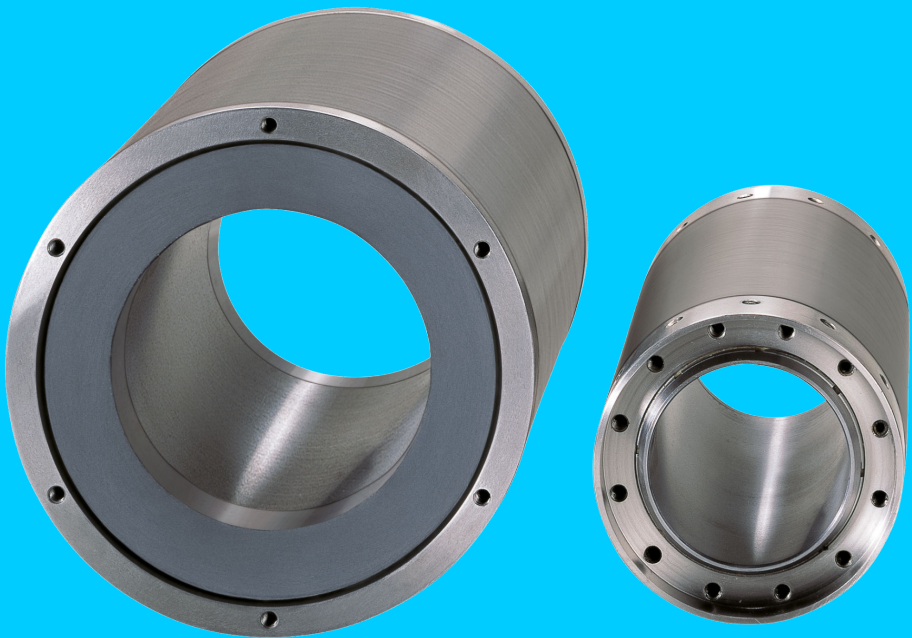


MBSxx2

Operating Instructions
(Translation of the original)

Synchronous Spindle Motors



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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 Validity of the documentation

This instruction has to be complied with by assemblers, operator, service engineers and facility operators. It contains notes about handling the motor or motor components of a kit motor.

Before operating motors or its components, read this operating instruction to ensure a safe and smooth functionality and a long motor lifetime.

1.2 Editions of this documentation

Table 1: Record of revisions

Edition	Release date	Notes
02	06/2025	Revision and amendment
01	10/2012	First edition

1.3 Additional documentation

This operating instruction is only valid with the following Rexroth documentation:

Table 2: Additional documentation

	Title	Document type		Document number
	Rexroth Motors Safety Notes	Safety instructions		DOP-MOTOR*-IDYN*SAFETY-**RS-□□-P ➔ R911340694
	MBS Synchronous Spindle Motors	Project Manual	Planning	DOK-MOTOR*-MBS-H*****-PR□□-□□-P ➔ R911297895
	Motor Cables and Connectors with IndraDrive	Product tion	informa-	DOK-CONNEC-MS2N*INDRV*-CA ➔ R911401938
	Electromagnetic Compatibility (EMC) in Drive and Control Systems	Project Manual	Planning	DOK-GENERL-EMV*****-PR□□-□□-P ➔ R911259814

 Documentation about special products are available on demand.

1.4 Presentation of information

Explanation of signal words and the safety alert symbol

The Safety Instructions in the available application documentation contain specific signal words (DANGER, WARNING, CAUTION or NOTICE) and, where required, a safety alert symbol (in accordance with 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 safety alert symbol (a triangle with an exclamation point), which precedes the signal words DANGER, WARNING and CAUTION, is used to alert the reader to personal injury hazards.

 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.

Table 3: Symbols

Symbol	Meaning
	Reference to supplementary documentation
	This note gives important information, which must be observed.
	Single, independent handling step
1.	Numbered instruction:
2.	The numbers show that the action steps must be taken one after the other.
3.	
	Warning against dangerous electric voltage.
	Warning against hot surfaces.
	Warning against rotating machine parts.
	Warning against overhead load.
	Warning against crushing hazard.
	Electrostatic sensitive devices.
	Access for persons with cardiac pacemaker forbidden.
	Do not carry along metal parts or clocks.
	Hammer scales are forbidden.

Markup

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

 Reference to supplementary documentation

 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

 Handling instructions are specified in numbered lists. Please comply with the order of the handling instructions.

2 Safety instructions

2.1 About this product

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

 This operating instruction must be stored and transferred in case of sale during the complete product lifetime.

2.2 Important directions on use

2.2.1 Intended use

Introduction

Bosch Rexroth products are designed and manufactured using the latest state-of-the-art-technology. The products are tested prior to delivery to ensure operational safety and reliability.

▲ WARNING	Personal injury and property damage by using products incorrectly! Failure to use our products in an unintended way may cause situations resulting in property damage and personal injury.
NOTICE	Inappropriate use Bosch Rexroth, as the manufacturer, does not provide any warranty, assume any liability, or pay any damages for damage caused by products not being used as intended. Any risks resulting from the products not being used as intended are the sole responsibility of the user.

Before using the products by Bosch Rexroth, the following condition precedent must be fulfilled so as to ensure that they are used as intended:

- Personnel that in any way uses our products must first read and understand the relevant safety instructions and be familiar with their appropriate use.
- Hardware products must be left in their original condition, i.e. no structural changes may be made. Software products must not be decompiled and their source code must not be changed.

- Damaged or defective products must not be installed or put into operation.
- It must be ensured that products are installed in compliance with all regulations specified in the documentation.

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

Areas of use and application

Typical applications include, for example:

- Handling and mounting systems
- Packaging and food machines
- Printing and paper converting machines
- Machine tools

The motors have been exclusively 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 EN 60034-1:2010 + Cor.:2010	Rating and performance behavior
EN 60034-5 EN IEC 60034-5:2020	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 2014/35/EC 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.

For application-specific use of motors, drive controllers with various levels of power, DC bus voltage and different interfaces are available. For regulation and controlling of motors, additional sensors like length measuring systems must be connected.

Before commissioning, every connected drive controller must be programmed according to the specified motor function for the specified application.



- The motors may only be operated under the assembly, mounting and installation conditions, in the normal position, and under the environmental conditions (temperature, degree of protection, humidity, EMC etc.) specified in this documentation.
- The motors may only be used with the accessories and attachments specified in this documentation. Components that are not explicitly specified must not be installed nor connected. The same applies for cables and lines.
- The device may only be operated in the explicitly specified configurations and combination of components and in compliance with the respective functional description of the software and firmware.

2.2.2 Unintended use

Any use of motors outside of the fields of application mentioned above or under operating conditions and technical data other than those specified in this documentation is considered as "non-intended use".

Do not use these motors, if

- the intended application range is not explicitly approved for Bosch Rexroth motors.
- the operating conditions do not comply with the specified ambient conditions. For example, they may not be operated under water, under extreme temperature fluctuations, under extreme maximum temperatures or in potentially explosive atmospheres.



These motors are not suited to be operated directly on the power supply.

Trademark right third parties

Comply with the trademark rights of third parties during assembly and use of single components delivered by Bosch Rexroth. For any infringement of the right, the customer is liable for the accruing damage.

2.3 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.

2.4 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.

2.5 Product- and technology-dependent safety instructions

2.5.1 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.

2.5.2 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.

2.5.3 Protection against magnetic and electromagnetic fields

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 certain persons. The machine operator must sufficiently protect personnel working in these areas from possibly occurring damage by suitable measures (e.g. warning notes, protective clothes, designation of the danger zone).

Electro magnetic and magnetic fields!

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

Danger for persons with active body aids or passive metallic implants and for pregnant women.

- For persons with active body aids (like heart pacemakers), passive metallic implants (like hip prosthesis) and pregnant women possible hazards exist due to electromagnetic 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.

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.

Crushing hazard of fingers and hand due to heavy attractive forces of the magnets!

The attractive forces of the permanent magnets influence all magnetizable materials. Especially in an area < 100 mm, the attractive forces rise. Loose or not fastened components made of magnetizable materials can abruptly and inadvertently attracted with the permanent magnets.

- Extreme caution during handling of motor components with permanent magnets. Do never underestimate strong attractive forces.
- Never work alone.
- Use personal safety equipment (e.g. protective gloves, protective glasses).

- Do not unpack several motor components with permanent magnets or directly place them side by side at your working space.
- Unpack single motor components with permanent magnets immediately prior mounting and mount them immediately.
- Do not bring magnetized or magnetizable materials in the area of permanent magnets. If using magnetizable tools cannot be avoided, hold on the tool very tight, move carefully and observe the attractive force effect of the permanent magnets.

Behavior in the case of accidents with permanent magnets

During work with permanent magnets, the following emergency tools must be ready to use in the case of an accident to release impacted body parts (like fingers, hands, arms a.s.o.):

- Hammer (3-5kg) made of non-magnetized material like brass
- Minimum 2 wedges with approx. 10 - 15 ° lip angles made of non-magnetized material like brass, wood or similar to impact driving into the cutting slit.

In the case of an accident:

- Keep calm!
- If the machine is live, immediately de-energize (emergency button).
- Give first aid or request appropriate help (e.g. emergency doctor).
- Separate inherent parts via emergency tools to loose clamped body parts, like fingers, hand, foot, for example.
 - Therefore, beat the wedges with a hammer into the cutting slit to free the caught body parts.

2.5.4 Protection during handling and assembly

Motor components with permanent magnets (e.g. secondary parts of a synchronous linear motor or rotor of a synchronous kit motor) create very strong attractive forces from ferromagnetic parts like further motor components with permanent magnets or parts of iron, nickel or cobalt.

Please observe the safety notes about strong attractive forces of permanent magnets under ➔ [Chapter 2.5.3 “Protection against magnetic and electromagnetic fields” on page 11](#).

The attractive forces of the permanent magnets influence all magnetizable materials. Especially in an area < 100 mm, the attractive forces rise. Surrounding components can abruptly and inadvertently be attracted by the permanent magnets. Apart from crushing hazard, even the danger of chipping recalcitrant material, causing eye injury, exists.

Use the origin package of the motor components for transport and storage only. The origin package of Rexroth is constructed in such a way that the motor components with the permanent magnets are positioned within the package with suitable distance, providing that the package is correctly used.

Observe the following instructions during unpacking and handling.

- Instruct the personal with regard to the danger.
- Use personal safety equipment (e.g. protective gloves, protective glasses).
- Store all components in its origin package until assembly and for transport.
- Do only work on clean working spaces in which no ferromagnetic parts exist.

- If possible, use non-magnetic tools, e.g. made from aluminum or brass.
- Remove only one motor component from the package and secure it on your working space against slipping, rolling away.

Instruct all participating persons about the dangers and if necessary, expand the preliminary instructions.

Store the original package of the motor components with permanent magnets

Store the original package for later use.

In the case of reuse, ensure a good readability of the safety notes on the package. They must not be paste over!

Risk of injuries due to improper handling! Bodily injury due to crushing, scissors, cutting, punching!

- Observe the instructions on the package.
- Store the motor components with permanent magnets in the original package, only.
- Do not internally store or transport the motor components unpacked.
- Observe the accident prevention regulations.
- Use suitable assembly and transport equipment.
- Prevent clamping and squeezing by means of suitable measures.
- Use suitable tools, if necessary use special tools.
- Properly use lifting devices and tools.
- Use suitable safety equipment (like protective helmets, protective glasses, safety shoes, protective gloves).
- Never walk under hanging loads.
- Immediately remove spill on the ground, otherwise risk of falling!

2.5.5 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.

2.5.6 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 Additional components

Documentation for external systems which are connected to Bosch Rexroth components are not included in the scope of delivery and must be ordered directly from the corresponding manufacturers.

4 About this product

4.1 Product description

4.1.1 Technical features

Product	Three phase synchronous motor
Manufacturer	Bosch Rexroth Electric Drives and Controls GmbH Buergermeister-Dr.-Nebel-Straße 2 97816 Lohr a. Main / Germany
Type	MSS102, -142, -162, -182, -202, -242, -272, -312, -381, -382, -482 MRS102, -142, -162, -182, -202, -242, -272, -312, -381, -382, -482
UL / CSA	UL 1004, Fifth Edition
"registered component"	Canadian National Standard(s) C22.2 No. 100-04
UL-Files (UL)	E 341734
Ambient temperature during operation	0 ... 40 °C
Motor design	Open (kit motor)
Type of protection (DIN EN 60034-5)	IP00
Installation altitude	0 ... 1000 m
Sound pressure level	< 75 dB(A)
Insulation class (DIN EN 60034-1)	155
Electrical connection	Connection cables



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

4.1.2 Cooling

Liquid cooling

Liquid-cooled energy storage devices may only operated on a closed coolant circuit with heat exchanger. The coolant flow direction must be determined depending on the installation position of the motor. Basically, the coolant inlet must be connected at the bottom and the coolant outlet at the top. Please observe the details in the project planning manual of MBS motors about position and dimension of the coolant connection thread.

Mix the cooling water of the motor with suitable corrosion inhibitors. Please also refer to the detailed information of the project engineering.

4.2 Identification

4.2.1 Identification of motor components

Type codes MSSxx2

Product

M	S	S				-				-			-			-			
---	---	---	--	--	--	---	--	--	--	---	--	--	---	--	--	---	--	--	--

M S S = stator of a MBS kit motor

Frame Size

M	S	S				-				-			-			-			
---	---	---	--	--	--	---	--	--	--	---	--	--	---	--	--	---	--	--	--

 = see project planning manual MBS

Frame Length

M	S	S				-				-			-			-			
---	---	---	--	--	--	---	--	--	--	---	--	--	---	--	--	---	--	--	--

 = see project planning manual MBS

Winding

M	S	S		-				-		-		-			
---	---	---	--	---	--	--	--	---	--	---	--	---	--	--	--

 = see project planning manual MBS

Cooling Mode

[illegible]

F = liquid cooling

Coolant Connection

M	S	S			-					-									
---	---	---	--	--	---	--	--	--	--	---	--	--	--	--	--	--	--	--	--

A = axial

R = radial

V = axial, extensioned

Motor Encoder

M	S	S			-				-			-					-				
---	---	---	--	--	---	--	--	--	---	--	--	---	--	--	--	--	---	--	--	--	--

N0 = without motor encoder

Electrical Connection

[illegible]

CN = cable lead out axially

Other Design

[illegible]

 = see project planning manual MBS

About this product

Fig. 1: Type codes MSSxx2



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

Type plate MSS stator

An individual type plate with the exact type designation and technical data are enclosed for each stator. Attach the type plate to an easily visible position at the machine. In this way, you can read the motor data at any time without having to work in areas that are difficult to access and where the motor may be attached.

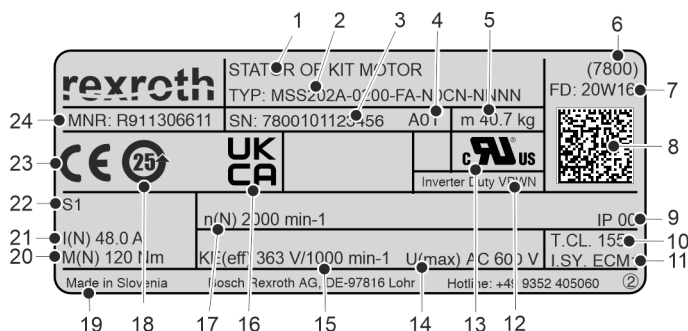


Fig. 2: Example of a MSS type plate

- | | | | |
|----|---------------------------------|----|------------------------------------|
| 1 | Type of machine | 13 | UL label |
| 2 | Type designation | 14 | Maximum input voltage |
| 3 | Serial number | 15 | R.m.s. voltage constant |
| 4 | Revision state | 16 | UK Conformity Assessed (UKCA) |
| 5 | Mass in kg | 17 | Rated velocity in mode S1 |
| 6 | Manufacturing plant | 18 | China-RoHS 2 label |
| 7 | Date of manufacture | 19 | Designation of origin |
| 8 | Rexroth barcode | 20 | Rated torque in mode S1 |
| 9 | Degree of protection by housing | 21 | Rated current in operation mode S1 |
| 10 | Thermal temperature class | 22 | Operation mode S1 |
| 11 | Insulation system | 23 | CE mark of conformity |
| 12 | Inverter Duty VPMW | 24 | Material number |

Type code MRSxx2

Product

M R S _ _ _ _ - _ _ - _ _ _ _ - _ _ _ _
M R S = rotor of a MBS kit motor

Frame Size

M R S _ _ _ - _ _ - _ _ _ _ - _ _ _ _
_ = see project planning manual MBS

Frame Length

M R S _ _ _ _ - _ - _ _ - _ _ _ _ - _ _ _ _
_ = see project planning manual MBS

Design

M R S _ _ _ _ - _ _ - _ _ _ _ - _ _ _ _
1 N = plain hole
2 N = step interference fit

Rotor Inner Diameter

M R S _ _ _ _ - _ _ - _ _ _ _ - _ _ _ _
_ = see project planning manual MBS

Other Design

M R S _ _ _ _ - _ _ - _ _ _ _ - _ _ _ _
_ _ _ _ = see project planning manual MBS

Fig. 3: Type code MRS



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

Type plate MRS rotor

An individual type plate with the exact type designation and technical data are enclosed for each rotor. Attach the type plate to an easily visible position at the machine. In this way, you can read the motor data at any time without having to work in areas that are difficult to access and where the motor may be attached.

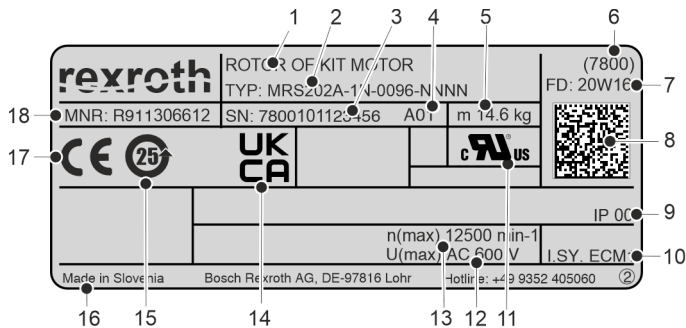


Fig. 4: Example of a MRS type plate

- | | |
|-----------------------------------|--|
| 1 Type of machine | 10 Insulation system |
| 2 Type designation | 11 UL label |
| 3 Serial number | 12 Maximum input voltage |
| 4 Revision state | 13 Highest allowed velocity (mechanical) |
| 5 Mass in kg | 14 UK Conformity Assessed (UKCA) |
| 6 Manufacturing plant | 15 China-RoHs 2 label |
| 7 Date of manufacture | 16 Designation of origin |
| 8 Rexroth barcode | 17 CE mark of conformity |
| 9 Degree of protection by housing | 18 Material number |

4.2.2 Certification mark

Table 4: Mark of conformity at type plate

Certification mark	Meaning
CE	Conformity with applicable EC Directives
C UL US	"registered component" according to UL + CSA
UKCA	UKCA approval
25	RoHS 2 conformity

5 Transport and storage

5.1 Transport instructions

Environmental conditions during transport

Transport our products only in their original package. Also refer to the specific ambient factors to protect the products from transport damage.

Based on EN IEC 60721-3-2:2018, the tables below specify classifications and limit values which are allowed for our products while they are transported by land, sea or air. Refer to the detailed description of the classifications to take all of the factors which are specified in the particular class into account.

Table 5: Allowed classes of environmental conditions during transport according to EN IEC 60721-3-2:2018

Classification type	Class
climatic environmental conditions	2K11
environmental conditions	2B1
chemically active substances	2C1
mechanically active substances	2S5
climatic environmental conditions	2M4

For a better overview, some essential environmental influencing variables of the previously mentioned classifications are listed. Unless otherwise specified, the values given are the values of the particular class. However, Bosch Rexroth reserves the right to adjust these values at any time based on future experiences or changed environmental factors.

Table 6: Permissible ambient conditions deviating from EN IEC 60721-3-2:2018

Environmental factor	Unit	Value ¹⁾
Temperature	°C	-25 ... +70
Relative air humidity	%	5 ... 75
Absolute air humidity	g/m³	1 ... 29
Occurrence of salt mist	-	Not permitted

1) Deviating from EN IEC 60721-3-2:2018



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

Lifting eyebolts

To lift the motor out of the transport crate or to install it in the machine, use the transport or lifting eyebolts at the motor.

The lifting eyebolts at least meet the requirements of DIN 580. Before each transport, ensure that the lifting eyebolts have been screwed down fully to the contact surface and that your selected lifting equipment and lifting method does not overstress the lifting eyebolts.



Please comply with DIN 580 on the transport of motors using the attached lifting eyebolts. Non-observance of the information in this standard can cause overstress to the lifting eyebolts and result in personal injury and/or product damage.

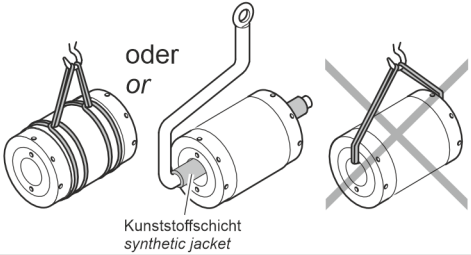
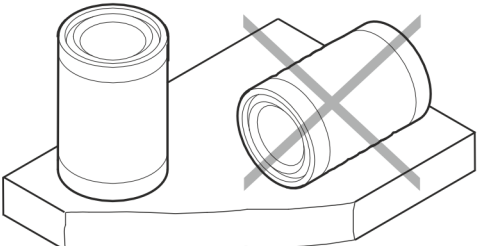
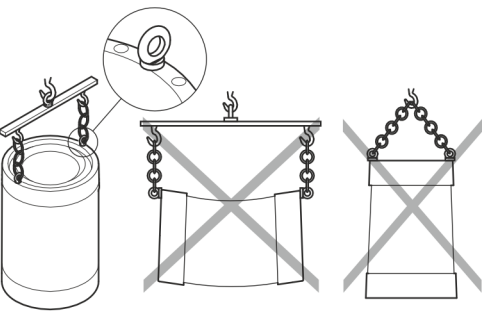
Achtung! Caution!	
Handhabungs- und Lager- vorschriften unbedingt beachten! <i>Note the handling and storage instructions!</i>	
Rotor Handhabung <i>Handling</i>	 oder or Kunststoffsicht synthetic jacket
Stator Rotor Lagerung <i>Storage</i>	
Stator Handhabung <i>Handling</i>	

Fig. 5: Transport MBSxx2

Please note:

- Use only suitable lifting gear.
- Use lifting eye bolts during transport in opposite holes only.

- Place the rotor and stator on a clean and level surface. If possible, both assemblies should be stored in vertical position and secured against falling over. If horizontal storage cannot be avoided for some frame sizes of rotors or stators, the components have to be secured against rolling. The surface on which the rotor is stored must not be magnetic.
- Damage to the fitting at the stator flanges has to be prevented to ensure that installation is not impeded.

Instructions on transport by air

If motor components with permanent magnets are shipped by air, the DGR (Dangerous Goods Regulations) 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.

5.2 Storage instructions

Environmental conditions during storage

NOTICE

Damage or destruction of motor components due to improperly handling during storage and transport!

- Observe the permitted environmental conditions for storage.
- Covers fitted to the motor at the factory must remain on the motor during transport and storage.

Generally, Bosch Rexroth recommends storing all components until they are actually installed in the machine as follows:

- at a dry and dustfree location
- at room temperature
- free from vibrations and oscillations
- protected against light or direct sunlight

Based on EN IEC 60721-3-1:2018, the tables below specify classifications and limit values which are allowed for our products while they are stored. Refer to the detailed description of the classifications to take all of the factors which are specified in the particular classification into account.

Table 7: Allowed classes of environmental conditions during storage according to EN IEC 60721-3-1:2018

Classification type	Class
Classification of climatic environmental conditions	1K21
Classification of biological environmental conditions	1B1
Classification of chemically active materials	1C1

Classification type	Class
Classification of mechanically active materials	1S10
Classification of mechanical environmental conditions	1M11

For a better overview, some essential environmental influencing variables of the previously mentioned classifications are listed. Unless otherwise specified, the values given are the values of the particular class. However, Bosch Rexroth reserves the right to adjust these values at any time based on future experiences or changed environmental factors.

Table 8: Permissible ambient conditions deviating from EN IEC 60721-3-1:2018

Environmental factor	Unit	Value
Air temperature	°C	-25 ... +55 ¹⁾
Relative air humidity	%	5 ... 75 ¹⁾
Absolute air humidity	g/m³	1 ... 29 ¹⁾
Direct solar radiation	-	Not permitted

1) Deviating from EN IEC 60721-3-1:2018

NOTICE	Damage due to moisture and humidity!
	– Protect the products from dampness and corrosion. – Store them only in rainproof and dry rooms. – Before storage, discharge the liquid coolant from liquid-cooled motors to avoid damage.

Storage times

The maximum storage duration is 2 years.

Storage durations of more than 6 months require conservation measures by the customer. Untreated metallic surfaces (e.g. shaft or flange) must be treated with a preserving agent to protect against corrosion.

Additional measures have to taken upon commissioning to ensure smooth functioning – irrespective of the storage time which may be longer than the warranty period of our products. However, this does not entail any additional warranty claims.

Table 9: Measures to be taken before commissioning motors or motor components in long-term storage

Storage time / months				Measures prior to commissioning
> 1	> 6	> 12	> 24	
●	●	●	●	Visual inspection of all parts to be damage-free
●	●	●	●	Resurface the holding brake ¹⁾
	●	●	●	Check conservation measures. Renew corrosion 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 ~20% of the specified nominal speed ²⁾

Storage time / months				Measures prior to commissioning
> 1	> 6	> 12	> 24	
		●	●	Measure insulation resistance. Dry the winding at a value of < 1kOhm per volt rated voltage.
			●	Function test and product revision if necessary by Bosch Rexroth Service

- 1) Only motors with holding brake are affected
- 2) Only motors with roller bearings are affected

6 Assembly

6.1 Screw lock

All screwed connections must be secured against potential impacts and vibrations during operation of the machine. A suitable and field-tested screw lock for all metal thread connections is, e.g., Loctite 243.

Loctite 243 is a liquid screw lock (medium-hard) and is applied to the parts to be mounted immediately prior to assembly. For detailed information on correct handling and processing, please refer to the manufacturer's data sheets under www.loctite.de. The manufacturer's homepage also provides information on hardening accelerators or other screw locks.

6.2 Mechanical assembly

6.2.1 Stator mounting

▲ WARNING

Strong magnetic forces may cause injury/damage!

The permanent magnets at the rotor and the resulting magnetic forces can cause the rotor to be abruptly pulled into the stator. Therefore, fasten the machine housing to the work table and only use lifting gear (e.g. crane with hoisting chains) which avoids uncontrolled movements of the rotor package while it is lowered into the stator.



Avoid...

- jamming or clamping or pitching the housing while mounting it to the machine,
- damaging the centering collar on the housing and the machine.



- In general, the stator has to be connected to the machine via all mounting holes.
- All screw connections are to be equipped with a liquid screw lock. See also ➔ Chapter 6.1 “Screw lock” on page 23.
- The necessary screw length for fastening the stator depends on the machine construction.
- The screwed connections has to be able to take up both the force due to the weight of the motor and the forces acting during operation.
- Use screws of the fastening class specified in the dimension sheet. The property class of the screws and the hardness category of the washers must be equivalent in order to transmit the required tightening torques.

The ➔ **MBSxx2 Project Planning Manual** Rexroth IndraDyn T includes installation instructions for general guidance. This describes a schematic structure without taking into account any special design features of the machine. The figures show parts that are required but are maybe not included in the Bosch Rexroth delivery and have to be appropriately dimensioned and provided by the user.

Starting position at assembly:

The motor components lie flat on a clean and flat base.

- Check whether the components are damaged. Damaged components must not be mounted.
- Provide tools, auxiliary material, measuring and test equipment and make sure that the rotor can be mounted in a clean, dry and dust-free environment.
- Check all components and mounting surfaces, holes and threads. Everything must be **clean, stainless and completely free from burrs**. Clean and deburr such areas if necessary.
- Prior to assembly, clean the contact surfaces of the stator with a suitable cleaning agent (e.g., RIVOLTA A.C.S.3).
- Screw the lifting eye bolts of the stator which are required for transport in mutually opposite threaded holes.

Ensure cleanliness during all working steps!

Fixing thread on the stator

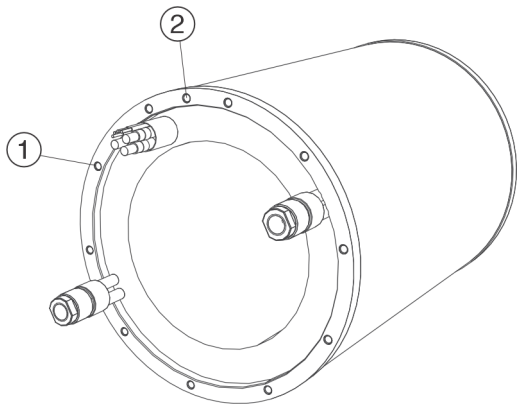


Fig. 6: Fastening thread for MSSxx2, for example.

- ① Circumferential fastening thread
- ② Fastening tread for ground connection

Stator MSS....	Stator fixing thread		Ground connection	
	Dimension	Amount (per end face)	Dimension	(Amount) (per end face)
102	M5 / 12 mm deep	8	M5 / 12 mm deep	1
142	M6 / 12 mm deep	10	M6 / 12 mm deep	1
162	M6 / 12 mm deep	6	M6 / 12 mm deep	1
182	M6 / 12 mm deep	6	M6 / 12 mm deep	1
202	M6 / 12 mm deep	10	M6 / 12 mm deep	1
242	M8 / 15 mm deep	12	M8 / 15 mm deep	1
272	M8 / 16 mm deep	12	M8 / 16 mm deep	1
312	M8 / 16 mm deep	14	M8 / 16 mm deep	1
381	M8 / 16 mm deep	18	M8 / 16 mm deep	1
382	M8 / 16 mm deep	18	M8 / 16 mm deep	1
482	M8 / 16 mm deep	18	M8 / 16 mm deep	1



Refer to the respective stator dimension sheet for the precise position of the threaded holes
➔ MBSxx2 Project Planning Manual.

6.2.2 Mounting the rotor

⚠ WARNING

Burns due to hot surfaces with temperatures above +100 °C when shrinking the rotor (rotor design 2N) onto the motor spindle!

- ⇨ When mounting the rotor on the motor spindle, heat the rotor to a temperature between +135 °C and +145 °C.
- ⇨ Mount the rotor with the utmost care. Wear heat-resistant working clothes and safety shoes.

⚠ CAUTION

Risk of injury due to heavily cooled parts with surface temperatures of at least -20 °C!

- ⇨ The motor spindle must be cooled to at least -20 °C before the rotor is shrunk on. Mount the hot rotor (rotor version 2N) on the cooled spindle with the utmost care. Wear heat- and cold-resistant working clothes and safety shoes.

⚠ WARNING

The rotor is magnetic! Risk of injury and danger of crushing body parts by magnetic forces!

- ⇨ Remove or secure any movable metal objects.
- ⇨ Strong magnetic and electromagnetic fields pose a health hazard for persons with heart pacemakers, metallic implants and hearing aids in the direct environment of motor components!
- ⇨ Please observe the notes in section ➔ Chapter 2.5.3 “Protection against magnetic and electromagnetic fields” on page 11.

For general orientation, the ➔ [MBSxx2 Project Planning Manual](#) contains installation instructions. This describes a schematic structure without taking into account the special design features of the machine. In this documentation, the figures also show parts that are required but are maybe not included in the Bosch Rexroth delivery and have to be appropriately dimensioned and provided by the user.

When inserting the rotor into the stator, take the radial and axial forces caused by magnetic force into account. Ensure by means of a mounting aid provided, that the rotor can be entered in a controlled manner into the stator and does not come into contact with the interior wall of the stator.

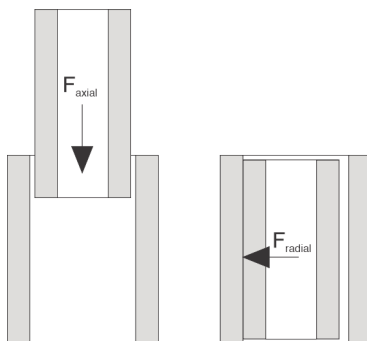


Fig. 7: Attractive forces during mounting

Table 10: Magnetic attractive forces

Type MRS...	F_{axial} [N]	F_{radial} [N]
102B	295	190
102D	445	
102F	740	
142B	635	265
142D	890	
142F	1140	
162B	960	310
162D	1215	
162F	1528	
162J	1975	
182A	215	360
182B	1500	
182D	1,890	
182F	2730	
182N	1280	
202A	1,660	420
202B	2210	
202D	2760	
202F	3860	
242B	3050	480
242D	4,580	
242F	5490	
272B	5290	570
272D	6880	
272F	8470	
312B	9180	690
312D	11480	
312F	13,780	
312H	16,850	
382B	12270	870
382D	22,280	
382F	27,280	

6.3 Electrical connection

6.3.1 Power connection

Connection diagram

NOTICE

Direct connection to the 50/60 Hz external supply network (three-phase or single-phase) results in motor destruction!

MBSxx2 motors can only be operated with suitable drive controllers with variable output voltage and frequency (converter mode) as specified by Bosch Rexroth.

The following figure shows the connection diagram with two options for power connection.

Please note:

- For thermal protection of the motor the temperature sensor SNM.150.DK needs to be connected to the controller .
- The temperature sensor STS1 is to be used only for external temperature measurements.

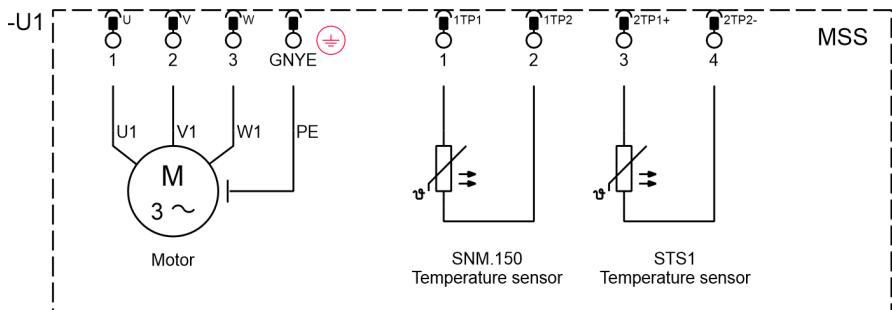


Fig. 8: MSS connection diagram

Connection and wire designation

The power connection of a kit spindle motor can be done as

- clamping connection** (terminal box) or as
- plug-in connection** (device connector).

As illustrated in the figure below, the stator is provided with an approx. 1.5 m long bundled cable connection (consisting of multiple single-core wires within a protective conduit). The bundled cable connection consists of three power wires and two wire pairs for the PTC thermistors in the winding head. At cross-sections exceeding 10 mm², the power connection wires in the bundled cable are marked with U-V-W. Smaller power wire cross-sections can be color-coded.

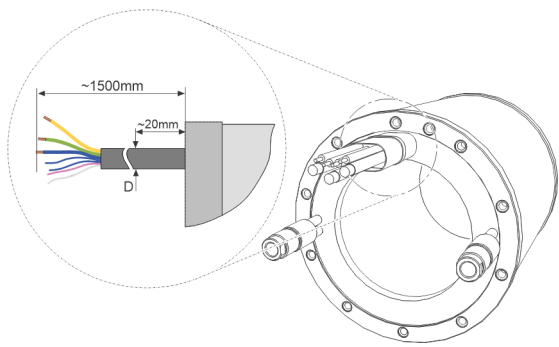


Fig. 9: Bundled cable connection of MSS stator

D Diameter of the bundled cable connection at a distance of approx. 20 mm from the outlet at the stator

Bundled cable connection wires

The cross-sections of power wires in the bundled cable connection depend on the rated current of the motor. For information on wire cross-section, refer to the following table.



The bundled cable connection connects to the motor internally. For this reason, the insulation of the cable connection running out of the motor is designed for higher temperatures than the power cables used for connection between the stator and controller. For this reason, the minimum cross-sections for power wires specified in the motor data sheet may deviate from the power wire cross-sections specified in the table below.

Table 11: Bundled cable connection - cross sections and diameters of wires

Type	Power wires cross section mm ²	Connection cable diameter (D) mm
MSS102B-0800-_-_-	AWG12	13.0
MSS102B-1600-_-_-	AWG8	22.0
MSS102D-0800-_-_-	AWG12	13.0
MSS102F-0300-_-_-	AWG14	13.0
MSS102F-0800-_-_-	10.0	22.0
MSS142B-0700-_-_-	AWG8	22.0
MSS142D-0700-_-_-	16.0	22.0
MSS142F-0400-_-_-	16.0	22.0
MSS142F-0700-_-_-	16.0	22.0
MSS162B-0200-_-_-	AWG12	13.0
MSS162B-0400-_-_-	AWG8	22.0
MSS162D-0400-_-_-	16.0	22.0
MSS162F-0310-_-_-	16.0	22.0

Type	Power wires cross section mm ²	Connection cable diameter (D) mm
MSS162J-0200- _ _ _	16.0	22.0
MSS162J-0500- _ _ _	25.0	30.0
MSS182A-0100- _ _ _	AWG14	13.0
MSS182A-0250- _ _ _	AWG14	13.0
MSS182B-0280- _ _ _	16.0	22.0
MSS182D-0260- _ _ _	16.0	22.0
MSS182F-0200- _ _ _	16.0	22.0
MSS182F-0550- _ _ _	2 x 10.0	2 x 22.0
MSS182N-0600- _ _ _	10.0	22.0
MSS202A-0200- _ _ _	AWG8	22.0
MSS202B-0150- _ _ _	AWG8	22.0
MSS202B-0210- _ _ _	25.0	30.0
MSS202D-0170- _ _ _	16.0	22.0
MSS202D-0360- _ _ _	25.0	30.0
MSS202F-0120- _ _ _	16.0	22.0
MSS202F-0350- _ _ _	2 x 25.0	2 x 30.0
MSS242B-0100- _ _ _	16.0	22.0
MSS242D-0070- _ _ _	16.0	22.0
MSS242F-0060- _ _ _	16.0	22.0
MSS272B-0065- _ _ _	16.0	22.0
MSS272B-0080- _ _ _	25.0	30.0
MSS272D-0050- _ _ _	16.0	22.0
MSS272F-0040- _ _ _	16.0	22.0
MSS312B-0035- _ _ _	16.0	22.0
MSS312D-0028- _ _ _	25.0	30.0
MSS312D-0060- _ _ _	25.0	30.0
MSS312F-0028- _ _ _	16.0	22.0
MSS312H-0025- _ _ _	16.0	22.0
MSS312H-0085- _ _ _	2 x 25.0	2 x 30.0
MSS381B-0025- _ _ _	2 x 16.0	2 x 22.0
MSS381F-0018- _ _ _	2 x 16.0	2 x 22.0
MSS382B-0025- _ _ _	2 x 16.0	2 x 22.0
MSS382D-0020- _ _ _	2 x 16.0	2 x 22.0
MSS382F-0018- _ _ _	2 x 16.0	2 x 22.0

Type	Power wires cross section mm ²	Connection cable diameter (D) mm
MSS482A-0200- - - -	16.0	22.0

Table 12: Bundled cable connection - cross sections of sensor wires and their permissible static bending radius

Cross section of sensor wires [mm ²]	Minimal static bending radius [mm]
2 x 0.25 (STS1)	4 x D
2 x 0.5 (SNM150)	

Bundled cable connection installation

The power cable that exits from the stator has open wire ends and must not be subjected to dynamic bending loads.

When wiring the cables, it must be ensured that:

- the specified admissible bending radius of the connection cable is observed (see → Tab. 12),
- the edges of the through holes at the spindle housing are rounded or protected by a plastic sleeve.

Power connection via terminal box

For clamp connection, the wires in the bundled cable of the stator are connected to the power cable inside a terminal box. The terminal box can be attached to the spindle housing. Inside, a three-pole terminal board for power connection and a terminal strip with at least four clamping points for PTC thermistors connection must be installed. A complete terminal box consists, for example, of the following components:

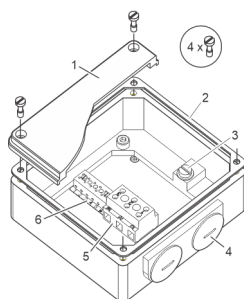


Fig. 10: Terminal box

- ① Cover
- ② Seal
- ③ PE connection
- ④ Cable entry
- ⑤ U-V-W power connection
- ⑥ Terminal strip

Please note:

These components are not provided by MBSxx2 and are not part of the standard delivery.

When selecting the components make sure that:

- The components are suitable for currents and voltages of the chosen drive system, particularly for high DC bus voltages up to 750 V_{DC}.
- Required cross-sections and connection threads of cable glands fittings are used.
- Sufficient degree of protection is ensured. Minimum protection class IP65 is recommended.

Power connection with device connector

⚠ WARNING

Risk of personal injury or damage to property due to disconnecting or connecting live plug connections!

- Only disconnect or connect plug connections when they are dry, clean and de-energized.
- During operation of the system, all plug connections must be firmly locked or screwed tight.

When choosing the device connector a range of possible solutions are possible. The preferred types for pin connectors that can be used on the motor side are shown in figure below.

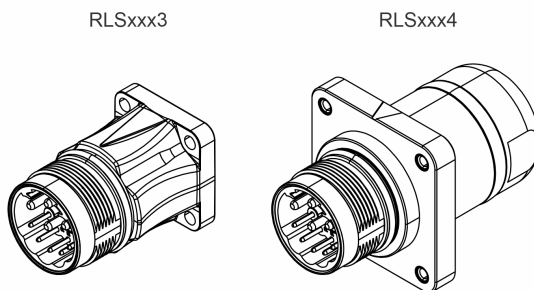


Fig. 11: RLSxxx3 and RLSxxx4 flange connectors

The required connection cross-section is determined based on the continuous current of the motor. For the smallest frame size 102 this corresponds to size M23 power connector. For technical specifications on other frame sizes refer to the motor data sheet in ➔ [MBSxx2 Project Planning Manual](#). For more connector types offered by MBSxx2 and their technical specifications see ➔ [plug connector products documentation](#).

The following table shows the range of flange sockets and flange connectors available to order.

Table 13: Flange connectors range

Power connector size	Flange socket RLSxxx3			Flange connector RLSxxx4		
	Designation	Material number	Maximum rated current plug-in connector power	Designation	Material number	Maximum rated current plug-in connector power
↪ M23	RLS2303/C02	R911381141	18 A (CSA), 27 A (UL)	RLS2304/CM01	R911386848	18 A (CSA), 27 A (UL)
↪ M23	RLS2303/C03	R911394319	18 A (CSA), 27 A (UL)	RLS2304/CM02	R911386847	18 A (CSA), 27 A (UL)
↪ M40	RLS4003/C03	R911383818	40 A (CSA), 65 A (UL)		N/A	
↪ M40	RLS4003/C06	R911383819	40 A (CSA), 65 A (UL)		N/A	
↪ M58	RLS5803/C16	R911389981	97 A (CSA), 110 A (UL)		N/A	
↪ M58	RLS5803/C25	R911389982	97 A (CSA), 110 A (UL)		N/A	

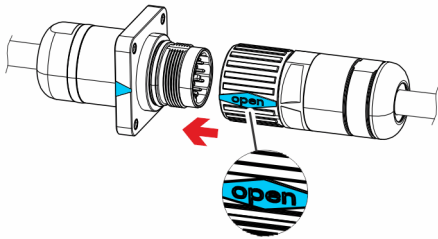
Please note:

- If a power cable dimensioned by Bosch Rexroth is used, the connection wires of the temperature sensor (STS1) must not be connected to the controller. For temperature measurement and analysis, they are to be connected to an external unit.
- Special tools are required for preparing plug-in connections with crimp contacts.
- When connecting the flange sockets protect the device connectors from external forces.

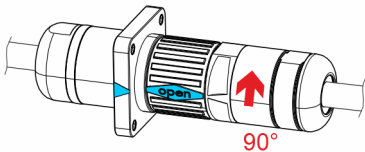
Connecting SpeedCon connectors

Before connecting, please ensure properly measured ready-made connection cables are available. The type, size and cable cross section of the plug-in connector must be adjusted to the motor.

1. ➔ Align the notch on the flange connector with an "open" label and insert the power connector.



2. ➔ Manually tighten the power connector with a rotation by approximately 90°.



3. ➔ Check the firm seat of the SpeedCon quick lock by a short pull on the connector.

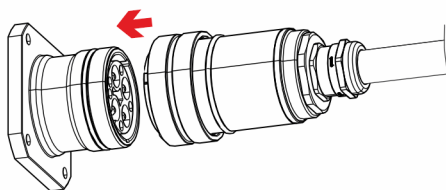
4. → Secure the cables, so that transmission of forces due to cable vibrations onto the connector are prevented.

➡ The plug-in connector is ready for use.

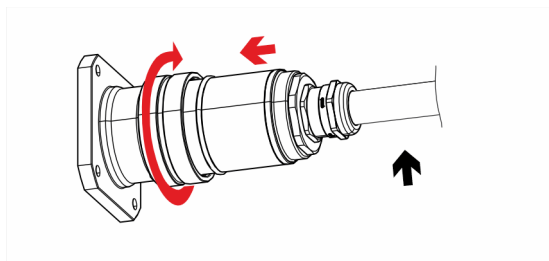
Connecting M58 threaded connector

Before connecting, please ensure properly measured ready-made connection cables are available. The type, size and cable cross section of the plug-in connector must be adjusted to the motor.

1. → Position the power connector towards the thread.



2. → Tighten the knurled nut securely, in doing so, retrace the cable.



3. → Check the firm seat of the connection by a short pull on the connector.
 4. → Secure the cables, so that transmission of forces due to cable vibrations onto the connector are prevented.
- ➡ The plug-in connector is ready for use.

Ready-made connection cables

The power supply to the device connector or terminal box junction can be realized using a power cable that connects to the controller. Bosch Rexroth provides a wide range of ready-made cables for motors connection. These cables are optimally adapted to the products and a great variety of requirements, see [ctrlX Motor Cables and Connectors](#). Please contact your sales partner in case of questions about available connection cables.

Significant advantages of Bosch Rexroth's ready-made cables are:

- Ready for connection without any additional finishing.
- Designed for continuous alternating bending stress.
- Resistant against mineral oil, grease and bio-oil, silicone and halogen-free, low-adhesion.
- Use of cables approved according to UL and CSA.
- Flammability fulfills requirements of VDE0472-804.
- Compliance with the EMC directives and protection class up to IP67.

NOTICE

Note that self assembled cables or cable systems of other manufactures possibly do not meet these requirements. Bosch Rexroth shall not be held responsible for resulting malfunction states or damage.

6.3.2 Ground connection

The grounding connection of the stator must be realized after installation into the machine by means of a separate cable. For this purpose, the stator is equipped with threaded bores for grounding connection at both face ends. Fasten the ground cable with a ring terminal at one of these threaded holes. For grounding connection, observe all applicable standards.

For details on the exact position and the connection thread of the threaded hole, refer to the dimensional drawing of the respective motor (see ➔ [MBSxx2 Project Planning Manual](#)). The power wire cross-section specified in the data sheet of the motor is also applies for the grounding cable and must be complied with (see ➔ [MBSxx2 Project Planning Manual](#)).

6.3.3 Sensors

Encoder

Encoder and encoder connection components are not included in the scope of delivery of the motor. Select the components according to the machine requirements.

Temperature sensors

In their standard configuration, MSSxx2 stators are equipped with integrated SNM.150.DK.* temperature sensors for motor protection. All stators are fitted with an additional temperature sensor STS1 for external temperature measurement.

To ensure safe motor protection against thermal overload, the temperature sensor SNM.150.DK has to be connected to the drive controller. Observe the respective connection diagram for the selected connection type in ➔ [Chapter 6.3.1 "Power connection" on page 28](#) to connect the temperature sensors.



- To ensure safe motor protection against thermal overload, temperature sensor SNM.150.DK has to be connected to the drive controller.
- The STS1 temperature sensor can be connected for external temperature measurement in any polarity.
- The STS1 temperature sensor is ESD-protected (ESD = electrostatic discharge).

Please also observe the notes on motor temperature monitoring in the ➔ [MBSxx2 Project Planning Manual](#).

6.4 Motor cooling

6.4.1 Coolant connection

The coolant connections at the stator can be realized "axially" or "radially".

The assignment of inlets and outlets does not influence the performance data of the motor. For standardization and easier handling, an arrangement once established should be retained.

For details on the dimension, shape and position of the coolant connections, refer to the dimensional drawing of the respective motor.

Install systems in the cooling circuit for monitoring flow, pressure and temperature.

i You need other installation materials like couplings, tubes and fastening clips (not in the scope of delivery) to supply motors with a coolant.

The machine manufacturer is responsible for ensuring that the coolant connection is tight and for verifying and accepting the tightness after the motor has been installed.

Additional, regular inspections to ensure proper condition of the coolant connection should be logged in the maintenance schedule of the machine.

"Axial" coolant connection

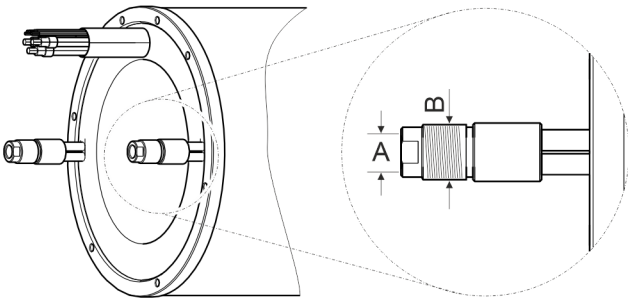


Fig. 12: "Axial" coolant connection

A Thread diameter for coolant connection

B Thread for coolant connection at the machine

Table 14: Overview of axial coolant connection threads

Stator MSS....	Thread A	Thread B
102 / 142	G 1/8	M16 x 1
162 / 182	G 1/8	M16 x 1
202 / 242	G 1/4	M22 x 1.5
272 / 312 / 382	G 1/2	M30 x 1.5
482	G 3/8	-

"Radial" coolant connection

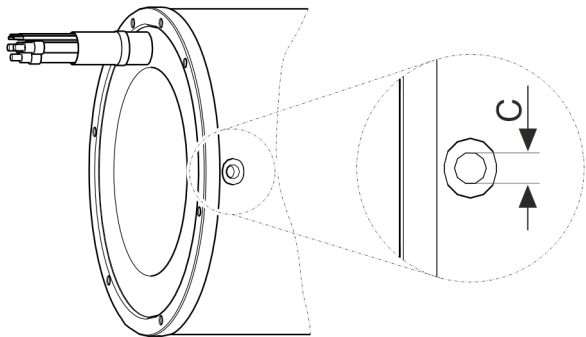


Fig. 13: "Radial" coolant connection
C Thread diameter for coolant connection

Table 15: Overview of radial coolant connection threads

Stator MSS....	Thread C
162 / 182	G 1/8
312	G 1/4

Realization and sealing of coolant connection

To seal the coolant connection thread, Bosch Rexroth therefore recommends to use screw connections which already contain an O-ring for sealing the screw connection in axial direction.
Not suited are sealings made of hamp, teflon-tape or with conical thread, as this mode of sealing can permanently damage the connection thread or lead to excessively overload due to unprofessional execution.

There are the following possibilities to connect liquid cooling, for example:

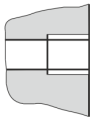
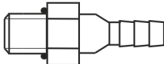
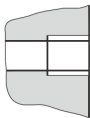
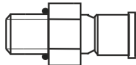
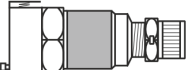
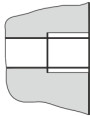
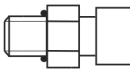
Connection mode	Draft			
Tube clip	Motor 	Tube clip with thread 	Tube 	Hose clamp 
Fast coupling connector	Motor 	Coupling with thread 	Coupling with clamp connection 	Tube 
Clamp connection	Motor 	Clamp connection with thread 	Tube 	

Fig. 14: Connection examples of liquid cooling

6.4.2 Operating pressure

The maximum coolant inlet pressure of **6 bar** applies to all MBSxx2 motors, in relation to the pressure effectively existing directly at the coolant connection of the motor.

Please observe that additional screw connections or junctions in the cooling circuit can reduce the flow and supply pressure of the cooling medium.

Select well-spaced dimensioned connection screws and tube diameters.

7 Commissioning and operation

7.1 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.
 - ► Do not connect or disconnect plug-connectors and connection clamps.

▲ WARNING

Risk of injury due to rotating motor shaft!

- Do not remove covers, machine parts or protective devices during operation.
 - Do not enter the motion area of the machine. Prevent personnel from accidentally entering the machine's range of motion by using, for example:
 - Safety fences, safety screens or protective covers.
 - Light barrier

▲ CAUTION

Thermal hazard due to hot surfaces during operation with temperatures over 70 °C.

- 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.

7.2 Environmental conditions during operation

Environmental conditions during operation

Environmental conditions during operation are defined according to EN IEC 60721-3-3:2019 in different classes. They are based on worldwide long-term experiences and take all influencing variables into account, e.g., air temperature and air humidity.

Table 16: Allowed classes of environmental conditions during operation according to EN IEC 60721-3-3:2019

Classification type	Allowed class
Classification of climatic environmental conditions	3K22
Classification of biological environmental conditions	3B1
Classification of mechanically active materials	3S6
Classification of mechanical environmental conditions	3M12

Based on EN IEC 60721-3-3:2019 , some limit values are partially defined in the following, which our products are allowed to be exposed to during operation. Unless otherwise specified, the values given are the values of the particular class. Observe the detailed description of the classifications to take all of the factors which are specified in the particular class into account.

However, Bosch Rexroth reserves the right to adjust these values at any time based on future experiences or changed environmental factors.

Table 17: Allowed operation conditions

Environmental factor	Unit	Value
Temperature	°C	0 ... +40 ¹⁾
		+5 ... +40 ²⁾
Relative air humidity	%	5 ... 95 ¹⁾
Absolute air humidity	g/m ³	1 ... 29 ¹⁾

Environmental factor	Unit	Value
Installation altitude	m	up to 1,000 m above sea level

¹⁾ Deviating from EN IEC 60721-3-3:2019

²⁾ for water cooling

7.3 Commissioning



The motor can be operated only after installation into a machine. For start up, please observe the documentation of all system components. For detailed start up procedure of the motors refer to the [MBSxx2 Project Planning Manual](#) and the respective documentation about drive controller or firmware description.

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

- Make sure that the motor cooling as well as the motor are mechanically and electrically connected correctly.
- Ensure that the motor and all participating components of the drive are undamaged and functional (e.g. encoder, cooling, brake, ...).
- Make sure that the axis can rotate freely over the complete rotation range.
- Observe the general safety instructions for the protection of hazardous movements [Chapter 2.5 "Product and technology-dependent safety instructions"](#) on page 10

7.4 Operation

During operation, the environmental and operating conditions and technical data specified in the [MBSxx2 Project Planning Manual](#) must be observed.

Checks during operation:

1. Pay attention to exceptional noise.
2. Pay attention to increased vibrations.
3. Check the motor for cleanliness.
4. Check the tightness of the coolant connections.
5. 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 [Chapter 9.1 "Disassembly"](#) on page 43.

7.5 Operation with third-party controllers

Rate of rise of voltage

The electrical insulation system of the motor is subject to a higher dielectric load in converter mode than when it is operated with a merely sinusoidal source voltage. The voltage load of the winding insulation in converter mode is mainly defined by the following factors:

- Crest value of voltage
- Rise time of pulses at the motor terminals

- Switching frequency of final converter stage
- Length of power cable to the motor

Main components are the switching times of the final converter stage and the length of the power cable to the motor. The rates of rise of the voltage occurring at the motor may not exceed the pulse voltage limits specified in **DIN VDE 0530-25 (VDE 0530-25): 2009-08 (picture 14, limit curve A)**, measured at the motor terminals of two strands in relation to the rise time.



These limits are complied with by the final stages of Rexroth converters.

8 Maintenance

8.1 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.

8.2 Service repair, maintenance and spare parts

Increase availability with regular preventive maintenance measures. Observe the machine manufacturer's instructions in the machine maintenance plan and the maintenance measures described below.

The following points should be observed and if necessary restored during the preventive check of motor and auxiliary components:

- Noticeable sound during operation
- State of power and encoder cables in a drag chain.
- Rated current of the motor

Table 18: Maintenance measures

Measure	Interval
Check the cooling system for proper functioning.	According to the specifications in the machine maintenance plan, but at least every 1000 operating hours.
Check the mechanical and electrical connections.	According to the specifications in the machine maintenance plan, but at least every 1000 operating hours.
Check the machine for smooth running, vibrations and bearing noise.	According to the specifications in the machine maintenance plan, but at least every 1000 operating hours.
Remove dust, chips and other dirt in the motor, from the motor housing, cooling fins and the connections.	Depending on the degree of soiling, but after one operating year at the latest.

 Our worldwide service network provides an optimized and efficient support. Our experts offer you advice and assistance should you have any queries. You can contact us **24/7**.

Service Germany

Our technology-oriented Competence Center in Lohr, Germany, is responsible for all your service-related queries for electric drives and controls.

Contact the **Service Helpdesk & Hotline**Service Helpdesk & Hotline under:

Table 19: Service Helpdesk

Telephone:	+49 9352 40 5060
Fax:	+49 9352 18 4941
Email:	↗ service.svc@boschrexroth.de
Internet:	↗ www.boschrexroth.com

Additional information on service, repair (e.g. delivery addresses) and training can be found on our internet sites.

Service worldwide

Outside Germany, please contact your local service office first. For hotline numbers refer to the sales office addresses on the Internet.

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, e-mail address)

9 Disassembly

9.1 General notes about disassembly

⚠ DANGER	Fatal injury due to errors during the activation of motors or work on moving elements! – Work on machines is only allowed if they are secured and while they are not running. – Before starting disassembly, secure the machine against unforeseeable movements and against unauthorized operation. – Before dismounting the motor and the supply lines, secure them against dropping or moving and disconnect the mechanical connections only thereafter.
⚠ 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. – Do not connect or disconnect plug-connectors and connection clamps.
NOTICE	The machine manufacturer must observe the special features of the construction and create a special disassembly instruction for the motor components. Only this disassembly instruction of the machine manufacturer is binding.

Basic procedure for disassembly:

1. ➤ Observe the disassembly instruction of the machine manufacturer.
2. ➤ Use the machine-side control command to decelerate the drive to a controlled standstill.
3. ➤ Switch off the power and control voltage of the controller.
4. ➤ Switch off the main switch of the machine and deactivate external systems according to the instructions of the manufacturer.
5. ➤ Secure the machine against accidental movements and against unauthorized operation.
6. ➤ Wait until the discharge time of the electrical systems has elapsed and then disconnect all electrical connections. Secure electric cables and contacts against contact with other electrical parts.
7. ➤ Remove dirt, chips and other any kind of residues from the motor.
8. ➤ Before disassembling the motor and the supply lines, secure them against dropping or movements. Subsequently, disconnect the mechanical connections.
9. ➤ Right after disassembly, store or transport the motor components in its origin package.
10. ➤ If necessary, record all measures in the commissioning log or machine maintenance plan.

10 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

11 Troubleshooting

11.1 Procedure

Possible causes for failures of motors can be restricted to the following areas:

- Motor cooling circuit and temperature curve
- Internal temperature sensor
- Mechanical damage of the motor
- Mechanical connection to machine

Encoder and temperature sensor are controlled by the controller or the control unit; corresponding diagnostic messages are displayed. Observe the instructions in the corresponding documentation.

The sections below describe examples of some fault states Fault states along with possible causes. This list is not exhaustive.

Table 20: Failure condition

Malfunction	Error cause	Measures
Motor does not run	a) Drive enable is missing	a) Activating drive enable
	b) Controller fault	b) Troubleshooting according to the documentation of the controller
	c) Supply voltage missing	c) Check the supply voltage
	d) Brake not released	d) Check brake control
Vibrations	a) Coupling elements or attachments are poorly balanced	a) Re-balance
	b) Adjustment of shaft end attachments (coupling, gearbox, ...) is insufficient	b) Re-align the attachments
	c) Fastening screws are loose	c) Lock screw connections acc. to specifications
Running noise	a) Foreign bodies within the motor	a) Stop operation of the motor -> repair by manufacturer
	b) Bearing is damaged	b) Stop operation of the motor -> repair by manufacturer
High motor temperatures	Operation outside of rated data	Reduce load and check the dimensioning
Motor temperature monitoring is activated	Heat dissipation is impaired	Clean the motor For liquid cooling, check cooling circuit.
Wrong or defective temperature display	a) Temperature sensor not connected	a) Connect temperature sensor
	b) Temperature sensor is defective	b) Connect backup temperature sensor or Stop the motor --> repair by manufacturer



In the case of malfunctions or troubleshooting, please observe the notes in the project planning manual, too. Contact the manufacturer, if necessary.

12 Appendix

12.1 Declarations of Conformity

12.1.1 EU Declaration of conformity



The latest edition of the EU Declaration of Conformity can be found in the Bosch Rexroth media directory: ➔ www.boschrexroth.com/MediaDirectory, search word: ➔ "DCTC-30322-004".



EU-Konformitätserklärung - Original

EU declaration of conformity

Dok.-Nr. / Doc. No.: DCTC-30322-004

Datum / Date: 2022-08-29

☐
☒
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nach Maschinenrichtlinie 2006/42/EG / in accordance with Machinery Directive 2006/42/EC

nach Niederspannungsrichtlinie 2014/35/EU / in accordance with Low Voltage Directive 2014/35/EU

nach EMV-Richtlinie 2014/53/EU / in accordance with EMC Directive 2014/53/EU

nach ATEX-Richtlinie 2014/34/EU / in accordance with ATEX Directive 2014/34/EU

nach Ökodesign-Richtlinie (ErP) 2009/125/EG (Verordnung ...) / in accordance with Ecodesign Directive (ErP) 2009/125/EC (Commission Regulation ...)

Produkt im Geltungsbereich der RoHS-Richtlinie 2011/65/EU / Product not in the scope of RoHS Directive 2011/65/EU

nach RoHS-Richtlinie 2011/65/EU / in accordance with RoHS Directive 2011/65/EU

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

Geltungsbereich RoHS-Richtlinie für Produkte des Herstellers: DCTC-30806-006 „Herstellereklärung 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“

Hiemit erklärt der Hersteller. / The manufacturer

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

dass die nachstehenden Produkte / hereby declares that the products below

Bezeichnung / Name: 3-PHASE SYNCHRONOUS MOTOR

Baureihen / Series:	Rotoren / rotors	Statoren / stators
MBS102...	MRS102...	MSS102...
MBS142...	MRS142...	MSS142...
MBS160...	MRS160...	MSS160...
MBS162...	MRS162...	MSS162...
MBS182...	MRS182...	MSS182...
MBS200...	MRS200...	MSS200...
MBS201...	MRS201...	MSS201...
MBS202...	MRS202...	MSS202...
MBS203...	MRS203...	MSS203...
MBS242...	MRS242...	MSS242...
MBS272...	MRS272...	MSS272...
MBS312...	MRS312...	MSS312...
MBS382...	MRS382...	MSS382...
MBS482...	MRS482...	MSS482...

Handelsbezeichnung / Trade name: Rexroth

ab Herstellungsdatum / from the date of manufacture: 2022-08-29

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

Die alleinige Verantwortung für die Ausstellung dieser EU-Konformitätserklärung trägt der Hersteller. / This EU declaration of conformity is issued under the sole responsibility of the manufacturer.

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Declarations of Conformity

EU-Konformitätserklärung - Original
EU declaration of conformity

Seite Page 2 / 2
DCTC-30322-004 : 2022-08-29

Angewandte harmonisierte Normen / Harmonized Standards applied:

Norm / Standard	Titel / Name	Ausgabe / Issue
EN 60034-1 (IEC 60034-1)	Drehende elektrische Maschinen – Teil 1: Bemessung und Betriebsverhalten / Rotating electrical machines – Part 1: Rating and performance	2010 + Cor.:2010 (2010, modifiziert)
EN IEC 60034-5 (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 (2020)
EN IEC 61800-3 (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 (2017)

Weitere Erläuterungen / Further explanations:

Die Montage- und Installationshinweise gemäß Produktdokumentation sind zu beachten. / The assembling and installation
instructions according to the manual have to be followed.

Lohr a.Main	2022-08-29	ppa.	i.v. / p.p.
Ort / Place	Datum / Date	Uwe Czychy Technische Werkleitung / Plant Manager	Dr. Hans-Jürgen Wehner Product Owner/Servo Motors and Gear boxes

Änderungen im Inhalt der EU-Konformitätserklärung sind vorbehalten. Derzeit gültige Ausgabe auf Anfrage.
We reserve the right to make changes to the content of the EU Declaration of Conformity. Current issue on request.

12.1.2 UKCA Declaration of conformity



The latest edition of the UK Declaration of Conformity can be found in the Bosch Rexroth media directory: ➔ www.boschrexroth.com/MediaDirectory, search word: ➔ "DCTC-30322-034".



A Bosch Company

UK Declaration of Conformity

Doc. No.: DCTC-30322-034

Date: 2022-08-29

☐ 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 (Amendment) (EU Exit) Regulations 2019, S.I. 2019/539

☐ Product in the scope of RoHS Directive 2011/65/EU

☐ 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 Directive 2011/65/EU

Product meets the substance restriction requirements of the directive

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 products below

Name: 3-PHASE SYNCHRONOUS MOTOR

Series:	Rotoren / rotors	Statoren / stators
MBS102...	MRS102...	MSS102...
MBS142...	MRS142...	MSS142...
MBS160...	MRS160...	MSS160...
MBS162...	MRS162...	MSS162...
MBS182...	MRS182...	MSS182...
MBS200...	MRS200...	MSS200...
MBS201...	MRS201...	MSS201...
MBS202...	MRS202...	MSS202...
MBS203...	MRS203...	MSS203...
MBS242...	MRS242...	MSS242...
MBS272...	MRS272...	MSS272...
MBS312...	MRS312...	MSS312...
MBS382...	MRS382...	MSS382...
MBS482...	MRS482...	MSS482...

Trade name: Rexroth

from the date of manufacture: 2022-08-29

were developed, designed and manufactured in compliance with the above-mentioned statutory instrument(s). This UK Declaration of Conformity is issued under the sole responsibility of the manufacturer.

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UK Declaration of Conformity

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DCTC-30322-034: 2022-08-29

Designated Standards or other technical standards and regulations applied:

Standard	Name	Issue
EN 60034-1	Rotating electrical machines – Part 1: Rating and performance	2010 + Cor.:2010
EN 60034-5	Rotating electrical machines – Part 5: Degrees of protection provided by integral design of rotating electrical machines (IP code) – Classification	2001/A1:2007
EN 61800-3	Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods	2004/A1:2012

Further explanations:

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

_____ Lohr a.Main Place	, 2022-08-29 ppa. _____ Date Uwe Czychy Plant Manager LoP2	p.p. _____ Dr. Hans-Jürgen Wehner Product Owner Servo Motors and Gear Boxes
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We reserve the right to make changes to the content of the UK Declaration of Conformity. Current issue on request.

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