Preventa™
Machine Safety Products

Catalog
2009



Schneider Electric

Preventa™ Machine Safety Products

1 Safety functions 1/2

Contents chapter 1 . . . . . 1/1

2 Safety automation system solutions

*Contents **chapter 2*** 2/0

Preventa safety PLCs 2/2

Selection guide: Safety PLCs **2/2**

Preventa safety controllers 2/104

Selection guide: Safety controllers **2/104**

Preventa safety relays 2/162

Selection guide: Safety relays **2/162**

Safety solutions on AS-Interface cabling system 2/262

Selection guide: Safety monitors and interfaces **2/262**

Safety modules integrated in automation platform 2/272

Selection guide: Safety modules for automation platform **2/272**

3 Safety detection solutions

*Contents **chapter 3*** 3/0

Safety switches 3/2

Selection guide: Safety switches **3/2**

Light curtains, type 4 and type 2 . . . . . 3/84

Selection guide: light curtains, types 4 and 2 . . . . . **3/84**

4 Safety dialog solutions

*Contents **chapter 4*** 4/0

Selection guide: Dialog components **4/2**

Cable pull switches 4/3

Palm buttons 4/15

5 Light Curtain Application and Installation

*Contents **chapter 5*** 5/0

6 European Safety Standards

*Contents **chapter 6*** 6/0

Safety Standards and Requirements for Europe 6/2

Additional EU Information *6/26*

7 US Safety Standards

*Contents **chapter 7*** *7/0*

Safety Standards and Requirements for the US *7/2*

Additional Information on US Safety Requirements *7/17*

8 Technical information

*Contents **chapter 8*** *8/0*

Product standards and certifications *8/2*

Degrees of protection provided by enclosures *8/4*

Product reference index *8/15*

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Safety Functions

Selection of protective functions *1/2*

Emergency stop function and principal protective functions *1/4*

Guards without locking device *1/4*

Guards with interlocking device *1/4*

Non-contact (coded magnetic) switch and system *1/5*

Light curtains *1/5*

Two-hand control stations *1/6*

Selection of Preventa™ safety solutions *1/7*

Selection of Preventa™ safety products *1/9*

Safety functions
Selection of protective functions

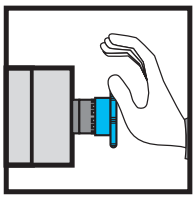
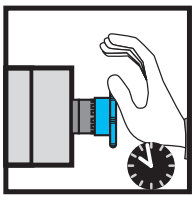
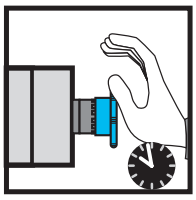
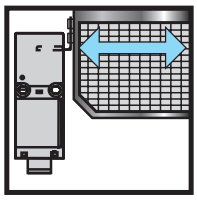
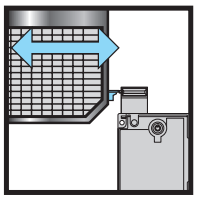
On the basis of the risk estimation established, the designer will select one or more protective functions that will meet the needs.
The standards classify these functions into two distinct groups.

Emergency stops

This function, required on all machines, is not considered as a principal method of risk reduction. It supplements other protective measures (standard EN/ISO 12100).

Depending on the type of stop, the standard recognizes three categories (see details below):
- emergency stop categories 0 or 1,
- controlled stop categories 1 or 2, generally used with variable speed drives (please refer to our specific Variable Speed Drive catalogs).

Selection of safety function families

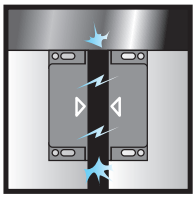
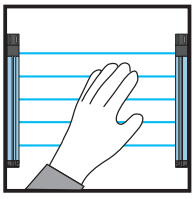
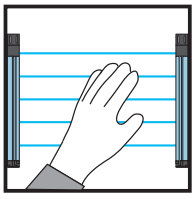
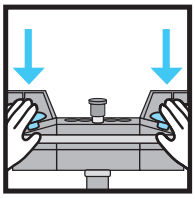
	Emergency stop			Protective solutions	
				Protective functions	
				Control of access to hazardous zones	
	Stop category 0	Stop category 1	Stop category 2	Interlocking Guard	
				Without guard locking	With guard locking
					
Access to hazardous zones:					
■ Free, frequent to continuous	-	-		-	-
■ Occasional (e.g.: once per shift) or frequent	-	-		X	X
Protection for all personnel	-	-		X	X
Stopping time of a dangerous movement:					
■ Short	X	-		X	-
■ Long (high inertia)	-	X		-	X
■ Long (high inertia) ; power is maintained on actuators	-	-	X	-	-

X	: The function provides the solution as long as the recommended use limits are complied with.
(X)	: The use of this function is possible but is not recommended.
-	: The function does not provide the solution.

Protection methods

The functions selected, as shown in the chart below, are based on two criteria:

1 persons may occasionally enter the hazardous zones or may work continuously within a hazardous zone,
2 the methods adopted to reduce the risks involve the use of defined functions.

				Starting and enabling of dangerous movements	
Coded magnetic switch	Light curtains		Safety mats	Two-hand control	Enabling switch
	ESPE	ESPE with muting function			
					
-	X	X	X	X	-
X	(X)	(X)	(X)	(X)	X
X	X	X	X	X	X
X	X	X	X	X	X
-	-	-	-	-	-
-	-	-	-	-	-

Safety functions
Selection of Preventa safety solutions

The table below indicates the associated control solutions for each safety function.
The Schneider Electric range of safety control solutions consists of four product families:
- dedicated safety relay modules with one or two safety functions,
- configurable controllers managing several safety functions,
- safety monitors and interfaces dedicated to the AS-Interface system, allowing use of a single medium for control and safety,
- safety PLCs used within complex safety systems.

		Product families		
		Safety relay modules	Configurable safety controllers	
				
Architecture		Simple machines	Machines with several safety functions	
Setting-up		Wired link	Configurable by pushbuttons	Configurable by software
Diagnostics		LED	LED	LED
		-	-	PC
		Solid-state outputs	Solid-state outputs	Modbus ® serial link (RTU), CANopen, Profibus DP
Functions	Emergency stop monitoring	XPSAC, XPSAF, XPSAK, XPSAR, XPSAX	X	X
	Monitoring of emergency stop and of a guard with timer	XPSATE, XPSAV	X	X
	Monitoring of a guard with safety switch	XPSAC, XPSAF, XPSAK, XPSAR, XPSAX	X	X
	Monitoring of a guard with coded magnetic switch	XPSDMB, XPSDME	X	X
	Monitoring of safety mats and sensitive edges	XPSAK	X	X
	Two-hand control (type IIIC acc. EN 574)	XPSBC, XPSBF	-	X
	Two-hand control (type IIIA acc. EN 574)	XPSBA	-	-
	Monitoring of type 4 light curtains, solid-state outputs and test function	XPSAFL, XPSAR, XPSAK	X	X
	Monitoring of single-beam photo-electric sensors (transmitter + receiver) with test input and built-in muting function	XPSCM	-	-
	Monitoring of 2 to 4 type 2 and type 4 light curtains	XPSLCD	-	X
	Monitoring of a type 4 light curtain with relay output	-	-	X
	Monitoring muting function of 2 light curtains with transistor outputs	XPS LCM	-	-
	Monitoring of an enabling switch	-	X	X
	Zero speed detection on motor	XPSVNE	-	X
	Monitoring the position of an elevator cabin	XPSDA	-	X
	Dynamic valve monitoring on linear hydraulic presses	XPSPVT	-	X
	Dynamic monitoring of double-bodied solenoid valves	XPSPVK	-	X
	Safety stop at top dead center with automatic overtravel monitoring on eccentric presses	XPSOT	-	X
	Foot switch	-	-	X

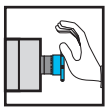
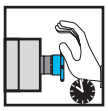
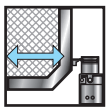
XPSAC, XPSAF,... : The product family provides the function.
X : The product family provides the function after programming (by means of pushbutton or software, depending on the product).
- : The product family does not provide the function.

AS-Interface “safety at work” safety interfaces and monitors			Safety PLCs
			
Machines using AS-Interface			Communication network
Interface to be connected	Built-in interfaces	Monitor library configurable by software	Programmable by software
-	-	LED	LED
-	-	PC	PC
-	-	AS-Interface	Modbus ® serial link (RTU), Modbus ® TCP/IP, Profibus DP
ASISSLB4, ASISSLE4, ASISSLE5	ASISEA1C, ASISSK1C, ASISSLE4, ASISSLE5	X	X
-	-	-	X
ASISSLC1, ASISSLC2, ASISSLLS	-	X	X
ASISSLC1, ASISSLC2, ASISSLLS	-	X	X
-	-	X	X
2 x ASISSLC2	-	X	X
-	-	X	X
-	-	X	X
-	-	-	-
-	-	X	X
ASISSLC1, ASISSLC2, ASISSLLS	-	X	X
-	-	-	-
-	-	-	X
-	-	-	X
-	-	-	X
-	-	-	X
-	-	-	X
-	-	-	X
ASISSLC1, ASISSLC2, ASISSLLS	-	X	X

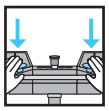
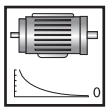
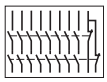
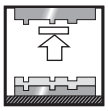
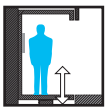
Safety functions
Selection of Preventa safety products

This selection table indicates which safety products to select, according to the required safety functions.

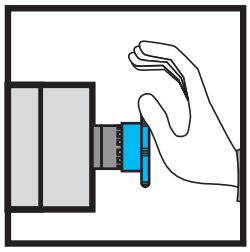
Final selection will be made by consulting the specific catalog pages for each of these products.

			Safety control solution						
			Emergency stop		Prevention functions				
					Control of access to hazardous zones				
			Stop category 0	Stop category 0+1	Interlocking guard with and without guard locking	Coded magnetic switch	ESPE light curtains	ESPE light curtains with muting function	Safety mats
									
	EN/ISO 13849	EN/IEC 62061							
Safety relay modules *One safety function, Hard wired.*	max. Category 1, PL = b	SIL 1	-	-	-	-	-	-	-
	max. Category 2, PL = c	SIL 1	-	-	-	-	XPSCM	XPSCM	-
	max. Category 3, PL = d	SIL 2	XPSAC, XPSAFL	XPSATE (cat. 1 stop)	XPSAC	XPSDMB, XPSDME	XPSAFL	-	XPSAK
	max. Category 4, PL = e	SIL 3	XPSAF, XPSAK, XPSAR	XPSATE (cat. 0 stop), XPSAV	XPSAF, XPSAK, XPSAR	XPSDMB, XPSDME	XPSAFL, if OSSDs are tested by ESPE	XPSCM, XPSLCM	-
Configurable safety *Several safety functions controllers, Hard wired, Fieldbus for diagnostics (only for XPSMC).*	max. Category 1, PL = b	SIL 1	-	-	-	-	-	-	-
	max. Category 2, PL = c	SIL 1	-	-	-	-	-	-	-
	max. Category 3, PL = d	SIL 2	-	-	-	-	-	-	-
	max. Category 4, PL = e	SIL 3	XPSMP, XPSMC	XPSMC	XPSMP, XPSMC	XPSMP, XPSMC	XPSMP, XPSMC	XPSMC	XPSMP, XPSMC
AS-Interface "safety at work" safety monitors and interfaces *Several safety functions, Safety Network, Fieldbus for diagnostics.*	max. Category 1, PL = b	SIL 1	-	-	-	-	-	-	-
	max. Category 2, PL = c	SIL 1	-	-	-	-	-	-	-
	max. Category 3, PL = d	SIL 2	-	-	-	-	-	-	-
	max. Category 4, PL = e	SIL 3	X	X	X	X	X	-	-
Safety PLCs *Several safety functions, Safety Network, Fieldbus for diagnostics.*	max. Category 1, PL = b	SIL 1	X	X	X	X	X	X	X
	max. Category 2, PL = c	SIL 1	X	X	X	X	X	X	X
	max. Category 3, PL = d	SIL 2	X	X	X	X	X	X	X
	max. Category 4, PL = e	SIL 3	X	X	X	X	X	X	X

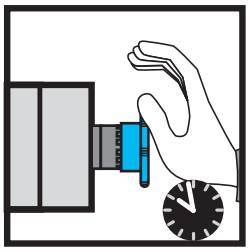
XPSAC, ... : The solution is specifically provided by the products indicated.
X : The solution is provided by the products.
- : The solution is not provided by the products.

Starting and enabling of dangerous movements		Safety monitoring functions				Functions for specific machines		
Two-hand control	**Enabling switch**	**Zero speed detection (remanent voltage)**	**Zero speed detection/safety speed reduction**	**Safety timer**	**Increasing the number of safety contacts**	**Safety valve monitoring**	**Safety function for presses**	**Elevator cabin levelling and door monitoring**
								
XPSBA	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	XPSVNE	-	XPSTSA XPSTSW	-	-	-	-
XPSBC, XPSBF	-	-	-	-	XPSECM, XPSECP	XPSPVT, XPSPVK	XPSOT	XPSDA
XPSBA	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
XPSMC	XPSMP, XPSMC	-	XPSMC	XPSMC	-	XPSMC	XPSMC	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
X	-	-	-	**X**	-	-	-	-
X	**X**	-	**X**	**X**	**X**	**X**	**X**	**X**
X	**X**	-	**X**	**X**	**X**	**X**	**X**	**X**
X	**X**	-	**X**	**X**	**X**	**X**	**X**	**X**
X	**X**	-	**X**	**X**	**X**	**X**	**X**	**X**

Safety functions
Emergency stop function
and Principal protective functions
Guards without guard locking device
Guards with guard locking device

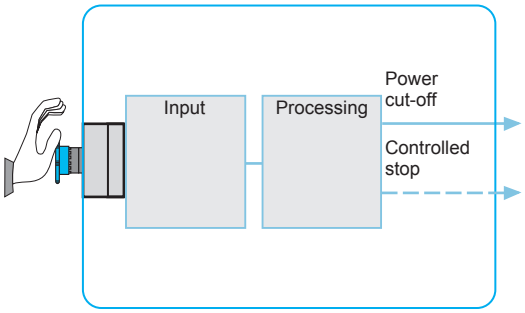


Stop category 0

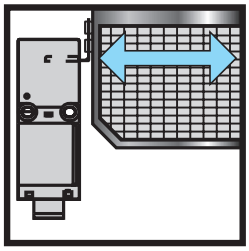


Stop category 1

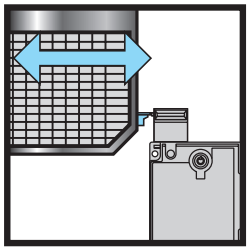
Emergency stop function



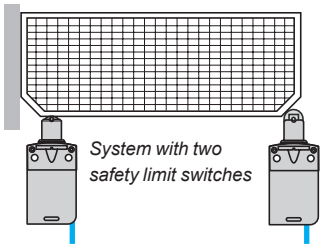
Sub-elements of the emergency stop function



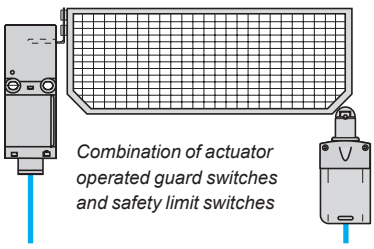
Guard without guard locking device



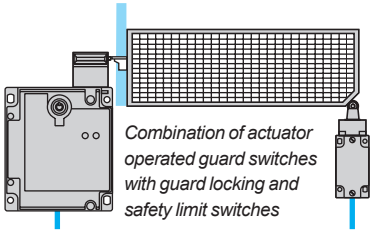
Guard with guard locking device



System with two safety limit switches



Combination of actuator operated guard switches and safety limit switches



Combination of actuator operated guard switches with guard locking and safety limit switches

Emergency stop function

International standard EN/ISO 13850 (which replaces standard EN 418) specifies the functional requirements and design principles of emergency stop devices.
It applies to all machines, whatever type of energy is used to control this function.
NFPA 79 (US) also has very similar electrical requirements for emergency stop functions.

When the emergency stop instruction ceases, the effect must be maintained until it is reset. Manual resetting must only be possible in the location where the instruction was given.
Resetting must not start the machine, but simply enable the starting cycle.
Restarting of the machine must not be possible until the emergency stop has been reset.

The standard allows two types of stop:
- category 0 : stopping by immediate cutting-off of power or mechanical disconnection between the dangerous components,
- category 1 stop: controlled stopping with power maintained to the actuator to achieve stopping (braking for example), then cut-off of power when standstill is reached.

The choice between these two stopping methods is determined by an evaluation of the machine-related risks.

This function includes several sub-functions but is generally represented by the drawings to the left.

The operator interface may be:
- a pushbutton equipped with a mushroom head,
- a cable actuated switch,
- a foot switch.

Guards without guard locking device

On a large number of potentially dangerous machines, the operator must be kept at a distance during operation, but needs to take action when the machine is stopped to position a part, remove a product or adjust a tool.

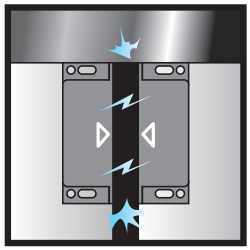
An effective means of protection is to install a guard which, according to the type of installation, will cut-off the power to the motor if an attempt is made to open it during the machine operating phase.
In all cases, it must not be possible to restart the machine until the guard is closed.

Depending on the level of protection required, the system will consist of two safety limit switches (safety interlock switches) or a combination of protected, actuator operated guard switches to prevent tampering.

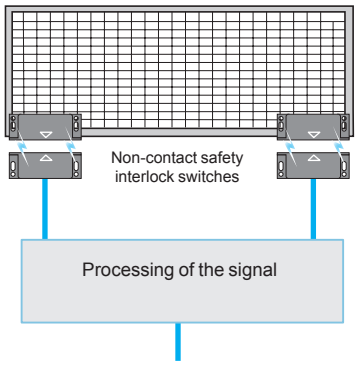
Guards with guard locking device

This type of guard is necessary for potentially dangerous machines with high inertia (long rundown time).
The guard is interlocked (by a solenoid for example); it cannot be opened until the machine has come to a complete standstill.

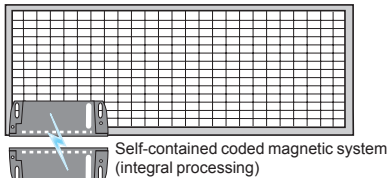
Safety functions
Principal protective functions *(continued)*
Non-contact safety interlock and light curtains



Non-contact safety interlock



Functions of non-contact safety interlockes



Functions of a non-contact safety interlock system

Non-contact safety interlock and system

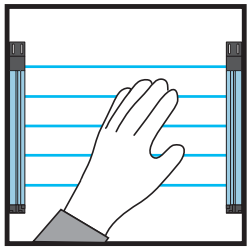
A non-contact solution is often used on industrial machines fitted with a door or guards with imprecise guiding.
It is particularly suitable for machines subjected to frequent washing or splashing of liquids as well as small machines with a single guard for self-contained systems.

Depending on the models used, the sensing distance will be between 0.19 and 0.30 in. (5 and 10 mm).

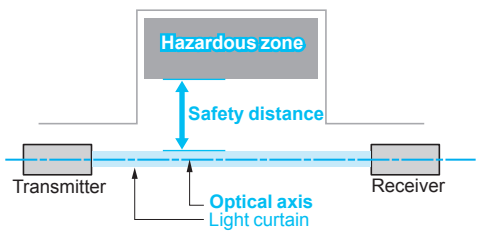
The reed contacts used for the non-contact safety interlock switches (coded magnetic switches) cannot withstand short-circuits and the switches always incorporate a resistor in series. Their operation can therefore only be guaranteed with the associated processing module (for example: safety relay or safety controller).

The Hall-effect self-contained systems with integral processing do not require any further processing of the signal (XCSDM3 and XCSDM4).

The illustrations to the left show the functions of non-contact safety interlocks and of a system.



Light curtain



Light curtains

Light curtains are electro-sensitive systems (Electro-Sensitive Protective Equipment - also referred to as ESPE) designed to protect persons working in the vicinity of machinery, by stopping dangerous movements when a light beam is broken.

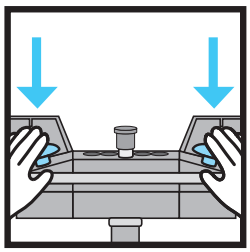
The absence of a door or guard reduces loading, inspection or tool changing times.

This type of system, defined by standards EN/IEC 61496-1 and EN/IEC 61496-2, is frequently used with machines such as:
- presses,
- machine tools,
- assembly lines, etc.

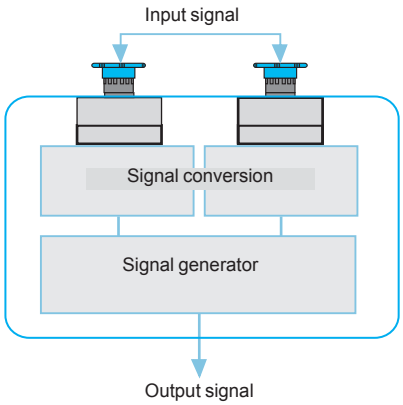
The machine must be designed so that a person cannot gain access to dangerous movements without breaking one or more of the light beams.
In addition, the movement must be stopped whatever the entry speed of the operator into the hazardous zone.

The diagram to the left illustrates the operation of a light curtain.

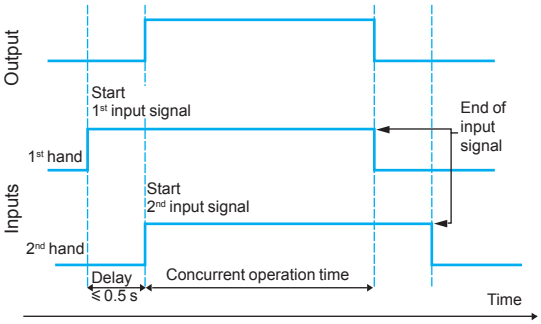
Safety functions
Principal protective functions *(continued)*
Two-hand control systems



Two-hand control system



Functions of a two-hand control system



Functional diagram of a two-hand control system

Two-hand control stations

Standards ISO 13851 and EN 574 define this type of system.
It requires simultaneous operation by both hands in order to start and maintain operation of a machine.
It therefore provides protection exclusively for the person operating it.

A diagram representing the function is given to the left; it must meet the following requirements:
- concurrent, maintained operation of the two input controls for the same period of time,
- synchronous operation; the delay between the two signals must not exceed 0.5 s,
- prevention of accidental operation (mechanical guard),
- protection against tampering.

2

Preventa™ safety PLCs, XPS MF

Selection guide: Preventa™ safety PLCs, XPS MF. 2/2

Preventa™ safety compact PLCs, XPS MF40 . . . . . *2/4*

Preventa™ safety compact PLCs, XPS MF31/30/35 . . . . . *2/18*

Preventa™ safety modular PLC, XPS MF60:

- Rack, power supply and central processing unit *2/34*
- "In rack" analog input card *2/50*
- "In rack" analog output card *2/52*
- "In rack" mixed card: counting inputs/digital outputs *2/54*
- "In rack" digital input card (24 digital inputs) *2/56*
- "In rack" digital input card (32 digital inputs) *2/58*
- "In rack" digital I/O card *2/60*
- "In rack" relay output card *2/62*

Communication on network and bus *2/64*

Programming software XPSMFWIN for Preventa™ safety compact and modular safety PLCs, XPS MF *2/68*

Selection guide: safety remote input/output modules, XPS MF1/2/3 . . . . . 2/74

- Safety remote input modules, XPS MF1 . . . . . *2/76*
- Safety remote output modules, XPS MF2 . . . . . *2/80*
- Safety remote mixed I/O modules, XPS MF3 . . . . . *2/90*

Preventa™ safety controllers

Selection guide: Preventa™ safety controllers 2/104

Controllers with pre-defined functions, XPS MP *2/106*

Configurable controllers, XPS MC *2/118*

Preventa™ safety relay modules

Selection guide: Preventa™ safety relay modules. 2/162

Electrical Ratings *2/172*

Type XPS AC, for Emergency stop and switch monitoring *2/174*

Type XPS AV and XPS ATE, for Emergency stop and switch monitoring *2/178*

Type XPS AF, for Emergency stop and switch monitoring *2/186*

Type XPS AFL, for Emergency stop, switch and light curtain monitoring *2/190*

Type XPS AR, for Emergency stop, switch or light curtain monitoring *2/194*

Type XPS AK, for Emergency stop, switch, sensing mat/edges or light curtain monitoring *2/200*

Type XPS BA, XPS BC and XPS BF, for electrical monitoring of two-hand control systems *2/206*

Type XPS LCD, for monitoring 2 to 4 light curtains type 2 and type 4 . . . . . *2/214*

Type XPS LCM, for the "muting" function of type 2 and type 4 light curtains *2/218*

Type XPS ECM and XPS ECP, for increasing the number of safety contacts *2/226*

Type XPS TSA and XPS TSW, for safety time delays *2/230*

Type XPS DMB and XPS DME,
for coded magnetic switch monitoring *2/234*

Type XPS VNE,
for zero speed detection *2/240*

Type XPS DA,
for elevator control *2/246*

Type XPS PVT,
for dynamic monitoring of hydraulic valves on linear presses *2/248*

Type XPS PVK,
for dynamic monitoring of double-bodied solenoid valves *2/252*

Type XPS OT,
for safety stop with automatic overtravel monitoring and control *2/256*

Dimensions *2/260*

Safety solutions on AS-Interface® cabling system

Selection guide: Safety monitors and interfaces ***2/262***

Safety monitors *2/264*

Safety interfaces *2/268*

Safety modules integrated in automation platform

Selection guide: Preventa™ safety modules for automation platform ***2/272***

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular, XPSMF

Presentation

*Products referenced **XPSMF31222, XPSMF3022** and **XPSMF35●●** are marked **HIMatrix® F31, HIMatrix® F30** and **HIMatrix® F35** (manufactured by Hima, sold by Schneider Electric).*

Compact PLCs:
- Designed for use with numerous machine safety functions and for the protection of personnel.
- Designed for use in safety related parts of control systems up to category 4 conforming to EN 954-1, up to performance level "e" conforming to EN/ISO 13849-1, and up to SIL 3 conforming to EN/IEC 61508.





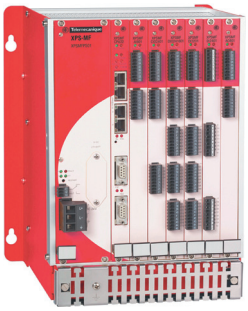




User memory	Application	250 kB			
	Data	250 kB			
Response time		Depending on size of application			
Maximum power consumption		8 A			9 A
Supply		External ⎓ 24 V supply (with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)			
Inputs	**Digital**	Number of channels	**24**, configurable, not electrically isolated	**20**, not electrically isolated	**24**, not electrically isolated
		Current at state 0	1.5 mA max. at ⎓ 24 V	1.5 mA max., 1.25 mA at 5 V	
		Current at state 1	3.5 mA at ⎓ 24 V 4.5 mA at ⎓ 30 V	≥ 2 mA at ⎓ 15 V	> 2 mA at ⎓ 15 V 3.5 mA at ⎓ 24 V 4.5 mA at ⎓ 30 V
	Analog	Number of channels	–	–	– **8**, single-pole
		Range: voltage/current	–	–	– 0…10 V/0…20 mA *(1)*
	Counting	Number of channels	–	–	– **2**
		Current	–	–	– 1.4 mA at ⎓ 5 V, 6.5 mA at ⎓ 24 V
Outputs	**Digital**	Number of channels	**24**, configurable, not electrically isolated	**8** *(2)*, not electrically isolated	**8**, not electrically isolated
		Output current	Chnls. 1 to 3, 5 to 7, 9 to 11, 13 to 15, 17 to 19, 21 to 23: 0.5 A at 140°F (60°C) Channels 4, 8, 12, 16, 20 and 24: 1 A at 140 °F (60 °C), 2 A at 122°F (50°C)	Channels 1 to 3 and 5 to 7: 0.5 A at 140 °F (60 °C) Channels 4 and 8: 1 A at 140°F (60 °C), 2 A at 122°F (50 °C)	
	Analog	Number of channels	–	–	– –
		Range: voltage/current	–	–	– –
	Relay	Number	–	–	– –
		Switching voltage	–	–	– –
	Line control		**2 x 4**	*(2)*	*(2)* –
Input/output connections			Removable screw terminals are provided with all Safety compact PLCs Reference **XPSMF40●●** is also provided with cage clamp terminal		
Communication on Ethernet network			**By integrated RJ45 switched Ethernet communication ports**		
■ **Safe communication** using SafeEthernet protocol			yes	yes	yes yes
■ **Non safe communication** using Modbus® TCP/IP protocol, server (slave)			yes (**XPSMF4002/4022/4042**)	yes (**XPSMF31222**)	yes (**XPSMF3022**) yes (**XPSMF3502/MF3522/MF3542**)
Communication on fieldbus					
Non safety using Modbus® RTU protocol, slave (RS 485)			yes (**XPSMF4020/4022**)	–	yes (**XPSMF3022**) yes (**XPSMF3522**)
Non safety using PROFIBUS DP protocol, (V0 slave)			yes (**XPSMF4040/4042**	–	– yes (**XPSMF3542**)
Safety PLC type			**XPSMF400●/MF402●/MF404●**	**XPSMF31222**	**XPSMF3022** **XPSMF3502/MF3522/MF3542**
See page			2/12	2/27	2/27 2/27
"In rack" card type			–	–	– –
See page			–	–	– –

(1) With 500 Ω jumper. (2) The digital outputs can be configured as line control outputs.

Modular PLC XPSMF60: metal rack **XPSMFGEH01** with slots for power supply module **XPSMFPS01**, central processing unit **XPSMFCPU22** and six “in rack” I/O cards.
- Designed for use with numerous machine safety functions and for the protection of personnel.
- Designed for use in safety related parts of control systems up to category 4 conforming to EN 954-1, up to performance level “e” conforming to EN/ISO 13849-1, and up to SIL 3 conforming to EN/IEC 61508.



500 kB						
500 kB						
Depending on size of application						
30 A max., 32 A external fuse						
External ⎓ 24 V supply (with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)						
–	–	–	**24**, electrically isolated	**32** *(2)*, electrically isolated	**24** *(2)*, electrically isolated	–
–	–	–	–	1 mA at 5 V	1 mA at 5 V	–
–	–	–	⩾ 2.2 mA at 79 V	2 mA at ⎓ 10 V, 5 mA at ⎓ 24 V	2 mA at ⎓ 10 V, 5 mA at ⎓ 24 V	–
8 single-pole or **4** 2-pole, configurable, electrically isolated	–	–	–	–	–	–
- 10…+ 10 V/0…20 mA *(1)*	–	–	–	–	–	–
–		**2**	–	–	–	–
–	–	0.8 A at ⎓ 3.3 V 0.1 A at ⎓ 5 V 0.1 A + output current at ⎓ 24 V	–	–	–	–
–	–	**4**	–	–	**16** *(3)*, electrically isolated	–
–	–	0.5 A per channel, 2 A max. per “in rack” card	–	–	2 A per channel at 86 °F (30 °C), 8 A max. at 86 °F (30 °C) per “in rack” card	–
–	**8**, electrically isolated	–	–	–	–	–
–	- 10…10 V / 0…20 mA	–	–	–	–	–
–	–	–	–	–	–	**8**
–	–	–	–	–	–	∿ 6…250 V
–	–	–	–	–	*(3)*	–
Removable screw terminals are provided with “in rack” I/O cards and Power supply module						
By integrated RJ45 switched Ethernet communication ports						
yes						
yes						
yes						
yes						

XPSMFGEH01 (rack) + XPSMFPS01 (power supply) + XPSMFCPU22 (central processing unit) + “in rack” I/O cards (to be selected from below)

2/44

XPSMFAI801	XPSMFAO801	XPSMFCIO2401	XPSMFDI2401	XPSMFDI3201	XPSMFDIO241601	XPSMFDO801
2/51	2/53	2/55	2/57	2/59	2/61	2/63

(1) With 250 Ω or 500 Ω jumper. (2) Digital inputs can be supplied by the line control outputs of the same I/O card. (3) The digital outputs (n° 1… n° 16) can be configured as line control outputs.

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF40



XPSMF4000
XPSMF4002



XPSMF4020
XPSMF4022



XPSMF4040
XPSMF4042

Presentation

Preventa™ compact safety PLCs **XPSMF40●●** enable the monitoring of simple to complex safety functions for all industrial applications relating to the protection of personnel and machine safety.

Designed for use with numerous machine safety functions, these compact safety PLCs are intended for use in safety related parts of control systems.
They can manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

The compact safety PLC range **XPSMF40●●** consists of 6 versions that are differentiated by their non safety related communication protocols.

Compact PLCs	Digital Inputs/Outputs	Line control outputs	Communication		
			On Ethernet network		On fieldbus
			Safety protocol	Non safety protocol	
XPSMF4000	24, configurable	8	SafeEthernet	–	–
XPSMF4002	24, configurable	8	SafeEthernet	Modbus® TCP/IP Server	–
XPSMF4020	24, configurable	8	SafeEthernet	–	Modbus® serial Slave (RTU)
XPSMF4022	24, configurable	8	SafeEthernet	Modbus® TCP/IP Server	Modbus® serial Slave (RTU)
XPSMF4040	24, configurable	8	SafeEthernet	–	PROFIBUS DP V0 slave
XPSMF4042	24, configurable	8	SafeEthernet	Modbus® TCP/IP Server	PROFIBUS DP V0 slave

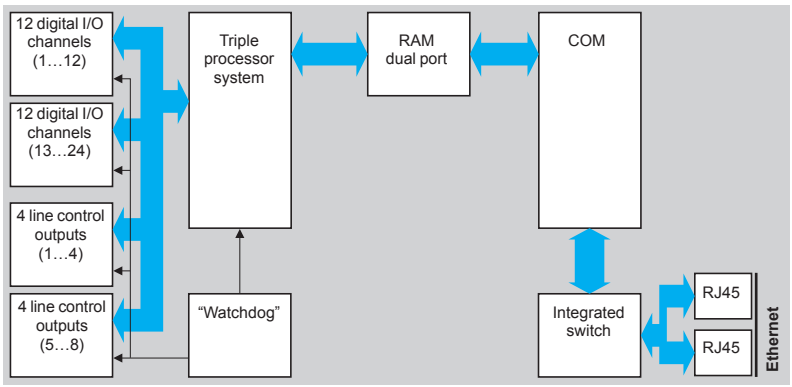
Safety PLCs

In order to meet safety requirements, the compact safety PLCs **XPSMF40●●** incorporate two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level “e” conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between the safety PLCs and the safety remote I/O modules (**Special Switch**).

■ **Redundancy**: the triple processor integrated in the compact safety PLCs analyzes and compares the data received from the safety inputs and outputs. The incoming and outgoing data (programmed values and received values) are received in parallel by the three processors and compared in real-time.
■ **Self-monitoring (“Watchdog”)**: the compact safety PLCs continuously monitor the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.
■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the inputs and outputs of the safety PLCs on the Ethernet network, while avoiding signal collisions and excessive amounts of data on the network.

Functional diagrams

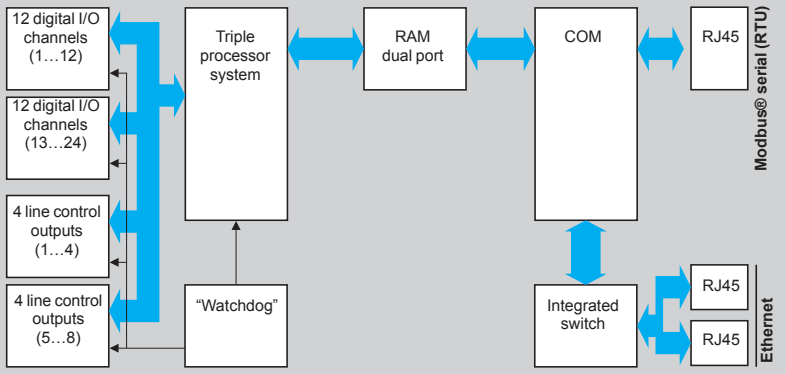
Compact safety PLCs XPS4000/MF4002



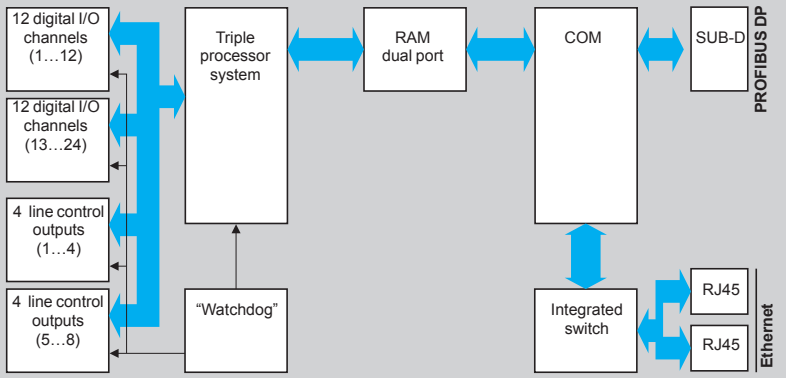
Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF 40

Functional diagrams *(continued)*

Compact safety PLCs XPSMF4020/MF4022



Compact safety PLCs XPSMF4040/MF4042



Line control for safety PLCs XPSMF40●●

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring anomaly (short-circuit, line break) to be seen at the inputs of the safety PLCs.

The line control outputs 1 to 8 are connected to the digital inputs of the same circuit.

Example: Emergency stop pushbutton with two normally closed (N.C.) contacts that are supplied by two different line control outputs connected via these two normally closed contacts and fed into the inputs of the safety PLCs

Programming automated safety functions

Software **XPSMFWIN** (reference SSV1XPSMFWIN) running on a PC enables the programming of all safety remote I/O modules and safety PLCs, as well as configuration of the communication settings.

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF40

Compact safety PLCs **XPSMF40●●** incorporate:
- ■ 24 configurable I/O channels
- □ digital inputs
- □ or digital outputs
- ■ and 8 (2 x 4) line control output channels.

Digital inputs

Compact safety PLCs **XPSMF40●●** incorporate up to 24 digital inputs for the connection of safety related input devices, such as emergency stop contacts, magnetic switches, light curtains, etc.

Compact PLCs	Digital inputs		
	N°	Safety detection	Safety dialog
XPSMF4000	24	Limit switches, Guard switches, with reset and with actuator, Light curtains type 2 and type 4, Safety mats and sensing edges…	Mushroom head Emergency stops, Enclosures for control and signalling units, Two-hand control stations…
XPSMF4002	24		
XPSMF4020	24		
XPSMF4022	24		
XPSMF4040	24		
XPSMF4042	24		

Digital outputs

Compact safety PLCs **XPSMF40●●** incorporate up to 24 digital outputs for the connection of safety related output devices, such as contactors, illuminated beacons, sirens, etc.

Compact PLCs	Digital outputs		
	N°	Safety actuators	Safety dialog
XPSMF4000	24	Contactors-motors, Contactors-reversing, Variable speed drives...	Beacons and indicator banks, Rotating mirror beacons, Sirens…
XPSMF4002	24		
XPSMF4020	24		
XPSMF4022	24		
XPSMF4040	24		
XPSMF4042	24		

Line control outputs

Compact PLCs	Line control outputs	
	N°	
XPSMF4000	8 (2 x 4)	Short-circuit and line break monitoring
XPSMF4002		
XPSMF4020		
XPSMF4022		
XPSMF4040		
XPSMF4042		

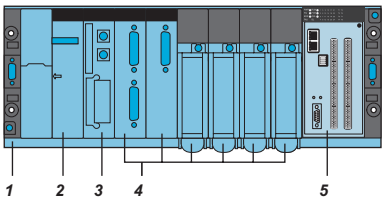
Remote inputs and outputs

In addition to the inputs/outputs integrated as standard, compact safety PLCs **XPSMF40●●** can be connected to safety remote input modules **XPSMF1** and/or safety remote output modules **XPSMF2** and/or safety remote mixed I/O modules **XPSMF3**.
The safety remote input, output and mixed I/O modules can be located within the vicinity of the machines to be monitored, thus reducing cabling.

Communication between these safety remote I/O modules and safety PLCs **XPSMF40●●** is performed on an Ethernet network using the SafeEthernet safety protocol, via the integrated RJ45 switched Ethernet communications ports.

Integrating safety PLCs XPSMF40 on a Premium™ automation platform

Designed for mechanical integration on a Premium™ automation platform, safety PLCs **XPSMF40●●** occupy 2 slots on the Premium™ rack **TSX RKY**.
There is interaction between the two programming environments (Unity and XPSMFWIN): the variables defined using software **XPSMFWIN** can be retrieved by Unity (platform programming software) by using a tool included in Safety Suite V2.



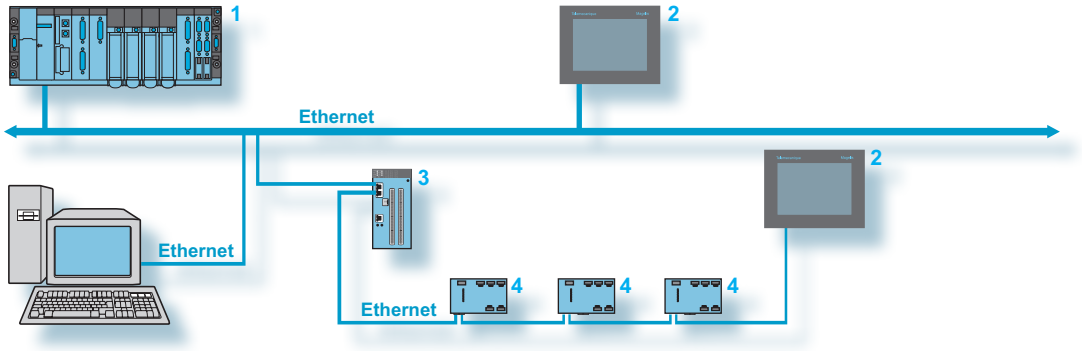
*Example of mechanical integration of a compact safety PLC **XPSMF40** on a Premium™ automation platform.*

1 *Premium™ rack*
2 *Power supply module*
3 *Premium™ processor module*
4 *Other Premium™ modules (communication, I/O)*
5 *Compact safety PLC **XPSMF40***

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF40

Safety communication on Ethernet network

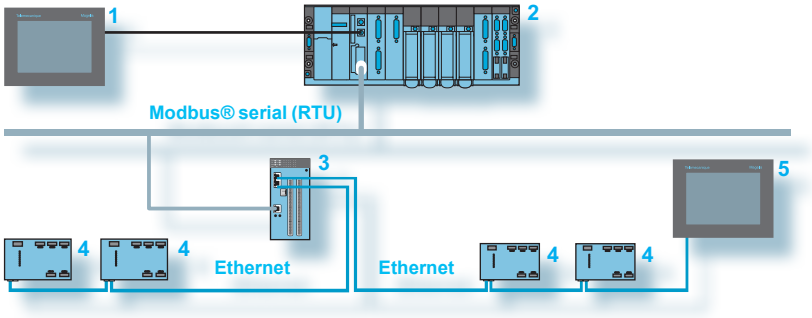
Communication between the PC, Magelis ® graphic terminals or automation platform (Premium™) and the compact safety PLCs **XPSMF40●●** is achieved by **Ethernet** network connection via the integrated RJ45 switched Ethernet communication ports of the compact PLCs.



1 Premium™ automation platform: Modbus® TCP/IP client.
2 Graphic terminal **XBTGT**: Modbus® TCP/IP client.
3 Safety PLCs **XPSMF40●●**: Modbus® TCP/IP servers.
4 Safety remote I/O modules **XPSMF1/2/3**. They communicate with safety PLCs **XPSMF40●2** using the SafeEthernet protocol.

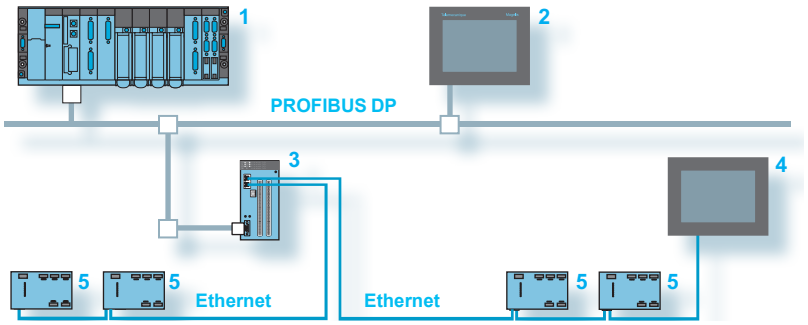
Communication on Modbus® serial (RTU) and PROFIBUS DP fieldbus

■ On **Modbus® serial (RTU)**, safety PLCs **XPSMF4020** and **XPSMF4022** are slaves of the Premium™ automation platform and Magelis ® graphic terminal.
They are connected to the Modbus® serial network via their RJ45 connector.



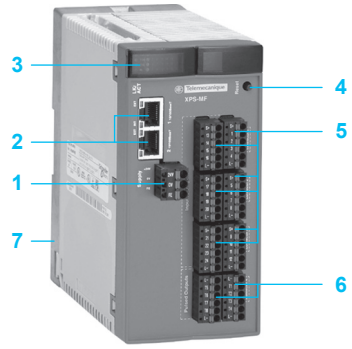
1 Graphic terminal **XBTGT**: Modbus® serial (RTU) master.
2 Premium™ automation platform: Modbus® serial (RTU) master.
3 Safety PLCs **XPSMF402●**: Modbus® serial (RTU) slave, Modbus® TCP/IP server.
4 Safety remote I/O modules **XPSMF1/2/3**. They communicate with safety PLCs **XPSMF402●** using the SafeEthernet protocol.
5 Graphic terminal **XBTGT**: Modbus® serial (RTU) client.

■ On **PROFIBUS DP**, safety PLCs **XPSMF4040** and **XPSMF4042** are slaves of the Premium™ automation platform and Magelis ® graphic terminal.
They are connected to the PROFIBUS DP network via their SUB-D 9-pin connector.



1 Premium™ automation platform: PROFIBUS DP master.
2 Graphic terminal **XBTGT**: PROFIBUS DP master.
3 Safety PLC **XPSMF404●**: PROFIBUS DP slave, Modbus® TCP/IP server.
4 Graphic terminal **XBTGT**: Modbus® TCP/IP client.
5 Safety remote I/O modules **XPSMF1/2/3**. They communicate with safety PLCs **XPSMF404●** using the SafeEthernet protocol.

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF40

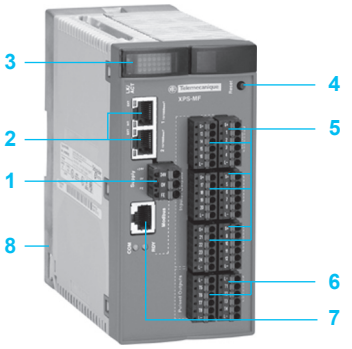


Description

Safety PLCs XPSMF4000/MF4002

On the front cover of the enclosure:

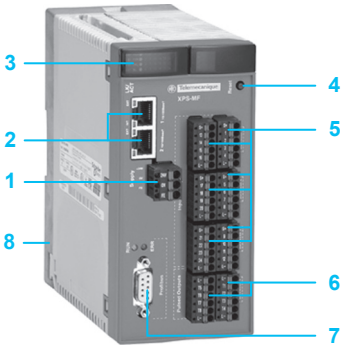
1 One terminal block *(1)* for ⎓ 24 V supply.
2 Two integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus® TCP/IP server protocol).
3 Process status LEDs.
4 One “Reset” button.
5 Six terminal blocks *(1)* for connection of configurable digital I/Os.
6 Two terminal blocks *(1)* for connection of line control outputs.
7 On the rear face: one removable plate with spring mounting for mounting on 35 mm ⊔ rail.



Safety PLCs XPSMF4020/MF4022

On the front cover of the enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 Two integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus® server protocol).
3 Process status LEDs.
4 One “Reset” button.
5 Six terminal blocks *(1)* for connection of configurable digital I/Os.
6 Two terminal blocks *(1)* for connection of line control outputs.
7 One RJ45 connector for connection on Modbus® serial (RTU), with 2 process status LEDs.
8 On the rear face: one removable plate with spring mounting for mounting on 35 mm ⊔ rail.



Safety PLCs XPSMF4040/MF4042

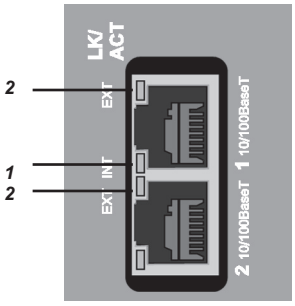
On the front cover of the enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 Two integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus® TCP/IP server protocol).
3 Process status LEDs.
4 One “Reset” button.
5 Six terminal blocks *(1)* for connection of configurable digital I/Os.
6 Two terminal blocks *(1)* for connection of line control outputs.
7 One SUB-D (9-pin female) connector for connection on PROFIBUS DP, with 2 process status LEDs.
8 On the rear face: one removable plate with spring mounting for mounting on 35 mm ⊔ rail.

*(1) Removable Screw and Cage clamp terminals are provided with compact safety PLCs **XPSMF40**.*



Process status LEDs



1 *Internal Ethernet LED*
2 *External Ethernet LEDs*



Modbus® serial (RTU) LEDs



PROFIBUS DP LEDs

LED details

Process status LEDs on safety PLCs XPSMF40●●

LED	Color	Status	Meaning
1…24	Green	On	Channels configured as inputs: input signal being received. Channels configured as outputs: output signal being sent.
T1…T8	Green	On	Line control outputs active.
PWR	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
PG	Yellow	On	The CPU is being loaded with a new configuration.
		Flashing	The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
ERR	Red	On	Software error or hardware anomaly detected by the CPU.
			The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the PC.
		Off	No errors detected.
FAU	Orange	On	Error display for line control.
			The user application has caused an error.
			The system configuration is defective.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred while writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/software tests carried out.
		Flashing	The CPU is in STOP and is not executing any user application. All the outputs are reset to a safe, de-energized state.
		Off	The CPU is in “ERROR” state (see ERR).
FOR	Green	On	The CPU is in RUN mode and force is active.
		Flashing	The system is not processing (STOP), but force is prepared and is activated if the triple processor is started.
		Off	Force mode not activated.
OSL	Orange	Flashing	Emergency loading of the operating system is active.
BL	Orange	Flashing	COM in INIT_Fail state.

Ethernet LEDs on safety PLCs XPSMF40●●

LK/ACT external	Green	Off	No connection/link established.
		On	Connection established/link established.
		Flashing	External data exchange (speed 10…100 Mbps).
LK/ACT internal	Green	Off	No connection/link established.
		On	Connection established/link established.
		Flashing	Internal data exchange (speed 10…100 Mbps).

Modbus® serial (RTU) LEDs on safety PLCs XPSMF4020/MF4022

COM	Yellow	Off	No bus network signals being received or transmitted.
		On	Bus network signals being received or transmitted.
RDY	Green	Off	Transmission power not available.
		On	Equipment on.

PROFIBUS DP LEDs on safety PLCs XPSMF4040/MF4042

RUN	Green	Off	Equipment not connected or not operational.
		On	Equipment operational.
ERR	Red	Off	Transmission power not available or the slave is exchanging data.
		On	Connection to other equipment is established but no data exchange is possible. Bus disconnected or bus Master not available.
		Flashing	A configuration error has occurred and no data exchange is possible.

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF40

Environment

Compact safety PLC type			XPSMF4000/4002, XPSMF4020/4022, XPSMF4040/4042
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1, EN/ISO 13849-1 and EN/IEC 61508)			Category 4 (EN 954-1), Performance level "e" (EN/ISO 13849-1), Safety integrity level: SIL 3 (EN/IEC 61508)
Product certifications			IEC 61511 part 1-3: 2004, DIN VDE 0116: 1989, EN 50156-1: 2004, EN 12067-2: 2004, EN 298: 2003, EN 230: 2005, NFPA 85: 2001, EN/IEC 61131-2: 2003, EN 61000-6-2: 2001, EN 61000-6-4: 2001
Ambient air temperature conforming to EN/IEC 61131-2	Operating	**°F (°C)**	+32… + 140 (0…+ 60)
	Storage	**°F (°C)**	-40… + 185 (- 40…+ 85)
Relative humidity			95% (supply not connected)
Degree of protection	Enclosure		IP 20
Pollution			Degree of pollution II
Altitude			6560 ft. (2,000 m)
Protection class			Class II, conforming to EN/IEC 61131-2
Electromagnetic compatibility			Conforming to EN/IEC 61131-2
Vibration resistance conforming to EN/IEC 61131-2	Operating		1 g, frequency 9…150 Hz
Shock resistance conforming to EN/IEC 61131-2	Operating		15 g (duration 11 ms), unit test while operating, 2 cycles per axis
Resistance to electrostatic discharges conforming to EN/IEC 61000-4-2		**kV**	4 contact, 8 air discharge
Immunity to high frequency interference conforming to EN/IEC 61000-4-3		**V/m**	10 (80 MHz…2 GHz), amplitude modulation 80%

Electrical characteristics

Supply	Voltage	**V**	⎓ 24 (external supply with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)
	Voltage limits		- 15…+ 20 %
Maximum power consumption		**A**	8
Idle current		**A**	0.5
Immunity to momentary supply interruptions		**ms**	10
Protection			Internal fuse, 10 A
Response time		**ms**	Depending on size of application
Clock			Supplied by backup capacitor for 1 week following loss of supply
User memory	Application	**kB**	250
	Data	**kB**	250
LED display			Yes
Digital inputs			
Number	Inputs not electrically isolated		24, configurable channels
Permissible current	At state 0	**mA**	1.5 max. at ⎓ 24 V
	At state 1	**mA**	3.5 at ⎓ 24 V, 4.5 at ⎓ 30 V
Input supply			3 x ⎓ 20 V/100 mA (on 24 V)
Input resistance		**kΩ**	< 7
Overvoltage protection		**V**	- 10, + 35
LED display			Yes, see page 2/9
Maximum distance of equipment			984 ft. (300 m)
Digital outputs			
Number	Outputs not electrically isolated		24, configurable channels
Output voltage		**V**	⎓ 24 ± 2
Output current	Channels 1 to 3, 5 to 7, 9 to 11, 13 to 15, 17 to 19, 21 to 23	**A**	0.5 at 140 °F (60 °C)
	Channels 4, 8, 12, 16, 20 and 24	**A**	1 at 140 °F (60 °C), 2 at 122 °F (50 °C)
Minimum load		**mA**	2 per channel
Leakage current at state 0		**mA**	1 max. at 2 V
Response to overload			Shutdown of outputs concerned with cyclic reconnection
Total output current		**A**	7 max., shutdown of all outputs if exceeded with cyclic reconnection
LED display			Yes
Maximum distance of equipment			984 ft. (300 m)
Line control outputs			
Number	Outputs not electrically isolated		8 (2 x 4)
Output voltage		**V**	20, depending on the supply voltage
Output current		**mA**	60
Minimum load		**mA**	None
Response to overload			4 x ≥ 19.2 V/60 mA (on 24 V), short-circuit current
LED display			Yes

Presentation: page 2/4 | Characteristics: page 2/10 | References: page 2/12 | Dimensions, mounting: page 2/15 | Connections: page 2/16

Communication

Ethernet network

Safety communication using SafeEthernet safety protocol

Compatibility			**XPSMF4000/MF4002, XPSMF4020/MF4022, XPSMF4040/MF4042**
Transmission	Communication ports		Integrated 2 RJ45 switched Ethernet communications ports
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)

Non safety communication using Modbus® TCP/IP protocol

Compatibility			**XPSMF4002, XPSMF4022, XPSMF4042**
Connection ports	Number and type		Integrated 2 RJ45 switched Ethernet communications ports
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation
	Master/Slave		Server (slave)
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)
Transparent Ready ® service	Class		A10
	Standard Ethernet TCP/IP communication services (supported by compact safety PLCs XPSMF40)		Modbus® TCP/IP server.
			Modbus® TCP/IP messaging (reading/writing of data words) Modbus® identification requests
	TCP port		Standard 502
	Max. number of Modbus® TCP/IP connections		1 to 20

Modbus® serial (RTU)

Compatibility			**XPSMF4020, XPSMF4022**
Serial link ports	Number and type		1 x RJ45
	Master/Slave		Slave, V0
Addressing			122 slave addresses
Physical layer			RS 485
Medium			Shielded dual twisted pair cable

PROFIBUS DP

Compatibility			**XPSMF4040, XPSMF4042**
Serial link ports	Number and type		1 x SUB-D 9-pin female
	Master/Slave		Slave, V0
Physical layer			RS 485
Medium			Shielded dual twisted pair cable

Connections *(1)*

Type of connection			**Removable screw clamp terminal blocks** *(2)*	**Removable spring terminal blocks** *(2)*
Supply connection	Number of terminal blocks		1	1
	For 1 cable without cable end		Solid or flexible AWG 24-12 (0.2…2.5 mm^2)	–
	For 1 flexible cable with or without plastic cable end		AWG 24-14 (0.25…2.5 mm^2)	–
	For 2 cables of same diameter, without cable end		–	Solid or flexible AWG 24-12 (0.2…2.5 mm^2)
	For 2 cables of same diameter, flexible without cable end		–	AWG 24-12 (0.25…2.5 mm^2)
	For 2 cables of same diameter, flexible with plastic cable end		–	AWG 24-12 (0.25…2.5 mm^2)
Cable connection	Tightening torque		4.43 lb-in (0.5 Nm)	–
	Bared length		0.39" (10 mm)	0.35" (9 mm)
Connection to digital input channels, digital output channels, line control output channels	Number of terminal blocks		8	8
	For 1 cable without cable end		Solid or flexible AWG 24-16 (0.14…1.5 mm^2)	–
	For 1 flexible cable without cable end		AWG 24-16 (0.25…1.5 mm^2)	–
	For 1 flexible cable with plastic cable end		AWG 24-20 (0.25…0.5 mm^2)	–
	For 2 cables of same diameter, without cable end		–	Solid or flexible AWG 26-16 (0.14…1.5 mm^2)
	For 2 cables of same diameter, flexible without cable end		–	AWG 22 (0.25…0.34 mm^2)
	For 2 cables of same diameter, flexible with plastic cable end		–	AWG 20 (0.5 mm^2)
Cable connection	Tightening torque		1.95...2.21 lb-in (0.22...0.25 Nm)	–
	Bared length		0.35" (9mm)	0.35" (9mm)

(1) AWG: American Wire Gauge.
(2) Removable Screw and Cage Clamp terminals provided with safety PLCs ***XPSMF40●●****.*

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF40



XPSMF4000
XPSMF4002



XPSMF4020
XPSMF4022



XPSMF4040
XPSMF4042

Compact safety PLCs

⎓ 24 V supply

Digital Inputs or Outputs	Line control outputs	Communication on Ethernet network: SafeEthernet protocol	Ethernet network: Modbus® TCP/IP protocol	Modbus® serial (RTU)	PROFIBUS DP	Reference	Weight oz (kg)
0…24 configurable channels	2 x 4	Yes	–	–	–	**XPSMF4000**	35.273 (1.000)
			Yes, server	–	–	**XPSMF4002**	35.273 (1.000)
			–	Yes, slave	–	**XPSMF4020**	35.273 (1.000)
			Yes, server	Yes, slave	–	**XPSMF4022**	35.273 (1.000)
			–	–	Yes, slave	**XPSMF4040**	35.273 (1.000)
			Yes, server	–	Yes, slave	**XPSMF4042**	35.273 (1.000)

Configuration software

■ Reference **SSV1XPSMFWIN** contains the full version of the programming software XPSMFWIN software for the XPSMF Safety PLCs. The XPSMFWIN is part of our Safety Suite and is not available separately.

Description	Operating system	Details	Languages	Reference	Weight oz (kg)
Configuration software XPSMFWIN for programming compact safety PLCs CD-ROM + user manual	Windows ® 2000, Windows ® XP	Software available on Safety Suite V2 software pack	English, German, French	**SSV1XPSMFWIN**	18.342 (0.520)

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF40



ABL 8RPS24050



ABL 1REM24025



XBTGT2130, XBTGT2330



XBTGT4330



XBTGT5●30



XBTGT6330



XBTGT7340

Phaseo ® regulated switch mode power supplies

Mains input voltage	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conformity to standard IEC EN 61000-3-2 and IEC EN 60950	Reference	Weight
V	⎓ V	W	A				oz (kg)
Universal range, single-phase (N-L1) **or 2-phase** (L1-L2) **connection**							
∿ **100…120 V/200...500** - 15%, + 10% 50/60 Hz	24...28.8	72	3	Auto/Manual	Yes	**ABL 8RPS24030**	10.582 (0.300)
		120	5	Auto/Manual	Yes	**ABL 8RPS24050**	24.692 (0.700)
		240	10	Auto/Manual	Yes	**ABL 8RPS24100**	35.273 (1.000)
Dedicated range, single-phase connection							
∿ **100…240** *(1)* wide range, 47…63 Hz	12	60	5	Auto	No	**ABL 1REM12050**	15.521 (0.440)
	24	60	2.5	Auto	No	**ABL 1REM24025**	15.521 (0.440)
∿ **100...120/200...240** *(2)*	24	240	10	Auto	No	**ABL 1REM24100**	31.041 (0.880)

Magelis ® multifunction graphic terminals with touch sensitive screen and on-board Ethernet *(1) (2)*

Supply voltage ⎓ 24 V

Description		Ports: serial and communication (type of link)	Application memory	Reference	Weight oz (kg)
5.7"	Monochrome black and white STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBTGT2130**	35.273 (1.000)
	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBTGT2330**	35.273 (1.000)
7.5"	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT4330**	63.493 (1.800)
10.4"	Color STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT5230**	105.822 (3.000)
	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT5330**	105.822 (3.000)
12.1"	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT6330**	105.822 (3.000)
15"	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT7340**	197.534 (5.600)

(1) Service instructions, USB connectors locking device and mounting kit included.
(2) Other operator dialog terminals, industrial PCs: please refer to our "Human Machine Interface" catalog.

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF40



490 NTW 000●●

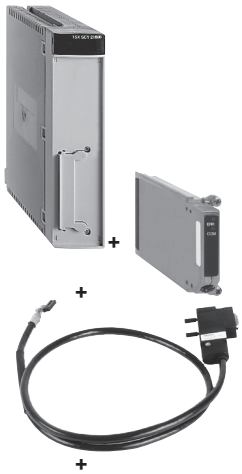
Connecting cables for network and bus

Connection to Ethernet network

Description	Pre-fitted connectors	Length ft. (m)	Reference	Weight oz (kg)
Shielded twisted pair cables, straight through	2 RJ45 connectors For connection to DTE (Data Terminal Equipment)	6.56 (2)	**490 NTW 000 02** *(1)*	–
		16.40 (5)	**490 NTW 000 05** *(1)*	–
		39.37 (12)	**490 NTW 000 12** *(1)*	–
		131.23 (40)	**490 NTW 000 40** *(1)*	–
		262.47 (80)	**490 NTW 000 80** *(1)*	–
Shielded twisted pair cables, crossed wires	2 RJ45 connectors For connection between hubs, switches and transceivers	16.40 (5)	**490 NTC 000 05** *(1)*	–
		49.21 (15)	**490 NTC 000 15** *(1)*	–
		131.23 (40)	**490 NTC 000 40** *(1)*	–
		262.47 (80)	**490 NTC 000 80** *(1)*	–

Connection to Modbus® serial link

Description	Use		Length ft. (m)	Reference	Weight lb (kg)
	From	To			
Trunk cables, shielded dual twisted pair, RS 485	Compact safety PLCs XPSMF4020/MF4022 (RJ45)	Modbus® splitter box LU9 GC3 (RJ45)	328 (100)	**TSX CSA 100**	12.522 (5.680)
			656 (200)	**TSX CSA 200**	24.030 (10.920)
			1640 (500)	**TSX CSA 500**	66.139 (30.000)
	Graphic terminals XBTGT (SUB-D 9-pin)	Modbus® splitter box LU9 GC3 (RJ45)	8.2 (2.5)	**XBTZ938** *(2)*	0.474 (0.210)
Adaptor for cable XBTZ938	SUB-D 9-pin (XBTGT)	XBTZ938 (SUB-D 25-pin)	0.66 (0.2)	**XBTZG909**	–



Description	Characteristics	Sold in lots of	Unit reference	Weight oz (kg)
End of line adaptors For RJ45 connector	R = 120 Ω, C = 1 nF	2	**VW3 A8 306 RC**	7.055 (0.200)
	R = 150 Ω	2	**VW3 A8 306 R**	0.353 (0.010)

PROFIBUS DP bus connection components

Description	Profile	Services	Reference	Weight oz (kg)
PROFIBUS DP module set for Premium™ PLCs	Master, 12 Mbps	Class 1 and Class 2 master V0 functions, see characteristics. PROFIBUS FMS messaging not supported	**TSX PBY 100**	30.688 (0.870)

Description	Use	Reference	Weight oz (kg)
Remote inputs/outputs on PROFIBUS DP bus	Advantys™ STB network interface module	**STB NDP 2112**	4.938 (0.140)
	Momentum™ communication module	**170 DTN 110 00**	–
Connectors for remote I/O communication module	Line terminators	**490 NAD 911 03**	–
	Intermediate connection	**490 NAD 911 04**	–
	Intermediate connection and terminal port	**490 NAD 911 05**	–



TSX PBY 100

Description	Length ft. (m)	Reference	Weight oz (kg)
PROFIBUS DP connecting cables	328 (100)	**TSX PBS CA 100**	–
	1312 (400)	**TSX PBS CA 400**	–



490 NAD 911 03

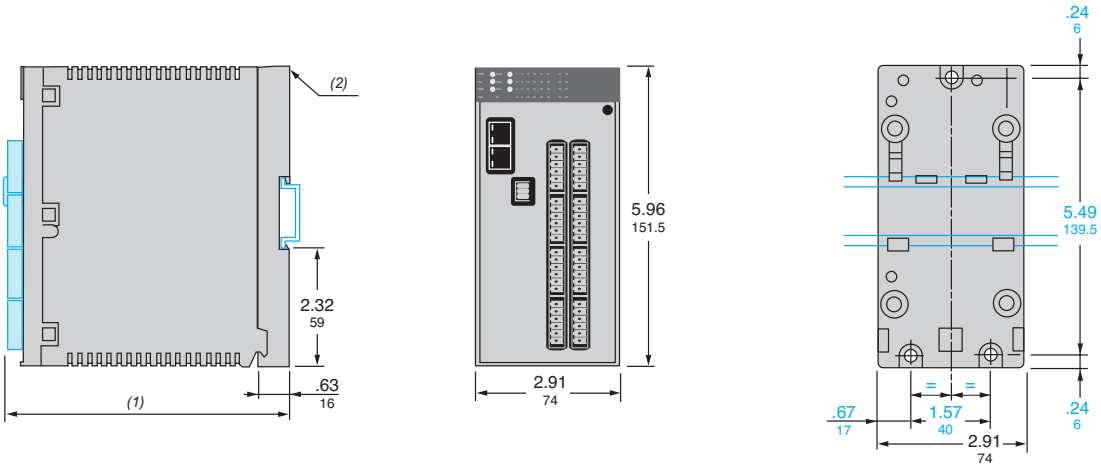
Description	Reference	Weight oz (kg)
Replacement parts	Main bus junction box	**490 NAE 911 00**	–
	PCMCIA card	**467 NHP 811 00**	–

*(1) Cable conforming to standard EIA/TIA-568 category 5 and IEC 1180/EN 50 173 class D. For UL and CSA 22.1 approved cables, add the letter **U** to the end of the reference.*
*(2) Requires adaptor **XBTZG909**.*

Presentation: page 2/4 | Characteristics: page 2/10 | References: page 2/12 | Dimensions, mounting: page 2/15 | Connections: page 2/16

Dimensions

XPSMF40●●

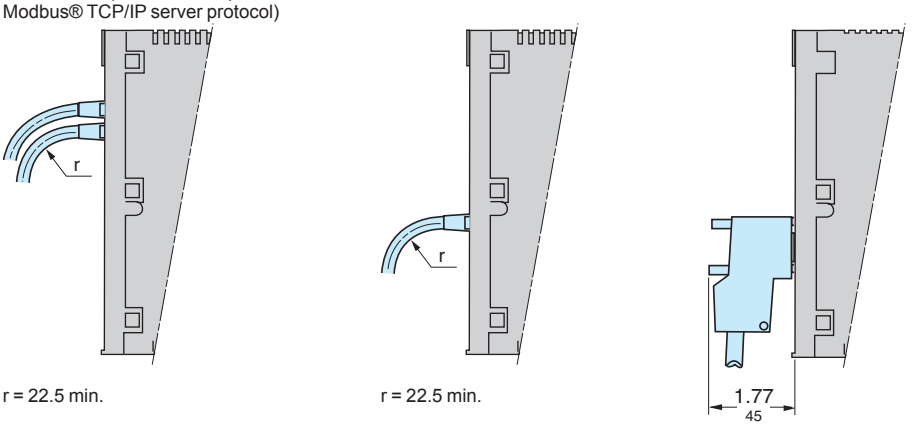


(1) 6.02 in (153 mm) with screw terminal block, 5.96 in (151.4 mm) with spring terminal block.
(2) Removable plate with spring mounting for mounting on 1.38 (35 mm) ⊥ rail.

Mounting

Mounting precautions relating to connectors

Access to Ethernet network	Access to Modbus® serial link (RTU)	Access to Profibus DP bus
RJ45 socket (SafeEthernet protocol, Modbus® TCP/IP server protocol)	RJ45 socket	Connector 490 NAD 911 03 in SUB-D 9-pin socket

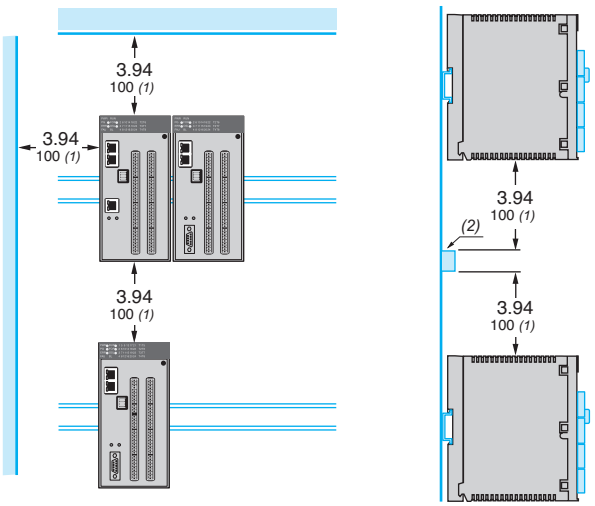


r = 22.5 min.

r = 22.5 min.

Dual Dimensions: INCHES / Millimeters

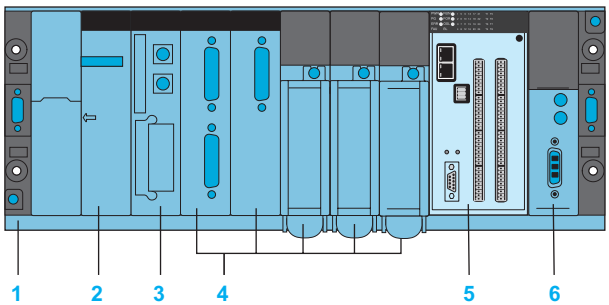
Mounting in panel or enclosure



(1) Minimum recommended value.
(2) Prefabricated electrical ducting for passage of cables.

Mounting on Premium™ rack

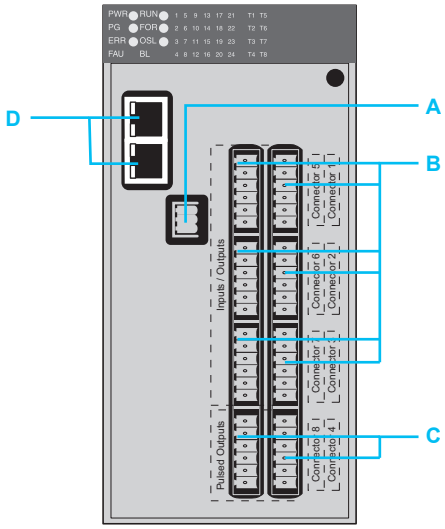
Mechanical mounting only, without connection to either the back plane bus or to the Premium™ platform supply



1 Premium™ rack
2 Premium™ supply
3 Premium™ CPU
4 Premium™ I/O module
5 Safety PLC **XPSMF40●●** (occupies 2 slots)
6 Premium™ As-interface master

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF40

Connections



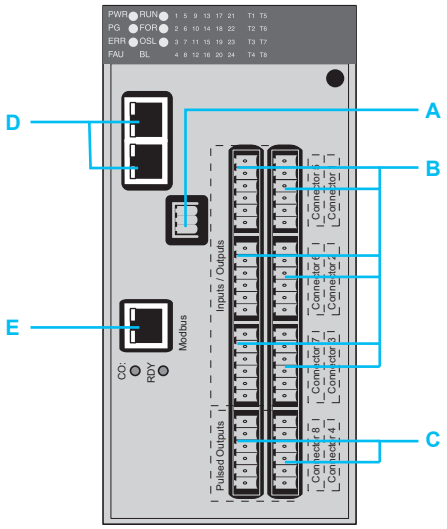
XPSMF4000/MF4002

XPSMF4000/MF4002, XPSMF4020/MF4022, XPSMF4040/MF4042

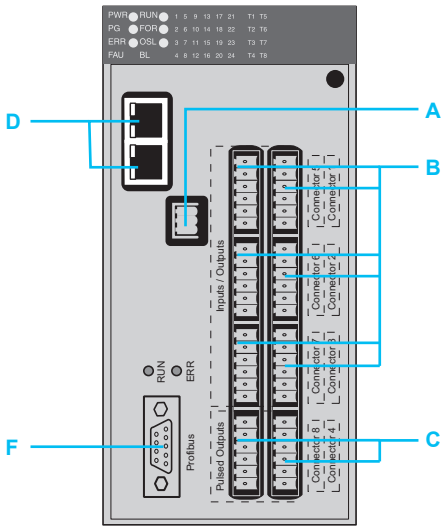
Item	Connection	Connector	Screw	Function
A	**Supply**	Supply	24 V	⎓ 24 V
			0 V	⎓ 24 V (reference pole)
			FE	Ground *(1)*
B	**Digital Inputs or Outputs**	Connector 1	S+	Supply to Inputs 1 to 4
			1	Input/Output 1
			2	Input/Output 2
			3	Input/Output 3
			4	Input/Output 4
			L-	Inputs/Outputs 1 to 4 common
		Connector 2	S+	Supply to Inputs 5 to 8
			5	Input/Output 5
			6	Input/Output 6
			7	Input/Output 7
			8	Input/Output 8
			L-	Inputs/Outputs 5 to 8 common
		Connector 3	S+	Supply to Inputs 9 to 12
			9	Input/Output 9
			10	Input/Output 10
			11	Input/Output 11
			12	Input/Output 12
			L-	Inputs/Outputs 9 to 12 common
		Connector 5	S+	Supply to Inputs 13 to 16
			13	Input/Output 13
			14	Input/Output 14
			15	Input/Output 15
			16	Input/Output 16
			L-	Inputs/Outputs 13 to 16 common
		Connector 6	S+	Supply to Inputs 17 to 20
			17	Input/Output 17
			18	Input/Output 18
			19	Input/Output 19
			20	Input/Output 20
			L-	Inputs/Outputs 17 to 20 common
		Connector 7	S+	Supply to Inputs 21 to 24
			21	Input/Output 21
			22	Input/Output 22
			23	Input/Output 23
			24	Input/Output 24
			L-	Inputs/Outputs 21 to 24 common
C	**Line control outputs**	Connector 4	L-	Outputs 1 to 4 common
			1	Line control Output 1 (T1)
			2	Line control Output 2 (T2)
			3	Line control Output 3 (T3)
			4	Line control Output 4 (T4)
			L-	Outputs 1 to 4 common
		Connector 8	L-	Outputs 5 to 8 common
			5	Line control Output 5 (T5)
			6	Line control Output 6 (T6)
			7	Line control Output 7 (T7)
			8	Line control Output 8 (T8)
			L-	Outputs 5 to 8 common

(1) Grounded when mounting on plate or rail.

Connections *(continuous)*



XPSMF4020/MF4022



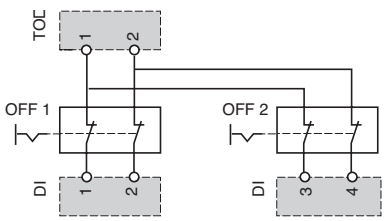
XPSMF4040/MF4042

XPSMF4000/MF4002, XPSMF4020/MF4022, XPSMF4040/MF4042

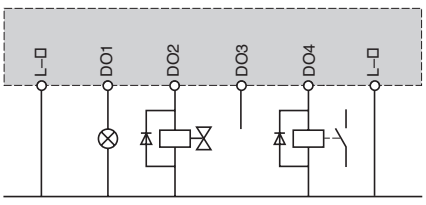
Item	Connection	Type	Function
D	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and the programming terminal in a point to point or via an Ethernet network for programming, setting IP address etc.
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.
	Non-Safe Communication available with references: XPSMF4002, XPSMF4022, XPSMF4042		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other non- safety related components (e.g HMI Magelis ®, standard PLCs, Scada systems,etc.) this can be established in a point to point way or via an Ethernet network.
XPSMF4020/MF4022			
E	**Communication**	RJ45 (Modbus®)	**XPSMF4020/MF4022**: slaves on Modbus® serial (RTU)
XPSMF4040/MF4042			
F	**Communication**	SUB-D 9-pin female (Profibus)	**XPSMF4040/MF4042**: slaves on PROFIBUS DP

Connections examples

Actuator connections to the outputs



Emergency stop connections (line control)



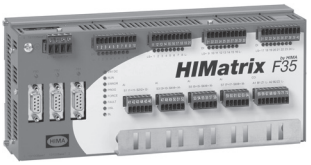
Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF31/30/35



XPSMF31222



XPSMF3022



XPSMF35●●

*Products referenced **XPSMF31222, XPSMF3022** and **XPSMF35●●** are marked **HIMatrix® F31**, **HIMatrix® F30** and **HIMatrix® F35** (manufactured by Hima, sold by Schneider Electric).*

Presentation

Preventa™ compact safety PLCs **XPSMF31/30/35** enable the monitoring of simple to complex safety functions for all industrial applications relating to the protection of personnel and machine safety.

Designed for use with numerous machine safety functions, these compact safety PLCs are intended for use in safety related parts of control systems.
They can manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

The compact safety PLC range **XPSMF31/30/35** comprises 5 versions that are differentiated by their characteristics, detailed below.

Compact PLCs	Inputs			Outputs Digital	Communication	
	Digital	Analog	Counter		On Ethernet network	On fieldbus
XPSMF31222	20	–	–	8 *(1)*	For all compact PLCs XPSMF31/30/35 using SafeEthernet safety protocol, and with non safety protocol Modbus® TCP/IP server	–
XPSMF3022	20	–	–	8 *(1)*		Modbus® serial Slave (RTU)
XPSMF3502	24	8	2	8		–
XPSMF3522	24	8	2	8		Modbus® serial Slave (RTU)
XPSMF3542	24	8	2	8		PROFIBUS DP V0 slave

Safety PLCs

In order to meet safety requirements, the compact safety PLCs **XPSMF31/30/35** incorporate two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level “e” conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between the safety PLCs and the safety remote I/O modules (**Special Switch**).

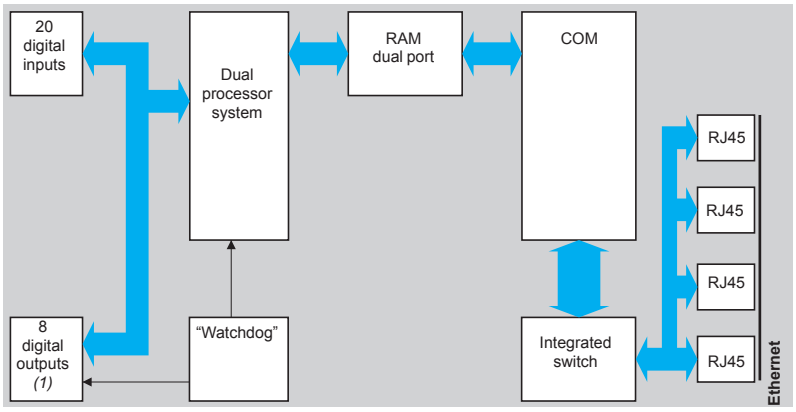
■ **Redundancy**: the dual processor integrated in the compact safety PLCs analyzes and compares the data received from the safety inputs and outputs.
The incoming and outgoing data (programmed values and received values) are received in parallel by the two processors and compared in real-time.

■ **Self-monitoring (“Watchdog”)**: the compact safety PLCs continuously monitor the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.

■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the inputs and outputs of the safety PLCs on the Ethernet network, while avoiding signal collisions and excessive amounts of data on the network.

Functional diagrams

Compact safety PLC XPSMF31222

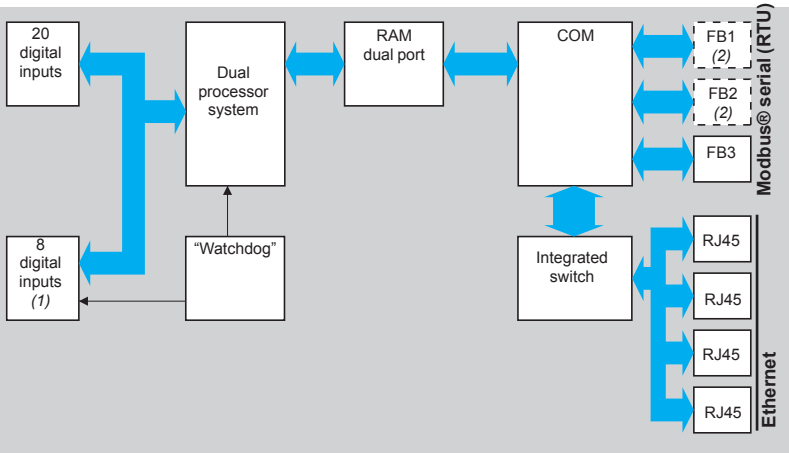


(1) Digital outputs can be configured for line control.

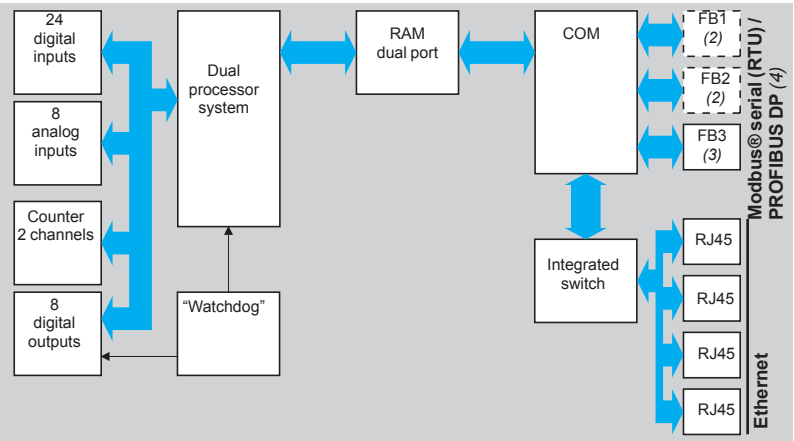
Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF31/30/35

Functional diagrams *(continued)*

Compact safety PLC XPSMF3022



Compact safety PLCs XPSMF35●●



Line control for XPSMF31222 and XPSMF3022

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring anomaly (short-circuit, line break) to be seen at the inputs of the safety PLC inputs.

Digital outputs 1 to 8 are connected to the digital inputs of the same circuit.

Example: Emergency stop pushbutton with two normally closed (N.C.) contacts that are supplied by two different line control outputs connected via these two normally closed contacts and fed into the inputs of the safety PLCs.

Programming automated safety functions

Software **XPSMFWIN** (reference SSV1XPSMFWIN) running on a PC enables the programming of all safety remote I/O modules and safety PLCs, as well as configuration of the communication settings.

(1) Digital outputs can be configured for line control.
(2) FB1 and FB2 not used.
*(3) FB3 not available on safety PLC **XPSMF3502**.*
(4) Depending on model.

Safety automation system solutions

Preventa™ safety PLCs
Compact, XPSMF31/30/35

Digital inputs

Compact safety PLCs **XPSMF3●●●●** incorporate up to 24 digital inputs for the connection of safety related input devices.

Compact PLCs	Digital inputs		
	N°	Safety detection	Safety dialog
XPSMF31222	20	Limit switches, Guard switches, with reset and with actuator, Light curtains type 2 and type 4, Safety mats and sensing edges…	Mushroom head Emergency stops, Enclosures for control and signalling units, Two-hand control stations…
XPSMF3022	20		
XPSMF3502	24		
XPSMF3522	24		
XPSMF3542	24		

Analog inputs

Compact safety PLCs **XPSMF35●●** incorporate 8 analog measuring inputs that receive analog safety related signals from the machines to be monitored *(1)*.

Compact PLCs	Analog inputs with transmitter supply	
	N°	Functions
XPSMF3502	8	Closed circuit scanning of input channels, Single-pole measuring of 0 to 10 V voltages, Measuring 0 to 20 mA currents using jumper
XPSMF3522	8	
XPSMF3542	8	

Counter inputs

Compact safety PLCs **XPSMF35●●** incorporate 2 independent and configurable counting channels:

- as a counting function, independent to the direction of counting,
- as a counting function, dependent to the direction of counting,
- or as a counting function via an absolute encoder with Gray code.

Compact PLCs	Counting inputs		
	N°	⎓ 5 V	⎓ 24 V
XPSMF3502	2	Incremental encoders	Sensors, 2/3-wire PNP/NPN
XPSMF3522	2		
XPSMF3542	2		

Digital outputs

All compact safety PLCs **XPSMF●●●●** incorporate 8 digital outputs for connection to signalling equipment and machines to be controlled *(1)*.

Compact PLCs	Digital outputs		
	N°	Safety actuators	Safety dialog
XPSMF31222	8	Contactors-motors, Control relays, Variable speed drives.	Beacons and indicator banks, Rotating mirror beacons, Sirens…
XPSMF3022	8		
XPSMF3502	8		
XPSMF3522	8		
XPSMF3542	8		

Remote inputs and outputs

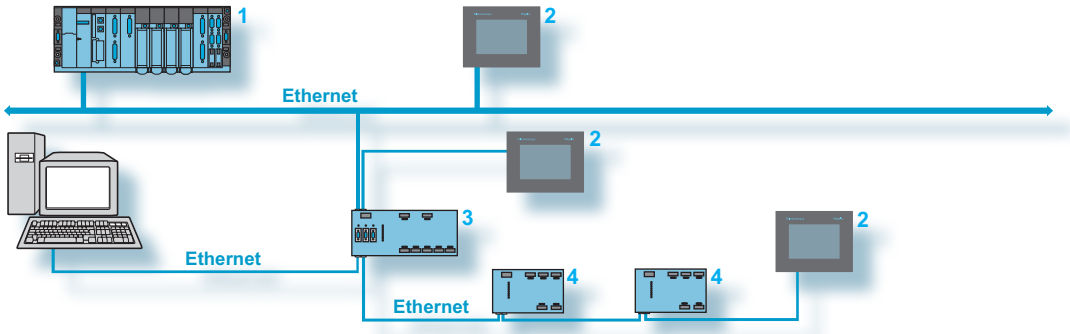
In addition to the inputs/outputs integrated as standard, compact safety PLCs **XPSMF31/30/35** can be connected to safety remote input modules **XPSMF1** and/or safety remote output modules **XPSMF2** and/or safety remote mixed I/O modules **XPSMF3**.
The safety remote input, output and mixed I/O modules can be located within the vicinity of the machines to be monitored, thus reducing cabling.
Communication between these safety remote I/O modules and compact safety PLCs **XPSMF31/30/35** is performed on an Ethernet network using the SafeEthernet safety protocol, via the Integrated RJ45 switched Ethernet communications ports.

(1) Use shielded dual twisted pair cables, maximum length 984.2 ft (300 m), short-circuit unused analog inputs.

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF31/30/35

Safety communication on Ethernet network

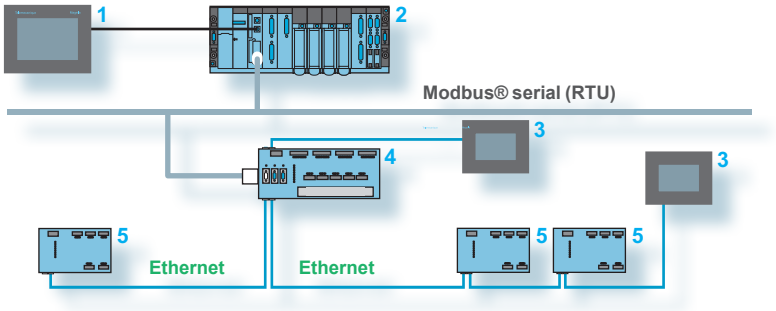
Communication between the PC, Magelis ® graphic terminal or automation platform (Premium™) and the compact safety PLCs is achieved by **Ethernet** network connection via the Integrated RJ45 switched Ethernet communications ports of compact PLCs **XPSMF31/30/35**.



1 Premium™ automation platform: Modbus® TCP/IP client.
2 Graphic terminal **XBTGT**: Modbus® TCP/IP client.
3 Safety PLC **XPSMF31/30/35**: Modbus® TCP/IP server.
4 Safety remote I/O modules **XPSMF1/2/3**. They communicate with safety PLCs **XPSMF31/30/35** using the SafeEthernet protocol.

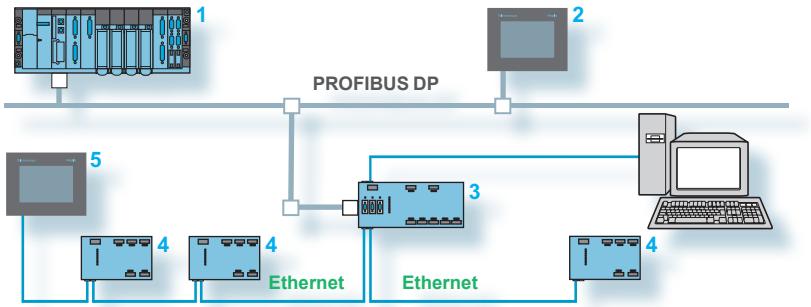
Communication on Modbus® serial (RTU) and PROFIBUS DP fieldbus

■ On **Modbus® serial (RTU)**, safety PLCs **XPSMF3022** and **XPSMF3522** are slaves of the Premium™ automation platform and Magelis ® graphic terminals.
They are connected to the Modbus® serial network via their SUB-D 9-pin connector (FB3).



1 Graphic terminal **XBTGT**: Modbus® serial (RTU) master.
2 Premium™ automation platform: Modbus® serial (RTU) master.
3 Graphic terminal **XBTGT**: Modbus® serial (RTU) client.
4 Safety PLC **XPSMF3022** or **XPSMF3522**: Modbus® serial (RTU) slave, Modbus® TCP/IP server.
5 Safety remote I/O modules **XPSMF1/2/3**. They communicate with safety PLCs **XPSMF3●●2** using the SafeEthernet protocol.

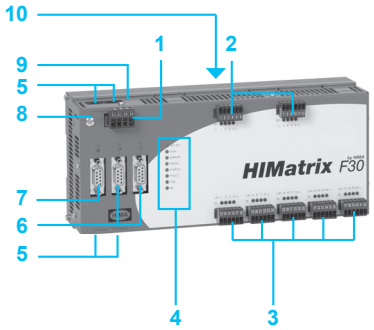
■ On **PROFIBUS DP**, safety PLC **XPSMF3542** is a slave of the Premium™ automation platform and Magelis ® graphic terminal.
It is connected to the PROFIBUS DP network via its SUB-D 9-pin connector (FB3).



1 Premium™ automation platform: PROFIBUS DP master.
2 Graphic terminal **XBTGT**: PROFIBUS DP master.
3 Safety PLC **XPSMF3542**: PROFIBUS DP slave, Modbus® TCP/IP server.
4 Safety remote I/O modules **XPSMF1/2/3**. They communicate with safety PLC **XPSMF3542** using the SafeEthernet protocol.
5 Graphic terminal **XBTGT**: Modbus® TCP/IP client.

Safety automation system solutions

Preventa™ safety PLCs
Compact, XPSMF31/30/35

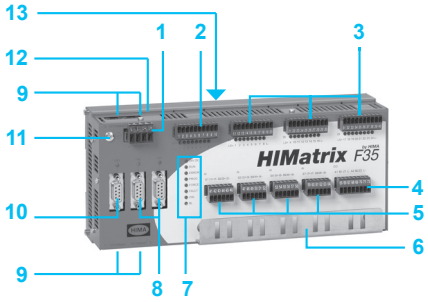


Description

Safety PLCs XPSMF31222 and XPSMF3022

On the front cover of the metal enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 Two terminal blocks *(1)* for connection of digital outputs, with output status LED (four LEDs per terminal block).
3 Five terminal blocks *(1)* for connection of digital inputs, with input status LED (four LEDs per terminal block).
4 Eight process status LEDs.
5 Four integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus® TCP/IP server protocol).
6 On **XPSMF3022** only: two unused SUB-D connectors (FB1 and FB2).
7 On **XPSMF3022** only: one SUB-D 9-pin connector for connection on Modbus® serial (RTU) (FB3).
8 One ground connection screw.
9 On the top: one “Reset” button.
10 On the rear face: one spring operated mounting device for mounting on 35 mm ⊔ rail.

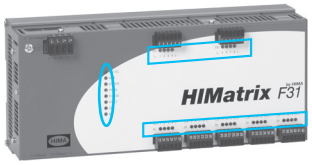


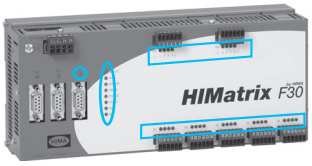
Safety PLCs XPSMF35●●

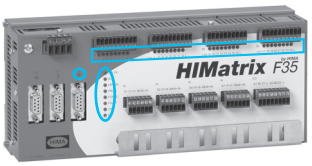
On the front cover of the metal enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 One terminal block *(1)* for connection of digital outputs, with four digital output status LEDs.
3 Three terminal blocks *(1)* for connection of digital inputs, with input status LED (eight LEDs per terminal block).
4 One terminal block *(1)* for connection of 2 counting input channels.
5 Four terminal blocks *(1)* for connection of analog inputs.
6 One plate for securing shielded analog input connection cables.
7 Eight process status LEDs.
8 Two unused SUB-D connectors (FB1 and FB2).
9 Four integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus® TCP/IP server protocol).
10 One type SUB-D 9-pin connector (FB3) for connection on PROFIBUS DP (**XPSMF3542**) or Modbus® serial (RTU) (**XPSMF3522**).
11 One ground connection screw.
12 On the top: one “Reset” button.
13 On the rear face: one spring operated mounting device for mounting on 35 mm ⊔ rail.

*(1) Removable screw terminals are provided with compact safety PLCs **XPSMF31/30/35**.*







Status LED details

Compact safety PLCs XPSMF31222, XPSMF3022 and XPSMF35●●

LED	Color	Status	Meaning
FB1, FB2	–	–	Not used.
FB3	Orange	On	Communication on Modbus® serial or PROFIBUS DP *(1)* active.
Inputs 1 to 20	Orange	On	Inputs active.
Outputs 1 to 8	Orange	On	Outputs active.
24 VDC	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/software tests carried out.
		Flashing	The CPU is in STOP and is not executing any user application. All the outputs are reset to a safe, de-energized state.
		Off	The CPU is in “ERROR” state (see ERROR).
ERROR	Red	On	Software error or hardware anomaly detected by the CPU.
			The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the PC.
		Off	No errors detected.
PROG	Orange	On	The CPU is being loaded with a new configuration.
		Flashing	The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
FORCE	Orange	On	The CPU is in RUN mode and force is active.
		Flashing	The system is not processing (STOP), but force is prepared and is activated if the dual processor is started.
		Off	Force mode not activated.
FAULT	Orange	On	Error display for line control.
			The user application has caused an error.
			The system configuration is defective.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred while writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
OSL	Orange	Flashing	Emergency loading of the operating system is active.
BL	Orange	Flashing	COM in INIT_Fail state.
RJ45	Green	On	Full duplex mode operation.
		Flashing	Signal collision.
		Off	Half duplex mode operation, no collision.
	Yellow	On	Connection established.
		Flashing	Interface active.

(1) Depending on PLC model.

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF31/30/35

Environment

Compact safety PLC type			XPSMF31222	XPSMF3022	XPSMF3502, XPSMF3522, XPSMF3542
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1, EN/ISO 13849-1 and EN/IEC 61508)			Category 4 (EN 954-1), Performance level "e" (EN/ISO 13849-1), Safety integrity level: SIL 3 (EN/IEC 61508)		
Product certifications			IEC 61511: 2004, DIN VDE 0116: 1989, EN 50156-1: 2004, EN 12067-2: 2004, EN 298: 2003, EN 230: 1990, NFPA 85: 2001, EN/IEC 61131-2: 2003, EN 61000-6-2: 2001, EN 61000-6-4: 2001		IEC 61511: 2004, DIN VDE 0116: 1989, EN 50156-1: 2004, EN 12067-2: 2004, EN 298: 2003, EN 230: 1990, NFPA 85: 2001, EN/IEC 61131-2: 2003, EN 61000-6-2: 2001, EN 61000-6-4: 2001, EN 54-2: 1997, NFPA 72: 2002
Ambient air temperature conforming to EN 61131-2	For operation	**°F(°C)**	+32… + 140 (0…+ 60)		
	For storage	**°F(°C)**	-40… + 185 (- 40…+ 85)		
Relative humidity			95% (supply not connected)		
Degree of protection	Enclosure		IP 20		
Pollution			Degree of pollution II		
Altitude			6560 ft (2000 m)		
Protection class			Class II, conforming to EN/IEC 61131-2		
Electromagnetic compatibility			Conforming to IEC 61131-2		
Vibration resistance conforming to EN 61131-2	Operating		1 g, frequency 9…150 Hz		
Shock resistance conforming to EN 61131-2	Operating		15 g (duration 11 ms), unit test while operating, 2 cycles per axis		
Resistance to electrostatic discharges conforming to EN/IEC 61000-4-2		**kV**	4 contact, 8 air discharge		
Immunity to high frequency interference conforming to EN/IEC 61000-4-3		**V/m**	10 (80 MHz…2 GHz), amplitude modulation 80%		

Electrical characteristics

Supply	Voltage	**V**	⎓ 24 (external supply with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)		
	Voltage limits		- 15…+ 20%		
Maximum power consumption		**A**	8	8	9
Idle current		**A**	0.4	0.5	0.75
Immunity to momentary supply interruptions		**ms**	10		
Protection			Internal fuse		
Response time		**ms**	Depending on size of application		
Clock			Supplied by backup capacitor for 1 week following loss of supply		
User memory	Application	**kB**	250		
	Data	**kB**	250		
LED display			Yes		
Digital inputs					
Number	Inputs not electrically isolated		20		24
Permissible current	At state 0	**mA**	1.5 max., 1 mA at 5 V	1.5 max., 1.25 mA at 5 V	1.5 max., 1 mA at 5 V
	At state 1	**mA**	≥ 2 at ⎓ 15 V	> 2 at ⎓ 15 V	Approx. 3.5 at ⎓ 24 V Approx. 4.5 at ⎓ 30 V
Input supply			5 x 20 V/100 mA (on 24 V)		20 V/100 mA
Input protection			Protected against short-circuits, short-circuits to ground		
Overvoltage protection		**V**	500, conforming to IEC 61000-4-5		
Switching point		**V**	Typically 7.5		–
Current		**mA**	> 2 (⎓ 15 V)		–
LED display			Yes		
Maximum distance of equipment			328 ft (100 m)		
Digital outputs					
Number	Outputs not electrically isolated		8, configurable for line control		8
Output voltage		**V**	⎓ 24 ± 2		
Output current	Channels 1 to 3 and 5 to 7	**A**	0.5 at 140 °F (60 °C)		
	Channels 4 and 8	**A**	1 at 140 °F (60 °C), 2 at 122 °F (50 °C)		
Minimum load		**mA**	2 per channel		
Leakage current at state 0		**mA**	1 max. at 2 V		
Response to overload			Shutdown of outputs concerned with cyclic reconnection		
Total output current		**A**	7 max., shutdown of all outputs if exceeded with cyclic reconnection		
LED display			Yes		
Maximum distance of equipment			328 ft (100 m)		

Characteristics: page 2/24 | References: page 2/27 | Dimensions, mounting: page 2/30 | Connections: page 2/32 | Presentation: page 2/18

Electrical characteristics *(continued)*

Compact safety PLC type			XPSMF3502, XPSMF3522, XPSMF3542		
Analog inputs					
Number	Inputs not electrically isolated		8, single-pole		
External jumper		Ω	250 or 500 depending on application		
Input values	Nominal value	**V**	⎓ 0…10		
		mA	0…20, with 500 Ω jumper		
	Service value	**V**	⎓ 0.1…11.5		
		mA	0/4…23, with 500 Ω jumper		
Input impedance		**MΩ**	1		
Maximum distance of equipment		**m**	300		
Internal resistance of signal source		Ω	⩽ 500		
Overvoltage protection		**V**	+ 15, - 4		
Resolution (A/D converter)			12-bit		
Safety accuracy			± 2%		
LED display			Yes		
Counting inputs					
Number	Counter		2, not electrically isolated		
	Inputs		3 on each pole (A, B, Z)		
Input voltages	High threshold 5 V	**V**	4…6		
	High threshold 24 V	**V**	13…33		
	Low threshold 5 V	**V**	0…0.5		
	Low threshold 24 V	**V**	- 3…5		
Input currents		**mA**	1.4 at 5 V 6.5 at 24 V		
Input impedance		**kΩ**	3.7		
Maximum distance of equipment			1640 ft (500 m), with shielded dual twisted pair cable		
Up/down counting resolution			24-bit		
Input frequency		**kHz**	100, at 5 and 24 V		
Triggering			On falling edge		
Edge steepness		**V/µs**	1		
LED display			Yes		

Communication

Compatibility			XPSMF31222	XPSMF3022	XPSMF3502, XPSMF3522, XPSMF3542
Ethernet network: safety communication using SafeEthernet protocol					
Transmission	Communication ports		Integrated 4 RJ45 switched Ethernet communications ports		
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation		
Structure			10BASE-T/100BASE-TX		
Medium			Dual twisted pair cable, category 5D or better (Ethernet)		
Ethernet network: Non-safety related communication using Modbus® TCP/IP protocol					
Connection Ports	Number and type		Integrated 4 RJ45 switched Ethernet communication ports		
	Baud rate	**Mbps**	100 Half Duplex, 10 Full Duplex, Autonegotiation		
	Master/Slave		Server (slave)		
Structure			10BASE-T/100BASE-TX		
Medium			Dual twisted pair cable, category 5D or better (Ethernet)		
Transparent Ready ® Services	Class		A10		
	Standard Ethernet TCP/IP communication services		Modbus® TCP/IP Server		
			Modbus® TCP/IP messaging (reading/writing of data words)		
			Modbus® identification request		
	TCP port		Standard 502		
	Max. number of Modbus® TCP/IP connections		1 to 20		
Modbus® serial (RTU)					
Serial link ports	Number and type		–	1 x SUB-D 9-pin female (FB3)	
	Master/Slave		–	Slave	
Addressing			–	122 slave addresses	
Physical layer			–	RS 485	
Medium			–	Shielded dual twisted pair cable	
PROFIBUS DP					
Serial link ports	Number and type		–	–	1 x SUB-D 9-pin female
	Master/Slave		–	–	Slave, V0
Physical layer			–	–	RS 485
Medium			–	–	Shielded dual twisted pair cable

2

Connections *(1)*

Safety PLC type			XPSMF31222	XPSMF3022	XPSMF3502, XPSMF3522, XPSMF3542
Type of connection			Screw clamp terminal blocks *(2)*		
Supply connection	Number of terminal blocks		1		
	For 1 cable without cable end		Solid or flexible AWG 24-12 (0.2…2.5 mm^2)		
	For 1 flexible cable with or without plastic cable end		AWG 22-16 (0.25…2.5 mm^2)		
	For 2 cables of same diameter, without cable end		Solid or flexible AWG 24-12 (0.2…1.5 mm^2)		
	For 2 cables of same diameter, flexible without cable end		AWG 22-18 (0.25…1.0 mm^2)		
	For 2 cables of same diameter, flexible with plastic cable end		AWG 22-16 (0.5…1.5 mm^2)		
Digital input channel and output channel connection	Number of terminal blocks		5 (inputs) and 2 (outputs)	5 (inputs) and 2 (outputs)	3 (inputs) and 1 (output)
	For 1 cable without cable end		Solid or flexible AWG 28-16 (0.14…1.5 mm^2)		
	For 1 flexible cable without cable end		AWG 22-16 (0.25…1.5 mm^2)		
	For 1 flexible cable with plastic cable end		AWG 22-20 (0.25…0.5 mm^2)		
	For 2 cables of same diameter, without cable end		Solid: AWG 28-20 (0.14…0.5 mm^2) Flexible: AWG 28-18 (0.14…0.75 mm^2)		
	For 2 cables of same diameter, flexible without cable end		AWG 22 (0.25…0.34 mm^2)		
	For 2 cables of same diameter, flexible with plastic cable end		AWG 20 (0.5 mm^2)		
Analog input channel connection	Number of terminal blocks		–	–	4
	For 1 cable without cable end		–	–	Solid or flexible AWG 28-16 (0.14…1.5 mm^2)
	For 1 flexible cable without cable end		–	–	AWG 22-16 (0.25…1.5 mm^2)
	For 1 flexible cable with plastic cable end		–	–	AWG 22-20 (0.25…0.5 mm^2)
	For 2 cables of same diameter, without cable end		–	–	Solid: AWG 28-20 (0.14…0.5 mm^2) Flexible: AWG 28-18 (0.14…0.75 mm^2)
	For 2 cables of same diameter, flexible without cable end		–	–	AWG 22 (0.25…0.34 mm^2)
	For 2 cables of same diameter, flexible with plastic cable end		–	–	AWG 20 (0.5 mm^2)
Counting channel connection	Number of terminal blocks		–	–	1
	For 1 cable without cable end		–	–	Solid or flexible AWG 28-16 (0.14…1.5 mm^2)
	For 1 flexible cable without cable end		–	–	AWG 22-16 (0.25…1.5 mm^2)
	For 1 flexible cable with plastic cable end		–	–	AWG 22-20 (0.25…0.5 mm^2)
	For 2 cables of same diameter, without cable end		–	–	Solid: AWG 28-20 (0.14…0.5 mm^2) Flexible: AWG 28-18 (0.14…0.75 mm^2)
	For 2 cables of same diameter, flexible without cable end		–	–	AWG 22 (0.25…0.34 mm^2)
	For 2 cables of same diameter, flexible with plastic cable end		–	–	AWG 20 (0.5 mm^2)
Cable connection	Tightening torque		1.9…2.2 lb-in (0.22…0.25 Nm)		
	Bared length		0.35 in. (9 mm)		

(1) AWG: American Wire Gauge.
(2) Removable screw terminals are provided with compact safety PLCs ***XPSMF31/30/35****.*

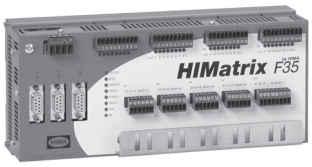
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Preventa™ safety PLCs
Compact, XPSMF31/30/35



XPSMF31222



XPSMF3022



XPSMF35●●

*Products referenced **XPSMF31222, XPSMF3022** and **XPSMF35●●** are marked **HIMatrix® F31**, **HIMatrix® F30** and **HIMatrix® F35** (manufactured by Hima, sold by Schneider Electric).*

Compact safety PLCs

⎓ **24 V supply**

Inputs			Outputs Digital	Communication on				Reference	Weight oz (kg)
				Ethernet network		Modbus® serial (RTU)	PROFIBUS DP		
Digital	Analog	Counting		Safe Ethernet protocol	Modbus® TCP/IP server protocol				
20	–	–	8	Yes	Yes	–	–	**XPSMF31222**	35.273 (1.000)
						Yes Slave	–	**XPSMF3022**	42.328 (1.200)
24	8	2	8	Yes	Yes	–	–	**XPSMF3502**	42.328 (1.200)
						Yes Slave	–	**XPSMF3522**	42.328 (1.200)
						–	Yes slave	**XPSMF3542**	42.328 (1.200)

Configuration software

■ Reference **SSV1XPSMFWIN contains the full version of the programming software XPSMFWIN software for the XPSMF Safety PLCs. The XPSMFWIN is part of our Safety Suite and is not available seperately.**

Description	Operating system	Details	Languages	Reference	Weight oz (kg)
Configuration software XPSMFWIN for programming compact safety PLCs CD-ROM + user manual	Windows ® 2000, Windows ® XP	Software available on Safety Suite V2 software pack	English, German, French	**SSV1XPSMFWIN**	18.342 (0.520)

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF31/30/35



ABL 8RPS24050



ABL 1REM24025



XBTGT2130, XBTGT2330



XBTGT4330



XBTGT5●30



XBTGT6330



XBTGT7340

Phaseo ® regulated switch mode power supplies

Mains input voltage	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conformity to standard IEC EN 61000-3-2 and IEC EN 60950	Reference	Weight
V	⎓ V	W	A				oz (kg)
Universal range, single-phase (N-L1) **or 2-phase** (L1-L2) **connection**							
∿ **100…120 V/200...500** - 15%, + 10% 50/60 Hz	24...28.8	72	3	Auto/Manual	Yes	**ABL 8RPS24030**	10.582 (0.300)
		120	5	Auto/Manual	Yes	**ABL 8RPS24050**	24.692 (0.700)
		240	10	Auto/Manual	Yes	**ABL 8RPS24100**	35.273 (1.000)
Dedicated range, single-phase connection							
∿ **100…240** *(1)* wide range, 47…63 Hz	12	60	5	Auto	No	**ABL 1REM12050**	15.521 (0.440)
	24	60	2,5	Auto	No	**ABL 1REM24025**	15.521 (0.440)
∿ **100...120/200...240** *(2)*	24	240	10	Auto	No	**ABL 1REM24100**	31.041 (0.880)

Magelis ® multifunction graphic terminals with touch sensitive screen and on-board Ethernet *(1) (2)*

Supply voltage ⎓ 24 V

Description		Ports: serial and communication (type of link)	Application memory	Reference	Weight oz (kg)
5.7"	Monochrome black and white STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBTGT2130**	35.273 (1.000)
	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBTGT2330**	35.273 (1.000)
7.5"	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT4330**	63.493 (1.800)
10.4"	Color STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT5230**	105.822 (3.000)
	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT5330**	105.822 (3.000)
12.1"	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT6330**	105.822 (3.000)
15"	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT7340**	197.534 (5.600)

(1) Service instructions, USB connectors locking device and mounting kit included.

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Preventa™ safety PLCs
Compact, XPSMF31/30/35



490 NTW 000●●

Connecting cables for network and bus

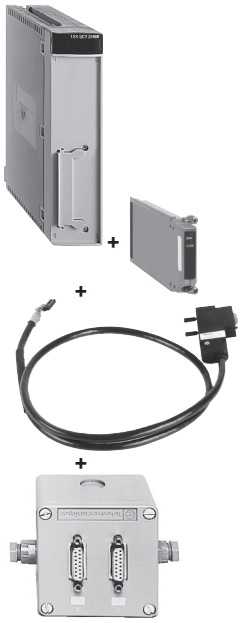
Connection to Ethernet network

Description	Pre-fitted connectors	Length ft (m)	Reference	Weight oz (kg)
Shielded twisted pair cables, straight through	2 RJ45 connectors For connection to DTE (Data Terminal Equipment)	6.6 (2)	**490 NTW 000 02** *(1)*	–
		16.4 (5)	**490 NTW 000 05** *(1)*	–
		39.4 (12)	**490 NTW 000 12** *(1)*	–
		131.2 (40)	**490 NTW 000 40** *(1)*	–
		262.5 (80)	**490 NTW 000 80** *(1)*	–
Shielded twisted pair cables, crossed wires	2 RJ45 connectors For connection between hubs, switches and transceivers	16.4 (5)	**490 NTC 000 05** *(1)*	–
		49.2 (15)	**490 NTC 000 15** *(1)*	–
		131.2 (40)	**490 NTC 000 40** *(1)*	–
		262.5 (80)	**490 NTC 000 80** *(1)*	–

Connection to Modbus® serial link

Description	Use		Length ft. (m)	Reference	Weight oz (kg)
	From	To			
Modbus® serial link connecting cables	Compact PLCs XPSMF3022/3522 + adaptor XPSMFADAPT (RJ45)	Modbus® splitter box LU9 GC3 (RJ45)	1.0 (0.3)	**VW3 A8 306 R03**	0.882 (0.025)
			3.28 (1)	**VW3 A8 306 R10**	2.116 (0.060)
			9.84 (3)	**VW3 A8 306 R30**	74.640 (1.130)
		Premium™ module TSX SCY 21601 (SUB-D 25-pin)	1.0 (0.3)	**XPSMCSCY**	–
	Graphic terminals XBTGT (SUB-D 9-pin)	Modbus® splitter box LU9 GC3 (RJ45)	8.2 (2.5)	**XBTZ938** *(2)*	7.408 (0.210)
Adaptor for cable XBTZ938	SUB-D 9-pin (XBTGT)	XBTZ938 (SUB-D 25-pin)	0.66 (0.2)	**XBTZG909**	–
Adaptor SUB-D 9-pin/RJ45	Compact PLCs (SUB-D 9-pin)	Connecting cables for Modbus® serial link (RJ45)	–	**XPSMFADAPT**	–

Description	Characteristics	Sold in lots of	Unit reference	Weight oz (kg)
End of line adaptors For RJ45 connector	R = 120 Ω, C = 1 nF	2	**VW3 A8 306 RC**	7.055 (0.200)
	R = 150 Ω	2	**VW3 A8 306 R**	0.353 (0.010)



TSX PBY 100

PROFIBUS DP bus connection components

Description	Profile	Services	Reference	Weight oz (kg)
PROFIBUS DP module set for Premium™ PLCs	Master, 12 Mbps	Class 1 and Class 2 master V0 functions, see characteristics. Profibus FMS messaging not supported	**TSX PBY 100**	30.688 (0.870)

Description	Use	Reference	Weight oz (kg)
Remote inputs/outputs on PROFIBUS DP bus	Advantys™ STB network interface module	**STB NDP 2112**	4.938 (0.140)
	Momentum™ communication module	**170 DTN 110 00**	–
Connectors for remote I/O communication module	Line terminators	**490 NAD 911 03**	–
	Intermediate connection	**490 NAD 911 04**	–
	Intermediate connection and terminal port	**490 NAD 911 05**	–

Description	Length (m)	Reference	Weight oz (kg)
PROFIBUS DP connecting cables	100	**TSX PBS CA 100**	–
	400	**TSX PBS CA 400**	–



490 NAD 911 03

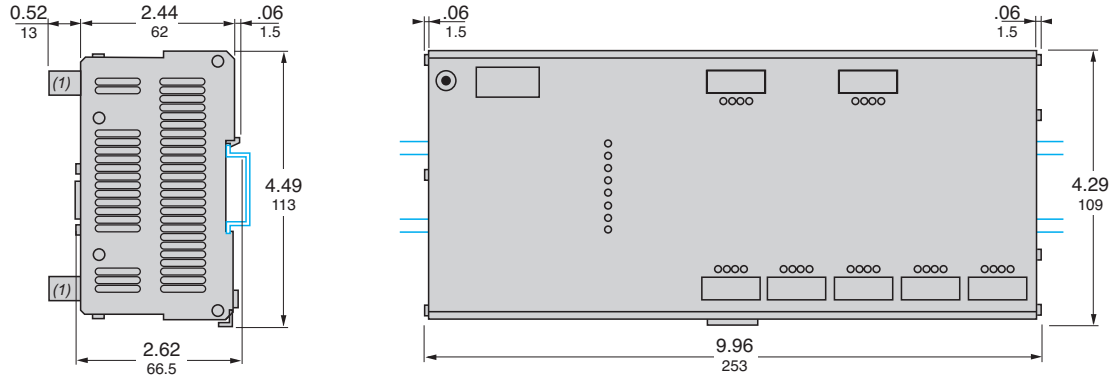
Description	Reference	Weight oz (kg)
Replacement parts	Main bus junction box	**490 NAE 911 00**	–
	PCMCIA card	**467 NHP 811 00**	–

*(1) Cable conforming to standard EIA/TIA-568 category 5 and IEC 1180/EN 50 173 class D. For UL and CSA 22.1 approved cables, add the letter **U** to the end of the reference.*
(2) Requires adaptor XBTZG909.

2

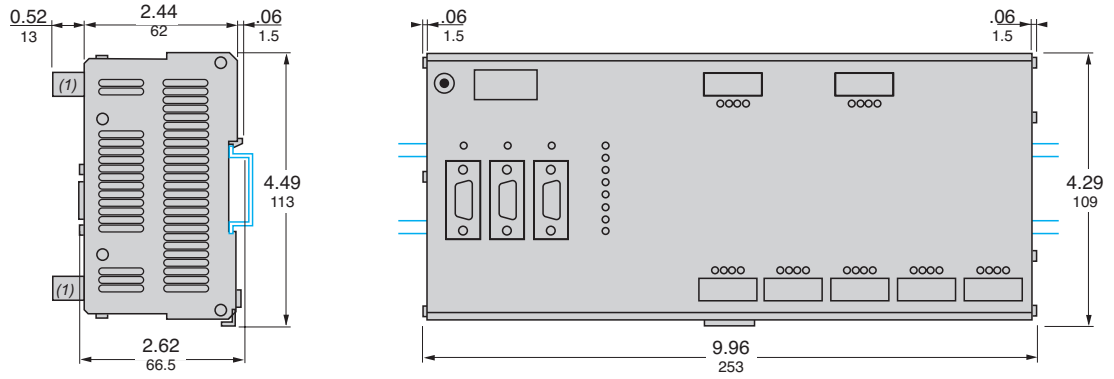
Dimensions

XPSMF31222



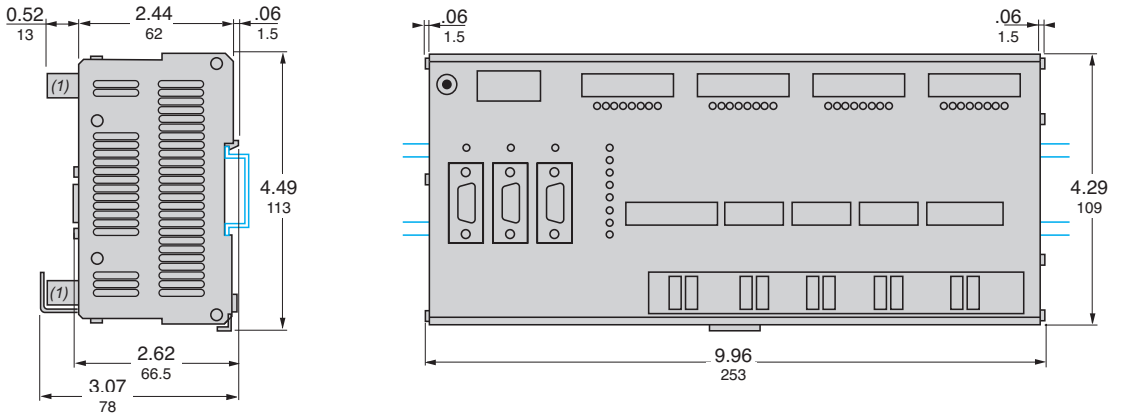
*(1) Removable screw terminals are provided with compact safety PLC **XPSMF31222**.*

XPSMF3022



*(1) Removable screw terminals are provided with compact safety PLC **XPSMF3022**.*

XPSMF35●●



Dual Dimensions: INCHES / Millimieters

*(1) Removable screw terminals are provided with compact safety PLC **XPSMF35●●**.*

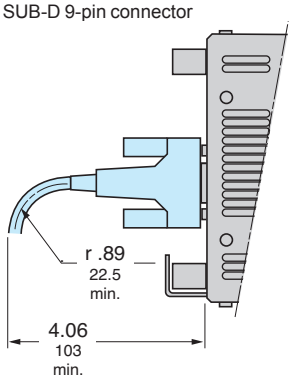
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Preventa™ safety PLCs
Compact, XPSMF31/30/35

Mounting

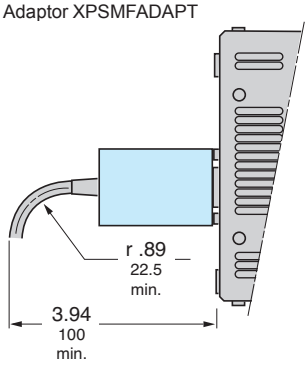
Mounting precautions relating to connectors

Access to Modbus® serial link (RTU)

SUB-D 9-pin connector

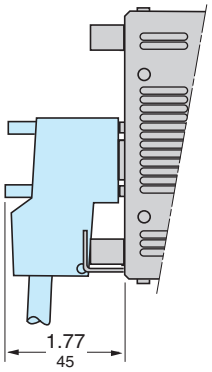


Adaptor XPSMFADAPT



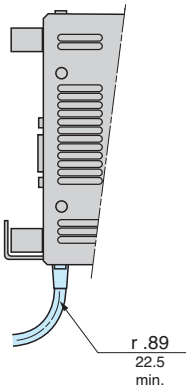
A ccess to PROFIBUS DP

Connector 490 NAD 911 03



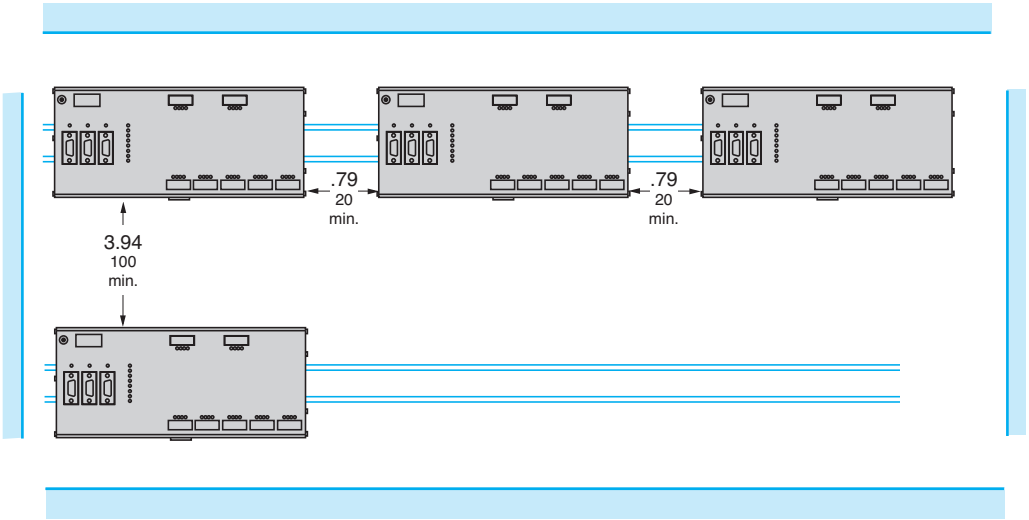
Access to Ethernet network

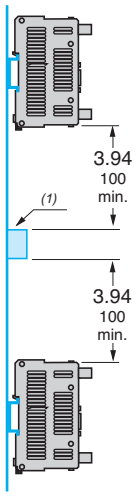
RJ45 socket (SafeEthernet protocol, Modbus® TCP/IP server protocol)



Dual Dimensions: INCHES Millimieters

Mounting in panel or enclosure



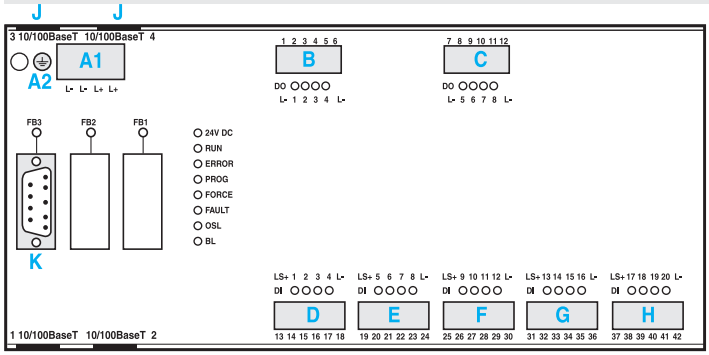


(1) Prefabricated electrical ducting for passage of cables.

Safety automation system solutions
Preventa™ safety PLCs
Compact, XPSMF31/30/35

Connections

XPSMF31222, XPSMF3022



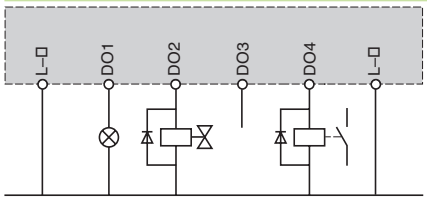
Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Ground**		⏚	Ground
B	**Outputs Digital**	1	L-	Outputs common
		2	1	Output 1
		3	2	Output 2
		4	3	Output 3
		5	4	Output 4 (for increased load)
		6	L-	Outputs common
C	**Outputs Digital**	7	L-	Outputs common
		8	5	Output 5
		9	6	Output 6
		10	7	Output 7
		11	8	Output 8 (for increased load)
		12	L-	Outputs common
D	**Inputs Digital**	13	LS+	Sensor supply for inputs 1 to 4
		14	1	Digital input 1
		15	2	Digital input 2
		16	3	Digital input 3
		17	4	Digital input 4
		18	L-	Inputs common
E	**Inputs Digital**	19	LS+	Sensor supply for inputs 5 to 8
		20	5	Digital input 5
		21	6	Digital input 6
		22	7	Digital input 7
		23	8	Digital input 8
		24	L-	Inputs common
F	**Inputs Digital**	25	LS+	Sensor supply for inputs 9 to 12
		26	9	Digital input 9
		27	10	Digital input 10
		28	11	Digital input 11
		29	12	Digital input 12
		30	L-	Inputs common

Item	Connection	Screw N°	Screw	Function
G	**Inputs Digital**	31	LS+	Sensor supply for inputs 13 to 16
		32	13	Digital input 13
		33	14	Digital input 14
		34	15	Digital input 15
		35	16	Digital input 16
		36	L-	Inputs common
H	**Inputs Digital**	37	LS+	Sensor supply for inputs 17 to 20
		38	17	Digital input 17
		39	18	Digital input 18
		40	19	Digital input 19
		41	20	Digital input 20
		42	L-	Inputs common

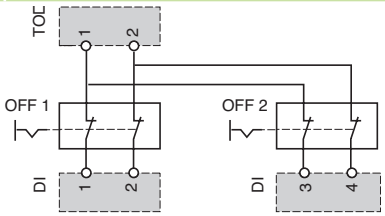
Item	Connection	Type	Function
K	**Communication**	SUB-D 9-pin (FB3)	**XPSMF3022**: slave on Modbus® serial (RTU)
J	**Programming**	Integrated 4 RJ45 switched Ethernet Communication ports	Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and the programming terminal in a point to point or via an Ethernet network for programming, setting IP address etc.
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.
	Non-Safe Communication available with references: XPSMF3022, and XPSMF31222		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other non- safety related components (e.g HMI Magelis ®, standard PLCs, Scada systems,etc.) this can be established in a point to point way or via an Ethernet network.

Connection examples

Actuator connections to the outputs

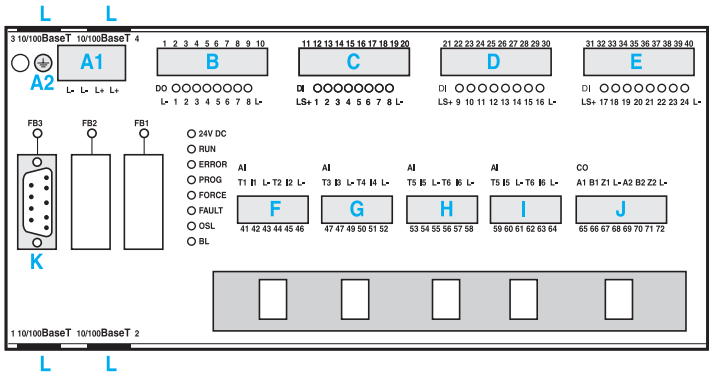


Emergency stop connections (line control)



Connections

XPSMF35●●

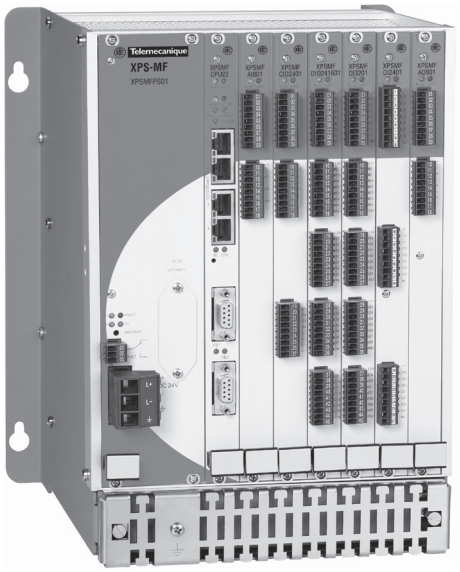


Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Ground**	–	⏚	Ground
B	**Outputs - Digital**	1	L-	Outputs common
		2	1	Digital output 1
		3	2	Digital output 2
		4	3	Digital output 3
		5	4	Digital output 4 (for increased load)
		6	5	Digital output 5
		7	6	Digital output 6
		8	7	Digital output 7
		9	8	Digital output 8 (for increased load)
		10	L-	Outputs common
C	**Inputs - Digital**	11	LS+	Sensor supply for inputs 1 to 8
		12	1	Digital input 1
		13	2	Digital input 2
		14	3	Digital input 3
		15	4	Digital input 4
		16	5	Digital input 5
		17	6	Digital input 6
		18	7	Digital input 7
		19	8	Digital input 8
		20	L-	Inputs common
D	**Inputs - Digital**	21	LS+	Sensor supply for inputs 9 to 16
		22	9	Digital input 9
		23	10	Digital input 10
		24	11	Digital input 11
		25	12	Digital input 12
		26	13	Digital input 13
		27	14	Digital input 14
		28	15	Digital input 15
		29	16	Digital input 16
		30	L-	Inputs common
E	**Inputs - Digital**	31	LS+	Sensor supply for inputs 17 to 24
		32	17	Digital input 17
		33	18	Digital input 18
		34	19	Digital input 19
		35	20	Digital input 20
		36	21	Digital input 21
		37	22	Digital input 22
		38	23	Digital input 23
		39	24	Digital input 24
		40	L-	Inputs common

Item (cont.)	Connection	Screw N°	Screw	Function
F	**Inputs - Analog**	41	T1	Transmitter supply 1
		42	I1	Analog input 1
		43	L-	Inputs common
		44	T2	Transmitter supply 2
		45	I2	Analog input 2
		46	L-	Inputs common
G	**Inputs - Analog**	47	T3	Transmitter supply 3
		48	I3	Analog input 3
		49	L-	Inputs common
		50	T4	Transmitter supply 4
		51	I4	Analog input 4
		52	L-	Inputs common
H	**Inputs - Analog**	53	T5	Transmitter supply 5
		54	I5	Analog input 5
		55	L-	Inputs common
		56	T6	Transmitter supply 6
		57	I6	Analog input 6
		58	L-	Inputs common
I	**Inputs - Analog**	59	T7	Transmitter supply 7
		60	I7	Analog input 7
		61	L-	Inputs common
		62	T8	Transmitter supply 8
		63	I8	Analog input 8
		64	L-	Inputs common
J	**Inputs - Counter**	65	A1	Input A1 or bit 0 (LSB)
		66	B1	Input B1 or bit 1
		67	Z1	Input Z1 or bit 2 (MSB)
		68	L-	Inputs common
		69	A2	Input A2 or bit 0 (LSB)
		70	B2	Input B2 or bit 1
		71	Z2	Input Z2 or bit 2 (MSB)
		72	L-	Inputs common

Item	Connection	Type	Function
K	**Communication**	SUB-D 9-pin (FB3)	**XPS3522**: slave on Modbus® serial (RTU) **XPS3542**: slave V0 on PROFIBUS DP
L	**Programming**	Integrated 4 RJ45 switched Ethernet Communication ports	Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and the programming terminal in a point to point or via an Ethernet network for programming, setting IP address etc.
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.
	Non-Safe Communication available with references: XPSMF3502, XPSMF3522 and XPSMF3542		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other non- safety related components (e.g HMI Magelis ®, standard PLCs, Scada systems,etc.) this can be established in a point to point way or via an Ethernet network.

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU



Modular safety PLC XPSMF60, fitted with 6 different "in rack" I/O cards

Presentation

Safety PLC **XPSMF60** offers a modular solution for monitoring simple to complex safety functions for all industrial applications relating to the protection of personnel and machine safety.

Designed for use with numerous machine safety functions, this modular safety PLC is intended for use in safety related parts of control systems.
It can manage up to:
- category 4 conforming to EN 954-1,
- performance level "e" conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

Modularity

The safety PLC **XPSMF60** is a modular system consisting of a metal housing or rack, fitted with a power supply module, a CPU and "in rack" I/O cards.
■ Various types of "in rack" I/O cards are catalog listed and are selected according to the application.
■ Mounting the "in rack" cards is a simple operation using the guide rails (6 slots). Electrical connection is automatic and assured by the back plane bus of the rack.
■ The mounting order of the "in rack" I/O cards is open to the user, but the order, however, must correspond to the programming software.
■ The removal of the "in rack" cards, performed with the supply switched-off, is facilitated by a grip at the base of the cards.
■ Covering plates for unused "in rack" I/O card slots are available to protect the system in polluted environments.

Composition of the modular safety PLC XPSMF60

Minimum basic equipment	Optional "in rack" I/O cards	
	Type	Details
Metal rack XPSMFGEH01 with back plane bus assuring electrical connection of components installed + metal securing plate for shielded cables (EMC), two cooling fans **+** **a power supply module (⎓ 24 V) XPSMFPS01**, **+** **a central processing unit XPSMFCPU22** with 4 x RJ45 integrated switched Ethernet ports for Programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus® TCP/IP server protocol) and in addition a SUB-D (FB2) connector for communication on Modbus® serial (RTU)	XPSMFAI801	8 single-pole analog inputs or 4 2-pole analog inputs
	XPSMFAO801	8 analog outputs
	XPSMFCIO2401	2 counting inputs, 4 digital outputs
	XPSMFDI2401	24 digital inputs (⎓ 110 V / ∿ 127 V)
	XPSMFDI3201	32 digital inputs
	XPSMFDIO241601	24 digital inputs, 16 digital outputs
	XPSMFDO801	8 relay outputs (∿ 6…250 V)

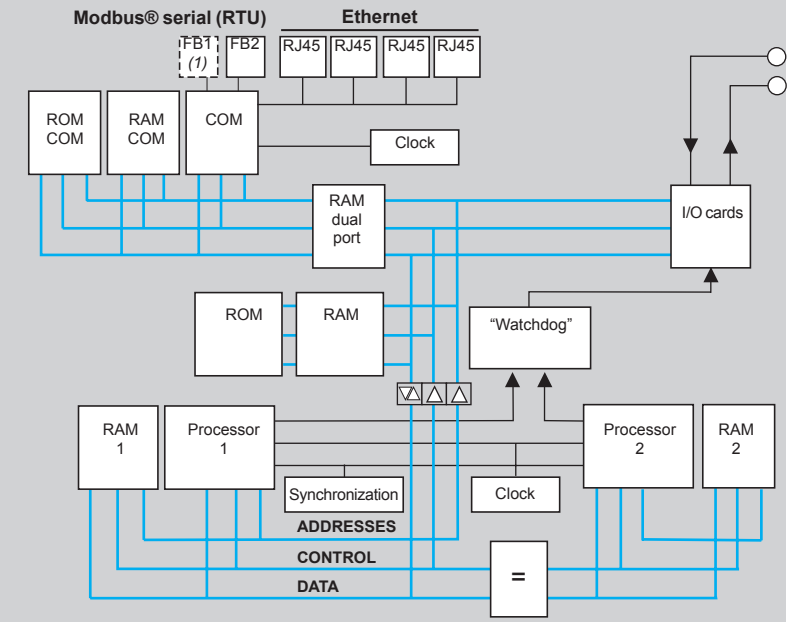
Safety PLCs

In order to meet safety requirements, the modular safety PLC **XPSMF60** incorporates two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level "e" conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between the safety PLCs and the safety remote I/O modules (**Special Switch**).
■ **Redundancy**: the 2 processors integrated in the modular safety PLC analyze and compare the data received from the safety inputs and outputs.
The incoming and outgoing data (programmed values and received values) are received in parallel by the two processors and compared in real-time.
■ **Self-monitoring ("Watchdog")**: the modular safety PLC continuously monitors the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.
■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the inputs and outputs of the safety PLC on the Ethernet network, while avoiding signal collisions and excessive amounts of data on the network.

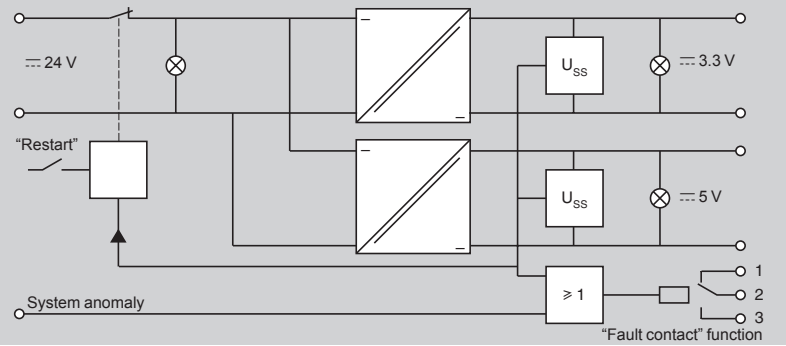
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Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU

Functional diagrams

Central processing unit XPSMFCPU22



Power supply module XPSMFPS01



Line control for "in rack" I/O card XPSMFDIO241601 and "in rack" input card XPSMFDI3201

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring anomaly (short-circuit, line break) to be seen at the inputs of the safety PLCs.
The digital outputs 1 to 16 of card **XPSMFDIO241601** are connected to the digital inputs of the same card or to the digital inputs of card **XPSMFDI3201**.

(1) FB1 not used.

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU



XPSMFDI2401



XPSMFDI3201



XPSMFAI801

Safety inputs and outputs (continued)

Programming automated safety functions

Software **XPSMFWIN** (reference SSV1XPSMFWIN) running on a PC enables the programming of all safety remote I/O modules and the modular safety PLCs, as well as configuration of the communication settings.

Safety inputs and outputs

The modularity of the PLC **XPSMF60** allows the user to select and install, in the six slots of the rack, various input, output and input/output cards to alter the number and type of safety inputs and/or outputs to be monitored.
6 identical cards can be installed in the same rack.
The cards listed (see below and next page) indicate the number of inputs and outputs available for connection to the machines to be monitored.

Digital input cards *(1)*

Cards	Digital inputs		
	Nº	Type	
		Safety detection	Safety dialog
XPSMFDI2401	24	Limit switches, Guard switches, with reset and with actuator, Light curtains type 2 and type 4, Safety mats and sensing edges…	Mushroom head emergency stops, Enclosures for control and signalling units, Two-hand control stations…
XPSMFDI3201	32		

Analog input card *(1) (2)*

Card	Analog measuring inputs	
	N°	Functions
XPSMFAI801	8 single-pole or 4 2-pole	Closed circuit scanning of input channels, Single-pole measuring of 0 to 10 V voltages, 2-pole measuring of -10 to +10 V voltages, Single-pole measuring of 0 to 20 mA currents

(1) Removable screw terminal blocks are provided with the power supply and "in rack" I/O cards.
(2) Use shielded dual twisted pair cables, maximum length 984 ft (300m), short-circuit unused analog inputs.

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU



XPSMFCIO2401



XPSMFDIO241601



XPSMFAO801



XPSMFDO801

Safety inputs and outputs *(continued)*

Mixed I/O cards *(1)*

Card	Counting inputs			Digital outputs	
	N°	⎓ 5 V	⎓ 24 V	N°	Type
XPSMFCIO2401	2	Incremental encoders	Sensors 2/3-wire PNP/NPN	4	**Safety actuators** Contactors-motors, Control relays, Variable speed drives. **Safety dialog** Beacons and indicator banks, Rotating mirror beacons, Sirens…
		Independent and configurable counting inputs (one channel for counting and one channel for increasing or decreasing counting direction)			

Card	Digital inputs		Digital outputs	
	N°	Type	N°	Type
XPSMFDIO241601	24	**Safety detection** Limit switches, Guard switches, with reset and with actuator, Light curtains type 2 and type 4, Safety mats and sensing edges… **Safety dialog** Mushroom head Emergency stops, Enclosures for control and signalling units, Two-hand control stations…	16	**Safety actuators** Contactors-motors, Control relays, Variable speed drives. **Safety dialog** Beacons and indicator banks, Rotating mirror beacons, Sirens…

Analog output card *(1) (2)*

Card	Analog outputs	
	N°	Functions
XPSMFAO801	8	Closed circuit scanning of output channels, Single-pole measuring of 0 to 10 V voltages, Measuring, using jumper, 0/4 to 20 mA currents (with 500 Ω external resistor)

Relay output card *(1) (2)*

Card	Relay outputs	
	N°	Type
XPSMFDO801	8	**Safety actuators** Contactors-motors, Control relays, Variable speed drives. **Safety dialog** Beacons and indicator banks, Rotating mirror beacons, Sirens…

Remote inputs and outputs

In addition to the inputs/outputs available as standard on the optional “in rack” cards, the modular safety PLC **XPSMF60** can be connected to safety remote input modules **XPSMF1** and/or safety remote output modules **XPSMF2** and/or safety remote mixed I/O modules **XPSMF3**.
The safety remote input, output and mixed I/O modules can be located within the vicinity of the machines to be monitored, thus reducing cabling.
Communication between these safety modules and the safety PLC **XPSMF60** is performed on an Ethernet network using the SafeEthernet safety protocol, via the integrated RJ45 switched Ethernet communications ports.

(1) Removable screw terminal blocks are provided with the power supply and “in rack” I/O cards.
(2) Use shielded dual twisted pair cables, maximum length 984 ft (300 m), short-circuit unused analog inputs.

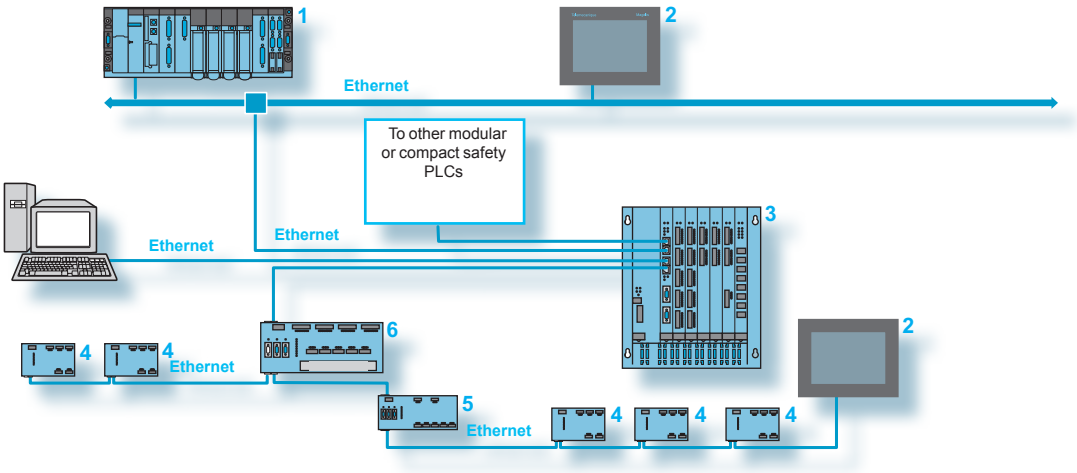
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Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU

Communication

Safety communication on Ethernet network

Communication between the PC, Magelis ® graphic terminals or automation platform (Premium™) and the modular safety PLC is achieved by the **Ethernet** network connection via the integrated RJ45 switched Ethernet communications ports of the modular safety PLC.

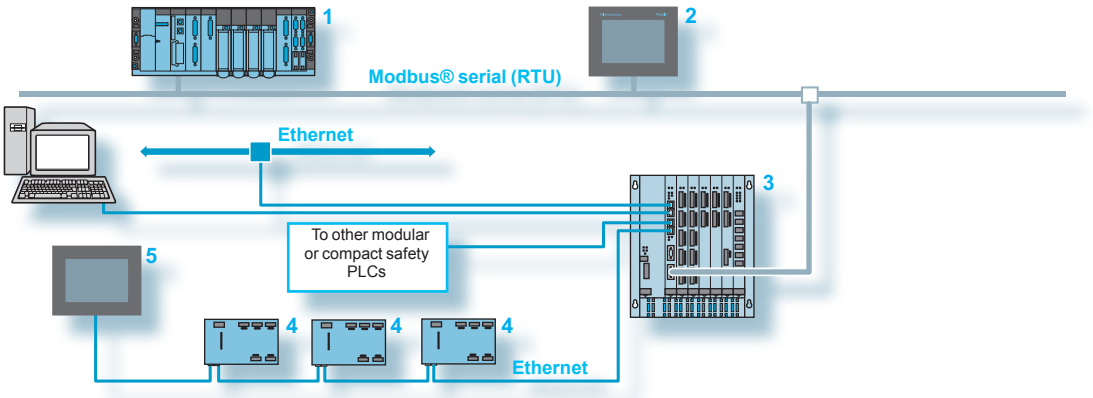
Modular PLC	Communication protocols	
	safety	non safety
XPSCPU22	SafeEthernet	Modbus® TCP/IP server (slave)



1 Premium™ automation platform: Modbus® TCP/IP client.
2 Graphic terminal **XBTGT**: Modbus® TCP/IP client.
3 Modular safety PLC: Modbus® TCP/IP server.
4 Safety remote I/O modules **XPSMF1/2/3**. They communicate with compact and modular safety PLCs using the SafeEthernet protocol.
5 Compact safety PLC **XPSMF31/30**: Modbus® TCP/IP server.
6 Compact safety PLC **XPSMF35●●**: Modbus® TCP/IP server.

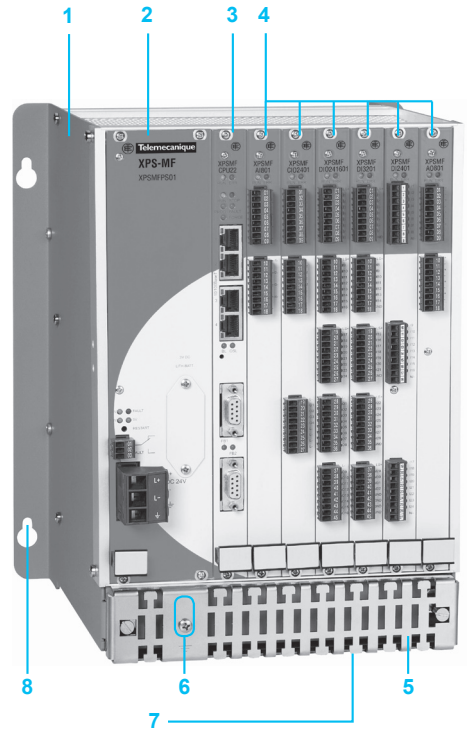
Communication on Modbus® serial (RTU) fieldbus

On Modbus® serial (RTU), the modular safety PLC is a slave of the Premium™ automation platform and Magelis ® graphic terminal.
It is connected to the Modbus® serial network via its SUB-D 9-pin connector (FB2).



1 Graphic terminal **XBTGT**: Modbus® serial (RTU) master.
2 Premium™ automation platform: Modbus® serial (RTU) master.
3 Modular safety PLC: Modbus® serial (RTU) slave, Modbus® TCP/IP server.
4 Safety remote I/O modules **XPSMF1/2/3**. They communicate with the modular safety PLC using the SafeEthernet protocol.
5 Graphic terminal **XBTGT**: Modbus® serial (RTU) client.

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU

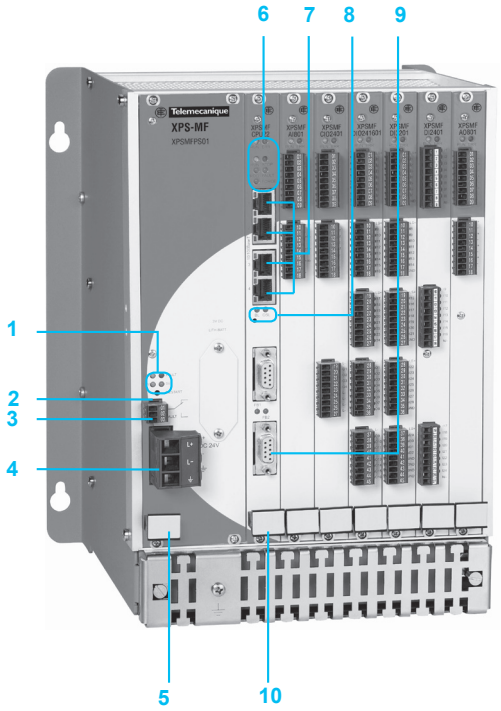


Description

Modular safety PLC

Modular assembly consisting of:

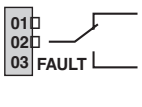
1 A metal rack **XPSMFGEH01**.
2 A ⎓ 24 V power supply module **XPSMFPS01**.
3 A central processing unit **XPSMFCPU22**.
4 Six optional “in rack” I/O cards (back plane bus assures the electrical connection of “in rack” cards installed, the power supply module and the CPU).
5 A metal plate for securing shielded analog input connection cables (EMC),
6 One ground connection screw.
7 Two cooling fans (beneath the metal rack).
8 Four Ø 0.55 in (14 mm) elongated holes for mounting the rack on a vertical support.



Power supply module XPSMFPS01 and Central processing unit XPSMFCPU22 consisting of:

1 Four voltage status LEDs (FAULT, 24 V, 3.3 V or 5 V).
2 A RESTART button (accessible using fine pointed tool).
3 A 3-pole terminal block (3 captive screws) for “Fault contact” function *(1)*.
4 A ⎓ 24 V supply terminal block, including ground connection *(2)*.
5 A grip to assist installation/removal of the power supply module.
6 Seven process status LEDs.
7 Four integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for Programming, and for Safety and non-safety related communication on Ethernet. (safety related using SafeEthernet protocol and Non-safety related using Modbus® TCP server protocol).
8 Two process status LEDs.
9 A SUB-D 9-pin connector (FB2) for connection on Modbus® serial (RTU) (FB1 not used), with process status LED.
10 A grip to assist installation/removal of the CPU.

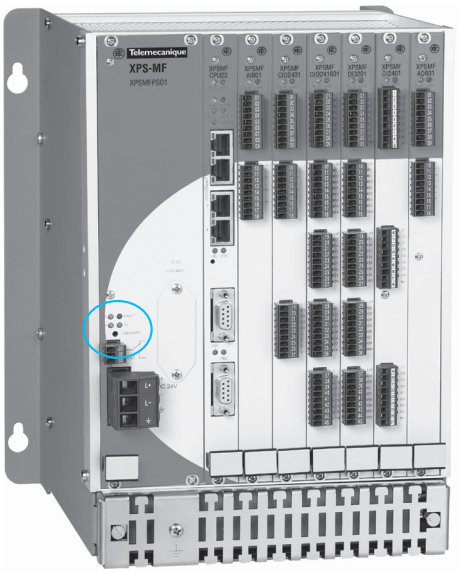
*(1) “**Fault contact**” function: the power supply module incorporates a volt-free changeover contact. Operating errors occurring in the system are read and displayed by the LEDs. The errors are analyzed on the programming PC:*



Contact positions	Status
1-2 closed (2-3 open)	Normal operation of the PLC.
1-2 open (2-3 closed)	Absence of supply to the PLC or the CPU is in ERROR STOP mode.

(2) Removable screw terminal blocks are provided with the power supply and “in rack” I/O cards.

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU

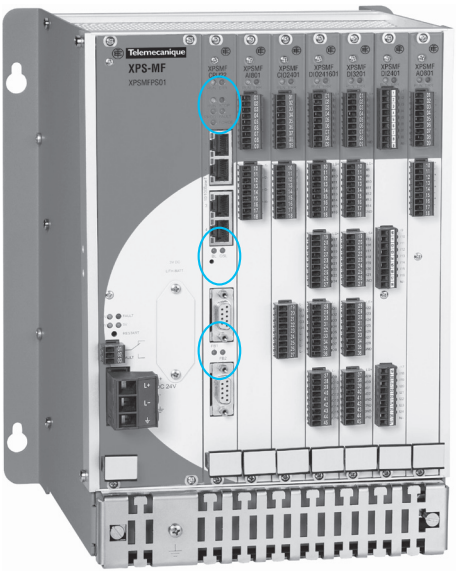


LED details

Power supply module XPSMFPS01

LED	Color	Status	Meaning
24 VDC	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
3.3 VDC	Green	On	⎓ 3.3 V voltage present.
		Off	No voltage.
5 VDC	Green	On	⎓ 5 V voltage present.
		Off	No voltage.
FAULT	Orange	On	Operating error.
			The user application has caused an error.
			The system configuration is defective.
			Replace module.
		Off	None of the above errors have occurred.

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU



LED details *(continued)*

Central processing unit XPSMFCPU22

LED	Color	Status	Meaning
RUN	Green	On	Program in operation: CPU in STOP or RUN mode.
		Flashing	A new programming system will be downloaded.
		Off	The CPU is in “ERROR” state (see ERROR).
ERR	Red	On	Software error or hardware anomaly detected by the CPU. The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded. The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset. The process can only be started again from the PC.
		Flashing	In the event of all the LEDs being on, restarting has detected a system error, a new operating system (OS) must be loaded.
		Off	No error detected.
FB1	–	–	Not used.
FB2	Orange	On	Communication on Modbus® serial link active.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/ software tests carried out.
		Off	The CPU is in “ERROR” state (see ERROR).
STOP	Red	On	The CPU is in STOP mode and no program can be executed.
			The outputs are in the waiting state for the correct supply.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the terminal.
		Off	CPU operating. A new programming system will be downloaded.
PROG	Orange	On	The CPU is being loaded with a new configuration.
		Flashing	CPU changing from INIT state to STOP state. The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
FAULT	Orange	On	Program error.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred while writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
FORCE	Orange	On	CPU in RUN mode and force is active.
		Flashing	Program in STOP mode, but force is prepared and activated if the program restarts.
		Off	Force not activated.
OSL	Orange	Flashing	Operating system and backup loading active.
BL	Orange	Flashing	COM in INIT_Fail state.
RJ45	Green	On	Full duplex mode operation.
		Flashing	Signal collision.
		Off	Half duplex mode operation, no collision.
	Yellow	On	Connection established.
		Flashing	Interface active.

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU

Environment

Modular safety PLC			Rack XPSMFGEH01 + power supply module XPSMFPS01 and central processing unit XPSMFCPU22
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1, EN/ISO 13849-1 and EN/IEC 61508)			Category 4 (EN 954-1), Performance level “e” (EN/ISO 13849-1), Safety integrity level: SIL 3 (EN/IEC 61508)
Product certifications			EN/IEC 61508, part 1-7: 2000, IEC 61511 part 1-3: 2004, DIN VDE 0116: 1989, EN 50156-1: 2004, EN 12067-2: 2004, EN 298: 2003, EN 230: 1990, NFPA 85: 2001, EN/IEC 61131-2: 2003, EN 61000-6-2: 2001, EN 61000-6-4: 2001 EN 54-2: 1997, NFPA 72: 2002
Ambient air temperature conforming to EN 61131-2	Operating	**°F (°C)**	Rack, power supply module and CPU: +32… + 140 (0…+ 60)
	Storage	**°F (°C)**	■ Rack **XPSMFGEH01**: -40… + 185 (- 40…+ 85), ■ Power supply module **XPSMFPS01**: □ -40… + 185 (- 40…+ 85), without backup battery □ -22… + 185 (- 30…+ 85), with backup battery ■ Central processing unit **XPSMFCPU22**: -40… + 185 (- 40…+ 85)
Relative humidity			95% (supply not connected)
Degree of protection	Enclosure		IP 20 with covering plate on unused “in rack” I/O card slots
Pollution			Degree of pollution II
Altitude			6560 ft (2000 m)
Protection class			Class II, conforming to EN/IEC 61131-2
Electromagnetic compatibility			Conforming to EN/IEC 61131-2
Vibration resistance conforming to EN 61131-2	Operating		1 g, frequency 10…150 Hz, unit test while operating, 10 cycles per axis
Shock resistance conforming to EN 61131-2	Operating		15 g (duration 11 ms), unit test while operating, 2 cycles per axis
Resistance to electrostatic discharges conforming to EN/IEC 61000-4-2		**kV**	4 contact, 8 air discharge
Immunity to high frequency interference conforming to EN/IEC 61000-4-3		**V/m**	10 (26 MHz…1 GHz)
Rack material			Metal alloy

Electrical characteristics

Supply	Voltage	**V**	⎓ 24 (External supply with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)
	Voltage limits		- 15… + 20% (power supply module) - 20… + 25%
Output voltage of power supply module		**V**	⎓ 3.3 / 10 A
		V	⎓ 5 / 2 A
Maximum power consumption		**A**	30 max., 32 A external fuse
Immunity to momentary supply interruptions		**ms**	10
Protection			Internal fuse
Response time		**ms**	Depending on size of application
Backup capacitor			Approximately 1 week for diagnostics and time information Program is not effected
Clock			Yes
Operational data of CPU			⎓ 3.3 V/1.5 A
			⎓ 5 V/1 A
User memory	Application	**kB**	500
	Data	**kB**	500
LED display			Yes

Communication

Ethernet network: safety communication using SafeEthernet protocol

Compatibility			Central processing unit XPSMFCPU22
Transmission	Communication ports		Integrated 4 RJ45 switched Ethernet communications ports
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)
Functions	Control of:		Transmitted data: duplication, loss, bit changing. Addressing of transmitted and received messages. Data sequence: repetition, loss of data, change. Data reception time: delay, repetition, echo
	Diagnostics on:		CPU, user program, communication, operating voltage and temperature, inputs & outputs

Communication *(continuous)*

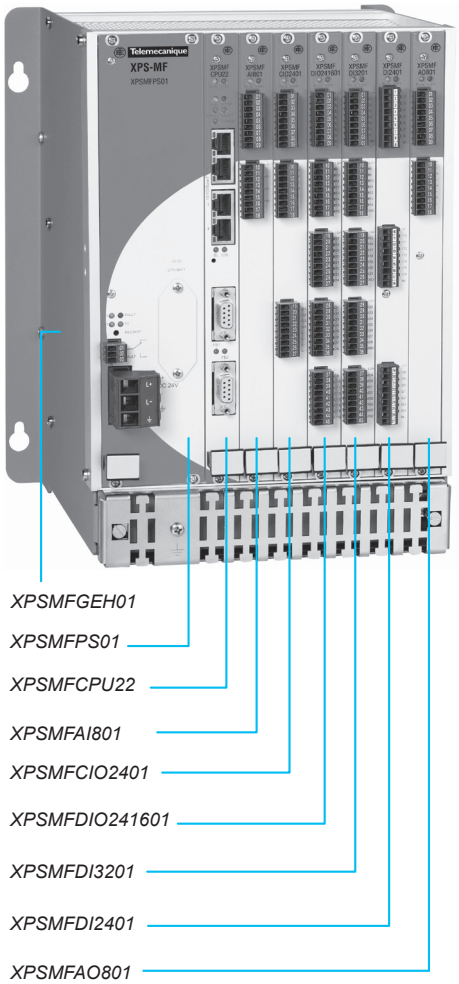
Compatibility			**Central processing unit XPSMFCPU22**
Ethernet network: Non-safety related communication using Modbus® TCP/IP protocol			
Connection Ports	Number and type		Integrated 4 RJ45 switched Ethernet communication ports
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation
	Master/Slave		Server (slave)
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)
Transparent Ready ® Services	Class		A10
	Standard Ethernet TCP/IP communication services		Modbus® TCP/IP Server
			Modbus® TCP/IP messaging (reading/writing of data words)
			Modbus® identification requests
	TCP port		standard 502
	Max. number of Modbus® TCP/IP connections		1 to 20
Modbus® serial (RTU)			
Serial link ports	Number and type		1 x SUB-D 9-pin female (FB2)
	Master/Slave		Slave
Addressing			122 slave addresses
Physical layer			RS 485

Connections *(1)*

Power supply module			**XPSMFPS01**
Type of connection			Removable screw terminal blocks *(2)*
Supply connection	Number of terminal blocks		1
	For 1 cable without cable end		Solid or flexible AWG 20 (0.75…16 mm^2)
	For 1 flexible cable with or without plastic cable end		AWG 20 (0.5…16 mm^2)
	For 2 cables of same diameter, without cable end		Solid or flexible AWG 20 (0.75…6 mm^2)
	For 2 cables of same diameter, flexible without cable end		AWG 20 (0.5…4 mm^2)
	For 2 cables of same diameter, flexible with plastic cable end		AWG 20 (0.5…6 mm^2)
"In rack" I/O card			**XPSMFAI801, XPSMFAO801, XPSMFCIO2401, XPSMFDI2401, XPSMFDI3201, XPSMFDIO241601, XPSMFDO801**
Type of connection			Removable screw terminal blocks *(2)*
Digital input channel and output channel connection	Number of terminal blocks		Depending on "in rack" I/O card type
	For 1 cable without cable end		Solid or flexible: AWG 28-16 (0.14…1.5 mm^2)
	For 1 flexible cable without cable end		AWG 22-16 (0.25…1.5 mm^2)
	For 1 flexible cable with plastic cable end		AWG 22-20 (0.25…0.5 mm^2)
	For 2 cables of same diameter, without cable end		Solid: AWG 28-20 (0.14…0.5 mm^2) Flexible: AWG 28-18 (0.14…0.75 mm^2)
	For 2 cables of same diameter, flexible without cable end		AWG 22 (0.25…0.34 mm^2)
	For 2 cables of same diameter, flexible with plastic cable end		AWG 20 (0.5 mm^2)
Analog input channel and output channel connection	Number of terminal blocks		Depending on "in rack" I/O card type
	For 1 cable without cable end		Solid or flexible: AWG 28-16 (0.14…1.5 mm^2)
	For 1 flexible cable without cable end		AWG 22-16 (0.25…1.5 mm^2)
	For 1 flexible cable with plastic cable end		AWG 22-20 (0.25…0.5 mm^2)
	For 2 cables of same diameter, without cable end		Solid: AWG 28-20 (0.14…0.5 mm^2) Flexible: AWG 28-18 (0.14…0.75 mm^2)
	For 2 cables of same diameter, flexible without cable end		AWG 22 (0.25…0.34 mm^2)
	For 2 cables of same diameter, flexible with plastic cable end		AWG 20 (0.5 mm^2)
Counting channel connection	Number of terminal blocks		Depending on "in rack" I/O card type
	For 1 cable without cable end		Solid or flexible: AWG 28-16 (0.14…1.5 mm^2)
	For 1 flexible cable without cable end		AWG 22-16 (0.25…1.5 mm^2)
	For 1 flexible cable with plastic cable end		AWG 22-20 (0.25…0.5 mm^2)
	For 2 cables of same diameter, without cable end		Solid: AWG 28-20 (0.14…0.5 mm^2) Flexible: AWG 28-18 (0.14…0.75 mm^2)
	For 2 cables of same diameter, flexible without cable end		AWG 22 (0.25…0.34 mm^2)
	For 2 cables of same diameter, flexible with plastic cable end		AWG 20 (0.5 mm^2)
Cable connection	Tightening torque		1.9…2.2 lb-in (0.22…0.25 Nm)
	Bared length		0.35 in (9mm)

(1) AWG: American Wire Gauge.
(2) Removable screw terminal blocks are provided with the power supply and "in rack" I/O cards.

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU



Modular PLC (⎓ 24 V supply)

Minimum basic equipment

Description	Reference	Weight oz (kg)
Metal rack *(1)* **fitted with:** □ a back plane bus, assuring electrical connection of components installed: power supply module, CPU and "in rack" cards □ two cooling fans □ a metal securing plate for shielded cables (EMC)	**XPSMFGEH01**	–
⎓ **24 V power supply module** *(1)*	**XPSMFPS01**	28.925 (0.820)
CPU *(1)* **fitted with:** □ 4 x integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for Programming, and for Safety and non-safety related communication on Ethernet. (safety related using SafeEthernet protocol and Non-safety related using Modbus® TCP/IP server protocol □ 1 x SUB-D 9-pin port (FB2) for access to Modbus® serial (RTU)	**XPSMFCPU22**	9.877 (0.280)

Optional "in rack" I/O cards

Description	Functions		Reference	Weight oz (kg)
	Inputs	Outputs		
"In rack" I/O card *(1)*	Analog: 8 single-pole or 4 2-pole, configurable	–	**XPSMFAI801**	8.466 (0.240)
	–	8 analog	**XPSMFAO801**	9.877 (0.280)
	2 counting	4 digital	**XPSMFCIO2401**	9.171 (0.260)
	24 digital (⎓ 110 V / ∿ 127 V)	–	**XPSMFDI2401**	9.171 (0.260)
	32 digital	–	**XPSMFDI3201**	9.171 (0.260)
	24 digital	16 digital *(2)*	**XPSMFDIO241601**	9.171 (0.260)
	–	8 relay ≂ 6…250 V	**XPSMFDO801**	21.164 (0.600)

(1) Removable screw terminal blocks are provided with the power supply and "in rack" I/O cards.
(2) Configurable for line control.

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU

Configuration software

■ Reference **SSV1XPSMFWIN** contains the full version of the programming software XPSMFWIN software for the XPSMF Safety PLCs. The XPSMFWIN is part of our Safety Suite and is not available seperately.

Description	Operating system	Details	Languages	Reference	Weight oz (kg)
Configuration software XPSMFWIN for programming modular safety PLCs CD-ROM + user manual	Windows ® 2000, Windows ® XP	Software available on Safety Suite V2 software pack	English, German, French	**SSV1XPSMFWIN**	18.342 (0.520)

Accessories for modular PLC

Description	For use with	Reference	Weight oz (kg)
Covering plate	Unused “in rack” I/O card slots	**XPSMFBLK**	–

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU



ABL 8RPS24050



ABL 1REM24025

Phaseo ® regulated switch mode power supplies

Mains input voltage	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conformity to standard IEC EN 61000-3-2 and IEC EN 60950	Reference	Weight
V	⎓ V	W	A				oz (kg)
Universal range, single-phase (N-L1) **or 2-phase** (L1-L2) **connection**							
∿ **100…120 V/200...500** - 15%, + 10% 50/60 Hz	24...28.8	72	3	Auto/Manual	Yes	**ABL 8RPS24030**	10.582 (0.300)
		120	5	Auto/Manual	Yes	**ABL 8RPS24050**	24.692 (0.700)
		240	10	Auto/Manual	Yes	**ABL 8RPS24100**	35.273 (1.000)
Dedicated range, single-phase connection							
∿ **100…240** *(1)* wide range, 47…63 Hz	12	60	5	Auto	No	**ABL 1REM12050**	15.521 (0.440)
	24	60	2.5	Auto	No	**ABL 1REM24025**	15.521 (0.440)
∿ **100...120/200...240** *(2)*	24	240	10	Auto	No	**ABL 1REM24100**	31.041 (0.880)



XBTGT2130, XBTGT2330



XBTGT4330



XBTGT5●30



XBTGT6330



XBTGT7340

Magelis ® multifunction graphic terminals with touch sensitive screen and on-board Ethernet *(1)*

Supply voltage ⎓ 24 V

Description		Ports: serial and communication (type of link)	Application memory	Reference	Weight oz (kg)
5.7"	Monochrome black and white STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBTGT2130**	35.273 (1.000)
	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBTGT2330**	35.273 (1.000)
7.5"	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT4330**	63.493 (1.800)
10.4"	Color STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT5230**	105.822 (3.000)
	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT5330**	105.822 (3.000)
12.1"	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT6330**	105.822 (3.000)
15"	Color TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBTGT7340**	197.534 (5.600)

(1) Service instructions, USB connectors locking device and mounting kit included.

Presentation: page 2/34 | Characteristics: page 2/42 | References: page 2/44 | Dimensions, mounting: page 2/48 | Connections: page 2/49

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU



490 NTW 000●●

Connecting cables for network and bus

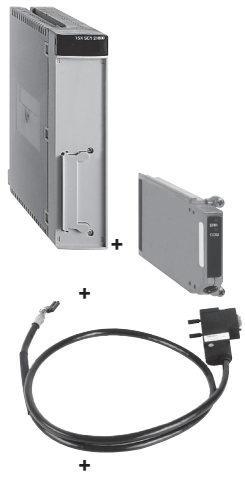
Connection to Ethernet network

Description	Pre-fitted connectors	Length ft (m)	Reference	Weight oz (kg)
Shielded twisted pair cables, straight through	2 RJ45 connectors For connection to DTE (Data Terminal Equipment)	6.6 (2)	**490 NTW 000 02** *(1)*	–
		16.4 (5)	**490 NTW 000 05** *(1)*	–
		39.4 (12)	**490 NTW 000 12** *(1)*	–
		131.2 (40)	**490 NTW 000 40** *(1)*	–
		262.5 (80)	**490 NTW 000 80** *(1)*	–
Shielded twisted pair cables, crossed wires	2 RJ45 connectors For connection between hubs, switches and transceivers	16.4 (5)	**490 NTC 000 05** *(1)*	–
		49.2 (15)	**490 NTC 000 15** *(1)*	–
		131.2 (40)	**490 NTC 000 40** *(1)*	–
		262.5 (80)	**490 NTC 000 80** *(1)*	–

Connection to Modbus® serial link

Description	Use		Length ft. (m)	Reference	Weight lb (kg)
	From	To			
Trunk cables, shielded dual twisted pair, RS 485	Compact safety PLCs XPSMF4020/MF4022 (RJ45)	Modbus® splitter box LU9 GC3 (RJ45)	328 (100)	**TSX CSA 100**	12.522 (5.680)
			656 (200)	**TSX CSA 200**	24.074 (10.920)
			1640 (500)	**TSX CSA 500**	66.139 (30.000)
	Graphic terminals XBTGT (SUB-D 9-pin)	Modbus® splitter box LU9 GC3 (RJ45)	8.2 (2.5)	**XBTZ938** *(2)*	0.441 (0.210)
Adaptor for cable XBTZ938	SUB-D 9-pin (XBTGT)	XBTZ938 (SUB-D 25-pin)	0.66 (0.2)	**XBTZG909**	–
Adaptor SUB-D 9-pin/RJ45	Compact PLCs (SUB-D 9-pin)	Connecting cables for Modbus® serial link (RJ45)	–	**XPSMFADAPT**	–

Description	Characteristics	Sold in lots of	Unit reference	Weight oz (kg)
End of line adaptors For RJ45 connector	R = 120 Ω, C = 1 nF	2	**VW3 A8 306 RC**	7.055 (0.200)
	R = 150 Ω	2	**VW3 A8 306 R**	0.353 (0.010)



TSX PBY 100

PROFIBUS DP bus connection components

Description	Profile	Services	Reference	Weight oz (kg)
PROFIBUS DP module set for Premium™ PLCs	Master, 12 Mbps	Class 1 and Class 2 master V0 functions, see characteristics. PROFIBUS FMS messaging not supported	**TSX PBY 100**	30.688 (0.870)

Description	Use	Reference	Weight oz (kg)
Remote inputs/outputs on PROFIBUS DP bus	Advantys™ STB network interface module	**STB NDP 2112**	4.938 (0.140)
	Momentum™ communication module	**170 DTN 110 00**	–
Connectors for remote I/O communication module	Line terminators	**490 NAD 911 03**	–
	Intermediate connection	**490 NAD 911 04**	–
	Intermediate connection and terminal port	**490 NAD 911 05**	–

Description	Length ft (m)	Reference	Weight oz (kg)
PROFIBUS DP connecting cables	328 (100)	**TSX PBS CA 100**	–
	1312 (400)	**TSX PBS CA 400**	–

Description		Reference	Weight oz (kg)
Replacement parts	Main bus junction box	**490 NAE 911 00**	–
	PCMCIA card	**467 NHP 811 00**	–



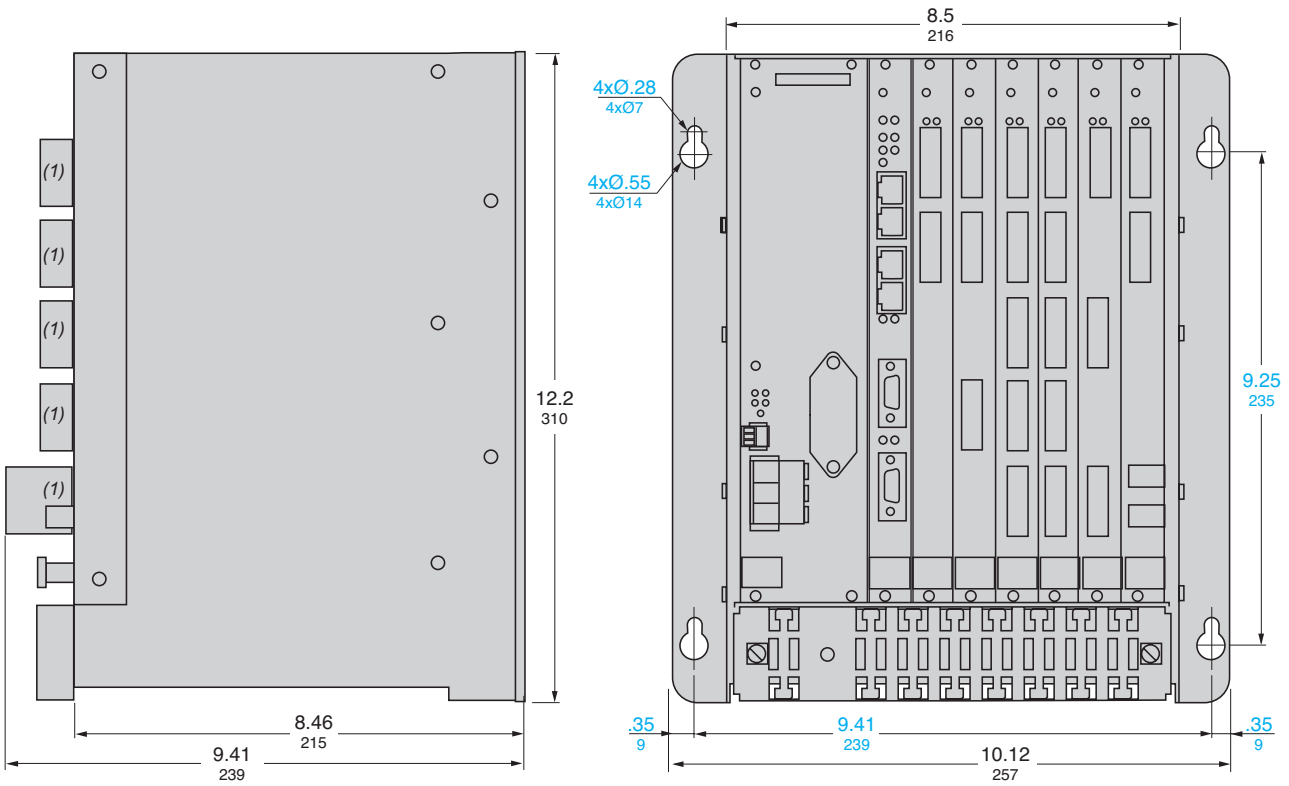
490 NAD 911 03

*(1) Cable conforming to standard EIA/TIA-568 category 5 and IEC 1180/EN 50 173 class D. For UL and CSA 22.1 approved cables, add the letter **U** to the end of the reference.*
(2) Requires adaptor XBTZG909.

2

Dimensions

XPSMF60



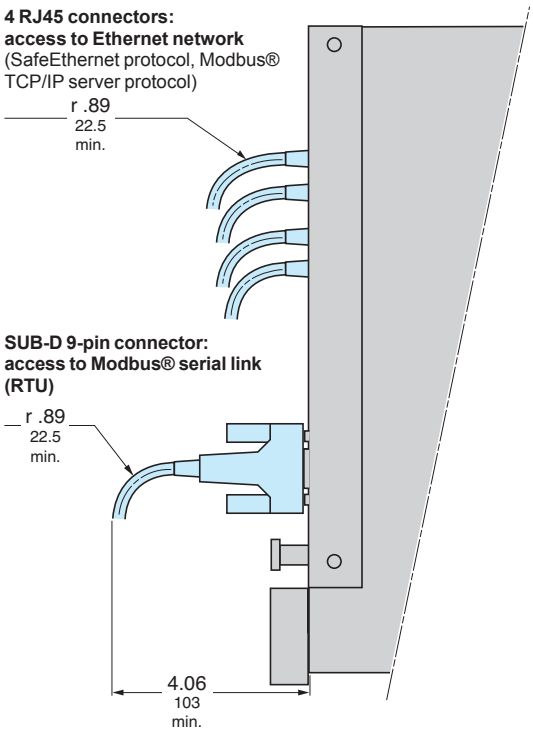
Dual Dimensions: INCHES Millimeters

(1) Removable screw terminal blocks are provided with the power supply and "in rack" I/O cards.

Mounting precautions relating to connectors

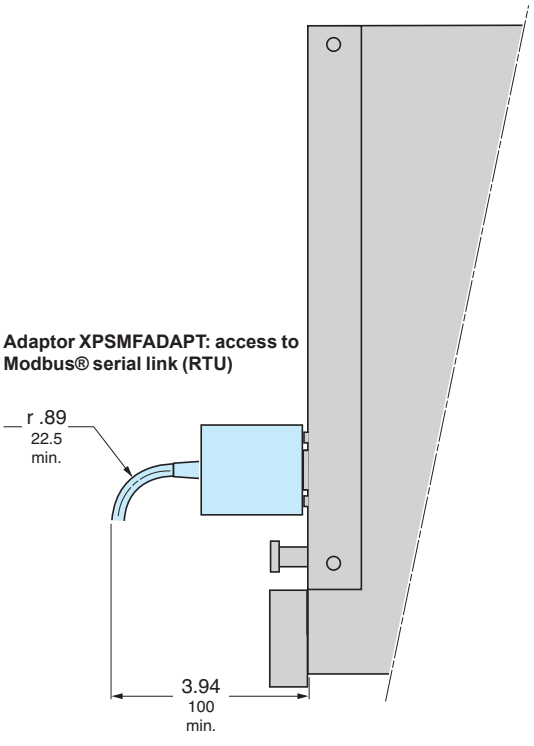
Access to Modbus® serial link (RTU) and Ethernet network

4 RJ45 connectors: access to Ethernet network (SafeEthernet protocol, Modbus® TCP/IP server protocol)



SUB-D 9-pin connector: access to Modbus® serial link (RTU)

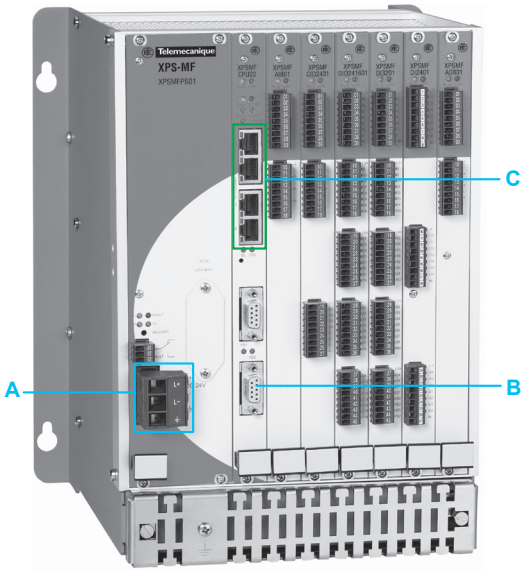
Adaptor XPSMFADAPT: access to Modbus® serial link (RTU)



Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
Rack, power supply and CPU

Connections

Power supply module and CPU

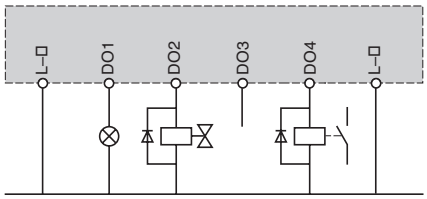


Item	Connection	Screw	Function
A	**Supply**	L+	⎓ 24 V
		L-	⎓ 24 V (reference pole)
		⏚	Ground

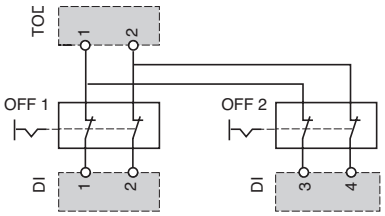
Item	Connection	Type	Function
B	**Communication**	SUB-D 9-pin female (FB2)	**XPSMFCPU22**: slave on Modbus® serial (RTU)
C	**Programming**	Integrated 4 RJ45 switched Ethernet Communication ports	Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and the programming terminal in a point to point or via an Ethernet network for programming, setting IP address etc.
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.
	Non-Safe Communication available with: XPSMF60 (reference XPSMFCPU22		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other non- safety related components (e.g HMI Magelis ®, standard PLCs, Scada systems,etc.) this can be established in a point to point way or via an Ethernet network.

Connection examples

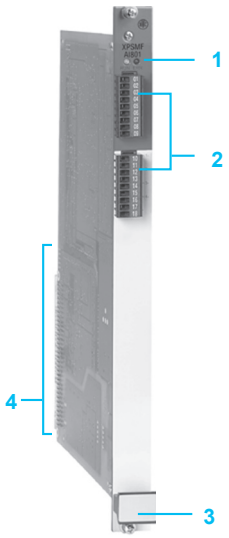
Actuator connections to the outputs



Emergency stop connections (line control)



Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
"In rack" analog input card



Presentation

The "in rack" analog input card **XPSMFAI801** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level "e" conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

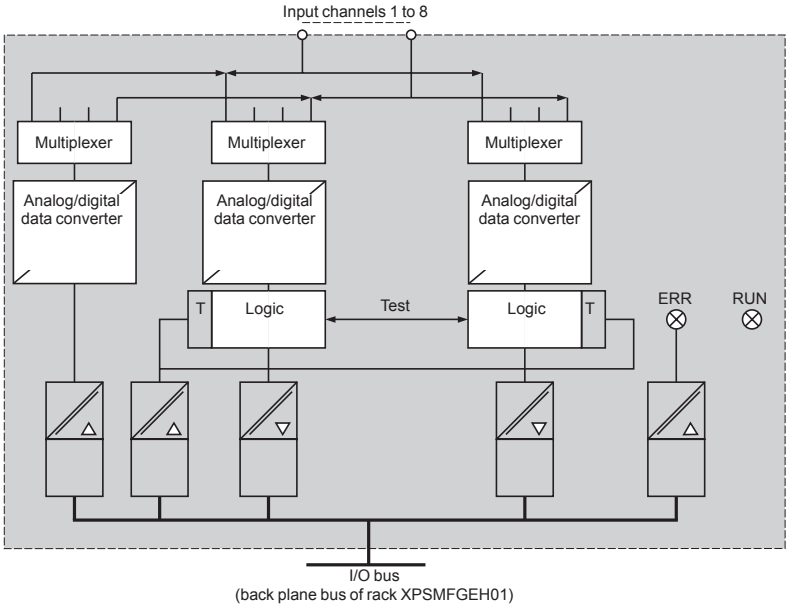
■ It incorporates 8 analog inputs:
□ electrically isolated from the back plane bus of rack **XPSMFGEH01**,
□ configured by choice of connection for managing eight single-pole or four 2-pole functions.

■ The card can be installed in rack **XPSMFGEH01** as many times as required in the six slots available.

Input values *(1)*

Number	Type	Voltage	Current	Value range	Example
8 inputs	Single-pole	± 10 V	–	± 1000	Single-pole measuring of 0 to 10 V voltages
		–	0...20 mA	0...1000 *(2)* 0...2000 *(3)*	Measuring 0 to 20 mA currents using jumper
4 inputs	2-pole	± 10 V	–	± 1000	Closed circuit scanning of input channels

Functional diagram



Description

On the front cover of the card:
1 Two process status LEDs (RUN, ERR).
2 Two removable screw terminal blocks (9 terminals per block) for connection of inputs *(4)*.
3 Grip to assist installation/removal.
4 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPSMFGEH01**.

LED details

LED	Color	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

(1) The unused input channels must be short-circuited on the reference pole (L-).
(2) With 250 Ω external jumper.
(3) With 500 Ω external jumper.
*(4) Removable screw terminals are provided with the "in rack" card **XPSMFAI801**.*

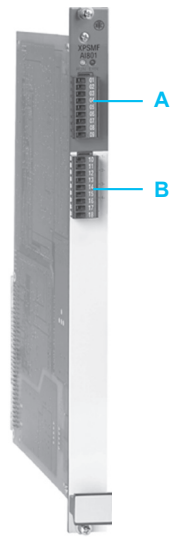
Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
"In rack" analog input card

Characteristics

Card type			XPSMFAI801
Number of analog inputs			8 single-pole inputs (± 10 V / 0…20 mA) or 4 2-pole inputs (± 10 V), electrically isolated, configurable by choice of connection
Supply	Voltage	**V**	⎓ 24, supplied by rack XPSMFGEH01 incorporating power supply module XPSMFPS01
	Voltage limits		- 15…+ 20%
Signal	Usable range	**V**	± 10.25
		mA	0...+ 20.5 (with jumper)
	Nominal value	**V**	± 10
		mA	0...+ 20 (with jumper)
Maximum input signal		**V**	± 10.7
Jumper for current measurement		Ω	250 or 500
Overvoltage protection		**V**	⎓ - 15…+ 15 (30 V range)
Input resistance	d.c.	**MΩ**	1
Operational data			⎓ 24 V/380 mA ⎓ 3.3 V/150 mA
Ambient air temperature conforming to EN 61131-2	Operating	**°F (°C)**	+32… + 140 (0…+ 60)
	Storage	**°F (°C)**	- 40… + 185 (- 40…+ 85)
Resolution	Effective		9-bit
	Maximum		12-bit
Output voltage			± 1% max.
Safety accuracy			± 1% max.
Transient deviation			± 1% max.
Value acquisition renewal			Once per CPU cycle
Processing time			Approximately 45 µs
Connections			See page 2/43

References

Description	Number of channels	Voltage Current	Reference	Weight oz (kg)
Analog input card	8 single-pole	± 10 V 0...20 mA *(1)*	**XPSMFAI801**	8.466 (0.240)
	4 2-pole	± 10 V		



XPSMFAI801

Connections

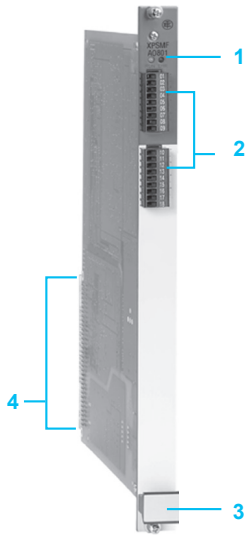
Item	Connection	Screw N°	Screw	Function
A	**Analog inputs**	01	L1+	Analog input 1
		02	L-	Input 1 (reference pole)
		03	L2+	Analog input 2
		04	L-	Input 2 (reference pole)
		05	L3+	Analog input 3
		06	L-	Input 3 (reference pole)
		07	L4+	Analog input 4
		08	L-	Input 4 (reference pole)
		09	⏚	Ground/Shielding
B	**Analog inputs**	10	L5+/L1-	Analog input 5
		11	L-	Input 5 (reference pole)
		12	L6+/L2-	Analog input 6
		13	L-	Input 6 (reference pole)
		14	L7+/L3-	Analog input 7
		15	L-	Input 7 (reference pole)
		16	L8+/L4-	Analog input 8
		17	L-	Input 8 (reference pole)
		18	⏚	Ground/Shielding

Configuration of analog inputs

Connection	…	with	…	Connection	…	with	…
8 single-pole inputs	L1+		L-	**4 2-pole inputs**	L1+		L5+/L1-
	L2+		L-		L2+		L6+/L2-
	L3+		L-		L3+		L7+/L3-
	L4+		L-		L4+		L8+/L4-
	L5+/L1-		L-				
	L6+/L2-		L-				
	L7+/L3-		L-				
	L8+/L4-		L-				

(1) With a 250 Ω or 500 Ω external jumper.

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
"In rack" analog output card



Presentation

The analog output card **XPSMFAO801** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level "e" conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates 8 configurable analog outputs (0…20 mA, 0…+ 10 V or - 10…+ 10 V):

□ For selection of the type of voltage/current measurement: a switch enables selection of 6 functions for each output channel.

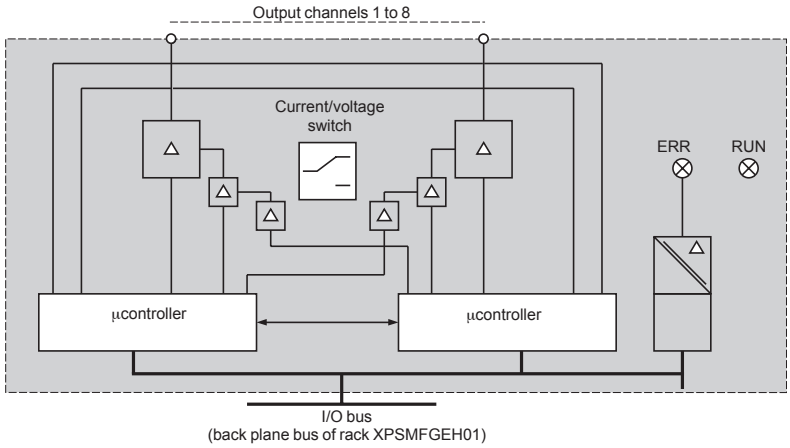
Switch position	Outputs	
	Voltage ± 10 V	Current 0…+ 20 mA
1	–	On
2	–	On
3	–	On
4	On	–
5	On	–
6	On	–

□ Selection of measuring scale using software **XPSMFWIN**: the "Properties" sub-menu displays the scale options in the "Type" window (…FS1000 or …FS2000).

Configurable output values				
Type	Voltage	Current	Value range	
			Half scale (version FS1000)	Full scale (version FS2000)
8 analog outputs	–	0…20 mA	0...+ 1000	0...+ 2000
	0…+ 10 V	–	0...+ 1000	0…+ 2000
	- 10...+ 10 V	–	- 1000...+ 1000	- 2000...+ 2000

■ The card can be installed in rack **XPSMFGEH01** as many times as required in the six slots available.

Functional diagram



Description

On the front cover of the card:

1 Two process status LEDs (RUN, ERR).
2 Two removable screw terminal blocks (9 terminals per block) for connection of outputs *(1)*.
3 Grip to assist installation/removal.
4 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPSMFGEH01**.

LED details

LED	Color	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the "in rack" card **XPSMFAO801**.*

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
“In rack” analog output card

Characteristics

Card type			XPSMFAO801
Number of outputs			8 analog outputs
Supply	Voltage	**V**	⎓ 24 (supplied by rack XPSMFGEH01 incorporating power supply module XPSMFPS01)
	Voltage limits		- 15…+ 20%
Nominal output values		**V**	± 10 (- 10…+ 10)
		mA	0...+ 20
Maximum output value		**V**	± 10.25
		mA	0...+ 21
Overvoltage protection		**V**	24
Output resistance	Current	Ω	≤ 600
	Voltage	**k**Ω	> 1
Operational data			3.3 V/130 mA 5 V/280 mA 24 V/630 mA
Ambient air temperature conforming to EN 61131-2	Operating	**°F (°C)**	+32… + 140 (0…+ 60)
	Storage	**°F (°C)**	-40… + 185 (- 40…+ 85)
Resolution	Effective		7-bit
	Maximum		12-bit
Symmetrical tolerance			± 1% max.
Safety accuracy			± 1% max.
Processing time			Approximately 45 µs
Connections			See page 2/43

References

Description	Number of channels	Configuration		Reference	Weight oz (kg)
		Current	Voltage		
Analog output card	8	0...20 mA	- 10…+ 10 V	**XPSMFAO801**	9.877 (0.280)



XPSMFAO801

Connections

Item	Connection	Screw N°	Screw	Function
A	**Analog outputs**	01	O1+	Analog output 1
		02	O1-	Output 1 (reference pole)
		03	O2+	Analog output 2
		04	O2-	Output 2 (reference pole)
		05	O3+	Analog output 3
		06	O3-	Output 3 (reference pole)
		07	O4+	Analog output 4
		08	O4-	Output 4 (reference pole)
		09	⏚	Ground/Shielding
B	**Analog outputs**	10	O5+	Analog output 5
		11	O5-	Output 5 (reference pole)
		12	O6+	Analog output 6
		13	O6-	Output 6 (reference pole)
		14	O7+	Analog output 7
		15	O7-	Output 7 (reference pole)
		16	O8+	Analog output 8
		17	O8-	Output 8 (reference pole)
		18	⏚	Ground/Shielding

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
“In rack” mixed card: counting inputs/digital outputs

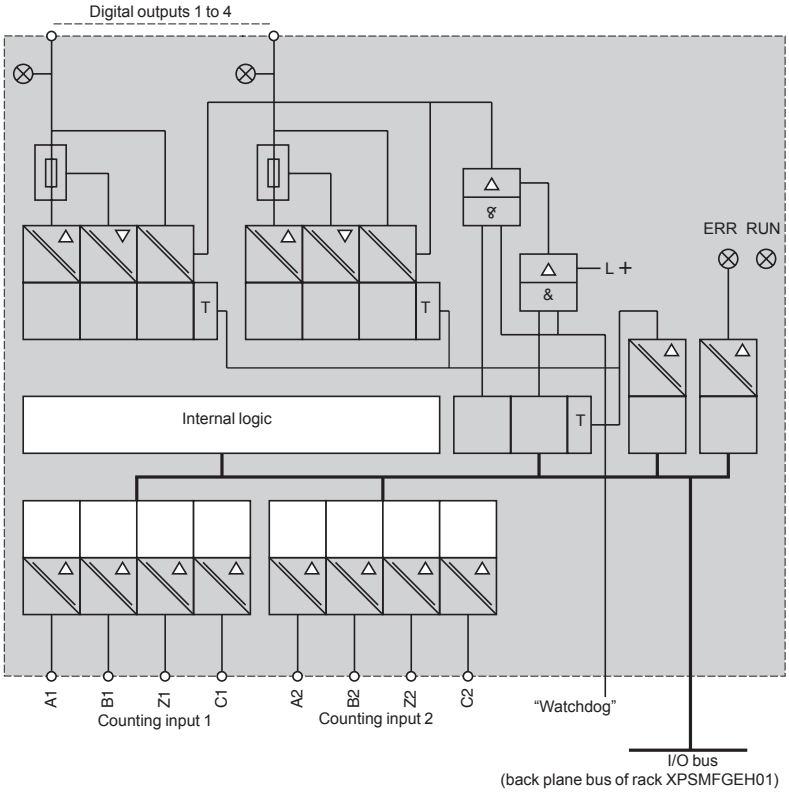
Presentation

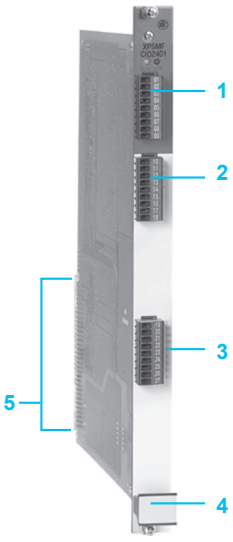
The mixed counting input and digital output card **XPSMFCIO2401** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates:
□ 2 24-bit independent and configurable counting channels (one channel for counting and one channel for increasing or decreasing counting direction). They are configured using software **XPSMFWIN**.
□ 4 digital outputs.

■ The card can be installed in rack **XPSMFGEH01** as many times as required in the six slots available.

Functional diagram





Description

On the front cover of the card:
1 Two process status LEDs (RUN, ERR).
2 Two removable screw terminal blocks (9 terminals per block) for connection of inputs *(1)*.
3 One removable screw terminal block (9 terminals) for connection of outputs *(1)* with four output status LEDs.
4 Grip to assist installation/removal.
5 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPSMFGEH01**.

LED details

LED	Color	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the “in rack” card **XPSMFCIO2401**.*

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
"In rack" mixed card: counting inputs/digital outputs

Characteristics

Mixed card type			XPSMFCIO2401
Supply	Voltage	**V**	⎓ 24 (supplied by rack XPSMFGEH01 incorporating power supply module XPSMFPS01)
	Voltage limits		- 15…+ 20%
Ambient air temperature conforming to EN 61131-2	Operating	**°F (°C)**	+32… + 140 (0…+ 60)
	Storage	**°F (°C)**	- 40… + 185 (- 40…+ 85)
Counting inputs			
Number	Counter		2
	Inputs		4 on each pole (A, B, Z, C)
Input voltage		**V**	⎓ 5 or 24
Input current		**mA**	≤ 3
Input resistance		**kΩ**	3.7
Counting frequency		**MHz**	0…1
Resolution			24-bit
Time base accuracy			0.2%
Operational data			⎓ 3.3 V/0.8 A ⎓ 5 V/0.1 A ⎓ 24 V / 0.1 A + output current
Maximum distance of equipment			1640 ft (500 m), with shielded dual twisted pair cable
Input connections			See page 2/43
Digital outputs			
Number			4
Output voltage		**V**	⎓ 18.4…26.8
Output current		**A**	0.5 per channel, 2 max. per card. Continuous short-circuit proof
Internal volt drop		**V**	3 max. at 0.5 A
Minimum current		**mA**	2 per channel
Permissible current	At state 0	**mA**	1 mA max. at 2 V
Current power consumption		**V**	⎓ 24 / 0.1 A + output current
Output connections			See page 2/43

References

Description	Characteristics	Reference	Weight oz (kg)
Mixed I/O card	■ 2 x 24-bit counting inputs, configurable: 5 V…24 V ■ 4 digital outputs	**XPSMFCIO2401**	9.171 (0.260)

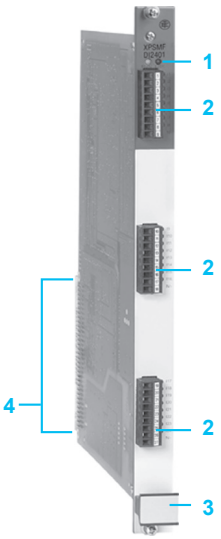


XPS MFCIO2401

Connections

Item	Connection	Screw N°	Screw	Function
1	**Counting input**	01	C-	Common reference pole
		02	A1	Input A1 or bit 1
		03	B1	Input B1 or bit 2
		04	Z1	Input Z1 or bit 3
		05	C1	Input C1 or bit 4
		06	C-	Common reference pole
		07	C-	Common reference pole
		08	C-	Common reference pole
		09	C-	Common reference pole
2	**Counting input**	10	C-	Common reference pole
		11	A2	Input A2 or bit 1
		12	B2	Input B2 or bit 2
		13	Z2	Input Z2 or bit 3
		14	C2	Input C2 or bit 4
		15	C-	Common reference pole
		16	C-	Common reference pole
		17	C-	Common reference pole
		18	C-	Common reference pole
3	**Digital outputs**	19	L-	Common reference pole
		20	1	Digital output 1
		21	2	Digital output 2
		22	3	Digital output 3
		23	4	Digital output 4
		24	L-	Common reference pole
		25	L-	Common reference pole
		26	L-	Common reference pole
		27	L-	Common reference pole

Safety automation system solutions
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Modular, XPSMF60
“In rack” digital input card

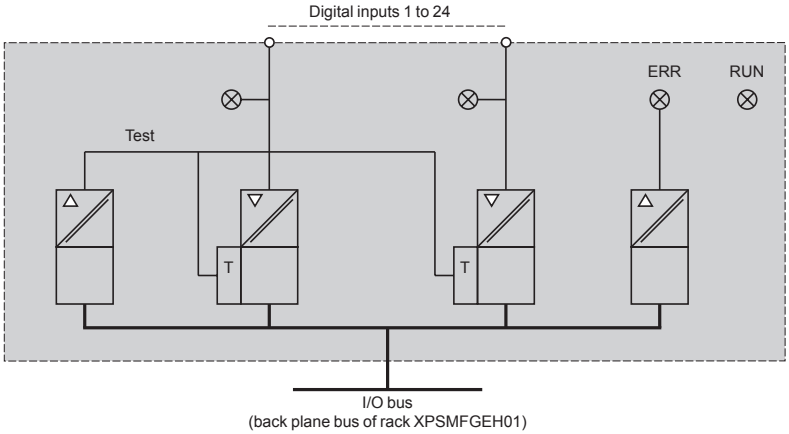


Presentation

The digital input card **XPSMFDI2401** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates 24 ⎓ 110 / ∿ 127 V digital inputs that are configurable using software **XPSMFWIN**.
■ The card can be installed in rack **XPSMFGEH01** as many times as required in the six slots available.

Functional diagram



Description

On the front cover of the card:
1 Two process status LEDs (RUN, ERR).
2 Three removable terminal blocks (9 terminals per block) for connection of inputs *(1)*, each with eight input status LEDs.
3 Grip to assist installation/removal.
4 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPSMFGEH01**.

LED details

LED	Color	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the “in rack” card **XPSMFDI2401**.*

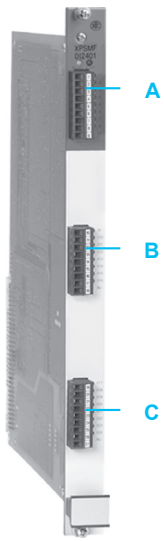
Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
“In rack” digital input card

Characteristics

Input card type			XPSMFDI2401
Supply	Voltage	**V**	⎓ 24 (supplied by rack XPSMFGEH01 incorporating power supply module XPSMFPS01)
	Voltage limits		- 15…+ 20%
Ambient air temperature conforming to EN 61131-2	Operating	**°F (°C)**	+32… + 140 (0…+ 60)
	Storage	**°F (°C)**	-40… + 185 (- 40…+ 85)
Number of inputs			24, electrically isolated
Nominal voltage		**V**	⎓ 110/∿ 127 (single-phase)
Input voltage	At state 0	**V**	⩽ 20
	At state 1	**V**	⩾ 79
Input current	At state 1	**mA**	⩾ 2.2 at 79 V
Operational data			⎓ 3.3 V/0.05 A ⎓ 24 V / 0.1 A (79 V at state 1)
LED display			Yes
Connections			Shielded dual twisted pair cable recommended to provide protection against electromagnetic interference, or Ø 0.47 in (12 mm) max. cable with connection to ground of rack XPSMFGEH01

References

Description	Characteristics	Reference	Weight oz (kg)
Input card	24 digital inputs ⎓ 110 V / ∿ 127 V	**XPSMFDI2401**	9.171 (0.260)

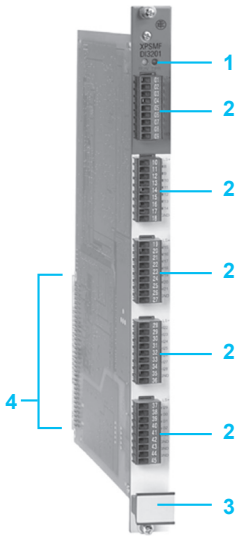


XPS MFDI2401

Connections

Item	Connection	Screw N°	Screw	Function
A	**Digital inputs**	01	I1	Input 1
		02	I2	Input 2
		03	I3	Input 3
		04	I4	Input 4
		05	I5	Input 5
		06	I6	Input 6
		07	I7	Input 7
		08	I8	Input 8
		09	N/-	Common reference pole
B	**Digital inputs**	10	I9	Input 9
		11	I10	Input 10
		12	I11	Input 11
		13	I12	Input 12
		14	I13	Input 13
		15	I14	Input 14
		16	I15	Input 15
		17	I16	Input 16
		18	N/-	Common reference pole
C	**Digital inputs**	19	I17	Input 17
		20	I18	Input 18
		21	I19	Input 19
		22	I20	Input 20
		23	I21	Input 21
		24	I22	Input 22
		25	I23	Input 23
		26	I24	Input 24
		27	N/-	Common reference pole

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“In rack” digital input card

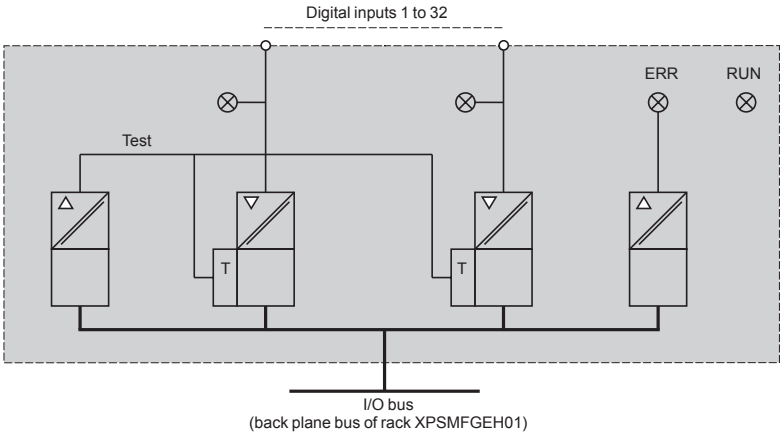


Presentation

The digital input card **XPSMFDI3201** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates 32 digital inputs that are configurable using programming software **XPSMFWIN**.
■ The card can be installed in rack **XPSMFGEH01** as many times as required in the six slots available.

Functional diagram



Line control for card XPSMFDI3201

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring anomaly (short-circuit, line break) to be seen at the inputs of the safety PLCs.

Description

On the front cover of the card:
1 Two process status LEDs (RUN, ERR).
2 Five removable terminal blocks (9 terminals per block) for connection of inputs *(1)*, with a status LED for each input terminal.
3 Grip to assist installation/removal.
4 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPSMFGEH01**.

LED details

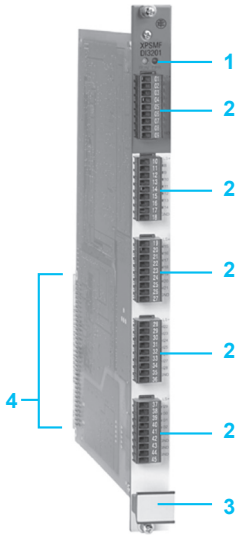
LED	Color	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the “in rack” card **XPSMFDI3201**.*

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
"In rack" digital input card

Characteristics

Input card type			XPSMFDI3201
Supply	Voltage	**V**	⎓ 24, supplied by rack XPSMFGEH01 incorporating power supply module XPSMFPS01
	Voltage limits		- 15…+ 20%
Ambient air temperature conforming to EN 61131-2	Operating	**°F (°C)**	+32… + 140 (0…+ 60)
	Storage	**°F (°C)**	-40… + 185 (- 40…+ 85)
Number of digital inputs			32, electrically isolated
Nominal voltage		**V**	⎓ 24
Input voltage	At state 0	**V**	5 max.
	At state 1	**V**	10…30
Input current	At state 0	**mA**	1.0 at 5 V
	At state 1	**mA**	2 at 10 V, 5 at 24 V
Operational data			⎓ 3.3 V / 0.05 A, ⎓ 24 V / 0.2 A
LED display			Yes
Connections			Shielded dual twisted pair cable recommended to provide protection against electromagnetic interference, or Ø 0.47 in (12mm) max. cable with connection to ground of rack XPSMFGEH01



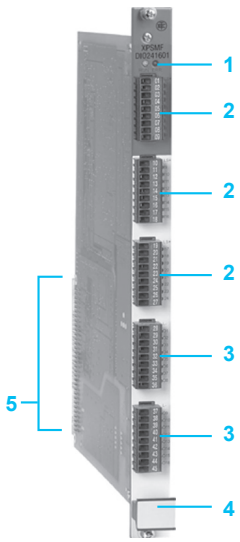
References

Description	Characteristics	Reference	Weight oz (kg)
Input card	32 digital inputs	**XPSMFDI3201**	9.171 (0.260)

Connections

Item	Connection	Screw N°	Screw	Function
A	**Digital inputs**	01	LS+	Supply for inputs 1 to 7
		02	I1	Input 1
		03	I2	Input 2
		04	I3	Input 3
		05	I4	Input 4
		06	I5	Input 5
		07	I6	Input 6
		08	I7	Input 7
		09	EGND	Reference pole
B	**Digital inputs**	10	LS+	Supply for inputs 8 to 14
		11	I8	Input 8
		12	I9	Input 9
		13	I10	Input 10
		14	I11	Input 11
		15	I12	Input 12
		16	I13	Input 13
		17	I14	Input 14
		18	EGND	Reference pole
C	**Digital inputs**	19	LS+	Supply for inputs 15 to 21
		20	I15	Input 15
		21	I16	Input 16
		22	I17	Input 17
		23	I18	Input 18
		24	I19	Input 19
		25	I20	Input 20
		26	I21	Input 21
		27	EGND	Reference pole
D	**Digital inputs**	28	LS+	Supply for inputs 22 to 28
		29	I22	Input 22
		30	I23	Input 23
		31	I24	Input 24
		32	I25	Input 25
		33	I26	Input 26
		34	I27	Input 27
		35	I28	Input 28
		36	EGND	Reference pole
E	**Digital inputs**	37	LS+	Supply for inputs 29 to 32
		38	I29	Input 29
		39	I30	Input 30
		40	I31	Input 31
		41	I32	Input 32
		42	EGND	Reference pole
		43	EGND	Reference pole
		44	EGND	Reference pole
		45	EGND	Reference pole

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
“In rack” digital I/O card



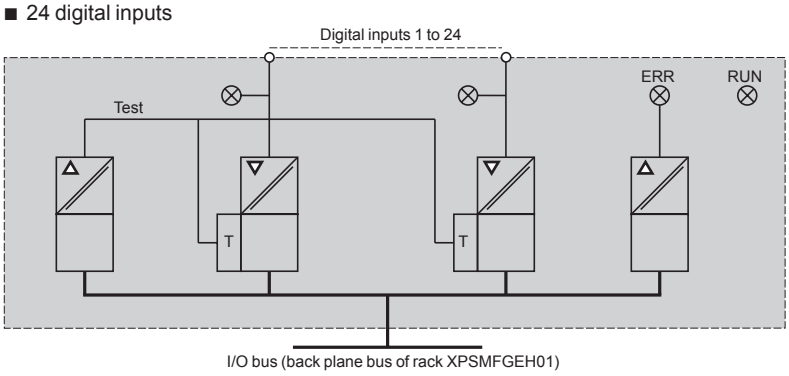
Presentation

The digital I/O card **XPSMFDIO241601** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

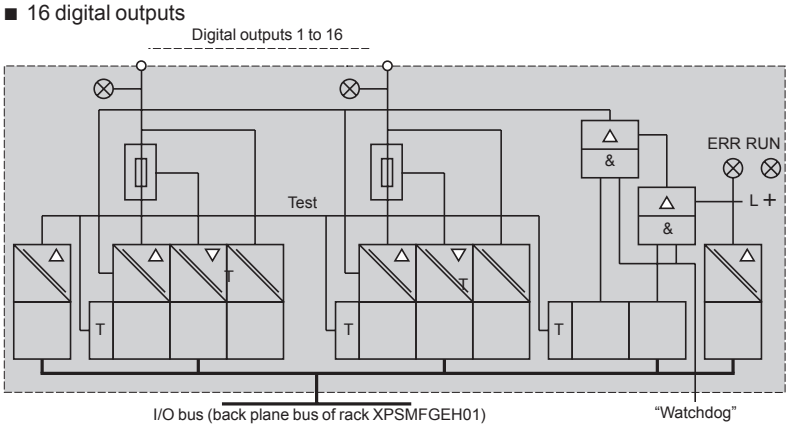
■ It incorporates 24 digital inputs and 16 digital outputs.
■ The card can be installed in rack **XPSMFGEH01** as many times as required in the six slots available.

Functional diagrams

■ 24 digital inputs



■ 16 digital outputs



Line control for card XPSMFDIO241601

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring anomaly (short-circuit, line break) to be seen at the inputs of the safety PLCs.

Description

On the front cover of the card:
1 Two process status LEDs (RUN, ERR).
2 Three removable terminal blocks (9 terminals per block) for connection of inputs *(1)*, each with eight input status LEDs.
3 Two removable screw terminal blocks (9 terminals per block) for connection of outputs *(1)*, each with eight output status LEDs.
4 Grip to assist installation/removal.
5 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPSMFGEH01**.

LED details

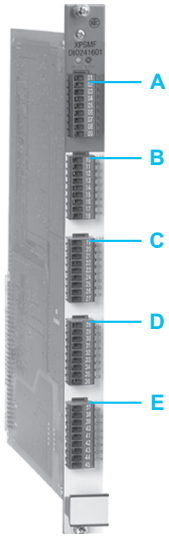
LED	Color	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the “in rack” card **XPSMFDIO241601**.*

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
"In rack" digital I/O card

Characteristics

I/O card type			XPSMFDIO241601
Supply	Voltage	**V**	⎓ 24, supplied by rack XPSMFGEH01 incorporating power supply module XPSMFPS01
	Voltage limits		- 15…+ 20%
Ambient air temperature conforming to EN 61131-2	Operating	**°F (°C)**	+32… + 140 (0…+ 60)
	Storage	**°F (°C)**	-40… + 185 (- 40…+ 85)
Digital input and output connections			Shielded dual twisted pair cable recommended to provide protection against electromagnetic interference, or Ø 0.47 in (12mm) max. cable with connection to ground of rack XPSMFGEH01
Digital inputs			
Number			24, electrically isolated
Nominal input voltage		**V**	⎓ 24
Input voltage	At state 0	**V**	5 max.
	At state 1	**V**	10…30
Input current	At state 0	**mA**	1.0 at 5 V
	At state 1	**mA**	2 at 10 V, 5 at 24 V
Operational data			⎓ 3.3 V / 0.3 A, ⎓ 24 V / 0.5 A
Digital outputs			
Number			16, electrically isolated
Output voltage		**V**	⎓ 18.4…26.8
Internal volt drop			2 V max. at 2 A
Output current	At 86 °F (30 °C)	**A**	2 per output channel, 8 max. per card. Continuous short-circuit proof
Minimum current		**mA**	2 per channel
Permissible current	At state 0	**mA**	1 max. at 2 V



XPSMFDIO241601

References

Description	Characteristics	Reference	Weight oz (kg)
I/O card	■ 24 digital inputs ■ 16 digital outputs, configurable for line control	**XPSMFDIO241601**	9.171 (0.260)

Connections

Digital inputs

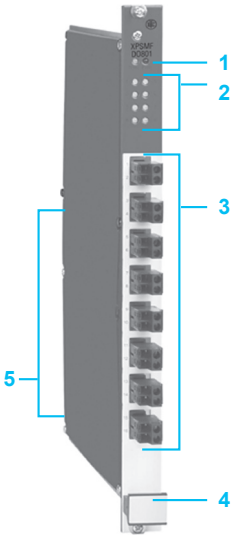
Item	Connection	Screw N°	Screw	Function
A	**Digital inputs**	01	LS+	Supply for inputs 1 to 8
		02	I1	Input 1
		03	I2	Input 2
		04	I3	Input 3
		05	I4	Input 4
		06	I5	Input 5
		07	I6	Input 6
		08	I7	Input 7
		09	I8	Input 8
B	**Digital inputs**	10	LS+	Supply for inputs 9 to 16
		11	I9	Input 9
		12	I10	Input 10
		13	I11	Input 11
		14	I12	Input 12
		15	I13	Input 13
		16	I14	Input 14
		17	I15	Input 15
		18	I16	Input 16
C	**Digital inputs**	19	LS+	Supply for inputs 17 to 24
		20	I17	Input 17
		21	I18	Input 18
		22	I19	Input 19
		23	I20	Input 20
		24	I21	Input 21
		25	I22	Input 22
		26	I23	Input 23
		27	I24	Input 24

Digital outputs

Item	Connection	Screw N°	Screw	Function
D	**Digital outputs**	28	L-	Reference pole for outputs 1 to 8
		29	O1	Output 1
		30	O2	Output 2
		31	O3	Output 3
		32	O4	Output 4
		33	O5	Output 5
		34	O6	Output 6
		35	O7	Output 7
		36	O8	Output 8

Item	Connection	Screw N°	Screw	Function
E	**Digital outputs**	37	L-	Reference pole for outputs 9 to 16
		38	O9	Output 9
		39	O10	Output 10
		40	O11	Output 11
		41	O12	Output 12
		42	O13	Output 13
		43	O14	Output 14
		44	O15	Output 15
		45	O16	Output 16

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
"In rack" relay output card

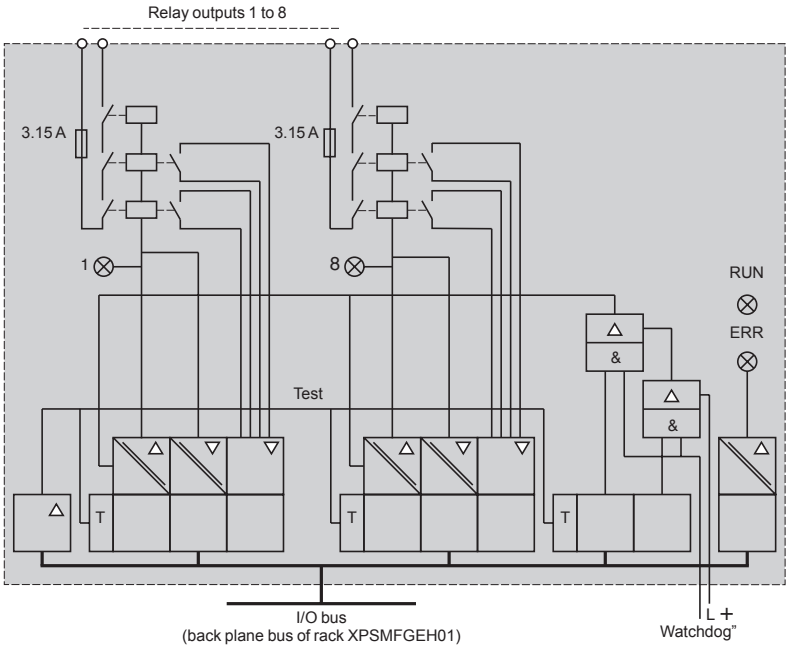


Presentation

The relay output card **XPSMFDO801** is designed to manage up to :
- category 4 conforming to EN 954-1,
- performance level "e" conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates 8 relay safety outputs (3.15 A fuse) that are configurable using software **XPSMFWIN**.
■ The card can be installed in rack **XPSMFGEH01** as many times as required in the six slots available.

Functional diagram



Description

On the front cover of the card:
1 Two process status LEDs (RUN, ERR).
2 Eight output status LEDs.
3 Eight removable screw terminal blocks (2 terminals per block) for connection of outputs *(1)*.
4 Grip to assist installation/removal.
5 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPSMFGEH0**.

LED details

LED	Color	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the "in rack" card **XPSMFDO801**.*

Safety automation system solutions
Preventa™ safety PLCs
Modular, XPSMF60
"In rack" relay output card

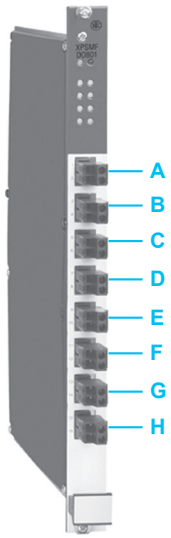
Characteristics

Output card type			XPSMFDO801
Supply	Voltage	**V**	⎓ 24, supplied by rack XPSMFGEH01 incorporating power supply module XPSMFPS01
	Voltage limits		- 15…+ 20%
Ambient air temperature conforming to EN 61131-2	Operating	**°F (°C)**	+ 32… + 122 (0…+ 50) *(1)*
	Storage	**°F (°C)**	- 40… + 185 (- 40…+ 85)
Number and type of outputs			8 relay outputs, relay hard contact, with N.O. contact
Relay	Type		2 safety relays with positively guided contacts
	Degree of protection		IP 40
	Contact material		Silver alloy, gold flashed
	Switching time	**ms**	30 approx.
	Reset time	**ms**	20 approx.
	Bounce time	**ms**	30 approx.
	Mechanical life		≥ 10 million operating cycles
	Electrical life		≥ 250 000 operating cycles on full load (resistive) and ≤ 0.1 operating cycles/s
Switching voltage		**V**	⎓ 6 V…250 V
Switching current		**A**	3.15 A with internal fuse Breaking capacity 100 A
Switching capacity	a.c.	**VA**	700 max., cos ϕ = 1
	d.c. (non inductive)		≤ ⎓ 30 V: 95 W max. (3.15 A) ≤ ⎓ 70 V: 40 W max. (0.5 A) ≤ ⎓ 110 V: 33 W max. (315 A) With suitable external fuse
Operational data			⎓ 3.3 V / 0.2 A, ⎓ 24 V ± 10% *(1)* / 0.7 A
LED display			Yes
Connections			Shielded dual twisted pair cable recommended to provide protection against electromagnetic interference, or Ø 0.47 in (12 mm) max. cable with connection to ground of rack XPSMFGEH01

(1) Limited system data.

References

Description	Characteristics	Reference	Weight oz (kg)
Output card	8 relay outputs ⎓ 6 V…250 V	**XPSMFDO801**	21.164 (0.600)



XPSMFDO801

Connections

Item	Connection	Screw N°	Screw	Function
A	**Relay output**	01	1	Contact 1, terminal A
		02		Contact 1, terminal B
B	**Relay output**	03	2	Contact 2, terminal A
		04		Contact 2, terminal B
C	**Relay output**	05	3	Contact 3, terminal A
		06		Contact 3, terminal B
D	**Relay output**	07	4	Contact 4, terminal A
		08		Contact 4, terminal B
E	**Relay output**	09	5	Contact 5, terminal A
		10		Contact 5, terminal B
F	**Relay output**	11	6	Contact 6, terminal A
		12		Contact 6, terminal B
G	**Relay output**	13	7	Contact 7, terminal A
		14		Contact 7, terminal B
H	**Relay output**	15	8	Contact 8, terminal A
		16		Contact 8, terminal B

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular, XPSMF
Communication on network and bus

Presentation

To communicate, Preventa™ compact and modular safety PLCs **XPSMF** are fitted with:
- Integrated 2 or 4 RJ45 Ethernet switched ports for transfer Safety and Non-safety related data (Safety Related using SafeEthernet protocol, Non-Safety Related using Modbus® TCP/IP protocol),
- and/or serial communication ports for transferring non safety related data.

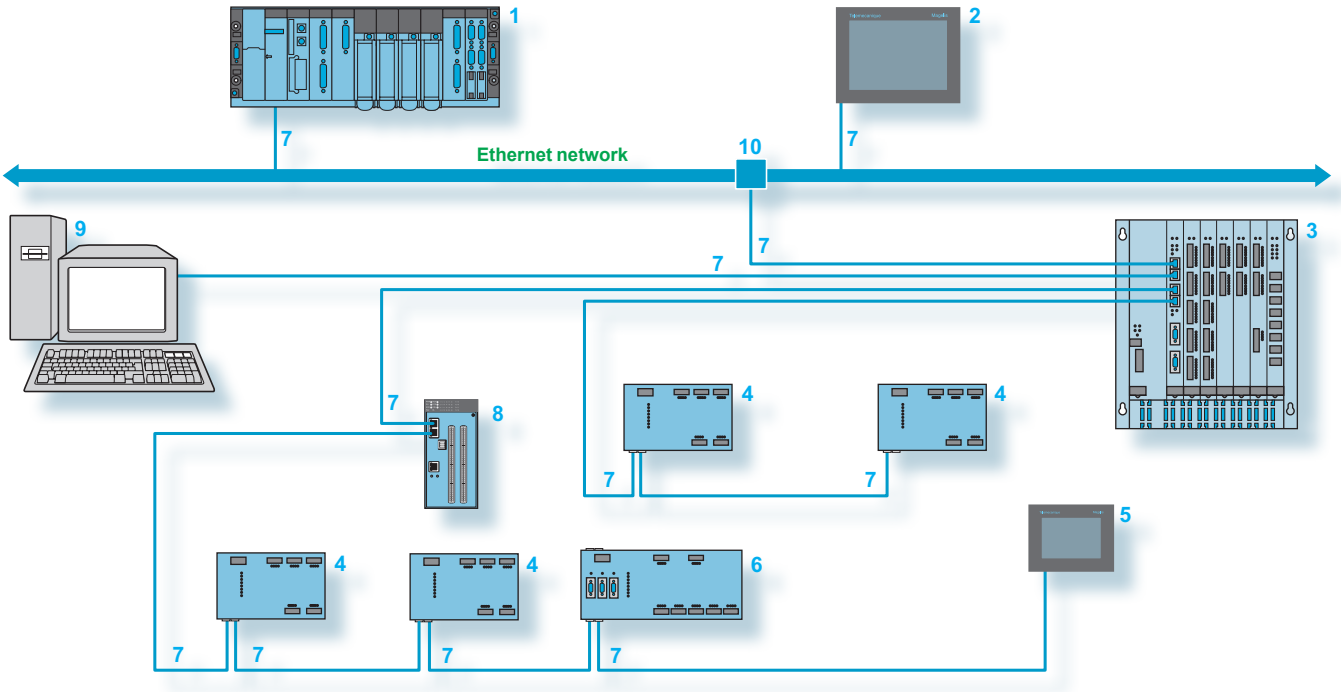
Safety communication on a single network
The Ethernet network supports the SafeEthernet protocol: physically, a single network is possible for communication between:
- safety products (SafeEthernet protocol),
- non safety related products (Modbus® TCP/IP and other protocols),
- safety related and non safety related products (Modbus® TCP/IP protocol).

Communication on more than one network: a minimum of two separate cabling systems are established.
- An Ethernet network with Modbus® TCP/IP protocol is used for communication between non safety related products and the safety PLCs.
- An Ethernet network with SafeEthernet protocol is used for communication between the safety PLCs **XPSMF** and safety remote I/O modules **XPSMF1/2/3**.
- A Modbus® serial network with Modbus® serial (RTU) protocol is used for communication between the safety PLCs **XPSMF** and non safety related products.
- A PROFIBUS DP network with PROFIBUS protocol is used for communication between the safety PLCs **XPSMF** and non safety related products.

Safety PLCs	Communication on Ethernet network			Communication on fieldbus	
Compact	**Port** (number x type)	**SafeEthernet protocol: safe communication**	**Modbus® TCP/IP protocol: non safe communication**	**Modbus® serial (RTU) protocol**	**PROFIBUS DP protocol**
XPSMF31222	4 x RJ45	yes	yes	no	no
XPSMF3022	4 x RJ45	yes	yes	yes (slave) / 1 x SUB-D (9-pin)	no
XPSMF3502	4 x RJ45	yes	yes	no	no
XPSMF3522	4 x RJ45	yes	yes	yes (slave) / 1 x SUB-D (9-pin)	no
XPSMF3542	4 x RJ45	yes	yes	no	yes (slave) / 1 x SUB-D (9-pin)
XPSMF4000	2 x RJ45	yes	no	no	no
XPSMF4002	2 x RJ45	yes	yes	no	no
XPSMF4020	2 x RJ45	yes	no	yes (slave) / 1 x RJ45	no
XPSMF4022	2 x RJ45	yes	yes	yes (slave) / 1 x RJ45	no
XPSMF4040	2 x RJ45	yes	no	no	yes (slave) / 1 x SUB-D (9-pin)
XPSMF4042	2 x RJ45	yes	yes	no	yes (slave) / 1 x SUB-D (9-pin)
Modular					
XPSMFCPU22 (central processing unit)	4 x RJ45	yes	yes	yes (slave) / 1 x SUB-D (9-pin)	no

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular, XPSMF
Communication on network and bus

Connection on Ethernet network



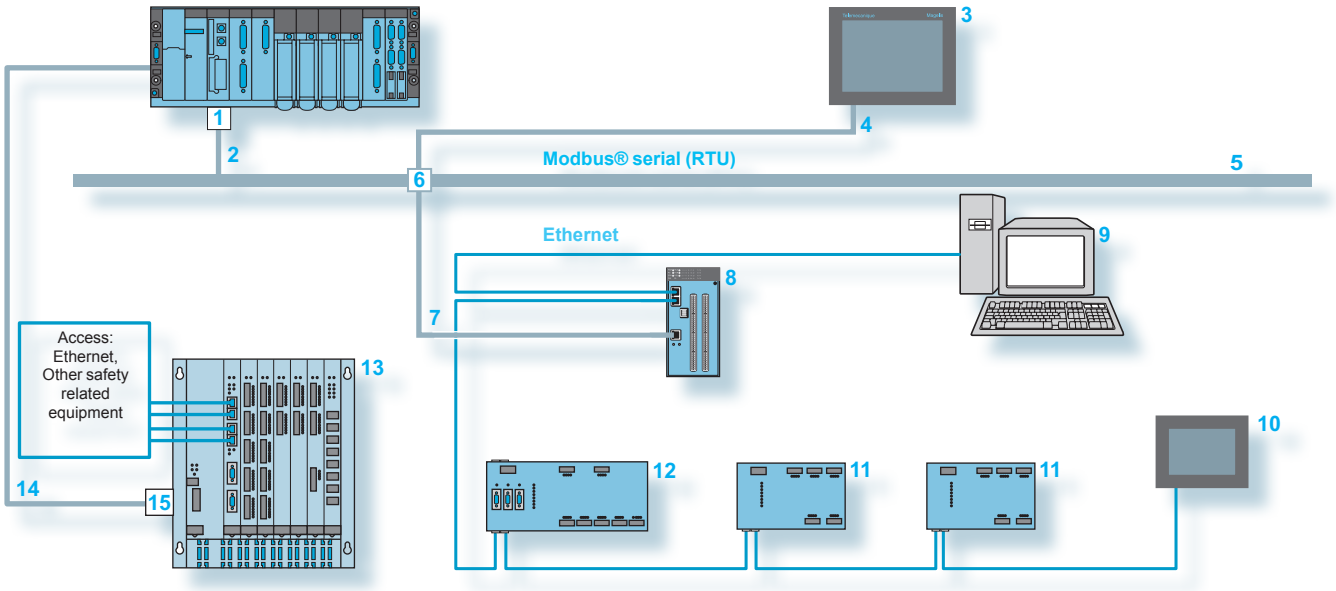
1 Premium™ processor **TSX P57 ●634M/●623M** or module **TSX ETY 4103** on Premium™ automation platform: Modbus® TCP/IP client (master).
2 Graphic supervision terminal **XBTGT5230**: Modbus® TCP/IP client (master).
3 Modular safety PLC **XPSMF60**: Modbus® TCP/IP server (slave).
4 Safety remote I/O modules **XPSMF1/2/3**.
5 Graphic supervision terminal **XBTGT2130**: Modbus® TCP/IP client (master).
6 Compact safety PLCs **XPSMF31/30/35**: Modbus® TCP/IP server (slave).
7 Shielded twisted pair cables **490 NTW 000 ●●**, lengths 6.6 to 262 ft (2 to 80 m).
8 Compact safety PLCs **XPSMF40**: Modbus® TCP/IP server (slave).
9 Programming PC.
10 Ethernet connector.

Characteristics

Protocol		**SafeEthernet**	
Compatibility with compact and modular safety PLCs		**XPSMF4000, XPSMF4002, XPSMF4020, XPSMF4022, XPSMF4040, XPSMF4042**	**XPSMF31222, XPSMF3022, XPSMF3502, XPSMF3522, XPSMF3542, XPSMFCPU22 (central processing unit of modular PLC XPSMF60)**
Transmission	Speed (Baud rate)	100 Mbps Half duplex, 10 Mbps Full duplex, Autonegotiation	
	Communication ports	Integrated 2 RJ45 switched Ethernet communications ports	Integrated 4 RJ45 switched Ethernet communications ports
	Medium	Dual twisted pair cable, category 5D or better	
Structure		10BASE-T/100BASE-TX	
Transparent Ready ® service	Class	A10	
	Standard Ethernet TCP/IP communication services (supported by compact and modular safety PLCs)	Modbus® TCP/IP	
		Modbus® TCP/IP messaging (reading/writing of data words) Modbus® identification requests	
	TCP port	Standard 502	
	Max. number of TCP/IP connections	1 to 20	

2

Connection on Modbus® serial (RTU)



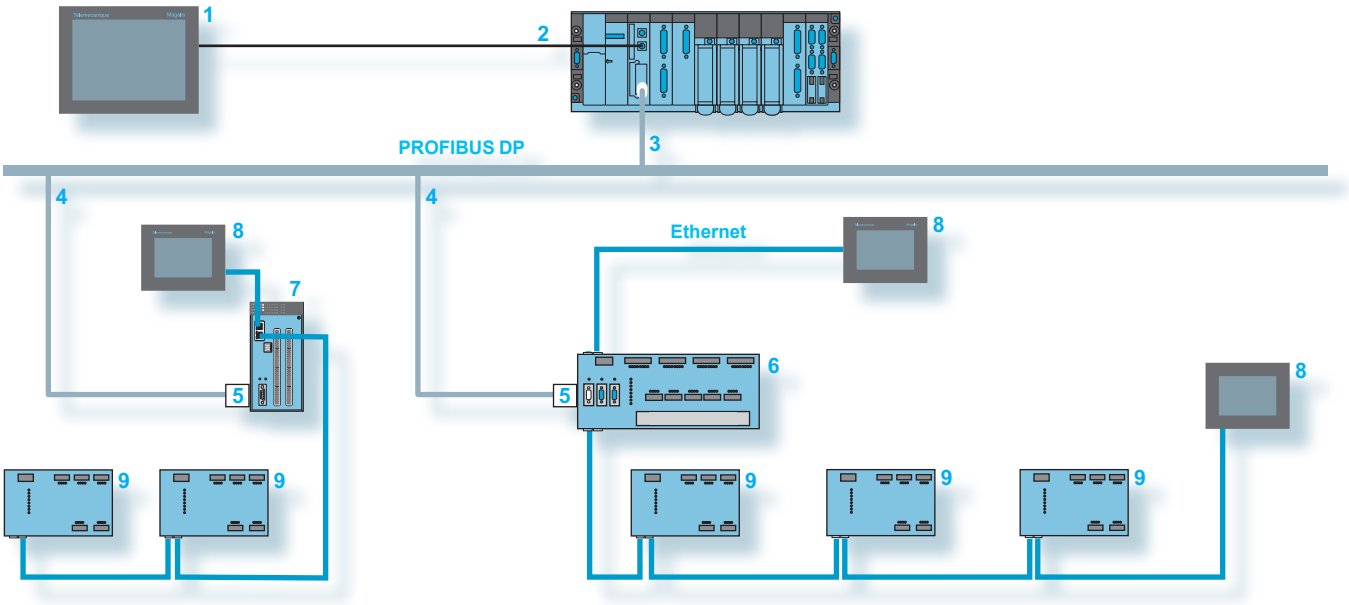
1 Premium™ module **TSX SCY 21601**: access to Modbus® serial, on a Premium™ automation platform: Modbus® serial (RTU) master.
2 Cable **TSX SCY CM6030**.
3 Graphic supervision terminal **XBTGT5230**: Modbus® serial (RTU) master.
4 Cable **XBTZ938** + adaptor **XBTZG909**.
5 Cables **VW3 A83 ●6R●●** for Modbus® serial, lengths 1.0 to 9.8 ft (0.3 to 3 m).
6 Modbus® serial splitter box **LU9 GC3** for equipment connection.
7 Cables **TSX CSA ●00** for Modbus® serial, lengths 328 to 1640 ft (100 to 500 m).
8 Compact safety PLCs **XPSMF4020/MF4022**: Modbus® serial (RTU) slaves, Modbus® TCP/IP server.
9 Programming PC.
10 Graphic supervision terminal **XBTGT2130**: Modbus® serial (RTU) client.
11 Safety remote I/O modules **XPSMF1/2/3**.
12 Compact safety PLCs **XPSMF3022/3522:** Modbus® serial (RTU) slaves, Modbus® TCP/IP server.
13 Modular safety PLC **XPSMF60**, Modbus® serial (RTU) slaves, Modbus® TCP/IP server.
14 Direct connection cables **XPSMCSCY** for safety PLCs to Premium™ module **TSX SCY 21601**, length 1 ft (0.3 m).
15 Connector **XPSMFADAPT** (RJ45/SUB-D 9-pin male) for connector FB2 or FB3, depending on PLC.

Characteristics

Bus type			**Modbus® serial (RTU)**		
Compatibility with compact and modular safety PLCs			**XPSMF3022, XPSMF3522**	**XPSMF4020, XPSMF4022**	**XPSMFCPU22 (CPU of modular PLC XPSMF60)**
Serial link port		Number and type	1 x SUB-D 9-pin female (FB3)	1 x RJ45 (Modbus®)	1 x SUB-D 9-pin female (FB2)
		Master/Slave	Slave		
Addressing			122 slave addresses. Addressing range: 1…247		
Medium			Shielded twisted pair cable		
Physical layer			RS 485		
Services			13 Modbus® functions (reading/writing of bits and words, event counters, connection events, diagnostics, identification)		
	Functions	**Code**	Modbus® slave		
		01	Reading n bits of output		
		02	Reading n bits of inputs		
		03	Reading n words of output		
		04	Reading n words of inputs		
		23	Reading/writing variables		
		15	Writing bit variables		
		16	Writing word variables		
		05	Writing 1 bit of output		
		06	Writing 1 word of output		
		08	Diagnostics		
		43	Reading equipment identification		
Transmission	**Binary transfer rate (bps)**		115 200, 76 800, 62 500, 57 600, 38 400, 19 200, 9600, 4800, 2400, 1200, 600, 300. Default value: 57 600		
Elements	**Parity**		None. Odd. Even. Default value: even		
	Stop bit		Standard. 1 stop bit. 2 stop bits. Default value: standard		

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular, XPSMF
Communication on network and bus

Connection on PROFIBUS DP



1 Graphic terminal connected to TER/AUX port of Premium automation platform: PROFIBUS DP master.
2 Connecting cable **XBTZ968** (RS 485) + adaptor **XBTZG909**.
3 PROFIBUS module **TSX PBY 100** on Premium™ processor: PROFIBUS DP master.
4 Connecting cable **TSX PBS CA ●00**, lengths 328 and 1312 ft (100 and 400 m).
5 Connector **490 NAD 911 03** (SUB-D 9-pin male) on the FB3 connector of safety PLC **XPSMF3542** or on the "PROFIBUS" connector of safety PLC **XPSMF4040/MF4042**.
6 Compact safety PLC **XPSMF3542**: PROFIBUS DP slaves, Modbus® TCP/IP server.
7 Compact safety PLCs **XPSMF4040/MF4042**: PROFIBUS DP slaves, Modbus® TCP/IP server.
8 Graphic supervision terminal **XBTGT2130**: Modbus® TCP/IP client.
9 Safety remote I/O modules **XPSMF1/2/3**.

Characteristics

Bus type		**PROFIBUS DP**	
Compatibility with compact safety PLCs		**XPSMF3542**	**XPSMF4040, XPSMF4042**
Serial port	Number and type	1 x SUB-D 9-pin female (FB3)	1 x SUB-D 9-pin female (PROFIBUS)
	Master/Slave	Slave, V0	
Physical layer		RS 485	
Topology		Linear, with line terminators at each end	
Medium		Shielded twisted pair cable	
Number of slaves		32 slaves on each segment, 126 slaves maximum with repeaters	
Data exchange speed		9.6 kbps…12 Mbps, depending on the length of the segment (3937...328 ft / 1200...100 m)	

Safety automation system solutions

Programming software XPSMFWIN for Preventa™ compact and modular safety PLCs XPSMF

Presentation

Conforming to standard IEC 61131-3, programming software **XPSMFWIN** is designed for programming all safety PLCs **XPSMF** and safety remote I/O modules. This safety software is part of the Safety Suite V2 software pack.

To create a program the user can use predefined function blocks, such as the elementary logic functions and certified function blocks, by dragging the blocks into the software programming area.
The “drag and drop” operation of the Windows ® programming environment enables quick and simple creation of configurations.

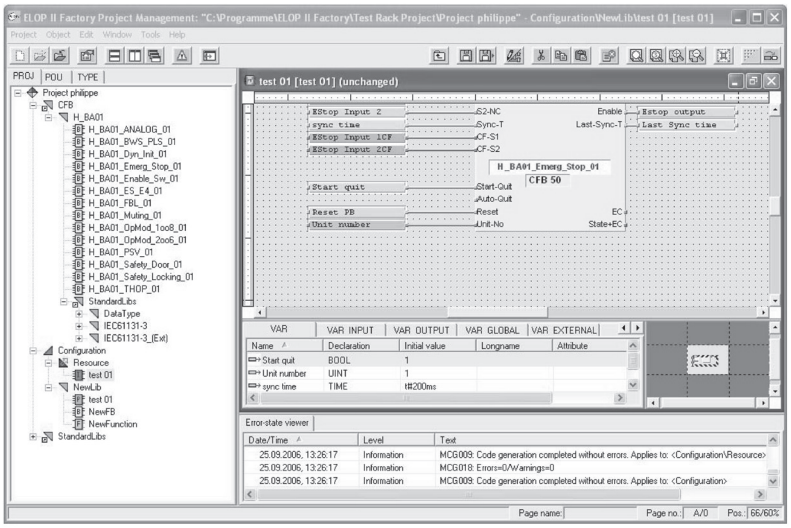
Using the **XPSMFWIN** software, it is possible to program complete systems consisting of several safety PLCs and safety remote I/O modules.
The conditions detailed in the software manual must be adhered to and a complete report accompanying the certificate should be established.

Reference

■ Reference **SSV1XPSMFWIN** contains the full version of the programming software XPSMFWIN software for the XPSMF Safety PLCs. The XPSMFWIN is part of our Safety Suite and is not available separately.

Description	Operating system	Composition	Language	Reference	Weight oz (kg)
Configuration software XPSMFWIN for programming compact XPSMF40●●, XPSMF3● and modular XPSMF60 safety PLCs	Windows ® 2000, Windows ® XP	CD-ROM + user manual	English, German, French	**SSV1XPSMFWIN** *Available with Safety Suite V2 software pack for safety systems*	18.342 (0.520)

Installation



Software XPSMFWIN: project management

Software **XPSMFWIN** uses an electronic key (dongle) for protection against unauthorized use.

A USB dongle is available. It must be connected to the PC before the software is installed.
Drivers must also be installed on the computer to recognise the dongle. These drivers are included with software **XPSMFWIN** and are automatically installed during installation.
To install software **XPSMFWIN**:
□ Connect the dongle.
□ Insert the **SSV1XPSMFWIN** software CD-ROM into the computer.
□ Launch installation.
□ Select the preferred language from the configuration menu.
□ Follow the guided installation procedure for the software.
□ Restart the computer.
□ Launch the software by clicking on the Safety Suite icon on the desktop.

The computer hardware requirements are as follows:
■ Processor (Intel ® Pentium II 400 MHz minimum, Intel ® Pentium III 800 MHz recommended).
■ RAM (128 Mb minimum, 256 Mb recommended).
■ Graphics card (2 Mb XGA, 1024 x 768, 256 colors minimum, 8 Mb XGA, 1280 x 1024 True color recommended).
■ Hard disk (1 Gigabyte minimum).
■ Operating system:
□ Windows ® 2000 Professional with Service Pack 1 or higher.
□ Windows ® XP with Service pack 1.

Safety automation system solutions

Programming software XPSMFWIN for Preventa™ compact and modular safety PLCs XPSMF

Safety related communication

Safety related communication for the safety systems is performed using SafeEthernet protocol.
SafeEthernet is a TCP/IP based protocol that uses highly intelligent switches to provide extremely reliable deterministic communication.
Connection is made automatically between the master and slaves when assigning the slaves to the corresponding masters. Transmission speeds of up to 100 Mbps in Half duplex mode and 10 Mbps in Full duplex mode can be achieved and using Autonegotiation ensures the correct baud rates for the connection.
Each safety PLC can manage up to 64 safety connections. These 64 connections can consist of safety remote I/Os and other safety PLCs.
Communication between two safety PLCs is established via a Peer-Peer link. This Peer-Peer communication enables data between two or more safety PLCs to be communicated safely.
The connectivity of all the equipment enables centralised or decentralised networks to be established. It also enables safety PLCs and safety remote I/O modules to be connected anywhere on the network with only the assigning of an IP address, to each module, in the software.

Interface

XPSMFWIN features two distinct windows, one for internal configuration and one for hardware management.

- Project management

This window enables creation, archiving and recalling of all the user programs. It contains all the logic functions and predefined certified function blocks.

- Hardware management

This window enables all hardware specific data, inputs and outputs and signal transfer between safety controllers to be defined, as well as the various safety PLCs being used or safety remote I/O modules.

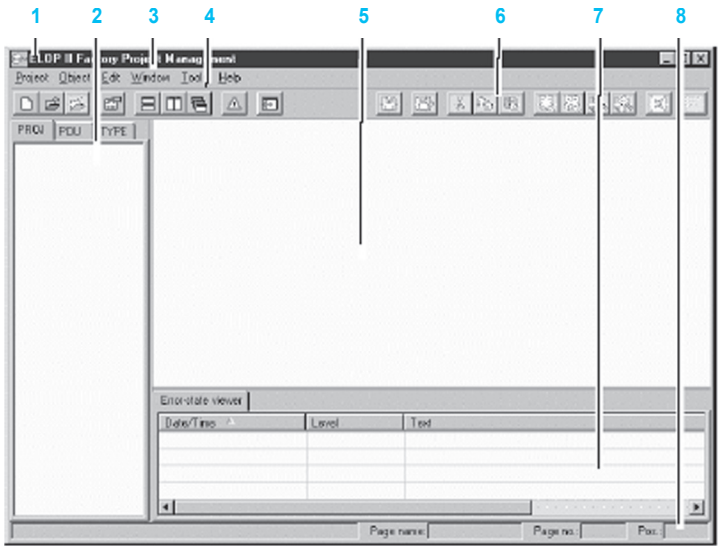
Items included in the XPSMFWIN interface

- Menu and title bar
- Toolbar and status bar
- Windows ® layout, structure window and work space
- Error display window

XPSMFWIN is a program offering numerous functions and features intuitive, Windows ® style, operation, making it a very user-friendly programming environment.

Project Management window layout

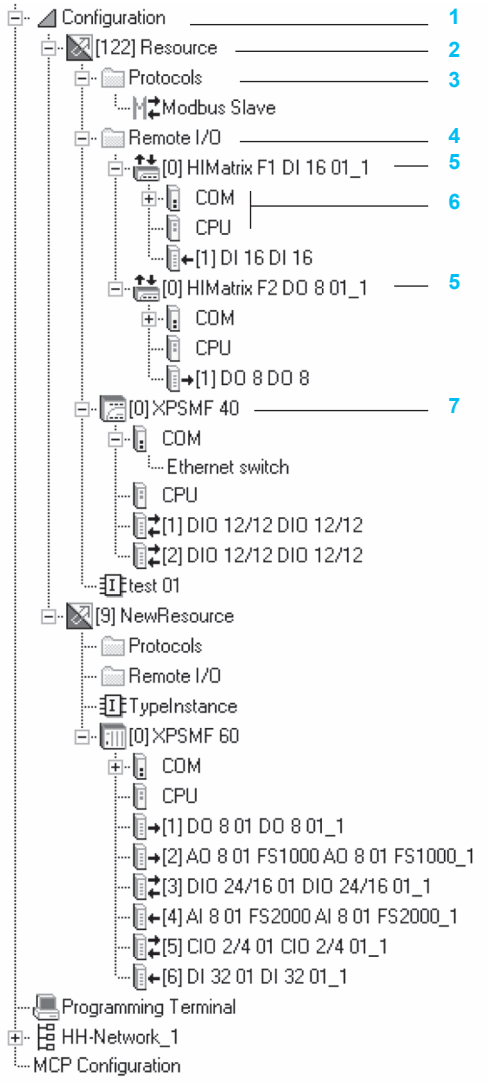
On launching software **XPSMFWIN**, the standard screen shown below opens.
This screen generally includes the following items:



1 Title bar.
2 Structure window.
3 Menu bar.
4 Project management toolbar.
5 Work space.
6 FBD (Function Block Diagram) editor toolbar.
7 Error display window.
8 Status bar with coordinate information of the function plan editor.

Safety automation system solutions

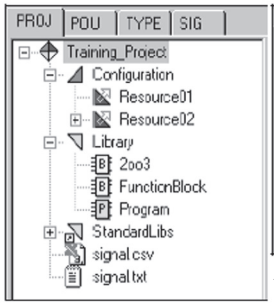
Programming software XPSMFWIN for Preventa™ compact and modular safety PLCs XPSMF



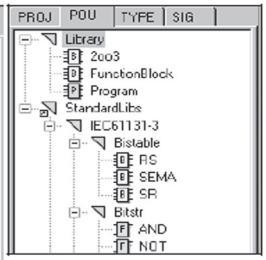
Structure window

1 Configuration.
2 Resource folder.
3 Communication protocols.
4 Remote I/O folder.
5 Remote I/O type.
6 Components and modules.
7 Resource type.

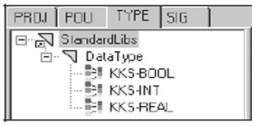
The structure window displays the hierarchical structure of the project. Selecting one of three views provides the user with different levels of detail.



Complete project



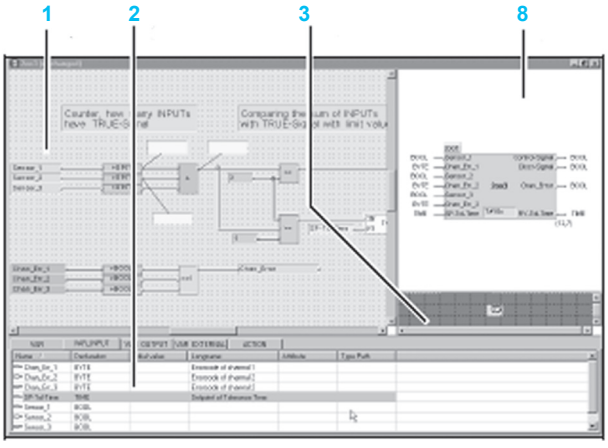
All POUs (Program Organisation Units)



All data types

FBD (Function Block Diagram) editor

Using this editor, the user can create function blocks in FBD (Function Block Diagram) language or SFC (Sequential Function Chart) language.
The FBD editor consists of the following panes:



1 Drawing field.
2 Variable declaration editor.
3 Overview window.
4 Interface declaration editor.

Safety automation system solutions

Programming software XPSMFWIN for Preventa™ compact and modular safety PLCs XPSMF

Programming

Software **XPSMFWIN** enables programming of the entire range of Preventa™ safety PLCs **XPSMF**.
The powerful and easy to use methodology of this software enables users to quickly and simply familiarize themselves with the product. The Windows ® based look and user-friendliness provides users with trouble free operation of the software.

On launching the software, the program's start-up assistant opens simultaneously. This assistant enables the user to easily open a new or existing file, delete a file or archive a file. Once a new or existing file is opened, the user quickly accesses the working environment.

Configuration

The user can begin creating a configuration as soon as a personal library is set-up, that will contain the user configuration(s).
Once the personal library is opened, the user can use the standard library function blocks (And, Or, Not, Flip-Flop, etc.) to create exactly what is required.

The user drags the function blocks into the configuration environment and places them where required. Once the function blocks are placed, the user can define specific signals or variables for the inputs and outputs.

The Hardware menu enables assigning of all the signals to the relevant inputs and outputs.

From within the Hardware menu the relevant safety PLCs are selected using the pull-down menu of each resource.
To add additional safety PLCs a new resource is easily created and assigned with the type of safety PLC.

Up to 64 remote inputs/outputs can be assigned to each safety PLC.
Once all the safety PLCs and remote I/Os have been selected, the signals can be simply connected to the relevant safety modules.
The "drag and drop" function enables defining of the inputs and outputs.

Therefore, configuration is very quick and simple.
Once all the inputs and outputs have been defined the user can compile the entire program, which is performed in the configuration menu.
Compilation must be performed twice and the results of both compilations printed and compared. If both results match, the program can be downloaded via the Ethernet RJ45 communication port on any of the safety PLCs.

Program execution

The program will automatically be stored in all the safety PLCs.
The safety PLCs can then execute the configuration and full diagnostics can be viewed on screen.
The software incorporates various diagnostic options that can be used to quickly identify the presence of errors. Some of these diagnostic options are "On-line test": which displays the logic condition of all the I/Os. Others allow the user to view the status of the transmission line, the cycle time and errors that have occurred on the communication line.

The programming tool enables the user to create and design to suit their needs. Other certified function blocks are available, which enable the overall configuration time to be further reduced. Included in these additional blocks are "Muting" and "Emergency stop" functions, together with 12 other certified functions.

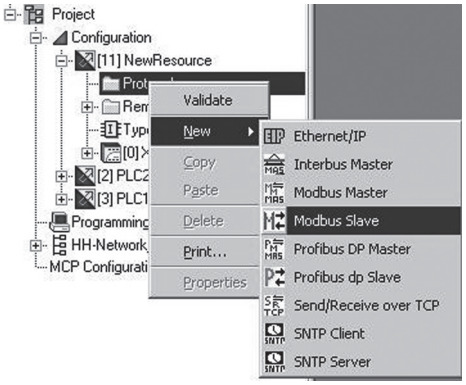
Modbus® TCP/IP, Modbus® serial (RTU) and PROFIBUS DP protocols are included in software **XPSMFWIN**. They can be used for non safety related data transfer.

Safety automation system solutions
Programming software XPSMFWIN for Preventa™ compact and modular safety PLCs XPSMF

Non safety related communication protocols

Modbus® TCP/IP server (slave)

The **XPSMF** range of safety PLCs (**XPSMFCPU22**, **XPSMF40●2**, **XPSMF35●2**, **XPSMF3022** and **XPSMF31222**) allow the communication of non safety related data on an Ethernet network via a Modbus® TCP/IP link.

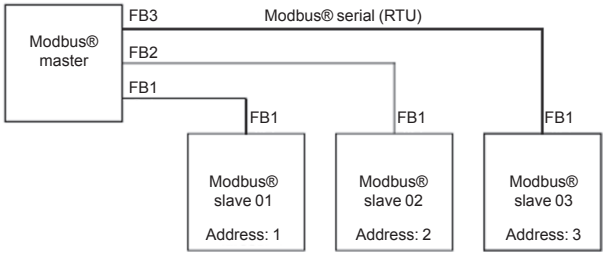


On the Ethernet network, several masters (clients) can read data provided by several slaves (servers).

Creation of Modbus® TCP/IP servers is quick and simple: Select Protocols / New / Modbus® Slave.

Modbus® serial (RTU)

The **XPSMF** range of safety PLCs (**XPSMFCPU22**, **XPSMF402●**, **XPSMF352●** and **XPSMF3022**) allow the communication of non safety related data on a Modbus® serial (RTU) link.
On the Modbus® serial network, a master can read the data provided by several slaves on a network segment.



Creation of Modbus® (RTU) servers is quick and simple: Select Protocols / New / Modbus® Slave.
Select the serial option in the properties window to activate, then select the signals to send and receive from your standard automation system equipment.

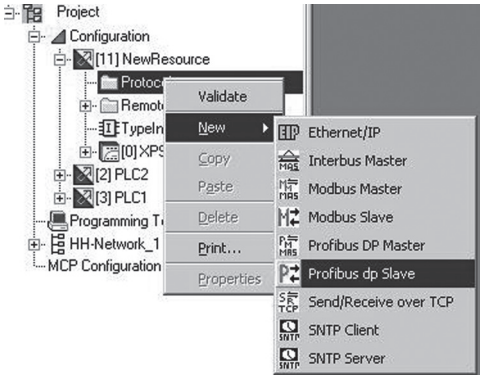
Safety automation system solutions

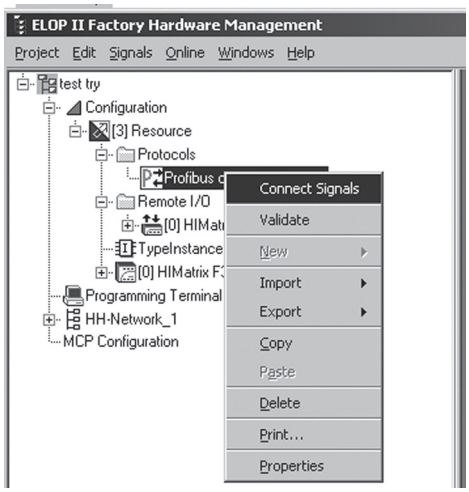
Programming software XPSMFWIN
for Preventa™ compact and modular
safety PLCs XPSMF

Non safety related communication protocols

PROFIBUS DP

To create a PROFIBUS DP slave on a resource (PLC), a project must be created.
Safety PLCs **XPSMF404●** and **XPSMF3542** are PROFIBUS DP V0 slaves.
Within hardware management, assignment of PROFIBUS DP slaves is simple:
Select Protocols / New / PROFIBUS DP slave from the protocol tag of a resource.





The PROFIBUS DP Slave menu contains the following fields:
□ Connect signals tab: for connecting the inputs and outputs to and from the safety PLC, and predefined signals for diagnostics.
□ Import and Export tool: used for importing and exporting the signal list to/from a .CSV format file (format that can be imported into a standard automation PLC).
□ Properties tab: enabling setting of the station address, interface, baud rate and data refresh rate.

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular, XPSMF
Safety remote input, output and input/output modules
XPSMF1/2/3

Presentation

Remote input, output and input/output modules:
- Location: within the vicinity of machines to be monitored.
- Extension of the I/O capacity of compact and modular safety PLCs.
- Designed for use in safety related parts of control systems up to category 4 conforming to EN 954-1, up to performance level “e” conforming to EN/ISO 13849-1, and up to SIL 3 conforming to EN/IEC 61508.







*Products referenced **XPSMF1DI1601** and **XPSMF2●●●●●** are marked **HIMatrix® F1DI** and **HIMatrix® F2DI** (manufactured by Hima, sold by Schneider Electric).*

User memory		Application	–		
		Data	–		
Response time			Depending on size of application		
Maximum power consumption			0.8 A	0.5 A	9 A
Supply			External ⎓ 24 V supply (with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)		
Inputs	**Digital**	Number of channels	16, not electrically isolated	–	–
		Current at state 0	1.5 mA max., 1 mA at 5 V	–	–
		Current at state 1	≥ 2 mA at ⎓ 15 V	–	–
	Analog	Number of channels	–	–	–
		Range: voltage/current	–	–	–
	Counting	Number of channels	–	–	–
		Current	–	–	–
Outputs	**Digital**	Number of channels	–	4, not electrically isolated	16, not electrically isolated
		Output current	–	5 A max.	1 A max. at 140 °F (60 °C), 2 A max. at 104 °F (40 °C)
	Analog	Number of channels	–	–	–
		Range: voltage/current	–	–	–
	Relay	Number	–	–	–
		Switching voltage	–	–	–
	Line control	Number	4, not electrically isolated	–	–
		Current/Voltage	60 mA/20 V	–	–
Input/output connections			Removable screw terminal blocks *(1)*		
Safety communication on Ethernet network using SafeEthernet protocol			Yes, access to network via integrated 2 RJ45 switched Ethernet communications ports		
Safety remote I/O module type			**XPSMF1DI1601**	**XPSMF2DO401**	**XPSMF2DO1601**
See page			2/78	2/85	

*(1) Removable screw terminal blocks are provided with safety remote I/O modules **XPSMF1/2/3**.*



*Products referenced **XPSMF2●●●●●●●** and **XPSMF3●●●●●●●** are marked **HIMatrix® F2DO** and **HIMatrix® F3...** (manufactured by Hima, sold by Schneider Electric).*

–					
–					
Depending on size of application					
0.6 A	0.6 A	8 A	14 A	8 A	0.8 A
External ⎓ 24 V supply (with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)					
–	–	8, not electrically isolated	16, not electrically isolated	20, not electrically isolated	–
–	–	1.5 mA max. 1.25 mA at ⎓ 5 V	1.5 mA max. 1 mA at ⎓ 5 V	1.5 mA max. 1.25 mA at ⎓ 5 V	–
–	–	> 2 mA at ⎓ 15 V	> 2 mA at ⎓ 15 V	≥ 2 mA at ⎓ 15 V	–
–	–	–	–	–	8 single-pole
–	–	–	–	–	⎓ 0…10 V/0…20 mA *(1)*
–	–	–	–	–	–
–	–	–	–	–	–
–	–	8 DO+ (reference pole L-) 2 DO- (reference pole S+)	8 2-pole or 16 single-pole, not electrically isolated	8, not electrically isolated *(2)*	–
–	–	DO+: channels 1 to 3 and 5 to 7: 0.5 A at 140 °F (60 °C) channels 4 and 8: 1 A at 140 °F (60 °C), 2 A at 104 °F (40 °C) DO-: channels 1 and 2: 1 A at 140 °F (60 °C)	2 A max. at 104 °F (40 °C), 1 A max. at 140 °F (60 °C), 10 mA min.	Channels 1 to 3 and 5 to 7: 0.5 A at 140 °F (60 °C) Channels 4 and 8: 1 A at 140 °F (60 °C), 2 A at 122 °F (50 °C)	–
–	–	–	–	–	4 non safety related outputs
–	–	–	–	–	Usable range: 0…20 mA Nominal range: 4…20 mA
8	16	–	–	–	–
≥ 5 V, ≤ ⎓ 250 V/ ∼ 250 V	≥ 5 V, ≤ ⎓ 30 V/ ∼ 60 V	–	–	–	–
–	–	2, not electrically isolated		–	–
–	–	60 mA/20 V	60 mA/20 V	–	–
Removable screw terminal blocks *(3)*					
Yes, access to network via integrated 2 RJ45 switched Ethernet communications ports					
XPSMF2DO801	**XPSMF2DO1602**	**XPSMF3DIO8801**	**XPSMF3DIO16801**	**XPSMF3DIO20802**	**XPSMF3AIO8401**
2/85		2/97			

(1) With 500 Ω jumper
(2) Configurable for Line control.
*(3) Removable screw terminal blocks are provided with safety remote I/O modules **XPSMF1/2/3**.*

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote input modules XPSMF1



XPSMF1DI1601

*This product, referenced **XPSMF1DI1601**, is marked **HIMatrix® F1DI** (manufactured by Hima, sold by Schneider Electric).*

Presentation

XPSMF1DI1601 is a compact safety remote input module which is designed to extend the input capacity of safety PLCs **XPSMF,** either compact or modular, to which it is associated.
The communication with either the compact or modular safety PLCs is managed via one of its' integrated 2 RJ45 switched Ethernet communications ports.
The safety remote input module **XPSMF1DI1601** does not have a user program: it receives its instructions from its' parent safety PLC.

Safety remote input module XPSMF1DI1601

Remote digital inputs		
N°	**Safety detection**	**Safety dialog**
16	Limit switches, Guard switches, with reset and with actuator, Light curtains type 2 and type 4, Safety mats and sensing edges…	Mushroom head Emergency stops, Enclosures for control and signalling units, Two-hand control stations…

Remote line control outputs	
N°	
4	Short-circuit and line break monitoring

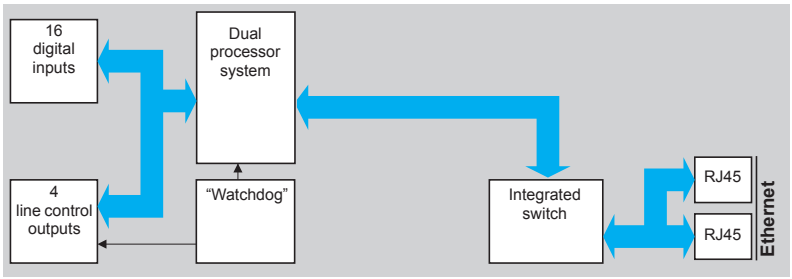
Line control

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring anomaly (short-circuit, line break) to be seen at the inputs of the safety modules.
Example: The line control outputs 1 to 4 are connected to the digital inputs 1 to 16.

Safety PLCs

In order to meet safety requirements, the safety remote input module **XPSMF1DI1601** incorporates two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level "e" conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between this safety remote input module and the safety PLCs (**Special Switch**).
■ **Redundancy**: the dual processor integrated in the safety remote input module **XPSMF1DI1601** analyzes and compares the data received from the safety inputs and outputs. The incoming and outgoing data (programmed values and received values) are received in parallel by the two processors and compared in real-time.
■ **Self-monitoring ("Watchdog")**: the safety remote input module **XPSMF1DI1601** continuously monitors the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.
■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the inputs of the safety module on the Ethernet network, while avoiding signal collisions and excessive amounts of data on the network.

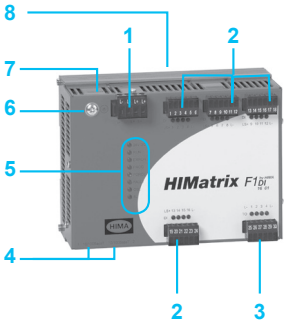
Functional diagram



Safety communication on Ethernet network

The safety input module **XPSMF1DI1601** incorporates two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, that enable communication on the Ethernet network using SafeEthernet communication protocol and therefore, data exchange with compact or modular safety PLCs **XPSMF**.

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote input modules XPSMF1



Description

Safety remote input module XPSMF1DI1601

On the front cover of the metal enclosure:

1 One terminal block *(1)* for c 24 V supply.
2 Four terminal blocks *(1)* for connection of digital inputs, with input status LED (four LEDs per terminal block).
3 One terminal block *(1)* for connection of digital line control outputs, with four digital output status LEDs.
4 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
5 Eight process status LEDs.
6 One ground connection screw.
7 On the top: one “Reset” button.
8 On the rear face: one spring operated mounting device for mounting on 35 mm 5 rail.

Status LED details

Safety remote input module XPSMF1DI1601

LED	Color	Status	Meaning
Inputs 1…16	Orange	On	Inputs active.
Outputs 1…4	Orange	On	Outputs active.
24 VDC	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/ software tests carried out.
		Flashing	The CPU is in STOP and is not executing any user application. All the outputs are reset to a safe, de-energized state.
		Off	The CPU is in “ERROR” state (see ERROR).
ERROR	Red	On	Software error or hardware anomaly detected by the CPU.
			The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the PC.
		Off	No errors detected.
PROG	Orange	On	The CPU is being loaded with a new configuration.
		Flashing	The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
FORCE	Orange	On	The CPU is in RUN mode and force is active.
		Flashing	The system is not processing (STOP), but force is prepared and is activated if the dual processor is started.
		Off	Force mode not activated.
FAULT	Orange	On	Error display for line control.
			The user application has caused an error.
			The system configuration is defective.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred while writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
OSL	Orange	Flashing	Emergency loading of the operating system is active.
BL	Orange	Flashing	COM in INIT_Fail state.
RJ45	Green	On	Full duplex mode operation.
		Flashing	Signal collision.
		Off	Half duplex mode operation, no collision.
	Yellow	On	Connection established.
		Flashing	Interface active.

*(1) Removable screw terminals are provided with safety input module **XPSMF1DI1601**.*

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote input modules XPSMF1

Characteristics

Safety remote input module type			XPSMF1DI1601
Supply voltage		**V**	⎓ 24 (external supply with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)
Voltage limits		**V**	- 15…+ 20%
Ambient air temperature	For operation	**°F (°C)**	+ 32… + 140 (0…+ 60)
	For storage	**°F (°C)**	- 40…+ 185 (- 40…+ 85)
Degree of protection			IP 20
Response time		**ms**	Depending on size of application
Current power consumption		**A**	0.8 max.
Backup battery			None
Digital inputs			
Number			16, not electrically isolated
Permissible current	At state 1	**mA**	≥ 2 at ⎓ 15 V
	At state 0	**mA**	1.5 max., 1 mA at 5 V
Switching point		**V**	Typically 7.5
Switching time		**µs**	250
Input supply			4 x 19.2 V/40 mA (on 24 V), protected against short-circuits
Line control outputs			
Number			4, not electrically isolated
Output voltage		**V**	20 (approximately, depending on the supply voltage)
Output current		**mA**	60
Minimum load			None
Response to overload			4 x ≥ 19.2 V, short-circuit current 60 mA at 24 V
Connections			See page 2/26 for wire sizes of the various connector types.

Communication

Ethernet network: safety communication using SafeEthernet protocol			
Transmission	Communication ports		Integrated 2 RJ45 switched Ethernet communications ports
	Baud rate	Mbps	100 Half duplex, 10 Full duplex, Autonegotiation
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)

References



XPSMF1DI1601

*This product, referenced **XPSMF1DI1601**, is marked **HIMatrix® F1DI** (manufactured by Hima, sold by Schneider Electric).*

Safety remote input module (⎓ 24 V supply)

For use with	Digital inputs	Line control outputs	Ports	Reference	Weight oz (kg)
Safety PLCs, modular XPSMF60 or compact XPSMF40 and XPSMF31/30/35	16	4	Integrated 2 RJ45 switched Ethernet communications ports	**XPSMF1DI1601**	24.692 (0.700)

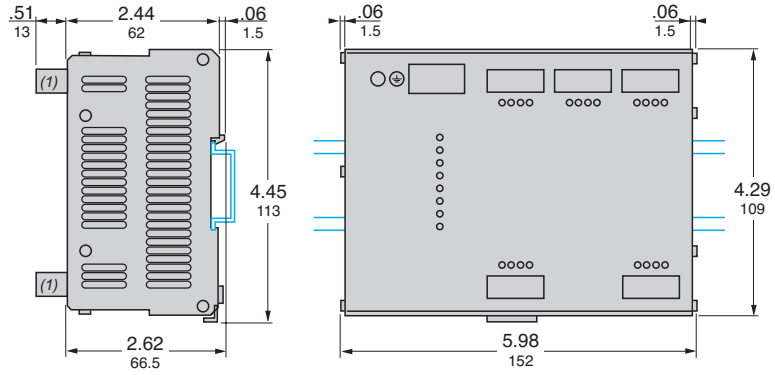
Connecting cables

Description	For	Reference	Weight oz (kg)
Ethernet network connecting cables	Connection between safety remote input modules and modular or compact safety PLCs XPSMF RJ45 connector fitted at each end	See 2/29	–

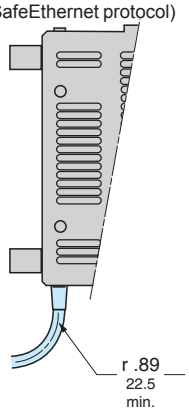
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Dimensions

XPSMF1DI1601



RJ45 connector for access to Ethernet network (SafeEthernet protocol)

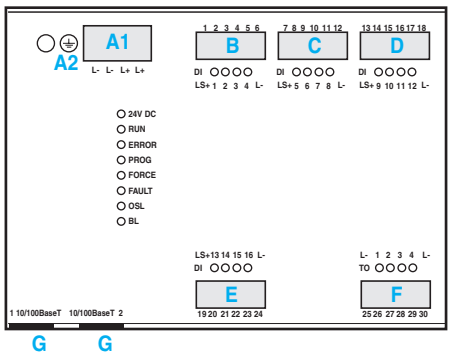


Dual Dimensions: INCHES Millimieters

*(1) Removable screw terminals are provided with safety input module **XPSMF1DI1601**.*

Connections

XPSMF1DI1601



Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Ground**	–	⏚	Ground
B	**Digital inputs**	1	LS+	Sensor supply for inputs 1 to 4
		2	1	Digital input 1
		3	2	Digital input 2
		4	3	Digital input 3
		5	4	Digital input 4
		6	L-	Reference pole
C	**Digital inputs**	7	LS+	Sensor supply for inputs 5 to 8
		8	5	Digital input 5
		9	6	Digital input 6
		10	7	Digital input 7
		11	8	Digital input 8
		12	L-	Reference pole
D	**Digital inputs**	13	LS+	Sensor supply for inputs 9 to 12
		14	9	Digital input 9
		15	10	Digital input 10
		16	11	Digital input 11
		17	12	Digital input 12
		18	L-	Reference pole
E	**Digital inputs**	19	LS+	Sensor supply for inputs 13 to 16
		20	13	Digital input 13
		21	14	Digital input 14
		22	15	Digital input 15
		23	16	Digital input 16
		24	L-	Reference pole
F	**Line control outputs**	25	L+	Outputs common
		26	1	Output 1
		27	2	Output 2
		28	3	Output 3
		29	4	Output 4
		30	L-	Outputs common

Item	Connection	Type	Function
G	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote output modules XPSMF2



XPSMF2DO401



XPSMF2DO1601



XPSMF2DO801



XPSMF2DO801

*Products referenced **XPSMF2●●●●●●** are marked **HIMatrix® F2 DO...** (manufactured by Hima, sold by Schneider Electric).*

Presentation

XPSMF2DO●●●● are compact safety remote output modules which are designed to extend the output capacity of safety PLCs **XPSMF**, either compact or modular, to which they are associated.
The communication with either the compact or modular safety PLCs is managed via one of its' integrated 2 RJ45 switched Ethernet communications ports.
Safety modules **XPSMF2DO●●●●** do not have a user program: they receive their instructions from its' parent safety PLC.

Safety remote output modules XPSMF2DO●●●●

Safety output modules	Remote outputs		
	N°	Type	
XPSMF2DO401	**4**	Digital power outputs	**Safety actuators:** Contactors-motors, Control relays, Variable speed drives…
XPSMF2DO1601	**16**	Digital outputs	
XPSMF2DO801	**8**	Relay outputs	**Safety dialog:** Beacons and indicator banks, rotating mirror beacons, sirens…
XPSMF2DO1602	**16**	Relay outputs	

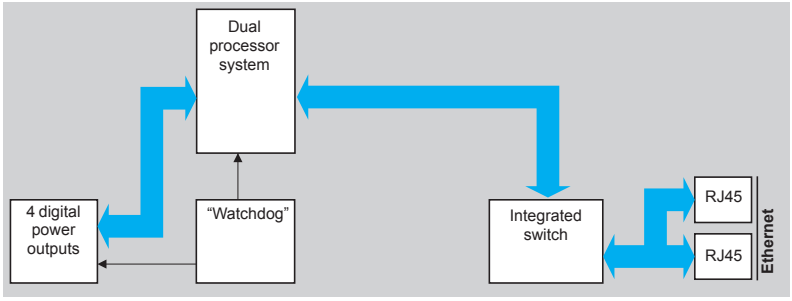
Safety PLCs

In order to meet safety requirements, the safety remote output modules **XPSMF2DO●●●●** incorporate two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level "e" conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between these safety remote output modules and the safety PLCs (**Special Switch**).

■ **Redundancy**: the dual processor integrated in the safety remote output modules **XPSMF2** analyzes and compares the data received from the safety inputs and outputs. The incoming and outgoing data (programmed values and received values) are received in parallel by the two processors and compared in real-time.
■ **Self-monitoring ("Watchdog")**: the safety remote output modules **XPSMF2** continuously monitor the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.
■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the outputs of the safety modules on the Ethernet network, while avoiding signal collisions and excessive amounts of data on the network.

Functional diagrams

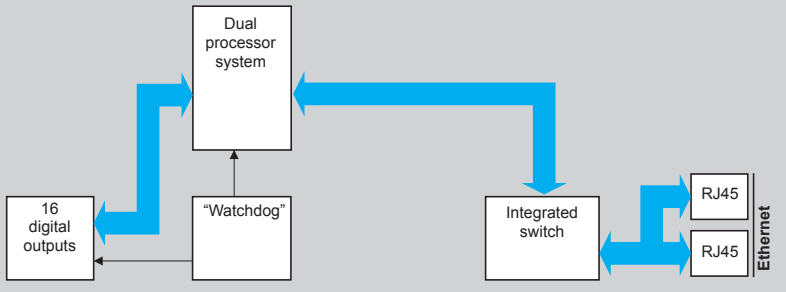
Remote output module XPSMF2DO401



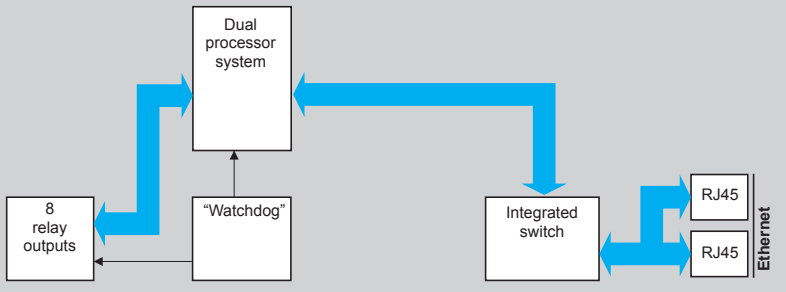
Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote output modules XPSMF2

Functional diagrams (continued)

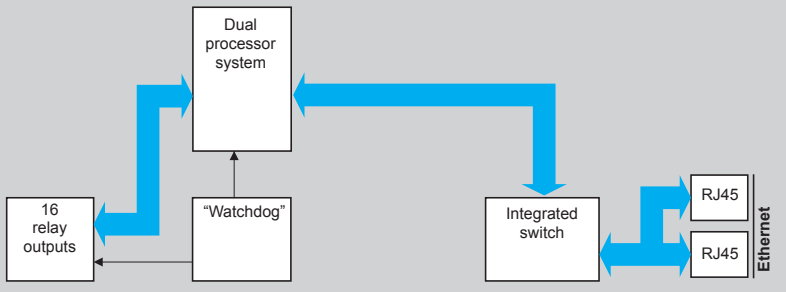
Remote output module XPSMF2DO801



Remote output module XPSMF2DO801



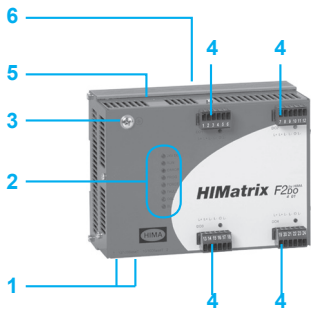
Remote output module XPSMF2DO1602



Safety communication on Ethernet network

The safety remote output modules **XPSMF2DO●●●●** incorporate two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, that enable communication on the Ethernet network using SafeEthernet communication protocol and therefore, data exchange with compact or modular safety PLCs **XPSMF**.

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote output modules XPSMF2

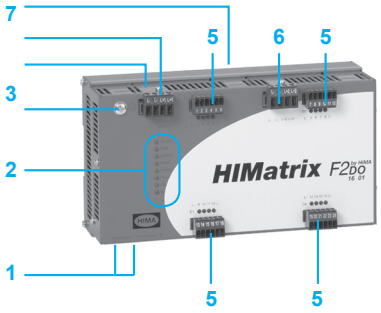


Description

Remote output module XPSMF2DO401

On the front cover of the metal enclosure:

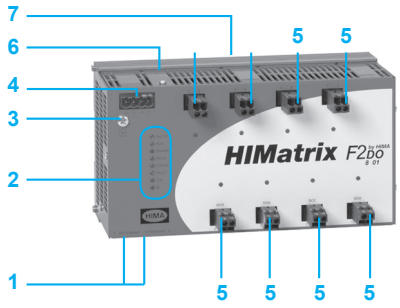
1 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
2 Eight process status LEDs.
3 One ground connection screw.
4 Four terminal blocks *(1)* for connection of digital outputs, with output status LED (one LED per terminal block).
5 **On the top**: one “Reset” button.
6 **On the rear face**: one spring operated mounting device for mounting on 35 mm ⊥ rail.



Remote output module XPSMF2DO1601

On the front cover of the metal enclosure:

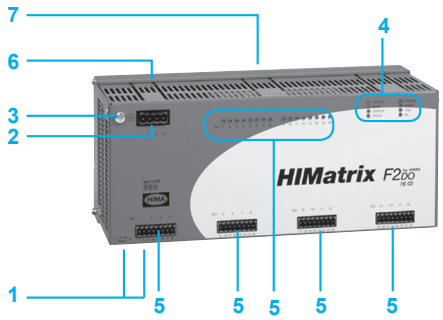
1 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
2 Eight process status LEDs.
3 One ground connection screw.
4 One terminal block *(1)* for ⎓ 24 V supply.
5 Four terminal blocks *(1)* for connection of digital outputs, with output status LED (four LEDs per terminal block).
6 One terminal block for connection of output channels.
7 **On the top**: one “Reset” button.
8 **On the rear face**: one spring operated mounting device for mounting on 35 mm ⊥ rail.



Remote output module XPSMF2DO801

On the front cover of the metal enclosure:

1 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
2 Eight process status LEDs.
3 One ground connection screw.
4 One terminal block *(1)* for ⎓ 24 V supply.
5 Eight terminal blocks *(1)* for connection of relay outputs, with output status LED (one LED per terminal block).
6 **On the top**: one “Reset” button.
7 **On the rear face**: one spring operated mounting device for mounting on 35 mm ⊥ rail.



Remote output module XPSMF2DO1602

On the front cover of the metal enclosure:

1 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
2 One terminal block *(1)* for ⎓ 24 V supply.
3 One ground connection screw.
4 Eight process status LEDs.
5 Four terminal blocks *(1)* for connection of relay outputs, with relay output status LEDs.
6 **On the top**: one “Reset” button.
7 **On the rear face**: one spring operated mounting device for mounting on 35 mm ⊥ rail.

*(1) Removable screw terminals are provided with the safety output modules **XPSMF2**.*

Status LED details

Safety remote output modules XPSMF2DO●●●●

LED	Color	Status	Meaning
Outputs 1…16	Orange	On	Outputs active.
24 VDC	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/ software tests carried out.
		Flashing	The CPU is in STOP and is not executing any user application. All the outputs are reset to a safe, de-energized state.
		Off	The CPU is in “ERROR” state (see ERROR).
ERROR	Red	On	Software error or hardware anomaly detected by the CPU.
			The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the PC.
		Off	No errors detected.
PROG	Orange	On	The CPU is being loaded with a new configuration.
		Flashing	The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
FORCE	Orange	On	The CPU is in RUN mode and force is active.
		Flashing	The system is not processing (STOP), but force is prepared and is activated if the dual processor is started.
		Off	Force mode not activated.
FAULT	Orange	On	Error display for line control.
			The user application has caused an error.
			The system configuration is defective.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred while writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
OSL	Orange	Flashing	Emergency loading of the operating system is active.
BL	Orange	Flashing	COM in INIT_Fail state.
RJ45	Green	On	Full duplex mode operation.
		Flashing	Signal collision.
		Off	Half duplex mode operation, no collision.
	Yellow	On	Connection established.
		Flashing	Interface active.

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote output modules XPSMF2

2

Characteristics

Safety remote output module type			XPSMF2DO401	XPSMF2DO1601	XPSMF2DO801	XPSMF2DO1602
Supply voltage		**V**	⎓ 24 (external supply with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)			
Voltage limits		**V**	- 15…+ 20%			
Ambient air temperature	For operation	**°F (°C)**	+32… + 140 (0…+ 60)			
	For storage	**°F (°C)**	- 40…+ 185 (- 40…+ 85)			
Degree of protection			IP 20			
Response time		**ms**	Depending on size of application			
Maximum current power consumption		**A**	0.5	9 per group Residual: 0.2 per group	0.6	
External fuse			10 A, slow blow			
Backup battery			None			
Connections			See page 2/26 for wire sizes of the various connector types.			
Digital outputs						
Number of outputs			4, not electrically isolated	16, not electrically isolated	–	
Permissible output channel current		**A**	20 max.	16 max.	–	
Output current		**A**	5 max.	1 max. at 140 °F (60 °C) 2 max. at 104 °F (40 °C)	–	
Maximum lamp load		**W**	60	10 for 1 A outputs 25 for 2 A outputs	–	
Maximum inductive load		**mH**	500	500	–	
Maximum leakage current	At state 0	**mA**	1 at 1 V	1 at 2 V	–	
Response to overload			Shutdown of outputs concerned with cyclic reconnection		–	
Relay outputs						
Relay type per channel			–	–	2, with positively guided contacts 1 magnetic, high resolution	
Outputs	Number		–	–	8	16
	Type				N.O.	
Switching voltage		**V**	–	–	⩾ 5, ⩽ ⎓ 250 V/ ∼ 250 V	⩾ 5, ⩽ ⎓ 30 V/ ∼ 60 V
Switching current		**mA**			3 A, with internal fuse Breaking capacity 100 A	3.15 A, with internal fuse Breaking capacity 100 A
Switching capacity (non inductive)	∼	**VA**	–	–	240 max., cos φ > 0.5	48 max., cos φ > 0.5
	Up to ⎓ 30 V	**W**			90 max. (3.15 A internal fuse)	
	Up to ⎓ 70 V	**W**			35 max. (0.5 A internal fuse)	–
	Up to ⎓ 127 V	**W**			30 max. (315 A internal fuse)	–
Contact material			–	–	Silver alloy	
Mechanical life			–	–	⩾ 1 million operating cycles	
Electrical life			–	–	⩾ 250 000 operating cycles on full load (resistive) and ⩽ 0.1 operating cycles/s	

Communication

Ethernet network: safety communication using SafeEthernet protocol

Transmission	Communication ports		Integrated 2 RJ45 switched Ethernet communications ports
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)

Characteristics: page 2/84 | References: page 2/85 | Dimensions, mounting: page 2/86 and 2/87 | Connections: page 2/88 and 2/89 | Presentation: page 2/80

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote output modules XPSMF2

References



XPSMF2DO401



XPSMF2DO1601



XPSMF2DO801



XPSMF2DO1602

*Products referenced **XPSMF2●●●●●●** are marked **HIMatrix® F2 DO...** (manufactured by Hima, sold by Schneider Electric).*

Safety remote output modules (⎓ 24 V supply)

For use with	Outputs		Ports	Reference	Weight oz (kg)
	Digital	Relay			
Safety PLCs, modular XPSMF60 or compact XPSMF40 and XPSMF31/30/35	4	–	Integrated 2 RJ45 switched Ethernet communications ports	**XPSMF2DO401**	28.219 (0.800)
	16	–	Integrated 2 RJ45 switched Ethernet communications ports	**XPSMF2DO1601**	29.983 (0.850)
	–	8	Integrated 2 RJ45 switched Ethernet communications ports	**XPSMF2DO801**	45.856 (1.300)
	–	16	Integrated 2 RJ45 switched Ethernet communications ports	**XPSMF2DO1602**	70.548 (2.000)

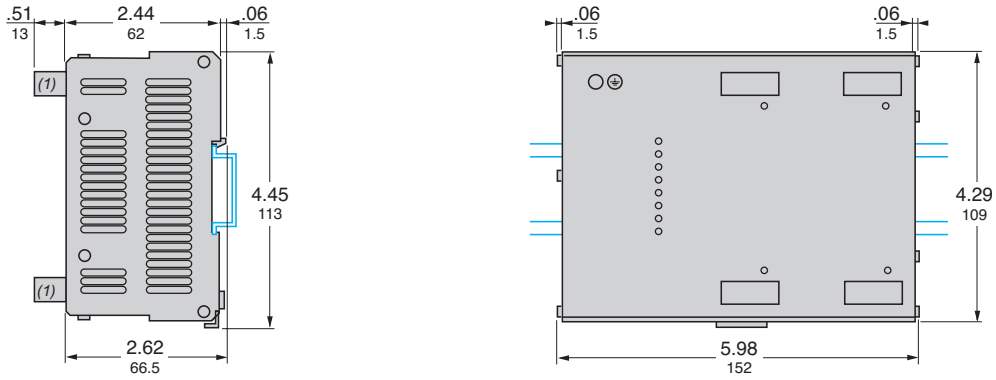
Connecting cables

Description	For	Reference	Weight oz (kg)
Ethernet network connecting cables	Connection between safety remote output modules and modular or compact safety PLCs XPSMF RJ45 connector fitted at each end	See page 2/29	–

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote output modules XPSMF2

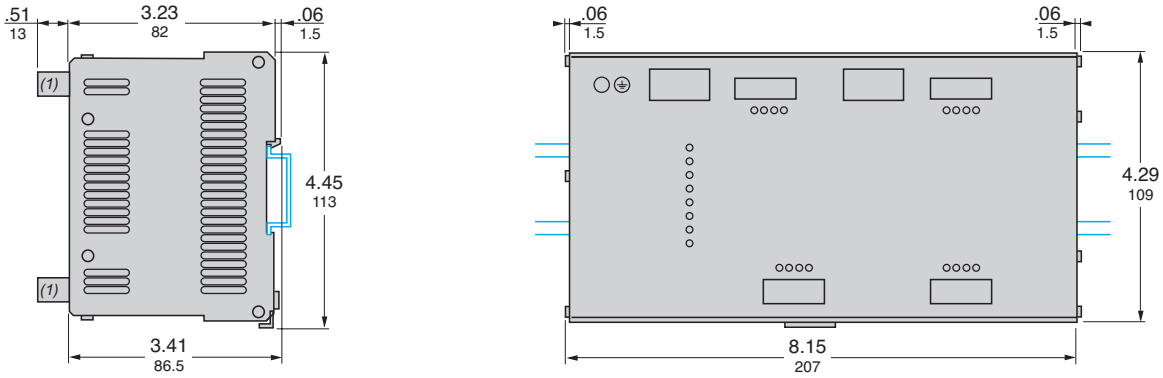
Dimensions

XPSMF2DO401



*(1) Removable screw terminals are provided with the safety output modules **XPSMF2DO401**.*

XPSMF2DO1601

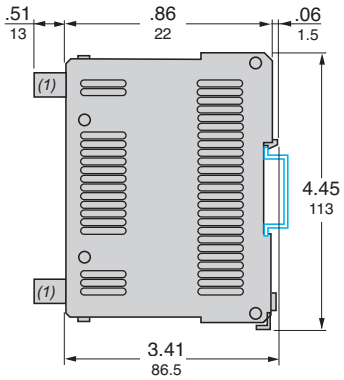


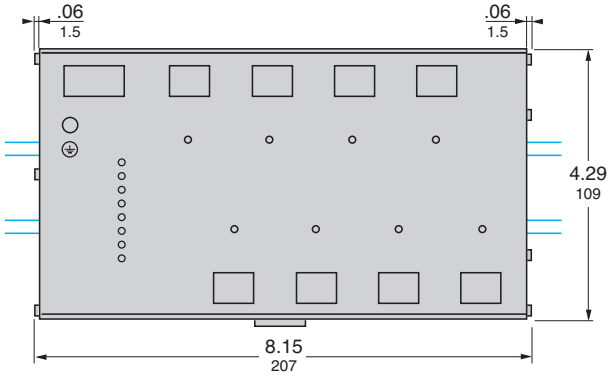
*(1) Removable screw terminals are provided with the safety output modules **XPSMF2DO1601**.*

Dual Dimensions: INCHES Millimieters

Dimensions

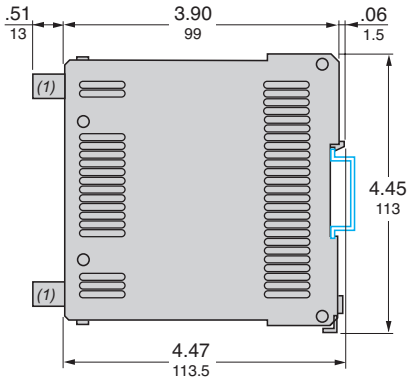
XPSMF2DO801

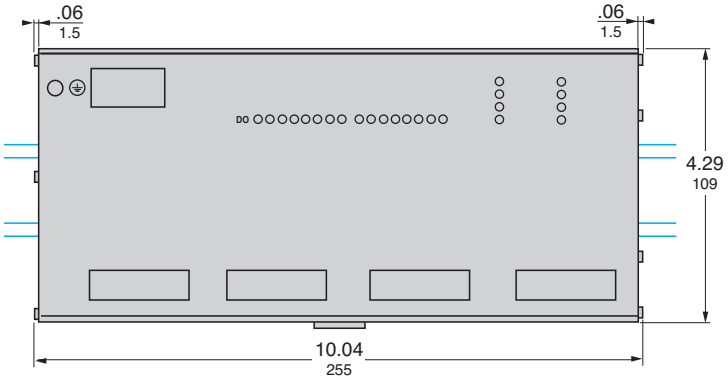




*(1) Removable screw terminals are provided with the safety output modules **XPSMF2DO801**.*

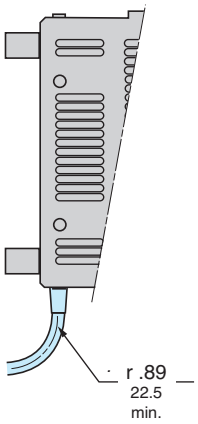
XPSMF2DO1602





*(1) Removable screw terminals are provided with the safety output modules **XPSMF2DO1602**.*

RJ45 connector for access to Ethernet network (SafeEthernet protocol)

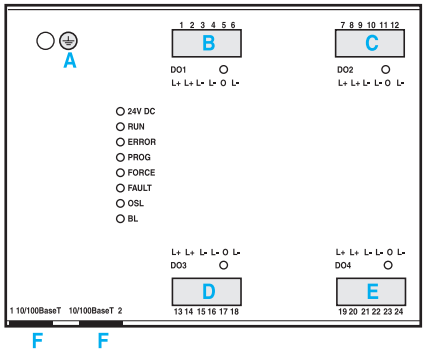


Dual Dimensions: INCHES / Millimieters

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote output modules XPSMF2

Connections

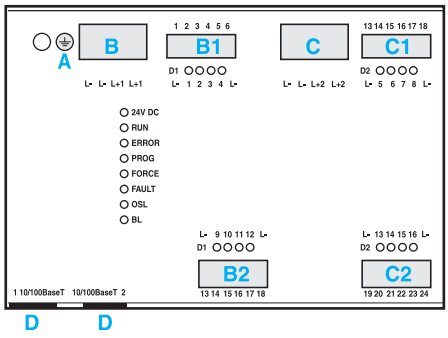
XPSMF2DO401



Item	Connection	Screw N°	Screw	Function
A	**Ground**	–	⏚	Ground
B	**Digital output 1**	1	L+	Supply for output 1
		2	L+	Supply for output 1
		3	L-	Reference pole
		4	L-	Reference pole
		5	O	Digital output 1
		6	L-	Reference pole
C	**Digital output 2**	7	L+	Supply for output 2
		8	L+	Supply for output 2
		9	L-	Reference pole
		10	L-	Reference pole
		11	O	Digital output 2
		12	L-	Reference pole
D	**Digital output 3**	13	L+	Supply for output 3
		14	L+	Supply for output 3
		15	L-	Reference pole
		16	L-	Reference pole
		17	O	Digital output 3
		18	L-	Reference pole
E	**Digital output 4**	19	L+	Supply for output 4
		20	L+	Supply for output 4
		21	L-	Reference pole
		22	L-	Reference pole
		23	O	Digital output 4
		24	L-	Reference pole

Item	Connection	Type	Function
F	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

XPSMF2DO1601



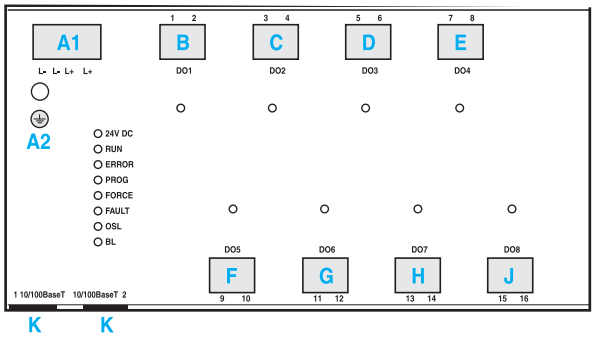
Item	Connection	Screw N°	Screw	Function
A	**Ground**	–	⏚	Ground
B	**Supply**	–	L-	Reference pole
		–	L-	Reference pole
		–	L+	Supply for outputs 1, 2, 3, 4, 9, 10, 11, 12
		–	L+	Supply for outputs 1, 2, 3, 4, 9, 10, 11, 12
B1	**Digital outputs**	1	L-	Reference pole
		2	1	Digital output 1
		3	2	Digital output 2
		4	3	Digital output 3
		5	4	Digital output 4
		6	L-	Reference pole
B2	**Digital outputs**	13	L-	Reference pole
		14	9	Digital output 9
		15	10	Digital output 10
		16	11	Digital output 11
		17	12	Digital output 12
		18	L-	Reference pole
C	**Supply**	–	L-	Reference pole
		–	L-	Reference pole
		–	L+	Supply for outputs 5, 6, 7, 8, 13, 14, 15, 16
		–	L+	Supply for outputs 5, 6, 7, 8, 13, 14, 15, 16
C1	**Digital outputs**	7	L-	Reference pole
		8	5	Digital output 5
		9	6	Digital output 6
		10	7	Digital output 7
		11	8	Digital output 8
		12	L-	Reference pole
C2	**Digital outputs**	19	L-	Reference pole
		20	13	Digital output 13
		21	14	Digital output 14
		22	15	Digital output 15
		23	16	Digital output 16
		24	L-	Reference pole

Item	Connection	Type	Function
D	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

Characteristics: page 2/84 | References: page 2/85 | Dimensions, mounting: page 2/86 and 2/87 | Connections: page 2/88 and 2/89 | Presentation: page 2/80

Connections

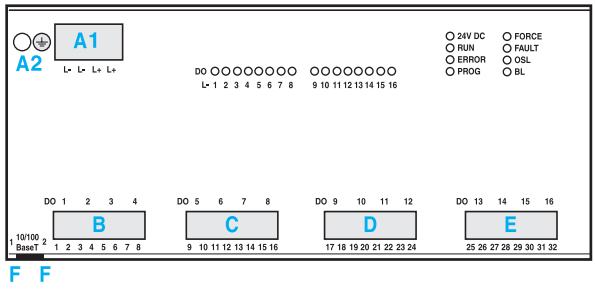
XPSMF2DO801



Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	Supply for relay outputs
		–	L+	Supply for relay outputs
		–	L-	Reference pole
		–	L-	Reference pole
A2	**Ground**	–	⏚	Ground
B	**Relay output 1**	1	–	Contact 1, terminal A
		2	–	Contact 1, terminal B
C	**Relay output 2**	3	–	Contact 2, terminal A
		4	–	Contact 2, terminal B
D	**Relay output 3**	5	–	Contact 3, terminal A
		6	–	Contact 3, terminal B
E	**Relay output 4**	7	–	Contact 4, terminal A
		8	–	Contact 4, terminal B
F	**Relay output 5**	9	–	Contact 5, terminal A
		10	–	Contact 5, terminal B
G	**Relay output 6**	11	–	Contact 6, terminal A
		12	–	Contact 6, terminal B
H	**Relay output 7**	13	–	Contact 7, terminal A
		14	–	Contact 7, terminal B
J	**Relay output 8**	15	–	Contact 8, terminal A
		16	–	Contact 8, terminal B

Item	Connection	Type	Function
K	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

XPSMF2DO1602



Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	Supply for relay outputs
		–	L+	Supply for relay outputs
		–	L-	Reference pole
		–	L-	Reference pole
A2	**Ground**	–	⏚	Ground
B	**Relay outputs 1 to 4**	1	–	Contact 1, terminal A
		2	–	Contact 1, terminal B
		3	–	Contact 2, terminal A
		4	–	Contact 2, terminal B
		5	–	Contact 3, terminal A
		6	–	Contact 3, terminal B
		7	–	Contact 4, terminal A
		8	–	Contact 4, terminal B
C	**Relay outputs 5 to 8**	9	–	Contact 5, terminal A
		10	–	Contact 5, terminal B
		11	–	Contact 6, terminal A
		12	–	Contact 6, terminal B
		13	–	Contact 7, terminal A
		14	–	Contact 7, terminal B
		15	–	Contact 8, terminal A
		16	–	Contact 8, terminal B
D	**Relay outputs 9 to 12**	17	–	Contact 9, terminal A
		18	–	Contact 9, terminal B
		19	–	Contact 10, terminal A
		20	–	Contact 10, terminal B
		21	–	Contact 11, terminal A
		22	–	Contact 11, terminal B
		23	–	Contact 12, terminal A
		24	–	Contact 12, terminal B
E	**Relay outputs 13 to 16**	25	–	Contact 13, terminal A
		26	–	Contact 13, terminal B
		27	–	Contact 14, terminal A
		28	–	Contact 14, terminal B
		29	–	Contact 15, terminal A
		30	–	Contact 15, terminal B
		31	–	Contact 16, terminal A
		32	–	Contact 16, terminal B

Item	Connection	Type	Function
F	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

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XPSMF3DIO8801



XPSMF3DIO16801



XPSMF3DIO20802



XPSMF3AIO8401

*Products referenced **XPSMF3●●●●●●** are marked **HIMatrix® F3...** (manufactured by Hima, sold by Schneider Electric).*

Presentation

XPSMF3DIO/AIO are compact safety remote input/output modules which are designed to extend the I/O capacity of safety PLCs **XPSMF**, either compact or modular, to which they are associated.
The communication with either the compact or modular safety PLCs is managed via one of its' integrated 2 RJ45 switched Ethernet communications ports.
Safety modules **XPSMF3DIO/AIO** do not have a user program: they receive their instructions from its' parent safety PLC.

Safety remote mixed I/O modules XPSMF3DIO/AIO

Mixed I/O safety modules	Remote inputs		Remote outputs	
	N°	Type	N°	Type
XPSMF3DIO8801	**8**	Digital	**8 DO+ / 2 DO-**	Digital
			2	Line control
XPSMF3DIO16801	**16**	Digital	**8 2-pole or 16 single-pole**	Digital
			2	Line control
XPSMF3DIO20802	**20**	Digital	**8**	Digital
XPSMF3AIO8401	**8**	Analog	**4**	Analog (non safety outputs)

Examples of remote inputs of safety modules XPSMF3●IO●●●●●

■ **Digital inputs**

Safety actuators	Safety detection	Safety dialog
Contactors-motors, Control relays, Variable speed drives…	Limit switches, Guard switches, with reset and with actuator, Light curtains type 2 and type 4, Safety mats and sensing edges…	Mushroom head Emergency stops, Enclosures for control and signalling units, Two-hand control stations…

■ **Analog inputs**

Closed circuit scanning of input channels,
Single-pole measuring of 0 to 10 V voltages,
Measuring, using jumper, 0/4 to 20 mA currents (with 500 Ω external resistor).

Examples of remote outputs of safety modules XPSMF3●IO●●●●●

■ **Digital outputs**

Safety actuators	Safety dialog
Contactors-motors, Control relays, Variable speed drives…	Beacons and indicator banks, Rotating mirror beacons, Sirens…

■ **Line control outputs**

Short-circuit and line break monitoring

■ **Analog outputs**

Closed circuit scanning of output channels,
Single-pole measuring of 0 to 10 V voltages,
Measuring, using jumper, 0/4 to 20 mA currents (with 500 Ω external resistor).

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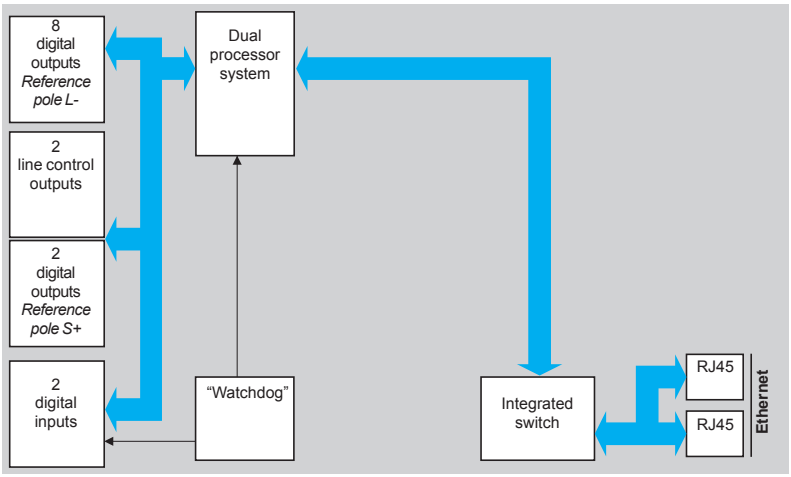
Safety PLCs

In order to meet safety requirements, the safety remote mixed I/O modules **XPSMF3●IO●●●●●** incorporate two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level “e” conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between these safety remote mixed I/O modules and the safety PLCs (**Special Switch**).

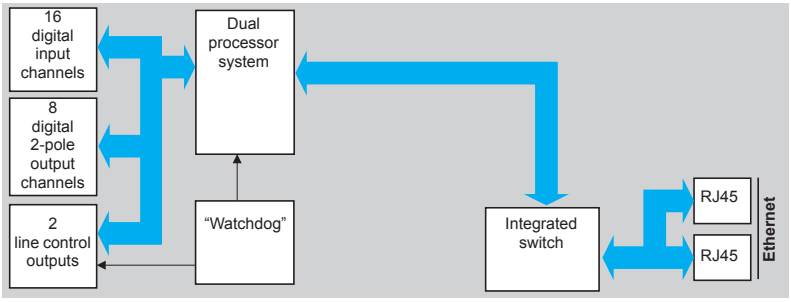
■ **Redundancy**: the dual processor integrated in safety modules **XPSMF3●IO●●●●●** analyzes and compares the data received from the safety inputs and outputs. The incoming and outgoing data (programmed values and received values) are received in parallel by the two processors and compared in real-time.
■ **Self-monitoring (“Watchdog”)**: the safety remote mixed I/O modules **XPSMF3●IO●●●●●** continuously monitor the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.
■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the inputs and outputs of the safety modules on the Ethernet network, while avoiding signal collisions and excessive amounts of data on the network.

Functional diagrams

Remote mixed I/O module XPSMF3DIO8801



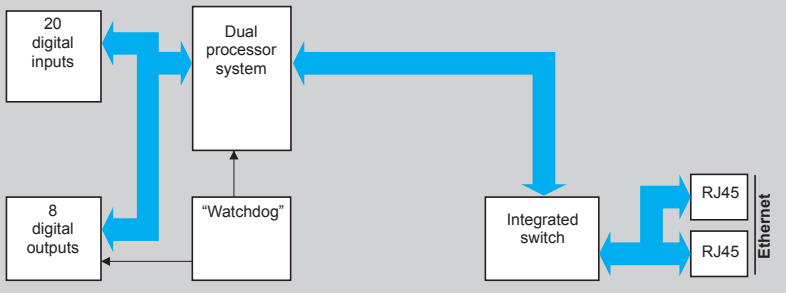
Remote mixed I/O module XPSMF3DIO16801



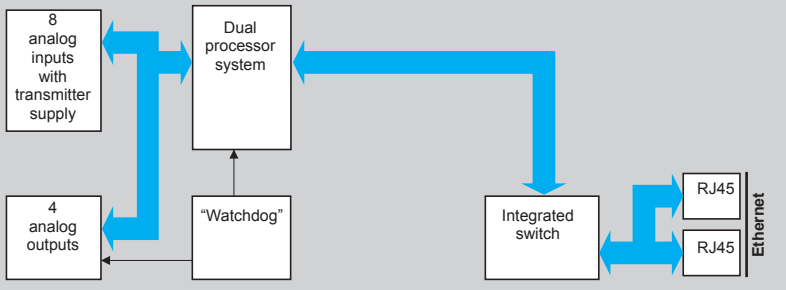
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Functional diagrams *(continued)*

Remote mixed I/O module XPSMF3DIO20802



Remote mixed I/O module XPSMF3AIO8401



Line control

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring anomaly (short-circuit, line break) to be seen at the inputs of the safety modules.

Examples

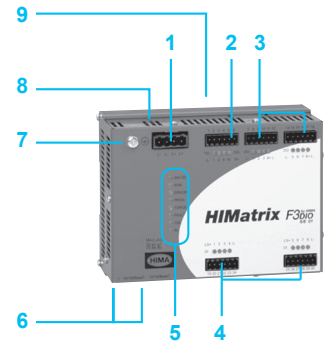
□ For **XPSMF3DIO8801** and **XPSMF3DIO16801**, the line control outputs 1 and 2 are connected to the digital inputs of the same circuit.

□ For **XPSMF3DIO20802**, the digital outputs 1 to 8 are connected to the digital inputs of the same circuit.

Safety communication on Ethernet network

The safety remote mixed I/O modules **XPSMF3●IO●●●●** incorporate two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, that enable communication on the Ethernet network using SafeEthernet communication protocol and therefore, data exchange with compact or modular safety PLCs **XPSMF**.

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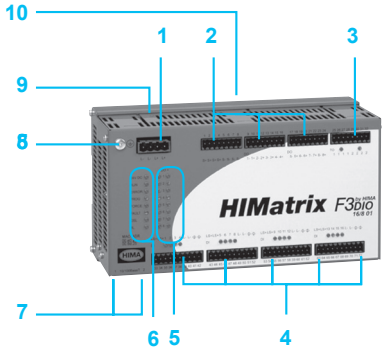


Description

Remote mixed I/O module XPSMF3DIO8801

On the front cover of the metal enclosure:

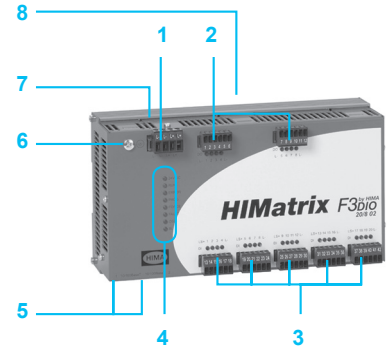
1 One terminal block *(1)* for ⎓ 24 V supply.
2 One terminal block *(1)* for connection of line control outputs, with four line control output status LEDs.
3 Two terminal blocks *(1)* for connection of digital outputs, with output status LED (four LEDs per terminal block).
4 Two terminal blocks *(1)* for connection of digital inputs, with input status LED (four LEDs per terminal block).
5 Eight process status LEDs.
6 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
7 One ground connection screw.
8 One “Reset” button (on the top).
9 **On the rear face:** One spring operated mounting device for mounting on 35 mm ⊥⌐ rail.



Remote mixed I/O module XPSMF3DIO16801

On the front cover of the metal enclosure:

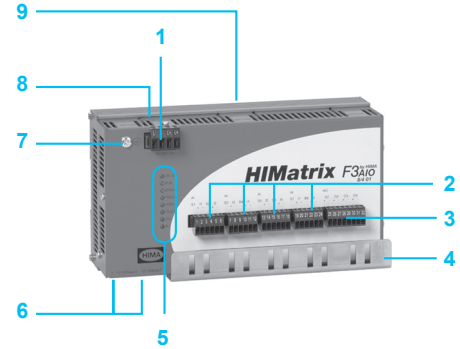
1 One terminal block *(1)* for ⎓ 24 V supply.
2 Three terminal blocks for connection of digital output channels.
3 One terminal block *(1)* for connection of line control outputs.
4 Four terminal blocks *(1)* for connection of digital inputs, with input status LED (four LEDs per terminal block).
5 Sixteen digital output status LEDs.
6 Eight process status LEDs.
7 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
8 One ground connection screw.
9 One “Reset” button (on the top).
10 **On the rear face:** One spring operated mounting device for mounting on 35 mm ⊥⌐ rail.



Remote mixed I/O module XPSMF3DIO20802

On the front cover of the metal enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 Two terminal blocks *(1)* for connection of digital outputs, with output status LED (four LEDs per terminal block)
3 Five terminal blocks *(1)* for connection of digital inputs, with input status LED (four LEDs per terminal block).
4 Eight process status LEDs.
5 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
6 One ground connection screw.
7 One “Reset” button (on the top).
8 **On the rear face:** One spring operated mounting device for mounting on 35 mm ⊥⌐ rail.



Remote mixed I/O module XPSMF3AIO8401

On the front cover of the metal enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 Four terminal blocks *(1)* for connection of analog inputs.
3 One terminal block *(1)* for connection of analog outputs.
4 One metal plate for securing shielded analog input/output connection cables (EMC).
5 Eight process status LEDs.
6 TwTwo RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
7 One ground connection screw.
8 One “Reset” button (on the top).
9 **On the rear face**: one spring operated mounting device for mounting on 35 mm ⊥⌐ rail.

*(1) Removable screw terminals are provided with the safety remote mixed I/O modules **XPSMF3DIO/AIO**.*

2

Status LED details

Safety remote mixed I/O modules XPSMF3●IO●●●●●

LED	Color	Status	Meaning
24 VDC	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/ software tests carried out.
		Flashing	The CPU is in STOP and is not executing any user application. All the outputs are reset to a safe, de-energized state.
		Off	The CPU is in “ERROR” state (see ERROR).
ERROR	Red	On	Software error or hardware anomaly detected by the CPU.
			The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the PC.
		Off	No errors detected.
PROG	Orange	On	The CPU is being loaded with a new configuration.
		Flashing	The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
FORCE	Orange	On	The CPU is in RUN mode and force is active.
		Flashing	The system is not processing (STOP), but force is prepared and is activated if the dual processor is started.
		Off	Force mode not activated.
FAULT	Orange	On	Error display for line control.
			The user application has caused an error.
			The system configuration is defective.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred while writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
OSL	Orange	Flashing	Emergency loading of the operating system is active.
BL	Orange	Flashing	COM in INIT_Fail state.
RJ45	Green	On	Full duplex mode operation.
		Flashing	Signal collision.
		Off	Half duplex mode operation, no collision.
	Yellow	On	Connection established.
		Flashing	Interface active.

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Characteristics

Safety remote mixed I/O module type			XPSMF3DIO8801	XPSMF3DIO16801	XPSMF3DIO20802	XPSMF3AIO8401
Supply voltage		**V**	⎓ 24 (external supply with separate protection conforming toEN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)			
Voltage limits		**V**	- 15…+ 20%			
Ambient air temperature	For operation	**°F (°C)**	+ 32… + 140 (0…+ 60)			
	For storage	**°F (°C)**	- 40…+ 185 (- 40…+ 85)	- 40…+ 185 (- 40… + 85) without battery	- 40…+ 185 (- 40…+ 85)	
Degree of protection			IP 20			
Response time		**ms**	Depending on size of application			
Maximum current power consumption		**A**	8	14 (max. load) Residual: 0.6	8 (max. load) Residual: 0.4	0.8
External fuse			10 A, slow blow	16 A, slow blow	–	–
Backup battery			None	–	None	None
Connections			See page 2/26 for wire sizes of the various connector types.			

Digital inputs

Safety remote mixed I/O module type			XPSMF3DIO8801	XPSMF3DIO16801	XPSMF3DIO20802
Number	Inputs not electrically isolated		8	16	20
Voltage	At state 1	**V**	⎓ 15…30		
		mA	> 2 at ⎓ 15 V		⩾ 2 at ⎓ 15 V
	At state 0	**V**	⎓ 5 max.		
		mA	1.5 max. 1.25 at ⎓ 5 V	1.5 max. 1 at ⎓ 5 V	1.5 max. 1.25 at ⎓ 5 V
Switching voltage		**V**	7.5	7.5	7.5
Switching time		**µs**	–	250	–
Supply		**V**	2 x 20 V/100 mA at 24 V, protected against short-circuits	4 x 20 V/40 mA at 24 V, protected against short-circuits, buffered for 20 ms. 20 V/2 A total at 22 V, protected against short-circuits, not buffered Max. current 2 A at 140 °F (60 °C)	5 x 20 V/100 mA at 24 V, protected against short-circuits
LED display			Yes		

Digital outputs

Safety remote mixed I/O module type			XPSMF3DIO8801	XPSMF3DIO16801	XPSMF3DIO20802
Number	Outputs not electrically isolated		8 DO+ (reference pole L-) 2 DO- (reference pole S+)	8 x 2-pole or 16 x single-pole	8
Output voltage		**V**	⎓ 24 ± 2	⎓ 24 ± 3	⎓ 24 ± 2
Output current	Channels 1 to 3 and 5 to 7	**A**	DO+: 0.5 at 140 °F (60 °C)	2 max. at 104 °F (40 °C) 1 max. at 140 °F (60 °C) 10 mA min.	0.5 at 140 °F (60 °C)
	Channels 4 and 8	**A**	DO+: 1 at 140 °F (60 °C), 2 at 104 °F (40 °C)		1 at 140 °F (60 °C), 2 at 50 °C
	Channels 1 and 2	**A**	DO-: 1 at 140 °F (60 °C)	–	–
Lamp load	Channels 1 to 3 and 5 to 7	**W**	DO+: 10	25 max.	–
	Channels 4 and 8		DO+: 25		
	Channels 1 and 2		DO-: 25		
Inductive load	Channels 1 to 3 and 5 to 7		DO+: 500	500 mH max.	–
	Channels 4 and 8		DO+: 500		
	Channels 1 and 2		DO-: 500		
Line break		**kΩ**	–	> 5	–
Short-circuit threshold		Ω	–	< 10	–
Minimum load		**mA**	2 per channel		
Leakage current at state 0		**mA**	1 max. at 2 V		
Response to overload			Shutdown of outputs concerned with cyclic reconnection		
Total output current		**A**	7 max.	9 max. (14 A for 2 ms)	7 max.
			Shutdown of all outputs if exceeded with cyclic reconnection		
LED display			Yes		

2

Characteristics *(continued)*

Line control outputs

Module type			XPSMF3DIO8801	XPSMF3DIO16801
Number	Outputs not electrically isolated		2	2
Output voltage		**V**	20, depending on the supply voltage	
Output current		**mA**	60	
Minimum load			None	
Response to overload			4 x ≥ 19.2 V/60 mA (on 24 V), short-circuit current	
LED display			Yes	

Analog inputs

Safety remote mixed I/O module type			XPSMF3AIO8401
Number	Inputs not electrically isolated		8, single-pole
External jumper		Ω	250 or 500 depending on application
Input values	Nominal value	**V**	⎓ 0…10
		mA	0…20, with 500 Ω jumper
	Service value	**V**	⎓ 0.1…11.5
		mA	0/4…23, with 500 Ω jumper
Input impedance		**MΩ**	2
Maximum distance of equipment			984 ft (300 m)
Internal resistance of signal source		Ω	≤ 500
Overvoltage protection		**V**	+ 15, - 4
Resolution			12-bit
Safety accuracy			± 2%
LED display			No

Analog outputs

Safety remote mixed I/O module type			XPSMF3AIO8401
Number	Outputs not electrically isolated		4 non safety outputs with breaking of safety common
Signal	Nominal range	**mA**	4…20
	Usable range	**mA**	0…20
Load impedance		Ω	600 max.
Maximum distance of equipment			984 ft (300 m)
Resolution			12-bit
Relative error			± 1%
LED display			No

Communication

Ethernet network: safety communication using SafeEthernet protocol

Safety remote mixed I/O module type			XPSMF3DIO8801	XPSMF3DIO16801	XPSMF3DIO20802	XPSMF3AIO8401
Transmission	Communication ports		Integrated 2 RJ45 switched Ethernet communications ports			
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation			
Structure			10BASE-T/100BASE-TX			
Medium			Dual twisted pair cable, category 5D or better (Ethernet)			

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XPSMF3DIO8801



XPSMF3DIO16801



XPSMF3DIO20802



XPSMF3AIO8401

*Products referenced **XPSMF3●●●●●●** are marked **HIMatrix® F3...** (manufactured by Hima, sold by Schneider Electric).*

References

Safety remote mixed I/O modules (⎓ 24 V supply)

For use with	Inputs		Outputs			Ports	Reference	Weight oz (kg)
	Digital	Analog	Digital	Line control	Analog			
Safety PLCs, modular XPSMF60 or compact XPSMF40 and XPSMF31/30/35	8	–	8 DO+ 2 DO-	2	–	Integrated 2 RJ45 switched Ethernet communications ports	**XPSMF3DIO8801**	35.274 (1.000)
	16	–	8 x 2 or 16 x 1	2	–	Integrated 2 RJ45 switched Ethernet communications ports	**XPSMF3DIO16801**	45.856 (1.300)
	20	–	8 *(1)*	–	–	Integrated 2 RJ45 switched Ethernet communications ports	**XPSMF3DIO20802**	35.273 (1.000)
	–	8	–	–	4	Integrated 2 RJ45 switched Ethernet communications ports	**XPSMF3AIO8401**	33.510 (0.950)

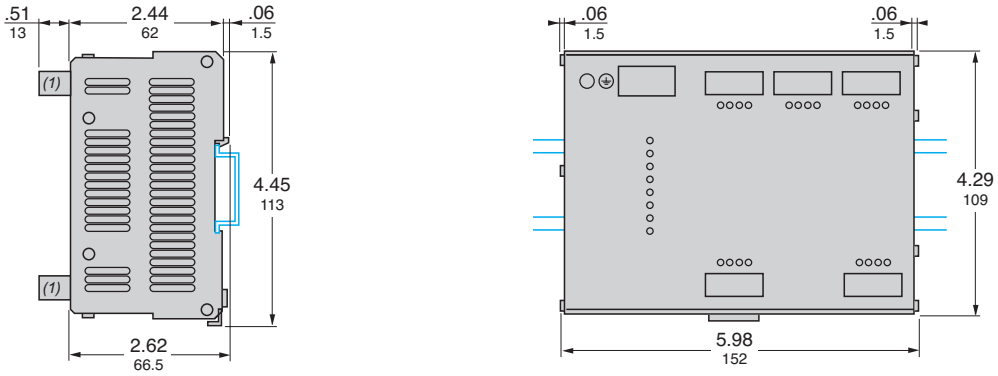
Connecting cables

Description	For	Reference	Weight oz (kg)
Ethernet network connecting cables	Connection between safety remote mixed I/O modules and modular or compact safety PLCs XPSMF. RJ45 connector fitted at each end	See page 2/29	–

(1) Configurable for line control.

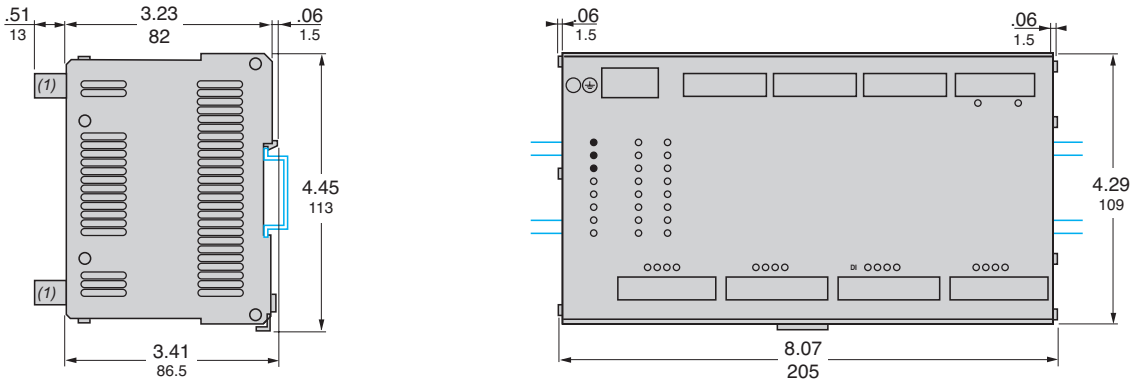
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XPSMF3DIO8801



*(1) Removable screw terminals are provided with the safety remote mixed I/O modules **XPSMF3DIO8801**.*

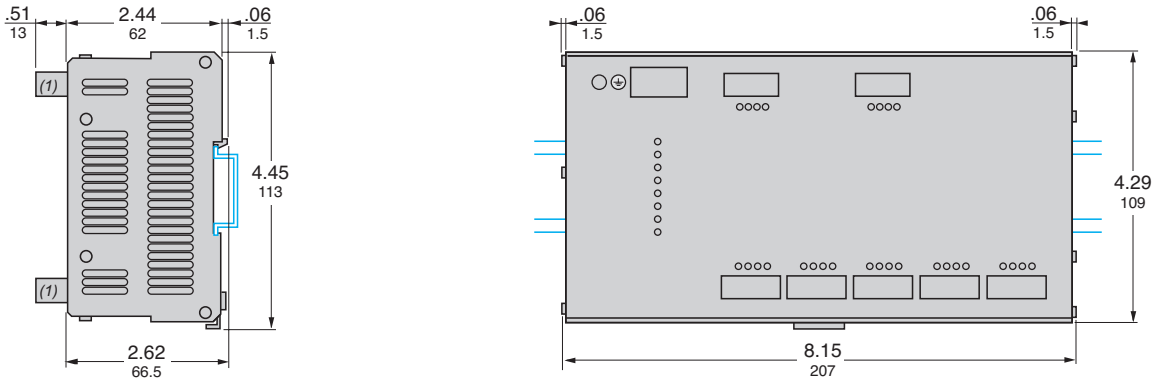
XPSMF3DIO16801



*(1) Removable screw terminals are provided with the safety remote mixed I/O modules **XPSMF3DIO16801**.*

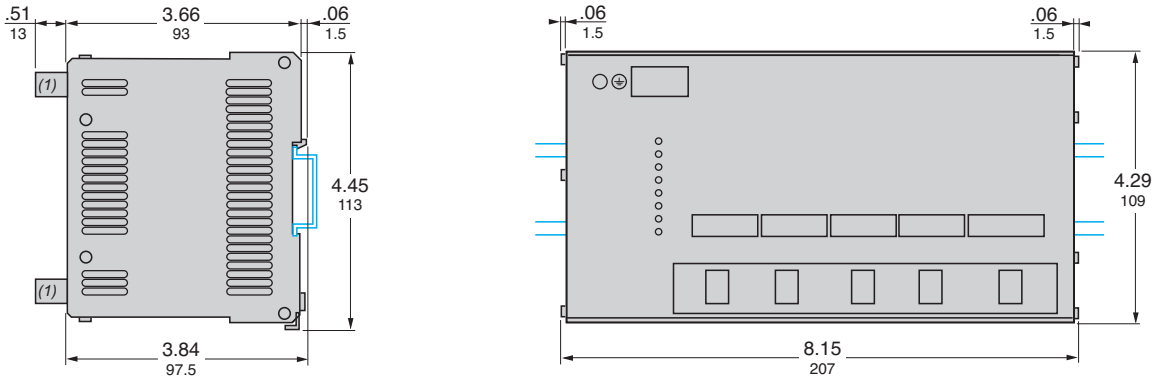
Dual Dimensions: INCHES Millimieters

XPSMF3DIO20802



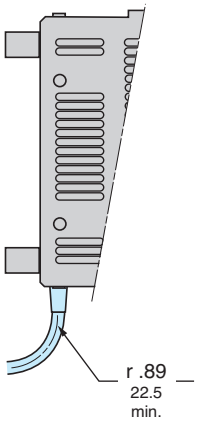
*(1) Removable screw terminals are provided with the safety remote mixed I/O modules **XPSMF3DIO20802**.*

XPSMF3AIO8401



*(1) Removable screw terminals are provided with the safety remote mixed I/O modules **XPSMF3AIO8401**.*

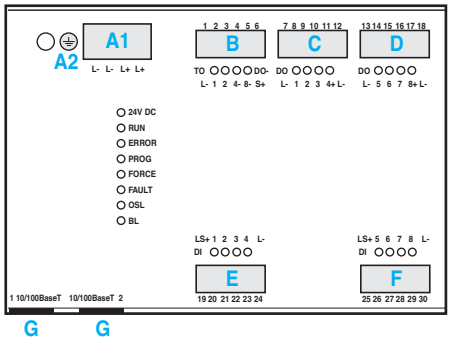
RJ45 connector for access to Ethernet network (SafeEthernet protocol)



Dual Dimensions: INCHES Millimieters

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote mixed I/O modules XPSMF3

XPSMF3DIO8801



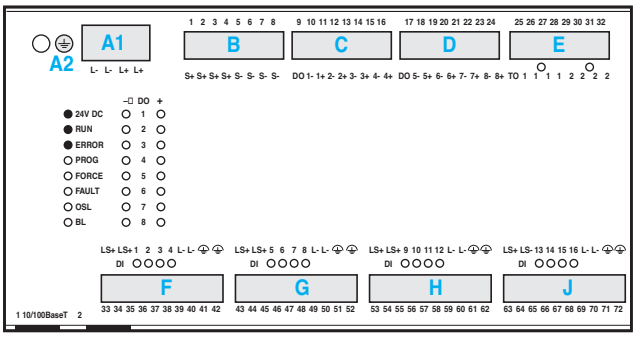
Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L-	⎓ 24 V (reference pole)
		–	L-	⎓ 24 V (reference pole)
		–	L+	⎓ 24 V
		–	L+	⎓ 24 V
A2	**Ground**	–	⏚	Ground
B	**Outputs - Line control/ Digital**	1	L-	Reference pole
		2	1	Line control output 1
		3	2	Line control output 2
		4	4-	Digital output 4- (for increased load)
		5	8-	Digital output 8- (for increased load)
		6	S+	Reference pole
C	**Outputs - Digital**	7	L-	Reference pole
		8	1	Digital output 1
		9	2	Digital output 2
		10	3	Digital output 3
		11	4+	Digital output 4+ (for increased load)
		12	L-	Reference pole
D	**Outputs - Digital**	13	L-	Reference pole
		14	5	Digital output 5
		15	6	Digital output 6
		16	7	Digital output 7
		17	8+	Digital output 8+ (for increased load)
		18	L-	Reference pole
E	**Inputs - Digital**	19	LS+	Sensor supply for inputs 1 to 4
		20	1	Digital input 1
		21	2	Digital input 2
		22	3	Digital input 3
		23	4	Digital input 4
		24	L-	Reference pole
F	**Inputs - Digital**	25	LS+	Sensor supply for inputs 5 to 8
		26	5	Digital input 5
		27	6	Digital input 6
		28	7	Digital input 7
		29	8	Digital input 8
		30	L-	Reference pole

Item	Connection		Function
G	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote mixed I/O modules XPSMF3

Connections

XPSMF3DIO16801



Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Ground**	–	⏚	Ground
B	**Supply of single-pole digital outputs**	1	S+	–
		2	S+	–
		3	S+	–
		4	S+	–
		5	S-	–
		6	S-	–
		7	S-	–
		8	S-	–
C	**Outputs - Digital**	9	1-	Output 1
		10	1+	Output 1
		11	2-	Output 2
		12	2+	Output 2
		13	3-	Output 3
		14	3+	Output 3
		15	4-	Output 4
		16	4+	Output 4
D	**Outputs - Digital**	17	5-	Output 5
		18	5+	Output 5
		19	6-	Output 6
		20	6+	Output 6
		21	7-	Output 7
		22	7+	Output 7
		23	8-	Output 8
		24	8-	Output 8
E	**Outputs - Line control**	25	1	Output 1
		26	1	Output 1
		27	1	Output 1
		28	1	Output 1
		29	2	Output 2
		30	2	Output 2
		31	2	Output 2
		32	2	Output 2

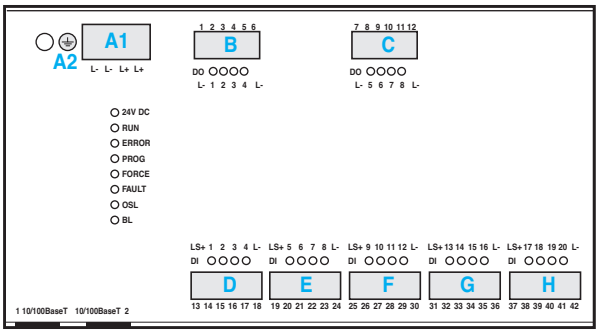
Item (cont.)	Connection	Screw N°	Screw	Function
F	**Inputs - Digital**	33	LS+	Sensor supply for inputs 1 to 4 (not protected)
		34	LS+	Sensor supply for inputs 1 to 4 (protected)
		35	1	Input 1
		36	2	Input 2
		37	3	Input 3
		38	4	Input 4
		39	L-	⎓ 24 V (reference pole)
		40	L-	⎓ 24 V (reference pole)
		41	PA	Electrically clean ground
		42	PA	Electrically clean ground
G	**Inputs - Digital**	43	LS+	Sensor supply for inputs 5 to 8 (not protected)
		44	LS+	Sensor supply for inputs 5 to 8 (protected)
		45	5	Input 5
		46	6	Input 6
		47	7	Input 7
		48	8	Input 8
		49	L-	⎓ 24 V (reference pole)
		50	L-	⎓ 24 V (reference pole)
		51	PA	Electrically clean ground
		52	PA	Electrically clean ground
H	**Inputs - Digital**	53	LS+	Sensor supply for inputs 9 to 12 (not protected)
		54	LS+	Sensor supply for inputs 9 to 12 (protected)
		55	9	Input 9
		56	10	Input 10
		57	11	Input 11
		58	12	Input 12
		59	L-	⎓ 24 V (reference pole)
		60	L-	⎓ 24 V (reference pole)
		61	PA	Electrically clean ground
		62	PA	Electrically clean ground
J	**Inputs - Digital**	63	LS+	Sensor supply for inputs 13 to 16 (not protected)
		64	LS+	Sensor supply for inputs 13 to 16 (protected)
		65	5	Input 13
		66	6	Input 14
		67	7	Input 15
		68	8	Input 16
		69	L-	⎓ 24 V (reference pole)
		70	L-	⎓ 24 V (reference pole)
		71	PA	Electrically clean ground
		72	PA	Electrically clean ground

Item	Connection		Function
K	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

Safety automation system solutions
Preventa™ safety PLCs
Compact and modular
Safety remote mixed I/O modules XPSMF3

Connections

XPSMFDIO20802



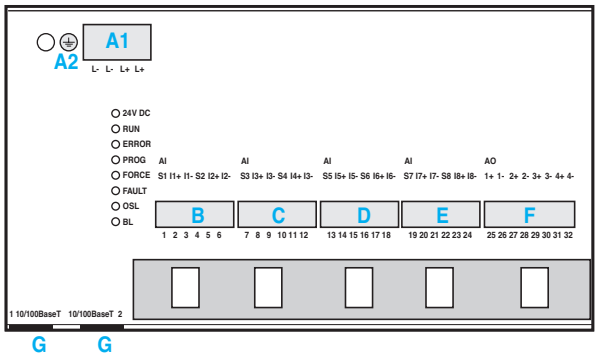
Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Ground**		⏚	Ground
B	**Outputs - Digital**	1	L-	Outputs common
		2	1	Output 1
		3	2	Output 2
		4	3	Output 3
		5	4	Output 4 (for increased load)
		6	L-	Outputs common
C	**Outputs - Digital**	7	L-	Outputs common
		8	5	Output 5
		9	6	Output 6
		10	7	Output 7
		11	8	Output 8 (for increased load)
		12	L-	Outputs common
D	**Inputs - Digital**	13	LS+	Sensor supply for inputs 1 to 4
		14	1	Digital input 1
		15	2	Digital input 2
		16	3	Digital input 3
		17	4	Digital input 4
		18	L-	Inputs common
E	**Inputs - Digital**	19	LS+	Sensor supply for inputs 5 to 8
		20	5	Digital input 5
		21	6	Digital input 6
		22	7	Digital input 7
		23	8	Digital input 8
		24	L-	Inputs common
F	**Inputs - Digital**	25	LS+	Sensor supply for inputs 9 to 12
		26	9	Digital input 9
		27	10	Digital input 10
		28	11	Digital input 11
		29	12	Digital input 12
		30	L-	Inputs common
G	**Inputs - Digital**	31	LS+	Sensor supply for inputs 13 to 16
		32	13	Digital input 13
		33	14	Digital input 14
		34	15	Digital input 15
		35	16	Digital input 16
		36	L-	Inputs common
H	**Inputs - Digital**	37	LS+	Sensor supply for inputs 17 to 20
		38	17	Digital input 17
		39	18	Digital input 18
		40	19	Digital input 19
		41	20	Digital input 20
		42	L-	Inputs common

Item	Connection		Function
J	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

Characteristics: page 2/95 | References: page 2/97 | Dimensions, mounting: page 2/98 | Connections: page 2/100 | Presentation: page 2/90

Connections

XPSMF3AIO8401

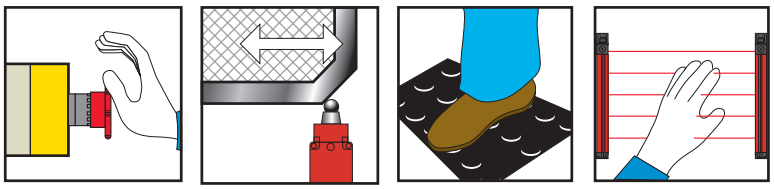


Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Ground**		⏚	Ground
B	**Inputs - Analog**	1	S1	Transmitter supply 1
		2	I1+	Input 1
		3	I1-	Reference pole
		4	S2	Transmitter supply 2
		5	I2+	Input 2
		6	I2-	Reference pole
C	**Inputs - Analog**	7	S3	Transmitter supply 3
		8	I3+	Input 3
		9	I3-	Reference pole
		10	S4	Transmitter supply 4
		11	I4+	Input 4
		12	I4-	Reference pole
D	**Inputs - Analog**	13	S5	Transmitter supply 5
		14	I5+	Input 5
		15	I5-	Reference pole
		16	S6	Transmitter supply 6
		17	I6+	Input 4
		18	I6-	Reference pole
E	**Inputs - Analog**	19	S7	Transmitter supply 7
		20	I7+	Input 7
		21	I7-	Reference pole
		22	S8	Transmitter supply 8
		23	I8+	Input 8
		24	I8-	Reference pole
F	**Outputs - Analog**	25	O1+	Output 1
		26	O1-	Output 1 reference pole
		27	O2+	Output 2
		28	O2-	Output 2 reference pole
		29	O3+	Output 3
		30	O3-	Output 3 reference pole
		31	O4+	Output 4
		32	O4-	Output 4 reference pole

Item	Connection		Function
G	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

Safety automation system solutions
Preventa™ safety controllers

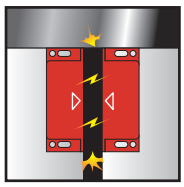
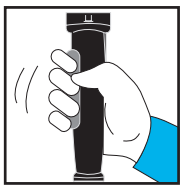
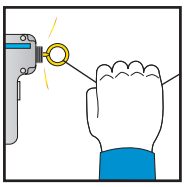
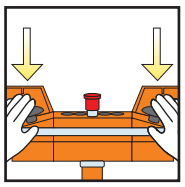
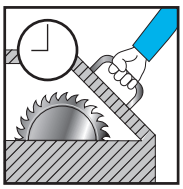
Applications



Modules	**Controllers for monitoring 2 independent safety functions simultaneously. User selection of 2 functions from a choice of 15. Programmable from front cover of controller.**



Functions		◻ Emergency stop monitoring ◻ Switch monitoring ◻ Enabling switch monitoring ◻ Sensing mat or edges monitoring ◻ Light curtain monitoring, relay output type ◻ etc.
Conformity to standards		EN 954-1 - category 4/ISO 13849-1, EN/IEC 60204-1, DIN V VDE 801 + A1, EN/IEC 60947-1 + A11, EN/IEC 60947-5-1
Product certifications		UL, CSA, BIA
Number of circuits		
	Safety	6 N.O. (3 N.O. per function)
	Additional	3 solid-state outputs for signalling to PLC
Display		12 LEDs
Supply voltage		⎓ 24 V
Communication	CANopen bus	–
	Profibus bus	–
	Modbus® network	–
Module type		**XPSMP**
Page		2/108

Configurable controllers using software, for several independent safety functions: selection of safety functions using configuration software running on Windows® (16 or 32 inputs and 8 independent safety outputs)



- Emergency stop monitoring
- Limit switch monitoring
- Two-hand control monitoring
- Light curtain monitoring, with or without “muting” function
- Enabling switch monitoring, coded magnetic switch monitoring
- Safety mat monitoring
- Hydraulic press solenoid valve monitoring
- Eccentric press safety stop at top dead center monitoring. Zero speed detection
- Hydraulic press monitoring
- Eccentric press monitoring
- Foot switch monitoring
- Chain shaft breakage monitoring
- Position selector

EN 954-1 - category 4/ISO 13849-1,
IEC 61508 - SIL 3,
EN/IEC 60204-1,
EN 1760-1/ISO 13856-1,
EN/IEC 60947-5-1,
EN/IEC 61496-1,
EN 574/ISO 13851,
EN 954-1/ISO 13849-1

UL, CSA, TÜV

4 N.O. (2 N.O. per function) + 6 solid-state

1 “muting” signalling output

LED display on front cover

⎓ 24 V

Via SUB-D 9-pin male connector, only on XPSMC16ZC and XPSMC32ZC

Via SUB-D 9-pin female connector, only on XPSMC16ZP and XPSMC32ZP

Via RJ45 connector, on all controllers XPSMC●●Z●

XPSMC

2/124

Safety automation system solutions

Preventa™ safety controllers type XPSMP

With pre-defined functions

Presentation

Operating principle

Preventa™ safety controller modules XPSMP are designed to conform with category 4 of the standard EN 954-1/ISO 13849-1.
They enable two independent safety functions (selected from a choice of 15 pre-defined configurations) to be performed using the same product. Configuration selection is easily made using 3 buttons on the front cover of the module.

These 15 pre-programmed safety functions provide a solution for the majority of safety applications up to level 4 conforming to the standard EN 954-1/ISO 13849-1, for example: monitoring Emergency stops, limit switches, safety mats and sensing edges, enabling switches, coded magnetic switches, type 4 relay output light curtains conforming to EN/IEC 61496-1 (for example, light curtains type XUS L. Safety controllers XPSMP incorporate 6 safety outputs (3 per function) and 3 solid-state signalling outputs for signalling to the process PLC.

To aid diagnostics, the modules have LEDs on the front cover which provide information on the monitoring circuit status. They also indicate and assist selection of the 2 required configurations.

	Configuration	Synchronization time	Type of start *(1)*		Start test	Notes
			Automatic or unmonitored	Monitored		
Functions disabled	**0**	–	–	–	–	Factory setting
Emergency stop monitoring, 1-channel wiring (category 2)	**1**	–	X	–	–	–
	2	–	–	X	–	–
Emergency stop monitoring, 2-channel wiring, or guard monitoring (category 4)	**3**	Unlimited	X	–	X	–
	4	Unlimited	–	X	X	–
	5	1.5 s	X	–	X	–
	6	1.5 s	–	X	X	–
	7	Unlimited	X	–	–	–
	8	Unlimited	–	X	–	–
Guard monitoring for injection press or blowing machine (category 4)	**9**	1.5 s	–	X	X	Uses both safety outputs *(2)*
Enabling grip switch monitoring (3 position switch) (category 4)	**10**	–	X	–	X	The start button acts as start-up preparation
Sensing mat and edges monitoring (category 3)	**11**	–	X	–	–	Mats with circuit making contacts
	12	–	–	X	–	
Relay output light curtain monitoring (category 4)	**13**	0.5 s	–	X	X	–
Non-contact safety interlock switch monitoring (category 4)	**14**	1.5 s	X	–	–	Magnetic switches with 2 contacts, 1 N.O. and 1 N.C.
	15	1.5 s	–	X	–	

(1) Automatic start: there is no start contact or it is jumpered.
Unmonitored start: the output is activated on closing of the start contact.
Monitored start: the start input is monitored so that there is no start-up in the event of the start contact being jumpered or the start circuit being closed for more than 10 seconds.
Start-up is triggered following activation of the start button (push-release function) on opening of the contact.
(2) Tool zone guard with 3rd switch.
Additional rear guard (optional) with automatic start. The opening of the guard cuts all outputs.

Safety automation system solutions
Preventa™ safety controllers type XPSMP
With pre-defined functions

Characteristics

Module type			XPSMP11123	XPSMP11123P
Conformity to standards			EN/IEC 60204-1, DIN V VDE 801 + A1, EN/IEC 60947-1 + A11, EN/IEC 60947-5-1	
Product certifications			UL, CSA, BIA	
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max.	
Supply		**V**	⎓ 24	
Voltage limits			- 20…+ 20%	
Power consumption		**W**	⩽ 5	
Module inputs fuse protection			Internal, electronic	
Start button monitoring			Yes/No (depending on configuration selected)	
Control unit voltage Between input terminals C1-I1, C2-I2, C3-I3, C4-I4, C5-I5 or C6-I6		**V**	24 (at nominal supply voltage)	
Calculation of wiring resistance RL between input terminals		Ω	100 max. Maximum cable length: 6561 ft (2000 m)	
Synchronization time between inputs		**s**	0.5, 1.5 or unlimited, depending on configuration selected	
Outputs	Voltage reference		Relay hard contacts	
	Number and type of safety circuits		3 N.O. per function (6 N.O. total) (13-14, 23-24, 33-34, 43-44, 53-54, 63-64)	
	Number and type of additional circuits		3 solid-state	
	Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13		24 V/1.5 A L/R = 50 ms	
	Breaking capacity of solid-state outputs		24 V/20 mA	
	Max. thermal current (Ithe) for each group of 3 outputs		3.3 A for all 3 outputs, or 6 A for 1 output and 2 A for the other 2 outputs, or 2 A for 1 output and 4 A for the other 2 outputs	
	Max. total thermal current	**A**	20	
	Output fuse protection		4 gG or 6 fast acting, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	
	Minimum current	**mA**	10	
	Minimum voltage	**V**	17	
Electrical life			See page 2/172	
Response time on input opening		**ms**	< 30	
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display			12	
Operating temperature		**°F (°C)**	+ 14…+ 131 (- 10…+ 55)	
Storage temperature		**°F (°C)**	- 13…+ 267.8 (- 25…+ 85)	
Degree of protection conforming to IEC 60529	Terminals		IP 20	
	Enclosure		IP 40	
Connections	Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection, without cable end		Solid or flexible cable: 26-14 AWG (0.14… 2.5 mm²)	Solid or flexible cable: 24-14 AWG (0.2… 2.5 mm²)
	1-wire connection, with cable end		Without bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)	
			With bezel, flexible cable: 24-16 AWG (0.25…1.5 mm²)	With bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)
	2-wire connection, without cable end		Solid or flexible cable: 26-20 AWG (0.14…0.75 mm²)	Solid cable: 24-18 AWG (0.2…1 mm²) Flexible cable: 24-18 AWG (0.2…1.5 mm²)
	2-wire connection, with cable end		Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)	
			Double, with bezel, flexible cable: 22-14 AWG (0.5…1.5 mm²)	

Safety automation system solutions

Preventa™ safety controllers type XPSMP

With pre-defined functions



XPSMP11123



XPSMP11123P

References

Description	Type of terminal block connection	Number of safety circuits	Additional outputs	Supply	Reference	Weight oz (kg)
Modules for 2 independent safety functions	Integrated in module	3 N.O. per function (6 N.O. total)	3 solid-state	⎓ 24 V	**XPSMP11123**	11.287 (0.320)
	Removable from module	3 N.O. per function (6 N.O. total)	3 solid-state	⎓ 24 V	**XPSMP11123P**	11.287 (0.320)

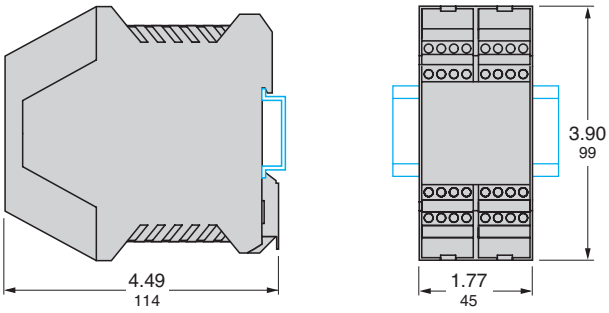
Safety automation system solutions

Preventa™ safety controllers type XPSMP

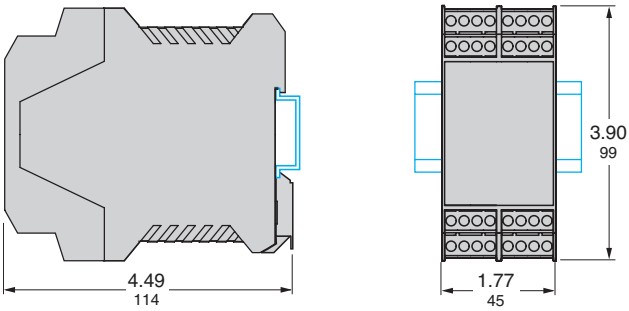
AM1 DP200 rail mounting

Dimensions

XPSMP●●●●

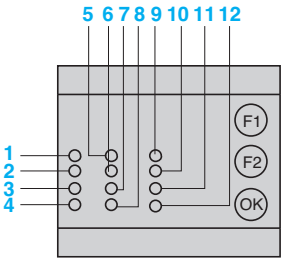


XPSMP●●●●P



Dual Dimensions: INCHES
Millimieters

LED details



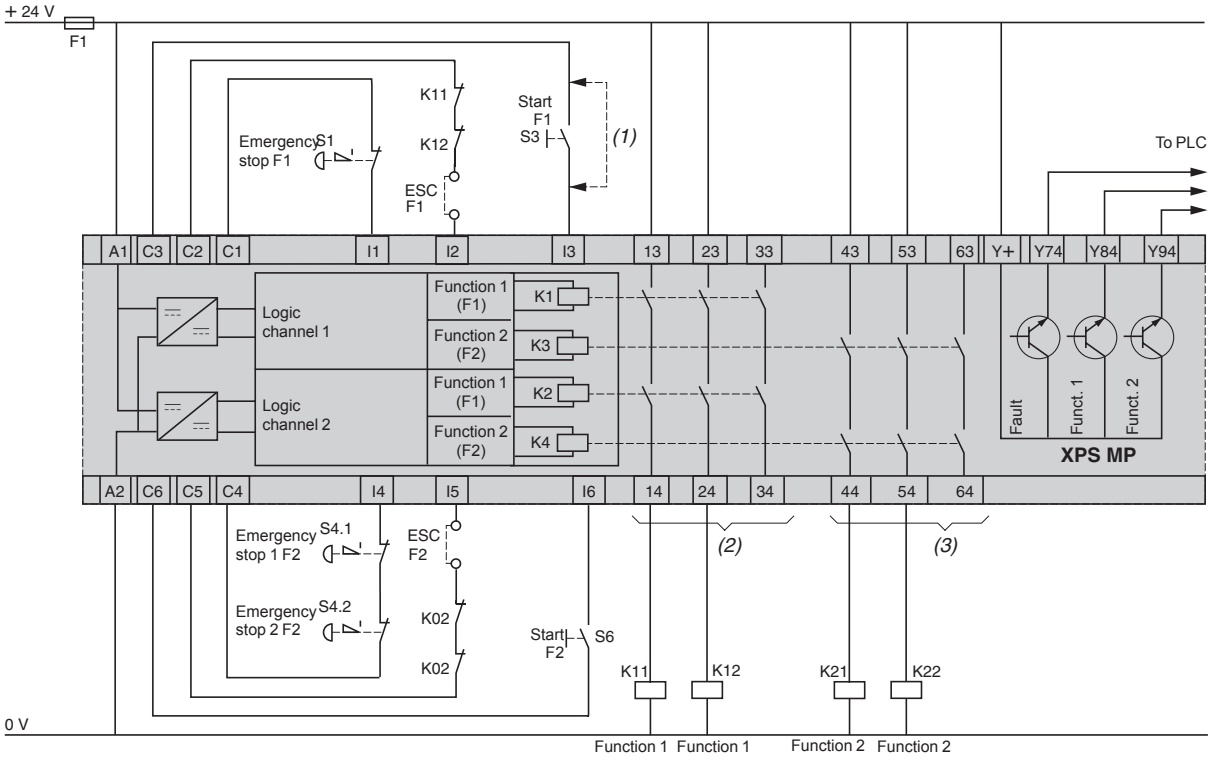
1-2-3	Function 1 configuration code.
4	K1/K2 status (function 1, N.O. safety outputs closed).
5-6-7	Function 2 configuration code.
8	K3/K4 status (function 2, N.O. safety outputs closed).
9	Supply voltage A1-A2.
10	Fault.
11	Function 1 configuration.
12	Function 2 configuration.
F1, F2, OK:	Configuration buttons.

2

XPSMP

Emergency stop monitoring, 1-channel wiring

Configuration 1 (1-channel Emergency stop, automatic or unmonitored start) = function 1.
Configuration 2 (1-channel Emergency stop, monitored start) = function 2.

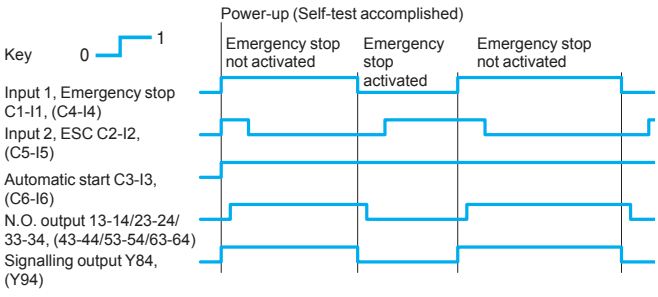


(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

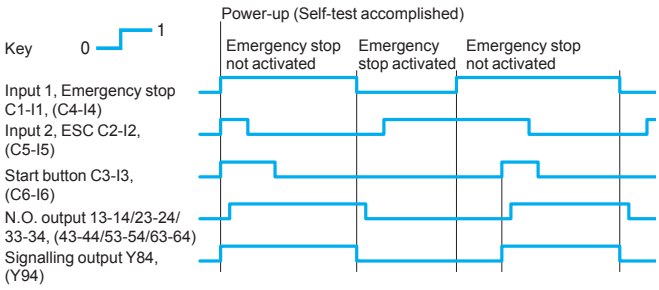
Configuration 1

Automatic start



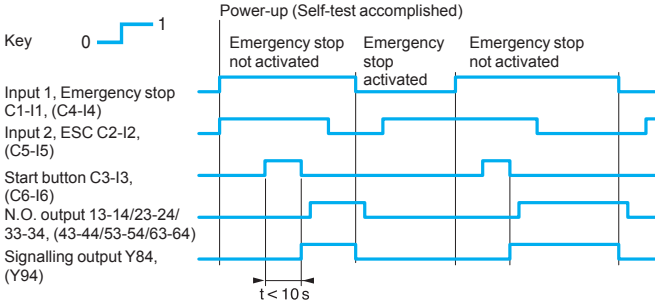
Configuration 1

Unmonitored start



Configuration 2

Monitored start

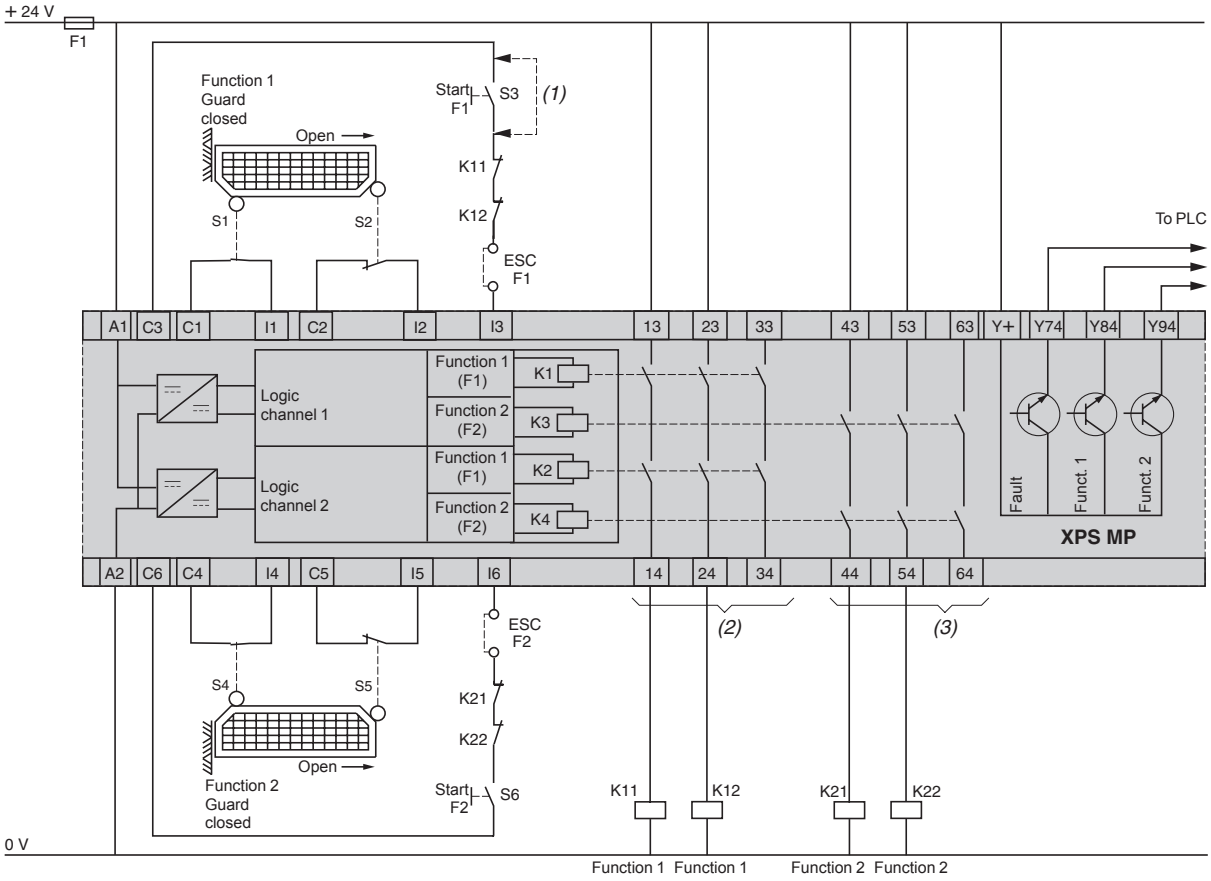


2

XPSMP

Guard monitoring with start test

Configuration 3 (locking of guard with start test, automatic or unmonitored start) = function 1.
Configuration 4 (locking of guard with start test, monitored start) = function 2.

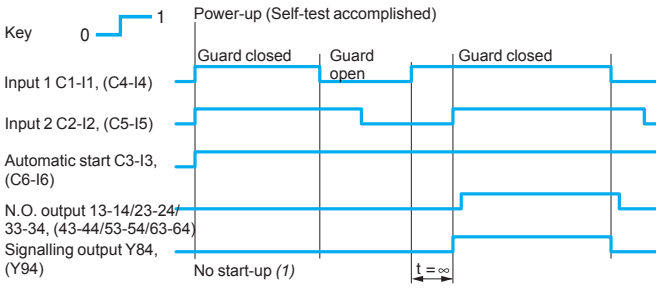


(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

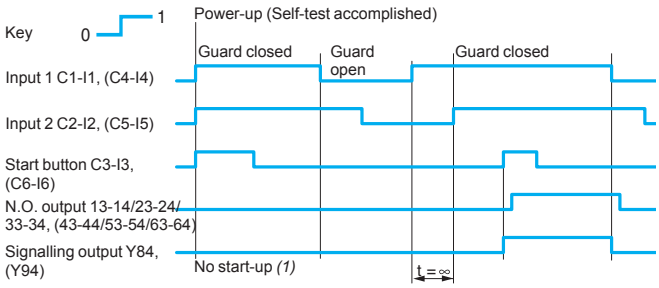
Configuration 3

Automatic start



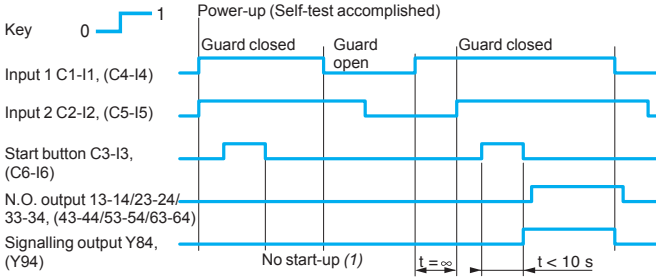
Configuration 3

Unmonitored start



Configuration 4

Monitored start



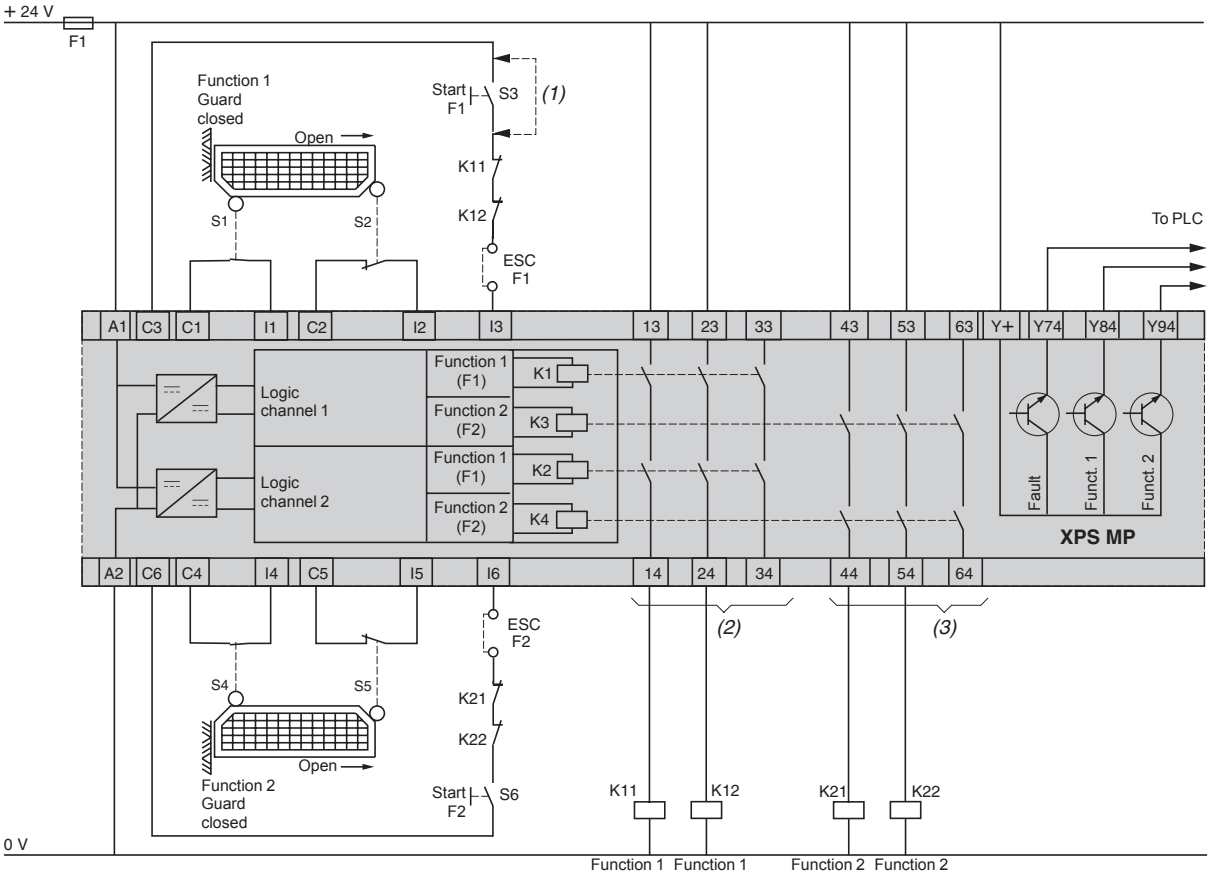
(1) Prevention of start-up necessary: to check the sensors connected, open and reclose the guard.

2

XPSMP

Guard monitoring with start test and synchronization time = 1.5 ms

Configuration 5 (locking of guard with start test, automatic or unmonitored start) = function 1.
Configuration 6 (locking of guard with start test, monitored start) = function 2.

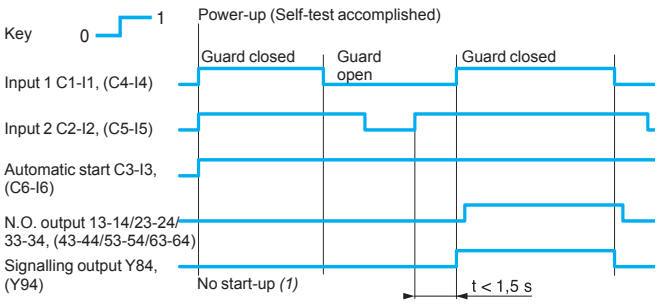


(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

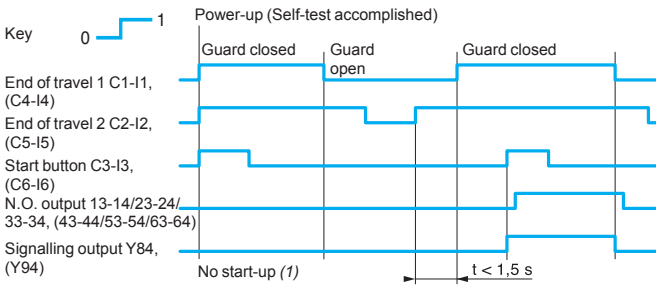
Configuration 5

Automatic start



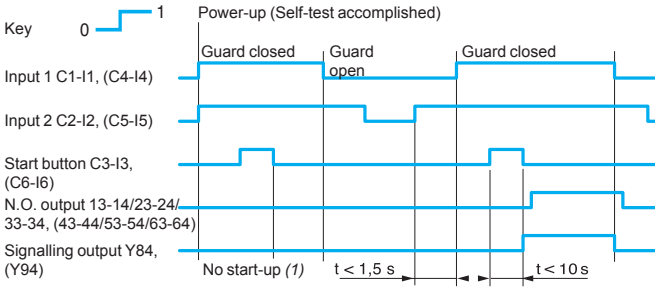
Configuration 5

Unmonitored start



Configuration 6

Monitored start



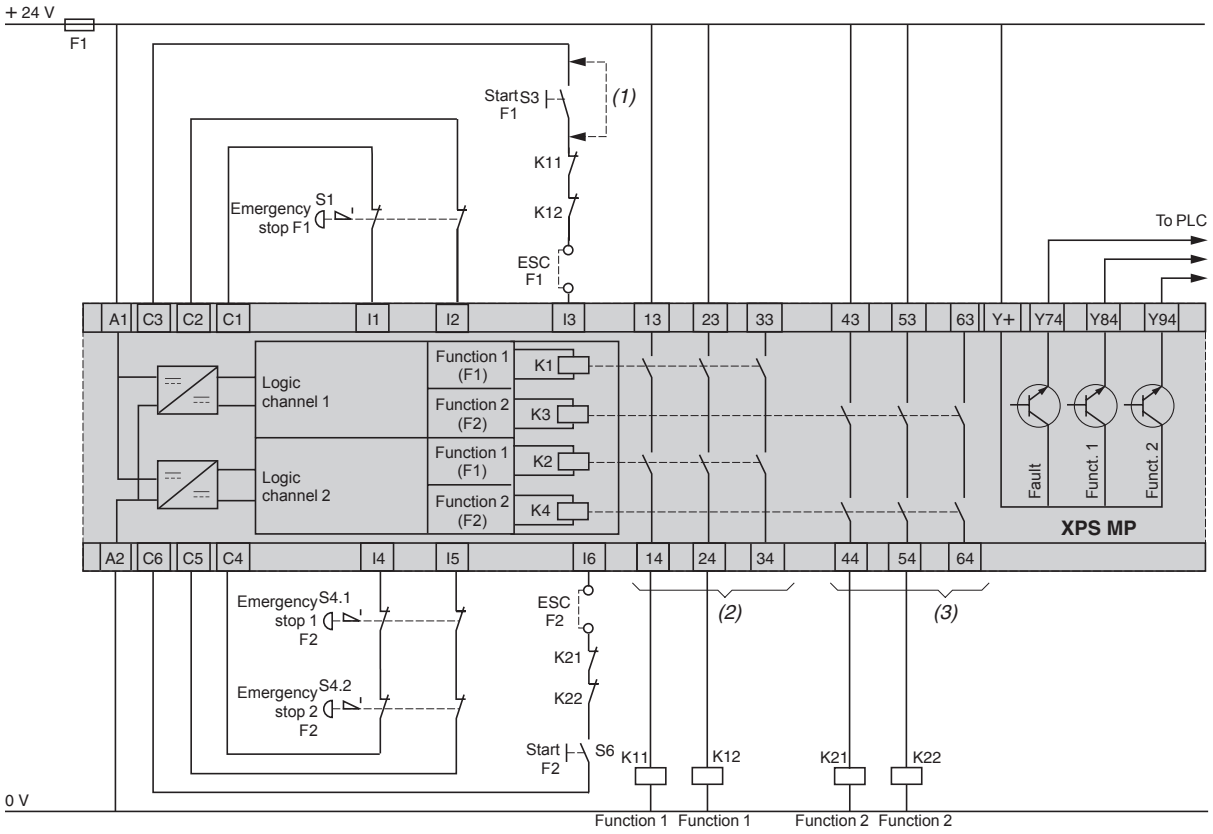
(1) Prevention of start-up necessary: to check the sensors connected, open and reclose the guard.

Presentation: page 2/106 | Characteristics: page 2/107 | References: page 2/108 | Dimensions: page 2/109 | Wiring Diagrams: page 2/110 to 2/117

XPSMP

Emergency stop monitoring, 2-channel wiring

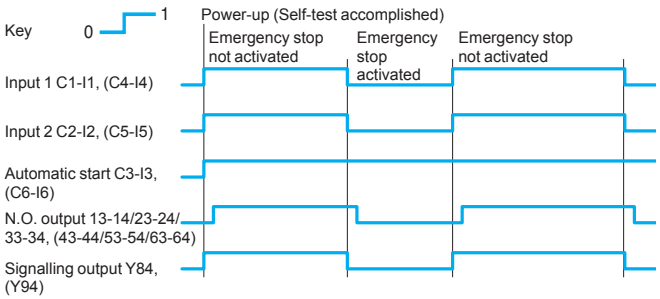
Configuration 7 (2-channel Emergency stop, automatic or unmonitored start) = function 1.
Configuration 8 (2-channel Emergency stop, monitored start) = function 2.



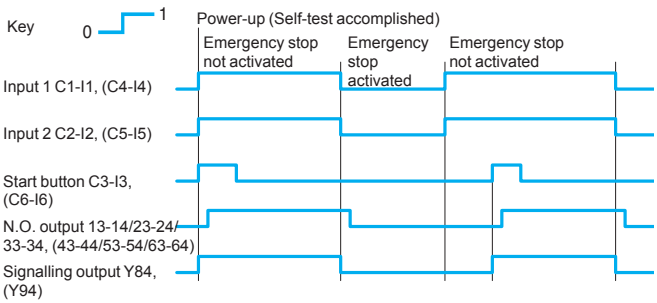
(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

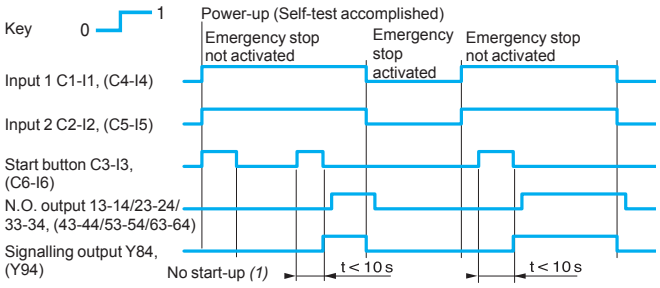
Configuration 7
Automatic start



Configuration 7
Unmonitored start



Configuration 8
Monitored start



(1) Start button control: the start button must not be activated on power-up.

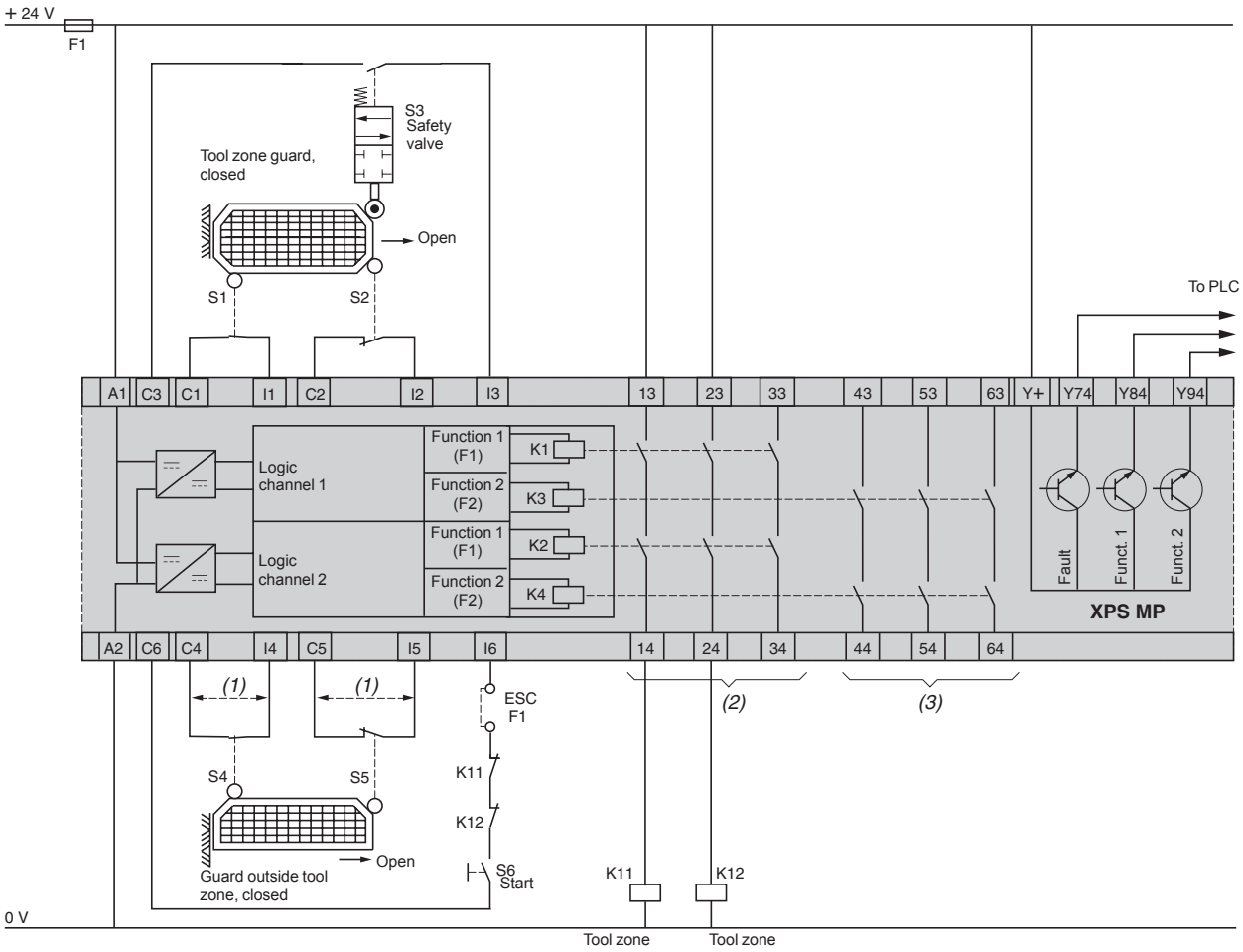
Presentation: page 2/106 | Characteristics: page 2/107 | References: page 2/108 | Dimensions: page 2/109 | Wiring Diagrams: page 2/110 to 2/117

2

XPSMP

Guard monitoring for injection press or blowing machine

Configuration 9 (this configuration uses both functions of the controller. Only function 1 is configured).



(1) If sensors S4 and S5 are not used, terminals C4-I4 and C5-I5 must be linked.

(2) Safety outputs for tool zone.

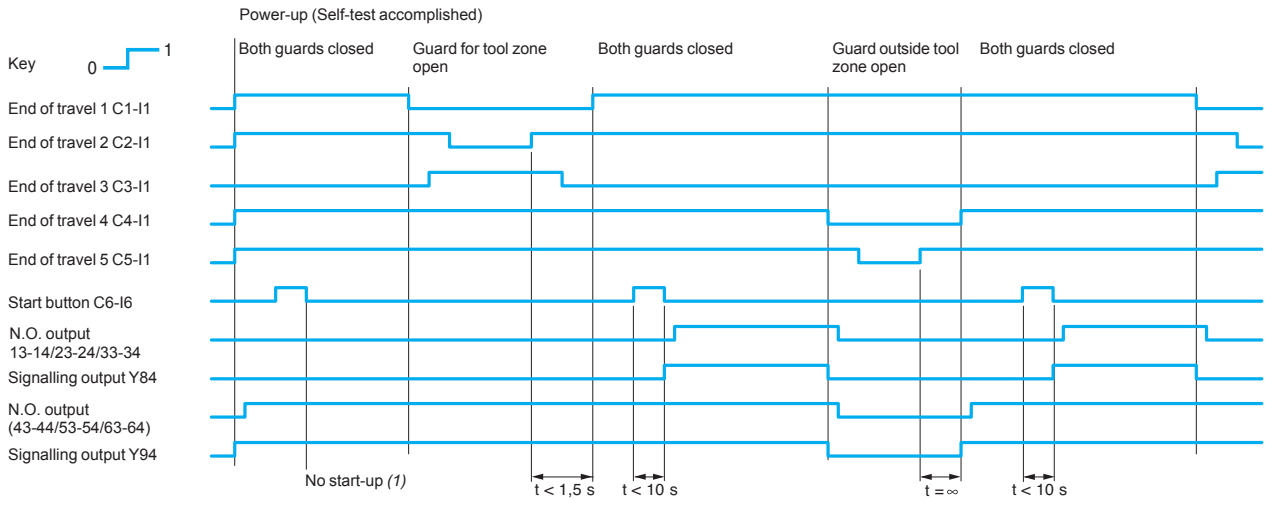
(3) Safety outputs for rear access safety doors.

In configuration mode 9, the N.C. contacts of the relays or contactors controlled via outputs 43-44, 53-54, 63-64 cannot be monitored by the feedback loop (ESC).

ESC = External start conditions.

Functional diagram

Configuration 9



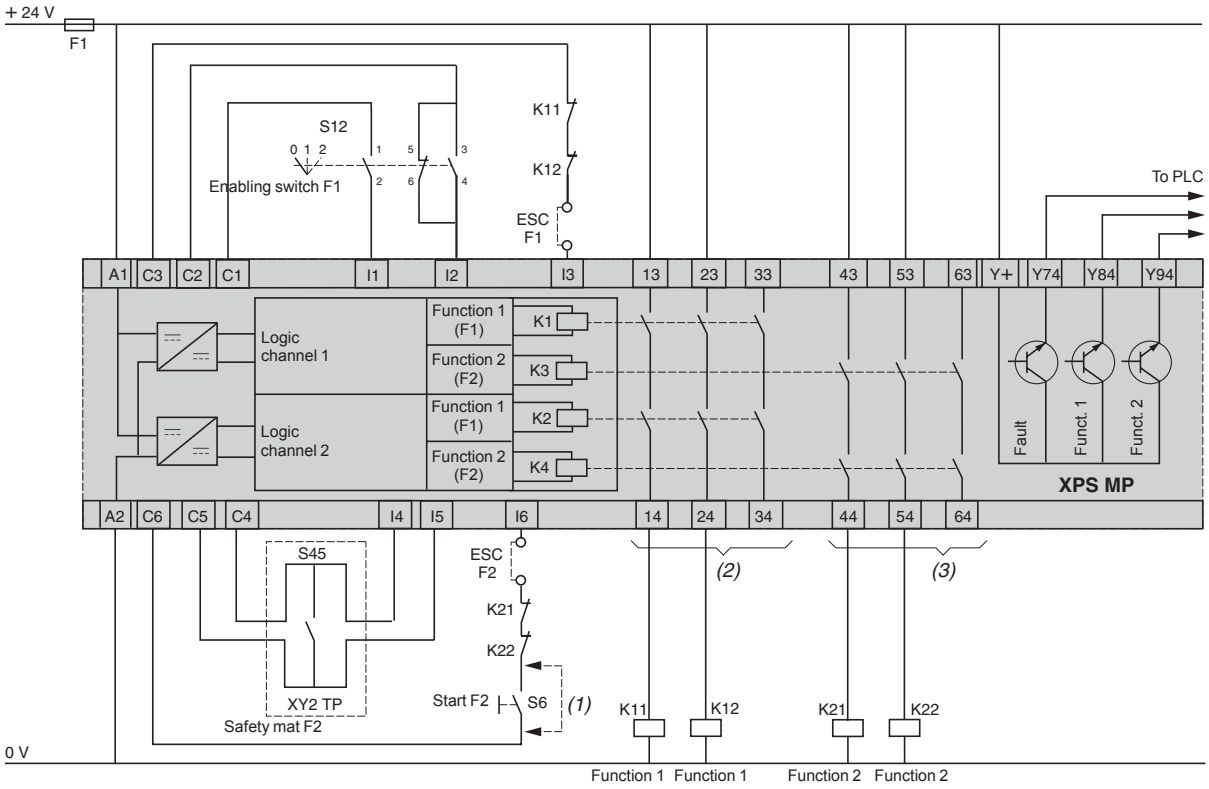
(1) Prevention of start-up necessary: to check the sensors connected, open and reclose the guard.

Presentation: page 2/106 | Characteristics: page 2/107 | References: page 2/108 | Dimensions: page 2/109 | Wiring Diagrams: page 2/110 to 2/117

XPSMP

Enabling switch monitoring, safety mat monitoring

Configuration 10 (enabling switch monitoring, with or without start-up preparation) = function 1.
Configuration 11 (safety mat monitoring, automatic or unmonitored start) = function 2.

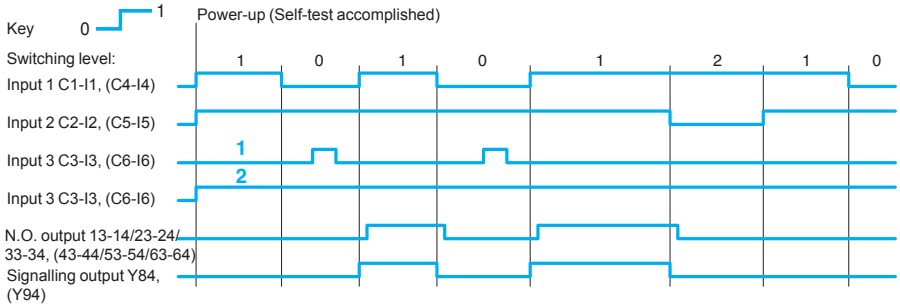


(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

Configuration 10

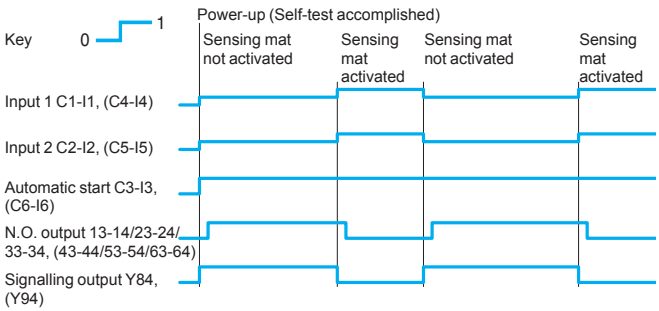
Enabling switch



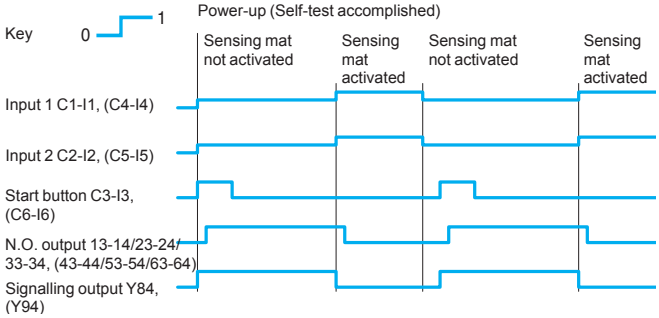
1 With start-up preparation.
2 Without start-up preparation.

Configuration 11

Safety mat with automatic start



Safety mat with unmonitored start

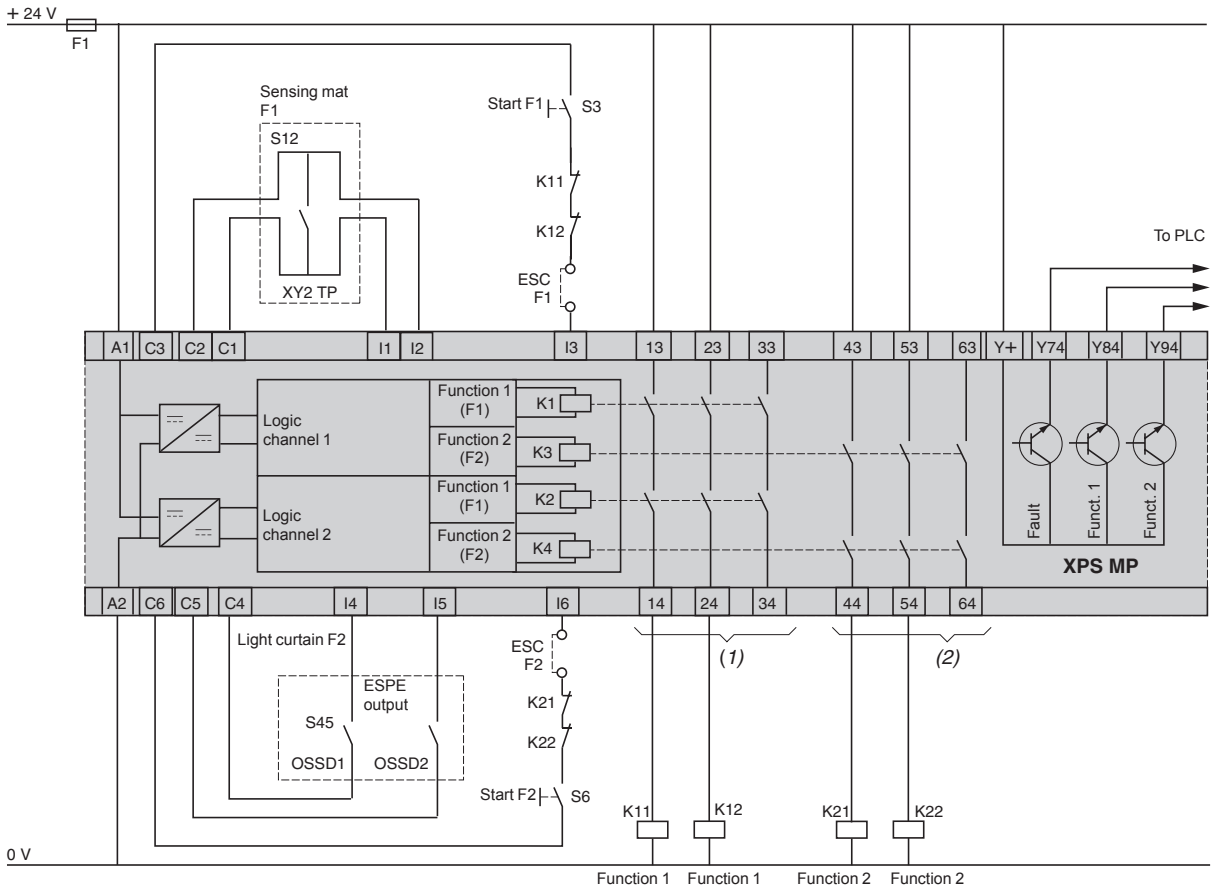


2

XPSMP

Safety mat monitoring, light curtain monitoring

Configuration 12 (sensing mat monitoring, monitored start) = function 1.
Configuration 13 (light curtain monitoring, monitored start; synchronization time = 0.5 s) = function 2.

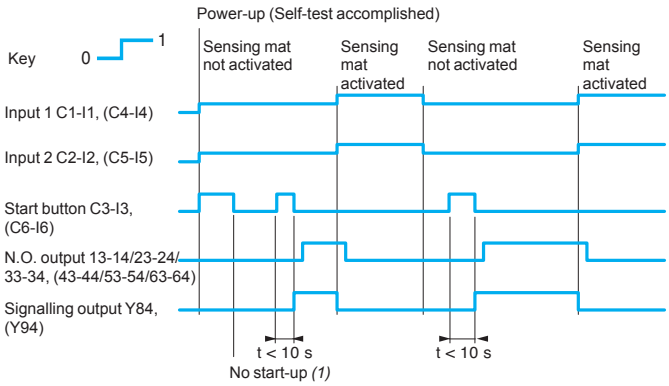


(1) Function 1 safety outputs.
(2) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

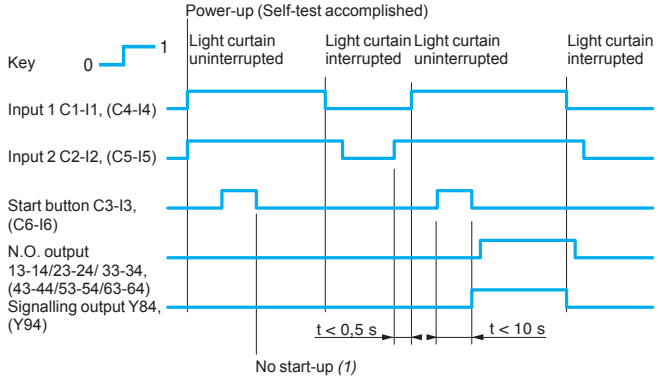
Configuration 12

Sensing mat with monitored start



Configuration 13

Light curtain with monitored start



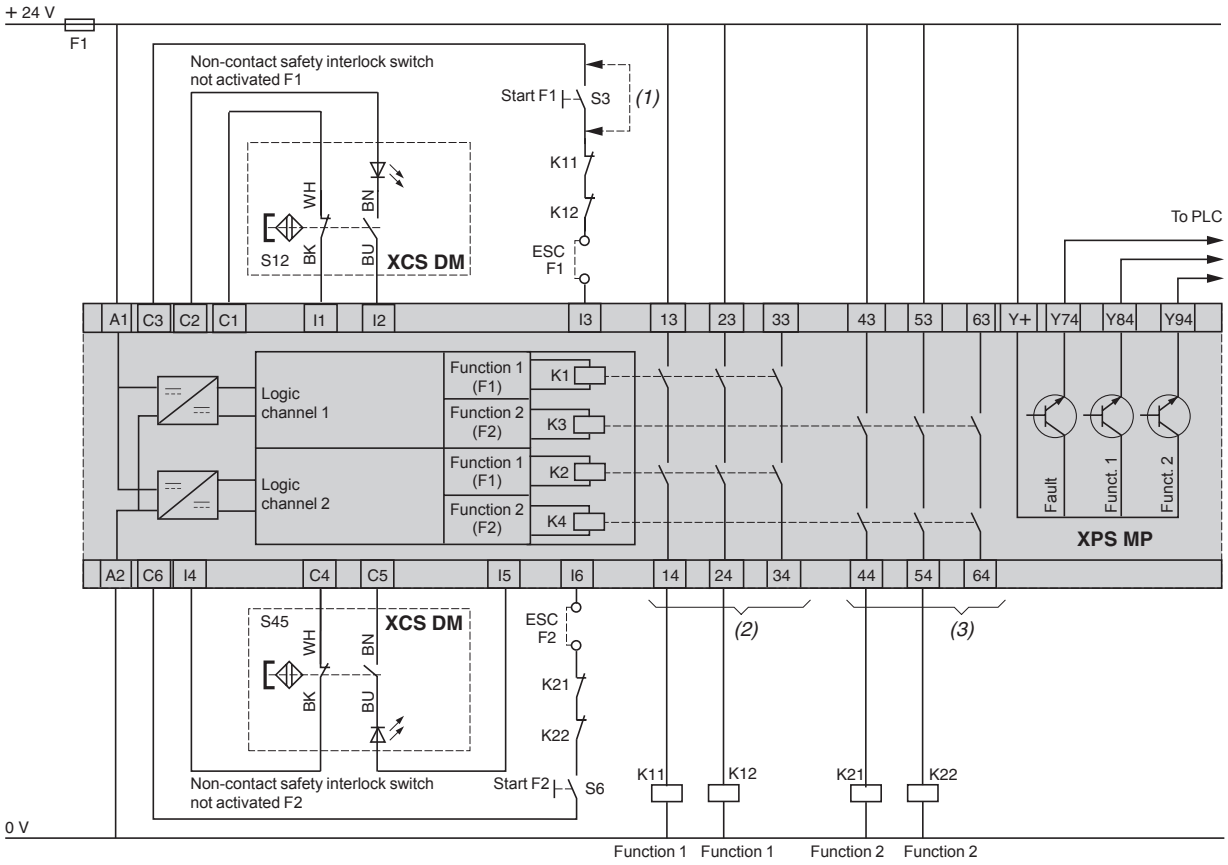
(1) Start button control: the start button must not be activated on power-up.

2

XPSMP

Non-contact safety interlock switch monitoring

Configuration 14 (automatic or unmonitored start, synchronization time = 1.5 s) = function 1.
Configuration 15 (monitored start, synchronization time = 1.5 s) = function 2.

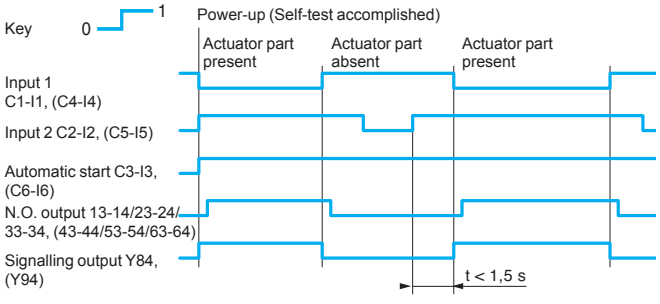


(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

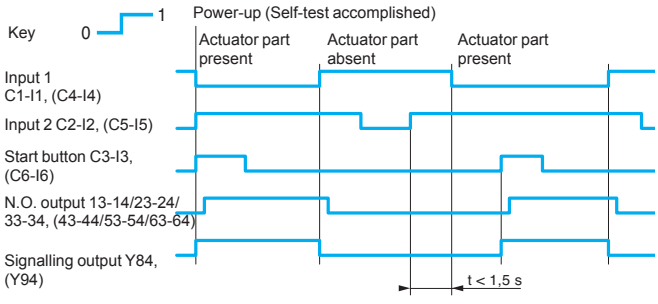
Configuration 14

Automatic start



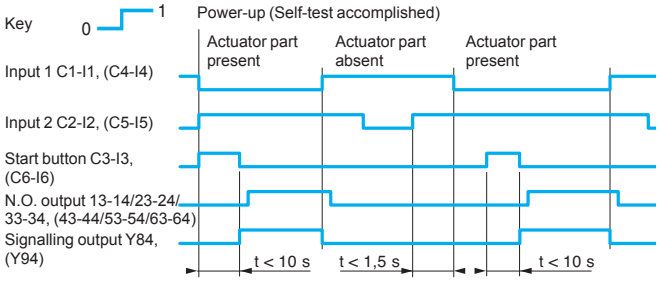
Configuration 14

Unmonitored start



Configuration 15

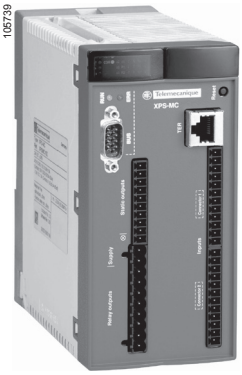
Monitored start



Safety automation system solutions

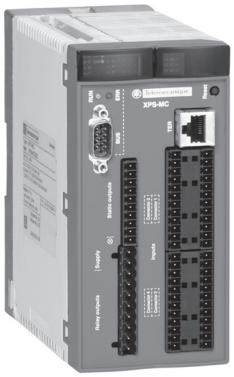
Preventa™ configurable safety controllers type XPSMC

105739



XPSMC16ZC

105545



XPSMC32ZC

Presentation

Configurable safety controllers XPSMC●●Z● are designed to provide a solution for safety applications requiring conformity to category 4 of standard EN 954-1/EN/ ISO 13849-1 and SIL 3 requirements of standard IEC 61508.
The range of configurable safety controllers consists of 6 products, each with different technical characteristics.

Configurable controllers	Safety inputs	Safety outputs *(1)*	Communication via		
			CANopen bus	Profibus bus	Modbus® serial link
XPSMC16Z	16	6 + 2 x 2	–	–	Yes, slave
XPSMC16ZC	16	6 + 2 x 2	Yes, slave	–	Yes, slave
XPSMC16ZP	16	6 + 2 x 2	–	Yes, slave	Yes, slave
XPSMC32Z	32	6 + 2 x 2	–	–	Yes, slave
XPSMC32ZC	32	6 + 2 x 2	Yes, slave	–	Yes, slave
XPSMC32ZP	32	6 + 2 x 2	–	Yes, slave	Yes, slave

Line control

The safety inputs are supplied by the various control outputs *(2)*, in such a manner so as to monitor for short-circuits between the inputs, short-circuits between each input and ground or the presence of residual voltages.
The controller, assisted by the control outputs, continuously tests all the connected inputs. As soon as an error is detected on an input, all the outputs associated with this input are disconnected. Safety outputs associated with other inputs remain active.

Configuration

Safety controllers XPSMC●●Z● are configurable and addressable using software XPSMCWIN running on a PC. Connection accessories required: see page 2/79.

Connections

For connection of safety inputs and outputs, safety controllers XPSMC●●Z● can be fitted with a choice of:
□ screw connectors type XPSMCTS●●, or
□ spring clip connectors type XPSMCTC●●.
These connectors are to be ordered separately, see page 2/124.

(1) 8 independent safety outputs = 6 solid-state safety outputs + 2 x 2 relay outputs (4 relay outputs with guided contacts).
(2) 8 control outputs are available but they are not safety outputs.

Safety automation system solutions
Preventa™ configurable safety controllers type XPSMC

Safety functions

Configuration of the safety functions is carried out using XPSMCWIN software.

30 certified safety functions are available with this software and they are easily assignable to the safety outputs. The safety functions have multiple combination possibilities and various starting conditions.

The safety functions are:
- certified in accordance with EN 954-1/EN/ISO 13849-1 and IEC 61508,
- configurable in controller XPSMC using XPSMCWIN software.

All 8 safety outputs are suitable for use in safety related parts of control systems conforming to category 4 of EN 954-1/EN/ISO 13849-1 and each output can disconnect one of its safety circuits.

Main safety functions

- Emergency stop monitoring, with or without time delay, 1 or 2-channel wiring
- Two-hand control (type III-C conforming to EN 574/ISO 13851)
- Guard monitoring with 1 or 2 limit switches
- Guard monitoring for injection presses and blowing machines
- Magnetic switch monitoring
- Sensing mat monitoring
- Light curtain (type 4 conforming to EN/IEC 61496, relay or solid-state output) monitoring
- Zero speed detection
- Dynamic monitoring of hydraulic valves on linear presses
- Monitoring safety stop at top dead center on eccentric press
- Safety time delays
- “Muting” function of light curtains
- Enabling switch monitoring, 2 or 3 contact
- Hydraulic press
- Eccentric press
- Foot switch monitoring
- Chain shaft breakage monitoring
- Position selector

Wiring diagrams and functional diagrams

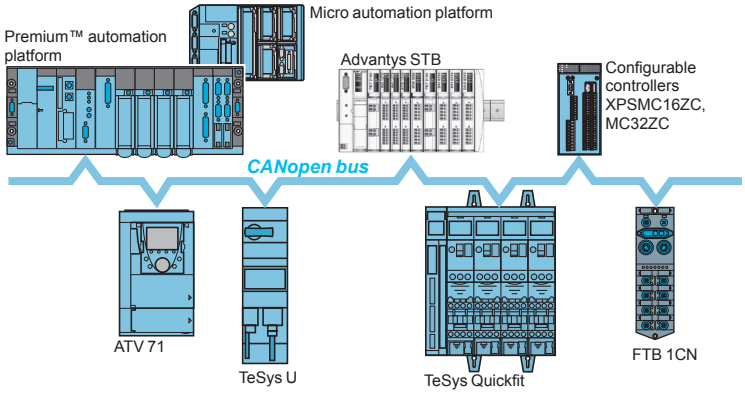
See from page 2/126

Safety automation system solutions

Preventa™ configurable safety controllers type XPSMC

Communication

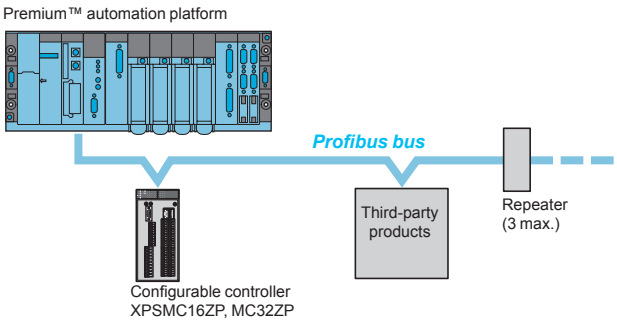
CANopen fieldbus



Configurable safety controllers XPSMC●●ZC incorporate a SUB-D 9-pin male connector for direct connection on CANopen bus.

CANopen bus is an open bus that ensures deterministic and reliable access to the real-time data of automation equipment. The bus uses a shielded dual twisted pair on which a maximum of 127 devices can be connected by chaining. The data rate varies between 10 Kbps and 1Mbps depending on the length of the bus (16,404 to 66 ft / 5,000 to 20 m).

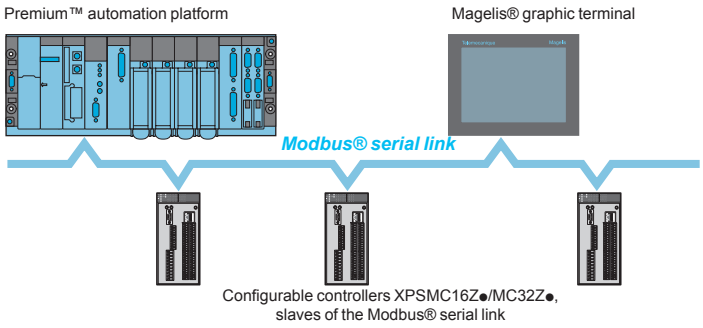
Profibus bus



Configurable safety controllers XPSMC●●ZP incorporate a SUB-D 9-pin female connector for connection on Profibus bus.
Configurable safety controllers XPSMC●●ZP are slaves on the Profibus bus.

Profibus bus is a fieldbus that meets industrial communication requirements. The topology of the Profibus bus is of the linear type with a centralised master/slave type access procedure. The physical link is a single shielded twisted pair.

Modbus® serial link

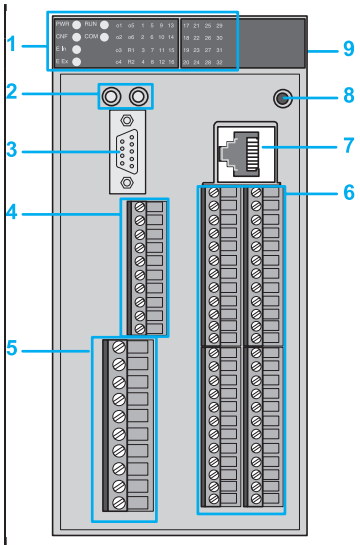


Configurable safety controllers XPSMC●●Z● MC incorporate a Modbus® communication interface (RJ45 connector) for configuration and diagnostics.
This interface enables connection of the controllers to:
□ a PC (configuration),
□ a PLC (diagnostics), or
□ an operator dialog terminal (diagnostics).

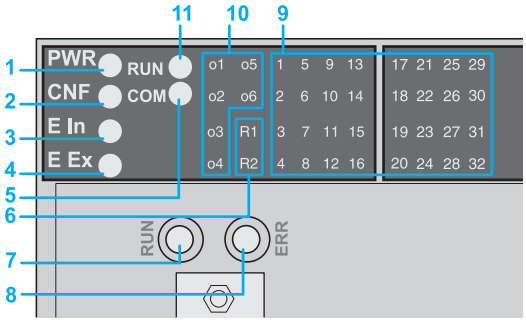
The Modbus® serial link consists of a master station (Premium™ automation platform) and slave stations (configurable controllers XPSMC16/32Z●).
Two exchange mechanisms are possible:
■ **Question/response:** the questions from the master are addressed to a given slave. The response is expected by return from the interrogated slave.
■ **Distribution:** the master distributes a message to all the stations of the Modbus® serial link. The latter execute the order without transmitting a reply.

Safety automation system solutions

Preventa™ configurable safety controllers type XPSMC



Configurable safety controller XPSMC●●Z●, with screw connectors



Illuminated display

Description

Configurable safety controllers XPSMC●●Z●

Front cover of controllers:

1 LED display and system diagnostics.
2 Two LEDs for CANopen or Profibus *(1)* connection status.
3 SUB-D 9-pin male connector for connection on CANopen bus (**XPSMC16ZC/ MC32ZC**)
or SUB-D 9-pin female connector for connection on Profibus bus (**XPSMC16ZP/ MC32ZP**).
4 Solid-state safety output and “muting” indicator light terminals.
5 Power supply (⎓ 24 V) and relay safety output terminals.
6 Control output terminals for power supply to safety inputs and safety input terminals.
7 RJ45 connector for connection on Modbus® serial link.
8 RESET button (resetting of controller).

Rear face of controllers:

9 Mounting plate for mounting on rail.

(1) Depending on controller model.

LED details

LED	Color	Status	Meaning
1 PWR	Green	On	Supply voltage present.
2 CNF	Yellow	On	In configuration mode.
		Flashing	Not configured, initial power-up.
3 E In	Red	On	Internal error: all safety outputs deactivated.
4 E Ex	Red	On	External error: all safety outputs associated with the defective circuit are deactivated.
5 COM	Green	On	Controller communicating via the TER (RJ45) connection.
6 R1, R2	Green	On	Relay outputs 13/14, 23/24, 33/34 and 43/44 activated.
		Flashing	Fault on these outputs.
7 RUN	Green	Off	Hardware OK for the Profibus bus or the CANopen bus.
		On	Communicating on Profibus bus or on CANopen bus. Normal status.
8 ERR	Red	On	Communication impossible, configuration error, damaged cabling or absence. Bus deactivated
		Off	Communicating on CANopen or Profibus bus. Normal status.
		Flashing (x 1)	Warning limit reach.
		Flashing (x 2)	Control event error on CANopen bus.
		Flashing (x 3)	Synchronization error on CANopen bus.
9 1…16 1…32	Green	On	Input circuit closed.
		Flashing	Error detected on input relating to LED.
10 o1…o6	Green	On	Solid-state output activated.
		Flashing	Short-circuit, anomaly on output.
11 RUN	Green	On	Run mode.
		Flashing	Changing from run mode to stop mode.

Safety automation system solutions

Preventa™ configurable safety controllers type XPSMC

2

Characteristics

Configurable safety controller type				XPSMC16Z and MC32Z, XPSMC16ZC and MC32ZC, XPSMC16ZP and MC32ZP
Conformity to standards				EN/IEC 60204-1, EN 1760-1/ISO 13856-1, EN/IEC 60947-5-1, EN/IEC 61496-1, EN 574/ISO 13851, EN 954-1/EN/ISO 13849-1, IEC 61508
Product certifications				UL, CSA, TÜV
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/EN/ISO 13849-1 and IEC 61508)				Category 4 max. (EN 954-1/EN/ISO 13849-1), SIL 3 max. (IEC 61508)
Supply voltage			**V**	⎓ 24 ± 20%
Maximum power consumption			**W**	12
Fuse protection			**A**	16 gL max.
Start button monitoring				Configurable
Control circuit voltage				28.8 V/13 mA (between input terminals C1-I1 to C8-I16, resp. I32)
Calculation of wiring resistance RL			Ω	100 max, maximum cable length: 2000 m (Between input terminals)
Synchronization time between inputs			**s**	Depending on configuration selected
Outputs	**Relay**	Voltage reference		Relay hard contacts
		Safety circuit		2 N.O. per function (4 N.O. total) (13-14, 23-24, 33-34, 43-44)
		Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180
		Breaking capacity in DC-13		24 V/1.5 A L/R = 50 ms
		Thermal current (Ithe) for each group of 2 outputs	**A**	6 for 1 output and 2 for the other, **or** 4 for both outputs.
		Current limit	**A**	Ith ⩽ 16 (with several relay output circuits simultaneously loaded)
		Output fuse protection	**A**	4 gL or 6 quick blow
		Minimum current	**mA**	10 *(1)*
		Minimum voltage	**V**	17 *(1)*
	Solid-state	Breaking capacity		24 V/2 A
		Safety circuit		6 solid-state (O1, O2, O3, O4, O5, O6)
		Current limit	**A**	Ith ⩽ 6.5 (with several solid-state output circuits simultaneously loaded)
Electrical life				See page 2/172
Response time on input opening			**ms**	Response time = 20 or 30, configurable using software XPSMCWIN □ if 20 for controllers XPSMC●●Z●: 30 for a safety mat □ if 30 for controllers XPSMC●●Z●: 45 for a safety mat
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to IEC 60647-5-1, DIN VDE 0110 part 1)
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to IEC 60647-5-1, DIN VDE 0110 part 1)
LED display				30 (XPSMC16Z), 46 (XPSMC32Z) 32 (XPSMC16ZC/MC16ZP, 48 (XPSMC32ZC/MC32ZP)
Temperature	Operating		**°F (°C)**	+ 14…+ 131 (- 10…+ 55)
	Storage		**°F (°C)**	- 13…+ 267.8 (- 25…+ 85)
Degree of protection				IP 20 conforming to EN/IEC 60529 (connector and enclosure)

(1) The controller is also capable of switching low power loads (17 V/10 mA minimum) provided that the contact has not been used for switching high power loads (possible contamination or wear of the gold layer on the contact tips).

Communication

Modbus® serial link

Compatibility			**XPSMC16Z, XPSMC32Z, XPSMC16ZC, XPSMC32ZC, XPSMC16ZP, XPSMC32ZP**
Serial link ports	Number and type		1 x RJ45
	Status		Slave
Data exchange			14 words
Addressing			1 …247
Baud rate		**bps**	1200, 2400, 4800, 9600 or 19200
Parity			Even, odd, none
Fixed parameters			RTU (Remote Terminal Unit) mode 1 start bit / 8 data bits 1 stop bit stop with “even” or “odd” parity 2 stop bits without parity
Functions supported			01: 8-bit output data / 32-bit input data (0 = OFF, 1 = ON) 02: 32-bit input data / 8-bit output data (0 = OFF, 1 = ON) 03: information and errors

CANopen bus

Compatibility			**XPSMC16ZC, XPSMC32ZC**
Serial link ports	Number and type		1 x SUB-D 9-pin male
	Status		Slave
Data exchange			14 words By included dual port memory: only data addresses, diagnostics, but no baud rates
Parameters (adjustable using software XPSMCWIN)	Baud rate	**Kbps**	20, 50, 125, 250, 500, 800
		Mbps	1
	Address		1…127

Profibus bus

Compatibility			**XPSMC16ZP, XPSMC32ZP**
Serial link ports	Number and type		1 x SUB-D 9-pin female
	Status		Slave
Data exchange			14 words By included dual port memory: only data addresses
Parameters	Baud rate	**Mbps**	12
	Address		1…125

Connections

Type			**Separate plug-in screw connector XPSMCTS●● *(1)***	**Separate plug-in spring clip connector XPSMCTS●● *(1)***
Power supply and relay output terminals				
1 conductor	Without cable end		Solid or flexible cable: 24-12 AWG (0.2…2.5 mm²)	
	With cable end		Without bezel, flexible cable: 22-12 AWG (0.25…2.5 mm²)	
			With bezel, flexible cable: 22-12 AWG (0.25…2.5 mm²)	
2 conductors	Without cable end		Solid or flexible cable: 24-16 AWG (0.2…1.5 mm²)	–
	With cable end		Without bezel, flexible cable: 22-16 AWG (0.25…1.5 mm²)	–
			Double, with bezel, flexible cable: 20-16 AWG (0.5…1.5 mm²)	Double, with bezel, flexible cable: 20-18 AWG (0.5…1.0 mm²)
Tightening torque of screw terminals			4.2...5.3 lb-in (0.5...0.6 Nm)	–
Wire stripping length			0.39 in (10 mm)	
Other terminals				
1 conductor	Without cable end		Solid or flexible cable: 28-16 AWG (0.14…1.5 mm²)	
	With cable end		Without bezel, flexible cable: 23-16 AWG (0.25…1.5 mm²)	
			With bezel, flexible cable: 23-20 AWG (0.25…0.5 mm²)	
2 conductors	Without cable end		Solid cable: 28-20 AWG (0.14…0.5 mm²) Flexible cable: 28-19 AWG (0.14…0.75 mm²)	–
	With cable end		Without bezel, flexible cable: 23-22 AWG (0.25…0.34 mm²)	–
			Double, with bezel, flexible cable: 20 AWG (0.5 mm²)	–
Enclosure mounting (conforming to DIN EN 50022)			Metal adaptor for mounting on ⊔ 35 mm metal rail	

(1) To be ordered separately.

Safety automation system solutions

Preventa™ configurable safety controllers type XPSMC

105569



XPSMC16Z

105570



XPSMC32Z

105739



XPSMC16ZC

105545



XPSMC32ZC

105540



XPSMC16ZP

105546



XPSMC32ZP

References

Configurable safety controllers (connector not included)

Number of inputs	Number of outputs		Communication (Link and bus)	Reference	Weight
	Relay	Solid-state			oz (kg)
16	**4 (2 x 2)**	**6**	Modbus®	**XPSMC16Z**	28.925 (0.820)
			Modbus®, CANopen	**XPSMC16ZC**	28.925 (0.820)
			Modbus®, Profibus	**XPSMC16ZP**	28.925 (0.820)
32	**4 (2 x 2)**	**6**	Modbus®	**XPSMC32Z**	29.630 (0.840)
			Modbus®, CANopen	**XPSMC32ZC**	29.630 (0.840)
			Modbus®, Profibus	**XPSMC32ZP**	29.630 (0.840)

Plug-in connectors for configurable safety controllers *(1)*

Description	For use with	Reference	Weight oz (kg)
Screw connectors	XPSMC16Z, MC16ZC, MC16ZP	**XPSMCTS16**	2.822 (0.080)
	XPSMC32Z, MC32ZC, MC32ZP	**XPSMCTS32**	3.880 (0.110)
Spring clip connectors	XPSMC16Z, MC16ZC, MC16ZP	**XPSMCTC16**	2.822 (0.080)
	XPSMC32Z, MC32ZC, MC32ZP	**XPSMCTC32**	3.880 (0.110)

Configuration software

Description	Operating system	Details *(2)*	Languages	Reference	Weight oz (kg)
Configuration software for controllers XPSMC●●Z● CD-ROM + user manual	Windows® 2000, Windows® XP	Software available on Safety Suite V2 software pack	EN, FR, DE, IT, ES, PT	**XPSMCWIN**	18.342 (0.520)

(1) To be ordered separately to the controllers.
(2) EDS and GSD files are available on the XPSMCWIN configuration software CD-ROM.

Safety automation system solutions
Preventa™ configurable safety controllers type XPSMC


XPSMCCPC


TSX PCX 1031


490 NT● 000 ●●

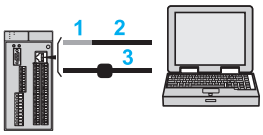

TSX CUSB485

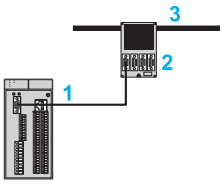

TSX CAN TDM4


ABL 8RPS24100

References

Connecting cables *(1)*

Function			Length ft (m)	Reference	Weight oz (kg)
Diagnostics using Magelis® operator dialog terminal type XBT GT			9.8 (3)	**VW3 A8 306 R30**	39.860 (1.130)
Configuration software	1	Adaptor: RJ45 socket/PC connection cables	–	**XPSMCCPC**	0.388 (0.011)
	2	Cable to PC serial port (type SUB-D9)	8.2 (2.5)	**TSX PCX 1031**	5.997 (0.170)
	3	Straight shielded twisted pair cables, EIA/TIA 568 standard (RJ45 connector at each end)	6.6 (2)	**490 NTW 000 02**	–
			16.4 (5)	**490 NTW 000 05**	–
			39.4 (12)	**490 NTW 000 12**	–
		Straight shielded twisted pair cables, UL and CSA 22.1 approved (RJ45 connector at each end)	6.6 (2)	**490 NTW 000 02U**	–
			16.4 (5)	**490 NTW 000 05U**	–
			39.4 (12)	**490 NTW 000 12U**	–
	with	RJ45/PC USB port converter *(2)*	1.3 (0.4)	**TSX CUSB485**	–

Function	Medium		Length ft (m)	Reference	Weight oz (kg)
Modbus® serial link access	Premium™ automation platform TSX SCY 21601		–	**XPSMCSCY**	–
CANopen bus access	1	CANopen connection cables (fitted with: 1 SUB-D 9-pin female connector at each end)	1 (0.3)	**TSX CANCADD03**	–
			3.3 (1)	**TSX CANCADD1**	–
			9.8 (3)	**TSX CANCADD3**	–
			16.4 (5)	**TSX CANCADD5**	–
	2	CANopen tap-off box	–	**TSC CANTDM4**	–
	3	Standard CANopen cables	164 (50)	**TSX CANCA50**	–
			328 (100)	**TSX CANCA100**	–
			984 (300)	**TSX CANCA300**	–
Profibus bus access			328 (100)	**TSX PBS CA100**	–
			1312 (400)	**TSX PBS CA400**	–

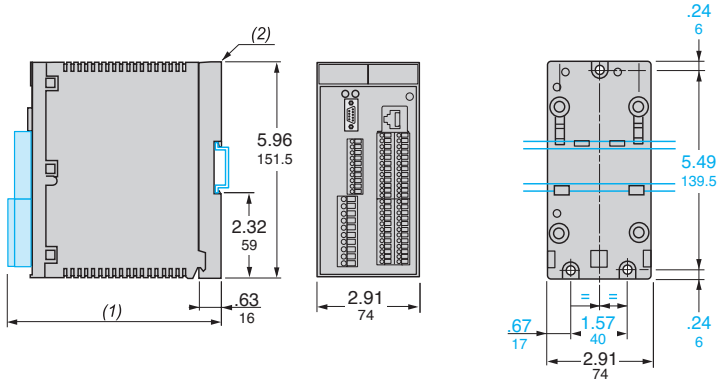
Accessories *(1)*

Regulated switch mode power supply, single-phase	Output voltage: ⎓ 24…28.8 V Nominal current: 10 A Nominal power: 240 W	**ABL 8RPS24100**	35.274 (1.000)

(1) To be ordered separately.
*(2) The converter **TSX CUSB485** is installed using **Driver Pack V2.3**. This "driver" is available on the Safety Suite V2 software pack or downloadable from our site: www.schneider-electric.com*

Dimensions, mounting

XPSMC●●Z●



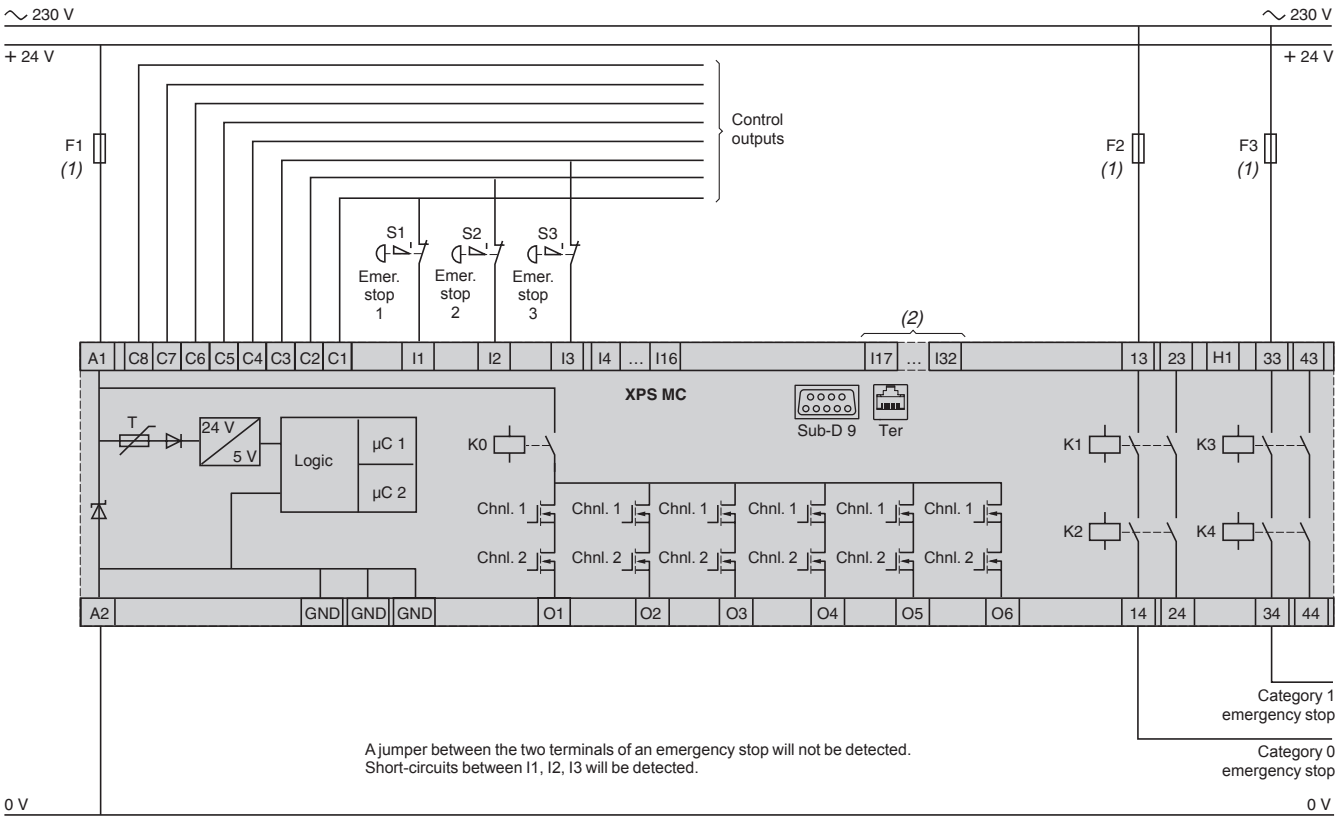
(1) 6.02 in (153 mm) with screw connector XPSMCTS●●. 5.96 in (151.4 mm) with spring clip connector XPSMCTC●●.
(2) Metal adaptor for mounting on metal ⊔ 35 mm rail.

2

Emergency stop monitoring, with or without time delay, 1-channel wiring, with automatic start

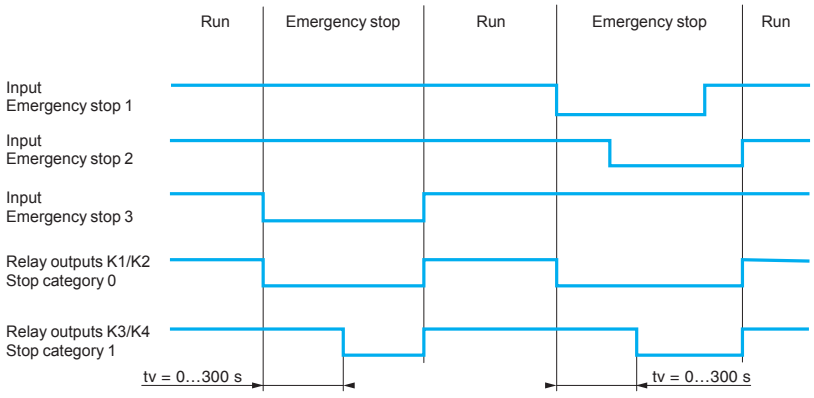
Category 4 achieved with necessary precautions taken to eliminate input circuit anomalies.

Wiring diagram



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Functional diagram

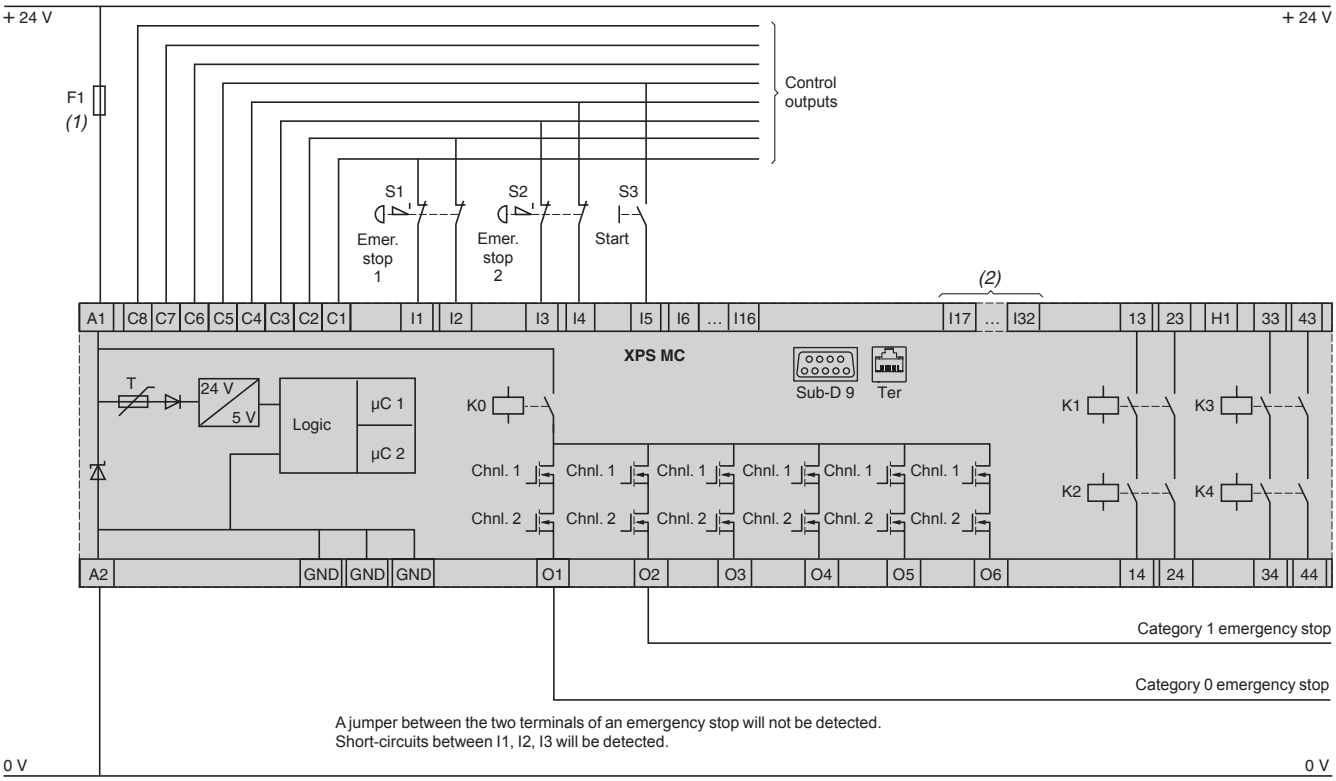


tv = delay time

Emergency stop monitoring, with or without time delay, 2-channel wiring, with start button

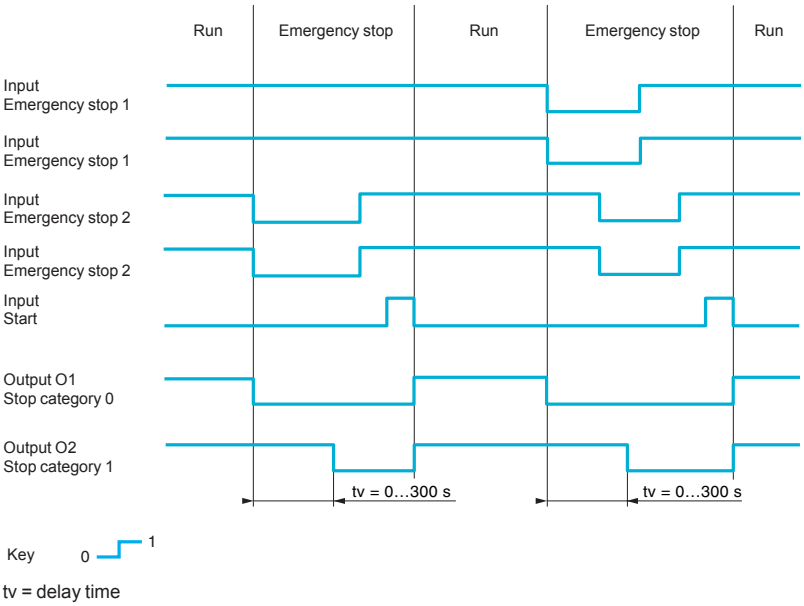
Category 4 conforming to standard EN 954-1.

Wiring diagram



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Functional diagram



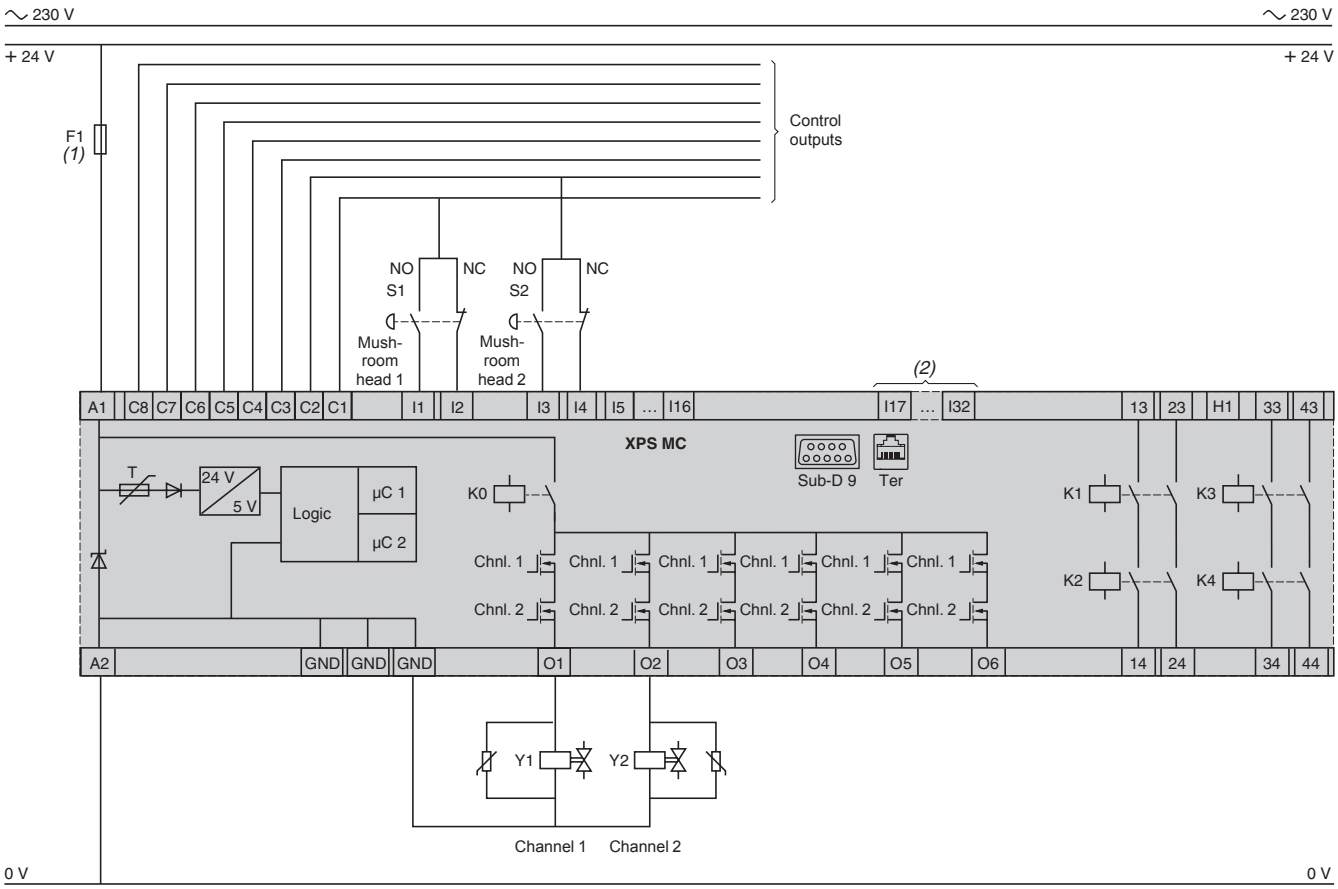
tv = delay time

2

Two-hand control (type III-C conforming to EN 574-1)

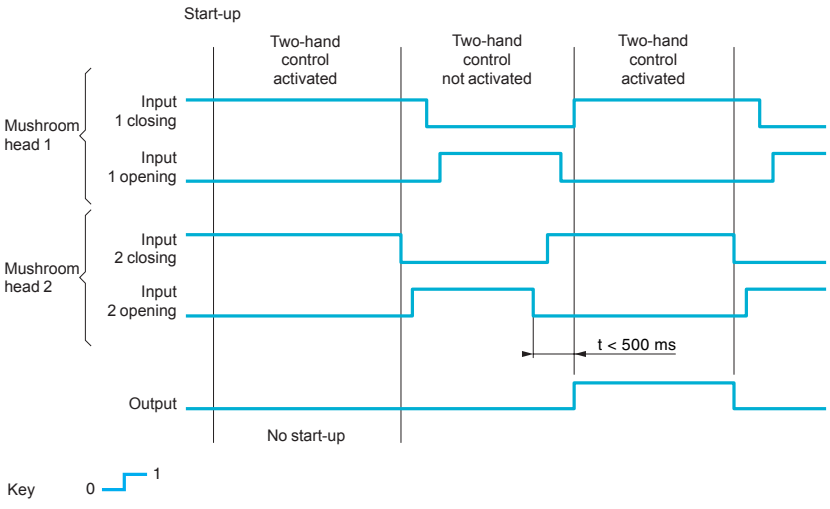
Category 4 conforming to standard EN 954-1.

Wiring diagram



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Functional diagram

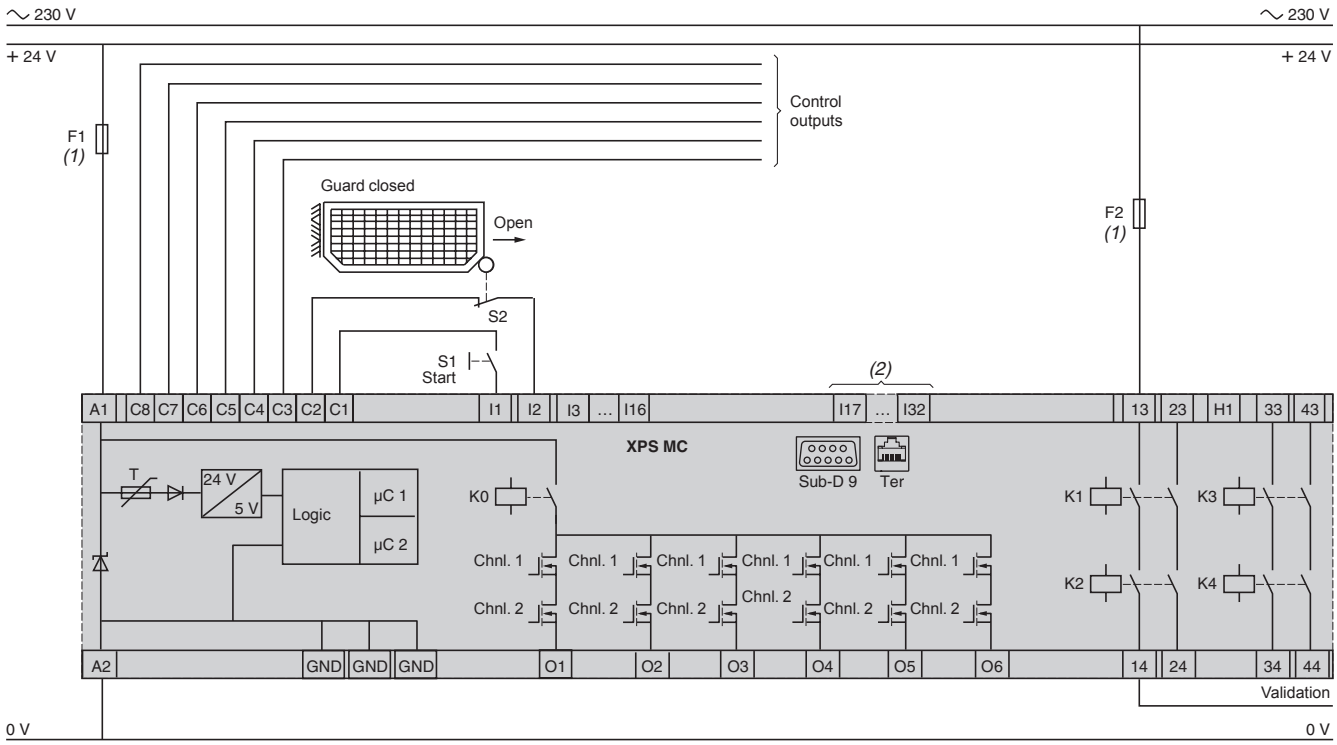


tv = delay time

Guard monitoring with 1 safety limit switch

Category 1 conforming to standard EN 954-1.

Wiring diagram

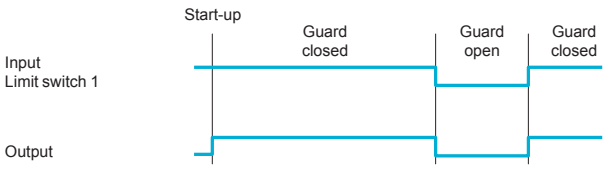


(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

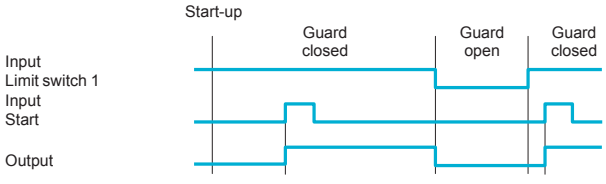
Functional diagrams

Start test = NO

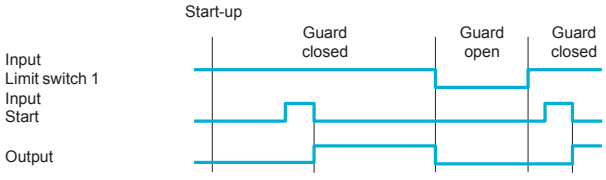
Automatic start



Rising edge monitored start

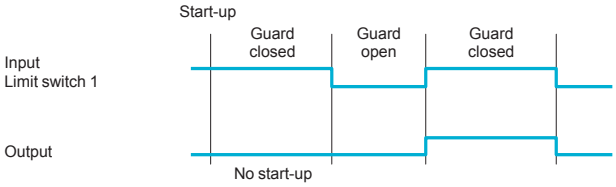


Falling edge monitored start

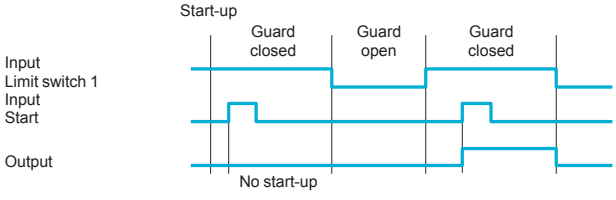


Start test = YES

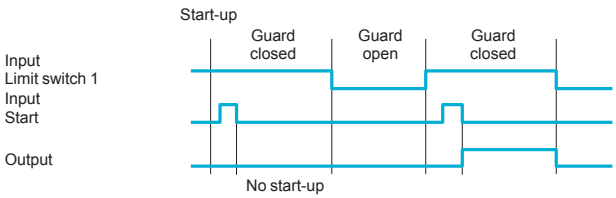
Automatic start



Rising edge monitored start



Falling edge monitored start



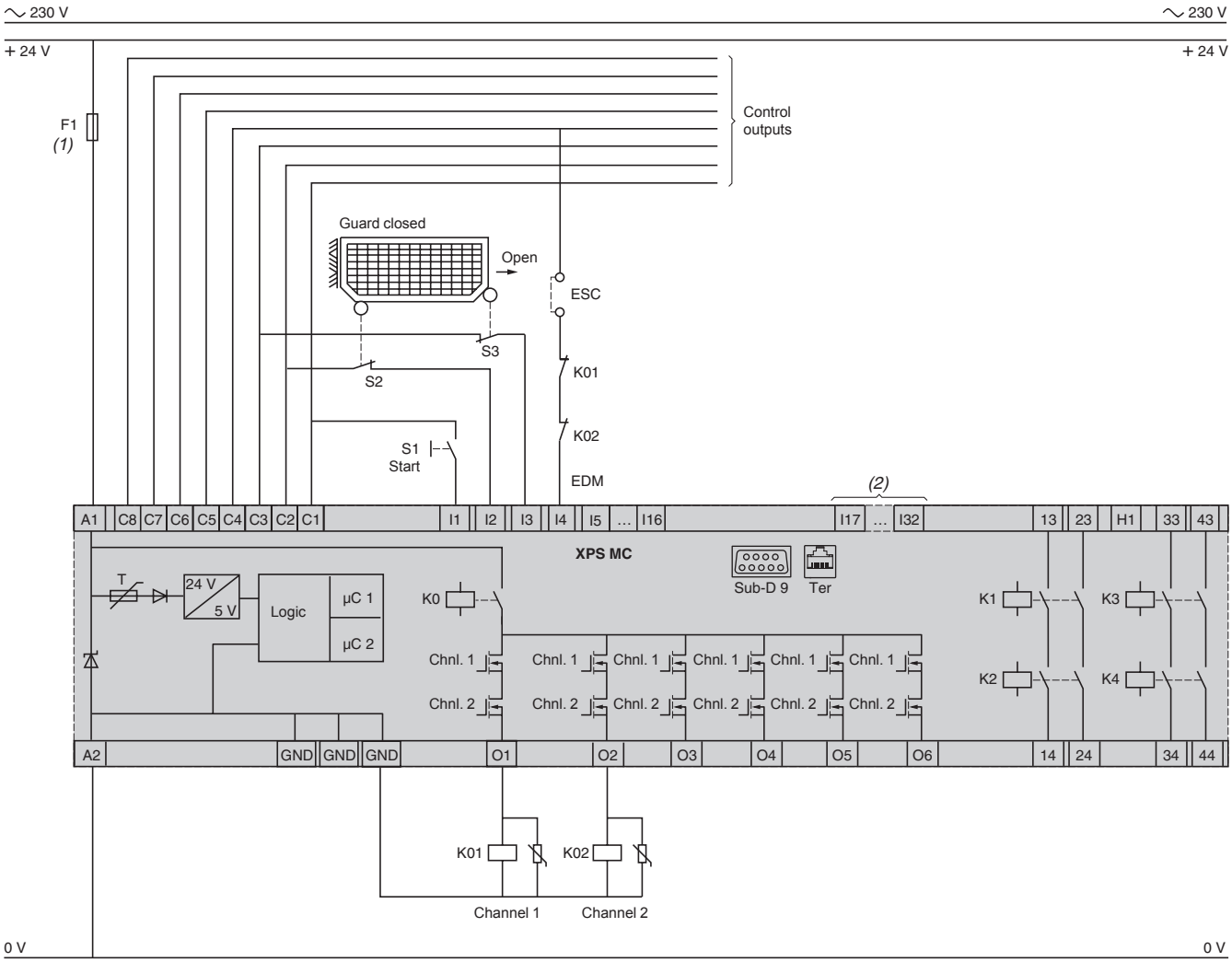
Key 0 1

2

Guard monitoring with 2 safety limit switches

Category 4 conforming to standard EN 954-1.

Wiring diagram



ESC = external start conditions
EDM = external devices monitoring

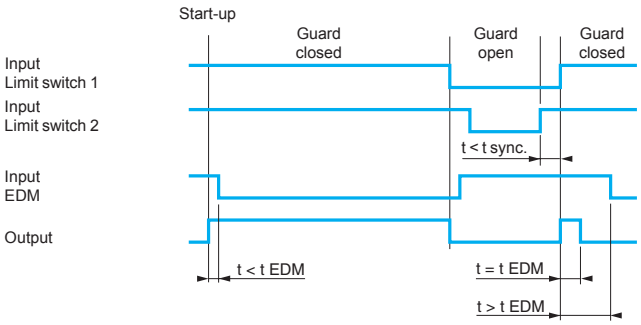
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Guard monitoring with 2 safety limit switches (continued)

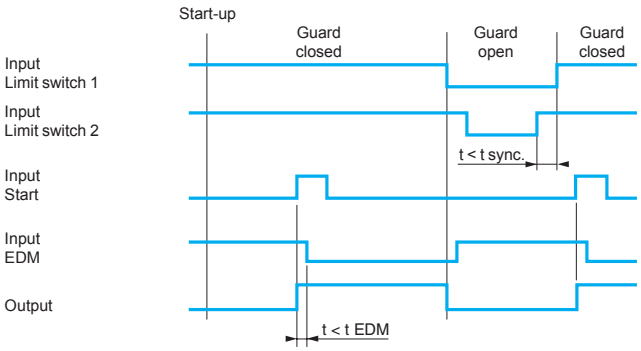
Functional diagrams

Start test = NO

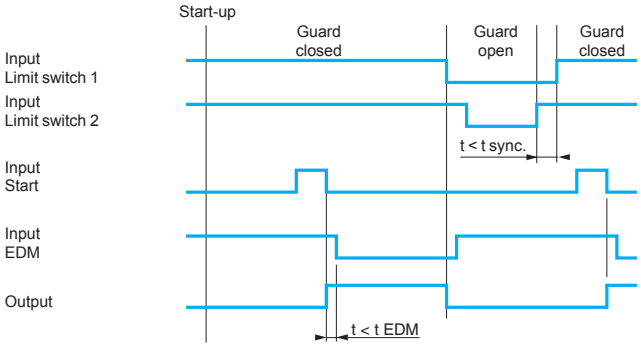
Automatic start



Rising edge monitored start

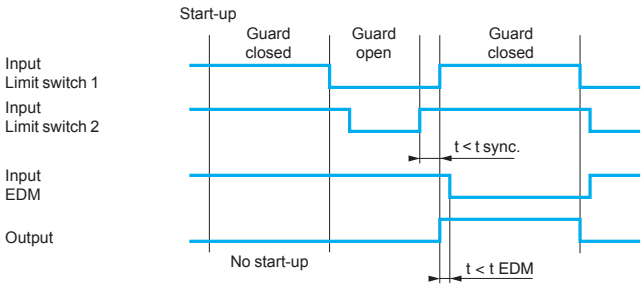


Falling edge monitored start

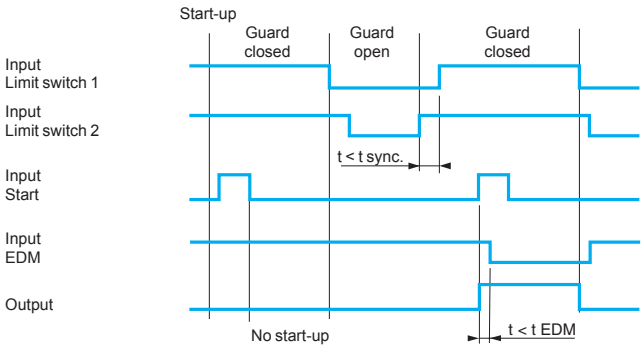


Start test = YES

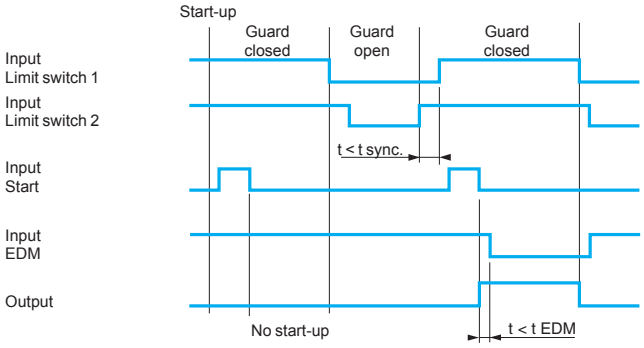
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 — 1

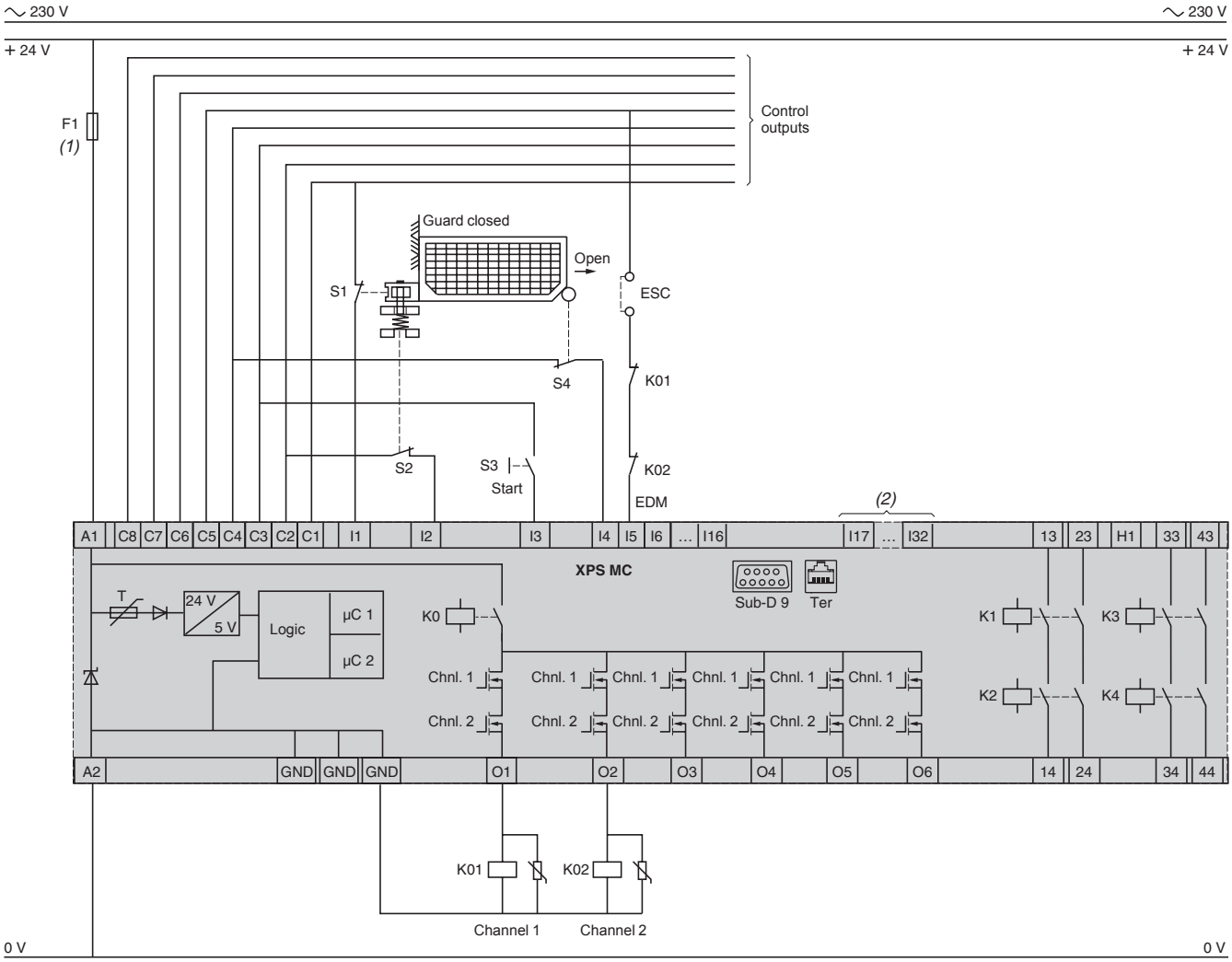
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices
t sync. = synchronization time

2

Guard monitoring with 2 safety limit switches, with guard locking

Category 4 conforming to standard EN 954-1.

Wiring diagram



ESC = external start conditions
EDM = external devices monitoring

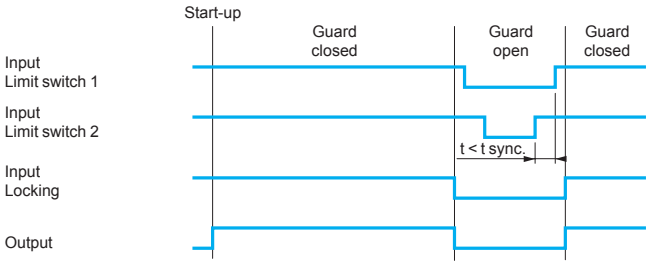
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Guard monitoring with 2 safety limit switches, with guard locking (continued)

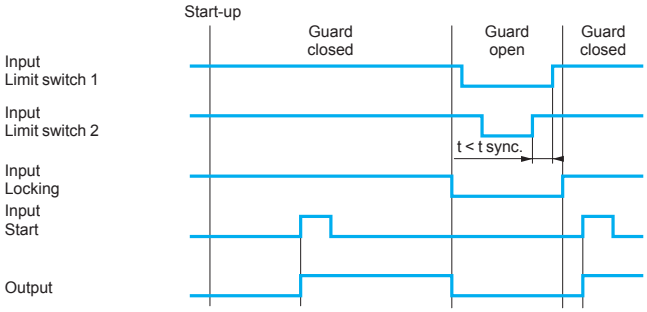
Functional diagrams

Start test = NO

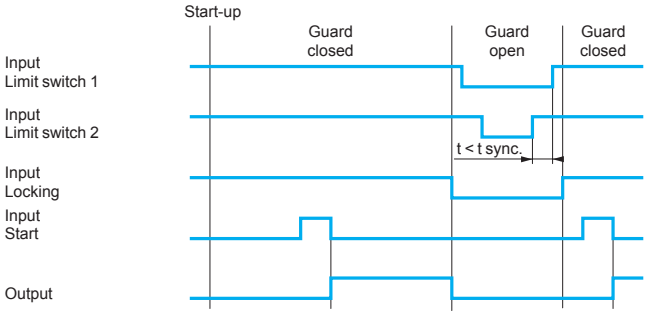
Automatic start



Rising edge monitored start

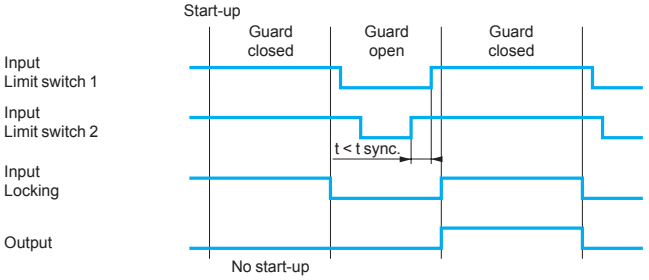


Falling edge monitored start

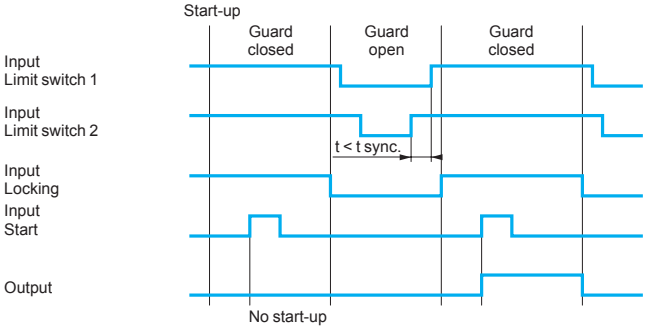


Start test = YES

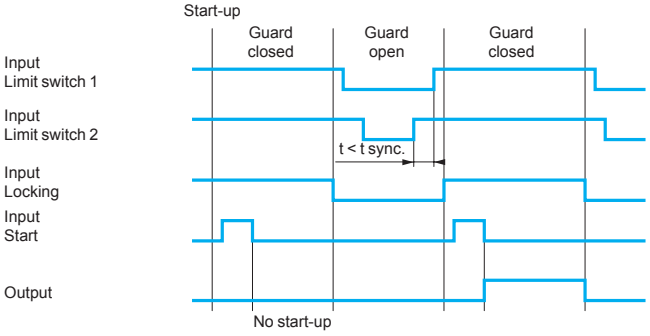
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 — 1

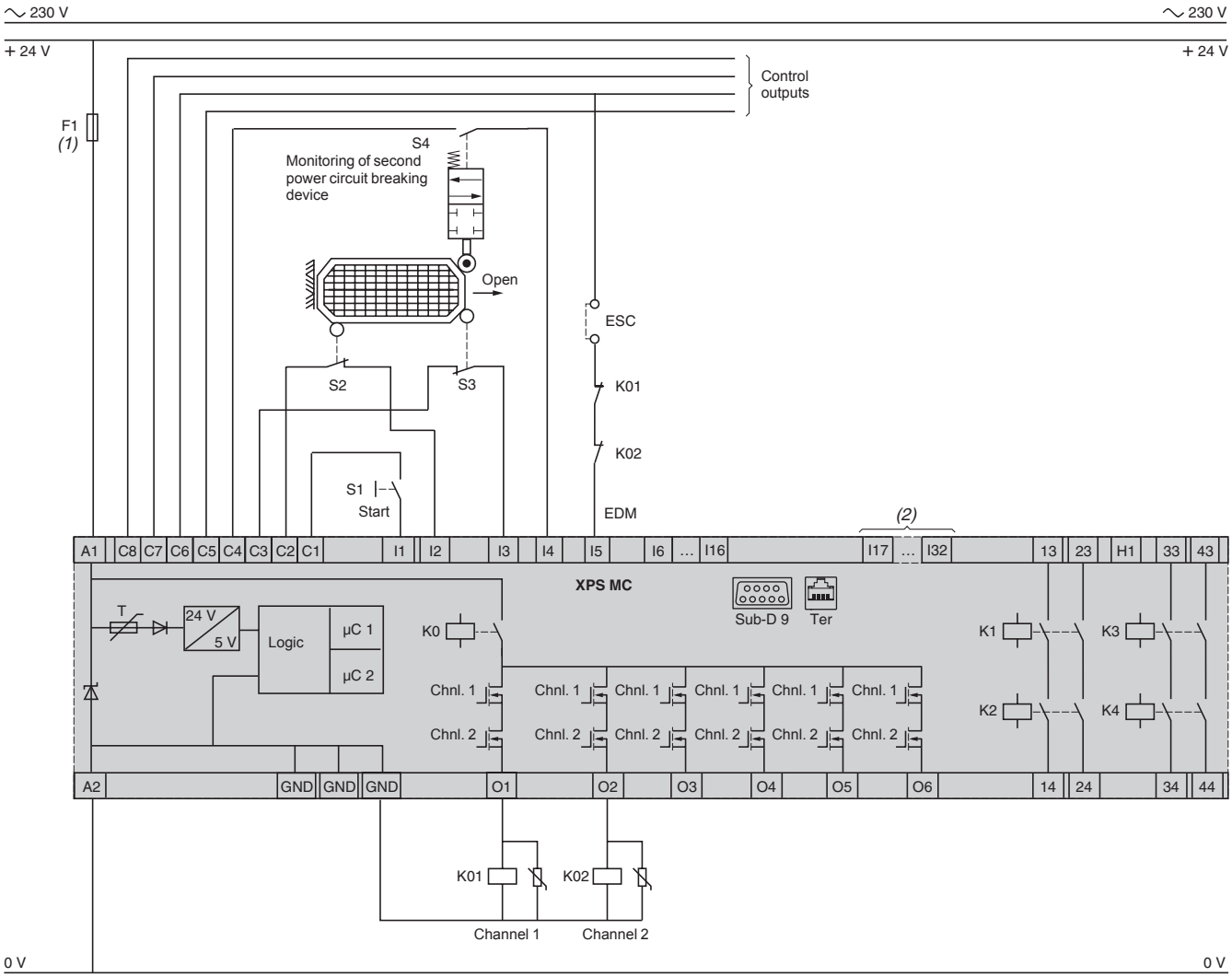
t sync. = synchronization time

2

Guard monitoring for injection presses and blowing machines

Category 4 conforming to standard EN 954-1.

Wiring diagram



ESC = external start conditions
EDM = external devices monitoring

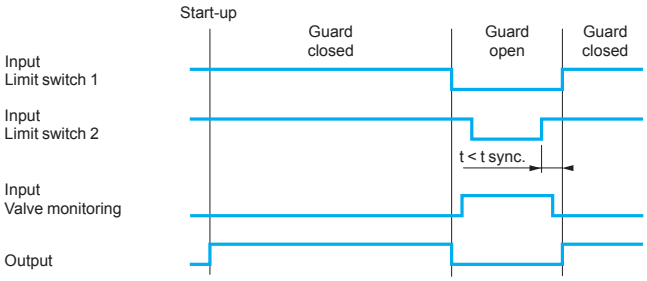
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Guard monitoring for injection presses and blowing machines (continued)

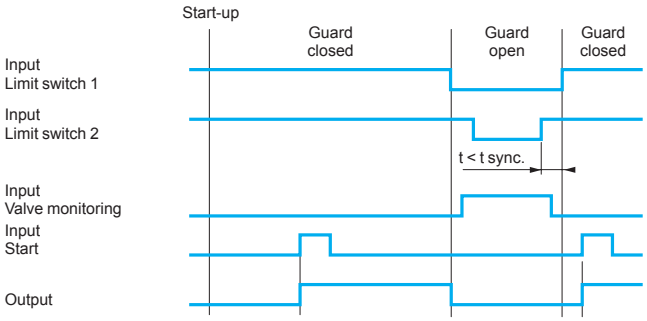
Functional diagrams

Start test = NO

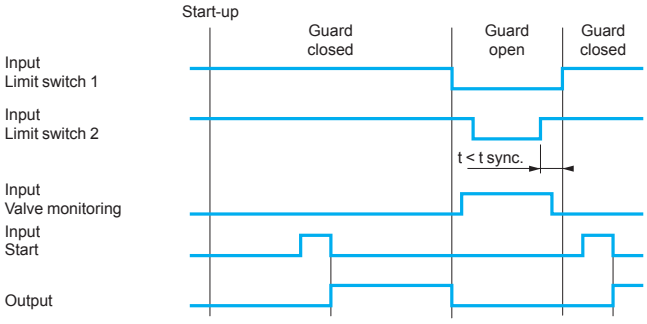
Automatic start



Rising edge monitored start

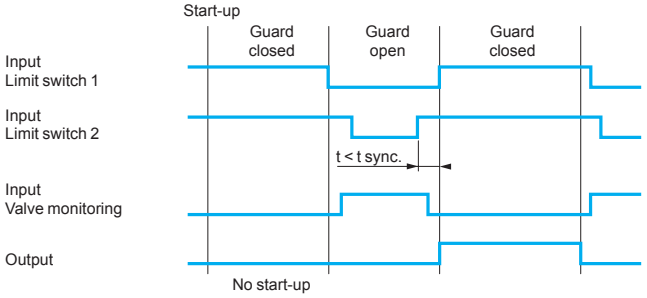


Falling edge monitored start

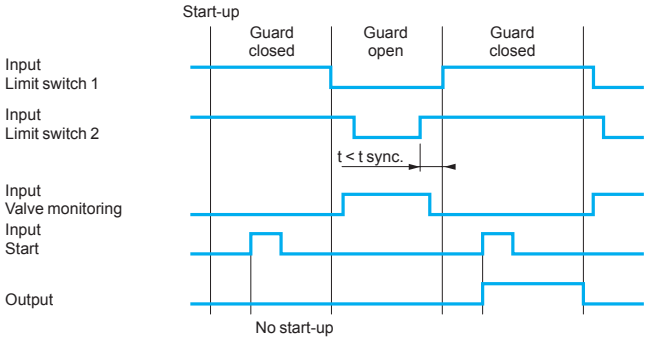


Start test = YES

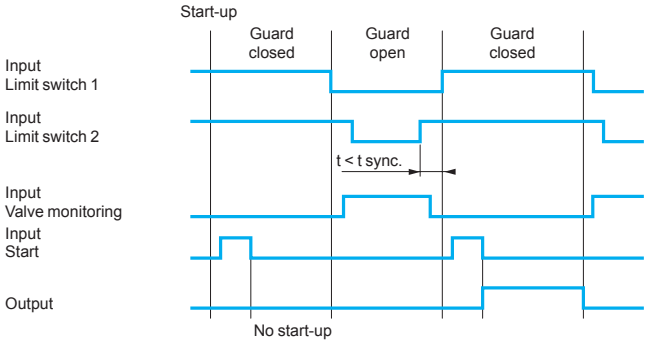
Automatic start



Rising edge monitored start



Falling edge monitored start



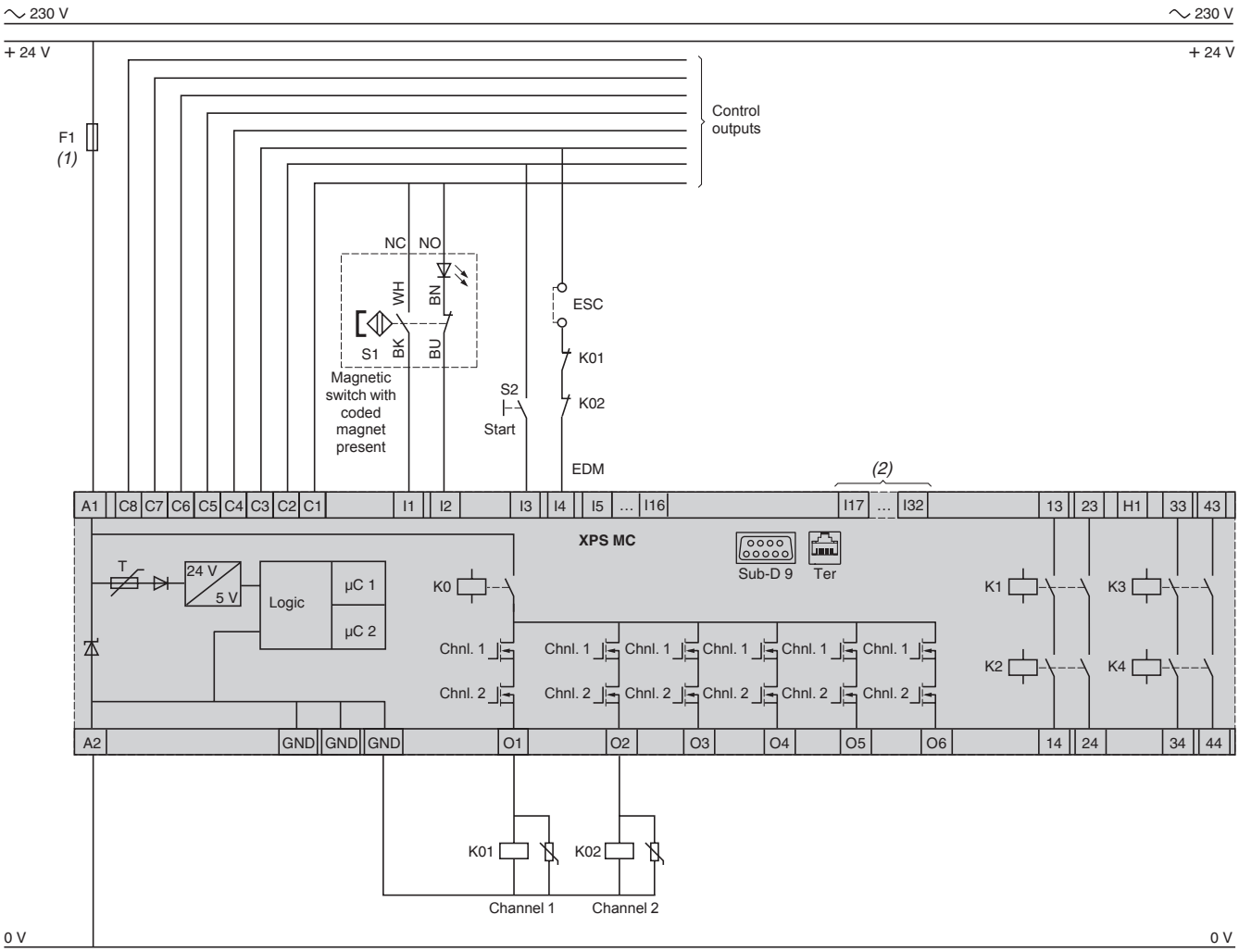
Key 0 ⌐ 1

t sync. = synchronization time

2

Non-contact safety interlock (magnetic switch) monitoring

Wiring diagram



ESC = external start conditions
EDM = external devices monitoring

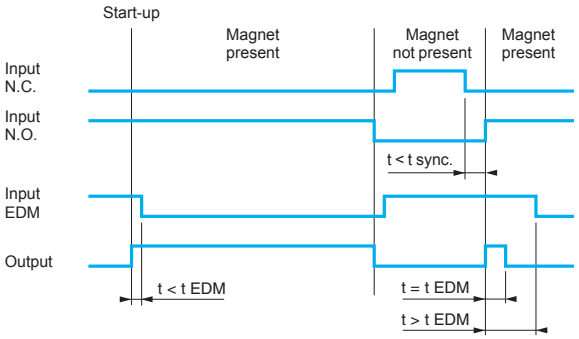
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Non-contact safety interlock (magnetic switch) monitoring (continued)

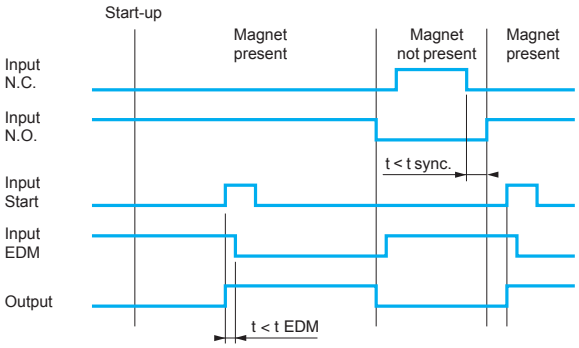
Functional diagrams

Start test = NO

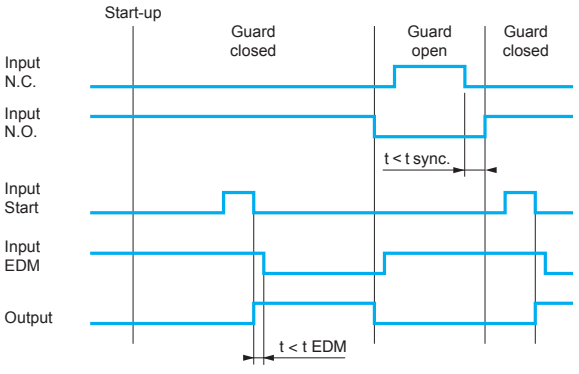
Automatic start



Rising edge monitored start

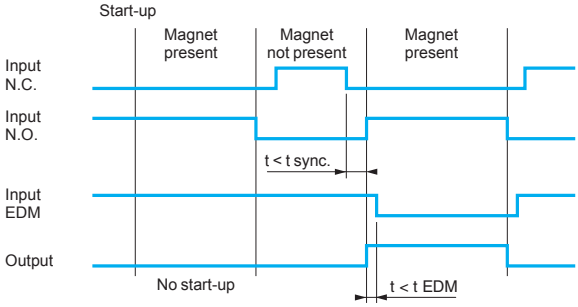


Falling edge monitored start

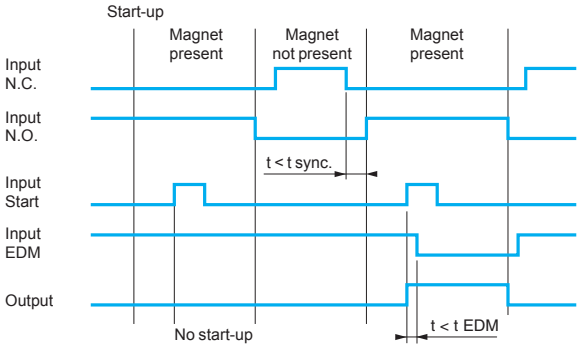


Start test = YES

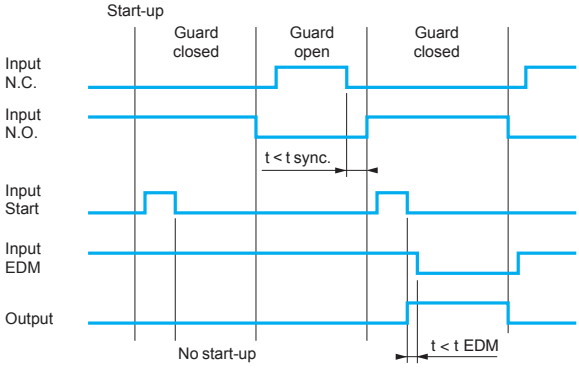
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 — 1

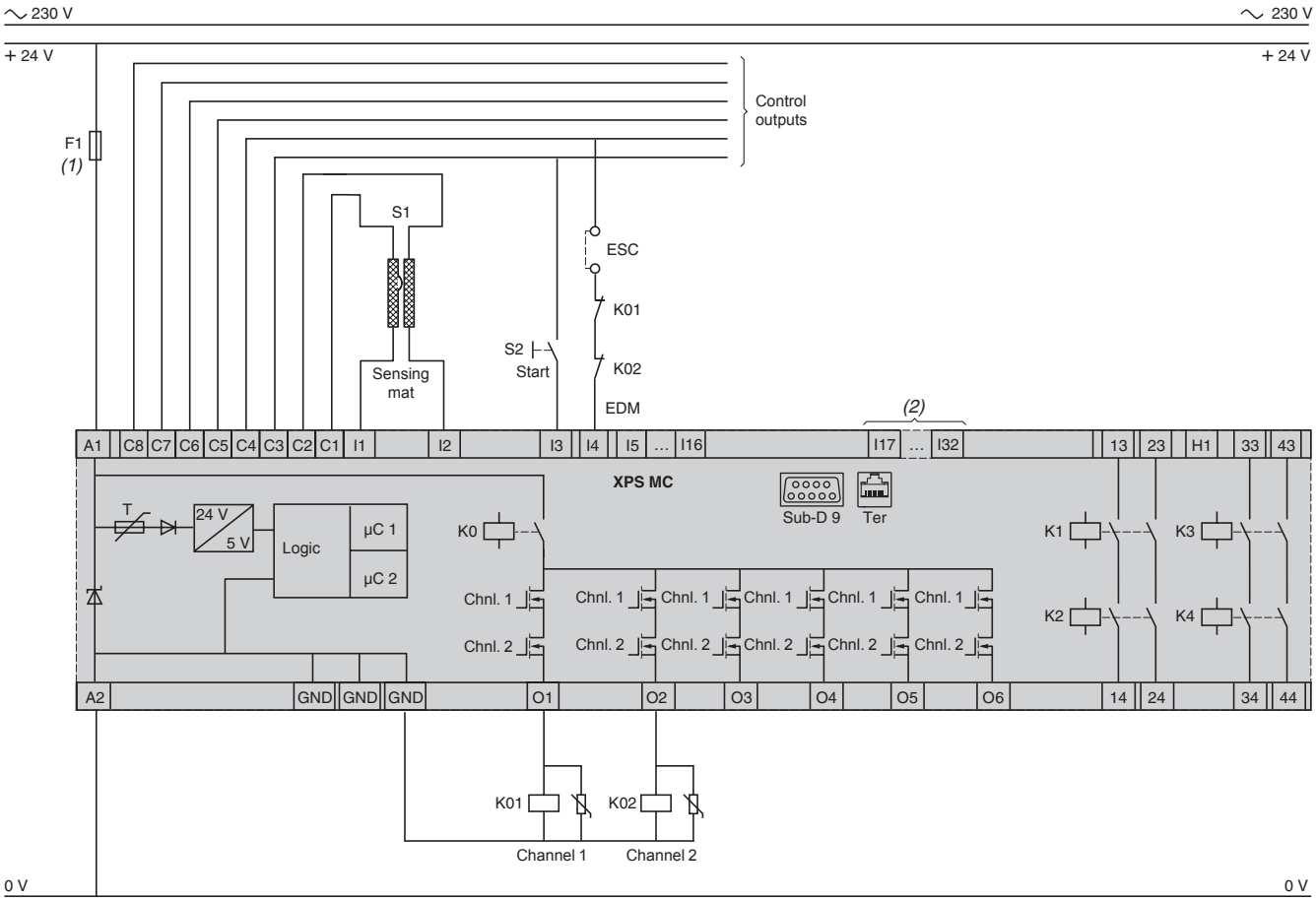
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices
t sync. = synchronization time

2

Sensing mat monitoring

- Category 3 conforming to standard EN 954-1.
- Control outputs connected to a sensing mat cannot be used for other items.

Wiring diagram



ESC = external start conditions
EDM = external devices monitoring

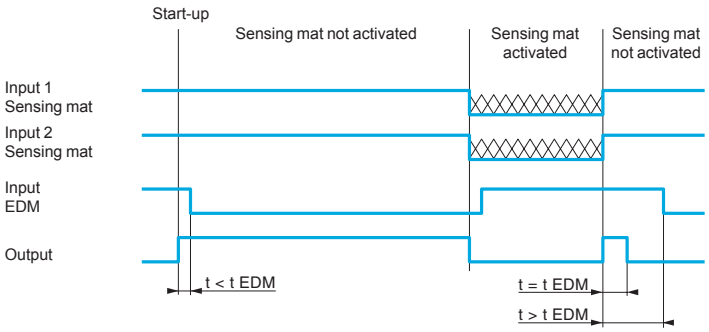
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Sensing mat monitoring (continued)

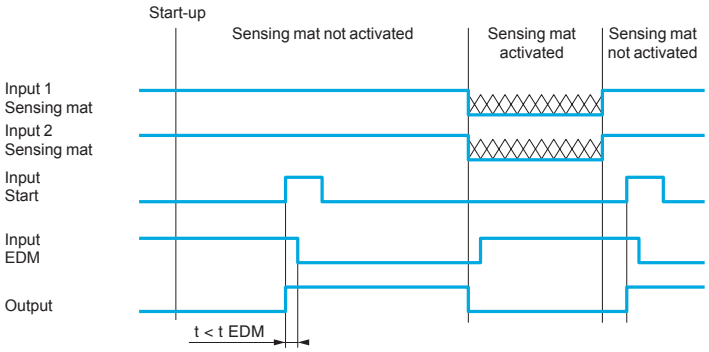
Functional diagrams

Start-up test

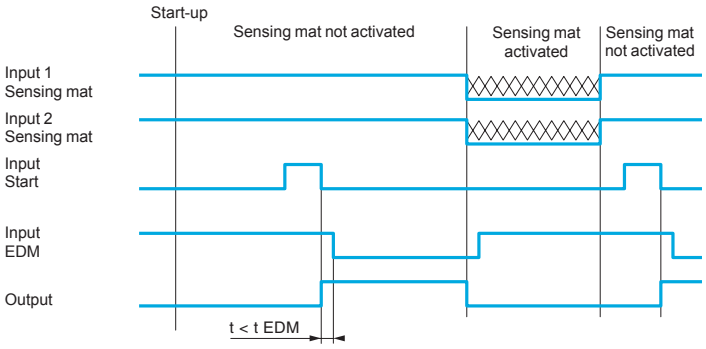
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 1

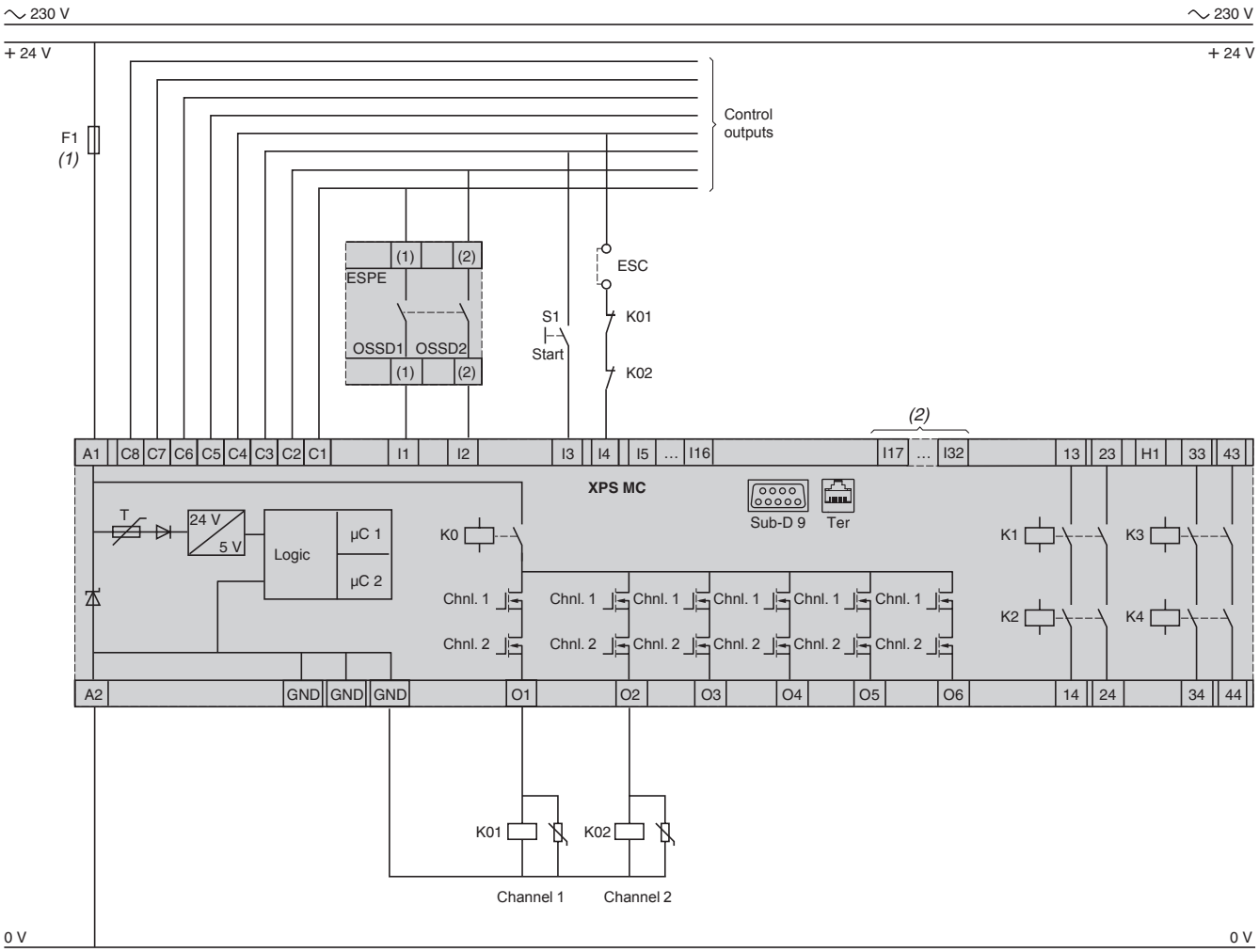
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices

2

Light curtain monitoring, relay output type

Category 4 conforming to standard EN 954-1.

Wiring diagram



ESC = external start conditions
ESPE = electro-sensitive protection equipment
OSSD1/OSSD2 = output signal switching device

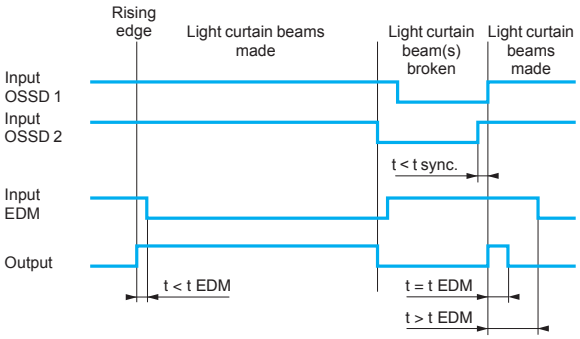
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Light curtain monitoring, relay output type (continued)

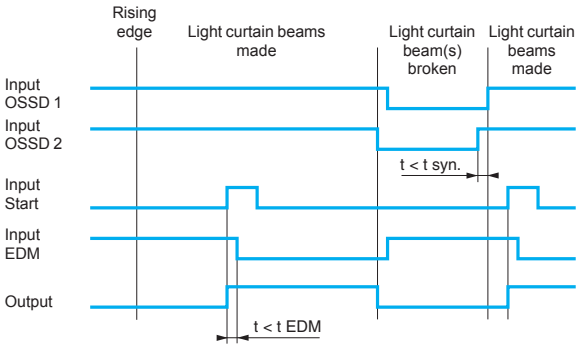
Functional diagrams

Start test = NO

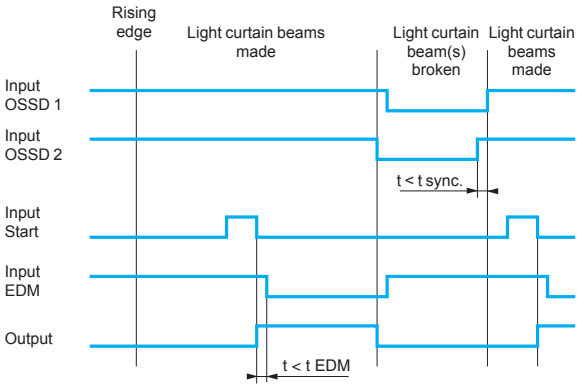
Automatic start



Rising edge monitored start

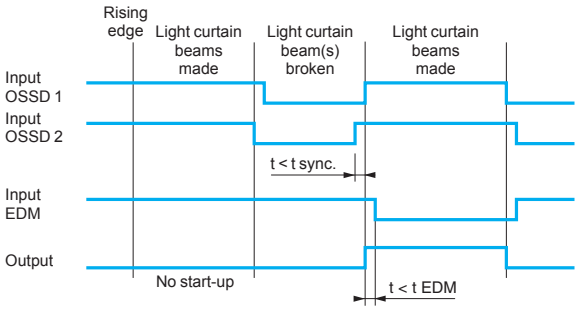


Falling edge monitored start

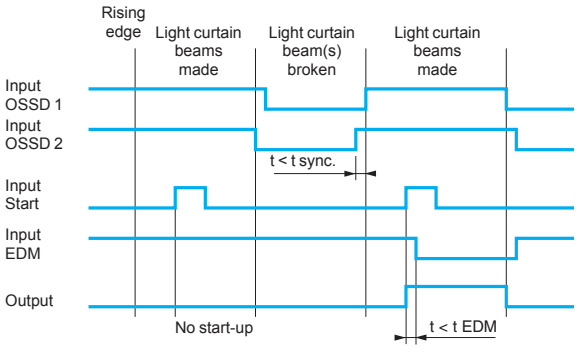


Start test = YES

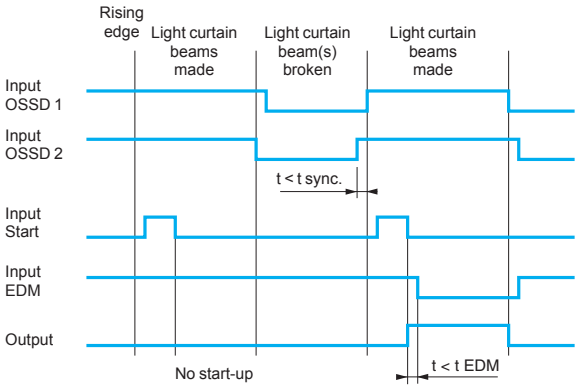
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 ⌐ 1

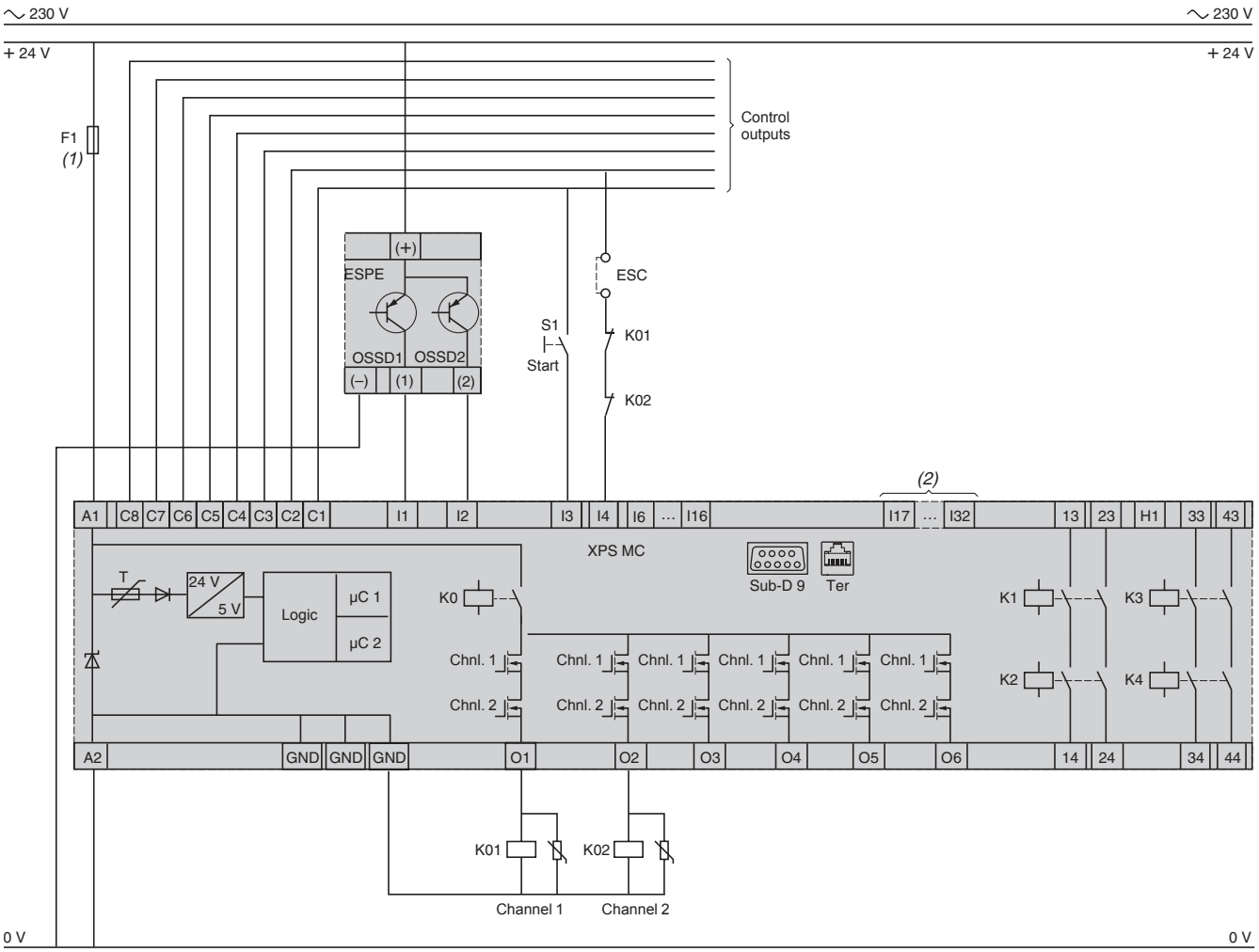
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices
t sync. = synchronization time

2

Light curtain monitoring, solid-state output type

Category 4 conforming to standard EN 954-1.

Wiring diagram



ESC = external start conditions
ESPE = electro-sensitive protection equipment
OSSD1/OSSD2 = output signal switching device

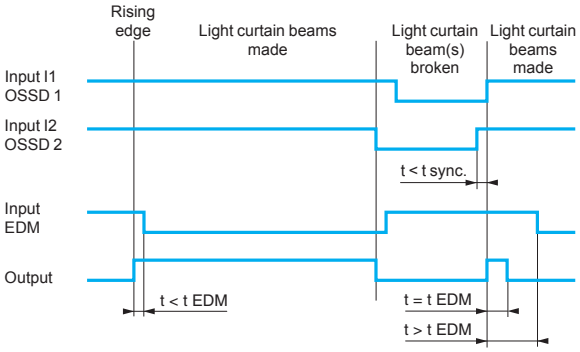
(1) Technical characteristics for maximum rating of fuses, see page2/122.
(2) Only applicable to XPSMC32Z●.

Light curtain monitoring, solid-state output type (continued)

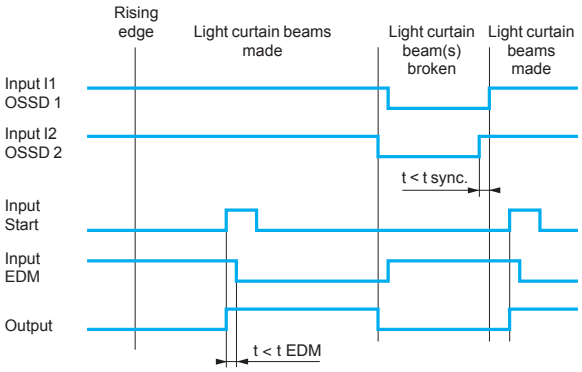
Functional diagrams

Start test = NO

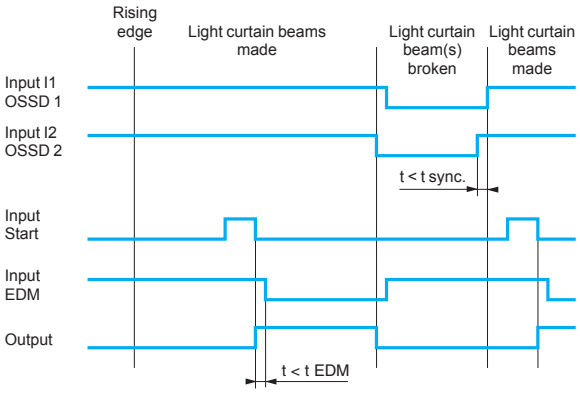
Automatic start



Rising edge monitored start

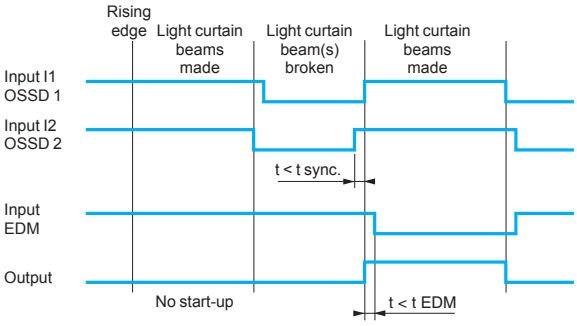


Falling edge monitored start

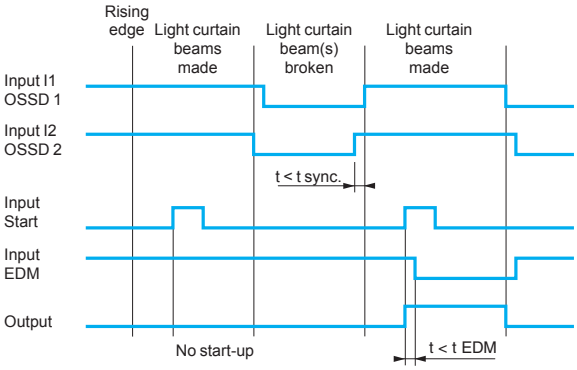


Start test = YES

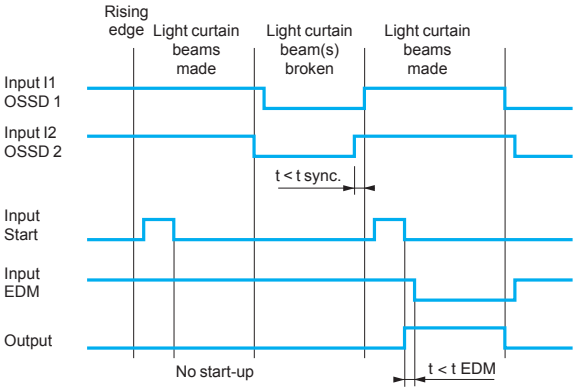
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 — 1

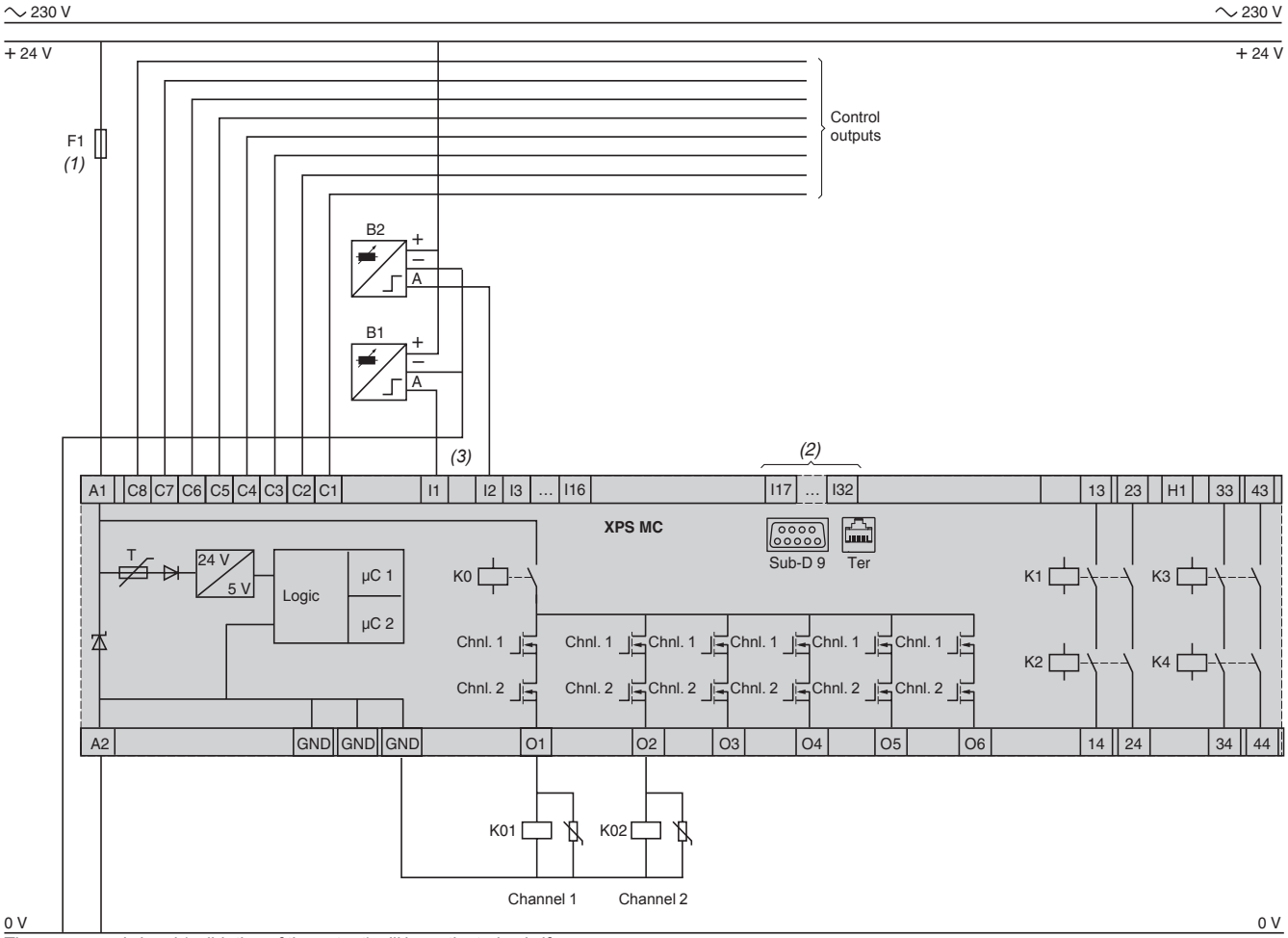
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices
t sync. = synchronization time

2

Zero speed detection

Category 4 conforming to standard EN 954-1.

Wiring diagram

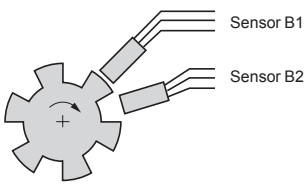


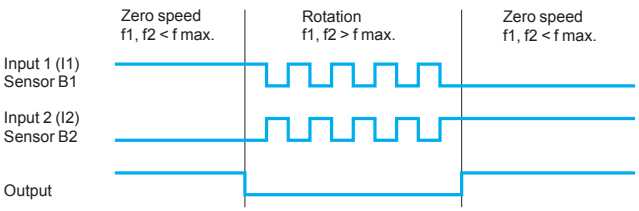
The zero speed signal (validation of the output) will be activated only if:
1: one input is in a high state,
2: the other input is in a low state,
3: the frequency of the two inputs is less than the stated value.

(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.
(3) Only one "Zero speed detection" function can be connected to an XPSMC controller, and only to the inputs i1 and i2.

Functional diagram

Sensor control

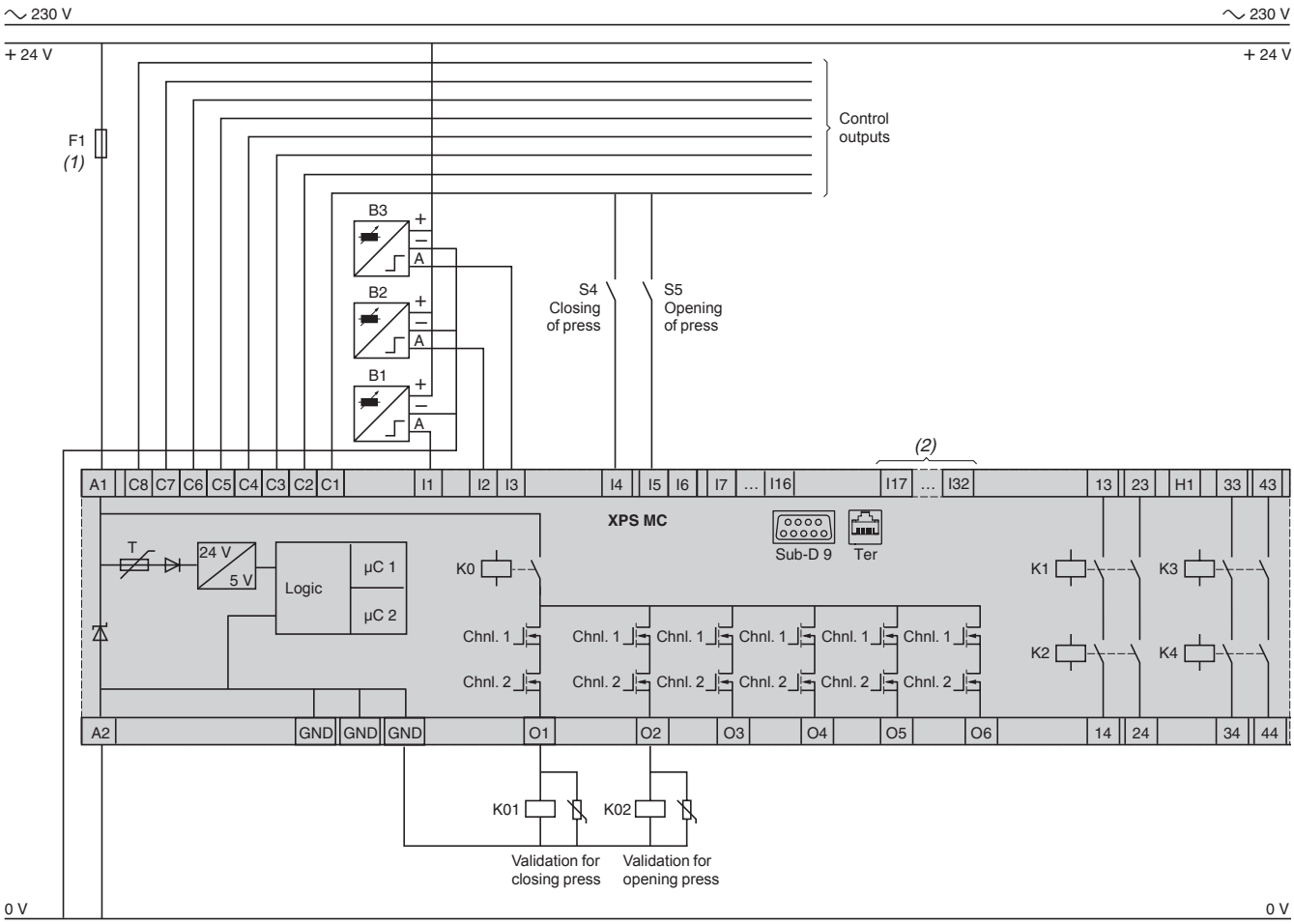




Dynamic monitoring of hydraulic valves on linear presses

Category 4 conforming to standard EN 954-1.

Wiring diagram

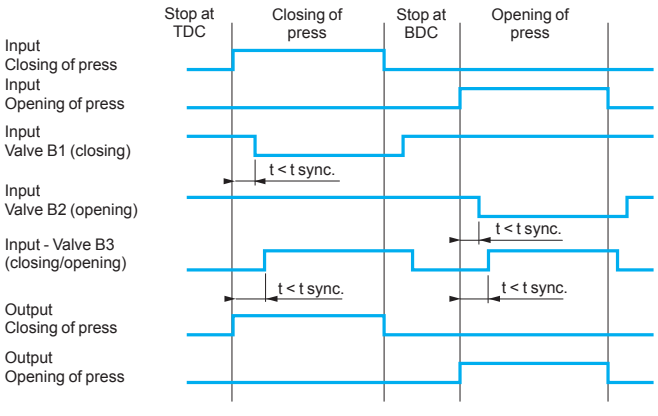


ESC = external start conditions

(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

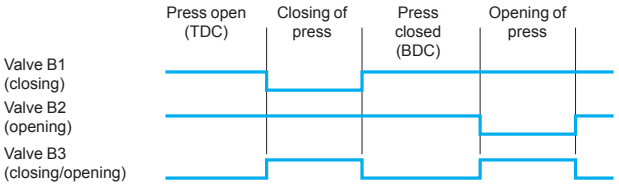
Functional diagrams

Valve control



BDC = Bottom Dead Center
TDC = Top Dead Center
t sync. = synchronization time

Valve sensor signals



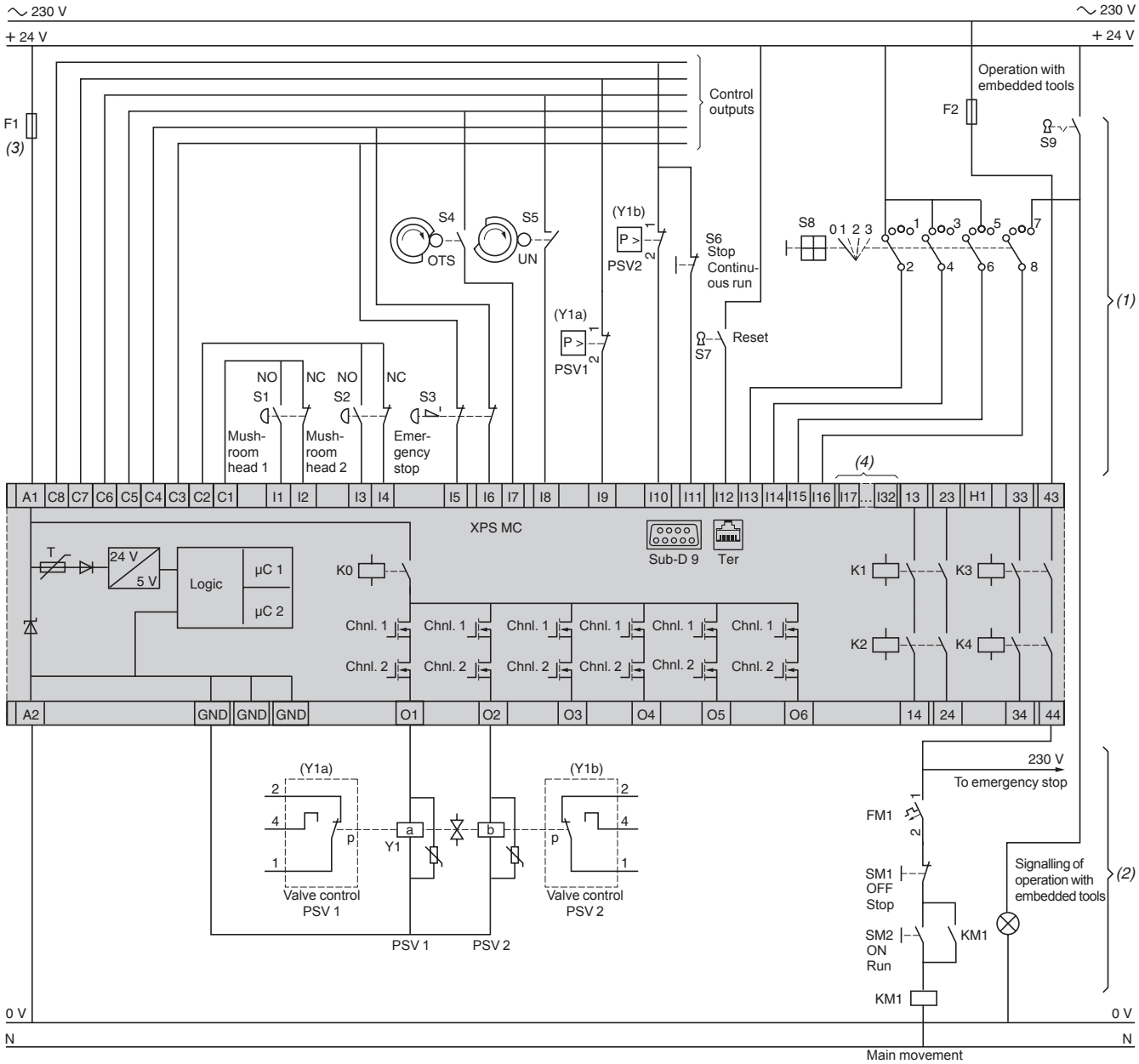
Note: *The valve sensor signals must function as described above.*

Monitoring safety stop at top dead center on eccentric press

- Category 4 conforming to standard EN 954-1.
- This function consists of several monitoring modes including:
  - Safety stop at top dead center *(1)*,
  - monitoring braking travel,
  - as an option, dynamic monitoring of doubled-bodied solenoid valves *(2)*.

2

Wiring diagram

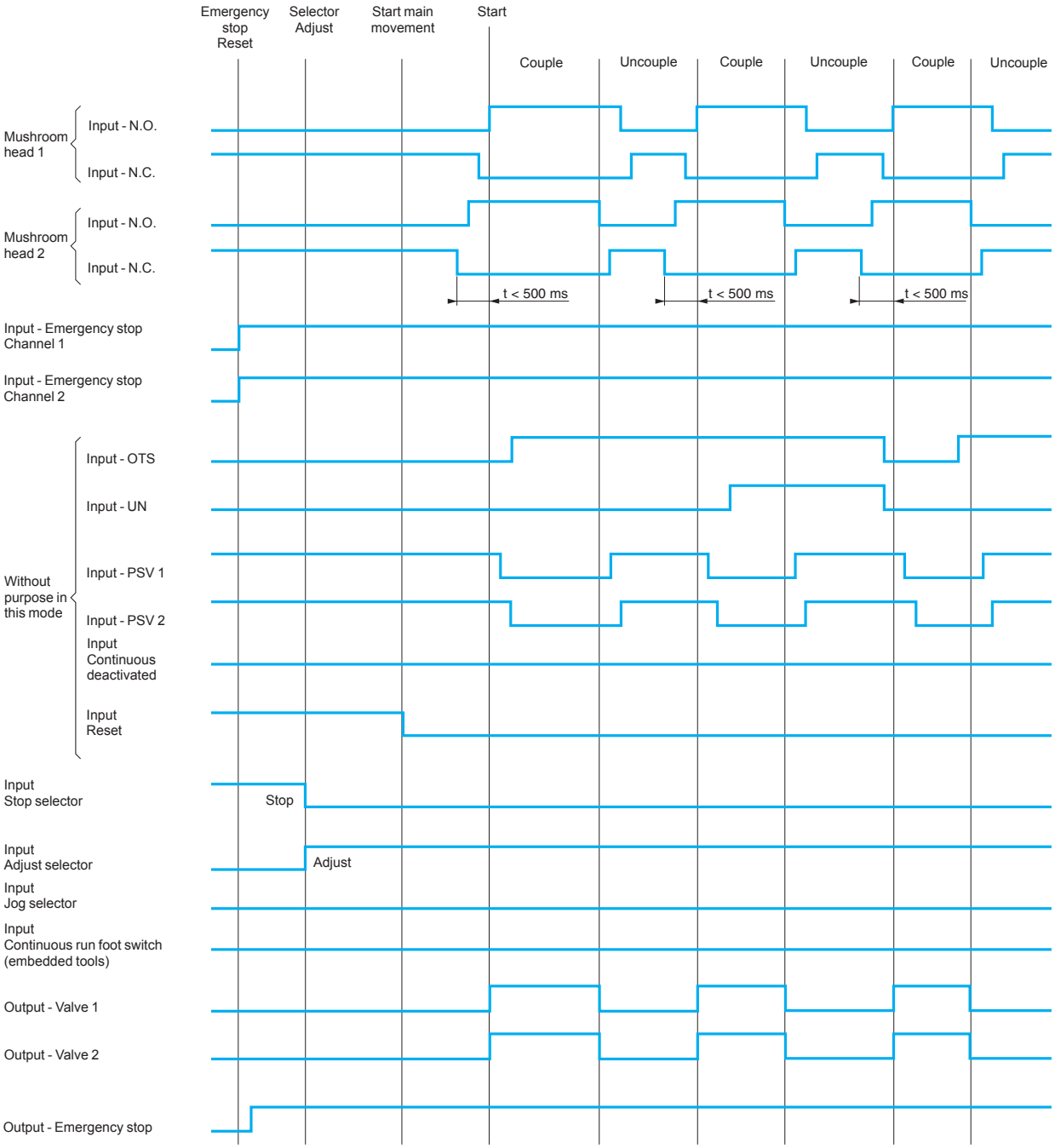


S8: Operating modes:
0 - stop,
1 - adjust,
2 - jog,
3 - automatic continuous run.
OTS = Limit switch associated with top dead center (TDC)
UN = Limit switch associated with bottom dead center (BDC)
PSV = safety valve

(3) Technical characteristics for maximum rating of fuses, see page 2/122.
(4) Only applicable to XPSMC32Z●.

Monitoring safety stop at top dead center on eccentric press (continued)

Functional diagram in adjust mode



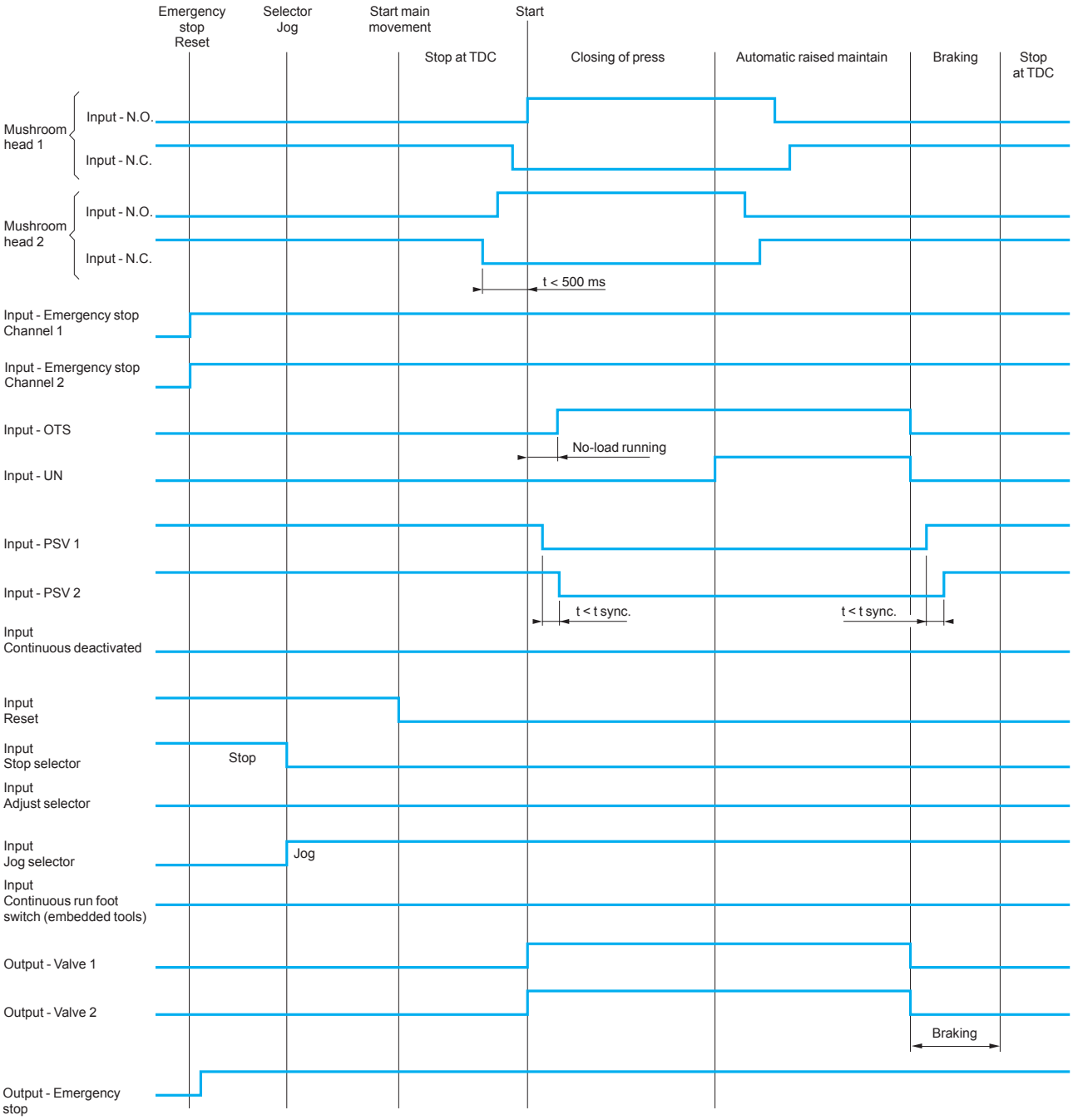
Key 0 — 1

OTS = Limit switch associated with top dead center (TDC)
UN = Limit switch associated with bottom dead center (BDC)
PSV = safety valve
t sync = synchronization time

2

Monitoring safety stop at top dead center on eccentric press (continued)

Functional diagram in jog mode

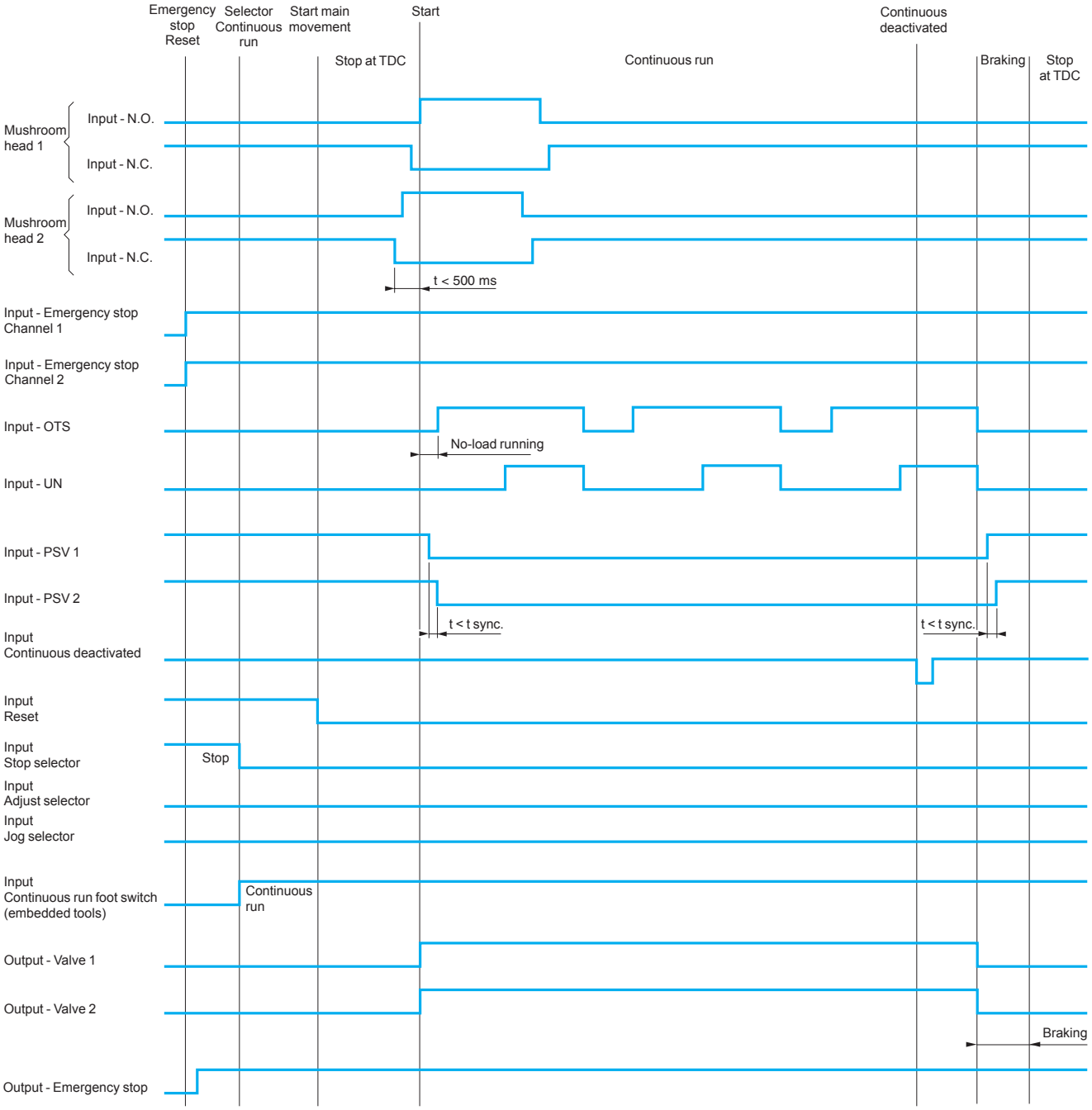


Key 0 — 1

BDC = Bottom Dead Center
TDC = Top Dead Center
OTS = Limit switch associated with top dead center (TDC)
UN = Limit switch associated with bottom dead center (BDC)
PSV = safety valve
t sync = synchronization time

Monitoring safety stop at top dead center on eccentric press (continued)

Functional diagram in automatic continuous run mode



Key 0 1

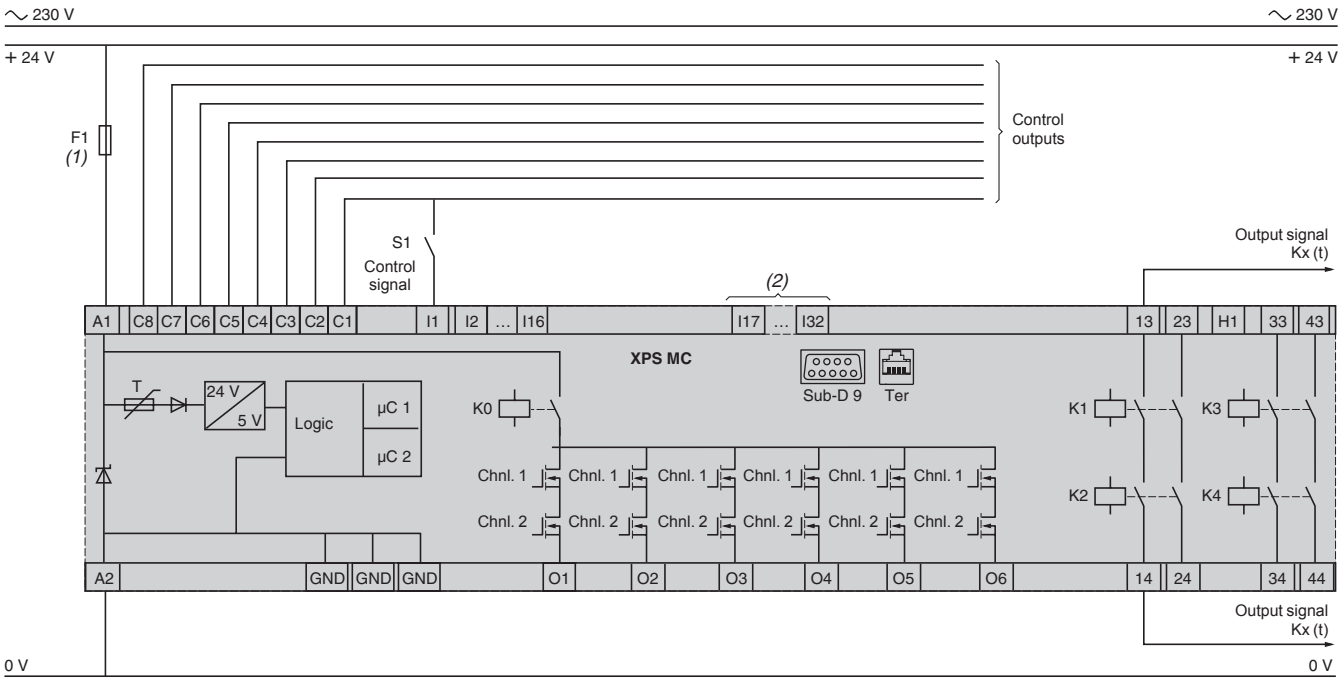
BDC = Bottom Dead Center
TDC = Top Dead Center
OTS = Limit switch associated with top dead center (TDC)
UN = Limit switch associated with bottom dead center (BDC)
PSV = safety valve
t sync = synchronization time

2

Safety time delays

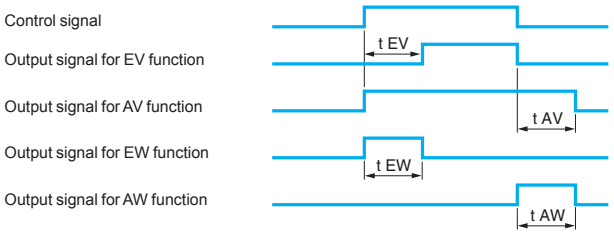
Category 4 conforming to standard EN 954-1.

Wiring diagram



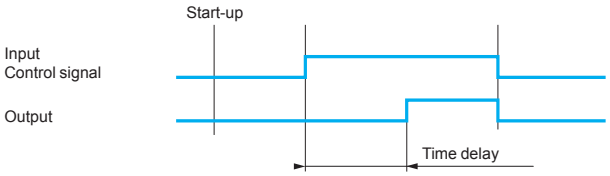
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Functional diagrams

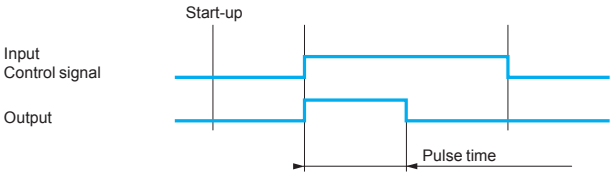


Functions:
EV = On-delay
AV = Off-delay
EW = Pulse on energization
AW = Pulse on de-energization

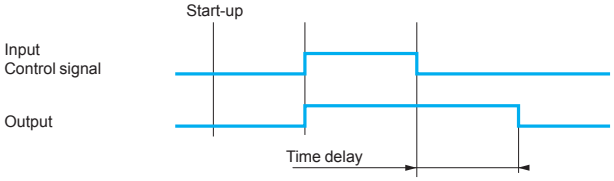
On-delay



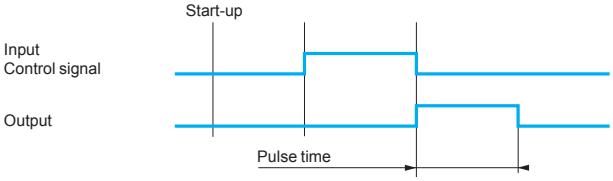
Pulse on energization



Off-delay



Pulse on de-energization

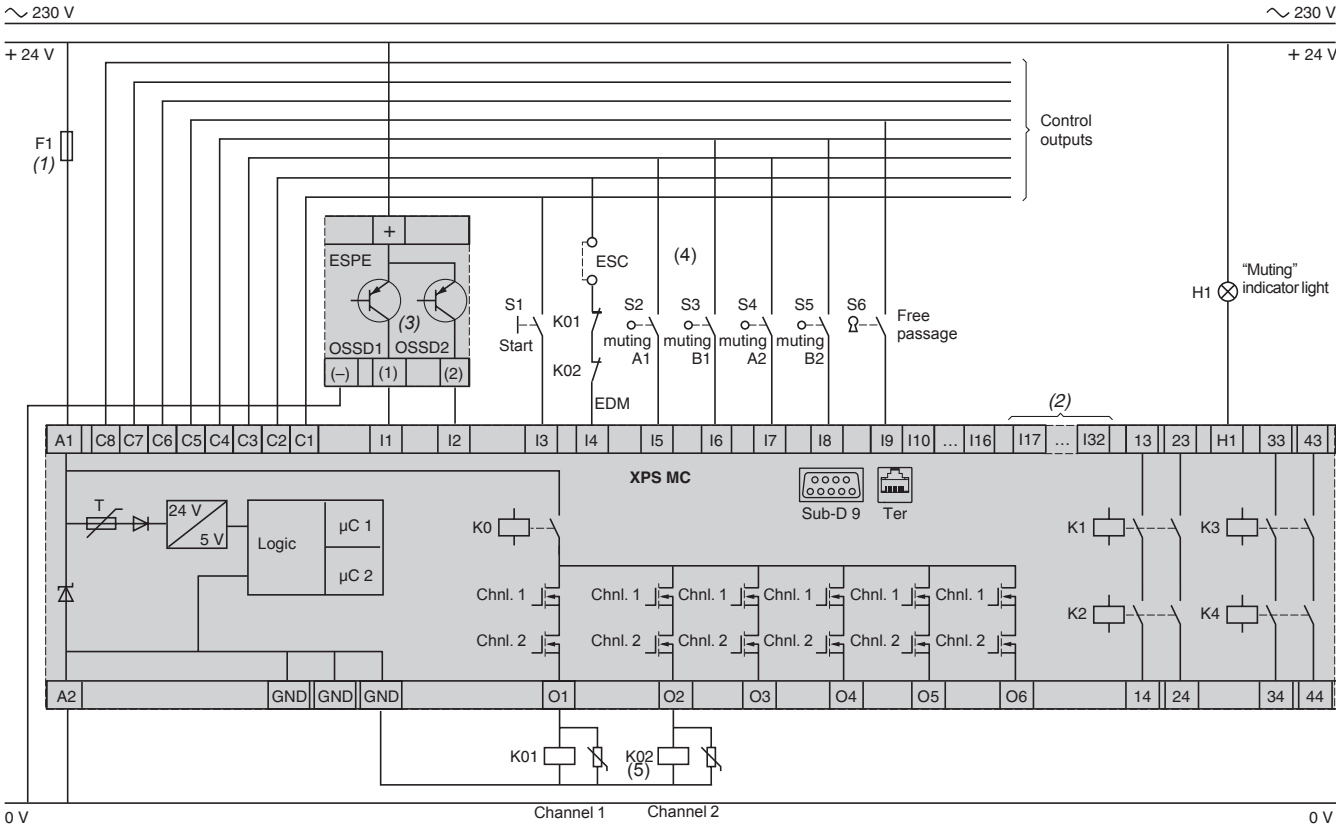


Key 0 1

"Muting" function for light curtains

Category 4 conforming to standard EN 954-1.

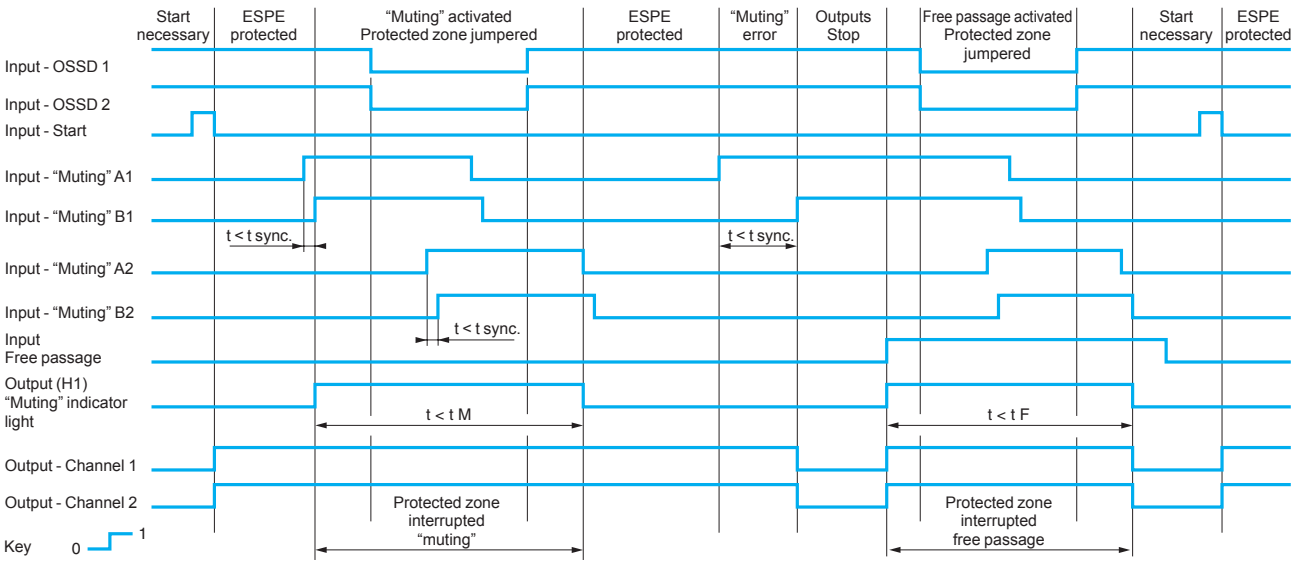
Wiring diagram



ESC = external start conditions
EDM = external devices monitoring
ESPE = electro-sensitive protection equipment
OSSD1/OSSD2 = output signal switching device

(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.
(3) A light curtain with relay outputs can also be used with the "Muting" function.
(4) Only one "Muting" function can be connected to an XPSMC controller.
(5) Example using 2 safety outputs to control 2 contactors linked to one safety function.

Functional diagram



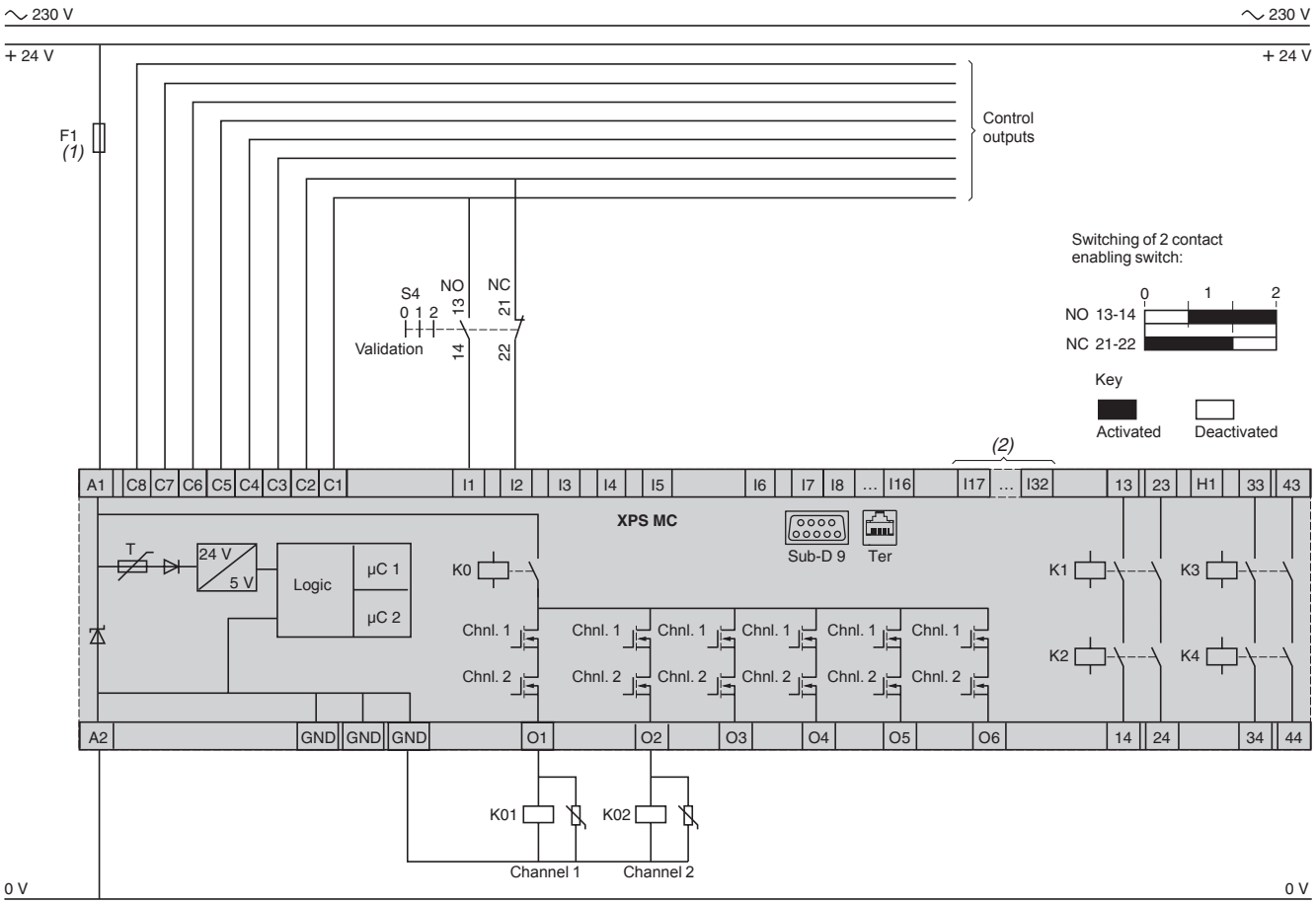
tM = "Muting" time
tF = free passage activation time
t sync. = synchronization time

2

Enabling switch monitoring, 2 contact type

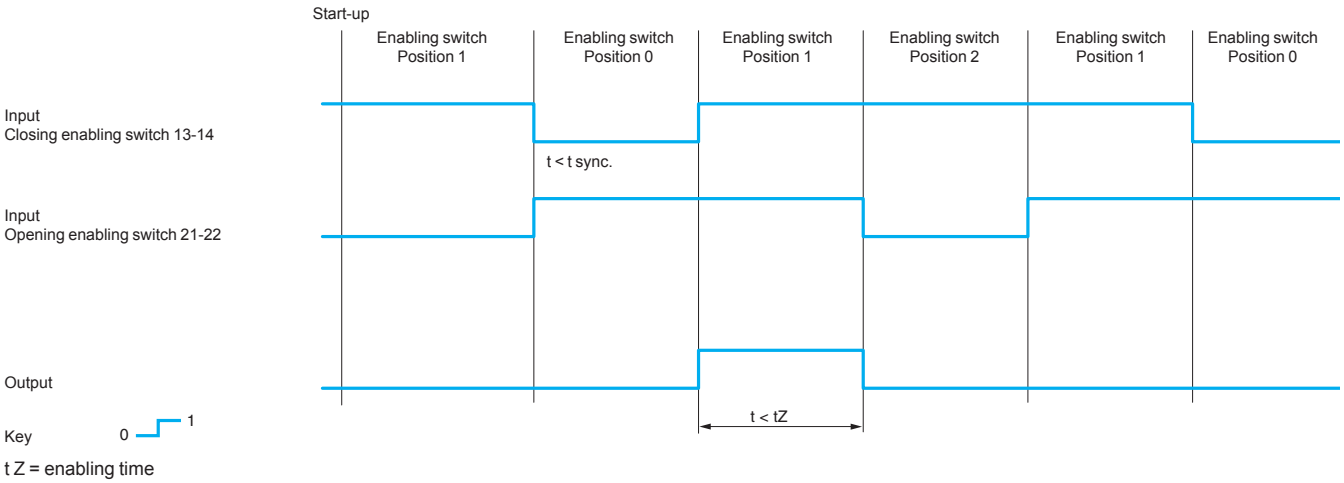
Category 1 conforming to standard EN 954-1.

Wiring diagram



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Functional diagram

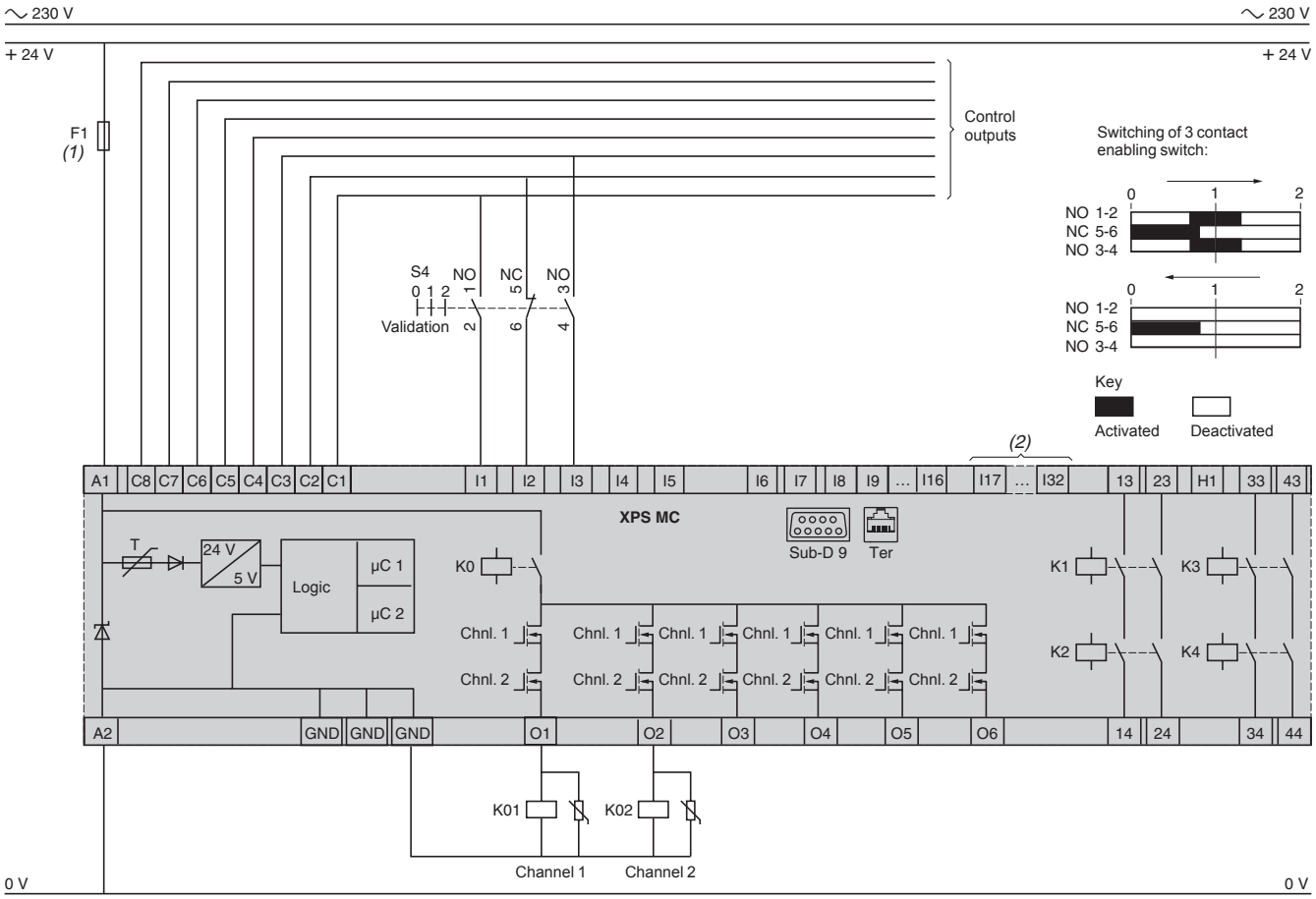


t Z = enabling time

Enabling switch monitoring, 3 contact type

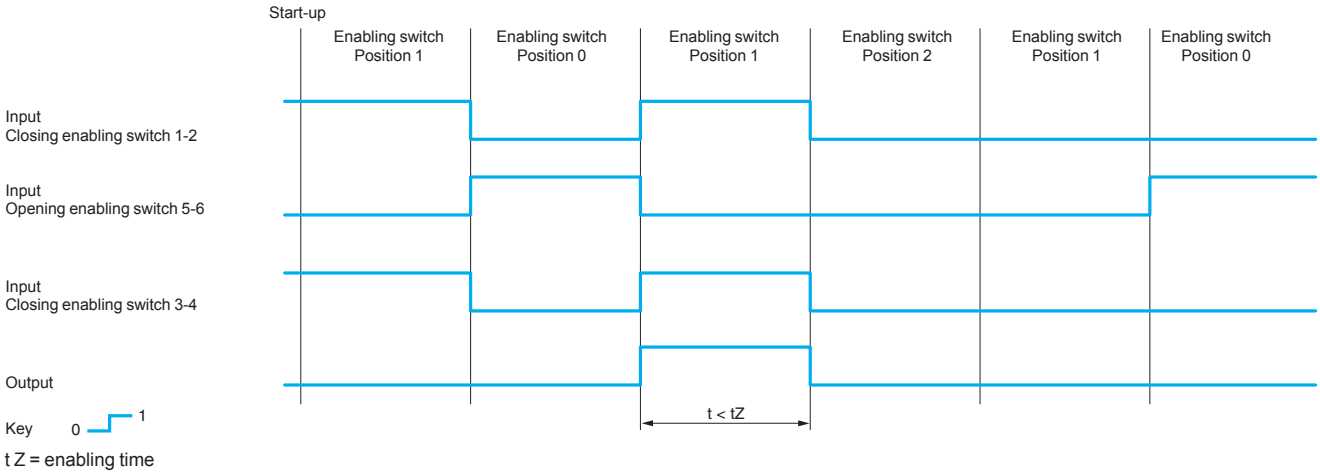
Category 4 conforming to standard EN 954-1.

Wiring diagram



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Functional diagram



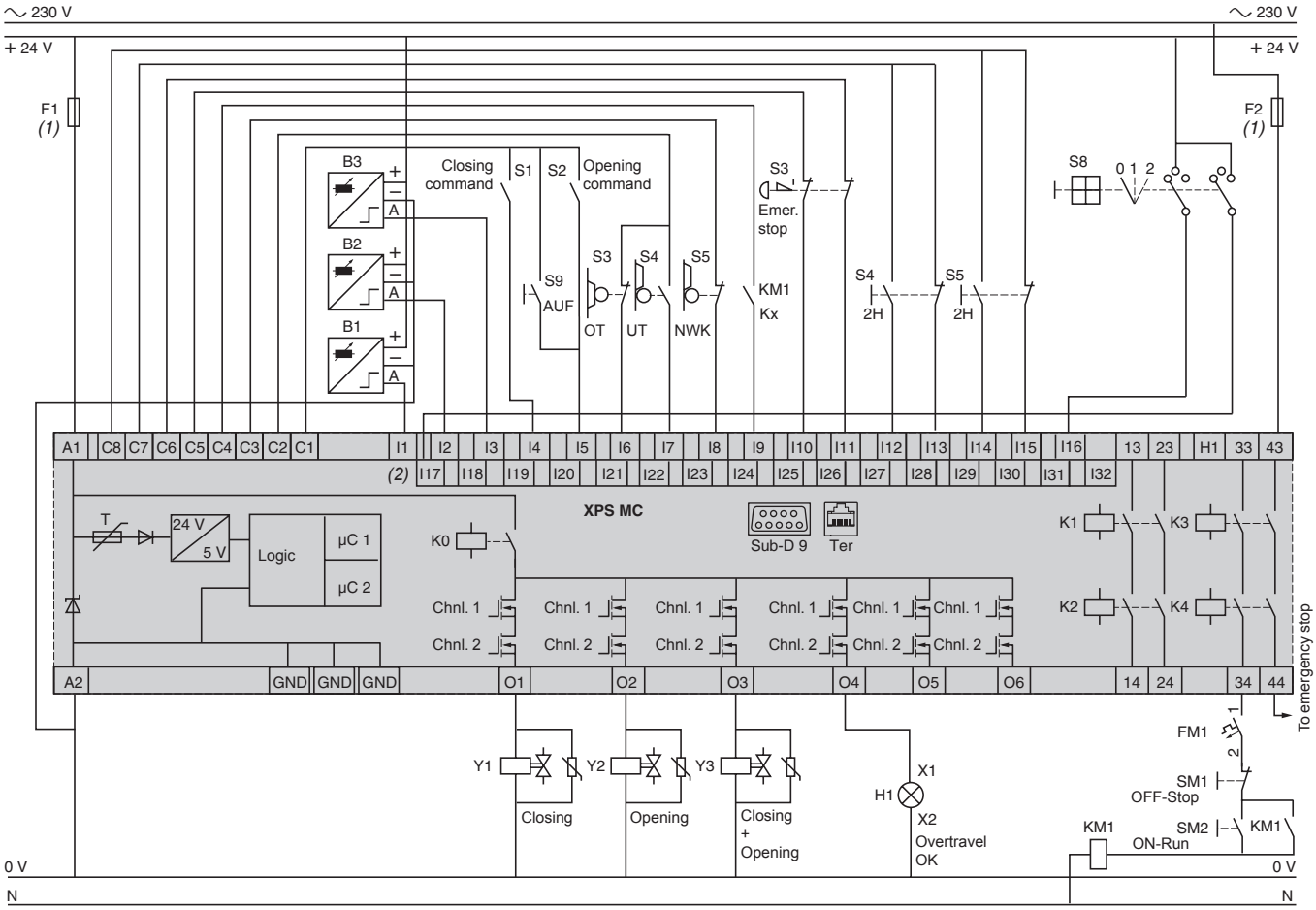
t Z = enabling time

2

Hydraulic press

Category 4 conforming to standard EN 954-1.

Wiring diagram



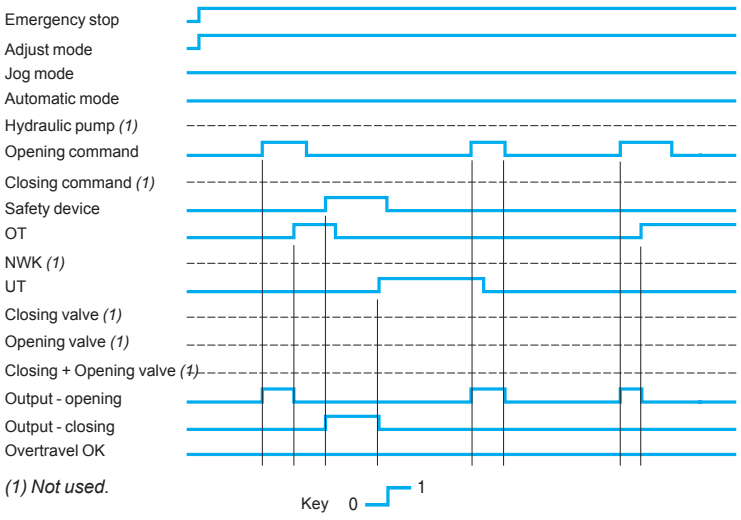
S8: Operating modes:
0 - stop,
1 - adjust,
2 - jog.

AUF = open, to be used in inching.
OT = Limit switch associated with top dead center (TDC).
UT = Limit switch associated with bottom dead center (BDC).
NWK = overtravel monitoring.

(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z● (I17…I32).

Functional diagram

Hydraulic press, adjust mode

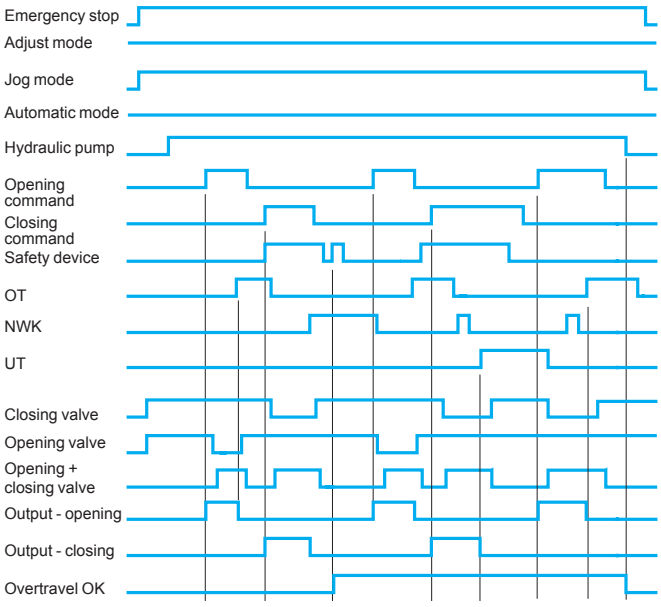


(1) Not used.

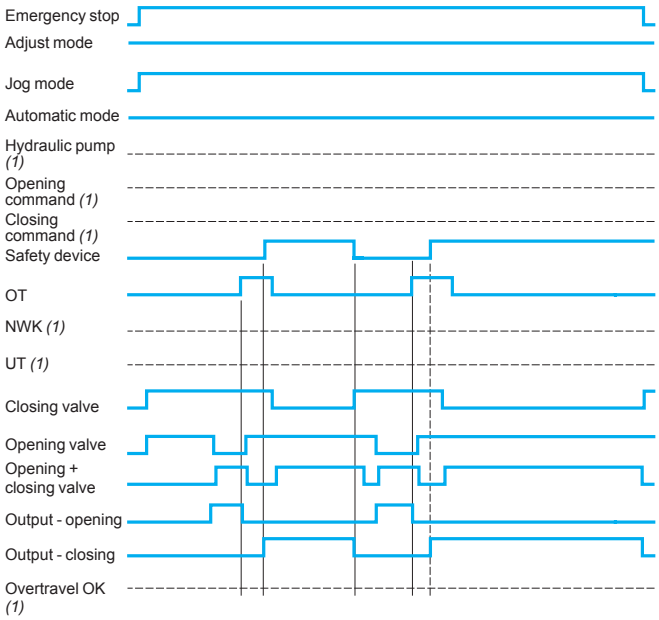
Hydraulic press

Functional diagrams *(continued)*

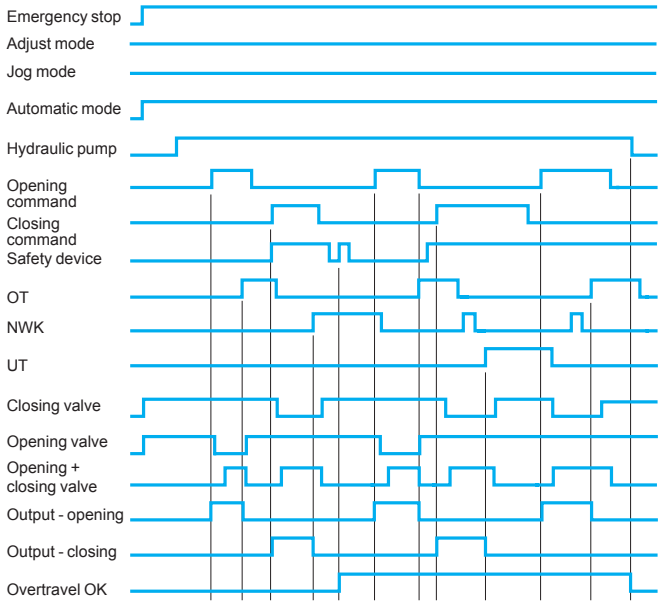
Hydraulic press, mode = jog, with overtravel monitoring and opening and closing control coming from the automation platform



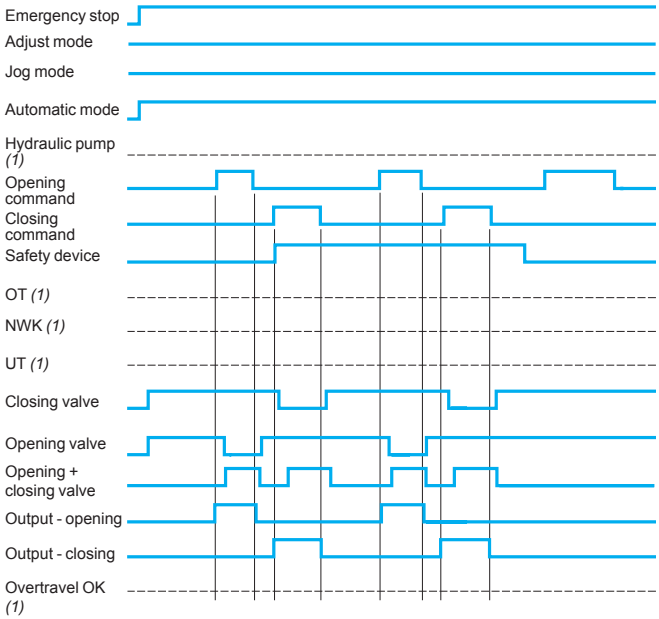
Hydraulic press, mode = jog



Hydraulic press, mode = automatic, with overtravel monitoring and opening and closing control coming from the automation platform



Hydraulic press, mode = automatic



Key 0 1

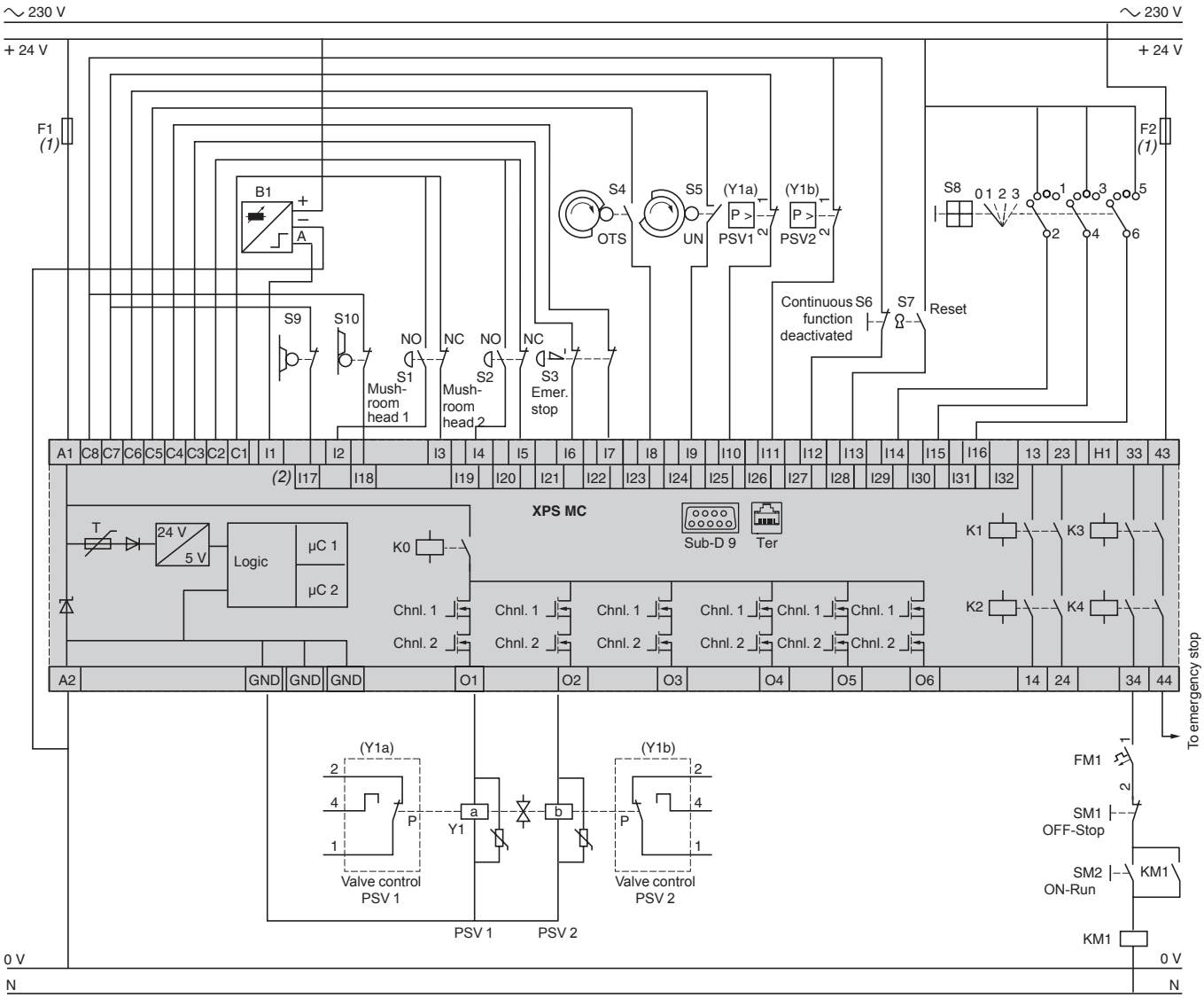
(1) Not used.

2

Eccentric press

Category 4 conforming to standard EN 954-1.

Wiring diagram

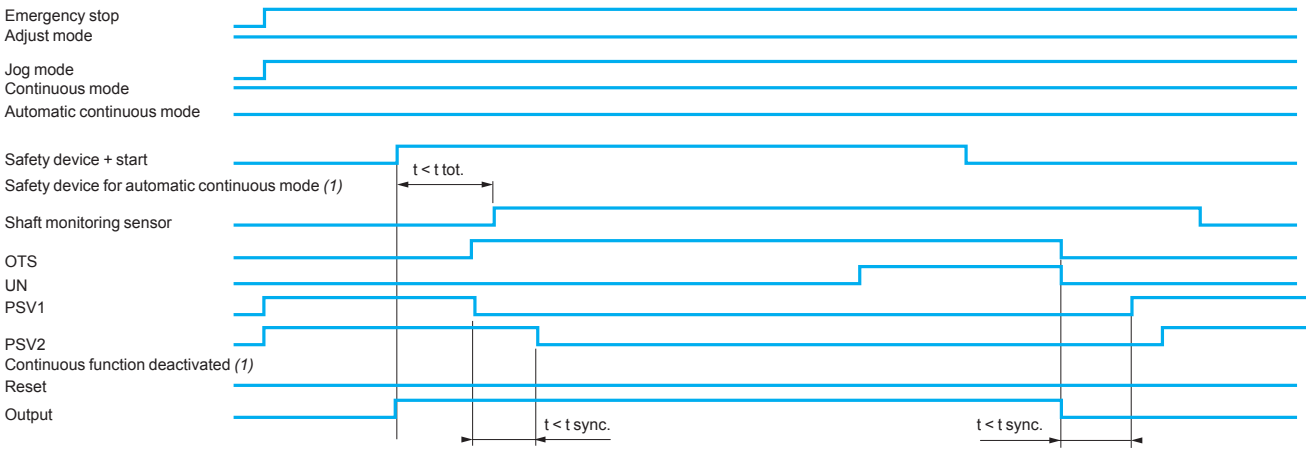


S8: Operating modes:
0 - stop,
1 - adjust,
2 - jog,
3 - automatic continuous run.
OTS = Limit switch associated with top dead center (TDC)
UN = Limit switch associated with bottom dead center (BDC)
PSV = safety valve
B1 = sensor at tooth wheel in cam switch mechanism.
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z● (I17…I32).

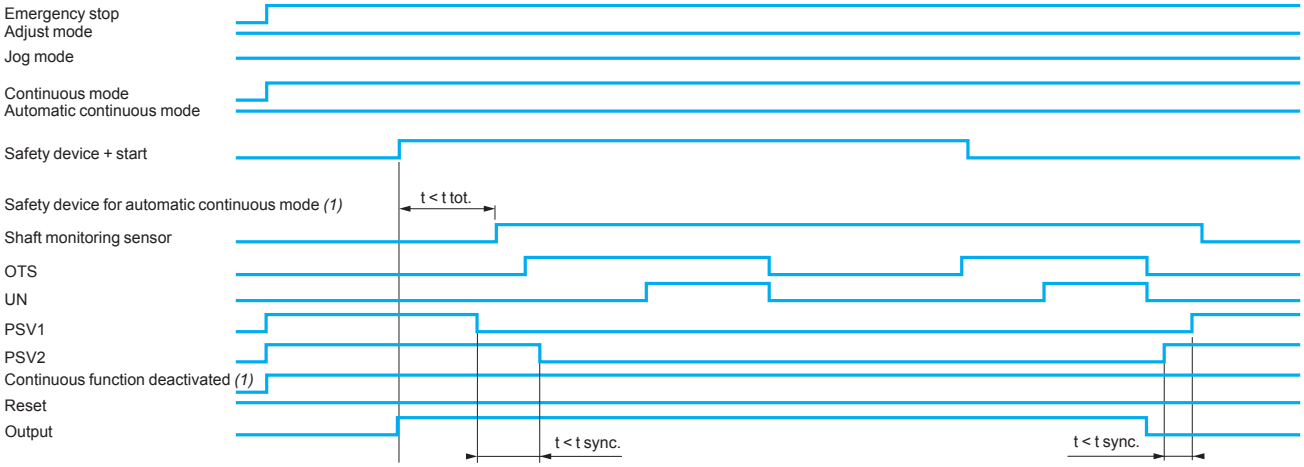
Eccentric press (continued)

Functional diagrams

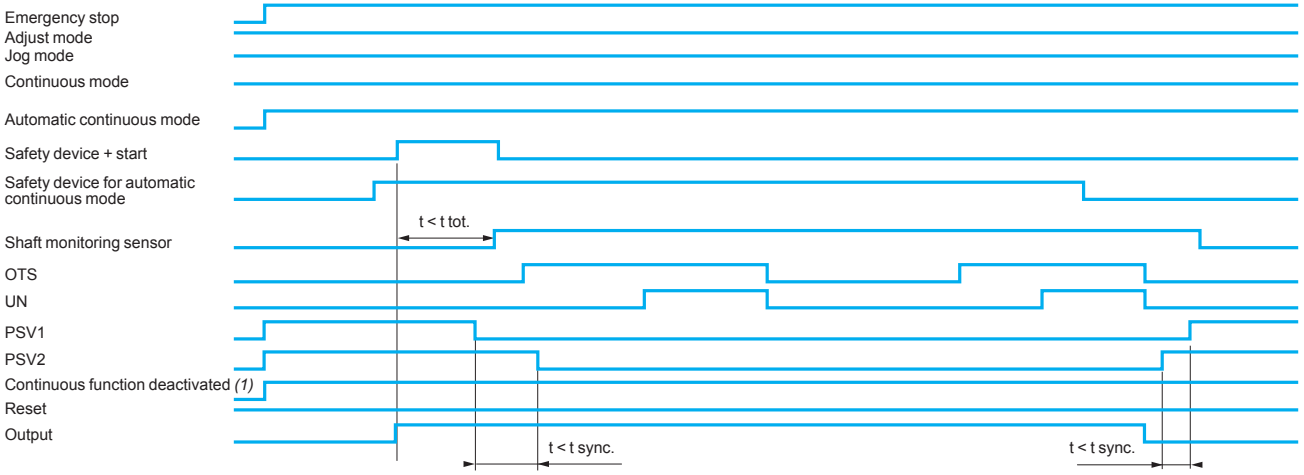
Eccentric press: Jog



Eccentric press: Continuous



Eccentric press: automatic continuous



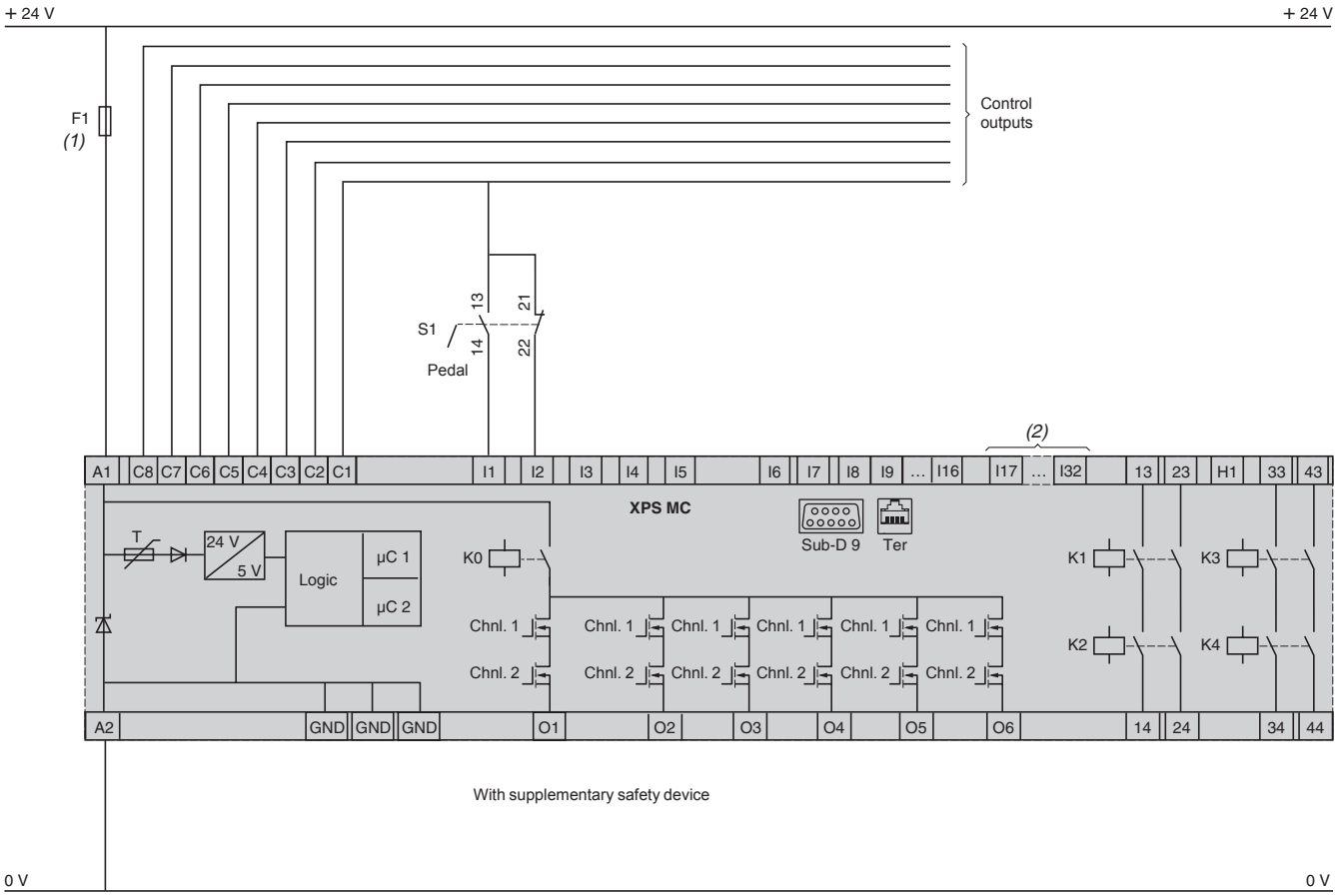
Key 0 — 1

t sync. = synchronization time
t tot. = dead time
(1) Not used.

2

Foot switch monitoring

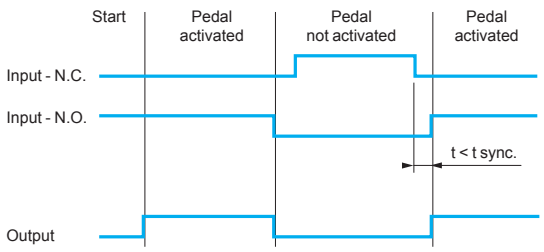
Wiring diagram



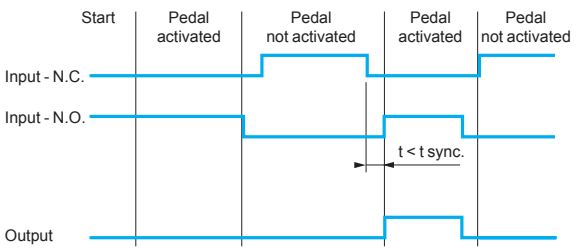
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Functional diagrams

Without start interlock



With start interlock

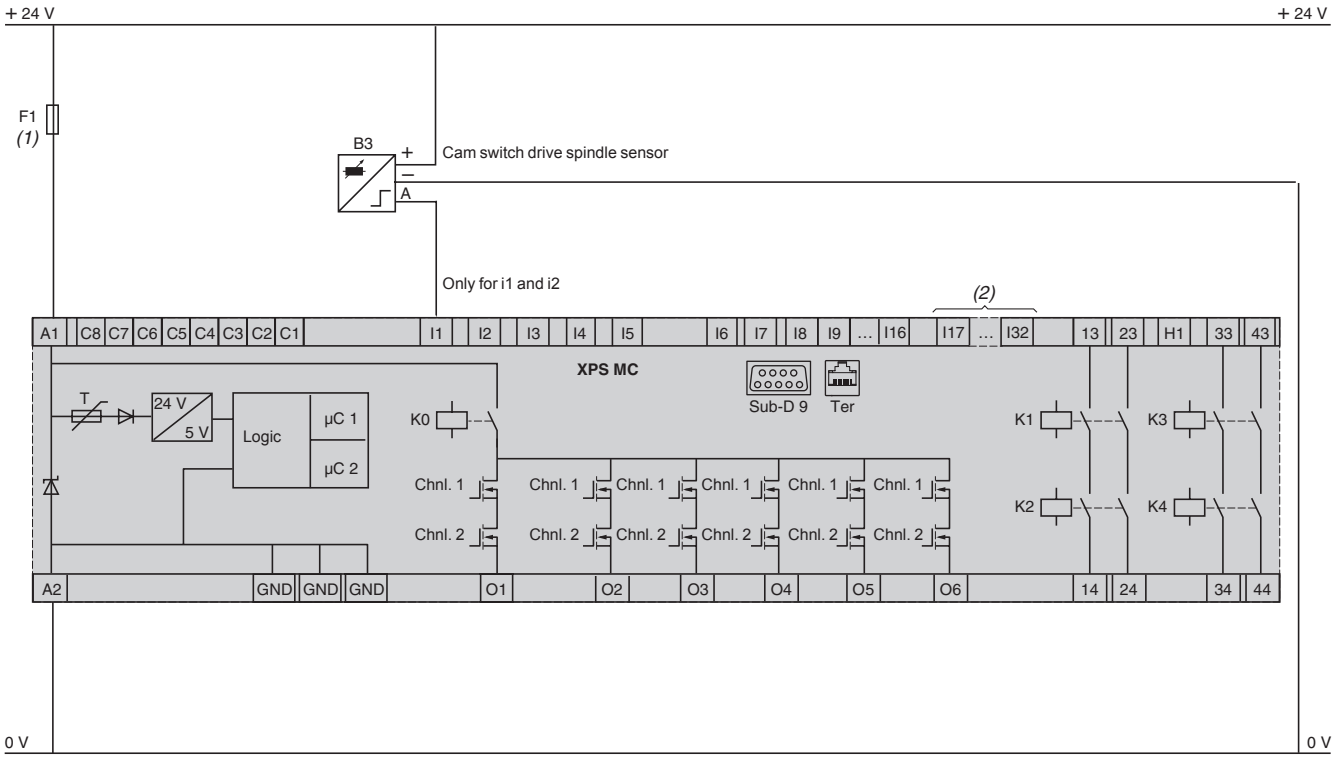


Key 0 1

t sync. = synchronization time

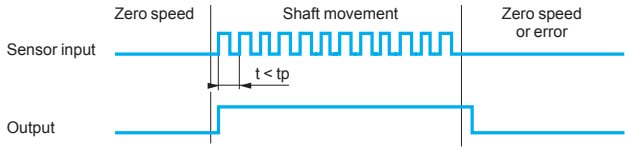
Chain shaft breakage monitoring

Wiring diagram



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Functional diagrams



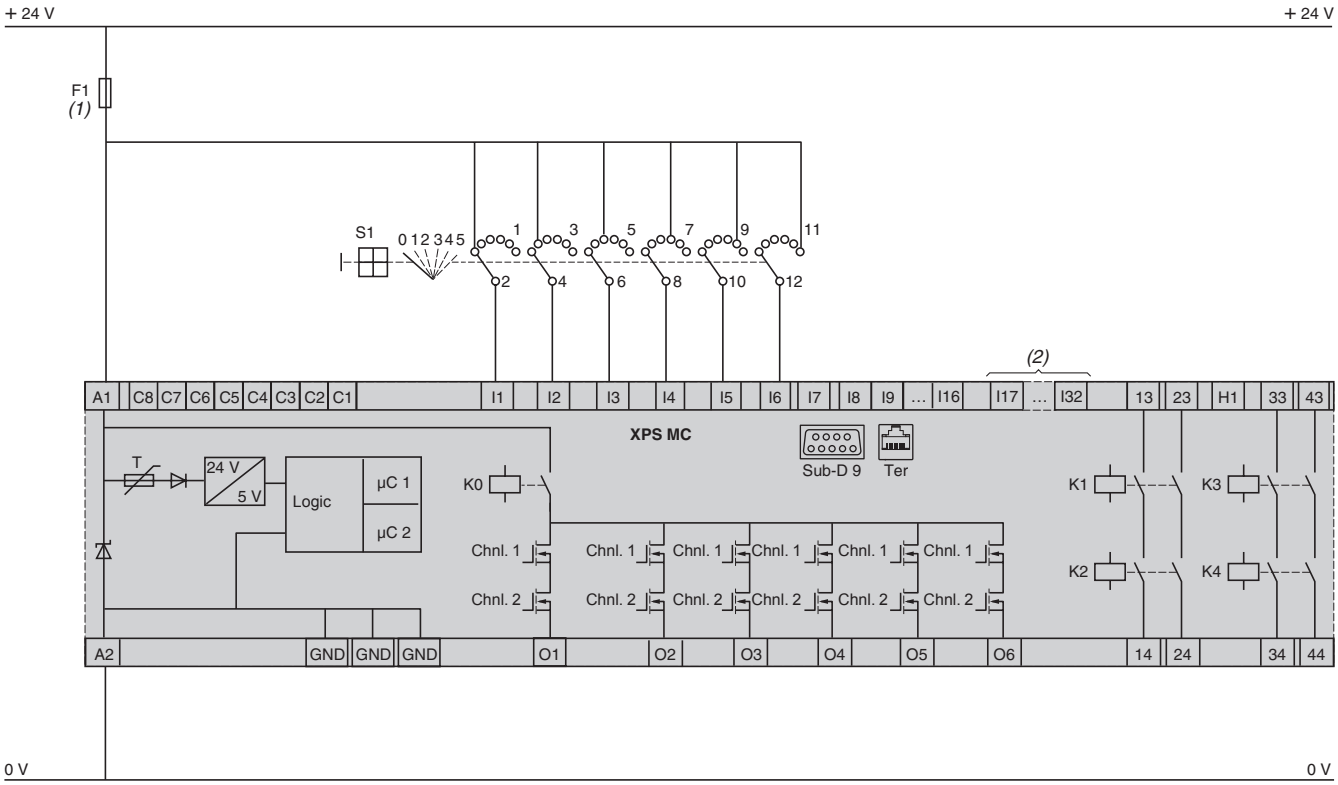
Key 0 1

tp = pulse time

2

Position selector

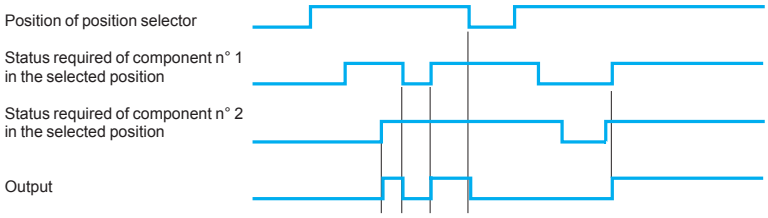
Wiring diagram

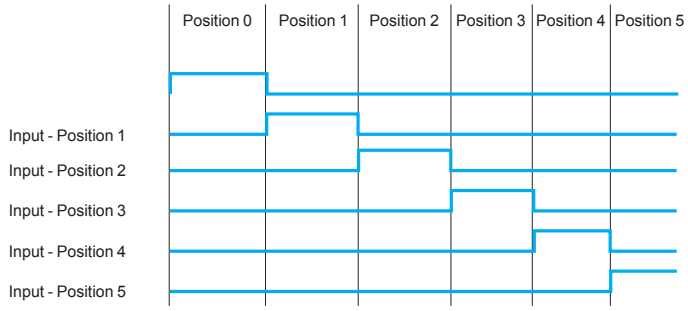


(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPSMC32Z●.

Position selector (continued)

Functional diagrams

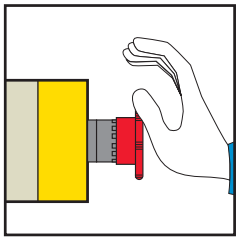
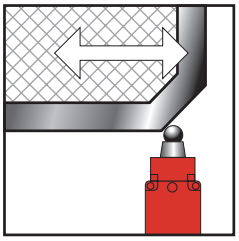
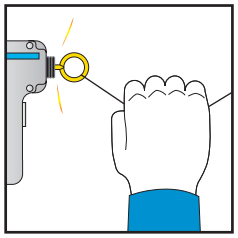




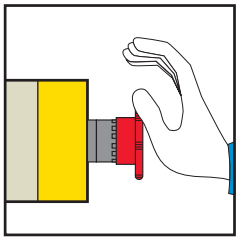


Safety automation system solutions
Preventa™ safety relay modules

Applications

Modules	For Emergency stop and switch monitoring		
			
Conformity to standards	EN 954-1 - category 3/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN ISO 13850, EN/IEC 60947-1 + A11, EN/IEC 60947-5-1	EN 954-1 - category 4/EN/ ISO 13849-1, (instantaneous contacts) EN 954-1 - category 3/ ISO 13849-1 (time delay contacts), EN/IEC 60204-1, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2	EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, DIN V VDE 801 + A1, EN/ISO 13850, EN 1088/ISO 14119, EN/IEC 60947-1 A11, EN/IEC 60947-5-1
Product certifications	UL, CSA, BG	UL, CSA, BG	UL, CSA, BIA
Number of circuits			
Safety	3 N.O.	2 N.O. instantaneous + 3 N.O. time delay	3 N.O. instantaneous + 3 N.O. time delay
Additional	1 solid-state output for signalling to PLC	4 solid-state output for signalling to PLC	3 solid-state outputs for signalling to PLC
Display	2 LEDs	4 LEDs	11 LEDs
Supply voltage	∿ and ⎓ 24 V ∿ 48 V ∿ 115 V ∿ 230 V	∿ and ⎓ 24 V ∿ 115 V ∿ 230 V	⎓ 24 V
Synchronization time between inputs	Unlimited	75 ms (automatic start)	Unlimited or 1.5 s (depending on wiring)
Input channel voltage			
24 V/48 V version	∿ and ⎓ 24 V/∿ 48 V	⎓ 24 V/–	⎓ 24 V/–
24 V/48 V or 110 V/120 V/230 V version	∿ 115 V/230 V –	∿ 48 V/48 V –	– –
Module type	**XPSAC**	**XPSATE**	**XPSAV**
Pages	2/175	2/180	



For Emergency stop and switch monitoring



EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2

UL, CSA, BG

3 N.O.

–

3 LEDs

∿ and ⎓ 24 V

Unlimited

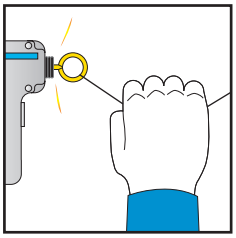
⎓ 24 V/–

–

–

XPSAF

2/187



For Emergency stop, switch or solid-state output light curtain monitoring

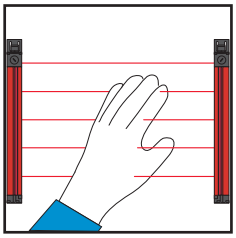


EN 954-1 - category 3, EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2 EN/IEC 61496-1 (type 4) Category 4 for the monitoring of light curtains type 4 with solid state outputs and test function

UL, CSA, BG

XPSAFL

2/191





EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN/ISO 13850, EN/IEC 60947-1, EN/IEC 60947-5-1

UL, CSA, BG

7 N.O.

2 N.C. + 4 solid-state outputs for signalling to PLC

4 LEDs

∿ and ⎓ 24 V
∿ 115 V and ⎓ 24 V
∿ 230 V and ⎓ 24 V

⎓ 24 V/–

∿ 24 V/24 V
–

XPSAR

2/195



For Emergency stop, switch, sensing mat/edges or solid-state output light curtain monitoring



EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN/ISO 13850, EN/IEC 60947-5-1, EN/ISO 13850, EN/IEC 60947-1 + A11

UL, CSA, BG

3 N.O. instantaneous

1 N.C. + 4 solid-state outputs for signalling to PLC

4 LEDs

∿ and ⎓ 24 V
∿ 48 V
∿ 110 V and ⎓ 24 V
∿ 120 V and ⎓ 24 V
∿ 230 V and ⎓ 24 V

Unlimited or 2 s, 4 s (depending on wiring)

⎓ 24 V/–

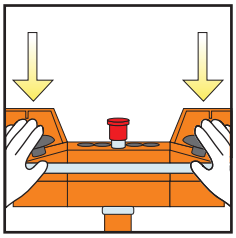
–
⎓ 24 V/24 V/24 V

XPSAK

2/201

2

Applications



Modules	**For electrical monitoring of two-hand control stations**	
		
Conformity to standards	EN 954-1 - category 1/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1, EN 574 type III A/ISO 13851, EN 50082-2	EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1, EN 574 type III C/ISO 13851, EN 50082-2
Product certifications	UL, CSA	UL, CSA, INRS
Number of circuits		
Safety	1 N.O.	2 N.O.
Additional	1 N.C.	1 N.C.
Display	2 LEDs	3 LEDs
Supply voltage	∿ and ⎓ 24 V ∿ 115 V ∿ 230 V	⎓ 24 V ∿ 24 V ∿ 115 V ∿ 230 V
Synchronization time between inputs	500 ms	500 ms
Input channel voltage		
24 V/48 V version	⎓ 24 V/–	⎓ 24 V (⎓ 24 V) ⎓ 48 V (∿ 24 V)
115 V/230 V version	∿ 24 V/24 V	∿ 48 V/48 V
Module type	**XPSBA**	**XPSBC**
Pages	2/209	



EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 60204-1, EN 574 type III C/ISO 13851, EN/IEC 60947-1, EN/IEC 60947-5-1, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)
UL, CSA, BIA

2 N.O.
2 solid-state outputs for signalling to PLC
3 LEDs
⎓ 24 V

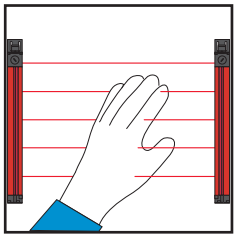
500 ms
⎓ 24 V/–
–

XPSBF

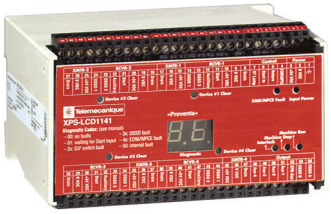
2/209

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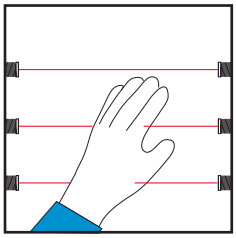
Applications

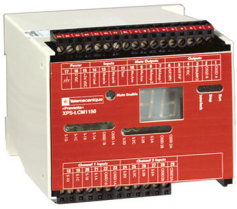


Modules		**For monitoring 2 to 4 type 2 and type 4 light curtains (transmitter-receiver pair)**

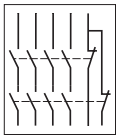


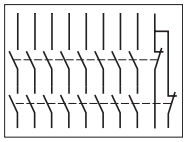
Functions		Protects access to a hazardous zone by associating the module with 2 to 4 light curtains type XUSL
	Built-in “muting” function	No
Conformity to standards		EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 61496-1, EN/IEC 61496-2
Product certifications		UL, CSA, TÜV
Number of circuits		
	Safety	2 solid-state PNP (N.O.)
	Additional	1 PNP N.O. + 1 NPN N.O. output for signalling to PLC
Display		9 LEDs + 2-digit display
Supply voltage		⎓ 24 V
Module type		**XPSLCD**
Pages		2/215



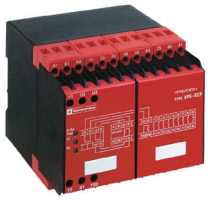
For control of 1 to 4 single-beam photo-electric sensors XU2 S (transmitter-receiver pair)	For monitoring type 4 light curtains Compact and slim ranges
	
Protects access to a hazardous zone by associating the module with 1 to 4 single-beam photo-electric sensors	Protects access to a hazardous zone by associating the module with light curtains XUSL
	2 transmitter-receiver pairs
Yes	Yes
EN 954-1 - category 2/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 61496-1, EN/IEC 60947-5-1, EN/IEC 60947-1	EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 61496-1, EN/IEC 61496-2
UL, CSA, BIA	UL, CSA, TÜV
2 N.O.	2 solid-state
4 solid-state PNP N.O. outputs for signalling to PLC	1 PNP + 1 NPN output for signalling to PLC
4 LEDs	14 LEDs + 2-digit display
⎓ 24 V	
XPSCM	**XPSLCM**
3/134	2/220

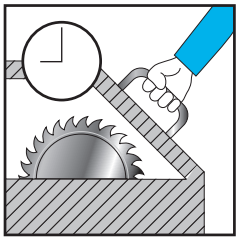
Applications

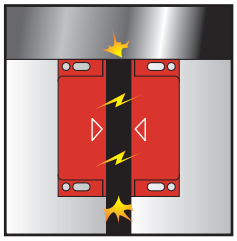




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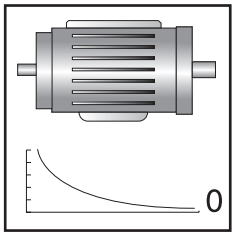
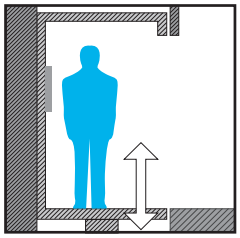
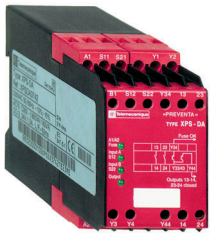
Modules	**For increasing the number of safety contacts**	
		
Functions	Allows additional safety contacts to be added to another module	
Conformity to standards	EN 954-1 - category 4/EN/ISO 13849-1 (when connected to the appropriate module), EN/IEC 60204-1, EN/IEC 60947-5-1	EN 954-1 - category 4/EN/ISO 13849-1 (when connected to the appropriate module), EN/IEC 60204-1, EN/IEC 60947-5-1
Product certifications	UL, CSA	UL, CSA
Number of circuits		
Safety	4 N.O.	8 N.O.
Additional	1 N.C. + 1 solid-state output for signalling to PLC	
Display	3 LEDs	
Supply voltage	∼ and ⎓ 24 V ∼ 115 V ∼ 230 V	
Module type	**XPSECM**	**XPSECP**
Pages	2/227	

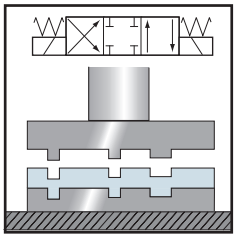




For the monitoring of applications requiring safety time delays		For non-contact (coded magnetic) switch monitoring	
		For 2 max.	For 6 max.
			
Unlocking of guards after a safety time delay for machines with long rundown time	Jumpering contact in association with XPSVNE modules for zero speed detection, solenoid valve monitoring, etc.	For monitoring 2 to 6 coded switches, depending on model	
EN 954-1 - category 3/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1	EN 954-1 - category 3/EN/ ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1	EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/IEC 60947-5-3, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)	EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/IEC 60947-5-3, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)
UL, CSA, BG	UL, CSA, BG	UL, CSA, BIA	UL, CSA, BIA
1 N.O. time delayed	1 N.O. pulse type	2 N.O.	
2 N.C. + 2 solid-state outputs for signalling to PLC		2 solid-state outputs for signalling to PLC	
4 LEDs		3 LEDs	15 LEDs
∼ and ⎓ 24 V ∼ 115 V ∼ 230 V		⎓ 24 V	
XPSTSA	**XPSTSW**	**XPSDMB**	**XPSDME**
2/231		2/235	

Safety automation system solutions
Preventa™ safety relay modules

Applications			
Modules		**For zero speed detection of a.c. or d.c. motors which produce a remanent voltage in their windings due to residual magnetism**	**For elevator control**
			
Functions		Detecting the stopping of the motor by measuring the remanent voltage in the stator windings (compatible with electronic motor control devices such as: variable speed drives, d.c. injection brakes, etc.)	Checks the height of the elevator cabin when it stops at a landing in order to compensate for any difference generated by variation of the load in the cabin
Conformity to standards		EN 954-1 - category 3/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1, EN 50082-2	EN 954-1 - category 4/EN/ISO 13849-1, EN 81-1, EN 81-2, EN/IEC 60947-5-1, EN 50082-2, EN 12015, EN 12016
Product certifications		UL, CSA, BG	UL, CSA, TÜV
Number of circuits	Safety	1 N.O. + 1 N.C.	2 N.O.
	Additional	2 solid-state outputs for signalling to PLC	
Display		4 LEDs	4 LEDs
Supply voltage		⎓ 24 V ∿ 115 V ∿ 230 V	∿ or ⎓ 24 V ∿ 115 V ∿ 230 V
Module type		**XPSVNE**	**XPSDA**
Pages		2/241	2/247



For dynamic monitoring of hydraulic valves on linear presses



Dynamic monitoring of the position of the valve pistons of the hydraulic safety system on linear presses.
Dangerous movements of the machine are allowed when the correct change of signal occurs

EN 954-1 - category 4/EN/ISO 13849-1,
EN/IEC 60204-1,
EN/IEC 60947-5-1,
EN 693,
EN 50082-2

UL, CSA

2 N.O. + 1 N.C.

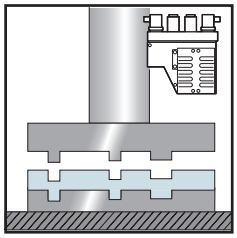
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8 LEDs

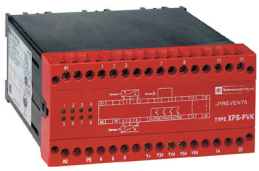
⎓ 24 V

XPSPVT

2/249



For dynamic monitoring of double-bodied solenoid valves



Dynamic monitoring of double-bodied safety solenoid valves on eccentric presses. The device prevents engagement of the clutch and engages the brake if an anomaly occurs in the solenoid valve

EN 954-1 - category 4/EN/ISO 13849-1,
EN/IEC 60204-1,
EN/IEC 60947-5-1,
EN 692,
EN 50082-2

UL, CSA

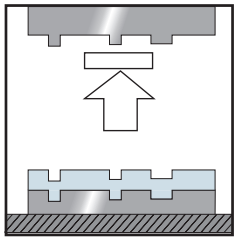
1 N.O. + 1 N.C.

4 solid-state outputs for signalling to PLC

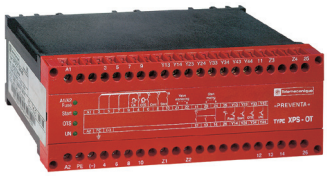
⎓ 24 V
∿ 115 V
∿ 230 V

XPSPVK

2/253



For safety stop at top dead center with automatic overtravel monitoring and control



Automatic monitoring of the stopping distance at each cycle + maintain open function for eccentric presses

EN 954-1 - category 4/EN/ISO 13849-1,
EN/IEC 60204-1,
EN/IEC 60947-5-1,
EN 692,
EN 50082-2

UL, CSA

3 N.O.

–
∿ 115 V
∿ 230 V

XPSOT

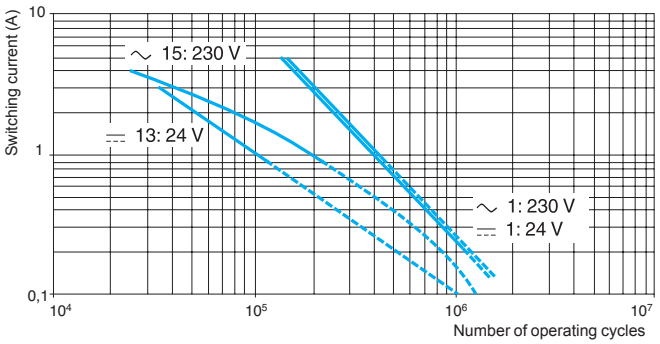
2/258

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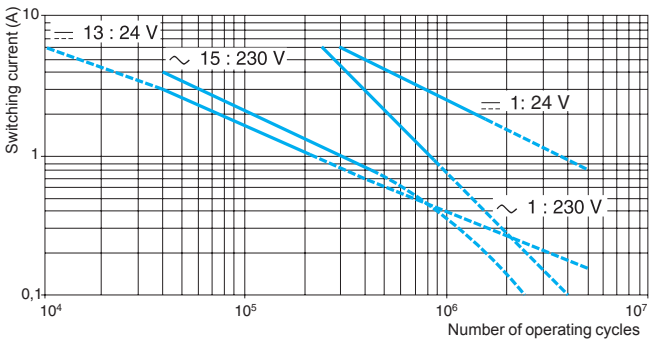
Electrical life

Electrical life ratings of safety contacts conforming to EN 60947-5-1, table C2

XPSAC, XPSTSA, XPSTSW, XPSBA, XPSBC, XPSCM, XPSDA, XPSOT, XPSPVK, XPSPVT, XPSVNE

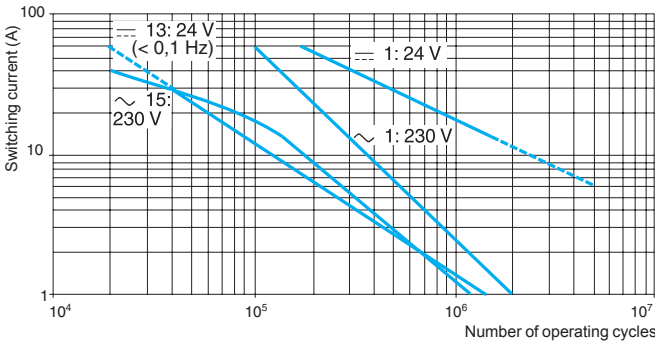


XPSECM, XPSECP

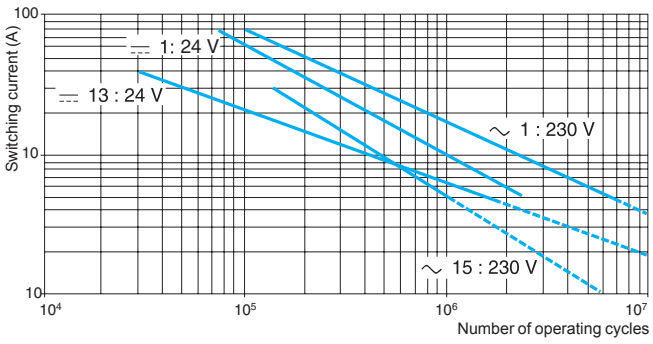


XPSATE

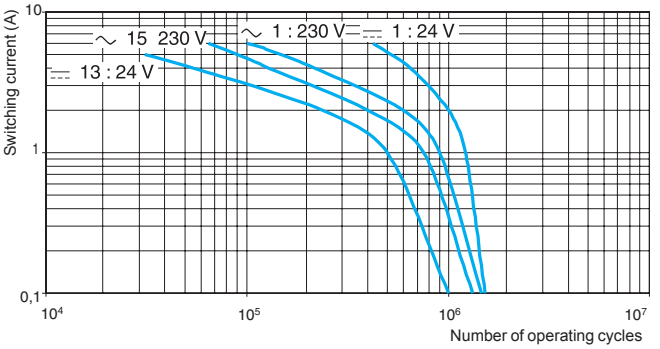
24 V ⎓ version



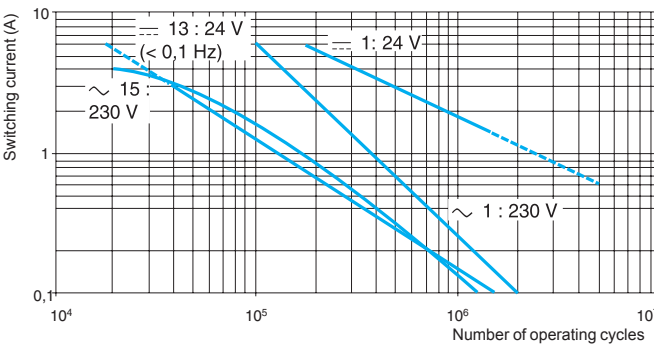
115 V ∿ + 230 V ∿ version



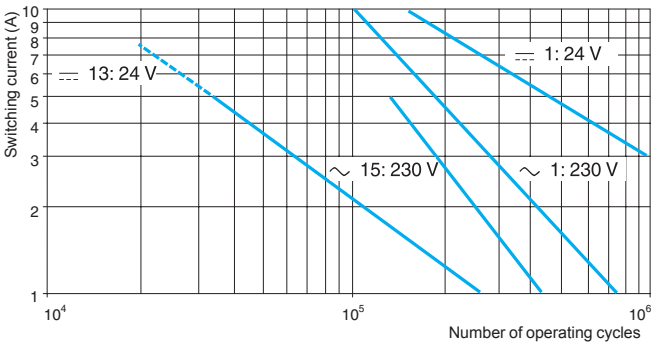
XPSAF, XPSAK, XPSAFL



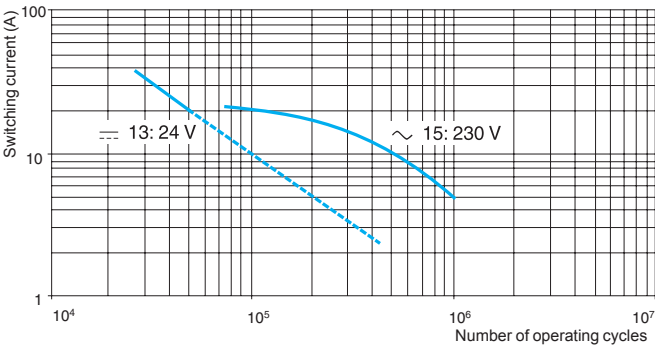
XPSAV, XPSMP, XPSVC, XPSBF, XPSMC



XPSAR



XPSDMB, XPSDME



Electrical life (continued)

Definition of tests

Determination of electrical life conforming to EN 60947-5-1 (table C2)

Type of current	Utilization category	Start-up			Breaking		
		Current	Voltage	Cos φ	Current	Voltage	Cos φ
a.c. supply	AC-15	10 x Ie	Ue	0.7	Ie	Ue	0.4
Type of current	**Utilization category**	**Start-up**			**Breaking**		
		Current	**Voltage**	**T0.95**	**Current**	**Voltage**	**T0.95**
d.c. supply	DC-13	Ie	Ue	50 ms	Ie	Ue	50 ms

Ie: operational current measured.
Ue: operational voltage measured.
Cos φ: power factor.
T0.95: time taken to reach 95% of nominal current.

The tests are carried out with a frequency of 6 switching operations per minute and with no additional protection of the components connected to the safety outputs. The use of additional protection for the components connected to the safety outputs significantly increases the durability of the safety outputs.

Determination of the breaking capacity conforming to EN 60947-5-1 (table 4)

Utilization category	Start-up			Breaking			Total number of switching operations	Switching operations per minute for 1…1000 switching operations	Switching operations per minute for 1001…6050 switching operations	Minimum duration of switching operation
	Current	Voltage	Cos φ	Current	Voltage	Cos φ				
AC-15	10 x Ie	Ue	0.3	Ie	Ue	0.3	6050	60	6	50 ms
Utilization category	**Start-up**			**Breaking**			**Total number of switching operations**	**Switching operations per minute for 1…1000 switching operations**	**Switching operations per minute for 1001…6050 switching operations**	**Minimum duration of switching operation**
	Current	**Voltage**	**T0.95**	**Current**	**Voltage**	**T0.95**				
DC-13	Ie	Ue	50 ms	Ie	Ue	50 ms	6050	60	6	50 ms

Ie: operational current measured.
Ue: operational voltage measured.
Cos φ: power factor.
T0.95: time taken to reach 95% of nominal current.

Notes:
The maximum values for the breaking capacity of the safety outputs in the various Utilization categories are not fixed and depend on the power factor and on the switching frequency. The test definition for the “breaking capacity” and “electrical life” tables in the European standard EN 60947-5-1 uses different values for the power factor and the switching frequency.

The power factor (cos φ) in the “breaking capacity” table (0.3) is greater than that in the “electrical life” table (0.7).

In the “breaking capacity” table, the switching frequency of the safety outputs is higher for the first 1000 switching operations (60 per minute) than that for 1001 to 6050 switching operations (6 per minute).

Consequently, the maximum breaking capacity values determined using the “breaking capacity” table are lower than those in the “electrical life” table.

Electrical life

The product life expressed is based on average usage and normal operating conditions. The above statements are not intended to nor shall they create any express or implied warranties as to product operation or life. For information on the limited warranty offered on this product please refer to the Square D ® terms and conditions of sale found in Square D ® *Digest*.

AC Voltage and Current Ratings 50-60 HZ

Contact Rating Designation	Thermal Continuous Test Current, Amperes	Maximum Current, Amperes				Volt amperes	
		120 Volts		240 Volts			
		Make	Break	Make	Break	Make	Break
B300	5	30	3.00	15	1.5	3600	360
C300	2.5	15	1.50	7.5	0.75	1800	180

Safety automation system solutions

Preventa™ safety relay modules type XPSAC

For Emergency stop and switch monitoring

Operating principle

Safety modules XPSAC are used for monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN 60204-1 and also meet the safety requirements for the electrical monitoring of switches in protection devices conforming to standard EN 1088/ISO 14119. They provide protection for both the machine operator and the machine by immediately stopping the hazardous movement on receipt of a stop instruction from the operator, or on detection of an anomaly in the safety circuit itself.

To aid diagnostics, the modules have LEDs which provide information on the monitoring circuit status.

The XPSAC module has 3 safety outputs and a solid-state output for signalling to the PLC.

Characteristics

Module type			**XPSAC**	**XPSAC●●●●P**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 3 max.	
Conformity to standards			EN 60204-1, EN 1088/ISO 14119, EN/ISO 13850, EN/IEC 60947-1 + A11, EN/IEC 60947-5-1	
Product certifications			UL, CSA, BG	
Supply	Voltage	**V**	∼ and ⎓ 24, ∼ 48, ∼ 115, ∼ 230	
	Voltage limits		- 20…+ 10% (∼ 24 V) - 20…+ 20% (⎓ 24 V) - 15…+ 10% (∼ 48) - 15…+ 15% (115 V) - 15…+10% (230 V)	
	Frequency	**Hz**	50/60	
Power consumption		**W**	< 1.2 (⎓ 24 V)	
		VA	< 2.5 (∼ 24 V) < 6 (∼ 48 V) < 7 (∼ 115 V) < 6 (∼ 230 V)	
Start button monitoring			No	
Control unit voltage (at nominal supply voltage)			Identical to supply voltage	
	24 V version	**V**	∼ 24 (approx. 90 mA), ⎓ 24 (approx. 40 mA)	
	48 V version	**V**	∼ 48 (approx. 100 mA)	
	115 V version	**V**	∼ 115 (approx. 60 mA)	
	230 V version	**V**	∼ 230 (approx. 25 mA)	
Outputs	Voltage reference		Relay hard contacts	
	Number and type of safety circuits		3 N.O. (13-14, 23-24, 33-34)	
	Number and type of additional circuits		1 solid-state	
	Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13		24 V/2 A L/R = 50 ms	
	Max. thermal current (Ithe)	**A**	6	
	Max. total thermal current	**A**	10.5	
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	**A**	4 gG (gl) or 6 fast acting	
	Minimum current	**mA**	10	
	Minimum voltage	**V**	17	
Electrical life			See page 2/172	
Response time on input opening		**ms**	< 100	
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)		**kV**	3 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display			2	
Operating temperature		**°F (°C)**	+ 14…+ 131 (- 10…+ 55)	
Storage temperature		**°F (°C)**	- 13…+ 267.8 (- 25…+ 85)	
Degree of protection conforming to EN/IEC 60529	Terminals		IP 20	
	Enclosure		IP 40	

Principle: page 2/174 | Characteristics: page 2/174 | References: 2/175 | Wiring Diagrams: page 2/176 | Dimensions: page 2/260

Characteristics

Module type			XPSAC	XPSAC●●●●P
Connection	Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end	Solid or flexible cable: 26-16 AWG (0.14…2.5 mm²)	Solid or flexible cable: 24-16 AWG (0.2…2.5 mm²)
		With cable end	Without bezel, flexible cable: 24-16 AWG (0.25…2.5 mm²)	
			With bezel, flexible cable: 24-16 AWG (0.25…1.5 mm²)	With bezel, flexible cable: 24-16 AWG (0.25…2.5 mm²)
	2-wire connection	Without cable end	Solid or flexible cable: 26-18 AWG (0.14…0.75 mm²)	Solid cable: 24-18 AWG (0.2…1 mm²), flexible cable: 24-16 AWG (0.2…1.5 mm²)
		With cable end	Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)	
			Double, with bezel, flexible cable: 20-16 AWG (0.5…1.5 mm²)	

References



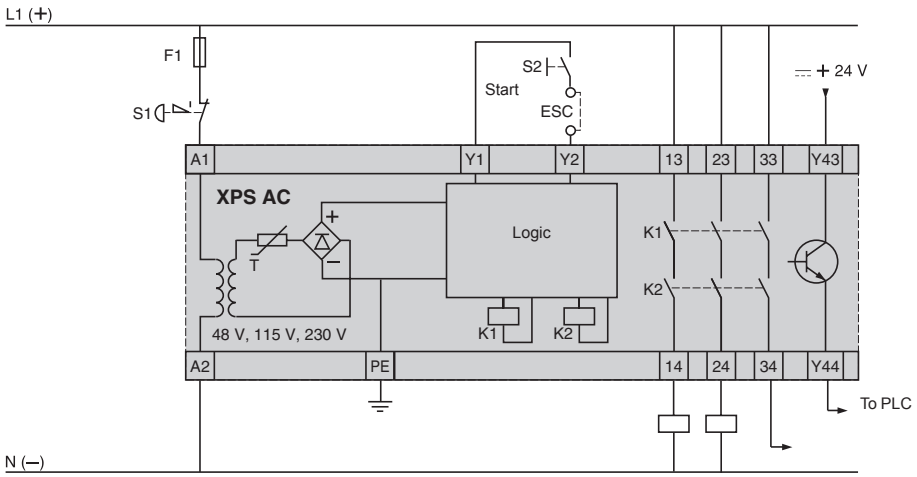
XPSAC●●●●P

Description	Type of terminal block connection	Number of instantaneous opening safety circuits	Additional outputs	Supply	Reference	Weight oz (kg)
Safety modules for Emergency stop and switch monitoring	Integrated in module	3	1 solid-state	∿ and ⎓ 24 V	**XPSAC5121**	5.644 (0.160)
				∿ 48 V	**XPSAC1321**	7.408 (0.210)
				∿ 115 V	**XPSAC3421**	7.408 (0.210)
				∿ 230 V	**XPSAC3721**	7.408 (0.210)
	Removable from module	3	1 solid-state	∿ and ⎓ 24 V	**XPSAC5121P**	5.644 (0.160)
				∿ 48 V	**XPSAC1321P**	7.408 (0.210)
				∿ 115 V	**XPSAC3421P**	7.408 (0.210)
				∿ 230 V	**XPSAC3721P**	7.408 (0.210)

2

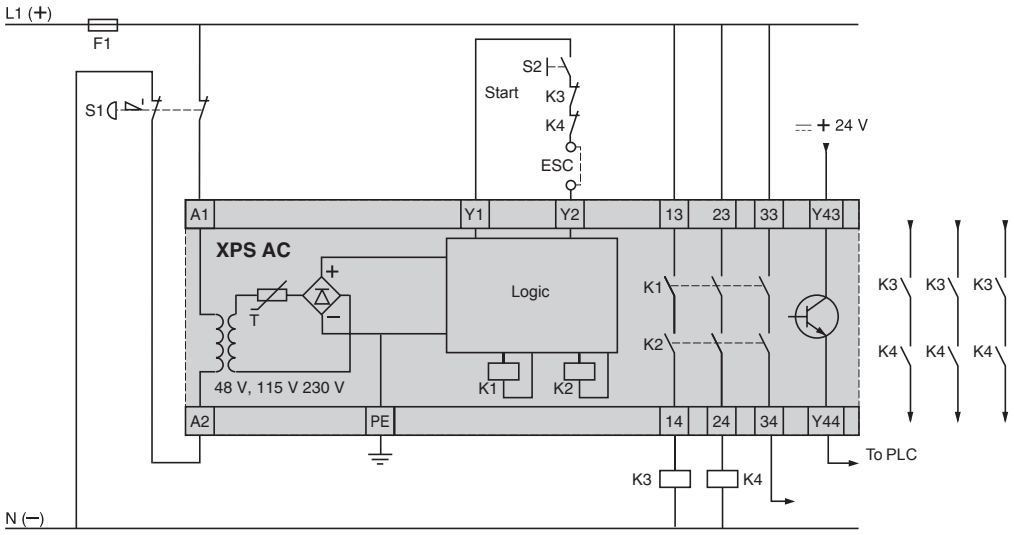
XPSAC

Module XPSAC associated with an Emergency stop button with 1 N.C. contact



Y1-Y2: Feedback loop.
ESC: External start conditions.

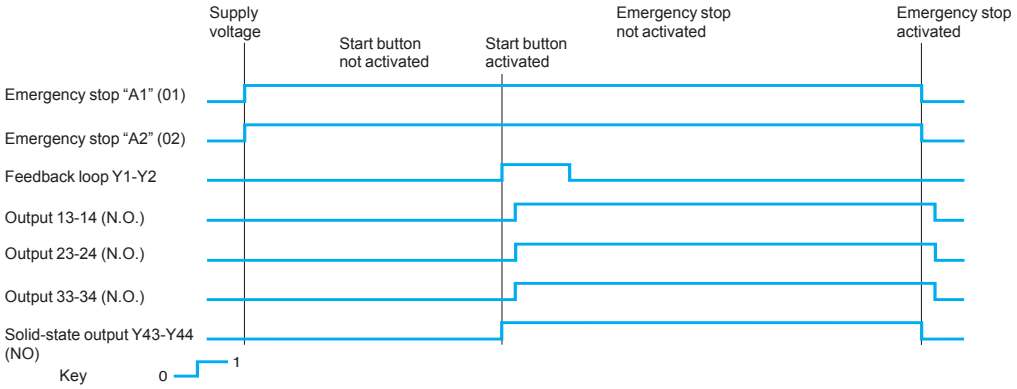
Module XPSAC associated with an Emergency stop button with 2 N.C. contacts (recommended application)



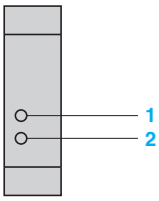
Y1-Y2: Feedback loop.
ESC: External start conditions.

XPSAC

Functional diagram of module XPSAC



LED details



1 Supply voltage A1-A2.
2 K1-K2 status (N.O. safety outputs closed).

Safety automation system solutions

Preventa™ safety relay modules types XPSAV, XPSATE

For Emergency stop and switch monitoring

Operating principle

Preventa™ Safety relay modules types XPSAV and XPSATE are used for monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN/IEC 60204-1 and also meet the safety requirements for the electrical monitoring of switches in protection devices (i.e.: safety interlock switches) conforming to standard EN 1088/ ISO 14119.
They provide protection for both the machine operator and the machine by immediately stopping the machine movement on receipt of a stop instruction from the operator, or on detection of an anomaly in the safety circuit itself.

In addition to the stop category 0 instantaneous opening safety outputs (3 for XPSAV and 2 for XPSATE), the modules incorporate stop category 1 time delay outputs (3 for XPSAV and 3 for XPSATE) which allow for controlled deceleration of the motor components until a complete stop is achieved (for example, motor braking by variable speed drive).
At the end of the preset delay, the supply is disconnected by opening the time delay output circuits.
For module XPSAV, the time delay of the 3 output circuits is adjustable, in 15 preset values, between 0 and 300 seconds using selector buttons.
For module XPSATE, the time delay of the 3 output circuits is adjustable between 0 and 30 seconds using a 12-position selector switch.
Module XPSAV also incorporates 3 solid-state signalling outputs for signalling to the process PLC. Module XPSATE incorporates 4 solid-state signalling outputs for signalling to the process PLC.
To aid diagnostics, the modules have LEDs which provide information on the monitoring circuit status.
The Start button monitoring function is configurable depending on the wiring.

Characteristics

Module type			XPSAV11113 and AV11113P	XPSATE●●●● and ATE●●●●P
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/EN/ISO 13849-1)			Category 4 max.	Category 4 max. (instantaneous safety outputs) Category 3 max. (time delay safety outputs)
Conformity to standards			EN/IEC 60204-1, DIN V VDE 801 + A1, EN/ISO 13850, EN 1088/ISO 14119, EN/IEC 60947-1 A11, EN/IEC 60947-5-1	EN/IEC 60204-1, EN/IEC 60947-5-1, EN/ ISO 13850, EN 50082-2
Product certifications			UL, CSA, BIA	UL, CSA, BG
Supply	Voltage	**V**	⎓ 24	∿ and ⎓ 24, ∿ 115, ∿ 230
	Voltage limits		- 20…+ 20%	- 20…+ 10% (24 V) - 15…+ 15% (115 V) - 15…+ 10% (230 V)
	Frequency	**Hz**	–	50/60
Power consumption		**W**	< 5	< 8
Module inputs fuse protection			Internal, electronic	Internal, electronic
Adjustable time delay		**s**	0…300	0…30
Start button monitoring			Yes/No (configurable by terminal connections)	Yes/No (configurable by terminal connections)
Control unit voltage (at nominal supply voltage)			Between input terminals S21-S22, S31-S32 or S11-S12	Between input terminals S11-S12, S21-S22 or S11-B1
	24 V version	**V**	24	24
	115 V, 230 V version	**V**	–	48
Calculation of wiring resistance RL between input terminals		Ω	100 max. Maximum cable length: 6562 ft. (2000 m)	RL max. = $\frac{\text{U int - U min.}}{\text{I min.}}$ Ue = true voltage applied to terminals A1-A2 U int (terminals S11-S21) = supply voltage Ue - 3 V (24 V version) U int between 42 V and 45 V, with typical value = 45 V (115 V, 230 V version) Calculated max. RL must be equal to or greater than the true value

Principle: page 2/178 | Characteristics: page 2/178 | References: page 2/180 | Wiring Diagrams: page 2/181 | Dimensions: page 2/260

Safety automation system solutions

Preventa™ safety relay modules types
XPSAV, XPSATE
For Emergency stop and switch monitoring

Characteristics (continued)

Module type				XPSAV11113	XPSAV11113P	XPSATE●●●●	ATE●●●●P
Synchronization time between inputs			**s**	For guard: 1.5 For Emergency stop: unlimited		Approx. 0.075 For automatic start, terminals S33-Y2 and Y3-Y4 linked	
Outputs	Voltage reference			Relay hard contacts		Relay hard contacts	
	Number and type of instantaneous opening safety circuits			3 N.O. (03-04, 13-14, 23-24)		2 N.O. (13-14, 23-24, 33-34)	
	Number and type of time delay opening safety circuits			3 N.O. (37-38, 47-48, 57-58)		3 N.O. (57-58, 67-68, 77-78)	
	Number and type of additional circuits			3 solid-state		4 solid-state	
	Breaking capacity in AC-15	Instantaneous outputs	**VA**	C300: inrush 1800, maintained 180		C300: inrush 1800, maintained 180	
		Time delay outputs	**VA**	C300: inrush 1800, maintained 180		C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13	Instantaneous outputs		24 V/1.25 A L/R = 50 ms		24 V/1.0 A L/R = 50 ms	
		Time delay outputs		24 V/1.25 A L/R = 50 ms		24 V/1.0 A L/R = 50 ms	
	Breaking capacity of solid-state outputs			24 V/20 mA		–	
	Max. thermal current (Ithe)	Instantaneous outputs	**A**	3.3 for all 3, or 6 for 1 and 2 for 2, or 4 for 2 and for 2 for 1		5	
		Time delay outputs	**A**	3.3 for all 3, or 6 for 1 and 2 for 2, or 4 for 2 and 2 for 1		2.5	
	Max. total thermal current		**A**	20		8	
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	Instantaneous outputs	**A**	4 gG or 6 fast acting		6 gG	
		Time delay outputs	**A**	4 gG or 6 fast acting		4 gG	
	Minimum current		**mA**	10		10	
	Minimum voltage		**V**	17		17	
Electrical life				See page 2/172			
Response time on instantaneous opening inputs			**ms**	< 30		< 20	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN//IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)			
Rated impulse withstand voltage (Uimp)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)			
LED display				11		4	
Operating temperature			**°F (°C)**	+ 14…+ 131 (- 10…+ 55)			
Storage temperature			**°F (°C)**	- 13…+ 267.8 (- 25…+ 85)			
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20			
		Enclosure		IP 40			
Connections		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block	Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 26-14 AWG (0.14 - 2.5 mm²)	Solid or flexible cable: 24-14 AWG (0.20 - 2.5 mm²)	Solid or flexible cable: 26-14 AWG (0.14 - 2.5 mm²)	Solid or flexible cable: 24-14 AWG (0.25 - 2.5 mm²)
		With cable end		Without bezel, flexible cable: 24-14 AWG (0.25 - 2.5 mm²)			
				With bezel, flexible cable: 24-16 AWG (0.25 - 1.5 mm²)	With bezel, flexible cable: 24-14 AWG (0.25 - 2.5 mm²)	With bezel, flexible cable: 24-16 AWG (0.25 - 1.5 mm²)	With bezel, flexible cable: 24-14 AWG (0.25 - 2.5 mm²)
	2-wire connection	Without cable end		Solid or flexible cable: 26-20 AWG (0.14 - 0.75 mm²)	Solid cable: 24-18 AWG (0.2 - 1.0 mm²) Flexible cable: 24-16 AWG (0.20 - 1.5 mm²)	Solid or flexible cable: 26-20 AWG (0.14 - 0.75 mm²)	Solid cable: 24-18 AWG (0.2 - 1.0 mm²) Flexible cable: 24-16 AWG (0.20 - 1.5 mm²)
		With cable end		Without bezel, flexible cable: 24-18 AWG (0.25 - 1.0 mm²)			
				Double, with bezel, flexible cable: 22-14 AWG (0.5 - 1.5 mm²)			

2

Safety automation system solutions

Preventa™ safety relay modules types XPSAV, XPSATE

For Emergency stop and switch monitoring

103244



XPSAV11113

103245



XPSAV11113P

105571



XPSAT●●●●

References

Description	Number of safety circuits	Additional outputs	Supply	Type of terminal block connection	Reference	Weight oz (kg)
Safety modules for Emergency stop and switch monitoring	6 N.O. (3 N.O. time delay)	3 solid-state	⎓ 24 V	Integrated in module	**XPSAV11113**	11.288 (0.320)
	6 N.O. (3 N.O. time delay)	3 solid-state	⎓ 24 V	Removable from module	**XPSAV11113P**	11.288 (0.320)
	5 N.O. (3 N.O. time delay)	4 solid-state	∿/⎓ 24 V	Integrated in module	**XPSATE5110**	9.877 (0.280)
				Removable from module	**XPSATE5110P**	9.877 (0.280)
			∿ 115 V	Integrated in module	**XPSATE3410**	13.404 (0.380)
				Removable from module	**XPSATE3410P**	13.404 (0.380)
			∿ 230 V	Integrated in module	**XPSATE3710**	13.404 (0.380)
				Removable from module	**XPSATE3710P**	13.404 (0.380)

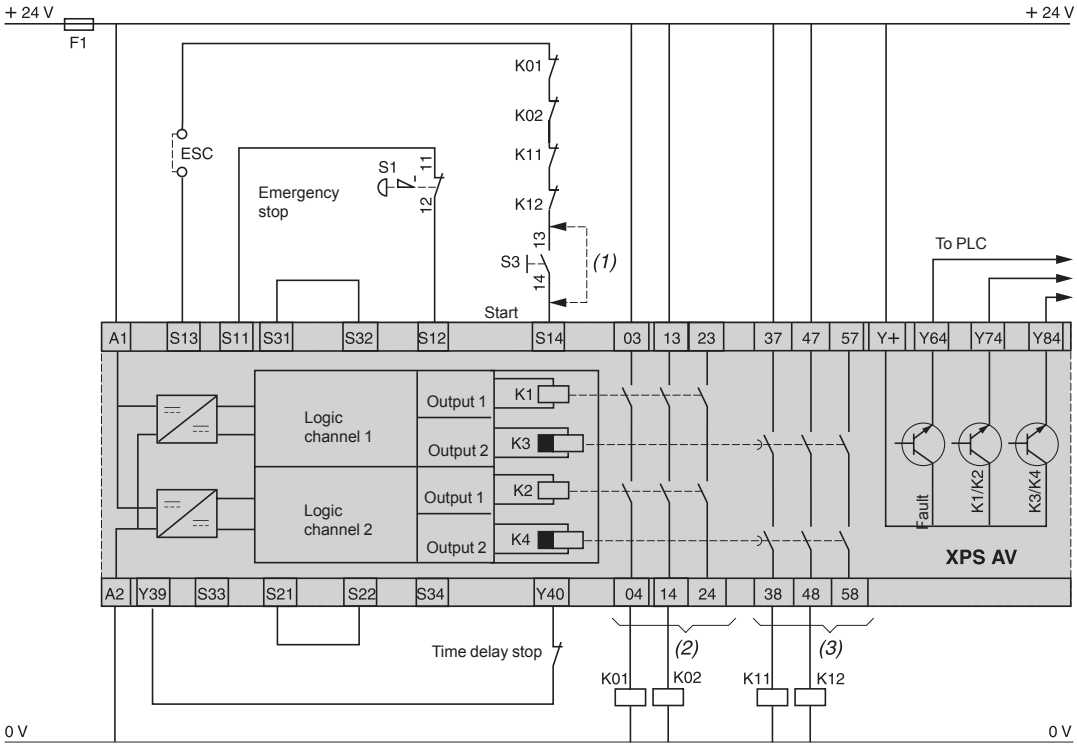
XPSAV safety relays are suitable for use in circuits through Category 4 per EN 954-1 and ISO 13849-1.

XPSAT safety relays are suitable for use in circuits through Category 4 per EN 954-1 and ISO 13849-1 when instantaneous break contacts are used.

XPSAT safety relays are suitable for use in circuits through Category 3 per EN 954-1 and ISO 13849-1 when time delay break contacts are used.

XPSAV

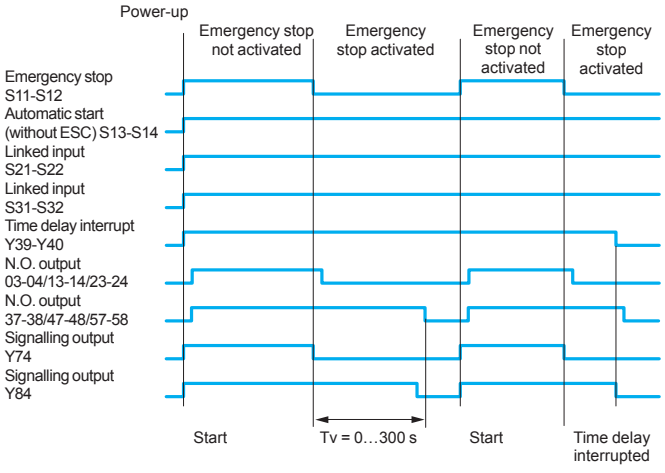
Module XPSAV associated with an Emergency stop button with 1 N.C. contact, automatic start or unmonitored start



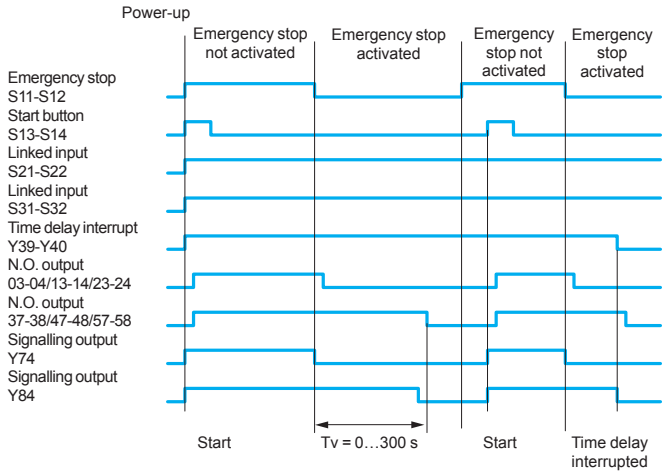
(1) Jumper for automatic start.
(2) Instantaneous opening safety outputs (stop category 0).
(3) Time delay opening safety outputs (stop category 1).
ESC = External start conditions.

Functional diagrams

Automatic start



Unmonitored start



Automatic start
There is no start contact or it is jumpered (wiring between terminals S13 - S14).
Note: Automatic start function is not available on the XPSAV with 2 channel wiring on the inputs. Automatic start function is only available on single channel wiring on the inputs.

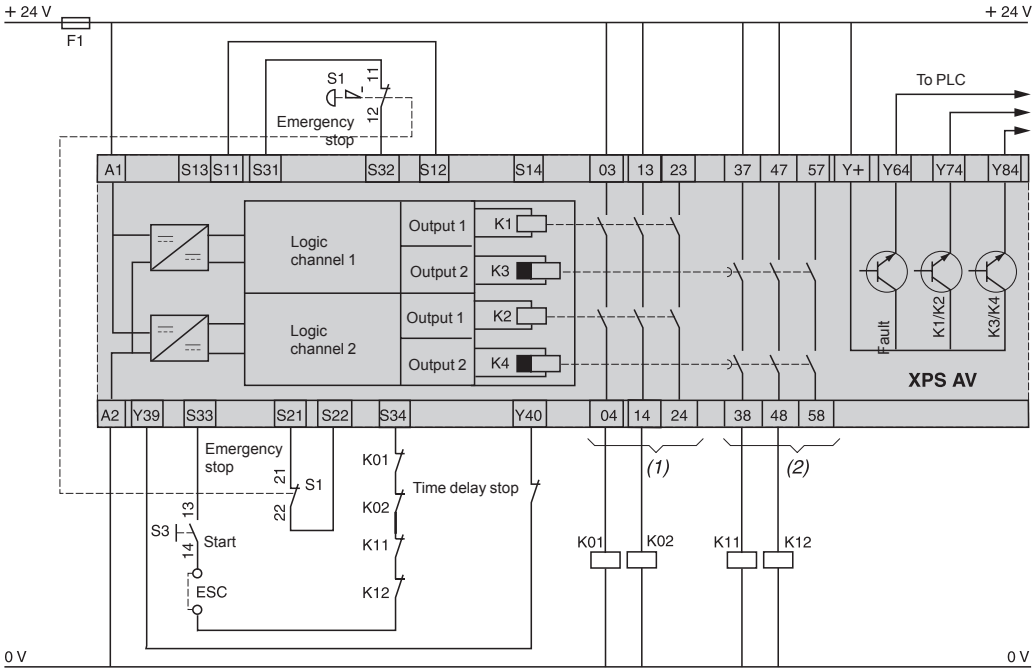
Unmonitored start
The output is activated on closing of the start contact (wiring between terminals S13 - S14).

Monitored start
The start input is monitored so that there is no start-up in the event of the start contact being jumpered or the start circuit being closed for more than 10 seconds. Start-up is triggered following activation of the start button (push-release function) on opening of the contact (wiring between terminals S33 - S34).

2

XPSAV

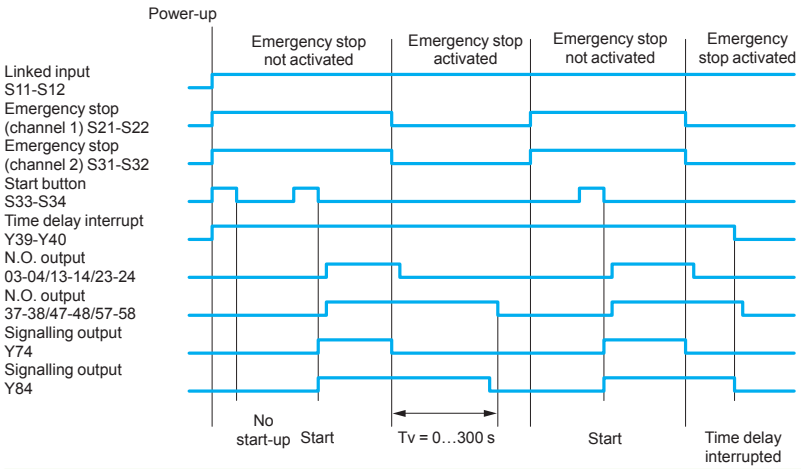
Module XPSAV associated with an Emergency stop button with 2 N.C. contacts, monitored start



(1) Instantaneous opening safety outputs (stop category 0).
(2) Time delay opening safety outputs (stop category 1).
ESC = External start conditions.
Note: Automatic start function is not available on the XPSAV with 2 channel wiring on the inputs. Automatic start function is only available on single channel wiring on the inputs.

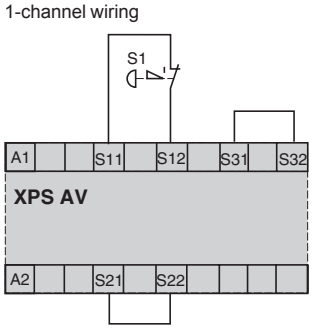
Functional diagram

Monitored start

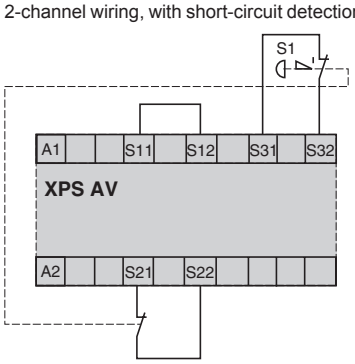


Emergency stop monitoring function configuration

1-channel wiring



2-channel wiring, with short-circuit detection

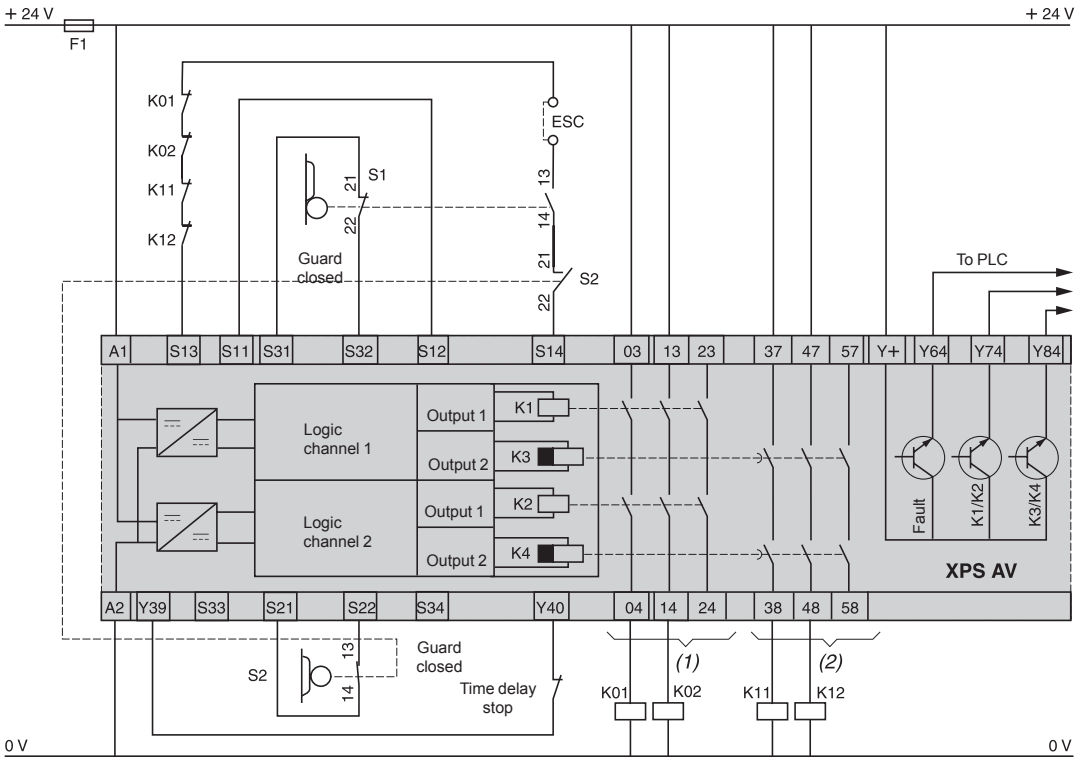


Principle: page 2/178 | Characteristics: page 2/178 | References: page 2/180 | Wiring Diagrams: page 2/181 | Dimensions: page 2/260

2

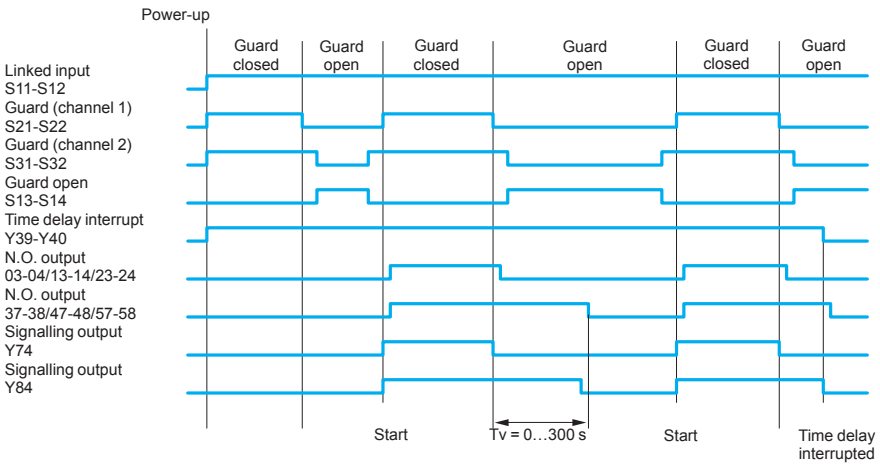
XPSAV

Monitoring of a movable guard associated with 2 switches
Automatic start (diagram shown for guard closed)

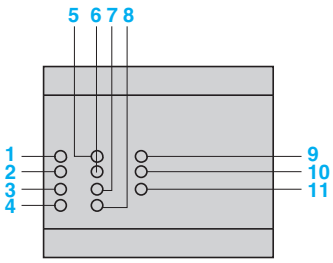


(1) Instantaneous opening safety outputs (stop category 0).
(2) Time delay opening safety outputs (stop category 1).
ESC = External start conditions.

Functional diagram



LED details

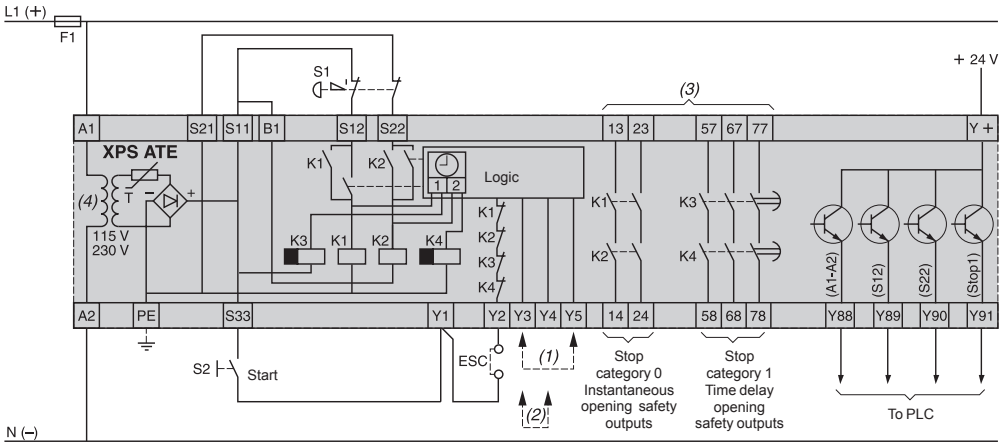


1 S12 input status.
2 S22 input status.
3 S32 input status.
4 S34 input status.
5 S14 input status.
6 Y40 input status (time delay stop).
7 K1/K2 status (N.O. instantaneous opening safety outputs).
8 K3/K4 status (time delay opening safety outputs).
9 Supply voltage A1-A2.
10 Fault.
11 Configuration mode

2

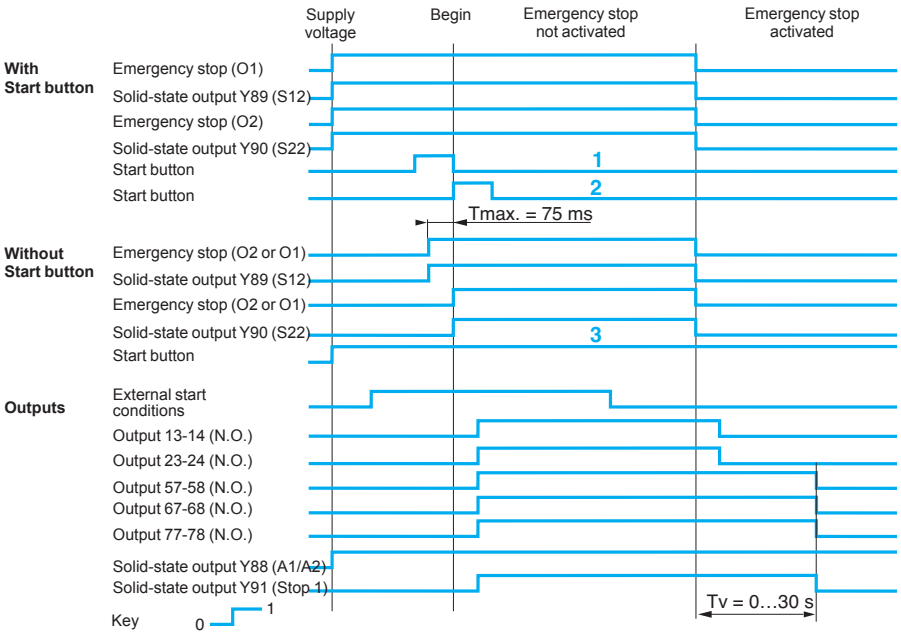
XPSATE

Module XPSATE associated with an Emergency stop button



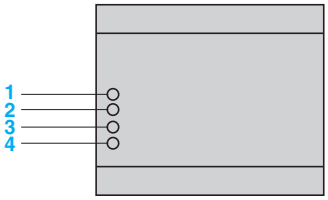
S1: Emergency stop button with 2 N.C. contacts (recommended application).
S2: Start button.
ESC: External start conditions.
Y1 (S33) - Y2: Feedback loop.
F1: 4 A max.
(1) With start button monitoring.
(2) Without start button monitoring.
(3) The outputs must be fuse protected. Technical characteristics for maximum rating of fuses, see page 4.
(4) ∼ 115/230 V only.
(5) For automatic start, jumper S2 (N.O. start button between terminals S33-Y1). This is only feasible when configured without start button monitoring (Y3 and Y4 jumpered). If S2 is jumpered and the module is configured for start button monitoring (Y3 and Y5 jumpered), the N.O. safety contacts will not close.

Functional diagram of module XPSATE with Emergency stop button monitoring



1 With start button monitoring (Y3-Y5 connection).
2 Without start button monitoring (Y3-Y4 connection).
3 Without start button (connection Y3-Y4 and S33-Y1).
Tv: adjustable time.

Description of LEDs

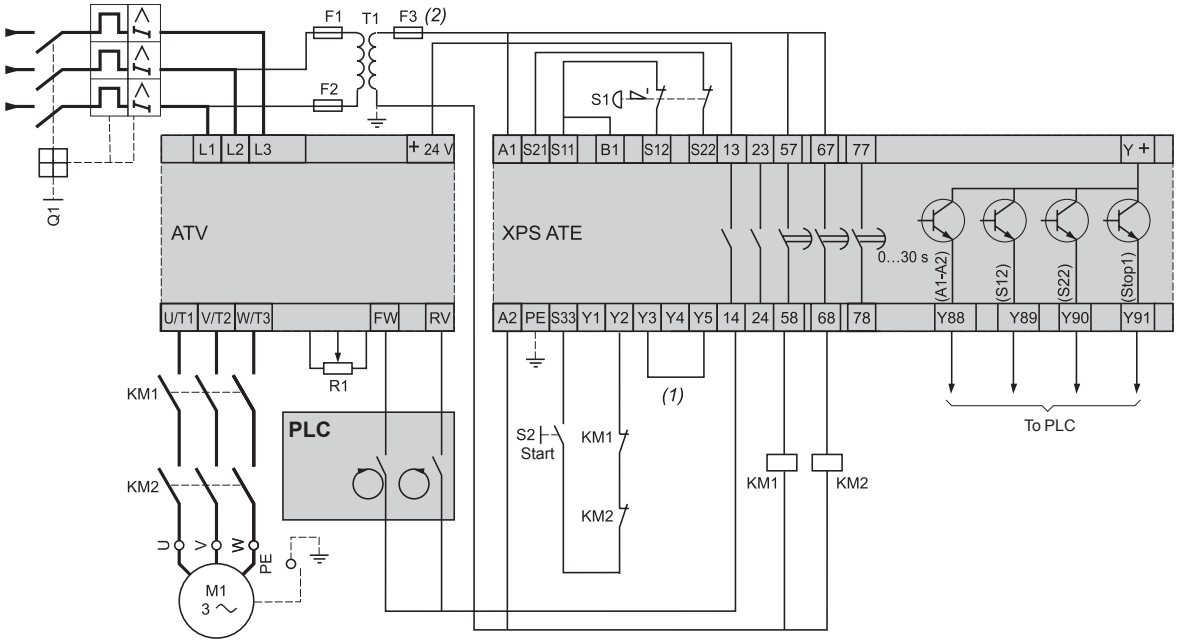


1 Supply voltage A1-A2, internal electronic fuse status.
2 S12 (A) input status.
3 S22 (B) input status.
4 Stop category 1 outputs closed.

Principle: page 2/178 | Characteristics: page 2/178 | References: page 2/180 | Wiring Diagrams: page 2/181 | Dimensions: page 2/260

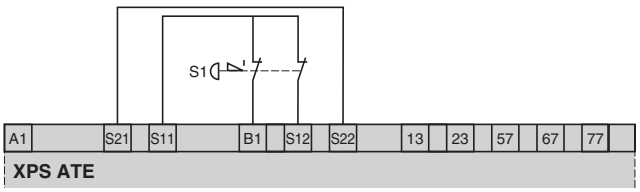
XPSATE

Example of a safety circuit combining an Emergency stop module with a variable speed drive



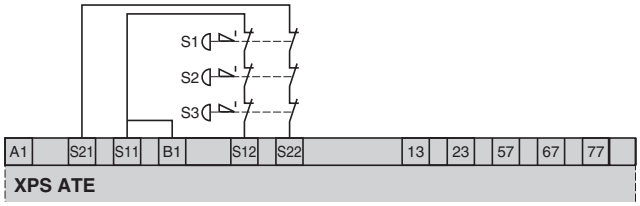
S1: Emergency stop button with 2 N.C. contacts (recommended application).
S2: Start button
(1) With start button monitoring.
(2) Technical characteristics for maximum rating of fuses, see page 4.

Connection with 1 Emergency stop button



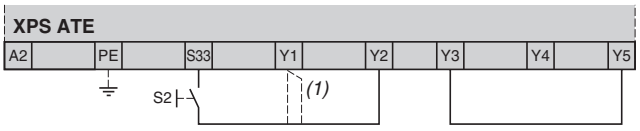
Both input channels are supplied at the same potential.
S1: Emergency stop button with 2 N.C. contacts.
A short-circuit between the 2 inputs is not detected.

Connection with multiple Emergency stop buttons



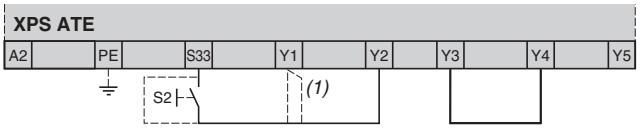
The 2 input channels are supplied at different polarities.
A short-circuit between the 2 inputs is detected.

Configuration with start button monitoring
(functional diagram for Start button 1, see *page 9*)



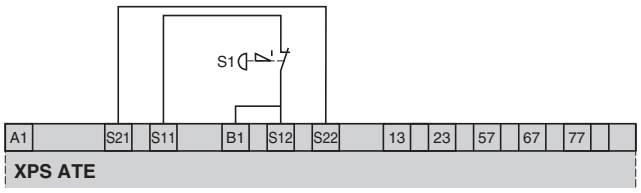
(1) Auxiliary terminal (to be used to separate the feedback loop from the wiring to the start button).

Configuration without start button monitoring
(functional diagram for Start button 2, see *page 9*)



(1) Auxiliary terminal (to be used to separate the feedback loop from the wiring to the start button).

Monitoring an Emergency stop button with 1 N.C. contact



S1: Emergency stop button with 1 N.C. contact.
Not all anomalies are detected: a short-circuit on the Emergency stop button is not detected.

Safety automation system solutions

Preventa™ safety relay modules type XPSAF

For Emergency stop and switch monitoring

Operating principle

Safety modules XPSAF are designed to conform with category 4 of the standard EN 954-1/ISO 13849-1.
They are used for:
■ Monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN/IEC 60204-1.
■ Electrical monitoring of switches activated by protection devices conforming to standard EN 1088/ISO 14119.

Housed in a compact enclosure, the modules have 3 safety outputs.
Preventa™ safety relay modules XPSAF●●●●P incorporate removable terminal blocks, thus optimizing machine maintenance.
To aid diagnostics, the modules have 3 LEDs on the front cover which provide information on the monitoring circuit status.
The Start button monitoring function is configurable depending on the wiring.

Characteristics

Module type				XPSAF5130	XPSAF5130P
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.	
Conformity to standards				EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2	
Product certifications				UL, CSA, BG	
Supply	Voltage		**V**	∼ and ⎓ 24	
	Voltage limits			- 15…+ 10%	
	Frequency		**Hz**	50/60	
Power consumption			**VA**	≤ 5	
Module inputs fuse protection				Internal, electronic	
Start button monitoring				Yes/No (configurable by terminal connections)	
Control unit voltage and current				⎓ 24 V/30 mA approx. (at nominal supply voltage)	
Maximum wiring resistance RL			Ω	90	
Synchronization time between inputs A and B				Unlimited	
Outputs	Voltage reference			Relay hard contacts	
	Number and type of safety circuits			3 N.O. (13-14, 23-24, 33-34)	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	6	
	Max. total thermal current		**A**	18	
	Output fuse protection		**A**	4 gG or 6 fast acting, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical life				See page 2/172	
Response time on input opening			**ms**	≤ 40	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				3	
Operating temperature			**°F (°C)**	+ 14…+ 131 (- 10…+ 55)	
Storage temperature			**°F (°C)**	- 13…+ 267.8 (- 25…+ 85)	
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connections		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 26-14 AWG (0.14…2.5 mm²)	Solid or flexible cable: 24-14 AWG (0.2…2.5 mm²)
		With cable end		Without bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)	
		With cable end		With bezel, flexible cable: 24-16 AWG (0.25…1.5 mm²)	With bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)
	2-wire connection	Without cable end		Solid or flexible cable: 26-18 AWG (0.14…0.75 mm²)	Solid cable: 24-18 AWG (0.2…1 mm²), flexible cable: 24-16 AWG (0.2…1.5 mm²)
		With cable end		Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)	
		With cable end		Double, with bezel, flexible cable: 20-16 AWG (0.5…1.5 mm²)	Double, with bezel, flexible cable: 20-16 AWG (0.5…1.5 mm²)

Principle: page 2/178 | Characteristics: page 2/178 | References: page 2/187 | Wiring Diagrams: page 2/187 | Dimensions: page 2/260

Safety automation system solutions

Preventa™ safety relay modules type XPSAF

For Emergency stop and switch monitoring

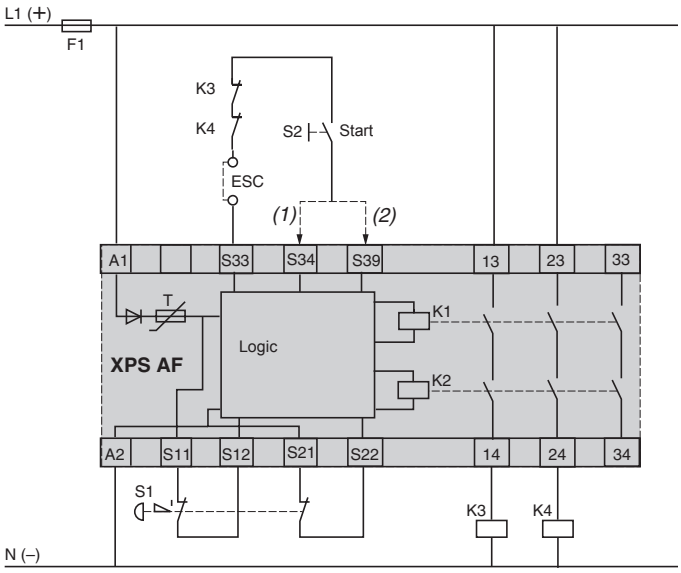
References

	Description	Type of terminal block connection	Number of safety circuits	Supply	Reference	Weight oz (kg)
 *XPSAF5130*	**Safety modules for Emergency stop and limit switch monitoring**	Integrated in module	3	∿ and ⎓ 24 V	**XPSAF5130**	8.818 (0.250)
 *XPSAF5130P*		Removable from module	3	∿ and ⎓ 24 V	**XPSAF5130P**	8.818 (0.250)

Wiring diagrams

XPSAF

Module XPSAF associated with an Emergency stop button with 2 N.C. contacts



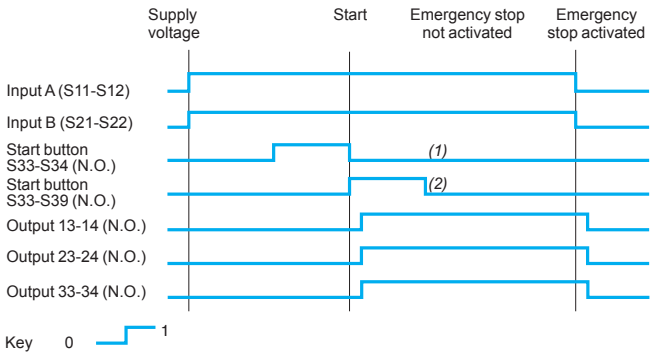
(1) With start button monitoring.
(2) Without start button monitoring.
ESC = External start conditions.

2

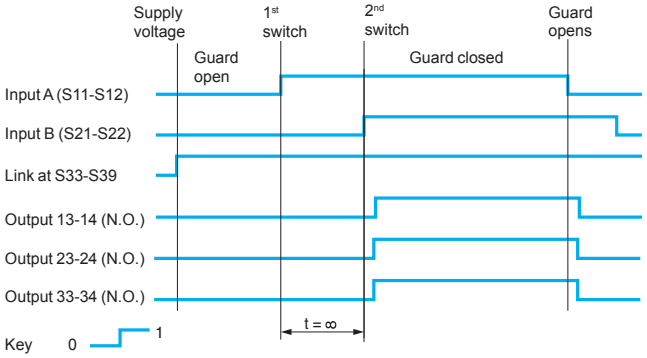
XPSAF

Functional diagrams

Emergency stop function

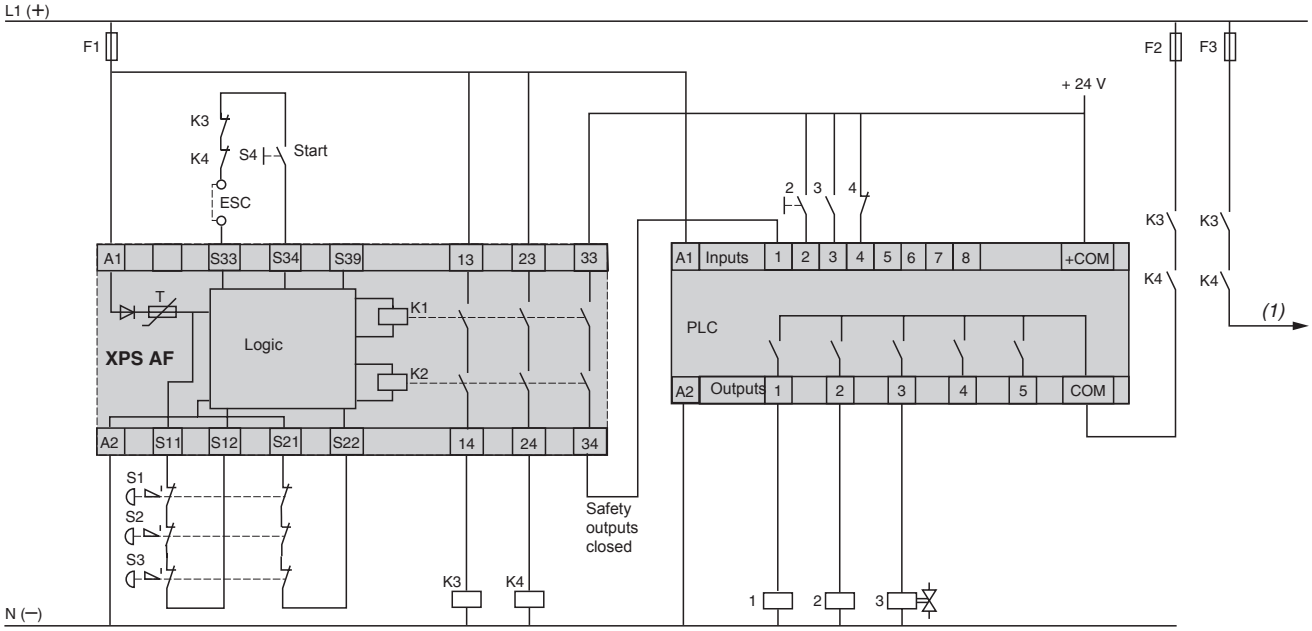


Guard function with automatic start



(1) With start button monitoring.
(2) Without start button monitoring.

Module XPSAF with connection of multiple Emergency stop buttons, combined with a PLC

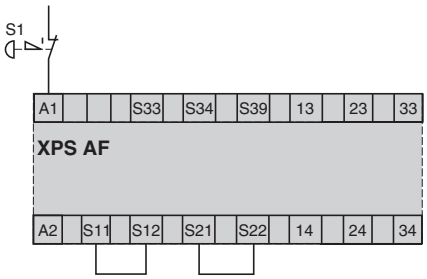


(1) Other circuits controlled by the XPSAF module.
ESC = External start conditions.

XPSAF

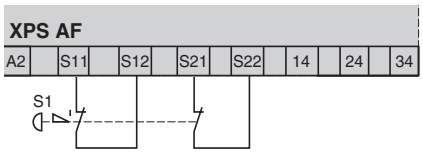
Emergency stop monitoring function configuration

1-channel wiring

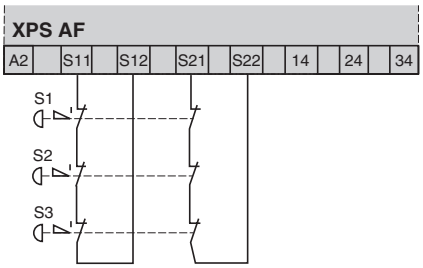


Emergency stop button with a single N.C. contact.
Not all anomalies are detected: a short-circuit on the Emergency stop pushbutton is not detected.

2-channel wiring

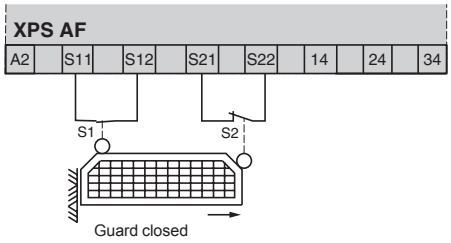


Emergency stop button with 2 N.C. contacts (recommended application).
The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

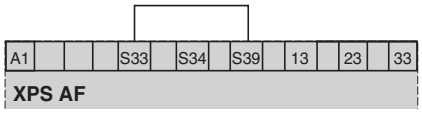


Connection of multiple Emergency stop buttons with 2 N.C. contacts (recommended application).
The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

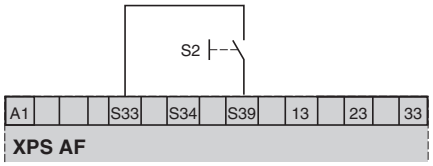
Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with N.O. contact, switch 2 with N.C. contact)



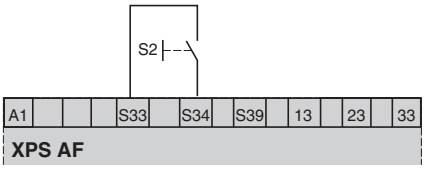
Configuration with automatic or manual start



Automatic start.

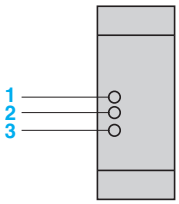


Without start button monitoring, manual reset.



Function: push-release.
With start button monitoring, manual reset.

LED details



1 Supply voltage A1-A2 internal electronic, fuse status.
2 Relay K1 energized.
3 Relay K2 energized.

Safety automation system solutions

Preventa™ safety relay modules type XPSAFL

For Emergency stop, switch and light curtain monitoring

Operating principle

Safety modules XPSAFL are designed to conform with category 3 of the standard EN 954-1. They are used for:

■ Monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN/IEC 60204-1.

■ Electrical monitoring of switches activated by protection devices conforming to standard EN 1088/ISO 14119, devices such as safety interlocks or safety limit switches.

They can also be used for monitoring type 4 light curtains conforming to EN/IEC 61496-1 which have solid-state safety outputs with test function (for example, light curtains type XUSL, see page 3/113). This system would be conforming to category 4 of standard EN 954-1/EN/ISO 13849-1.

Housed in a compact enclosure, the modules have 3 safety outputs.
Preventa™ safety relay modules XPSAFL●●●●P incorporate removable terminal blocks, thus optimizing machine maintenance.
To aid diagnostics, the modules have 3 LEDs on the front cover which provide information on the monitoring circuit status.
The Start button monitoring function is configurable depending on the wiring.

Characteristics

Module type				**XPSAFL5130**	**XPSAFL5130P**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1)				Category 3 Category 4 for the monitoring of light curtains type 4 with solid state outputs and test function	
Conformity to standards				EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2, EN/IEC 61496-1 (type 4)	
Product certifications				UL, CSA, BG	
Supply	Voltage		**V**	∼ and ⎓ 24	
	Voltage limits			- 15…+ 10%	
	Frequency		**Hz**	50/60	
Power consumption			**VA**	≤ 5	
Module inputs fuse protection				Internal, electronic	
Start button monitoring				No (configurable by terminal connections)	
Control unit voltage and current				⎓ 24 V/30 mA approx. (at nominal supply voltage)	
Maximum wiring resistance RL			Ω	90	
Synchronization time between inputs A and B				Unlimited	
Outputs	Voltage reference			Relay hard contacts	
	Number and type of safety circuits			3 N.O. (13-14, 23-24, 33-34)	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	6	
	Max. total thermal current		**A**	18	
	Output fuse protection		**A**	4 gG or 6 fast acting, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical life				See page 2/172	
Response time on input opening			**ms**	≤ 20	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				3	
Operating temperature			**°F (°C)**	+ 14…+ 131 (- 10…+ 55)	
Storage temperature			**°F (°C)**	- 13…+ 267.8 (- 25…+ 85)	
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connection		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 26-14 AWG (0.14…2.5 mm²)	Solid or flexible cable: 24-14 AWG (0.2…2.5 mm²)
		With cable end		Without bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)	
		With cable end		With bezel, flexible cable: 24-16 AWG (0.25…1.5 mm²)	With bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)
	2-wire connection	Without cable end		Solid or flexible cable: 26-18 AWG (0.14…0.75 mm²)	Solid cable: 24-18 AWG (0.2…1 mm²), flexible cable: 24-16 AWG (0.2…1.5 mm²)
		With cable end		Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)	
		With cable end		Double, with bezel, flexible cable: 20-16 AWG (0.5…1.5 mm²)	

Principle: page 2/190 | Characteristics: page 2/190 | References: page 2/191 | Wiring Diagrams: page 2/192 | Dimensions: page 2/260

Safety automation system solutions

Preventa™ safety relay modules type XPSAFL

For Emergency stop, switch and light curtain monitoring

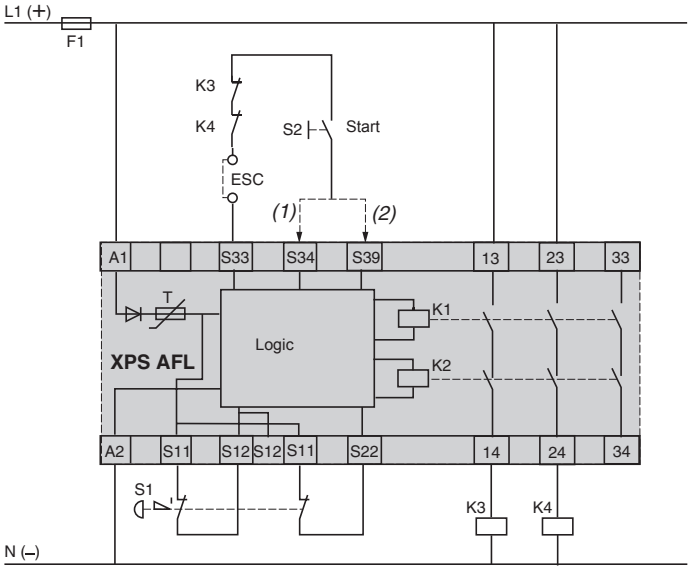
References

	Description	Type of terminal block connection	Number of safety circuits	Supply	Reference	Weight oz (kg)
103240  *XPSAFL5130*	**Safety modules for Emergency stop, switch and light curtain monitoring**	Integrated in module	3	∿ and ⎓ 24 V	**XPSAFL5130**	8.818 (0.250)
103241  *XPSAFL5130P*		Removable from module	3	∿ and ⎓ 24 V	**XPSAFL5130P**	8.818 (0.250)

2

XPSAFL

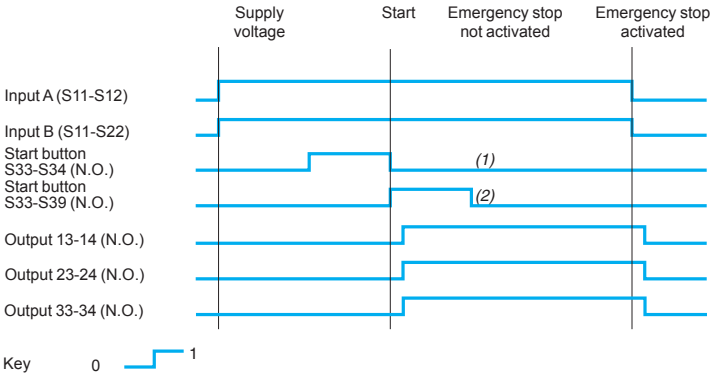
Module XPSAFL associated with an Emergency stop button with 2 N.C. contacts



(1) With start button monitoring.
(2) Without start button monitoring.
ESC: External start conditions.

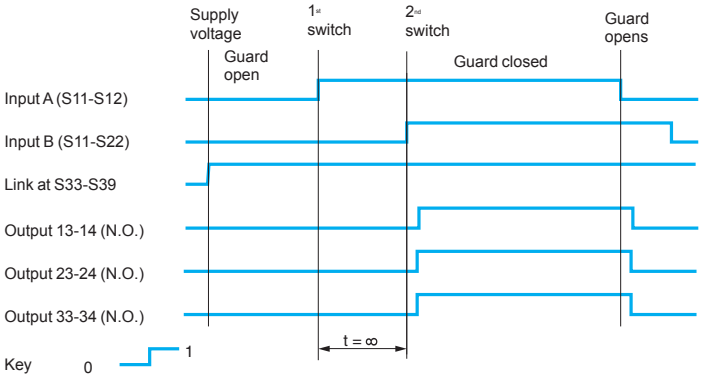
Functional diagrams

Emergency stop function



(1) With start button monitoring.
(2) Without start button monitoring.

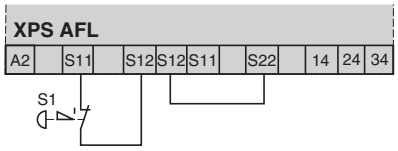
Guard function with automatic start



XPSAFL

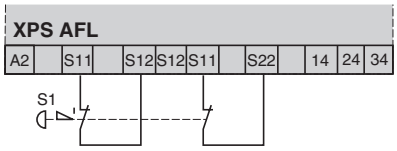
Emergency stop monitoring function configuration

1-channel wiring
Emergency stop button with a single N.C. contact



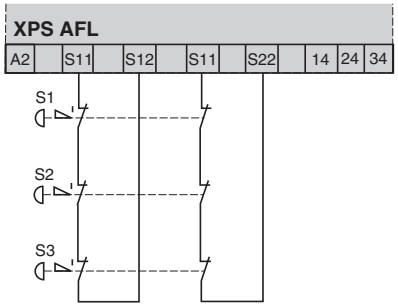
A short-circuit on the Emergency stop pushbutton is not detected.

2-channel wiring
Emergency stop button with 2 N.C. contacts



A short-circuit between the 2 inputs is not detected.

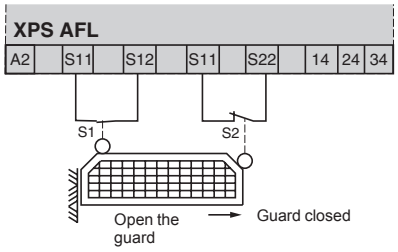
2-channel wiring
Connection of multiple Emergency stop buttons



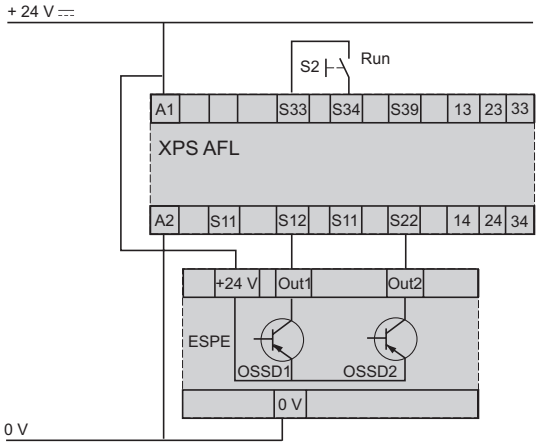
A short-circuit between the 2 inputs is not detected.

Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with N.O. contact, switch 2 with N.C. contact)

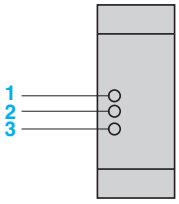
Without short-circuit detection



Monitoring of electro-sensitive protection equipment (ESPE)



LED details



1 Supply voltage A1-A2, fuse status.
2 Relay K1 energized.
3 Relay K2 energized.

Safety automation system solutions

Preventa™ safety relay modules type XPSAR

For Emergency stop, switch or light curtain monitoring

Operating principle

Safety modules XPSAR meet the requirements of category 4 of the standard EN 954-1/EN/ISO 13849-1 and are designed for the following safety applications:
■ Monitoring Emergency stop circuits conforming to EN/ISO 13850 and EN/IEC 60204-1.
■ Electrical monitoring of switches activated by protection devices conforming to standard EN 1088/ISO 14119.
■ Monitoring type 4 light curtains conforming to EN/IEC 61496-1 which have solid-state safety outputs with test function (for example, light curtains type XUSL), conforming to category 4 of standard EN 954-1/ISO 13849-1.
In addition to 7 safety outputs, modules XPSAR incorporate 2 relay signalling outputs and 4 solid-state signalling outputs for signalling to the process PLC.
Safety modules XPSAR●●●●●●P incorporate removable terminal blocks, thus optimizing machine maintenance.
To aid diagnostics, the modules have 4 LEDs on the front cover which provide information on the monitoring circuit status.
The Start button monitoring function is configurable depending on the wiring.

Characteristics

Module type				XPSAR3●1144	XPSAR3●1144P
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/EN/ISO 13849-1)				Category 4 max.	
Conformity to standards				EN/IEC 60204-1, EN 1088/ISO 14119, EN/ISO 13850, EN/IEC 60947-1, EN/IEC 60947-5-1	
Product certifications				UL, CSA, BG	
Supply	Voltage		**V**	∼ and ⎓ 24, ∼ 115, ∼ 230	
	Voltage limits	⎓ 24 V	**%**	- 15…+ 10	
		∼ 24 V	**%**	- 15…+ 10	
		∼ 115 V	**%**	- 15…+ 15	
		∼ 230 V	**%**	- 15…+ 10	
	Frequency		**Hz**	50/60	
Power consumption				⎓ 24 V version: < 4 W, ∼24 V version: < 7 VA, 115/230 V version: < 9 VA	
Module inputs fuse protection				Internal, electronic	
Start button monitoring				Yes/No (configurable by terminal connections)	
Control unit voltage and current (between terminals S11-S52 and S21-S22). 24 V, 115 V and 230 V version			**V**	⎓ 24 (20 mA approx.) (at nominal supply voltage)	
Maximum wiring resistance RL (between terminals S11-S52 and S21-S22)			Ω	50	
Synchronization time between inputs A and B Automatic start, terminals S33, S34 linked			**ms**	100	
Safety outputs	Voltage reference			Relay hard contacts	
	Number and type of safety circuits			7 N.O. (13-14/23-24/33-34/43-44/53-54/63-64/73-74)	
	Number and type of additional outputs			4 solid-state (Y31-Y32, Y31-Y64, Y31-Y74, Y31-Y35)	
	Number and type of auxiliary contacts			2 N.C. (81-82/91-92)	
	Breaking capacity in AC-15		**VA**	B300 (inrush: 3600, maintained: 360)	
	Breaking capacity in DC-13			24 V/2 A, L/R = 50 ms	
	Breaking capacity of solid-state outputs			24 V/20mA	
	Max. thermal current (Ithe)		**A**	10	
	Max. total thermal current		**A**	40	
	Output fuse protection		**A**	6 gG or 10 fast acting, conforming to EN/IEC 947-5-1, DIN VDE0660 part 200	
	Minimum current		**mA**	170	
	Minimum voltage		**V**	17	
Electrical life				See page 2/172	
Response time on input opening			**ms**	< 20	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				4	
Operating temperature			**°F (°C)**	+ 14…+ 131 (- 10…+ 55)	
Storage temperature			**°F (°C)**	- 13…+ 267.8 (- 25…+ 85)	
Degree of protection conforming to IEC 529				Terminals: IP 20, enclosure: IP 40	
Connection	Type			Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 26-14 AWG (0.14…2.5 mm²)	Solid or flexible cable: 24-14 AWG (0.2…2.5 mm²)
		With cable end		Without bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)	
		With cable end		With bezel, flexible cable: 24-16 AWG (0.25…1.5 mm²)	With bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)
	2-wire connection	Without cable end		Solid or flexible cable: 26-18 AWG (0.14…0.75 mm²)	Solid cable: 24-18 AWG (0.2…1 mm²), flexible cable: 24-16 AWG (0.2…1.5 mm²)
		With cable end		Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)	
		With cable end		Double, with bezel, flexible cable: 20-16 AWG (0.5…1.5 mm²)	

Principle: page 2/194 | Characteristics: page 2/194 | References: page 2/195 | Wiring Diagrams: page 2/196 | Dimensions: page 2/260

Schneider Electric

Safety automation system solutions

Preventa™ safety relay modules type XPSAR

For Emergency stop, switch or light curtain monitoring

580011



XPSAR3●1144

References

Description	Type of terminal block connection	Number of safety circuits	Additional outputs/ solid-state outputs to PLC	Supply	Reference	Weight
				V		oz (kg)
Safety modules for Emergency stop, switch or light curtain monitoring	Integrated in module	7	2 / 4	∼ 24 ⎓ 24	**XPSAR311144**	10.582 (0.300)
				∼ 115 ⎓ 24	**XPSAR351144**	14.110 (0.400)
				∼ 230 ⎓ 24	**XPSAR371144**	14.110 (0.400)
	Removable from module	7	2 / 4	∼ 24 ⎓ 24	**XPSAR311144P**	10.582 (0.300)
				∼ 115 ⎓ 24	**XPSAR351144P**	14.110 (0.400)
				∼ 230 ⎓ 24	**XPSAR371144P**	14.110 (0.400)

Safety automation system solutions

Preventa™ safety relay modules type XPSAR

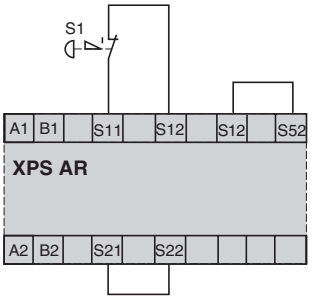
For Emergency stop, switch or light curtain monitoring

2

XPSAR

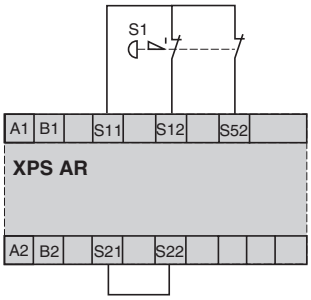
Emergency stop monitoring function configuration

1-channel wiring
Emergency stop button with a single N.C. contact

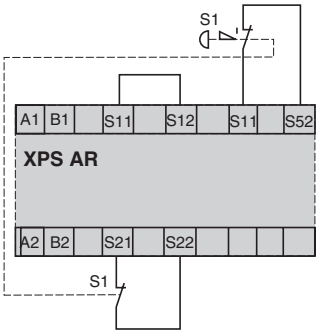


Not all faults are detected:
a short-circuit on the Emergency stop pushbutton is not detected

2-channel wiring
Emergency stop button with 2 N.C. contacts, without short-circuit detection

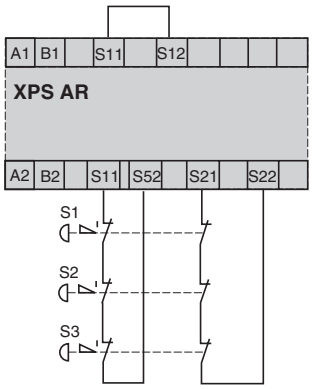


Emergency stop button with 2 N.C. contacts, with short-circuit detection (recommended application)



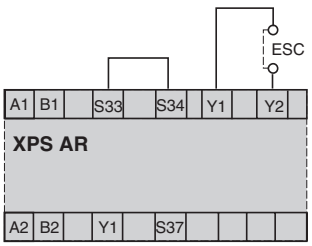
The 2 input channels are supplied at different potentials.
A short-circuit between the 2 inputs is detected

Connection of multiple Emergency stop buttons with 2 N.C. contacts (recommended application)

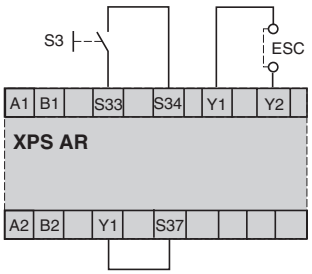


Start configurations

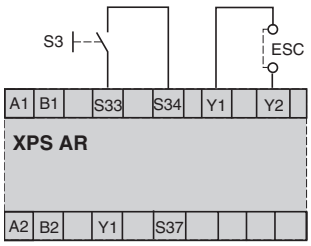
Automatic start



With start button monitoring



Without start button monitoring

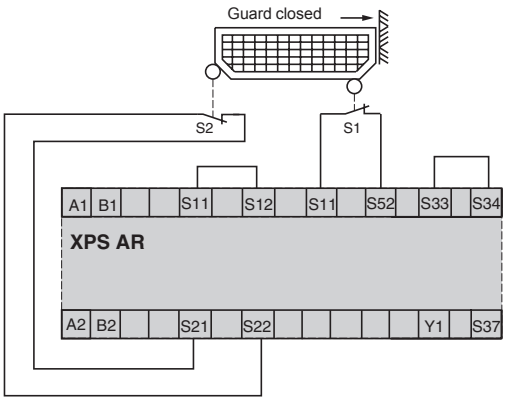


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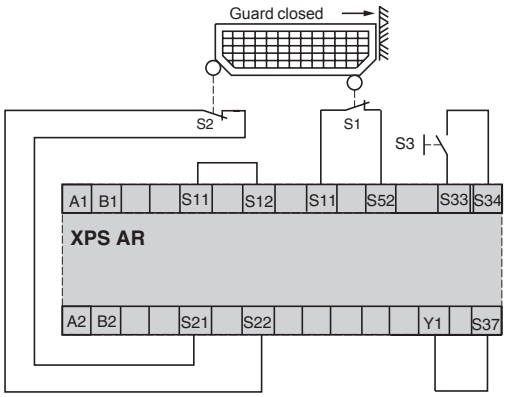
XPSAR

Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with N.O. contact, switch 2 with N.C. contact)

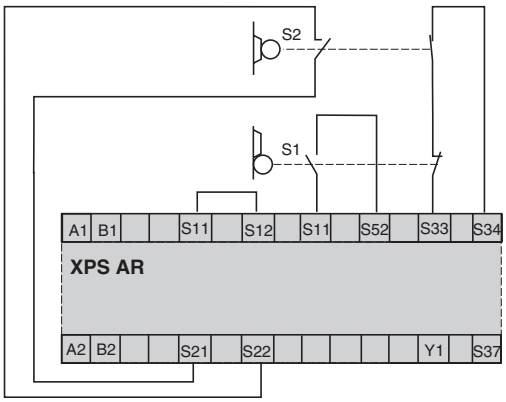
Automatic start, without synchronization time monitoring



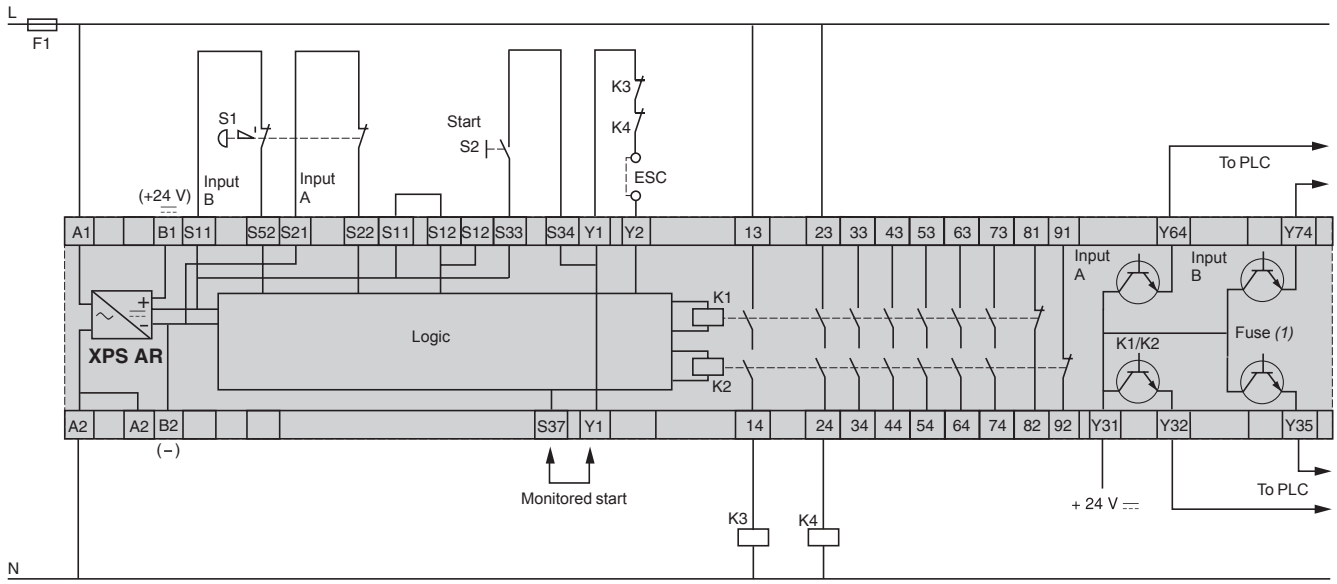
Manual start by start button



Monitoring of a movable guard associated with 2 switches in combined mode and automatic start
(shown with guard open)



Module XPSAR associated with an Emergency stop button with 2 N.C. contacts



Supply connection according to voltage:
~ across terminals A1/A2, or ⎓ 24 V across terminals B1/B2

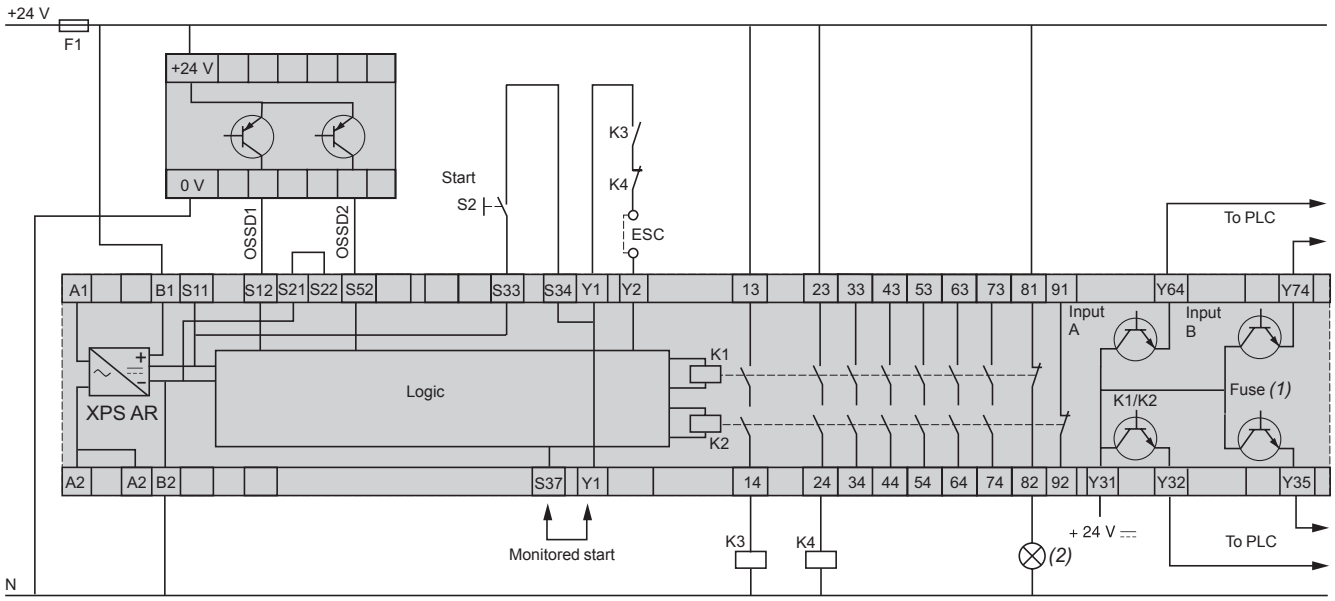
ESC: External start conditions
(1) Operating status of internal electronic fuse

Principle: page 2/194
Characteristics: page 2/194
References: page 2/195
Wiring Diagrams: page 2/196
Dimensions: page 2/260

2

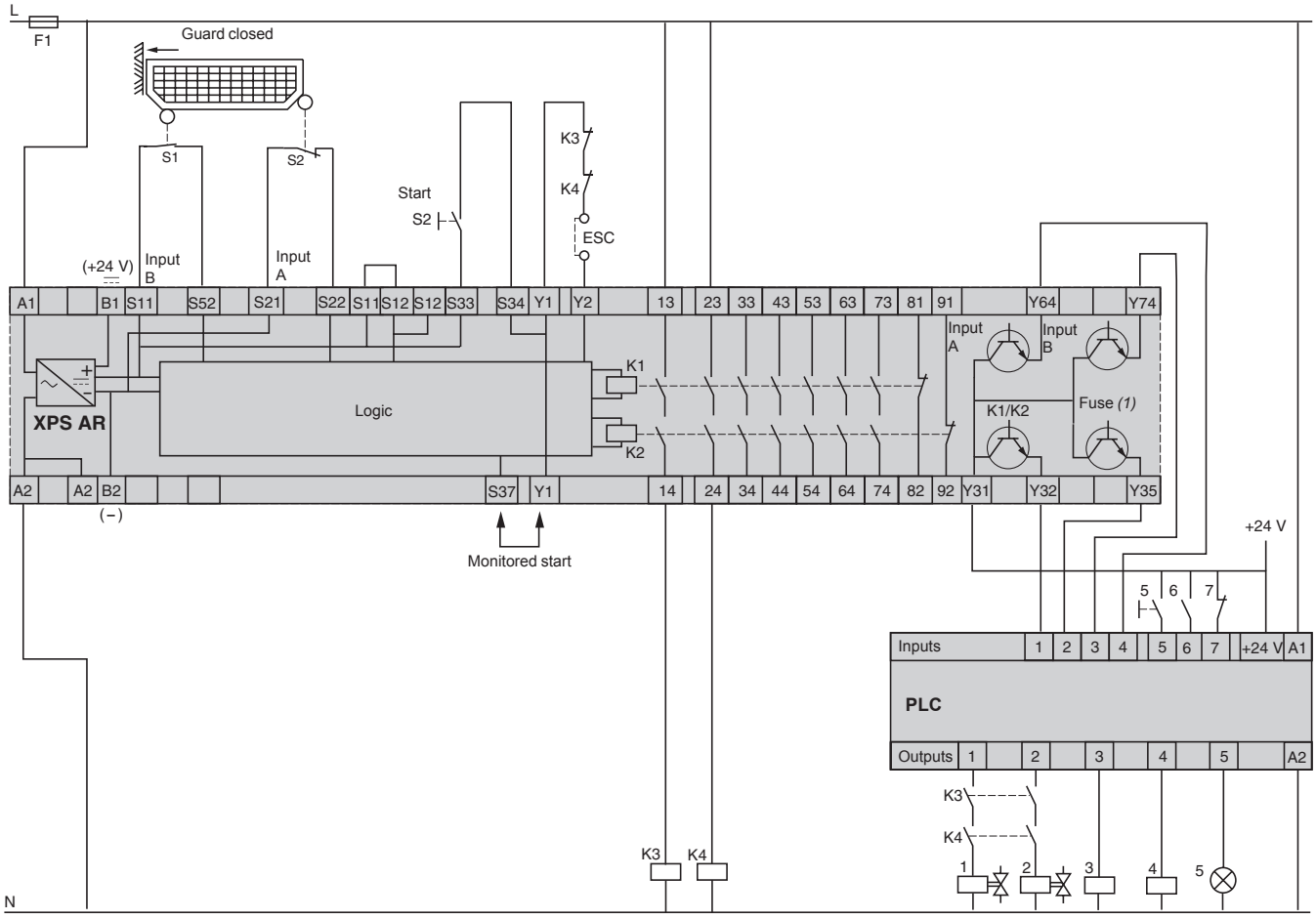
XPSAR

Module XPSAR for monitoring electro-sensitive protection equipment (ESPE)



ESC: External start conditions
(1) Operating status of internal electronic fuse
(2) ESPE indicator light deactivated

Example of safety circuit combining module XPSAR for switch monitoring and a PLC

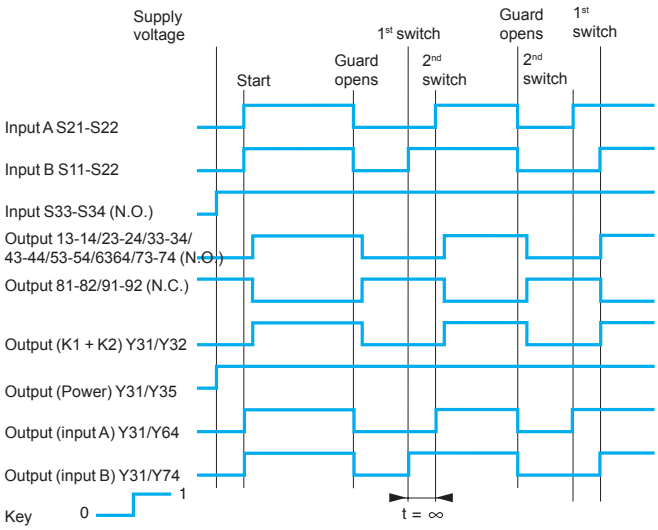


ESC: External start conditions
(1) Operating status of internal electronic fuse

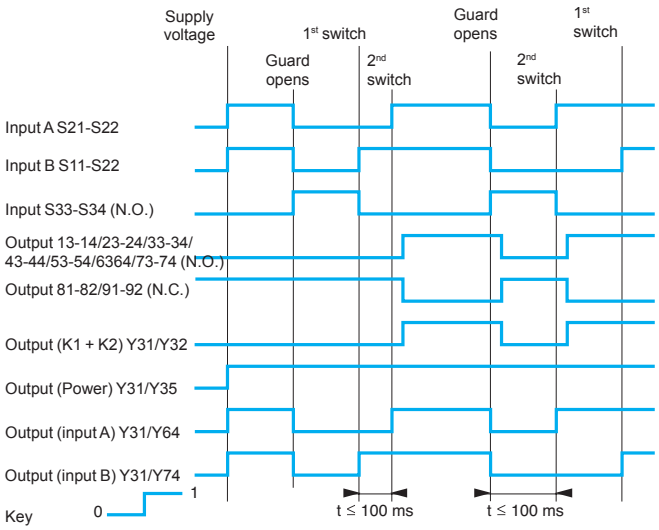
Principle: page 2/194 | Characteristics: page 2/194 | References: page 2/195 | Wiring Diagrams: page 2/196 | Dimensions: page 2/260

Functional diagrams of module XPSAR

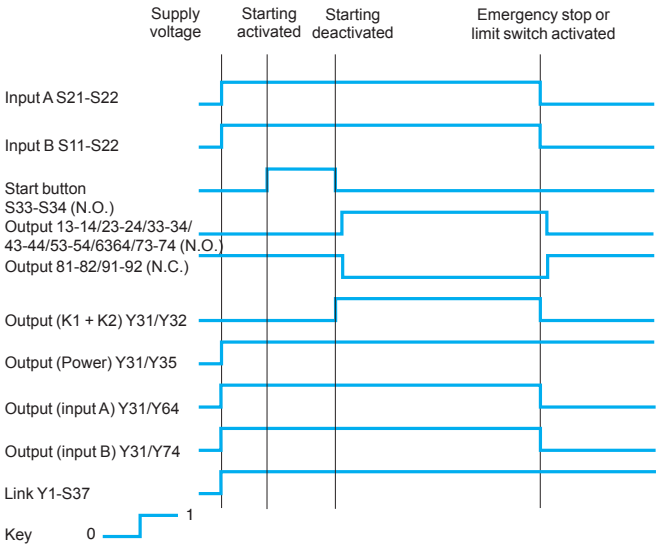
Limit switch monitoring function with automatic start



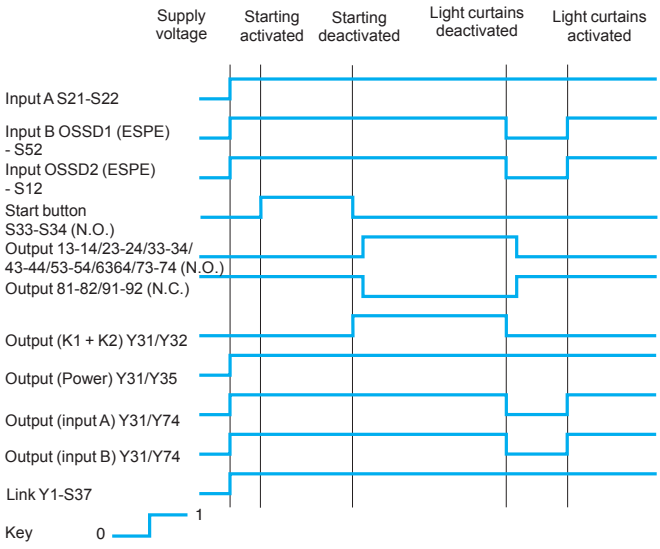
Limit switch monitoring function with automatic start and synchronization time monitoring



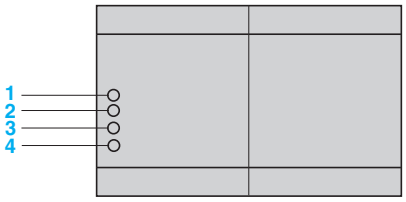
Emergency stop monitoring or limit switch monitoring function with monitored start



Light curtain monitoring (ESPE) function, curtains with solid-state outputs, and monitored start



LED details



1 Supply voltage A1-A2, internal electronic fuse status
2 Input S22 (A)
3 Input S52 (B)
4 K1/K2 status (N.O. safety outputs closed)

Safety automation system solutions

Preventa™ safety relay modules type XPSAK

For Emergency stop, switch, sensing mat/edges or light curtain monitoring

Operating principle

Safety modules XPSAK are designed to conform with category 4 of the standard EN 954-1/ISO 13849-1.
They are used for:
■ Monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN/IEC 60204-1.
■ Electrical monitoring of switches activated by protection devices, with optional selection of synchronization time between signals.
■ Monitoring 4-wire sensing mats or edges.
■ Monitoring type 4 light curtains conforming to EN/IEC 61496-1 which have solid-state safety outputs with test function (for example, light curtains type XUSL, conforming to the category 4 of standard EN 954-1/ISO 13849-1.
Housed in a compact enclosure, the modules have 3 safety outputs, a relay signalling output and 4 solid-state signalling outputs for signalling to the process PLC.
Preventa™ safety relay modules XPSAK●●●●P incorporate removable terminal blocks, thus optimizing machine maintenance.
To aid diagnostics, the modules have 4 LEDs on the front cover which provide information on the monitoring circuit status.
The Start button monitoring function is configurable depending on the wiring.

Characteristics

Module type				**XPSAK3●1144**	**XPSAK3●1144P**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.	
Conformity to standards				EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN/IEC 60947-1 + A11	
Product certifications				UL, CSA, BG	
Supply	Voltage		**V**	∼ and ⎓ 24, ∼ 48, ∼ 110 and ⎓ 24, ∼ 120 and ⎓ 24, ∼ 230 and ⎓ 24	
	Voltage limits			- 15…+ 10%	
	Frequency		**Hz**	50/60	
Power consumption	24 V version		**VA**	≤ 5	
	110/120/230 V versions			≤ 6	
Module inputs fuse protection				Internal, electronic	
Start button monitoring				Yes/No (configurable by terminal connections)	
Control unit voltage and current between terminals S21-S22, S31-S32				⎓ 24 V/30 mA approx. (at nominal supply voltage)	
Maximum wiring resistance RL between terminals S21-S22, S31-S32			Ω	28	
Synchronization time between inputs A and B (terminals S21-S22, S31-S32)			**s**	Automatic start: 2 or 4 depending on wiring Manual start (start button between S33 and S34): unlimited	
Outputs	Voltage reference			Relay hard contacts	
	Number and type of safety circuits			3 N.O. (13-14, 23-24, 33-34)	
	Number and type of additional circuits			1 N.C. (41-42) + 4 solid-state	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Breaking capacity of solid-state outputs			24 V/20 mA, 48 V/10 mA	
	Max. thermal current (Ithe)		**A**	6	
	Max. total thermal current		**A**	18	
	Output fuse protection		**A**	4 gG or 6 fast acting, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical life				See page 2/172	
Response time on input opening			**ms**	≤ 40	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				4	
Operating temperature			**°F (°C)**	+ 14…+ 131 (- 10…+ 55)	
Storage temperature			**°F (°C)**	- 13…+ 267.8 (- 25…+ 85)	
Degree of protection	Conforming to IEC 60529	Terminals		IP 20	
		Enclosure		IP 40	
Connections		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 26-14 AWG (0.14…2.5 mm²)	Solid or flexible cable: 24-14 AWG (0.2…2.5 mm²)
		With cable end		Without bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)	
		With cable end		With bezel, flexible cable: 24-16 AWG (0.25…1.5 mm²)	With bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)
	2-wire connection	Without cable end		Solid or flexible cable: 26-18 AWG (0.14…0.75 mm²)	Solid cable: 24-18 AWG (0.2…1 mm²), flexible cable: 24-16 AWG (0.2…1.5 mm²)
		With cable end		Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)	
		With cable end		Double, with bezel, flexible cable: 20-16 AWG (0.5…1.5 mm²)	

Principle: page 2/200 | Characteristics: page 2/200 | References: page 2/201 | Wiring Diagrams: page 2/202 | Dimensions: page 2/260

Safety automation system solutions

Preventa™ safety relay modules type XPSAK

For Emergency stop, switch, sensing mat/edges or light curtain monitoring

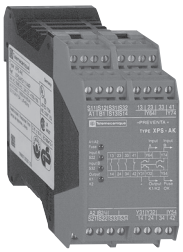
References

DF565754



XPSAK3●1144

DF565755



XPSAK3●1144P

Description	Type of terminal block connection	Number of safety circuits	Outputs: Additional / Solid-state for PLC	Supply	Reference	Weight oz (kg)
Safety modules for Emergency stop, switch, sensing mat/edges or light curtain monitoring	Integrated in module	3	1 / 4	∼ 24 V ⎓ 24 V	**XPSAK311144**	10.582 (0.300)
				∼ 110 V ⎓ 24 V	**XPSAK361144**	14.110 (0.400)
				∼ 120 V ⎓ 24 V	**XPSAK351144**	14.110 (0.400)
				∼ 230 V ⎓ 24 V	**XPSAK371144**	14.110 (0.400)
	Removable from module	3	1 / 4	∼ 24 V ⎓ 24 V	**XPSAK311144P**	10.582 (0.300)
				∼ 48 V	**XPSAK331144P**	10.582 (0.300)
				∼ 110 V ⎓ 24 V	**XPSAK361144P**	14.110 (0.400)
				∼ 120 V ⎓ 24 V	**XPSAK351144P**	14.110 (0.400)
				∼ 230 V ⎓ 24 V	**XPSAK371144P**	14.110 (0.400)

Safety automation system solutions

Preventa™ safety relay modules type XPSAK

For Emergency stop, switch, sensing mat/edges or light curtain monitoring

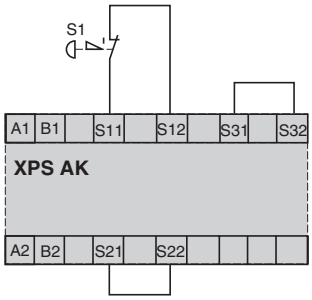
2

XPSAK

Emergency stop monitoring function configuration

1-channel wiring

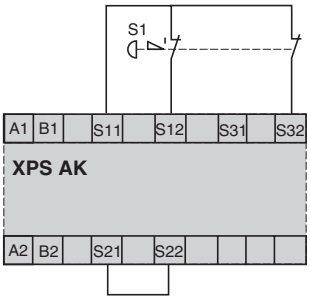
Emergency stop button with a single N.C. contact



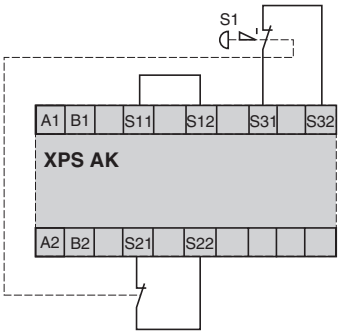
Not all anomalies are detected: a short-circuit on the Emergency stop pushbutton is not detected.

2-channel wiring

Emergency stop button with 2 N.C. contacts, without short-circuit detection

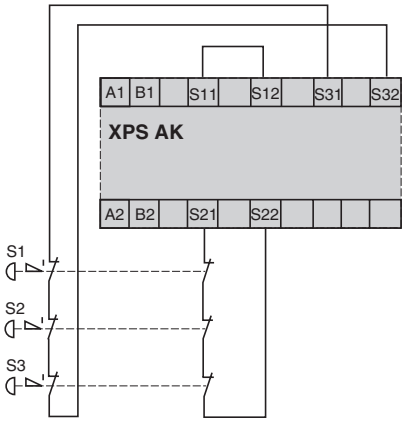


Emergency stop button with 2 N.C. contacts, with short-circuit detection (recommended application)



The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

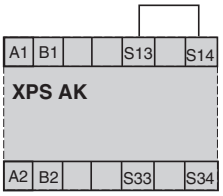
Connection of multiple Emergency stop buttons with 2 N.C. contacts (recommended application).



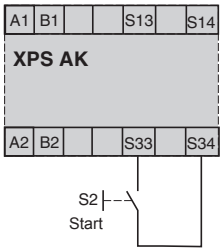
The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

Start configurations

Automatic start

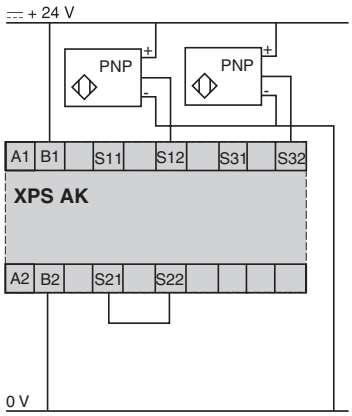


With start button monitoring

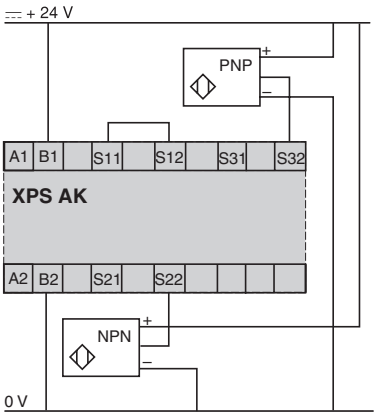


Proximity sensor monitoring

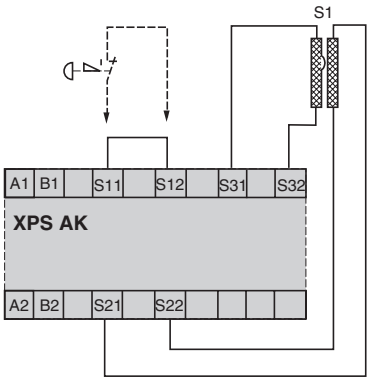
Proximity sensors with PNP outputs
Without short-circuit detection



Proximity sensors with NPN and PNP outputs
With short-circuit detection



Sensing mat or edges monitoring



Safety automation system solutions

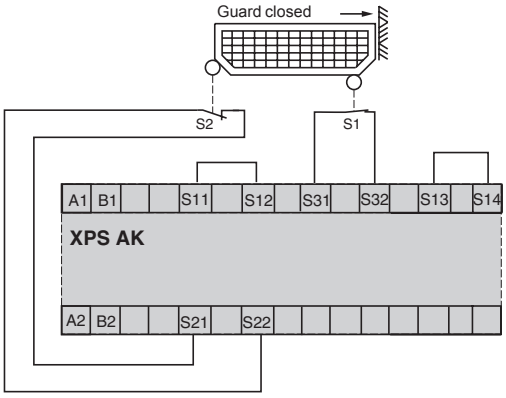
Preventa™ safety relay modules type XPSAK

For Emergency stop, switch, sensing mat/edges or light curtain monitoring

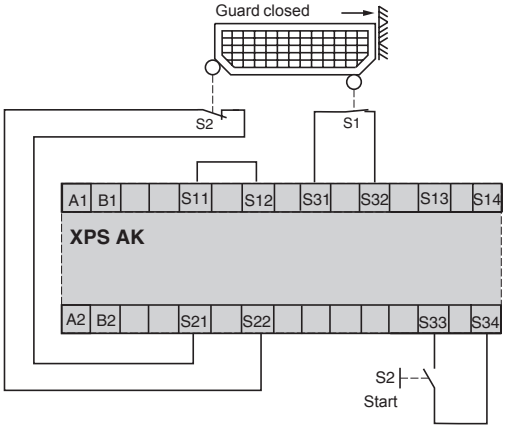
XPSAK

Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with N.O. contact, switch 2 with N.C. contact)

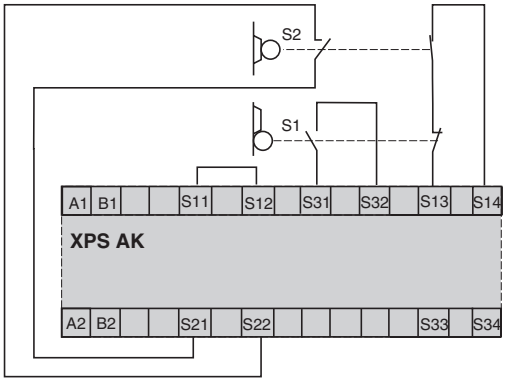
Automatic start, without synchronization time monitoring



Manual start by Start button

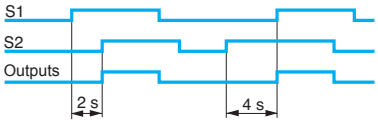


Monitoring of a movable guard associated with 2 switches and automatic start
(shown with guard open)

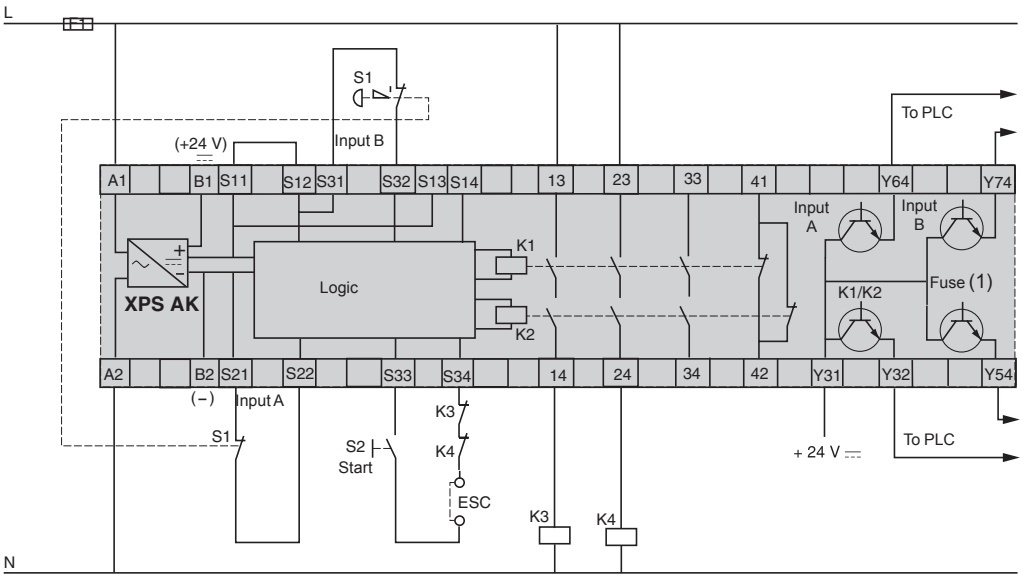


For synchronization monitoring of the inputs, S13 and S14 must be wired per the diagram to the left (if S13 and S14 are jumpered, the result would be automatic start without synchronization monitoring). The synchronization time is determined by the first limit switch that is activated.
If S1 is actuated before S2, then the synchronization time is two seconds on closing.
If S2 is actuated before S1, then the synchronization time is four seconds on closing.
There is no synchronization on opening the door or guard.

Functional diagram of outputs



Module XPSAK associated with an Emergency stop button with 2 N.C. contacts

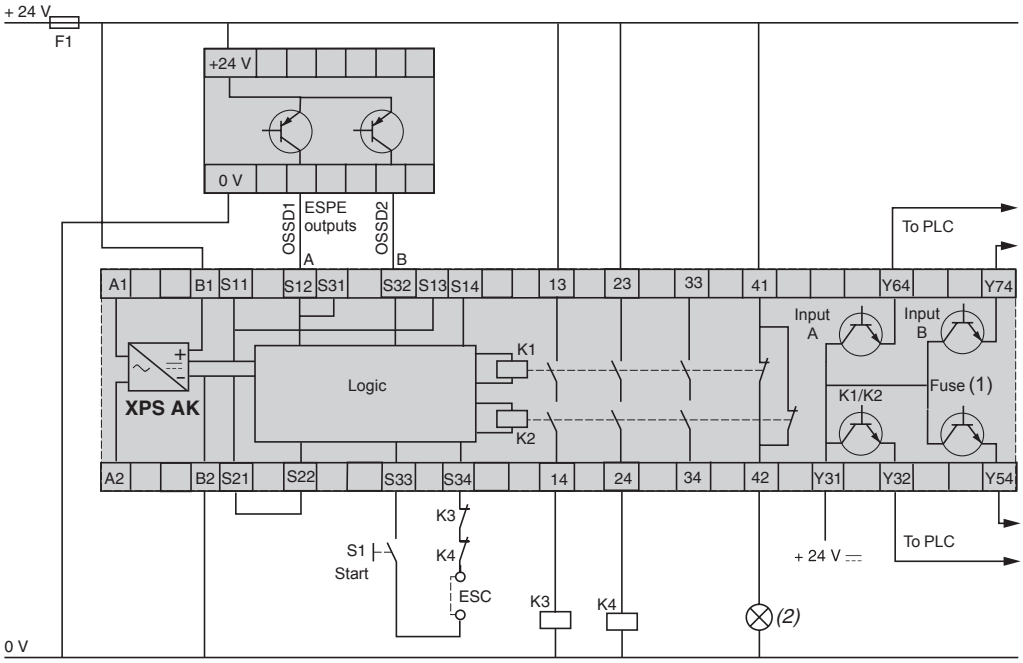


Supply connection according to voltage: ∿ across terminals A1/A2, or ⎓ 24 V across terminals B1/B2.
(1) Operating status of internal electronic fuse.
ESC: External start conditions.

2

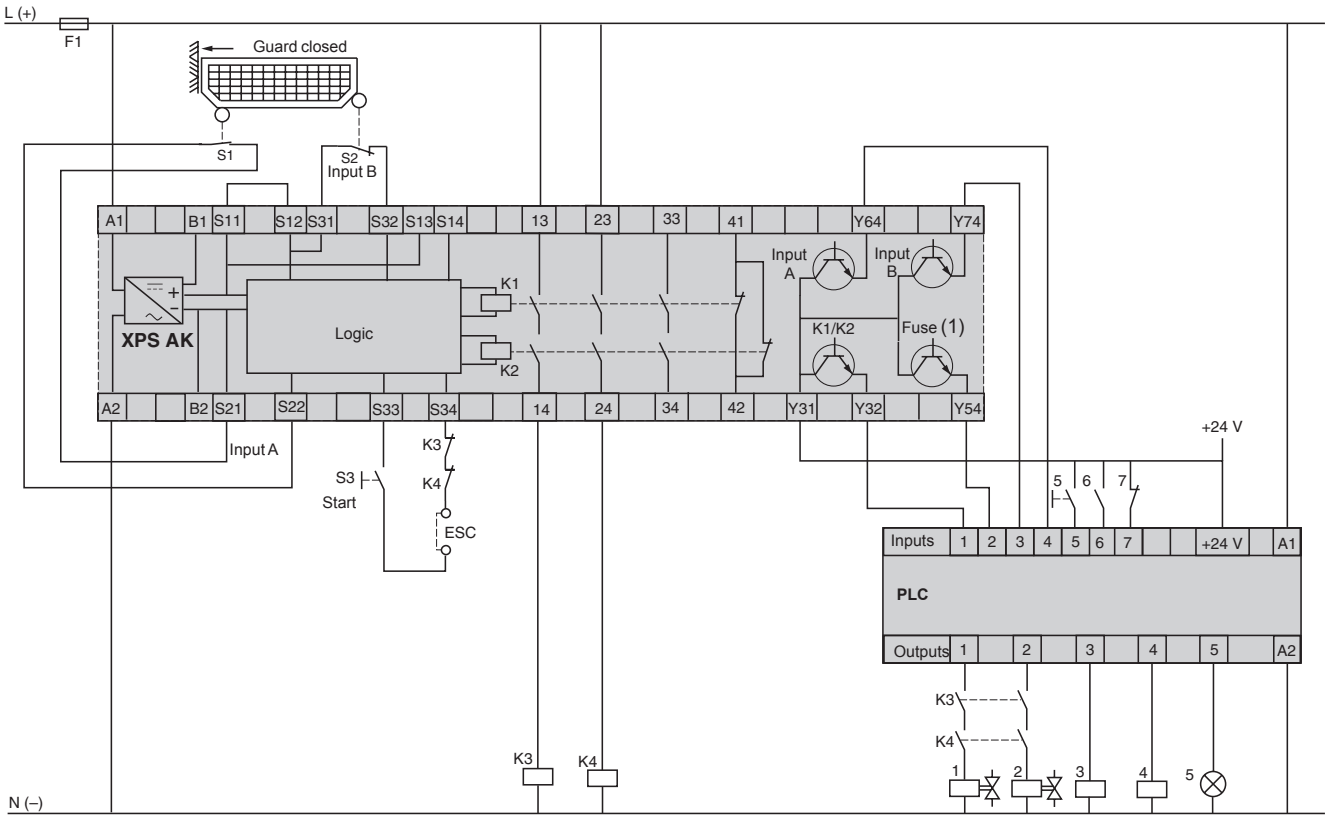
XPSAK

Module XPSAK for monitoring electro-sensitive protection equipment (ESPE)



(1) Operating status of internal electronic fuse.
(2) ESPE indicator light deactivated.
ESC: External start conditions.

Example of safety circuit combining module XPSAK for limit switch monitoring and a PLC



(1) Operating status of internal electronic fuse.
ESC: External start conditions.

Safety automation system solutions

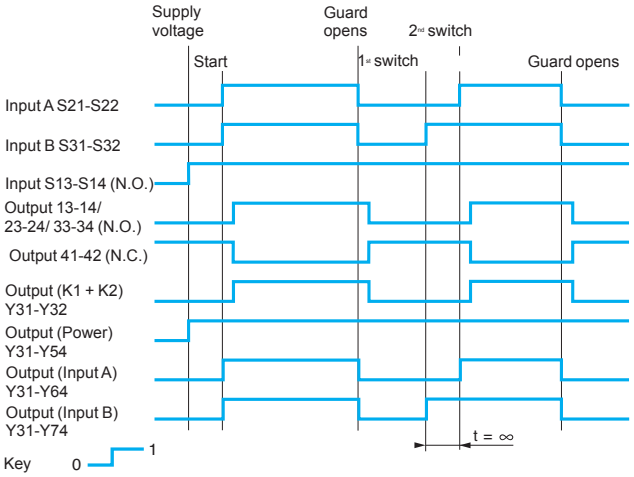
Preventa™ safety relay modules type XPSAK

For Emergency stop, switch, sensing mat/edges or light curtain monitoring

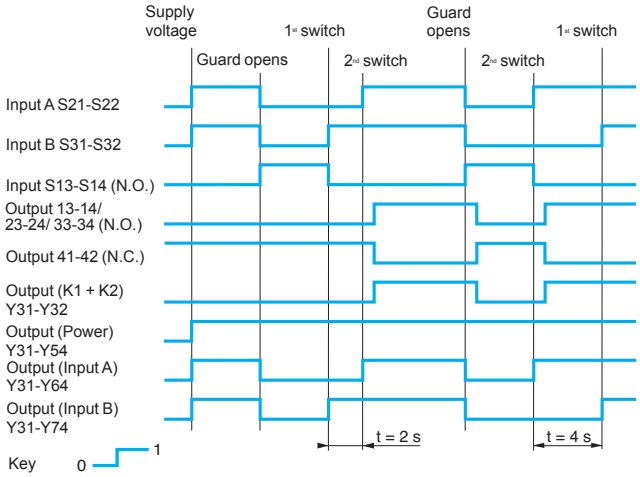
XPSAK

Functional diagrams

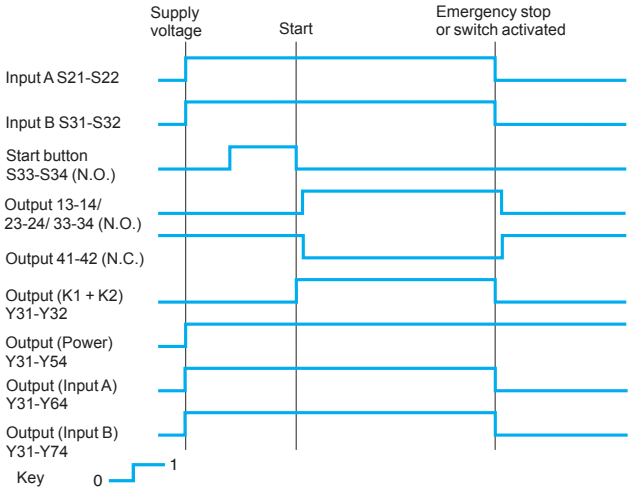
Switch monitoring function with automatic start



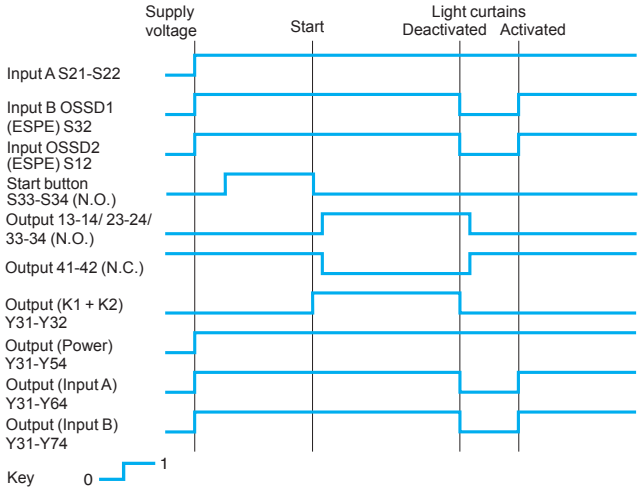
Switch monitoring function with automatic start and synchronization time monitoring



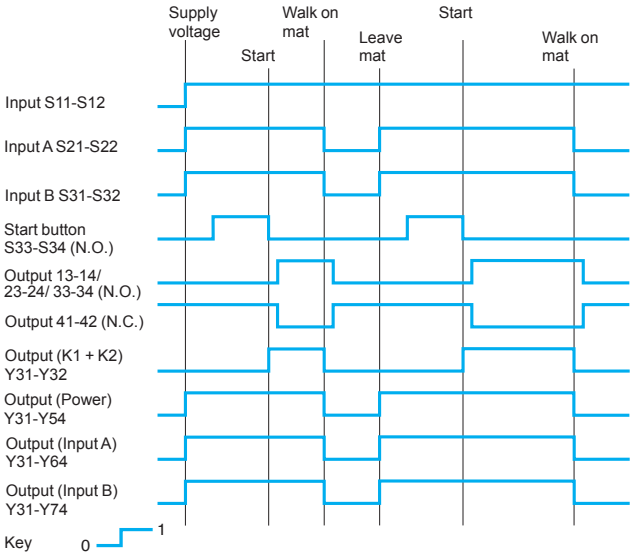
Emergency stop monitoring or switch monitoring function



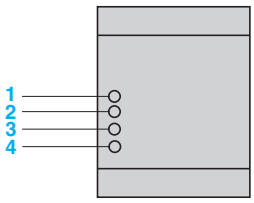
Light curtain monitoring (ESPE) function, curtains with solid-state outputs



Sensing mat or edge monitoring function, with monitored start



LED details



1 Supply voltage A1-A2, fuse status.
2 Input S22 (A).
3 Input S32 (B).
4 K1/K2 status (N.O. safety outputs closed).

Principle: page 2/200
Characteristics: page 2/200
References: page 2/201
Wiring Diagrams: page 2/202
Dimensions: page 2/260

Safety automation system solutions

Preventa™ safety relay modules types XPSBA, XPSBC, XPSBF

For electrical monitoring of two-hand control stations

Operating principle

Two-hand control stations are designed to provide protection against hand injury. They require machine operators to keep their hands clear of the hazardous movement zone.

The use of two-hand control is an individual protective measure, which can safely protect only one operator. Separate two-hand control stations must be provided for each operator in a multiple-worker environment.

Safety modules XPSBA, BC and BF for two-hand control stations comply with the requirements of European standard EN 574/ISO 13851 for two-hand control systems.

The control stations must be designed and installed such that they cannot be activated involuntarily or easily rendered inoperative. Depending on the application, the requirements of type C standards specific to the machinery involved must be met (additional personal protection methods may have to be considered).

To initiate a hazardous movement, both operators (two-hand control pushbuttons) must be activated within an interval ≤ 0.5 s (synchronous activation). If one of the two pushbuttons is released during a hazardous operation, the control sequence is cancelled. Resumption of the hazardous operation is possible only if both pushbuttons are returned to their initial position and reactivated within the required time interval.

The control sequence does not occur if:

- Both two-hand control push buttons are pressed during a time period greater than 0.5 seconds,
- A short-circuit is present in a push button contact,
- The feedback loop is not closed at start-up.

The safety distance between the control units and the hazardous zone must be sufficient to ensure that when only one operator is released, the hazardous zone cannot be reached before the hazardous movement has been completed or stopped.

XPSBA

This module is designed for use on lighter duty applications where a two-hand control function is desired, but where the safety category is B or 1 (per EN 954-1) and the two-hand control requirements meet Type III A (per EN 574). **This module is not to be used for applications, such as presses, which require a Type III C module or where the application is not a category B or 1.** For press applications, for applications in category 2, 3, or 4, or if application calls for a Type III C module, use XPSBC or XPSBF module.

XPSBC and XPSBF

These modules can be used on applications, such as presses, which require a Type III C module. The XPSBC and XPSBF can be used for a two-hand control application, including presses and similar equipment.

Safety automation system solutions

Preventa™ safety relay modules types XPSBA, XPSBC

For electrical monitoring of two-hand control stations

Characteristics

Module type				XPSBA	XPSBC
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 1 max.	Category 4 max.
Conformity to standards				EN/IEC 60204-1, EN/IEC 60947-5-1, EN 574/ISO 13851 type III A, EN 50082-2	EN/IEC 60204-1, EN/IEC 60947-5-1, EN 574 type III C/ISO 13851, EN 50082-2
Product certifications				UL, CSA	UL, CSA, INRS
Supply	Voltage		**V**	⎓ 24, ∿ 115, ∿ 230	⎓ 24, ∿ 24, ∿ 115, ∿ 230
	Voltage limits			- 20…+ 20% (⎓ 24 V), - 20…+ 10% (∿ 24 V), - 15…+ 15% (∿ 115 V), - 15…+ 10% (∿ 230 V)	- 20…+ 10% (⎓ 24 V), - 15…+ 10% (∿ 24 V), - 15…+ 15% (∿ 115 V), - 15…+ 10% (∿ 230 V)
	Frequency		**Hz**	50/60	
Power consumption			**VA**	< 20 (apparent power)	< 6
Module inputs fuse protection				Internal, electronic	
Inputs				S1: 1 N.C. + N.O., S2: 1 N.C. + N.O.	
Two-hand control type Conforming to EN 574/ISO 13851				III A	III C
Synchronization time			**s**	0.5 maximum	
Control unit voltage	⎓ 24 V version		**V**	24	24
	∿ 24 V, 115 V, 230 V version		**V**	24	48
Minimum voltage and current				**Between terminals T11-T12, T11-T13**	**Between terminals T11-T13, T21-T23**
	U min./I min. - ⎓ 24 V version 68 °F (20 °C)			18 V/30 mA	18 V/140 mA
	U min./I min. - ∿ 24 V/115 V/230 V version 68 °F (20 °C)			18 V/30 mA	30 V/50 mA
Calculation of wiring resistance RL (for XPSBC only) between terminals T11-T13, T21-T23 as a function of the internal supply voltage U int (terminals T13-T23)			Ω	–	RL max. = $\frac{\text{U int - U min.}}{\text{I min.}}$ Ue = true voltage applied to terminals A1-A2 U int = supply voltage Ue -1 V (24 V version) (115 V, 230 V version) RL max. must not exceed 50 Ω U int between 30.5 V and 35 V, with typical value = 35 V
Outputs	Voltage reference			Relay hard contacts	
	Number and type of safety circuits			1 N.O. (11-14)	2 N.O. (13-14, 23-24)
	Number and type of additional circuits			1 N.C. (11-12)	1 N.C. (31-32)
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	5	2.5
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, VDE 0660 part 200		**A**	4 gG or 6 fast acting	4 gG
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical life				See page 2/172	
Response time			**ms**	< 25	< 30
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				2	3
Operating temperature			**°F (°C)**	+ 14…+ 131 (- 10…+ 55)	
Storage temperature			**°F (°C)**	- 13…+ 267.8 (- 25…+ 85)	
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connections		Type		Captive screw clamp terminals	
	1-wire connection	Without cable end		Solid or flexible cable: 26-14 AWG (0.14…2.5 mm²)	
		With cable end		Without bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)	
		With cable end		With bezel, flexible cable: 24-16 AWG (0.25…1.5 mm²)	
	2-wire connection	Without cable end		Solid or flexible cable: 26-18 AWG (0.14…0.75 mm²)	
		With cable end		Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)	
		With cable end		Double, with bezel, flexible cable: 20-16 AWG (0.5…1.5 mm²)	

2

Characteristics

Module type				XPSBF1132	XPSBF1132P
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.	
Conformity to standards				EN/IEC 60204-1, EN 574 type III C/ISO 13851, EN/IEC 60947-1, EN/IEC 60947-5-1, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)	
Product certifications				UL, CSA, BIA	
Supply		Voltage	**V**	⎓ 24	
		Voltage limits		- 20…+ 20%	
Power consumption			**W**	< 2.5	
Module inputs fuse protection				Internal, electronic	
Inputs				S1: 1 N.C. + N.O., S2: 1 N.C. + N.O.	
Two-hand control type				III C conforming to EN 574/ISO 13851	
Synchronization time			**s**	0.5 maximum	
Control unit voltage			**V**	24 V/8 mA	
Outputs	Voltage reference			Relay hard contacts	
	Number and type of safety circuits			2 N.O. (13-14, 23-24)	
	Number and type of additional circuits			2 solid-state (type 24 V - 20 mA)	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	4.2	
	Max. total thermal current		**A**	8.4	
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, VDE 0660 part 200		**A**	4 gG or 6 fast acting	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical life				See page 2/172	
Response time			**ms**	< 20	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				3	
Operating temperature			**°F (°C)**	+ 14…+ 131 (- 10…+ 55)	
Storage temperature			**°F (°C)**	- 13…+ 267.8 (- 25…+ 85)	
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connection		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 26-14 AWG (0.14…2.5 mm²)	Solid or flexible cable: 24-14 AWG (0.2…2.5 mm²)
		With cable end		Without bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)	
		With cable end		With bezel, flexible cable: 24-16 AWG (0.25…1.5 mm²)	With bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)
	2-wire connection	Without cable end		Solid or flexible cable: 26-18 AWG (0.14…0.75 mm²)	Solid cable: 24-18 AWG (0.2…1 mm²), flexible cable: 24-16 AWG (0.2…1.5 mm²)
		With cable end		Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)	
		With cable end		Double, with bezel, flexible cable: 20-16 AWG (0.5…1.5 mm²)	

Safety automation system solutions

Preventa™ safety relay modules types XPSBA, XPSBC, XPSBF

For electrical monitoring of two-hand control stations

Selection

Standard EN 574/ISO 13851 defines the selection of two-hand controls according to the control system category.
The following table details the three types of two-hand control conforming to EN 574/ISO 13851.
For each type, it lists the operating characteristics and minimum requirements.

Requirements of standard EN 574/ ISO 13851	Type I	Type II	Type III		
			A	B	C
Use of both hands (simultaneous action)	■	■	■	■	■
Link between input and output signals	■	■	■	■	■
Output signal inhibited	■	■	■	■	■
Prevention of accidental operation	■	■	■	■	■
Tamper-proof	■	■	■	■	■
Output signal reinitialized		■	■	■	■
Synchronous action (specified time limit)			■	■	■
Use of proven components (Category 1 conforming to EN 954-1/ ISO 13849-1)	■		XPSBA●●		
Redundancy with partial error detection (Category 3 conforming to EN 954-1/ ISO 13849-1)		■		XPSBC XPSBF	
Redundancy + Self-monitoring (Category 4 conforming to EN 954-1/ ISO 13849-1)					XPSBC XPSBF

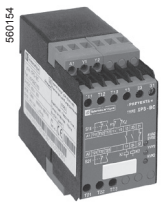
■ Meets the requirements of standard EN 574/ISO 13851

■ Conforming to standard EN 954-1/ISO 13849-1

References



XPSBA●●●●



XPSBC●●●●



XPSBF1132P

Description	Type conforming to standard EN 574/ ISO 13851	Type of terminal block connection	Number of safety circuits	Additional outputs	Supply	Reference	Weight oz (kg)
Safety modules for electrical monitoring of two-hand control stations	III A	Integrated in module	1 N.O.	1 N.C.	∼ or ⎓ 24 V	**XPSBA5120**	7.055 (0.200)
					∼ 115 V	**XPSBA3420**	7.055 (0.200)
					∼ 230 V	**XPSBA3720**	7.055 (0.200)
	III C	Integrated in module	2 N.O.	1 N.C.	⎓ 24 V	**XPSBC1110**	14.110 (0.400)
					∼ 24 V	**XPSBC3110**	14.110 (0.400)
					∼ 115 V	**XPSBC3410**	14.110 (0.400)
					∼ 230 V	**XPSBC3710**	14.110 (0.400)
			2 N.O.	2 solid-state	⎓ 24 V	**XPSBF1132**	5.291 (0.150)
		Removable from module	2 N.O.	2 solid-state	⎓ 24 V	**XPSBF1132P**	5.291 (0.150)

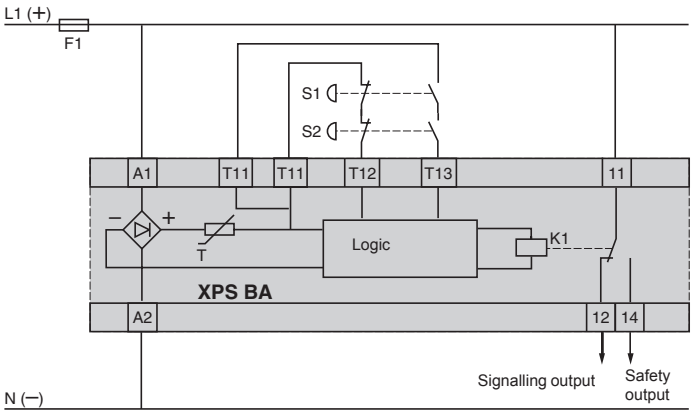
Safety automation system solutions
Preventa™ safety relay modules type XPSBA
For electrical monitoring of two-hand control stations

2

XPSBA

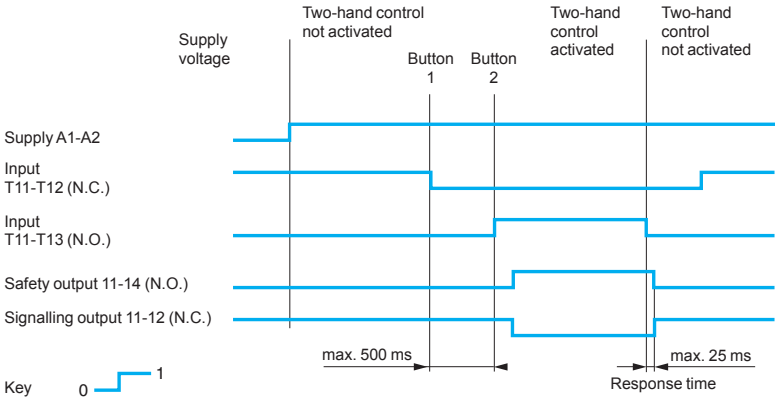
Module XPSBA associated with a two-hand control station

Type III A conforming to EN 574/ISO 13851

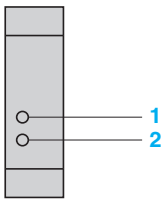


S1 and S2: pushbuttons. Must not be used for applications (presses) which require a type III C module (XPSBC).

Functional diagram of module XPSBA



LED details (XPSBA)

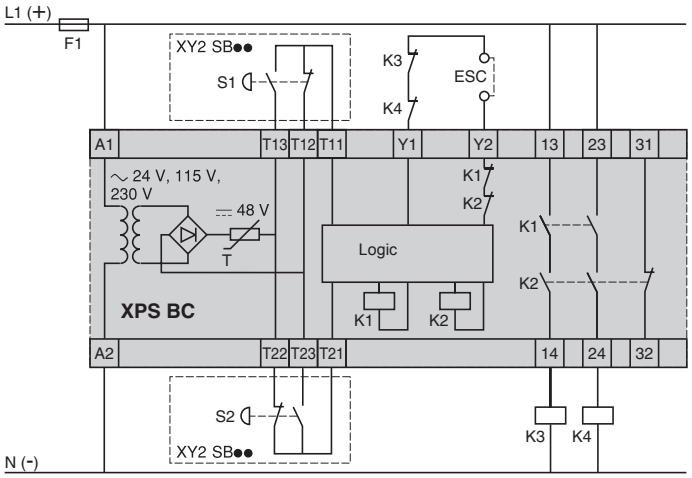


1 Supply voltage A1-A2.
2 K1 status (N.O. safety output 11-14 closed).

XPSBC

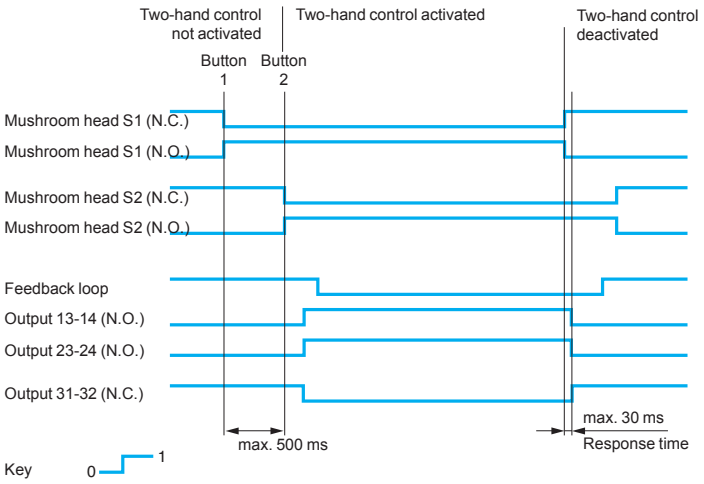
Module XPSBC associated with a two-hand control station

Type III C conforming to EN 574/ISO 13851

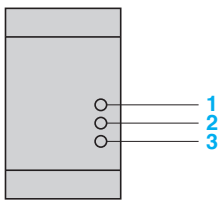


ESC: external start conditions.
Y1-Y2: feedback loop.
Output (31-32) must not be used as a safety circuit. It can be used for non-hazardous machine movements.

Functional diagram of module XPSBC



LED details (XPSBC)

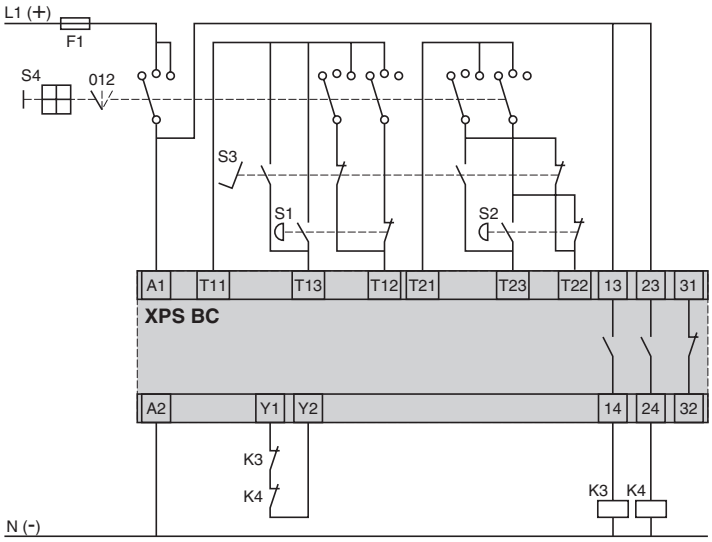


1 Supply voltage A1-A2, S1-S2. LED 1 indicates that buttons S1 and S2 are correctly connected.
2 Feedback loop Y1-Y2.
3 K1-K2 status (N.O. safety outputs closed).

2

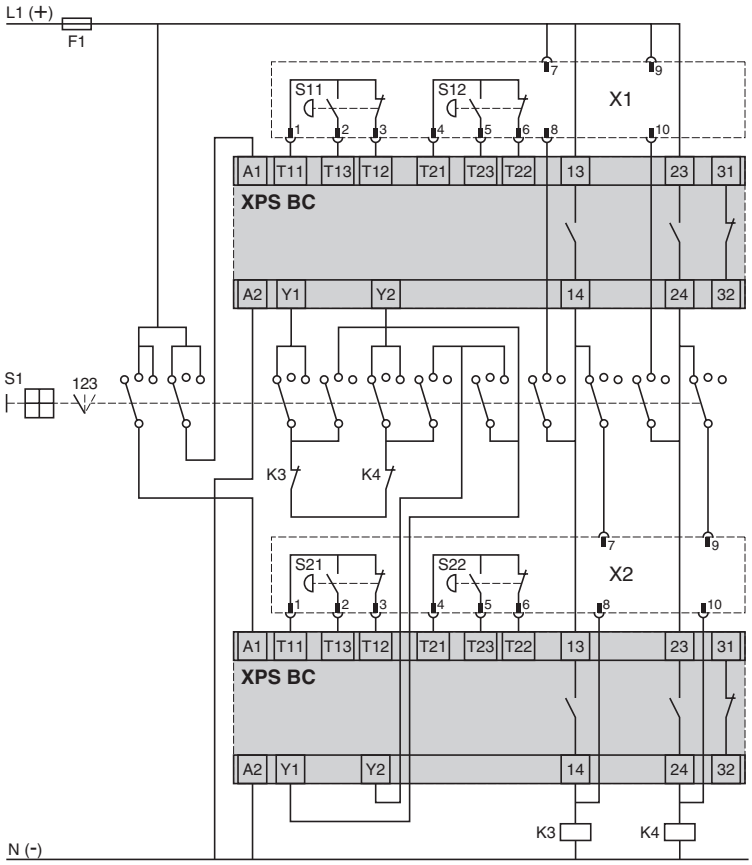
XPSBC

Module XPSBC associated with a two-hand control station and a foot switch



S4 selector switch:
0 = stop
1 = control station
2 = foot switch
S1-S2: two-hand control station pushbuttons
S3: foot switch

Modules XPSBC associated with 2 two-hand control stations



When operator 1 is absent: replace terminal block X1 by X3 and physically remove the two-hand control station.

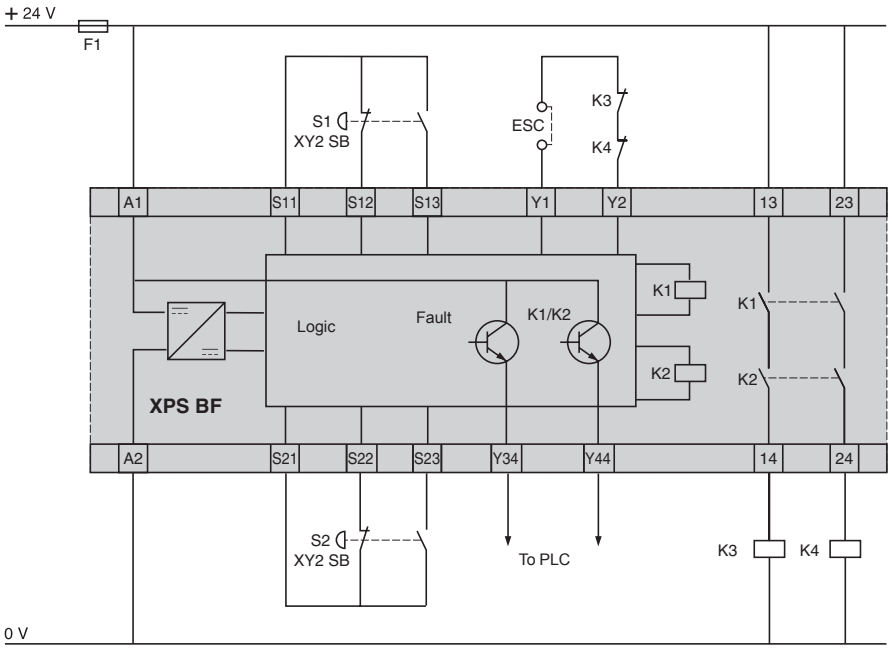
When operator 2 is absent: replace terminal block X2 by X3 and physically remove the two-hand control station.



S1 selector switch:
1 = operator 1
2 = operator 2
3 = operator 1 and operator 2
S11-S12, S21-S22: two-hand control station pushbuttons

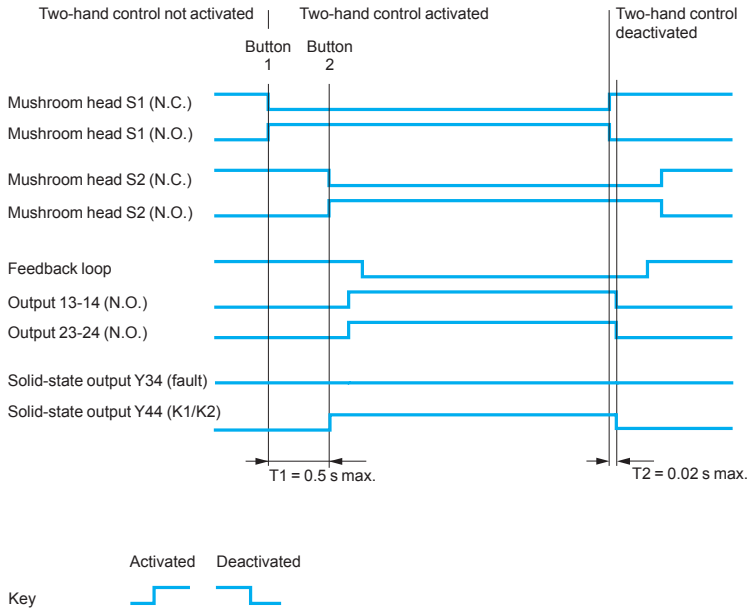
XPSBF

Module XPSBF associated with a two-hand control station

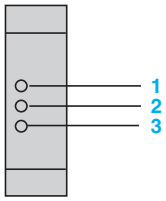


ESC: External start conditions.
Y1-Y2: feedback loop

Functional diagram of module XPSBF



LED details (XPSBF)



1 Supply voltage A1-A2 (fuse status).
2 Fault signalling.
3 K1-K2 status (N.O. safety outputs closed).

Safety automation system solutions

Preventa™ safety relay modules type XPSLCD

For monitoring 2 to 4 light curtains type 2 and type 4

Operating principle

The safety monitoring module XPSLCD1141 enables independent monitoring of 2 to 4 light curtains type 2 and type 4.
Each output of the light curtain is separately connected to the inputs of the safety monitoring module, which either authorises or prevents activation of its two safety outputs.
The module manages starting and EMD/MPCE functions and therefore, the light curtains connected to it must be configured for automatic start and the EDM/MPCE function deactivated. The safety monitoring module XPSLCD1141 provides the supply and also manages, in addition to its own auxiliary outputs (1 PNP and 1 NPN), the auxiliary outputs of the light curtains.
At the slightest intrusion through one or more light beams of any of the light curtains, the outputs of the safety monitoring module open. This also applies in the event of any internal fault or output relay(s) fault (subject to the EDM/MPCE configuration on the module).
The light curtain system conforms to the standard EN/IEC 61496-1 (type 4).
The Preventa™ safety monitoring module XPSLCD1141 incorporates removable terminal blocks, thus optimizing machine maintenance.
To aid diagnostics, the safety monitoring module has 9 LEDs and a 2-digit display on the front cover which provide information on the monitoring circuit status.

Environmental characteristics

Safety monitoring module type			**XPSLCD1141**
Certifications			CE, TÜV, CSA, UL
Ambient air temperature		**°F (°C)**	Operation: 0…+ 55; storage: - 25…+ 75
Relative humidity			95% maximum, without condensation
Degree of protection			IP 20
Shock and vibration resistance	Conforming to EN/IEC 61496-1		Shock resistance: 10 gn, impulse 16 ms. Vibration resistance: 5…55 Hz max. on all 3 axes
Materials			ABS thermoplastic enclosure
Mounting			35 mm rail

Electrical characteristics

Power supply		**V**	⎓ 24 ± 10%
Current		**A**	10 max.
Response time		**ms**	< 1
Safety outputs			2 solid-state PNP outputs (N.O.), 625 mA on ⎓ 24 V
Alarm or auxiliary output			1 solid-state PNP (N.O.), 500 mA on ⎓ 24 V, and 1 solid-state NPN (N.O.),100 mA on ⎓ 24 V, output
Monitoring activation of output switching devices (EDM/MPCE)		**mA**	50 ± 20% on ⎓ 24 V
Signalling			9 LEDs plus 2-digit display
Functions			-Auto/Manual, manual 1st cycle, -Monitoring of external switching devices (EDM: External Devices Monitoring), -Restart request indicator light, -Display of operating modes and alarm by 9 LEDs and 2-digit display. Selection of Auto/Manual, blanking relay monitoring, floating/blanking and blanking + floating/ blanking relay monitoring using configuration switches behind front cover of module. -Independent monitoring of 2 to 4 light curtains.
Monitoring of external switching devices (EDM = External Devices Monitoring)			Monitoring of the function (open or closed) as well as the response time of the power components. Selectable by using configuration switches.
Start input		**mA**	50 at 24 V
Connection	Type		Captive screw clamp terminals, removable terminal block
1-wire connection	Without cable end		Solid cable: 14 AWG (1.63 mm^2)
	Without cable end		Flexible cable: 26-16 AWG (0.14...1.5 mm^2)
	With cable end		Without bezel, flexible cable: 26-16 AWG (0.14…1.5 mm^2)
2-wire connection	Without cable end		Solid cable: 26-16 AWG (0.14...1.5 mm^2)
	Without cable end		Flexible cable: 26-16 AWG (0.14...1.5 mm^2)

Principle: page 2/214 | Characteristics: page 2/214 | References: page 2/215 | Wiring Diagrams: page 2/215 | Dimensions: page 2/260

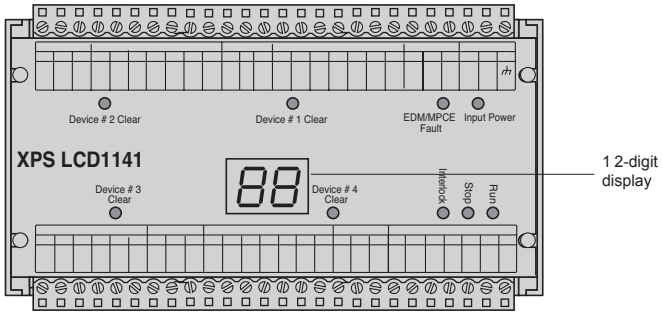
Safety automation system solutions

Preventa™ safety relay modules type XPSLCD

For monitoring 2 to 4 light curtains type 2 and type 4

Description

The safety monitoring module XPSLCD has 9 LEDs and a 2-digit display on the front cover.



Reference



107800-55-M

XPSLCD1141

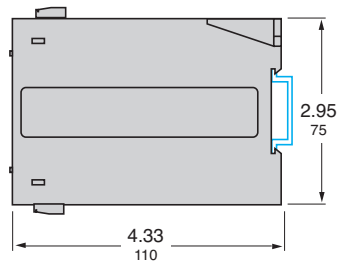
Description	Type of terminal block connection	Number of safety circuits	Additional outputs	Supply	Reference	Weight
				V		oz (kg)
Safety module for monitoring 2 to 4 light curtains type 2 and type 4	Removable from module	2 PNP	5 (4 PNP + 1 PNP or NPN)	⎓ 24 V	**XPSLCD1141**	26.455 (0.750)

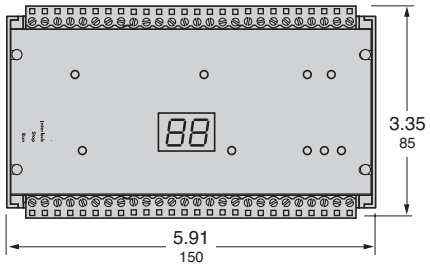
Dimensions

Safety monitoring module

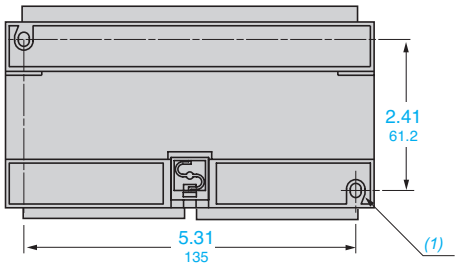
XPSLCD1141

Mounting on 35 mm rail





Rear view



(1) 2 elongated holes Ø 4 x 5.7.

Dual Dimensions: INCHES Millimieters

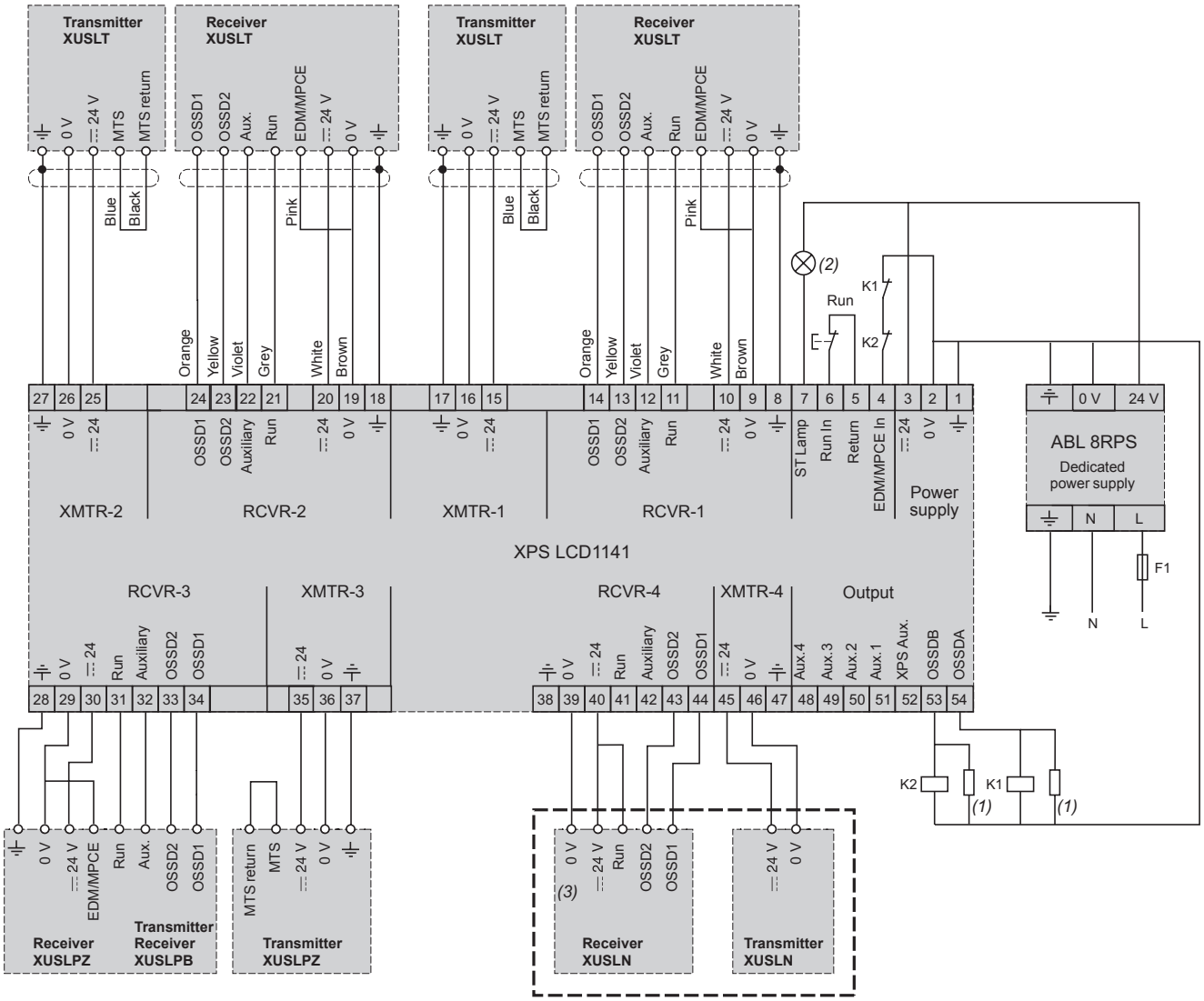
Safety automation system solutions

Preventa™ safety relay modules type XPSLCD

For monitoring 2 to 4 light curtains type 2 and type 4

Connection via the safety monitoring module XPSLCD1141

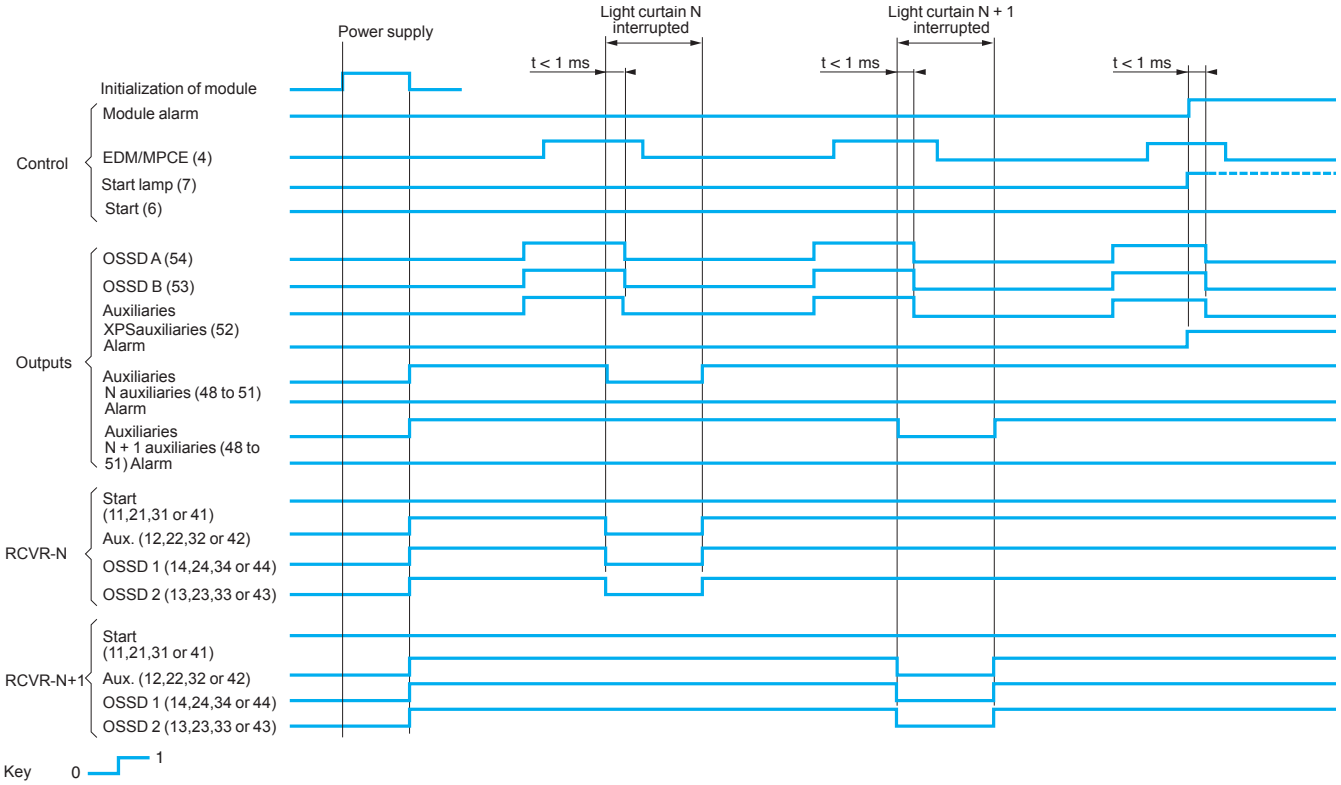
Example: configuration with light curtains XUSLT, XUSLP and XUSLN



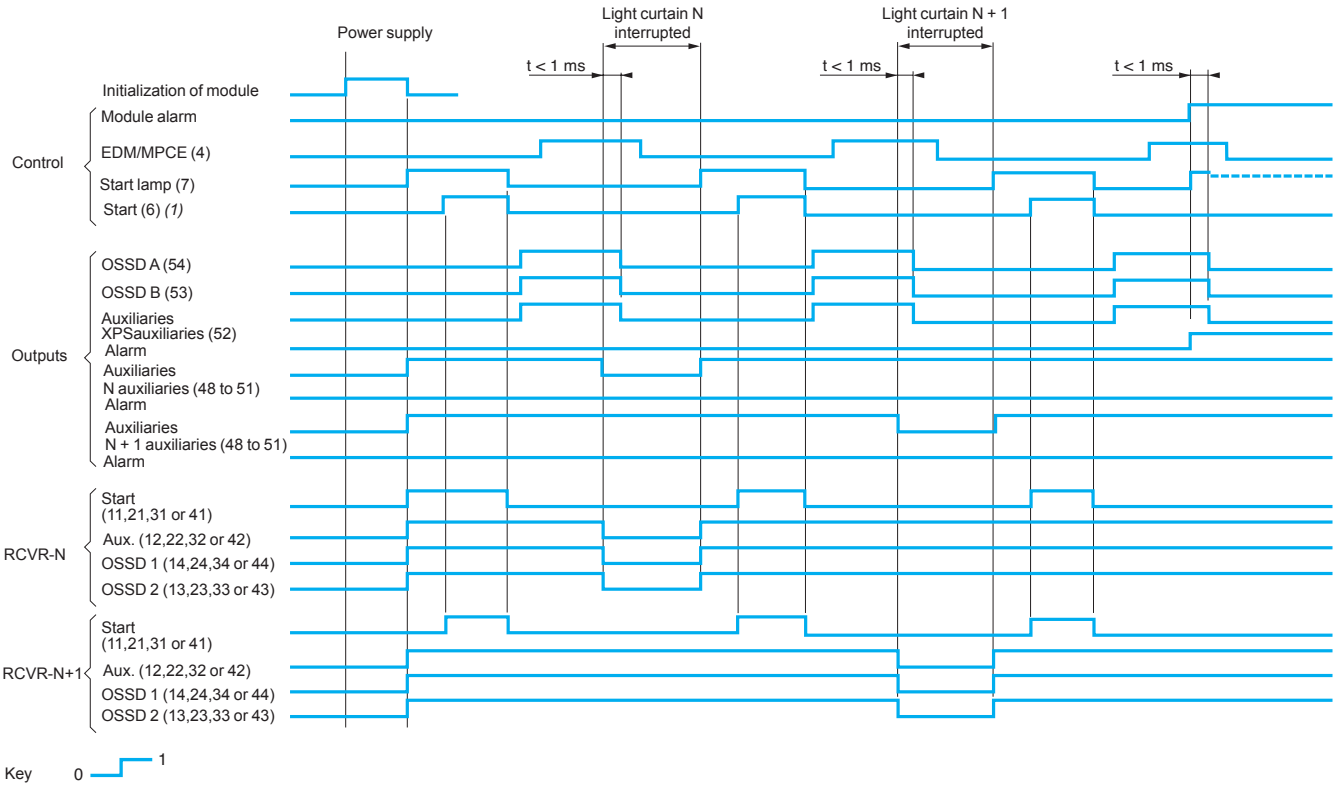
(1) Arc suppressor.
(2) Restart request indicator light.
(3) When module XPSLCD1141 is used with a type 2 light curtain (example: XUSLN), the entire protection system is downgraded to category 2.

Functional diagram of module XPSLCD1141

Automatic start and restart mode



Manual start and restart mode



(1) Start button.

Safety automation system solutions

Safety monitoring module
Preventa™ XPSLCM
For the “muting” function of type 2 and type 4 light curtains

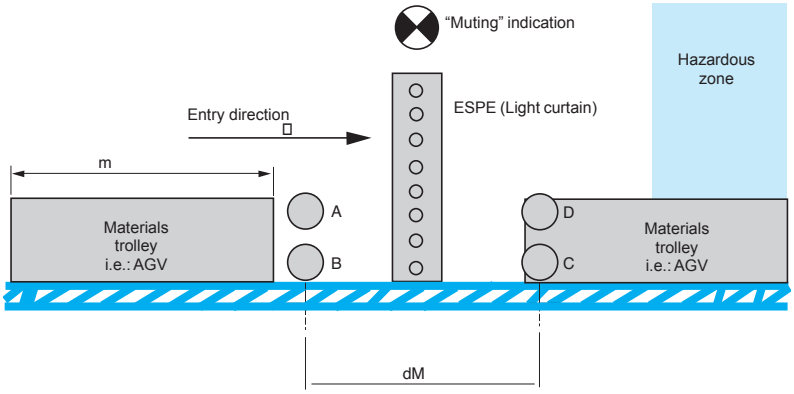
Operating principle

Safety modules XPSLCM are used with type 4 light curtains conforming to EN/IEC 61496-1 to provide a system inhibiting the light curtain protection, i.e. “muting”. This function enables the automatic passage of parts for machining or loaded pallets, without interrupting the transportation movement within the zone protected by the electro-sensitive protection equipment (ESPE) system. In addition to the electro-sensitive protection and safety relay modules XPSLCM, the system consists of 4 to 8 inhibition sensors, 2 indicator lights and a key switch to reset the system to the initial state in the event of a sequence error.

When the system is switched on by the start command and the light curtain protection not interrupted, the main circuit is closed by the safety outputs of the XPSLCM modules (solid-state safety outputs). In addition to safety outputs, the modules incorporate signalling outputs for sending system status information to the PLC. Either 5 or 14 LEDs and a 2-digit display, mounted on the front cover of the module, provide information on the safety circuit status.

An interruption of the protection field monitored by the electro-sensitive protection equipment causes instantaneous opening of the safety outputs; the process PLC receives a stop command and the LED display mounted on the front cover indicates the change of state of the safety circuits. The “open” state is maintained until the module is restarted using the Start button.

The “muting” function cannot be activated by supplying the inhibition sensors unless the safety outputs have been switched on beforehand. To trigger the “muting” function, the inhibition devices must be activated within the 3 second time interval. During the activated “muting” phase, materials can be transported through the protection field without deactivating the safety outputs. In the event of intrusion into the hazardous zone, a person cannot activate the inhibition sensors in the same way and the system stops.
While the “muting” function is activated, a “muting” status indicator light is controlled by the XPSLCM module. An anomaly at indicator light level (short-circuit, open circuit) is immediately recognized and deactivates the “muting” function. The indicator light only illuminates when a “muting” signal is generated and indicates the inhibition of the protection function.



ESPE: electro-sensitive protection equipment (light curtain).
A, B, D, C: “muting” sensors.
m: trolley length and dM = distance between A, B and D, C.

Conditions to be observed for the “muting” function

- The “muting” sensors must either be thru-beam type XUB 0BPSNL2 + XUB 0BKSNL2T, polarized reflex type XUB 0BPSNL2 + XUC Z50 or mechanical limit switches with contacts.
- dM ≤ m to obtain continuous validation of the “muting” function.
- Avoid the intrusion of persons during the “muting” phase. This phase is indicated by the indicator light connected to the “muting” indicator output of the XPSLCM module.
- A materials trolley must provide the “muting” signal before entering the protection field and cease it once it has cleared all the sensors of the protection field on exiting.

Safety automation system solutions

Safety monitoring module
Preventa™ XPSLCM
For the “muting” function of type 2 and type 4 light curtains

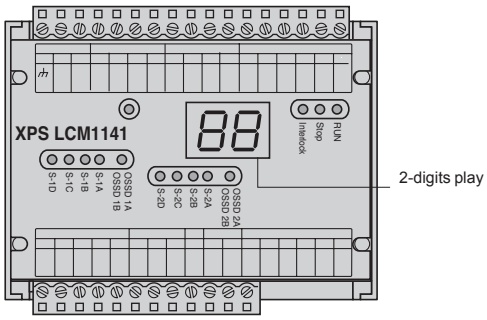
Characteristics

Module type			XPSLCM1150
Certifications			CE, TÜV, CSA, UL
Products designed for max. use in safety related parts of control systems	Conforming to EN 954-1/ ISO 13849-1		Category 4
Ambient air temperature	For operation	**°F (°C)**	0…+ 55
	For storage	**°F (°C)**	- 25…+ 75
Degree of protection conforming to IEC 529	Terminals		IP 20
	Enclosure		IP 20
Power supply	Voltage	**V**	⎓ 24
	Voltage limits		- 10…+ 10%
Maximum power consumption		**W**	< 150
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)
Rated impulse withstand voltage (Uimp)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)
Number of light curtains monitored			1 or 2 transmitter-receiver pairs
Inputs for “muting” sensors			
- number of inputs to be monitored			2 to 4 per “muting” function
- supply voltage of sensors		**V**	24
- output current of each sensor		**mA**	< 20
Type of “muting” sensors			Thru-beam, polarised reflex or sensors with relay hard contacts
Synchronization time of “muting” sensors		**s**	3 or unlimited
Maximum “muting” time		**min**	2 or unlimited
Safety outputs			
- number and type			2 PNP (terminals 1 and 2), 0.625 A at 24 V
- max. thermal current (Ithe)	1 output	**A**	–
	2 outputs	**A**	2 x 0.108
	3 outputs	**A**	–
	3 contacts	**A**	–
Auxiliary outputs			1 PNP (terminal 5) + 1 NPN (terminal 6)
- breaking capacity of solid-state PNP outputs		**mA**	24 V/500
- breaking capacity of solid-state NPN outputs		**mA**	24 V/100
“Muting” indicator light power		**W**	1 to 7 max.
Response time on input change of state		**ms**	1
Signalling			14 LEDs plus 2-digit display
Connection	Type		Captive screw clamp terminals, removable terminal block
1-wire connection	Without cable end		Solid cable: 14 AWG (1.63 mm^2)
	Without cable end		Flexible cable: 26-16 AWG (0.14...1.5 mm^2)
	With cable end		Without bezel, flexible cable: 26-16 AWG (0.14…1.5 mm^2)
2-wire connection	Without cable end		Solid cable: 26-16 AWG (0.14...1.5 mm^2)
	Without cable end		Flexible cable: 26-16 AWG (0.14...1.5 mm^2)

Safety automation system solutions

Safety monitoring module Preventa™ XPSLCM

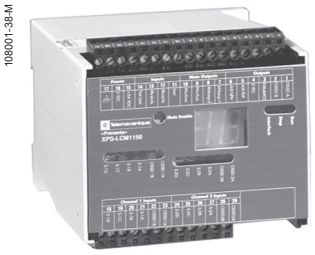
For the “muting” function of type 2 and type 4 light curtains



Description

XPSLCM1150

To aid diagnostics, the safety monitoring module has 14 LEDs and a 2-digit display on the front cover which provide information on the monitoring circuit status.



108001-38-M

XPSLCM1150

References

Safety module

Description	Type of terminal block connection	Number of safety circuits	Auxiliary outputs	Supply	Reference	Weight
						oz (kg)
Safety module for “muting” function	Removable from module	2 PNP	1 PNP + 1 NPN	⎓ 24 V	**XPSLCM1150**	23.281 (0.660)

Spare parts

Description	Power	Reference	Weight
	W		oz (kg)
“Muting” indicator light kit	5	**XSZ CM01**	0.423 (0.012)
Replacement bulbs for “muting” indicator light kit consisting of one lot of 10 replacement bulbs and 1 removal/insertion tool XBF-X13	1 to 7	**XSZ CM02**	0.564 (0.016)

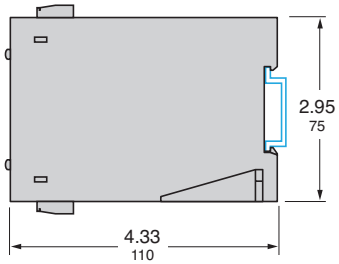
Safety automation system solutions

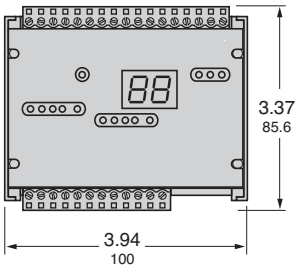
Safety monitoring module
Preventa™ XPSLCM
For the “muting” function of type 2 and type 4 light curtains

Dimensions

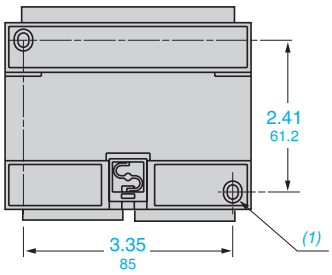
XPSLCM1150

Mounting on 35 mm rail



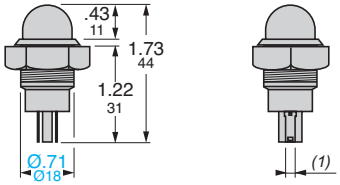


Rear view



(1) 2 elongated holes Ø 4 x 5.7

“Muting” indicator light kit XSZ CM01



(1) Faston connector 4.7.

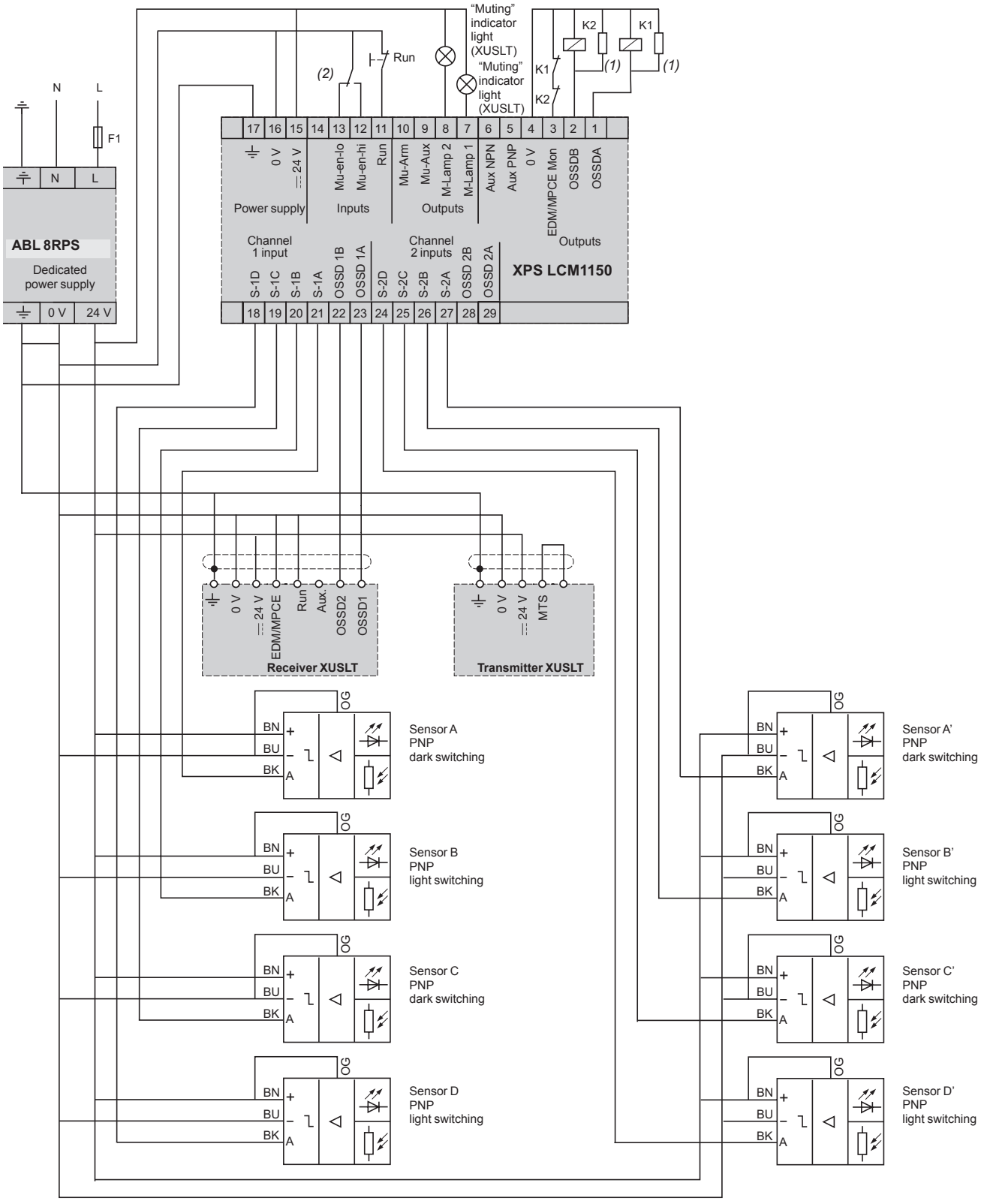
Dual Dimensions: INCHES Millimieters

Safety automation system solutions

Safety monitoring module
Preventa™ XPSLCM
For the “muting” function of type 2 and type 4 light curtains

Connection via the safety monitoring module XPSLCM1150

Example: configuration with light curtains XUSLT



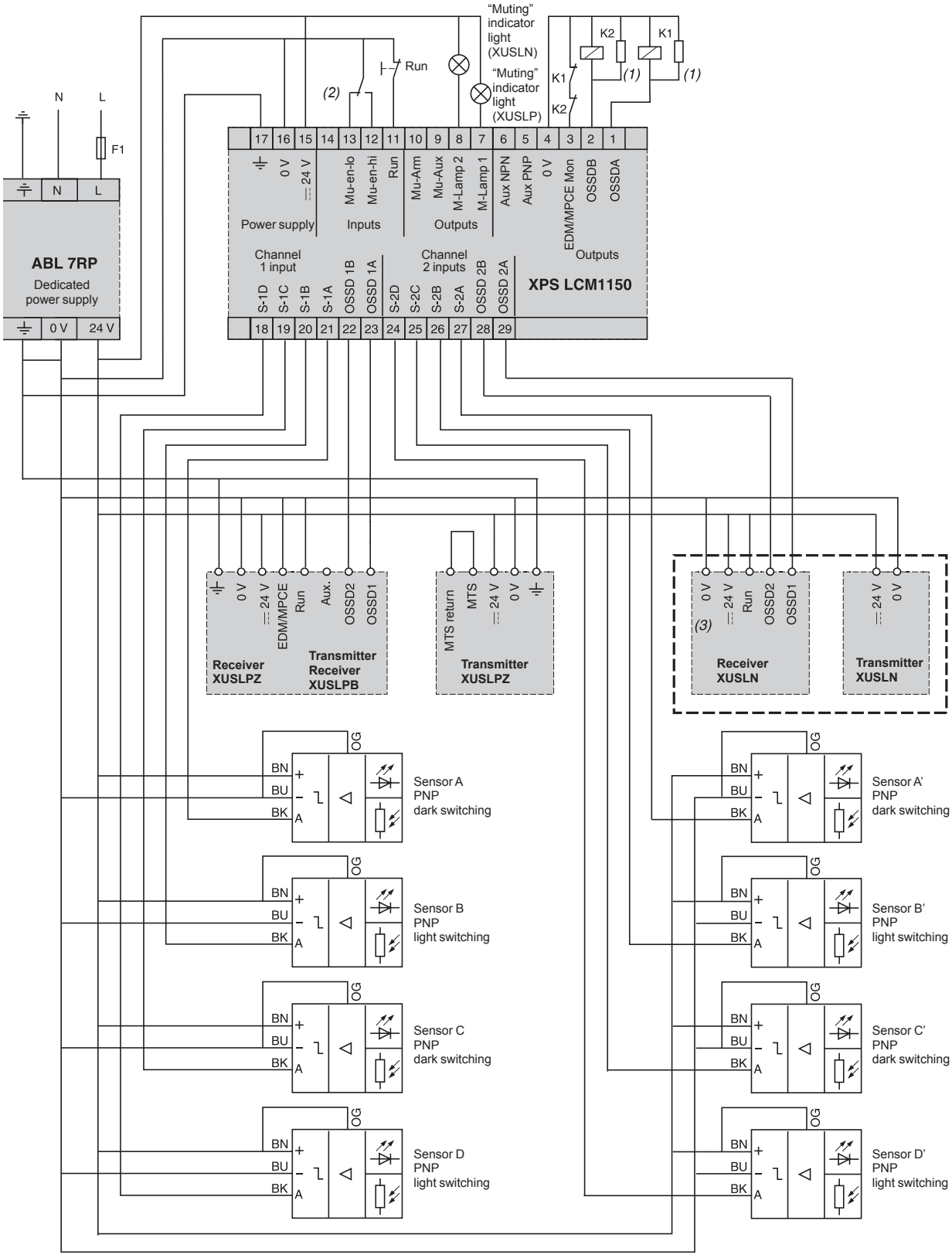
(1) Arc suppressor.
(2) Inhibition activation/deactivation key switch.

Safety automation system solutions

Safety monitoring module
Preventa™ XPSLCM
For the “muting” function of type 2 and type 4 light curtains

Connection via the safety monitoring module XPSLCM1150

Example: configuration with 2 light curtains XUSLP and XUSLN



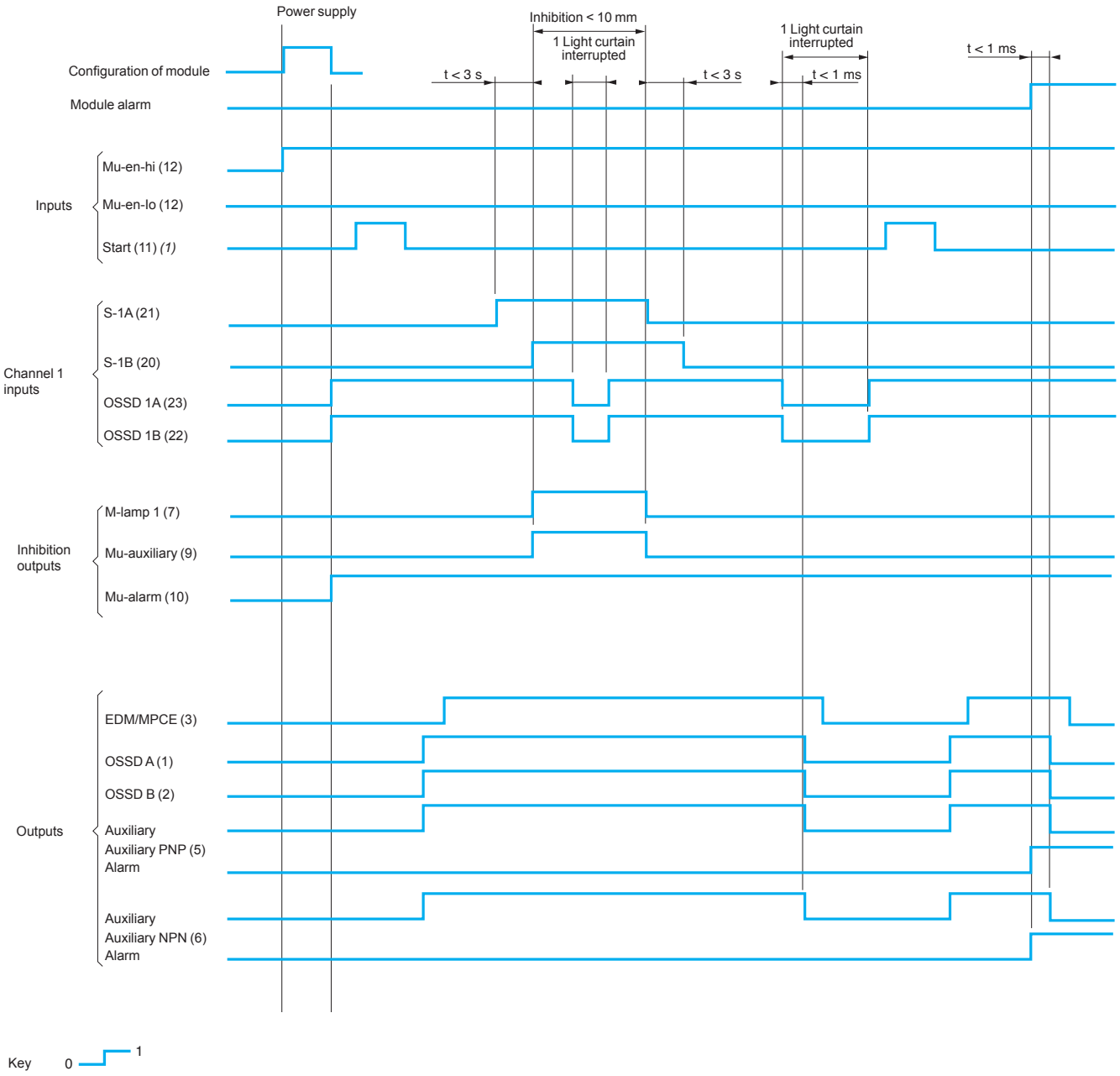
(1) Arc suppressor.
(2) Inhibition activation/deactivation key switch.
(3) When module XPSLCM1150 is used with a type 2 light curtain (example: XUSLN), the entire protection system is downgraded to category 2.

Safety automation system solutions

Safety monitoring module
Preventa™ XPSLCM
For the “muting” function of type 2
and type 4 light curtains

Functional diagram of safety monitoring module XPSLCM1150

“Start/restart interlock” mode with 2 sensors



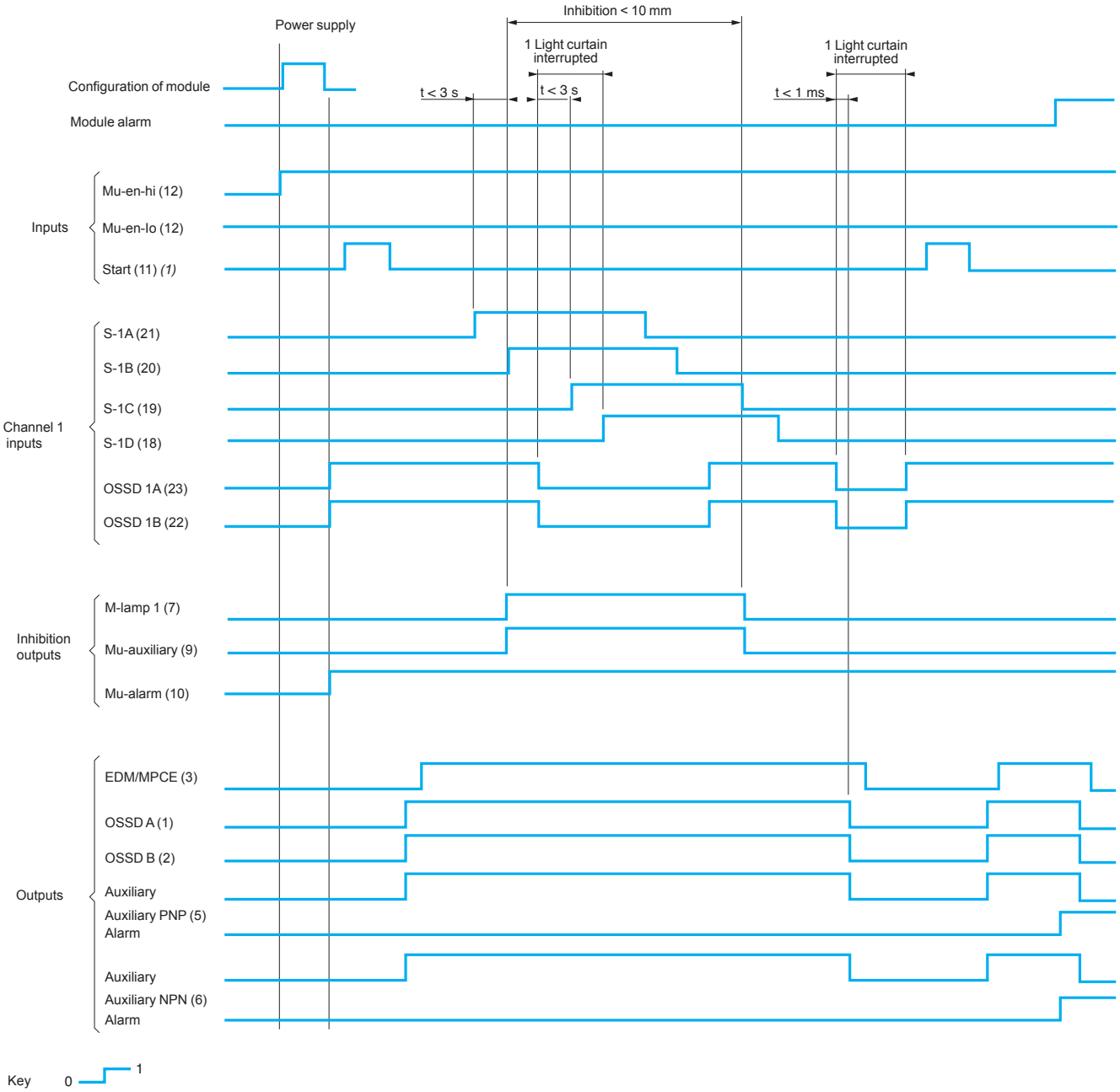
(1) Press Start button.

Safety automation system solutions

Safety monitoring module
Preventa™ XPSLCM
For the “muting” function of type 2
and type 4 light curtains

Functional diagram of safety monitoring module XPSLCM1150

“Start/restart interlock” mode with 4 sensors



(1) Press Start button.

Safety automation system solutions

Preventa™ safety relay modules types XPSECM, XPSECP

For increasing the number of safety contacts

Operating principle

Safety modules XPSEC●, for increasing the number of safety contacts, are available as additions to Preventa™ XPS based modules (Emergency stop, limit switch, two-hand control, etc.).
They are used to increase the number of safety output contacts of the base modules.

Characteristics

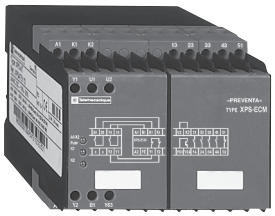
Module type			XPSECM	XPSECP
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max. (when connected to the appropriate module)	
Conformity to standards			EN 60204-1, EN/IEC 60947-5-1	
Product certifications			UL, CSA	
Supply	Voltage	**V**	∼ and ⎓ 24, ∼ 115, ∼ 230	
	Voltage limits		- 20…+ 10% (∼ 24 V), - 20…+ 20% (⎓ 24 V), - 15…+ 15% (∼ 115 V), - 15…+ 10% (∼ 230 V)	
	Frequency	**Hz**	50/60	
Power consumption	24 V	**VA**	< 5	
	115 V/230 V	**VA**	< 6	
Module inputs fuse protection			Internal, electronic	
Outputs	Voltage reference		Relay hard contacts	
	Number and type of safety circuits		4 N.O. (13-14, 23-24, 33-34, 43-44)	8 N.O. (13-14, 23-24, 33-34, 43-44, 53-54, 63-64, 73-74, 83-84)
	Number and type of additional circuits		1 N.C. (41-42) + 1 solid-state	1 N.C. (91-92) + 1 solid-state
	Breaking capacity in AC-15	**VA**	B300: inrush 3600, maintained 360	
	Breaking capacity in DC-13		24 V/1.5 A - L/R = 50 ms	
	Breaking capacity of solid-state outputs		24 V/20 mA, 48 V/10 mA	
	Max. thermal current (Ithe)	**A**	6	
	Max. total thermal current	**A**	24	30
	Output fuse protection	**A**	6 gG	
	Minimum current (relay hard contact)	**mA**	10 (conforming to EN/IEC 60947-5-1, VDE 0660 part 200)	
	Minimum voltage (relay hard contact)	**V**	17	
Electrical life			See page 2/172	
Response time on input opening		**ms**	< 20	
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN//IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-1, DIN VDE 0110 parts 1 & 2)	
LED display			3	
Operating temperature		**°F (°C)**	+ 14…+ 131 (- 10…+ 55)	
Storage temperature		**°F (°C)**	- 13…+ 185 (- 25…+ 85)	
Degree of protection conforming to IEC 60529	Terminals		IP 20	
	Enclosure		IP 40	
Connection	Type		Captive screw clamp terminals: without cable end 1 x 12 AWG (1 x 4 mm²), with cable end 2 x 14 AWG (2 x 2.5 mm²)	

Principle: page 2/226 | Characteristics: page 2/226 | References: page 2/227 | Wiring Diagrams: page 2/228 | Dimensions: page 2/260

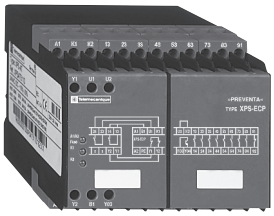
Safety automation system solutions

Preventa™ safety relay modules types XPSECM, XPSECP

For increasing the number of safety contacts



XPSECM



XPSECP

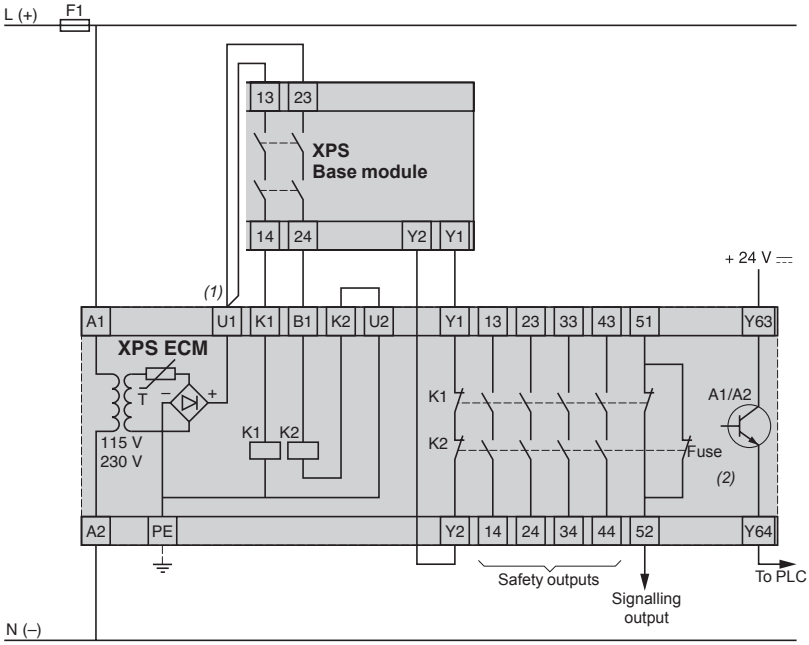
References

Description	Number of safety circuits	Additional outputs	Solid-state outputs for PLC	Supply	Reference	Weight oz (kg)
Safety modules for increasing the number of safety contacts, for use with XPS based modules	4	1	1	∼ and ⎓ 24 V	**XPSECM5131**	19.401 (0.550)
				∼ 115 V	**XPSECM3431**	22.928 (0.650)
				∼ 230 V	**XPSECM3731**	22.928 (0.650)
	8	1	1	∼ and ⎓ 24 V	**XPSECP5131**	19.401 (0.550)
				∼ 115 V	**XPSECP3431**	22.928 (0.650)
				∼ 230 V	**XPSECP3731**	22.928 (0.650)

2

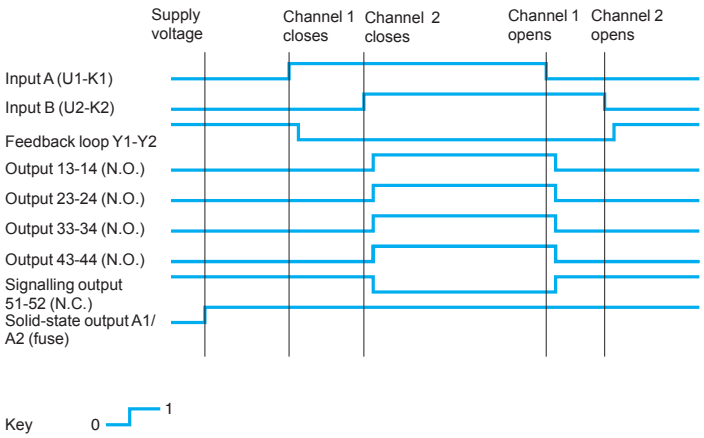
Safety automation system solutions
Preventa™ safety relay modules type XPSECM
For increasing the number of safety contacts

XPSECM
Wiring diagram



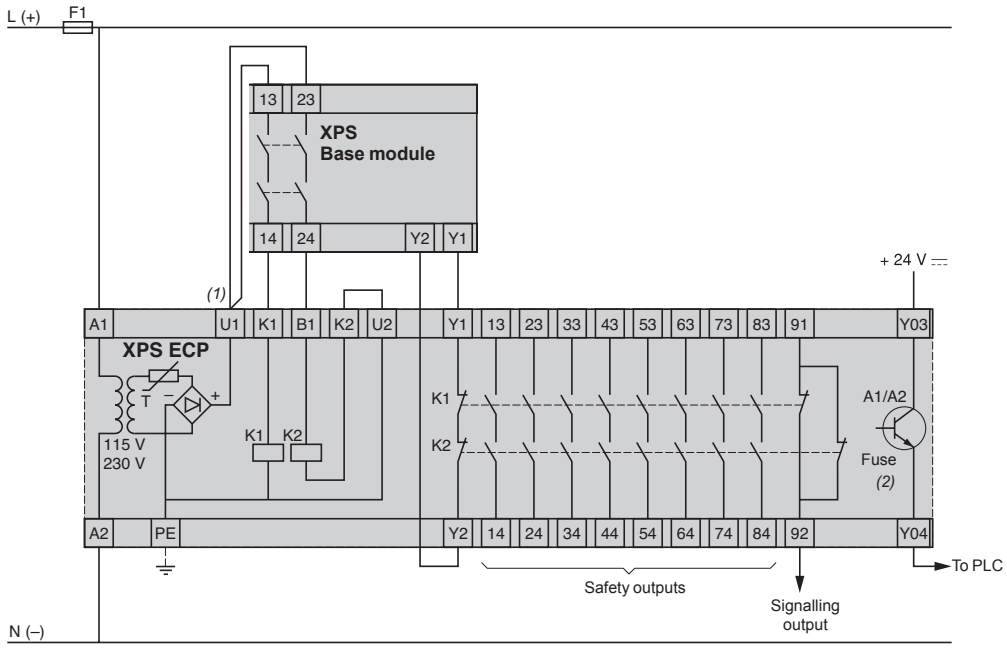
(1) When installing base modules and modules for increasing the number of safety contacts into different electrical enclosures, run separate cables for terminals U1-13 and U1-23.
(2) Operating status of internal electronic fuse.

Functional diagram



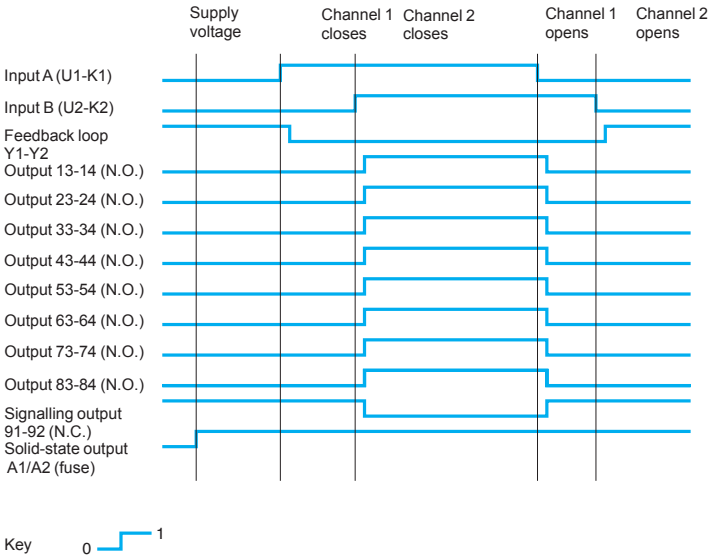
XPSECP

Wiring diagram



(1) When installing base modules and modules for increasing the number of safety contacts into different electrical enclosures, run separate cables for terminals U1-13 and U1-23.
(2) Operating status of internal electronic fuse.

Functional diagram



Safety automation system solutions

Preventa™ safety relay modules types XPSTSA, XPSTSW

For safety time delays

Operating principle

Safety modules XPSTSA and XPSTSW are used in applications requiring safety time delays:

■ modules XPSTSA in applications with interlocking on high inertia machines with long rundown time (guards unlocked after safety time delay has elapsed),

■ modules XPSTSW in applications with a safety switchover contact (jumpering contact in association with XPSVN modules for zero speed detection, solenoid valve monitoring, etc.).

The time delay of safety circuits can be set to 16 preset values, using 2 selectors located on the front cover of the modules.

To aid diagnostics, the modules have LEDs which provide information on the monitoring circuit status and 2 solid-state outputs for signalling to the process PLC.

In addition, their removable terminal blocks optimize machine maintenance.

Characteristics

Module type				**XPSTSA**	**XPSTSW**
Product designed for max. use in safety related parts of control systems (conforming to EN 60954-1/ISO 13849-1)				Category 3 max.	
Conformity to standards				EN/IEC 60204-1, EN/IEC 60947-5-1	
Product certifications				UL, CSA, BG	
Supply	Voltage		**V**	∼ and ⎓ 24, ∼ 115, ∼ 230	
	Voltage limits			- 15…+ 15% (⎓ 24 V) - 20…+ 10% (∼ 24 V) - 15…+ 15% (115 V) - 15…+ 10% (230 V)	
	Frequency		**Hz**	50/60	
Power consumption	⎓ 24		**VA**	< 2.3	
	∼ 24 V			< 4.3	
	∼ 115			< 6.5	
	∼ 230 V			< 5.5	
Module inputs fuse protection				Internal, electronic	
Time delay			**s**	1…31 (16 positions)	–
Pulse time			**s**	–	0.1…3.1 (16 positions)
Outputs	Voltage reference			Relay hard contacts	
	Number and type of safety circuits			1 N.O. (17-18) + 2 N.C. (25-26, 35-36)	
	Number and type of additional circuits			2 solid-state (Y53-Y54, Y63-Y64)	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Breaking capacity of solid-state outputs			24 V/20 mA, 48 V/10 mA	
	Max. thermal current (Ithe)		**A**	6	
	Output fuse protection		**A**	4 gG (gl) or 6 fast acting, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical life				See page 2/172	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				4	
Operating temperature			**°F (°C)**	+ 14…+ 131 (- 10…+ 55)	
Storage temperature			**°F (°C)**	- 13…+ 185 (- 25…+ 85)	
Degree of protection conforming to IEC 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connection		Type		Captive screw clamp terminals, removable terminal block	
	1-wire connection	Without cable end		Solid or flexible cable: 24-14 AWG (0.2…2.5 mm²)	
		With cable end		Without bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)	
		With cable end		With bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)	
	2-wire connection	Without cable end		Solid cable: 24-18 AWG (0.2…1 mm²), flexible cable: 24-16 AWG (0.2…1.5 mm²)	
		With cable end		Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)	
		With cable end		Double, with bezel, flexible cable: 20-16 AWG (0.5…1.5 mm²)	

Principle: page 2/230 | Characteristics: page 2/230 | References: page 2/231 | Wiring Diagrams: page 2/231 | Dimensions: page 2/260

Safety automation system solutions

Preventa™ safety relay modules types XPSTSA, XPSTSW

For safety time delays

References



XPSTSA●●●●P



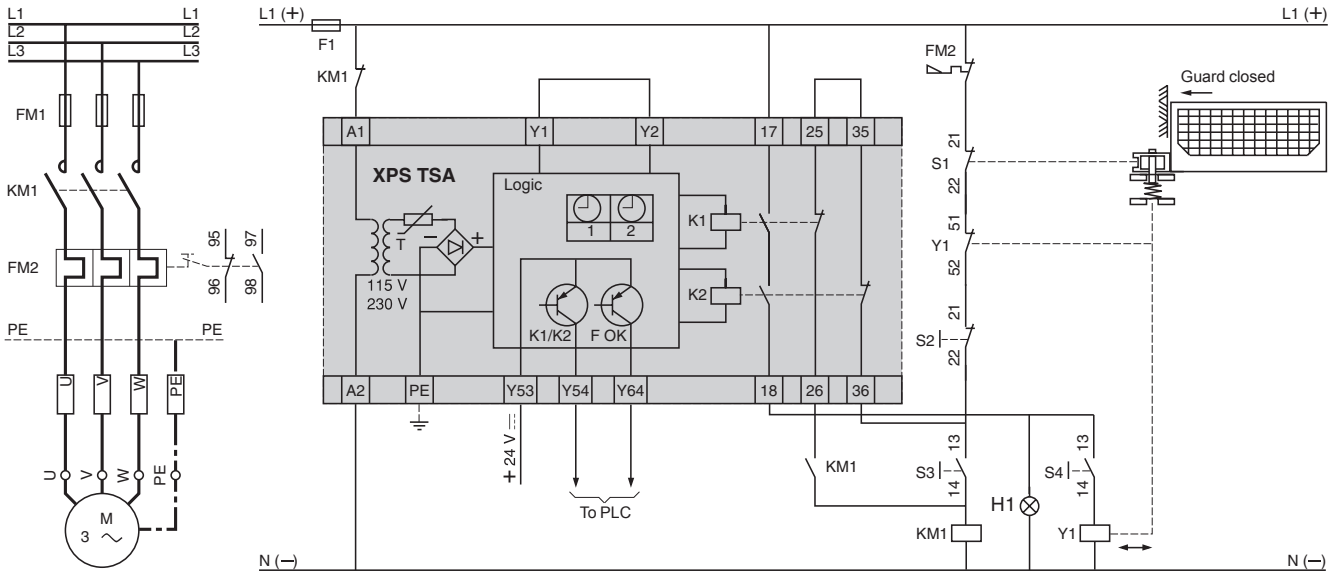
XPSTSW●●●●P

Description	Number of safety circuits	Number of additional outputs	Supply	Reference	Weight oz (kg)
Safety modules for applications with interlocking on high inertia machines	1 delayed	2 N.C. + 2 solid-state to PLC	∼ and ⎓ 24 V	**XPSTSA5142P**	8.818 (0.250)
			∼ 115 V	**XPSTSA3442P**	12.699 (0.360)
			∼ 230 V	**XPSTSA3742P**	12.699 (0.360)
Safety modules for applications with safety switchover contact	1 pulse type	2 N.C. + 2 solid-state to PLC	∼ and ⎓ 24 V	**XPSTSW5142P**	8.818 (0.250)
			∼ 115 V	**XPSTSW3442P**	12.699 (0.360)
			∼ 230 V	**XPSTSW3742P**	12.699 (0.360)

Wiring diagrams

XPSTSA

Delayed unlocking of a guard application

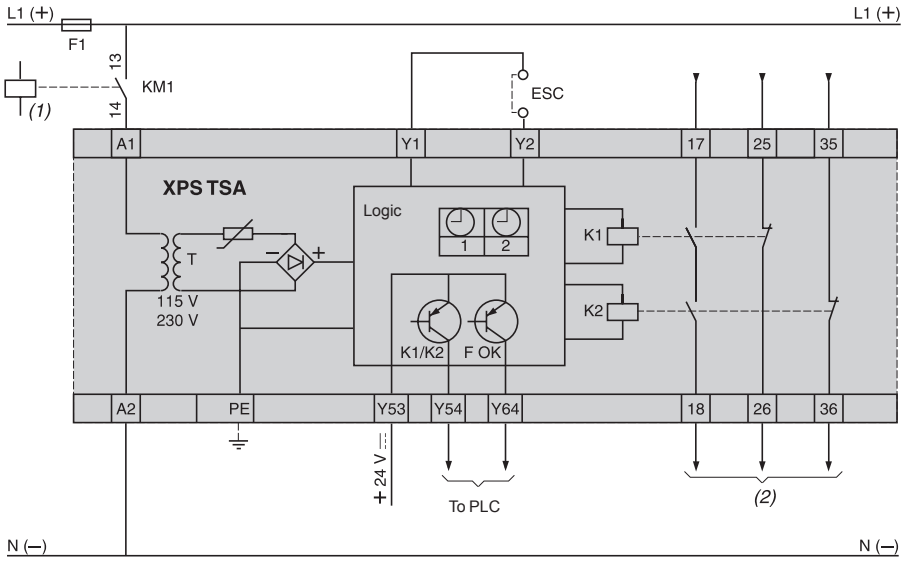


Contacts 95/96 and 97/98 are trip contacts for an overload relay.
S1 is one of the N.C. safety contacts in an XCSE switch
Y1 is the N.C. solenoid contact in the XCSE switch (wired in series with the S1)
S2 is the motor stop push button
S3 is the motor start push button, in parallel of KM1 contact
S4 is the push button to energize the XCSE solenoid to unlock the guard

2

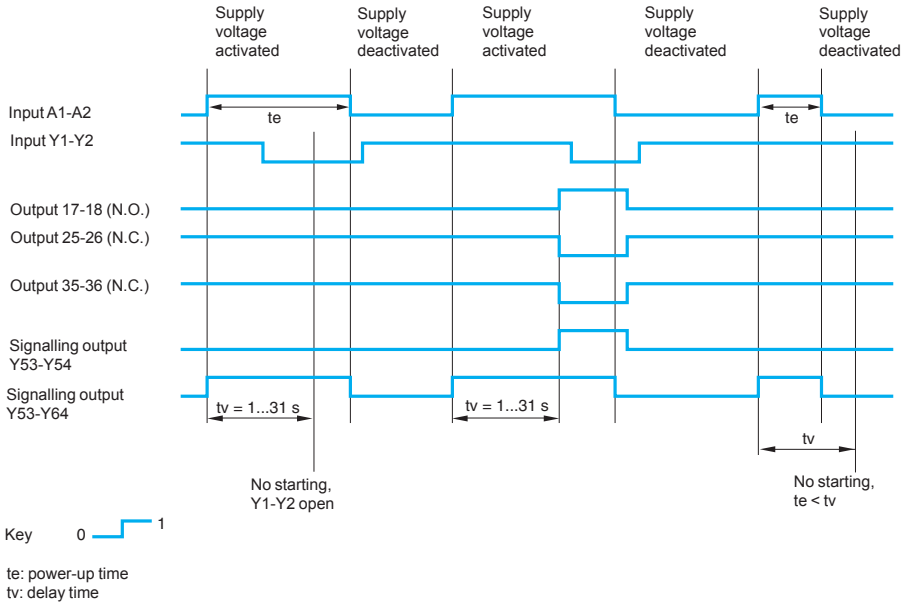
XPSTSA

Wiring diagram



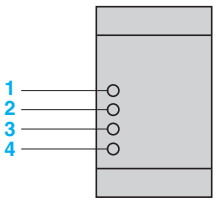
(1) Signal to be delayed.
(2) Relay hard contact outputs with on-delay.
ESC: External start conditions.

Functional diagram of module XPSTSA



te: power-up time
tv: delay time

LED details (XPSTSA, XPA TSW)

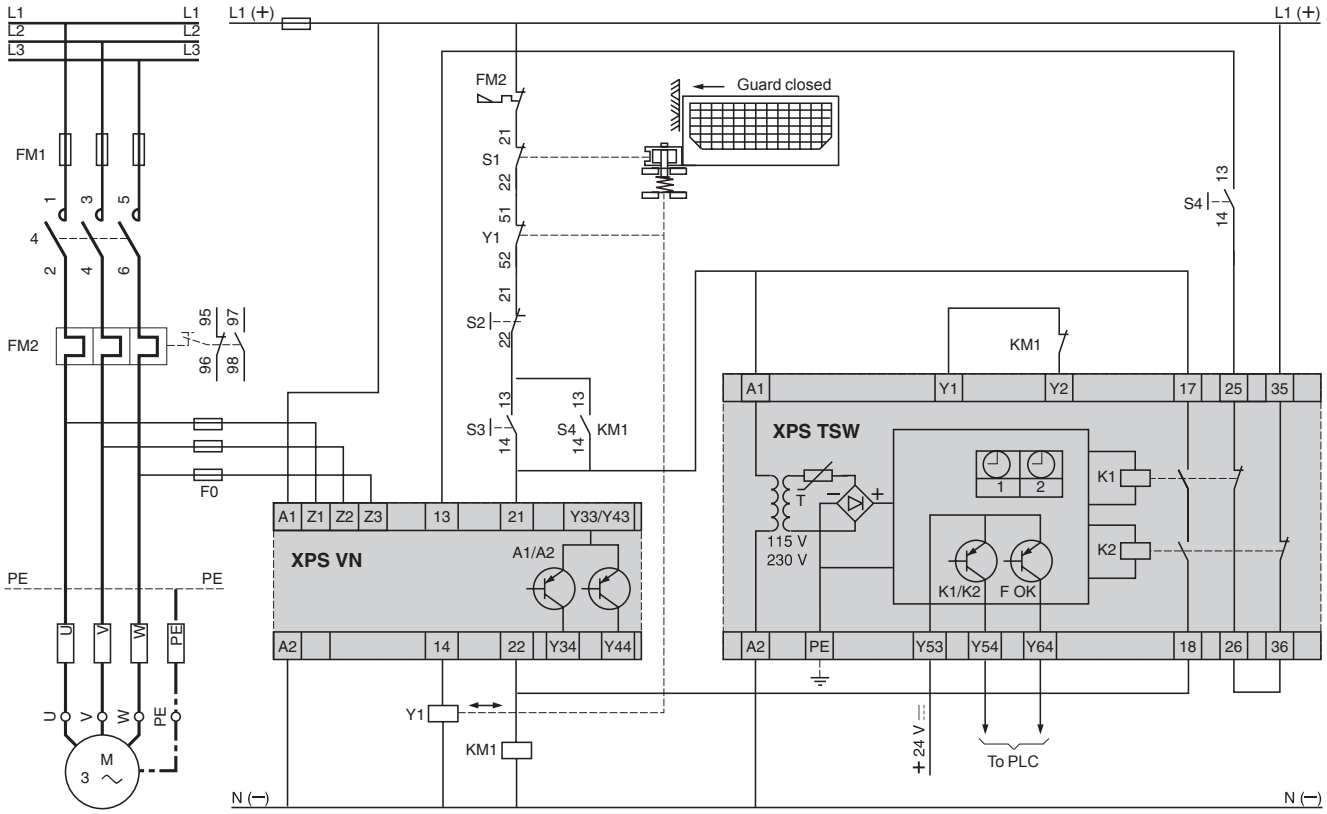


1 Supply voltage A1-A2 (fuse status).
2 Safety output closed.
3 Feedback loop Y1-Y2 status.
4 Time function active.

2

XPSTSW

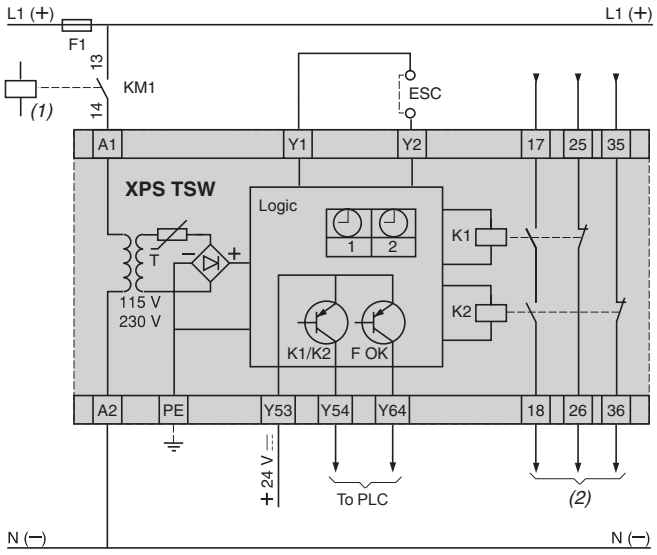
Guard unlocking application using zero speed detection



Contacts 95/96 and 97/98 are trip contacts for an overload relay.
S1 is one of the N.C. safety contacts in an XCSE switch
Y1 is the N.C. solenoid contact in the XCSE switch (wired in series with the S1)

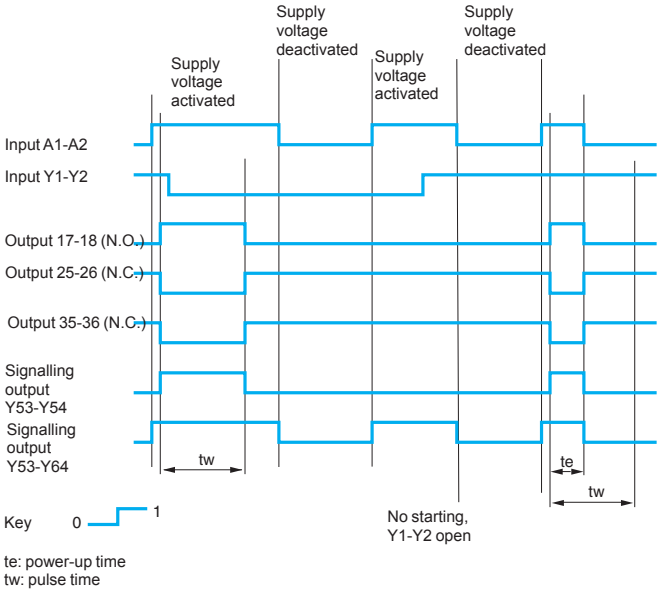
S2 is the motor stop push button
S3 is the motor start push button, in parallel of KM1 contact
S4 is the push button to energize the XCSE solenoid to unlock the guard

Wiring diagram



(1) Control signal.
(2) Relay hard contact outputs with pulse time delay.
ESC: External start conditions.
LED details: see page 2/232.

Functional diagram of module XPSTSW



te: power-up time
tw: pulse time

Safety automation system solutions

Preventa™ safety relay modules types XPSDMB, XPSDME

For non-contact safety interlock (coded magnetic) switch monitoring

Operating principle

Safety modules XPSDMB and XPSDME are specifically designed for monitoring coded magnetic safety switches. They incorporate two safety outputs and two solid-state outputs for signalling to the process PLC.
Conforming to category 4 of EN 954-1/ISO 13849-1, modules XPSDMB can monitor two independent sensors and modules XPSDME can monitor up to six independent sensors.
To monitor a higher number of magnetic switches using these safety modules, the magnetic switches can be connected in series, while meeting the requirements of category 3 of EN 954-1/ISO 13849-1.

Safety modules XPSDM●●●●●P incorporate removable terminal blocks, thus optimizing machine maintenance.

To aid diagnostics, the modules have LEDs on the front cover which provide information on the monitoring circuit status.

Characteristics

Module type				XPSDMB1132	XPSDME1132	XPSDMB1132P	XPSDME1132P
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.			
Conformity to standards				EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/IEC 60947-5-3, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)			
Product certifications				UL, CSA, BIA			
Supply (Ue) conforming to IEC 38	Voltage		V	⎓ 24			
	Voltage limits	⎓ 24 V		- 20…+ 20%			
Power consumption			W	< 2.5	< 3.5	< 2.5	< 3.5
Module inputs fuse protection				Internal, electronic			
Maximum wiring resistance RL between the module and the coded magnetic switches			Ω	100			
Control unit voltage and current				28 V/8 mA			
Synchronization time between magnetic switch inputs			s	< 0.5			
Safety outputs	Voltage reference			Relay hard contacts			
	Number and type of safety circuits			2 N.O.			
	Number and type of solid-state outputs			2			
	Breaking capacity in AC-15		VA	C300: inrush 1800, sealed: 180			
	Breaking capacity in DC-13			24 V/1.5 A, L/R = 50 ms			
	Max. thermal current (Ithe)		A	6			
	Max. total thermal current		A	12			
	Output fuse protection		A	4 gG or 6 fast acting			
	Minimum current		mA	10			
	Minimum voltage		V	17			
Electrical life				See page 2/172			
Response time on input opening			ms	< 20			
Rated insulation voltage (Ui)			V	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)			
Rated impulse withstand voltage (Uimp.)			kV	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)			
LED display				3	15	3	15
Ambient air temperature			°F (°C)	For operation: + 14…+ 131 (- 10…+ 55), for storage: - 13…+ 185 (- 25…+ 85)			
Degree of protection conforming to IEC 60529				Terminals: IP 20, enclosure: IP 40			
Connection	Type			Captive screw clamp terminals		Captive screw clamp terminals, removable terminal block	
	1-wire connection	Without cable end		Solid or flexible cable: 26-14 AWG (0.14… 2.5 mm²)		Solid or flexible cable: 24-14 AWG (0.2…2.5 mm²)	
		With cable end		Without bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)			
		With cable end		With bezel, flexible cable: 24-16 AWG (0.25…1.5 mm²)		With bezel, flexible cable: 24-14 AWG (0.25…2.5 mm²)	
	2-wire connection	Without cable end		Solid or flexible cable: 26-18 AWG (0.14…0.75 mm²)		Solid cable: 24-18 AWG (0.2…1 mm²), flexible cable: 24-16 AWG (0.2…1.5 mm²)	
		With cable end		Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)			
		With cable end		With bezel, flexible cable: 20-16 AWG (0.5… 1.5 mm²)			

Principle: page 2/234 | Characteristics: page 2/234 | References: page 2/235 | Wiring Diagrams: page 2/236 | Dimensions: page 2/260

Safety automation system solutions

Preventa™ safety relay modules types XPSDMB, XPSDME

For non-contact safety interlock (coded magnetic) switch monitoring



XPSDMB1132●



XPSDME1132

References

Description	Type of terminal block connection	Number of safety circuits	Solid-state outputs for PLC	Supply V	Reference	Weight oz (kg)
Safety module for monitoring 2 coded magnetic switches	Integrated in module	2 N.O.	2	⎓ 24	**XPSDMB1132**	8.818 (0.250)
Safety module for monitoring 6 coded magnetic switches	Integrated in module	2 N.O.	2	⎓ 24	**XPSDME1132**	10.582 (0.300)
Safety module for monitoring 2 coded magnetic switches	Removable from module	2 N.O.	2	⎓ 24	**XPSDMB1132P**	8.818 (0.250)
Safety module for monitoring 6 coded magnetic switches	Removable from module	2 N.O.	2	⎓ 24	**XPSDME1132P**	10.582 (0.300)

Principle: page 2/234 | Characteristics: page 2/234 | References: page 2/235 | Wiring Diagrams: page 2/236 | Dimensions: page 2/260

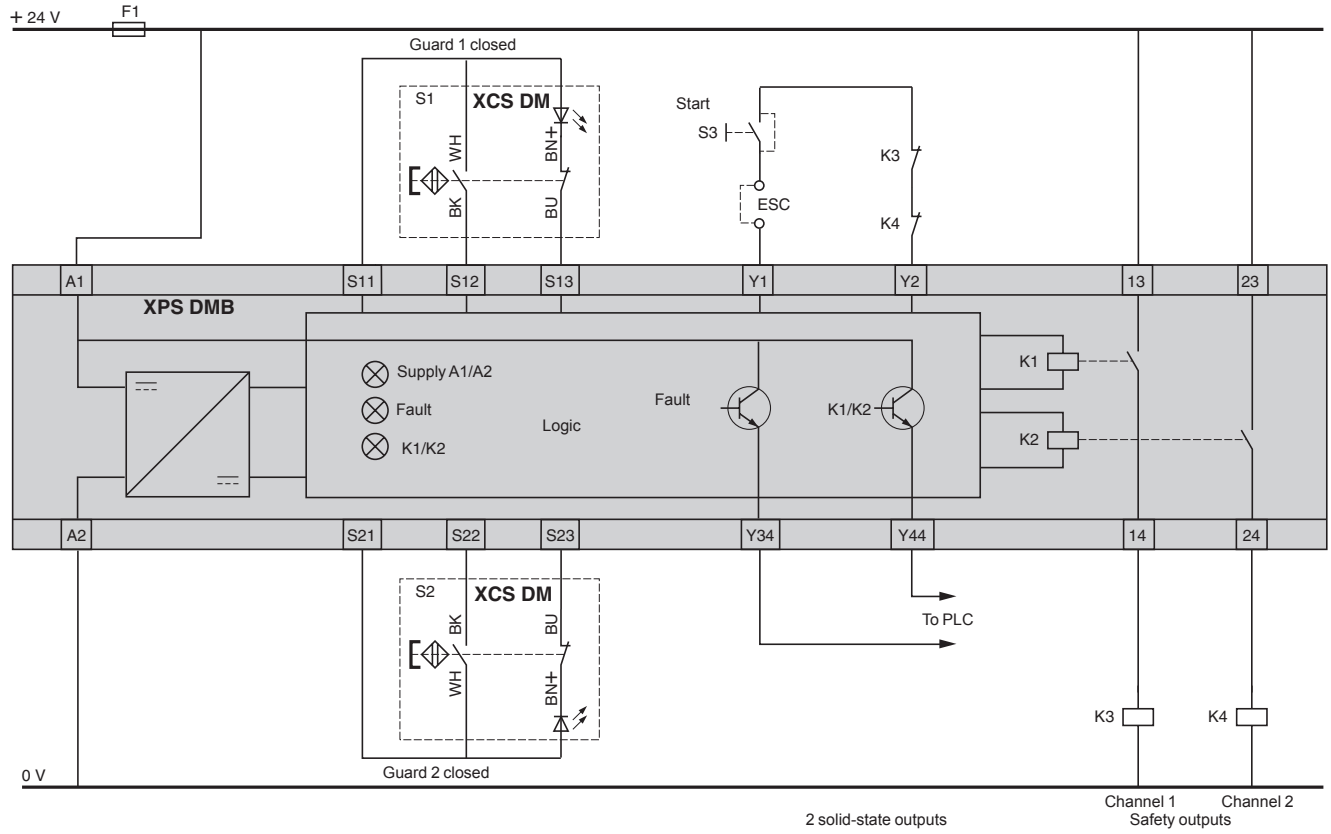
Safety automation system solutions

Preventa™ safety relay modules types XPSDMB, XPSDME

For non-contact safety interlock (coded magnetic) switch monitoring

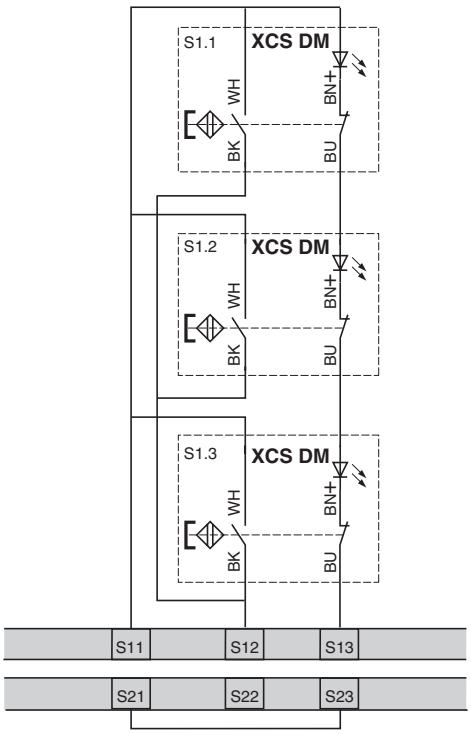
XPSDMB

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N.C. + N.O. (N.C. staggered) contact.
For example with 3-pole N.C. + N.C. + N.O. contact see page 3/58



ESC: External start conditions.

Wiring to category 3 conforming to EN 954-1/ISO 13849-1. Example with 3 switches with 2-pole N.C. + N.O. (N.C. staggered) contacts.



Input: S11, S12, S13 or S21, S22, S23.
Unused inputs must be jumpered: i.e.: if only input S11, S12, S13 is used, then terminals S21 and S23 must be jumpered.
The order in which the inputs are wired or jumpered will not affect operation.

Principle: page 2/234 | Characteristics: page 2/234 | References: page 2/235 | Wiring Diagrams: page 2/236 | Dimensions: page 2/260

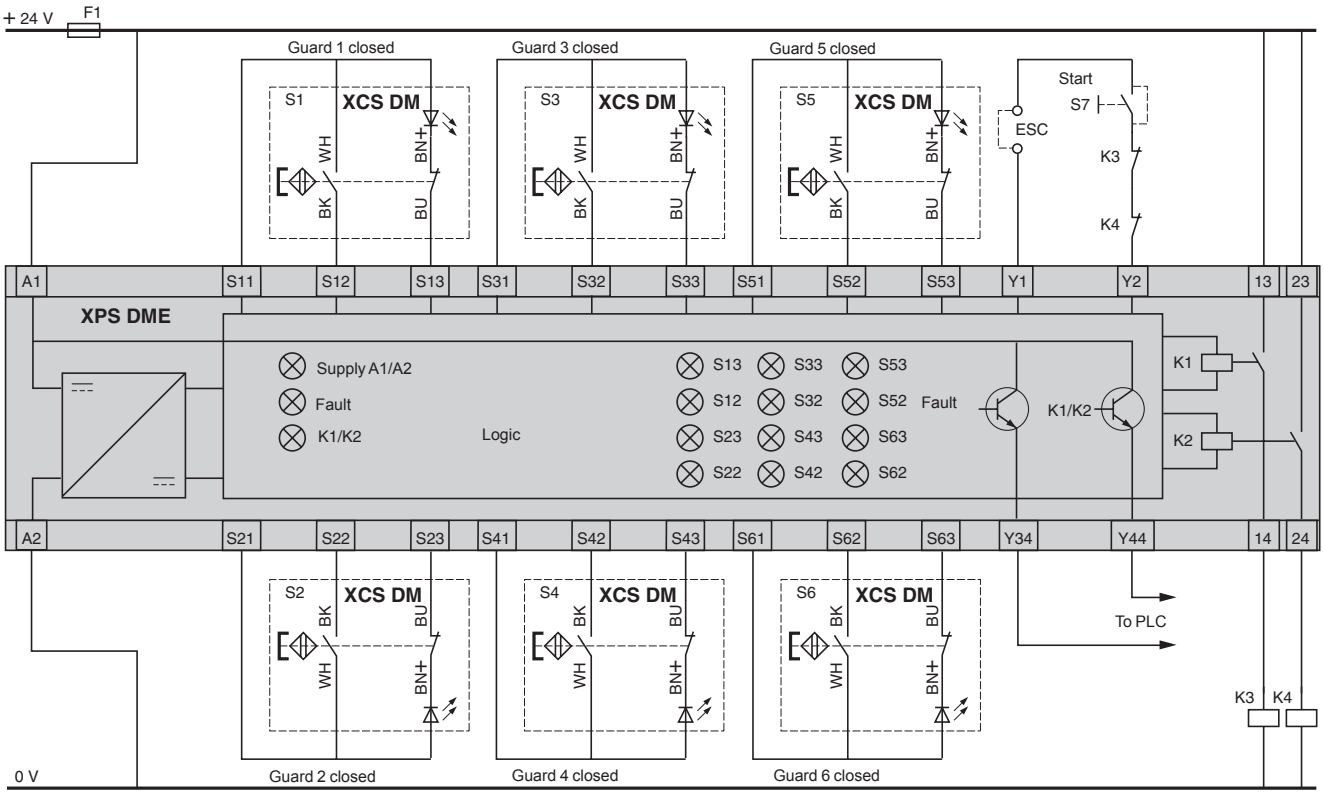
Safety automation system solutions

Preventa™ safety relay modules types XPSDMB, XPSDME

For non-contact safety interlock (coded magnetic) switch monitoring

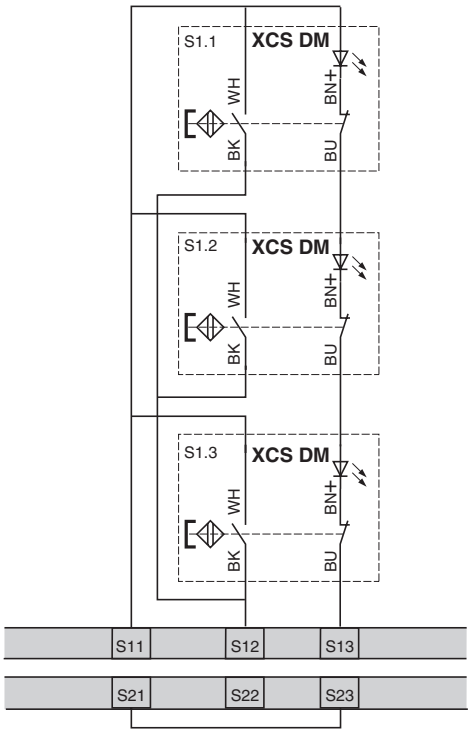
XPSDME

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N.C. + N.O. (N.C. staggered) contact



ESC: External start conditions.

Wiring to category 3 conforming to EN 954-1/ISO 13849-1. Example with 3 switches with 2-pole N.C. + N.O. (N.C. staggered) contacts.



Input: S11, S12, S13 or S21, S22, S23 or S31, S32, S33 or S41, S42, S43 or S51, S52, S53 or S61, S62, S63.
Unused inputs must be jumpered i.e.: if input S61, S62, S63 is not used, then terminals S61 and S63 must be jumpered.
Terminals to be jumpered if the input is not used are: S11 and S13, S21 and S23, S31 and S33, S41 and S43, S51 and S53, S61 and S63.

The order in which the inputs are wired will not affect device operation.

Principle: page 2/234 | Characteristics: page 2/234 | References: page 2/235 | Wiring Diagrams: page 2/236 | Dimensions: page 2/260

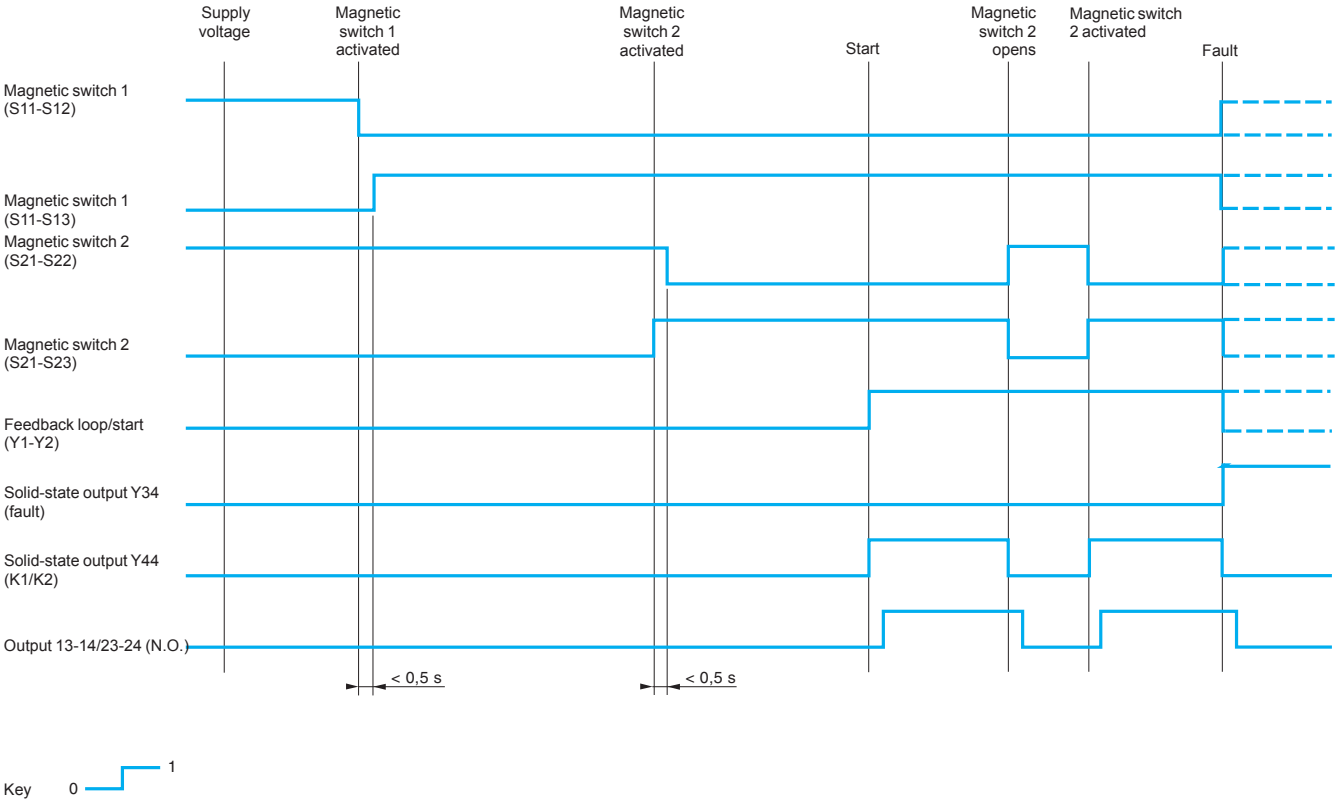
Safety automation system solutions

Preventa™ safety relay modules types XPSDMB, XPSDME

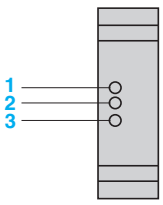
For non-contact safety interlock (coded magnetic) switch monitoring

XPSDMB

Functional diagram



LED details



1 Supply voltage A1-A2, internal electronic fuse status.
2 Fault signalling.
3 Safety outputs closed.

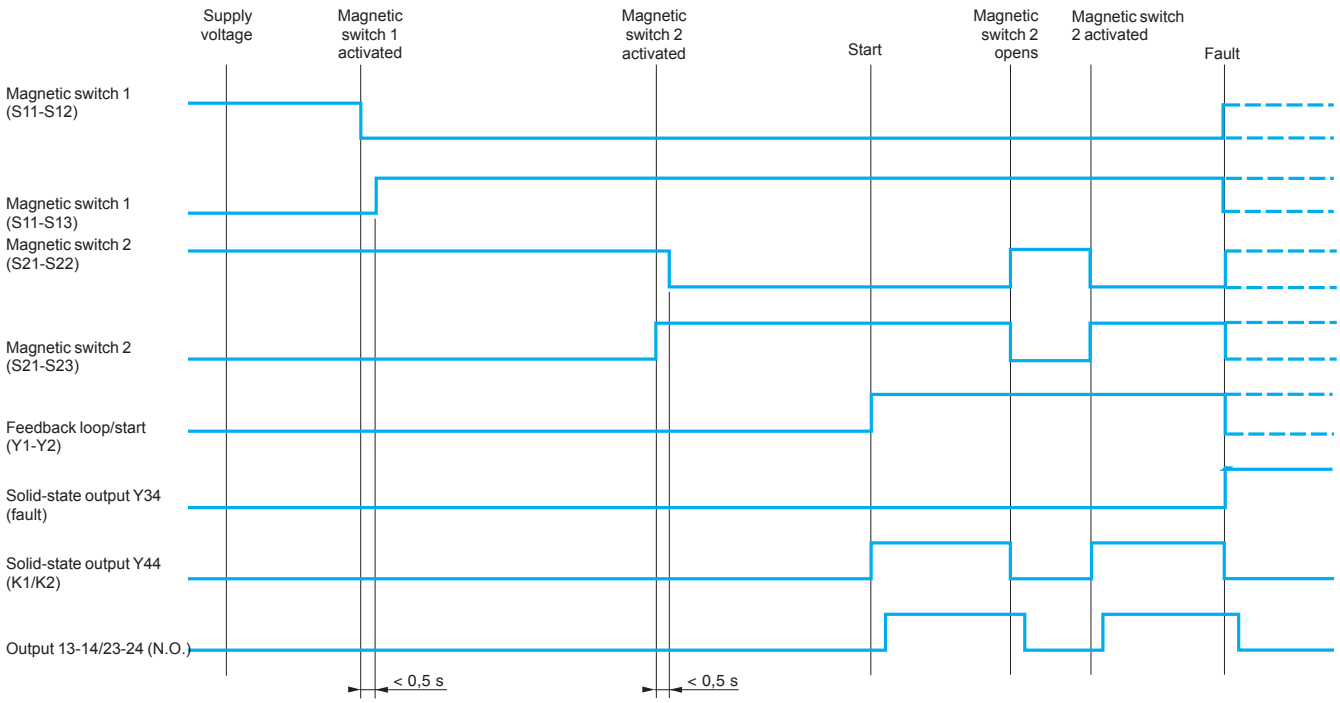
Safety automation system solutions

Preventa™ safety relay modules types XPSDMB, XPSDME

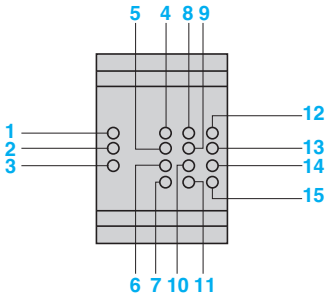
For non-contact safety interlock (coded magnetic) switch monitoring

XPSDME

Functional diagram



LED details



1 Supply voltage A1-A2, internal electronic fuse status.
2 Fault signalling.
3 Safety outputs closed.
4 Magnetic switch 1 activated.
5 Magnetic switch 1 deactivated.
6 Magnetic switch 2 activated.
7 Magnetic switch 2 deactivated.
8 Magnetic switch 3 activated.
9 Magnetic switch 3 deactivated.
10 Magnetic switch 4 activated.
11 Magnetic switch 4 deactivated.
12 Magnetic switch 5 activated.
13 Magnetic switch 5 deactivated.
14 Magnetic switch 6 activated.
15 Magnetic switch 6 deactivated.

Safety automation system solutions
Preventa™ safety relay modules type XPSVNE
For zero speed detection

Operating principle

Preventa™ safety relay modules type XPSVNE for zero speed detection are used to detect the stop condition of electric motors. Their most common applications include: providing the unlock signal for electrically interlocked sliding or removable machine guards, controlling rotation direction signals for reversing motors and engaging locking brakes after a motor has come to a standstill.

As electric motors run down, a remanent voltage is produced in the windings of the motor due to residual magnetism. This voltage is proportional to the speed of the motor and, therefore, decreases as the motor comes to a standstill.
This remanent voltage is measured in a redundant manner so as to detect the stop condition of the motor. The cabling between the motor windings and the inputs of the XPSVNE module is also monitored to prevent a cabling breakage or anomaly being seen as a stopped motor.
A transformer should not be used to connect the motor to terminals Z1, Z2 and Z3 since there is no monitoring of the connection with the motor winding via the resistance monitoring.

Modules XPSVNE are suitable for detecting the stop condition of all types of a.c. or d.c. motor driven machines which, when the motor runs down, produce a remanent voltage in the windings due to residual magnetism. These machines can be controlled by electronic devices, such as variable speed drives or d.c. injection brakes.
The input filters for standard XPSVNE modules are designed for a frequency of up to 60 Hz.
For motors operating at a frequency higher than 60 Hz, which therefore produce a high frequency remanent voltage, special modules XPSVNE●●●●HS should be used.

The XPSVN is not compatible with Wound Rotor Motors. These motors are typically used in high HP (1000+) low speed applications, where the additional windings (required for these types of motors) pay for themselves. If power is removed from stator, but rotor is left energized, then transformer coupling between the two could create a small voltage across the stator. This could make the XPSVN think the motor is still turning, which means the safety outputs would never energize or change state. These motors do not have residual magnetism in the rotor that can act as a source of flux for generator effect, in which case the XPSVN may think the motor is at zero speed, and could energize the safety outputs while the motor is still running. Wound Rotor motors are not in common use today, and very rare.

The XPVN is not designed to detect locked rotor conditions. Here the motor still has voltage applied to it, but in essence has zero speed. Generally, a locked rotor condition is not a safe state for machinery nor the operators. The XPSVN will sense voltage applied to the windings, and will not indicate the motor's "apparent" zero speed. The outputs of the XPSVN will not change state, the gates or guards will not be unlocked, and operators will not be allowed access to the unsafe area.

Modules XPSVNE have 2 potentiometers mounted on the front cover of the module which allow independent adjustment of the switching threshold for each input circuit. This allows adjustment for different types of motors and application requirements.

To aid diagnostics, modules XPSVNE have 4 LEDs and 2 solid-state outputs to provide information on the status of the zero speed detection circuit.

Safety automation system solutions
Preventa™ safety relay modules type XPSVNE
For zero speed detection

Characteristics

Module type				XPSVNE
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 3 max.
Conformity to standards				EN 60204-1, EN/IEC 60947-5-1, EN 50082-2
Product certifications				UL, CSA, BG
Supply	Voltage		**V**	⎓ 24 ∿ 115 ∿ 230
	Voltage limits			- 15…+ 10% (⎓ 24 V) - 15…+ 15% (∿ 115 V) - 15…+ 10% (∿ 230 V)
	Frequency		**Hz**	50/60 (115 V, 230 V)
Power consumption			**W**	⩽ 3.5 (⎓ 24 V)
			VA	⩽ 7.5 (∿115 V), ⩽ 7 (∿ 230 V)
Frequency of motor power supply			**Hz**	⩽ 60 Hz (XPSVN●●42), > 60 Hz (XPSVN●●42HS)
Inputs	Maximum voltage between terminals Z1 - Z2 - Z3		**V**	500 rms
	Detection threshold		**V**	0.01 - 0.1 (adjustable)
Outputs	Voltage reference			Hard contacts
	Number and type of safety circuits			1 N.O. (13-14), 1 N.C. (21-22)
	Number and type of additional circuits			2 solid-state
	Breaking capacity in AC-15			C300 (inrush: 1800 VA/maintained: 180 VA)
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms (contact 13-14) 24 V/1.2 A - L/R = 50 ms (contact 21-22)
	Breaking capacity of solid-state outputs			24 V/20 mA, 48 V/10 mA
	Max. thermal current (Ithe)		**A**	2.5
	Output fuse protection		**A**	4 gG, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200
	Minimum current (volt-free contact)		**mA**	10
	Minimum voltage (volt-free contact)		**V**	17
Electrical life				See page 2
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (Uimp)			**kV**	4 (overvoltage category III, conforming to EN//IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
LED display				4
Operating temperature			**°F (°C)**	+ 14…+ 131 (- 10…+ 55)
Storage temperature			**°F (°C)**	- 13…+ 185 (- 25…+ 85)
Degree of protection Conforming to IEC 60529		Terminals		IP 20
		Enclosure		IP 40
Connection		Type		Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 24-14 AWG (0.2…2.5 mm²)
		With cable end		Without bezel, solid or flexible cable: 24-14 AWG (0.25…2.5 mm²)
				With bezel, solid or flexible cable: 24-14 AWG (0.25…2.5 mm²)
	2-wire connection	Without cable end		Solid cable: 24-18 AWG (0.2…1 mm²), flexible cable: 24-16 AWG (0.2…1.5 mm²)
		With cable end		Without bezel, flexible cable: 24-18 AWG (0.25…1 mm²)
				With bezel, flexible cable: 22-14 AWG (0.5…1.5 mm²)

References

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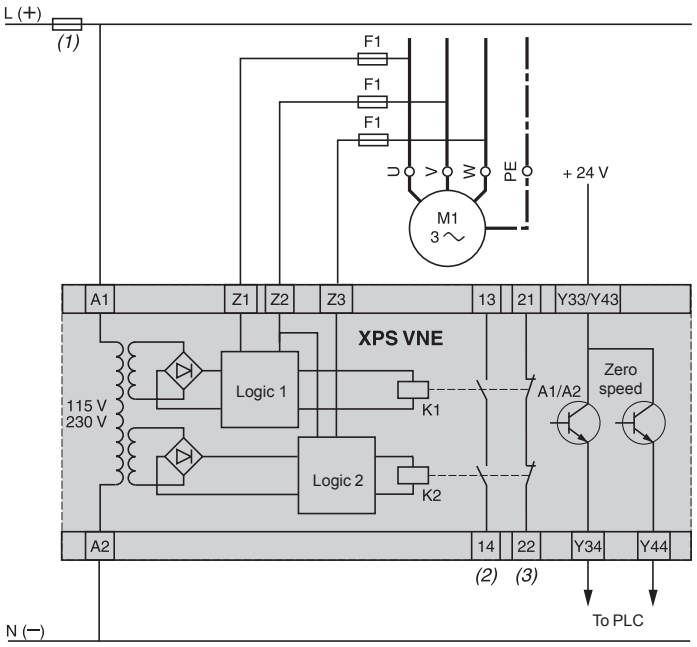
XPSVNE

Description	Number of safety circuits	Solid-state outputs for PLC	Supply	Frequency of motor power supply	Reference	Weight oz (kg)
Safety modules for zero speed detection	2	2	⎓ 24 V	⩽ 60 Hz	**XPSVNE1142P**	17.637 (0.500)
				> 60 Hz	**XPSVNE1142HSP**	17.637 (0.500)
			∿ 115 V	⩽ 60 Hz	**XPSVNE3442P**	21.164 (0.600)
				> 60 Hz	**XPSVNE3442HSP**	21.164 (0.600)
			∿ 230 V	⩽ 60 Hz	**XPSVNE3742P**	21.164 (0.600)
				> 60 Hz	**XPSVNE3742HSP**	21.164 (0.600)

Safety automation system solutions
Preventa™ safety relay modules type XPSVNE
For zero speed detection

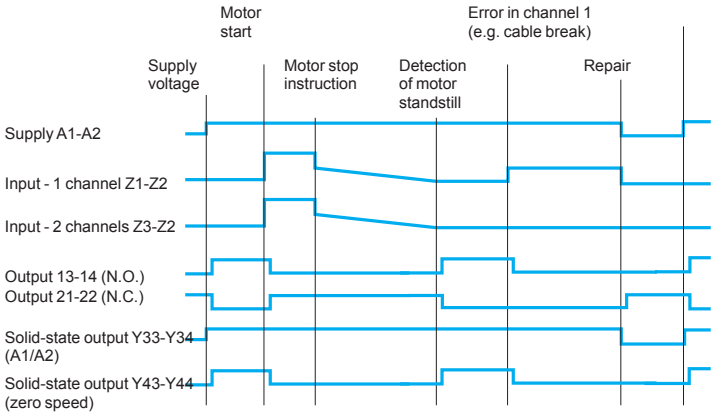
XPSVNE

Wiring diagram



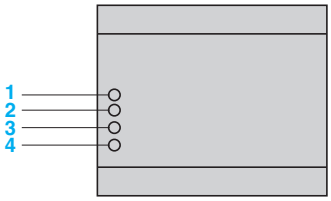
(1) Technical characteristics for establishing maximum rating of fuses, see page 12.
(2) Contacts are open when motor is running, closed when motor is stopped.
(3) Contacts are closed when motor is running, open when motor is stopped.
F1 = 2 A

Functional diagram of module XPSVNE



Key 0 ⌐ 1
The voltages at terminals Z1, Z2 and Z3 are indicated solely for the purposes of schematic diagram representation.

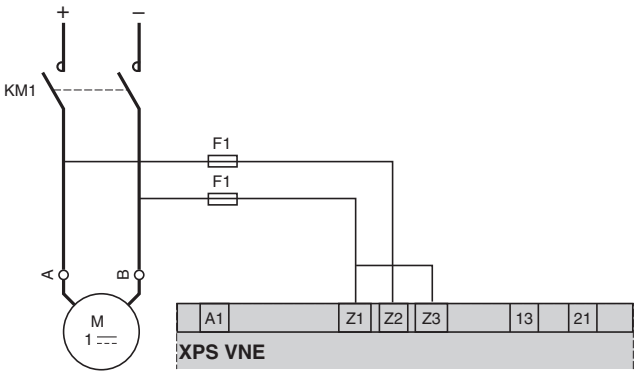
LED details



1 Supply voltage A1-A2.
2 Stop detected by channel 1.
3 Stop detected by channel 2.
4 Motor stop condition detected by both channels within time window.

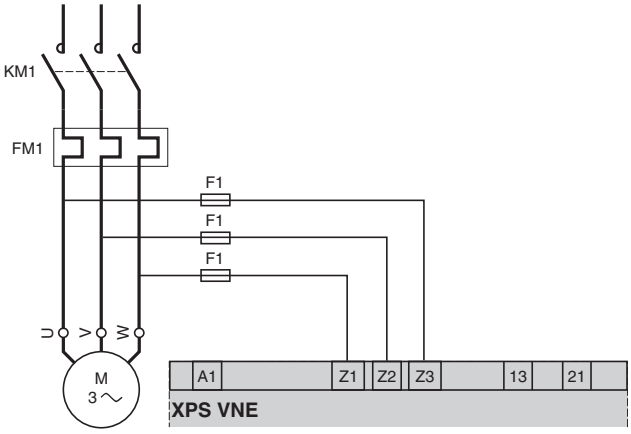
Safety automation system solutions
Preventa™ safety relay modules type XPSVNE
For zero speed detection

Module XPSVNE associated with a d.c. motor



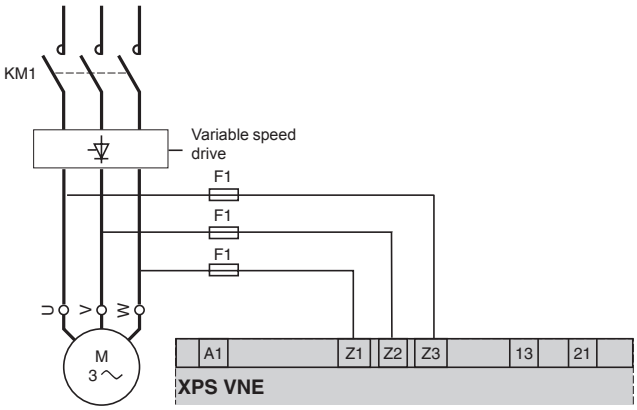
F1 = 2 A

Module XPSVNE associated with a 3-phase motor



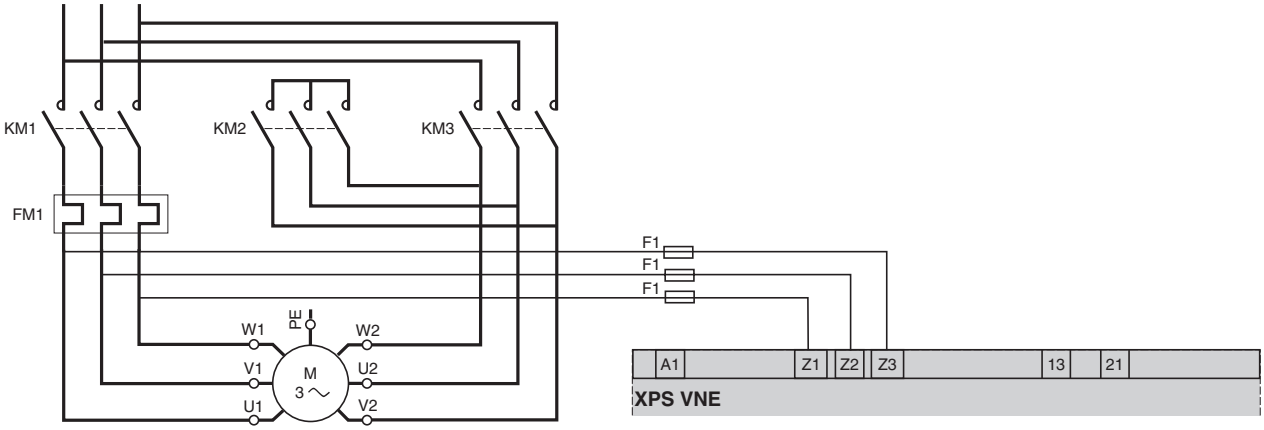
F1 = 2 A

Module XPSVNE associated with a 3-phase motor + variable speed drive



F1 = 2 A

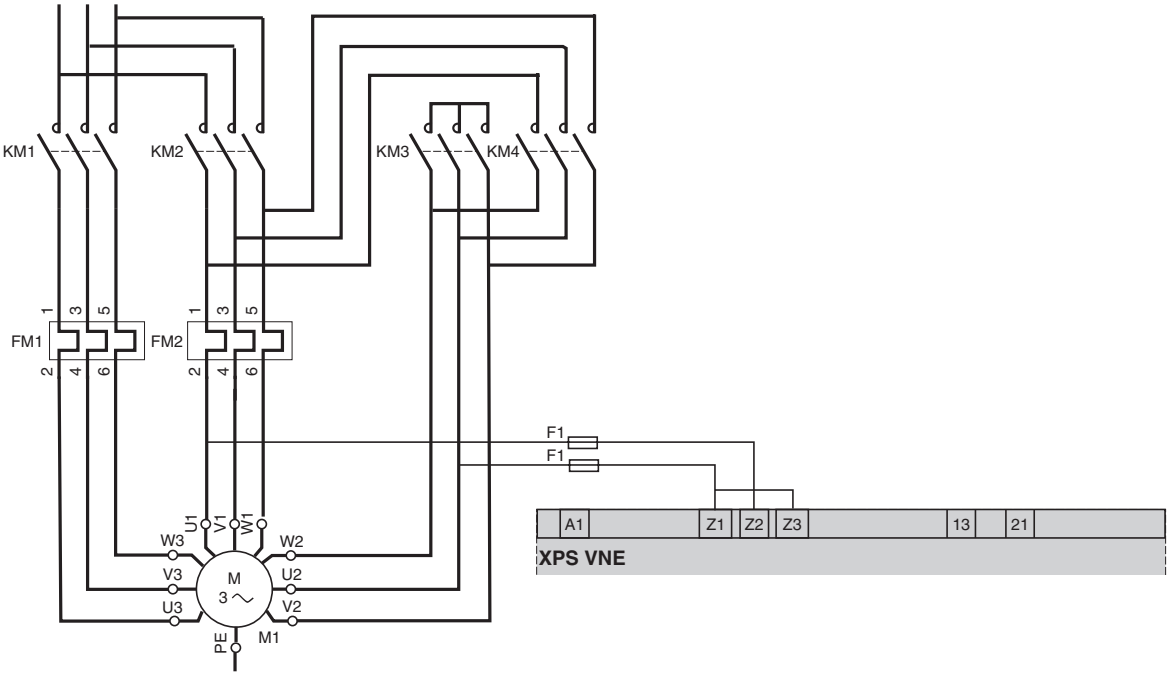
Module XPSVNE associated with a 3-phase motor with start-delta starting



F1 = 2 A
KM1: Fast rotation speed
KM2: Slow rotation speed
KM3: Star
The “Star” contactor (KM3) must be closed after the motor is de-energized, in order to allow detection of zero speed.

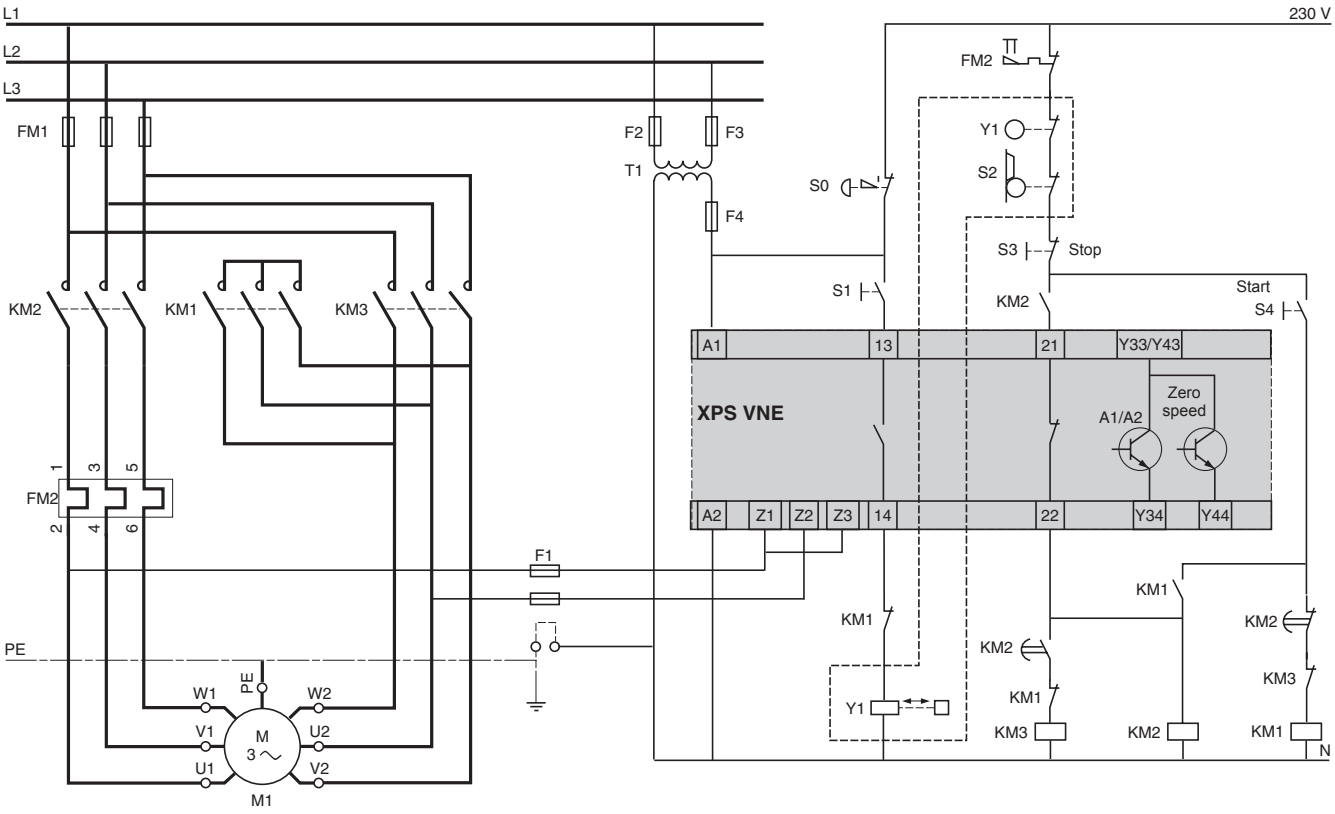
2

Module XPSVNE associated with a 3-phase motor with variable number of poles and star-delta starting

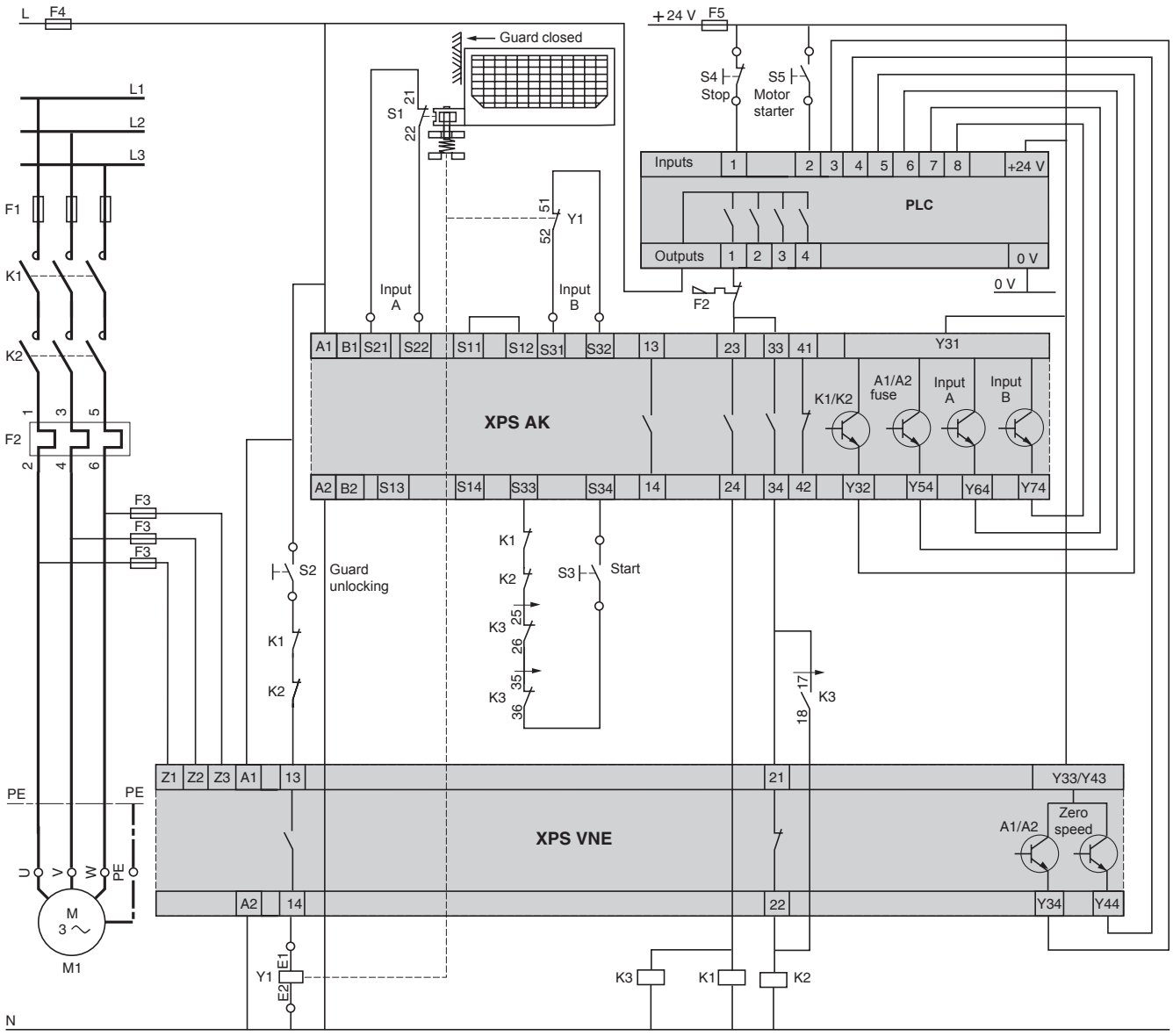


F1 = 2 A
KM1: Fast rotation speed
KM2: Slow rotation speed
KM3: Star
KM4: Delta

Module XPSVNE associated with a star-delta motor starter and guard switch type XCS E



Association of safety modules XPSVNE and XPSAK

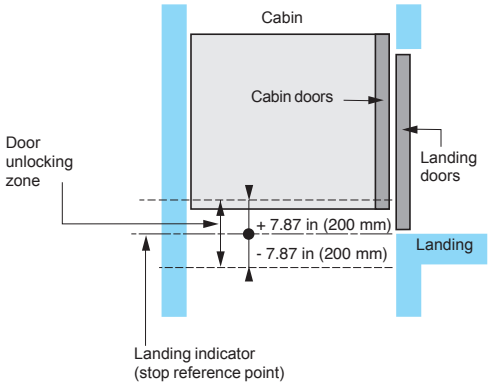


S1 + Y1: Guard switch with solenoid locking without power, type XCSE or XCSL

Pulse on de-energization relay XPSTSW

Safety automation system solutions
Preventa™ safety relay modules type XPSDA
For elevator control

Operating principle



When the cabin is parked at a landing, with the doors open, some elevators automatically correct their level (isolevelling) in relation to the landing in order to compensate for any differences generated by changes in the load in the cabin. During this operation, European standard EN-81 recommends that the presence of the cabin be checked within a zone of +/- 7.87 in (200 mm) around the landing (door unlocking zone), by means of a safety circuit which will cause the cabin to stop if it moves out of the specified zone.

The use of a safety module XPSDA, which checks the presence of the cabin in the specified zone at two points, meets this requirement.
The module incorporates two safety outputs and two solid-state outputs for signalling functions. Four LEDs on the front cover of the module provide visual indication of the status of the safety circuit.
The position of the cabin in relation to the landing is detected by two limit switches in the elevator shaft. It is also possible to use non-contact sensors (magnetic sensors with reed contact).
When the cabin reaches the preset position and when it is within the permissible tolerances in relation to the landing, the two safety circuits in safety module XPSDA close and allow isolevelling of the cabin with the doors open. Any change in one of the input signals (cabin outside the specified zone) or detection of an anomaly (break in the wiring, short-circuit, etc.) causes immediate opening of the safety outputs in the XPSDA module and subsequent stopping of the cabin.

Characteristics

Module type			**XPSDA**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max.
Conformity to standards			EN 81-1, EN 81-2, EN/IEC 60947-5-1, EN 50082-2, EN 12015, EN 12016
Product certifications			UL, CSA, TÜV
Supply	Voltage	**V**	∼ and ⎓ 24, ∼ 115, ∼ 230
	Voltage limits		- 20…+ 10% (∼ 24 V), - 20…+ 20% (⎓ 24 V), - 15…+ 15% (∼ 115 V), - 15…+ 10% (∼ 230 V)
	Frequency	**Hz**	50/60
Maximum power consumption	24 V	**VA**	< 9
	115 V/230 V	**VA**	< 10
Module inputs fuse protection			Internal, electronic
Control unit voltage between S11-S12, S21-S22		**V**	24 (24 V version), 48 (115 V, 230 V versions)
Protection of the control unit contacts			By limitation of the maximum current in the event of short-circuit (< 185 mA)
Minimum voltage and current between terminals S11-S12, S21-S22 (inputs A and B)	U min./I min. - 24 V version 68 °F (20 °C)		16 V/70 mA
	U min./I min. - 115 V/230 V version 68 °F (20 °C)		41 V/25 mA
Calculation of wiring resistance RL between terminals S11-S12, S21-S22 as a function of the internal supply voltage U int (terminals S11-S21)		Ω	RL max. = $\frac{\text{U int - U min.}}{\text{I min.}}$ Ue = true voltage applied to terminals A1-A2 U int = supply voltage Ue - 3 V (24 V version) U int between 42 V and 45 V, with typical value = 45 V (115 V, 230 V version) RL max. must not exceed 50 Ω
Synchronization time between inputs A and B, automatic start, linked terminals S33-S34 and Y3-Y4		**ms**	Approx. 300
Outputs	Voltage reference		Relay hard contacts
	Number and type of safety circuits		2 N.O. (13-14, 23-24)
	No. and type of additional circuits		2 solid-state
	Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180
	Breaking capacity in DC-13		24 V/1.5 A - L/R = 50 ms
	Breaking capacity of solid-state outputs		24 V/20 mA
	Max. thermal current (Ithe)	**A**	2.5
	Output fuse protection		6 A fast acting, 4 gG, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200
	Minimum current (relay hard contact)	**mA**	10
	Minimum voltage (relay hard contact)	**V**	17
	Max. total thermal current		5
Electrical life			See page 2/172
Response time on input opening		**ms**	< 40
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (Uimp.)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-1, DIN VDE 0110 parts 1 & 2)
LED display			4
Operating temperature		**°F (°C)**	+ 14 …+ 149 (- 10…+ 65)
Storage temperature		**°F (°C)**	- 13…+ 185 (- 25…+ 85)
Degree of protection conforming to IEC 60529			Terminals: IP 20. Enclosure: IP 50
Connection	Type		Captive screw clamp terminals: without cable end 1 x 12 AWG (1 x 4 mm²), with cable end 2 x 14 AWG (2 x 2.5 mm²)

Safety automation system solutions
Preventa™ safety relay modules type XPSDA
For elevator control

References



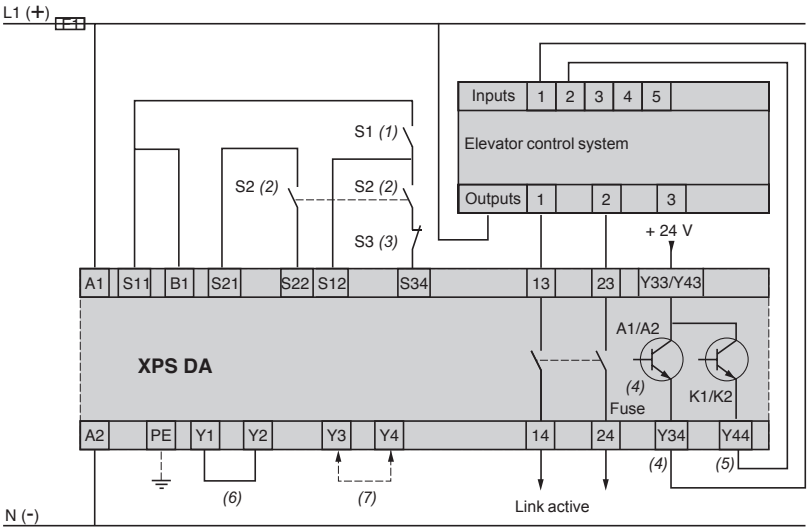
XPSDA

Description	Number of safety circuits	Solid-state outputs for PLC	Supply	Reference	Weight kg
Safety modules for elevator control	2	2	∼ and ⎓ 24 V	**XPSDA5142**	12.346 (0.350)
			∼ 115 V	**XPSDA3442**	15.874 (0.450)
			∼ 230 V	**XPSDA3742**	15.874 (0.450)

Wiring diagrams

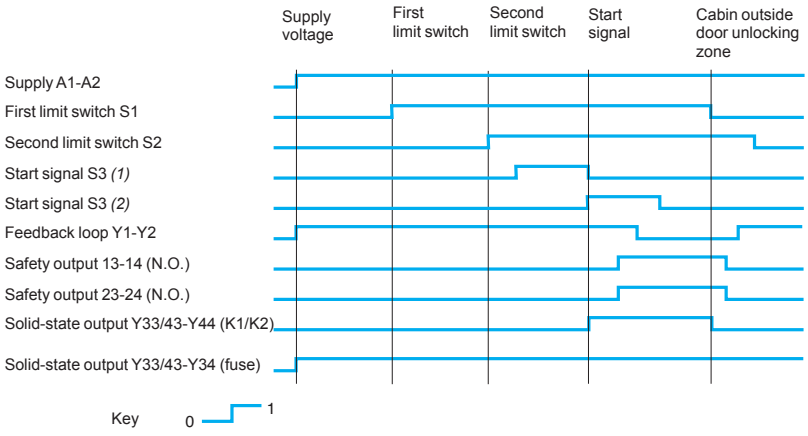
XPSDA

Module XPSDA associated with an elevator control system



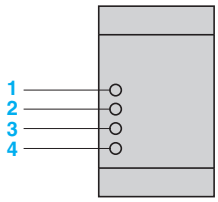
(1) Limit switch S1 (cabin position).
(2) Limit switch S2 (cabin position).
(3) Enable instruction given by the elevator control system.
(4) Operating status of internal electronic fuse.
(5) Output status (only permissible for functions not relating to safety).
(6) Feedback loop.
(7) Without start signalling monitoring (Y3-Y4 linked).

Functional diagram of module XPSDA



(1) With start signal monitoring, Y3-Y4 open.
(2) Without start signalling monitoring, Y3-Y4 jumpered.

LED details



1 Supply voltage A1-A2. Fuse status.
2 Input S12 (A).
3 Input S22 (B).
4 K1/K2 status (N.O. safety outputs closed).

Safety automation system solutions

Preventa™ safety relay modules type XPSPVT

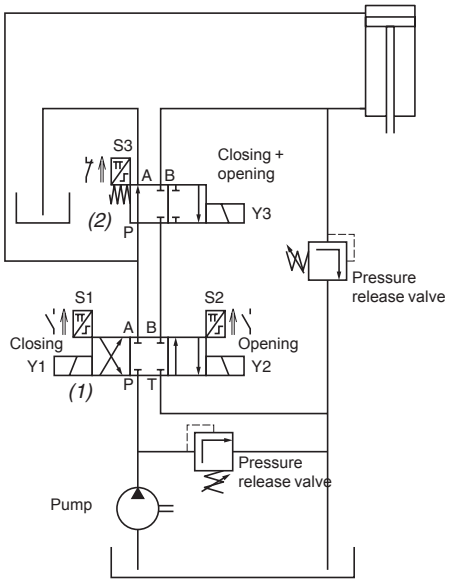
For dynamic monitoring of hydraulic valves on linear presses

Operating principle

Safety module XPSPVT is specifically designed for monitoring hydraulic safety system valves which control the movements of potentially hazardous machines.
The operating principle of this module is explained in the circuit diagram of a hydraulic safety system for linear presses (see below).

This hydraulic safety system features a 3 position piston which controls the up and down stroke of the operating cylinder. The circuit is equipped with a safety valve, to complete the redundant system. This circuit must be activated to enable the up and down stroke of the cylinder.
If either of the 2 pistons becomes defective (for example, due to a broken spring or to oil contamination), and the valve piston shifts from its normal position towards the open position, the XPSPVT module will detect it and prevent resumption of the piston stroke.
Proximity sensors integrated in the valve to detect the piston positions and connected to the XPSPVT module must be damped when the valve coils are in the de-energized state (zero position).
The sensor circuits of the XPSPVT module are designed to allow connection of NPN and PNP proximity sensors or sensing components. Either 2-wire or 3-wire types can be used.
The wiring diagram on page 2/228 shows how to connect proximity sensors.

Hydraulic safety system circuit operating on a linear press.
Monitoring of valves in position 0.



(1) 3 position hydraulic valve.
(2) 2 position hydraulic valve.

Safety automation system solutions

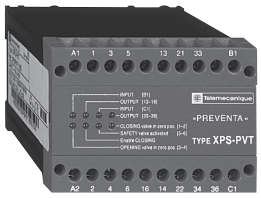
Preventa™ safety relay modules type XPSPVT

For dynamic monitoring of hydraulic valves on linear presses

Characteristics

Module type				XPSPVT
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.
Conformity to standards				EN 60204-1, EN/IEC 60947-5-1, EN 693, EN 50082-2
Product certifications				UL, CSA
Supply	Voltage		**V**	⎓ 24
	Voltage limits			- 10…+ 10%
Power consumption			**W**	< 6
Outputs	Voltage reference			Relay hard contacts
	Number and type of safety circuits			2 N.O. (13-14, 33-34) + 1 N.C. (21-22)
	Number and type of additional circuits			–
	Wiping time		**ms**	100 (minimum value)
	Breaking capacity	AC-15	**VA**	C300: inrush 1800, maintained 180
		DC-13	**VA**	24 V/1.5 A - L/R = 50 ms
	Max. thermal current (Ithe)		**A**	2.5
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, VDE 0660 part 200		**A**	4 gG
	Minimum current		**mA**	10
	Minimum voltage		**V**	17
Electrical life				See page 2/172
Response time			**ms**	< 15
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-1, DIN VDE 0110 parts 1 & 2)
LED display				8
Operating temperature			**°F (°C)**	+ 14…+ 131 (- 10…+ 55)
Storage temperature			**°F (°C)**	- 13…+ 185 (- 25…+ 85)
Degree of protection conforming to IEC 60529		Terminals		IP 20
		Enclosure		IP 40
Polycarbonate enclosure		Type		Removable
		Number of terminals		20
Connection		Type		Captive screw clamp terminals: without cable end 2 x 14 AWG (2 x 2.5 mm²), with cable end 2 x 16 AWG (2 x 1.5 mm²), min. Ø 0.5 mm

Reference



XPSPVT

Description	Display	Supply	Reference	Weight oz (kg)
Safety module for dynamic monitoring of hydraulic valves on linear presses	8 LEDs	⎓ 24 V	**XPSPVT1180**	19.048 (0.540)

Principle: page 2/248 | Characteristics: page 2/249 | References: page 2/249 | Wiring Diagrams: page 2/250 | Dimensions: page 2/260

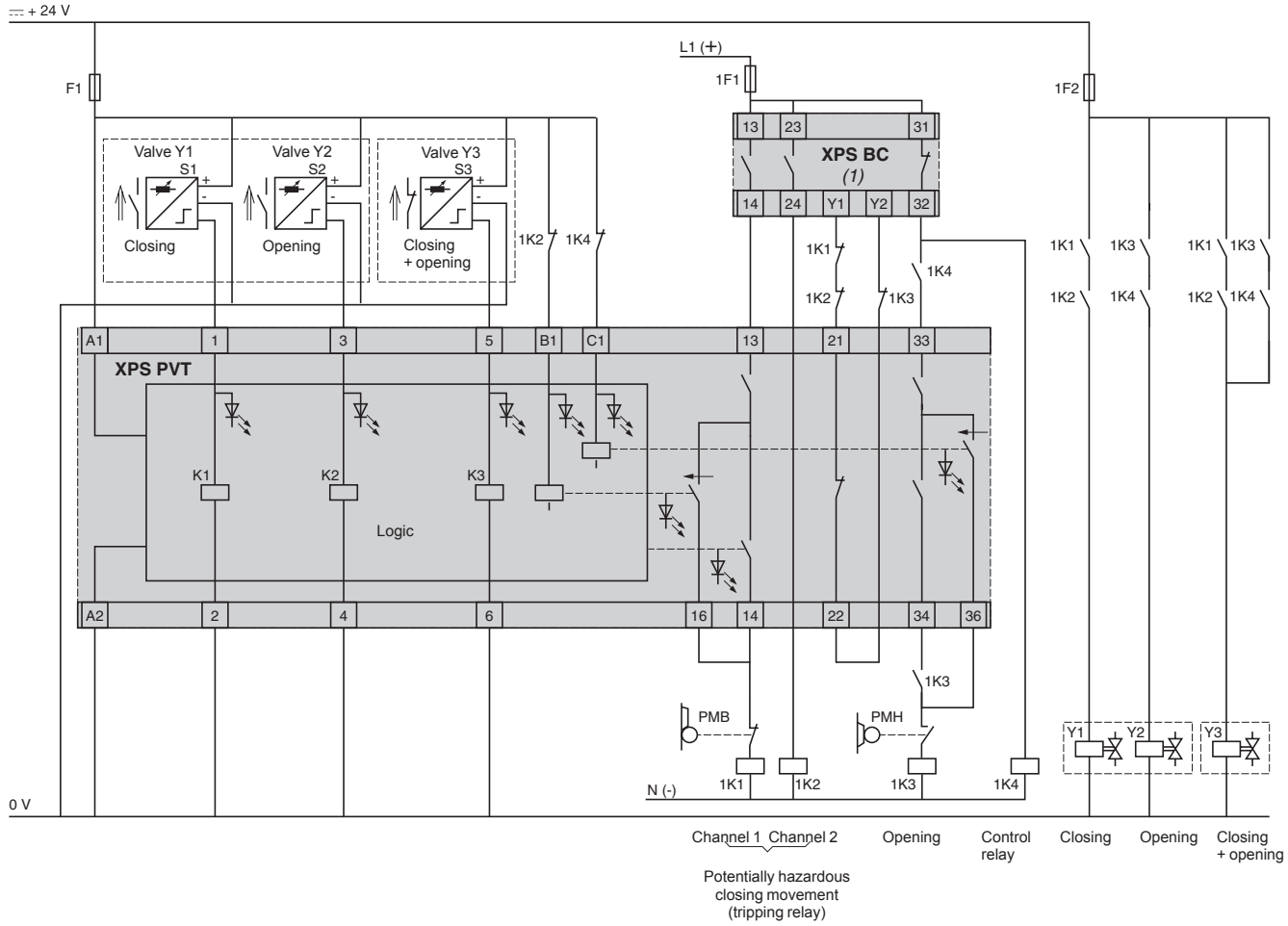
Safety automation system solutions

Preventa™ safety relay modules type XPSPVT

For dynamic monitoring of hydraulic valves on linear presses

XPSPVT

Wiring diagram for module XPSPVT



(1) Two-hand control or presence sensor outputs.

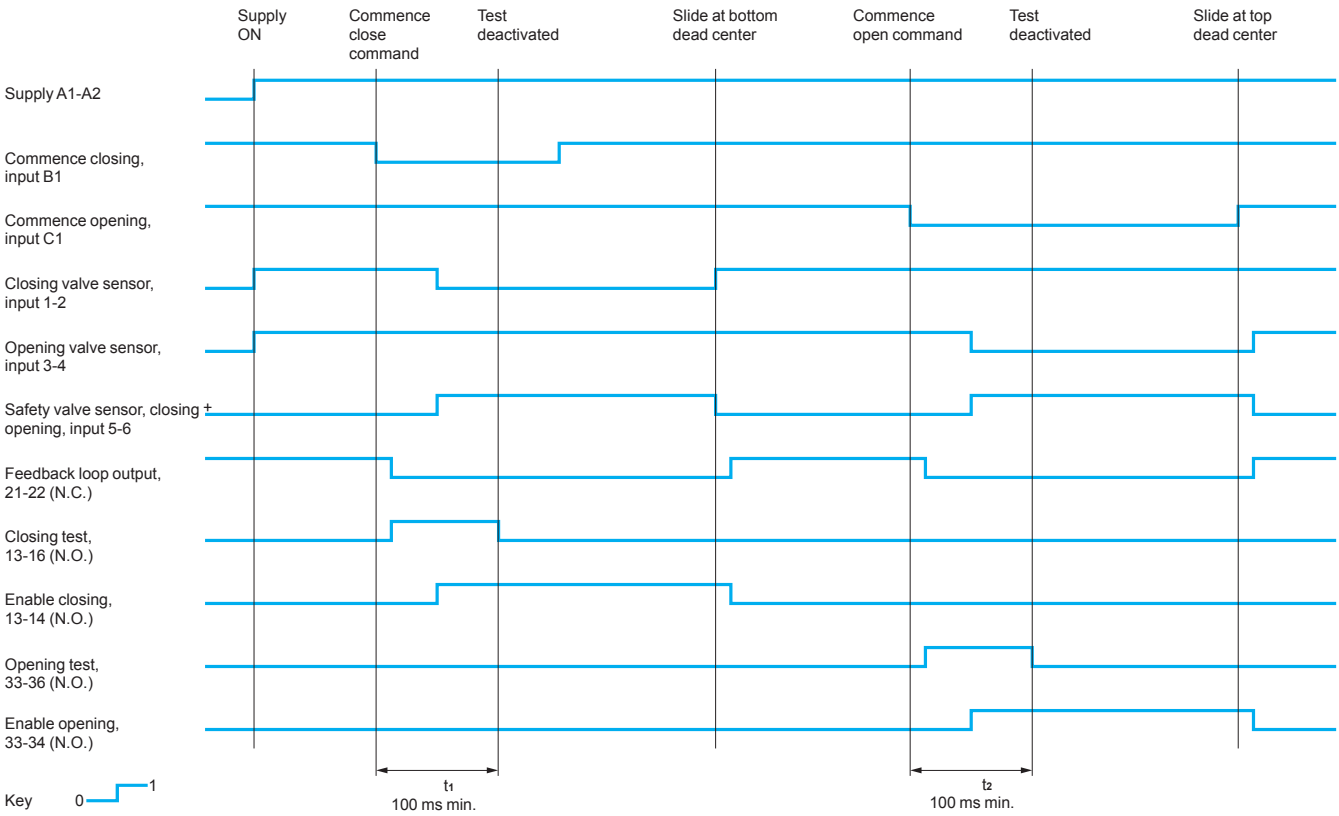
Safety automation system solutions

Preventa™ safety relay modules type XPSPVT

For dynamic monitoring of hydraulic valves on linear presses

XPSPVT

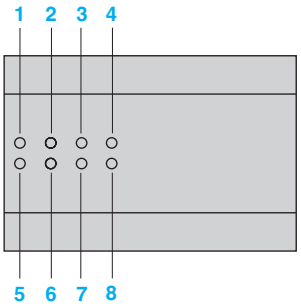
Functional diagram of module XPSPVT



Sensor Status During Press Cycle

Description	Valve Y1 Sensor S1 (N.O.)	Valve Y2 Sensor S2 (N.O.)	Valve Y3 Sensor S3 (N.C.)
Press Ram Stopped	Contact closed	Contact closed	Contact open
Press Ram Moving	Contact open	Contact closed	Contact closed
Press Ram Closing	Contact closed	Contact open	Contact closed

LED details



1 Closing command.
2 Closing test.
3 Opening command.
4 Opening test.
5 Opening valve (Y2) in position 0.
6 Closing enabled.
7 Safety valve (Y3) activated.
8 Closing valve (Y2) in position 0.

Safety automation system solutions
Preventa™ safety relay modules type XPSPVK
For dynamic monitoring of double-bodied solenoid valves

Operating principle

Safety module XPSPVK is specially designed for dynamic monitoring of the safety valves in eccentric presses, conforming to European standard EN 692.
This standard establishes the specifications related to safety control systems for presses equipped with friction clutches.
To meet the requirements of this standard, the clutch/brake control must be monitored dynamically.

This function is provided by a double-bodied solenoid valve (safety valve for presses) which performs the functions of two valves mounted in one body.
The position of the two valve pistons can be monitored by proximity sensors, mechanical limit switches or pressure switches.
Module XPSPVK checks for the correct operation of the double-bodied safety valves at 3 points in the cycle.
- Start at top dead center: checks the rest position of the two valves.
- Take-on point (transfer function): checks that the two valves are in the “activated” (energized) position.
- Press stop trigger point: checks that the two valves return to the rest position.

Return must be simultaneous for both valves within a defined time period.
To set up an automatic disconnect of the XPSPVK module at the first machine stroke, a N.C. auxiliary contact mounted on the main control contactor or on another contactor/relay, activated at the same time, can be wired to terminals 7 and 8 in parallel with the RESET button.
If an anomaly is detected during the cycle, the XPSPVK module will stop the slide stroke and will also inhibit the start of another cycle.

Characteristics

Module type			**XPSPVK**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max.
Conformity to standards			EN 60204-1, EN/IEC 60947-5-1, EN 692, EN 50082-2
Product certifications			UL, CSA
Supply	Voltage	**V**	⎓ 24, ∿115, ∿ 230
	Voltage limits		- 10…+ 10% (⎓ 24 V) - 15…+ 15% (∿ 115 V) - 15…+ 10% (∿ 230 V)
	Frequency	**Hz**	50/60
Power consumption	⎓ 24 V	**W**	< 9
	∿ 115 V/230 V	**VA**	< 16
Outputs	Voltage reference		Relay hard contacts
	Number and type of safety circuits		1 N.O. (13-14) transfer function + 1 N.C. (21-22) feedback loop
	Number and type of additional circuits		4 solid-state outputs
	Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180
	Breaking capacity in DC-13		24 V/1.5 A - L/R = 50 ms
	Max. thermal current (Ithe)	**A**	2.5
	Breaking capacity of solid-state outputs		24 V/20 mA, 48 V/10 mA
	Output fuse protection	**A**	4 gG, conforming to EN/IEC 60947-5-1, VDE 0660 part 200
	Minimum current (relay hard contacts)	**mA**	10
	Minimum voltage (relay hard contacts)	**V**	17
Response time		**ms**	< 40
Electrical life			See page 2/172
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (Uimp.)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-1, DIN VDE 0110 parts 1 & 2)
LED display			8
Operating temperature		**°F (°C)**	+ 14…+ 131 (- 10…+ 55)
Storage temperature		**°F (°C)**	- 13…+ 185 (- 25…+ 85)
Degree of protection Conforming to IEC 60529	Terminals		IP 20
	Enclosure		IP 40
Polycarbonate enclosure	Type		Removable
	Number of terminals		32
Connection	Type		Captive screw clamp terminals: without cable end 2 x14 AWG (2 x 2.5 mm²), with cable end 2 x16 AWG (2 x 1.5 mm²), min. Ø 0.5 mm

Principle: page 2/252 | Characteristics: page 2/252 | References: page 2/253 | Wiring Diagrams: page 2/253 | Dimensions: page 2/260

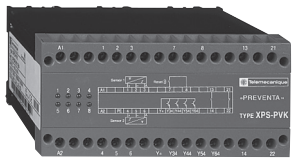
Safety automation system solutions

Preventa™ safety relay modules type XPSPVK

For dynamic monitoring of double-bodied solenoid valves

References

DF565750



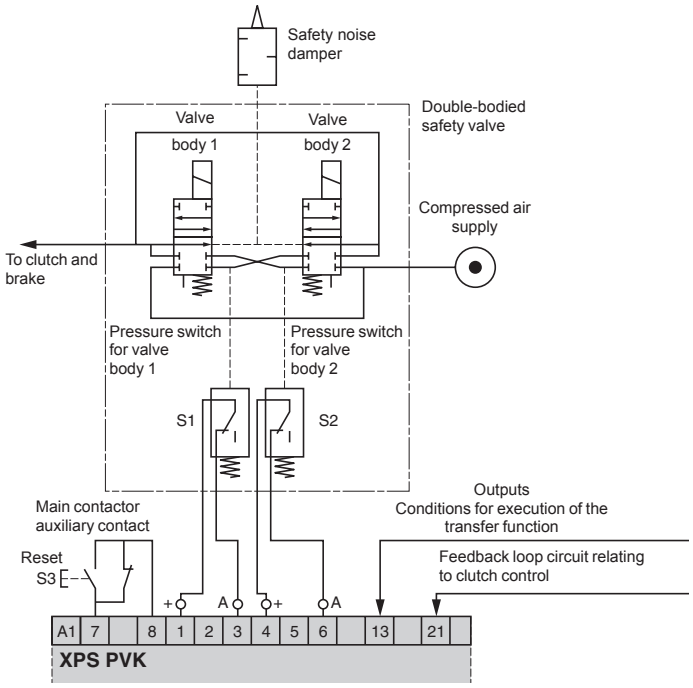
XPSPVK

Description	Display	Supply	Reference	Weight oz (kg)
Safety modules for dynamic monitoring of double-bodied solenoid valves	8 LEDs	⎓ 24 V	**XPSPVK1184**	24.692 (0.700)
		~ 115 V	**XPSPVK3484**	31.747 (0.900)
		~ 230 V	**XPSPVK3784**	31.747 (0.900)

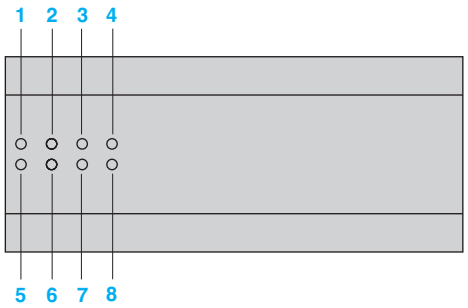
Wiring diagrams

XPSPVK

Monitoring of a press safety valve by an XPSPVK module



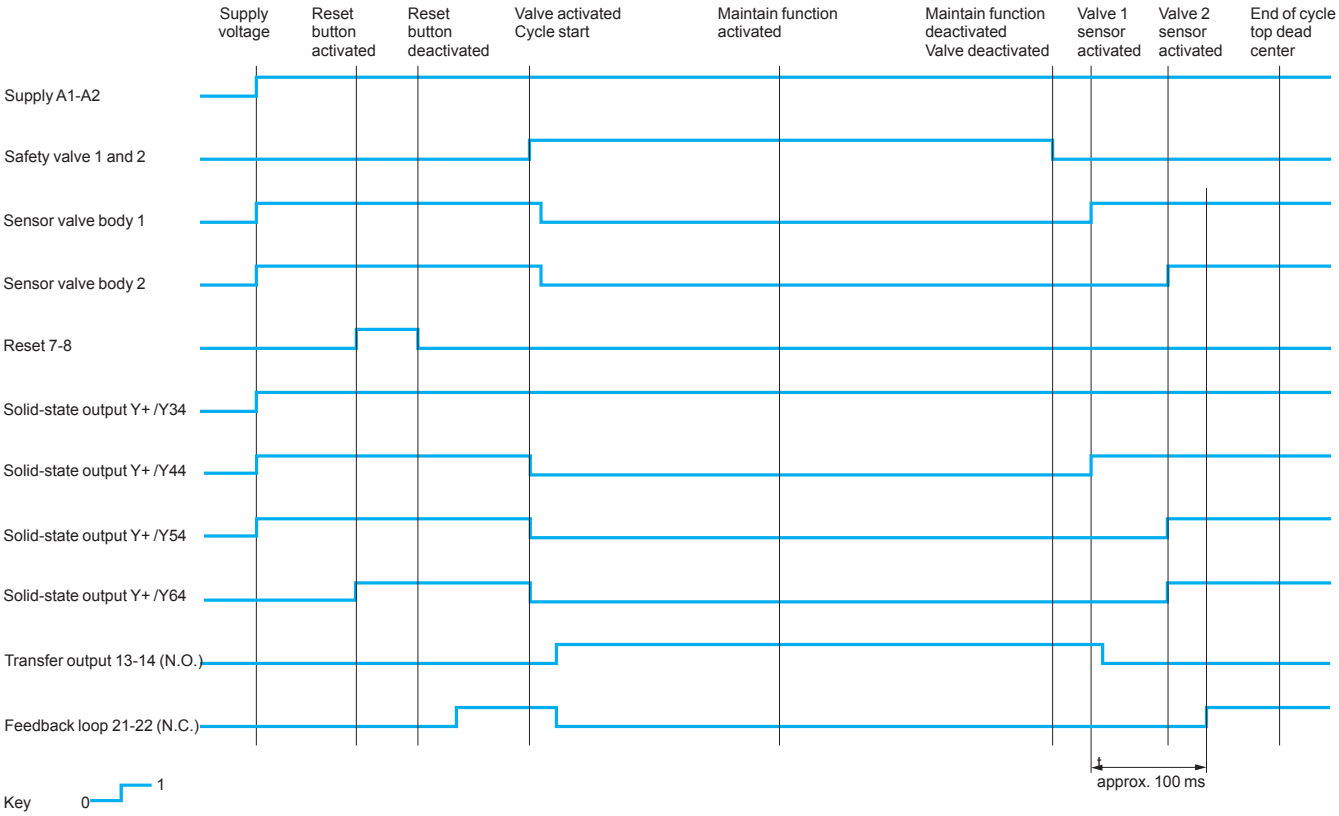
LED details



1 DC internal supply n° 1.
2 DC internal supply n° 2.
3 Valve n° 1 blocked.
4 Valve n° 2 blocked.
5 Ready for monitoring
6 Disconnect synchronised.
7 Reset.
8 Valves 1 and 2 energized.

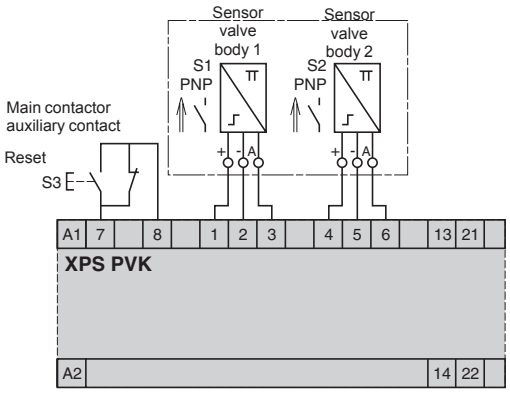
XPSPVK

Functional diagram of module XPSPVK

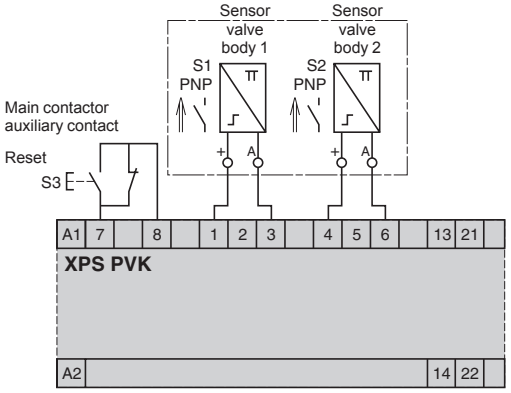


Connection of module XPSPVK with 3-wire (or 2-wire) proximity sensors

3-wire sensors

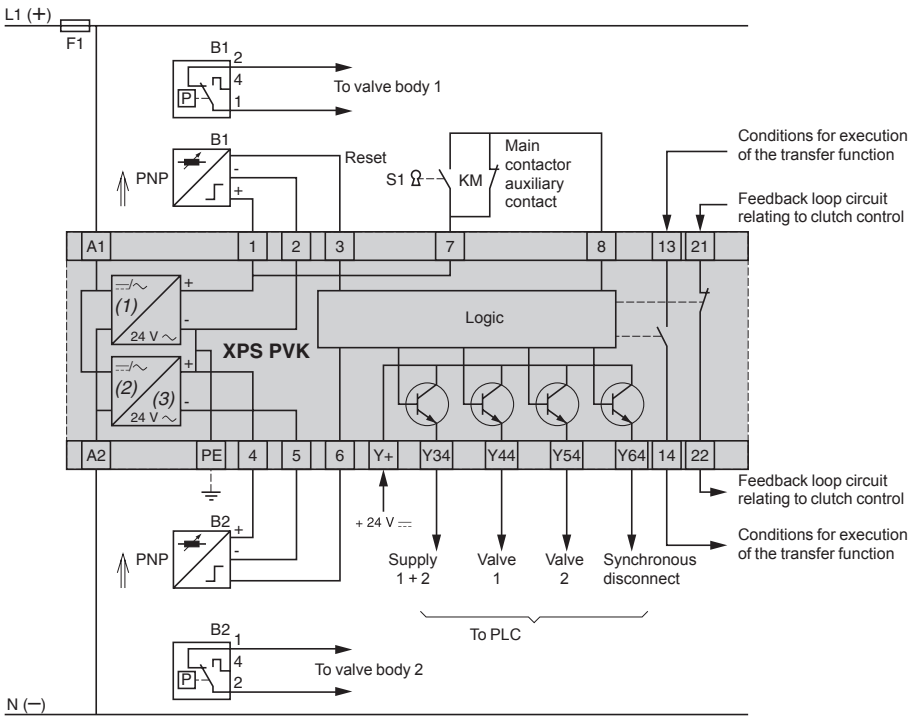


2-wire sensors



XPSPVK

Connection of module XPSPVK with an eccentric press safety valve



(1) Internal supply n° 1.
(2) Internal supply n° 2.
(3) For a ⎓ 24 V version: integrated ⎓/~ adaptor.

Safety automation system solutions

Preventa™ safety relay modules type XPSOT

For safety stop with automatic overtravel monitoring and control

Operating principle

Safety module XPSOT is used on eccentric presses to monitor overtravel and ensure that the press slide stops in a non-hazardous position, that is, top dead center (TDC) during normal (non-emergency) operation. Use of this module, designed in accordance with standard EN 692 relating to mechanical press safety, makes it possible to create a redundant, self-monitoring control system.

The two essential functions of this safety module are to:

■ **Trigger the end of cycle stop sequences slightly before top dead center (at point A) so as to come to complete stop at TDC.**

After TDC, the permissible overtravel is approximately 10°. The safety module immediately detects any overtravel. Overtravel is indicative of braking device deterioration and, in this case, jog mode must be used to move the slide back to TDC. The next cycle will be inhibited to allow maintenance to be performed on the braking device (cam 1).

■ Take over control monitoring during the dangerous part of the cycle (slide downstroke). Any stop instruction issued between TDC (0°) and point C (approximately 150° after TDC) causes an immediate stop of the press. **This approximate value of 150° corresponds to the 0.315" (8mm) tool closure dimension (safety point)**.

When a stop instruction is issued after this safety point, the press completes the cycle and comes to a complete stop at TDC (cam 2).

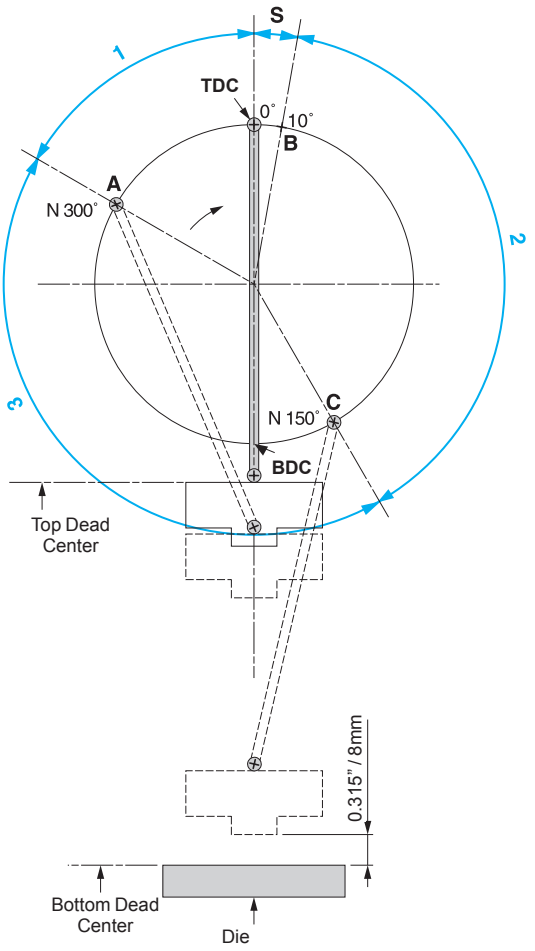
Control of the hazardous part of the cycle (generally the slide downstroke) is usually activated from a two-hand control station associated with a safety module (type XPSBC) monitoring this station to qualify as a category 4 control system according to standard EN 954-1/ISO 13849-1.

Overtravel monitoring is performed **on each cycle** by safety module XPSOT.

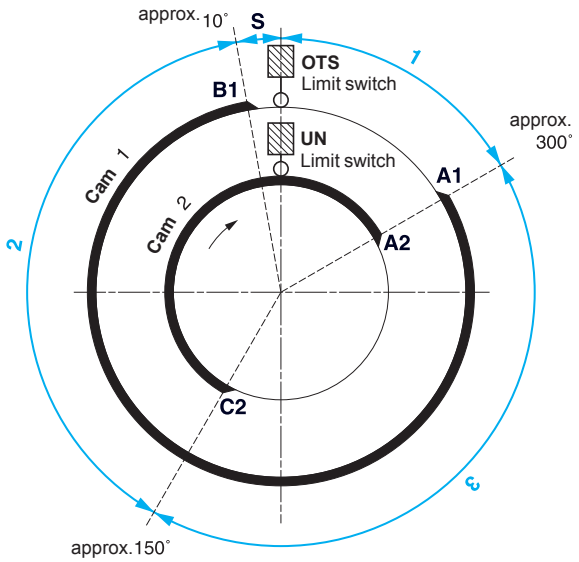
Safety automation system solutions
Preventa™ safety relay modules type XPSOT
For safety stop with automatic overtravel monitoring and control

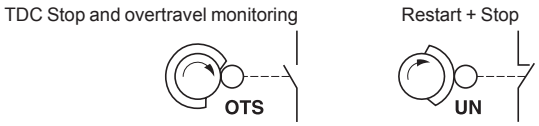
Operating principle (continued)

Press diagram



Control cams diagram





1 Permissible overtravel zone.
2 Dangerous zone (usually slide downstroke).
3 Non-dangerous zone (usually slide upstroke).

S Permissible overtravel.
A Stop instruction trip point.
B Point at which permissible overtravel is exceeded (a stop instruction issued after point **B** will lock up the press).
C Takeover point, beyond which the press will complete its cycle up to **TDC**.
TDC Top dead center, actual stopping zone of the press.
BDC Bottom dead center.

Cam operation
Cam 1 is associated with the **OTS** limit switch (LS), cam 2 with the **UN** limit switch (the limit switches must be located on different cams for safety reasons).
The **OTS** limit switch is deactivated at TDC, at which point the **UN** limit switch is activated.
Point A1 of **cam 1** is located approximately 300° after TDC and, when reached, the press stops and comes to a standstill: **A1 is the press stop trigger point.**
Point B1, located approximately 10° after TDC, constitutes the end of cam 1: **If B1 is exceeded during stopping**, the overtravel is abnormally long, **the press locks up** and the next cycle is inhibited.
Point A2 of cam 2 functions like point A1 on cam 1 (contact state of the **UN** limit switch reversed in relation to the state of the **OTS** limit switch).
Point C2, located approximately 150° after TDC, corresponds to the 8 mm tool closing dimension. Stop instructions issued after C2 is reached are not executed until point A2 is reached.

Safety automation system solutions

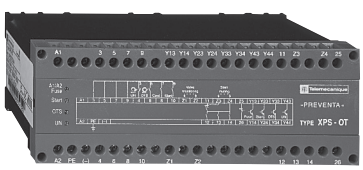
Preventa™ safety relay modules type XPSOT

For safety stop with automatic overtravel monitoring and control

Characteristics

Module type			XPSOT
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max.
Conformity to standards			EN 60204-1, EN/IEC 60947-5-1, EN 692, EN 50082-2
Product certifications			UL, CSA
Supply	Voltage	**V**	∼ 115, ∼ 230
	Voltage limits		- 15…+ 15% (115 V) - 15…+ 10% (230 V)
	Frequency	**Hz**	50/60
Power consumption		**VA**	< 12
Module inputs fuse protection			Internal, electronic
Outputs	Voltage reference		Relay hard contacts
	Number and type of safety circuits		3 N.O. (11-12, 11-13, 11-14)
	Number and type of additional circuits		4 solid-state outputs
	Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180
	Breaking capacity in DC-13		24 V/1.5 A - L/R = 50 ms
	Breaking capacity of solid-state outputs		24 V/20 mA, 48 V/10 mA
	Max. thermal current (Ithe)	**A**	2.5
	Output fuse protection	**A**	4 gG, conforming to EN/IEC 60947-5-1, VDE 0660 part 200
	Minimum current (relay hard contacts)	**mA**	10
	Minimum voltage (relay hard contacts)	**V**	17
Electrical life			See page 2/172
Response time		**ms**	< 20
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (Uimp.)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-1, DIN VDE 0110 parts 1 & 2)
LED display			4
Operating temperature		**°F (°C)**	+ 14…+ 131 (- 10…+ 55)
Storage temperature		**°F (°C)**	- 13…+ 185 (- 25…+ 85)
Degree of protection conforming to IEC 60529	Terminals		IP 20
	Enclosure		IP 40
Polycarbonate enclosure	Type		Removable
	Number of terminals		42
Connection	Type		Captive screw clamp terminals: - without cable end 2 x 14 AWG (2 x 2.5 mm²), - with cable end 2 x 16 AWG (2 x 1.5 mm²), - min. Ø 0.5 mm

References



XPSOT

Description	Display	Supply	Reference	Weight oz (kg)
Safety modules for safety stop with automatic overtravel monitoring and control	4 LEDs	∼ 115 V	**XPSOT3444**	38.801 (1.100)
		∼ 230 V	**XPSOT3744**	38.801 (1.100)

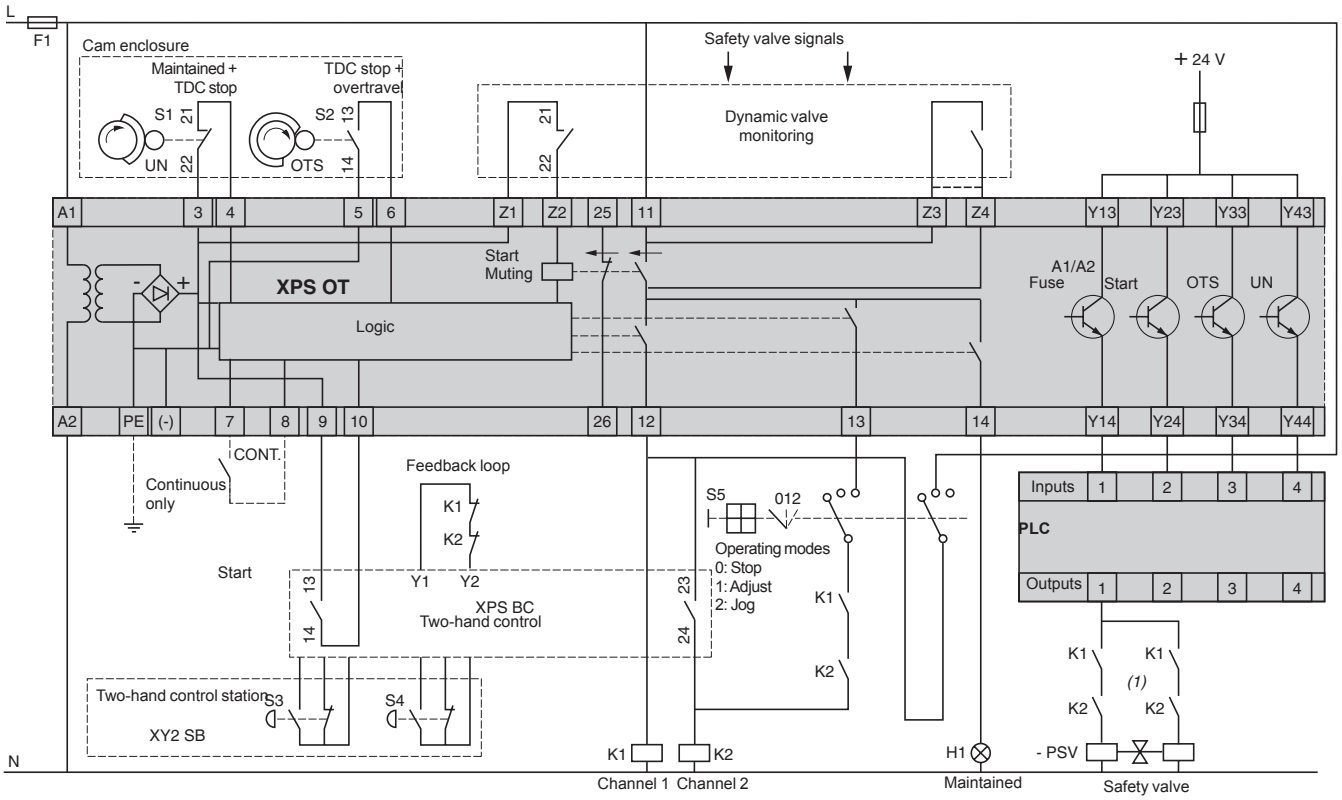
Safety automation system solutions

Preventa™ safety relay modules type XPSOT

For safety stop with automatic overtravel monitoring and control

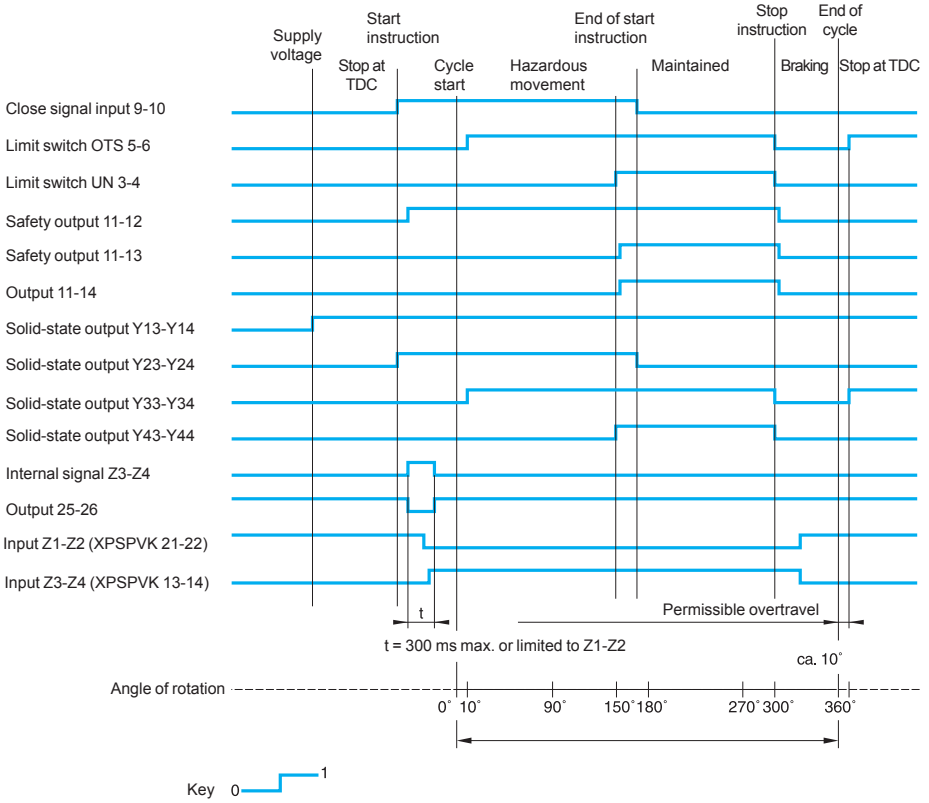
XPSOT

Wiring diagram

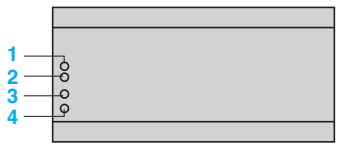


(1) The 2 coils of the safety valve must be wired separately.

Functional diagram



LED details

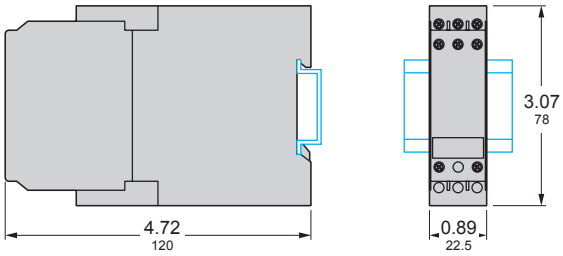


1 Voltage present on terminals A1/A2.
2 Close instruction.
3 **OTS** limit switch activated.
4 **UN** limit switch activated.

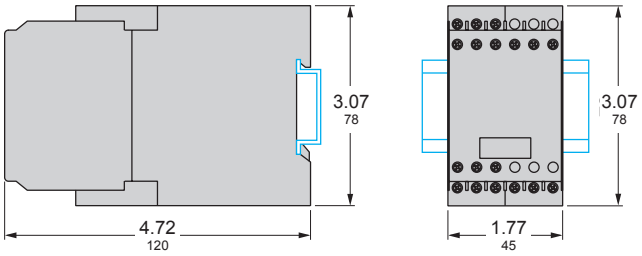
Safety automation system solutions
Preventa™ safety relay modules
AM1 DP200 rail mounting

Dimensions

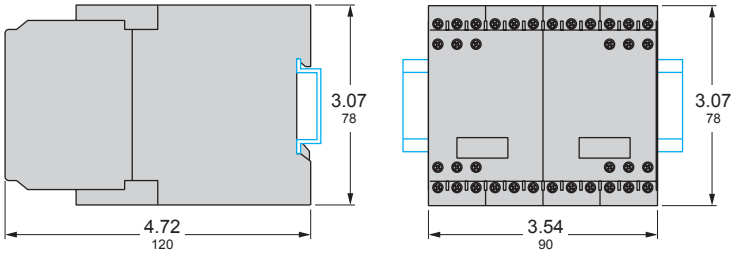
XPSBA



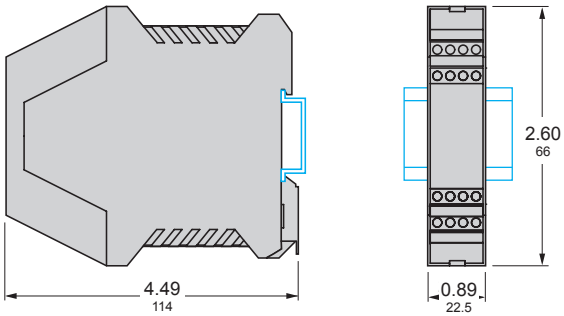
XPSBC, XPSDA



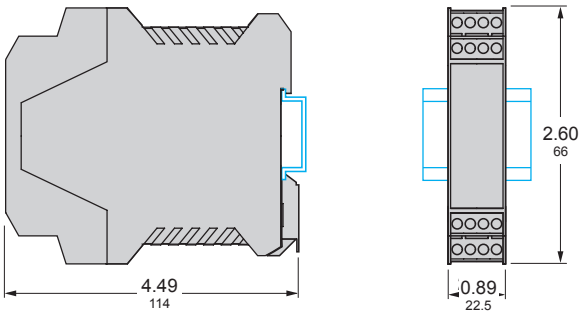
XPSECM, XPSECP



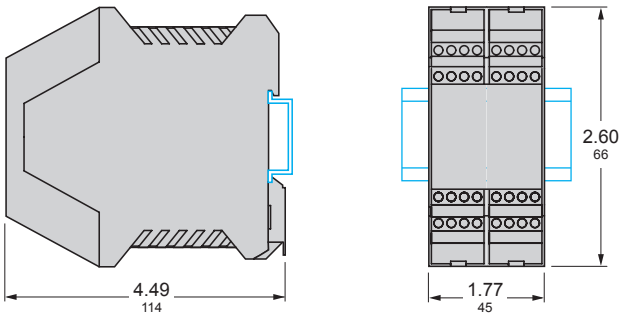
XPSAC●●●●, XPSAF●●●●, XPSAFL●●●●, XPSDMB●●●●, XPSVC●●●●, XPSBF●●●●



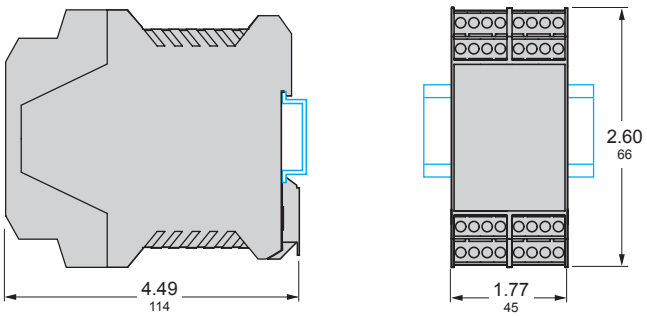
XPSAC●●●●P, XPSAF●●●P●, XPSAFL●●●●P, XPSDMB●●●●P, XPSVC●●●●P, XPSBF●●●●P



XPSAK●●●●, XPSAV●●●●, XPSCM●●●●, XPSDME●●●● XPSATE●●●●



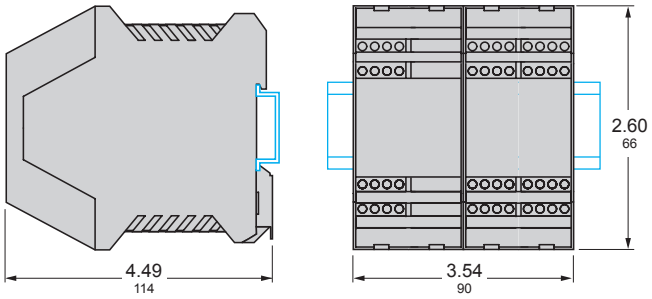
XPSAK●●●●P, XPSAV●●●●P, XPSCM●●●●P, XPSTSA●●●P, XPSTSW●●●●P, XPSDME●●●●P, XPSATE●●●●P, XPSVNE●●●●P



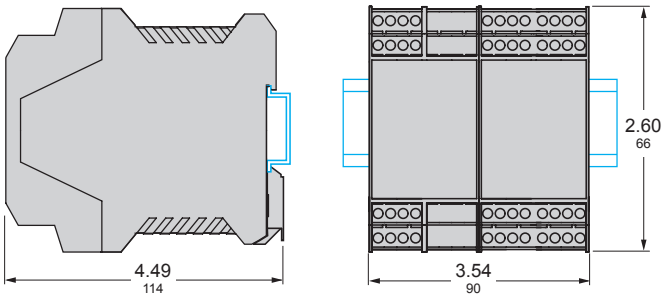
Dual Dimensions: INCHES Millimieters

Dimensions

XPSAR●●●●●●

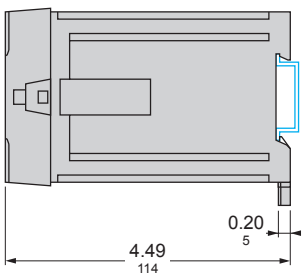


XPSAR●●●●●●P

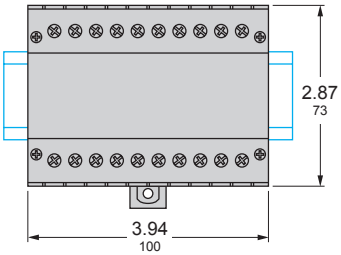


XPSPVT, XPSPVK

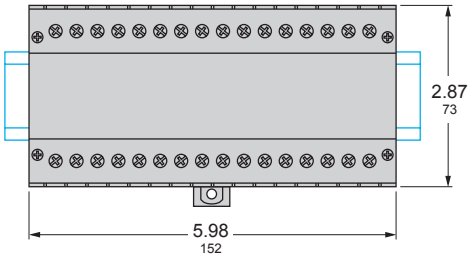
Common side view



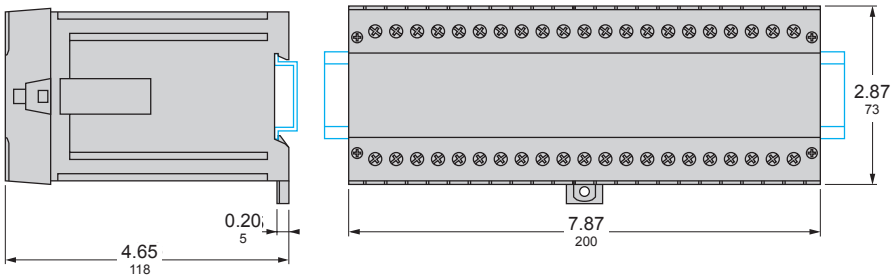
XPSPVT



XPSPVK



XPSOT

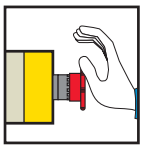
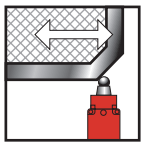
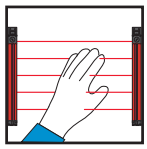
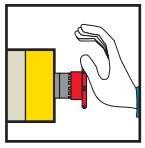


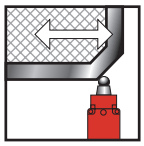
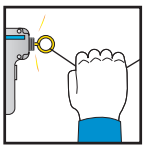
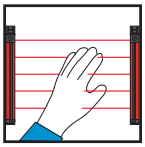
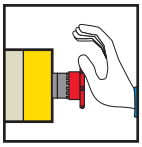
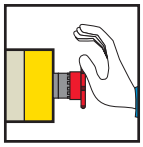
Dual Dimensions: INCHES / Millimeters

Mounting

All safety modules: 1.38 in (35 mm) ⊔ rail mounting.

Safety automation system solutions
Safety solutions on AS-Interface® cabling system
Safety monitors and interfaces

Applications	Safety monitors on AS-Interface ® cabling system		Safety interfaces on AS-Interface ® cabling system	
				
AS-Interface ® "Safety at work"	Safety is incorporated into the AS-Interface ® cabling system by adding a monitor and a safety interface connected together with other standard AS-Interface ® components on the AS-Interface ® line			
				
Functions	Safety applications integrated on the AS-Interface ® line. Emergency stop, safety switches and light curtain monitoring		Emergency stop interfaces	
			Metal	Plastic
AS-Interface ® profile	7.F		0.B.F.F	0.B.F.F
Addressing	Using configuration software ASISWIN2		Using adjustment terminal ASITERV2 and adaptor ASISAD1	
Conformity to standards	IEC 61508 (2000), EN 954-1 (1997) - category 4/ISO 13849-1, EN/IEC 60204-1 (1998), EN 50295 (1999), EN 61000-6-2 (2000), EN 50081-2 (1993), EN/IEC 61496-1 (1997), EN/IEC 60947-5-1 (1997), EN 574 (1996)/ISO 13851		EN 954-1 - category 4/ISO 13849-1, EN/IEC 60947-5-1, EN/IEC 60204-1, EN/ISO 13850 (pending), EN/IEC 60947-5-5 (pending)	
Product certifications	UL, CSA, TÜV		UL, CSA, TÜV	
Number of safety circuits	2 N.O.	2 x 2 N.O.	–	
Number of additional circuits	1 solid-state output for signalling to PLC	2 solid-state outputs	–	
Display	5 LEDs	8 LEDs	2 LEDs	
Supply	⎓ 24 V		By AS-Interface ® line	
Type	**ASISAFEMON1●**	**ASISAFEMON2●**	**ASISSLB●**	
Page	2/266	2/266	2/270	





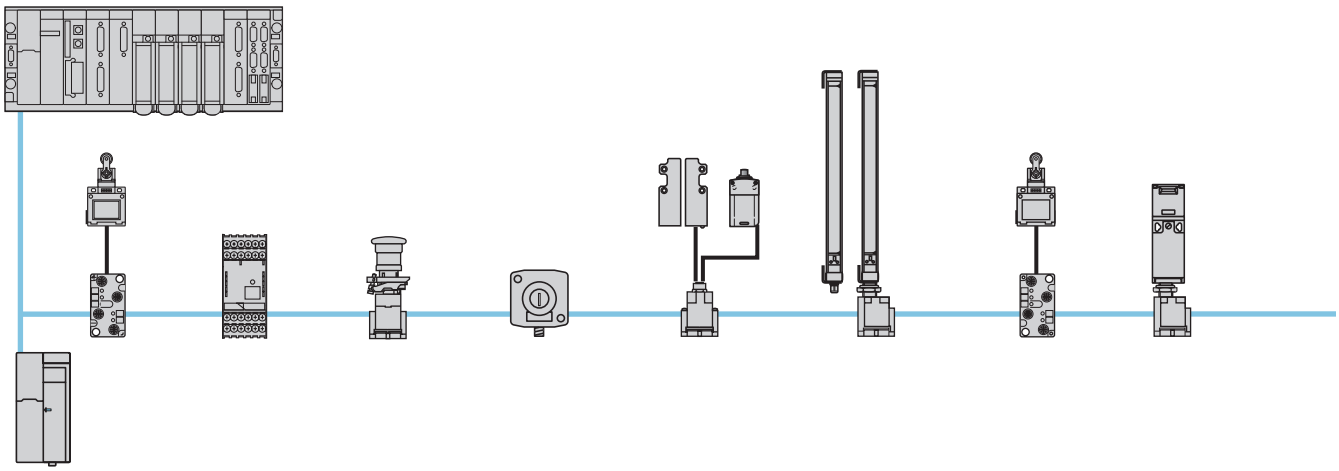




Interfaces for safety products			Interfaces premounted in Emergency stop mushroom head pushbutton stations XAL K	Interfaces for mounting in enclosure for Harmony® Ø 22 mm Emergency stop mushroom head pushbuttons
1 x M12 entry	2 x M12 entries	1 x ISO M16 entry	1 x M12 entry	Connector
0.B.F.F	0.B.F.F	0.B.F.F	0.B.F.F	
Using adjustment terminal ASITERV2 and adaptor ASISAD1			Using adjustment terminal ASITERV2	
EN 954-1 - category 4/ISO 13849-1, EN/IEC 60947-5-1, EN/IEC 60204-1			EN 1088/ISO 14119, EN/IEC 61496-1, EN/IEC 60947-5-3, EN 574/ISO 13851 IEC/EN 60204-1, EN/ISO 12100, EN/ISO 13850	
UL, CSA, TÜV			UL, CSA, TÜV	
–			–	
–			–	
2 LEDs			–	
By AS-Interface ® line			By AS-Interface ® line	
ASISSLC●		**ASISSLLS**	**ASISE●1C**	**ASISSLE●**
2/270			2/270	

2

Operating principle



AS-Interface ®, the recognized cabling system for sensors and actuators, has evolved. Standard process information and information relating to safety can now be transmitted over the same cable. Capable of managing safety functions up to level 4 of standard EN-954-1/ISO 13849-1 and conforming to standard IEC 61508 (2000), the AS-Interface ® “Safety at work” system meets the needs of the most common safety applications, such as:

- monitoring of Emergency stops with instantaneous break contacts (stop category 0),
- monitoring of Emergency stops with delayed break contacts (stop category 1),
- monitoring of switches with and without interlocking,
- monitoring of light curtains, etc.

Parameters for options relative to the selected safety function (for example, start button monitoring) may be set for all pre-defined, certified functions.
Safety is incorporated into the AS-Interface ® cabling system by adding a safety monitor and safety interfaces connected together with other standard AS-Interface ® components on the yellow cable.
Safety information is exchanged only between the safety monitor, the AS-Interface ® line master and the safety interfaces. This is transparent for the other standard AS-Interface ® components.
Based on this principle, AS-Interface ® cabling systems that are already installed can be updated with safety functions without having to replace the existing components (masters, I/O interfaces, power supplies, etc.). Safety circuits are diagnosed readily, and with no additional wiring, by the standard AS-Interface ® cabling system master communicating with the safety monitor(s) via the yellow cable.

The AS-Interface ® “Safety at work” system is configured using software ASISWIN2 running on Windows®. A library of pre-defined and certified safety functions is made available by the software and the user can graphically select the desired safety functions, even at the last minute, by using the “Drag and drop” method in the configuration software. Knowledge of a programming language or specific tools is not necessary to parameter the system. The configuration is loaded into the safety monitor(s) by means of a PC by carrying out a secure serial transmission and using the parameter setting connector on the front cover of the monitor.

The AS-Interface ® “Safety and work” enhanced monitor is available with:

- 1 safety output with 2 contacts, or
- 2 independent safety outputs with 2 x 2 contacts.

In addition to safety outputs with relay hard contacts, AS-Interface ® “Safety at work” safety monitors are equipped, depending on the model, with one or two solid-state signalling outputs and LEDs on the front cover to indicate the status of the system and of the monitoring circuits. To monitor more safety functions simultaneously or to stop several safety circuits at different locations, an increased number of safety monitors can be used in an AS-Interface ® cabling system.
The safety interfaces are connected directly on the yellow cable via an insulation displacement connector (IDC). Their addressing is carried out using self-addressing via the AS-Interface ® cabling system master or manually, using addressing terminal ASISTERV2.
The compactness of the safety interfaces enables their direct attachment to control devices such as Emergency stop buttons or switches. In addition to interfaces that can be attached to products, versions with 1 or 2 M12 connectors are also available.

Monitoring functions

	AS-Interface ® "Safety at work" monitors
	For enhanced monitoring of safety devices ASISAFEMON1B, ASISAFEMON2B
Monitoring of safety devices	■ Emergency stops ■ Safety switches ■ Light curtains ■ Button for validation of linked devices ■ Conditionally dependent devices ■ Devices with bouncing contacts
Logic functions	■ "OR" (up to 6 devices) ■ "AND" ■ "FLIP FLOP" ■ On-delay ■ Off-delay ■ "PULSE" on positive edge
External devices monitoring (EDM)	■ Feedback loop ■ Feedback loop monitoring over the AS-Interface ® cabling system
Start devices	■ Automatic start ■ Start monitored by the AS-Interface ® cabling system slave ■ Start monitored by connection to monitor ■ Start monitored by the safety interface
Output devices	■ Stop category 1 ■ Stop category 0

Characteristics

AS-Interface ® "Safety at work" monitor type			**ASISAFEMON1B** **ASISAFEMON2B**
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 conforming to EN 954-1/ISO 13849-1
Conformity to standards			IEC 61508 (2000), EN/IEC 60204-1 (1998), EN 50295 (1999), EN 61000-6-2 (2000), EN 50081-2 (1993), EN/IEC 61496-1 (1997), EN/IEC 60947-5-1 (1997), EN 574 (1996)/ISO 13851
Product certifications			UL, CSA, TÜV
AS-Interface ® profile			7.F
Power consumption on AS-Interface ® line		**mA**	44
Type of protection (suitable only for use in electronic rooms/ electrical enclosures with a minimum IP 54 degree of protection)			IP 20
Operating voltage Ub		**V**	⎓ 24 ± 15%
Rated operating current		**mA**	150: **ASISAFEMON1B** 200: **ASISAFEMON2B**
Response duration		**ms**	< 40
Pick-up delay		**s**	< 10
Inputs	"Start"		Opto-electronic coupler input (active when High), input current approximately 10 mA à ⎓ 24 V
	"Protection control (EDM)"		Opto-electronic coupler input (active when High), input current approximately 10 mA at ⎓ 24 V
Outputs	"Safety on" indication		PNP transistor output, 200 mA
	Safety		Relay hard contacts N.O. contacts, max. contact load
Fuse protection			External, with max. of 4 A MT
Operating temperature		**°F (°C)**	- 4…+ 140 (- 20…+ 60)
Storage temperature		**°F (°C)**	- 22…+ 158 (- 30…+ 70)
Enclosure	Material		Polyamide PA66
	Mounting		Clip-on mounting on ⊥ rail conforming to EN 50022

Note: The impedance of a safety monitor must be taken into account when selecting the number of interfaces on the AS-Interface ® cabling system, even if it is used in "watchdog" mode.

Principle: page 2/264 | Characteristics: page 2/265 | References : page 2/266 | Dimensions, connections: page 2/267

Safety automation system solutions
Safety solutions on AS-Interface ® cabling system
AS-Interface ® “Safety at work” monitors

References

AS-Interface ® “Safety at work” monitors

Type	Number of safety circuits	Solid-state outputs for PLC	Supply	Reference	Weight oz (kg)
For enhanced monitoring of safety devices	2 N.O.	1	⎓ 24 V	**ASISAFEMON1B**	12.346 (0.350)
	2 x 2 N.O.	2	⎓ 24 V	**ASISAFEMON2B**	15.874 (0.450)

Configuration software

Description	For use with	Operating system	Languages	Reference	Weight oz (kg)
AS-Interface ® “Safety at work” configuration software CD-ROM + user manual	□ Safety monitors ASISAFEMON●B for enhanced monitoring of safety devices	Windows® 95, Windows® 98, Windows® ME, Windows® NT®, Windows® 2000, Windows® XP	EN, FR, DE, IT, ES, PT	**ASISWIN2**	18.342 (0.520)



ASITERV2

Setting-up and diagnostic tools

Description	Application	Reference	
Adjustment terminal	Addressing and diagnostics of AS-Interface ® V2.1 interfaces AS-Interface ® I/O test while powered-up AS-Interface ® interface diagnostics	**ASITERV2**	17.637 (0.500)
AS-Interface ® line analyzer	Identification of transmission errors on the AS-Interface ® line	**ASISA01**	5.644 (0.160)



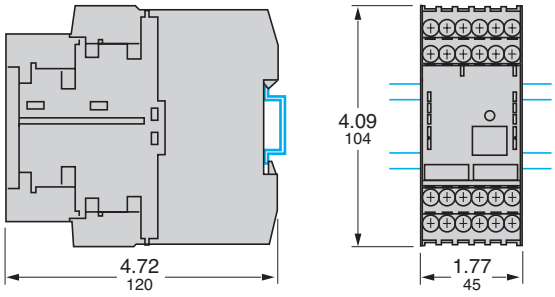
ASISA01

Accessories

Description	Function	Reference	Weight oz (kg)
Cables	For configuring AS-Interface ® “Safety at work” monitors, RS 232	**ASISCPC**	3.527 (0.100)
	Transfer between 2 monitors	**ASISCM**	17.637 (0.500)

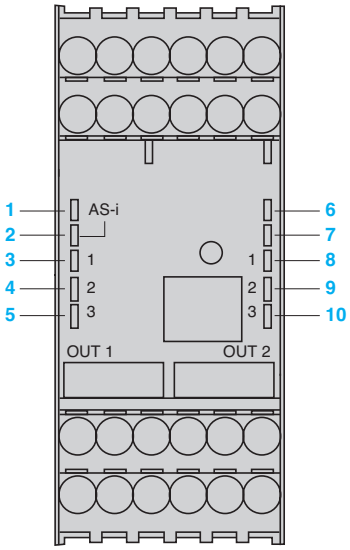
Dimensions

ASISAFEMON●, ASISAFEMON●B



Dual Dimensions: INCHES / Millimieters

LED details



ASISAFEMON1B

1 AS-Interface ® line supply (green)
2 AS-Interface ® line fault (red)
3 Restart signal (yellow)
4 Safety outputs closed (green)
5 Safety outputs open (red) or output error (flashing red)

ASISAFEMON2B

Output 1

1 AS-Interface ® line supply (green)
2 AS-Interface ® line fault (red)
3 Restart signal (yellow)
4 Safety outputs closed (green)
5 Safety outputs open (red) or output error (flashing red)

Output 2

6 AS-Interface ® line supply (green)
7 AS-Interface ® line fault (red)
8 Restart signal (yellow)
9 Safety outputs closed (green)
10 Safety outputs open (red) or output error (flashing red)

Safety automation system solutions
Safety solutions on AS-Interface® cabling system
Safety interfaces

Operating principle

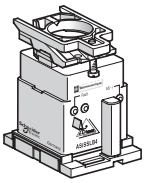
Safety is incorporated into the AS-Interface ® cabling system by adding a safety monitor and safety interfaces connected together with other standard AS-Interface ® components on the yellow cable.

Safety information is exchanged only between the safety monitor, the AS-Interface ® line master and the safety interfaces. This is transparent for the other standard AS-Interface ® components. Based on this principle, AS-Interface ® cabling systems that are already installed can be updated with safety functions without having to replace the existing components (master, I/O interfaces, power supplies, etc.).

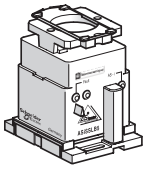
Safety circuits are diagnosed readily, and with no additional wiring, by the standard AS-Interface ® cabling system master communicating with the safety monitor via the yellow cable.

Presentation

Interfaces for Harmony® Ø 22 mm Emergency stop

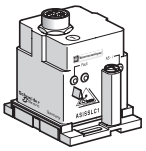


Metal

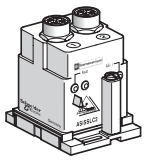


Plastic

Interfaces for products with M12 connector

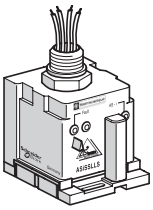


1 x M12 entry



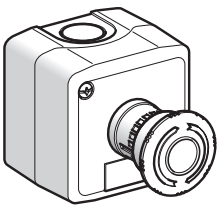
2 x M12 entries

Interfaces for products with ISO entry

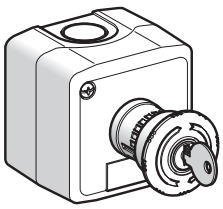


ISO M16 or M20 entry

Interfaces premounted in Emergency stop mushroom head pushbutton stations XAL K, with M12 entry

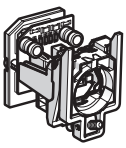


"Turn to release"

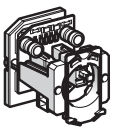


Key release (n° 455)

Interfaces for mounting in enclosure for Harmony® Ø 22 mm Emergency stop mushroom head pushbuttons



Metal



Plastic

Principle: page 2/268 | Characteristics: page 2/269 | References : page 2/270 | Dimensions, connections: page 2/271

Safety interface type			ASI SSLB4	ASI SSLB5	ASI SSLC1	ASI SSLC2	ASI SSLLS	ASI SEA1C	ASI SEK1C	ASI SSLE4	ASI SSLE5
Environment											
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max.								
Conformity to standards			EN/IEC 60947-5-1, EN/IEC 60204-1, EN/ISO 13850 (pending), EN/IEC 60947-5-5 (pending)		EN/IEC 60947-5-1, EN/IEC 60204-1			EN 1088/ISO 14119, EN/IEC 61496-1, EN/IEC 60947-5-3, EN 574/ISO 13851 EN/IEC 60204-1, EN/ISO 12100, EN/ISO 13850			
Product certifications			UL, CSA, TÜV					UL, CSA			
Degree of protection	Conforming to IEC 529		IP 20		IP 67			IP 65		IP 00	
AS-Interface ® profile			0.B.F.F								
Addressing			Using adjustment terminal ASITERV2								
Ambient air temperature	For operation	**°F (°C)**	+ 14…+ 131 (- 10…+ 55)								
	For storage	**°F (°C)**	- 13…+ 185 (- 25…+ 85)								
Mechanical characteristics											
Mechanical life*	In thousands of operating cycles		0.3		–		–	0.3		–	
Shock resistance			10 gn								
Vibration resistance			5 gn								
Electrical characteristics											
Supply by AS-Interface ® line	Voltage	**V**	Via AS-Interface ®, ⎓ 24								
	Voltage limits		- 15…+ 15%								
Power consumption		**W**	1.2								
Power consumption on AS-Interface ® line		**mA**	45								
Connection on AS-Interface ® line	IDC (Insulation Displacement Connector)		■		–		■	–		–	
	Connector (type)		–		■ (M12)		–	■ (M12)		■	

***Mechanical Life**
The product life expressed is based on average usage and normal operating conditions. The above statements are not intended to nor shall they create any express or implied warranties as to product operation or life. For information on the limited warranty offered on this product please refer to the Square D ® terms and conditions of sale found in Square D ® *Digest*.

2

Principle: page 2/268 | Characteristics: page 2/269 | References : page 2/270 | Dimensions, connections: page 2/271

Safety automation system solutions
Safety solutions on AS-Interface® cabling system
Safety interfaces


580116
ASISSLB4 + ZB4BS844


580117
ASISSLB5 + ZB5AS844

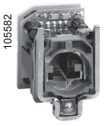

580118
ASISSLC1


580119
ASISSLC2

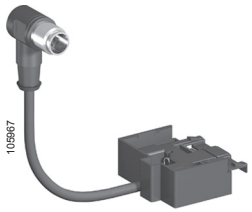

580120
ASISSLLS


105580
ASISEA1C


105581
ASISEK1C


105582
ASISSLE4


105583
ASISSLE5


105967
ASISAD1

References

Interfaces for Ø 22 Emergency stop

Type	Type of contact	Connection on AS-Interface® line	Reference	Weight oz (kg)
Metal	N.C. + N.C.	IDC	**ASISSLB4**	2.822 (0.080)
Plastic	N.C. + N.C.	IDC	**ASISSLB5**	1.411 (0.040)

Interfaces for products with connector

Type	Number of contacts	Connection on AS-Interface® line	Reference	Weight oz (kg)
1 x M12 entry *(1)*	2	Connector	**ASISSLC1**	1.411 (0.040)
2 x M12 entries *(1) (2)*	2	Connector	**ASISSLC2**	1.764 (0.050)

Interfaces for products with ISO entry

Type	Number of contacts	Connection on AS-Interface® line	Reference	Weight oz (kg)
1 x ISO M16 entry *(1) (3)*	2	IDC	**ASISSLLS**	1.411 (0.040)

Interfaces premounted in Emergency stop mushroom head pushbutton stations XAL K

Type	Number of contacts	Connection on AS-Interface® line	Reference	Weight oz (kg)
"Turn to release"	2	Connector	**ASISEA1C**	5.997 (0.170)
Key release (n° 455)	2	Connector	**ASISEK1C**	6.702 (0.190)

Interfaces for mounting in enclosure for Harmony® Ø 22 mm Emergency stop mushroom head pushbuttons

Type	Number of contacts	Connection on AS-Interface® line	Reference	Weight oz (kg)
Metal	2	Connector	**ASISSLE4**	2.116 (0.060)
Plastic	2	Connector	**ASISSLE5**	0.882 (0.025)

Addressing accessories

Description	Application	Reference	
Adaptor specifically for safety interfaces type ASISSLB●, ASISSLC●, ASISSLLS	Connection to adjustment terminal ASITERV2	**ASISAD1**	2.116 (0.060)

Setting-up and diagnostic tools

Description	Application	Reference	
Adjustment terminal	Addressing and diagnostics of AS-Interface® V2.1 interfaces AS-Interface® I/O test while powered-up AS-Interface® interface diagnostics	**ASITERV2**	17.637 (0.500)
AS-Interface® line analyzer	Identification of transmission errors on the AS-Interface® line	**ASISA01**	5.644 (0.160)

Accessories

Type	Material	Unit reference	Weight oz (kg)
Adaptor for ISO M20 (sold in lots of 5)	Metal	**DE9RI2016**	1.411 (0.040)
Ø 40 red mushroom head Emergency stop buttons, turn to release *(4)*	Metal	**ZB4BS844**	2.116 (0.060)
	Plastic	**ZB5AS844**	1.764 (0.050)
Ø 40 red mushroom head Emergency stop buttons, key release (n° 455) *(4)*	Metal	**ZB4BS944**	3.457 (0.098)
	Plastic	**ZB5AS944**	2.504 (0.071)

*(1) To be used with yellow AS-Interface® "standard" version cable **XZCB●●●●●**.*
*The yellow AS-Interface® "TPE" version cable **XZCB●●●●●H** cannot be used with the safety interfaces **ASISSLC●** and **ASISSLLS**.*

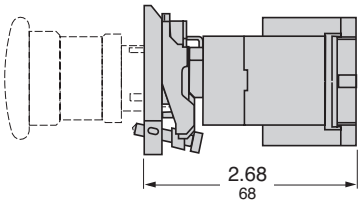
*(2) Only use pre-wired connectors **XZCP1541L●**, refer to our sensors catalog 9006CT0101 R5/04.*

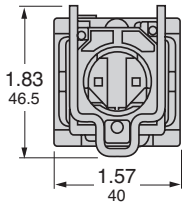
(3) For ISO M20 product, see adaptor - DE9R12016.

Principle: page 2/268 | Characteristics: page 2/269 | References : page 2/270 | Dimensions, connections: page 2/271

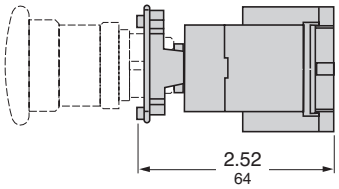
Dimensions

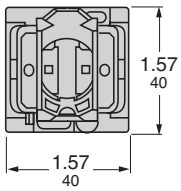
ASISSLB4



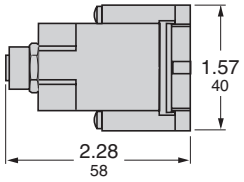


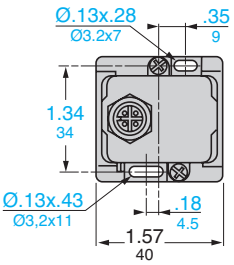
ASISSLB5



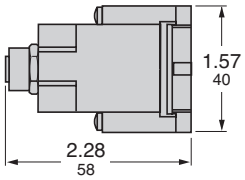


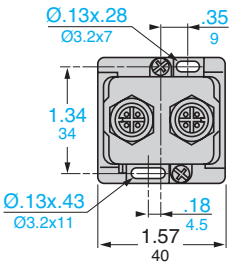
ASISSLC1



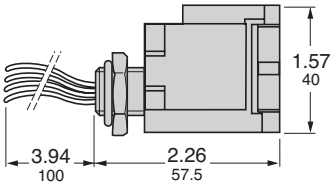


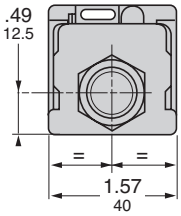
ASISSLC2



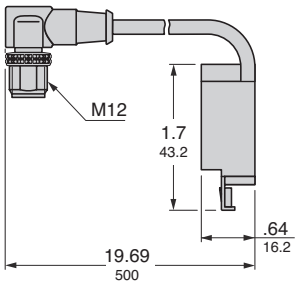


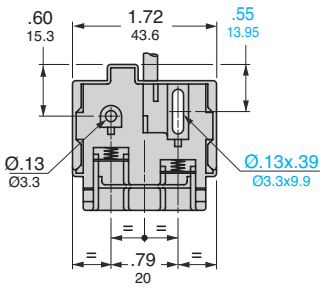
ASISSLLS



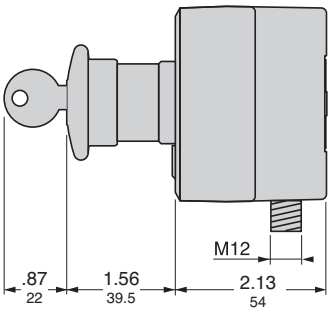


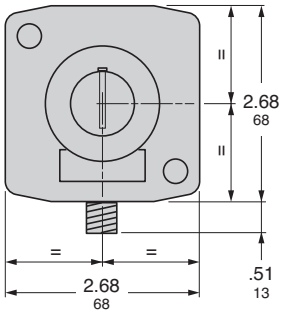
ASISAD1

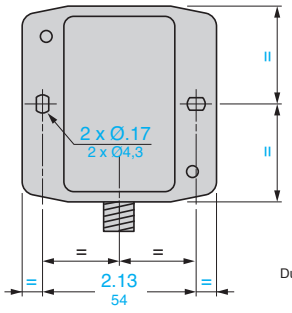




ASISE●1C

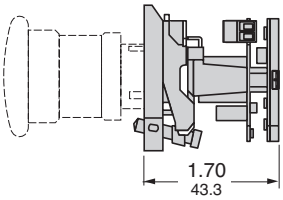


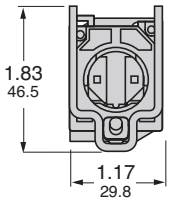




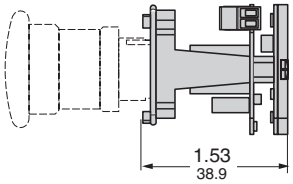
Dual Dimensions: INCHES / Millimeters

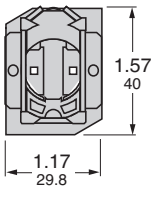
ASISSLE4





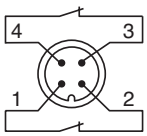
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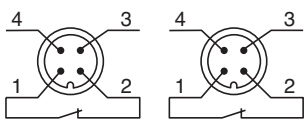


Connections

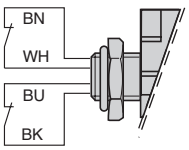
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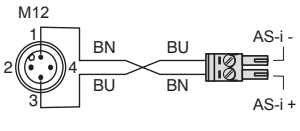
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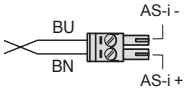
ASISSLLS



ASISE●1C



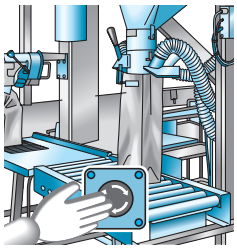
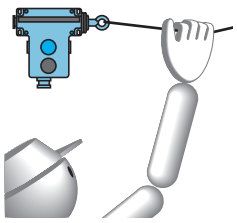
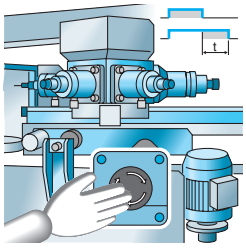
ASISSLE●



Principle: page 2/268
Characteristics: page 2/269
References : page 2/270
Dimensions, connections: page 2/271

Safety automation system solutions
Preventa™ safety relay modules

Applications

Modules		For Emergency stop and limit switch monitoring (modules integrated in TSX Micro PLCs)	For Emergency stop and limit switch monitoring (modules integrated in TSX Premium™ PLCs)	
				
Conforming to standards		EN 954-1 - category 3/ISO 13849-1, pr EN 954-2, EN 1088/ISO 14119, IEC 61508-SIL 2, EN/IEC 60204-1, EN/ISO 12100, EN/ISO 13850	EN 954-1 - category 4/ ISO 13849-1, EN 1088/ISO 14119, pr IEC 61508-SIL 3, EN/IEC 60204-1, EN/ISO 12100, EN/ISO 13850	
Number of safety outputs		2 N.O.	2 N.O.	4 N.O.
Number of dual or single contact safety inputs		4 N.C.	12 N.C.	
PLC diagnostics	Input contacts	10 bit	24 bit	
	Reset and feedback loop inputs	1 bit	2 bit	
	Reading output control signal	1 bit	1 bit	
	Supply monitoring	1 bit	1 bit	
Display		10 LED	28 LED	
Supply voltage		⎓ 24 V	⎓ 24 V	
PLC type		TSXMicro™	TSX Premium™	
Module type		**TSXDPZ 10D2A**	**TSXPAY 262**	**TSXPAY 282**

Safety Relay Modules for Micro and Premium™ PLC's
The safety relay modules listed above perform the same function as the XPS safety relays and plug into the Micro and Premium™ platforms. The safety module operation is independent of the PLC processor. For more information, refer to the Micro Automation Platform Catalog, MKTED204012EN, and the Premium™ Automation Platform catalog, MKTED204072EN. Or, call 800-468-5342.

Safety Detection Solutions

Safety interlock switches

Selection guide: Safety interlock switches . . . . . *3/2 to 3/5*

General . . . . . *3/6 to 3/21*

Safety interlock switches, actuator operated

■ Presentation, General characteristics *3/22*
■ Metal, turret head, types XCSA, XCSB, XCSC and XCSE *3/24*
■ Metal, fixed head, type XCSL *3/26*
■ Plastic, double insulated, fixed head, type XCS MP *3/40*
■ Plastic, turret head, types XCSPA, XCSTA and XCSTE *3/44*

Safety interlock switches with rotary lever or rotary shaft operator

■ Presentation, General characteristics *3/50*
■ Plastic, double insulated, turret head, types XCSPL, XCSTL, XCSPR and XCSTR *3/52*

Non-contact safety interlock switches

■ Presentation, General characteristics *3/54*
■ Plastic,
□ pre-cabled *3/56*
□ connector on pigtail *3/57*
■ Accessories *3/58*

Non-contact safety interlock systems

■ Presentation, General characteristics *3/66*
■ Plastic, solid-state PNP type output,
□ Pre-cabled connection *3/68*
□ M12 connector connection *3/69*
■ Accessories *3/70*

Safety limit switches

Metal, miniature

■ Presentation, General characteristics *3/74*
■ Pre-cabled, type XCSM *3/76*

Compact

■ Presentation, General characteristics *3/78*
■ Metal, type XCSD *3/80*
■ Plastic, type XCSP *3/82*

Light curtains

Selection guide: Light curtains 3/84

General 3/88

Light curtains, type 4

For finger or hand protection

- Optimum light curtains with solid state output, type XUSLB. *3/92*
- Universal light curtains with solid state output, type XUSLD *3/93*
- Substitution table. *3/102*
- Muting module for XUSLDM universal light curtains, type XPSLCM1 . . . . . *3/106*
- Compact light curtains with solid-state output, type XUSLT *3/111*

For body protection

- Compact light curtains with solid-state output, type XUSLP
  - with connector *3/119*
  - with terminal block. *3/120*

Light curtains, type 2

For hand protection

- Slim, compact light curtains with solid-state output, type XUSLN *3/127*

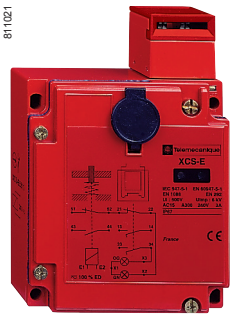
For body protection

- Preventa safety modules and single-beam photo-electric sensors, type XPSCM *3/140*

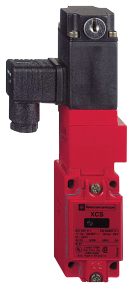
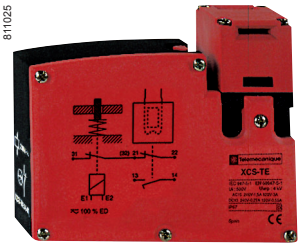
Accessories for light curtains types 2 and 4. . . . . 3/130

3

Safety detection solutions
Safety interlock switches

Applications		**Protection of operators by stopping the machine when the actuating key (attached to machine guard) is withdrawn from the head of the switch**		
		All heavy industrial machines, with quick rundown time *(1)*	**All heavy and light industrial machines, with slow rundown time** *(2)*	
Device		**Actuator operated safety interlock switches**		
		 811019	 811020	 811021
Conformity to standards	Products	IEC/EN 60947-5-1, UL 508, CSA C22-2 n°14, JIS C4520		
	Machine assemblies	IEC/EN 60204-1, EN 1088/ISO 14119, EN/ISO 12100		
Product certifications		UL, CSA		
Enclosure		Metal		
Degree of protection		IP 67		
Dimensions (w x h x d) inches (mm)	Switch	1.58 x 4.47 x 1.73 (40 x 113.5 x 44)	2.05 x 4.47 x 1.73 (52 x 113.5 x 44)	3.86 x 5.75 x 1.73 (98 x 146 x 44)
	Mounting	1.18 x 2.36 (30 x 60)	1.18 x 2.36 (30 x 60)	3.47 x 3.74 (88 x 95)
Features		Without locking of actuator. Turret head: 8 positions for insertion of actuator.	Manual locking and unlocking of actuator by pushbutton or key operated lock (can be mounted on left or right-hand side of switch head). Turret head: 8 positions for insertion of actuator.	Locking and unlocking of actuator by solenoid (either locking without power or locking with power). Manual unlocking (using key lock) of actuator in abnormal conditions. Turret head: 8 positions for insertion of actuator.
Contact blocks		Safety contacts actuated by the actuator. Slow break with positive opening operation		
		N.C. + N.O. + N.O. (2 N.O. staggered) N.C. + N.C. + N.O. (N.O. staggered) N.C. + N.C. + N.C.		N.C. + N.O. + N.O. (2 N.O. staggered) N.C. + N.C. + N.O. (N.O. staggered) N.C. + N.C. + N.C. + N.C. + N.O. auxiliary contact with positive opening operation, controlled by solenoid
Connection		Screw clamp terminals. Tapped entry for n° 13 cable gland, tapped ISO M20 x 1.5 or tapped 1/2" NPT		
		1 conduit entry		2 conduit entries
Type references		**XCSA**	**XCSB, XCSC**	**XCSE**
Page		3/24		3/25

(1) Stopping time of machine less than time taken for operator to access hazardous zone.
(2) Stopping time of machine greater than time taken for operator to access hazardous zone.

All heavy and light industrial machines, with slow rundown time *(2)*	All light industrial machines, with quick rundown time *(1)*			All light industrial machines, with slow rundown time *(2)*
	 540091	 811022	 811024	 811025
IEC/EN 60947-5-1, IEC 68-2-30, UL 508, CSA C22-2 n° 14, JIS C4520				
IEC/EN 60204-1, EN 1088/ISO 14119, EN/ISO 12100				
UL, CSA	cULus, BG	UL, CSA		
Metal	Plastic			
IP 67				
1.58 x 7.64 x 3.09 (40 x 194 x 78)	1.18 x 3.4 x 0.6 (30 x 87 x 15)	1.18 x 3.68 x 1.18 (30 x 93.5 x 30)	2.05 x 4.51 x 1.18 (52 x 114.5 x 30)	4.33 x 3.68 x 1.30 (110 x 93.5 x 33)
1.18 x 2.36 (30 x 60)	Centers: 0.79 x 0.87 (20 x 22)		Centers: 0.79 x 0.87 or 1.59 (20 x 22 or 40.3)	Centers: 0.79 x 0.87 (20 x 22)
Locking and unlocking of actuating key by solenoid (either locking without power or locking with power versions). Manual unlocking (using Ronis key lock) of actuating key in abnormal conditions. Turret head: 4 alternative access points for insertion of actuating key.	Without locking of actuator. Fixed head. 2 positions for insertion of actuator.	Without locking of actuator. Optional accessory: guard retaining device. Turret head: 8 positions for insertion of actuator.		Locking and unlocking of actuator by solenoid (either on energization or on de-energization). Turret head: 8 positions for insertion of actuator.
Safety contacts actuated by the actuator. Slow break with positive opening operation				
N.C. + N.O. + N.O. (2 N.O. staggered) N.C. + N.C. + N.O. (N.O. staggered) N.C. + N.C. + N.C. + N.C. + N.O. auxiliary contact with positive opening operation, controlled by solenoid	N.C. + N.O. (N.O. staggered) N.C. + N.C. N.C. + N.C. + N.O. (N.O. staggered) N.C. + N.C. + N.C.	N.C. + N.O. N.C.+N.O. (N.O. staggered) N.O. + N.C. make before break N.C. + N.C. N.C. + N.O. + N.O. (2 N.O. staggered) N.C. + N.C. +N.O. N.C. + N.C. + N.O. (N.O. staggered)	N.C. + N.O. + N.O. (2 N.O. staggered) N.C. + N.C. + N.O. (N.O. staggered) N.C. + N.C. + N.C.	N.C. + N.O. (N.O. staggered) N.O. + N.C. make before break N.C. + N.C. + N.C. auxiliary contact with positive opening operation, controlled by solenoid
Screw clamp terminals. Tapped entry for n° 13 cable gland, tapped ISO M20 x 1.5 or tapped 1/2" NPT	Pre-cabled, 4 or 6 x 20 AWG (0.5 mm²), L = 6.6, 16.4, or 32.8 ft. (2, 5, or 10 m)	Screw clamp terminals. Tapped entry for n° 11 cable gland, tapped ISO M16 x 1.5 or tapped 1/2" NPT.		
2 conduit entries	–	1 conduit entry	2 conduit entries	1 conduit entry
XCSL	**XCS MP**	**XCSPA**	**XCSTA**	**XCS TE**
3/26	3/40	3/44		3/45

(1) Stopping time of machine less than time taken for operator to access hazardous zone.
(2) Stopping time of machine greater than time taken for operator to access hazardous zone.

3

Applications		**Protection of operators by stopping the machine when the operating lever (attached to hinged machine guard) is displaced by 5°** **All light industrial machines fitted with hinged or rotary protective covers with small opening radius**		**Protection of operators by stopping the machine when the guard hinge rotates through 5°** **All light industrial machines fitted with hinged access doors**	
Device		**Safety interlock switches with rotary lever operating head**		**Rotary shaft operated safety interlock switches**	
					
Conformity to standards	Products	IEC/EN 60947-5-1, UL 508, CSA C22-2 n°14, JIS C4520			
	Machine assemblies	IEC/EN 60204-1, EN 1088/ISO 14119, EN/ISO 12100			
Product certifications		UL, CSA			
Enclosure		Plastic			
Degree of protection		IP 67			
Dimensions (w x h x d or Ø) inches (mm)	Switch	1.18 x 3.45 x 1.18 (30 x 87.5 x 30)	2.05 x 4.27 x 1.18 (52 x 108.4 x 30)	1.18 x 3.78 x 1.18 (30 x 96 x 30)	2.05 x 4.61 x 1.18 (52 x 117 x 30)
	Mounting	Centers: 0.79 x 0.87 (20 x 22)	Centers: 0.79 x 0.87 or 1.59 (20 x 22 or 40.3)	Centers: 0.79 x 0.87 (20 x 22)	Centers: 0.79 x 0.87 x 1.59 (20 x 22 or 40.3)
Features		2 types of lever: straight or elbowed (flush with rear of switch) 3 lever positions: to left, centered or to right Turret head: 4 positions.		2 types of rotary shafts: length 1.18 or 3.15 in. (30 or 80 mm) Turret head: 4 positions.	
Contact blocks or outputs		Slow break safety contacts with positive opening operation N.C. contacts open when lever displaced by more then 5°			
		N.C. + N.O. (N.O. staggered) N.C. + N.C. N.C. + N.O. + N.O. (2 N.O. staggered) N.C. + N.C. + N.O. (N.O. staggered)	N.C. + N.O. + N.O. (2 N.O. staggered) N.C. + N.C. + N.O. (N.O. staggered) N.C. + N.C. + N.C.	N.C. + N.O. (N.O. staggered) N.C. + N.C. N.C. + N.O. + N.O. (2 N.O. staggered) N.C. + N.C. + N.O. (N.O. staggered)	N.C. + N.O. + N.O. (2 N.O. staggered) N.C. + N.C. + N.O. (N.O. staggered) N.C. + N.C. + N.C.
Connection		Tapped entry for n° 11 cable gland, tapped ISO M16 x 1.5 or tapped 1/2" NPT			
	Screw terminals	1 conduit entry	2 conduit entries	1 conduit entry	2 conduit entries
	Pre-cabled	–	–	–	–
	Connector	–	–	–	–
Type references		**XCSPL**	**XCSTL**	**XCSPR**	**XCSTR**
Page		3/52			

Protection of operators by stopping the machine when the gate is opened					Protection of operators by stopping the machine when the gate is opened
All light industrial machines fitted with access gates with imprecise guidance and/or subjected to frequent washing					All machines with quick rundown time
Non-contact safety interlocks, pre-cabled or with connector on pigtail			Non-contact safety interlock system		Limit switches
 540096	 540097	 540098	 525582	 540099	 107872-8-Q
IEC/EN 60947-5-1, UL 508, CSA C22-2 n° 14			IEC 61508, EN/IEC 62601 (SIL 2 and SIL 3), EN 13849-1 (Category 3 and 4), EN/IEC 60947-1, EN/IEC 60947-2, EN/IEC 60947-5-3		IEC/EN 60947-5-1, UL 508, CSA C22-2 n° 14
IEC/EN 60204-1, EN 1088/ISO 14119, EN/ISO 12100			EN 1088/ISO 14119		IEC/EN 60204-1, EN 1088/ISO 14119
UL, CSA BG combined with safety modules XPS AF, XPS DM, XPS MP			UL, CSA, TÜV		UL, CSA
Plastic			Plastic		Metal or plastic
IP 66 and IP 67 for pre-cabled version IP 67 for connector on pigtail version			IP 66, IP 67 and IP69K for pre-cabled version IP 67 for connector version		IP 66, IP 67 and IP 68
0.63 x 2 x 0.27 (16 x 51 x 7)	0.98 x 3.46 x 0.51 (25 x 88 x 13)	Ø 30, L 1.51 (Ø 30, L 38.5)	1.33 x 3.94 x 1.26 (34 x 100 x 32)	1.18 x 1.97 x0.62 (30 x 50 x 16)	1.22 x 1.34 x 3.5 (31 x 34 x 89)
0.63 (16)	3.07 (78)	–	3.23 (82)	0.79 (20)	
3 approach directions		1 approach direction	9 approach directions	Plunger or rotary head Head adjustable in 15° steps throughout 360°	
Independent Reed type contacts operated by coded magnet Contacts change state from a distance of 0.31 in. (8mm) (0.20 in. (5 mm for XCSDMC) Must be used with a Preventa™ safety module			Self-contained system not requiring use of safety module or non-magnetic slim	N.C. contacts with positive opening operation	
N.C. + N.O. (N.C. staggered) N.O. + N.O. (1 N.O. staggered)	N.C. + N.O. (N.C. staggered) N.O. + N.O. (1 N.O. staggered) N.C. + N.C. + N.O. (1 N.C. staggered) N.C. + N.O. + N.O. (1 N.O. staggered)	N.C. + N.O. (N.O. staggered) N.O. + N.O. (1 N.O. staggered)	2 PNP type Solid-state outputs XCSDM4 : EDM function + 1 alarm output	N.C. + N.C. + N.O. (N.O. staggered) slow break N.C. + N.C. + N.O. and N.C. + N.C. + N.O. snap action	
–			–	XCSD and XCS P: tapped entry for Pg 13.5 cable gland, tapped ISO M20 x 1.5 or tapped 1/2" NPT	
–	–	–	–	–	1 conduit entry
2 contacts: 4 x 23 AWG (0.25 mm²), L = 6.6, 16.4, or 32.8 ft. (2, 5, or 10 m)	2 contacts: 4 x 22 AWG (0.25 mm²) 3 contacts: 6 x 23 AWG (0.25 mm²) L = 6.6, 16.4, or 32.8 ft. (2, 5, or 10 m)	2 contacts: 4 x 22 AWG (0.25 mm²) L = 6.6, 16.4, or 32.8 ft. (2, 5, or 10 m)	XCSDM3 : 6 x 23 AWG (0,25 mm²) XCSDM4 : 8 x 22 AWG (0,25 mm²) L = 6.6, 16.4, or 32.8 ft. (2, 5, or 10 m)	XSC M: 7 x 21 AWG (0.5 mm²), or 9 x 22 AWG (0.34 mm²), L = 3.3, 6.6, or 16.4 ft. (1, 2, or 5 m)	
M8 on 0.15 m pigtail	M12 on 0.15 m pigtail	M12 on 0.15 m pigtail	M12 connector (A coding)	–	
XCSDMC	**XCSDMP**	**XCSDMR**	**XCSDM3/XCSDM4**	**XCS M**	**XCSD/XCS P**
3/56			3/68	3/76	3/80

Safety detection solutions
Safety interlock switches

Refer to standards EN/ISO 12100-2 and EN 1088/ISO 14119

Removable or moveable protective guards for potentially dangerous machine functions must be used in conjunction with locking or interlocking devices.
Application requiring an interlocking device: high inertia (long rundown time) machines.
An interlocking device must be used when the rundown time is greater than the time it takes for a person to reach the danger zone.
This device ensures that the guard remains locked until the potentially dangerous movement has stopped.

Guard switches

The mechanical actuator guard switches (i.e.: safety interlock switches), specifically designed for machine guarding applications, provide an ideal solution for the locking or interlocking of movable guards associated with industrial machinery. They meet the requirements of standards
EN/ISO 12100, EN 294/ISO 13852, EN 1088/ISO 14119 and IEC/EN 60204-1.
They contribute to the protection of operators working on potentially dangerous machines by breaking the start control circuit of the machine when a protective guard is opened or removed, using **positive opening operation contacts**, thus stopping the dangerous movement of the machine.
The removal/opening of the guard (after the dangerous movement has stopped) can either be:
- at the time the machine is switched-off for low inertia machines (machines where the rundown time is less than the time it takes for the operator to access the hazardous zone), or
- delayed for high inertia machines (machines where the rundown time is greater than the time it takes for the operator to access the hazardous zone).

Control circuit categories

Guard switches used in conjunction with a Preventa™ safety module enable designers, with reference to EN 954-1/ISO 13849-1, to establish category 4 control systems.
Safety related parts of control systems should be developed taking into account the results of an appropriate Risk Assessment (EN 1050/ISO 14121 - EN/ISO 12100 - 1 and 2).

Safety of personnel

The start command for the machine can only be initiated following correct operation of the guard switch.
On its release, the N.C. safety contacts are opened by **positive action** or, for non-contact safety interlocks, change state **(must be monitored using a Preventa™ safety relay module)**.

Safety of operation

Guard switches incorporate slow break or snap action contacts with **positive opening operation** (except for non-contact safety interlocks where this is not possible). For mechanical actuator guard switches, on closing of the guard the actuator fitted to it enters the head of the switch, operates the multiple interlock device and closes the N.C. contacts. For non-contact safety interlocks, the presence of the magnet causes the contacts to change state.

Safety in use

All guard switches are designed to accept a few millimetres of misalignment between the actuator and the switch in order to compensate for mechanical play, vibration, etc.

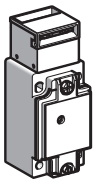
Design to minimize defeat

Both mechanically and magnetically actuated guard switches are designed to be operated by specific actuators so that they cannot be defeated in a simple manner using common tools, rods, metal plates, simple magnets, etc. When loosening the mounting screws for re-orientation of the turret head on mechanical actuator guard switches, the head itself remains attached to the switch body and the contact states remain unchanged.
All guard switches and safety limit switches are designed in such a manner that it is virtually impossible to adjust the head setting, remove the switch or gain access to the contacts without using the appropriate tool.
There are various methods for obtaining a higher level of tamper proofing, for example:
- using a cage device to prevent the insertion of a spare actuator or magnet, or any other foreign body,
- mounting the actuator or coded magnet to the guard by means that make it very difficult to remove (riveting or welding).

Safety detection solutions
Safety interlock switches

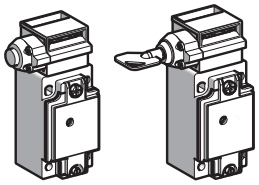
Metal safety interlock switches with mechanical actuator

Without locking of actuator



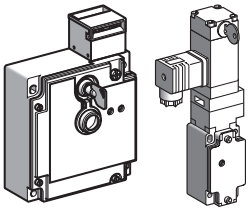
Metal safety interlock switches for use on machines **with low inertia** and operating in normal conditions (no vibration or shock and guard mounted vertically, without risk of rebound on closing), thus eliminating unintentional opening of the guard.

With locking of actuator and manual unlocking



Metal safety interlock switches for use on heavy machines **with low inertia** and operating in **arduous conditions** (shock or vibration exist), whereby the guard could open unintentionally.
A key operated lock or a pushbutton enables the positive locking of the guard and its subsequent unlocking.

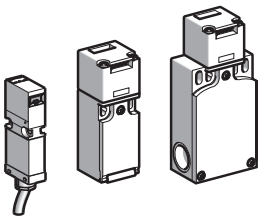
With interlocking and locking of actuator by solenoid



Metal safety interlock switches for use on machines **with high inertia** or necessitating a controlled opening of the protective guard.
The locking of the moving guard can either be on de-energization or energization of the solenoid.
A key operated lock enables manual unlocking of the guard in the event of an interlocking circuit malfunction, and also provides extra safety for maintenance personnel likely to be working on the machine.
The switches incorporate 2 LEDs: one indicating guard “open/closed” and the other, guard “locked/unlocked”.

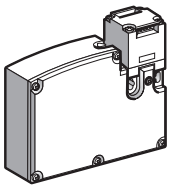
Plastic safety interlock switches with mechanical actuator

Without locking of actuator



Plastic safety interlock switches for use on light machines **with low inertia.**
For use in arduous conditions (shock or vibration exist, guard not vertical or risk of rebound on closing) where the guard could open unintentionally, a **guard retaining device (XCSPA or XCSTA)** is available as an accessory.

With interlocking and locking of actuator by solenoid



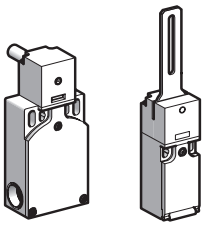
Plastic safety interlock switches for use on machines **with high inertia** or necessitating a controlled opening of the protective guard.
The locking of the moving guard can either be on de-energization or energization of the solenoid.
A special tool enables manual unlocking of the guard in the event of an interlocking circuit malfunction, and also provides extra safety for maintenance personnel likely to be working on the machine.

Safety detection solutions

Safety interlock switches, safety limit switches and non-contact safety interlock systems

Rotary lever and rotary shaft operated guard switches for hinged guards

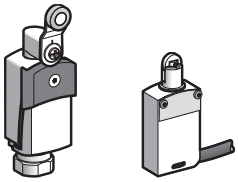
With head for rotary movement (lever or rotary shaft)



Plastic safety interlock switches with straight or elbowed operating lever or rotary shaft operator.
Specifically designed for small industrial machines fitted with small sized **hinged doors, covers or protective guards**.
They protect the operator by stopping the dangerous movement of the machine as soon as the rotary lever or rotary shaft displacement reaches an angle of 5°.

Safety limit switches

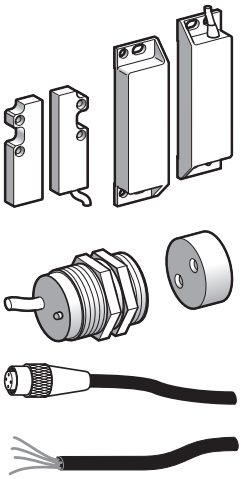
With head for linear movement (plunger) or rotary movement (lever)



Metal or plastic limit switches.
For use on machines with low inertia and also on machines with high inertia, when used in conjunction with actuator operated guard switches, for monitoring access doors and/or guards. When used on their own, they are always installed in “positive mode” or combined in pairs, with one switch being in “positive mode” and the other in “negative mode”.

Non-contact safety interlocks

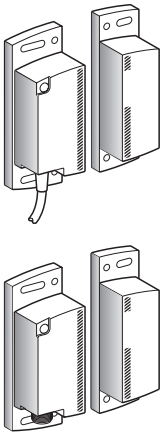
With an associated coded magnet



Plastic case guard switches for use on machines with low inertia.
Specifically designed for industrial machines fitted with **doors, covers or guards with imprecise guiding**.
They are ideally suited for machines subjected to frequent washing or liquid spray.
They protect the operator by immediately stopping any dangerous movement, as soon as the distance between the switch and its magnet is greater than 0.31 or 0.20 in (8 or 5 mm), depending on the switch model.

Non-contact safety interlock systems

With dedicated transmitter

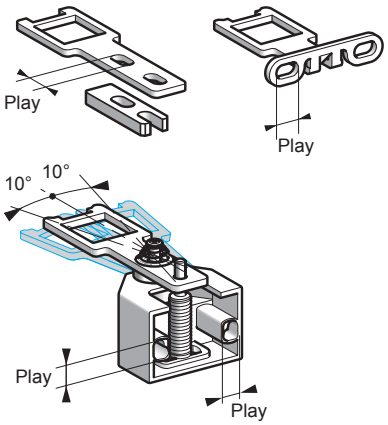


Plastic case system for use on machines with low inertia.
Specifically designed for industrial machines fitted with **one or more doors, covers or guards with imprecise guiding**.
They are ideally suited for machines subjected to frequent washing or liquid spray and that are not necessarily equipped with an enclosure or control cabinet.
These self-contained category 3 (SIL 2) or 4 (SIL 3) (per IEC 61508 and EN/IEC 62061) systems protect the operator by stopping any dangerous movement, as soon as the distance between the transmitter and receiver is greater than 0.39 in. (10 mm).

Safety detection solutions
Metal safety interlock switches

Actuating keys

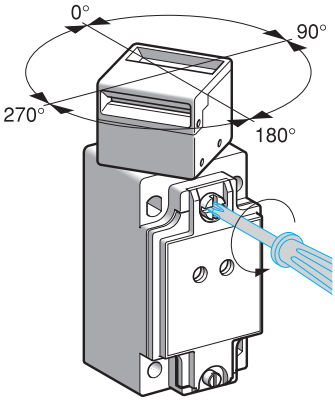
The actuating keys are common to all XCSA, XCSB, XCSC and XCSE



Their oblong mounting holes enable simple adjustment when mounting on moving guards.
A pivoting actuator (both horizontally and vertically) is available when using guard switches in conjunction with hinged guards or guards with imprecise guiding.
Straight actuators are supplied with an adaptor shank for simple replacement of an **XCK J** guard switch by an **XCS** switch, without the need to drill additional mounting holes for the switch or actuator.

Turret head

All XCSA, XCSB, XCSC and XCSE are fitted with a square turret head which can be rotated through 360° in 90° steps

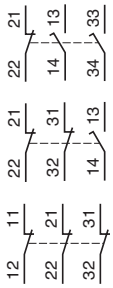


8 directions of actuation are possible for the actuating key:
- 4 in the horizontal plane,
- 4 from above the switch (4 alternative positions of the actuator slot, depending on the orientation of the head).

When loosening the mounting screw for re-orientation of the operating head, the head itself remains attached to the body and the contact states remain unchanged.

Safety contacts

XCSA, XCSB, XCSC and XCSE incorporate a **3-pole contact block** with positive opening operation, which is actuated by insertion or withdrawal of the actuating key attached to the guard.



The withdrawal of the actuating key opens the N.C. safety contact(s), even in the event of the contact sticking or welding.
The 3-pole contact block enables redundant safety circuits to be established (for example: N.C. + N.C. or N.C. + N.O.) and also, to provide signalling (for example: PLC, illuminated beacon, etc.).

LED indicators

An orange LED (optional for type XCSA, XCSB and XCSC, standard for type XCSE) **indicates the position of the machine guard:**



LED illuminated: actuating key not inserted in head of switch, N.C. contact(s) open, guard open.



LED not illuminated: actuating key inserted in head of switch, N.C. contact(s) closed, guard closed.

A green LED (incorporated on type XCSE) **indicates the locking of the machine guard:**



LED not illuminated: actuating key not inserted in head of switch: the machine cannot be operated,

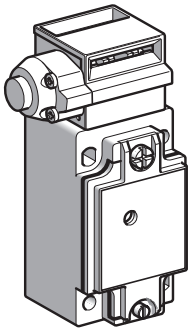


LED illuminated: actuating key inserted in head of switch **and actuating key locked**. The machine is either ready for starting, running or decelerating to a standstill.

Safety detection solutions
Metal safety interlock switches

Manual locking/unlocking by pushbutton or key operated lock on XCSB and XCSC

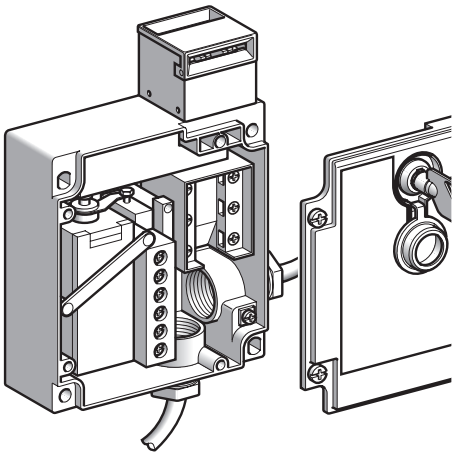
The pushbutton or key operated lock fitted to type XCSB and XCSC allows manual locking/unlocking of the machine guard



Their use is not necessary for the normal operation of the guard switch.
For ease of access, the pushbutton or lock may be mounted on the right or the left of the guard switch head.
For type XCSC, when the machine guard is locked (key in position “LOCK”), the resistance to forcible withdrawal of the actuator fitted to the guard is **337 lbs. (1500 N).**
The key is removable from the locking device in the “LOCK” position.

Locking/unlocking by solenoid on XCSE

Type XCSE incorporate a solenoid for locking/unlocking of the machine guard

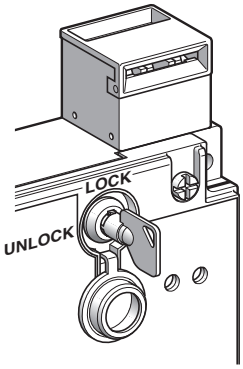


With the machine guard closed and locked, the resistance to forcible withdrawal of the actuator fitted to the guard is **450 lbs. (2000 N)**.

In addition to the 3-pole contact block, positively operated by the actuating key mounted to the guard, XCSE guard switches incorporate a **N.C. + N.O. or N.C. + N.C. contact block mechanically linked to the solenoid**.
The N.C. contact(s) are for use in the safety circuit of the machine and the N.O. contact for signalling the status of the solenoid.

Key operated lock on XCSE

Type XCSE are fitted with a key operated lock allowing the unlocking of the machine guard while being held in the lock position by the solenoid (for use by authorized personnel only)



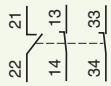
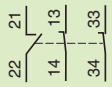
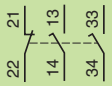
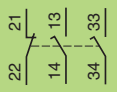
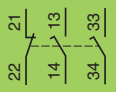
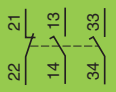
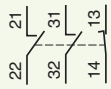
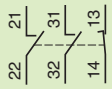
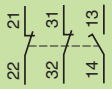
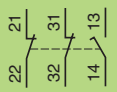
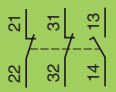
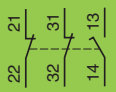
The manual unlocking of the guard using the key operated lock is useful in the following cases:
- while the machine is undergoing maintenance (with the key turned to the “UNLOCK” position and then removed, the level of protection is higher in preventing an accidental machine start. The safety for maintenance personnel is thus improved),
- in the event of a power failure,
- in the event of an interlocking circuit malfunction (interlocked condition maintained: positive safety). The electrical supply providing the unlocking via the solenoid always takes priority over manual unlocking using the key operated lock.

The lock fitted to standard guard switches has key withdrawal from the “LOCK” and “UNLOCK” positions.

Safety detection solutions
Metal safety interlock switches type XCSE

Example of operation for an XCSE safety interlock switch: locking without power

Actuating key locks into the switch when inserted. This is typically preferred as the door is secured, regardless of electrical power availability or power failure. Applying power to the electromagnet will unlock the actuating key and allow it to be removed from the switch. The N.C. Safety contacts will not open until the actuating key is removed.

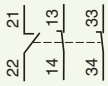
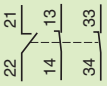
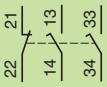
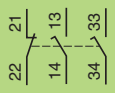
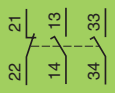
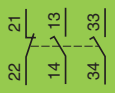
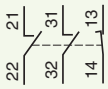
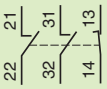
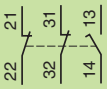
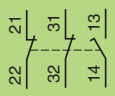
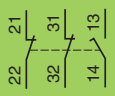
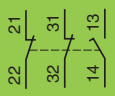
Machine status	Power off, machine off	Power on, machine off	Machine stopped, ready to start	Machine running	Stopping sequence	Machine stopped, power on
Guard position	Open	Open	Closed	Closed	Closed	Closed
Guard status	Free	Free	Free	Locked	Locked	Free
Solenoid status	"O" (de-energized)	"1" (energized)	"1" (energized)	"O" (de-energized)	"O" (de-energized)	"1" (energized)
3-pole contact state for XCSE5●●●						
3-pole contact state for XCSE7●●●						
Status	Machine in a non-operational state.	Machine cannot be operated.	Guard closed, actuating key can be locked. It will be locked as soon as the start instruction is given.	Start instruction given, the machine is running.	Stop instruction given, the machine stops gradually (deceleration then complete stop of motor).	Machine has stopped. The guard can be opened.
Contact states (N.C. + N.O.) of solenoid						
Orange LED						
Green LED						
Safety circuit of the machine	Open	Open	Open	Closed	Closed	Open

Safety detection solutions
Safety interlock switches type XCSE

Example of operation for an XCSE safety interlock switch: locking with power

Actuating key is locked into switch *only* when actuating key is inserted *and* power is applied to the electromagnet. Door or guard is not locked in the event of a power failure or when power is removed from the electromagnet. Removing power to the electromagnet will unlock the actuating key and allow it to be removed from the switch. The N.C. safety contacts will not open until the actuating key is removed.

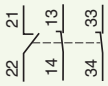
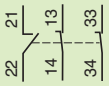
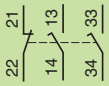
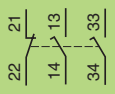
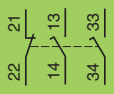
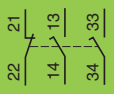
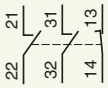
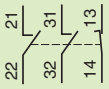
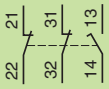
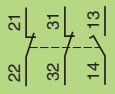
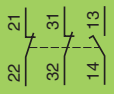
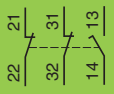
Note: Locking with power devices does not meet European standards regarding the safety of machinery, especially EN 1088 regarding guard locking. European standards do not allow a "locking with power" function for gate or door guarding/locking. Locking without power devices meet European requirements, and should be used when machinery is to be shipped to Europe or where machinery must meet European standards.

Machine status	Power Off, Machine Off	Power On, Machine Off	Machine Stopped, Ready to Start	Machine running	Stopping sequence	Machine Stopped, Power On
Guard position	Open	Open	Closed	Closed	Closed	Closed
Guard status	Free	Free	Free	Locked	Locked	Free
Electromagnet state	"0" (de-energized)	"0" (de-energized)	"0" (de-energized)	"1" (energized)	"1" (energized)	"0" (de-energized)
3-pole contact state for XCSE5●●●						
3-pole contact state for XCSE7●●●						
Status	Machine in a non-operational state.	Machine cannot be operated.	Guard closed, actuating key can be locked. It will be locked as soon as the start instruction is given.	Start instruction given, the machine is running.	Stop instruction given, the machine stops gradually (deceleration then complete stop of motor).	Machine has stopped. The guard can be opened.
Contact states of Electromagnet						
Orange LED						
Green LED						
Safety circuit of the machine	Open	Open	Open	Closed	Closed	Open

Safety detection solutions
XCSL safety interlock switches type XCSL

Example of Operation for an XCSL Safety Interlock Switch: Locking Without Power

Actuating key locks into the switch when inserted. This is typically preferred as the door is secured, regardless of electrical power availability or power failure. Applying power to the electromagnet will unlock the actuating key and allow it to be removed from the switch. Applying power to the electromagnet will open the N.C. safety contacts as well.

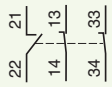
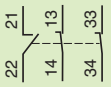
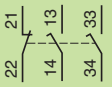
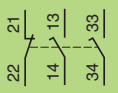
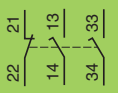
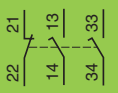
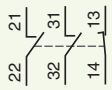
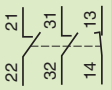
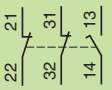
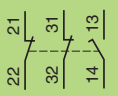
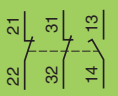
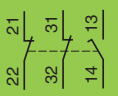
Machine status	Power Off, Machine Off	Power On, Machine Off	Machine Stopped, Ready to Start	Machine running	Stopping sequence	Machine Stopped, Power On
Guard position	Open	Open	Closed	Closed	Closed	Closed
Guard status	Free Movement	Free Movement	Free Movement	Locked	Locked	Free Movement
Electromagnet state	"0" (de-energized)	"1" (energized)	"1" (energized)	"0" (de-energized)	"0" (de-energized)	"1" (energized)
3-pole contact state for XCSL5●●●						
3-pole contact state for XCSL7●●●						
Status	Machine is in non-operational state.	Machine cannot be started.	Guard is closed, actuating key can be locked. It will be locked as soon as the start instruction is given.	Start instruction is given, the machine is running.	Stop instruction is given, the machine stops gradually (deceleration then complete stop of motor).	Machine has stopped. The guard can be opened.
Orange LED						
Safety circuit of the machine	Open	Open	Open	Closed	Closed	Open

Safety detection solutions
XCSL safety interlock switches
type XCSL

Example of operation for an XCSL safety interlock switch: locking with power

Actuating key is locked into switch *only* when actuating key is inserted *and* power is applied to the electromagnet. Door or guard is not locked in the event of a power failure or when power is removed from the electromagnet. Removing power to the electromagnet will unlock the actuating key and allow it to be removed from the switch. Removing power to the electromagnet will open the N.C. safety contacts as well.

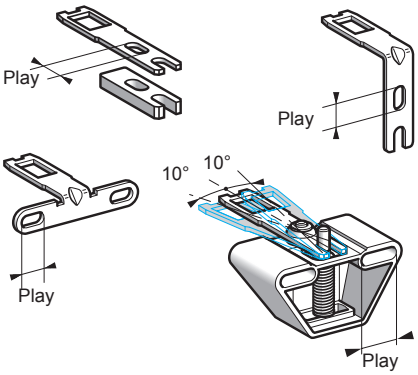
Note: Locking with power devices does not meet European standards regarding the safety of machinery, especially EN 1088 regarding guard locking. European standards do not allow a "locking with power" function for gate or door guarding/locking. Locking without power devices meet European requirements, and should be used when machinery is to be shipped to Europe or where machinery must meet European standards.

Machine status	Power Off, Machine Off	Power On, Machine Off	Machine Stopped, Ready to Start	Machine running	Stopping sequence	Machine stopped, Power On
Guard position	Open	Open	Closed	Closed	Closed	Closed
Guard status	Free Movement	Free Movement	Free Movement	Locked	Locked	Free Movement
Electromagnet state	"0" (de-energized)	"0" (de-energized)	"0" (de-energized)	"1" (energized)	"1" (energized)	"0" (de-energized)
3-pole contact state for XCSL5●●●						
3-pole contact state for XCSL7●●●						
Status	Machine in a non-operational state.	Machine cannot be operated.	Guard closed, actuating key can be locked. It will be locked as soon as the start instruction is given.	Start instruction given, the machine is running.	Stop instruction given, the machine stops gradually (deceleration then complete stop of motor).	Machine has stopped. The guard can be opened.
Orange LED						
Safety circuit of the machine	Open	Open	Open	Closed	Closed	Open

Safety detection solutions
Plastic safety interlock switches

Actuating keys

The actuating keys are common to all plastic XCSP and XCST switches



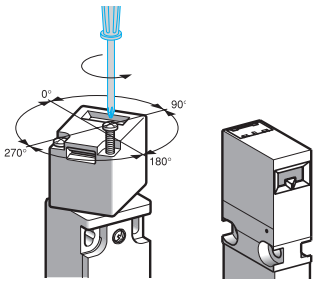
Their oblong mounting holes enable simple adjustment when mounting on moving guards.

A pivoting actuator (both horizontally and vertically) is available when using guard switches in conjunction with hinged guards or guards with imprecise guiding.

Straight actuating keys are supplied with an adaptor for simple replacement of an **XCKP** guard switch by an **XCSPA** switch, or an **XCKT** switch by an **XCSTA** switch, without the need to drill additional mounting holes for the switch or the actuating key.

Turret head

Safety interlock switches XCSPA, XCSTA and XCS TE are fitted with a square turret head which can be rotated through 360° in 90° steps. Guard switches XCS MP have a fixed head



8 directions of actuation are possible for the actuator:
- 4 in the horizontal plane (1 for **XCS MP**),
- 4 from above the switch (1 for **XCS MP**)

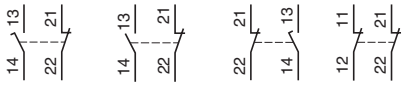
(4 alternative positions of the actuator slot, depending on the orientation of the head).

When loosening the 2 mounting screws for re-orientation of the operating head, the head itself remains attached to the body and the contact states remain unchanged **(XCSPA, XCSTA, XCS TE)**.

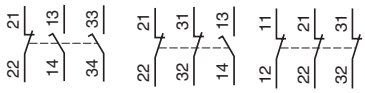
Safety contacts

The guard switches incorporate either a 2-pole contact block (XCS MP, XCSPA and XCS TE) or a 3-pole contact block (XCSMP and XCSTA), with positive opening operation, which is actuated by insertion or withdrawal of the actuating key attached to the guard

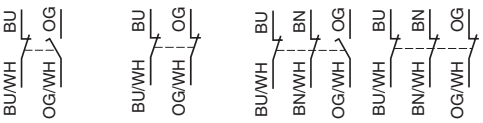
XCSPA, XCS TE



XCSTA



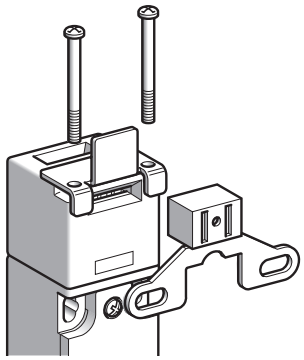
or **XCS MP**



In addition, guard switches type XCS TE incorporate a N.C. contact block (with positive opening operation) actuated by the solenoid. The N.C. contact is for use in the safety circuit of the machine. The withdrawal of the actuating key opens the N.C. safety contact(s), even in the event of the contact sticking or welding.
The 2-pole N.C. + N.C. or 3-pole N.C. + N.C. + N.O. or N.C. + N.C. + N.C. (XCSTA/MP only) contact block enables category 3 control circuits to be established conforming to EN 954-1/ISO 13849-1 by using both N.C. safety contacts in redundancy, or a category 1 control circuit by using one N.C. contact in the safety circuit and the other N.C. contact for signalling (for example: PLC, illuminated beacon, etc.). Alternatively, these guard switches used in conjunction with a **Preventa™ XPS** safety relay module establish a category 4 control circuit.
Designers should follow the relevant recommendations for validation of control systems.

Guard retaining device

The guard retaining device XCS Z21 can be used with all plastic switches type XCSPA and XCSTA that are used in conjunction with either the wide (XCS Z12) or pivoting (XCS Z13) actuating key



It assists in holding the guard closed by providing an extra retaining force of 11.2 lbs. (50 N).

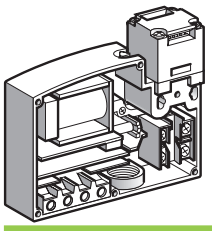
It is specially suited for use with light machines operating in arduous conditions (vibration, mechanical shock, guard not vertical, risk of guard rebound on closing, etc.).

It can be used for horizontal actuator actuation directions as well as those from above.

Safety detection solutions
Plastic safety interlock switches

Locking/unlocking by solenoid on XCS TE

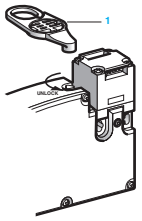
Type XCS TE incorporate a solenoid for locking/unlocking of the machine guard



With the machine guard closed and locked, the resistance to forcible withdrawal of the actuator fitted to the guard is **112 lbs. (500 N)**.
In addition to the 2-pole contact block, positively operated by the actuator mounted to the guard, XCS TE switches incorporate a **N.C. contact block mechanically linked to the solenoid**.
The N.C. contact is for use in the safety circuit of the machine.

Unlocking by special tool for XCS TE

Type XCS TE are supplied with a special tool 1 that enables unlocking of the machine guard while being held in the locked position by the solenoid (for use by authorized personnel only)



The manual unlocking of the guard using the tool 1 is useful in the following cases:
- while the machine is undergoing maintenance (with the tool turned to the "UNLOCK" position and then removed, the level of protection is higher in preventing an accidental machine start. The safety for maintenance personnel is thus improved),
- in the event of a power failure,
- in the event of an interlocking circuit malfunction (interlocked condition maintained: positive safety). The electrical supply providing the unlocking via the solenoid always takes priority over manual unlocking using the special tool.

Example of operation for an XCS TE safety interlock switch: locking without power

Actuating key locks into switch when inserted. This is typically preferred as the door is secured regardless of electrical power availability or failure. Applying power to the electromagnet will unlock actuating key and allow it to be removed from the switch. The N.C. safety contacts will not open until the actuating key is removed.

Machine status	Power off, machine off	Power on, machine off	Machine stopped, ready to start	Running	Stopping sequence	Machine stopped, power on
Guard position	Open	Open	Closed	Closed	Closed	Closed
Guard status	Free	Free	Free	Locked	Locked	Free
Solenoid status	"O" (de-energized)	"1" (energized)	"1" (energized)	"O" (de-energized)	"O" (de-energized)	"1" (energized)
2-pole contact state for XCS TE5●●●						
2-pole contact state for XCS TE7●●●						
Status	Machine is in non-operational state.	Machine cannot be operated.	Guard closed, actuating key can be locked. It will be locked as soon as the start instruction is given.	Start instruction given, the machine is running.	Stop instruction given, the machine stops gradually (deceleration then complete stop of motor).	Machine has stopped. The guard can be opened.
Contact state of solenoid						
Safety circuit of the machine	Open	Open	Open	Closed	Closed	Open

Safety detection solutions
Safety interlock switches
Type XCSTE

Example of operation for an XCS TE safety interlock switch: locking with power

The actuating key is locked into switch *only* when the actuating key is inserted *and* power is applied to the electromagnet. The door or guard is not locked in the event of a power failure or when power is removed from the electromagnet. Removing power to the electromagnet will unlock the actuating key and allow it to be removed from the switch. The N.C. safety contacts will not open until the actuating key is removed.

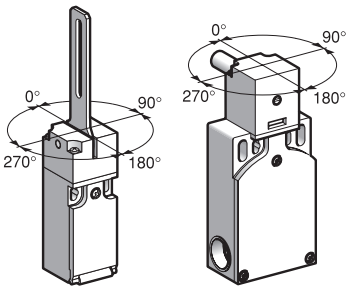
Note: Locking with power devices does not meet European standards regarding the safety of machinery, especially EN 1088 regarding guard locking. European standards do not allow a "locking with power" function for gate or door guarding/locking. Locking without power devices meets European requirements, and should be used when machinery is to be shipped to Europe or where machinery must meet European standards.

Machine Status	Power Off, Machine Off	Power On, Machine Off	Machine Stopped, Ready to Start	Machine running	Stopping Sequence	Machine Stopped, Power On
Guard Position	Open	Open	Closed	Closed	Closed	Closed
Guard Status	Free Movement	Free Movement	Free Movement	Locked	Locked	Free Movement
Electromagnet State	"0" (de-energized)	"0" (de-energized)	"0" (de-energized)	"1" (energized)	"1" (energized)	"0" (de-energized)
2-pole contact state for XCS TE5●●●						
2-pole contact state for XCS TE7●●●						
Status	Machine is in non-operational state.	Machine cannot be operated.	Guard closed, actuating key can be locked. It will be locked as soon as the start instruction is given.	Start instruction given, the machine is running.	Stop instruction given, the machine stops gradually (deceleration then complete stop of motor).	Machine has stopped. The guard can be opened.
Contact state of Electromagnet						
Safety circuit of the machine	Open	Open	Open	Closed	Closed	Open

Safety detection solutions
Rotary lever and rotary shaft operated safety interlock switches

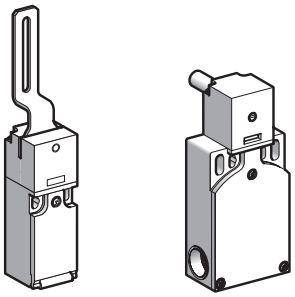
Presentation

Turret head



Safety interlock switches for hinged covers or guards, featuring a hinged lever or rotary shaft operator, incorporate a turret head that can be rotated through 360° in 90° steps.
Two additional self-locking screws are included with each switch for positive mounting of the head.

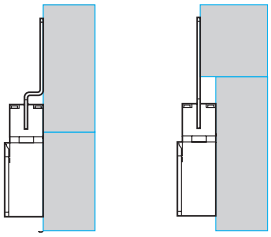
2 types of body



XCSPL *XCSTR*

- Plastic body, narrow, with 1 conduit entry for **XCSPL** and **XCSPR**.
- Plastic body, wide, with 2 conduit entries for **XCSTL** and **XCSTR**.

2 types of operating lever, 2 rotary shaft lengths



- **Levers**

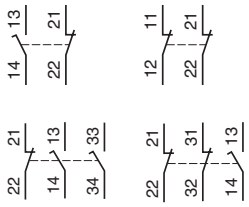
Straight or elbowed (flush with rear of switch), making the lever switches suitable for use with all types of hinged guards, whether:
- flush with the machine framework (use a switch with an elbowed flush lever),
- overhanging in relation to the machine framework (use a switch with a straight lever).

3 alternative operating lever positions allow the switches to be used with guards that open to the left, center or right.

- **Rotary shaft operators**

2 shaft lengths: 1.18 or 3.15 in. (30 or 80 mm).

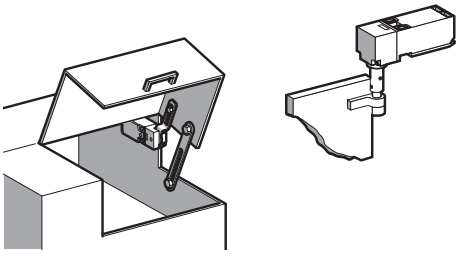
Safety contacts



Types **XCSPL** and **XCSPR** incorporate a 2-pole contact block, with positive opening operation. The contact arrangements can be: N.C. + N.O. (N.O. staggered) or N.C. + N.C.
Types **XCSTL** and **XCSTR** incorporate a 3-pole contact, with positive opening operation. The contact arrangements can be:
N.C. + N.O. + N.O. (2 N.O. staggered) or N.C. + N.C. + N.O.) (N.O. staggered).
Opening of the N.C. safety contact(s) occurs when the operating lever or spindle is displaced by an angle equal to or greater than 5°.

Applications

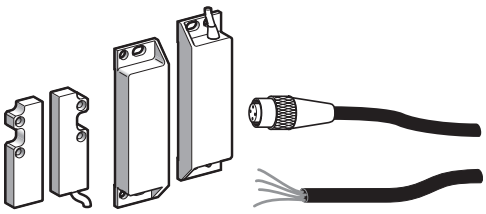
These safety interlock switches provide a solution for monitoring **hinged protective guards** with small opening radius on machines with low inertia (no rundown time).
They are specially suitable for existing machines which need to be brought in-line with the latest standards and directives since they can be used in conjunction with existing covers, including those whose mounting is somewhat imprecise.
Mounting of these switches improve the machine operator's level of safety by limiting the opening of the protective guard and reducing the risk of touching any moving parts before they have come to a stop.

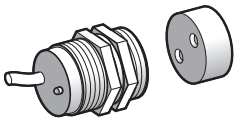


Safety detection solutions
Non-contact safety interlocks and systems

Presentation

Non-contact safety interlocks





3 body types

- PBT plastic body
- Compact rectangular, **XCSDMC**
- Standard rectangular, **XCSDMP**
- Cylindrical Ø 30, **XCSDMR**
- Pre-cabled, length 6.6, 16.4, or 32.8 ft. (2, 5, or 10 m)
- Connector on pigtail connection:
  - M8: DMC
  - M12: DMP, DMR

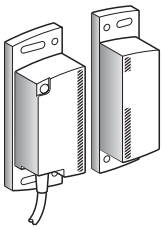
Contacts

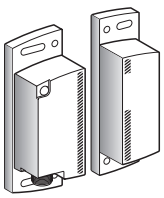
Non-contact safety interlocks are fitted with 2-pole **(XCSDMC/XCSDMR/XCSDMP)** or 3-pole **(XCSDMP)** Reed type contacts and are available with or without a “guard closed” LED indicator.
The N.C. and N.O. contacts change state as soon as the magnet is at a distance from the sensor of approximately 0.31 in. (8 mm) for types **XCSDMP** and **XCSDMR** and approximately 0.20 in. (5mm) for type **XCSDMC**.

Connection

When used in safety circuits, the Reed technology contacts must always be used in conjunction with a Preventa™ safety module.

Non-contact safety interlock systems with dedicated transmitter





1 body type

- PBT plastic body
- Self-contained range: category 3 and SIL 2 - **XCSDM3** and category 4 and SIL 3 - **XCSDM4** (SIL 2 and SIL 3 per IEC 61508 and EN/IEC 62061)
- Pre-cabled, length 6.6, 16.4, or 32.8 ft. (2, 5, or 10 m)
- Pigtail with M12 connector

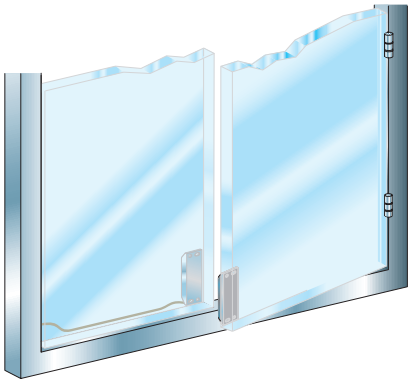
Technology

Coded “Hall effect” detection
PNP safety outputs
Integrated self-monitoring using micro-processors.
Detection distance from 0 to 0.39 in. (0 to 10 mm) obtained on approach of dedicated transmitter XCSDMT.

Functions

- Dynamic EDM (External Device Monitoring) only for **XCSDM4**,
- Fault and short-circuit detection,
- Output diagnostics (non safety related) only for XCSDM4
- LED indicator
- Series wiring of up to a maximum of 32 systems for **XCSDM3** only.

Applications

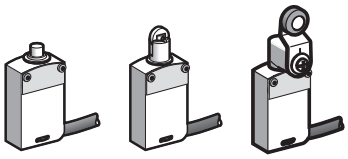


These switches provide a solution for monitoring moveable machine guards on machines with quick rundown times.
They are particularly suitable for guards without accurate guidance and for use in difficult environments (dust, liquids, etc.).
Installing self-contained systems provides an optimum solution (no control system required).
They enable
- monitoring of one or several guards (opening, closing) on small machines,
- savings in space and the elimination of enclosures and/or control cabinets.

Safety detection solutions
Safety limit switches

Presentation

With head for linear movement (plunger) or rotary movement (lever)



- Narrow metal body.
- Compact **XCS M**
- With protective cover, preventing both access to the mounting screws or adjustment of the head by non authorized personnel.
- Torx mounting screws.
- A removable cable entry to facilitate wiring.

Contacts

XCS M3 limit switches are fitted with 3-pole contacts and **XCS M4** switches are fitted with 4-pole contacts. 4 versions of complete switches are available incorporating these contacts:

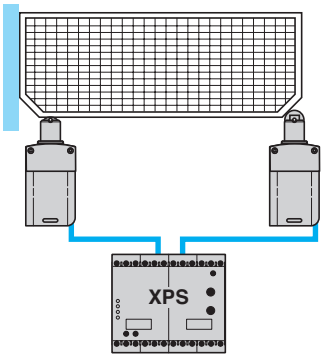
- metal end plunger,
- roller plunger,
- thermoplastic roller lever,
- 0.75 in. (19 mm) diameter steel roller lever.

Connection

Pre-cabled switches, either 7 x 20 AWG (0.5 mm²) or 9 x 22 AWG (0.34 mm²).

Applications

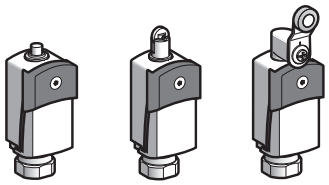
These switches provide a solution for monitoring covers, guards or grilles on machines with low inertia (quick rundown time), either in conjunction with actuator operated guard switches or not.
When used on their own, they are always installed in “positive mode” or combined in pairs, with one switch being in “positive mode” and the other in “negative mode”, and can, when connected to Preventa™ safety relay modules, establish a category 4 safety control system.



Safety detection solutions
Safety limit switches

Presentation

With head for linear movement (plunger) or rotary movement (lever)



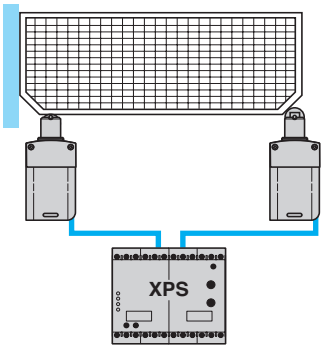
- Compact metal case **XCSD** and plastic body **XCS P**.
- With protective cover, preventing both access to the mounting screws or adjustment of the head by non authorized personnel.
- Torx mounting screws.
- A removable cable entry to facilitate wiring.

Contacts

XCS P3●●●● and **XCSD3●●●●** limit switches are fitted with 3-pole contacts.
4 versions of complete switches are available incorporating these contacts:
- metal end plunger,
- roller plunger,
- thermoplastic roller lever,
- 0.75 in. (19 mm) diameter steel roller lever.

Applications

These switches provide a solution for monitoring covers, guards or grilles on machines with low inertia (quick rundown time), either in conjunction with actuator operated guard switches or not.
When used on their own, they are always installed in “positive mode” or combined in pairs, with one switch being in “positive mode” and the other in “negative mode”, and can, when connected to Preventa™ safety relay modules, establish a category 4 safety control system.



Application information for all guard switches

Application information for all safety interlock and safety limit switches

When designing a door or gate guarding system, these guidelines must be followed:
- The actuating key, coded magnet or lever alone must not be used as the sole means to hold the gate or guard closed. A separate locking or latching mechanism must be used to hold the door closed.
- The safety interlock switch or safety limit switch must not be used as a mechanical stop for the moving guard. A separate mechanical stop must be provided. (EN 1088 - 1995: 5.2.2)
- The actuating key must not be used as a gate guiding device. Install a guide for the guard to ensure proper alignment.
- Actuating keys must be securely attached to gates, guards, and doors only. They should not be attached to cables, cords or chains.
- Actuating keys for safety interlocks should not be inserted further than the maximum depth indicated for that device.
- Levers or plungers on safety limit switches should not be operated in excess of the parameters indicated for maximum travel.
- Non-Contact safety interlock switches or actuating keys should not be used as a mechanical stop. Their operation is to be non-contact.

Operation of solenoid locking

Operation of safety interlock switches with solenoid locking

Safety interlocks are available with two types of locking of the actuating key: locking with power and locking without power. The operation of each is described below.
- **Locking Without Power.** Actuating key locks into switch when inserted. This is typically preferred as the door is secured regardless of electrical power availability or power failure. Applying power to the electromagnet will unlock actuating key and allow it to be removed from the switch. The N.C. safety contacts will not open until the actuating key is removed.
- **Locking With Power.** Actuating key locks into switch only when actuating key is inserted and power is applied to the electromagnet. Door or guard is not locked in the event of a power failure or when power is removed from the electro-magnet. Removing power from the electromagnet will unlock actuating key and allow it to be removed from the switch. The N.C. safety contacts will not open until the actuating key is removed.

Note: Locking with power devices do not meet European standards regarding the safety of machinery, especially EN 1088 regarding guard locking. European standards do not allow a “locking with power” function for gate or door guarding/locking. Locking without power devices meets European requirements, and should be used when machinery is to be shipped to Europe or where machinery must meet European standards.

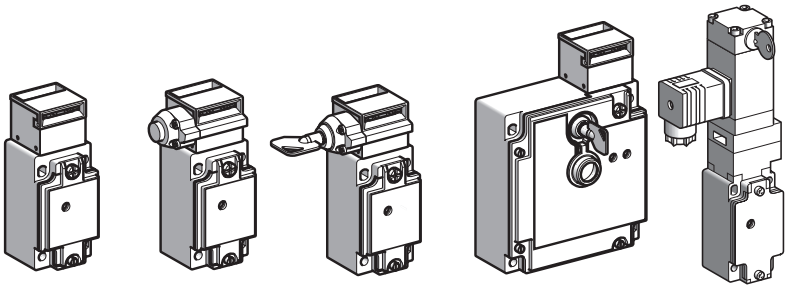
Safety detection solutions

Safety interlock switches, actuator operated

Metal, types XCSA, XCSB, XCSC, XCSE and XCSL
Plastic, double insulated, turret head,
types XCSMP, XCSPA, XCSTA and XCSTE

Metal, types XCS A, XCS B, XCS C, XCSE

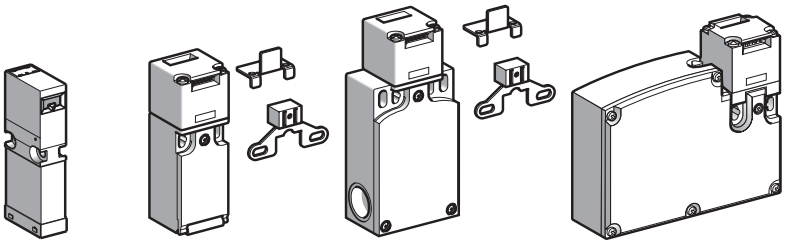
Safety interlock switches with or without locking of the actuating key



Pages 3/24 to 3/43

Plastic, types XCS MP, XCSPA XCSTA, XCS TE

Safety interlock switches with or without locking of the actuating key



Pages 3/44 to 3/49

Environment characteristics

Safety interlock switch type		XCS A, XCS B, XCS C, XCSE, XCSL (metal)	XCS MP, XCSPA, XCSTA, XCS TE (plastic)
Conformity to standards	Products	IEC/EN 60947-5-1, UL 508, CSA C22-2 n° 14	
	Machine assemblies	IEC/EN 60204-1, EN 1088/ISO 14119, EN/ISO 12100	
Product certifications		UL, CSA	UL, CSA (c UL for **XCS MP**)
Protective treatment		Standard version: "TC"	
Ambient air temperature	For operation	- 13…+ 158 °F (- 25…+ 70 °C) - 13…+ 104 °F (- 25…+ 40 °C) for **XCSE** - 13…+ 140 °F (- 25…+ 60 °C) for **XCS TE**	
	For storage	- 40…+ 158 °F (- 40…+ 70 °C) - 13…+ 176 °F (- 25…+ 80 °C) for **XCS MP**	
Vibration resistance		5 gn (10…500 Hz) conforming to IEC/EN 60068-2-6 (6 gn (10…55 Hz) for **XCS MP**)	
Shock resistance		10 gn (duration 11 ms) conforming to IEC/EN 60068-2-27 (50 gn (duration 11 ms) for **XCS MP**)	
Electric shock protection		Class I conforming to IEC/EN 60536	Class 2 conforming to IEC/EN 60536
Degree of protection		**IP 67 conforming to IEC/EN 60529 and IEC/EN 60947-5-1** *(1)*	
Cable entry		1 entry (**XCS A, XCS B, XCS C**) or 2 entries (**XCSE**) tapped for n° 13 (Pg 13.5) cable gland, tapped M20 or tapped 1/2" NPT	1 entry (**XCSPA and XCS TE**) or 2 entries (**XCSTA**) tapped for n° 11 (Pg 11) cable gland, tapped M16 or tapped 1/2" NPT (with adaptor) for **XCSTA** and **XCS TE**
Connecting cable		–	Pre-cabled, either 4 x 20 AWG (0.5 mm²) or 6 x 20 AWG (0.5 mm²) (**XCS MP**)
Materials		XCS A/B/C/E Zamak case	XCS MP/PA/TA/TE/PL/TL/PR/TR Polyamide PA66 fiberglass impregnated enclosure
		Actuators (all types): steel XC60, surface treated	

(1) Live parts of these switches are protected against the penetration of dust and water. However, when installing take all necessary precautions to prevent the penetration of solid bodies, or liquids with a high dust content, into the actuator aperture. Not recommended for use in saline atmospheres.

Safety detection solutions

Safety interlock switches, actuator operated
Metal, types XCSA, XCSB, XCSC, XCSE and XCSL
Plastic, double insulated, turret head, types XCSMP, XCSPA, XCSTA and XCSTE

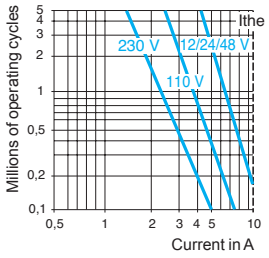
Contact block characteristics

Rated operational characteristics		2 and 3 contact, slow break	**XCS A**, **XCS B**, **XCS C**, **XCSTA**, **XCSPA**: ∼ AC-15, A300: Ue = 240 V, Ie = 3 A or Ue = 120 V, Ie = 6 A **XCSE**, **XCS TE**: ∼ AC-15, B300: Ue = 240 V, Ie = 1.5 A or Ue = 120 V, Ie = 3 A **XCS MP**: ∼ AC-15, C300: Ue = 240 V, Ie = 0.75 A or Ue = 120 V, Ie = 1.5 A All models: ⎓ DC-13, Q300: Ue = 250 V, Ie = 0.27 A or Ue = 125 V, Ie = 0.55 A conforming to IEC/EN 60947-5-1
Conventional thermal current in enclosure			**XCS A**, **XCS B**, **XCS C**, **XCSPA** (2 & 3 slow break contact and 2 snap action contact versions) **XCSE, XCS TE, XCSPA** (3 snap action contact version): Ithe = 6 A **XCS MP**: Ithe = 2.5 A
Rated insulation voltage		2 and 3 contact	3 contacts (**XCS A, XCS B, XCS C, XCSE, XCSTA**), 2 contacts (**XCSPA, XCS TE**), 2 and 3 contacts (**XCS MP**): Ui = 500 V conforming to IEC/EN 60947-1; Ui = 300 V conforming to UL 508, CSA C22-2 n° 14
Rated impulse withstand voltage		2 and 3 contact	3 contacts (**XCS A, XCS B, XCS C, XCSE, XCSTA**), 2 contacts (**XCSPA, XCS TE**), 2 and 3 contacts (**XCS MP**): Uimp = 6 kV conforming to IEC/EN 60947-5-1
Positive operation			N.C. contact(s) with positive opening operation conforming to IEC/EN 60947-5-1, Section 3
Resistance across terminals			⩽ 30 mΩ conforming to IEC/EN 60947-5-4
Short-circuit protection		2 and 3 contact	3 contacts (**XCS A**, **XCS B**, **XCS C**, **XCSE**, **XCSTA**), 2 contacts (**XCSPA**, **XCS TE**), 2 and 3 contacts (**XCS MP**): 10 A cartridge fuse type gG (gl)
		3 contact	**XCSPA**: 6 A cartridge fuse type gG (gl)
Connection	Pre-cabled		4 x 20 AWG (0.5 mm²) or 6 x 20 AWG (0.5 mm²) (**XCS MP**), PVC
	Screw clamp terminals	2 contact, snap action	**XCSPA**, **XCSTA**: Clamping capacity, min: 1 x 22 AWG (0.34 mm²), max: 2 x 14 AWG (1.5 mm²)
		2 and 3 contact	3 contacts **(XCS A, XCS B, XCS C, XCSE, XCSTA)**, 2 contacts **(XCSPA, XCS TE)**: Clamping capacity, min: 1 x 20 AWG (0.5 mm²), max: 2 x 14 AWG (1.5 mm²) with or without cable end

Electrical life

Conforming to IEC/EN 60947-5-1 Appendix C.
Utilisation categories AC-15 and DC-13.
Maximum operating rate: 3600 operating cycles/hour.
Load factor: 0.5

3 contact version XCSA/B/C/E/TA and 2 slow break contact version



Voltage	V	24	48	120
⎓	W	13	9	7

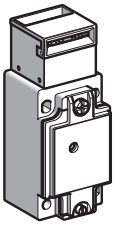
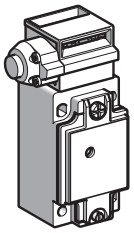
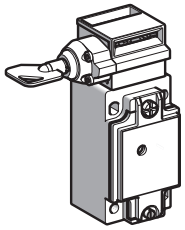
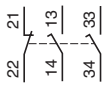
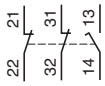
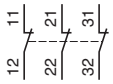
Electrical Life The product life expressed is based on average usage and normal operating conditions. Actual operating life will vary with conditions. The above statements are not intended to nor shall they create any express or implied warranties as to product operation or life. For information on the limited warranty offered on this product please refer to the Square D ® terms and conditions of sale found in the Square D ® Digest.

Safety detection solutions

Safety interlock switches, actuator operated

Metal, turret head *(1)*, types XCSA, XCSB, XCSC and XCSE

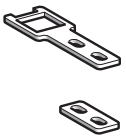
Conduit entries tapped 1/2” NPT

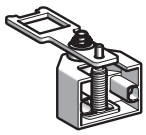
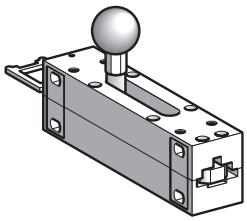
Type of switch	Without locking of actuator			With locking of actuator, manual unlocking *(2)*			
							
LED indication on opening of N.C. contacts	Without	1 orange LED ⎓ 24/48 V	1 orange LED ∿ 110/240 V	Without	1 orange LED ⎓ 24/48 V	1 orange LED ∿ 110/240 V	Without
References of switches without actuator (⊖ **N.C. contact with positive opening operation)**							
3-pole N.C. + N.O. + N.O. (2 N.O. staggered) slow break *(3)* 	**XCSA503** ⊖	–	**XCSA523** ⊖	**XCSB503** ⊖	–	–	–
3-pole N.C. + N.C. + N.O. (N.O. staggered) slow break *(3)* 	**XCSA703** ⊖	**XCSA713** ⊖	**XCSA723** ⊖	**XCSB703** ⊖	**XCSB713** ⊖	**XCSB723** ⊖	**XCSC703** ⊖
3-pole N.C. + N.C. + N.C. slow break *(3)* 	**XCSA803** ⊖	–	–	**XCSB803** ⊖	–	–	**XCSC803** ⊖
Weight oz (kg)	15.521 (0.440)	15.521 (0.440)	15.521 (0.440)	16.755 (0.475)	16.755 (0.475)	16.755 (0.475)	16.932 (0.480)

Complementary characteristics not shown under General characteristics (page 3/22 and 3/23)

Actuation speed	Maximum: 19.7 in./s (0.5 m/s), minimum: 0.39 in./s (0.01 m/s)
Resistance to forcible withdrawal of actuator	**XCSB** and **XCSC**: 337 lbs. (1500 N);; **XCSE**: 450 lbs. (2000 N)
Maximum operating rate	For maximum life: 600 operating cycles per hour
Minimum force for extraction of actuator	≥ 4.5 lbs (20 N)
Cable entry	**XCSA**, **XCSB**, **XCSC**: 1 conduit entry **XCSE**: 2 conduit entries Entries tapped for 1/2” NPT (USAS B2-1) conduit
Materials	Body: zamak. Head: zamak. Safety screws: 5-lobe torque. Protective plate: steel.

References of actuators



Description	Straight actuator	Actuator with wide mounting	Pivoting actuator	Latch for sliding doors (Padlockable in open position)
For guard switches XCS A, B, C, E	**XCS Z01**	**XCS Z02**	**XCS Z03**	**XCS Z05**
Weight oz (kg)	0.705 (0.020)	0.705 (0.020)	3.351 (0.095)	21.164 (0.600)

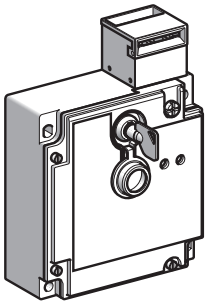
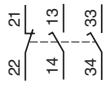
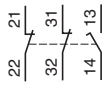
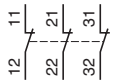
(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) Unlocking by pushbutton for XCS B●●● and by key operated lock for XCS C●●●.
(3) Schematic diagrams shown represent the contact states while the actuating key is inserted in the head of the switch.

The devices listed above are threaded for 1/2" NPT, and are available with metric conduit:
- To order devices tapped for 13 mm cable gland, conforming to NFC 68-300 (DIN PG 13.5): Change the last character in the part number to 1.
  For example: XCSA723 is changed to XCSA721.
- To order devices tapped for M20 x 1.5 for ISO cable gland: Change the last character in the part number to 2.
  For example: XCSA723 is changed to XCSA722.

Principle: page 3/7 | Characteristics: page 3/22 | References: page 3/24 | Dimensions: page 3/33 | Wiring Diagrams: page 3/35

Safety detection solutions

Safety interlock switches, actuator operated
Metal, turret head *(1)*, types XCSA, XCSB, XCSC and XCSE
Conduit entries tapped 1/2" NPT

Type of switch	With interlocking, locking by solenoid	
		
Type of interlocking	**Locking without power and unlocking on energization of solenoid** *(2)*. To order a guard switch with locking with power and unlocking on de-energization of the solenoid, replace the 2nd number *(3)* by **5** in the references shown below. Example: **XCSE5313 becomes XCSE5513**	
LED indication	Orange LED: "guard open" signalling. Green LED: "guard closed and locked" signalling.	
Supply voltage of solenoid	∿ or ⎓ 24 V (50/60 Hz on ∿)	∿ or c 110/120 V *(3)* (50/60 Hz on ∿)
Type of contact on solenoid	N.C. + N.O.	N.C. + N.O.
References of switches without actuating key (⊖ N.C. contact with positive opening operation)		
3-pole N.C. + N.O. + N.O. (2 N.O. staggered) slow break *(4)* 	**XCSE5313** ⊖	**XCSE5333** ⊖
3-pole N.C. + N.C. + N.O. (N.O. staggered) slow break *(4)* 	**XCSE7313** ⊖	**XCSE7333** ⊖
3-pole N.C. + N.C. + N.C. slow break *(4)* 	**XCSE8313** ⊖ *(5)*	**XCSE8333** ⊖
Weight oz (kg)	40.212 (1.140)	

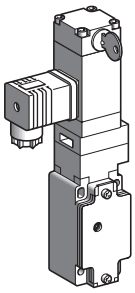
Solenoid characteristics		
Load factor	100 %	
Rated operational voltage	∿ **or** ⎓ **24 V**	∿ **or** ⎓ **110/120 V**
Voltage limits	- 20%, + 10% of the rated operational voltage (including ripple on ⎓) conforming to IEC/EN 60947-1	
Service life	20,000 hours	
Power consumption	Inrush: 10 VA. Sealed: 10 VA	

LED indicator characteristics		
Rated insulation voltage	50 V conforming to IEC/EN 60947-1	250 V conforming to IEC/EN 60947-1
Current power consumption	7 mA	7 mA
Rated operational voltage	∿ **or** ⎓ **24/48 V**	∿ **110/240 V**
Voltage limits	∿ or ⎓ 20...52 V (including ripple)	∿ 95...264 V (including ripple)
Service life	100,000 hours	100,000 hours
Protection against overvoltages	Yes	Yes

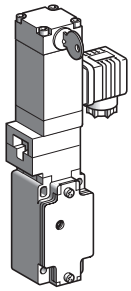
(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) A key operated lock enables forced opening of the interlocking mechanism, by authorized personnel, allowing withdrawal of the actuating key and subsequent opening of the N.C. safety contacts.
(3) For use on ⎓ 110/120 V, remove the LED module.
(4) Wiring diagrams shown represent the contact states while the actuating key is inserted in the head of the switch.
(5) Switches supplied with a single green LED.
(6) The N.O. contacts will close after the N.C. contacts open. They do not change state simultaneously.

The devices listed above are threaded for 1/2" NPT, and are available with metric conduit:
- To order devices tapped for 13mm cable gland, conforming to NF C 68-300 (DIN Pg 13.5): Change the last character in the part number to 1
  For example: XCSE7333 is changed to XCSE7331
- To order devices tapped for M20 x 1.5 for ISO cable gland: Change the last character in the part number to 2
  For example: XCSE7333 is changed to XCSE7332

Safety detection solutions
Safety interlock switches, actuator operated
Metal, fixed head, type XCSL
Conduit entries tapped 1/2” NPT



XCSL764F3



XCSL766F3

Metal, Type XCSL, Conduit Entry Tapped 1/2 NPT - Locking Without Power

Positive opening N.C. contacts meet the IEC and EN requirements for positive opening contacts per IEC/EN 60947-5-1; and NEMA ICS-5, part 6 (positive opening action).
Standard devices are shown on pages 3/26 and 3/27. If these devices do not meet your application requirements, refer to page 3/28 to build a part number.

Type of Switch	With Interlocking, Locking by Electromagnet •					
Type of interlocking	**Locking Without Power.** Actuating key locks into switch when inserted. This is typically preferred as the door is secured regardless of electrical power availability or power failure. Applying power to the electromagnet will unlock actuating key and allow it to be removed from the switch. Applying power to the electromagnet will open the N.C. safety contacts as well.					
Position of Head (for actuating key)	To Right			To Left		
Position of Electromagnet Connector	To Left			To Right		
Position of Ronis key release lock	Front			Front		
LED indication	Orange LED: “guard open” signaling					
Supply voltage of electromagnet	24 Vdc	120 Vac or Vdc Δ	230 Vac or Vdc Δ	24 Vdc	120 Vac or Vdc Δ	230 Vac or Vdc Δ
References of switches without actuating key (select actuating key from page 3/30)						
N.C. + N.O. + N.O. (2 N.O. staggered) slow break ♦ ∇	XCSL564B3	XCSL564F3	XCSL564M3	XCSL566B3	XCSL566F3	XCSL566M3
N.C. + N.C. + N.O. (N.O. staggered) slow break ♦ ∇	XCSL764B3	XCSL764F3	XCSL764M3	XCSL766B3	XCSL766F3	XCSL766M3
Weight oz (kg)	32 (0.920 kg)	32 (0.920 kg)	32 (0.920 kg)	32 (0.920 kg)	32 (0.920 kg)	32 (0.920 kg)

- A Ronis key operated lock allows the forced opening of the guard in an emergency situation. When the Ronis key is turned to the unlock position, the actuating key is unlocked and is free to be removed from the switch. The N.C. safety contacts will open when the Ronis key is turned to the unlock position as well.

Δ For use on 110/120 Vdc or 220/240 Vdc, remove the LED indicator module.
♦ Schematic diagrams shown represent the contact states while the actuating key is fully inserted and engaged in the head of the switch.
∇ The N.O. contacts will close after the N.C. contacts open. They do not change state simultaneously.

Only the N.C. contacts should be used in the safety control circuit. The N.O. contacts are provided solely for signalling – NOT for safety functions.
Actuating head, solenoid and related components are NOT field convertible and should not be rotated or modified.
The only replacement parts or components available are covers and LED indicator modules. **These devices are not to be repaired or adjusted.** The complete switch should be replaced.

Complementary Characteristics not shown under general characteristics (pages 3/22 and 3/23)

Actuation speed	Maximum: 19.7 in/s (0.5 m/s), Minimum: 0.39 in/s (0.01 m/s)
Resistance to Forcible Key Withdrawal	XCSL: 337 lbs. (1500 N)
Maximum Operating Rate	For maximum life: 600 operating cycles per hour, i.e.: 10/min. (or once in 6 seconds)
Minimum Force for Positive Opening	4.5 lbs (20 N)
Conduit Entry	XCSL: 1 entry. Conduit entry tapped for 1/2 NPT

Electromagnet Characteristics

DC electromagnet is supplied on all XCSL models. For use with an AC power supply, a bridge rectifier is supplied in the connector on all AC devices.

Load Factor	100%		
Rated Operational Voltage	24 Vac or Vdc	110/120 Vac or Vdc	220/240 Vac or Vdc
Voltage Limits	-10%, +10% of the rated operational voltage (including ripple on) conforming to IEC 60947-1		
Power consumption	Inrush: 10 VA. Sealed: 10 VA		

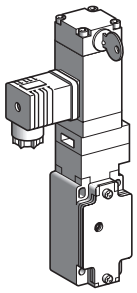
LED Indicator Characteristics

Rated Operational Voltage	24 Vac or Vdc	110 Vac	220 Vac
Rated Insulation Voltage	50 V conforming to IEC 60947-1	250 V conforming to IEC 60947-1	
Current Power consumption	7 mA	2.5 mA	5 mA
Voltage Limits	20...30 Vac or Vdc (including ripple)	95...130 Vac (including ripple)	190...260 Vac (including ripple)
Protection Against Over voltages	Yes	Yes	

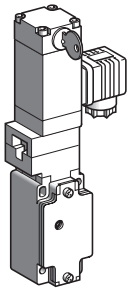
The devices listed above are threaded for 1/2” NPT, and are available with metric conduit:
- To order devices tapped for 13mm cable gland, conforming to NF C 68-300 (DIN Pg 13.5): Change the last character in the part number to 1
  For example: XCSL764B**3** is changed to XCSL764B**1**
- To order devices tapped for M20 x 1.5 for ISO cable gland: Change the last character in the part number to 2
  For example: XCSL764B**3** is changed to XCSL764B**2**

Principle: page 3/7 | Characteristics: page 3/22 | References: page 3/26 | Dimensions: page 3/38 | Wiring Diagrams: page 3/38

Safety detection solutions
Safety interlock switches, actuator operated
Metal, fixed head, type XCSL
Conduit entries tapped 1/2” NPT



XCSL784F3



XCSL786F3

Metal, Type XCSL, Conduit Entry Tapped 1/2 NPT - Locking With Power

Positive opening N.C. contacts meets the IEC and EN requirements for positive opening contacts per IEC/EN 60947-5-1; and NEMA ICS-5, part 6 (positive opening action).

Standard devices are shown on pages 3/26 and 3/27. If these devices do not meet your application requirements, refer to page 3/28 to build a part number.

Type of Switch	With Interlocking, Locking by Electromagnet •
Type of interlocking	**Locking With Power.** Actuating key locks into switch *only* when actuating key is inserted *and* power is applied to the electromagnet. Door or guard is not locked in the event of a power failure or when power is removed from the electro-magnet. Removing power from the electromagnet will unlock actuating key and allow it to be removed from the switch. Removing power to the electromagnet will open the N.C. safety contacts as well.

Note: Locking with power devices do not meet European standards regarding the safety of machinery, especially EN 1088 regarding guard locking. European standards do not allow a “locking with power” function for gate or door guarding/locking. Locking without power devices meet European requirements, and should be used when machinery is to be shipped to Europe or where machinery must meet European standards.

Position of Head (for actuating key)	To Right			To Left		
Position of Electromagnet Connector	To Left			To Right		
Position of Ronis key release lock	Front			Front		
LED indication	Orange LED: “guard open” signaling					
Supply voltage of electromagnet	24 Vdc	120 Vac or Vdc Δ	230 Vac or Vdc Δ	24 Vdc	120 Vac or Vdc Δ	230 Vac or Vdc Δ
References of switches without actuating key (select actuating key from page 3/30)						
N.C. + N.O. + N.O. (2 N.O. staggered) slow break ♦ ∇ 	XCSL584B3	XCSL584F3	XCSL584M3	XCSL586B3	XCSL586F3	XCSL586M3
N.C. + N.C. + N.O. (N.O. staggered) slow break ♦ ∇ 	XCSL784B3	XCSL784F3	XCSL784M3	XCSL786B3	XCSL786F3	XCSL786M3
Weight oz (kg).	32 (0.920 kg)	32 (0.920 kg)	32 (0.920 kg)	32 (0.920 kg)	32 (0.920 kg)	32 (0.920 kg)

- • A Ronis key operated lock allows the forced opening of the guard in an emergency situation. When the Ronis key is turned to the unlock position, the actuating key is unlocked and is free to be removed from the switch. The N.C. safety contacts will open when the Ronis key is turned to the unlock position as well.
- Δ For use on 110/120 Vdc or 220/240 Vdc, remove the LED indicator module.
- ♦ Schematic diagrams shown represent the contact states while the actuating key is fully inserted and engaged in the head of the switch.
- ∇ The N.O. contacts will close after the N.C. contacts open. They do not change state simultaneously.

Only the N.C. contacts should be used in the safety control circuit. The N.O. contacts are provided solely for signalling – NOT for safety functions.

Actuating head, solenoid and related components are NOT field convertible and should not be rotated or modified.

The only replacement parts or components available are covers and LED indicator modules. **These devices are not to be repaired or adjusted.** The complete switch should be replaced.

Complementary Characteristics not shown under general characteristics (pages 3/22 and 3/23)

Actuation Speed	Maximum: 19.7 in/s (0.5 m/s), Minimum: 0.39 in/s (0.01 m/s)
Resistance to Forcible Key Withdrawal	XCSL: 337 lbs. (1500 N)
Maximum Operating Rate	For maximum life: 600 operating cycles per hour, i.e.: 10/min. (or once in 6 seconds)
Minimum Force for Positive Opening	4.5 lbs (20 N)
Conduit Entry	XCSL: 1 entry. Conduit entry tapped for 1/2 NPT

Electromagnet Characteristics

DC electromagnet is supplied on all XCSL models. For use with an AC power supply, a bridge rectifier is supplied in the connector on all AC devices.

Load Factor	100%		
Rated Operational Voltage	24 Vac or Vdc	110/120 Vac or Vdc	220/240 Vac or Vdc
Voltage Limits	-10%, +10% of the rated operational voltage (including ripple on) conforming to IEC 60947-1		
Power consumption	Inrush: 10 VA. Sealed: 10 VA		

LED Indicator Characteristics

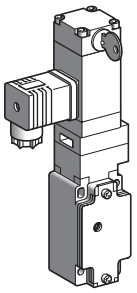
Rated Operational Voltage	24 Vac or Vdc	110/240 Vac	220 Vac
Rated Insulation Voltage	50 V conforming to IEC 60947-1	250 V conforming to IEC 60947-1	
Current Power consumption	7 mA	7 mA	5 mA
Voltage Limits	20...30 Vac or Vdc (including ripple)	95...264 Vac (including ripple)	190...260 Vac (including ripple)
Protection Against Over voltages	Yes	Yes	

The devices listed above are threaded for 1/2” NPT, and are available with metric conduit:

- • To order devices tapped for 13mm cable gland, conforming to NF C 68-300 (DIN Pg 13.5): Change the last character in the part number to 1
  For example: XCSL784B**3** is changed to XCSL784B**1**
- • To order devices tapped for M20 x 1.5 for ISO cable gland: Change the last character in the part number to 2
  For example: XCSL784B**3** is changed to XCSL784B**2**

Safety detection solutions

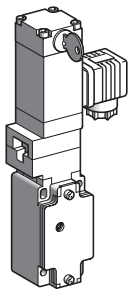
Safety interlock switches, actuator operated
Metal, fixed head, type XCSL
Conduit entries tapped 1/2” NPT



Metal, Type XCSL, Conduit Entry Tapped 1/2 NPT

Positive opening N.C. contacts meets the IEC and EN requirements for positive opening contacts per IEC/EN 60947-5-1; and NEMA ICS-5, part 6 (positive opening action).
If the devices shown on pages 3/26 and 3/27 do not meet you application needs, use the table below to build a part number. A complete part number requires a code character from each of the following columns: Base Number, Ronis Key Position, Actuating Key and Connector, Electromagnet Voltage, and Conduit Connection. A code character column Connector is optional, and is only used if a connector is required for the application.

All devices have an Orange LED as standard.



References of switches without actuating key (select actuating key from page 3/30)

		Base Number	Ronis Key Position	Actuating Key and Connector	Electro-magnet voltage	Conduit Connection	Connector (Optional)
Contact Arrangement							
N.C. + N.O. + N.O.		XCSL5					
N.C. + N.C. + N.O.		XCSL7					
Locking Without Power							
Ronis Key Position	Front		6				
	Right		2				
	Left		0				
	Back		4				
Locking With Power							
Note: A Ronis key lock is NOT provided on the Locking With Power devices.			8				
Actuating Key and Connector Position							
Actuating Key Position	Connector Position						
Front	Left			1			
	Right			2			
	Back			3			
Right	Left			4			
	Front			5			
Left	Right			6			
	Front			7			
Back	Left			8			
	Right			9			
	Front			0			
Electromagnet Supply Voltage							
24 Vdc					B		
110 Vac					F		
220 Vac					M		
Conduit Connection							
PG 13.5						1	
M20 x 1.5						2	
1/2 inch NPT						3	
Connector (optional)							
5 Pin Mini (LEDs not wired/powered)							CA
6 Pin Mini (use with LEDs)							DA

Type of Interlocking

Locking Without Power. Actuating key locks into switch when inserted. This is typically preferred as the door is secured regardless of electrical power availability or power failure. Applying power to the electromagnet will unlock actuating key and allow it to be removed from the switch. Applying power to the electromagnet will open the N.C. safety contacts as well.

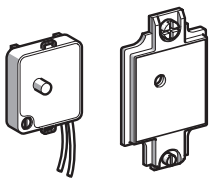
Locking With Power. Actuating key locks into switch *only* when actuating key is inserted *and* power is applied to the electromagnet. Door or guard is not locked in the event of a power failure or when power is removed from the electromagnet. Removing power from the electromagnet will unlock actuating key and allow it to be removed from the switch. Removing power to the electromagnet will open the N.C. safety contacts as well.

Note: Locking with power devices do not meet European standards regarding the safety of machinery, especially EN 1088 regarding guard locking. European standards do not allow a “locking with power” function for gate or door guarding/locking. Locking without power devices meet European requirements, and should be used when machinery is to be shipped to Europe or where machinery must meet European standards.

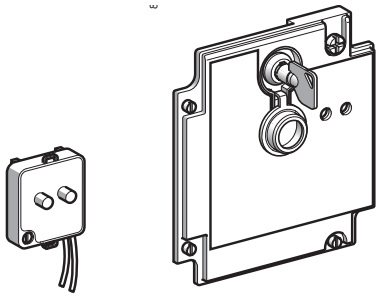
Safety detection solutions

Safety interlock switches, actuator operated

Metal, turret head, types XCSA, XCSB, XCSC and XCSE



XCS Z3●



XCS Z4●



XCS Z90

Separate components

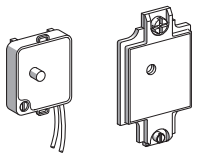
Description	For use with	Supply voltage	Reference	Weight oz (kg)
1 orange LED indicator module with cover, seal and 2 mounting screws	XCSA XCSB XCSC	∿ or ⎓ 24/48 V	**XCS Z31**	1.41 (0.040)
		∿ 110/240 V	**XCS Z32**	1.41 (0.040)
1 orange LED + 1 green LED indicator module with cover + lock *(1)*, seal and 4 mounting screws (2 keys included for lock)	XCSE73●●	∿ or ⎓ 24/48 V	**XCS Z43**	6.17 (0.175)

(1) Lock incorporated as standard on safety interlock switches XCSE: key withdrawal in LOCK and UNLOCK positions.

Description	For use with	Key withdrawal positions from lock	Unit reference	Weight oz (kg)
Blanking plugs for operating head slot (Sold in lots of 10)	XCSA, XCSB, C, XCSE	–	**XCS Z27**	1.76 (0.050)
Tubular high security keys to manually unlock and open guards (Sold in lots of 10)	XCSC, XCSE	–	**XCS Z25**	3.53 (0.100)
Padlocking attachment to prevent insertion of actuating key, for up to 3 padlocks (padlocks not included). The padlock attachment cannot be used as a lock-out tag-out means.	XCSA, XCSB, C, XCSE	–	**XCS Z90**	1.94 (0.055)

Description	For use with	Unit reference	Weight oz (kg)
1/2" NPT conduit adaptor (Sold in lots of 5)	XCS A, XCS B, XCS C, XCSE	**DE9 RA2012**	1.69 (0.048)
M20 x 1.5 adaptor (Sold in lots of 5)	XCS A, XCS B, XCS C, XCSE	**DE9 RA13520**	0.35 (0.010)

XCS Safety Interlock Switches
Safety interlock switches, actuator operated
Metal, fixed head, type XCSL



XCSZ33



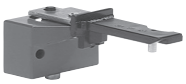
BH206 ZCKJ921



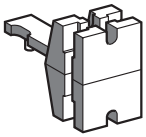
ZCKY071



ZCKY081



ZCKY091



ZCKY061



ZCKY101



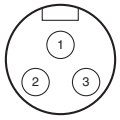
ZCKZ01

Actuating keys and accessories, for XCSL only

Description	Type	Catalog Number
Indicator light module, 1 orange LED with cover, seal, and 2 mounting screws.	24/48 Vac or Vdc	**XCSZ33**
	110/230 Vac	**XCSZ34**
Connector for electromagnet (supplied with switches as standard)	DC	**ZCKJ921**
	AC Contains a rectifier bridge inside connector for use on AC	**ZCKJ922**
Plug and cable assemblies mini-style 5 pins *	Cable 6.6 ft. (2m) length	**XSZCA1501Y**
	Cable 13.1 ft. (4m) length	**XSZCA1502Y**
Plug and cable assemblies mini-style 6 pins *	Cable 6.6 ft. (2m) length	**XSZCA1601Y**
	Cable 13.1 ft. (4m) length	**XSZCA1602Y**
Straight actuating key		**ZCKY071**
Actuating key for perpendicular mounting/mounting		**ZCKY081**
Adjustable actuating key for Horizontal movement		**ZCKY091**
Adjustable actuating key for Vertical movement		**ZCKY061**
Sliding bolt actuating key		**ZCKY101**
Overriding key: Ronis 520 key (sold in lots of 2)		**Q9990912**
Padlock attachment to lock into actuating key opening. Painted yellow. Prevents actuating key from entering switch. Note: Cannot be used as a lock-out tag-out means.		**ZCKZ01**

* More varieties and lengths of connector cables are available. See Sensors catalog # 9006CT0101.

3 pin



1-Green
2-Black
3-White

5 pin



1-White
2-Red
3-Green
4-Orange
5-Black

6 pin



1-Orange
2-Blue
3-Black
4-White
5-Red
6-Green

NOTE: View of connectors shown above are the male views as it is installed in the switch.

Pre-Wired Mini Connectors for XCS Safety Interlocks

The XCS safety interlock switches are available with mini connectors in several different wiring schemes. Each wiring option shown below has a notation of which devices are available with that option. Add the following suffixes to the appropriate XCS catalog number. Only a small number of the pre-wired options available are listed here and on the next page. **Many other connectors and wiring schemes are available. New wiring schemes to meet your applications are available upon request.**

3 Pin: (for all XCSExcept XCSE, XCSMP, and XCSDM) Suffix AA

Switch Terminals	Wire Color
21	Black
22	White
Ground	Green

5 Pin: (for all XCSExcept XCSE, XCSMP, and XCSDM) Suffix CA ◊

Switch Terminals	Wire Color
13	Orange
14	Red
21	White
22	Black
Ground	Green

5 Pin: (for XCSE) Suffix CC ◊

Switch Terminals	Wire Color
13	Orange
14	Red
E1	White
E2	Black
Ground	Green

5 Pin: (for all XCSExcept XCSE, XCSMP, and XCSDM) Suffix CB ◊

Switch Terminals	Wire Color
13	White
14	Black
21	Orange
22	Red
Ground	Green

5 Pin: (for XCSE) Suffix CD ◊

Switch Terminals	Wire Color
13	White
14	Black
E1	Orange
E2	Red
Ground	Green

6 Pin: (for all XCS with LED except for XCSE) Suffix DA

Switch Terminals	Wire Color
13	Orange
14	Blue
21	Red
22	White
X1	Black
Ground	Green

◊ Not for XCSDevices with all N.C. contacts. Device must have at least 1 N.O. contact.
More connector versions are available on the next page

3

7 pin



1-White-Blk. Tr.
2-Black
3-White
4-Red
5-Orange
6-Blue
7-Green

9 pin



1 - Orange
2 - Blue
3 - Red-Blk. Tr.
4 - Green-Blk. Tr.
5 - White
6 - Red
7 - Green
8 - White-Blk. Tr.
9 - Black

NOTE: View of connectors shown above are the male views as it is installed in the switch.

Pre-Wired Mini Connectors for XCS Safety Interlocks *(continued)*

The XCS safety interlock switches are available with mini connectors in several different wiring schemes. Each wiring option shown below and on the previous page has a notation of which devices are available with that option. Add the following suffixes to the appropriate XCS catalog number. Only a small number of the pre-wired options available are listed here and on the previous page. **Many other connectors and wiring schemes are available. New wiring schemes to meet your applications are available upon request.**

7 Pin: (for XCSE) Suffix EA ◊

Switch Terminals	Wire Color
13	Orange
14	Red
21	White
22	Black
Ground	Green
E1	Blue
E2	White with Black tracer/stripe

7 Pin: (for XCSE) Suffix EB ◊

Switch Terminals	Wire Color
13	White
14	Black
21	Orange
22	Red
Ground	Green
E1	Blue
E2	White with Black tracer/stripe

7 Pin: (for XCSE - locking without power) Suffix EC ◊

Switch Terminals	Wire Color
33	Orange
34	Red
51	White
X1	Black
Ground	Green
E1	Blue
E2	White with Black tracer/stripe
Jumper between 52 and 21 (installed by Schneider Electric)	
Jumper between 22 and X2 (installed by Schneider Electric)	
Jumper between 34 and X3 (installed by Schneider Electric)	

7 Pin: (for XCSE - locking without power) Suffix ED ◊

Switch Terminals	Wire Color
33	White
34	Black
51	Orange
X1	Red
Ground	Green
E1	Blue
E2	White with Black tracer/stripe
Jumper between 52 and 21 (installed by Schneider Electric)	
Jumper between 22 and X2 (installed by Schneider Electric)	
Jumper between 34 and X3 (installed by Schneider Electric)	

7 Pin: (for XCSE) Suffix EE

Switch Terminals	Wire Color
21	Orange
22	Red
51	White
52	Black
Ground	Green
E1	Blue
E2	White with Black tracer/stripe

7 Pin: (for XCSE) Suffix EF

Switch Terminals	Wire Color
21	White
22	Black
51	Orange
52	Red
Ground	Green
E1	Blue
E2	White with Black tracer/stripe

9 Pin: (for XCSE) Suffix GA ◊

Switch Terminals	Wire Color
13	Orange
14	Red
21	White
22	Black
Ground	Green
51	Red with Black tracer/stripe
52	Green with Black tracer/stripe
E1	Blue
E2	White with Black tracer/stripe

9 Pin: (for XCSE) Suffix GB ◊

Switch Terminals	Wire Color
13	White
14	Black
21	Orange
22	Red
Ground	Green
51	Red with Black tracer/stripe
52	Green with Black tracer/stripe
E1	Blue
E2	White with Black tracer/stripe

9 Pin: (for XCSE) (Locking with Power) Suffix GC

Switch Terminals	Wire Color
31	Orange
32	Red
21	White
22	Black
Ground	Green
43	Red with Black tracer/stripe
44	Green with Black tracer/stripe
E1	Blue
E2	White with Black tracer/stripe

9 Pin: (for XCSE) (Locking without Power) Suffix GD

Switch Terminals	Wire Color
31	Orange
32	Red
21	White
22	Black
Ground	Green
51	Red with Black tracer/stripe
52	Green with Black tracer/stripe
E1	Blue
E2	White with Black tracer/stripe

◊ Not for XCSDevices with all N.C. contacts. Device must have at least 1 N.O. contact.
More connector versions are available on the the previous page.

Safety detection solutions

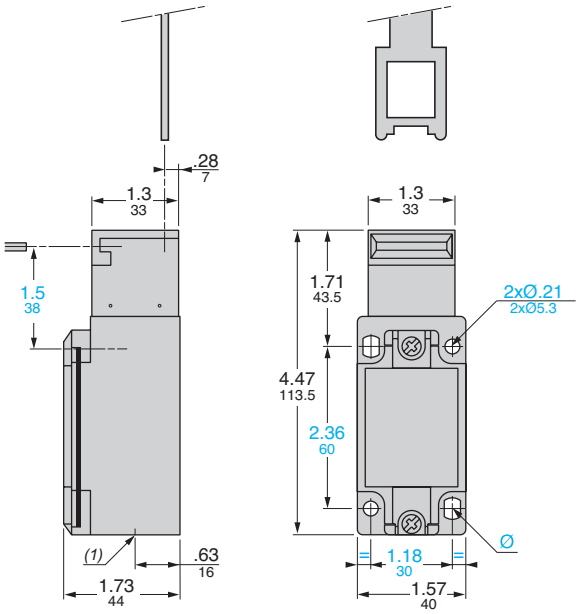
Safety interlock switches, actuator operated

Metal, turret head, types XCSA, XCSB, XCSC and XCSE

Dimensions

Safety interlock switches

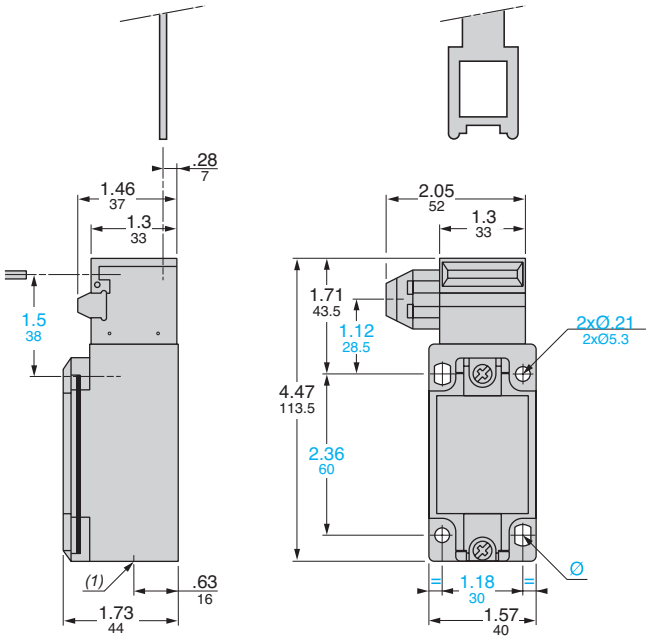
XCSA●●●



(1) 1/2" NPT conduit entry

Ø: 2 elongated holes Ø 5.3 x 7.3

XCSB●●●, XCSC●●●

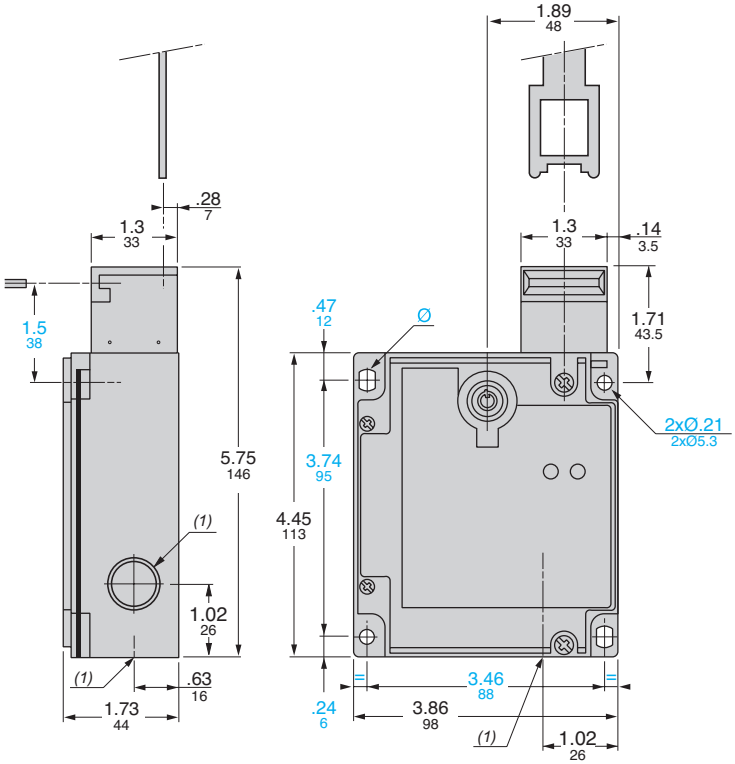


(1) 1/2" NPT conduit entry

Ø: 2 elongated holes Ø 5.3 x 7.3

Safety interlock switches

XCSE●●●●

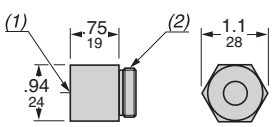


(1) 1/2" NPT conduit entry

Ø: 2 elongated holes Ø 5.3 x 7.3

M20 x 1.5 adaptor

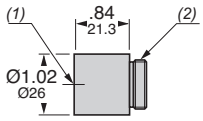
DE9 RA13520



(1) M20 x 1.5 tapped entry
(2) Pg 13.5 threaded shank

1/2" NPT conduit adaptor

DE9 RA2012

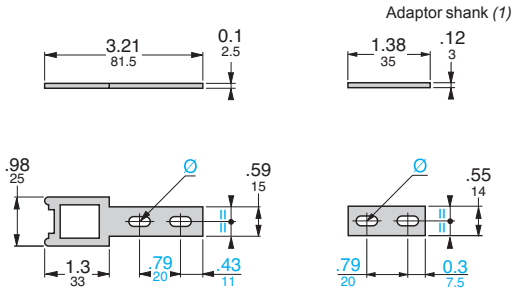


(1) Tapped entry for 1/2" NPT conduit
(2) M20 x 1.5 threaded shank

Dual Dimensions: INCHES / Millimeters

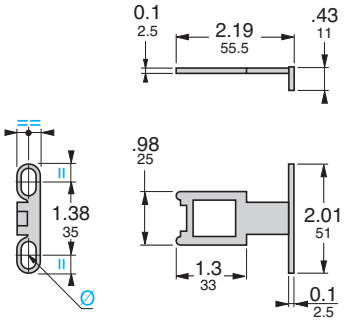
Dimensions (continued)

XCS Z01



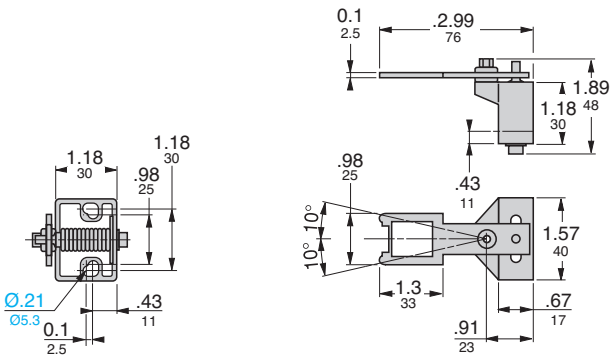
(1) Adaptor (included with actuator XCS Z01) for replacing, without drilling additional mounting hole, a safety interlock switch XCK J with actuating key ZCK Y07 by an XCSA, B, C or E with actuating key XCS Z01.

XCS Z02



Ø: 2 elongated holes Ø 5.3 x 10

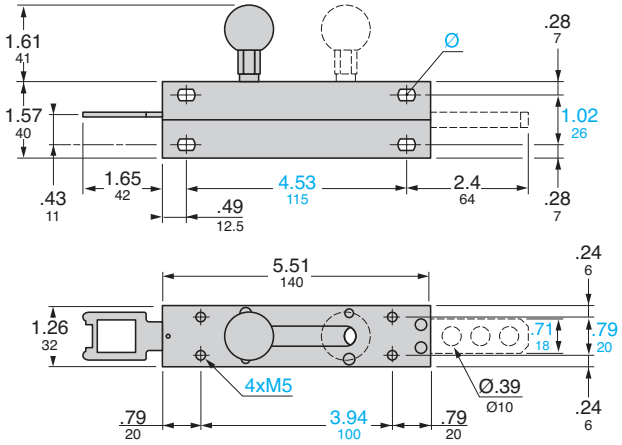
XCS Z03



Mounting axis % related to actuator.

Ø: 2 elongated holes Ø 5.3 x 10

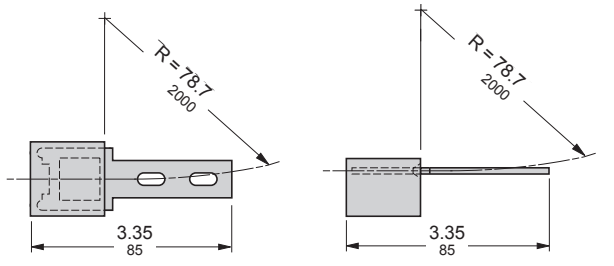
XCS Z05



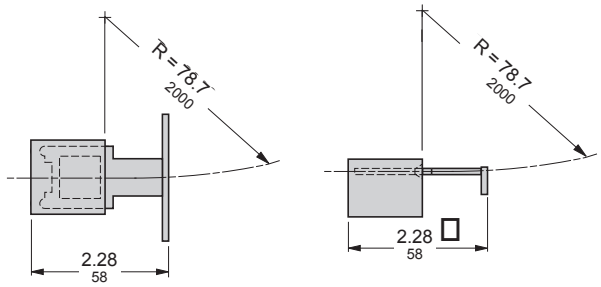
Ø: 4 elongated holes Ø 5.3 x 7.3

Operating radius required for actuator

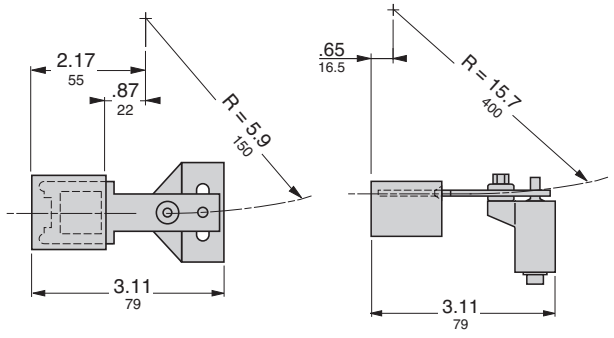
XCS Z01



XCS Z02



XCS Z03



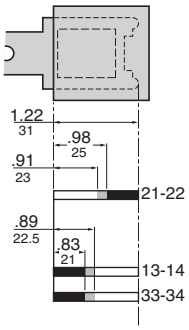
Dual Dimensions: INCHES / Millimeters

R = minimum radius

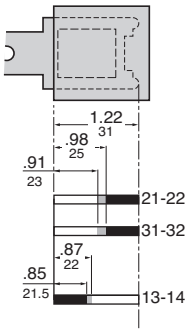
Safety detection solutions
Safety interlock switches, actuator operated
Metal, turret head, types XCSA, XCSB, XCSC and XCSE

Functional diagrams

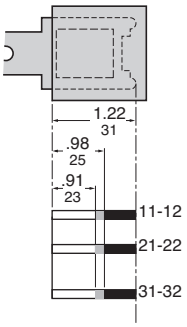
XCS ●5●●●



XCS ●7●●●



XCS ●8●●●



Contact operation

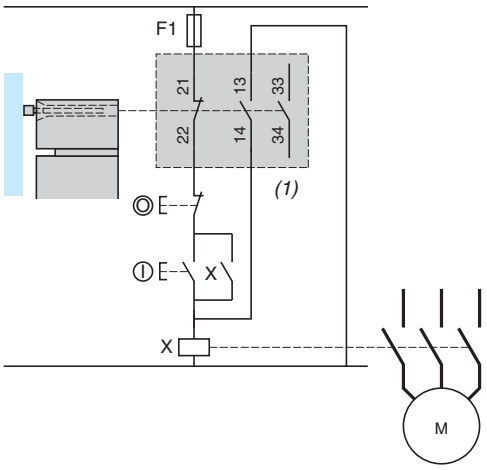
- Contact closed
- Contact open
- Contact in transition

Dual Dimensions: INCHES / Millimeters

Wiring diagrams
Note: These diagrams are given as examples only, the designer must refer to the relevant safety standards for guidance

Wiring to category 1 conforming to EN 954-1/ ISO 13849-1

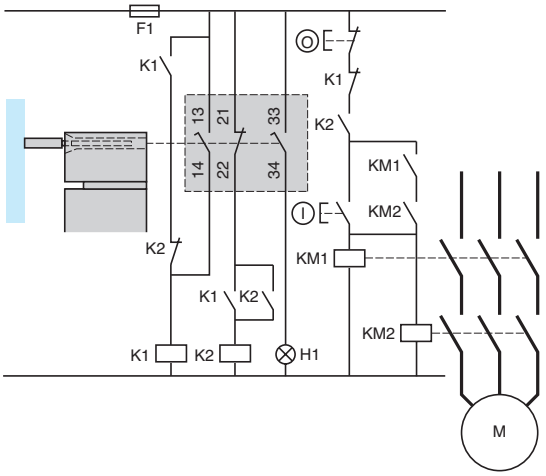
Example with 3-pole N.C. + N.O. + N.O. contact and protection fuse to prevent jumpering of the N.C. contact, either by cable damage or by tampering.



(1) Signalling contact

Wiring to category 3 conforming to EN 954-1/ISO 13849-1

Example with 3-pole N.C. + N.O. + N.O. contact with mixed redundancy of the contacts and the associated control relays. To activate K1, it is necessary to remove and re-insert the actuating key when the supply is switched on.

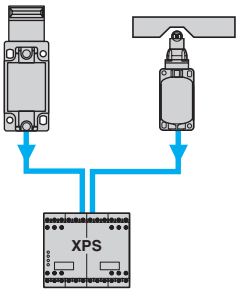


H1: "actuating key not inserted" indicator

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Wiring method used in conjunction with Preventa™ safety module
(The guard switch should be used in conjunction with a safety limit switch to give electrical/mechanical redundancy)

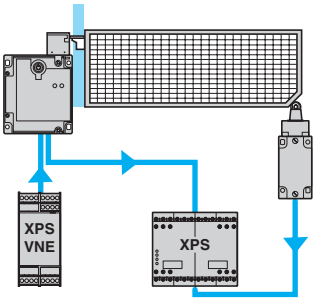
Method for machines with quick rundown time (low inertia)

Locking or interlocking device based on the principle of redundancy and self-monitoring.
The safety modules ensure these functions.



Locking of actuating key and operation in positive mode associated with a safety module.

Method for machines with long rundown time (high inertia)

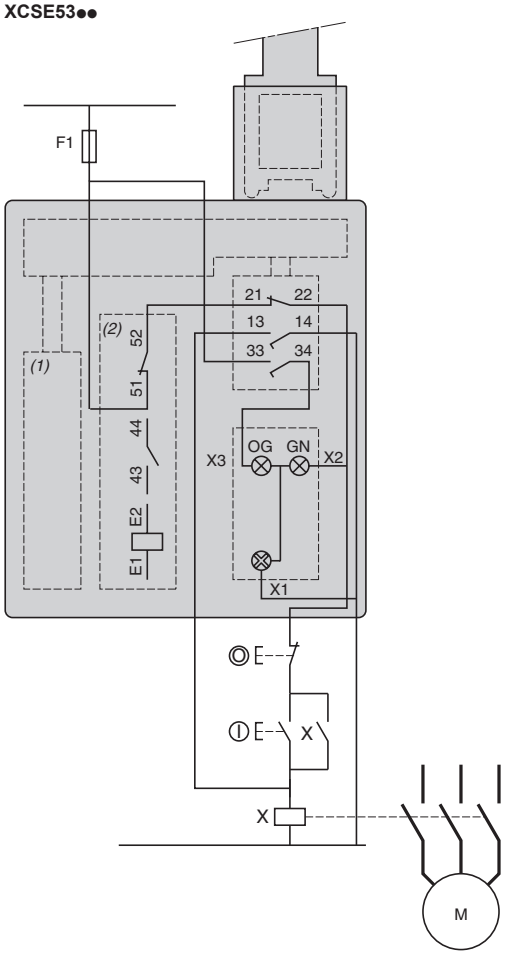


Interlocking device for actuating key mounted on guard and zero speed detection.

Wiring to category 1 conforming to EN 954-1/ISO 13849-1
Wiring examples with protective fuse to prevent jumpering of the N.C. contact, either by cable damage or by tampering.

Locking without power, N.C. + N.O. + N.O.

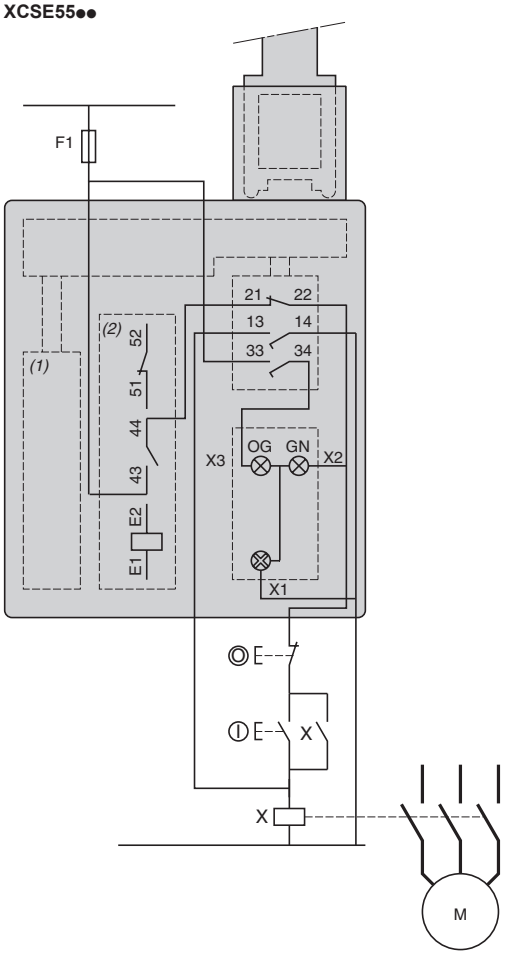
XCSE53●●



(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
43-44: Solenoid signalling contact
13-14: Safety contact, available for redundancy
33-X1: LED (orange): actuating key withdrawn
51-X1: LED (green): actuating key inserted and locked
21-52: Safety pre-wiring provided

Locking with power, N.C. + N.O. + N.O.

XCSE55●●



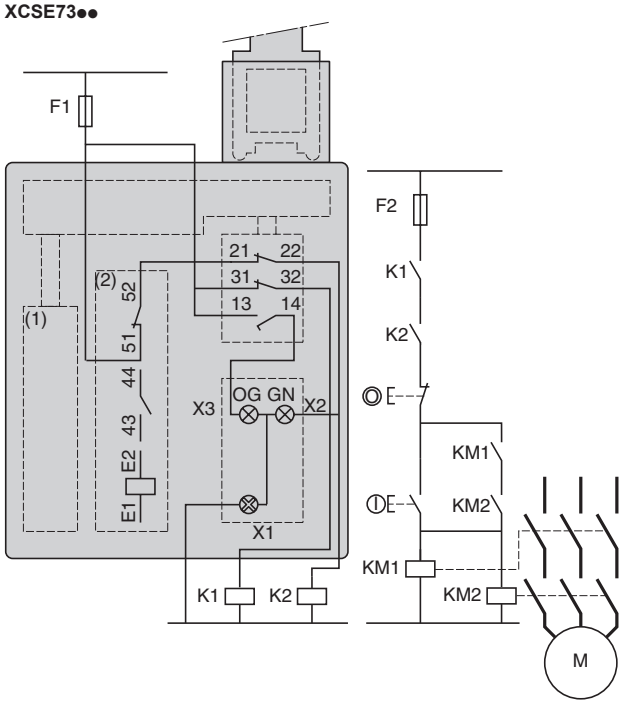
(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
51-52: Solenoid signalling contact
13-14: Safety contact, available for redundancy
33-X1: LED (orange): actuating key withdrawn
43-X1: LED (green): actuating key inserted and locked
21-44: Safety pre-wiring provided

Note: *These wiring diagrams are given as examples only, the designer must refer relevant safety standards for guidance.*

Wiring to category 3 conforming to EN 954-1/ISO 13849-1
Wiring examples with redundancy for the switch contacts, without monitoring or redundancy in the power circuit

Locking without power, N.C. + N.C. + N.O.

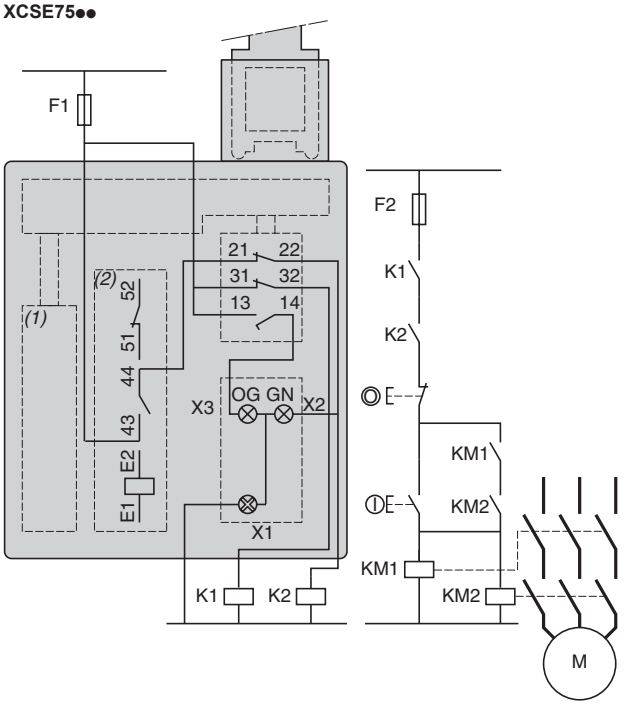
XCSE73●●



(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
43-44: Solenoid signalling contact
21-22 and 31-32: Safety contacts, available for redundancy
13-X1: LED (orange): actuating key withdrawn
51-X1: LED (green): actuating key inserted and locked
21-52: Safety pre-wiring provided

Locking without power, N.C. + N.C. + N.O.

XCSE75●●

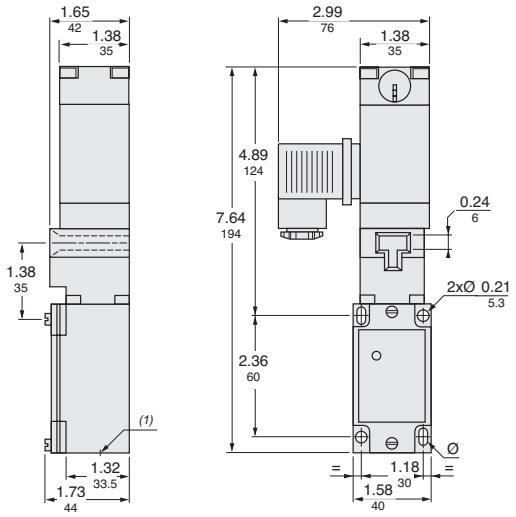


(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
51-52: Solenoid signalling contact
21-22 and 31-32: Safety contacts, available for redundancy
13-X1: LED (orange): actuating key withdrawn
43-X1: LED (green): actuating key inserted and locked
21-44: Safety pre-wiring provided

Safety detection solutions
Safety interlock switches, actuator operated
Metal, fixed head, type XCSL

Metal, turret head, type XCSL dimensions

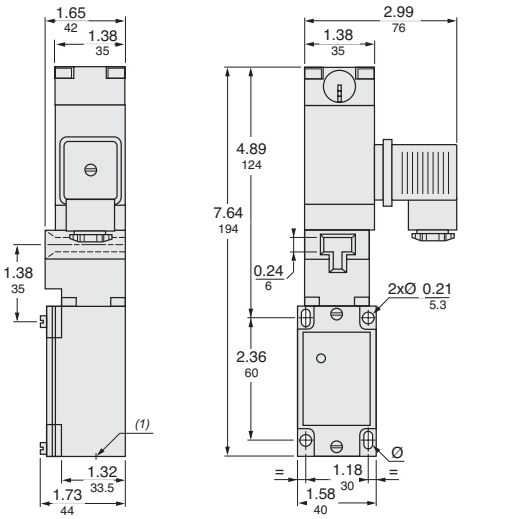
XCSL•66••



Ø: 2 elongated holes Ø 0.21 x 0.29 (5.3 x 7.3)

(1) 1 tapped entry for 1/2" NPT conduit entry

XCSL•64••



Ø: 2 elongated holes Ø 0.21 x 0.29 (5.3 x 7.3)

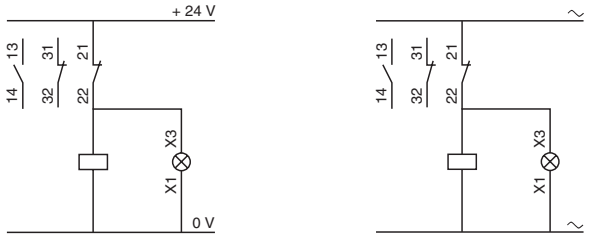
(1) 1 tapped entry for 1/2" NPT conduit entry

Dual Dimensions: INCHES Millimeters

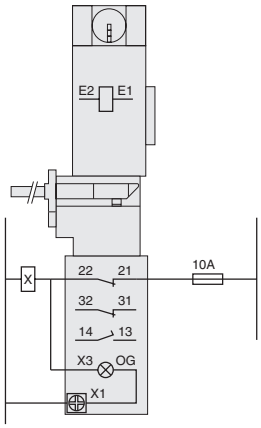
Wiring Diagrams

Wiring diagram example using a 3-pole N.C. + N.C. + N.O. safety interlock switch
LED wiring
Shown with actuating key inserted

LED, 24 Vac	LED, 110/120 Vac or 220/240 Vac



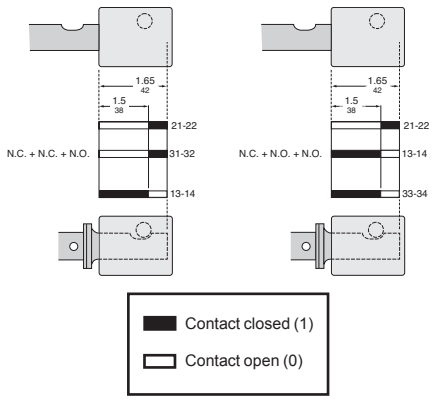
Recommended wiring diagram
Locking with and without power



Contact Status Relative to Actuating Key Position

Function Diagrams

N.C. + N.C. + N.O.	N.C. + N.O. + N.O.

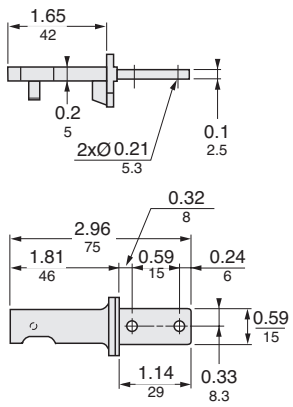


Dual Dimensions: INCHES Millimeters

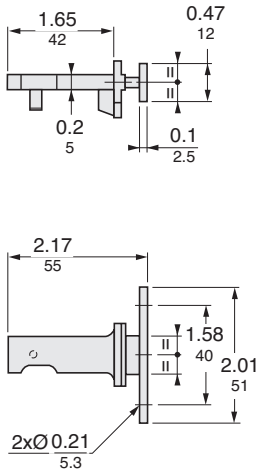
Actuating Keys for Metal, Turret Head, Type XCSL

Actuating Keys

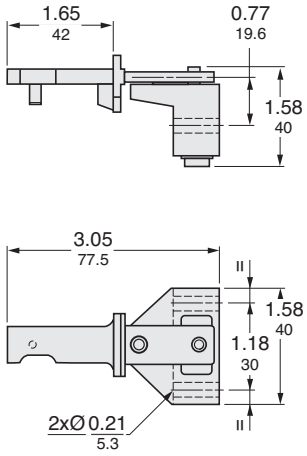
ZCKY071



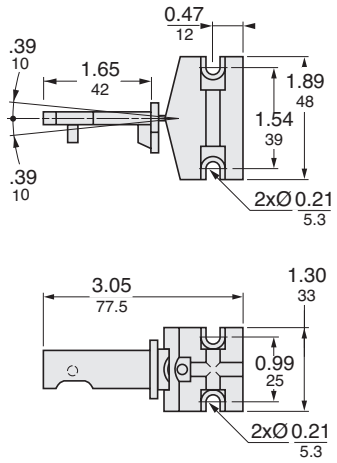
ZCKY081



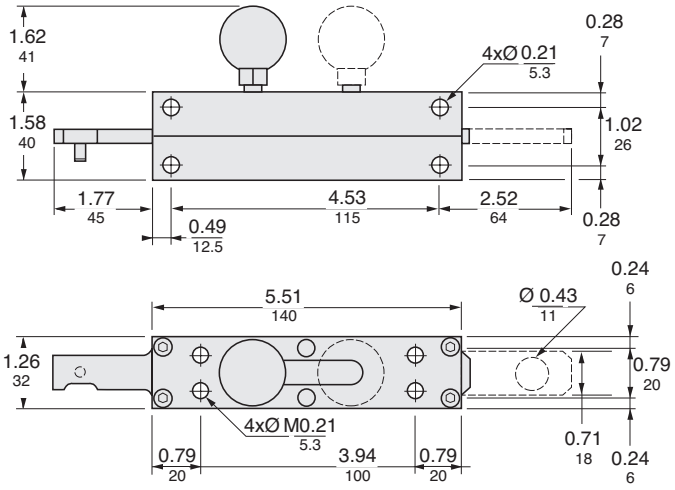
ZCKY091



ZCKY061



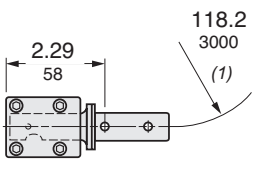
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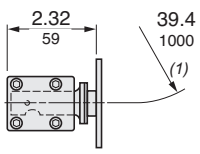
Operating radius required for actuating key

Horizontal mounting

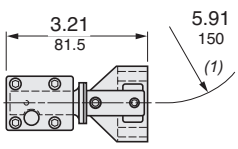
ZCKY071



ZCKY081



ZCKY091

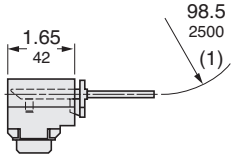


ZCKY101

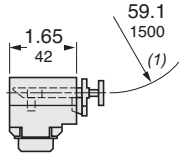


Vertical mounting

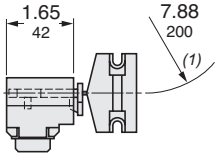
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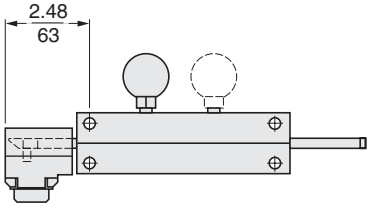
ZCKY081



ZCKY061



ZCKY101



(1) For mounting the actuating key on hinged guards (minimum radius)

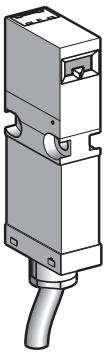
Dual Dimensions: INCHES / Millimeters

Safety detection solutions

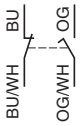
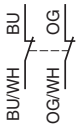
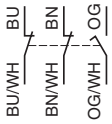
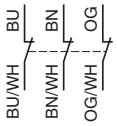
Safety interlock switches, actuator operated

Plastic, double insulated, fixed head, type XCS MP
Pre-cabled, length 6.6, 16.4, or 32.8 ft (2, 5, or 10 m)

Type of switch	Without locking of actuating key



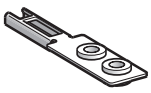
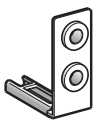
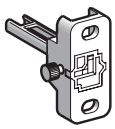
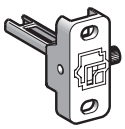
References of switches without actuating key (⊖ N.C. contact with positive opening operation) *(1)*

2-pole N.C. + N.O. **break before make, slow break** *(2)* 6.6 ft (2m) cable (3)		**XCS MP59L2** ⊖
2-pole N.C. + N.C. **slow break** *(2)* 6.6 ft (2m) cable (3)		**XCS MP79L2** ⊖
3-pole N.C. + N.C. + N.O. **break before make, slow break** *(2)* 6.6 ft (2m) cable (3)		**XCS MP70L2** ⊖
3-pole N.C. + N.C. + N.C. **slow break** *(2)* 6.6 ft (2m) cable (3)		**XCS MP80L2** ⊖
Weight oz (kg)	3.880 (0.110)	

Complementary characteristics not shown under general characteristics (page 3/22 and 3/23)

Actuation speed	Maximum: 59 in./s (1.5 m/s), minimum: 2 in./s (0.05 m/s)
Resistance to forcible withdrawal of actuating key	1.8 lbs. (8 N)
Connection	Pre-cabled, 4 x 20 AWG (0.5 mm²) or 6 x 20 AWG (0.5 mm²)
Maximum operating rate	For maximum life: 1200 operating cycles per hour
Minimum force for extraction of key	1.8 lbs. (8 N)

References of actuating keys

Description	Straight key	Right-angled key	Pivoting key For right-hand door	Pivoting key For left-hand door
				
For switches XCS MP	**XCS Z81**	**XCS Z84**	**XCS Z83**	**XCS Z85**
Weight oz (kg)	0.529 (0.015)	0.882 (0.025)	2.998 (0.085)	2.998 (0.085)

Spare parts

Description	Unit reference	Weight oz (kg)
Blanking plugs (Sold in lots of 10)	**XCS Z29**	0.176 (0.005)

(1) Blanking plug for operating head slot included with switch
(2) Schematic diagrams shown represent the contact states while the operating key is inserted in the head of the switch.
(3). Part numbers shown have a 6.6 ft. (2 m) cable. Other cable lengths are available: replace the 2 at the end of the part number with 5 for a 16.4 ft. (5m) cable, or with 10 for a 32.8 ft. (10 m) cable.
*Example: XCSMP59L**2** becomes XCSMP59L**10** for a switch with a 32.8 ft. (10 m) long cable.*

Principle: page 3/7 | Characteristics: page 3/22 | References: page 3/40 | Dimensions: page 3/41 | Wiring Diagrams: page 3/43

Safety detection solutions

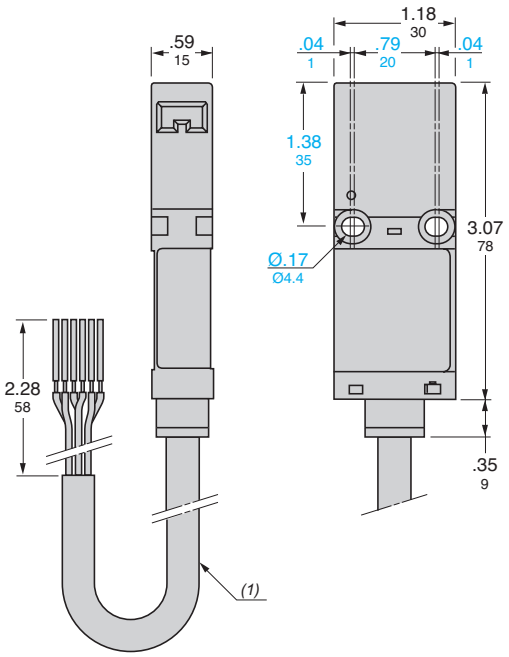
Safety interlock switches, actuator operated

Plastic, double insulated, fixed head, type XCS MP

Pre-cabled, length 6.6, 16.4, or 32.8 ft (2, 5, or 10 m)

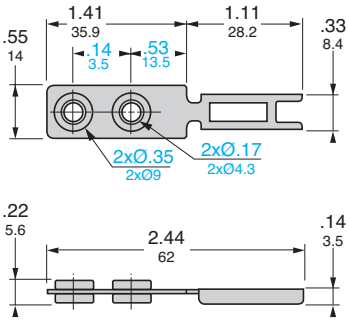
Dimensions

XCS MP

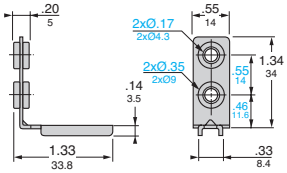


(1) Ø 0.29 in (7.6 mm); length 6.6, 16.4, or 32.8 ft (2, 5, or 10 m).

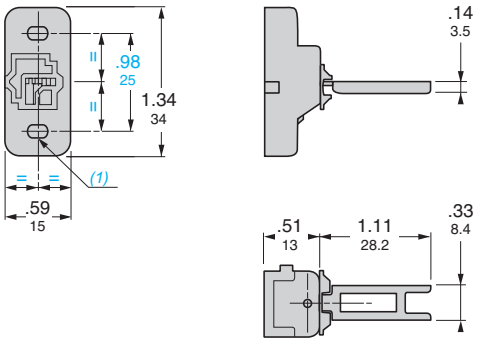
XCS Z81



XCS Z84

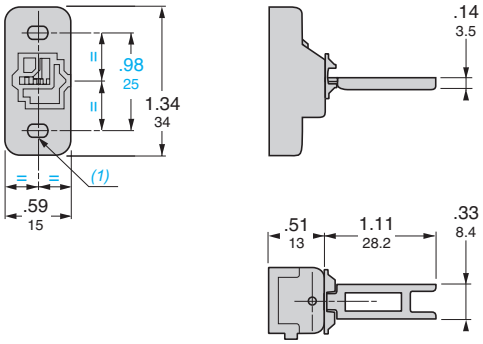


XCS Z83



(1) 2 elongated holes Ø 4.2 x 6.

XCS Z85



(1) 2 elongated holes Ø 4.2 x 6.

Dual Dimensions: INCHES / Millimeters

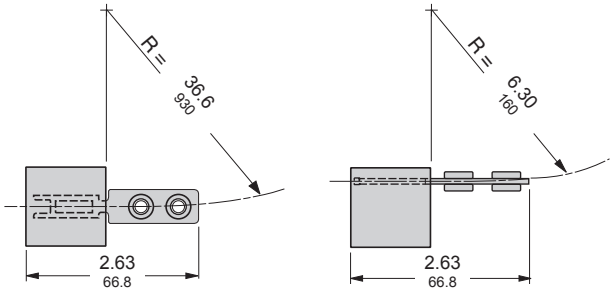
Safety detection solutions

Safety interlock switches, actuator operated

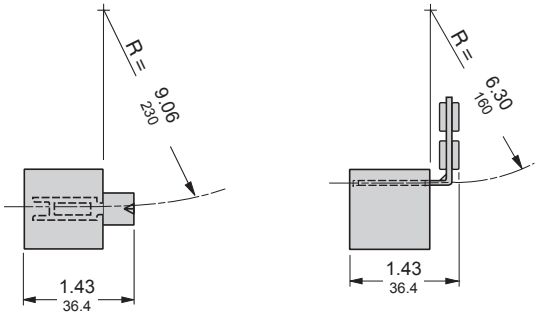
Plastic, double insulated, fixed head, type XCS MP
Pre-cabled, length 6.6, 16.4, or 32.8 ft (2, 5, or 10 m)

Operating radius required for key

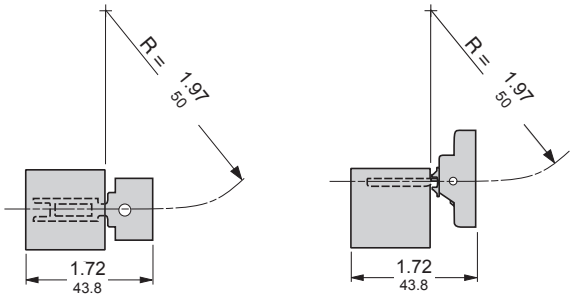
XCS Z81



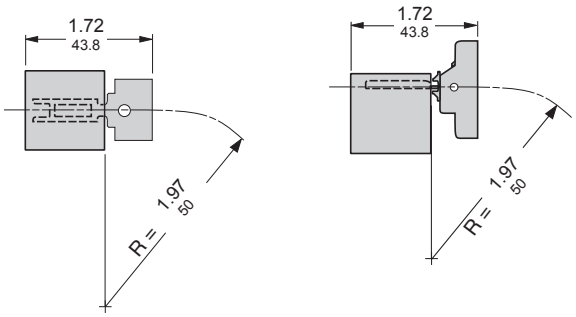
XCS Z84



XCS Z83

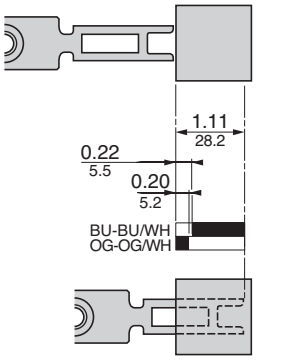


XCS Z85

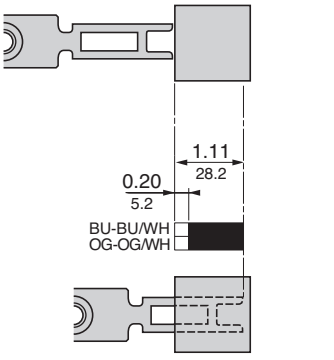


Functional diagrams

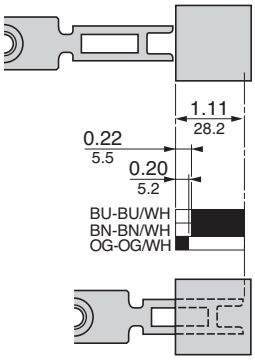
XCS MP59●



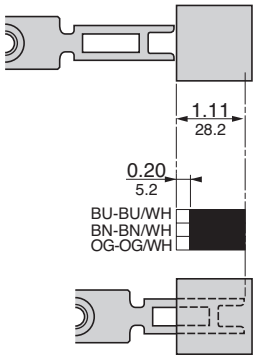
XCS MP79●



XCS MP70●



XCS MP80●



Contact operation

Contact closed
Contact open

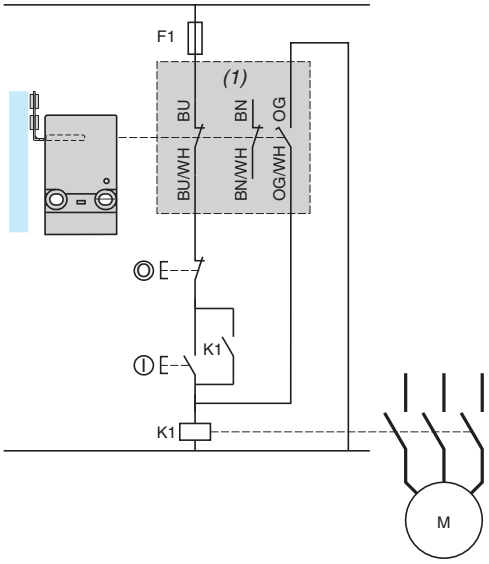
Dual Dimensions: INCHES / Millimieters

Safety detection solutions
Safety interlock switches, actuator operated
Plastic, double insulated, fixed head, type XCS MP
Pre-cabled, length 6.6, 16.4, or 32.8 ft (2, 5, or 10 m)

Wiring diagrams

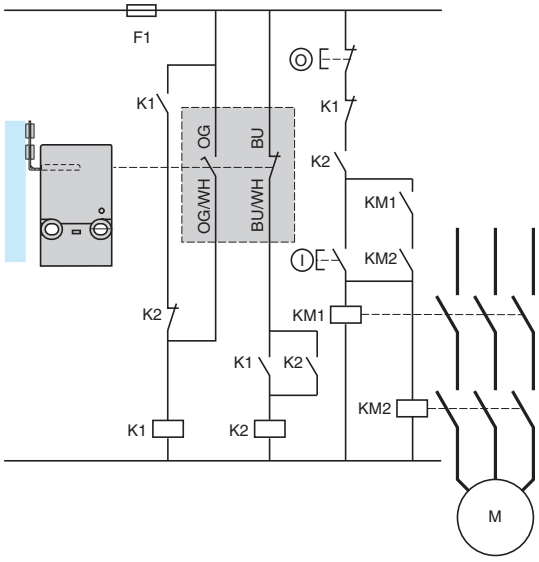
Wiring to category 1 conforming to EN 954-1/ ISO 13849-1

Example with 3-pole N.C. + N.C. + N.O. contact and protective fuse to prevent jumpering of the N.C. contact, either by cable damage or by tampering.



Wiring to category 3 conforming to EN 954-1/ISO 13849-1

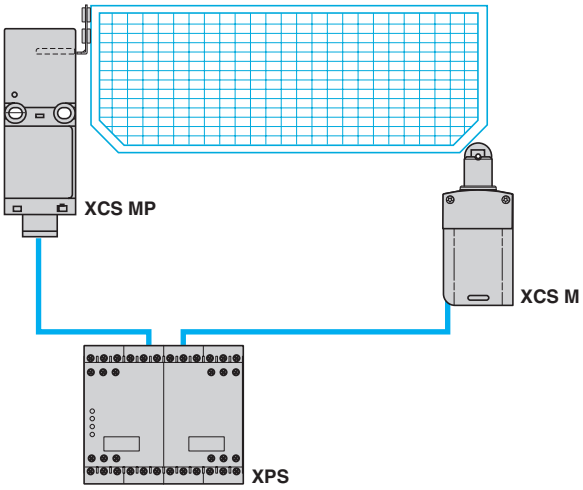
Example with 2-pole N.C. + N.O. contact with mixed redundancy of the contacts and the associated control relays.
Actuating key withdrawal and re-insertion necessary on power-up, in order to activate K1.



(1) Signalling contact

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Wiring method used in conjunction with Preventa™ safety relay (the keyed safety interlock switch is generally used in conjunction with a safety limit switch)

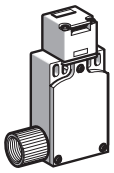
Method for machines with quick rundown time (low inertia)
Locking or interlocking mechanism uses the principles of redundancy and autocheck.
The safety relays help to ensure these functions.



Locking by actuating key and actuation in positive mode associated with a safety relay module

Safety detection solution

Safety interlock switches, actuator operated
Plastic, turret head *(1)*, types XCSPA, XCSTA and XCSTE
Conduit entries tapped 1/2" NPT

Type of switch		Without locking of actuator			
					
References of switches without actuating key (⊖ **N.C. contact with positive opening operation)**					
2-pole N.C. + N.O. *(2)* break before make slow break		**XCSPA593**	⊖	–	
2-pole N.O. + N.C. *(2)* make before break slow break		**XCSPA693**	⊖	–	
2-pole N.C. + N.C. *(2)* *slow break*		**XCSPA793**	⊖	–	
3-pole N.C. + N.O. + N.O. *(2)* (2 N.O. staggered) slow break		–		**XCSTA593**	⊖
3-pole N.C. + N.C. + N.O. *(2)* (N.O. staggered) slow break		–		**XCSTA793**	⊖
3-pole N.C. + N.C. + N.C. *(2)* slow break		–		**XCSTA893**	⊖
Weight oz (kg)		3.880 (0.110)		5.644 (0.160)	

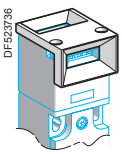
Complementary characteristics not shown under General characteristics (pages 3/22 and 3/23)

Actuation speed	Maximum: .19.6 in./s(0.5 m/s), minimum: 0.39 in./s (0.01 m/s)
Resistance to forcible withdrawal of actuator	**XCSPA**, **XCSTA**: 2.3 lbs (10 N) (11.3 lbs (50 N) using actuators **XCSZ12** or **XCSZ13** together with guard retaining device **XCSZ21**) **XCSTE**: 112 lbs (500 N)
Maximum operating rate	For maximum life: 600 operating cycles per hour
Minimum force for positive opening	3.4 lbs (15 N)
Cable entry	**XCSPA**: 1 entry tapped for 1/2" NPT (USAS B2-1) conduit. **XCSTE**: 1 entry tapped 11 mm and fitted with metal adaptor DE9 RA1012 for 1/2" NPT (USAS B2-1) conduit. **XCSTA**: 2 entries tapped 11 mm, 1 fitted with metal adaptor DE9 RA1012 for 1/2" NPT (USAS B2-1) conduit. Second entry fitted with blanking plug.
Materials	Body: zamak. Head: zamak. Safety screws: 5-lobe torque. Protective plate: steel.

References of accessories



XCSZ91



XCSZ200

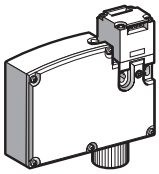
Description	For use with	Unit reference	Weight oz (kg)
Blanking plugs for operating head slot (Sold in lots of 10)	XCSPA, XCSTA, XCSTE	**XCSZ28**	1.764 (0.050)
Tool for forced opening of interlocking device (Sold in lots of 10)	XCSTE	**XCSZ100**	1.764 (0.050)
Padlocking device to prevent insertion of actuator, for up to 3 padlocks (padlocks not included)	XCSPA, XCSTA, XCSTE	**XCSZ91**	1.870 (0.053)
Actuator centering device *(3)* (Mounting screws included)	XCSPA, XCSTA, XCSTE	**XCSZ200**	0.776 (0.022)

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) Wiring diagrams shown represent the contact states while the actuating key is inserted in the head of the switch.
(3) Do not use with XCSZ91.

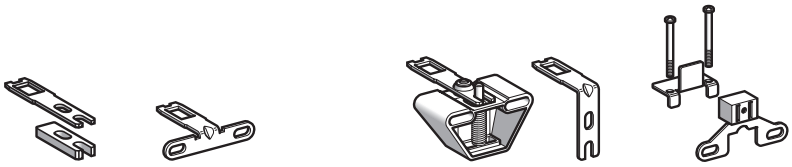
The devices listed above are threaded for 1/2" NPT (using the supplied adaptor on the XCSTA), and are available with metric conduit:
- To order devices tapped for 11 mm cable gland, conforming to NFC 68-300 (DIN Pg 11): Change the last character in the part number to 1. For example: XCSPA59**3** is changed to XCSPA59**1**
- To order devices tapped for M16 x 1.5 for ISO cable gland: Change the last character in the part number to 2. For example: XCSPA59**3** is changed to XCSPA59**2**

Safety detection solutions

Safety interlock switches, actuator operated
Plastic, turret head *(1)*, types XCSPA, XCSTA and XCSTE
Conduit entries tapped for 1/2" NPT

Type of switch	With interlocking, locking by solenoid		
			
Type of interlocking	**Locking without power and unlocking on energization of solenoid** *(2)*. To order a guard switch with locking with power and unlocking on de-energization of the solenoid, replace the 2nd number *(3)* by **5** in the references shown below. Example: **XCSTE5313** becomes **XCSTE5513.**		
Supply voltage of solenoid	∿ or ⎓ 24 V (50/60 Hz on ∿)	∿ or ⎓ 120 V (50/60 Hz on ∿)	∿ or ⎓ 230 V (50/60 Hz on ∿)
References of switches without actuating key (⊖ **N.C. contact with positive opening operation)**			
2-pole N.C. + N.O. *(3)* break before make slow break 	**XCSTE5313** ⊖	**XCSTE5333** ⊖	**XCSTE5343** ⊖
2-pole N.O. + N.C. *(3)* make before break slow break 	**XCSTE6313** ⊖	**XCSTE6333** ⊖	**XCSTE6343** ⊖
2-pole N.C. + N.C. *(3)* slow break 	**XCSTE7313** ⊖	**XCSTE7333** ⊖	**XCSTE7343** ⊖
Weight oz (kg)	12.7 (0.360)	12.7 (0.360)	12.7 (0.360)
Solenoid characteristics			
Load factor	100 %		
Rated operational voltage	∿ **or** ⎓ **24 V**	∿ **or** ⎓ **120 V**	∿ **or** ⎓ **230 V**
Voltage limits	- 20%, + 10% of the rated operational voltage (including ripple on ⎓) conforming to EN/IEC 60947-1		
Service life	20,000 hours		
Power power consumption	10 VA max.		

References of actuating keys and guard retaining device



Description	Straight actuator	Actuator with wide mounting *(5)*		Pivoting actuator	Right-angled actuator	Guard retaining device *(4)*
For interlock switches XCSPA, TA, TE	**XCSZ11**	**XCSZ12**	**XCSZ15**	**XCSZ13**	**XCSZ14**	**XCSZ21**
Weight oz (kg)	0.5 (0.015)	0.5 (0.015)	0.4 (0.012)	3.0 (0.085)	0.9 (0.025)	2.8 (0.080)

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) A special tool included with the guard switch enables forced opening of the interlocking mechanism, by authorized personnel, allowing withdrawal of the actuating key and subsequent opening of the N.C. safety contacts.
(3) Wiring diagrams shown represent the contact states while the actuating key is inserted in the head of the switch.
(4) Only for use with guard interlock switches XCSPA and XCSTA (without the actuator centering device XCSZ200), used in conjunction with actuators XCSZ12, XCSZ13 or XCSZ15.
(5) 2 actuator lengths, XCSZ12: L = 1.57 in (40 mm), XCSZ15: L = 1.14 in (29 mm).

The devices listed above are threaded for 1/2" NPT (using the supplied adaptor on the XCSTA), and are available with metric conduit:
- To order devices tapped for 11 mm cable gland, conforming to NFC 68-300 (DIN Pg 11): Change the last character in the part number to 1. For example: XCSTE5313 is changed to XCSTE5311
- To order devices tapped for M16 x 1.5 for ISO cable gland: Change the last character in the part number to 2. For example: XCSTE5313 is changed to XCSTE5312.

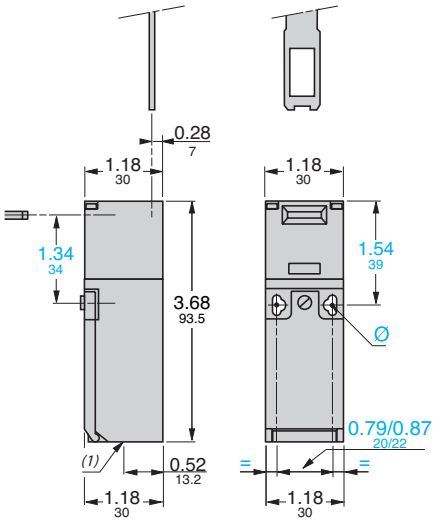
Safety detection solutions

Safety interlock switches, actuator operated

Plastic, turret head, types XCSPA, XCSTA and XCSTE

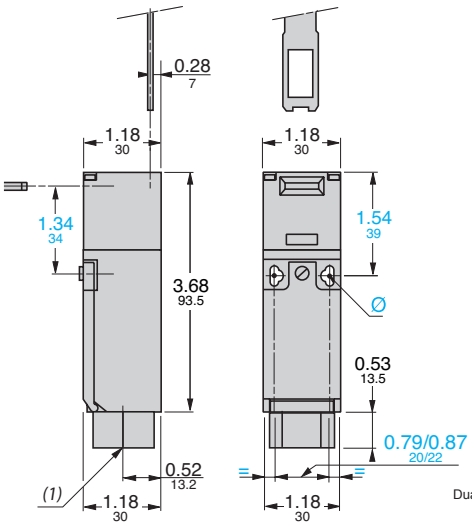
Dimensions

XCSPA•91, XCSPA•92



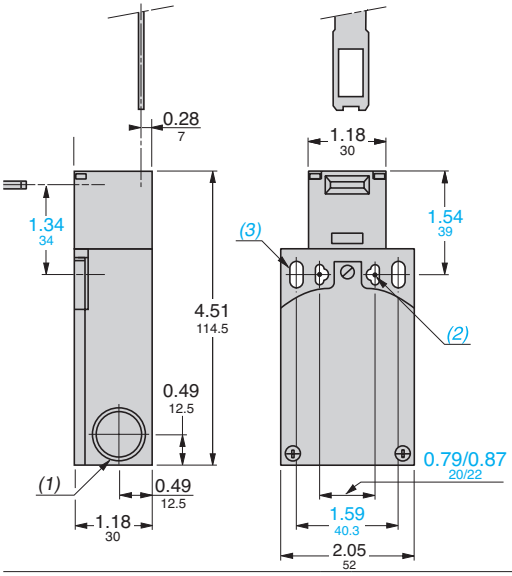
(1) 1 tapped entry for cable gland
Ø: 2 elongated holes Ø 0.17 x 0.33 in (4.3 x 8.3 mm) on 0.87 in (22 mm) centers, 2 holes Ø 0.17 in (4.3 mm) on 0.79 in (20 mm) centers

XCSPA•93



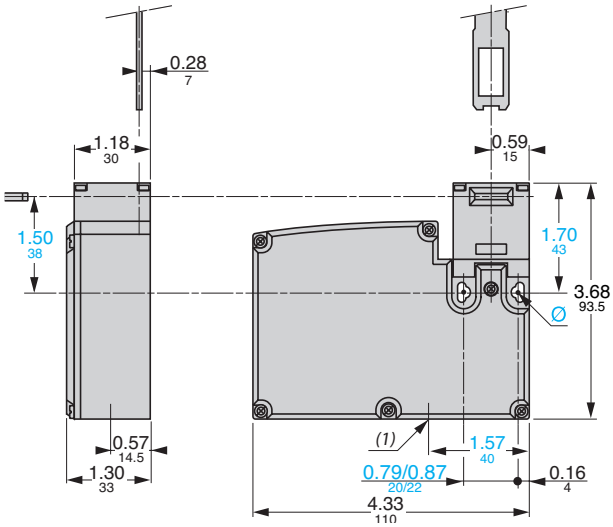
(1) 1 tapped entry for 1/2" NPT conduit
Ø: 2 elongated holes Ø 0.17 x 0.33 in (4.3 x 8.3 mm) on 0.87 in (22 mm) centers, 2 holes Ø 0.17 in (4.3 mm) on 0.79 in (20 mm) centers

XCSTA•9•



(1) 2 tapped entries for cable gland or 1/2" NPT conduit adaptor
(2) 2 elongated holes Ø 0.17 x 0.33 in (4.3 x 8.3 mm) on 0.87 in (22 mm) centers, 2 holes Ø 0.17 in (4.3 mm) on 0.79 in (20 mm) centers
(3) 2 elongated holes Ø 0.21 x 0.52 in (5.3 x 13.3 mm)

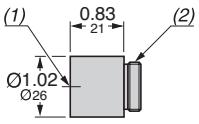
XCSTE••••



(1) 1 tapped entry for cable gland or 1/2" NPT conduit adaptor
Ø: 2 elongated holes Ø 0.17 x 0.33 in (4.3 x 8.3 mm) on 0.87 in (22 mm) centers, 2 holes Ø 0.17 in (4.3 mm) on 0.79 in (20 mm) centers

1/2" NPT conduit adaptor

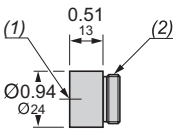
DE9 RA1012



(1) Tapped entry for 1/2" NPT conduit
(2) Pg 11 threaded shank

M16 x 1.5 adaptor

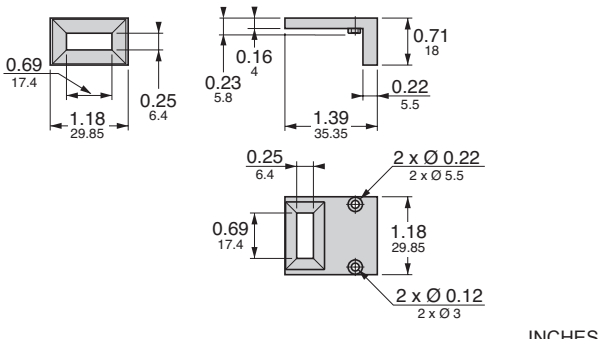
DE9 RA1016



(1) M16 x 1.5 tapped entry
(2) Pg 11 threaded shank

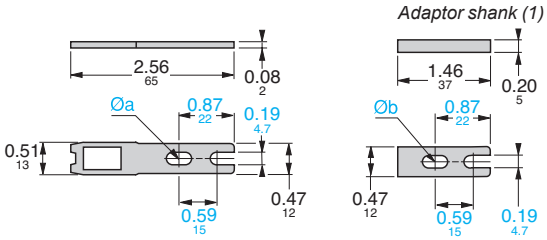
Actuator centering device

XCSZ200



Dimensions (continued)

XCSZ11

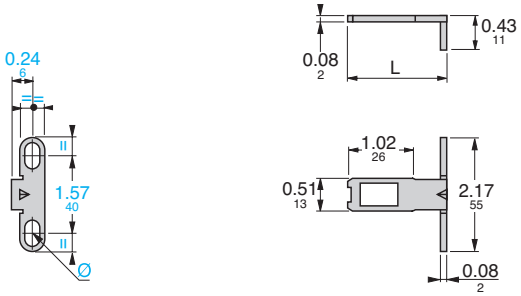


(1) Adaptor (included with actuating key XCSZ11) for replacing, without drilling additional mounting hole, an XCK T with actuating key XCK Y01 by a safety interlock switch XCSTA with actuating key XCSZ11.

Ø a: 2 elongated holes Ø 0.19 x 0.39 in (4.7 x 10 mm)

Ø b: 1 elongated hole for M4 or M4.5 screw

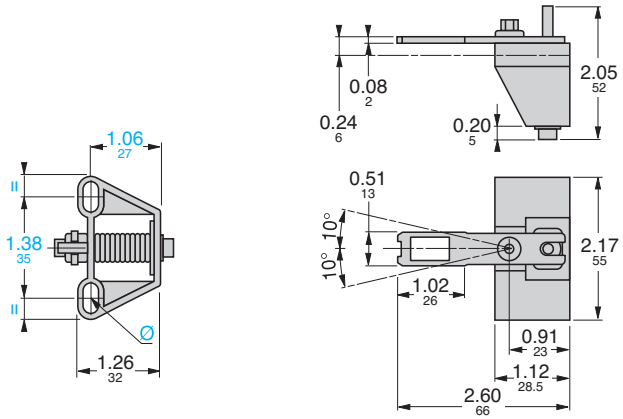
XCSZ12, XCSZ15



Ø: 2 elongated holes Ø 0.19 x 0.39 in (4.7 x 10 mm)

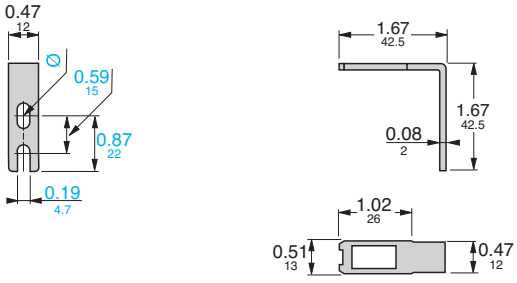
L = 1.57 in (40 mm) (XCSZ12) or 1.14 in (29 mm) (XCSZ15)

XCSZ13



Ø: 2 elongated holes Ø 0.19 x 0.39 in (4.7 x 10 mm)

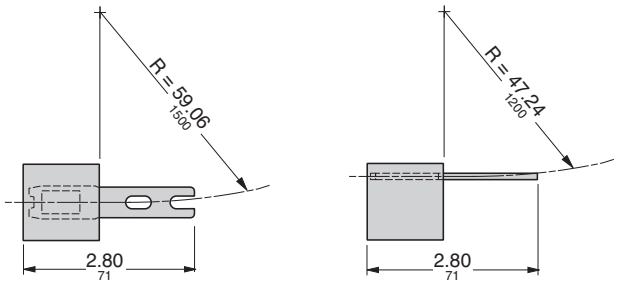
XCSZ14



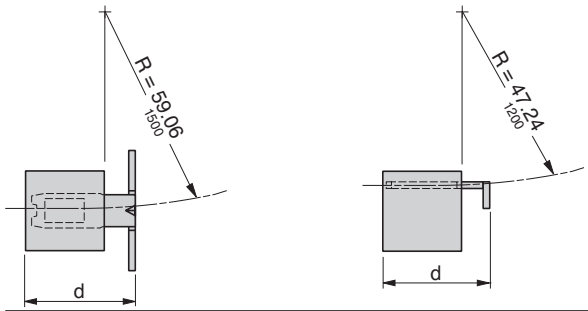
Ø: 1 elongated hole Ø 0.19 x 0.39 in (4.7 x 10 mm)

Operating radius required for actuator

XCSZ11

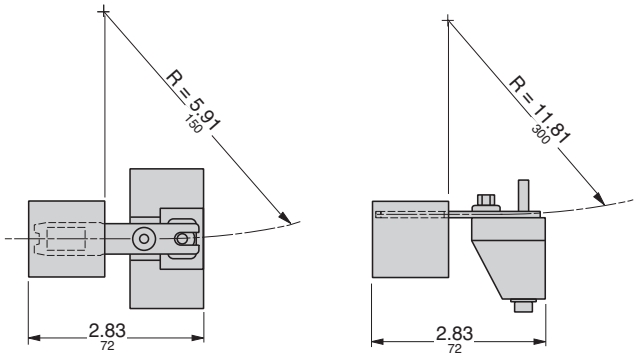


XCSZ12, XCSZ15

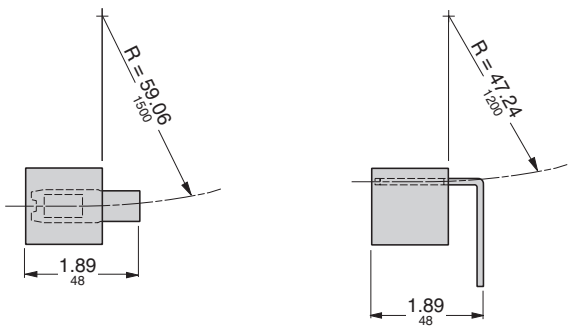


d = 1.81 in (46 mm) (XCSZ12) or 1.38 in (35 mm) (XCSZ15)

XCSZ13



XCSZ14



R = minimum radius

Dual Dimensions: INCHES / Millimeters

Principle: page 3/7 | Characteristics: page 3/22 | References: page 3/44 | Dimensions: page 3/46 | Wiring Diagrams: page 3/48

3

Safety detection solutions

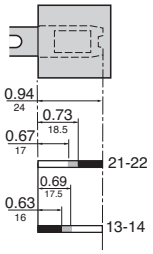
Safety interlock switches, actuator operated

Plastic, turret head, types XCSPA, XCSTA and XCSTE

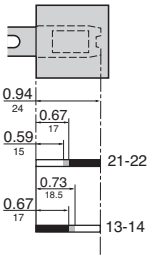
Setting-up

Functional diagrams

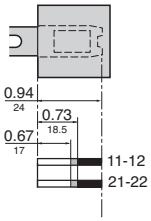
XCSPA5●●, XCSTE5●●●



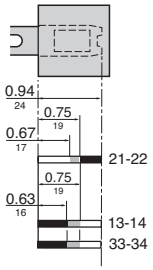
XCSPA6●●, XCSTE6●●●



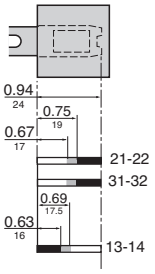
XCSPA7●●, XCSTE7●●●



XCSTA5●●,



XCSTA7●●,



Contact operation

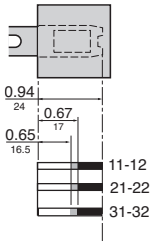
■ Contact closed ☐ Contact open ▨ Contacts in transition

Dual Dimensions: INCHES / Millimieters

Setting-up

Functional diagrams

XCSTA8●●



Contact operation

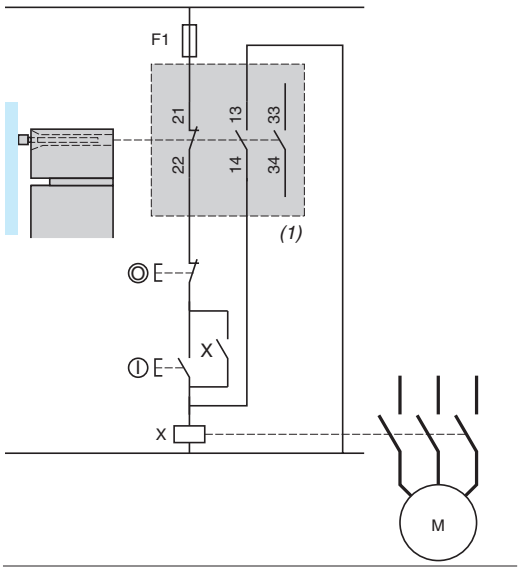
■ Contact closed
☐ Contact open
▨ Contact in transition

Wiring diagrams

Note: These wiring diagrams are given as examples only, the designer must refer to the relevant safety standards for guidance

Wiring to category 1 conforming to EN 954-1/ ISO 13849-1

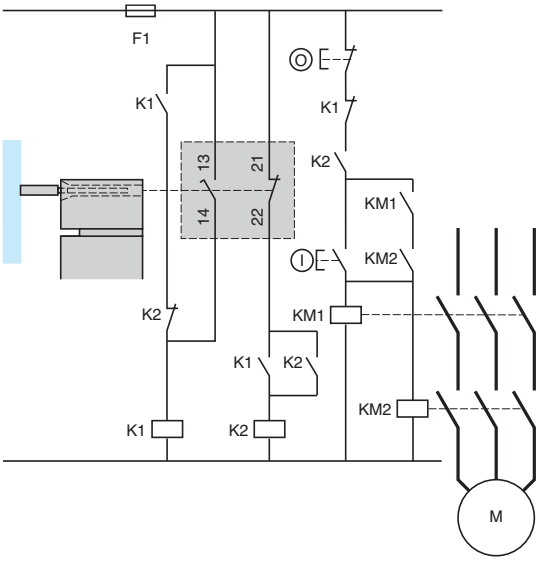
Example with 3-pole N.C. + N.O. + N.O. contact and protection fuse to prevent jumpering of the N.C. contact, either by cable damage or by tampering.



(1) Signalling contact

Wiring to category 3 conforming to EN 954-1/ ISO 13849-1

Example with 2-pole N.C. + N.O. contact with mixed redundancy of the contacts and the associated control relays. To activate K1, it is necessary to remove and re-insert the actuator when the supply is switched on.



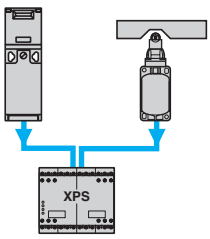
Wiring to category 4 conforming to EN 954-1/ISO 13849-1

Wiring method used in conjunction with safety relay module

(The guard interlock switch should be used in conjunction with a safety limit switch to give electrical/mechanical redundancy)

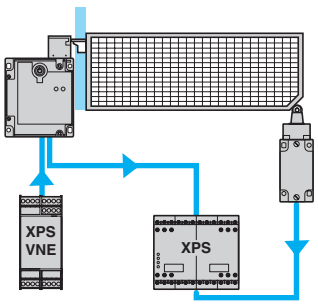
Method for machines with quick rundown time (low inertia)

Locking or interlocking device based on the principle of redundancy and self-monitoring.



Locking of actuator and operation in positive mode associated with a safety relay module.

Method for machines with long rundown time (high inertia)



Interlocking device for actuator fitted on guard and zero speed detection.

Principle: page 3/7 | Characteristics: page 3/22 | References: page 3/44 | Dimensions: page 3/46 | Wiring Diagrams: page 3/48

Schneider Electric

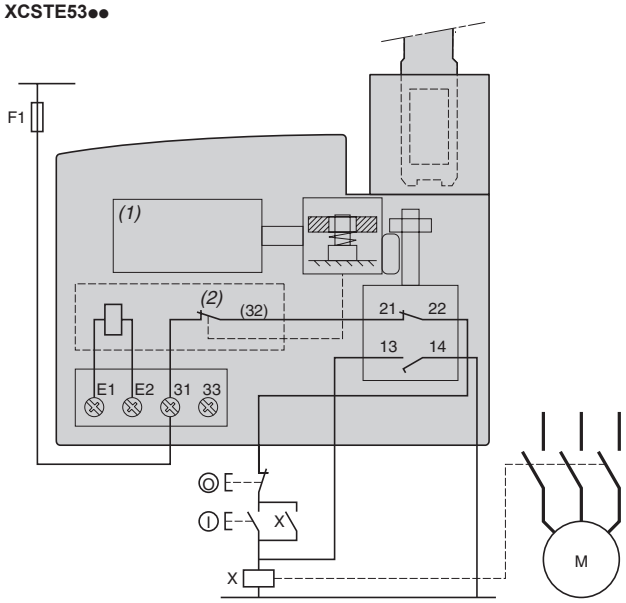
Wiring diagrams (continued)

Wiring to category 1 conforming to EN 954-1/ISO 13849-1

Wiring examples with protection fuse to prevent jumpering of the N.C. contact, either by cable damage or by tampering

Locking without power

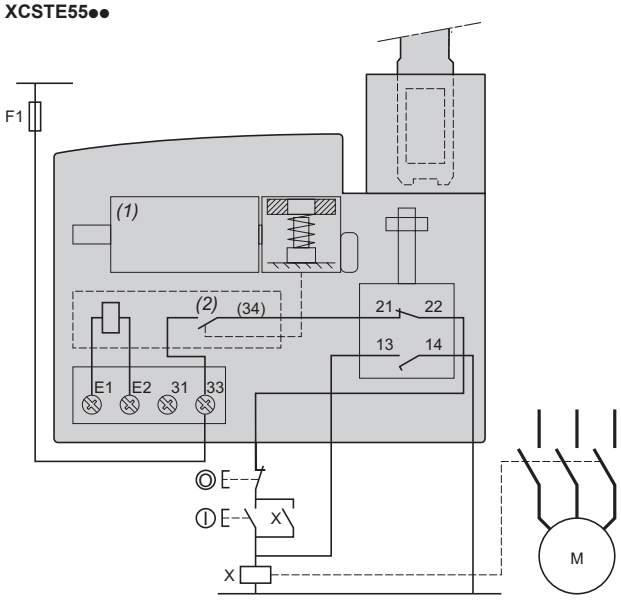
N.C. + N.O.
XCSTE53●●



(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
13-14: Safety contact, available for redundancy or signalling

Locking with power

N.C. + N.O.
XCSTE55●●



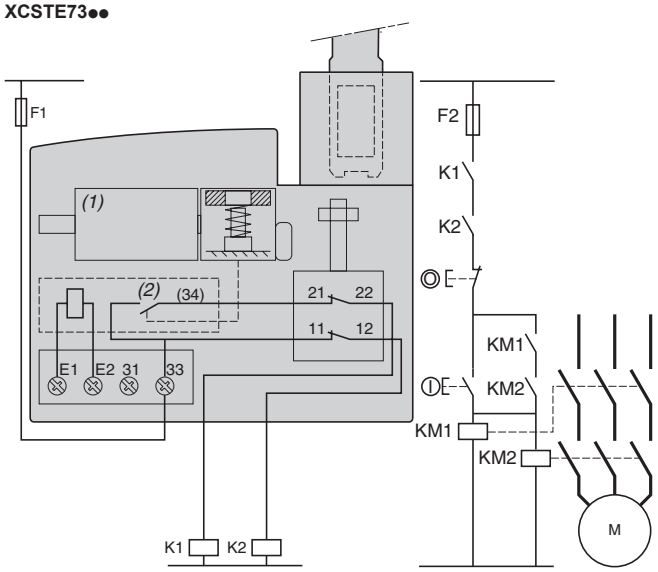
(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
13-14: Safety contact, available for redundancy or signalling

Wiring to category 3 conforming to EN 954-1/ISO 13849-1

Wiring examples with redundancy for the guard switch contacts, without monitoring

Locking without power

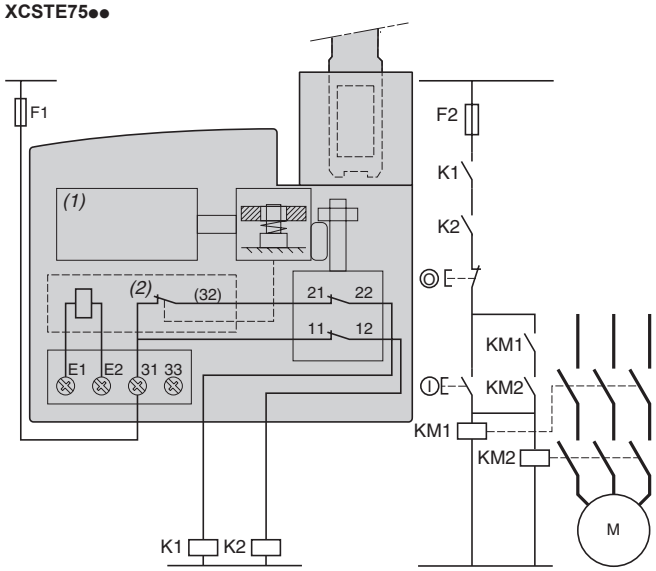
N.C. + N.C.
XCSTE73●●



(1) Solenoid
(2) Solenoid auxiliary contact
E1-E2: Solenoid supply
11-12: Safety contact, available for redundancy

Locking with power

N.C. + N.C.
XCSTE75●●



(1) Solenoid
(2) Solenoid auxiliary contact
E1-E2: Solenoid supply
11-12: Safety contact, available for redundancy

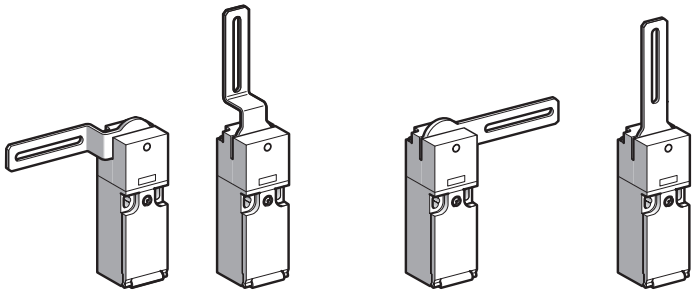
Safety detection solutions

Safety interlock switches with lever or shaft operator

Plastic, double insulated, turret head, types XCSPL, XCSTL, XCSPR and XCSTR

XCSPL with 1 conduit entry

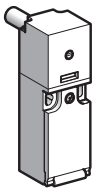
With rotary operating head, with elbowed lever (flush with rear of switch) or straight lever, for hinged covers and guards



Page 3/52

XCSPR with 1 conduit entry

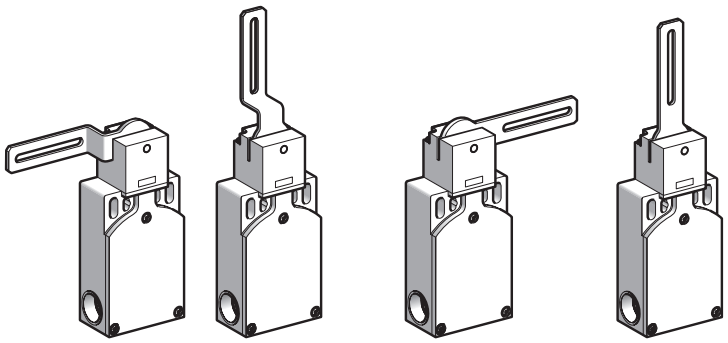
With rotary operating head, with rotary shaft, for hinged covers and guards



Page 3/52

XCSTL with 2 conduit entries

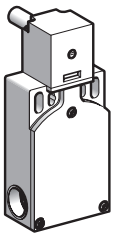
With rotary operating head, with elbowed lever (flush with rear of switch) or straight lever, for hinged covers and guards



Page 3/52

XCSTR with 2 conduit entries

With rotary operating head, with rotary shaft, for hinged covers and guards



Page 3/52

Safety detection solutions

Safety interlock switches with lever or shaft operator

Plastic, double insulated, turret head, types XCSPL, XCSTL, XCSPR and XCSTR

Environment characteristics

Conformity to standards	Products	EN/IEC 60947-5-1, EN/IEC 60947-5-4, UL 508, CSA C22-2 n° 14
	Machine assemblies	EN/IEC 60204-1, EN 1088/ISO 14119, EN/ISO 12100
Product certifications		UL, CSA, BG
Protective treatment		Standard version: “TC” and “TH”
Ambient air temperature	For operation	-13…+158 °F (- 25…+70 °C)
	For storage	-40…+158 °F (- 40…+70 °C)
Vibration resistance		50 gn (10…500 Hz) conforming to IEC 60068-2-6
Shock resistance		50 gn (duration 11 ms) conforming to IEC 60068-2-27
Electric shock protection		Class 2 conforming to IEC 60536
Degree of protection		**IP 67 conforming to IEC 60529**
Cable entry		Depending on model, either: 1 tapped entry for n° 11 (Pg 11) cable gland, tapped M16 x 1.5 or tapped 1/2" NPT
Materials		Polyamide PA66 fiberglass impregnated case Stainless steel lever and mountings

Contact block characteristics

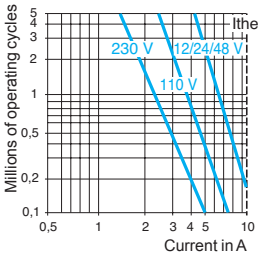
Rated operational characteristics	2 and 3 contact versions slow break	**XCSPL, XCSTL, XCSPR, XCSTR**: ∼ AC-15, A300: Ue = 240 V, Ie = 3 A or Ue = 120 V, Ie = 6 A All models: ⎓ DC-13, Q300: Ue = 250 V, Ie = 0.27 A or Ue = 125 V, Ie = 0.55 A conforming to IEC/EN 60947-5-1
Rated insulation voltage	2 and 3 contact versions	**XCSPL, XCSTL, XCSPR, XCSTR** : Ui = 500 V conforming to IEC/EN 60947-1 Ui = 300 V conforming to UL 508, CSA C22-2 n° 14
Rated impulse withstand voltage	2 and 3 contact versions	**XCSPL, XCSTL, XCSPR, XCSTR**: Uimp = 6 kV conforming to IEC/EN 60947-5-1
Positive operation		N.C. contacts with positive opening operation conforming to EN/IEC 60947-5-1 Section 3
Resistance across terminals		≤ 30 mΩ conforming to EN/IEC 60947-5-4
Short-circuit protection	2 and 3 contact versions	**XCSPL, XCSTL, XCSPR, XCSTR**: 10 A cartridge fuse type gG (gl)
Connection	2 contact version	**XCSPL, XCSTL, XCSPR, XCSTR**: Clamping capacity, min: 1 x 21 AWG (0.5 mm²), max: 2 x 15 AWG (1.5 mm²) with or without cable end
Minimum actuation speed	3 contact version	0.39 in./s (0.01 m/s)

Electrical life

Conforming to EN/IEC 60947-5-1 Appendix C.
Utilisation categories AC-15 and DC-13.
Maximum operating rate: 3600 operating cycles/hour.
Load factor: 0.5

a.c. supply
∼ 50/60 Hz
⎓⎓ inductive circuit

2 and 3 slow break contact versions



d.c. supply ⎓

Power broken in W for 1 million operating cycles

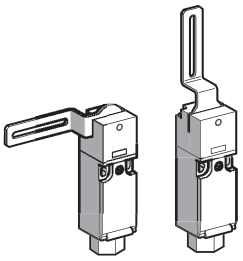
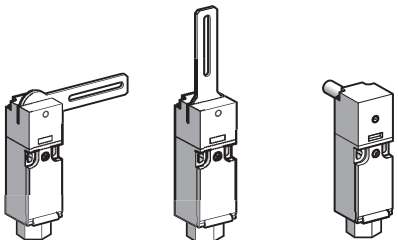
Voltage	V	24	48	120
⎓⎓	W	13	9	7

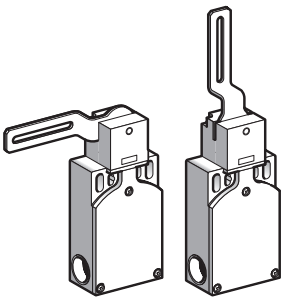
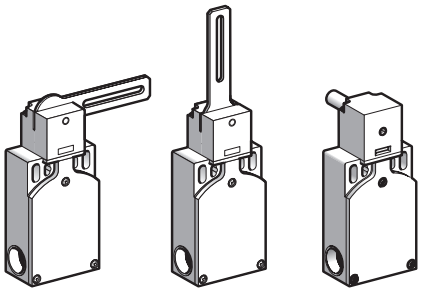
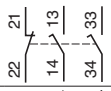
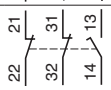
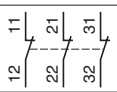
Electrical Life

The product life expressed is based on average usage and normal operating conditions. Actual operating life will vary with conditions. The above statements are not intended to nor shall they create any express or implied warranties as to product operation or life. For information on the limited warranty offered on this product please refer to the Square D ® terms and conditions of sale found in the Square D ® *Digest*.

Safety detection solutions

Safety interlock switches with lever or shaft operator
Plastic, double insulated, turret head,
types XCSPL, XCSTL, XCSPR and XCSTR
Conduit entries tapped 1/2" NPT

Type	Elbowed lever (flush with rear of switch)			Straight lever		Spindle
						
Operator	To left	Centered	To right	To right OR to left	Centered	Length 1.18 in (30 mm) *(2)*
References (⊖ N.C. contact with positive opening operation)						
2-pole N.C. + N.O. break before make slow break 	**XCSPL593** ⊖	**XCSPL583** ⊖	**XCSPL573** ⊖	**XCSPL563** ⊖	**XCSPL553** ⊖	**XCSPR553** ⊖
2-pole N.C. + N.C. slow break 	**XCSPL793** ⊖	**XCSPL783** ⊖	**XCSPL773** ⊖	**XCSPL763** ⊖	**XCSPL753** ⊖	**XCSPR753** ⊖
Weight oz (kg)	3.351 (0.095)	3.351 (0.095)	3.351 (0.095)	3.351 (0.095)	3.351 (0.095)	3.704 (0.105)

						
Operator	To left	Centered	To right	To right OR to left	Centered	Length 1.18 in (30 mm) *(2)*
References (⊖ N.C. contact with positive opening operation)						
3-pole N.C. + N.O. + N.O. (2 N.O. staggered) slow break 	–	**XCSTL583** ⊖	–	**XCSTL563** ⊖	**XCSTL553** ⊖	**XCSTR553** ⊖
3-pole N.C. + N.C. + N.O. (N.O. staggered) slow break 	**XCSTL793** ⊖	**XCSTL783** ⊖	**XCSTL773** ⊖	**XCSTL763** ⊖	**XCSTL753** ⊖	**XCSTR753** ⊖
3-pole N.C. + N.C. + N.C. slow break 	–	**XCSTL883** ⊖	**XCSTL873** ⊖	**XCSTL863** ⊖	–	**XCSTR853** ⊖
Weight oz (kg)	5.115 (0.145)	5.115 (0.145)	5.115 (0.145)	5.115 (0.145)	5.115 (0.145)	5.467 (0.155)

Complementary characteristics not shown under General characteristics (pages 3/22 and 3/23)

Tripping angle	5°
Mechanical life	**1 million operating cycles**
Minimum torque	For tripping: 0.07 lb-ft; for positive opening: 0.18 lb-ft (XCSPL and XCSPR), 0.33 lb-ft (XCSTL and XCSTR)
Cable entry	**XCSP●**: 1 entry tapped for 1/2" NPT conduit **XCST●**: 2 entries tapped for n° 11 cable gland conforming to NF C 68-300 (DIN Pg 11). with one DE9RA1012 conduit adaptor for 1/2" NPT

(1) Head adjustable in 90° steps throughout 360°. Switches supplied with 2 additional self-locking screws for positive mounting of the head.
*(2) For switches with 3.15 in. (80 mm) spindle: replace the 2nd number in the reference (5) by **6**. Example: XCSPR5**5**3 becomes XCSPR5**6**3.. The weight increases by 1.1 oz. (0.032 kg.)*

The devices listed above are threaded for 1/2" NPT, (using the supplied adaptor on the XCST) and are available with metric conduit:
■ To order devices tapped for 11 mm cable gland, conforming to NFC 68-300 (DIN Pg 11): Change the last character in the part number to 1. For example: XCSPL593 is changed to XCSPL591.
■ To order devices tapped for M16 x 1.5 for ISO cable gland: Change the last character in the part number to 2.For example: XCSPL59**3** is changed to XCSPL59**2**.

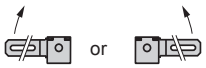
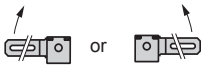
Principle: page 3/7 | Characteristics: page 3/22 | References: page 3/52 | Dimensions: page 3/53 | Wiring Diagrams: page 3/53

Safety detection solutions

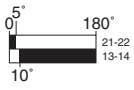
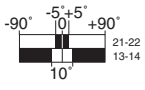
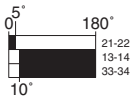
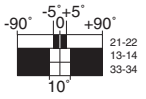
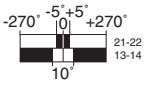
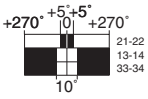
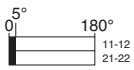
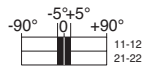
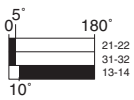
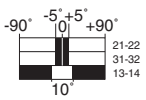
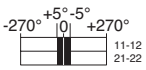
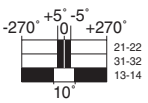
Safety interlock switches with lever or shaft operator
Plastic, double insulated, turret head,
types XCSPL, XCSTL, XCSPR and XCSTR
Conduit entries tapped for 1/2" NPT conduit

Operation

Operator displacement

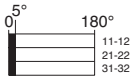
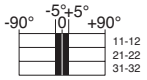
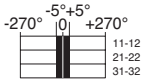
XCSPL•93, PL•73, PL•63	XCSPL•83, PL•53	XCSTL•93, TL•73, TL•63	XCSTL•83, TL•53	XCSPR•53	XCSTR•53
					

Functional diagrams

XCSPL593, PL573, PL563	XCSPL583, PL553	XCSTL563	XCSTL583, TL553	XCSPR553	XCSTR553
					
XCSPL793, PL773, PL763	**XCSPL783, PL753**	**XCSTL793, TL773, TL763**	**XCSTL783, TL753**	**XCSPR753**	**XCSTR753**
					

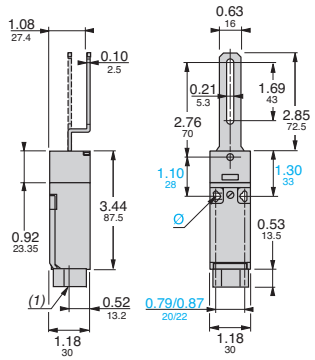
Contact operation

■ contact closed
□ contact open

XCSTL873, TL863	XCSTL883, TL853	XCSTR853
		

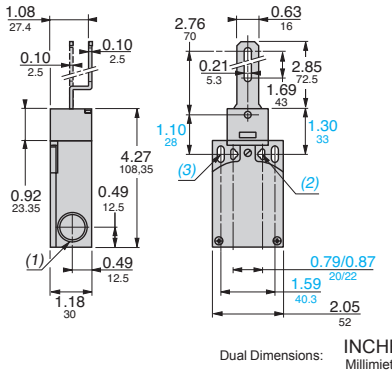
Dimensions

XCSPL••3



(1) 1 tapped entry for 1/2" NPT conduit
Ø: 2 elongated holes Ø 0.17 x 0.33 in (4.3 x 8.3 mm) on 0.87 in (22 mm) centers, 2 holes Ø 0.17 in (4.3 mm) on 0.79 in (20 mm) centers

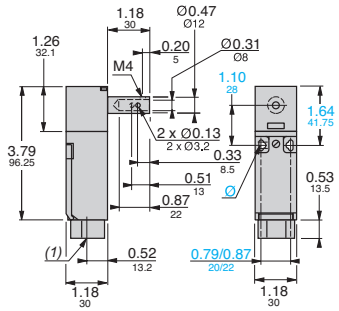
XCSTL••3



Dual Dimensions: INCHES / Millimeters

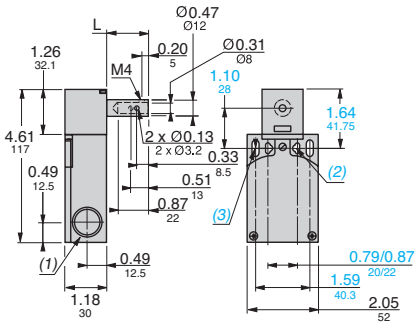
(1) 2 tapped entries for n° 11 cable gland
(2) 2 elongated holes Ø 0.17 x 0.33 in (4.3 x 8.3 mm) on 0.87 in (22 mm) centers, 2 holes Ø 0.17 in (4.3 mm) on 0.79 in (20 mm) centers
(3) 22 elongated holes Ø 0.21 x 0.52 in (5.3 x 13.3 mm)

XCSPR••3



(1) 1 tapped entry for 1/2" NPT conduit
Ø: 2 elongated holes Ø 0.17 x 0.33 in (4.3 x 8.3 mm) on 0.87 in (22 mm) centers, 2 holes Ø 0.17 in (4.3 mm) on 0.79 in (20 mm) centers
L = 1.18 in (30 mm) (XCSPR•53)
or 3.15 in (80 mm) (XCSPR•63)

XCSTR••3

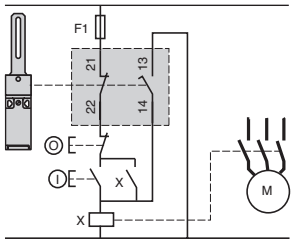


(1) 2 tapped entries for n° 11 cable gland
(2) 2 elongated holes Ø 0.17 x 0.33 in (4.3 x 8.3 mm) on 0.87 in (22 mm) centers, 2 holes Ø 0.17 in (4.3 mm) on 0.79 in (20 mm) centers
(3) 2 elongated holes Ø 0.21 x 0.52 in (5.3 x 13.3 mm)
L = 1.18 in (30 mm) (XCSTR•53)
or 3.15 in (80 mm) (XCSTR•63)

Wiring diagrams

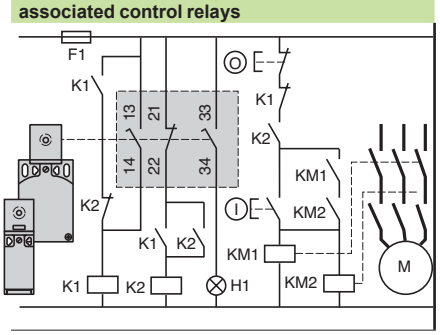
Category 1 to EN 954-1/ISO 13849-1

Example with cable short-circuit protection fuse



Category 3 to EN 954-1/ISO 13849-1

Example with 3-pole N.C. + N.O. + N.O. contact with mixed redundancy of the contacts and the associated control relays



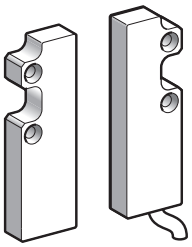
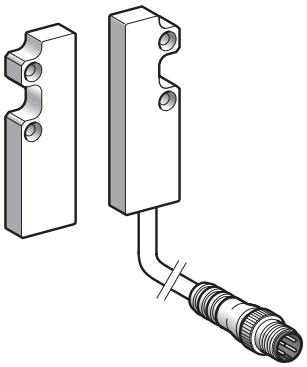
To activate K1, the lever or spindle must be rotated when the supply is switched on. H1: "lever or spindle displaced from initial position" indicator. When used in conjunction with an XPSsafety relay module and another safety switch, the rotary lever or spindle operator guard switch can provide a category 3 or 4 control and monitoring system for moving guards to EN 954-1/ISO 13849-1.

Principle: page 3/7 | Characteristics: page 3/22 | References: page 3/52 | Dimensions: page 3/53 | Wiring Diagrams: page 3/53

Safety detection solutions
Non-contact safety interlock switches
Plastic

XCSDMC

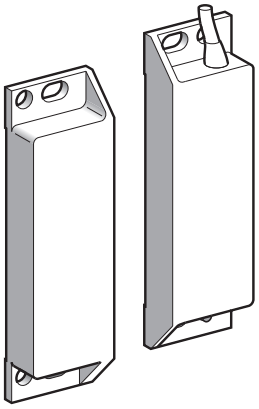
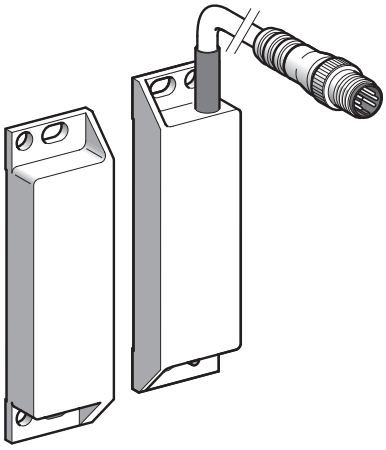
Rectangular, compact: 2.01 x 0.63 x 0.28 in (51 x 16 x 7 mm)

Pre-cabled connection	Connector on pigtail connection
	

3/56 and 3/57

XCSDMP

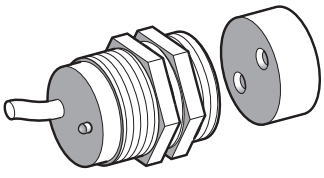
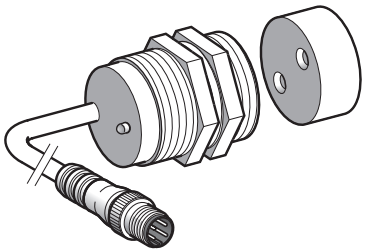
Rectangular, standard: 3.46 x 0.98 x 0.51 in (88 x 25 x 13 mm)

Pre-cabled connection	Connector on pigtail connection
	

3/56 and 3/57

XCSDMR

Cylindrical, diameter: 1.18 in (30 mm), length: 1.51 in (38.5 mm)

Pre-cabled connection	Connector on pigtail connection
	

3/56 and 3/57

Safety detection solutions
Non-contact safety interlock switches
Plastic

Environment

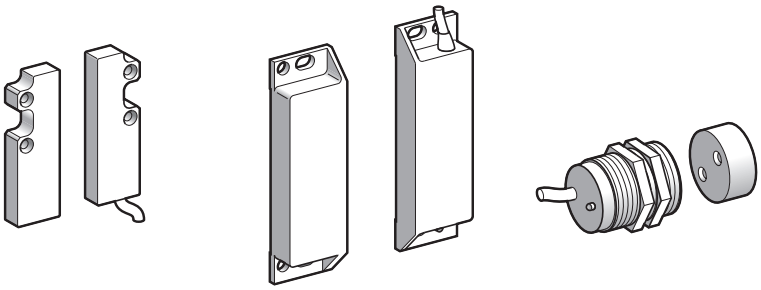
Conformity to standards	Products		IEC/EN 60947-5-1, UL 508, CSA C22 2 n° 14
	Machine assemblies		IEC/EN 60204-1, EN/ISO 12100, EN 1088/ISO 14119 (XCSDM●5●● only)
Product certifications			UL-CSA, BG
Protective treatment			Standard version: "TH"
Ambient air temperature	For operation	**°F (°C)**	-13…+185 (- 25…+ 85)
	For storage	**°F (°C)**	-40…+185 (- 40…+ 85)
Vibration resistance			10 gn (10…150 Hz) conforming to IEC 60068-2-6
Shock resistance			30 gn (11 ms) conforming to IEC 60068-2-7
Sensitivity to magnetic fields		**mT**	≥ 0.3
Electric shock protection			Class II conforming to IEC 60536
Degree of protection	Conforming to IEC 60529		IP 66 and IP 67 for non-contact safety interlock switches with pre-cabled connection IP 67 for non-contact safety interlock switches with connector on pigtail connection
Materials			Thermoplastic case (PBT) PVC cable (ROHS)

Contact block characteristics

Rated operational characteristics				Ue: ⎓ 24 V, Ie: 100 mA max.
Rated insulation voltage (Ui)				Ui: ⎓ 100 V
Rated impulse withstand voltage (U imp)			**kV**	2.5 conforming to EN/IEC 60947-5-1
Resistance across terminals		Contact with LED	Ω	57
		Contact without LED	Ω	10
Protection (not using safety module)				External cartridge fuse: 500 mA gG (gl)
Connection	XCSDMC			Pre-cabled, 4 x 22 AWG, length: 2, 5 or 10 m depending on model or M8 connector on 5.95 in. (0.15 m) pigtail
	XCSDMP	2 contact model		Pre-cabled, 4 x 22 AWG, length: 2, 5 or 10 m depending on model or M12 connector on 5.95 in. (0.15 m) pigtail
		3 contact model		Pre-cabled, 6 x 22 AWG, length: 2, 5 or 10 m depending on model or M12 connector on 5.95 in. (0.15 m) pigtail
	XCSDMR			Pre-cabled, 4 x 22 AWG, length: 2, 5 or 10 m depending on model or M12 connector on 5.95 in. (0.15 m) pigtail
Contact material				Rhodium
Electrical life				1.2 million operating cycles
Maximum switching voltage			**V**	⎓ 100
Switching capacity		Contact with LED	**mA**	5…100
		Contact without LED	**mA**	0.1…100
Insulation resistance			**M**W	1000
Maximum breaking capacity		Contact with LED	**VA**	3
		Contact without LED	**VA**	10
Maximum switching frequency			**Hz**	150

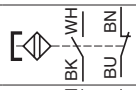
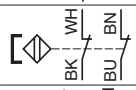
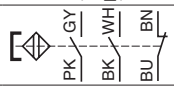
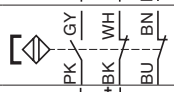
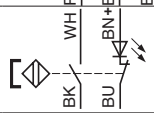
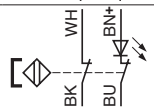
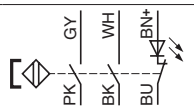
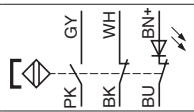
Safety detection solutions
Non-contact safety interlock switches
Plastic, pre-cabled

Type	Rectangular		Cylindrical
	Compact 2.01 x 0.63 x 0.28 in (51 x 16 x 7 mm)	Standard 3.46 x 0.98 x 0.51 in (88 x 25 x 13 mm)	Diameter: 1.18 in (30 mm) Length: 1.51 in (38.5 mm)



References of switches *(1)* must be used in conjunction with XPS safety relay modules, see pages 3/62 to 3/65

Contact states shown are with the magnet positioned in front of the switch

2-pole N.C. + N.O. (N.C. staggered)		**XCSDMC5902**	**XCSDMP5902**	**XCSDMR5902**
2-pole N.O. + N.O. *(2)* (1 N.O. staggered)		**XCSDMC7902**	**XCSDMP7902**	**XCSDMR7902**
3-pole N.C. + N.C. + N.O. (1 N.C. staggered)		–	**XCSDMP5002**	–
3-pole N.C. + N.O. + N.O. *(2)* (1 N.O. staggered)		–	**XCSDMP7002**	–
2-pole N.C. + N.O. *(3)* (N.C. staggered) With LED		**XCSDMC5912**	**XCSDMP5912**	**XCSDMR5912**
2-pole N.O. + N.O. *(2) (3)* (1 N.O. staggered) With LED		**XCSDMC7912**	**XCSDMP7912**	**XCSDMR7912**
3-pole N.C. + N.C. + N.O. *(3)* (1 N.C. staggered) With LED		–	**XCSDMP5012**	–
3-pole N.C. + N.O. + N.O. *(2) (3)* (1 N.O. staggered) With LED		–	**XCSDMP7012**	–
Weight oz (kg)		3.563 (0.101)	6.349 (0.180)	5.150 (0.146)

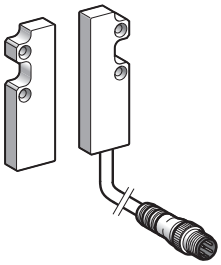
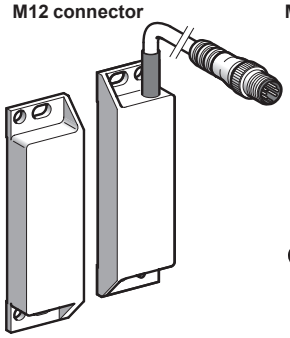
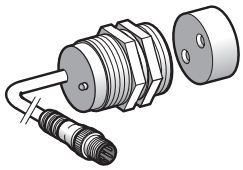
(1) Magnetic switch + coded magnet (XCSZC●●●●).
Switch pre-cabled with 6.6 ft.(2m) long cable. For other cable lengths, replace the last number of the reference (2) by 5 for a 16.4 ft. (5 m) long cable or by 10 for a 32.8 ft. (10 m) long cable.
*Example: XCSDMC5902 rectangular, compact switch with N.C. + N.O. contacts and 10 m cable becomes **XCSDMC59010**.*
(2) Only to be wired in conjunction with an XPSAF module (see pages 3/63 and 3/65).
(3) The green LED is lit when the coded magnet is positioned in front of the switch (guard closed).
·N.O. contact PK-GY is to be used as an indicator of the device state, typically to a PLC. It is not to be used for the safety function.

Complementary characteristics not shown under General characteristics (page 3/55)

Operating zone	Sao: 0.20 in (5 mm) Sar: 0.59 in. (15 mm)	Sao: 0.31 in. (8 mm) Sar: 0.79 in. (20 mm)	Sao: 0.31 in. (8 mm) 0.79 in. (20 mm)
Approach directions	3 directions	3 directions	1 direction

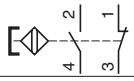
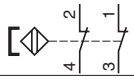
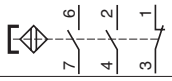
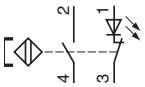
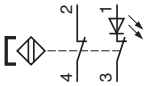
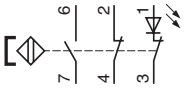
Accessories (page 3/58)

Safety detection solutions
Non-contact safety interlock switches
Plastic, connector on 5.9 in (151 mm) pigtail

Type	Rectangular		Cylindrical
	Compact 2.01 x 0.63 x 0.28 in (51 x 16 x 7 mm)	Standard 3.46 x 0.98 x 0.51 in (88 x 25 x 13 mm)	Diameter: 1.18 in (30 mm) Length: 1.51 in (38.5 mm)
	M8 connector	**M12 connector**	**M12 connector**
			

References of switches *(1)* must be used in conjunction with XPS safety relay modules, see pages 3/62 to 3/65

Contact states shown are with the magnet positioned in front of the switch

2-pole N.C. + N.O. (N.C. staggered)		**XCSDMC590L01M8**	**XCSDMP590L01M12**	**XCSDMR590L01M12**
2-pole N.O. + N.O. *(2)* (1 N.O. staggered)		**XCSDMC790L01M8**	**XCSDMP790L01M12**	**XCSDMR790L01M12**
3-pole N.C. + N.C. + N.O. (1 N.C. staggered)		–	**XCSDMP500L01M12**	–
3-pole N.C. + N.O. + N.O. *(2)* (1 N.O. staggered)		–	**XCSDMP700L01M12**	–
2-pole N.C. + N.O. *(3)* (N.C. staggered) With LED		**XCSDMC591L01M8**	**XCSDMP591L01M12**	**XCSDMR591L01M12**
2-pole N.O. + N.O. *(2) (3)* (1 N.O. staggered) With LED		**XCSDMC791L01M8**	**XCSDMP791L01M12**	**XCSDMR791L01M12**
3-pole N.C. + N.C. + N.O. *(3)* (1 N.C. staggered) With LED		–	**XCSDMP501L01M12**	–
3-pole N.C. + N.O. + N.O. *(2) (3)* (1 N.O. staggered) With LED		–	**XCSDMP701L01M12**	–
Weight oz (kg)		3.563 (0.101)	6.349 (0.180)	5.150 (0.146)

(1) Magnetic switch + coded magnet (XCSZC●●●●).
(2) Only to be wired in conjunction with an XPSAF module (see pages 3/63 and 3/65).
(3) The green LED is lit when the coded magnet is positioned in front of the switch (guard closed).
N.O. contact PK-GY is to be used as an indicator of the device state, typically to a PLC. It is not to be used for the safety function.

Complementary characteristics not shown under General characteristics (page 3/55)

Operating zone	Sao: 0.20 in (5 mm) Sar: 0.59 in. (15 mm)	Sao: 0.31 in. (8 mm) Sar: 0.79 in. (20 mm)	Sao: 0.31 in. (8 mm) Sar: 0.79 in. (20 mm)
Approach directions	3 directions	3 directions	1 direction

Accessories (page 3/58)

Accessories

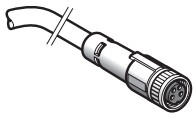
Accessories for non-contact safety interlock switches	XCSDMC●●●2 XCSDMC●●●L	XCSDMP●●●2 XCSDMP●●●L	XCSDMR●●●2 XCSDMR●●●L
Mounting clamp	–		**XSZ B130**
Weight oz (kg)	–		2.822 (0.080)
Additional coded magnet	**XCSZC1**	**XCSZP1**	**XCSZR1**
Weight oz (kg)	0.317 (0.009)	1.764 (0.050)	0.635 (0.018)
Non-magnetic shims	**XCSZCC** (lot of 2)	**XCSZCP** (lot of 2)	**XCSZCR**
Weight oz (kg)	0.282 (0.008)	0.423 (0.012)	0.071 (0.002)

Pre-wired female connectors for connector version switches

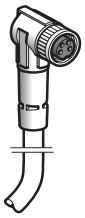
Pre-wired connector characteristics

Pre-wired connector type		XZCP0941L●, XZCP1041L●	XZCP29P11L●	XZCP1141L●, XZCP1241L●
Type of connection		Screw threaded (metal clamping ring)	Screw threaded (metal clamping ring)	Screw threaded (metal clamping ring)
Number of conductors/pins		4	8	4
Degree of protection		IP 67 (with clamping ring correctly tightened)		
Ambient air temperature	Static	- 31…+ 194 °F (- 35…+ 90 °C)	- 31…+ 194 °F (- 35…+ 90 °C)	- 31…+ 194 °F (- 35…+ 90 °C)
	Dynamic	+ 23…+ 194 °F (- 5…+ 90 °C)	+ 23…+ 194 °F (- 5…+ 90 °C)	+ 23…+ 194 °F (- 5…+ 90 °C)
Cabling		Ø 0.205" (5.2 mm) cable, wire c.s.a.: 4 x 22 AWG (0.34 mm²)	Ø 0.205" (5.2 mm) cable, wire c.s.a.: 8 x 24 AWG (0.25 mm²)	Ø 0.205" (5.2 mm) cable, wire c.s.a.: 4 x 22 AWG (0.34 mm²)
LED signalling		–	–	–
Nominal voltage		∼ 60 V, ⎓ 75 V	∼ 250 V, ⎓ 300 V	∼ 250 V, ⎓ 300 V
Nominal current		4 A	2 A	4 A
Insulation resistance		> 10^9 Ω	> 10^9 Ω	> 10^9 Ω
Contact resistance		⩽ 5 mΩ	⩽ 5 mΩ	⩽ 5 mΩ

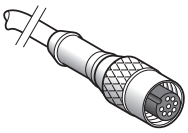
References of pre-wired connectors



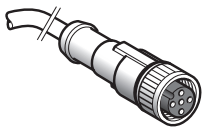
XZ CP0941L●



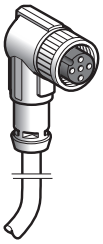
XZ CP1041L●



XZ CP29P11L●



XZ CP1141L●



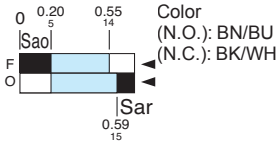
XZ CP1241L●

Type of connector	Number of pins	For use with	Type	Cable length ft. (m)	Reference	Weight oz (kg)
Female, M8	4	XCSDMC●●●L	Straight	6.56 (2)	**XZCP0941L2**	2.822 (0.080)
				16.40 (5)	**XZCP0941L5**	6.349 (0.180)
				32.81 (10)	**XZCP0941L10**	12.699 (0.360)
			Elbowed	6.56 (2)	**XZCP1041L2**	2.822 (0.080)
				16.40 (5)	**XZCP1041L5**	6.349 (0.180)
				32.81 (10)	**XZCP1041L10**	12.699 (0.360)
Female, M12	8	XCSDMP●●●L	Straight	6.56 (2)	**XZCP29P11L2**	3.527 (0.100)
				16.40 (5)	**XZCP29P11L5**	10.229 (0.290)
				32.81 (10)	**XZCP29P11L10**	16.579 (0.470)
Female, M12	4	XCSDMR●●●L/ XCSDMP●●●L	Straight	6.56 (2)	**XZCP1141L2**	3.175 (0.090)
				16.40 (5)	**XZCP1141L5**	6.702 (0.190)
				32.81 (10)	**XZCP1141L10**	13.051 (0.370)
			Elbowed	6.56 (2)	**XZCP1241L2**	3.175 (0.090)
				16.40 (5)	**XZCP1241L5**	6.702 (0.190)
				32.81 (10)	**XZCP1241L10**	13.051 (0.370)

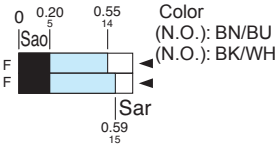
Characteristics: Page 3/55 | References: Page 3/56 | Accessories: Page 3/58 | Dimensions: Page 3/60 | Wiring Diagrams: Page 3/61

Function diagrams with magnet present (pre-cabled version)

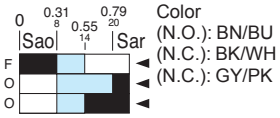
XCSDMC59●●



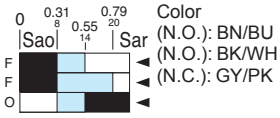
XCSDMC79●●



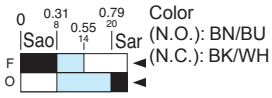
XCSDMP50●●



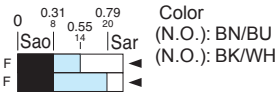
XCSDMP70●●



XCSDMR59●●/XCSDMP59●●

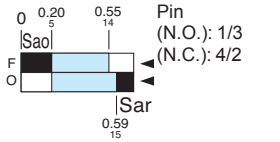


XCSDMR79●●/XCSDMP79●●

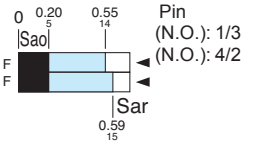


Function diagrams with magnet present (connector on pigtail version)

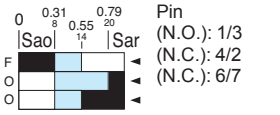
XCSDMC59●●



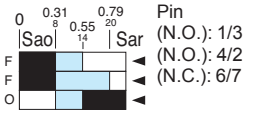
XCSDMC79●●



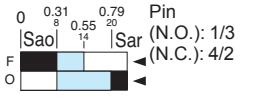
XCSDMP50●●



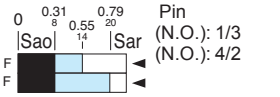
XCSDMP70●●



XCSDMR59●●/XCSDMP59●●



XCSDMR79●●/XCSDMP79●●



Contact closed

Contact open

Contact in transition

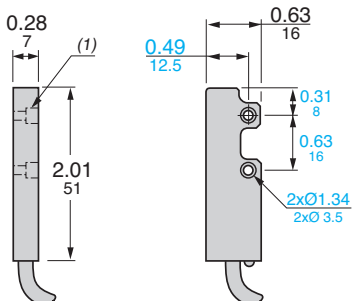
Sao: specified operating distance.
Sar: specified tripping distance.
Conforming to EN/IEC 60947-5-3.

Safety detection solutions
Non-contact safety interlock switches
Plastic

Non-contact safety interlock switches

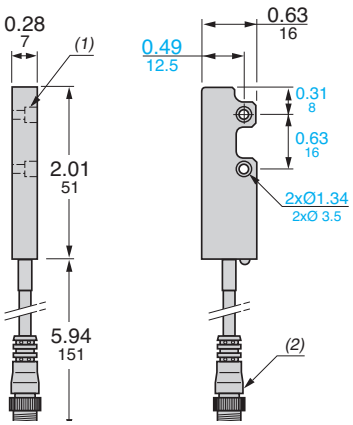
XCSDMC

Pre-cabled connection



(1) Counterbored: 0.24 x 0.14 in. (Ø 6 x 3.5 mm.)

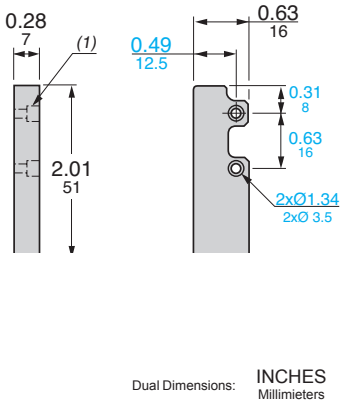
Connector on pigtail connection



(1) Counterbored: 0.24 x 0.14 in. (Ø 6 x 3.5 mm.)
(2) M8 4-pin connector.

Coded magnet for XCSDMC

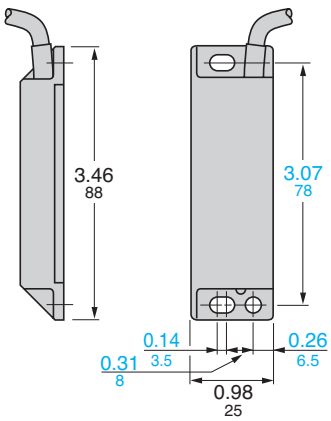
XCSZC1



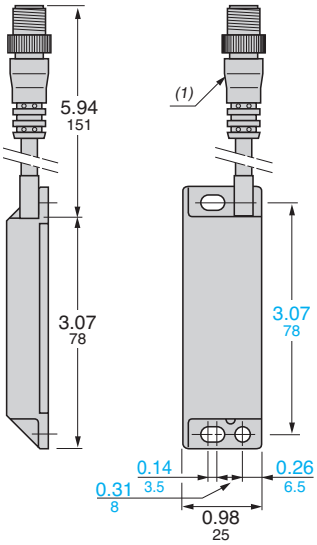
(1) Counterbored: 0.24 x 0.14 in. (Ø 6 x 3.5 mm.)

XCSDMP

Pre-cabled connection



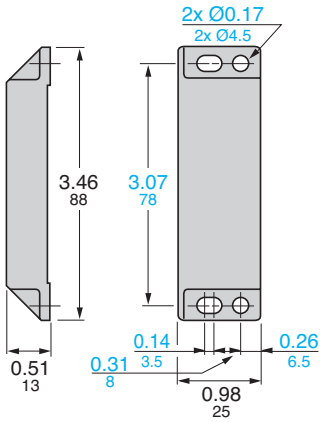
Connector on pigtail connection



(1) 4 or 6-pin M12 connector.

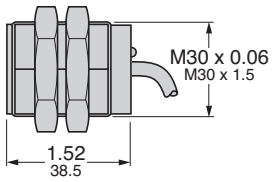
Coded magnet for XCSDMP

XCSZP1

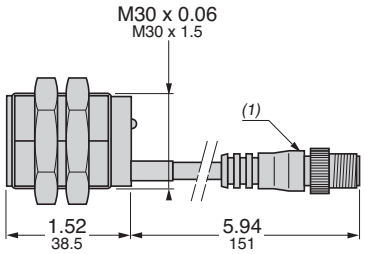


XCSDMR

Pre-cabled connection



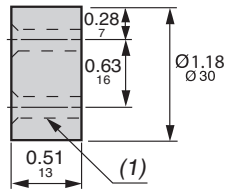
Connector on pigtail connection



(1) M12 4-pin connector.

Coded magnet for XCSDMR

XCSZR1

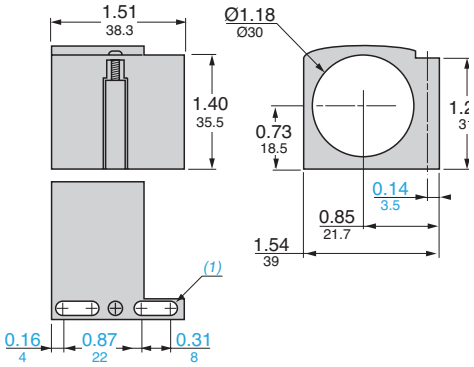


(1) 0.08 x Ø 0.17 (2 x Ø 4.3), countersunk: Ø 7.5 at 45°.

Accessories

Mounting clamp

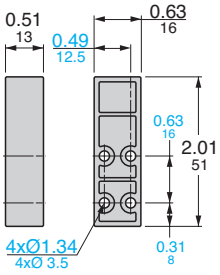
XSZ B130



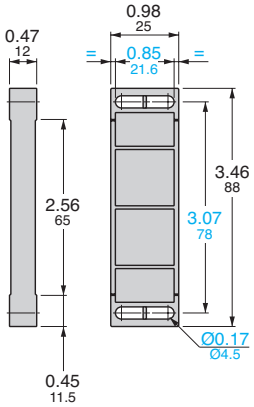
(1) 2 elongated holes Ø 4 x 8.

Non-magnetic shims

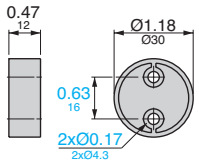
XCSZCC



XCSZCP

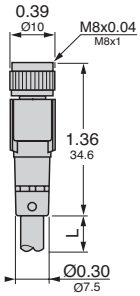


XCSZCR

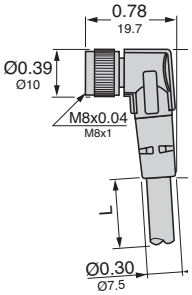


Pre-wired female connectors

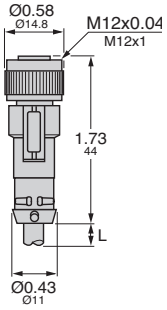
XZ CP0941L●



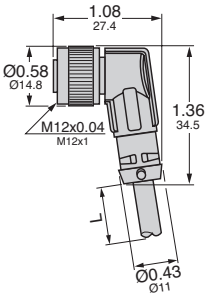
XZ CP1041L●



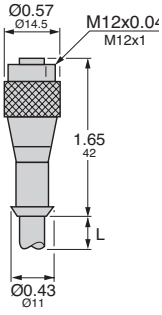
XZ CP1141L●



XZ CP1241L●



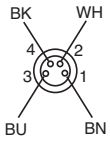
XZ CP29P11L●



Wiring diagrams

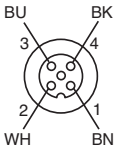
M8 pre-wired female connector

XZ CP0941L●

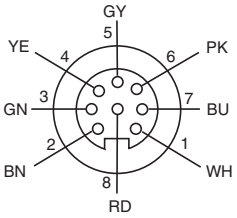


M12 pre-wired female connector

XZ CP1141L●, XZ CP1241L●

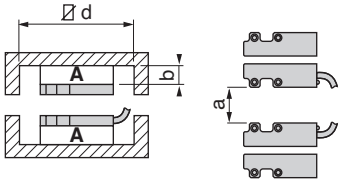


XZ CP29P11L●

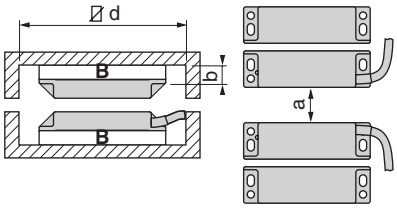


Mounting

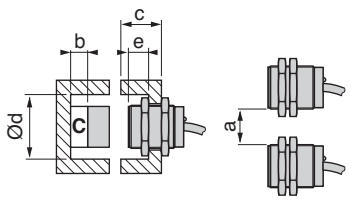
XCSDMC



XCSDMP



XCSDMR



XCS	a	b	c	d	e
DMC	1.57 (40)	0.51 (13) min.	–	3.19 x 2.17 (81 x 55)	–
DMP	3.94 (100)	0.39 (10) min.	–	4.65 x 2.17 (118 x 55)	–
DMR	1.57 (40)	0.47 (12) min.	> 0.39 (10)	Ø 1.77 (45)	0.79 (20)
		–	> 0.39 (10)	Ø 1.77 (45)	0.51 (13)
		0.47 (12) min.	< 0.39 (10)	–	0.79 (20)
		–	< 0.39 (10)	–	0.67 (17)

Non-magnetic shims	
A	XCSZCC
B	XCSZCP
C	XCSZCR

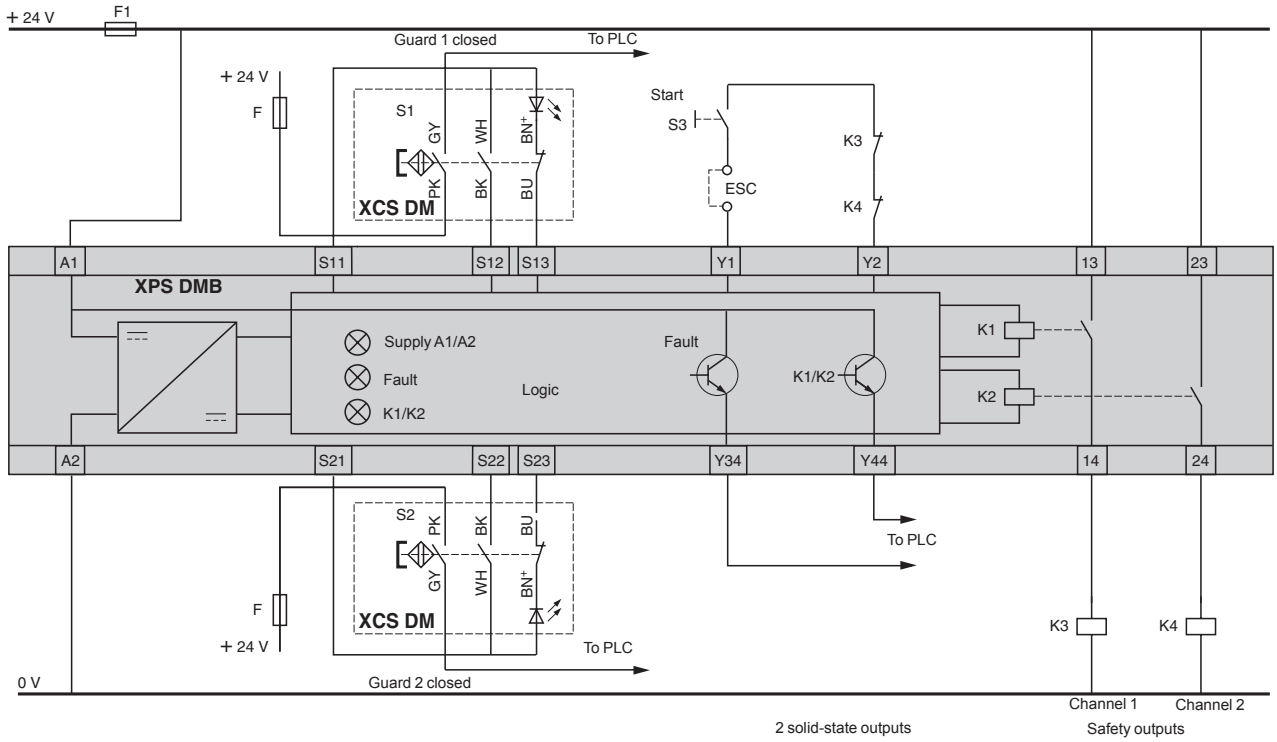
Dual Dimensions: INCHES / Millimeters

Characteristics: Page 3/55
References: Page 3/56
Accessories: Page 3/58
Dimensions: Page 3/60
Wiring Diagrams: Page 3/61

3

XCSDMP5●●● with XPSDMB

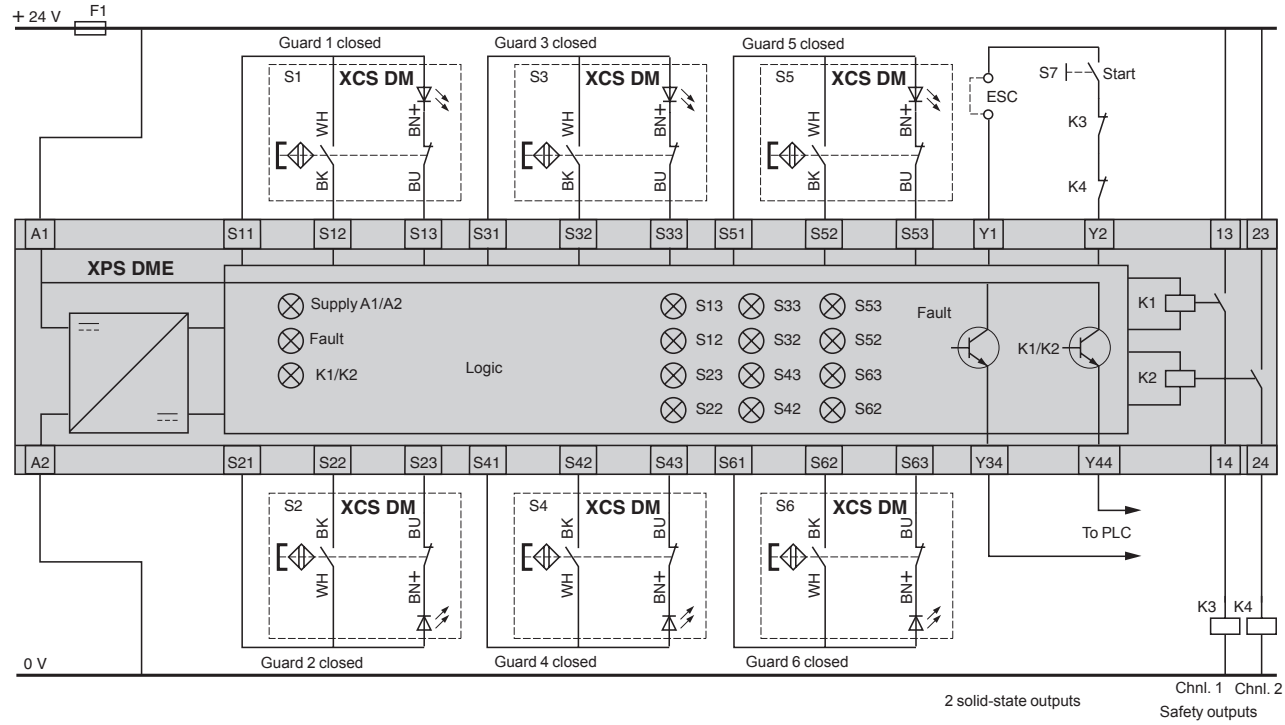
Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 3-pole N.C. + N.C. + N.O. (1 N.C. staggered) contact.



ESC: External start conditions.
- Inputs: S11, S12, S13 or S21, S22, S23
- Unused inputs must be jumpered from S_1 to S_3. For example: S21 to S23.
- The order in which the inputs are wired or jumpered will not affect device operation.

XCSDMC5●●●, XCSDMP5●●●, XCSDMR5●●● with XPSDME

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N.C. + N.O. (N.C. staggered) contact.



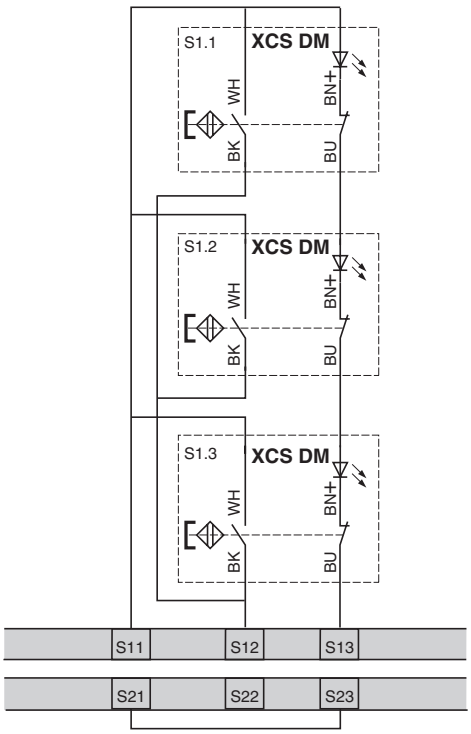
ESC: External start conditions.
- Inputs: S_1, S_2, S_3
- Unused inputs must be jumpered from S_1 to S_3. For example if input S61, S62, S63 is not used, then terminals S61 and S63 must be jumpered.
- The order in which the inputs are wired or jumpered will not affect device operation.

Characteristics: Page 3/55 | References: Page 3/56 | Accessories: Page 3/58 | Dimensions: Page 3/60 | Wiring Diagrams: Page 3/61

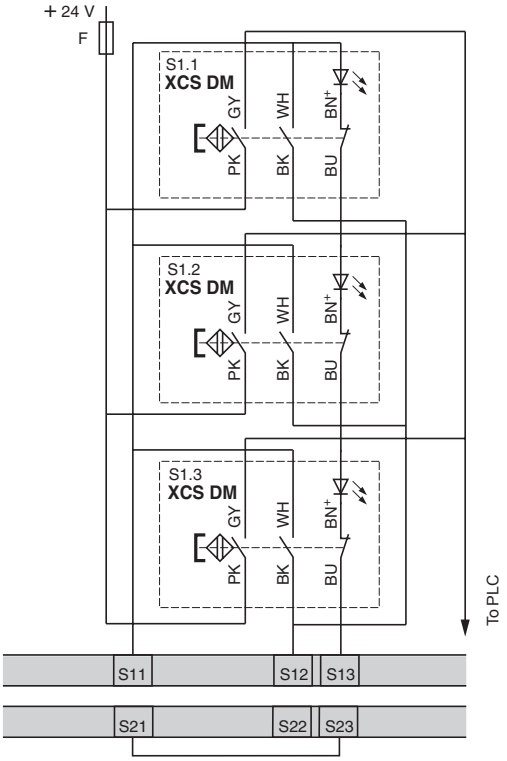
Connection of up to 3 non-contact safety interlock switches, with an LED on one input, with XPSDM● *(1)*

Wiring to category 3 conforming to EN 954-1/ISO 13849-1

Example with 2-pole N.C. + N.O. contact



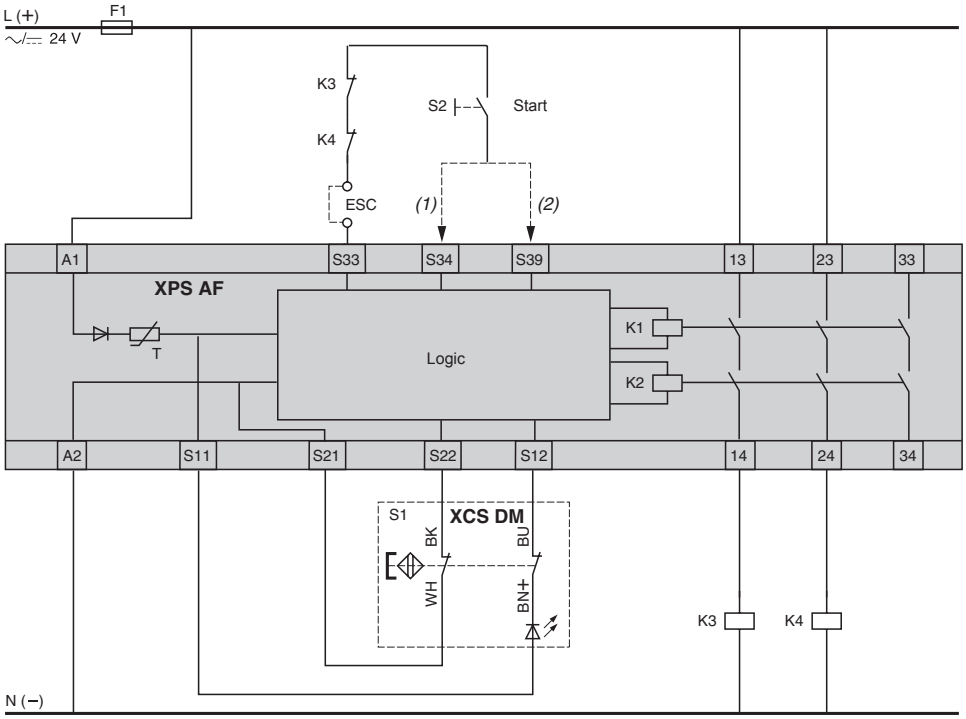
Example with 3-pole N.C. + N.C. + N.O. contact



(1) Input: S11, S12, S13 or S21, S22, S23.

XCSDM●7●●● with XPSAF

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N.C. + N.C. contact (not conforming to standard EN 1088/ISO 14119)

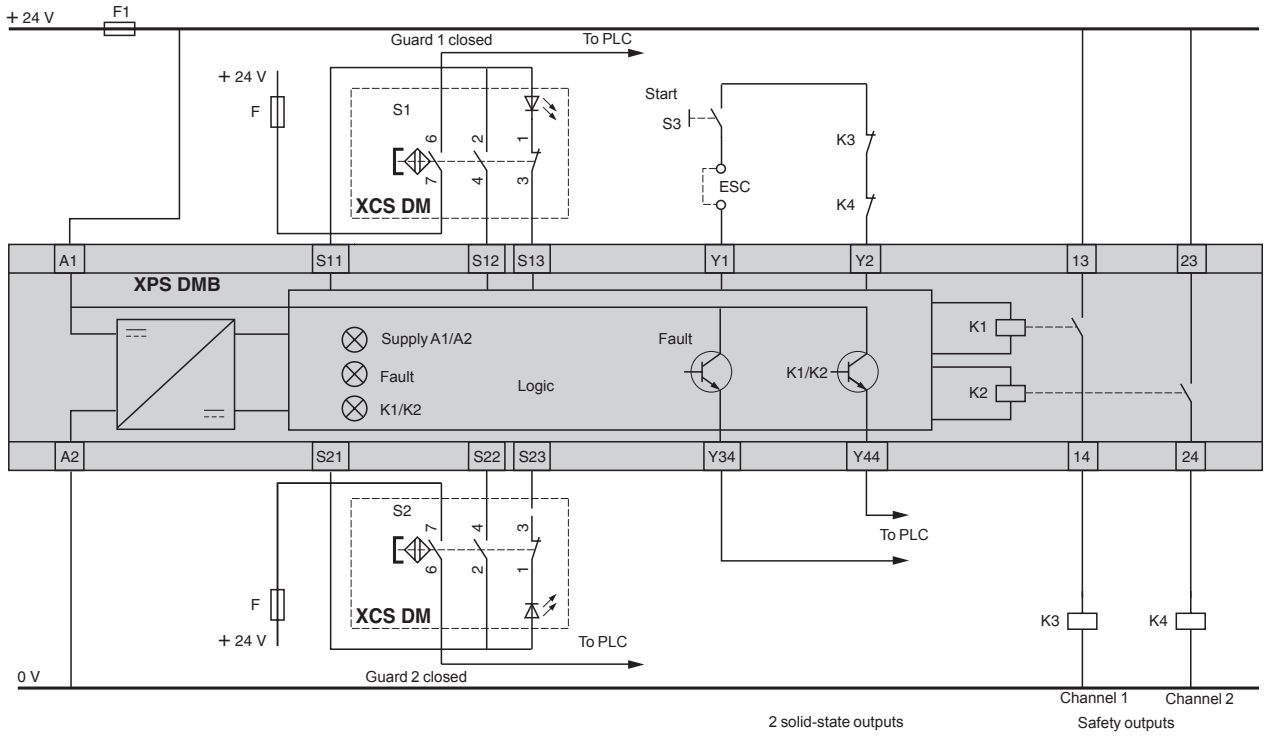


(1) With start button monitoring.
(2) Without start button monitoring.
ESC: External start conditions.

3

XCSDMP5●●● with XPSDMB

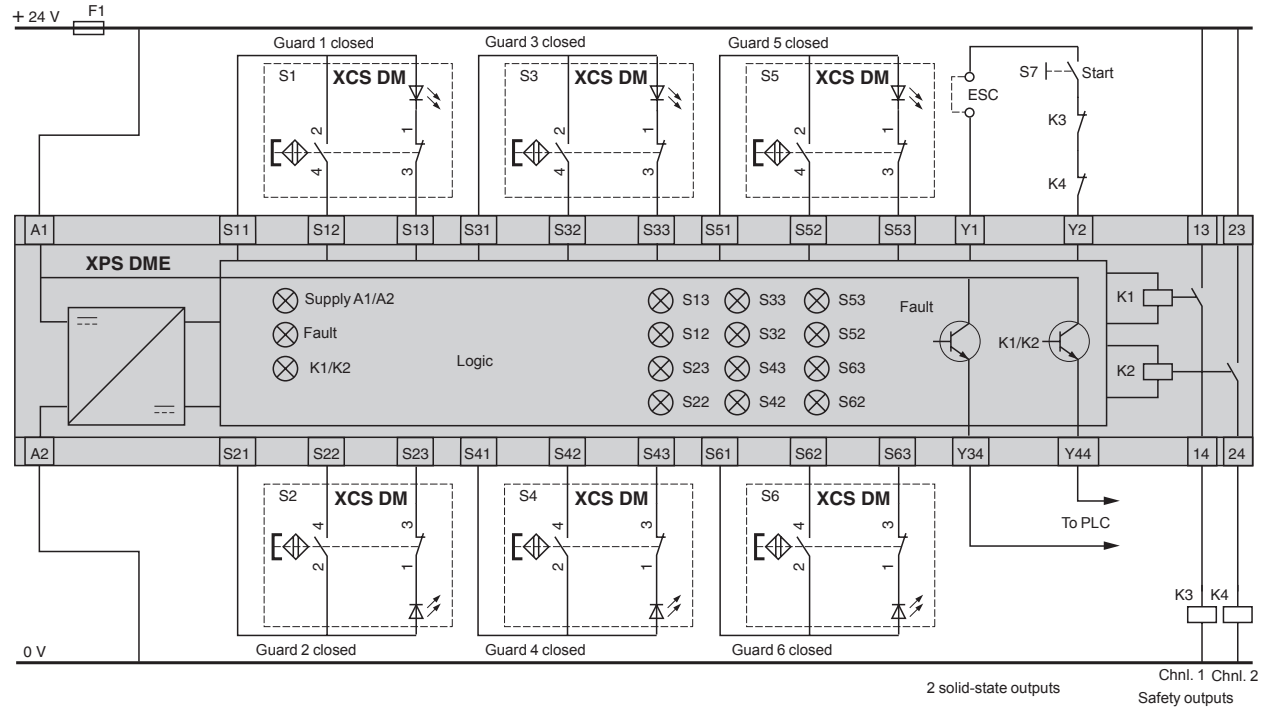
Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 3-pole N.C. + N.C. + N.O. (1 N.C. staggered) contact.



ESC: External start conditions.
- Inputs: S11, S12, S13 or S21, S22, S23
- Unused inputs must be jumpered from S_1 to S_3. For example: S21 to S23.
- The order in which the inputs are wired or jumpered will not affect device operation.

XCSDMC5●●●, XCSDMP5●●●, XCSDMR5●●● with XPSDME

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N.C. + N.O. (N.C. staggered) contact.



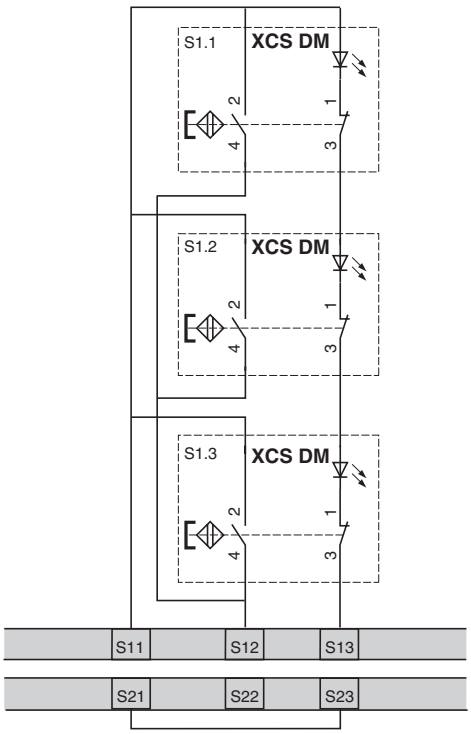
ESC: External start conditions.
- Inputs: S_1, S_2, S_3
- Unused inputs must be jumpered from S_1 to S_3. For example if input S61, S62, S63 is not used, then terminals S61 and S63 must be jumpered.
- The order in which the inputs are wired or jumpered will not affect device operation.

Characteristics: Page 3/55 | References: Page 3/56 | Accessories: Page 3/58 | Dimensions: Page 3/60 | Wiring Diagrams: Page 3/61

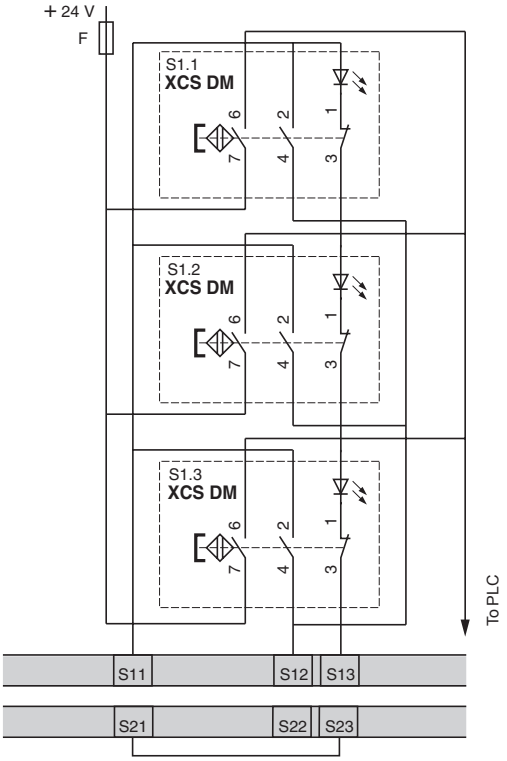
Connection of up to 3 non-contact safety interlock switches, with an LED on one input, with XPSDM● *(1)*

Wiring to category 3 conforming to EN 954-1/ISO 13849-1

Example with 2-pole N.C. + N.O. contact



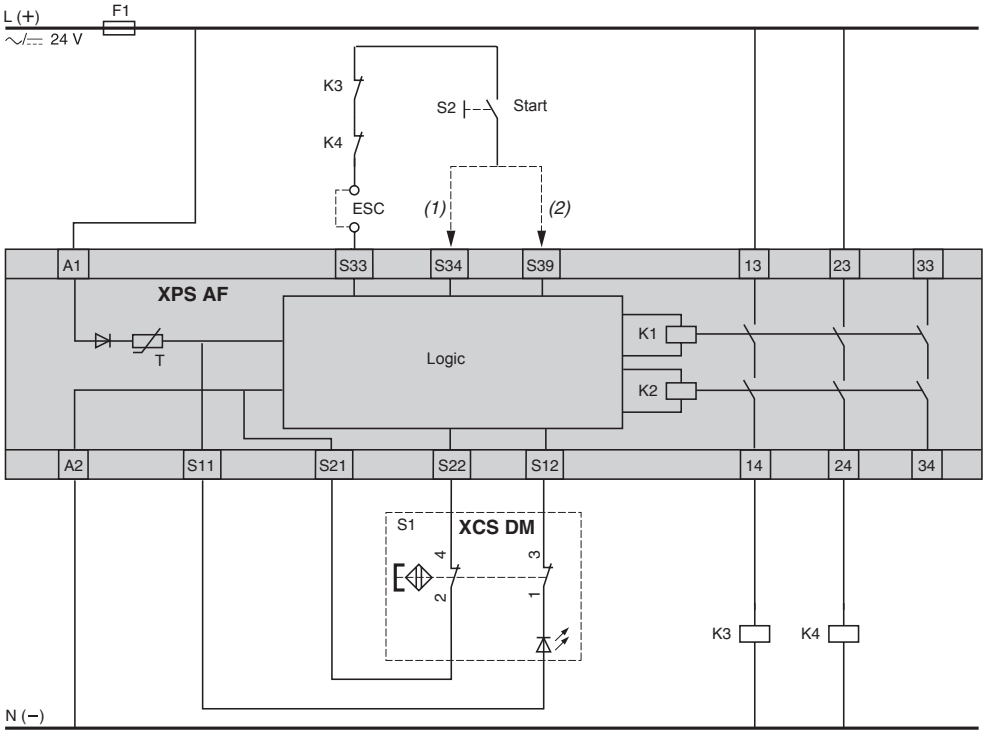
Example with 3-pole N.C. + N.C. + N.O. contact



(1) Input: S11, S12, S13 or S21, S22, S23.

XCSDM●7●●● with XPSAF

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N.C. + N.C. contact (not conforming to standard EN 1088/ISO 14119)

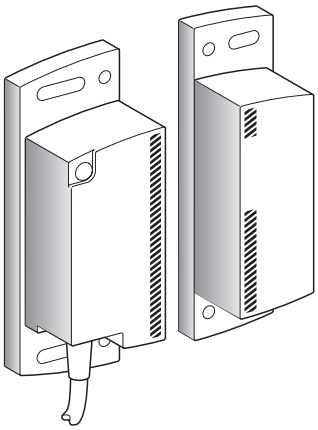


(1) With start button monitoring.
(2) Without start button monitoring.
ESC: External start conditions.

Non-Contact safety interlock switches Pre-cabled connection

SIL 2 and 3/Categories 3 and 4

XCSDM3791●● /XCSDM4801●●

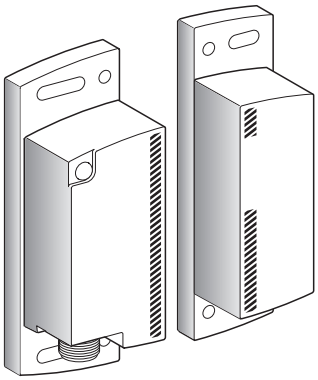


page 6

Non-Contact safety interlock switches M12 connector connection

SIL 2 and 3/Categories 3 and 4

XCSDM3791M12/ XCSDM4801M12



page 18

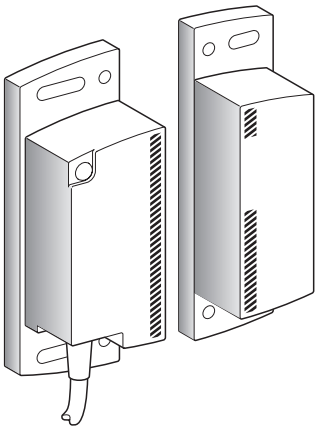
Safety detection solutions
Non-Contact safety interlock switches

Non-Contact safety interlock type			SIL2/Category 3 XCSDM3	SIL3/Category 4 XCSDM4
Environment				
Conformity to standards			IEC 61508, EN/IEC 62061(SIL2 and SIL3), EN 13849-1 (Category 3 and Category 4), EN 1088/ISO 14119, EN/IEC 60947-5-1; EN/IEC 60947-5-2 ; EN/IEC 60947-5-3	
Product certifications			CE, UL, CSA, TÜV	
Ambient air temperature	For operation	**°F (°C)**	-13...+158 (-25...+70)	
	For storage	**°F (°C)**	+ 40 ...+ 185 (-40...+85)	
Vibration resistance	Conforming to IEC 60068-2-6		10 gn (10…500 Hz)	
Shock resistance	Conforming to IEC 60068-2-7		30 gn, 11 ms	
Sensitivity to magnetic fields		**mT**	≤ 0,5	
Electric shock protection	Conforming to IEC 61140		Class III	
Degree of protection	Conforming to IEC 60529		Pre-cabled version: IP 66, IP 67 Connector version: IP 67	
	Conforming to DIN 40050		Pre-cabled version: IP 69K	
Materials			Thermoplastic case (PBT); PVC cable	
Characteristics				
Rated operational characteristics			Ub : ⎓ 24 V + 10% - 20%	
Rated insulation voltage (Ui)			Ui : ⎓ 36V	
Rated impulse withstand voltage (U imp)	Conforming to EN 60947-5-1	kV	2,5	
Integrated output protection			Overload and short-circuit protection	
Connection	Conforming to IEC 60947-5-2-A3 and IEC 61076		Pre-cabled, 6 x 22 AWG (0.25 mm²), length: 6.6, 16.4 or 32.8 ft. (2, 5, or 10 m) depending on model or M12 connector (A coding)	Pre-cabled, 8 x 22 AWG (0.25 mm²), length: 6.6, 16.4 or 32.8 ft. (2, 5, or 10 m) depending on model or M12 connector (A coding)
Cable diameter		**in. (mm)**	0.24 (6.1 +/- 0.3)	
Cable resistance		**mΩ/m**	90	
Safety outputs (OSSD) **(Output Signal Switching Devices)**			2 PNP type (NO) solid-state outputs, 1.5 A (2 A up to 140 °F (60°C)), ⎓ 24 V (short-circuit protected)	
Alarm output			–	1 solid-state output, 0.5 A, ⎓ 24 V, PNP
Signalling			LED (green/red/orange)	
Maximum switching frequency		**Hz**	3	
Activation delay		**ms**	100	
Discordance time		**s**	2	
HFT (Hardware Fault Tolerance)			1	
			Test interval: 12 months	
Tightening torque		**lb-ft (Nm)**	1.327 (1.8) maximum	
Maximum series mounting			32 maximum with 6.6 ft. (2 m) long cable	–
Functions				
Functions			- LED status signalling	- Auto/Manual start via “Start”input - Monitoring of external switching devices (EDM: External Devices Monitoring) - Display of operating modes (LED) - Monitoring of the function (open or closed) as well as the response time of the power components.

3

Safety detection solutions
Non-contact safety interlock switches
Plastic, solid-state PNP type output

Type	Non-Contact safety interlock switches with dedicated transmitter
	Pre-cabled connection



References

Description	Type of connection	SIL2/Category 3	SIL3/Category 4	Weight oz (kg)
Magnetic system with dedicated transmitter *(1)*	Pre-cabled, L = 6.6 ft (2 m)	**XCSDM379102**	**XCSDM480102**	11.288 (0.320)
	Pre-cabled, L = 16.4 ft. (5 m)	**XCSDM379105**	**XCSDM480105**	16.932 (0.480)
	Pre-cabled, L = 32.8 ft. (10 m)	**XCSDM379110**	**XCSDM480110**	26.279 (0,745)

(1) Self-contained system not requiring use of safety module or non-magnetic shim.

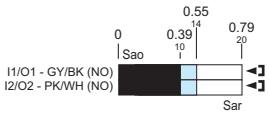
Detection characteristics

Assured operating distance	Sao : 0.39 in. (10 mm)
Assured tripping distance	Sar : 0.79 in. (20 mm)
Approach directions	9
Approach speed	0.03 ft./s (0.01 m/s) mini

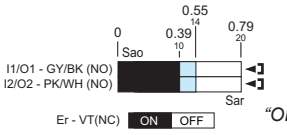
Output status (pre-cabled connection)

Output states shown are with the dedicated transmitter positioned in front of the receiver.

XCSDM3791●●



XCSDM4801●●

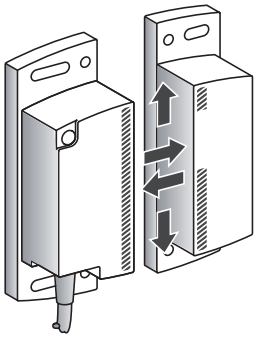


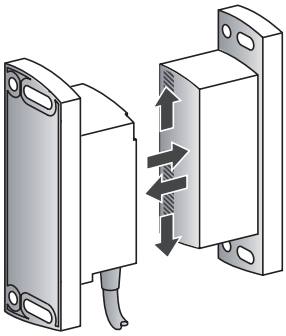
"OFF" = Error

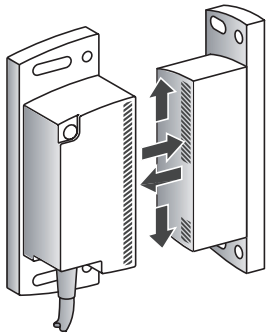
Output closed
Output open
Transitional state

Sao : Specified operating distance.
Sar : Specified tripping distance.
Conforming to EN/IEC 60947-5-3

Approach directions



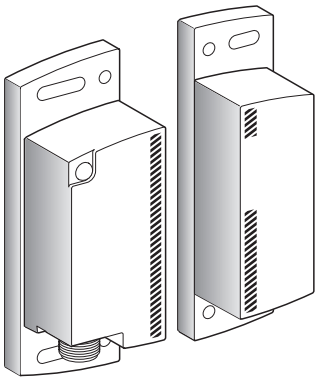




Characteristics: Page 3/67 | References: Page 3/68 | Accessories: Page 3/70 | Dimensions: Page 3/71 | Wiring Diagrams: Page 3/73

Safety detection solutions
Non-contact safety interlock switches
Plastic, solid-state PNP type output

Type	Non-contact safety interlock with dedicated transmitter
	M12 connector connection



References

Description	Type of connection	SIL2/Category 3	SIL3/Category 4	Weight oz (kg)
Non-Contact safety interlock switches with dedicated transmitter *(1)*	M12 connector	**XCSDM3791M12**	**XCSDM4801M12**	7.584 (0.215)

1) Self-contained system not requiring use of safety module or non-magnetic shim.

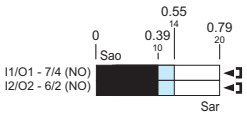
Detection characteristics

Assured operating distance	Sao : 0.39 in. (10 mm)
Assured tripping distance	Sar : 0.79 in. (20 mm)
Approach directions	9
Approach speed	0.03 ft./s (0.01 m/s) mini

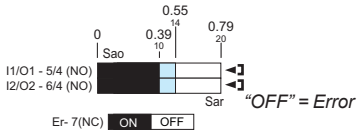
Output status (pre-cabled connection)

Output states shown are with the dedicated transmitter positioned in front of the receiver.

XCSDM3791M12



XCSDM4801M12



Output closed
Output open
Transitional state

Sao : Specified operating distance.
Sar : Specified tripping distance.
Conforming to EN/IEC 60947-5-3

Accessories

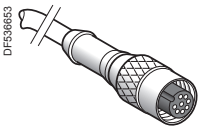
Description	For use with	Reference	Weight oz (kg)
Replacement dedicated transmitter	XCSDM3/4●●●02/05/10 XCSDM3/4●●●M12	**XCSDMT**	3.527 (0.100)
Arc suppressor (pair)	XCSDM3/4●●●02/05/10 XCSDM3/4●●●M12	**XUSLZ500**	0.705 (0.020)

Pre-wired female connectors for connector version Non-contact safety interlock switches

Pre-wired connector characteristics

Pre-wired connector type			**XZ CP29P12L●**
Type of connection			Screw threaded (metal clamping ring)
Number of contacts			8
Degree of protection			IP 67 (with clamping ring correctly tightened)
Ambient air temperature	Operation	**°F (°C)**	- 13 ...+ 158 (- 25 ...+ 70)
	Storage	**°F (°C)**	- 40 ...+ 185 (- 40…+ 85)
Cabling	Conforming to IEC 60947-5-2		Ø 6.1 mm PUR cable, wire c.s.a.: 8 x 22 AWG (0.25 mm²)
LED signalling			–
Nominal current		**A**	2
Insulation resistance		Ω	> 10^9
Contact resistance		**mΩ**	≤ 5

References of pre-wired connectors



XZ CP29P12L●

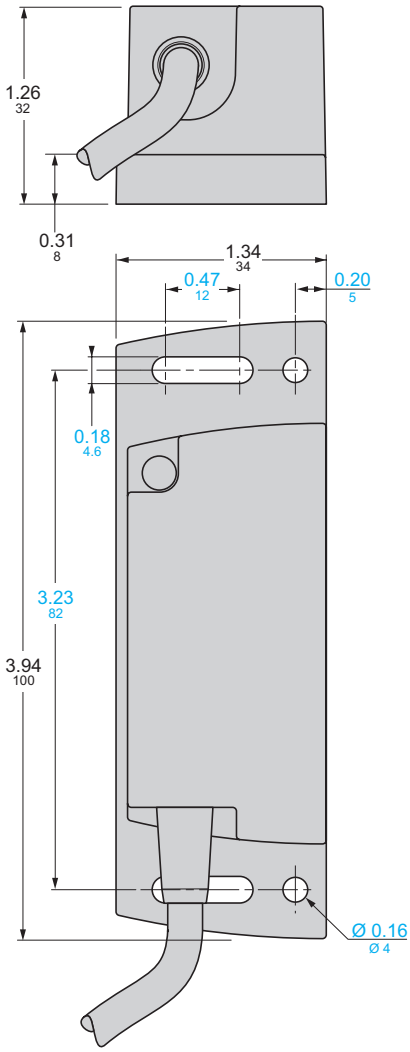
Type of connector	No. of contacts	For use with	Type	Cable length ft. (m)	Reference	Weight oz (kg)
Female, M12 (Coding A)	8	XCSDM3/4●●●02 XCSDM3/4●●●05 XCSDM3/4●●●10	Straight	6.6 (2)	**XZCP29P12L2**	3.527 (0.100)
				16.4 (5)	**XZCP29P12L5**	10.229 (0.290)
				32.8 (10)	**XZCP29P12L10**	16.579 (0.470)

Safety detection solutions
Non-contact safety interlock switches
Plastic

Non-contact safety interlock switches

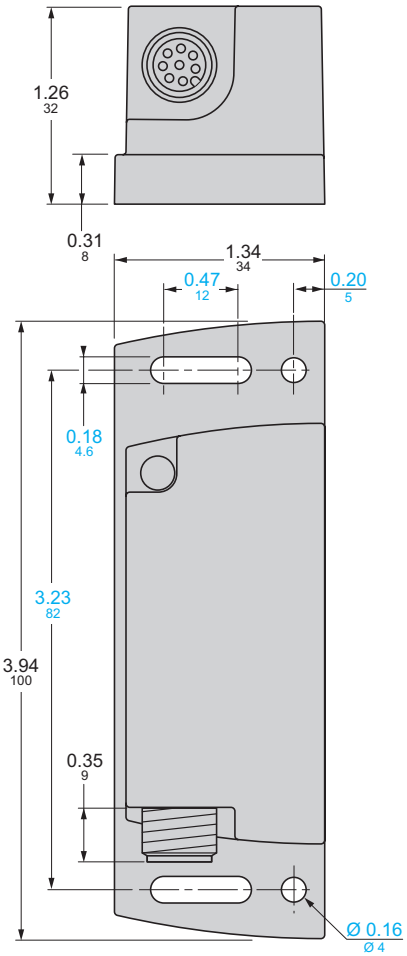
Pre-cabled connection

XCSDM3/4●●●02/05/10



M12 connector (Coding A) connection

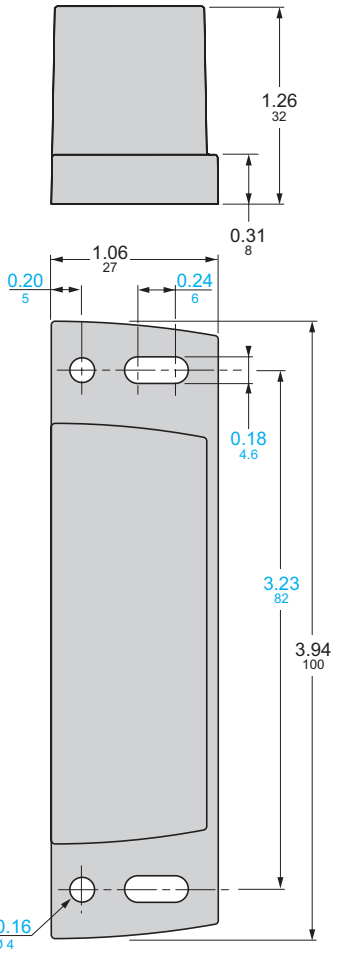
XCSDM3/4●●●M12



Accessory

Replacement dedicated transmitter

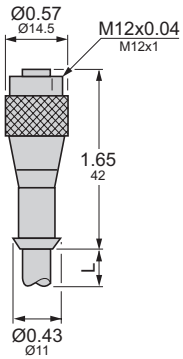
XCSDMT



Dual Dimensions: INCHES Millimieters

Pre-wired female connectors

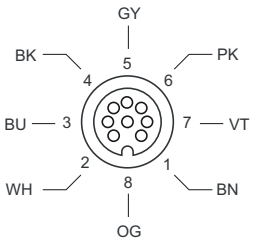
XZ CP29P12L●



Wiring diagram

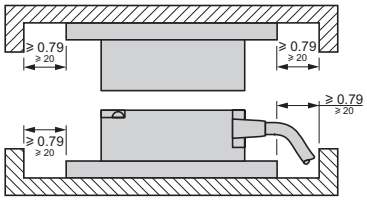
M12 pre-wired female connector

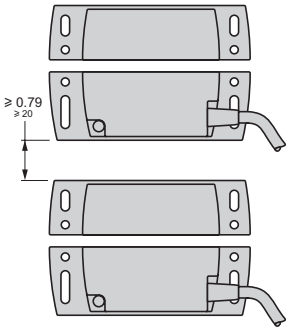
XZ CP29P12L●

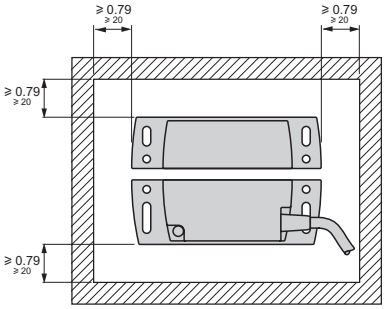


Mounting

XCSDM3/DM4







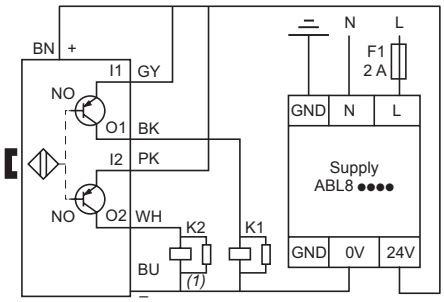
Dual Dimensions: INCHES
Millimieters

Wiring diagrams

Category 3 (this Category 3 wiring can attain SIL2)

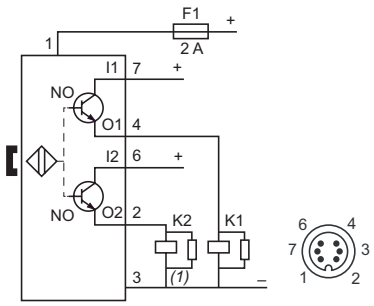
Pre-cabled connection

XCSDM3791●●



M12 connector (A coding) connection

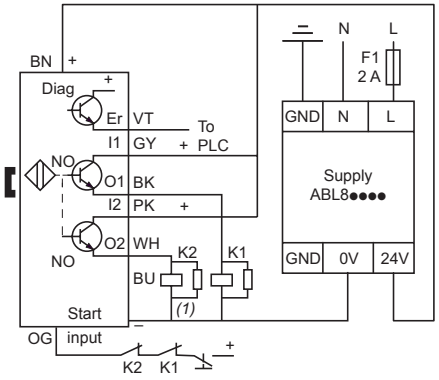
XCSDM3791M12



SIL3/Category 4

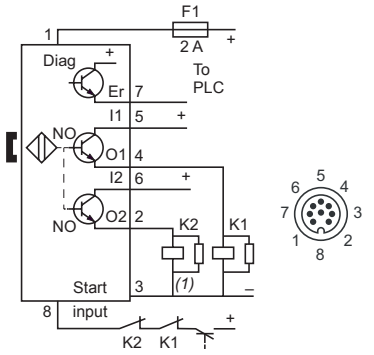
Pre-cabled connection

XCSDM4801●●



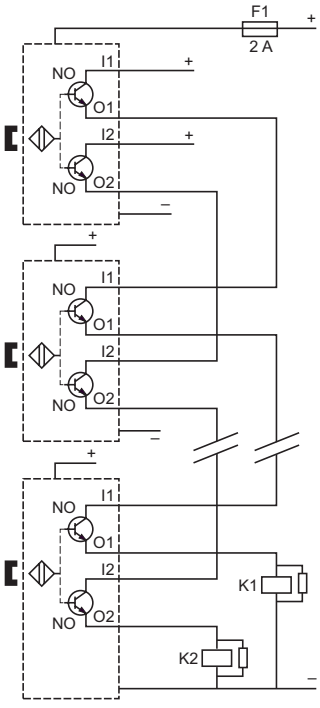
M12 connector (A coding) connection

XCSDM4801M12



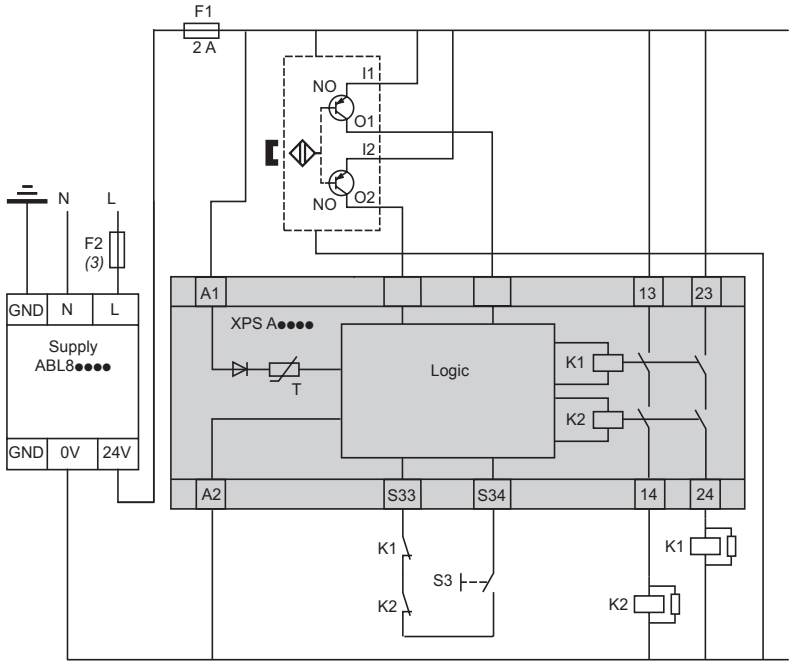
Series mounting non-contact safety interlock switches *(2)*

XCSDM3791●●



Wiring to SIL3/Category 4 with safety relay module

Example: XCSDM3●●●●● + XPSAFL5130



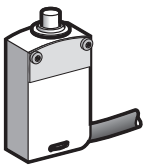
(1) Mechanically linked contacts
(2) Maximum series mounting: 32 maximum with 6.6 ft. (2 m) long cable.
(3) 2A maximum

Safety detection solutions
Safety limit switches
Miniature design, metal, type XCS M

XCS M
pre-cabled

With head for linear movement (plunger). Mounting by the body

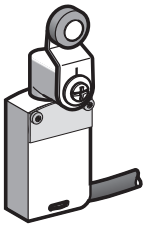
520576



page 3/76

With head for rotary movement (lever). Mounting by the body

520577



page 3/76

Safety detection solutions
Safety limit switches
Miniature design, metal, type XCS M

Environment

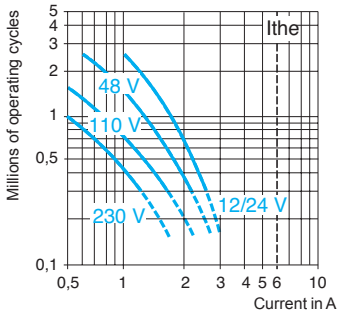
Conforming to standards	Products	IEC/EN 60947-5-1, UL 508, CSA C22-2 No. 14
	Machine assemblies	IEC/EN 60204-1, EN 1088
Product certifications		UL, CSA
Protective treatment		Standard version: “TC”
Ambient air temperature		Operation: - 13…+ 158 °F(- 25...+ 70 °C). Storage: - 40…+ 158 °F (- 40…+ 70 °C)
Vibration resistance		XCS M snap action: 5 gn. XCS M slow break: 25 gn (10…500 Hz) conforming to IEC 60068-2-6
Shock resistance		25 gn, (18 ms) conforming to IEC 60068-2-27
Electric shock protection		Class I, conforming to IEC 6140 and NF C 20-030
Degree of protection		**IP 66, IP 67 and IP 68** *(1)* **conforming to IEC 60529; IK 06 conforming to EN 50102**
Materials		Body: zamak. Head: zamak. Protective cover: steel.
Repeat accuracy		0.002 in. (0.05 mm) on the tripping points with 1 million operating cycles for head with end plunger

Contact block characteristics

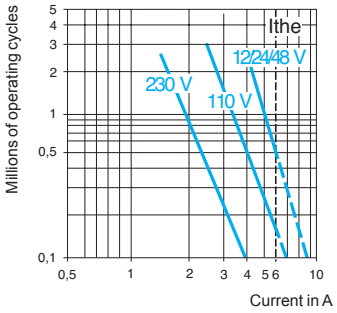
Rated operational characteristics	**~ AC-15; B300 (Ue = 240 V, Ie = 1.5 A)** **⎓ DC-13 ; R300 (Ue = 250 V, Ie = 0.1 A), conforming to IEC 60947-5-1 Appendix A, EN 60947-5-1**
Rated insulation voltage	Ui = 400 V degree of pollution 3 conforming to IEC 60947-5-1 Ui = 300 V conforming to UL 508, CSA C22-2 No. 14
Rated impulse withstand voltage	U imp = 4 kV conforming to IEC 60947-1, IEC 60664
Positive operation (depending on model)	N.C. contacts with positive opening operation conforming to IEC/EN 60947-5-1 Appendix K
Resistance across terminals	≤ 25 mΩ conforming to IEC 60255-7 category 3
Short-circuit protection	6 A cartridge fuse type gG (gl)
Minimum actuation speed	Snap action contact: 0.01 m/minute Break before make, slow break: 6 m/minute
Electrical life	■ Conforming to 60947-5-1 Appendix C ■ Utilisation category AC-15 and DC-13 ■ Maximum frequency: 3600 operating cycles/hour ■ Load factor: 0.5

a.c. supply
~ 50/60 Hz
⎍ inductive circuit

XCS M snap action (N.C.+ N.C. + N.O., N.C.+ N.C. + N.O. + N.O. contacts)



XCS M slow break (N.C.+ N.C. + N.O. contact)



d.c. supply ⎓

Power broken in W for 5 million operating cycles

Voltage	V	24	48	120
⎍	W	3	2	1

Power broken in W for 5 million operating cycles

Voltage	V	24	48	120
⎍	W	4	3	3

Electrical Life

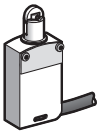
The product life expressed is based on average usage and normal operating conditions. Actual operating life will vary with conditions. The above statements are not intended to nor shall they create any express or implied warranties as to product operation or life. For information on the limited warranty offered on this product please refer to the Square D ® terms and conditions of sale found in the Square D ® *Digest*.

Safety detection solutions

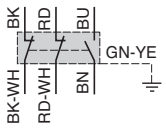
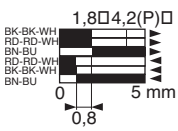
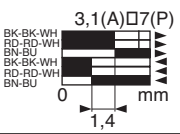
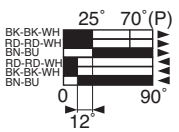
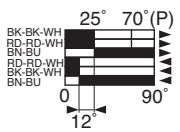
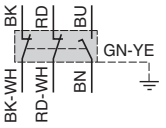
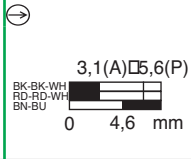
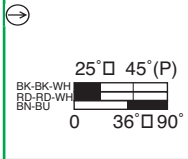
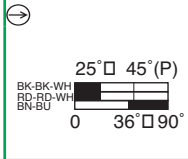
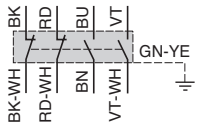
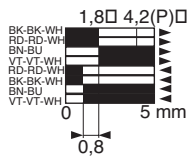
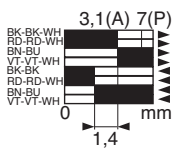
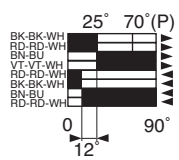
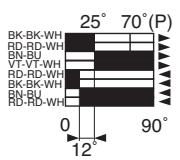
Safety limit switches

Miniature design, metal, type XCS M

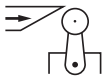
Pre-cabled

Type of head	Plunger (mounting by the body)		Rotary (mounting by the body)	
				
Type of operator	Metal end plunger	Roller plunger	Thermoplastic roller lever	Steel roller lever

References with 6.6 ft (2 m) cable (1)

	**3-pole N.C.+N.C.+N.O. snap action contact**	**XCS M3910L2** 	**XCS M3902L2** 	**XCS M3915L2** 	**XCS M3916L2** 
	**3-pole N.C.+N.C.+N.O. break before make, slow break contact**	**XCS M3710L2** 	**XCS M3702L2** 	**XCS M3715L2** 	**XCS M3716L2** 
	**4-pole N.C.+N.C.+N.O.+N.O. snap action contact**	**XCS M4110L2** 	**XCS M4102L2** 	**XCS M4115L2** 	**XCS M4116L2** 
Weight oz (kg)	5.820 (0.165)	5.997 (0.170)	7.231 (0.205)	7.408 (0.210)	
Contact operation	*closed* *open*		*(A) = cam displacement* *(P) = positive opening point* *⊖ N.C. contact with opening positive operation*		

Complementary characteristics not shown under general characteristics (page 3/75)

Switch actuation		On end	By 30° cam	
Type of actuation				
Maximum actuation speed		1.64 ft/s (0.5 m/s)	1.64 ft/s (0.5 m/s)	4.9 ft/s (1.5 m/s)
Minimum force or torque	Tripping	1.9 lb (8.5 N)	1.6 lb (7 N)	0.9 lb-in (0.1 N•m)
	Positive opening	9.6 lb (42.4 N)	7.9 lb (35 N)	4.4 lb-in (0.5 N•m)
Cabling	3-pole contacts	PVR pre-cabled, 7 x 20 AWG (0.5 mm²)		
	4-pole contacts	PVR pre-cabled, 9 x 22 AWG (0.34 mm²),		

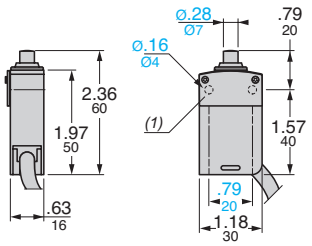
(1) Devices shown have a 6.6 ft (2 m) cable, and are available with other lengths of cable:
For a 3.3 ft (1 m) long cable, replace L2 with L1.
For a 16.4 ft (5 m) long cable, replace L2 with L5.

Characteristics: Page 3/75 | References: Page 3/76 | Accessories: Page 3/76 | Dimensions: Page 3/77 | Wiring Diagrams: Page 3/77

Safety detection solutions
Safety limit switches
Miniature design, metal, type XCS M
Pre-cabled

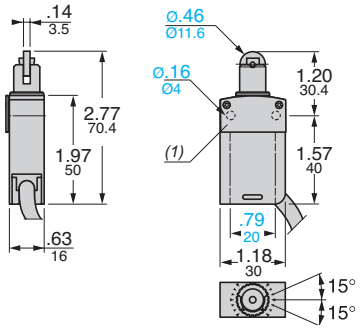
Dimensions

XCSM ●●10L1

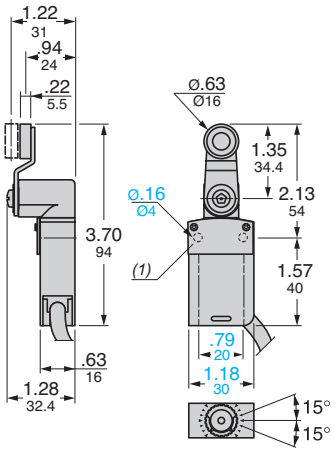


(1) Protective cover mounted with 5-lobe torque safety screws.

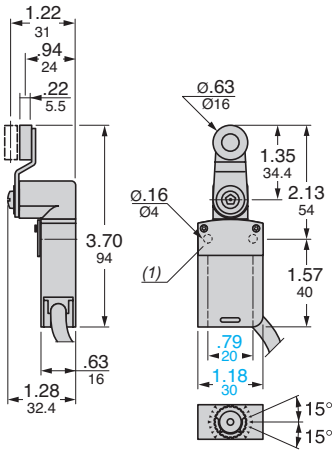
XCSM ●●02L1



XCSM ●●15L1



XCSM ●●16L1



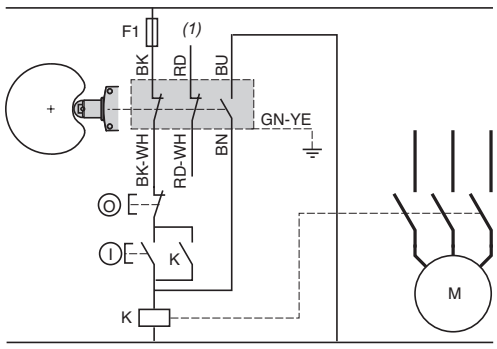
Dual Dimensions: INCHES / Millimieters

(1) Protective cover mounted with 5-lobe torque safety screws.

Wiring diagrams

Wiring to category 1 conforming to EN 954-1/ IEC 13849-1

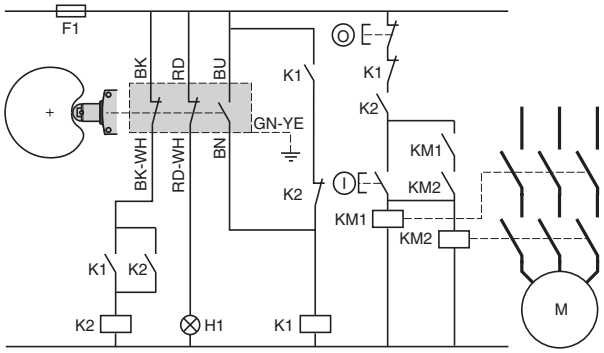
Example with 3-pole N.C.+N.C.+N.O. contact and protective fuse to prevent jumpering of the N.C. contacts, either by cable damage or by tampering.



(1) Signalling contact

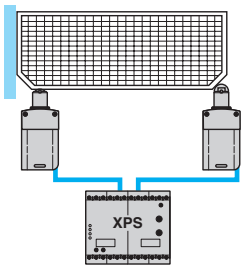
Wiring to category 3 conforming to EN 954-1/IEC 13849-1

Example with 3-pole N.C.+N.C.+N.O. contact with mixed redundancy of the contacts and the associated control relyas. Opening and closing of the guard necessary to activate K1.



H1: "guard closed" indicator light

Example of guard monitoring using 2 switches and 1 safety relay module (category 4)
Operation in positive and negative (combined) mode



Characteristics: Page 3/75
References: Page 3/76
Accessories: Page 3/76
Dimensions: Page 3/77
Wiring Diagrams: Page 3/77

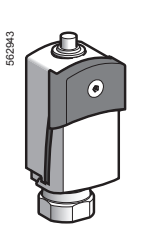
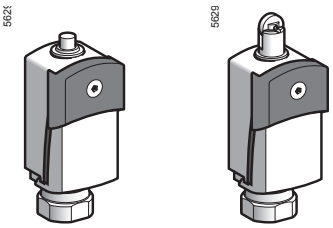
Safety detection solutions

Safety limit switches

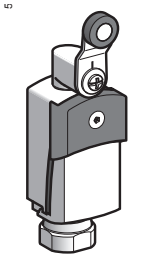
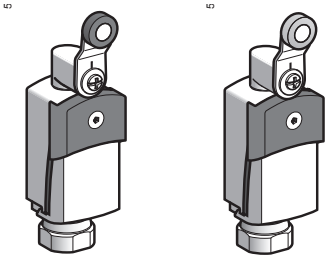
Compact design, metal, type XCSD
Compact design, plastic, type XCS P

■ XCSD, XCS P
with 1 conduit entry
conforming to EN 50047

With head for linear movement (plunger)

XCSD	XCS P
	
Pages 3/80 and 3/81	Pages 3/82 and 3/83

With head for rotary movement (lever)

XCSD	XCS P
	
Pages 3/80 and 3/81	Pages 3/82 and 3/83

Safety detection solutions
Safety limit switches
Compact design, metal, type XCSD
Compact design, plastic, type XCS P

Environmental characteristics

Conformity to standards	Products	IEC/EN 60947-5-1, UL 508, CSA C22-2 n° 14
	Machine assemblies	IEC/EN 60204-1, EN 1088/ISO 14119
Product certifications		UL, CSA
Protective treatment	Standard version	"TC"
Ambient air temperature	For operation	- 13…+ 158 °F (- 25…+ 70 °C)
	For storage	- 40…+ 158 °F (- 40…+ 70 °C)
Vibration resistance	Conforming to IEC 60068-2-6	25 gn (10…500 Hz)
Shock resistance	Conforming to IEC 60068-2-27	50 gn (11 ms)
Electric shock protection		Class I conforming to IEC 61140 and NF C 20-030 for **XCSD**
		Class II conforming to IEC 61140 and NF C 20-030 for **XCS P**
Degree of protection	Conforming to IEC 60529	**IP 66 and IP 67**
	Conforming to EN 50102	**IK 06 for XCSD** **IK 04 for XCS P**
Repeat accuracy		0.004 in (0.1 mm) on the tripping points, with 1 million operating cycles for head with end plunger
Cable entry	Depending on model	Tapped entry for 13.5 cable gland, tapped ISO M20 x 1.5 or tapped 1/2" NPT
Materials		**XCSD** zamak bodies and heads, **XCS P** plastic bodies, zamak heads Plastic protective cover, secured by 5-lobe socket head safety screw

Contact block characteristics

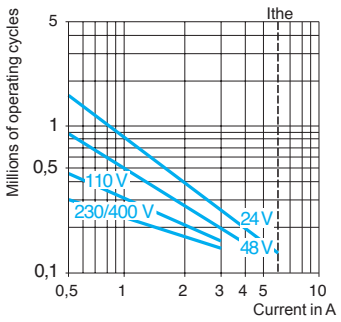
Rated operational characteristics		∼ AC-15; B300 (Ue = 240 V, Ie = 1.5 A); Ithe = 6 A ⎓ DC-13; R300 (Ue = 250 V, Ie = 0.1 A), conforming to IEC/EN 60947-5-1 Appendix A
Rated insulation voltage		Ui = 400 V degree of pollution 3 conforming to EN/IEC 60947-1 Ui = 300 V conforming to UL 508, CSA C22-2 n° 14
Rated impulse withstand voltage		U imp = 4 kV conforming to EN/IEC 60947-1, IEC 60664
Positive operation		N.C. contacts with positive opening operation conforming to IEC/EN 60947-5-1 Appendix K
Resistance across terminals		≤ 25 mΩ conforming to IEC 60255-7 category 3
Short-circuit protection		6 A cartridge fuse type gG (gI)
Connection (screw clamp terminals)		Clamping capacity, min: 1 x 22 AWG (0.34 mm²), max: 1 x 18 AWG (1 mm²) or 2 x 18 AWG (0.75 mm²)
Minimum actuation speed (for head with end plunger)	Snap action	0.39 in/ (0.01 m) per minute
	Slow break	19.7 ft/ (6 m) per minute

Electrical life

- Conforming to EN/IEC 60947-5-1 Appendix C
- Utilisation categories AC-15 and DC-13
- Maximum operating rate: 3600 operating cycles/hour
- Load factor: 0.5

a.c. supply
∼ 50/60 Hz
⎍ inductive circuit

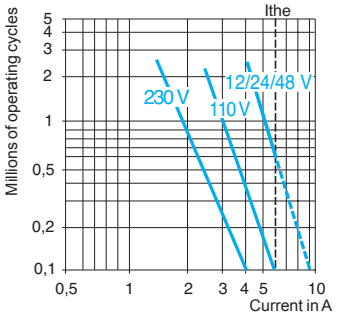
Snap action contacts



Power broken in W for 5 million operating cycles.

Voltage	V	24	48	120
⎍	W	3	2	1

Slow break contacts



Power broken in W for 5 million operating cycles.

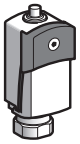
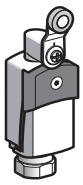
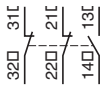
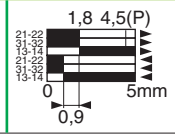
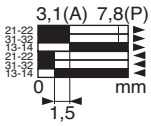
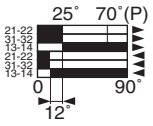
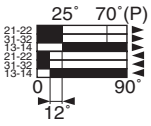
Voltage	V	24	48	120
⎍	W	4	3	2

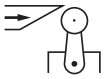
d.c. supply ⎓

Electrical Life

The product life expressed is based on average usage and normal operating conditions. Actual operating life will vary with conditions. The above statements are not intended to nor shall they create any express or implied warranties as to product operation or life. For information on the limited warranty offered on this product please refer to the Square D ® terms and conditions of sale found in the Square D ® *Digest*.

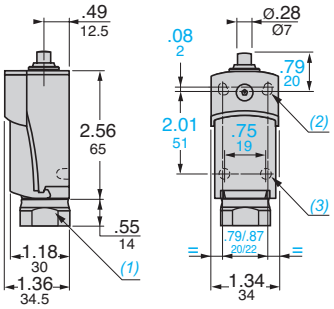
Safety detection solutions
Safety limit switches
Compact design, metal, type XCSD

Type of head	Plunger		Rotary	
				
Type of operator	Metal end plunger	Steel roller plunger	Thermoplastic roller lever	Steel roller lever
References of complete switches with 3-pole N.C. + N.C. + N.O. snap action contact				
With 1/2" NPT cable entry				
	XCSD3910N12 ⊖	**XCSD3902N12** ⊖	**XCSD3918N12** ⊖	**XCSD3919N12** ⊖
With ISO M20 x 1.5 cable entry				
	XCSD3910P20 ⊖	**XCSD3902P20** ⊖	**XCSD3918P20** ⊖	**XCSD3919P20** ⊖
With Pg 13.5 cable entry				
	XCSD3910G13 ⊖	**XCSD3902G13** ⊖	**XCSD3918G13** ⊖	**XCSD3919G13** ⊖
Weight oz (kg)	7.585 (0.215)	7.760 (0.220)	8.995 (0.255)	8.995 (0.255)
Contact functional diagrams				
 **3-pole N.C. + N.C. + N.O. snap action contact**				
Contact operation	*contact closed* *contact open* ⊖ *N.C. contact with positive opening operation*		*(A) = cam displacement* *(P) = positive opening point*	

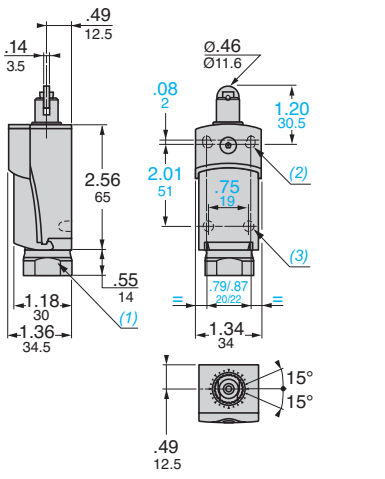
Complementary characteristics not shown under general characteristics (page 3/79)				
Switch actuation		On end	By 30° cam	
Type of actuation				
Maximum actuation speed		1.64 ft/s (0.5 m/s)		4.9 ft/s (1.5 m/s)
Minimum force or torque	For tripping	3.72 lb (15 N)	2.70 lb (12 N)	0.89 lb-in (0.1 N•m)
	For positive opening	10.12 lb (45 N)	8.09 lb (36 N)	2.21 lb-in (0.25 N•m)
Conduit entry		1 entry tapped M20 x 1.5 mm for ISO cable gland, clamping capacity 7 to 13 mm 1 entry tapped Pg 13.5 for cable gland, clamping capacity 9 to 12 mm 1 entry tapped for 1/2" NPT (USAS B2-1) conduit		

Dimensions

XCSD3●10●●●



XCSD3●02●●●



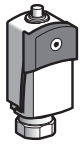
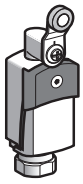
(1) Tapped entry for ISO M20 x 1.5 or Pg 13.5 cable gland or 1/2" NPT conduit.
(2) 2 elongated holes Ø.17 x .25 in. (Ø 4.3 x 6.3 mm) on .87 in. (22 mm) centers or 2 holes Ø.17 in. (Ø 4.3 mm) on .79 in. (20 mm) centers.
(3) .08 x Ø.12 in. (2 x Ø 3 mm) holes for studs, depth .16 in. (4 mm).

Dual Dimensions: INCHES Millimeters

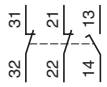
Characteristics: Page 3/79 | References: Page 3/80 | Accessories: Page 3/80 | Dimensions: Page 3/80 | Wiring Diagrams: Page 3/80

Schneider Electric

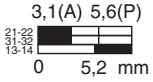
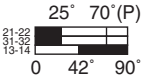
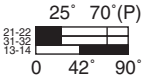
Safety detection solutions
Safety limit switches
Compact design, metal, type XCSD

Type of head	Plunger		Rotary	
				
Type of operator	Metal end plunger	Steel roller plunger	Thermoplastic roller lever	Steel roller lever
References of complete switches with 3-pole N.C. + N.C. + N.O. break before make, slow break contact				
With 1/2" NPT cable entry				
	XCSD3710N12 ⊖	**XCSD3702N12** ⊖	**XCSD3718N12** ⊖	**XCSD3719N12** ⊖
With ISO M20 x 1.5 cable entry				
	XCSD3710P20 ⊖	**XCSD3702P20** ⊖	**XCSD3718P20** ⊖	**XCSD3719P20** ⊖
With Pg 13.5 cable entry				
	XCSD3710G13 ⊖	**XCSD3702G13** ⊖	**XCSD3718G13** ⊖	**XCSD3719G13** ⊖
Weight oz (kg)	7.585 (0.215)	7.760 (0.220)	8.995 (0.255)	8.995 (0.255)

Contact functional diagrams



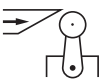
3-pole N.C. + N.C. + N.O. break before make, slow break contact

1,8 3,2(P)	3,1(A) 5,6(P)	25˚ 70˚(P)	25˚ 70˚(P)
			
0 3 5mm	0 5,2 mm	0 42˚ 90˚	0 42˚ 90˚

Contact operation

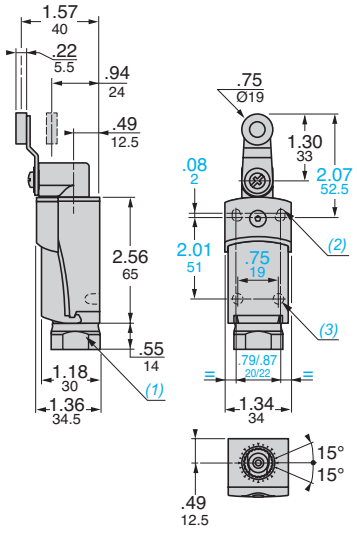
■ *contact closed* *(A) = cam displacement*
□ *contact open* *(P) = positive opening point*
⊖ *N.C. contact with positive opening operation*

Complementary characteristics not shown under general characteristics (page 3/79)

Switch actuation		On end	By 30° cam	
Type of actuation				
Maximum actuation speed		1.64 ft/s (0.5 m/s)		4.9 ft/s (1.5 m/s)
Minimum force or torque	For tripping	3.72 lb (15 N)	2.70 lb (12 N)	0.89 lb-in (0.1 N•m)
	For positive opening	10.12 lb (45 N)	8.09 lb (36 N)	2.21 lb-in (0.25 N•m)
Conduit entry		1 entry tapped M20 x 1.5 mm for ISO cable gland, clamping capacity 7 to 13 mm 1 entry tapped Pg 13.5 for cable gland, clamping capacity 9 to 12 mm 1 entry tapped for 1/2" NPT (USAS B2-1) conduit		

Dimensions

XCSD3●18●●●, XCSD3●19●●●

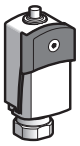
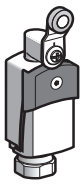


(1) Tapped entry for ISO M20 x 1.5 or Pg 13.5 cable gland or 1/2" NPT conduit.
(2) 2 elongated holes Ø.17 x .25 in. (Ø 4.3 x 6.3 mm) on .87 in. (22 mm) centers or 2 holes Ø.17 in. (Ø 4.3 mm) on .79 in. (20 mm) centers.
(3) .08 x Ø.12 in. (2 x Ø 3 mm) holes for studs, depth .16 in. (4 mm).

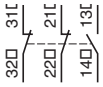
Dual Dimensions: INCHES Millimieters

Characteristics: Page 3/79 | References: Page 3/80 | Accessories: Page 3/80 | Dimensions: Page 3/80 | Wiring Diagrams: Page 3/80

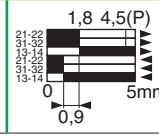
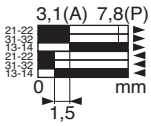
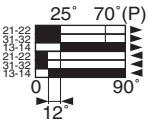
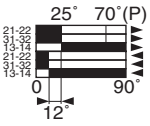
Safety detection solutions
Safety limit switches
Compact design, plastic, type XCS P

Type of head	Plunger		Rotary	
				
Type of operator	Metal end plunger	Steel roller plunger	Thermoplastic roller lever	Steel roller lever
References of complete switches with 3-pole N.C. + N.C. + N.O. snap action contact				
With 1/2" NPT cable entry				
	XCS P3910N12 ⊖	**XCS P3902N12** ⊖	**XCS P3918N12** ⊖	**XCS P3919N12** ⊖
With ISO M20 x 1.5 cable entry				
	XCS P3910P20 ⊖	**XCS P3902P20** ⊖	**XCS P3918P20** ⊖	**XCS P3919P20** ⊖
With Pg 13.5 cable entry				
	XCS P3910G13 ⊖	**XCS P3902G13** ⊖	**XCS P3918G13** ⊖	**XCS P3919G13** ⊖
Weight oz (kg)	7.585 (0.215)	7.760 (0.220)	8.995 (0.255)	8.995 (0.255)

Contact functional diagrams

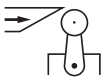


3-pole N.C. + N.C. + N.O. snap action contact

Contact operation	 1,8 4,5(P) 0 5mm 0,9	 3,1(A) 7,8(P) 0 mm 1,5	 25° 70°(P) 0 90° 12°	 25° 70°(P) 0 90° 12°

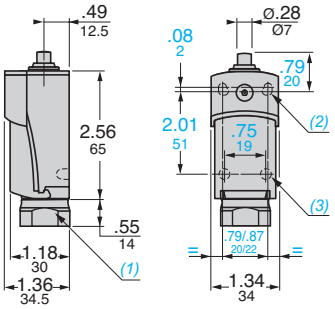
contact closed *(A) = cam displacement*
contact open *(P) = positive opening point*
⊖ *N.C. contact with positive opening operation*

Complementary characteristics not shown under general characteristics (page 3/79)

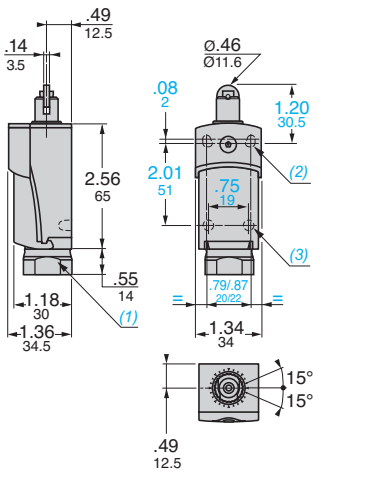
Switch actuation		On end	By 30° cam	
Type of actuation				
Maximum actuation speed		1.64 ft/s (0.5 m/s)		4.9 ft/s (1.5 m/s)
Minimum force or torque	For tripping	3.72 lb (15 N)	2.70 lb (12 N)	0.89 lb-in (0.1 N•m)
	For positive opening	10.12 lb (45 N)	8.09 lb (36 N)	2.21 lb-in (0.25 N•m)
Conduit entry		1 entry tapped M20 x 1.5 mm for ISO cable gland, clamping capacity 7 to 13 mm 1 entry tapped Pg 13.5 for cable gland, clamping capacity 9 to 12 mm 1 entry tapped for 1/2" NPT (USAS B2-1) conduit		

Dimensions

XCS P3●10●●●



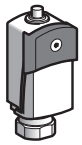
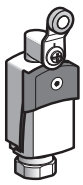
XCS P3●02●●●



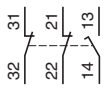
(1) Tapped entry for ISO M20 x 1.5 or Pg 13.5 cable gland or 1/2" NPT conduit.
(2) 2 elongated holes Ø.17 x .25 in. (Ø 4.3 x 6.3 mm) on .87 in. (22 mm) centers or 2 holes Ø.17 in. (Ø 4.3 mm) on .79 in. (20 mm) centers.
(3) .08 x Ø.12 in. (2 x Ø 3 mm) holes for studs, depth .16 in. (4 mm).

Dual Dimensions: INCHES Millimeters

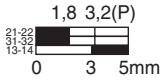
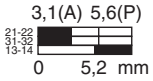
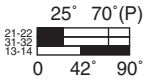
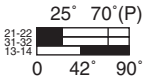
Characteristics: Page 3/79 | References: Page 3/82 | Accessories: Page 3/82 | Dimensions: Page 3/82 | Wiring Diagrams: Page 3/82

Type of head	Plunger		Rotary	
				
Type of operator	Metal end plunger	Steel roller plunger	Thermoplastic roller lever	Steel roller lever
References of complete switches with 3-pole N.C. + N.C. + N.O. break before make, slow break contact				
With 1/2" NPT cable entry				
	XCS P3710N12 ⊖	**XCS P3702N12** ⊖	**XCS P3718N12** ⊖	**XCS P3719N12** ⊖
With ISO M20 x 1.5 cable entry				
	XCS P3710P20 ⊖	**XCS P3702P20** ⊖	**XCS P3718P20** ⊖	**XCS P3719P20** ⊖
With Pg 13.5 cable entry				
	XCS P3710G13 ⊖	**XCS P3702G13** ⊖	**XCS P3718G13** ⊖	**XCS P3719G13** ⊖
Weight oz (kg)	7.585 (0.215)	7.760 (0.220)	8.995 (0.255)	8.995 (0.255)

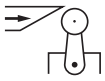
Contact functional diagrams



3-pole N.C. + N.C. + N.O. break before make, slow break contact

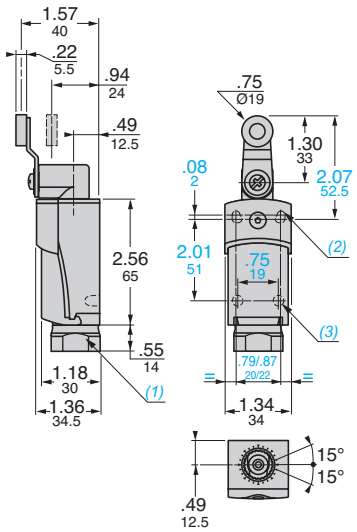
				
Contact operation	*contact closed* *contact open* ⊖ *N.C. contact with positive opening operation*	*(A) = cam displacement* *(P) = positive opening point*		

Complementary characteristics not shown under general characteristics (page 3/79)

Switch actuation		On end	By 30° cam	
Type of actuation				
Maximum actuation speed		1.64 ft/s (0.5 m/s)		4.9 ft/s (1.5 m/s)
Minimum force or torque	For tripping	3.72 lb (15 N)	2.70 lb (12 N)	0.89 lb-in (0.1 N•m)
	For positive opening	10.12 lb (45 N)	8.09 lb (36 N)	2.21 lb-in (0.25 N•m)
Conduit entry		1 entry tapped M20 x 1.5 mm for ISO cable gland, clamping capacity 7 to 13 mm 1 entry tapped Pg 13.5 for cable gland, clamping capacity 9 to 12 mm 1 entry tapped for 1/2" NPT (USAS B2-1) conduit		

Dimensions

XCS P3●18●●●, XCS P3●19●●●



(1) Tapped entry for ISO M20 x 1.5 or Pg 13.5 cable gland or 1/2" NPT conduit.
(2) 2 elongated holes Ø.17 x .25 in. (Ø 4.3 x 6.3 mm) on .87 in. (22 mm) centers or 2 holes Ø.17 in. (Ø 4.3 mm) on .79 in. (20 mm) centers.
(3) .08 x Ø.12 in. (2 x Ø 3 mm) holes for studs, depth .16 in. (4 mm).

Dual Dimensions: INCHES Millimeters

Characteristics: Page 3/79 | References: Page 3/82 | Accessories: Page 3/82 | Dimensions: Page 3/82 | Wiring Diagrams: Page 3/82

Safety detection solutions
Light curtains

Applications		**Machine tool, material handling, automotive, etc.**	
Functions		**Finger protection: 0.55 in (14 mm), or hand protection: 1.18 in (30 mm)**	
Device		Light curtains, type 4	
		Multi-beam, infrared transmission, light curtains (1 transmitter-receiver pair)	
		Optimum Type	Universal Type
			
Conformity	Product standards	ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, EN/IEC 61496-1 and EN/IEC 61496-2 and IEC 61508-1, 2 (Type 4 ESPE)	
	European directives	Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC ROHS directive 2002/95/EC	
Product certifications		CE, TUV, UL, CSA	
Degree of protection		IP 65	
Cross-section		1.50 x 1.97 in. (38 x 50 mm)	
Protected height	Conforming to EN 999	11 to 53.5 in (280 to 1360 mm) (finger protection) 12.6 to 83.5 in (320 to 2120 mm) (hand protection)	
Nominal sensing distance		1 to 23 ft (finger protection) 1 to 65 ft (hand protection)	
Response time		Depending on height protected: 23 to 41 ms (finger protection) Depending on height protected: 23 to 32 ms (hand protection)	
Type of outputs	Safety	2 solid-state PNP outputs (N.O.) ⎓ 24 V, ≤ 625 mA Short-circuit protection	
	Auxiliary	1 solid-state 100 mA, ⎓ 24 V, PNP or NPN output depending on model	
Main functions **"Muting" function** (inhibition of the light curtain "detection" function)		- Auto/manual - Test - EDM (External Devices Monitoring) - Light beam coding	- Auto/manual - Test - EDM (External Devices Monitoring) - Light beam coding - Blanking (fixed and floating) - Cascadable (up to 4 segments) - Muting
Supply voltage		⎓ 24 V ± 20%, 2 A	
Type references		**XUSLB**	**XUSLD**
Pages		3/92	3/93

Machine tool, material handling, automotive, etc.

Finger protection: 0.55 in (14 mm), or hand protection: 1.18 in (30 mm)

Light curtains, type 4

Multi-beam, infrared transmission, light curtains
(1 transmitter-receiver pair)

Compact model, solid-state safety outputs (PNP)



ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212,
type 4 (ESPE) conforming to IEC 61496-1 and 2

Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive
89/336 EEC

CE, TUV, UL, CSA

IP 65 (IP 67 with protection tube)

1.38 x 1.97 in. (35 x 50 mm)

10.4 to 54.9 in. (264 to 1394 mm) (finger protection)
13.8 to 82.5 in. (351 to 2095 mm) (hand protection)

0.98 to 24.6 ft (0.3 to 7.5 m) (finger protection)
0.98 to 29.5 ft (0.3 to 9 m) or 0.98 to 65.7 ft (0.3 to 20 m) (hand protection)

Depending on height protected: 20…40 ms (finger protection)
Depending on height protected: 20…35 ms (hand protection)

2 solid-state PNP outputs (N.O.)
⎓ 24 V, ≤ 500 mA
Short-circuit protection

1 solid-state 100 mA, ⎓ 24 V, PNP or NPN output depending on model

Functions integrated in the light curtain:
Auto/Manual start and manual 1st cycle,
- EDM (external devices monitoring),
- test input,
- Blanking (ECS/B), Floating Blanking (FB) and Blanking + Floating Blanking,
- Muting via external module

⎓ 24 V ± 20%, 2 A

XUSLT

3/111

Safety detection solutions
Light curtains

Applications		**Packaging, conveyor systems, materials handling, warehousing, stocking, etc.**	
Functions		**Body protection (300, 400, 500 and 600 mm)**	**Hand protection (1.18 in. (30 mm))**
Device		Light curtains, type 4 1 to 6 beam light curtains with infrared transmission (1 transmitter-receiver pair) Type 4 model, solid-state output	Light curtains, type 2 Multi-beam light curtains with infrared transmission (1 transmitter-receiver pair) Slim, compact model, solid-state output Automatic or manual start
			
Conformity	Product standards	ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, type 4 (ESPE) conforming to IEC 61496-1 and 2	IEC 61496-1 and IEC 61496-2 type 2 (ESPE)
	European directives	Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336/EEC	Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336/EEC
Product certifications		CE, TUV, UL, CSA	CE, TUV. UL, CSA
Degree of protection		IP 67	IP 65
Cross-section		2.05 x 2.17 in. (52 x 55 mm)	1.12 x 1.26 in. (28.5 x 32 mm)
Protected height	Conforming to EN 999	29.53 to 70.87 in. (750 to 1800 mm) (1 to 6 light beams)	5.91 to 59.06 in. (150 to 1500 mm) (hand protection)
Nominal sensing distance		0.8…20 m or 0.8…70 m dpg. on configuration 0.8…8 m for light curtains with passive receiver	0.98 to 49.21 ft (0.3 to 15 m)
Response time		< 16…< 24 ms depending on light beam coding selected	14…24 ms
Type of outputs	Safety	2 solid-state PNP outputs (N.O.) ⎓ 24 V, ≤ 650 mA Short-circuit protection	2 solid-state PNP outputs (N.O.) ⎓ 24 V, ≤ 500 mA Short-circuit protection
	Auxiliary	1 solid-state 100 mA, ⎓ 24 V PNP output	1 x 100 mA, ⎓ 24 V PNP alarm output
Main functions **"Muting" function** (inhibition of the light curtain "detection" function)		Functions integrated in the light curtain: Auto/Manual start and manual 1st cycle, - EDM (external devices monitoring), - test input, - 3 light beam codings available, - Muting via external module	Functions integrated in the light curtain: - automatic or manual start depending on version - Muting via external module
Supply voltage		⎓ 24 V ± 20%, 2 A	⎓ 24 V ± 20%, 2 A
Type references		**XUS LP●●●●**	**XUSLNG5C●●●●, XUSLNG5D●●●●**
Pages		3/119	3/127

Packaging, conveyor systems, materials handling, warehousing, stocking, etc.

Body protection

Light curtains, type 2

Single-beam, infrared transmission, light curtains (Preventa™ safety monitoring module + 1 to 4 thru-beam photo-electric sensors)

Type 2 model, relay outputs (N.O.)



IEC 60947-1, EN 61496-1, EN 60825-1, UL 508, type 2 (ESPE) conforming to IEC 61496-1 and 2

Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336/EEC EN 60825-1 (emission class 1)

CE type approval BIA/Cologne. UL, CSA

IP 67

Ø of sensors: 18 mm

29.5 to 47.2 in. (750 to 1200 mm) (1 to 4 light beams)

26.2 ft (8 m)

< 20 ms (sensors + safety module)

Solid-state PNP
Preventa™ safety module XPS CM outputs
2 guided contact relays, each 1 N.O.
AC-15: C300, 1800 VA inrush, 180 VA maintained
DC-13: ⎓ 24 V/1.5 A, L/R = 50 ms
Maximum thermal current = 2.5 A

⎓ 24 V, 20 mA

“Muting” integrated in the safety monitoring module XPS CM

Safety module XPS CM: ⎓ 24 V (19…29 V)
Sensors XU2S: ⎓ 24 V (10…30 V)

XU2 S●●●●●●● + XPS CM

3/140

Safety detection solutions
Light curtains

Presentation

Protection of personnel

Light curtains are electro-sensitive protection equipment (ESPE) designed for the protection of persons operating or working in the vicinity of machinery, by stopping the dangerous movement of parts as soon as one of the light beams is broken.
In particular, they provide protection for the **safety of personnel** operating dangerous machinery (annex IV of 98/37/EC) but they are equally suitable for use with many other types of machines. They make it possible to protect personnel while allowing free access to machines.

The absence of a door or guard reduces the time required for loading, inspection or adjustment operations as well as making access easier.

Directives and standards

Conformity to standards

These light curtains conform to:
- European Machinery Safety Directive 98/37/EC and European Work Equipment Directive 89/655/EEC,
- Low Voltage Directives 73/23/EEC and 93/68/EEC and also, the Electromagnetic Compatibility Directive 89/336/EEC,
- Standard EN/IEC 61496-1, EN/IEC 61496-2 (electro-sensitive protection equipment: ESPE),
- Standard EN 60825 (emission power),
- Standard EN 999/ISO 13855 (installation positioning),

These light curtains are UL, CSA and TÜV certified.

Applications

Main applications

- Applications for type 2 products:
  - assembly and packaging lines,
  - conveying and handling lines,
  - warehousing and storage systems,
  - waste disposal skips.

- Types of machine requiring the use of type 4 products:
  - presses (all types), shears and trimmers,
  - hoisting equipment,
  - saws (all types),
  - machine tools (lathes, milling machines, machining centers),
  - woodworking machines (planing machines, lathes, spindle moulding machines, side and face milling cutters),
  - textile machinery (carding machines, weaving looms, steam rooms),
  - assembly machines,
  - assembly robots.

Safety requirements

Detection of anomalies

Detection of anomalies liable to compromise safety and stopping of the machine

The design of the machine and its control system must be to the same level of safety as that of the light curtain in order to provide the immediate stopping of the machines dangerous movement as soon as the hazardous zone, protected by the light curtain, is entered.

It must not be possible to enter the protected zone without breaking the protective light beams. The light curtain must therefore be installed in such a manner that the light beams cannot be avoided.
The machine can only be restarted if no danger exists and no personnel are present in the hazardous zone. The risk that persons might be inside the protected zone but out of the protective light beams must be addressed.

Functions

Protection mode

AUTO/MAN (automatic/manual): this is what standard EN/IEC 61496 calls start (or restart) interlock of the light curtain:
- in AUTO mode: on power-up or after the beams have been cleared, the light curtain resets itself automatically (closing of the OSSD output safety circuits),
- in MANUAL mode: on power-up or after the beams have been cleared, the light curtain keeps its output safety circuits in the “open” position. Pressing (and releasing) the reset button will cause actual resetting of the light curtain (and closing of its OSSD output safety circuits).

Note: in all cases, a general start instruction for the machine will trigger its actual start-up.

Monitoring of external switching devices

Also called EDM (External Devices Monitoring) by standard EN/IEC 61496, this consists of monitoring the function (open or closed), together with the time taken to reach that condition, of the machines power switching components.

Auxiliary output

This is a low power solid-state output for signalling, when configurable (XUSLM/XUSLP), to the automation system. This output closes when the light curtain switches to run mode.

Alarm

This is a low power solid-state output for signalling to the automation system. This output closes when the light curtain switches to alarm mode.

Signalling

LED display of operating modes and alarm.

Alignment aid

Display by visible infrared LED of each beam broken.

Muting (inhibition)

When activated, the “muting” function inhibits the detection function of the light curtain.
Activation (or deactivation) is achieved by means of standard sensors (photo-electric or other). When activated, a signal is sent to the automation system. This function is used to allow objects to access the hazardous zones during the process.
Signalling informs the operator or operators that they are not protected.

Blanking

This function makes it possible to inhibit detection by a selected group of light beams in the light curtain (and not all the beams as with muting). This function (adapted to the size of the objects) allows the presence of objects during process operations. Blanking effectively increases the Minimum Object Sensitivity (MOS). This imposes a greater safety distance , increasing the minimum distance between the light curtain and the hazard. In addition, the use of additional protection each side of the object present must be included, in order to prevent any intrusion into the free areas.

Floating blanking

This function makes it possible to inhibit one or two light beams (adjacent or otherwise), anywhere in the light curtain. This configuration is used, for example, for metal plate feeding applications on folding presses or shears.

Blanking plus floating blanking

The Blanking (fixed inhibition of light beams) and Floating Blanking (moving inhibition of one or two light beams) functions can be combined.

Safety detection solutions

Safety light curtains, type 4
Light curtains Optimum XUSLB and Universal XUSLDM with solid-state output

Light curtain type			XUSLBQ6A●●●● XUSLDMQ6A●●●● 0.55 in. (14 mm)	XUSLBR5A●●●● 1.18 in. (30 mm)	XUSLDMY5A●●●●● 1.18 in. (30 mm)
Environment characteristics					
Conformity to standards			ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, EN/IEC 61496-1 and EN/IEC 61496-2 and IEC 61508-1, 2 (Type 4 ESPE)		
Certifications			CE, TUV, UL, CSA		
European directives			Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC ROHS directive 2002/95/EC		
Ambient air temperature	Operating	**°F (°C)**	14…+ 131 (- 10…+ 55)		
	For storage	**°F (°C)**	- 13…+ 167 (- 25…+ 75)		
Relative humidity			95% maximum, without condensation		
Degree of protection			IP 65		
Shock and vibration resistance	Conforming to IEC 61496-1		Shock resistance: 10 gn, impulse 16 ms Vibration resistance: 10…55 Hz, amplitude: 0.35 ± 0.05 mm		
Materials			Casing: aluminium with electrostatically applied red (RAL 3000) polyester paint finish; end caps: 20% fiberglass impregnated polycarbonate.		
Mounting			End brackets (included)		
Optical characteristics					
Minimum detection capacity (MOS)			0.55 in. (14 mm) (finger)	1.18 in. (30 mm) (hand)	
Nominal sensing distance (Sn)		**ft (m)**	1…23 (0.3…7) or 9.8 (3) with PDM *(1)*	1…26.2 (0.3…8) or 65.6 (20) with PDM *(1)*	1…65.6 (0.3…20) or 26.2 (8) with PDM *(1)*
Protected height		**in (mm)**	11…53.5 (280…1360)	12.6…83.5 (320…2120)	
Effective aperture angle (EAA)			2.5° at 9.8ft. (3 m) (3° when used with IP 67 protection tube)		
Light source			GaAlAs LED, 880 nm		
Immunity to ambient light			Conforming to IEC/EN 61496-2		
Electrical characteristics					
Response time		**ms**	23…41	23…32	
Power supply			⎓ 24 V ± 20% 2 A conforming to EN/IEC 61496 and EN/IEC 60204-1		
	Transmitter	**mA**	285		
	Receiver	**A**	1.8 (with maximum load)		
Maximum current consumption (no-load)	Transmitter	**mA**	285		
	Receiver	**mA**	450		
Immunity to interference			Conforming to EN 61496-1		
Safety outputs OSSD (Output Signal Switching Devices)			2 solid-state PNP (N/O) outputs ≤ 625 mA, ⎓ 24 V (Short-circuit protected)		
Auxiliary output			1 solid-state output 100 mA, ⎓ 24 V, PNP or NPN (depending on model)		
Monitoring activation of output switching devices (MPCE/EDM)			50 mA, ⎓ 24 V and start/restart 10 mA		
Signalling	Transmitter		1 LED (power supply)		
	Receiver		4 LEDs (stop, run, interlock, ECS/B Blanking or FB Floating Blanking)		
Connections *(2)*					
Light curtains	Transmitter		M12, 5-pin, female connector		
	Receiver		M12, 8-pin, female connector		
Segments XUSLDS	Transmitter/Receiver		M12, 4-pin, female connector on flying lead		
XPSLCM1	Receiver		M12, 4-pin, female connector		
Pre-wired connectors c.s.a.	Transmitter/Receiver		22 AWG (0.32 mm²) conductors with M12, 5-pin, male connector		
	Receiver		22 AWG (0.32 mm²) conductors with M12, 8-pin, male connector		
Jumper cables c.s.a.	Transmitter/receiver		22 AWG (0.32 mm²) conductors with M12, 4-pin, male/female connectors		
Cable resistance of pre-wired connectors	Transmitter/receiver	Ω	0.1686 per ft. (0.05531 per m)		
Cable lengths			Pre-wired connectors with cable lengths of 16.4, 32.8, 49.2, and 98.4 ft (5, 10, 15 and 30 m) are available separately. The maximum cable length is 196.9 ft (60 m), depending on the load current and power supply.		

(1) PDM: Programming and Diagnostic Module, available as option, see page 3/96.
(2) Pre-wired connectors to be ordered separately, see page 3/96.

Light curtain type		XUSLB●●●●●●	XUSLDM●●●●●
Functions			
Functions	Accessible by cabling alone *(1)*	□ Automatic start □ Auxiliary output (PNP, status signalling) □ Test (MTS: Monitoring Test Signal) □ Alignment aid by display of each light beam broken □ LED display of operating modes and anomalies	
	Accessible via programming and diagnostic module	□ Auto/Manual □ Monitoring of external switching devices (EDM: External Device Monitoring) □ Light beam coding (A or B) □ Sensing distance (short, long) □ Programming and downloading of configuration settings, via programming and diagnostic module (PDM) □ Display of operating modes and anomalies by LED and/or PDM *(2)*	□ Auto/Manual, manual 1st cycle □ Monitoring of external switching devices (EDM: External Device Monitoring) □ Blanking (ECS/B) □ Monitored Blanking □ Floating Blanking (FB) □ Reduction of resolution □ Response time (normal, slow) □ Light beam coding (A or B) □ Sensing distance (short, long) □ Auxiliary output (alarm or status signalling, PNP or NPN) □ Start button (N/O or N/C, 0 V or 24 V) □ Muting (see page 18) □ Cascadable versions with up to 4 segments total (256 light beams max., modular finger/hand) using segments XUSLDS □ Programming and downloading of configuration settings, via programming and diagnostic module (PDM) □ Display of operating modes and anomalies by LED and/or PDM *(2)*
Monitoring of external switching devices (EDM = External Device Monitoring)		Monitoring of the function (open or closed) as well as the response time of the power components.	
"Test" function		Instigates the stop instruction of the light curtain by opening the contact (simulated intrusion)	
"Muting" function (inhibition)		□ With external module XPSLCM1150	□ Integrated when using connection module XPSLCM1 for connecting sensors and "muting" indicator light □ or with module XPSLCM1150

(1) Not requiring use of PDM.
(2) PDM: Programming and Diagnostic Module, available as option, see page 3/96.

Safety detection solutions
Safety light curtains, type 4
Light curtains Optimum XUSLB with solid-state output



XUSLBQ6A●●●●

Transmitter-receiver pairs for finger protection *(1)*

Detection capacity 0.55 in. (14 mm). Sensing distance 1 to 22.9 ft (0.3 to 7 m) (or 9.8 ft (3 m) with PDM).

■ 2 PNP safety outputs

Protected height	Response time	Number of light beams	Auxiliary output	Reference *(2)*	Weight
in (mm)	ms				lb. (kg)
11 (280)	23	24	PNP	**XUSLBQ6A0280**	3.95 (1.790)
12.6 (320)	23	32	PNP	**XUSLBQ6A0320**	4.34 (1.970)
14.2 (360)	23	36	PNP	**XUSLBQ6A0360**	4.74 (2.150)
17.3 (440)	23	44	PNP	**XUSLBQ6A0440**	5.51 (2.500)
20.5 (520)	23	52	PNP	**XUSLBQ6A0520**	6.33 (2.870)
23.6 (600)	23	60	PNP	**XUSLBQ6A0600**	7.10 (3.220)
28.3 (720)	32	72	PNP	**XUSLBQ6A0720**	8.29 (3.760)
29.9 (760)	32	76	PNP	**XUSLBQ6A0760**	8.69 (3.940)
34.6 (880)	32	88	PNP	**XUSLBQ6A0880**	9.85 (4.470)
36.2 (920)	32	92	PNP	**XUSLBQ6A0920**	10.25 (4.650)
37.8 (960)	32	96	PNP	**XUSLBQ6A0960**	10.65 (4.830)
40.9 (1040)	32	104	PNP	**XUSLBQ6A1040**	11.44 (5.190)
44.1 (1120)	32	112	PNP	**XUSLBQ6A1120**	12.21 (5.540)
47.2 (1200)	32	120	PNP	**XUSLBQ6A1200**	13.01 (5.900)
53.5 (1360)	41	136	PNP	**XUSLBQ6A1360**	13.62 (6.180)



XUSLBR5A●●●●

Transmitter-receiver pairs for hand protection *(1)*

Detection capacity 1.18 in. (30 mm). Sensing distance 1 to 26.2 ft (0.3 to 8 m) (or 65.6 ft (20 m) with PDM).

■ 2 PNP safety outputs

Protected height	Response time	Number of light beams	Auxiliary output	Reference *(2)*	Weight
in (mm)	ms				lb. (kg)
12.6 (320)	23	16	PNP	**XUSLBR5A0320**	4.34 (1.970)
14.2 (360)	23	18	PNP	**XUSLBR5A0360**	4.74 (2.150)
17.3 (440)	23	22	PNP	**XUSLBR5A0440**	5.51 (2.500)
20.5 (520)	23	26	PNP	**XUSLBR5A0520**	6.33 (2.870)
23.6 (600)	23	30	PNP	**XUSLBR5A0600**	7.10 (3.220)
26.8 (680)	23	34	PNP	**XUSLBR5A0680**	7.89 (3.580)
29.9 (760)	23	38	PNP	**XUSLBR5A0760**	8.69 (3.940)
34.6 (880)	23	44	PNP	**XUSLBR5A0880**	9.85 (4.470)
36.2 (920)	23	46	PNP	**XUSLBR5A0920**	10.25 (4.650)
40.9 (1040)	23	52	PNP	**XUSLBR5A1040**	11.44 (5.190)
47.2 (1200)	23	60	PNP	**XUSLBR5A1200**	13.01 (5.900)
53.5 (1360)	23	68	PNP	**XUSLBR5A1360**	14.59 (6.620)
55.1 (1400)	23	70	PNP	**XUSLBR5A1400**	14.99 (6.800)
59.8 (1520)	32	76	PNP	**XUSLBR5A1520**	16.16 (7.330)
61.4 (1560)	32	78	PNP	**XUSLBR5A1560**	16.53 (7.500)
64.6 (1640)	32	82	PNP	**XUSLBR5A1640**	17.35 (7.870)
67.7 (1720)	32	86	PNP	**XUSLBR5A1720**	18.14 (8.230)
70.9 (1800)	32	88	PNP	**XUSLBR5A1800**	18.94 (8.590)
75.6 (1920)	32	96	PNP	**XUSLBR5A1920**	20.11 (9.120)
83.5 (2120)	32	106	PNP	**XUSLBR5A2120**	22.09 (10.020)

(1) Supplied with a test rod, 2 sets of 2 brackets with mounting hardware, user guide with certificate of conformity on CD-ROM and 1 arc suppressor set.
Programming and Diagnostic Module (if required) and pre-wired connectors to be ordered separately, see page 3/96.

*(2) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLBR5A0320 becomes **XUSLBR5A0320R** for the receiver only.*
*To order a transmitter only, add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLBR5A0320 becomes **XUSLBR5A0320T** for the transmitter only.*

Other versions Combining type 4 safety light curtains with external module for muting function (see page 2/218)..

Separate components and accessories - page 3/96

Safety detection solutions

Safety light curtains, type 4

Light curtains Universal XUSLDM with solid-state output



XUSLDMQ●●●●



XUSLDMY●●●●

Transmitter-receiver pairs for finger protection *(1)*

Detection capacity 0.55 in. (14 mm). Sensing distance 1 to 22.9 ft (0.3 to 7 m) (or 9.8 ft (3 m) with PDM).

■ 2 PNP safety outputs

Protected height	Response time		Number of light beams	Auxiliary output	Reference *(2)*	Weight
	Normal	Slow				
in (mm)	ms	ms				lb. (kg)
11 (280)	23	38	24	PNP/NPN	**XUSLDMQ6A0280**	3.95 (1.790)
12.6 (320)	23	38	32	PNP/NPN	**XUSLDMQ6A0320**	4.34 (1.970)
14.2 (360)	23	38	36	PNP/NPN	**XUSLDMQ6A0360**	4.74 (2.150)
17.3 (440)	23	38	44	PNP/NPN	**XUSLDMQ6A0440**	5.51 (2.500)
20.5 (520)	23	38	52	PNP/NPN	**XUSLDMQ6A0520**	6.39 (2.900)
23.6 (600)	23	38	60	PNP/NPN	**XUSLDMQ6A0600**	7.10 (3.220)
28.3 (720)	32	53	72	PNP/NPN	**XUSLDMQ6A0720**	8.29 (3.760)
29.9 (760)	32	53	76	PNP/NPN	**XUSLDMQ6A0760**	8.69 (3.940)
34.6 (880)	32	53	88	PNP/NPN	**XUSLDMQ6A0880**	9.85 (4.470)
36.2 (920)	32	53	92	PNP/NPN	**XUSLDMQ6A0920**	10.25 (4.650)
37.8 (960)	32	53	96	PNP/NPN	**XUSLDMQ6A0960**	10.65 (4.830)
40.9 (1040)	32	53	104	PNP/NPN	**XUSLDMQ6A1040**	11.44 (5.190)
44.1 (1120)	32	53	112	PNP/NPN	**XUSLDMQ6A1120**	12.21 (5.540)
47.2 (1200)	32	53	120	PNP/NPN	**XUSLDMQ6A1200**	13.01 (5.900)
53.5 (1360)	41	68	136	PNP/NPN	**XUSLDMQ6A1360**	14.59 (6.620)

Transmitter-receiver pairs for hand protection *(1)*

Detection capacity 1.18 in. (30 mm). Sensing distance 1 to 65.6 ft (0.3 to 20 m) (or 26.2 ft (8 m) with PDM).

■ 2 PNP safety outputs

Protected height	Response time		Number of light beams	Auxiliary output	Reference *(2)*	Weight
	Normal	Slow				
in (mm)	ms					lb. (kg)
12.6 (320)	23	38	16	PNP/NPN	**XUSLDMY5A0320**	4.34 (1.970)
14.2 (360)	23	38	18	PNP/NPN	**XUSLDMY5A0360**	4.74 (2.150)
17.3 (440)	23	38	22	PNP/NPN	**XUSLDMY5A0440**	5.51 (2.500)
20.5 (520)	23	38	26	PNP/NPN	**XUSLDMY5A0520**	6.33 (2.870)
23.6 (600)	23	38	30	PNP/NPN	**XUSLDMY5A0600**	7.10 (3.220)
26.8 (680)	23	38	34	PNP/NPN	**XUSLDMY5A0680**	7.89 (3.580)
29.9 (760)	23	38	38	PNP/NPN	**XUSLDMY5A0760**	8.69 (3.940)
34.6 (880)	23	38	44	PNP/NPN	**XUSLDMY5A0880**	9.85 (4.470)
36.2 (920)	23	38	46	PNP/NPN	**XUSLDMY5A0920**	10.25 (4.650)
40.9 (1040)	23	38	52	PNP/NPN	**XUSLDMY5A1040**	11.44 (5.190)
47.2 (1200)	23	38	60	PNP/NPN	**XUSLDMY5A1200**	13.01 (5.900)
53.5 (1360)	23	38	68	PNP/NPN	**XUSLDMY5A1360**	14.59 (6.620)
55.1 (1400)	23	38	70	PNP/NPN	**XUSLDMY5A1400**	14.99 (6.800)
59.8 (1520)	32	53	76	PNP/NPN	**XUSLDMY5A1520**	16.16 (7.330)
61.4 (1560)	32	53	78	PNP/NPN	**XUSLDMY5A1560**	16.53 (7.500)
64.6 (1640)	32	53	82	PNP/NPN	**XUSLDMY5A1640**	17.35 (7.870)
67.7 (1720)	32	53	86	PNP/NPN	**XUSLDMY5A1720**	18.14 (8.230)
70.9 (1800)	32	53	88	PNP/NPN	**XUSLDMY5A1800**	18.94 (8.590)
75.6 (1920)	32	53	96	PNP/NPN	**XUSLDMY5A1920**	20.11 (9.120)
83.5 (2120)	32	53	106	PNP/NPN	**XUSLDMY5A2120**	22.09 (10.020)

(1) Supplied with a test rod, 2 sets of 2 brackets with mounting hardware, user guide with certificate of conformity on CD-ROM and 1 arc suppressor set.
Programming and Diagnostic Module (if required) and pre-wired connectors to be ordered separately, see page 3/96.

*(2) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLDMY5A0320 becomes **XUSLDMY5A0320R** for the receiver only.*
*To order a transmitter only, add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLDMY5A0320 becomes **XUSLDMY5A0320T** for the transmitter only.*

Other versions Combining type 4 safety light curtains with external module for muting function (see page 2/218).

Separate components and accessories - page 3/96

Safety detection solutions
Safety light curtains, type 4
Segments XUSLDS for Universal XUSLDM light curtains



XUSLDM + XUSLDS

Segments for cascadable Universal light curtains

Cascadable versions with up to 4 segments total (256 light beams max., modular finger/hand) using segments XUSLDS

Configuration of segments XUSLDS

Two segments

Number of light beams	Response time ms
0 to 65	23
66 to 120	32
121 to 174	41
175 to 229	50
230 to 256	59

Three segments

Number of light beams	Response time ms
0 to 59	23
60 to 114	32
115 to 168	41
169 to 223	50
224 to 256	59

Four segments

Number of light beams	Response time ms
0 to 53	23
54 to 108	32
109 to 162	41
163 to 217	50
218 to 256	59

Separate components and accessories - page 3/96

Safety detection solutions
Safety light curtains, type 4
Segments XUSLDS for Universal XUSLDM light curtains



XUSLDSQ6A●●●●

Transmitter-receiver pairs for finger protection *(1)*

Detection capacity 0.55 in. (14 mm).. Sensing distance depending on XUSLDM light curtain used

■ Segments for cascadable Universal light curtains *(2)*

Protected height	Number of light beams	Reference *(3)*	Weight
in (mm)			lb. (kg)
11 (280)	24	**XUSLDSQ6A0280**	3.95 (1.790)
12.6 (320)	32	**XUSLDSQ6A0320**	4.34 (1.970)
14.2 (360)	36	**XUSLDSQ6A0360**	4.74 (2.150)
17.3 (440)	44	**XUSLDSQ6A0440**	5.51 (2.500)
20.5 (520)	52	**XUSLDSQ6A0520**	6.33 (2.870)
23.6 (600)	60	**XUSLDSQ6A0600**	7.10 (3.220)
28.3 (720)	72	**XUSLDSQ6A0720**	8.29 (3.760)
29.9 (760)	76	**XUSLDSQ6A0760**	8.69 (3.940)
34.6 (880)	88	**XUSLDSQ6A0880**	9.85 (4.470)
36.2 (920)	92	**XUSLDSQ6A0920**	10.25 (4.650)
37.8 (960)	96	**XUSLDSQ6A0960**	10.65 (4.830)
40.9 (1040)	104	**XUSLDSQ6A1040**	11.44 (5.190)
44.1 (1120)	112	**XUSLDSQ6A1120**	12.21 (5.540)
47.2 (1200)	120	**XUSLDSQ6A1200**	13.01 (5.900)



XUSLDSY5A●●●●

Transmitter-receiver pairs for hand protection *(1)*

Detection capacity 1.18 in. (30 mm). Sensing distance depending on XUSLDM light curtain used

■ Segments for cascadable Universal light curtains *(2)*

Protected height	Number of light beams	Reference *(3)*	Weight
in (mm)			lb. (kg)
12.6 (320)	16	**XUSLDSY5A0320**	4.34 (1.970)
14.2 (360)	18	**XUSLDSY5A0360**	4.74 (2.150)
17.3 (440)	22	**XUSLDSY5A0440**	5.51 (2.500)
20.5 (520)	26	**XUSLDSY5A0520**	6.33 (2.870)
23.6 (600)	30	**XUSLDSY5A0600**	7.10 (3.220)
26.8 (680)	34	**XUSLDSY5A0680**	7.89 (3.580)
29.9 (760)	38	**XUSLDSY5A0760**	8.69 (3.940)
34.6 (880)	44	**XUSLDSY5A0880**	9.85 (4.470)
36.2 (920)	46	**XUSLDSY5A0920**	10.25 (4.650)
40.9 (1040)	52	**XUSLDSY5A1040**	11.44 (5.190)
47.2 (1200)	60	**XUSLDSY5A1200**	13.01 (5.900)
53.5 (1360)	68	**XUSLDSY5A1360**	14.59 (6.620)
55.1 (1400)	70	**XUSLDSY5A1400**	14.99 (6.800)
59.8 (1520)	76	**XUSLDSY5A1520**	16.16 (7.330)
61.4 (1560)	78	**XUSLDSY5A1560**	16.53 (7.500)
64.6 (1640)	82	**XUSLDSY5A1640**	17.35 (7.870)
67.7 (1720)	86	**XUSLDSY5A1720**	18.14 (8.230)
70.9 (1800)	88	**XUSLDSY5A1800**	18.94 (8.590)
75.6 (1920)	96	**XUSLDSY5A1920**	20.11 (9.120)
83.5 (2120)	106	**XUSLDSY5A2120**	22.09 (10.020)

(1) Supplied with 2 sets of 2 brackets and hardware.
Jumper cables to be ordered separately, see 3/96.
(2) The segments are to be connected to the M12 4-pin connector on top of the XUSLDM light curtains.
*(3) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLDSY5A0320 becomes **XUSLDSY5A0320R** for the receiver only.*
*To order a transmitter only, add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLDSY5A0320 becomes **XUSLDSY5A0320T** for the transmitter only.*

Separate components and accessories - page 3/96

Safety detection solutions
Safety light curtains, type 4
Light curtains Optimum XUSLB and Universal XUSLDM/LDS with solid-state output

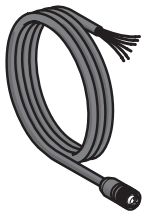


XUSLPDM

563528



XSZ BCT●●



XSZ BCR●●

Separate components

Power supplies, 90° mirror adaptors, protective covers, anti-vibration kit, mounting bases, laser alignment tool

3/97 and 3/130 to 3/137.

Accessories

Description	For use with	Length ft (m)	Reference	Weight lb. (kg)
Programming and Diagnostic Module (PDM)	Light curtains XUSLB/LDM	–	**XUSLPDM**	0.62 (0.280)
Holder mount	Programming and diagnostic module XUSLPDM	–	**XUSLZPDM**	0.09 (0.040)
Pre-wired connectors for light curtains XUSLB/XUSLDM	Transmitter type	16.4 (5)	**XSZBCT05**	0.86 (0.390)
		32.8 (10)	**XSZBCT10**	1.52 (0.690)
		49.2 (15)	**XSZBCT15**	2.27 (1.030)
		98.4 (30)	**XSZBCT30**	4.25 (1.930)
	Receiver type	16.4 (5)	**XSZBCR05**	0.99 (0.450)
		32.8 (10)	**XSZBCR10**	1.72 (0.780)
		49.2 (15)	**XSZBCR15**	2.43 (1.100)
		98.4 (30)	**XSZBCR30**	5.03 (2.280)
Jumper cables for segments XUSLDS M12 male/female, 4-pin, straight	Transmitter type	1 (0.3)	**XSZDCT003**	0.11 (0.050)
		1.6 (0.5)	**XSZDCT005**	0.15 (0.070)
		3.3 (1)	**XSZDCT010**	0.24 (0.110)
		6.6 (2)	**XSZDCT020**	0.46 (0.210)
		9.9 (3)	**XSZDCT030**	0.66 (0.300)
		16.4 (5)	**XSZDCT050**	1.08 (0.490)
		32.8 (10)	**XSZDCT100**	2.09 (0.950)
	Receiver type	1 (0.3)	**XSZDCR003**	0.11 (0.050)
		1.6 (0.5)	**XSZDCR005**	0.15 (0.070)
		3.3 (1)	**XSZDCR010**	0.24 (0.110)
		6.6 (2)	**XSZDCR020**	0.46 (0.210)
		9.9 (3)	**XSZDCR030**	0.66 (0.300)
		16.4 (5)	**XSZDCR050**	1.08 (0.490)
		32.8 (10)	**XSZDCR100**	2.12 (0.960)
Jumpers for replacement of light curtains XUSLT by XUSLB or XUSLDM	Transmitter type Male/Female 5 pins	1 (0.3)	**XSZTBDMCT003**	0.13 (0.060)
	Receiver type Male/Female 8 pins	1 (0.3)	**XSZTBDMCR003**	0.13 (0.060)

Description	For use with	Unit reference	Weight lb. (kg)
Replacement caps for M12 connector (Sold in lots of 10)	Light curtains XUSLDM and segments XUSLDS	**XUSLZ600**	0.002 (0.001)
Replacement caps for M8 connector (programming and diagnostic module XUSLPDM connection to light curtains) (Sold in lots of 10)	Light curtains XUSLB/LDM and segments XUSLDS	**XUSLZ610**	0.02 (0.010)
mounting kit (2 brackets)	Light curtains XUSLB/LDM and segments XUSLDS	**XUSLZ228**	0.22 (0.100)
Sliding nuts (4 nuts) for rear or side mounting with XUSLZ228	Light curtains XUSLB/LDM	**XUSLZ330**	0.09 (0.040)
Arc suppressor (pair)	All types of light curtain	**XUSLZ500**	0.04 (0.020)
IP 67 protection tube (see page 3/97)			–
User guide on CD-ROM	All types of light curtain	**XUSLZ450**	0.02 (0.010)
Connection module for sensors and Muting indicator light (see page 3/104)	Light curtains XUSLDM	**XPSLCM1**	0.42 (0.190)

Safety detection solutions

Safety light curtains, type 4

Protection tubes for light curtains with solid-state output XUSLB/XUSLDM and segments XUSLDS

IP 67 protection tubes for light curtains XUSLB/XUSLDM and segments XUSLDS			XUSLZD7●●●●
Environment characteristics			
Air temperature	For operation	**°F (°C)**	32...+ 104 (0...+ 40)
	For storage	**°F (°C)**	- 13...+ 158 (- 25...+ 70)
Degree of protection			IP 67 conforming to IEC 60529
Material			Acrylic
Sensing distance (Sn) **reduction coefficient**			0.90
Environmental chemicals			
Chemical resistance	Aliphatic hydrocarbons		Resistant
	Alkalis		
	Aqueous solutions		
	Detergents and cleaners		
	Inorganic diluted acids		
	Chlorinated or aromatic hydrocarbons		Limited resistance
	Esters		
	Ketones		
Environmental resistance	Adverse weather, sunlight (UV)		Resistant
	Humidity		
	Immersion in water		

References of IP 67 protection tubes

108048



XUSLZD7●●●

Description	For use with	Height in (mm)	Reference	Weight lb. (kg)
IP 67 protection tubes for XUSLB/LDM transmitter-receiver pair and segments XUSLDS●●● (0.90 Sn) *(1)* **(Sold in lots of 2)**	XUSL●●6A0280	11.2 (284.4)	**XUSLZD70280**	5.84 (2.650)
	XUSL●●●A0320	12.8 (324.8)	**XUSLZD70320**	6.19 (2.810)
	XUSL●●●A0360	14.4 (364.5)	**XUSLZD70360**	6.53 (2.960)
	XUSL●●●A0440	17.5 (443.9)	**XUSLZD70440**	7.21 (3.270)
	XUSL●●●A0520	20.6 (523.4)	**XUSLZD70520**	7.89 (3.580)
	XUSL●●●A0600	23.8 (604.1)	**XUSLZD70600**	8.58 (3.890)
	XUSL●●5A0680	26.9 (683.6)	**XUSLZD70680**	9.24 (4.190)
	XUSL●●6A0720	28.5 (724)	**XUSLZD70720**	9.59 (4.350)
	XUSL●●●A0760	30 (763)	**XUSLZD70760**	9.92 (4.500)
	XUSL●●●A0880	34.8 (882.8)	**XUSLZD70880**	10.93 (4.960)
	XUSL●●●A0920	36.3 (922.5)	**XUSLZD70920**	11.28 (5.120)
	XUSL●●6A0960	37.9 (963.6)	**XUSLZD70960**	11.62 (5.270)
	XUSL●●●A1040	41.1 (1042.9)	**XUSLZD71040**	12.30 (5.580)
	XUSL●●6A1120	44.2 (1122.3)	**XUSLZD71120**	12.99 (5.890)
	XUSL●●●A1200	47.4 (1203.8)	**XUSLZD71200**	13.67 (6.200)
	XUSL●●●A1360	53.6 (1362)	**XUSLZD71360**	15.01 (6.810)
	XUSL●●5A1400	55.2 (1401.7)	**XUSLZD71400**	15.37 (6.970)
	XUSL●●5A1520	59.9 (1521.5)	**XUSLZD71520**	16.38 (7.430)
	XUSL●●5A1560	61.5 (1563.3)	**XUSLZD71560**	16.71 (7.580)
	XUSL●●5A1640	64.6 (1641.3)	**XUSLZD71640**	17.89 (7.890)
	XUSL●●5A1720	67.7 (1720.8)	**XUSLZD71720**	18.08 (8.200)
	XUSL●●5A1800	71 (1802.9)	**XUSLZD71800**	18.76 (8.510)
	XUSL●●5A1920	75.7 (1922.8)	**XUSLZD71920**	19.78 (8.970)
	XUSL●●5A2120	83.5 (2120.7)	**XUSLZD72120**	21.47 (9.740)

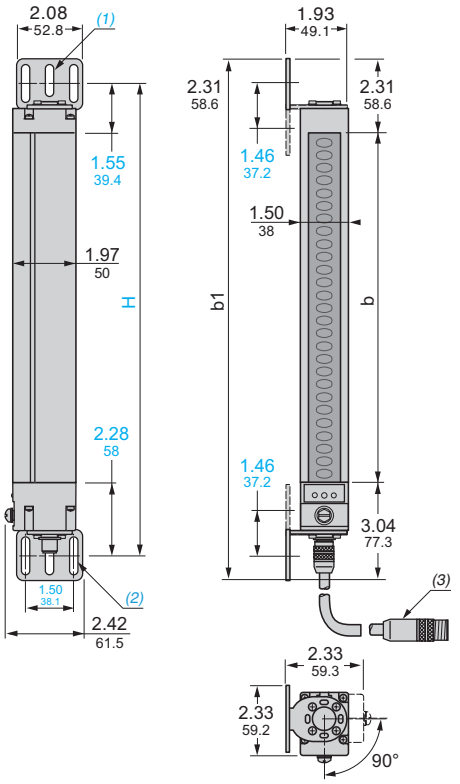
(1) Sensing distance reduction coefficient to be taken into account for each pair of IP 67 protection tubes used.

Characteristics:: page 3/97
References: page 3/97
Dimensions: page 3/99

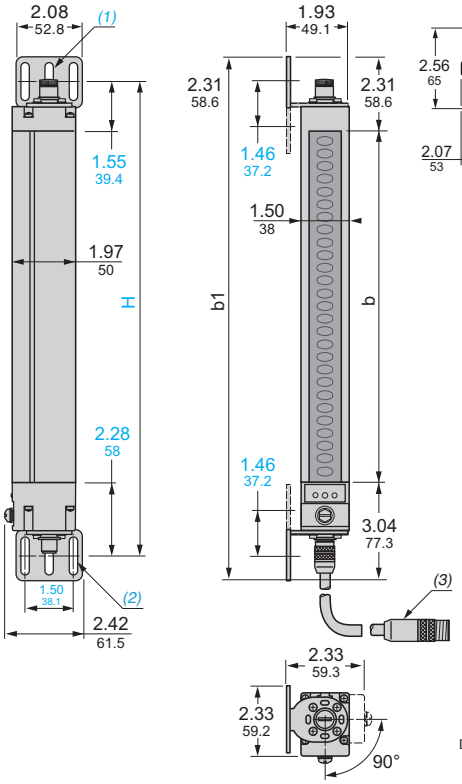
Safety detection solutions
Preventa™
Safety light curtains, type 4
Light curtains Optimum XUSLB and Universal XUSLDM with solid-state output

Light curtains

XUSLB

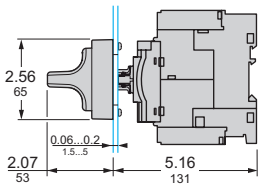


XUSLDM



Programming and diagnostic module

XUSLPDM



Dual Dimensions: INCHES Millimeters

XUS	b	b1	H	Protected height
LB●●●0280	11.2 (284.4)	16.6 (420.4)	15 (381.7)	11 (280)
LB●●●0320	12.8 (324.8)	18.1 (460.8)	16.6 (422.1)	12.6 (320)
LB●●●0360	14.4 (364.5)	19.7 (500.5)	18.2 (461.8)	14.2 (360)
LB●●●0440	17.5 (443.9)	22.8 (579.9)	21.3 (541.2)	17.3 (440)
LB●●●0520	20.6 (523.4)	26 (659.4)	24.4 (620.7)	20.5 (520)
LB●●●0600	23.8 (604.1)	29.1 (740.1)	27.6 (701.4)	23.6 (600)
LB●●●0680	26.9 (683.6)	32.3 (819.6)	30.7 (780.9)	26.8 (680)
LB●●●0720	28.5 (724)	33.9 (860)	32.3 (821.3)	28.3 (720)
LB●●●0760	30 (763)	35.4 (899)	33.9 (860.3)	29.9 (760)
LB●●●0880	34.8 (882.8)	40.1 (1018.8)	38.6 (980.1)	34.6 (880)
LB●●●0920	36.3 (922.5)	41.7 (1058.5)	40.1 (1019.8)	36.2 (920)
LB●●●0960	37.9 (963.6)	43.3 (1099.6)	41.8 (1060.9)	37.8 (960)
LB●●●1040	41.1 (1042.9)	46.4 (1178.9)	44.9 (1140.2)	40.9 (1040)
LB●●●1120	44.2 (1122.3)	49.5 (1258.3)	48 (1219.6)	44.1 (1120)
LB●●●1200	47.4 (1203.8)	52.7 (1339.8)	51.2 (1301.1)	47.2 (1200)
LB●●●1360	53.6 (1362)	59 (1498)	57.5 (1459.3)	53.5 (1360)
LB●●●1400	55.2 (1401.7)	60.5 (1537.7)	59 (1499)	55.1 (1400)
LB●●●1520	59.9 (1521.5)	65.3 (1657.5)	63.7 (1618.8)	59.8 (1520)
LB●●●1560	61.5 (1563.3)	66.9 (1699.3)	65.4 (1660.6)	61.4 (1560)
LB●●●1640	64.6 (1641.3)	70 (1777.3)	68.4 (1738.6)	64.6 (1640)
LB●●●1720	67.7 (1720.8)	73.1 (1856.8)	71.6 (1818.1)	67.7 (1720)
LB●●●1800	71 (1802.9)	76.3 (1938.9)	74.8 (1900.2)	70.9 (1800)
LB●●●1920	75.7 (1922.8)	81.1 (2058.8)	79.5 (2020.1)	75.6 (1920)
LB●●●2120	83.5 (2120.7)	88.8 (2256.7)	87.3 (2217.3)	83.5 (2120)

XUS	b	b1	H	Protected height
LDM●●0280	11.2 (284.4)	16.6 (420.4)	15 (381.7)	11 (280)
LDM●●0320	12.8 (324.8)	18.1 (460.8)	16.6 (422.1)	12.6 (320)
LDM●●0360	14.4 (364.5)	19.7 (500.5)	18.2 (461.8)	14.2 (360)
LDM●●0440	17.5 (443.9)	22.8 (579.9)	21.3 (541.2)	17.3 (440)
LDM●●0520	20.6 (523.4)	26 (659.4)	24.4 (620.7)	20.5 (520)
LDM●●0600	23.8 (604.1)	29.1 (740.1)	27.6 (701.4)	23.6 (600)
LDM●●0680	26.9 (683.6)	32.3 (819.6)	30.7 (780.9)	26.8 (680)
LDM●●0720	28.5 (724)	33.9 (860)	32.3 (821.3)	28.3 (720)
LDM●●0760	30 (763)	35.4 (899)	33.9 (860.3)	29.9 (760)
LDM●●0880	34.8 (882.8)	40.1 (1018.8)	38.6 (980.1)	34.6 (880)
LDM●●0920	36.3 (922.5)	41.7 (1058.5)	40.1 (1019.8)	36.2 (920)
LDM●●0960	37.9 (963.6)	43.3 (1099.6)	41.8 (1060.9)	37.8 (960)
LDM●●1040	41.1 (1042.9)	46.4 (1178.9)	44.9 (1140.2)	40.9 (1040)
LDM●●1120	44.2 (1122.3)	49.5 (1258.3)	48 (1219.6)	44.1 (1120)
LDM●●1200	47.4 (1203.8)	52.7 (1339.8)	51.2 (1301.1)	47.2 (1200)
LDM●●1360	53.6 (1362)	59 (1498)	57.5 (1459.3)	53.5 (1360)
LDM●●1400	55.2 (1401.7)	60.5 (1537.7)	59 (1499)	55.1 (1400)
LDM●●1520	59.9 (1521.5)	65.3 (1657.5)	63.7 (1618.8)	59.8 (1520)
LDM●●1560	61.5 (1563.3)	66.9 (1699.3)	65.4 (1660.6)	61.4 (1560)
LDM●●1640	64.6 (1641.3)	70 (1777.3)	68.4 (1738.6)	64.6 (1640)
LDM●●1720	67.7 (1720.8)	73.1 (1856.8)	71.6 (1818.1)	67.7 (1720)
LDM●●1800	71 (1802.9)	76.3 (1938.9)	74.8 (1900.2)	70.9 (1800)
LDM●●1920	75.7 (1922.8)	81.1 (2058.8)	79.5 (2020.1)	75.6 (1920)
LDM●●2120	83.5 (2120.7)	88.8 (2256.7)	87.3 (2217.3)	83.5 (2120)

(1) 2 elongated holes 0.73 x 0.27 in (18.5 x 6.8 mm).
(2) 4 elongated holes 0.91 x 0.27 in (23.2 x 6.8 mm).
(3) M12 male connector on 10.6 in. (0.27 m) pigtail.

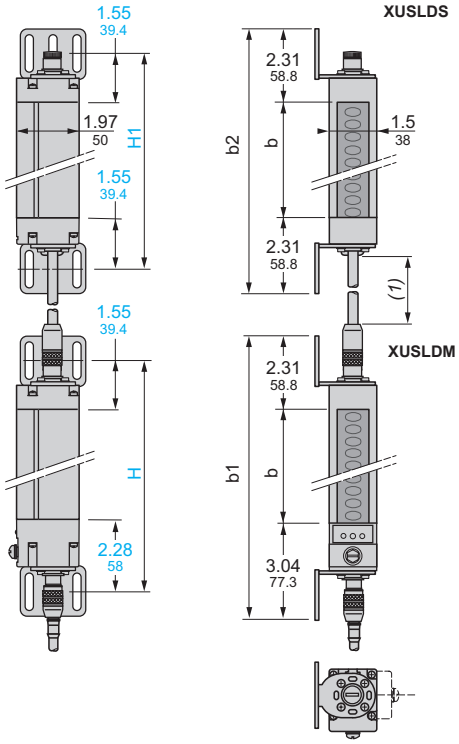
Safety detection solutions Preventa™

Safety light curtains, type 4

Segments XUSLDS for Universal XUSLDM light curtains Protection tube

Cascadable segments

XUSLDS

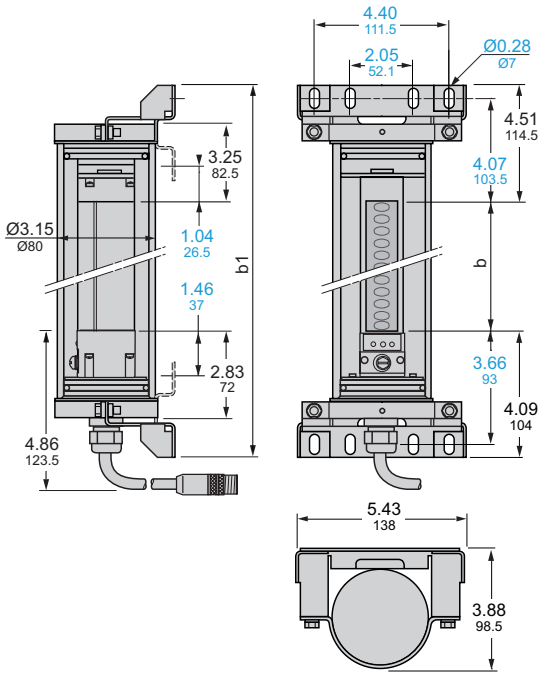


XUS	b	b1	b2	H	H1	Protected height
LDS●●●0280	11.2 (284.4)	16.6 (420.4)	15.8 (401.5)	15 (381.7)	14.3 (363.1)	11 (280)
LDS●●●0320	12.8 (324.8)	18.1 (460.8)	17.4 (442.3)	16.6 (422.1)	15.9 (403.5)	12.6 (320)
LDS●●●0360	14.4 (364.5)	19.7 (500.5)	19 (482)	18.2 (461.8)	17.4 (443.2)	14.2 (360)
LDS●●●0440	17.5 (443.9)	22.8 (579.9)	22.1 (561.4)	21.3 (541.2)	20.6 (522.6)	17.3 (440)
LDS●●●0520	20.6 (523.4)	26 (659.4)	25.2 (640.9)	24.4 (620.7)	23.7 (602.1)	20.5 (520)
LDS●●●0600	23.8 (604.1)	29.1 (740.1)	28.4 (721.6)	27.6 (701.4)	26.9 (682.8)	23.6 (600)
LDS●●●0680	26.9 (683.6)	32.3 (819.6)	31.5 (801.1)	30.7 (780.9)	30 (762.3)	26.8 (680)
LDS●●●0720	28.5 (724)	33.9 (860)	33.1 (841.5)	32.3 (821.3)	31.6 (802.7)	28.3 (720)
LDS●●●0760	30 (763)	35.4 (899)	34.7 (880.5)	33.9 (860.3)	33.1 (841.7)	29.9 (760)
LDS●●●0880	34.8 (882.8)	40.1 (1018.8)	39.4 (1000.3)	38.6 (980.1)	37.9 (961.5)	34.6 (880)
LDS●●●0920	36.3 (922.5)	41.7 (1058.5)	40.9 (1040)	40.1 (1019.8)	39.4 (1001.2)	36.2 (920)
LDS●●●0960	37.9 (963.6)	43.3 (1099.6)	42.6 (1081.1)	41.8 (1060.9)	41 (1042.3)	37.8 (960)
LDS●●●1040	41.1 (1042.9)	46.4 (1178.9)	45.7 (1160.4)	44.9 (1140.2)	44.2 (1121.6)	40.9 (1040)
LDS●●●1120	44.2 (1122.3)	49.5 (1258.3)	48.8 (1239.8)	48 (1219.6)	47.3 (1201)	44.1 (1120)
LDS●●●1200	47.4 (1203.8)	52.7 (1339.8)	52 (1321.3)	51.2 (1301.1)	50.5 (1282.5)	47.2 (1200)
LDS●●●1360	53.6 (1362)	59 (1498)	58.2 (1479.5)	57.5 (1459.3)	56.7 (1440.7)	53.5 (1360)
LDS●●●1400	55.2 (1401.7)	60.5 (1537.7)	59.8 (1519.2)	59 (1499)	58.3 (1480.4)	55.1 (1400)
LDS●●●1520	59.9 (1521.5)	65.3 (1657.5)	64.5 (1639)	63.7 (1618.8)	63 (1600.2)	59.8 (1520)
LDS●●●1560	61.5 (1563.3)	66.9 (1699.3)	66.2 (1680.8)	65.4 (1660.6)	66.1 (1679.2)	61.4 (1560)
LDS●●●1640	64.6 (1641.3)	70 (1777.3)	69.2 (1758.8)	68.4 (1738.6)	67.7 (1720)	64.6 (1640)
LDS●●●1720	67.7 (1720.8)	73.1 (1856.8)	72.4 (1838.3)	71.6 (1818.1)	70.8 (1799.5)	67.7 (1720)
LDS●●●1800	71 (1802.9)	76.3 (1938.9)	75.6 (1920.4)	74.8 (1900.2)	74.1 (1881.6)	70.9 (1800)
LDS●●●1920	75.7 (1922.8)	81.1 (2058.8)	80.3 (2040.3)	79.5 (2020.1)	78.8 (2001.5)	75.6 (1920)
LDS●●●2120	83.5 (2120.7)	88.8 (2256.7)	88.1 (2237.5)	87.3 (2217.3)	86.6 (2198.7)	83.5 (2120)

(1) Flexible 4.33 in (0.11 m) long cable.

Protection tube for light curtains XUSLB/XUSLDM and segments XUSLDS

XUSLZD7●●●●



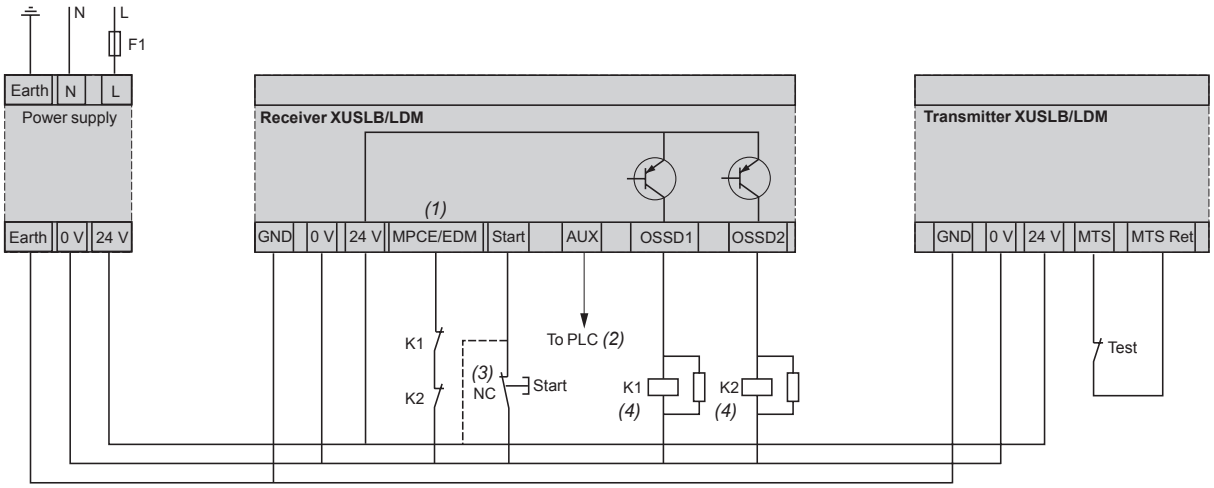
XUS	b	b1
LZD70280	11.2 (284.4)	19.8 (502.8)
LZD70320	12.8 (324.8)	21.4 (543.2)
LZD70360	14.4 (364.5)	22.9 (582.9)
LZD70440	17.5 (443.9)	26.1 (662.3)
LZD70520	20.6 (523.4)	29.2 (741.8)
LZD70600	23.8 (604.1)	32.4 (822.5)
LZD70680	26.9 (683.6)	35.5 (902)
LZD70720	28.5 (724)	37.1 (942.4)
LZD70760	30 (763)	38.6 (981.4)
LZD70880	34.8 (882.8)	43.4 (1101.2)
LZD70920	36.3 (922.5)	44.9 (1140.9)
LZD70960	37.9 (963.6)	46.5 (1182)

XUS	b	b1
LZD71040	41.1 (1042.9)	49.7 (1261.3)
LZD71120	44.2 (1122.3)	52.8 (1340.7)
LZD71200	47.4 (1203.8)	56 (1422.2)
LZD71360	53.6 (1362)	62.2 (1580.4)
LZD71400	55.2 (1401.7)	63.8 (1620.1)
LZD71520	59.9 (1521.5)	68.5 (1739.9)
LZD71560	61.5 (1563.3)	70.1 (1781.7)
LZD71640	64.6 (1641.3)	73.2 (1859.2)
LZD71720	67.7 (1720.8)	76.3 (1939.2)
LZD71800	71 (1802.9)	79.6 (2021.2)
LZD71920	75.7 (1922.8)	84.3 (2141.2)
LZD72120	83.5 (2120.7)	92.1 (2338.4)

Dual Dimensions: INCHES Millimieters

Safety detection solutions
Safety light curtains, type 4
Light curtains Optimum XUSLB and Universal XUSLDM with solid-state output

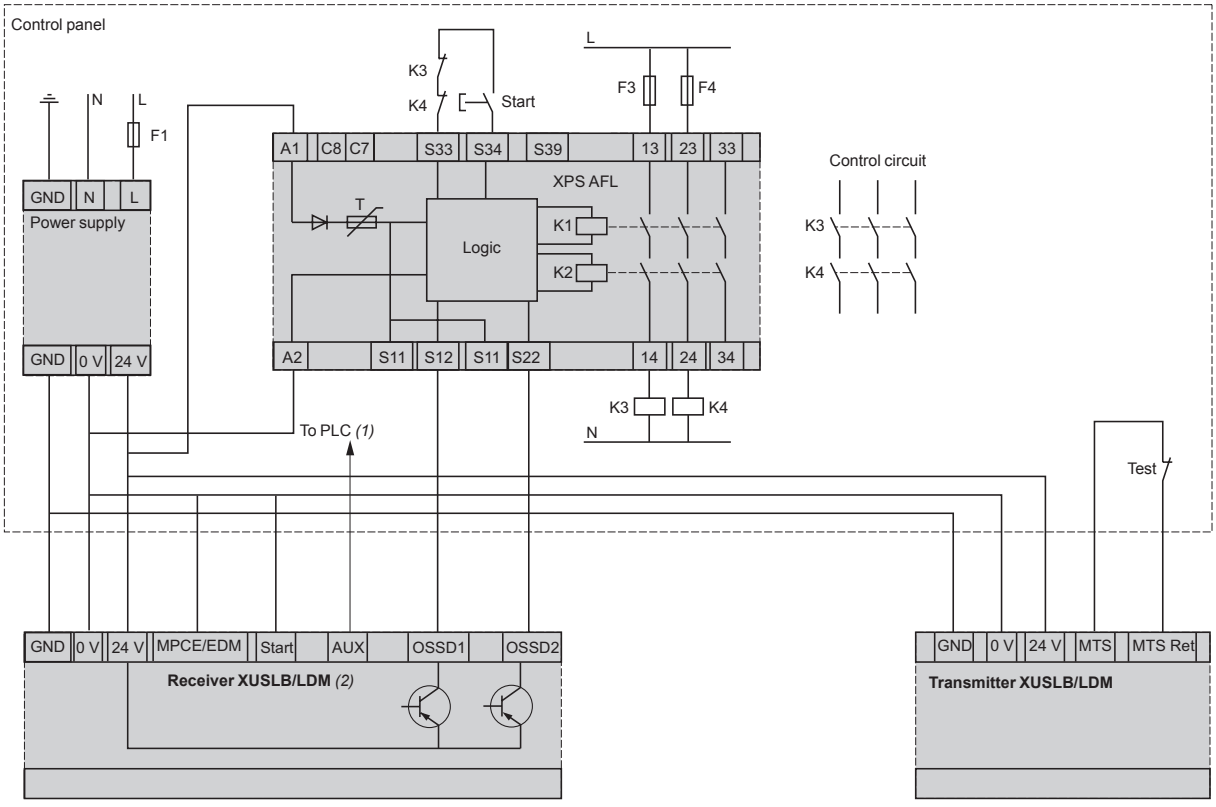
Direct connection with XUSLB/LDM●●●



(1) *For testing prior to installation, the user can select MPCE/EDM OFF (default factory setting). In this case, the MPCE/EDM line must be connected to the 0 V line of the system.*
(2) *The auxiliary output connects to a PLC (optional).*
(3) *If remote start is not used, connect the start line to the 0 V line.*
(4) *The K1 and K2 coils must be protected using the arc suppressors included in the documentation kit.*

Note: *Relays K1 and K2 must have mechanically linked contacts.*

Connection via a Preventa™ XPSAFL module

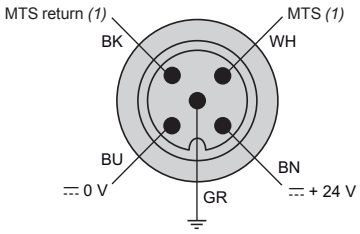


(1) *The auxiliary output connects to a PLC (optional).*
(2) *The light curtain must be configured with MPCE/EDM OFF and with automatic start.*

Note: *Relays K1 and K2 must have mechanically linked contacts.*

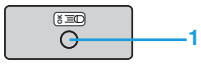
Transmitter

Transmitter connector



(1) Light curtain test input.

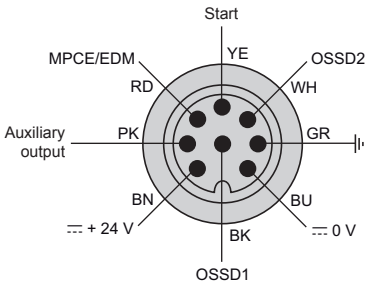
Transmitter status indicator



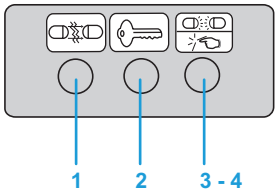
1 Yellow LED

Receiver

Receiver connector



Receiver status indicator

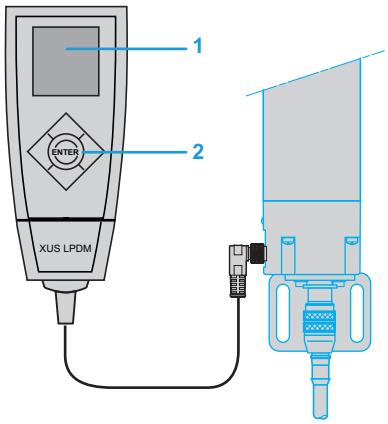


1 Blanking: Orange LED
2 Interlock or Alarm: Yellow LED
3 - 4 Machine run: Green LED
Machine stop: Red LED

Programming and diagnostic module

Description and connection to light curtains XUSLB/LDM

XUSLPDM



1 Screen
2 Navigation button for displaying menus and selecting functions

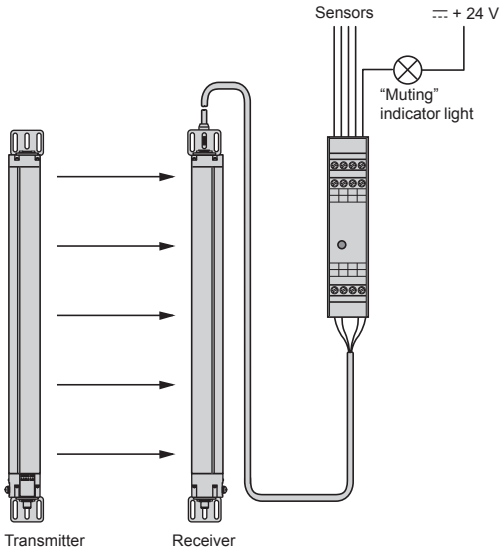
Light curtains Optimum	
Detection capacity 0.55 in. (14 mm).	
Old light curtain	**New light curtain**
XUSLTQ6A0260, XUSLTQ6B0260	**XUSLBQ6A0280**
XUSLTQ6A0350, XUSLTQ6B0350	**XUSLBQ6A0320, XUSLBQ6A0360**
XUSLTQ6A0435, XUSLTQ6B0435	**XUSLBQ6A0440**
XUSLTQ6A0520, XUSLTQ6B0520	**XUSLBQ6A0520**
XUSLTQ6A0610, XUSLTQ6B0610	**XUSLBQ6A0600**
XUSLTQ6A0700, XUSLTQ6B0700	**XUSLBQ6A0720**
XUSLTQ6A0785, XUSLTQ6B0785	**XUSLBQ6A0760**
XUSLTQ6A0870, XUSLTQ6B0870	**XUSLBQ6A0880, XUSLBQ6A0920**
XUSLTQ6A0955, XUSLTQ6B0955	**XUSLBQ6A0960**
XUSLTQ6A1045, XUSLTQ6B1045	**XUSLBQ6A1040**
XUSLTQ6A1130, XUSLTQ6B1130	**XUSLBQ6A1120**
XUSLTQ6A1215, XUSLTQ6B1215	**XUSLBQ6A1200**
XUSLTQ6A1305, XUSLTQ6B1390, XUSLTQ6A1390, XUSLTQ6B1390	**XUSLBQ6A1360**
Detection capacity 1.18 in. (30 mm)	
Old light curtain	**New light curtain**
XUSLTR5A0350, XUSLTR5B0350	**XUSLBR5A0320, XUSLBR5A0360, XUSLBR5A0440**
XUSLTR5A0520, XUSLTR5B0520	**XUSLBR5A0520, XUSLBR5A0600**
XUSLTR5A0700, XUSLTR5B0700	**XUSLBR5A0680, XUSLBR5A0760**
XUSLTR5A0870, XUSLTR5A0870,	**XUSLBR5A0880, XUSLBR5A0920**
XUSLTR5A1045, XUSLTR5B1045	**XUSLBR5A1040**
XUSLTR5A1215, XUSLTR5B1215	**XUSLBR5A1200, XUSLBR5A1360**
XUSLTR5A1390, XUSLTR5B1390	**XUSLBR5A1400, XUSLBR5A1520**
XUSLTR5A1570, XUSLTR5B1570	**XUSLBR5A1560, XUSLBR5A1640**
XUSLTR5A1745, XUSLTR5B1745	**XUSLBR5A1720, XUSLBR5A1800**
XUSLTR5A1920, XUSLTR5B1920	**XUSLBR5A1920**
XUSLTR5A2095, XUSLTR5B2095	**XUSLBR5A2120**

Note: the characteristics of the ranges (optics, connections, dimensions, mounting, functions, etc.) are not exactly the same.
Please refer to the detailed characteristics of the XUSLB●●●●●●● and XUSLD●●●●●●● ranges and associated accessories when replacing a light curtain from the XUSLT●●●●●●● range.

Light curtains Universal	
Detection capacity 1.18 in. (30 mm)	
Old light curtain	**New light curtain**
XUSLTY5A0350, XUSLTY5B0350	**XUSLDMY5A0320, XUSLDMY5A0360, XUSLDMY5A0440**
XUSLTY5A0520, XUSLTY5B0520	**XUSLDMY5A0520, XUSLDMY5A0600**
XUSLTY5A0700, XUSLTY5B0700	**XUSLDMY5A0680, XUSLDMY5A0760**
XUSLTY5A0870, XUSLTY5B0870	**XUSLDMY5A0880, XUSLDMY5A0920**
XUSLTY5A1045, XUSLTY5B1045	**XUSLDMY5A1040**
XUSLTY5A1215, XUSLTY5B1215	**XUSLDMY5A1200, XUSLDMY5A1360**
XUSLTY5A1390, XUSLTY5B1390	**XUSLDMY5A1400, XUSLDMY5A1520**
XUSLTY5A1570, XUSLTY5B1570	**XUSLDMY5A1560, XUSLDMY5A1640**
XUSLTY5A1745, XUSLTY5B1745	**XUSLDMY5A1720, XUSLDMY5A1800**
XUSLTY5A1920, XUSLTY5B1920	**XUSLDMY5A1920**
XUSLTY5A2095, XUSLTY5B2095	**XUSLDMY5A2120**

Note: Caution, the characteristics of the ranges (optics, connections, dimensions, mounting, functions, etc.) are not exactly the same.
Please refer to the detailed characteristics of the XUSLB●●●●●●● and XUSLD●●●●●●● ranges and associated accessories when replacing a light curtain from the XUSLT●●●●●●● range.

Safety detection solutions
Connection module Preventa™ XPSLCM1 For “muting” function on light curtains type XUSLDM



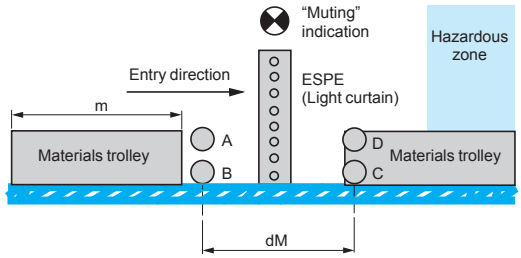
Operating principle

Universal XUSLDM light curtains have an integrated “muting” function that is configurable using the programming and diagnostic module XUSLPDM. This function enables the automatic passage of parts for machining or loaded pallets, without interrupting the transportation movement within the zone protected by the electro-sensitive protection equipment (ESPE) system. In addition to the safety light curtain, a connection module XPSLCM1, which is connected directly to the top of the light curtain receiver, enables the cabling of 2 to 4 “muting” sensors as well as an indicator light. In the event of a sequence error the “muting” indicator light flashes (1 second interval) and turning the Start key switch off and back on restarts the system.

When the system is switched on by the start command and the light curtain protection not interrupted, the main circuit is closed by the safety outputs of the XUSLDM light curtain (solid-state safety outputs). In addition to the safety outputs, the light curtain incorporates signalling LEDs and an auxiliary output (alarm or status signalling) for sending system status information to the PLC. Four LEDs on the light curtain and one on the front face of connection module XPSLCM1 provide information on the safety circuit status.

An interruption of the protection field monitored by the electro-sensitive protection equipment causes instantaneous opening of the safety outputs; the process PLC receives a stop command and the LED display mounted on the front face indicates the change of state of the safety circuits. The “open” state is maintained until the light beams are unobstructed and, if included in the light curtain configuration, the Start key switch operated.

The “muting” function cannot be activated by supplying the “muting” sensors unless the safety outputs have been closed beforehand. To trigger the “muting” function, the “muting” devices must be activated within the configurable time interval (50 milliseconds to 5 seconds in increments of 50 milliseconds). During the activated “muting” phase, materials can be transported through the protection field without deactivating the safety outputs. In the event of intrusion into the hazardous zone, a person cannot activate the “muting” sensors in the same way and the system stops. While the “muting” function is activated, a “muting” status indicator light is controlled by the connection module XPSLCM1. A fault at indicator light level (short-circuit, open circuit) is immediately recognized and deactivates the “muting” function. The indicator light only illuminates when a “muting” signal is generated and indicates the inhibition of the protection function.



ESPE: electro-sensitive protection equipment (light curtain).
A, B, D, C: “muting” sensors.
m: trolley length and dM = distance between A, B and D, C.

Conditions to be observed for the “Muting” function

- The “muting” sensors must either be
  - thru-beam: XUK 0ARCTL2 (sensing distance 98.4 ft (30 m)) + XUK 0ARCTL2T
  - polarised reflex: XUK 0ARCTL2 (sensing distance 16.4 ft (5 m)) + reflector XUZ C50

  or mechanical limit switches with contacts.
- dM ≤ m to obtain continuous validation of the “muting” function.
- Avoid the intrusion of persons during the “muting” phase. This phase is indicated by the indicator light connected to the “muting” indicator output of connection module XPSLCM1.
- A materials trolley must provide the “muting” signal before entering the protection field and cease it once it has cleared all the sensors of the protection field on exiting.

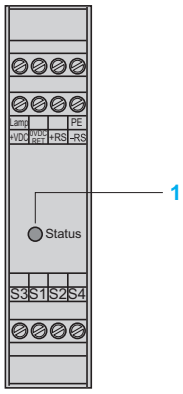
Principle: page 3/104 | Characteristics: page 3/105 | References: page 3/106 | Dimensions: page 3/106 | Wiring Diagrams: page 3/107

Safety detection solutions
Connection module Preventa™ XPSLCM1
For “muting” function on light curtains type XUSLDM

Characteristics

Connection module type			XPSLCM1
Certifications			CE, TÜV, CSA, UL
Product designed for max. use in safety related parts of control systems	Conforming to EN 954-1/ISO 13849-1		Category 4
Ambient air temperature	For operation	**°F (°C)**	32…+ 131 (0…+ 55)
	For storage	**°F (°C)**	- 13…+ 167 (- 25…+ 75)
Degree of protection conforming to IEC 529	Terminals		IP 20
	Enclosure		IP 20
Power supply by light curtain XUSLDM	Voltage	**V**	⎓ 24 (- 20…+ 20**%**)
	Maximum current	**mA**	30
Maximum consumption		**W**	0.7
Rated insulation voltage (Ui)		**V**	500
Rated impulse withstand voltage (Uimp)		**kV**	1.1
Shock resistance	Conforming to IEC 68-2-6	**gn**	6 (10...55 Hz)
Vibration resistance	Conforming to IEC 68-2-29	**gn**	10 (16 ms)
Number of light curtains that can be connected			1 transmitter-receiver pair
Inputs for “muting” sensors - number of inputs to be monitored			2 to 4 per “muting” function
- supply voltage of sensors		**V**	⎓ 24
- output current of each sensor		**mA**	< 20
Type of “muting” sensors			Thru-beam, polarized reflex or sensors with volt-free contacts
Synchronization time of “muting” sensors		**ms**	50 to 500 (configurable in light curtain XUSLDM in increments of 50 ms)
Maximum “muting” time		**min**	2 or unlimited
Safety outputs - number and type			2 PNP (terminals 1 and 2)
- breaking capacity of outputs		**mA**	30 V/100
“Muting” indicator light output			1 NPN
“Muting” indicator light power		**W**	1 to 7 max.
“Muting” indicator light type			LED or filament bulb
Signalling			1 LED
Connection	Type		Captive screw clamp terminals, non removable
1-wire connection	Without cable end		Solid or flexible cable: 26-14 AWG (0.14...2.5 mm^2)
	With cable end		Without bezel, flexible cable: 24-14 AWG (0.25...2.5 mm^2)
	With cable end		With bezel, flexible cable: 24-16 AWG (0.25...1.5 mm^2)
2-wire connection	Without cable end		Without bezel, flexible cable: 24-18 AWG (0.25...1.0 mm^2)
	Without cable end		Double, with bezel, flexible cable: 22-16 AWG (0.5...1.5 mm^2)

Safety detection solutions
Connection module Preventa™ XPSLCM1
For “muting” function on light curtains type XUSLDM



Description

XPSLCM1

To aid diagnostics, the connection module has 1 LED on the front face **1**.

References

Connection module

Description	Type of terminal block connection	“Muting” indicator light output	Supply	Reference	Weight oz (kg)
Connection module for “muting” function	Non removable	1 NPN	⎓ 24 V	**XPSLCM1**	6.70 (0.190)

Spare parts

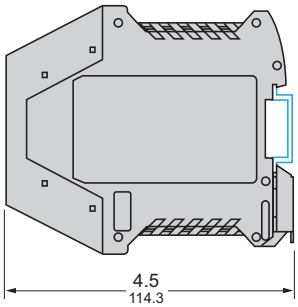
Description	Power W	Reference	Weight oz (kg)
“Muting” indicator light kit *(1)*	5	**XSZCM01**	0.42 (0.012)
Replacement bulbs for “muting” indicator light kit comprising one lot of 10 replacement bulbs and 1 removal/insertion tool XBF X13	1 to 7	**XSZCM02**	0.56 (0.016)

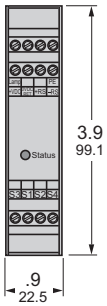
(1) XVB or XVD with steady light LED or filament bulb can also be used.

Dimensions

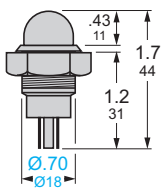
XPSLCM1

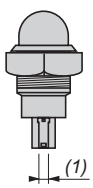
Mounting on 35 mm rail





“Muting” indicator light kit XSZ CM01





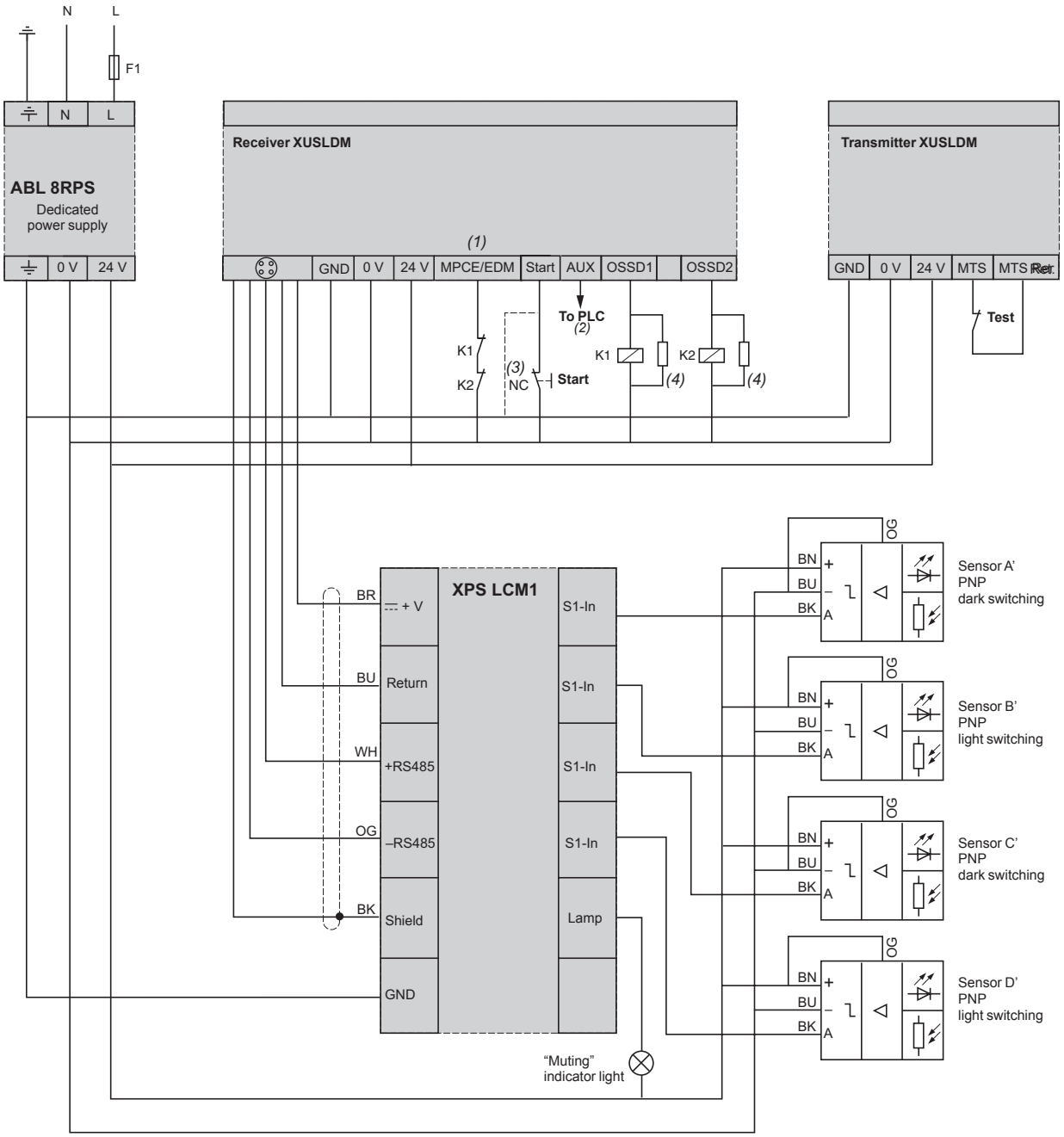
(1) Faston connector 4.7.

Dual Dimensions: INCHES Millimeters

Safety detection solutions
Connection module Preventa™ XPSLCM1
For “muting” function on light curtains type XUSLDM

Connection of light curtains XUSLDM with connection module XPSLCM1

Example: configuration with light curtains XUSLDM

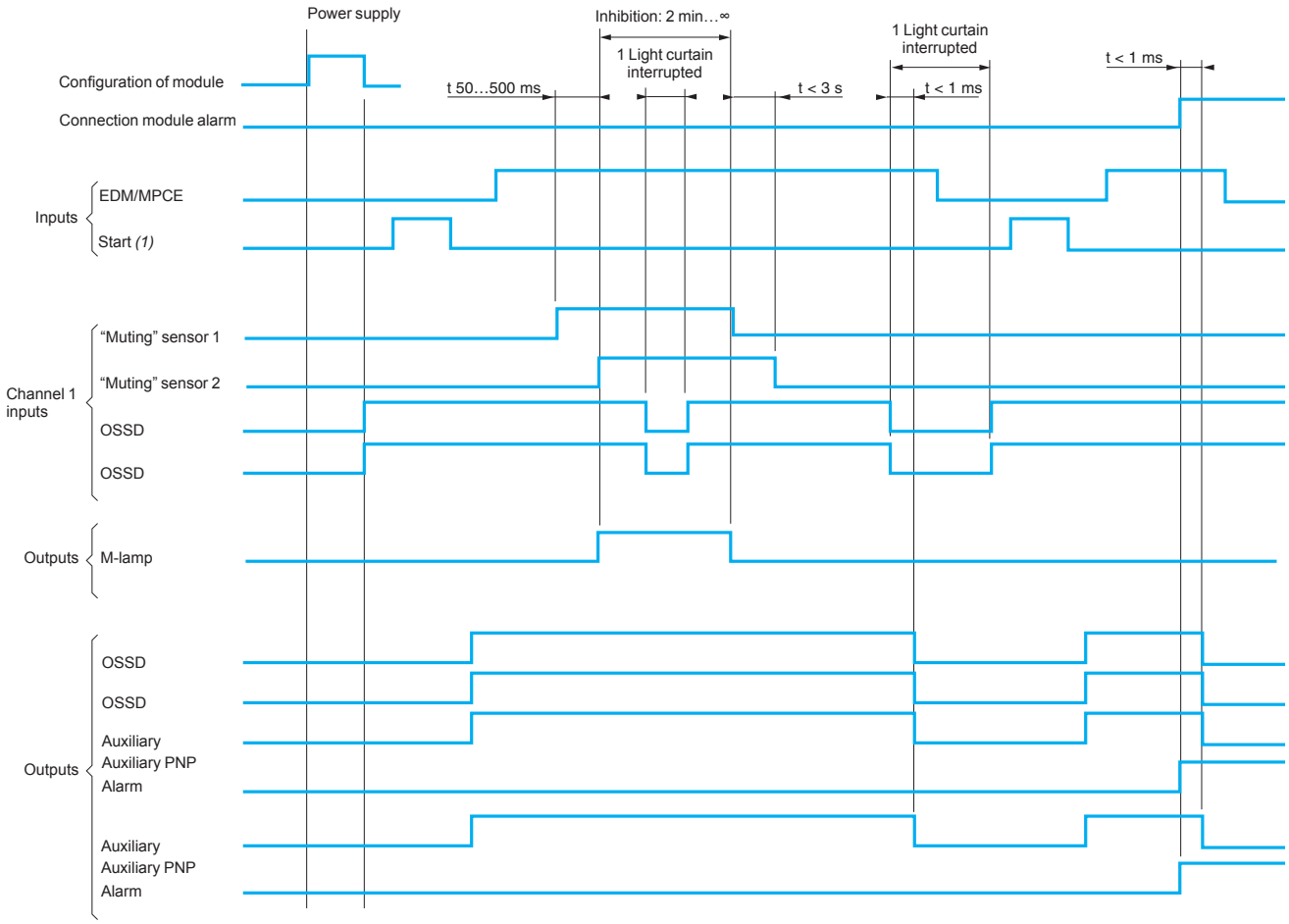


(1) For testing prior to installation, the user can select MPCE/EDM OFF (default factory setting). In this case, the MPCE/EDM line must be connected to the 0 V line of the system.
(2) The auxiliary output connects to a PLC (optional).
(3) If remote start is not used, connect the start line to the 0 V line.
(4) The K1 and K2 coils must be protected using the arc suppressors included in the documentation kit.

Safety detection solutions
Connection module Preventa™ XPSLCM1
For “muting” function on light curtains type XUSLDM

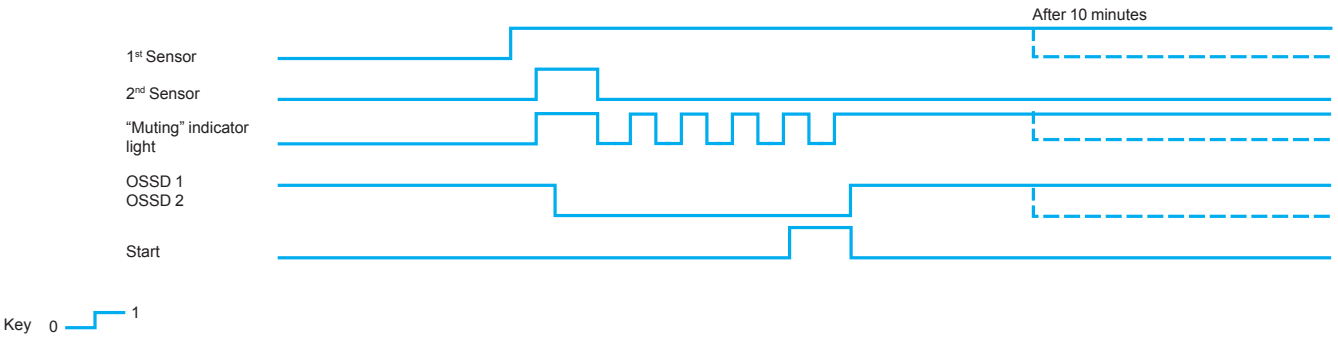
Functional diagram of light curtain XUSLDM with connection module XPSLCM1

“Start/restart interlock” mode with 2 sensors



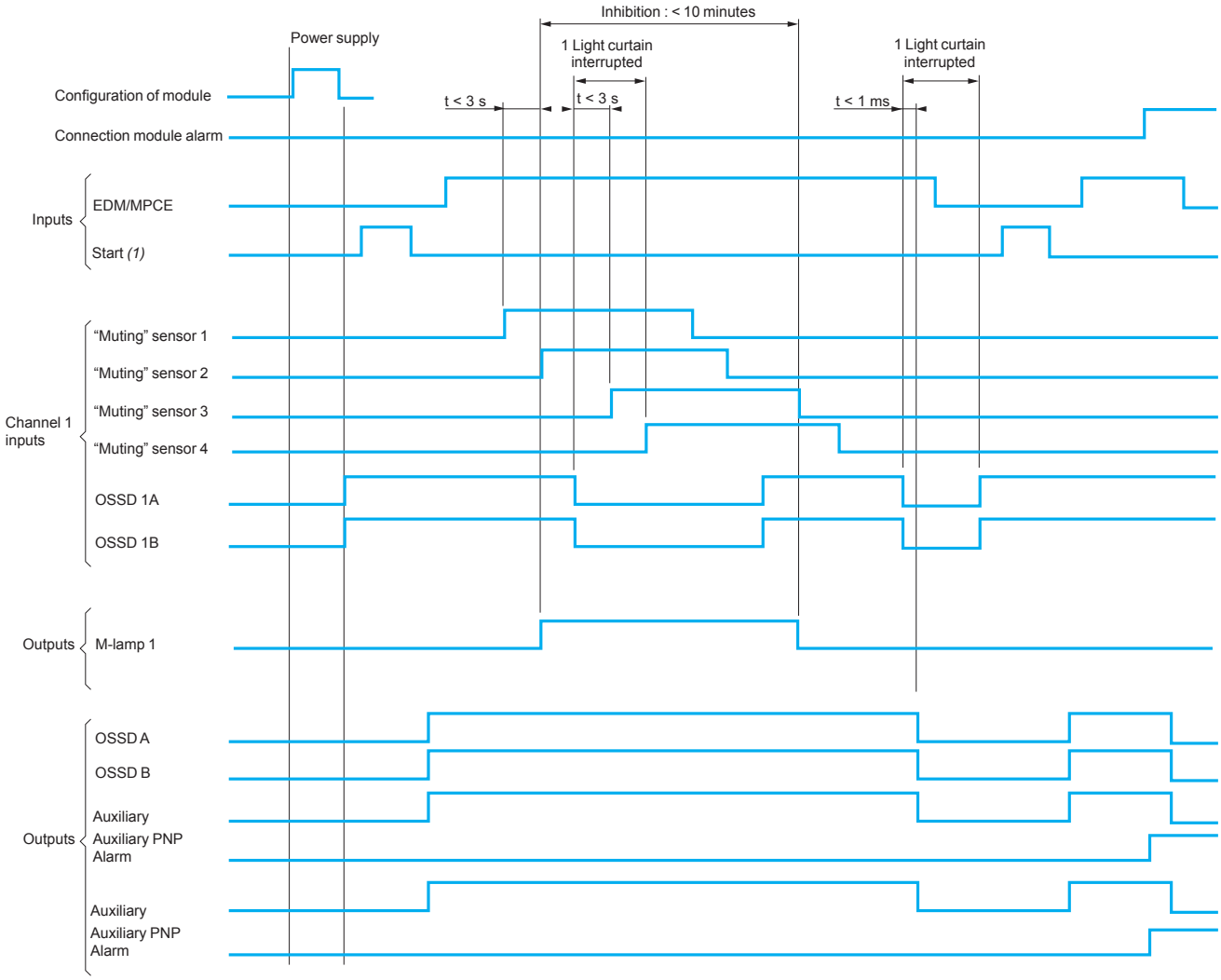
(1) Press Start button.

Override function



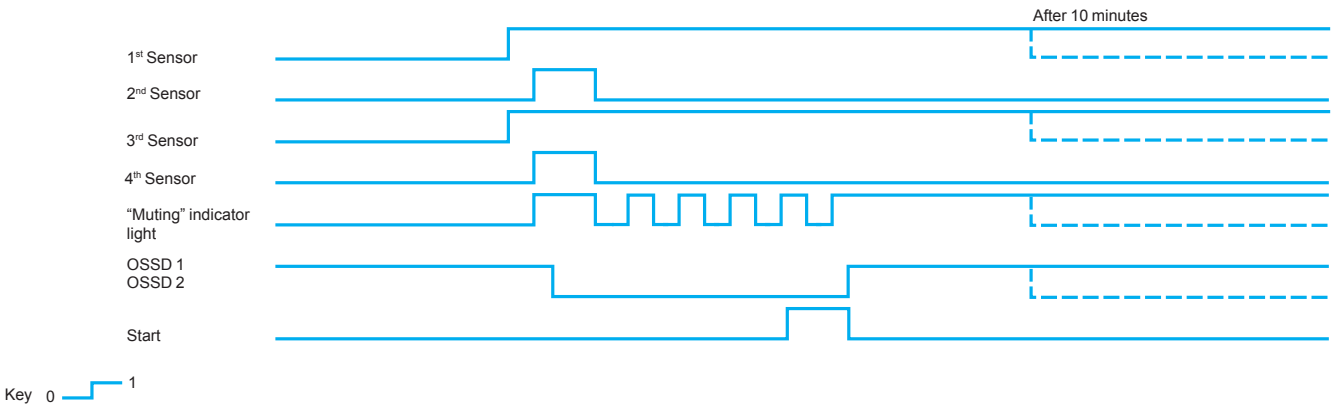
Functional diagram of light curtain XUSLDM with connection module XPSLCM1

"Start/restart interlock" mode with 4 sensors



(1) Press Start button.

Override function



Safety detection solutions
Light curtains, type 4
Compact light curtains XUS LT with solid-state output

Light curtain type			XUSLTQ6●●●● 0.55 in.(14 mm)	XUSLTR5●●●●● 1.18 in. (30 mm)	XUSLTY5●●●●● 1.18 in. (30 mm)
Environmental characteristics					
Conformity to standards			ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, EN/IEC 61496-1 and EN/IEC 61496-2 (Type 4)		
Certifications			CE, TUV, UL, CSA		
European directives			Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC		
Ambient air temperature	Operating	**°F (°C)**	+ 32…+ 131 (0…+ 55)		
	For storage	**°F (°C)**	- 13…+ 167 (- 25…+ 75)		
Relative humidity			95% maximum, without condensation		
Degree of protection			IP 65		
Shock and vibration resistance	Conforming to IEC 61496-1		Shock resistance: 10 gn, impulse 16 ms, Vibration resistance: 10…55 Hz, amplitude: 0.35 ± 0.05 mm		
Materials			Casing: aluminium with electrostatically applied red (RAL 3000) polyester paint finish; end caps: 20% fiberglass impregnated polycarbonate.		
Mountings			End brackets (included)		
Optical characteristics					
Minimum detection capacity		**in. (mm)**	0.55 (14) (finger)	1.18 (30) (hand)	
Nominal sensing distance (Sn)		**ft. (m)**	1 to 24.6 ft. (0.3 to 7.5 m)	1 to 29.5 ft. (0.3 to 9 m)	1 to 65 ft. (0.3 to 20 m)
Protected height		**in. (mm)**	10.2 to 54.7 (260 to 1390)	13.8 to 82.5 (350 to 2095)	
Effective aperture angle (EAA)			2.5° at 3 m (3° when used with IP 67 protection tube)		
Light source			GaAlAs LED, 850 nm		
Immunity to ambient light			Conforming to IEC/EN 61496-2		
Electrical characteristics					
Response time		**ms**	20…40	20…35	
Power supply			⎓ 24 V ± 20% 2 A conforming to EN/IEC 61496 and EN/IEC 60204-1		
	Transmitter	**mA**	285		
	Receiver	**A**	1.4 (with maximum load)		
Maximum current power consumption (no-load)	Transmitter	**mA**	285		
	Receiver	**mA**	300		
Immunity to interference			Conforming to EN 61496-1		
Safety outputs OSSD (Output Signal Switching Devices)			2 solid-state PNP (N.O.) outputs ≤ 500 mA, ⎓ 24 V (Short-circuit protected)		
Alarm output			1 solid-state output 100 mA, ⎓ 24 V, PNP or NPN depending on model		
Monitoring activation of output switching devices (MPCE/EDM)			50 mA, ⎓ 24 V		
Signalling	Transmitter		1 LED (power supply)		
	Receiver		4 LEDs (stop, run, interlock, ECS/B Blanking or FB Floating Blanking)		
Connections *(1)*	Transmitter		M12, 5-pin, male connector on 9.8 in. (0.25 m) pigtail		
	Receiver		M12, 8-pin, male connector on 9.8 in. (0.25 m) pigtail		
Conductor	Transmitter	**AWG (mm²)**	22 (0.34). Tinned wires.		
	Receiver	**AWG (mm²)**	Power supply and output signals: 20 (0.5) (white, orange and yellow wires); 22 AWG (0.34) (grey, pink and violet wires). Tinned wires.		
Cable resistance	Transmitter	Ω	0.169 per ft (0.056 per m) for 22 AWG (0.34 mm²) wire		
	Receiver	Ω	0.012 per ft. (0.039 per m) for 22 AWG (0.50 mm²) wire		
Cable lengths		**ft. (m)**	Pre-wired connectors with shielded (60% coverage) cable lengths of 32.8, 49.2, and 98.4 ft (5, 10, and 30 m) are available separately. The maximum cable length is 196.8 ft. (60 m), depending on the load current and power supply.		
Tightening torque			Receiver end cap assembly screw: 8 lb-in. (0.9 Nm)		
Functions					
Functions			- Auto/Manual, manual 1st cycle, - Monitoring of external switching devices (EDM: External Devices Monitoring), - Test (MTS: Monitoring Test Signal), - Blanking (ECS/B), - Floating Blanking (FB), - Alignment aid by display of each light beam broken, - LED display of operating modes and alarm. Selection of Auto/Manual, blanking relay monitoring, floating/blanking and blanking + floating/blanking relay monitoring by configuration switches.		
Monitoring of external switching devices (EDM = External Devices Monitoring)			Monitoring of the function (open or closed) as well as the response time of the power components. Parameterable using configuration switches.		
"Test" function			Instigates the stop instruction of the light curtain by opening the contact (simulated intrusion)		
"Muting" function (inhibition)			Possible with external module **XPS LCM1150**		

(1) Pre-wired female connectors to be ordered separately, see page 3/112.

Safety detection solutions
Light curtains, type 4
Compact light curtains XUS LT with solid-state output



XUSLTQ6A●●●●

Transmitter-receiver pairs for finger protection *(1)*

Detection capacity 0.55 in. (14 mm). Sensing distance 1 to 24.6 ft (0.3 to 7.5 m).

■ 2 PNP safety outputs

Protected height	Response time	Number of light beams	Alarm output	Reference *(2) (3)*	Weight
in. (mm)	ms				lb. (kg)
10.24 (260)	20	24	PNP	**XUSLTQ6A0260**	8.82 (4.000)
13.78 (350)	20	32	PNP	**XUSLTQ6A0350**	9.41 (4.270)
17.13 (435)	20	40	PNP	**XUSLTQ6A0435**	9.99 (4.530)
20.47 (520)	25	48	PNP	**XUSLTQ6A0520**	10.58 (4.800)
24.02 (610)	25	56	PNP	**XUSLTQ6A0610**	11.16 (5.060)
27.56 (700)	25	64	PNP	**XUSLTQ6A0700**	11.75 (5.330)
30.91 (785)	30	72	PNP	**XUSLTQ6A0785**	12.35 (5.600)
34.25 (870)	30	80	PNP	**XUSLTQ6A0870**	12.92 (5.860)
37.60 (955)	35	88	PNP	**XUSLTQ6A0955**	14.82 (6.720)
41.14 (1045)	35	96	PNP	**XUSLTQ6A1045**	15.41 (6.990)
44.49 (1130)	35	104	PNP	**XUSLTQ6A1130**	15.98 (7.250)
47.83 (1215)	40	112	PNP	**XUSLTQ6A1215**	16.58 (7.520)
51.38 (1305)	40	120	PNP	**XUSLTQ6A1305**	17.15 (7.780)
54.72 (1390)	40	128	PNP	**XUSLTQ6A1390**	17.75 (8.050)

(1) Supplied with a test rod, 2 sets of 2 brackets with mountings and a user guide with certificate of conformity and 1 arc suppressor set.
Pre-wired female connectors to be ordered separately, see page 3/112.
*(2) To order a transmitter-receiver pair with an NPN alarm output, replace the letter **A** by the letter **B** in the reference.*
*Example: reference XUSLTQ6A0260 becomes **XUSLTQ6B0260**, with an NPN alarm output.*
*(3) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLTQ6A0260 becomes **XUSLTQ6A0260R** for the receiver only.*
*To order a transmitter only, replace the letter A or B by **E** and add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLTQ6A0260 becomes **XUSLTQ6E0260T** for the transmitter only.*



XUSLTR/Y●●●●●●

Transmitter-receiver pairs for hand protection *(1)*

Detection capacity 1.18 in. (30 mm). Sensing distance 1 to 29.5 ft. (0.3 to 9 m).

■ 2 PNP safety outputs

Protected height	Response time	Number of light beams	Alarm output	Reference *(2) (3)*	Weight
in. (mm)	ms				lb. (kg)
13.78 (350)	20	16	PNP	**XUSLTR5A0350**	9.41 (4.270)
20.47 (520)	20	24	PNP	**XUSLTR5A0520**	10.58 (4.800)
27.56 (700)	20	32	PNP	**XUSLTR5A0700**	11.75 (5.330)
34.25 (870)	20	40	PNP	**XUSLTR5A0870**	12.92 (5.860)
41.14 (1045)	25	48	PNP	**XUSLTR5A1045**	15.41 (6.990)
47.83 (1215)	25	56	PNP	**XUSLTR5A1215**	16.58 (7.520)
54.72 (1390)	25	64	PNP	**XUSLTR5A1390**	17.75 (8.050)
61.81 (1570)	30	72	PNP	**XUSLTR5A1570**	18.92 (8.580)
68.70 (1745)	30	80	PNP	**XUSLTR5A1745**	20.08 (9.110)
75.59 (1920)	35	88	PNP	**XUSLTR5A1920**	21.25 (9.640)
82.48 (2095)	35	96	PNP	**XUSLTR5A2095**	22.40 (10.160)

Detection capacity 1.18 in. (30 mm). Sensing distance 1 to 65 ft. (0.3 to 20 m).

■ 2 PNP safety outputs

To order a transmitter-receiver pair with a sensing distance 1 to 65 ft. (0.3 to 20 m) . replace the letter **R** by **Y**. Example: reference XUSLTR5A0350 becomes **XUSLTY5A0350**, with a sensing distance 1 to 65 ft. (0.3 to 20 m).

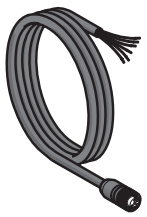
(1) Supplied with a test rod, 2 sets of 2 brackets with mountings and a user guide with certificate of conformity and 1 arc suppressor set.
Pre-wired female connectors to be ordered separately, see page 3/112.
*(2) To order a transmitter-receiver pair with an NPN alarm output, replace the letter **A** by the letter **B** in the reference.*
*Example: reference XUSLTR5A0350 becomes **XUSLTR5B0350**, with an NPN alarm output.*
*(3) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLTR5A0350 becomes **XUSLTR5A0350R** for the receiver only.*
*To order a transmitter only, replace the letter A or B by **E** and add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLTR5A0350 becomes **XUSLTR5E0350T** for the transmitter only.*

Other versions Combining type 4 light curtains with external module for muting function (page 2/218).

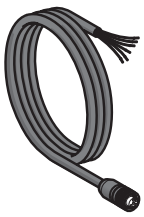
Separate components and accessories - page 3/112

Safety detection solutions
Light curtains, type 4
Compact light curtains XUS LT with solid-state output

5



XSZ TCT●●



XSZ TCR●●

5



XUZ LZ100

Separate components

Power supplies, 90° mirror adaptors, protective covers, anti-vibration kit, mounting bases

See pages 3/113 and 3/130 to 3/137

Accessories

Description	Usage	Length ft. (m)	Reference	Weight oz (kg)
Mountings kit (2 brackets)	For light curtains XUS LT	–	**XUSLZ213**	3.52 (0.100)
Pre-wired female connectors	Transmitter type	16.4 (5)	**XSZ TCT05**	12.69 (0.360)
		32.8 (10)	**XSZ TCT10**	24.34 (0.690)
		49.2 (15)	**XSZ TCT15**	35.27 (1.000)
		98.4 (30)	**XSZ TCT30**	68.08 (1.930)
	Receiver type	16.4 (5)	**XSZ TCR05**	16.23 (0.460)
		32.8 (10)	**XSZ TCR10**	31.75 (0.900)
		49.2 (15)	**XSZ TCR15**	45.50 (1.290)
		98.4 (30)	**XSZ TCR30**	86.07 (2.440)
End cap with connector	Receiver type	–	**XUSLZ222**	0.35 (0.010)
Validation kit	For light curtains XUS LT	–	**XUSLZ100**	0.25 (0.007)
Arc suppressor (pair)	All types of light curtain	–	**XUSLZ500**	0.71 (0.020)
Protection tube (see page 3/113)				
User guide on CD-ROM	All types of light curtain	–	**XUSLZ450**	0.35 (0.010)

Safety detection solutions
Light curtains, type 4
Compact light curtains XUS LT with solid-state output

IP 67 protection tubes for compact light curtains XUS LT			XUSLZ7●●●●
Environmental characteristics			
Air temperature	For operation	**°F (°C)**	+ 32…+ 104 (0...+ 40)
	For storage	**°F (°C)**	- 13…+ 158 (- 25...+ 70)
Degree of protection			IP 67 conforming to IEC 60529
Material			Acrylic
Sensing distance (Sn) **reduction coefficient**			0.90
Environmental chemicals			
Chemical resistance	Aliphatic hydrocarbons		Resistant
	Alkalis		
	Aqueous solutions		
	Detergents and cleaners		
	Inorganic diluted acids		
	Chlorinated or aromatic hydrocarbons		Limited resistance
	Esters		
	Ketones		
Environmental resistance	Adverse weather, sunlight (UV)		Resistant
	Humidity		
	Immersion in water		

References of IP 67 protection tubes



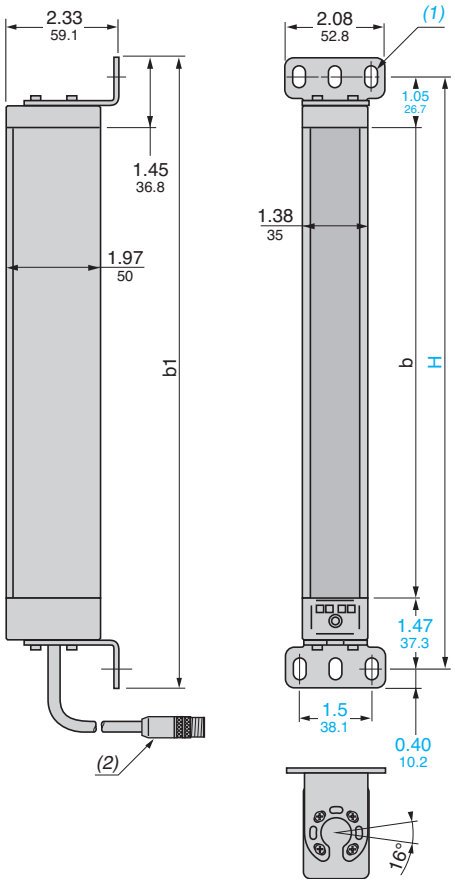
XUS LZ7●●●

Description	For use with	Height in (mm)	Reference	Weight lb. (kg)
IP 67 protection tubes for XUS LT●●● transmitter-receiver pair (0.90 Sn) *(1)* (Sold in sets of 2)	XUSLT●●●260	10.4 (262.9)	**XUSLZ70260**	5.95 (2.700)
	XUSLT●●●350	13.8 (350)	**XUSLZ70350**	5.95 (2.700)
	XUSLT●●●435	17.2 (436)	**XUSLZ70435**	5.95 (2.700)
	XUSLT●●●520	20.6 (523.8)	**XUSLZ70520**	7.05 (3.200)
	XUSLT●●●610	24.1 (610.9)	**XUSLZ70610**	7.05 (3.200)
	XUSLT●●●700	27.5 (697.7)	**XUSLZ70700**	7.05 (3.200)
	XUSLT●●●785	30.9 (784.6)	**XUSLZ70785**	7.05 (3.200)
	XUSLT●●●870	34.3 (871.1)	**XUSLZ70870**	7.05 (3.200)
	XUSLT●●●955	37.7 (958.6)	**XUSLZ70955**	7.05 (3.200)
	XUSLT●●●1045	41.2 (1045.5)	**XUSLZ71045**	9.04 (4.100)
	XUSLT●●●1130	44.6 (1132)	**XUSLZ71130**	9.04 (4.100)
	XUSLT●●●1215	48 (1219.5)	**XUSLZ71215**	9.92 (4.500)
	XUSLT●●●1305	51.4 (1306.3)	**XUSLZ71305**	9.92 (4.500)
	XUSLT●●●1390	54.9 (1393.4)	**XUSLZ71390**	9.92 (4.500)
	XUSLT●●●1570	61.7 (1567.4)	**XUSLZ71570**	14.99 (6.800)
	XUSLT●●●1745	68.6 (1741.4)	**XUSLZ71745**	14.99 (6.800)
	XUSLT●●●1920	75.4 (1915.4)	**XUSLZ71920**	14.99 (6.800)
	XUSLT●●●2095	82.3 (2089.7)	**XUSLZ72095**	14.99 (6.800)

(1) Sensing distance reduction coefficient to be taken into account for each pair of IP 67 protection tubes used.

Safety detection solutions
Light curtains, type 4
Compact light curtains XUS LT with solid-state output

Light curtains
XUSLT●●●

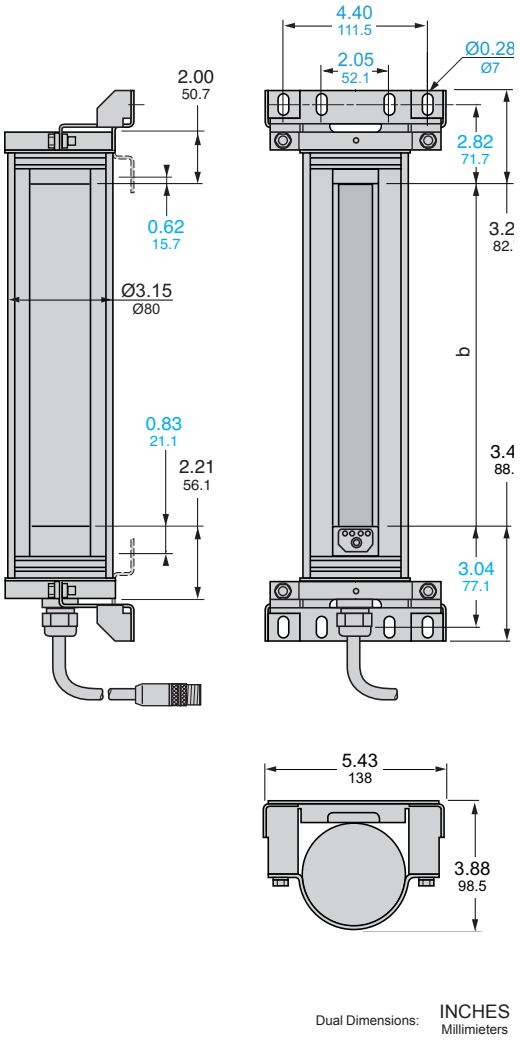


(1) 6 elongated holes .45 x .27 in. (11.45 x 6.75 mm).
(2) M12 male connector on 10.63 in. (0.27 m) pigtail.

XUS	b in. (mm)	b1 in. (mm)	H in. (mm)	Protected height in. (mm)
LT●●●0260	10.35 (263)	13.67 (347.3)	12.87 (327)	10.24 (260)
LT●●●0350	13.82 (351)	17.14 (435.3)	16.34 (415)	13.78 (350)
LT●●●0435	17.24 (438)	20.56 (522.3)	19.76 (502)	17.13 (435)
LT●●●0520	20.59 (523)	23.91 (607.3)	23.11 (587)	20.47 (520)
LT●●●0610	24.13 (613)	27.45 (697.3)	26.65 (677)	24.02 (610)
LT●●●0700	27.56 (700)	30.88 (784.3)	30.08 (764)	27.56 (700)
LT●●●0785	30.91 (785)	34.22 (869.3)	33.43 (849)	30.91 (785)
LT●●●0870	34.29 (871)	37.61 (955.3)	36.81 (935)	34.25 (870)
LT●●●0955	37.71 (958)	41.04 (1042.3)	40.24 (1022)	37.60 (955)
LT●●●1045	41.18 (1046)	44.50 (1130.3)	43.70 (1110)	41.14 (1045)
LT●●●1130	44.61 (1133)	47.93 (1217.3)	47.13 (1197)	44.49 (1130)
LT●●●1215	47.99 (1219)	51.31 (1303.3)	50.51 (1283)	47.83 (1215)
LT●●●1305	51.42 (1306)	54.74 (1390.3)	53.94 (1370)	51.38 (1305)
LT●●●1390	54.88 (1394)	50.33 (1478.3)	57.40 (1458)	54.72 (1390)
LT●●●1570	61.81 (1570)	65.13 (1654.3)	64.33 (1634)	61.81 (1570)
LT●●●1745	68.74 (1746)	72.06 (1830.3)	71.26 (1810)	68.70 (1745)
LT●●●1920	75.59 (1920)	78.91 (2004.3)	78.11 (1984)	75.59 (1920)
LT●●●2095	82.48 (2095)	85.80 (2179.3)	85.00 (2159)	82.48 (2095)

Dual Dimensions: INCHES Millimieters

Protection tube for compact light curtains XUS LT
XUSLZ7●●●●



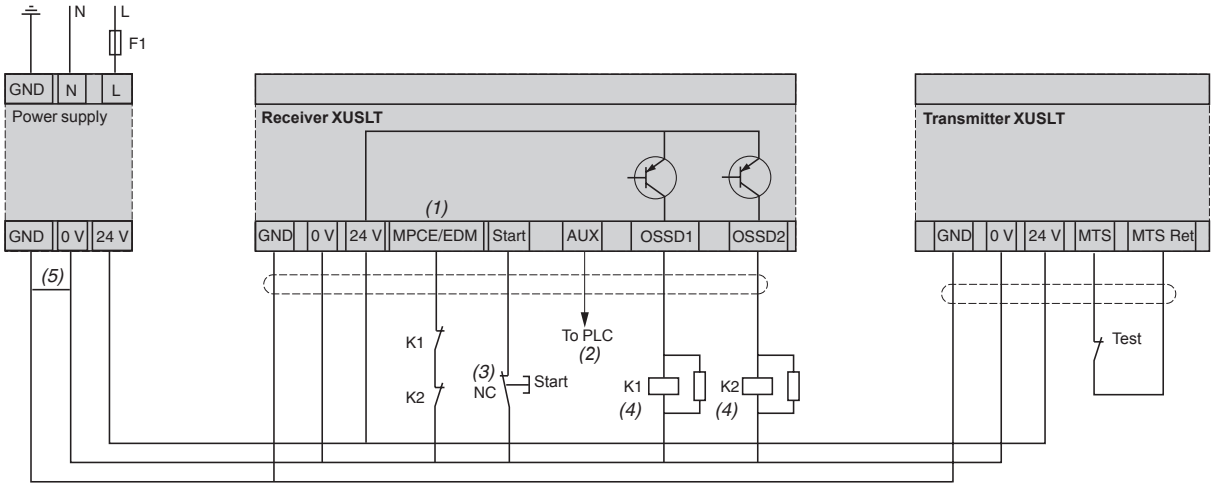
Dual Dimensions: INCHES
Millimieters

XUS	b in. (mm)
LZ70260	10.35 (263)
LZ70350	13.82 (351)
LZ70435	17.24 (438)
LZ70520	20.59 (523)
LZ70610	24.13 (613)
LZ70700	27.56 (700)
LZ70785	30.91 (785)
LZ70870	34.29 (871)
LZ70955	37.71 (958)

XUS	b in. (mm)
LZ71045	41.18 (1046)
LZ71130	44.61 (1133)
LZ71215	47.99 (1219)
LZ71305	51.42 (1306)
LZ71390	54.88 (1394)
LZ71570	61.81 (1570)
LZ71745	68.74 (1746)
LZ71920	75.59 (1920)
LZ72095	82.48 (2095)

Safety detection solutions
Light curtains, type 4
Compact light curtains XUS LT with solid-state output

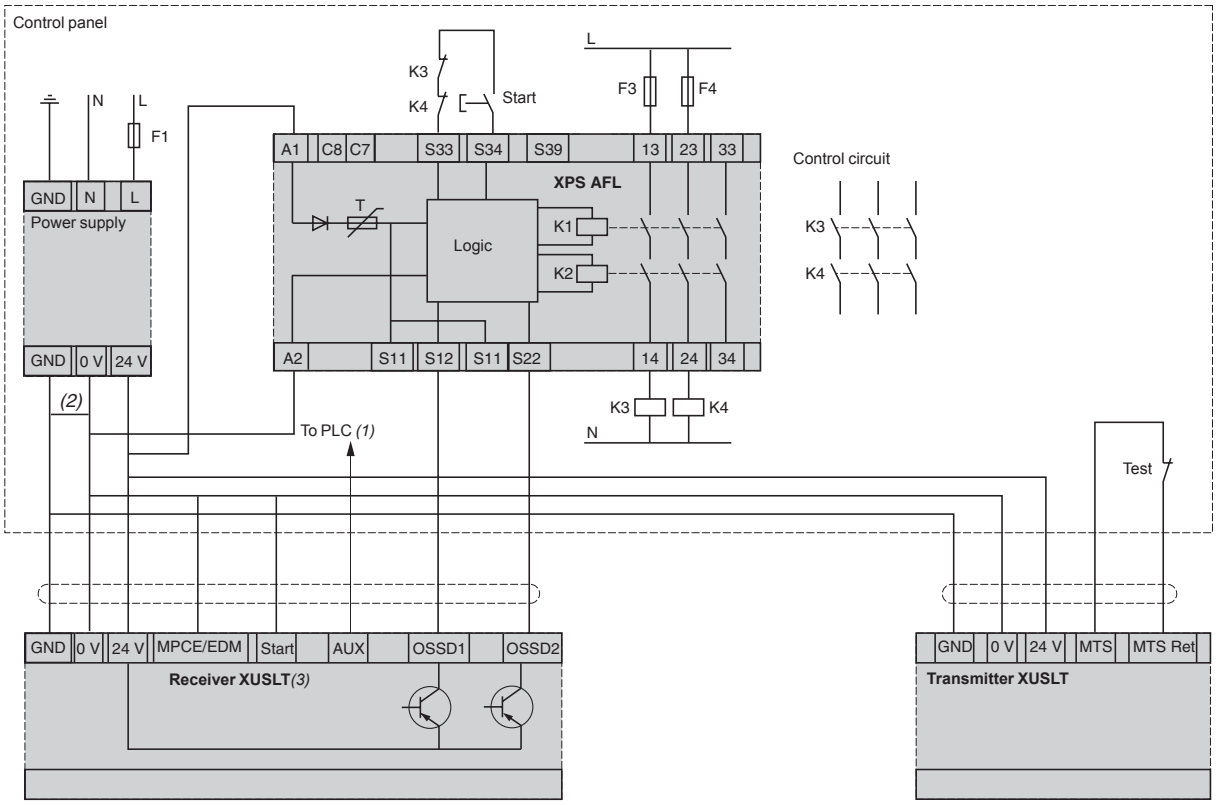
Direct connection with XUSLT●●●



(1) For testing prior to installation, the user can select MPCE/EDM OFF (default factory setting). In this case, the MPCE/EDM line must be connected to the 0 V line of the system.
(2) The auxiliary output connects to a PLC (optional).
(3) If remote start is not used, connect the start line to the 0 V line.
(4) The MPCE/EDM coils must be protected using the arc suppressors included in the documentation kit.
(5) Connect the 0 V terminal to ground.

***Note:** There must not be an unshielded connection exceeding 3.3 ft. (1 m) in length (for example: start button, auxiliary outputs, power supply, MPCE/EDM, OSSD1 and OSSD2). Relays K1 and K2 must have mechanically linked contacts.*

Connection via a Preventa™ XPS AFL module



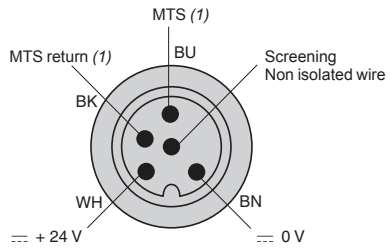
(1) The auxiliary output connects to a PLC (optional).
(2) Connect the 0 V terminal to ground.
(3) The light curtain must be configured with MPCE/EDM OFF and with automatic start.

***Note:** There must not be an unshielded connection exceeding 3.3 ft. (1 m) in length (for example: start button, auxiliary outputs, power supply, MPCE/EDM, OSSD1 and OSSD2). Relays K1 and K2 must have mechanically linked contacts.*

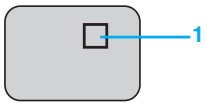
Principle: page 3/88 | Characteristics: page 3/110 | References: page 3/111 | Dimensions: page 3/114 | Wiring Diagrams: page 3/116

Transmitter

Remote connector of transmitter



Transmitter status indicator

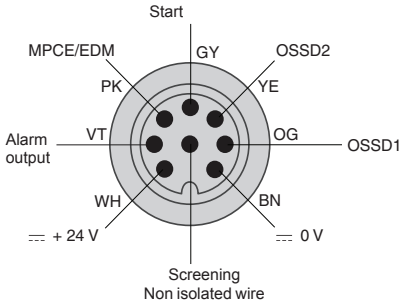


1 Yellow LED

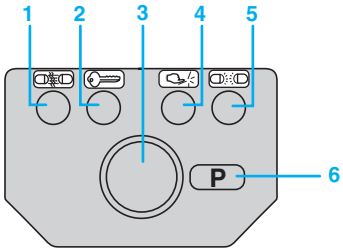
(1) Light curtain test input.

Receiver

Remote connector of receiver

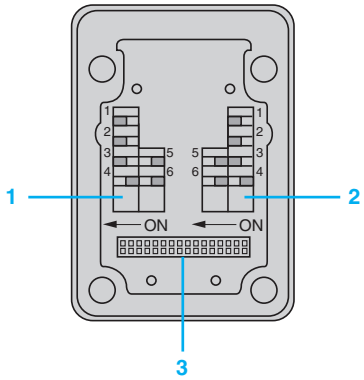


Receiver status indicator



1 Blanking or floating blanking orange LED
2 Interlock or Alarm yellow LED
3 Connector
4 Machine stop red LED
5 Machine run green LED
6 Programming button

Configuration indicator



1 Switches A
2 Switches B
3 Connector

Safety detection solutions
Light curtains, type 4
Compact light curtains XUS LP with solid-state output

Light curtain type			XUSLP●●●●
Environmental characteristics			
Conformity to standards			ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, EN/IEC 61496-1-2 for type 4 ESPE
Certifications			CE, TUV, UL, CSA
European directives			Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC
Ambient air temperature	Operating	**°F (°C)**	+ 32…+ 131 (0…+ 55)
	For storage	**°F (°C)**	- 13…+ 167 (- 25…+ 75)
Relative humidity			95% maximum, without condensation
Degree of protection			IP 65 and IP 67
Shock and vibration resistance	Conforming to IEC 61496-1		Shock resistance: 10 gn, impulse 16 ms, Vibration resistance: 10…55 Hz, amplitude: 0.35 ± 0.05 mm
Materials			Casing: aluminium with electrostatically applied red (RAL 3000) polyester paint finish; end caps: 20% fiberglass impregnated polycarbonate. Front cover: acrylic.
Mountings			End brackets (included)
Optical characteristics			
Minimum detection capacity		**in. (mm)**	11.8, 15.7, 19.7, 23.6 (300, 400. 500. 600) and single beam (Body protection)
Nominal sensing distance (Sn)		**ft. (m)**	2.6 to 65.5 or 2.6 to 229.7 (0.8 to 20 or 0.8 to 70) depending on configuration and 2.6 to 26.2 (0.8 to 8) for light curtains with passive receiver
Protected height			Depending on number of light beams, see table on page 3/123
Effective aperture angle (EAA)			2.5° at 9.8 ft (3 m)
Light source			GaAlAs LED, 850 nm
Immunity to ambient light			Conforming to EN/IEC 61496-2
Electrical characteristics			
Response time		**ms**	< 16…< 24 depending on light beam coding selected
Power supply			⎓ 24 V ± 20% 2 A conforming to EN/IEC 61496 and EN/IEC 60204-1
	Transmitter	**mA**	100
	Receiver	**A**	1.6 (with maximum load)
Maximum current power consumption (no-load)	Transmitter	**mA**	100
	Receiver	**mA**	300
Immunity to interference			Conforming to EN/IEC 61496-1
Safety outputs OSSD (Output Signal Switching Devices)			2 solid-state PNP (N.O.) outputs ≤ 650 mA, ⎓ 24 V (Short-circuit protected)
Auxiliary output			1 solid-state output 100 mA, ⎓ 24 V, PNP
Monitoring activation of output switching devices (MPCE/EDM)			50 mA, ⎓ 24 V
Signalling	Transmitter		1 LED (power supply)
	Receiver		3 LEDs (stop, run, interlock) and a 2-digit display for diagnostics
Connections *(1)*	Transmitter		M12, 5-pin, male connector or terminal block
	Receiver		M12, 8-pin, male connector or terminal block
Conductor	Transmitter/receiver pre-wired connector	**AWG (mm²)**	22 (0.35). Tinned wires.
Cable resistance	Transmitter/receiver	Ω	0.016 per ft. (0.055 per m) for 22 AWG (0.35 mm²) wire
Cable lengths		**ft. (m)**	Pre-wired connectors with cable lengths of 16.4, 32.8, 49.2 and 98.4 ft. (5,10, 15, 30 m) are available separately. The maximum cable length is 394 (120), depending on the load current and power supply.
Functions			
Functions			Start: - Auto/Manual, manual 1st cycle, - Monitoring of external switching devices (EDM: External Devices Monitoring), - Test (MTS: Monitoring Test Signal) for XUS LPZ only, - Alignment aid by display of each light beam broken, - Display of operating modes and alarm by LEDs and 2-digit display. Selection of Auto/Manual, relay monitoring, alarm or auxiliary output functions, light beam coding and selection of sensing distance using configuration switches.
Monitoring of external switching devices (EDM = External Devices Monitoring)			Monitoring of the function (open or closed) as well as the response time of the power components. Parameterable using configuration switches.
"Test" function			Instigates the stop instruction of the light curtain by opening the contact (simulated intrusion)
"Muting" function (inhibition)			Possible with external module **XPS LCM1150**

(1) Pre-wired female connectors to be ordered separately, see page 3/121

Safety detection solutions

Light curtains, type 4

Compact light curtains XUS LP with solid-state output, with connector

105561



XUSLPZ1AM



XUSLPZ3A●●●●M

Transmitter-receiver pairs for body protection *(1)*

Detection capacity 11.8, 15.7, 19.7, 23.6 in. (300, 400. 500. 600 mm) and single beam.
Sensing distance 2.6 to 65.5 ft. or 2.6 to 229.7 ft. (0.8 to 20 m or 0.8 to 70 m) (depending on configuration)

■ 2 PNP safety outputs

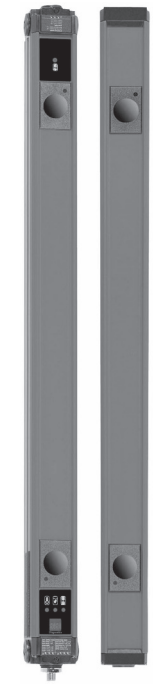
Detection capacity	Response time Light beam coding			Number of light beams	Auxiliary output	Reference *(2)*	Weight
	A	B	C				
in. (mm)	ms	ms	ms				lb. (kg)
–	< 24	< 20	< 16	1	PNP	**XUSLPZ1AM**	9.92 (4.500)
19.69 (500)	< 24	< 20	< 16	2	PNP	**XUSLPZ2A0500M**	13.89 (6.300)
23.62 (600)	< 24	< 20	< 16	2	PNP	**XUSLPZ2A0600M**	14.77 (6.700)
15.75 (400)	< 24	< 20	< 16	3	PNP	**XUSLPZ3A0400M**	15.87 (7.200)
19.69 (500)	< 24	< 20	< 16	3	PNP	**XUSLPZ3A0500M**	18.96 (8.600)
11.81 (300)	< 24	< 20	< 16	4	PNP	**XUSLPZ4A0300M**	18.08 (8.200)
11.81 (300)	< 24	< 20	< 16	5	PNP	**XUSLPZ5A0300M**	20.94 (9.500)
11.81 (300)	< 24	< 20	< 16	6	PNP	**XUSLPZ6A0300M**	22.93 (10.400)

(1) Supplied with 2 sets of 2 brackets with mountings and a user guide with certificate of conformity.
Pre-wired female connectors to be ordered separately, see page 3/121.
*(2) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLPZ2A0600M becomes **XUSLPZ2A0600MR** for the receiver only.*
*To order a transmitter only, add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLPZ2A0600M becomes **XUSLPZ2A0600MT** for the transmitter only.*

Transmitter-receiver pairs for body protection, with passive receiver *(1)*

Detection capacity 19.7 and 23.6 in. (500 and 600 mm). Sensing distance 2.6 to 26.3 ft. (0.8 to 8 m)

■ 2 PNP safety outputs



XUSLPB2●●

Detection capacity	Response time Light beam coding			Number of light beams	Auxiliary output	Reference *(2)*	Weight
	A	B	C				
in. (mm)	ms	ms	ms				lb. (kg)
19.69 (500)	< 24	< 20	< 16	2	PNP	**XUSLPB2A500M**	13.89 (6.300)
23.62 (600)	< 24	< 20	< 16	2	PNP	**XUSLPB2A600M**	14.77 (6.700)

(1) Supplied with 2 sets of 2 brackets with mountings and a user guide with certificate of conformity.
Pre-wired female connectors to be ordered separately, see page 3/121.
*(2) To order a passive receiver, replace the letter **M** by the letter **P** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLPB2A500M becomes **XUSLPB2A500P** for the passive receiver.*
*To order a transmitter only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLPB2A600M becomes **XUSLPB2A600MR** for the transmitter only.*

Other versions Combining type 4 light curtains with external module for muting function (page 2/218).

Separate components and accessories - page 3/121

Safety detection solutions

Light curtains, type 4

Compact light curtains XUS LP with solid-state output, with terminal block

535340



XUSLPZ1AB



XUSLPZ3A●●●●B

Transmitter-receiver pairs for body protection *(1)*

Detection capacity 11.8, 15.7, 19.7, 23.6 in. (300, 400. 500. 600 mm) and single beam.
Sensing distance 2.6 to 65.5 ft. or 2.6 to 229.7 ft. (0.8 to 20 m or 0.8 to 70 m) (depending on configuration)

■ 2 PNP safety outputs

Detection capacity	Response time Light beam coding			Number of light beams	Auxiliary output	Reference *(2)*	Weight
	A	B	C				
in. (mm)	ms	ms	ms				lb. (kg)
–	< 24	< 20	< 16	1	PNP	**XUSLPZ1AB**	9.92 (4.500)
19.69 (500)	< 24	< 20	< 16	2	PNP	**XUSLPZ2A0500B**	13.89 (6.300)
23.62 (600)	< 24	< 20	< 16	2	PNP	**XUSLPZ2A0600B**	14.77 (6.700)
15.75 (400)	< 24	< 20	< 16	3	PNP	**XUSLPZ3A0400B**	15.87 (7.200)
19.69 (500)	< 24	< 20	< 16	3	PNP	**XUSLPZ3A0500B**	18.96 (8.600)
11.81 (300)	< 24	< 20	< 16	4	PNP	**XUSLPZ4A0300B**	18.08 (8.200)
11.81 (300)	< 24	< 20	< 16	5	PNP	**XUSLPZ5A0300B**	20.94 (9.500)
11.81 (300)	< 24	< 20	< 16	6	PNP	**XUSLPZ6A0300B**	22.93 (10.400)

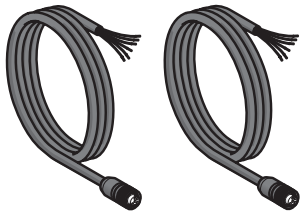
(1) Supplied with 2 sets of 2 brackets with mountings and a user guide with certificate of conformity.

*(2) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLPZ2A0600B becomes **XUSLPZ2A0600BR** for the receiver only.*
*To order a transmitter only, add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUSLPZ2A0600B becomes **XUSLPZ2A0600BT** for the transmitter only.*

Other versions Combining type 4 light curtains with external module for muting function (page 2/218).

Separate components and accessories - page 3/121

Safety detection solutions
Light curtains, type 4
Accessories for compact light curtains XUS LP



XSZ PCT●● *XSZ PCR●●*

Separate components

Power supplies, 90° mirror adaptors, protective covers, anti-vibration kit, mounting bases

See pages 3/130 to 3/137.

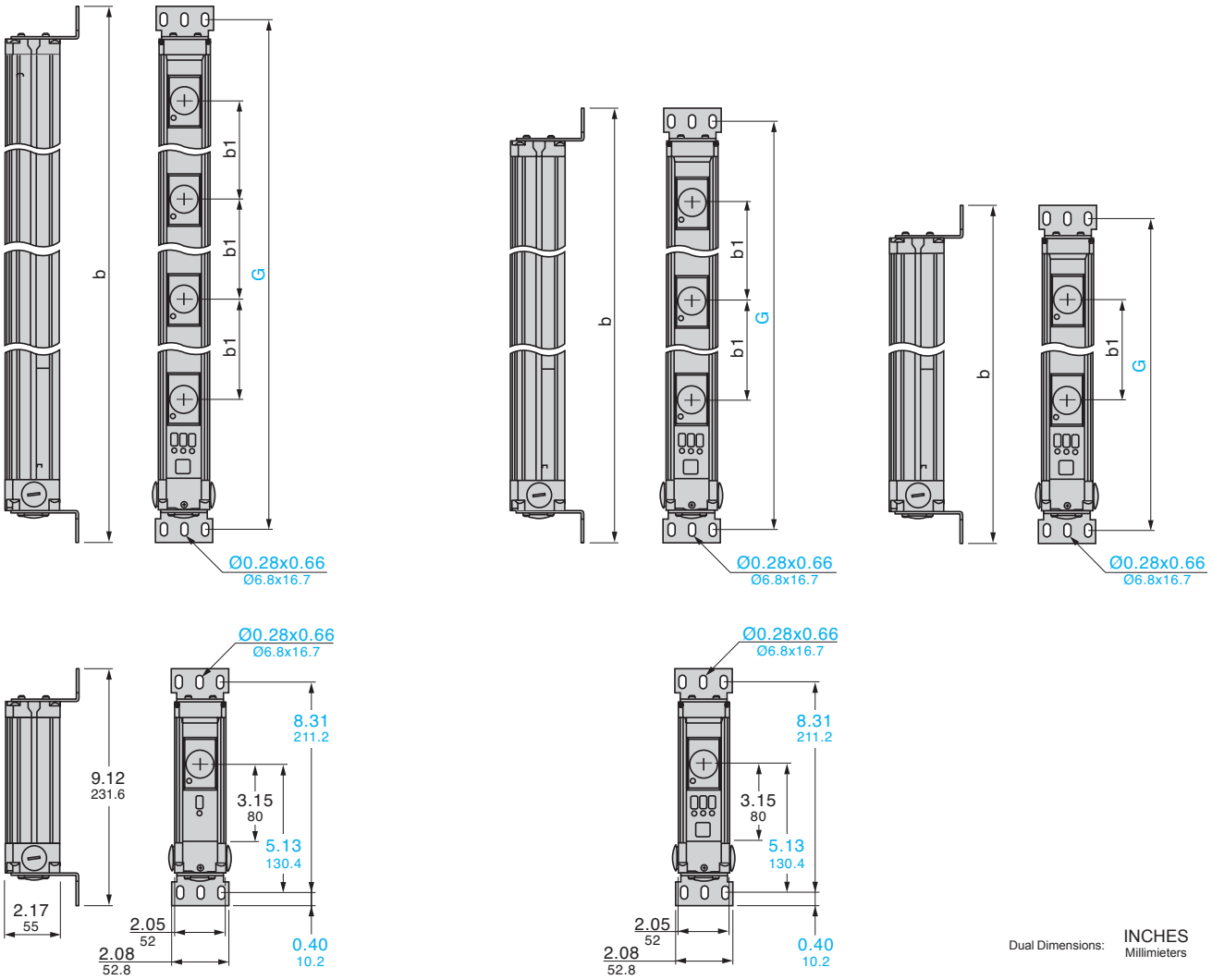
Accessories

Description	Usage	Length m	Reference	Weight lb. (kg)
Mountings kit (2 brackets)	For light curtains XUS LP	–	**XUSLZ219**	0.99 (0.450)
Pre-wired female connectors	Transmitter type	16.40 (5)	**XSZ PCT05**	0.77 (0.350)
		32.81 (10)	**XSZ PCT10**	1.54 (0.700)
		49.21 (15)	**XSZ PCT15**	2.25 (1.020)
		98.43 (30)	**XSZ PCT30**	4.45 (2.020)
	Receiver type	16.40 (5)	**XSZ PCR05**	0.77 (0.350)
		32.81 (10)	**XSZ PCR10**	1.54 (0.700)
		49.21 (15)	**XSZ PCR15**	2.25 (1.020)
		98.43 (30)	**XSZ PCR30**	4.45 (2.020)
Sliding nuts for side mounting (4 nuts)	–	–	**XUSLZ320**	0.99 (0.450)
User guide on CD-ROM	All types of light curtain	–	**XUSLZ450**	0.04 (0.020)
Arc suppressor (pair)	All types of light curtain	–	**XUSLZ500**	0.04 (0.020)

Safety detection solutions
Light curtains, type 4
Compact light curtains XUS LP with solid-state output

Light curtains

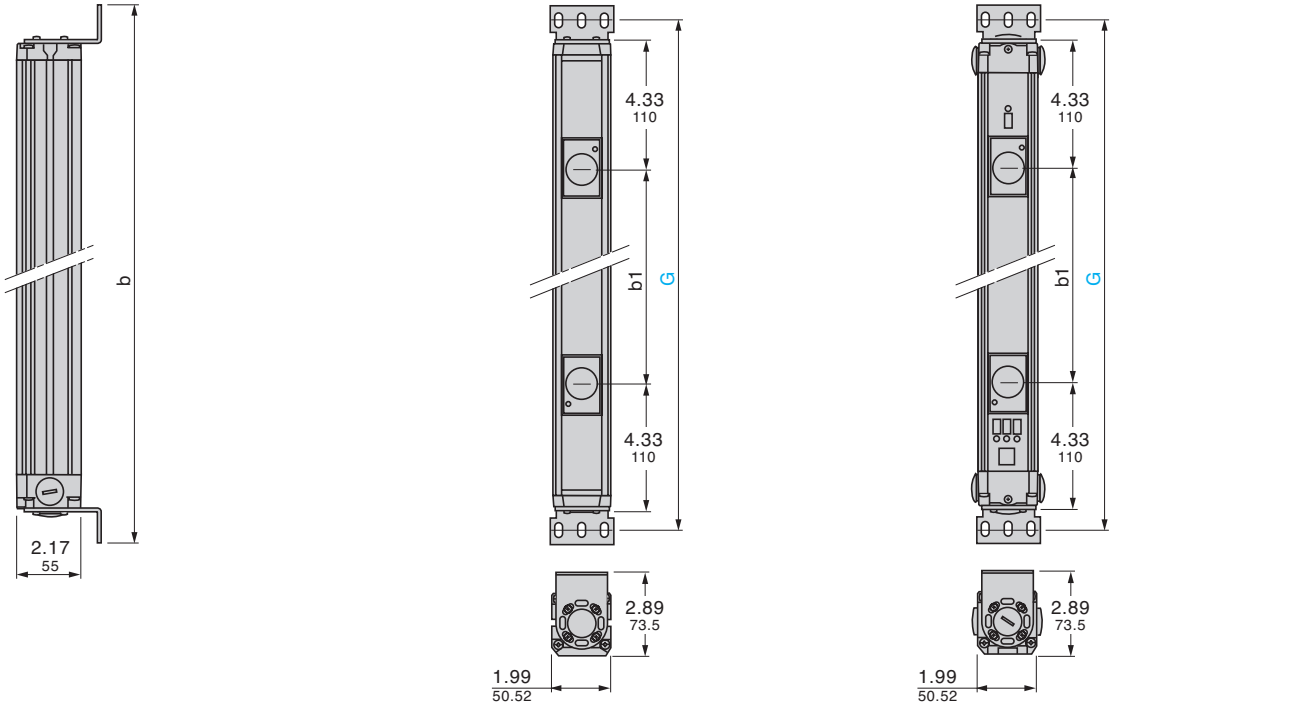
XUS LPZ●●●



XUS	b in. (mm)	b1 in. (mm)	G in. (mm)
LPZ1A●	9.12 (231.6)	–	8.69 (220.7)
LPZ2A0500●	28.80 (731.6)	19.69 (500)	28.37 (720.7)
LPZ2A0600●	32.74(831.6)	23.62 (600)	32.31 (820.7)
LPZ3A0400●	40.61 (1031.6)	15.75 (400)	40.19 (1020.7)
LPZ3A0500●	48.49 (1231.6)	19.69 (500)	48.06 (1220.7)
LPZ4A0300●	44.93 (1141.1)	11.81 (300)	44.12 (1120.7)
LPZ5A0300●	56.36 (1431.6)	11.81 (300)	55.56 (1411.2)
LPZ6A0300●	68.17 (1731.6)	11.81 (300)	67.37 (1711.2)

Principle: page 3/88 | Characteristics: page 3/118 | References: page 3/119 | Dimensions: page 3/122 | Wiring Diagrams: page 3/124

Light curtains
XUS LPB●●●

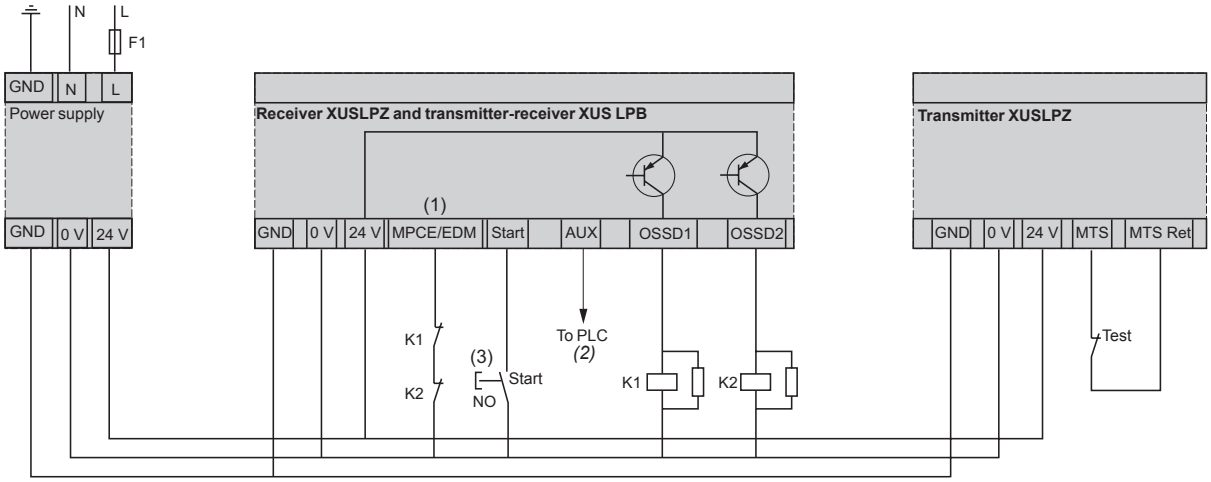


Dual Dimensions: INCHES
Millimieters

XUS	b in. (mm)	b1 in. (mm)	G in. (mm)
LPB2A500M	30.75 (781.1)	19.69 (500)	29.95 (760.7)
LPB2A600M	34.69 (881.1)	23.62 (600)	33.89 (860.7)

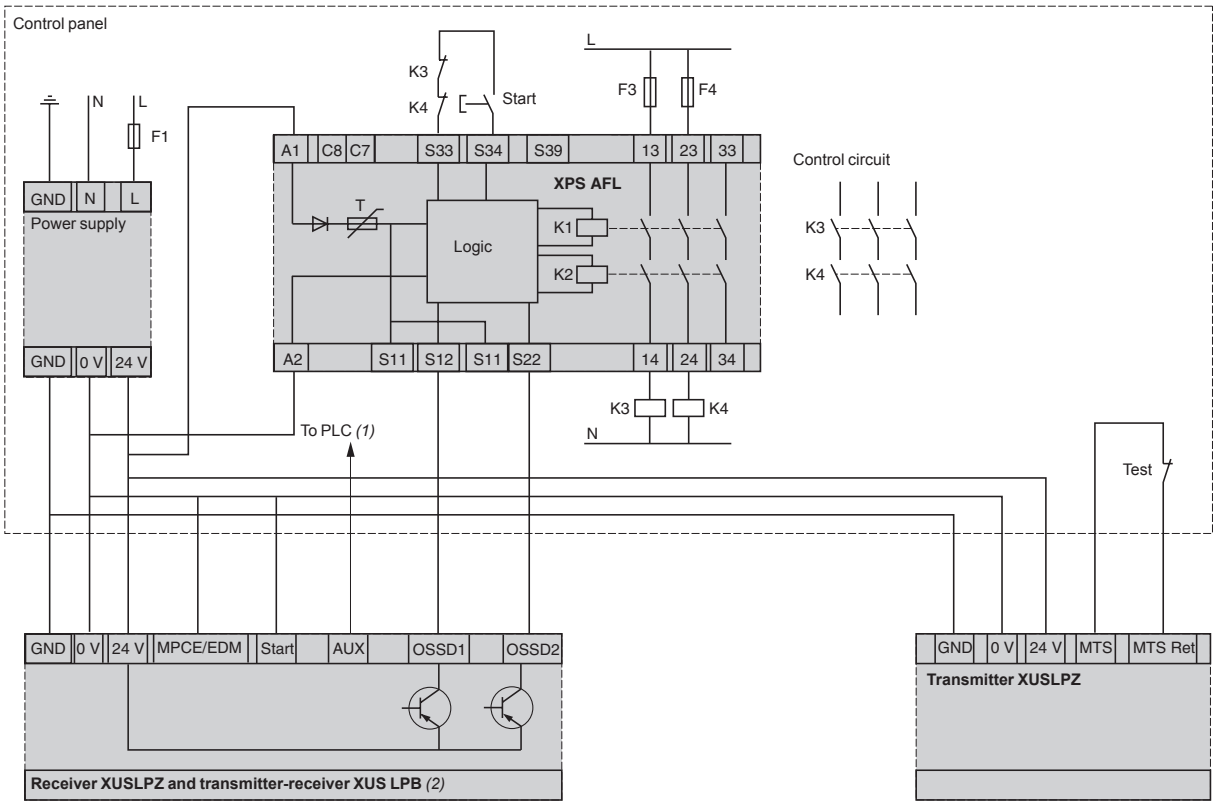
Safety detection solutions
Light curtains, type 4
Compact light curtains XUS LP with solid-state output

Direct connection with XUSLP●●●



(1) For testing prior to installation, the user can select MPCE/EDM OFF (default factory setting). In this case, the MPCE/EDM line must be connected to the 0 V line of the system.
(2) The auxiliary output connects to a PLC (optional).
(3) If remote start is not used, connect the start line to the 0 V line.

Connection via a Preventa™ XPS AFL module

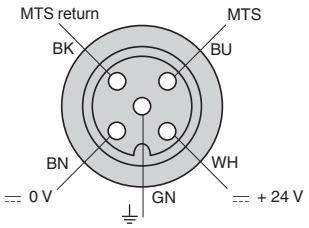


(1) The auxiliary output connects to a PLC (optional).
(2) The light curtain must be configured with MPCE/EDM OFF and with automatic start.

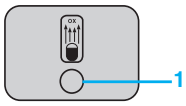
XUS LPZ/LPB●

Transmitter

Pre-wired connector of transmitter (XUS LPZ)

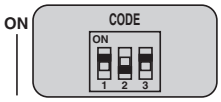


Transmitter status indicator

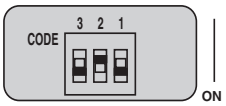


1 Yellow LED

Configuration indicator XUS LPZ

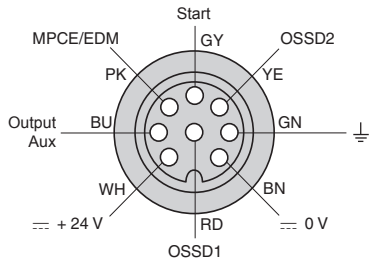


Configuration indicator XUS LPB

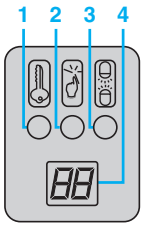


Receiver

Pre-wired connector of receiver (XUS LPZ) and pre-wired connector of transmitter-receiver (XUS LPB)

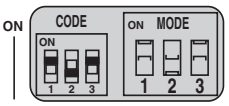


Receiver status indicator

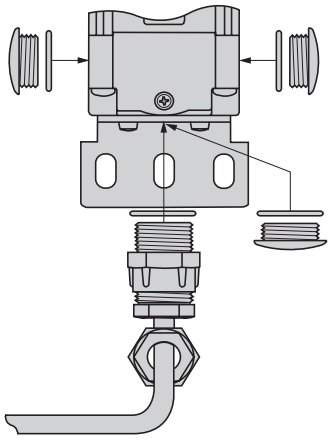


1 Interlock or Alarm yellow LED
2 Machine stop red LED
3 Machine run green LED
4 2-digit display

Configuration indicator XUS LPZ and XUS LPB

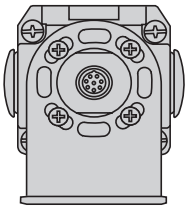


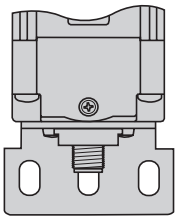
Connection to terminal block





Connection to M12 connector





Safety detection solutions
Light curtains, type 2
Slim, compact light curtains XUS LN with solid-state output

Light curtain type			XUSLNG●●●● 1.18 in. (30 mm)
Environmental characteristics			
Conformity to standards			IEC 61496-1 and IEC 61496-2 (Type 2 ESPE)
Certifications			CE, TUV, UL, CSA
European directives			Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC
Ambient air temperature	Operating	**°F (°C)**	+ 32…+ 131 (0…+ 55)
	For storage	**°F (°C)**	- 13…+ 167 (- 25…+ 75)
Relative humidity			95% maximum, without condensation
Degree of protection			IP 65
Shock and vibration resistance	Conforming to IEC 61496-1		Shock resistance: 10 gn, impulse 16 ms, Vibration resistance: 10…55 Hz, amplitude: 0.35 ± 0.05 mm
Materials			Casing: aluminium with electrostatically applied red (RAL 3000) polyester paint finish; end caps: 30% fiberglass impregnated nylon; front cover: acrylic.
Mountings			End brackets (included)
Optical characteristics			
Minimum detection capacity		**in. (mm)**	1.18 (30) (Hand)
Nominal sensing distance (Sn)		**ft. (m)**	1 to 49.3 (0.3 to 15)
Protected height		**in. (mm)**	5.29 to 57.87 in. (150 to 1500 mm)
Effective aperture angle (EAA)			5° at 3 m conforming to IEC 61496-1 and IEC 61496-2 (Type 2 ESPE)
Light source			GaAlAs LED, 880 nm
Immunity to ambient light			Conforming to IEC/EN 61496-2
Electrical characteristics			
Response time		**ms**	14…24
Power supply			⎓ 24 V ± 20% 2 A conforming to IEC 61496 and IEC 60204-1 (- 10% using the EDM function)
	Transmitter	**mA**	50
	Receiver	**A**	1.09 (with maximum load)
Maximum current power consumption (no-load)	Transmitter	**mA**	50
	Receiver	**mA**	90
Immunity to interference			Conforming to EN 61496-1 and EN 61496-2
Safety outputs OSSD (Output Signal Switching Devices)			2 solid-state PNP (N.O.) outputs ≤ 500 mA, ⎓ 24 V (Short-circuit protection)
Signalling	Transmitter		2 LEDs (power supply and diagnostic)
	Receiver		4 LEDs (stop, run, top alignment and bottom alignment)
Connections *(1)*	Transmitter		M12, 4-pin, male connector
	Receiver		M12, 5-pin, male connector
Pre-wired connectors	Transmitter/Receiver	**AWG (mm^2)**	22 (0.25) Tinned wires.
Cable resistance	Transmitter/Receiver	Ω	0.028 Ω per foot. (0.093 Ω per m) for 22 AWG (O.25 mm^2) wire
Cable lengths		**ft. (m)**	Pre-wired connectors with cable lengths of 9.84, 32.81, and 98.43 ft. (3, 10, and 30 m) are available separately. The maximum cable length is 164 ft. (50 m), depending on the load current and power supply.
Functions			
Functions			■ Start: □ Automatic: model **XUSLNG5C** □ Manual: model **XUSLNG5D** ■ Alignment aid using 2 LEDs ■ LED display of operating modes ■ Monitoring of external switching devices EDM/MPCE
"Muting" function (inhibition)			Possible with external module **XPS LCM1150**

(1) Pre-wired female connectors to be ordered separately, see page 3/127.

Safety detection solutions
Light curtains, type 2
Slim, compact light curtains XUS LN with solid-state output



XUSLNG5●●●●●

Transmitter-receiver system for hand protection *(1)*

Detection capacity 1.18 in. (30 mm) Sensing distance 0.89 to 49.21 ft. (0.3 to 15 m).

■ 2 PNP safety outputs - Automatic start

Protected height	Response time	Number of light beams	Alarm output	Reference *(2)*	Weight
in. (mm)	ms				lb. (kg)
5.91 (150)	14	7	PNP	**XUSLNG5C0150**	5.95 (2.700)
11.81 (300)	15	14	PNP	**XUSLNG5C0300**	6.39 (2.900)
17.72 (450)	16	21	PNP	**XUSLNG5C0450**	7.05 (3.200)
23.62 (600)	17	28	PNP	**XUSLNG5C0600**	7.50 (3.400)
29.53 (750)	18	35	PNP	**XUSLNG5C0750**	7.94 (3.600)
35.43 (900)	19	42	PNP	**XUSLNG5C0900**	8.60 (3.900)
41.34 (1050)	20	49	PNP	**XUSLNG5C1050**	9.04 (4.100)
47.24 (1200)	21	56	PNP	**XUSLNG5C1200**	9.48 (4.300)
53.15 (1350)	22	63	PNP	**XUSLNG5C1350**	9.92 (4.500)
59.06 (1500)	23	70	PNP	**XUSLNG5C1500**	10.58 (4.800)

■ 2 PNP safety outputs - Manual start

Protected height	Response time	Number of light beams	Alarm output	Reference *(2)*	Weight
in. (mm)	ms				lb. (kg)
5.91 (150)	14	7	PNP	**XUSLNG5D0150**	5.95 (2.700)
11.81 (300)	15	14	PNP	**XUSLNG5D0300**	6.39 (2.900)
17.72 (450)	16	21	PNP	**XUSLNG5D0450**	7.05 (3.200)
23.62 (600)	17	28	PNP	**XUSLNG5D0600**	7.50 (3.400)
29.53 (750)	18	35	PNP	**XUSLNG5D0750**	7.94 (3.600)
35.43 (900)	19	42	PNP	**XUSLNG5D0900**	8.60 (3.900)
41.34 (1050)	20	49	PNP	**XUSLNG5D1050**	9.04 (4.100)
47.24 (1200)	21	56	PNP	**XUSLNG5D1200**	9.48 (4.300)
53.15 (1350)	22	63	PNP	**XUSLNG5D1350**	9.92 (4.500)
59.06 (1500)	23	70	PNP	**XUSLNG5D1500**	10.58 (4.800)

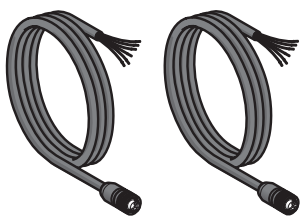
(1) Supplied with a test rod, 2 sets of 2 brackets with mountings and a user guide with certificate of conformity and 1 arc suppressor set.
***Pre-wired female connectors to be ordered separately**, see below.*

*(2) To order a transmitter only, replace the letter C or D by **E** and add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LNG5C0150 becomes **XUS LNG5E0150T** for the transmitter only.*
*To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LNG5C0150 becomes **XUS LNG5C0150R** for the receiver only.*

Other versions
Combining type 2 light curtains with external module for muting function and monitoring 2 to 4 light curtains.
See pages 2/218.

Accessories

Description		For use with	Length ft. (m)	Reference	Weight oz (kg)
Mounting kit (2 brackets)		Light curtains XUSLN	–	**XUSLZ218**	0.99 (0.450)
Pre-wired female connectors	Transmitter type	Light curtains XUSLN	9.84 (3)	**XSZ NCT03**	1.50 (0.680)
			32.81 (10)	**XSZ NCT10**	2.01 (0.910)
			98.43 (30)	**XSZ NCT30**	3.00 (1.360)
	Receiver type	Light curtains XUSLN	9.84 (3)	**XSZ NCR03**	1.50 (0.680)
			32.81 (10)	**XSZ NCR10**	2.01 (0.910)
			98.43 (30)	**XSZ NCR30**	3.00 (1.360)
Arc suppressor (pair)		All types of light curtain	–	**XUSLZ500**	0.04 (0.020)
User guide on CD-ROM		All types of light curtains and accessories	–	**XUSLZ450**	0.04 (0.020)



XSZ NCT●● XSZ NCR●●

Separate components

Power supplies, 90° mirror adaptors, anti-vibration kit and mounting bases

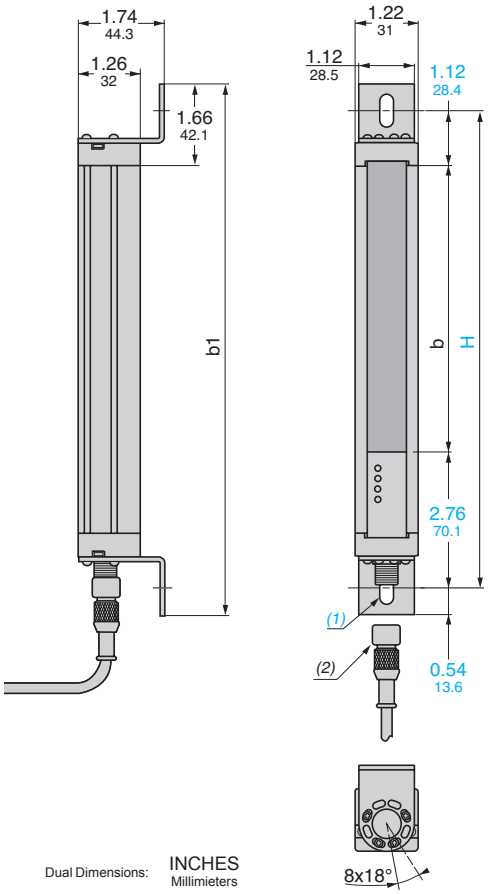
See pages 3/130 and 3/132 to 3/137

3

Dimensions

Slim, compact light curtains

XUSLN●●●



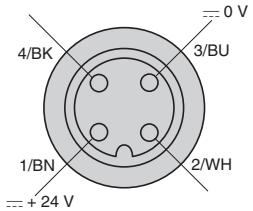
XUS	b in. (mm)	b1 in. (mm)	H in. (mm)	Protected height in. (mm)
LN●●●0150	5.79 (147)	10.71 (272)	9.67 (245.6)	5.91 (150)
LN●●●0300	11.57 (294)	16.50 (419)	15.46 (392.6)	11.81 (300)
LN●●●0450	17.36 (441)	22.28 (566)	21.24 (539.5)	17.72 (450)
LN●●●0600	23.15 (588)	28.07 (713)	27.03 (686.6)	23.62 (600)
LN●●●0750	28.94 (735)	33.86 (860)	32.82 (833.6)	29.53 (750)
LN●●●0900	34.72 (882)	39.65 (1007)	38.61 (980.6)	35.43 (900)
LN●●●1050	40.51 (1029)	45.43 (1154)	44.39 (1127.6)	41.34 (1050)
LN●●●1200	46.30 (1176)	51.22 (1301)	50.18 (1274.6)	47.24 (1200)
LN●●●1350	52.09 (1323)	57.01 (1448)	55.97 (1421.6)	53.15 (1350)
LN●●●1500	57.87 (1470)	62.80 (1595)	61.76 (1568.6)	59.06 (1500)

(1) 1 elongated hole Ø 0.27 x 0.66 in. (Ø 6.75 x 16.75 mm.)
(2) M12 male connector.

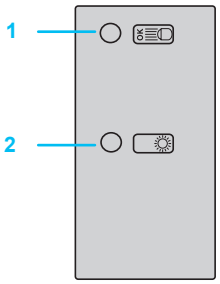
Connections

Transmitter

Pre-wired connector of transmitter XSZ NCT



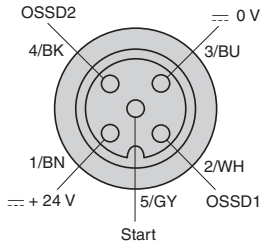
Transmitter status indicator



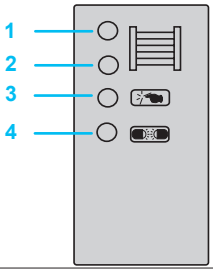
1 Interlock or Alarm
yellow LED
2 Switch-on/Machine run
green LED

Receiver

Pre-wired connector of receiver XSZ NCR



Receiver status indicator

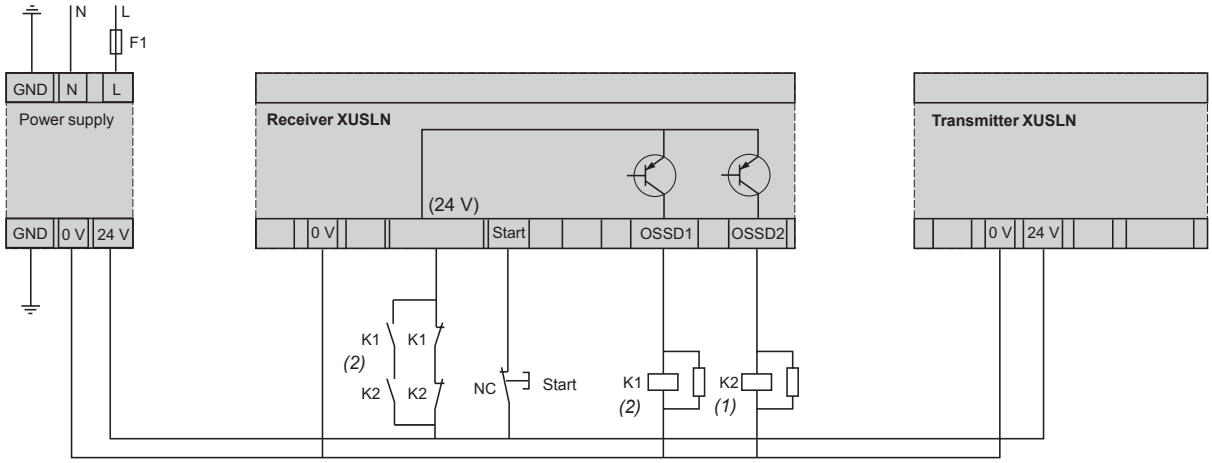


1 Top alignment
yellow LED
2 Bottom alignment
yellow LED
3 Stop
red LED
4 Run
green LED

Principle: page 3/88 | Characteristics: page 3/126 | References: page 3/127 | Dimensions: page 3/128 | Wiring Diagrams: page 3/129

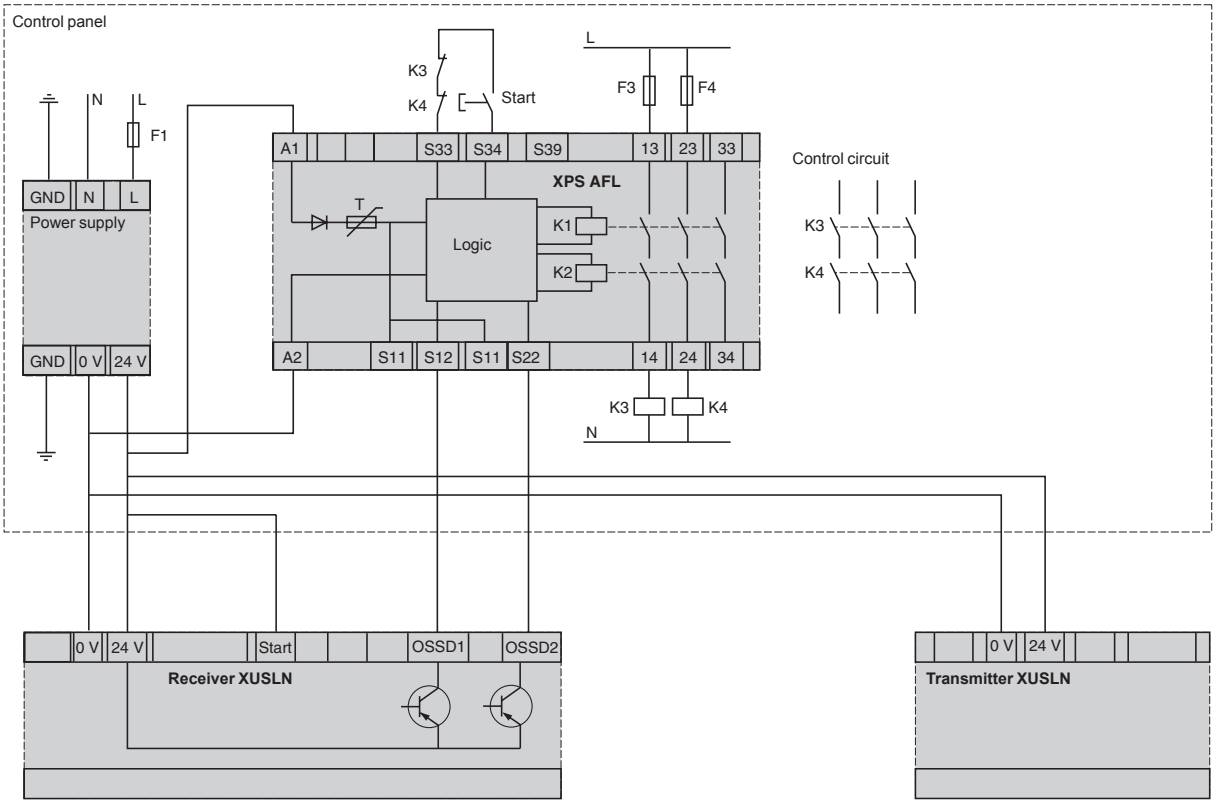
Wiring diagrams (continued)

Direct connection with XUSLNG5D●●●

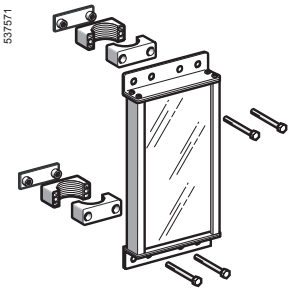


(1) The K1 and K2 coils must be protected using the arc suppressors included in the documentation kit.
(2) For the EDM function, contactors LC1D●●BD and control relays CAD●●BD, CA4KN●●BW3 and CA3KN●●BD are recommended

Connection of light curtain XUSLN5C●●● via a Preventa™ XPS AFL module



Safety detection solutions
Preventa™
Accessories for safety light curtains types 2 and 4



XUSZM/ZA●●●●

90° mirror adaptor for light curtains

Glass mirror (0.88 Sn) *(1)*

Description	For use with light curtains			Height *(2)*	Reference	Weight
	XUSLB/LDM	XUSLP	XUSLN	in (mm)		lb (kg)
90° mirror adaptor with rotatable mounting	–	XUSLPZ1A●	–	5.5 (140)	**XUSZM0102**	2.3 (1.040)
	–	–	–	7.5 (191)	**XUSZM0152**	2.9 (1.300)
	XUSLB/LDM0280	–	XUSLN●●●0150	13.5 (343)	**XUSZM0305**	4.2 (1.900)
	XUSLB/LDM0320 XUSLB/LDM0360	–	XUSLN●●●0300	19.5 (495)	**XUSZM0457**	5.5 (2.500)
	XUSLB/LDM0440	–	XUSLN●●●0450	21.5 (546)	**XUSZM0508**	6.2 (2.800)
	XUSLB/LDM0520	XUSLP●2A500●	–	25.5 (648)	**XUSZM0610**	7.1 (3.200)
	XUSLB/LDM0600/0680	XUSLP●2A0600●	XUSLN●●●0600	29.5 (749)	**XUSZM0711**	8.2 (3.700)
	XUSLB/LDM0720	–	–	31.5 (800)	**XUSZM0762**	8.4 (3.800)
	XUSLB/LDM0760	–	XUSLN●●●0750	33.5 (851)	**XUSZM0813**	8.8 (4.000)
	XUSLB/LDM0880	XUSLPZ3A0400●	–	37.5 (953)	**XUSZM0914**	9.9 (4.500)
	XUSLB/LDM0920/0960		XUSLN●●●0900	41.5 (1054)	**XUSZM1016**	11 (5.000)
	XUSLB/LDM1040	XUSLPZ3A0500●	–	43.5 (1105)	**XUSZM1067**	11.5 (5.200)
	XUSLB/LDM1120	XUSLPZ4A0300●	XUSLN●●●1050	49.5 (1257)	**XUSZM1219**	13 (5.900)
	XUSLB/LDM1200	XUSLPZ5A0300●	XUSLN●●●1200	53.5 (1359)	**XUSZM1321**	13.9 (6.300)
	XUSLB/LDM1360	–	XUSLN●●●1350	55.5 (1410)	**XUSZM1372**	14.3 (6.500)
	XUSLB/LDM1400	–	–	57.5 (1461)	**XUSZM1422**	14.8 (6.700)
	XUSLB/LDM1520	–	XUSLN●●●1500	61.5 (1562)	**XUSZM1524**	15.9 (7.200)
	XUSLB/LDM1560	XUSLPZ6A0300●	–	65.5 (1664)	**XUSZM1626**	16.8 (7.600)
	XUSLB/LDM1640/1720	–	–	73.5 (1867)	**XUSZM1830**	18.7 (8.500)
	XUSLB/LDM1800	–	–	73.5 (1867)	**XUSZM1830**	18.7 (8.500)
	XUSLB/LDM1920/2120	–	–	85.5 (2172)	**XUSZM2134**	21.6 (9.800)

Stainless steel mirror (0.82 Sn) *(1)*

Description	For use with light curtains			Height *(2)*	Reference	Weight
	XUSLB/LDM	XUSLP	XUSLN	in (mm)		lb (kg)
90° mirror adaptor with rotatable mounting	–	XUSLPZ1A●	–	5.5 (140)	**XUSZA0102**	2.4 (1.090)
	–	–	–	7.5 (191)	**XUSZA0152**	2.9 (1.300)
	XUSLB/LDM0280	–	XUSLN●●●0150	13.5 (343)	**XUSZA0305**	4.4 (2.000)
	XUSLB/LDM0320 XUSLB/LDM0360	–	XUSLN●●●0300	19.5 (495)	**XUSZA0457**	6 (2.700)
	XUSLB/LDM0440	–	XUSLN●●●0450	21.5 (546)	**XUSZA0508**	6.6 (3.000)
	XUSLB/LDM0520	XUSLP●2A500●	–	25.5 (648)	**XUSZA0610**	7.7 (3.500)
	XUSLB/LDM0600/0680	XUSLP●2A0600●	XUSLN●●●0600	29.5 (749)	**XUSZA0711**	8.6 (3.900)
	XUSLB/LDM0720	–	–	31.5 (800)	**XUSZA0762**	9.3 (4.200)
	XUSLB/LDM0760	–	XUSLN●●●0750	33.5 (851)	**XUSZA0813**	9.7 (4.400)
	XUSLB/LDM0880	XUSLPZ3A0400●	–	37.5 (953)	**XUSZA0914**	9.9 (4.500)
	XUSLB/LDM0920/0960		XUSLN●●●0900	41.5 (1054)	**XUSZA1016**	11.9 (5.400)
	XUSLB/LDM1040	XUSLPZ3A0500●	–	43.5 (1105)	**XUSZA1067**	12.3 (5.600)
	XUSLB/LDM1120	XUSLPZ4A0300●	XUSLN●●●1050	49.5 (1257)	**XUSZA1219**	14.1 (6.400)
	XUSLB/DM1200	XUSLPZ5A0300●	XUSLN●●●1200	53.5 (1359)	**XUSZA1321**	15 (6.800)
	XUSLB/LDM1360	–	XUSLN●●●1350	55.5 (1410)	**XUSZA1372**	15.4 (7.000)
	XUSLB/LDM1400	–	–	57.5 (1461)	**XUSZA1422**	16.1 (7.300)
	XUSLB/LDM1520	–	XUSLN●●●1500	61.5 (1562)	**XUSZA1524**	17.2 (7.800)
	XUSLB/LDM1560	XUSLPZ6A0300●	–	65.5 (1664)	**XUSZA1626**	18.3 (8.300)
	XUSLB/LDM1640/1720	–	–	73.5 (1867)	**XUSZA1830**	20.3 (9.200)
	XUSLB/LDM1800	–	–	73.5 (1867)	**XUSZA1830**	20.3 (9.200)
	XUSLB/LDM1920/2120	–	–	85.5 (2172)	**XUSZA2134**	23.4 (10.600)

(1) Sensing distance reduction coefficient to be taken into account for each 90° mirror adaptor used.
(2) Usable reflective height.

Accessories

Description	Usage	Reference	Weight lb (kg)
Laser alignment tool	All types of light curtain	**XUSLAT1**	0.75 (0.340)



ABL8RPS24050

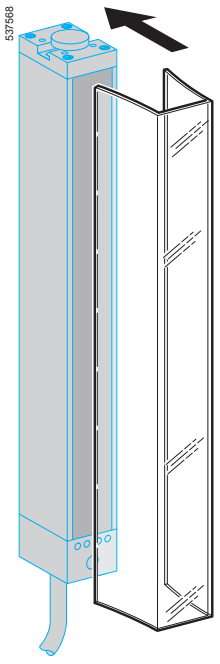
Power supplies for light curtains XUSL●

Input voltage	Secondary			Reset	Conforming to standard EN 61000-3-2	Reference	Weight
	Output voltage	Nominal power	Nominal current				lb (kg)
Single phase (N-L1) or 2-phase (L1-L2) connection							
~ 100…120 V - 200...500 V - 15 %,+ 10 % 50/60 Hz	⎓ 24...28,8 V	72 W	3 A	Auto/manu	Yes	**ABL8RPS24030**	0.7 (0.300)
		120 W	5 A	Auto/manu	Yes	**ABL8RPS24050**	1.5 (0.700)
		240 W	10 A	Auto/manu	Yes	**ABL8RPS24100**	2.2 (1.000)

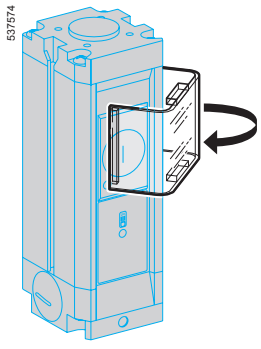
Characteristics: page 3/88 | References: page 3/130 | Dimensions: pages 3/134 and 3/137 | Wiring diagrams: page 3/137

Protective covers for light curtains XUSLB/XUSLDM/XUSLP			XUSZWS●●●●
Environmental characteristics			
Air temperature	For operation	**°F (°C)**	32 ...+ 131 (0...+ 55)
	For storage	**°F (°C)**	- 13... + 158 (- 25... + 70)
Material			polycarbonate
Sensing distance (Sn) **reduction coefficient**			0.91 *(1)*
Environmental chemicals			
Chemical resistance	Acids, aliphatic hydrocarbons		Resistant
	Alcohols, Alkalis		Limited resistance
	Detergents and cleaners		
	Greases and oils		
	Silicone oils and greases not containing alkaline products		
	Amines		Not resistant
	Aromatic hydrocarbons		
	Detergents and cleaners containing alkaline		
	Esters		
	Halogenated hydrocarbons		
	Ketones		
	Silicone oils and greases containing alkaline products		

References of protective covers



XUSLZWB●●●●



XUSZWSP

Description	For use with	Height in (mm)	Reference	Weight lb (kg)
polycarbonate protective covers for transmitter-receiver pair (0.91 Sn) *(1)* (Sold in sets of 2)	XUSLB/DM280	12.2 (310)	**XUSLZWB0280**	0.6 (0.282)
	XUSLB/DM320	13.8 (350)	**XUSLZWB0320**	0.7 (0.318)
	XUSLB/DM360	15.4 (390)	**XUSLZWB0360**	0.8 (0.354)
	XUSLB/DM440	18.5 (470)	**XUSLZWB0440**	0.9 (0.426)
	XUSLB/DM520	21.7 (550)	**XUSLZWB0520**	1.1 (0.497)
	XUSLB/DM600	24.8 (630)	**XUSLZWB0600**	1.3 (0.569)
	XUSLB/DM680	28 (710)	**XUSLZWB0680**	1.4 (0.641)
	XUSLB/DM720	29.5 (750)	**XUSLZWB0720**	1.5 (0.677)
	XUSLB/DM760	31.1 (790)	**XUSLZWB0760**	1.6 (0.713)
	XUSLB/DM880	35.8 (910)	**XUSLZWB0880**	1.8 (0.821)
	XUSLB/DM920	37.4 (950)	**XUSLZWB0920**	1.9 (0.857)
	XUSLB/DM960	39 (990)	**XUSLZWB0960**	2.0 (0.893)
	XUSLB/DM1040	42.1 (1070)	**XUSLZWB1040**	2.1 (0.965)
	XUSLB/DM1120	45.3 (1150)	**XUSLZWB1120**	2.3 (1.037)
	XUSLB/DM1200	48.4 (1230)	**XUSLZWB1200**	2.4 (1.108)
	XUSLB/DM1360	54.7 (1390)	**XUSLZWB1360**	2.8 (1.252)
	XUSLB/DM1400	56.3 (1430)	**XUSLZWB1400**	2.8 (1.288)
	XUSLB/DM1520	61 (1550)	**XUSLZWB1520**	3.1 (1.396)
	XUSLB/DM1560	62.6 (1590)	**XUSLZWB1560**	3.2 (1.432)
	XUSLB/DM1640	65.7 (1670)	**XUSLZWB1640**	3.3 (1.504)
	XUSLB/DM1720	68.9 (1750)	**XUSLZWB1720**	3.5 (1.576)
	XUSLB/DM1800	72 (1830)	**XUSLZWB1800**	3.6 (1.648)
	XUSLB/DM1920	76.8 (1950)	**XUSLZWB1920**	3.9 (1.756)
	XUSLB/DM2120	84.6 (2150)	**XUSLZWB2120**	4.3 (1.935)

Description	For use with	Height in (mm)	Reference	Weight lb (kg)
polycarbonate protective covers for single beam device (0.91 Sn) *(1)* (Sold in sets of 2)	XUSLP	2.5 (62.48)	**XUSZWSP**	2.2 (0.100)

(1) Sensing distance reduction coefficient to be taken into account for each pair of polycarbonate protective covers used.

3

Anti-vibration kit

Selection according to weight and application

Weight classes

Light curtain type	Height in (mm)	Weight class 1	2	3	4
XUSLN	5.9...23.6 (150...600)	•			
	29.5...59.1 (750...1500)		•		
XUSLB/LDMQ/LDSQ/XUSLTQ	11...40.9 (280…1040)		•		
	44.1...53.5 (1120…1360)			•	
XUSLBR/LDMY/LDSY/XUSLTR/Y	12.6...40.9 (320…1040)		•		
	44.1...83.5 (1120…2120)			•	
XUSLPZ1A	–			•	
XUSLPZ2A0500 et XUSLPZ2A0600	–			•	
XUSLPZ3A0400	–			•	
XUSLPZ3A0500	–				•
XUSLPZ4A0300	–			•	
XUSLPZ5A0300 et XUL LPZ6A0300	–				•
XUSLPB2A500 et XUSLPB2A600	–			•	

Type of mirror adaptors	Height in (mm)	Weight class 1	2	3	4
XUSZM *(1)*	4 (102)	•			
	12...18 (305...457)		•		
	20...28 (508…711)			•	
	32...40 (813…1016)				•
XUSZA	4 (102)	•			
	12...42 (305…1067)		•		
	48...64 (1219…1626)			•	
	72...84 (1830…2134)				•

(1) Use of the anti-vibration kit is not recommended for mirror adaptors greater than 40 in (1016 mm) in height.

Applications

Weight class	Anti-shock applications *(1)* Shear mounted: Number of mountings per head *(3)*	Reference	Anti-shock applications *(1)* Compression mounted: Number of mountings per head *(3)*	Reference	Anti-vibration applications *(2)* Shear mounted: Number of mountings per head *(3)*	Reference	Anti-vibration applications *(2)* Compression mounted: Number of mountings per head *(3)*	Reference
1	2	XSZSMK	Not recommended		2 or 4	XSZSMK	2	XSZSMK1
	2	XSZSMK1			2 or 4	XSZSMK1		
2	2 or 4	XSZSMK	2	XSZSMK1	2 or 4	XSZSMK	2	XSZSMK
	2 or 4	XSZSMK1			2 or 4	XSZSMK1	2 or 4	XSZSMK1
					2	XSZSMK2		
3	4	XSZSMK	2	XSZSMK	2 or 4	XSZSMK	2 or 4	XSZSMK
	4	XSZSMK1	2 or 4	XSZSMK1	4	XSZSMK1	4	XSZSMK1
	2 or 4	XSZSMK2			2 or 4	XSZSMK2		
4	4	XSZSMK	2	XSZSMK	4	XSZSMK	2	XSZSMK
	4	XSZSMK1	4	XSZSMK1	4	XSZSMK1	4	XSZSMK1
	2	XSZSMK2			2 or 4	XSZSMK2		

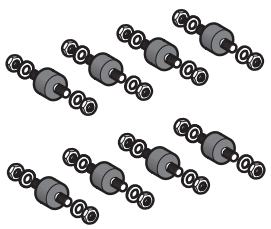
(1) Low frequency, high amplitude applications, such as punching presses where a powerful shock can exist.
(2) High frequency, low amplitude applications, such as offset printing machines where constant vibration can exist.
(3) Head: transmitter, receiver or mirror.

Shock absorber characteristics

Characteristics per shock absorber		Compression mounted: Maximum load	Torque	Natural frequency	Shear mounted: Maximum load	Torque	Natural frequency
		lb (kg)	lb•in (N•m)	Hz	lb (kg)	lb•in (N•m)	Hz
For anti-vibration kit	**XSZSMK**	18.0 (8.16)	222.5 (25.16)	11	3.0 (1.36)	27.7 (3.13)	9.5
	XSZSMK1	4.8 (2.177)	96.1 (10.86)	14	2.5 (1.13)	20.7 (2.34)	9
	XSZSMK2	55.0 (24.94)	949.7 (107.39)	13	23.0 (10.43)	132.2 (14.94)	7.5

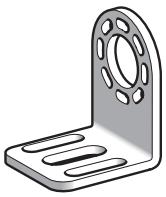
References of anti-vibration kits

537583



XSZ SMK•

537570



XUSLZ227

Description	For use with	Reference	Weight lb (kg)
Anti-vibration kit kit consisting of 8 shock absorbers, stud fixing. 16 washers and 16 nuts included with kit.	All types of light curtain and 90° mirror adaptors	**XSZSMK**	0.07 (0.030)
		XSZSMK1	0.04 (0.020)
		XSZSMK2	0.1 (0.045)
Mounting kit for XUSLN (2 brackets)	Anti-vibration kit	**XUSLZ227**	1.0 (0.450)

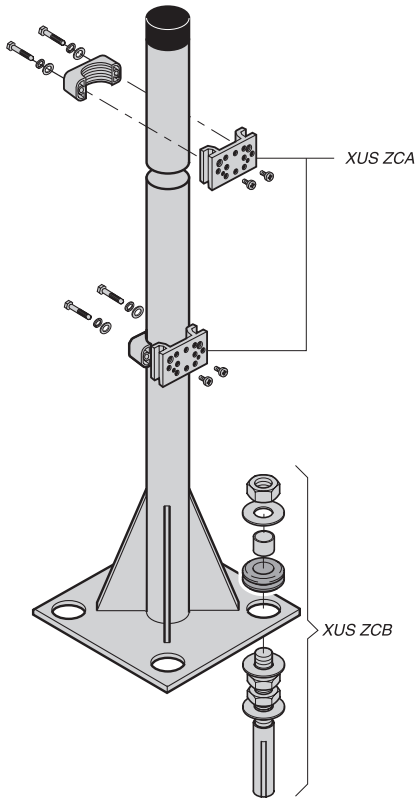
Characteristics: page 3/132
References: page 3/132
Dimensions : page 3/135

Safety detection solutions Preventa™

Accessories for safety light curtains types 2 and 4

Mounting base for light curtains and mirrors			XUSZC●●●●
Environmental characteristics			
Ambient air temperature	Operating	**°F (°C)**	- 13…+ 158 (- 25…+ 70)
	For storage	**°F (°C)**	- 13…+ 158 (- 25…+ 70)
Materials			Mounting base: steel End protection: black polycarbonate, 20% fiberglass

References



XUSZC●●●●

Mounting bases

Désignation	For use with			Protected height	Reference	Weight
	Light curtains Height	Mirrors Height	IP 67 tube Height			
	in (mm)	in (mm)	in (mm)	in (mm)		lb (kg)
Mounting base XUSZC●●●●	5.9 …35.4 (150…900)	7.2 …35.2 (182…894)	19.8 …38.6 (503…981)	47.2 (1200)	**XUSZC1200**	25 (11.340)
	36.2 …59.1 (920…1500)	39.2 …59.2 (995…1503)	43.4 …63.8 (1102…1620)	70.9 (1800)	**XUSZC1800**	35 (15.880)
	59.8 …70.9 (1520…1800)	63.2 …67.2 (1605…1706)	68.5 …76.3 (1740…1939)	82.7 (2100)	**XUSZC2100**	45 (20.410)
	75.6 …82.5 (1920…2095)	75.2 (1910)	79.6 …84.3 (2021…2141)	94.5 (2400)	**XUSZC2400**	60 (27.220)
	–	88.2 (2240)	92 (2336)	122 (3100)	**XUSZC3100**	66 (29.940)

Accessories

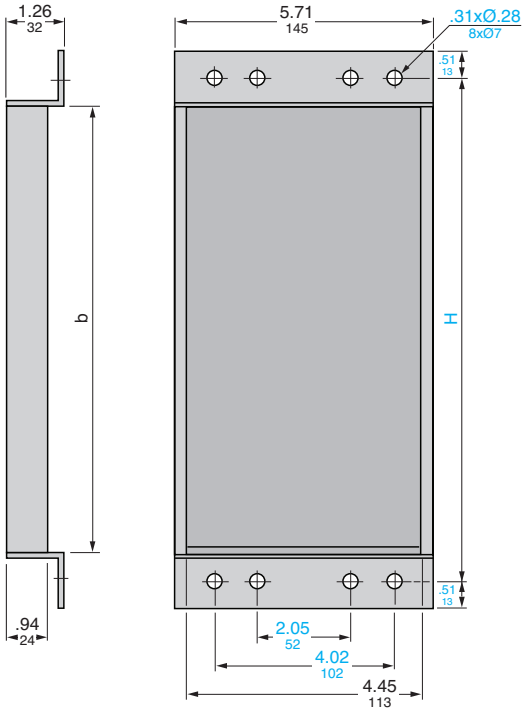
Description	For use with	Reference	Weight lb (kg)
Mounting kit (sold in lots of 2)	Mounting base XUSZC●●●●	**XUSZCA**	1.0 (0.450)
Floor mounting kit Consisting of: 4 bolts, 4 rawplugs, 12 washers, 8 standard nuts, 4 lock nuts, 4 rubber insulators, 4 spacers (tube)	Mounting base XUSZC●●●●	**XUSZCB**	1.0 (0.450)

3

Safety detection solutions
Preventa™
Accessories for safety light curtains types 2 and 4

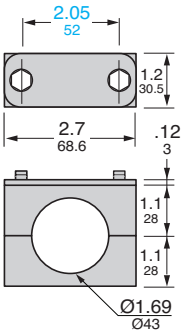
90° mirror adaptors + Mounting clamps

XUSZM●●●●/XUSZA●●●●



XUS			
Glass	Stainless steel	b in. (mm)	H in. (mm)
ZM0102	ZA102	5.5 (140)	0.7 (182)
ZM0152	ZA152	7.5 (191)	9.2 (233)
ZM0305	ZA0305	13.5 (343)	15.2 (386)
ZM0457	ZA0457	19.5 (495)	21.2 (538)
ZM0508	ZA0508	21.5 (546)	23.2 (589)
ZM0610	ZA0610	25.5 (648)	27.2 (690)
ZM0711	ZA0711	29.5 (749)	31.2 (792)
ZM0762	ZA0762	31.5 (800)	33.2 (843)
ZM0813	ZA0813	33.5 (851)	35.2 (894)
ZM0914	ZA0914	37.5 (953)	39.2 (995)
ZM1016	ZA1016	41.5 (1054)	43.2 (1097)
ZM1067	ZA1067	43.5 (1105)	45.2 (1148)
ZM1219	ZA1219	49.5 (1257)	51.2 (1300)
ZM1321	ZA1321	53.5 (1359)	55.2 (1402)
ZM1372	ZA1372	55.5 (1410)	57.2 (1452)
ZM1422	ZA1422	57.5 (1461)	59.2 (1503)
ZM1524	ZA1524	61.5 (1562)	63.2 (1605)
ZM1626	ZA1626	65.5 (1664)	67.2 (1706)
ZM1830	ZA1830	73.5 (1867)	75.2 (1910)
ZM2134	ZA2134	85.5 (2172)	87.2 (2214)

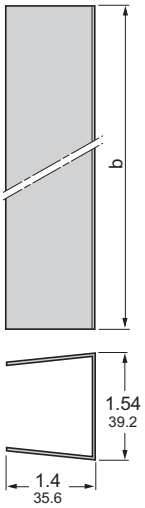
Mounting clamp (quantity 2)



Dual Dimensions: INCHES Millimeters

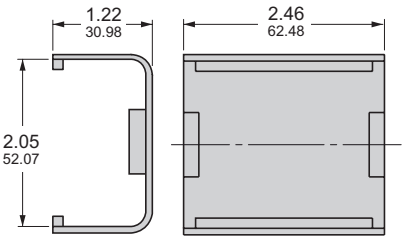
Protective cover

XUSZW●●● for XUL B/D



XUS	b in. (mm)
LZWB0280	12.2 (310)
LZWB0320	13.8 (350)
LZWB0360	15.4 (390)
LZWB0440	18.5 (470)
LZWB0520	21.7 (550)
LZWB0600	24.8 (630)
LZWB0680	28 (710)
LZWB0720	29.5 (750)
LZWB0760	31.1 (790)
LZWB0880	35.8 (910)
LZWB0920	37.4 (950)
LZWB0960	39 (990)
LZWB1040	42.1 (1070)
LZWB1120	45.3 (1150)
LZWB1200	48.4 (1230)
LZWB1360	54.7 (1390)
LZWB1400	56.3 (1430)
LZWB1520	61 (1550)
LZWB1560	62.6 (1590)
LZWB1640	65.7 (1670)
LZWB1720	68.9 (1750)
LZWB1800	72 (1830)
LZWB1920	76.8 (1950)
LZWB2120	84.6 (2150)

XUSZWSP for XUSLP

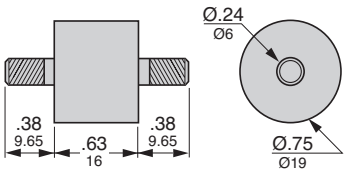


Characteristics: page 3/130 and 3/131
References : pages 3/130 and 3/131
Dimensions: page 3/134

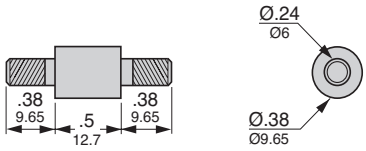
Schneider Electric

Anti-vibration kits *(1)*

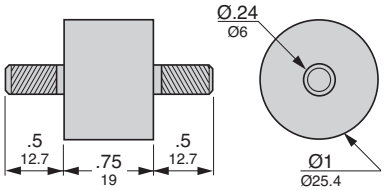
XSZSMK



XSZSMK1



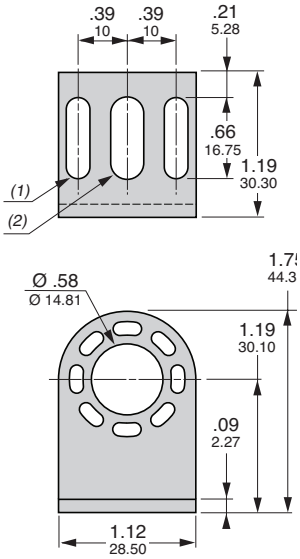
XSZSMK2



(1) The anti-vibration kit consists of 8 shock absorbers, 16 washers and 16 nuts.

Mounting brackets for anti-vibration kit

XUSLZ227 and XUSLN



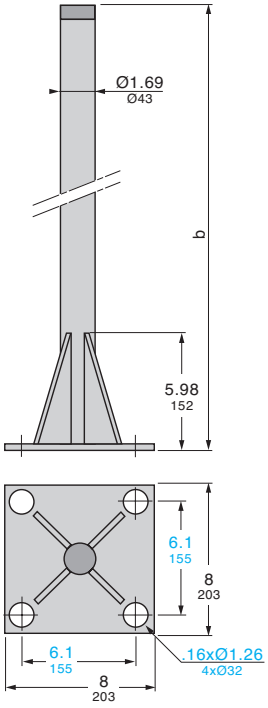
Dual Dimensions: INCHES / Millimieters

(1) 2 elongated holes Ø 0.2 x 0.7 in (Ø 5.10 x 16.75 mm).
(2) 1 elongated hole Ø 0.3 x 0.7 in (Ø 6.75 x 16.75 mm).

Characteristics : page 3/132
References : page 3/132
Dimensions: page 3/135

3

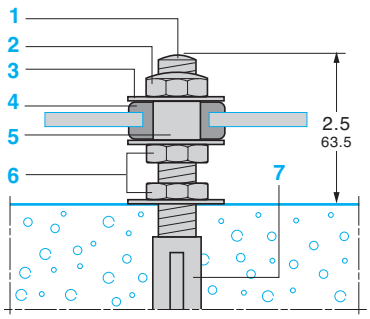
Mounting base
XUSZC●●●●



XUS	b in (mm)
ZC1200	47.3 (1200)
ZC1800	70.9 (1800)
ZC2100	82.7 (2100)
ZC2400	94.5 (2400)
ZC3100	122 (3100)

Floor mounting kit (quantity 4) for mounting base XUSZC●●●●
XUSZCB

Echelle 2,5



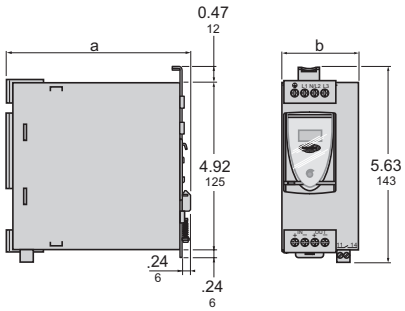
1 Bolt,
2 1 lock nut,
3 3 washers,
4 Rubber insulator,
5 Spacer (tube),
6 2 standard nuts,
7 Rawplug.

Dual Dimensions: INCHES Millimeters

characteristics : page 3/133
References : page 3/133
Dimensions: page 3/136

Dimensions

ABL8RPS24●●●
common side view

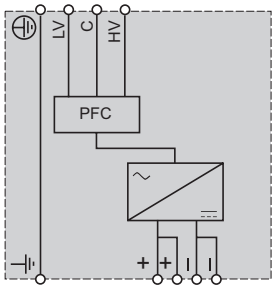


ABL8	a in (mm)	b in (mm)
RPS24030	4.7 (120)	1.7 (44)
RPS24050	4.7 (120)	2.2 (56)
RPS24100	5.5 (140)	3.3 (85)

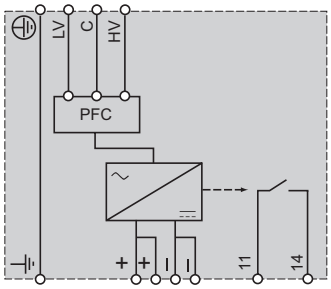
Dual Dimensions: INCHES Millimeters

Internal wiring diagrams

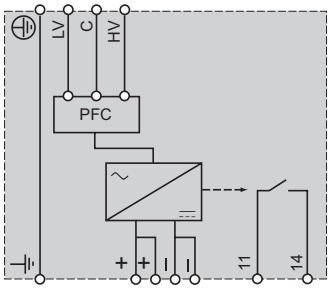
ABL8RPS24030



ABL8RPS24050



ABL8RPS24100



Safety detection solutions

Preventa™ safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function

Operating principle

XPSCM safety modules form, with XU2S single-beam photo-electric sensors (periodically tested), a category 2 light curtain conforming to standards IEC/EN 61496 parts 1 and 2 and EN 60825-1.
The connection of 1 to 4 pairs of XU2S photo-electric sensors makes it possible to create a protected space up to 47.2 in. (1200 mm) high conforming to EN 999/ISO 13855 and 26.2 ft. (8 m) long.

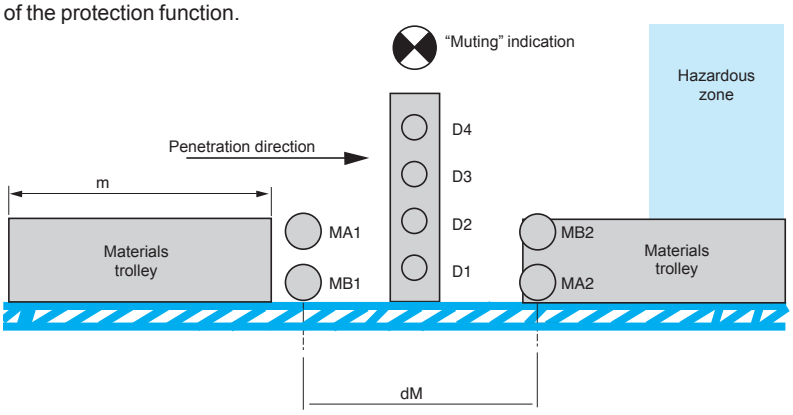
The built-in “muting” function allows for the automatic passage of parts to be machined or loaded pallets without interrupting the transportation movement.
When the system is engaged by the operating control (in series with the main circuit feedback loop) and the light protection is not interrupted, the main circuit is closed by the two safety relays of the XPSCM module.

An interruption of the protection field causes the safety outputs to open instantaneously, and the process PLC receives a stop command. The LED on the XPSCM front panel changes from green to red. The “open” state is maintained until the module is restarted using the start button.

The “muting” function allows the light protection to be inhibited (muted). This possibility allows a trolley transporting materials to pass through without triggering the main circuit. The “muting” function cannot be activated by supplying the inhibition devices unless the safety outputs have been switched on beforehand.

To trigger the “muting” function, the inhibition devices (muting sensors) must be activated within the 3-second time interval. This synchronization time for the two inhibition inputs can be deactivated by connecting two configuration terminals. The “muting” cycle has a maximum duration of 60 seconds. During this period, materials can be transported through the protection field without deactivating the safety outputs. The 60 second limit value of the “muting” cycle may be made infinite by connecting two configuration terminals.

During the “muting” operation process, a light indicating the “muting” state is controlled by the XPSCM module. An error at the level of the indicator light (short-circuit, open-circuit) will be recognized, and will deactivate the “muting” function. The indicator light comes on when a “muting” signal is generated and indicates the inhibition of the protection function.



D1, D2, D3, D4: monitoring photo-electric sensors.
MA1, MB1, MA2, MB2: “Muting” photo-electric sensors.
m = trolley length
dM = distance between MA1, MB1 and MA2, MB2.

Conditions to be observed for the “muting” function

- “Muting” sensors must be of the XU2 M18PP340 thru-beam or XU9 M18PP340 polarized reflex type or mechanical limit switches with contacts.
- dM ≤ m to obtain continuous validation of the “muting” function.
- Avoid the intrusion of persons during the “muting” phase. This phase is indicated by an indicator light on the “muting” indicator output of the XPSCM module.
- A materials transportation trolley (i.e.: Automatically Guided Vehicle (AGV)) must generate the “muting” signal before it enters the protection field and interrupt the signal when it is once again released from all the sensors of the protection field.

Safety detection solutions

Preventa™ safety modules and single-beam photo-electric sensors

With a test input associated with a built-in "muting" function

Characteristics of safety modules

Module type			XPSCM1144	XPSCM1144P
Products designed for max. use in safety related parts of control systems conforming to EN 954-1			Category 2 (type 2) conforming to IEC/EN 61496-1	
Ambient air temperature		**°F (°C)**	Operation: + 14…+ 131 (-10...+ 55). Storage: - 13…+ 185 (- 25…+ 85)	
Degree of protection conforming to IEC 529			Terminals: IP 20, enclosure: IP 40	
Supply	Voltage	**V**	⎓ 24, voltage limits: - 20…+ 20 %	
Maximum power consumption		**W**	< 15, with thru-beam photoelectric sensors and "muting" signalling	
Module fuse protection			Internal, electronic	
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)	
Rated impulse withstand voltage (Uimp)		**kV**	4 (overvoltage category 3, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)	
Inputs for sensors	Number of inputs to be monitored		4 (terminals Z1, Z2, Z3, Z4)	
	Input voltage	**V**	⎓ 24	
	Supply voltage of sensors	**V**	⎓ 24 (terminal U+/U-)	
	Supply current of sensors	**mA**	< 200	
Inputs for the "muting" function	Number of "muting" inputs		2 (terminals MA, MB)	
	Input voltage	**V**	⎓ 24 (terminal U+/U-)	
	Maximum current	**mA**	< 200	
	Synchronization time for the activation of the MA/MB "muting" signal	**s**	3 (+/- 20 %)	
	"Muting" maximum duration	**s**	60 (- 10…+ 30 %)	
Single-beam thru-beam photo-electric sensors for input monitoring Z1-Z2-Z3-Z4 - sensors authorized for the protection field (max. 4)			XU2S18PP340●●● (infrared)	
- "muting" sensors			XU2 M18PP340●●● or XU9 M18PP340●●● photo-electric sensors or XC limit switches	
- Sensor supply resistivity		Ω	10 max.	
Safety outputs - number and type			2 N.O. (terminals 13-14, 23-24), hard contacts	
- solid-state output breaking capacity			4 N.O. 24 V/20 mA, (Y33-Y34, Y33-Y44, Y33-Y54, Y33-Y64)	
- breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
- breaking capacity in DC-13			24 V/1.5 A, L/R = 50 ms	
- maximum thermal current (Ithe)		**A**	5.6	
- sum of maximum thermal current		**A**	11	
- minimum current (volt-free contact)		**mA**	10	
- minimum voltage (volt-free contact)		**V**	17	
- short-circuit protection		**A**	4 gG or 6 fast-acting fuse cartridge, conforming to EN/IEC 60947-5-1 and DIN VDE 0660 part 200	
"Muting" signalling sensors for incandescent lamp			Number 1 (terminal H1), maximum power: 6.5 W/⎓ 24 V, maximum power: 4 W/⎓ 24 V	
Response time on input change of state		**ms**	< 25	
Electrical life			See page 2/172	
Display			4 LEDs	
Connection	Type		Captive screw clamp terminals	Captive screw clamp terminals, separate removable terminal block
- 1-wire connection	Without cable ends		Solid or flexible cable: 26-14 AWG	Solid or flexible cable: 24-14 AWG
	With cable ends		Without bezel, flexible cable: 24-14 AWG	Without bezel, flexible cable: 24-14 AWG
	With cable ends		With bezel, flexible cable: 24-16 AWG	With bezel, flexible cable: 24-14 AWG
- 2-wire connection	Without cable ends		Solid or flexible cable: 26-18 AWG	Solid cable: 24-18 AWG, flexible cable: 24-16 AWG
	With cable ends		Without bezel, flexible cable: 24-18 AWG	Without bezel, flexible cable: 24-18 AWG[2]
	With cable ends		Double with bezel, flexible cable: 22-14 AWG	Double with bezel, flexible cable: 22-14 AWG

Characteristics of photo-electric sensors

Product certification			CE, conforming to EN/IEC 61496-1/-2 and EN/IEC 60825-1
Ambient air temperature		**°F (°C)**	Operation: - 13…+ 131 (- 25…+ 55) (infrared transmission sensors), Storage: - 40…+ 158 (- 40…+ 70)
Vibration resistance			7 gn (f = 10…55 Hz), conforming to EN/IEC 60068-2-6
Shock resistance			30 gn, 3 axes: 3 times, conforming to EN/IEC 60068-2-27
Degree of protection			IP 67 conforming to EN/IEC 60529
Connection	Pre-cabled		PVC cable, diameter 0.20 in. (5 mm), 16.4 ft. (5 m) long wire: 4 x 22 AWG (O.34 mm²) for thru-beam transmitter)
	Connector		M12 male connector, 4-pin (suitable jumper cables and female connectors M12, 4-contact, see our catalogue "Global detection")
Materials			Case: nickel-plated brass (infrared transmission sensors). Lenses: PMMA
Nominal sensing distance		**ft. (m)**	26.2 (8) (infrared transmission sensors)
Rated supply voltage		**V**	⎓ 12…24 (with protection against reverse polarity)
Voltage limits		**V**	⎓ 10…30 V (including ripple)
Switching capacity (sealed)		**mA**	≤ 100 mA (with overload and short-circuit protection)
Voltage drop, closed state		**V**	≤ 1.5
Current power consumption, no-load		**mA**	≤ 35
Maximum switching frequency		**Hz**	500
Delays		**ms**	Response: ≤ 1; recovery: ≤ 1

Principle: page 3/138 | Characteristics: page 3/139 | References: page 3/140 | Dimensions: page 3/143 | Wiring Diagrams: page 3/143

Safety detection solutions

Preventa™ safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function

580000



XPSCM1144●

Safety modules

Description	Type of terminal block connection	Number of safety circuits	Additional outputs	Supply	Reference	Weight oz (kg)
Safety modules for the monitoring of single-beam photo-electric sensors with a test input associated with a built-in “muting” function	Integrated in module	2	4	⎓ 24 V	**XPSCM1144**	12.35 (0.350)
	Separate, can be removed from module	2	4	⎓ 24 V	**XPSCM1144P**	12.35 (0.350)

Principle: page 3/138 | Characteristics: page 3/139 | References: page 3/140 | Dimensions: page 3/143 | Wiring Diagrams: page 3/143

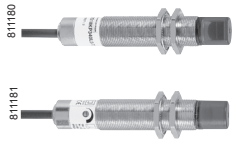
Safety detection solutions

Preventa™ safety modules and single-beam photo-electric sensors

With a test input associated with a built-in "muting" function



XU2S18●P340L5



XU2S18●P340WL5



XU2S18KP340L5T



XU2S18KP340WL5T



XU2S18PP340DR



XU2S18PP340WL5R

Single-beam photo-electric sensors with a test input

Description	Transmission type	Line of sight	Connection	Reference	Weight oz (kg)
PNP thru-beam pair (transmitter + receiver) Light or dark programmable switching	Infrared Sensing distance: 26.2 ft. (8 m)	Along case axis	Pre-cabled L = 16.4 ft (5 m)	**XU2S18PP340L5**	17.11 (0.485)
			M12 connector	**XU2S18PP340D**	5.47 (0.155)
		90° to case axis	Pre-cabled L = 16.4 ft (5 m)	**XU2S18PP340WL5**	17.11 (0.485)
			M12 connector	**XU2S18PP340WD**	5.47 (0.155)
Thru-beam transmitter alone (for XPSCM1144●)	Infrared	Along case axis	Pre-cabled L = 16.4 ft (5 m)	**XU2S18KP340L5T**	8.29 (0.235)
			M12 connector	**XU2S18KP340DT**	2.65 (0.075)
		90° to case axis	Pre-cabled L = 16.4 ft (5 m)	**XU2S18KP340WL5T**	8.29 (0.235)
			M12 connector	**XU2S18KP340WDT**	5.47 (0.155)
PNP thru-beam receiver alone (for XPSCM1144●)	Infrared	Along case axis	Pre-cabled L = 16.4 ft (5 m)	**XU2S18PP340L5R**	8.82 (0.250)
			M12 connector	**XU2S18PP340DR**	2.82 (0.080)
		90° to case axis	Pre-cabled L = 16.4 ft (5 m)	**XU2S18PP340WL5R**	8.82 (0.250)
			M12 connector	**XU2S18PP340WDR**	2.82 (0.080)

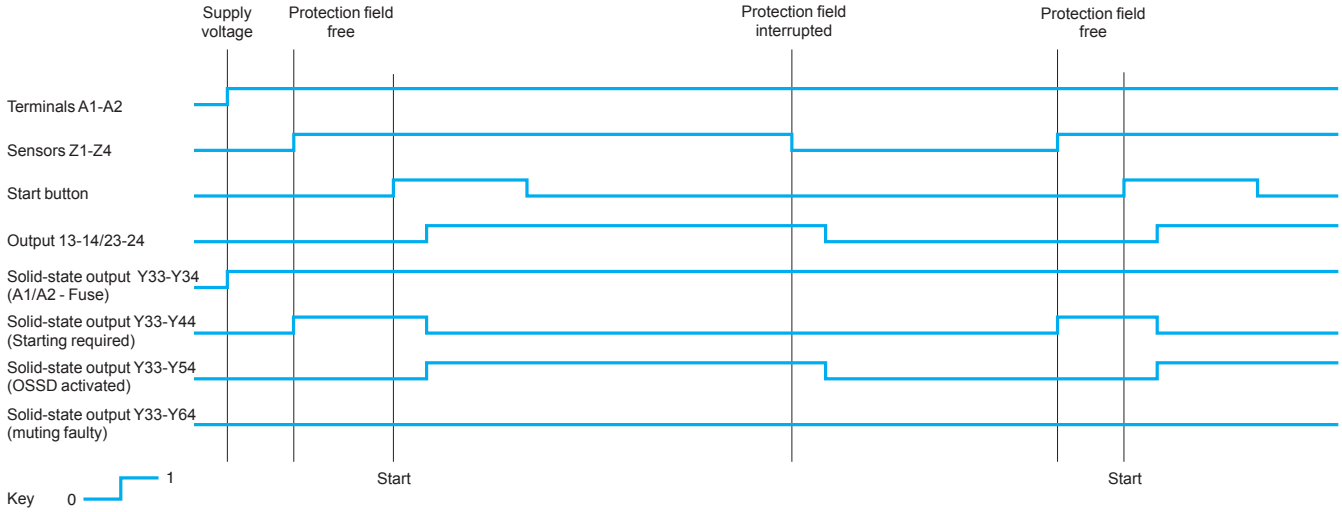
3

Safety detection solutions

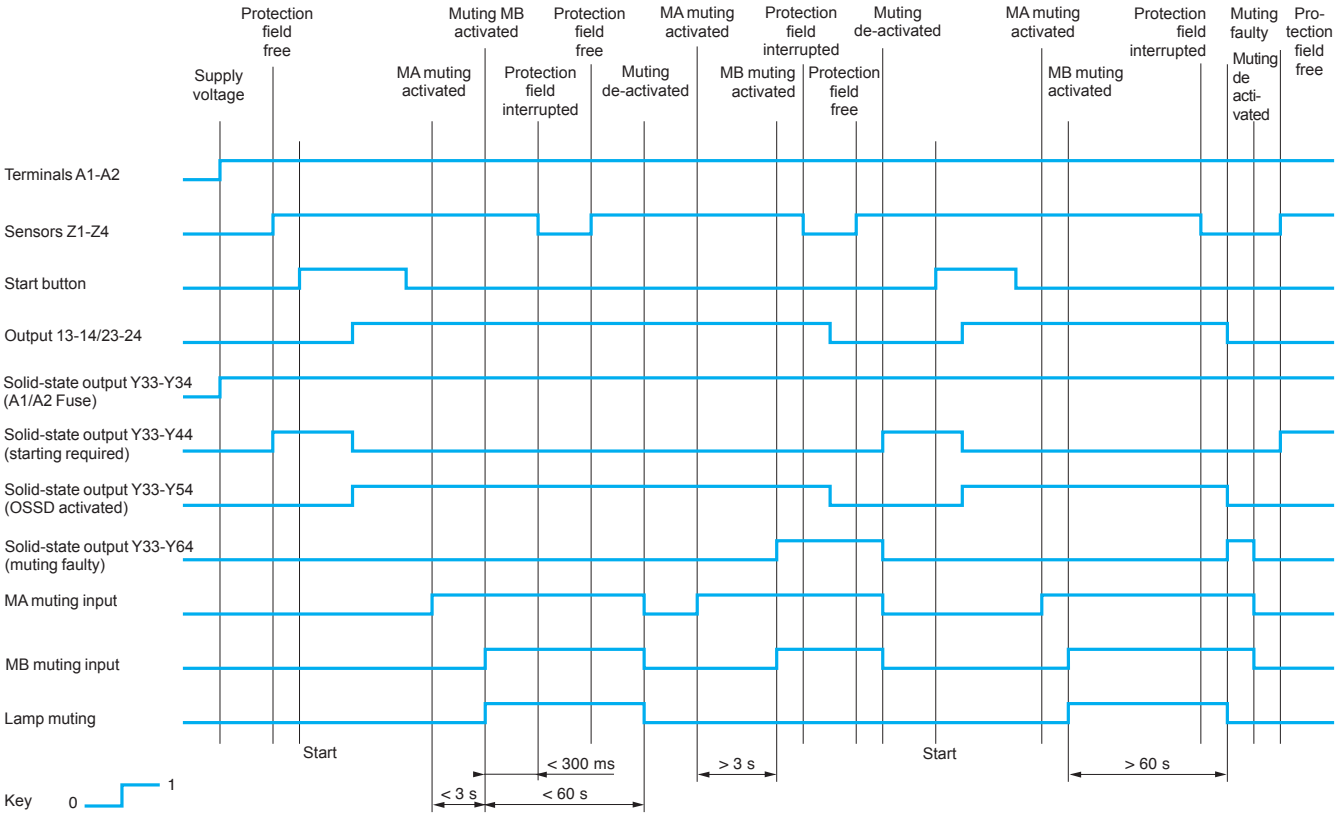
Preventa™ safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function

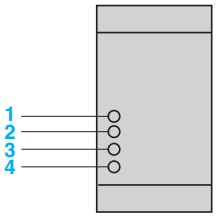
Functional diagram of XPSCM module



Functional diagram of the XPSCM module with “muting” function



Key to LEDs



1 A1-A2 supply voltage, electronic internal fuse status
2 Signalling for restarting
3 Safety output closed
4 Safety output open

Principle: page 3/138
Characteristics: page 3/139
References: page 3/140
Dimensions: page 3/143
Wiring Diagrams: page 3/143

Safety detection solutions

Preventa™ safety modules and single-beam photo-electric sensors

With a test input associated with a built-in "muting" function

Operation

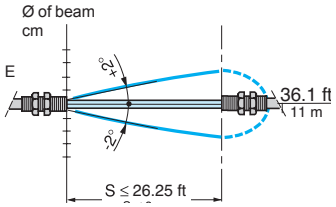
Output state (PNP) indicator, yellow LED (illuminated when sensor output is on)

Light switching		Dark switching	
No object in beam	Object in beam	No object in beam	Object in beam

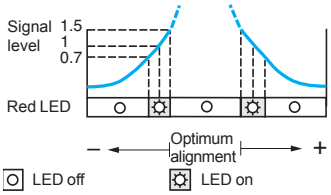


Curves

Infrared detection curve

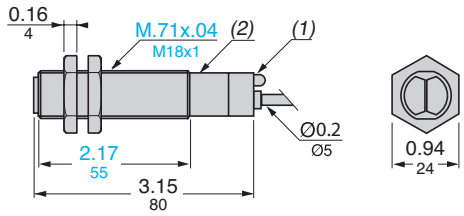


Functional check



Dimensions

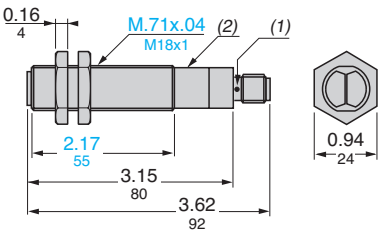
XU2S18PP340L5, XU2S18PP340L5L



(1) LED

(2) Potentiometer

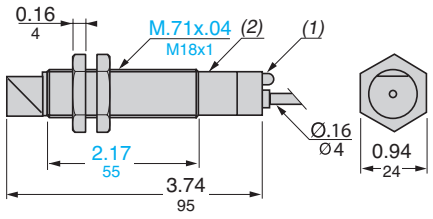
XU2S18PP340D



Mounting nut tightening torque: 17.7 lb-ft (24 N.m)

Connector tightening torque: 1.5 lb-ft (2 N.m)

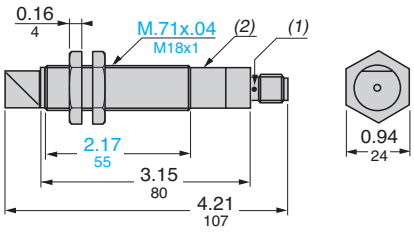
XU2S18PP340WL5



(1) LED

(2) Potentiometer

XU2S18PP340WD



Dual Dimensions: INCHES / Millimeters

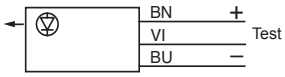
Mounting nut tightening torque: 17.7 lb-ft (24 N.m)

Connector tightening torque: 1.5 lb-ft (2 N.m)

Wiring diagrams (3-wire ⎓)

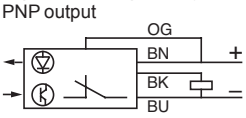
Cable connection

Transmitter



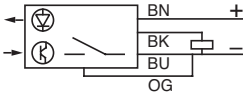
Receiver

Light switching (no object present). PNP output



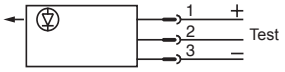
Receiver

Dark switching (no object present). PNP output



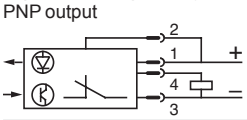
Plug-in connector

Transmitter



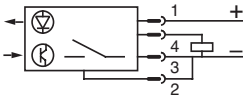
Receiver

Light switching (no object present). PNP output



Receiver

Dark switching (no object present). PNP output



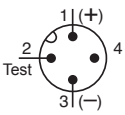
Cable connections

(–)	BU	(Blue)
(+)	BN	(Brown)
(OUT)	BK	(Black) (receiver)
(Prog.)	OG	(Orange) (receiver)
(Test)	VI	(Violet) (transmitter)

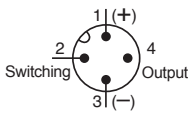
Connector diagrams

Sensor connector pin view

Transmitter

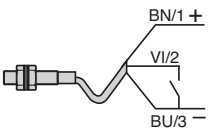


Receiver

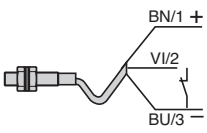


Beam break test (for transmitter only)

Beam made



Beam broken



Principle: page 3/138 | Characteristics: page 3/139 | References: page 3/140 | Dimensions: page 3/143 | Wiring Diagrams: page 3/143

Safety detection solutions

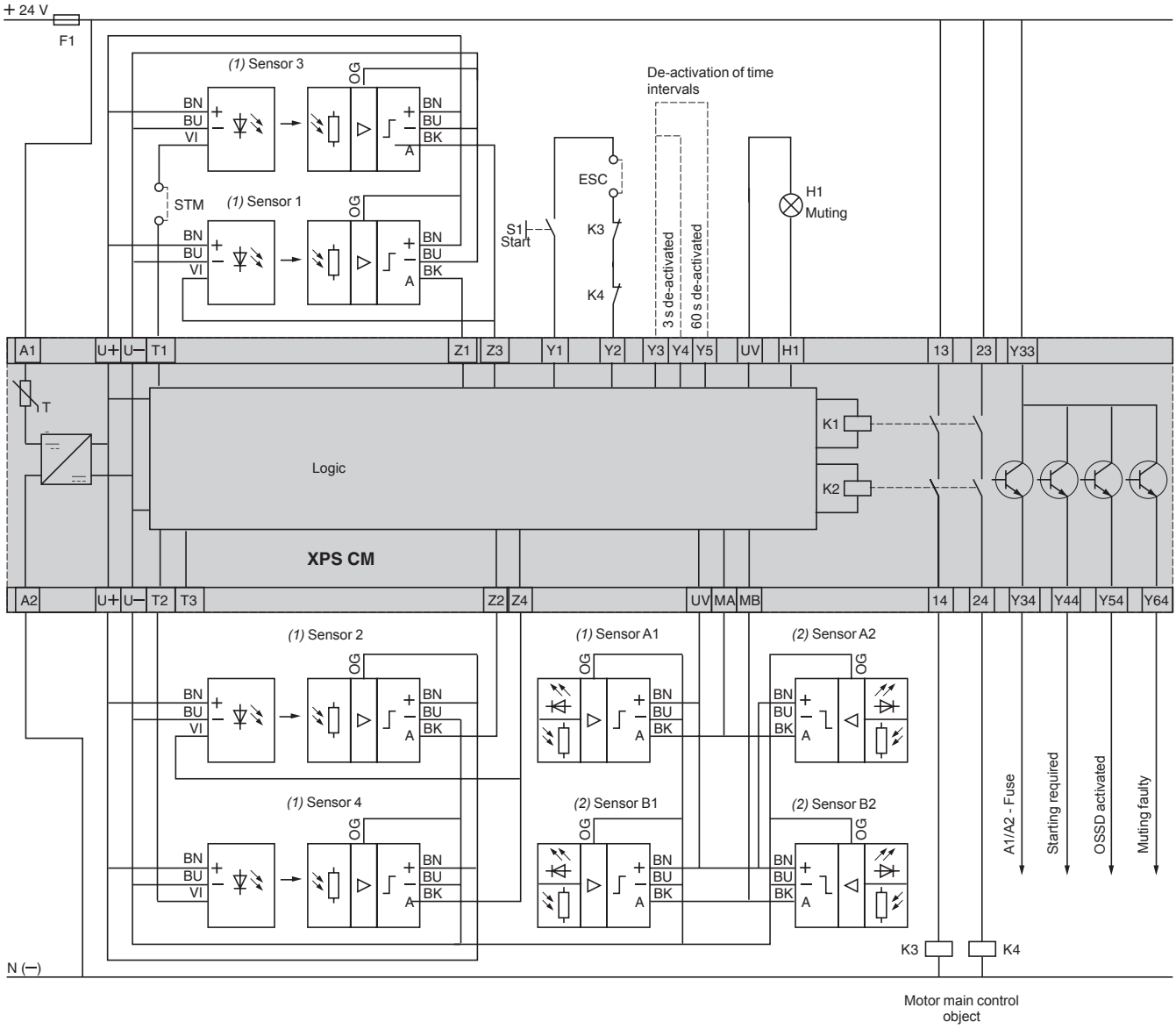
Preventa™ safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function

Wiring Diagrams

Connection of XPSCM module with 4 pairs of XU2S single-beam sensors

(Connection of 1 to 4 pairs of XU2S sensors to XPSCM, see page 3/147)



XU2S sensors can be programmed for light switching or dark switching (dark switching with sensors 1 and 3 and light switching with sensors 2 and 4, for example).
ESC: external start conditions
Y1-Y2: feedback loop.
STM: for stopping time measurement.
(1) Protection field sensors
(2) Muting sensors

Safety detection solutions

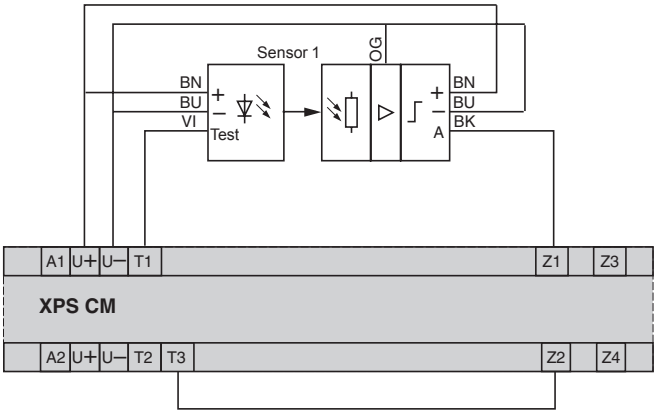
Preventa™ safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function

Wiring Diagrams (continued)

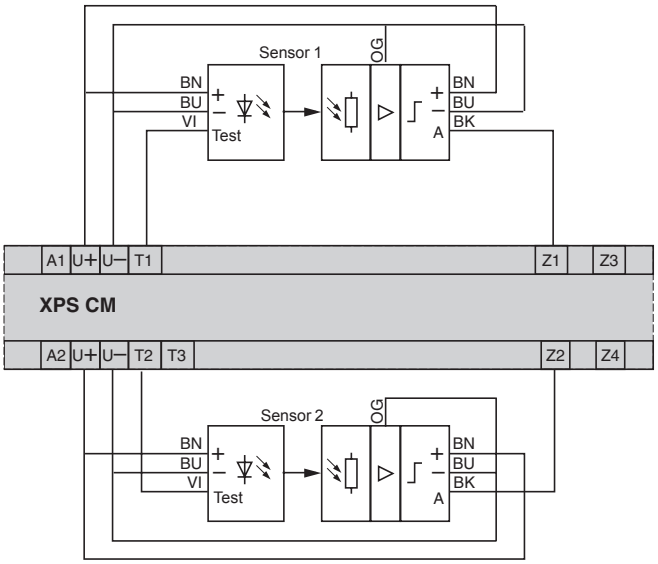
Connection of XPSCM module with 1 pair of XU2S sensors

(dark switching)



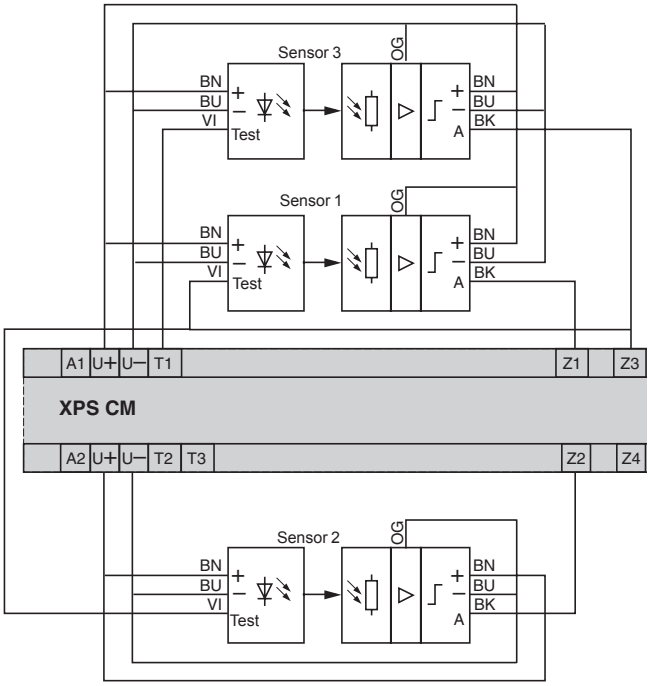
Connection of XPSCM module with 2 pairs of XU2S sensors

(dark switching)



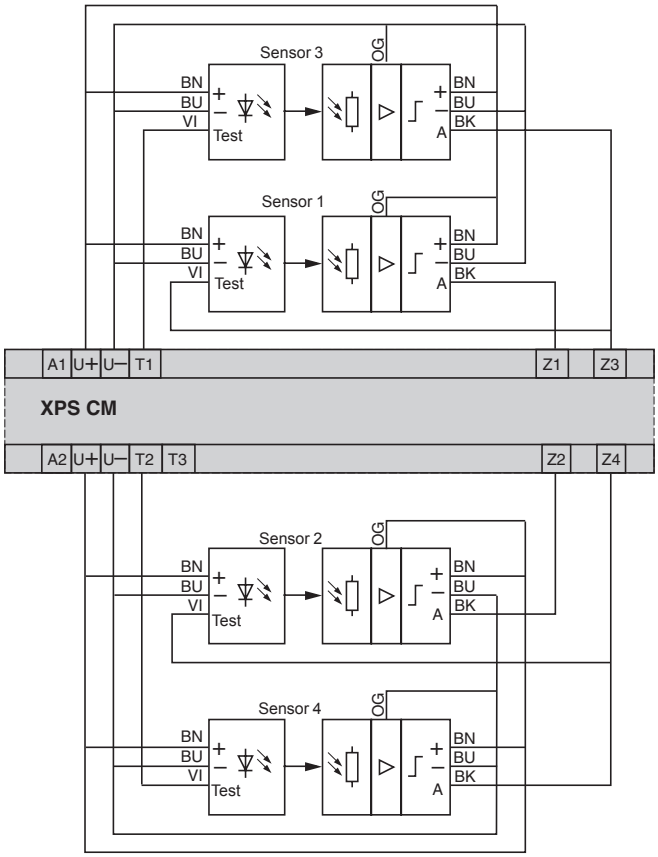
Connection of XPSCM module with 3 pairs of XU2S sensors

(2 for dark switching, 1 for light switching)



Connection of XPSCM module with 4 pairs of XU2S sensors

(2 for dark switching, 2 for light switching)



Safety Dialog Solutions

Selection guide: Dialog components *4/2*

Cable pull switches type XY2 C *4/3*
- Specifications *4/4*
- Selection *4/5*

Two Hand Control 9001 Type P *4/15*

Safety dialog solutions
Dialog components

Applications	**Cable Pull switches for:** - conveyor systems, - materials handling, machine tools, - electrical testing stations		**Palm Buttons for:** - Two hand control and stamping presses, or where a very large button is required
			
Features	For cable lengths up to 165 ft (50 m). Can be tripped by the operator at any point in the work zone	For cable lengths up to 50 ft (15 m). Can be tripped by the operator at any point in the work zone	Large button area, short button travel, large easily read legend plates
Conformity to standards	**XY2CE**: EN/IEC 60947-5-1, EN/ISO 13850:2006, UL 508 and CSA C22-2 n° 14 (when specified H7)	**XY2CH**: EN/IEC 60947-5-1, EN/ISO 13850:2006, UL 508 and CSA C22-2 n° 14 (when specified H7)	UL, CSA
Protective treatment	Special version, “TK”	Special version, “TK”	None
Ambient temperature For operation	-13…+ 158 °F (- 25…+ 70 °C)	-13…+ 158 °F (- 25…+ 70 °C)	
For storage	-40…+ 158 °F (- 40…+ 70 °C)	-40…+ 158 °F (- 40…+ 70 °C)	
Electric shock protection conforming to EN/IEC 61140	Class I	Class I	
Degree of protection conforming to EN/IEC 60529	**XY2CE**: IP 65	**XY2CH**: IP 65	NEMA 12, Oiltight enclosure
Positive operation conforming to EN/IEC 60947-5-1 Appendix K	N.C. contacts with positive opening operation ⊖	N.C. contacts with positive opening operation ⊖	Snap action non-positive opening contacts
Rated insulation voltage	Ui = 400 V degree of pollution 3 conforming to EN/IEC 60947-1, Ui = 300 V conforming to UL 508, CSA C22-2 n° 14	Ui = 400 V degree of pollution 3 conforming to EN/IEC 60947-1, Ui = 300 V conforming to UL 508, CSA C22-2 n° 14	
Rated impulse withstand voltage conforming to EN/IEC 60947-1	Uimp = 4 kV	Uimp = 4 kV	
Type references	**XY2CE**	**XY2CH**	**9001 P**
Pages	4/5	4/6	4/15

Safety dialog solutions
Cable pull switches, type XY2



XY2CE1A196



XY2CH13150

Operating Principle

XY2 Cable Pull Switches provide for an emergency stop to be signaled at any point along a cable up to 165 feet (50 m) in length. This is many times preferred to installing many individual emergency stop push button stations along a conveyor or around the machine, providing a more cost effective solution. Typical applications include conveyor systems, packaging, textiles, transfer machines, presses, woodworking equipment, paint lines, and test laboratories.

The cable pull switch is typically mounted at one end of a machine or conveyor and the operating cable is routed along the conveyor or around the machine and secured at the other end. The operation of the XY2 is based on the taut cable principle – the cable must be tight and have appropriate tension applied to set or reset the switch. Once cable tension has been set, the device will open the N.C. control contacts if either the cable is pulled or if it should become slack due to stretching or breakage of the cable. Once the switch is tripped, it must be manually reset.

Two versions are available:

- Emergency stop versions have positive opening N.C. contacts that latch upon tripping (positive opening) and must be manually reset.
- Normal stop versions are used where a momentary, non-emergency signal is required at any point along a cable. These devices have snap acting contacts and are non-latching devices.

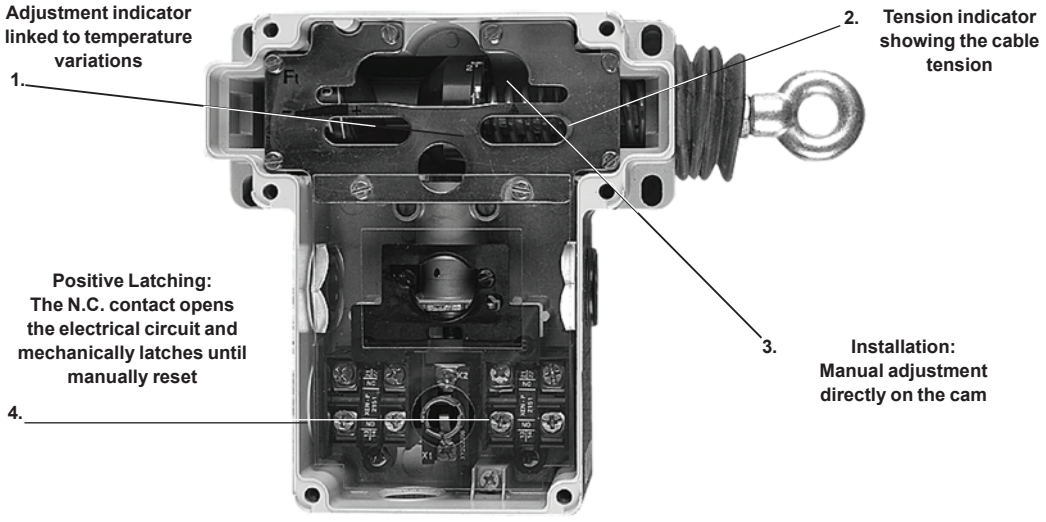
Features Include:

3 cable entries 1/2" NPT	Manual tripping force adjustment (XY2CE)
Positive latching (no teasing)	Adjustment indicator
Slow-make slow-break for emergency stop	UL Listed and CSA Certified
Snap action contacts for momentary switch	XY2CH for applications up to 50 feet (15m)
Works properly even if spring is broken	XY2CH has two viewing windows to aid in setting and adjusting the switch
Padlock attachment	XY2CE for applications up to 165 feet (50m)
Doesn't reset if out of adjustment	Positive opening N.C. contacts meets the IEC and EN requirements for positive opening contacts per IEC/EN 60947-5-1; and NEMA ICS-5, part 6 (direct opening action).

The use of an end spring is strongly advised when using cable pull devices on continuous duty mechanical handling equipment and systems.

The following standards allow the use of cable pull (pull cord) devices in e-stop circuits:

IEC 60204-1: 10.7 AND 10.8	ISO 13850	NFPA 79 (2002): 10.7.2



Interior View of XY2CE

4

Safety dialog solutions
Cable pull switches, type XY2

Characteristics

Conformity to Standards Approvals	ANSI A 17.1, IEC 60947-5-1, EN 60204-1, NFC 79-130, NFC 63144, VDE 0660-207. XY2CE and XY2CH: UL Listed and CSA Approved.
Ambient Temperature	For operation from -13 °F to +158 °F (-25 °C to +70 °C) for standard devices; -40 °F to 158 °F (-40 °C to +70 °C) for TK (corrosion proof) versions. For storage from -40 °F to +158 °F (-40 °C to +70 °C) for all devices. The minimum temperatures listed are based on the absence of freezing moisture or water. ♦
Vibration Resistance	XY2CE: 10G, (F=10 to 300 Hz), XY2CH: 10G, (F=10 to 150 Hz), conforming to IEC 68-2-6
Shock Resistance	50G, duration 11 ms, conforming to IEC 600068-2-27
Electric Shock Protection	UL 508, 19-1, Class I conforming to IEC 60536 and NF C 20-030.
Enclosure Rating	Type 1,4,12. IP 65 conforming to IEC 60529, IP 657 conforming to NF C 20-010 (IP 667 with booted push button).
Mechanical Life	10,000 operations for emergency stop; 100,000 operations for normal stop
Cable Entry	3 x 0.5" NPT
Operating Position	All positions.
Length of Protected Area	XY2CE: maximum 165 ft. (50m), XY2CH: maximum 50 ft. (15m)

♦ The minimum temperatures listed are based on the absence of freezing moisture or water. Care should be taken to avoid sub-freezing temperatures where dripping or splashing water is present and to avoid bringing a cold device into a humid atmosphere and then back into sub-freezing temperatures. The water or moisture may freeze around internal or external components and prevent it from performing as intended.

Electrical Characteristics

Rated Thermal Current	10A conforming to UL 508, CSA C 22-2 N° 14, IEC/EN 60947-5-1, NFC 63140, VDE 0660-200.
Rated Insulation Voltage	300 Vac and Vdc conforming to UL 508, CSA 22-2 N° 14. 500 V conforming to IEC 158-1, NFC 20-040; 300 V conforming to VDE 0660-207.
Contact Operation	SPDT Slow-make slow-break, positive ⁎ opening operation contacts for emergency stops. SPDT Snap action for normal stops without mechanical latching.
Resistance Between Terminals	• 25 mΩ
Terminal Referencing	13-14 normally open, 21-22 normally closed (conforming to CENELEC EN 50013).
Voltage Range	24 to 380 V
Wiring Terminals	Screw clamp terminals. Min: 1#20 AWG (1 x 1.05mm²), Max: 2#16 AWG (2 x 1.5mm²)
Recommended Terminal Clamp Torque	7.0 in.lbs. (0.8 Nvm)
Short Circuit Protection*	In U.S. use fast action fuse 10A type SC; form I Class J, H or equivalent. 10A cylindrical fuses type g1 or N conforming to IEC 337-1B- and VDE 0660-200
Contact Rating	Utilization category A300 and Q300. Operating rate: 3600 operations/hour. Load factor: 0.5.
Minimum Contact Rating	15 Vdc, 2mA (based on clean environment)
Rated Power	Conforms to IEC/EN 60947-5-1, duty categories AC 15 and DC 13. Operating rate: 3600 operations per hour. Load factor: 0.5

⁎ Positive opening N.C. contacts meet the IEC and EN requirements for positive opening contacts per IEC/EN 60947-5-1; and NEMA ICS-5, part 6.

• The use of the recommended fuse is mandatory for emergency stop applications. Without a fuse to protect the circuit, the contacts may develop a weld significant enough that the positive opening contact mechanism may not be able to break through the weld.

AC Voltage and Current Ratings 50-60 Hz

Contact Rating Designation	Thermal Continuous Test Current, Amperes	Maximum Current, Amperes								Voltamperes	
		120 Volts		240 Volts		480 Volts		600 Volts			
		Make	Break	Make	Break	Make	Break	Make	Break	Make	Break
A300	10	60	6.00	30	3.00	. . .	. . .	. . .	. . .	7200	720

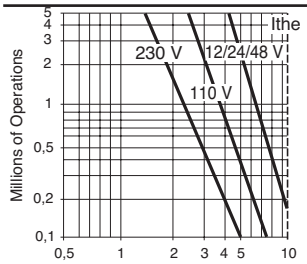
DC Voltage and Current Ratings

Contact Rating Designation	Thermal Continuous Test Current, Amperes	Maximum Make or Break Current, Amperes			Make or Break at 300 Volts or Less, Voltamperes
		125 Volts	250 Volts	301 to 600 Volts	
Q300	2.5	0.55	0.27	. . .	69

Snap Action Contact — **For Normal Stop**

AC supply 50-60 Hz
Inductive circuit

DC Supply
Power broken in W
for 5 million operations

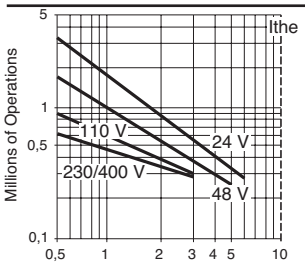


Voltage V	24	48	120
Power W	10	7	4

Slow Break Contact — **For Emergency Stop**

AC supply 50-60 Hz
Inductive circuit

DC Supply
Power broken in W
for 5 million operations



Voltage V	24	48	120
Power W	13	9	7

The product life expressed above is based on average usage and normal operating conditions. Actual operating life will vary with conditions. The above statements are not intended to nor shall they create any express or implied warranties as to product operation or life. For information on the limited warranty offered on this product refer to the Square D ® terms and conditions of sale found in the Square D ® Digest.

Safety dialog solutions
Cable pull switches,
type XY2 C

XY2CE Cable Pull for up to 165 ft. (50 m) cable length

Cable and accessories must be selected and ordered separately from pages4/7 and 4/8.



Right Cable Mount



Left Cable Mount

Emergency Stop

Emergency Stop (Latching contact - reset by push button - positive ∗ opening contacts)
Available only with slow break contacts.

The N.O. contacts will close after the N.C. contacts open. They do not change state simultaneously.

*The N.C. contacts only should be used in the safety control circuit. The N.O. contacts are provided solely for signaling – **NOT** for safety functions.*

To conform with ISO 13850 of the European Union Machinery Directive safety circuits must use emergency stop devices with 2 N.C. contacts in category 3 or 4 safety control systems. Using devices with 1 N.O. and 1 N.C. contact will not allow the system to meet category 3 or 4 as it would not meet the requirements for redundancy. Cable pull switches with 1 N.O. and 1 N.C. contact would be suitable for Category B, 1 or 2 safety control systems. XY2 cable pull switches are ideal choices for use with Preventa™ XPS Safety Relays.

Reset	Contact	Pilot light (only available on 2 N.O. - 2 N.C. devices)	Catalog Number
Right cable mount			
Standard push button	N.O. + N.C.	No	**XY2CE1A150**
Booted push button ∇	N.O. + N.C.	No	**XY2CE1A250**
Standard push button	2 N.O. + 2 N.C.	No	**XY2CE1A190**
Standard push button	2 N.O. + 2 N.C.	Yes ♦	**XY2CE1A196**
Booted push button ∇	2 N.O. + 2 N.C.	No	**XY2CE1A290**
Booted push button ∇	2 N.O. + 2 N.C.	Yes ♦	**XY2CE1A296**
Left cable mount			
Standard push button	N.O. + N.C.	No	**XY2CE2A150**
Booted push button ∇	N.O. + N.C.	No	**XY2CE2A250**
Standard push button	2 N.O. + 2 N.C.	No	**XY2CE2A190**
Standard push button	2 N.O. + 2 N.C.	Yes ♦	**XY2CE2A196**
Booted push button ∇	2 N.O. + 2 N.C.	No	**XY2CE2A290**
Booted push button ∇	2 N.O. + 2 N.C.	Yes ♦	**XY2CE2A296**

∇ Recommended for outdoors applications where icy conditions are likely.
♦ Bulb not included, see spare parts list on page 4/7 For 220 V Δ change last digit to 7, bulb included.
∗ Positive opening N.C. contacts meet the IEC and EN requirements for positive opening contacts per IEC/EN 60947-5-1; and NEMA ICS-5, part 6 (direct opening action).

Normal Stop

Normal stop Δ (momentary action - no reset, no positive ∗ opening contact)
Available only with snap action contacts. Not for use in safety circuit.

	Contact	Pilot Light (only available on 2 N.O.-2 N.C. devices)	Catalog Number
Right cable mount	N.O.+N.C.	No	**XY2CE3A010**
	2 N.O.+2N.C.	No	**XY2CE3A020**
	2 N.O.+2N.C.	Yes ♦	**XY2CE3A026**
Left cable mount	N.O.+N.C.	No	**XY2CE4A010**
	2 N.O.+2N.C.	No	**XY2CE4A020**
	2 N.O.+2N.C.	Yes ♦	**XY2CE4A026**

∇ Recommended for outdoors applications where icy conditions are likely.
♦ Bulb not included, see spare parts list on page 4/7 For 220VΔ change last digit to 7, bulb included.
∗ Positive opening N.C. contacts meet the IEC and EN requirements for positive opening contacts per IEC/EN 60947-5-1; and NEMA ICS-5, part 6 (direct opening action).

Options for XY2CE

Description	Designator
Corrosion resistant (only available on devices with booted push button on Emergency Stop devices and all Normal Stop devices) Not available on key operated emergency stop reset nor mushroom head reset versions. Enclosure color changes from beige to an olive-blue color.	Provides a silicone boot, special finish, and copper/brass eyelet. -For non-pilot light devices: 1. Add suffix TK to the part number 2. Change A to C Example: XY2CE1A250 changes to XY2CE1C250TK -For pilot light devices: 1. Add suffix TK to the part number 2. Change A to E Example: XY2CE1A296 changes to XY2CE1E296TK
Low Temperature -40 °F (-40 °C) The minimum temperatures listed are based on the absence of freezing moisture or water.	Non pilot light versions -Change A to C - silicone boot Ex: XY2CE1A150 changes to XY2CE1C150 Pilot light versions -Change A to E - silicone boot Ex: XY2CE1A196 changes to XY2CE1**E**196
N.C. + N.C. contact	-Change the 9th digit to 7 (for emergency stop only) **Ex:** XY2CE1A150 changes to XY2CE1A170
Mushroom head reset	-Change the 8th digit to 3 Ex: XY2CE1A150 changes to XY2CE1A350
Key operated emergency stop reset (Uses Ronis key No. 421)	-Change the 8th digit to 4. Ex: XY2CE1A150 changes to XY2CE1A450

Δ These devices or components are not UL/CSA.

Acceptable Wire Sizes . . . . . 14-24 AWG
Recommended Terminal Clamp Torque . . . . . 13 in-lbs.

Safety dialog solutions
Cable pull switches, type XY2

XY2CH Cable Pull for up to 50 ft. (15 m) cable length

Cable and accessories must be selected and ordered separately from pages 4/7 and 4/8.



XY2CH13150

Emergency Stop

Emergency Stop (Latching contact - reset by push button - positive ∗ opening contacts)
Available only with slow break contacts.

The N.O. contacts will close after the N.C. contacts open. They do not change state simultaneously.

*Only the N.C. contacts should be used in the safety control circuit. The N.O. contacts are provided solely for signaling – **NOT** for safety functions.*

To conform with ISO 13850 of the European Union Machinery Directive safety circuits must use emergency stop devices with 2 N.C. contacts in category 3 or 4 safety control systems. Using devices with 1 N.O. and 1 N.C. contact will not allow the system to meet category 3 or 4 as it would not meet the requirements for redundancy. Cable pull switches with 1 N.O. and 1 N.C. contact would be suitable for Category B, 1 or 2 safety control systems. XY2 cable pull switches are ideal choices for use with Preventa™ XPS Safety Relays.

Reset	Contact	Pilot Light	Catalog Number
Standard push button	N.O. + N.C.	No	**XY2CH13150**
Booted push button ∇	N.O. + N.C.	No	**XY2CH13250**
Mushroom head push button	N.O. + N.C.	No	**XY2CH13350**
Key operated emergency stop (uses Ronis Key No. 421)	N.O. + N.C.	No	**XY2CH13450**

Normal Stop

Normal stop ∆ (momentary action - no reset, no positive ∗ opening contacts)
Available only with snap action contacts. Not for use in safety circuits.

Reset	Contact	Pilot Light	Catalog Number
No Reset Required	N.O. + N.C.	No	**XY2CH33010**

∇ Booted push button recommended for outdoors applications where icy conditions are likely.
∗ Positive opening N.C. contacts meet the IEC and EN requirements for positive opening contacts per IEC/EN 60947-5-1; and NEMA ICS-5, part 6 (direct opening action).
∆ Normal stop devices are not UL/CSA.

Options for XY2CH

Description	Designator
Corrosion resistant (only available on devices with booted push button on Emergency Stop devices and all Normal Stop devices). Not available on key operated emergency stop reset nor mushroom head reset versions. Enclosure color changes from beige to an olive-blue color.	Provides a silicone boot and special finish 1. Add suffix TK to the part number 2. Change the seventh character to 4 Example: XY2CH13150 changes to XY2CH14150TK
Silicone bellows	-Change the 7th digit to 4 Ex: XY2CH13150 changes to XY2CH14150
N.C. + N.C. contact	-Change the 9th digit to 7 (for emergency stop only) Ex: XY2CH13150 changes to XY2CH13170
Pilot light (not UL/CSA) Bulb is included, replacement bulbs available on page 4/7	-For 24 V, change last digit to 3 -For 48 V, change last digit to 4 -For 120 V, change last digit to 5 -For 230 V, change last digit to 7 Ex: XY2CH13150 changes to XY2CH13153

Acceptable Wire Sizes . . . . . 14-24 AWG
Recommended Terminal Clamp Torque . . . . . 13 in-lbs.

Safety dialog solutions
Cable pull switches, type XY2
Accessories and spare parts


XY2CZ702


XY2CZ404


XY2CZ203


XY2CZ917


XY2CZ906


ZB2BV04


ZB2BV014


DL1CE024


XY2CZ901


XY2CZ0130H4


XY2CZ902

XY2CE Accessories

Description	Sold in lots of	Catalog Number
End spring for cables longer than 83 ft (25m) ⁎ Can also be used on shorter length cables.	1	XY2CZ702
Padlock attachment (Yellow) Contains padlock attachment and two tamper proof cover mounting screws with special key	1	XY2CZ916
Turnbuckle to tighten actuating cable. Threaded eye bolt is M8 x 70 + locknut	1	XY2CZ404
Tensioning device. Used instead of a turnbuckle, provides for easy adjustment right on the switch.	1	XY2CZ203
Tensioning device + support. Used instead of a turnbuckle, provides for easy adjustment right on the switch, and also provides the first cable support for the actuating cable.	1	XY2CZ917

XY2CE Spare Parts

Description		Sold in lots of	Catalog Number
Pilot light body Direct voltage to 130 V, bulb not supplied Direct voltage for 230 V, bulb not supplied		 1 1	 XY2CZ906 XY2CZ907
Pilot light head		1	ZB2BV04
Red lens		1	ZB2BV014
Yellow lens		1	ZB2BV015
BA9s incandescent bulb	24 V – 2.6 W	1	DL1CE024
	48 V – 2.6 W	1	DL1CE048
	130 V – 2.6 W ★	1	DL1CE130
Dust and damp protecting bellows	Polychloroprene (std.)	1	XY2CZ901
	Silicone	1	XY2CZ904

★ This lamp is used in both 120 V and 230 V applications. For 230 V application, a pilot light body with resistor (XY2CZ907) is used in the switch.

XY2CH Accessories

Description		Sold in lots of	Catalog Number
End spring ⁎		1	XY2CZ703
Pilot light Yellow (Not UL/CSA)	24 V	1	XY2CZ0024H4
	48 V	1	XY2CZ0048H4
	120 V	1	XY2CZ0130H4
	220…240 V	1	XY2CZ0230H4

XY2CH Spare Parts

Description		Sold in lots of	Catalog Number
Dust and damp protecting bellows	Polychloroprene (std.)	1	XY2CZ902
	Silicone	1	XY2CZ903
Pilot light bulb Screw fitting for XY2CH Max. diameter 17mm Length 34mm	24 V – 6 W	10	DL1AA024
	48 V – 6 W	10	DL1AA048
	130 V – 6 W	10	DL1AA127
	230 V – 6 W	10	DL1AA220

⁎ The use of an end spring is strongly advised when using cable pull devices on continuous duty mechanical handling equipment and systems.

Safety dialog solutions
Cable pull switches, type XY2
Accessories and spare parts


XY2CZ301


XY2CZ503


XY2CZ513


XY2CZ523


XY2CZ601


XY2CZ701


XY2CZ602


XY2CZ705


XY2CZ708

4

XY2CE and XY2CH Accessories (These accessories are suitable for both XY2CE and XY2CH)

Description		Sold in lots of	Catalog Number
Cable kits			
34.4 ft (10.5 m) (For use with XY2CH)	Contains: 1 cable: XY2CZ301, 34.4 ft. (10.5 m) 1 cable clamp: XY2CZ523 1 end spring: XY2CZ703 *	1	**XY2CZ9310**
83.7 ft (25.5 m) (For use with XY2CE in medium length applications)	Contains: 1 cable: XY2CZ302, 83.7 ft. (25.5 m) 4 cable clamps: XY2CZ523 1 turnbuckle: XY2CZ404 3 cable end protectors: XY2CZ701 1 cable support: XY2CZ601 1 end spring: XY2CZ702 *	1	**XY2CZ9325**
165.6 ft (50.5 m) (For use with XY2CE in maximum length applications)	Contains: 1 cable: XY2CZ305, 165.6 ft. (50.5 m) 4 cable clamps: XY2CZ523 1 turnbuckle: XY2CZ404 3 cable end protectors: XY2CZ701 1 cable support: XY2CZ601 1 end spring: XY2CZ702 *	1	**XY2CZ9350**
Galvanized steel cable with red jacket 1/8" (3.2 mm) diameter. The red cable jacket meets EN requirements for emergency stop actuators to be red.	Length 34.4 ft (10.5 m)	1	**XY2CZ301**
	Length 83.7 ft (25.5 m)	1	**XY2CZ302**
	Length 165.6 ft (50.5 m)	1	**XY2CZ305**
Cable clamps	Single; 0.138" (3.5mm) diameter cable (max.)	10	**XY2CZ503**
	Double; 0.138" (3.5mm) diameter cable (max.)	10	**XY2CZ513**
	Clamp; 0.138" (3.5mm) diameter cable (max.)	10	**XY2CZ523**
Cable support	Fixed ($^5/_{16}$" coarse thread, 0.35" deep)	10	**XY2CZ601**
	Swivelling	1	**XY2CZ602**
	Pulley support (to be used with Pulley XYZCZ708)	1	**XY2CZ705**
Pulley, 0.2" (5mm) max. diameter cable (to be used with XYZCZ705 Pulley Support)		1	**XY2CZ708**
Wire and protective guard for 0.118" to 0.138" (3 to 3.5mm) diameter cable. Guard is used to protect cable when securing to the switch, turnbuckles, and end springs, etc. The cable is placed in the groove of the guard so the guard comes in contact with the switch, turnbuckle, or end springs – instead of the cable itself. Reduces stress and strain on cable.		10	**XY2CZ701**

* The use of an end spring is strongly advised when using the cable pull devices on continuous duty mechanical handling equipment and systems.

XY2CE and XY2CH Spare Parts (These spare parts are suitable for both XY2CE and XY2CH)


ZA2BA639


ZA2BP6



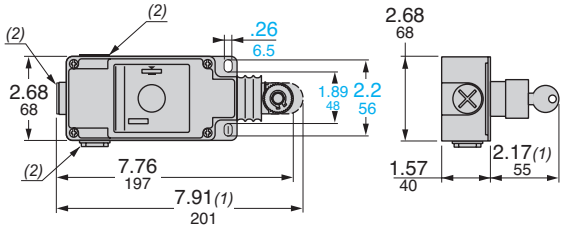



Q99900911

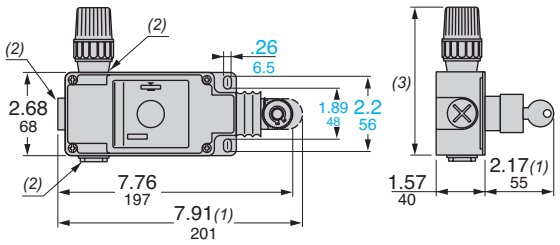
Description		Sold in lots of	Catalog Number
Contact block	Slow break, N.O. + N.C. (emergency stop)	0	Not available separately
	Slow break, N.C. + N.C. (emergency stop)	0	Not available separately
	Snap action, N.O. + N.C. (normal stop)	1	**XESP2151**
Reset operators	Flush with marking R	1	**ZA2BA639**
	Booted	1	**ZA2BP6**
	Emergency stop head 30 mm diameter – blue	1	**ZA2BC64**
	Key operated emergency stop – blue (Ronis Key No. 421)	1	**ZA2BS06212**
Key	Ronis No. 421	1	**Q99900911**

XY2CH

Without pilot light



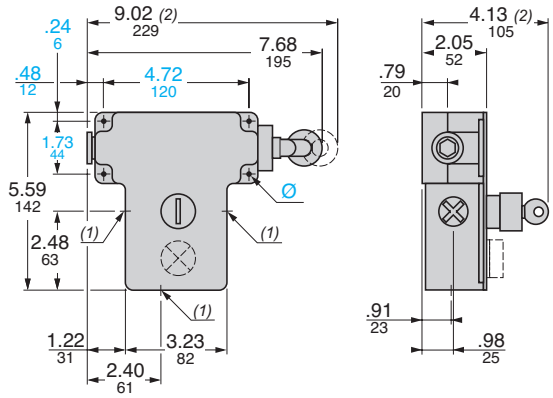
With pilot light



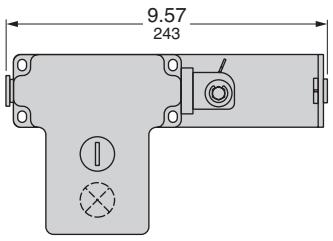
(1) Maximum extension.
(3) 4.76 in. (121 mm): 24 V and 48 V versions. 5.16 in. (131 mm): 130 V and 230 V versions.

XY2CE

XY2CE●A●●●, XY2CE●C●●●



XY2CE●A●●● + XY2 CZ917 (tensioner + bracket)

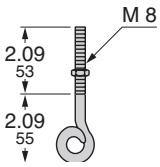


(2) Maximum extension.
Ø: 4 elongated holes Ø .24 in. (6 mm).

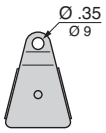
Dual Dimensions: INCHES / Millimieters

Accessories

XY2 CZ705



XY2 CZ708



4

Safety dialog solutions
Cable pull switches, type XY2
Operating principles and adjustment

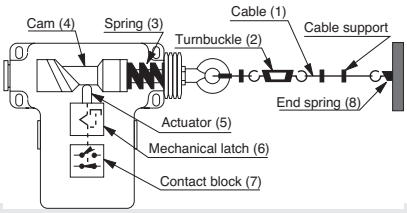
NOTE: An end spring (8) is recommended at the far end of the cable (1) allowing the cable to be moved right or left, especially for cables 80 ft. or longer. The use of an end spring is strongly advised when using the cable pull devices on continuous duty mechanical handling equipment and systems.

Operating Principles – XY2CE

Normal Position

The cable (1) is tightened by the turnbuckle (2) and held in a normal position by the spring (3). As the turnbuckle is turned, the cam (4) moves from left to right, and allows the actuator (5) to be positioned according to the particulars of the desired setting (see page 4/14).

The mechanical latch is unlocked when the N.C. contact is in the locked position.



Tripping the Device

Operating or breaking the cable results in the cam shifting position.

The active part of the cam presses down the actuator (5), simultaneously causing the N.C. contact (7) to open and the mechanical latch (6) to maintain it in its open position. Cable supports ensure the transmission of the cable tension into the axis of the switch cam.

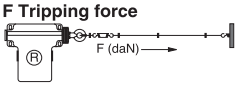
Definitions

The value of the **tension** (F) **along the cable** which trips the switch.
Adjustable value according to cam position (see table on page 4/11).

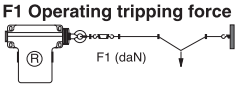
The value of the **traction force** (F1) applied by the operation **perpendicular to the cable** which trips the switch. Adjustable value according to the table on page 4/11

The distance (f) travelled by the operator (i.e.: operator's hand), between the normal position and the tripping point. Adjustable value according to the table on page 4/11

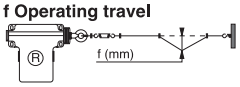
F Tripping force



F1 Operating tripping force



f Operating travel



General Purpose Adjustment Method

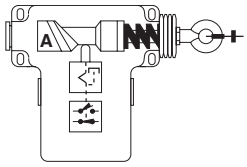
XY2CE - Cable Traction Force

Adjust either directly when mounting the cable or using a turnbuckle positioned near the switch but **after the first cable support.** For standard adjustment the **tension indicator should be in the middle of the range.**

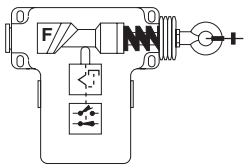
Operating Travel

The tripping point is adjusted by the rotating cam marked by letters A to F. Position A corresponds to the minimum travel. Position F corresponds to the maximum travel.

NOTE: The switches are delivered from the factory in position A.



Position A



Position F

XY2CH

XY2CH has two viewing windows to aid in adjusting cable tension and resetting the switch. When the cable tension indicator is in mid-range in its viewing window, the reset button should be pushed to reset the device. When reset, a green indicator is visible in the contact viewing window. When the switch is tripped, a yellow indicator is visible in the contact viewing window and the cable tension indicator is at the edge of its viewing window.

Specific Adjustment Method – XY2CE

When the travel or tripping force is specified the cable tension and the cam position should be adjusted based on the values below. (Refer to General Purpose Adjustment Method on page 4/10) **For each position of the cam, the values of the operating travel and force (F1) corresponding to the minimum and maximum cable tension are tabulated below.**

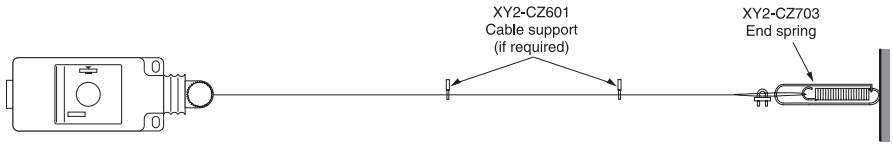
Cable characteristics: length = 165 ft. (50 m); maximum elongation of cable to be no more than 0.00834 inches per foot (.7mm/m), equivalent to a maximum co-efficient of expansion of 0.07%, based on a 108 °F (60 ° C) temperature variance.

Switch Type	Cam Position		Cable Tension (Axial)		2 m Between Supports				5 m Between Supports				Tripping Force (Axial)	
			F		f		F1		f		F1			
			N	Lbf	mm	IN	N	Lbf	mm	IN	N	Lbf	N	Lbf
XY2CE	A	Min.	145	32.6	94.0	3.7	59	13.2	160	6.30	20	4.5	323	72.7
		Max.	195	43.9	81.3	3.2	57	12.8	160	6.30	32	7.2		
	B	Min.	150	33.8	104.1	4.1	83	18.7	170	6.69	24	5.4	333	74.9
		Max.	205	46.1	91.4	3.6	76	17.1	175	6.89	38	8.6		
	C	Min.	152	34.2	114.3	4.5	90	20.2	180	7.09	28	6.3	352	79.3
		Max.	215	48.4	106.7	4.2	83	18.7	190	7.48	44	9.9		
	D	Min.	155	34.9	124.5	4.9	98	22.0	190	7.48	32	7.2	372	83.7
		Max.	225	50.6	114.3	4.5	89	20.0	200	7.87	49	11.0		
	E	Min.	160	36.0	134.6	5.3	109	24.6	200	7.87	35	7.9	402	90.4
		Max.	235	52.9	124.5	4.9	104	23.5	210	8.27	56	12.6		
	F	Min.	165	37.1	144.8	5.7	117	26.4	205	8.07	39	8.8	421	94.8
		Max.	245	55.1	134.6	5.3	111	24.9	220	8.66	60	13.5		
XY2CH	—	—	100	22.5	—	—	—	—	160	6.30	20	4.5	—	—

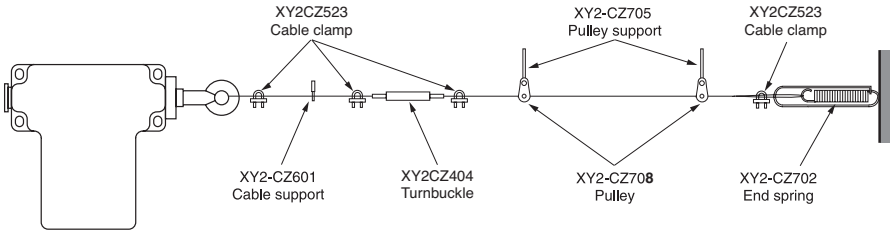
Safety dialog solutions
Cable pull switches, type XY2

Setting up

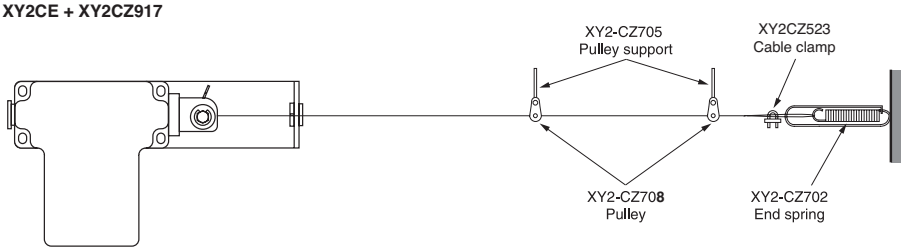
XY2CH



XY2CE



XY2CE + XY2CZ917



Application and Installation Recommendations

The XY2 cable pull switches are based on the taut cable principle, which means the cable must be tight and have a tension applied to allow the switch to be reset and work properly. This is different from slack cable switches where the cable is normally slack and is only tight when pulled. The benefit of the taut cable principle is that the operator knows that if the cable is taut, the machine can be shut down. If slack cable switches are used, the operator is not assured the cable is affixed properly at the switch and may be unsure that when the cable is pulled the machine will stop.

The distance an operator must pull the cable on a slack cable switch depends on the operator's distance from the switch and the amount of slack in the cable. An operator close to the switch needs to take up much less slack in the cable before tripping the switch than an operator at the far end of the installation. With a taut cable switch, the operating force and distance the cable needs to be pulled is the same throughout the installation. The taut cable style of device is more reliable in an emergency situation.

Effects of Friction

To operate properly, the cable must be tight with tension on it, and the cable must have a minimum of friction. Care must be taken in the machine design to insure that the system avoids ANY friction between the cable on the machine parts or components, and moving parts on the machine or material handling system.

- The cable must be free of motion on its supports. It should not lay against the supports nor rub on them except when the cable is pulled by an operator.
- The cable must not have weights attached nor applied to it as a standard part of the application.
- The application must be designed to reduce friction as low as possible. This is accomplished by using reduced friction pulleys and guides.
- The cables should never be run through conduit or tubing.

Cornering

The operating cable should be installed so that the cable run is straight, but this cable can also be routed around corners using pulleys. If the cable deviates from a straight line, pulleys **must** be used. The effects of friction could be more noticeable if the cable is not installed correctly and with a minimum of friction.

- DO NOT allow the cable to turn corners or change direction using only cable supports.
- A pulley **must** be used when routing cable around corners, regardless of the angle. Use a pulley whenever direction is changed even slightly. The pulley must have freedom of movement on its mounting to maintain the self-alignment of the cable.
- If a fixed pulley is used, a cable support should be positioned within 4 inches (10 cm) of both sides of the pulley.
- The total sum of the angles for the cable bends or turns should be no more than 180°.
  i.e.: qty of two 90-degree angle turns is acceptable.
  i.e.: qty of three 60-degree angle turns is acceptable.
  i.e.: qty of three 90-degree angle turns is not acceptable.

Temperature

Note:
*Routing the cable through both hot and cold production areas with the same cable could require more frequent adjustment and **may** not allow proper adjustment throughout the production cycle.*

Example:
A cable pull switch on a production line where the product is cooked and then flash frozen in a short distance. Some sections of the cable could be very hot, and other sections very cold, and other sections at room temperature. Temperature variations in any of these areas could affect the overall adjustment of the cable. Where such variations occur, we recommend the use of multiple cable pulls.

Temperature variations in the area where the cable pull switch is installed can affect the adjustment of the switch. The cable expands (becomes longer) when temperature increases, and contracts (shrinks) when temperature decreases. Wide temperature variations should be avoided where possible. If temperature variations are significant, the adjustment of the cable and switch must be checked at regular intervals. If the switch is not adjusted properly during installation, temperature variations could affect cable length and trip the switch without operator intervention. If this occurs, the switch needs to be readjusted.

Temperature variances can come from any of the following:

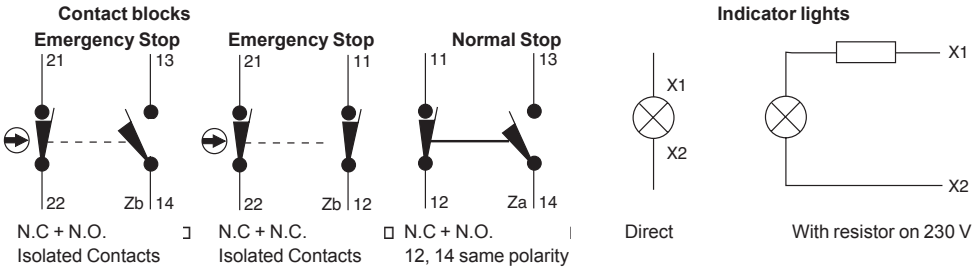
- Seasonal temperature changes in non-climate controlled areas.
- Freezers and refrigeration equipment which are cold during production but are brought to room temperature for cleaning.
- Equipment that is used to heat treat or cook material during production but is brought to room temperature for cleaning.
- Equipment which is at room temperature (or lower temperatures) for production but is cleaned with hot water or steam.
- Equipment placed near windows and large glass areas: sunlight could cause an expansion of the cable where an overcast day may cause a contraction of the cable.

General Guidelines

- Be sure the cable remains accessible and visible to the operators for its entire length.
- The switch, cable supports, and other hardware must be rigidly mounted on the machine or application. If these mountings are not secure and rigid, the tension on the cable could be changed and the switch will trip. Mounting points must not move when the cable is pulled.
- Supports are not to be placed on moveable parts of the application.
- Cable lengths used must not be in excess of maximum lengths listed for the particular cable pull switch.
- The turnbuckle allows for the proper adjustment of the switch, and must be mounted close to the switch to ease and simplify adjustment of the system.
- The turnbuckle locknuts should be tightened securely.
- The first cable support should be within 4 inches (10 cm) of the switch.
- The sheath around the end of the cable must be removed when inserted into the cable clamps to assure metal to metal contact. Failure to remove sheathing could cause slipping of the cable, reducing the tension on the cable, and switches may not perform to published specifications.

Wiring Diagrams

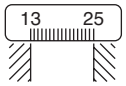
For the versions with two contact blocks the left one is identified as A and the right one is identified as B. The markings are permanently inscribed on the mounting fixture above the contact blocks. Ex. B 21-22 is the normally closed contact of the right contact block.



NOTE: When the emergency stop switch operates in conjunction with solid state controls, i.e. PLCs, the supply for the safety functions must be disconnected independent of the PLC.

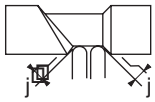
Operating instructions

4



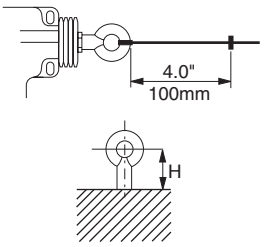
Indicator Displays

The indicators define the maximum cable tension adjustment zone. The cable tension is adjusted via the turnbuckle. **The device will not function outside this zone.**
For general purpose adjustment the indicator should be in the middle of the window.



Adjustment Limits for Effective Operating

In a normal position, adjustments should be made so that there must be a play (J) between the actuator and the conical parts of the cam.



Cable Supports

It is recommended to space supports along the entire length of the cable at 6 to 16 foot (2 to 5 meter) intervals. **Cable supports ensure the transmission of the cable tension in the axis of the switch cam. The first one after the switch is mandatory for correct operation** (4.0", 100 mm). Also, if pulleys are used to change the direction of the cable, **cable supports at 4" (100 mm) before and after the pulley are mandatory**.

Use supports with 0.8" (20 mm) maximum height H with respect to the product mounting surface.

Cable Characteristics

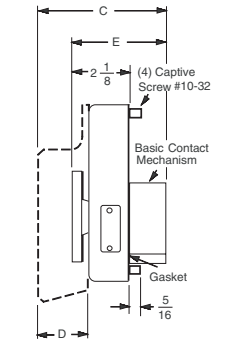
Recommended cable diameter is 1/8" (3.2 mm). However, any galvanized steel cable (aircraft type) less than 9/32" (7 mm) diameter can be used, provided it meets the following criteria:
Maximum elongation of cable to be no more than 0.00834" per ft. (.7 mm/m), which is equivalent to a maximum
co-efficient of expansion of 0.07%, based on a 140 °F (60 °C) temperature variance.

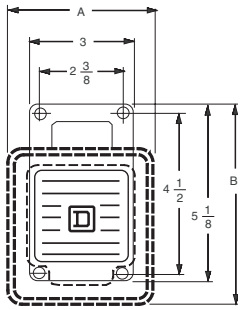
Safety dialog solutions
Palm buttons, type 9001P
Application data, dimensions, Order information



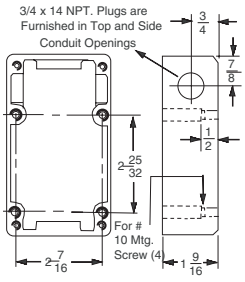
Class 9001, Type P1 with Class 9001, Type PB

Approximate Dimensions





Type P



Type PB

File E78403
CCN NKCR

Operating Principle

Safety requirements on power operated stamping presses are necessarily very rigid. One of the basic requirements is that all operators concerned with the stamping press be required to depress a push button with each hand before the press is allowed to start its stroke. The Class 9001 Type P palm operated button has been designed for this application.

General Features are: Oil-tight enclosure, large plastic button area, short button travel, and large easily read legend plates.

The Class 9001 Type P enclosure is of heavy wall die cast construction designed to take lots of abuse. The button is available for mounting in a machine cavity or in its own oil-tight enclosure.

These buttons and contact mechanisms are UL Listed.

N.P. Marking (color)	Contact Symbol	Features All Operators Have Momentary Contacts	Operator Only Without Box Without Guard Type
RUN (green)		1 N.O., 1 N.C. Green Button	P1
STOP (red)		1 N.C. Red Button	P2
INCH (black)		1 N.O., 1 N.C. Black Button	P3
RUN (green)		2 N.O., 2 N.C. Green Button	P4
STOP (red)		2 N.O., 2 N.C. Red Button	P5
INCH (black)		2 N.O., 2 N.C. Black Button	P6
TOP STOP (yellow)		1 N.C. Yellow Button	P7

Description	Type
Box	PB
Deep Guard	PG1
Shallow Guard	PG2

Characteristics

Acceptable Wire Size . . . . . 12-24 AWG
Recommended Terminal Clamp Torque . . . . . 7 lb-in

Electrical Ratings – Single Pole

AC — Heavy Duty — NEMA A600					DC — Standard Duty — NEMA P600		
Volts	Inductive 35% Power Factor			Resistive 75% Power Factor	Volts	Inductive and Resistive	
	Make Amperes	Break Amperes	Continuous Carrying Amperes	Make Break and Continuous Amperes		Make and Break Amperes	Continuous Carrying Amperes
120	60	6	10	10	120	1.1	10
240	30	3	10	10	240	0.55	10
480	15	1.5	10	10	600	0.2	10
600	12	1.2	10	10			

Approximate Dimensions – Inches

NOTE: The Class 9001 Type PB Box must be mounted in position as shown to permit proper mounting of a Class 9001 Type P1 thru P7 Palm Operated Press Button

Type	A	B	C	D	E
P1, P2, P3, P4, P5, P6	. . . .	. . . .	. . . .	. . . .	$3^{1}/_{2}$
With Deep Guard, PG1	$4^{5}/_{16}$	$5^{3}/_{4}$	$4^{1}/_{8}$	$1^{1}/_{2}$	$3^{1}/_{2}$
With Shallow Guard, PG2	$4^{1}/_{32}$	$5^{19}/_{32}$	$3^{5}/_{8}$	1	$3^{1}/_{2}$

Basic Contact Mechanism (For Replacement)

Contacts are Square D ® Class 9001 Type KA2 (N.O.) and Class 9001 Type KA3 (N.C.) installed on a mounting bracket and sealed to prevent individual block removal. Contact blocks must be replaced in complete assemblies only.

Contacts	Used With	Part No.
1 N.O., 1 N.C.	P1, P3	31013-051-50
2 N.O., 2 N.C.	P4, P5, P6	31013-051-51
1 N.C.	P2, P7	31013-051-52

Contents ***chapter 5***

Light Curtain Application and Installation

Protection of personnel. 5/2

Safety systems. 5/3

Light curtains in the United States 5/4

Light curtains in Europe 5/6

Special rules for presses. 5/7

Prevention of access to hazardous area 5/8

Light curtain alignment 5/9

Using mirrors 5/10

Minimum object sensitivity (MOS) 5/11

Fixed and floating blanking. 5/12

Test procedure for the United States 5/13

Light curtain application and installation
Protection of personnel

Protection of Personnel

Safety light curtains are electro-sensitive protective equipment (ESPE) designed for the protection of personnel operating or working around industrial machinery by sending stop signals to the machine control for stopping the hazardous movement as soon as one of the light beams is broken.

In particular, they provide protection for the safety of personnel operating hazardous machinery, but they are equally suitable for use with many other types of machines. They make it possible to protect personnel while allowing free access to machines.

The absence of a door or guard reduces the time required for loading, inspection or adjustment operations, as well as making access easier.

Directives and Standards — These Safety Light Curtains Conform to:

- The essential protection requirements of the Electromagnetic Compatibility (EMC) Directive 89/336/EEC, 92/31/EEC, 93/68/EEC,
- Relevant essential health and safety requirements (EHSR's) of the European Machinery Directive 98/37/EEC,
- Low Voltage Directives 73/23/EEC and 93/68/EEC,
- Standard EN 61496-1 (electro-sensitive protective equipment: ESPE),
- EN 954-1,
- ANSI B11-19,
- Draft standard EN 999 (installation conditions),
- UL 61496 Type 4 requirements.

Applications — The Main Applications are:

For Type 2 Light Curtains:

- Packaging and Assembly Plant
- Conveyor and Mechanical Handling Systems
- Warehousing and Storage Systems
- Waste Disposal Skips
- Robot Areas

For Type 4 Light Curtains

- Presses (all types), Shears and Trimmers
- Hoisting Equipment
- Saws (all types)
- Machine Tools (lathes, milling machines, machining centers)
- Woodworking Machines (truing, lathes, spindle molding machines, side and face milling cutters)
- Textile Machinery (carding machines, weaving looms, steam rooms)
- Assembly Machines
- Assembly Robots

Safety Requirements — Detection of Anomalies that may Jeopardize Machine Safety and Stopping

The machine design and its controls must have the same level of safety as that of the safety light curtain so as to ensure that the machine is able to immediately stop its hazardous movement if something enters the zone protected by the safety light curtain.

It must be impossible to enter the protected zone without breaking the protective light beams. The safety light curtain must therefore be installed so that the light curtain cannot be avoided.

Re-starting of the machine must only be possible when there is no hazard present and when there is no one in the hazardous zone.

Light curtain application and installation
Standards and basic requirements

Safety Systems

Safety systems are comprised of many components. No one safety component will insure the safety of the system. The design of the complete safety system should be considered before you begin. It is very important to follow applicable safety standards when installing and wiring these components.

Standards to be Followed – United States

Standards referenced below refer to presses and other metal working and general equipment. This is not a complete listing of all applicable standards to be referenced when using light curtains. There may be other OSHA, ANSI, ANSI/RIA, NEC, NFPA, national, state, and local codes that may include requirements for installation of light curtains on machinery.

- OSHA 1910.211
- OSHA 1910.212
- OSHA 1910.217
- ANSI B11.1
- ANSI B11.19
- ANSI B11.20
- ANSI/RIA R15.06

Directives and standards to be followed – Europe

Standards referenced below refer to general machinery. This is not a complete listing of all applicable standards to be referenced when using light curtains. There may be other European and local codes that may include requirements for installation of light curtains on machinery.

- (NF) E09-010
- DIN 31001
- BS 5304
- EN 294
- EN 811
- EN 999
- EN 954-1
- EN 61496-1

LIGHT CURTAINS IN THE UNITED STATES — BASIC REQUIREMENTS

- This device must be installed, set-up and serviced only by authorized personnel. ANSI defines Authorized Personnel in ANSI B30.2-1983.
- User must follow all applicable codes, standards and regulations. Standards specifically referenced in this document need to be followed: ANSI B11.1 through B11.20, OSHA 29 CFR 1910 standards, and ANSI/RIA R15.06 standard. There may be other national and local standards that may also need to be followed.
- Do not alter or modify this equipment.
- Light curtains must be securely mounted to a rigid surface using the mounting brackets supplied.
- Machine must be capable of stopping immediately at any place in its stroke after receiving a stop signal.
- Light curtains must not be used with single stroke (full revolution clutched) machinery.
- Read and understand Sections on Calculating Minimum Safety Distances of this catalog for important details regarding standards, spacings and safe operating distances and stopping times before beginning installation.
- Light curtains must not be used as a lockout device to meet OSHA lock-out/tag-out requirements.
- Light curtains will not protect machine operators and other personnel from liquids, gases, chips, hot surfaces and other debris from point of operation.
- Light curtains must be sized and installed so that machine operator cannot reach over, under or around the sensing field to reach the point of operation.
- Light curtains must be installed so the machine operator cannot position themselves between the hazardous area (pinch point) and the light curtain.
- Light curtains currently cannot be used as PSDI devices to initiate machine movement on mechanical power presses. For PSDI, refer to OSHA 29 CFR 1910.217 (h), the various appendices referenced on PSDI, and OSHA mandatory regulations requiring third party approval.

  Using the light curtain to initiate a machine after an object is removed from the sensing area is called Presence Sensing Device Initiation (PSDI). Use of PSDI places additional requirements on the guarding and safety controls. It can restrict advanced light curtain features such as floating blanking, and Exact Channel Selection (ECS) blanking. Contact your local sales office for further information. Other sources of references for PSDI include: ANSI RIA 15.06-1999, OSHA 1910.217(h), and ANSI B11.2-1995.

Light curtain application and installation
Minimum safety distances

Minimum Safety Distance

Light Curtains in the United States (Vertical Mount)

The basic formulas for calculating minimum safety distances for light curtains mounted vertically are listed below. These formulas apply to ALL light curtains, including perimeter and point of operation light curtains. ANSI B11.1 is listed first, OSHA 29 CFR 1910.217 listed next.

ANSI B11.1:

This formula applies specifically to the guarding of mechanical power presses, but it is typically used on other applications as well.

D_s = $K \times (T_s + T_c + T_r + T_{bm}) + D_{pf}$

D_s = Minimum safe distance between the light curtain sensing area to the nearest point of operation potential hazard.

K = Hand speed constant of 63 inches per second. This is the standard minimum accepted value for both ANSI and OSHA. ANSI recognizes this constant may not be optimal, and that the user should consider all factors before deciding on the value of the K factor to use in the above formula.

T_s = Stop time of the machine (press), as measured from the final control element. It is measured at the maximum velocity of the press, usually at 90° of press rotation on the downstroke.

T_c = Response time of the control circuit to activate the braking system.

NOTE: T_s and T_c are usually measured as one value by a stop time measurement device.

T_r = Response time of the light curtain.

T_{bm} = Additional time allowed for the brake monitor to compensate for wear and variations in the stopping time. Brake monitors will stop the machine (press) when the stop time of the machinery exceeds a pre-set limit.

NOTE: If a brake monitor is not installed on the machine, a factor must to be added to the measured stop time to include brake wear. Generally, brake monitors add approximately 20% to 25% additional stop time. To determine the actual factor to be used, contact machine manufacturer.

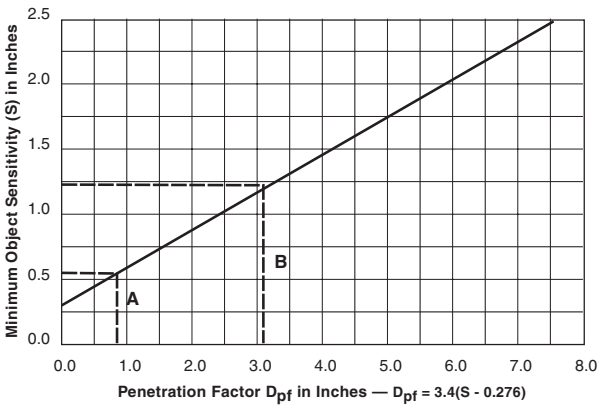
D_{pf} = Penetration depth factor, to provide for possible penetration through the sensing field by fingers or hands before detection occurs. This value is determined by the Penetration Depth Factor Chart from ANSI B11.1 (see Penetration Depth Factor graph below). Alternately, the following ANSI formula can be used: $D_{pf} = 3.4 (S-0.276)$, where S = minimum object sensitivity.

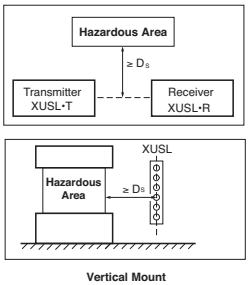
Example: For devices with minimum object sensitivity of 0.55” (14 mm):

$D_{pf} = 3.4 \times (.55-0.276) = 0.94$” (23.88 mm)

For devices with minimum object sensitivity of 1.18” (30 mm):
$D_{pf} = 3.4 \times (1.18-0.276) = 3.07$” (77.98 mm)

Penetration Depth Factor





Vertical Mount

A = Finger Protection 0.55” (14 mm) has a D_{pf} of 0.94” (23.88 mm)
B = Hand Protection 1.18” (30 mm) has a D_{pf} of 3.07” (77.98 mm)

Light curtain application and installation
Minimum safety distances *(continued)*

Minimum Safety Distance *(continued)*

OSHA: CFR 1910.217 (c)(3)(iii)(e)

This formula applies specifically to the guarding of mechanical power presses, but it is typically used on other applications as well.

D_s = 63 in. per second x T_s

Where:

D_s = Minimum safety distance (inches)

63 in. per second = hand speed constant

T_s = Stopping time of the press measured at approximately 90° position of the crankshaft rotation (seconds).

Stop time of the machine (press), as measured from the final control element. It is measured to determine worst case time and maximum velocity of the press. Usually at 90° of press rotation on the downstroke.

In addition to the formula above, we recommend that OSHA 1910.217 Table O-10 be followed. Per OSHA, the table below shows the maximum width of openings allowed for a guard based on the distance from the guard (light curtain) to the point of operation hazard. The maximum width of opening in the table below corresponds to the minimum object sensitivity for a light curtain.

Example:

Using the formula: D_s = 63 in. per second x T_s

if T_s = 0.10 sec

D_s = 63 in. X 0.10 = 6.3 inches

- For an XUSL light curtain with a minimum object sensitivity of 0.55 inches:
- Using the example above, the separation distance from the point of operation hazard to the light curtain would be 6.3” + a minimum distance (from table O-10) of 3.5”, for a total separation distance of 9.8”.
  The 3.5” was chosen from Table O-10 as the additional distance because the opening (minimum object sensitivity) is 0.55”. Since 0.55” is larger than 0.50”, the values for 0.50” cannot be used. Therefore the next larger opening, 0.625”, must be used and the distance corresponding to the 0.625” opening is 3.5”.
- For an XUSL light curtain with a minimum object sensitivity of 1.18 inches:
- Using the example above, the separation distance from the point of operation hazard to the light curtain would be 6.3” + a minimum distance (from table O-10) of 7.5”, for a total separation distance of 13.8”.
- The 7.5” was chosen from Table O-10 as the additional distance because the opening (minimum object sensitivity) is 1.18”. Since 1.18” is larger than 0.875”, the values for 0.875” cannot be used. Therefore the next larger opening, 1.25, must be used and the distance corresponding to the1.25 opening is 7.5”.

NOTE: 3.5 inches = 89 mm, and 7.5 inches = 191 mm.

OSHA 1910.217 Table O-10

Distance of Opening from Point of Operation Hazard (inches)	Maximum Width of Opening (inches)
1/2 to1-1/2	1/4
1-1/2 to 2-1/2	3/8
2-1/2 to 3-1/2	1/2
3-1/2 to 5-1/2	5/8
5-1/2 to 6-1/2	3/4
6-1/2 to 7-1/2	7/8
7-1/2 to 12-1/2	1-1/4
12-1/2 to 15-1/2	1-1/2
15-1/2 to 17-1/2	1-7/8
17-1/2 to 31-1/2	2-1/8

NOTE: If the light curtain is to be used on machinery that will be standardized throughout North America and Europe, then all minimum distance formulas on Calculating Minimum Safety Distances of this catalog (see pages 5/4 through 5/10) must be calculated, and the largest separation distance must be used.

Light curtain application and installation
Minimum safety distances *(continued)*

Light Curtains in Europe (Vertical Mount) — Minimum Safety Distance

The minimum safety distance "D_s" must be calculated using the following General Formula:

$D_s \geq K (t_1 + t_2) + C$

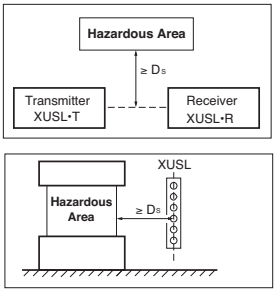
D_s = Minimum safety (separation) distance between the hazardous area and the light curtain.

K = Accepted general approach speed of a body or parts of the body. Generally accepted values are: 63" per second (1600 mm per second).

t_1 = Response time of the light curtain in seconds. This is the total time from detection of a beam broken to the switching of the outputs of the light curtain.

t_2 = The time needed to stop all hazardous movements of the machine in seconds. This information is supplied by the machine manufacturer. It is the time between the stop instruction of the light curtain and the actual stop of the hazardous machine components.

C = Additional safety distance. Generally accepted values are:
0" (0 mm) for 0.55" (14 mm) minimum object sensitivity
5.04" (128 mm) for 1.18" (30 mm) minimum object sensitivity



Vertical Mount

Using Individual Beam Sensors (XPSCM and XU2S Perimeter Light Curtain)

The formula above is modified from a security light curtain where the light beams are all mounted in the same enclosure. Typically, for a system with individual beam sensors up to 4 photoelectric sensors are used.

General Formula: $D_s \geq K (t_1 + t_2) + C$

D_s = Minimum safety (separation) distance between the hazardous area and the light curtain.

K = Accepted general approach speed of a body or parts of the body. Generally accepted values are: 63" per second (1600 mm per second).

t_1 = Response time of the light curtain in seconds. This is the total time from detection of a beam broken to the switching of the outputs of the light curtain.

t_2 = The time needed to stop all hazardous movements of the machine in seconds. This information is supplied by the machine manufacturer. It is the time between the stop instruction of the light curtain and the actual stop of the hazardous machine components.

C = Additional safety distance. Generally accepted values are:
33.5" (850 mm) when using several individual photoelectric beams
47.3" (1200 mm) when using a single photoelectric beam

Presses and New Machines

For presses and new machines put into service in accordance to EEC European Machine Safety Directive 89/392, the following parameters and formulas must be used:

	K: inches (mm)	C: inches (mm) XUSL: 0.55" (14 mm)	C: Inches (mm) XUSL: 1.18" (30 mm)
EN Standards	78.74" (2000 mm)	0	5.04" (128 mm)

Calculations should be made by using the General Formula and parameters "K" and "C" from the table above that correspond to the light curtain being used.

If "D_s" is calculated to be ≤ 19.69" (500 mm), calculate the distance using values from the table above.

If "D_s" is calculated to be > 19.69" (500 mm), the calculation can be re-done using the **Alternate Formula** below. If this formula is used, the value for "D_s" that may be used must be at least 19.69" (500 mm). The **Alternate Formula** is:

For inches: $D_s \geq 63 (t_1 + t_2) + C$

For millimeters: $D_s \geq 1{,}600 (t_1 + t_2) + C$

D_s must be at least 3.94" (100 mm)

Light curtain application and installation
Minimum safety distances *(continued)*

Special Rules for Presses

The European standards specify that only light curtains or mechanical barriers must be used as safety devices so that, if a person enters the protected area while there are hazardous movements, the machine stops as quickly as possible. “Quick Stopping” means stopping of the press ram before the operator can reach the hazardous area, when considering the speed at which an operator can move.

For determining the minimum safety distance for particular machines, refer to the following European standards:

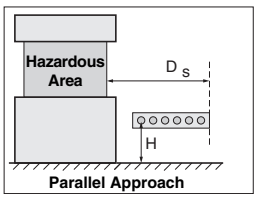
- Mechanical power presses: refer to EN692
- Hydraulic presses, pneumatic folding machines, shears, bending and shaping machines: refer to EN693.

Light Curtains Mounted Horizontally or at an Angle

There are applications which may require the light curtain to be mounted horizontally or at an angle instead of vertically. ANSI and OSHA do not include in their standards requirements when mounting light curtains in the horizontal or angular modes. European Standard EN999 does address this type of application.

When using light curtains at an angle of 30° or greater from horizontal, use the formulas listed in the sections for vertical installations. When using light curtains at an angle of less than 30°, use the formulas below.

Parallel Approach to the Hazardous Area



If the direction of approach is parallel to the detection area, the minimum safety distance “D_s” between the hazardous area and the beam furthest away from the hazardous area, depends on the height “H” at which the light curtain is installed. This safety distance “D_s” must be calculated using the following formula:

For in: $D_s \geq K (t_1 + t_2) + 33.5$

For mm: $D_s \geq K (t_1 + t_2) + 850$ If 34.45” (875 mm) < H ≤ 39.39” (1000 mm)

D_s = Minimum safety (separation) distance between the hazardous area and the light curtain.

K = Accepted general approach speed of a body or parts of the body. Generally accepted values are: 63” per second (1600mm per second).

t_1 = Response time of the light curtain in seconds. This is the total time from detection of a beam broken to the switching of the outputs of the light curtain.

t_2 = The time needed to stop all hazardous movements of the machine in seconds. This information is supplied by the machine manufacturer. It is the time between the stop instruction of the light curtain and the actual stop of the hazardous machine components.

H = Height (distance) of light curtain from floor.

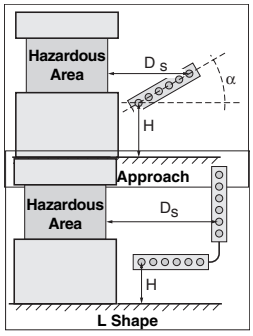
Or the following formula is used:

For in: $D_s \geq 63 (t_1 + t_2) + (47.2 - 0.4H)$

For mm: $D_s \geq 1600 (t_1 + t_2) + (1200 - 0.4H)$ If 0 < H ≤ 34.45” (875 mm)

The maximum allowed height “H” is 39.39” (1000 mm)
Once the height “H” exceeds 11.81” (300 mm), additional protective devices must be used.

Angular Approach to the Hazardous Area



If the operator’s direction of approach and the detection area form an angle α, then the formulas used to calculate the safety distance “D_s” depends on this angle:

- If the angle a is greater than 30°, the formulas used for perpendicular approach (vertical mounting) to the detection area must be used.
- If the angle a is less than or equal to 30°, then the formulas given for the parallel direction of approach (horizontal mounting) to the detection area must be used.

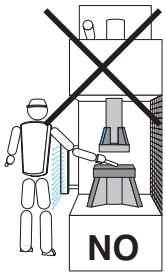
Installation in “L” Shape

This type of installation uses one light curtain mounted vertically and another light curtain mounted horizontally per the diagram to the left. The maximum allowed height “H” is 39.37” (1000 mm). If height “H” is greater than 11.81” (300 mm) additional protective devices must be used. Distance D_s is calculated from the formulas for light curtains mounted vertically (see page).

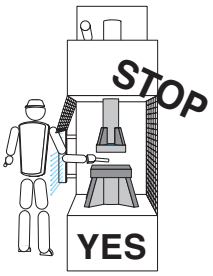
NOTE: Europe uses the symbol “S” instead of “D_s”. This catalog uses the symbol “D_s” for consistency and for ease of understanding.

Light curtain application and installation
Prevention of access to hazardous area

Prevention of access over top of light curtain

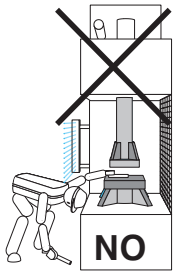


Without additional safety device: insufficient degree of protection

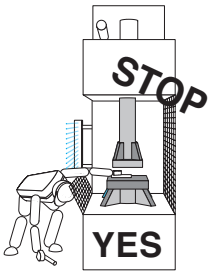


With additional device: light beams broken, the machine stops

Prevention of access from beneath the light curtain

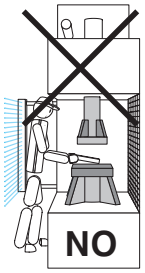


Without additional safety device: insufficient degree of protection

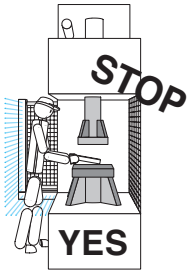


With additional device: light beams broken, the machine stops

Prevention of access from the back of the light curtain



Without additional safety device: insufficient degree of protection



With additional device: light beams broken,the machine stops

Prevention of Access to Hazardous Area

Security light curtains can only be used on machines on which the movement of working components may be s*topped at any time during the hazardous operation phase of the machine*.

These light curtains provide a stop signal, not a control instruction. This stop signal must be stored.

Clearing of the light curtain must not result in restarting of moving parts or hazardous operation.

Subsequent restarting must only be possible by means of deliberate operation of the appropriate control device, or start-up procedure after having checked that there is no longer any hazard.

Electrical interfacing between the security light curtain and the machine circuits must meet all applicable codes where the machine will be used.

Where security light curtains do not provide an adequate degree of protection due to their location, additional suitable safety devices, guards, or additional security light curtains must be used to prevent operators from entering the protective light curtain and reaching the hazardous zone (EN 294, EN 811), or from remaining in the area between the hazardous zone and the security light curtain (EN 999).

The position and size of these additional safety devices must be such that it is *impossible for operators to reach the hazardous zone* in any way whatsoever (over the top, from beneath, from behind or from the side) *without breaking the beams of the light curtain*.

These additional safety devices must be:

- Either fixed
  (if possible, screwed or welded to the machine),
- Or moving
  (with continuous monitoring of their position if they have to open).

It must be impossible for operators to disconnect or turn-off the switching circuits for these additional safety devices.

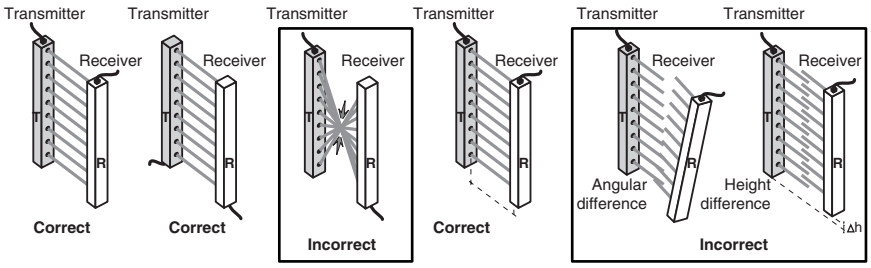
As well as conforming to standards EN 61496 and EN 699, they must also conform to the following European Standards:

- (NF) E 09-010
- DIN 31001
- BS 5304
- EN 294

Light curtain application and installation
Alignment and mutual interference

Light Curtain Alignment

Light curtains need to be firmly and securely mounted to the machine. The diagrams below show correct and incorrect mounting. Incorrect mounting as shown below will not allow correct alignment.



Installation Near Reflective Surfaces

The devices must be installed such that the transmitter and associated receiver are mounted facing each other and correctly aligned for both height and angle.

The effective aperture angle of the optics and transmitter/receiver alignment is 2.5° maximum > 3 m (9.8 ft).

Reflective surfaces located near areas protected by light curtains could interfere with the proper operation of the light curtain. Reflective surfaces may include painted metal, shiny sheet metal, stainless steel, or plastic. These reflective surfaces may allow unwanted stray light rays to “go around” objects entering the sensing area of the light curtain. It is necessary to take into account a minimum distance “D” between the axes of the nearest beam and the reflective surface. This distance is measured from the mid-point between the transmitter and receiver.

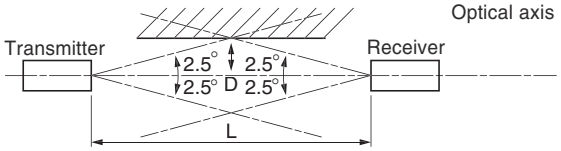
European Standard EN 61496-1 specifies a minimum distance D where:

for 0 < L < 9.84’ (3m), D = 5.16” (131 mm)

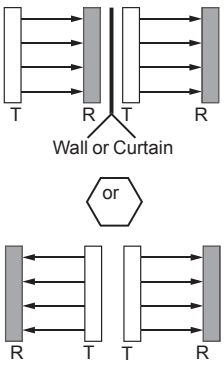
for L > 9.84’ (3m), D = (0.035 x L) + 0.2” (5mm), with a minimum value for D of 5.16” (131mm)

D = minimum distance between the light curtain and reflective surface

L = sensing distance of the security light curtain.



Mutual Interference



Certain configurations may require the installation of 2 (or more) security light curtains side by side.

The products in the XUSL range are designed to provide the user with maximum operating safety (coded infrared light beams).

Setting-up as illustrated to the left is recommended for maximum performance and safety.

Environments Subject to Interference

Industrial applications sometimes place products in extreme operating conditions, due in particular to:

- Electromagnetic interference generated by the close proximity of variable speed controllers, welding machines or walkie-talkies. The products in the XUSL range are designed to be immune to such interference. They conform to:
  - level 3 conforming to EN 61496-1 (fast transient/burst interference),
  - resistance to interference caused by variable speed controllers,
  - resistance to the emissions of walkie-talkies conforming to IEC 61004-3.
- Light interference at a low angle of incidence in relation to the optical axis. The products in the XUSL range are resistant in accordance with IEC 61496-2

Light curtain application and installation
Using mirrors

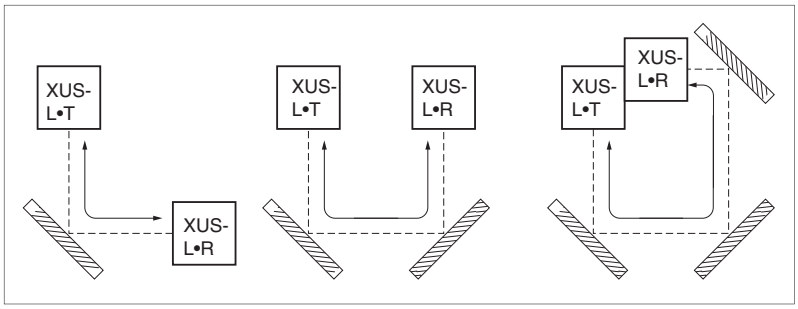
Using Mirrors

It is important to comply with the minimum safety distances throughout the protected area, and around the perimeter where the light curtain beams are being reflected by the mirrors. The distances relating to reflective surfaces must also be calculated and observed.

The use of mirrors will significantly reduce the sensing distance of any light curtain. Each mirror used will further reduce the sensing distance.

Reminder: any contamination on the mirror surfaces, such and dust or dirt, will further reduce the sensing distance. This should be considered when installing a light curtain with mirrors in an area where there will be dust, dirt or other contaminants. More frequent cleaning of the light curtain lenses and the mirrors may be required.

Mirror Configurations



The total nominal range between the transmitter (XUSL•T) and the receiver (XUSL•R) will be reduced according to the number of deflecting mirrors.

Recommended Maximum Range for Glass Mirrors – XUSLB/XUSLD

No. of Mirrors	XUSLB/XUSLDM Range			
	3 m (9.84 ft.)	7 m (21.34 ft.)	8 m (26.25 ft.)	20 m (60.96 ft.)
1	2.6 m (8.66 ft.)	6.2m (18.78 ft.)	7.0 m (23.50 ft.)	17.6 m (53.64 ft.)
2	2.3 m (7.61 ft.)	5.4 m (16.52 ft.)	6.2 m (20.30 ft.)	15.4 m (46.94 ft.)
3	2.0 m (6.69 ft.)	4.8 m (14.54 ft.)	5.5m (17.90 ft.)	13.6 m (41.45 ft.)
4	1.8 m (5.91 ft.)	4.2 m (12.80 ft.)	4.8 m (15.75 ft.)	12 0 m (36.58 ft.)

Recommended Maximum Range for Stainless Steel Mirrors – XUSLB/XUSLD

No. of Mirrors	XUSLB/XUSLDM Range			
	3 m (9.84 ft.)	7 m (21.34 ft.)	8 m (26.25 ft.)	20 m (60.96 ft.)
1	2.5 m (8.07 ft.)	5.7 m (17.50 ft.)	6.6 m (21.50 ft.)	16.4 m (49.99 ft.)
2	2.0 m (6.63 ft.)	4.7 m (14.35 ft.)	5.4 m (17.60 ft.)	13.4 m (40.84 ft.)
3	1.7 m (5.41 ft.)	3.9 m (11.76 ft.)	4.9 m (14.50 ft.)	11.0 m (33.53 ft.)
4	1.4 m (4.46 ft.)	3.2 m (9.65 ft.)	3.6 m (11.90 ft.)	9.0 m (23.43 ft.)

Recommended Maximum Range for Glass Mirrors - XUSLT

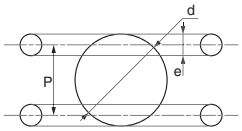
No. of Mirrors	XUSLTQ6••••	XUSLTR5••••	XUSLTY5••••
1	6.6 m (21.65 ft.)	7.9 m (25.9 ft.)	17.6 m (57.74 ft.)
2	5.7 m (18.70 ft.)	6.9 m (22.6 ft.)	15.4 m (50.52 ft.)
3	5.1 m (16.73 ft.)	6.1 m (20.01 ft.)	13.6 m (44.62 ft.)
4	4.5 m (14.76 ft.)	5.4 m (17.71 ft.)	12 m (39.37 ft.)

Recommended Maximum Range for Stainless Steel Mirrors - XUSLT

No. of Mirrors	XUSLTQ6••••	XUSLTR5••••	XUSLTY5••••
1	6.1 m (20.01 ft.)	7.6 m (24.93 ft.)	16.4 m (53.80 ft.)
2	5.0 m (16.40 ft.)	6.0 m (19.68 ft.)	13.4 m (43.96 ft.)
3	4.1 m (13.45 ft.)	4.9 m (16.07 ft.)	11 m (36.09 ft.)
4	3.7 m (12.14 ft.)	4.0 m (13.12 ft.)	9 m (29.52 ft.)

NOTE: When mirrors are used, the effects of vibration will be more noticeable. Proper alignment may require more time in the set-up of the light curtain and the associated mirrors. The mirrors must be firmly and securely mounted and be protected from shock, vibration, and other physical damage.

Light curtain application and installation
MOS and protected height



Minimum Object Sensitivity (MOS)

This is the smallest diameter (object) which a Type 4 security light curtain is capable of detecting.

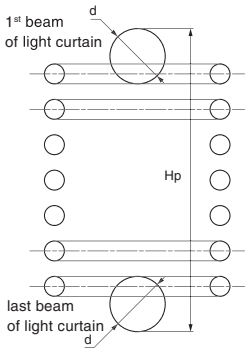
d = P + e

d: minimum object sensitivity

P: distance between the axes of 2 adjacent beams

e: diameter of the beams

XUSL range	P in. (mm)	e in. (mm)	d in. (mm)
Finger protection	0.30" (7.5 mm)	0.26" (6.5 mm)	0.55" (14 mm)
Hand protection	0.63" (16 mm)	0.59" (15 mm)	1.18" (30 mm)



Protected Height (HP)

According to EN 61496, this is the zone (or height) within which an object of equal diameter to the minimum object sensitivity d is always detected.

Test Rod

A test rod is supplied with each XUSL light curtain for the purposes of periodically testing the light curtain for proper operation. A test rod is the appropriate diameter for testing the light curtain it was shipped with.

Light curtain application and installation
Blanking

Blanking

ECS (Blanking)

The feature of blanking or Exact Channel Select (ECS) can be used as an option to disable selected beams or channels in the safety light curtains sensing field. This option is accomplished by blocking the beams or channels at fixed locations in the sensing field. Reasons for using this feature are when a stationary object such as fixtures, conveyors, or tooling obstruct fixed areas of the sensing field. Once the specific beams or channels have been blocked and the blanking feature has been activated, the selected beams must remain blocked. If the obstruction is removed, the light curtain will transmit a stop signal to the machine.

Floating Blanking

Floating blanking is an option for use with ECS (blanking) or as a stand alone feature. Floating blanking provides the ability for up to two beams or channels to be disabled at any position in the sensing field. The two beams or channels disabled with this feature are not fixed at a single position, they are allowed to float through the sensing field.

It is important to follow the instruction manual provided with the safety light curtain when using the ECS (blanking) and floating blanking optional features together.

If the ECS (blanking) or floating blanking feature is active, the minimum safe distance is affected by an increase in the light curtains minimum object sensitivity (MOS). According to the ANSI safety distance formula, if the object sensitivity of the light curtain increases, the minimum safe distance must increase.

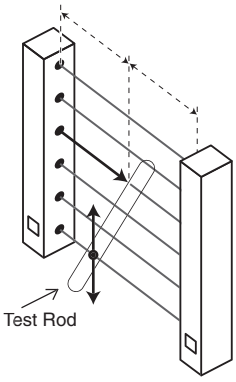
Protection for the Functions of Blanking and Floating Blanking

The functions of ECS/blanking and floating blanking create “holes” in the detection zone. These “holes” are required for certain applications. If an obstruction does not completely fill these “holes” one of two actions will be required:

- The safe mounting distance will need to be increased to account for the larger opening in the detection zone.
- The area not filled by an obstruction must be guarded, typically by some method of hard guarding.

Hard guarding refers to mechanical barriers such as sheet or expanded metal.

Light curtain application and installation
Test procedure



Testing Protected Area of Light Curtain

Test Procedure

Test Procedure for the United States

The tests below must be performed by qualified personnel (per ANSI B30.2 - 1993) at or after the following:

- After installation and before the machine is commissioned,
- At regular inspections determined by the employer,
- After any maintenance, adjustment, or modification to the light curtain or machine,
- After tooling or fixture changes.
- We also recommend the following test procedure be performed daily or at each shift change.

Test procedure:

1. Turn off machine. Turn on light curtain.
2. Check machine to make sure all guarding is firmly in place, operates properly, and the only access to the hazardous area is through the area protected by the light curtain.
3. Check that light curtain mounting meets or exceeds the minimum safety distance from the nearest hazardous area (pinch point). Verify the light curtain is mounted securely to a rigid mounting surface.
4. Check for damage to mounting brackets, mounting surface, wiring, or mirrors (if used). If any damage is found, the machine should be locked out▲ until it is repaired.
5. Verify the operator cannot position themselves between the hazardous area (pinch point) and the light curtain. If this is possible, additional guarding must be installed.
6. Check distance between hazardous area and light curtain sensing area to verify it meets or exceeds the minimum safety distance.
7. Insert test rod (round rod supplied with each XUSL light curtain) into the protected (sensing) area and move the test rod throughout the entire protected area (top, bottom, sides, vertically up & down in the middle of the sensing area).
8. Remove the test rod and start up the machine. With the machine running, insert the test rod into the sensing area and verify the machine stops immediately.
9. With the test rod still in the sensing area, verify the machine cannot be re-started.
10. Remove the test rod from the sensing area and verify the machine cannot be re-started except when the proper start-up sequence has been followed.
11. Check the stopping mechanisms (including brakes) to verify proper working condition.
12. If any of the above tests do not give the indicated results, the machine should be locked out▲ until it is repaired. Then run the above tests again.

▲ Follow OSHA 1910.147 for lock-out/tag-out procedures

European Safety Standards

Introduction - European legislation *6/2*

Industrial accidents. *6/3*

European legislation and the standards *6/4*

Standards to be applied *6/6*

Assessment of machinery related risk *6/8*

Standard to be applied according to the design selected for the machine control system *6/10*

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (SRP/CS). *6/12*

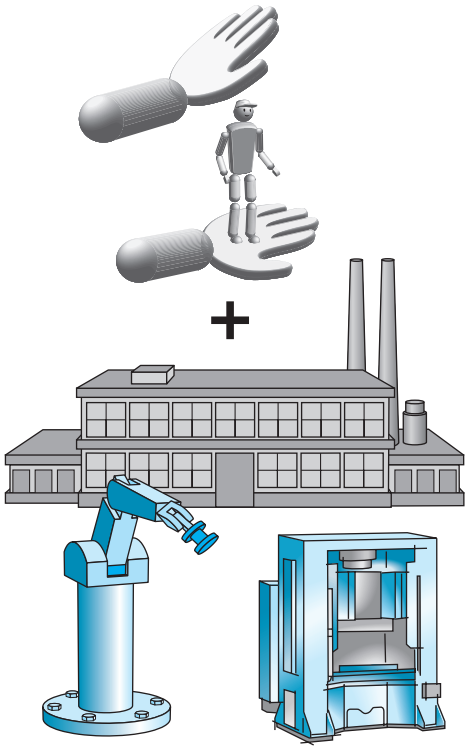
Standard EN/ISO 62061
Machine Safety - Safety related electrical control systems (SRECS) *6/16*

Certification and CE marking. *6/20*

Relays and contactors for use in safety control circuits . . . *6/22*

Additional EU information *6/26*

European safety standards
Introduction - European legislation



Safety and process reliability

Introduction

Safety has become a key issue for businesses.
Social developments in association with technological progress have had a profound impact on legislation and on regulations for the use of building electrical automation equipment.

Social issues

The safety-conscious nature of our western societies has led the legislature to increase the number of requirements and establish stricter rules, while the high cost of accidents has prompted companies to make efforts in the same direction.

Technological issues

■ Increasing levels of automation have led to new restrictions. In some case it is difficult, if not dangerous, to stop a machine suddenly and it is necessary to perform a safe shut down sequence before allowing personnel to enter into a production cell.

■ The increasingly widespread use of electronics and software has required a different approach to the solutions adopted; empirical rules are no longer enough. Selection includes a reliability calculation to determine the behavior of the system.

In this context, the specification and design phase are crucial. Studies show that more than 2/3rds of incidents are due to bad design and inadequate specifications. At this stage it is therefore necessary to estimate potential risks and select the most appropriate solutions to reduce their consequences. Standards are available to assist and guide the designer.
Manufacturers of components and solutions help their customers by offering complete, ready-to-use functions which, when combined in accordance with the regulations, satisfy the customer's needs and meet legislative requirements.

In this chapter, we will present a simplified process. To make a choice, the customer will then be able to refer to the safety functions chapter and to the safety products chapters.

European legislation

European legislation requires that preventive action be taken to preserve and protect the quality of the environment and human health. To achieve these objectives, European Directives have been prepared which must be applied by plant operators and by manufacturers of equipment and machines. It also assigns responsibility for possible accidents.

■ Notwithstanding the constraints, machine safety has the following positive repercussions:
- prevention of industrial accidents,
- protection of workers and personnel by means of suitable safety measures that take into account the machine's application and the local environment.

■ This makes it possible to reduce direct and indirect related costs:
- by reducing physical harm,
- by reducing insurance premiums,
- by reducing production losses and possible delay penalties,
- by limiting damages and costs for maintenance.

■ Safe operation involves two principles: safety and reliability of the process:
- safety is the ability of a device to keep the risk incurred by persons within acceptable limits,
- reliability of operation is the ability of a system or device to perform its function at any moment in time and for a specified duration.

■ Safety must be taken into account right from the beginning of the design stage and kept in place throughout all stages of a machine's life cycle: transport, installation, commissioning, maintenance, dismantling.

European safety standards
Industrial accidents

Industrial accidents

An industrial accident occurs through work or in the workplace and causes minor to serious injury to a person using a machine, feeding it or carrying out special work on it (fitter, operator, maintenance personnel, etc.).

Causes of accidents in the workplace

■ Human-related factors (designers, users):
- poor grasp of machine design,
- over-familiarity with danger through habit and failure to take dangerous situations seriously,
- underestimation of hazards, causing people to ignore safe working procedure,
- loss of concentration on tasks to be performed (e.g. fatigue),
- failure to comply with procedures,
- stressful working conditions (noise, work rates, etc.),
- uncertainty of employment which can lead to inadequate training,
- inadequate or bad maintenance, generating unsuspected hazards.

■ Machine-related factors:
- inadequate guards,
- inherent machine hazards (e.g. reciprocal motion of a machine, unexpected starting or stopping),
- machines not suited to the application or environment (e.g. sound alarms deadened by the noise of surrounding machinery).

■ Plant-related factors:
- movement of personnel from machine to machine (automated production line),
- machinery from different manufacturers and using different technologies,
- flow of materials or products between machines.

Consequences

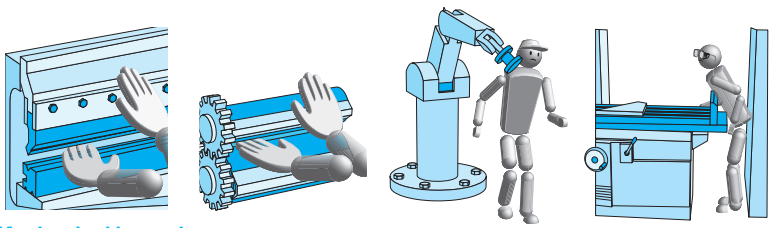
- Risk of varying degrees of physical injury to the user,
- stoppage of the machine involved,
- stoppage of similar machine installations for inspection, for example by health and safety inspectors,
- if necessary, modifications to make machinery safe,
- change of personnel and training new personnel for the job,
- damage to the company brand image.

Conclusion

Damages for physical injuries are equivalent to about 20 thousand million euro paid out each year in the European Union. Decisive action is required to reduce the number of accidents in the workplace. The first essentials are adequate company policies and efficient organisation.
Reducing the number of industrial accidents and injuries depends on the safety of machines and equipment.

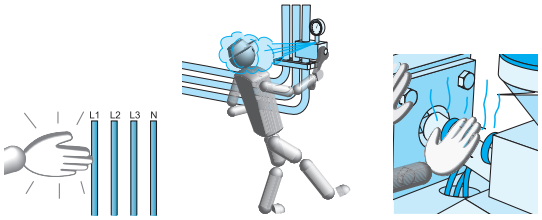
Types of potential hazard

The potential hazards of a machine can be classified into three main groups, as illustrated below:



Mechanical hazards

Puncturing, cutting, shearing, fractures, severing	*Catching, entanglement, drawing in, trapping*	*Impact*	*Crushing*



Electrical hazards **Physical and chemical hazards**

Electric shock, electrocution, burns	*Discharge of dangerous substances*	*Burns*

European safety standards
European legislation and the standards

European legislation and the standards

The main purpose of the Machinery Directive 98/37/EC is to compel manufacturers to provide a minimum safety level for machinery and equipment sold within the European Union. A new version of the Machinery Directive 2006/42/EC will be effective at the end of 2009.

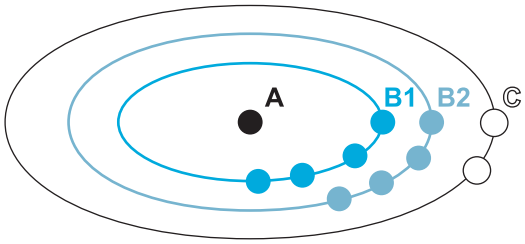
To allow free circulation of machinery within the European Union, the CE marking must be applied to the machine and an EC declaration of conformity is issued to the purchaser. This directive came into effect in January 1995 and has been enforced since January 1997 for all machines.

The user has obligations defined by the Use of Work Equipment directive 89/655/EEC which can in most cases be met by using machinery compliant with relevant standards.
These standards are complex. After a brief presentation of the structure of the standards system, we will provide the reader with a practical guide to the typical standards to be applied according to the selected control system design.

Standards

The harmonized European safety standards establish technical specifications which comply with the minimum safety requirements defined in the related directives. Compliance with all applicable harmonized European standards **can be assumed to provide** compliance with the related directives. The main purpose is to provide a minimum safety level for machinery and equipment sold within the EU market and allow the free circulation of machinery within the European Union.

The 3 groups of European standards



■ Type **A** standards
Basic safety standards which specify the basic concepts, design principles and general aspects valid for all types of machine: e.g. EN/ISO 12100.

■ Type **B** standards
Standards relating to specific aspects of safety or to a particular device that can be used on a wide range of machines.

□ Type **B1** standards
Standards relating to specific safety aspects of machines: e.g. EN/IEC 60204-1 Electrical equipment of machines.

□ Type **B2** standards
Standards relating to specific products such as two-hand control stations (EN 574), guard switches (EN 1088), emergency stops (EN/ISO 13850), etc.

■ Type C standards
Standards relating to various families or groups of machines (e.g.: hydraulic presses EN 693, robots, ...) and giving detailed applicable requirements.

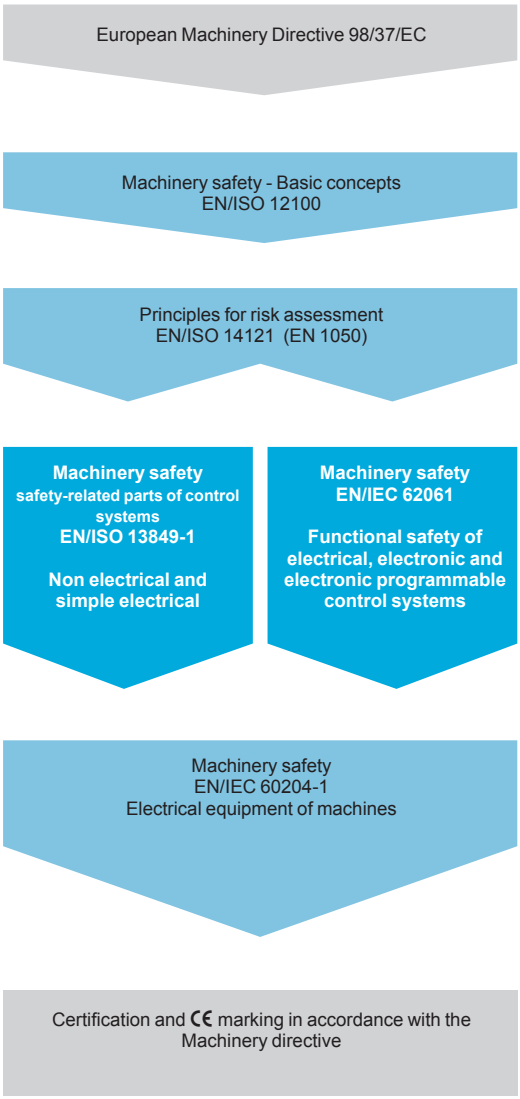
European safety standards
European legislation and the standards
(continued)

European legislation and the standards ***(continued)***

A selection of standards

Standards	Type	Subject
EN/ISO 12100-1 EN/ISO 12100-2	A	Machinery safety - Basic concepts - Part 1: Terminology, methodology, - Part 2: Technical principles
EN/ISO 14121-1 (EN 1050)	A	Machinery safety - Principles for risk assessment
EN 574	B	Two-hand control devices - Functional aspects and design principles
EN/ISO 13850	B	Emergency stop - Principles for design
EN/IEC 62061	B	Functional safety of safety-related electrical, electronic and electronic programmable control systems
EN/ISO 13849-1 (EN 954-1)	B	Machinery safety - Safety-related parts of control systems - Part 1 general principles for design
EN 349	B	Minimum gaps to avoid crushing parts of the human body
EN 294	B	Safety distances to prevent hazardous zones being reached by upper limbs
EN 811	B	Safety distances to prevent hazardous zones being reached by lower limbs
EN 60204-1	B	Machinery safety - Electrical equipment of machines - Part 1: general requirements
EN 999	B	Positioning of protective equipment in respect of approach speeds of body parts
EN 1088	B	Interlocking devices associated with guards - Principles for design and selection
EN/IEC 61496-1	B	Electro-sensitive protective equipment
EN/IEC 60947-5-1	B	Electromechanical control circuit devices
EN 842	B	Visual danger signals - General requirements, design and testing
EN 1037	B	Prevention of unexpected start-up
EN 953	B	General requirements for the design and construction of fixed and movable guards
EN 201	C	Machinery for plastics and rubber - Injection moulding machines - Safety requirements
EN 692	C	Mechanical presses - Safety requirements
EN 693	C	Hydraulic presses - Safety requirements
EN 289	C	Machinery for plastics and rubber - Presses - Safety requirements
EN 422	C	Blow moulding machines for producing hollow parts - Design and construction requirements
EN/ISO 10218-1	C	Manipulating industrial robots - Safety requirements
EN 415-4	C	Safety of packaging machines - Part 4: palletisers and depalletisers
EN 619	C	Safety and EMC requirements for equipment for mechanical handling of unit loads
EN 620	C	Safety and EMC requirements for fixed belt conveyors for bulk material
EN 746-3	C	Industrial thermo processing equipment - Part 3: safety requirements for the generation and use of atmosphere gases

European safety standards
Standards to be applied



Standards to be applied for the design of machines

Standards to be applied
The process

European Machinery Directive 98/37/EC
Compliance with the following standards ensure compliance with the Machinery Directive (a new version of the Machinery Directive 2006/42/EC will be effective in November 2009).

EN/ISO 12100: Basic concept, General principles for design.
See page 6/7.
The purpose of this standard is to provide designers with an overall framework and guidance to enable them to produce machines that are safe for their intended use.

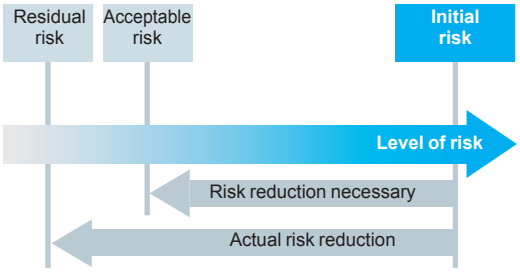
EN/ISO 14121: Principles for risk assessment.
See page 6/8.

Standards to be apply according to the design selected for the Machine control system.
See page 6/10.

EN/IEC 60204-1: Electrical equipment of machines
Standard EN/IEC 60204-1 completes the safety standards by giving setting-up rules for each component of a machine's electrical functions.
It specifies, amongst other things:
- the type of connection terminals and disconnection and breaking devices,
- the type of electric shock protection,
- the type of control circuits,
- the type of conductors and wiring rules,
- the type of motor protection.

See page 6/17.

European safety standards
Standards to be applied *(continued)*



Reduction of risk to an acceptable level

Standards to be applied (continued)

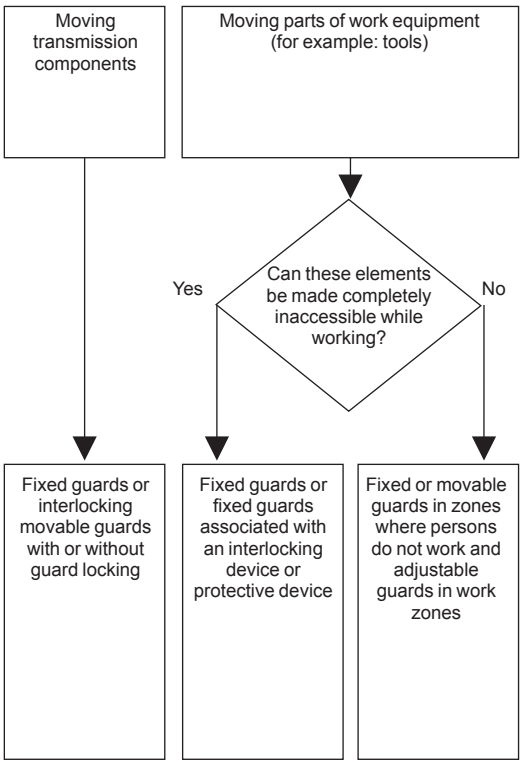
Risk and safety

Safety is the absence of risks which could cause injury to or damage the health of persons. Functional safety is a part of safety that depends on the correct operation of safety functions.

According to the requirements of standard EN/ISO 12100-1, the machine designer's job is to reduce all risks to a value lower than the acceptable risk.
For more details concerning the sources of accidents and risk prevention, the reader is referred on page 6/3.

This standard recognizes two sources of hazardous phenomena:
- moving parts of machines,
- moving tools and/or workpieces.

It gives guidelines for the selection and installation of devices which can be used to protect persons and identifies those measures that are implemented by the machine designer and those dependent on its user.

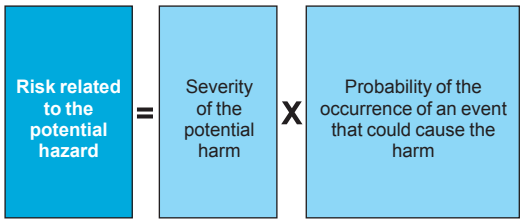


Selection of the protection system (EN/ISO 12100-2)

The measures taken by the machine designer may be:
- inherent in the design,
- selection of guards and additional measures, including control systems,
- information for the user.

The measures taken by the user may be (non-exhaustive list):
- organisation, procedures, etc.,
- personal protective equipment,
- training.

European safety standards
Assessment of machinery related risk



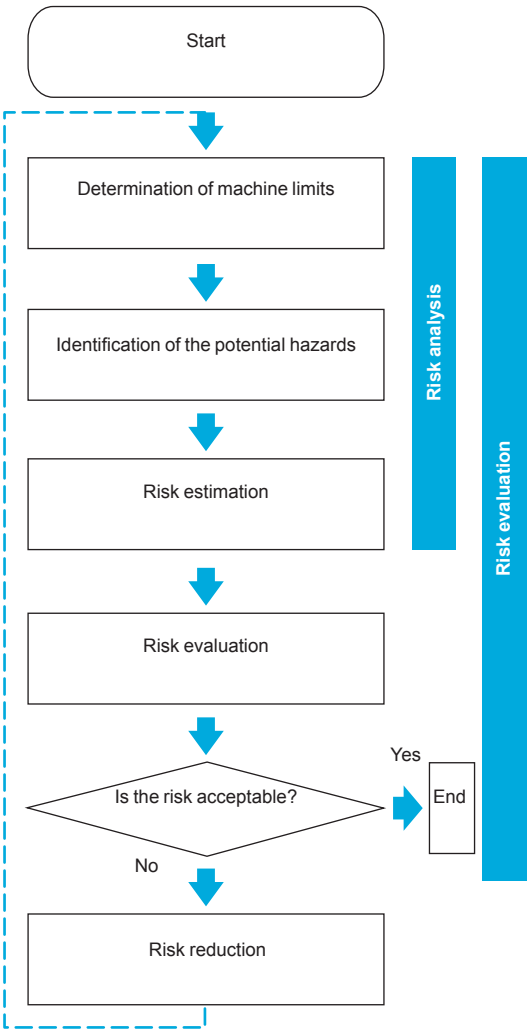
Definition of risk

Assessment of machinery related risk

European legislation

■ Machines are sources of potential risk and the Machinery Directive requires a risk assessment to ensure that any potential risk is reduced to less than the acceptable risk.

Standard EN/ISO 14121 defines risk as follows: risk is the severity multiplied by the possibility of occurrence. It defines an iterative process for achieving machine safety, which states that the risks for each potential hazard can be determined in four stages. This method provides the basis for the requisite risk reduction.



Logic steps for risk analysis

Risk assessment

Risk assessment consists of a series of logic steps which make it possible to systematically analyze and evaluate machinery-related risks.

Risk assessment is followed, whenever necessary, by a reduction of the risk. This definition taken from standard EN/ISO 14121-1 is based on an iterative process represented in the diagram opposite.

Determination of machine limits

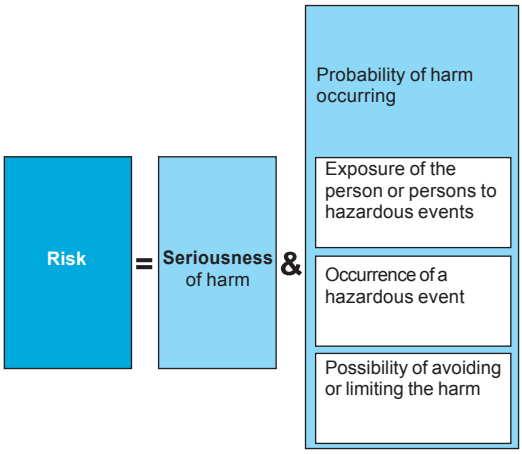
Risk assessment starts by determining the limits of the machine at all stages of its life cycle:
- transport, assembly, installation,
- commissioning,
- use,
- de-commissioning, dismantling.

The use limitations must then be specified:
- operating modes,
- level of training required,
- space limits (amplitude, movement...),
- time limits (life cycle, frequency of maintenance...).

Identification of the potential hazard

If a potential hazard exists, a hazardous phenomenon will cause harm if measures are not taken. All the tasks associated with the machine's life cycle must be identified, such as:
- assembly, transport and installation,
- adjustment, testing,
- learning, programming,
- tool changing,
- feeding, removal of product from the machine,
- starting, stopping,
- emergency stops, restarting after an unexpected stop,
- maintenance, cleaning, etc.

European safety standards
Assessment of machinery related risk *(continued)*



Elements of the risk

Assessment of machinery related risk (continued)

Risk assessment (continued)

Risk estimation

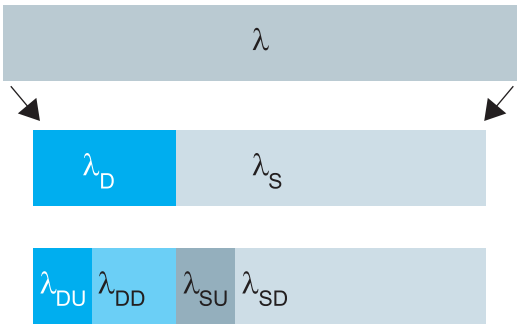
The risk is a function of the severity of the harm and the probability that this harm will occur.

■ The severity of the harm takes into account:
- the severity of injuries (slight, serious, death),
- the extent of the harm (number of persons).

■ The probability of the harm occurring takes into account:
- exposure to the hazard (nature of access, time spent in the hazardous zone, number of persons exposed, frequency of access...),
- the occurrence of a hazardous event (accident history, comparison of risks, ...),
- the possibility of avoiding or limiting the harm (experience, awareness of the risk, ...).

Risk evaluation

On the basis of the risk assessment, the designer has to define the safety related control system. To achieve that, the designer will chose one of the two standards appropriate to the application:
- either standard EN/ISO 13849-1, which defines performance levels (PL),
- or standard EN/IEC 62061, which defines safety integrity levelS (SIL).



λ rate of control system failures
λ_D rate of dangerous failures
λ_{DU} rate of undetected dangerous failures
λ_{DD} rate of detected dangerous failures
λ_S rate of safe failures
λ_S rate of undetected safe failures
λ_S rate of detected safe failures

Breakdown of the probability of failures as defined in IEC 61508

Risk reduction

The process of risk reduction for dangerous events starts by:
- intrinsic prevention (inherently safe design),
- definition of the appropriate protective means (guards, cover, fix fences, ...),
- personal training.

If the selected preventive measure depends on a safety related control system, the designer has to perform an iterative process for the design of the safety relative control system.

■ The first stage is to define the necessary safety-related control functions:
- either through the choice of components,
- or by adapting the control system architecture. Redundancy (double circuit components), for example, significantly increases the reliability of the solution.

■ Once the limits of available technologies have been reached, it will not be possible to further reduce the rate of dangerous failures. To achieve the required level of safety, it will be necessary to use a diagnostic system that allows dangerous failures (per IEC 61508) to be detected.

European safety standards
Standard to be applied according to the design selected for the machine control system

Standard to be applied according to the design selected for the machine control system

Safety standards to be applied according to type of architecture selected

Based on the generic definition of the risk the standards classify levels of risk reduction using different calculation methods, which we will explain in the paragraphs specific to each of these standards.

Two definitions coexist:
- standard EN/ISO 13849-1: PL (Performance Level),
- standard EN/IEC 62061: SIL (Safety Integrity Level).

The table below gives **relations** between these two definitions.

Standard	Definition	Relations				
EN/ISO 13849-1	PL	a	b	c	d	e
EN/IEC 62061	SIL	x	1	1	2	3

In order to be able to select the applicable standard, a common table in both standards gives indications which are summarised in the table below:

Technology used	EN/ISO 13849-1 max. PL	EN/IEC 62061 max. SIL
Non electric only, for example hydraulic	e	Not covered
Including some electromechanical, for example relays and/or non complex electronics	e *(1)*	3
Including complex electronics, for example programmable	e	3

(1) For designated architectures only.

For building specific complex sub-systems or for higher level requirements including software, standard EN/IEC 61508 relating to systems must be used.

European safety standards
Standard to be applied according to the design selected for the machine control system *(continued)*

Standard to be applied according to the design selected for the machine control system *(continued)*

Designing a control system taking into account the requirements of safety standards may seem rather complex. We will guide the reader through this process by presenting:
- the basis and development of the standards,
- the safety standards to be applied according to the type of architecture selected,
- machine equipment and wiring.

Basis and development of the standards

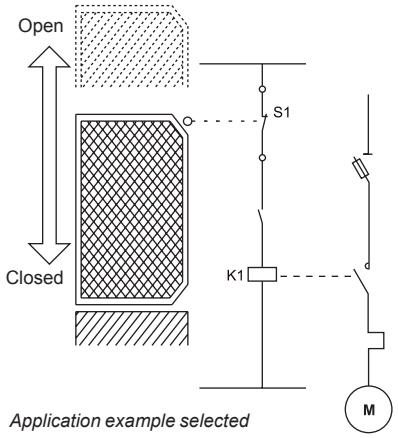
In a complex system, such as a refinery, it is no longer sufficient to consider only the sub-systems to ensure protection; failure of a sub-system could be catastrophic for persons and the environment.
The approach is therefore more global.Taking into account the whole safety life cycle standard EN/IEC 61508 deals with control systems, and includes safety rules, technical specifications, management and training of personnel.

The use of more complex control systems based on electronics and software highlights the weaknesses of standard EN 954-1:
- the reliability of components is not taken into account,
- insufficient requirements for programmable products,
- combining components with a category certification is not enough to “guarantee” the required level of risk reduction.

Based on experience gained with systems, the standards body has, in line with standard EN/IEC 61508, developed standard EN/IEC 62061 which applies the principles of functional safety to the design of control systems for machinery.
This standard offers two important advantages:
- it incorporates the new electronic and electronic programmable technologies to provide the safety functions,
- it is consistent with the basic standard EN/IEC 61508 and is therefore being specified more and more for machines by users.

At the same time, standard EN/ISO 13849-1 will totally replace the standard EN 954-1 in November 2009, which brings several improvements and, above all, is consistent with safety standards in general.

European safety standards
Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (SRP/CS)



Application example selected

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems

Standard EN/ISO 13849-1 is a development of standard EN 954-1. For clarity, only a simplified analysis of this new version will be presented here.

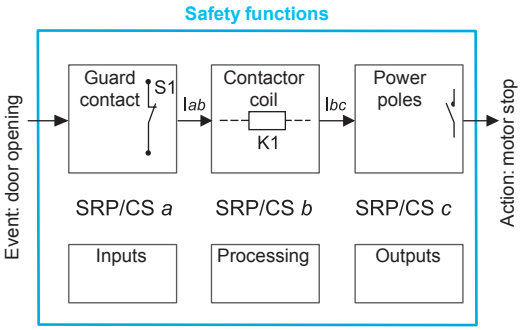
Field of application of the standard

This standard gives safety requirements and advice relating to principles for the design and integration of safety-related parts of control systems (SRP/CS), including software design. For these parts, it specifies the characteristics, including the performance level, needed to achieve these safety functions. It applies to the SRP/CS of all types of machine, regardless of the technology and type of energy used (electric, hydraulic, pneumatic, mechanical, etc.).

Process

Risk assessment as defined in standard EN/ISO 14121 (see page 6/6) leads to decisions on risk reduction measures. If these measures depend on a control system, then EN/ISO 13849-1 can apply. It defines a 6-stage design process.
1 - Selection of the essential safety functions that SRP/CS must perform. For each safety function, specify the required characteristics.
2 - Determine the required performance level (PLr).
3 - Design and technical creation of safety functions: identify the parts that perform the safety function.
Determine the performance level (PL) for all safety-related parts, taking into account all the other criteria.
4 - Evaluate the performance level PL for each safety-related part.
5 - Check that the performance level PL achieved is greater than or equal to the required level (PLr).
6 - Validate to ensure that all requirements are satisfied.

We will now illustrate these stages, taking as an example a safety function that stops operation of a machine motor when a safety guard is opened. The machine is potentially dangerous, there is a risk of the operator's arm being amputated if there is no guard.



Representation of the safety function

Stage 1 - Selection of safety functions
The diagram opposite shows a safety function which consists of several parts:
- the input actuated by opening of the guard (SRP/CSa),
- the control logic, limited in this example to opening or closing of a contactor coil (SRP/CSb),
- the power output that controls the motor (SRP/CSc),
- the connections (Iab, Ibc).

Stage 2 - Estimation of required performance level (PLr)
For our safety function, this is estimated using the risk graph.

The parameters to be considered are:
□ **S** severity of the injury
- S1 slight injury, normally reversible,
- S2 Serious, normally irreversible, including death.

□ **F** frequency and/or duration of exposure to the hazardous phenomenon.
- F1 rare to fairly frequent and/or short duration of exposure,
- F2 frequent to permanent and/or long duration of exposure.

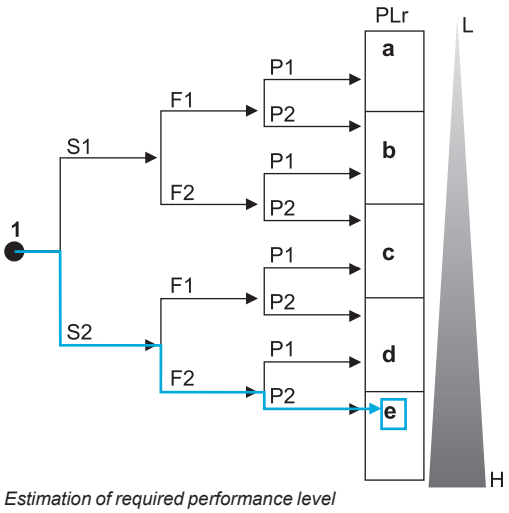
□ **P** possibility of avoiding the hazardous phenomena or limiting the harm.
- P1 possible under certain circumstances,
- P2 virtually impossible.

As a failure of the safety function could result in a serious injury, the estimate (in blue on the drawing on the next page) gives a required performance level PLr = e.

Risk related to the potential hazard	=	Severity of the potential harm	X	Probability of occurrence - frequency and duration of exposure - possibility of avoiding or limiting the probability of the occurrence of an event that could cause the harm

Risk analysis

European safety standards
Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (SRP/CS) *(continued)*



Estimation of required performance level
1: Starting point for estimation
L: Low contribution to risk reduction
PLr: Required Performance Level
H: High contribution to risk reduction
→ : Estimation

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems *(continued)*

Process *(continued)*

Stage 3

Design and creation of the safety functions

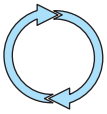
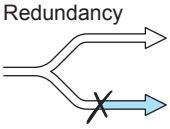
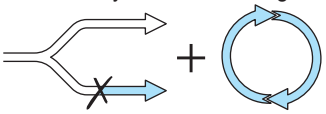
At this point, we need to describe the PL calculation method.
The PL is defined in terms of the probability of a dangerous failure per hour:

PL	Probability of a dangerous failure per hour
a	$\geq 10^{-5} \ldots < 10^{-4}$
b	$\geq 3 \times 10^{-6} \ldots < 10^{-5}$
c	$\geq 10^{-6} \ldots < 3 \times 10^{-6}$
d	$\geq 10^{-7} \ldots < 10^{-6}$
e	$\geq 10^{-8} \ldots < 10^{-7}$

It consists of the following main elements:
- the category of the components used,
- the reliability of the components ($MTTF_d$: mean time to dangerous failure),
- the diagnostic capability DC.

■ Category of components used

The table below summarizes system behavior in the event of a failure, for the 5 categories defined:

	System behavior	Principles to achieve safety
B	A fault can lead to loss of the safety function	Selection of appropriate component
1	As for category B but greater reliability of the safety function required.	Selection of appropriate component
2	A fault can lead to loss of the safety function between two periodic inspections and loss of the safety function is detected by the control system at the next test.	Self-monitoring 
3	For a single fault, the safety function is always ensured. Only some faults will be detected. The accumulation of undetected faults can lead to loss of the safety function.	Redundancy 
4	When faults occur, the safety function is always ensured. Faults will be detected in time to prevent loss of the safety function	Redundancy + Self-monitoring 

■ Reliability of the components

The $MTTF_d$ is the Mean Time To dangerous Failure of the component.
Without going into the suggested calculation methods, we can decide to use the three ranges suggested below:

Reliability levels of components	
Index	**Range**
Low	3 years ≤ $MTTF_d$ < 10 years
Medium	10 years ≤ $MTTF_d$ < 30 years
High	30 years ≤ $MTTF_d$ < 100 years

A $MTTF_d$ of less than 3 years should never be found, because this would mean that after one year in operation, 30% of all those components in use would have failed to a dangerous state. The maximum value is limited to 100 years because devices dealing with a significant risk should not depend on the reliability of a single component. Additional measures such as redundancy and tests are required.

European safety standards
Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (SRP/CS) *(continued)*

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems *(continued)*

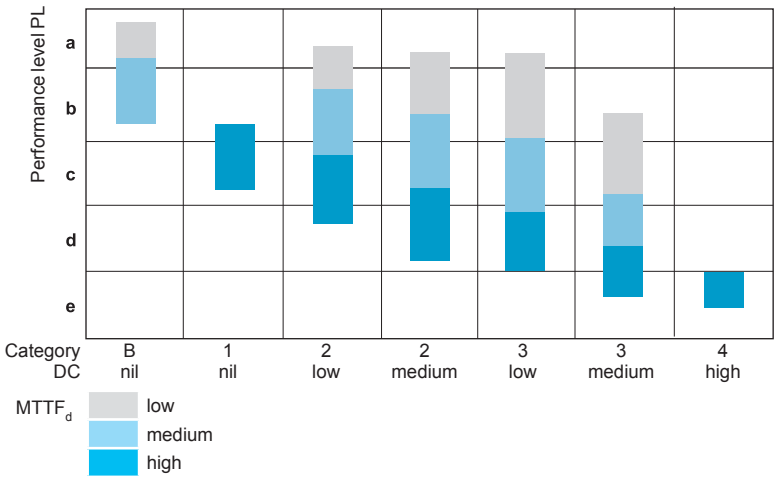
Process ***continued)***

Stage 3- ***(continued)***

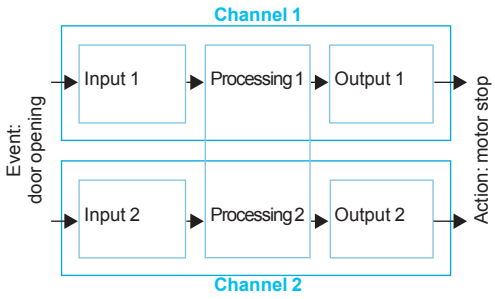
■ Diagnostic capability: this term is expressed as a percentage and quantifies the ability to diagnose a dangerous failure.
For example, in the event of welding of a N.C. contact in a relay, the state of the N.O. contact could incorrectly indicate the opening of the circuit, unless the relay has mechanically linked N.O. and N.C. contacts, when the fault can be detected.
The standard recognizes four ranges:

Diagnostic capability categories	
Index	**Range**
Nil	DC < 60%
Low	60% ⩽ DC < 90%
Medium	90% ⩽ DC < 99%
High	99% ⩽ DC

■ Summary table for the designer: to help the designer make their choice, the following table summarizes the elements of the **PL**.

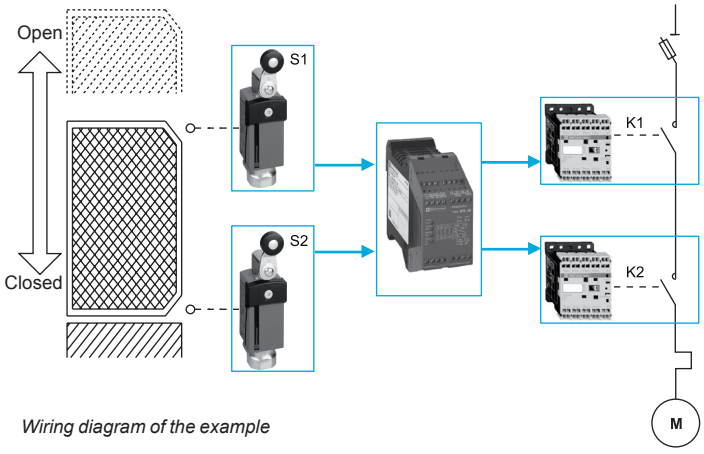


□ In our example, to reach the PL = e, the solution will therefore have to correspond to category 4 with redundant circuit; the function scheme is shown opposite with two channels in parallel,
□ a high diagnostic capability,
□ a high $MTTF_d$.



Functional diagram of the example

For our application, we could suggest a redundant relay scheme but it is nowadays easier to use safety function blocks.
The solution is illustrated below.



Wiring diagram of the example

The process suggested by the standard is iterative and a few estimations are therefore necessary in order to obtain the expected result. In view of the required performance level, we have chosen a solution with redundant circuit.

European safety standards
Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (SRP/CS) *(continued)*

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems *(continued)*

Process *(continued)*

Stage 4 - Evaluate the performance level PL for each safety-related part
Based on the information in the supplier's catalog and Annex E of the standard, we obtain the following values:

Example	B_{10} (number of operations) / % dangerous failure	$MTTF_d$	DC
SRP/CS_a: Safety limit switches	10.000.000 / 20% dangerous failure	7102	99%
SRP/CS_b: XPS AK safety module	-	191.5	99%
SRP/CS_c: LCK contactor	1.000.000 / 73% dangerous failure	194	99%

For electromechanical products,
the $MTTF_d$ is calculated on the basis of the total number of operations that the product can perform, using $\mathbf{B_{10d}}$ values:
In our case, the machine operates for 220 days per year, 8 hours per day with a cycle of 90 s.
N = 220 x 8 x (3600 / 90) = 70 400 operations/year
$MTTF_d = B_{10d} / (0.1 \times N)$ and $B_{10d} = B_{10} / \%$ dangerous failure.

For the safety switches,
the $MTTF_d$ = (1 / 0.20 x 10 000 000) / (0.1) x 70 400 = 284 years
For the contactors,
the $MTTF_d$ = (1 / 0.73 x 1 000 000) / (0.1) x 70 400 = 194 years
The $MTTF_d$ for each channel will then be calculated using the formula:

$$\frac{1}{MTTF_d} = \frac{1}{MTTF_{da}} + \frac{1}{MTTF_{db}} + \frac{1}{MTTF_{dc}}$$

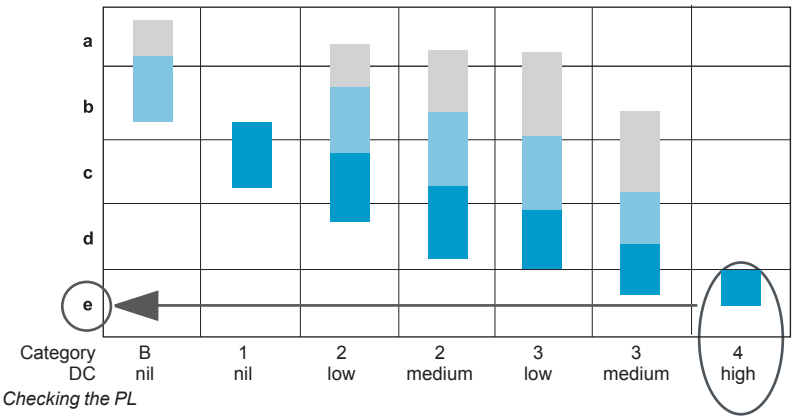
i.e. 95.2 years for each channel.
A similar formula is used to calculate the diagnostic capability

$$DC_{avg} = \frac{\frac{DC_a}{MTTF_{da}} + \frac{DC_b}{MTTF_{db}} + \frac{DC_c}{MTTF_{dc}}}{\frac{1}{MTTF_{da}} + \frac{1}{MTTF_{db}} + \frac{1}{MTTF_{dc}}}$$

The result of the calculation in our example gives a value of 99%

Stage 5 - Checking that required performance level is achieved
The result of the above calculations is summarized below:
- a redundant architecture: category 4,
- a mean time to failure > 30 years: high $MTTF_d$,
- a diagnostic capability of 99%: high DC.

Looking at this table, we confirm that **PL** level **e** is achieved:



Checking the PL

Stage 6 - Validation of the required performance level
The design of SRP/CS must be validated and must show that the combination of SRP/CS performing each safety function satisfies all the applicable requirements of EN/ISO 13849.

European safety standards
Standard EN/IEC 62061
Machinery safety - Safety-related electrical control systems (SRECS)

Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS)

Functional Safety of safety-related electrical, electronic and electronic programmable control systems

Field of application of the standard

Safety-related electrical control systems in machines (**SRECS**) are playing an increasing role in ensuring the overall safety of machines and are more and more frequently using complex electronic technology.

This standard is specific to the machine sector within the framework of EN/IEC 61508. It gives rules for the integration of sub-systems designed in accordance with EN/ISO 13849. It does not specify the operating requirements of non-electrical control components in machines (for example: hydraulic, pneumatic).

Functional approach to safety

As with EN/ISO 13849-1, the process starts with analysis of the risks (EN/ISO 14121) in order to be able to determine the safety requirements. **A particular feature of this standard is that it prompts the user to make a functional analysis of the architecture, then split it into sub-functions and analyse their interactions before deciding on a hardware solution for them (the SRECS)**.

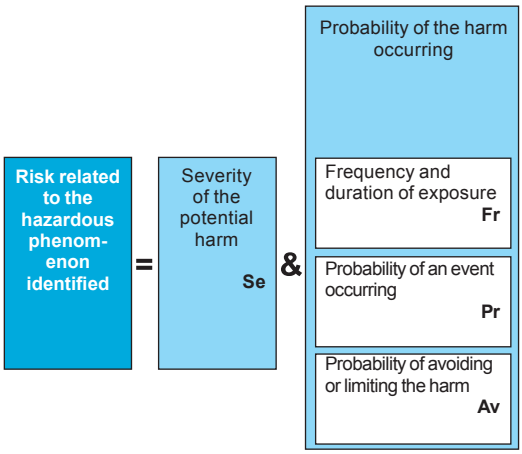
■ A functional safety plan must be drawn up and documented for each design project. It must include:
□ a specification of the safety requirements for the safety functions (**SRCF**) that is in two parts:
- a description of the functions and interfaces, operating modes, function priorities, frequency of operation, etc.
- specification of the safety integrity requirements for each function, expressed in terms of SIL (Safety Integrity Level).
The table below gives the target maximum failure values for each level.

SIL	Probability of a dangerous failure per hour (PFHd)
3	$\geqslant 10^{-8} ... < 10^{-7}$
2	$\geqslant 10^{-7} ... < 10^{-6}$
1	$\geqslant 10^{-6} ... < 10^{-5}$

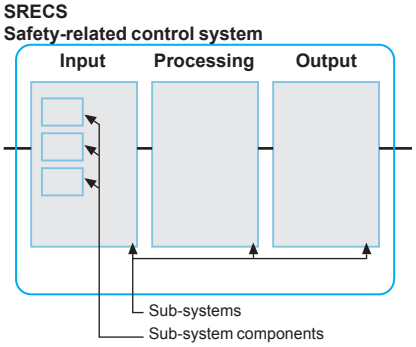
□ The structured and documented design process for electrical control systems (**SRECS**),
□ the procedures and resources for recording and maintaining appropriate information,
□ the process for management and modification of the configuration, taking into account organisation and authorised personnel,
□ the verification and validation plan.

■ Functional safety
The decisive advantage of this approach is that of being able to offer a failure calculation method that incorporates all the parameters that can affect the reliability of electrical systems, whatever the technology used.
The method consists of assigning a SIL to each function, taking into account the following parameters:
- the probability of a dangerous failure of the components (PFHd),
- the type of architecture; with or without redundancy, with or without diagnostic device making it possible to avoid some of the dangerous failures,
- common cause failures (power cuts, overvoltage, loss of communication network, etc.) (CCF),
- the probability of a dangerous transmission error where digital communication is used,
- electromagnetic interference (EMC).

European safety standards
Standard EN/IEC 62061
Machinery safety - Safety-related electrical control systems (SRECS) *(continued)*



Risk assessment parameters



***Stage 1**: Basic structure of the electrical control system*

Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS) *(continued)*

Process

Designing a system is split into 5 stages after having drawn up the functional safety plan:
1 - based on the safety requirements specification (**SRS**), assign a safety level (**SIL**) and identify the basic structure of the electrical control system (**SRECS**), describe each related function (**SRCF**),
2 - break down each function into a function block structure (**FB**),
3 - list the safety requirements for each function block and assign the function blocks to the sub-systems within the architecture,
4 - select the components for each sub-system,
5 - design the diagnostic function and check that the specified safety level (**SIL**) is achieved.
We will retain the previous example which consists of stopping the operation of a motor when the safety guard is opened. In the event of an incident, there is a risk of an harm being amputated or fracture of a limb.

■ **Stage 1** - Assign a safety integrity level (**SIL**) and identify the structure of the **SRECS**
Based on the risk assessment performed in accordance with standard EN/ISO 14121, estimation of the required **SIL** is performed for each hazardous phenomenon and is broken down into parameters, see illustration opposite.

□ Severity **Se**
The severity of injuries or damage to health can be estimated by taking into account reversible injuries, irreversible injuries and death.
The classification is shown in the table below.

Consequence	Severity Se
Irreversible: death, loss of an eye or an arm	4
Irreversible: shattered limb, loss of a finger	3
Reversible: requires the attention of a medical practitioner	2
Reversible: requires first aid	1

□ Probability of the harm occurring
Each of the three parameters **Fr**, **Pr**, **Av** must be estimated separately using the most unfavourable case. It is strongly recommended that a task analysis model be used in order to ensure that estimation of the probability of the harm occurring is correctly taken into account.
- Frequency and duration of exposure Fr

The level of exposure is linked to the need to access the hazardous zone (normal operation, maintenance, ...) and the type of access (manual feeding, adjustment, ...). It must then be possible to estimate the average frequency of exposure and its duration.
The classification is shown in the table below:

Frequency of dangerous exposure	Fr
≤ 1 hour	5
>1 hour... ≤ 1 day	5
> 1 day... ≤ 2 weeks	4
2 weeks... ≤ 1 year	3
> 1 year	2

- Probability of occurrence of a hazardous event Pr.

Two basic concepts must be taken into account:
- the predictability of the dangerous components in the various parts of the machine in its various operating modes (normal, maintenance, troubleshooting), paying particular attention to unexpected restarting,
- behaviour of the persons interacting with the machine, such as stress, fatigue, inexperience, etc.

Probability of occurrence of a dangerous event	Pr
Very high	5
Probable	4
Possible	3
Almost impossible	2
Negligible	1

European safety standards
Standard EN/IEC 62061
Machinery safety - Safety-related electrical control systems (SRECS) *(continued)*

Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS) *(continued)*

Process *(continued)*

■ **Stage 1** *-(continued)*

- Probability of avoiding or limiting the harm Av.

This parameter is linked to the design of the machine. It takes into account the suddenness of the occurrence of the hazardous event, the nature of the dangerous component (cutting, temperature, electrical) and the possibility for a person to identify a hazardous phenomenon.

Probability of avoiding or limiting the harm	Av
Impossible	5
Almost impossible	3
Probable	1

□ Assignment of the **SIL**

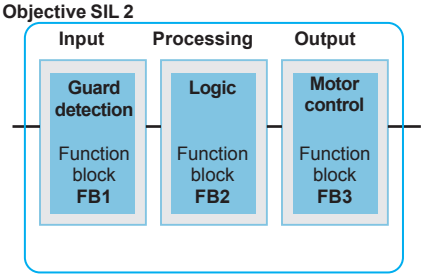
Estimation is made with the help of the table below.
In our example, the degree of severity is 3 because there is a risk of a finger being amputated; this value is shown in the first column of the table.
All the other parameters must be added together in order to select one of the classes (vertical columns in the table below), which gives us:
Fr = 5 accessed several times a day
Pr = 4 hazardous event probable
Av = 3 probability of avoiding almost impossible
Therefore a class Cl = 5 + 4 + 3 = 12
A level of SIL 2 must be achieved by the safety-related electrical control system(s) (**SRECS**) on the machine.

Estimation of the SIL

Se	Class Cl				
	3-4	5-7	8-10	11-13	14-15
4	SIL 2	SIL 2	SIL 2	SIL 3	SIL 3
3	-	-	SIL 1	SIL 2	SIL 3
2	-	-	-	SIL 1	SIL 2
1	-	-	-	-	SIL 1

□ Basic structure of the **SRECS**

Without going into detail about the hardware components to be used, the system is broken down into sub-systems. In our case, we find the 3 sub-systems that will perform the input, processing and output functions. The figure opposite illustrates this stage, using the terminology given in the standard.



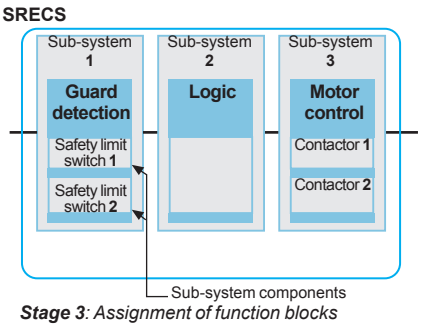
***Stage 2**: Break down into function blocks*

■ **Stage 2** - Break down each function into a function block structure (**FB**)

A function block (**FB**) is the result of a detailed break down of a safety-related function.
The function block structure gives an initial concept of the SRECS architecture. The safety requirements of each block are deduced from the specification of the safety requirements of the system's function.

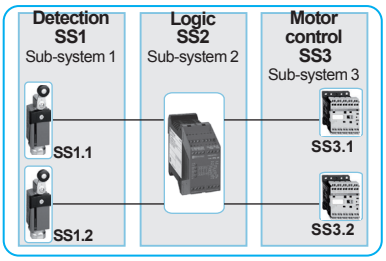
■ **Stage 3** - List the safety requirements for each function block and assign the function blocks to the sub-systems within the architecture

Each function block is assigned to a sub-system in the SRECS architecture. A failure of any sub-system will lead to the failure of the safety-related control function. More than one function block may be assigned to each sub-system. Each sub-system may include sub-system elements and, if necessary, diagnostic functions in order to ensure that anomalies can be detected and the appropriate action taken.
These diagnostic functions (D) are considered as separate functions; they may be performed within the sub-system, by another internal or external sub-system.

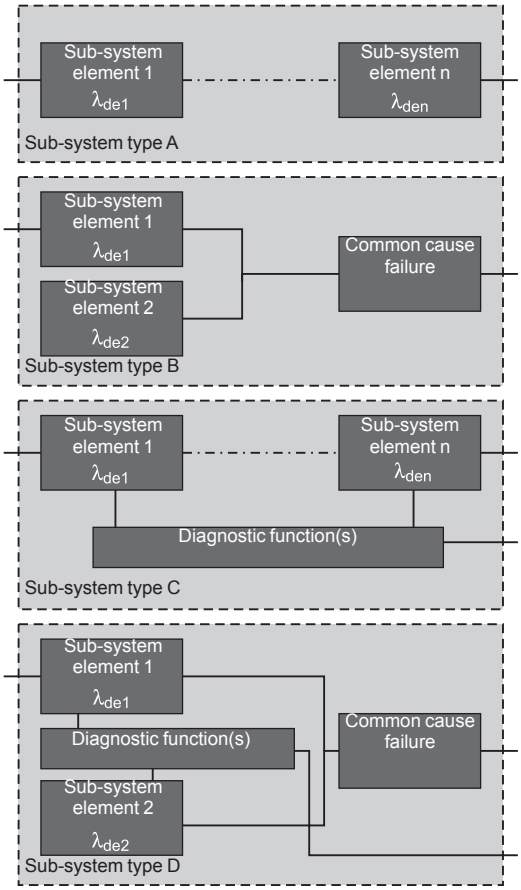


***Stage 3**: Assignment of function blocks*

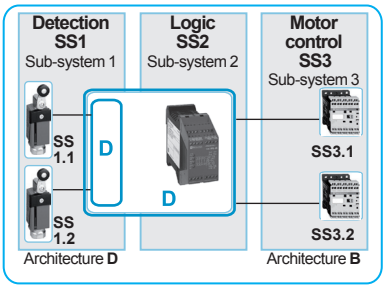
European safety standards
Standard EN/IEC 62061
Machinery safety - Safety-related electrical control systems (SRECS) *(continued)*



***Stage 4**: Component selection*



Types of sub-system architecture



***Stage 5**: Design of the diagnostic function*

Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS) *(continued)*

Process *(continued)*

■ **Stage 4** - Select the components for each sub-system

The products shown in the illustration opposite are selected. If the sensors and contactors are the same as in the previous example, a safety module XPS AK will be chosen. The cycle in this example is 450s which means the duty cycle **C** is 8 operations per hour.

As the safety integrity level required for the entire system is SIL 2, each of the components must achieve this level.
The manufacturer's catalogue gives the following values:
Safety limit switches 1 and 2: B_{10} = 10 000 000 operations, the proportion of dangerous failures is 20%, lifetime is 10 years.
- Safety module: $PFH_d = 5.96\ 10^{-9}$
- Contactors 1 and 2: B_{10} = 1 000 000 operations, the proportion of dangerous failures = 73%, lifetime is 20 years.

■ **Stage 5** - Design the diagnostic function

The SIL of the sub-system depends not only on the components, but also on the architecture selected. For our example, we will choose architectures B and D of the standard.
In our architecture, the safety module performs diagnostics not only on itself, but also on the safety limit switches.

We have three sub-systems for which the safety levels must be determined:
□ SS1: two redundant safety limit switches in a sub-system with a type D architecture,
□ SS2: a SIL 3 safety module (obtained on the basis of the PFH provided by the manufacturer),
□ SS3: two redundant contactors built in accordance with a type B architecture.

The calculation method is quite complex, so we will only give the final result. This method takes into account the following parameters:
- B_{10}: number of operations at which 10% of the population fail
- C: Duty cycle (number of operations per hour)
- λ_D: rate of dangerous failures ($\lambda_D = \lambda$ x portion of dangerous failures in %)
- □: common cause failure coefficient, which is 10 % here and 10% is the worst case: see Annex F.
- T1: Proof Test Interval or life time whichever is smaller, as provided by the supplier
- T2: diagnostic test interval
- DC: Diagnostic coverage rate = λ_{DD}/λ_D, ratio between the rate of detected failures and the rate of dangerous failures.

We obtain:
- for SS1 $PFH_d = 1.6\ E^{-9}$
- for SS3 $PFH_d = 1.07\ E^{-7}$

The total probability of dangerous failures per hour is:
- $PFH_{DSRECS} = PFH_{DSS1} + PFH_{DSS2} + PFH_{DSS3}$
- $PFH_{DSRECS} = 1.6\ E^{-9} + 5.96\ 10^{-9} + 1.07\ E^{-7} = 1.14\ E^{-7}$

Which corresponds to the expected result (table below) of a SIL = 2 .
Comment: A level of SIL 3 could have been achieved by using mirror contacts to create a feedback loop on the contactors, i.e. a sub-system architecture type D.

Checking the required SIL	
SIL	**Probability of dangerous failures per hour (PFHd)**
3	⩾ 10^{-8} ... < 10^{-7}
2	**⩾ 10^{-7} ... < 10^{-6}**
1	⩾ 10^{-6} ... < 10^{-5}

European safety standards
Certification and CE marking

Certification and CE marking

There are 6 stages in the process for certification and affixing of the CE marking on machines:
1 - apply all the relevant directives,
2 - conform to the essential health and safety requirements,
3 - draw up the technical documentation,
4 - if applicable proceed with the conformity examination,
5 - draw up the Declaration of Conformity,
6- affix the CE marking.

The Machinery Directive

The Machinery Directive is an example of the “New approach” for the harmonization of products in terms of technical specifications and standards. It is based on:
- essential health and safety requirements which must be complied with before the machine is put on the market,
- a voluntary harmonisation process of standards undertaken by the European Standards Committee (CEN) and the European committee for electro-technical standardisation (CENELEC).
- conformity of evaluation procedures adapted to the types of risk and associated with machine types,
- the CE marking, affixed by the manufacturer to indicate that the machine conforms to the applicable directives; machines bearing this marking can circulate freely within the European Union.

The directive has considerably simplified the multiple national legislations which were in force and has therefore removed many barriers which made trading difficult in the European Union. This has also made it possible to reduce the social cost of accidents. The directives do not apply to pre-existing machines within the EU unless they are substantially modified.
A list of the machines requiring special attestation procedures can be found in the Machinery Directive Annex 4.

The essential requirements

Annex I of the Machinery Directive groups together the essential health and safety requirements, for putting machines and safety components on the market and into service in Europe.
It follows that:
- if all the requirements of the directive are complied with, no member state of the European Union can oppose circulation of this product.
- if the requirements of the directive are not complied with, putting the product on the market may be prohibited or withdrawal of the product from the market may be required.

In the European Union, this concerns not only manufacturers or their distributors, but also importers and resellers who import these machines or put them into service. Second-hand machines within the EU are not covered, but used machines that have been modified or refurbished can be considered to be new machines.

The harmonized standards

The simplest way to demonstrate conformity with the directives is to conform to the European Harmonized Standards. When, for a product listed in Annex 4 of the Machinery Directive, there is no harmonized standard, or the existing standards are not relevant to cover the essential health and safety requirements, or if the manufacturer considers that these standards are not applicable to their product, they can apply for approval by an outside Notified Body.

These bodies are approved by the Member States after having shown that they have the recognized expertise to give such an opinion (TÜV, BGIA, INRS, BSI Product Services, etc.).

Although the Notified Body has a certain number of responsibilities under the Directive, it is always the manufacturer or their representative who remain responsible for conformity of the product.

European safety standards
Certification and CE marking *(continued)*

Certification and CE marking *(continued)*

Declaration of conformity

In accordance with Article 1 of the Machinery Directive, the manufacturer or their authorized representative established in the European Union must draw up a European Declaration of Conformity for each machine (or safety component). This is in order to certify that the machine or safety component conforms to the Directive.
Before putting a product on the market, the manufacturer or their representative must be able to prepare a technical file.

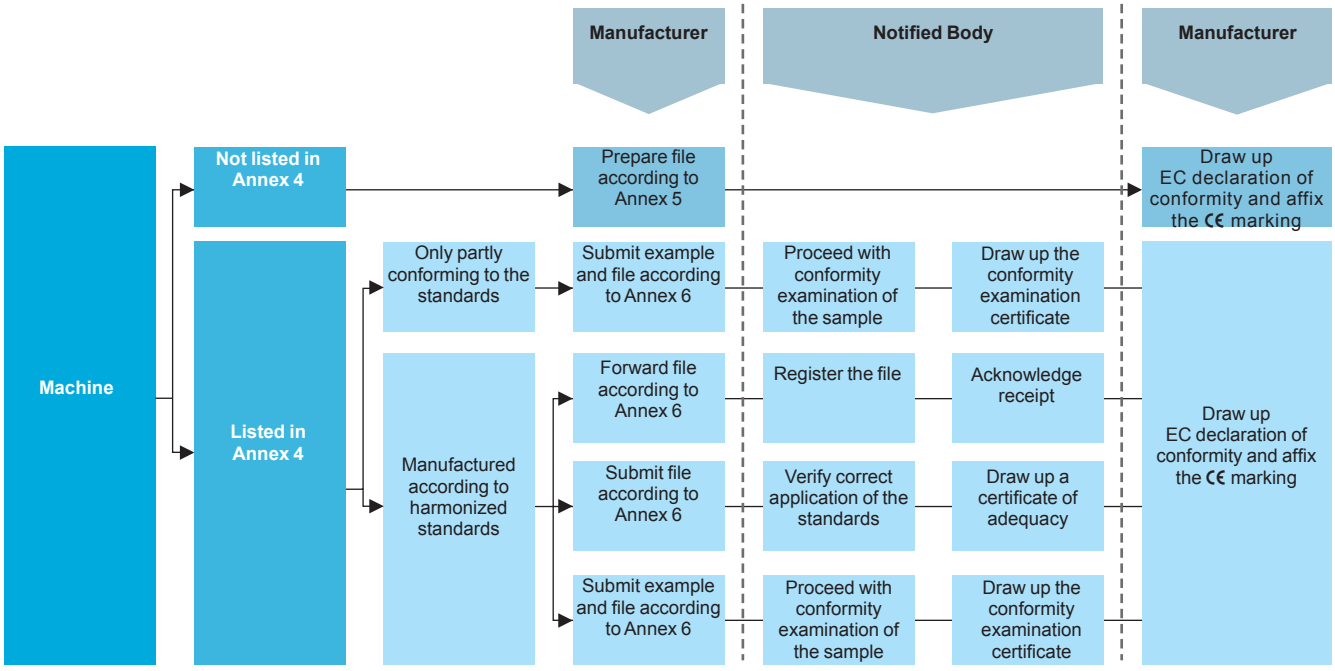
CE marking

Finally, the CE mark must be affixed to the machine by the manufacturer or their authorized representative in the European Union. This marking has been obligatory since 1st January 1995 and can only be affixed if the machine conforms to all the applicable directives, such as:
- the Machinery Directive 98/37/EC,
- the Electromagnetic Compatibility (EMC) directive 2004/108/EC,
- the Low Voltage Directive 2006/95/EC.

There are other directives such as the protection of persons, lifts, medical equipment, etc., which may also be applicable.

The CE marking is the machine's passport in the European Union, which allows it to be marketed in all countries within the Union without taking into account regulations in each individual country.

CE marking procedure



European safety standards
Relays and contactors for use in safety control Circuits with PREVENTA™ safety relays

Safety category requirements for relays and contactors

The overall safety category of a safety circuit depends on the components used in the circuit and the method of wiring. The actual maximum category possible for the safety control circuit may be reduced based on the components chosen. The relays or contactors used in a safety circuit, as well as how they are wired, can significantly affect the overall safety category. Relays and contactors used in the safety circuits must use linked contacts. While there are many relays and contactors available with linked contacts, a majority of them are suitable for use only in category 3 safety circuits – they are not suitable for category 4 circuits (per EN 954-1 and EN 13849-1). It is recommended that customers use relays and contactors suitable
for use in category 4 circuits as these devices can be used in any safety circuit and eliminate any concern about the devices suitability for the safety circuit desired, whether Category 3 or 4.

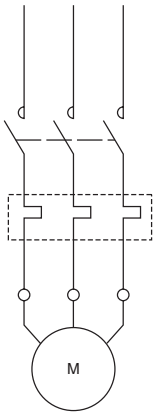
All of the relays and contactors referenced on these pages are suitable for category 4 safety circuits.

The wiring of the safety circuit also affects the overall safety level of the installation. The following needs to be considered when designing a safety circuit:

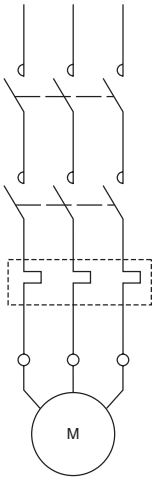
To meet the requirements of Category 3 per EN 954-1 and EN 13849-1 (These standards deal with safety related parts of control systems), the output devices must be redundant - meaning there must be two relays or contactors in series controlling the load which can cause a hazardous movement. Using only one relay or contactor will reduce the control system to a maximum Category 2.

To meet the requirements of Category 4 per EN 954-1 and EN 13849-1, the requirements for Category 3 need to be met, plus one of the N.C. auxiliary contacts from each of the two relays or contactors in series must be wired in series in the feedback loop. Without both of these N.C. contacts wired in series in the feedback loop, the control system is reduced to a maximum Category 3. The auxiliary contacts of the relays or contactors also need to be linked contacts in conjunction with the power contacts of the relay or contactor to be suitable for Category 4. Even if there are two relays or contactors wired in series and a feedback loop is wired to the safety relay, if the contacts in the feedback loop are not linked contacts with the contacts wired to the load, the maximum category of the safety circuit is now reduced to a maximum Category 3.

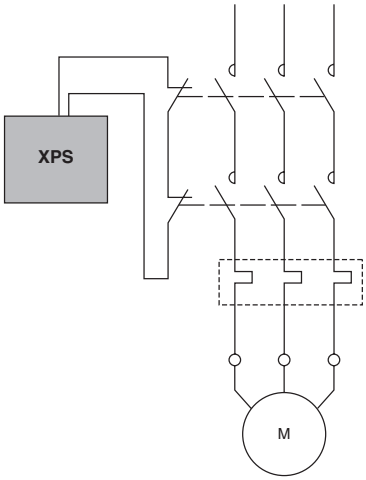
The TeSys IEC contactors and 8501 Type X relays shown on the next few pages are suitable for use in safety circuits to category 4 per EN 954-1 and EN 13849-1 in the configurations listed. This is a brief listing and many more devices that meet category 4 are available. The TeSys contactors should be your first choice in any application, as they can be used for both standard control and safety related applications - for no additional cost.



Maximum Category 2 only



Meets Category 3 requirements for output portion of circuit



Meets Category 4 requirements for output portion of circuit

European safety standards
Relays and contactors for use in safety control Circuits with PREVENTA™ safety relays



TeSys IEC contactors for category 4 safety circuits per EN 954-1 and EN 13849-1

Below is a listing of just some of the devices suitable for category 4 safety circuits, many more devices are available. Contact us for additional devices for your application.

TeSys D Contactors (9 - 65 Amps)
Designed to start motors up to 80 A (60 hp @ 460 V), D-Line Contactors offer high reliability and long electrical and mechanical life. The industry's most complete selection of accessories including auxiliary contacts, timers, and electronic interface modules.

TeSys D (9 - 32 Amps)

All TeSys D contactors (including AC and standard DC) have mechanically-linked power contacts and are suitable for use in safety circuits through Category 3 per EN 954-1. When used with LADN•• auxiliary contacts, the combination of contactor and auxiliary contacts below meet the requirements of IEC 60947-5-1 and are suitable for use in safety circuits through Category 4 per EN 954-1 and EN 13849-1:

LC1D•••• plus LADN••
LC2D•••• plus LADN••

On contactors up to 32 A, the use of the internal auxiliary N.C. contact on the devices below also meet IEC 60947-5-1 and are suitable for use in safety circuits through Category 4 per EN 954-1 and EN 13849-1:

LC1D••••••
LC2D••••••

European safety standards
Relays and contactors for use in safety control Circuits with PREVENTA™ safety relays



TeSys IEC relays for category 4 safety circuits per EN 954-1 and EN 13849-1

Below is a listing of just some of the devices suitable for category 4 safety circuits, many more devices are available. Contact us for additional devices for your application.

TeSys D Relays
TeSys D 10 amp 600 volt industrial control relays are available in fixed contact arrangements up to 9 poles. Two or four pole adder decks in a combination of NO and NC contacts can be snapped on to the basic five pole relay. TeSys D relays are built to a design specification of 30,000,000 mechanical operations.

TeSys D

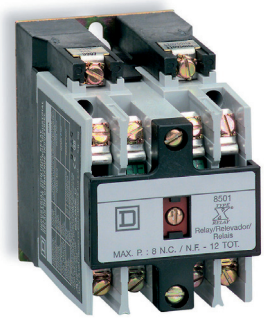
The contacts of the relays below meet IEC 60947-5-1 and are suitable for use in safety circuits through Category 4 per EN 954-1 and EN 13849-1:

CADN32••
CADN50••

These relays can also be used with the following auxiliary contact blocks and all of the resulting contacts also meet the requirements of IEC 60947-5-1 and are suitable for use in safety circuits through Category 4 per EN 954-1 and EN 13849-1:

LADN••

European safety standards
Relays and contactors for use in safety control
Circuits with PREVENTA™ safety relays



NEMA type relays for category 4 safety circuits per EN 954-1 and EN 13849-1

Type X Relays

Class 8501 Type X relays combine a rugged, heavy duty design with modular construction for greater flexibility. They are ideal for those applications where long life, high reliability and ease of maintenance are important. The Type X family offers a complete line of relays and accessories for all control applications. The basic relay has room for up to 4 convertible contact cartridges. It can be expanded to 6 or 8 poles by installing an adder deck. A 10 or 12 pole relay can be built by adding a second adder deck.

All Type X relays and adder blocks have mechanically-linked power contacts. When a Type X relay is used with any of the adder blocks, the combination of relay and additional contacts meet the requirements of IEC 60947-5-1:

Type X AC Relays

AC control relays below meet the requirements of IEC 60947-5-1 and are suitable for use in safety circuits through Category 4
per EN 954-1:

XO00••
XO20••
XO30••
XO40••
XO60••
XO80••
XO1000••
XO1200••

AC Master relays meet IEC 60947-5-1 and are suitable for use in safety circuits through Category 4 per EN 954-1:

XMO20••
XMO40••
XMO60••

The above Type X relays can be used with either the 8501 Type XB20 or XB40 adder decks and meet the requirements of IEC 60947-5-1. Logic reed contact blocks can be mounted to the above relays, but the contacts from these auxiliary logic reed contact blocks do not meet the requirements of IEC 60947-5-1

Type X DC Relays

DC control relays below meet the requirements of IEC 60947-5-1 and are suitable for use in safety circuits through Category 4
per EN 954-1:

XDO00••
XDO20••
XDO40••
XDO60••
XOD80••

DC utility relays below meet IEC 60947-5-1 and are suitable for use in safety circuits through Category 4 per EN 954-1:

XUDO40••
XUDO04••
XUDO80••
XUDO1200••
XUDO0012••

NOTE: The catalog numbers of the 8501 Type X shown above are basic offerings and include all normally open contacts. Since this product line is extremely flexible, the possible contact configurations from normally open (NO) and normally closed (NC) are far too long for this document. Refer to the catalog or Digest for a complete listing of NO/NC combinations and ordering information. However, each of the contact cartridges are easily field convertible to NC.

Overlapping contacts are available on many of the relays above by ordering Forms 1591, 1592, 1593, and 1594. Overlapping contacts are not suitable for use in safety circuits and therefore these forms should not be used where safety is concerned.

The •• indicate positions for voltage codes. Refer to the Square D Digest for complete catalog numbers.

European safety standards
Additional EU information

Additional information on EU safety standards

There are many sources of information on the EU, EU standards, and directives, below is a partial list of these sources. This information has been taken from literature, personal contacts, and from the internet. While we believe this information to be correct, there may have been changes in phone numbers and addresses from when we acquired this information. If you need any additional information regarding the EU, directives or standards, please contact any of the sources listed below:

American National Standards Institute (ANSI)
(for IEC/CENELEC/CEN /ISO Standards)
1819 L Street, NW, 6th floor, Washington, DC 20036
Phone: 202-293-8020
Fax: 202-293-9287
http://web.ansi.org

American Society for Quality
600 North Plankinton Ave, Milwaukee, WI 53203
Phone: 800-248-1946
http://www.asq.org

British American Chamber of Commerce
PO Box 372, Hudson, OH 44236
Phone: 216-621-0222
Fax: 330-342-7963
http://www.bacgl.org

Compliance Engineering
11444 W. Olympic Blvd., Los Angeles, CA 90064
Phone: 310-445-4200
Fax: 310-445-4299
http://www.ce-mag.com

Delegation of the European Commission
Office of Press and Public Affairs, 2300 M Street, Washington DC 20037
Phone: 202-862-9500
Fax: 202-429-1766
http://www.eurunion.org

European Committee for Standardization (CEN)
Avenue Marnix 17, B-1000, Brussels
Phone: 32-2-550-08-11
Fax: 32-2-550-08-19

European Document Research
http://www.europeandocuments.com

Continued on page 3/27

European safety standards
Additional EU information *(continued)*

Additional information on EU safety standards *(continued)*

European Telecommunication Standards Institute (ETSI)
650 route de Lucioles, F-06291 Sophia-Antipolis Cedex, France
Phone: 33-92-94-42-00
Fax: 33-93-65-47-16
http://www.etsi.org

European Union, Delegation of the European Commission to the United States
2300 M Street NW, Washington DC 20037
Phone: 202-862-9500
http://www.eurunion.org

Global Engineering Documents
15 Inverness Way East, Englewood, Colorado 80112
Phone: 800-854-7179
Fax: 303-397-2740
http://global.ihs.com

Information Handling Services (IHS)
PO Box 1154, 15 Iverness Way East, Englewood, CO 80150
Phone: 303-790-0660 or 800-525-7052 or 800-241-7824
Fax: 303-397-2559
http://www.ihs.com

International Electrotechnical Commission (IEC)
rue de Varembe 3, PO Box 131, CH-1211 Geneva 20, Switzerland
Phone: 41-22-919-0211
Fax: 41-22-919-0330
http://www.iec.ch

International Standards Organization (ISO)
ISO 1, ch. de la Voie-Creuse, Case postale 56, 1, CH-1211 Geneva 20, Switzerland
Phone: 41-22-749-0111
Fax: 41-22-733-3430
http://www.iso.ch

National Center for Standards and Certification Information
NCSCI
Global Standards and Information Group
National Institute of Standards and Technology
100 Bureau Drive, Stop 2100, Gaithersburg, MD 20899-2100
Phone: 301-975-4040
Fax: 301-926-1559
http://ts.nist.gov/standards/information/index.cfm

Underwriters Laboratories Inc.
333 Pfingsten Road, Northbrook IL 60062-2096
Phone: 847-272-8800
http://www.ul.com

Techstreet Inc.
http://www.techstreet.com

University of Wisconsin (Seminars on EU compliance)
University of Wisconsin, Engineering Professional Development
432 North Lake Street, Madison, WI 53706
Phone: 800-462-0876
http://epdwww.engr.wisc.edu

European safety standards
Additional EU information *(continued)*

Additional information on EU safety standards *(continued)*

Internet sites:

CORDIS
Information on EU research and development programs
http://www.cordis.lu

EUROPA
The main server for all institutions
http://europa.eu.int

EUROPARL
Information on the European Parliament's activities
http://www.europarl.europa.eu

EUROPEAN ENVIRONMENT AGENCY
Information on the mission, products and services, and organization and staff of the EEA
http://www.eea.europa.eu

US Safety Standards

Introduction 7/2
OSHA and other standards 7/2
Topics of interest 7/5
Emergency stop 7/8
Stop categories 7/11
Safety relays 7/11
Safety controllers and safety PLCs 7/11
Guards, barriers and interlocking 7/12
Light curtains 7/14
Two hand control 7/15
Foot switches 7/15
Summary 7/16
Additional information on US safety standards 7/17

US safety standards
Introduction and OSHA

Introduction

There are many organizations and standards that affect safety in the United States. Some are legally required (such as OSHA regulations) and others are consensus standards guidelines by various associations. The most significant of the legally required standards are OSHA and the related ANSI standards. The OSHA standards, however, are the minimum legally required standards in the United States. Many companies have adopted ANSI and NFPA (as well as others) as part of their corporate standards, and this trend is increasing as interest in improved safety is growing. The most pertinent standards dealing with machinery and machine safety are listed below. We have not attempted to provide details on these standards since there are volumes of additional information available from OSHA, ANSI, and NFPA as well as other sources. There are other codes and standards that also need to be referenced and followed such as the National Electrical Code (NEC - NFPA 70), as well as regional and local requirements.

This section provides portions of the referenced standards from OSHA, ANSI and NFPA. This material is provided to help users better understand some of the issues that need to be taken into consideration when designing new applications or upgrading current applications when the safety of personnel is concerned. The complete versions of the referenced standards must be used, read, and referenced whenever designing safety solutions, as more detailed information and additional information is provided in the complete versions of these standards.

Hazards to Personnel

When considering potential safety hazards for personnel, it is easy for everyone to recognize examples of some safety hazards, such as presses or saws, because they are easy to visualize. Some hazards that are often overlooked but are no less dangerous to personnel are:

- Chemical
- Thermal - both heat and cold
- Electrical and shock
- Magnetic
- Toxicity
- Hydraulic
- Pneumatic
- Mechanical
- Kinetic
- Movement of mechanical components, whether related to the equipment under consideration or not
- Plus many more

OSHA 29 CFR1910 Occupational Safety and Health Standards

OSHA began as the Occupational Safety and Health Act of 1970, passed as an act of Congress “to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our national resources.” This act is mandatory and legally binding in the United States.

The Occupational Safety and Health Administration (OSHA) standards cover a number of topics regarding safety and health, from A to Z, including Work Surfaces, Hazardous Materials, Personal Protective Equipment, as well as many others.

While OSHA does cover a great deal of topics and areas of safety, there are other organizations that are not government agencies that have developed standards for various industries or situations. OSHA has, in many cases, chosen to use existing consensus standards instead of developing new ones. Many of these existing standards are referenced in OSHA 1910, and according to 1910.6, these “organizations which are not agencies of the U.S. Government which are incorporated by reference in this part, have the same force and effect as other standards in this part”. OSHA has incorporated the standards of two primary standards groups, the American National Standards Institute (ANSI) and the National Fire Protection Association (NFPA), into its set of standards.

Subpart O of 1910 deals with Machinery and Machinery Guarding. Subpart R deals with Special Industries. The topics for Subpart O and R are listed below; followed by Subparts J and S which are of interest to anyone involved with machinery.

US safety standards
OSHA

OSHA 29 CFR1910 Occupational Safety and Health Standards (continued)

OSHA 1910, Subpart O, Machinery and Machine Guarding

1910.211 Definitions

1910.212 General Requirements for all Machines

1910.213 Woodworking Machinery Requirements

1910.214 Cooperage Machinery

1910.215 Abrasive Wheel Machinery

1910.216 Mills and Calenders in the Rubber and Plastics Industries

1910.217 Mechanical Power Presses

1910.218 Forging Machines

1910.219 Mechanical Power Transmission Apparatus

1910.220 Effective Dates

1910.221 Source of Standards

1910.222 Standards Organizations

OSHA 1910, Subpart R, Special Industries

1910.261 Pulp, Paper, and Paperboard Mills

1910.262 Textiles

1910.263 Bakery Equipment

1910.264 Laundry Machinery and Operations

1910.265 Sawmills

1910.266 Logging Operations

1910.267 Agricultural Operations

1910.268 Telecommunications

1910.269 Electric Power Generation, Transmission, and Distribution

1910.272 Grain Handling Facilities



OSHA 1910 Subpart J, General Environmental Controls

1910.147 Control of Hazardous Energy (also known as Lockout/Tagout)

This standard was effective as of January 2, 1990. It was adopted to help safeguard personnel from hazardous energy while maintaining or servicing equipment. Before maintenance is performed, the hazardous energy must be turned off to the machine, and an energy-isolating device must be used to either lockout or tagout the machine.

This energy source can be electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other forms of energy. Multiple energy sources may need to be locked out/tagged out before service or maintenance can be performed on the equipment. Section (b) of this standard states “Push buttons, selector switches, and other control circuit type devices are not energy isolating devices.” This would include limit switches, safety interlock switches, cable pull switches, and other types of control equipment. 1910.147 may be the most far reaching standard OSHA has adopted, covering virtually all equipment in use today.

The lockout/tagout is similar in principle to the European Machinery Directive 98/37/EC, Annex 1, Isolation of Energy Sources.

OSHA 1910 Subpart S, Electrical

This subpart addresses electrical safety requirements that are necessary for the practical safeguarding of employees in their workplaces.

US safety standards
ANSI

The American National Standards Institute (ANSI)

The American National Standards Institute (ANSI) is a private, nonprofit membership organization supported by a diverse constituency of private and public sector organizations, founded in 1918. ANSI does not develop standards, but acts as a facilitator in establishing voluntary consensus standards with various groups. They promote US standards internationally and encourage the adoption of international standards as national standards. ANSI was a founding member of the ISO, and is still active in governing it. They are also strong members of the IEC.

ANSI B11.19, Performance Criteria for Safeguarding

Of the many ANSI standards available, the ANSI B11 Series standards are the most pertinent to machines and machine safety. One of the most pertinent of these standards for general industrial use is: “ANSI B11.19, Performance Criteria for Safeguarding”

B11.1 Mechanical Power Presses – Safety Requirements for Construction, Care and Use

B11.2 Hydraulic Power Presses – Safety Requirements for Construction, Care and Use

B11.3 Safety Requirements for Power Press Brakes

B11.4 Safety Requirements for Shears

B11.5 Iron Workers - Safety Requirements for Construction, Care and Use

B11.6 Safety Requirements for Manual Turning Machines

B11.7 Cold Headers and Cold Formers - Safety Requirements for Construction, Care and Use

B11.8 Safety Requirements for Manual Milling, Drilling and Boring Machines

B11.9 Safety Requirements for Construction, Care and Use of Grinding Machines

B11.10 Safety Requirements for Metal Sawing Machines

B11.11 Safety Requirements for Gear and Spline Cutting Machines

B11.12 Safety Requirements for Roll Forming and Roll Bending Machines

B11.13 Automatic Screw/Bar and Chucking Machines – Safety Requirements for Construction, Care and Use

B11.14 Coil Slitting Machines – Safety Requirements for Construction, Care and Use

B11.15 Safety Requirements for Pipe, Tube, and Shape Bending Machines

B11.16 Safety Requirements for Powder/Metal Compacting Presses

B11.17 Safety Requirements for Horizontal Hydraulic Extrusion Presses

B11.18 Safety Requirements for Machines Processing or Slitting Coiled or Non-Coiled Metal

B11.19 Performance Criteria for Safeguarding

B11.20 Safety Requirements for Integrated Manufacturing Systems

B11.21 Safety Requirements for Machine Tools Using Lasers for Processing Materials

B11.22 Safety Requirements for Turning Centers and Automatic, Numerically Controlled Turning Machines

B11.23 Safety Requirements for Machining Centers and Automatic, Numerically Controlled Milling, Drilling and Boring Machines

B11.24 Safety Requirements for Transfer Machines.

Technical Reports and Explanatory Information

B11.TR1 Ergonomic Guidelines for the Design, Installation and Use of Machine Tools

B11.TR2 Mist Control Considerations for the Design, Installation and Use of Machine Tools Using Metalworking Fluids

B11.TR3 Risk Assessment and Risk Reduction – A guide to estimate, evaluate and reduce risks associated with machine tools.

B11.TR4 Selection of Programmable Electronic Systems (PES/PLC) for Machine Tools

US safety standards
Additional standards and topics of interest

Additional Standards

Industrial Robots and Robot System Safety

OSHA has recommended

• That robots comply with ANSI/RIA R15.06 (1999), Manufacturing, Remanufacture and Rebuild of Robots. Some of the sections of this standard deal with: manufacture, remanufacture, and rebuild of robots (section 4), performance requirements of safeguarding devices (section 5), installation of robots and robot systems (section 6), safeguarding of personnel (section 7, 8, and 9). In addition, robots and robot systems must comply with OSHA 1910.333 and 1910.147.

• This recommendation is a part of OSHA instruction TED 1.15, September 1995, from the Office of Science and Technology Assessment.

National Fire Protection Association (NFPA)

The NFPA has developed many standards covering a wide variety of subjects over the past 100 years. While they began out of a need to standardize on automatic sprinkler system standards, they grew to become the major recognized group in fire protection in the United States, and are recognized internationally as well.

NFPA 79 began in 1941, with an NFPA subcommittee. It appeared as a supplement to the 1940 NEC in Article 670 - Machine Tools, and remained in Article 670 through the 1959 edition of the NEC. It was officially adopted as a stand alone standard in 1962, but continues to be referenced in Article 670 of the NEC. NFPA 79 – Electrical Standard for Industrial Machinery, as its title indicates, covers all industrial machinery in the US and should be a frequently referred to standard in all industrial facilities.

Topics of interest

Several topics on safety have generated significant interest over the past few years, and these topics are discussed below for general industrial applications. There are standards specific to particular industries in the various standards, and these need to be consulted separately. There are also standards specific to certain types of machinery, and these need to be consulted separately as well. Below are topics that are of the most interest for general industrial machinery.

Similarities between the US standards are noted, as well as similarities to European EN and IEC standards. There has been significant interest in the European and IEC standards recently, and it is interesting to note the similarities between the European standards and US nationally accepted consensus standards and OSHA. As many of the various standards evolve, the US, IEC, and EN standards are becoming more similar, resulting in fewer differences than just a decade ago. Companies doing business globally are already familiar with the EN and IEC standards and their requirements.

References to these standards are provided in the sections below for reference only. The complete versions of the referenced standards must be used, read, and referenced whenever designing safety solutions, as more detailed information and additional information is provided in the complete versions of these standards.

Safety systems and qualified persons

Safety systems are comprised of many components. No one safety component will insure the safety of the system. The design of the complete safety system should be considered before you begin. It is very important to follow applicable safety standards when installing and wiring these components. OSHA has a similar definition of safety systems in their standards. OSHA and ANSI have also defined an “authorized (qualified) person” to perform tasks, and that the authority is given by the employer to this person. This person has also received training on the hazards involved in the tasks they are to perform. It important that appropriately trained and qualified personnel design, develop and maintain safety equipment and systems to provide an appropriate safety level for all personnel.

OSHA 1910.211 Definitions - Safety System

(d)(60) (d) (62) “Safety system” means the integrated total system, including the pertinent elements of the press, the controls, the safeguarding, and any required supplemental safeguarding, and their interfaces with the operator, and the environment, designed, constructed, and arranged to operate together as a unit, such that a single failure or single operating error will not cause injury to personnel due to point of operation hazards.

OSHA 1910.211 Definitions – Authorized Person

(d) (63) “Authorized person” means one to whom the authority and responsibility to perform a specific assignment has been given by the employer.

NFPA 79 3.3.79 – Definitions: Qualified Person.

One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved.

US safety standards
Topics of interest

Topics of interest *(continued)*

User's Responsibilities

The user (employer) is responsible for ensuring the safeguarding equipment is installed and maintained correctly, and that the various personnel are trained in the operation and maintenance of the safeguarding

ANSI B11.19 – 3.74: User: An entity that utilizes machines, systems, and related equipment.

ANSI B11.20 – 3.38: User: An individual, corporation, partnership, or other legal entity or form of business that employs individuals to operate and maintain manufacturing systems/cells.

ANSI B11.19 – 4.2.1: SAFEGUARDING USER

The user shall be responsible for ensuring that safeguarding is provided, integrated, installed, maintained, and used in accordance with the requirements of this standard.

ANSI B11.19 – 4.2.2: SAFEGUARDING USER

The user shall be responsible for ensuring that supervisors, operators, maintenance and service personnel are trained in the proper installation, adjustment, operation and maintenance of the safeguarding, within the scope of their work activity.

Control Reliability

The sections identified below for control reliability are very similar to the intent of Category 3 and 4 as defined in European Harmonized Standard EN 954-1 and EN/ISO 13849-1. In all cases- if a single component fails, it shall not prevent the normal stopping action of the machine, and it does prevent the machine from re-starting.

It stands to reason that if a single component fails, there must be a similar component available to complete the stopping action, and that there must be some type of checking circuit to acknowledge that single component failure and prevent a re-start of the machine. This would suggest some type of redundancy of the various components and self checking circuitry would be required if a circuit is to be control reliable.

OSHA 1910.217 (b) (13) Control Reliability

The control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system. This requirement does not apply to those elements of the control system which have no effect on the protection against point of operation injuries.

ANSI B11.19: 6.1 Performance of the Safety Related Function(s)

When a component, module, device or system failure occurs, such that it or a subsequent failure of another component, module, device or system would lead to the inability of the safety-related function(s) to respond to a normal stop command or an immediate stop command, the safety-related function shall:

• Prevent initiation of hazardous machine motion (or situation) until the failure is corrected or until the control system is manually reset, or:

• Initiate an immediate stop command and prevent re-initiation of hazardous machine motion (or situation) until the failure is corrected or until the control system is manually reset; or

• Prevent re-initiation of hazardous machine motion (or situation) at the next normal stop command until the failure is corrected or until the control system is manually reset.

In the Explanatory Information are the following comments:

• Control Reliability:

— Is one of the strategies that may be used to meet these requirements;

— Cannot prevent a repeat cycle in the event of a major mechanical failure or in the presence of multiple simultaneous component failures;

— Is not provided by simple redundancy. There must be monitoring to assure that redundancy is maintained.

ANSI B11.20: 6.13 Control Component Failure Protection (Control Reliability)

The control system shall be designed, constructed, and installed such that a single control component failure within the system does not prevent stopping action from taking place but will prevent successive system cycles until the failure has been corrected.

This requirement only applies to those components whose failure can result in a hazardous condition.

In the Explanatory Information it states: Protection against the consequences of failure of control components should not depend solely upon simple redundancy. Additionally: Control component failure protection does not mean "fail safe". "fail-safe" is a magnitude of reliability that is not practically achievable.

ANSI/RIA R15.06: 4.5.4 Control Reliable provides a similar definition of control reliability as above.

US safety standards
Topics of interest

Topics of interest *(continued)*
Electrical Equipment

Many standards require conformance to NFPA 79 for electrical equipment and emergency stop devices. Two examples are identified below.

ANSI B11.19: 12.9 STOP AND EMERGENCY STOP DEVICES
Stop and emergency stop devices shall meet the requirements of ANSI/NFPA 79

ANSI B11.20: 6.2 ELECTRICAL EQUIPMENT
The electrical equipment shall meet the requirements of ANSI/NFPA 70, ANSI/NFPA 79, and ANSI/NFPA 70E

US safety standards
Individual products and emergency stop

Requirements for individual products

There are many products used in control systems for safety, and each of these products perform different functions in their application, either as emergency stopping or for guarding personnel. The various safety standards have specific requirements for each of these devices, and a summary of some of these requirements are listed in the following sections. Some of the requirements listed here have been in the US standards for a long time, while many of the requirements have changed over the past few years. As these standards evolve, it is important to keep up to date on the changes as they will affect the design of your equipment.

The information listed here is intended to help make the reader aware of some of the US safety requirements. The complete versions of the referenced standards must be used, read, and referenced whenever designing safety solutions, as more detailed information and additional information is provided in the complete versions of these standards.

Emergency Stop

This section is divided into 5 different groups, due to the amount of information available and to make it easier to locate the information required. Most of the references in this section are from NFPA 79, since ANSI B11.19 states that Stop and emergency stop devices shall meet the requirements of NFPA 79.

General Emergency Stop Requirements

Listed below are highlights of the requirements for emergency stop devices per NFPA 79. More detail on all of these highlights are provided in the information below, but for full information, please refer to NFPA 79 - 2007.

• Emergency stop devices must have absolute priority over all other functions (NFPA 79: 9.2.5.4.1.1)

• Must have stop or emergency stop capability at each operator workstation and other locations where emergency stop is required (NFPA 79: 10.7.1.2)

• Every machine must have a category 0 emergency stop (NFPA 79: 9.2.5.3.1) or category 1 emergency stop (NFPA 79: 9.2.5.4.1.3)

• Actuators of push button devices shall be of the palm or mushroom button type (NFPA 79: 10.7.3)

• Emergency stop devices shall include push button (per 10.7.3), pull-cord (cable pull) or foot switch (without cover) (NFPA 79: 10.7.2.1, 10.8.2.1)

• Emergency stop switches shall not be flat switches or graphic representations based on software applications (NFPA 79: 10.7.2.3, 10.8.2.3)

• Must have self latching means (i.e.: pull to release or rotate) (NFPA 79: 10.7.2.2)

• Shall be initiated by a single human action (NFPA 79: 9.2.5.4.2)

• Must be manually reset (NFPA 79: 10.8.3)

• Resetting of the e-stop shall not restart the machinery but only permit restarting (NFPA 79: 9.2.5.4.1.1)

• Must have positive/direct opening contacts (NFPA 79: 10.7.2.2)

• RED actuator with a YELLOW background (NFPA 79: 10.7.3)

• The emergency stop devices must be continuously operable and readily accessible (NFPA 79: 10.7.1.1)

ANSI has some additional information on emergency stops as follows:

ANSI B11.19: 12.9 STOP AND EMERGENCY STOP DEVICES

Stop and emergency stop devices are not safeguarding devices. They are complimentary to the guards, safeguarding devices, awareness barriers, signals and signs, safeguarding methods and safeguarding procedures in clauses 7 through 11.

Stop and emergency stop devices shall meet the requirements of ANSI/ NFPA 79.

ANSI B11.19: E12.9 EXPLANATORY INFORMATION

A safeguarding device detects or prevents inadvertent access to a hazard, typically without overt action by the individual or others. Since an individual must actuate an emergency stop device to issue the stop command, usually in reaction to an event or hazardous situation, it neither detects nor prevents exposure to a hazard.

ANSI/RIA R15.06 states in 4.6.1 that the emergency stop shall be fully compliant to NFPA 79.

US safety standards
Emergency stop

Emergency Stop *(continued)*

1. Emergency Stop Color



Actuators of emergency stop devices shall be red and the background around these devices shall be yellow. Visibility and recognition of emergency stop devices is the primary concern. The red and yellow color combination shall only be used for emergency stop applications.

OSHA 1910.144: Safety color code for marking physical hazards.

(a)(1)(iii) Stop. Emergency stop bars on hazardous machines such as rubber mills, wire blocks, flat work ironers, etc., shall be red. Stop buttons or electrical switches which letters or other markings appear, used for emergency stopping of machinery shall be red.

NFPA 79: 10.7.3 Emergency Stop Actuators.

Actuators of emergency stop devices shall be colored RED. The background immediately around push buttons and disconnect switch actuators used as emergency stop devices shall be colored YELLOW. The actuator of a pushbutton-operated device shall be of the palm or mushroom-head type and shall effect an emergency stop when depressed. The RED/YELLOW color combination shall be reserved exclusively for emergency stop applications.

2. Emergency Stop Device Types



Emergency stop devices include mushroom head push buttons, pull cord (cable pull), push bar (bumper guards), and foot switches. Mushroom head push buttons shall be self latching and have positive opening contacts.

NFPA 79: 10.7.3 – Refer to previous page under this citation for “The actuator of a pushbutton-operated device shall be of the palm or mushroom-head type …”

NFPA 79: 10.7.2.1: Types (Devices for Stop and Emergency Stop)

The types of devices for emergency stop shall include, but are not limited to, the following:

1. Push button-operated switches in accordance with 10.7.2.2 and 10.7.3
2. Pull-cord-operated switches
3. Foot-operated switches without a mechanical guard
4. Push-bar-operated switches
5. Rod-operated switches



NFPA 79: 10.7.2.2: Types (Devices for Stop and Emergency Stop)

Push button-type devices for emergency stop shall be of the self-latching type and shall have direct opening operation.

NFPA 79:10.7.2.3 Emergency stop switches shall not be flat switches or graphic representations based on software applications. (Similar wording is found in NFPA79: 10.8.2.3.)

3. Emergency Stop Function

Emergency stop devices shall override all other controls. They shall be hard wired into the emergency stop circuit. Emergency stop devices shall be initiated by a single human action, and must be manually re-set. Resetting of the emergency stop device shall not start, restart, nor cause any hazardous motion or condition.

ANSI B11.20; 6.7.1: System Emergency Stop

System emergency stop shall immediately initiate stopping action of those motions that pose an imminent hazard to personnel. Resetting of the emergency stop shall not initiate, restart, or create any hazardous motion. A manually operated emergency stop device shall be hard wired into the emergency stop circuit and shall function independently from the programmable electronic system (PES).

NFPA 79: 9.2.5.4.1: Emergency Stop

Emergency stop functions provided in accordance with 9.2.5.3 shall be designed to be initiated by a single human action.

NFPA 79: 9.2.5.3.2: Stop

Category 0, Category 1, and/or Category 2 stops shall be provided where indicated by an analysis of the risk assessment and the functional requirements of the machine. Category 0 and Category 1 stops shall be operational regardless of operating modes, and Category 0 shall take priority. Stop function shall operate by de-energizing that relevant circuit and shall override related start functions.

US safety standards
Emergency stop

Emergency Stop *(continued)*

3. Emergency Stop Function *(continued)*

NFPA 79: 9.2.5.3.3 Stop

Where required, provisions to connect protective devices and interlocks shall be provided. Where applicable, the stop function shall signal the logic of the control system that such a condition exists. The reset of the stop function shall not initiate any hazardous conditions.

NFPA 79: 9.2.5.4.1.1: Emergency Stop
In addition to the requirements for stop, the emergency stop shall have the following requirements:

1. It shall override all other functions and operations in all modes.
2. Power to the machine actuators, which causes a hazardous condition(s), shall be removed as quickly as possible without creating other hazards (e.g., by the provision of mechanical means of stopping requiring no external power, by reverse current braking for a Category 1 stop).
3. The reset of the command shall not restart the machinery but only permit restarting.

NFPA 79: 9.2.5.4.2 Emergency Switching Off.
Where the emergency switching off function is used, it shall be initiated by a single human action.

NFPA 79: 10.8.3 Restoration of Normal Function After Emergency Switching Off.
It shall not be possible to restore an emergency switching off circuit until the emergency switching off circuit has been manually reset.

4. Emergency Stop Location

Emergency stop devices shall be at every operator workstation and other locations where required; continuously operable; readily accessible; and easily distinguishable from other controls.

NFPA 79: 10.7.1.1 Location and Operation
Stop and emergency stop push buttons shall be continuously operable and readily accessible.

NFPA 79: 10.7.1.2 Location and Operation
Stop or emergency stop push buttons shall be located at each operator control station and at other locations where emergency stop is required.

5. Emergency Stop and Related Components

NFPA 79: 9.2.5.4.1.4 Emergency Stop

Where a Category 0 or Category 1 stop is used for the emergency stop function, it shall have a circuitry design (including sensors, logic, and actuators) according to the relevant risk as required by section 4.1 and 9.4.1. Final removal of power to the machine actuators shall be ensured and shall be by means of electromechanical components. Where relays are used to accomplish a Category 0 emergency stop function, they shall be nonretentive relays

Exception: Drives, or solid state output devices designed for safety-related functions shall be allowed to be the final switching element, when designed according to relevant safety standards.

NFPA 79: 9.4.3 – Control Systems Incorporating Software and Firmware Based Controllers contains detailed information regarding the use of software and firmware based controllers in standard and safety related functions.

US safety standards
Stop categories, safety relays, safety controllers and PLCs

Stop Categories

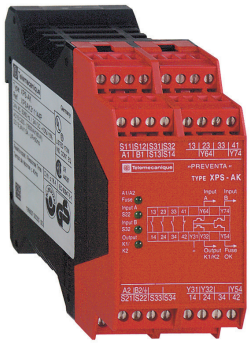
The NFPA 79 Stop Category 0, 1 and 2 identified below are very similar to the same Stop Categories in IEC/EN 60204-1. There are no similar stop categories identified in OSHA 1910. The choice of stop category to use is determined by the type of machine and control circuit used, plus the hazards available to personnel.

NFPA 79: 9.2.2 Stop Functions.
The three categories of stop functions shall be as follows:

1. Category 0 is an uncontrolled stop by immediately removing power to the machine actuators.
2. Category 1 is a controlled stop with power to the machine actuators available to achieve the stop then remove power when the stop is achieved.
3. Category 2 is a controlled stop with power left available to the machine actuators.

NFPA 79: 9.2.5.3.1 Stop
Each machine shall be equipped with a Category 0 stop.

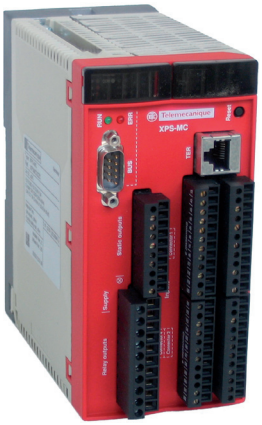
NFPA 79: 9.2.5.3.2 Stop
Category 0, Category 1, and/or Category 2 stops shall be provided where indicated by an analysis of the risk assessment and the functional requirements of the machine. Category 0 and Category 1 stops shall be operational regardless of operating modes, and Category 0 shall take priority. Stop function shall operate by de-energizing that relevant circuit and shall override related start functions.



NFPA 79: 9.2.5.4.1.3 Emergency Stop
The emergency stop shall function as either a Category 0 or a Category 1 stop (see 9.2.2). The choice of the category of the emergency stop shall be determined by the risk assessment of the machine.

NFPA 79: 9.2.5.4.1.4 Emergency Stop
Where a Category 0 or Category 1 stop is used for the emergency stop function, it shall have a circuitry design (including sensors, logic, and actuators) according to the relevant risk as required by section 4.1 and 9.4.1. Final removal of power to the machine actuators shall be ensured and shall be by means of electromechanical components. Where relays are used to accomplish a Category 0 emergency stop function, they shall be nonretentive relays

Exception: Drives, or solid state output devices designed for safety-related functions shall be allowed to be the final switching element, when designed according to relevant safety standards.



Safety Relays

Safety relays and their use are now referenced as such in US standards.

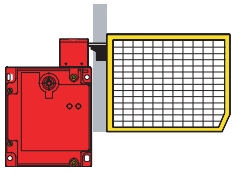
ANSI B11.19, 12.7 SAFETY INTERFACE (SAFETY RELAY) MODULES
Safety interface modules shall meet the requirements of 6.1 (the contents of 6.1 is listed under the section on Control Reliability in this appendix).

EXPLANATORY INFORMATION: A safety interface module usually consists of monitored, multiple, force-guided captive contact relays, or other devices. A single discrete force-guided captive contact relay does not meet the requirements of this standard.

Safety Controllers and Safety PLCs

Control Systems Incorporating Software and Firmware based Controllers are referenced in NFPA 79: 9.4.3

US safety standards
Guards, barriers and interlocking



Guards, Barriers and Interlocking

There are many ways to protect personnel: guards and barriers, two hand controls, light curtains, and sometimes distance. All of these methods are discussed in this section. Guards will be discussed first.

Guards need to prevent personnel from being in the hazardous zones when the machine is operating, and machinery cannot be operated with the guards open. It is clear that the responsibility for these guards falls on the employer per OSHA.

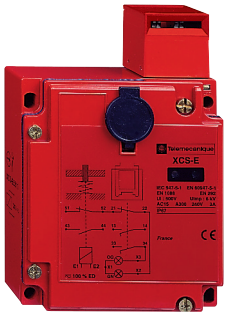
General Requirements



Some of the requirements of guards and interlocks are:

- Guards or interlocks shall be difficult to defeat.
- Devices used in safety related functions shall have positive (direct) opening contacts.
- Closing of the guard or interlock shall not initiate machine motion or any hazardous condition
- When doors or guards are opened and open, no hazardous motion or condition can exist
- Machinery is allowed to start and run only when gates and guards are closed.
- Switches and interlocks shall be installed so they will not be damaged on over-travel.

When guards, barriers, light curtains or other safeguarding is used to protect personnel, there is always a minimum safety distance required to protect personnel from harm. With hard guards or barriers, this distance may be determined by the size of the openings in the guard and using a table or chart for the correct minimum safety distance, i.e.: OSHA 1910.217 Table O-10. Other safeguarding devices, such as light curtains or two hand control devices, need to be located a minimum distance away from the hazard such that the hazardous situation can be eliminated before an individual can be injured. ANSI B11.19, Annex D – Safety Distance is an excellent resource for determining these minimum safety distances. It covers a wide variety of safeguarding techniques and methods to determine the minimum safety distances and the factors that need to be considered.



Standards References

The ANSI B11 and NFPA 79 references below are very similar to the European Harmonized Standard EN 1088, Locking and Interlocking Devices.

OSHA 1910.212 General Requirements for all Machines
(a) (1) Types of guarding. One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips, and sparks. Examples of guarding methods are: barrier guards, two-hand tripping devices, and electronic safety devices.

OSHA 1910.212 General Requirements for all Machines
(a) (3) (ii) The point of operation of machines whose operation exposes an employee to injury, shall be guarded. The guarding device shall be in conformity with any appropriate standards therefore, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.

OSHA 1910.217 Mechanical Power presses
(c) (1) (i) It shall be the responsibility of the employer to provide and ensure the usage of “point of operation guards” or properly applied and adjusted point of operation devices on every operation performed on a mechanical power press. See Table O-10.

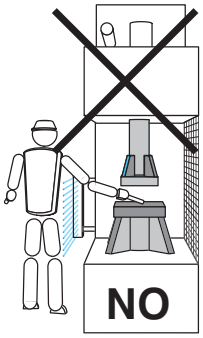
OSHA 1910.217 Table O-10 identifies the minimum distance from the barrier or guard to the point of operation hazard based on the size of the opening. If there are any openings in the guard, such as holes or openings in a mesh guard, the maximum dimensions of these openings are used as the basis for use with Table O-10

ANSI B11.19: 6.2 SAFETY DISTANCE
When required by this standard, the guard or safeguarding device shall be located at a distance from its associated hazard such that individuals cannot reach the hazard before cessation of hazardous motion (or situation).

ANSI B11.19: E6.2 EXPLANATORY INFORMATION
The Explanatory information states that guards and safeguarding devices should be located at a safety distance in accordance with (ANSI B11.19) Annex D. This annex provides a thorough coverage of safety distances of all types of guards and barriers.

Guards, Barriers and Interlocking *(continued)*

Standards References *(continued)*

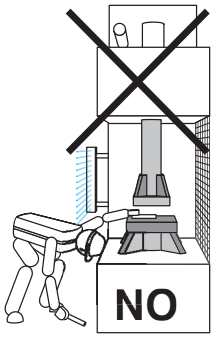


ANSI B11-19: 7.1.3 Guards. Design and Construction
The design and construction of the barrier guard shall ensure that individuals can not reach the hazard by reaching over, under, around or through the barrier guard. Note: Similar wording is included in ANSI B11-19: 7.2.1 and ANSI B11.19: 7.2.2

ANSI B11-19: 7.2.4 Guards. Installation and Operation
The interlocked section of the interlocking barrier guard(s) shall be prevented from opening until hazardous motion has ceased, or shall be located so that an individual cannot reach the hazard before cessation of the hazardous motion when the interlocked section is open.

ANSI B11-19: 7.1.6 Design and Construction
Interlocking barrier guards shall be designed and constructed to meet the following additional requirements:

1. Interlock devices used in conjunction with barrier guards shall be specifically designed and constructed for use in safeguarding applications.
2. Handles placed on interlocking barrier guards shall be secured to the guard so as not to create a pinch point between the handles of the guard, frame or machine

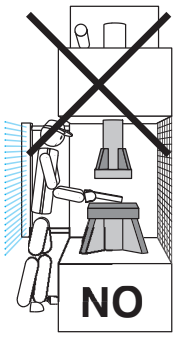


ANSI B11-19: 7.2.6: Installation and Operation
The user shall ensure that barrier guards are installed, maintained and operated so as to protect against:

a. Unauthorized adjustment or circumvention
b. Hazards between the guard and the moving machine or tooling parts
c. Operation such that when the interlock is opened, re-closing of the interlock shall not, in or of itself, cause any hazardous motion of the machine

ANSI B11-19; 8.1.1.3 Movable Barrier Devices
The initiation of the machine cycle shall require:

a. The movable device to be in the closed position; and
b. that the cycle initiation means be actuated



NFPA 79: 9.2.3.3 Operating Modes: Safeguarding means shall remain effective for all operating modes.

NFPA 79: 9.3.1 Re-closing or Resetting of an Interlocking Safeguard.

The re-closing or resetting of an interlocking safeguard shall not initiate machine motion or operation that results in a hazardous condition.

NFPA 79: 9.3.6 Protective Interlock
Where doors or guards have interlocked switches used in circuits with safety related functions, the interlocking devices shall be listed, have either positive (direct) opening operation, or provide similar reliability and prevent the operation of the equipment when the doors or guards are open (difficult to defeat or bypass).

NFPA 79: 10.1.4.1 Position Sensors
Position sensors (e.g., limit switches, position switches, proximity switches) shall be arranged so that they will not be damaged in the event of overtravel.

NFPA 79: 10.1.4.2 Position Sensors
Position sensors used in circuits with safety-related control functions either shall have direct opening operation or shall provide similar reliability.

NFPA 79: 11.6.2 Machine Mounted Control Equipment
All limit switches or position sensors shall be installed so that accidental over-travel by the machine will not damage the limit switch or sensor.

US safety standards
Light curtains

Light Curtains

The application, use, and installation of light curtains is covered in much greater detail in Section 5 of this catalog. The safety distance formulas in Section 5 must be used to determine the minimum safety distance a light curtain must be mounted away from the hazardous activity, based on the particular machine and light curtain used. Listed below are some highlights from ANSI B11.19 regarding light curtains.

Also included are two additional topics that may be of concern for some light curtain applications: Muting and PSDI. These are included here for information only and references for more information on these topics are provided.

ANSI B11.19: 8.3.1.5 The presence sensing device shall incorporate visual means to indicate that the device is detecting an individual within the sensing field of the device.



ANSI B11.19: 8.3.2.1 Exposure to the hazard(s) shall not be possible by reaching over, under or around the sensing field of the device. Additional guards or safeguarding devices shall be provided to protect these areas.

The effective sensing field shall be of adequate height, width and depth so that entry of the individual into the hazard area is detected.

Explanatory Information: If individuals can place themselves between the sensing field and the hazard area, additional safeguarding should be used in conjunction with the device to prevent the individual from exposure to the hazard.

ANSI B11.19: 8.3.2.2 The presence sensing device shall be installed at a location so that the effective sensing field prevents individuals from reaching the hazard(s) during the hazardous portion of the machine cycle

Explanatory Information: See Annex D of ANSI B11.19 for the formula(e) to calculate the sensing distance. This appendix gives excellent detailed information on calculating the safe distances.

ANSI B11.19: 8.3.2.3 The presence-sensing device shall protect individuals from hazards by initiating an immediate stop command to the machine control system when the sensing field of the device is interrupted during the hazardous portion of the machine cycle. It shall require re-initiation of the normal actuating means prior to the start or continuation of the motion of the machine

When an individual can pass through the sensing field of the presence-sensing device, the device shall initiate an immediate stop command to the machine control system and shall require that the device be manually reset before hazardous motion can occur.

The reset device shall be located outside of the safeguarded area such that it cannot be reached from the safeguarded area. Reset of the device or machine control shall not occur until verification that the safeguarded area is clear of individuals.

Explanatory Information: The operator should ensure that no individual is in the safeguarded area before re-setting the device or machine control and initiating hazardous motion.

Other items of interest regarding light curtains are listed below:

- Muting: See ANSI B11.19: 8.3.2.5
- Presence Sensing Device Initiation (PSDI): See OSHA 1910.217 (h)

US safety standards
Two hand control and foot switches

Two Hand Control

Two hand control device functioning identified by the OSHA, ANSI and NFPA 79 standards below state the two hand controls are to operate concurrently with each other. However, no specific time constraints are identified in the OSHA nor ANSI B11 standards. NFPA 79 and ANSI/RIA R15.06 require the concurrent operation of the two hand controls in 500ms or less. European Harmonized Standard EN 574 requires a synchronous operation of the two operators of 500ms or less as well.



OSHA 1910.217 Mechanical Power Presses
(b) (6) (i) A two-hand trip shall have the individual operator's hand controls protected against unintentional operation and have the individual operator's hand controls arranged by design and construction and/or separation to require the use of both hands to trip the press and use a control arrangement requiring concurrent operation of the individual operator's hand controls.

OSHA 1910.217 Mechanical Power Presses
(b)(7)(v) Two-hand controls for single stroke shall conform to the following requirements:
(b)(7)(v)(a) Each hand control shall be protected against unintended operation and arranged by design, construction, and/ or separation so that the concurrent use of both hands is required to trip the press.
(b)(7)(v)(c) The control system shall incorporate an anti-repeat feature.

ANSI B11-19: 8.4.1.3 Two Hand Control Devices
The two-hand control device shall have individual hand controls arranged by design, construction, or separation to require the use of both hand controls for actuation
The two-hand control device shall be designed and constructed to protect each hand control against unintended or inadvertent actuation.
The two-hand control device shall require concurrent actuation of both hand controls within a certain time limit before initiating hazardous motion. (In the explanatory information, there is a reference to NFPA 79 that requires the time limit to be 500 ms or less)
Release of either hand control during the hazardous portion of the machine cycle shall initiate a stop command.
Release and reactivation of both hand controls is required before motion is re-initiated.
Components, subassemblies or modules of the device shall meet the requirements of 6.1 (this section is listed in this appendix under the Control Reliability / Component Failures heading)

NFPA 79: 9.2.5.6 Two-Hand Control.

All two-hand controls shall have the following features:
1. The provision of two control devices shall require the concurrent actuation by both hands.
2. It shall be necessary to actuate the control devices within a certain time limit of each other, not exceeding 0.5 seconds.
3. Where this time limit is exceeded, both control devices shall be released before operation is initiated.
4. The control devices shall require continuous actuation during the hazardous conditions.
5. Machine operation shall cease upon the release of either control device when hazardous conditions are still present.
6. Machine operation shall require the release of both control devices, before the machine operation is re-initiated (See Annex B (NFPA 79)).

Foot Switches

Foot switches are not considered to be safety products, but they have been used to keep personnel out of reach of a hazard. An example is the operator of a machine using the foot switch to start and run the machine. When an operator removes their foot from the foot switch, the machine stops. The foot switch needs to be located a sufficient distance away from the machine to keep the operator out of harm's way.

The references below indicate that foot switches need to be protected from accidental operation from falling objects and unintended operation. Foot switches used for emergency stop need to be unguarded.



OSHA 1910.217(b)(7)(x) MECHANICAL POWER PRESSES
Foot operated tripping controls, if used, shall be protected so as to prevent operation from falling or moving objects, or from unintended operation by accidental stepping onto the foot control.

OSHA 1910.218(b)(2) MECHANICAL POWER PRESSES
Foot operated devices. All foot operated devices (i.e., treadles, pedals, bars, valves, and switches) shall be substantially and effectively protected from unintended operation.

NFPA 79: 10.1.7 FOOT OPERATED SWITCHES

Foot-operated switches used for applications where accidental actuation could create a hazardous situation shall be protected to prevent accidental actuation by falling or moving objects and from unintended operation by accidental stepping onto the switch.
Exception: Foot-operated switches used for emergency stop in accordance with 10.7.2.1 shall not be of the covered or hooded type.

US safety standards
Summary

Summary

Safety systems are comprised of many components. No one safety component will insure the safety of the system. The design of the complete safety system should be considered before you begin. It is very important to follow applicable safety standards when installing and wiring these components.

This appendix provides portions of the references standards from OSHA, ANSI and NFPA. This material is provided to help users better understand some of the issues that need to be taken into consideration when designing new applications or upgrading current applications when the safety of personnel is concerned. The complete versions of the referenced standards must be used, read, and referenced whenever designing safety solutions, as more detailed information and additional information is provided in the complete versions of these standards.

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US safety standards
Additional information

Additional information on US Safety Standards

There are many sources of information on US safety standards, and below is a partial list of these sources. This information was taken from literature, personal contacts, and from the internet. While we believe this information to be correct, there may have been changes in phone numbers and addresses from when we acquired this information. If you need any additional information regarding the US safety standards, please contact any of the sources listed below:

American National Standards Institute (ANSI)
1819 L Street, NW, 6th Floor, Washington, DC 20036
Phone: 202-293-8020
Fax: 202-293-9287
http://web.ansi.org

American Society of Mechanical Engineers (ASME)
1828 L St, N.W., Suite 906, Washington, DC 20036-5104
Phone: 202-785-3756
Fax: 202-429-9417
http://www.asme.org

American Society for Testing and Materials (ASTM)
100 Barr Harbor Drive, West Conshohocken, Pennsylvania, USA 19428-2959
Phone: 610 832-9500
Fax: 610 832-9555
http://www.astm.org

Association for Manufacturing Technology (AMT)
7901 Westpark Dr., McLean, VA 22102-4206
Phone: 703-893-2900
Fax: 703-893-1151
http://www.mfgtech.org

IHS
15 Inverness Way East, Englewood, Colorado 80112
Phone: 800-854-7179
Fax: 303-397-2740
http://global.ihs.com

Institute of Electrical and Electronics Engineers (IEEE)
Operations Center, 445 Hoes Lane, Piscataway, New Jersey 08854-5997
Phone: 732-981-0060
http://www.ieee.org

National Fire Protection Association (NFPA)
1 Batterymarch Park, Quincy, MA 02169-7471
Phone: 617-770-3000
Fax: 617-770-0700
http://www.nfpa.org

National Institute for Occupational Safety and Health (NIOSH)
Phone: 800-232-4636
http://www.cdc.gov/niosh/

National Safety Council
1121 Spring Lake Dr., Itasca, IL 60143-3201
Phone: 800-621-7615
http://www.nsc.org

NEMA
1300 N. 17th Street, Suite 1752, Rosslyn, VA, 22209.
Phone: 703-841-3200
Fax: 703-841-5900,
http://www.nema.org

US safety standards
Additional information

Additional information on US Safety Standards *(continued)*

NIST (National Institute of Standards and Technology)
100 Bureau Drive, Stop 2100, Gaithersburg, MD 20899-2100
Phone: 301-975-4040
http://www.nist.gov/

Occupational Safety and Health Administration (OSHA)
http://www.osha.gov

Precision Metalforming Association (PMA)
6363 Oak Tree Blvd., Independence, Ohio 44131-2500
Phone: 216-901-8800 ---- Fax: 216-901-9190
http://www.pma.org

Robotic Industries Association
900 Victors Way, Suite 140, Ann Arbor, Michigan 48106
Phone: 313-994-6088
http://www.robotics.org

Society of Automotive Engineers (SAE)
400 Commonwealth Drive, Warrendale, PA 15096-0001
Phone: 724-776-4841
Fax: 724-776-4841
http://www.sae.org

Underwriters Laboratories Inc.
333 Pfingsten Rd., Northbrook, IL 60062
Phone: 847-272-8800
Fax: 847-272-8129
http://www.ul.com

Technical Information

Product standards and certifications *8/2*

Degrees of protection provided by enclosures *8/4*

IP code *8/4*

IK code *8/5*

Contact design and operation *8/6*

Glossary *8/10*

Product reference index *8/15*

Technical information
Product standards and certifications

Standardization

Conformity to standards

Telemecanique brand products satisfy, in the majority of cases, national (for example: BS in Great Britain, NF in France, DIN in Germany), European (for example: CENELEC) or international (IEC) standards. These product standards precisely define the performance of the designated products (such as IEC 60947 for low voltage equipment).
When used correctly, as designated by the manufacturer and in accordance with regulations and correct practices, these products will allow users to build equipment, machine systems or installations that conform to their appropriate standards (for example: IEC 60204-1, relating to electrical equipment used on industrial machines).
Schneider Electric is able to provide proof of conformity of its production to the standards it has chosen to comply with, through its quality assurance system.
On request, and depending on the situation, Schneider Electric can provide the following:
- a declaration of conformity,
- a certificate of conformity (ASEFA/LOVAG),
- a homologation certificate or approval, in the countries where this procedure is required or for particular specifications, such as those existing in the merchant navy.

Code	Certification authority		Country
	Name	Abbreviation	
ANSI	American National Standards Institute	ANSI	USA
BS	British Standards Institution	BSI	Great Britain
CEI	Comitato Elettrotecnico Italiano	CEI	Italy
DIN/VDE	Verband Deutscher Electrotechniker	VDE	Germany
EN	Comité Européen de Normalisation Electrotechnique	CENELEC	Europe
GOST	Gosudarstvenne Komitet Standartov	GOST	Russia
IEC	International Electrotechnical Commission	IEC	Worldwide
JIS	Japanese Industrial Standard	JISC	Japan
NBN	Institut Belge de Normalisation	IBN	Belgium
NEN	Nederlands Normalisatie Institut	NNI	Netherlands
NF	Union Technique de l'Electricité	UTE	France
SAA	Standards Association of Australia	SAA	Australia
UNE	Asociacion Española de Normalizacion y Certificacion	AENOR	Spain

European EN standards

These are technical specifications established in conjunction with, and with approval of, the relative bodies within the various CENELEC member countries (European Union, European Free Trade Association and many central and eastern European countries having «member» or «affiliated» status). Prepared in accordance with the principle of consensus, the European standards are the result of a weighted majority vote. Such adopted standards are then integrated into the national collection of standards, and contradictory national standards are withdrawn.
European standards incorporated within the French collection of standards carry the prefix NF EN. At the 'Union Technique de l'Electricité' *(Technical Union of Electricity)* (UTE), the French version of a corresponding European standard carries a dual number: European reference (NF EN …) and classification index (C …).
Therefore, the standard NF EN 60947-4-1 relating to motor contactors and starters, effectively constitutes the French version of the European standard EN 60947-4-1 and carries the UTE classification C 63-110.
This standard is identical to the British standard BS EN 60947-4-1 or the German standard DIN EN 60947-4-1.
Whenever reasonably practical, European standards reflect the international standards (IEC).
With regard to automation system components and distribution equipment, in addition to complying with the requirements of French NF standards, Telemecanique brand components conform to the standards of all other major industrial countries.

Regulations

European Directives

Opening up of European markets assumes harmonisation of the regulations pertaining to each of the member countries of the European Union.
The purpose of the European Directive is to eliminate obstacles hindering the free circulation of goods within the European Union, and it must be applied in all member countries. Member countries are obliged to transcribe each Directive into their national legislation and to simultaneously withdraw any contradictory regulations. The Directives, in particular those of a technical nature which concern us, only establish the objectives to be achieved, referred to as "essential requirements".
The manufacturer must take all the necessary measures to ensure that his products conform to the requirements of each Directive applicable to his production.
As a general rule, the manufacturer certifies conformity to the essential requirements of the Directive(s) for his product by affixing the CE mark.
The CE mark is affixed to Telemecanique brand products concerned, in order to comply with French and European regulations.

Significance of the CE mark
- The CE mark affixed to a product signifies that the manufacturer certifies that the product conforms to the relevant European Directive(s) which concern it; this condition must be met to allow free distribution and circulation within the countries of the European Union of any product subject to one or more of the E.U. Directives.
- The CE mark is intended solely for national market control authorities.
- The CE mark must not be confused with a conformity marking.

Technical information
Product standards and certifications

European Directives (continued)

For electrical equipment, only conformity to standards signifies that the product is suitable for its designated function, and only the guarantee of an established manufacturer can provide a high level of quality assurance.
For Telemecanique brand products, one or several Directives are likely to be applicable, depending on the product, and in particular:

- the Low Voltage Directive 73/23/EEC amended by Directive 93/68/EEC: the CE mark relating to this Directive has been compulsory since 1st January 1997.
- the Electromagnetic Compatibility Directive 89/336/EEC, amended by Directives 92/31/EEC and 93/68/EEC: the CE mark on products covered by this Directive has been compulsory since 1st January 1996

ASEFA-LOVAG certification

The function of ASEFA (Association des Stations d'Essais Française d'Appareils électriques - *Association of French Testing Stations for Low Voltage Industrial Electrical Equipment)* is to carry out tests of conformity to standards and to issue certificates of conformity and test reports.
ASEFA laboratories are authorized by the French authorisation committee (COFRAC).
ASEFA is now a member of the European agreement group LOVAG (Low Voltage Agreement Group). This means that any certificates issued by LOVAG/ASEFA are recognised by all the authorities which are members of the group and carry the same validity as those issued by any of the member authorities.

Quality labels

When components can be used in domestic and similar applications, it is sometimes recommended that a "Quality label" be obtained, which is a form of certification of conformity.

Code	Quality label	Country
CEBEC	Comité Electrotechnique Belge	Belgium
KEMA-KEUR	Keuring van Electrotechnische Materialen	Netherlands
NF	Union Technique de l'Electricité	France
ÖVE	Österreichischer Verband für Electrotechnik	Austria
SEMKO	Svenska Electriska Materiel Kontrollanatalten	Sweden

Product certifications

In some countries, the certification of certain electrical components is a legal requirement. In this case, a certificate of conformity to the standard is issued by the official test authority.
Each certified device must bear the relevant certification symbols when these are mandatory:

Code	Certification authority	Country
CSA	Canadian Standards Association	Canada
UL	Underwriters Laboratories	USA
CCC	China Compulsory Certification	China

Note on certifications issued by the Underwriters Laboratories (UL). There are two levels of approval:

"Recognized" ( ) The component is fully approved for inclusion in equipment built in a workshop, where the operating limits are known by the equipment manufacturer and where its use within such limits is acceptable by the Underwriters Laboratories.
The component is not approved as a "Product for general use" because its manufacturing characteristics are incomplete or its application possibilities are limited.
A "Recognized" component does not necessarily carry the certification symbol.

"Listed" (UL) The component conforms to all the requirements of the classification applicable to it and may therefore be used both as a "Product for general use" and as a component in assembled equipment. A "Listed" component must carry the certification symbol.

Marine classification societies

Prior approval (= certification) by certain marine classification societies is generally required for electrical equipment which is intended for use on board merchant vessels.

Code	Classification authority	Country
BV	Bureau Veritas	France
DNV	Det Norske Veritas	Norway
GL	Germanischer Lloyd	Germany
LR	Lloyd's Register	Great Britain
NKK	Nippon Kaiji Kyokaï	Japan
RINA	Registro Italiano Navale	Italy
RRS	Register of Shipping	Russia

Note

For further details on a specific product, please refer to the "Characteristics" pages in this catalog or consult your Regional Sales Office.

Technical information
Degrees of protection provided by enclosures
IP code

Degrees of protection against the penetration of solid bodies, water and personnel access to live parts

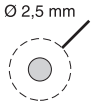
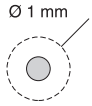
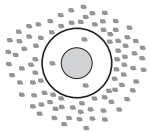
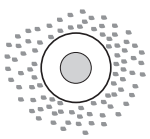
The European standard EN 60529 dated October 1991, IEC publication 529 (2nd edition - November 1989), defines a coding system (IP code) for indicating the degree of protection provided by electrical equipment enclosures against accidental direct contact with live parts and against the ingress of solid foreign objects or water.
This standard does not apply to protection against the risk of explosion or conditions such as humidity, corrosive gasses, fungi or vermin.
Certain equipment is designed to be mounted on an enclosure which will contribute towards achieving the required degree of protection (example : control devices mounted on an enclosure).
Different parts of an equipment can have different degrees of protection (example : enclosure with an opening in the base).
Standard NF C 15-100 (December 2002 edition), section 512, table 51 A, provides a cross-reference between the various degrees of protection and the environmental conditions classification, relating to the selection of equipment according to external factors.
Practical guide UTE C 15-103 shows, in the form of tables, the characteristics required for electrical equipment (including minimum degrees of protection), according to the locations in which they are installed.

IP ●●● code

The IP code comprises **2 characteristic numerals** (e.g. **IP 55**) and may include **an additional letter** when the actual protection of personnel against direct contact with live parts is better than that indicated by the first numeral (e.g. IP 20C).
Any characteristic numeral which is unspecified is replaced by an X (e.g. IP XXB).

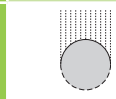
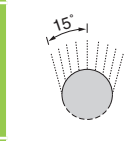
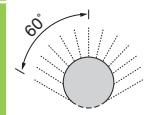
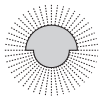
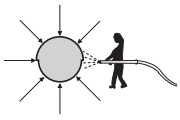
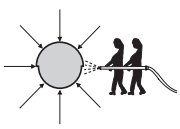
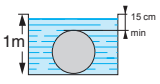
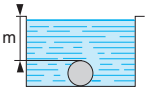
1st characteristic numeral:

corresponds to protection of the equipment against penetration of solid objects and protection of personnel against direct contact with live parts.

	Protection of the equipment		Protection of personnel
0	Non-protected		Non-protected
1		Protected against the penetration of solid objects having a diameter greater than or equal to 50 mm	Protected against direct contact with the back of the hand (accidental contacts).
2		Protected against the penetration of solid objects having a diameter greater than or equal to 12.5 mm.	Protected against direct finger contact.
3		Protected against the penetration of solid objects having a diameter greater than or equal to 2.5 mm.	Protected against direct contact with a Ø 2.5 mm tool.
4		Protected against the penetration of solid objects having a diameter > 1 mm.	Protected against direct contact with a Ø 1 mm wire.
5		Dust protected (no harmful deposits).	Protected against direct contact with a Ø 1 mm wire.
6		Dust tight.	Protected against direct contact with a Ø 1 mm wire.

2nd characteristic numeral:

corresponds to protection of the equipment against penetration of water with harmful effects.

0	Non-protected	
1		Protected against vertical dripping water, (condensation).
2		Protected against dripping water at an angle of up to 15°.
3		Protected against rain at an angle of up to 60°.
4		Protected against splashing water in all directions.
5		Protected against water jets in all directions.
6		Protected against powerful jets of water and waves.
7		Protected against the effects of temporary immersion.
8		Protected against the effects of prolonged immersion under specified conditions.

Additional letter:

corresponds to protection of personnel against direct contact with live parts.

A	With the back of the hand.
B	With the finger.
C	With a Ø 2.5 mm tool.
D	With a Ø 1 mm wire.

8

Technical information
Degrees of protection provided by enclosures
IK code

Degrees of protection against mechanical impact

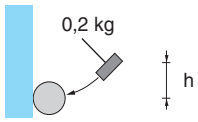
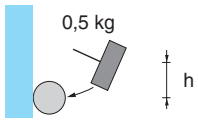
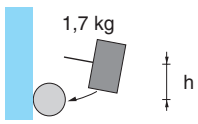
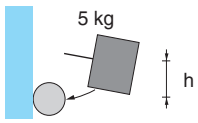
The European standard EN 62262 dated February 2002 defines a coding system (IK code) for indicating the degree of protection provided by electrical equipment enclosures against external mechanical impact.
Standard NF C 15-100 (December 2002 edition), section 512, table 51 A, provides a cross-reference between the various degrees of protection and the environmental conditions classification, relating to the selection of equipment according to external factors.
Practical guide UTE C 15-103 shows, in the form of tables, the characteristics required for electrical equipment (including minimum degrees of protection), according to the locations in which they are installed.

IK ●● code

The IK code comprises **2 characteristic numerals** (e.g. **IK 05**).

2 characteristic numerals:

corresponding to a value of impact energy.

		h (cm)	Energy (J)
00	Non-protected		
01		7.5	0.15
02		10	0.2
03		17.5	0.35
04		25	0.5
05		35	0.7
06		20	1
07		40	2
08		30	5
09		20	10
10		40	20

Technical information
Contact design and operation

Safety Systems

Safety systems are comprised of many components. No one safety component will insure the safety of the system. The design of the complete safety system should be considered before you begin. It is very important to follow applicable safety standards when installing and wiring these components.

Terminal Identification

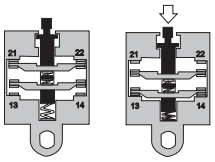
European (IEC) Contact Terminal Markings: Each terminal is marked with 2 digits. The first digit indicates the pole (circuit). The second digit indicates the type of contact: _1 - _2 is N.C., _3 - _4 is N.O. i.e., 11-12, 21-22 are N.C. and 13-14, 23-24 are N.O.

Example of European Terminal Markings:

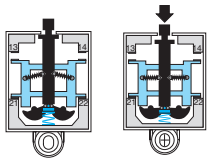
For switch elements without isolated contacts:
11-12 Is the N.C. contact of Pole No. 1
13-14 Is the N.O. contact of Pole No. 1

For switch elements with isolated contacts:
21-22 Is the N.C. contact of Pole No. 2
13-14 Is the N.O. contact of Pole No. 1

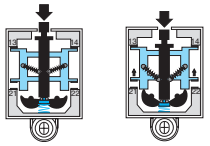
Slow Break Contacts



Snap Action Contacts



Unactuated state | **Approach travel**



Contact change of state | **Positive opening**

21-22
13-14 — **Make-before-break** (overlapping) SPDT: the normally open contact closes before the normally closed contact opens.

21-22
13-14 — **Break-before-make** (offset) SPDT: the normally closed contact opens before the normally open contact closes. They do not change state simultaneously.

21-22
13-14 — **Concurrent make and break** - SPDT: the normally closed contact opens at the same time as the normally open contact closes.

Contact Open Contact Closed

Positive Opening Contact Operation

The diagrams to the left show the operation of both slow make and break contacts, and snap action contacts. Positive opening N.C. contacts meet the IEC and EN requirements for positive opening contacts per IEC 60947-5-1, EN 60947-5-1, and NEMA ICS-5, part 6 (direct opening action).

Slow Make-and-Break Contacts

The speed of transfer of the moveable contacts is dependent on the speed of the operator. The amount of travel of the moveable contacts is also dependent on the amount of travel by the operator. Slow make and break contacts have the same trip and reset points, and do not have the differential travel common to snap switches.

Snap Action Contacts

The speed of transfer of the moveable contacts is not dependent on the speed of the operator. The amount of travel of the moveable contacts is also not dependent on the amount of travel by the operator. The movement of the moveable contacts are determined by a preset travel, after this point is reached, the contacts will trip. Snap action contacts have different trip and reset points, the difference is identified as “differential”.

Snap Action with Positive Opening Contacts

The snap action contacts operate the same as snap action contacts above but with a mechanical component to forcibly open the N.C. contacts if they did not open during the snap action part of the actuator travel. The actuator travel for snap acting contact opening is different (shorter) than the actuator travel to the point of positive opening. If this difference is not designed into the application, the actuator may not be operated far enough to invoke the positive opening function in the event of a contact weld or other failure. Positive opening slow make and break contacts are therefore preferred in safety circuits.

Technical information
Contact design and operation

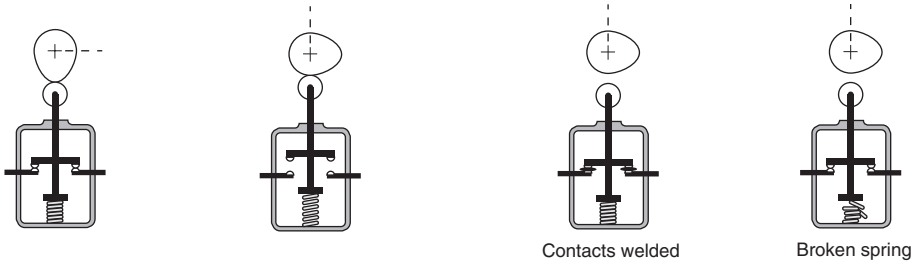
Operation in negative mode and in positive mode

Operation in negative mode

The mechanical system for machine protection must be properly designed

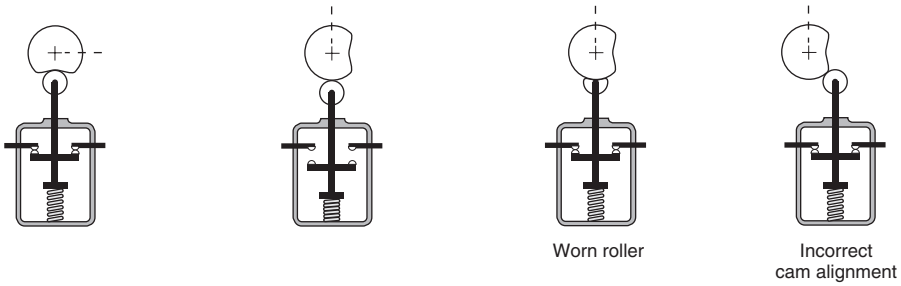
For this, it is recommended that the protection system should work in positive mode, as described below.

The two hazardous anomalies represented in positive mode can be cleared by preventive maintenance; this is not the case with those represented in negative mode (the negative mode anomalies are internal and therefore difficult to detect).



Machine operating | **Machine Stopped** | **Hazard: the machine continues to operate**

Operation in positive mode



Machine operating | **Machine Stopped** | **Hazard: the machine continues to operate**

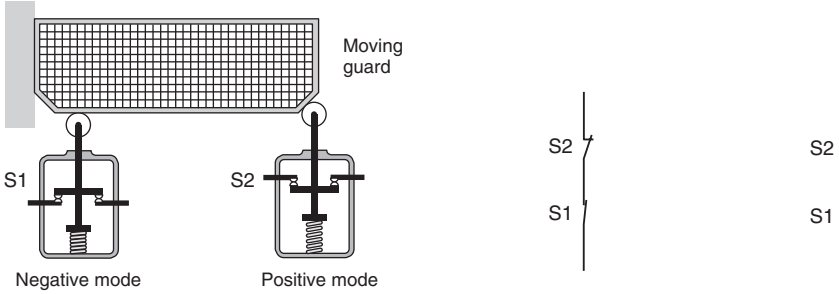
If there is only one switch, it must be wired in positive mode

Operation in combined mode

Combined positive and negative mode

To clear anomalies due to positive mode, use combined mode.

Combined mode makes it possible to clear anomalies due to use of positive mode only. Negative mode is only acceptable if it is combined with a switch in positive mode; combination of the two modes by means of a positive mode switch used in conjunction with a negative mode switch avoids the risk of common mode anomalies (same anomaly on both switches).



Machine operating | **Guard closed: Machine operating** | **Guard open: machine stopped**

8

Technical information
Contact design and operation

Positive Opening Operation of Electrical Contacts

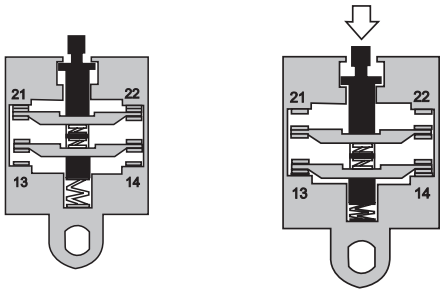
Per EN 60947-5-1, Positive Opening Contacts are defined as:

"A control switch having one or more break contact elements coupled to the switch via non-resilient members so that full contact opening of the break contact element(s) is obtained when the actuator is moved through the positive-opening travel by applying the force stated by the manufacturer".

"For the part of the travel that separates the contacts, there shall be a positive drive with no resilient members (I.e.: springs) between the moving contacts and the point of the actuator to which the actuating force is applied". This is almost identical to the definition in NFPA 79.

Operation cannot be relied on solely through the use of conventional snap switches which inherently do have springs or other "resilient members".

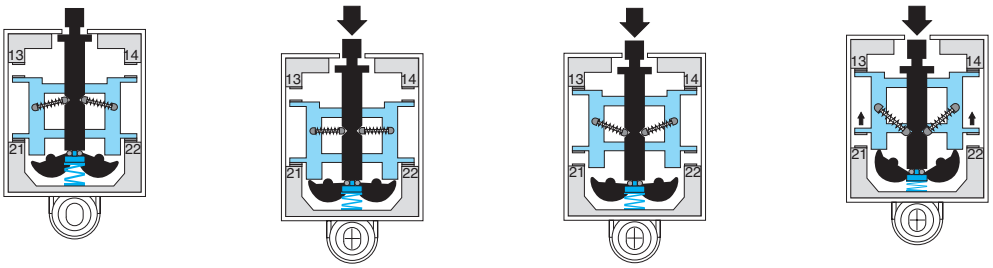
Positive Opening Slow-Make Slow Break Contacts



Unactuated State

Actuated State
N.C. Contacts Forced Open

Snap Acting Contacts with Positive Opening Mechanisms



Unactuated State

Approach State

Snap Action
Contact Change of State

Positive Opening

Positive Opening Slow-Make Slow-Break vs. Snap Acting With Positive Opening Contacts

Traditionally, Positive Opening Contacts have been slow-make slow-break type. There are now contact units which are snap action type that have positive opening mechanisms which force the NC contacts open to meet EN 60947-5-1. Either type is suitable (and required) for use in safety applications.

The actuator travel to the snap acting contact opening is different than the actuator travel to the point of positive opening of the N.C. contacts. If this difference is not designed into the application, the actuator may not be operated far enough to invoke the positive opening function in the event of a contact weld or other anomaly.

Slow-make slow-break positive opening construction is overwhelmingly PREFERRED in safety related circuits.

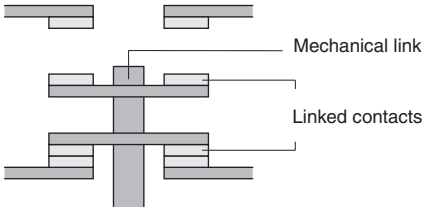
Mechanically Linked Electrical Contacts

Definition

Mechanically linked contacts are contacts which have:

- A mechanical link between the contacts.
- A minimum distance between the points of an open contact in the event of a closed contact being welded.

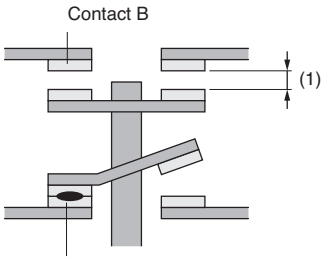
Linked contacts are contacts which are mechanically linked in such a way as to ensure that the normally closed and normally open contacts can never be closed at the same time.



Mechanical guiding (forced guiding)

If a normally closed contact becomes welded, it must be impossible for the normally open contacts to close when the coil is energized.

If a normally open contact becomes welded, it must be impossible for the normally closed contacts to close when the coil is de-energized.



(1) Suitable distance providing resistance to electrical shorts

If an anomaly occurs: contact A welded: then contact B stays open

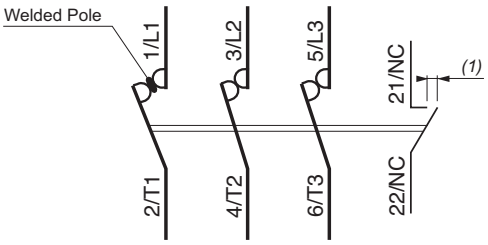
Electrical auxiliary contact, mechanically linked to the power poles

Definition

An electrical auxiliary contact mechanically linked to the power poles is an N.C. auxiliary contact which can never be closed at the same time as the power poles.

If one of the power pole contacts becomes welded, the mechanical link prevents the N.C. auxiliary contact from closing when the coil is de-energized

The N.C. auxiliary contact present in TeSys K and D contactors meets this definition.



(1) Distance required to ensure isolation of the circuit.

Access Time

The time taken to access the hazardous machine parts after the initiation of the stop command by the interlocking device, as calculated on the basis of an approach speed chosen for each particular case, taking into account the parameters as listed in EN 999, Safety of machinery – The positioning of protective equipment in respect of approach speeds of parts of the human body".

American National Standards Institute (ANSI)

The premier private standards organization in the United States. ANSI operates as the United States National Committee to the IEC. ANSI itself does not write standards, but acts as a national clearing house.

Angle of Divergence

The angle at which the light diverges, or spreads, as it travels away from the transmitter. A small angle of divergence is more immune to interference and problems from: outside light sources, reflective surfaces, and other light curtains. Operating (sensing) ranges are generally longer on light curtains with smaller angles of divergence.

AOPD

Active Opto-Electronic Protective Device: a device whose sensing function is performed by opto-electronic emitting and receiving elements detecting the interruption of optical radiations, generated within the device, by an opaque object present in the specified detection zone.

ASEFA

Association des Stations D'essais Francaise d'Appareils electriques. This is an association of French testing stations for low voltage industrial control equipment.

Authorized Person

A person to whom the authority and responsibility to perform a specific assignment has been given by the employer. Also further defined in OSHA 1920.211 Definitions, and as Qualified Person in NFPA 79 3.3.78 and NEC 2002 Article 100 – Definitions

Blanking

Disables (other terms: blinds or masks) a fixed beam(s) in the light curtain\qs sensing field, and the light curtain ignores this beam's existence. This is used where other machine components (such as conveyors, brackets, tooling or fixtures) are required to be in the sensing field, or where material is fed into the machine at a pre-determined location.

NOTE: If material being fed into the machine will not always be at a pre-determined location, floating blanking is used. Using blanking increases the minimum safety distance. Blanking is also referred to as "deselect" and "exact channel select" or "channel select".

Brake

The mechanism used on a mechanical power press or other machinery to stop and/or hold the crankshaft, either directly or through a gear train, when the clutch is disengaged.

Brake Monitor

A sensing device or unit which is designed, constructed, and arranged to monitor the effectiveness of the braking system.

Category

A classification of the safety related parts of a control system in respect of its resistance to faults and its subsequent behavior in the fault condition, and which is achieved by the structural arrangement of the parts and/or by their reliability.

CENELEC

A major standards organization is the result of the European Union. The Commission of the European Communities issued a directive in the mid 1970\qs to harmonize standards. The CENELEC Organization was assigned this task and was directed to base their new standards on the IEC work. In addition to the Common Market countries, other Western European countries have adopted these standards. The resulting CENELEC standards are similar to IEC standards.

Clutch

The coupling mechanism used on a mechanical power press or other machinery to couple the flywheel to the crankshaft, either directly or through a gear train.

Competent Body

An accredited test laboratory or other EMC agency with the resources and expertise to help manufacturers verify their products' compliance with the EMC Directive. Competent bodies are appointed by national authorities within the member states of the EU and charged with the task of supporting manufacturers, importers, and exporters wishing to CE Mark their products by assessing Technical Construction Files.

Concurrent

Acting in conjunction with another component. Where two or more control components exist in the operated state at the same time.

Control Reliability

The control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the machine when required, but does prevent initiation of a successive machine cycle until the failure is corrected. See OSHA 1910.217 (b)(13) and ANSI B11.19; 6.1.

Declaration of Conformity

A formal signed statement indicating conformity of the referenced product(s) to the listed provisions of the applicable Directive(s).

Direct Opening

See Positive Opening Operation

Directive

Legislation which is binding on all European member states that has been adopted by the Council of the European Communities. They contain essential requirements (ERs). These requirements are mandatory (part of European law)

EAA

Effective Aperture Angle: the maximum angle of deviation from the optical alignment of the emitting element(s) and the receiving element(s) within which the active opto-electronic protective device (AOPD) continues in normal operation.

EDM

External Device Monitoring – a means by which the ESPE monitors the state of the control devices which are external to the ESPE.

Energy isolating device

A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

Energy source

Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

ESPE

Electro-Sensitive Protective Equipment – An assembly of devices and/or components working together for protective tripping or presence sensing purposes and comprising: a sensing device, controlling/monitoring devices/and output signal switching devices.

European Union

The regional geographic and economic union formed by various European nations bound by treaty to form a single European Economic Community.

Exact Channel Select

Same as blanking except that any beams blanked must remain blocked. It prevents any stationary object that is intended to be in the sensing field from being removed from the machine. If the object is moved, the machine shuts down.

Factory Mutual Research Corporation

Factory Mutual Research Corporation (FM) publishes standards and guides.

Floating Blanking

Similar to blanking except that one or more beams are blanked – but the location of these blanked beams is not fixed. This allows the blanked beams to “float” up and down throughout the sensing field. This is very useful where the material is being fed into a machine can flex, making it difficult to maintain its location to one fixed beam. A typical example is where material is taken off a roll and into a machine. Floating blanking can include one or more beams. Using floating blanking increases the minimum safety distance. Floating blanking is also referred to as “floating deselect”.

Force Guided Contacts (Linked contacts)

All-or-nothing relay with at least one break contact and at least one make contact designed in such a way that it is made sure by mechanical means that make and break contacts can not be in closed position simultaneously. Also known as: forced contacts, positively activated contacts, guided contacts, and linked contacts.

FSD

Final Switching Device: the component of the machine safety related control system that interrupts the circuit to the machine primary control element when the OSSD (Output Signal Switching Device) goes to the OFF state.

Full Revolution

Full revolution machinery uses a clutch assembly that, when tripped, cannot be disengaged until the crankshaft (or machine) has completed a full revolution and returned to its initial position. It cannot be stopped in mid-stroke. Light curtains cannot be used on these types of machines.

Guard

Part of a machine specifically used to provide protection by means of physical barrier. Depending on its construction, a guard can be called casing, cover, screen, door, enclosing guard, etc.

Harmonized Standard

A standard developed and adopted by the European Union, which support and clarify the essential requirements (ERs) of the Directives. A product complying with the provisions of a harmonized standard is presumed to comply with the corresponding ERs.

Hazard

A source of possible injury or damage to health.

Hazardous Area

An area which can be a source of possible injury or damage to health. Usually associated with areas containing pinch points.

Interlock (for safeguarding)

An arrangement that interconnects guard(s) or device(s) with the control system and/or all or part of the electrical energy distributed to the machine.

Interlocking Device (interlock)

A device whose purpose is to prevent the operation of machine elements under specified conditions, generally as long as a guard is not closed.

International Electrotechnical Commission (IEC)

The major organization for worldwide electrical standards is the International Electrotechnical Commission (IEC) based in Geneva. This organization was founded in 1906 and has grown so that now there are over 40 member countries. They are responsible for electrical standardization activities.

LCIE

Laboratoire Centrale des Industries Electriques. Electrical Industries Central Laboratory, a French organization.

Linked Contacts

All-or-nothing relay with at least one break contact and at least one make contact designed in such a way that it is made sure by mechanical means that make and break contacts can not be in closed position simultaneously. Also known as: forced contacts, positively activated contacts, force guided contacts, and guided contacts.

Lockout

The placing of a lockout device on an energy isolating device to insure that the energy isolating device and the equipment being controlled cannot be operated until the lock out device is removed (See OSHA 1910.147).

LOVAG

Low Voltage Agreement Group, an association in England which approves low voltage electrical equipment.

Machinery

An assembly of linked parts or components, at least one of which moves, which have been combined to process, treat, move or package a material. Also an assembly of such machines. Machinery moved by manual effort is excluded – except for lifting equipment.

Minimum Safe Distance

The distance between the hazardous area and the light curtain, which is sufficient to stop the machine before the operator can access the hazardous area once the operator penetrates the light curtain's sensing field. This distance is based on a formula which considers many factors, including the stopping time of the machine, speed of approach of various body parts, response time of the safety controls, and braking time. Also referred to as Minimum Separation Distance.

Minimum Object Sensitivity (MOS)

Minimum Object Sensitivity of a light curtain: the minimum diameter object that a light curtain will be able to detect at any point in the sensing field.

MPCE

Machine Primary Control Element: the electrically powered element that directly controls the normal operation of a machine in such a way that it is the last element (in time) to function when machine operation is to be initiated or stopped.

NOTE: This element can be, for example, a main contactor, a magnetic clutch or an electrically operated hydraulic valve.

MSCE

Machine Secondary Control Element: a machine control element, independent of the machine primary control element(s) (MPCE above), that is capable of removing the source power from the prime driving component(s) of the relevant hazardous parts in an emergency. The MSCE is normally controlled by the secondary switching device.

NOTE: This element can be, for example, a main contactor, a magnetic clutch or an electrically operated hydraulic valve.

Muting

Defined as “the temporary, automatic suspension of safety functions by a safety related control system during normal operation of a machine”. Muting is only permitted during the non-hazardous portion of the machine cycle. (see ANSI B11.19:8.3.2.5) It is generally used for parts ejecting and feeding of material.

National Electrical Manufacturers Association

The National Electrical Manufacturers Association (NEMA) publishes standards on the construction and performance of electrical equipment.

Notified Body

An independent testing laboratory that a Member State has determined to be qualified to perform testing and certification functions relating to specified EU Directives. The Member State “notifies” the EC and the laboratory of the laboratory’s qualified status as tester and certifier. The Notified body must reside in one of the EU countries, but it may have testing facilities outside the EU.

Object Sensitivity

See MOS.

Occupational Safety and Health Administration

The United States Occupational Safety and Health Administration (OSHA) is a federal government regulatory agency with jurisdiction in the United States.

OSSD

Output Signal Switching Device: the component of the ESPE connected to the machine control system which, when the sensing device is actuated during normal operation, responds by going to the OFF state.

Part Revolution

Part revolution machinery uses a clutch assembly that can be disengaged at any point before the crankshaft (or machine) has completed a full revolution and returned to its initial position. It can be stopped in mid-stroke.

Pinch Point

Any point other than the point of operation where it is possible for any part of the body to be caught between moving parts of a machine, between the machine and the material (being worked with), between the machine and other equipment, between the moving parts of the machine and a stationary object such as a wall or floor or other stationary part of the machine.

Point of Operation

That point where material is actually positioned and work is being performed during any process such as shearing, punching, forming, or assembling.

Positive Opening Operation (of a contact element)

The achievement of contact separation as the direct result of a specified movement of the switch actuator through non-resilient members (e.g.: not dependent on springs).The term Positive Opening is used throughout NFPA 79, and in IEC 60947-5-1, and EN 60947-5-1. Direct Opening is the term referred to in NEMA ICS-5, part 6 (direct opening action). The terms Positive Opening and Direct Opening identify the same contact action and characteristics

PSD

Presence Sensing Device: a device designed, constructed and arranged to create a sensing field or area to detect when an operator’s hand or any other part of their body is within such a field or area (i.e.: a light curtain).

PSDI

Presence Sensing Device Initiation: an operating mode of indirect manual initiation of a single stroke of a press or machine by a presence sensing device (such as a light curtain). When the PSD senses that the work motions of the operator related to feeding and/or removing parts are completed, and that all parts of the operator's body or hand tools are safely clear of the point of operation, the press is initiated for a single stroke.

Example: The operator reaches into machine to place a part, the light curtain beams are broken, and the machine is stopped. The operator positions part in machine, the light curtain field is still broken, machine remains stopped. When done positioning part, the operator retracts his hands to clear the light curtain. The light curtain resets, returns to a safe status, and initiates a machine start.

For more information on PSDI, refer to OSHA 29 CFR 1910.217 (h), the various appendices referenced on PSDI, and OSHA mandatory regulations requiring third party approval.

Qualified Person

A person to whom the authority and responsibility to perform a specific assignment has been given by the employer. Defined as Authorized Person in OSHA 1920.211 Definitions, and as Qualified Person in NFPA 79 3.3.78 and NEC 2002 Article 100 – Definitions

Redundancy

The application of more than one device or system, or part of a device or system, with the objective of providing that in the event of one failing to perform its function another is available to perform that function.

Risk

A combination of the probability and the degree of the possible injury or damage to health in a hazardous situation.

Safeguard

A guard or protective device used in a safety function to protect persons from a present or impending hazard.

Safeguarding

Safety measures consisting of the use of specific technical means called safeguards to protect persons from the hazards which cannot be reasonably removed or sufficiently limited by design.

SPM

Stopping Performance Monitor: a monitoring means to determine whether or not the overall system stopping performance is within the preset limit(s).

SSD

Secondary Switching Device: a device which, in a lock-out condition, performs a back-up safety function by going to the OFF state and initiating an appropriate machine control action. e.g: de-energizing the MCSE.

Stopping Time

The period between the point at which the interlocking or other safety device (such as a light curtain) initiates the stop command and the point at which the risk from hazardous machine functions has passed.

Stop Time Measurement Device

This device measures the time from when a stop signal is issued to the time the machine has come to a complete stop. Typically used on mechanical or hydraulic presses and press brakes, many devices are available with accessories so they can be used with other machinery such as lathes, mills, and drills.

Tagout

The placing of a tagout device on an energy isolating device to insure that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed (See OSHA 1910.147).

Test Object

An object (usually supplied by the light curtain manufacturer) which is the same size as the minimum object sensitivity for periodically testing the light curtain for proper operation. This test object is typically a rod of a specific diameter, and is therefore also referred to as a test rod.

Type A Standards

Fundamental safety standards giving basic concepts, principles of design, and general aspects that can be applied to all machinery.

Type B Standards

Group safety standards dealing with one aspect or one type of safety related device that can be used across a wide range of machinery.

Type C Standards

Machine safety standards giving detailed safety requirements for a particular machine or group of machines

Underwriters Laboratories Inc.

Underwriters Laboratories Inc. (UL) publishes a number of different standards providing detailed construction and performance requirements for equipment.

Product reference index

1
170DTN 110 00 2/14 2/29 2/47
4
467NHP 811 00 2/14 2/29 2/47
490NAD 911 03 2/14 2/29 2/47
490NAD 911 04 2/14 2/29 2/47
490NAD 911 05 2/14 2/29 2/47
490NAE 911 00 2/14 2/29 2/47
490NTC 000 05 2/14 2/29 2/47
490NTC 000 15 2/14 2/29 2/47
490NTC 000 40 2/14 2/29 2/47
490NTC 000 80 2/14 2/29 2/47
490NTW 000 02 2/14 2/29 2/47 2/125
490NTW 000 02U 2/125
490NTW 000 05 2/14 2/29 2/47
490NTW 000 05U 2/125
490NTW 000 12 2/14 2/29 2/47
490NTW 000 12U 2/125
490NTW 000 40 2/14 2/29 2/47
490NTW 000 80 2/14 2/29 2/47
9001P1 4/15
9001P2 4/15
9001P3 4/15
9001P4 4/15
9001P5 4/15
9001P6 4/15
9001P7 4/15
9001PB 4/15
9001PG1 4/15
9001PG2 4/15
A
ABL1REM12050 2/13 2/28 2/46
ABL1REM24025 2/13 2/28 2/46
ABL1REM24100 2/13 2/28 2/46 3/130
ABL8RPS24030 2/13 2/28 2/46 3/130
ABL 8RPS24050 2/13 2/28 2/46 3/130
ABL 8RPS24100 2/13
ASISA01 2/266 2/270
ASISAD1 2/270
ASISAFEMON1B 2/266
ASISAFEMON2B 2/266
ASISCM 2/266
ASISCPC 2/266
ASISEA1C 2/270
ASISEK1C 2/270
ASISSLB4 2/270
ASISSLB5 2/270
ASISSLC1 2/270
ASISSLC2 2/270
ASISSLE4 2/270
ASISSLE5 2/270
ASISSLLS 2/270
ASISWIN2 2/266
ASITERV2 2/266 2/270
D
DE9 RA13520 3/29
DE9 RA2012 3/29
DE9 RI2016 2/270
DL1AA024 4/7
DL1AA048 4/7
DL1AA127 4/7
DL1AA220 4/7
DL1CE024 4/7
DL1CE048 4/7
DL1CE130 4/7
Q
Q99900911 4/8
S
SSV1XPSMFWIN 2/12 2/27 2/45 2/68
STBNDP 2112 2/14 2/29 2/47
T
TSCCANTDM4 2/125
TSXCANCA100 2/125
TSXCANCA300 2/125
TSXCANCA50 2/125
TSXCANCADD03 2/125
TSXCANCADD1 2/125
TSXCANCADD3 2/125
TSXCANCADD5 2/125
TSXCSA 100 2/14 2/47
TSXCSA 200 2/14 2/47
TSXCSA 500 2/14 2/47
TSXCUSB485 2/125
TSXPBS CA 100 2/14 2/29 2/47 2/125
TSXPBS CA 400 2/14 2/29 2/47 2/125
TSXPBY 100 2/14 2/29 2/47
TSXPCX 1031 2/125
V
VW3A8 306 R 2/14 2/47
VW3A8 306 R30 2/125
VW3A8 306 RC 2/14 2/47
VW3A8 306 R03 2/29
VW3A8 306 R10 2/29
VW3A8 306 R30 2/29
X
XBTGT7340 2/13 2/28 2/46
XBTGT2130 2/13 2/28 2/46
XBTGT2330 2/13 2/28 2/46
XBTGT4330 2/13 2/28 2/46
XBTGT5230 2/13 2/28 2/46
XBTGT5330 2/13 2/28 2/46
XBTGT6330 2/13 2/28 2/46
XBTGT7340 2/13 2/28 2/46
XBTZ938 2/14 2/29 2/47
XBTZG909 2/14 2/29 2/47
XCSA503 3/24
XCSA523 3/24
XCSA703 3/24
XCSA713 3/24
XCSA723 3/24
XCSA803 3/24
XCSB503 3/24
XCSB703 3/24
XCSB713 3/24
XCSB723 3/24
XCSB803 3/24
XCSC703 3/24
XCSC803 3/24
XCSD3702G13 3/81
XCSD3702N12 3/81
XCSD3702P20 3/81
XCSD3710G13 3/81
XCSD3710N12 3/81
XCSD3710P20 3/81
XCSD3718G13 3/81
XCSD3718N12 3/81
XCSD3718P20 3/81
XCSD3719G13 3/81
XCSD3719N12 3/81
XCSD3719P20 3/81
XCSD3902G13 3/80
XCSD3902N12 3/80
XCSD3902P20 3/80
XCSD3910G13 3/80
XCSD3910N12 3/80
XCSD3910P20 3/80
XCSD3918G13 3/80
XCSD3918N12 3/80
XCSD3918P20 3/80
XCSD3919G13 3/80
XCSD3919N12 3/80
XCSD3919P20 3/80
XCSDM379102 3/68
XCSDM379105 3/68
XCSDM379110 3/68
XCSDM3791M12 3/66 3/69
XCSDM480102 3/68
XCSDM480105 3/68
XCSDM480110 3/68
XCSDM4801M12 3/69
XCSDMC5902 3/56
XCSDMC590L01M8 3/57
XCSDMC5912 3/56
XCSDMC591L01M8 3/57
XCSDMC7902 3/56
XCSDMC790L01M8 3/57
XCSDMC7912 3/56
XCSDMC791L01M8 3/57
XCSDMP5002 3/56
XCSDMP500L01M12 3/57
XCSDMP5012 3/56
XCSDMP501L01M12 3/57
XCSDMP5902 3/56
XCSDMP590L01M12 3/57
XCSDMP5912 3/56
XCSDMP591L01M12 3/57
XCSDMP7002 3/56
XCSDMP700L01M12 3/57
XCSDMP7012 3/56
XCSDMP701L01M12 3/57
XCSDMP7902 3/56
XCSDMP790L01M12 3/57
XCSDMP7912 3/56
XCSDMP791L01M12 3/57
XCSDMR5902 3/56
XCSDMR590L01M12 3/57
XCSDMR5912 3/56
XCSDMR591L01M12 3/57
XCSDMR7902 3/56
XCSDMR790L01M12 3/57
XCSDMR7912 3/56
XCSDMR791L01M12 3/57
XCSDMT 3/70
XCSE5313 3/25
XCSE5323 3/25
XCSE5333 3/25
XCSE5343 3/25
XCSE5513 3/25
XCSE5523 3/25
XCSE5533 3/25
XCSE5543 3/25
XCSE7313 3/25
XCSE7323 3/25
XCSE7333 3/25
XCSE7343 3/25
XCSE7513 3/25
XCSE7523 3/25
XCSE7533 3/25
XCSE7543 3/25
XCSE8313 3/25
XCSE8323 3/25
XCSE8333 3/25
XCSE8343 3/25
XCSE8513 3/25
XCSE8523 3/25
XCSE8533 3/25
XCSE8543 3/25
XCSL564B3 3/26
XCSL564F3 3/26
XCSL564M3 3/26
XCSL566B3 3/26
XCSL566F3 3/26
XCSL566M3 3/26
XCSL584B3 3/27
XCSL584F3 3/27
XCSL584M3 3/27
XCSL586B3 3/27
XCSL586F3 3/27
XCSL586M3 3/27
XCSL764B3 3/26
XCSL764F3 3/26
XCSL764M3 3/26
XCSL766B3 3/26
XCSL766F3 3/26
XCSL766M3 3/26
XCSL784B3 3/27
XCSL784F3 3/27
XCSL784M3 3/27
XCSL786B3 3/27
XCSL786F3 3/27
XCSL786M3 3/27
XCSM3702L2 3/76
XCSM3710L2 3/76
XCSM3715L2 3/76
XCSM3716L2 3/76
XCSM3902L2 3/76
XCSM3910L2 3/76
XCSM3915L2 3/76
XCSM3916L2 3/76
XCSM4102L2 3/76
XCSM4110L2 3/76
XCSM4115L2 3/76
XCSM4116L2 3/76
XCSMP59L2 3/40
XCSMP70L2 3/40
XCSMP79L2 3/40
XCSMP80L2 3/40
XCSP3702G13 3/83
XCSP3702N12 3/83
XCSP3702P20 3/83
XCSP3710G13 3/83
XCSP3710N12 3/83
XCSP3710P20 3/83
XCSP3718G13 3/83
XCSP3718N12 3/83
XCSP3718P20 3/83
XCSP3719G13 3/83
XCSP3719N12 3/83
XCSP3719P20 3/83
XCSP3902G13 3/82
XCSP3902N12 3/82
XCSP3902P20 3/82
XCSP3910G13 3/82
XCSP3910N12 3/82
XCSP3910P20 3/82
XCSP3918G13 3/82
XCSP3918N12 3/82
XCSP3918P20 3/82
XCSP3919G13 3/82
XCSP3919N12 3/82
XCSP3919P20 3/82
XCSPA593 3/44
XCSPA693 3/44
XCSPA793 3/44
XCSPL553 3/52
XCSPL563 3/52
XCSPL573 3/52
XCSPL583 3/52
XCSPL593 3/52
XCSPL753 3/52

Product reference index

XCSPL763 *3/52*
XCSPL773 *3/52*
XCSPL783 *3/52*
XCSPL793 *3/52*
XCSPR553 *3/52*
XCSPR753 *3/52*
XCSTA593 *3/44*
XCSTA793 *3/44*
XCSTA893 *3/44*
XCSTE5313 *3/45*
XCSTE5333 *3/45*
XCSTE5343 *3/45*
XCSTE5513 *3/45*
XCSTE5533 *3/45*
XCSTE5543 *3/45*
XCSTE6313 *3/45*
XCSTE6333 *3/45*
XCSTE6343 *3/45*
XCSTE6513 *3/45*
XCSTE6533 *3/45*
XCSTE6543 *3/45*
XCSTE7313 *3/45*
XCSTE7333 *3/45*
XCSTE7343 *3/45*
XCSTE7513 *3/45*
XCSTE7533 *3/45*
XCSTE7543 *3/45*
XCSTL553 *3/52*
XCSTL563 *3/52*
XCSTL573 *3/52*
XCSTL583 *3/52*
XCSTL593 *3/52*
XCSTL753 *3/52*
XCSTL763 *3/52*
XCSTL773 *3/52*
XCSTL783 *3/52*
XCSTL793 *3/52*
XCSTL853 *3/52*
XCSTL863 *3/52*
XCSTL873 *3/52*
XCSTL883 *3/52*
XCSTL893 *3/52*
XCSTR553 *3/52*
XCSTR753 *3/52*
XCSZ01 *3/24*
XCSZ02 *3/24*
XCSZ03 *3/24*
XCSZ05 *3/25*
XCSZ100 *3/44*
XCSZ11 *3/45*
XCSZ12 *3/45*
XCSZ13 *3/45*
XCSZ14 *3/45*
XCSZ15 *3/45*
XCSZ200 *3/44*
XCSZ21 *3/45*
XCSZ25 *3/29*
XCSZ27 *3/29*
XCSZ28 *3/44*
XCSZ29 *3/40*
XCSZ31 *3/29*
XCSZ32 *3/29*
XCSZ43 *3/29*
XCSZ81 *3/40*
XCSZ83 *3/40*
XCSZ84 *3/40*
XCSZ85 *3/40*
XCSZ90 *3/29*
XCSZ91 *3/44*
XCSZC1 *3/58*
XCSZCC *3/58*
XCSZCP *3/58*
XCSZCR *3/58*
XCSZP1 *3/58*
XCSZR1 *3/58*
XESP2151 *4/8*
XPSAC1321 *2/175*
XPSAC1321P *2/175*
XPSAC3421 *2/175*
XPSAC3421P *2/175*
XPSAC3721 *2/175*
XPSAC3721P *2/175*
XPSAC5121 *2/175*
XPSAC5121P *2/175*
XPSAF5130 *2/187*
XPSAF5130P *2/187*
XPSAFL5130 *2/191*
XPSAFL5130P *2/191*
XPSAK311144 *2/201*
XPSAK311144P *2/201*
XPSAK331144P *2/201*
XPSAK351144 *2/201*
XPSAK351144P *2/201*
XPSAK361144 *2/201*
XPSAK361144P *2/201*
XPSAK371144 *2/201*
XPSAK371144P *2/201*
XPSAR311144 *2/195*
XPSAR311144P *2/195*
XPSAR351144 *2/195*
XPSAR351144P *2/195*
XPSAR371144 *2/195*
XPSAR371144P *2/195*
XPSATE3410 *2/180*
XPSATE3410P *2/180*
XPSATE3710 *2/180*
XPSATE3710P *2/180*
XPSATE5110 *2/180*
XPSATE5110P *2/180*
XPSAV11113 *2/180*
XPSAV11113P *2/180*
XPSBA3420 *2/209*
XPSBA3720 *2/209*
XPSBA5120 *2/209*
XPSBC1110 *2/209*
XPSBC3110 *2/209*
XPSBC3410 *2/209*
XPSBC3710 *2/209*
XPSBF1132 *2/209*
XPSBF1132P *2/209*
XPSDA3442 *2/247*
XPSDA3742 *2/247*
XPSDA5142 *2/247*
XPSDMB1132 *2/235*
XPSDMB1132P *2/235*
XPSDME1132 *2/235*
XPSDME1132P *2/235*
XPSECM3431 *2/227*
XPSECM3731 *2/227*
XPSECM5131 *2/227*
XPSECP3431 *2/227*
XPSECP3731 *2/227*
XPSECP5131 *2/227*
XPSLCD1141 *2/215*
XPSLCM1 *3/96*
3/106
XPSLCM1150 *2/220*
XPSMC16Z *2/124*
XPSMC16ZC *2/124*
XPSMC16ZP *2/124*
XPSMC32Z *2/124*
XPSMC32ZC *2/124*
XPSMC32ZP *2/124*
XPSMCCPC *2/125*
XPSMCSCY *2/29*
2/125
XPSMCTC16 *2/124*
XPSMCTC32 *2/124*
XPSMCTS16 *2/124*
XPSMCTS32 *2/124*
XPSMCWIN *2/124*
XPSMCWIN *2/124*
XPSMF1DI1601 *2/78*
XPSMF2DO1601 *2/85*
XPSMF2DO1602 *2/85*
XPSMF2DO401 *2/85*
XPSMF2DO801 *2/85*
XPSMF3022 *2/27*
XPSMF31222 *2/27*
XPSMF3502 *2/27*
XPSMF3522 *2/27*
XPSMF3542 *2/27*
XPSMF3AIO8401 *2/97*
XPSMF3DIO16801 *2/97*
XPSMF3DIO20802 *2/97*
XPSMF3DIO8801 *2/97*
XPSMF4000 *2/12*
XPSMF4002 *2/12*
XPSMF4020 *2/12*
XPSMF4022 *2/12*
XPSMF4040 *2/12*
XPSMF4042 *2/12*
XPSMFADAPT *2/29*
2/47
XPSMFAI801 *2/51*
XPSMFAO801 *2/53*
XPSMFBLK *2/45*
XPSMFCIO2401 *2/55*
XPSMFCPU22 *2/44*
XPSMFDI2401 *2/57*
XPSMFDI3201 *2/59*
XPSMFDIO241601 *2/61*
XPSMFDO801 *2/63*
XPSMFGEH01 *2/44*
XPSMFPS01 *2/44*
XPSMP11123 *2/108*
XPSMP11123P *2/108*
XPSOT3444 *2/258*
XPSOT3744 *2/258*
XPSPVK1184 *2/253*
XPSPVK3484 *2/253*
XPSPVK3784 *2/253*
XPSPVT1180 *2/249*
XPSTSA3442P *2/231*
XPSTSA3742P *2/231*
XPSTSA5142P *2/231*
XPSTSW3442P *2/231*
XPSTSW3742P *2/231*
XPSTSW5142P *2/231*
XPSVNE1142HSP *2/241*
XPSVNE1142P *2/241*
XPSVNE3442HSP *2/241*
XPSVNE3442P *2/241*
XPSVNE3742HSP *2/241*
XPSVNE3742P *2/241*
XSZB130 *3/58*
XSZBCR05 *3/96*
XSZBCR10 *3/96*
XSZBCR15 *3/96*
XSZBCR30 *3/96*
XSZBCT05 *3/96*
XSZBCT10 *3/96*
XSZBCT15 *3/96*
XSZBCT30 *3/96*
XSZCM01 *2/220*
3/106
XSZCM02 *2/220*
3/106
XSZDCT003 *3/96*
XSZDCT005 *3/96*
XSZDCT010 *3/96*
XSZDCT020 *3/96*
XSZDCT030 *3/96*
XSZDCT050 *3/96*
XSZDCT100 *3/96*
XSZDCR003 *3/96*
XSZDCR005 *3/96*
XSZDCR010 *3/96*
XSZDCR020 *3/96*
XSZDCR030 *3/96*
XSZDCR050 *3/96*
XSZDCR100 *3/96*
XSZNCR03 *3/127*
XSZNCR10 *3/127*
XSZNCR30 *3/127*
XSZNCT03 *3/127*
XSZNCT10 *3/127*
XSZNCT30 *3/127*
XSZPCR05 *3/121*
XSZPCR10 *3/121*
XSZPCR15 *3/121*
XSZPCR30 *3/121*
XSZPCT05 *3/121*
XSZPCT10 *3/121*
XSZPCT15 *3/121*
XSZPCT30 *3/121*
XSZSMK *3/132*
XSZSMK1 *3/132*
XSZSMK2 *3/132*
XSZTBDMCR003 *3/96*
XSZTBDMCT003 *3/96*
XSZTCR05 *3/112*
XSZTCR10 *3/112*
XSZTCR15 *3/112*
XSZTCR30 *3/112*
XSZTCT05 *3/112*
XSZTCT10 *3/112*
XSZTCT15 *3/112*
XSZTCT30 *3/112*
XUSLBQ6A0280 *3/92*
XUSLBQ6A0320 *3/92*
XUSLBQ6A0360 *3/92*
XUSLBQ6A0440 *3/92*
XUSLBQ6A0520 *3/92*
XUSLBQ6A0600 *3/92*
XUSLBQ6A0720 *3/92*
XUSLBQ6A0760 *3/92*
XUSLBQ6A0880 *3/92*
XUSLBQ6A0920 *3/92*
XUSLBQ6A0960 *3/92*
XUSLBQ6A1040 *3/92*
XUSLBQ6A1120 *3/92*
XUSLBQ6A1200 *3/92*
XUSLBQ6A1360 *3/92*
XUSLBR5A0320 *3/92*
XUSLBR5A0360 *3/92*
XUSLBR5A0440 *3/92*
XUSLBR5A0520 *3/92*
XUSLBR5A0600 *3/92*
XUSLBR5A0680 *3/92*
XUSLBR5A0760 *3/92*
XUSLBR5A0880 *3/92*
XUSLBR5A0920 *3/92*
XUSLBR5A1040 *3/92*
XUSLBR5A1200 *3/92*
XUSLBR5A1360 *3/92*
XUSLBR5A1400 *3/92*
XUSLBR5A1520 *3/92*
XUSLBR5A1560 *3/92*
XUSLBR5A1640 *3/92*
XUSLBR5A1720 *3/92*
XUSLBR5A1800 *3/92*
XUSLBR5A1920 *3/92*
XUSLBR5A2120 *3/92*
XUSLDMQ6A0280 *3/93*
XUSLDMQ6A0320 *3/93*
XUSLDMQ6A0360 *3/93*
XUSLDMQ6A0440 *3/93*
XUSLDMQ6A0520 *3/93*
XUSLDMQ6A0600 *3/93*
XUSLDMQ6A0720 *3/93*
XUSLDMQ6A0760 *3/93*
XUSLDMQ6A0880 *3/93*
XUSLDMQ6A0920 *3/93*
XUSLDMQ6A0960 *3/93*
XUSLDMQ6A1040 *3/93*
XUSLDMQ6A1120 *3/93*
XUSLDMQ6A1200 *3/93*
XUSLDMQ6A1360 *3/93*
XUSLDMY5A0320 *3/93*
XUSLDMY5A0360 *3/93*
XUSLDMY5A0440 *3/93*
XUSLDMY5A0520 *3/93*
XUSLDMY5A0600 *3/93*
XUSLDMY5A0680 *3/93*
XUSLDMY5A0760 *3/93*
XUSLDMY5A0880 *3/93*
XUSLDMY5A0920 *3/93*
XUSLDMY5A1040 *3/93*
XUSLDMY5A1200 *3/93*
XUSLDMY5A1360 *3/93*
XUSLDMY5A1400 *3/93*
XUSLDMY5A1520 *3/93*
XUSLDMY5A1560 *3/93*
XUSLDMY5A1640 *3/93*
XUSLDMY5A1720 *3/93*
XUSLDMY5A1800 *3/93*
XUSLDMY5A1920 *3/93*
XUSLDMY5A2120 *3/93*
XUSLDSQ6A0280 *3/95*
XUSLDSQ6A0320 *3/95*
XUSLDSQ6A0360 *3/95*
XUSLDSQ6A0440 *3/95*
XUSLDSQ6A0520 *3/95*
XUSLDSQ6A0600 *3/95*
XUSLDSQ6A0720 *3/95*
XUSLDSQ6A0760 *3/95*
XUSLDSQ6A0880 *3/95*
XUSLDSQ6A0920 *3/95*
XUSLDSQ6A0960 *3/95*
XUSLDSQ6A1040 *3/95*
XUSLDSQ6A1120 *3/95*
XUSLDSQ6A1200 *3/95*
XUSLDSY5A0320 *3/95*
XUSLDSY5A0360 *3/95*
XUSLDSY5A0440 *3/95*
XUSLDSY5A0520 *3/95*
XUSLDSY5A0600 *3/95*
XUSLDSY5A0680 *3/95*
XUSLDSY5A0760 *3/95*
XUSLDSY5A0880 *3/95*
XUSLDSY5A0920 *3/95*
XUSLDSY5A1040 *3/95*
XUSLDSY5A1200 *3/95*
XUSLDSY5A1360 *3/95*

XUSLDSY5A1400 *3/95*
XUSLDSY5A1520 *3/95*
XUSLDSY5A1560 *3/95*
XUSLDSY5A1640 *3/95*
XUSLDSY5A1720 *3/95*
XUSLDSY5A1800 *3/95*
XUSLDSY5A1920 *3/95*
XUSLDSY5A2120 *3/95*
XUSLNG5C0150 *3/127*
XUSLNG5C0300 *3/127*
XUSLNG5C0450 *3/127*
XUSLNG5C0600 *3/127*
XUSLNG5C0750 *3/127*
XUSLNG5C0900 *3/127*
XUSLNG5C1050 *3/127*
XUSLNG5C1200 *3/127*
XUSLNG5C1350 *3/127*
XUSLNG5C1500 *3/127*
XUSLNG5D0150 *3/127*
XUSLNG5D0300 *3/127*
XUSLNG5D0450 *3/127*
XUSLNG5D0600 *3/127*
XUSLNG5D0750 *3/127*
XUSLNG5D0900 *3/127*
XUSLNG5D1050 *3/127*
XUSLNG5D1200 *3/127*
XUSLNG5D1350 *3/127*
XUSLNG5D1500 *3/127*
XUSLPB2A500M *3/119*
XUSLPB2A600M *3/119*
XUSLPDM *3/96*
XUSLPZ1AB *3/120*
XUSLPZ1AM *3/119*
XUSLPZ2A0500B *3/120*
XUSLPZ2A0500M *3/119*
XUSLPZ2A0600B *3/120*
XUSLPZ2A0600M *3/119*
XUSLPZ3A0400B *3/120*
XUSLPZ3A0400M *3/119*
XUSLPZ3A0500B *3/120*
XUSLPZ3A0500M *3/119*
XUSLPZ4A0300B *3/120*
XUSLPZ4A0300M *3/119*
XUSLPZ5A0300B *3/120*
XUSLPZ5A0300M *3/119*
XUSLPZ6A0300B *3/120*
XUSLPZ6A0300M *3/119*
XUSLTQ6A0260 *3/111*
XUSLTQ6A0350 *3/111*
XUSLTQ6A0435 *3/111*
XUSLTQ6A0520 *3/111*
XUSLTQ6A0610 *3/111*
XUSLTQ6A0700 *3/111*
XUSLTQ6A0785 *3/111*
XUSLTQ6A0870 *3/111*
XUSLTQ6A0955 *3/111*
XUSLTQ6A1045 *3/111*
XUSLTQ6A1130 *3/111*
XUSLTQ6A1215 *3/111*
XUSLTQ6A1305 *3/111*
XUSLTQ6A1390 *3/111*
XUSLTR5A0350 *3/111*
XUSLTR5A0520 *3/111*
XUSLTR5A0700 *3/111*
XUSLTR5A0870 *3/111*
XUSLTR5A1045 *3/111*
XUSLTR5A1215 *3/111*
XUSLTR5A1390 *3/111*
XUSLTR5A1570 *3/111*
XUSLTR5A1745 *3/111*
XUSLTR5A1920 *3/111*
XUSLTR5A2095 *3/111*
XUSLZ100 *3/112*
XUSLZ213 *3/112*
XUSLZ218 *3/127*
XUSLZ219 *3/121*
XUSLZ222 *3/112*
XUSLZ227 *3/132*
XUSLZ228 *3/96*
XUSLZ320 *3/121*
XUSLZ330 *3/96*
XUSLZ450 *3/96*
XUSLZ500 *3/112 3/121 3/127 3/96 3/112 3/121 3/127*
XUSLZ500 *3/70*
XUSLZ600 *3/96*
XUSLZ610 *3/96*
XUSLZ70260 *3/113*
XUSLZ70350 *3/113*
XUSLZ70435 *3/113*
XUSLZ70520 *3/113*
XUSLZ70610 *3/113*
XUSLZ70700 *3/113*
XUSLZ70785 *3/113*
XUSLZ70870 *3/113*
XUSLZ70955 *3/113*
XUSLZ71045 *3/113*
XUSLZ71130 *3/113*
XUSLZ71215 *3/113*
XUSLZ71305 *3/113*
XUSLZ71390 *3/113*
XUSLZ71570 *3/113*
XUSLZ71745 *3/113*
XUSLZ71920 *3/113*
XUSLZ72095 *3/113*
XUSLZD70280 *3/97*
XUSLZD70320 *3/97*
XUSLZD70360 *3/97*
XUSLZD70440 *3/97*
XUSLZD70520 *3/97*
XUSLZD70600 *3/97*
XUSLZD70680 *3/97*
XUSLZD70720 *3/97*
XUSLZD70760 *3/97*
XUSLZD70880 *3/97*
XUSLZD70920 *3/97*
XUSLZD70960 *3/97*
XUSLZD71040 *3/97*
XUSLZD71120 *3/97*
XUSLZD71200 *3/97*
XUSLZD71360 *3/97*
XUSLZD71400 *3/97*
XUSLZD71520 *3/97*
XUSLZD71560 *3/97*
XUSLZD71640 *3/97*
XUSLZD71720 *3/97*
XUSLZD71800 *3/97*
XUSLZD71920 *3/97*
XUSLZD72120 *3/97*
XUSLZPDM *3/96*
XUSZA0102 *3/130*
XUSZA0152 *3/130*
XUSZA0305 *3/130*
XUSZA0457 *3/130*
XUSZA0508 *3/130*
XUSZA0610 *3/130*
XUSZA0711 *3/130*
XUSZA0762 *3/130*
XUSZA0813 *3/130*
XUSZA0914 *3/130*
XUSZA1016 *3/130*
XUSZA1067 *3/130*
XUSZA1219 *3/130*
XUSZA1321 *3/130*
XUSZA1372 *3/130*
XUSZA1422 *3/130*
XUSZA1524 *3/130*
XUSZA1626 *3/130*
XUSZA1830 *3/130*
XUSZA2134 *3/130*
XUSZA2134 *3/130*
XUSZC1200 *3/133*
XUSZC1800 *3/133*
XUSZC2100 *3/133*
XUSZC2400 *3/133*
XUSZC3100 *3/133*
XUSZCA *3/133*
XUSZCB *3/133*
XUSZM0102 *3/130*
XUSZM0152 *3/130*
XUSZM0305 *3/130*
XUSZM0457 *3/130*
XUSZM0508 *3/130*
XUSZM0610 *3/130*
XUSZM0711 *3/130*
XUSZM0762 *3/130*
XUSZM0813 *3/130*
XUSZM0914 *3/130*
XUSZM1016 *3/130*
XUSZM1067 *3/130*
XUSZM1219 *3/130*
XUSZM1321 *3/130*
XUSZM1372 *3/130*
XUSZM1422 *3/130*
XUSZM1524 *3/130*
XUSZM1626 *3/130*
XUSZM1830 *3/130*
XUSZM2134 *3/130*
XUSZM2134 *3/130*
XY2CE1A150 *4/5*
XY2CE1A250 *4/5*
XY2CE1A190 *4/5*
XY2CE1A196 *4/5*
XY2CE1A290 *4/5*
XY2CE1A296 *4/5*
XY2CE2A150 *4/5*
XY2CE2A250 *4/5*
XY2CE2A190 *4/5*
XY2CE2A196 *4/5*
XY2CE2A290 *4/5*
XY2CE2A296 *4/5*
XY2CE3A010 *4/5*
XY2CE3A020 *4/5*
XY2CE3A026 *4/5*
XY2CE4A010 *4/5*
XY2CE4A020 *4/5*
XY2CE4A026 *4/5*
XY2CH13150 *4/6*
XY2CH13250 *4/6*
XY2CH13350 *4/6*
XY2CH13450 *4/6*
XY2CH33010 *4/6*
XY2CZ0024 *4/7*
XY2CZ0048 *4/7*
XY2CZ0130 *4/7*
XY2CZ0230 *4/7*
XY2CZ203 *4/7*
XY2CZ301 *4/8*
XY2CZ302 *4/8*
XY2CZ305 *4/8*
XY2CZ404 *4/7*
XY2CZ503 *4/8*
XY2CZ513 *4/8*
XY2CZ523 *4/8*
XY2CZ601 *4/8*
XY2CZ602 *4/8*
XY2CZ701 *4/8*
XY2CZ702 *4/7*
XY2CZ703 *4/7*
XY2CZ705 *4/8*
XY2CZ708 *4/8*
XY2CZ901 *4/7*
XY2CZ902 *4/7*
XY2CZ903 *4/7*
XY2CZ904 *4/7*
XY2CZ906 *4/7*
XY2CZ907 *4/7*
XY2CZ916 *4/7*
XY2CZ917 *4/7*
XY2CZ9310 *4/8*
XY2CZ9325 *4/8*
XY2CZ9350 *4/8*
XZCP0941L10 *3/58*
XZCP0941L2 *3/58*
XZCP0941L5 *3/58*
XZCP1041L10 *3/58*
XZCP1041L2 *3/58*
XZCP1041L5 *3/58*
XZCP1141L10 *3/58*
XZCP1141L● *3/58*
XZCP1241L●● *3/58*
XZCP29P11L●● *3/58*
XZCP29P12L●● *3/70*

Z

ZA2BA639 *4/8*
ZA2BC64 *4/8*
ZA2BP6 *4/8*
ZA2BS06212 *4/8*
ZB2BV04 *4/7*
ZB2BV014 *4/7*
ZB2 BV015 *4/7*
ZB4BS844 *2/270*
ZB5AS844 *2/270*
ZB5AS944 *2/270*

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