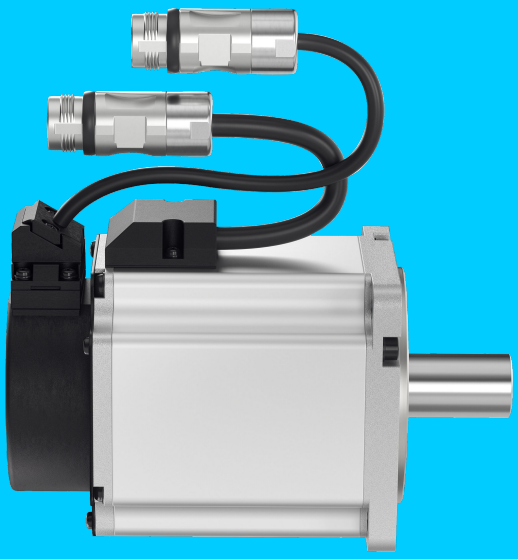
rexroth
A Bosch Company

Operating Instructions

# MS2M
# Synchronous Servomotors



R912010223 Edition 02

**Disclaimer**

The data specified above only serve to describe the product. As our products are constantly being further developed, no statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

DOK-MOTOR*-MS2M*******-IT02-EN-P

b2fa9049216a89080a347e881a578b33, 2, en_US

# Table of contents

# 1 About this documentation

## 1.1 Editions of this documentation

This documentation explains the product characteristics, application possibilities, operating conditions and the operational limits of the motors, contains the technical data of the available motors and provides information on product selection, handling and operation.

Table 1: Record of revisions

| Edition | Release date | Notes |
|---|---|---|
| 01 | 2025-03 | First edition |
| 02 | 2025-12 | Contents upgrade |

## 1.2 Presentation of information

### Safety instructions

The safety instructions in this documentation include signal words (danger, warning, caution, note) and a signal symbol (acc. to ANSI Z535.6-2011).

The signal word is intended to draw your attention to the safety instructions and describes the seriousness of the danger. The warning triangle with exclamation mark indicates the danger for persons.

| | |
|---|---|
| ⚠ DANGER | Non-compliance with this safety instructions **will** result in death or severe personal injury. |
| ⚠ WARNING | Non-compliance with this safety instructions **can** result in death or severe personal injury. |
| ⚠ CAUTION | Non-compliance with this safety instructions **can** result in moderate or minor personal injury. |
| *NOTICE* | Non-compliance with this safety instructions **can** result in material damage. |

### Safety symbols

In the documentation, the following internationally standardized safety signs and graphic symbols are used. The meaning of the symbols is described in the table.

Table 2: Meaning of safety signs

| Safety symbols | Meaning |
|---|---|
|  | Warning against dangerous electric voltage |
|  | Warning against hot surfaces |
|  | Warning against rotating machine parts |
|  | Warning against overhead load |

| Safety symbols | Meaning |
|---|---|
|  | Electrostatic sensitive devices |
|  | Prohibited for persons with active implantable medical devices (AIMD) or passive metallic implants (body aids) as well as for pregnant women |
|  | Do not carry along metal parts or clocks. |
|  | Hammer scales are forbidden |

## Meaning of symbols

Table 3: Meaning of symbols

| Symbol | Meaning |
|---|---|
|  | Reference to supplementary documentation |
|  | The UL Recognized Component Mark identifies recognized component parts which are components of a bigger product or system. |
|  | The letters “C” and “E” stand for “Conformité Européenne”. The CE-marking expresses the conformity of a product with relevant EC-regulations. |
|  | UKCA means “UK Conformity Assessed”. The UKCA-marking expresses the conformity of a product with all valid statutory requirements of the United Kingdom. |
|  | Components for the use in systems for “integrated safety technique” prepared. |
|  | The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin. |

## Markup

The following markups are used for a user-friendly text information representation:

**Remark**

This note gives important information, which must be observed.

- Listings on the first level contain a bullet point
  - Listings on the second level contain a dash

# 1.3 Further documentation

## 1.3.1 Drive systems, system components

Table 4: Documentation - Drive systems, system components

| Title | Document type | Documentation type[1)] | Material number |
|---|---|---|---|
| ctrlX<br>DRIVE XCS2-F | Project Planning Manual | DOK-XDRV**-XCS-F******-PRxx-EN-P | R912009455 |
| Security Guidelines Electric Drives and Controls | Project Planning Manual | DOK-IWORKS-SECURITY***-PRxx-EN-P | R911342562 |
| Control cabinet<br>Climatization, EMC, Setup, Protection Class, IndraDrive Electric, Rexroth EFC/Fv, Sytronix | Project Planning Manual | DOK-DRIVE*-CABINET****-PRxx-EN-P | R911344988 |

1) In the documentation types, xx is a placeholder for the current issue status of the documentation (example: PR01 means the first issue of the documentation catalog)

## 1.3.2 Firmware/Runtime

Table 5: Documentation - Firmware

| Title | Document type | Documentation type[1)] | Material number |
|---|---|---|---|
| AXS-V-05<br>Functions | Application Manual | DOK-XDRV**-AXS-05VRS**-APxx-EN-P | R911422255 |
| AXS-V-05 (CoE)<br>Functions | Application Manual | DOK-XDRV**-AXS-05VRS*C-APxx-EN-P | R911422257 |
| Diagnostic messages of runtime AXS-V-05RS | Reference | DOK-XDRV**-GEN5-DIAG**-RExx-EN-P | R911422251 |
| Parameter/Objects of Runtime AXS-V-05RS | Reference | DOK-XDRV**-GEN5-PARA*C-RExx-EN-P | R911422253 |
| AXS-V-04<br>Functions | Application Manual | DOK-XDRV**-AXS-04VRS**-APxx-EN-P | R911421281 |
| AXS-V-04 (CoE)<br>Functions | Application Manual | DOK-XDRV**-AXS-04VRS*C-APxx-EN-P | R911421283 |
| Diagnostic messages of runtime AXS-V-04RS | Reference | DOK-XDRV**-GEN4-DIAG**-RExx-EN-P | R911421277 |
| Parameter/Objects of Runtime AXS-V-04RS | Reference | DOK-XDRV**-GEN4-PARA*C-RExx-EN-P | R911421279 |
| AXS-V-03<br>Functions | Application Manual | DOK-XDRV**-AXS-03VRS**-APxx-EN-P | R911410073 |
| AXS-V-03 (CoE)<br>Functions | Application Manual | DOK-XDRV**-AXS-03VRS*C-APxx-EN-P | R911398021 |

| Title | Document type | Documentation type[1)] | Material number |
|---|---|---|---|
| Diagnostic messages of runtime AXS-V-03RS | Reference | DOK-XDRV**-GEN3-DIAG**-RExx-EN-P | R911409763 |
| Parameter of Runtime AXS-V-03RS | Reference | DOK-XDRV**-GEN3-PARA**-RExx-EN-P | R911409808 |
| Parameter/Objects of Runtime AXS-V-03RS | Reference | DOK-XDRV**-GEN3-PARA*C-RExx-EN-P | R911419643 |
| AXS-V-02 Functions | Application Manual | DOK-XDRV**-AXS-02VRS**-APxx-EN-P | R911398021 |
| Diagnostic messages of runtime AXS-V-02RS | Reference | DOK-XDRV**-GEN2-DIAG**-RExx-EN-P | R911383776 |
| Parameter of Runtime AXS-V-02RS | Reference | DOK-XDRV**-GEN2-PARA**-RExx-EN-P | R911383778 |

1) In the documentation types, xx is a placeholder for the current issue status of the documentation (example: RE02 means the second issue of a reference document)

### 1.3.3 Functional safety

Table 6: Documentation - functional safety

| Title | Document type | Documentation type[1)] | Material number |
|---|---|---|---|
| Integrated Safety Technology Safe Torque Off | Application Manual | DOK-XDRV**-SI-TX******-APxx-EN-P | R911383774 |
| Integrated Safety Technology SafeMotion | Application Manual | DOK-XDRV**-SI-MX******-APxx-EN-P | R911404905 |

1) In the documentation types, xx is a placeholder for the current issue status of the documentation (example: AP02 means the second issue of a reference document)

### 1.3.4 Cable

Table 7: Documentation - Cables

| Title | Document type | Documentation type[1)] | Material number |
|---|---|---|---|
| ctrlX Motor Cables and Connectors | Reference | DOK-CONNEC-XDRV*******-RExx-EN-P | R911420100 |

1) In the documentation types, xx is a placeholder for the current issue status of the documentation (example: CA03 means the third issue of the documentation catalog)

# 2 Safety instructions

## 2.1 Important directions on use

### 2.1.1 Intended use

Prerequisites for proper and safe use of the motors are proper transport, appropriate storage, proper assembly and connection, careful maintenance, operation and overhaul.

The motors have been exclusively designed for installation in industrial machinery. The motors have been designed and manufactured in compliance with the directives and harmonized standards specified in the following.

| EU Product standard | |
|---|---|
| EN 60034-1:2010 + Cor.:2010 | Rotating electrical machines - Part 1: Rating and performance (IEC 60034-1:2010, modified) |

### Valid within EU

| EU Directives | |
|---|---|
| 2014/35/EU | Low voltage directive |
| **EN Standards** | |
| EN IEC 60034-5:2020 | Rotating electrical machines - Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification (IEC 60034-5:2020) |

The machine manufacturer must evaluate the electric and mechanic safety as well as environmental influences in the assembled state of the machine according to the Machine Directive 2006/42/EC and EN 60204-1:2018 Safety of machinery - Electrical equipment of machines -Part 1: General requirements).

The electrical installation must comply with the protection requirements of EMC Directive 2014/30/EU. The plant manufacturer is responsible for appropriate installation (for example: physical separation of signal and power cables, using shielded cables, ...). The EMC instructions of the converter manufacturer must be observed.

The machine may not be commissioned before conformity with these directives has been confirmed.

The observance of and compliance with the specifications of the operating instructions (DOK-MOTOR*-MS2M*******-PRRS-EN-E) are part of the intended use.

### 2.1.2 Unintended use

Any use of MS2M motors outside of the specified fields of application or under operating conditions and technical data other than those specified in this documentation is considered to be unintended use.

Unless explicitly provided for this purpose, the motors may not be used in explosion-hazardous areas.

Direct operation on the three-phase network is forbidden.

## 2.2 Qualification of personnel

Any work with or on the described product may only done by qualified or skilled personnel. For the purpose of this manual, qualified personnel means persons who are familiar with transporting, installing, mounting, commissioning and operating the components of the electrical drive and control system and the associated hazards and have an appropriate qualification for their job.

All persons working on, with or in the vicinity of an electrical system must be informed of the relevant safety requirements, safety guidelines and internal instructionsEN 50110-1:2013.

## 2.3 General safety instructions

**Important! Please read all instructions before motor installation.**

Do not install or operate motors or components of the electric drive and control system before you have not carefully read all delivered documents.

**Keep this instructions!**
The operating instruction must be stored and transferred in case of sale during the complete product lifetime.

Please observe the particular applicable national, local and system-specific regulations, the safety instructions in the documentation and the warning and informative labels on the motors.

Observe the general safety notes in this chapter and the safety instructions in this documentation. Therewith, you avoid personal danger, damage and errors.

**Improper use of the motors and failure to follow the safety instructions in this document may result in material damage, personal injury, electric shock or, in extreme cases, to death!**

In the case of damage due to non-observance of the safety notes, Bosch Rexroth assumes no liability.

Applications for functional safety are only allowed if the motors have the **SI**-sign on the rating plate.

## 2.4 Product- and technology-dependent safety instructions

### 2.4.1 Protection from electric voltage

**Work required on the electric system may only be carried out by skilled electricians. Tools for electricians (VDE tools) are absolutely necessary.**

Before working:

- Enable.
- Secure against reactivation.
- Ensure de-energization.
- Ground and short-circuit.
- Cover or shield any adjacent live parts.

After completing the job, cancel the measures in reverse order.

**Dangerous voltage occurs during operation! Danger to life, risk of injury by electric shock!**

- Before start-up, connect the protective conductors on all electric components according to the connection plan.
- Operation, even for short measuring purposes is only allowed with fixed connected protective conductor on the specified points of the components.

## 2.4.2 Protection from mechanical danger

**Dangerous movements! Danger to life, risk of injury, heavy injury or material damage.**

- Do not stay within the motion zone of the machine. Avoid unauthorized access into the danger zone.
- Additionally secure vertical axes to prevent them from sinking or descending after having shutdown the motor, for instance as follows:
  - Mechanically lock the vertical axis,
  - providing an external braking / catching / clamping device, or
  - ensure sufficient weight compensation of the axes.

  Only using the serially delivered **motor holding brake** or an external holding brake activated by the drive controller **is not suitable for personal protection!**

**Rotating parts! Danger to life, risk of injury, heavy injury or material damage.**

- Secure key and/or transmission elements against ejection.
- Install covers on dangerous rotating machine parts before start-up.

## 2.4.3 Protection against magnetic and electromagnetic fields

**Health hazard for persons with active body aids or passive metallic implants and for pregnant women.**

Magnetic and electromagnetic fields are created in the direct environment of live conductors or permanent magnets of electro motors and are a serious danger for persons.

Observe the country-specific regulations. For Germany, please observe the specifications of the occupational insurance association BGV B11 and BGR B11 regarding “electromagnetic fields”.

- For persons with active body aids (like heart pacemakers), passive metallic implants (like hip prosthesis) and pregnant women possible hazards exist due to electro magnetic or magnetic fields in direct environment of electric drive and control components and the corresponding live conductors.

  Access into these areas can be dangerous for these persons:
  - Areas, in which components of electrical drive and control systems and corresponding live conductors are mounted, activated or operated.
  - Areas in which motor parts with permanent magnets are stored, repaired or assembled.
- Above mentioned persons must contact their attending physician before entering these areas.
- Please observe the valid industrial safety regulations for plants which are fitted with components of electrical drive and control systems and corresponding live conductors.

**Crushing hazard of fingers and hands due to strong attractive forces of the magnets!**

- Handle only with protective gloves.

**Risk of destruction of sensitive parts! Data loss!**

- Keep watches, credit cards, check cards and identity cards and all ferromagnetic metal parts, such as iron, nickel and cobalt away from permanent magnets.

### 2.4.4 Protection against burns

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

- Avoid contact with hot motor surfaces. **Temperatures may rise over 60 °C**.
- Allow the motors to cool down long enough before touching them.
- Temperature-sensitive components may not come into contact with the motor surface. Ensure appropriate mounting distance of connection cables and other components.

### 2.4.5 Electrostatic sensitive devices (ESD)

**Electrostatic sensitive devices (ESD)**

The motors contain parts which underlie an electrostatic danger. These components, especially temperature sensors of the motor winding can be destroyed by improper use.

Avoid, e.g. direct contact of open wires without being electrostatically discharged or grounded.

Remark

Do suitable ESD protective measures before you handle imperiled components (e.g. ESD protective clothes, wristlets, conductive floor, grounded cabinets and working surfaces).

# 3 Scope of delivery

The scope of delivery of a MS2M synchronous servomotor contains:

- Motor in original package
- Safety notes and instructions on use
- Protective covers for output shaft, plug connections.
- Accompanying papers

On delivery, immediately verify whether the delivered goods are those specified on the delivery note. The forwarder must be promptly informed of any damage on the packaging and goods, which is detected on delivery. Start-up of damaged goods is prohibited.

# 4 Identification

## 4.1 Type plate

MS2M motors have an individual type plate showing the device designation and providing technical information. The two-part type plate is attached at the side of the encoder housing.

The type plate is provided for

- Identification of the motor
- Procurement of spare parts in case of a fault
- Service information.

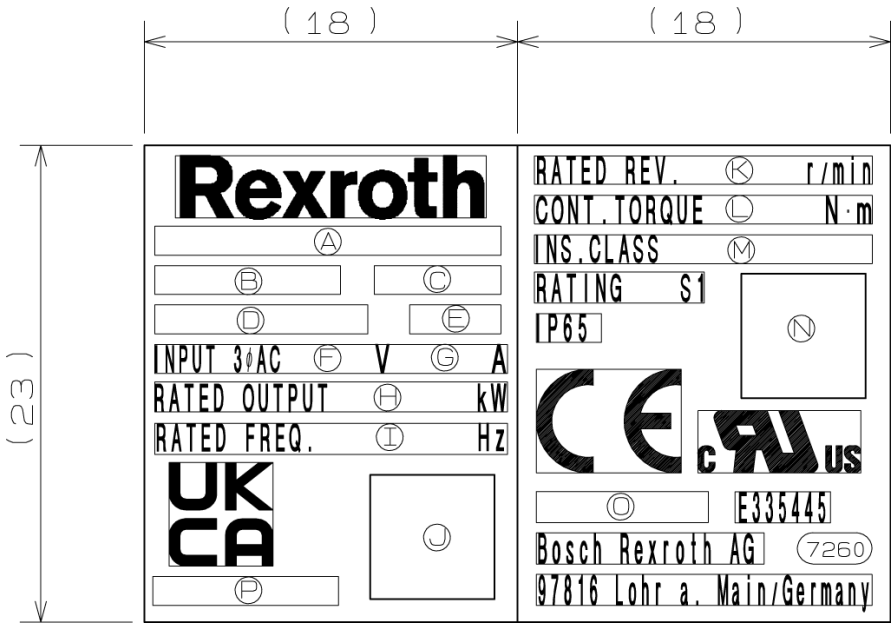



Fig. 1: Type plate MS2M

(A) Model Number
(B) Material Number
(C) Manufacturing Date
(D) Serial Number
(E) Hardware Index
(F) Rated Input Voltage
(G) Rated Input Current
(H) Rated Output
(I) Rated Frequency
(J) BRC Serial Number
(K) Rated Speed
(L) Rated Torque
(M) Insulation Classification
(N) QR Code
(O) Country of Origin
(P) Production Date

Table 8: Meaning of marks of conformity

| Certification mark | Meaning |
|---|---|
| c US | The UL Recognized Component Mark (UL recognized) identifies recognized component parts which are components of a bigger product or system. The recognition relates on Standards UL 1004-1 „Rotating electrical machines –General requirements“, UL 1004-6 „Servo and stepper motors“, CSA C22.2 No. 100 „Motors and generators“. |
| CE | The CE-marking confirms the conformity of a product according to the declaration of conformity. |
| UK CA | The UKCA-marking confirms the conformity of a product with relevant regulations. |

| Certification mark | Meaning |
|---|---|
|  | Motors labelled with the symbol EFUP 10 (enviromental-friendly use period) can be used for 10 years as intended before substances limited in their concentration according to China RoHS2 may leak and subsequently pose a risk to environment and health. |

# 4.2 Type code

## 4.2.1 MS2M02 Type code

The figure illustrates the basic structure of the type code. Our sales representative will help you with the current status of available versions.

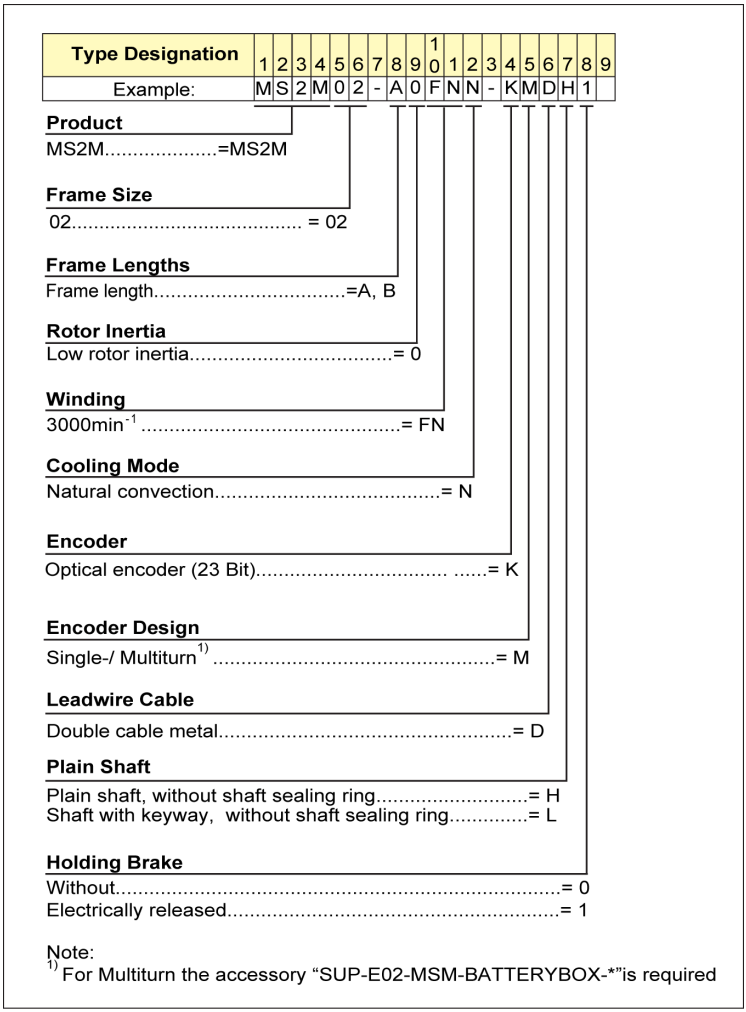



Fig. 2: MS2M02 Type code

## 4.2.2 MS2M03 Type code

The figure illustrates the basic structure of the type code. Our sales representative will help you with the current status of available versions.

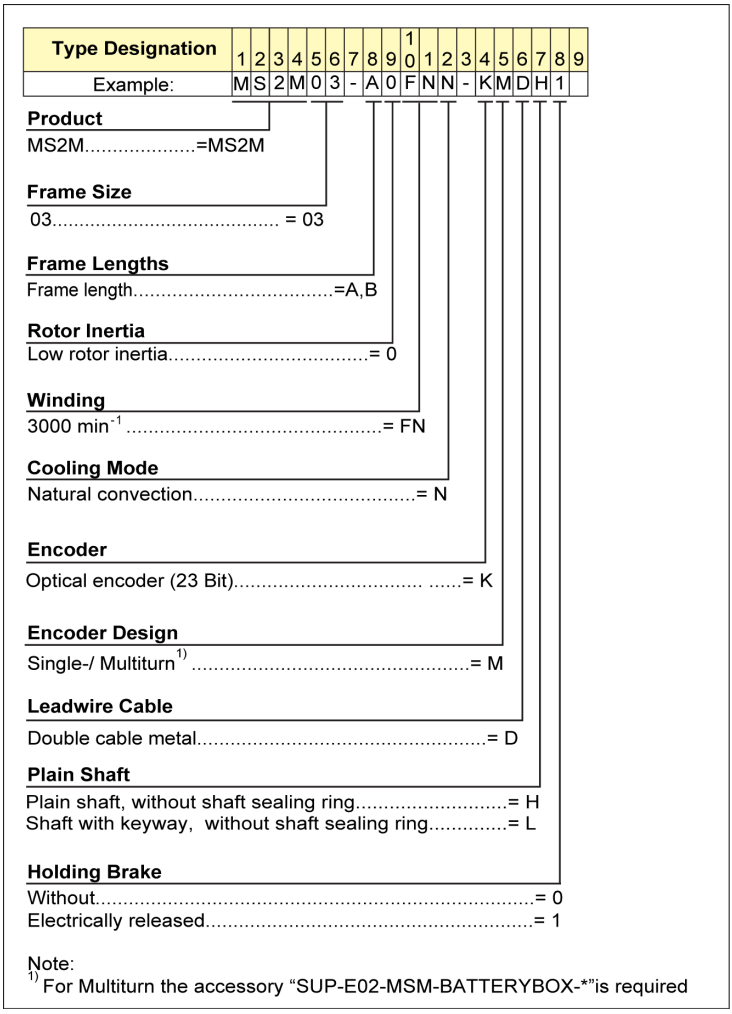



Fig. 3: MS2M03 Type code

## 4.2.3 MS2M04 Type code

The figure illustrates the basic structure of the type code. Our sales representative will help you with the current status of available versions.

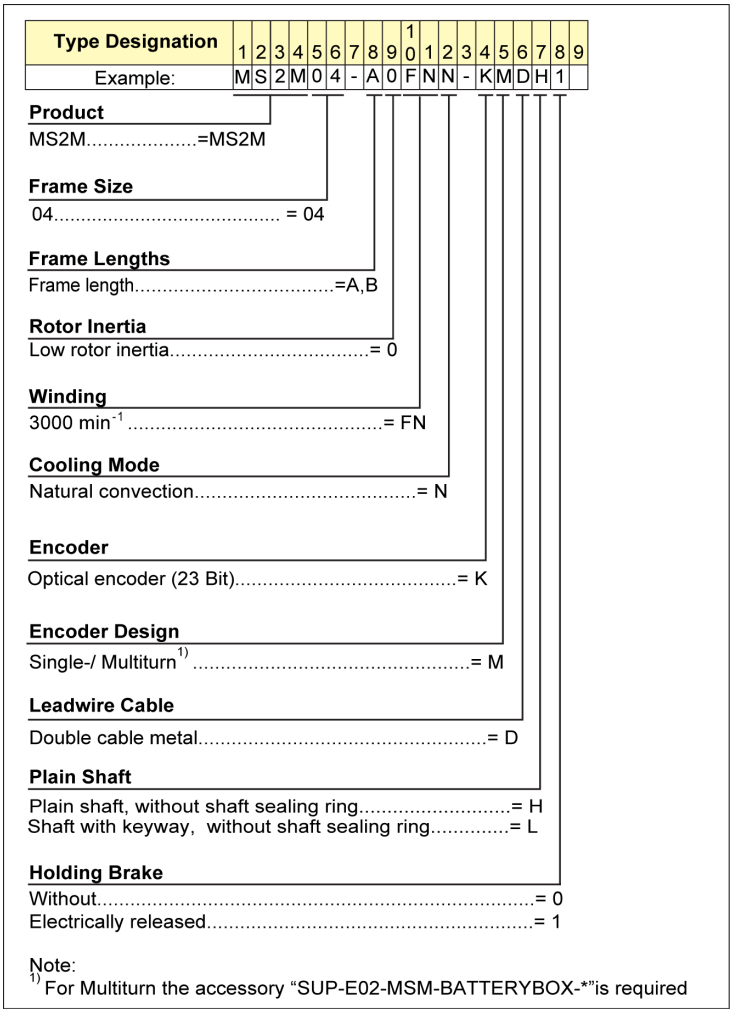



Fig. 4: MS2M04 Type code

# 5 About this product

## 5.1 Safety instructions on the product

Please note these safety and prohibitive signs on the motor.

| ⚠ WARNING | **Hot surfaces with temperatures over 60 °C may cause burns**<br>Let the motors cool down before working on the motors or in close proximity to the motors.Cooling down can require up to 140 minutes.<br>– Wear safety gloves.<br>– Do not work on hot surfaces. |
|---|---|

| ⚠ WARNING | **Warning against dangerous electric voltage**<br>Electric connection may only be established by specialized staff. Tools for electricians (VDE tools) are absolutely necessary.<br>– The installation has to be switched de-energized before operation and de-energization must be ensured via a suitable measuring device. De-energize the machine and secure the mains switch again unintended or unauthorized re-energization.<br>– Open the terminal boxes only in switched-off voltage. |
|---|---|

| ⚠ CAUTION | **Motor damage due to strikes onto the motor shaft**<br>Do not strike the shaft end and do not exceed the allowed axial and radial forces of the motor. |
|---|---|

## 5.2 Features and functions

### 5.2.1 Basic data

| Product |
|---|
| 3~ PM Motor |

| Type |
|---|
| MS2M |

| Ambient temperature during operation |
|---|
| 0 ... 40 °C (with derating up to 65 °C) |

| Type of protection (EN IEC 60034-5:2020) |
|---|
| **IP65** Equivalent of IP65 (Except for shaft through sections and connector sections.) |

**Cooling mode(EN 60034-6:1993)**

IC410, Self-cooling

**Motor design(EN 60034-7:1993 + A1:2001)**

IM B5
IM V1
IM V3

**Coating**

MS2M02: Silver

MS2M03: No coating (w. brake partly silver coating)

MS2M04: No coating (w. brake partly silver coating)

**Flange**

similar to DIN 42948:1965-11

**Shaft end**

Cylindrical (DIN 748-3),, centering hole with thread "DS" (DIN 332-2:1983-05), optional with keyway

**Concentricity, run-out, alignmentDIN 42955:1981-12)**

Tolerance N (standard)

**Installation altitude**

0 ... 1000 m above sea level (without derating)

**Sound pressure level**

65 dB(A)

**Thermal class(EN 60034-1:2010 + Cor.:2010)**

155 (F)

**Encoder system**

Optical absolute value encoder 23 bit, digital in Single- or Multiturn design

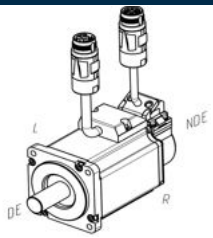
**Electrical connection**

- Power connectors M17
- M17 Encoder connector, quick lock SPEEDCON®

**Motor holding brake**

Optional, electrically released $U_N$ 24V DC (±5%)

**Motor ends**




| | |
|---|---|
| DE | Drive End, A-side |
| NDE | Non Drive End, B-side |
| L | Left |
| R | Right |

**Remark**

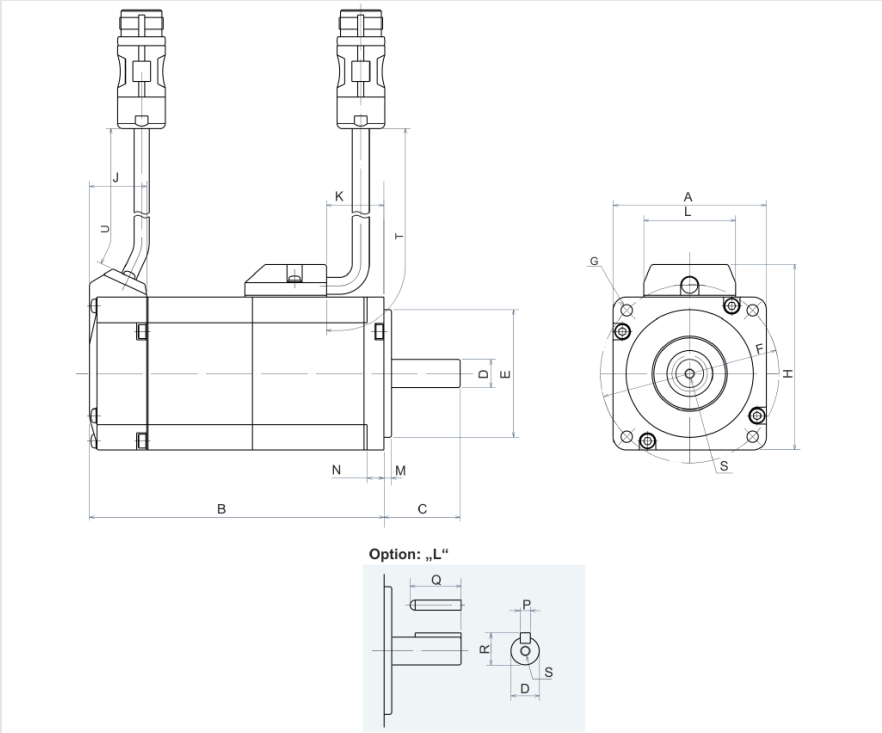
In the case of special design, details named in the operating instructions can deviate. In this case, order the supplementary documentation.

## 5.2.2 MS2M Specifications

### MS2M02 Specifications

### Dimensions MS2M02

Table 9: MS2M02-A0FNN-..H.,MS2M02-B0FNN-..H.



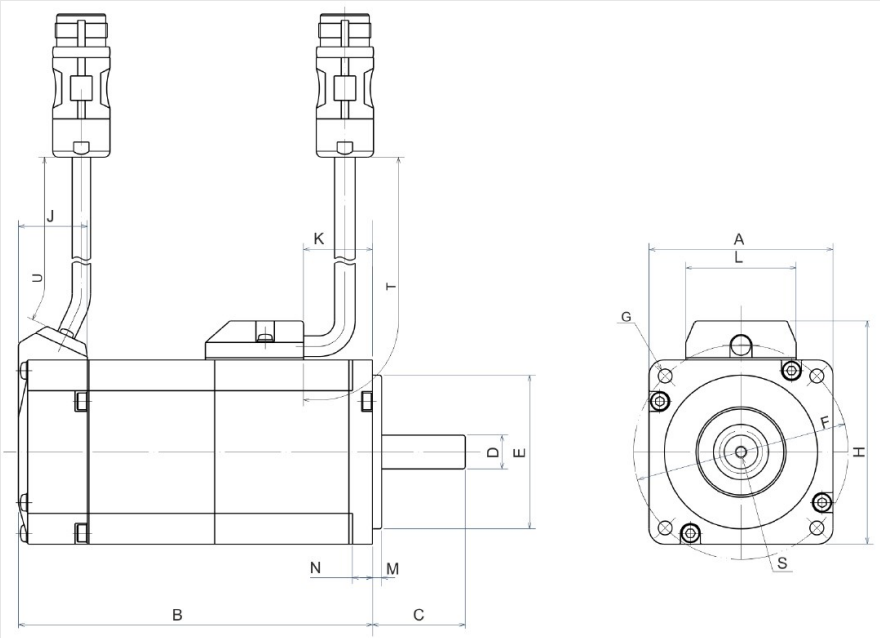

| Motor / size | A | B | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| MS2M02-A0...-....0 | □38 | 72 | 25 | ø8$^{h6}$ | ø30$^{h7}$ | ø45±0.20 | ø3.4 | 51 | 24 | 20.8 |
| MS2M02-A0...-....1 | □38 | 102 | 25 | ø8$^{h6}$ | ø30$^{h7}$ | ø45±0.20 | ø3.4 | 51 | 24 | 20.8 |
| MS2M02-B0...-....0 | □38 | 92 | 25 | ø8$^{h6}$ | ø30$^{h7}$ | ø45±0.20 | ø3.4 | 51 | 24 | 40.8 |
| MS2M02-B0...-....1 | □38 | 122 | 25 | ø8$^{h6}$ | ø30$^{h7}$ | ø45±0.20 | ø3.4 | 51 | 24 | 40.8 |

| Motor / size | L | M | N | P | Q | R | S | T | U |
|---|---|---|---|---|---|---|---|---|---|
| MS2M02-A0...-....0 | 27 | 3 | 6 | 3h9(groove p9) | 14 | 9.2 | M3 (6 deep) | 200 | 230 |
| MS2M02-A0...-....1 | 27 | 3 | 6 | 3h9(groove p9) | 14 | 9.2 | M3 (6 deep) | 200 | 230 |
| MS2M02-B0...-....0 | 27 | 3 | 6 | 3h9(groove p9) | 14 | 9.2 | M3 (6 deep) | 200 | 230 |
| MS2M02-B0...-....1 | 27 | 3 | 6 | 3h9(groove p9) | 14 | 9.2 | M3 (6 deep) | 200 | 230 |

## MS2M03 Specifications

## Dimensions MS2M03

Table 10: MS2M03-A0FNN-..H.,MS2M03-B0FNN-..H.



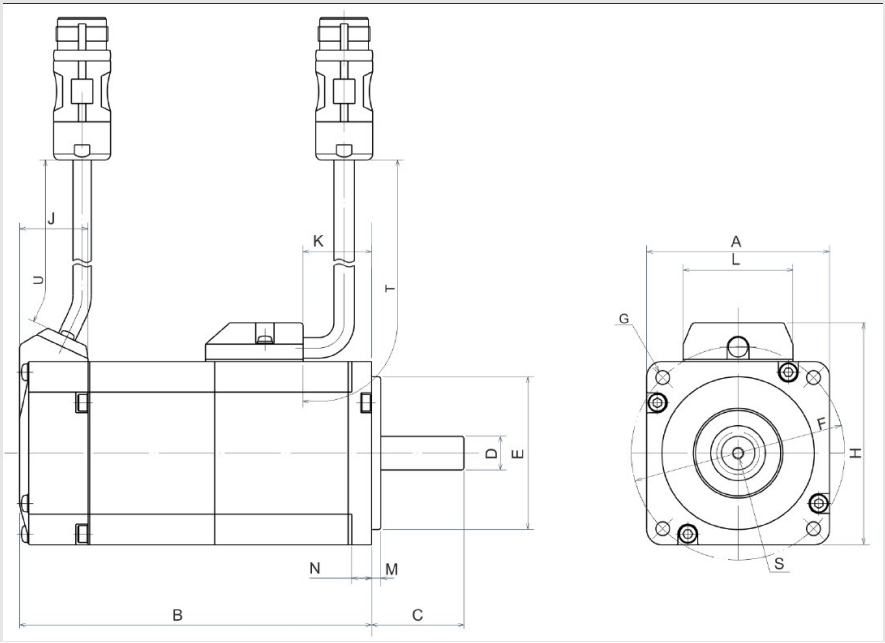

| Motor / size | A | B | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| MS2M03-A0...-....0 | □60 | 79.5 | 30 | ø11$^{h6}$ | ø50$^{h7}$ | ø70±0.20 | ø4.5 | 73 | 22.5 | 22.5 |
| MS2M03-A0...-....1 | □60 | 116 | 30 | ø11$^{h6}$ | ø50$^{h7}$ | ø70±0.20 | ø4.5 | 73 | 22.5 | 22.5 |
| MS2M03-B0...-....0 | □60 | 99 | 30 | ø14$^{h6}$ | ø50$^{h7}$ | ø70±0.20 | ø4.5 | 73 | 22.5 | 42 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| MS2M03-B0...-....1 | □60 | 135.5 | 30 | ø14$^{h6}$ | ø50$^{h7}$ | ø70±0.20 | ø4.5 | 73 | 22.5 | 42 |
| Motor / size | L | M | N | | | | | | T | U |
| MS2M03-A0...-....0 | 36 | 3 | 6.5 | | | | | | 200 | 220 |
| MS2M03-A0...-....1 | 36 | 3 | 6.5 | | | | | | 200 | 220 |
| MS2M03-B0...-....0 | 36 | 3 | 6.5 | | | | | | 200 | 220 |
| MS2M03-B0...-....1 | 36 | 3 | 6.5 | | | | | | 200 | 220 |

## MS2M04 Specifications

## Dimensions MS2M04

Table 11: MS2M04-A0FNN-..H,MS2M04-B0FNN-..H.




| Motor / size | A | B | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|---|---|
| MS2M04-A0...-....0 | □80 | 112.2 | 35 | ø19$^{h6}$ | ø70$^{h7}$ | ø90±0.20 | ø6 | 93 | 22.5 | 52.2 |
| MS2M04-A0...-....1 | □80 | 149.2 | 35 | ø19$^{h6}$ | ø70$^{h7}$ | ø90±0.20 | ø6 | 93 | 22.5 | 52.2 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| MS2M04-B0...-....0 | □80 | 127.2 | 35 | ø19$^{h6}$ | ø70$^{h7}$ | ø90±0.20 | ø6 | 93 | 22.5 | 67.2 |
| MS2M04-B0...-....1 | □80 | 164.2 | 35 | ø19$^{h6}$ | ø70$^{h7}$ | ø90±0.20 | ø6 | 93 | 22.5 | 67.2 |
| Motor / size | L | M | N | | | | | | T | U |
| MS2M04-A0...-....0 | 36 | 3 | 8 | | | | | | 200 | 220 |
| MS2M04-A0...-....1 | 36 | 3 | 8 | | | | | | 200 | 220 |
| MS2M04-B0...-....0 | 36 | 3 | 8 | | | | | | 200 | 220 |
| MS2M04-B0...-....1 | 36 | 3 | 8 | | | | | | 200 | 220 |

## Flange fastening

The screw connection must be adjusted to the installation situation (screw-length, property class, screw-in depth, material, ...). The dimensioning of the screw connection is in the responsibility of the customer.

To attach the motors properly and safely to the machine, Bosch Rexroth recommends the following screws and washers for attachment.

## Tightening torque of mounting screws

Table 12: Mounting screws: MS2M Motors

| Hole □ [mm] | Screw 8.8 DIN EN ISO 4762 DIN EN ISO 4014 | Tightening torque $M_A$[Nm] at $\mu_K$= 0.12 | Washer DIN EN ISO 28738 |
|---|---|---|---|
| 3.4 | M3 × 16 | 1.3 | - |
| 4.5 | M4 × 20 | 3.1 | - |
| 6 | M5 × 20 | 6.1 | - |

The screwed connections must be able to take up both the force due to the weight of the motor and the forces acting during operation.

If the screws and washers used do not comply with this recommendation, the property class of the screws and the hardness class must be equivalent in order to transmit the required tightening torques.

MS2M motors are produced for flange mounting (B05). Details on the mounting holes are given in the corresponding dimension sheet.

### 5.2.3 Thermal motor protection

The motor temperature is monitored by the drive-internal **temperature model** ensure the best protection of motors against thermal overload.

### 5.2.4 Cooling mode

#### Self-cooling (IC410)

In case of self-cooling motors, the heat dissipation is realized via natural convection and radiation to the ambient air as well as by heat conduction to the machine construction.

The specified nominal data is reached at ambient temperatures of up to 40 °C. Unhindered vertical convection has to be ensured by a sufficient distance of 100 mm to adjacent components. Any usage at increased ambient temperature (0 ... 65°C) is possible.

Pollution of the surface of the motor reduces heat dissipation and can result in thermal overload. The availability of the system can be increased by regular checks and cleaning of the motors. Please ensure access to the motors for maintenance purposes.

### 5.2.5 Motor encoder

# Encoder

## Functional details

## Data sheet - Encoder

Table 13: Data sheet - Encoder MS2M

| Designation | Symbol | Unit | Encoder (MS2M) | |
|---|---|---|---|---|
| Battery external | | | - | Yes |
| Encoder design | - | - | Singleturn absolute | Multiturn absolute |
| Distinguishable revolutions | - | - | 1 | 65536 |
| Incremental signals | - | - | without | |
| Resolution of encoder | - | - | 23 bit | 23 + 16 bit |
| System accuracy typical/maximum | - | “ | -170 / -240 | |
| Maximum encoder speed | | $min^{-1}$ | 6000 | |
| Supply voltage | $VCC_{Encoder}$ | V | 4.75 ... 5.25 | |
| Max. current consumption | $I_{Encoder}$ | mA | 80 | |

“ Angular seconds

Operate the absolute value encoder without any other accessory as a singleturn encoder. It can be operated as a multiturn encoder variant by using a batterybox which is available as accessory.

### Singleturn absolute value encoder

The singleturn absolute value encoder serves for absolute indirect position detection within 1 motor revolution. For this encoder variant, the absolute axis position gets lost after switching-off the voltage.

### Multiturn absolute value encoder

The multiturn absolute value encoder serves for absolute indirect position detection within 65536 motor revolutions. The absolute axis position at this encoder variant is retained by the battery buffering even after switching-off the voltage. If the motor is disconnected from the batterybos, the information about absolute axis position gets lost after about 1 minute. It replaces a separate absolute value encoder at the motor.

### Details for multiturn signals

For using the multiturn option, the buffering memory via a necessary battery is necessary. Therefore, the following accessory must be used:

Table 14: Batterybox

| Designation | Order number | Length |
|---|---|---|
| SUP-E02-MSM-BATTERYBOX-L010 | R911346063 | 1000 mm |
| SUP-E02-MSM-BATTERYBOX-L030 | R911346065 | 3000 mm |
| SUP-E02-MSM-BATTERYBOX-NNNN | R911346084 | 250 mm |

Table 15: Spare battery

| Designation | Order number |
|---|---|
| SUP-E02-MSM-BATTERY | R911369925 |

### Notes on maintenance and service measures

Maintenance work on encoders is possible to replace the battery on multiturn encoders or to replace the encoder completely.

| | |
|---|---|
| ⚠ WARNING | **Improper battery change can lead to loss of the safety functions!**<br>The battery may only be replaced by specialists or qualified electricians.<br>For motors with multiturn encoders, it is possible to replace the battery by opening battery box located on the cable cover without changing the encoder calibration. |
| ⚠ WARNING | The encoder may only be replaced by Rexroth Service or an authorized workshop.<br>The encoder must be recalibrated after loosening the screws of the encoder.<br>The encoder must be recalibrated after it has been replaced. |

## 5.2.6 Degree of protection

The protection type according to EN 60034-5 is determined by the abbreviation IP (International Protection) and two code numbers for the degree of protection. The first code number stands for the degree of protection against contact and ingress of foreign bodies. The second code number stands for the degree of protection against ingress of water.

Standard motors (specification according to type plate)

- **IP65** Equivalent of IP65 (Except for shaft through sections and connector sections.)

## 5.2.7 Output shaft, balancing and extension elements

### Shaft end

### Options according to type code

| Shaft | Type |
|---|---|
| Plain, without shaft sealing ring | H |
| Key, without shaft sealing ring | L |

## Plain shaft

Cylindrical shaft end according to DIN 748-3 with frontal centering hole with "DS" thread according to DIN 332-2.

The standard design for a non-positive shaft-hub connection without play and excellent smooth running. Use clamping sets, pressure sleeves or clamping elements for coupling the machine elements to be driven.

## Attachment of drive elements

The mode of balancing of drive elements must be adjusted to the motor. Observe the notes about mounting drive elements.

| ⚠ CAUTION | **Ingressing fluid may damage the motor!** |
|---|---|
| | Fluids (e.g., cooling lubricants, gear oil, etc.) may not be present at the output shaft. |
| | When attaching gearboxes, only use gearboxes with a closed (oil-tight) lubrication system. |

## Gearbox mounting on motors

Refer to the notes regarding the motor and gearbox configuration in .

Observe the instructions in the corresponding manufacturer´s documentation.

## Overdetermined bearing

When installing drive elements, avoid overdetermined bearing, as impermissibly high bearing reactions can be generated due to unfavorable bearing ratios.

**Remark**

If an overdetermined arrangement of bearings cannot be avoided, please contact Bosch Rexroth.

## Couplings

The machine construction and the drive elements used must be carefully adapted to the motor type so as to make sure that the load limits of the shaft and the bearing are not exceeded.

**Remark**

When extremely stiff couplings are attached, the revolving radial force may cause an impermissibly high load on the shaft and bearing.

### Bevel gear pinion or helical drive pinion

Due to thermal expansion, the DE side of the drive shaft can be displaced by up to 0.3 mm in relation to the motor housing. If helical drive pinions or bevel gear pinions directly attached to the output shaft are used, this change in the lengths will lead to

- a shift in the position of the axis, if the driving pinions are not axially fixed on the machine side.
- a thermally dependent component of the axial force, if the driving pinions are axially fixed on the machine side. This causes the risk of exceeding the maximum permissible axial force or of the gear backlash increasing to an impermissible degree.
- damage of the NDE bearing by exceeding the maximum permissible axial force.

**Remark**

It is recommended to use drive elements with integrated bearings and mount them on the motor shaft via axially compensating couplings.

## 5.2.8 Holding brake

| Holding brakes - Technical data | | | | | | | |
|---|---|---|---|---|---|---|---|
| Type | Holding torque $M_4$ Nm | Rated voltage[1] $U_N$ V | Rated current $I_N$ A | Maximum connection time $t_1$ ms | Maximum disconnection time $t_2$ ms | Moment of inertia of the holding brake $J_{br}$ kg*m² | Maximum switched energy $W_{max}$ J |
| MS2M02-_0___-___1 | 0.294 | 24 | 0.3 | 20 | 35 | 0.0000002 | 39.2 |
| MS2M03-_0___-___1 | 1.27 | 24 | 0.36 | 15 | 50 | 0.0000018 | 137 |
| MS2M04-A0___-___1 | 2.45 | 24 | 0.42 | 20 | 70 | 0.0000075 | 196 |
| MS2M04-B0___-___1 | 3.8 | 24 | 0.42 | 20 | 70 | 0.0000075 | 185 |

1) Tolerance ± 5%

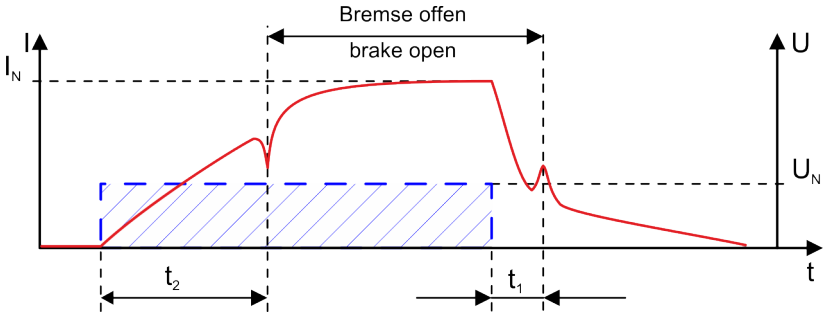



Fig. 5: Switching times of static hold mode

$t_1$ Connection time (close)
$t_2$ Disconnection time (open)

The holding brakes are operated according to the “electrically-released” principle (closed-circuit principle) and open upon applying the switching voltage.

- The holding brakes with emergency stop function are intended to secure motor shafts at standstill. **The holding brakes are no operation brakes to decelerate motors in operation from speed.**
- In case of an emergency stop or voltage drop, the brake operation is only allowed to a limited extend.

| ⚠ CAUTION | **Malfunctions due to wear** |
|---|---|
| | Impermissibly high wear due to breaking from speed by exceeding the specified emergency stop properties. |
| | Avoid deceleration from speed during setup mode. |
| | Using the operating brake to decelerate the rotating motor is not permissible. |

The voltage supply of the holding brake has to be designed so as to guarantee under the worst installation and operation conditions that a sufficient voltage **24 V DC ±5%** is available at the motor in order to release the holding brake.

| ⚠ CAUTION | **Malfunction in case of exceeded tolerance of the rated voltage (switching voltage)** |
|---|---|
| | For safe switching of the holding brake, a rated voltage of **24 V DC ±5%** is required at the motor. |
| | Ensure correct dimensioning of the supply wires (wire length and cross-section) for the holding brake. |

The holding brakes are intended for direct connection to the ctrlX DRIVE. A protective circuit to switch inductive loads of holding brakes is integrated in IndraDrive controllers. Please observe when operating of third-party converters that MS2M motors do not have an integrated protective circuit.

## Safety technology

The Holding brake of a MS2M motor is no safety brake. This means, a torque reduction by non-influenceable disturbance factors can occur. Especially for use in vertical axes.

| ⚠ WARNING | **Grievous bodily harm due to dangerous movements from falling or dropping axes!** |
|---|---|
| | Secure vertical axes against dropping or sinking after switching off by e.g.:<br>– Mechanical locking of the vertical axis<br>– External brake, arrestor, clamping device.<br>– Weight compensation of the axes |

The holding brake itself is not suitable for personal protection. Ensure protection of individuals by superordinate protective measures such as cordoning off of danger zones using protective fences or grids.

For European countries, additionally comply with the following standards and guidelines, e.g.

- EN ISO 13849-1:2015 "Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)" and EN ISO 13849-2:2012 "Safety of machinery. Safety-related parts of control systems. General principles for design"
- Information sheet no. 005 “Gravity-loaded axes (vertical axes)” published by: DGUV Fachbereich Holz und Metall (German Employer's Liability Insurance Association Wood and Metal)

Determine the safety requirements valid for the case of application and observe the safety requirements during plant design. Comply with national regulations at the installation site of the system.

### Commissioning and maintenance instructions

That is why the function and the holding brakes have to be checked in regular intervals and malfunctions must be removed in an appropriate period.

The braking effect can be reduced by:

- Corrosion on friction surfaces, vapor and sediment
- Over voltages and too high temperatures
- Wear (increasing the air gap between armature and pole)

The holding brake functionality can be checked mechanically by hand (torque wrench) or automatically by means of the software function.

## 5.2.9 Bearing

The motors are equipped with a deep-groove ball bearing with high-temperature grease for prelubrication.

Table 16: Bearing size MS2M

| Type | Floating bearing | Fixed bearing |
|---|---|---|
| MS2M02 | DE | NDE |
| MS2M03 | DE | NDE |
| MS2M04 | DE | NDE |

### Bearing service life

The bearing lifetime is an important criterion for the availability of motors. The operating conditions influence the bearing service life $L_{10h}$ considerably.

The following boundary conditions apply to the bearing service life $L_{10h}$:

- Operation within the specified permissible loads (radial and axial force)
- Operation within the permissible ambient conditions (temperature range 0 ... 40 °C, vibration, and so on).
- Operation within the thermally permissible operating characteristic curve

The bearing lifetime also depends on the service life of the grease. A calculated grease service life was used for the mentioned specifications, taking into consideration the following boundary conditions.

- Horizontal installation
- Low vibration and impact loads

- No oscillating bearing movement < 180°
- Mean speed according to ➦ Table 17 “Mean speed - basis of calculated grease service life” on page 32:

Table 17: Mean speed - basis of calculated grease service life

| Type | Mean speed |
|---|---|
| MS2M02,-03,-04 | ≤ 3,000 1/min |

The following standard values apply under the specified preconditions for the 60K operation modes:

## $L_{10h}$ in case of operation after S1-60K

**$L_{10h}$ = 20.000 h**, in case of utilization after S1-60K and max. load factor 90% during the runtime.

**Remark**

When exceeding or not complying with these conditions, a reduced service life is to be expected.

## Explanation of radial and axial force

During operation, both radial and axial forces act upon the motor shaft and the motor bearing. The permissible radial force $F_R$ in distance x from the shaft shoulder and the mean speed is specified in the radial force diagrams.

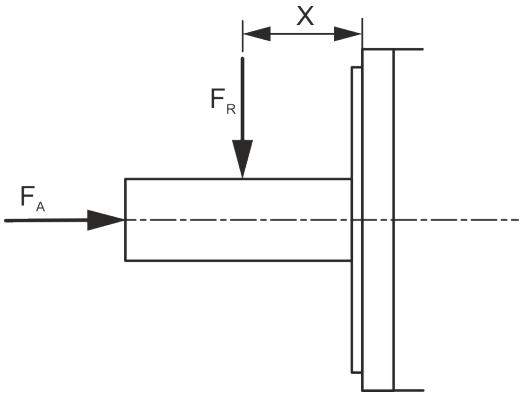



Fig. 6: Point of action of radial force $F_R$ and axial force $F_A$

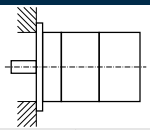
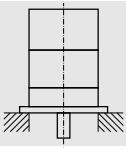
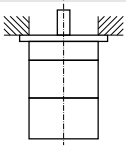
The axial force values are the minimum permissible axial forces $F_A$ without limitations. A detailed dimensioning is only possible if more boundary conditions are known:

- Occurring radial force and axial force with force application point
- Installation position (horizontal, vertical with the shaft end pointing to the top or bottom)
- Mean speed

For radial force diagrams, refer to the project planning manual.

### 5.2.10 Frame size, installation type

The motors can be installed horizontally and vertically with the shaft end pointing to the top or bottom. The mounting variants comply with the IM code according to EN 60034-7:1993 + A1:2001 for design and installation type.

| Code I / Code II (EN 60034-7) | | |
|---|---|---|
| IM B5 / IM 3001 |  | Flange attachment on the drive side of the flange |
| IM V1 / IM 3011 |  | Flange attachment on the drive side of the flange, drive side facing down |
| IM V3 / IM 3031 |  | Flange attachment on the drive side of the flange, drive side facing up |

Avoid liquid at the drive shaft in case of vertical installation according to IM V3. For further information regarding the protection class, see ➥ Chapter 5.2.6 “Degree of protection” on page 27.

# 6 Transport and storage

## 6.1 Storage

### General storage conditions

Store the motors in their original packaging in a dry, dust-free, vibration-free and light-protected place without direct solar radiation. Please observe classes 1K21, 1B1, 1C1, 1S10, 1M11 specified for storage acc. to DIN EN 60721-3-1.

Deviations and enhancements according to the follwing table must be observed.

Table 18: Deviations and enhancements of classification (DIN EN IEC 60721-3-1)

| Bearing | |
|---|---|
| Ambient temperature | -25 … +65 °C |
| Relative air humidity | 20 … 85 % |
| Direct solar radiation | Not permitted |
| Shock load | ➥ Chapter 6.3 “Shock load during transport und storage” on page 35 |

### Storage time

The maximum storage duration is 2 years.

Storage durations of more than 6 months require conservation measures by the customer. Treat untreated surfaces, e. g. shaft, flange, with preserving agents.

Irrespective of the storage period, which may also extend beyond the warranty period, the function of the products is maintained if additional measures are observed and implemented during commissioning. Warranty extension is not a consequence.

Table 19: Measures before commissioning motors that have been stored over a prolonged period of time

| Storage time / months | | | | Measures for commissioning |
|---|---|---|---|---|
| > 1 | > 6 | > 12 | > 24 | |
| ● | ● | ● | ● | Visual inspection of all parts to be damage-free |
| ● | ● | ● | ● | Resurface the holding brake [1] |
| | ● | ● | ● | Check conservation measures. Renew corrision protection if necessary. Remove the preserving agent before commissioning |
| | | ● | ● | Check the electric contacts to verify that they are free from corrosion |
| | | ● | ● | Let the motor run in without load for one hour at 800 ... … 1000 1/min |
| | | ● | ● | Measure insulation resistance. Dry the winding at a value of < 1 kΩ per volt rated voltage. |
| | | | ● | Function test and product revision if necessary by Bosch Rexroth Service |

[1] Only for motors with holding brake

## 6.2 Transport

The motors must be transported in their original package taking classes 2K11, 2B1, 2C1, 2S5, 2M4 specified acc. to DIN EN 60721-3-2 into account.

Deviations and enhancements according to the follwing table must be observed.

Table 20: Deviations and enhancements of classification (DIN EN IEC 60721-3-2)

| Transport | |
|---|---|
| Ambient temperature | -25 ... +70 °C |
| Relative humidity | 5 ... 75 % |
| Shock load | ➥ Chapter 6.3 “Shock load during transport und storage” on page 35 |

**Remark**

Before transport, discharge the liquid coolant from liquid-cooled motors to avoid frost damage.

### Instructions on transport by air

If motor components with permanent magnets are shipped by air, the DGR (**D**angerous **G**oods **R**egulations) of the IATA (International Air Transport Association) for hazardous materials of class 9 which also include magnetized substances and objects has to be complied with. This involves, for example:

- Secondary parts of synchronous linear motors
- Rotors of synchronous kit motors
- Rotors of synchronous housing motors (if these are dispatched as motor component, i.e. separate from the stator or motor housing, in service cases)

For details on the maximum allowed magnetic field strengths as well as information on measurement methods for these magnetic field strengths, please refer to the current IATA DGR.

## 6.3 Shock load during transport und storage

Function-impairing effects are avoided as long as the specified limits are complied with.

Table 21: Permissible shock load for MS2M motors

| Frame size | Maximum allowed shock load (11 ms)<br>X,Y,Z directions |
|---|---|
| MS2M02,03,04 | 98 m/s² |

The specified limit values do not apply to half-sine-shaped single shock load acc. to EN 60068-2-27.

**Remark**

The specifications do **not apply to motor operation**. Applications with continuous shock load make a case-by-case review necessary.

# 7 Assembly

## 7.1 Flange assembly

| NOTICE | **Motor damage due to ingress of liquids!**<br>Liquid which exists over a longer period on the output shaft can ingress into the motor and cause damage.<br>– Ensure that liquid cannot be present at the output shaft.<br>– Do not mount any open gearboxes (gearboxes that are not hermetically sealed). |
|---|---|

Use all motor mounting holes to mount the motor safely to the machine. For details on mounting holes, please refer to the dimension sheets.

- If coupling is direct, ensure that the support is plane and the orientation is precise.
- Avoid pinching or jamming the centering collar on the motor side.
- Avoid damaging the receptacle fit on the plant side.
- Use screws and washers for flange fastening.

## 7.2 Assemble transmission elements

| NOTICE | **Motor damage due to strikes onto the motor shaft**<br>Do not strike the shaft end and do not exceed the allowed axial and radial forces of the motor. |
|---|---|

Fit and pull off the transmission elements such as pulleys and couplings only with suitable equipment; heat them, if necessary.

- Avoid inadmissible belt tensions. Please consider the allowed radial and axial forces in the project planning manuals.

### Fitting

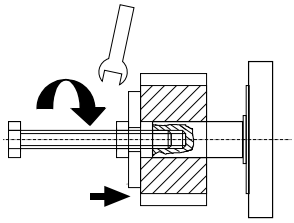


Fig. 7: Fitting the transmission element

- Use the centering hole for fitting transmission elements. For details on centering holes, please refer to the specifications.
- Heat the transmission element, if necessary.

## 7.3 Electrical connection

### 7.3.1 Electrical connection general notes

| ⚠ WARNING | **Danger! Electric voltage! Operations in the vicinity of live parts are extremely dangerous.**<br>– Work required on the electric system may only be carried out by skilled electricians. Tools for electricians (VDE tools) are absolutely necessary.<br>  – Isolate (even auxiliary circuits).<br>  – Secure against reactivation.<br>  – Ensure de-energization.<br>  – Ground and short-circuit.<br>  – Cover or shield any adjacent live parts. |
|---|---|

| | |
|---|---|
| ⚠ WARNING  | **High electric voltage! Danger to life, risk of injury by electric shock.**<br>While the rotor is rotating, motors with permanent magnet excitation create a voltage > 60 V at the motor connections.<br>Any work may only be carried out while the motor is at standstill.<br>Never connect or disconnect plug connectors under load! |
| *NOTICE* | **Never touch the connection points of electrostatic sensitive devices!**<br>– Mounted components e.g. temperature sensor, encoder) can contain parts susceptible to electrical discharge (ESD).<br>Observe ESD safety measures. |

## 7.3.2 Circuit diagram

### MS2M connection plan

**Connection for MS2M with encoder and optional brake**

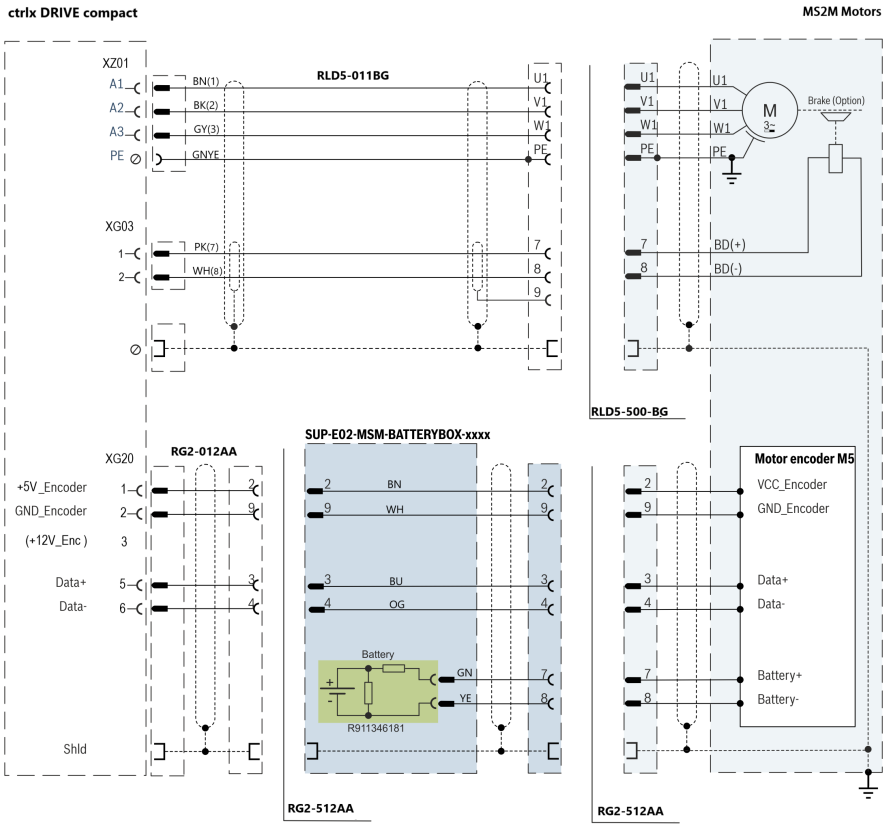



Fig. 8: MS2M connection plan

## 7.3.3 Electrical connection "D" cable connection circular connector M17

### SpeedCon quick lock IP67

The connections for power and encoder MS2M are done via flexible connection lines with circular connector M17 (IP67) and Speedcon fastener.

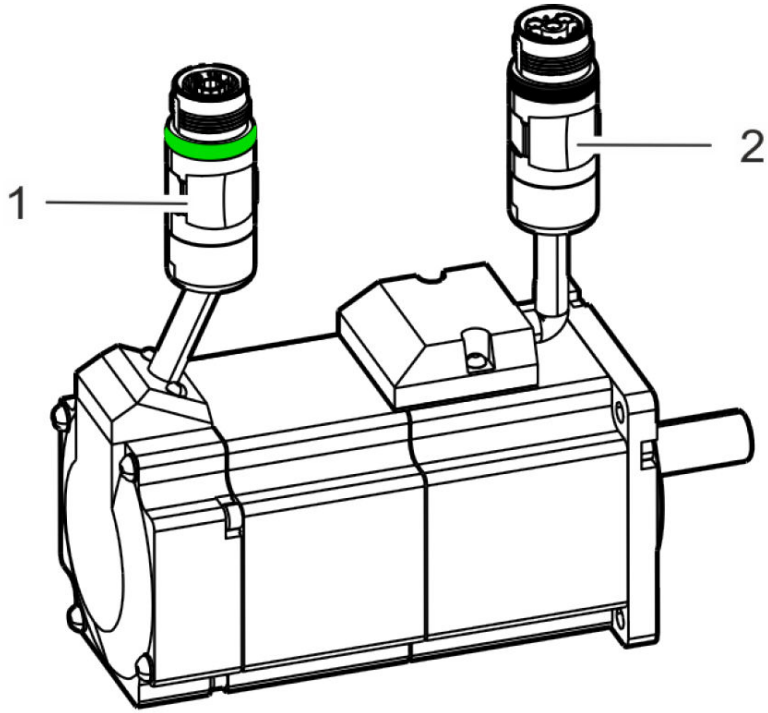



Fig. 9: MS2M SpeedCon motor connection

1 Encoder connection (green code ring)
2 Power connection (black code ring)

For the length of the flexible connection line, please refer to the following table.

Table 22: MS2M motors: Length of connection line

| Motor | Length connection line (" **M** " cable connection circular connetor M17) | | |
|---|---|---|---|
| | Singleturn | Multiturn + Battery box | Power |
| MS2M02<br>MS2M03<br>MS2M04 | RG2-012AA<br>(RG2-512AA) | RG2-012AA + SUP-E02-MSM- BAT-TERYBOX-xxxx (+ RG2-512AA) | RLD5-011BG<br>(RLD5-500-BG) |

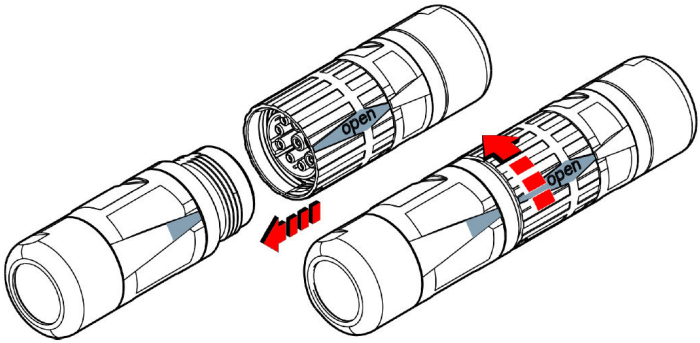



Fig. 10: SpeedCon quick lock

Rack the cable connector in “open” position and "manually" tighten the power connector with a rotation by approx. 90°.

# 8 Commissioning and operation

## 8.1 Safety

| | |
|---|---|
| ⚠ WARNING | **High electric voltage! Danger to life, risk of injury by electric shock.** |
| | – Life parts are dangerous.<br>Do not open any covers or flange sockets during operation.<br>Never connect or disconnect plug connectors under load! |
| ⚠ WARNING | **Risk of injury due to rotating motor shaft!** |
| | – Do not remove any covers, machine parts or protection devices during operation.<br>Do not enter the range of movement of the machine. Avoid unintended access for persons, due to<br>– Safety fences, safety screens or protective covers.<br>– Optical sensors |
| ⚠ CAUTION | **Thermal danger due to hot surfaces with temperatures over 60 °C during operation** |
| | – Do not touch hot motor surfaces.<br>Install protection against contact, if necessary.<br>Make sure that no temperature-sensitive components (cables, electronic components, ...) touch hot surfaces. |

All persons working with motors (responsible persons, mechanics and planners) must have knowledge, skills and competence according to EN 60079-14:2014.

## 8.2 Commissioning

MS2M Motors can only be commissioned with other components (drive controller, control unit).

### Prior to commissioning

Prior to commissioning, ensure that the following requirements are met.

- Storage time of the motor. Depending on the storage time, take measures to ensure safe operation. Run in bearings, resurface the holding brake.
- Ensure that all device connector are correctly connected and protected against coming loose.
- Ensure that a holding brake voltage of 24 V ±5% is applied to the motor. If necessary, adjust the voltage.
- Check the proper function of the holding brake.
- Ensure that the motor and all participating components of the drive are undamaged.

### Commissioning

For start up procedure refer to the project planning manual and the respective documentation about drive controller or firmware description.

Observe the general safety notes.

## 8.3 Ambient conditions during operation

Climatic conditions are defined in classes according to EN IEC 60721. The classes are differentiated in the areas storage, transport and operation. They are based on long-term experiences and take all influencing variables into account, e.g., air temperature and air humidity.

A permanent use of the motors is possible when the specified class 3K22 according to EN IEC 60721-3-3:2019 is observed. Deviations and enhancements according to the follwing table must be observed.

Table 23: Ambient conditions

| Operation | |
|---|---|
| Installation altitude | 0 ... 1,000 m above MSL |
| Ambient temperature | 0 ... +40 °C |
| Relative humidity | 20 ... 85 % |

### 8.3.1 Vibration load during operation

Vibrations are sine-wave oscillations in stationary use, which vary in their effect on the resistance of the motors depending on their intensity.

The specified limit values are valid for frequencies of 10-2000 Hz during stimulation on the motor flange. Limitations can be necessary for occurring resonances depending on the application and installation situation.

The following limit values apply according to EN 60068-2-6 for MS2M motors:

Table 24: Permissible vibration load for MS2M motors

| Measuring point, direction | Limit value (10-2000 Hz)<br>Motors<br>Self-cooling |
|---|---|
| 1, 2 (radial motor flange) | 30 m/s² |
| 3 (axial motor flange) | 10 m/s² |

## 8.4 Operation

During operation, keep the ambient and operation conditions and technical data specified in the project planning manual.

Checks during operation:

- Pay attention to exceptional noise.
- Pay attention to increased vibrations.
- Check the motors for cleanliness.
- Check the tightness of the coolant connections.
- Check the monitoring devices and diagnostic / error messages of the controllers.

**Decommission the drive when deviations from normal operation exist.**

# 9 Maintenance

## 9.1 Cleaning and servicing

**⚠ WARNING**

**Operations in the vicinity of live parts are extremely dangerous.**

– Work required on the electric system may only be carried out by skilled electricians. Tools for electricians (VDE tools) are absolutely necessary.
  – Isolate (even auxiliary circuits).
  – Secure against reactivation.
  – Ensure de-energization.
  – Ground and short-circuit.
  – Cover or shield any adjacent live parts.

**⚠ WARNING**

**Personal and material damage during maintenance work in operation!**

– Never carry out maintenance work on running machines.
  While carrying out maintenance work, secure the machine such that it cannot restart or be used by unauthorized persons.

| ⚠ CAUTION | Hot surfaces with temperatures over 60 °C may cause burns! |
|---|---|
|  | – Allow the motors to cool down prior to commencing work.<br>Wear safety gloves.<br>Do not work on hot surfaces. |

### Motors

Dirt, dust or chips may adversely affect the functionality of the motors and, in extreme cases, even cause a failure of the motors. Therefore, in regular intervals (after one year at the latest), you should clean the surface of the motors in order to achieve a sufficiently large heat radiation surface. If the cooling fins are partially covered with dirt, sufficient heat dissipation via the ambient air is no longer possible.

Insufficient heat dissipation can have undesirable consequences. The bearing life is reduced by operation at inadmissibly high temperatures (bearing grease decomposes). Overtemperature switch-off despite operation on the basis of selected data, because the appropriate cooling is missing.

### Connection cables

| ⚠ WARNING | Electric shock due to contact with live parts! |
|---|---|
|  | – Change damaged connection cables and decommission the plant immediately.<br>Do not repair any connection lines provisionally. |

- Check the connection cable for damage at regular intervals and replace it if necessary.
- Check optionally existing drag chains on defects.
- Check the protective conductor connection at regular intervals for proper condition and tight fit and replace if necessary.

## 9.2 Service repair, maintenance and spare parts

Wearing parts are reliably and professionally repaired and replaced by the Rexroth Service in shopfloor-oriented quality.

| NOTICE | Product damage possible, loss of warranty claims! |
|---|---|
| | Please note that any repairs or modifications may only be carried out by Bosch Rexroth Service or an authorized specialist workshop.<br>Improper modifications can lead to damage to the engine and are therefore prohibited. In addition, improper modifications will result in the loss of warranty claims. For modification requests, conversions or repairs, please always contact our service department. |

The Bosch Rexroth service helpdesk at our headquarters in Lohr, Germany and our worldwide service provide You can contact us 24/7.

| | |
|---|---|
| Telephone: | +49 (0) 9352 40 50 60 |
| Fax: | +49 (0) 9352 18 49 41 |

| | |
|---|---|
| Email: | service.svc@boschrexroth.de |
| Internet: | ➦ https://www.boschrexroth.com |

### Preparing information

For quick and efficient help, please have the following information ready:

- Detailed description of the fault and the circumstances
- Information on the rating plate of the products in question, particularly type codes and serial numbers
- Your contact data (phone number, fax number, email address)

# 10 Disassembly and exchange

## 10.1 Tools required

| NOTICE | Motor damage due to strikes onto the motor shaft |
|---|---|
| | – Do not strike the shaft end and do not exceed the allowed axial and radial forces of the motor. |

Use suitable tools when disassembling transmission elements.

### Pulling off

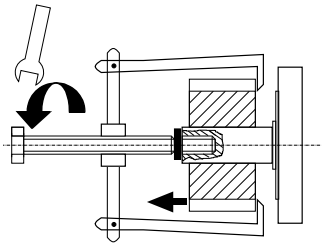


Fig. 11: Remove transmission element

Use tools suitable for pulling off. Use a shim to protect the shaft end when using pulling-off tools. Heat the output element, if necessary.

## 10.2 Replace the motor

| ⚠ WARNING | Electric shock due to live parts with more than 50 V! |
|---|---|
| | Replacement may only be performed by personnel trained and qualified to work on or with electrical equipment. |

Remark

The motor should be replaced by a motor of identical type. This is the only way to ensure that all parameterizations can remain unchanged.

1. If necessary, note the previous absolute value
2. Open the main switch
3. Make sure the main switch cannot be switched back on
4. Disconnect the plug-in connectors and clamping connections

   Remark: When exchanging the motor, close open plug sides of power connections with protection caps if moistening with coolant/lubricant or soiling must be expected (allowed soiling degree 2 according to EN 50178:1997).
5. Replace the motor

   Remark: Observe the machine manufacturer's instructions when exchanging the motor mechanically.
6. Connect the plug-in connectors and clamping connections
7. Re-establish the dimensional reference

   **⚠ WARNING** **Risk of accidents due to unintentional axis movements!** If servo axes are provided with an indirect position measuring system via the motor encoder, the dimensional reference is lost after motor replacement!
   Restore dimensional reference to the machine coordinate system after replacing the motor.

## 10.3 Preparing storage

Before storing motors, the protective covers attached to the motor at the time of delivery must be attached to connectors on the shaft.

# 11 Environmental protection and disposal

Disposal of the motor components can be done according to the applicable legal process in normal recycling process.

### Recycling

Most of the products can be recycled due to their high content of metal. In order to recycle the metal in the best possible way, the products must be disassembled into individual assemblies. Metals contained in electric and electronic assemblies can also be recycled by means of special separation processes.

### Basic components

Basically, our motors consist of the following components:

- Steel, stainless steel, aluminum, copper, brass
- Plastic parts, insulation and composite material

- Electronic components
- Permanent magnets

Plastic parts of the products may contain flame retardants. These plastic parts are labeled according to EN ISO 1043-1:2011 + A1:2016. They have to be recycled separately or disposed of according to the applicable legal provisions.

## Magnets

| ⚠ WARNING | Danger due to permanent magnets! |
|---|---|
|  | – Health hazard for persons with heart pacemakers, metallic implants and hearing aids in direct environment of permanent magnets.<br>– Crushing hazard of fingers and hand due to heavy attractive forces of the magnets.<br>– Risk of destruction of sensitive parts like watches, credit cards, ... |

Remark

The permanent magnets must be demagnetized before disposal to avoid injuries or damage. The demagnetization is reached via thermal treatment. The duration of the treatment depends on the size (guide value: 300 °C, 30 min).

## Packaging

Our packaging materials do not contain any problematic materials and can therefor be easily disposed. Packaging materials are: wood, cardboard and polystyrene.

## Batteries and accumulators

The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin. End users in the EU are legally bound to return used batteries and accumulators. Outside the scope of the EU Directive 2006/66/EC, the applicable regulations must be followed. Batteries and accumulators can contain hazardous substances which can harm the environment or people's health when improperly stored or disposed of. The batteries or accumulators must be returned to the country-specific collection systems for proper disposal.

### Disposal by the manufacturer

Our products can be returned to us for disposal. However, this requires that the products are free from oil, grease or other dirt. The motor components must be returned in a suitable packaging (origin package if possible). In the case of a transport by air freight, please observe the dangerous goods regulations (IATA) for the secondary part.
Send the products to the following address, carriage free:

Bosch Rexroth AG
Bgm.-Dr.-Nebel-Str. 2
97816 Lohr a.Main, Germany

# 12 Eliminate malfunction

As a matter of principle, the instructions in the project planning and commissioning manuals must be followed in case of failures and errors. Contact the manufacturer, if necessary.

| Fault description | Cause | Remedy |
|---|---|---|
| Motor does not run | Controller enable signal missing | Activating drive enable |
| | Controller fault | Troubleshoot acc. to documentation of controller |
| | Voltage supply missing | Control voltage supply |
| | Brake is not released | Check the brake activation |

| Fault description | Cause | Remedy |
|---|---|---|
| Vibrations | Coupling elements or attachments are poorly balanced | Re-balance |
| | Adjustment of shaft end attachments (coupling, gearbox, ...) is insufficient | Re-align the attachments |
| | Mounting screws loose | Lock screw connections acc. to specifications |

| Fault description | Cause | Remedy |
|---|---|---|
| Running noise | Foreign bodies within the motor | Motor shutdown<br>⇨ Repair manufacturer |
| | Bearing is damaged | Motor shutdown<br>⇨ Repair manufacturer |

| Fault description | Cause | Remedy |
|---|---|---|
| High motor temperatures is activated | Operation outside of rated data | Reduce load and check the dimensioning |

# 13 Technical data

## 13.1 Technical data

Technical data with operating characteristic curves are described in the project planning manual for all motor types.

Additional documentation

MS2M Synchronous servomotors, project planning manual
DOK-MOTOR*-MS2M*******-PRxx-xx-E

# 14 Appendix

## 14.1 CE

### Declaration of conformity

Declaration of conformity confirm that the components comply with the valid EN standards and EC Directives.

**MS2M**

CE-Conformity regarding

**EN 60034-1**: Rotating electrical machines - Part 1: Rating and performance (Edition 2010 + Cor.:2010 (2010, modified))

**EN 60034-5**: Rotation electrical machines – Part 5: Degrees of protection provided by the integral of rotation electrical machines (IP code) - Classification (Edition 2020)

**EN 61800-3**: Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods for PDS and machine tools (Edition 2023)

# EU Declaration of Conformity

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A Bosch Company

**EU-Konformitätserklärung** - Original [1] Dok.-Nr. / *Doc. No.*: DCTC-30321-002 [1.1]
***EU Declaration of Conformity*** Datum / *Date*: 2024-05-10 [1.2]

☐ nach Maschinenrichtlinie 2006/42/EG / *in accordance with Machinery Directive 2006/42/EC* [2.1]
(ABl. L 157, 09.06.2006, S. 24 / *OJ L 157, 09/06/2006, p. 24*)

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(ABl. L 96, 29.03.2014, S. 357 / *OJ L 96, 29/03/2014, p. 357*)

☒ nach EMV-Richtlinie 2014/30/EU / *in accordance with EMC Directive 2014/30/EU* [2.3]
(ABl. L 96, 29.03.2014, S. 79 / *OJ L 96, 29/03/2014, p. 79*)

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(ABl. L 96, 29.03.2014, S. 309 / *OJ L 174, 1/07/2011, p. 88*)

☐ nach Ökodesign-Richtlinie (ErP) 2009/125/EG / *in accordance with Ecodesign Directive (ErP) 2009/125/EC* [2.5]
(ABl. L 285, 31.10.2009, S. 10 / *OJ L 285, 31/10/2009, p. 10*

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(ABl. L 174, 01.07.2011, S. 88 / *OJ L 174, 1/07/2011, p. 88*)

☒ Produkt nicht im Geltungsbereich der RoHS-Richtlinie 2011/65/EU / *Product not in the scope of RoHS Directive 2011/65/EU:* [2.7]
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Geltungsbereich RoHS-Richtlinie für Produkte des Herstellers: DCTC-30806-006 „Herstellererklärung zur RoHS-Richtlinie 2011/65/EU & 2015/863/EU" / *Scope of RoHS Directive for products of the manufacturer: DCTC-30806-006 "Declaration of compliance to the RoHS Directive 2011/65/EU & 2015/863/EU"* [2.8]

Der Hersteller / *the manufacturer:* **Bosch Rexroth AG**
Bgm.-Dr.-Nebel-Str. 2
97816 Lohr a.Main / Germany [3]

erklärt hiermit, dass das nachstehende Produkt / *hereby declares that the product below* [4]

Bezeichnung / *Name*: Servo motors [5]

Bestellbezeichnung / *ordering code:* [5.2]
MS2M02**********
MS2M03**********
MS2M04**********

* = 0-9, A-Z, "blank" or "-"

Handelsbezeichnung / *Trade name:* Rexroth [5.4]

ab Herstelldatum / *from the date of manufacture*: 2024-05-10 [5.5]

in Übereinstimmung mit oben genannte(n) Richtlinie(n) entwickelt, konstruiert und gefertigt wurde. / *was developed, designed, and manufactured in compliance with the above-mentioned directive(s).* [6]

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Seite / *Page:* 2 / 8
**DCTC-30321-002 :** 2024-05-10

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| **Norm / *Standard*** | *[8]* | **Titel / *Name*** | *[8.1]* | **Ausgabe / *Issue*** | *[8.2]* |
|---|---|---|---|---|---|
| EN 60034-1 | | Drehende elektrische Maschinen – Teil 1: Bemessung und Betriebsverhalten / *Rotation electrical machines – Part 1: Rating and performance* | | 2010 + Cor. 2010 | |
| EN IEC 60034-5 | | Drehende elektrische Maschinen – Teil 5: Schutzarten aufgrund der Gesamtkonstruktion von drehenden elektrischen Maschinen (IP-Code) - Einteilung / *Rotation electrical machines – Part 5: Degrees of protection provided by the integral of rotation electrical machines (IP code) - Classification* | | 2020 | |
| EN IEC 61800-3 | | Drehzahlveränderbare elektrische Antriebssysteme – Teil 3: EMV-Anforderungen einschließlich spezieller Prüfverfahren für Antriebssysteme und Werkzeugmaschinen mit darin enthaltenen Antriebssystemen / *Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods for PDS and machine tools* | | 2023 | |

Weitere Erläuterungen / *Further explanations:* *[12]*

Die Montage- und Installationshinweise, gemäß Produktdokumentation sind zu beachten / *The assembling and installation instructions according to the manual must be followed* *[13]*

Lohr a.Main — Ort / *place* *[14]*

2024-05-10 — Datum / *date* *[14.1]*

ppa.
DocuSigned by:
927D0A707DF944E...
Steffen Winkler
Vertriebsleitung /
*Vice President Sales*
*[14.2]*

i.V. / p.p.
DocuSigned by:
8535C1EB95AE44F...
Dr. Hans-Jürgen Wehner
*Product Owner Servo Motors and Gear boxes*
*[14.3]*

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# 14.2 UKCA

## UK Declaration of Conformity

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**UK Declaration of Conformity**

Doc. No.: DCTC-30321-032
Date: 2024-05-10

☐ in accordance with Supply of Machinery (Safety) Regulation 2008, S.I. 2008/1597

☒ in accordance with Electrical Equipment (Safety) Regulation 2016, S.I. 2016/1101

☒ in accordance with Electromagnetic Compatibility Regulation 2016, S.I. 2016/1091

☐ in accordance with Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016, S.I. 2016/1107

☐ in accordance with Ecodesign for Energy-Related Products and Energy Information Regulations 2021, S.I. 2021/745

☐ Product in the scope of RoHS Regulation S.I. 2012/3032:
in accordance with Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012, S.I. 2012/3032

☒ Product not in the scope of RoHS Regulation S.I. 2012/3032:
Product meets the substance restriction requirements of the regulation.

Scope of RoHS Directive for products of the manufacturer: DCTC-30806-006 “Declaration of compliance to the RoHS Directive 2011/65/EU & 2015/863/EU”



The manufacturer: **Bosch Rexroth AG**
Bgm.-Dr.-Nebel-Str. 2
97816 Lohr a.Main / Germany

Hereby declares that the product below

Name: Servo motors

Ordering code:
MS2M02**********
MS2M03**********
MS2M04**********

* = 0-9, A-Z, “blank” or “-“

Trade name: Rexroth

From the date of manufacture: 2024-05-10

was developed, designed, and manufactured in compliance with the above-mentioned regulation(s).

This UK Declaration of Conformity is issued under the sole responsibility of the manufacturer.

**UK Declaration of Conformity**

*Page:* 2 / 2
**DCTC-30321-032 :** 2024-05-10

Designated Standards or other technical standards and regulations applied:

| Standard | Name | Issue |
|---|---|---|
| EN 60034-1 | Rotation electrical machines – Part 1: Rating and performance | 2010 + Cor. 2010 |
| EN IEC 60034-5 | Rotation electrical machines – Part 5: Degrees of protection provided by the integral of rotation electrical machines (IP code) - Classification | 2020 |
| EN IEC 61800-3 | Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods for PDS and machine tools | 2023 |

Further explanations:
The assembling and installation instructions according to the manual have to be followed.

Lohr a.Main — Place
2024-05-10 — Date

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927D0A707DF944E...
Steffen Winkler
Vice President Sales

p.p.
DocuSigned by:
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Dr. Hans-Jürgen Wehner
Product Owner Servo Motors and Gear boxes

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# 14.3 EU

## EU Declaration of Conformity

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| EN IEC 61800-3 | | Drehzahlveränderbare elektrische Antriebssysteme – Teil 3: EMV-Anforderungen einschließlich spezieller Prüfverfahren für Antriebssysteme und Werkzeugmaschinen mit darin enthaltenen Antriebssystemen / *Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods for PDS and machine tools* | | 2023 | |

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# 14.4 cURus

## C-UR-US-Listing

The motors are listed by **UL** ("Underwriters Laboratories Inc.®"). A proof of certification can be found in the Internet via ➦ http://www.ul.com under "Certifications" by entering the file number or the "Company Name: Rexroth ".

**MS2M**

**Company Name:**

BOSCH REXROTH AG

**Category Name:**

Servo and Stepper Motors Components

For file numbers, standards refer to table “Technical data”

**Wiring material UL (ready-made cables of Rexroth)**

Only use copper lines of class 6 (or equivalent) with minimal allowed wire temperature of 75 °C in the scope of application of CSA / UL for wiring the components.

**Allowed degree of contamination**

Please observe the allowed pollution degree 2 of the components.

## 14.5 China RoHS 2


The China RoHS 2 conformity can be found on the type plate of the motors.
Information about listing: ➦ https://www.boschrexroth.com.cn/zh/cn/certificates/china-rohs2/

# Index

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A Bosch Company

Bosch Rexroth AG
Bgm.-Dr.-Nebel-Str. 2
97816 Lohr a.Main
Germany
Tel. +49 9352 18 0
Fax +49 9352 18 8400
www.boschrexroth.com/electrics

R912010223 02