

Rexroth MKE Synchronous Motors for Potentially Explosive Areas according to ATEX and UL/CSA

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Project Planning Manual



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Table of Contents

	Page
1 Introduction to the Product.....	1
1.1 MKE.....	1
1.1.1 General.....	1
1.1.2 Versions.....	2
1.2 About this Documentation.....	3
1.2.1 Structure of this Document Edition.....	3
1.2.2 Additional Documentation.....	3
1.2.3 Standards.....	3
1.2.4 External Systems.....	4
1.2.5 Your Feedback.....	4
2 Important Instructions on Use	5
2.1 Intended Use	5
2.1.1 Introduction.....	5
2.1.2 Areas of Use and Application.....	5
2.2 Inappropriate Use.....	6
3 Safety Instructions for Electric Drives and Controls.....	7
3.1 Safety Instructions - General Information.....	7
3.1.1 Using the Safety Instructions and Passing them on to Others.....	7
3.1.2 How to Employ the Safety Instructions.....	7
3.1.3 Explanation of Warning Symbols and Degrees of Hazard Seriousness.....	8
3.1.4 Hazards by Improper Use.....	9
3.2 Instructions with Regard to Specific Dangers.....	10
3.2.1 Protection Against Contact with Electrical Parts and Housings.....	10
3.2.2 Protection Against Electric Shock by Protective Extra-Low Voltage.....	11
3.2.3 Protection Against Dangerous Movements.....	11
3.2.4 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting.....	14
3.2.5 Protection Against Contact with Hot Parts.....	14
3.2.6 Protection During Handling and Mounting.....	14
3.2.7 Battery Safety.....	15
3.2.8 Protection Against Pressurized Systems.....	15
4 Technical Data	17
4.1 Definition of Parameters.....	17
4.1.1 Parameters on the Data Sheet.....	17
4.1.2 Parameters of the Characteristic Curves.....	18
4.2 MKE037.....	20
4.3 MKE047.....	22
4.4 MKE098.....	24
4.5 MKE118.....	27

Table of Contents

	Page
5 Specifications	33
5.1 Specifications MKE037.....	33
5.2 Specifications MKE047.....	36
5.3 Specifications MKE098.....	39
5.4 Specifications MKE118.....	42
6 Type Codes	45
6.1 Description.....	45
6.2 MKE037.....	47
6.3 MKE047.....	49
6.4 MKE098.....	51
6.5 MKE118.....	53
7 Options and Accessories	55
7.1 Motor Encoder.....	55
7.2 Holding Brakes.....	56
7.3 Gearboxes.....	57
7.3.1 General.....	57
7.3.2 Planetary Gearbox	57
8 Connection Technique	59
8.1 Variants.....	59
8.2 Motor Connection according to European Standard (EU).....	61
8.3 Connection according to American Standard (UL).....	62
8.4 Dimensioning Power Cable.....	63
8.5 Cable – Handling and Installation Recommendations	63
9 Operating Conditions and Application Notes	67
9.1 Potentially Explosive Areas	67
9.1.1 Terms and Definitions	67
General.....	67
The following terms are used in the European Standard EN 50014: 1992.....	68
Zones.....	70
Degree of ignition protection, groups and temperature classes.....	70
9.1.2 Application Conditions for MKE Motors.....	71
General.....	71
Motor-internal holding brake (if applicable).....	72
9.1.3 Type Test of the Motors according to European Standard (EN).....	72
9.1.4 Type Test of the Motors according to American Standard (UL).....	73
9.2 Setup Height and Ambient Temperature.....	75
9.3 Degree of Protection.....	75
9.4 Compatibility.....	76
9.5 Designs and Installation Positions.....	76
9.6 Housing Varnish.....	77

Table of Contents

	Page
9.7	Vibration..... 77
9.8	Shock..... 78
9.9	Output Shaft and Shaft Sealing Ring..... 78
9.9.1	Plain Shaft..... 78
9.9.2	Output Shaft with Key..... 78
9.9.3	Output Shaft with Shaft Sealing Ring..... 79
9.10	Bearings and Shaft Load..... 80
9.10.1	General..... 80
9.10.2	Radial Load, Axial Load..... 80
9.10.3	Attachment of Drive Elements..... 81
9.10.4	Bearing Lifetime..... 83
9.11	Holding Brakes (Ex)..... 84
9.11.1	Holding Brake Electrically Releasing..... 84
9.11.2	Holding Brakes Notes Regarding Safety..... 84
9.11.3	Holding Brakes Note Regarding the System's Safety..... 85
9.11.4	Layout of Holding Brakes..... 86
9.11.5	Holding Brake–Commissioning and Maintenance Instructions..... 86
9.12	Acceptances and Authorizations..... 87
9.12.1	Motors in EU Version..... 87
9.12.2	Motors in UL Version..... 87
10	State of Delivery, Identification, Handling, Transport and Storage..... 89
10.1	State of Delivery..... 89
10.1.1	Packaging..... 89
10.1.2	High-voltage Test..... 89
10.2	Identification 89
10.2.1	Shipping Documents and Delivery Note..... 89
10.2.2	Name Plate..... 89
10.3	Handling, Transport and Storage..... 90
11	Installation..... 93
11.1	Safety..... 93
11.2	Skilled Personnel..... 93
11.3	Mechanical Mounting – Motor Assembly..... 93
11.3.1	Flange Connection..... 93
11.3.2	Preparation..... 94
11.3.3	Assembly..... 94
11.4	Electrical Connection..... 94
11.4.1	Notes Regarding Safety..... 94
11.4.2	Motor Connection according to European Standard (EN)..... 95
	MKE037, -047, -098..... 95
	MKE118..... 98
11.4.3	Motor Connection according to American Standard (UL)..... 102
	MKE037, -047, -098..... 102
	MKE118..... 103

Table of Contents

	Page
12 Startup, Operation and Maintenance	105
12.1 Commissioning.....	105
12.2 Operation.....	105
12.3 Deactivation.....	105
12.4 Maintenance.....	106
12.4.1 General.....	106
12.4.2 Cleaning.....	106
12.4.3 Bearings.....	106
12.4.4 Connection Cables.....	106
12.4.5 Holding Brakes	107
12.4.6 Battery Change.....	107
12.5 Troubleshooting.....	108
12.6 Dismantling.....	109
13 Environmental Protection and Disposal.....	111
13.1 Environmental Protection.....	111
13.1.1 Production Processes.....	111
13.1.2 Prohibited Substances.....	111
13.1.3 No Release of Hazardous Substances.....	111
13.1.4 Principal Components.....	111
13.2 Disposal.....	111
13.2.1 Return of Products.....	111
13.2.2 Packaging Materials.....	111
13.2.3 Recycling.....	112
14 Appendix.....	113
14.1 List of Standards.....	113
14.2 Selection of Connection Cable.....	115
14.2.1 Power Cable IndraDyn S MKE.....	115
14.2.2 Encoder Cable IndraDyn S MKE.....	116
14.3 Declaration of Conformity	117
15 Service and Support.....	121
15.1 Helpdesk.....	121
15.2 Service Hotline.....	121
15.3 Internet.....	121
15.4 Helpful Information.....	121
Index.....	123

1 Introduction to the Product

1.1 MKE

1.1.1 General

The MKE servo motors of the second generation fulfill the specifications according to ATEX and UL/CSA in one series. This permits the worldwide use of Rexroth MKE-motors with one machine design only.

In connection with the drive control devices offered by Rexroth, the MKE motors are drive systems with a high functionality for the use in potentially explosive areas.

Performance list MKE motors are available in the following power spectrum:

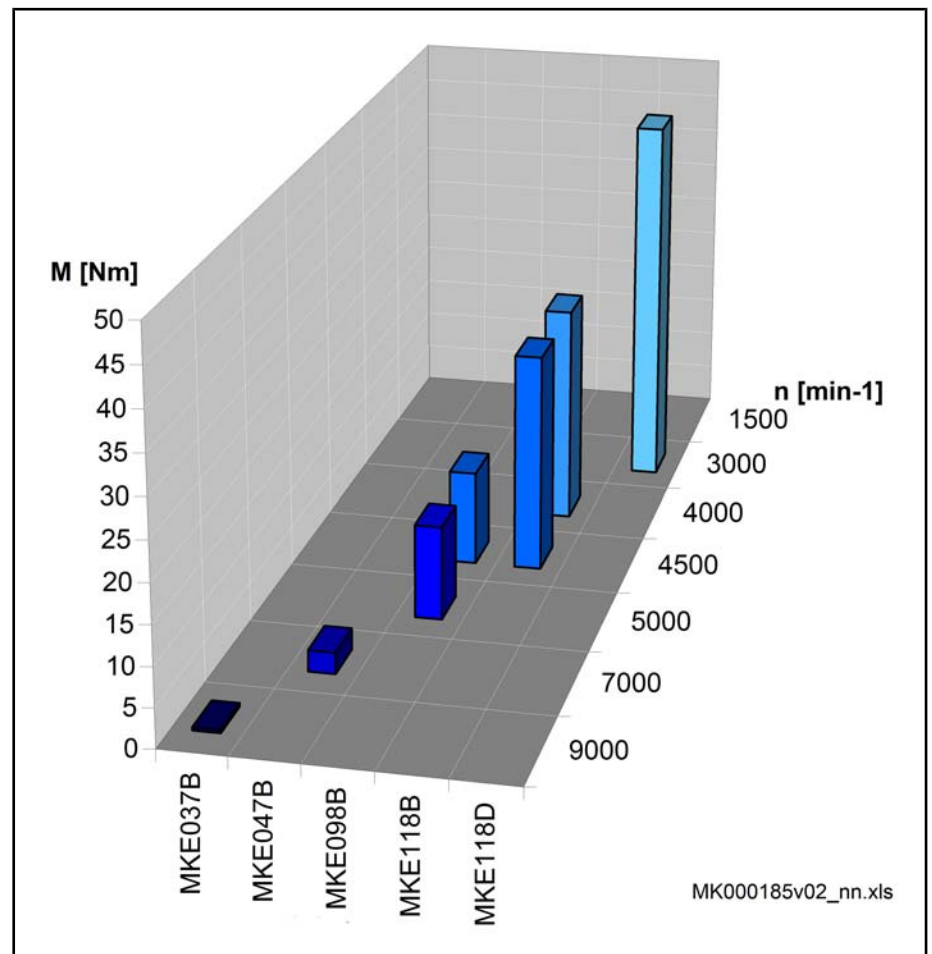


Fig. 1-1: MKE power gradation

Performance features

MKE motors are characterized by the following advantages:

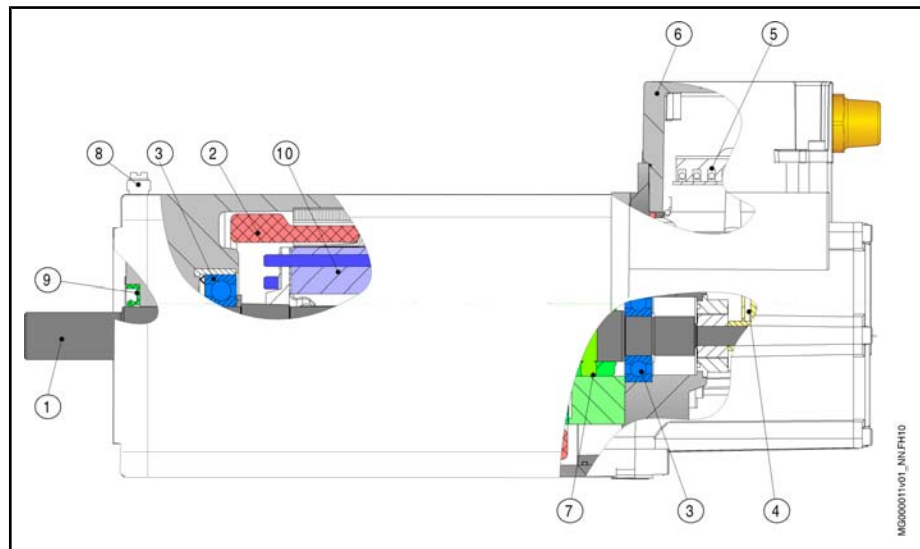
- Motor construction in "Flameproof Enclosures" according to EN 50 014 : 1992
- High operational reliability
- Maintenance-free operation (owing to the brushless design and use of bearings grease-lubricated for their entire lifetime)
- Use under adverse environmental conditions is possible (owing to the completely closed motor design in IP 65 degree of protection)
- Overload protection (by means of motor-temperature control)

Introduction to the Product

- High performance data
- High dynamics (owing to the favorable ratio of torque to inertia mass)
- High overload capability (owing to the favorable heat dissipation from the stator windings to the outside wall of the motor housing)
- Peak torque utilizable across a wide speed range (owing to electronic commutation)
- Continuous start-stop operation possible with high repeat frequencies (owing to electrical commutation)
- Easy attachment to the machine (owing to flange according to DIN 42948) 11.65)
- Any installation position
- Simple and fast startup (thanks to data memory)

Structure and components

MKE motors are permanent-magnet motors with electronic commutation. Special magnet materials permit the motors to be designed with low inertia masses. The following figure shows the principal design of MKD motors.



- (1) Drive shaft
- (2) Stator with winding
- (3) Bearings
- (4) Motor encoder
- (5) Connection unit
- (6) Terminal box lid
- (7) Holding brake (optional)
- (8) Grounding clamp
- (9) Shaft sealing ring
- (10) Rotor with permanent magnets

Fig. 1-2: Design of MKE motors

1.1.2 Versions

MHE motors are available in various designs. On the basis of existing national regulations and standards, the MKE motors have to be subdivided into housing types

- E according to European Standard (EU) and
- U according to American Standard (UL)

The connection technology of the MKE motors is processed differently according to the national regulations.



Please heed the notes as regards the applicable national regulations in the chapter "Application notes".

1.2 About this Documentation

1.2.1 Structure of this Document Edition

The present documentation contains safety regulations, technical data, and operating instructions for MKE motors. The individual chapters can be subdivided into the following focal points:

Chapter	Title	Contents
1	Introduction to the product	General information
2	Important instructions on use	Safety
3	Notes regarding safety	
4	Technical data	Product description (for planners and designers)
5	Specifications	
6	Type codes	
7	Accessories and options	
8	Connection techniques	
9	Operating conditions and application notes	
10	State of delivery, identification, handling, transport and storage	Practical information (for operating and maintenance personnel)
11	Installation	
12	Startup, operation and maintenance	
13	Environmental protection and disposal	General information
14	Appendix	
15	Service and support	
	Index	

Fig. 1-3: Document structure

1.2.2 Additional Documentation



If this documentation contains references to additional documentation, the version of the latter is always represented in bold and underlined type (e.g. **06**). If documentation is ordered, its version may be a higher one!

1.2.3 Standards

This documentation refers to German, European and international technical standards. Documents and sheets on standards are subject to copyright protection and may not be passed on to third parties by Rexroth. If need be, please contact the authorized sales outlets or, in Germany, directly:

BEUTH Verlag GmbH

Introduction to the Product

Burggrafenstrasse 6
10787 Berlin, Germany
Phone +49-(0)30-26 01-22 60, Fax +49-(0)30-26 01-12 60
Internet: <http://www.din.de/beuth>
Email: postmaster@beuth.de

1.2.4 External Systems

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

1.2.5 Your Feedback

Your experiences are an essential part of the process of improving both the product and the documentation.

Please do not hesitate to inform us of any mistakes you detect in this documentation or of any modifications you might desire. We would appreciate your feedback.

Please send your remarks to:

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2 Important Instructions on Use

2.1 Intended Use

2.1.1 Introduction

Rexroth products are developed and manufactured according to the state of the art. Before they are delivered, they are inspected to ensure that they operate safely.



Corporal and material damage due to wrong use of products!

The products were designed for the use in an industrial environment and must only be used as intended. If they are inappropriately used, situations may arise that result in damage to material and personnel.



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 Rexroth products can be used, the following requirements must be fulfilled so as to ensure that they are used as intended:

- Everyone who in any way deals with one of our products must read and understand the corresponding notes regarding safety and regarding the intended use.
- If the products are hardware, they must be kept in their original state, i.e. no constructional modifications must be made. Software products must not be decompiled; their source codes must not be modified.
- Damaged or improperly working products must not be installed or put into operation.
- It must be ensured that the products are installed according to the regulations mentioned in the documentation.

2.1.2 Areas of Use and Application

Rexroth motors of the MKE series are intended to be used as rotary main and servo drives, as linear drives or as modular motors. The following are typical fields of application:

- Machine tools
- Printing and paper-processing machines
- Packaging and food-processing machines
- Metal-forming machines

Unit types with different driving powers and different interfaces are available for an application-specific use of the motors.

Controlling and monitoring of the motors may require connection of additional sensors and actuators.

Important Instructions on Use



The MKE motors may only be used with the accessories specified in the documentation. Components that are not explicitly mentioned may be neither attached nor connected. The same is true for cables and lines.

Operation may be carried out only in the explicitly mentioned configurations and combinations of the component and with the software and firmware specified in the corresponding functional description.

Any connected drive controller must be programmed before startup in order to ensure that the motor executes the functions specific to the particular application.

MKE motors may only be operated under the assembly, mounting and installation conditions, in the normal position, and under the ambient conditions (temperature, degree of protection, humidity, EMC, and the like) specified in this documentation.

2.2 Inappropriate Use

Any use of MKE 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 to be "inappropriate use".

MKE must not be used if ...

- the ambient conditions require a higher explosion protection than is indicated on the motor's name plate.
- they are subject to operating conditions which do not comply with the ambient conditions described above. For example, they must not be operated under water, under extreme temperature fluctuations or extreme maximum temperatures.
- the intended application is not explicitly approved by Bosch Rexroth. Please also observe the statements made in the general notes regarding safety.

3 Safety Instructions for Electric Drives and Controls

3.1 Safety Instructions - General Information

3.1.1 Using the Safety Instructions and Passing them on to Others

Do not attempt to install or commission this device without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with the device. If you do not have the user documentation for the device, contact your responsible Bosch Rexroth sales representative. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the device.

If the device is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the device in the official language of the user's country.



Improper use of these devices, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, may result in material damage, bodily harm, electric shock or even death!

Observe the safety instructions!

3.1.2 How to Employ the Safety Instructions

Read these instructions before initial commissioning of the equipment in order to eliminate the risk of bodily harm and/or material damage. Follow these safety instructions at all times.

- Bosch Rexroth AG is not liable for damages resulting from failure to observe the warnings provided in this documentation.
- Read the operating, maintenance and safety instructions in your language before commissioning the machine. If you find that you cannot completely understand the documentation for your product, please ask your supplier to clarify.
- Proper and correct transport, storage, assembly and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of this device.
- Only assign trained and qualified persons to work with electrical installations:
 - Only persons who are trained and qualified for the use and operation of the device may work on this device or within its proximity. The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the product, as well as an understanding of all warnings and precautionary measures noted in these instructions.
 - Furthermore, they must be trained, instructed and qualified to switch electrical circuits and devices on and off in accordance with technical safety regulations, to ground them and to mark them according to the requirements of safe work practices. They must have adequate safety equipment and be trained in first aid.
- Only use spare parts and accessories approved by the manufacturer.

Safety Instructions for Electric Drives and Controls

- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The devices have been designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Only use safety-relevant applications that are clearly and explicitly approved in the Project Planning Manual. If this is not the case, they are excluded. Safety-relevant are all such applications which can cause danger to persons and material damage.
- The information given in the documentation of the product with regard to the use of the delivered components contains only examples of applications and suggestions.

The machine and installation manufacturer must

- make sure that the delivered components are suited for his individual application and check the information given in this documentation with regard to the use of the components,
- make sure that his application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Commissioning of the delivered components is only permitted once it is sure that the machine or installation in which they are installed complies with the national regulations, safety specifications and standards of the application.
- Operation is only permitted if the national EMC regulations for the application are met.
- The instructions for installation in accordance with EMC requirements can be found in the section on EMC in the respective documentation (Project Planning Manuals of components and system).
The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.
- Technical data, connection and installation conditions are specified in the product documentation and must be followed at all times.

National regulations which the user must take into account

- European countries: according to European EN standards
- United States of America (USA):
 - National Electrical Code (NEC)
 - National Electrical Manufacturers Association (NEMA), as well as local engineering regulations
 - regulations of the National Fire Protection Association (NFPA)
- Canada: Canadian Standards Association (CSA)
- Other countries:
 - International Organization for Standardization (ISO)
 - International Electrotechnical Commission (IEC)

3.1.3 Explanation of Warning Symbols and Degrees of Hazard Seriousness

The safety instructions describe the following degrees of hazard seriousness. The degree of hazard seriousness informs about the consequences resulting from non-compliance with the safety instructions:

Safety Instructions for Electric Drives and Controls




Warning symbol	Signal word	Degree of hazard seriousness acc. to ANSI Z 535.4-2002
	Danger	Death or severe bodily harm will occur.
	Warning	Death or severe bodily harm may occur.
	Caution	Minor or moderate bodily harm or material damage may occur.

Fig.3-1: Hazard classification (according to ANSI Z 535)

3.1.4 Hazards by Improper Use

**DANGER****High electric voltage and high working current! Risk of death or severe bodily injury by electric shock!**

Observe the safety instructions!

**DANGER****Dangerous movements! Danger to life, severe bodily harm or material damage by unintentional motor movements!**

Observe the safety instructions!

**WARNING****High electric voltage because of incorrect connection! Risk of death or bodily injury by electric shock!**

Observe the safety instructions!

**WARNING****Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!**

Observe the safety instructions!

**CAUTION****Hot surfaces on device housing! Danger of injury! Danger of burns!**

Observe the safety instructions!

**CAUTION****Risk of injury by improper handling! Risk of bodily injury by bruising, shearing, cutting, hitting or improper handling of pressurized lines!**

Observe the safety instructions!

**CAUTION****Risk of injury by improper handling of batteries!**

Observe the safety instructions!

3.2 Instructions with Regard to Specific Dangers

3.2.1 Protection Against Contact with Electrical Parts and Housings



This section concerns devices and drive components with voltages of **more than 50 Volt**.

Contact with parts conducting voltages above 50 Volts can cause personal danger and electric shock. When operating electrical equipment, it is unavoidable that some parts of the devices conduct dangerous voltage.

**DANGER****High electrical voltage! Danger to life, electric shock and severe bodily injury!**

- Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain and repair this equipment.
- Follow general construction and safety regulations when working on power installations.
- Before switching on the device, the equipment grounding conductor must have been non-detachably connected to all electrical equipment in accordance with the connection diagram.
- Do not operate electrical equipment at any time, even for brief measurements or tests, if the equipment grounding conductor is not permanently connected to the mounting points of the components provided for this purpose.
- Before working with electrical parts with voltage potentials higher than 50 V, the device must be disconnected from the mains voltage or power supply unit. Provide a safeguard to prevent reconnection.
- With electrical drive and filter components, observe the following:
Wait **30 minutes** after switching off power to allow capacitors to discharge before beginning to work. Measure the electric voltage on the capacitors before beginning to work to make sure that the equipment is safe to touch.
- Never touch the electrical connection points of a component while power is turned on. Do not remove or plug in connectors when the component has been powered.
- Install the covers and guards provided with the equipment properly before switching the device on. Before switching the equipment on, cover and safeguard live parts safely to prevent contact with those parts.
- A residual-current-operated circuit-breaker or r.c.d. cannot be used for electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device according to the relevant standards.
- Secure built-in devices from direct touching of electrical parts by providing an external housing, for example a control cabinet.

Safety Instructions for Electric Drives and Controls



For electrical drive and filter components with voltages of **more than 50 volts**, observe the following additional safety instructions.



DANGER

High housing voltage and high leakage current! Risk of death or bodily injury by electric shock!

- Before switching on, the housings of all electrical equipment and motors must be connected or grounded with the equipment grounding conductor to the grounding points. This is also applicable before short tests.
- The equipment grounding conductor of the electrical equipment and the devices must be non-detachably and permanently connected to the power supply unit at all times. The leakage current is greater than 3.5 mA.
- Over the total length, use copper wire of a cross section of a minimum of 10 mm² for this equipment grounding connection!
- Before commissioning, also in trial runs, always attach the equipment grounding conductor or connect to the ground wire. Otherwise, high voltages may occur at the housing causing electric shock.

3.2.2 Protection Against Electric Shock by Protective Extra-Low Voltage

Protective extra-low voltage is used to allow connecting devices with basic insulation to extra-low voltage circuits.

All connections and terminals with voltages between 5 and 50 volts at Rexroth products are PELV systems. ¹⁾ It is therefore allowed to connect devices equipped with basic insulation (such as programming devices, PCs, notebooks, display units) to these connections and terminals.



WARNING

High electric voltage by incorrect connection! Risk of death or bodily injury by electric shock!

If extra-low voltage circuits of devices containing voltages and circuits of more than 50 volts (e.g. the mains connection) are connected to Rexroth products, the connected extra-low voltage circuits must comply with the requirements for PELV. ²⁾

3.2.3 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of connected motors. Some common examples are:

- improper or wrong wiring of cable connections
- incorrect operation of the equipment components
- wrong input of parameters before operation
- malfunction of sensors, encoders and monitoring devices
- defective components
- software or firmware errors

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

¹⁾ "Protective Extra-Low Voltage"

²⁾ "Protective Extra-Low Voltage"

Safety Instructions for Electric Drives and Controls

The monitoring in the drive components will normally be sufficient to avoid faulty operation in the connected drives. Regarding personal safety, especially the danger of bodily harm and material damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

**DANGER****Dangerous movements! Danger to life, risk of injury, severe bodily harm or material damage!**

- Ensure personal safety by means of qualified and tested higher-level monitoring devices or measures integrated in the installation.

These measures have to be provided for by the user according to the specific conditions within the installation and a hazard and fault analysis. The safety regulations applicable for the installation have to be taken into consideration. Unintended machine motion or other malfunction is possible if safety devices are disabled, bypassed or not activated.

To avoid accidents, bodily harm and/or material damage:

- Keep free and clear of the machine's range of motion and moving parts. Possible measures to prevent people from accidentally entering the machine's range of motion:
 - use safety fences
 - use safety guards
 - use protective coverings
 - install light curtains or light barriers
- Fences and coverings must be strong enough to resist maximum possible momentum.
- Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Don't operate the device if the emergency stop is not working.
- Isolate the drive power connection by means of an emergency stop circuit or use a safety related starting lockout to prevent unintentional start.
- Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone.
- Additionally secure vertical axes against falling or dropping after switching off the motor power by, for example:
 - mechanically securing the vertical axes,
 - adding an external braking/ arrester/ clamping mechanism or
 - ensuring sufficient equilibration of the vertical axes.
- The standard equipment motor brake or an external brake controlled directly by the drive controller are **not sufficient to guarantee personal safety!**
- Disconnect electrical power to the equipment using a master switch and secure the switch against reconnection for:
 - maintenance and repair work
 - cleaning of equipment
 - long periods of discontinued equipment use
- Prevent the operation of high-frequency, remote control and radio equipment near electronics circuits and supply leads. If the use of such devices cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial startup. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.

3.2.4 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated by current-carrying conductors and permanent magnets in motors represent a serious personal danger to those with heart pacemakers, metal implants and hearing aids.



WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

- Persons with heart pacemakers and metal implants are not permitted to enter following areas:
 - Areas in which electrical equipment and parts are mounted, being operated or commissioned.
 - Areas in which parts of motors with permanent magnets are being stored, repaired or mounted.
- If it is necessary for somebody with a pacemaker to enter such an area, a doctor must be consulted prior to doing so. The noise immunity of present or future implanted heart pacemakers differs greatly so that no general rules can be given.
- Those with metal implants or metal pieces, as well as with hearing aids, must consult a doctor before they enter the areas described above. Otherwise health hazards may occur.

3.2.5 Protection Against Contact with Hot Parts



CAUTION

Hot surfaces at motor housings, on drive controllers or chokes! Danger of injury! Danger of burns!

- Do not touch surfaces of device housings and chokes in the proximity of heat sources! Danger of burns!
- Do not touch housing surfaces of motors! Danger of burns!
- According to the operating conditions, temperatures can be **higher than 60 °C, 140°F** during or after operation.
- Before accessing motors after having switched them off, let them cool down for a sufficiently long time. Cooling down can require **up to 140 minutes!** Roughly estimated, the time required for cooling down is five times the thermal time constant specified in the Technical Data.
- After switching drive controllers or chokes off, wait 15 minutes to allow them to cool down before touching them.
- Wear safety gloves or do not work at hot surfaces.
- For certain applications, the manufacturer of the end product, machine or installation, according to the respective safety regulations, has to take measures to avoid injuries caused by burns in the end application. These measures can be, for example: warnings, guards (shielding or barrier), technical documentation.

3.2.6 Protection During Handling and Mounting

In unfavorable conditions, handling and mounting certain parts and components in an improper way can cause injuries.

**CAUTION****Risk of injury by improper handling! Bodily injury by bruising, shearing, cutting, hitting!**

- Observe the general construction and safety regulations on handling and mounting.
- Use suitable devices for mounting and transport.
- Avoid jamming and bruising by appropriate measures.
- Always use suitable tools. Use special tools if specified.
- Use lifting equipment and tools in the correct manner.
- If necessary, use suitable protective equipment (for example safety goggles, safety shoes, safety gloves).
- Do not stand under hanging loads.
- Immediately clean up any spilled liquids because of the danger of skidding.

3.2.7 Battery Safety

Batteries consist of active chemicals enclosed in a solid housing. Therefore, improper handling can cause injury or material damage.

**CAUTION****Risk of injury by improper handling!**

- Do not attempt to reactivate low batteries by heating or other methods (risk of explosion and cauterization).
- Do not recharge the batteries as this may cause leakage or explosion.
- Do not throw batteries into open flames.
- Do not dismantle batteries.
- When replacing the battery/batteries do not damage electrical parts installed in the devices.
- Only use the battery types specified by the manufacturer.



Environmental protection and disposal! The batteries contained in the product are considered dangerous goods during land, air, and sea transport (risk of explosion) in the sense of the legal regulations. Dispose of used batteries separate from other waste. Observe the local regulations in the country of assembly.

3.2.8 Protection Against Pressurized Systems

According to the information given in the Project Planning Manuals, motors cooled with liquid and compressed air, as well as drive controllers, can be partially supplied with externally fed, pressurized media, such as compressed air, hydraulics oil, cooling liquids and cooling lubricating agents. Improper handling of the connected supply systems, supply lines or connections can cause injuries or material damage.

Safety Instructions for Electric Drives and Controls



CAUTION

Risk of injury by improper handling of pressurized lines!

- Do not attempt to disconnect, open or cut pressurized lines (risk of explosion).
 - Observe the respective manufacturer's operating instructions.
 - Before dismounting lines, relieve pressure and empty medium.
 - Use suitable protective equipment (for example safety goggles, safety shoes, safety gloves).
 - Immediately clean up any spilled liquids from the floor.
-

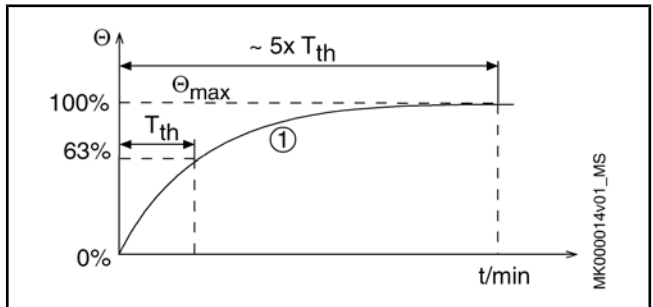


Environmental protection and disposal! The agents used to operate the product might not be economically friendly. Dispose of ecologically harmful agents separately from other waste. Observe the local regulations in the country of assembly.

4 Technical Data

4.1 Definition of Parameters

4.1.1 Parameters on the Data Sheet

Description	Symbol	Unit	Description
Continuous torque at standstill 60K	M_{0_60}	Nm	Continuous torque that can be released to the motor output shaft at a speed of $n \geq 0.1$ Hz.
Continuous torque at standstill 60K	$I_{0_60(rms)}$	A	Phase current (crest value) of the motor M_{dN} required for the continuous torque at standstill M_{dN} at a speed of $n \geq 0.1$ Hz.
Maximum torque	M_{max}	Nm	Maximum torque I_{max} that can be released for about 400 ms (manufacturing tolerances +5 % / 20 %).
Maximum current	$I_{max(rms)}$	A	Maximum, briefly permissible phase current (crest value) of the motor winding without adverse affect on the permanent magnet circuit of the motor.
Torque constant at 20 °C	K_{M_N}	Nm/A	Ratio of the generated torque to the motor phase current (crest value) at a motor temperature of 20 °C. Unit: (Nm/A). Applicable up to approx. $i = 2x I_{dN}$.
Constant voltage at 20 °C	K_{EMK_1000}	V/min ⁻¹	Root-mean-square value of the induced motor voltage at a motor temperature of 20 °C and 1000 revolutions per minute.
Winding resistance at 20 °C	R_{12}	Ohm	Resistance measured between two winding ends in ohms (Ω).
Winding inductivity	L_{12}	mH	Inductivity measured between two phases in (mH).
Discharge capacity	C_{ab}		
Number of pole pairs	o		
Moment of inertia of rotor ¹⁾	J_{rot}	kgm ²	Moment of inertia of the rotor without the optional holding brake. Unit = kgm ² .
Thermal time constant	T_{th}	min	<p>Time of the temperature rise to 63% of the maximum temperature of the motor housing with the motor loaded with the permissible S1 continuous torque. The thermal time constant is defined by the type of cooling used.</p>  <p>① chronological course of the motor housing temperature Θ_{max} highest temperature (motor housing) T_{th} Thermal time constant <i>Fig.4-1: Thermal time constant</i></p>
Maximum torque	n_{max}	min ⁻¹	Maximum permissible speed of the motor. Limiting factors can have mechanical (centrifugal forces, bearing stress) or electrical (DC link voltage) causes.

Technical Data

Description	Symbol	Unit	Description
Sound pressure level	L_p	dB(A)	
Ambient temperature in operation	T_{am}	°C	
Degree of protection			
Insulation class according to DIN EN 60034-1			Insulation class
Holding brake (optional)			
Holding torque	M_4	Nm	Transferable holding torque
Rated voltage (+/-10 %)	U_N	V	Input voltage of the holding brake
Rated current	I_N	A	Current input of the holding brake
Connection time	t_1	ms	Response sensitivity during connection
Disconnection time	t_2	ms	Disconnection time
Moment of inertia of the brake	J_{Br}	kgm ²	Moment of inertia of the holding brake. Has to be added to the moment of inertia of the rotor.

- 1) Indication without brake. Add moment of inertia of brake, if required.
 - 2) Value in brackets in case of motor with holding brake.
- Fig.4-2: Data sheet: Description of individual values*

4.1.2 Parameters of the Characteristic Curves

The speed-torque curves and the technical data are specified in consideration of the following conditions.



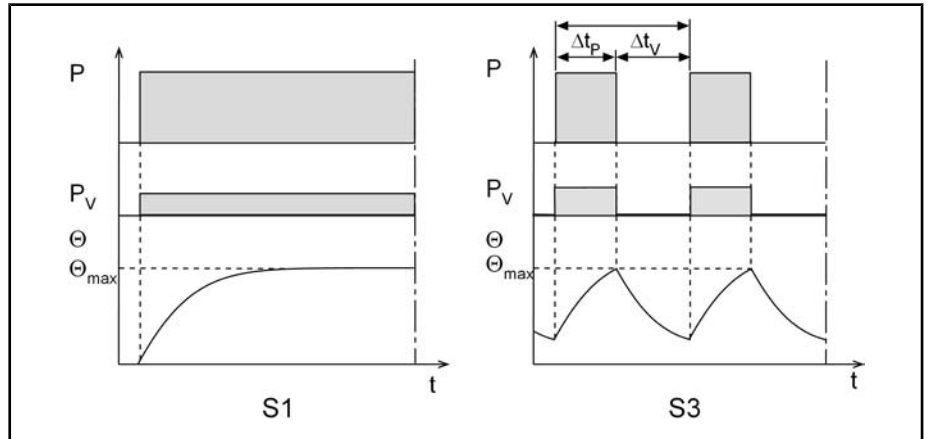
When selecting the technical data, observe the temperatures specified!

The motor data and characteristic curves are determined using MKE motors under the following conditions:

- Ambient temperature max. 40°C
- Insulated structure (aluminum flange)
- In the case of motors with the optional holding brake, the data are always specified for motors **with** a holding brake.
- Motors with radial shaft sealing ring

Operating modes

Bosch Rexroth motors are documented according to the test criteria and measuring methods of EN 60034-1. The specified characteristic curves correspond to operating modes S1 or S3.



- P Load
- P_V Electric losses
- Θ Temperature
- Θ_{max} Highest temperature (motor housing)
- t Time
- T_C Cycle duration
- Δt_P Operating time with constant load
- Δt_V Idle time

Fig.4-3: Operating modes according to EN 60034-1:1998

Operating time Operating mode S6 is supplemented by specification of the ON time (ED) in %. The operating time is calculated as follows:

$$ED = \frac{\Delta t_P}{T_C} \cdot 100\%$$

- ED Cyclic duration factor in %
- Δt_P Operating time with constant load

Fig.4-4: Cyclic duration factor

The values specified in the documentation have been determined on the basis of the following parameters:

Cycle duration: 15 min

Operating time (ED): 25%



If valid, conditions deviating therefrom are marked accordingly.

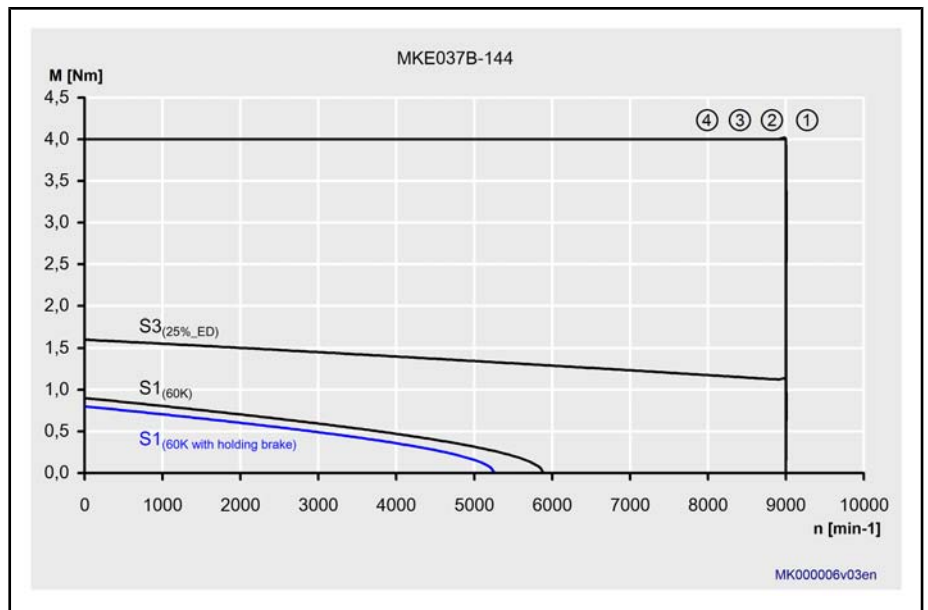
Technical Data

4.2 MKE037

Description	Symbol	Unit	MKE037B-144
Continuous torque at standstill, 60K	$M_{0,60}$	Nm	0,9 (0,8) ²⁾
Continuous current at standstill, 60K	$I_{0,60(rms)}$	A	3,3 (3,0) ²⁾
Maximum torque	M_{max}	Nm	4,0
Maximum current	$I_{max(rms)}$	A	15,0
Torque constant at 20 °C	$K_{M,N}$	Nm/A	0,21
Constant voltage at 20 °C	$K_{EMK,1000}$	V/min ⁻¹	18,2
Winding resistance at 20 °C	R_{12}	mH	3,700
Winding inductivity	L_{12}	Ohm	2,70
Discharge capacity	C_{ab}		1,0
Number of pole pairs	o		3
Moment of inertia of rotor ¹⁾	J_{rot}	kgm ²	0,00003
Thermal time constant	T_{th}	min	15,0
Maximum speed	n_{max}	min ⁻¹	9000
Sound pressure level	L_p	dB(A)	<75
Weight ²⁾	m	kg	2,5 (2,8)
Ambient temperature in operation	T_{am}	°C	0...40
Degree of protection			IP 65
Insulation class according to DIN EN 60034-1			F
Holding brake (optional)			
Holding torque	M_4	Nm	1,0
Rated voltage (+/-10 %)	U_N	V	24,0
Rated current	I_N	A	0,4
Connection time	t_1	ms	3
Disconnection time	t_2	ms	4
Moment of inertia of brake	J_{Br}	kgm ²	0,000007

- 1) Indication without brake. Add moment of inertia of brake, if required.
 2) (...) Values for motors with holding brake, sorted (holding brake 1, holding brake 2 ...)

Fig.4-5: Technical data of MKE037B-144



- $M_{max}①$ IndraDrive, controlled feed 3 x AC 400V
- $M_{max}②$ IndraDrive, uncontrolled feed 3 x AC 480V
- $M_{max}③$ IndraDrive, uncontrolled feed 3 x AC 440V
- $M_{max}④$ IndraDrive, uncontrolled feed 3 x AC 400V

Fig.4-6: Speed-torque curve

Shaft and bearing load

For additional information about permissible radial and axial forces, see the chapter [chapter 9.10 "Bearings and Shaft Load"](#) on page 80

Diagram for determining the maximum permissible radial F_{radial} .

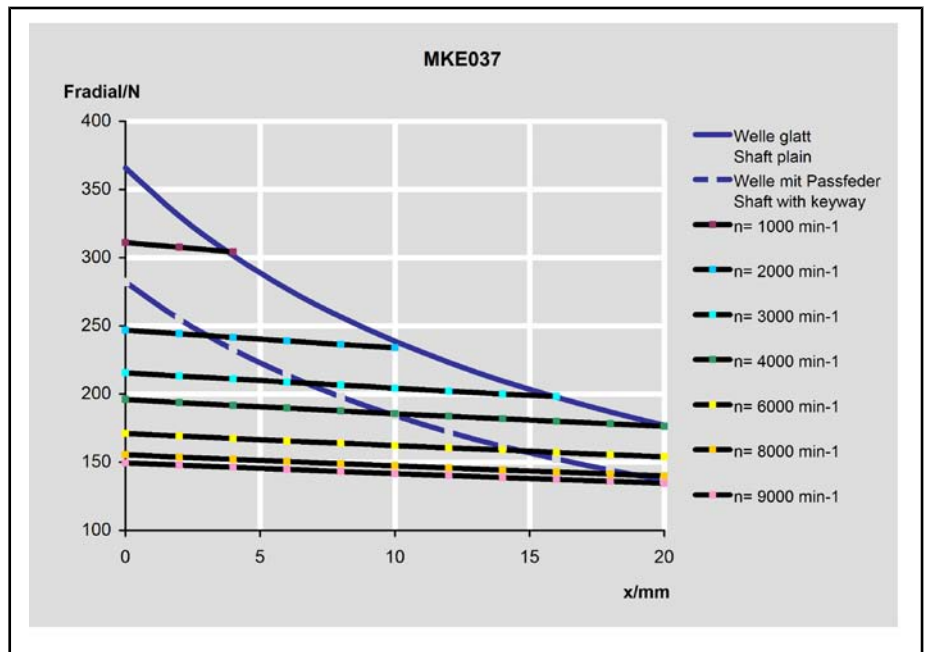


Fig.4-7: MKE037: permissible radial force (shaft and bearing load)

Axial force not permissible.

Technical Data

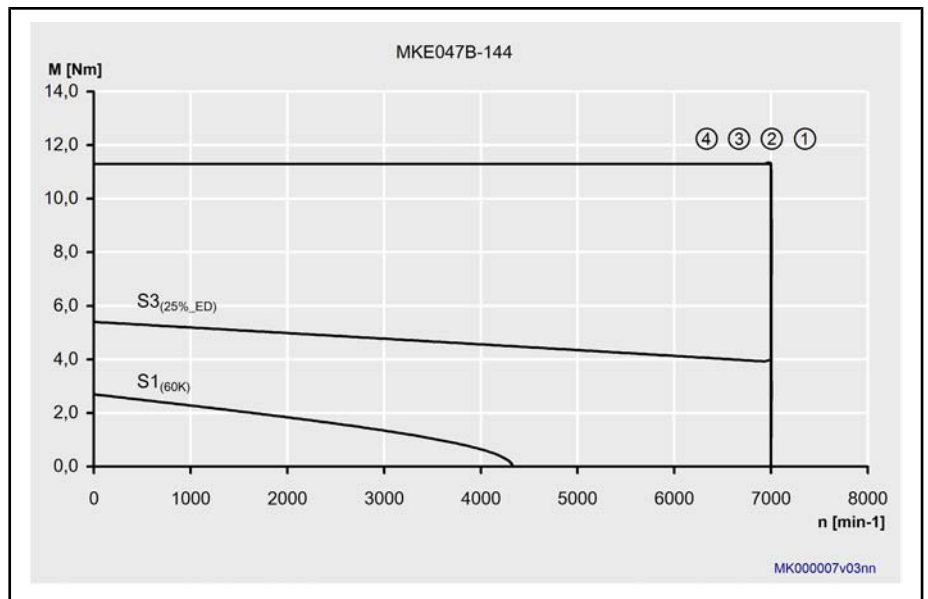
4.3 MKE047

Description	Symbol	Unit	MKE047B-144
Continuous torque at standstill, 60K	$M_{0,60}$	Nm	2,7
Continuous current at standstill, 60K	$I_{0,60(rms)}$	A	5,0
Maximum torque	M_{max}	Nm	11,3
Maximum current	$I_{max(rms)}$	A	22,6
Torque constant at 20 °C	$K_{M,N}$	Nm/A	0,42
Constant voltage at 20 °C	$K_{EMK,1000}$	V/min ⁻¹	36,3
Winding resistance at 20 °C	R_{12}	mH	5,000
Winding inductivity	L_{12}	Ohm	1,80
Discharge capacity	C_{ab}		1,6
Number of pole pairs	o		3
Moment of inertia of rotor ¹⁾	J_{rot}	kgm ²	0,00017
Thermal time constant	T_{th}	min	30,0
Maximum speed	n_{max}	min ⁻¹	7000
Sound pressure level	L_p	dB(A)	<75
Weight ²⁾	m	kg	5,5 (5,8)
Ambient temperature in operation	T_{am}	°C	0...40
Degree of protection			IP 65
Insulation class according to DIN EN 60034-1			F
Holding brake (optional)			
Holding torque	M_4	Nm	2,2
Rated voltage (+/-10 %)	U_N	V	24
Rated current	I_N	A	0,34
Connection time	t_1	ms	2,8
Disconnection time	t_2	ms	14
Moment of inertia of brake	J_{Br}	kgm ²	0,00001

1) Indication without brake. Add moment of inertia of brake, if required.

2) (...) Values for motors with holding brake, sorted (holding brake 1, holding brake 2 ...)

Fig.4-8: *Technical data MKE047B*



- M_{max}① IndraDrive, controlled feed 3 x AC 400V
- M_{max}② IndraDrive, uncontrolled feed 3 x AC 480V
- M_{max}③ IndraDrive, uncontrolled feed 3 x AC 440V
- M_{max}④ IndraDrive, uncontrolled feed 3 x AC 400V

Fig.4-9: Motor's characteristic curve MKE047B-144

Bearing and shaft load

For additional information about permissible radial and axial forces, see [chapter 9.10 "Bearings and Shaft Load" on page 80.](#)

Diagram for determining the maximum permissible radial F_{radial}.

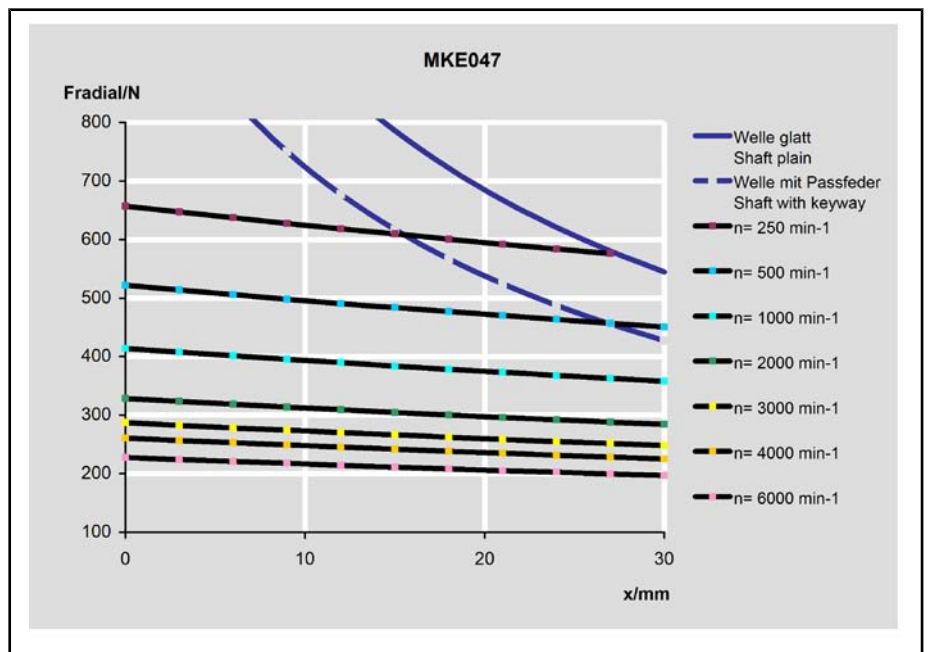


Fig.4-10: MKE047: permissible radial force (shaft and bearing load)

Permissible axial force 30 Nm.

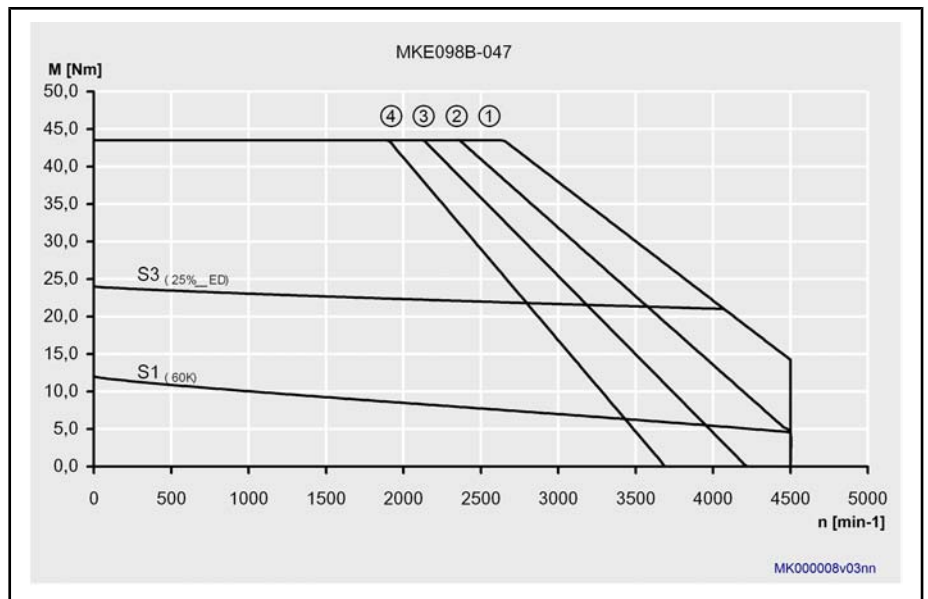
Technical Data

4.4 MKE098

Description	Symbol	Unit	MKE098B-047	MKE098B-058
Continuous torque at standstill, 60K	$M_{0,60}$	Nm	12,0	
Continuous current at standstill, 60K	$I_{0,60(rms)}$	A	9,8	12,4
Maximum torque	M_{max}	Nm	43,5	
Maximum current	$I_{max(rms)}$	A	44,3	55,9
Torque constant at 20 °C	$K_{M,N}$	Nm/A	1,0	0,77
Constant voltage at 20 °C	$K_{EMK,1000}$	V/min ⁻¹	91,0	70,0
Winding resistance at 20 °C	R_{12}	mH	10,100	5,800
Winding inductivity	L_{12}	Ohm	1,20	0,74
Discharge capacity	C_{ab}		6,7	
Number of pole pairs	o		4	
Moment of inertia of rotor ¹⁾	J_{rot}	kgm ²	0,00430	
Thermal time constant	T_{th}	min	60,0	
Maximum speed	n_{max}	min ⁻¹	4500	5000
Weight ²⁾	m	kg	18,0 (19,1)	
Sound pressure level	L_p	dB(A)	<75	
Ambient temperature in operation	T_{am}	°C	0...40	
Degree of protection			IP 65	
Insulation class according to DIN EN 60034-1			F	
Holding brake (optional)				
Holding torque	M_4	Nm	11,0	
Rated voltage (+/-10 %)	U_N	V	24,0	
Rated current	I_N	A	0,71	
Connection time	t_1	ms	30	
Disconnection time	t_2	ms	11	
Moment of inertia of brake	J_{Br}	kgm ²	0,00036	

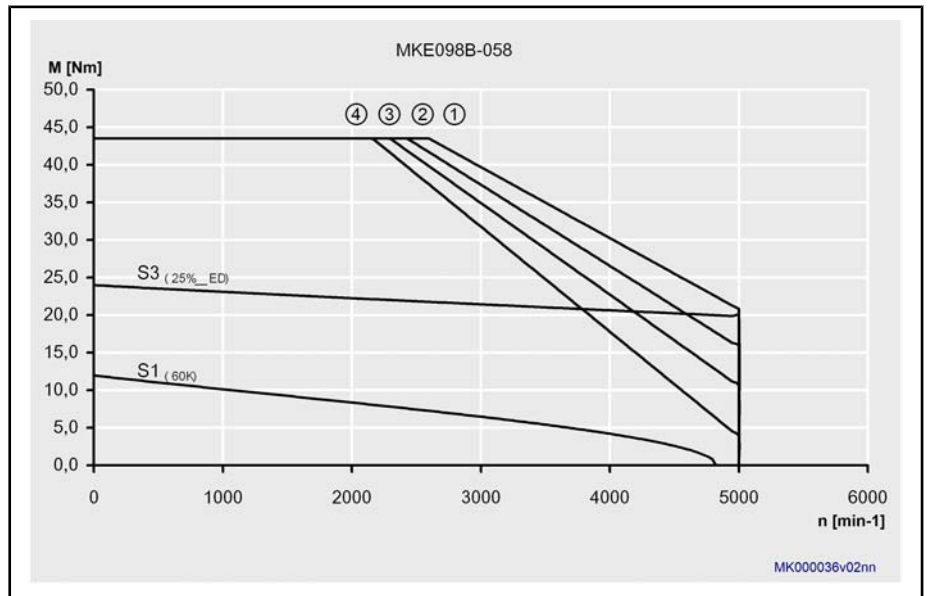
- 1) Indication without brake. Add moment of inertia of brake, if required.
 2) (...) Values for motors with holding brake, sorted (holding brake 1, holding brake 2 ...)

Fig.4-11: Technical data MKE098B-047, MKE098B-058



- M_{max}① IndraDrive, controlled feed 3 x AC 400V
- M_{max}② IndraDrive, uncontrolled feed 3 x AC 480V
- M_{max}③ IndraDrive, uncontrolled feed 3 x AC 440V
- M_{max}④ IndraDrive, uncontrolled feed 3 x AC 400V

Fig.4-12: Motor's characteristic curve MKE098B-047



- M_{max}① IndraDrive, controlled feed 3 x AC 400V
- M_{max}② IndraDrive, uncontrolled feed 3 x AC 480V
- M_{max}③ IndraDrive, uncontrolled feed 3 x AC 440V
- M_{max}④ IndraDrive, uncontrolled feed 3 x AC 400V

Fig.4-13: Motor's characteristic curve MKE098B-058

Bearing and shaft load

For additional information about permissible radial and axial forces, see [chapter 9.10 "Bearings and Shaft Load" on page 80](#).

Diagram for determining the maximum permissible radial F_{radial}.

Technical Data

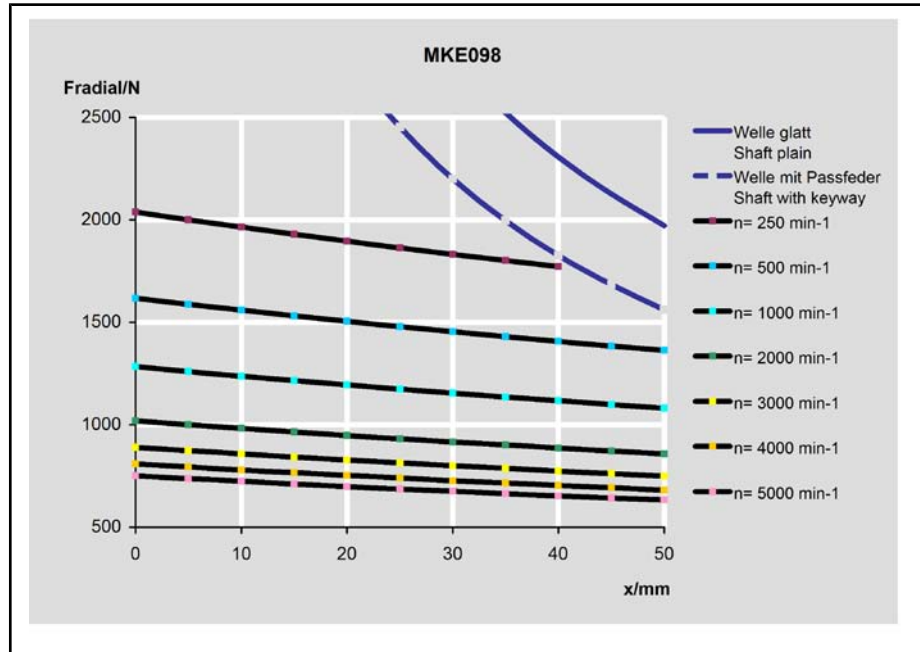


Fig. 4-14: MKE098: permissible radial force (shaft and bearing load)
Permissible axial force 60 Nm.

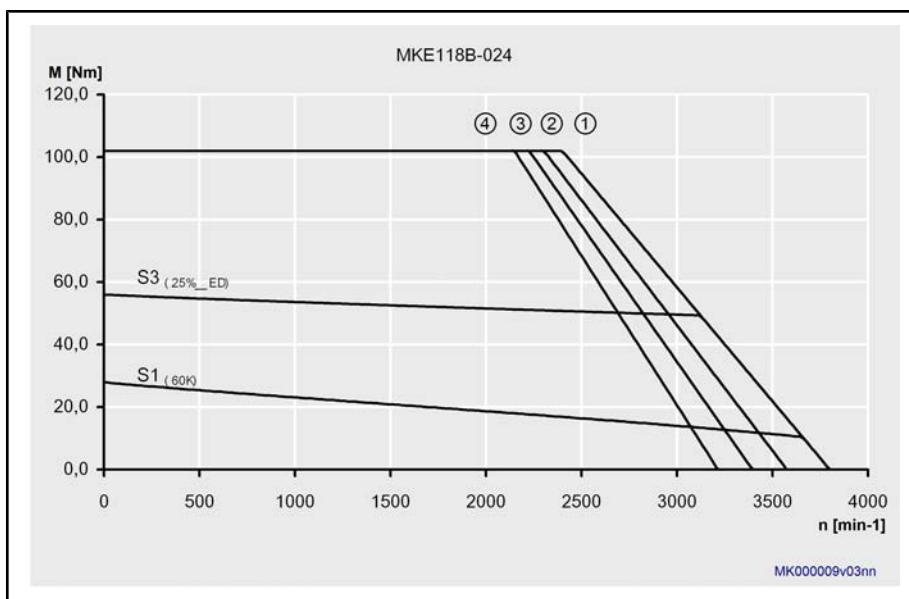
4.5 MKE118

Description	Symbol	Unit	MKE118B-024	MKE118B-058
Continuous torque at standstill, 60K	$M_{0,60}$	Nm	28,0	
Continuous current at standstill, 60K	$I_{0,60(rms)}$	A	15,3	28,4
Maximum torque	M_{max}	Nm	102,0	
Maximum current	$I_{max(rms)}$	A	69,1	127,6
Torque constant at 20 °C	$K_{M,N}$	Nm/A	1,50	0,81
Constant voltage at 20 °C	$K_{EMK,1000}$	V/min ⁻¹	130,0	70,0
Winding resistance at 20 °C	R_{12}	mH	7,600	2,200
Winding inductivity	L_{12}	Ohm	0,58	0,17
Discharge capacity	C_{ab}		10,3	
Number of pole pairs	o		4	
Moment of inertia of rotor ¹⁾	J_{rot}	kgm ²	0,01940	
Thermal time constant	T_{th}	min	90,0	
Maximum speed	n_{max}	min ⁻¹	4000	4500
Sound pressure level	L_P	dB(A)	<75	
Weight ²⁾	m	kg	44 (45,1)	
Ambient temperature in operation	T_{am}	°C	0...40	
Degree of protection			IP 65	
Insulation class according to DIN EN 60034-1			F	
Holding brake (optional)				
Holding torque	M_4	Nm	22,0	
Rated voltage (+/-10 %)	U_N	V	24,0	
Rated current	I_N	A	0,71	
Connection time	t_1	ms	25	
Disconnection time	t_2	ms	15	
Moment of inertia of brake	J_{Br}	kgm ²	0,00124	

- 1) Indication without brake. Add moment of inertia of brake, if required.
 2) (...) Values for motors with holding brake, sorted (holding brake 1, holding brake 2 ...)

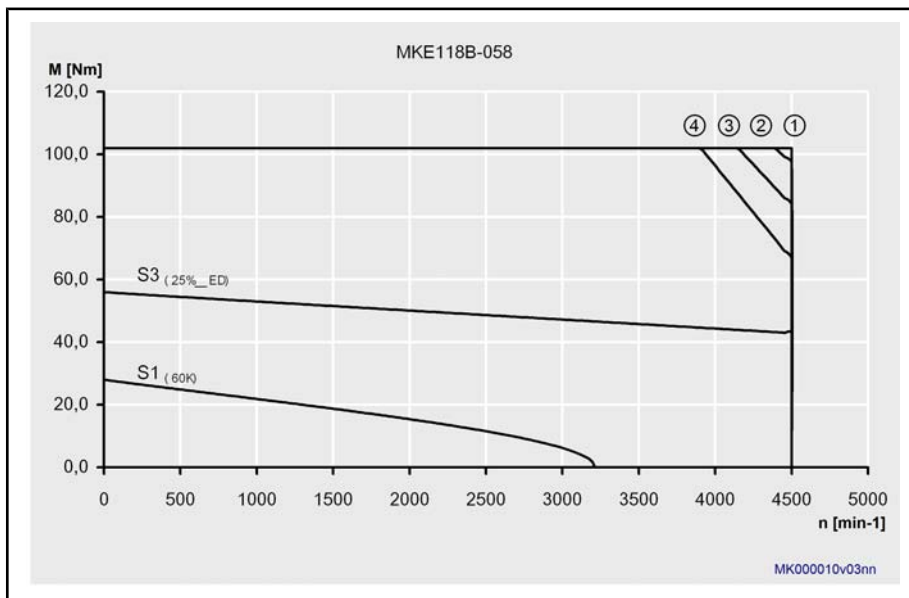
Fig.4-15: Technical data MKE118B-024, MKE118B-058

Technical Data



- $M_{max}①$ IndraDrive, controlled feed 3 x AC 400V
- $M_{max}②$ IndraDrive, uncontrolled feed 3 x AC 480V
- $M_{max}③$ IndraDrive, uncontrolled feed 3 x AC 440V
- $M_{max}④$ IndraDrive, uncontrolled feed 3 x AC 400V

Fig.4-16: Motor's characteristic curve MKE118B-024



- $M_{max}①$ IndraDrive, controlled feed 3 x AC 400V
- $M_{max}②$ IndraDrive, uncontrolled feed 3 x AC 480V
- $M_{max}③$ IndraDrive, uncontrolled feed 3 x AC 440V
- $M_{max}④$ IndraDrive, uncontrolled feed 3 x AC 400V

Fig.4-17: Motor's characteristic curve MKE118B-058

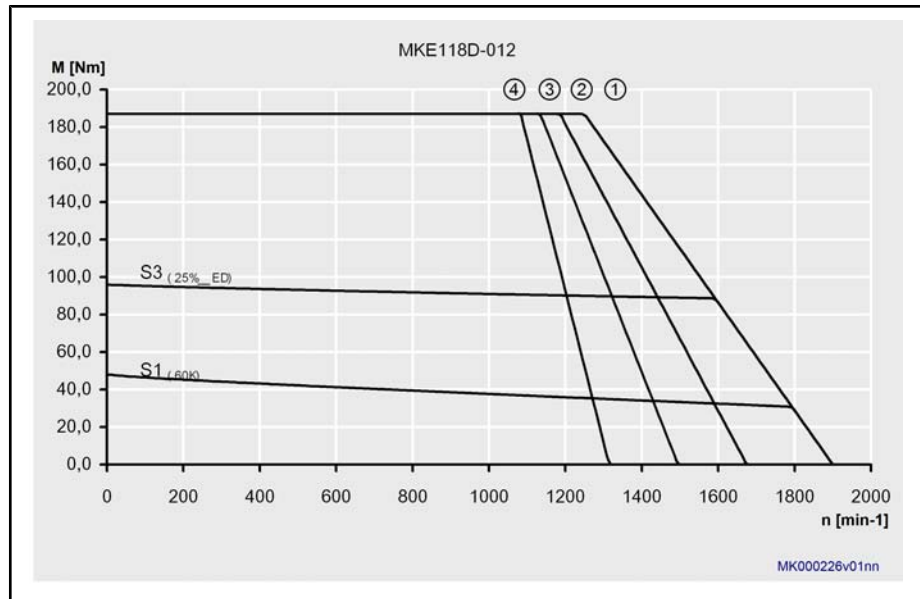
Technical Data

Description	Symbol	Unit	MKE118D-012	MKE118D-027	MKE118D-035
Continuous torque at standstill, 60K	$M_{0,60}$	Nm	48,0		
Continuous current at standstill, 60K	$I_{0,60(rms)}$	A	13,0	22,1	29,8
Maximum torque	M_{max}	Nm	187,0		
Maximum current	$I_{max(rms)}$	A	58,5	99,6	134,3
Torque constant at 20 °C	$K_{M,N}$	Nm/A	4,29	1,78	1,32
Constant voltage at 20 °C	$K_{EMK,1000}$	V/min ⁻¹	263,5	154,5	114,5
Winding resistance at 20 °C	R_{12}	mH	15,000	5,700	3,200
Winding inductivity	L_{12}	Ohm	0,98	0,35	0,21
Discharge capacity	C_{ab}		20,2		
Number of pole pairs	o		4		
Moment of inertia of rotor ¹⁾	J_{rot}	kgm ²	0,03620		
Thermal time constant	T_{th}	min	90		
Maximum speed	n_{max}	min ⁻¹	2000	3000	
Sound pressure level	L_P	dB(A)	<75		
Weight ²⁾	m	kg	65,0 (69,1)		
Ambient temperature in operation	T_{am}	°C	0...40		
Degree of protection			IP 65		
Insulation class according to DIN EN 60034-1			F		
Holding brake (optional)			Holding brake 1	Holding brake 3	
Holding torque	M_4	Nm	32,0	70,0	
Rated voltage (+/-10 %)	U_N	V	24,0	24,0	
Rated current	I_N	A	0,93	1,29	
Connection time	t_1	ms	15	53	
Disconnection time	t_2	ms	115	97	
Moment of inertia of brake	J_{Br}	kgm ²	0,001242	0,00318	

- 1) Indication without brake. Add moment of inertia of brake, if required.
2) (...) Values for motors with holding brake, sorted (holding brake 1, holding brake 2 ...)

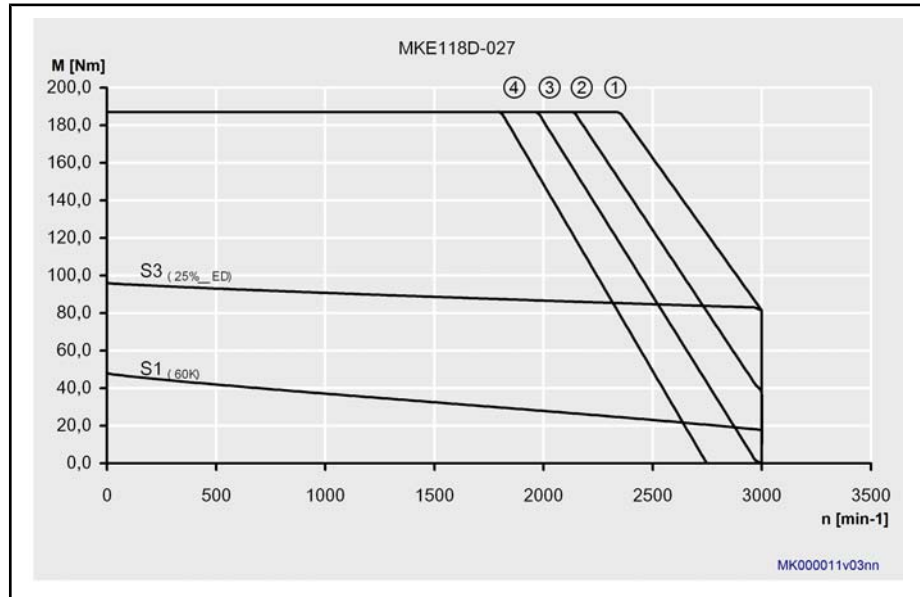
Fig.4-18: Technical data MKE118D-012, MKE118D-027, MKE118D-035

Technical Data



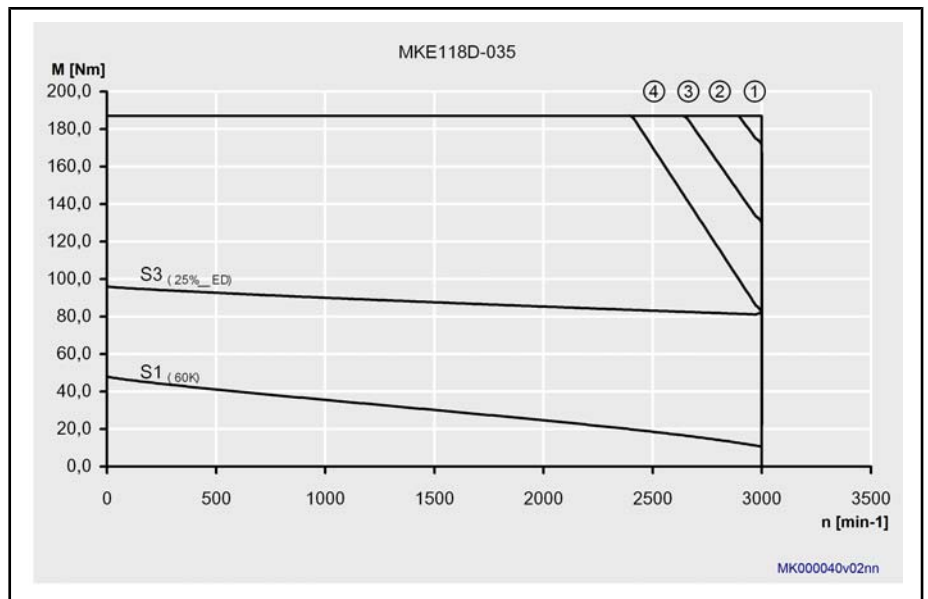
- $M_{max}①$ IndraDrive, controlled feed 3 x AC 400V
- $M_{max}②$ IndraDrive, uncontrolled feed 3 x AC 480V
- $M_{max}③$ IndraDrive, uncontrolled feed 3 x AC 440V
- $M_{max}④$ IndraDrive, uncontrolled feed 3 x AC 400V

Fig.4-19: Motor's characteristic curve MKE118D-012



- $M_{max}①$ IndraDrive, controlled feed 3 x AC 400V
- $M_{max}②$ IndraDrive, uncontrolled feed 3 x AC 480V
- $M_{max}③$ IndraDrive, uncontrolled feed 3 x AC 440V
- $M_{max}④$ IndraDrive, uncontrolled feed 3 x AC 400V

Fig.4-20: Motor's characteristic curve MKE118D-027



- M_{max}① IndraDrive, controlled feed 3 x AC 400V
- M_{max}② IndraDrive, uncontrolled feed 3 x AC 480V
- M_{max}③ IndraDrive, uncontrolled feed 3 x AC 440V
- M_{max}④ IndraDrive, uncontrolled feed 3 x AC 400V

Fig.4-21: Motor's characteristic curve MKE118B-035

Bearing and shaft load

For additional information about permissible radial and axial forces, see [chapter 9.10 "Bearings and Shaft Load" on page 80.](#)

Diagram for determining the maximum permissible radial F_{radial}.

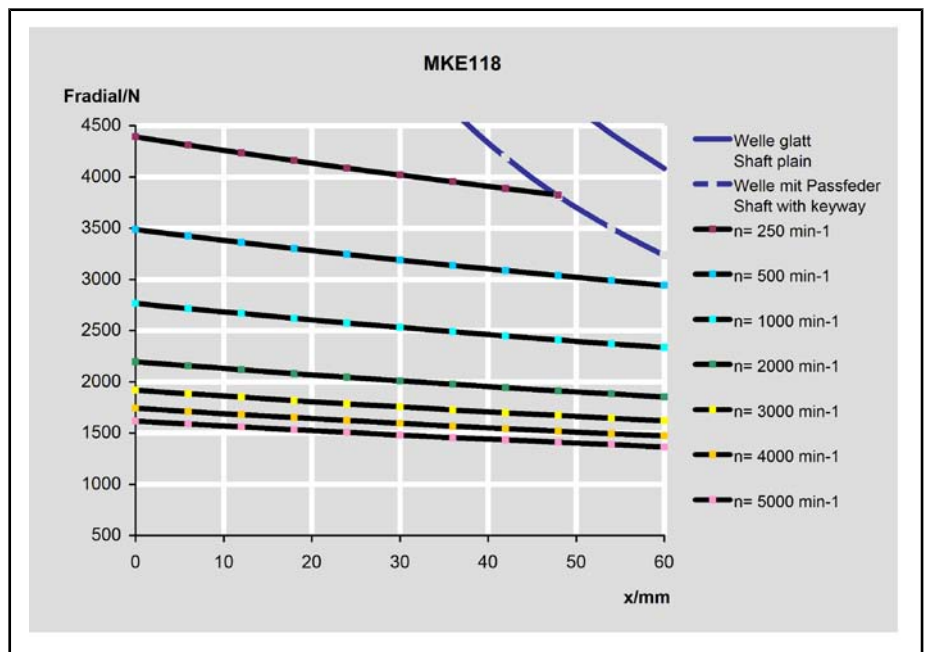


Fig.4-22: MKE118: permissible radial force (shaft and bearing load)

Permissible axial force 200 Nm.

5 Specifications

5.1 Specifications MKE037

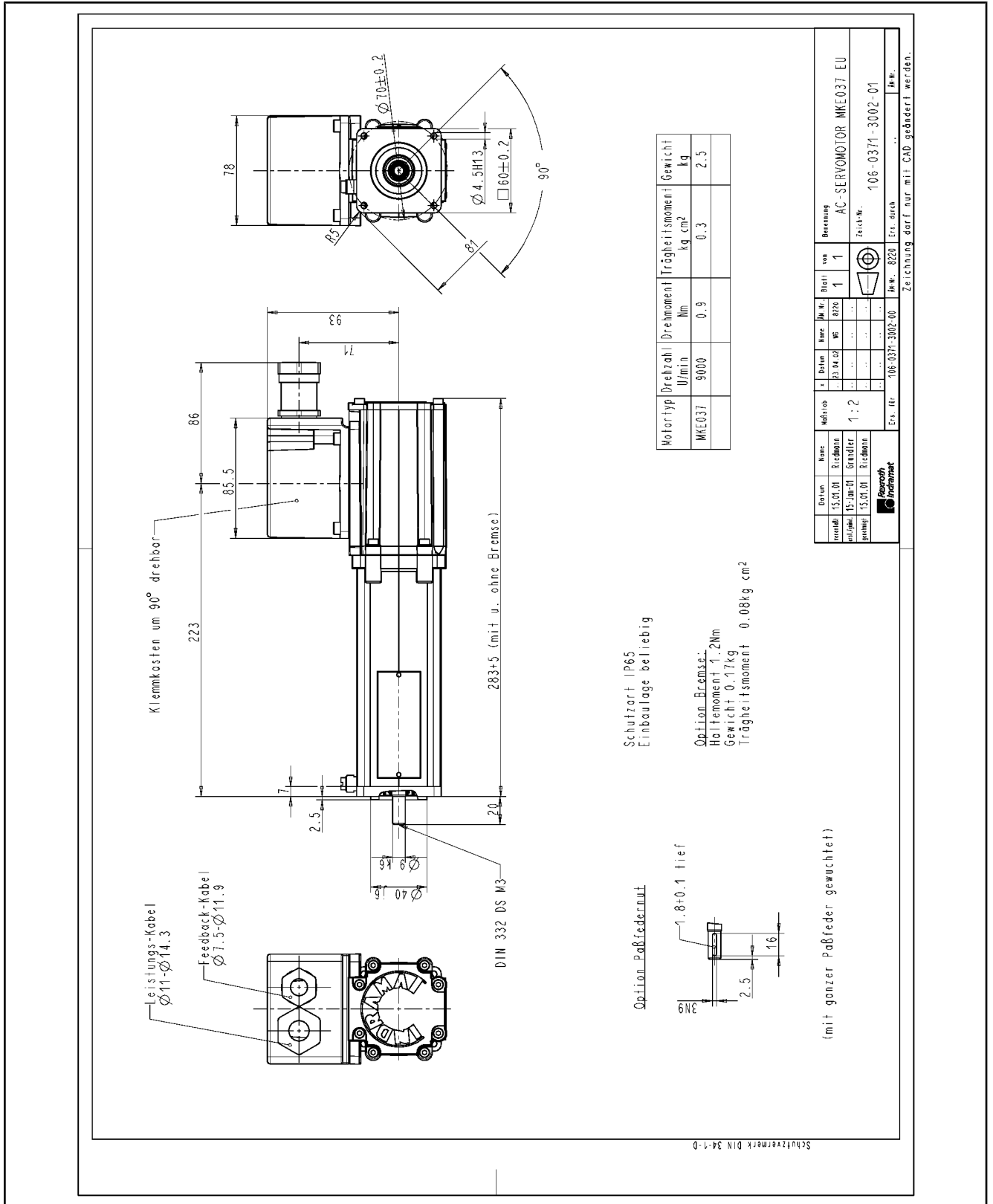


Fig.5-1: Specifications MKE037 ATEX

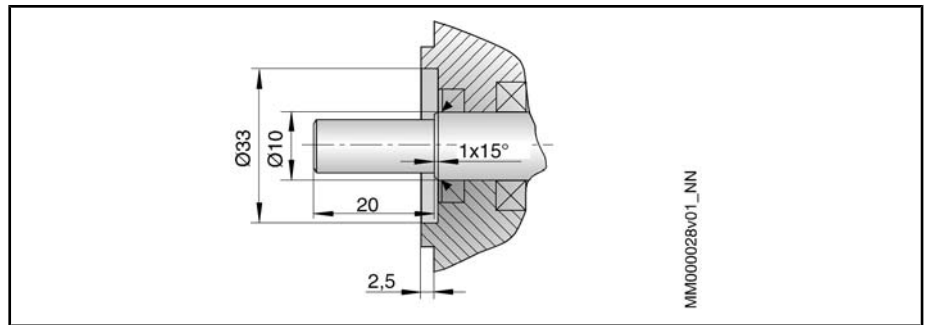
Stub shaft

Fig.5-3: Stub shaft MKE037

- Stub shaft cylindrical according to DIN 748, Part 3, ed. 07.75. IEC 60072 (1971).
 - DS M3 centering hole according to DIN 332, Part 2, ed. 05.83, max. tightening torque for screw 0.7 Nm.
 - Vibration severity grade N according to DIN VDE 0530, Part 14, ed. 02.93.
- Motor design**
- Motor design B5 according to EN 60034-7 / 1993 for all installation positions.
- Flange**
- Flange according to DIN 42948, ed. 11.65.
 - Positional accuracy with regard to true running, axial running and coaxiality to the shaft according to DIN 42955 Tolerance Class N, ed. 12.81
- Output shaft**
- Plain shaft (preferred type)
 - or -
 - Shaft with keyway according to DIN 6885, Sheet 1, ed. 08.68.



Caution! Balanced with key!

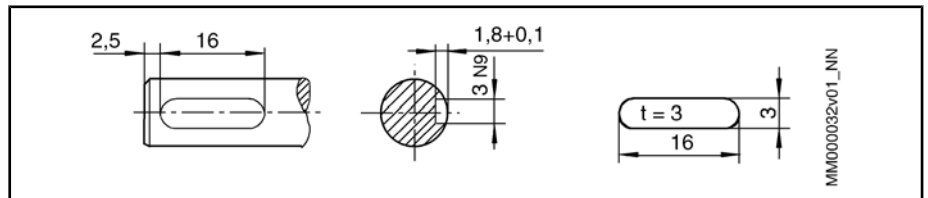


Fig.5-4: Output shaft with keyway MKE037



Related key: DIN 6885-A 3 x 3 x 16; not included in the scope of delivery of the motor.

Options For options, refer to the chapter entitled "Type code / order designation".

Specifications

Stub shaft

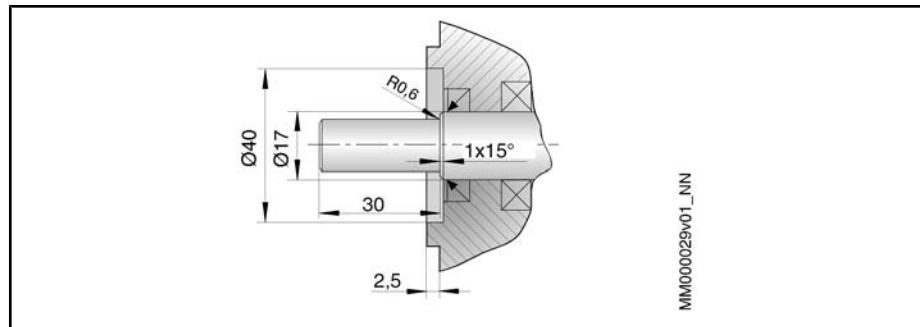


Fig.5-7: Stub shaft MKE047

- Stub shaft cylindrical according to DIN 748, Part 3, ed. 07.75. IEC 60072 (1971).
 - DS M5 centering hole according to DIN 332, Part 2, ed. 05.83, max. tightening torque for screw 3.0 Nm.
 - Vibration severity grade N according to DIN VDE 0530, Part 14, ed. 02.93.
- Motor design**
- Motor design B5 according to EN 60034-7 / 1993 for all installation positions.
- Flange**
- Flange according to DIN 42948, ed. 11.65.
 - Positional accuracy with regard to true running, axial running and coaxiality to the shaft according to DIN 42955 Tolerance Class N, ed. 12.81
- Output shaft**
- Plain shaft (preferred type)
 - or -
 - Shaft with keyway according to DIN 6885, Sheet 1, ed. 08.68.



Caution! Balanced with key!

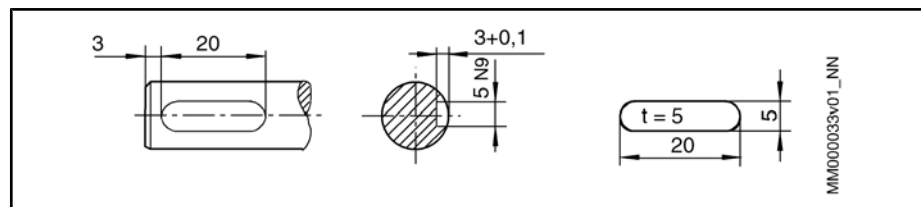


Fig.5-8: Output shaft with keyway MKE047



Related key: DIN 6885-A 5 x 5 x 20; not included in the scope of delivery of the motor.

Options For options, refer to the chapter entitled "Type code – order designation".

5.3 Specifications MKE098

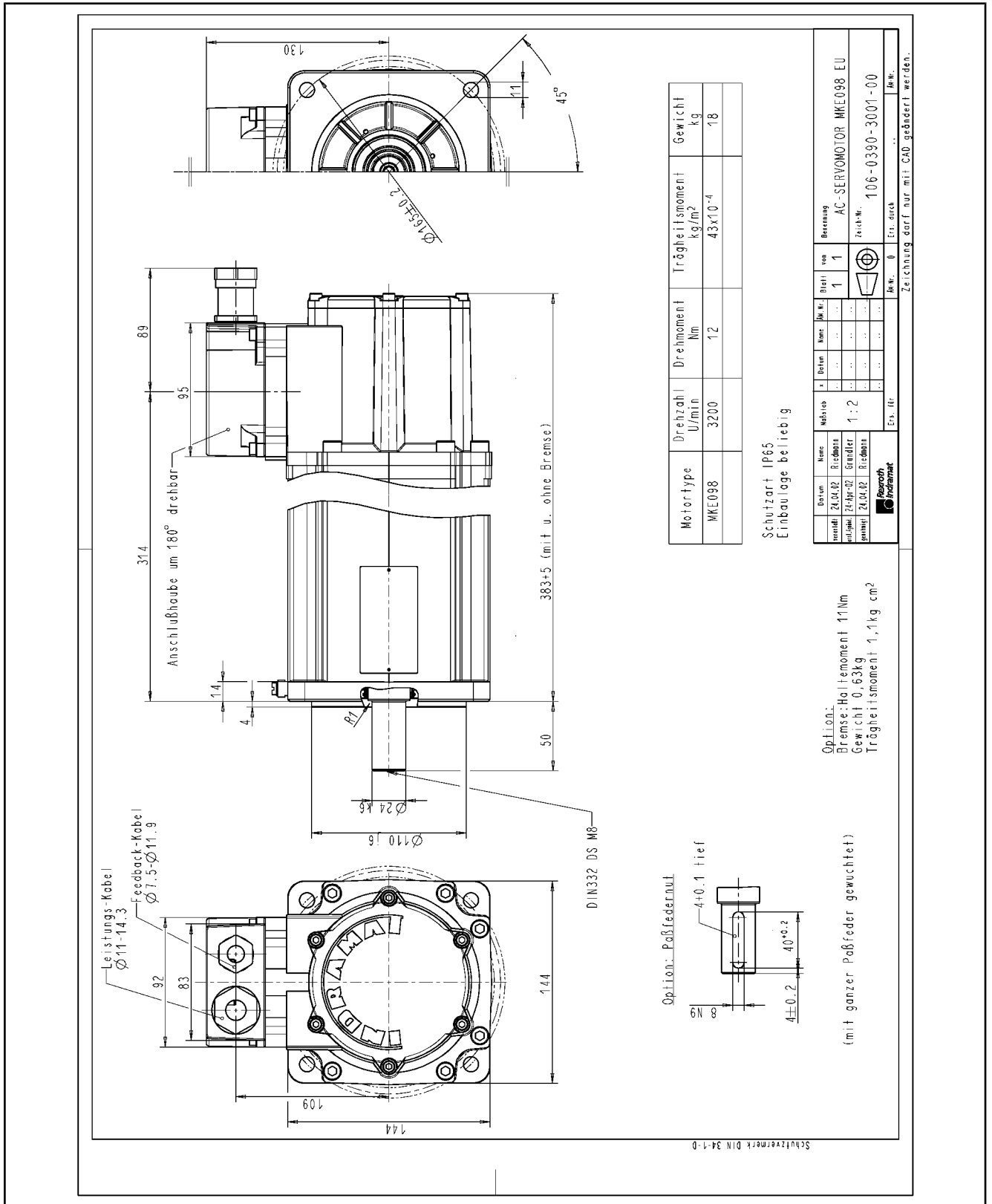


Fig. 5-9: Specifications MKE098 ATEX

Specifications

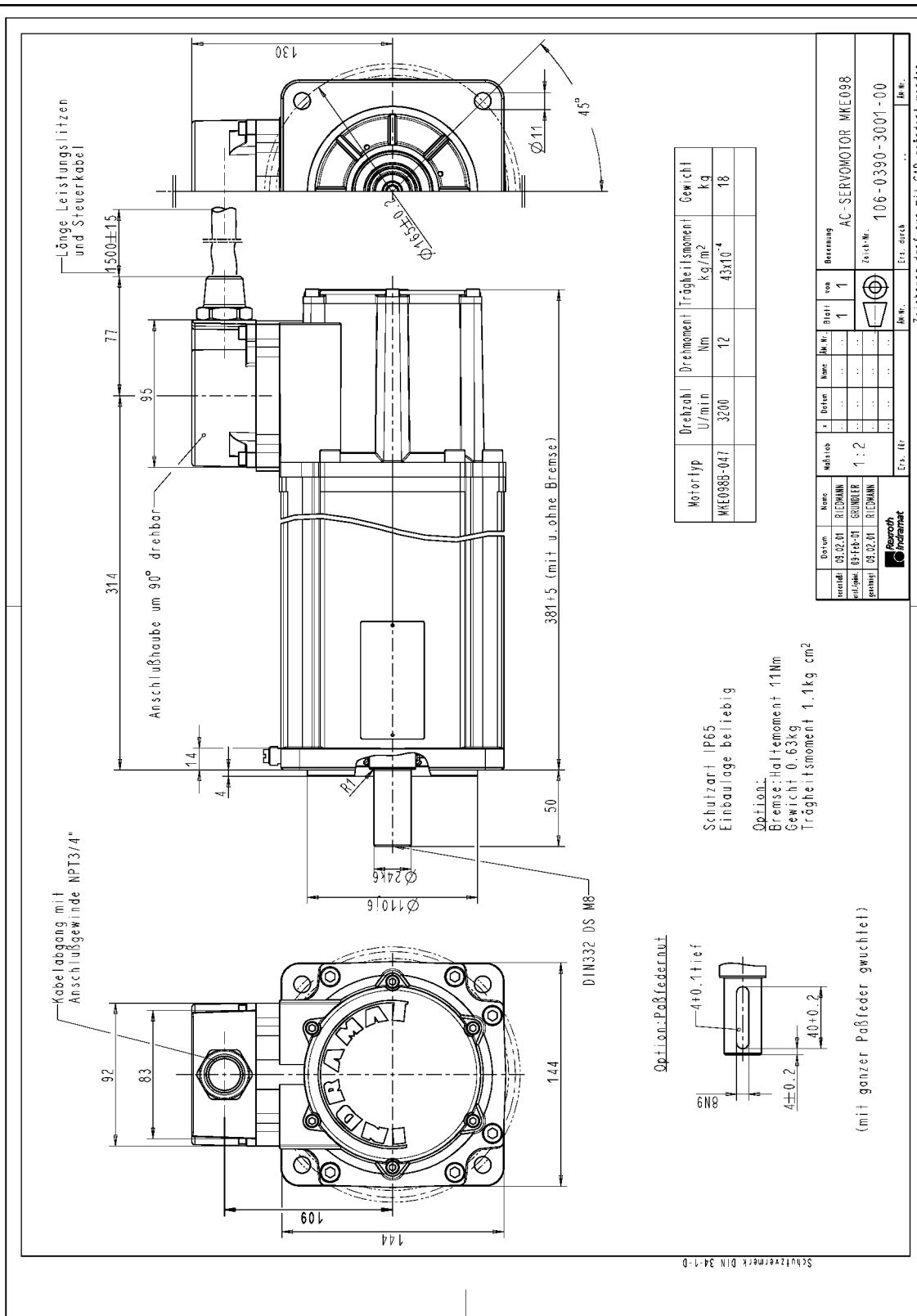


Fig.5-10: Specifications MKE098 UL/CSA

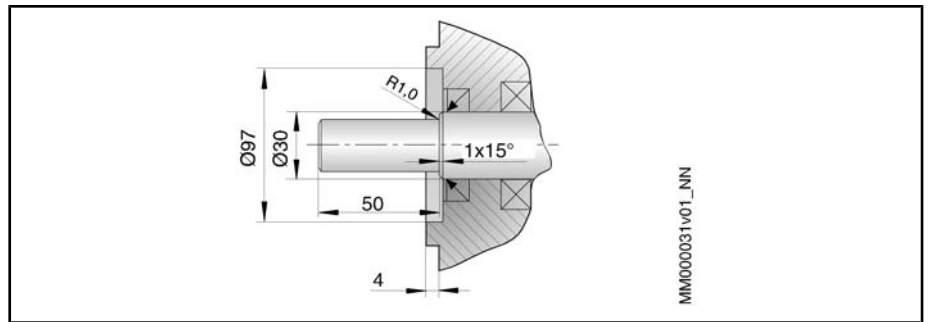
Stub shaft

Fig. 5-11: Stub shaft MKE098

- Stub shaft cylindrical according to DIN 748, Part 3, ed. 07.75. IEC 60072 (1971).
 - DS M5 centering hole according to DIN 332, Part 2, ed. 05.83, max. tightening torque for screw 3.0 Nm.
 - Vibration severity grade N according to DIN VDE 0530, Part 14, ed. 02.93.
- Motor design**
- Motor design B5 according to EN 60034-7 / 1993 for all installation positions.
- Flange**
- Flange according to DIN 42948, ed. 11.65.
 - Positional accuracy with regard to true running, axial running and coaxiality to the shaft according to DIN 42955 Tolerance Class N, ed. 12.81
- Output shaft**
- Plain shaft (preferred type)
 - or -
 - Shaft with keyway according to DIN 6885, Sheet 1, ed. 08.68.



Caution! Balanced with key!

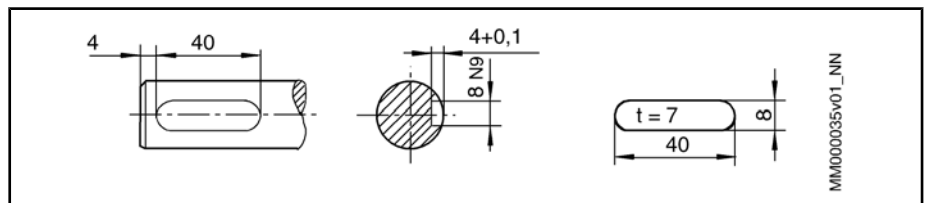


Fig. 5-12: Output shaft with keyway MKE098



Pertinent key: DIN 6885-A 5 x 5 x 20; not included in the scope of delivery of the motor.

Options For options, refer to the chapter entitled "Type code / order designation".

Specifications

Stub shaft

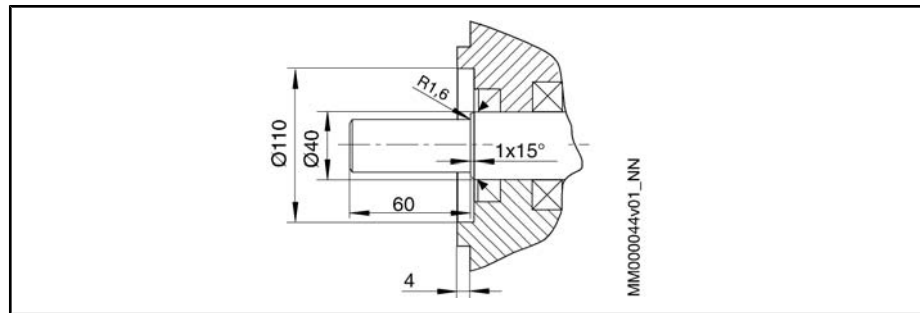


Fig.5-15: Stub shaft MKE118

- Stub shaft cylindrical according to DIN 748, Part 3, ed. 07.75. IEC 60072 (1971).
- DS M10 centering hole according to DIN 332, Part 2, ed. 05.83, max. tightening torque for screw 25 Nm.
- Vibration severity grade N according to DIN VDE 0530, Part 14, ed. 02.93.
- Motor design
 - Motor design B5 according to EN 60034-7 / 1993 for all installation positions.
- Flange
 - Flange according to DIN 42948, ed. 11.65.
 - Positional accuracy with regard to true running, axial running and coaxiality to the shaft according to DIN 42955 Tolerance Class N, ed. 12.81
- Output shaft
 - Plain shaft (preferred type)
 - or -
 - Shaft with keyway according to DIN 6885, Sheet 1, ed. 08.68.



Caution! Balanced with key!

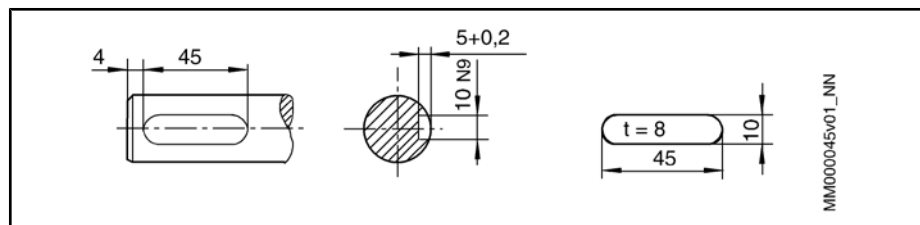


Fig.5-16: Output shaft with keyway MKE118



Related key: DIN 6885-A 10 x 8 x 45; not included in the scope of delivery of the motor.

Options For options, refer to the chapter entitled "Type code / order designation".

6 Type Codes

6.1 Description

General Each order of a product by Rexroth must be based on the type code. All available motor variants are uniquely described by their type code. The individual characters of the type code (abbrev. column) and their meaning are described below.



- The chapter "Application notes" includes detailed explanations for the separate options.
- Before ordering, please check the availability of the separate options with your Bosch Rexroth sales partner.

Product group **MKE**, Rexroth designation for servomotors that are suited for the use in potentially explosive areas.

Motor frame size The motor frame size determines important mechanical motor specifications and is proportional to the performance variables.

Motor frame length Within a series, the graduation of increasing motor frame length is indicated in alphabetic order.

Winding code In connection with the motor frame size and motor frame length, the winding codes define the electric motor output data for all Bosch Rexroth motors.

Motor encoder MKE motors are equipped with encoder systems. For the regulation of the motor speed or the positioning of the motor, the drive control device must know the current motor position. The integrated encoder system provides the drive control device with corresponding signals.

The following options are available:

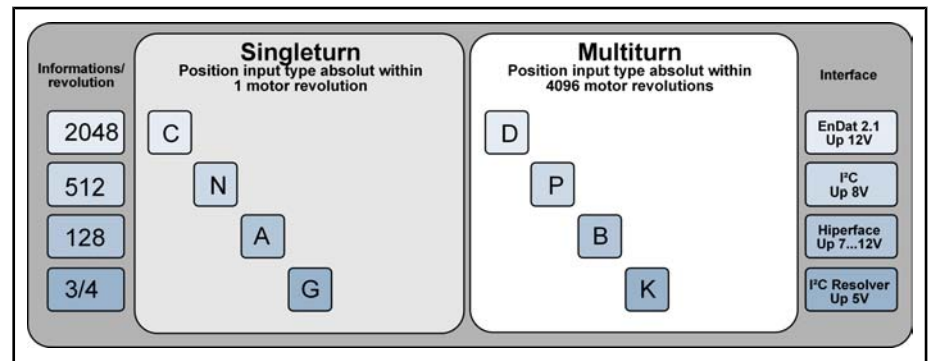


Fig. 6-1: MKE motor encoder

Output shaft To connect the machine elements to be driven to the motor drive shafts, the following variants are available for MKE motors.

Option	Version	Detail
G	Plain shaft	With frontal centering hole with "DS" thread according to DIN 332, Part 2, Edition 05.83
P	Shaft with keyway ¹⁾	
¹⁾ Keyway according to DIN 6885, Sheet 1, ed. 08.68. For details, refer to the motor rating sheet!		

Fig. 6-2: MKE output shafts



MKE motors are balanced with the featherkey. The related key is not included in the scope of delivery.

Type Codes

Holding brake As an option, IndraDyn S motors are available with electrically releasing holding brakes with various holding torques.

Option	Holding brakes	
0	Without holding brake	
1, 2, 3	With holding brake	The holding torques are indicated in the motor type code.

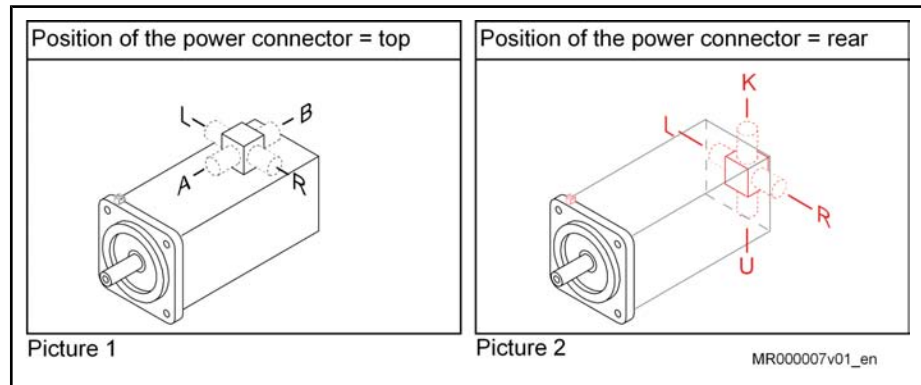
Fig.6-3: IndraDyn S holding brakes



The holding brake is not suitable for the protection of personnel or as a service brake! Please also observe the installation and safety instructions on the motor holding brakes in the chapter entitled "Application notes".

Output direction of power connector

The cable outlet direction of the UL/CSA motors will be delivered according to the order. For the EU version, only output direction B is available. However, the output direction can be changed when the motor is mounted.



Picture1 Valid for MKE037, -047, -098
 Picture2 Valid for MKE118

Fig.6-4: Position of the power connector for MKE motors

Housing type

Option	Housing type	Comment
E	According to European standard (EN)	Output direction power connector only B side
U	According to American Standard (UL)	

U Housing type for North American countries (USA, Canada)
 E Housing type for European and Asian countries

Fig.6-5: MKE housing type

Other types / line entry (diameter)

For options and availability, see type code.

Reference to standards

Note regarding the standards cited in the type code (e.g. DIN, EN, ISO) or factory standards RNC...). The version listed is always that valid at the time the type code is issued.

Comment

Please refer to this item for additionally required information concerning the handling of the type code. This includes, for example, descriptions on footnotes or notes on availability.

6.2 MKE037

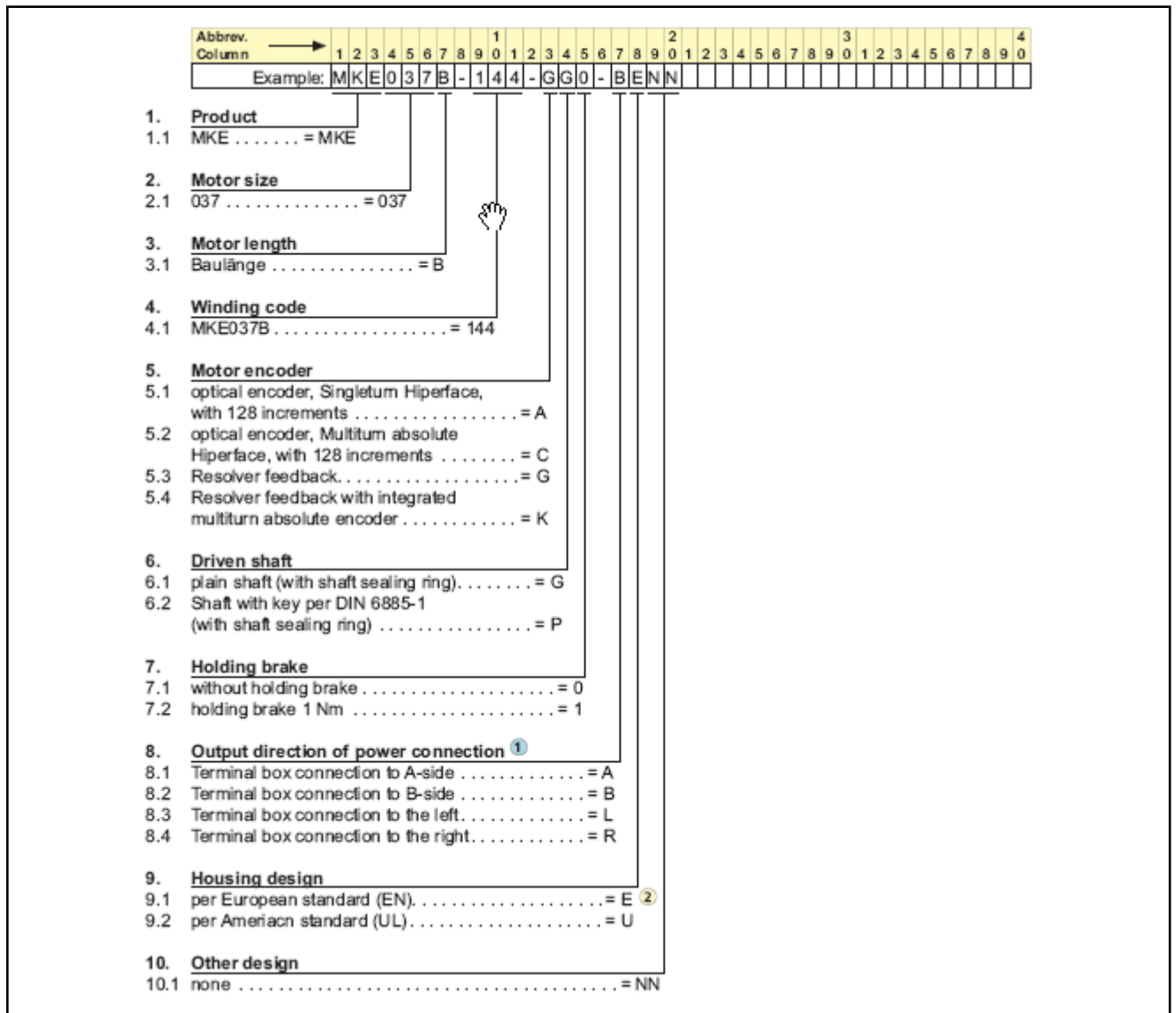


Fig. 6-6: MKE037 type code (page 1)

Type Codes

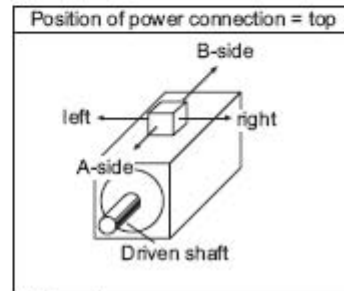
11. Standard reference

Standard	Title	Edition
DIN 6885-1	Drive Type with Fastenings without Taper Action; Parallel Keys, Keyways, Deep Pattern	1968-08
DIN EN 50014	Electrical apparatus for potentially explosive atmospheres - General requirements; Amendment AA; German version EN 50014:1997/prAA:1999	1998-02
DIN EN 50018	Electrical apparatus for potentially explosive atmospheres - Flameproof enclosures "d"; German version EN 50018:1994	1995-03
UL 508C	Power conversion equipment	1996-11
UL 674*ANSI 674	Electric motors and generators for use in division 1 hazardous (classified) locations	1994-04
UL 1446	Systems of insulating materials - General	1997-05

Note:

- ① Looking from front onto driven shaft (see picture 1)
- ② Housing design "E" is only available with output direction of power connection "B"

Illustration example: MKE037



Picture 1

Fig.6-7: MKE037 type code (page 2)

6.3 MKE047

Abbrev.	1									2									3									4																																
Column	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9											
Example:	M	K	E	0	4	7	B	-	1	4	4	-	G	G	0	-	B	E	N	N																																								

1. **Product**
 - 1.1 MKE = MKE
2. **Size**
 - 2.1 047 = 047
3. **Length**
 - 3.1 Length = B
4. **Winding**
 - 4.1 MKE047B = 144
5. **Encoder**
 - 5.1 optical encoder, Singletum Hiperface, with 128 increments = A
 - 5.2 optical encoder, Multitum-Absolut Hiperface, with 128 increments = C
 - 5.3 Resolver feedback = G
 - 5.4 Resolver feedback with integrated multiturn absolute encoder = K
6. **Shaft**
 - 6.1 plain shaft (with shaft sealing ring). = G
 - 6.2 shaft with key per DIN 6885-1 (with shaft sealing ring) = P
7. **Holding break**
 - 7.1 without holding break = 0
 - 7.2 with holding break 2.2 Nm. = 1
8. **Output direction of power connection ①**
 - 8.1 Terminal box to A-Side = A
 - 8.2 Terminal box to B-Side = B
 - 8.3 Terminal box to the left = L
 - 8.4 Terminal box to the right = R
9. **Housing design**
 - 9.1 per European standard (EN) = E ②
 - 9.2 per American standard (UL) = U
10. **Other design**
 - 10.1 none = NN

Fig.6-8: MKE047 type code (page 1)

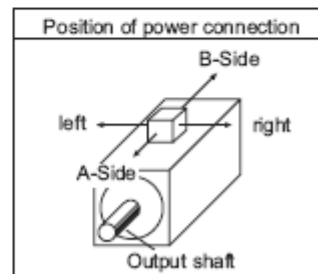
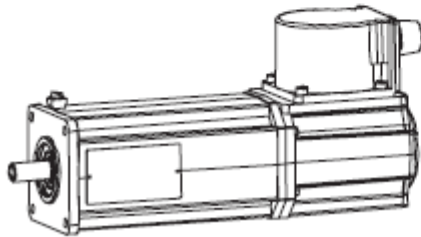
Type Codes

11. Standard reference		
Standard	Title	Edition
DIN 6885-1	Drive Type with Fastenings without Taper Action; Parallel Keys, Keyways, Deep Pattern	-
DIN EN 50014	Electrical apparatus for potentially explosive atmospheres - General requirements; German version EN 50014:1997 + Corrigendum:1998 + A1:1999 + A2:1999	-
DIN EN 50018	Electrical apparatus for potentially explosive atmospheres - Flameproof enclosures "d"; German version EN 50018:2000	-
UL 508C	Power conversion equipment	-
UL 674*ANSI 674	Electric motors and generators for use in division 1 hazardous (classified) locations	-
UL 1446	Systems of insulating materials - General	-

Note:

- ① Looking from front onto driven shaft (see picture 1)
- ② Housing design "E" is only available with output direction of power connection "B"

Illustration example: MKE047



Picture 1

Fig.6-9: MKE047 type code (page 2)

Type Codes

Abbrev.	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
Column	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
Example:	M	K	E	0	9	8	B	-	0	4	7	-	K	P	1	-	R	U	N	N																				

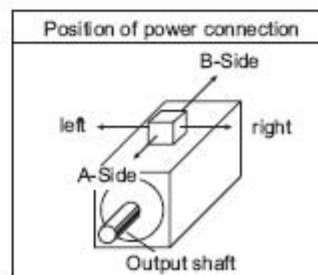
- 8. **Output direction of power connection**
 - 8.1 Terminal box to side A = A
 - 8.2 Terminal box to side B = B
 - 8.3 Terminal box to the left = L
 - 8.4 Terminal box to the right = R
- 9. **Housing design**
 - 9.1 per European standard (EN) = E ②
 - 9.2 per American standard (UL) = U
- 10. **Other design**
 - 10.1 none = NN

11. Standard reference		Edition
Standard	Title	
DIN 6885-1	Drive Type with Fastenings without Taper Action; Parallel Keys, Keyways, Deep Pattern	-
DIN EN 50014	Electrical apparatus for potentially explosive atmospheres - General requirements; Amendment AA; German version EN 50014:1997/prAA:1999	-
DIN EN 50018	Electrical apparatus for potentially explosive atmospheres - Flameproof enclosures "d"; German version EN 50018:1994	-
UL 508C	Power conversion equipment	-
UL 674*ANSI 674	Electric motors and generators for use in division 1 hazardous (classified) locations	-
UL 1446	Systems of insulating materials - General	-

Note:

- ① Looking from front onto driven shaft (see picture 1)
- ② Housing design "E" is only available with output direction of power connection "B"

Illustration example: MKE098



Picture 1

Fig.6-11: MKE098 type code (page 2)

6.5 MKE118

Abbrev. Column	1									2									3									4																															
→	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9										
Example:	M	K	E	1	1	8	D	-	0	3	5	-	P	G	3	-	K	U	N																																								

- 1. Product**
- 1.1 MKE = MKE

- 2. Motor size**
- 2.1 118 = 118

- 3. Motor length**
- 3.1 Lengths = B, D

- 4. Winding code**
- 4.1 MKE118B = 024, 058
- 4.2 MKE118D = 012, 027, 035

- 5. Motor encoder**
- 5.1 optical encoder, Singleturn Hiperface, with 128 increments (S1) = A
- 5.2 optical encoder, Singleturn EnDat2.1 mit 2048 increments (S2) = B
- 5.3 optical encoder, Multiturn-Absolut Hiperface, with 128 increments (M1) = C
- 5.4 optical encoder, Multiturn Absolute EnDat2.1, with 2048 increments (M2). ... = D
- 5.5 digital servo feedback = N
- 5.6 digital servo feedback with integrated multiturn absolute encoder = P

- 6. Shaft**
- 6.1 plain shaft (with shaft sealing ring). = G
- 6.2 shaft with key per DIN 6885-1 (with shaft sealing ring) = P

- 7. Holding break ①**
- 7.1 without holding break = 0
- 7.2 with holding break 22 Nm. = 1
- 7.3 with holding break 70 Nm. = 3

- 8. Output direction of power connection ②**
- 8.1 Terminal box, top. = K
- 8.2 Terminal box, left. = L
- 8.3 Terminal box, right. = R
- 8.4 Terminal box, bottom. = U

Fig. 6-12: MKE118 type code (page 1)

Type Codes

Abbrev. Column →	1									2									3									4																															
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9										
Example:	M	K	E	1	1	8	D	-	0	3	5	-	P	G	3	-	K	U	N																																								

9. Housing design ③

9.1 per European standard (EN) = E

9.2 per American standard (UL) = U

10. Cable input (diameter) ④

10.1 13,0 mm to 16,0 mm = 4

10.2 17,0 mm to 19,5 mm = 6

10.3 US standard = N

11. Standard reference

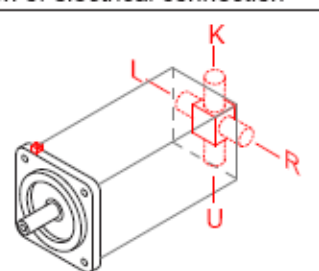
Standard	Title	Edition
DIN 6885-1	Drive Type with Fastenings without Taper Action; Parallel Keys, Keyways, Deep Pattern	1968-08
DIN EN 50014	Electrical apparatus for potentially explosive atmospheres - General requirements; German version EN 50014:1997 + Corrigendum:1998 + A1:1999 + A2:1999	2000-02
DIN EN 50018	Electrical apparatus for potentially explosive atmospheres - Flameproof enclosures "d"; German version EN 50018:2000	2001-12
UL 508C	Power conversion equipment	2002-05
UL 674*ANSI 674	Electric motors and generators for use in division 1 hazardous (classified) locations	2003-12
UL 1446	Systems of insulating materials - General	1997-05

Note:

- ① Holding break "1" is only available with length "B"
Holding break "3" is only available with length "D"
- ② Looking from front onto driven shaft (see picture 1)
- ③ Housing design "E" is only available with output direction of power connection "K"
- ④ Cable input "4" and "6" is only available with housing design "E"
Cable input "N" is only available with housing design "U"

Illustration example:

Position of electrical connection = back



Picture 1

Fig.6-13: MKE118 type code (page 2)

7 Options and Accessories

7.1 Motor Encoder

To control the motor speed and / or to position the motor, the drive control device must know the current motor position.

To achieve this, the integrated encoder system provides the drive control device with the corresponding signals. The drive control devices are capable of transmitting the positional value thus determined to a superordinate CNC or SPS.

Encoder data memory

The encoder electronics is equipped with a data memory where the motor type name, the control loop parameters and the motor parameters are filed. Rexroth drive control devices read out this data. This ensures

- quick and easy startup,
- adaptation between the motor and the drive control device without the risk of damage to the motor.

The following encoder variants are available for MKE motors:

Type	Description	Measuring method	System accuracy	Type of position detection	Position resolution on the motor
G ¹⁾	Digital resolver feedback (RSF)	Induktive	±8 angular minutes	Relative	MKE037, 047
K ¹⁾	Digital resolver feedback (RSF with integrated multiturn absolute encoder)			Absolute (more than 4096 revolutions)	3 x 2 ¹³ = 24576 MKE098 4 x 2 ¹³ = 32768 Information / Revolution
N ¹⁾	Digital servo feedback (HSF)	Optical	±0.5 angular minutes	Relative	MKE098, 118
P ¹⁾	Digital servo feedback (HSF with integrated multiturn absolute encoder)			Absolute (more than 4096 revolutions)	512 x 2 ¹³ = 4194304 Information / Revolution
A ²⁾	Optical singleturn Hiperface encoder		±80 angular seconds	Absolute (more than 1 revolution)	128 x 2 ¹³ = 1.048.576 Information / Revolution
C ²⁾	Optical multiturn Hiperface encoder			Absolute (more than 4096 revolutions)	
B ²⁾	Optical singleturn EnDat 2.1 encoder		±20 angular seconds	Absolute (more than 1 revolution)	2048 x 2 ¹³ = 16.777.216 Information / Revolution
D ²⁾	Optical multiturn EnDat 2.1 encoder			Absolute (more than 4096 revolutions)	

1) for drive control devices DiAx 04, EcoDrive 03, DuraDrive

2) for IndraDrive drive control devices

Fig. 7-1: MKE motor encoder

Further information and details on the encoder types are described in the following.





Resolver feedback (RSF)

Provided for relative indirect position detection. Replaces separate incremental encoders on the motor.



Characteristics of the resolver feedback: After a voltage failure or after the first POWER ON, the axis must first always be moved to its reference point, before the processing can begin.


Options and Accessories

<p>Resolver feedback (RSF) with integrated multiturn absolute encoder</p>	<ul style="list-style-type: none"> When placing the home position circuit breaker and during the reference, note that the resolver's mode of action generates several reset signals during a mechanical motor revolution. For MKE037 and MKE047: 3 reset signals per revolution For MKE098: 4 reset signals per revolution Avoid too high a gear ratio or to slight a feed-constant. <p>Provided for absolute indirect position detection within 4096 motor revolutions. Replaces separate absolute value encoders on the motor.</p>
	<p> The absolute axis position for this encoder variant remains valid after power shut down because of the battery back-up. The nominal durability of the batterie is about 10 years.</p>
<p>Digital servo feedback (HSF)</p>	<p>Provided for relative indirect position detection. Replaces separate incremental encoder on the motor.</p>
	<p> After a voltage failure or after the first POWER ON, the axis must first always be moved to its home position.</p>
<p>Digital servo feedback (HSF) with integrated multiturn absolute encoder</p>	<p>Provided for absolute indirect position detection within 4096 motor revolutions. Replaces separate absolute encoder on the motor.</p>
	<p> The absolute axis position for this encoder variant remains valid after power shut down because of the battery back-up.</p>
<p>Optical singleturn encoder Option A, B</p>	<p>These encoders permit absolute, indirect position recording within one mechanical rotation. The encoders replace separate incremental encoders on the motor.</p>
	<p> After a power failure or after the first POWER ON, the axis must first always be moved to its home position.</p> <p>Exception: Applications in which the maximum working path is within one mechanical rotation of the motor.</p>
<p>Multiturn absolute optical encoder Option C, D</p>	<p>These encoders permit absolute, indirect position recording within 4096 mechanical rotations. The encoders replace a separate absolute value encoder on the motor. With this encoder version, the absolute position of the axis is preserved even after voltage switch-off.</p>

7.2 Holding Brakes

The holding brake serves to hold the axis when the machine is in a de-energized state. In **normal operation**, use the holding brake only at standstill or for **EMERGENCY STOP** in order to deactivate an axis ($n < 10 \text{ min}^{-1}$).

Please observe the application notes when using holding brakes in [chapter 9.11 "Holding Brakes \(Ex\)" on page 84](#).

 For technical data and availability of holding brakes, see chapters "Technical data" and "Type codes".

7.3 Gearboxes

7.3.1 General



DANGER

Risk of explosion! Fatal injuries, damage to the building and installation.

A motor-gearbox combination must comply with the explosion protection requirements according to the ATEX directive 94/5EC.

Servo planetary gearboxes according to ATEX for the attachment to MKE motors are not offered or supplied by Rexroth, neither separately, nor mounted to motors.



Renowned gearbox manufacturers have explosion-protected gearboxes in their scope of delivery.

Please contact one of the following manufacturers recommended by Rexroth, if need be:

Neugart GmbH

Kellterstr. 16

77971 Kippenheim, Germany

Tel.: +49(0)7825-847-0

Fax: +49(0)7825-847-102

Internet: <http://www.neugart.de>

7.3.2 Planetary Gearbox

Planetary gearboxes of the GTS and GTP series are mechanically suitable for the assembly on MKE motors.

They are particularly suited for use in S5 operation in gear racks or toothed belts in handling systems with high speeds and accelerations (e.g.: loader, robots).



Gearboxes of the GTS and GTP series are **not certified** according to the directive 94/9/EC. For MKE motors with attached encoders, Rexroth assumes no warranty or liability. The Ex protection verification certificate refers exclusively to the MKE motors. All further mechanical add-on pieces are not considered and need an additional inspection under the responsibility of the machine or system manufacturer.

High operational reliability

- Low-maintenance operation owing to lifetime lubrication
- Use under adverse ambient conditions is possible (owing to the completely closed design in IP 65 degree of protection)

High performance data

- Low-play gear teeth with minimum reverse play owing to ground gear pairs
- High torsional strength owing to load distribution to three planetary wheels
- High efficiency owing to planetary wheel principle
- High dynamic because of inertia
- Low weight due to compact design

Easy attachment to machine

- Direct overhung mounting of gear pinions and belt pulleys, owing to the bearing being designed for high permissible radial loads

Options and Accessories

- The flange design allows attachment according to design B5 (EN 60034, Part 7, ed. 1993) with hole in the flange.

The output shaft can be mounted in two different ways:

- non-positive shaft-hub connection by means of a plain shaft, or
- form-fitting shaft-hub connection by means of an output shaft with keyway.

8 Connection Technique

8.1 Variants

MKE motors are available in:

- Housing type E (according to European standard EN)
- Housing type U (according to American Standard UL)

The different regulations of the responsible public authority require the connection variants shown below.

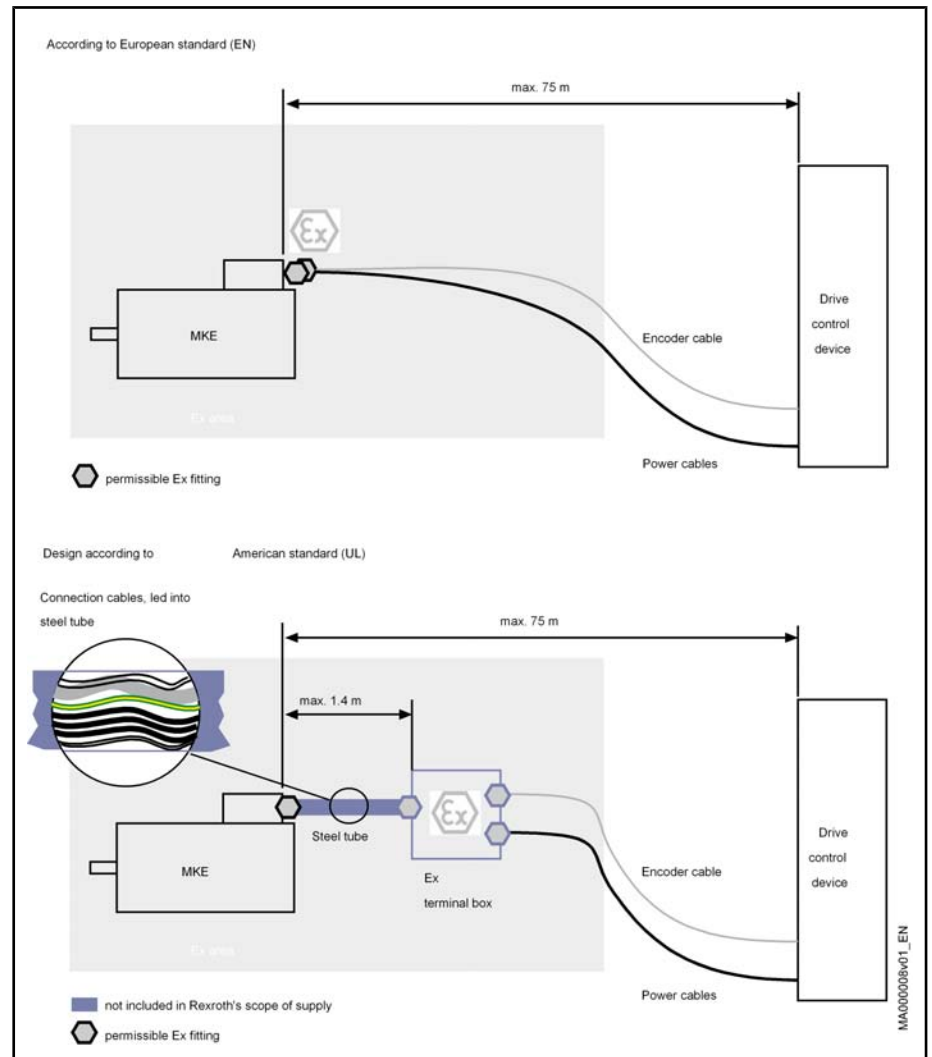


Fig. 8-1: Connection variants MKE motors

Thermostat connection

If MKE motors are used in potentially explosive areas, the analysis of the motor temperature has to be done at Rexroth by means of the drive control device

- IndraDrive
- DuraDrive
- EcoDrive
- DIAX04

offered by Rexroth.

Connection Technique

The connection of the PTC resistors for the motor temperature analysis is stipulated in the respective terminal diagram of the drive control devices.



DANGER

Risk of explosion due to impermissible temperature increase in case of wrong temperature analysis!

⇒ The temperature analysis of the motors **must** be done with drive control devices by Rexroth!

⇒ Connections [1] and [2] of the PTC resistor must be connected to the temperature monitoring unit of the drive control device!

Additional protective conductor

The MKE motors comply with the temperature class T4 according to EN 50014:1992. Thus the maximum permissible surface temperature of the equipment amounts to ≤ 135 °C. The PTC resistors mounted in the MKE motors ensure a reliable and safe overtemperature interruption in connection with the plotting system of the drive control devices.

Protective-conductor terminal	Nominal cross-section	Terminal area
MKE037 MKE047 MKE098 MKE118	2.5 mm ²	2.5 mm ² fine-strand up to 4.0 mm ² single-strand

Fig.8-2: Additional protective conductor

Temperature resistance of connection cables

For using the MKE motors in explosive areas, cables with a temperature resistance of **80 °C (176 °F)** have to be used.

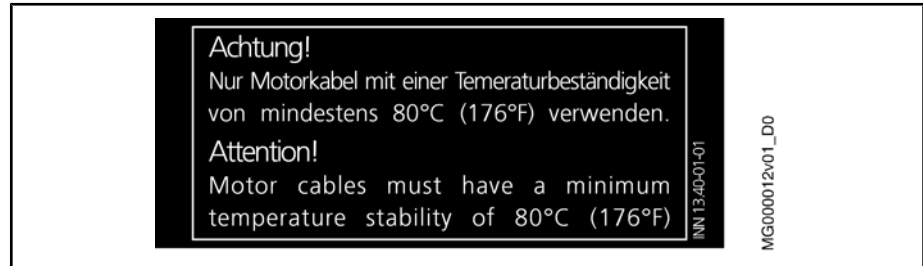


Fig.8-3: Information sign temperature resistance connection cable

The cables of Rexroth given in the selective lists comply with this condition precedent.

Ready-made connection cables

Ready-made connection cables in various length for motors according to European Standard can be ordered at Bosch Rexroth.

Selective lists of available connection cables [chapter 14.2 "Selection of Connection Cable" on page 115](#)

Additional documentation:

DOK-CONN-CABLE*STAND-AUxx-EN-P

8.2 Motor Connection according to European Standard (EU)

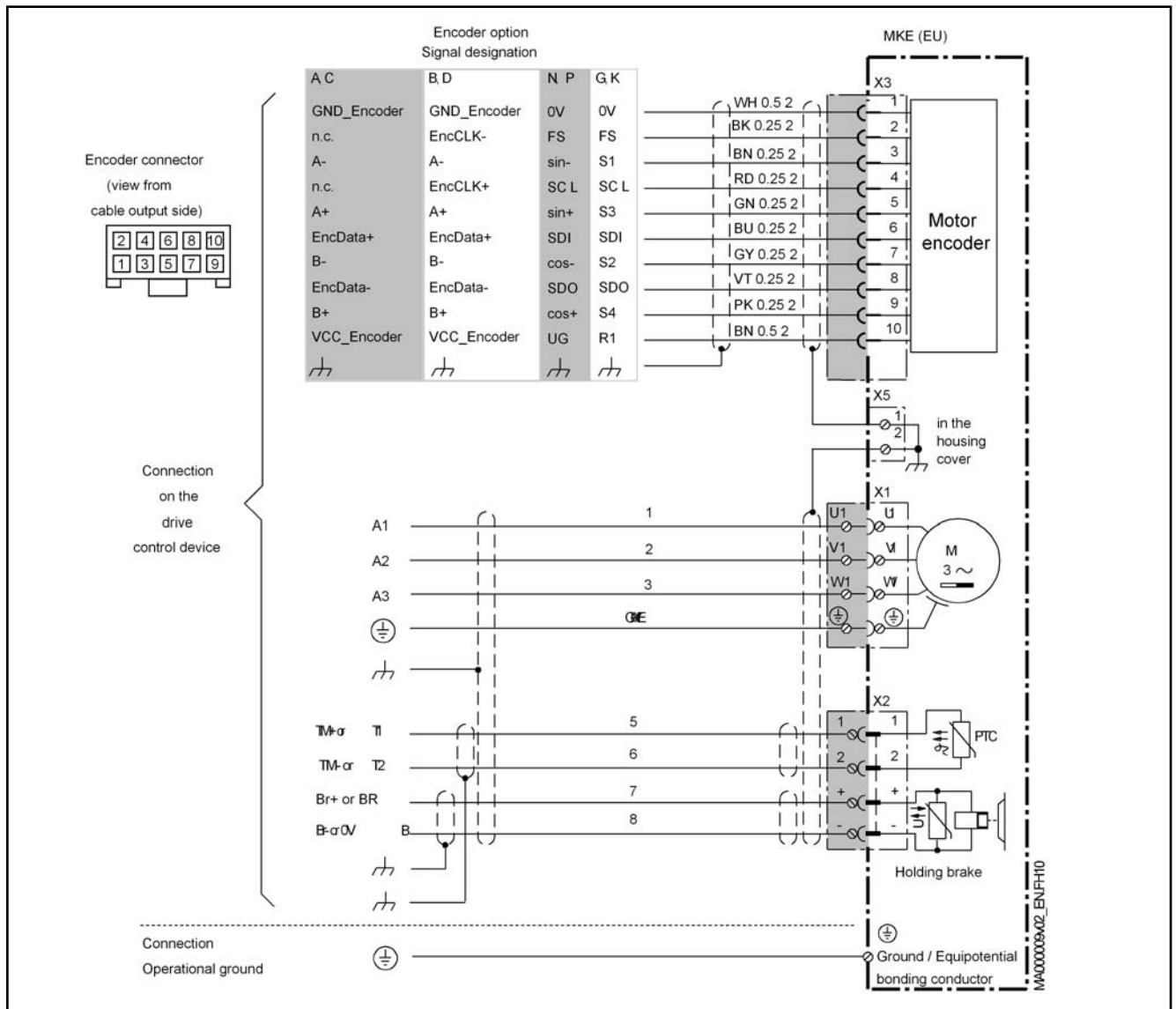


Fig. 8-4: Connection overview MKE according to European standard

The connection of the MKE motors, according to European standard, consists of the following components:

- Power connector (incl. connection for temperature sensor and holding brake)
- Encoder connection
- Additional outside connection for an equipotential bonding conductor (according to EN 50014: 1992)

Power and encoder connection

The power and the encoder cables have to be lead together with the EExd cable duct into the terminal box and to be connected there with the plug-connector and the screw-terminal.

Protection or equipotential bonding conductor

The connection of the protective conductor terminal is to be made over the power cable in the protective conductor into the terminal box of the MKE motor.

An additional connection of a protective or equipotential bonding conductor is prescribed for MKE motors according to EN 50014: 1992. All MKE motors have to be grounded over the additional connection part (protective conductor clamp

Connection Technique

on the motor flange). Protective conductor cross-section see [fig. 8-2 "Additional protective conductor"](#) on page 60.

8.3 Connection according to American Standard (UL)

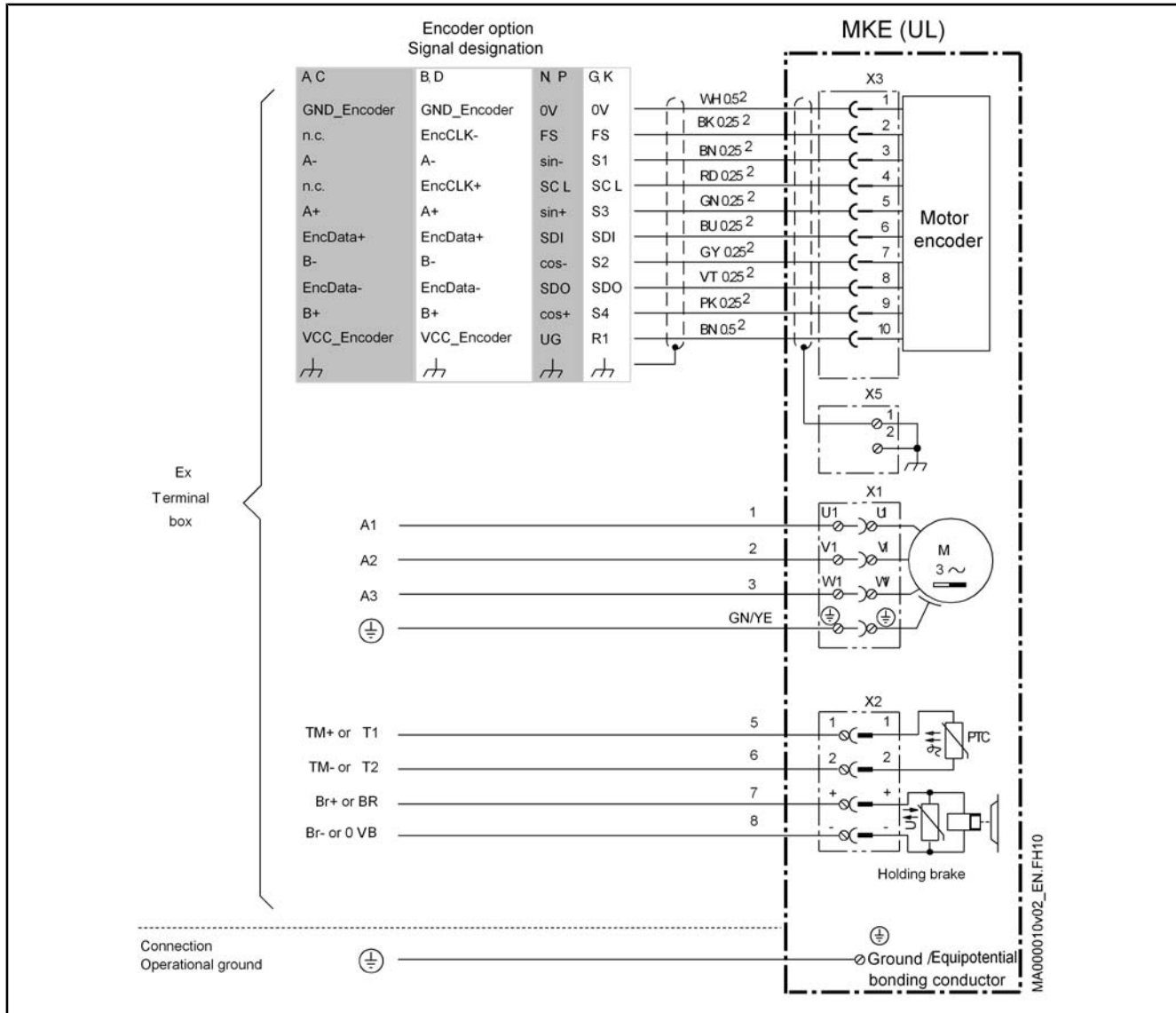


Fig. 8-5: Connection overview according to American standard

The connection of the MKE motors, according to American standard, consists of the following components:

- a power connector, incl. connection for temperature sensor and holding brake, single-wire construction
- encoder connection, standard-cable construction
- additional outside connection for an equipotential bonding conductor (according to EN 50014: 1992)

Power and encoder connection

The connection cable of the MKE motors are to be realised through a special cable duct into the motor. The ca. 1.5 m long connection cables have to be led through a 3/4 inch metal pipe into an approved Ex terminal box (see [fig. 8-1 "Connection variants MKE motors"](#) on page 59). Standard connection cables lead from an Ex terminal box to a drive control device.

Protective or equipotential bonding conductor

The connection of the protective conductor terminal is to be made over the power cable in the protective conductor into the terminal box of the MKE motor. An additional connection of a protective or equipotential bonding conductor is prescribed for MKE motors according to EN 50014: 1992. All MKE motors have to be grounded over the additional connection part (protective conductor clamp on the motor flange). Protective conductor cross-section see [fig. 8-2 "Additional protective conductor"](#) on page 60.

8.4 Dimensioning Power Cable

The cables' cross-sections specified and calculated in this Bosch Rexroth documentation base upon RMS currents and the assumption of a "rotating motor". The basis for this calculation are the continuous currents at standstill which are given as crest values in the technical data chapter of this documentation.

The relevant electric currents are related as follows:

Speed $n \geq 0.01$ Hz "rotating motor"

$$I_{\text{Kabel}} = \frac{I_{\text{dN(Motor)}}}{\sqrt{2}}$$

$I_{\text{(cable)}}$ relevant electric current for the dimensioning of the cable

$I_{\text{dN(motor)}}$ Constant current at standstill of the motor (crest value)

Fig. 8-6: RMS and peak values ("rotating motor")

In general, it suffices to dimension according to the RMS current for a "rotating motor".

Speed $n \leq 0.01$ Hz "rotating motor"

$$I_{\text{Kabel}} = I_{\text{dN(Motor)}}$$

$I_{\text{(cable)}}$ relevant electric current for the dimensioning of the cable

$I_{\text{dN(motor)}}$ Constant current at standstill of the motor (crest value)

Fig. 8-7: RMS and peak values ("motor at stillstand")

In individual cases, for applications of longer time intervals (guide values see [Fig.:8-8](#)) which require the continuous torque at standstill at speed = 0 min^{-1} , it is recommended to realise the cable dimensioning according to the crest values ("motor at standstill") given in the Technical Data.

Motor type	Period of time
MKE037	10 min
MKE047, -098, -118	15 min

Fig. 8-8: Longer-term operation



The recommended minimum cross-sections specified are to be checked by the machine / system manufacturer for the machine- / system-specific conditions and, if necessary, corrected.

8.5 Cable – Handling and Installation Recommendations

General

The maximum operating time of cables largely depends on the mode of installation and environmental factors at the place of installation. Since there is a great variety of operating conditions, the following recommendations can only be a help in order to provide for a faultless operation of the lines (cables) as long as possible.

Connection Technique

- General recommendations:**
- Avoid any tensile or torsional stressing for the cables. Do never pull on the cable, when loosening the connectors.
 - Do not lay the cables over sharp edges.
 - Always observe the minimum bending radius! The same applies for storage on drums or in rings.
 - Avoid high temperature fluctuations during storage. For storage outside, use covers.
 - Cables have always to be unrolled. Do never unroll "over head".
 - Do never use damaged cables.

Cables in Drag chains To mount the cables in drag chains in the right way, some basic rules have to be taken into account. Inserting the cables into the drag chains is to be done with utmost care.

- Do only use cables, which are suited for the use in drag chains.
- The minimum bending radius of the drag chain is determined through the cable with the biggest outer diameter.
- Lay out or hang out the cables before mounting so that the twisting disappears. An axial twisting of the cables must be avoided in any case.
- Lay the cables into the drag chains tension-free and twisting-free.
- Lay only laid out or hanged out cables into the drag chains and then mount the chain into the machine.
- Ensure that the cables do not intersect or overlap each other in the chain.
- The cables have to be freely movable in the area of the bending radius as well as in the width and height. The overall diameter of the drag chain or rack / hole segment must only be filled with 85-90 %.

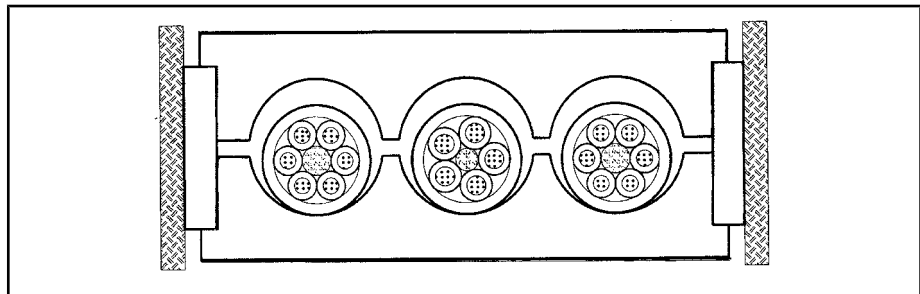


Fig.8-9: Filling degree of drag chains

- It is not allowed to fasten or to bind the cables together within the chain.
- When equipping the drag chain, it must be taken into account that the weight must be distributed as symmetrically as possible. In other words, install heavy cables in the outer and lightweight cables in the inner section.

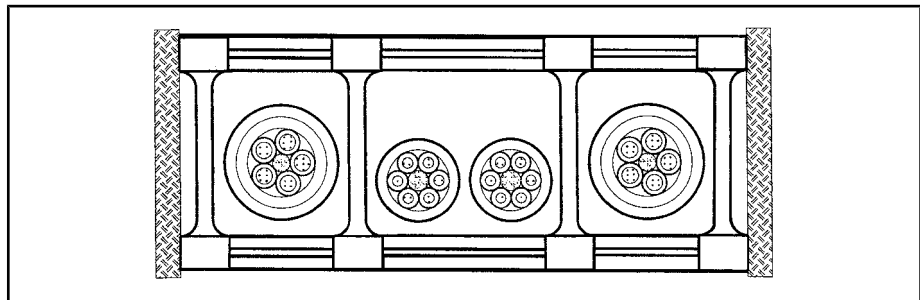


Fig.8-10: Symmetrical distribution within drag chains

Connection Technique

- When fitting the drag chains with cables of varying diameters ($> \pm 20\%$) use chains with divided chambers or racks. When fitting the drag chains with multi-layered cables, mount bars between the layers.

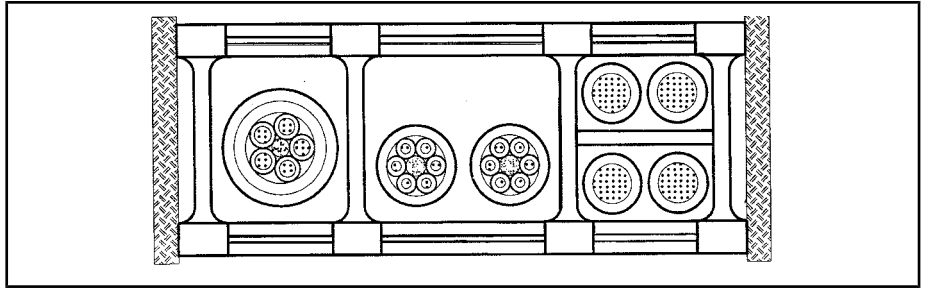


Fig. 8-11: Multi-layer allocation of drag chains

- Before fastening the cables within the drag chains, move them at least 10 to 20 times. This relaxes the cables and brings them into a neutral position. After the machine has been operated for approx. 24 hours, readjust the cables.
- Fasten both ends of the cables. The minimum distance is 30 times the cable diameter measured from the end point of the bending motion. Fasten the cables across a large area of the outer jacket. The inner wires (core) must only be slightly squeezed. If the cables are squeezed strongly, their service life will be shortened.

9 Operating Conditions and Application Notes

9.1 Potentially Explosive Areas

9.1.1 Terms and Definitions

General

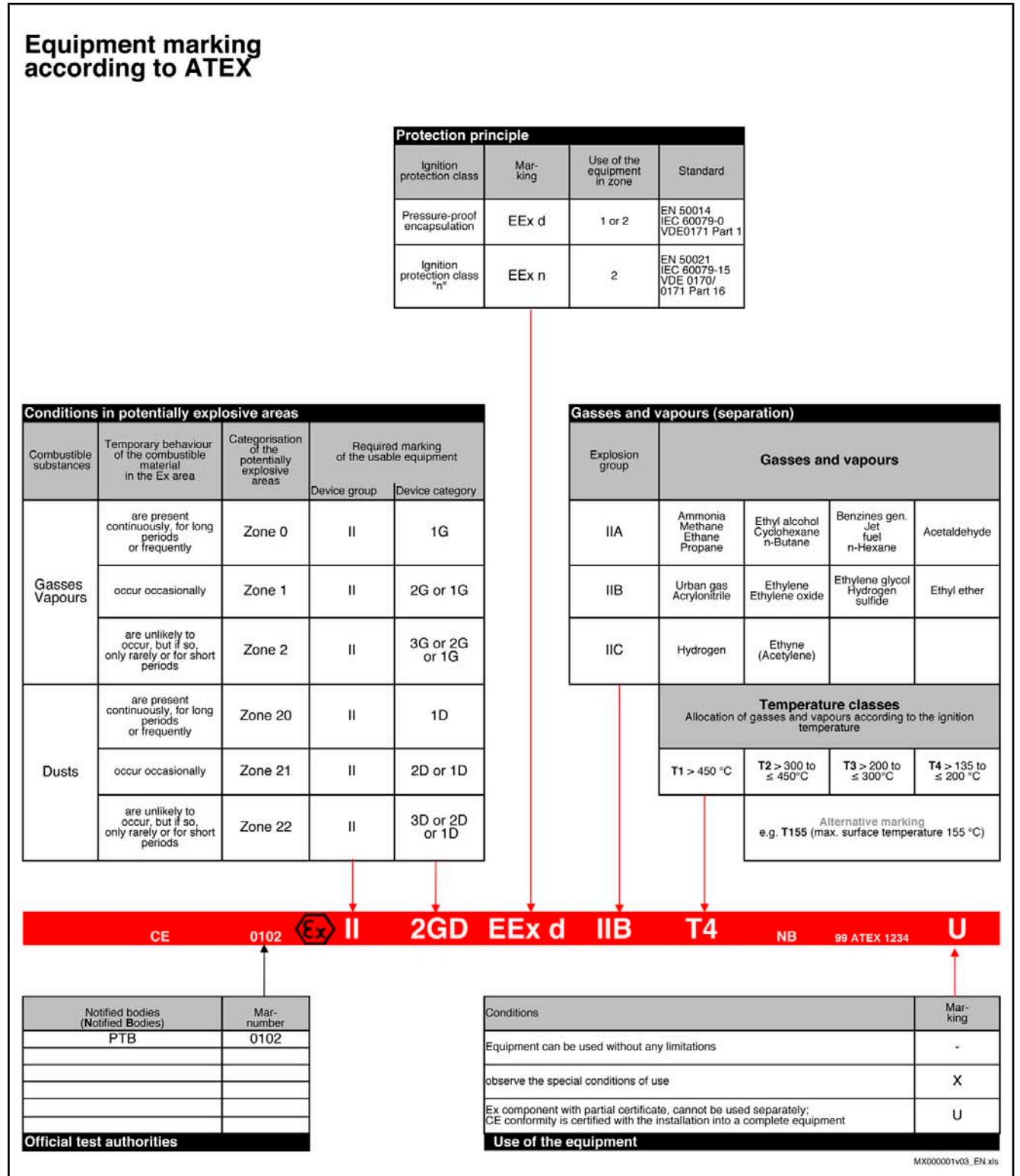


Fig.9-1: Equipment marking according to ATEX

Operating Conditions and Application Notes

Equipment group II Category 1



Equipment that are designed so as to function in conformity with the operational parameters established by the manufacturer and so as to ensure a very high level of protection. Equipment of this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dust mixtures are present **continuously, for long periods or frequently**. Equipment of this category must ensure the required level of protection, even if there are only rare incidents, and is characterized by means of protection, meaning that

- in the event of failure of one means of protection, at least an independent second means of protection provides the required level of protection; or
- in the event of two faults occurring independently of each other, the required protection is guaranteed.



Motors of equipment group II, category 1 for the use in potentially explosive areas are not offered by Bosch Rexroth.

Equipment group II Category 2



Equipment designed so as to function in conformity with the operational parameters established by the manufacturer and so as to ensure a high level of protection. Equipment of this category is intended for use in areas, in which it can be expected that an explosive atmosphere of dust / air mixture can occur **occasionally**. The means of protection relating to equipment in this category ensure the required level of protection, even in case of frequently occurring disturbances which normally have to be taken into account.



are equipment according to equipment group II, category 2 for use in potentially explosive areas.

Equipment group II Category 3



Equipment designed so as to function in conformity with the operational parameters established by the manufacturer and so as to ensure a normal level of protection. Equipment of this category is intended for use in areas in which explosive atmospheres caused by dust whirled up are **unlikely** to occur or, if they do occur, are likely to do so only **rarely and for a short period of time**. Equipment of this category ensures the required level of protection during normal operation.



in housing type "S" is equipment according to equipment group II, category 3 for use in potentially explosive areas.

The following terms are used in the European Standard EN 50014: 1992.

Electrical equipment	All items as a whole or in part for the utilization of electrical energy. These include, among others, items for the generation, transmission, distribution, storage, measurement, regulation, conversion, and consumption of electrical energy for telecommunication applications.
Potentially explosive area	An area which could become explosive (the danger is a potential one).
Explosive gas atmosphere	A mixture of air, under atmospheric conditions, with inflammable substances in the form of gas, vapour or mist, in which - after an ignition - a combustion spreads throughout the unburnt mixture.
Explosive test mix	A specified explosive mixture used for the testing of electrical equipment for potentially explosive areas.
Operating temperature	The temperature that is reached, when the apparatus is operating at its rating.

Maximum operating temperature	The highest value of the operating temperature. NOTE: Every equipment may reach different operating temperatures in different parts.
Maximum surface temperature	The highest temperature which is reached under the most adverse conditions (but within the recognized tolerances) by any part or surface of an electrical equipment in service, which would be able to produce an ignition of the surrounding explosive atmosphere.
Ignition protection class	The specific measures taken for electrical equipment to avoid ignition of a surrounding explosive atmosphere.
Degree of protection of the housing (IP)	A numerical classification preceded by the symbol "IP" applied to the housing of electrical equipment to provide for: <ul style="list-style-type: none"> • the protection of persons against contact with or approach to live parts and against contact with moving parts (other than plain rotating shafts and the like) inside the housing, • the protection of the electrical equipment penetration of solid foreign bodies; and, where indicated by the classification, • the protection of the electrical equipment against harmful penetration of water. NOTE: The housing that provides the degree of protection IP is not necessarily identical with the housing of the equipment for the ignition protection.
Rated value	A quantitative value assigned usually by the manufacturer for a specified operating condition of a component, a unit or an equipment.
Rated data	The set of rated values and operating conditions.
Cable entry	A device permitting the feeding-in of one or more electric and / or fibre-optic cables into an electrical equipment so as to maintain the relevant type of ignition protection.
Ex cable and line entry	A cable and line entry which is tested separately from the equipment housing, but certified as an equipment, and which can be fitted to the equipment housing during installation without further certification being required.
Entry for pipelines	A means permitting the entry of a pipeline into an electrical equipment.
Pressure part	An element of a cable entry acting on the sealing ring to enable the latter to fulfil its function.
Strength member	An element of a cable entry for preventing tensile or torsional forces of the cable from being transmitted to the connection parts.
Sealing ring	A ring used for the entry of a cable, conduit or pipeline in order to ensure the impermeability between the entry and the cable, conduit or pipeline.
Connection compartment	A separate compartment or part of a main enclosure, communicating or not with the main enclosure, and containing connection facilities.
Connection facilities	Clamps, screws or other parts, used for the electrical connection of conductors of external circuits.
Feedthrough	An insulation device carrying one or more conductors through an internal or external wall of a housing.
Ex component	A part of an electrical equipment for potentially explosive areas, or a module (other than an Ex cable entry), marked with the symbol "U", which is not intended to be used alone and requires additional certification, when incorporated into electrical equipments or systems or use in potentially explosive atmospheres.

Operating Conditions and Application Notes

Zones

Potentially explosive areas are classified into the following zones according to the probability with which an explosive atmosphere develops in them.



The following information is based on EN 60079-14:1997 and the BGBl. 1996 Part 1. If you would like to receive detailed information, please consult these documents.

- Zone 0** Zone 0 includes areas in which an explosive atmosphere, which contains a mixture of air and gas, dust and mist, exists continuously, for a long-term or frequently.
- Electrical equipments must only be used in zone 0, if they comply with the specifications according to EN 50020: 1994 (intrinsic safety "1").
- Zone 1** Zone 1 contains areas in which an explosive atmosphere of gas, dust or mist can exist occasionally.
- Electrical equipments must only be used in zone 1, if they are constructed for zone 0 or for one of the degrees of protection .
- Zone 2** Zone 2 contains areas in which an explosive atmosphere of gas, dust or mist is unlikely to occur. But if it occurs then in all likelihood rarely and for a short period of time.
- Electrical equipment is permissible for use in zone 2 if it:
- is designed according to the requirements for zone 0 or 1;
 - is specifically designed for zone 2.
 - corresponds to the requirements of a recognized standard for industrial electrical equipment and has no ignitable hot surfaces when in undisturbed operation.

Degree of ignition protection, groups and temperature classes

Ignition protection classes

The electrical equipments for potentially explosive areas are subdivided into:

The electrical equipment is designed according to the type of protection. The requirements are stipulated in special standards.

Ignition protection class	Description	Standard
Oil immersion	o	EN50015: 1998
Pressurizing	o	EN50016: 1995
Powder filling	q	EN50017: 1998
Pressure-resistant casing	-{}-{}-d	EN50018: 1994
Increased safety	e	EN50019: 1994
Intrinsic safety category a	ia	EN50020: 1994
Intrinsic safety category b	ib	EN50020: 1994
Encapsulation	m	EN 50028: 1987

Fig.9-2: Degree of protection

Electrical equipment of these degrees of protection are certified by way of a prototype test by a neutral body.

- Groups**
- **Group I:** Electrical equipment for mines susceptible to fire damp.
 - **Group II:** Electrical equipment for all potentially explosive areas, other than mines susceptible to fire damp.

Operating Conditions and Application Notes

The electrical equipment of Group II are classified according to the character of explosive atmosphere, for which they are intended for.

For the degree of protection "pressure resistant casing "d"" and "intrinsic safety category "i"", all electrical equipment of Group II are classified into IIA, IIB and IIC (see appendix A according to EN 50014:1992).

For all degrees of protection, the equipment of Group II has to be labeled subject to its maximum surface temperature.

Temperature classes

The maximum surface temperature for electrical equipments of Group I has to be indicated in the testing documents.

Electrical equipment of Group II are classified and labeled and have to be either:

- classified preferably in a temperature class in compliance with Fig.: 9-3;
- or labeled with the particular maximum surface temperature;
- or, if applicable, labeled with the specific gas for which the apparatus is intended for.

Temperature class	Maximum surface temperature °C
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

Fig.9-3: Classification of the maximum surface temperature in classes for electrical equipment of Group II

9.1.2 Application Conditions for MKE Motors

General

Connection conditions The motors are only allowed to operate with the Rexroth drive control devices Indradrive, DIAx04, EcoDrive, and DURADRIVE. Controllers of other manufacturers are not permitted.

The clamp terminals in the terminal box must be screwed on tightly.

Do not disconnect or connect connectors in explosive areas!

Grounding Speed-controlled drive systems contain unavoidable discharge currents above ground. For this reason, the motors have to be grounded over the motor cable and over a separate ground wire with min. 4 mm² of cross-section, as specified in the terminal diagram. Check that the position of the grounded conductor is fixed before commissioning.

If the protective conductor in the motor cable and the second separate protective conductor on the motor housing are not connected or are interrupted by corrosion or other defects during their lifetime, the discharge current flows (as leakage current) over conducting housing parts. This has to be prevented with the above-mentioned measures. (ATEX-Directive 94/9/EG, appendix II, Cap. 1.2.3 and Cap. .1.3.3, 1.4)

Risks of corrosion Corrosion of the motor housing due to aggressive substances (such as certain coolants, lubricants, cutting oils or salt mists) is to be prevented.

Emergency stop Stored energy in the drive devices circuit has to be degraded or isolated as soon as possible via pressing the **emergency stop**, so that in the case of failure

Operating Conditions and Application Notes

the risk of an effect into the danger zone is reduced. (ATEX Directive 94/9/EG, Appendix II, section 1.6.2)

The user has the following possibilities:

- Energy isolation is guaranteed from the exit of the drive device, if at emergency stop, in addition to the power loss, the drive device is locked electronically. This is done by switching off the power contactor - with subsequent failure reaction of the drive device because of power failure (cp. F281). Adjusting the required drive-end failure reaction must be made by the user at the drive device via the drive parameters (cp. P-0-0119) according to the functional description.
- To have the encoder feeder cable also de-energized, shut down the control voltage of the drive device.

After the control voltage and the power of the drive device are interrupted, the exit on the motor side has electronically locked itself over the output stage and eventually stored energies in the intermediate direct current link are therewith isolated on the motor side and on the output side.

- The intermediate direct current link short-circuit can be used – if possible – to reduce the energies within the intermediate direct current link of the drive device after shutdown of supply voltage fast.

Irrespective of these possibilities, the user has to check – as stipulated in the notes regarding safety - by means of an appropriate measuring instrument, in general, before working on the machine, if the machine or parts of it are under residual voltage (e.g. caused by rest energy of condensers in filters and drive devices etc.). Wait for their discharging time.

Other environmental influences

Heed the following regarding dangers caused by other disturbances:

- Operation only inside the specified ambient conditions,
- Do not exceed the maximum vibration and shock loads.
- Prevent corrosion due to humidity, aggressive substances and soiling of the protective conductor connections.

Motor-internal holding brake (if applicable)

see [chapter 9.11 "Holding Brakes \(Ex\)" on page 84](#) .

9.1.3 Type Test of the Motors according to European Standard (EN)

MKE motor are manufactured according to the European standards

- EN 50014: 1992 and
- EN50018: 2000

1994 and are controlled by the Physikalisch Technischen Bundesanstalt PTB.

Motor type	Licence No.	Ignition protection types / protection concepts or standards
MKE037/047/098	PTB 03 ATEX 1107 X	Pressure-resistant casing d/ acc. To EN 50014 and EN 50018
MKE118	PTB 03 ATEX 1108 X	

Fig.9-4: Type tests MKE motors

Conformity certificate

Declarations of conformity confirming the structure and the compliance with the applicable EN standards are available for all MKE motors. The conformity certificates are included in the scope of supply of the motor and are attached to this documentation.

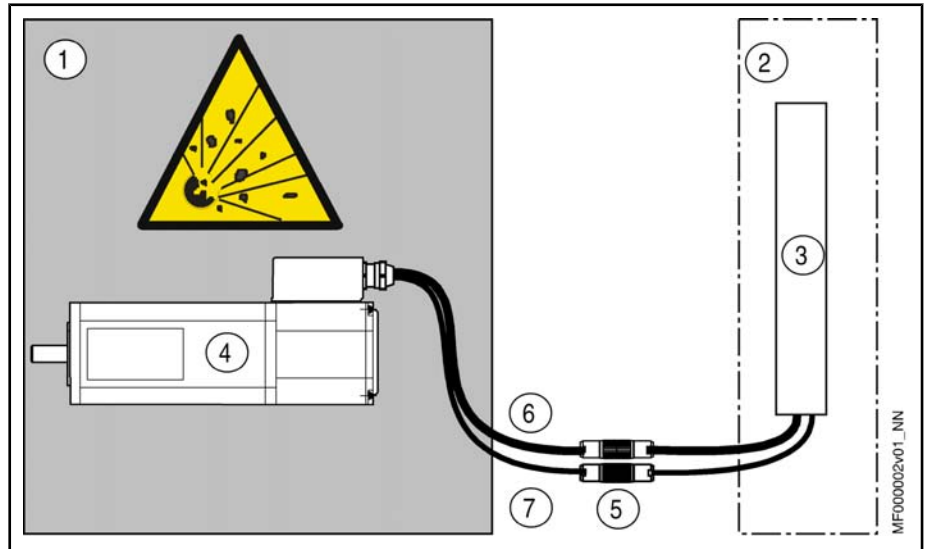


In potentially explosive areas, MKE037, -047, -098 and -118 motors must only be operated with Rexroth drive control devices.

When mounting the drive control devices in potentially explosive areas, the following components must fulfill the Ex protection requirements.

- Motor with attached parts
- Circuits leading into the potentially explosive area

Potentially explosive area



- | | |
|-----|--|
| (1) | Potentially explosive area with explosion-protected equipments |
| (2) | Control cabinet |
| (3) | Drive control device |
| (4) | MKE motor |
| (5) | Connections |
| (6) | Motor power cables |
| (7) | Encoder cable |

Fig.9-5: Potentially explosive area

Use in zone 1 and 2

It is allowed to use MKE motors of Rexroth Indramat in hazardous areas of zone 1 and 2.

The related drive control devices and connections of the connection cables (power and encoder connection) must lie outside of the potentially explosive area.



DANGER

Danger of explosion, danger to life, heavy injury and material damage

- ⇒ Do not set up drive control devices or connectors in potentially explosive areas.
- ⇒ Make sure that connectors cannot reach into the hazardous areas.
- ⇒ Do not disconnect the connections under load!
- ⇒ Make sure that no ignition sparks could occur within the hazardous area.

9.1.4 Type Test of the Motors according to American Standard (UL)

MKE motor are manufactured according to the American standards

- UL 508C/1996-11,
- UL 674/1994-04 and
- UL 1446/1997-05

and checked by the UL authority Underwriters Laboratories Inc.®.

Operating Conditions and Application Notes

Motor type	UL number	Classification
MKE037_ - _ - _ - _ U _	E203009	Class I, Groups C and D
MKE047_ - _ - _ - _ U _	E203009	
MKE098_ - _ - _ - _ U _	E203009	
MKE118_ - _ - _ - _ U _	E203009	

Fig.9-6: Type tests MKE motors

Conformity certificate Yellow Cards

For all MKE motors, Yellow cards are available which confirm the structure and the compliance with the applicable US standards. If necessary, these Yellow cards can be requested from the responsible sales office.

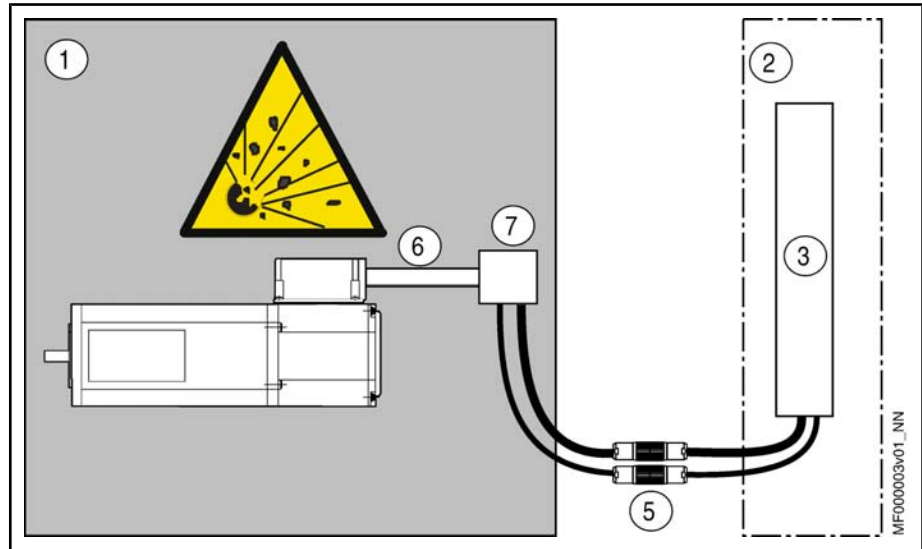


Within potentially explosive areas, MKE motors must only be used in connection with the drive devices of Bosch Rexroth AG.

When mounting the drive control devices in potentially explosive, the following components must fulfill the Ex protection requirements:

- Motor with attached parts
- Circuits leading into the potentially explosive area

Potentially explosive area



- (1) Potentially explosive area with explosion-protected equipments
- (2) Control cabinet
- (3) Drive control device
- (4) MKE motor
- (5) Connections (optional)
- (6) Connection cables in a steel pipe
- (7) Ex terminal box (not included in scope of delivery)

Fig.9-7: Potentially explosive area

Use in Class I

The MKE motors described in this documentation are UL listed and may be used in hazardous areas according to Class I, Groups C and D.

The related drive control devices and connections of the connection cables (power and feedback connection) must be outside of the hazardous area.

**DANGER****Danger of explosion, danger to life, heavy injury and material damage**

- ⇒ Do not set up drive control devices or connectors in potentially explosive areas.
- ⇒ Make sure that connectors cannot reach into the hazardous areas.
- ⇒ Do not disconnect the connections under load!
- ⇒ Make sure that no ignition sparks could occur within the hazardous area.

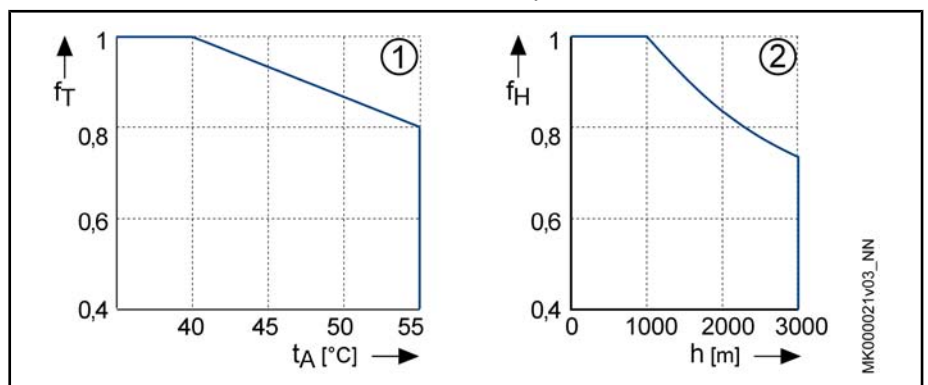
9.2 Setup Height and Ambient Temperature

Nominal data The performance data specified for the motors apply under the following conditions:

- Ambient temperatures of 0 to +40 °C
- Setup heights of 0 to 1000 m above MSL.

Exceeding the nominal data Derating – curves

If you intend to use motors above these ranges, you must take the “utilization factors” into consideration. This reduces the performance data.



(1) Utilization depending on the ambient temperature

(2) Utilization depending on the setup elevation

f_T Temperature utilization factor

t_A Ambient temperature in degrees Celsius

ΔT_{60} Operating mode

f_H Height utilization factor

h Setup height in meters

Fig.9-8: MKE derating (utilization factors)

If **either** the ambient temperature **or** the setup height exceeds the nominal data:

1. Multiply the torque data specified in the selection data by the utilization factor.
2. Ensure that the reduced torque data are not exceeded by your application.

If **both** the ambient temperature **and** the setup height are exceeding the nominal data:

1. Multiply the load factors f_T and f_H determined.
2. Multiply the value obtained by the motor torque data specified in the selection data.
3. Ensure that the reduced torque data are not exceeded by your application.

9.3 Degree of Protection

The degree of protection is defined by the abbreviation IP (International Protection) and two reference numbers specifying the degree of protection.

Operating Conditions and Application Notes

The **first characteristic numeral** defines the degree of protection against contact and penetration of foreign particles. The **second code numeral** defines the degree of protection against water.

1st code number	Degree of protection
6	Protection against penetration of dust (dust-proof); complete contact protection
2nd code number	Degree of protection
5	Protection against a water jet from a nozzle directed against the housing from all directions (jet water)

Fig.9-9: IP degrees of protection



The inspections for the second ID number are executed with fresh water. If cleaning is effected using high pressure and/or solvents, coolants, or penetrating oils, it might be necessary to select a higher degree of protection.

The design of the MKE motors complies with the following Degrees of protection according to DIN VDE 0470, Part 1, ed. 11/1992 (EN 60529):

Motor area	Degree of protection	Comment
Motor housing, output shaft, power and encoder connections (only if mounted properly)	IP 65	Standard design

Fig.9-10: IP degree of protection for the motors

9.4 Compatibility

All Rexroth controls and drives are developed and tested according to the state of the art. However, since it is impossible to follow the continuing further development of every material with which our controls and drives could come into contact (e.g. lubricants on tool machines), reactions with the materials that we use cannot be ruled out in every case. For this reason, you must execute a compatibility test between new lubricants, cleansers, etc. and our housings and device materials before using these products.

9.5 Designs and Installation Positions

MKE motors are available in design B05. Please refer to the table below for the conditions of installation permissible according to EN 60034-7:1993.

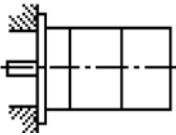
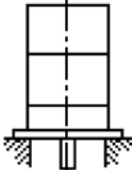
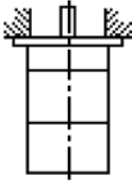
Motor design	Permissible conditions of installation		
	Description	Sketch	Setup
B05	IM B5		Flange mounting on the drive end of the flange
	IM V1		Flange attached on the drive side of the flange; drive side pointing down
	IM V3		Flange attached on the drive side of the flange; drive side pointing down

Fig.9-11: Installation positions



DANGER

Penetration of fluids! If motors are attached according to IM V3, fluid present at the output shaft over a prolonged time may penetrate and cause damage to the motors.

⇒ For that reason, make sure that fluid cannot develop at the output shaft.

9.6 Housing Varnish

The housing varnish of the motors consists of a black (RAL9005) 2K epoxy resin coating based on epoxy polyamide resin in water.

Chemically resistant against	Limited resistance against	No resistance against
<ul style="list-style-type: none"> diluted acids and alkaline solutions water, sea-water, sewage current mineral oils 	<ul style="list-style-type: none"> organic solvents hydraulic oil 	<ul style="list-style-type: none"> concentrated acids/brines

Fig.9-12: Varnish resistance

It is permitted to provide the housing with additional varnish (coat thickness no more than 40 µm). Check the adhesion and resistance of the new varnish coat before applying it.

9.7 Vibration

Sinusoidal vibrations

Sine-shaped vibrations occur in stationary use; depending on their intensity, they have different effects on the robustness of the motors.

Based on DIN EN 60721-3-3 and DIN EN 60068-2-6, the following values result for Rexroth motors:

Operating Conditions and Application Notes

Direction	Maximum permissible vibration load (10-2,000 Hz) for MKE motors in dependance on the encoder design							
	A	B	C	D	G	K	N	P
axial	10 m/s ²		10 m/s ²					
radial	30 m/s ²		10 m/s ²					

Fig.9-13: Permissible vibration load for MSK motors

9.8 Shock

The shock load of the motors is indicated by providing the maximum permitted acceleration in non-stationary use, such as during transport.

Damage to functions is prevented by maintaining the limit values specified.

Based on DIN EN 60721-3-3 and DIN EN 60068-2-6, the following values result for Rexroth motors:

Size	Maximum permitted shock load (6 ms)	
	axial	radial
MKE037 MKE047	10 m/s ²	1000 m/s ²
MKE098	10 m/s ²	300 m/s ²
MKE118	10 m/s ²	200 m/s ²

Fig.9-14: Permitted shock load for MSK motors

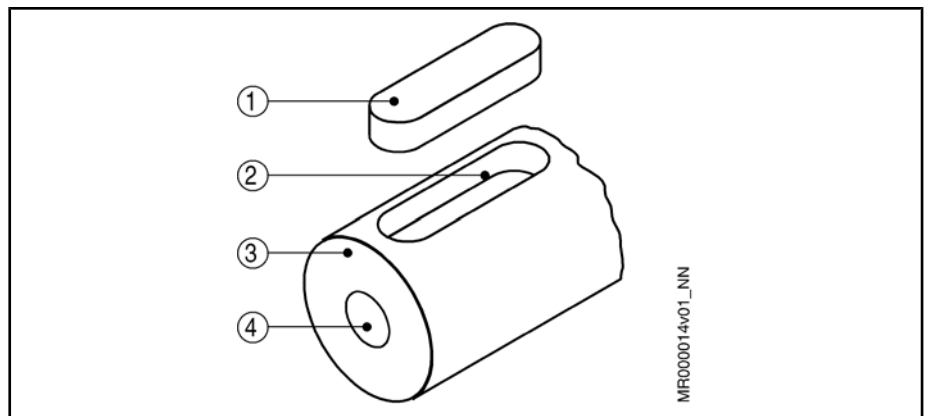
9.9 Output Shaft and Shaft Sealing Ring

9.9.1 Plain Shaft

The standard design recommended for MKE motors provides a non-positive friction-locked shaft-hub connection without play and excellent running smoothness. Use clamping sets, clamping sleeves or clamping elements to couple the machine elements to be driven.

9.9.2 Output Shaft with Key

The optional key according to DIN 6885, Sheet 1, version 08-1968, permits keyed transmission of torques with constant direction, with low requirements for the shaft-hub connection.



- (1) Key
 (2) Keyway
 (3) Motor shaft
 (4) Centering hole

Fig.9-15: MKE output shaft with featherkey

The machine elements to be driven must additionally be secured in the axial direction via the centering hole on the end face.



CAUTION

Shaft damage! In case of intense reversing operation, the seat of the fitting spring may deflect. Increasing deformations in this area can then lead to breakage of the shaft!

⇒ Preferably, plain output shafts should be used.

Balancing with a complete key

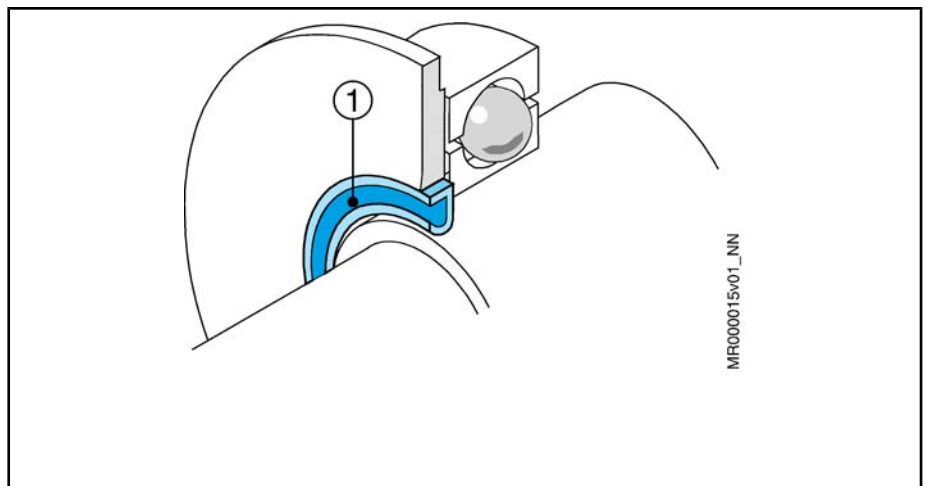
MKE motors are balanced with the **complete** featherkey. Hence, the machine element to be driven must be balanced without a key.



Modifications to the keys may be made only by the user himself and on his own responsibility. Bosch Rexroth does not provide any warranty for modified key or motor shafts.

9.9.3 Output Shaft with Shaft Sealing Ring

MKE motors are designed with radial shaft sealing rings according to DIN 3760 – design A.



- ① Radial shaft sealing ring

Fig.9-16: MKE radial shaft sealing ring

Operating Conditions and Application Notes

Wear Radial shaft sealing rings are rubbing seals. Hence, they are subject to wear and generate frictional heat.

Wear of the rubbing seal can be reduced only if lubrication is adequate and the sealing point is clean. Here, the lubricant also acts as a coolant, supporting the discharge of frictional heat from the sealing point.

- Prevent the sealing point from becoming dry and dirty. Always ensure adequate cleanliness.



Under unfavorable ambient conditions (e.g. grinding dust, metal shavings), maintenance could be necessary.

Resistance The materials used for the radial shaft sealing rings are highly resistant to oils and chemicals. The performance test for the particular operating conditions lies, however, within the machine manufacturer's responsibility.

Vertical installation positions IM V3 The degree of protection on the flange side of motors with a shaft sealing ring is IP 65. Hence, tightness is ensured only in case of splashing fluids. Fluid levels present on the A-side require a higher degree of protection. If the motor is installed in vertical position (shaft pointing up), the instructions in the section "Design and Installation Positions" in this chapter must, in addition, be observed.

Note on construction Rexroth recommends that any direct contact of the drive shaft and the radial shaft sealing ring with the processing medium (coolant, material corrosion) caused by the machine or system construction should be avoided.

9.10 Bearings and Shaft Load

9.10.1 General

During operation, both radial and axial forces act upon the motor shaft and the motor bearings. The construction of the machine, the selected motor type and the attachment of driving elements on the shaft side must be adapted to one another to ensure that the load limits specified are not exceeded.

9.10.2 Radial Load, Axial Load

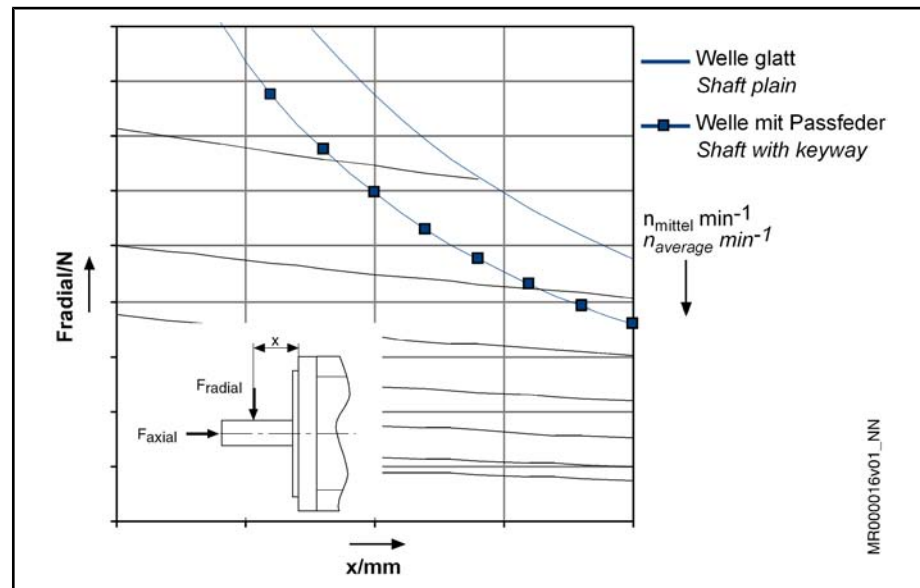


Fig.9-17: Example of a shaft load diagram

The shaft load diagrams of the individual motors are given in the following chapters:

- MKE037 chapter 4.2 "MKE037" on page 20
- MKE047 chapter 4.3 "MKE047" on page 22
- MKE098 chapter 4.4 "MKE098" on page 24
- MKE118 chapter 4.5 "MKE118" on page 27

Maximum permissible radial force F_{radial_max}

The maximum permissible radial force F_{radial_max} depends on the following factors:

- Shaft break load
- Force's point of application x
- Shaft design (plain; with key)

Permissible radial force F_{radial}

The maximum permissible radial force F_{radial} depends on the following factors

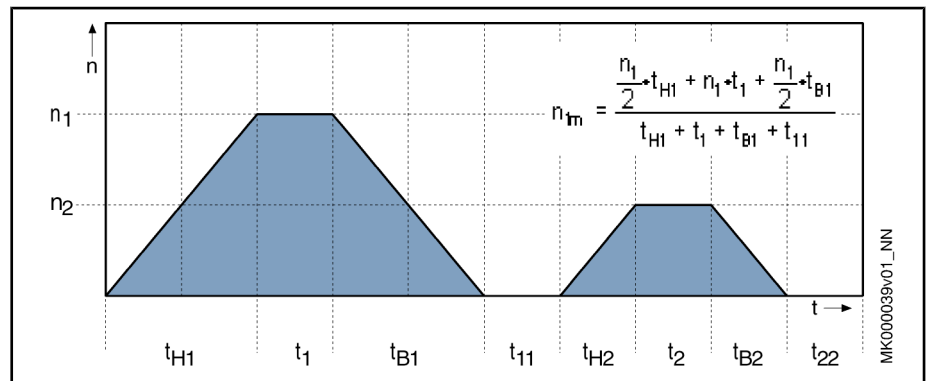
- Arithmetic mean speed (n_{mittel})
- Force's point of application x
- Bearing lifetime

Permitted axial force F_{axial}

The maximum permitted axial force F_{axial} is specified in the Technical Data, in the "Shaft load" section.

Mean speed

In the exact calculation of the mean speed according to the following example, the run-up and braking times are taken into account.



- $n_{1m}; n_{2m}$ Mean speed section
- $n_1; n_2$ processing speed
- $t_{H1}; t_{H2}$ run-up time
- $t_1; t_2$ processing time
- $t_{B1}; t_{B2}$ braking time
- $t_{11}; t_{22}$ standstill time

Fig. 9-18: Mean speed

A complete processing cycle can consist of several sections with different speeds. In this case, the average is to be generated from all the sections.



The run-up and braking times can be ignored in the calculation if the time in which the drive is operated at a constant speed is significantly greater than the acceleration and braking time.

9.10.3 Attachment of Drive Elements

Whenever attaching drive elements to the output shaft, such as

- gearboxes

Operating Conditions and Application Notes

- couplings
- pinions

it is imperative that the following notes are observed.

Gearbox mounting on motors

If gearboxes are mounted on motors, the thermal coupling of the motors on machines or constructions changes.

Depending on the gearbox type, the heat development on the gearbox is different. In any case, the heat dissipation of the motor via the flange is reduced when gearboxes are mounted. This must be observed in project planning.

A reduction of the given performance data is necessary, to prevent overloading of the motors when using gearboxes.

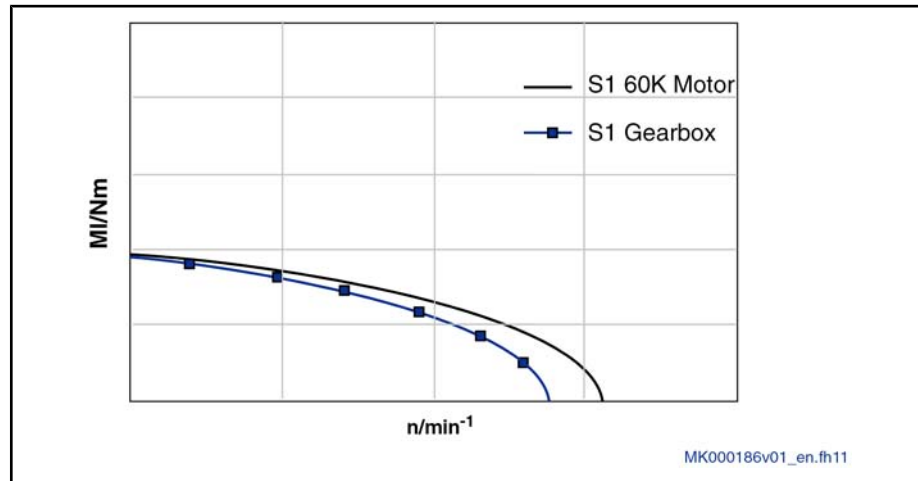


Fig.9-19: S1 characteristic curve of gearboxes



The indicated torques in the characteristic curves of the motor have to be reduced by 10-20 % when mounting gearboxes.

Please, heed all further notes and specifications within this documentation for the used gearboxes.

Redundant bearings

If drive elements are mounted, a redundant bearing must be avoided. The tolerances inevitably present in such cases will lead to additional forces acting on the bearing of the motor shaft and, should the occasion arise, to a distinctly reduced service life of the bearing.



If redundant attachment cannot be avoided, it is necessary to consult Bosch Rexroth.

Couplings

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



When connecting extremely stiff couplings, the radial force which constantly changes the angular position may cause an impermissibly high load on the shaft and bearing.

Ball bearing pinion or helical teeth drive pinions

Owing to thermal effects, the flange-sided end of the output shaft may shift by 0.6 mm in relation to the motor housing. If skew bevel driving pinions or bevel gear pinions directly attached to the output shaft are used, this change in position will lead to

- a shift in the position of the axis if the driving pinions are not defined axially on the machine side,
- a thermally dependent component of the axial force if the driving pinions are defined axially on the machine side. This causes the risk of exceeding the maximum permissible axial force or of the play within the gears increasing to an impermissible degree.



In such cases, you should therefore preferably use drive elements with their own bearings which are connected to the motor shaft via axially compensating couplings.

9.10.4 Bearing Lifetime

The bearing lifetime is an important criterion for the availability of MKE motors. When the lifetime is considered, the "mechanical lifetime" of bearing components and materials is differentiated from the "grease lifetime" of the bearing lubricant.

If the MKE motors are operated within the limits specified for radial and axial loads, the nominal service life of the bearings is as follows:

Mechanical service life of bearings

$L_{10h} = 30,000$ operating hours

(calculated according to ISO 281, ed. 12/1990)

This applies to all MKE motors based on the following:

- The permitted loads from the corresponding chapter "Technical Data" are never exceeded.
- The motor is operated under the permitted conditions for use and in the permitted ambient temperature range of 0 °C to +40 °C.
-

Differing loads can have the following effects:

- Premature failure of the bearing due to increased wear or mechanical damage.
- Reduction of the grease lifetime leads to premature failure of the bearing.
- Avoid exceeding the load limits.

Mechanical bearing lifetime with increased radial force

In other cases, the bearing lifetime is reduced as follows:

$$L_{10h} = \left(\frac{F_{radial_ist}}{F_{radial_max}} \right)^3 \cdot 30000$$

L_{10h} Bearing lifetime (according to ISO 281, ed. 12/1990)

F_{radial} Determined permissible radial force in N (Newtons)

F_{radial_ist} Actually acting radial force in N (Newtons)

Fig. 9-20: Calculation of the bearing service life L_{10h} if the permissible radial force F_{radial} is exceeded



Under no circumstances may the actually acting radial force F_{radial_ist} be higher than the maximum permissible radial force F_{radial_max} .

Operating Conditions and Application Notes

9.11 Holding Brakes (Ex)

9.11.1 Holding Brake Electrically Releasing

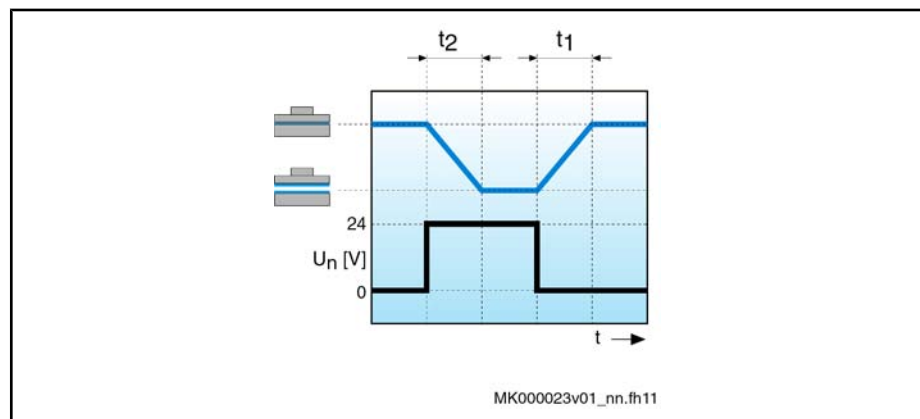
Operation of the holding brakes of IndraDyn S motors is based on the "electrical release" principle. Non-operative closed holding brakes open once the operating voltage is applied.

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 of 24 Volt $\pm 10\%$ is available at the motor in order to ventilate the holding brake. (see also Rexroth IndraDrive drive system DOK-INDRV*-SYSTEM*****-PRxx-EN-P chapter "Control voltage specification")



The switching voltage arriving at the motor is influenced by the length of the cable as well as by its characteristics, such as e.g. the resistance.

- For power cables designed for Bosch Rexroth up to a max. length of 50 m, a minimum voltage of 22.8 V (24 V - 5 %) is recommended on the drive control device..
- For power cables designed for Bosch Rexroth longer than 50 m, a minimum voltage of 23.4 V (26 V - 5 %) is recommended on the drive control device.



t_1 Connection time
 t_2 Disconnection time

Fig.9-21: Holding brake diagram

The electrically-released holding brake is used to hold the axes at a standstill and when the "controller enable" signal is off. If the power supply voltage fails and the controller enable signal is turned off, the electrically-released brake will automatically shutdown.



Do not use the holding brake as an operational brake for moving axes.

If the holding brake is engaged repeatedly on a drive in motion or the rated brake torque is exceeded, premature brake wear can occur.

9.11.2 Holding Brakes Notes Regarding Safety

Observe the safety requirements during the system design.

**DANGER**

Personal injury through hazardous movements caused by falling or descending axes!

Secure vertical axes against falling or descending after disconnection:

- lock the vertical axes mechanically,
- provide an external braking / collecting / clamping device, or
- ensure sufficient equilibration of the vertical axes.

The serially delivered holding brakes which are driven by the control device are **not** suited for personal safety!

Ensure protection of persons by superordinate fail-safe measures.

Cordon off the hazardous area by means of a safety fence or a safety screen.



Observe supplementary standards and recommendations.

For European countries:

- **EN 954 and ISO 13849-1 (2003) and ISO 13849-2 (2007)**
Safety-related components of controls
- **"Vertikalachsen" Leaflet on vertical axes (Editor: Süddeutsche Metall - Berufsgenossenschaft Fachausschuss Eisen und Metall II, Wilhelm-Theodor-Römheld-Str. 15, 55130 Mainz, Germany)**

For US:

- See National Electric Code (NEC), National Electrical Manufacturers Association (NEMA) as well as local building regulations.

The following is generally valid: Comply with all applicable national regulations!

The permanent magnetic brake is no safety brake. This means, a torque reduction by non-influenceable disturbance factors can occur (see EN 954 and ISO 13849-1 (2003) and ISO 13849-2 (2007) or the leaflet about vertical axes SMBG).

Please pay particular attention to the following:

- Corrosion on friction surfaces, as well as dust, perspiration and sediments reduce the braking effect.
- Grease must not hit the friction surface.
- Over voltage and too high temperatures can weaken the permanent magnets and therewith the brake.

Engaging of the brake is no longer ensured, if the air gap between armature and pole is improperly increased due to deterioration. In this case, no braking occurs.

9.11.3 Holding Brakes Note Regarding the System's Safety

Control of the holding brake during operation (recommendation)

Malfunctions that occur in the course of the operating period and that may change the design parameters or the operating conditions, must be recognised and eliminated within an appropriated period of time. For this case, we recommend to check the function and the state of the holding brake in regular time intervals (see [chapter 9.11.5 "Holding Brake-Commissioning and Maintenance Instructions"](#) on page 86).

Operating Conditions and Application Notes

9.11.4 Layout of Holding Brakes

Holding brakes on motors of Rexroth are basically not designed for service braking. The effective braking torques are different in static and dynamic operation for physical reasons.

Normal operation and EMERGENCY STOP	Fault condition
<p>In normal operation, using the holding brake for clamping of a standstill axis, the "static holding torque" (M_4) - adhesive friction applies.</p> <p>In case of EMERGENCY STOP for the deactivation of an axis ($n < 10 \text{ min}^{-1}$), a "dynamic holding torque" (M_{dyn}) – sliding friction is effective.</p>	<p>Under a fault condition, using the holding brake for the desactivation of a moving axis ($n \geq 10 \text{ min}^{-1}$), a "dynamic holding torque" (M_{dyn}) – sliding friction is effective.</p>
<p>$M_4 > M_{dyn}$</p> <p>Therefore, note the following description of dynamic sizing.</p>	

Fig.9-22: Dynamic sizing

Dynamic sizing

The load torque must be smaller than the minimum dynamic torque M_{dyn} which the holding brake can provide. Otherwise the dynamic holding brake torque is not sufficient to stop the axes.

If a mass is to be decelerated in a defined time or in a defined route, the additional mass moment of inertia of the whole system must be taken into account.

Project planning recommendation

To ensure the system's safety, reduce the required holding torque to 60% of the static holding torque (M_4) of the holding brake.

9.11.5 Holding Brake—Commissioning and Maintenance Instructions

Before initial commissioning

In order to ensure proper functioning of the holding brake, it must be checked before the motors are installed.

Measure the holding torque (M_4) of the holding brake. If necessary, grind in the holding brake.

Measure the holding torque (M_4) of the holding brake

1. De-energize the motor and secure it against re-energization.
2. Measure the transferable holding torque (M_4) of the holding brake with a torque wrench. Holding torque (M_4) see "Technical Data".
 - If the holding torque (M_4) indicated is achieved, the motor is ready for the assembly.
 - If the holding torque (M_4) indicated is **not achieved**, the subsequent grinding process can be used to reconstitute the holding torque.

Grinding in the holding brake

1. At closed holding brake, turn the output shaft by hand, e.g. with the help of a torque wrench, by about 5 revolutions.
2. Measure the holding torque (M_4).
 - If the holding torque (M_4) indicated is achieved, the motor is ready for the assembly.

Operating Conditions and Application Notes

- If the specified holding torque (M4) is not attained after several grinding-in processes, the holding brake is not operable. Please consult Rexroth Service.

During operation A missing holding torque of holding brakes caused by tear and corrosion can lead to operational disturbances in machines and plants. For this case, IndraDrive control devices offer the advantage to control the efficiency of the holding brake at regular intervals. This brake test can be carried out e.g. in the framework of a preventive maintenance (see P-0-0541, C2100 Command holding system check).

In order to counteract to an insufficient holding torque, there is also the possibility to grind in the holding brakes:

1. Realisation of the grinding-in routine IndraDrive "Reconstitution of the holding torque" (see P-0-0544, C3900 Command grind in motor holding brake). A repeated realisation of the grinding-in routine is possible.
2. Grinding-in routine due to superior control. Here, special control programs adapted to the machine and system concepts are required. If necessary, please contact your Bosch Rexroth distribution partner and discuss the grinding-in parameters for your application.

9.12 Acceptances and Authorizations

9.12.1 Motors in EU Version

Declaration of conformity Certificate of conformity certifying the structure of and the compliance with the applicable EN standards are available for all MKE motors. If necessary, these certificates of conformity can be requested from the responsible sales office.

The CE symbol and Ex mark can be seen on the type plates of the MKE Motors.

CE symbol



Fig. 9-23: CE symbol

Ex mark

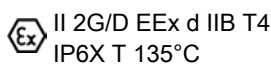


Fig. 9-24: Ex mark

9.12.2 Motors in UL Version

UL, CSA Listing The MKE motors listed below have been presented to the UL authorities "Underwriters Laboratories Inc.®".

- MKE037B
- MKE047B
- MKE098B
- MKE118

The motors are approved by the UL authority and are marked with the following symbol



on the motor's name plate.

10 State of Delivery, Identification, Handling, Transport and Storage

10.1 State of Delivery

10.1.1 Packaging

On delivery, the MKE motors are packed in cardboard boxes or crates. Packing units on pallets are secured by retaining straps.



WARNING

Injuries due to uncontrolled movement of the retaining straps when cutting!

⇒ Maintain a sufficient distance and carefully cut the retaining straps.

On delivery from the factory, the motor drive shaft and the connectors have protective sleeves. Remove the protective sleeves just before assembly.

10.1.2 High-voltage Test

All MKE motors are submitted to standardised test procedures in the factory. High-voltage tests by the customer are, therefore, not required. Motors and components could be damaged if they undergo several high-voltage inspections.



DANGER

Destruction of motor components due to improperly executed high-voltage inspection! Invalidation of warranty!

⇒ Avoid repeated inspections.

⇒ Please observe the target values of the EN 60034-1

10.2 Identification

10.2.1 Shipping Documents and Delivery Note

The total scope of a delivery can be seen in the delivery note or waybill. However, the contents of a delivery can be distributed over several packages.

Each individual package can be identified using the shipment label attached to the outside.

10.2.2 Name Plate

Each device has an individual name plate containing the device designation and providing technical information.

- After having received the goods, compare the ordered and the supplied type. Submit claims concerning deviations immediately.

Motor

The motor is delivered with its own separate name plate. This is attached to the motor housing. In addition, a second name plate is attached using two-side tape onto the original motor name plate. The second name plate can be put where visible on the machine, if the original name plate on the motor is concealed by parts of the machine.

Because of different national regulations, different type plates are used for motors according to EN and UL-standards. The differences are shown in the following picture.

State of Delivery, Identification, Handling, Transport and Storage

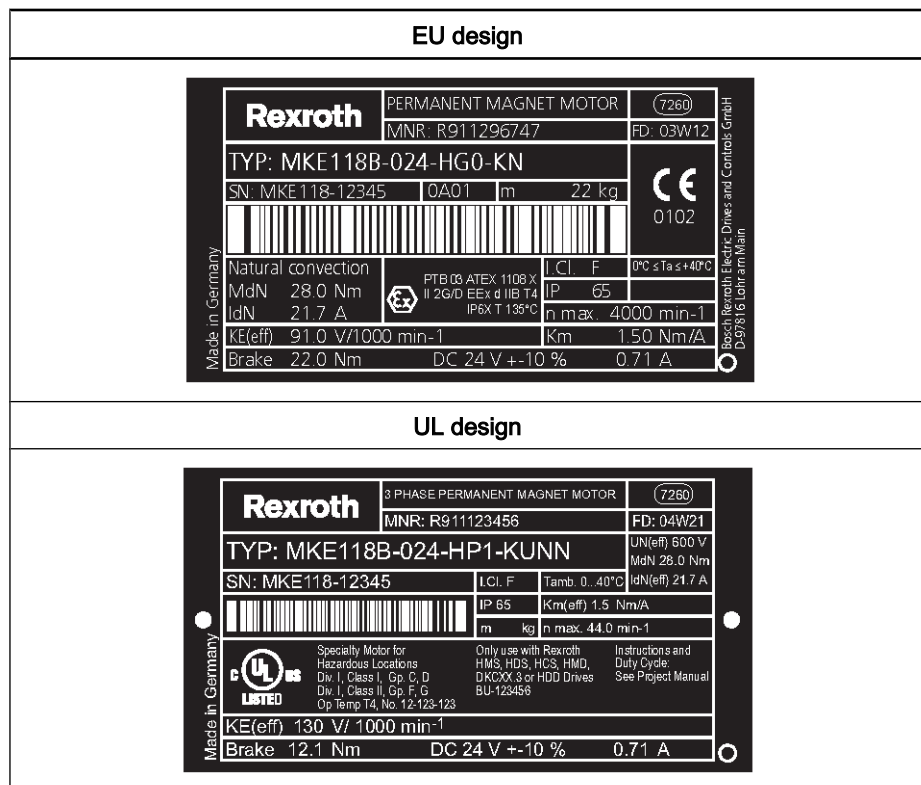


Fig.10-1: Name plate (example MKE)

The name plate is provided for

- identification of the motor
- procurement of spare parts in case of a failure
- service information.



The type designation of the motor is also filed in the encoder data memory.

10.3 Handling, Transport and Storage



CAUTION

Damage or injuries and invalidation of the warranty due to improper handling!

- ⇒ Avoid mechanical stressing, throwing, tipping or dropping of the products.
- ⇒ Use only suitable lifting equipment.
- ⇒ Never lift up the motor on the optional fan housing.
- ⇒ Use suitable protective equipment and protective clothing during transport.
- ⇒ Protect the products from dampness and corrosion.

Also observe the notes regarding storage and transport on the packages

Handling

On delivery, the MKE motors have protective caps and covers on the output shaft and on the flange sockets. During transport and storage, the protective sleeves must remain on the motor.

- Remove the protective sleeves just before assembly.
- Also use the protective sleeves if you return the goods.
- Avoid damage to the motor flange and drive shaft.

State of Delivery, Identification, Handling, Transport and Storage

- Do not exert impact or pressure to the stub shaft.



Fig. 10-2: Adhesive label

Transport Requirements for transport according to DIN EN 60271-3-2:

Environmental factor	Unit	Class 2K3
Low air temperature	°C	-25
High air temperature	°C	+70
Max. rel. air humidity	%	95
Max. absolute air humidity	g/m ³	60
Shock stress	see "Technical Data"	

Fig. 10-3: Conditions for transport

Please observe the following points during transport:

- Use suitable means of transport and consider the weight of the components (you can find the weight information on the data sheets or on the type label of the motor).
- Provide shock absorbers if strong vibrations may occur during transport.
- Transport the motors only in the horizontal position.
- Use cranes with lifting sling belts to lift the motors.

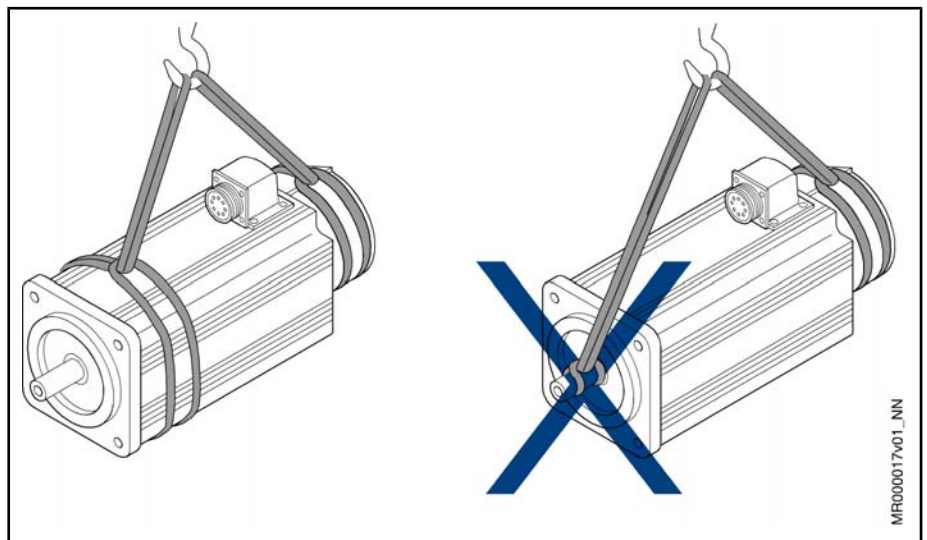


Fig. 10-4: Lifting and transporting motors by means of lifting sling belts

Bearing Requirements for storage according to DIN EN 60271-3-1.

Environmental factor	Unit	Class 1K3
Low air temperature	°C	-5
High air temperature	°C	+45
Low rel. air humidity	%	5

State of Delivery, Identification, Handling, Transport and Storage

Environmental factor	Unit	Class 1K3
High rel. air humidity	%	95
Low absolute air humidity	g/m ³	1
High absolute air humidity	g/m ³	29
Shock stress	see "Technical Data"	

Fig.10-5: Conditions for storage**CAUTION****Damage and invalidation of the warranty due to incorrect storage!**

⇒ Store the motors horizontally in a dry, vibration-free, dust-free and corrosion-protected location.

⇒ Permissible temperature range -20 °C to +80 °C.

11 Installation

11.1 Safety



WARNING

Injuries due to live parts! Lifting of heavy loads!

- ⇒ Install the motors only when they are de-energized and not connected electrically.
- ⇒ Use suitable tackles, protective equipment and protective clothing during transport.
- ⇒ Observe the notes regarding safety found in previous chapters.

Carry out all working steps especially carefully. In this way, you minimize the risk of accidents and damage.

11.2 Skilled Personnel

Any work on the system and on the drives or in their vicinity may be carried out only by appropriately trained technical personnel.

Please make sure that all persons carrying out

- Installation work
- Maintenance, or
- Operational activities

on the system are adequately familiar with the contents of this documentation as well as with all warnings and precautionary measures contained therein.



Qualified skilled personnel are defined as those who have been trained, instructed or are authorized to activate and deactivate, ground and mark electric circuits and equipment according to the technical safety regulations. Qualified technical personnel must possess appropriate safety equipment and have been trained in first aid.

11.3 Mechanical Mounting – Motor Assembly

11.3.1 Flange Connection

To attach the motors correctly and safely to the machine, Bosch Rexroth recommends the following screws and washers for motor mounting.



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

For standard case, use pan-head machine screw DIN 912 - M... x ... - 8.8 and related washers according to DIN EN 28738. In case of several motors, the integration of washers is not required, see table.



If the screws and washers used do not comply with this recommendation, the stability class of the screws and the hardness class must be equivalent in order to transmit the required tightening torques (see Fig. 11-1).

Installation

IndraDyn S motors are designed for flange assembly (B05). Details for the fastening holes can be found in the corresponding dimension sheet. For fastening, the following general assignment applies:

Motor	B05 (flange assembly)			
	Hole	Thread (8.8)		Washer DIN EN 28738
	Ø [mm]	Type ¹⁾	M _{GA} [Nm]	Ø [mm]
MKE037:	4,5	M4×20	3,1	not required
MKE047:	6,6	M6×20	10,4	not required
MKE098	11,0	M10×30	51	12
MKE118	14,0	M12×40	87	14

M_{GA} Torque given in Newton meters

1) The indicated screw lengths apply for screwing into steel.

Fig. 11-1: Fastening accessories for flange mounting

11.3.2 Preparation

Prepare the motor assembly as follows:

1. Procure tools, supplies, measuring and test equipment.
2. Check all components for visible damaged. Defective components may not be mounted.
3. Make sure that dimensions and tolerances on the system side are suitable for motor attachment (for details, see the dimension sheet).
4. Check whether all components, assembly surfaces and threads are clean.
5. Make sure that the assembly can be carried out in a dry and clean environment.
6. Make sure that the holder for the motor flange is deburred.
7. Remove the protective sleeve of the motor drive shaft and keep it for further use.
8. Only for motors with holding brake

Check whether the motor holding brake reaches the holding torque specified in the data sheet. Should the brake fail to reach the torque specified, first grind in the holding brake as described in the [Chapter9.11.5](#).

11.3.3 Assembly

Please observe the following points during assembly:

1. Avoid pinching or jamming the centering bundle on the motor side.
2. Avoid damage to the insertion fitting on the system side.
3. Check the fit and precision of the connection before you proceed.

After proper mechanical assembly, make the electrical connections.

11.4 Electrical Connection

11.4.1 Notes Regarding Safety

It is recommended that you use ready-made Rexroth connection cables. These cables provide a number of advantages, such as UL/CSA authorization, extreme load capability and resistance as well as a design suitable for EMC.

**DANGER**

Danger to life and limb due to electrical power! Handling within the range of live parts is extremely dangerous. Therefore:

- Any work required on the electric system may be carried out only by skilled electricians. It is absolutely necessary to use power tools.
- Before starting work, the system must be de-energized and the power switch be secured against unintentional or unauthorized re-energization.
- Before starting work, the appropriate measuring equipment must be used to check whether parts of the system are still applied to residual voltage (e.g. caused by capacitors, etc.). If yes, wait until these parts have discharged.

**WARNING**

Injuries to persons or property possible! Interrupting or connecting live lines may cause unpredictable dangerous situations or lead to physical damage. Therefore:

- Connect and disconnect plug connectors only when they are dry and de-energized.
- During operation of the system, all plug connectors must be securely tightened.

**WARNING**

Risk of short-circuit caused by liquid coolant or lubricant! Short-circuits of live lines may cause unpredictable dangerous situations or lead to physical damage. Therefore:

- Provide open mating sides of power plug connectors with safety caps when installing or replacing drive components if you cannot exclude that they might be moistened with liquid coolant or lubricant.

11.4.2 Motor Connection according to European Standard (EN)

MKE037, -047, -098

**WARNING**

Damages to the terminal box or the cable are possible!

Too high tightening torques can damage the bolt-on fixing or can squeeze the cable. If bolt-on fixings are damaged, the protection IP65 on the terminal box cannot be ensured any longer.

- In fact of this use no automatic screwdriver (e.g. electronic, pneumatic or hydraulic screwdriver).

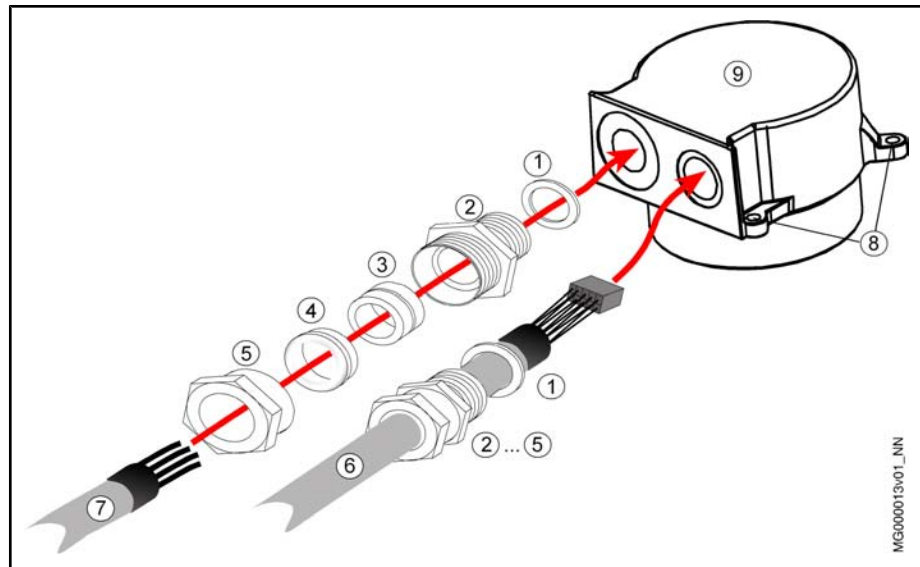
MKE motors in EU design are equipped with terminal boxes that are optimised for the storage of ready-made Rexroth cables.



In case of MKE motors, ignition cleavages are a positive Ex protection measure. Perfect compliance with the ignition cleavage tolerances ensures that, under a fault condition, ignition sparks cannot leave the motor's inner chamber to the outside. The terminal box cover forms an ignition cleavage with the motor housing which has to be opened and closed again during assembly and disassembly of the terminal box cover. Work carefully! Replace damaged terminal box covers.

Mount the ready-made cables in the following order:

Installation



- 1 Sealing
- 2 Screwed connection
- 3 Cable sealing
- 4 Pressure piece
- 5 Union nut
- 6 Encoder cable
- 7 Power cables
- 8 Lid screws
- 9 Terminal box lid

Fig. 11-2: Connection of MKE037, -047, -098

1. Remove the lid screws (8) and take off the terminal box lid (9).



The lid screws are coated with TFL. By screwing in resp. out of lid screws, the coating will be destroyed. When assembling the terminal box lid, use only the added, coated lid screws.



The EExd-Cable screwings are mounted factory-attached. The sealing (1) is screwed with with the screwing (2) on the terminal box lid (9) (tightening torque of Nm). – The terminal box includes the complete accessory incl. assembly instruction.

2. Insert the union nut (5), the pressure piece (4) and the cable sealing (3) in the indicated order over the power cable (7)
3. Tighten the screwing (2) with the sealing (1) within the terminal box lid (9) with tightening torque of 50 Nm.
4. Insert the power cable (7) through the screwing (2) into the terminal box lid (9).
5. Remove the EExd-Cable screwing for the encoder cable.



When using the ready-made cables of Rexroth, the EExd cable screwing on the motor is not needed.

6. Insert the encoder cable (6) into the terminal box lid (9) (see Fig.11-4).
7. Tighten the screwing of the encoder cable (2) with the sealing (1) within the terminal box lid (9) with tightening torque of 50 Nm.
8. Pull back the cable until the shrinking sleeve penetrates the inside of the terminal box by about 16mm (see Fig.: 11-4).

Installation

9. Tighten the union nuts (5) on the screwing (2) with a tightening torque of $15 \text{ Nm} \pm 10 \%$.
10. Connect the ring terminal (10) and (11) on X5 within the terminal box lid (9) (tightening torque $1.3 \text{ Nm} \pm 10 \%$).
11. Connect plug-in terminals X1 and X2 according to terminal diagram (see Fig.: 8-4) to the power cable.
12. Connect the plug-in terminals X1 and X2 into the appropriate position of the motor connection plate.
13. Safe the plug-in terminals X1 with the connection screw of the printed-circuit board socket.
14. Mount the plug-in interlock on the encoder connector X3 (see Fig. 11-3).

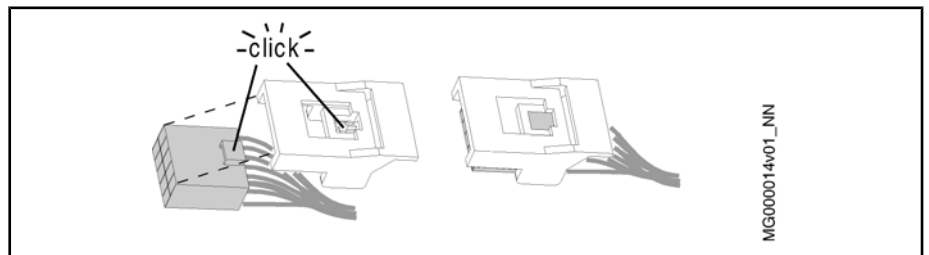


Fig. 11-3: Plug-in interlock

15. Connect the encoder connector X2 to the motor connection plate.
16. Set the terminal box lid (9) on the motor. Make sure that no wire can be crushed or damaged.
17. Tighten the terminal box lid (9) with the added TFL-coated lid screws (8) with 6.1 Nm .

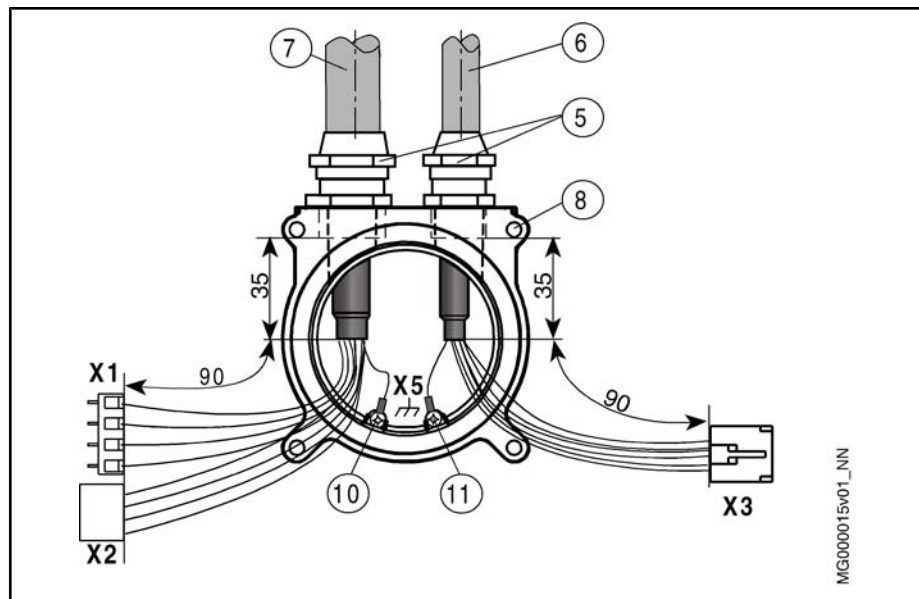


If substitute is necessary, please use for lid screws (8) only IS-Screws according to DIN 4762 with a minimum consistency of 8.8!



In case of repeated assembling of the terminal box lid, we recommend to secure the lid screws (8) with Loctite 243.

Installation



- (5) EExd cable screwing
- (6) Encoder cable
- (7) Power cables
- (8) Lid screw tighten torque 6.3 Nm
- (10),(11) Shield connection screw tighten torque 1.3 Nm
- X1 Plug-in terminal
- X2 Plug-in terminal brake, temperature
- X3 Encoder connector
- X5 Shield connection

Fig. 11-4: Entry of power and conductor cables MKE 096

MKE118

Cable fittings MKE118/EU motors of Rexroth are to be connected with Ex screwings especially adapted to the cable's outer diameter.

Observe the notes of the manufacturer:

All cable entries of **LE... type** have to be included into the type test according to EN 50018, Section 15.1.3 (overpressure test) according to the group classification of the respective electrical equipments (group classification I, IIA, IIB or IIC), if the operating pressure exceeds 20 bar.

The cable entries must be fastened into the electrical equipment in such a way that they are secured against twisting and loosening.

The cable entry include a multiple-part set of sealing rings per nominal diameter of the cables. The fitting sealing ring has to be selected and the union nut has to be screwed as far as it will go.

When investigating the maximum current-carrying capacity of the connection wires, assume the self-warming and housing-warming on the mounting place at maximum permitted ambient temperature.



The explosion protection for the cable entries can only be guaranteed, when they are in their original condition. The explosion protection can no longer be guaranteed, if:

- the isolator is damaged, broken or flaking.
- the winding of the screw-grommet is damaged.
- the cleavage face of the assembling bolt was changed, processed or damaged.

The servicing and repair of MKE motors must only be carried out by certified Rexroth service employees.

Grommets **must** be used at mounting, which are adjusted with the cable outer diameter in which the threads must be applied.


Screwing 	Available grommets with nominal diameter Tolerance -0.5 mm						
LE20/9 (Encoder)	8,5	9,0	9,5				
LE26/15 (Power 2.5 mm ²)	13,5	14,0	14,5	15,0	15,5	16,0	16,5
LE26/19 (Power 6.0 mm ²)	17,5	18,0	18,5	19,0	19,5		

Fig. 11-5: Grommets for Ex cable fittings



DANGER

Danger of explosion, danger to life, heavy injury and material damage

⇒ Only cable fittings mounted according to the rules prevent the penetration of potentially explosive gases / dusts.

⇒ Make sure that only grommets are used, which are adjusted to the cable diameter.

The following steps are necessary:

1. Determine the outer diameter of the cable on the clamping of the cable fitting.

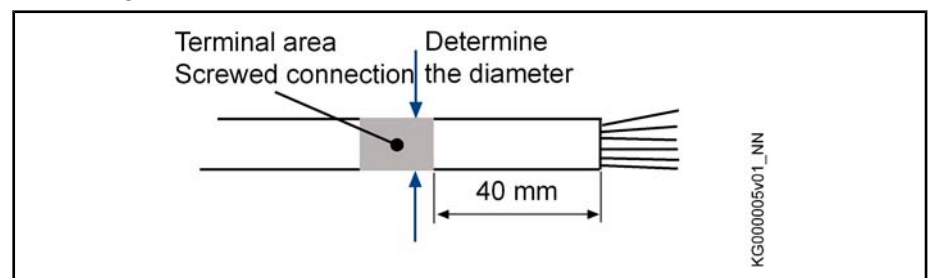


Fig. 11-6: Determine the cable's diameter

2. Select the necessary grommet and mount it on the cable fitting.
3. Tighten the cable fitting as far as it will go.

The cable fittings are mounted according to the Ex regulations.

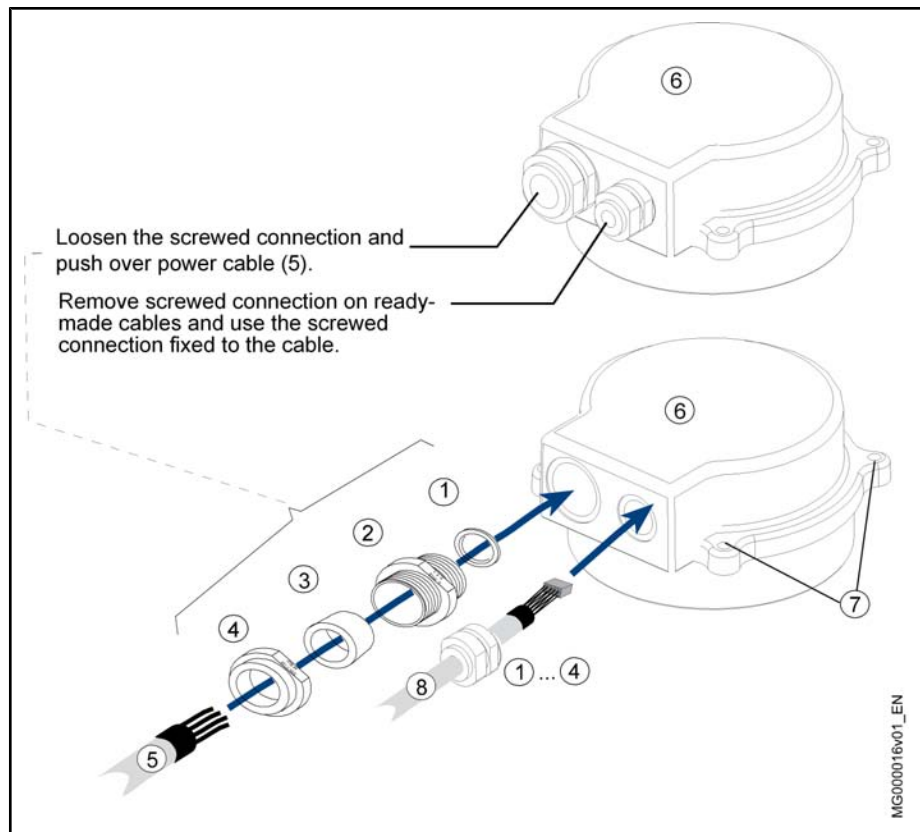
Mount and connect ready-made cables

Ready-made cables are mounted according to Fig. 11-7.

When using ready-made encoder cables (see Abb. 14-3) remove the fitting which is mounted on the motor and use the fitting which is mounted on the cable.

It is not necessary to define the cable's outer diameter.

Installation



- (1) Sealing
- (2) Screwing
- (3) Use grommets according to the cable diameter
- (4) Union nut
- (5) Ready-made power cable
- (6) Terminal box lid
- (7) Lid screws
- (8) Ready-made encoder cable

Fig. 11-7: Mounting of the EExd fitting and MKE118 cable



Loosen and tighten the cable fittings is not permitted. In this cases, "new grommets" have to be used.

The cables, which are thread into the terminal box have be connected according to (Abb. 11-8).

1. Connect the shield
Connect the ring terminal of the power and encoder cable on the X5 within the terminal box lid (Tightening torque 1.3 Nm 10%)
2. Connect the power cable
Lay the wires according to the connection plan (Fig. 8-4) onto the terminal block X1 and X2.
3. Connect the encoder plug
Mount the connection lock onto the encoder connector X3.

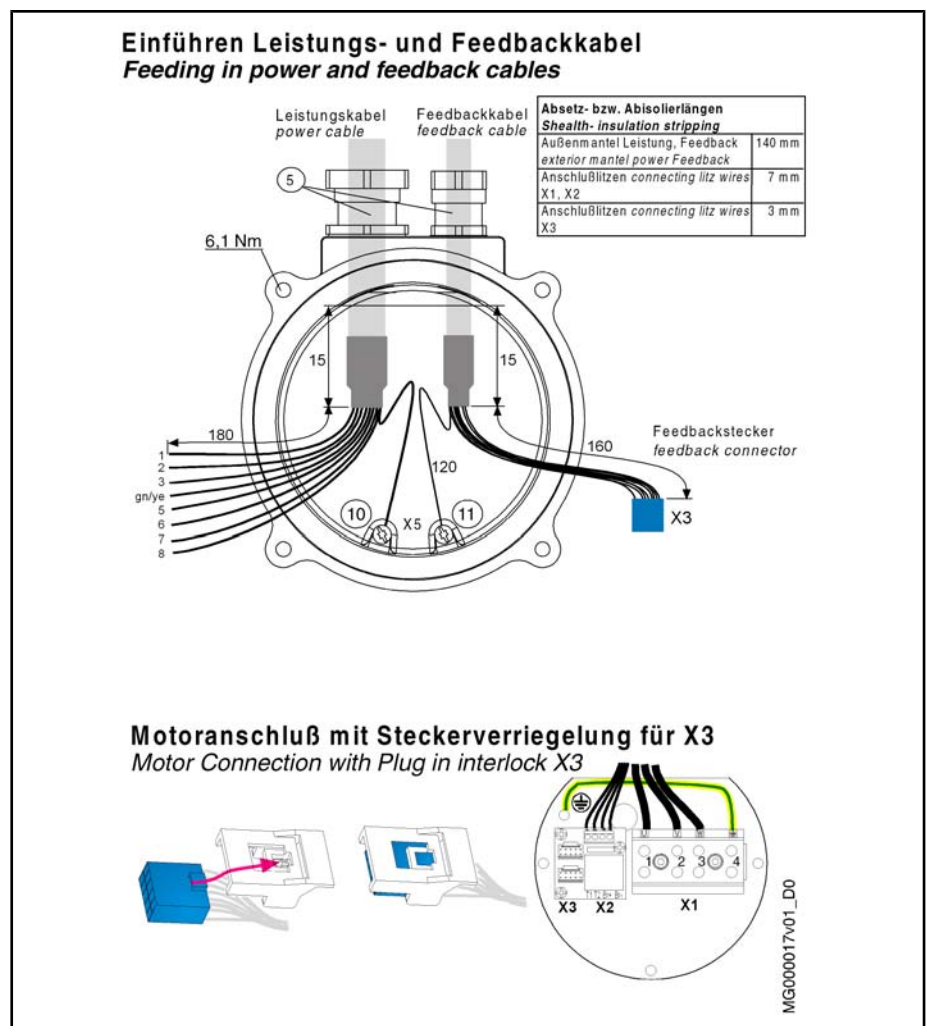


Fig. 11-8: Connection MKE118 encoder and power cable

4. Mount the terminal box lid

Set the terminal box lid (9) on the motor. Make sure that no wire can be crushed or damaged.

5. Tighten the terminal box lid (9) with the added TFL-coated lid screws (8) with 6.1 Nm.



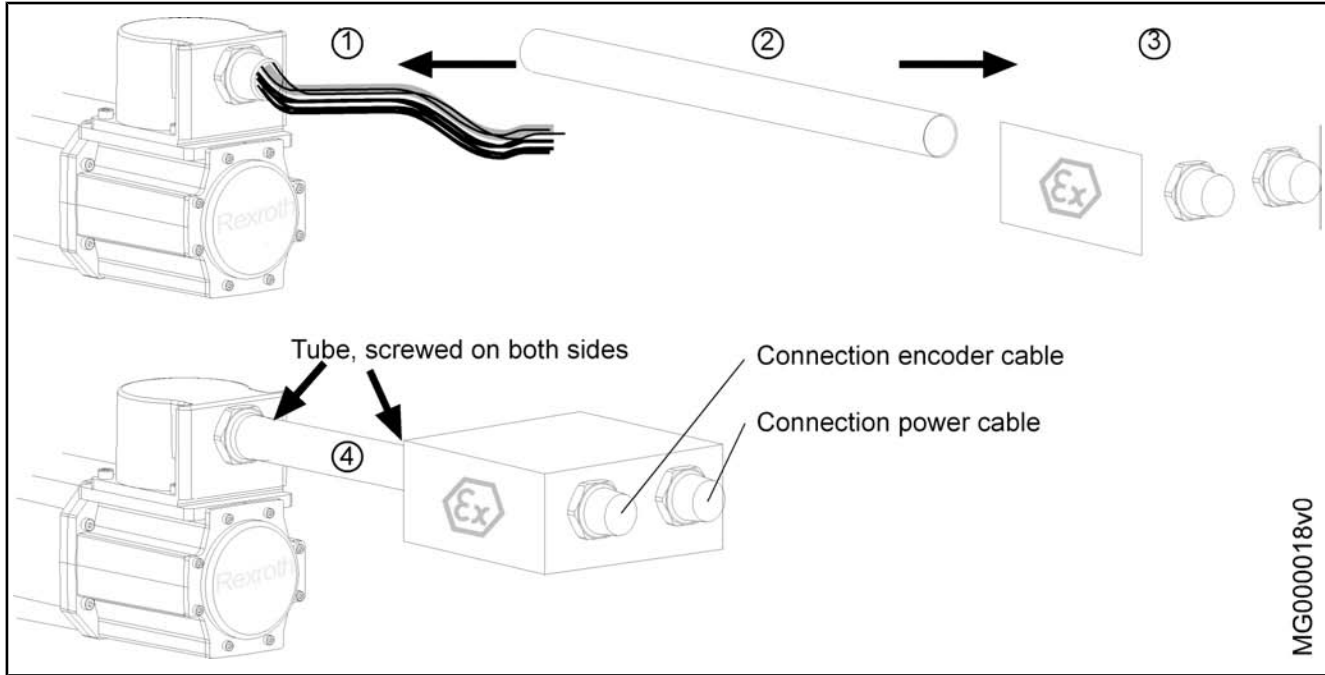
If substitute is necessary, please use for lid screws (8) only IS-Screws according to DIN 4762 with a minimum consistency of 8.8!



In case of repeated assembling of the terminal box lid, we recommend to secure the lid screws (8) with Loctite 243.

Installation

11.4.3 Motor Connection according to American Standard (UL)
MKE037, -047, -098



- (1) MKE with connection cable (single conductor)
- (2) Steel tube NPT 3/4 inch (not included in the scope of delivery)
- (3) Ex terminal box (not included in scope of delivery)
- (4) Lead the connection cable into the steel tube

Fig.11-9: Electrical connection MKE037, -047, -098 UL

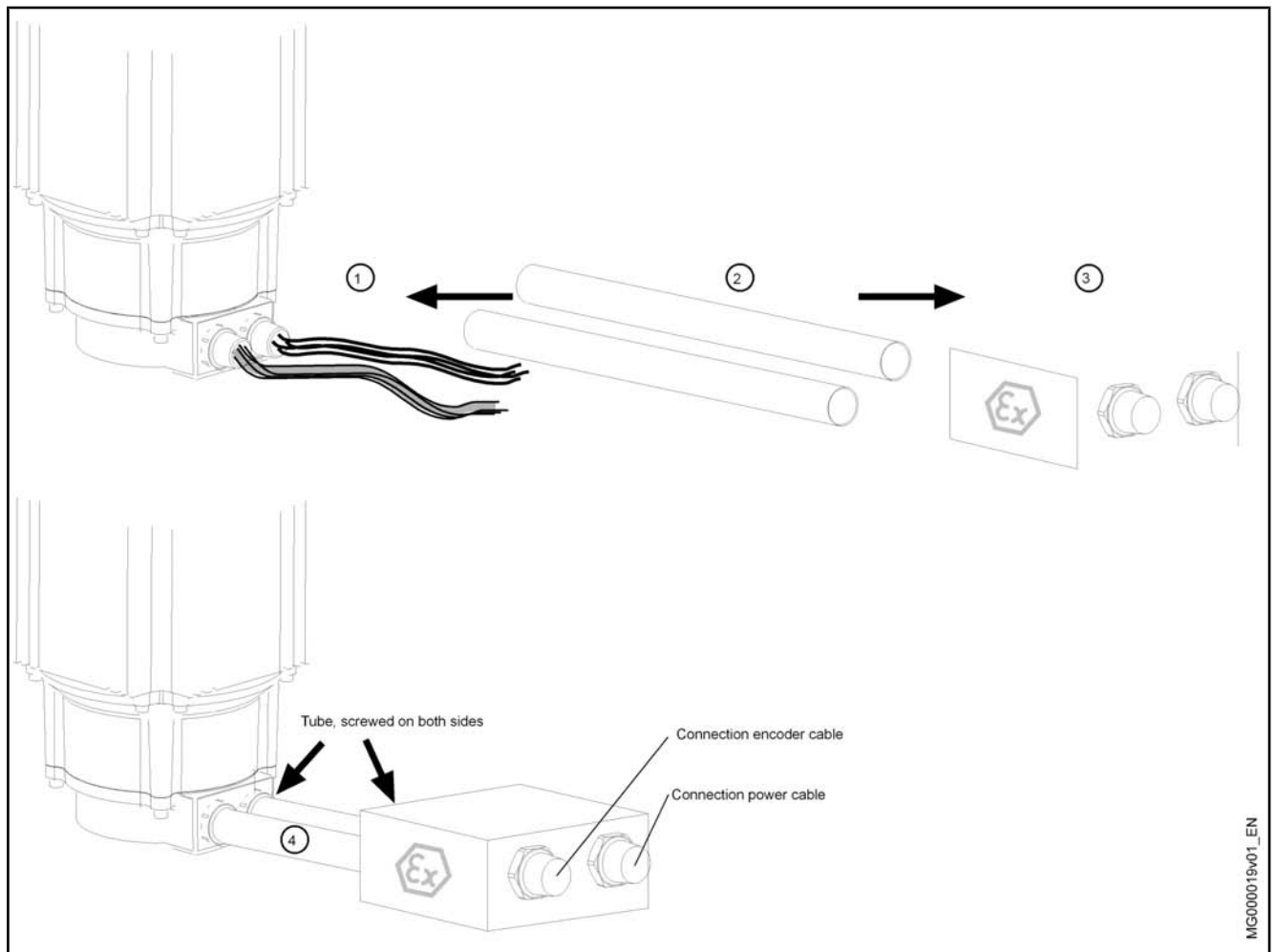


The machine manufacturer is responsible for observing the respectively valid standards and regulations.

Apply the shield in the Ex-terminal box as described in the documentation DOK-GENRL*-EMV*****-PRxx-EN-P.

Interconnect the single conductors after the mechanical assembly within the Ex terminal box according to the terminal diagram (Fig. 8-5).

MKE118



- (1) MKE with connection cable (single conductor)
- (2) Steel tube NPT ¼ inch (not included in the scope of delivery)
- (3) Ex terminal box (not included in scope of delivery)
- (4) Lead the connection cable into the steel tube

Fig. 11-10: Electrical connection MKE118 UL



The machine manufacturer is responsible for observing the respectively valid standards and regulations.

Apply the shield in the Ex-terminal box as described in the documentation DOK-GENRL*-EMV*****-PRxx-EN-P.

Interconnect the single conductors after the mechanical assembly within the Ex terminal box according to the terminal diagram (Fig. 8-5).

12 Startup, Operation and Maintenance

12.1 Commissioning



Material damage due to errors in the controls of motors and moving elements! Unclear operating states and product data!

- ⇒ Do not carry out commissioning if connections, operating states or product data are unclear or faulty!
- ⇒ Do not carry out commissioning if the safety and monitoring equipment of the system is damaged or not in operation.
- ⇒ Damaged products must not be operated!
- ⇒ Contact Rexroth for missing information or support during commissioning!

The following commission notes refer to the MKE motors as part of a drive-system with drive and control unit.

Preparation

1. Keep the documentation of all applied products ready.
2. Check the products for damage.
3. Check all mechanical and electrical connections.
4. Activate the safety and monitoring equipment of the system.

Execution

When all requirements are met, proceed as follows:

1. Activate the optional blower.
2. Carry out the commission of the drive system according to the instructions provided in the respective documentation. You can find the respective information in the functional description of the drive controllers.



Commissioning of drive controllers and the control unit may require additional steps. The inspection of the functioning and performance of the systems is not part of the commissioning of the motor; instead, it is carried out within the framework of the commissioning of the machine as a whole. Observe the instructions and regulations given by the machine manufacturer.

12.2 Operation

Make sure that the ambient conditions described in Chapter [chapter 9.2 "Setup Height and Ambient Temperature"](#) on page 75 are kept during operation.

12.3 Deactivation

In the case of malfunctions or maintenance, or to deactivate the motors, proceed as follows:

1. Observe the instructions of the machine documentation.
2. Use the control commands to bring the drive to a controlled standstill.
3. Switch off the power and control voltage of the drive controller.
4. Switch off the main switch of the machine.
5. Secure the machine against accidental movements and against unauthorized operation.
6. Wait for the discharge time of the electrical systems to expire and then disconnect all electrical connections.
7. Before dismantling, secure the motor against falling or movements before disconnecting the mechanical connections.

Startup, Operation and Maintenance

12.4 Maintenance

12.4.1 General

Synchronous motors of the MK series operate without wear within the given operating conditions. However, operation under unfavorable conditions can lead to limitations in availability.

- Increase availability with regular preventive maintenance measures. Observe the instructions in the maintenance schedule of the machine manufacturer and the described service measures.

**WARNING**

Danger of injury due to moving elements! Danger of injury due to hot surfaces!

- ⇒ Do not carry out any maintenance measures when the machine is running.
 - ⇒ During maintenance work, secure the system against restarting and unauthorized use.
 - ⇒ Do not work on hot surfaces.
-

12.4.2 Cleaning

Excessive dirt, dust or shavings may affect the function of the motors adversely, may in extreme cases even cause a failure of the motors. For that reason, you should clean

Cooling ribs

- the cooling ribs of the motors at regular intervals, in order to obtain a sufficiently large heat radiation surface. If the cooling ribs are dirty in part, sufficient heat dissipation via the environmental air is not possible any longer.

An insufficient heat radiation may have undesired consequences. The bearing service life is reduced by operation at impermissibly high temperatures (the bearing grease is decomposing). Switchoff caused by overtemperature despite operation on the basis of selected data, because the appropriate cooling is missing.

12.4.3 Bearings

The nominal lifetime of the bearings is $L_{10h} = 30,000$ h according to DIN ISO 281, ed. 1990, provided the permissible radial and axial forces are not exceeded ([chapter 9.10.2 "Radial Load, Axial Load" on page 80](#)). Even if the bearings are loaded with higher forces to a minor degree only, their service life is affected negatively.

The motor bearings should be replaced if

- the nominal bearing service life has been reached,
- running noises occur.



We recommend that bearings be replaced by the Bosch Rexroth Service.

12.4.4 Connection Cables

Check connection cables for damage at regular intervals and replace them, if necessary.

Check any optionally present energy management chains (drag chains) for defects.

**DANGER****Death by electrocution possible due to live parts with more than 50 V!**

⇒ Do not repair any connection lines provisionally. If the slightest defects are detected in the cable sheath, the system must be put out of operation immediately. Then the cable must be replaced.

Check the protective conductor connection for proper state and tight seat at regular intervals and replace it, if necessary.

12.4.5 Holding Brakes

see [chapter 9.11 "Holding Brakes \(Ex\)" on page 84](#)

12.4.6 Battery Change

Drive devices of Bosch Rexroth observe voltage of battery safely and give just in time a warning "battery change".

**DANGER****Danger of explosion! Death, heavy personal injury and material damage by opening the motor housing in hazardous areas!**

⇒ Do not loosen housing screws when the motor is in hazardous operation.
⇒ The MKE motor **must** be brought out of the hazardous area for changing the battery.

Change battery when machine is under load

Changing the battery should be made, when machine is under load. This is necessary to avoid an overrun in the motor encoder (switch off control voltage can cause loss of absolute values).

Battery change

The following tools and spare parts are needed:

- Hex screwdriver for
 - MKE037 Size 2.5
 - MKE047 Size 3
 - MKE098 Size 4
- Needle-nosed pliers
- Torque wrench with setting range 1.3-6.8 Nm.
- New, ready-made battery for
 - MKE037 and MKE047 MNR: R911277133
 - MKE098 MNR: R911265187

**DANGER****Danger to life and limb due to electrical power!**

To change the battery you must work when machine is under load. Therefore:

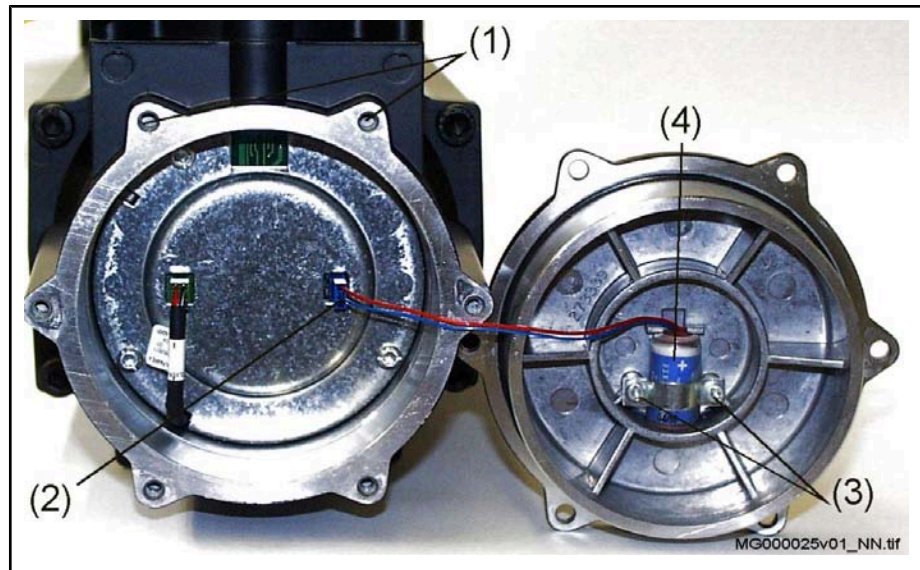
- Any work required on the electric system must only be carried by skilled electricians.
- Shut down the power supply at the drive control systems and save against re-energization!

**DANGER****Dangerous movements! Danger to life, severe corporal or material damage!**

⇒ Shut down power supply at the drive control systems and save against re-energization!

⇒ Change battery on drive control systems only when control voltage is switched on. Is the control voltage is switched off, while the battery is removed, the absolute value is lost and, when the machine will be switched on, a failing movement could be possible.

Startup, Operation and Maintenance



- (1) Use housing screws according to DIN EN ISO 4762 with minimum resistance of 8.8!
- (2) Battery connector
- (3) Screws for mounting the battery.
- (4) Battery

Fig.12-1: Battery change

Battery removal

1. Loosen the internal hexagon screw (1).
2. Take off the encoder lid.
3. Pull off the battery connector (2).
4. Loosen screws (3) of the battery's screw terminal (4) and remove the battery.

Battery installation

1. Connect the ready-made battery according to the motor type and fasten it with the clamping apparatus (4) and the screws (3) (tightening torque maximum 1.0 Nm).



Do not squeeze the battery cable!

2. Attach the battery connector (2).
3. Close the encoder lid.
4. Screw in the hexagon screws (1) and tighten it with the torque indicated. (MKE037 with 3,1 Nm, MKE047 with 1,3 Nm, MKE098 with 6,1 Nm).

The motor is operational.

Restart the system

1. Turn on power supply of drive control system.
2. Carry out a test run of the axes.

12.5 Troubleshooting

In preparation

12.6 Dismantling



DANGER

Fatal injury due to errors in activating motors and working on moving elements!

- ⇒ Do not work on unsecured and operating machines.
 - ⇒ Secure the machine against accidental movements and against unauthorized operation.
 - ⇒ Before dismantling, secure the motor and feeder against falling or movements before disconnecting the mechanical connections.
-

- Observe the instructions of the machine documentation.
- Please heed the safety notes and carry out all steps as described in the anterior instructions in the chapter "Deactivation".
- Before dismantling, secure the motor and power supply against falling or movement before disconnecting the mechanical connections.
- Dismantle the motor from the machine. Store the motor properly!

13 Environmental Protection and Disposal

13.1 Environmental Protection

13.1.1 Production Processes

The products are made with energy- and resource-optimized production processes which allow re-using and recycling the resulting waste. We regularly try to replace pollutant-loaded raw materials and supplies by more environment-friendly alternatives.

13.1.2 Prohibited Substances

We guarantee that our products do not contain any of the substances specified in the German regulation of prohibited chemicals ("Chemikalien-Verbotsverordnung"). We furthermore declare that our products are free of mercury, asbestos, PCB and chlorinated hydrocarbons.

13.1.3 No Release of Hazardous Substances

Our products do not contain any hazardous substances which may be released in the case of appropriate use. Accordingly, our products will normally not have any negative effect on the environment.

13.1.4 Principal Components

The principal components contained in our products are listed below:

Electronic devices	Motors
<ul style="list-style-type: none"> • steel • aluminum • copper • synthetic materials • electronic components and modules 	<ul style="list-style-type: none"> • steel • aluminum • copper • brass • magnetic materials • electronic components and modules

Fig. 13-1: Principal components

13.2 Disposal

13.2.1 Return of Products

Our products can be returned to us free of charge for disposal. It is a precondition, however, that the products are free of oil, grease or other dirt.

Furthermore, the products returned for disposal mustn't contain any undue foreign matter or foreign component.

Please send the products free domicile to the following address:

Bosch Rexroth AG
Electric Drives and Controls
Bürgermeister-Dr.-Nebel-Strasse 2
D-97816 Lohr am Main

13.2.2 Packaging Materials

The packaging materials consist of cardboard, wood and polystyrene. These materials can be recycled anywhere without any problem.

Environmental Protection and Disposal

For ecological reasons, please refrain from returning the empty packages to us.

13.2.3 Recycling

Due to their high content of metal, most of the product components can be recycled. In order to recycle the metal in the best possible way, the products must be disassembled into individual modules.

Metals contained in electric and electronic modules can also be recycled by means of special separation processes. The synthetic materials remaining after these processes can be thermally recycled.

If the products contain batteries or accumulators, these have to be removed before recycling and disposed of.

14 Appendix

14.1 List of Standards

Standard	Edition	Title	Concordance
Directive 94/9/EC	1994-03-23	Directive 94/9/EC of the European Parliament and the Council dated 23.03.94 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres	
ATEX DIRECTIVES	2000-05	ATEX DIRECTIVES (1st edition) Directives for the application of directive 94/9/EC of the European Parliament and the Council dated 23.03.94 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres	
Directive 89/336/EEC	1989-05-03	Directive of the Council dated May 3, 1989 on the approximation of the laws of the Member States concerning electromagnetic compatibility	
89/392/EEC replaced by 98/37/EC	1998-06-22	Directive 98/37/EC of the European Parliament and the Council dated June 22, 1998 on the approximation of the laws and administrative regulations of the member states concerning machines	
DIN 332-2	1983-05	Center holes 60° with thread for stub shafts of rotating electrical machines	
DIN 42948	1965-11	Mounting flanges for electrical machines	
DIN 42955	1981-12	True running of stub shafts, coaxiality and planned running of the mounting flanges of rotating electrical machines; tolerances, test	IEC 60072(1971)
DIN 6885-1	1968-08	Driver connection without pick-up; feather keys, grooves, high shape	
DIN 748-3	1975-07	Cylindrical stub shafts ends for electrical machines	IEC 60072(1971)
DIN EN 50014, VDE0170/0171 Part 1	2000-02	Electrical equipment for potentially explosive areas - General conditions; German version EN50014:1997 + Corrigendum: 1998 + A1:1999 + A2:1999	EN 50014(1997-06); EN 50014/A1(1999-02); EN 50014/A2(1999-02)
DIN EN 50014/A3; VDE 0170/0171 Part 1/A3 Draft	1998-08	Electrical equipment for potentially explosive areas - General conditions; amendment A3; German version EN50014:1997/prA3:1998	EN 50014/prA3 (1998-03)
DIN EN 50014/AA; VDE 0170/0171 Part 1/AA Draft	1999-09	Electrical equipment for potentially explosive areas - General conditions; amendment AA; German version EN50014:1997/prAA:1999	EN 50014/prAA (1999-02)
DIN EN 50015, VDE 0170/0171 Part 2	2000-02	Electrical equipment for potentially explosive areas - Oil immersion "o"; German version EN 50015:1998	EN 50015(1998-09)
DIN EN 50016/A1;	2003-03	Electrical equipment for potentially explosive areas - Pressure-proof encapsulation "p"; German version EN 50016:2002	
DIN EN 50016, VDE 0170/0171 Part 3	2003-03	Electrical equipment for potentially explosive areas; Pressure-proof encapsulation "p"; German version EN 50016:2002	EN 50016(1995-10)

Appendix

Standard	Edition	Title	Concordance
DIN EN 50017 , VDE 0170/0171 Part 4	2000-02	Electrical equipment for potentially explosive areas - Powder filling "q"; German version EN 50017:1998	EN 50017(1998-09)
DIN EN 50018 , VDE 0170/0171 Part 5	2001-12	Electrical equipment for potentially explosive areas - Pressure-proof encapsulation "d"; German version EN 50018:2000	EN 50018(1994-08)
DIN EN 50019 ; VDE 0170/0171 Part 6	2001-06	Electrical equipment for potentially explosive areas - Increased safety "e"; German version EN 50019:2000	EN 50019(2000-07)
DIN EN 50020 , VDE 0170/0171 Part 7	2003-08	Electrical equipment for potentially explosive areas - Intrinsic safety "i"; German version EN 50020:2002	EN 50020(1994-08)
DIN EN 50178 ; VDE 0160	1998-04	Electronic equipment for use in power installations; German version EN 50178:1997	EN 50178(1997-10)
DIN EN 60034-1 ; VDE 0530 Part 1	2000-09	Rotating electrical machines - Part 1: Rating and operating behaviour (IEC 60034-1:1996, modified +A1: 1997 +A2:1999); German version EN 60034-1;1998 +A1: 1998 +A2:1999	EN 60034-1(1998-05); EN 60034-1/A1 (1998-05); EN 60034-1/ A2(1999-08); IEC 60034-1(1996-11); IEC 60034-1 AMD 1 (1997-06); IEC 60034-1 AMD 2(1999-05)
DIN EN 60034-14 ; VDE 0530 Part 14	1997-09	Rotating electrical machines - Part 14: Mechanical vibration of certain machines with axis heights of 56 mm and higher; measurement, evaluation and limits of vibration (IEC 60034-14:1996); German version EN 60034-14:1996	EN 60034-14(1996-12); IEC 60034-14(1996-11)
DIN EN 60034-7 ; VDE 0530 Part 7	2001-12	Rotating electrical machines - Part 7: Classification of construction types, of setup types and of terminal position (IM code) (IEC 60034-7:1992 +A1:2000); German version EN 60034-7:1993 +A1:2001	EN 60034-7(1993-01); IEC 60034-7(1992-12)
DIN EN 60079-14 ; VDE 0165 Part 1	1998-08	Electrical apparatus for potentially explosive gas - Part 14: Electrical systems in potentially explosive areas (with the exception of mines) (IEC 60079-14:1996); German version EN 60079-14:1997	EN 60079-14(1997-08); IEC 60079-14(1996-12)
DIN EN 60529 ; VDE 0470 Part 1	2000-09	Protection classes via housings (IP code) (IEC 60529:1989 +A1:1999); German version EN 60529:1991 + A1:2000)	EN 60529(1991-10); EN 60529/A1(2000-02); IEC 60529(1989-11); IEC 60529 AMD 1(1999-11)
DIN EN 60721-3-3	1995-09	Classification of ambient conditions - Part 3: Classification of groups of environmental parameters and their limits; section 3: Stationary use at weatherprotected locations (IEC 60721-3-3:1994); German version EN 60721-3-3:1995	EN 60721-3-3(1995-01); IEC 60721-3-3(1994-12)
DIN IEC 60721-1	1997-02	Classification of ambient conditions - Part 1: Environmental parameters and their severities (IEC 60721-1:1990 + A1:1992 + A2:1995); German version EN 60721-1:1995 + A2:1995	EN 60721-1(1995-04); EN 60721-1/A2 (1995-07); IEC 60721-1 (1990-12); IEC 60721-1 AMD 1(1992-12); IEC 60721-1 AMD 2 (1995-04)

Standard	Edition	Title	Concordance
DIN VDE 0170/0171-9	1988-07	Electrical equipment for potentially explosive areas; Casting capsule "m"; German version EN 50028:1987	EN 50028(1987-02)
IEC 60072-1	1991-02	Dimensions and power series for rotating electrical machines; Part 1: Housing sizes 56 to 400 and flange sizes 55 to 1080	
IEC 60072-2	1990-12	Dimensions and power series for rotating electrical machines; Part 2: Housing sizes 355 to 1000 and flange sizes 1180 to 2360	
IEC 60072-3	1994-03	Dimensions and power series for rotating electrical machines; Part 3: Small built-in motors; flange size BF10 to BF50	
IEC 60364-4-41	2003-04	Construction of low-voltage installations - Part 4-41: Protection for safety; Protection against electric shock (IEC 64/1272/CDV:2002)	
IEC 721-1		see DIN IEC 60721-1	
IEC 721-3-3		see DIN EN 60721-3-3	
UL 1446	1997-05	Insulation material systems - General	
UL 508C	2002-05	Static converter	
UL 674*ANSI 674	1994-04	Electric motors and current generators for potentially explosive (classified) areas	

Fig. 14-1: List of Standards

14.2 Selection of Connection Cable

14.2.1 Power Cable IndraDyn S MKE

Motor	IndraDrive		DuraDrive ¹⁾		Cross-section [mm ²]
	HCS02_W0012 HCS02_W0028 HMD01_W0012 HMD01_W0020 HMD01_W0036 HMS01_W0020 HMS01_W0036	HCS02_W0054 HCS02_W0070 HCS03_W0070 HMS01_W0054 HMS01_W0070	HDC01_A040N	HDC01_A100N	
MKE037B-144	□	IKG4145	IKG0309	□	1
MKE047B-144	□	IKG4145	IKG0309	□	1
MKE098B-047	□	IKG4145	IKG0309	□	1
MKE098B-058	□	IKG4145	IKG0309	□	1
MKE118B-024	IKG4148	IKG4146	□	IKG0324	2,5
MKE118B-058	IKG4149	□	□	IKG0327	6
MKE118D-012	IKG4148	IKG4146	□	IKG0324	2,5
MKE118D-027	IKG4148	IKG4146	□	IKG0324	2,5
MKE118D-035	IKG4149	□	□	IKG0327	6

Appendix

Motor	DIAX04		EcoDirve03		Cross-section [mm ²]
	HDD02_* HDD02_*	HDS02_* HDS02_*	DKC**.3	DKC**.3 16A	
MKE037B-144	IKG0312	□	IKG0311	IKG0329	1
MKE047B-144	IKG0312	□	IKG0311	IKG0329	1
MKE098B-047	IKG0312	□	IKG0311	IKG0329	1
MKE098B-058	IKG0312	□	IKG0311	IKG0329	1
MKE118B-024	IKG0313	IKG0314	IKG0317	□	2,5
MKE118B-058	□	IKG0322	IKG0326	□	6
MKE118D-012	IKG0313	IKG0314	IKG0317	□	2,5
MKE118D-027	IKG0313	IKG0314	IKG0317	□	2,5
MKE118D-035	□	IKG0322	IKG0326	□	6

□ Connection not possible
 1) max. cable length for DuraDrive 25 m
Fig. 14-2: MKE power cable

Ordering example Then add the cable length to the order designation (.../xxx,x). Cables are available in lengths ranging from 2 to 75 m, in increments of 0.5 m.

Example:

Order code for a cable length of 25,5 m: **RKL4321/025,5**

14.2.2 Encoder Cable IndraDyn S MKE

Motor	Encoder design		
	K; G; N; P;		A; B; C; D;
	EcoDrive03 DiAx04	DuraDrive ¹⁾ IndraDrive	IndraDrive
MKE037B-144	IKS0205	IKS0223	RKG0020
MKE047B-144	IKS0205	IKS0223	RKG0020
MKE098B-047	IKS0205	IKS0223	RKG0022
MKE098B-058	IKS0205	IKS0223	RKG0022
MKE118B-024	IKS0225	IKS0226	RKG0022
MKE118B-058	IKS0225	IKS0226	RKG0022
MKE118D-012	IKS0225	IKS0226	RKG0022
MKE118D-027	IKS0225	IKS0226	RKG0022
MKE118D-035	IKS0225	IKS0226	RKG0022

1) max. cable length for DuraDrive 25 m
Fig. 14-3: Encoder cable IndraDyn S MKE

Ordering example Then add the cable length to the order designation (.../xxx,x). Cables are available in lengths ranging from 2 to 75 m, in increments of 0.5 m.

Example:

Order code for a cable length of 25,5 m: **RKL4321/025,5**

14.3 Declaration of Conformity

The declaration of conformity is included in the scope of supply of each motor. If necessary, further copies can be requested from the responsible sales office.

Appendix

Industrial Hydraulics | Electric Drives and Controls | Linear Motion and Assembly Technologies | Pneumatics | Service Automation | Mobile Hydraulics

Rexroth
Bosch Group

Konformitätserklärung
Im Sinne der EG-Richtlinie 94/9/EG
Produkt/Product/produit: MKE

RNC 87416-000
2004-02-09

Declaration of Conformity as per EC directive 94/9/EG
Déclaration du fabricant conformément à la directive "CE" 94/9/EG

Hiерmit еrklären wir, dass das We herewith declare that the Par la présente nous déclarons que
Produkt product le produit

1. Produkt:	AC-Motor	
Product:	AC motor	
Produit:	Moteur AC	
2. Hersteller:	Rexroth Indramat GmbH	
Manufacturer:	Bürgermeister-Dr.-Nebel-Straße 2	
Constructeur:	97816 Lohr a. Main / Germany	
3. Typ / Type:	MKE037, MKE047, MKE098, MKE118	
4. ab Herstellungsdatum:	2003-09-15	
from date of manufacture:		
à partir de la date de fabrication:		
5. Angewendete Normen / Applicable standard / Normes utilisées		
<u>Norm / Standard / Norme</u>	<u>Titel / Title / Titre</u>	<u>Ausgabe / Edition</u>
EN 50018	Electrical apparatus for potentially explosive atmospheres - Flameproof enclosure „d“	2001-12
EN 50281-1-1	Electrical apparatus for use in the presence of combustible dust – Part 1-1: Electrical apparatus protected by enclosures; construction and testing	1999-10
EN 50014	Electrical apparatus for potentially explosive atmospheres - General requirements	2000-02
6. Baumusterprüfbescheinigungen		
PTB 03 ATEX 1107 X	Baumusterprüfbescheinigung der PTB, Braunschweig, Germany mit Prüfbericht 03-12133, betreffend MKE037, MKE047, MKE098	
PTB 03 ATEX 1108 X	Baumusterprüfbescheinigung der PTB, Braunschweig, Germany mit Prüfbericht 03-12107, betreffend MKE118	

einschließlich des erforderlichen including the necessary accessories, satisfait, comme les accessoires
Zubehörs den Bestimmungen der complies with the provisions of EC nécessaires, aux dispositions de la
EG-Richtlinie 94/9/EG vom 23. März Directive 94/9/EC dated 23rd March Directive CE 94/9 CE du 23 mars
1994 entspricht. Die Produkte sind 1994. The product is intended solely 1994. Les produits sont tous, sans
ausschließlich zum Anbau in eine for installation in a machine. It is exception, destinés être intégrés á
Maschine bestimmt. Die prohibited to put the product into une machine. La mise en service du
Inbetriebnahme des Produktes ist operation until it has been produit est proscrite tant qu'il n'a
solange untersagt, bis festgestellt established that the machine in pas été constaté que la machine
wurde, dass die Maschine, in die which the product is to be installed dans laquelle ce produit doit être
das Produkt eingebaut werden soll, complies with the provisions of the monté, répond aux dispositions de la
den Bestimmungen der EG- EC Directive. directive CE.
Richtlinie entspricht.

Fig.14-4: Declaration of conformity MKE (page 1)

MKE, Konformitätserklärung

Page 2 / 2
RNC 87416-000 : 2004-02-09**Erläuterungen:**

Der bestimmungsgemäße Gebrauch des Produktes setzt die Einhaltung der Benutzungsbestimmungen und Anwendungsbedingungen, die in der Dokumentation „MKE Synchronmotoren für explosionsgefährdete Bereiche nach ATEX und UL/CSA – Projektierung“ (Dokumentationstyp DOK-MOTOR*-MKE*GEN2***-PRxx-xx-x) angegeben werden, durch den Nutzer voraus.

Der Motor hat die folgende Kennzeichnung:

 II 2 G/D EEx d IIB T4
IP6X T 135°C

Explanations:

For the product to be used as intended the user must comply with the provisions of use and conditions of application laid down in the documentation „MKE synchronous motors for hazardous areas in accordance with ATEX and UL/CSA – Project planning“ (documentation type DOK-MOTOR*-MKE*GEN2***-PRxx-xx-x). The motor has the following markings:

 II 2 G/D EEx d IIB T4
IP6X T 135°C

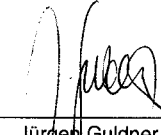
Explications:

L'utilisation correcte du produit, c'est-à-dire en conformité avec sa destination, présuppose le respect par son utilisateur des prescriptions d'utilisation et conditions d'application stipulées dans la documentation „MKE Moteurs synchrones pour atmosphères explosibles suivant les normes d'études de projet ATEX et UL/CSA“ (Type de documentation DOK-MOTOR*-MKE*GEN2***-PRxx-xx-x). Le moteur a la caractérisation suivante:


 II 2 G/D EEx d IIB T4
IP6X T 135°C

Lohr, den 2004-02-09
Ort/location/localité Datum/date

i.V.


Jürgen Guldner
Leiter Qualitätsmanagement/
Quality Management/
Responsable Qualité

i.V.


Norbert Nellen
Produktsicherheitsbeauftragter/
Product assurance supervisor/
Responsable sécurité de produit

Änderungen im Inhalt der Konformitätserklärung sind vorbehalten. Derzeit gültige Ausgabe auf Anfrage.
We reserve the right to make changes in the conformity declaration. Presently applicable edition can be obtained upon request.
Le fabricant se réserve le droit de modifier le contenu de la déclaration. Edition actuellement en vigueur demande.

15 Service and Support

15.1 Helpdesk

Our service helpdesk at our headquarters in Lohr, Germany, will assist you with all kinds of inquiries.

Contact us:

- By phone through the Service Call Entry Center,
Monday to Friday 7:00 am - 6:00 pm CET
+49 (0) 9352 40 50 60
- By fax
+49 (0) 9352 40 49 41
- By e-mail: service.svc@boschrexroth.de

15.2 Service Hotline

Out of helpdesk hours please contact our German service department directly:

+49 (0) 171 333 88 26

or

+49 (0) 172 660 04 06

Hotline numbers for other countries can be found in the addresses of each region (see below).

15.3 Internet

Additional notes regarding service, maintenance and training, as well as the current addresses of our sales and service offices can be found on

<http://www.boschrexroth.com>

Outwith Germany please contact our sales/service office in your area first.

15.4 Helpful Information

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

- Detailed description of the fault and the circumstances
- Information on the type plate of the affected products, especially type codes and serial numbers
- Your phone and fax numbers as well as your e-mail address so we can contact you in case of questions

Index

A

Ambient temperature 75
Ambient temperature in operation 18
ATEX
 gearboxes 57

B

Ball bearing pinion 82
Battery change 107
Battery installation 108
Battery removal 108
Bearing
 wear 83
Bearing failure 83
Bearing lifetime 83
Brake
 see holding brake 72
Brake torque 84

C

Cable – handling and installation recommendations 63
 Drag chains 64
Conformity certificate 72, 74
Connection cables 106
Connection compartment 69
Connection conditions 71
Connection time 18
Constant voltage at 20 °C 17
Contained materials
 See "Principal Components" 111
Continuous torque at standstill 17
Cooling ribs 106
Couplings 82

D

degree of protection 76
Degree of protection 18, 69
Discharge capacity 17
Disconnection time 18
Disposal 111
Drag chains 106
Drive pinion, helical teeth 82

E

Electrical equipment 68
Emergency stop 71
Encoder
 Digitales Resolverfeedback (RSF) 55
 Digitales Resolverfeedback (RSF with integrated multiturn absolute encoder) 55
 Digital servo feedback (HSF) 55
 Digital servo feedback (HSF with integrated multiturn absolute encoder) 55
 Optical multiturn EnDat 2.1 encoder 55

 Optical multiturn Hiperface encoder 55
 Optical singleturn EnDat 2.1 encoder 55
 Optical singleturn Hiperface encoder 55
encoder system 45
Energy management chains 106
Entry for pipelines 69
Environmental protection 111
Ex area 73, 74
Ex cable and line entry 69
Ex component 69
Explosive gas atmosphere 68
Explosive test mix 68
External systems 4

F

flange assembly 94
Flange connection 93

G

gearboxes according to ATEX 57
grease lifetime 83
Grounding 71
Groups 70

H

Hazardous substances 111
heat dissipation 106
Holding brake 46, 72
 Commissioning 86
Holding brakes 84
 commissioning 107
 Danger notices 85
 electrically-released 84
Holding torque 18
Housing varnish 77

I

Identification 90
Ignition protection class 69, 70
Inappropriate use, 6
 Consequences, exclusion of liability 5
Insulation class according to DIN EN 60034-1 18
Intended use 5
 Applications 5

K

key 78
Keyway 45

M

Maximum current 17
Maximum surface temperature 69
Maximum torque 17

Index

Mean speed 81

Moment of inertia of rotor 17

Moment of inertia of the brake 18

Motor feedback

Encoder data memory 55

N

Number of pole pairs 17

O

Operating modes 18

Operating temperature 68

Operating time 19

Output shaft

Plain output shaft 78

P

Packaging materials 111

position detection 55

Potentially explosive area 68

Pressure part 69

Principal components 111

processing cycle 81

Production processes 111

Prohibited substances 111

R

Radial force 83

radial shaft sealing ring 79

Radial shaft sealing ring 18

Rated current 18

Rated value 69

Rated voltage 18

Recycling 112

Redundant bearing 82

Return of products 111

Risk of corrosion 71

running noises 106

S

Safety instructions for electric drives 7

Sealing ring 69

Setup height 75

Shaft

plain 78

with key 78

Shaft sealing ring 79

Shock 78

Shock absorber 91

Sinusoidal vibrations 77

Sling belts 91

Sound pressure level 18

Standards 3

state of the art 5

Strength member 69

Structure and components 2

T

Temperature classes 71

Thermal time constant 17

Thermostat 59

tightness 80

Torque constant at 20 °C 17

U

Use

Inappropriate use 6

Intended use 5

V

Varnish 77

Versions 2

Vibration 77

W

Winding inductivity 17

Winding resistance at 20 °C 17

Notes

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