# 80MP stepper motors

## User's manual

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# 1 General information

## 1.1 Manual history

| Version | Date | Comment |
|---|---|---|
| 2.10 | April 2023 | Revised entire manual.<br><br>Changed "General overview" to "Technical data" and added updates.<br><br>Other additions:<br>• Information about the Nameplate.<br>• Chapter "Standards and certifications".<br>• Stepper motor "80MPH6.101S100-01 (IP65 protection, with built-in connector, without encoder)".<br>• Chapter "Transport and storage".<br>• Chapter "Installation conditions".<br>• Replacement parts kit for IP65 encoder housing cover. |
| 2.00 | May 2016 | Revised and updated entire manual. |
| 1.11 | April 2013 | Added updates in technical data (ABR encoder and HIPERFACE). |
| 1.10 | March 2013 | Entire document revised, new cables and stepper motor options added. |
| 1.06 | August 2011 | Correction to "Power consumption" technical data for brake option. |
| 1.05 | July 2011 | Addition of "Max. surface temperature" for motors with brake option:<br>• Standard motors, flange size 60 mm,<br>• Standard motors, NEMA 34, flange size 86 mm, |
| 1.04 | February 2011 | Additions:<br>• "Areas of application" expanded.<br>• "Operating principle" section added to brake option documentation. |
| 1.03 | January 2011 | Corrections:<br>• Pinout text corrected from "9-pin DSUB plug (5 pins used)" to "9-pin DSUB plug (8 pins used)"<br>• Text corrected in "Lifespan" section. |
| 1.02 | January 2011 | Corrected spelling errors. |
| 1.01 | December 2010 | Corrections:<br>• The reference to the "Dimensioning" chapter has been expanded to include the "ACOPOSmicro User's Manual".<br>• Notice regarding grounding: only screws intended for this may be used.<br>• Standards and Certifications chapter shortened. |
| 1.00 | November 2010 | First edition |

### Information:

**B&R makes every effort to keep user's manuals as current as possible. New versions are available in electronic form on the B&R website (www.br-automation.com). Check regularly to determine if you have the most current version.**

## 1.2 About this user's manual

This user's manual describes the product, informs you how to use it and warns of possible dangers.

The personnel responsible for installation, operation, fault rectification, maintenance and cleaning must read and understand this manual before starting any work. The machine documentation must also be taken into account; the product described here is a component of this. This, along with observing all specifications and safety guidelines, will ensure safe functionality and a long service life.

As a component of the machine, this manual must be made freely accessible and stored in the immediate vicinity of the machine.

In addition to the information in this manual, local accident prevention regulations and national industrial safety regulations apply.

**This document is not intended for end customers! The safety guidelines required for end customers must be incorporated into the operating instructions for end customers in the respective national language by the machine manufacturer or system provider.**

## 1.3 Safety

This chapter provides you with safety-related information about working with the product.

Safety guidelines relevant to certain phases of the product's service life have been documented in the relevant chapters in this manual.

**Organization of safety notices**

Safety notices in this manual are organized as follows:

| Safety notice | Description |
|---|---|
| **Danger!** | Failure to observe these safety guidelines and notices can result in death. |
| **Warning!** | Failure to observe these safety guidelines and notices can result in severe injury or substantial damage to property. |
| **Caution!** | Failure to observe these safety guidelines and notices can result in injury or damage to property. |
| **Note:** | These instructions are important for avoiding malfunctions. |

### 1.3.2 Intended use

B&R motors and gear motors are components designed for installation in electrical systems or machines. They were designed, developed and manufactured for general industrial use. They are intended to be operated in covered rooms and under normal climatic conditions, which is usually the case in modern production halls. When used in residential areas, commercial areas or small businesses, additional filtering measures are required or must be provided by the user. Only operate the motor with B&R drive systems.

Use in accordance with the intended purpose is prohibited until:

- It has been determined that the machine complies with the provisions of EC Directive 2006/42/EC (Machinery Directive) and EMC Directive 2014/30/EU.
- All values specified on the nameplate and in the user's manual (e.g. connection and ambient conditions) have been observed.

### 1.3.3 Protection against electrostatic discharge

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

#### 1.3.3.1 Packaging

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

#### 1.3.3.2 Guidelines for proper ESD handling

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

### 1.3.4 Reasonably foreseeable misuse

Use of this product in areas with fatal risks or dangers is prohibited!

## Danger!

**Severe personal injury and damage to property due to failure!**

**When used without ensuring exceptionally high safety measures, death, injury, severe physical impairments or other serious losses are possible.**

**Do not use the product in the following areas, as well as other areas associated with fatal risks or dangers:**

- **Explosive areas**
- **Monitoring nuclear reactions in nuclear power plants**
- **Flight control systems and air traffic control**
- **Controlling mass transport systems**
- **Medical life support systems**
- **Controlling weapons systems**

**In special cases – use in non-commercial installations – with additional requirements (e.g. protection of children's fingers), these requirements must be satisfied during setup on the system side.**

### 1.3.5 General sources of danger

**Tampering of protection or safety devices**

Protective and/or safety devices protect you and other persons from dangerous voltage, rotating or moving elements and hot surfaces.

## Danger!

**Personal injury and damage to property due to tampering of protective equipment!**

**If protective or safety devices are removed or put out of operation, there is no longer any personal protection and serious personal injury and damage to property can occur.**

- **Do not remove any safety devices.**
- **Do not put any safety devices out of operation.**
- **Always use all safety devices also for temporary testing and trial operations!**

**Dangerous voltage**

To operate the motors, dangerous voltage must be applied to certain parts.

## Danger!

**Risk of injury due to electric shock!**

**If live parts are touched, there is immediate danger of fatal electric shock.**

**If connections are connected or disconnected in the incorrect order or when the power is switched on, electric arcs can occur and persons and contacts can be damaged.**

**Even if the motor is not rotating or is running as a generator driven externally, the control and power connections can still carry voltage!**

- **Never touch connections when the power is switched on.**
- **Never disconnect or connect electrical connections to the motor and servo drive when the power is switched on!**
- **Do not stay in the danger zone during operation and secure it against access by unauthorized persons.**
- **Always operate the motor with all safety equipment. Do this also for temporary testing and trial operations!**
- **Keep all covers and control cabinet doors closed during operation and as long as the machine is not disconnected from the mains.**
- **Before working on motors, gearboxes or servo drives or in the danger zone of your machine, disconnect them completely from the mains and secure them against being switched on again by other persons or automatic systems.**
- **Note the discharge time of any existing DC bus.**
- **Only connect measuring instruments when the power is switched off!**

### Danger due to electromagnetic fields

Electromagnetic fields are generated by the operation of electrical power engineering equipment such as transformers, drives and motors.

## Danger!

**Danger to health due to electromagnetic fields!**

**The functionality of a heart pacemaker can be impaired by electromagnetic fields to such an extent that the wearer experiences harm to his or her health, possibly with a fatal outcome.**

- **Observe relevant national health and safety regulations.**
- **Persons with pacemakers are not allowed to be in endangered areas.**
- **Warn staff by providing information, warnings and safety identification.**
- **Secure the danger zone by means of barriers.**
- **Ensure that electromagnetic fields are reduced at their source (using shields, for example).**

### Dangerous motion

By rotating and positioning motions of the motors, machine elements are moved or driven and loads conveyed.

After switching on the machine, movements of the motor shaft must always be expected! For this reason, higher-level protective measures must be put in place to ensure that personnel and the machine are protected. This type of protection can be achieved, for example, by using stable mechanical protective equipment such as protective covers, protective fences, protective gates or photoelectric sensors.

In the immediate vicinity of the machine, provide sufficient and easily accessible emergency switching-off devices to stop the machine as quickly as possible in the event of an accident.

## Danger!

**Danger of injury due to rotating or moving elements and loads!**

**By rotating or moving elements, body parts can be drawn in or severed or subjected to impacts.**

- **Do not stay in the danger zone during operation and secure it against access by unauthorized persons.**
- **Before working on the machine, secure it against unwanted movements. A holding brake is not suitable for this!**
- **Keep all covers and control cabinet doors closed during operation and as long as the machine is not disconnected from the mains.**
- **Always operate the motor with all safety equipment. Do this also for temporary testing and trial operations!**
- **Motors can be started automatically via remote control! If appropriate, a corresponding warning symbol must be applied, and protective measures must be implemented to prevent entry into the high-risk area!**

## Warning!

**Danger of injury due to incorrect control or a defect!**

**Improper control of motors or a defect can result in injuries and unintended and hazardous movements of motors.**

**Such incorrect behavior can be triggered by:**

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

**Risk due to hot surfaces**

Due to the power dissipation from the motor and friction in the gearbox, these components as well as their environment can reach a temperature of more than 100°C.

The resulting heat is released to the environment via the housing and the flange.

## Warning!

**Risk of burns due to hot surfaces!**

**Touching hot surfaces (e.g. motor and gearbox housings, as well as connected components), can result in very severe burns due to the very high temperature of these parts.**

- **Do not stay in the danger zone during operation and secure it against access by unauthorized persons.**
- **Never touch the motor or gearbox housing as well as adjacent surfaces during nominal load operation.**
- **Be aware of hot surfaces also during standstill.**
- **Allow the motor and gearbox to cool down sufficiently before working on them; there remains the risk of burns for a long period of time after they are switched off.**
- **Always operate the motor or gearbox with all safety devices. Do this also for temporary testing and trial operations!**

### 1.3.6 Provisions and safety guidelines

To ensure proper commissioning and safe operation, be sure to observe the following:

- General safety regulations
- The applicable work safety regulations
- National accident prevention regulations (e.g. VBG 4) for working with high-voltage systems

- National, local and plant-specific regulations for your end product
- Relevant regulations for electrical installations (e.g. line cross section, fuses, protective conductor connection). The values provided in chapter "Technical data" must also be taken into account here.

The operator is solely responsible for these and all other regulations applicable at the place of use!

### 1.3.7 Responsibility of the operator

The operator is the person who uses the motor for commercial purposes or who provides it for use by a 3rd party while carrying legal product responsibility for the protection of the user, personnel or other 3rd parties.

**Obligations of the operator**

- Applicable industrial safety regulations must be observed.
- National, local and plant-specific regulations must be observed.
- A risk assessment must identify hazards that can arise due to on-site working conditions.
- Documentation including safety guidelines must be prepared for operating the finished system (with motors, gearboxes, servo drives, etc.).
- Whether the applicable operating instructions and manuals correspond to current rules and standards must be checked regularly.
- Responsibilities for installation, operation, fault correction, maintenance and cleaning must be clearly regulated and defined.
- It must be ensured that responsible personnel have read and understood this user's manual.
- Personnel must receive training on a regular basis and be informed of hazards.
- Personnel must be provided with the required protective equipment.

### 1.3.8 Qualified personnel

All tasks such as the transport, installation, commissioning and servicing of devices are only permitted to be carried out by qualified personnel. Qualified personnel are those familiar with the transport, mounting, installation, commissioning and operation of devices who also have the appropriate qualifications to perform these tasks (e.g. IEC 60364). National accident prevention regulations must be observed.

The safety guidelines, information about connection conditions (nameplate and documentation) and limit values specified in the technical data must be read carefully before installation and commissioning and must be strictly observed.

### 1.3.9 Protective equipment

Always wear suitable safety clothing and equipment for your personal protection.

## 1.4 80MP stepper motors

B&R stepper motors are distinguished by the following properties:

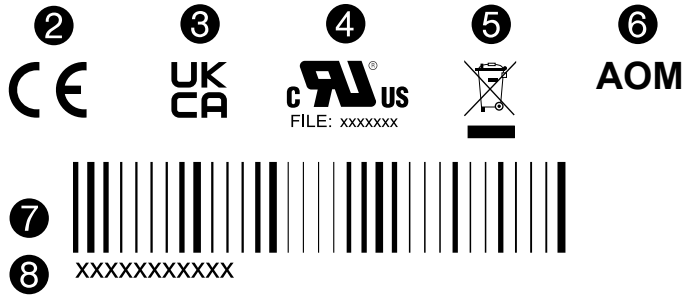
- High torque
- High overload capability
- Cost-effective encoder options
- Parallel and serial operation
- Optional IP65 protection
- Optional holding brake

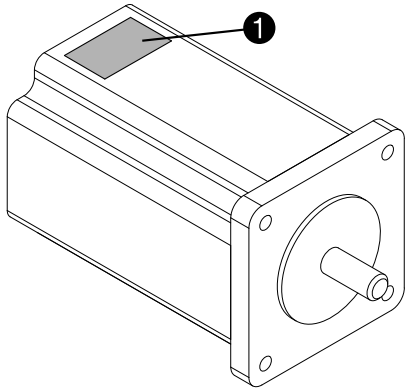
### 1.4.1 Nameplate

The nameplate clearly identifies each motor. The serial number ensures traceability.

The nameplate adhesive label depends on the motor type, is attached to the stepper motor housing and may include the following content:

| | |
|---|---|
| **1** | Nameplate |
| **2** | CE marking [1] |
| **3** | UKCA marking (UK Conformity Assessed) [1] |
| **4** | UL Recognized Component mark (80MPH only) [1] |
| **5** | WEEE mark |
| **6** | AOM = Air over motor [2] |
| **7** | Serial number as a barcode (Code 128) |
| **8** | 11-digit serial number |
| Additional information without a figure: Technical data, manufacturer, revision, production date | |




Position of nameplate

1) see "Chapter "Standards and certifications"" on page 106
2) see "Mounting type and cooling" on page 93

## Information:

**The nameplate should be visible at all times in installed state.**

# 2 System overview

## 2.1 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.

## 2.2 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.

## 2.3 Selecting the proper motor

When selecting a motor, parameters such as concentricity, counter EMF, efficiency, resonance frequencies, etc. must be considered.

Using series-wired stepper motors is preferred because of the corresponding thermal conditions.

## 2.4 Detent torque 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 stepping 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 concentric properties and reduces potential problems with resonance.

## 2.5 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 by using position feedback. This is why all B&R stepper motors are also available in affordable encoder variations, which achieve a resolution of up to 16 bits. This makes repeat accuracy possible with angle deviations less than 0.1°, even when the load torque changes.

## 2.6 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.

## 2.7 Documentation

All stepper motors offered by B&R have been 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, concentricity 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.

## 2.8 Quality features

The aluminum housing used on the new 80MPH motors (NEMA 34, flange size 87.1 mm) 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.

## 2.9 Extensive stepper motor control

| | X20DS1119 | X20DS1319 | X20SM1426 | X20SM1436 | X67SM2436 | X67SM4320 | ACOPOSmicro |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Channels | 1 | | 1 | | 2 | 4 | 1/2 |
| Current | Direction/frequency | | 1 A | 3 A | 3 A | 1 A | 10 A |
| Voltage | 5 V | 24 V | 24 | 24 to 39 V ±25% | 24 to 39 V ±25% | 24 V | 24 to 64 V ±25% |
| Encoder | 1x incremental encoder<br>1x SSI encoder | | 1x incremental encoder | | 2x incremen-tal encoder | - | Up to<br>2x incremental encoder<br>2x SSI encoder or<br>2x Hiperface encoder |
| Protection | IP20 | | IP20 | | IP67 | | IP20 |

# 3 Useful information

## 3.1 Torque characteristics and stepping angle of a stepper motor

**Holding torque:** Torque that the stepper motor can hold without continuous rotation of the rotor.

**Torque (stall torque):** Maximum torque that the motor can apply at standstill (or starting from standstill).

### 3.1.1 Full-step mode

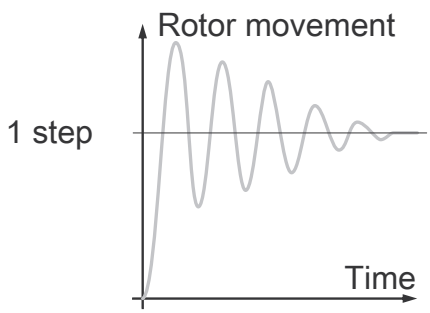
> **Information:**
>
> **In full-step mode, a step corresponds to 1.8°.**

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.

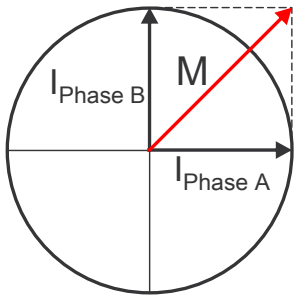
One additional significant disadvantage of full-step mode with maximum phase current is the increased dissipation loss of approximately 50% that leads to a higher motor temperature and a reduction in the motor's service life.

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.

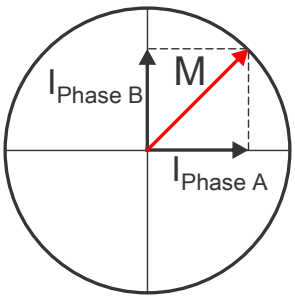
> **Information:**
>
> **In general, full-step mode is possible with the power amplifiers offered by B&R, but due to the disadvantages listed above it is not recommended.**




Transient effect for full step




Full step position without current reduction



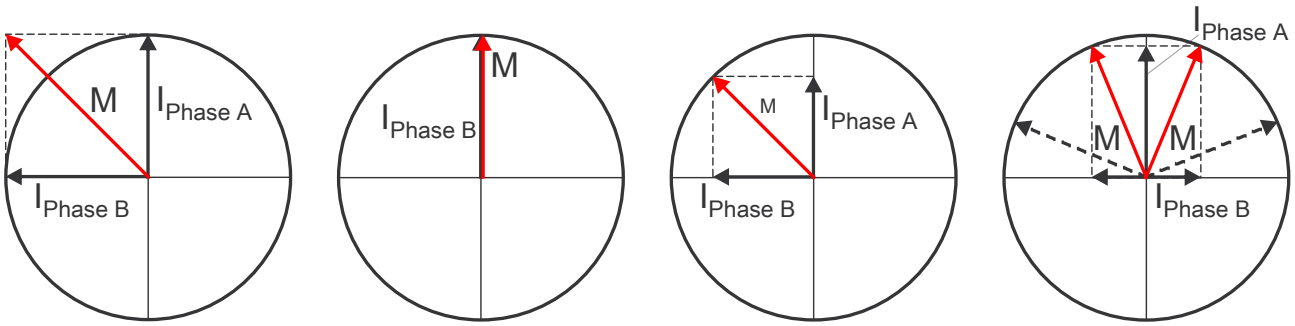

Full step position with current reduction

### 3.1.2 Half-step mode

> **Note:**
>
> **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 power the windings.

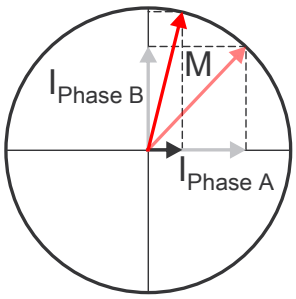
1) The drive alternates between two windings on (supplied with current) and a single winding on. In this variant, it is important that current is reduced in the full-step position; otherwise, an unbalanced torque curve results that can cause torque fluctuations that bring about resonance.
2) Both windings 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.




Full-step position without current reduction | Half-step position | Full step position with current reduction | Half-step position with 22.5° vector

### 3.1.3 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.




Microstep mode

# 4 Technical data

## 4.1 General overview

### 80MPD (flange size 56.4 mm, NEMA 23, flat-sided shaft)

| Order number[1] | Encoder | IPXX [3] | | | | Length [mm] | Max. surface temperature [°C] [4] | Technical data Page | Torque curve | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 20 | 30 | 40 | 65 | | | | Page | Curve number / Connection |
| 80MPD1.300S000-01 [2] | --- | | ● | | | 45 | 100 | 26 | 70 | 80MPD1.300xxxx-xx / Series 3 A |
| | --- | | ● | | | 45 | 100 | | 70 | 80MPD1.600xxxx-xx / Parallel 6 A |
| 80MPD1.300S014-01 | ABR | ● | F | | | 66 | 95 | 35 | 70 | 80MPD1.300xxxx-xx / Series 3 A |
| 80MPD1.600S014-01 | ABR | ● | F | | | 66 | 95 | | 70 | 80MPD1.600xxxx-xx / Parallel 6 A |
| 80MPD3.300S000-01 [2] | --- | | ● | | | 57.5 | 100 | 26 | 72 | 80MPD3.300xxxx.xx / Series 3 A |
| | --- | | ● | | | 57.5 | 100 | | 72 | 80MPD3.600xxxx.xx / Parallel 6 A |
| 80MPD3.300S014-01 | ABR | ● | F | | | 78.5 | 95 | 35 | 72 | 80MPD3.300xxxx.xx / Series 3 A |
| 80MPD3.600S014-01 | ABR | ● | F | | | 78.5 | 95 | | 72 | 80MPD3.600xxxx.xx / Parallel 6 A |
| 80MPD5.300S000-01 [2] | --- | | ● | | | 80.5 | 100 | 26 | 74 | 80MPD5.300xxxx-xx / Series 3 A |
| | --- | | ● | | | 80.5 | 100 | | 74 | 80MPD5.600xxxx-xx / Parallel 6 A |
| 80MPD5.300S014-01 | ABR | ● | F | | | 101.5 | 95 | 35 | 74 | 80MPD5.300xxxx-xx / Series 3 A |
| 80MPD5.600S014-01 | ABR | ● | F | | | 101.5 | 95 | | 74 | 80MPD5.600xxxx-xx / Parallel 6 A |

1) For an explanation of order numbers, see "80MP - Order key" on page 20.
2) The stepper motors without an encoder can be wired in either series or parallel. The model numbers for the basic motors are therefore, for logistical reasons, derived from the series connection.
3) The degree of protection of the stepper motors is divided into two ranges. It is therefore possible that motors on the flange (face of the screw-on flange and motor shaft) have a lower degree of protection. The letter **F** means that the flange has a different degree of protection than the motor from the flange, see "Degree of protection / Optional holding brake (ee)" on page 22.
4) Maximum surface temperature, see "Mounting type and cooling" on page 93.

### 80MPF (flange size 60 mm, flat-sided shaft)

| Order number[1] | Encoder / Holding brake | IPXX [3] | | | | Length [mm] | Max. temp. [°C] [4] | Technical data Page | Torque curve | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 20 | 30 | 40 | 65 | | | | Page | Curve number / Connection |
| 80MPF1.250S000-01 [2] | --- | | ● | | | 51.8 | 100 | 29 | 76 | 80MPF1.250xxxx-xx / Series 2.5 A |
| | --- | | ● | | | 51.8 | 100 | | 76 | 80MPF1.500xxxx-xx / Parallel 5 A |
| 80MPF1.250D114-01 | ABR and holding brake | | F | | ● | 142.9 | 90 | 55 | 76 | 80MPF1.250xxxx-xx / Series 2.5 A |
| 80MPF1.250S114-01 | ABR | | F | | ● | 97.1 | 95 | 41 | | |
| 80MPF1.500D114-01 | ABR and holding brake | | F | | ● | 142.9 | 90 | 55 | 76 | 80MPF1.500xxxx-xx / Parallel 5 A |
| 80MPF1.500S114-01 | ABR | | F | | ● | 97.1 | 95 | 41 | | |
| 80MPF3.250S000-01 [2] | --- | | ● | | | 62 | 100 | 29 | 77 | 80MPF3.250xxxx-xx / Series 2.5 A |
| | --- | | ● | | | 62 | 100 | | 77 | 80MPF3.500xxxx-xx / Parallel 5 A |
| 80MPF3.250D114-01 | ABR and holding brake | | F | | ● | 153.1 | 90 | 55 | 77 | 80MPF3.250xxxx-xx / Series 2.5 A |
| 80MPF3.250S114-01 | ABR | | F | | ● | 107.3 | 95 | 41 | | |
| 80MPF3.500D114-01 | ABR and holding brake | | F | | ● | 153.1 | 90 | 55 | 77 | 80MPF3.500xxxx-xx / Parallel 5 A |
| 80MPF3.500S114-01 | ABR | | F | | ● | 107.3 | 95 | 41 | | |
| 80MPF5.250S000-01 [2] | --- | | ● | | | 93.3 | 100 | 29 | 78 | 80MPF5.250xxxx-xx / Series 2.5 A |
| | --- | | ● | | | 93.3 | 100 | | 78 | 80MPF5.500xxxx-xx / Parallel 5 A |
| 80MPF5.250S113-01 | SSI | | F | | ● | 138.6 | 95 | 47 | 78 | 80MPF5.250xxxx-xx / Series 2.5 A |
| 80MPF5.250D114-01 | ABR and holding brake | | F | | ● | 184.4 | 90 | 55 | | |
| 80MPF5.250S114-01 | ABR | | F | | ● | 138.6 | 95 | 41 | | |
| 80MPF5.500D113-01 | SSI and holding brake | | F | | ● | 184.4 | 90 | 62 | 78 | 80MPF5.500xxxx-xx / Parallel 5 A |
| 80MPF5.500S113-01 | SSI | | F | | ● | 138.6 | 95 | 47 | | |
| 80MPF5.500D114-01 | ABR and holding brake | | F | | ● | 184.4 | 90 | 55 | | |
| 80MPF5.500S114-01 | ABR | | F | | ● | 138.6 | 95 | 41 | | |

1) For an explanation of order numbers, see "80MP - Order key" on page 20.
2) The stepper motors without an encoder can be wired in either series or parallel. The model numbers for the basic motors are therefore, for logistical reasons, derived from the series connection.
3) The degree of protection of the stepper motors is divided into two ranges. It is therefore possible that motors on the flange (face of the screw-on flange and motor shaft) have a lower degree of protection. The letter **F** means that the flange has a different degree of protection than the motor from the flange, see "Degree of protection / Optional holding brake (ee)" on page 22.
4) Maximum surface temperature, see "Mounting type and cooling" on page 93.

## 80MPH (flange size 87.1 mm, NEMA 34, keyed shaft)

| Order number[1] | Encoder / Holding brake | IPXX [3] | | | | Length [mm] | Max. Temperature [°C] [4] | Technical data Page | Torque curve | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 20 | 30 | 40 | 65 | | | | Page | Curve number / Connection |
| 80MPH1.300S000-01 [2] | --- | | | ● | | 66 | 100 | 32 | 80 | 80MPH1.300xxxx-xx / Series 3 A |
| | --- | | | ● | | 66 | 100 | | 80 | 80MPH1.600xxxx-xx / Parallel 6 A |
| 80MPH1.300S014-01 | ABR | ● | | F | | 87 | 95 | 36 | 80 | 80MPH1.300xxxx-xx / Series 3 A |
| 80MPH1.300D114-01 | ABR and holding brake | | | F | ● | 172.5 | 85 | 56 | | |
| 80MPH1.300S114-01 | ABR | | | F | ● | 117.5 | 95 | 42 | | |
| 80MPH1.600S014-01 | ABR | ● | | F | | 87 | 95 | 36 | 80 | 80MPH1.600xxxx-xx / Parallel 6 A |
| 80MPH1.600D114-01 | ABR and holding brake | | | F | ● | 172.5 | 85 | 56 | | |
| 80MPH1.600S114-01 | ABR | | | F | ● | 117.5 | 95 | 42 | | |
| 80MPH3.300S000-01 [2] | --- | | | ● | | 98 | 100 | 32 | 82 | 80MPH3.300xxxx-xx / Series 3 A |
| | --- | | | ● | | 98 | 100 | | 82 | 80MPH3.600xxxx-xx / Parallel 6 A |
| 80MPH3.300S014-01 | ABR | ● | | F | | 119 | 95 | 36 | 82 | 80MPH3.300xxxx-xx / Series 3 A |
| 80MPH3.300S114-01 | ABR | | | F | ● | 149.5 | 95 | | 82 | 80MPH3.300xxxx-xx / serial 3 A |
| 80MPH3.600S014-01 | ABR | ● | | F | | 119 | 95 | 36 | 82 | 80MPH3.600xxxx-xx / Parallel 6 A |
| 80MPH3.600D114-01 | ABR and holding brake | | | F | ● | 204.5 | 85 | 56 | | |
| 80MPH3.600S114-01 | ABR | | | F | ● | 149.5 | 95 | 42 | | |
| 80MPH4.101S014-01 | ABR | ● | | F | | 119 | 95 | 37 | 86 | 80MPH4.101xxxx-xx / Parallel 10 A |
| 80MPH4.101D114-01 | ABR and holding brake | | | F | ● | 204.5 | 85 | 56 | | |
| 80MPH4.101S114-01 | ABR | | | F | ● | 149.5 | 95 | 42 | | |
| 80MPH4.300S000-01 | --- | | | ● | | 98 | 100 | 32 | 84 | 80MPH4.300xxxx-xx / Series 3 A |
| | --- | | | ● | | 98 | 100 | | 84 | 80MPH4.600xxxx-xx / Parallel 6 A |
| 80MPH4.300S014-01 | ABR | ● | | F | | 119 | 95 | 37 | 84 | 80MPH4.300xxxx-xx / Series 3 A |
| 80MPH4.300S114-01 | ABR | | | F | ● | 149.5 | 95 | 43 | | |
| 80MPH4.500S000-01 [2] | --- | | | ● | | 98 | 100 | 32 | 86 | 80MPH4.500xxxx-xx / Series 5 A |
| | --- | | | ● | | 98 | 100 | | 86 | 80MPH4.101xxxx-xx / Parallel 10 A |
| 80MPH4.500S014-01 | ABR | ● | | F | | 119 | 95 | 37 | 86 | 80MPH4.500xxxx-xx / Series 5 A |
| 80MPH4.500S114-01 | ABR | | | F | ● | 149.5 | 95 | 43 | | |
| 80MPH4.600S014-01 | ABR | ● | | F | | 119 | 95 | 37 | 84 | 80MPH4.600xxxx-xx / Parallel 6 A |
| 80MPH4.600S111-02 | HIPERFACE | | | F | ● | 128.5 | 95 | 51 | | |
| 80MPH4.600D114-01 | ABR and holding brake | | | F | ● | 204.5 | 85 | 56 | | |
| 80MPH4.600S114-01 | ABR | | | F | ● | 149.5 | 95 | 43 | | |
| 80MPH6.101S000-01 [2] | --- | | | ● | | 130 | 100 | 32 | 90 | 80MPH6.101xxxx-xx / Parallel 10 A |
| 80MPH6.101S014-01 | ABR | ● | | F | | 151 | 95 | 37 | | |
| 80MPH6.101S100-01 | --- | | | F | | 160.5 | 100 | 67 | | |
| 80MPH6.101D114-01 | ABR and holding brake | | | F | ● | 236.5 | 85 | 56 | | |
| 80MPH6.101S114-01 | ABR | | | F | ● | 181.5 | 95 | 43 | | |
| 80MPH6.300S000-01 [2] | --- | | | ● | | 130 | 100 | 32 | 88 | 80MPH6.300xxxx-xx / Series 3 A |
| | --- | | | ● | | 130 | 100 | | 88 | 80MPH6.600xxxx-xx / Parallel 6 A |
| 80MPH6.300S014-01 | ABR | ● | | F | | 151 | 95 | 37 | 88 | 80MPH6.300xxxx-xx / Series 3 A |
| 80MPH6.300D114-01 | ABR and holding brake | | | F | ● | 236.5 | 85 | 56 | | |
| 80MPH6.300S114-01 | ABR | | | F | ● | 181.5 | 95 | 43 | | |
| 80MPH6.600S014-01 | ABR | ● | | F | | 151 | 95 | 37 | 88 | 80MPH6.600xxxx-xx / Parallel 6 A |
| 80MPH6.600D114-01 | ABR and holding brake | | | F | ● | 236.5 | 85 | 56 | | |
| 80MPH6.600S114-01 | ABR | | | F | ● | 181.5 | 95 | 43 | | |

1) For an explanation of order numbers, see "80MP - Order key" on page 20.
2) The stepper motors without an encoder can be wired in either series or parallel. The model numbers for the basic motors are therefore, for logistical reasons, derived from the series connection.
3) The degree of protection of the stepper motors is divided into two ranges. It is therefore possible that motors on the flange (face of the screw-on flange and motor shaft) have a lower degree of protection. The letter **F** means that the flange has a different degree of protection than the motor from the flange, see "Degree of protection / Optional holding brake (ee)" on page 22.
4) Maximum surface temperature, see "Mounting type and cooling" on page 93.

## 4.2 80MP - Order key

| 80MP | a | b | . | cc | d | ee | ff | - | hh |
|---|---|---|---|---|---|---|---|---|---|

**Flange size**

**D** ... 56.4 mm (NEMA 23)
**F** ... 60 mm
**H** ... 87.1 mm (NEMA 34)

**Overall length** (specification for base motor without encoder / holding brake)

**1** ... 45 mm (80MPD**1**), 51.8 mm (80MPF**1**), 66 mm (80MPH**1**)
**3** ... 57.5 mm (80MPD**3**), 62 mm (80MPF**3**), 98 mm (80MPH**3**)
**4** ... 98 mm (80MPH**4**)
**5** ... 80.5 mm (80MPD**5**), 93.3 mm (80MPF**5**)
**6** ... 130 mm (80MPH**6**)

**Current** [1]

**cc** ... Current x 100 mA
Example: Code 30 corresponds to 3,000 mA = 3 A

**Current multiplier** [1]

**d** ... $10^d$
Example: cc = 10, d = 1
10 x 100 mA x $10^1$ = 10,000 mA = 10 A

**Degree of protection / Optional holding brake**

**S0** ... Standard
**S1** ... IP65
**D1** ... IP65 and holding brake

**Motor encoder system**

**00** ... No encoder
**11** ... HIPERFACE
**13** ... SSI absolute encoder
**14** ... ABR incremental encoder

**Motor version**

**01** ... Motor version 01
**02** ... Motor version 02
The currently valid motor version can be seen in the CAD configurator.

1) With 8-wire motors (**eeff** = S000), the user can use the wiring to determine whether the stepper motor is operated in a serial or parallel connection. Specification **ccd** in the order number corresponds to the current specification for serial wiring for these motors. If the 8-wire motor is operated in a parallel connection, current specification **ccd** of the order number must be doubled.

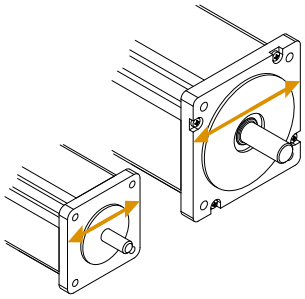
The use of serially wired stepper motors (2.5 A, 3 A and 5 A) is preferable for thermal reasons.

## Note:

**Order keys only provide information about possible combinations in exceptional cases. Information about possible combinations is available in the CAD configurator (cad.br-automation.com).**

## 4.3 Flange size (a)

| 80MP | a | b | . | cc | d | ee | ff | - | hh |
|---|---|---|---|---|---|---|---|---|---|



Stepper motors 80MP are available in different sizes (D, F and H). These differ in dimensions (especially flange dimensions) and power data.

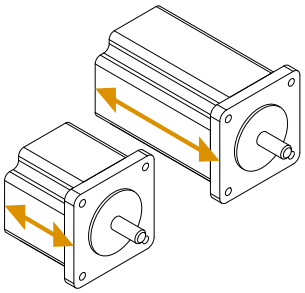
The sizes are differentiated by a code (**a**) in the order number.

### Overview

| | Available sizes | | |
|---|---|---|---|
| **Order code (a)** | **D** | **F** | **H** |
| Motor | 80MPD | 80MPF | 80MPH |
| **Flange size** | 56.4 mm (NEMA 23) | 60 mm | 87.1 mm (NEMA 34) |
| 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 |
| Degree of protection (IPXX) | see "Degree of protection / Optional holding brake (ee)" on page 22 | | |
| Shaft type | Flat-sided shaft (D-cut) | | Keyed shaft (ANSI 4.1) |
| Standard motor (technical data) | see "Motor (M)" on page 25 | see "Motor (M)" on page 28 | see "Motor (M)" on page 31 |

## 4.4 Length (b)

| 80MP | a | b | . | cc | d | ee | ff | - | hh |
|---|---|---|---|---|---|---|---|---|---|



80MP stepper motors are available in various lengths. These differ in the power data with identical flange dimensions.

The lengths are differentiated by a code (**b**) in the order number.

The specified lengths refer in each case to the standard motor without an encoder and without a holding brake.

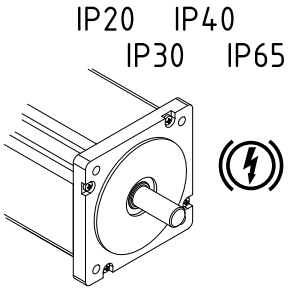
### Overview

| | Available lengths | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Order code (b)** | **1** | | | **3** | | | **4** | **5** | | **6** |
| Motor | 80MPD1 | 80MPF1 | 80MPH1 | 80MPD3 | 80MPF3 | 80MPH3 | 80MPH4 | 80MPD5 | 80MPF5 | 80MPH6 |
| Length [mm] **Standard motor**[1] | 45 | 51.8 | 66 | 57.5 | 62 | 98 | 98 | 80.5 | 93.3 | 130 |
| Other lengths | see "General overview" on page 18 | | | | | | | | | |

1) The specified lengths refer in each case to the standard motor without an encoder and without a holding brake.

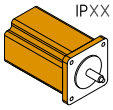
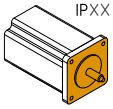
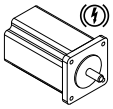
## 4.5 Degree of protection / Optional holding brake (ee)

| 80MP | a | b | . | cc | d | ee | ff | - | hh |
|---|---|---|---|---|---|---|---|---|---|



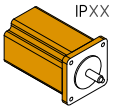

80MP stepper motors are available in different protection classes (from IP20 to IP65) and with optional holding brake.

The protection class and holding brake are specified by a code (**ee**) in the order number.

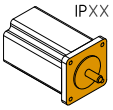
| | Degrees of protection / Optional holding brake | | |
|---|---|---|---|
| **Order code (ee)** | **S0** | **S1** | **D1** |
| Degree of protection **from flange**   | IP20, IP30 or IP40<br>see "General overview" on page 18<br><br>IP65 is available as an accessory for "S0":<br>see "IP extension / Higher degree of protection for standard motors" on page 109<br>(only possible for 80MPxx.xxxS000-01 standard motors) | IP65 | IP65 |
| Degree of protection for **flange**   | Front-side of screw-on flange and motor shaft:<br>Corresponding to the respective standard motor **without encoder**<br>80MPD = IP54<br>80MPF = IP54<br>80MPH = IP54 | | |
| Holding brake  | --- | --- | Yes |
| Availability | see "General overview" on page 18 | | |

### Degree of protection

Motor from flange



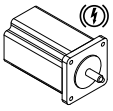

Flange




The degree of protection of the stepper motors is divided into two ranges.

It is therefore possible that motors on the flange (face of the screw-on flange and motor shaft) have a lower degree of protection.

### Holding brake



The holding brake is a permanent magnet brake and can be controlled by the B&R drive system. Based on principle, this type of holding brake exhibits a minimal amount of backlash. Voltage (see the technical data) is required to release the brake.

The brake is designed as a holding brake. It not permitted to be used for operational braking! Under these conditions, the brake has a service life of approximately 5,000,000 cycles (opening and closing the brake is one cycle). Loaded braking during an emergency stop is permitted but reduces its service life.

## Information:

**The required brake holding torque is determined based on the actual load torque. It is recommended by the brake manufacturer to take into account a safety factor of 2.**

## Warning!

**The holding brake is not intended for normal braking. The holding brake does not provide protection for personnel. The maximum motor torque far exceeds the holding torque for the brake.**

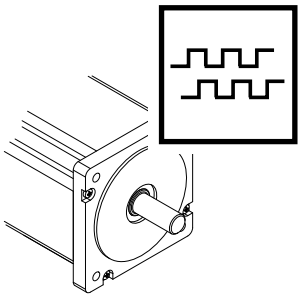
| Availability | 80MPD | 80MPF | 80MPH |
|---|---|---|---|
| **Holding brake** | --- | Yes | Yes |
| Braking torque[1] | --- | 1.5 - 2.0 Nm | 7.5 - 9.0 Nm |
| Combinable encoders | --- | ABR incremental encoders<br>or<br>SSI absolute encoder | ABR incremental encoders |
| Technical data | --- | see "Motor (M)" on page 53<br>see "Motor (M)" on page 61 | see "Motor (M)" on page 53 |

1) Braking torque $M_{2N}$ / Mean dynamic braking torque 20°C / M stat. at 100°C

For the exact values for the respective motors, see the technical data.

## 4.6 Motor encoder system (ff)

| 80MP | a | b | . | cc | d | ee | ff | - | hh |
|---|---|---|---|---|---|---|---|---|---|



80MP stepper motors are available both without an encoder (standard motor) and with the following motor encoders:

- 10-bit ABR incremental encoder
- 12-bit SSI encoder
- 16-bit HIPERFACE encoder

The motor encoder system is specified as part of the order number in the form of a 2-digit code (**ff**).

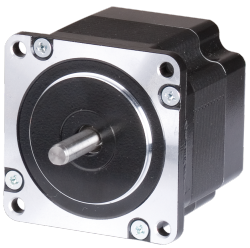
Availability: see "General overview" on page 18

# 5 Stepper motors without options

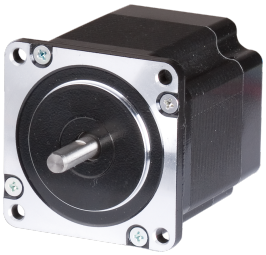
This chapter describes stepper motors without any options installed (standard motors). The stepper motors with options can be found in chapter 6 "Stepper motors with additional options" on page 34.

## 5.1 Basic motors 80MPD (NEMA 23, flange size 56.4 mm)

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



80MPD1.300S000-01

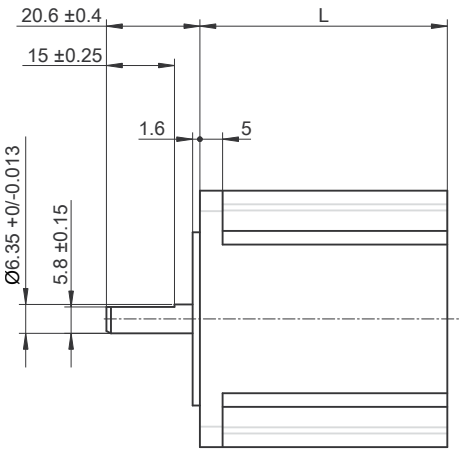


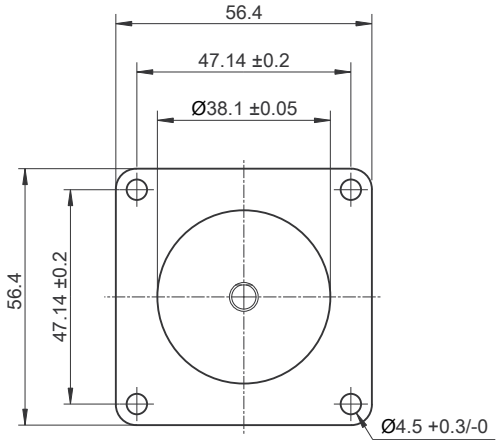
80MPD3.300S000-01

80MPD5.300S000-01

| Order number | Short description |
|---|---|
| | **Stepper motors without encoder** |
| 80MPD1.300S000-01 | 2-phase hybrid stepper motor, 56.4 mm flange, length 45 mm, 3 A serial / 6 A parallel, 1.1 Nm holding torque, 0.8 Nm stall torque |
| 80MPD3.300S000-01 | 2-phase hybrid stepper motor, 56.4 mm flange, length 57.5 mm, 3 A serial / 6 A parallel, 1.8 Nm holding torque, 1.25 Nm stall torque |
| 80MPD5.300S000-01 | 2-phase hybrid stepper motor, 56.4 mm flange, length 80.5 mm, 3 A serial / 6 A parallel, 3.0 Nm holding torque, 2.2 Nm stall torque |
| | **Optional accessories** |
| | **Accessories** |
| 80XMPDXRE.W1-10 | IP expansion and wiring clamp for stepper motors in the 80MPD and 80MPF series, IP65 for 80MPD motors and 80MPF motors, 10 units per package |

### 5.1.1 Dimensions




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

## 5.1.2 Technical data

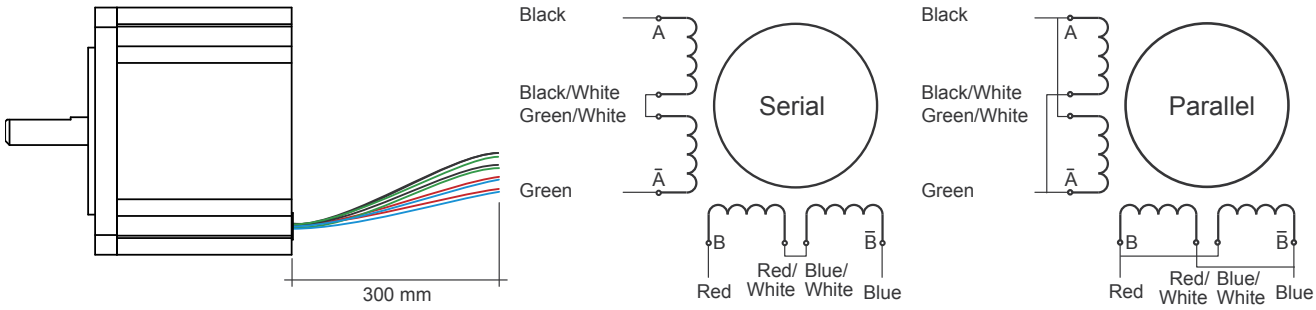
### Basic motors 80MPD (NEMA 23, flange size 56.4 mm)

| Order number | 80MPD1.300S000-01 | 80MPD3.300S000-01 | 80MPD5.300S000-01 |
|---|---|---|---|
| **Short description** | | | |
| Stepper motor | Stepper motor flange size 56.4 mm, length 45 mm | Stepper motor flange size 56.4 mm, length 57.5 mm | Stepper motor flange size 56.4 mm, length 80.5 mm |
| **General information** | | | |
| Certifications | | | |
| CE | | Yes | |
| UKCA | | Yes | |
| **Specific motor data** | | | |
| Wiring | | | |
| Serial | | True | |
| Parallel | | True | |
| Current | | | |
| Series wiring | | 3 A | |
| Parallel wiring | | 6 A | |
| Resistance/Phase | | | |
| Series wiring | 1.2 Ω | 1.6 Ω | 2.4 Ω |
| Parallel wiring | 0.3 Ω | 0.4 Ω | 0.6 Ω |
| Inductance/Phase | | | |
| Series wiring | 3.6 mH | 5.2 mH | 8.8 mH |
| Parallel wiring | 0.9 mH | 1.3 mH | 2.2 mH |
| Stall torque | 0.8 Nm | 1.25 Nm | 2.2 Nm |
| Holding torque [1] | 1.1 Nm | 1.8 Nm | 3.0 Nm |
| Detent torque | <30 mNm | <50 mNm | <90 mNm |
| Rotor inertia | Approx. 145 $gcm^2$ | Approx. 245 $gcm^2$ | Approx. 470 $gcm^2$ |
| **General motor data** | | | |
| Protection class | | IP30 | |
| Stepping angle | | 1.8° | |
| Max. surface temperature | | 100°C | |
| Average period of operation between failures | | 21,000 hours | |
| Cable length | | 300 mm | |
| Cable cross section | | 22 AWG, UL 3266 | |
| Shaft type | | Flat-sided shaft (D-cut) | |
| Insulation class | | B (130°C) | |
| Insulation resistance | | 100 MΩ min. 500 VDC | |
| Dielectric resistance | | 500 VAC for 1 minute | |
| Driver supply voltage | | Max. 80 VDC | |
| **Ambient conditions** | | | |
| Temperature | | | |
| Operation | | -20 to 40°C | |
| Storage | | -30 to 85°C | |
| Transport | | -30 to 85°C | |
| Relative humidity | | | |
| Operation | | 5 to 95%, non-condensing | |
| Storage | | 5 to 95%, non-condensing | |
| Transport | | 5 to 95%, non-condensing | |
| **Mechanical properties** | | | |
| Max. radial load [2] | | 73.5 N | |
| Max. axial load | | The permissible axial load is not permitted to be greater than the motor mass. | |
| Weight | 520 g | 720 g | 1,110 g |
| Length | 45 mm | 57.5 mm | 80.5 mm |

1) Measured with serial wiring
2) Measured in the middle of the shaft

### 5.1.3 Wiring

Standard motors can be wired either serially or in parallel.



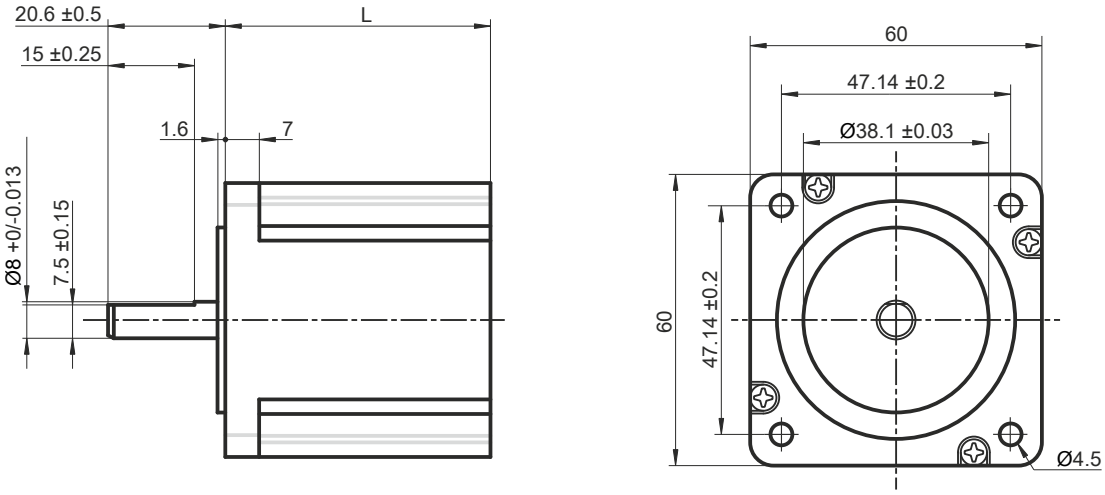
## 5.2 80MPF standard motors (flange size 60 mm)

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

80MPF1.250S000-01 80MPF3.250S000-01 80MPF5.250S000-01

| Order number | Short description |
|---|---|
| | **Stepper motors without encoder** |
| 80MPF1.250S000-01 | 2-phase hybrid stepper motor, 60 mm flange, length 51.8 mm, 2.5 A serial / 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 serial / 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 serial / 5 A parallel, 3.5 Nm holding torque, 2.5 Nm stall torque |
| | **Optional accessories** |
| | **Accessories** |
| 80XMPDXRE.W1-10 | IP expansion and wiring clamp for stepper motors in the 80MPD and 80MPF series, IP65 for 80MPD motors and 80MPF motors, 10 units per package |

### 5.2.1 Dimensions




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

## 5.2.2 Technical data

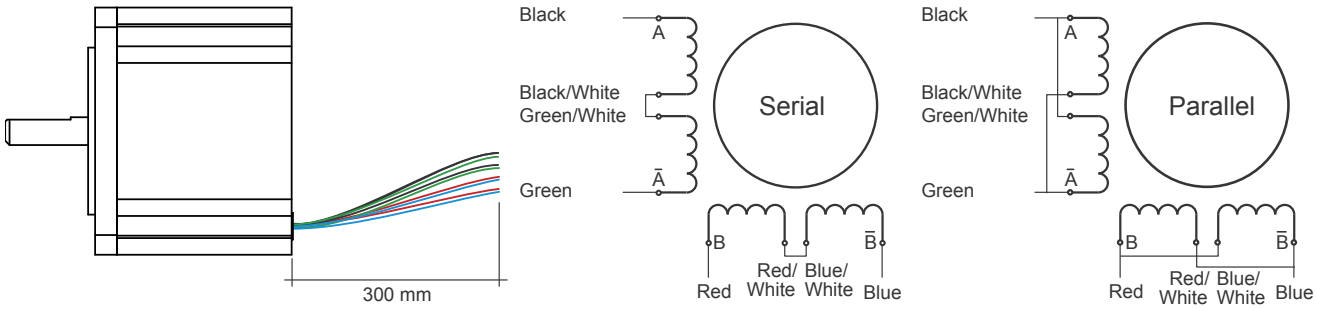
### Basic motors 80MPF (flange size 60 mm)

| Order number | 80MPF1.250S000-01 | 80MPF3.250S000-01 | 80MPF5.250S000-01 |
|---|---|---|---|
| **Short description** | | | |
| Stepper motor | Stepper motor flange size 60 mm, length 51.8 mm | Stepper motor flange size 60 mm, length 62 mm | Stepper motor flange size 60 mm, length 93.3 mm |
| **General information** | | | |
| Certifications | | | |
| CE | | Yes | |
| UKCA | | Yes | |
| **Specific motor data** | | | |
| Wiring | | | |
| Serial | | True | |
| Parallel | | True | |
| Current | | | |
| Series wiring | | 2.5 A | |
| Parallel wiring | | 5 A | |
| Resistance/Phase | | | |
| Series wiring | 1.28 Ω | 1.52 Ω | 2.4 Ω |
| Parallel wiring | 0.32 Ω | 0.38 Ω | 0.6 Ω |
| Inductance/Phase | | | |
| Series wiring | 3.4 mH | 5.6 mH | 11.2 mH |
| Parallel wiring | 0.85 mH | 1.4 mH | 2.8 mH |
| Stall torque | 0.8 Nm | 1.2 Nm | 2.5 Nm |
| Holding torque [1] | 1.1 Nm | 1.7 Nm | 3.5 Nm |
| Detent torque | <35 mNm | <45 mNm | <75 mNm |
| Rotor inertia | 280 $gcm^2$ | 440 $gcm^2$ | 920 $gcm^2$ |
| **General motor data** | | | |
| Protection class | | IP30 | |
| Stepping angle | | 1.8° | |
| Max. surface temperature | | 100°C | |
| Average period of operation between failures | | 21,000 hours | |
| Cable length | | 300 mm | |
| Cable cross section | | 22 AWG | |
| Shaft type | | Flat-sided shaft (D-cut) | |
| Insulation class | | B (130°C) | |
| Insulation resistance | | 100 MΩ min. 500 VDC | |
| Dielectric resistance | | 500 VAC for 1 minute | |
| Driver supply voltage | | Max. 80 VDC | |
| **Ambient conditions** | | | |
| Temperature | | | |
| Operation | | -20 to 40°C | |
| Storage | | -30 to 85°C | |
| Transport | | -30 to 85°C | |
| Relative humidity | | | |
| Operation | | 5 to 95%, non-condensing | |
| Storage | | 5 to 95%, non-condensing | |
| Transport | | 5 to 95%, non-condensing | |
| **Mechanical properties** | | | |
| Max. radial load [2] | | 75 N | |
| Max. axial load | | The permissible axial load is not permitted to be greater than the motor mass. | |
| Weight | 620 g | 880 g | 1,400 g |
| Length | 51.8 mm | 62 mm | 93.3 mm |

1) Measured with serial wiring
2) Measured in the middle of the shaft

### 5.2.3 Wiring

Standard motors can be wired either serially or in parallel.



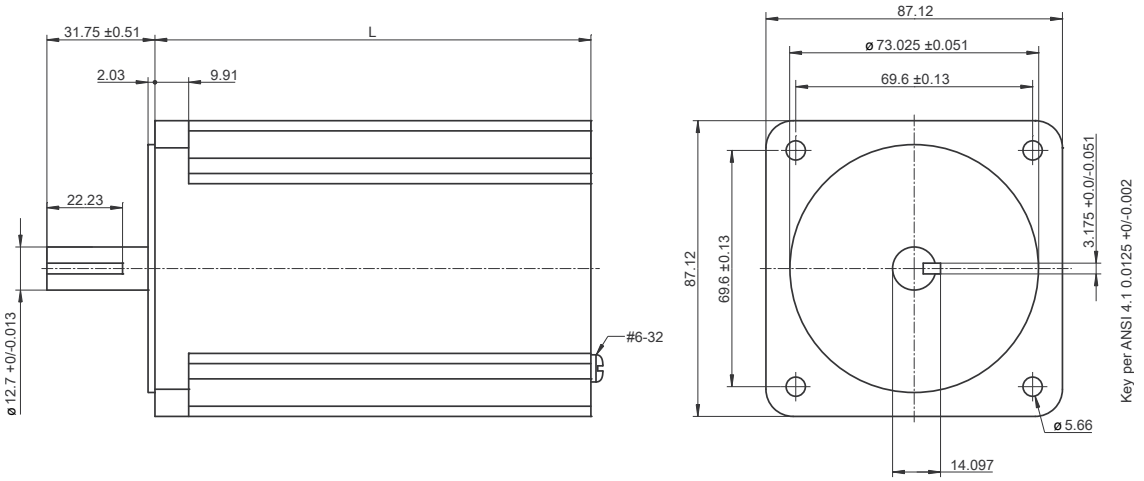
## 5.3 80MPH standard motor (NEMA 34, flange size 87.1 mm)

- 12.7 mm shaft
- 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

80MPH1.300S000-01 80MPH3.300S000-01 80MPH6.300S000-01

| Order number | Short description |
|---|---|
| | **Stepper motors without encoder** |
| 80MPH1.300S000-01 | 2-phase hybrid stepper motor, 87.1 mm flange, length 66 mm, 3 A serial / 6 A parallel, 4.0 Nm holding torque, 2.9 Nm stall torque |
| 80MPH3.300S000-01 | 2-phase hybrid stepper motor, 87.1 mm flange, length 98 mm, 3 A serial / 6 A parallel, 7.8 Nm holding torque, 5.5 Nm stall torque |
| 80MPH4.300S000-01 | 2-phase hybrid stepper motor, 87.1 mm flange, length 98 mm, 3 A serial / 6 A parallel, 9.5 Nm holding torque, 6.3 Nm stall torque |
| 80MPH4.500S000-01 | 2-phase hybrid stepper motor, 87.1 mm flange, length 98 mm, 5 A serial / 10 A parallel, 9.5 Nm holding torque, 6.3 Nm stall torque |
| 80MPH6.101S000-01 | 2-phase hybrid stepper motor, 87.1 mm flange, length 130 mm, 10 A parallel, 13.6 Nm holding torque, 9.3 Nm stall torque |
| 80MPH6.300S000-01 | 2-phase hybrid stepper motor, 87.1 mm flange, length 130 mm, 3 A serial / 6 A parallel, 13.6 Nm holding torque, 9.3 Nm stall torque |
| | **Optional accessories** |
| | **Accessories** |
| 80XMPHXRE.W1-10 | IP expansion and wiring clamp for stepper motors in the 80MPH series, IP65, 10 units per package |

### 5.3.1 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 |

## 5.3.2 Technical data

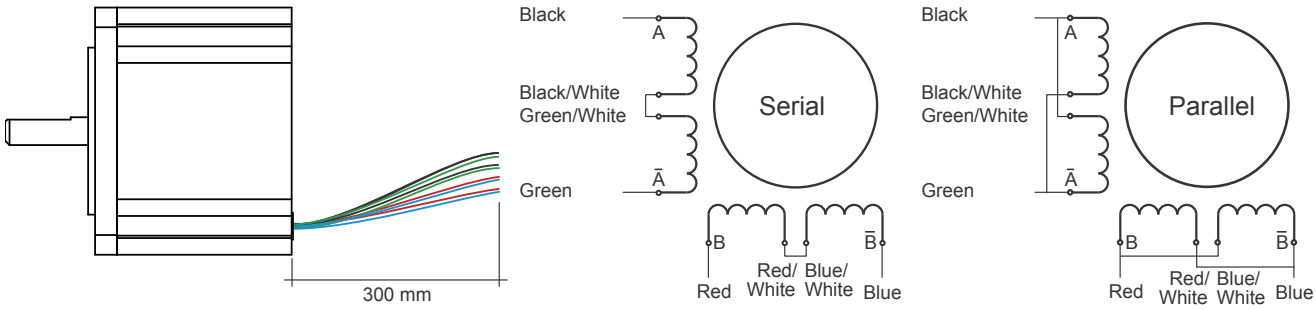
### Basic motors 80MPH (NEMA 34, flange size 87.1 mm)

| Order number | 80MPH1. 300S000-01 | 80MPH3. 300S000-01 | 80MPH4. 300S000-01 | 80MPH4. 500S000-01 | 80MPH6. 101S000-01 | 80MPH6. 300S000-01 |
|---|---|---|---|---|---|---|
| **Short description** | | | | | | |
| Stepper motor | Stepper motor flange size 87.1 mm, length 66 mm | Stepper motor flange size 87.1 mm, length 98 mm | | | Stepper motor flange size 87.1 mm, length 130 mm | |
| **General information** | | | | | | |
| Certifications | | | | | | |
| CE | Yes | | | | | |
| UKCA | Yes | | | | | |
| **Specific motor data** | | | | | | |
| Wiring | | | | | | |
| Serial | True | | | | False | True |
| Parallel | True | | | | | |
| Current | | | | | | |
| Series wiring | 3 A | | | 5 A | - | 3 A |
| Parallel wiring | 6 A | | | 10 A | | 6 A |
| Resistance/Phase | | | | | | |
| Series wiring | 1.7 Ω | 2.2 Ω | | 0.9 Ω | - | 2.7 Ω |
| Parallel wiring | 0.4 Ω | 0.6 Ω | | 0.2 Ω | 0.24 Ω | 0.7 Ω |
| Inductance/Phase | | | | | | |
| Series wiring | 12.9 mH | 17.3 mH | | 5.6 mH | - | 20.0 mH |
| Parallel wiring | 3.2 mH | 4.3 mH | | 1.4 mH | 1.6 mH | 5.0 mH |
| Stall torque | 2.9 Nm | 5.5 Nm | 6.3 Nm | | 9.3 Nm | |
| Holding torque [1] | 4.0 Nm | 7.8 Nm | 9.5 Nm | | 13.6 Nm | |
| Detent torque | <160 mNm | <210 mNm | <320 mNm | | <420 mNm | |
| Rotor inertia | Approx. 1.31 $kgcm^2$ | Approx. 2.61 $kgcm^2$ | | | Approx. 3.92 $kgcm^2$ | |
| **General motor data** | | | | | | |
| Protection class | IP40 | | | | | |
| Stepping angle | 1.8° | | | | | |
| Max. surface temperature | 100°C | | | | | |
| Average period of operation between failures | 20,000 hours | | | | | |
| Cable length | 300 mm | | | | | |
| Cable cross section | 22 AWG, UL 3266 | | | | | |
| Shaft type | With key | | | | | |
| Insulation class | B (130°C) | | | | | |
| Insulation resistance | 100 MΩ min. 500 VDC | | | | | |
| Dielectric resistance | 1776 VAC for 1 minute | | | | | |
| Driver supply voltage | Max. 80 VDC | | | | | |
| **Ambient conditions** | | | | | | |
| Temperature | | | | | | |
| Operation | -20 to 40°C | | | | | |
| Storage | -30 to 85°C | | | | | |
| Transport | -30 to 85°C | | | | | |
| Relative humidity | | | | | | |
| Operation | 5 to 95%, non-condensing | | | | | |
| Storage | 5 to 95%, non-condensing | | | | | |
| Transport | 5 to 95%, non-condensing | | | | | |
| **Mechanical properties** | | | | | | |
| Max. radial load [2] | 290 N | | | | | |
| Max. axial load | 225 N | | | | | |
| Weight | 1.8 kg | 3.0 kg | | | 4.2 kg | |
| Length | 66 mm | 98 mm | | | 130 mm | |

1) Measured with serial wiring
2) Measured in the middle of the shaft

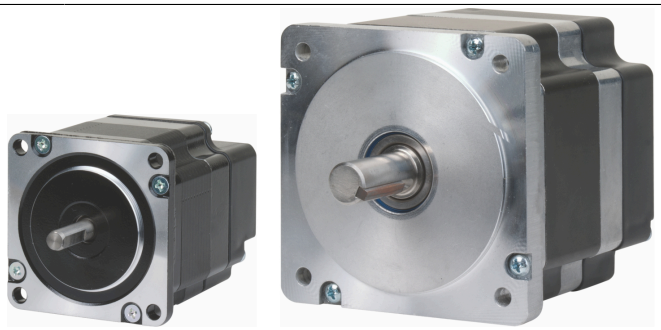
### 5.3.3 Wiring

Standard motors can be wired either serially or in parallel.



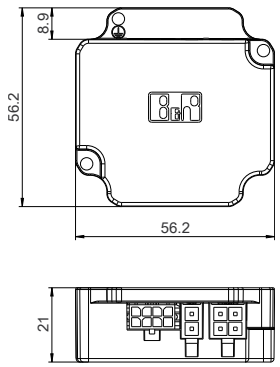
# 6 Stepper motors with additional options

## 6.1 Motors with ABR incremental encoder IP20 option

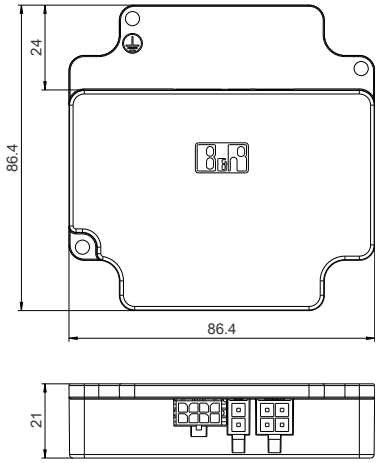


| Model number | Short description |
|---|---|
| 80MPxx.xxxS014-01 | Option ABR incremental encoder 24 VDC, IP20, for 80MPD and 80MPH motors.<br>For a list of all model numbers and the respective motor data, see the "ABR encoder" and "IP20" columns in "General overview" on page 18. |
| | **Optional accessories** (more information in the "Accessories" on page 109 section) |
| 80XMPXAC0.00-01 | Accessory set for motors with an encoder, 8-pin and 4-pin connector and crimp contact |
| 80CMxxxxx.xx-01 | Motor and encoder cables |

### 6.1.1 Dimensions




80MPD motors
ABR incremental encoder IP20 option




80MPH motors
ABR incremental encoder IP20 option

The effective length of the motor is calculated from the length of the standard motor plus the length of the encoder option.

See basic motor:

"Basic motors 80MPD (NEMA 23, flange size 56.4 mm)" on page 25

"80MPH standard motor (NEMA 34, flange size 87.1 mm)" on page 31

## 6.1.2 Technical data (80MPD)

### Motors with the ABR incremental encoder IP20 option

| Order number | 80MPD1. 300S014-01 | 80MPD1. 600S014-01 | 80MPD3. 300S014-01 | 80MPD3. 600S014-01 | 80MPD5. 300S014-01 | 80MPD5. 600S014-01 |
|---|---|---|---|---|---|---|
| **Short description** | | | | | | |
| Stepper motor | Stepper motor flange size 56.4 mm, length 66 mm, incremental encoder | | Stepper motor flange size 56.4 mm, length 78.5 mm, incremental encoder | | Stepper motor flange size 56.4 mm, length 101.5 mm, incremental encoder | |
| **General information** | | | | | | |
| Certifications | | | | | | |
| CE | Yes | | | | | |
| UKCA | Yes | | | | | |
| EAC | Yes | | | | | |
| **Specific motor data** | | | | | | |
| Wiring | Serial | Parallel | Serial | Parallel | Serial | Parallel |
| Current | 3 A | 6 A | 3 A | 6 A | 3 A | 6 A |
| Resistance/Phase | 1.2 Ω | 0.3 Ω | 1.6 Ω | 0.4 Ω | 2.4 Ω | 0.6 Ω |
| Inductance/Phase | 3.6 mH | 0.9 mH | 5.2 mH | 1.3 mH | 8.8 mH | 2.2 mH |
| Stall torque | 0.8 Nm | | 1.25 Nm | | 2.2 Nm | |
| Holding torque | 1.1 Nm | | 1.8 Nm | | 3.0 Nm | |
| Detent torque | <30 mNm | | <50 mNm | | <90 mNm | |
| Rotor inertia | Approx. 145 $gcm^2$ | | Approx. 245 $gcm^2$ | | Approx. 470 $gcm^2$ | |
| **General motor data** | | | | | | |
| Stepping angle | 1.8° | | | | | |
| Max. surface temperature | 95°C | | | | | |
| Average period of operation between failures | 21,000 hours | | | | | |
| Shaft type | Flat-sided shaft (D-cut) | | | | | |
| Insulation class | B (130°C) | | | | | |
| Insulation resistance | 100 MΩ min. 500 VDC | | | | | |
| Dielectric resistance | 500 VAC for 1 minute | | | | | |
| Driver supply voltage | Max. 80 VDC | | | | | |
| **Operating conditions** | | | | | | |
| Degree of protection per EN 60529 [1] | IP20 | | | | | |
| **Ambient conditions** | | | | | | |
| Temperature | | | | | | |
| Operation | -20 to 40°C | | | | | |
| Storage | -30 to 85°C | | | | | |
| Transport | -30 to 85°C | | | | | |
| Relative humidity | | | | | | |
| Operation | 5 to 95%, non-condensing | | | | | |
| Storage | 5 to 95%, non-condensing | | | | | |
| Transport | 5 to 95%, non-condensing | | | | | |
| **Electrical properties - Encoder** | | | | | | |
| Number of outputs | 3<br>A / B / R | | | | | |
| Resolution | 1024 increments / 256 positions per rotation | | | | | |
| Output circuit | Push/Pull level, asymmetrical | | | | | |
| Output protection | Protection against short circuit | | | | | |
| Current consumption | Max. 12 mA + Output load | | | | | |
| Supply voltage | 18 to 30 VDC | | | | | |
| Max. output current | ±10 mA per output | | | | | |
| **Mechanical properties** | | | | | | |
| Max. radial load [2] | 73.5 N | | | | | |
| Max. axial load | The permissible axial load is not permitted to be greater than the motor mass. | | | | | |
| Weight | 550 g | | 750 g | | 1,140 g | |
| Length | 66 mm | | 78.5 mm | | 101.5 mm | |

1) From back of flange
2) Measured in the middle of the shaft

## 6.1.3 Technical data (80MPH1, 80MPH3)

### Motors with the ABR incremental encoder IP20 option

| Order number | 80MPH1.300S014-01 | 80MPH1.600S014-01 | 80MPH3.300S014-01 | 80MPH3.600S014-01 |
|---|---|---|---|---|
| **Short description** | | | | |
| Stepper motor | Stepper motor flange size 87.1 mm, length 87 mm, incremental encoder | | Stepper motor flange size 87.1 mm, length 119 mm, incremental encoder | |
| **General information** | | | | |
| Certifications | | | | |
| CE | Yes | | | |
| UKCA | Yes | | | |
| UL | cURus E360421<br>Servo and stepper motors - Component | | | |
| EAC | Yes | | | |
| **Specific motor data** | | | | |
| Wiring | Serial | Parallel | Serial | Parallel |
| Current | 3 A | 6 A | 3 A | 6 A |
| Resistance/Phase | 1.7 Ω | 0.4 Ω | 2.2 Ω | 0.6 Ω |
| Inductance/Phase | 12.9 mH | 3.2 mH | 17.3 mH | 4.3 mH |
| Stall torque | 2.9 Nm | | 5.5 Nm | |
| Holding torque | 4.2 Nm | | 7.8 Nm | |
| Detent torque | <160 mNm | | <210 mNm | |
| Rotor inertia | Approx. 1.31 kgcm² | | Approx. 2.61 kgcm² | |
| **General motor data** | | | | |
| Stepping angle | 1.8° | | | |
| Max. surface temperature | 95°C | | | |
| Average period of operation between failures | 20,000 hours | | | |
| Shaft type | With key | | | |
| Insulation class | B (130°C) | | | |
| Insulation resistance | 100 MΩ min. 500 VDC | | | |
| Dielectric resistance | 1776 VAC for 1 minute | | | |
| Driver supply voltage | Max. 80 VDC | | | |
| **Operating conditions** | | | | |
| Degree of protection per EN 60529 [1] | IP20 | | | |
| **Ambient conditions** | | | | |
| Temperature | | | | |
| Operation | -20 to 40°C | | | |
| Storage | -30 to 85°C | | | |
| Transport | -30 to 85°C | | | |
| Relative humidity | | | | |
| Operation | 5 to 95%, non-condensing | | | |
| Storage | 5 to 95%, non-condensing | | | |
| Transport | 5 to 95%, non-condensing | | | |
| **Electrical properties - Encoder** | | | | |
| Number of outputs | 3<br>A / B / R | | | |
| Resolution | 1024 increments / 256 positions per rotation | | | |
| Output circuit | Push/Pull level, asymmetrical | | | |
| Output protection | Protection against short circuit | | | |
| Current consumption | Max. 12 mA + Output load | | | |
| Supply voltage | 18 to 30 VDC | | | |
| Max. output current | ±10 mA per output | | | |
| **Mechanical properties** | | | | |
| Max. radial load [2] | 290 N | | | |
| Max. axial load | 225 N | | | |
| Weight | 1,900 g | | 3,100 g | |
| Length | 87 mm | | 119 mm | |

1) From back of flange
2) Measured in the middle of the shaft

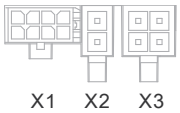
## 6.1.4 Technical data (80MPH4, 80MPH6)

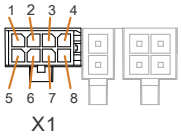
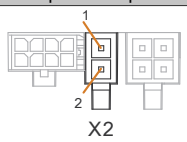
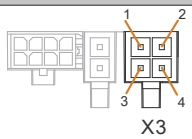
### Motors with the ABR incremental encoder IP20 option

| Order number | 80MPH4. 101S014-01 | 80MPH4. 300S014-01 | 80MPH4. 500S014-01 | 80MPH4. 600S014-01 | 80MPH6. 101S014-01 | 80MPH6. 300S014-01 | 80MPH6. 600S014-01 |
|---|---|---|---|---|---|---|---|
| **Short description** | | | | | | | |
| Stepper motor | Stepper motor flange size 87.1 mm, length 119 mm, incremental encoder | | | | Stepper motor flange size 87.1 mm, length 151 mm, incremental encoder | | |
| **General information** | | | | | | | |
| Certifications | | | | | | | |
| CE | Yes | | | | | | |
| UKCA | Yes | | | | | | |
| UL | cURus E360421<br>Servo and stepper motors - Component | | | | | | |
| EAC | Yes | | | | | | |
| **Specific motor data** | | | | | | | |
| Wiring | Parallel | Serial | | Parallel | | Serial | Parallel |
| Current | 7.2 Arms | 3 A | 5 A | 6 A | 7.2 Arms | 3 A | 6 A |
| Resistance/Phase | 0.2 Ω | 2.2 Ω | 0.9 Ω | 0.6 Ω | 0.24 Ω | 2.7 Ω | 0.7 Ω |
| Inductance/Phase | 1.4 mH | 17.3 mH | 5.6 mH | 4.3 mH | 1.6 mH | 20.0 mH | 5.0 mH |
| Stall torque | 6.3 Nm | | | | 9.3 Nm | | |
| Holding torque | 9.5 Nm | | | | 13.6 Nm | | |
| Detent torque | <320 mNm | | | | <420 mNm | | |
| Rotor inertia | Approx. 2.61 kgcm² | | | | Approx. 3.92 kgcm² | | |
| **General motor data** | | | | | | | |
| Stepping angle | 1.8° | | | | | | |
| Max. surface temperature | 95°C | | | | | | |
| Average period of operation between failures | 20,000 hours | | | | | | |
| Shaft type | With key | | | | | | |
| Insulation class | B (130°C) | | | | | | |
| Insulation resistance | 100 MΩ min. 500 VDC | | | | | | |
| Dielectric resistance | 1776 VAC for 1 minute | | | | | | |
| Driver supply voltage | Max. 80 VDC | | | | | | |
| **Operating conditions** | | | | | | | |
| Degree of protection per EN 60529 [1] | IP20 | | | | | | |
| **Ambient conditions** | | | | | | | |
| Temperature | | | | | | | |
| Operation | -20 to 40°C | | | | | | |
| Storage | -30 to 85°C | | | | | | |
| Transport | -30 to 85°C | | | | | | |
| Relative humidity | | | | | | | |
| Operation | 5 to 95%, non-condensing | | | | | | |
| Storage | 5 to 95%, non-condensing | | | | | | |
| Transport | 5 to 95%, non-condensing | | | | | | |
| **Electrical properties - Encoder** | | | | | | | |
| Number of outputs | 3<br>A / B / R | | | | | | |
| Resolution | 1024 increments / 256 positions per rotation | | | | | | |
| Output circuit | Push/Pull level, asymmetrical | | | | | | |
| Output protection | Protection against short circuit | | | | | | |
| Current consumption | Max. 12 mA + Output load | | | | | | |
| Supply voltage | 18 to 30 VDC | | | | | | |
| Max. output current | ±10 mA per output | | | | | | |
| **Mechanical properties** | | | | | | | |
| Max. radial load [2] | 290 N | | | | | | |
| Max. axial load | 225 N | | | | | | |
| Weight | 3,100 g | | | | 4,300 g | | |
| Length | 119 mm | | | | 151 mm | | |

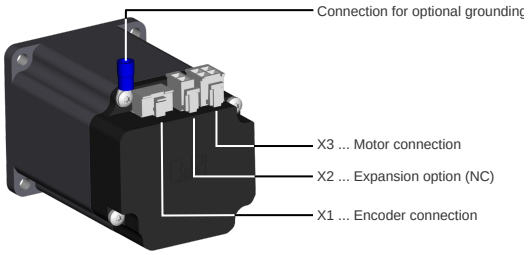
1) From back of flange
2) Measured in the middle of the shaft

### 6.1.5 Pinout X1 - X3



| X1 - ABR incremental encoder | Pinout | |
|---|---|---|
|   | Pin | Name |
| | 1 | A |
| | 2 | B |
| | 3 | R |
| | 4 | NC |
| | 5 | NC |
| | 6 | 24 VDC (encoder supply) |
| | 7 | GND |
| | 8 | NC |
| **X2 - Optional expansion** | **Pinout** | |
|   | Pin | Name |
| | 1 | NC |
| | 2 | NC |
| **X3 - Motor connection** | **Pinout** | |
|   | Pin | Name |
| | 1 | Motor phase A\ |
| | 2 | Motor phase B\ |
| | 3 | Motor phase A |
| | 4 | Motor phase B |

### 6.1.6 Arrangement of terminal blocks

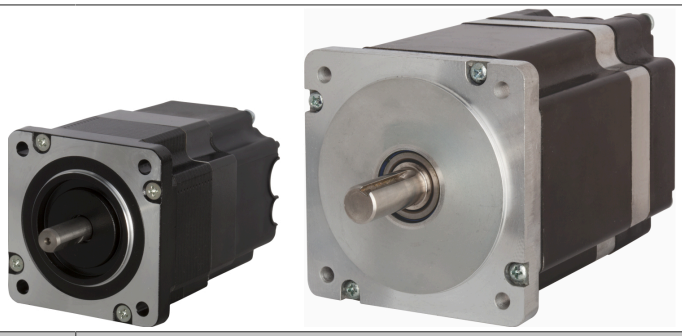



## Information:

**A single screw (M3 x 8 mm) is included with the motor in delivery for the "optional grounding".**

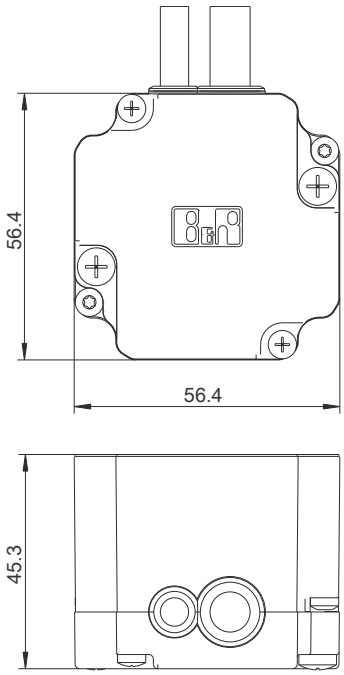
**The grounding line may only be clamped using this screw. The other screws are only used to mount the mechanical parts and may not be loosened!**

## 6.2 Motors with the ABR incremental encoder IP65 option

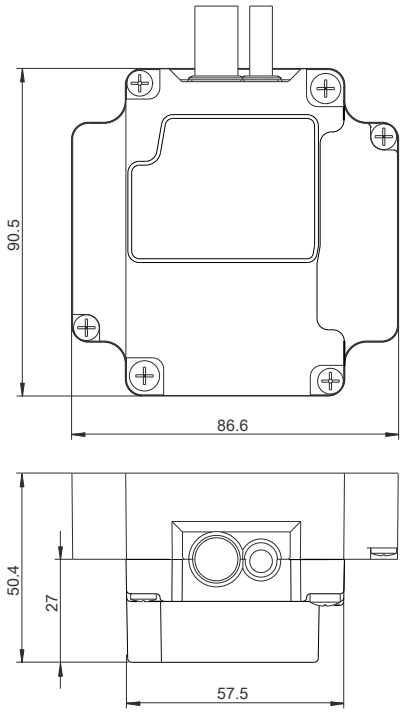


| Model number | Short description |
|---|---|
| 80MPxx.xxxx114-01 | Option ABR incremental encoder 24VDC, IP65, for 80MPF and 80MPH motors.<br>For a list of all model numbers and the respective motor data, see the "ABR encoder" and "IP65" columns in "General overview" on page 18. |
| | **Optional accessories** (more information in the "Accessories" on page 109 section) |
| 80XMPXAC0.00-01 | Accessory set for motors with an encoder, 8-pin and 4-pin connector and crimp contact |
| 80CMxxxxx.xx-01 | Motor and encoder cables |

### 6.2.1 Dimensions




80MPF motors
ABR incremental encoder IP65 option




80MPH motors
ABR incremental encoder IP65 option
(cover B)

The effective length of the motor is calculated from the length of the standard motor plus the length of the encoder option.

See basic motor:

"80MPF standard motors (flange size 60 mm)" on page 28

"80MPH standard motor (NEMA 34, flange size 87.1 mm)" on page 31

## 6.2.2 Technical data (80MPF)

### Motors with the ABR incremental encoder IP65 option

| Order number | 80MPF1. 250S114-01 | 80MPF1. 500S114-01 | 80MPF3. 250S114-01 | 80MPF3. 500S114-01 | 80MPF5. 250S114-01 | 80MPF5. 500S114-01 |
|---|---|---|---|---|---|---|
| **Short description** | | | | | | |
| Stepper motor | Stepper motor flange size 60 mm, length 97.1 mm, incremental encoder | | Stepper motor flange size 60 mm, length 107.3 mm, incremental encoder | | Stepper motor flange size 60 mm, length 138.6 mm, incremental encoder | |
| **General information** | | | | | | |
| Certifications | | | | | | |
| CE | Yes | | | | | |
| UKCA | Yes | | | | | |
| EAC | Yes | | | | | |
| **Specific motor data** | | | | | | |
| Wiring | - | Parallel | - | Parallel | - | Parallel |
| Current | 2.5 A | 5 A | 2.5 A | 5 A | 2.5 A | 5 A |
| Resistance/Phase | 1.28 Ω | 0.32 Ω | 1.52 Ω | 0.38 Ω | 2.4 Ω | 0.6 Ω |
| Inductance/Phase | 3.4 mH | 0.85 mH | 5.6 mH | 1.4 mH | 11.2 mH | 2.8 mH |
| Stall torque | 0.8 Nm | | 1.2 Nm | | 2.5 Nm | |
| Holding torque | 1.1 Nm | | 1.7 Nm | | 3.5 Nm | |
| Detent torque | <35 mNm | | | | <75 mNm | |
| Rotor inertia | 280 $gcm^2$ | | 440 $gcm^2$ | | 920 $gcm^2$ | |
| **General motor data** | | | | | | |
| Stepping angle | 1.8° | | | | | |
| Max. surface temperature | 95°C | | | | | |
| Average period of operation between failures | 21,000 hours | | | | | |
| Shaft type | Flat-sided shaft (D-cut) | | | | | |
| Insulation class | B (130°C) | | | | | |
| Insulation resistance | 100 MΩ min. 500 VDC | | | | | |
| Dielectric resistance | 500 VAC for 1 minute | | | | | |
| Driver supply voltage | Max. 80 VDC | | | | | |
| **Operating conditions** | | | | | | |
| Degree of protection per EN 60529 [1] | IP65 | | | | | |
| **Ambient conditions** | | | | | | |
| Temperature | | | | | | |
| Operation | -20 to 40°C | | | | | |
| Storage | -30 to 85°C | | | | | |
| Transport | -30 to 85°C | | | | | |
| Relative humidity | | | | | | |
| Operation | 5 to 95%, non-condensing | | | | | |
| Storage | 5 to 95%, non-condensing | | | | | |
| Transport | 5 to 95%, non-condensing | | | | | |
| **Electrical properties - Encoder** | | | | | | |
| Number of outputs | 3<br>A / B / R | | | | | |
| Resolution | 1024 increments / 256 positions per rotation | | | | | |
| Output circuit | Push/Pull level, asymmetrical | | | | | |
| Output protection | Protection against short circuit | | | | | |
| Current consumption | Max. 12 mA + Output load | | | | | |
| Supply voltage | 18 to 30 VDC | | | | | |
| Max. output current | ±10 mA per output | | | | | |
| **Mechanical properties** | | | | | | |
| Max. radial load [2] | 75 N | | | | | |
| Max. axial load | The permissible axial load is not permitted to be greater than the motor mass. | | | | | |
| Weight | 750 g | | 1,000 g | | 1,500 g | |
| Length | 97.1 mm | | 107.3 mm | | 138.6 mm | |

1) From back of flange
2) Measured in the middle of the shaft

## 6.2.3 Technical data (80MPH1, 80MPH3, 80MPH4)

### Motors with the ABR incremental encoder IP65 option

| Order number | 80MPH1.300S114-01 | 80MPH1.600S114-01 | 80MPH3.300S114-01 | 80MPH3.600S114-01 | 80MPH4.101S114-01 |
|---|---|---|---|---|---|
| **Short description** | | | | | |
| Stepper motor | Stepper motor flange size 87.1 mm, length 117.5 mm, incremental encoder | | Stepper motor flange size 87.1 mm, length 149.5 mm, incremental encoder | | |
| **General information** | | | | | |
| Certifications | | | | | |
| CE | Yes | | | | |
| UKCA | Yes | | | | |
| UL | cURus E360421<br>Servo and stepper motors - Component | | | | |
| EAC | Yes | | | | |
| **Specific motor data** | | | | | |
| Wiring | Serial | Parallel | Serial | Parallel | |
| Current | 3 A | 6 A | 3 A | 6 A | 7.2 Arms |
| Resistance/Phase | 1.7 Ω | 0.4 Ω | 2.2 | 0.6 Ω | 0.2 Ω |
| Inductance/Phase | 12.9 mH | 3.2 mH | 17.3 mH | 4.3 mH | 1.4 mH |
| Stall torque | 2.9 Nm | | 5.5 Nm | | 6.3 Nm |
| Holding torque | 4.0 Nm | | 7.8 Nm | | 9.5 Nm |
| Detent torque | <160 mNm | | <210 mNm | | <320 mNm |
| Rotor inertia | Approx. 1.31 kgcm² | | Approx. 2.61 kgcm² | | |
| **General motor data** | | | | | |
| Stepping angle | 1.8° | | | | |
| Max. surface temperature | 95°C | | | | |
| Average period of operation between failures | 20,000 hours | | | | |
| Shaft type | With key | | | | |
| Insulation class | B (130°C) | | | | |
| Insulation resistance | 100 MΩ min. 500 VDC | | | | |
| Dielectric resistance | 1776 VAC for 1 minute | | | | |
| Driver supply voltage | Max. 80 VDC | | | | |
| **Operating conditions** | | | | | |
| Degree of protection per EN 60529 [1] | IP65 | | | | |
| **Ambient conditions** | | | | | |
| Temperature | | | | | |
| Operation | -20 to 40°C | | | | |
| Storage | -30 to 85°C | | | | |
| Transport | -30 to 85°C | | | | |
| Relative humidity | | | | | |
| Operation | 5 to 95%, non-condensing | | | | |
| Storage | 5 to 95%, non-condensing | | | | |
| Transport | 5 to 95%, non-condensing | | | | |
| **Electrical properties - Encoder** | | | | | |
| Number of outputs | 3<br>A / B / R | | | | |
| Resolution | 1024 increments / 256 positions per rotation | | | | |
| Output circuit | Push/Pull level, asymmetrical | | | | |
| Output protection | Protection against short circuit | | | | |
| Current consumption | Max. 12 mA + Output load | | | | |
| Supply voltage | 18 to 30 VDC | | | | |
| Max. output current | ±10 mA per output | | | | |
| **Mechanical properties** | | | | | |
| Max. radial load [2] | 290 N | | | | |
| Max. axial load | 225 N | | | | |
| Weight | 1,900 g | | 3,100 g | | |
| Length | 117.5 mm | | 149.5 mm | | |

1) From back of flange
2) Measured in the middle of the shaft

## 6.2.4 Technical data (80MPH4, 80MPH6)

### Motors with the ABR incremental encoder IP65 option

| Order number | 80MPH4. 300S114-01 | 80MPH4. 500S114-01 | 80MPH4. 600S114-01 | 80MPH6. 101S114-01 | 80MPH6. 300S114-01 | 80MPH6. 600S114-01 |
|---|---|---|---|---|---|---|
| **Short description** | | | | | | |
| Stepper motor | Stepper motor flange size 87.1 mm, length 149.5 mm, incremental encoder | | | Stepper motor flange size 87.1 mm, length 181.5 mm, incremental encoder | | |
| **General information** | | | | | | |
| Certifications | | | | | | |
| CE | Yes | | | | | |
| UKCA | Yes | | | | | |
| UL | cURus E360421<br>Servo and stepper motors - Component | | | | | |
| EAC | Yes | | | | | |
| **Specific motor data** | | | | | | |
| Wiring | Serial | | Parallel | | Serial | Parallel |
| Current | 3 A | 5 A | 6 A | 7.2 Arms | 3 A | 6 A |
| Resistance/Phase | 2.2 Ω | 0.9 Ω | 0.6 Ω | 0.24 Ω | 2.7 Ω | 0.7 Ω |
| Inductance/Phase | 17.3 mH | 5.6 mH | 4.3 mH | 1.6 mH | 20.0 mH | 5.0 mH |
| Stall torque | 6.3 Nm | | | 9.3 Nm | | |
| Holding torque [1] | 9.5 Nm | | | 13.6 Nm | | |
| Detent torque | <320 mNm | | | <420 mNm | | |
| Rotor inertia | Approx. 2.61 kgcm² | | | Approx. 3.92 kgcm² | | |
| **General motor data** | | | | | | |
| Stepping angle | 1.8° | | | | | |
| Max. surface temperature | 95°C | | | | | |
| Average period of operation between failures | 20,000 hours | | | | | |
| Shaft type | With key | | | | Keyed | With key |
| Insulation class | B (130°C) | | | | | |
| Insulation resistance | 100 MΩ min. 500 VDC | | | | | |
| Dielectric resistance | 1776 VAC for 1 minute | | | | | |
| Driver supply voltage | Max. 80 VDC | | | | | |
| **Operating conditions** | | | | | | |
| Degree of protection per EN 60529 [2] | IP65 | | | | | |
| **Ambient conditions** | | | | | | |
| Temperature | | | | | | |
| Operation | -20 to 40°C | | | | | |
| Storage | -30 to 85°C | | | | | |
| Transport | -30 to 85°C | | | | | |
| Relative humidity | | | | | | |
| Operation | 5 to 95%, non-condensing | | | | | |
| Storage | 5 to 95%, non-condensing | | | | | |
| Transport | 5 to 95%, non-condensing | | | | | |
| **Electrical properties - Encoder** | | | | | | |
| Number of outputs | 3<br>A / B / R | | | | | |
| Resolution | 1024 increments / 256 positions per rotation | | | | | |
| Output circuit | Push/Pull level, asymmetrical | | | | Push / Pull level, asymmetric | Push/Pull level, asymmetrical |
| Output protection | Protection against short circuit | | | | Short circuit protection | Protection against short circuit |
| Current consumption | Max. 12 mA + Output load | | | | Max. 12 mA + output load | Max. 12 mA + Output load |
| Supply voltage | 18 to 30 VDC | | | | | |
| Max. output current | ±10 mA per output | | | | | |
| **Mechanical properties** | | | | | | |
| Max. radial load [3] | 290 N | | | | | |
| Max. axial load | 225 N | | | | | |
| Weight | 3,100 g | | | 4,300 g | 4300 g | 4,300 g |
| Length | 149.5 mm | | | 181.5 mm | | |

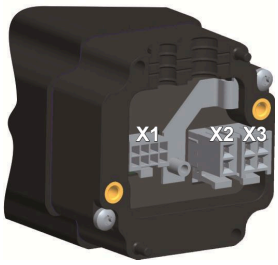
1) Measured with serial wiring
2) From back of flange
3) Measured in the middle of the shaft

## Information:

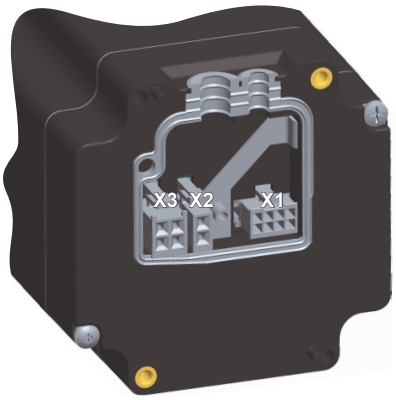
**IP65 protection has been tested with pre-assembled cables from B&R only.**

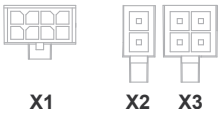
## 6.2.5 Pinout X1 - X3

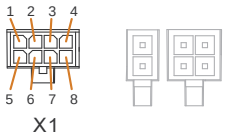
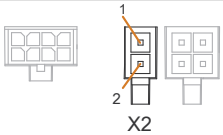
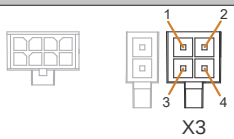
80MPF motor



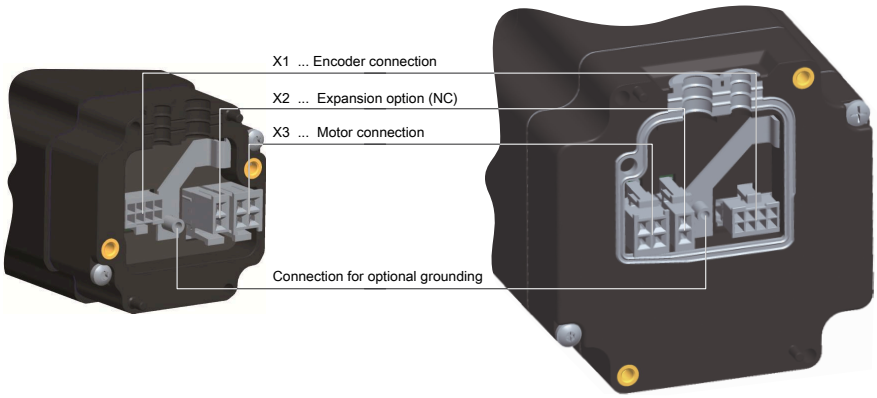

80MPH motor




| X1 - ABR incremental encoder | Pinout | |
|---|---|---|
|   | Pin | Name |
| | 1 | A |
| | 2 | B |
| | 3 | R |
| | 4 | NC |
| | 5 | NC |
| | 6 | 24 VDC (encoder supply) |
| | 7 | GND |
| | 8 | NC |
| **X2 - Optional expansion** | **Pinout** | |
|   | Pin | Name |
| | 1 | NC |
| | 2 | NC |
| **X3 - Motor connection** | **Pinout** | |
|   | Pin | Name |
| | 1 | Motor phase A\ |
| | 2 | Motor phase B\ |
| | 3 | Motor phase A |
| | 4 | Motor phase B |

## 6.2.6 Arrangement of terminal blocks




80MPF motor

80MPH motor

# Information:

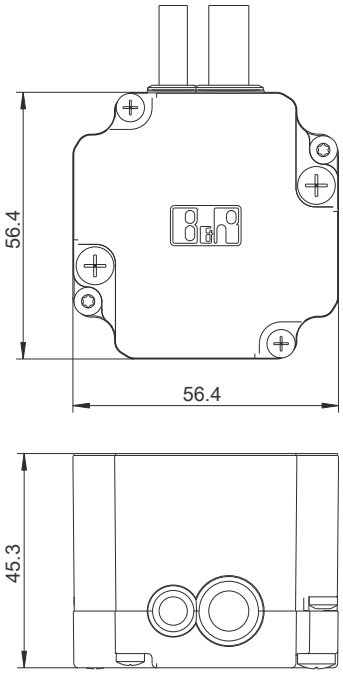
**A single screw (M3 x 8 mm) is included with the motor in delivery for the "optional grounding".**

**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!**

## 6.3 Motors with the SSI absolute encoder IP65 option

| Model number | Short description | Figure |
|---|---|---|
| 80MPF5.xxxS113-01 | Option SSI encoder 24 VDC, IP65, for 80MPF motors. For a list of all model numbers and the respective motor data, see the "SSI encoder" and "IP65" columns in "General overview" on page 18. | |
| | **Optional accessories** (more information in the "Accessories" on page 109 section) | |
| 80XMPXAC0.00-01 | Accessory set for motors with an encoder, 8-pin and 4-pin connector and crimp contact | |
| 80CMxxxxx.xx-01 | Motor and encoder cables | |

### 6.3.1 Dimensions




80MPF motors
SSI absolute encoder IP65 option

The effective length of the motor is calculated from the length of the standard motor plus the length of the encoder option.

See basic motor:

"80MPF standard motors (flange size 60 mm)" on page 28

## 6.3.2 Technical data (80MPF)

### Motors with SSI absolute encoder IP65 option

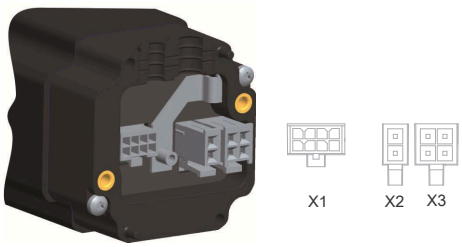
| Order number | 80MPF5.250S113-01 | 80MPF5.500S113-01 |
|---|---|---|
| **Short description** | | |
| Stepper motor | Stepper motor flange size 60 mm, length 138.6 mm, SSI encoder | |
| **General information** | | |
| Certifications | | |
| CE | Yes | |
| UKCA | Yes | |
| EAC | Yes | |
| **Specific motor data** | | |
| Wiring | Serial | Parallel |
| Current | 2.5 A | 5 A |
| Resistance/Phase | 2.4 Ω | 0.6 Ω |
| Inductance/Phase | 11.2 mH | 2.8 mH |
| Stall torque | 2.5 Nm | |
| Holding torque | 3.5 Nm | |
| Detent torque | <75 mNm | |
| Rotor inertia | 920 $gcm^2$ | |
| **General motor data** | | |
| Stepping angle | 1.8° | |
| Max. surface temperature | 95°C | |
| Average period of operation between failures | 21,000 hours | |
| Shaft type | Flat-sided shaft (D-cut) | |
| Insulation class | B (130°C) | |
| Insulation resistance | 100 MΩ min. 500 VDC | |
| Dielectric resistance | 500 VAC for 1 minute | |
| Driver supply voltage | Max. 80 VDC | |
| **Operating conditions** | | |
| Degree of protection per EN 60529 [1] | IP65 | |
| **Ambient conditions** | | |
| Temperature | | |
| Operation | -20 to 40°C | |
| Storage | -30 to 85°C | |
| Transport | -30 to 85°C | |
| Relative humidity | | |
| Operation | 5 to 95%, non-condensing | |
| Storage | 5 to 95%, non-condensing | |
| Transport | 5 to 95%, non-condensing | |
| **Electrical properties - Encoder** | | |
| Encoder type | SSI single-turn | |
| Number of outputs | 4 (Data / nData / CLK / nCLK)<br><br>Nominal voltage: 3.3 VDC differential signal<br>Signal transmission: RS485 standard<br>Differential voltage:<br>(Data ↔ nData) >2 VDC<br>(CLK ↔ nCLK) >2 VDC | |
| Resolution | 4096 increments per revolution | |
| Output circuit | Differential signal | |
| Output protection | Protection against short circuit | |
| Current consumption | Max. 16 mA + Output load | |
| Supply voltage | 18 to 30 VDC | |
| Max. output current | ±25 mA per output | |
| Data format | Gray | |
| Counting direction | Clockwise | |
| Clock frequency | Max. 400 kHz | |
| Counter size | 12-bit | |
| Monostable multivibrator | | |
| Time | 100 µs | |
| Signal | Low | |
| **Mechanical properties** | | |
| Max. radial load [2] | 75 N | |
| Max. axial load | The permissible axial load is not permitted to be greater than the motor mass. | |
| Weight | 1,500 g | |
| Length | 138.6 mm | |

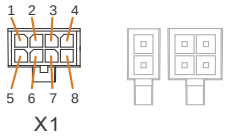
1) From back of flange
2) Measured in the middle of the shaft

## Information:

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

### 6.3.3 Pinout X1 - X3

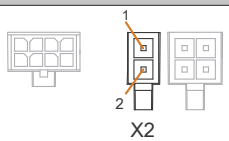



| X1 - Encoder connection | Pinout | |
|---|---|---|
|  | Pin | Name |
| | 1 | DATA |
| | 2 | nDATA |
| | 3 | CLK |
| | 4 | nCLK |
| | 5 | NC |
| | 6 | 24 VDC (encoder supply) |
| | 7 | GND |
| | 8 | NC |

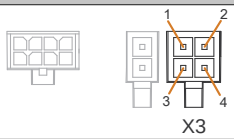


## Information:

**Pins 5 and 8 (NC) must remain free and may not be used.**

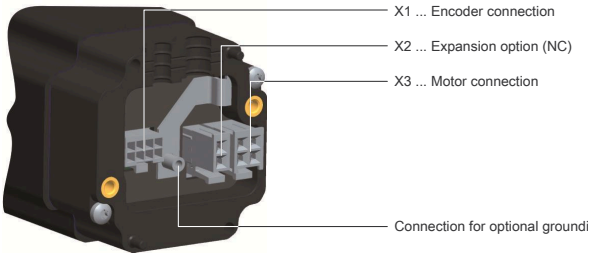
| X2 - Motor brake | Pinout | |
|---|---|---|
|  | Pin | Name |
| | 1 | NC |
| | 2 | NC |



| X3 - Motor connection | Pinout | |
|---|---|---|
|  | Pin | Name |
| | 1 | Motor phase A\ |
| | 2 | Motor phase B\ |
| | 3 | Motor phase A |
| | 4 | Motor phase B |



### 6.3.4 Arrangement of terminal blocks




## Information:

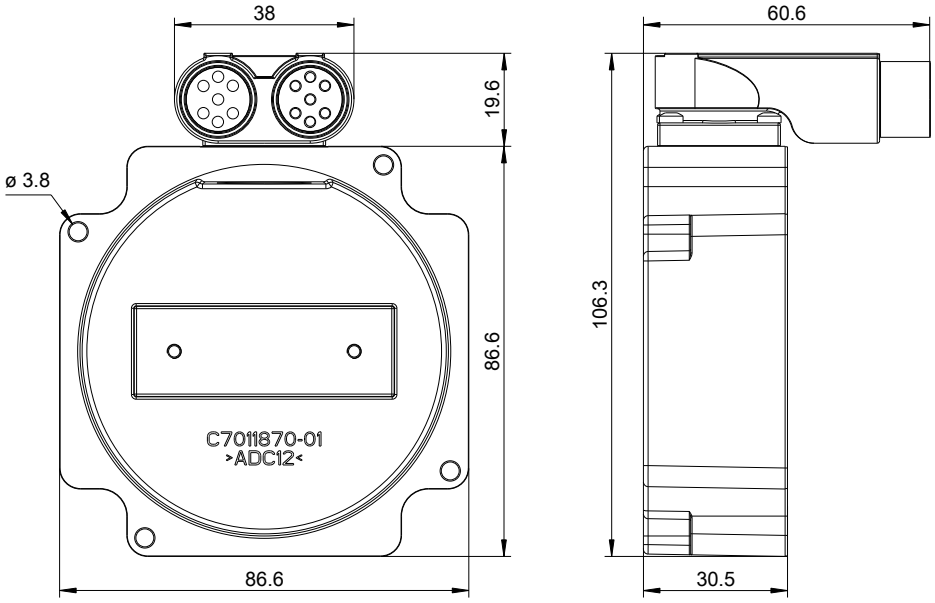
**A single screw (M3 x 8 mm) is included with the motor in delivery for the "optional grounding".**

**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!**

## 6.4 Motors with the HIPERFACE IP65 option

| Model number | Short description | Figure |
|---|---|---|
| 80MPH4.xxxS111-02 | Option HIPERFACE, IP65, for 80MPH motors. For a list of all model numbers and the respective motor data, see the "HIPERFACE" and "IP65" columns in "General overview" on page 18. | |
| | **Optional accessories** (more information in the "Accessories" on page 109 section) | |
| 80CMxxxxx.xx-01 | Motor and encoder cables | |

### 6.4.1 Dimensions

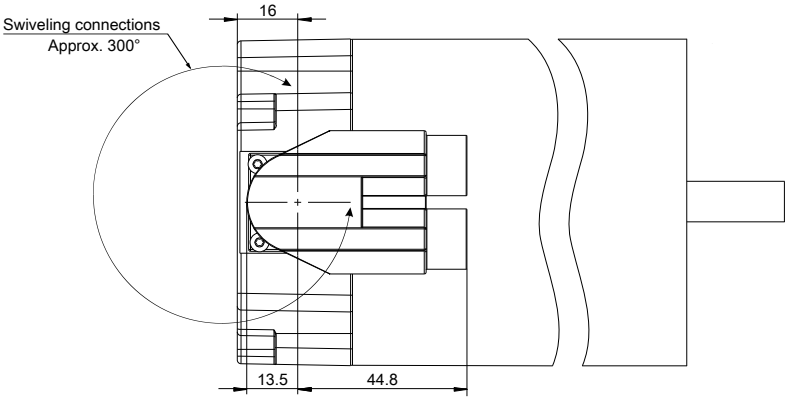



80MPH motors
HIPERFACE encoder IP65 option

The effective length of the motor is calculated from the length of the standard motor plus the length of the encoder option.

See basic motor:

"80MPH standard motor (NEMA 34, flange size 87.1 mm)" on page 31




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

## 6.4.2 Technical data (80MPH)

### Motors with the Hiperface IP65 option

| Order number | 80MPH4.600S111-02 |
|---|---|
| **Short description** | |
| Stepper motor | Stepper motor flange size 87.1 mm, length 128.5 mm, HIPERFACE encoder |
| **General information** | |
| Certifications | |
| CE | Yes |
| UKCA | Yes |
| UL | cURus E360421<br>Servo and stepper motors - Component |
| EAC | Yes |
| **Specific motor data** | |
| Wiring | Parallel |
| Current | 6 A |
| Resistance/Phase | 0.6 Ω |
| Inductance/Phase | 4.3 mH |
| Stall torque | 6.3 Nm |
| Holding torque | 9.5 Nm |
| Detent torque | <320 mNm |
| Rotor inertia | Approx. 2.61 kgcm² |
| **General motor data** | |
| Stepping angle | 1.8° |
| Max. surface temperature | 95°C |
| Average period of operation between failures | 20,000 hours |
| Shaft type | With key |
| Insulation class | B (130°C) |
| Insulation resistance | 100 MΩ min. 500 VDC |
| Dielectric resistance | 1776 VAC for 1 minute |
| Driver supply voltage | Max. 80 VDC |
| **Operating conditions** | |
| Degree of protection per EN 60529 [1] | IP65 |
| **Ambient conditions** | |
| Temperature | |
| Operation | -20 to 40°C |
| Storage | -30 to 85°C |
| Transport | -30 to 85°C |
| Relative humidity | |
| Operation | 5 to 95%, non-condensing |
| Storage | 5 to 95%, non-condensing |
| Transport | 5 to 95%, non-condensing |
| **Electrical properties - Encoder** | |
| Encoder type | HIPERFACE multi-turn, 4096 revolutions measurable |
| Integral nonlinearity | ±288 angular seconds |
| Supply voltage | 10 VDC |
| Sine-Cosine signals | |
| Periods per revolution | 16 |
| Peak-to-peak signal voltage | 0.8 to 1.2 Vss |
| Signal offset | 2.2 to 2.8 V |
| Digital interface | |
| Address | 64 |
| Total width of position value | 21-bit |
| Width of multi-turn information | 12-bit |
| Width of single-turn information | 9-bit |
| **Mechanical properties** | |
| Max. radial load [2] | 290 N |
| Max. axial load | 225 N |
| Weight | 3,400 g |
| Length | 128.5 mm |

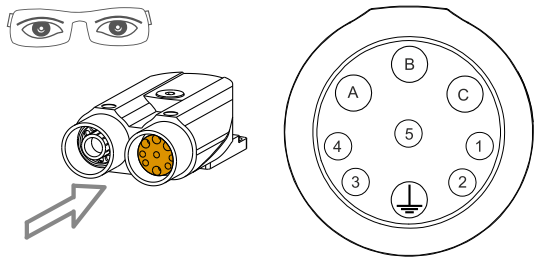
1) From back of flange
2) Measured in the middle of the shaft

## Information:

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

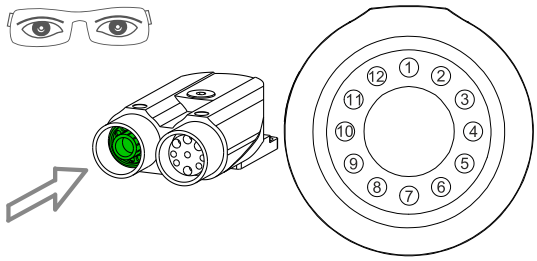
## 6.4.3 Pinout X1 - X3

### Pinout for power connection (ytec system)




| Pin | Name |
|---|---|
| A | --- |
| B | --- |
| C | --- |
| PE | PE wire / Shield |
| 1 | A |
| 2 | A\ |
| 3 | B |
| 4 | B\ |
| 5 | --- |

### Pinout for encoder connection (ytec system)

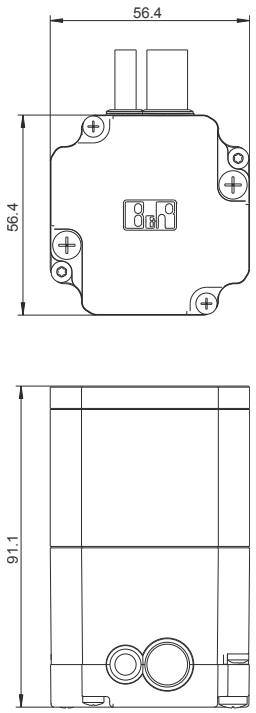



| Pin | Name |
|---|---|
| 1 | Encoder power supply 10 VDC |
| 2 | Data input |
| 3 | Data input inverted |
| 4 | --- |
| 5 | --- |
| 6 | --- |
| 7 | Encoder power supply 0 V |
| 8 | Channel SIN |
| 9 | REF SIN channel |
| 10 | Channel COS |
| 11 | REF COS channel |
| 12 | --- |

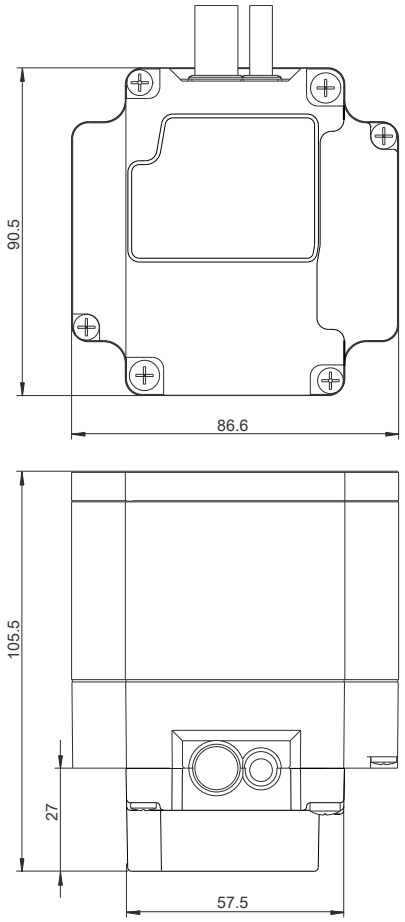
## 6.5 Motors with the ABR incremental encoder IP65 and brake options

| Model number | Short description |
|---|---|
| 80MPxx.xxxD114-01 | Brake option, IP65, for 80MPF and 80MPH motors. For a list of all model numbers and the respective motor data, see the "ABR encoder" and "Brake" columns in "General overview" on page 18. |
| | **Optional accessories** (more information in the "Accessories" on page 109 section) |
| 80XMPXAC0.00-02 | Accessory set for motors with encoder and brake, 8-pin, 4-pin and 2-pin connector and crimp contact |
| 80CMxxxxx.xx-01 | Motor and encoder cables |

### 6.5.1 Dimensions




80MPF motors
ABR incremental encoder IP65 and brake options




80MPH motors
ABR incremental encoder IP65 and brake option
(cover B)

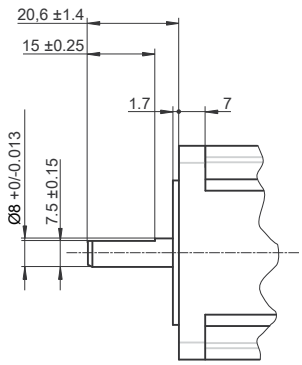
The effective length of the motor is calculated from the length of the standard motor plus the length of the encoder option.

See basic motor:

"80MPF standard motors (flange size 60 mm)" on page 28

"80MPH standard motor (NEMA 34, flange size 87.1 mm)" on page 31

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



## 6.5.2 Technical data (80MPF)

### Motors with the ABR incremental encoder IP65 and brake options

| Order number | 80MPF1. 250D114-01 | 80MPF1. 500D114-01 | 80MPF3. 250D114-01 | 80MPF3. 500D114-01 | 80MPF5. 250D114-01 | 80MPF5. 500D114-01 |
|---|---|---|---|---|---|---|
| **Short description** | | | | | | |
| Stepper motor | Stepper motor flange size 60 mm, length 142.9 mm, incremental encoder and brake | | Stepper motor flange size 60 mm, length 153.1 mm, incremental encoder and brake | | Stepper motor flange size 60 mm, length 184.4 mm, incremental encoder and brake | |
| **General information** | | | | | | |
| Certifications | | | | | | |
| CE | Yes | | | | | |
| UKCA | Yes | | | | | |
| EAC | Yes | | | | | |
| **Specific motor data** | | | | | | |
| Wiring | - | Parallel | - | Parallel | - | Parallel |
| Current | 2.5 A | 5 A | 2.5 A | 5 A | 2.5 A | 5 A |
| Resistance/Phase | 1.28 Ω | 0.32 Ω | 1.52 Ω | 0.38 Ω | 2.4 Ω | 0.6 Ω |
| Inductance/Phase | 3.4 mH | 0.85 mH | 5.6 mH | 1.4 mH | 11.2 mH | 2.8 mH |
| Stall torque | 0.8 Nm | | 1.2 Nm | | 2.5 Nm | |
| Holding torque | 1.1 Nm | | 1.7 Nm | | 3.5 Nm | |
| Detent torque | <35 mNm | | | <45 mNm | <75 mNm | |
| Rotor inertia | 280 $gcm^2$ | | 440 $gcm^2$ | | 920 $gcm^2$ | |
| **General motor data** | | | | | | |
| Stepping angle | 1.8° | | | | | |
| Max. surface temperature | 90°C | | | | | |
| Average period of operation between failures | 21,000 hours | | | | | |
| Shaft type | Flat-sided shaft (D-cut) | | | | | |
| Insulation class | B (130°C) | | | | | |
| Insulation resistance | 100 MΩ min. 500 VDC | | | | | |
| Dielectric resistance | 500 VAC for 1 minute | | | | | |
| Driver supply voltage | Max. 80 VDC | | | | | |
| **Operating conditions** | | | | | | |
| Degree of protection per EN 60529 1) | IP65 | | | | | |
| **Ambient conditions** | | | | | | |
| Temperature | | | | | | |
| Operation | -20 to 40°C | | | | | |
| Storage | -30 to 85°C | | | | | |
| Transport | -30 to 85°C | | | | | |
| Relative humidity | | | | | | |
| Operation | 5 to 95%, non-condensing | | | | | |
| Storage | 5 to 95%, non-condensing | | | | | |
| Transport | 5 to 95%, non-condensing | | | | | |
| **Electrical properties - Encoder** | | | | | | |
| Number of outputs | 3<br>A / B / R | | | | | |
| Resolution | 1024 increments per revolution | | | | | |
| Output circuit | Push/Pull level, asymmetrical | | | | | |
| Output protection | Protection against short circuit | | | | | |
| Current consumption | Max. 12 mA + Output load | | | | | |
| Supply voltage | 18 to 30 VDC | | | | | |
| Max. output current | ±10 mA per output | | | | | |
| **Electrical properties - Brake** | | | | | | |
| Supply voltage | 24 VDC +6%/-10% | | | | | |
| Braking torque 2) | 2 Nm / 1.5 Nm / 1.8 Nm | | | | | |
| Coil resistance | 52.36 Ω ±7% | | | | | |
| Inductance | 0.7 H | | | | | |
| Power consumption | Typ. 11 W | | | | | |
| Connection time 3) | 6 ms | | | | | |
| Response delay 4) | 2 ms | | | | | |
| Cutoff time 5) | 25 ms | | | | | |
| **Mechanical properties** | | | | | | |
| Max. radial load 6) | 75 N | | | | | |
| Max. axial load | The permissible axial load is not permitted to be greater than the motor mass. | | | | | |
| Weight | 1,020 g | | 1,280 g | | 1,800 g | |
| Length | 142.9 mm | | 153.1 mm | | 184.4 mm | |

1) From back of flange
2) Braking torque $M_{2N}$ / Mean dynamic braking torque 20°C / M stat. at 100°C
3) Time from switching off the current until the nominal torque is reached
4) Time from switching off the current until the torque increases
5) Time from switching on the current until the torque begins decreasing
6) Measured in the middle of the shaft

## 6.5.3 Technical data (80MPH)

### Motors with the ABR incremental encoder IP65 and brake options

| Order number | 80MPH1. 300D114-01 | 80MPH1. 600D114-01 | 80MPH3. 600D114-01 | 80MPH4. 101D114-01 | 80MPH4. 600D114-01 | 80MPH6. 300D114-01 | 80MPH6. 600D114-01 | 80MPH6. 101D114-01 |
|---|---|---|---|---|---|---|---|---|
| **Short description** | | | | | | | | |
| Stepper motor | Stepper motor flange size 87.1 mm, length 172.5 mm, incremental encoder and brake | | Stepper motor flange size 87.1 mm, length 204.5 mm, incremental encoder and brake | | | Stepper motor flange size 87.1 mm, length 236.5 mm, incremental encoder and brake | | |
| **General information** | | | | | | | | |
| Certifications | | | | | | | | |
| CE | Yes | | | | | | | |
| UKCA | Yes | | | | | | | |
| UL | cURus E360421<br>Servo and stepper motors - Component | | | | | | | |
| EAC | Yes | | | | | | | |
| **Specific motor data** | | | | | | | | |
| Wiring | Serial | Parallel | | | | Serial | Parallel | |
| Current | 3 A | 6 A | | 7.2 Arms | 6 A | 3 A | 6 A | 7.2 Arms |
| Resistance/Phase | 1.7 Ω | 0.4 Ω | 0.6 Ω | 0.2 Ω | 0.6 Ω | 2.7 Ω | 0.7 Ω | 0.24 Ω |
| Inductance/Phase | 12.9 mH | 3.2 mH | 4.3 mH | 1.4 mH | 4.3 mH | 20.0 mH | 5.0 mH | 1.6 mH |
| Stall torque | 2.9 Nm | | 5.5 Nm | 6.3 Nm | | 9.3 Nm | | |
| Holding torque | 4.0 Nm | | 7.8 Nm | 9.5 Nm | | 13.6 Nm | | |
| Detent torque | <160 mNm | | <210 mNm | <320 mNm | | <420 mNm | | |
| Rotor inertia | Approx. 1.31 $kgcm^2$ | | Approx. 2.61 $kgcm^2$ | | | Approx. 3.92 $kgcm^2$ | | |
| **General motor data** | | | | | | | | |
| Stepping angle | 1.8° | | | | | | | |
| Max. surface temperature | 85°C | | | | | | | |
| Average period of operation between failures | 20,000 hours | | | | | | | |
| Shaft type | With key | | | | | | | |
| Insulation class | B (130°C) | | | | | | | |
| Insulation resistance | 100 MΩ min. 500 VDC | | | | | | | |
| Dielectric resistance | 1776 VAC for 1 minute | 500 VAC for 1 minute | 1776 VAC for 1 minute | | | | | 500 VAC for 1 minute |
| Driver supply voltage | Max. 80 VDC | | | | | | | |
| **Operating conditions** | | | | | | | | |
| Degree of protection per EN 60529 [1] | IP65 | | | | | | | |
| **Ambient conditions** | | | | | | | | |
| Temperature | | | | | | | | |
| Operation | -20 to 40°C | | | | | | | |
| Storage | -30 to 85°C | | | | | | | |
| Transport | -30 to 85°C | | | | | | | |
| Relative humidity | | | | | | | | |
| Operation | 5 to 95%, non-condensing | | | | | | | |
| Storage | 5 to 95%, non-condensing | | | | | | | |
| Transport | 5 to 95%, non-condensing | | | | | | | |
| **Electrical properties - Encoder** | | | | | | | | |
| Number of outputs | 3<br>A / B / R | | | | | | | |
| Resolution | 1024 increments per revolution | | | | | | | |
| Output circuit | Push/Pull level, asymmetrical | | | | | | | |
| Output protection | Protection against short circuit | | | | | | | |
| Current consumption | Max. 12 mA + Output load | | | | | | | |
| Supply voltage | 18 to 30 VDC | | | | | | | |
| Max. output current | ±10 mA per output | | | | | | | |
| **Electrical properties - Brake** | | | | | | | | |
| Supply voltage | 24 VDC +6%/-10% | | | | | | | |
| Braking torque [2] | 9 Nm / 7.5 Nm / 8.0 Nm | | | | | | | |
| Coil resistance | 32.00 Ω ±7% | | | | | | | |
| Inductance | 0.83 h | | | | | | | |
| Power consumption | Typ. 18 W | | | | | | | |
| Connection time [3] | 7 ms | | | | | | | |
| Response delay [4] | 2 ms | | | | | | | |
| Cutoff time [5] | 40 ms | | | | | | | |
| **Mechanical properties** | | | | | | | | |
| Max. radial load [6] | 290 N | | | | | | | |
| Max. axial load | 225 N | | | | | | | |
| Weight | 2,500 g | | 3,700 g | | | 4,900 g | | |
| Length | 172.5 mm | | 204.5 mm | | | 236.5 mm | | |

1) From back of flange
2) Braking torque $M_{2N}$ / Mean dynamic braking torque 20°C / M stat. at 100°C
3) Time from switching off the current until the nominal torque is reached

4) Time from switching off the current until the torque increases
5) Time from switching on the current until the torque begins decreasing
6) Measured in the middle of the shaft

## Notice!

**These brakes are not certified safety brakes!**

## Information:

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

### 6.5.4 Operating principle

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.**

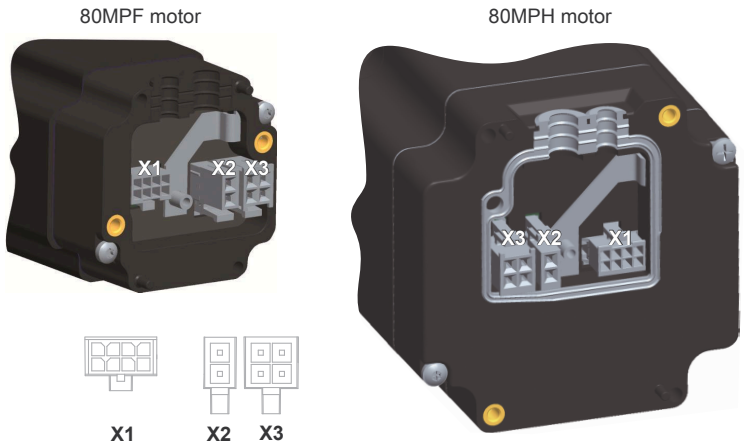
**The holding brake does not provide protection for personnel.**

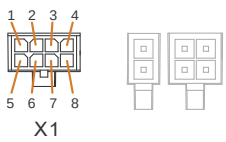
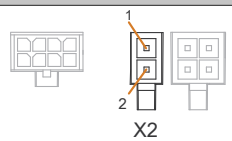
**The maximum motor torque can exceed the holding torque for the brake.**

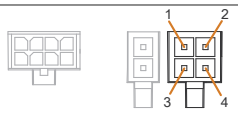
## Warning!

**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).**

### 6.5.5 Pinout X1 - X3



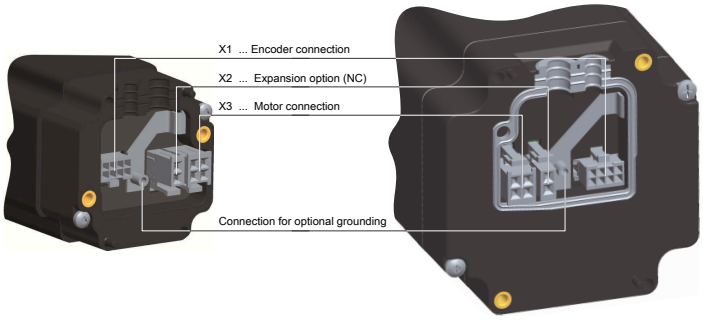

| X1 - Encoder connection | Pinout | |
|---|---|---|
|   | Pin | Name |
| | 1 | A |
| | 2 | B |
| | 3 | R |
| | 4 | NC |
| | 5 | NC |
| | 6 | 24 VDC (encoder supply) |
| | 7 | GND |
| | 8 | NC |
| **X2 - Motor brake** | **Pinout** | |
|   | Pin | Name |
| | 1 | 24 VDC (brake) |
| | 2 | GND |
| **X3 - Motor connection** | **Pinout** | |




X3

| Pin | Name |
|---|---|
| 1 | Motor phase A\ |
| 2 | Motor phase B\ |
| 3 | Motor phase A |
| 4 | Motor phase B |

### 6.5.6 Arrangement of terminal blocks




80MPF motor 80MPH motor

## Information:

**A single screw (M3 x 8 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!**

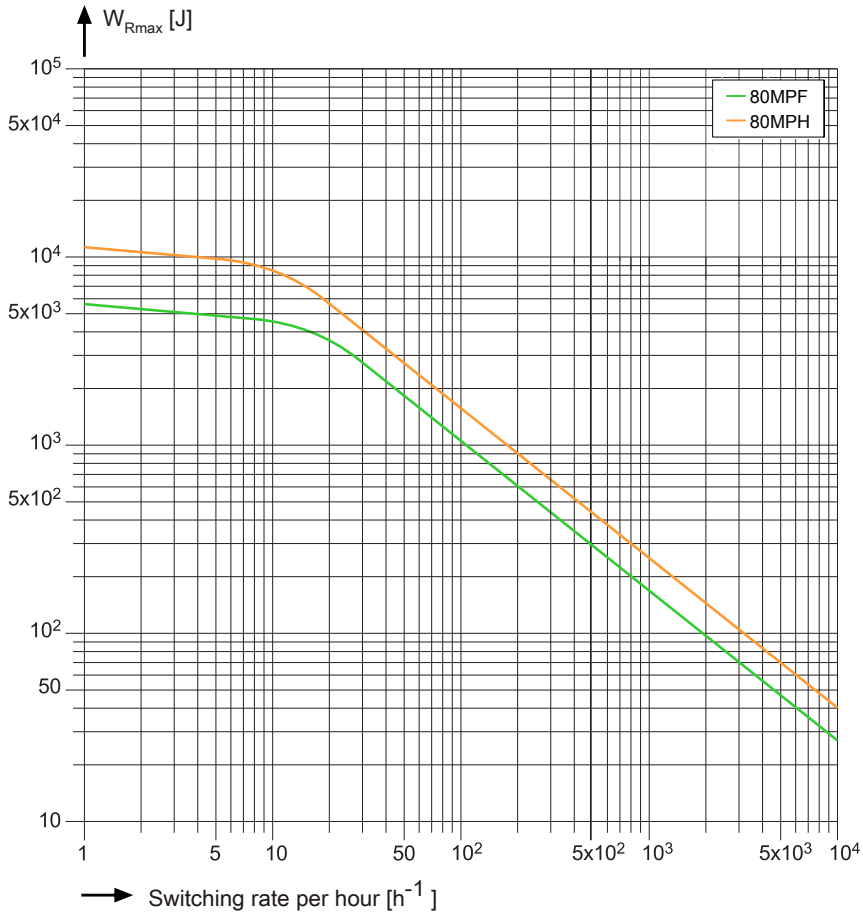
### 6.5.7 Holding brake

#### Maximum switching rate

The switching rate depends on the speed of rotation as well as the inertia. It can be taken from the image or calculated using the following formulas:

The permissible friction work $W_{Rmax}$ [J] work in dependence on the switching rate.

The values for $W_{Rmax}$ are valid for a rotary speed of 3000 rpm. Depending on the application at hand, these values can be exceeded int he positive and negative directions.




The necessary braking torque, thermal load, braking time and service life are important aspects when sizing brakes.

#### Nominal 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.

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

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.

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

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

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

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 may not 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:

$$W_R = \frac{J \cdot n^2}{182.5} \cdot \frac{M_{2n}}{M_{2n} \pm M_L} \qquad WR \leq WRmax$$

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 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.

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

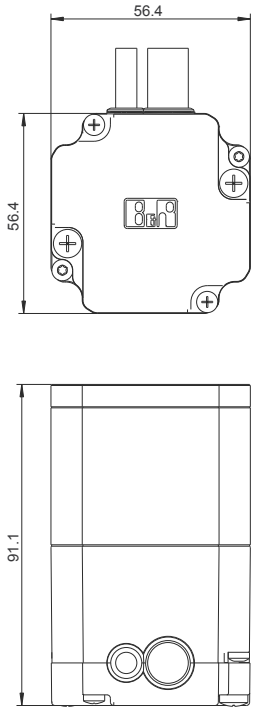
- $\alpha$ ... Angular acceleration [$s^{-2}$]
- J ... Moment of inertia [kgm²]
- K ... Safety factor (K ≥2)
- $M_{2N}$ ... Rated torque [Nm]
- $M_a$ ... dynamic torque [Nm]
- $M_{req}$ ... required braking torque [Nm]
- $M_L$ ... Load torque [Nm]
- n ... Speed [$s^{-1}$]
- $\Delta n$ ... Differential speed [$s^{-1}$]
- P ... Drive power [W]
- t ... Acceleration/Braking time [ms]
- $t_1$ ... Turn-on time [ms]
- $t_{11}$ ... Response delay[1)] [ms]
- $t_3$ ... Slip time[2)] [ms]
- $\omega$ ... Angular speed [$s^{-1}$]
- $W_R$ ... Friction [J]
- $W_{Rmax}$ ... maximum friction [J]

1) Time from switching off the current until the torque increases
2) Refers to the time the torque begins increasing until the moment of synchronization is reached

## 6.6 Motors with the SSI absolute encoder IP65 and brake options

| Model number | Short description | Figure |
|---|---|---|
| 80MPF5.500D113-01 | Brake option, IP65, for 80MPF motors For a list of all model numbers and the respective motor data, see the "SSI encoder" and "Brake" columns in "General overview" on page 18. | |
| | **Optional accessories** (more information in the "Accessories" on page 109 section) | |
| 80XMPXAC0.00-02 | Accessory set for motors with encoder and brake, 8-pin, 4-pin and 2-pin connector and crimp contact | |
| 80CMxxxxx.xx-01 | Motor and encoder cables | |

### 6.6.1 Dimensions



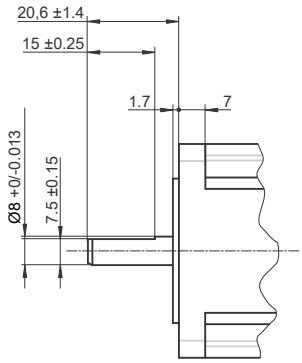

80MPF motors
SSI absolute encoder IP65 and brake options

The effective length of the motor is calculated from the length of the standard motor plus the length of the encoder option.

See basic motor:

"80MPF standard motors (flange size 60 mm)" on page 28

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



## 6.6.2 Technical data (80MPF)

### Motors with the SSI absolute encoder IP65 and brake options

| Order number | 80MPF5.500D113-01 |
|---|---|
| **Short description** | |
| Stepper motor | Stepper motor flange size 60 mm, length 184.4 mm, SSI encoder and brake |
| **General information** | |
| Certifications | |
| CE | Yes |
| UKCA | Yes |
| EAC | Yes |
| **Specific motor data** | |
| Wiring | Parallel |
| Current | 5 A |
| Resistance/Phase | 0.6 Ω |
| Inductance/Phase | 2.8 mH |
| Stall torque | 2.5 Nm |
| Holding torque | 3.5 Nm |
| Detent torque | <75 mNm |
| Rotor inertia | 920 $gcm^2$ |
| **General motor data** | |
| Stepping angle | 1.8° |
| Max. surface temperature | 90°C |
| Average period of operation between failures | 21,000 hours |
| Shaft type | Flat-sided shaft (D-cut) |
| Insulation class | B (130°C) |
| Insulation resistance | 100 MΩ min. 500 VDC |
| Dielectric resistance | 500 VAC for 1 minute |
| Driver supply voltage | Max. 80 VDC |
| **Operating conditions** | |
| Degree of protection per EN 60529 [1)] | IP65 |
| **Ambient conditions** | |
| Temperature | |
| Operation | -20 to 40°C |
| Storage | -30 to 85°C |
| Transport | -30 to 85°C |
| Relative humidity | |
| Operation | 5 to 95%, non-condensing |
| Storage | 5 to 95%, non-condensing |
| Transport | 5 to 95%, non-condensing |
| **Electrical properties - Encoder** | |
| Encoder type | SSI single-turn |
| Number of outputs | 4 (Data / nData / CLK / nCLK)<br><br>Nominal voltage: 3.3 VDC differential signal<br>Signal transmission: RS485 standard<br>Differential voltage:<br>(Data ↔ nData) >2 VDC<br>(CLK ↔ nCLK) >2 VDC |
| Resolution | 4096 increments per revolution |
| Output circuit | Differential signal |
| Output protection | Protection against short circuit |
| Current consumption | Max. 16 mA + Output load |
| Supply voltage | 18 to 30 VDC |
| Max. output current | ±25 mA per output |
| Data format | Gray |
| Counting direction | Clockwise |
| Clock frequency | Max. 400 kHz |
| Counter size | 12-bit |
| Monostable multivibrator | |
| Time | 100 µs |
| Signal | Low |
| **Electrical properties - Brake** | |
| Supply voltage | 24 VDC +6%/-10% |
| Braking torque [2)] | 2 Nm / 1.5 Nm / 1.8 Nm |
| Coil resistance | 52.36 Ω ±7% |
| Inductance | 0.7 H |
| Power consumption | Typ. 11 W |
| Connection time [3)] | 6 ms |
| Response delay [4)] | 2 ms |
| Cutoff time [5)] | 25 ms |

| Order number | 80MPF5.500D113-01 |
|---|---|
| **Mechanical properties** | |
| Max. radial load [6] | 75 N |
| Max. axial load | The permissible axial load is not permitted to be greater than the motor mass. |
| Weight | 1,800 g |
| Length | 184.4 mm |

1) From back of flange
2) Braking torque $M_{2N}$ / Mean dynamic braking torque 20°C / M stat. at 100°C
3) Time from switching off the current until the nominal torque is reached
4) Time from switching off the current until the torque increases
5) Time from switching on the current until the torque begins decreasing
6) Measured in the middle of the shaft

## Information:

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

### 6.6.3 Operating principle

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.**

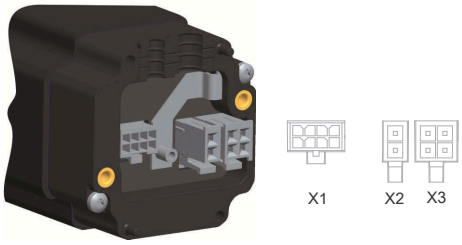
**The holding brake does not provide protection for personnel.**

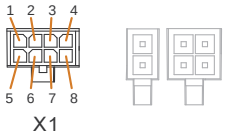
**The maximum motor torque can exceed the holding torque for the brake.**

## 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).**

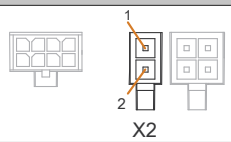
### 6.6.4 Pinout X1 - X3

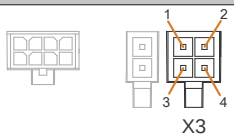



| X1 - Encoder connection | Pinout | |
|---|---|---|
|   | Pin | Name |
| | 1 | DATA |
| | 2 | nDATA |
| | 3 | CLK |
| | 4 | nCLK |
| | 5 | NC |
| | 6 | 24 VDC (encoder supply) |
| | 7 | GND |
| | 8 | NC |

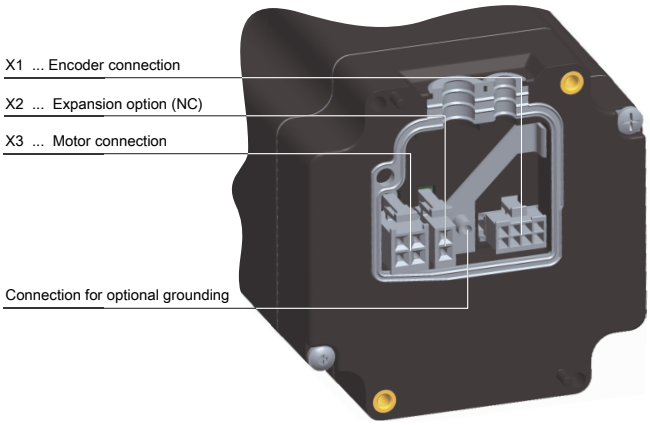
## Information:

**Pins 5 and 8 (NC) must remain free and may not be used.**

| X2 - Motor brake | Pinout | |
|---|---|---|
|   | Pin | Name |
| | 1 | 24 VDC (brake) |
| | 2 | GND |

| X3 - Motor connection | Pinout | |
|---|---|---|
|   | Pin | Name |
| | 1 | Motor phase A\ |
| | 2 | Motor phase B\ |
| | 3 | Motor phase A |
| | 4 | Motor phase B |

### 6.6.5 Arrangement of terminal blocks




80MPH motor

## Information:

**A single screw (M3 x 8 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!**

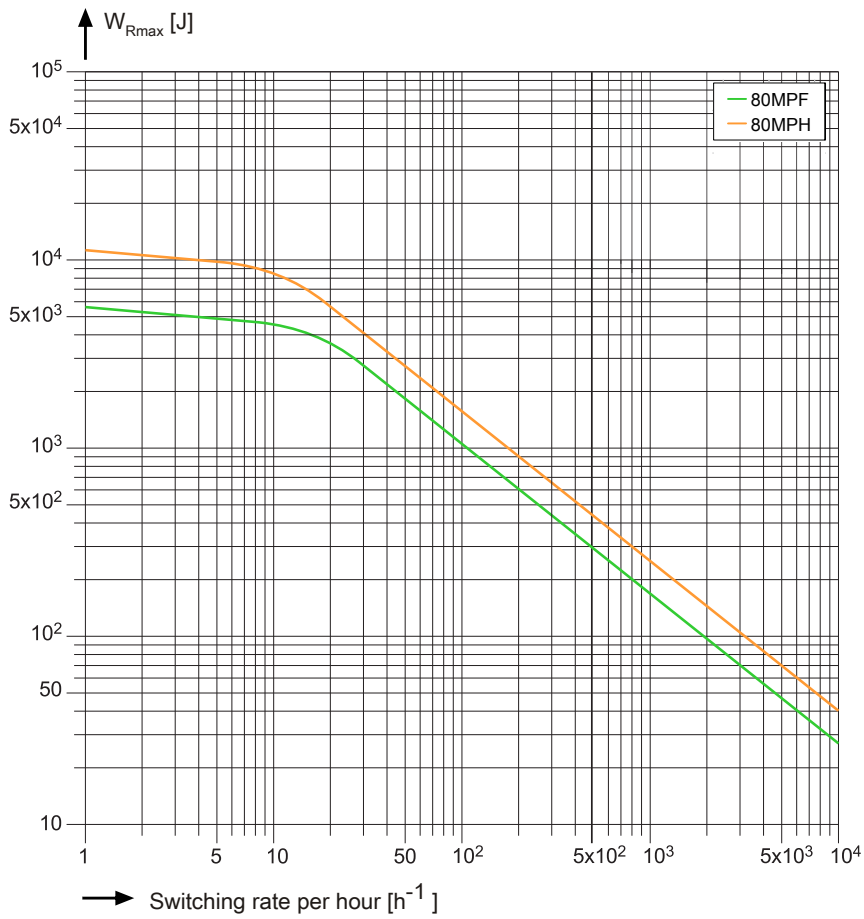
### 6.6.6 Holding brake

#### Maximum switching rate

The switching rate depends on the speed of rotation as well as the inertia. It can be taken from the image or calculated using the following formulas:

The permissible friction work $W_{R\text{-}max}$ [J] work in dependence on the switching rate.

The values for $W_{Rmax}$ are valid for a rotary speed of 3000 rpm. Depending on the application at hand, these values can be exceeded int he positive and negative directions.




The necessary braking torque, thermal load, braking time and service life are important aspects when sizing brakes.

### Nominal 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.

$M_{2N} = M_{req} \cdot K$ $\quad K \geq 2$ $\quad M_{req}$= required braking 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.

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

### 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:

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

### 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 may not 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:

$$W_R = \frac{J \cdot n^2}{182.5} \cdot \frac{M_{2n}}{M_{2n} \pm M_L} \qquad WR \leq WRmax$$

### 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.

### Acceleration/Braking time

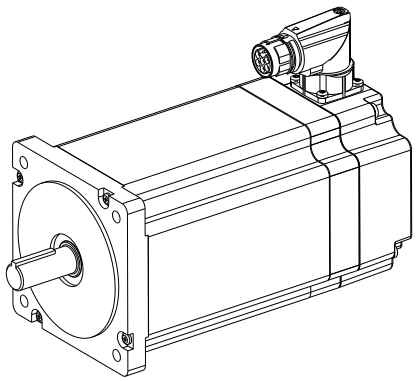
$$t = \frac{J \cdot \omega}{M_{2n} \pm M_L} + t_1$$

### Overview of formula variables

- $\alpha$ ... Angular acceleration [$s^{-2}$]
- J ... Moment of inertia [kgm²]
- K ... Safety factor (K ≥2)
- $M_{2N}$ ... Rated torque [Nm]
- $M_a$ ... dynamic torque [Nm]
- $M_{req}$ ... required braking torque [Nm]
- $M_L$ ... Load torque [Nm]
- n ... Speed [$s^{-1}$]
- $\Delta n$ ... Differential speed [$s^{-1}$]
- P ... Drive power [W]
- t ... Acceleration/Braking time [ms]
- $t_1$ ... Turn-on time [ms]
- $t_{11}$ ... Response delay[1)] [ms]
- $t_3$ ... Slip time[2)] [ms]
- $\omega$ ... Angular speed [$s^{-1}$]
- $W_R$ ... Friction [J]
- $W_{Rmax}$ ... maximum friction [J]

1) Time from switching off the current until the torque increases
2) Refers to the time the torque begins increasing until the moment of synchronization is reached

# 6.7 80MPH6.101S100-01 (IP65 protection, with built-in connector, without encoder)

| Order number | Short description | |
|---|---|---|
| 80MPH6.101S100-01 | Standard motor 80MPH6.101S000-01<br>• Built-in connector for power connection (7-pin, Intercontec series 917)<br>• **Without** encoder<br>• IP65 protection (from flange)<br>• IP40 protection (flange) |  |
| | **Optional accessories** | |
| | There is no pre-assembled B&R cable available. | |

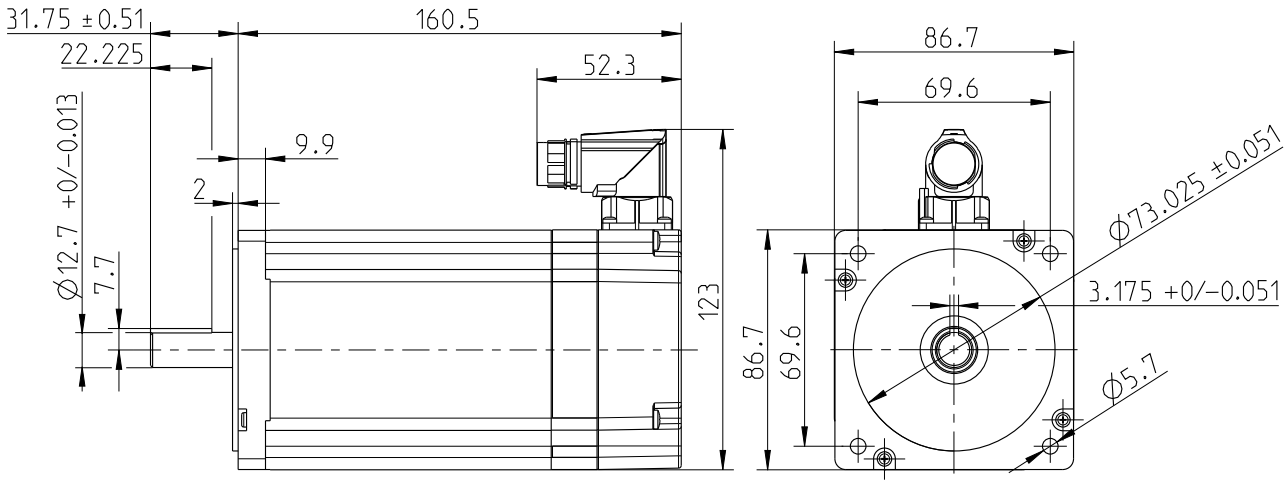
## 6.7.1 Technical data

### 80MPH6.101S100-01

| Order number | 80MPH6.101S100-01 |
|---|---|
| **Short description** | |
| Stepper motor | Stepper motor flange size 87.1 mm, length 160 mm |
| **General information** | |
| Certifications | |
| CE | Yes |
| UKCA | Yes |
| UL | cURus E360421<br>Servo and stepper motors - Component |
| **Specific motor data** | |
| Wiring | Parallel |
| Current | 10 A |
| Resistance/Phase | 0.24 Ω |
| Inductance/Phase | 1.6 mH |
| Stall torque | 9.3 Nm |
| Holding torque | 13.6 Nm |
| Detent torque | <420 mNm |
| Rotor inertia | Approx. 3.92 kgcm² |
| **General motor data** | |
| Stepping angle | 1.8° |
| Max. surface temperature | 100°C |
| Average period of operation between failures | 20,000 hours |
| Shaft type | With key |
| Insulation class | B (130°C) |
| Insulation resistance | 25 MΩ min. 500 VDC |
| Dielectric resistance | 1.63 kVDC for 1 minute |
| Driver supply voltage | Max. 80 VDC |
| **Operating conditions** | |
| Degree of protection per EN 60529 [1] | IP65 |
| **Ambient conditions** | |
| Temperature | |
| Operation | -20 to 40°C |
| Storage | -20 to 85°C |
| Transport | -20 to 85°C |
| Relative humidity | |
| Operation | 5 to 95%, non-condensing |
| Storage | 5 to 95%, non-condensing |
| Transport | 5 to 95%, non-condensing |
| **Mechanical properties** | |
| Max. radial load [2] | 290 N |
| Max. axial load | 225 N |
| Weight | 4,400 g |
| Length | 160.5 mm |

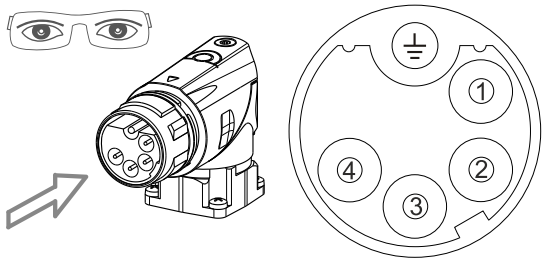
1) From back of flange
2) Measured in the middle of the shaft

## 6.7.2 Dimensions




## 6.7.3 Pinout

### Built-in connector (Intercontec series 917)




| Pin | Description | Function |
|---|---|---|
| 1 | A | Motor phase A |
| 2 | A\ | Motor phase A\ |
| 3 | B | Motor phase B |
| 4 | B\ | Motor phase B\ |
| ⏚ | PE | Grounding |

# 7 Torque curves

This chapter shows all torque curves for B&R stepper motors. A list of all stepper motors and the corresponding torque curves can be found in the "General overview" on page 18.

Series-wired stepper motors are preferred because of the corresponding thermal conditions.

The motor performance is highly dependent on thermal conditions, so it is important to ensure that motor losses and the resulting heat is properly dissipated.

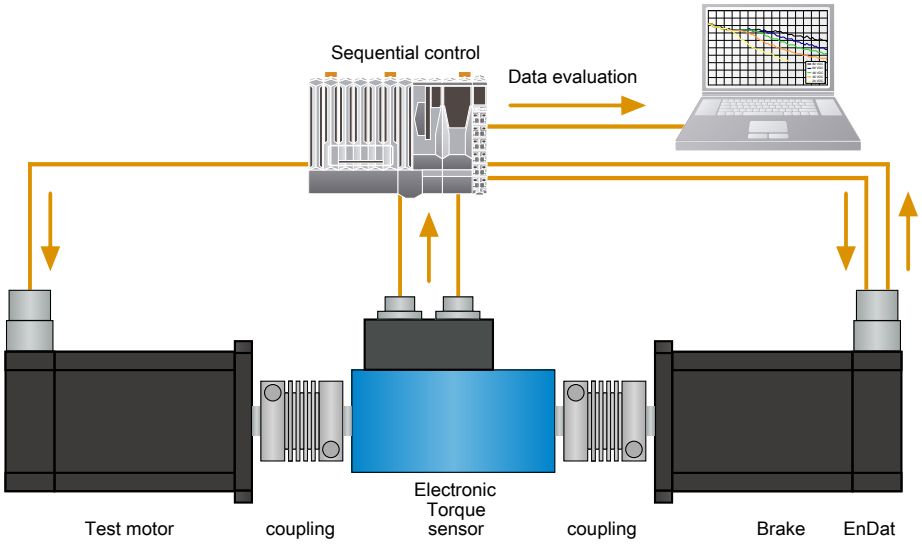


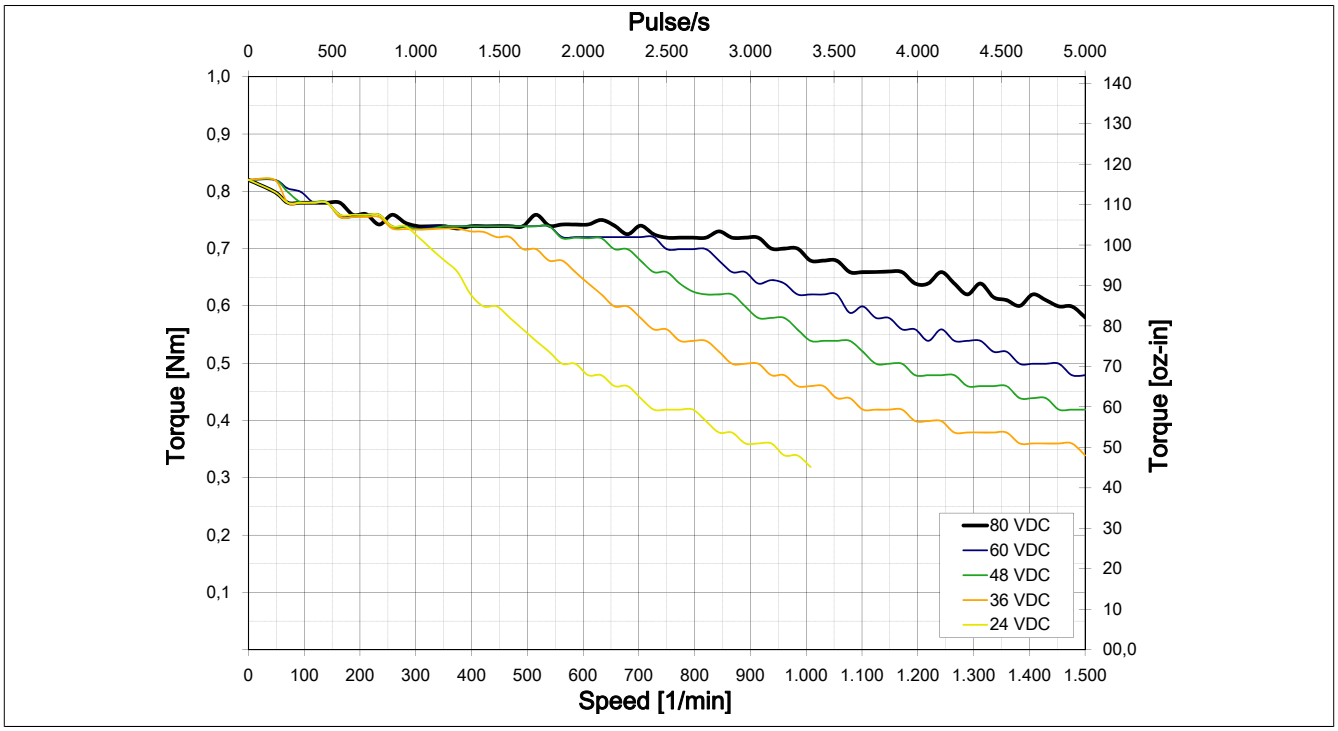

Diagram of motor torque measurement procedure

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.

# 7.1 80MPD1.x00xxxx-xx[1)]

## 7.1.1 Series wiring 3 A (80MPD1.300xxxx-xx)




## 7.1.2 Parallel wiring 6 A (80MPD1.600xxxx-xx)

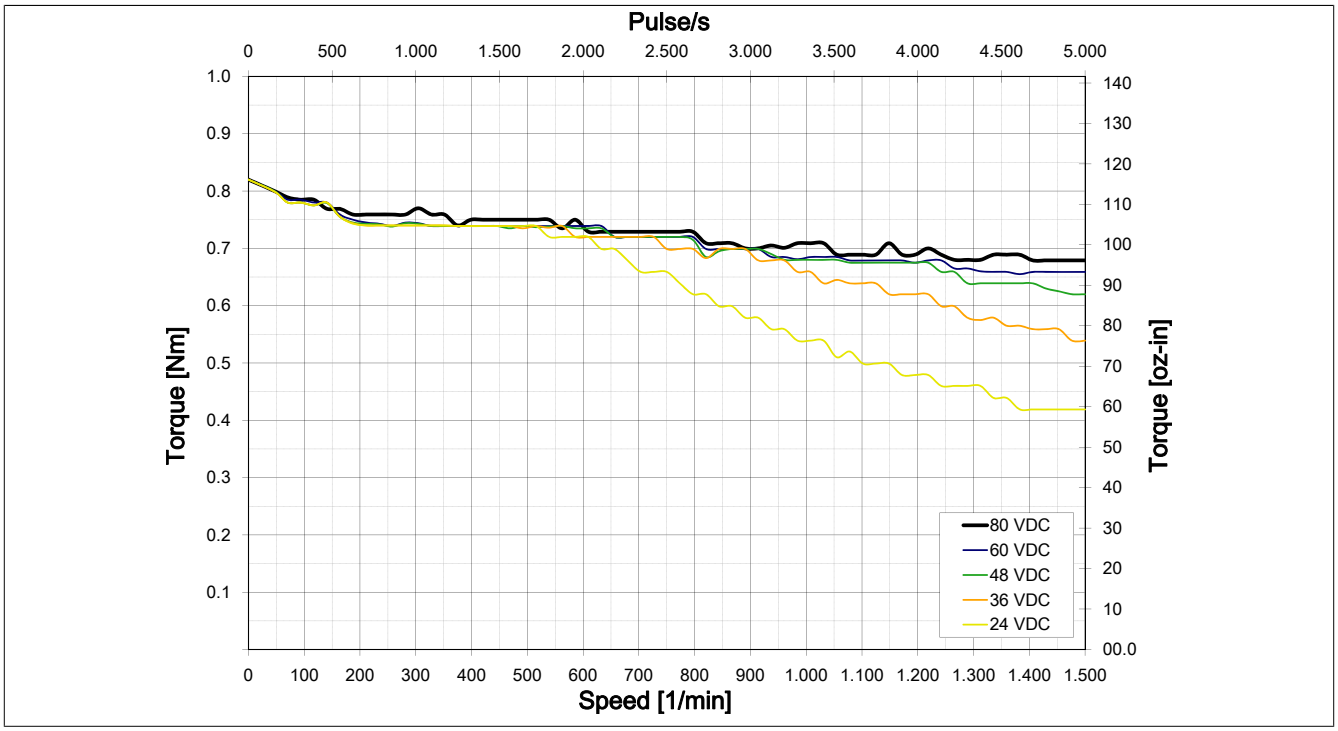



Figure 1: 80MPD1.300S000-01 torque curves, parallel 6 A

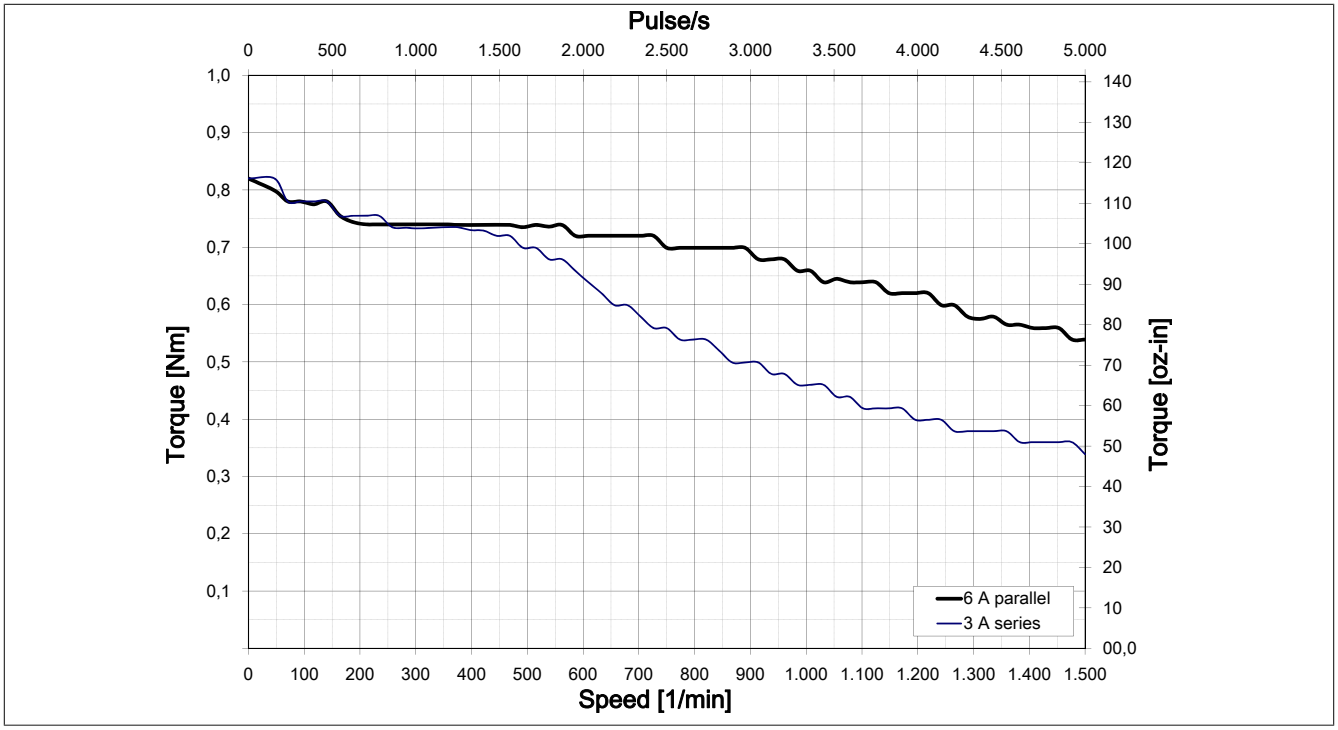
[1)] The torque curve is represented in microsteps.

### 7.1.3 Selecting the suitable connection type[2)]

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

**80MPD1.300xxxx-xx / 80MPD1.600xxxx-xx**

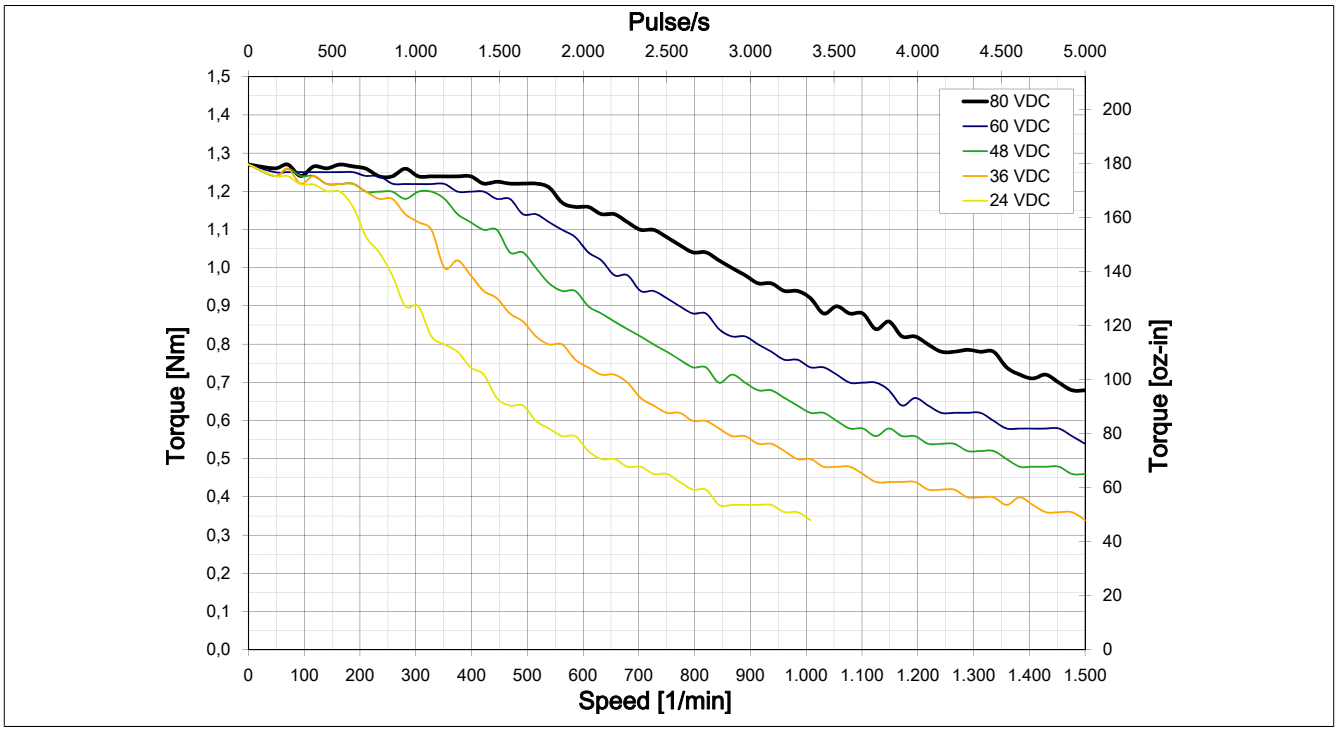
**Comparison: series / parallel wiring at 36 V**



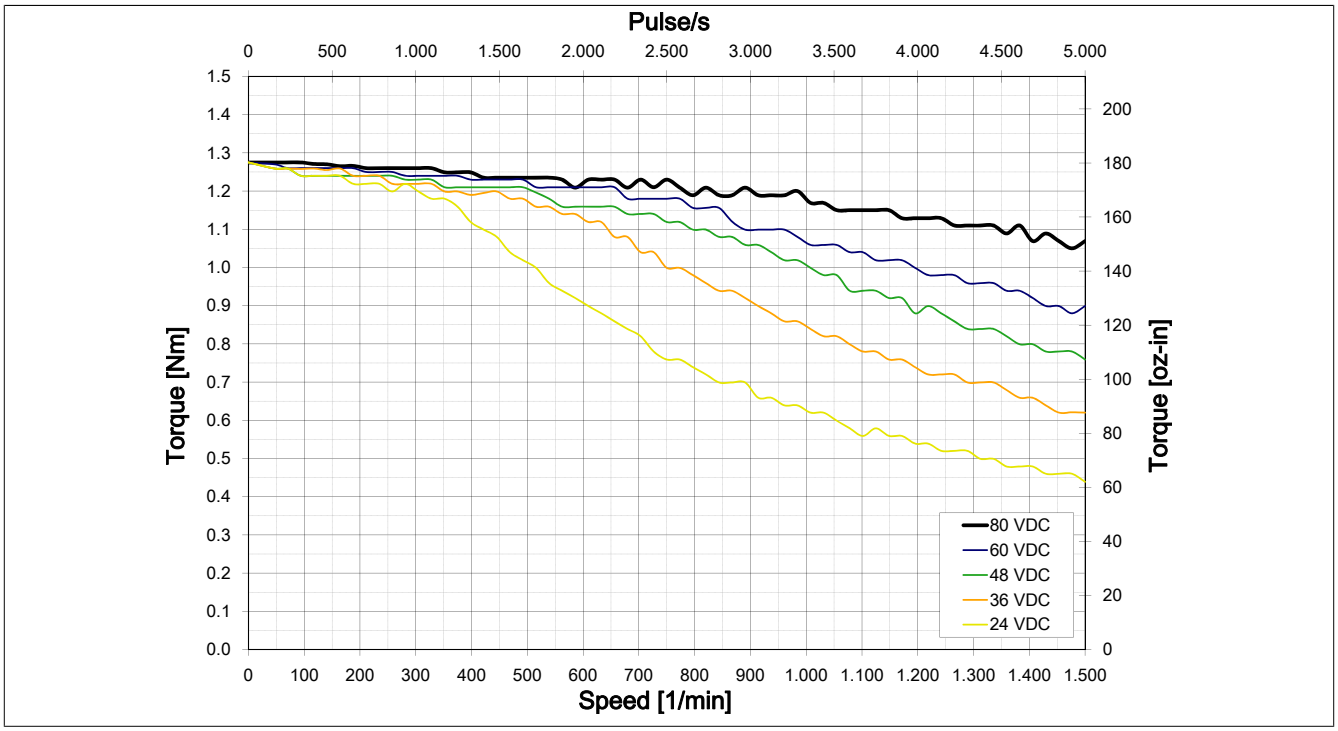

[2)] The torque curve is represented in microsteps.

## 7.2 80MPD3.x00xxxx-xx[3)]

### 7.2.1 Series wiring 3 A (80MPD3.300xxxx-xx)




### 7.2.2 Parallel wiring 6 A (80MPD3.600xxxx-xx)



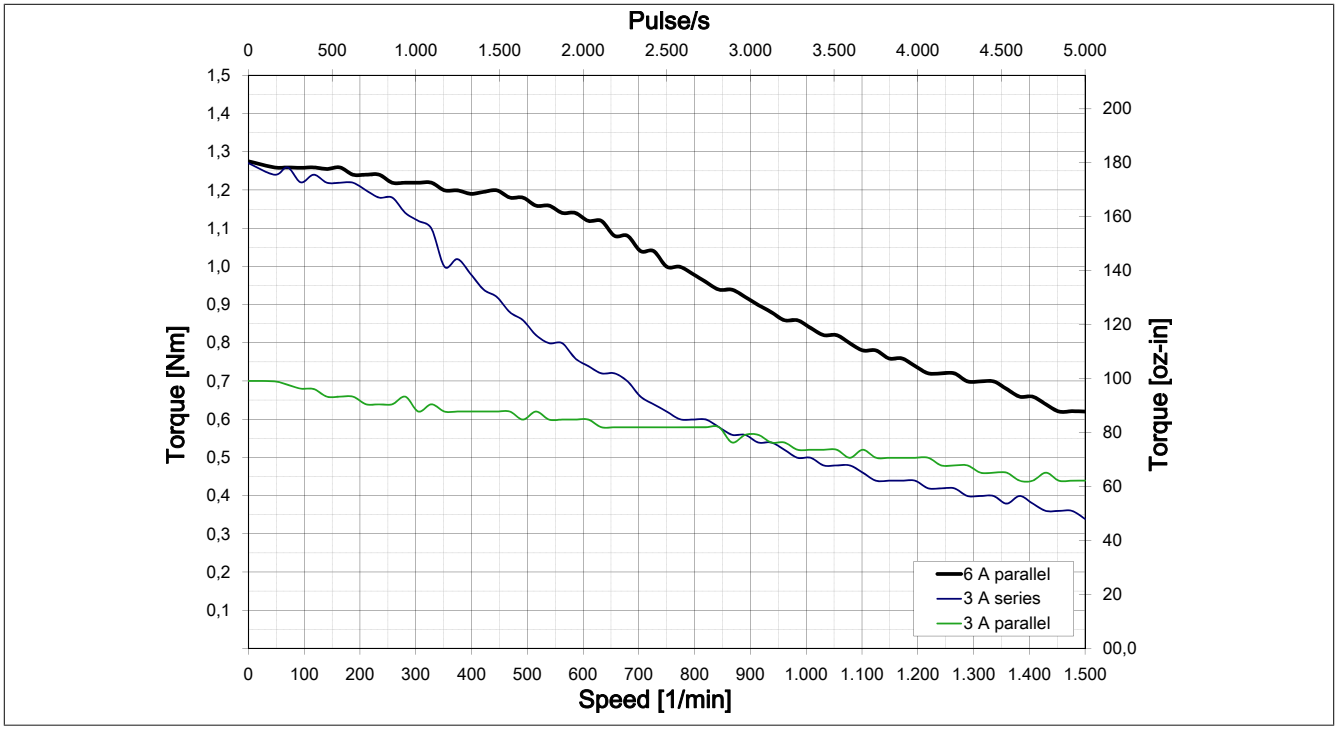

[3)] The torque curve is represented in microsteps.

### 7.2.3 Selecting the suitable connection type[4)]

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

**80MPD3.300xxxx-xx / 80MPD3.600xxxx-xx**

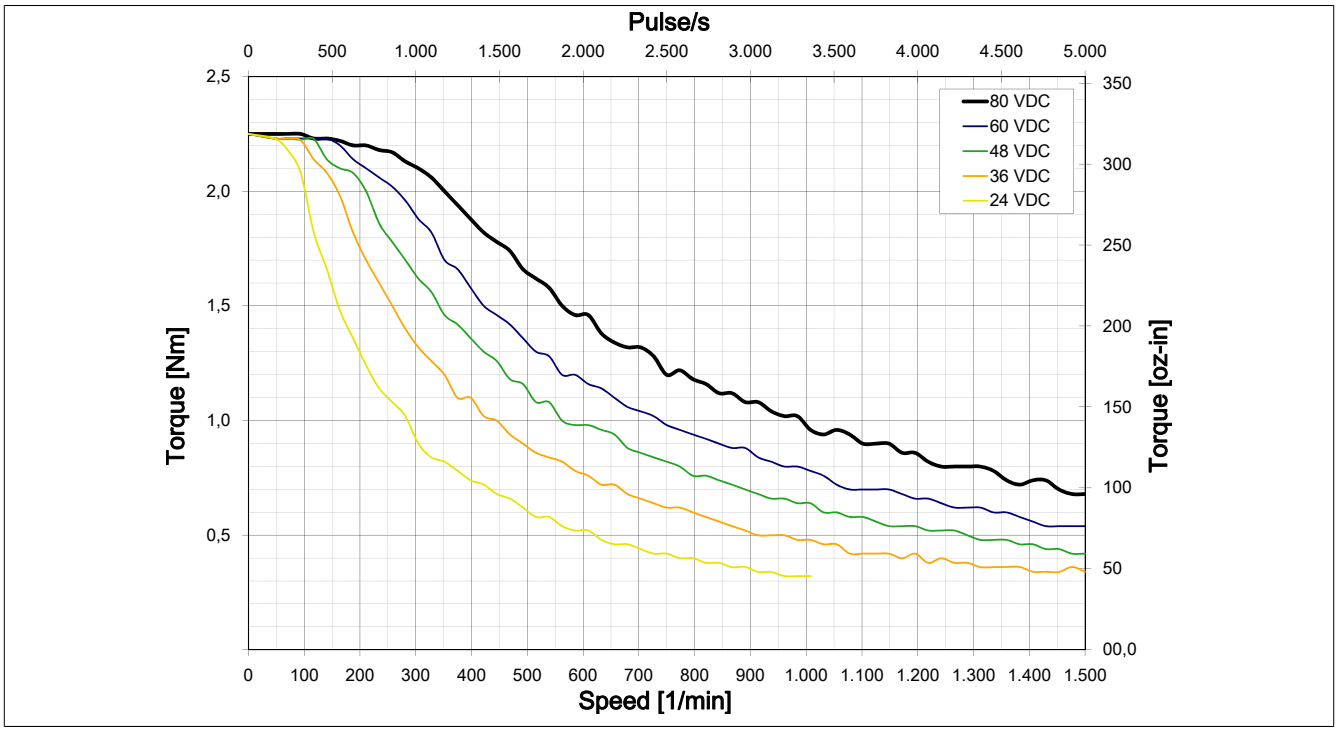
**Comparison: series / parallel wiring at 36 V**



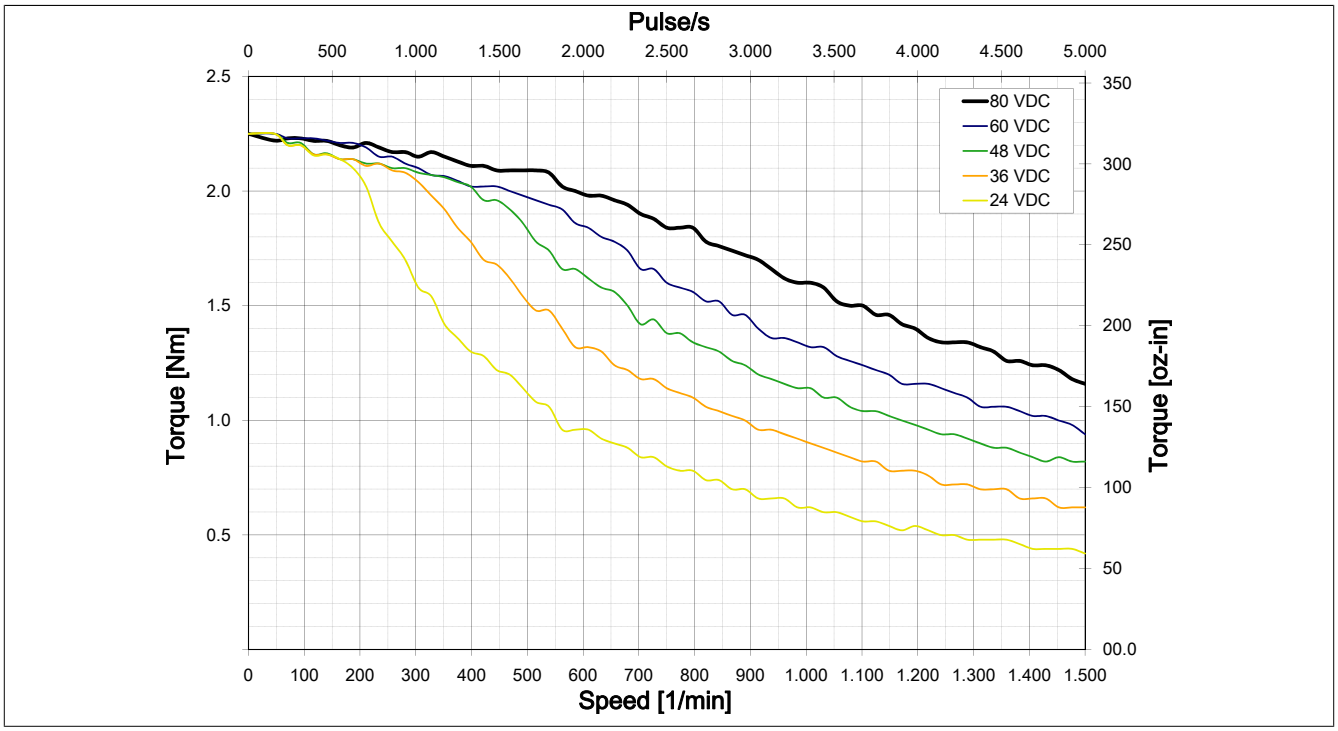

[4)] The torque curve is represented in microsteps.

## 7.3 80MPD5.x00xxxx-xx[5)]

### 7.3.1 Series wiring 3 A (80MPD5.300xxxx-xx)




### 7.3.2 Parallel wiring 6 A (80MPD5.600xxxx-xx)



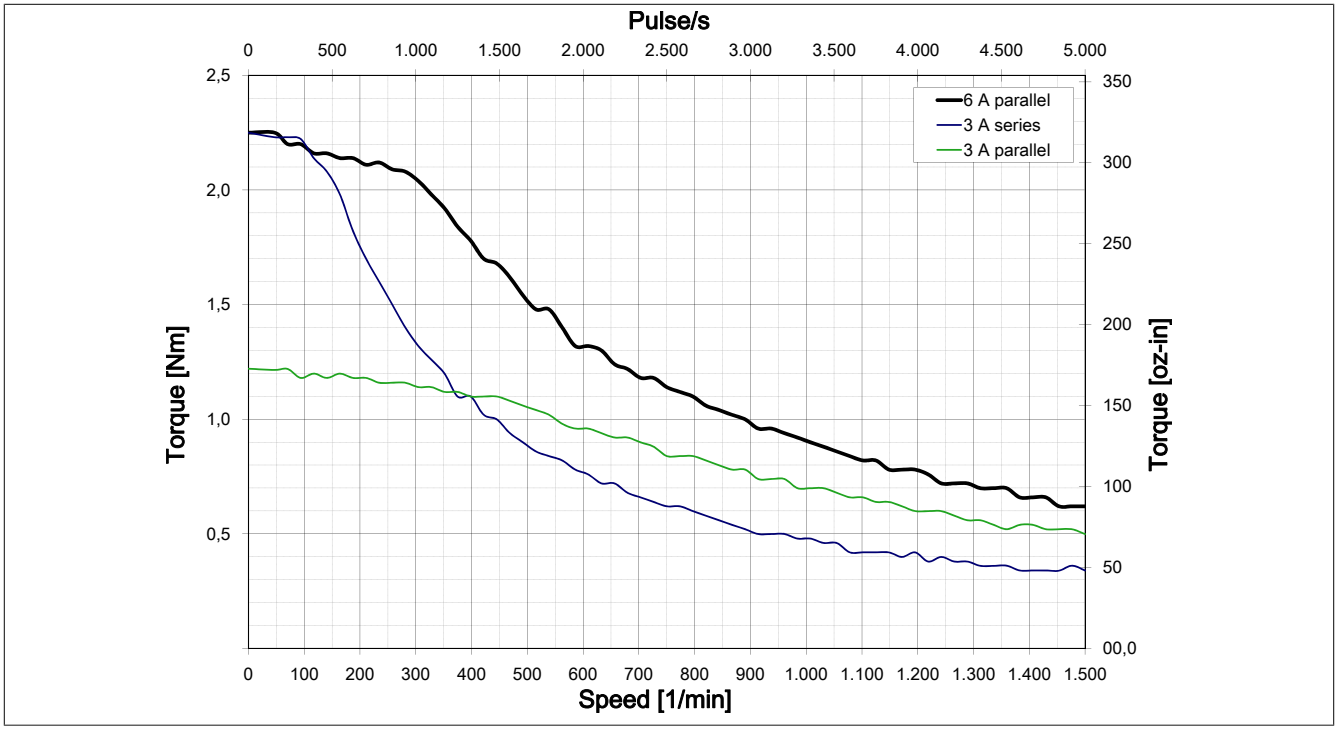

[5)] The torque curve is represented in microsteps.

### 7.3.3 Selecting the suitable connection type[6)]

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

**80MPD5.300xxxx-xx / 80MPD5.600xxxx-xx**

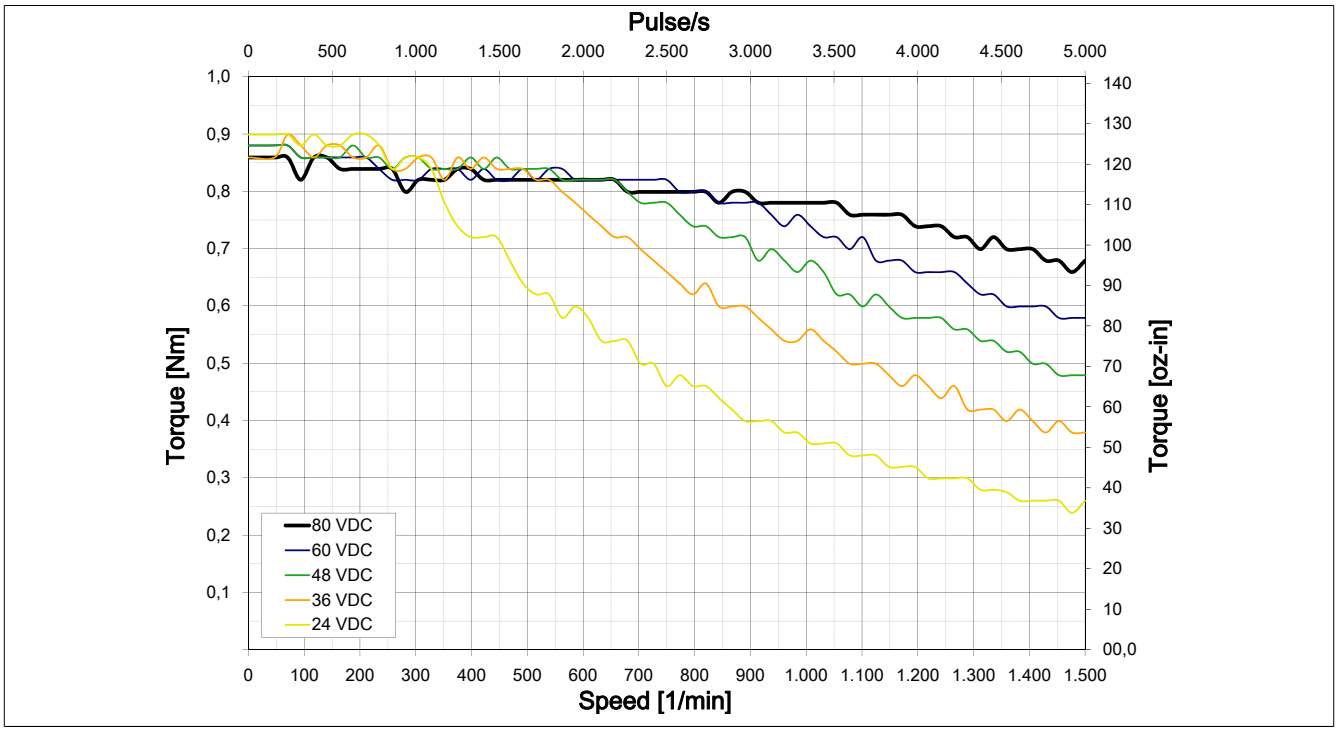
**Comparison: series / parallel wiring at 36 V**



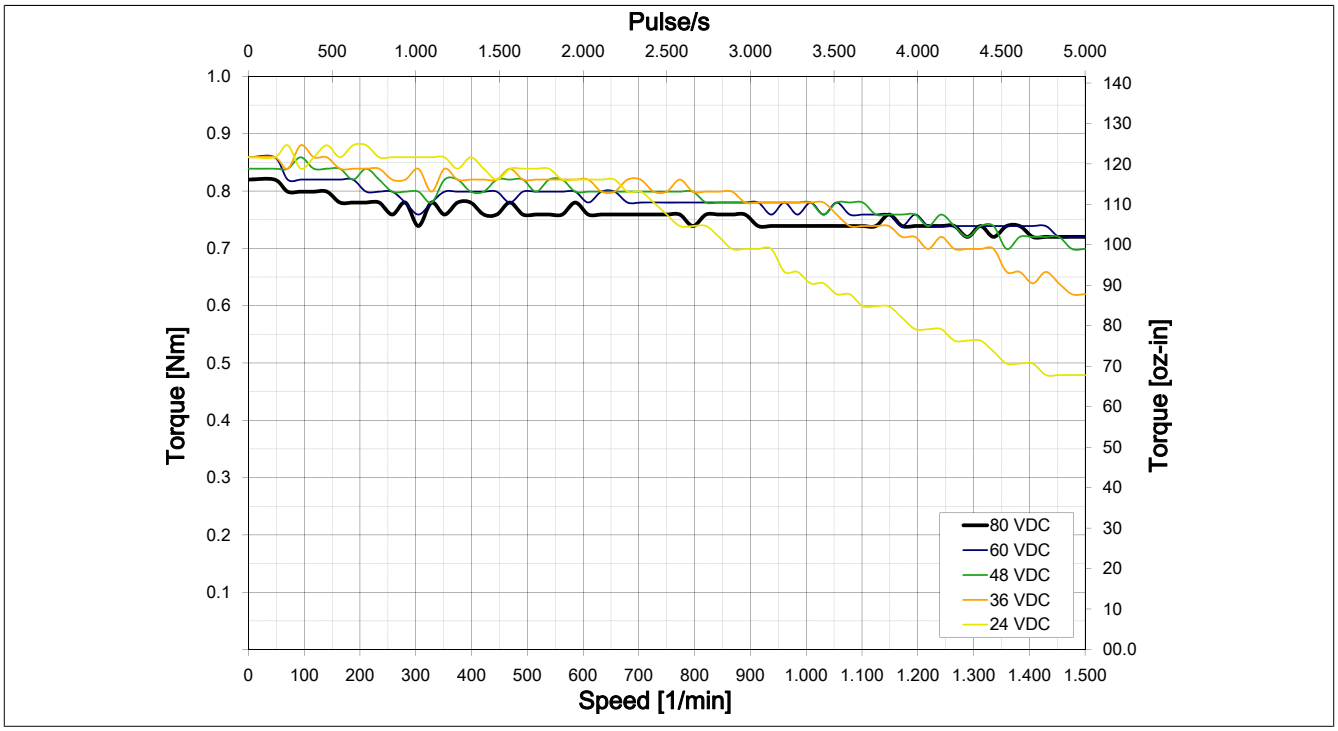

[6)] The torque curve is represented in microsteps.

## 7.4 80MPF1.xx0xxxx-xx[7)]

### 7.4.1 Series wiring 2.5 A (80MPF1.250xxxx-xx)



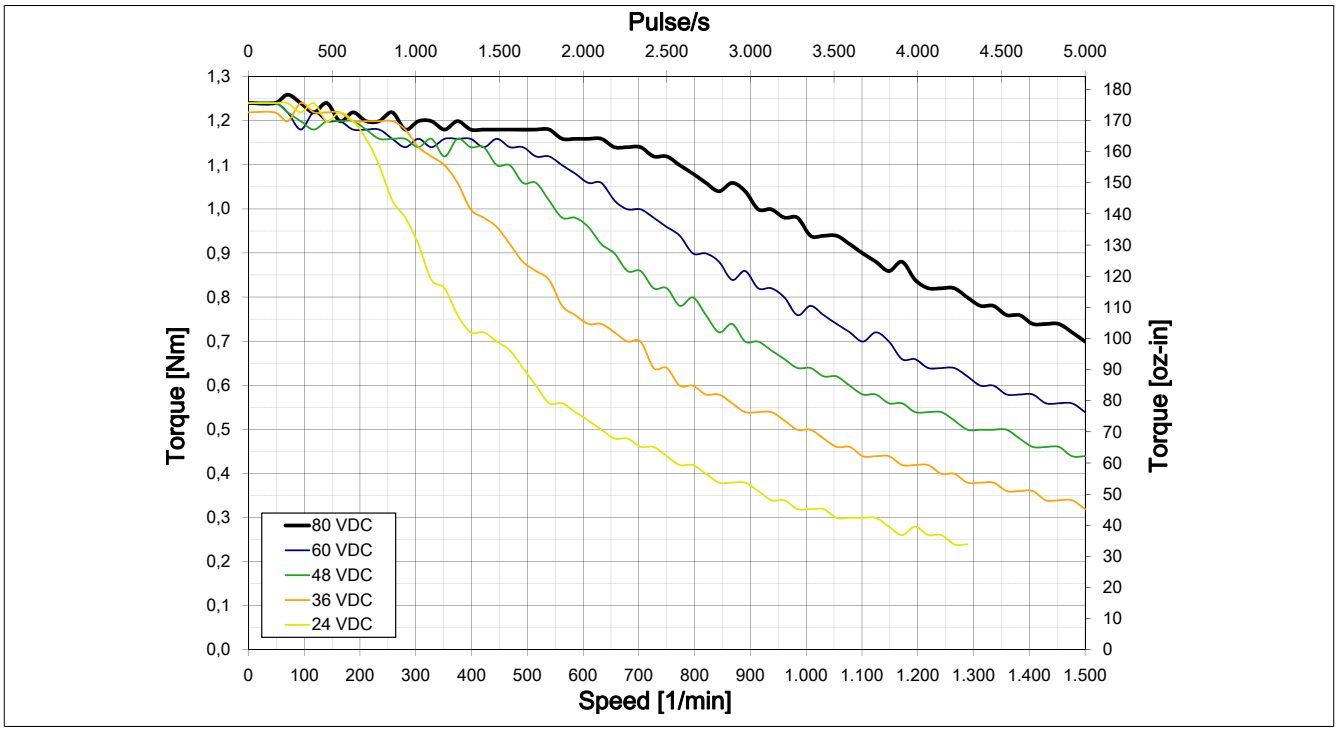

### 7.4.2 Parallel wiring 5 A (80MPF1.500xxxx-xx)



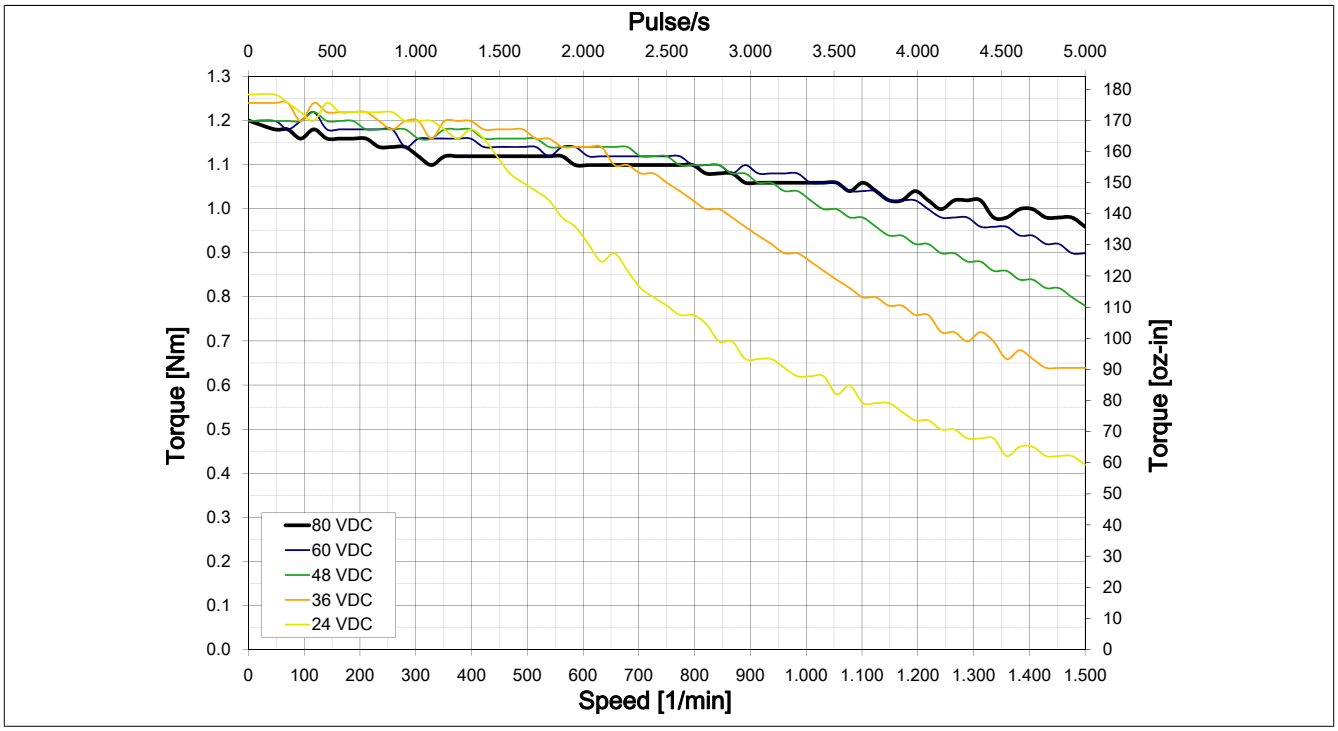

[7)] The torque curve is represented in microsteps.

## 7.5 80MPF3.xx0xxxx-xx[8)]

### 7.5.1 Series wiring 2.5 A (80MPF3.250xxxx-xx)



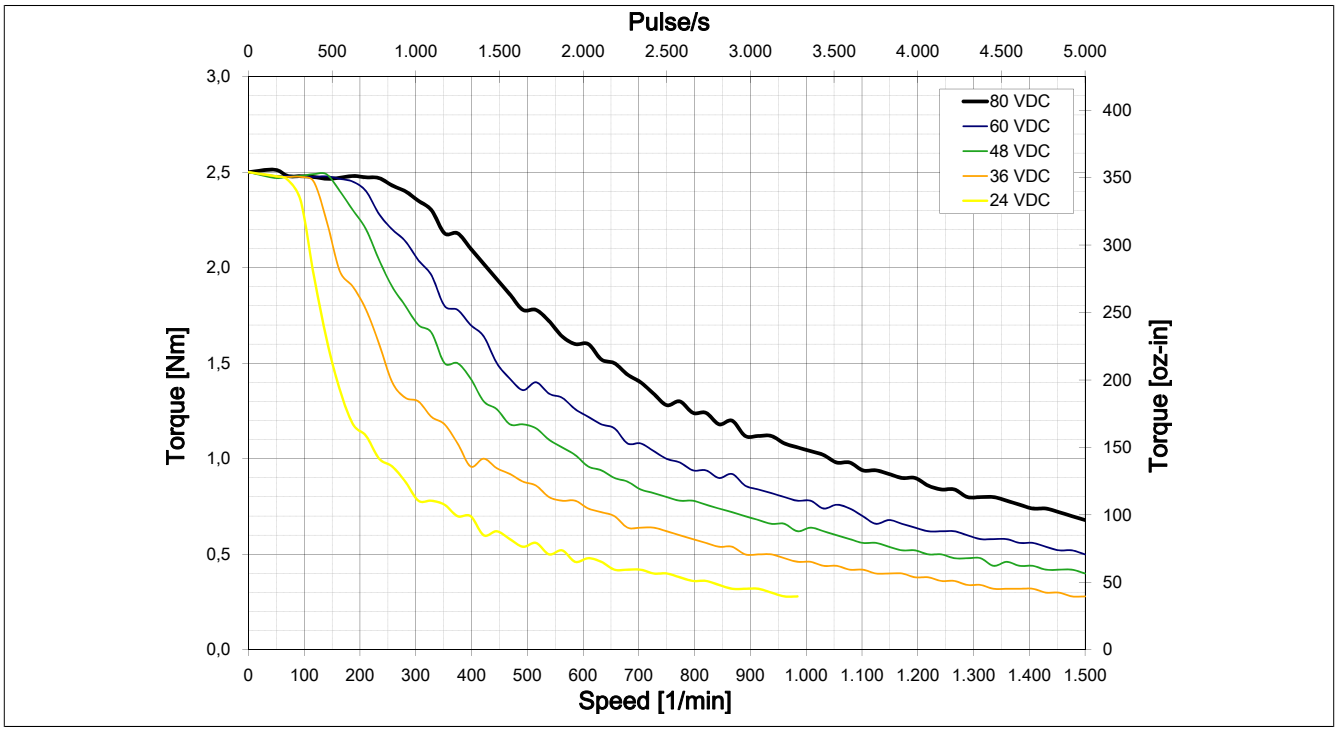

### 7.5.2 Parallel wiring 5 A (80MPF3.500xxxx-xx)



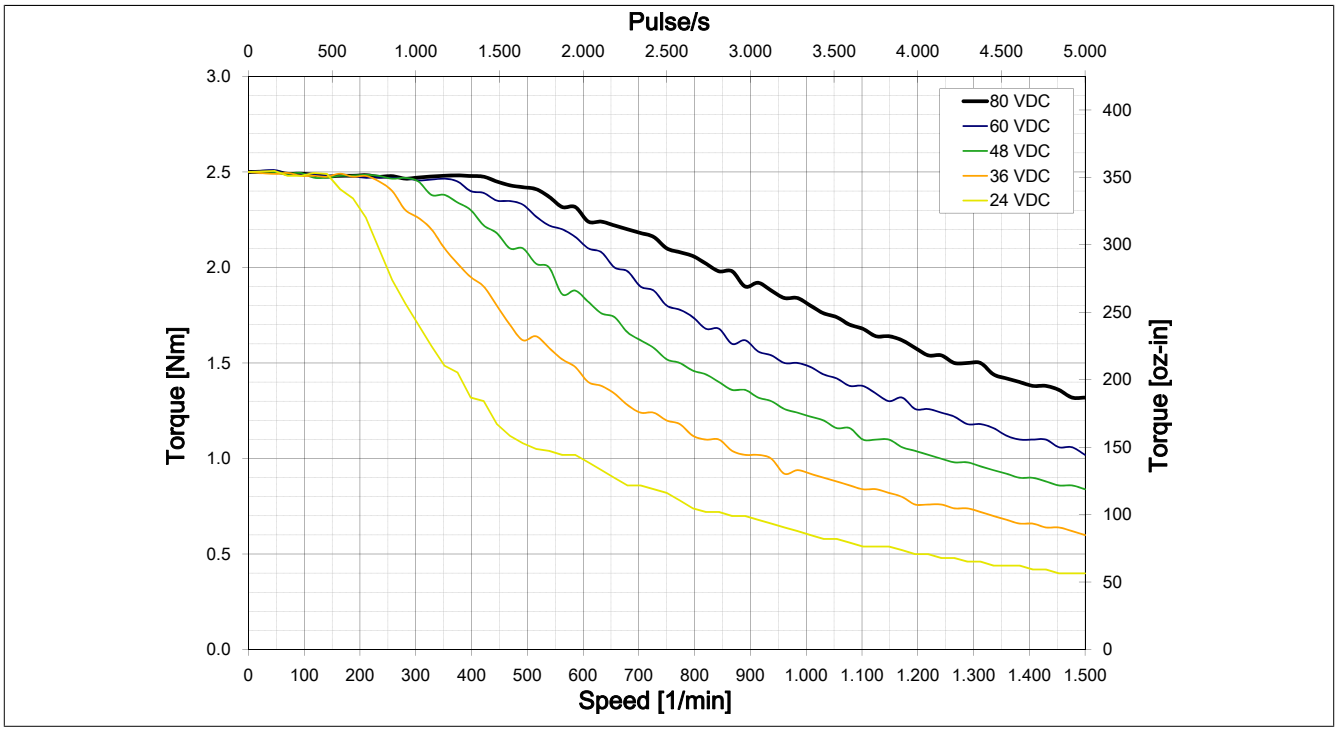

8) The torque curve is represented in microsteps.

## 7.6 80MPF5.xx0xxxx-xx[9)]

### 7.6.1 Series wiring 2.5 A (80MPF5.250xxxx-xx)



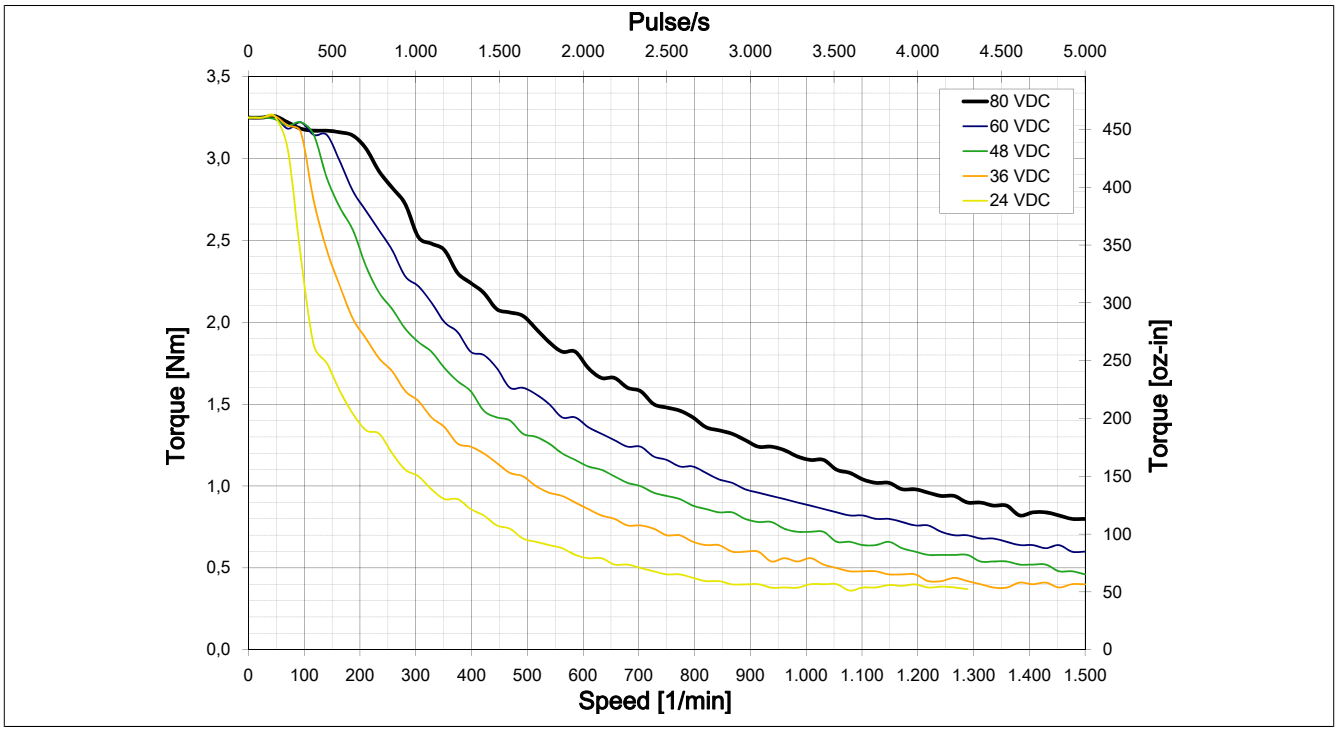

### 7.6.2 Parallel wiring 5 A (80MPF5.500xxxx-xx)



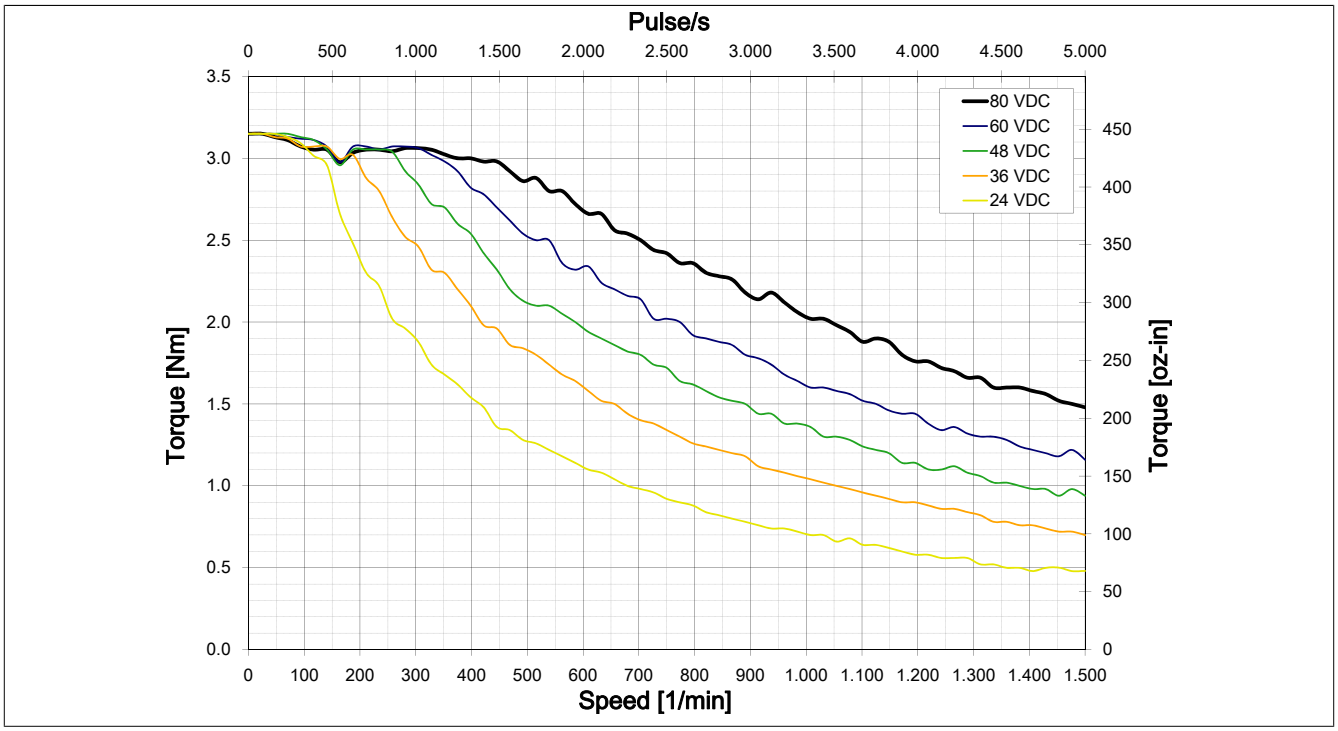

9) The torque curve is represented in microsteps.

## 7.7 80MPH1.x00xxxx-xx[10)]

### 7.7.1 Series wiring 3 A (80MPH1.300xxxx-xx)




### 7.7.2 Parallel wiring 6 A (80MPH1.600xxxx-xx)



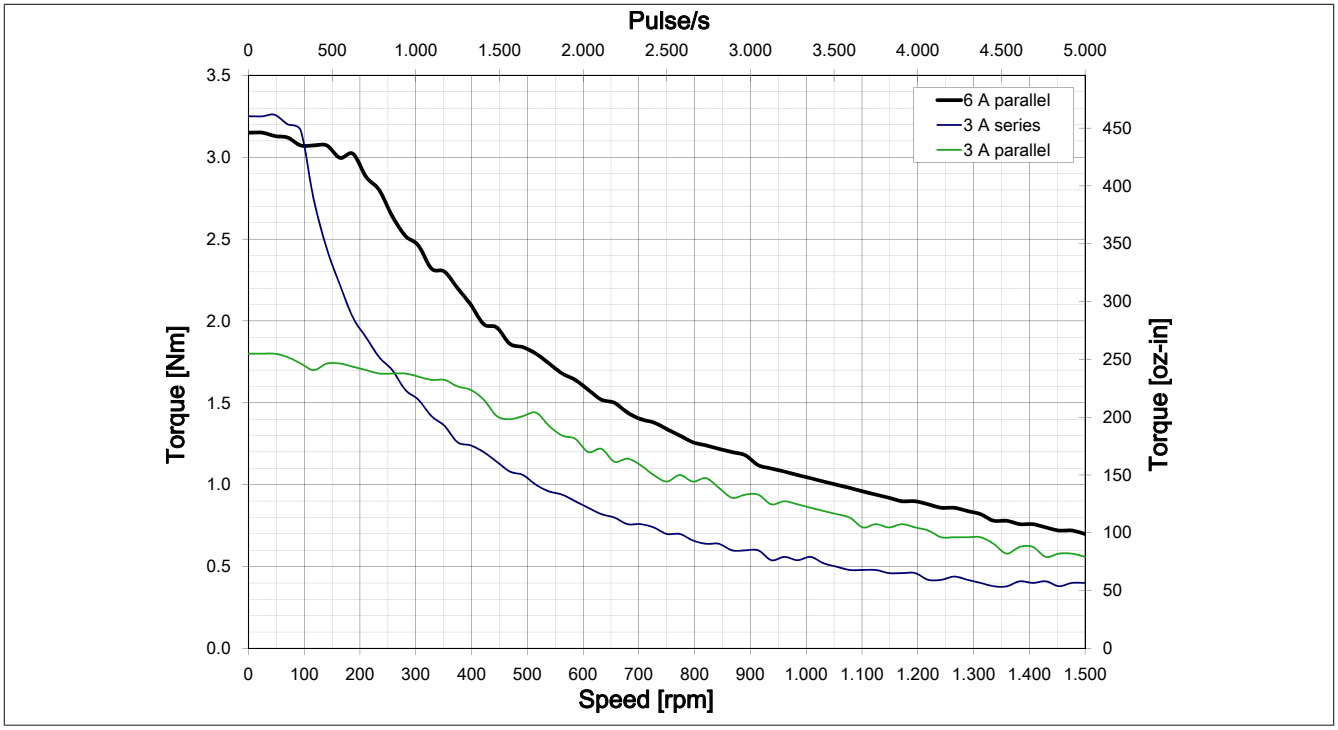

[10)] The torque curve is represented in microsteps.

### 7.7.3 Selecting the suitable connection type[11)]

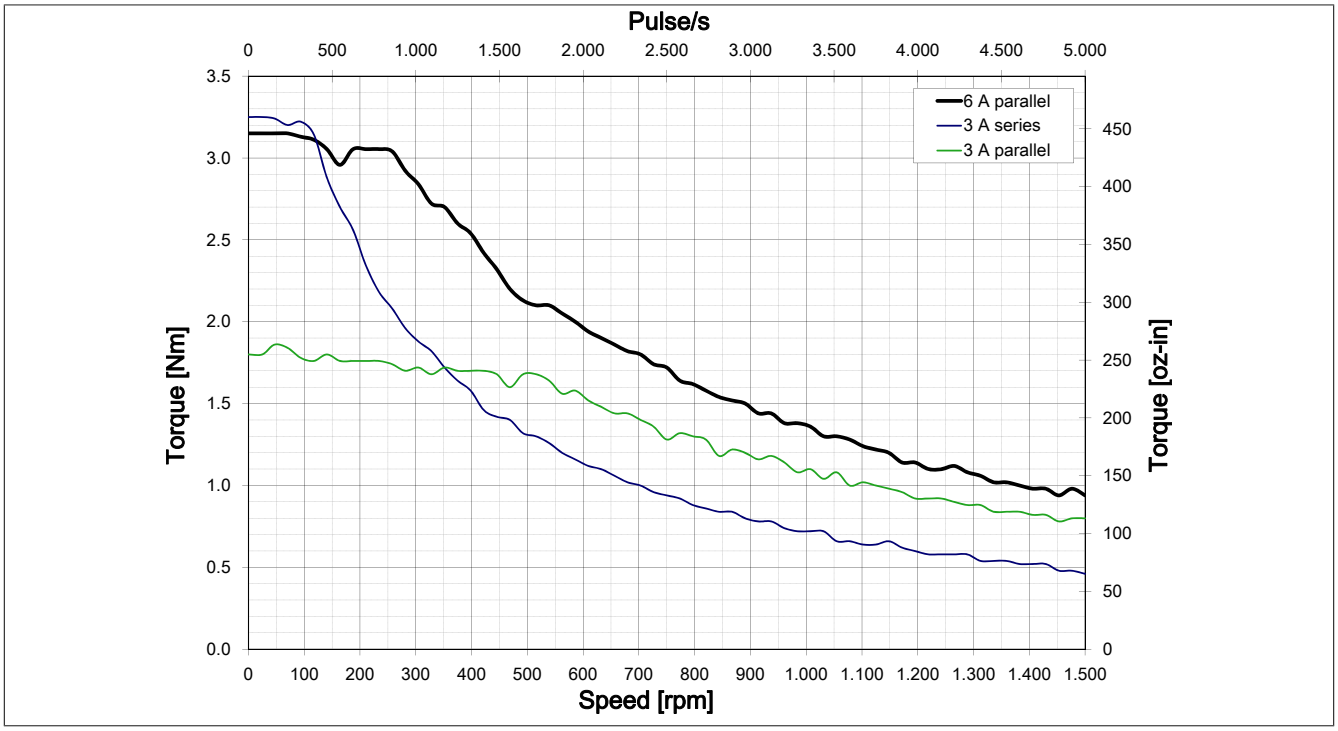
The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

**80MPH1.300xxxx-xx / 80MPH1.600xxxx-xx**

**Comparison: series / parallel wiring at 36 V**



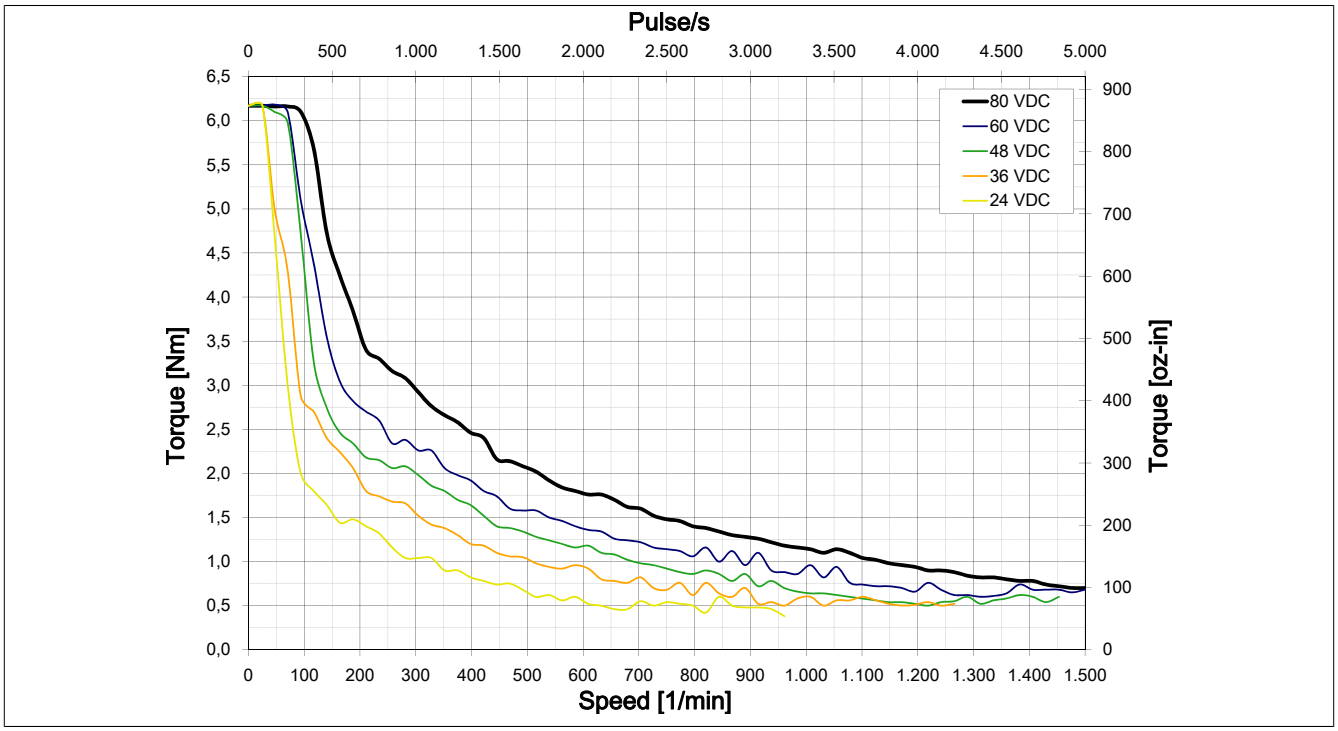

**Comparison: series / parallel wiring at 48 V**



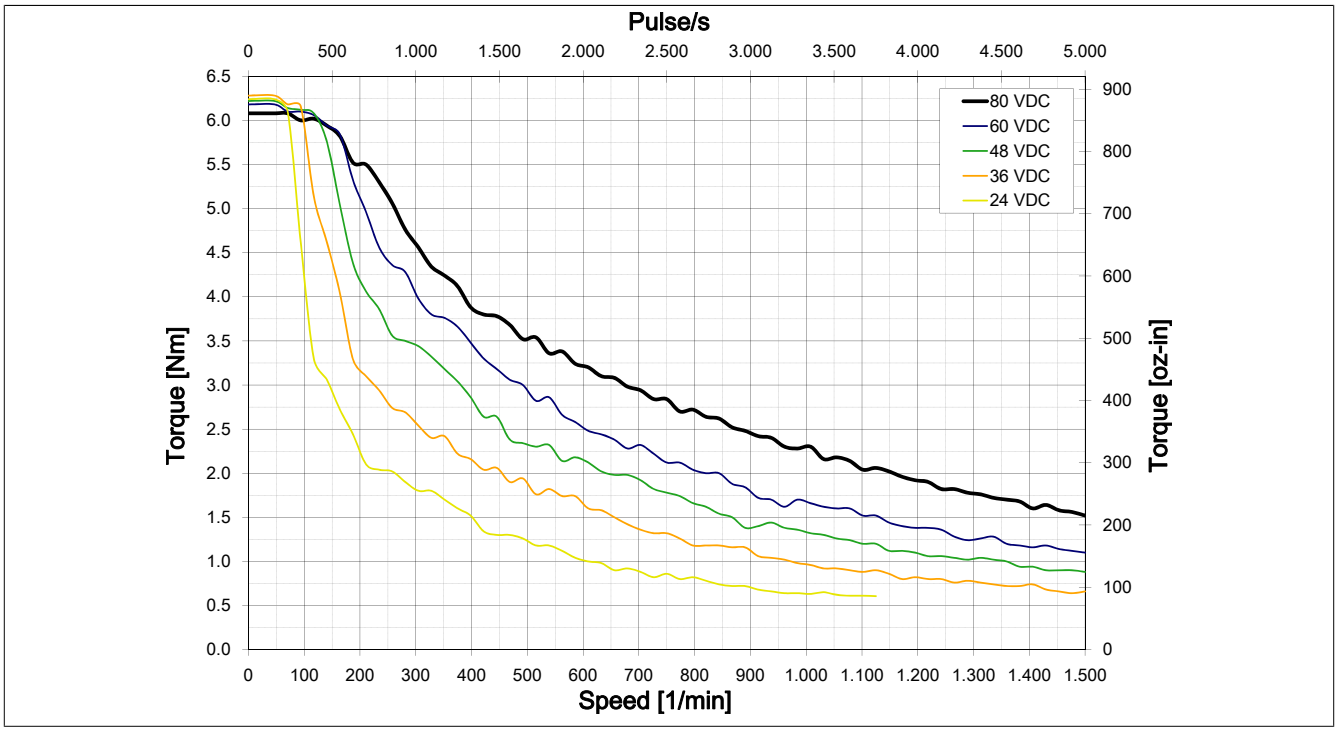

[11)] The torque curve is represented in microsteps.

## 7.8 80MPH3.x00xxxx-xx[12)]

### 7.8.1 Series wiring 3 A (80MPH3.300xxxx-xx)




### 7.8.2 Parallel wiring 6 A (80MPH3.600xxxx-xx)



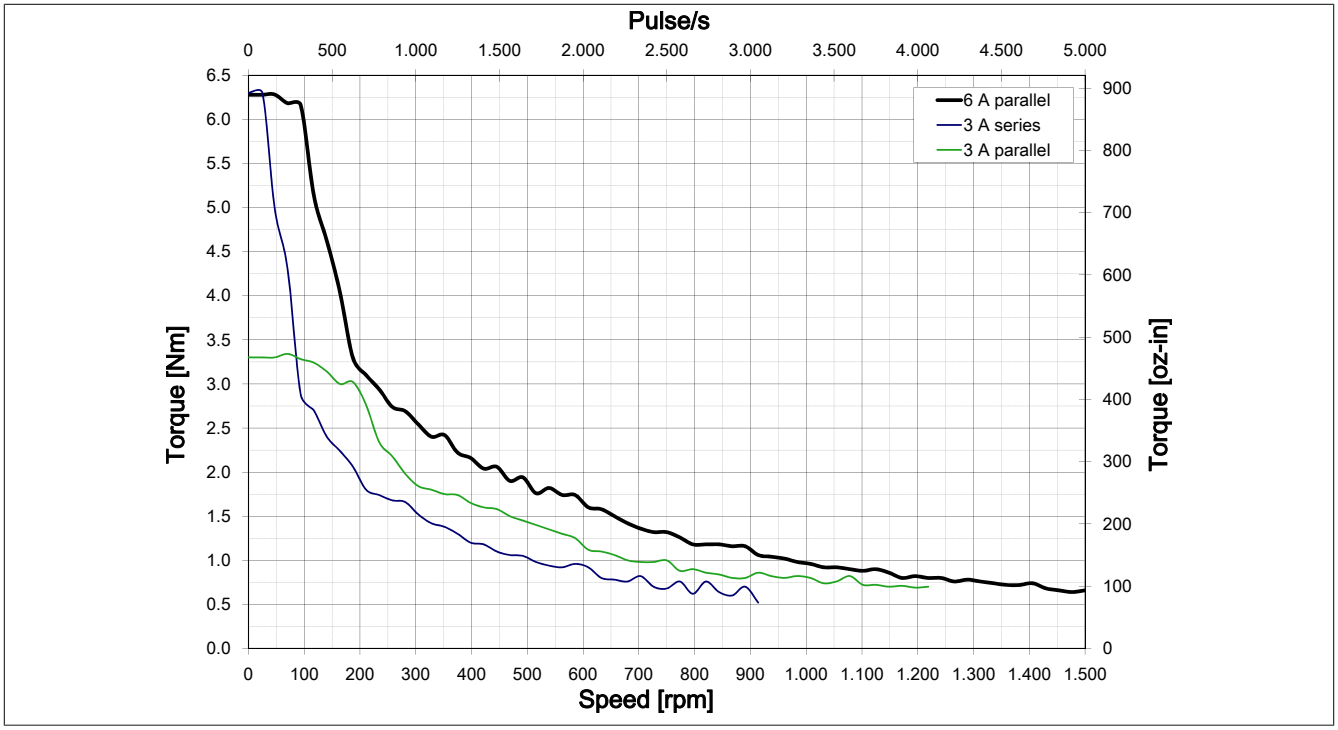

[12)] The torque curve is represented in microsteps.

### 7.8.3 Selecting the suitable connection type[13)]

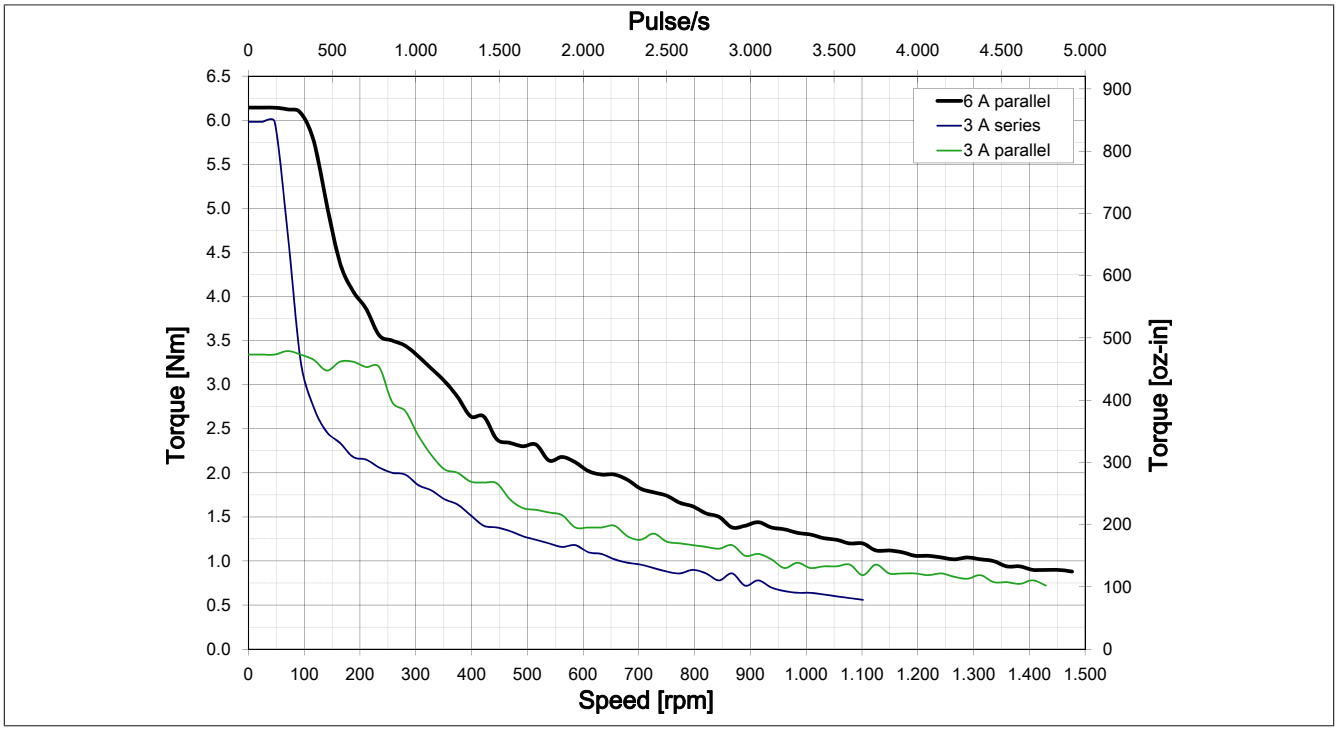
The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

**80MPH3.300xxxx-xx / 80MPH3.600xxxx-xx**

**Comparison: series / parallel wiring at 36 V**



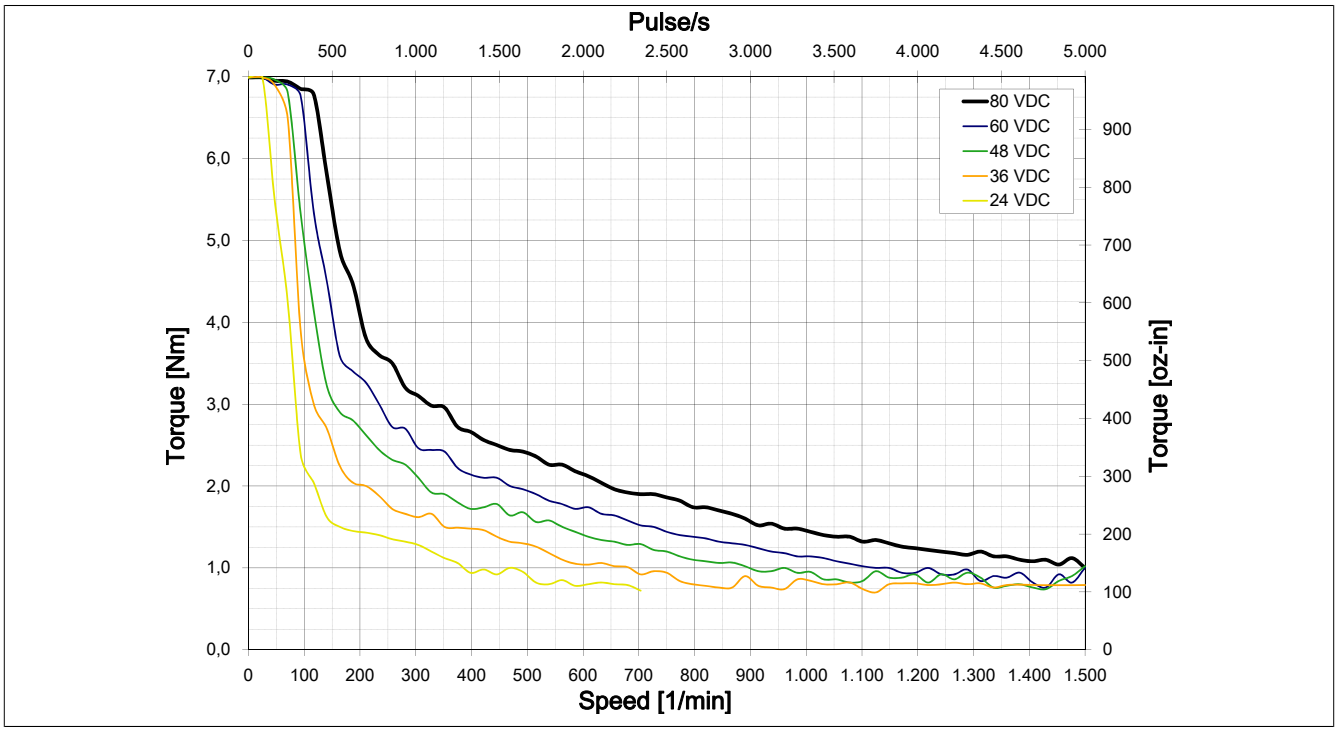

**Comparison: series / parallel wiring at 48 V**



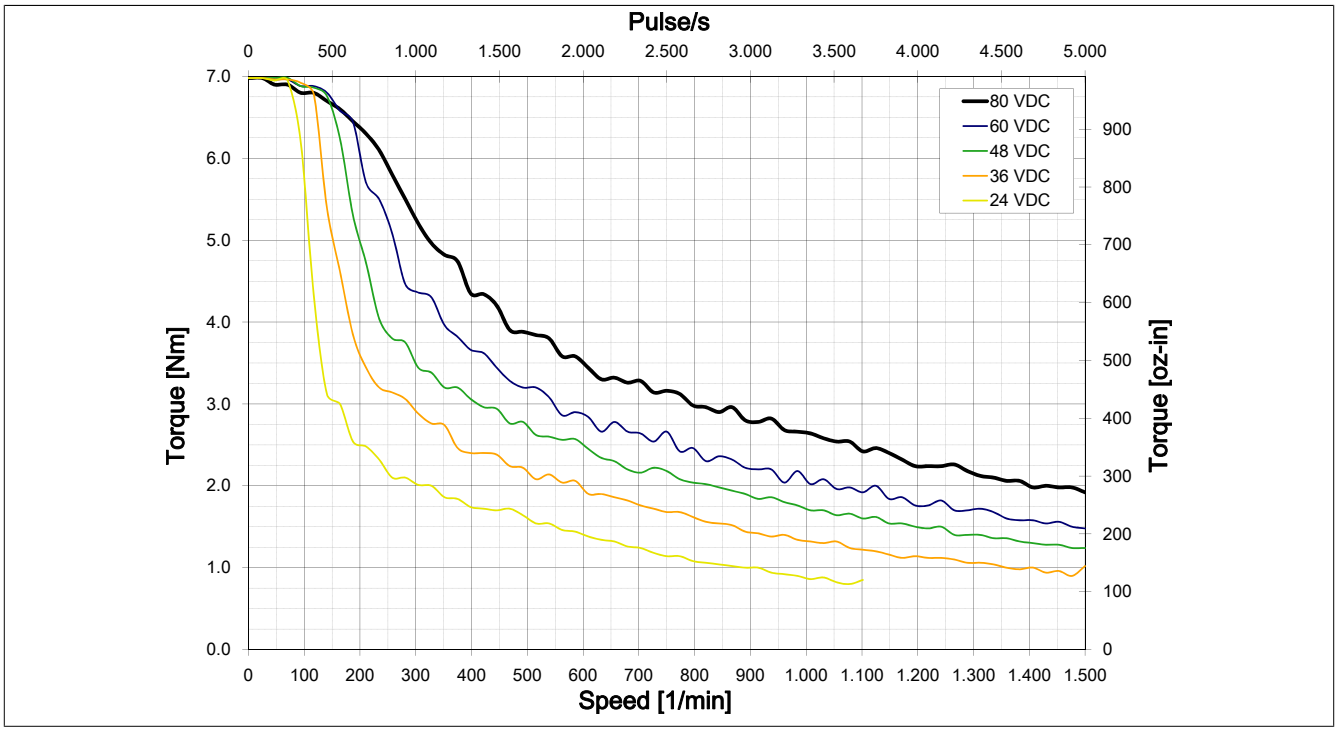

[13)] The torque curve is represented in microsteps.

## 7.9 80MPH4.x0xxxxx-xx[14)]

### 7.9.1 Series wiring 3 A (80MPH4.300xxxx-xx)




### 7.9.2 Parallel wiring 6 A (80MPH4.600xxxx-xx)



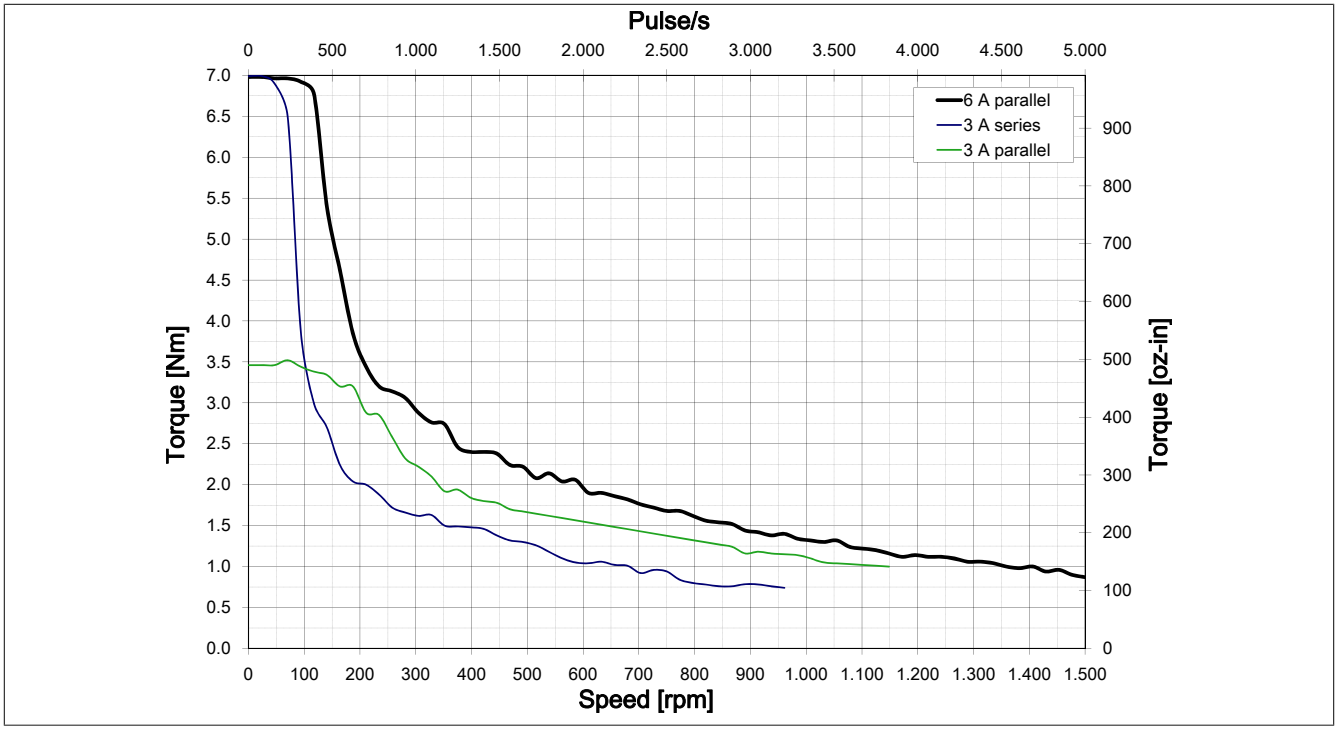

[14)] The torque curve is represented in microsteps.

### 7.9.3 Selecting the suitable connection type[15)]

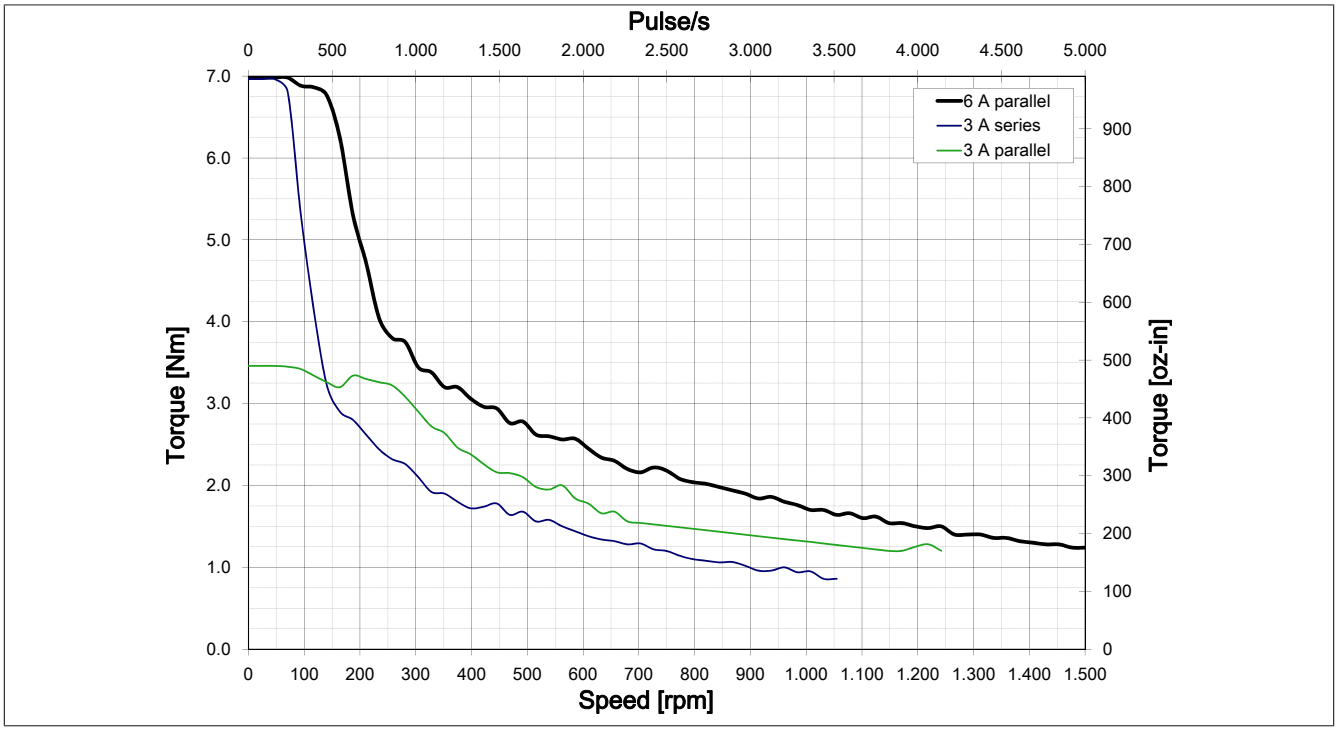
The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

**80MPH4.300xxxx-xx / 80MPH4.600xxxx-xx**

**Comparison: series / parallel wiring at 36 V**

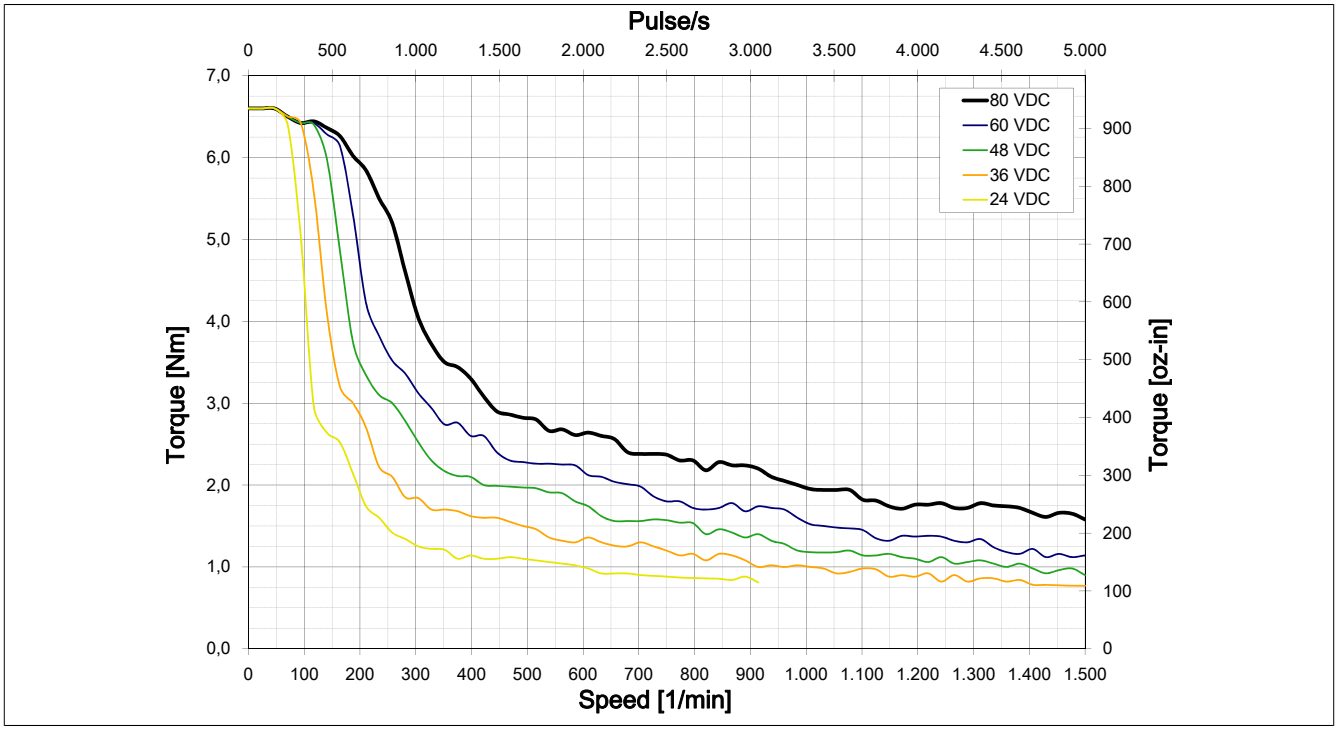



**Comparison: series / parallel wiring at 48 V**

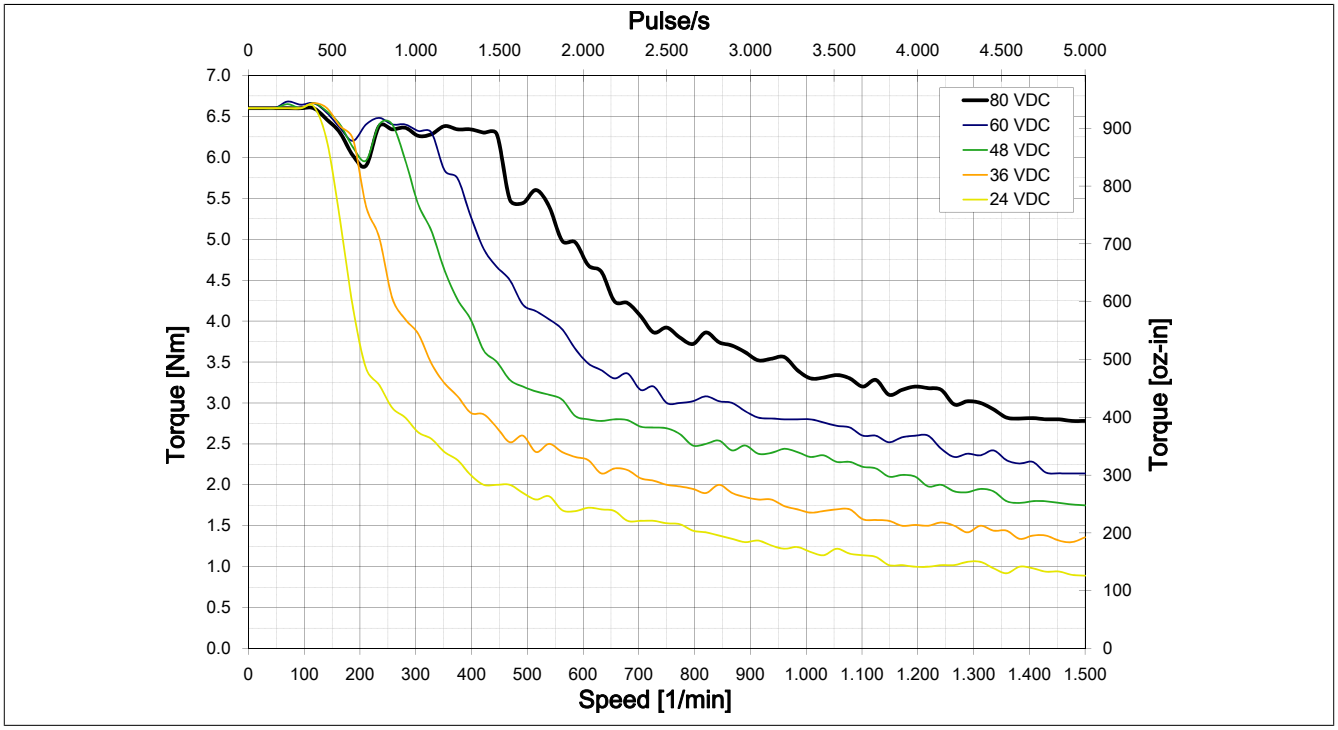



[15)] The torque curve is represented in microsteps.

### 7.9.4 Series wiring 5 A (80MPH4.500xxxx-xx)[16)]




### 7.9.5 Parallel wiring 10 A (80MPH4.101xxxx-xx + 80MPH4.500S000-01)[17)]



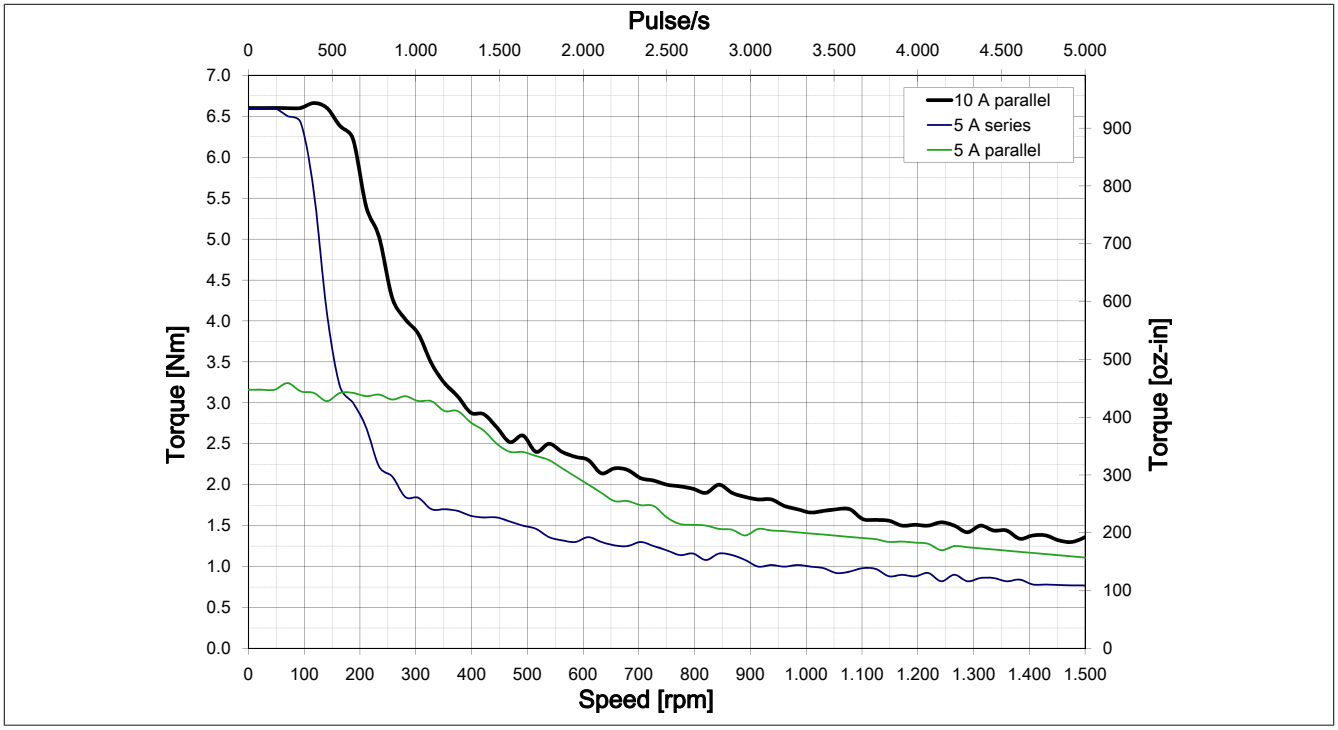

[16)] The torque curve is represented in microsteps.
[17)] The torque curve is represented in microsteps.

### 7.9.6 Selecting the suitable connection type[18)]

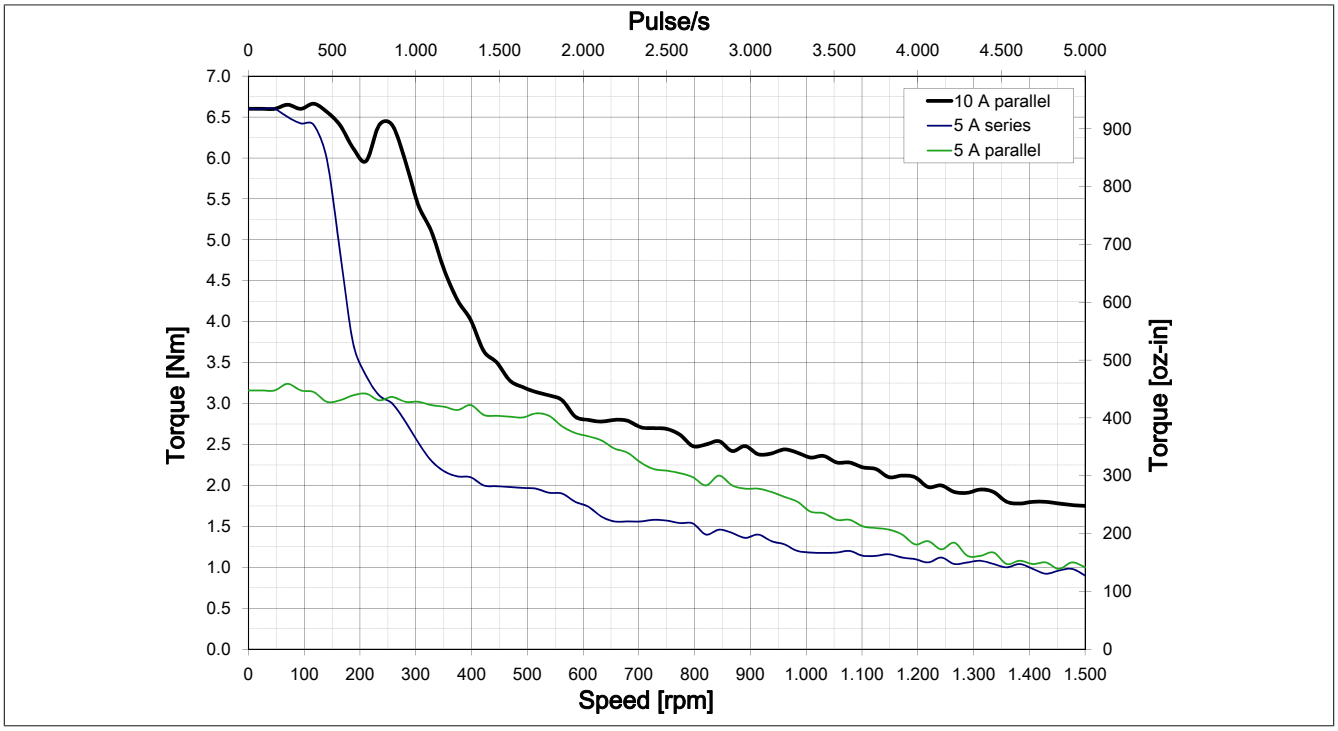
The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

**80MPH4.101xxxx-xx + 80MPH4.500S000-01**

**Comparison: series / parallel wiring at 36 V**



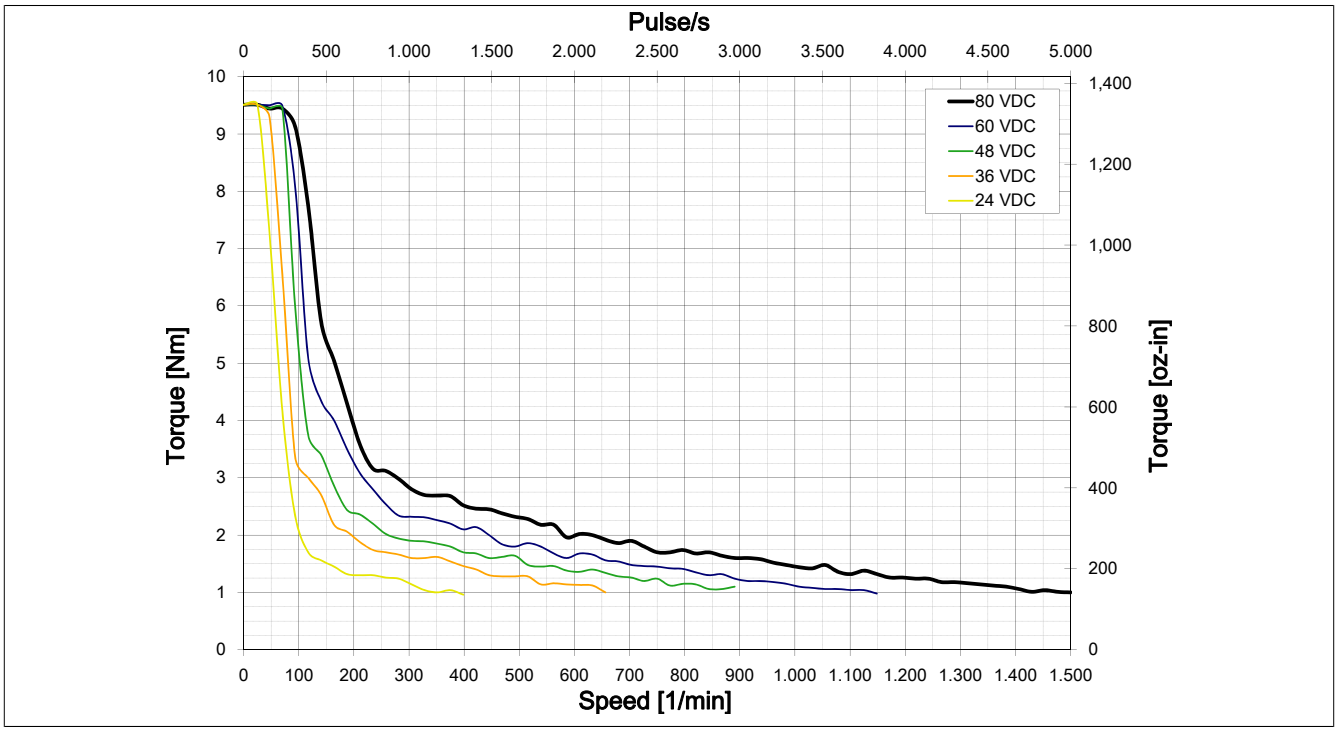

**Comparison: series / parallel wiring at 48 V**



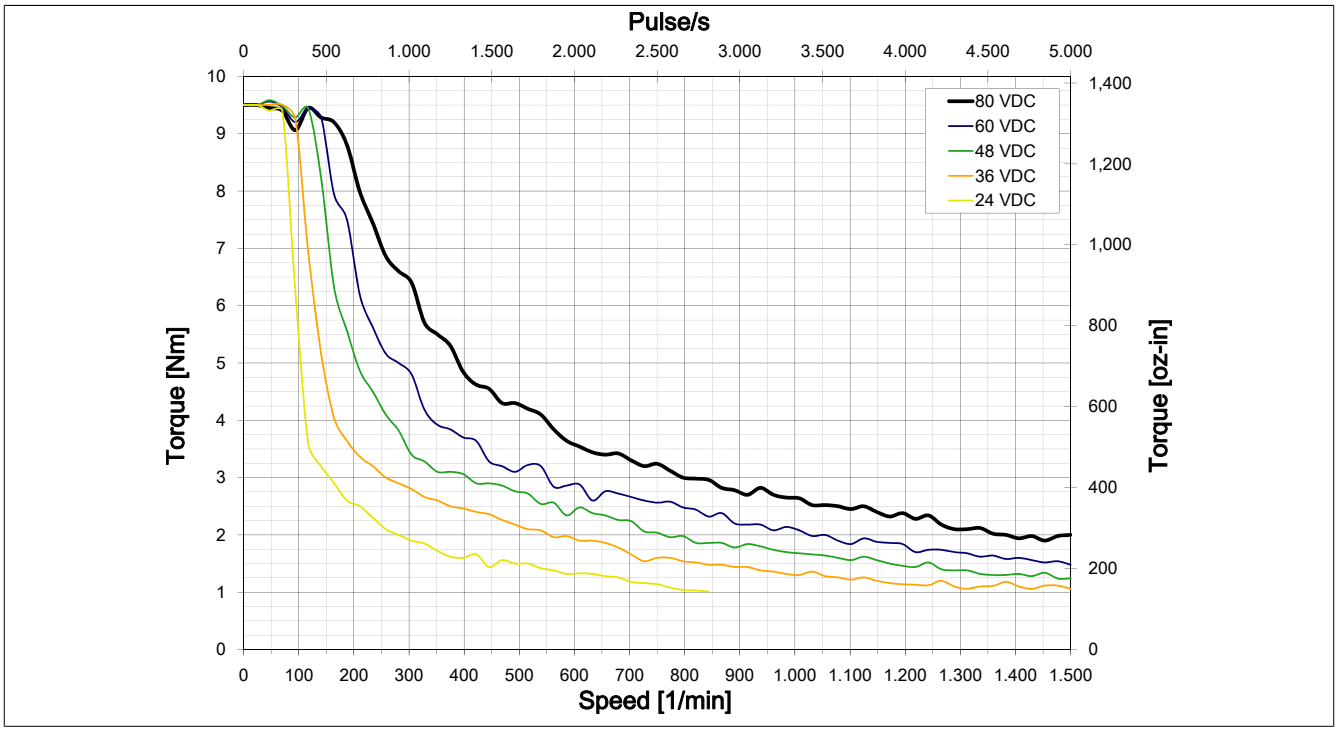

[18)] The torque curve is represented in microsteps.

## 7.10 80MPH6.x00xxxx-xx[19)]

### 7.10.1 Series wiring 3 A (80MPH6.300xxxx-xx)




### 7.10.2 Parallel wiring 6 A (80MPH6.600xxxx-xx)



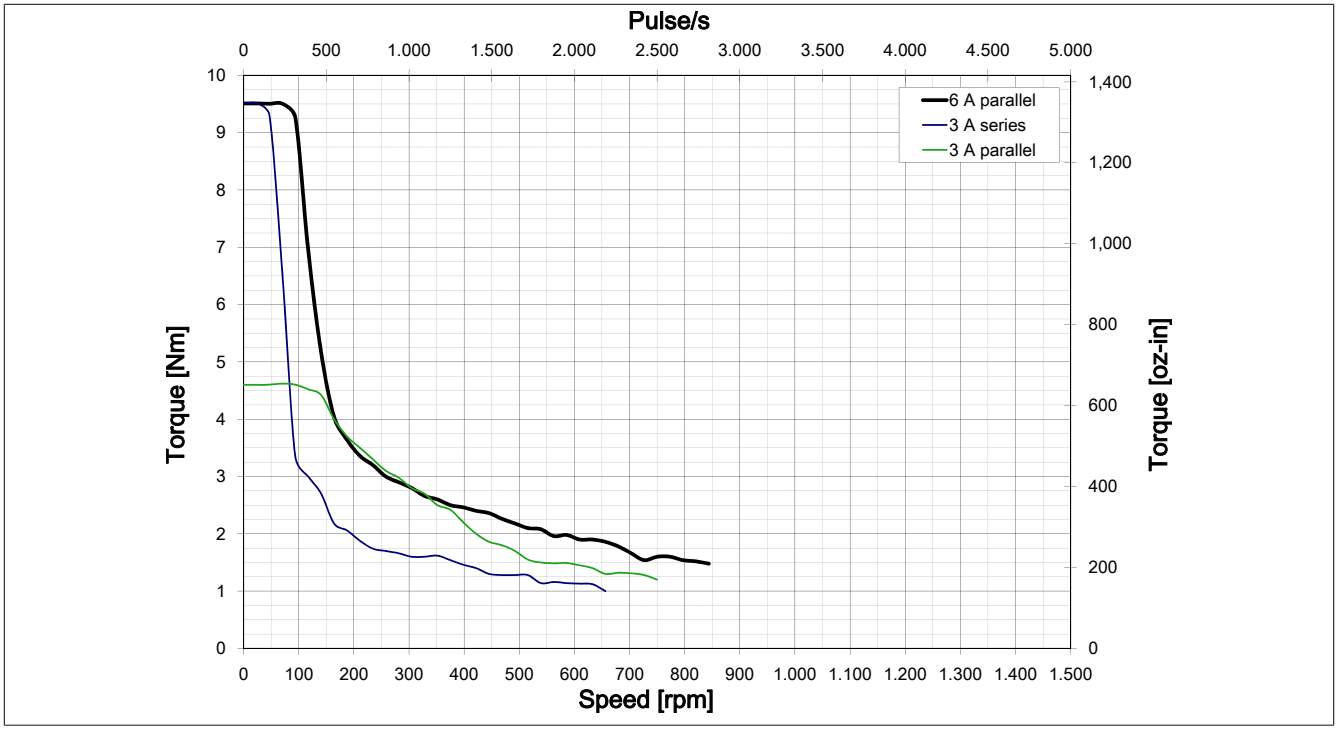

[19)] The torque curve is represented in microsteps.

### 7.10.3 Selecting the suitable connection type[20)]

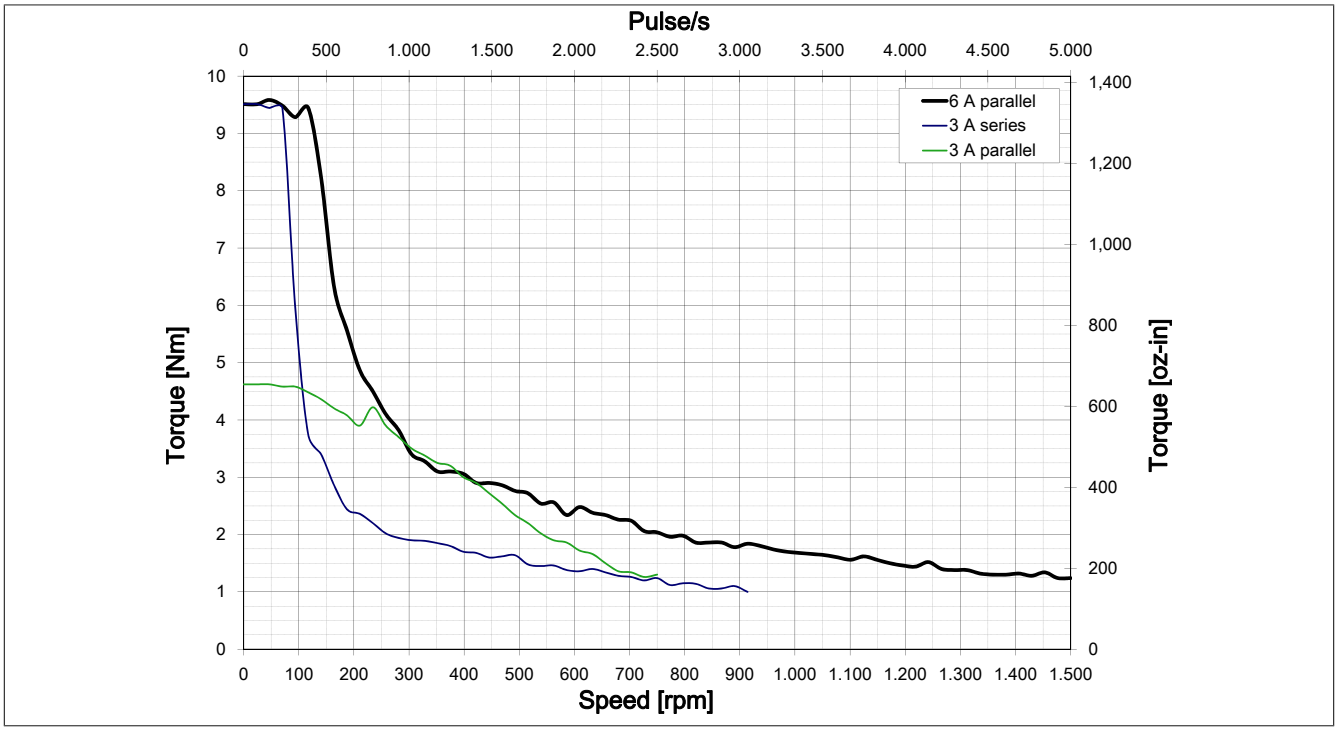
The 8-line design of the motor provides the customer with the option of either parallel or series wiring.

**80MPH6.300xxxx-xx / 80MPH6.600xxxx-xx**

**Comparison: series / parallel wiring at 36 V**




**Comparison: series / parallel wiring at 48 V**




[20)] The torque curve is represented in microsteps.

## 7.11 80MPH6.101xxxx-xx[21)]

### 7.11.1 Parallel wiring 10 A

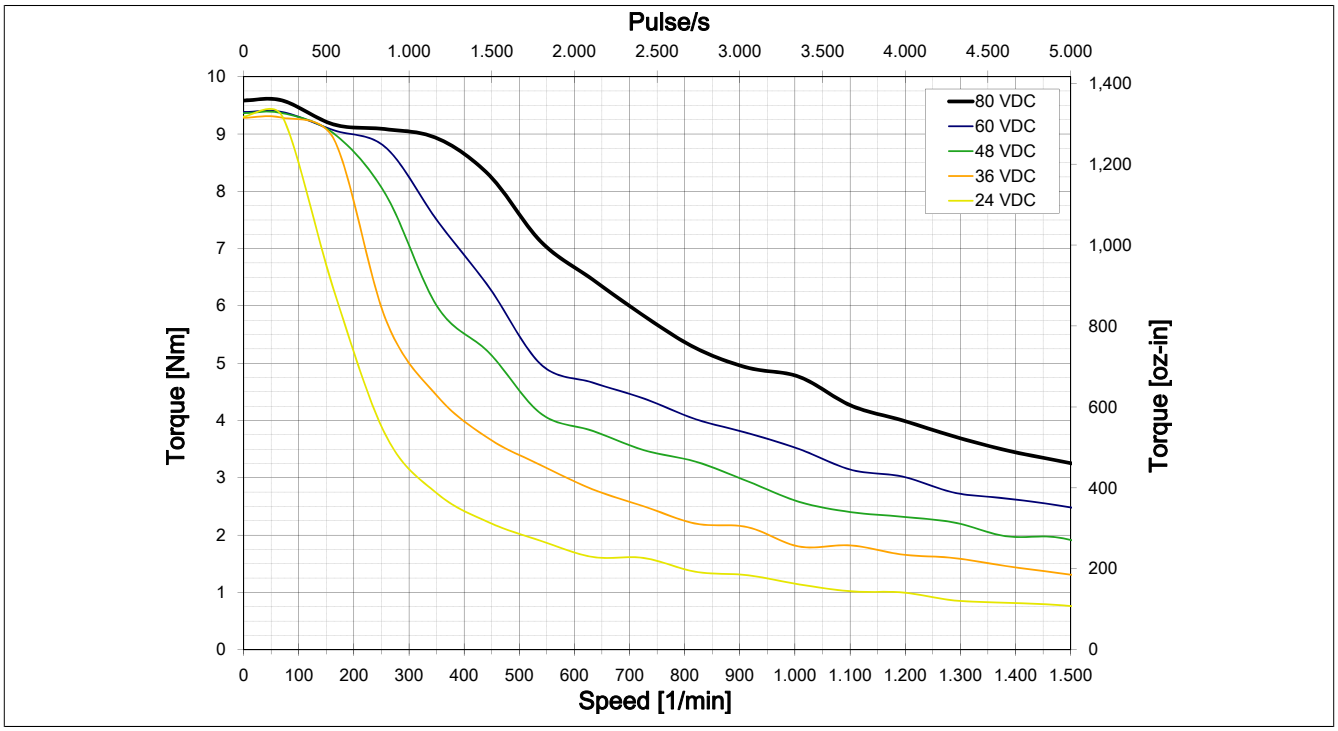



Figure 2: 80MPH6.101S000-01 torque curves, parallel 10 A

[21)] The torque curve is represented in microsteps.

# 8 Transport and storage

During transport and storage, the product must be protected against undue stress (mechanical loads, temperature, moisture, corrosive atmospheres, etc.).

If necessary, also protect existing electrostatically sensitive components such as the encoders in motors against electrostatic discharge (ESD).

Never use attachment parts (cable connection, terminal boxes, fans, etc.) as transport locks or supporting surfaces.

**Transport and storage conditions**

- The room must be dry, dust-free and free of vibrations.
- The room must be well ventilated and free from drafts.
- The air in the room is not permitted to contain aggressive or hazardous gases.

For the storage and transport conditions, see the respective technical data.

**Radial or axial forces on the shaft**

## Caution!

**Damage to property due to excessive radial or axial forces on the shaft.**

**Excessive radial or axial forces on the shaft can damage the bearing and impair the effect of any holding brake present to such an extent that the braking effect is non-existent or reduced. Similarly, encoder errors or damage to the gearbox can occur as a result.**

- **Transport and store the product only in its original packaging and lying on the housing.**
- **Avoid pressure and impact on the shaft end and housing.**
- **Do not use the shaft as a transport lock.**
- **Transport and lift heavy output shaft components separately and not installed on the shaft end.**

**Transport**

Check product deliveries immediately for transport damage and report any damage immediately to the carrier. In the event of damage, discontinue use where applicable.

## Danger!

**Danger of injury due to loads!**

**Suspended loads can result in personal injury or death if they fall down. Heavy loads can tilt and trap people or severely injure them.**

**Failure to comply with instructions, guidelines and regulations or use of unsuitable or damaged tools and devices can result in serious injury and/or damage to property.**

- **Motors should only be lifted without any additional load from other products (e.g. gears, pulleys, couplings).**
- **If motors have eye bolts, only lift the motors using the eye bolts.**
- **Only use permitted lifting, transport and aids with sufficient lifting capacity.**
- **Never stand in the danger zone or under suspended loads.**
- **Secure the product against dropping and tilting.**
- **Wear safety shoes, protective clothing and a safety helmet.**
- **Comply with the national and local regulations.**

**Storage**

## Caution!

**Damage caused by degraded material properties.**

**Storage for long periods of time or storage under improper conditions can cause certain materials to age prematurely, to have degraded properties and to become damaged. Damaged components can then result in further damage to property.**

**Recommendations to avoid damage during storage:**

- **Reduce the storage time to a minimum and do not exceed the maximum storage time of 2 years.**
- **Rotate the motor shaft a few turns at least every 6 months either by hand or at a low speed (max. 50 rpm). Bearing noise can occur during the run-in phase, which is perfectly normal and is not a sign of bearing damage.**
- **Apply a preservative coating to unprotected components such as the shaft end.**
- **Avoid contact corrosion.**
- **Use the original packaging.**
- **Use covers to protect against dust.**
- **Check the seals for damage when the item is issued or prior to use.**

# 9 Installation conditions

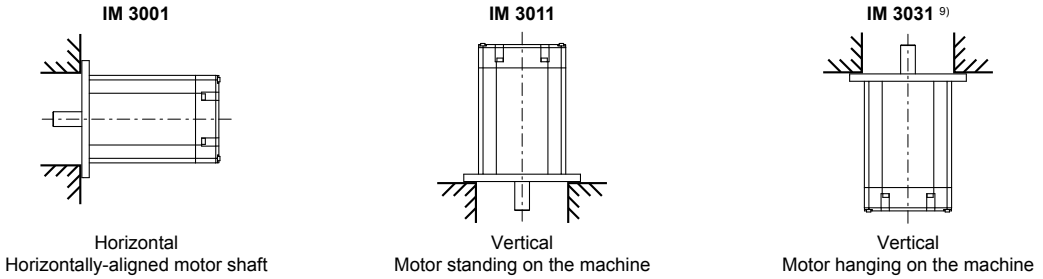
Before every commissioning procedure, the motor must be checked by qualified personnel. The check must include the proper condition in terms of mounting and installation, the installation conditions and safe operation.

The installation conditions include the technical data of the respective stepper motors; for this, see the user's manual.

A uniform condition of use for all stepper motors is the **type of construction and mounting arrangement per EN 60034-7**:

| | 80MPH, 80MPF, 80MPH |
|---|---|
| Type of construction and mounting arrangement per EN 60034-7 (IM code) | Horizontal, motor shaft aligned horizontally (IM 3001)<br>Vertical, motor standing on the machine (IM 3011)<br>Vertical, motor hanging on the machine (IM 3031)[9] |

**Image of type of construction and mounting arrangement per EN 60034-7 (IM code)**



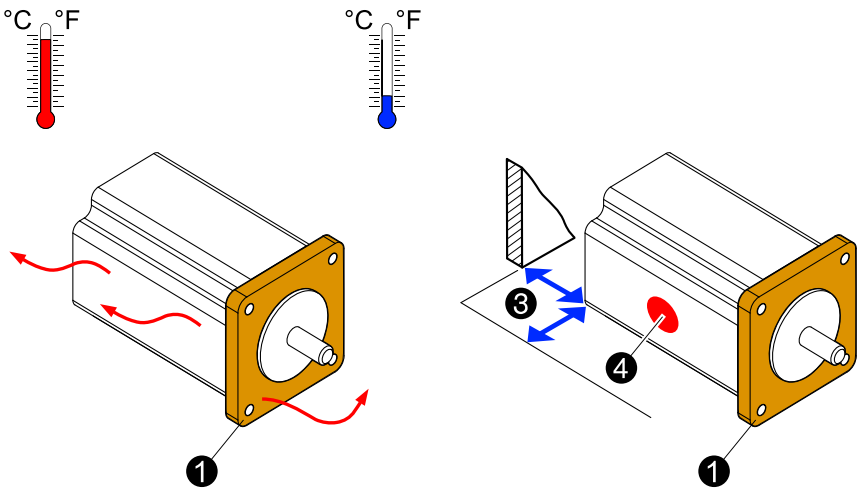

## 9.1 Mounting type and cooling

Ensure unobstructed air circulation and cooling so that no heat accumulation can build up on the stepper motor.

Attach the stepper motor with the **motor flange** (1), which also serves as a **cooling surface**, directly onto the machine.

For 80MP stepper motors, **AOM** (Air over motor) applies, **sufficient distance** (3) from other components must be maintained on all sides and cooling airflow must be provided. Suction of already heated air or recirculation operation is not permitted.

If the **maximum surface temperature** specified in the technical data is exceeded, an external cooling system must be fitted to cool the motor below the maximum permissible temperature in all operating states.
To determine whether external cooling is required, the surface temperature in the center of the motor housing (4) must be measured during startup. The motor must be in operation for a sufficiently long time and be thermally stable for this.




[9] With the IM 3031 type of construction and mounting arrangement (vertical, motor hanging on the machine), there is a risk of production fluids or oils penetrating the motor on the flange side. Motors or motor-gearbox combinations that should be used with this mounting arrangement must therefore have at least IP65 protection on the flange side.

The following points must be observed:

- The opposite side of the mounting flange is not permitted to be thermally insulated. Heat from the motor must be allowed to dissipate sufficiently.
- Air circulation must not be impeded. There must be sufficient cooling air on the motor housing.
- Exceeding the specified maximum values for motor temperature is not permitted.

It is important to note the following:

- Power or heat from the motors is dissipated via the mounting flange and surface of the motor housing.
- The motor can heat up due to external heat sources.

## Caution!

**Personal injury and damage to property due to failure or overheating of the drive.**

**If the maximum permissible operating temperature is exceeded, a drive defect with consequential damage is very probable.**

**The cause of a defect could insufficient lubrication due to overheating, for example.**

- **For safety reasons, switch off the machine if the maximum permissible temperature is exceeded.**
- **Ensure unobstructed air circulation and cooling so that no heat accumulation can build up in the drive or machine.**

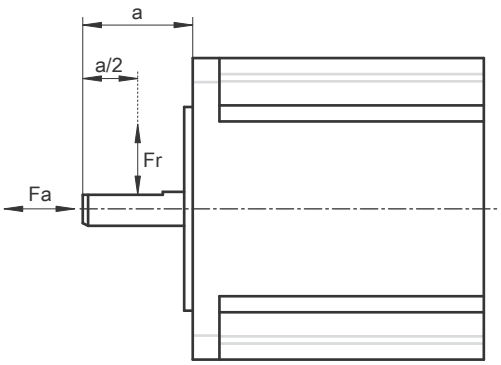
## 9.2 Reliability of B&R motors

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.

## 9.3 Maximum permissible  and radial force (Fa and Fr)

| Stepper motor | Radial force (Fr)[1] | Axial force (Fa) |
|---|---|---|
| **80MPDx** (see "Basic motors 80MPD (NEMA 23, flange size 56.4 mm)" on page 25) | 73.5 N | ≤ motor mass[2] |
| **80MPFx** (see "80MPF standard motors (flange size 60 mm)" on page 28) | 75.0 N | ≤ motor mass[2] |
| **80MPHx** (see "80MPH standard motor (NEMA 34, flange size 87.1 mm)" on page 31) | 290.0 N | 225.0 N |

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




Axial and radial force (Fa and Fr)

## 9.4 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.
- Insufficient heat dissipation

## 9.5 Holding brake - Nominal 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. This safety factor is derived mainly from the application at hand. The dynamic torque can therefore be considerably less than the rated torque.

$M_{2N} = M_{req} \times K$

$M_{req}$= required braking torque [Nm]

$K \geq 2$

## 9.6 Bearing lubrication

### Caution!

**Damage due to loss of bearing lubrication.**

**Due to permanently restricted rotary motion (<360 degrees), no continuous lubricant film is formed in the bearing and dry running cannot be ruled out. Damaged bearings can then result in further damage to property.**

**Recommendations to prevent damage:**

- **Stepper motors should perform movements at >360 degrees to maintain the lubricant film in the bearings circumferentially.**

# 10 Installation

## 10.1 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!**

### Caution!

**Bearing elements must not be subjected to shocks or impacts! Incorrect handling will reduce the service life and result in damage to the bearings.**

## 10.2 Note: Connecting the motor/encoder cable for IP65 variants

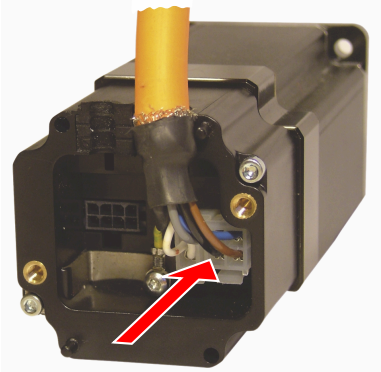
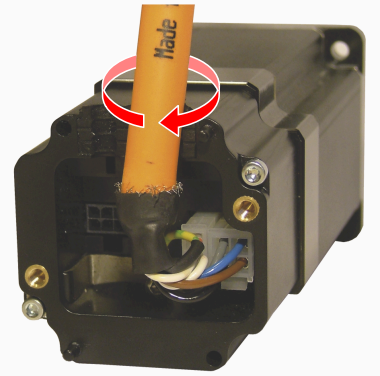
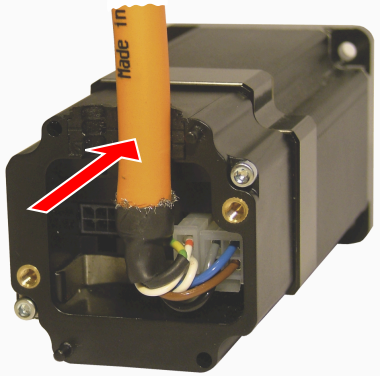
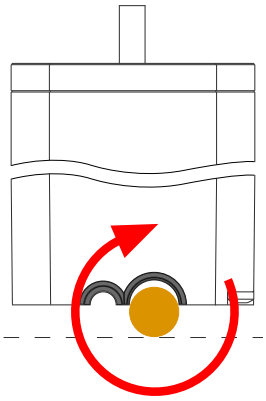
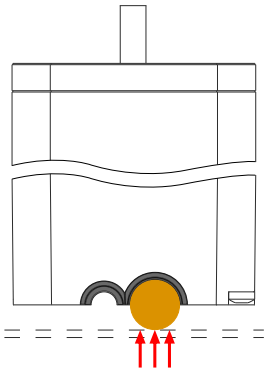
### 10.2.1 Pre-assembled cables from B&R

**Information:**

**IP65 protection has been tested with pre-assembled cables from B&R only. (See Cables - Overview.)**

### 10.2.2 Installing the motor cables

The motor cable takes up quite a bit of space. Rotating the cable minimizes the space needed and makes it easier to mount the cover.

| Connecting the cables | Rotate cable | Press cable against gasket |
|---|---|---|
|  |  |  |
| |  |  |

**Information:**

**Failure to follow the installation procedure shown in these images (plug in - rotate - press against gasket) can cause the motor to malfunction.**

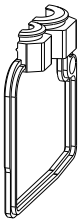
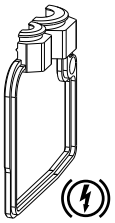
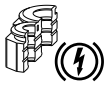
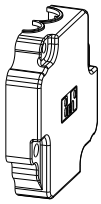
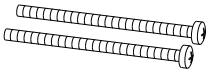
**Caution!**

**The heat shrink tubing must not be inside the gasket!**

## 10.2.3 Installing the encoder housing cover IP65 (80MPF)

### Content of delivery

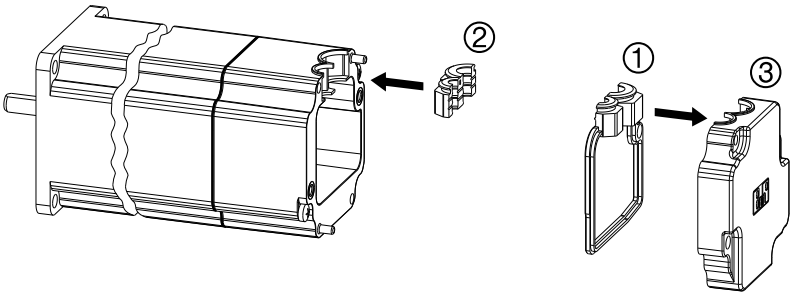
The cover, gaskets and screws for the encoder housing are shipped with the motor separately packaged but are also available as a replacement parts kit.

| Item | Description | Figure | Without holding brake | With holding brake |
|---|---|---|---|---|
| | | | 80MPF replacement parts kit - Order number | |
| | | | 80XMPFBC0.00-01 | 80XMPFBCB.00-01 |
| ① | **Gasket**<br>(80MPF without holding brake)<br>Cable grommet:<br>Ø 8.2 to 8.8 mm<br>Ø 5.6 to 6.6 mm |  | • | |
| | **Gasket**<br>(80MPF with holding brake)<br>Cable grommet:<br>Ø 10.4 to 11.2 mm<br>Ø 5.6 to 6.6 mm |  | | • |
| ② | **Gasket**<br>(80MPF without holding brake)<br>Cable grommet:<br>Ø 8.2 to 8.8 mm<br>Ø 5.6 to 6.6 mm | | • | |
| | **Gasket**<br>(80MPF with holding brake)<br>Cable grommet:<br>Ø 10.4 to 11.2 mm<br>Ø 5.6 to 6.6 mm |  | | • |
| ③ | **Cover** |  | • | • |
| ⑥ | **Screw M3x50 mm**<br>Galvanized, ISO 7045<br>(Observe tightening torque 0.5 Nm!) |  | • | • |
| ⑧ | **Screw M4x12 mm**<br>Galvanized, ISO 7045<br>(Observe tightening torque 1 Nm!) | | • | • |

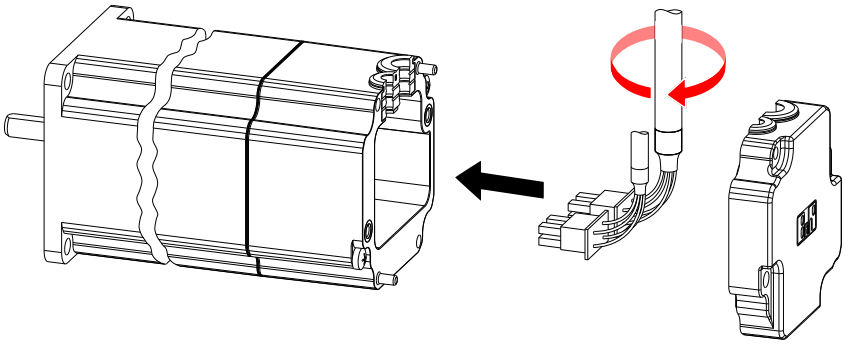
### Installation (80MPF)

Cover installation on an 80MPF motor is performed as follows:

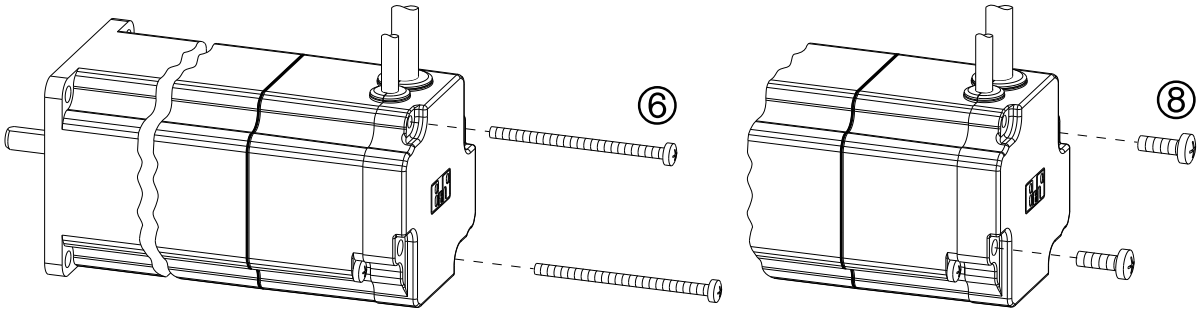
| 1) | Insert gasket item 2 into the motor and press tight. Insert gasket item 1 into cover item 3 and press tight. |
|---|---|



| 2) | **Connect the encoder cable, motor cable and, if present, the PE conductor. Connect the motor cable as shown on page 97 and hold it in the twisted position.**<br>**Place the cover with gasket on the motor and hold it in place; the two pins specify the position.** |
|---|---|



| 3) | **Secure the cover with the item 6 and 8 screws and the corresponding correct tightening torque.**<br>**Secure the cover first with the item 6 screws (M3x50 mm, 0.5 Nm) and then the item 8 screws (M4x12 mm, 1 Nm). The screws must be tightened in the order shown and to the specified tightening torque.** |
|---|---|




**Note:**

**Install the screws in the specified order (starting with the long screw).**

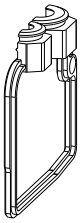
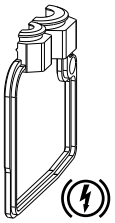
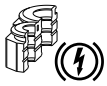
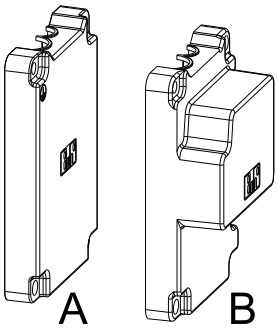
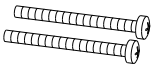
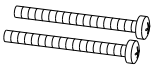
## Tightening torque

| Pos. | Description | Tightening torque | Amount | 80MPF Without holding brake | 80MPF With holding brake |
|---|---|---|---|---|---|
| ⑥ | M3x50 mm screw, galvanized, ISO7045 | 0.5 Nm | 2 | • | • |
| ⑧ | Screw M4x12 mm, galvanized, ISO 7045 | 1 Nm | 2 | • | • |

## 10.2.4 Installing the encoder housing cover IP65 (80MPH)

### Content of delivery

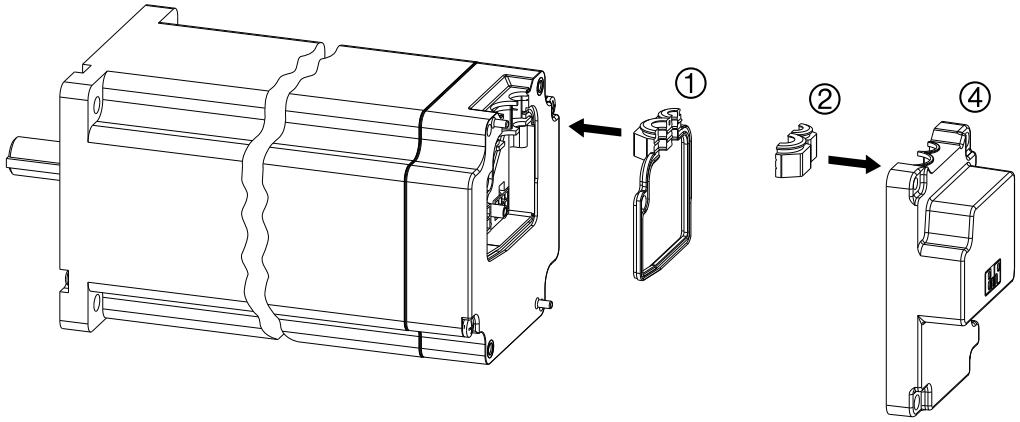
The cover, gaskets and screws for the encoder housing are shipped with the motor separately packaged but are also available as a replacement parts kit.

| Item | Description | Figure | Without holding brake | With holding brake |
|---|---|---|---|---|
| | | | 80MPH replacement parts kit - Order number | |
| | | | 80XMPHBC0.00-01 | 80XMPHBCB.00-01 |
| ① | **Gasket**<br>(80MPH without holding brake)<br>Cable grommet:<br>Ø 8.2 to 8.8 mm<br>Ø 5.6 to 6.6 mm |  | • | |
| | **Gasket**<br>(80MPH with holding brake)<br>Cable grommet:<br>Ø 10.4 to 11.2 mm<br>Ø 5.6 to 6.6 mm |  | | • |
| ② | **Gasket**<br>(80MPH without holding brake)<br>Cable grommet:<br>Ø 8.2 to 8.8 mm<br>Ø 5.6 to 6.6 mm | | • | |
| | **Gasket**<br>(80MPH with holding brake)<br>Cable grommet:<br>Ø 10.4 to 11.2 mm<br>Ø 5.6 to 6.6 mm |  | | • |
| ④ | **Cover**<br>(Content of delivery: Covers A+B)<br><br>**Cover B corresponds to the current development status and should be used preferentially!**<br>**Cover A** is only permitted to be used if a defective motor is replaced by an identical motor and space conditions do not permit otherwise. |  | • | • |
| ⑦ | **Screw UNC6-32x 1.5"**<br>Galvanized<br>(Observe tightening torque 0.7 Nm!) |  | • | |
| | **Screw M3x40 mm**<br>Galvanized, ISO 7045<br>(Observe tightening torque 0.7 Nm!) |  | | • |
| ⑧ | **Screw M4x12 mm**<br>Galvanized, ISO 7045<br>(Observe tightening torque 1 Nm!) | | • | • |
| ⑨ | Pin | | • | • |

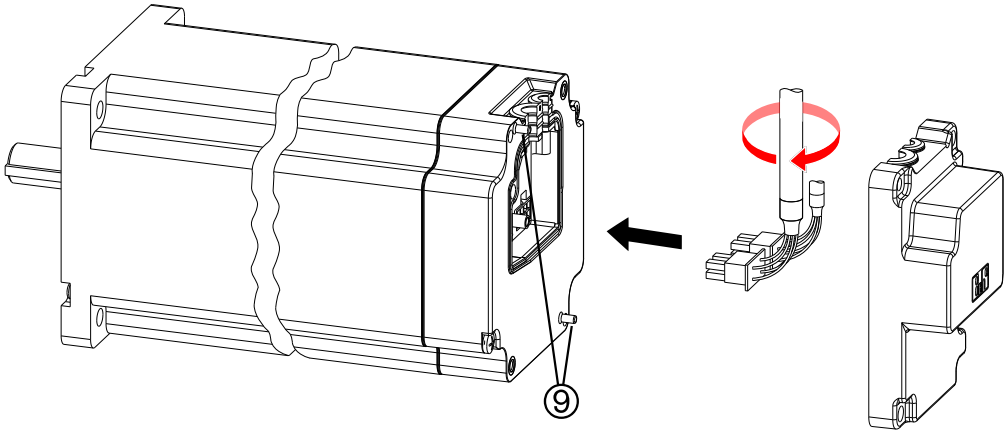
## Installation (80MPH)

Cover installation on an 80MPH motor is performed as follows:

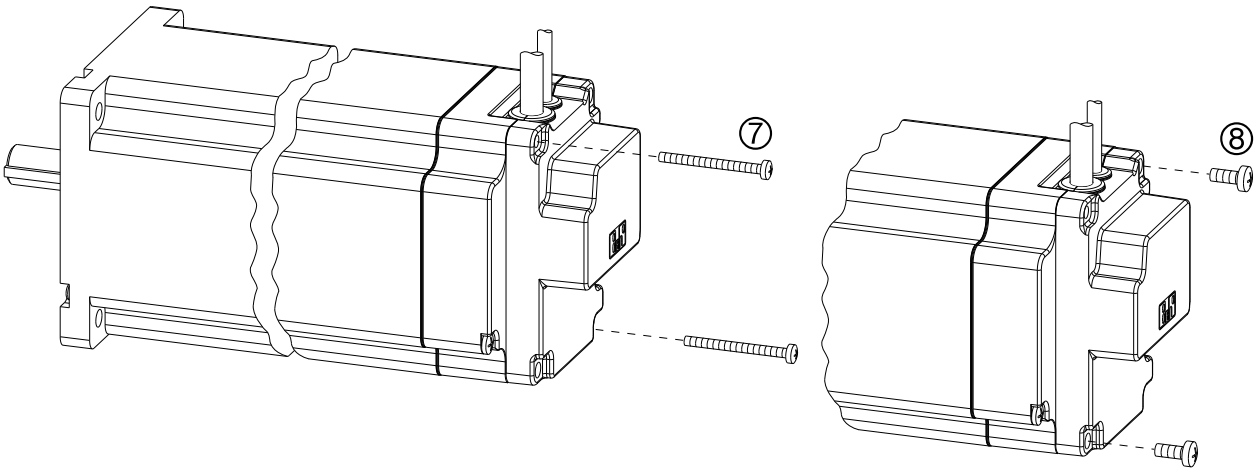
| 1) | Insert gasket item 1 into the motor and press tight. Insert gasket item 2 into cover item 4 and press tight. |
|---|---|




| 2) | Connect the encoder cable, motor cable and, if present, the PE conductor. Connect the motor cable as shown on page 97 and hold it in the twisted position.<br>Place the cover with gasket on the motor and hold it in place; the two item 9 pins specify the position. |
|---|---|




| 3) | Secure the cover with the item 7 and 8 screws and the corresponding correct tightening torque. |
|---|---|




**Note:**

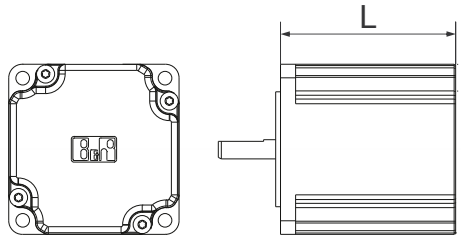
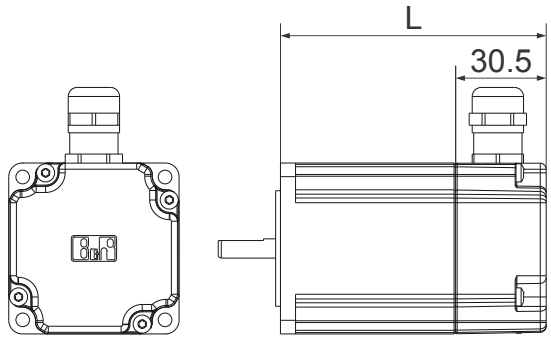
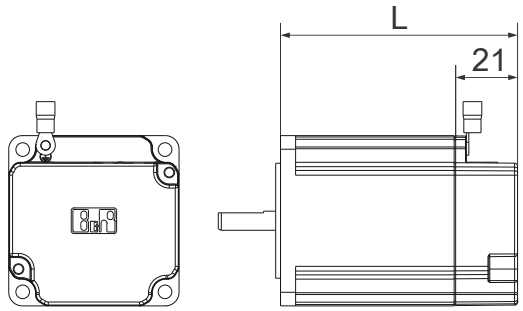
**Install the screws in the specified order (starting with the long screw).**

## Tightening torque

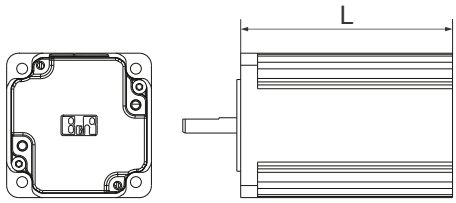
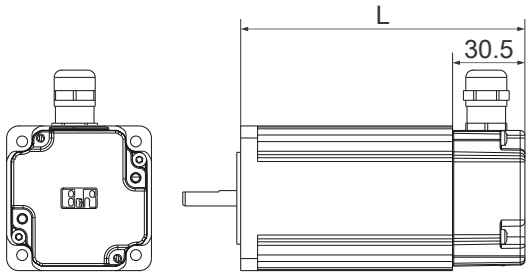
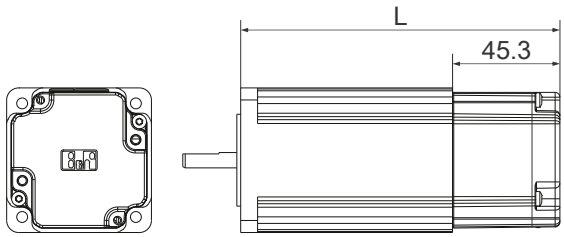
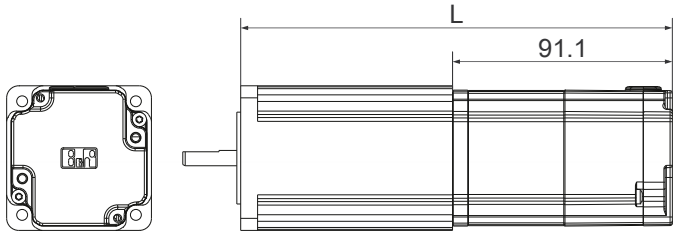
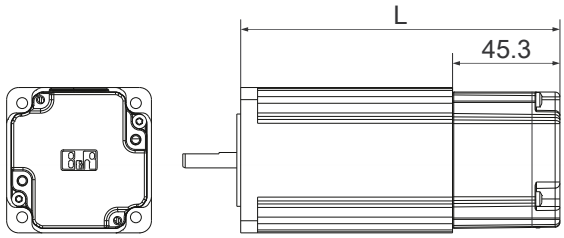
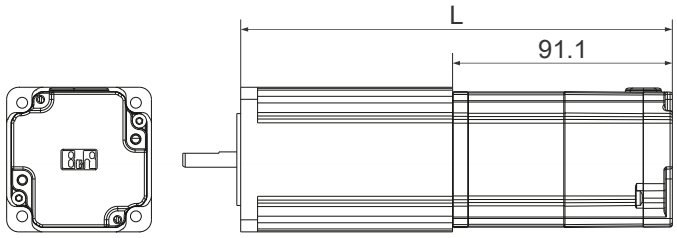
| Pos. | Description | Tightening torque | Amount | 80MPH Without holding brake | 80MPH With holding brake |
|---|---|---|---|---|---|
| ⑦ | UNC6-32x 1.5" screw, galvanized | 0.7 Nm | 2 | ● | |
| | M3x40 mm screw, galvanized, ISO7045 | 0.7 Nm | 2 | | ● |
| ⑧ | Screw M4x12 mm, galvanized, ISO 7045 | 1 Nm | 2 | ● | ● |

# 10.3 Motor-specific mounting data

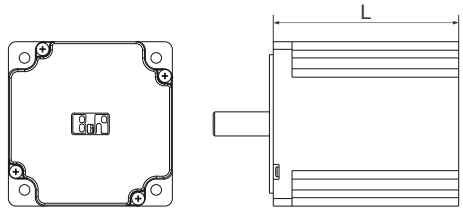
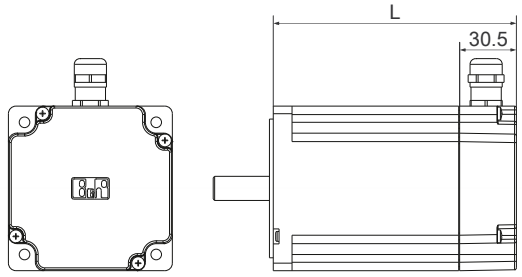
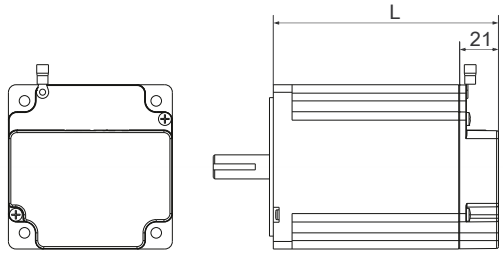
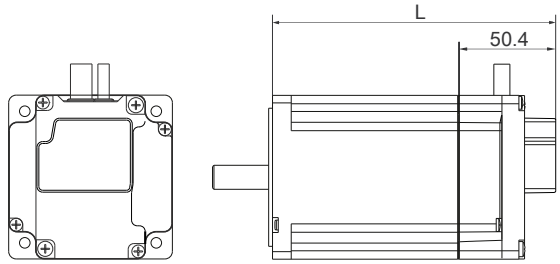
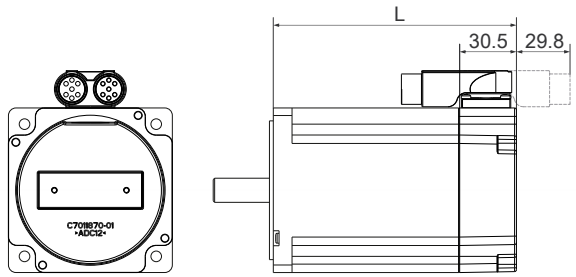
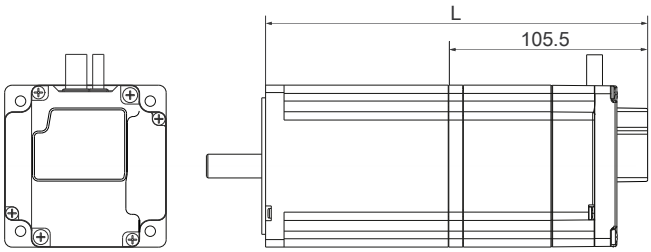
## 10.3.1 80MPD (NEMA 23, flange size 56.4 mm)

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

## 10.3.2 80MPF (flange size 60 mm)

| | Length / Weight | | |
|---|---|---|---|
| Standard motor | 80MPF1 | 80MPF3 | 80MPF5 |
|  | 51.8 mm<br>0.62 kg | 62.0 mm<br>0.88 kg | 93.3 mm<br>1.40 kg |
| Standard motor + IP upgrade kit IP65 | 80MPF1 | 80MPF3 | 80MPF5 |
|  | 82.3 mm<br>0.75 kg | 92.5 mm<br>1.00 kg | 123.8 mm<br>1.55 kg |
| Standard motor and ABR incremental encoder IP65 | 80MPF1 | 80MPF3 | 80MPF5 |
|  | 97 mm<br>0.75 kg | 106.5 mm<br>1.00 kg | 138.5 mm<br>1.50 kg |
| Standard motor + ABR incremental encoder + brake IP65 | 80MPF1 | 80MPF3 | 80MPF5 |
|  | 142.9 mm<br>1.02 kg | 153.1 mm<br>1.28 kg | 184.4 mm<br>1.80 kg |
| Standard motor + SSI encoder IP65 | 80MPF1 | 80MPF3 | 80MPF5 |
|  | - | - | 138.6 mm<br>1.50 kg |
| Basic motor + SSI encoder + brake IP65 | 80MPF1 | 80MPF3 | 80MPF5 |
|  | - | - | 184.4 mm<br>1.80 kg |

## 10.3.3 80MPH (NEMA 34, flange size 87.1 mm)

| | Length / Weight | | | |
|---|---|---|---|---|
| Standard motor | 80MPH1 | 80MPH3 | 80MPH4 | 80MPH6 |
|  | 66.0 mm<br>1.80 kg | 98.0 mm<br>3.00 kg | 98.0 mm<br>3.00 kg | 130.0 mm<br>4.20 kg |
| Standard motor + IP upgrade kit IP65 | 80MPH1 | 80MPH3 | 80MPH4 | 80MPH6 |
|  | 96.5 mm<br>2.10 kg | 128.5 mm<br>3.30 kg | 128.5 mm<br>3.30 kg | 160.5 mm<br>4.50 kg |
| Standard motor + ABR incremental encoder IP20 | 80MPH1 | 80MPH3 | 80MPH4 | 80MPH6 |
|  | 87.0 mm<br>1.90 kg | 119.0 mm<br>3.10 kg | 119.0 mm<br>3.10 kg | 151.0 mm<br>4.30 kg |
| Standard motor + ABR incremental encoder IP65 | 80MPH1 | 80MPH3 | 80MPH4 | 80MPH6 |
|  | 117.5 mm<br>1.90 kg | 149.5 mm<br>3.10 kg | 149.5 mm<br>3.10 kg | 181.5 mm<br>4.30 kg |
| Standard motor + HIPERFACE encoder IP65 | 80MPH1 | 80MPH3 | 80MPH4 | 80MPH6 |
|  | - | - | 128.5 mm<br>3.40 kg | - |
| Standard motor + ABR incremental encoder + brake IP65 | 80MPH1 | 80MPH3 | 80MPH4 | 80MPH6 |
|  | 172.5 mm<br>2.50 kg | 204.5 mm<br>3.70 kg | 204.5 mm<br>3.70 kg | 236.5 mm<br>4.90 kg |

# 11 Standards and Certifications

## 11.1 International and national certifications

Products and services from B&R comply with applicable regulations, directives and standards. These are national, European and international regulations, mainly from organizations such as ISO, IEC and CENELEC. We are committed to ensuring the reliability of our products in industrial environments.

> **Information:**
>
> **Certifications that apply to a particular motor are available at the following places:**
>
> - **"Technical data → General" in the user's manual**
> - **On the website (www.br-automation.com) and corresponding product page under "Technical data → General information"**
> - **On the nameplate of the motor.**

### 11.1.1 Mark

| Mark | Explanation | Region |
|---|---|---|
| CE | CE marking | Europe (EU) |
| UK CA | UK Conformity Assessed (UKCA) | United Kingdom (UK) |
| FILE: xxxxxxx | Underwriters Laboratories Inc. (UL) | USA |

## 11.1.2 EU directives and standards (CE)

**CE marking**

**Europe (EU)**

The respective product complies with all applicable EU directives and relevant harmonized standards.

Certification of these products is performed in cooperation with accredited testing laboratories.

### EMC Directive 2014/30/EU

All devices meet the protection requirements of the "Electromagnetic Compatibility" directive and are designed for typical industrial use.

Applicable standards from this directive:

| | |
|---|---|
| EN 61800-3 | Adjustable speed electrical power drive systems<br>- Part 3: EMC requirements and specific test methods |

### Low Voltage Directive 2014/35/EU

The low voltage directive applies to electrical equipment with a nominal voltage from 50 to 1000 VAC and from 75 to 1500 VDC.
All devices within the area of application of this directive satisfy the its protection requirements.

Applicable standard from this directive:

| | |
|---|---|
| EN 60034-1 | Rotating electrical machines - Part 1: Rating and performance |

The corresponding declaration of conformity is available for download on the B&R website. The editions of the applied standards are located in the declaration of conformity.

**Declaration of conformity**

Website > Downloads > Certificates > Declarations of conformity > Motoren > EU Declaration Motors Hybrid

### Ecodesign Directive (EU) No. 2019/1781

B&R motors are not induction motors, but servo and synchronous motors. These cannot be connected directly to the public power grid and also cannot be operated with a sinusoidal voltage with a frequency of 50 Hz, 60 Hz or 50/60Hz. B&R motors are used exclusively in combination with B&R drives and are operated with variable voltage and frequency.

B&R motors are therefore excluded from the scope of Regulation (EU) 2019/1781.

#### 11.1.2.1 Overview of standards

The following overview contains standards that are partially or completely taken into account for product certification.

| Standard | Description |
|---|---|
| EN 60034-1 | Rotating electrical machines<br>• Part 1: Measurement and operational behavior |

#### 11.1.2.2 Mechanical conditions

| Test | Testing performed per |
|---|---|
| Vibration (sinusoidal) | EN 60068-2-6:2008 Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal) |
| Shock | EN 60068-2-27:2009 Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock |

### 11.1.3 UK regulation

**UK Conformity Assessed (UKCA)**

All directives applicable to the respective product and their relevant standards are met. Products with this marking are permitted to be imported into Great Britain (England, Wales, Scotland).

The corresponding UK declaration of conformity is available for download on the B&R website. For information about the editions of applicable standards, see the UK declaration of conformity.

**UK Conformity Assessed (UKCA)**

Website > Downloads > Certificates > Declarations of conformity > Motors > UK Declaration Motors Hybrid

### 11.1.4 UL (80MPH)

FILE: xxxxxxx

**Underwriters Laboratories (UL)**

80MPH stepper motors with this mark are tested by Underwriters Laboratories and listed with the file number E360421.

The UL Recognized Component mark indicates that the UL recognized component can be used in a product or system that bears the UL Listed mark.

Standards applied:

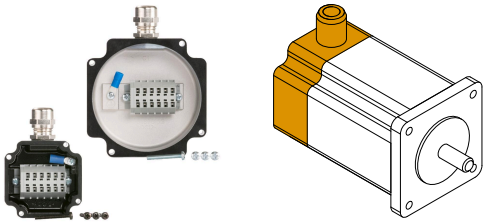
| | |
|---|---|
| UL 1004-1 | Rotating Electrical Machines - General Requirements |
| UL 1004-6 | Servo and Stepper Motors |

**Certificate**

Website > Downloads > Certificates > UL > 80MP stepper motors > E360421 UL Certificate of Compliance 80MPH

# 12 Accessories

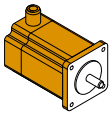
## 12.1 IP extension / Higher degree of protection for standard motors



Special covers with which IP65 protection is achieved starting from the flange are available for the **80MPxx.xxxS000-01 standard motors**.
The optionally available extension is installed by the customer and thus offers every freedom as far as the wiring is concerned.

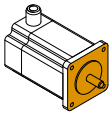
### Degree of protection achievable with IP extension

Degree of protection **from flange**



IP65

Degree of protection for **flange**

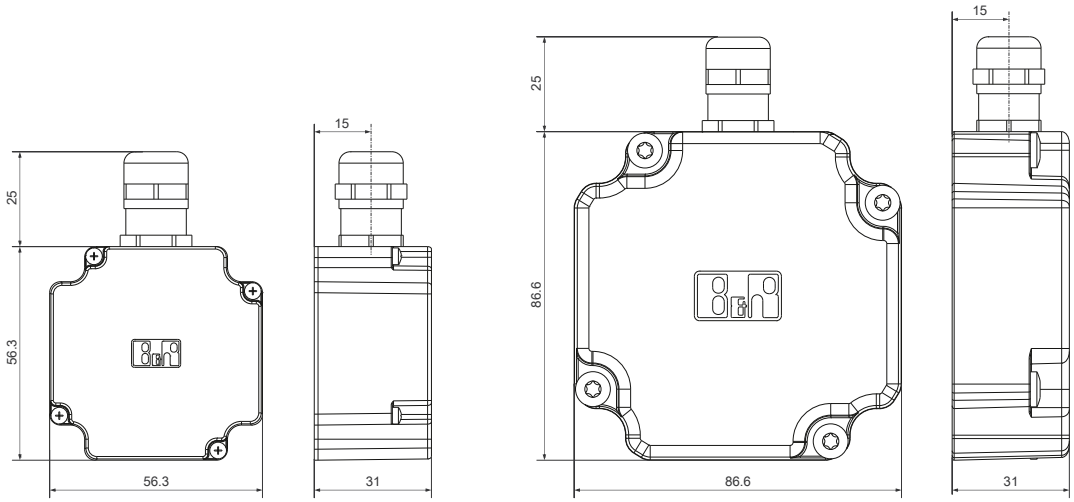


80MPD = IP54
80MPF = IP54
80MPH = IP54

### Order data

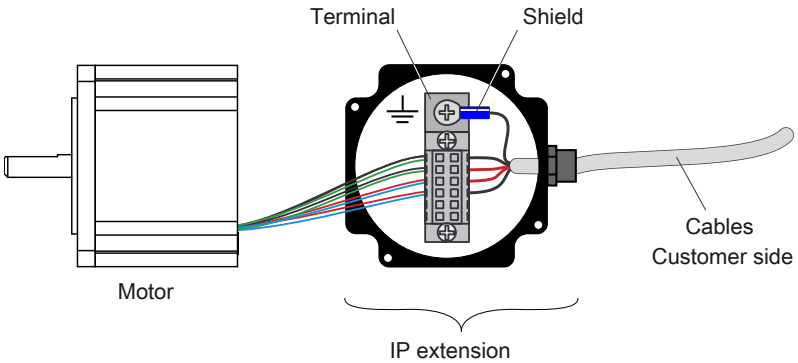
| Order number | | Content of delivery per unit/cover | Suitable for standard motors |
|---|---|---|---|
| 80XMP**D**XRE.W1-10<br><br>(10 piece packaging unit) | | • 1x cover with affixed gasket<br>• 1x cable routing M16x1.5 mm (cable diameter 5 - 9 mm)<br>• 1x cable lug<br>• 1x terminal strip<br>• 3x M3 x 8 mm screws<br>• 4x M3 x 25 mm screws (tightening torque 1 Nm) | 80MP**D**x.xxxS000-01<br>80MP**F**x.xxxS000-01 |
| 80XMP**H**XRE.W1-10<br><br>(10 piece packaging unit) | | | 80MP**H**x.xxxS000-01 |

### Dimensions

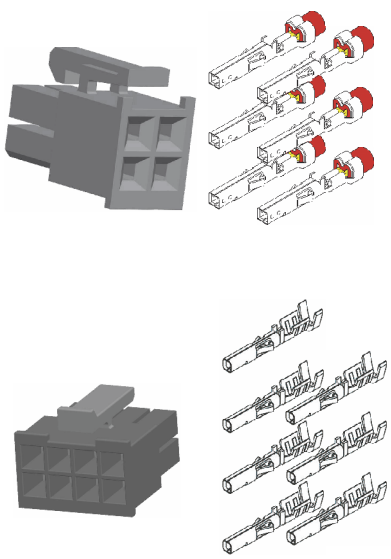
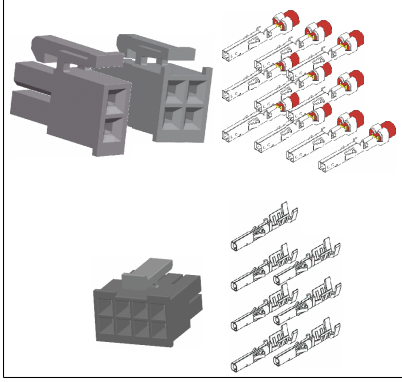


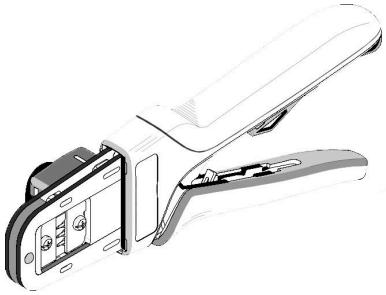
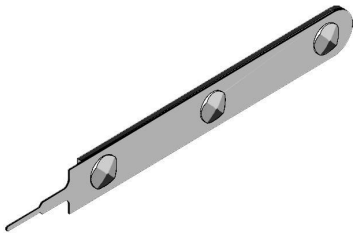

80XMP**D**XRE.W1-10 80XMP**H**XRE.W1-10

### Connection



## 12.2 Accessories for motors with encoder / holding brake

| Model number | Short description |
|---|---|
| 80XMPXAC0.00-01  | Accessory set for motors with an encoder, 8-pin and 4-pin connector and crimp contact<br><br>**Content of delivery**<br>• 1x 8-pin connector<br>• 1x 4-pin connector<br>• 7x crimp contacts (for 8-pin connector)<br>• 6x crimp contacts (for 4-pin connector) |
| 80XMPXAC0.00-02  | Accessory set for motors with encoder and brake, 8-pin, 4-pin and 2-pin connector and crimp contact<br><br>**Content of delivery**<br>• 1x 8-pin connector<br>• 1x 4-pin connector<br>• 1x 2-pin connector<br>• 7x crimp contacts (for 8-pin connector)<br>• 10x crimp contacts (for 4-/2-pin connectors) |

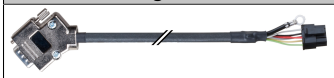
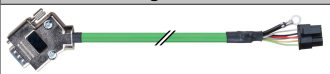
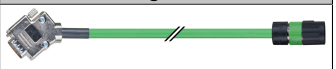
| | Molex order number | |
|---|---|---|
| Special crimping tools are required for the assembly/disassembly of the crimp contacts. | **Crimping pliers**  | **Release tool**  |
| 2-pin or 4-pin plugs | 0638190900 | 0011030044 |
| 8-pin plugs | 0638190000 | 0011030043 |

# 12.3 Cables - Overview

## Motor cables

| Standard motor cables | Motor cables with male M12 connector | HIPERFACE motor cable | Motor cable (incl. brake lines) |
|---|---|---|---|
| **80CMxxx01.21-01**<br>**Page** 112 | **80CMxxx01.26-01**<br>**Page** 114 | **80CMxx001.61-01**<br>**Page** 116 | **80CMxx002.21-01**<br>**Page** 118 |
| <br>◄ Wire end sleeves on the drive side<br>► 4-pin Molex connector on the motor side<br><br>5x 0.75 mm²<br>Can be used in cable drag chains<br>UL/CSA listed | <br>◄ M12 connector<br>► 4-pin Molex connector on the motor side<br><br>5x 0.34 mm²<br>Can be used in cable drag chains<br>UL listed | <br>◄ 8-pin female connector on the motor side<br>► Wire end sleeves on the drive side<br><br>5x 0.75 mm²<br>Can be used in cable drag chains<br>UL/CSA listed | <br>◄ 4-pin Molex connector on the motor side and 2-pin Molex connector on the brake side<br>► Wire end sleeves on the drive side<br><br>5x 0.75 mm²<br>2x 0.5 mm²<br>Can be used in cable drag chains<br>UL/CSA listed |

## Encoder cables

| ABR incremental encoder cable | ABR incremental encoder cable M12 | SSI encoder cable | HIPERFACE encoder cable |
|---|---|---|---|
| **80CMxxx03.25-01**<br>**Page** 120 | **80CMxxx03.26-01**<br>**Page** 122 | **80CMxx004.25-01**<br>**Page** 124 | **80CMxx005.65-01**<br>**Page** 126 |
|  <br>◄ 9-pin DSUB connector on the drive side<br>► 8-pin Molex connector on the motor side<br><br>4x 0.14 mm²<br>2x 0.35 mm²<br>Can be used in cable drag chains<br>UL listed | <br>◄ M12 connector<br>► 8-pin Molex connector on the motor side<br><br>5x 0.34 mm²<br>Can be used in cable drag chains<br>UL listed |  <br>◄ 9-pin DSUB connector on the drive side<br>► 8-pin Molex connector on the motor side<br><br>4x 0.14 mm²<br>4x 0.34 mm²<br>Can be used in cable drag chains<br>UL listed |  <br>◄ 9-pin DSUB connector on the drive side<br>► 12-pin female connector on the motor side<br><br>5x 2x 0.14 mm²<br>2x 0.5 mm²<br>Can be used in cable drag chains<br>UL/CSA listed |

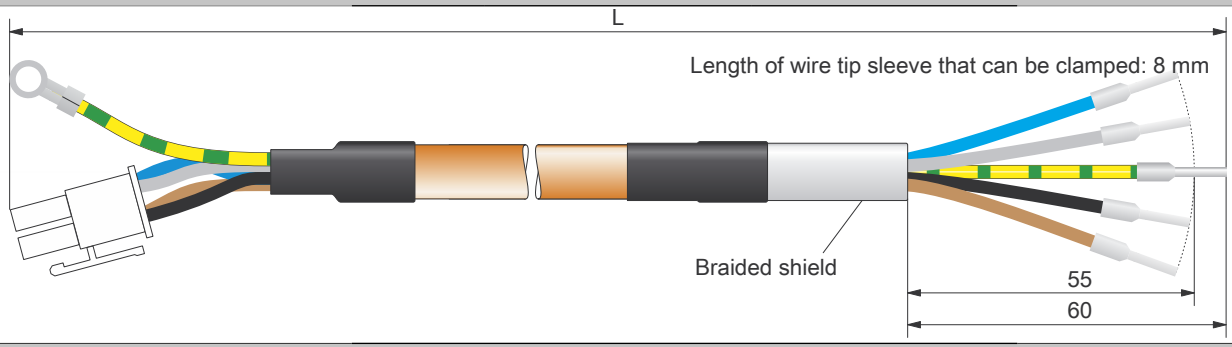
## Hybrid cable

| 80CMxx013.21-01<br>**Page** 128 | |
|---|---|
| | ◄ 4-pin and 8-pin connector on the motor side<br>► Wire end sleeves on the drive side<br><br>4x 0.5 mm², 2x 0.35 mm², 3x 0.14 mm²<br>Can be used in cable drag chains<br>UL listed |

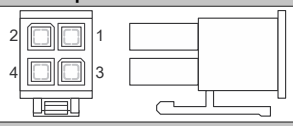
## 12.3.1 80CMxxx01.21-01 - Motor cables

### Pinout

**Dimensions**

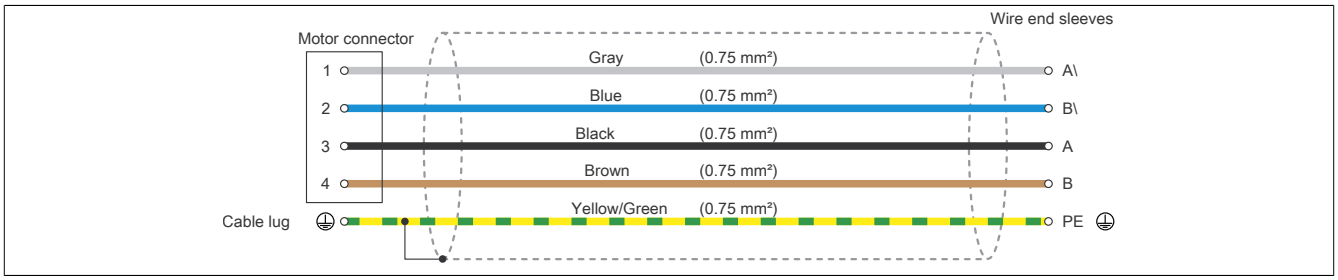



**Pinout**

| 4-pin terminal block | Pin | Description | Wire colors | Open-ended |
|---|---|---|---|---|
|  | 1 | A\ | Gray | For custom wiring<br>Connection to drive system |
| | 2 | B\ | Blue | |
| | 3 | A | Black | |
| | 4 | B | Brown | |
| **Cable lug** | **Pin** | **Description** | **Wire colors** | |
| | - | PE wire / Shield | Yellow/Green | |

| Cable lengths (L) | |
|---|---|
| **Model number** | **Length [m]** |
| 80CM**010**01.21-01 | 1.0 |
| 80CM**015**01.21-01 | 1.5 |
| 80CM**020**01.21-01 | 2.0 |
| 80CM**030**01.21-01 | 3.0 |
| 80CM**050**01.21-01 | 5.0 |
| 80CM**100**01.21-01 | 10 |
| 80CM**150**01.21-01 | 15 |
| 80CM**200**01.21-01 | 20 |
| 80CM**250**01.21-01 | 25 |

### Cable diagram



### 12.3.1.1 Technical data

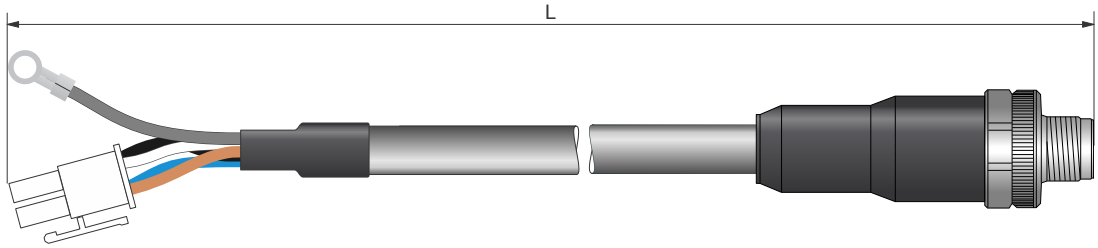
| Order number | 80CMxxx01.21-01 |
|---|---|
| **General information** | |
| Cable cross section | 5x 0.75 mm² |
| Durability | Oil resistance according to VDE 0472 part 803 as well as standard hydraulic oil |
| Certification | UL AWM Style 20234, 80°C, 1000 V, E63216 and CSA AWM I/II A/B, 90°C, 1000 V, FT2 LL46064 |
| **Cable construction** | |
| Power lines | |
| Quantity | 5 |
| Wire insulation | Special thermoplastic material |
| Wire colors | Black, brown, blue, green, yellow/green |
| Variant | Tinned copper stranded wire |
| Cross section | 0.75 mm² |
| Shield | No |
| Stranding | No |
| Cable stranding | With filler elements and foil banding |
| Cable shield | Tinned copper braiding, optical coverage >85% and wrapped in isolating film |
| Outer jacket | |
| Material | PUR |
| Color | Orange, similar to RAL 2003 flat |
| Labeling | B&R 5x0,75 FLEX UL AWM STYLE 20234 80°C 1000 V<br>E63216 CSA AWM I/II A/B 90°C 1000 V FT2 LL46064 |
| **Electrical properties** | |
| Test voltage | |
| Wire - Wire | 3 kV |
| Wire - Shield | 3 kV |
| Conductor resistance | |
| Power lines | ≤29 Ω/km |
| Insulation resistance | >200 MΩ/km |
| Current-carrying capacity per DIN VDE 0298 part 4, table 11 | |
| Wall mounting | 13 A |
| Installed in conduit or cable duct | 11.5 A |
| Installed in cable tray | 13.5 A |
| **Ambient conditions** | |
| Temperature | |
| Moving | -10 to 70°C |
| Static | -20 to 90°C |
| **Mechanical properties** | |
| Dimensions | |
| Diameter | 8.5 mm ±0.3 mm |
| Bend radius | |
| Single bend | >34 mm |
| Moving | ≥85 mm |
| Drag chain data | |
| Acceleration | <60 m/s² |
| Flex cycles [1] | ≥3,000,000 |
| Velocity | ≤4 m/s |
| Weight | 0.128 kg/m |

1) At an ambient temperature of 20°C and a flex radius of 125 mm.

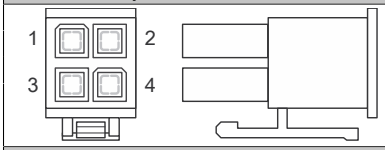
## 12.3.2 80CMxxx01.26-01- Motor cables with M12 connector

### Pinout

**Dimensions**




**Pinout**

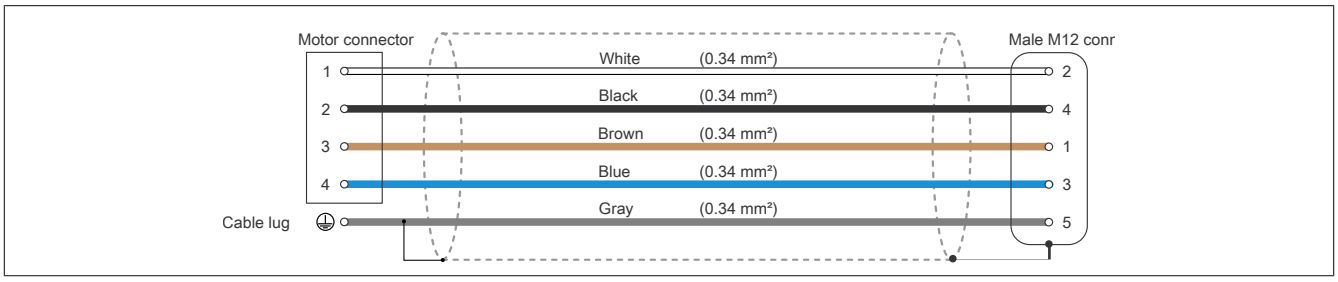
| 4-pin terminal block | Pin | Name | Pin | M12 circular connector |
|---|---|---|---|---|
|  | 1 | A\ | 2 | |
| | 2 | B\ | 4 | |
| | 3 | A | 1 | |
| | 4 | B | 3 | |
| **Cable lug** | **Pin** | **Name** | **Pin** | |
| | - | PE wire / Shield | 5 | |

| Cable lengths (L) | |
|---|---|
| **Order number** | **Length [m]** |
| 80CM**003**01.26-01 | 0.3 |
| 80CM**005**01.26-01 | 0.5 |
| 80CM**007**01.26-01 | 0.7 |
| 80CM**008**01.26-01 | 0.8 |
| 80CM**010**01.26-01 | 1.0 |
| 80CM**011**01.26-01 | 1.1 |

| Cable lengths (L) | |
|---|---|
| **Order number** | **Length [m]** |
| 80CM**013**01.26-01 | 1.3 |
| 80CM**014**01.26-01 | 1.4 |
| 80CM**015**01.26-01 | 1.5 |
| 80CM**017**01.26-01 | 1.7 |
| 80CM**020**01.26-01 | 2.0 |
| 80CM**025**01.26-01 | 2.5 |

| Cable lengths (L) | |
|---|---|
| **Order number** | **Length [m]** |
| 80CM**026**01.26-01 | 2.6 |
| 80CM**029**01.26-01 | 2.9 |
| 80CM**040**01.26-01 | 4.0 |
| 80CM**050**01.26-01 | 5.0 |
| 80CM**054**01.26-01 | 5.4 |
| 80CM**100**01.26-01 | 10.0 |

### Cable diagram



### 12.3.2.1 Technical data

| Product ID | 80CMxxx01.26-01 |
|---|---|
| **General information** | |
| Cable cross section | 5x 0.34 mm² |
| **Cable construction** | |
| Power lines | |
| Quantity | 5 |
| Wire insulation | PVC |
| Wire colors | Black, brown, blue, gray, white |
| Cross section | 0.34 mm² |
| Shield | Yes |
| Stranding | Yes |
| Cable stranding | With filler elements and foil shield |
| Cable shield | Tinned copper braiding, optical coverage >85% and foil shield |
| Outer jacket | |
| Material | PUR/PVC |
| **Electrical properties** | |
| Nominal current | Max. 4 A / contact |
| Connection voltage | Max. 60 V AC/DC |
| **Ambient conditions** | |
| Temperature | |
| Moving | -10 to 70°C |
| Static | -20 to 90°C |
| **Mechanical properties** | |
| Dimensions | |
| Diameter | 6.4 mm ±0.2 mm |
| Bend radius | ≥10x outer diameter |
| Drag chain data | |
| Acceleration | 5 m/s² |
| Flex cycles | Max. 2.5 million |
| Velocity | 2 m/s |

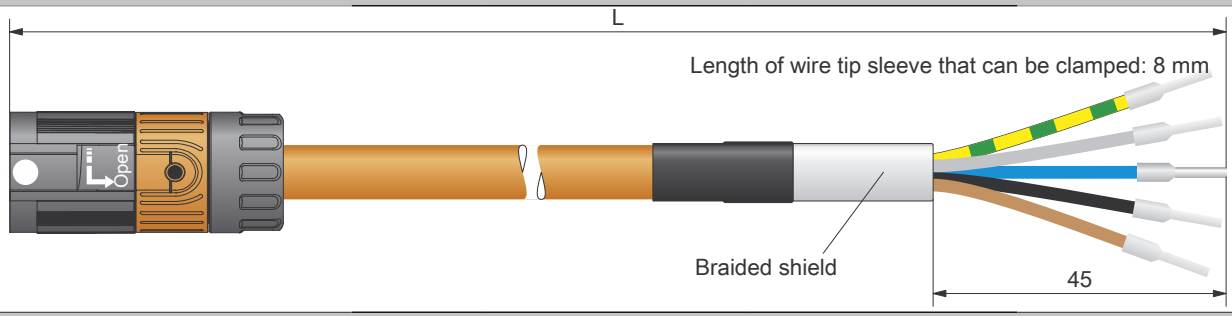
When using motors with IP65 protection, an adapted gasket is required that can be ordered in an accessory set.

| Accessory set for motors with IP65 option | Model number |
|---|---|
| Gaskets for IP65 stepper motors for use with 80CMxxxxx.26-01 cables<br>Cable grommets 5.6 to 6.6 / 5.6 to 6.6 mm | 80XMPXAC1.00-10<br>(10 pcs. per package) |

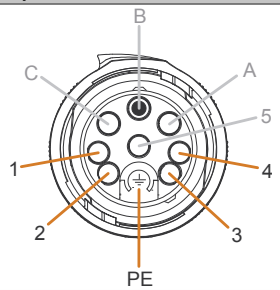
## 12.3.3 80CMxx001.61-01 - HIPERFACE motor cables

### Pinout

**Dimensions**



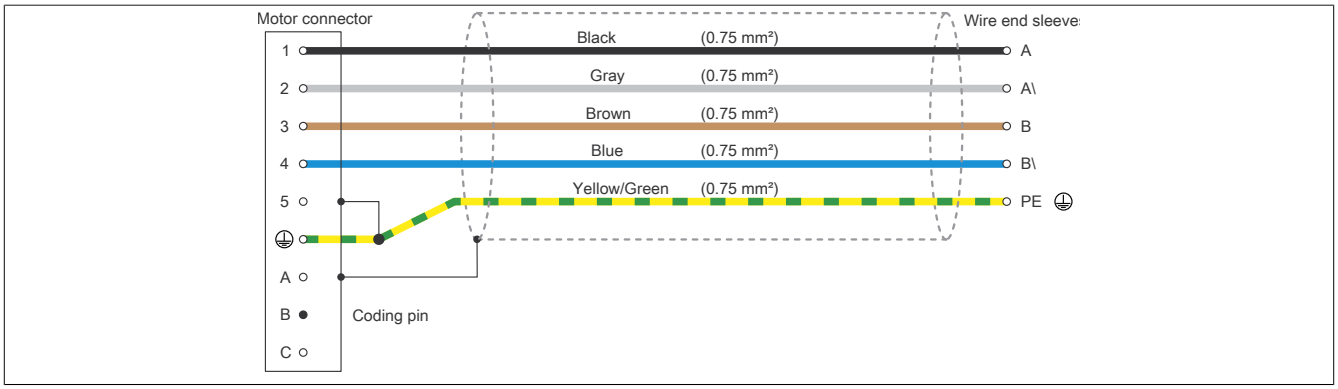

**Pinout**

| 9-pin circularfemale connector | Pin | Description | Wire colors | Open-ended |
|---|---|---|---|---|
|  | 1 | A | Black | For custom wiring<br>Connection to drive system |
| | 2 | A\ | Gray | |
| | 3 | B | Brown | |
| | 4 | B\ | Blue | |
| | 5 | NC | - | |
| | A | NC | - | |
| | B | Used for coding purposes and to prevent improper connections. | | |
| | C | NC | - | |
| | PE | PE wire / Shield | Yellow / green | |



| Cable lengths (L) | |
|---|---|
| **Model number** | **Length [m]** |
| 80CM**01**001.61-01 | 1 |
| 80CM**02**001.61-01 | 2 |
| 80CM**03**001.61-01 | 3 |
| 80CM**05**001.61-01 | 5 |
| 80CM**10**001.61-01 | 10 |
| 80CM**15**001.61-01 | 15 |
| 80CM**20**001.61-01 | 20 |

### Cable diagram



### 12.3.3.1 Technical data

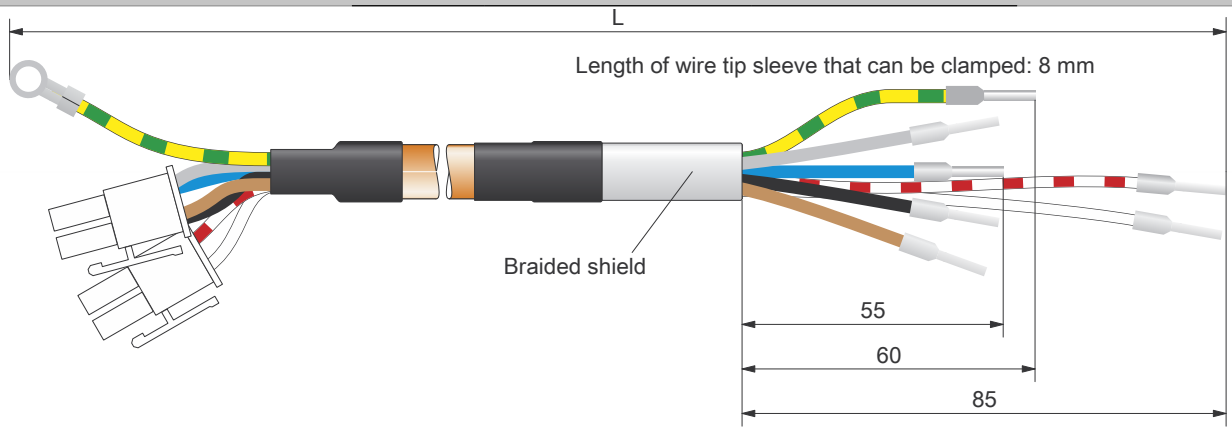
| Order number | 80CMxx001.61-01 |
|---|---|
| **General information** | |
| Cable cross section | 5x 0.75 mm² |
| Durability | Oil resistance according to VDE 0472 part 803 as well as standard hydraulic oil |
| Certification | UL AWM Style 20234, 80°C, 1000 V, E63216 and CSA AWM I/II A/B, 90°C, 1000 V, FT2 LL46064 |
| **Cable construction** | |
| Power lines | |
| Quantity | 5 |
| Wire insulation | Special thermoplastic material |
| Wire colors | Black, brown, blue, green, yellow/green |
| Variant | Tinned copper stranded wire |
| Cross section | 0.75 mm² |
| Shield | No |
| Stranding | No |
| Cable stranding | With filler elements and foil banding |
| Cable shield | Tinned copper braiding, optical coverage >85% and wrapped in isolating film |
| Outer jacket | |
| Material | PUR |
| Color | Orange, similar to RAL 2003 flat |
| Labeling | B&R 5x0,75 FLEX UL AWM STYLE 20234 80°C 1000 V<br>E63216 CSA AWM I/II A/B 90°C 1000 V FT2 LL46064 |
| **Electrical properties** | |
| Test voltage | |
| Wire - Wire | 3 kV |
| Wire - Shield | 3 kV |
| Conductor resistance | |
| Power lines | ≤29 Ω/km |
| Insulation resistance | >200 MΩ/km |
| Current-carrying capacity per DIN VDE 0298 part 4, table 11 | |
| Wall mounting | 13 A |
| Installed in conduit or cable duct | 11.5 A |
| Installed in cable tray | 13.5 A |
| **Ambient conditions** | |
| Temperature | |
| Moving | -10 to 70°C |
| Static | -20 to 90°C |
| **Mechanical properties** | |
| Dimensions | |
| Diameter | 8.5 mm ±0.3 mm |
| Bend radius | |
| Single bend | >34 mm |
| Moving | ≥85 mm |
| Drag chain data | |
| Acceleration | <60 m/s² |
| Flex cycles [1] | ≥3,000,000 |
| Velocity | ≤4 m/s |
| Weight | 0.128 kg/m |

1) At an ambient temperature of 20°C and a flex radius of 125 mm.

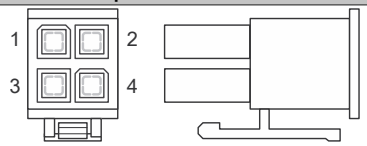
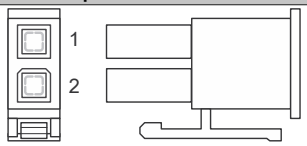
## 12.3.4 80CMxx002.21-01 - Motor cables (incl. brake lines)

### Pinout

**Dimensions**

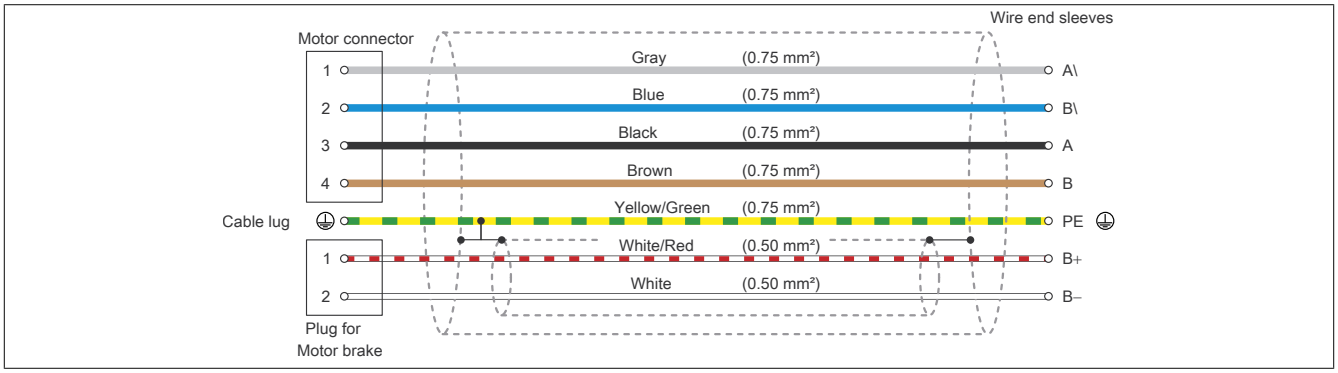



**Pinout**

| 4-pin terminal block | Pin | Description | Wire colors | Open-ended |
|---|---|---|---|---|
|  | 1 | A\ | Gray | For custom wiring<br>Connection to drive system |
| | 2 | B\ | Blue | |
| | 3 | A | Black | |
| | 4 | B | Brown | |
| **2-pin terminal block** | **Pin** | **Description** | **Wire colors** | |
|  | 1 | 24 VDC brake | White / red | |
| | 2 | GND | White | |
| **Cable lug** | **Pin** | **Description** | **Wire colors** | |
| | - | PE wire / Shield | Yellow / green | |

| Cable lengths (L) | |
|---|---|
| **Model number** | **Length [m]** |
| 80CM**01**002.21-01 | 1 |
| 80CM**02**002.21-01 | 2 |
| 80CM**03**002.21-01 | 3 |
| 80CM**05**002.21-01 | 5 |
| 80CM**10**002.21-01 | 10 |
| 80CM**15**002.21-01 | 15 |
| 80CM**20**002.21-01 | 20 |

### Cable diagram



### 12.3.4.1 Technical data

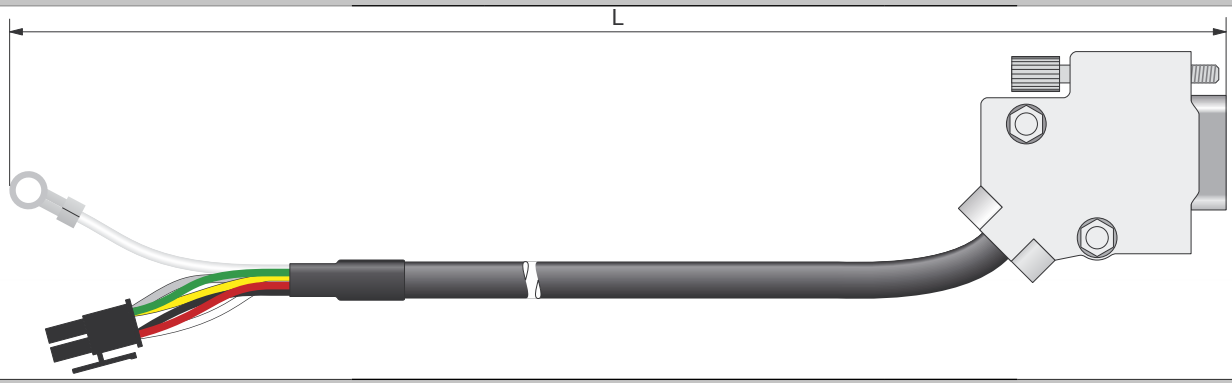
| Order number | 80CMxx002.21-01 |
|---|---|
| **General information** | |
| Cable cross section | 5x 0.75 mm² + 1x 2x 0.5 mm² |
| Durability | Oil resistance according to VDE 0472 part 803 as well as standard hydraulic oil |
| Certification | UL AWM Style 20234, 80°C, 1000 V, E63216 and CSA AWM I/II A/B, 90°C, 1000 V, FT2 LL46064 |
| **Cable construction** | |
| Power lines | |
| Quantity | 5 |
| Wire insulation | Special thermoplastic material |
| Wire colors | Black, brown, blue, green, yellow/green |
| Variant | Tinned copper stranded wire |
| Cross section | 0.75 mm² |
| Shield | No |
| Stranding | No |
| Signal line | |
| Quantity | 2 |
| Wire insulation | Special thermoplastic material |
| Wire colors | White, white/red |
| Variant | Tinned copper stranded wire |
| Cross section | 0.5 mm² |
| Shield | Separate shielding for pairs, tinned copper braiding, optical coverage >85% and foil banding |
| Stranding | White with white/red |
| Cable stranding | With filler elements and foil banding |
| Cable shield | Tinned copper braiding, optical coverage >85% and wrapped in isolating film |
| Outer jacket | |
| Material | PUR |
| Color | Orange, similar to RAL 2003 flat |
| Labeling | B&R 5x0,75+1x2x0,5 FLEX UL AWM STYLE 20234 80°C<br>1000 V E63216 CSA AWM I/II A/B 90°C 1000 V FT2 LL46064 |
| **Electrical properties** | |
| Test voltage | |
| Wire - Wire | 3 kV |
| Wire - Shield | 3 kV |
| Conductor resistance | |
| Power lines | ≤29 Ω/km |
| Signal line | ≤39 Ω/km |
| Insulation resistance | >200 MΩ/km |
| Current-carrying capacity per DIN VDE 0298 part 4, table 11 | |
| Wall mounting | 13 A |
| Installed in conduit or cable duct | 11.5 A |
| Installed in cable tray | 13.5 A |
| **Ambient conditions** | |
| Temperature | |
| Moving | -10 to 70°C |
| Static | -20 to 90°C |
| **Mechanical properties** | |
| Dimensions | |
| Diameter | 10.8 mm ±0.4 mm |
| Bend radius | |
| Single bend | >34 mm |
| Moving | ≥85 mm |
| Drag chain data | |
| Acceleration | <60 m/s² |
| Flex cycles [1)] | ≥3,000,000 |
| Velocity | ≤4 m/s |
| Weight | 0.26 kg/m |

1) At an ambient temperature of 20°C and a flex radius of 125 mm.

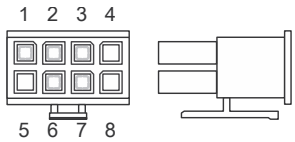
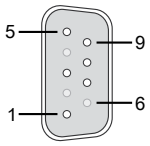
## 12.3.5 80CMxxx03.25-01 - ABR incremental encoder cables

### Pinout

**Dimensions**



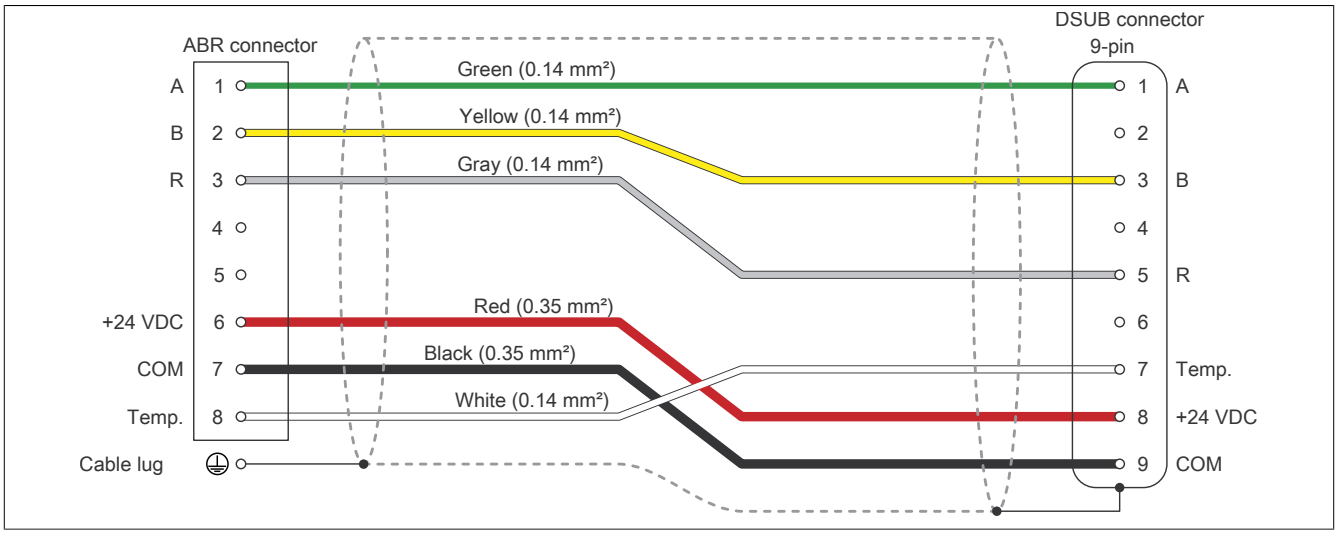

**Pinout**

| 8-pin terminal block | Pin | Description | | Pin | DSUB male 9-pin connector (6 pins used) |
|---|---|---|---|---|---|
|  | 1 | A | A | 1 |  |
| | 2 | B | B | 3 | |
| | 3 | R | R | 5 | |
| | 4 | - | NC | | |
| | 5 | - | NC | | |
| | 6 | +24 VDC | Encoder power supply +24 V | 8 | |
| | 7 | COM | Encoder power supply 0 V | 9 | |
| | 8 | Temp | Temperature | 7 | |
| | Wire colors / wiring, see cable diagram. | | | | |
| **Cable lug** | **Pin** | **Description** | | **Pin** | |
| | - | PE wire / Shield | | - | |



| Cable lengths (L) | |
|---|---|
| **Model number** | **Length [m]** |
| 80CM**010**03.25-01 | 1.0 |
| 80CM**020**03.25-01 | 2.0 |
| 80CM**030**03.25-01 | 3.0 |
| 80CM**050**03.25-01 | 5.0 |
| 80CM**075**03.25-01 | 7.5 |
| 80CM**100**03.25-01 | 10 |
| 80CM**150**03.25-01 | 15 |
| 80CM**200**03.25-01 | 20 |
| 80CM**250**03.25-01 | 25 |

### Cable diagram



### 12.3.5.1 Technical data

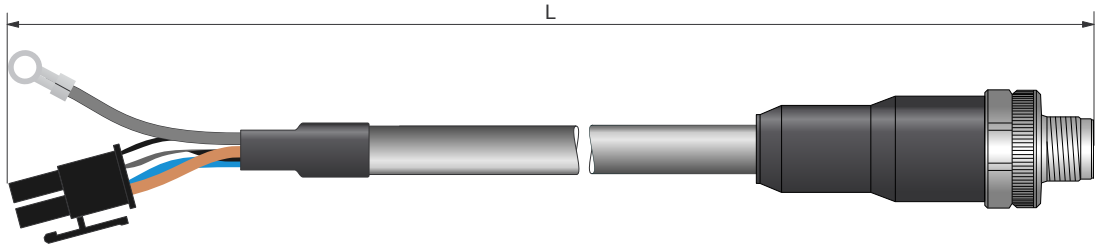
| Product ID | 80CMxxx03.25-01 |
|---|---|
| **General information** | |
| Cable cross section | 4x 0.14 mm² + 2x 0.35 mm² |
| Durability | Oil resistance per VDE 0472 Part 803 as well as standard hydraulic oils |
| Certification | UL AWM Style 20963, 80°C, 30 V, E63216 |
| **Cable construction** | |
| Supply lines | |
| Quantity | 2 |
| Wire insulation | Special thermoplastic material |
| Wire colors | Red, black |
| Variant | Tinned copper stranded wire |
| Cross section | 0.35 mm² |
| Shield | No |
| Stranding | No |
| Signal line | |
| Quantity | 4 |
| Wire insulation | Special thermoplastic material |
| Wire colors | Gray, yellow, green, white |
| Variant | Tinned copper stranded wire |
| Shield | No |
| Stranding | All 4 wires together |
| Cable stranding | With terminating foil shield |
| Cable shield | Copper braiding, optical coverage ≥85% and foil shield |
| Outer jacket | |
| Material | PUR |
| Color | Gray |
| Labeling | B&R 4x0.14+2x0.35 FLEX UL AWM STYLE 20963 80°C 30 V E63216 |
| **Electrical properties** | |
| Test voltage | |
| Wire - Wire | 1.5 kV |
| Wire - Shield | 0.8 kV |
| Conductor resistance | |
| 0.14 mm² | ≤134 Ω/km |
| 0.34 mm² | >55 Ω/km |
| Insulation resistance | >200 MΩ/km |
| **Ambient conditions** | |
| Temperature | |
| Moving | -10 to 50°C |
| Static | -20 to 80°C |
| **Mechanical properties** | |
| Dimensions | |
| Diameter | 5.8 mm ±0.2 mm |
| Bend radius | |
| Single bend | ≥20 mm |
| Moving | ≥50 mm |
| Drag chain data | |
| Acceleration | <60 m/s² |
| Flex cycles[1)] | ≥3,000,000 |
| Velocity | ≤4 m/s |
| Weight | 0.045 kg/m |

1) At an ambient temperature of 20°C and bend radius of 65 mm.

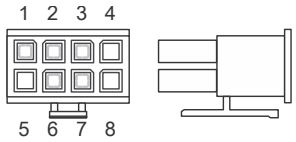
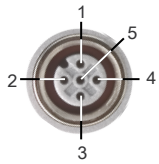
## 12.3.6 80CMxxx03.26-01 - ABR incremental encoder cables with M12 connector

### Pinout

**Dimensions**




**Pinout**

| 8-pin terminal block | Pin | Name | | Pin | M12 circular connector |
|---|---|---|---|---|---|
|   | 1 | A | A | 2 |   |
| | 2 | B | B | 4 | |
| | 3 | R | R | 5 | |
| | 4 | - | NC | | |
| | 5 | - | NC | | |
| | 6 | +24 VDC | Encoder supply +24 V | 1 | |
| | 7 | COM | Encoder supply 0 V | 3 | |
| | 8 | - | NC | | |
| | Wire colors / wiring, see cable diagram. | | | | |
| **Cable lug** | **Pin** | **Name** | | **Pin** | |
| | - | PE wire / Shield | | - | |

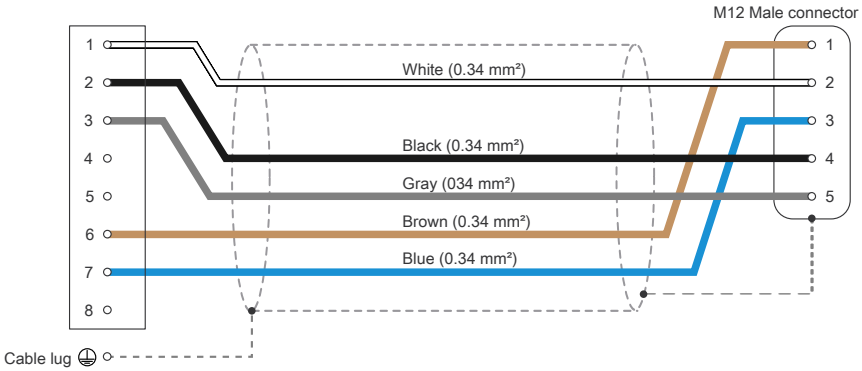
| Cable lengths (L) | |
|---|---|
| **Order number** | **Length [m]** |
| 80CM**003**03.26-01 | 0.3 |
| 80CM**005**03.26-01 | 0.5 |
| 80CM**007**03.26-01 | 0.7 |
| 80CM**008**03.26-01 | 0.8 |
| 80CM**010**03.26-01 | 1.0 |
| 80CM**011**03.26-01 | 1.1 |

| Cable lengths (L) | |
|---|---|
| **Order number** | **Length [m]** |
| 80CM**014**03.26-01 | 1.4 |
| 80CM**015**03.26-01 | 1.5 |
| 80CM**017**03.26-01 | 1.7 |
| 80CM**020**03.26-01 | 2.0 |
| 80CM**025**03.26-01 | 2.5 |
| 80CM**026**03.26-01 | 2.6 |

| Cable lengths (L) | |
|---|---|
| **Order number** | **Length [m]** |
| 80CM**029**03.26-01 | 2.9 |
| 80CM**040**03.26-01 | 4.0 |
| 80CM**050**03.26-01 | 5.0 |
| 80CM**054**03.26-01 | 5.4 |
| 80CM**100**03.26-01 | 10.0 |

| Accessory for M12 connector | |
|---|---|
| **Model number** | **Description** |
| 80XMPXAC1.00-10 | 10x gasket for cable with M12 connector |

### Cable diagram



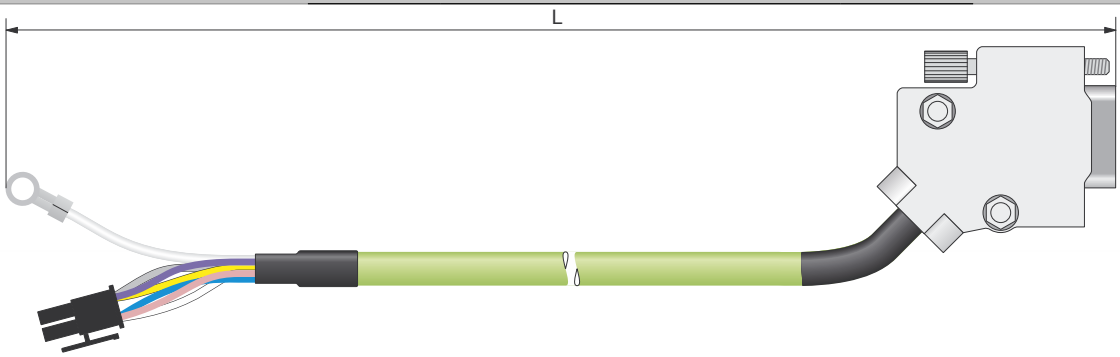
### 12.3.6.1 Technical data

| Product ID | 80CMxxx03.26-01 |
|---|---|
| **General information** | |
| Cable cross section | 5x 0.34 mm² |
| **Cable construction** | |
| Power lines | |
| Quantity | 5 |
| Wire insulation | PVC |
| Wire colors | Black, brown, blue, gray, white |
| Cross section | 0.34 mm² |
| Shield | Yes |
| Stranding | Yes |
| Cable stranding | With filler elements and foil shield |
| Cable shield | Tinned copper braiding, optical coverage >85% and foil shield |
| Outer jacket | |
| Material | PUR/PVC |
| **Electrical properties** | |
| Nominal current | Max. 4 A / contact |
| Connection voltage | Max. 60 V AC/DC |
| **Ambient conditions** | |
| Temperature | |
| Moving | -10 to 70°C |
| Static | -20 to 90°C |
| **Mechanical properties** | |
| Dimensions | |
| Diameter | 6.4 mm ±0.2 mm |
| Bend radius | ≥10x outer diameter |
| Drag chain data | |
| Acceleration | Max. 5.0 m/s² |
| Flex cycles | >2.5 million |
| Velocity | Max. 2.0 m/s |

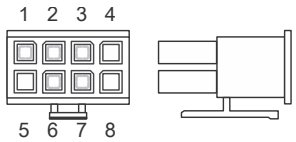
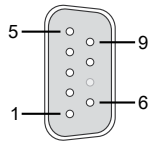
## 12.3.7 80CMxx004.25-01 - SSI absolute encoder cables

### Pinout

**Dimensions**

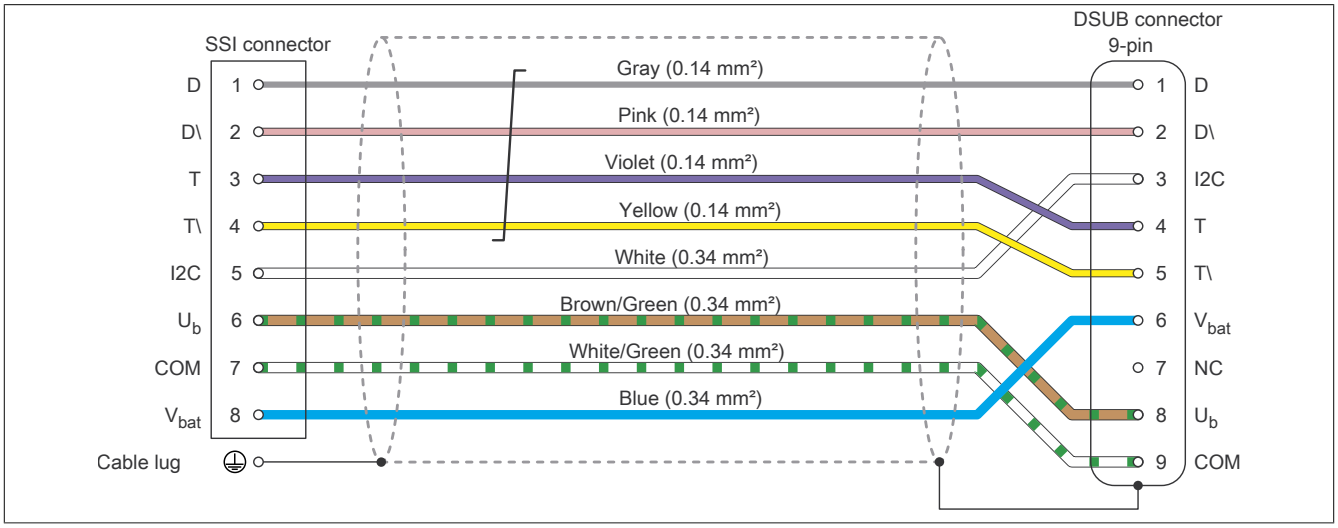



**Pinout**

| 8-pin terminal block | Pin | Description | | Pin | DSUB male 9-pin connector (8 pins used) |
|---|---|---|---|---|---|
|   | 1 | D | Data input | 1 |   |
| | 2 | D\ | Data input inverted | 2 | |
| | 3 | T | Clock output | 4 | |
| | 4 | T\ | Clock output inverted | 5 | |
| | 5 | I2C | I2C | 3 | |
| | 6 | $+U_b$ | Encoder power supply +24 V | 8 | |
| | 7 | COM | Encoder power supply 0 V | 9 | |
| | 8 | $V_{Bat}$ | Battery-backed 3 V | 6 | |
| | Wire colors / wiring, see cable diagram. | | | | |
| **Cable lug** | **Pin** | **Description** | | **Pin** | |
| | - | Shield | | - | |

| Cable lengths (L) | |
|---|---|
| **Model number** | **Length [m]** |
| 80CM**01**004.25-01 | 1 |
| 80CM**02**004.25-01 | 2 |
| 80CM**03**004.25-01 | 3 |
| 80CM**05**004.25-01 | 5 |
| 80CM**10**004.25-01 | 10 |
| 80CM**15**004.25-01 | 15 |
| 80CM**20**004.25-01 | 20 |

### Cable diagram



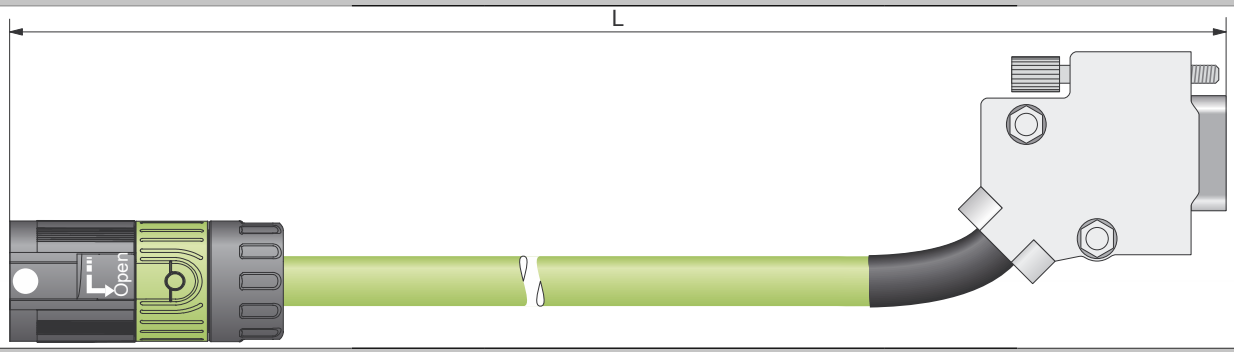
### 12.3.7.1 Technical data

| Order number | 80CMxx004.25-01 |
|---|---|
| **General information** | |
| Cable cross section | 1x 4x 0.14 mm² + 4x 0.34 mm² |
| Durability | Oil resistance according to VDE 0472 part 803 test type B |
| Certification | UL AWM Style 20963, 80°C, 30 V, E63216 |
| **Cable construction** | |
| Supply lines | |
| Quantity | 4 |
| Wire insulation | Special thermoplastic material |
| Wire colors | White/green, brown/green, blue, white |
| Variant | Tinned copper stranded wire |
| Cross section | 0.34 mm² |
| Shield | No |
| Stranding | No |
| Signal line | |
| Quantity | 4 |
| Wire insulation | Special thermoplastic material |
| Wire colors | Yellow, gray, pink, violet |
| Variant | Tinned copper stranded wire |
| Cross section | 0.14 mm² |
| Shield | No |
| Stranding | All 4 leads together |
| Cable stranding | With foil shield |
| Cable shield | Copper/tin braiding |
| Outer jacket | |
| Material | PUR |
| Color | Green |
| Labeling | Heidenhain UR AWM Style 20963 80°C 30V E63216 |
| **Electrical properties** | |
| Test voltage | |
| Wire - Wire | 0.5 kV |
| Wire - Shield | 0.5 kV |
| Conductor resistance | |
| Supply lines | ≤55 Ω/km |
| Signal line | ≤134 Ω/km |
| Insulation resistance | >200 MΩ/km |
| **Ambient conditions** | |
| Temperature | |
| Moving | -10 to 80°C |
| Static | -40 to 80°C |
| **Mechanical properties** | |
| Dimensions | |
| Diameter | 6 mm ±0.25 mm |
| Bend radius | |
| Single bend | ≥20 mm |
| Moving | ≥75 mm |
| Drag chain data | |
| Acceleration | <60 m/s² |
| Flex cycles | ≥3,000,000 |
| Velocity | ≤4 m/s |
| Weight | 0.08 kg/m |

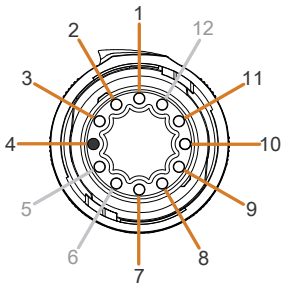
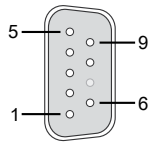
## 12.3.8 80CMxx005.65-01 - HIPERFACE encoder cables

### Pinout

**Dimensions**




**Pinout**

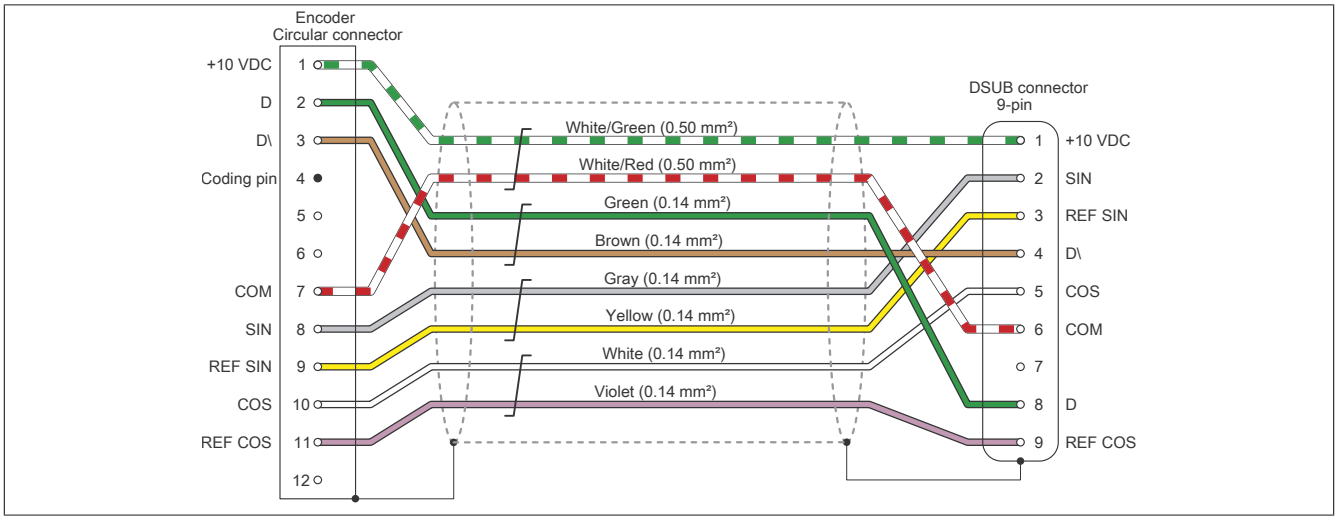
| 12-pin female circular connector | Pin | Description | | Pin | DSUB male 9-pin connector (8 pins used) |
|---|---|---|---|---|---|
|  | 1 | +10 VDC | Encoder power supply | 1 |  |
| | 2 | D | Data input | 8 | |
| | 3 | D\ | Data input inverted | 4 | |
| | 4 | Used for coding purposes and to prevent improper connections. | | - | |
| | 7 | COM | Encoder power supply 0 V | 6 | |
| | 8 | SIN | Channel SIN | 2 | |
| | 9 | REF SIN | REF SIN channel | 3 | |
| | 10 | COS | Channel COS | 5 | |
| | 11 | REF COS | REF COS channel | 9 | |
| | Wire colors / wiring, see cable diagram. Each shield connected to housing on connector side | | | | |





| Cable lengths (L) | |
|---|---|
| **Model number** | **Length [m]** |
| 80CM**01**005.65-01 | 1 |
| 80CM**02**005.65-01 | 2 |
| 80CM**03**005.65-01 | 3 |
| 80CM**05**005.65-01 | 5 |
| 80CM**10**005.65-01 | 10 |
| 80CM**15**005.65-01 | 15 |
| 80CM**20**005.65-01 | 20 |

### Cable diagram



### 12.3.8.1 Technical data

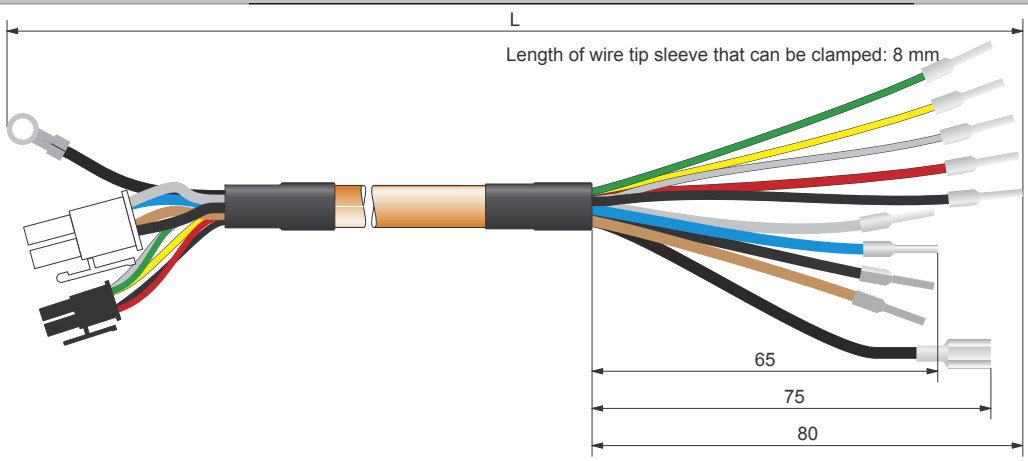
| Order number | 80CMxx005.65-01 |
|---|---|
| **General information** | |
| Cable cross section | 5x 2x 0.14 mm² + 1x 2x 0.50 mm² |
| Durability | Oil resistance according to VDE 0472 part 803 as well as standard hydraulic oil |
| Certification | UL AWM Style 20963, 80°C, 30 V, E63216 and CSA AWM I/II A/B, 90°C, 30 V, FT1 LL46064 |
| **Cable construction** | |
| Supply lines | |
| Quantity | 2 |
| Wire insulation | Special thermoplastic material |
| Wire colors | White/Green, white/red |
| Variant | Tinned copper stranded wire |
| Cross section | 0.5 mm² |
| Shield | No |
| Stranding | White/Red with white/green and filler elements |
| Signal line | |
| Quantity | 10 |
| Wire insulation | Special thermoplastic material |
| Wire colors | Blue, brown, yellow, gray, green, pink, red, black, violet, white |
| Variant | Tinned copper stranded wire |
| Cross section | 0.14 mm² |
| Shield | No |
| Stranding | Green with brown, gray with yellow, white with violet, black with red, pink with blue |
| Cable stranding | With foil shield |
| Cable shield | Copper braiding, optical coverage >85% and wrapped in foil shield |
| Outer jacket | |
| Material | PUR |
| Color | RAL 6018 |
| Labeling | B&R 10x0,14+2x0,50 FLEX UL AWM STYLE 20963 80°C<br>30 V E63216 CSA AWM I/II A/B 90°C 30 V FT1 LL46064 |
| **Electrical properties** | |
| Test voltage | |
| Wire - Wire | 1 kV |
| Wire - Shield | 0.8 kV |
| Conductor resistance | |
| Supply lines | ≤40 Ω/km |
| Signal line | ≤140 Ohm/km |
| Insulation resistance | >200 MΩ/km |
| **Ambient conditions** | |
| Temperature | |
| Moving | -10 to 80°C |
| Static | -40 to 90°C |
| **Mechanical properties** | |
| Dimensions | |
| Diameter | 7.85 mm ±0.2 mm |
| Bend radius | |
| Single bend | ≥24 mm |
| Moving | ≥60 mm |
| Drag chain data | |
| Acceleration | <60 m/s² |
| Flex cycles [1] | ≥3,000,000 |
| Velocity | ≤4 m/s |
| Weight | 0.08 kg/m |

1) At an ambient temperature of 20°C and a flex radius of 65 mm.

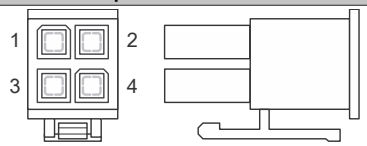
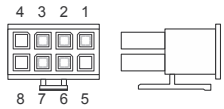
## 12.3.9 80CMxx013.21-01 - Hybrid cables

### Pinout

**Dimensions**

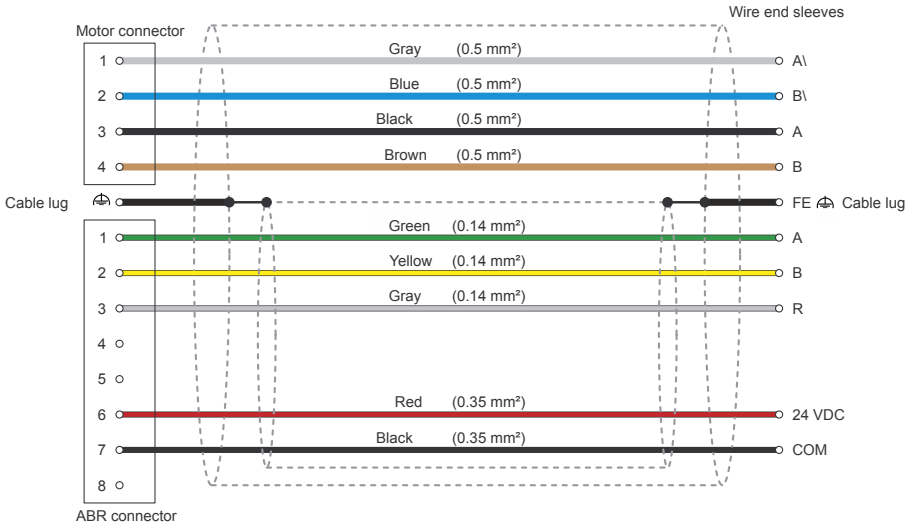



**Pinout**

| 4-pin terminal block | Pin | Description | Wire colors | Open-ended |
|---|---|---|---|---|
|  | 1 | A\ | Gray | For custom wiring<br>Connection to drive system |
| | 2 | B\ | Blue | |
| | 3 | A | Black | |
| | 4 | B | Brown | |
| **8-pin terminal block** | **Pin** | **Description** | **Wire colors** | |
|  | 1 | A | Green | |
| | 2 | B | Yellow | |
| | 3 | R | Gray | |
| | 4 | NC | - | |
| | 5 | NC | - | |
| | 6 | 24 VDC | Red | |
| | 7 | COM | Black | |
| | 8 | NC | - | |
| **Cable lug** | **Pin** | **Description** | **Wire colors** | **Cable lug** |
| | - | FE wire / Shield | Black | |

| Cable lengths (L) | |
|---|---|
| **Model number** | **Length [m]** |
| 80CM**01**013.21-01 | 1 |
| 80CM**02**013.21-01 | 2 |
| 80CM**03**013.21-01 | 3 |
| 80CM**05**013.21-01 | 5 |
| 80CM**10**013.21-01 | 10 |
| 80CM**15**013.21-01 | 15 |

### Cable diagram



### 12.3.9.1 Technical data

| Order number | 80CMxx013.21-01 |
|---|---|
| **General information** | |
| Cable cross section | 4x 0.5 mm² + 2x 0.35 mm² + 3x 0.14 mm² |
| Certification | UL AWM Style 20963, 80°C, 30 V, E63216 and CSA AWM I/II A/B, 90°C, 30 V, FT2 LL46064 |
| **Cable construction** | |
| Power lines | |
| Quantity | 4 |
| Wire insulation | Special thermoplastic material |
| Wire colors | Black, gray, brown, blue |
| Variant | Tinned copper stranded wire |
| Cross section | 0.5 mm² |
| Supply lines | |
| Quantity | 2 |
| Wire insulation | Special thermoplastic material |
| Wire colors | Red, black |
| Variant | Tinned copper stranded wire |
| Cross section | 0.35 mm² |
| Shield | Yes |
| Stranding | Yes |
| Signal line | |
| Quantity | 3 |
| Wire insulation | Special thermoplastic material |
| Wire colors | Gray, yellow, green |
| Variant | Tinned copper stranded wire |
| Cross section | 0.14 mm² |
| Shield | Yes |
| Stranding | Yes |
| Cable stranding | Yes |
| Cable shield | Tinned copper wire braiding, optical coverage ≥ 85% |
| Outer jacket | |
| Material | PUR |
| Labeling | B&R 4x0.50+1x(2x0.35+3x0.14 C) FLEX<br>UL AWM STYLE 20963 80°C 30 V E63216<br>CSA AWM I/II A/B 90°C 30 V FT2 LL46064 |
| **Electrical properties** | |
| Test voltage | |
| Wire - Wire | 1.0 kV |
| Wire - Shield | 0.5 kV |
| Conductor resistance | |
| 0.14 mm² | ≤134 Ω/km |
| 0.35 mm² | ≤55 Ω/km |
| 0.50 mm² | ≤39 Ω/km |
| Insulation resistance | >200 MΩ/km |
| **Ambient conditions** | |
| Temperature | |
| Moving | -10 to 50°C |
| Static | -20 to 80°C |
| **Mechanical properties** | |
| Dimensions | |
| Diameter | 7.9 mm ±0.25 mm |
| Bend radius | |
| Single bend | ≥20 mm |
| Moving | ≥50 mm |
| Drag chain data | |
| Acceleration | <60 m/s² |
| Flex cycles [1)] | ≥3,000,000 |
| Velocity | ≤4 m/s |
| Weight | 0.085 kg/m |

1) At an ambient temperature of 20°C and a flex radius of 65 mm.