

# BRUSHLESS range from CROUZET

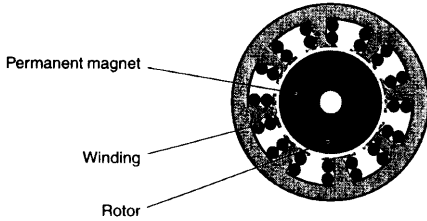
## 1 - Composition

This new product range is based on the 3-phase motor with **internal rotor**. The high-energy plasto-ferrite magnet is completely integral with the motor shaft. The chosen structure gives high dynamic performance : made possible by the low inertia of the rotor (unlike motors with external rotors, which have high inertia).

The stator lamination stack acts as a heat dissipator for energy losses induced by the winding.

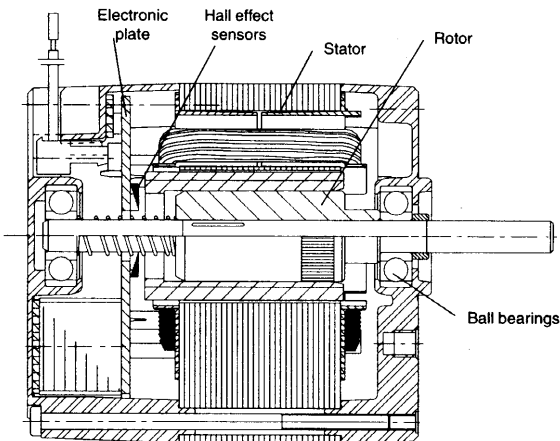
### ■ Motor principle :

With internal rotor,



Both zamac flanges mounted on the stator lamination stack are fitted with a ball bearing, ensuring the motor will have a long service life.

### ■ Composition :



**The electronics required for operation are completely integrated in the motor.**

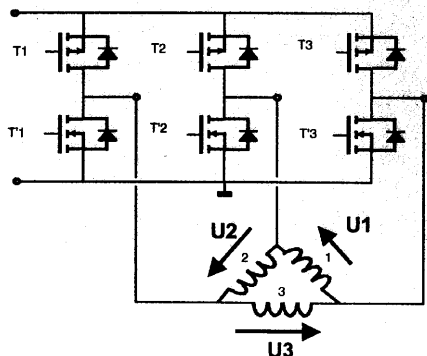
## 2 - Operating principle

The chosen architecture is based on a "3-phase" motor, with a 4-pole rotor.

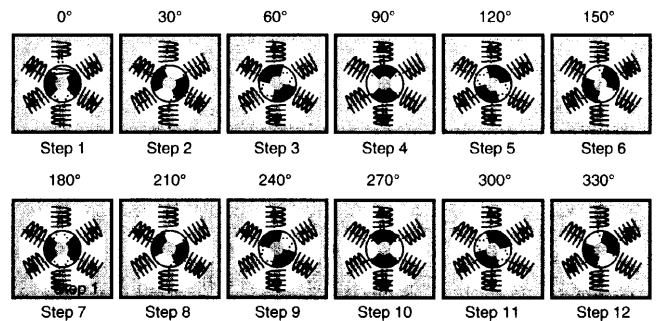
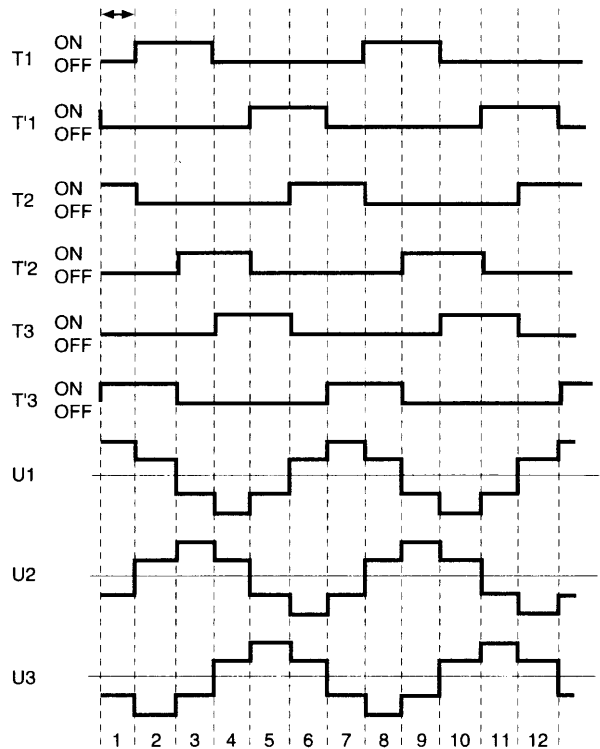
■ **Sequencing** : the "3-phase" motor is wired as "delta".

Three hall effect sensors are used to locate the position of the rotor.

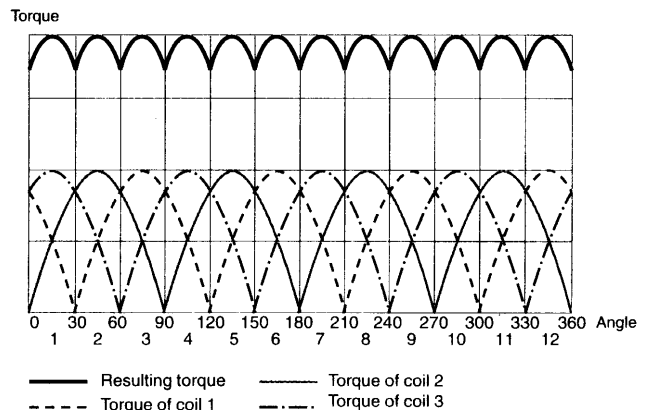
**The transistors conduct up to 120°**



## Communication logic



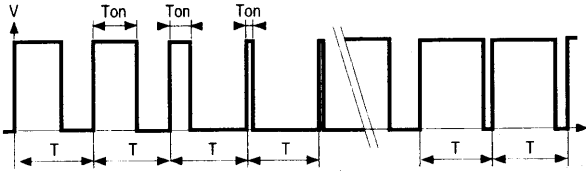
### ■ Resulting torque form



The "3-phase" motor provides the best possible compromise in terms of regularity of the resulting torque (low ripple percentage). As the electronics are completely integrated, all the sequencing is performed by the electronics inside the motor.

### 3 - Functions and inputs/outputs

The speed of the motors offered with integrated electronics can be controlled : by an analogue (0 - 10 volts), or digital (PWM : 15 kHz) speed signal.



#### ■ Definition of PWM

T is constant, but Ton varies ; the Ton/T ratio is the cyclical ratio (as a %).

In this case, PWM is a control signal, converted by the electronics to set the speed.

- If the cyclical ratio is 0%, the speed is 0 rpm.
- If the cyclical ratio is 100%, the speed is N0 (no-load speed).
- If the cyclical ratio is 50%, the speed is N0/2 (half the no-load speed).

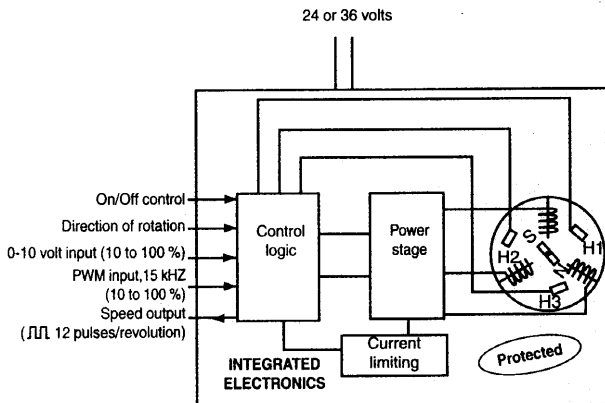
The voltage V is not significant (between 5 and 28 V), and does not affect the speed.

The PWM input is a digital input : it can be used by PLCs and micro-controllers.

#### ■ Motor protection :

The motors are completely protected during operation : by current limiting and thermal protection. During abnormal operation, in a machine or device : for example locking, the motor stops after approximately 3 seconds, (power stage off) and must be reinitialised via the On/Off input : **this is a failsafe system.**

#### ■ Inputs / Outputs :



#### ■ Truth table for Inputs / Outputs :

On/Off	PWM	0-10 V	Direction	
0	x	x	x	motors off
1	1	0	0	reverse rotation
1	0	1	0	reverse rotation
1	1	1	0	unauthorised configuration
1	0	0	x	motors stopped
1	1	0	1	clockwise rotation
1	0	1	1	clockwise rotation
1	1	1	1	unauthorised configuration

X= don't care

1=Vih

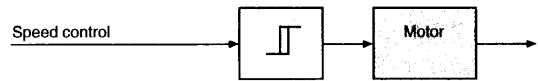
0=Vil

#### ■ Speed regulation :

Two types of product with integrated electronics are offered for the whole range, both motors and geared motors.

**a) No speed regulation :** this option is offered for users who do not need to regulate speed in a closed loop, or who wish to reuse their own regulation electronics on an external card, to limit modifications to the architecture of their machine.

**Motors without integrated speed regulation :** no data feedback on action taken.

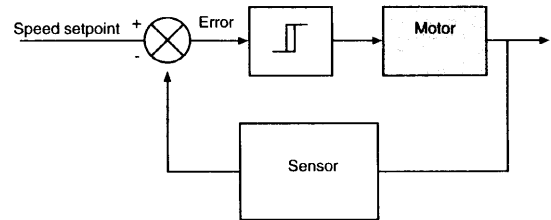


**b) With integrated speed regulation (eg : Part no. 80 030 003)** see page 10.

This integrated option can be used simply for a speed regulation function suitable for most applications. In effect : there is no longer any need to wire a motor to a card, no electromagnetic compatibility problems linked to wiring, hence reduced net cost!

#### Motor with integrated speed loop :

Hall effect sensors monitor the action taken, enabling the electronics to modify the command to achieve the desired effect.



### 4- Safety

Crouzet BRUSHLESS DC motors are designed and manufactured to be integrated into devices or machines which meet, for example, the specifications of the machine standard : EN 60335-1 (IEC 335-1, "Safety of domestic electrical appliances").

The integration of Crouzet DC motors into devices or machines, should generally take account of the following motor characteristics :

- no earth connection
- "main isolation" motors (simple isolation)
- protection index : IP40
- isolation system class : B (120°C)

#### European low voltage directive 73/23/EEC of 19/02/73 :

CROUZET DC motors and geared motors are outside the field of application of this directive (LVD 73/23/EEC applies to voltages over 75 volts DC).

## 5 - Electromagnetic Compatibility (EMC) :

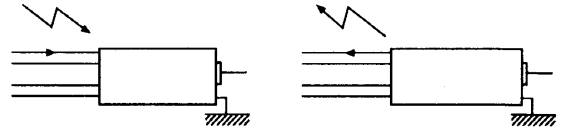
On request, Crouzet will provide the EMC characteristics of the various types of product.

**European directive 89/336/EEC of 03/05/89**, "electromagnetic compatibility" :

DC motors and geared motors which are components designed for professionals, to be incorporated in more complex devices, and not for end users, are excluded from the field of application of this directive.

However, conscious of potential customer difficulties concerning problems linked to electromagnetic compatibility, Crouzet has designed its products to meet the requirements of the standards : for example EN 55011 Gr. 1 class B (medical) as well as EN 55022, class B (data processing) in terms of emitted electromagnetic interference, as well as standards linked to immunity : IEC 1000- 4 -2/3/4/5/6/8.

### ■ Wiring precautions



For EMC conformity :

- The motor must be connected to earth via its front flange.
- The length of the wires is 20 cm.

## 6- Electrical characteristics

	Symbol	Conditions Ta = -10 to 40 °C	Min.	Nominal	Max.	Units
<b>Power supply</b>						
Supply voltage	Vmot	Version 1	10.8	24	28	V
		Version 2	32.4	36	39.6	V
<b>Logic level inputs</b>						
Logic level 1	Vih		3		Vmot	V
Logic level 0	Vil		-1		1.7	V
Current for logic level 1	Iih				0.5	mA
Current for logic level 0	Iil				0.05	mA
<b>5V input</b>						
Voltage	Vma		-1		Vmot	V
Input impedance	Ze			10		kΩ
<b>PWM (Pulse width modulation) input</b>						
Logic level 1	Vih		3		28	V
Logic level 0	Vil		-1		1.7	V
Current for logic level 1	Iih				0.5	mA
Current for logic level 0	Iil				0.05	mA
PWM input frequency	Fin		13	15	17	kHz
<b>Logic output</b>						
Voltage for level 0	Vol	Vih = 5 V, R pull up = 1.2 kΩ			0.4	V
Voltage for level 1	Voh				35	V
Current for level 0	Iol				5	mA
Current for level 1	Ioh				0.8	mA
Width of low level	Wle			320		µs
<b>Current limiting</b>						
Limit value	I <sub>max</sub>	Ta = 20 °C, electronics at ambient 20 °C			3	A
Derating	I <sub>dt</sub>			-23		mA/°C

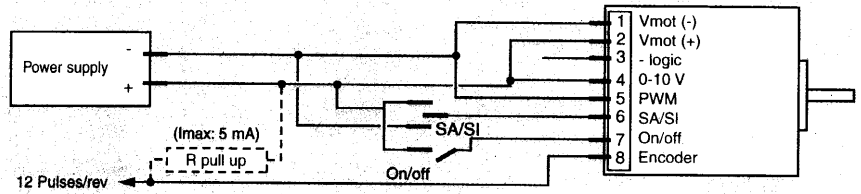
## 7 - Connection diagrams

General precautions : see page 7, 8, 10.  
Connector marking : see page 10.

### ■ Simplified connection

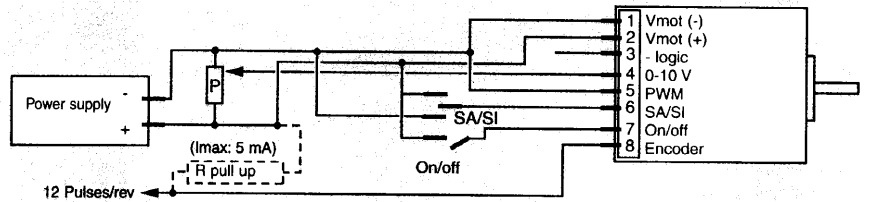
This connection only requires a power supply ( 24 or 36 V, 3 A).  
Point 3 should not be connected.

This diagram can be further simplified by connecting input 7 directly to the power supply positive and input 6 either to the power supply positive or negative depending on the direction of rotation required.



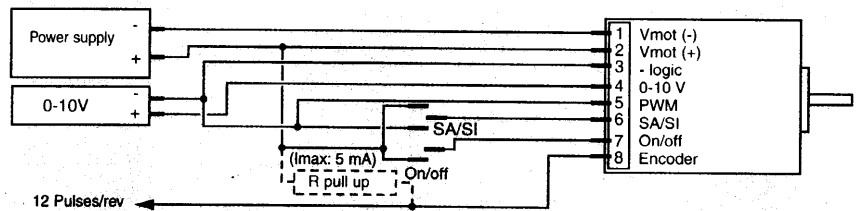
### ■ Adjusting the speed using a potentiometer

Point 3 should not be connected.



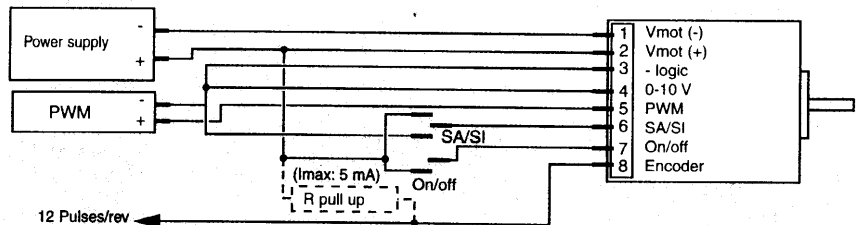
### ■ Using the 0-10 V input, with a separate power supply

This connection requires a power supply (24 or 36 V, 3 A) and a 0-10 V supply.



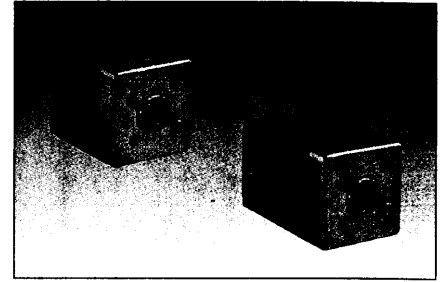
### ■ Using the PWM input

This connection requires a power supply (24 or 36 V, 3 A) and a supply with PWM and a frequency of 15 kHz.



# BRUSHLESS DC motors

- Brushless motors with integrated electronics and speed regulation without integrated speed regulation
- Maximum power : 35 to 60 W (at 24 V)
- Long service life
- Motors with integrated temperature sensor
- Conform to EMC standards (Electromagnetic Emissions EN 55022 / EN 55024)



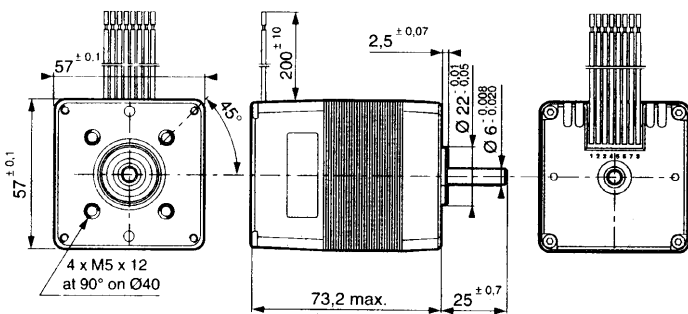
## Applications

- Pumps, turbines
- Compressors
- Gas analysers
- Dialysis equipment
- Physiotherapy equipment
- Respirators
- Copiers and peripherals
- Postal sorting systems
- Bank processing systems
- Motor-driven fans
- Engraving machines
- Textiles
- Packaging
- Automated materials handling belts
- Aerials and radar

## OPTIONS : on request

- Integrated speed regulation
- High-resolution encoder from 100 to 512 pulses/rev
- Adaptations with front/rear shaft in stainless steel
- Motors with Hall sensors only
- Adaptations on electronics
- Alternative protection index : IP54

## Dimensions



## Connections

AMP MTA 100 640440-8 connector with AWG22 wire, Ø on insulation 1.8 mm (supplied)

Marking on motor	Wire colour	
1	* a Black	0 volt reference for the power supply
2	* a Red	Power supply (24 or 36 V)
3	* b Blue	0 volt reference for control (not isolated from 1)
4	Brown	0-10 volt speed analogue input
5	Orange	PWM speed digital input (15 KHz)
6	* c Yellow	Logic input, direction of rotation (1=clockwise direction)
7	Green	Logic input, run/stop (1=run)
8	White	Encoder logic output, 12 pulses per revolution

### Necessary precautions to avoid damaging the motor

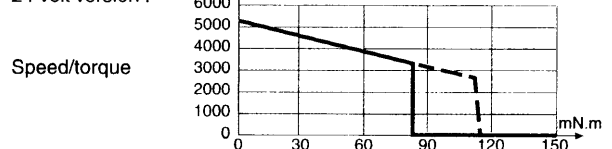
- \*a) Do not reverse the polarity. \*b) If only 1 power supply is being used, do not connect 3 to 1.
- \*c) Stop the motor before changing direction.

## Type

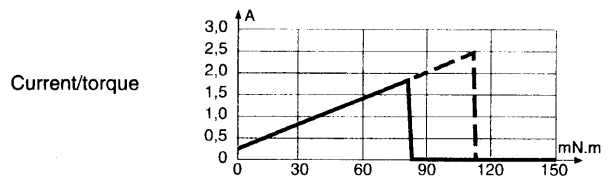
	80 030	80 030
<b>Nominal voltages</b>	24 V	36 V
<b>Part numbers</b>		
Without speed regulation	80 030 002	80 030 004
With speed regulation	80 030 003	80 030 005
<b>No-load characteristics</b>		
Speed of rotation	rpm	5400
Absorbed power	W	5
Absorbed current	A	0.22
<b>Nominal characteristics (acc. to IEC 68-2-14) given for 100% of nominal speed</b>		
Speed of rotation (adjustable from 10 to 100%)	rpm	3410
Torque	mN.m	85
Usable power	W	30
Absorbed power	W	45
Casing temperature	°C	62
Ambient temperature	°C	-10 to +40
Efficiency	%	66
<b>General characteristics</b>		
Precision of speed regulation	%	± 5
Isolation system acc. to IEC 85		B (120 °C)
Degree of protection acc. to IEC 529		IP40
Maximum usable power	W	35
Starting torque	mN.m	115
Starting current	A	2.5
Maximum efficiency	%	75
Acoustic pressure (at 50 cm)	dBA	40
Resistance	Ω	2.1
Inductance	mH	4
Torque constant	Nm/A	0.045
Electrical time constant	ms	1.9
Mechanical time constant	ms	1.9
Thermal time constant	min	5
Thermal impedance winding/ambient air	°C/W	2.2
Inertia	g.cm <sup>2</sup>	28
Weight	g	800
Service life	h	20 000

## Curves

24 Volt version :

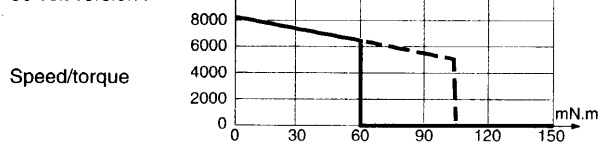


Speed/torque

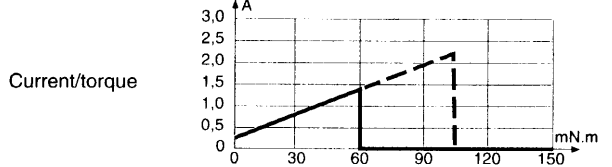


Current/torque

36 Volt version :



Speed/torque



Current/torque

## To order, specify

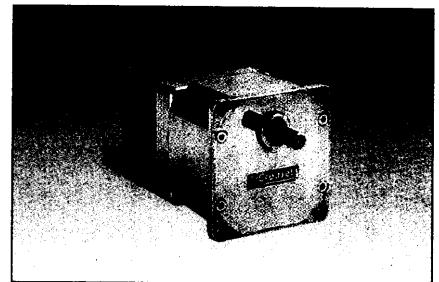
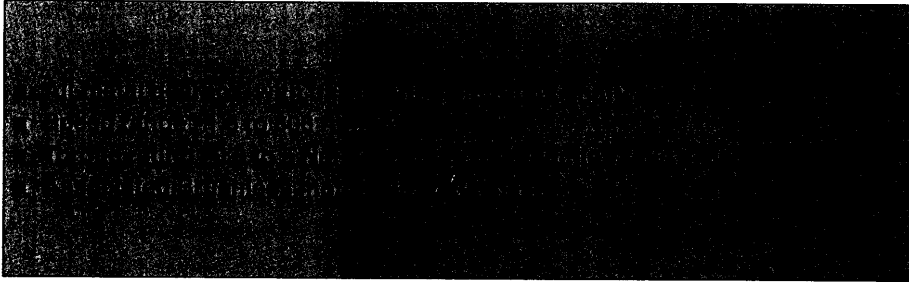
Standard products



Part number

Example : BRUSHLESS DC motor - 80 030 002

# BRUSHLESS DC geared motors



- Special reduction ratio
- Special greasing
- Shaft adaptation
- Stainless steel shaft option
- Motor : see page 10

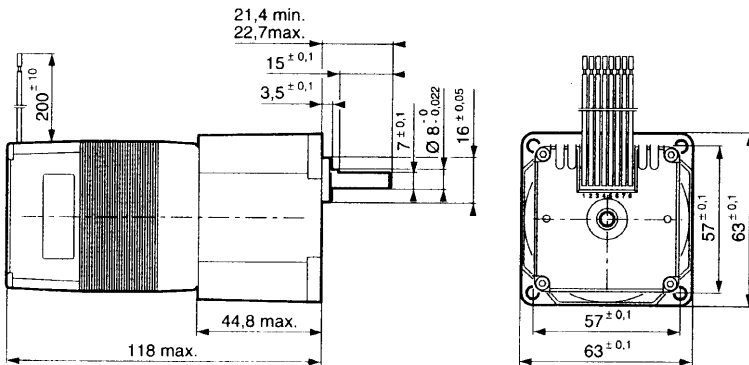
## Types

		80 035 5	80 035 5
<b>Nominal voltage</b>		24 V	24 V
<b>Gearbox output speeds (rpm)</b>		<b>Part numbers</b>	
Without speed regulation		●	
With speed regulation		●	
10%	100% of speed (rpm)	Ratios	
81 to 806		4.22	80 035 501
51 to 504		6.75	80 035 502
45 to 444		7.66	80 035 503
28 to 278		12.25	80 035 504
23 to 222		15.31	80 035 505
14 to 139		24.5	80 035 508
9 to 89		38.28	80 035 509
7 to 69		49	80 035 510
6 to 56		61.25	80 035 511
3 to 28		122.5	80 035 512
1.5 to 14		245	

## General characteristics

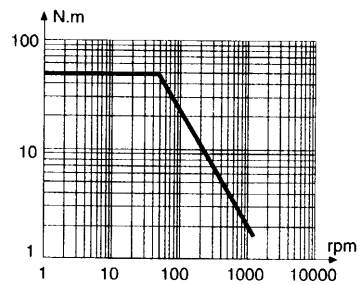
Motor		80 030	80 030
Gearbox		81 035 5	81 035 5
Maximum permitted gearbox torque in steady state	Nm	5	5
Axial load (dynamic)	daN	6	6
Radial load (dynamic)	daN	6	6
Nominal usable power	W	24	24
Casing temperature	°C	58	58
Weight	g	1300	1300

## Dimensions



## Curve : nominal torque/speed

The unbroken line represents the maximum operating ranges for the geared motors in continuous operation.



## Standard products

**3**

Part number

Example : Brushless DC geared motor - 80 035 502

●

Standard products, non stocked

**1**

Type

**2**

Nominal voltage

**3**

Output speed

Example : BRUSHLESS DC geared motor - 80 035 5 - 24 V - With speed regulation 222 rpm.