

# IndraDyn S

Synchronous Motors MSM

**Data sheet**  
**R911329338**

Edition 04



**Title** IndraDyn S  
 Synchronous Motors MSM

**Type of Documentation** Data sheet

**Document Typecode** DOK-MOTOR\*-MSM\*\*\*\*\*-DA04-EN-P

**Internal File Reference** RS-e2609feaf2a631970a6846a0002c9d48-6-en-US-3

**Purpose of Documentation** This documentation ...

- explains the features of the product, possibilities for use, operating conditions and operational limits von MSM motors.
- contains technical data.
- provides information regarding product selection, handling and operation.

**Record of Revision**

Edition	Release Date	Notes
DOK-MOTOR*-MSM*****-DA01-EN-P	Edition 2009-07	First edition
DOK-MOTOR*-MSM*****-DA02-EN-P	Edition 2015-02	Revision; Plug connector Revision
DOK-MOTOR*-MSM*****-DA03-EN-P	Edition 2015-06	Note about encoder lifetime and table row about storage and transport temperature removed from technical data tables.
DOK-MOTOR*-MSM*****-DA03-EN-P	Edition 2015-12	System accuracy encoder in definition
DOK-MOTOR*-MSM*****-DA04-EN-P	Edition 2017-09	System accuracy encoder M5, switching cycles holding brakes

**Copyright** © Bosch Rexroth AG 2017  
 This document, as well as the data, specifications and other information set forth in it, are the exclusive property of Bosch Rexroth AG. It may not be reproduced or given to third parties without its consent.

**Liability** The specified data is intended for product description purposes only and shall not be deemed to be a guaranteed characteristic unless expressly stipulated in the contract. All rights are reserved with respect to the content of this documentation and the availability of the product.

# Table of Contents

	Page
<b>1 Introduction.....</b>	<b>3</b>
<b>2 Operating conditions.....</b>	<b>5</b>
2.1 Environmental and operating conditions.....	5
2.2 Compatibility with foreign matters.....	6
2.3 Materials.....	7
2.4 Design and installation positions.....	7
2.5 Installation space.....	7
2.6 Output shaft.....	7
2.7 Bearings and shaft load.....	8
2.8 Holding brakes.....	10
2.9 Attachment of drive elements.....	10
2.10 Certifications .....	12
<b>3 Identification and type code.....</b>	<b>13</b>
3.1 Identification.....	13
3.2 MSM019 Type code.....	14
3.3 MSM031 Type code.....	15
3.4 MSM041 Type code.....	16
<b>4 Technical data.....</b>	<b>17</b>
4.1 Basics.....	17
4.2 MSM019.....	19
4.2.1 MSM019 Technical data.....	19
4.2.2 MSM019 Specifications.....	22
4.3 MSM031.....	24
4.3.1 MSM031 Technical data.....	24
4.3.2 MSM031 Specifications.....	27
4.4 MSM041.....	29
4.4.1 MSM041 Technical data.....	29
4.4.2 MSM041 Specifications.....	31
<b>5 Motor encoder MSM.....</b>	<b>33</b>
5.1 Motor encoder M0.....	33
5.2 Motor encoder M5.....	34
<b>6 Connection technique.....</b>	<b>35</b>
6.1 Electrical connection "C" cable connection .....	35
6.2 Electrical connection "M" cable connection round plug M17 .....	37
6.3 Ready-made connection cables.....	39
6.3.1 Power cables .....	39
6.3.2 Encoder cable .....	40

## Table of Contents

	Page
<b>7</b>	<b>Transport and storage..... 41</b>
7.1	Transport of motors..... 41
7.2	Storage of motors..... 41
<b>8</b>	<b>Assembly accessory..... 43</b>
8.1	Flange fastening..... 43
8.2	Battery box SUP-E01-MSM-BATTERYBOX..... 44
8.3	Batterybox SUP-E02-MSM-BATTERYBOX-xxxx..... 46
8.4	Shaft sealing ring..... 48
<b>9</b>	<b>Environmental protection and disposal ..... 49</b>
9.1	Environmental protection..... 49
9.2	Disposal..... 49
<b>10</b>	<b>Service and support..... 51</b>
<b>11</b>	<b>Appendix..... 53</b>
	<b>Index..... 55</b>


# 1 Introduction

## IndraDyn S - servo motors MSM introduction to the product

The maintenance-free MSM motors are available in five sizes up to a mechanical continuous output of 750 Watt. The high power density in connection with short frame length and minimized flange size allow for use in the most varied fields of application. The motors with degree of protection IP54 are equipped with an absolute encoder and can be optionally provided with or without holding brake. They are predestined for use in IndraDrive Cs controller with 3 AC 230 V power connection.

MSM motors are characterized by

- Dynamics
- Compact construction
- Degree of protection IP54
- Precision by optic single-turn and multi-turn absolute encoders
- Holding brake
- Plug connector for encoder and power connection

Motor MSM 	Continuous output $P_N$ [W]	Torque at standstill $M_O$ [Nm]	Maximum torque $M_{max}$ [Nm]	Maximum speed $n_{max}$ [min <sup>-1</sup> ]	Degree of protection
019A	50	0.16	0.48	5000	IP54 (shaft IP40)
019B	100	0.32	0.95		
031B	200	0.64	1.91		
031C	400	1.3	3.8		
041B	750	2.4	7.1	4500	

Tab. 1-1: Performance features MSM motors

This documentation is intended for

- Selection of motors
- Description of variants

**Feedback**

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

Please send your remarks to [dokusupport@boschrexroth.de](mailto:dokusupport@boschrexroth.de).



## 2 Operating conditions

### 2.1 Environmental and operating conditions

Servo motors MSM are designed for use in machines and systems.

#### Environmental and operating conditions

Designation	Symbol	Unit	Value
Degree of protection (IEC529)			IP54
Use within scope of application of CSA / UL			Only authorized for use in NFPA-79 applications.
Storage temperature			see chapter "chapter 7.1 "Transport of motors" on page 41"
Transport temperature			see chapter "chapter 7.2 "Storage of motors" on page 41"
Admissible installation position Definition of installation positions: see keyword "Installation positions"			IM B5 IM V1 IM V3
Ambient temperature range	$T_{a\_work}$	°C	0 ... 40
Installation altitude	$h_{nenn}$	m	1000
<b>De-rating vs. ambient temperature:</b> In the ambient temperature range $T_{a\_work\_red}$ the performance data <sup>3)</sup> should be reduced by the reduction factor $f_{Ta}$ . The use out of $T_{a\_work}$ or $T_{a\_work\_red}$ is not allowed!			
	$T_{a\_work\_red}$	°C	40 ... 55
	$f_{Ta}$	%/K	2.0 see also the technical data of the individual components
<b>De-rating vs. installation altitude:</b> Starting at an installation altitude $h > h_{nenn}$ , performance data <sup>2) 3)</sup> reduced by the factor $f$ will be available. At the installation altitude in the range $h_{max\_ohne}$ to $h_{max}$ , an <b>overvoltage limiter</b> against transient overvoltage should be installed for the system. The use above $h_{max}$ is not allowed!			
	$h_{max\_ohne}$	m	2000
	$h_{max}$	m	4000

## Operating conditions

Designation	Symbol	Unit	Value
<b>Simultaneous de-rating</b> for ambient temperature and installation altitude			allowed; reduced by factors f and $f_{Ta}$
Relative air humidity		%	5 ... 95
Absolute air humidity		g/m <sup>3</sup>	1 ... 29
Climatic class (IEC721)			3K3
Admissible level of contamination (EN50178)			2
Admissible dusts, vapors			EN50178 table A.2
Vibration sinus: Acceleration at 10 ... 2000 Hz <sup>1)</sup> , axial		g	1
Vibration sinus: Acceleration at 10 ... 2000 Hz <sup>1)</sup> , radial		g	3
Overvoltage category			III (acc. to IEC60664-1)

- 1) acc. to DIN EN 60068-2-6  
 2) reduced performance data with drive controllers: admissible continuous output of intermediate circuit, continuous output of brake resistance, continuous current  
 3) reduced performance data with motors: output, torque S1 and S3

Tab. 2-1: *Environmental and operating conditions - Operation*

## 2.2 Compatibility with foreign matters

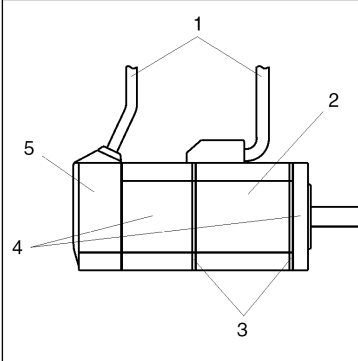
All Rexroth controls and drives are developed and tested according to the state-of-the-art technology.

As it is impossible to follow the continuing development of all materials (e.g. lubricants in machine tools) which may interact with the controls and drives, it cannot be completely ruled out that any reactions with the materials we use might occur.

For this reason, before using the respective material a compatibility test has to be carried out for new lubricants, cleaning agents etc. and our housings/materials.

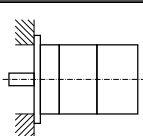
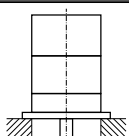
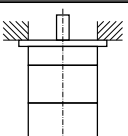


## 2.3 Materials

	No.:	Material
 <p style="text-align: center; font-size: small;">motor_materialien.fh11</p>	1	Polyvinyl chloride resin (oil resistance: corresponding to standard" JIS C 3005"; test conditions: oil temperature: 70 °C; test duration (cable in oil): 4 hours; oil: machine oil 46 (by GENERAL))
	2	Aluminum; anodized
	3	Rubber
	4	Aluminum pressure casting; blank
	5	Polyamide 46 (nylon 46)

Tab. 2-2: Materials

## 2.4 Design and installation positions

Motor design B05		
IM B5	IM V1	IM V3
		
Flange attachment on the drive side of the flange	Flange attachment on the drive side of the flange, drive side facing down	Flange attachment on the drive side of the flange, drive side facing up

Tab. 2-3: Permissible conditions of installation according to EN 60034-7:1993

### NOTICE

### Motor damage due to penetration of liquids!

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.

Ensure that fluid cannot be present at the output shaft.

## 2.5 Installation space

The own cooling of the motor must not be prevented by the installation situation.

## 2.6 Output shaft

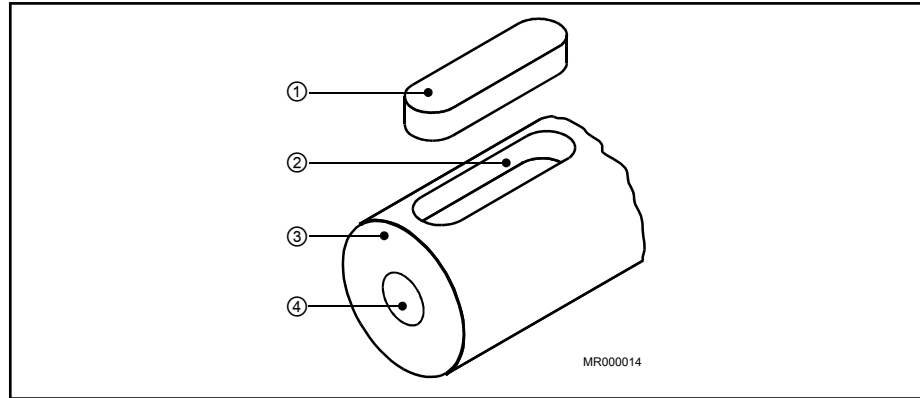
**Plain shaft** MSM motors offer a non-positive shaft-hub connection without play and excellent running smoothness. Use clamping sets, pressure sleeves or clamping elements for coupling the machine elements to be driven.

Labeling in motor type: MSM.....-.....-.....H

Operating conditions

**Shaft with keyway** MSM motors with key allow form-locking transmission of torques with constant direction and lower requirements for the shaft-hub connection. The key is enclosed in the package upon delivery.

Labeling in motor type: MSM.....-.....-.....-L



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

Fig. 2-1: MSM Output shaft with key

In addition, the machine elements to be driven must be secured in axial direction via the centering hole on the end face.

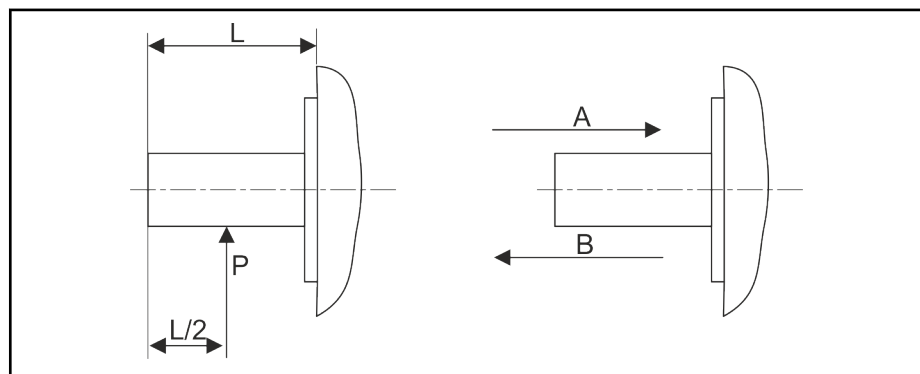
**NOTICE** Damage to property due to reversing mode!

Shaft damage! In case of intense reversing operation, the seat of the fitting spring may deflect. Increasing deformations can lead to a break of shaft.

Preferably, use plain output shafts.

## 2.7 Bearings and shaft load

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



- L Length of shaft
- P Application point of radial force
- A, B Directions of axial force

Fig. 2-2: Shaft load parameters

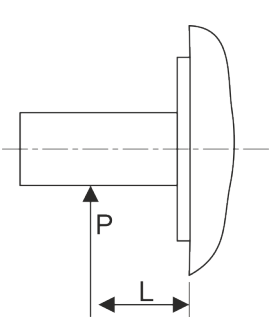
The following table shows the admissible shaft loads of the individual motors.

Operating conditions

Motor	At assembly			During operation	
	Radial force (N)	Axial force (N)		Radial force (N)	Axial force (N)
		Direction	Direction		
MSM019	147	88	117.6	68.6	58.8
MSM031	392	147	196	245	98
MSM041	686	294	392	392	147

Tab. 2-4: Admissible radial/axial force

When shifting the application point of the radial force, the admissible radial force should be calculated as follows.

	Motor	Radial force depending on force application point
	MSM019A	$P = \frac{3533}{L + 39}$
	MSM019B	$P = \frac{4905}{L + 59}$
	MSM031B	$P = \frac{14945}{L + 46}$
	MSM031C	$P = \frac{19723}{L + 65,5}$
	MSM041B	$P = \frac{37044}{L + 77}$

Tab. 2-5: Radial force depending on force application point

Lifetime of motor bearings



If the MSM motors are operated within the limits specified for radial and axial loads, the nominal service life of the bearings will be **L<sub>10h</sub> 20000 operating hours**.

When exceeding the admissible radial force, the bearing service life will be reduced to:

$$L_{10h} = \left( \frac{F_{\text{radial}}}{F_{\text{radial\_ist}}} \right)^3 \times 20000$$

**L<sub>10h</sub>** Bearing service life (according to ISO 281, Version 12/1990)

**F<sub>radial</sub>** Determined allowed radial force in N (Newton)

**F<sub>radial\_act</sub>** Actually acting radial force in N (Newton)

Fig. 2-3: Calculating the bearing service life L<sub>10h</sub> if the allowed radial force F<sub>radial</sub> is exceeded



The actually acting radial force F<sub>radial\_act</sub> may never be higher than the maximum allowed radial force F<sub>radial\_max</sub>.

Operating conditions

## 2.8 Holding brakes

The following general data are decisive for all MSM motors. The holding brake data depending on frame size are stated in the "Technical data" section.

- The values stated in the technical data, except for holding torque, trigger voltage and rated voltage, represent typical values
- After moving the motor, the brake play will be  $\pm 1^\circ$  or less.
- The voltage supply of the holding brake is fed externally.
- Maximum number of acceleration and brake processes with the highest admissible angular acceleration: 10 million.

## 2.9 Attachment of drive elements

Please observe the following notes when attaching drive elements to the output shaft.

### Gearbox mounting on motors

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

Depending on the gearbox type, the heat development on the gearbox is different. The heat dissipation of the motor via the flange is reduced in every case when a gearbox is mounted. This must be heeded at the project planning.

A reduction of the given performance data is necessary, to do not overload motors when using gearboxes.

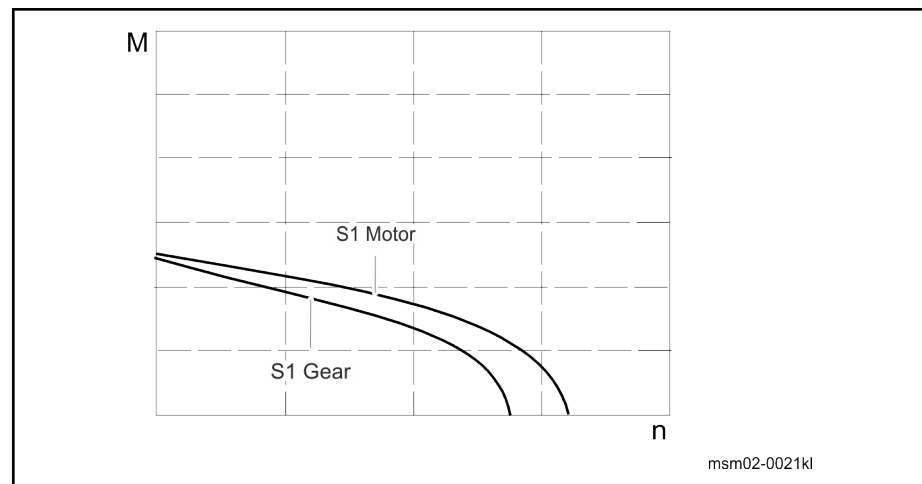


Fig. 2-4: S1 characteristic curve of gearboxes



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.

### Overdetermined bearing

When attaching drive elements, overdetermined bearing should be avoided because the tolerances inevitably present in such cases will lead to additional forces acting on the bearing of the motor shaft and, as the case may be, to a distinctly reduced service life of the bearing.



If an overdetermined attachment cannot be avoided, it is absolutely necessary to consult with Rexroth.

Operating conditions

**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.



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

---

**Bevel gear pinion or helical gear drive**

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 helical drive 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.
- Damage of the motor bearing on the B-side due to exceeding of the maximum permissible axial force.



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

---

Operating conditions

## 2.10 Certifications

**Declaration of conformity** Declarations of conformity (see [chapter 11 "Appendix" on page 53](#) ) confirm that the components comply with the applicable EN standards and EC directives.

### MSM motors



DX00011v01\_m.FH11

CE conformity regarding

**EN 60034-1:** Rotating electrical machines - Part 1: Rating and performance (IEC 60034-1:2004); German version EN 60034-1:2004

**EN 60034-5:** Rotating electrical machines - Part 5: Degrees of protection provided by integral design of rotating electrical machines (IP Code) - Classification (IEC 60034-5:2000 + Corrigendum 2001 + A1:2006); German version EN 60034-5:2001 + A1:2007

**C-UR-US listing** The motors are listed by **UL** ("Underwriters Laboratories Inc.®"). The proof of certification is available in the Internet at <http://www.ul.com> at "Certifications" by entering the File Number or the "Company Name: Rexroth".

### MSM motors



CUR\_Zeichen.fh11

#### Company Name:

BOSCH REXROTH AG

#### Category Name:

Servo and Stepper Motors - Component

For file numbers and standards, see table "Technical data"



#### Wiring material UL (ready-made cables by Rexroth)

Within scope of application of CSA / UL, only use class 6 copper lines (or equivalent) with minimal admissible conductor temperature of 75 °C for wiring of the components.



#### Admissible level of contamination

Observe the allowed storage temperature of the components (see "Environmental and operating conditions").

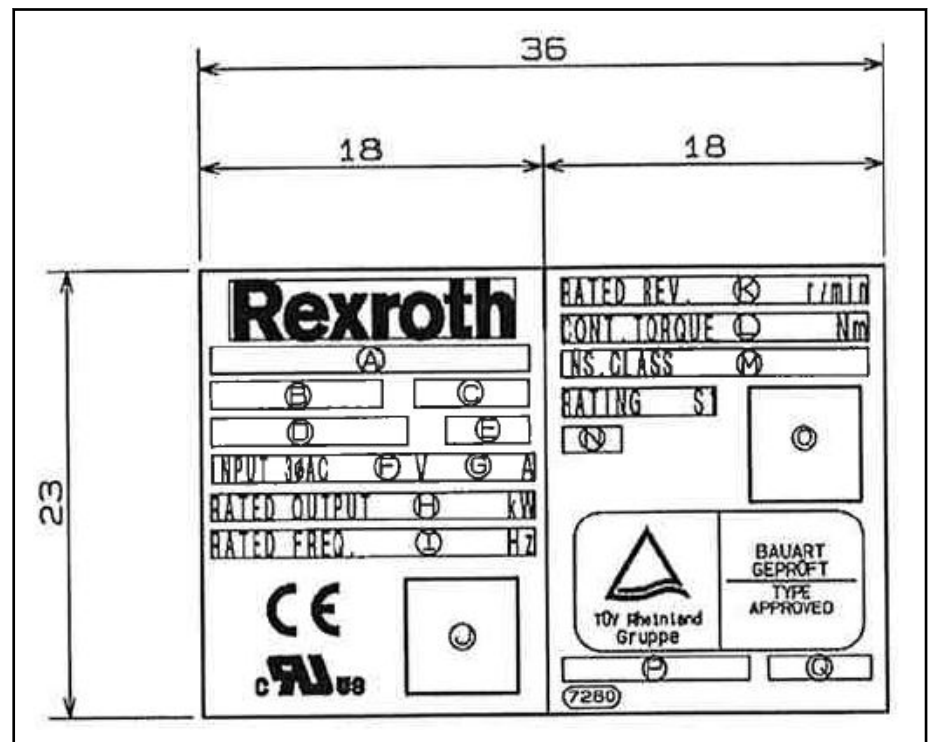
### 3 Identification and type code

#### 3.1 Identification

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

The type plate is provided for

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



- (A) Type
- (B) Material number
- (C) Date of manufacture
- (D) Serial number
- (E) Hardware index
- (F) Rated voltage
- (G) Rated current
- (H) Rated power
- (I) Frequency
- (J) Serial number (Rexroth)
- (K) Speed
- (L) Torque
- (M) Insulation class
- (N) Degree of protection
- (O) Barcode
- (P) Country of manufacture
- (Q) UL file number

Fig. 3-1: Type plate MSM

Identification and type code

### 3.2 MSM019 Type code



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

Type Designation	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
Example:	M	S	M	0	1	9	B	-	0	3	0	0	-	N	N	-	M	0	-	C	H	1								

**Product**  
 MSM ..... = MSM

**Frame Size**  
 019 ..... = 019

**Frame Lengths**  
 Frame length ..... = A, B

**Winding** <sup>1)</sup>  
 MSM019A ..... = 0300  
 MSM019B ..... = 0300, R300

**Cooling Mode**  
 Natural convection ..... = NN

**Encoder** <sup>1) 2)</sup>  
 Optical encoder, Multiturn absolute (17 Bit) ..... = M0  
 Optical encoder, Multiturn absolute (20 Bit) ..... = M5

**Electrical Connection** <sup>2)</sup>  
 Cable connection ..... = C  
 Cable connection, circular connector M17 ..... = M

**Shaft** <sup>1) 2)</sup>  
 Smooth shaft, without shaft sealing ring ..... = H  
 Shaft with keyway, without shaft sealing ring ..... = L

**Holding Brake**  
 Without ..... = 0  
 Electrically released, 1.27 Nm ..... = 1

**Note:**  
 1) Winding „R300“ for reduced voltage (100 V) only available with shaft „H“  
 2) Encoder „M0“ only available with electrical connection „C“ and shaft „H“  
 Encoder „M5“ only available with electrical connection „M“

msm02-0001ty

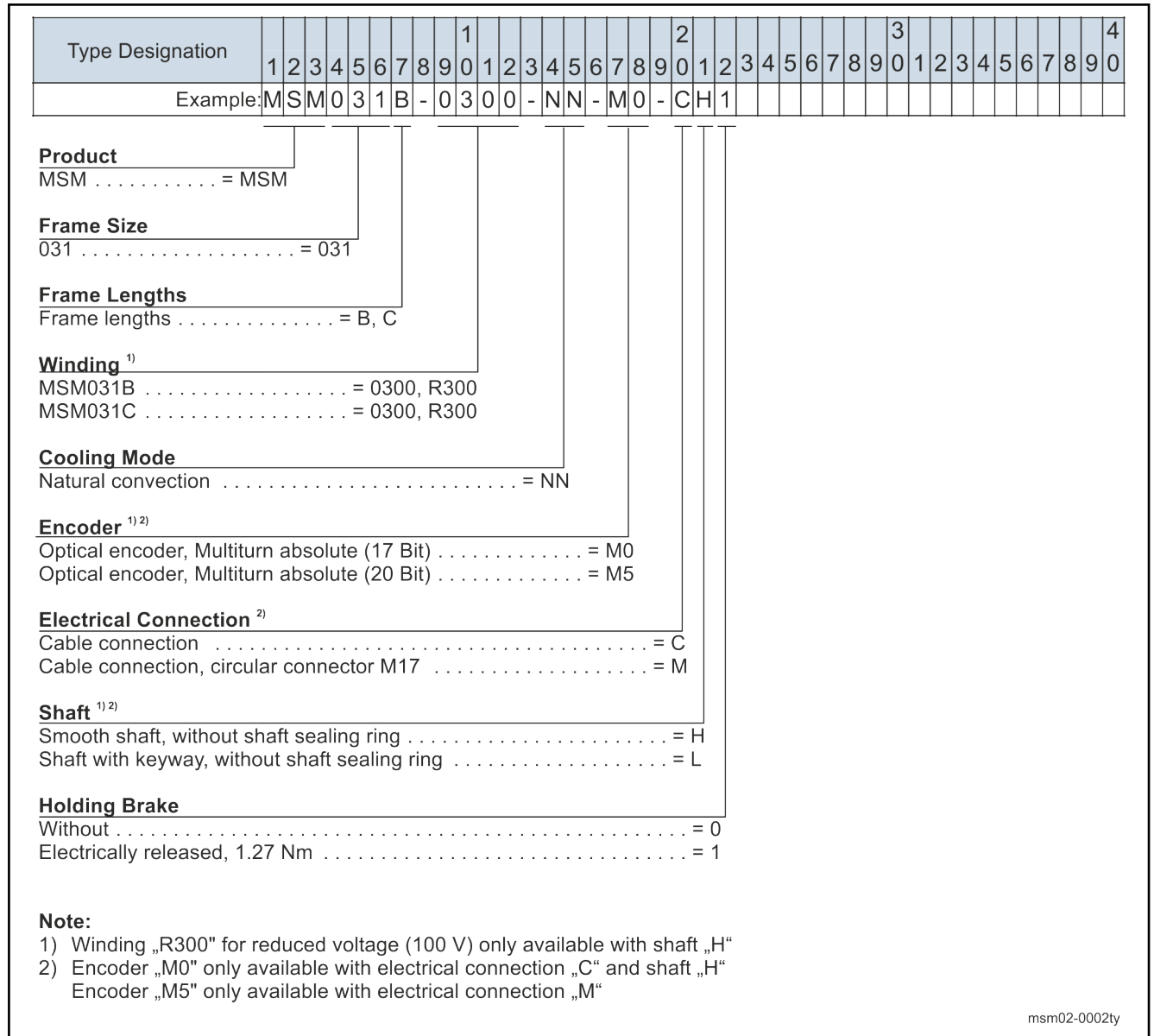
Fig. 3-2: MSM019



### 3.3 MSM031 Type code



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



msm02-0002ty

Fig. 3-3: MSM031

Identification and type code

### 3.4 MSM041 Type code



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

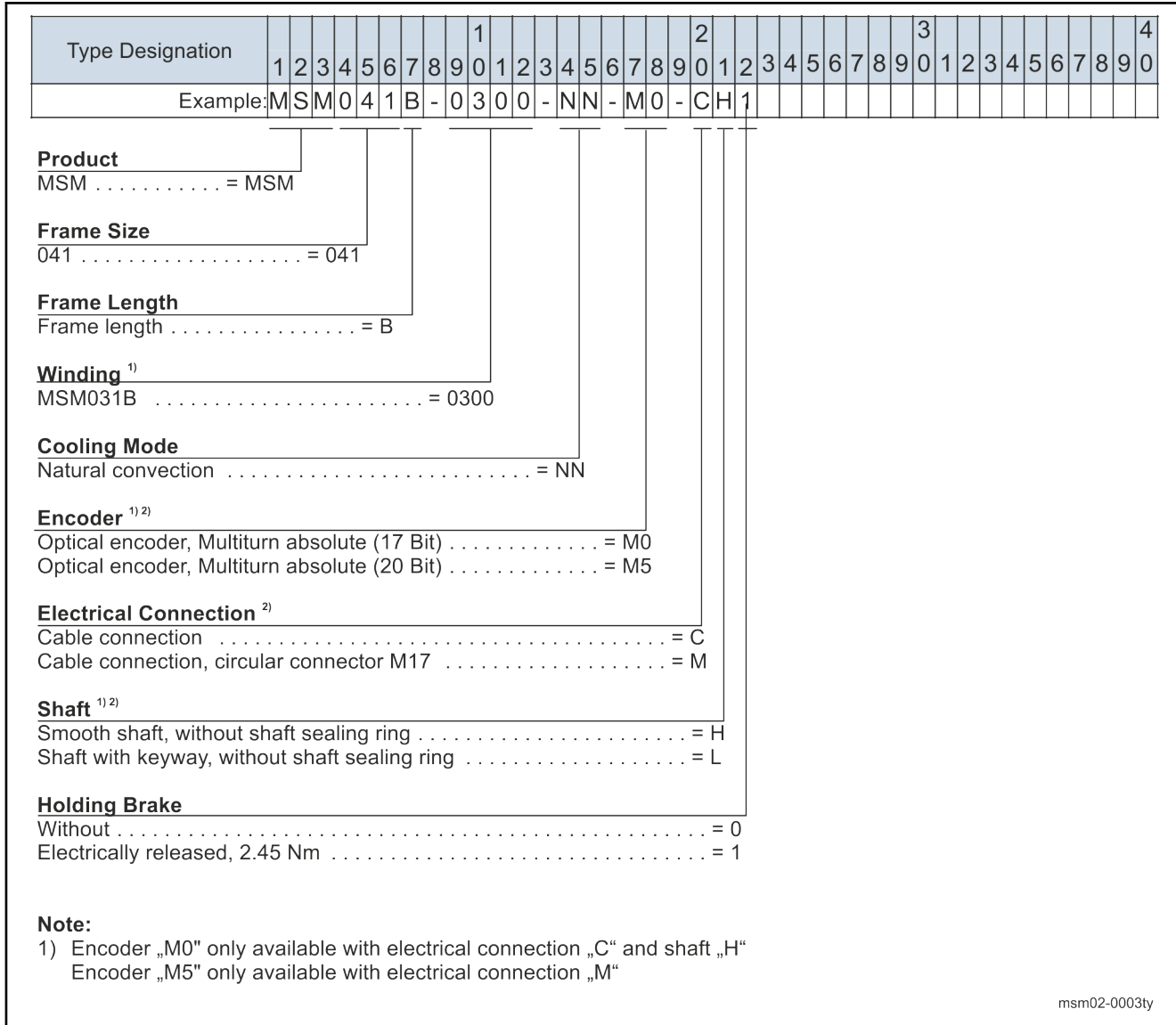


Fig. 3-4: MSM041

## 4 Technical data

### 4.1 Basics

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

**Duty cycle** Operating mode S6 is only available with duty cycle DC ≤100%. The duty cycle is calculated as follows:

$$ED = \frac{\Delta t_P}{T_C} \times 100\% = \left( \frac{M_d}{M_{KB}} \right)^2 \times 100\%$$

**ED** Duty cycle  
**T<sub>C</sub>** Cycle duration  
**ΔT<sub>P</sub>** Operating time with constant load  
**M<sub>d</sub>** Continuous torque  
**M<sub>KB</sub>** Short-time service torque

Fig. 4-1: Relative duty cycle

#### Definition of parameters

Designation	Symbol	Unit	Definition
Cooling mode acc. to EN 60034-6			Short name acc. to EN
Listed acc. to UL standard (UL)			UL Standard
Listed acc. to CSA standard (UL)			CSA Standard
UL-Files (UL)			UL File Number
<b>Electrical parameters</b>			
Continuous torque at standstill 60 K	M <sub>0_60</sub>	Nm	Continuous torque that can be applied to the motor output shaft at a speed of n ≥ 0.1 Hz.
Continuous current at standstill 60 K	I <sub>0_60(rms)</sub>	A	Phase current (crest value) of the motor M <sub>0_60</sub> required for the continuous torque at standstill at a speed of n ≥ 0.1 Hz.
Maximum current	I <sub>max(eff)</sub>	A	Maximum, briefly permissible phase current of the motor winding without adverse affect on the permanent magnet circuit of the motor.
Maximum torque	M <sub>max</sub>	Nm	Maximum torque that can be applied for about 400 ms at maximum current I <sub>max</sub> . The maximum torque that can be attained depends on the drive control device used.
Torque constant at 20 °C <sup>1)</sup>	K <sub>M,N</sub>	Nm/A	Ratio of the generated torque to the motor phase current at a motor temperature of 20°C. Applicable up to approx. i = 2 × I <sub>0_60</sub> .
Voltage constant at 20 °C <sup>2)</sup>	K <sub>EMK_1000</sub>	V/min <sup>-1</sup>	Root-mean-square value of the induced motor voltage at a motor temperature of 20 °C and 1,000 revolutions per minute.
Winding resistance at 20 °C	R <sub>12</sub>	Ohm	Winding resistance measured between two phases.
Winding inductivity	L <sub>12</sub>	mH	Measured inductivity between two strands.
Discharge capacity of the component	C <sub>dis</sub>	nF	Discharge capacity
Number of pole pairs	p	-	Number of pole pairs
<b>Mechanical parameters</b>			
Moment of inertia of the rotor	J <sub>red</sub>	kg*m <sup>2</sup>	Moment of inertia of the rotor without the optional holding brake.
Power wire cross-section	A <sub>60</sub>		Minimum cross-section of the power wire to be connected on the motor

## Technical data

Designation	Symbol	Unit	Definition
Thermal time constant	$T_{th}$		<p>Time of the temperature increase to 63 % of the final temperature of the motor housing with the motor loaded with the permissible S1 continuous torque. The thermal time constant is defined by the cooling type used.</p> <p>① : Chronological course of the motor housing temperature  <math>\Theta_{max}</math> : Highest temperature (motor housing)  <math>T_{th}</math> : Thermal time constant</p>
Maximum speed	$n_{max}$	$\text{min}^{-1}$	Maximum permissible speed of the motor. Limiting factors can have mechanical (centrifugal forces, bearing stress) or electrical (DC link voltage) causes.
Mass <sup>3)</sup>	m	kg	Motor mass
Ambient temperature during operation	$T_{amb}$		Admissible ambient temperature during operation
Installation altitude			Maximale installation altitude
Insulation class according to DIN EN 60034-1	---	-	Insulation class
Type of protection according to IEC 60529	---	-	IP type of protection
Sound pressure level	$L_p$		Value of sound emission

1) 2)

3)

Tab. 4-1:

Manufacturing tolerance  $\pm 5\%$ 

(...) Values for motors with holding brake

Definition of parameters

## 4.2 MSM019

### 4.2.1 MSM019 Technical data

Designation	Symbol	Unit	MSM019A-0300-NN	MSM019B-0300-NN	MSM019B-R300-NN
Cooling mode nach EN 60034-6		-	IC00		
Listed acc. to UL standard (UL)		-	UL 1004; ANSI UL 840		
Listed acc. to CSA standard		-	CSA-C22.2 No. 100		
UL files			E335445		
<b>Electrical parameters</b>					
Rated power	$P_N$	kW	0.05	0.10	
Continuous torque at standstill 60 K	$M_{0,60}$	Nm	0.16	0.32	
Continuous current at standstill 60 K	$I_{0,60(rms)}$	A	1.10		1.70
Maximum current	$I_{max(eff)}$	A	3.30		7.20
Maximum torque	$M_{max}$	Nm	0.48	0.95	
Torque constant at 20 °C	$K_{M,N}$	Nm/A	0.14	0.30	0.19
Voltage constant at 20 °C <sup>1)</sup>	$K_{EMK,1000}$	V/min <sup>-1</sup>	8.6	17.4	11.4
Winding resistance at 20 °C	$R_{12}$	Ohm	9.30	13.20	5.50
Winding inductivity	$L_{12}$	mH	5.650	9.250	3.800
Discharge capacity of the component	$C_{dis}$	nF	0.3	0.7	
Number of pole pairs	$p$	-	4		
<b>Mechanical parameters</b>					
Moment of inertia of the rotor	$J_{red}$	kg*m <sup>2</sup>	0.0000025	0.0000051	
Wire cross section	$A_{60}$	mm <sup>2</sup>	0.75		
Maximum speed	$n_{max}$	min <sup>-1</sup>	5000		
Mass <sup>2)</sup>	$m$	kg	0.32 (0.53)	0.47 (0.68)	
Ambient temperature during operation	$T_{amb}$	°C	0 ... 40		
Installation altitude		m	0 ... 1000		
Thermal class (EN 60034-1)	T.CL.	-	130 (B)		
Degree of protection according to IEC 60529	IP	-	IP54		
Sound pressure level	$L_p$	dB[A]	Less than 70		

Latest amendment: 2008-11-20

- 1) Manufacturing tolerance ±5 %  
 2) (...) Motors with holding brake  
 Tab. 4-2: MSM019 - Technical data

Technical data

Designation	Symbol	Unit	Holding brake 1 (MSM019)
Holding torque	$M_4$	Nm	0.29
Rated voltage	$U_N$	V	$24 \pm 1.2$
Rated current	$I_N$	A	0.3
Connection time	$t_1$	ms	35
Disconnection time	$T_2$	ms	20
Moment of inertia of the holding brake	$J_{red}$	$kg \cdot m^2$	0.0000002
Switching cycles within standstill			2 Mio

Latest amendment: 2017-09-21

Tab. 4-3: MSM019 Holding brakes - Technical data (optional)

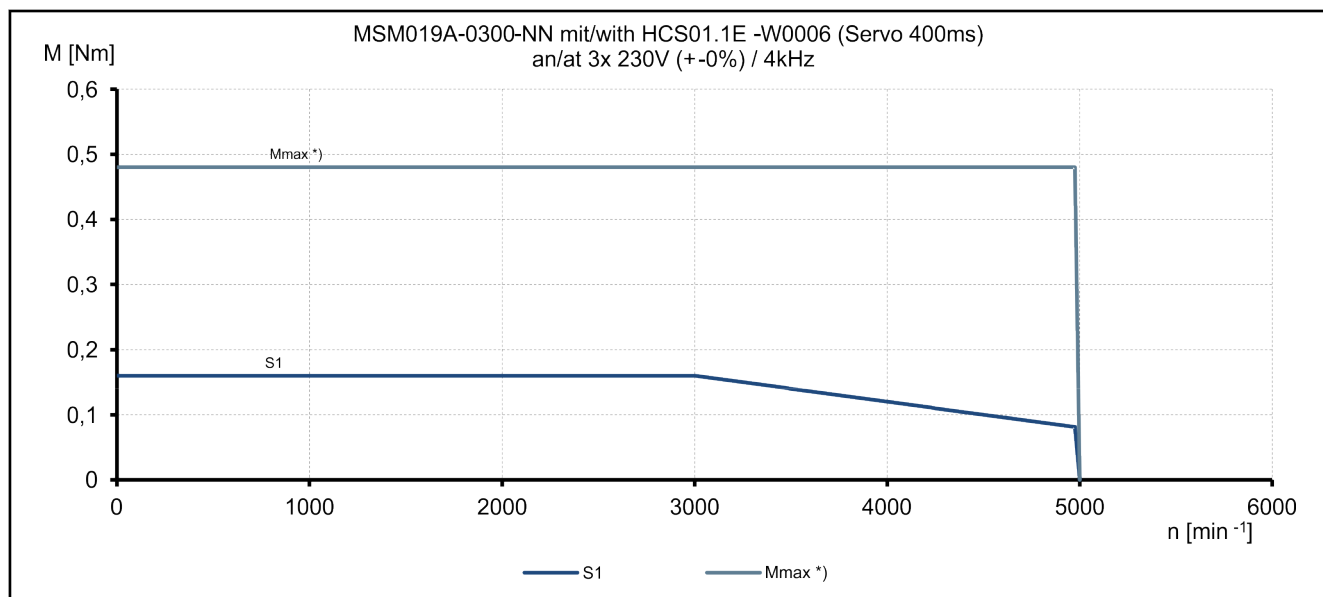


Fig. 4-2: Speed-torque characteristic curves

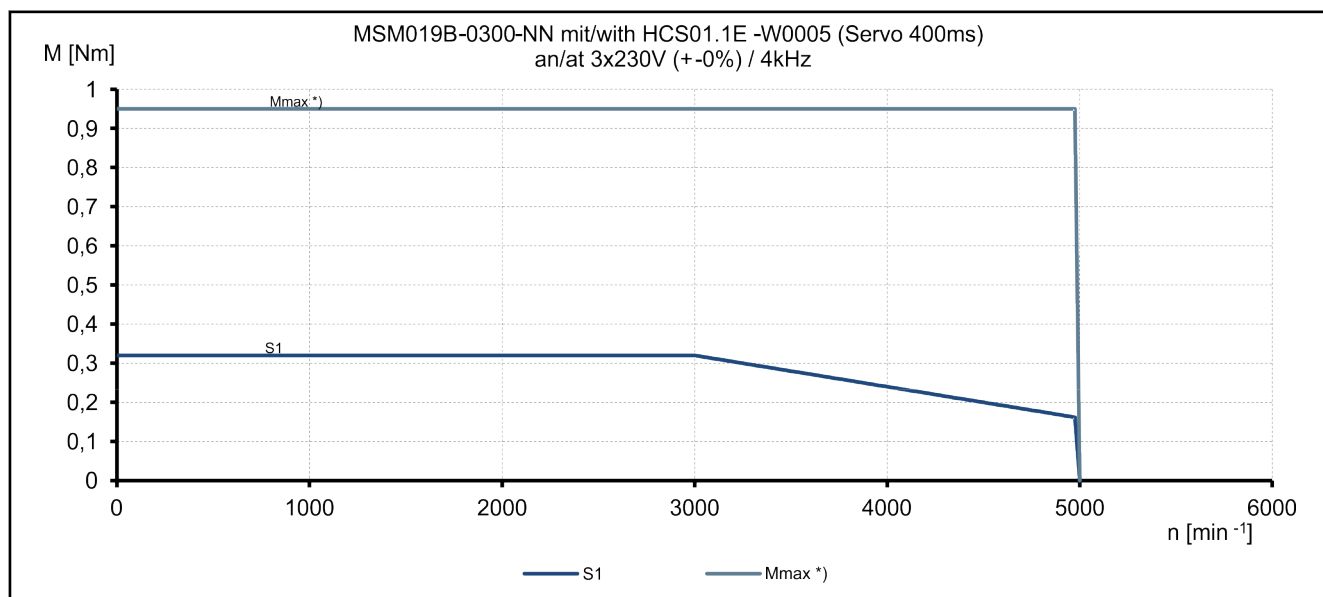


Fig. 4-3: Speed-torque characteristic curves

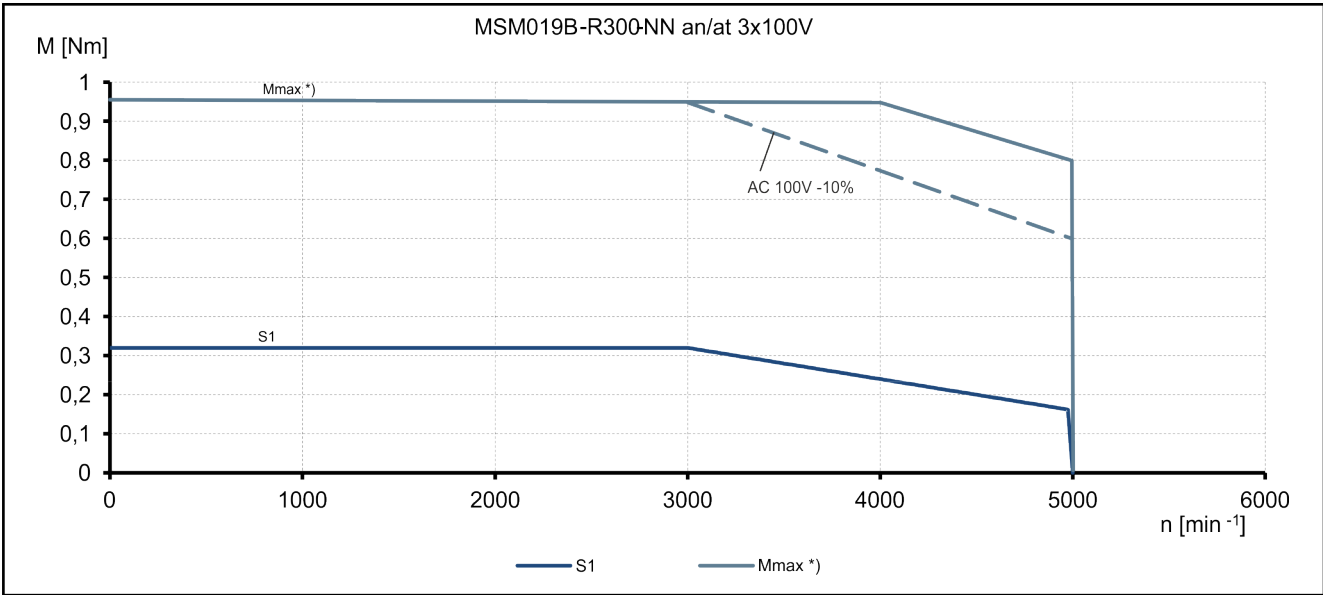
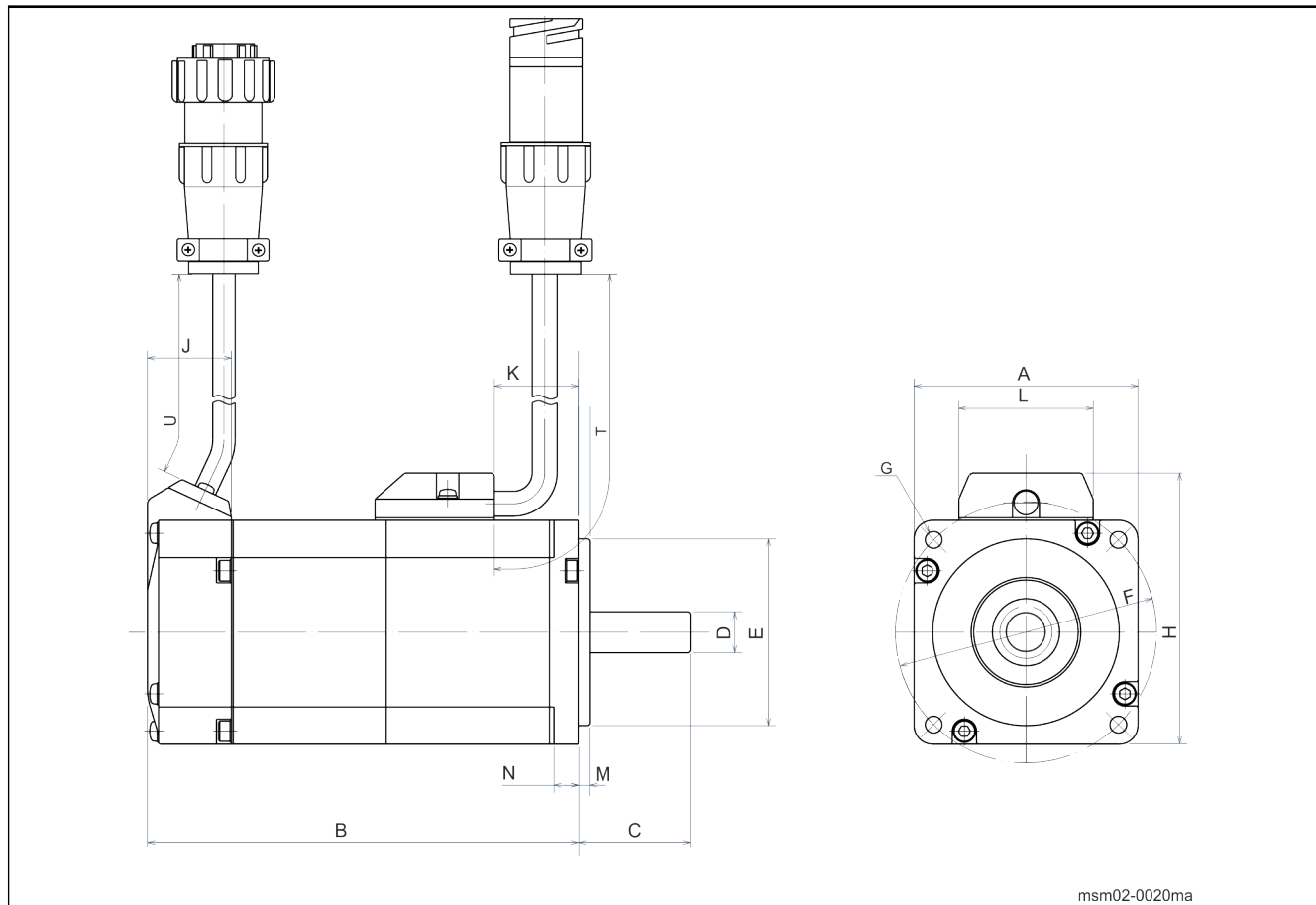


Fig. 4-4: Speed-torque characteristic curves

## Technical data

## 4.2.2 MSM019 Specifications

## MSM019...M0-C...



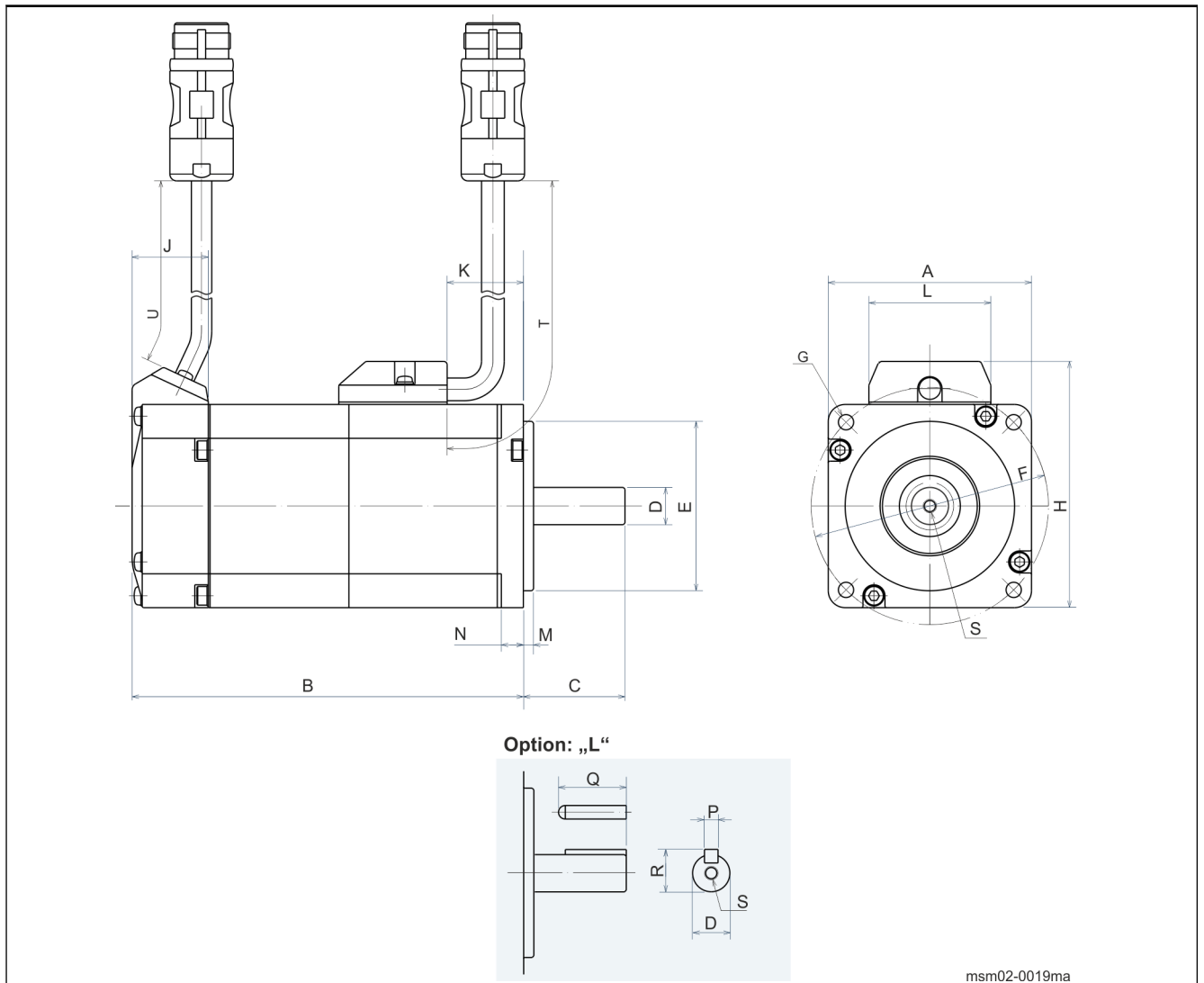
msm02-0020ma

Motor / size	A	B	C	D	E	F	G	H	J	K
MSM019A-...-M0-CH0	□38	72	25	ø8 <sup>h6</sup>	ø30 <sup>h7</sup>	ø45±0.20	ø3.4	51	24	20.8
MSM019A-...-M0-CH1	□38	102	25	ø8 <sup>h6</sup>	ø30 <sup>h7</sup>	ø45±0.20	ø3.4	51	24	20.8
MSM019B-...-M0-CH0	□38	92	25	ø8 <sup>h6</sup>	ø30 <sup>h7</sup>	ø45±0.20	ø3.4	51	24	40.8
MSM019B-...-M0-CH1	□38	122	25	ø8 <sup>h6</sup>	ø30 <sup>h7</sup>	ø45±0.20	ø3.4	51	24	40.8
Motor / size	L	M	N						T	U
MSM019A-...-M0-CH0	27	3	6						200	230
MSM019A-...-M0-CH1	27	3	6						200	230
MSM019B-...-M0-CH0	27	3	6						200	230
MSM019B-...-M0-CH1	27	3	6						200	230

Tab. 4-4: Dimensions MSM019



MSM019...M5-M...



msm02-0019ma

Motor / size	A	B	C	D	E	F	G	H	J	K
MSM019A-...-M5-M.0	□38	72	25	ø8 <sup>h6</sup>	ø30 <sup>h7</sup>	ø45±0.20	ø3.4	51	24	17.3
MSM019A-...-M5-M.1	□38	102	25	ø8 <sup>h6</sup>	ø30 <sup>h7</sup>	ø45±0.20	ø3.4	51	24	17.3
MSM019B-...-M5-M.0	□38	92	25	ø8 <sup>h6</sup>	ø30 <sup>h7</sup>	ø45±0.20	ø3.4	51	24	37.4
MSM019B-...-M5-M.1	□38	122	25	ø8 <sup>h6</sup>	ø30 <sup>h7</sup>	ø45±0.20	ø3.4	51	24	37.4
Motor / size	L	M	N	P	Q	R	S	T	U	
MSM019A-...-M5-M.0	27	3	6	3h9 (groove p9)	14	9.2	M3 (6 deep)	200	230	
MSM019A-...-M5-M.1	27	3	6	3h9 (groove p9)	14	9.2	M3 (6 deep)	200	230	
MSM019B-...-M5-M.0	27	3	6	3h9 (groove p9)	14	9.2	M3 (6 deep)	200	230	
MSM019B-...-M5-M.1	27	3	6	3h9 (groove p9)	14	9.2	M3 (6 deep)	200	230	

Tab. 4-5: Dimensions MSM019

## Technical data

## 4.3 MSM031

## 4.3.1 MSM031 Technical data

## Data sheet - Motor

Designation	Symbol	Unit	MSM031B-0300-NN	MSM031B-R300-NN	MSM031C-0300-NN	MSM031C-R300-NN
Cooling mode nach EN 60034-6		-	IC00			
Listed acc. to UL standard		-	UL 1004; ANSI UL 840			
Listed acc. to CSA standard		-	CSA-C22.2 No. 100			
UL files			E335445			
<b>Electrical parameters</b>						
Rated power	$P_N$					
Continuous torque at standstill 60 K	$M_{0,60}$	Nm	0.64		1.30	
Continuous current at standstill 60 K	$I_{0,60(rms)}$	A	1.60	2.50	2.60	4.60
Maximum current	$I_{max(eff)}$	A	4.90	10.60	7.70	19.50
Maximum torque	$M_{max}$	Nm	1.91		3.80	
Torque constant at 20 °C	$K_{M,N}$	Nm/A	0.41	0.26	0.51	0.28
Voltage constant at 20 °C <sup>1)</sup>	$K_{EMK,1000}$	V/min <sup>-1</sup>	24.5	15.4	30.6	17.0
Winding resistance at 20 °C	$R_{12}$	Ohm	6.10	2.50	3.60	1.10
Winding inductivity	$L_{12}$	mH	14.700	5.700	10.600	3.200
Discharge capacity of the component	$C_{dis}$	nF	0.7		1.4	1.2
Number of pole pairs	$p$	-	4			
<b>Mechanical parameters</b>						
Moment of inertia of the rotor	$J_{red}$	kg*m <sup>2</sup>	0.0000140		0.0000260	
Wire cross section	$A_{60}$	mm <sup>2</sup>	0.75			
Maximum speed	$n_{max}$	min <sup>-1</sup>	5000	3000	5000	3000
Mass <sup>2)</sup>	$m$	kg	0.82 ( 1.3 )		1.2 ( 1.7 )	
Ambient temperature during operation	$T_{amb}$	°C	0 ... 40			
Installation altitude		m	0 ... 1000			
Thermal class (EN 60034-1)	T.CL.	-	130 (B)			
Degree of protection according to IEC 60529	IP	-	IP54			
Sound pressure level	$L_p$	dB[A]	Less than 70			

Latest amendment: 2009-07-07

- 1) Manufacturing tolerance  $\pm 5\%$   
 2) (...) Motors with holding brake  
 Tab. 4-6: MSM - Technical data

Technical data

Designation	Symbol	Unit	Holding brake 1 (MSM031)
Holding torque	$M_4$	Nm	1.27
Rated voltage	$U_N$	V	$24 \pm 1.2$
Rated current	$I_N$	A	0.36
Connection time	$t_1$	ms	50
Disconnection time	$T_2$	ms	15
Moment of inertia of the holding brake	$J_{red}$	kg*m <sup>2</sup>	0.0000018
Switching cycles within standstill			2 Mio

Latest amendment: 2017-09-21

Tab. 4-7: MSM031 Holding brakes - Technical data (optional)

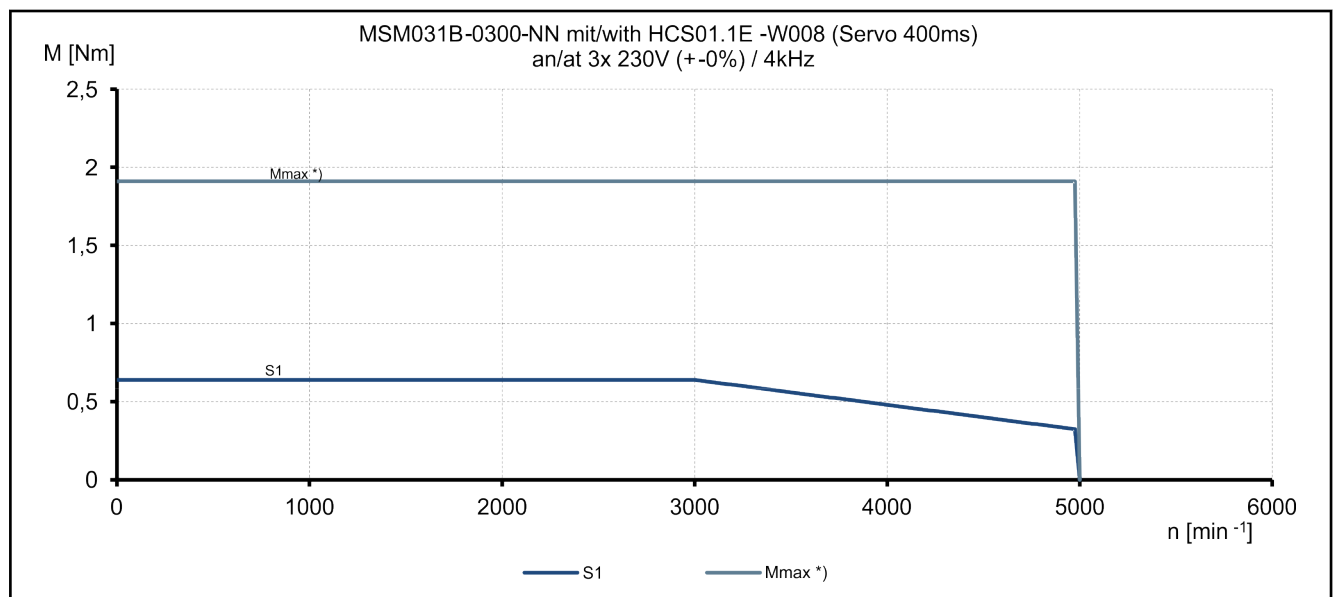


Fig. 4-5: Speed-torque characteristic curves

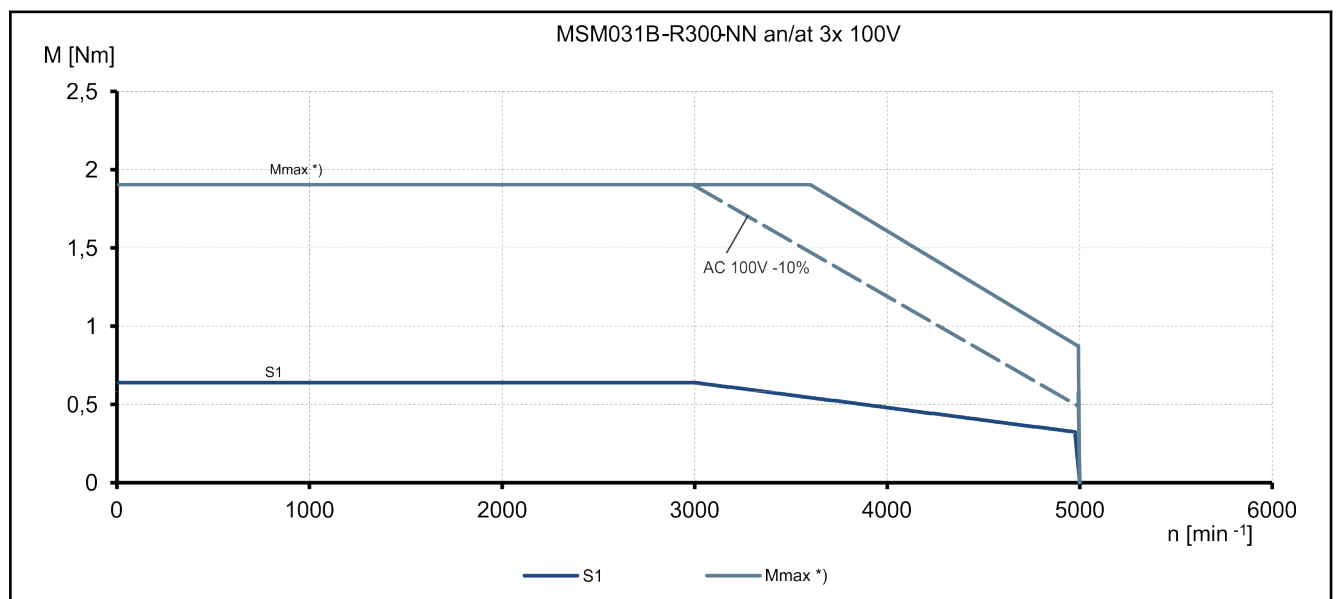


Fig. 4-6: Speed-torque characteristic curves

Technical data

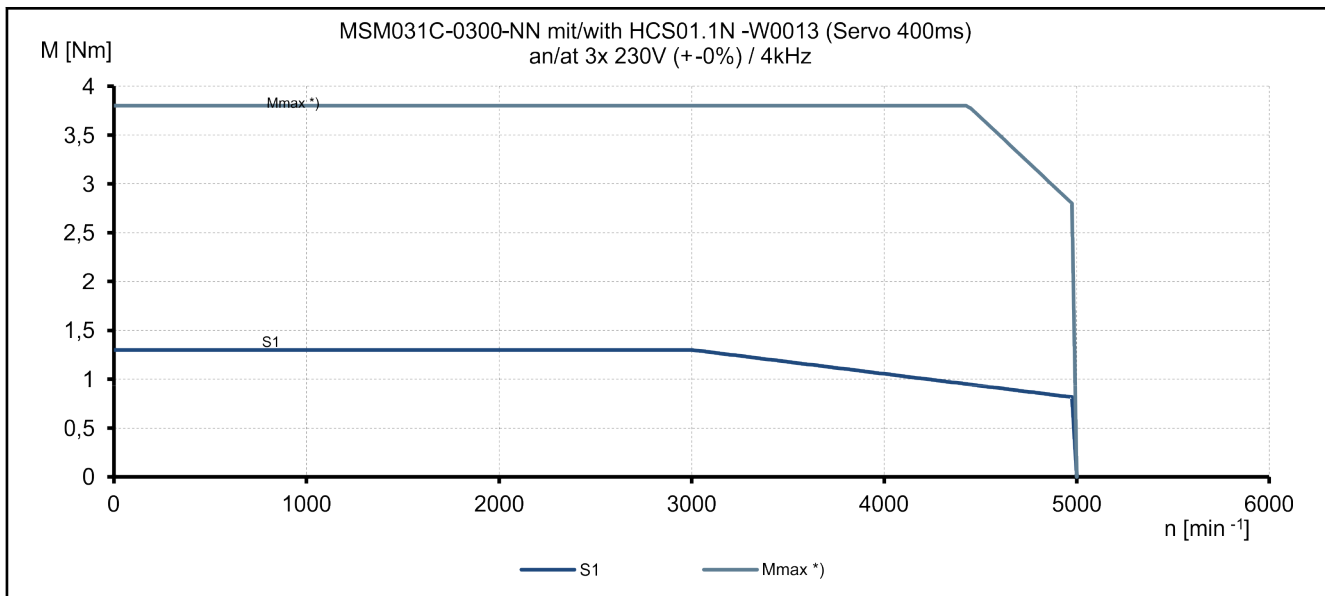


Fig. 4-7: Speed-torque characteristic curves

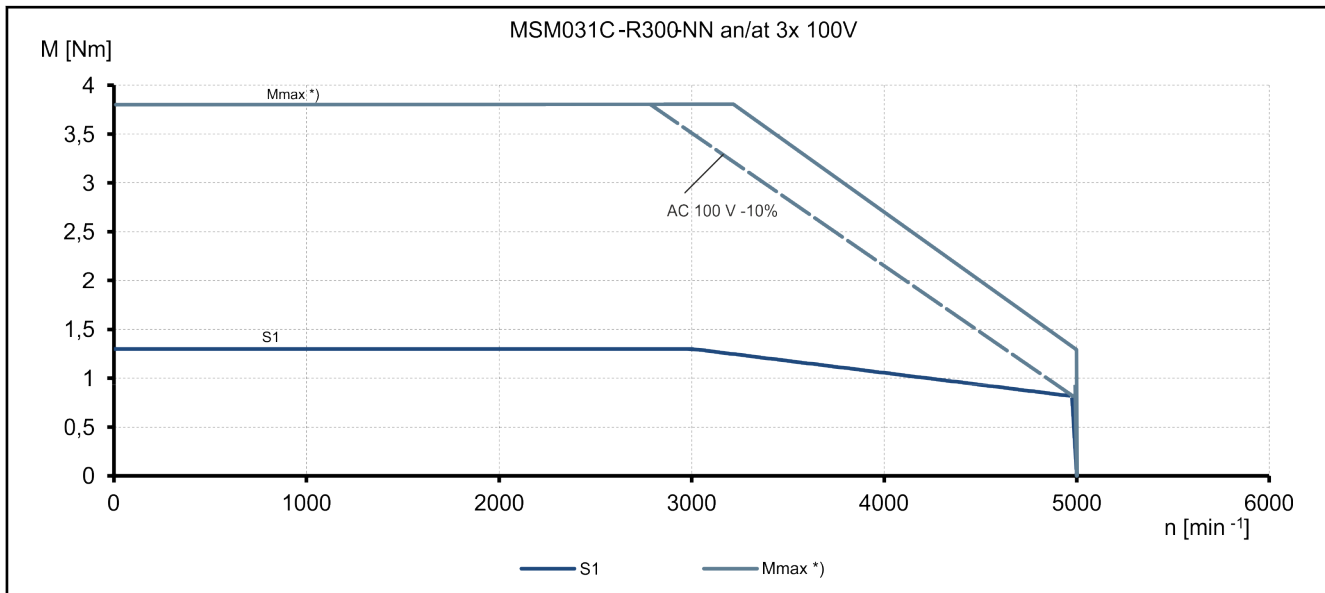
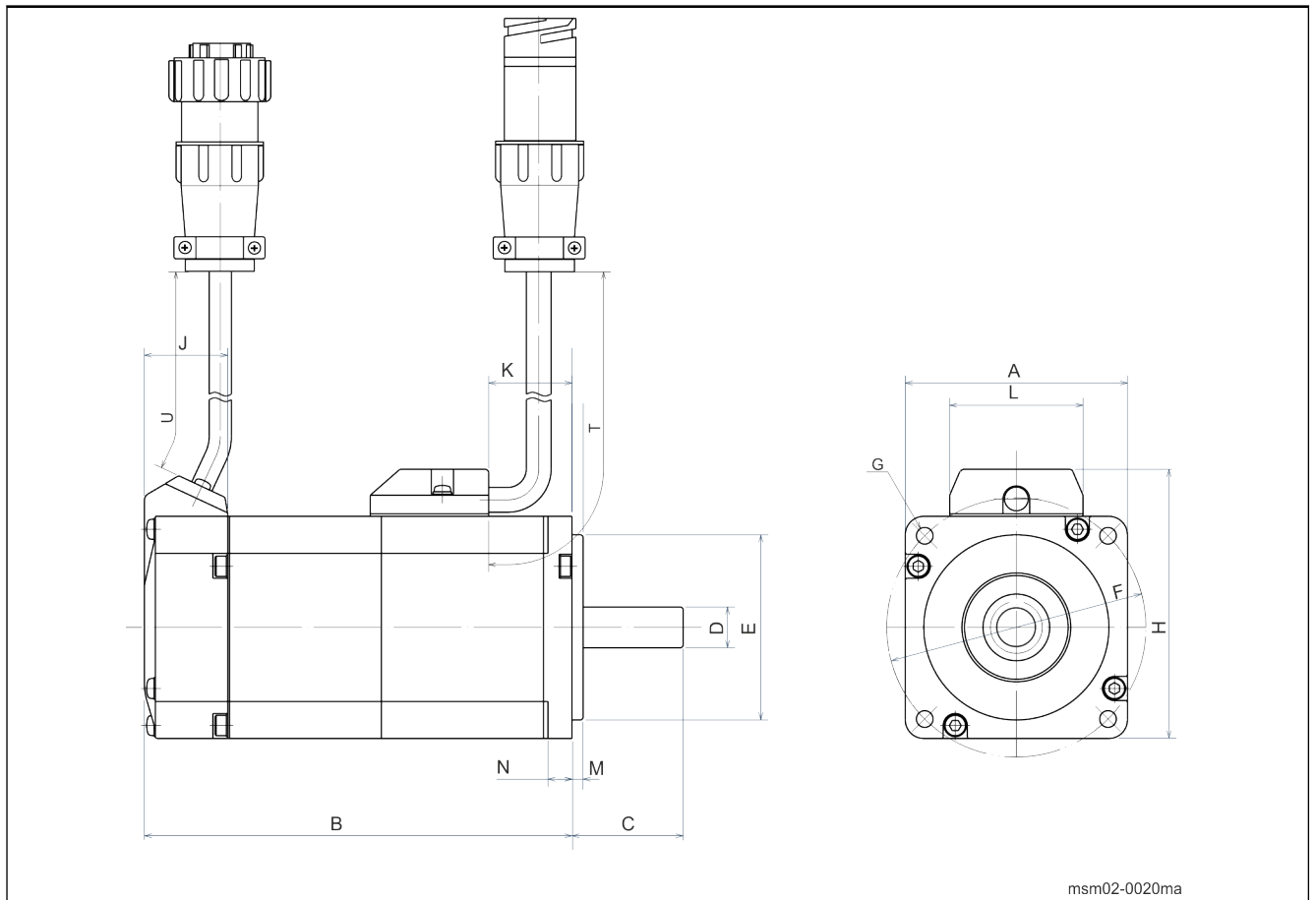


Fig. 4-8: Speed-torque characteristic curves

### 4.3.2 MSM031 Specifications

#### MSM031...M0-C...



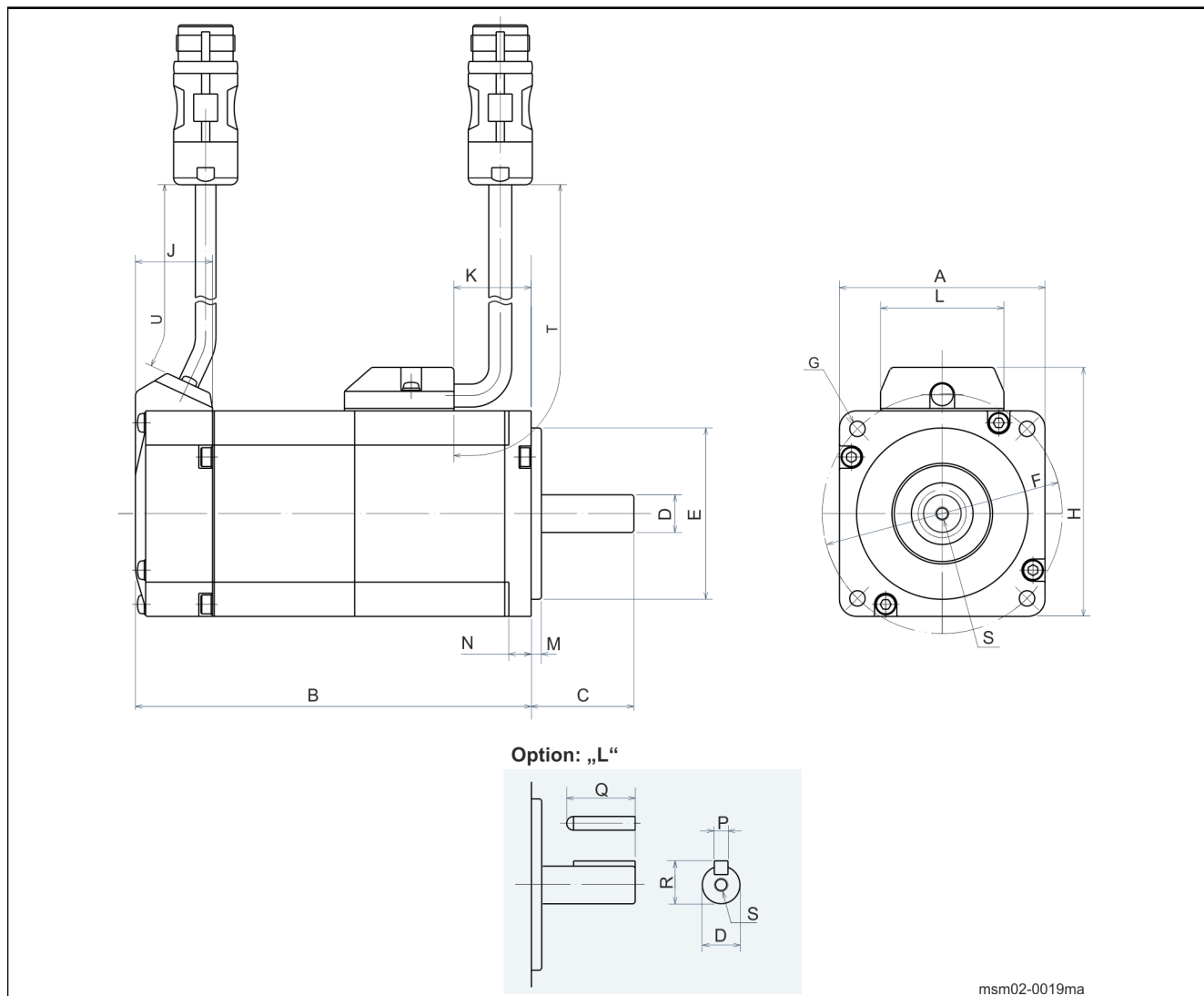
msm02-0020ma

Motor / size	A	B	C	D	E	F	G	H	J	K	
MSM031B-...-M0-CH0	□60	79	30	∅11 <sup>h6</sup>	∅50 <sup>h7</sup>	∅70±0.20	∅4.5	73	22.5	22.5	
MSM031B-...-M0-CH1	□60	115.5	30	∅11 <sup>h6</sup>	∅50 <sup>h7</sup>	∅70±0.20	∅4.5	73	22.5	22.5	
MSM031C-...-M0-CH0	□60	98.5	30	∅14 <sup>h6</sup>	∅50 <sup>h7</sup>	∅70±0.20	∅4.5	73	22.5	42	
MSM031C-...-M0-CH1	□60	135	30	∅14 <sup>h6</sup>	∅50 <sup>h7</sup>	∅70±0.20	∅4.5	73	22.5	42	
Motor / size	L	M	N							T	U
MSM031B-...-M0-CH0	36	3	6.5							200	220
MSM031B-...-M0-CH1	36	3	6.5							200	220
MSM031C-...-M0-CH0	36	3	6.5							200	220
MSM031C-...-M0-CH1	36	3	6.5							200	220

Tab. 4-8: Dimensions MSM031

Technical data

MSM031...M5-M...



mism02-0019ma

Motor / size	A	B	C	D	E	F	G	H	J	K
MSM031B-...-M5-M.0	□60	79	30	ø11 <sup>h6</sup>	ø50 <sup>h7</sup>	ø70±0.20	ø4.5	73	22.5	22.5
MSM031B-...-M5-M.1	□60	115.5	30	ø11 <sup>h6</sup>	ø50 <sup>h7</sup>	ø70±0.20	ø4.5	73	22.5	22.5
MSM031C-...-M5-M.0	□60	98.5	30	ø14 <sup>h6</sup>	ø50 <sup>h7</sup>	ø70±0.20	ø4.5	73	22.5	42
MSM031C-...-M5-M.1	□60	135	30	ø14 <sup>h6</sup>	ø50 <sup>h7</sup>	ø70±0.20	ø4.5	73	22.5	42
Motor / size	L	M	N	P	Q	R	S	T	U	
MSM031B-...-M5-M.0	36	3	6.5	4h9 (groove p9)	20	12.5	M4 (8 deep)	200	220	
MSM031B-...-M5-M.1	36	3	6.5	4h9 (groove p9)	20	12.5	M4 (8 deep)	200	220	
MSM031C-...-M5-M.0	36	3	6.5	5h9 (groove p9)	25	16	M5 (10 deep)	200	220	
MSM031C-...-M5-M.1	36	3	6.5	5h9 (groove p9)	25	16	M5 (10 deep)	200	220	

Tab. 4-9: Dimensions MSM031

## 4.4 MSM041

### 4.4.1 MSM041 Technical data

#### Data sheet - Motor

Designation	Symbol	Unit	MSM041B-0300-NN
Cooling mode nach EN 60034-6		-	IC00
Listed acc. to UL standard		-	UL 1004; ANSI UL 840
Listed acc. to CSA standard		-	CSA-C22,2 No, 100
UL files			E335445
<b>Electrical parameters</b>			
Rated power	$P_N$		
Continuous torque at standstill 60 K	$M_{0,60}$	Nm	2.40
Continuous current at standstill 60 K	$I_{0,60(\text{rms})}$	A	4.00
Maximum current	$I_{\text{max}(\text{eff})}$	A	12.00
Maximum torque	$M_{\text{max}}$	Nm	7.10
Torque constant at 20 °C	$K_{M,N}$	Nm/A	0.64
Voltage constant at 20 °C <sup>1)</sup>	$K_{EMK,1000}$	V/min <sup>-1</sup>	37.6
Winding resistance at 20 °C	$R_{12}$	Ohm	1.50
Winding inductivity	$L_{12}$	mH	6.700
Discharge capacity of the component	$C_{\text{dis}}$	nF	1.3
Number of pole pairs	$p$	-	4
<b>Mechanical parameters</b>			
Moment of inertia of the rotor	$J_{\text{red}}$	kg*m <sup>2</sup>	0.0000870
Wire cross section	$A_{60}$	mm <sup>2</sup>	0.75
Maximum speed	$n_{\text{max}}$	min <sup>-1</sup>	4500
Mass <sup>2)</sup>	$m$	kg	2.3 ( 3.1 )
Ambient temperature during operation	$T_{\text{amb}}$	°C	0 ... 40
Installation altitude		m	0 ... 1000
Thermal class (EN 60034-1)	T.CL.	-	130 (B)
Degree of protection according to IEC 60529	IP	-	IP54
Sound pressure level	$L_p$	dB[A]	Less than 70

Latest amendment: 2008-11-05

- 1) Manufacturing tolerance  $\pm 5\%$   
 2) (...) Motors with holding brake  
 Tab. 4-10: MSM - Technical data

Technical data

Designation	Symbol	Unit	Holding brake 1 (MSM041)
Holding torque	$M_4$	Nm	2.45
Rated voltage	$U_N$	V	$24 \pm 1.2$
Rated current	$I_N$	A	0.42
Connection time	$t_1$	ms	70
Disconnection time	$T_2$	ms	20
Moment of inertia of the holding brake	$J_{red}$	$kg \cdot m^2$	0.0000075
Switching cycles within standstill			2 Mio

Latest amendment: 2017-09-21

Tab. 4-11: MSM041 Holding brakes - Technical data (optional)

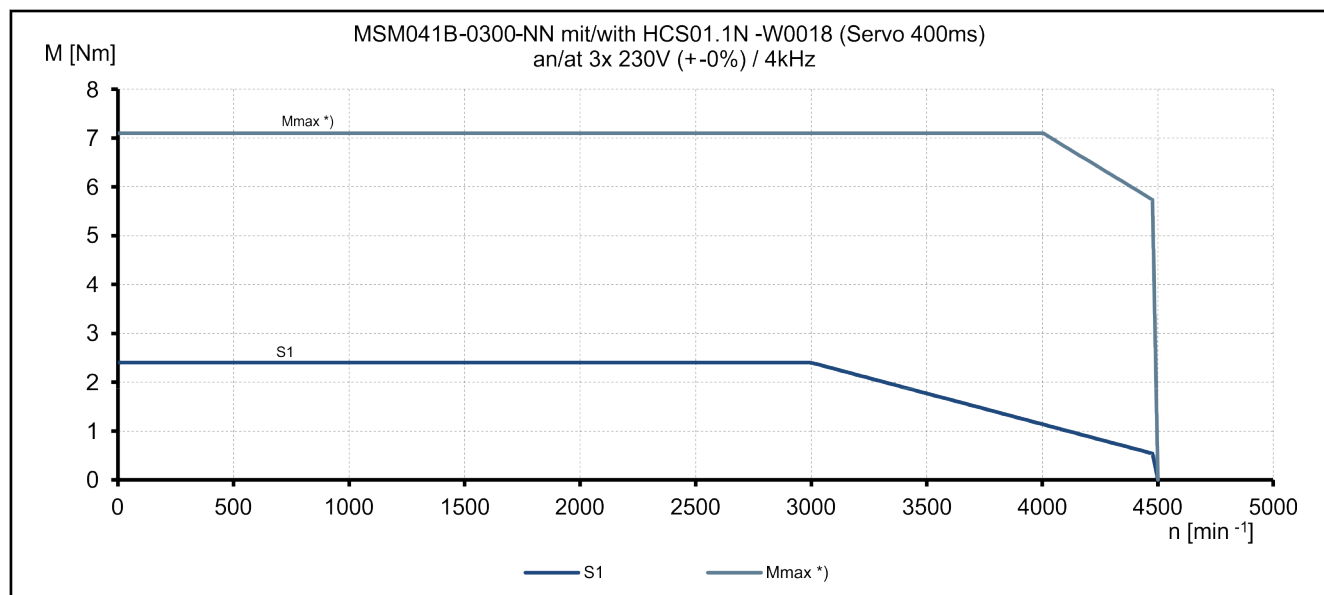
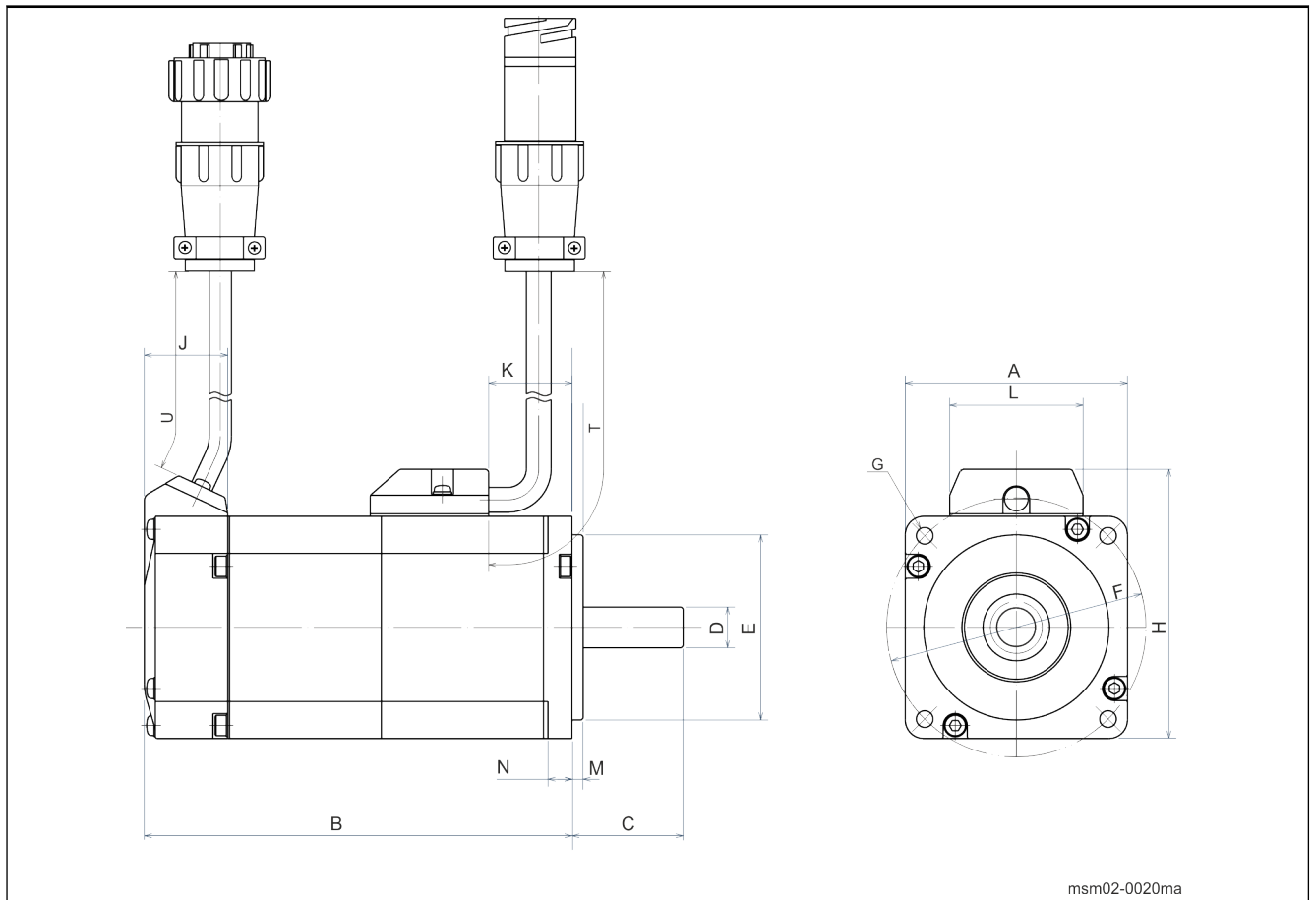


Fig. 4-9: Speed-torque characteristic curves



## 4.4.2 MSM041 Specifications

### MSM041...M0-C...



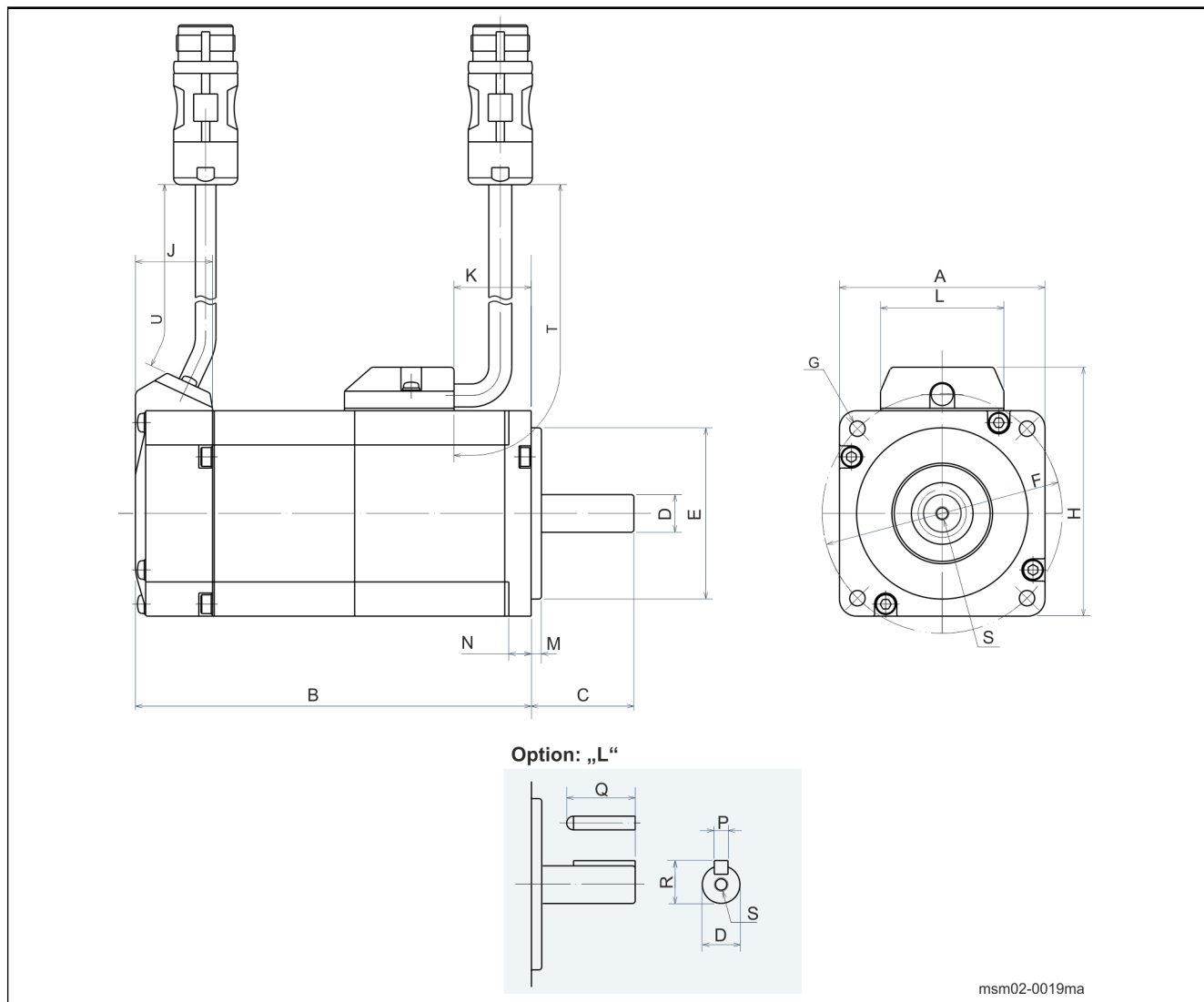
msm02-0020ma

Motor / size	A	B	C	D	E	F	G	H	J	K	
MSM041B-...-M0-CH0	□80	112	35	∅19 <sup>h6</sup>	∅70 <sup>h7</sup>	∅90±0.20	∅6	93	25.5	52.2	
MSM041B-...-M0-CH1	□80	149	35	∅19 <sup>h6</sup>	∅70 <sup>h7</sup>	∅90±0.20	∅6	93	25.5	52.2	
Motor / size	L	M	N							T	U
MSM041B-...-M0-CH0	36	3	8							200	220
MSM041B-...-M0-CH1	36	3	8							200	220

Tab. 4-12: Dimensions MSM041

Technical data

MSM041...M5-M...



Motor / size	A	B	C	D	E	F	G	H	J	K
MSM041B-...-M5-M.0	□80	112	35	ø19 <sup>h6</sup>	ø70 <sup>h7</sup>	ø90±0.20	ø6	93	25.5	52.2
MSM041B-...-M5-M.1	□80	149	35	ø19 <sup>h6</sup>	ø70 <sup>h7</sup>	ø90±0.20	ø6	93	25.5	52.2
Motor / size	L	M	N	P		Q	R	S	T	U
MSM041B-...-M5-M.0	36	3	8	6h9 (groove p9)		25	21.5	M5 (10 deep)	200	220
MSM041B-...-M5-M.1	36	3	8	6h9 (groove p9)		25	21.5	M5 (10 deep)	200	220

Tab. 4-13: Dimensions MSM041

## 5 Motor encoder MSM

### 5.1 Motor encoder M0

Data sheet - Geber

Designation	Symbol	Unit	GEBER-M0 (MSM)	
Battery extern			-	Yes
Encoder design	-	-	Singleturn absolute	Multiturn absolute
Distinguishable revolutions	-	-	1	65536
Incremental signals	-	-	without	
Resolution of encoder	-	-	17 bit	17+16 bit
System accuracy	-	"	tbd	
Maximum encoder speed		min <sup>-1</sup>	6000	
Supply voltage	V <sub>CC Encoder</sub>	V	4.75 ... 5.25	
Max. current consumption	I <sub>Encoder</sub>	mA	70	
Latest amendment: 2009-07-07				

" Angular seconds

Tab. 5-1: Encoder data

**Singleturn absolute value encoder**

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

**Multiturn absolute value encoder**

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

**Details for multiturn signals**

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

**Batterybox**

Designation	Order number
SUP-E01-MSM-BATTERYBOX	R911324240

**Spare battery**

Designation	Order number
SUP-E03-DKC*CS-BATTRY	R911295648

Motor encoder MSM

## 5.2 Motor encoder M5

### Data sheet - Geber

Designation	Symbol	Unit	GEBER-M5 (MSM)	
Battery extern			-	Yes
Encoder design	-	-	Singleturn absolute	Multiturn absolute
Distinguishable revolutions	-	-	1	65536
Incremental signals	-	-	without	
Resolution of encoder	-	-	20 bit	20 + 16 bit
System accuracy typical/ maximum	-	"	-170 / -240	
Maximum encoder speed		min <sup>-1</sup>	6000	
Supply voltage	VCC <sub>Encoder</sub>	V	4.5 ... 5.5	
Max. current consumption	I <sub>Encoder</sub>	mA	70	
Latest amendment: 2017-09-21				

" Angular seconds

Tab. 5-2: Encoder data

#### Singleturn absolute value encoder

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

#### Multiturn absolute value encoder

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

#### Details for multiturn signals

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

#### Batterybox

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

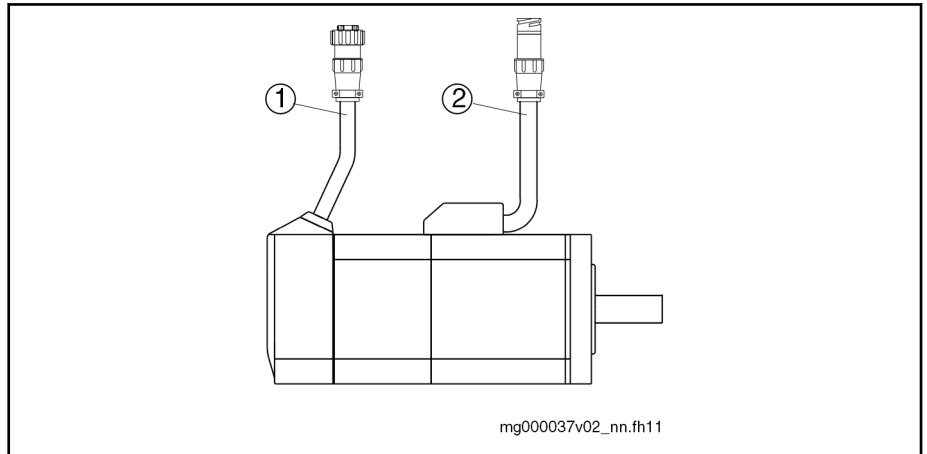
#### Spare battery

Designation	Order number
SUP-E02-MSM-BATTERY	R911369925

## 6 Connection technique

### 6.1 Electrical connection "C" cable connection

**Bayonet lock IP54** The connections for output and encoder of MSM motors are provided by flexible connection cables with plug connector (IP 54) and bayonet lock. When connecting the connection cables, the bayonet lock should lock in place.



- 1 Encoder connection
- 2 Power connection

Fig. 6-1: Motor connection MSM

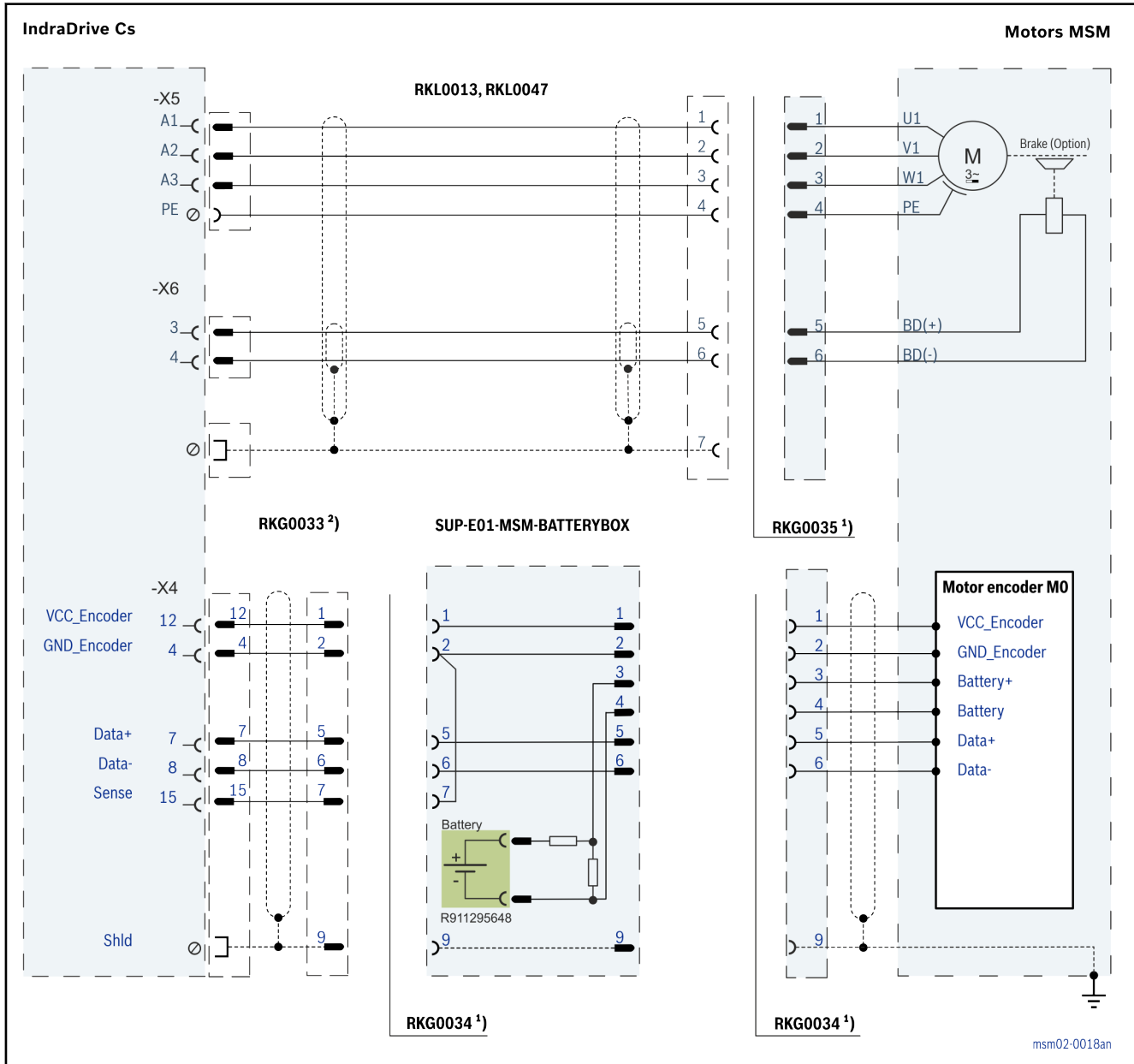
The length of the flexible connection cable is included in the following table.

Motor	Length of connection cable and plug connector	
	Encoder	Output
MSM019	230 mm (+63 mm plug connector INS0758)	200 mm (+70 mm plug connector INS0757)
MSM031	220 mm (+63 mm plug connector INS0758)	
MSM041		

Tab. 6-1: MSM motors: Length of connection cable

Connection technique

Connection overview



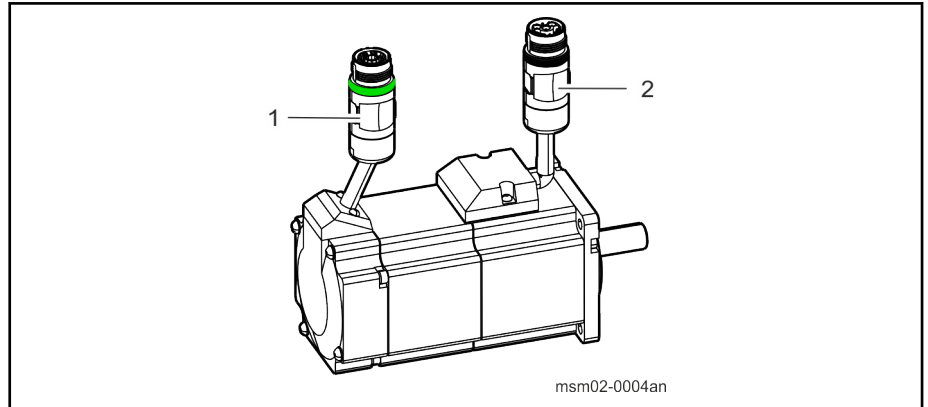
- 1) Optional extension cable
- 2) In case of single-turn applications, RKG033 should be connected directly to the MSM motor by using the INS0758 cable plug.
- ② Shielding connection over housing

Fig. 6-2: Interconnection diagram MSK with encoder M0 and battery box

The battery box is to be installed close to the motor; the maximum cable length between battery box and MSM motor (RKG0034) is 2.0 m.

## 6.2 Electrical connection "M" cable connection round plug M17

**SpeedCon quick lock IP67** The connections for output and encoder of MSM motors are provided by flexible connection cables with round plug connector M17 (IP 67) and Speedcon lock.



- 1 Encoder connection (green color coder ring)
- 2 Power connection (black color code ring)

Fig. 6-3: Motor connection Speedcon MSM

The length of the flexible connection cable is included in the following table.

Motor	Length of connection cable ("M" cable connection round plug M17)	
	Encoder	Output
MSM019	230 mm (+47 mm plug connector RGS1782)	200 mm (+47 mm plug connector RLS1722)
MSM031	220 mm (+47 mm plug connector RGS1782)	
MSM041	220 mm (+47 mm plug connector RGS1782)	

Tab. 6-2: MSM motors: Length of connection cable ("M" cable connection round plug M17)

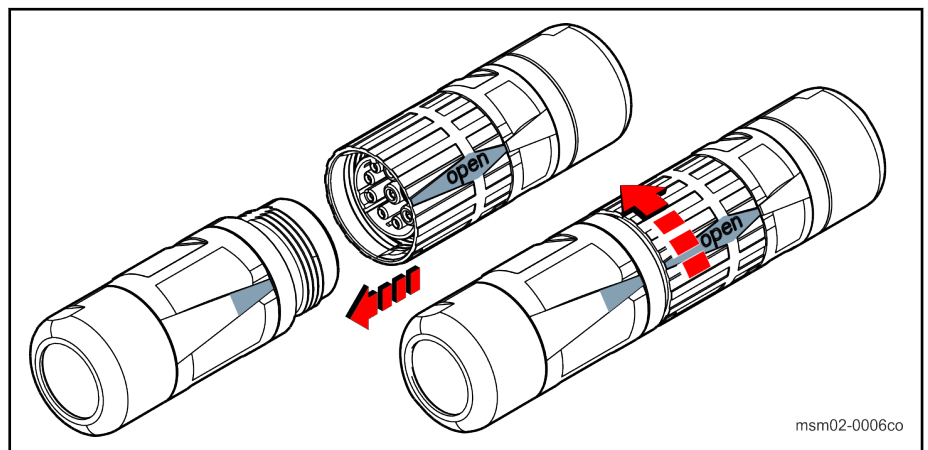
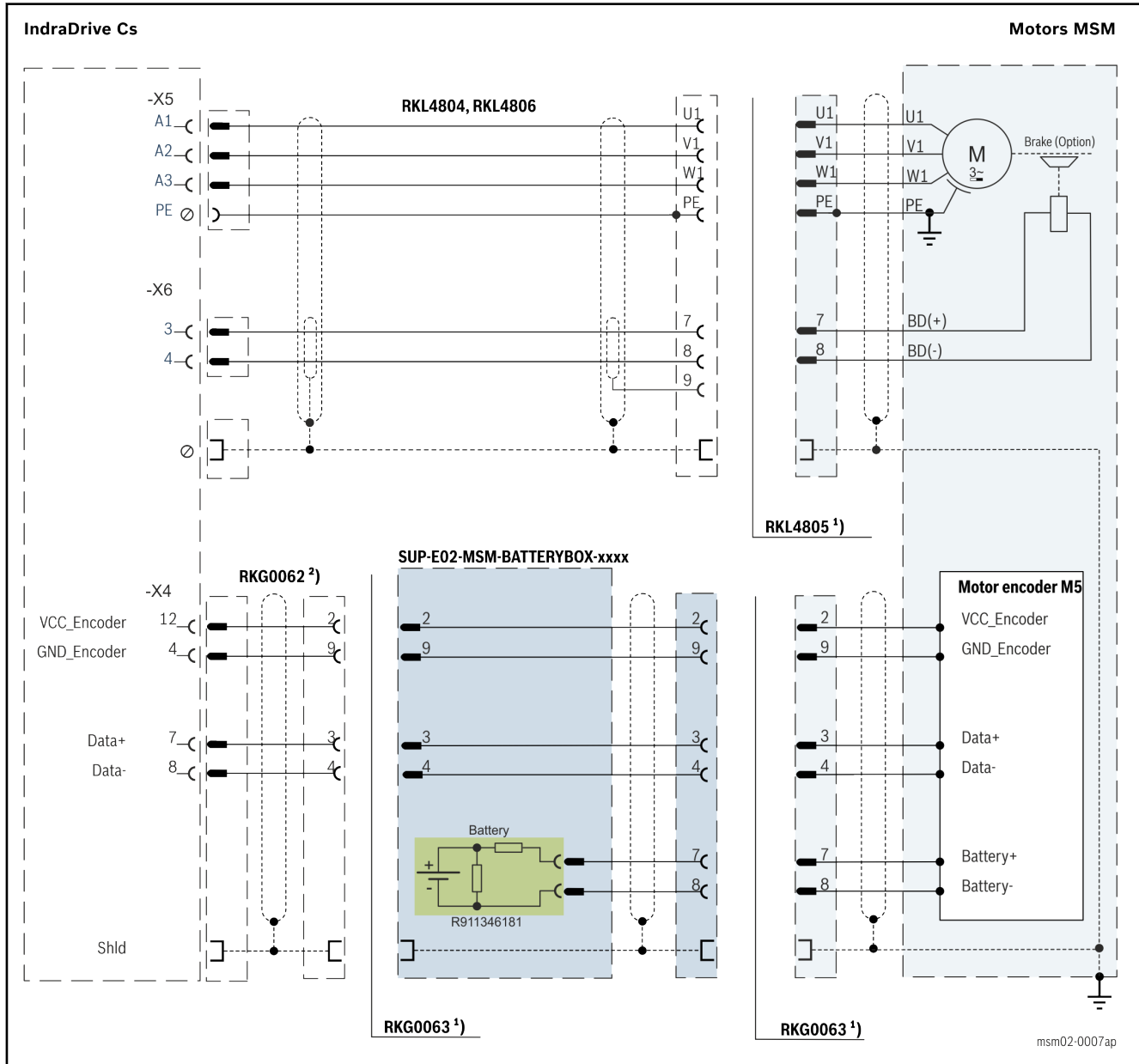


Fig. 6-4: Speedcon quick lock

Plugging of cable plugs in "open" position and "hand-tighten" the cable plug with a rotation of approx. 90°.

Connection technique

Connection overview



- 1 Optional extension cable
  - 2 In case of single-turn applications, the cable should be connected directly to the motor
  - ② Shielding connection over housing
- Fig. 6-5: Interconnection diagram MSM



## 6.3 Ready-made connection cables

### 6.3.1 Power cables

Motor	Controllers		
	HCS01.1E-W0003 HCS01.1E-W0005 HCS01.1E-W0006 HCS01.1E-W0008 HCS01.1E-W0009 HCS01.1E-W0013	HCS01.1E-W0018 HCS01.1E-W0028	NYCe4000
MSM019A-_300-NN-__-C__	RKL0013 (RKL0035)	RKL0047 (RKL0035)	-
MSM019B-_300-NN-__-C__			
MSM031B-_300-NN-__-C__			
MSM031C-_300-NN-__-C__			
MSM041B-_300-NN-__-C__	RKL4804 (RKL4805)	RKL4806 (RKL4805)	-
MSM019A-_300-NN-__-M__			
MSM019B-_300-NN-__-M__			
MSM031B-_300-NN-__-M__			
MSM031C-_300-NN-__-M__	-	-	RKL0044 (RKL0035)
MSM041B-_300-NN-__-C__			
MSM019B-R300-NN-__-C__			
MSM031B-R300-NN-__-C__			
MSM031C-R300-NN-__-C__	-	-	RKL4807 (RKL4805)
MSM041B-R300-NN-__-C__			
MSM019B-R300-NN-__-M__			
MSM031B-R300-NN-__-M__			
MSM031C-R300-NN-__-M__			
MSM041B-R300-NN-__-M__			

(...) Extension (optional)  
 Tab. 6-3: MSM power cable

## Connection technique

## 6.3.2 Encoder cable

Motor	Controllers			
				NYCe4000
		HCS01.1E-W0003 HCS01.1E-W0005 HCS01.1E-W0006 HCS01.1E-W0008 HCS01.1E-W0009 HCS01.1E-W0013 HCS01.1E-W0018 HCS01.1E-W0028		
	Single-turn	Multi-turn + battery box	Multi-turn + battery at controller	
MSM019A-_300-NN-__-C__	RKG0033 (RKG0034)	RKG0033	RKG0041 (RKG0034)	-
MSM019B-_300-NN-__-C__		+		
MSM031B-_300-NN-__-C__		SUP-E01-MSM-BAT- TERRYBOX		
MSM031C-_300-NN-__-C__		+		
MSM041B-_300-NN-__-C__		RKG0034		
MSM019A-_300-NN-__-M__	RKG0062 (RKG0063)	RKG0062	RKG0065 (RKG0063)	-
MSM019B-_300-NN-__-M__		+		
MSM031B-_300-NN-__-M__		SUP-E02_MSM-BAT- TERRYBOX-xxxx		
MSM031C-_300-NN-__-M__		+		
MSM041B-_300-NN-__-M__		RKG0063		
MSM019B-R300-NN-__-C__	-	-	-	RKG0040 (RKG0034)
MSM031B-R300-NN-__-C__				
MSM031C-R300-NN-__-C__				
MSM041B-R300-NN-__-C__				
MSM019B-R300-NN-__-M__	-	-	-	RKG0064 (RKG0063)
MSM031B-R300-NN-__-M__				
MSM031C-R300-NN-__-M__				
MSM041B-R300-NN-__-M__				

(...) Extension (optional)  
 Tab. 6-4: MSM power cable

## 7 Transport and storage

### 7.1 Transport of motors

#### Environmental and operating conditions - Transport

Designation	Symbol	Unit	Value
Temperature range	$T_{a\_tran}$	°C	-20 ... +80
Relative air humidity		%	5 ... 95
Absolute air humidity		g/m <sup>3</sup>	1 ... 60
Climatic class (IEC721)			2K3
Condensation			not allowed
Icing			not allowed

Tab. 7-1: Environmental and operating conditions - Transport

### 7.2 Storage of motors

#### Environmental and operating conditions - Storage

Designation	Symbol	Unit	Value
Temperature range	$T_{a\_store}$	°C	-20 ... +60
Relative air humidity		%	5 ... 95
Absolute air humidity		g/m <sup>3</sup>	1 ... 29
Climatic class (IEC721)			1K3
Condensation			not allowed
Icing			not allowed

Tab. 7-2: Environmental and operating conditions - Storage



## 8 Assembly accessory

### 8.1 Flange fastening

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

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

#### Mounting screws: MSM Motors

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

Tab. 8-1: Tightening torque of mounting screws



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

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

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

Assembly accessory

## 8.2 Battery box SUP-E01-MSM-BATTERYBOX

**Use** The battery box "SUP-E01-MSM-BATTERYBOX" is an set of accessories for operation of MSM motors with absolute encoder (M0) and is used for buffering of the encoder data in case of power shut off.

Scope of delivery

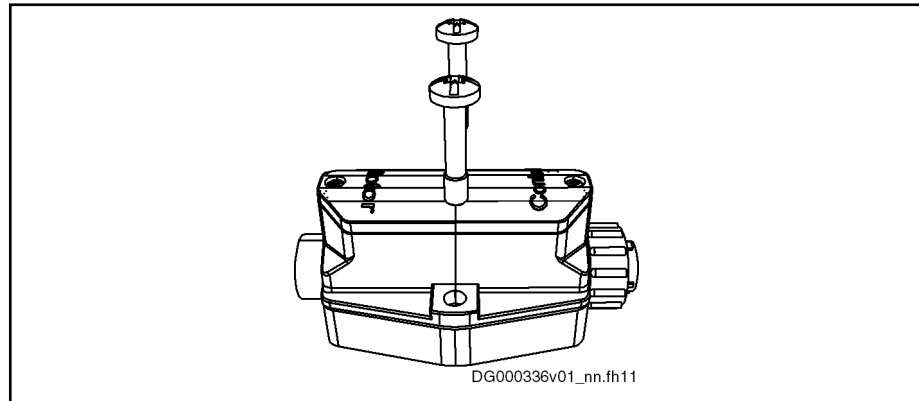


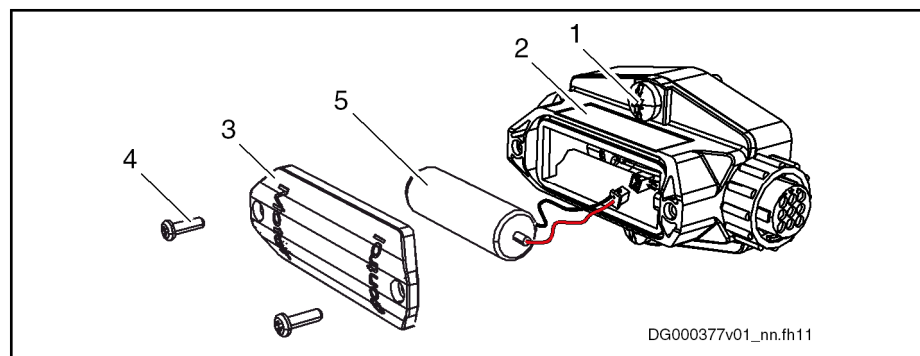
Fig. 8-1: Battery box

**Battery box complete with**

- **Battery:** Type: ER6C, 3.6 V; 1800 mA, lithium; lifetime: up to 10 years, depending on use and ambient temperature
- **Assembly screws:** M6×30; screw head: Torx and slot

The battery box "SUP-E01-MSM-BATTERYBOX" is delivered in ready-for-use state with battery.

Components:



- |   |  |
|---|--|
| 1 | Assembly screw   |
| 2 | Housing  |
| 3 | Housing lid  |
| 4 | Housing lid screw (self-shaping screw 30×10; tightening torque 0.8 Nm) |
| 5 | Battery  |

Fig. 8-2: Components of battery box

Assembly accessory

Dimensions

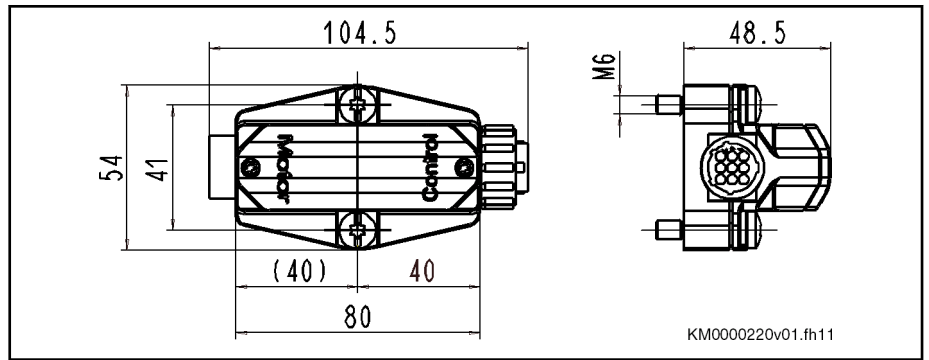


Fig. 8-3: Dimensions

Weight 120 g

Mounting



Install the battery box in the immediate vicinity of the motor.

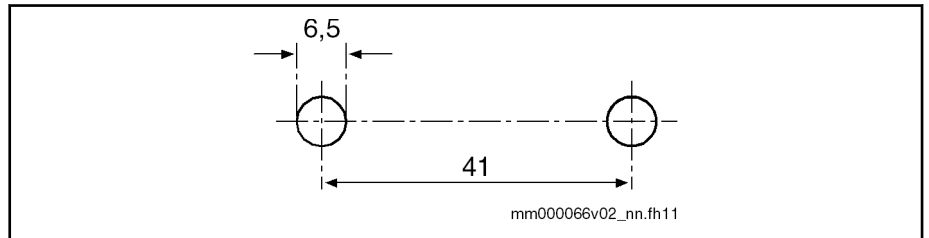
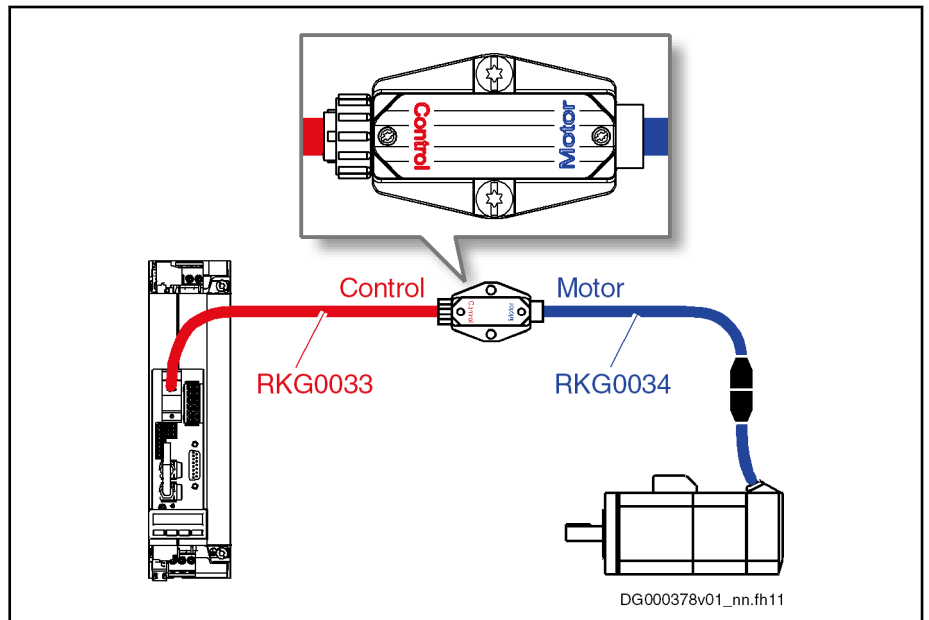


Fig. 8-4: Drilling diagram for battery box

- Assembly screws: M6×30
- Tightening torque  $M_A$ : 3 Nm

Cabling



- RKG0033 Encoder cable
- RKG0034 Extension cable (optional)

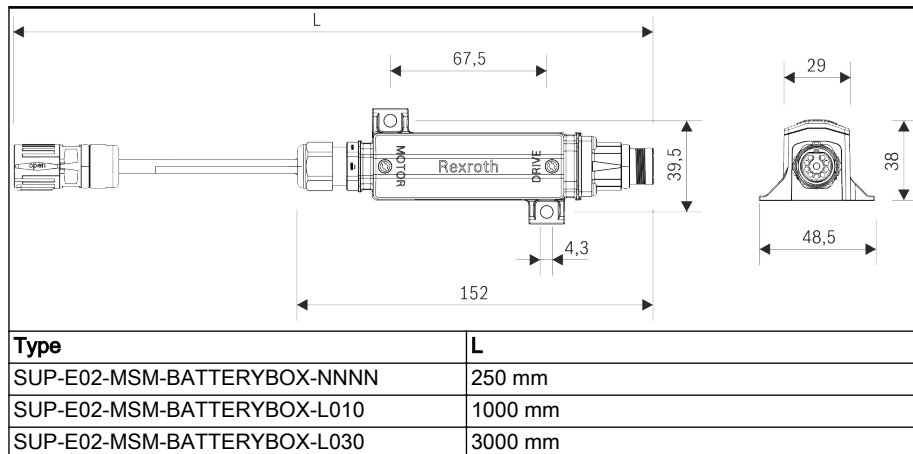
Fig. 8-5: Cabling of battery box

Assembly accessory

## 8.3 Batterybox SUP-E02-MSM-BATTERYBOX-xxxx

**Use** When operating MSM motors with absolute value encoder (M5), the battery-box serves for buffering the encoder data when disconnecting the voltage.

**Scope of delivery**



Tab. 8-2: Batterybox measures

**Battery box complete with**

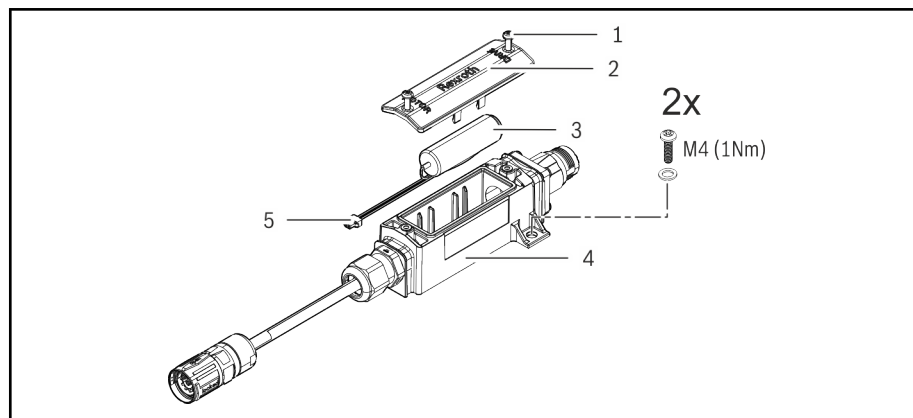
- **Battery:** Type PRM1-03V6-2600C-D2-LITH-ZNR-50, 3.6 V; 2600 mAh, Lithium; Lifetime: up to 10 years, dependet from stress and environmental temperature

When the "SUP-E02-MSM-BATTERYBOX-xxxx" battery box is delivered, it is ready to use.

Recommendation Battery change after 5 years

Order number spare battery **R911369925** SUP-E02-MSM-BATTERY

Components:



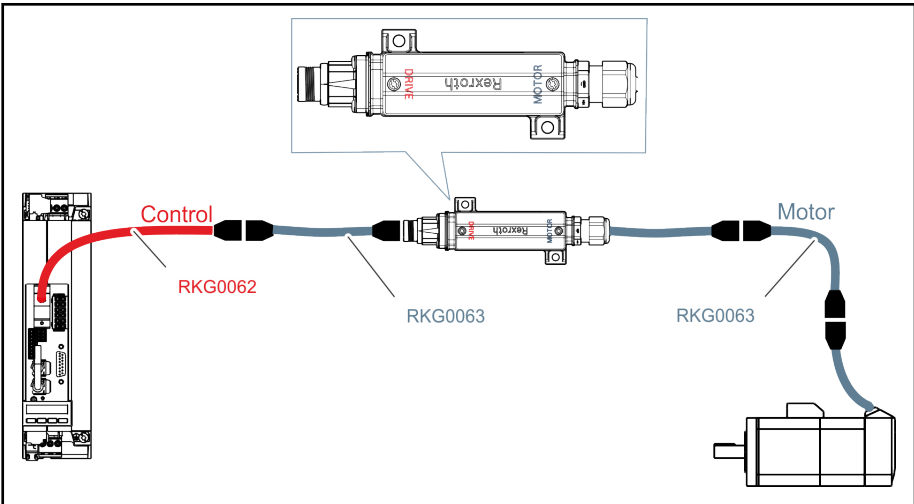
- 1 Housing screw ( $M_A$  0.7 Nm)
- 2 Housing lid
- 3 Battery
- 4 Housing
- 5 Battery connector

Fig. 8-6: Components of a battery box

For fastening the battery box, use 2xM4 mounting screws mit washer and screw locking. The fastening screws are not included in the scope of delivery and must be customized onto the required mounting situation. Tightening torque of fastening screws 1 Nm.



Cabling



- RKG0062 Encoder cable
  - RKG0063 Extension cable (optional)
- Fig. 8-7: Batterybox cabling

Assembly accessory

## 8.4 Shaft sealing ring

Shaft sealing rings are available as accessory. The shaft sealing rings increase the IP protection within the output shaft.

Retrofitting must be done on the customer side. The proper function requires proper mounting.

Motor	Order no.	Designation
MSM019	R911311237	SUP-M01-MSM020-OILSEAL
MSM031	R911311238	SUP-M01-MSM030-OILSEAL
MSM041	R911311239	SUP-M01-MSM040-OILSEAL

Tab. 8-3: Accessories MSM Shaft sealing ring

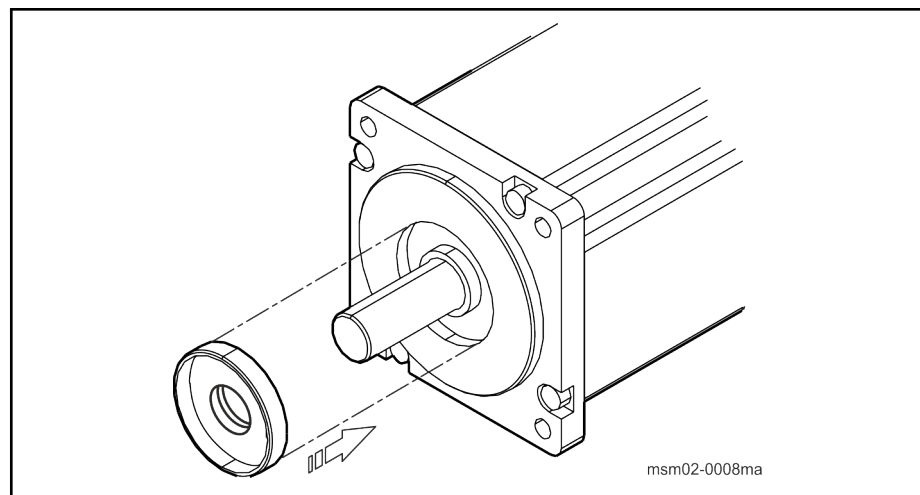


Fig. 8-8: Mounting accessories radial shaft sealing ring MSM

Mounting notes:

- Clean the place of the radial shaft sealing ring.
- Slide the radial shaft sealing ring over the shaft and observe that the key does not damage the sealing lip.
- Slowly slight the radial shaft sealing ring by means of mounting tools onto the motor.
- Grease the radial shaft sealing ring.

## 9 Environmental protection and disposal

### 9.1 Environmental protection

**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.

**No release of hazardous substances** Our products do not contain any hazardous substances which may be released in the case of appropriate use. Normally, our products will not have any negative influences on the environment.

**Significant components** Basically, our products contain the following components:

**Electronic devices**

- steel
- aluminum
- copper
- synthetic materials
- electronic components and modules

**Motors**

- steel
- aluminum
- copper
- brass
- magnetic materials
- electronic components and modules

### 9.2 Disposal

**Return of products** Our products can be returned to our premises 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 must not contain any undue foreign material or foreign components.

Send the products "free domicile" to the following address:

Bosch Rexroth AG  
Electric Drives and Controls  
Buergermeister-Dr.-Nebel-Strasse 2  
97816 Lohr am Main, Germany

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

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

**Batteries and accumulators** Batteries and accumulators can be labeled with this symbol.



The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin.

The end user within the EU is legally obligated to return used batteries. Outside the validity of the EU Directive 2006/66/EC keep the stipulated directives.

Used batteries can contain hazardous substances, which can harm the environment or the people's health when they are improperly stored or disposed of.

After use, the batteries or accumulators contained in Rexroth products have to be properly disposed of according to the country-specific collection.

**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 modules.

## Environmental protection and disposal

Metals contained in electric and electronic modules can also be recycled by means of special separation processes.

Products made of plastics can contain flame retardants. These plastic parts are labeled according to EN ISO 1043. They have to be recycled separately or disposed of according to the valid legal requirements.

## 10 Service and support

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

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

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

Phone: **+49 9352 40 5060**  
Fax: **+49 9352 18 4941**  
E-mail: [service.svc@boschrexroth.de](mailto:service.svc@boschrexroth.de)  
Internet: <http://www.boschrexroth.com>

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

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

**Preparing information** To be able to help you more quickly and efficiently, please have the following information ready:

- Detailed description of malfunction and circumstances
- Type plate specifications of the affected products, in particular type codes and serial numbers
- Your contact data (phone and fax number as well as your e-mail address)



# 11 Appendix

Electric Drives and Controls	Hydraulics	Linear Motion and Assembly Technologies	Pneumatics	Service	<b>Rexroth</b> Bosch Group																																																																																																
<p><b>Konformitätserklärung</b>                  im Sinne der EG-Niederspannungsrichtlinie 2006/95/EG, Anhang III B                  Produkt/Product/Produit: MSM</p>					<p><b>TC 30321-1</b>                  2008-11-28</p>																																																																																																
<p><b>Declaration of Conformity as per EC Low-Voltage directive 2006/95/EC, Attachment III B</b>  <b>Déclaration du fabricant conformément à la directive "CE" relative à la basse tension 2006/95/EC, Annexe III B</b></p>																																																																																																					
Hiermit erklären wir in alleiniger Verantwortung, dass das Produkt		Assuming sole responsibility, we herewith declare that the product		Par la présente, nous déclarons sous notre propre et unique responsabilité que le produit																																																																																																	
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;"><b>1</b></td> <td style="width: 30%;"><b>Produkt:</b></td> <td colspan="4">AC-Motor</td> </tr> <tr> <td></td> <td><b>Product:</b></td> <td colspan="4">AC motor</td> </tr> <tr> <td></td> <td><b>Produit:</b></td> <td colspan="4">Moteur AC</td> </tr> <tr> <td><b>2</b></td> <td><b>Hersteller:</b></td> <td colspan="4">Bosch Rexroth Electric Drives and Controls GmbH</td> </tr> <tr> <td></td> <td><b>Manufacturer:</b></td> <td colspan="4">Bürgermeister-Dr.-Nebel-Straße 2</td> </tr> <tr> <td></td> <td><b>Constructeur:</b></td> <td colspan="4">97816 Lohr a. Main Germany</td> </tr> <tr> <td><b>3</b></td> <td><b>Typ:</b></td> <td>MSM019</td> <td>MSM020</td> <td colspan="2"></td> </tr> <tr> <td></td> <td><b>Type:</b></td> <td>MSM030</td> <td>MSM031</td> <td colspan="2"></td> </tr> <tr> <td></td> <td><b>Type:</b></td> <td>MSM040</td> <td>MSM041</td> <td colspan="2"></td> </tr> <tr> <td><b>4</b></td> <td><b>ab Herstellungsdatum:</b></td> <td colspan="4">2003-01-01</td> </tr> <tr> <td></td> <td><b>from date of manufacture:</b></td> <td colspan="4"></td> </tr> <tr> <td></td> <td><b>à partir de la date de fabrication:</b></td> <td colspan="4"></td> </tr> <tr> <td><b>5</b></td> <td colspan="4"><b>Angewendete Normen / Applicable standard / Normes utilisées</b></td> <td></td> </tr> <tr> <td></td> <td><u>Norm / Standard / Norme</u></td> <td><u>Titel / Title / Titre</u></td> <td colspan="3"><u>Ausgabe / Edition</u></td> </tr> <tr> <td></td> <td>EN 60034-1</td> <td>Rotating electrical machines – Part 1: Ratings and performance</td> <td colspan="3">2004</td> </tr> <tr> <td></td> <td>EN 60034-5</td> <td>Rotating electrical machines – Part 5: Degrees of protection provided by integral design of rotating electrical machines (IP-Code) - Classification</td> <td colspan="3">2001 + A1:2007</td> </tr> </table>						<b>1</b>	<b>Produkt:</b>	AC-Motor					<b>Product:</b>	AC motor					<b>Produit:</b>	Moteur AC				<b>2</b>	<b>Hersteller:</b>	Bosch Rexroth Electric Drives and Controls GmbH					<b>Manufacturer:</b>	Bürgermeister-Dr.-Nebel-Straße 2					<b>Constructeur:</b>	97816 Lohr a. Main Germany				<b>3</b>	<b>Typ:</b>	MSM019	MSM020				<b>Type:</b>	MSM030	MSM031				<b>Type:</b>	MSM040	MSM041			<b>4</b>	<b>ab Herstellungsdatum:</b>	2003-01-01					<b>from date of manufacture:</b>						<b>à partir de la date de fabrication:</b>					<b>5</b>	<b>Angewendete Normen / Applicable standard / Normes utilisées</b>						<u>Norm / Standard / Norme</u>	<u>Titel / Title / Titre</u>	<u>Ausgabe / Edition</u>				EN 60034-1	Rotating electrical machines – Part 1: Ratings and performance	2004				EN 60034-5	Rotating electrical machines – Part 5: Degrees of protection provided by integral design of rotating electrical machines (IP-Code) - Classification	2001 + A1:2007		
<b>1</b>	<b>Produkt:</b>	AC-Motor																																																																																																			
	<b>Product:</b>	AC motor																																																																																																			
	<b>Produit:</b>	Moteur AC																																																																																																			
<b>2</b>	<b>Hersteller:</b>	Bosch Rexroth Electric Drives and Controls GmbH																																																																																																			
	<b>Manufacturer:</b>	Bürgermeister-Dr.-Nebel-Straße 2																																																																																																			
	<b>Constructeur:</b>	97816 Lohr a. Main Germany																																																																																																			
<b>3</b>	<b>Typ:</b>	MSM019	MSM020																																																																																																		
	<b>Type:</b>	MSM030	MSM031																																																																																																		
	<b>Type:</b>	MSM040	MSM041																																																																																																		
<b>4</b>	<b>ab Herstellungsdatum:</b>	2003-01-01																																																																																																			
	<b>from date of manufacture:</b>																																																																																																				
	<b>à partir de la date de fabrication:</b>																																																																																																				
<b>5</b>	<b>Angewendete Normen / Applicable standard / Normes utilisées</b>																																																																																																				
	<u>Norm / Standard / Norme</u>	<u>Titel / Title / Titre</u>	<u>Ausgabe / Edition</u>																																																																																																		
	EN 60034-1	Rotating electrical machines – Part 1: Ratings and performance	2004																																																																																																		
	EN 60034-5	Rotating electrical machines – Part 5: Degrees of protection provided by integral design of rotating electrical machines (IP-Code) - Classification	2001 + A1:2007																																																																																																		
einschließlich des erforderlichen Zubehörs den Bestimmungen der EG-Richtlinie 2006/95/EG entspricht.		including the accessories required, complies with the requirements specified by EC directive 2006/95/EC.		accessoires nécessaires compris, satisfait aux dispositions de la directive CE 2006/95/EC.																																																																																																	
<p><u>Erläuterungen:</u>                  Dieses Produkt ist eine Einbaueinheit, die auf Grund ihrer Einbaueigenschaften nicht vornehmlich den Vorschriften für Endgeräte, Maschinen oder Anlagen entsprechen kann. Es darf daher nur zu Einbauzwecken verwendet werden.</p>		<p><u>Explanatory notes:</u>                  This product is a built-in unit which, owing to its installation characteristics, is not able to comply with the regulations for complete apparatus, machines or installations from the outset. For this reason, it may only be used for built-in purposes.</p>		<p><u>Explications:</u>                  Ce produit est un composant devant être encastré et qui, en tant que tel, peut ne pas correspondre aux prescriptions imposées pour appareils finaux, machines ou installations. En conséquence, ce produit ne doit être utilisé qu'à l'état encastré.</p>																																																																																																	
Die Bewertung der elektrischen und mechanischen Sicherheit, der Umwelteinflüsse (Fremdkörper, Feuchtigkeit) muss im eingebauten Zustand am Endprodukt erfolgen.		The product may only be assessed with regard to its electrical and mechanical safety as well as to environmental effects (foreign bodies, moisture) after it has been installed in the product intended for the final user.		L'évaluation de la sécurité électrique et mécanique ainsi que celle de l'influence exercée par des conditions ambiantes extérieures (corps étrangers, humidité) doivent être effectuées sur l'appareil final, après encastrement du produit.																																																																																																	
<p><b>Bosch Rexroth Electric Drives and Controls GmbH</b>                  Bürgermeister-Dr.-Nebel-Straße 2 • 97816 Lohr a. Main                  Germany</p>																																																																																																					
					Page 1 / 2																																																																																																

© Bosch Rexroth AG 2008

TC-30321-001-KOE\_N\_D3\_2008-11-28.doc

Fig. 11-1: Declaration of conformity 1/2

## Appendix

Konformitätserklärung / Declaration of Conformity / Déclaration du fabricant conformément

Page 2 / 2

**MSM****TC 30321-1 : 2008-11-28**

Im eingebauten Zustand können sich die EMV-Eigenschaften dieses Produktes ändern.

Deshalb ist für das Endprodukt (Endgerät, Maschine, Anlagen) eine Überprüfung der EMV-Eigenschaften durch den Endprodukt-hersteller zweckmäßig.

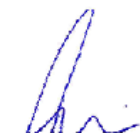
After the product has been installed, its EMC properties may change. Hence the product intended for the final user (complete apparatus, machines or installations) should be inspected with regard to its EMC properties by the manufacturer of the product intended for the final user.

En état monté, les propriétés CEM du présent produit peuvent subir des modifications. C'est pourquoi, il est recommandé au constructeur du produit final (appareils, machines, installations où est intégré le présent produit) d'effectuer un nouveau contrôle des propriétés CEM du produit final.

Lohr a. Main , den  
Ort/place/lieu

2008-11-28  
Datum/date

i.V.



Michael Steinbrecher  
Leiter Qualitäts-Management/  
Head of Quality Management/  
Directeur Gestion Qualité

i.V.



Eberhard Schemm  
Entwicklungsbereichsleiter Antriebe/  
Head of Development Drives/  
Directeur Développement

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.

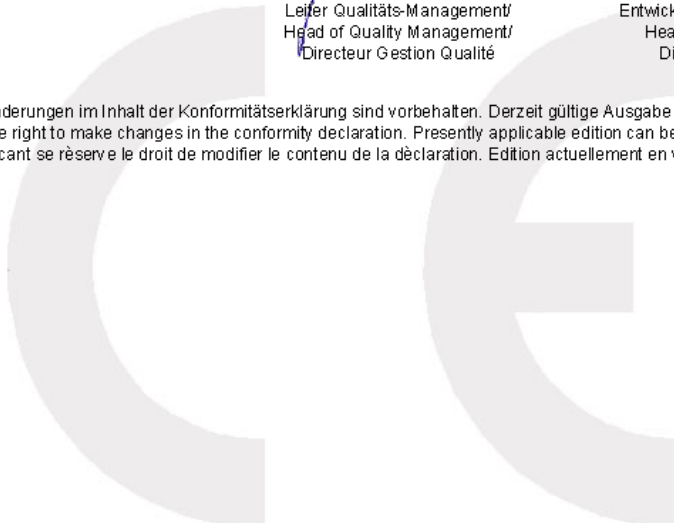


Fig. 11-2: Declaration of conformity 2/2



# Index

## A

Absolute encoder.....	33
Absolute encoder value.....	33, 34
Accessories.....	43
Battery box, SUP-E01-MSM-BATTERY-BOX.....	44
Batterybox, SUP-E02-MSM-BATTERY-BOX.....	46
Accumulators.....	49
Assembly accessory.....	43
Attachments.....	10

## B

Batteries.....	49
Battery	
Battery box.....	44
Batterybox.....	46
Bevel gear pinion.....	11
Brake (holding brake)	
Data.....	10

## C

C-UR-US listing.....	12
CE sign.....	12
Certifications.....	12
Compatibility	
With foreign matters.....	6
Conditions of installation.....	7
Contained substances	
see "Significant components".....	49
Coupling.....	11

## D

Data	
Motor MSM019.....	19
Motor MSM031.....	24
Motor MSM041.....	29
De-rating vs. installation altitude	
Overvoltage limiter.....	5
Declaration of conformity.....	12
Design.....	7
Disposal.....	49
Duty cycle	
Motors.....	17

## E

Encoder	
Absolute value encoder.....	33, 34
Multiturn.....	33, 34
Single-turn.....	34
Singleturn.....	33
Environmental conditions.....	5
Environmental protection.....	49

## F

Fastening screws.....	43
Flange fastening.....	43
Foreign matters	
Compatibility.....	6

## G

Gear pinion.....	11
Gearbox .....	10

## H

Hazardous substances.....	49
Helical teeth.....	11
Helpdesk.....	51
Holding brake	
Data.....	10
Hotline.....	51

## I

IndraDyn S	
Overview.....	3
Installation positions.....	7

## L

Listing	
C-UR-US.....	12

## M

Materials	
Motor.....	7
Motor	
Holding brake.....	10
Materials.....	7
MSM019.....	19
MSM031.....	24
MSM041.....	29
Shaft.....	7, 8
Shaft load.....	8
Technical data.....	17
Motor fastening.....	43
MSM	
Certifications.....	12
Performance feature.....	3
MSM019.....	19
MSM031.....	24
MSM041.....	29
Multi-turn.....	34
Multiturn.....	33

## O

Operating conditions.....	5
Operation modes	
Motors.....	17
Output shaft.....	7, 8

## Index

Keyway.....	8
plain.....	7
Overdetermined bearing.....	10
Overvoltage limiter	
De-rating vs. installation altitude.....	5

**P**

Packaging.....	49
Production processes.....	49

**R**

Recycling.....	49
Return of products.....	49
Rexroth IndraDyn S MSM	
Introduction.....	3
Overview.....	3
RKG0033.....	45, 47
RKG0034.....	45, 47

**S**

Service hotline.....	51
Shaft	
Keyway.....	8
plain.....	7
Shaft load.....	8
Significant components.....	49
Single-turn.....	34
Singleturn.....	33
Storage	
of components.....	41
SUP-E01-MSM-BATTERYBOX	
Battery box.....	44
SUP-E02-MSM-BATTERYBOX	
Batterybox.....	46
Support.....	51

**T**

Technical data	
Motor MSM019.....	19
Motor MSM031.....	24
Motor MSM041.....	29
Motors.....	17
Transport	
of components.....	41
Type code	
MSM019.....	14
MSM031.....	15
MSM041.....	16

**U**

UL	
Listing.....	12

# Notes

**Bosch Rexroth AG**

Electric Drives and Controls

P.O. Box 13 57

97803 Lohr, Germany

Bgm.-Dr.-Nebel-Str. 2

97816 Lohr, Germany

Phone +49 9352 18 0

Fax +49 9352 18 8400

[www.boschrexroth.com/electrics](http://www.boschrexroth.com/electrics)



R911329338