HYBRID AND ELECTRIC VEHICLE CONNECTION SYSTEM SELECTOR GUIDE

APTIV

A world of transportation

Aptiv has been a trusted automotive supplier for decades, introducing practical innovations in the areas of safety, efficiency, and connectivity. The transportation market has been advancing in these same areas and Aptiv can offer product solutions upgraded to its tougher operational and environmental requirements.

Commercial and recreation vehicles, such as trucks, buses, construction, agriculture equipment and motorcycles, are often exposed to higher levels of environmental forces, including vibration, duct, water, debris, and temperatures. To protect the integrity of the electrical system, high performance connection systems are often required.

To deliver superior performance, a number of complex factors in the electrical system must be addressed in the component design, including sealing, locking features, and materials.

About Aptiv

Aptiv is a global technology company that develops safer, greener and more connected solutions, which enable the future of mobility. Headquartered in Dublin, Aptiv has 147,000 employees and operates 14 technical centers, as well as manufacturing sites and customer support centers in 45 countries.

Image Source : PSA

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Why is vehicle electrification now a reality?

Driven by rising fuel costs, environmental concerns and a combination of government regulations and incentives, the market for EVs (Electric Vehicles) and HEVs (Hybrid Electric Vehicles) is now becoming a reality. Vehicle specifications and infrastructure deployment have reached a certain level of industrialization. Standards have already been established for vehicle charging interfaces used on plug-in HEVs and EVs.

There are three standards used throughout the world including SAE J1772 in North America and Japan, IEC62196 Type II in Europe and GB/T 20234 in China. In addition, SAE has established a common footprint for DC (Direct Current) fast charging in North America and Europe. Aptiv offers a complete line of all global charging standards.

A comprehensive product portfolio

High Voltage Auxiliary Modules

High Voltage connection systems designed specifically for the voltage and current needs of auxiliary modules, such as A/C compressor, heater, coolant control module, on board-board charger, DC converter, and battery accessory output.

Page 9

High Voltage Power Conversion

High Voltage connection systems designed specifically for the voltage and current needs up to 250A. Power conversion modules consist of inverters, drive motors/generators, and High Current/ High Voltage battery outputs.

Page 23

High Power 12, 24, 48 Volt Solutions

Growing requirements and a quickly increasing market for 48 Volt applications drive our technology for innovative solutions. Two key characteristics define these solutions: High current carrying capabilities and high sealing protection.

Page 35

Charging Solutions

Unique technologies to help facilitate a global charging infrastructure, from Aptiv's Portable Electric Vehicle Charger and Charge Coupler pigtails for integration into Electric Vehicle Supply Equipment (EVSE). With Aptiv products, hybrid and electric vehicles can be powered safely and efficiently at home or away.

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Performance key & Aptiv design indicators key

Performance

Voltage

Range	12V – 1000V

Amperage

Range	10A – 250A

Temperature

Class	Ambient Temperature Range
T1	-40˚C to +85˚C
T2	-40˚C to +100˚C
T3	-40˚C to +125˚C
T4	-40˚C to +150˚C

Sealing

Class	Common Name
S1	Unsealed
S2	Sealed
S3	Sealed (w/high pressure spray)

Vibration

Class	Common Name	Typical Application
V1	Chassis Profile	Components on sprung portions of vehicle not coupled to Engine
V2	Engine Profile	Components coupled to Engine with severe vibration possible
V3	Severe On-Engine	Components subject to severe vibration
V4	Extreme Vibration	Used as needed to correlate to extreme vibration areas

On-Board Charger Connector Level 1 / Level 2

6 way Device Connection System

APPLICATION

- High voltage unshielded system for on-board charger applications: Level 1(16A) and 2 (32A)

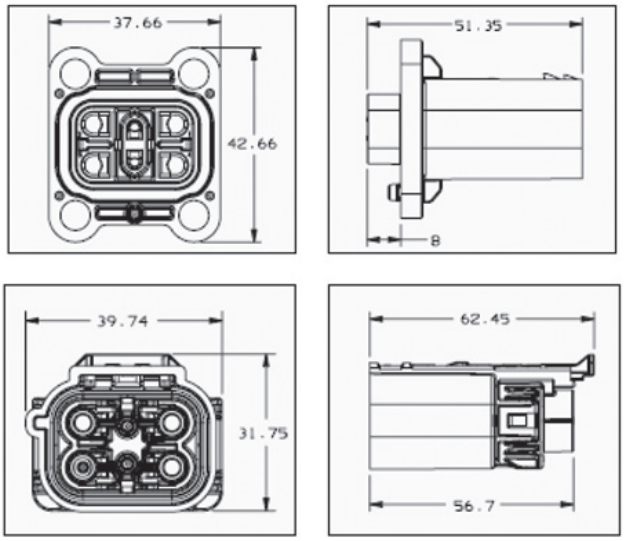
DESCRIPTION

- Sealed connection system
- Capability for four power circuits and two signal circuits
- Unshielded with terminal spacing for HV applications
- Two-stage locking system for electrical protection
- One-stage locking system also available
- Cable range: 2 mm² to 5 mm²
- Capable of multiple keys/indexes
- Electrical protection: Finger-proof IP2XB

Performance	
32A@85C	
600V DC	
Temperature	T3
Vibration	V1
Sealing	S3

Dimensions

Shown in millimeters



On-Board Charger Connector Level 1 / Level 2

6 way Inline Connection System

APPLICATION

- High voltage unshielded system for on-board charger applications (Level 1 and 2)

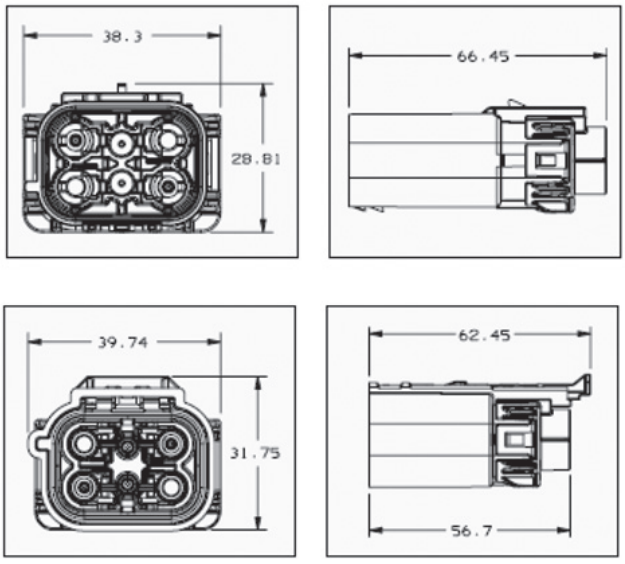
DESCRIPTION

- Sealed connection system
- Capability for four power circuits and two signal circuits
- Unshielded with terminal spacing for HV applications
- Two-stage locking system for electrical protection
- One-stage locking system also available
- Cable range: 2 mm² to 5 mm²
- Capable of multiple keys/indexes
- Electrical protection: Finger-proof IP2XB

Performance
32A@85C
600V DC
Temperature T3
Vibration V1
Sealing S3

Dimensions

Shown in millimeters



Shield-Pack™ HV280

AK CLASS 1 female connector

APPLICATION

- High voltage accessories connection system

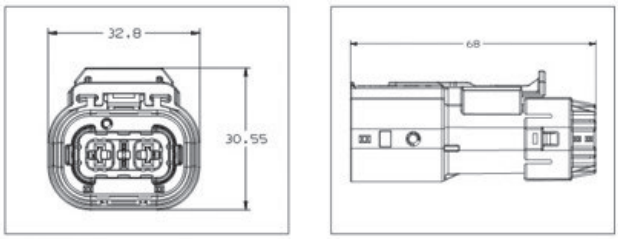
DESCRIPTION

- Sealed connection system
- Two or three HV power circuits (2.8 mm terminal)
- 2 Way: HVIL shunted in harness connection and pass-through HVIL options available
- 3 Way: No HVIL
- Cable range: 2.5 & 4mm² multi-core circuit; 0.5 mm² HVIL circuit (2 way only)
- Four Key/indexes
- Electrical protection: Finger-proof IP2XB

Performance	
32A@85C	
1000V DC	
Temperature	T4
Vibration	V1
Sealing	S3

Dimensions

Shown in millimeters



APEX® HV280

2 way Connection System with HVIL

APPLICATION

- High voltage peripheral equipment connection system: Air conditioning, PTC, Charger

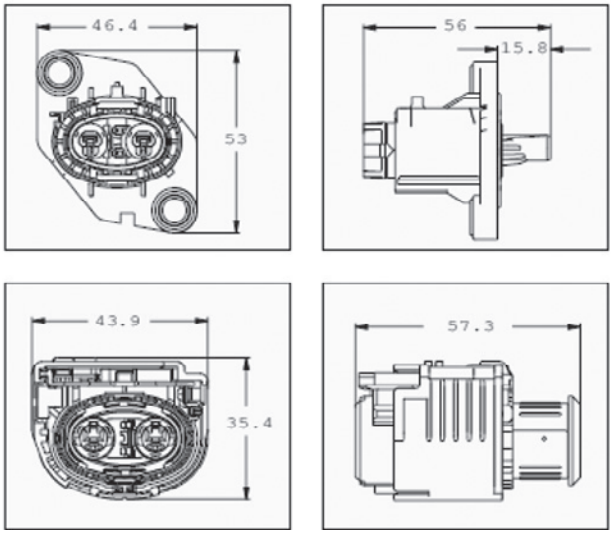
DESCRIPTION

- Bundle shielding with external braid
- Dual sealing connection system: mated & unmated header
- Panel mount to device with face seal
- Unique integrated electric interlock
- HVIL shunted in harness connector
- Two-stage disconnect for safe unmating
- ErgoMate™ Axial Mating Assist System on harness connector
- Two HV power circuits (2.8 mm terminal)
- Cable range: 2.5 to 4 mm² power circuit; 0.5 to 0.75 mm²
- HVIL circuit
- Two keys/indexes
- Electrical protection: Finger-proof IP2XB

Performance
35A@70C
1000V DC
Temperature T3
Vibration V1
Sealing S3

Dimensions

Shown in millimeters



Shield-Pack™ HV280

2 Piece Header with Pluggable Inner Connector

APPLICATION

- Ideal for auxiliary devices/high voltage connection system

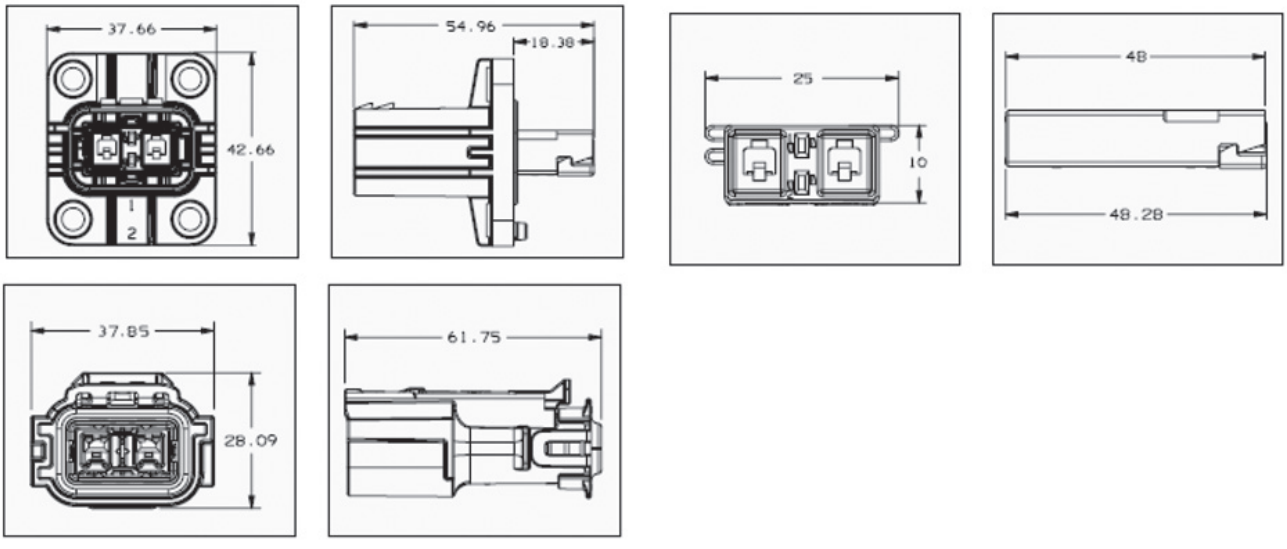
DESCRIPTION

- Inner Connector with TPA can be plugged into header during device assembly
- Sealed connection system
- Panel mount to device with face seal
- Internal HVIL (shunt in harness connector)
- Two options available : Two-stage locking system for HVIL time delay - Tool-less mating system
- Two HV power circuits (2.8 mm terminal)
- Finger proof/touch safe
- Cable range: 2 mm² to 5 mm² power circuit; 0.5 mm² HVIL circuit
- Electrical protection: Finger-proof IP2XB

Performance	
40A@85C	
1000V DC	
Temperature	T3
Vibration	V1
Sealing	S3

Dimensions

Shown in millimeters



APEX® 950 On-Board Charger Connector

4 + 1 Way Connection System with HVIL

APPLICATION

- High voltage unshielded system, especially on-board charger applications

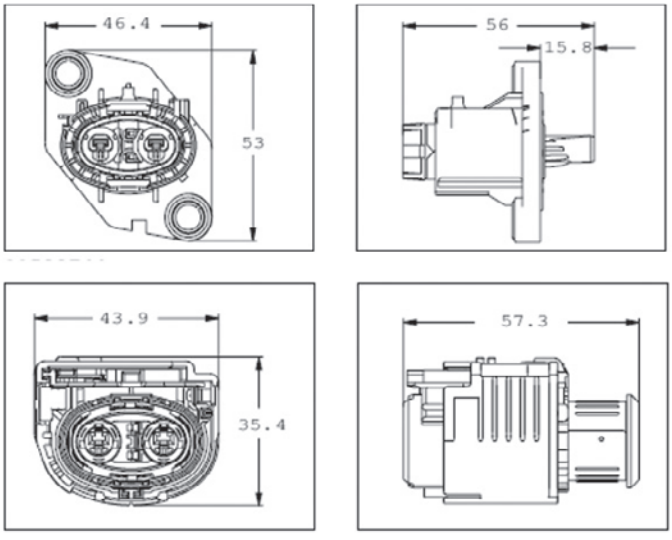
DESCRIPTION

- Sealed in mated or unmated position
- Unshielded 4 + 1 way connector
- Panel mount to device with face seal to module
- Unique integrated electric interlock
- HVIL shunted in harness connector
- ErgoMate™ slider for easy handling and reduced mating force
- 5 HV power circuits (four 9.5 mm and one 2.8 mm terminals)
- Cable range: 10 to 16 mm² power circuit; 0.5 to 0.75 mm² electric interlock
- 1 key/index
- Electrical protection: Finger-proof IP2XB

Performance
125A@70C
750V DC
Temperature T3
Vibration V3
Sealing S3

Dimensions

Shown in millimeters



HV890 AK Class 4

2 Way Connection System with HVIL

APPLICATION

- High voltage/high current modules: inverter, battery, junction box, power electric box

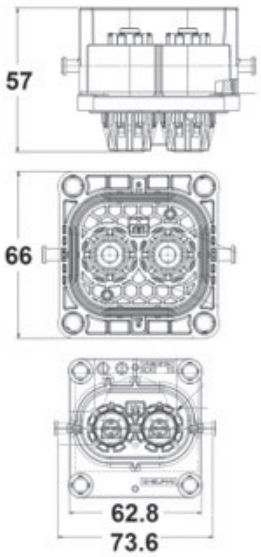
DESCRIPTION

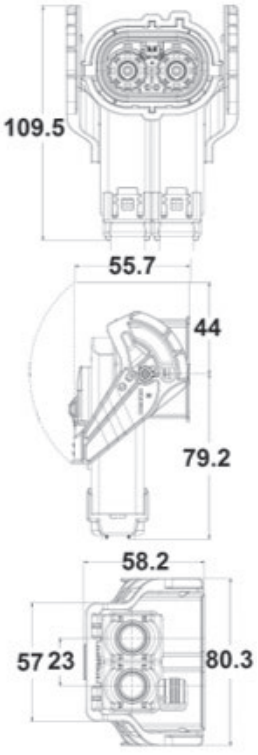
- Number of ways: 2
- Number of indexes: 4
- Terminal Size/Style: Ø8mm Pin & Sleeve
- Wire range: 25mm² to 50mm²
- Fully interchangeable with other AK products
- Vibration severity 3 LV215
- Temperature severity 4 LV215
- Electrical Protection: Finger-proof IP2XB

Performance
170A@140C
1000V DC
Temperature T4
Vibration V2
Sealing S3

Dimensions

Shown in millimeters





RCS800 High Voltage

2 Way Connection System with HVIL

APPLICATION

- High voltage/high current modules: inverter, battery, junction box, power electric box

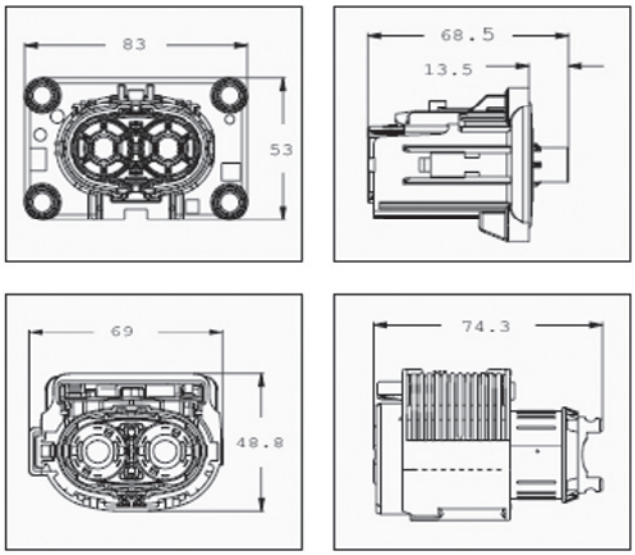
DESCRIPTION

- Bundle shielding with external braid
- Dual sealing connection system: mated and unmated header
- Panel mount to device with face seal to module
- Unique integrated electric interlock
- HVIL shunted in harness connector
- Two-stage disconnect for safe unmating
- ErgoMate™ Axial Mating Assist System on harness connector
- Two HV power circuits (8.0 mm round terminal)
- Cable range: 35 to 50 mm² power circuit; 0.5 to 0.75 mm²
- Sealing protection: IP67, IPX9K
- Electrical protection: Finger-proof IP2XB

Performance	
230A@70C	
1000V DC	
Temperature	T3
Vibration	V1
Sealing	S3

Dimensions

Shown in millimeters



RCS890 High Voltage

2 Way Right Angle Connection System with HVIL

APPLICATION

- High voltage/high current modules: inverter, battery, junction box, power electric box

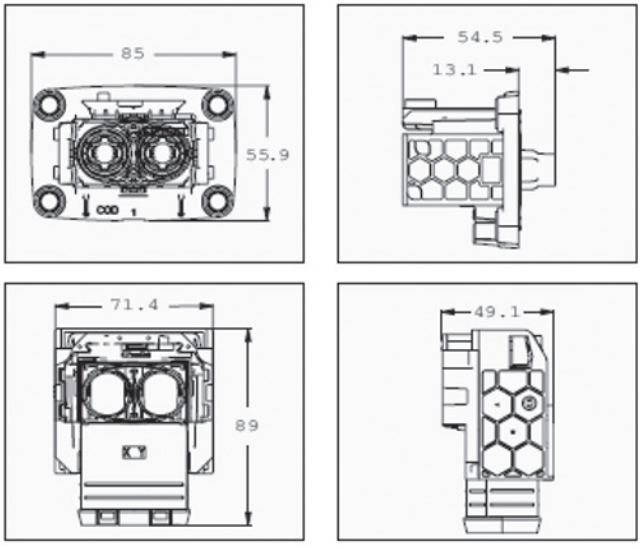
DESCRIPTION

- Bundle shielding with external braid
- Dual sealing connection system: mated and unmated header
- Panel mount to device with face seal to module
- HVIL shunted in harness connector
- Two-stage disconnect for safe unmating
- Slider Mating Assist System on harness connector
- Two HV power circuits (8.0 mm round terminal)
- Flange size: 51 mm x 62 mm
- Cable range: 35 to 50 mm² power circuit; 0.5 to 0.75 mm² HVIL
- Sealing protection: IP67, IPX9K
- Electrical protection: Finger-proof IP2XB

Performance
220A@70C
1000V DC
Temperature T3
Vibration V2
Sealing S3

Dimensions

Shown in millimeters



AK Plastic pass-through

1, 2 & 3 way Panel Mount System

APPLICATION

- High voltage/high current modules: inverter, battery, junction box, power electric box

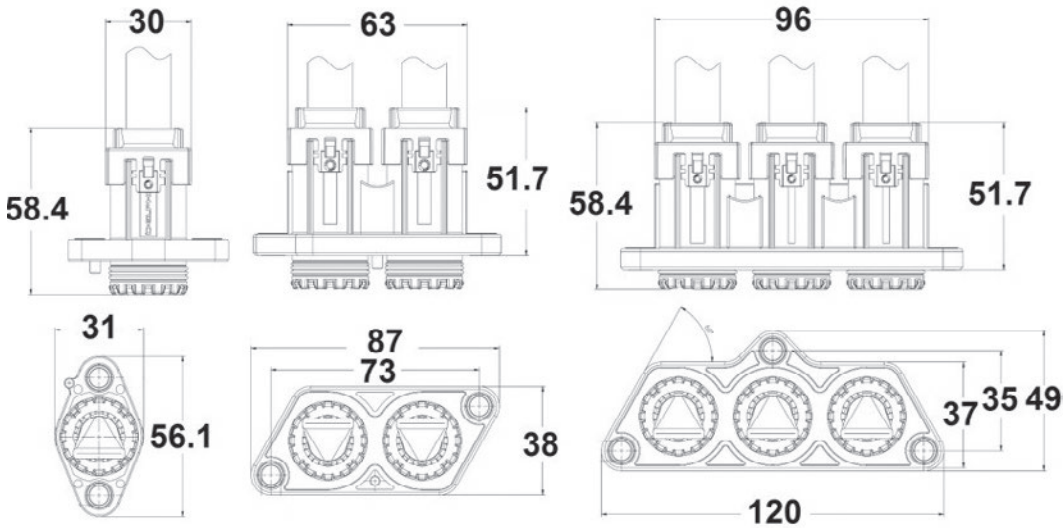
DESCRIPTION

- Possible configurations: 1, 2 or 3 ways
- Main Housing Material: Plastic
- Terminal Size/Style: Ring-Tongue
- Wire range: 16mm² to 50mm²
- Shielding principle: 360° Individually Shielded

Performance
200A@140C
1000V DC
Temperature T4
Vibration V3
Sealing S3

Dimensions

Shown in millimeters



Metal pass-through

1 way Panel Mount System

APPLICATION

- High voltage/high current modules: inverter, battery, junction box, power electric box

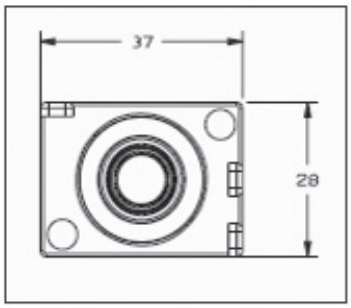
DESCRIPTION

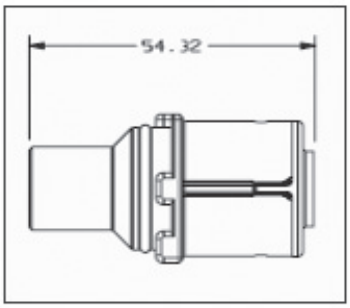
- High voltage panel mount system
- One way sealed and shielded
- Ring terminal bolted to device
- Cable range: 25 to 50 mm²
- Six to eight keys/indexes depending on wire sections
- Very compact dimensions
- Robust deign for harsh environment

Performance	
250A@85C	
1000V DC	
Temperature	T3
Vibration	V4
Sealing	S3

Dimensions

Shown in millimeters





Power Pack 1000

1 Way Inline Connectors

APPLICATION

- High current wiring harness inline

DESCRIPTION

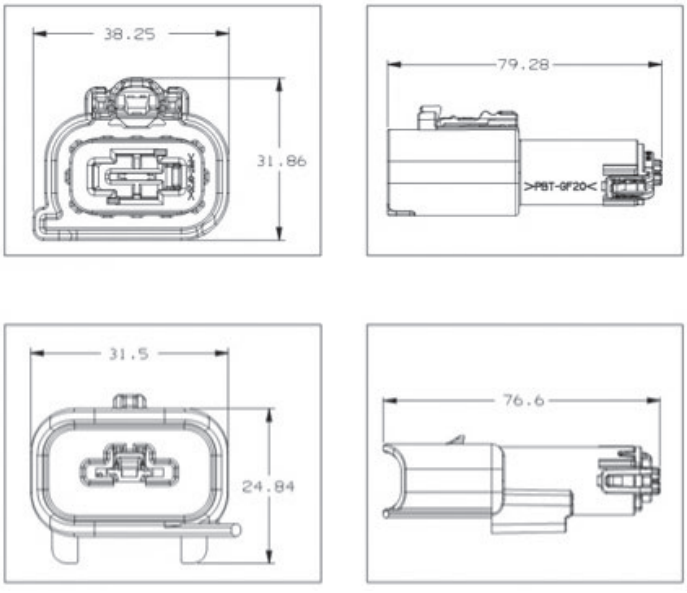
- Sealed connection system
- Silver-plated Power Pack1000 multi-contact terminal system
- Cable range: 8 mm² to 25 mm²
- One key/index
- Capable of additional indexes

Performance

145A@85C	
48V	
Temperature	T3
Vibration	V1
Sealing	S3

Dimensions

Shown in millimeters



Power Pack 1000

2 Way Device Connectors

APPLICATION

- High current device applications and sealed pass-through panel mount system

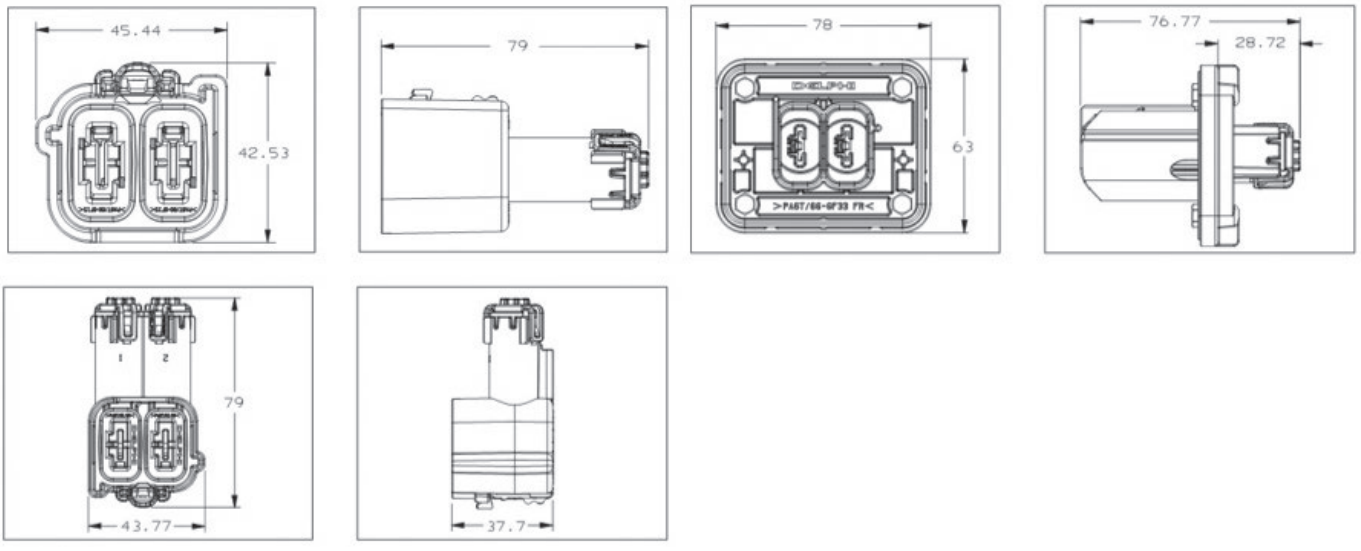
DESCRIPTION

- Sealed connection system
- Sealed panel mount pre-stages prior to fastening through self tapping screws
- Silver-plated Power Pack 1000 multi-contact terminal system
- Cable range: 8 mm² to 25 mm²

Performance
145A@85C
48V
Temperature T3
Vibration V1
Sealing S3

Dimensions

Shown in millimeters



Power Pack 1000

2 Way Inline Connectors

APPLICATION

- High current wiring harness inline

DESCRIPTION

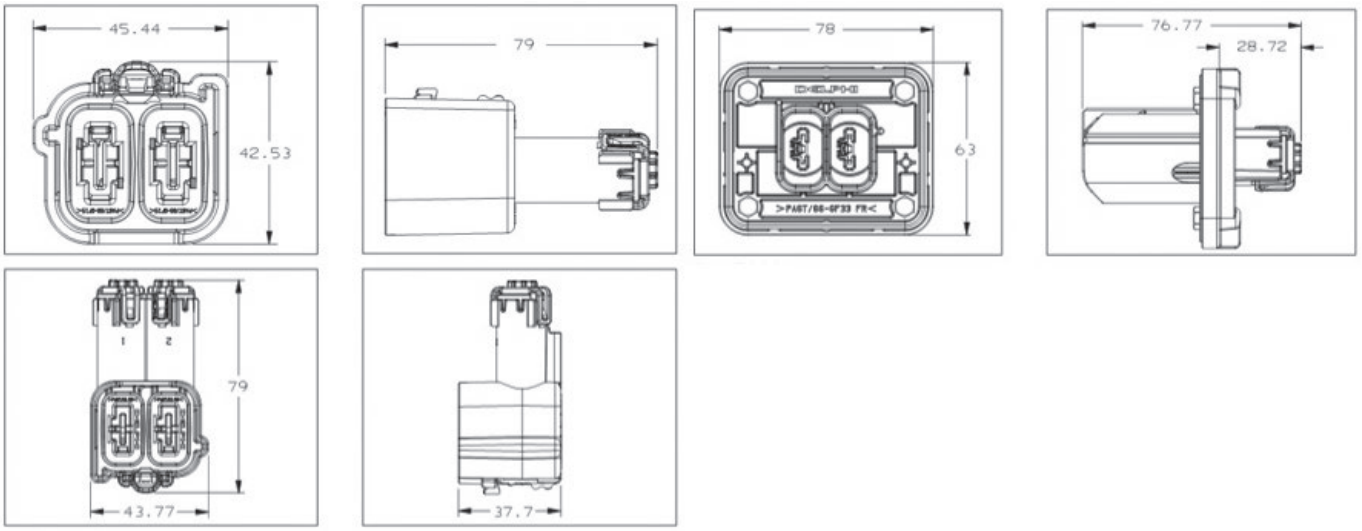
- Sealed connection system
- Silver-plated Power Pack 1000 multi-contact terminal system
- Cable range: 8 mm² to 25 mm²
- One key/index

Performance

145A@85C	
48V	
Temperature	T3
Vibration	V1
Sealing	S3

Dimensions

Shown in millimeters



Charge Inlet

SAE J1772 Type 1 Vehicle Charging Inlet

APPLICATION

- Plug-in hybrid and electric vehicle charge inlet

DESCRIPTION

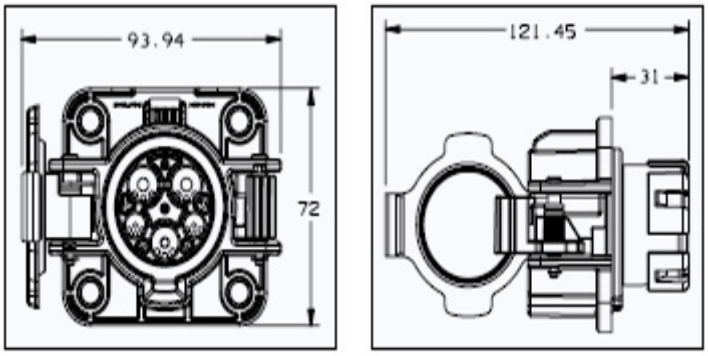
- Interface complies with SAE J1772 and IEC62196 Type I standard
- Panel mounts to vehicle
- Protective grommet/wire dress mounts to inlet

PERFORMANCE

- Supports: AC Level 1 (15A, 120V) and AC Level 2 (32A, 240V)
- Voltage: 600V maximum rating
- Temperature range: -40°C to +85°C
- Validation: UL recognized
- Electrical protection: Finger-proof IP2XB
- Design life: 10,000 mating cycles

Dimensions

Shown in millimeters



Charge Inlet

Type II Vehicle Charging Inlet

APPLICATION

- Plug-in hybrid and electric vehicle charge inlet

DESCRIPTION

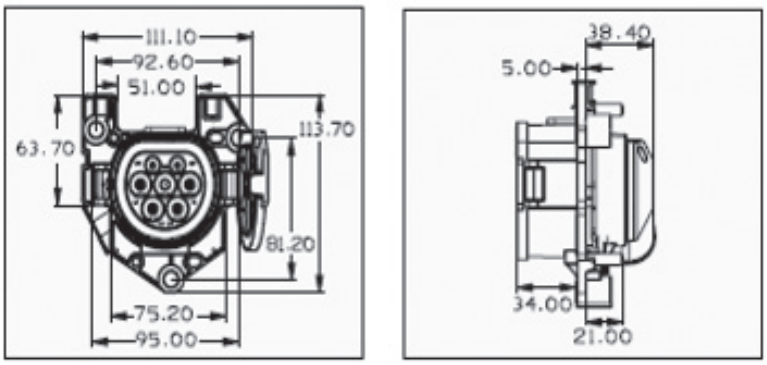
- Interface complies with IEC62196 Type II standard
- Panel mounts to vehicle
- Integrated thermal circuit breaker to prevent abnormal temperature increase
- Cover provides dust protection
- Inlet designed to drain fluids when opened
- Lock actuator positioned on the top
- Available with cover opening right or left

PERFORMANCE

- Supports single-phase or three-phase power supply
- Supports: From 16A, 230V to 63A, 400V
- Temperature range: -40°C to +50°C
- Electrical protection: Finger-proof IP2XB
- Sealing protection: IP44 (connector/inlet mated)
- Wiring crimps sealed from environment
- Design life: 10,000+ mating cycles

Dimensions

Shown in millimeters



Combo 1

AC/DC Vehicle Charging Inlet

APPLICATION

- Charging interface for slow AC (Type 1) and fast DC charging applications

DESCRIPTION

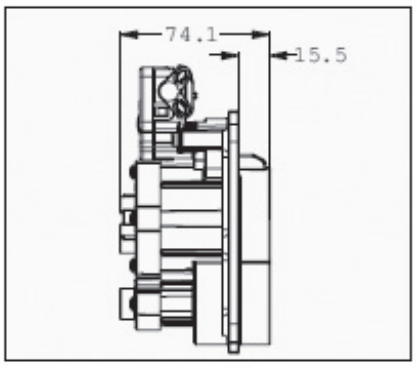
- Interface complies with SAE J1772 and IEC62196
- Combined charging system for electrical vehicle
- AC/DC: slow + fast charge (600V, 125A)
- Actuator pin for locking connector to inlet during charging
- Optional thermistor for additional thermal protection during DC charging
- Wire Cross Section: Contact Pin/Present Pin (0.5 mm²), PE (16mm², L1/N (6.0 mm²), DC +/-(40 mm²)

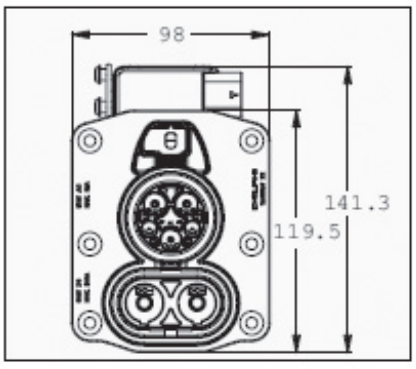
PERFORMANCE

- Temperature range: -40°C to +80°C
- Voltage: 600V
- Max. current capacity: 32A AC/ 125A DC
- Sealing protection: IP55 with cover, IP44 when mated
- Connector/Inlet mating and unmating force <100N
- Design life: 10,000+ mating cycles

Dimensions

Shown in millimeters





Combo 2

AC/DC Vehicle Charging Inlet

APPLICATION

- Charging interface or slow AC (Type 11) and fast DC charging applications

DESCRIPTION

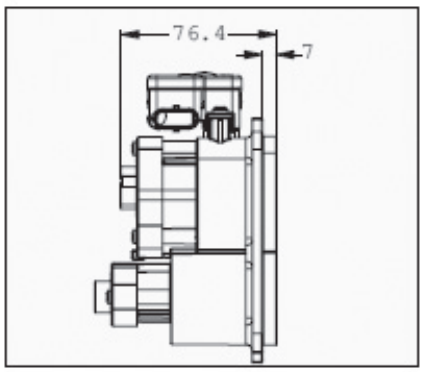
- Interface complies with SAE J1772 and IEC62196
- Combined charging system for electrical vehicle
- AC/DC: slow + fast charge (600V, 125A)
- Actuator pin for locking connector to inlet during charging
- Optional thermistor for additional thermal protection during DC charging
- Wire Cross Section: Contact Pin/Present Pin (0.5 mm²), PE (16mm², L1/N (6.0 mm²), DC +/-(40 mm²)

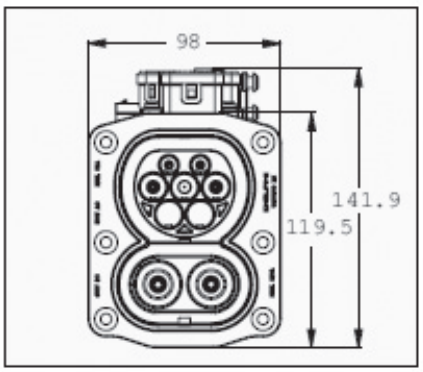
PERFORMANCE

- Temperature range: -40°C to +80°C
- Voltage: 600V
- Max. current capacity: 32A AC/ 125A DC
- Sealing protection: IP55 with cover, IP44 when mated
- Connector/Inlet mating and unmating force <100N
- Design life: 10,000+ mating cycles

Dimensions

Shown in millimeters





Charge Connectors

Pigtails

APPLICATION

- Grid-to-vehicle charging
- Charging infrastructure-to-vehicle

DESCRIPTION

- SAE J1772/IEC62196 Type I, IEC62196 Type II, and GB/T 20234 standards
- Wiring crimps sealed from environment
- Rubber over-mold and plastic grip options vailable

PERFORMANCE

- Current capacity: 18A to 40A
- Voltage range: 120V to 480V
- Temperature range: -40°C to +50°C
- Validation: See part number information

SAE J1772/IEC62196 Type I – Plastic Handle

IEC62196 Type II – Plastic Handle

SAE J1772/IEC62196 Type I – Rubber Over Mold

IEC62196 Type II – Rubber Over Mold

Charge Connectors

Mode 3 Jumpers

APPLICATION

- Cable assemblies for plugging from charging station to vehicle

DESCRIPTION

- Vehicle to charging station connection
- Vehicle connector according to IEC62196-2-1 and IEC62196-2-2
- Wiring crimps sealed from environment
- CE marking

AVAILABLE OPTIONS

- 20 to 32A
- 1-phase 240V or 3-phase 400V charging for Type II
- Superior durability: 14,000 cycles (10,000 cycles is required from IEC standard)
- Low mating / unmating forces: Initial < 40N, Mating forces < 80N guaranteed until 14,000 cycles

SAE J1772/IEC62196 Type I – Plastic Handle

SAE J1772/IEC62196 Type I – Plastic Handle

SAE J1772/IEC62196 Type I – Plastic Handle

Part number	Type (veh/wall)	Current	# phase	Design	cable length (m/ft)	Cable sections	Marking	Manufacturing plant
33358146	Jumper T2 -T2	20A	3-phase	All plastic grip	6.5/21.32	5G4+0.75	CE	Europe
35137656	Jumper T2 -T2	32A	3-phase	All plastic grip	4.0/13.12	5G4+0.75	CE	Europe
35141693	Jumper T2 -T2	32A	3-phase	All plastic grip	6.5/21.32	5G4+0.75	CE	Europe
33401184	Jumper T1 -T2	20A	1-phase	All plastic grip	6.0/19.68	3G2.5+0.75	CE	Europe
33403378	Jumper T1 -T2	32A	1-phase	All plastic grip	6.0/19.68	3G6+0.75	CE	Europe
33401185	Jumper T1 –T3	20A	1-phase	All plastic grip	6.0/19.68	3G2.5+0.75	CE	Europe

For more information:

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Contact your local Distributor

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