



Stepper Motors

User's Manual

Version: **1.05 (July 2011)**
Model no.: **MASMOT-GER**

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Chapter 1 • General information

1. Manual history

Information:

B&R works hard to keep the printed versions of its user's manuals as current as possible. If a newer version of the user's manual is available, it can always be downloaded in electronic form (PDF) from the B&R homepage: www.br-automation.com.

Version	Date	Comment
1.05	July 2011	Added technical data "Max. surface temperature" for motors with brake option: <ul style="list-style-type: none"> Standard motors, flange size 60 mm, "Technical data" on page 43 Standard motors, NEMA 34, flange size 86 mm, "Technical data" on page 49
1.04	February 2011	Changes: <ul style="list-style-type: none"> New text added to section 3.2 "Areas of use" (page 18). New section 6.3 "Functionality" (page 81) added to brake option documentation.
1.03	January 2011	Corrections: <ul style="list-style-type: none"> Pin assignments in "Hiperface encoder cables - 80CMxx005.65-01": "9-pin DSUB plug (5 pins used)" corrected as "9-pin DSUB plug (8 pins used)" Text in section "Service life" on page 86 corrected.
1.02	No English version	Spelling mistakes corrected
1.01	No English version	Corrections <ul style="list-style-type: none"> The reference to the "Dimensioning" chapter has been expanded to include the "ACOPOSmicro User's Manual". Notice regarding grounding: only screws intended for this may be used. Standards and Certifications chapter shortened.
1.00	No English version	First edition

Table 1: Manual history

2. Safety notices

Information:

The following safety notices are used uniformly across user's manuals and are valid for both stepper motors as well as drive systems.

Information:

These safety notices, the connection specifications (type plate and documentation) and the limit values listed in the technical data are to be read carefully before installation and commissioning and must be observed.

These safety notices must be retained and included with the device if it is passed on to anyone else (e.g. sold, rented, etc.).

The user is responsible for observing all applicable international and national electrical standards.

2.1 Organization of safety notices

Safety notice	Description
Danger!	Disregarding safety regulations and notices can be life-threatening.
Warning!	Disregarding safety regulations and notices can result in severe injury or substantial damage to equipment.
Caution!	Disregarding safety guidelines and notices can result in injury or damage to equipment.
Information:	Important information for preventing errors.

Table 2: Safety notices used in this manual

2.2 General information

B&R drive systems and motors have been designed, developed and manufactured for conventional use in industrial environments. They were not designed, developed, and manufactured for any use involving serious risks or hazards that could lead to death, injury, serious physical damage or loss of any kind without the implementation of exceptionally stringent safety precautions. Such risks include, in particular, the use of these devices to monitor nuclear reactions in nuclear power plants, their use in flight control or flight safety systems as well as in the control of mass transportation systems, medical life support systems or weapons systems.

Danger!

Drive systems and motors can have exposed parts that carry voltage (e. g. terminals) as well as hot surfaces. Additional hazardous sources include moving machine parts. Improperly removing required covers, inappropriate use of the devices or their improper installation or operation can result in severe personal injury or damage to property.

All tasks such as the transport, installation, commissioning and servicing of devices may only be carried out by qualified personnel. Qualified personnel are those experienced in the transport, mounting, installation, commissioning and operation of the device who also have the appropriate qualifications (e. g. IEC 60364). National accident prevention guidelines must be followed.

The safety notices, connection descriptions (type plate and documentation) and limit values listed in the technical data are to be read carefully before installation and commissioning and must be observed.

Danger!

The improper handling of drive systems and motors can cause severe personal injury or damage to property!

2.3 Intended use

Motor drives and motors are components designed to be installed in electrical systems or machines. Their operation is only permitted if the machine meets directive 2006/42/EC (machine directive) as well as directive 2004/108/EC (EMC directive).

Danger!

Before applying power, it is necessary to check if the B&R drive system being used is suitable for the respective mains. The specifications and restrictions in the user documentation for the respective device series must be followed completely!

When used in residential areas, shops or small businesses, additional measures must be implemented by the user.

Technical data as well as connection and environmental specifications can be found on the type plate and in the user's manual. These connection and environmental specifications must be followed!

Danger!

Electronic devices are never completely failsafe. If the drive systems fails, the user is responsible for ensuring that any connected motors are brought to a secure state.

2.4 Protection against electrostatic discharge

Electrical components that can be damaged by electrostatic discharge (ESD) must be handled accordingly.

2.4.1 Packaging

Electrical components with a housing do not require special ESD packaging but still must be handled properly.

2.4.2 Guidelines for proper ESD handling

- Do not touch the connector contacts on connected cables.
- Do not touch the contact tips on the circuit boards.

2.5 Transport and storage

During transport and storage, devices must be protected against impermissible stress (mechanical loads, temperature, humidity, aggressive atmospheres, etc.).

Drive systems contain components sensitive to electrostatic charges that can be damaged by inappropriate handling. It is therefore necessary to adhere to the required safety precautions against electrostatic discharge during installation or removal of drive systems.

2.6 Handling and installation

Warning!

During handling and installation of B&R drive systems or motors, there exists the danger of personal injury or damage to equipment (through shearing, impacts, cutting or crushing). Suitable protective equipment (e.g. safety glasses, protective gloves, safety shoes, etc.) must be used when necessary!

Devices must be installed according to the user's manual using suitable equipment and tools.

Devices must be installed by qualified personnel without voltage applied. Before installation, voltage to the control cabinet should be switched off and prevented from being switched on again.

General safety regulations and national accident prevention guidelines must be observed when working with high voltage systems.

The electrical installation must be carried out according to the relevant guidelines (e. g. wire cross section, fuses, protective ground connections, etc.; see also the "Dimensioning" chapter in the ACOPOSmicro User's Manual.

2.7 Operation

2.7.1 Protection against touching electrical parts

Danger!

For drive systems to operate, it is necessary for certain parts to carry dangerous voltages over 42 VDC. Touching one of these parts can result in a life-threatening electric shock. This could lead to death, severe injury or damage to equipment.

Before turning on a drive system, it is important to ensure that the housing is properly connected to ground (PE rail). These ground connections must be made even when the drive system is being tested or operated for only a short time!

Before turning the device on, all parts that carry voltage must be securely covered. During operation, all covers and control cabinet doors must remain closed.

Control and high power contacts can still carry voltage even if the motor is not turning. Touching contacts when the device is switched on is prohibited.

Before performing any work on drive systems, they must first be disconnected from the power mains and protected against being switched on again.

Loosening electrical drive system connections while voltage is applied is never permitted. In some cases, electric arcs may occur that can cause personal injury and/or damage to contacts.

2.7.2 Protection against hazardous movements

Danger!

Improper control of motors can result in unintended hazardous movements!

Some possible causes for this improper control may include:

- **Incorrect installation or a mistake when handling components**
- **Improper or incomplete wiring**
- **Defective devices (drive system, motor, position encoder, cables, brake)**
- **Flawed control (e. g. caused by software error)**

Some of these causes can be detected and prevented by the drive system's internal monitoring. Nevertheless, it is still possible for the motor shaft to move anytime the device is switched on! For this reason, higher-level safety precautions need to be put in place to ensure that personnel and machines are protected.

The moving parts on machines must be mechanically shielded in such a way as to prevent accidental access. This type of protection can be obtained by using stable mechanical protective equipment such as protective covers, protective fences, protective gates or photocells.

Removing, bypassing or circumventing these protective measures and entering the area where movement takes place is prohibited.

A sufficient number of emergency stop switches must be installed in direct proximity to the machine and be easily accessible at all times. This emergency stop equipment must be checked before the machine is commissioned.

On free running motors, the keyed shaft (if present) must be removed or measures taken to prevent its ejection.

The holding brake built into the motors cannot prevent hoisting devices from dropping their load.

2.7.3 Protection against burns

The surfaces of drive systems and motors can reach very high temperatures during operation.

For this reason, stickers must be placed on drive systems and motors (see the section "Multilingual ACOPOSmicro warning stickers" in the "Technical data" chapter of the ACOPOSmicro User's Manual).



Figure 1: Sticker for "Hot surface" (3 of these stickers are included in delivery of the ACOPOSmicro device)

3. System overview

B&R stepper motors are characterized by the following features:

- High torque
- High overload capability
- Cost-effective encoder option
- Operation in parallel and in series
- Optional IP65 protection
- Optional brake

3.1 Proven technology

Stepper motors are far from getting "a bit long in the tooth". The technology itself is proven and continues to undergo advanced development to reduce costs and size while increasing torque. The construction and control of stepper motors enables high-precision and cost-effective positioning without having to rely on an encoder system.

All B&R motors are constructed from only the highest quality materials, which guarantees a long service life.

3.2 Areas of use

More and more stepper motors are being built every year. Although most of these motors are used in very simple applications, they are also seeing increased usage in applications that were handled primarily by DC and BLDC motors in the past. High-performance controllers increasingly make it possible for more complex tasks to be solved. Many applications that were once handled using smaller servo motors can now be handled by a stepper motor outfitted with the corresponding electronics.

Not only have the possibilities involving controllers advanced over the last few years, but the motors themselves are running considerably smoother and with higher torque thanks to improved technology. New, robust position feedback possibilities are becoming much less expensive and are also playing their part in opening up new areas of use for stepper motors.

Of course, stepper motor solutions also have their limitations. High speeds in particular, long achieved easily by servo motors, can often not be handled well by a stepper motor. If implementing a geared solution, however, many opportunities present themselves by using a smaller gear ratio or even no gears at all. The reason for this is the high torque that can be achieved with stepper motors in the low to intermediate speed range.

Stepper motors are primarily used for infeed axes or for positioning tasks with comparatively lengthy idle times.

Due to their technology, stepper motors are limited in their use in applications where the motor runs continuously. In these types of applications, it is important to make sure that the maximum surface temperature is not exceeded.

Suitable countermeasures for this include reducing the current or oversizing the motor. Special attention should be paid to the motor mounting in every case.

3.3 Selecting the proper motor

The user faces many difficulties when it comes to choosing a motor. There are considerable differences between motors from different manufacturers or even between motor generations from the same manufacturer. The standard specifications listed in the datasheets often do not provide enough information to make a decision in this regard. Only detailed information can reliably indicate the possible areas of use. The more complex the application, the more important parameters such as concentricity, counter EMF, efficiency, resonance frequencies, etc. become.

When chosen with care, stepper motors can be used for many more applications than is the case today. Special attention must be given to the characteristics that are particularly important for the respective application. These characteristics often cannot be achieved unless a drive is also used.

3.4 Concentricity and angular precision

A majority of two-phase hybrid stepper motors have a step angle of 1.8° . In addition, there are versions with a step angle of 0.9° and even, less commonly, 0.45° . The smaller step angle often results in poorer torque characteristics. Positioning at a higher resolution can only be handled with stepper motor drivers that support microstepping. Moreover, a high step resolution produces excellent rotational properties and reduces potential problems with resonance.

3.5 Position accuracy

The manner in which the desired position is ultimately reached depends on the applied load torque as well as how accurate the stepper motor is when it is manufactured. The position accuracy within one step is always dependent on the load and the resulting angular slip. In practice, however, this is always considerably less than a full step (1.8° on a stepper motor with 200 steps). This load angle is best compensated for when using position feedback. This is why all B&R stepper motors are also available in affordable encoder variations that achieve a resolution of up to 12 bits. This makes repeat accuracy possible with angle deviations less than 0.1° , even when the load torque changes.

3.6 Ball bearing assembly, high mechanical loads

Tight-fitting seals protect not only against oil loss caused by contamination, as often occurs in the textile industry through clinging fibers, but they are also highly effective at preventing the intrusion of dirt particles. This maintains the full performance of the lubricant. They are also highly effective at preventing the loss of oil at high rotational speeds. In addition, the seals also provide a high level of protection for the bearings against humidity. The low loss of torque caused by the seals has almost no effect on these powerful motors.

B&R has put a lot of time and thought into the selection of these components, applying their own experience in the area of servo drives as well as feedback from many different customers. Because of this, motor suppliers are required to meet strict internal standards.

The bearings used are dimensioned to the best possible size. This helps the motors to handle longitudinal and lateral forces. An additional safety ring in the front bearing holds the ball bearing in position even under high axial loads. This and other mechanical properties of the motor play a major role in significantly increasing reliability and the possible areas of application.

3.7 Documentation

All stepper motors offered by B&R are measured in a specialized motor laboratory, where all of their relevant characteristics are tested. Results are documented for important values such as detent torque, torque curves at different voltages, rotation characteristics and much more. Torque curves are also recorded for currents that deviate from the specified rated current. Information about possible areas of use and potential limitations for applications with stepper motors is also provided.

This considerably raises the quality of the selection process for a stepper motor application by identifying potential mistakes in selection right from the start. As a result, dimensioning is based on solid principles and allows leeway for new concepts.

3.8 Torque curves

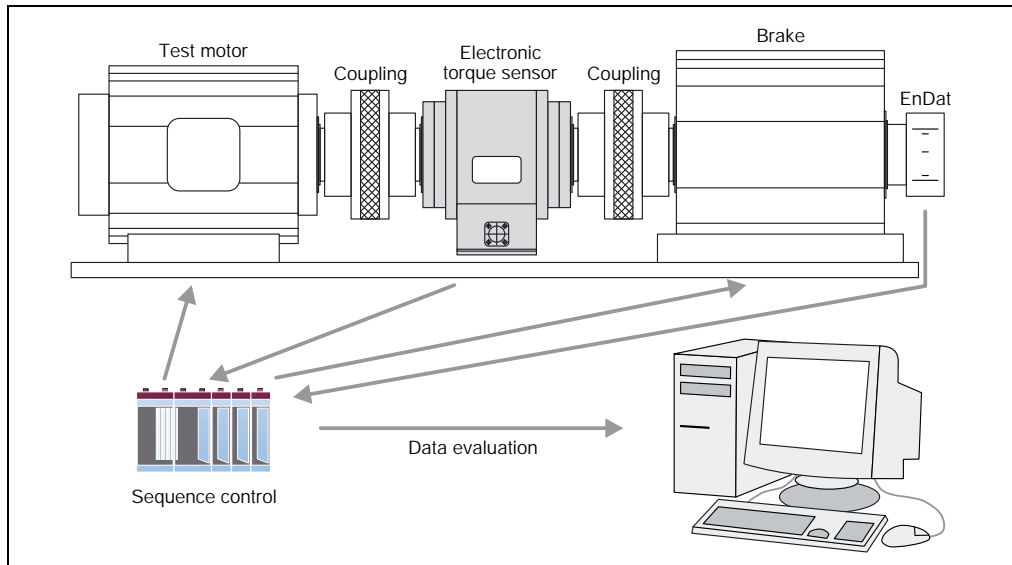


Figure 2: Diagram of motor torque measurement procedure

Comparing torque curves from different manufacturers usually produces differing results, even when the motors share specific comparable properties. This is often caused by differing methods of measurement and how the torque curves are displayed. For example, measuring the motor in full-step mode and with maximum current on both phases results in a somewhat higher torque, but resonance and motor temperature are also considerably increased. If the resonant points are not shown or if the resolution of the measurement points is simply too low, the result is a completely misrepresented image. Resonance can be counteracted when microstepping by adjusting the phase current in such a way that the same torque is present at every position.

If the torque drops are accounted for in full-step mode and the entire rotational range is observed, then ultimately all disadvantages of microstepping are eliminated, leaving only its benefits. This is why B&R always specifies a microstepping torque curve for their motors.

3.9 Various sizes




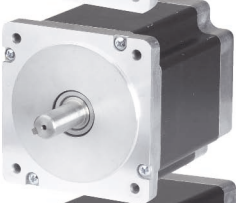
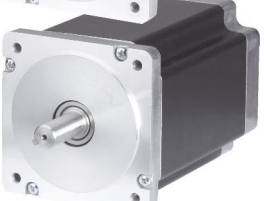


			
			
			
	NEMA 23, flange size 56 mm	Flange size 60 mm	NEMA 34, flange size 86 mm
Holding torque	1.1 to 3.0 Nm	1.15 to 3.5 Nm	4.0 to 13.6 Nm
Stall torque	0.8 to 2.2 Nm	0.81 to 2.5 Nm	2.9 to 9.3 Nm
Protection	IP30	IP30	IP40
Page	 33	 42	 48

Table 3: Stepper motors in various sizes

3.10 Quality features

The aluminum housing used on the new NEMA 34 motors makes it possible to disperse dissipated thermal power with the lowest thermal resistance possible.

This minimizes the heating of the motor and considerably increases the service life of the bearings. The ball bearing used in a stepper motor is generally one of the major components that determines reliability under rough conditions.

3.11 Options

3.11.1 IP upgrade kits / increased protection

B&R offers a solution particularly geared for use in industrial environments. The optional upgrade kit is installed by the customer, providing them with full freedom with regard to cabling. This upgrade kit makes it possible to achieve up to IP65 protection.

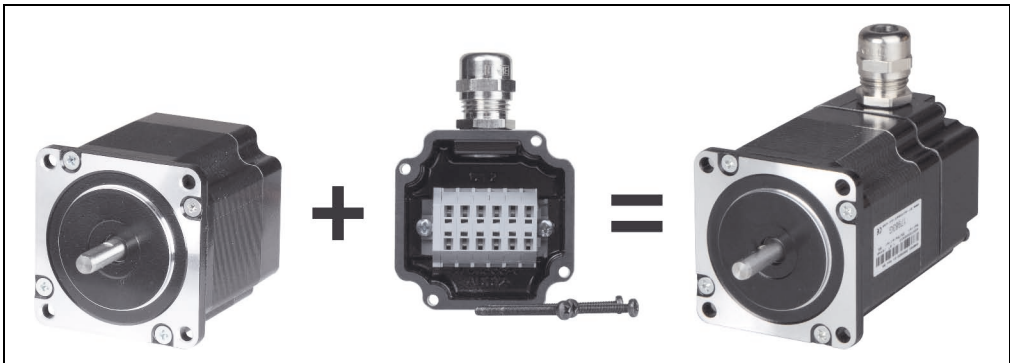


Figure 3: Stepper motor with the IP65 upgrade kit option / connection terminal provided with the IP65 option

3.11.2 Encoders

B&R stepper motors can be delivered with an optional encoder system. The magnetic encoders that are used are highly robust, which makes them an ideal solution for use in harsh environments.

10-bit ABR incremental encoders, 12-bit SSI encoders and 16-bit Hiperface encoders are available as options.

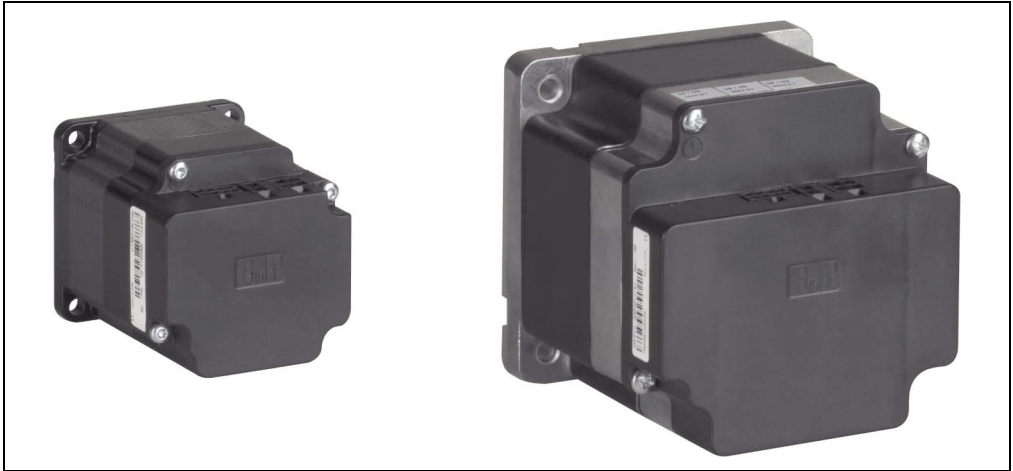


Figure 4: Stepper motors with an IP20 encoder

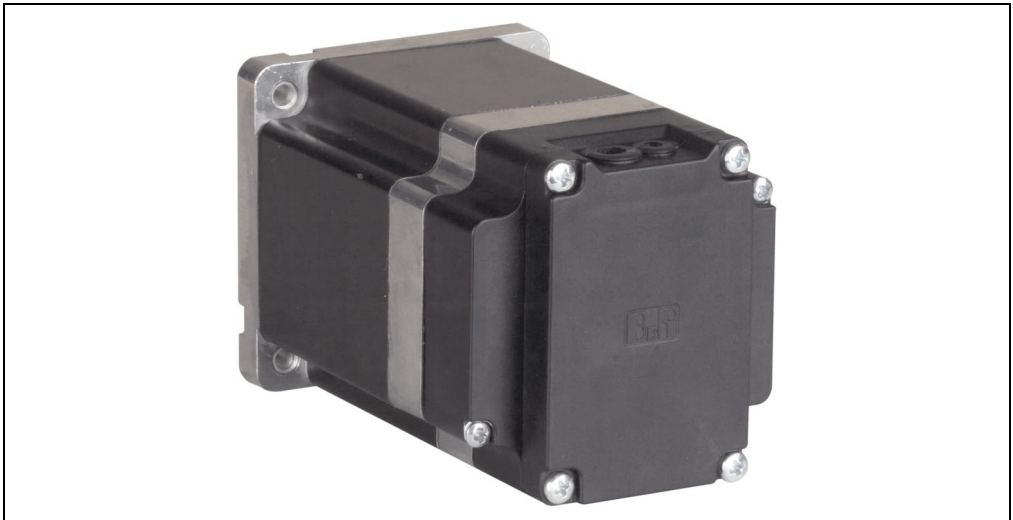


Figure 5: NEMA 34 stepper motor with an IP65 encoder option

3.11.3 Holding brakes

Brakes are used wherever moving mass must be stopped in a defined manner and whenever braking torque must be maintained if the power supply fails.

Here again with their holding brakes, B&R offers yet another cost-effective and high-performance solution.

Holding brakes are available with up to 2 Nm for the 60 mm motors and even up to 9 Nm for the 86 mm motors. Braking force is provided by a permanent magnet. A voltage of 24 VDC is required to release the brakes.



Figure 6: NEMA 34 stepper motor with the encoder and brake options

3.12 Extensive stepper motor control






					
Name	X20DS1319 X20DS1119	X20SM1436 X20SM1426	X67SM4320 X67SM2436	X20SM3456	ACOPOSmicro
Channels	1	1	4/2	3	1/2
Current	Pulse/direction	1 A / 3 A	1 A / 3 A	6 A	10 A
Voltage	5 V 24 V	24 V 24 to 38.5 V $\pm 25\%$	24 V 24 to 38.5 V $\pm 25\%$	24 to 48 V $\pm 25\%$	24 to 64 V $\pm 25\%$
Encoders	1x incremental encoder 1x SSI encoder	1x incremental encoder	2x incremental encoder	3x incremental encoder	Up to 2x incremental encoder 2x SSI encoder or 2x Hiperface encoder
Protection	IP20	IP20	IP67	IP20	IP20

Table 4: Controlling stepper motors

4. Useful information

4.1 Torque characteristics and stepping angle of a stepper motor

Holding torque refers to the torque that results when applying the maximum permissible current in both phases.

Stall torque is the minimum torque available in any of the intermediate steps of the rotor when the maximum phase current is being applied.

4.1.1 Full-step mode

Information:

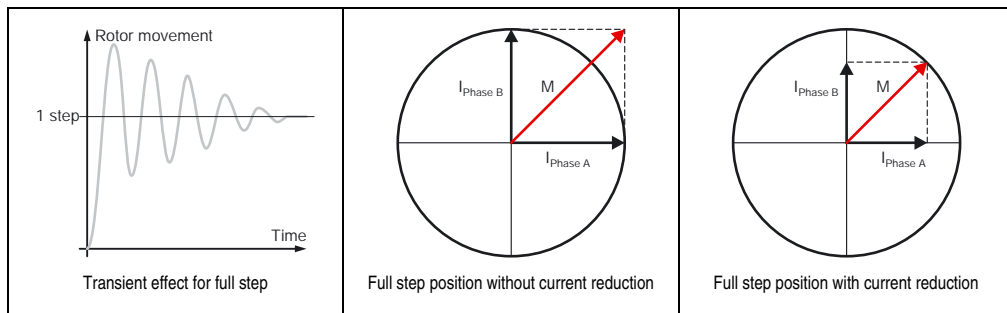
In full-step mode, a step corresponds to 1.8° .

In full-step mode, a stepper motor can achieve more torque because the maximum phase current can always be applied. Because of the natural resonance brought about by the transient effect, however, torque weakens with each full step. This can cause the motor to stall. The strong increase in the motor's noise levels is also a substantial disadvantage of full step driving.

One additional significant disadvantage of full-step mode with maximum phase current is the increased dissipation loss of approximately 50% that leads to a higher motor temperature and a reduction in the motor's service life.

This can be counteracted by reducing the current by a factor of radical 2. Although this reduces the torque by approximately the same factor, it also reduces the motor's natural resonance, which can help reduce the weakening of the motor's torque in some instances.

In general, full-step mode is possible with the power amplifiers offered by B&R, but due to the disadvantages listed above it is not recommended.



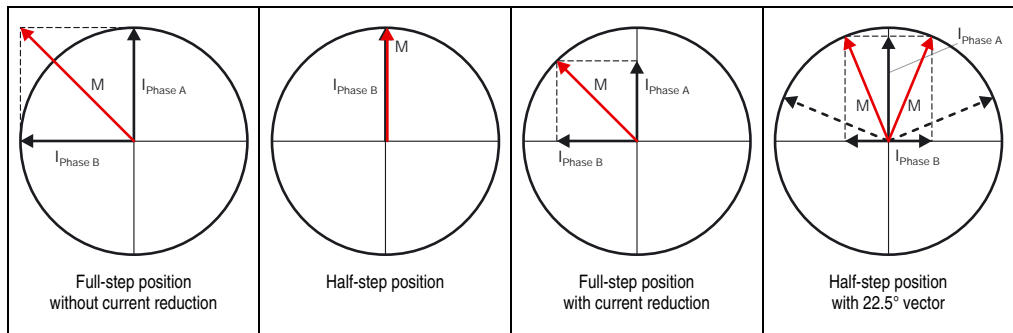
4.1.2 Half-step mode

Information:

In half-step mode, each step is 0.9° .

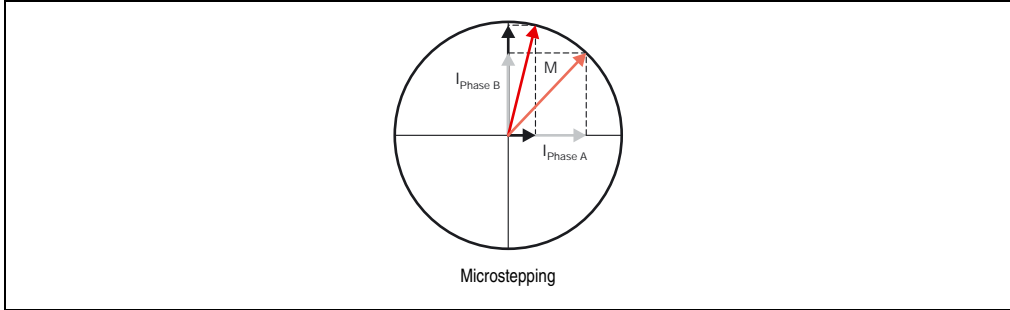
Because of an additional intermediate position, the resonance when half stepping is not as pronounced as in full-step operation. In half-step mode, there are two methods that can be used to supply the windings with current.

- 1) The drive alternates between two windings on (supplied with current) and a single winding on. In this variant, it is important that current is reduced in the full-step position; otherwise, an unbalanced torque curve results that can cause torque fluctuations that bring about resonance.
- 2) Both windings are supplied with current so that a torque vector forms that is offset by 22.5° from the half-step position in the first method. This is a considerably better method since it also mostly compensates for the torque fluctuations caused by the detent torque.



4.1.3 Microstep mode

With microstepping, a step corresponds theoretically to 0.007° when there are 256 microsteps. In microstep mode, the nearly sinusoidal current waveform and the fine resolution of the steps achieves a consistent torque curve. This method results in a high degree of position accuracy, greatly reduced resonance and quieter operation.



4.2 Reliability of B&R motors

All B&R motors are brushless, have high-quality ball bearings in the front and rear bearing seats and have a life expectancy of over 20,000 operating hours when used in the permitted operating voltage range. This service life is based on the results of testing carried out by well-known ball bearing manufacturers. Calculated L10h values are merely theoretical values at optimal operating conditions that are not valid for warranty claims.

4.2.1 Maximum permissible axial and radial force (Fa and Fr)

Stepper motor	Radial force (Fr) ¹⁾	Axial force (Fa)
80MPDx (see chapter "Standard motors", section 3 "NEMA 23, flange size 56 mm" on page 33)	73.5 N	≤ Motor mass ²⁾
80MPFx (see chapter "Standard motors", section 4 "Flange size 60 mm" on page 42)	75.0 N	≤ Motor mass ²⁾
80MPHx (see chapter "Standard motors", section 5 "NEMA 34, flange size 86 mm" on page 48)	290.0 N	225.0 N

Table 5: Maximum permissible axial and radial force (Fa and Fr)

- 1) Measured in the middle of the shaft.
- 2) The permitted axial load may not be larger than the motor mass.

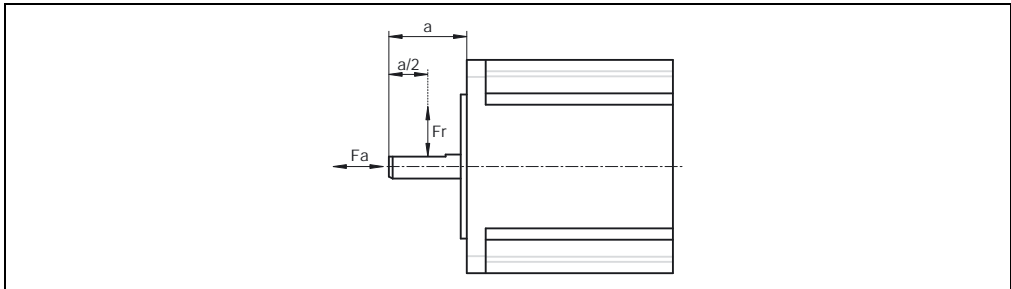


Figure 7: Axial and radial force (Fa and Fr)

4.2.2 Reducing average life expectancy

Negative influences on the average life expectancy L10h value specified by B&R include:

- Impact-related forces
- Excessive radial and axial loads
- Vibration and oscillation, very high cyclic acceleration
- Imprecise angle and centering alignment
- Environmental conditions such as dust, humidity, corrosive gases, etc.

Chapter 2 • Standard motors

This chapter provides information about standard motors (stepper motors without options). Options available with the delivery of stepper motors can be found in Chapter 3 "Options" on page 63.

1. Overview¹⁾



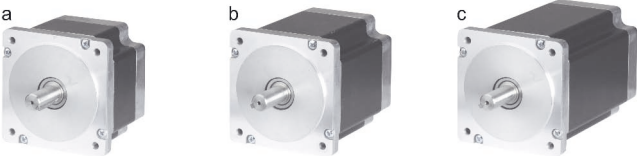
Model number		Holding torque [Nm]	Standstill torque (Nm)	Protection	Technical data	Motor characteristics
NEMA 23 Flange size 56 mm						
80MPD1.300S000-01	a	1.1	0.8	IP30	33	36
80MPD3.300S000-01	b	1.8	1.25	IP30		38
80MPD5.300S000-01	c	3.0	2.2	IP30		40
Flange size 60 mm						
80MPF1.250S000-01	a	1.1	0.8	IP30	42	45
80MPF3.250S000-01	b	1.7	1.2	IP30		46
80MPF5.250S000-01	c	3.5	2.5	IP30		47
NEMA 34 Flange size 86 mm						
80MPH1.300S000-01	a	4.0	2.9	IP40	48	51
80MPH3.300S000-01	b	7.8	5.5	IP40		53
80MPH4.300S000-01		9.5	6.3	IP40		55
80MPH4.500S000-01		9.5	6.3	IP40		57
80MPH6.300S000-01	c	13.6	9.3	IP40		59
80MPH6.101S000-01		13.6	9.3	IP40		61

Table 6: Stepper motors - Overview

1) Order key: see Section 2 "Order key" on page 32

2. Order key

<table border="1" style="margin: auto;"> <tr> <td style="padding: 5px;">8</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">M</td> <td style="padding: 5px;">P</td> <td style="padding: 5px;">a</td> <td style="padding: 5px;">b</td> <td style="padding: 5px;">.</td> <td style="padding: 5px;">c</td> <td style="padding: 5px;">c</td> <td style="padding: 5px;">d</td> <td style="padding: 5px;">e</td> <td style="padding: 5px;">e</td> <td style="padding: 5px;">f</td> <td style="padding: 5px;">f</td> <td style="padding: 5px;">-</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">1</td> </tr> </table>		8	0	M	P	a	b	.	c	c	d	e	e	f	f	-	0	1
8	0	M	P	a	b	.	c	c	d	e	e	f	f	-	0	1		
a	Flange size of the stepper motor:																	
	D	56 mm (NEMA 23)																
	F	60 mm																
	H	86 mm (NEMA 34)																
b	Number of stacks (corresponds to the length of the motor)																	
	1	1 stack																
	3	2 stacks																
	4	2 stacks - high torque																
	6	3 stacks																
cc	Current x 100 mA, examples:																	
	30	3000 mA = 3 A																
	50	5000 mA = 5 A																
d	Current multiplier 10 ^d																	
	E.g.	cc = 10, d = 1 10 x 100 mA x 10 ¹ = 10.000 mA = 10 A																
ee	Protection type / brake option																	
	S0	Standard																
	S1	IP65																
	D1	IP65 + brake																
ff	Option: No encoder, Hiperface, SSI absolute encoder or ABR incremental encoder																	
	00	No encoder																
	11	Hiperface																
	13	SSI absolute encoder																
	14	ABR incremental encoder																

Table 7: Stepper motors - Order key

Information:

Not all combinations in the above table are available (see Table 17 "Stepper motors - Overview" on page 63).

3. NEMA 23, flange size 56 mm

- High torque with respect to length
- High-quality ball bearing with double seals

3.1 Order data





Model number	Short description	Image
80MPD1.300S000-01	2-phase hybrid stepper motor, 56 mm flange, length 45 mm, 3 A series / 6 A parallel, 1.1 Nm holding torque, 0.8 Nm stall torque	
80MPD3.300S000-01	2-phase hybrid stepper motor, 56 mm flange, length 57.5 mm, 3 A series / 6 A parallel, 1.8 Nm holding torque, 1.25 Nm stall torque	
80MPD5.300S000-01	2-phase hybrid stepper motor, 56 mm flange, length 80.5 mm, 3 A series / 6 A parallel, 3.0 Nm holding torque, 2.2 Nm stall torque	
Optional accessories		
80XMPDXRE.W1-10	IP upgrade cover and cable clamp for stepper motors from the 80MPD and 80MPF series, 10 units per package	
80CMxxxx.xx-01	For motor and encoder cables, see Chapter 5 "Accessories" on page 95.	

Table 8: Stepper motors NEMA 23 - Order data

3.2 Technical data

Model number	80MPD1.300S000-01		80MPD3.300S000-01		80MPD5.300S000-01	
Specific motor data						
Wiring	Series	Parallel	Series	Parallel	Series	Parallel
Current [A]	3.0	6.0	3.0	6.0	3.0	6.0
Resistance / phase [Ω]	1.2	0.3	1.6	0.4	2.4	0.6
Inductance / phase [mH]	3.6	0.9	5.2	1.3	8.8	2.2
Stall torque [Nm]	0.8		1.25		2.2	
Holding torque ¹⁾ [Nm]	1.1		1.8		3.0	
Detent torque [mNm]	<30		<50		<90	
Rotor inertia [gcm ²]	Approx. 145		Approx. 245		Approx. 470	
For motor characteristics, see page.	36		38		40	
General motor data						
IP protection	IP30					
Stepping angle [°]	1.8					
Average period of operation between failures	21,000 hours					
Cable length [mm]	300					
Cable cross section	AWG 22, UL 3266					
Shaft type	Flat-sided (D-cut)					
Insulation class	B (130°C)					
Insulation resistance	100 M Ω min. 500 VDC					
Dielectric resistance	500 VAC for 1 minute					
Driver voltage supply	Max. 80 VDC					
Operating conditions						
Temperature	-20 to 40°C					
Max. surface temperature [°C]	100					
Relative humidity	5 to 95%, non-condensing					
Storage and transport conditions						
Temperature	-30 to 85°C					
Relative humidity	5 to 95%, non-condensing					
Mechanical characteristics						
Max. radial force ²⁾ [N]	73.5					
Max. axial force [N]	The permitted axial load may not be larger than the motor mass.					
Length [mm]	45.0		57.5		80.5	
Weight [g]	520		720		1,110	

Table 9: Stepper motors NEMA 23 - Technical data

1) Measured with series wiring

2) Measured in the middle of the shaft

3.3 Dimensions

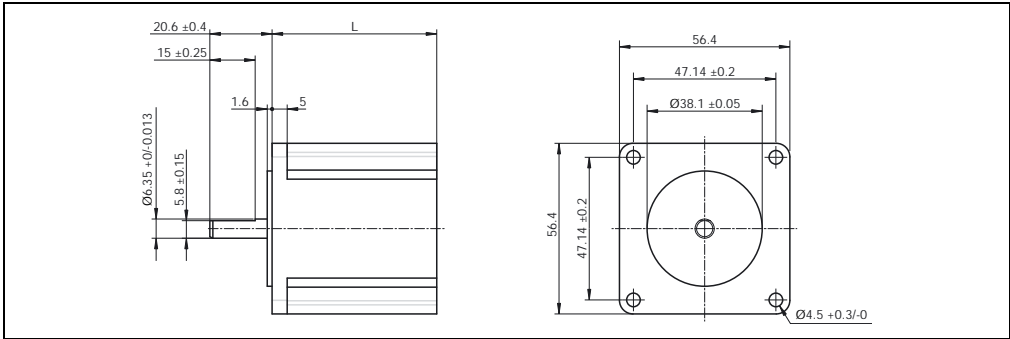


Figure 8: Stepper motors NEMA 23 - Mechanical dimensions

Stepper motor	Length L [mm]
80MPD1.300S000-01	45.0
80MPD3.300S000-01	57.5
80MPD5.300S000-01	80.5

Table 10: Stepper motors NEMA 23 - Motor length

3.4 Wiring

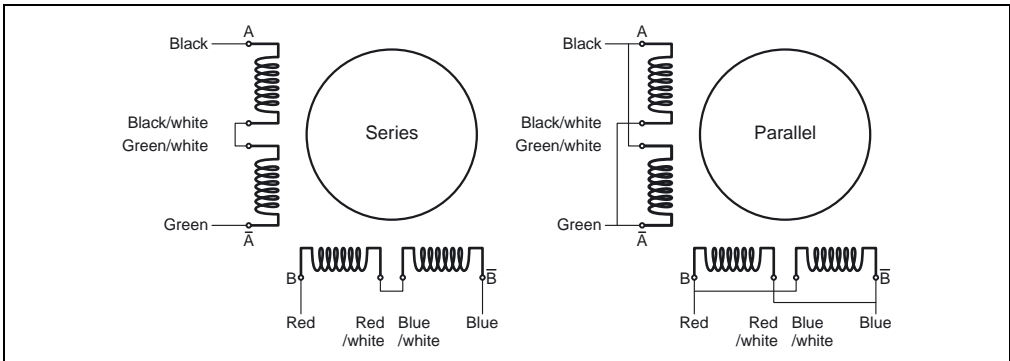


Figure 9: Stepper motors - Wiring

3.5 Torque curves

3.5.1 80MPD1.300S000-01 ¹⁾

Series wiring 3 A

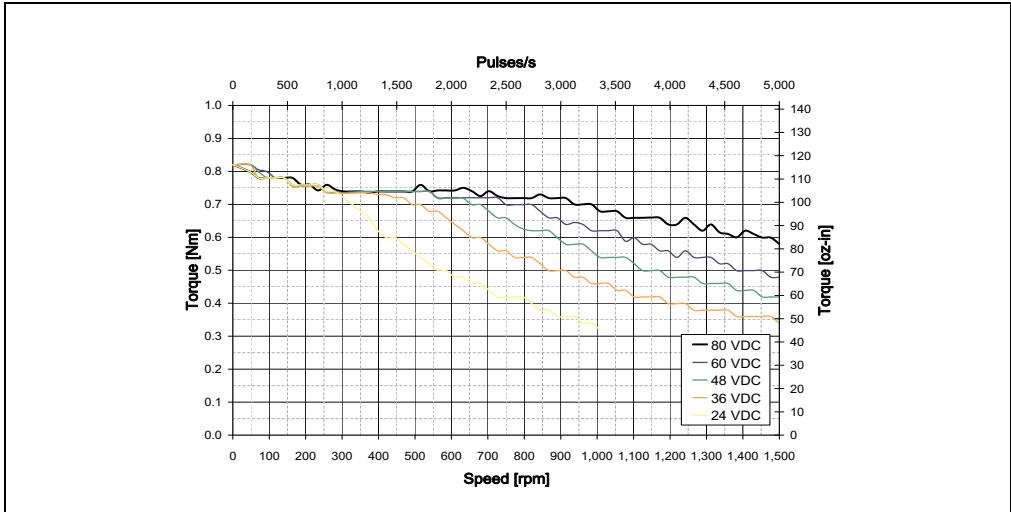


Figure 10: 80MPD1.300S000-01 torque curves, series 3 A

Parallel wiring 6 A

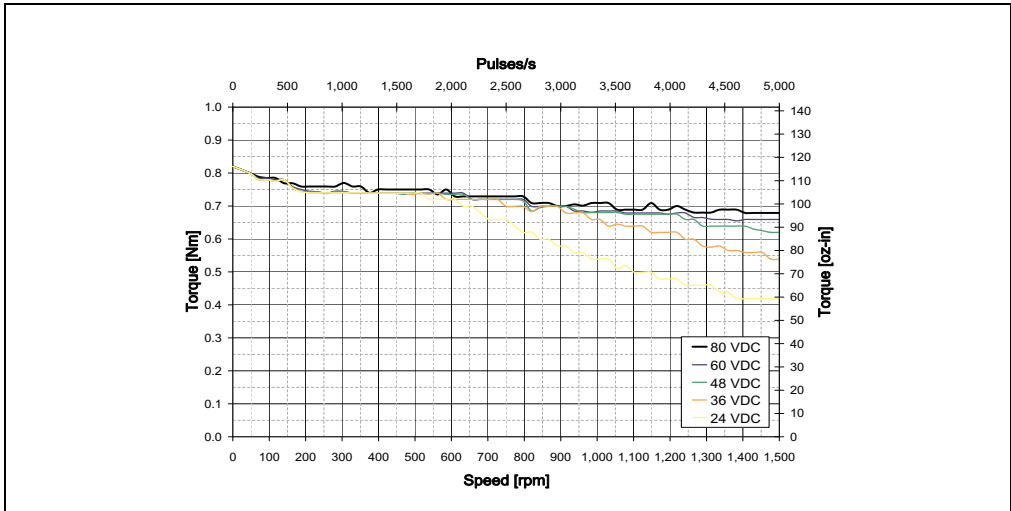


Figure 11: 80MPD1.300S000-01 torque curves, parallel 6 A

1) All torque curves are measured in microstepping mode.

Selecting the suitable connection type

The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

This wiring freedom allows a larger selection of drives. With this motor, it is possible to use an X20SM1436 with 3 A rated current up to approximately 500 rpm, wire the motor in series and still have the same torque as with parallel wiring and 6 A. However, if higher torque is needed, the motor can be wired in parallel with an ACOPOSmicro device used as the drive.

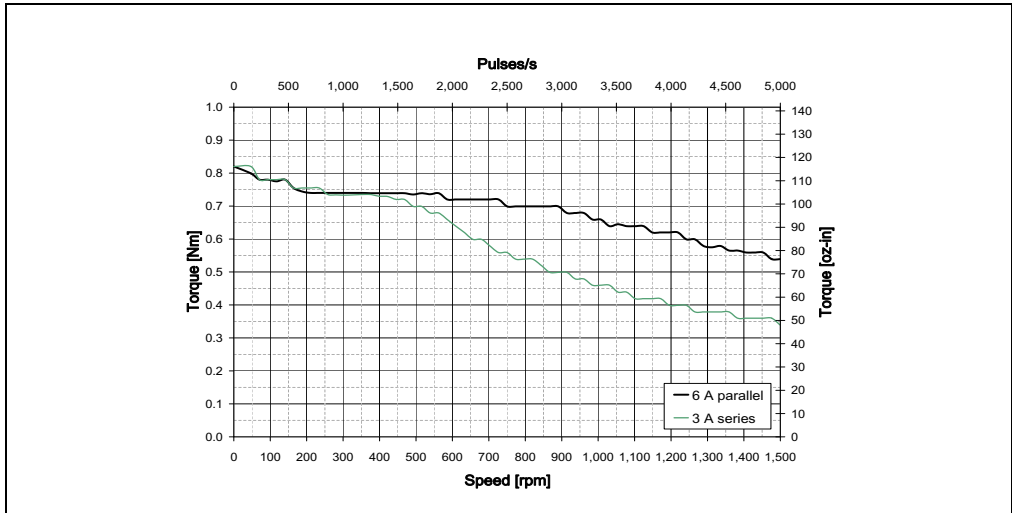


Figure 12: 80MPD1.300S000-01 torque curves, series/parallel comparison

3.5.2 80MPD3.300S000-01 ¹⁾

Series wiring 3 A

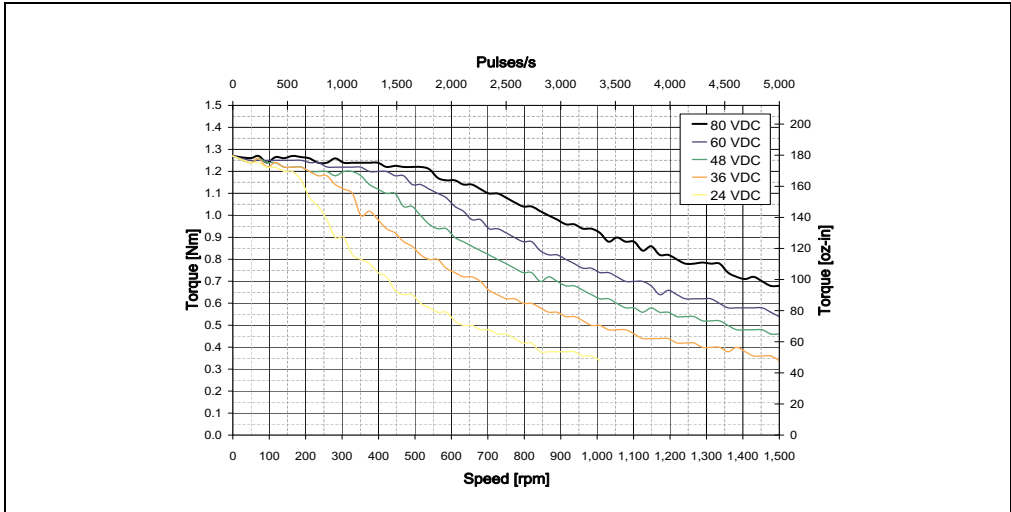


Figure 13: 80MPD3.300S000-01 torque curves, series 3 A

Parallel wiring 6 A

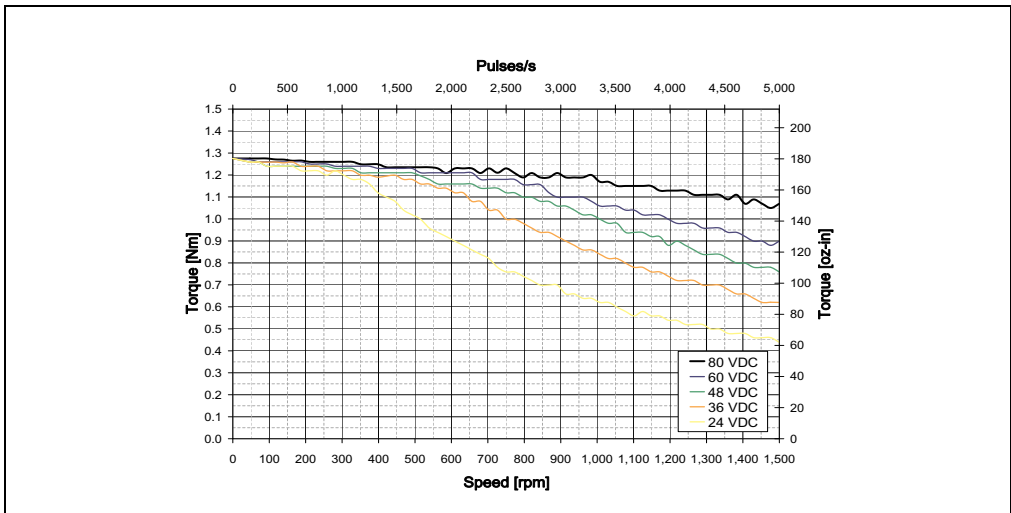


Figure 14: 80MPD3.300S000-01 torque curves, parallel 6 A

1) All torque curves are measured in microstepping mode.

Selecting the suitable connection type

The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

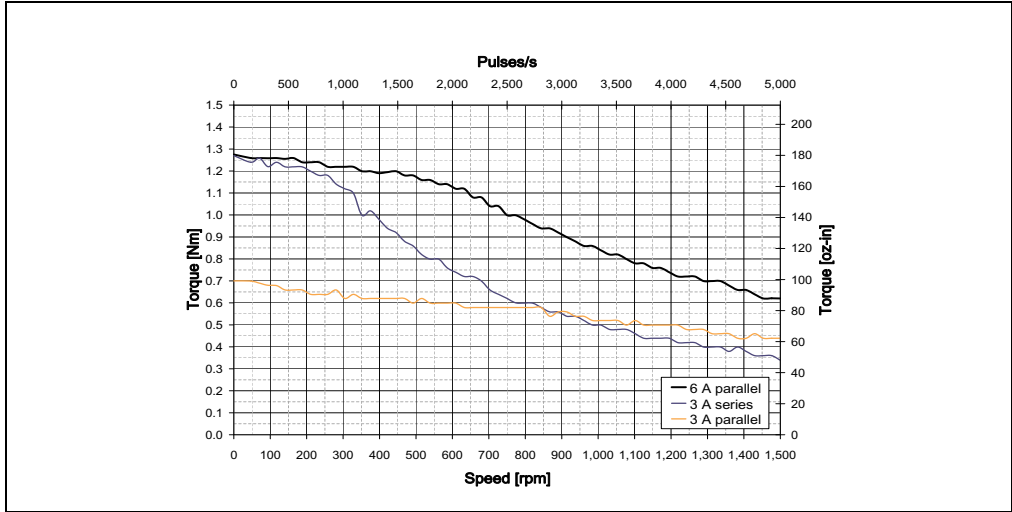


Figure 15: 80MPD3.300S000-01 torque curves, series/parallel comparison

3.5.3 80MPD5.300S000-01 ¹⁾

Series wiring 3 A

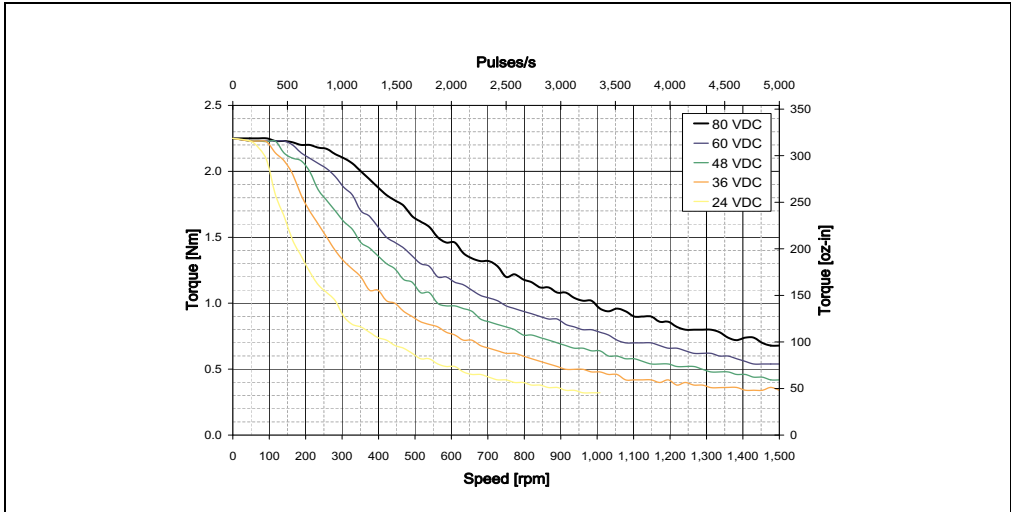


Figure 16: 80MPD5.300S000-01 torque curves, series 3 A

Parallel wiring 6 A

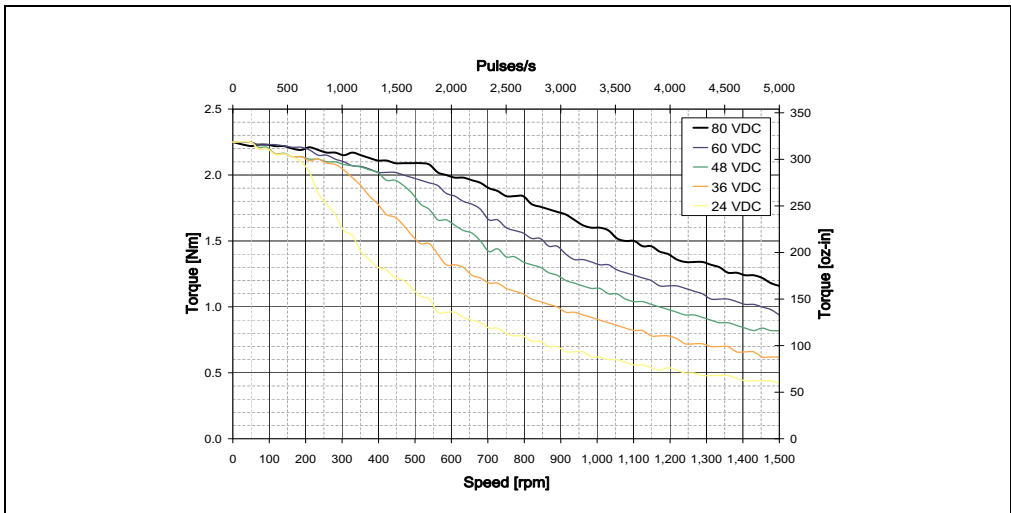


Figure 17: 80MPD5.300S000-01 torque curves, parallel 6 A

1) All torque curves are measured in microstepping mode.

Selecting the suitable connection type

The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

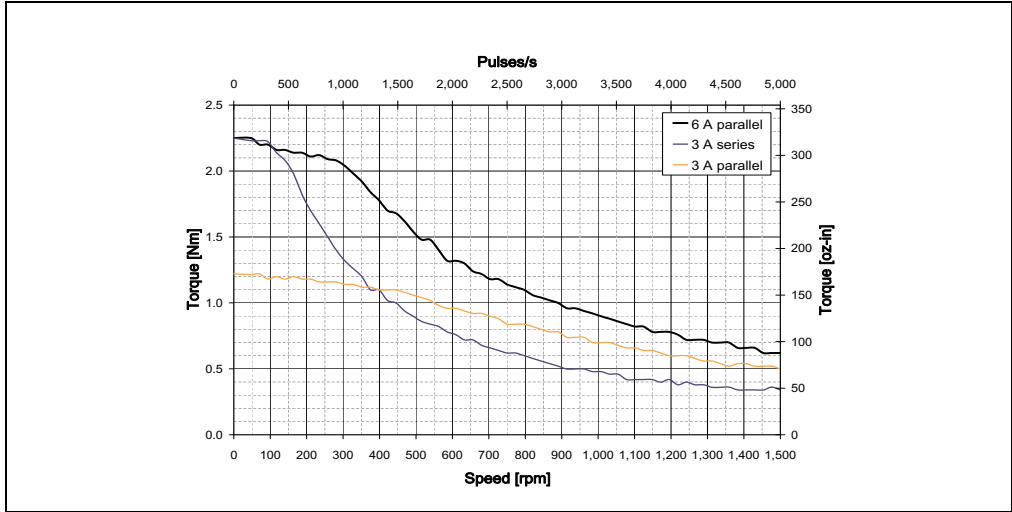


Figure 18: 80MPD5.300S000-01 torque curves, series/parallel comparison

4. Flange size 60 mm

- 8 mm shaft
- Lower current consumption at the same or higher torque compared with 56 mm motors
- Better thermal properties due to the larger surface compared with 56 mm motors
- High-quality ball bearing with double seals

4.1 Order data





Model number	Short description	Image
80MPF1.250S000-01	2-phase hybrid stepper motor, 60 mm flange, length 51.8 mm, 2.5 A series / 5 A parallel, 1.1 Nm holding torque, 0.8 Nm stall torque	
80MPF3.250S000-01	2-phase hybrid stepper motor, 60 mm flange, length 62 mm, 2.5 A series / 5 A parallel, 1.7 Nm holding torque, 1.2 Nm stall torque	
80MPF5.250S000-01	2-phase hybrid stepper motor, 60 mm flange, length 93.3 mm, 2.5 A series / 5 A parallel, 3.5 Nm holding torque, 2.5 Nm stall torque	
Optional accessories		
80XMPDXRE.W1-10	IP upgrade cover and cable clamp for stepper motors from the 80MPD and 80MPF series, 10 units per package	
80CMxxxx.xx-01	For motor and encoder cables, see Chapter 5 "Accessories" on page 95.	

Table 11: Stepper motors flange size 60 mm - Order data

4.2 Technical data

Model number	80MPF1.250S000-01		80MPF3.250S000-01		80MPF5.250S000-01	
Specific motor data						
Wiring	Series	Parallel	Series	Parallel	Series	Parallel
Current [A]	2.5	5.0	2.5	5.0	2.5	5.0
Resistance / phase [W]	1.28	0.32	1.52	0.38	2.4	0.6
Inductance / phase [mH]	3.4	0.85	5.6	1.4	11.2	2.8
Stall torque [Nm]	0.8		1.2		2.5	
Holding torque ¹⁾ [Nm]	1.1		1.7		3.5	
Detent torque [mNm]	<35		<45		<75	
Rotor inertia [gcm ²]	280		440		920	
Motor characteristics	■ 45		■ 46		■ 47	
General motor data						
IP protection	IP30					
Stepping angle [°]	1.8					
Max. surface temperature [°C]	100 / 90 ²⁾					
Average period of operation between failures	21,000 hours					
Cable length [mm]	300					
Cable cross section	AWG 22					
Shaft type	Flat-sided (D-cut)					
Insulation class	B (130°C)					
Insulation resistance	100 M Ω min. 500 VDC					
Dielectric resistance	500 VAC for 1 minute					
Operating conditions						
Temperature	-20 to 40°C					
Relative humidity	5 to 95%, non-condensing					
Storage and transport conditions						
Temperature	-30 to 85°C					
Relative humidity	5 to 95%, non-condensing					
Mechanical characteristics						
Max. radial force ³⁾ [N]	75.0					
Max. axial force [N]	The permitted axial load may not be larger than the motor mass.					
Length [mm]	51.8		62		93.3	
Weight [g]	620		880		1,400	

Table 12: Stepper motors flange size 60 mm - Technical data

- 1) Measured with series wiring
- 2) For motors with brake option (see section "Brake option" on page 80)
- 3) Measured in the middle of the shaft

4.3 Dimensions

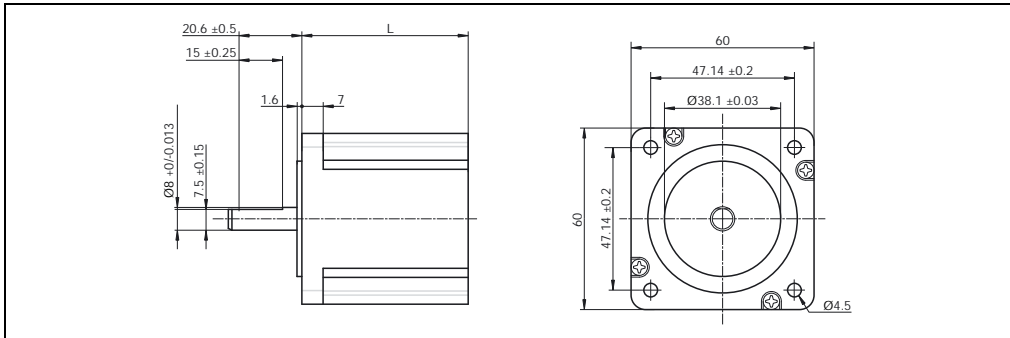


Figure 19: Stepper motors flange size 60 mm - Mechanical dimensions

Stepper motor	Length L [mm]
80MPF1.250S000-01	51.8
80MPF3.250S000-01	62.0
80MPF5.250S000-01	93.3

Table 13: Stepper motors flange size 60 mm - Motor length

4.4 Wiring

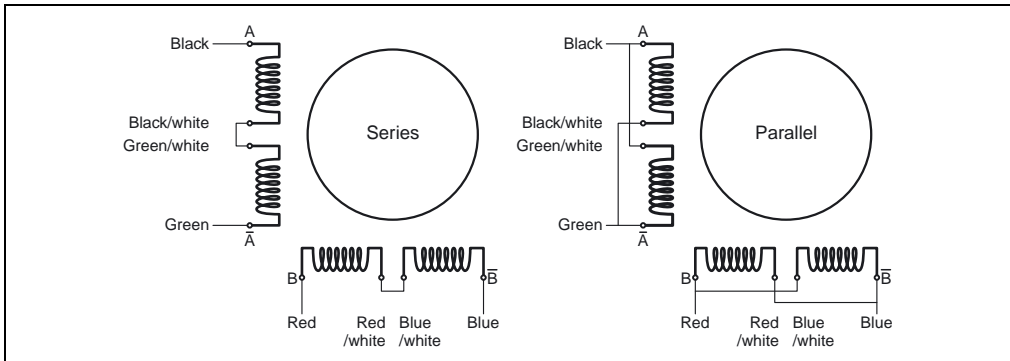


Figure 20: Stepper motors - Wiring

4.5 Torque curves

4.5.1 80MPF1.250S000-01 ¹⁾

Series wiring 2.5 A

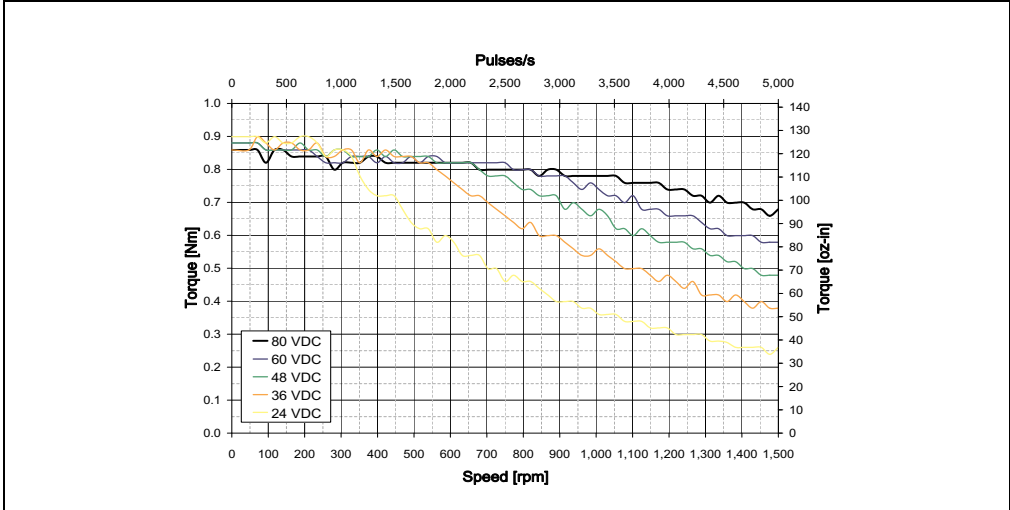


Figure 21: 80MPF1.250S000-01 torque curves, series 2.5 A

Parallel wiring 5 A

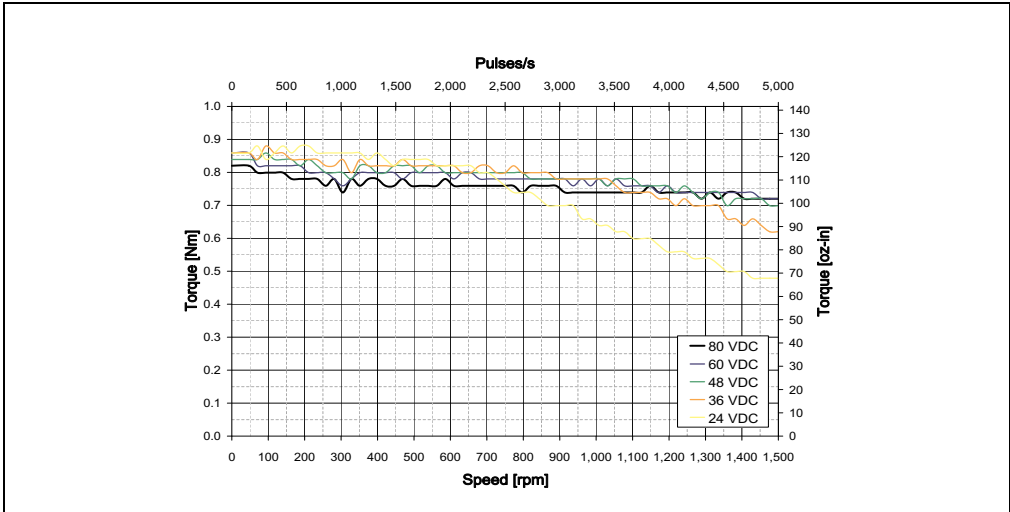


Figure 22: 80MPF1.250S000-01 torque curves, parallel 5 A

1) All torque curves are measured in microstepping mode.

4.5.2 80MPF3.250S000-01 ¹⁾

Series wiring 2.5 A

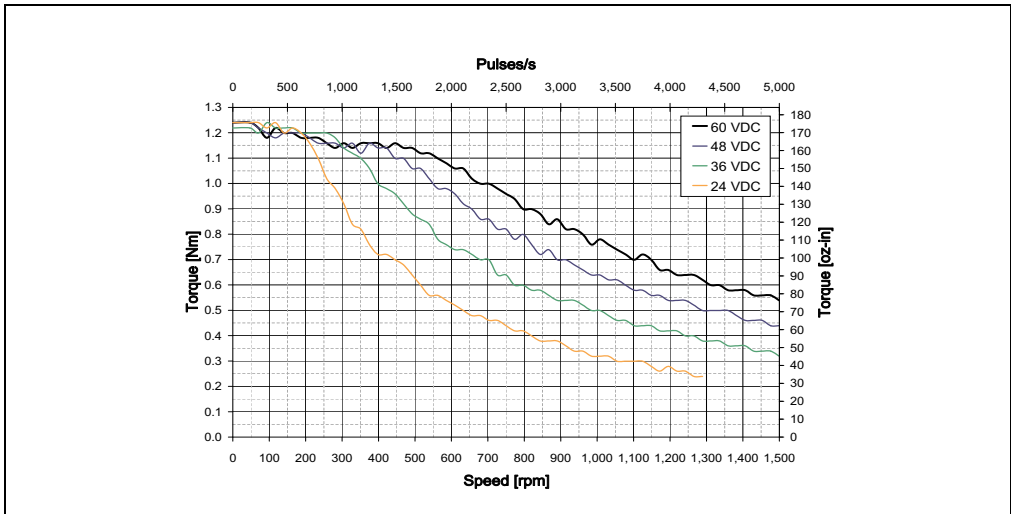


Figure 23: 80MPF3.250S000-01 torque curves, series 2.5 A

Parallel wiring 5 A

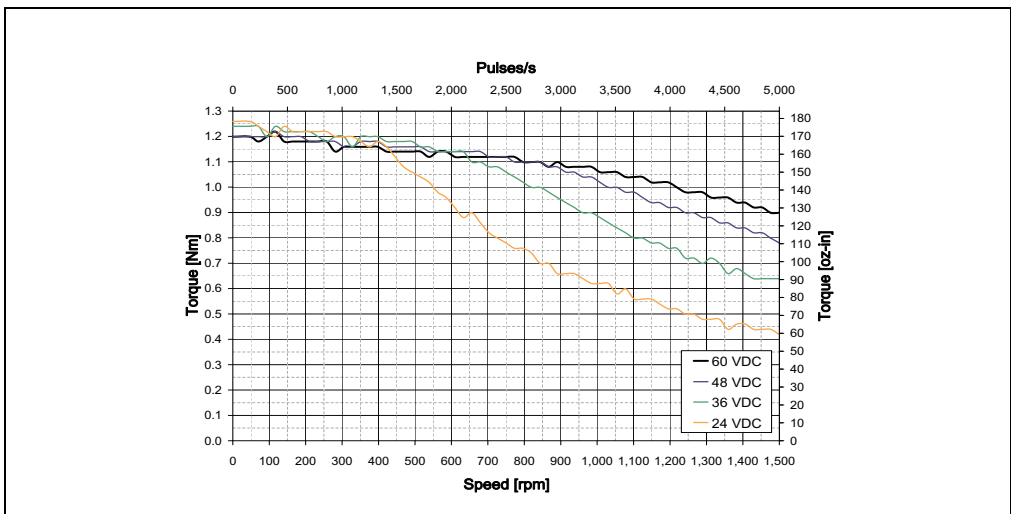


Figure 24: 80MPF3.250S000-01 torque curves, parallel 5 A

1) All torque curves are measured in microstepping mode.

4.5.3 80MPF5.250S000-01 ¹⁾

Series wiring 2.5 A

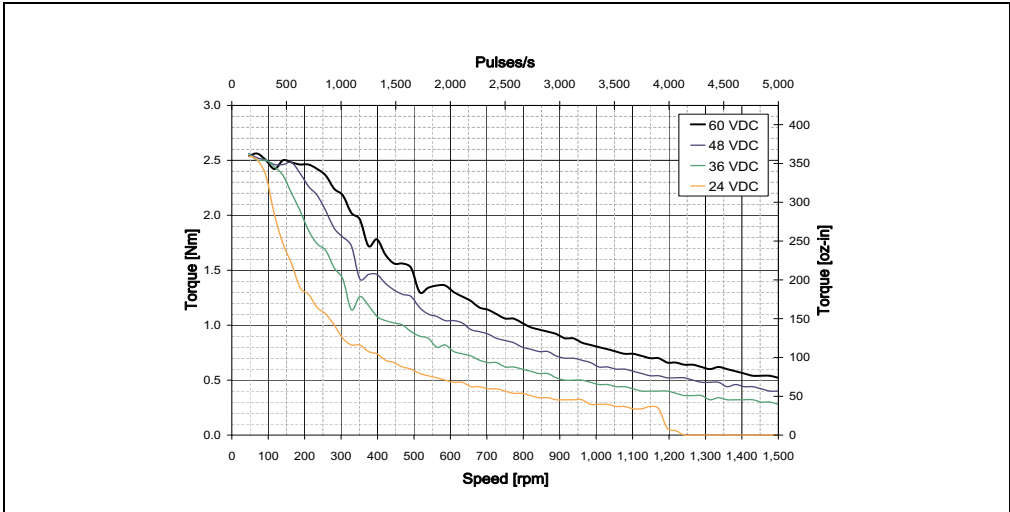


Figure 25: 80MPF5.250S000-01 torque curves, series 2.5 A

Parallel wiring 5 A

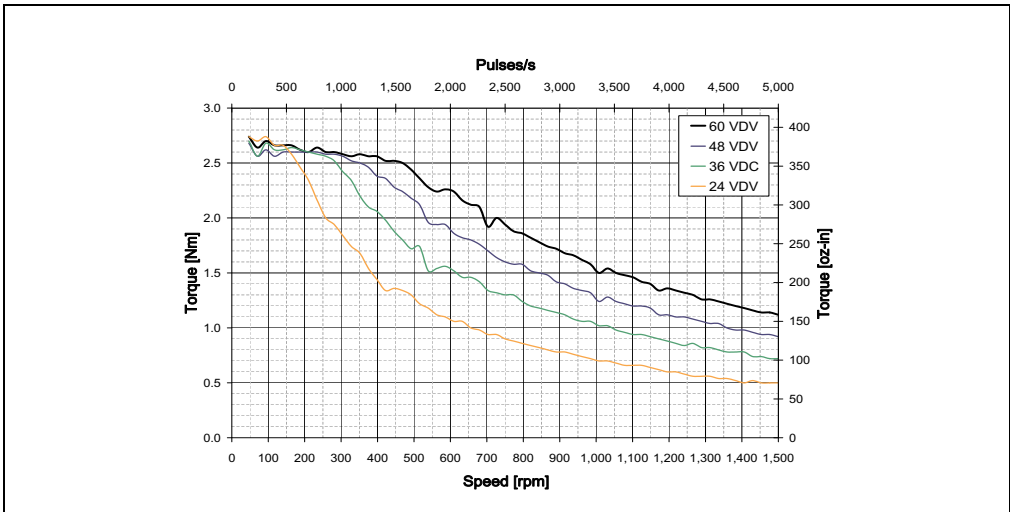


Figure 26: 80MPF5.250S000-01 torque curves, parallel 5 A

1) All torque curves are measured in microstepping mode.

5. NEMA 34, flange size 86 mm

- High torque
- High axial load due to the safety ring in the front bearing
- Aluminum housing for better thermal flow
- 10 A variant for higher speeds

5.1 Order data


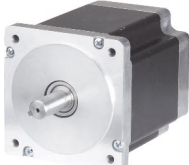
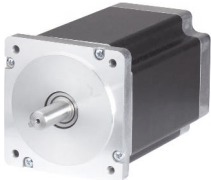

Model number	Short description	Image
80MPH1.300S000-01	2-phase hybrid stepper motor, 86 mm flange, length 66 mm, 3 A series / 6 A parallel, 4.0 Nm holding torque, 2.9 Nm stall torque	
80MPH3.300S000-01	2-phase hybrid stepper motor, 86 mm flange, length 98 mm, 3 A series / 6 A parallel, 7.8 Nm holding torque, 5.5 Nm stall torque	
80MPH4.300S000-01	2-phase hybrid stepper motor, 86 mm flange, length 98 mm, 3 A series / 6 A parallel, 9.5 Nm holding torque, 6.3 Nm stall torque	
80MPH4.500S000-01	2-phase hybrid stepper motor, 86 mm flange, length 98 mm, 5 A series / 10 A parallel, 9.5 Nm holding torque, 6.3 Nm stall torque	
80MPH6.300S000-01	2-phase hybrid stepper motor, 86 mm flange, length 130 mm, 3 A series / 6 A parallel, 13.6 Nm holding torque, 9.3 Nm stall torque	
80MPH6.101S000-01	2-phase hybrid stepper motor, 86 mm flange, length 130 mm, 10 A parallel, 13.6 Nm holding torque, 9.3 Nm stall torque	
Optional accessories		
80XMPHXRE.W1-10	IP65 upgrade cover and cable clamp for stepper motors from the 80MPH series, 10 units per package	
80CMxxxx.xx-01	For motor and encoder cables, see Chapter 5 "Accessories" on page 95.	

Table 14: Stepper motors NEMA 34 - Order data

5.2 Technical data

	80MPH1. 300S000-01		80MPH3. 300S000-01		80MPH4. 300S000-01		80MPH4. 500S000-01		80MPH6. 300S000-01		80MPH6. 101S000-01
Specific motor data											
Wiring (series/parallel)	Ser.	Par.	Ser.	Par.	Ser.	Par.	Ser.	Par.	Ser.	Par.	Par.
Current [A]	3.0	6.0	3.0	6.0	3.0	6.0	5.0	10	3.0	6.0	10.0
Resistance / phase [Ω]	1.7	0.4	2.2	0.6	2.2	0.6	0.9	0.2	2.7	0.7	0.24
Inductance / phase [mH]	12.9	3.2	17.3	4.3	17.3	4.3	5.6	1.4	20.0	5.0	1.6
Stall torque [Nm]	2.9		5.5		6.3		6.3		9.3		9.3
Holding torque ¹⁾ [Nm]	4.0		7.8		9.5		9.5		13.6		13.6
Detent torque [mNm]	<160		<210		<320		<320		<420		<420
Rotor inertia [kgcm ²]	Approx. 1.31		Approx. 2.61		Approx. 2.61		Approx. 2.61		Approx. 3.92		Approx. 3.92
Motor characteristics	■ 51		■ 53		■ 55		■ 57		■ 59		■ 61
General motor data											
IP protection	IP40										
Stepping angle [°]	1.8										
Max. surface temperature [°C]	100 / 85 ²⁾										
Average period of operation between failures	20,000 hours										
Cable length [mm]	300										
Cable cross section	AWG 22, UL 3266										
Shaft type	Keyed										
Insulation class	B (130°C)										
Insulation resistance	100 M Ω min. 500 VDC										
Dielectric resistance	1776 VAC for 1 second										
Operating conditions											
Temperature	-20 to 40°C										
Relative humidity	5 to 95%, non-condensing										
Storage and transport conditions											
Temperature	-30 to 85°C										
Relative humidity	5 to 95%, non-condensing										
Mechanical characteristics											
Max. radial force ³⁾ [N]	290										
Max. axial force [N]	225										
Length [mm]	66		98		98		98		130		130
Weight [kg]	1.8		3.0		3.0		3.0		4.2		4.2

Table 15: Stepper motors NEMA 34 - Technical data

- 1) Measured with series wiring
- 2) For motors with break option (see section "Brake option" on page 80)
- 3) Measured in the middle of the shaft

5.3 Dimensions

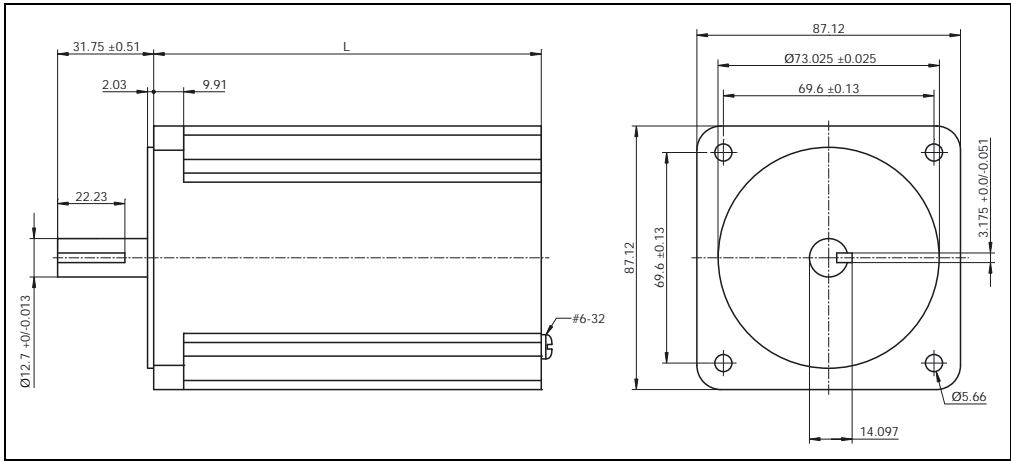


Figure 27: Stepper motors NEMA 34 - Mechanical dimensions

Stepper motor	Length L [mm]
80MPH1.300S000-01	66.0
80MPH3.300S000-01	98.0
80MPH4.300S000-01	98.0
80MPH4.500S000-01	98.0
80MPH6.300S000-01	130.0
80MPH6.101S000-01	130.0

Table 16: Stepper motors NEMA 34 - Motor length

5.4 Wiring

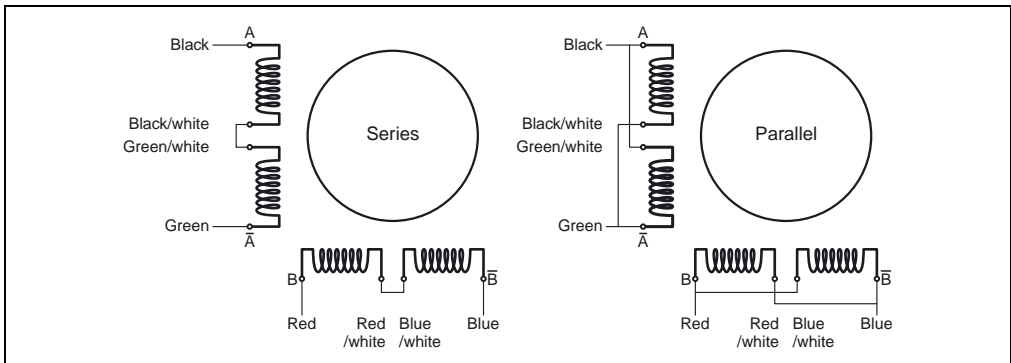


Figure 28: Stepper motors - Wiring

5.5 Torque curves

5.5.1 80MPH1.300S000-01 ¹⁾

Series wiring 3 A

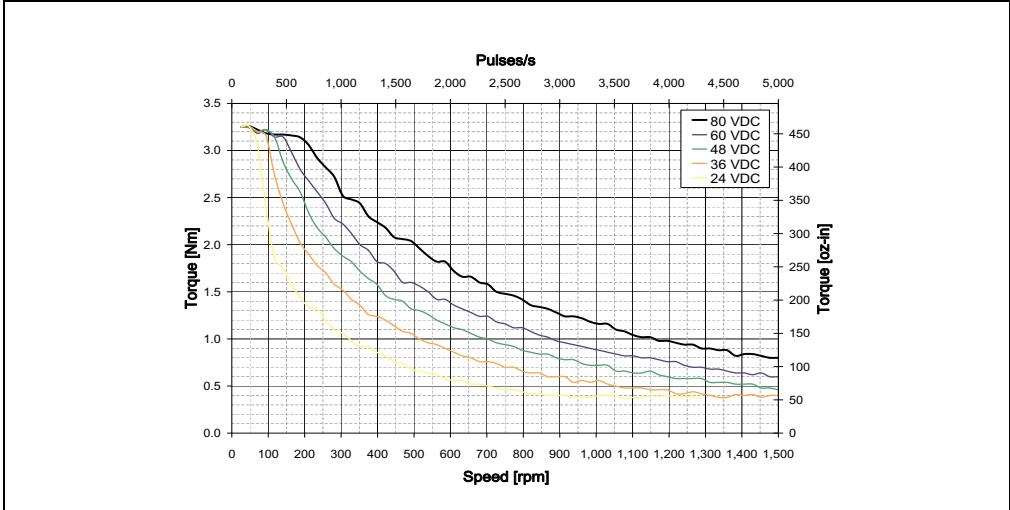


Figure 29: 80MPH1.300S000-01 torque curves, series 3 A

Parallel wiring 6 A

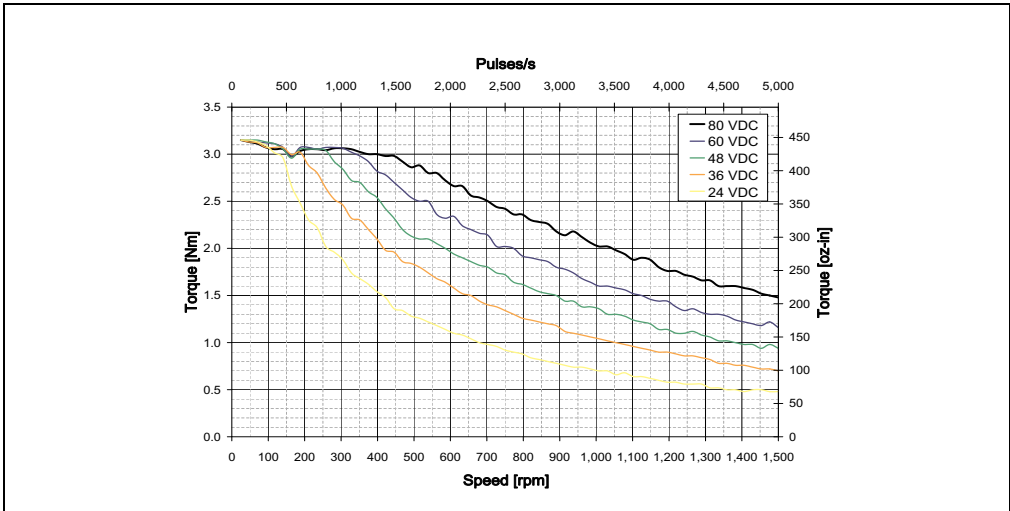


Figure 30: 80MPH1.300S000-01 torque curves, parallel 6 A

1) All torque curves are measured in microstepping mode.

Selecting the suitable connection type ¹⁾

The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

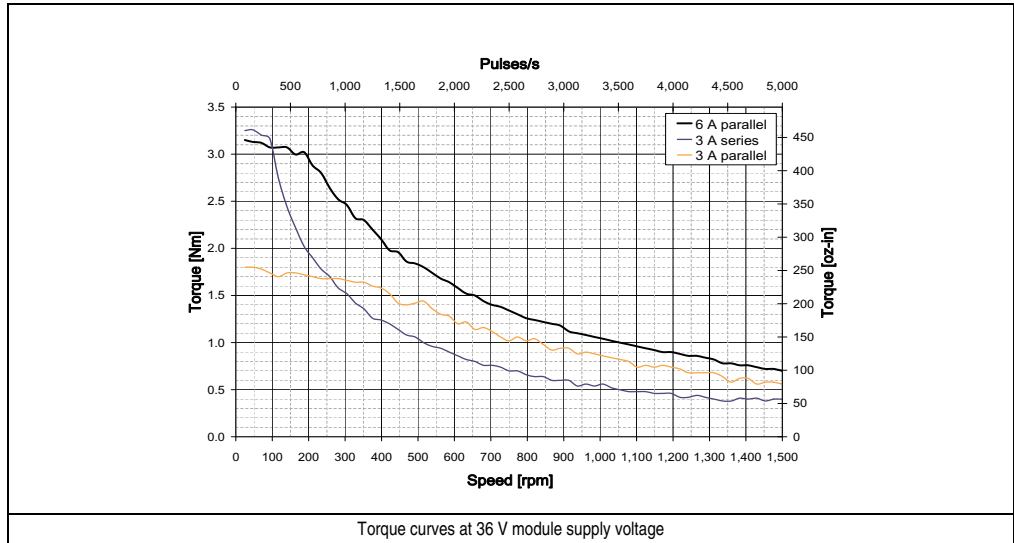


Figure 31: 80MPH1.300S000-01 torque curves, series/parallel comparison at 36 V

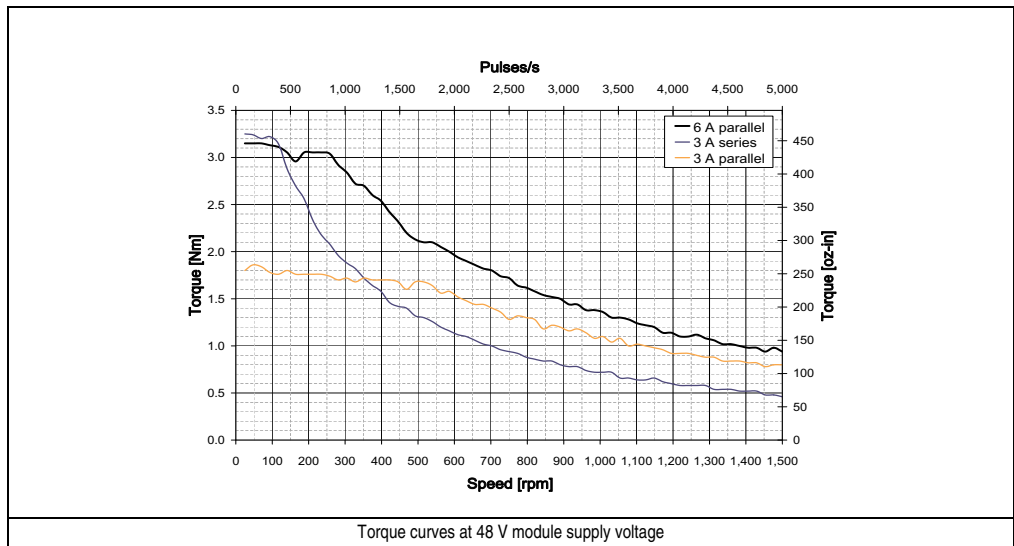


Figure 32: 80MPH1.300S000-01 torque curves, series/parallel comparison at 48 V

1) All torque curves are measured in microstepping mode.

5.5.2 80MPH3.300S000-01 ¹⁾

Series wiring 3 A

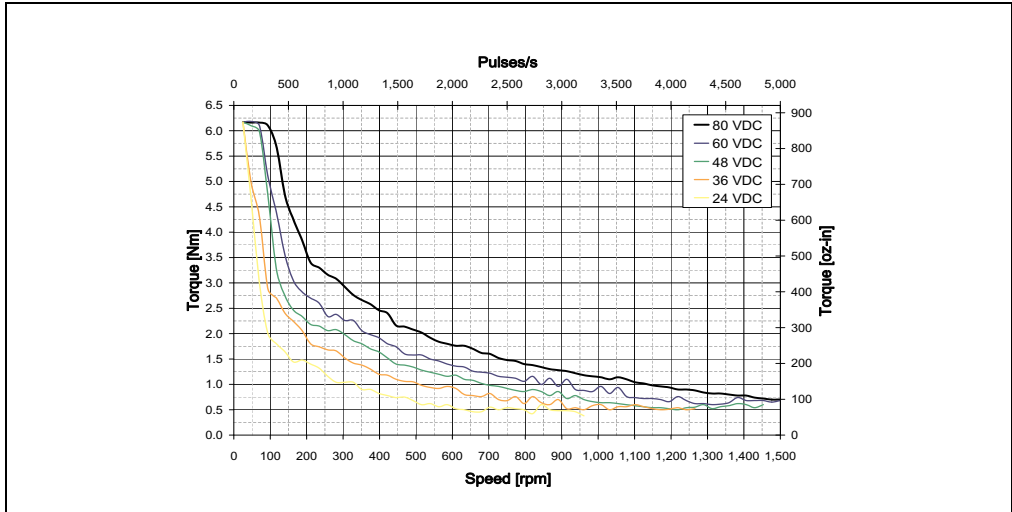


Figure 33: 80MPH3.300S000-01 torque curves, series 3 A

Parallel wiring 6 A

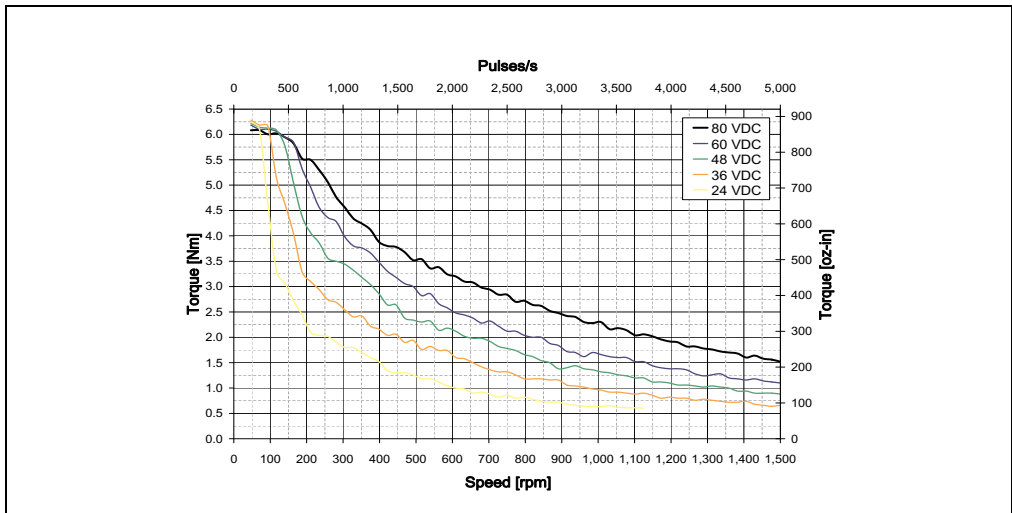


Figure 34: 80MPH3.300S000-01 torque curves, parallel 6 A

1) All torque curves are measured in microstepping mode.

Selecting the suitable connection type ¹⁾

The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

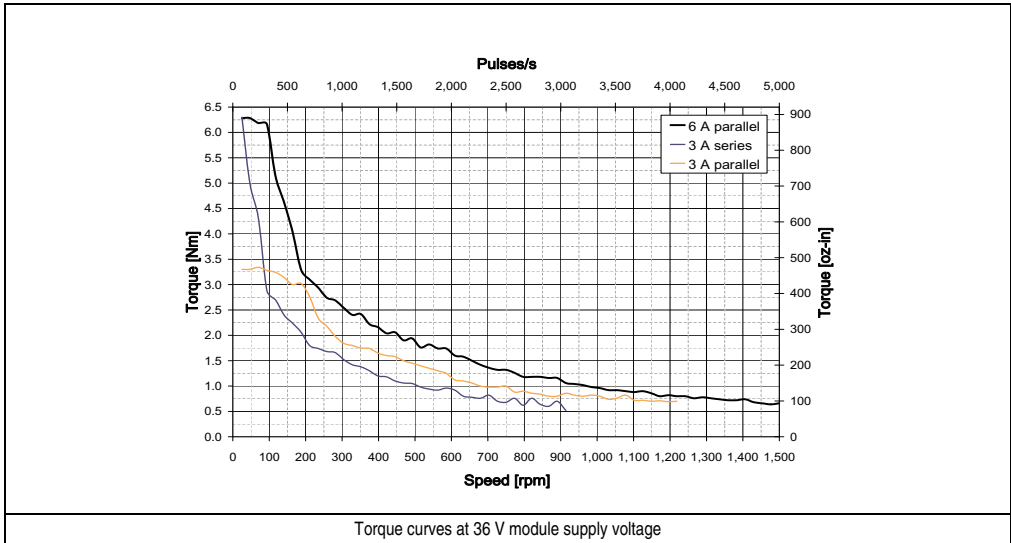


Figure 35: 80MPH3.300S000-01 torque curves, series/parallel comparison at 36 V

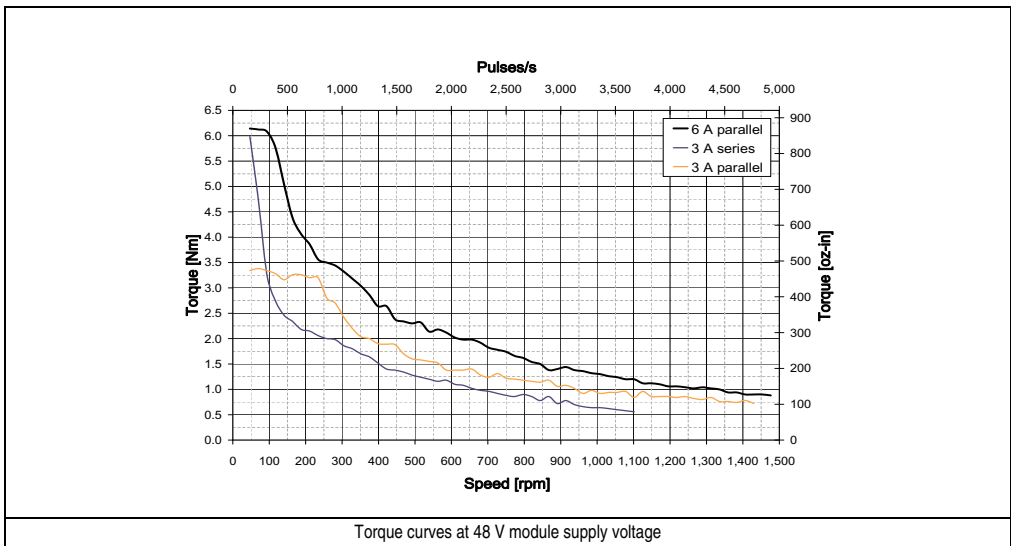


Figure 36: 80MPH3.300S000-01 torque curves, series/parallel comparison at 48 V

1) All torque curves are measured in microstepping mode.

5.5.3 80MPH4.300S000-01 ¹⁾

Series wiring 3 A

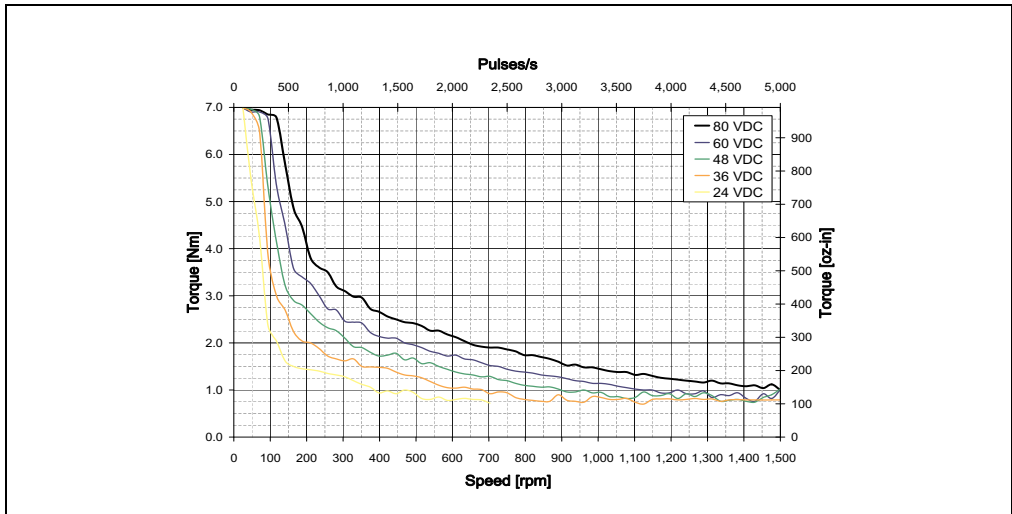


Figure 37: 80MPH4.300S000-01 torque curves, series 3 A

Parallel wiring 6 A

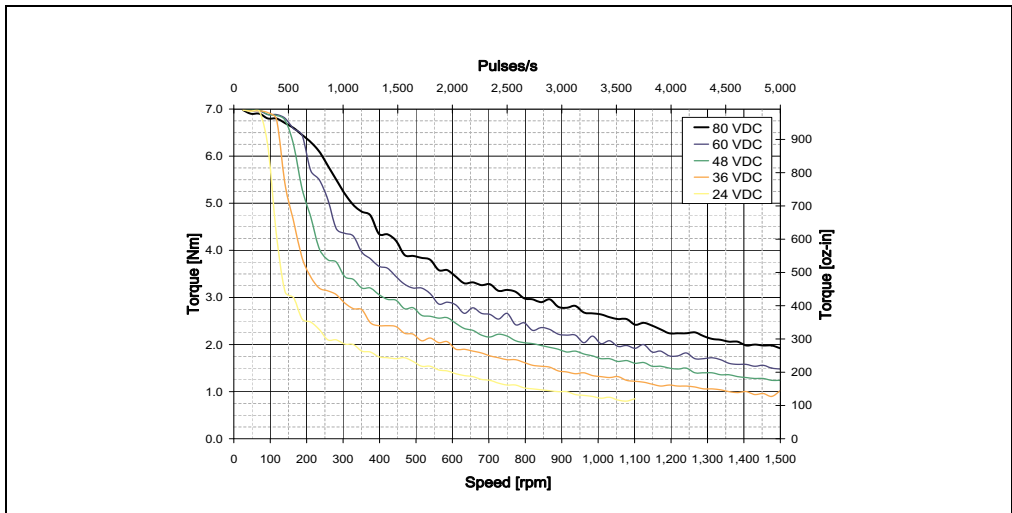


Figure 38: 80MPH4.300S000-01 torque curves, parallel 6 A

1) All torque curves are measured in microstepping mode.

Selecting the suitable connection type ¹⁾

The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

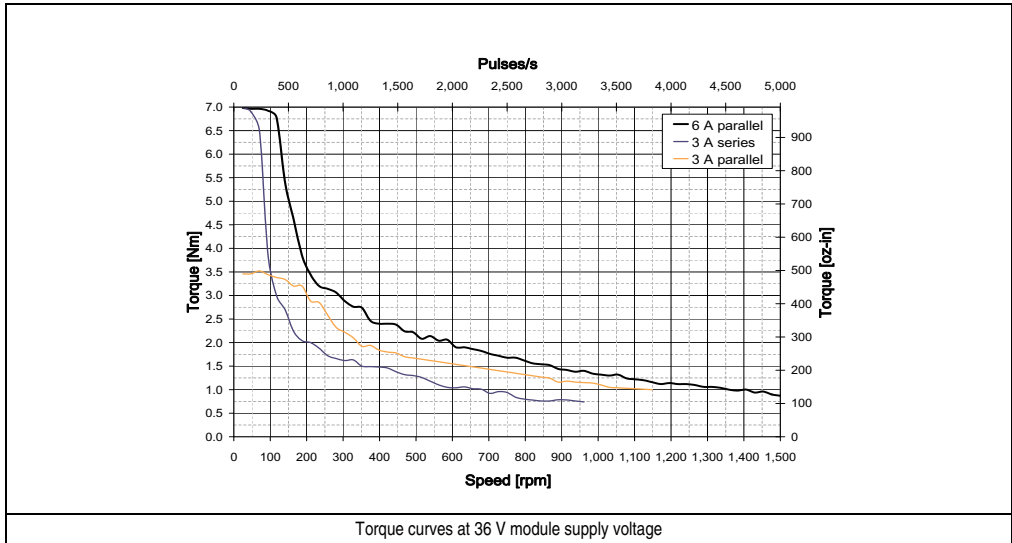


Figure 39: 80MPH4.300S000-01 torque curves, series/parallel comparison at 36 V

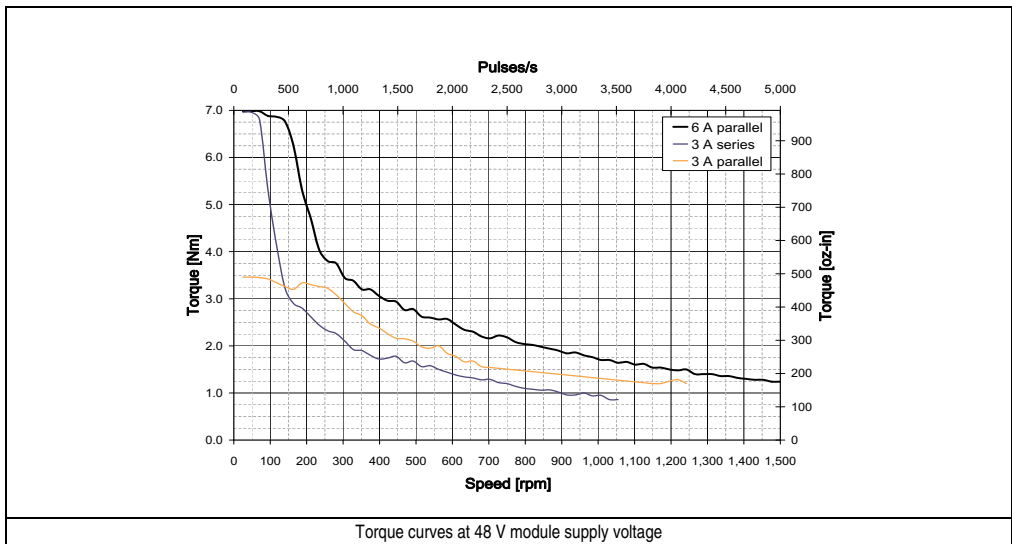


Figure 40: 80MPH4.300S000-01 torque curves, series/parallel comparison at 48 V

1) All torque curves are measured in microstepping mode.

5.5.4 80MPH4.500S000-01 ¹⁾

Series wiring 5 A

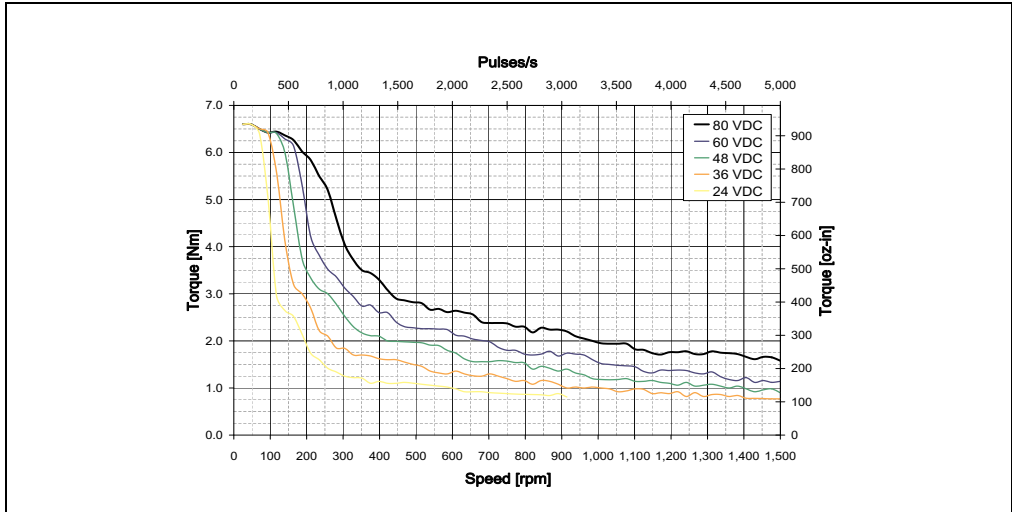


Figure 41: 80MPH4.500S000-01 torque curves, series 5 A

Parallel wiring 10 A

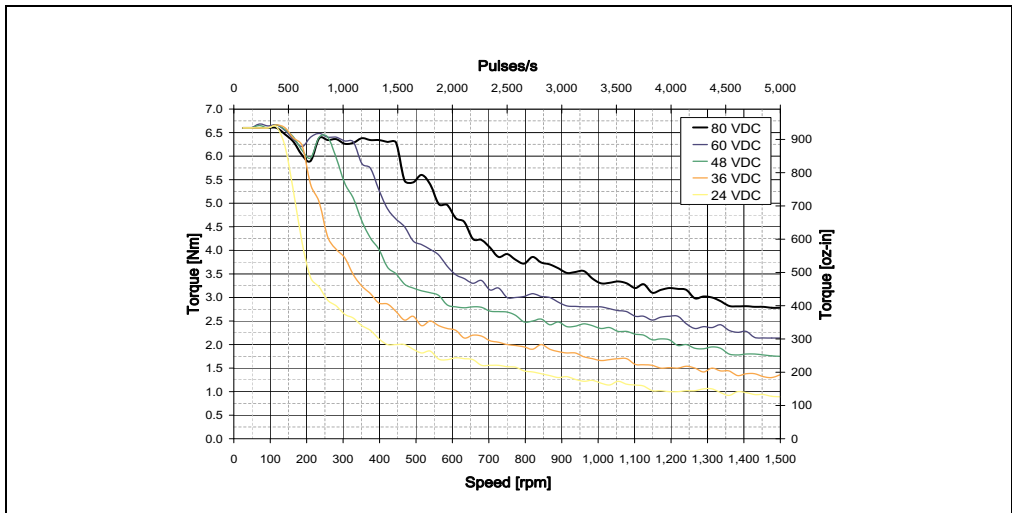


Figure 42: 80MPH4.500S000-01 torque curves, parallel 10 A

1) All torque curves are measured in microstepping mode.

Selecting the suitable connection type ¹⁾

The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

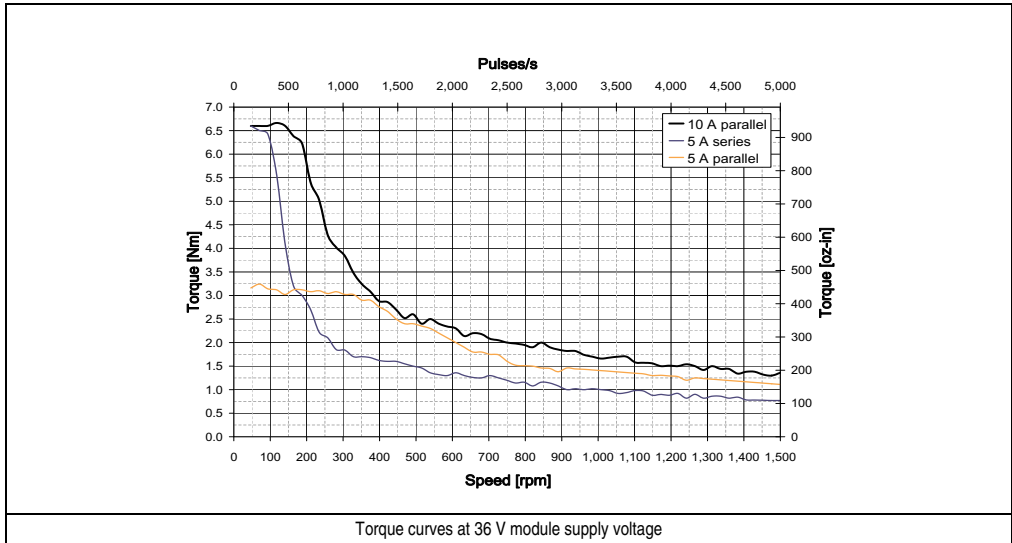


Figure 43: 80MPH4.500S000-01 torque curves, series/parallel comparison at 36 V

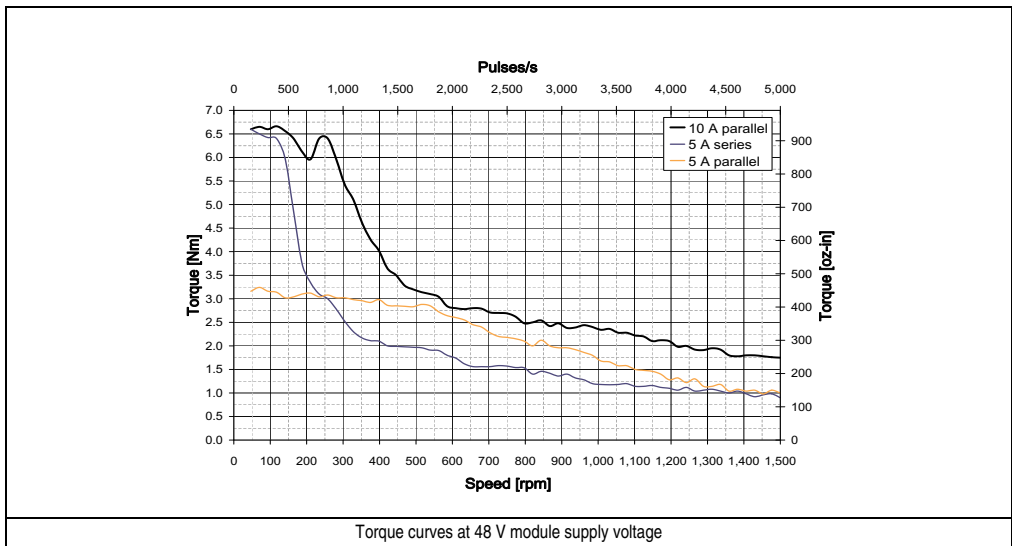


Figure 44: 80MPH4.500S000-01 torque curves, series/parallel comparison at 48 V

1) All torque curves are measured in microstepping mode.

5.5.5 80MPH6.300S000-01 ¹⁾

Series wiring 3 A

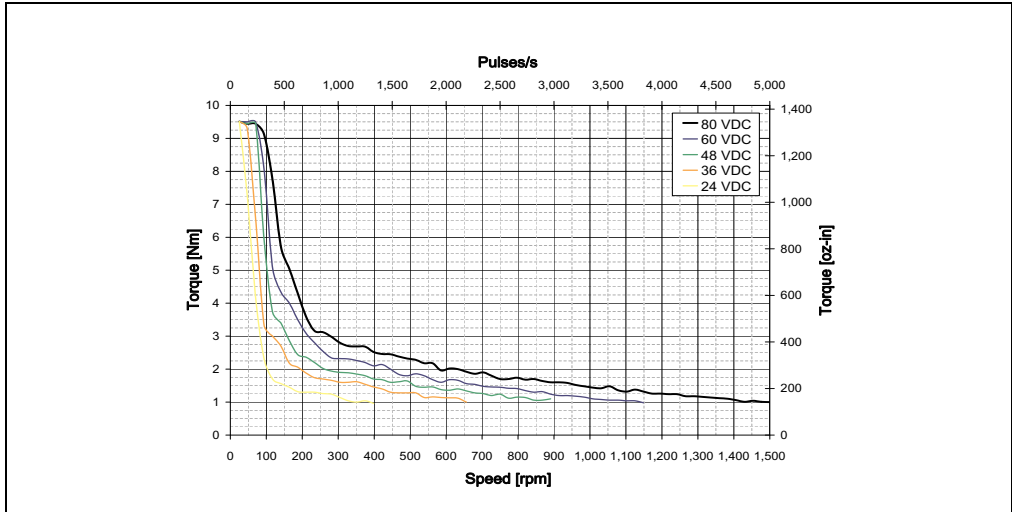


Figure 45: 80MPH6.300S000-01 torque curves, series 3 A

Parallel wiring 6 A

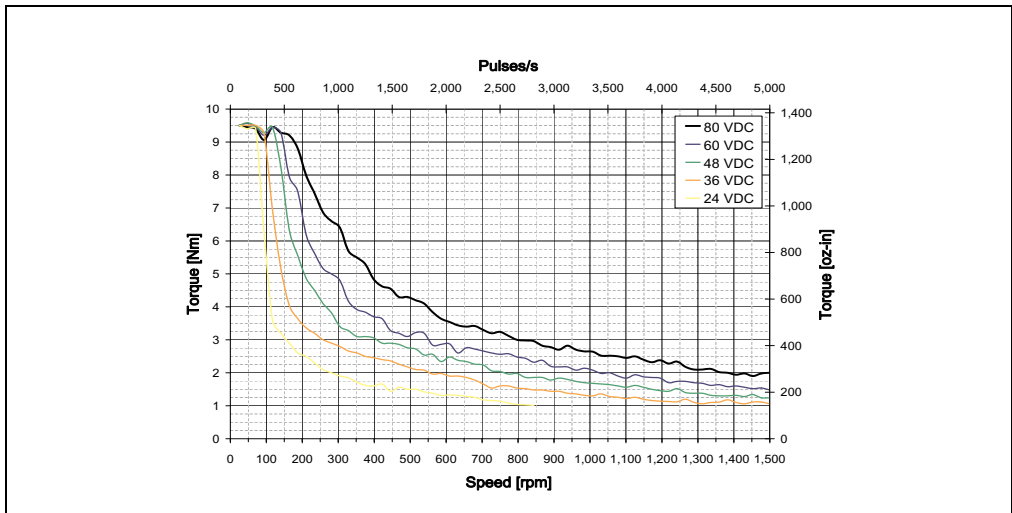


Figure 46: 80MPH6.300S000-01 torque curves, parallel 6 A

1) All torque curves are measured in microstepping mode.

Selecting the suitable connection type ¹⁾

The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

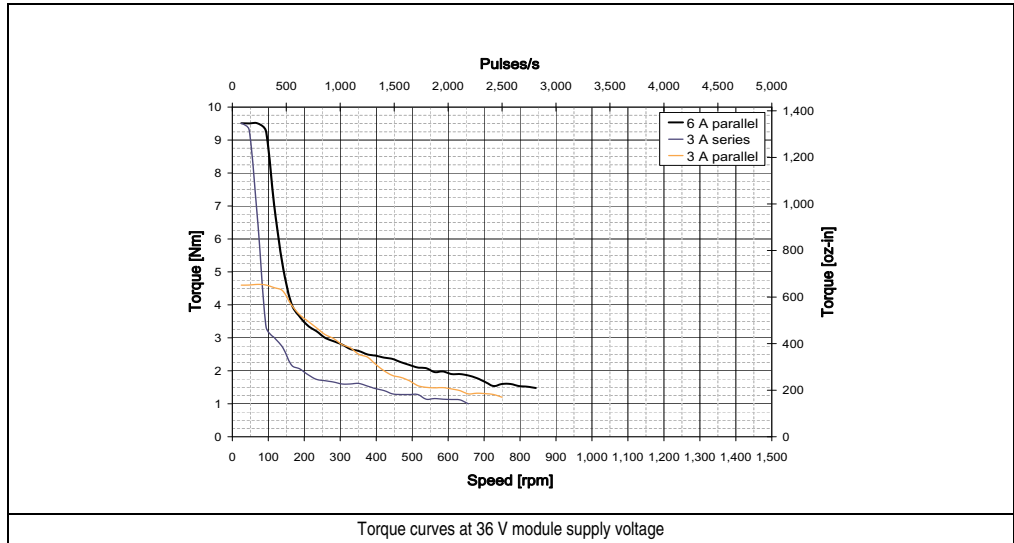


Figure 47: 80MPH6.300S000-01 torque curves, series/parallel comparison at 36 V

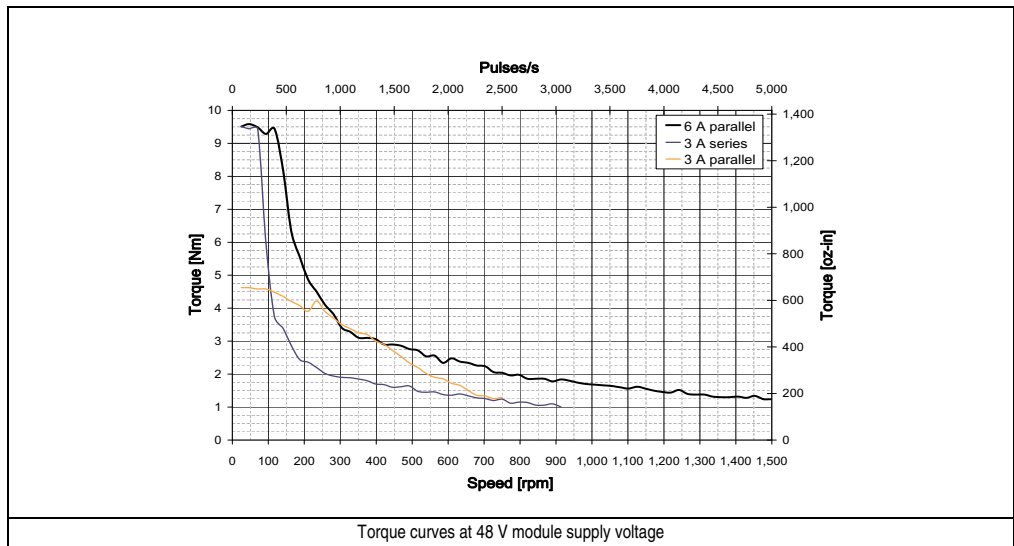


Figure 48: 80MPH6.300S000-01 torque curves, series/parallel comparison at 48 V

1) All torque curves are measured in microstepping mode.

5.5.6 80MPH6.101S000-01 ¹⁾

Parallel wiring 10 A

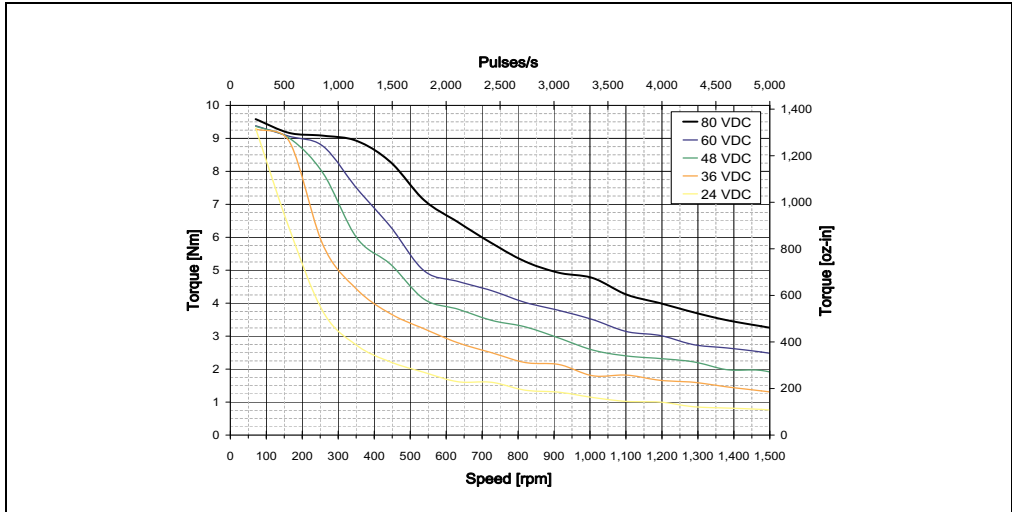


Figure 49: 80MPH6.101S000-01 torque curves, parallel 10 A

1) All torque curves are measured in microstepping mode.

Chapter 3 • Options

1. Overview ¹⁾

Model number	ABR enc.	SSI enc.	Hiper-face	Brake	IP20	IP65	Circuit	Standard motor	TD	ED	BD	MC	
NEMA 23, flange size 56 mm													
80MPD1.300S014-01	●				●		Series	80MPD1.300S000-01	34	65	-	36	
80MPD1.600S014-01	●				●	Parallel					-		
80MPD3.300S014-01	●				●	Series	80MPD3.300S000-01	-			38		
80MPD3.600S014-01	●				●	Parallel						-	
80MPD5.300S014-01	●				●	Series	80MPD5.300S000-01	-	40				
80MPD5.600S014-01	●				●	Parallel				-			
Flange size 60 mm													
80MPF1.250S114-01	●					●	Series	80MPF1.250S000-01	43	69	-	45	
80MPF3.250S114-01	●					●	Series	80MPF3.250S000-01			-		46
80MPF3.500S114-01	●					●	Parallel						
80MPF5.250D114-01	●			●		●	Series	80MPF5.250S000-01				80	
80MPF5.250S113-01		●				●	Series			74	-	47	
80MPF5.250S114-01	●					●	Series			69	-		
80MPF5.500S113-01		●				●	Parallel			74	-		
80MPF5.500D114-01	●			●		●	Parallel			69	80		
NEMA 34, flange size 86 mm													
80MPH1.300S014-01	●					●	Series	80MPH1.300S000-01	49	65	-	51	
80MPH1.600S014-01	●					●	Parallel						-
80MPH3.300S014-01	●					●	Series	80MPH3.300S000-01				-	53
80MPH3.600S014-01	●					●	Parallel					-	
80MPH4.300S014-01	●					●	Series	80MPH4.300S000-01		-	55		
80MPH4.600S014-01	●					●	Parallel			-			
80MPH4.600S114-01	●					●	Parallel			69		-	
80MPH4.600S111-02			●			●	Parallel		77	-			
80MPH4.500S014-01	●					●	Series	80MPH4.500S000-01		65	-	57	
80MPH4.101D114-01	●			●		●	Parallel			69	80		
80MPH4.101S014-01	●					●	Parallel			65	-		
80MPH6.300D114-01	●			●		●	Series	80MPH6.300S000-01		69	80	59	
80MPH6.300S014-01	●					●	Series			65	-		
80MPH6.300S114-01	●					●	Series				-		
80MPH6.600D114-01	●			●		●	Parallel			69	80		
80MPH6.600S014-01	●					●	Parallel			65	-		
80MPH6.600S114-01	●					●	Parallel			69	-		

Table 17: Stepper motors - Overview

- 1) Key: TD ... Technical data of the standard motor, ED ... Technical data of the encoder
 BD ... Technical data of the brake, MC ... Motor characteristics
 Order key: see Section 2 "Order key" on page 32

2. ABR incremental encoder IP20 option

2.1 Order data



Model number	Short description	Image
80MPxx.xxxS014-01	ABR incremental encoder option 24 VDC, IP20, for 80MPD and 80MPH motors. For a list of all model numbers, the respective motor data and characteristics, see the "ABR encoder" and "IP20" columns in "Overview" on page 63.	 <p data-bbox="769 483 1084 505">80MPD series with ABR incremental encoder</p>  <p data-bbox="769 753 1084 774">80MPH series with ABR incremental encoder</p>
	Optional accessories	
80XMPXAC0.00-01	Accessory set for motors with encoder, 8-pin and 4-pin connector and crimp contact	
For motor and encoder cables, see Chapter 5 "Accessories" on page 95.		

Table 18: Stepper motors with ABR incremental encoder IP20 option - Order data

2.2 Technical data

	ABR incremental encoder
General information	
Encoder type	ABR incremental encoder
Electrical properties	
Number of outputs	3 A / B / R
Resolution (steps per rotation)	1,024 increments per rotations
Output wiring	Push-pull level, asymmetric
Output protection	Short circuit protection
Current consumption	Max. 12 mA + output load
Supply voltage	18 to 30 VDC
Output current	Max. ± 10 mA per output
Signal level	
High	>15 VDC
Low	<5 VDC
Accuracy	$\pm 1.8^\circ$
Mechanical characteristics	
Dimensions	
Length ¹⁾	21 mm

Table 19: Stepper motors with ABR incremental encoder IP20 option - Technical data

1) For the length of the encoder option and the motor length, see 2.5 "Dimensions" on page 67.

2.3 X1 - X3 terminal pin assignments

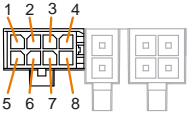
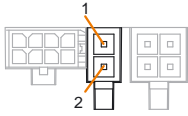
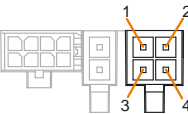
X1 - ABR incremental encoder		Pin assignments	
 <p>X1</p>		Pin	Name
		1	A
		2	B
		3	R
		4	NC
		5	NC
		6	24 VDC (encoder supply)
		7	GND
 <p>X2</p>		Pin	Name
		1	NC
 <p>X3</p>		Pin	Name
		1	Motor phase A\
		2	Motor phase B\
		3	Motor phase A
		4	Motor phase B

Table 20: Stepper motors with ABR incremental encoder IP20 option - X1 - X3 pin assignments

2.4 Arrangement of terminal blocks

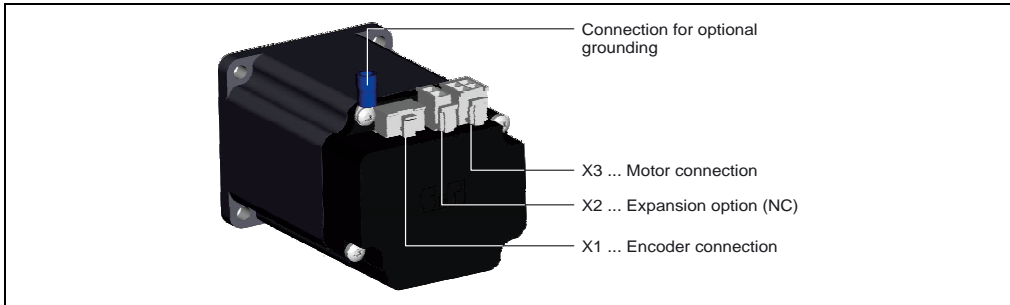


Figure 50: Stepper motors with ABR incremental encoder IP20 option - Arrangement of terminal blocks

Information:

A single screw (M3x8 mm) is included in the delivery of the motor for the "optional grounding".

The grounding line only be clamped using this screw only. The other screws are only used to mount the mechanical parts and must not be loosened!

2.5 Dimensions

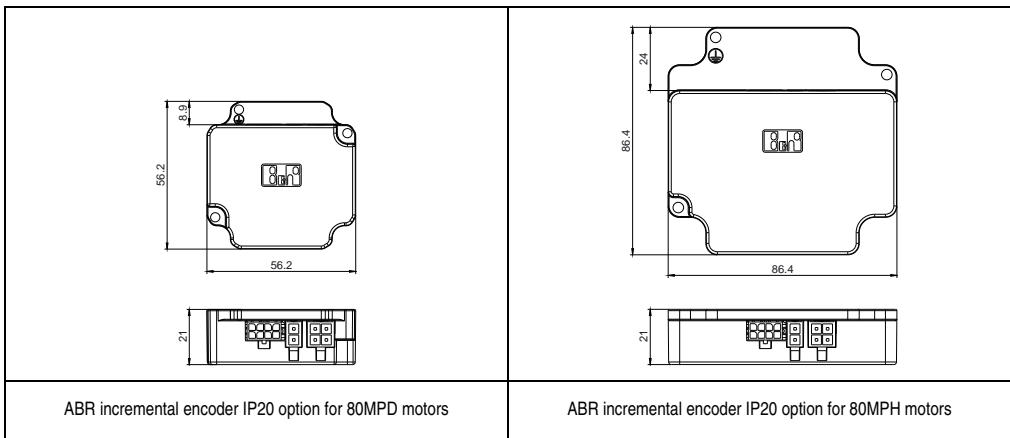


Figure 51: Stepper motors with ABR incremental encoder IP20 option - Dimensions

The effective length of the motor is calculated from the length of the standard motor (see Chapter 2 "Standard motors" on page 31) plus the length of the encoder option (21 mm).

3. ABR incremental encoder IP65 option

3.1 Order data


Model number	Short description	Image
80MPxx.xxxx114-01	ABR incremental encoder option 24 VDC, IP65, for 80MPF and 80MPH motors. For a list of all model numbers, the respective motor data and characteristics, see the "ABR encoder" and "IP65" columns in "Overview" on page 63.	 <p data-bbox="769 565 1081 586">80MPH series with ABR incremental encoder</p>
Optional accessories		
80XMPXAC0.00-01	Accessory set for motors with encoder, 8-pin and 4-pin connector and crimp contact	
For motor and encoder cables, see Chapter 5 "Accessories" on page 95.		

Table 21: Stepper motors with ABR incremental encoder IP65 option - Order data

3.2 Technical data

	ABR incremental encoder
General information	
Encoder type	ABR incremental encoder
Electrical properties	
Number of outputs	3 A / B / R
Resolution (steps per rotation)	1,024 increments per rotations
Output wiring	Push-pull level, asymmetric
Output protection	Short circuit protection
Current consumption	Max. 12 mA + output load
Supply voltage	18 to 30 VDC
Output current	Max. ± 10 mA per output
Signal level	
High	>15 VDC
Low	<5 VDC
Accuracy	$\pm 1.8^\circ$
Mechanical characteristics	
Dimensions	
Length ¹⁾	
80MPF series	45.3 mm
80MPH series	35.4 mm

Table 22: Stepper motors with ABR incremental encoder IP20 option - Technical data

1) For the length of the encoder option and the motor length, see 3.5 "Dimensions" on page 72.

Information!

IP65 protection has been tested with pre-assembled cables from B&R only.

3.3 X1 - X3 terminal pin assignments

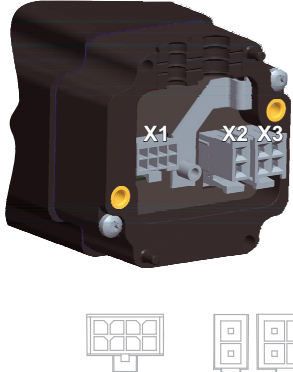
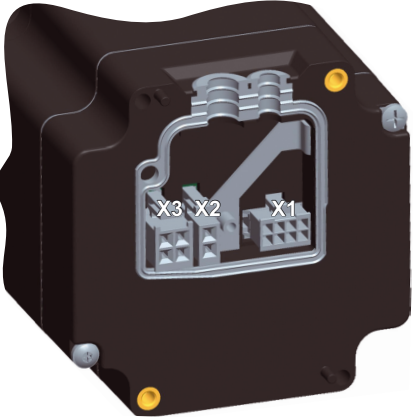
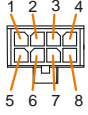
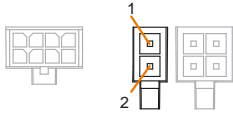
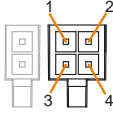
80MPF motor	80MPH motor																		
 <p data-bbox="350 651 379 672">X1</p> <p data-bbox="451 651 480 672">X2</p> <p data-bbox="509 651 538 672">X3</p>	 <p data-bbox="769 444 798 466">X3</p> <p data-bbox="827 444 856 466">X2</p> <p data-bbox="879 444 908 466">X1</p>																		
<p data-bbox="294 1019 521 1040">X1 - ABR incremental encoder</p>	<p data-bbox="854 1019 980 1040">Pin assignments</p>																		
 <p data-bbox="320 922 349 943">X1</p>	<table border="1" data-bbox="698 1045 1135 1008"> <thead> <tr> <th data-bbox="715 1052 744 1073">Pin</th> <th data-bbox="778 1052 824 1073">Name</th> </tr> </thead> <tbody> <tr> <td data-bbox="728 1084 740 1105">1</td> <td data-bbox="791 1084 803 1105">A</td> </tr> <tr> <td data-bbox="728 1117 740 1138">2</td> <td data-bbox="791 1117 803 1138">B</td> </tr> <tr> <td data-bbox="728 1149 740 1170">3</td> <td data-bbox="791 1149 803 1170">R</td> </tr> <tr> <td data-bbox="728 1182 740 1203">4</td> <td data-bbox="791 1182 824 1203">NC</td> </tr> <tr> <td data-bbox="728 1214 740 1235">5</td> <td data-bbox="791 1214 824 1235">NC</td> </tr> <tr> <td data-bbox="728 1247 740 1268">6</td> <td data-bbox="791 1247 955 1268">24 VDC (encoder supply)</td> </tr> <tr> <td data-bbox="728 1279 740 1300">7</td> <td data-bbox="791 1279 824 1300">GND</td> </tr> <tr> <td data-bbox="728 1312 740 1333">8</td> <td data-bbox="791 1312 824 1333">NC</td> </tr> </tbody> </table>	Pin	Name	1	A	2	B	3	R	4	NC	5	NC	6	24 VDC (encoder supply)	7	GND	8	NC
Pin	Name																		
1	A																		
2	B																		
3	R																		
4	NC																		
5	NC																		
6	24 VDC (encoder supply)																		
7	GND																		
8	NC																		
<p data-bbox="320 1230 496 1252">X2 - Optional expansion</p>	<p data-bbox="854 1230 980 1252">Pin assignments</p>																		
 <p data-bbox="420 1188 449 1209">X2</p>	<table border="1" data-bbox="698 1261 1135 1224"> <thead> <tr> <th data-bbox="715 1268 744 1289">Pin</th> <th data-bbox="778 1268 824 1289">Name</th> </tr> </thead> <tbody> <tr> <td data-bbox="728 1284 740 1305">1</td> <td data-bbox="791 1284 824 1305">NC</td> </tr> <tr> <td data-bbox="728 1317 740 1338">2</td> <td data-bbox="791 1317 824 1338">NC</td> </tr> </tbody> </table>	Pin	Name	1	NC	2	NC												
Pin	Name																		
1	NC																		
2	NC																		
<p data-bbox="320 1393 488 1414">X3 - Motor connection</p>	<p data-bbox="854 1393 980 1414">Pin assignments</p>																		
 <p data-bbox="476 1409 505 1430">X3</p>	<table border="1" data-bbox="698 1424 1135 1386"> <thead> <tr> <th data-bbox="715 1430 744 1451">Pin</th> <th data-bbox="778 1430 824 1451">Name</th> </tr> </thead> <tbody> <tr> <td data-bbox="728 1446 740 1468">1</td> <td data-bbox="791 1446 887 1468">Motor phase A\</td> </tr> <tr> <td data-bbox="728 1479 740 1500">2</td> <td data-bbox="791 1479 887 1500">Motor phase B\</td> </tr> <tr> <td data-bbox="728 1511 740 1533">3</td> <td data-bbox="791 1511 887 1533">Motor phase A</td> </tr> <tr> <td data-bbox="728 1544 740 1565">4</td> <td data-bbox="791 1544 887 1565">Motor phase B</td> </tr> </tbody> </table>	Pin	Name	1	Motor phase A\	2	Motor phase B\	3	Motor phase A	4	Motor phase B								
Pin	Name																		
1	Motor phase A\																		
2	Motor phase B\																		
3	Motor phase A																		
4	Motor phase B																		

Table 23: Stepper motors with ABR incremental encoder IP65 option - X1 - X3 pin assignments

3.4 Arrangement of terminal blocks

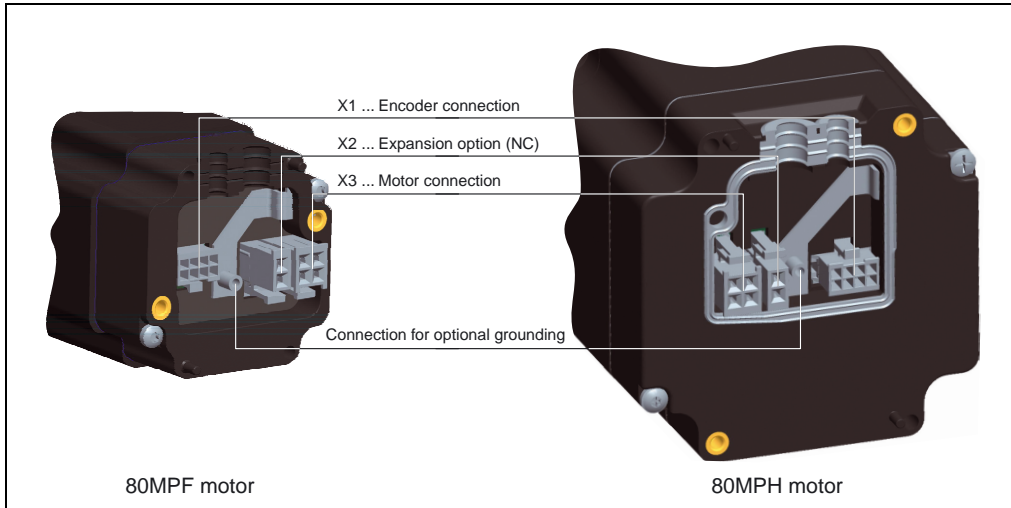


Figure 52: Stepper motors with ABR incremental encoder IP65 option - Arrangement of terminal blocks

Information:

A single screw (M3x8 mm) is included in the delivery of the the motor for the "optional grounding".

The grounding line must be clamped using this screw only. The other screws are only used to mount the mechanical parts and must not be loosened!

3.5 Dimensions

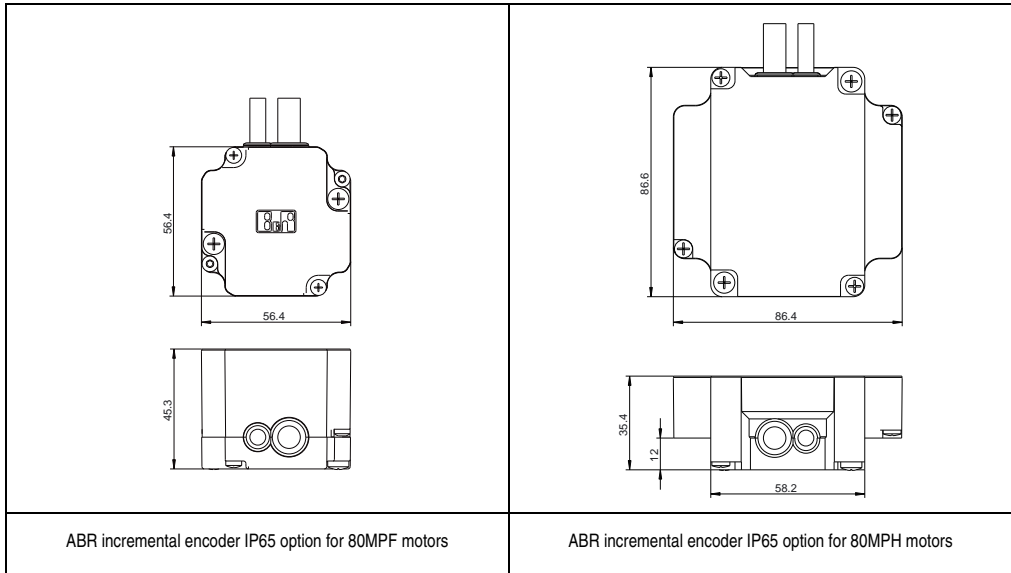


Figure 53: Stepper motors with ABR incremental encoder IP65 option - Dimensions

The effective length of the motor is calculated from the length of the standard motor (see Chapter 2 "Standard motors" on page 31) plus the length of the encoder option.

4. SSI absolute encoder IP65 option

4.1 Order data


Model number	Short description	Image
80MPF5.xxxS113-01	SSI encoder option 24 VDC, IP65, for 80MPF motors. For a list of all model numbers, the respective motor data and characteristics, see the "SSI encoder" and "IP65" columns in "Overview" on page 63.	 <p>80MPH series with SSI encoder</p>
	Optional accessories	
80XMPXAC0.00-01	Accessory set for motors with encoder, 8-pin and 4-pin connector and crimp contact	
For motor and encoder cables, see Chapter 5 "Accessories" on page 95.		

Table 24: Stepper motors with SSI absolute encoder IP65 option - Order data

4.2 Technical data

	SSI absolute encoder
General information	
Encoder type	SSI single-turn
Electrical properties - SSI	
Number of outputs	4 Data, nData, CLK, nCLK
Resolution	4096 increments per rotations
Output wiring	Differential signal
Output protection	Short circuit protection
Current consumption	Max. 25 mA at 24V + output load
Supply voltage	18 to 30 VDC
Output current	Max. ± 25 mA per output
Data format	Gray
Counting direction	Clockwise
Clock frequency	Max. 400 kHz
Output signal	
High	>2 V
Low	<0.8 V
Counter size	16- bit
Monostable multivibrator	
Time	100 μ s
Signal	Low
Mechanical characteristics	
Dimensions	
Length ¹⁾	
80MPF series	45.3 mm
80MPH series	35.4 mm

Table 25: Stepper motors with SSI absolute encoder IP65 option - Technical data

1) For the length of the encoder option and the motor length, see 4.5 "Dimensions" on page 76.

Information!

IP65 protection has been tested with pre-assembled cables from B&R only.

4.3 X1 - X3 terminal pin assignments

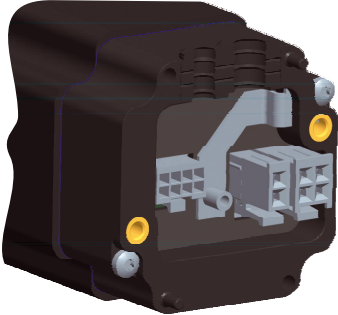



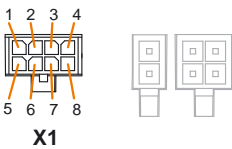
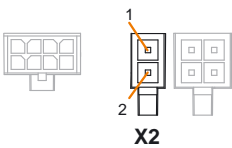
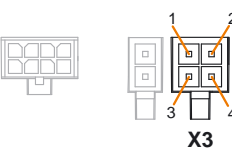
					
	X1	X2	X3		
X1 - ABR incremental encoder		Pin assignments			
		Pin	Name		
		1	DATA		
		2	nDATA		
		3	CLK		
		4	nCLK		
		5	NC		
		6	+24 VDC encoder supply		
		7	GND		
		8	NC		
Information:					
Pins 5 and 8 (NC) must remain free and may not be used.					
X2 - Motor brake		Pin assignments			
		Pin	Name		
		1	NC		
		2	NC		
X3 - Motor connection		Pin assignments			
		Pin	Name		
		1	Motor phase A1		
		2	Motor phase B1		
		3	Motor phase A		
		4	Motor phase B		

Table 26: Stepper motors with SSI absolute encoder IP65 option - X1 - X3 pin assignments

4.4 Arrangement of terminal blocks

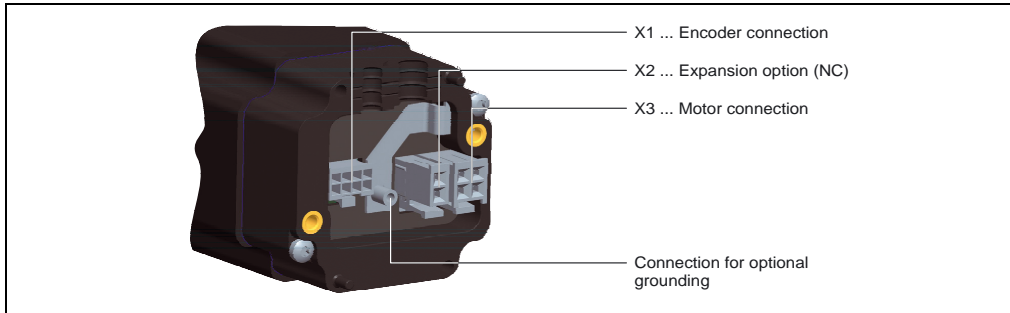


Figure 54: Stepper motors with SSI absolute encoder IP65 option - Arrangement of terminal blocks

Information:

A single screw (M3x8 mm) is included in delivery with the motor for the "optional grounding".

The grounding line must be clamped using this screw only. The other screws are only used to mount the mechanical parts and must not be loosened!

4.5 Dimensions

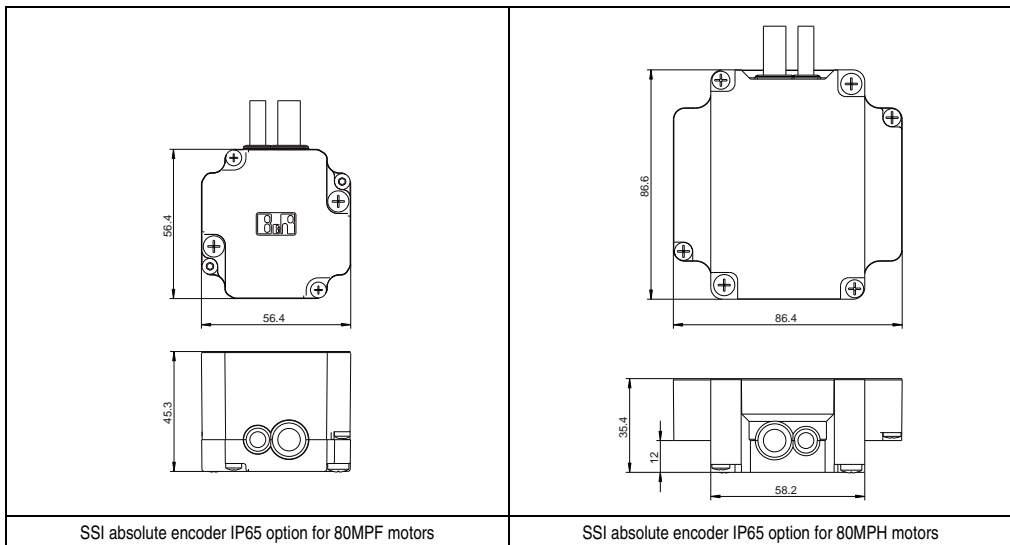


Figure 55: Stepper motors with SSI absolute encoder IP65 option - Dimensions

The effective length of the motor is calculated from the length of the standard motor (see Chapter 2 "Standard motors" on page 31) plus the length of the encoder option.

5. Hiperface IP65 option

5.1 Order data

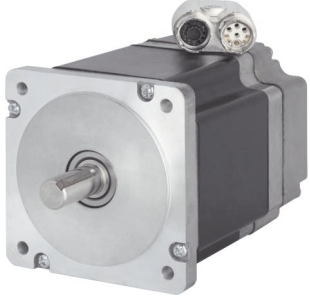
Model number	Short description	Image
80MPH4.xxxS111-02	Option Hiperface, IP65, for 80MPH motors. For a list of all model numbers, the respective motor data and characteristics, see the "Hiperface" and "IP65" columns in "Overview" on page 63.	 <p>80MPH series with Hiperface</p>
For motor and encoder cables, see Chapter 5 "Accessories" on page 95.		

Table 27: Stepper motors with Hiperface IP65 option - Order data

5.2 Technical data

	SSI absolute encoder
General information	
Encoder type	Hiperface Multiturn, 4096 rotations measurable
Integral nonlinearity	±300 angular seconds
Electrical properties	
Encoder supply	10 VDC
Resolution	16- bit

Table 28: Stepper motors with Hiperface IP65 option - Technical data

Information!

IP65 protection has been tested with pre-assembled cables from B&R only.

5.3 X1 - X3 terminal pin assignments

Motor connection		Pin assignments	
		Pin	Name
		1	A
		2	A\
		3	B
		4	B\
		5	NC
		A	NC
		B	NC
		C	NC
		PE	PE lead / shielding
		Hiperface connection	
		Pin	Name
		1	+10 VDC
		2	D
		3	D\
		4	NC
		5	NC
		6	NC
		7	COM
		8	SIN
		9	REF SIN
		10	COS
		11	REF COS
		12	NC

Table 29: Stepper motors with Hiperface IP65 option - Hiperface and motor connections

5.4 Dimensions

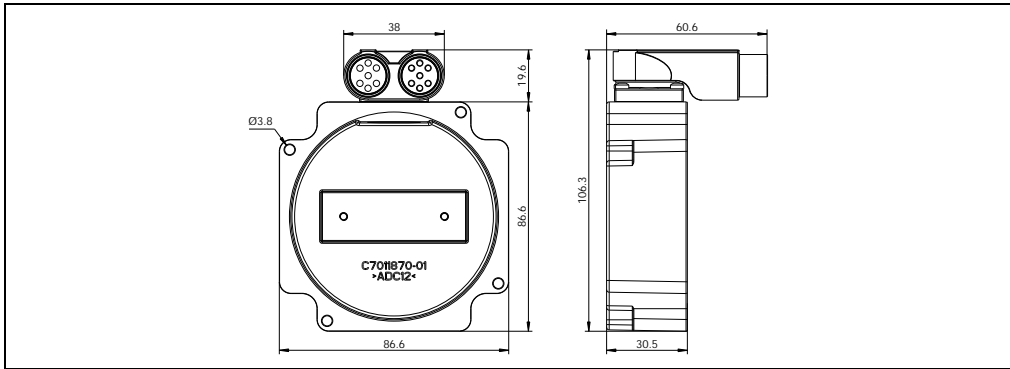


Figure 56: Stepper motors with Hiperface IP65 option - Dimensions

The effective length of the motor is calculated from the length of the standard motor (see Chapter 2 "Standard motors" on page 31) plus the length of the encoder option.

The motor/encoder connections can be rotated up to 300°:

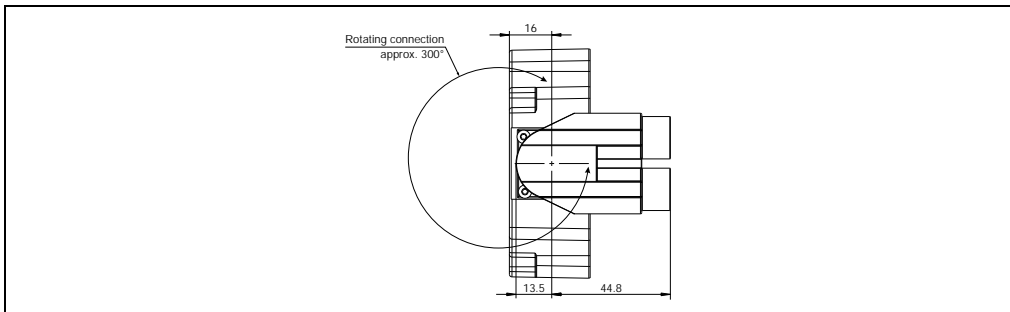


Figure 57: Stepper motors with Hiperface IP65 option - Rotating connections

6. Brake option

6.1 Order data


Model number	Short description	Image
80MPxx.xxxD114-01	Brake option, IP65, for 80MPF and 80MPH motors. For a list of all model numbers, the respective motor data and characteristics, see the "Brake" column in "Overview" on page 63.	 <p>80MPH series with brake option</p>
	Optional accessories	
80XMPXAC0.00-02	Accessory set for motors with encoder and brake, 8-pin, 4-pin and 2-pin connector and crimp contact	
For motor and encoder cables, see Chapter 5 "Accessories" on page 95.		

Table 30: Stepper motors with brake option - Order data

6.2 Technical data

Motor brake	80MPF	80MPH
Supply voltage	24 VDC +6%/-10%	
Braking torque	2 Nm	9 Nm
Coil resistance	52.36 Ω \pm 7%	32.00 Ω \pm 7%
Inductance	0.7 H	0.83 H
Power consumption	Max. 11 W	Max. 18 W
Connection time ¹⁾	6 ms	7 ms
Response delay ²⁾	2 ms	2 ms
Cut-off time ³⁾	25 ms	40 ms

Table 31: Stepper motors with brake option - Technical data

- 1) Time from switching off the current until the rated torque is reached
- 2) Time from switching off the current until the torque increases
- 3) Time from switching on the current until the torque begins decreasing

Important!

These brakes are not certified safety brakes!

Information!

IP65 protection has been tested with pre-assembled cables from B&R only.

6.3 Functionality

The holding brake uses permanent magnets that are demagnetized when 24 VDC is applied to a magnet winding. This releases the brake.

The brake is designed as a holding brake. It is not permitted to be used for operational braking!

Warning!

The holding brake is not intended for normal braking.

The holding brake does not provide protection for personnel.

The maximum motor torque can exceed the holding torque for the brake.

Warning!

If the holding brake is not used regularly for a long period of time, we recommend periodically checking the holding brake because the holding brake could fail in certain environmental conditions (e.g. humidity, oil vapor).

6.4 X1 - X3 terminal pin assignments

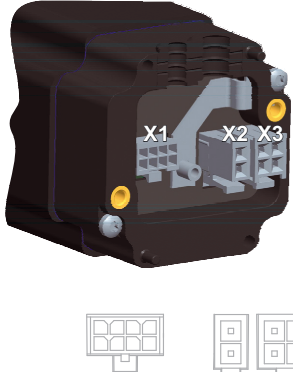
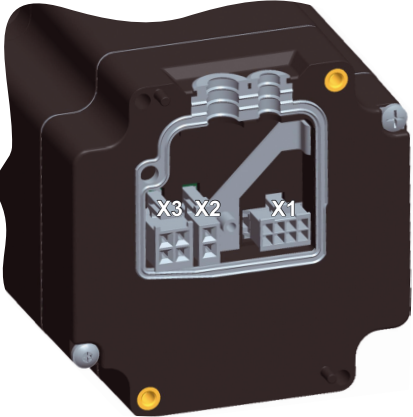
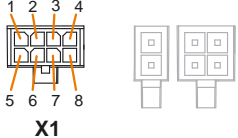
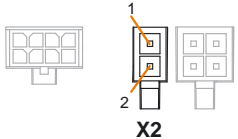
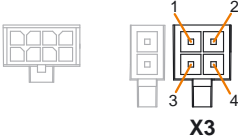
80MPF motor	80MPH motor																		
 <p data-bbox="350 651 379 672">X1</p> <p data-bbox="451 651 480 672">X2</p> <p data-bbox="505 651 534 672">X3</p>	 <p data-bbox="769 444 798 466">X3</p> <p data-bbox="820 444 849 466">X2</p> <p data-bbox="874 444 903 466">X1</p>																		
<p data-bbox="316 1019 501 1040">X1 - Encoder connection</p>	<p data-bbox="854 1019 976 1040">Pin assignments</p>																		
 <p data-bbox="316 922 345 943">X1</p>	<table border="1" data-bbox="696 1047 1135 1008"> <thead> <tr> <th data-bbox="715 1052 744 1073">Pin</th> <th data-bbox="778 1052 820 1073">Name</th> </tr> </thead> <tbody> <tr> <td data-bbox="728 1084 740 1105">1</td> <td data-bbox="791 1084 803 1105">A</td> </tr> <tr> <td data-bbox="728 1117 740 1138">2</td> <td data-bbox="791 1117 803 1138">B</td> </tr> <tr> <td data-bbox="728 1149 740 1170">3</td> <td data-bbox="791 1149 803 1170">R</td> </tr> <tr> <td data-bbox="728 1182 740 1203">4</td> <td data-bbox="791 1182 820 1203">NC</td> </tr> <tr> <td data-bbox="728 1214 740 1235">5</td> <td data-bbox="791 1214 820 1235">NC</td> </tr> <tr> <td data-bbox="728 1247 740 1268">6</td> <td data-bbox="791 1247 955 1268">24 VDC (encoder supply)</td> </tr> <tr> <td data-bbox="728 1279 740 1300">7</td> <td data-bbox="791 1279 820 1300">GND</td> </tr> <tr> <td data-bbox="728 1312 740 1333">8</td> <td data-bbox="791 1312 820 1333">NC</td> </tr> </tbody> </table>	Pin	Name	1	A	2	B	3	R	4	NC	5	NC	6	24 VDC (encoder supply)	7	GND	8	NC
Pin	Name																		
1	A																		
2	B																		
3	R																		
4	NC																		
5	NC																		
6	24 VDC (encoder supply)																		
7	GND																		
8	NC																		
<p data-bbox="350 1230 472 1252">X2 - Motor brake</p>	<p data-bbox="854 1230 976 1252">Pin assignments</p>																		
 <p data-bbox="417 1188 446 1209">X2</p>	<table border="1" data-bbox="696 1263 1135 1224"> <thead> <tr> <th data-bbox="715 1268 744 1289">Pin</th> <th data-bbox="778 1268 820 1289">Name</th> </tr> </thead> <tbody> <tr> <td data-bbox="728 1284 740 1305">1</td> <td data-bbox="791 1284 892 1305">24 VDC (brake)</td> </tr> <tr> <td data-bbox="728 1317 740 1338">2</td> <td data-bbox="791 1317 820 1338">GND</td> </tr> </tbody> </table>	Pin	Name	1	24 VDC (brake)	2	GND												
Pin	Name																		
1	24 VDC (brake)																		
2	GND																		
<p data-bbox="325 1393 488 1414">X3 - Motor connection</p>	<p data-bbox="854 1393 976 1414">Pin assignments</p>																		
 <p data-bbox="476 1409 505 1430">X3</p>	<table border="1" data-bbox="696 1425 1135 1386"> <thead> <tr> <th data-bbox="715 1430 744 1451">Pin</th> <th data-bbox="778 1430 820 1451">Name</th> </tr> </thead> <tbody> <tr> <td data-bbox="728 1446 740 1468">1</td> <td data-bbox="791 1446 892 1468">Motor phase A\</td> </tr> <tr> <td data-bbox="728 1479 740 1500">2</td> <td data-bbox="791 1479 892 1500">Motor phase B\</td> </tr> <tr> <td data-bbox="728 1511 740 1533">3</td> <td data-bbox="791 1511 892 1533">Motor phase A</td> </tr> <tr> <td data-bbox="728 1544 740 1565">4</td> <td data-bbox="791 1544 892 1565">Motor phase B</td> </tr> </tbody> </table>	Pin	Name	1	Motor phase A\	2	Motor phase B\	3	Motor phase A	4	Motor phase B								
Pin	Name																		
1	Motor phase A\																		
2	Motor phase B\																		
3	Motor phase A																		
4	Motor phase B																		

Table 32: Stepper motors with brake option - X1 - X3 pin assignments

6.5 Arrangement of terminal blocks

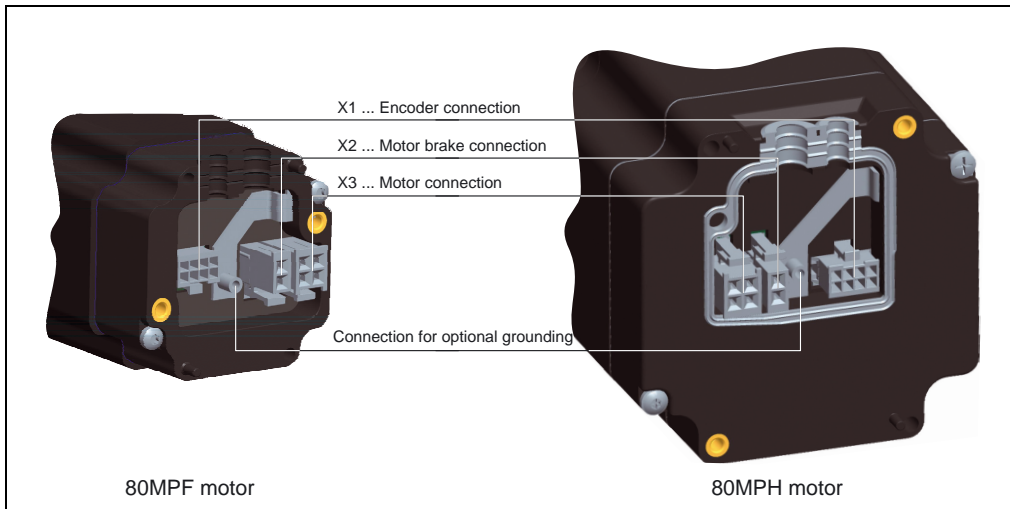


Figure 58: Stepper motors with brake option - Arrangement of terminal blocks

Information:

A single screw (M3x8 mm) is included with the motor in delivery for the "optional grounding".

The grounding line may only be clamped using this screw. The other screws are only used to mount the mechanical parts and may not be loosened!

6.6 Dimensions

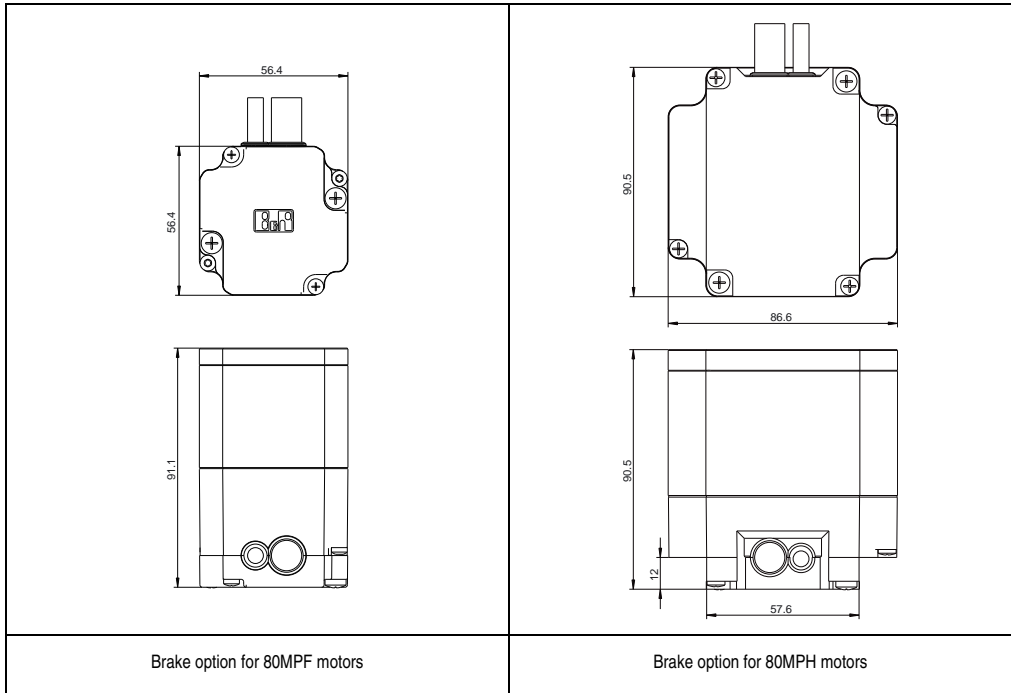


Figure 59: Stepper motors with brake option - Dimensions

The effective length of the motor is calculated from the length of the standard motor (see Chapter 2 "Standard motors" on page 31) plus the length of the brake option.

The following dimensions apply for the 80MPF motor as opposed to the standard motor:

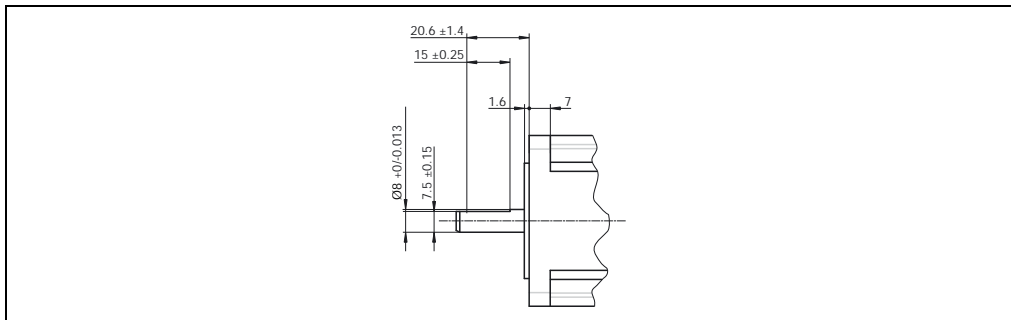


Figure 60: Stepper motors with brake option - Dimensions of 80MPF motors

6.7 Maximum switching frequency

Switching frequency depends on the speed of rotation as well as the inertia. It can be calculated with the following formula:

Rated torque M_{2N}

In order for the brakes and couplings to function safely even in extreme conditions, a safety factor must be applied to the required rated torque. The chosen safety factor depends substantially on the application at hand.

The dynamic torque can be considerably less than the rated torque.

$$M_{2N} = M_{\text{req}} \cdot K \quad K \geq 2 \quad M_{\text{req}} = \text{Required torque [Nm]}$$

Required braking torque M_{req}

The required braking torque is frequently a mix of the dynamic and static loads. When choosing the sign to use (plus or minus), it is important to determine whether the load torque contributes to the deceleration or works against it.

$$M_{\text{req}} = M_a \pm M_L \quad M_a = J \cdot \alpha$$

Estimating the required braking torque

If the drive power is known but the mass moment of inertia is not, the required braking torque can be calculated as follows:

$$M_{\text{req}} = 9500 \cdot \frac{P}{n}$$

Thermal load

Dimensioning solely according to the required braking torque is permissible only in a very few instances. When braking the load and the mass moment of inertia reduced to the brake shaft, the kinetic energy J is converted into heat (friction work of the brake). The permissible friction work in dependence on the switching frequency is not to be exceeded.

Note that the maximum permissible friction work is valid only up to the corresponding speed. When emergency stopping at maximum speed, the maximum permissible friction work lies considerably below the values specified here:

$$W_R = \frac{J \cdot n^2}{182.5} \cdot \frac{M_{2N}}{M_{2N} \pm M_L} \quad W_R \leq W_{R\text{max}}$$

Slip time t_3 [ms]

Slip time refers to the time the torque begins increasing until the moment of synchronization is reached:

$$t_3 = 104.6 \cdot \frac{J \cdot \Delta n}{M_{2N} \pm M_L} + t_{11}$$

Service life

Service life depends greatly on the peak temperature during braking. This is a function of the speed, deceleration and the current braking torque.

For this reason, it is not possible to specify a universally valid service life that applies under all operating conditions. Reliable conclusions can only be made for particular applications when all operating conditions are known. At no time should the friction lining thickness be less than g_{\min} :

$$L_n = \frac{(X_n - X) \cdot W_{R0,1}}{0,1 \cdot W_R}$$

Acceleration/Braking time

$$t = \frac{J \cdot \omega}{M_{2N} \pm M_L} + t_1$$

Overview of formula variables

α ... Angular acceleration [s^{-2}]	t ... Acceleration/Braking time [ms]
J ... Moment of inertia [kgm^2]	t_1 ... Turn-on time [ms]
K ... Safety factor ($K \geq 2$)	t_{11} ... Response delay ¹⁾ [ms]
L_n ... Lifespan until an adjustment is needed ²⁾	t_3 ... Slip time ³⁾ [ms]
M_{2N} ... Rated torque [Nm]	ω ... Angular velocity [s^{-1}]
M_a ... Dynamic torque [Nm]	W_R ... Friction [J]
M_{req} ... Required torque [Nm]	$W_{R0,1}$... Friction until 0.1 mm abrasion is reached [J]
M_L ... Load torque [Nm]	W_{Rmax} ... Maximum friction [J]
n ... Speed [s^{-1}]	X ... Rated air gap [mm]
Δn ... Differential speed [s^{-1}]	X_n ... Clearance at which an adjustment is recommended [mm]
P ... Drive power [W]	

1) Time from switching off the current until the torque increases

2) Number of switches until an adjustment is needed

3) Refers to the time the torque begins increasing until the moment of synchronization is reached

Chapter 4 • Installation

1. General information

Caution!

Stepper motors must be mounted on the cooling surface (flange) in order to ensure heat dissipation.

Caution!

Free convection on the motor housing must be guaranteed!

1.1 Installing drive elements

Information:

To connect pinion gears, belt disks or similar drive elements, be sure to use suitable clamping sets, pressure sleeves or other fastening elements.

Drive elements must be protected against unintentional removal.

Caution!

The bearing elements are not to be subjected to shocks or impacts!
Incorrect handling will cause the lifespan of the bearings to be reduced or the bearing to be damaged.

2. Note: Connecting the motor/encoder cable for IP65 variants

2.1 Pre-assembled cables from B&R

Information:

B&R only guarantees the level of protection of IP65 stepper motor variants if pre-assembled cables from B&R are used (see Chapter 5 "Accessories", Section 3 "Cables" on page 98).

2.2 Notes regarding installation

The motor cable takes up quite a bit of space. By rotating the cable, the space needed can be minimized sufficiently so that the cover can be mounted more easily.

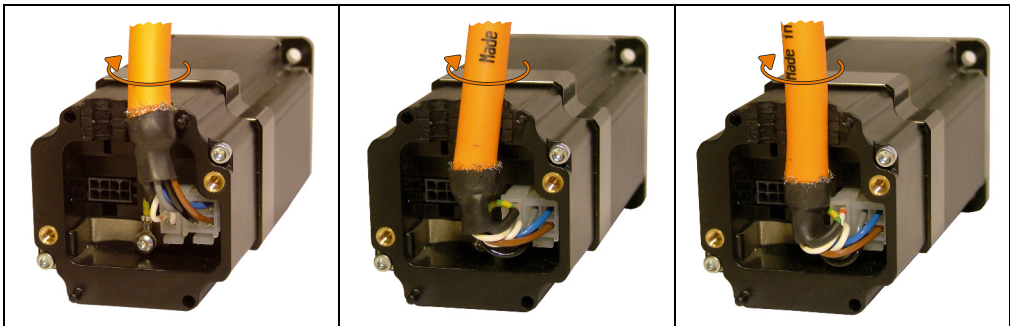


Figure 61: Installation note - Motor/Encoder cables

Installation • Note: Connecting the motor/encoder cable for IP65 variants

The following covers, gaskets and screws for the encoder housing are packaged separately and delivered along with the motor:



No.	Included accessory for IP65 encoder housing	Image	80MPF motors with IP65 option	80MPH motors with IP65 option
1	Cover for 80MPF motor		●	
2	Cover for 80MPH motor			●
3	1x gasket 2		●	●
4	1x gasket 1		●	●
5	2x M4x12 mm screws, galvanized, DIN7985 Fastening torque 1 Nm		●	●
6	2x M3x50 mm screws, galvanized, DIN7985 Fastening torque 0.5 Nm		●	
7	2x UNC6-32x 1.5" screws, galvanized Fastening torque 0.7 Nm			●

Table 33: Accessories for IP65 encoder housing included in delivery

Installation • Note: Connecting the motor/encoder cable for IP65 variants

The cover, gaskets and screws are installed on an 80MPF motor as follows:




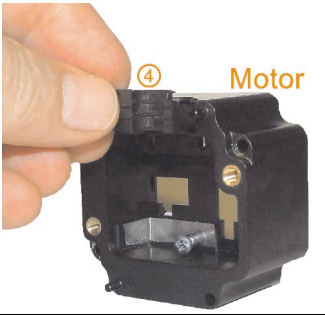


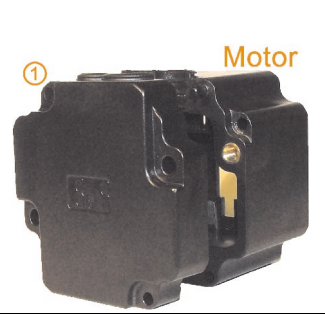
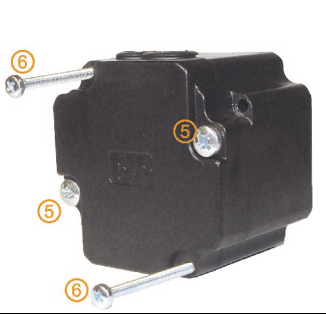

1) Insert gasket 2 into the cover and press to secure.		
		
2) Insert gasket 2 into the motor and press to secure.		
		
3) Fasten the cover with the corresponding screws.		
		
For the fastening torque of the screws, see Table 33 "Accessories for IP65 encoder housing included in delivery" on page 89		

Figure 62: Installation - 80MPF motor, cover, gaskets and screws

Installation • Note: Connecting the motor/encoder cable for IP65 variants

The cover, gaskets and screws are installed on an 80MPH motor as follows:

1) Insert gasket 1 into the cover and press to secure.		
		
2) Insert gasket 2 into the motor and press to secure.		
		
3) Fasten the cover with the corresponding screws.		
		
For the fastening torque of the screws, see Table 33 "Accessories for IP65 encoder housing included in delivery" on page 89		

Figure 63: Installation - 80MPH motor, cover, gaskets and screws

3. Motor-specific mounting data

3.1 NEMA 23, flange size 56 mm

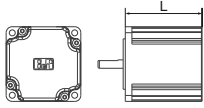
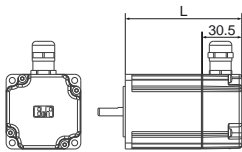
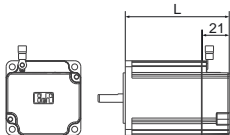
Standard motor	Length / Weight		
	80MPD1	80MPD3	80MPD5
	45.0 mm 0.52 kg	57.5 mm 0.72 kg	80.5 mm 1.11 kg
Standard motor + IP upgrade kit IP40	80MPD1	80MPD3	80MPD5
	75.5 mm 0.65 kg	88.0 mm 0.85 kg	111.0 mm 1.25 kg
Standard motor + ABR incremental encoder IP20	80MPD1	80MPD3	80MPD5
	66.0 mm 0.55 kg	78.5 mm 0.75 kg	101.5 mm 1.14 kg

Table 34: Mounting data - NEMA 23, flange size 56 mm

3.2 Flange size 60 mm

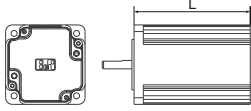
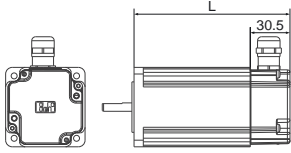
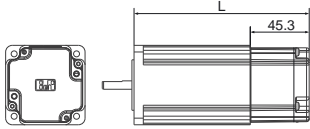
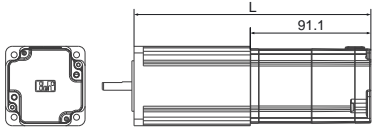
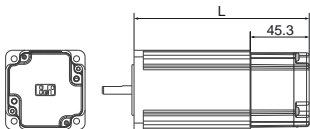
	Length / Weight		
	80MPF1	80MPF3	80MPF5
Standard motor 	51.8 mm 0.62 kg	62.0 mm 0.88 kg	93.3 mm 1.40 kg
Standard motor + IP upgrade kit IP40 	82.3 mm 0.75 kg	92.5 mm 1.00 kg	123.8 mm 1.55 kg
Standard motor + ABR incremental encoder IP65 	97.1 mm 0.75 kg	107.3 mm 1.00 kg	138.6 mm 1.50 kg
Standard motor + ABR incremental encoder + brake IP65 	-	-	184.4 mm 1.80 kg
Standard motor + SSI encoder IP65 	-	-	138.6 mm 1.50 kg

Table 35: Mounting data - Flange size 60 mm

3.3 NEMA 34, flange size 86 mm

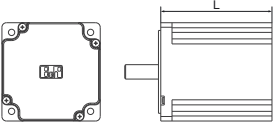
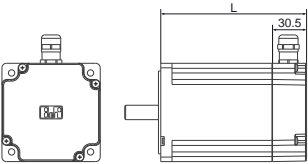
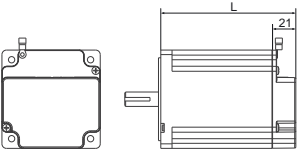
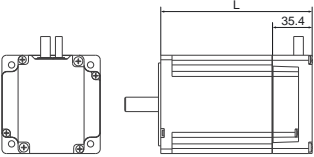
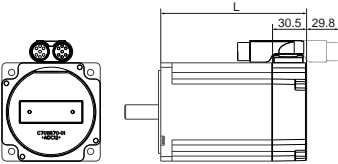
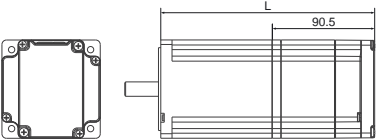
Standard motor	Length / Weight			
	80MPH1	80MPH3	80MPH4	80MPH6
	66.0 mm 1.8 kg	98.0 mm 3.0 kg	98.0 mm 3.0 kg	130.0 mm 4.2 kg
Standard motor + IP upgrade kit IP65	80MPH1	80MPH3	80MPH4	80MPH6
	96.5 mm 2.1 kg	128.5 mm 3.3 kg	128.5 mm 3.3 kg	160.5 mm 4.5 kg
Standard motor + ABR incremental encoder IP20	80MPH1	80MPH3	80MPH4	80MPH6
	87.0 mm 1.9 kg	119.0 mm 3.1 kg	119.0 mm 3.1 kg	151.0 mm 4.3 kg
Standard motor + ABR incremental encoder IP65	80MPH1	80MPH3	80MPH4	80MPH6
	-	-	133.4 mm 3.1 kg	165.4 mm 4.3 kg
Standard motor + Hiperface encoder IP65	80MPH1	80MPH3	80MPH4	80MPH6
	-	-	128.5 mm 3.4 kg	-
Standard motor + ABR incremental encoder + brake IP65	80MPH1	80MPH3	80MPH4	80MPH6
	-	-	188.5 mm 3.7 kg	220.5 mm 4.9 kg

Table 36: Mounting data - NEMA 34, flange size 86 mm

Chapter 5 • Accessories

1. Overview

Model number	Short description	Page
IP upgrade kits		
80XMPDXRE.W1-10	IP upgrade kit with cable clamp for stepper motors from the 80MPD and 80MPF series, IP40 for 80MPD motors and IP65 for 80MPF motors, 10 units per package	96
80XMPHXRE.W1-10	IP upgrade kit with cable clamp for stepper motors from the 80MPH series, IP65, 10 units per package	96
Motor/Encoder cables		
80CMxx001.21-01	Motor cable, length xx m, 5x 0.75 mm ² , 4-pin Molex plug for motor, can be used in cable drag chains, UL/CSA listed	99
80CMxx001.61-01	Hiperface motor cable, length xx m, 5x 0.75 mm ² , 8-pin SpringTec socket on the motor side, wire tip sleeves on the amplifier side, can be used in cable drag chains, UL/CSA listed	102
80CMxx002.21-01	Motor cable, length xx m, 5x 0.75 mm ² , 2x 0.5 mm ² , 4-pin Molex plug for motor, 2-pin Molex plug for brake, can be used in cable drag chains, UL/CSA listed	105
80CMxx003.25-01	Incremental encoder cable, length xx m, 4x 0.14 mm ² , 2x 0.35 mm ² , 8-pin Molex plug for motor, 9-pin DSUB plug on the amplifier side, can be used in cable drag chains, UL listed	108
80CMxx005.65-01	Hiperface encoder cable, length xx m, 5x 2x 0.14 mm ² , 2x 0.5 mm ² , 12-pin SpringTec socket on the motor side, 9-pin DSUB plug on the amplifier side, can be used in cable drag chains, UL/CSA listed	114
80CMxx013.21-01	Hybrid cable, length xx m, 4x 0.5 mm ² , 2x 0.35 mm ² , 3x 0.14 mm ² , Molex plug for motor, wire tip sleeves on the amplifier side	117
Accessory sets for motors		
80XMPXAC0.00-01	Accessory set for motors with encoder, 8-pin and 4-pin connector and crimp contact	121
80XMPXAC0.00-02	Accessory set for motors with encoder and brake, 8-pin, 4-pin and 2-pin connector and crimp contact	121

Table 37: Accessories - Overview

2. IP upgrade kits

2.1 Order data

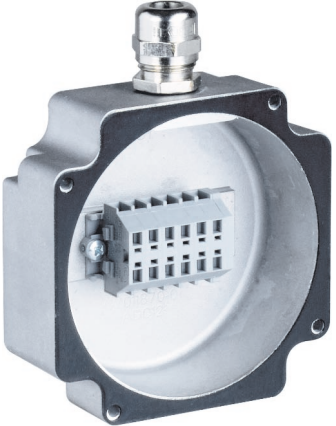
Model number	Short description	Image
80XMPDXRE.W1-10	IP40 upgrade cover and cable clamp for stepper motors from the 80MPD and 80MPF series, 10 units per package	
80XMPHXRE.W1-10	IP65 upgrade cover and cable clamp for stepper motors from the 80MPH series, 10 units per package	

Table 38: IP upgrade kits - Order data

2.2 Technical data

Model number	80XMPDXRE.W1-10	80XMPHXRE.W1-10
General information		
Standard motor	80MPD, 80MPF	80MPH
Protection ¹⁾	IP40	IP65
Fastening torque of the mounting screws	1 Nm	1 Nm

Table 39: IP upgrade kits - Technical data

1) Does not apply to the gap between the shaft and the flange

2.3 Dimensions

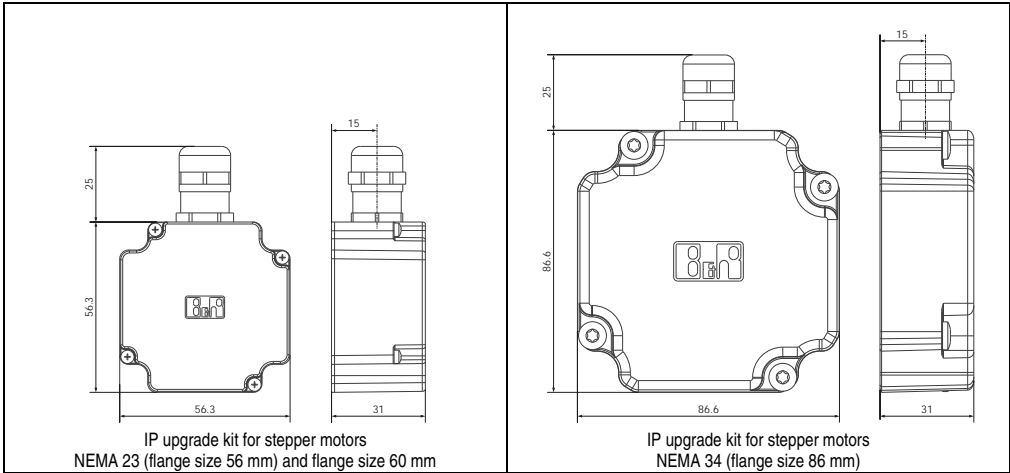


Figure 64: IP upgrade kits - Dimensions

2.4 Connection

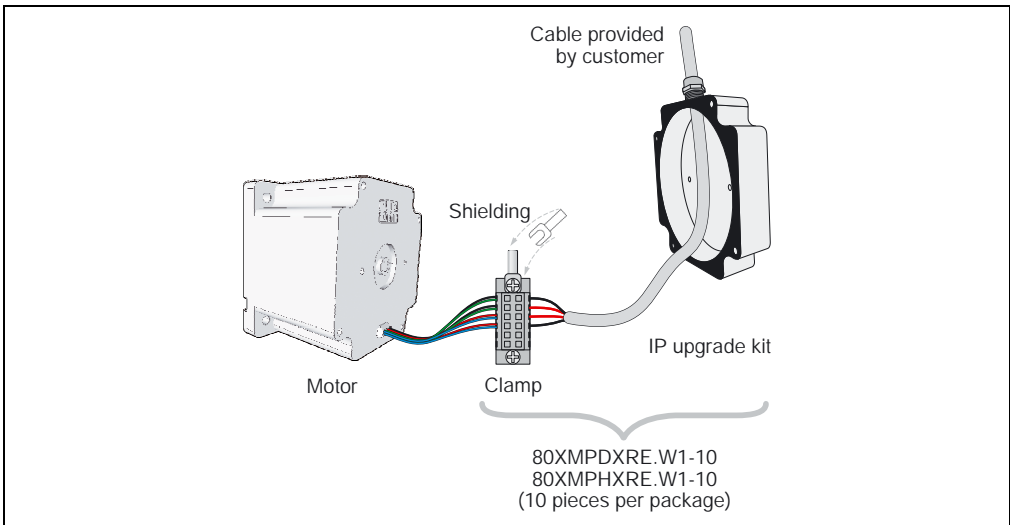


Figure 65: IP upgrade kits - Connection

3. Cables

3.1 Order data

Length	Motor cables		
	Standard motor cables	Hiperface motor cables	Motor cables (incl. brake lines)
1.0 m	80CM01001.21-01	80CM01001.61-01	80CM01002.21-01
2.0 m	80CM02001.21-01	80CM02001.61-01	80CM02002.21-01
3.0 m	80CM03001.21-01	80CM03001.61-01	80CM03002.21-01
5.0 m	80CM05001.21-01	80CM05001.61-01	80CM05002.21-01
10.0 m	80CM10001.21-01	80CM10001.61-01	80CM10002.21-01
15.0 m	80CM15001.21-01	80CM15001.61-01	80CM15002.21-01
20.0 m	80CM20001.21-01	80CM20001.61-01	80CM20002.21-01
Page	99	102	105

Table 40: Motor cables - Order data

Length	Encoder cables		
	ABR encoder cables	SSI encoder cables	Hiperface encoder cables
1.0 m	80CM01003.25-01	80CM01004.25-01	80CM01005.65-01
2.0 m	80CM02003.25-01	80CM02004.25-01	80CM02005.65-01
3.0 m	80CM03003.25-01	80CM03004.25-01	80CM03005.65-01
5.0 m	80CM05003.25-01	80CM05004.25-01	80CM05005.65-01
10.0 m	80CM10003.25-01	80CM10004.25-01	80CM10005.65-01
15.0 m	80CM15003.25-01	80CM15004.25-01	80CM15005.65-01
20.0 m	80CM20003.25-01	80CM20004.25-01	80CM20005.65-01
Page	108	111	114

Table 41: Encoder cables - Order data

Length	Hybrid cables
1.0 m	80CM01013.21-01
2.0 m	80CM02013.21-01
3.0 m	80CM03013.21-01
Page	117

Table 42: Hybrid cables - Order data

3.2 Motor cables - 80CMxx001.21-01

3.2.1 Pin assignments

Dimensions				
Pin assignments				
4-pin terminal block	Pin	Name	Wire color	Open
	1	A\	Gray	For custom wiring Connection to drive system
	2	B\	Blue	
	3	A	Black	
	4	B	Brown	
Cable lug		Name	Wire color	
	-	PE lead / shielding	Yellow / green	

Table 43: 80CMxx001.21-01 motor cables - Dimensions and pin assignments

Cable lengths		
Model number	Length [cm]	Length [m]
80CM01001.21-01	100	1.0
80CM02001.21-01	200	2.0
80CM03001.21-01	300	3.0
80CM05001.21-01	500	5.0
80CM10001.21-01	1,000	10.0
80CM15001.21-01	1,500	15.0
80CM20001.21-01	2,000	20.0

Table 44: 80CMxx001.21-01 motor cables - Cable lengths

3.2.2 Cable diagram

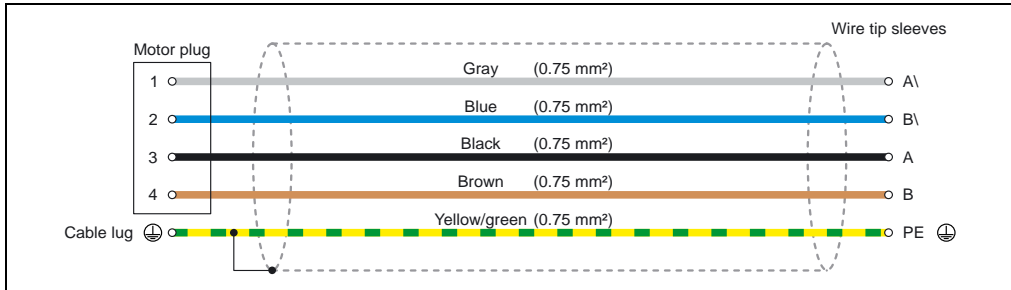


Figure 66: 80CMxx001.21-01 motor cables - Cable diagram

3.2.3 Technical data

Product ID	80CMxx001.21-01
General information	
Cable cross section	5x 0.75 mm ²
Durability	Oil resistance according to DIN VDE 0472 Part 803 as well as conventional hydraulic oil
Listed	UL AWM Style 20234, 80°C, 1000 V E63216 as well as CSA AWM I/II, 90°C, 1000 V, FT2, LL46064
Certification	c-UL-us
Cable structure	
Power lines, PE	
Amount	5
Cross section	0.75 mm ²
Wire insulation	Special thermoplastic material
Wire colors	Black, brown, blue, green, yellow/green
Design	Tinned Cu wire 96x Ø0.10 mm
Shielding	No
Stranding	No
Cable stranding	5-wire twisted pair
Total shielding	Tinned Cu wire mesh, optical coverage ≥85%
Outer sheathing	
Material	PUR
Color	Orange
Labeling	B & R 5x0.75 FLEX
	UL AWM STYLE 20234 80°C 1000V E63216
	CSA AWM I/II A/B 90°C 1000V FT2 LL46064

Table 45: 80CMxx001.21-01 motor cables - Technical data

Product ID	80CMxx001.21-01
Electrical properties	
Operating voltage	Max. 1,000 V
Test voltage Wire/wire Wire/shield	3.0 kV 3.0 kV
Conductor resistance	≤29.0 Ω/km
Insulation resistance	>200 MΩ x km
Max. current load according to IEC 60364-5-523 depending on type of installation Wall mounting Installed in conduit or cable duct Installed in a cable tray	13.0 A 11.5 A 13.5 A
Environmental conditions	
Temperature range Moving Static	-10 to 70°C -20 to 90°C
Mechanical characteristics	
Outer diameter	8.5 mm ±0.3 mm
Flex radius	≥7.5x outer diameter
Drag chain data Speed Acceleration Reverse bends (expected)	≤4 m/s ≤6 g ≥3,000,000
Weight	Approx. 128 g/m

Table 45: 80CMxx001.21-01 motor cables - Technical data

3.3 Hiperface motor cables - 80CMxx001.61-01

3.3.1 Pin assignments

Dimensions				
Pin assignments				
Circular plug ¹⁾ 9-pin socket	Pin	Name	Wire color	Open
	1	A	Black	For custom wiring Connection to drive system
	2	A\	Gray	
	3	B	Brown	
	4	B\	Blue	
	5	NC	-	
	A	NC	-	
	B	Coding pin		
	C	NC	-	
	PE	PE lead / shielding	Yellow / green	

Table 46: 80CMxx001.61-01 Hiperface motor cables - Dimensions and pin assignments

1) Pin B of the circular plug is used for coding purposes and prevents improper connections.

Cable lengths		
Model number	Length [cm]	Length [m]
80CM05001.61-01	500	5.0
80CM15001.61-01	1,500	15.0
80CM20001.61-01	2,000	20.0

Table 47: 80CMxx001.61-01 Hiperface motor cables - Cable lengths

3.3.2 Cable diagram

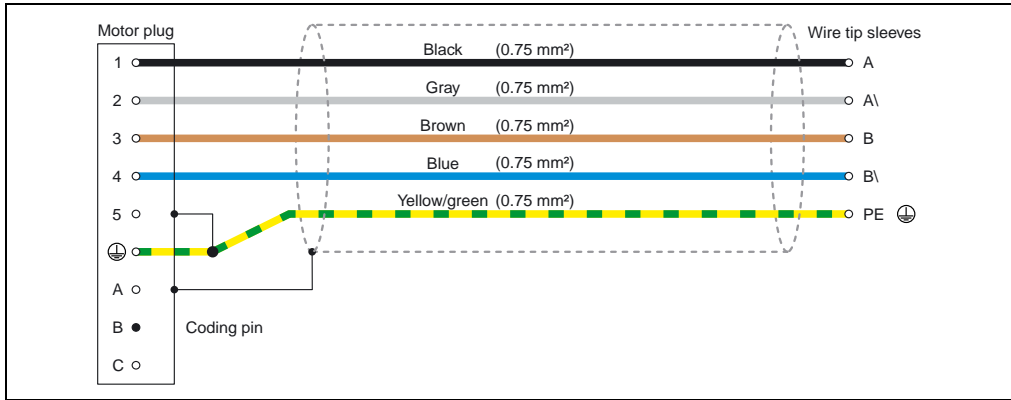


Figure 67: 80CMxx001.61-01 Hiperface motor cables - Cable diagram

3.3.3 Technical data

Product ID	80CMxx001.61-01
General information	
Cable cross section	5x 0.75 mm ²
Durability	Oil resistance according to DIN VDE 0472 Part 803 as well as conventional hydraulic oil
Listed	UL AWM Style 20234, 80°C, 1000 V E63216 as well as CSA AWM I/II, 90°C, 1000 V, FT2, LL46064
Certification	c-UL-us
Cable structure	
Power lines, PE	5
Amount	0.75 mm ²
Cross section	Special thermoplastic material
Wire insulation	Black, brown, blue, green, yellow/green
Wire colors	Tinned Cu wire 96x Ø0.10 mm
Design	No
Shielding	No
Stranding	No
Cable stranding	5-wire twisted pair
Total shielding	Tinned Cu wire mesh, optical coverage ≥85%
Outer sheathing	PUR
Material	Orange
Color	B & R 5x0.75 FLEX
Labeling	UL AWM STYLE 20234 80°C 1000V E63216 CSA AWM I/II A/B 90°C 1000V FT2 LL46064

Table 48: 80CMxx001.61-01 Hiperface motor cables - Technical data

Accessories • Cables • Hiperface motor cables - 80CMxx001.61-01

Product ID	80CMxx001.61-01
Electrical properties	
Operating voltage	Max. 1,000 V
Test voltage	
Wire/wire	3.0 kV
Wire/shield	3.0 kV
Conductor resistance	≤29.0 Ω/km
Insulation resistance	>200 MΩ x km
Max. current load according to IEC 60364-5-523 depending on type of installation	
Wall mounting	13.0 A
Installed in conduit or cable duct	11.5 A
Installed in a cable tray	13.5 A
Environmental conditions	
Temperature range	
Moving	-10 to 70°C
Static	-20 to 90°C
Mechanical characteristics	
Outer diameter	8.5 mm ±0.3 mm
Flex radius	≥7.5x outer diameter
Drag chain data	
Speed	≤4 m/s
Acceleration	≤6 g
Reverse bends (expected)	≥3,000,000
Weight	Approx. 128 g/m

Table 48: 80CMxx001.61-01 Hiperface motor cables - Technical data

3.4 Motor cables (incl. brake lines) - 80CMxx002.21-01

3.4.1 Pin assignments

Dimensions						
Pin assignments						
4-pin terminal block	Pin	Name	Wire color	Open		
	1	A\	Gray	For custom wiring Connection to drive system		
	2	B\	Blue			
	3	A	Black			
	4	B	Brown			
2-pin terminal block	Pin	Name	Wire color		For custom wiring Connection to drive system	
	1	24 VDC brake	White / red			
	2	GND	White			
Cable lug		Name	Wire color			For custom wiring Connection to drive system
	-	PE lead / shielding	Yellow / green			

Table 49: 80CMxx002.21-01 motor cables (incl. brake lines) - Dimensions and pin assignments

Cable lengths		
Model number	Length [cm]	Length [m]
80CM01002.21-01	100	1.0
80CM02002.21-01	200	2.0
80CM03002.21-01	300	3.0
80CM05002.21-01	500	5.0
80CM10002.21-01	1,000	10.0
80CM15002.21-01	1,500	15.0
80CM20002.21-01	2,000	20.0

Table 50: 80CMxx002.21-01 motor cables (incl. brake lines) - Cable lengths

3.4.2 Cable diagram

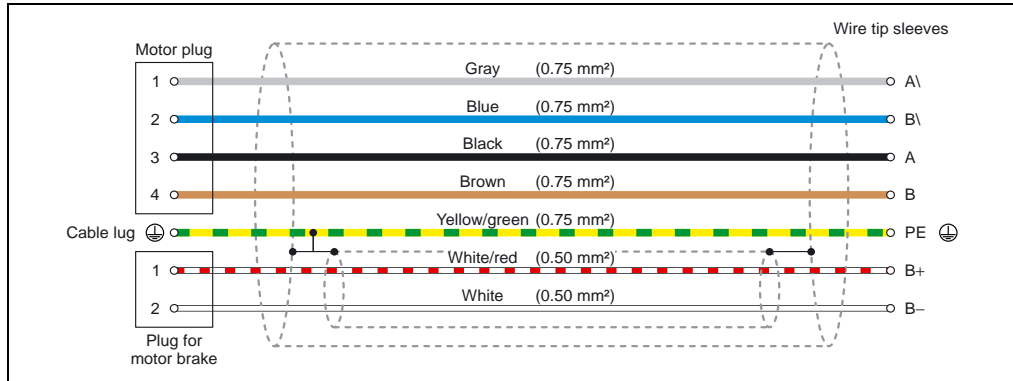


Figure 68: 80CMxx002.21-01 motor cables (incl. brake lines) - Cable diagram

3.4.3 Technical data

Product ID	80CMxx002.21-01
General information	
Cable cross section	5x 0.75 mm ²
Durability	Oil resistance according to DIN VDE 0472 Part 803 as well as conventional hydraulic oil
Listed	UL AWM Style 20234, 80°C, 1000 V E63216 as well as CSA AWM I/II, 90°C, 1000 V, FT2, LL46064
Certification	c-UL-us
Cable structure	
Power lines, PE	
Amount	5
Cross section	0.75 mm ²
Wire insulation	Special thermoplastic material
Wire colors	Black, brown, blue, green, yellow/green
Design	Tinned Cu wire 96x ∅0.10 mm
Shielding	No
Stranding	No
Signal lines (brake)	
Amount	2
Cross section	0.50 mm ²
Wire insulation	Special thermoplastic material
Wire colors	White, white/red
Design	Tinned Cu wire 64x ∅0.10 mm
Shielding	Shielding for pairs, tinned Cu mesh, optical coverage ≥85% and foil banding
Stranding	White with white/red
Cable stranding	With filler elements and foil banding
Total shielding	Tinned Cu wire mesh, optical coverage ≥85%

Table 51: 80CMxx002.21-01 motor cables (incl. brake lines) - Technical data

Accessories • Cables • Motor cables (incl. brake lines) - 80CMxx002.21-01

Product ID	80CMxx002.21-01
Outer sheathing Material Color Labeling	PUR Orange B & R 5x0.75 + 1x2x0.50 FLEX UL AWM STYLE 20234 80°C 1000V E63216 CSA AWM I/II A/B 90°C 1000V FT2 LL46064
Electrical properties	
Operating voltage	Max. 1,000 V
Test voltage Wire/wire Wire/shield	3.0 kV 3.0 kV
Conductor resistance Power lines, PE Signal lines (brake)	≤29.0 Ω/km ≤39.0 Ω/km
Insulation resistance	>200 MΩ x km
Max. current load according to IEC 60364-5-523 depending on type of installation Wall mounting Installed in conduit or cable duct Installed in a cable tray	13.0 A 11.5 A 13.5 A
Environmental conditions	
Temperature range Moving Static	-10 to 70°C -20 to 90°C
Mechanical characteristics	
Outer diameter	10.8 mm ±0.4 mm
Flex radius	≥7.5x outer diameter
Drag chain data Speed Acceleration Reverse bends (expected)	≤4 m/s ≤6 g ≥3,000,000
Weight	Approx. 260 g/m

Table 51: 80CMxx002.21-01 motor cables (incl. brake lines) - Technical data

3.5 ABR encoder cables - 80CMxx003.25-01

3.5.1 Pin assignments

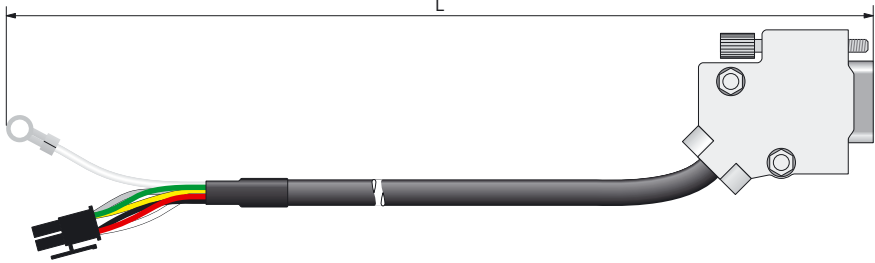
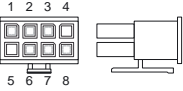
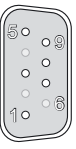

Dimensions					
					
Pin assignments					
8-pin terminal block	Name				9-pin DSUB plug (6 pins used)
	1	A	A	1	
	2	B	B	3	
	3	R	R	5	
	4	-	NC		
	5	-	NC		
	6	+24 VDC	Encoder supply +24 V	8	
	7	COM	Encoder supply 0 V	9	
	8	Temp	Temperature	7	
For wire colors / wiring, see 3.5.2 "Cable diagram" on page 109.					
Cable lug	Name		Wire color		
	Shielding		-		

Table 52: 80CMxx003.25-01 ABR encoder cables - Dimensions and pin assignments

Cable lengths		
Model number	Length [cm]	Length [m]
80CM01003.25-01	100	1.0
80CM02003.25-01	200	2.0
80CM03003.25-01	300	3.0
80CM05003.25-01	500	5.0
80CM10003.25-01	1,000	10.0
80CM15003.25-01	1,500	15.0
80CM20003.25-01	2,000	20.0

Table 53: 80CMxx003.25-01 ABR encoder cables - Cable lengths

3.5.2 Cable diagram

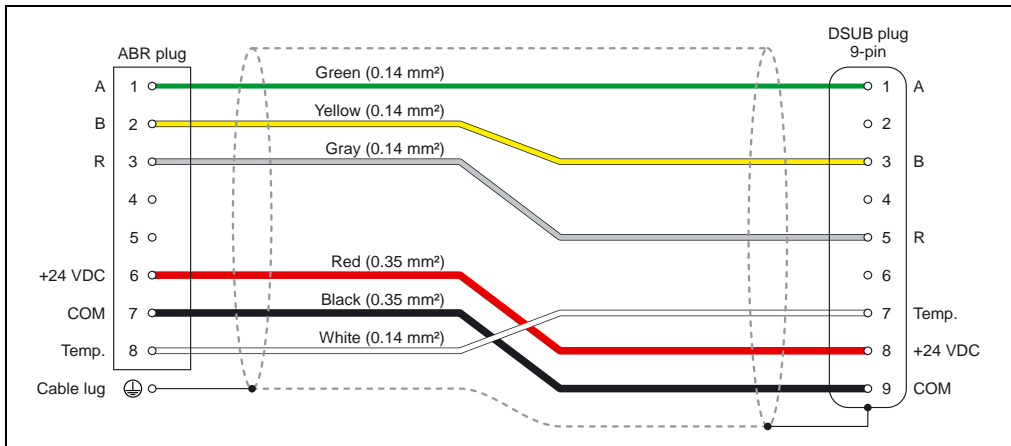


Figure 69: 80CMxx003.25-01 ABR encoder cables - Cable diagram

3.5.3 Technical data

Product ID	80CMxx003.25-01
General information	
Cable cross section	2x 0.35 mm ² + 4x 0.14 mm ²
Durability	Oil resistance according to DIN VDE 0472 Part 803 as well as conventional hydraulic oil
Listed	UL AWM Style 20963, 80°C, 30 V E63216
Certification	c-UL-us
Cable structure	
Supply lines	
Amount	2
Cross section	0.35 mm ²
Wire insulation	Special thermoplastic material
Wire colors	Red, black
Design	Tinned Cu wire 45x Ø0.10 mm
Shielding	No
Stranding	No
Signal lines	
Amount	4
Cross section	0.14 mm ²
Wire insulation	Polyolefin foam
Wire colors	Green, yellow, gray, white
Design	Tinned Cu wire 19x Ø0.102 mm
Wire/Wire capacity	Nom. 38 pF/m
Shielding	No
Stranding	All 4 leads together
Cable stranding	With filler elements and foil banding
Total shielding	Tinned Cu wire mesh, optical coverage ≥85%

Table 54: 80CMxx003.25-01 ABR encoder cables - Technical data

Accessories • Cables • ABR encoder cables - 80CMxx003.25-01

Product ID	80CMxx003.25-01
Outer sheathing Material Color Labeling	PUR Flat B & R 4x0.14 + 2x0.35 FLEX UL AWM STYLE 20963 80°C 30 E63216
Electrical properties	
Operating voltage	Max. 30 V
Test voltage Wire/wire Wire/shield	1.0 kV 0.5 kV
Conductor resistance Supply lines Signal lines	≤55.0 Ω/km ≤134.0 Ω/km
Insulation resistance	>200 MΩ x km
Environmental conditions	
Temperature range Moving Static	-10 to 50°C -20 to 80°C
Mechanical characteristics	
Outer diameter	5.8 mm ±0.2 mm
Flex radius	≥12.5x outer diameter
Drag chain data Speed Acceleration Reverse bends (expected)	≤4 m/s ≤6 g ≥3,000,000
Weight	Approx. 45 g/m

Table 54: 80CMxx003.25-01 ABR encoder cables - Technical data

3.6 SSI encoder cables - 80CMxx004.25-01

3.6.1 Pin assignments

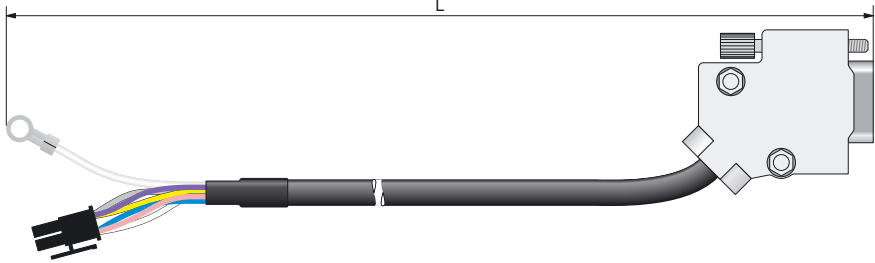
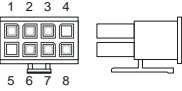
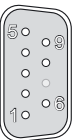

Dimensions					
					
Pin assignments					
8-pin terminal block	Name				9-pin DSUB plug (8 pins used)
	1	D	Data input	1	
	2	D\	Inverted data input	2	
	3	T	Clock output	4	
	4	T\	Inverted clock output	5	
	5	I2C	I2C	3	
	6	U _b	Encoder supply +24 V	8	
	7	COM	Encoder supply 0 V	9	
	8	V _{bat}	Battery buffering 3 V	6	
For wire colors / wiring, see 3.6.2 "Cable diagram" on page 112.					
Cable lug	Name		Wire color		
	Shielding		-		

Table 55: 80CMxx004.25-01 SSI encoder cables - Dimensions and pin assignments

Cable lengths		
Model number	Length [cm]	Length [m]
80CM01004.25-01	100	1.0
80CM02004.25-01	200	2.0
80CM03004.25-01	300	3.0
80CM05004.25-01	500	5.0
80CM10004.25-01	1,000	10.0
80CM15004.25-01	1,500	15.0
80CM20004.25-01	2,000	20.0

Table 56: 80CMxx004.25-01 SSI encoder cables - Cable lengths

3.6.2 Cable diagram

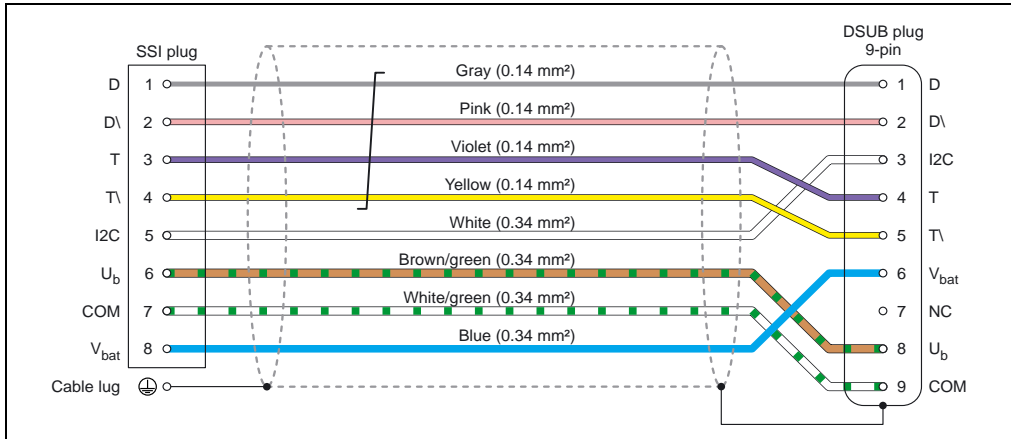


Figure 70: 80CMxx004.25-01 SSI encoder cables - Cable diagram

3.6.3 Technical data

Product ID	80CMxx003.25-01
General information	
Cable cross section	1x 4x 0.14 mm ² + 4x 0.34 mm ²
Durability	Oil resistance according to VDE 0472 part 803 test type B
Listed	UL AWM Style 20963, 80°C, 30 V E63216
Certification	c-UL-us
Cable structure	
Supply lines	
Amount	4
Cross section	0.34 mm ²
Wire insulation	Special thermoplastic material
Wire colors	White/green, brown/green, blue, white
Design	Tinned Cu wire
Shielding	No
Stranding	No
Signal lines	
Amount	4
Cross section	0.14 mm ²
Wire insulation	Special thermoplastic material
Wire colors	Yellow, gray, pink, violet
Design	Tinned Cu wire
Shielding	No
Stranding	All 4 leads together
Cable stranding	With foil banding
Total shielding	Tinned Cu wire mesh

Table 57: 80CMxx003.25-01 SSI encoder cables - Technical data

Product ID	80CMxx003.25-01
Outer sheathing Material Color Labeling	PUR Black Heidenhain UR AWM Style 20963 80°C 30 V E63216
Electrical properties	
Test voltage Wire/wire Wire/shield	0.5 kV 0.5 kV
Conductor resistance Supply lines Signal lines	≤55.0 Ω/km ≤134.0 Ω/km
Insulation resistance	>200 MΩ x km
Environmental conditions	
Temperature range Moving Static	-10 to 80°C -40 to 80°C
Mechanical characteristics	
Outer diameter	6.0 mm ±0.25 mm
Flex radius Single bend Moving	≥20 mm ≥75 mm
Drag chain data Speed Acceleration Reverse bends (expected)	≤4 m/s <60 m/s ² ≥3,000,000
Weight	Approx. 80 g/m

Table 57: 80CMxx003.25-01 SSI encoder cables - Technical data

3.7 Hiperface encoder cables - 80CMxx005.65-01

3.7.1 Pin assignments

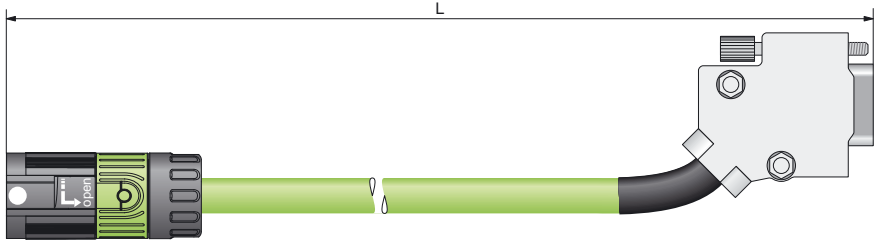
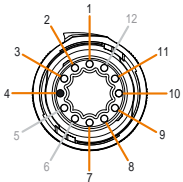
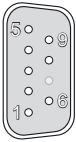
Dimensions		
		
Pin assignments		
Circular plug ¹⁾ 12-pin socket	Wire color / Description	9-pin DSUB plug (8 pins used)
	<p>See 3.7.2 "Cable diagram" on page 115.</p> <p>Shielding is connected to the housing on both sides via the plug.</p>	

Table 58: 80CMxx005.65-01 Hiperface encoder cables - Dimensions and pin assignments

1) Pin 4 of the circular plug is used for coding purposes and prevents improper connections.

Cable lengths		
Model number	Length [cm]	Length [m]
80CM01005.65-01	100	1.0
80CM02005.65-01	200	2.0
80CM03005.65-01	300	3.0
80CM05005.65-01	500	5.0
80CM10005.65-01	1,000	10.0
80CM15005.65-01	1,500	15.0
80CM20005.65-01	2,000	20.0

Table 59: 80CMxx005.65-01 Hiperface encoder cables - Cable lengths

3.7.2 Cable diagram

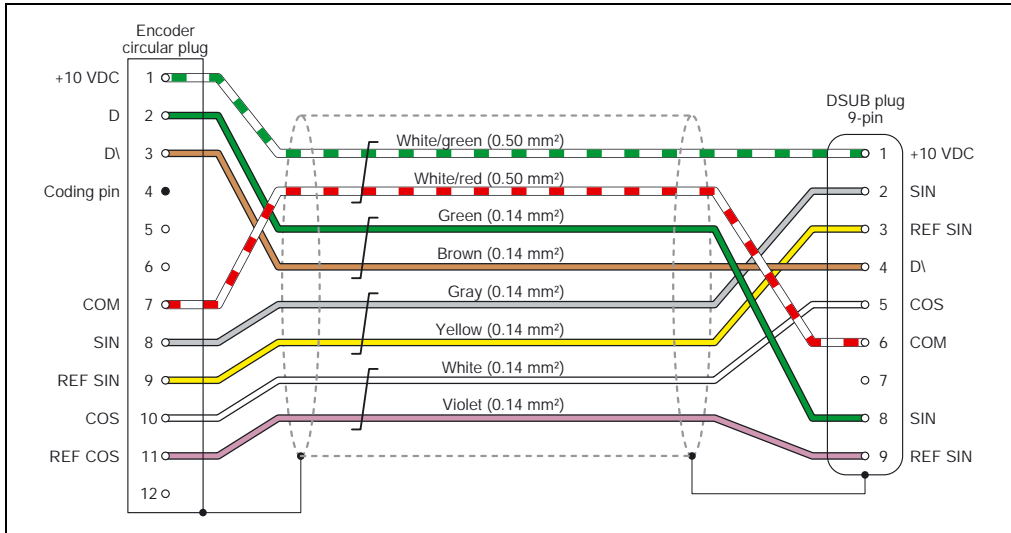


Figure 71: 80CMxx005.65-01 Hiperface encoder cables - Cable diagram

3.7.3 Technical data

Product ID	80CMxx005.65-01
General information	
Cable cross section	5x 2x 0.14 mm ² + 1x 2x 0.50 mm ²
Durability	Oil resistance according to VDE 0472 part 803 as well as standard hydraulic oil
Listed	UL AWM Style 20963, 80°C, 30 V, E63216 as well as CSA AWM I/II A/B, 90°C, 30 V, FT1 LL46064
Certification	c-UL-us
Cable structure	
Supply lines	
Amount	2
Cross section	0.50 mm ²
Wire insulation	Special thermoplastic material
Wire colors	White/green, white/red
Design	Tinned Cu wire
Shielding	No
Stranding	White/red with white/green and filler elements
Signal lines	
Amount	10
Cross section	0.14 mm ²
Wire insulation	Special thermoplastic material
Wire colors	Blue, brown, yellow, gray, green, pink, red, black, violet, white
Design	Tinned Cu wire
Shielding	No
Stranding	Green with brown, gray with yellow, white with violet, black with red, pink with blue

Table 60: 80CMxx005.65-01 Hiperface encoder cables - Technical data

Accessories • Cables • Hiperface encoder cables - 80CMxx005.65-01

Product ID	80CMxx005.65-01
Cable stranding	With foil banding
Total shielding	Cu mesh, optical coverage >85% and wrapped in isolating fabric
Outer sheathing Material Color Labeling	PUR RAL 6018 BERNECKER + RAINER 10x0.14+2x0.50 FLEX UL AWM STYLE 20963 80°C 30 V E63216 CSA AWM I/II A/B 90°C 30 V FT1 LL46064
Electrical properties	
Test voltage Wire/wire Wire/shield	1.0 kV 0.8 kV
Conductor resistance Supply lines Signal lines	≤40.0 Ω/km ≤140.0 Ω/km
Insulation resistance	>200 MΩ x km
Environmental conditions	
Temperature range Moving Static	-10 to 80°C -40 to 90°C
Mechanical characteristics	
Outer diameter	7.85 mm ±0.2 mm
Flex radius Single bend Moving	≥24 mm ≥60 mm
Drag chain data Speed Acceleration Reverse bends (expected)	≤4 m/s <60 m/s ² ≥3,000,000
Weight	Approx. 80 g/m

Table 60: 80CMxx005.65-01 Hiperface encoder cables - Technical data

3.8 Hybrid cables - 80CMxx013.21-01

3.8.1 Pin assignments

Dimensions					
Pin assignments					
4-pin terminal block	Pin	Name	Wire color	Open	
	1	A\	Gray	For custom wiring Connection to drive system	
	2	B\	Blue		
	3	A	Black		
	4	B	Brown		
8-pin terminal block	Wire color / Description				
	1	A	Green		
	2	B	Yellow		
	3	R	Gray		
	4	NC	-		
	5	NC	-		
	6	24 VDC	Red		
	7	COM	Black		
	8	NC	-		
Cable lug		Name	Wire color	Cable lug	
	-	PE lead / shielding	Yellow / green		

Table 61: 80CMxx013.21-01 hybrid cables - Dimensions and pin assignments

Cable lengths		
Model number	Length [cm]	Length [m]
80CM01013.21-01	100	1.0
80CM02013.21-01	200	2.0
80CM03013.21-01	300	3.0

Table 62: 80CMxx013.21-01 hybrid cables - Cable lengths

3.8.2 Cable diagram

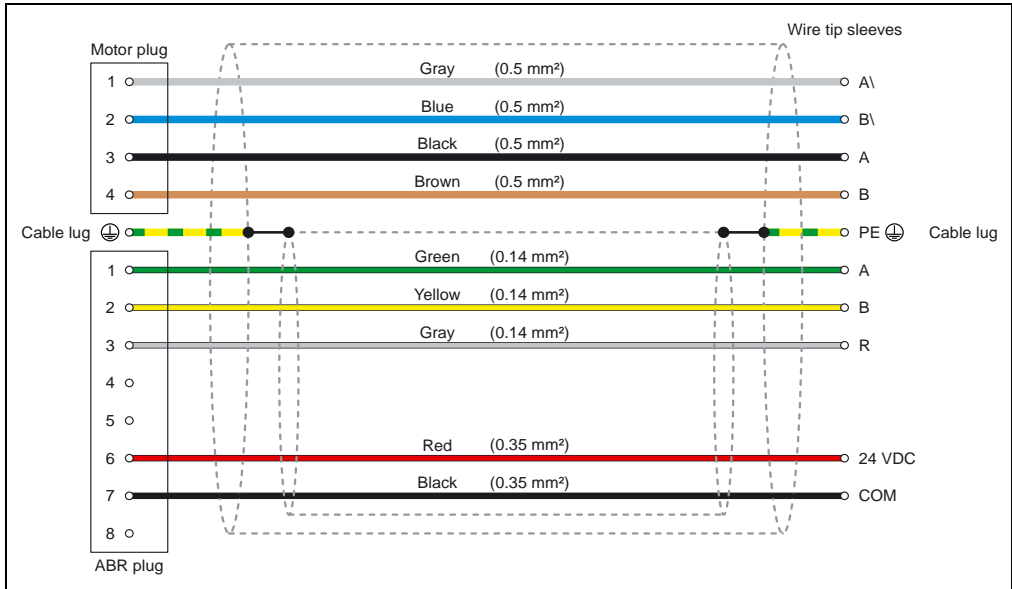


Figure 72: 80CMxx013.21-01 hybrid cables - Cable diagram

3.8.3 Technical data

Product ID	80CMxx013.21-01
General information	
Cable cross section	4x 0.5 mm ² + 2x 0.35 mm ² + 3x 0.14 mm ²
Durability	Oil resistance according to VDE 0472 part 803 as well as standard hydraulic oil
Listed	UL AWM Style 20963 80°C 30 V E63216 as well as CSA AWM I/II A/B 90°C 30 V FT2 LL46064
Certification	c-UL-us
Cable structure	
Supply lines Amount Cross section Wire insulation Wire colors Design	2 0.35 mm ² Special thermoplastic material Red, black Tinned Cu wire 45x Ø0.10 mm
Signal lines Amount Cross section Wire insulation Wire colors Design	3 0.14 mm ² Special thermoplastic material Green, yellow, gray Tinned Cu wire 19x Ø0.102 mm
Supply lines + Signal lines Shielding Stranding	Tinned Cu wire mesh, optical coverage ≥85% Yes, together with the supply lines
Power lines Amount Cross section Wire insulation Wire colors Design Shielding Stranding	4 0.50 mm ² Special thermoplastic material Gray, blue, black, brown Tinned Cu wire 64x Ø0.10 mm No No
Cable stranding	No
Total shielding	Tinned Cu wire mesh, optical coverage ≥85%
Outer sheathing Material Color Labeling	PUR Flat B & R 4x0.50+1x(2x0.35+3x0.14 C) FLEX UL AWM STYLE 20963 80°C 30 V E63216 CSA AWM I/II A/B 90°C 30 V FT2 LL46064
Electrical properties	
Operating voltage	Max. 30 V
Test voltage Wire/wire Wire/shield	1.0 kV 0.5 kV
Conductor resistance Supply lines Signal lines Power lines	≤55.0 Ω/km ≤134.0 Ω/km ≤39.0 Ω/km
Insulation resistance	>200 MΩ x km

Table 63: 80CMxx013.21-01 hybrid cables - Technical data

Accessories • Cables • Hybrid cables - 80CMxx013.21-01

Product ID	80CMxx013.21-01
Environmental conditions	
Temperature range	
Moving	-10 to 50°C
Static	-20 to 80°C
Mechanical characteristics	
Outer diameter	7.20 mm ±0.25 mm
Flex radius	≥12.5 x outer diameter
Drag chain data	
Speed	≤4 m/s
Acceleration	≤6 g
Reverse bends (expected)	≥3,000,000
Weight	Approx. 85 g/m

Table 63: 80CMxx013.21-01 hybrid cables - Technical data

4. Accessory sets for motors with encoder / holding brake

4.1 Order data

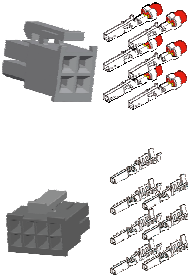
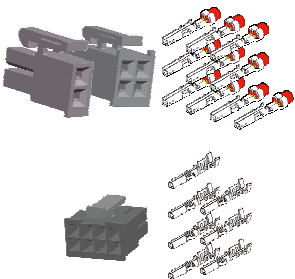
Model number	Short description		
80XMPXAC0.00-01	Accessory set for motors with encoder, 8-pin and 4-pin connector and crimp contact		
	Contents	Molex parts number	
	1x 8-pin plug	0430250800	
	1x 4-pin plug	0039012040	
	7x crimp contact (for 8-pin plug)	0430300002	
	6x crimp contact (for 4-pin plug)	0444761111	
80XMPXAC0.00-02	Accessory set for motors with encoder and brake, 8-pin, 4-pin and 2-pin connector and crimp contact		
	Contents	Molex parts number	
	1x 8-pin plug	0430250800	
	1x 4-pin plug	0039012040	
	1x 2-pin plug	0039012040	
	7x crimp contact (for 8-pin plug)	0430300002	
	10x crimp contact (for 2-pin or 4-pin plug)	0444761111	

Table 64: Accessory sets for motors with encoder / holding brake

Special crimping tools are required to install/dismantle the crimp contacts:


Molex parts number		
		
	Crimping pliers	Release tool
2-pin or 4-pin plugs	0638190900	0011030044
8-pin plugs	0638190000	0011030043

Figure 73: Crimping tools for installing/dismantling crimp contacts

Chapter 6 • Standards and certifications

1. Applicable European directives

- EMC directive 89/336/EEC
- Low-voltage directive 73/23/EEC
- Machine directive 98/37/EC

2. Applicable standards

Standard	Description
EN 60034-1	Rotating electrical machines <ul style="list-style-type: none"> • Part 1: Measurement and operational behavior

Table 65: Applicable standards

Appendix A • Abbreviations

1. General information

Abbreviations appear throughout this user's manual, for example in data tables or descriptions of pin assignments.

2. Overview

Abbreviation	Stands for	Description
NC	Normally closed	A normally closed (N.C.) relay contact.
	Not connected	Used in the description of pin assignments if a terminal or pin is not connected to a module.
ND	Not defined	In data tables, this stands for a value that has not been defined, e.g. when a cable manufacturer does not provide certain technical data.
NO	Normally open	A normally open (N.O.) relay contact.
TBD	To be defined	Used in technical data tables when certain information is not yet available. This value will be provided at some point in the future.

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80CM01005.65-01	98	80MPD5.300S014-01	63
80CM01013.21-01	98	80MPD5.600S014-01	63
80CM02001.21-01	98	80MPF1.250S000-01	42
80CM02001.61-01	98	80MPF1.250S114-01	63
80CM02002.21-01	98	80MPF3.250S000-01	42
80CM02003.25-01	98	80MPF3.250S114-01	63
80CM02005.65-01	98	80MPF3.500S114-01	63
80CM02013.21-01	98	80MPF5.250D114-01	63
80CM03001.21-01	98	80MPF5.250S000-01	42
80CM03001.61-01	98	80MPF5.250S113-01	63
80CM03002.21-01	98	80MPF5.250S114-01	63
80CM03003.25-01	98	80MPF5.500S113-01	63
80CM03005.65-01	98	80MPH1.300S000-01	48
80CM03013.21-01	98	80MPH1.300S014-01	63
80CM05001.21-01	98	80MPH1.600S014-01	63
80CM05001.61-01	98	80MPH3.300S000-01	48
80CM05002.21-01	98	80MPH3.300S014-01	63
80CM05003.25-01	98	80MPH3.600S014-01	63
80CM05005.65-01	98	80MPH4.101D114-01	63
80CM10001.21-01	98	80MPH4.101S014-01	63
80CM10001.61-01	98	80MPH4.300S000-01	48
80CM10002.21-01	98	80MPH4.300S014-01	63
80CM10003.25-01	98	80MPH4.500S000-01	48
80CM10005.65-01	98	80MPH4.500S014-01	63
80CM15001.21-01	98	80MPH4.600S014-01	63
80CM15001.61-01	98	80MPH4.600S111-02	63
80CM15002.21-01	98	80MPH4.600S114-01	63
80CM15003.25-01	98	80MPH6.101S000-01	48
80CM15005.65-01	98	80MPH6.300D114-01	63
80CM20001.21-01	98	80MPH6.300S000-01	48
80CM20001.61-01	98	80MPH6.300S014-01	63
80CM20002.21-01	98	80MPH6.300S114-01	63
80CM20003.25-01	98	80MPH6.600D114-01	63
80CM20005.65-01	98	80MPH6.600S014-01	63
80MPD1.300S000-01	33	80MPH6.600S114-01	63
80MPD1.300S014-01	63	80XMPDXRE.W1-10	96
80MPD1.600S014-01	63	80XMPHXRE.W1-10	96
		80XMPXAC0.00-01	121
		80XMPXAC0.00-02	121

