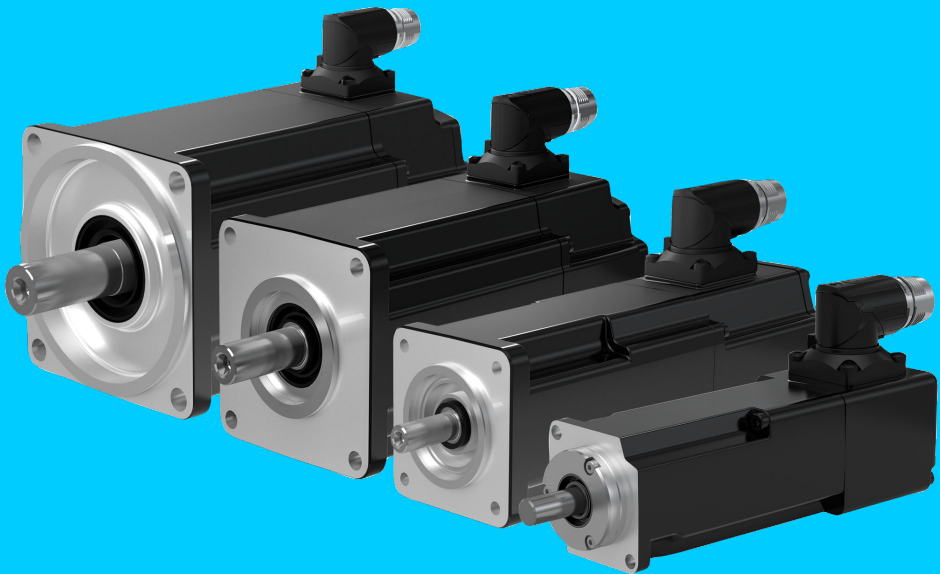


MS2S

Operating Instructions
(Original document)

Synchronous Servomotors



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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.

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1 About this documentation

1.1 Purpose and editions of this documentation

This documentation is for technicians, service engineers and users. 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 assembly, installation, handling and operation.

Table 1: Record of revisions

Edition	Release date	Notes
02	07/2025	Extending product range: Frame size 02 UKCA amended Technical data updated Editorial revisions
01	08/2021	First edition

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

Safety symbols	Meaning
	Warning against hot surfaces
	Warning against rotating machine parts
	Warning against overhead load
	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

Instruction

- ➔ Instruction
 - ➔ Result of one instruction

Instruction multilevel

- ➔ Action step one
- ➔ Action step two
 - ➔ Result of an instruction

Please comply with the order of the handling instructions.

Trademark information

ctrlX®, ctrlX DRIVE®, ctrlX SENSE® are registered trademarks of Bosch Rexroth AG
SpeedTec® is a registered trademark of the TE Connectivity Ltd.

1.3 Additional documentation

Table 4: Additional documentation

Title		Documenta- tion type	Document type code ¹⁾ and number
	Rexroth Motors Safety Notes	Safety Instructions	DOP-MOTOR*-IDYN*SAFETY-**RS-□□-P ➔ R911340694
	MS2S Synchronous Servomotors	Project Planning Manual	DOK-MOTOR*-MS2S*****-PR□□-EN-P ➔ R911410075
	ctrlX Motor Cables and Connectors	Reference	DOK-CONNEC-XDRV*****-RE□□-EN-P ➔ R911420100
	ctrlX Drive Systems	Project Planning Manual	DOK-XDRV**X*****-PR□□-EN-P ➔ R911386579

¹⁾ In the document type code, □□ is a placeholder for the current edition of the documentation (example: IT01 means the first edition of the Operating Instructions).



Remark

All other drive and control related documentation can be found on the ➔ [ctrlX AUTOMATION – Product information Content Delivery Portal](#).

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

Standards

EN 60034-1	Rating and performance behavior
EN 60034-5	Type of protection

Directives

2014/35/EU	Low voltage directive
------------	-----------------------

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 DIN EN 60204-1 (safety of machines) using the motors.

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.

2.1.2 Unintended use

Any use of MS2S 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 inappropriate 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 instructions EN 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)

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 or contacts of the connection cable of temperature sensors 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 MS2S synchronous servomotor contains:

- Motor in original package
- Additional type plate
- Operating instructions with safety instructions
- Protective coverings for output shaft and connection points
- 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

The type plate contains all relevant product data.

Type plate (example)

rexroth

3~ PM MOTOR
TYP: MS2S04-C0BTN-IMHG1-NNDNN-NN

(CN60)
FD: 20W51

MNR: R911403644

SN: 1321364400402

AA1

m 4,2 kg

M(0) 3,5 Nm
I(0) 3,9 A

Inverter Duty VPWM

P(N) 0,67 kW
I(N) 1,99 A

Brake 3,5 Nm

DC 24 V

+10%

0,35 A

IE-1

IP65

n(N) 3900 min-1

n(max) 6000 min-1

U(max) AC 600 V

T.CL. 155

I.SY. ECM1

Made in China

Bosch Rexroth, CN - 710021 Xi'AN

Hotline: +49 9352-405060

TYPE	Product type code
SN	Serial number
FD	Manufacturing date
P(N)	Rated power - 100K
I(N)	Rated current - 100K
M(0)	Standstill torque - 100K
I(0)	Standstill current - 100K
Brake	Holding brake data (optional)
n(max)	Maximum speed
U(max)	Maximum voltage UL
IP	Degree of protection IPxx
m	Mass
T.CL.	Thermal class
I.SY.	Insulation system identification

The following marks of conformity are used:

Table 5: Meaning of marks of conformity

Certification mark	Meaning
	The UL Recognized Component Mark identifies recognized component parts which are components of a bigger product or system
	Conformity is according to low-voltage directive 2014/35/EU , EN 60034-1, EN 60034-5.
	The UKCA-marking confirms the conformity of a product with relevant regulations.

Certification mark	Meaning
	Motors labeled with the symbol EFUP 25 (environmental-friendly use period) can be used for 25 years as intended before substances limited in their concentration according to China RoHS2 may leak and subsequently pose a risk to environment and health.



Remark

Individual marks of conformity are printed only on the first type plate that is attached to the product - marked with ○. This depends on the requirements of the test and certification body.

4.2 Type code

The type code is printed onto the type plate of the motor. For the meaning of the type code refer to the following details.

Type codes, meaning of the digits	
MS2S03 - B0BYN - IMHG1 - NNDNN - NN 1 3 5 7 9 11 13 15 17 2 4 6 8 10 12 14 16	
1	Product
2	Frame size
3	Frame length
4	Characteristics of moment of inertia of the rotor
5	Winding code
6	Cooling
7	Encoder performance
8	Encoder design
9	Electrical connection
10	Shaft
11	Holding brake
12	Flange exactness
13	Bearings
14	Frame size
15	Coating
16	Other design
17	Special design

5 About this product

5.1 Safety instructions on the product

Please note the safety and prohibitive sign on the motor.

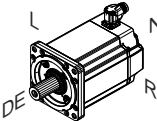
Table 6: Safety sign on the product

Safety symbols	Meaning
	Hot surfaces with temperatures over 60 °C may cause burns Let the motors cool down before working on the motors or in close proximity to the motors. The thermal time constant stated in the technical data is a measure for the cooling time. Cooling down can require up to 140 minutes. - Wear safety gloves. - Do not work on hot surfaces.
	Warning against dangerous electric voltage Electric connection may only be established by specialized staff. Tools for electricians (VDE tools) are absolutely necessary. - 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.
	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.

5.2 Features and functions

5.2.1 Basic data

Product	3~ PM motor
Type	MS2S
Ambient temperature during operation	0 ... 40 °C (with derating up to 60 °C)
Protection class (EN 60034-5)	IP65 with shaft sealing ring
Cooling mode (EN 60034-6)	IC410, Self-cooling
Motor design (EN 60034-7)	IM B5
Coating	Varnish RAL 9005
Flange	similar to DIN 42948
Shaft end	Cylindrical (DIN 748 part 3), centering hole with thread "DS" (DIN 332 part 2),
Concentricity, run-out, alignment	Standard tolerance N (DIN 42955)
Oscillating quantity level	Level A (EN 60034-14) up to the rated speed
Installation altitude	0 ... 1,000 m above sea level (without derating)
Sound pressure level	MS2S02 ... MS2S05: 75 dB(A) +3 dB(A)
Thermal class	155 (F) (EN 60034-1)
Encoder system	Basic Performance ctrlX SENSE^{motor} Magnetic 18 bit encoder, digital in Multiturn design for operation on ctrlX controllers
Electrical connection	Single cable connection with circular connector M17, rotatable, quick lock SpeedTec®

Holding brake (option)	Electrically released U_N 24V DC ($\pm 10\%$)		
Motor ends	 DE NDE L R Drive End, A-side Non Drive End, B-side Left Right		

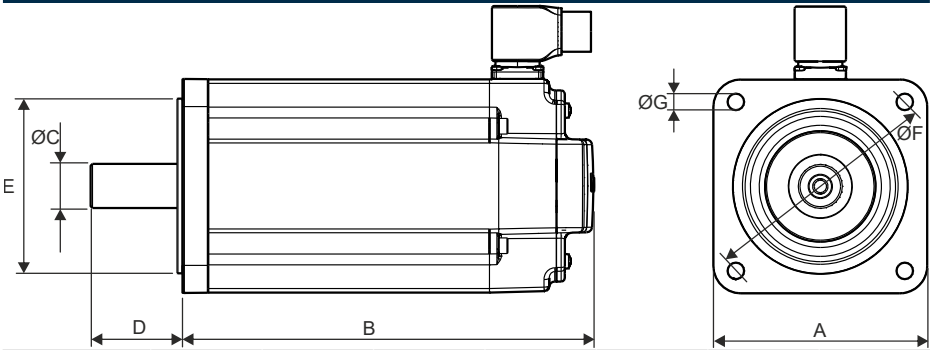


Remark

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

5.2.2 Mechanical interfaces

Dimensions (flange)



Type	A □ Flange [mm]	B Length [mm]	C Shaft Ø [mm]	D Shaft length [mm]	E Centering collar [mm]	F Hole circle [mm]	G Mounting holes [mm]
MS2S02	40	1)	8	18	30	46	4.5
MS2S03	58	1)	9	20	40	63	4.5
MS2S04	82	1)	14	30	50	95	6.6
MS2S05	98	1)	19	40	95	115	9

1) See dimensions in the ➔ MS2S Project Planning Manual

Use the following screws and washers for flange assembly.

Screws according to DIN EN ISO 4762 or DIN EN ISO 4014. Property class 8.8 The screw lengths depends on material and installation situation. The specified tightening torque must be ensured.

Table 7: Tightening torque of mounting screws

Screw	M4	M6	M8
Mounting holes □ [mm]	4.5	6.6	9
Tightening torque M_A [Nm] at $\mu_K = 0.12$	3.0	10.1	24.6
Washer	-	-	yes

5.2.3 Thermal motor protection

The motor temperature is monitored via a sensor-based, drive-internal temperature model and ensures a high level of protection for the motors against thermal overload.

The threshold values for motor temperature monitoring are contained in the encoder data memory and are read in and monitored automatically during the operation with Rexroth controllers. Threshold values for MS2S motors are:

- Motor-warning temperature (140°C)
- Motor-disconnection temperature (145°C)

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 ... 60°C) is possible. Please note the details in [➔ Chapter 8.5 "Derating in case of deviating ambient conditions" on page 37](#).

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

Introduction

The motor encoder is defined with encoder performance and encoder type (see [➔ Chapter 4.2 "Type code" on page 14](#)). The MS2S is offered with BASIC encoder performance **"I"** and multiturn encoder type **"M"**.

Multiturn

The multiturn version **"M"** enables absolute, indirect position detection within a defined number of mechanical motor revolutions. The number of mechanical motor revolutions that can be detected **U_{turn}** is 65,536 motor revolutions (ctrlX SENSE).

ctrlX SENSE

Encoder performance

BASIC

BASIC encoders with encoder performance **"I"** use a magnetic sampling method. Data output of process and parameter data (electronic type plate) happens digitally via the ctrlX SENSE^{motor} protocol. The motor temperature is transmitted digitally.

Functional details

Table 8: Technical data motor encoder ctrlX SENSE

Designation	Symbol	Unit	Standard IM
Performance			
Resolution per revolution			18 bit
System accuracy of encoder	◀	"	±360
System accuracy typical/maximum ¹⁾	◀	"	±250 / ±360
Number of recordable revolutions	U _{turn}	-	65,536
Measuring principle			magnetic
1) Reachable overall system accuracy by considering the installation mechanics, typical and maximum value.			
Interfaces	Symbol	Unit	IM
Communication interface	-	-	ctrlX SENSE ^{motor}
Maximum initialization time		ms	500
Electrical data	Symbol	Unit	IM
Voltage supply	V _{CC} Encoder	V DC	8...12
Current consumption	I _{Encoder}	mA	130
Encoder power maximum	P _{Encoder}	mW	1200
- The voltage drop on the cable must be taken into account for the voltage tolerance. - The data specified in the table are valid for the connection points at the encoder. - The power supply source must be a power supply unit with SELV protection in accordance with IEC 60950-1 or PELV in accordance with IEC 60204-1. - The integrated encoder battery has an expected service life of 10 years.			
Mechanical data	Symbol	Unit	IM
Moment of inertia of rotor		kg*mm²	0.91

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** with shaft sealing ring

5.2.7 Output shaft, balancing and extension elements

Shaft end

Options according to type code

Shaft	Type
Smooth, with shaft sealing ring	G

Smooth shaft

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

Type	Centering hole DIN 332 Part 2
MS2S02	DS M3
MS2S03	DS M3
MS2S04	DS M5
MS2S05	DS M6

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.

The shaft sealing ring affects the degree of protection. We recommend regular visual inspections on shaft sealing rings. Depending on operating conditions, signs of wear may appear after 5,000 operating hours. If necessary, replace the shaft sealing rings.

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 oil should not be in permanent contact with the shaft sealing ring of the motors.

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 0.25 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

MS2S motors can optionally be provided with spring force brakes. The holding brakes operate according to the “electrically-released” principle (closed-circuit principle) and open upon applying the switching voltage.

- The service life (switching cycles) of spring force brakes depends on the number of start-stop cycles. With spring force brakes, there is always startup wear, since an air cushion must first build up between the lining and the friction surfaces when the speed increases. This wear can be increased by accelerations of the friction disk, e.g. in the case of a vertical arrangement (acceleration due to gravity) or by external centrifugal forces, whereby in this case only one friction lining side is affected in most cases.
- 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. Up to 500 breaking cycles from speed 3000 1/min can be performed, whereas the maximum switched energy per emergency stop of the brake must not be exceeded. The number of brake applications per hour is 20, whereas a uniform scheduling is a precondition. For specifications about the max. switched energy per emergency stop, see ➔ [Chapter “Technical data holding brakes” on page 21](#)

⚠ 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.

The rated voltage to apply the brakes is 24 V DC $\pm 10\%$.

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 $\pm 10\%$** is available at the motor in order to release the holding brake.

The voltage drop ΔU on the brake supply can approximately be calculated for copper conductors using the following formula:

$$\Delta U = \rho_{Cu} \cdot \left(\frac{2 \cdot l}{q} \right) \cdot I_N$$

Fig. 1: Voltage drop of brake supply for Cu (copper) conductor

- ΔU Voltage drop [V]
- ρ_{Cu} Specific resistance of copper [$\Omega \cdot \text{mm}^2/\text{m}$]
- l Cable length [m]
- q Wire cross section [mm^2]
- I_N Rated current [A]

⚠ 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 ±10%** is required at the motor.

Ensure correct dimensioning of the supply wires (wire length and cross-section) for the holding brake.

The control voltage can be reduced using the energy saving function after safely releasing the brake.

The holding brakes are intended for direct connection to the ctrlX controllers. A protective circuit to switch inductive loads of holding brakes is integrated in ctrlX controllers.

Technical data holding brakes

Type	Holding torque	Rated voltage ¹⁾	Rated current	Maximum connection time	Maximum disconnection time	Moment of inertia of the holding brake	Maximum switched energy
	M ₄	U _N	I _N	t ₁	t ₂	J _{br}	W _{max}
	Nm	V	A	ms	ms	kg*m ²	J
MS2S02-A0BYN-__1-__-__	0.45	24	0.28	15	35	0.0000002	50
MS2S02-C0BYN-__1-__-__	0.45	24	0.28	15	35	0.0000002	50
MS2S03-B0BYN-__1-__-__	1.50	24	0.31	20	60	0.0000018	120
MS2S03-C0BYN-__1-__-__	1.50	24	0.31	20	60	0.0000018	120
MS2S04-B0BTN-__1-__-__	3.50	24	0.35	30	85	0.0000075	200
MS2S04-C0BTN-__1-__-__	3.50	24	0.35	30	85	0.0000075	200
MS2S05-B0BTN-__1-__-__	7.20	24	0.60	30	120	0.0000230	500
MS2S05-C0BTN-__1-__-__	7.20	24	0.60	30	120	0.0000230	500

¹⁾ Tolerance ± 10%, measured on terminal or junction of the motor

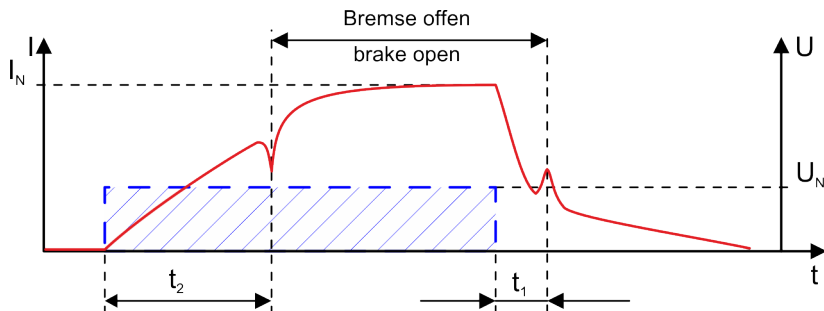


Fig. 2: Switching times of static hold mode

t_1 Connection time (close)

t_2 Disconnection time (open)

Energy saving function (Eco mode) for holding brakes

Decrease brake voltage

The control voltage of the holding brake in MS2S holding brakes can be reduced after executing the switching operation "Open brake". By decreasing the control voltage, energy can be saved of up to 50% and the self-heating of the motor can be reduced.

To decrease the control voltage of MS2S holding brakes, the following conditions apply:

- Maximum decrease of control voltage to U_N 17 V
- Waiting time after releasing the holding brake is at least 200 ms
- Decreasing the control voltage by voltage control or pulse width modulation with a PWM cycle frequency ≥ 4 kHz



Remark

Refer to the instructions in the control module documentation.

Refer to the notes for dimensioning of the cable length and cable cross-section of brake cables.

Properties

The permanent magnet holding brakes optionally used in MS2S motors operate according to the closed-circuit principle. Non-operative holding brakes are closed and open when reaching the release voltage. To ensure safe functioning of the brake, the rated voltage at the brake (24 V DC $\pm 10\%$) has to be ensured. Please note the installation conditions such as ambient temperature, cable length, cable cross-section and the laying type.

The holding brake is used to hold the motor shaft in case of motor standstill. Using the operating brake to decelerate the rotating motor is not permissible.

Holding brakes safety instructions

The spring force brake of MS2S motors 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.:

- Mechanical locking of the vertical axis
- External brake, arrestor, clamping device.
- 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 954; ISO 13849-1 and ISO 13849-2 Safety-related parts of control units
- 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.

Holding brake - 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.

Manually check holding torque (M4)

1. ➞ Disconnect the motor from the power supply and secure it against being switched on again.
2. ➞ Measure the transferable holding torque (M4) of the holding brake with a torque wrench.

Check holding torque (M4) automatically

- ➞ Start the P-0-0541, C2100 Command Holding system check in drive controller. The efficiency of the holding brake and the opened state are checked by starting the routine.
 - ➞ If the holding torque (M4) **is not achieved**, the resurfacing routine can be used to reconstitute the holding torque.

5.2.9 Vibration behavior

The oscillation behavior corresponds to oscillating quantity level A according to EN IEC 60034-14:2018 up to the rated speed.

5.2.10 Bearing

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

Table 9: Bearing size MS2S

Type	Bearing size DE	Bearing size NDE	Floating bearing	Fixed bearing
MS2S02	608	607	DE	NDE
MS2S03	6001	6000	DE	NDE
MS2S04	6003	6001	DE	NDE
MS2S05	6,204	6,303	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 10 “Mean speed - basis of calculated grease service life” on page 24:

Table 10: Mean speed - basis of calculated grease service life

Type	Mean speed
MS2S02, -03, -04, -05	≤ 3500 1/min

The following standard values apply under the specified preconditions for the 60K and 100K operation modes:

L_{10h} during operation

L_{10h} = 20.000 h, in case of utilization with 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.

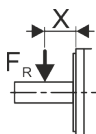


Fig. 3: Point of action of radial force F_R and axial force F_A

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

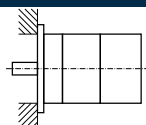
For radial force diagrams, refer to the technical data

5.2.11 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 for design and installation type.

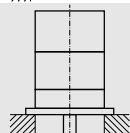
Code I / Code II (EN 60034-7)

IM B5 / IM 3001



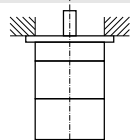
Flange attachment on the drive side of the flange

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 or the shaft sealing ring 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 18.

5.2.12 Coating

One-layer standard varnish (1K), water-based, in conductive form, RAL9005 jet black

An additional varnish with a coat thickness of max. 40 µm is allowed.

Protect all safety notes (stickers), type plates and open connectors with a painting protection when painting additionally.

5.2.13 Noise emission

The typical sound pressure level $L_p(A)$ is specified for the speed range 0 rpm up to the rated speed. The installation situation affects the noise emission.



Noise reduction by switching the PWM frequency

MS2S Synchronous servomotors are equipped with windings in toothed coil technology for a compact motor design; typical of toothed coil technology are undershoots and harmonics in the magnetic air gap field. The high number of harmonics and undershaft in connection with the 4 kHz frequency of the converters can lead to magnetic noise stimulation in certain speed ranges, especially if a mechanic motor-self frequency is stimulated velocity-dependent. If this noise is found to be disturbing, a switchover of the PWM clock frequency from 4 kHz to 8 kHz optimized for the motor type can be used. Therewith, the stimulation of motor-self frequencies caused by the 4 kHz frequency can be avoided.

If necessary, use the setting options on the control unit.

IndraDrive: Parameter P-0-0062 "Switching speed for speed-dependent PWM switching" is available from firmware versions MPx-20V17. The default value of the parameter is 0.

ctrlX: CAN-Parameter inverter power section: Velocity-dependent PWM switching 0x2120:04 P-0-0062

The PWM switch (4 kHz / 8 kHz) can be selected and observed during **drive sizing with IndraSize**.

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 following table must be observed.

Table 11: Deviations and enhancements of classification (DIN EN IEC 60721-3-1)

Bearing	
Ambient temperature	-25 ... +55 °C
Relative air humidity	5 ... 75 %
Absolute air humidity	1 ... 29 g/m³
Direct solar radiation	Not permitted
Shock load	➔ Chapter 6.3 "Shock load during transport und storage " on page 28

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.

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

- **> 1 month storage time**
 - Visual inspection of all parts to be damage-free
 - Resurface the holding brake
- **> 6 months storage time (additionally)**
 - Check conservation measures. Renew corrosion protection if necessary. Remove the pre-serving agent before commissioning
- **> 12 months storage time (additionally)**
 - 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.
- **> 24 months storage time (additionally)**
 - Function test and product revision if necessary by Bosch Rexroth Service

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.

Please observe the following classification limitations:

Table 12: Classification limitation (DIN EN IEC 60721-3-2)

Transport	
Ambient temperature	-25 ... +70 °C
Relative humidity	5 ... 75 %

Transport

Shock load

➔ Chapter 6.3 “Shock load during transport und storage” on page 28

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 (see chapter 3.9.2.2).



Further information on air freight:

Integrated battery for ctrlX SENSE (classification UN 3091) is exempted from dangerous goods regulations. MS2S can therefore be transported via air freight without declaration.

6.2.1 Instructions on machine transport

NOTICE

Never touch the connection points of electrostatic sensitive devices!

- Mounted components (e.g. temperature sensors, encoder) can contain parts susceptible to electrical discharge.
- Observe the ESD safety measures.

⚠ WARNING

Risk of injury and material damage due to improper handling during transport!

- Only use hoisting gear suited for the weight of the motors.
- Never walk under hanging loads.
- Never lift the motor on the shaft.
- Use suitable protective equipment and protective clothing during transport, and wear safety shoes.

- Before transporting the motor, determine the weight of the motor. For more details about motor weight, please refer to the type plate or the project planning manual (Technical data).
- Adjust the carrying capacity of the lifting device to the motor weight.
- Avoid increased transport vibrations.
- Remove any existing transport locks prior to commissioning and keep them.

6.3 Shock load during transport und storage

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

Table 13: Permissible shock load for MS2S motors

Frame size	Maximum allowed shock load (11 ms)	
	Axial	radial
MS2S02, -03, -04, -05	100 m/s²	1000 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! Liquid which exists over a longer period on the shaft sealing ring of the output shaft can ingress into the motor and cause damage. – Ensure that liquid cannot be present at the output shaft. – 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 assembly according to ➔ [Chapter 5.2.2 “Mechanical interfaces”](#) on page 16.

7.2 Assemble transmission elements

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.
--------	--

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.
- The balancing state of transmission elements must comply with the full-key balancing of the motors.

Fitting

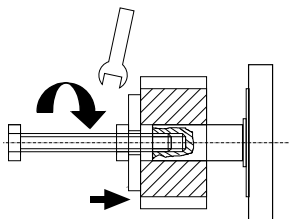


Fig. 4: Fitting the transmission element

- 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.

- 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



High electric voltage! Danger to life, risk of injury by electric shock.

While the rotor is rotating, motors with permanent magnet excitation create a voltage > 60 V at the motor connections.

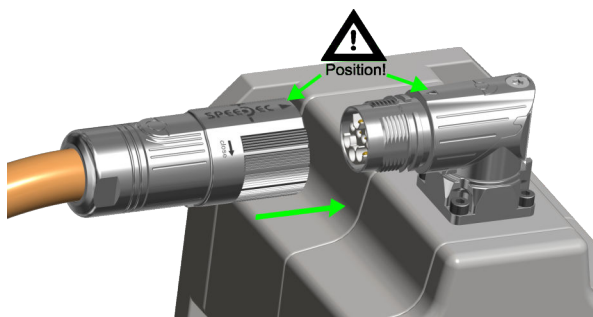
Any work may only be carried out while the motor is at standstill.

Never connect or disconnect plug connectors under load!

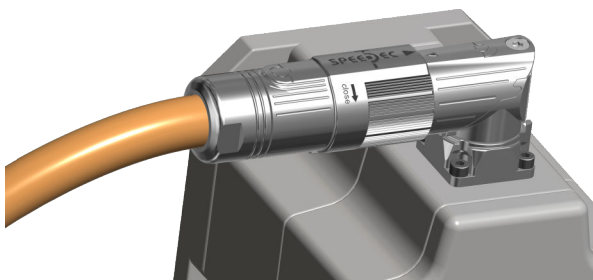
NOTICE

Never touch the connection points of electrostatic sensitive devices!

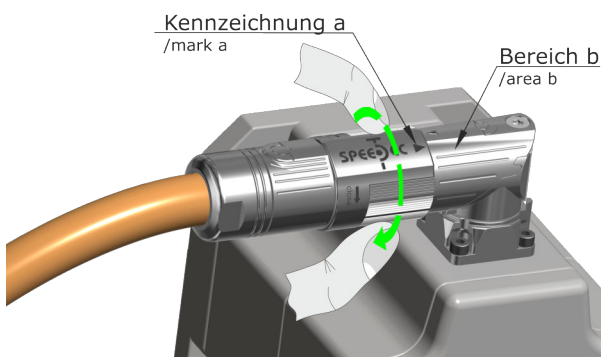
- Mounted components e.g. temperature sensor, encoder) can contain parts susceptible to electrical discharge (ESD).
Observe ESD safety measures.

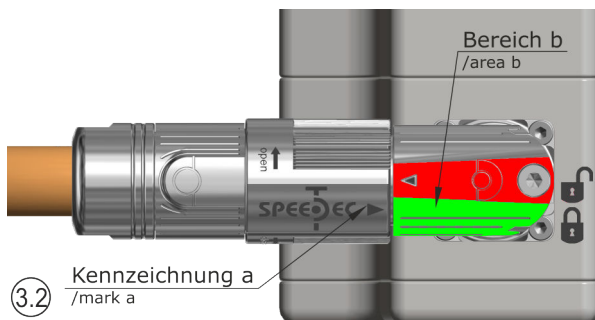


1. → Code and mount the connector



2. → Attach the connector



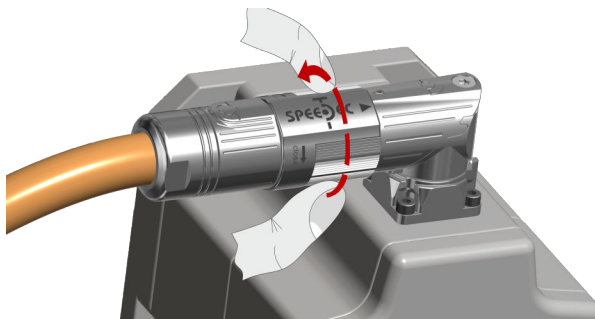


3. Turn the nut clockwise (arrow direction “close”)

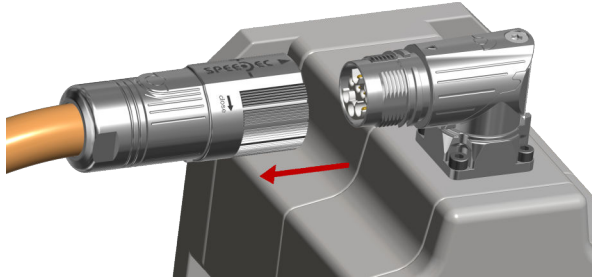
Tightening torque hand-tight or 1.5 Nm. At a minimum, the lock must be turned by approx. 20° (at least 3 clicks), or until the marking a is in the area b.

➔ Should this position be reached, the connector is safely locked.
4. Secure the cables, that accruing forces due to cable vibrations onto the connector are prevented.

Disconnect SpeedTec connector



1. Turn the nut counterclockwise (arrow direction “open”)



2. ➔ Straight and evenly disconnect the connector from the mounting box.
➔ The plug is disconnected.

8 Commissioning and operation

8.1 Safety

▲ WARNING



High electric voltage! Danger to life, risk of injury by electric shock.

- Life parts are dangerous.
Do not open any covers or flange sockets during operation.
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.
Do not enter the range of movement of the machine. Avoid unintended access for persons, due to
 - Safety fences, safety screens or protective covers.
 - Optical sensors

▲ CAUTION



Thermal danger due to hot surfaces with temperatures over 60 °C during operation

- Do not touch hot motor surfaces.
Install protection against contact, if necessary.
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

MS2S motors can only be commissioned with **ctrlX 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, ... See ➔ Chapter 6.1 “Storage” on page 26.
- Ensure that all device connector are correctly connected and protected against coming loose.
- Ensure that a holding brake voltage of 24 V $\pm$ 10% 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 ➔ Chapter 2.3 “General safety instructions” on page 10.

8.3 Ambient conditions during operation

Climatic conditions are defined in classes according to DIN 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 DIN EN IEC 60721-3-3 is observed. Deviations and enhancements according to the following table must be observed.

Table 14: Ambient conditions

Operation	
Installation altitude	0 ... 1,000 m above sea level
Ambient temperature	0 ... +40 °C
Relative humidity	5 ... 95 %
Absolute humidity	1 ... 29 g/m ³

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 MS2S motors:

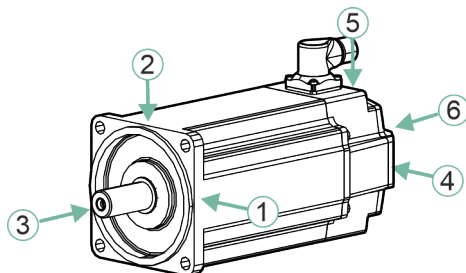


Fig. 6: Vibration load on measuring points

Table 15: Permissible vibration load for MS2S motors

Direction	Measuring point	Limit value (10-2000 Hz)
		Motors Self-cooling
radial	1, 2 (radial motor flange)	30 m/s ²
	4, 5 (radial bearing shield)	50 m/s ²
Axial	3 (axial motor flange)	10 m/s ²
	6 (axial bearing shield)	25 m/s ²

The specified values must not be exceeded.

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 and fan units 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. For further procedure refer to .

8.5 Derating in case of deviating ambient conditions

Reduce high performance data:

1. ➔ Reduce the standstill torque $M_{0\ 60K}$, specified in the data sheet, with the following factors.
We have:

$$M_{0\ red} = M_{0\ 60K} \times f_{TH\ 60K}$$

$$M_{0\ red} = M_{0\ 100K} \times f_{TH\ 100K}$$

2. ➔ Pan the $S1$ -characteristic curve M_{S1} parallel to the speed axis to the junction of the $S1$ -characteristic curve and to the calculated point $M_{0\ red}$ on the torque axis.
- ➔ The determined characteristic curve $M_{S1\ red}$ shows approximately the $S1$ -characteristic curve with appropriate derating.

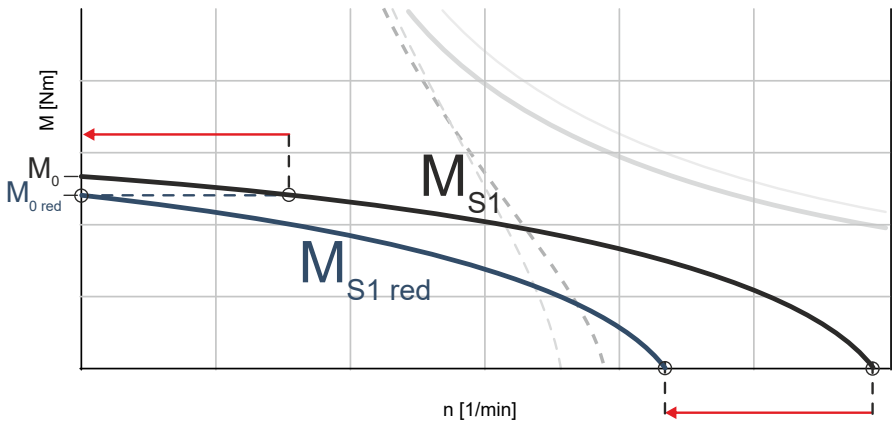


Fig. 7: Determine $S1$ -characteristic curve $M_{S1\ red}$ with derating factor f_{TH}

Table 16: Derating factors for self-cooling 60K

Height [m]	40 °C	45 °C	50 °C	55 °C	60 °C
1,000	1.00	0.94	0.88	0.83	0.78
1,500	0.97	0.91	0.85	0.81	0.76
2,000	0.94	0.88	0.83	0.78	0.73
2,500	0.90	0.85	0.79	0.75	0.70
3,000	0.86	0.81	0.76	0.71	0.67

Table 17: Derating factors for self-cooling 100K

Height [m]	40 °C	45 °C	50 °C	55 °C	60 °C
1,000	1.00	0.96	0.92	0.88	0.85
1,500	0.97	0.93	0.89	0.85	0.82
2,000	0.94	0.90	0.86	0.83	0.80
2,500	0.90	0.86	0.83	0.79	0.77
3,000	0.86	0.83	0.79	0.76	0.73

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.
Wear safety gloves.
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.
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.

MS2S may only be repaired in the manufacturer's works or in a workshop authorized by Rexroth.

The service lives of motor components, such as seals and bearings, may vary depending on the operating conditions, such as operation mode, speed, vibration and shock load, and frequent reverse mode. We recommend to change the bearing after **20,000** operating hours. Shorter replacement intervals may be necessary; cf. checks during operation. We recommend regular visual inspections on shaft sealing rings. Depending on operating conditions, signs of wear may appear after 5,000 operating hours. If necessary, replace the shaft sealing rings.

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)

9.3 Spare parts

Hybrid connector, size M17 (RHS1701/CM07)

Order code: **R911404252**

Order text: **RHS1701/CM07**

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

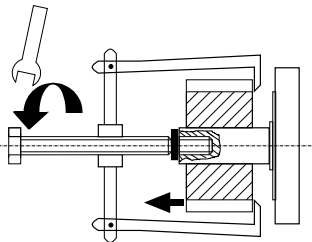


Fig. 8: Remove transmission element

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.
- Crushing hazard of fingers and hand due to heavy attractive forces of the magnets.
- 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 therefore 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	Activate controller enable signal
	Controller fault	Troubleshoot acc. to documentation of controller
	Voltage supply missing	Control voltage supply
	Brake is not released	Check the brake activation
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
	.	.
Running noise	Foreign bodies within the motor	Stop the motor --> repair by manufacturer
	Bearing is damaged	Stop the motor --> repair by manufacturer
High motor temperatures; motor temperature monitoring is activated	Operation outside the parameters	Reduce load and check the dimensioning
	Heat dissipation is impaired	Clean the motor

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.

13 Technical data

13.1 Technical data

Technical data with operating characteristic curves for all motor types are described in the ➔ MS2S Project Planning Manual under chapter ➔ Technical data.

Additional documentation



MS2S Synchronous servomotors, project planning manual
DOK-MOTOR*-MS2S*****-PR□□-□□-P

Technical data

14 Appendix

14.1 EU Declaration of Conformity



The CE mark is attached to the type label of the motors.

You will find the full text of the current version of the EU Declaration of Conformity and available translations in **Bosch Rexroth Download Center**:

➔ ["Declaration of Conformity DCTC-30318-003"](#)

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EU-Konformitätserklärung - Original

[1]

Dok.-Nr. / Doc. No.: DCTC-30318-003

[1.1]

EU Declaration of Conformity

Datum / Date: 2025-04-30

[1.2]

- ☐ nach Maschinenrichtlinie 2006/42/EG / in accordance with Machinery Directive 2006/42/EC
- (ABl. L 157, 09.06.2006, S. 24 / OJ L 157, 09/06/2006, p. 24)
- [2.1]
- ☒ nach Niederspannungsrichtlinie 2014/35/EU / in accordance with Low Voltage Directive 2014/35/EU
- (ABl. L 96, 29.03.2014, S. 357 / OJ L 96, 29/03/2014, p. 357)
- [2.2]
- ☒ nach EMV-Richtlinie 2014/30/EU / in accordance with EMC Directive 2014/30/EU
- (ABl. L 96, 29.03.2014, S. 79 / OJ L 96, 29/03/2014, p. 79)
- [2.3]
- ☐ nach ATEX-Richtlinie 2014/34/EU / in accordance with ATEX Directive 2014/34/EU
- (ABl. L 96, 29.03.2014, S. 309 / OJ L 174, 1/07/2011, p. 88)
- [2.4]
- ☐ nach Ökodesign-Verordnung (EU) 2024/1781 / in accordance with Ecodesign Regulation (EU) 2024/1781
- (ABl. L 2024/1781, 28.06.2024 / OJ L 2024/1781, 28/06/2024)
- [2.5]
- ☐ und nach Ökodesign-Verordnung (EU) 2019/1781 / and in accordance with the Ecodesign Regulation (EU) 2019/1781

(ABl. L 272, 25.10.2019, S. 74 / OJ L 272, 25/10/2019, p. 74)
- ☐ und nach Ökodesign-Verordnung (EU) 2019/2021 / and in accordance with the Ecodesign Regulation (EU) 2019/2021
- (ABl. L 315, 05.12.2019, S. 241 / OJ L 315, 05/12/2019, p. 241)
- ☐ Produkt im Geltungsbereich der RoHS-Richtlinie 2011/65/EU / Product in the scope of RoHS Directive 2011/65/EU:
- nach RoHS-Richtlinie 2011/65/EU / in accordance with RoHS Directive 2011/65/EU
- (ABl. L 174, 01.07.2011, S. 88 / OJ L 174, 1/07/2011, p. 88)
- [2.6]
- ☒ Produkt nicht im Geltungsbereich der RoHS-Richtlinie 2011/65/EU / Product not in the scope of RoHS Directive 2011/65/EU:
- Produkt erfüllt die Anforderungen zur Stoffbeschränkung der Richtlinie / Product meets the substance restriction requirements of the Directive
- [2.7]
- 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]
- ☐ nach Batterie-Verordnung (EU) 2023/1542 / in accordance with Batteries Regulation (EU) 2023/1542
- (ABl. L 191, 28.07.2023, S. 1-117 / OJ L 191, 28/07/2023, p. 1-117)
- [2.9]

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EU-Konformitätserklärung - Original
EU Declaration of Conformity

Seite / Page: 2 / 9
DCTC-30318-003 : 2025-04-30

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

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

Bezeichnung / Name: 3- PM-MOTOR [5]

Bestellbezeichnung / ordering code: [5.2]

MS2S02*****
MS2S03*****
MS2S04*****
MS2S05*****

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

Handelsbezeichnung / Trade name: Rexroth [5.4]

ab Herstellungsdatum / from the date of manufacture: 2025-04-30 [5.5]

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

Die alleinige Verantwortung für die Ausstellung dieser EU-Konformitätserklärung trägt der Hersteller. / [6.1]
This EU Declaration of Conformity is issued under the sole responsibility of the manufacturer.

Angewendete harmonisierte Normen bzw. sonstige technische Normen und Vorschriften / [7]
Applied harmonized standards or other technical standards and regulations:

Norm / Standard	[8]	Titel / Name	[8.1]	Ausgabe / Issue	[8.2]
EN 60034-1		Drehende elektrische Maschinen – Teil 1: Bemessung und Betriebsverhalten / Rotating 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 / Rotating electrical machines – Part 5: Degrees of protection provided by integral design of rotating electrical machines (IP code) – Classification		2020	
EN IEC 61800-3		Drehzahlveränderbare elektrische Antriebssysteme – Teil 3: EMV-Anforderungen einschließlich spezieller Prüfverfahren / Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods		2018	

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EU Declaration of Conformity

DCTC-30318-003 : 2025-04-30

Weitere Erläuterungen / Further explanations:

[12]

Die Montage- und Installationshinweise, gemäß Produktdokumentation sind zu beachten /

[13]

The assembling and installation instructions according to the manual must be followed

Lohr a.Main

2025-04-30

ppa.

Ort / place

[14]

Datum / date

[14.1]

DocuSigned by:

Dr. Falk Zwicker

FF5F6CCEBFE3F8

Dr. Falk Zwicker

Kaufmännische Werkleitung /

Commercial Plant Management

[14.2]

i.V. / p.p.

Signiert von:

Marco Mehling

8B56CC3BFE3441

Marco Mehling

Business Owner Motors

[14.3]

Die letztverfügbliche Version der EU-Konformitätserklärung finden Sie im Bosch Rexroth Download-Center. Für weitere Versionen (z.B. für ältere Produkte) wenden Sie sich bitte an Ihren Bosch Rexroth Ansprechpartner. /

[15]

The last published version of the EU Declaration of Conformity can be found in the Bosch Rexroth Download Centre. For further versions (e.g. for older products), please contact your Bosch Rexroth contact person.

Appendix

R911410077 Edition 02

Bosch Rexroth AG

14.2 UK Declaration of Conformity



You will find the full text of the current version of the UK Declaration of Conformity and available translations in **Bosch Rexroth Download Center**:

➔ ["Declaration of Conformity DCTC-30318-033"](#).

Document Envelope ID: 0CAC82F9-E2F2-476D-9B1A-D0DAA760E989



UK Declaration of Conformity

Doc. No.: DCTC-30318-033

Date: 2025-04-30

- | | |
|-------------------------------------|--|
| ☐ | 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:

3~ PM-MOTOR

Ordering code:

MS2S02*****
MS2S03*****
MS2S04*****
MS2S05*****

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

Trade name:

Rexroth

From the date of manufacture:

2025-04-30

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.

DOCTC 30318-033_KOE_N_EN_2025-04-30.docx

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Page: 1 / 2

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UK Declaration of Conformity

Page: 2 / 2

DCTC-30318-033 : 2025-04-30

Standard	Name	Issue
EN 60034-1	Rotating electrical machines – Part 1: Rating and performance	2010 + Cor.:2010
EN IEC 60034-5	Rotating electrical machines – Part 5: Degrees of protection provided by integral design of rotating electrical machines (IP code) - Classification	2020
EN IEC 61800-3	Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods	2018

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

Lohr a.Main
Place

2025-04-30
Date

ppa,

DocuSigned by:

Dr. Falk Zwickner
Commercial Plant Management

p.p.

Signiert von:

Marco Mehling
Business Owner Motors

We reserve the right to make changes to the content of the UK Declaration of Conformity. The current issue is available as download in Bosch Rexroth Media Directory or on request from your Bosch Rexroth contact person

14.3 UL / CSA



The UL/CSA conformity of MS2S motors can be found on the type plate of the motors.

The list of MS2S motors is available under UL file number E335445 ➔ www.ul.com.

14.4 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/>

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