rexroth
A Bosch Company

Operating Manual

MKE
Synchronous Servomotors

UL/CSA

R911414374, Edition 01

Liability

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1 About this documentation

1.1 Purpose and editions of this documentation

This instruction must be observed by assemblers, operators, service engineers and facility operators. It contains notes about handling a motor. Before operating motors, read this operating instruction to ensure a safe and smooth functionality and a long motor lifetime.

Table 1: Record of revisions

Edition	Release date	Notes
DOK-MOTOR*-MKE*GEN3U**-IT01-EN-P	12/2021	First edition

1.2 Presentation of information

Safety instructions

The safety instructions in this documentation include signal words (danger, warning, caution, note) and a signal symbol (acc. to ANSI Z535.6-2006).

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

⚠ DANGER

Non-compliance with this safety instructions **will** result in death or severe personal injury.

⚠ WARNING

Non-compliance with this safety instructions **can** result in death or severe personal injury.

⚠ CAUTION

Non-compliance with this safety instructions **can** result in moderate or minor personal injury.

NOTICE

Non-compliance with this safety instructions **can** result in material damage.

Safety symbols

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

Table 2: Meaning of safety signs

Safety symbols	Meaning
	Warning against dangerous electric voltage
	Warning against hot surfaces
	Warning against rotating machine parts
	Warning against overhead load
	Electrostatic sensitive devices
	No access for persons with cardiac pacemakers or implanted defibrillators.
	Do not carry along metal parts or clocks.
	Hammer scales are forbidden

Meaning of symbols

Table 3: Meaning of symbols

Symbol	Meaning
	Reference to supplementary documentation
	The UL Listed Mark identifies products tested by Underwriters' Laboratories (UL) to nationally recognized safety standards.
SI	Components for the use in systems for “integrated safety technique” prepared.
	The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin.

Markup

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

Reference to supplementary documentation

Remark: This note gives important information, which must be observed.

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

Instruction

Instruction

➡ Result of one instruction

Instruction multilevel

1. Action step one
2. Action step two

➡ Result of an instruction

Please comply with the order of the handling instructions.

2 Safety instructions

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

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

2.1 Important directions on use

2.1.1 Intended use

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

The motors are suited for proper use in hazardous areas according to UL 674:2020-12-28.

The motors have been exclusively designed for installation in industrial machinery. The motors are according to the following standards.

Standards
UL 508A:2020-08-06 UL Standard for Safety for Industrial Control Panels, UL 508A (Third Edition, Dated April 24, 2018)
UL 674:2020-12-28 UL Standard for Safety for Electric Motors and Generators for Use in Hazardous (Classified) Locations, UL 674 (Fifth Edition, Dated May 31, 2011)
CSA C22.2 NO. 145-11 Electric motors and generators for use in hazardous (classified) locations (R2020)

The evaluation of the electrical and mechanical safety and the environmental influences must be carried out by the machine manufacturer in accordance with the country-specific regulations for safety of machines in installed condition.

The electrical installation must comply with the country-specific protection requirements for electromagnetic compatibility. The plant manufacturer is responsible for appropriate installation (for example: physical separation of signal and

power cables, using shielded cables, ...). The EMC instructions of the converter manufacturer must be observed.

Die Inbetriebnahme ist solange untersagt, bis die Konformität mit diesen Anforderungen festgestellt ist.

2.1.2 Unintendend use

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

Do not use the motors if the ambient conditions require a higher ATEX protection category than specified on the type plate of the motors.

Direct operation on the three-phase network is forbidden.

2.2 Qualification of personnel

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

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

2.3 General safety instructions

Important! Please read all instructions before motor installation.

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

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

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

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

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

2.4 Product- and technology-dependent safety instructions

2.4.1 Protection against explosion hazard

Product use only in hazardous areas according to the specified labeling on the product

This product is only allowed to be used in an area of use which is specified on the type plate according to the explosion protection standards. In the case of several Ex designations labelled on the type plate, like gas and dust protection, please observe that during operation only one hazardous atmosphere occurs - no combination of several.

Do any maintenance in non-hazard atmosphere.

Observe the conditions on use

Observe the notes in the application conditions and do not exceed the specified limit values.

Observe residual risks

Specified residual risks and special using conditions must be evaluated by the plant manufacturer and operator according to the product application. This makes own measures necessary to prevent risks.

2.4.2 Protection from electric voltage

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

Before working:

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

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

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

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

2.4.3 Protection from mechanical danger

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

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

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

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

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

2.4.4 Protection against magnetic and electromagnetic fields

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

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

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

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

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

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

- Handle only with protective gloves.

Risk of destruction of sensitive parts! Data loss!

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

2.4.5 Protection against ignitable electrostatic discharges

Danger of explosion due to electrostatic discharge

Electrostatic discharges may ignite gases, vapors and dust. Electrostatic charges may be caused e.g. by the following processes:

- electrostatic painting
- pneumatically conveyed dust or bulk material
- hydraulically conveyed or flowing liquids and droplets
- mechanically driven belts, brushes and films, etc.

Danger of explosion due to highly charge-generating processes

Highly charge-generating processes may cause bush discharges or propagating bush discharges and lead to explosions. This must be prevented. This, in turn, may lead to death, severe injury and damage to property.

Carry out cleaning work only with a moist cloth

Clean the motor with a moist cloth to avoid electrostatic charge. Rubbing with non-conductive materials must be avoided to prevent electrostatic charges resulting in ignition hazards.

2.4.6 Protection against burns

Risk of burns due to hot motor surfaces!

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

2.4.7 Electrostatic sensitive devices (ESD)

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

Avoid, e.g. direct contact of open wires or contacts of the connection cable of temperature sensors without being electrostatically discharged or grounded.

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

3 Scope of delivery

The scope of delivery of a MKE synchronous motor contains:

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

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

4 Explosion protection

4.1 UL E-file number

MKE motors are listed under UL E-file number **E203009**. Information can be recalled under ➦ www-ul.com.

The motors must be operated with the power control units listed by the manufacturers of the following manufacturers and series:

Manufacturer	Type / series
Bosch Rexroth	HMS
	HMD
	HCS
	HDD
	HDS
	DKCXX.3

4.2 Product description

The MKE037, -047, -098, -118 three-phase synchronous motors are used for operation with drive systems. The motors are flameproof, non-ventilated, servo-controlled permanent magnet special motors for use in hazardous areas with a free internal volume of 300 cu. in. or less. The motors are controlled by a pulse width modulated (PWM) variable frequency drive. The speed of the motor is varied by changing the frequency of the power supplied. The drive frequency and voltage are changed by fast pulse width modulation of a bus voltage. The used current waveform is sinusoidal.

The motors are brushless designs with a resolver or optical encoder.

4.3 ATEX label

Motor classification	
c UL us LISTED	
MKE037	Class I Division 1 Groups C, D
MKE047	Class I Division 1 Groups C, D
	Class II Division 1 Groups F, G
MKE098	Class I Division 1 Groups C, D
	Class II Division 1 Groups F, G
MKE118	Class I Division 1 Groups C, D
	Class II Division 1 Groups F, G

Surface temperature

The T-code identifies the maximum absolute motor surface temperature that develops under all operating conditions. Surface temperature of motors will not exceed the following UL and CSA maximum values under fault conditions.

Maximum surface temperature of motor		
T-Code	°C	°F
T4	+135	+275

Labeling on the motor:

Specialty Motor for Hazardous Locations

Only use with Rexroth HCS,HDD,HDS,HMD,HMS or DKCXX.3

Op Temp T4

Instruction and Duty Cycle: See Project Manual

5 Identification

5.1 Type plate

The type plate is provided for identification of the motor and contains all significant electric data, serial number, manufacturing date, mark of conformity, manufacturer information and the classification according to ANSI.

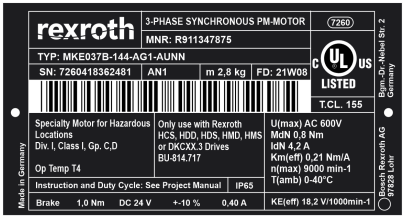


Fig. 1: MKE Type plate (example)

Remark: Before installing the motor, make sure that it is marked accordingly and has a sufficiently high protection class for your application.

Table 4: Type plate specification MKE

Symbol	Meaning
3-PHASE SYNCHRONOUS PM-MOTOR	Type of machine / product
MNR	Material number (Rexroth product)
TYPE	Type designation
SN	Serial number
AN1	Revision index
m	Mass
FD	Manufacturing date
T.CL.	Thermal class
U(max)	Maximum voltage UL
M(0), *Md/N*	Standstill torque - 60K
I(0), *Id/N*	Standstill current - 60K
Km(eff)	Torque constant
n(max)	Maximum speed
T(amb)	Ambient temperature during operation
KE(eff)	R.m.s. voltage constant
Op Temp T4	Maximum surface temperature
BU-814.717	UL serial number
Brake	Holding brake data (optional)
IP65	Degree of protection IPxx
Manufacturer information	Made in Germany / Bosch Rexroth AG, 97816 Lohr Bgm.-Dr.-Nebel Str. 2 Germany

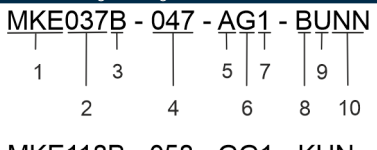
Table 5: Meaning of marks of conformity

Certification mark	Meaning
c UL us LISTED	The UL Listed Mark identifies products tested by Underwriters' Laboratories (UL) to nationally recognized safety standards.

5.2 Type codes

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

Type codes, meaning of the digits



1	Product
2	Frame size
3	Frame length
4	Winding
5	Encoder
6	Shaft
7	Holding brake
8	Electrical connection
9	Housing design
10	Other designs (MKE037, -047, 098) / cable gland (MKE118)

6 About this product

6.1 Safety instructions on the product

Please note the safety and prohibitive sign on the motor. The sign significance is explained in the following.

Information / meaning


CAUTION!
Risk of injuries due to hot surfaces.

Do not touch! Allow to cool down before maintenance work.

Hot surfaces with temperatures over 60 °C may cause burns

Let the motors cool down before working on the motors or in close proximity to the motors. The thermal time constant stated in the technical data is a measure for the cooling time. Cooling down can require up to 140 minutes.

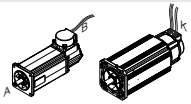
- Wear safety gloves.
- Do not work on hot surfaces.

Motor damage due to strikes onto the motor shaft

Do not strike the shaft end and do not exceed the allowed axial and radial forces of the motor.

6.2 Features and functions

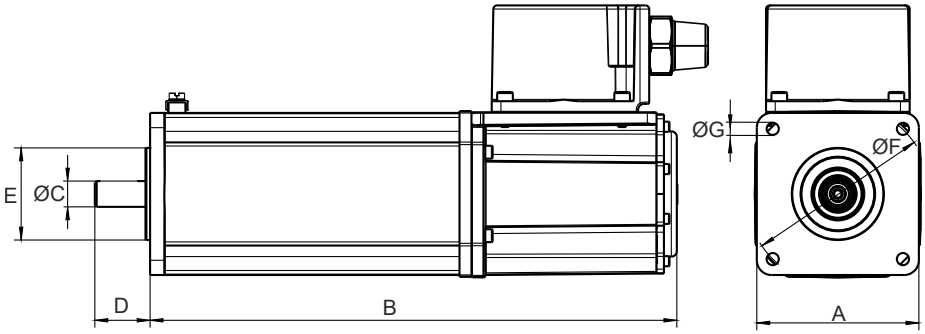
6.2.1 Basic data

Product	3~ PM motor
Type	MKE
Ambient temperature during operation	0 ... 40 °C (without de-rating)
Type of protection	IP65 with shaft sealing ring (EN 60529:1991 + A1:2000 + A2:2013)
Cooling mode	IC410, Self-cooling (EN 60034-6:1993)
Motor design	IM B5 (EN 60034-7:1993 + A1:2001)
Coating	Varnish RAL 9005
Flange	similar to DIN 42948:1965-11
Shaft end	Cylindrical (DIN 748-3), centering hole with thread "DS" (DIN 332-2:1983-052), Optional with keyway (full-key balancing)
Concentricity, run-out, alignment	Standard tolerance N (DIN 42955:1981-12)
Oscillating quantity level	Level A (EN IEC 60034-14:2018) up to rated speed
Installation altitude	0 ... 1000 m above MSL (without derating)
Sound pressure level	MKE037 ... MKE118: < 75 dB(A) +3 dB(A)
Thermal class	155 (F) (EN 60034-1:2010 + Cor.:2010)
Encoder system	A (optically, Singleturn Hiperface, 128 signal periods) B (optical, Singleturn EnDat 2.1, 2,048 signal periods) C (optically, Multiturn Hiperface, 128 signal periods) D (optical, Multiturn Hiperface, 2,048 signal periods)
Electrical connection	Terminal box
Holding brake (option)	Electrically released U_N 24V DC (±10%)
Motor ends, position of the electrical connection	 A: A side (Drive End **DE**) B: B side (Non Drive End **NDE**) K: Terminal box US standard (single wires cast)

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

6.2.2 Mechanical interface

Dimensions (flange)



Type	A ☐ Flange [mm]	B Length [mm]	C Shaft Ø [mm]	D Shaft length [mm]	E Centering collar [mm]	F Hole circle [mm]	G Mounting holes [mm]
MKE037	60	283 +5	9	20	40	70	4.5
MKE047	88	287 +5	14	30	50	100	6.6
MKE098	144	383 +5	24	50	110	165	11
MKE118B	194	489 +5	32	60	130	215	14
MKE118D	194	662 +5	32	60	130	215	14

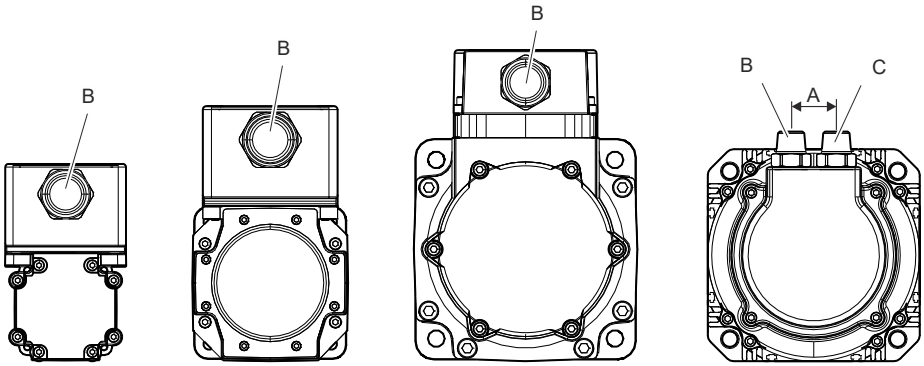
Use the following screws and washers for flange and foot assembly.

Table 6: Tightening torque of mounting screws

Screw [1]	M4	M6	M8	M10	M12	M16
Mounting holes ⌀ [mm]	4.5	6.6	9	11 ... 12	14	18
Tightening torque M_A[Nm] at μ_K= 0.12	3.0	10.1	24.6	48	84	206
Washer	-	-	yes	yes	yes	yes

[1] Screws according toEN ISO 4762:2004 or EN ISO 4014:2011. Fastening class 8.8. The screw lengths depends on material and installation situation. The specified tightening torque must be ensured.

Dimensions KLE connection thread



Type	A [mm]	B	C
MKE037	–	NPT 3/4´´	–
MKE047	–	NPT 3/4´´	–
MKE098	–	NPT 3/4´´	–
MKE118	41	NPT 3/4´´	NPT 3/4´´

6.2.3 Thermal motor protection

The motor temperature is monitored by two systems that are operated independently of each other. The mounted **temperature sensor** and the drive-internal **temperature model** ensure the best protection of motors against thermal overload.

MKE motors are protected against impermissible heating by a PTC drilling integrated in the motor winding.

A series circuit of three PTC thermistors (one PTC resistor per string) is installed in each motor. Triggering devices or control devices monitor the resistance to a maximum value. Voltage disconnection occurs when only one PTC is heated up to nominal tripping temperature (130 °C±5 °C) by the winding.

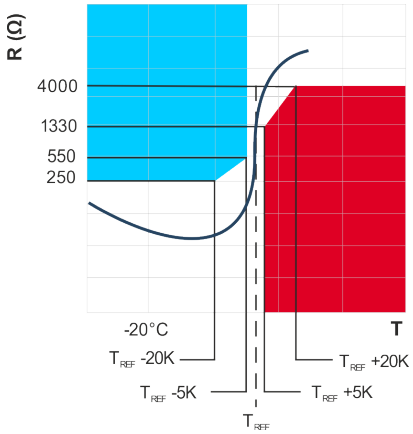


Fig. 2: Temperature-resistance-diagram according to EN 60034-11:2004, DIN 44082:1985-06 Thermistors; PTC for thermal machine protection; climate category HFF

Temperature range	Resistance	Measuring voltage [V_{DC}]
-20 °C to T_{REF} -20K	20 Ω to 250 Ω	≤2.5 V
Temperature range 90 °C - 160 °C		
T_{REF} -5K	≤550 Ω	≤2.5 V
T_{REF} +5K	≤1330 Ω	≤2.5 V
T_{REF} +15K	≤4,000 Ω	≤7.5 V pulsed

The resistance rises sharply in the range of the nominal response temperature. This change can be made via an electronical evaluation within the drive controller.

Safe disconnection of the load circuit must be ensured.

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

- Motor-warning temperature (120 °C)
- Motor-disconnection temperature (130 °C)

The temperature signal is transmitted via the motor interface -X2 (T1, T2).

Monitoring for a maximum value of the resistance ensures that any cable breakage that may occur is detected as a fault.

6.2.4 Cooling mode

Self-cooling (IC410)

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

The specified nominal data is reached at ambient temperatures of 0 ... 40 °C. Unhindered vertical convection has to be ensured by a sufficient distance of 100 mm to adjacent components. The allowed limit temperatures must be kept in the case of deviating minimum distances.

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

6.2.5 Encoder

Table 7: MKE - Technical data of encoder

Designation	Symbol	Unit	Encoder			
			A	B	C	D
Protocol			Hiperface	EnDat 2.1	Hiperface	EnDat 2.1
Encoder design			Singleturn absolute	Singleturn absolute	Multiturn absolute	Multiturn absolute
Distinguishable rotations			1	1	4,096	4,096
Encoder resolution			12 bit	13 bit	12 bit	13 bit
Number of impulse			128	2,048	128	2,048
System accuracy		"	± 120	± 20	±120	±20
Incremental signals			1Vss			
Max. current consumption	$I_{Encoder}$	mA	60	150	60	250
Supply voltage	$VCC_{Encoder}$	V	7 ... 12	3.6 ... 14	7 ... 12	3.6 ... 14

Optical encoder Singleturn option A, B

The encoders allow an absolute, indirect position recording within **one** mechanical rotation. The encoders replace additional separate incremental encoders on the motor.

Remark: After a voltage drop or after the first POWER ON, the axis must always be moved to its reference point first.
Exception: Applications where the maximum travel is within one mechanical revolution of the motor.

Optical encoder Multiturn absolute option C, D

The encoders enable absolute, indirect position sensing within **4,096** mechanical revolutions. The encoders replace a separate absolute value encoder at the motor. The absolute axis position at this encoder variant is retained by the battery buffering.

6.2.6 Degree of protection

The protection type according to EN 60529:1991 + A1:2000 + A2:2013 is determined by the abbreviation IP (International Protection) and two code numbers for the degree of protection. The first reference number stands for the degree of protection against contact and ingress of foreign bodies, the second one stands for the degree of protection against ingress of water.

Standard motors (specification according to type plate)

- **IP65** with shaft sealing ring

6.2.7 Output shaft, balancing and extension elements

Shaft end

Table 8: Options according to type code

Shaft	Type
Smooth	G
Keyway, with shaft sealing ring	P

Smooth shaft

Cylindrical shaft end according to DIN 748-3, with frontal centering hole with "DS" thread according to DIN 332-2:1983-05.

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

Shaft with keyway

Cylindrical shaft end according to DIN 748-3 with frontal centering hole with "DS" thread according to DIN 332-2:1983-05 and keyway.

The keyway design allows form-locking transmission of torques with constant direction and low requirements on the shaft-hub connection.

The machine elements to be driven have to be secured in axial direction via the centering hole.

Table 9: Keys and centering hole for MKE motors

Type	KeyDIN 6885-1:2021-11	Centering holeDIN 332-2:1983-05
MKE037	3×3×16	DS M3
MKE047	5×5×20	DS M5
MKE098	8×8×40	DS M8
MKE118	10×8×45	DS M10

Remark: Keys are not included in the scope of delivery.

We recommend regular visual inspections on shaft sealing rings. Depending on operating conditions, signs of wear may appear after 5,000 operating hours. If necessary, replace the shaft sealing rings. **Repairs must be carried out by Rexroth Service.**

Balancing

MKE motors are balanced with the “complete key”.

Attachment of drive elements

Observe the notes about mounting drive elements.

Explosion protection

When mounting drive elements, check their suitability and keep the explosion protection directives during operation. Selecting of all mounting components underlies the sole responsibility of the plant manufacturer or operator.

⚠ WARNING

Explosion hazard and danger to life, or substantial property damage!

The totality of a motor-machine combination must comply with the specifications for explosion protection.

Please observe the notes within the product documentation of the used components when projecting and during operation.

Gearboxes with approvals for use in hazardous areas for the attachment to MKE motors are delivered by Rexroth neither separately nor mounted on motors.

The mounting of gearbox on MKE motors, including selection and certification underlies the sole responsibility of the plant manufacturer or operator.

⚠ CAUTION

Ingressing fluid may damage the motor!

Fluids (e.g., cooling lubricants, gear oil, etc.) may not be present at the output shaft.

When attaching gearboxes, only use gearboxes with a closed (oil-tight) lubrication system. Gearbox oil should not be in permanent contact with the shaft sealing ring of the motors.

Overdetermined bearing

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

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

Couplings

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

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

Bevel gear pinion or helical drive pinion

Due to thermal expansion, the DE side of the drive shaft can be displaced by up to 0.6 mm in relation to the motor housing. If helical drive pinions or bevel gear pinions directly attached to the output shaft are used, this change in the lengths will lead to

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

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

6.2.8 Holding brake

⚠ WARNING

Danger to life or high damage to property, ignition and explosion hazard due to inappropriate use!

In order to prevent danger due to ignitable gases or explosive dust-air mixtures in the vicinity of the motors, the user must make sure that the holding brake does not present a source of ignition in the normal service. For this reason, the holding brake must never be used outside the design parameters and operating conditions!

- Any commissioning and maintenance works must only be carried out in non-explosive environments.
- The brakes must be designed so as to fulfill their function in normal service, if they are installed and used as intended.
- The holding brake integrated in the motor must only be used at standstill and never as EMERGENCY STOP brake to stop the motor, see P-0-0119, Optimal shutdown(IndraDrive firmware - functional description).
- The holding brake must not be used to brake or stop the motor or coupled loads from higher speeds or velocities.

MKE motors can optionally be provided with permanent magnet brakes. The backlash-free holding brakes are operated according to the “electrically-released” principle (closed-circuit principle) and open upon applying the switching voltage.

- Number of operating cycles ≥ 5,000,000
- The holding brakes with emergency stop function are intended to secure motor shafts at standstill (normal operation). **The holding brakes are no operation brakes to decelerate motors in operation from speed**.
- Emergency stop situations are not a normal operation.

- In case of an emergency stop or voltage drop, the brake operation is only allowed to a limited extend. Up to 500 breaking cycles from speed 3000 1/min can be performed, whereas the maximum switched energy per emergency stop of the brake must not be exceeded. The number of brake applications per hour is 20, whereas a uniform scheduling is a precondition. Specifications about the max. switched energy per emergency stop on request.
- Idle time after an emergency stop before restarting ≥ 3 minutes.

⚠ CAUTION

Malfunctions due to wear

Impermissibly high wear due to breaking from speed by exceeding the specified emergency stop properties.

Ensure the functionality of the brake in normal operation, due to voltage control, current monitoring, cyclic control of the brake holding torque, for example.

The rated voltage to apply the brakes is 24 V DC ±10%.

The voltage supply of the holding brake has to be designed so as to guarantee under the worst installation and operation conditions that a sufficient voltage **24 V DC ±10%** is available at the motor in order to release the holding brake.

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

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

Fig. 3: Voltage drop of brake supply

ΔU Voltage drop [V]
ρ_{Cu} Specific resistance of copper [Ω*mm²/m]
l Cable length [m]
q Conductor cross-section [mm²]
I_N Rated current [A]

⚠ CAUTION

Malfunction in case of exceeded tolerance of the rated voltage (switching voltage)

For safe switching of the holding brake, a rated voltage of **24 V DC ±10%** is required at the motor.

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

The control voltage can be reduced using the energy saving function after safely releasing the brake, see ➦ Chapter “Energy saving function for holding brakes” on page 22.

The holding brake in the motor is intended for direct connection to the Bosch Rexroth controller.

The protective circuit for switching holding brakes (inductive load) is not integrated in the MKE motors; in Bosch Rexroth drive systems it is integrated in the control units.

Technical data holding brakes

Table 10: Holding brake data (optional)

Type	Holding torque	Rated voltage 1)	Rated current	Maximum connection time	Maximum disconnection time
	M_4 [Nm]	U_N [V]	I_N [A]	t_1 [ms]	t_2 [ms]
MKE037B-__-__1-___	1.00	24	0.40	3	4
MKE047B-__-__1-___	2.20	24	0.34	14	28
MKE098B-__-__1-___	11.00	24	0.71	13	30
MKE118B-__-__1-__	32.00	24	0.93	15	115
MKE118D-__-__3-__	70.00	24	1.29	53	97
1) Tolerance ± 10%					

Energy saving function for holding brakes

Decrease brake voltage

The control voltage of the holding brake in MKE holding brakes can be reduced after executing the switching operation “Open brake” by using suitable control modules (e.g. IndraDrive brake control module HAT02.1-003). By decreasing the control voltage, energy can be saved of up to 50% and the self-heating of the motor can be reduced.

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

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

  Decreasing the controlled voltage or PWM cycle frequency of the control voltage ≥ 4 kHz
- Ensure the functionality of the holding brake.

ℹ Remark: Refer to the instructions in the control module documentation.
Refer to the notes for dimensioning of the cable length and cable cross-section of brake cables.

Safety and personal protection

The permanent magnet brakes of the MKE motors are not safety brakes, since a holding torque reduction can occur due to uninfluenceable disturbance factors. Especially for use in vertical axes.

⚠ WARNING

Grievous bodily harm due to dangerous movements from falling or dropping axes!

Secure vertical axes against dropping or sinking after switching off by e.g.:

- Mechanical locking of the vertical axis
- External brake, arrestor, clamping device.
- Weight compensation of the axes

The holding brake itself is not suitable for personal protection. Ensure protection of persons by superordinate fail-safe measures, like block danger zones via safety fences.

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

- EN ISO 13849-1:2015Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015), EN ISO 13849-2:2012

Safety of machinery. Safety-related parts of control systems. General principles for design

- Information sheet no. 005 “Gravity-loaded axes (vertical axes)” published by: DGUV Fachbereich Holz und Metall (German Employer's Liability Insurance Association Wood and Metal)

Determine the complete safety requirements valid for the specific case of application and observe them during plant design. Comply with all applicable national regulations!

Functionality test

⚠ WARNING

Danger of explosion at maintenance work and check operation

Do maintenance work only outside of hazardous areas.

Ensure that no hazardous gas or dust atmosphere exists during grind in procedures.

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

The braking effect can be reduced by:

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

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

Manually check holding torque (M4)

1. De-energize the motor and ensure it cannot be restarted.
2. Measure the transferable holding torque (M4) of the holding brake with a torque wrench.

Check holding torque (M4) using the software function

For Bosch Rexroth drive controller

- Start the P-0-0541, C2100 Command Holding system check in drive controller. The efficiency of the holding brake and the opened state are checked by starting the routine.
  - ➡ If the holding torque (M4) **is not achieved**, the resurfacing routine can be used to reconstitute the holding torque. If you have any questions about grind in parameters, contact Bosch Rexroth service.

6.2.9 Vibration behavior

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

6.2.10 Bearing

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

Bearing service life

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

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

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

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

- Horizontal installation
- Low vibration and impact loads
- No oscillating bearing movement < 180°
- Mean speed according to the following table

Table 11: Mean speed - basis of calculated grease service life

Type	Mean speed
MKE037	≤ 3,500 1/min
MKE047	≤ 3,500 1/min
MKE098	≤ 3,000 1/min
MKE118	≤ 2,000 1/min

The following standard values apply under the specified preconditions:

L_{10h} = 30.000 h, in case of utilization after S1-60K and max. load factor 95% during the runtime.

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

Explanation of radial and axial force

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

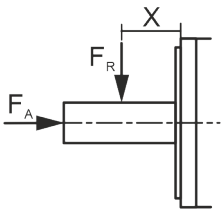


Fig. 4: Point of action of radial force F_R and axial force F_A

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

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

For radial force diagrams, refer to the technical data

6.2.11 Frame size, installation type

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

Code I / Code II (EN 60034-7:1993 + A1:2001)		
IM B5 / IM 3001		Flange attachment on the drive side of the flange
IM V1 / IM 3011		Flange attachment on the drive side of the flange, drive side facing down
IM V3 / IM 3031		Flange attachment on the drive side of the flange, drive side facing up

Avoid liquid at the drive shaft or the shaft sealing ring in case of vertical installation according to IM V3.

6.2.12 Coating

One-layer standard varnish (1K), waterbased, in condutive form, RAL9005 jet black, nominal thickness 40 µm

⚠ WARNING

Danger of explosion due to improper change of the surface characteristics.

An additional varnish on motors for hazardous areas is not allowed in order not to negatively influence the surface characteristics (like e.g. insulation resistance, electrostatic charging).

6.2.13 Noise emission

The typical sound pressure level Lp(A) is specified for the speed range 0 rpm up to the rated speed in the chapter “Technical data”. The installation situation affects the noise emission.

7 Transport and storage

7.1 Storage

Store the motors in their original packaging in a dry, dust-free, vibration-free and light-protected place without direct solar radiation. Please observe classes 1K21, 1B1, 1C1, 1S10, 1M11 specified for storage according to EN IEC 60721-3-1:2018.

Please observe the following classification limitations:

Table 12: Classification limitations according to EN IEC 60721-3-1:2018

Bearing	
Ambient temperature	-25 … +55 °C
Relative air humidity	5 … 75 %
Absolute air humidity	1 … 29 g/m³
Direct solar radiation	Not permitted

Bearing	
Shock load	➥ Chapter 7.3 “Shock load during transport und storage ” on page 26

Do not remove factory-fitted transport protection devices such as dust protection, shaft protection, blind screw fittings when storing the motors. Keep the transport protection devices for later use.

NOTICE

Damage due to moisture and humidity!

- Protect the products from dampness and corrosion.
- Store them only in rainproof and dry rooms.

Additional measures have to taken upon commissioning to ensure smooth functioning – irrespective of the storage time which may be longer than the warranty period of our products. Warranty extension is not a consequence.

Table 13: Measures before commissioning motors that have been stored over a prolonged period of time

Storage time / months			Measures for commissioning
> 1	> 12	> 60	
●	●	●	Visual inspection of all parts to be damage-free
●	●	●	Resurface the holding brake
	●	●	Check the electric contacts to verify that they are free from corrosion
	●	●	Let the motor run in without load for one hour at 800 … 1000 rpm.
	●	●	Measure insulation resistance. Dry the winding at a value of < 1kOhm per volt rated voltage.

Storage time / months			Measures for commissioning
> 1	> 12	> 60	
		●	Replace bearings
		●	Replace encoder

7.2 Transport

The motors must be transported in their original package taking classes 2K11, 2B1, 2C1, 2S5, 2M4 specified acc. to EN IEC 60721-3-2:2018.

Please observe the following classification limitations:

Table 14: Classification limitations (EN IEC 60721-3-2:2018)

Transport	
Ambient temperature	-25 ... +70 °C
Relative humidity	5 ... 75 %
Shock load	➥ Chapter 7.3 “Shock load during transport und storage ” on page 26

7.2.1 Instructions on machine transport

Do not remove factory-fitted transport protection devices such as dust protection, shaft protection, blind screw fittings until the motors are used. Keep the transport protection devices for later use.

NOTICE

Never touch the connection points of electrostatic sensitive devices!

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

⚠ WARNING

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

– Only use hoisting gear suited for the weight of the motors. Use lifting sling belts or lifting eye bolts. Secure the lifting eye bolts before use.
  Never walk under hanging loads.
– Never lift the motor on the shaft.
– Use suitable protective equipment and protective clothing during transport, and wear safety shoes.

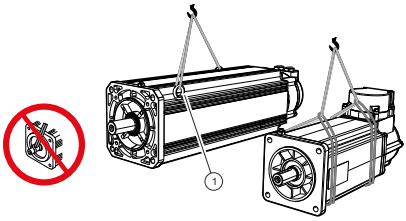


Fig. 5: Lifting and transporting motors

- Before transporting the motor, determine the weight of the motor. For more details about motor weight, please refer to the type plate or the project planning manual (Technical data).
- Adjust the carrying capacity of the lifting device to the motor weight.
- If provided by the manufacturer, all lifting eye bolts must be used and tightened before use.
- Avoid increased transport vibrations.
- Remove any existing transport locks prior to commissioning and keep them.

7.3 Shock load during transport und storage

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

Table 15: Permissible shock load for MKE motors

Frame size	Maximum allowed shock load (11 ms)	
	Axial	Radial
MKE037	10 m/s²	1000 m/s²
MKE047	10 m/s²	1000 m/s²
MKE098	10 m/s²	300 m/s²
MKE118	10 m/s²	200 m/s²

8 Assembly

8.1 Flange assembly

NOTICE

Motor damage due to ingress of liquids!

Liquid which exists over a longer period on the shaft sealing ring of the output shaft can ingress into the motor and cause damage.

– Ensure that liquid cannot be present at the output shaft.
– Do not mount any open gearboxes (gearboxes that are not hermetically sealed).

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

- If coupling is direct, ensure that the support is plane and the orientation is precise.
- Avoid pinching or jamming the centering collar on the motor side.
- Avoid damaging the receptacle fit on the plant side.
- Use screws and washers for flange assembly according to ➥ Chapter 6.2.2 “Mechanical interface” on page 15.

8.2 Assemble transmission elements

NOTICE

Motor damage due to strikes onto the motor shaft

Do not strike the shaft end and do not exceed the allowed axial and radial forces of the motor.

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

- Avoid inadmissible belt tensions. Please consider the allowed radial and axial forces in the project planning manuals.
- The balancing state of transmission elements must comply with the full-key balancing of the motors.

Fitting

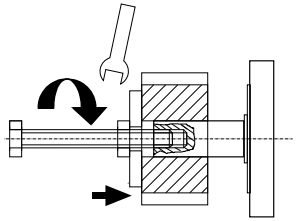


Fig. 6: Fitting the transmission element

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

8.3 Electrical connection

8.3.1 Electrical connection general notes

⚠ WARNING

Risk of explosion due to improper handling during motor connection!

Make sure that the motor is only connected in de-energized state and a non-explosive atmosphere.

Before working on the system, always use a suitable measuring device (e.g. multimeter) to check whether any parts of the system are still under residual voltage (e.g. caused by residual energies of capacitors in filters and drive units etc.) their discharge times are to be waited for.

The connection between the protective conductor terminal and the operating ground must be made before any other connections.

The connection or terminal points to or on the control unit must be located outside the potentially explosive atmosphere or must be approved for use in potentially explosive atmospheres.

⚠ WARNING

Danger! Electric voltage! Operations in the vicinity of live parts are extremely dangerous.

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

⚠ WARNING

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

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

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

Never connect or disconnect plug connectors under load!

NOTICE

Never touch the connection points of electrostatic sensitive devices!

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

Power and encoder connection

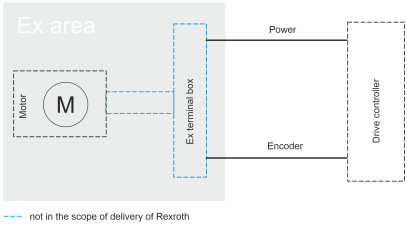


Fig.:

An additional connection of a protective or equipotential bonding conductor is mandatory for Ex motors. MKEmust be grounded via the additional connection part (protective earth terminal on the motor flange). Ground terminal cross section see ➦ Chapter 8.3.5 “Ground connection” on page 32.

Connection thermo controller

The connection of the PTC resistors, for the motor temperature evaluation, is shown in the respective connection diagrams of the drive control units.

⚠ WARNING

Risk of explosion due to impermissible temperature increase in case of faulty temperature evaluation!

The connections [1] and [2] of the PTC resistor (triplet PTC thermistor) must be connected to the temperature monitoring of the drive controller!

The maximum permissible surface temperature of the MKE motors is ≤ 135 °C, which corresponds to temperature class T4. The triplet thermistors installed in the MKE motors, in conjunction with the evaluation circuits of the drive controllers, ensure reliable and safe overtemperature shutdown.

8.3.2 Wiring diagram

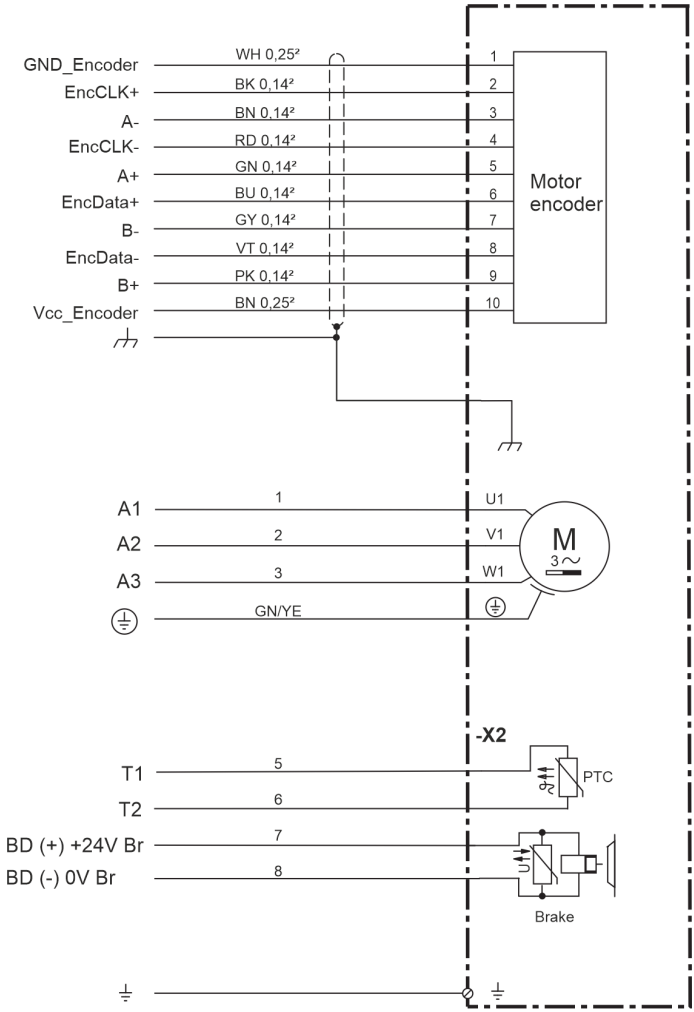


Fig. 7: Connection MKE US with EnDat2.1

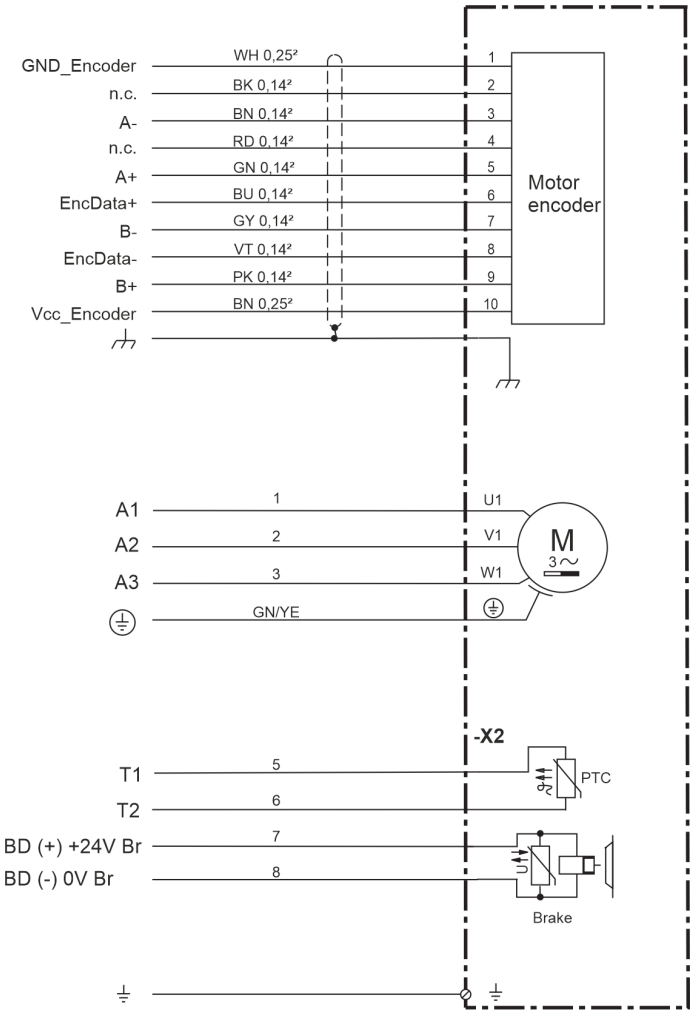


Fig. 8: Connection MKE US with Hiperface

8.3.3 Electrical connection motor types MKE037...098

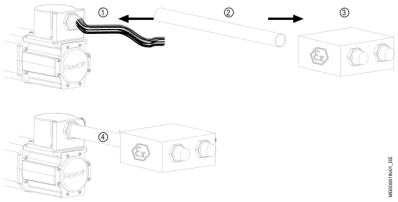


Fig. 9: Electrical connection MKE037...098 UL
(1) MKE with connection cables (single wires)
(2) Steel pipe NPT ¾ inch (not included in the scope of delivery)
(3) ATEX terminal box (not included in the scope of delivery)
(4) Connection cables guided in steel pipe

Remark: The system/machine manufacturer is responsible for compliance with the applicable standards and regulations.
Apply shielding over a large area in the Ex terminal box.

After mechanical assembly, connect the single wires in the Ex terminal box according to the wiring diagram.

8.3.4 Electrical connection motor types MKE118

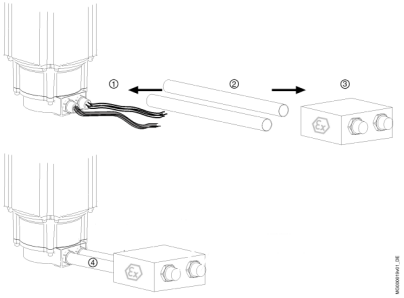


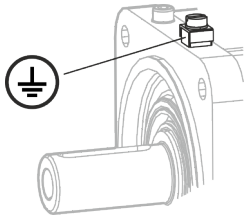
Fig. 10: Electrical connection MKE118 UL
(1) MKE with connection cables (single wires)
(2) Steel pipe NPT ¾ inch (not included in the scope of delivery)
(3) ATEX terminal box (not included in the scope of delivery)
(4) Connection cables guided in steel pipe

Remark: The system/machine manufacturer is responsible for compliance with the applicable standards and regulations.
Apply shielding over a large area in the Ex terminal box.

After mechanical assembly, connect the single wires in the Ex terminal box according to the wiring diagram.

8.3.5 Ground connection

Motors for hazardous areas must be grounded via a separate ground conductor and a grounding conductor within the motor power cable. An additional connection clamp is provided on the motor flange to connect the grounding conductor.



Ground connection	M5 screw
Nominal cross-section	4 mm²
Clamping range	4 mm² (fine-wired); 6 mm² (single stranded)
Tightening torque	maximum 2 Nm

9 Commissioning and operation

9.1 Safety

⚠ WARNING

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

– Life parts are dangerous.
  Do not open any covers or flange sockets during operation.
  Never connect or disconnect plug connectors under load!

⚠ WARNING

Risk of injury due to rotating motor shaft!

– Do not remove any covers, machine parts or protection devices during operation.
  Do not enter the range of movement of the machine. Avoid unintended access for persons, due to
  – Safety fences, safety screens or protective covers.
  – Optical sensors

⚠ CAUTION

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

– Do not touch hot motor surfaces.
  Install protection against contact, if necessary.
  Make sure that no temperature-sensitive components (cables, electronic components, ...) touch hot surfaces.

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

9.2 Ambient conditions during operation

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

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

Table 16: Ambient conditions

Operation	
Installation altitude	0 ... 1,000 m above sea level
Ambient temperature	0 ... +40 °C
Relative humidity	5 ... 95 %
Absolute humidity	1 ... 29 g/m³

9.2.1 Vibration load during operation

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

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

The following limit values apply for MKE motors according toEN 60068-2-6:2008:

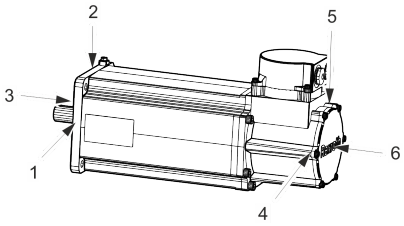


Fig. 11: Vibration load on measuring points

Table 17: Allowed vibration load MKE motors.

Direction	Measuring point	Limit value (10-2000 Hz)	
		Encoder	
		A, C	B, D
Radial	1, 2 (radial motor flange)	30 m/s²	10 m/s²
	4, 5 (radial, bearing shield)	50 m/s²	50 m/s²
Axial	3 (axial motor flange)	10 m/s²	10 m/s²
	6 (axial bearing shield)	25 m/s²	25 m/s²

The specified values must not be exceeded.

9.3 Commissioning

⚠ CAUTION

Explosion hazard!

Do not install the amplifier (drive controller) in a hazardous area.

⚠ CAUTION

Explosion hazard!

Do not operate the motor in potentially explosive atmospheres if any mounting screws or covers are removed. Do not remove any screws or covers while the motor is in a potentially explosive area.

⚠ CAUTION

Explosion hazard!

Do not operate the motor outside the parameters shown in the motor performance curves

Commissioning in potentially explosive atmospheres is prohibited until it has been ascertained that the overall system corresponds to the demands and certification conditions for explosion protection.

MKE motors can only be commissioned with other components (drive controller, control unit).

Prior to commissioning

Make sure you have the documentations of all used products ready.

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

- Ensure that the motor and all participating components of the drive are undamaged.
- Storage time of the motor. Depending on the storage time, take measures to ensure safe operation. Run in bearings, resurface the holding brake, ... See table .
- Make sure that all mechanical and electrical connections (temperature sensor, potential equalization conductor, ...) are properly connected and secured against loosening.
- Ensure that a holding brake voltage of 24 V ±10% is applied to the motor. If necessary, adjust the voltage.
- Check the proper function of the holding brake.

- **Do not** do the grinding procedure in hazardous ambience.
- Ensure that keys are protected against ejection.

Enable the safety devices and monitoring systems of the machine.

Commissioning

Once all requirements are met, proceed as follows:

- Commission the drive system according to the instructions of the corresponding product documentation. The respective information can be found in the functional description of the drive controllers.
- Record all measures taken in the commissioning log.

Observe the general and technology-dependend safety instructions in this documentation.

For commissioning of the controllers and control systems, additional steps may be required. The inspection of the functioning and performance of the systems is not object of these Operating Instructions; instead, it is carried out within the framework of the commissioning of the machine as a whole. Comply with the information and instructions of the machine manufacturer.

9.4 Operation

⚠ CAUTION

Explosion hazard!

Do not install the amplifier (drive controller) in a hazardous area.

⚠ CAUTION

Explosion hazard!

Do not operate the motor in potentially explosive atmospheres if any mounting screws or covers are removed. Do not remove any screws or covers while the motor is in a potentially explosive area.

⚠ CAUTION

Explosion hazard!

Do not operate the motor outside the parameters shown in the motor performance curves

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

Checks during operation:

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

Decommission the drive when deviations from normal operation exist. For further procedure refer to ➥ Chapter 13 “Eliminate malfunction ” on page 40.

10 Maintenance

10.1 Cleaning and servicing

⚠ WARNING

Operations in the vicinity of live parts are extremely dangerous.

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

⚠ WARNING

Personal and material damage during maintenance work in operation!

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

⚠ CAUTION

Hot surfaces with temperatures over 60 °C may cause burns!

– Allow the motors to cool down prior to commencing work.
  Wear safety gloves.
  Do not work on hot surfaces.

Motors

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

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

Connection cables

⚠ WARNING

Electric shock due to contact with live parts!

– Change damaged connection cables and decommission the plant immediately.
  Do not repair any connection lines provisionally.

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

10.2 Service repair, maintenance and spare parts

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

MKE may only be repaired at certified Bosch Rexroth service branches. External service providers are not allowed to perform repairs on MKE, otherwise the product certification will expire.

The service lives of motor components, such as seals and bearings, may vary depending on the operating conditions, such as operation mode, speed, vibration and shock load, and frequent reverse mode. We recommend to change the bearing after 30,000 operating hours. Shorter replacement intervals may be necessary; cf. checks during operation . We recommend regular visual inspections on shaft sealing rings. Depending on operating conditions, signs of wear may appear after 5,000 operating hours. If necessary, replace the shaft sealing rings.

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

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

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

Preparing information

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

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

11 Disassembly and exchange

11.1 Tools required

NOTICE

Motor damage due to strikes onto the motor shaft

– Do not strike the shaft end and do not exceed the allowed axial and radial forces of the motor.

Use suitable tools when disassembling transmission elements.

Pulling off

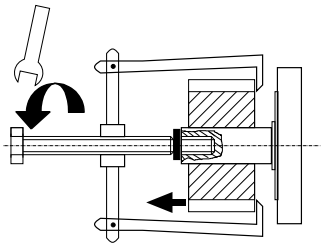


Fig. 12: Remove transmission element

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

11.2 Replace the motor

⚠ WARNING

Electric shock due to live parts with more than 50 V!

Replacement may only be performed by personnel trained and qualified to work on or with electrical equipment.

ℹ Remark: The motor must be replaced by a motor of identical type. This is the only way to ensure that all adjusted parameters can remain unchanged.

1. If necessary, note the previous absolute value
2. Open the main switch
3. Make sure the main switch cannot be switched back on
4. Disconnect electrical connections

   ℹ Remark: Protect electrical connections from pollution (allowed pollution severty “2” according to EN 50178:1997).
5. Replace the motor

   ℹ Remark: Observe the machine manufacturer's instructions when exchanging the motor mechanically.
6. Rebuilt electrical connections
7. Re-establish the dimensional reference

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

11.3 Preparing storage

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

12 Environmental protection and disposal

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

Recycling

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

Basic components

Basically, our motors consist of the following components:

- Steel, stainless steel, aluminum, copper, brass
- Plastic parts, insulation and composite material
- Electronic components
- Permanent magnets

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

Magnets

⚠ WARNING

Danger due to permanent magnets!

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

Remark: The permanent magnets of the rotor or secondary part must be demagnetized before disposal to avoid injuries or damage.
The demagnetization is reached via special thermal treatment. The handling duration is influenced by the rotor frame size. The rotor or the secondary part has to remain in the oven for a minimum of 30 minutes, starting at the time, the magnetic surface has reached 300 °C. If the magnets are surrounded by a bandage or a cover plate, it is recommended to remove it before heating in the oven to expose the magnets.

If demagnetization is successful, the magnets can be separated from the rotor or secondary part after cooling without applying force.

Packaging

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

Batteries and accumulators

The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin. End users in the EU are legally bound to return used batteries and accumula-

tors. Outside the scope of the EU Directive 2006/66/EC, the applicable regulations must be followed. Batteries and accumulators can contain hazardous substances which can harm the environment or people's health when improperly stored or disposed of. The batteries or accumulators must be returned to the country-specific collection systems for proper disposal.

Disposal by the manufacturer

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

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

13 Eliminate malfunction

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

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

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

Fault description	Cause	Remedy
Running noise	Foreign bodies within the motor	Stop the motor; repair by manufacturer
	Bearing is damaged	Stop the motor; repair by manufacturer

Fault description	Cause	Remedy
High motor temperatures; motor temperature monitoring is activated	Operation outside the parameters	Reduce load and check the dimensioning
	Heat dissipation is impaired	Clean the motor

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

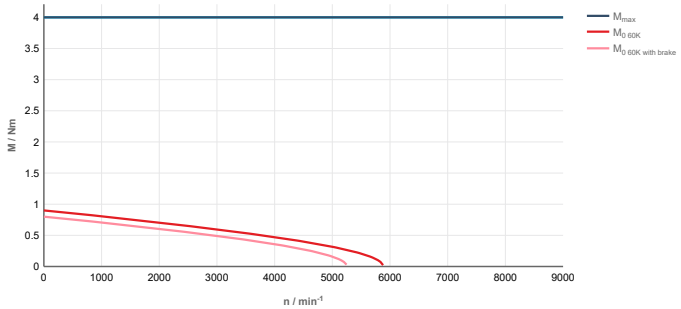
14 Technical data

14.1 MKE037B-144

Designation	Symbol	Unit	MKE037B-144-__0-___	MKE037B-144-__1-___
Continuous torque at standstill 60K [1]	M_{0_60}	Nm	0.9	0.8
Continuous current at standstill 60K	$I_{0\_60(eff)}$	A	3.3	3.0
Maximum torque [1]	M_{max}	Nm	4.0	
Maximum current	I_{max}	A	15.0	
Torque constant at 20 °C [1]	Km	Nm/A	0.30	
Voltage constant at 20 °C [1]	K_{EMK_1000}	V/1000 min^{-1}	18.2	
Winding resistance at 20 °C	R_{12}	ΩOhm	2.7	
Winding inductance	L_{12}	mH	3.7	
Leakage capacitance of the component	C_{ab}	nF	1.0	
Number of pole pairs	p		3	
Moment of inertia of the rotor [1] [2]	J_{rot}	kgm^2	0.00003	
Thermal time constant	T_{th}	min	15.0	
Maximum speed (electrical)	n_{max}	1/min	9,000	
Mass	m	kg	2.5	2.8
Sound pressure level	LP	dB[A]	61.8 (±3)	
Ambient temperature during operation	T_{um}	°C	0...40	
Degree of protection (IEC 60529)	-	-	IP65	
Thermal class (EN 60034-1)	T.CL.		155	
Holding brake				
Holding torque	M_4	Nm	0	1.00
Rated voltage [1]	U_N	V	0	24
Rated current	I_N	A	0	0.40
Maximum connection time	t_1	ms	0	3
Maximum disconnection time	t_2	ms	0	4
Moment of inertia of the holding brake [1] [2]	J_{br}	$kg*m^2$	0	0.0000070

1) For tolerance details refer to ➦ Chapter 14.10 “Tolerances” on page 50

2) For motors with holding brake, the moment of inertia of the holding brake must be added to the moment of inertia of the motors to determine the total moment of inertia.



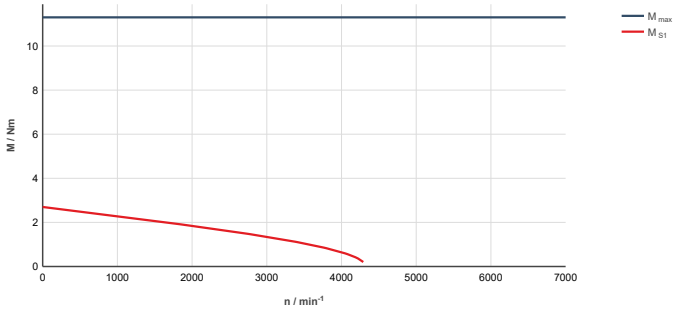
MKE037B-144-__-_-__, ctrlX DRIVE, controlled supply 3 x AC 400 ... 480 V

14.2 MKE047B-144

Designation	Symbol	Unit	MKE047B-144-_0-___	MKE047B-144-_1-___
Continuous torque at standstill 60K [1]	M_{0_60}	Nm	2.7	
Continuous current at standstill 60K	$I_{0\_60(eff)}$	A	5.0	
Maximum torque [1]	M_{max}	Nm	11.3	
Maximum current	I_{max}	A	22.6	
Torque constant at 20 °C [1]	Km	Nm/A	0.59	
Voltage constant at 20 °C [1]	K_{EMK_1000}	V/1000 min^{-1}	36.3	
Winding resistance at 20 °C	R_{12}	Ω (Ohm)	1.8	
Winding inductance	L_{12}	mH	5	
Leakage capacitance of the component	C_{ab}	nF	1.6	
Number of pole pairs	p		3	
Moment of inertia of the rotor [1] [2]	J_{rot}	kgm^2	0.00017	
Thermal time constant	T_{th}	min	30.0	
Maximum speed (electrical)	n_{max}	1/min	7,000	
Mass	m	kg	5.5	5.8
Sound pressure level	LP	dB[A]	63.0 (±3)	
Ambient temperature during operation	T_{um}	°C	0...40	
Degree of protection (EN 60034-5)	-	-	IP65	
Thermal class (EN 60034-1)	T.CL.		155	
Holding brake				
Holding torque	M_4	Nm	0	2.20
Rated voltage [1]	U_N	V	0	24
Rated current	I_N	A	0	0.34
Maximum connection time	t_1	ms	0	14
Maximum disconnection time	t_2	ms	0	28
Moment of inertia of the holding brake [1] [2]	J_{br}	$kg*m^2$	0	0.0000100

1) For tolerance details refer to ➥ Chapter 14.10 “Tolerances” on page 50

2) For motors with holding brake, the moment of inertia of the holding brake must be added to the moment of inertia of the motors to determine the total moment of inertia.



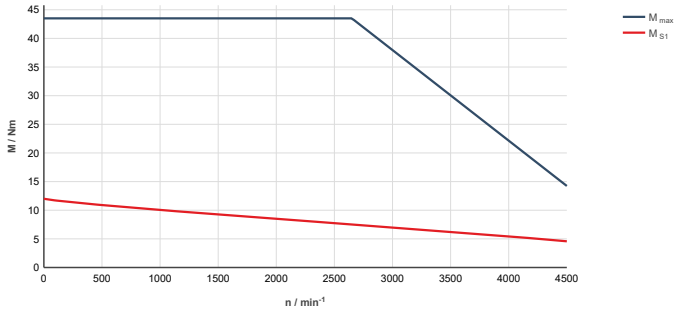
MKE047B-144-___-___, ctrlX DRIVE, controlled supply 3 x AC 400 ... 480 V

14.3 MKE098B-047

Designation	Symbol	Unit	MKE098B-047-__0-___	MKE098B-047-__1-___
Continuous torque at standstill 60K [1]	M_{0_60}	Nm	12.0	
Continuous current at standstill 60K	$I_{0\_60(eff)}$	A	9.8	
Maximum torque [1]	M_{max}	Nm	43.5	
Maximum current	I_{max}	A	44.3	
Torque constant at 20 °C [1]	Km	Nm/A	1.41	
Voltage constant at 20 °C [1]	K_{EMK_1000}	V/1000 min^{-1}	91.0	
Winding resistance at 20 °C	R_{12}	ΩOhm	1.2	
Winding inductance	L_{12}	mH	8.4	
Leakage capacitance of the component	C_{ab}	nF	6.7	
Number of pole pairs	p		4	
Moment of inertia of the rotor [1] [2]	J_{rot}	kgm^2	0.00430	
Thermal time constant	T_{th}	min	60.0	
Maximum speed (electrical)	n_{max}	1/min	4,500	
Mass	m	kg	18.0	19.1
Sound pressure level	LP	dB[A]	61.8 (±3)	
Ambient temperature during operation	T_{um}	°C	0...40	
Degree of protection (EN 60034-5)	-	-	IP65	
Thermal class (EN 60034-1)	T.CL.		155	
Holding brake				
Holding torque	M_4	Nm	0	11.00
Rated voltage [1]	U_N	V	0	24
Rated current	I_N	A	0	0.71
Maximum connection time	t_1	ms	0	13
Maximum disconnection time	t_2	ms	0	30
Moment of inertia of the holding brake [1] [2]	J_{br}	$kg*m^2$	0	0.0003600

1) For tolerance details refer to ➦ Chapter 14.10 “Tolerances” on page 50

2) For motors with holding brake, the moment of inertia of the holding brake must be added to the moment of inertia of the motors to determine the total moment of inertia.



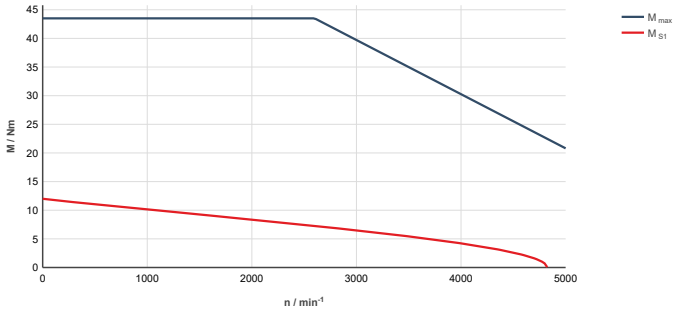
MKE098B-047-__-____, ctrlX DRIVE, controlled supply 3 x AC 400 ... 480 V

14.4 MKE098B-058

Designation	Symbol	Unit	MKE098B-058-_0-___	MKE098B-058-_1-___
Continuous torque at standstill 60K [1]	M_{0_60}	Nm	12.0	
Continuous current at standstill 60K	$I_{0\_60(eff)}$	A	12.4	12.4
Maximum torque [1]	M_{max}	Nm	43.5	
Maximum current	I_{max}	A	55.9	
Torque constant at 20 °C [1]	Km	Nm/A	1.09	
Voltage constant at 20 °C [1]	K_{EMK_1000}	V/1000 min^{-1}	70.0	
Winding resistance at 20 °C	R_{12}	ΩOhm	0.74	
Winding inductance	L_{12}	mH	5.8	
Leakage capacitance of the component	C_{ab}	nF	6.7	
Number of pole pairs	p		4	
Moment of inertia of the rotor [1] [2]	J_{rot}	kgm^2	0.00430	
Thermal time constant	T_{th}	min	60.0	
Maximum speed (electrical)	n_{max}	1/min	5,000	
Mass	m	kg	18.0	19.1
Sound pressure level	LP	dB[A]	61.8 (±3)	
Ambient temperature during operation	T_{um}	°C	0...40	
Degree of protection (EN 60034-5)	-	-	IP65	
Thermal class (EN 60034-1)	T.CL.		155	
Holding brake				
Holding torque	M_4	Nm	0	11.00
Rated voltage [1]	U_N	V	0	24
Rated current	I_N	A	0	0.71
Maximum connection time	t_1	ms	0	13
Maximum disconnection time	t_2	ms	0	30
Moment of inertia of the holding brake [1] [2]	J_{br}	$kg*m^2$	0	0.0003600

1) For tolerance details refer to ➥ Chapter 14.10 “Tolerances” on page 50

2) For motors with holding brake, the moment of inertia of the holding brake must be added to the moment of inertia of the motors to determine the total moment of inertia.



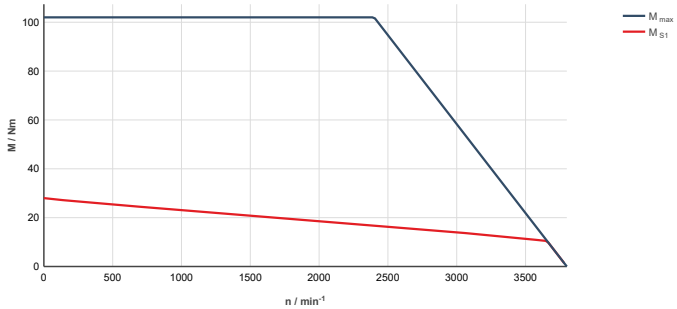
MKE098B-058-___-___, ctrlX DRIVE, controlled supply 3 x AC 400 ... 480 V

14.5 MKE118B-024

Designation	Symbol	Unit	MKE118B-024-__0-___	MKE118B-024-__1-___
Continuous torque at standstill 60K [1]	M_{0_60}	Nm	28.0	
Continuous current at standstill 60K	$I_{0\_60(eff)}$	A	15.3	
Maximum torque [1]	M_{max}	Nm	102.0	
Maximum current	I_{max}	A	69.1	
Torque constant at 20 °C [1]	Km	Nm/A	2.12	
Voltage constant at 20 °C [1]	K_{EMK_1000}	V/1000 min^{-1}	130.0	
Winding resistance at 20 °C	R_{12}	ΩOhm	0.58	
Winding inductance	L_{12}	mH	7.6	
Leakage capacitance of the component	C_{ab}	nF	10.3	
Number of pole pairs	p		4	
Moment of inertia of the rotor [1] [2]	J_{rot}	kgm^2	0.01940	
Thermal time constant	T_{th}	min	90.0	
Maximum speed (electrical)	n_{max}	1/min	4,000	
Mass	m	kg	45.0	46.0
Sound pressure level	LP	dB[A]	61.1 (±3)	
Ambient temperature during operation	T_{um}	°C	0...40	
Degree of protection (EN 60034-5)	-	-	IP65	
Thermal class (EN 60034-1)	T.CL.		155	
Holding brake				
Holding torque	M_4	Nm	0	32.00
Rated voltage [1]	U_N	V	0	24
Rated current	I_N	A	0	0.93
Maximum connection time	t_1	ms	0	15
Maximum disconnection time	t_2	ms	0	115
Moment of inertia of the holding brake [1] [2]	J_{br}	$kg*m^2$	0	0.0012420

1) For tolerance details refer to ➦ Chapter 14.10 “Tolerances” on page 50

2) For motors with holding brake, the moment of inertia of the holding brake must be added to the moment of inertia of the motors to determine the total moment of inertia.



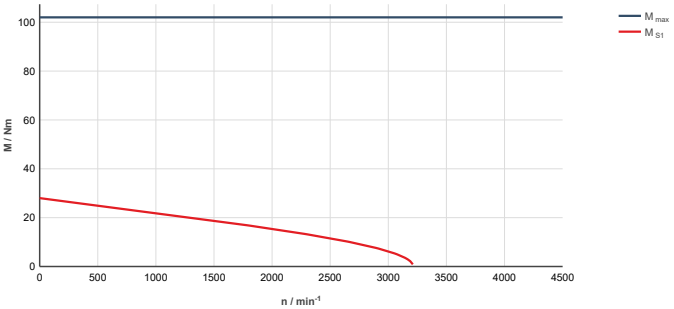
MKE118B-024-__-___, ctrlX DRIVE, controlled supply 3 x AC 400 ... 480 V

14.6 MKE118B-058

Designation	Symbol	Unit	MKE118B-058-_0-___	MKE118B-058-_1-___
Continuous torque at standstill 60K [1]	M_{0_60}	Nm	28.0	
Continuous current at standstill 60K	$I_{0\_60(eff)}$	A	28.4	
Maximum torque [1]	M_{max}	Nm	102.0	
Maximum current	I_{max}	A	127.6	
Torque constant at 20 °C [1]	Km	Nm/A	1.15	
Voltage constant at 20 °C [1]	K_{EMK_1000}	V/1000 min^{-1}	70.0	
Winding resistance at 20 °C	R_{12}	ΩOhm	0.17	
Winding inductance	L_{12}	mH	2.2	
Leakage capacitance of the component	C_{ab}	nF		
Number of pole pairs	p		4	
Moment of inertia of the rotor [1] [2]	J_{rot}	kgm^2	0.01940	
Thermal time constant	T_{th}	min	90.0	
Maximum speed (electrical)	n_{max}	1/min	4,500	
Mass	m	kg	45.0	46.0
Sound pressure level	LP	dB[A]	61.1 (±3)	
Ambient temperature during operation	T_{um}	°C	0...40	
Degree of protection (EN 60034-5)	-	-	IP65	
Thermal class (EN 60034-1)	T.CL.		155	
Holding brake				
Holding torque	M_4	Nm	0	32.00
Rated voltage [1]	U_N	V	0	24
Rated current	I_N	A	0	0.93
Maximum connection time	t_1	ms	0	15
Maximum disconnection time	t_2	ms	0	115
Moment of inertia of the holding brake [1] [2]	J_{br}	$kg*m^2$	0	0.0012420

1) For tolerance details refer to ➥ Chapter 14.10 “Tolerances” on page 50

2) For motors with holding brake, the moment of inertia of the holding brake must be added to the moment of inertia of the motors to determine the total moment of inertia.



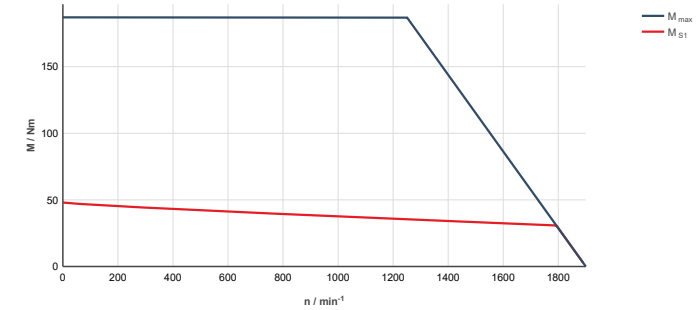
MKE118B-058-__-___, ctrlX DRIVE, controlled supply 3 x AC 400 ... 480 V

14.7 MKE118D-012

Designation	Symbol	Unit	MKE118D-012-__0-___	MKE118D-012-__3-___
Continuous torque at standstill 60K [1]	M_{0_60}	Nm	48.0	
Continuous current at standstill 60K	$I_{0\_60(eff)}$	A	13.0	
Maximum torque [1]	M_{max}	Nm	187.0	
Maximum current	I_{max}	A	58.5	
Torque constant at 20 °C [1]	Km	Nm/A	4.29	
Voltage constant at 20 °C [1]	K_{EMK_1000}	V/1000 min^{-1}	263.5	
Winding resistance at 20 °C	R_{12}	ΩOhm	0.98	
Winding inductance	L_{12}	mH	15	
Leakage capacitance of the component	C_{ab}	nF	20.2	
Number of pole pairs	p		4	
Moment of inertia of the rotor [1] [2]	J_{rot}	kgm^2	0.03620	
Thermal time constant	T_{th}	min	90.0	
Maximum speed (electrical)	n_{max}	1/min	2,100	
Mass	m	kg	65.0	69.1
Sound pressure level	LP	dB[A]	61.1 (±3)	
Ambient temperature during operation	T_{um}	°C	0...40	
Degree of protection (EN 60034-5)	-	-	IP65	
Thermal class (EN 60034-1)	T.CL.		155	
Holding brake				
Holding torque	M_4	Nm	0	70.00
Rated voltage [1]	U_N	V	0	24
Rated current	I_N	A	0	1.29
Maximum connection time	t_1	ms	0	53
Maximum disconnection time	t_2	ms	0	97
Moment of inertia of the holding brake [1] [2]	J_{br}	$kg*m^2$	0	0.0031800

1) For tolerance details refer to ➦ Chapter 14.10 “Tolerances” on page 50

2) For motors with holding brake, the moment of inertia of the holding brake must be added to the moment of inertia of the motors to determine the total moment of inertia.



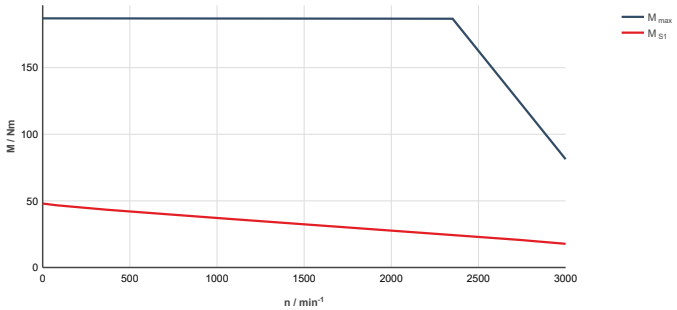
MKE118D-012-__-___, ctrlX DRIVE, controlled supply 3 x AC 400 ... 480 V

14.8 MKE118D-027

Designation	Symbol	Unit	MKE118D-027-_0-___	MKE118D-027-_3-___
Continuous torque at standstill 60K [1]	M_{0_60}	Nm	48.0	
Continuous current at standstill 60K	$I_{0\_60(eff)}$	A	22.1	
Maximum torque [1]	M_{max}	Nm	187.0	
Maximum current	I_{max}	A	99.6	
Torque constant at 20 °C [1]	Km	Nm/A	2.52	
Voltage constant at 20 °C [1]	K_{EMK_1000}	V/1000 min^{-1}	154.5	
Winding resistance at 20 °C	R_{12}	ΩOhm	0.35	
Winding inductance	L_{12}	mH	5.7	
Leakage capacitance of the component	C_{ab}	nF		
Number of pole pairs	p		4	
Moment of inertia of the rotor [1] [2]	J_{rot}	kgm^2	0.03620	
Thermal time constant	T_{th}	min	90.0	
Maximum speed (electrical)	n_{max}	1/min	3,000	
Mass	m	kg	65.0	69.1
Sound pressure level	LP	dB[A]	61.1 (±3)	
Ambient temperature during operation	T_{um}	°C	0...40	
Degree of protection (EN 60034-5)	-	-	IP65	
Thermal class (EN 60034-1)	T.CL.		155	
Holding brake				
Holding torque	M_4	Nm	0	70.00
Rated voltage [1]	U_N	V	0	24
Rated current	I_N	A	0	1.29
Maximum connection time	t_1	ms	0	53
Maximum disconnection time	t_2	ms	0	97
Moment of inertia of the holding brake [1] [2]	J_{br}	$kg*m^2$	0	0.0031800

1) For tolerance details refer to ➥ Chapter 14.10 “Tolerances” on page 50

2) For motors with holding brake, the moment of inertia of the holding brake must be added to the moment of inertia of the motors to determine the total moment of inertia.



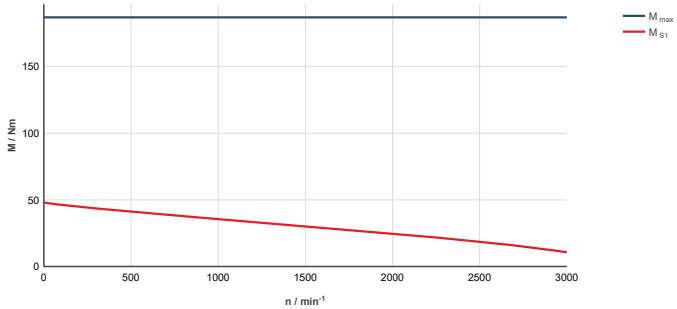
MKE118D-027-___-___, ctrlX DRIVE, controlled supply 3 x AC 400 ... 480 V

14.9 MKE118D-035

Designation	Symbol	Unit	MKE118D-035-__0-___	MKE118D-035-__3-___
Continuous torque at standstill 60K [1]	M_{0_60}	Nm	48.0	
Continuous current at standstill 60K	$I_{0\_60(eff)}$	A	29.8	
Maximum torque [1]	M_{max}	Nm	187.0	
Maximum current	I_{max}	A	134.3	
Torque constant at 20 °C [1]	Km	Nm/A	1.87	
Voltage constant at 20 °C [1]	K_{EMK_1000}	V/1000 min^{-1}	114.5	
Winding resistance at 20 °C	R_{12}	ΩOhm	0.21	
Winding inductance	L_{12}	mH	3.2	
Leakage capacitance of the component	C_{ab}	nF		
Number of pole pairs	p		4	
Moment of inertia of the rotor [1] [2]	J_{rot}	kgm^2	0.03620	
Thermal time constant	T_{th}	min	90.0	
Maximum speed (electrical)	n_{max}	1/min	3,000	
Mass	m	kg	65.0	69.1
Sound pressure level	LP	dB[A]	61.1 (±3)	
Ambient temperature during operation	T_{um}	°C	0...40	
Degree of protection (EN 60034-5)	-	-	IP65	
Thermal class (EN 60034-1)	T.CL.		155	
Holding brake				
Holding torque	M_4	Nm	0	70.00
Rated voltage [1]	U_N	V	0	24
Rated current	I_N	A	0	1.29
Maximum connection time	t_1	ms	0	53
Maximum disconnection time	t_2	ms	0	97
Moment of inertia of the holding brake [1] [2]	J_{br}	$kg*m^2$	0	0.0031800

1) For tolerance details refer to ➦ Chapter 14.10 “Tolerances” on page 50

2) For motors with holding brake, the moment of inertia of the holding brake must be added to the moment of inertia of the motors to determine the total moment of inertia.



MKE118D-035-__-___, ctrlX DRIVE, controlled supply 3 x AC 400 ... 480 V

14.10 Tolerances

The values specified in the technical data are subject to a natural dispersion. Observe the tolerance specifications for the following parameters.

Table 18: Tolerance specifications of the motor data

Designation	Symbol	Tolerance value
Standstill torque - 60K	$M_{0\,60K}$	±5 %
Moment of inertia of rotor	J_{rot}	± 10 %
Maximum torque	M_{max}	±5 %
Torque constant at 20 °C	K_m	±5%
Voltage constant at 20 °C	K_E	±5 %

14.11 Axial force

Motor	Symbol	Unit	Value
MKE037	F_A	Nm	Not permitted
MKE047	F_A	Nm	30
MKE098	F_A	Nm	60
MKE118	F_A	Nm	200

14.12 Radial force

14.12.1 MKE037 Radial force

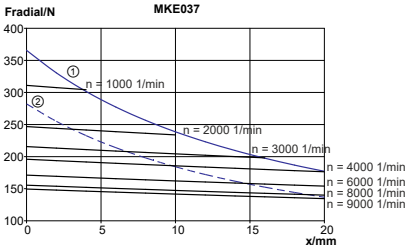


Fig. 13: MKE037: permissible radial force
① Shaft plain
② Shaft with keyway

14.12.2 MKE047 Radial force

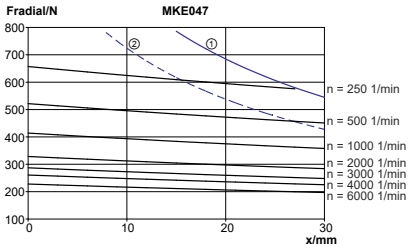


Fig. 14: MKE047: permissible radial force
① Shaft plain
② Shaft with keyway

14.12.3 MKE098 Radial force

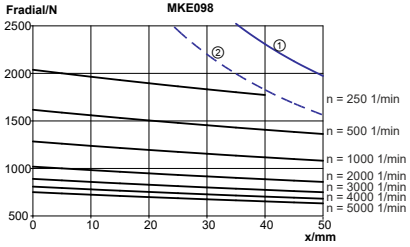


Fig. 15: MKE098: permissible radial force
① Shaft plain
② Shaft with keyway

14.12.4 MKE118 Radial force

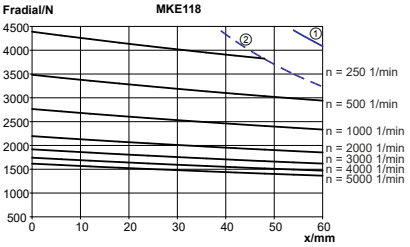


Fig. 16: MKE118: permissible radial force

① Shaft plain
② Shaft with keyway

14.13 Specifications

14.13.1 MKE037 Specifications

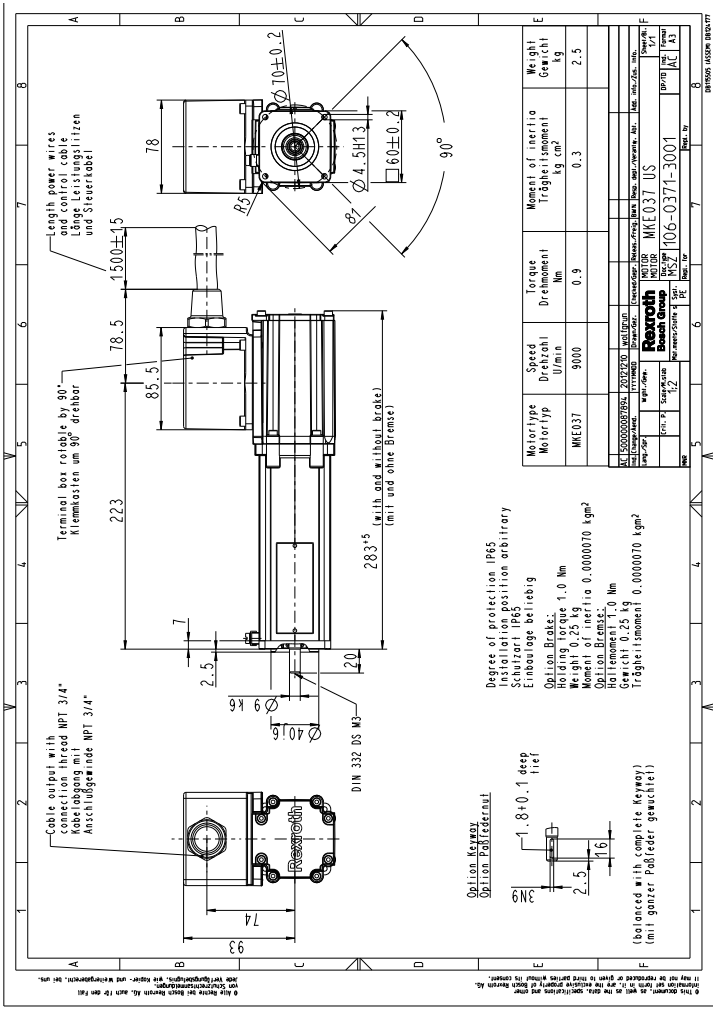


Fig. 17: MKE037

14.13.2 MKE047 Specifications

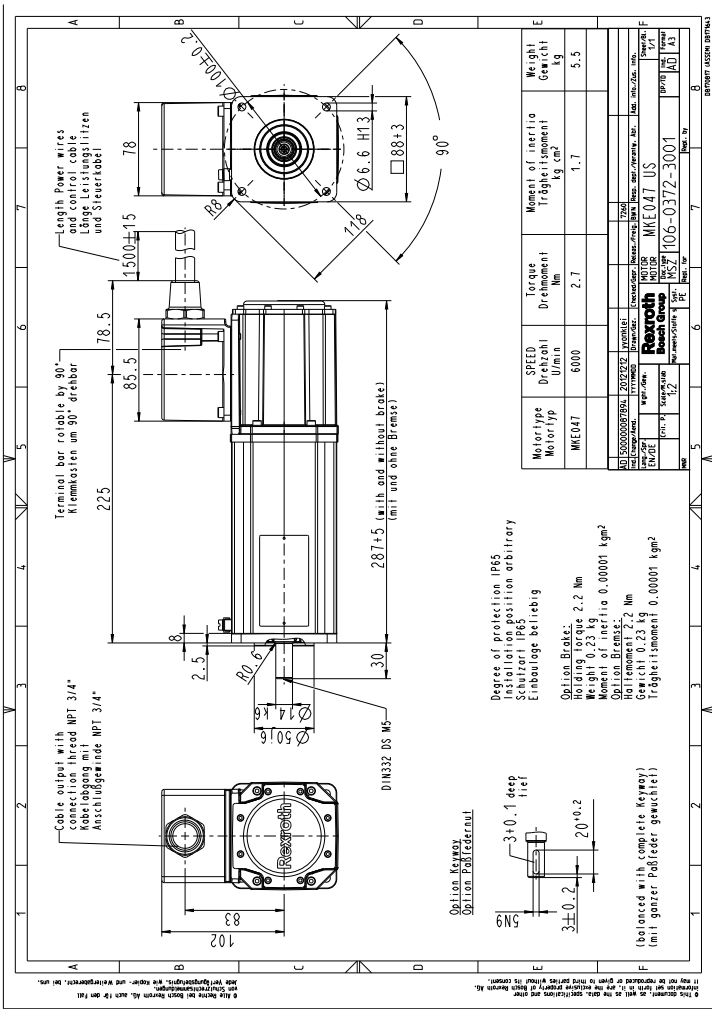


Fig. 18: MKE047

14.13.3 MKE098 Specifications

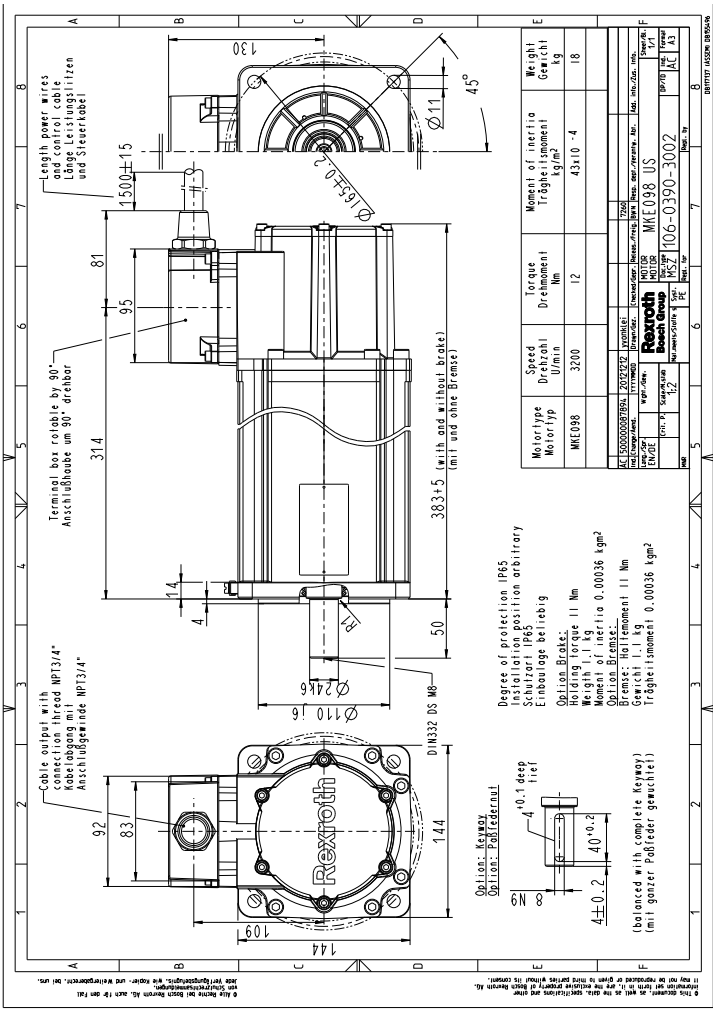


Fig. 19: MKE098

14.13.4 MKE118 Specifications

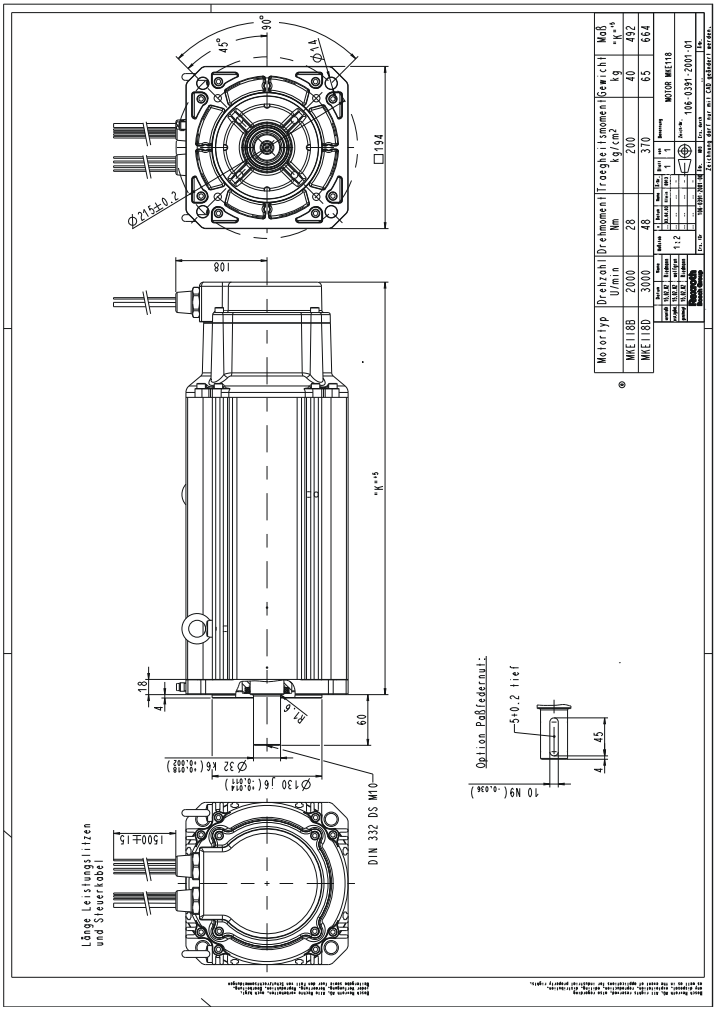


Fig. 20: MKE118

15 Appendix

15.1 UL / CSA

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

The UL Listed Mark identifies products tested by Underwriters' Laboratories (UL) to nationally recognized safety standards.

Information can be found under UL file number E203009 on the website ➦ www.ul.com.

15.2 China RoHS 2

The China RoHS 2 conformity can be found on the type plate of the motors.
Information about listing:➦ www.boschrexroth.com.cn/zh/cn/home_2/china_rohs2

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