

BMH

Servo motor

Motor manual

V2.1, 03.2016



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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Table of contents



Table of contents	3
Safety Information	5
Hazard categories	5
Please note	6
Qualification of personnel.....	6
Intended use	6
Product Related Information.....	7
Terminology Derived from Standards	10
About the book	13
1 Introduction	15
1.1 Motor family.....	15
1.2 Options and accessories	15
1.3 Nameplate.....	16
1.4 Type code.....	19
2 Technical Data	21
2.1 General characteristics	21
2.2 Motor-specific data.....	25
2.2.1 BMH070.....	25
2.2.2 BMH100.....	27
2.2.3 BMH140.....	29
2.2.4 BMH190.....	31
2.2.5 BMH205.....	32
2.3 Dimensions	34
2.4 Shaft-specific data.....	40
2.4.1 Force for pressing on.....	40
2.4.2 Shaft load	41
2.5 Options	44
2.5.1 Encoder	44
2.5.2 Holding brake.....	46
2.5.3 Fan (BMH1904.....B only).....	46
2.6 Conditions for UL 1004-1, UL 1004-6 and CSA 22.2 No. 100.....	46
2.7 Certifications	47
2.8 Declaration of conformity.....	48
3 Installation	49
3.1 Overview of procedure.....	51

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3.2	Electromagnetic compatibility (EMC).....	51
3.3	Before mounting.....	54
3.4	Mounting the motor	60
3.4.1	Installation and connection of IP67 kit (accessory).....	63
3.5	Electrical installation.....	65
3.5.1	Connectors and connector assignments.....	65
3.5.2	Power and encoder connection.....	70
3.5.3	Holding brake connection.....	77
3.6	Mounting and connecting the fan (BMH1904•••••B only).....	78
4	Commissioning.....	81
5	Diagnostics and troubleshooting	85
5.1	Mechanical problems.....	85
5.2	Electrical problems.....	85
6	Accessories and spare parts.....	87
6.1	IP67 Kit.....	87
6.2	Connectors.....	87
6.3	Motor cables.....	88
6.3.1	Motor cables 1.5 mm ²	88
6.3.2	Motor cables 2.5 mm ²	89
6.3.3	Motor cables 4 mm ²	90
6.3.4	Motor cables 6 mm ²	91
6.3.5	Motor cables 10 mm ²	92
6.4	Encoder cables.....	93
7	Service, maintenance and disposal.....	95
7.1	Service address.....	95
7.2	Maintenance.....	95
7.3	Replacing the motor.....	98
7.4	Shipping, storage, disposal.....	99
	Glossary.....	101
	Terms and Abbreviations.....	101
	Table of figures.....	103
	Index.....	105

Safety Information



Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a DANGER safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety instructions that follow this symbol to avoid possible injury or death.

Hazard categories

Safety instructions to the user are highlighted by safety alert symbols in the manual. In addition, labels with symbols and/or instructions are attached to the product that alert you to potential hazards.

Four hazard categories exist depending on the criticality and nature of the hazard.

DANGER

DANGER indicates a hazardous situation, which, if not avoided, **will result** in death or serious injury.

WARNING

WARNING indicates a hazardous situation, which, if not avoided, **could result** in death, serious injury, or equipment damage.

CAUTION

CAUTION indicates a hazardous situation, which, if not avoided, **could result** in injury or equipment damage.

NOTICE

NOTICE indicates a hazardous situation, which, if not avoided, **can result** in equipment damage.

Please note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

Qualification of personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product.

In addition, these persons must have received safety training to recognize and avoid the hazards involved.

The qualified person must be able to detect possible hazards that may arise from parameterization, modifying parameter values and generally from mechanical, electrical, or electronic equipment.

The qualified person must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when designing and implementing the system.

Intended use

This product is a motor and intended for industrial use according to the present manual.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements and the technical data.

Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented.

Since the product is used as a component in an overall system, you must ensure the safety of persons by means of the design of this overall system.

Operate the product only with the specified cables and accessories. Use only genuine accessories and spare parts.

Any use other than the use explicitly permitted is prohibited and can result in hazards.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.

Product Related Information

The use and application of the information contained herein require expertise in the design and programming of automated control systems.

Only you, the user, machine builder or integrator, can be aware of all the conditions and factors present during installation and setup, operation, repair and maintenance of the machine or process.

You must also consider any applicable standards and/or regulations with respect to grounding of all equipment. Verify compliance with any safety information, different electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

Many components of the equipment, including the printed circuit board, operate with mains voltage, or present transformed high currents, and/or high voltages.

The motor itself generates voltage when the motor shaft is rotated.

⚠ ⚠ DANGER

HAZARD DUE TO ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Before performing work on the drive system:
 - Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires.
 - Place a "Do Not Turn On" or equivalent hazard label on all power switches.
 - Lock all power switches in the open (non-energized) position.
 - Wait 15 minutes to allow the DC bus capacitors to discharge.
 - Measure the voltage on the DC bus with a properly rated voltage sensing device as per the instructions in the present document and verify that the voltage is less than 42.4 Vdc.
 - Do not assume that the DC bus is voltage-free when the DC bus LED is off.
- Do not touch any connectors, contacts, terminals, unshielded components or printed circuit boards while, or if you suspect that, the equipment is under power.
- Use only electrically insulated tools.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Insulate both ends of unused conductors of the motor cable to help prevent AC voltage from coupling to unused conductors in the motor cable.
- Do not create a short-circuit across the DC bus terminals or the DC bus capacitors.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

⚠ DANGER

POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

Failure to follow these instructions will result in death or serious injury.

NOTE: See the product manual of the servo drive for additional important safety information.

If the power stage is disabled unintentionally, for example as a result of power outage, errors or functions, the motor is no longer decelerated in a controlled way. Overload, errors or incorrect use may cause

the holding brake to no longer operate properly and may result in premature wear.

⚠ WARNING
<p>UNINTENDED EQUIPMENT OPERATION</p> <ul style="list-style-type: none"> • Verify that movements without braking effect cannot cause injuries or equipment damage. • Verify the function of the holding brake at regular intervals. • Do not use the holding brake as a service brake. • Do not use the holding brake for safety-related purposes. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

⚠ WARNING
<p>LOSS OF CONTROL</p> <ul style="list-style-type: none"> • The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart. • Separate or redundant control paths must be provided for critical control functions. • System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link. • Observe all accident prevention regulations and local safety guidelines.¹⁾ • Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

1) For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in this manual, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as "safety", "safety function", "safe state", "fault", "fault reset", "malfunction", "failure", "error", "error message", "dangerous", etc.

Among others, these standards include:

Standard	Description
EN 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2008	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 1088:2008 ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2006	Safety of machinery - Emergency stop - Principles for design
EN/IEC 62061:2005	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2008	Digital data communication for measurement and control: Functional safety field buses.
2006/42/EC	Machinery Directive
2004/108/EC	Electromagnetic Compatibility Directive
2006/95/EC	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term "zone of operation" may be used in conjunction with the description of specific hazards, and is defined as it is for a "hazard zone" or "danger zone" in the Machinery Directive (2006/42/EC) and ISO 12100:2010.

NOTE: The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

About the book



This manual is valid for BMH standard products. Chapter "1 Introduction" lists the type code for this product. The type code allows you to identify whether your product is a standard product or a customized version.

Source manuals The latest versions of the manuals can be downloaded from the Internet at:

<http://www.schneider-electric.com>

Work steps If work steps must be performed consecutively, this sequence of steps is represented as follows:

- Special prerequisites for the following work steps
- ▶ Step 1
- ◁ Specific response to this work step
- ▶ Step 2

If a response to a work step is indicated, this allows you to verify that the work step has been performed correctly.

Unless otherwise stated, the individual steps must be performed in the specified sequence.

Making work easier Information on making work easier is highlighted by this symbol:



Sections highlighted this way provide supplementary information on making work easier.

SI units Technical data are specified in SI units. Converted units are shown in parentheses behind the SI unit; they may be rounded.

Example:

Minimum conductor cross section: 1.5 mm² (AWG 14)

Glossary Explanations of special technical terms and abbreviations.

Index List of keywords with references to the corresponding page numbers.

1 Introduction

1.1 Motor family

The motors are AC synchronous servo motors with a very high power density. A drive system consists of the AC synchronous servo motor and the appropriate drive. Maximum performance requires the motor and drive to be adapted to each other.

Characteristics The AC synchronous servo motors feature:

- High power density: the use of the latest magnetic materials and an optimized design result in motors with a shorter length at a comparable torque.
- High peak torque: the peak torque can be up to four times the continuous stall torque

1.2 Options and accessories

The motors are available with various options such as:

- Various encoder systems
- Holding brake
- Various shaft versions
- Various degrees of protection
- Various lengths
- Various sizes
- Various winding versions
- Various connection versions
- Fan cooling

The options can be found in the type code section on page 19.

For accessories see chapter "6 Accessories and spare parts", page 87.

Gearboxes adapted to the motor can be found in the Lexium 32 product catalog.

1.3 Nameplate

The nameplate contains the following data:

BMH070 and BMH100

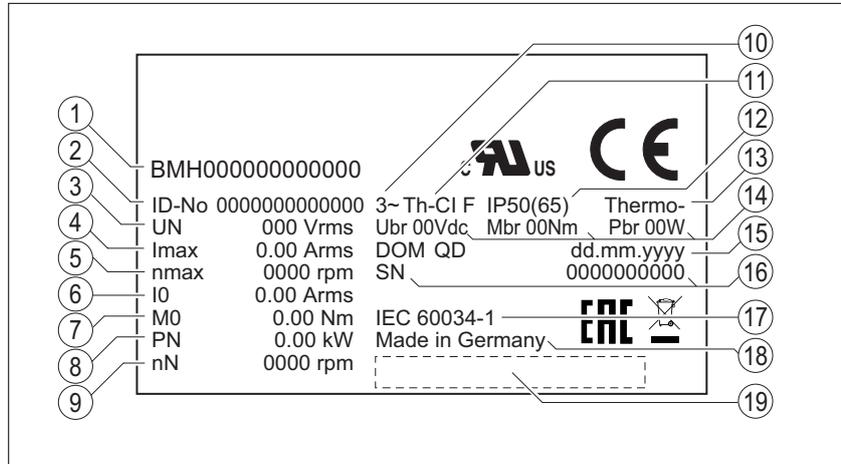


Figure 1: Nameplate BMH070 and BMH100

- (1) Motor type, see type code
- (2) Identification number
- (3) Maximum nominal value of supply voltage
- (4) Maximum Current
- (5) Maximum speed of rotation
- (6) Continuous stall current
- (7) Continuous stall torque
- (8) Nominal power
- (9) Nominal speed of rotation
- (10) Number of motor phases
- (11) Thermal class
- (12) Degree of protection (housing without shaft bushing)
- (13) Temperature sensor
- (14) Holding brake data
- (15) Date of manufacture
- (16) Serial number
- (17) Applied standard
- (18) Country of manufacture, site
- (19) Barcode

BMH140 and BMH190

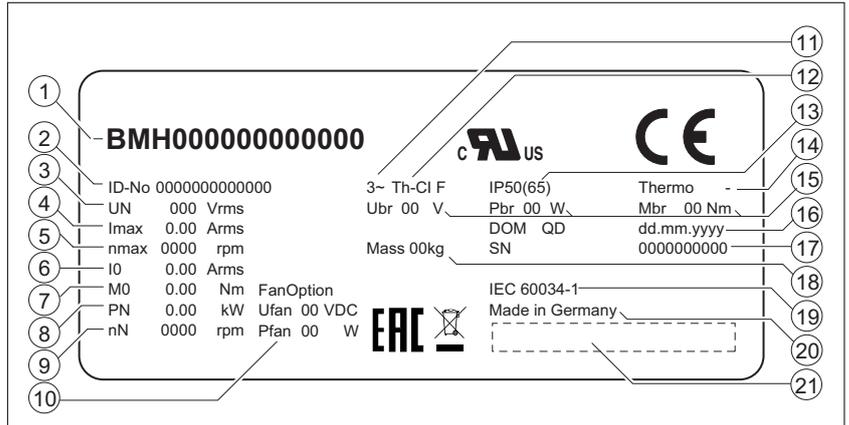


Figure 2: Nameplate BMH140 and BMH190

- (1) Motor type, see type code
- (2) Identification number
- (3) Maximum nominal value of supply voltage
- (4) Maximum Current
- (5) Maximum speed of rotation
- (6) Continuous stall current
- (7) Continuous stall torque
- (8) Nominal power
- (9) Nominal speed of rotation
- (10) Fan data (BMH1904•••••B only)
- (11) Number of motor phases
- (12) Thermal class
- (13) Degree of protection (housing without shaft bushing)
- (14) Temperature sensor
- (15) Holding brake data
- (16) Date of manufacture
- (17) Serial number
- (18) Mass of the motor
- (19) Applied standard
- (20) Country of manufacture, site
- (21) Barcode

BMH205

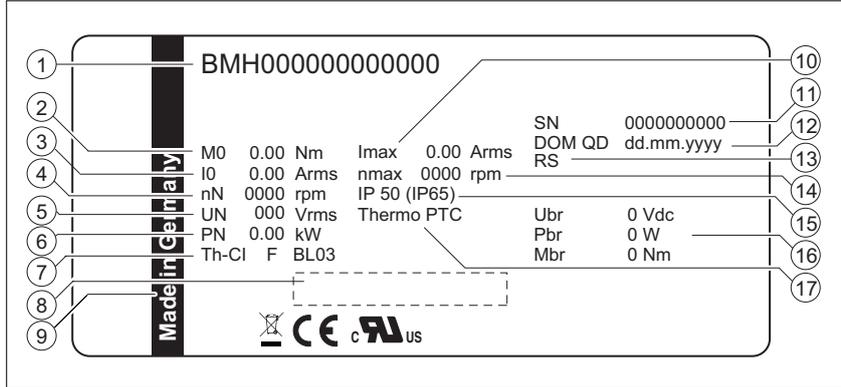


Figure 3: Nameplate BMH205

- (1) Motor type, see type code
- (2) Continuous stall torque
- (3) Continuous stall current
- (4) Nominal speed of rotation
- (5) Maximum nominal value of supply voltage
- (6) Nominal power
- (7) Thermal class
- (8) Barcode
- (9) Country of manufacture, site
- (10) Maximum Current
- (11) Serial number
- (12) Date of manufacture
- (13) Hardware version
- (14) Maximum speed of rotation
- (15) Degree of protection (housing without shaft bushing)
- (16) Holding brake data
- (17) Temperature sensor

1.4 Type code

	BMH	070	1	P	0	1	A	1	A
Product family	BMH: Synchronous motor - medium moment of inertia								
Size (housing)	070 = 70 mm flange 100 = 100 mm flange 140 = 140 mm flange 190 = 190 mm flange 205 = 205 mm flange								
Length	1 = 1 stack 2 = 2 stacks 3 = 3 stacks 4 = 4 stacks								
Winding	P = Optimized in terms of torque and speed of rotation T = Optimized in terms of high speed of rotation								
Shaft and degree of protection	0 = Smooth shaft; degree of protection: shaft IP54 ¹⁾ , housing IP65 1 = Parallel key; degree of protection: shaft IP 54 ¹⁾ , housing IP 65 2 = Smooth shaft; degree of protection: shaft and housing IP65 ^{1) 2)} 3 = Parallel key; degree of protection: shaft and housing IP 65 ^{1) 2)}								
Encoder system	1 = Absolute singleturn 128 Sin/Cos periods per revolution (SKS36) 2 = Absolute multiturn 128 Sin/Cos periods per revolution (SKM36) 6 = Absolute singleturn 16 Sin/Cos periods per revolution (SEK37) 7 = Absolute multiturn 16 Sin/Cos periods per revolution (SEL37)								
Holding brake	A = Without holding brake F = With holding brake								
Connection version	1 = Straight connector 2 = Angular connector 90°, can be rotated								
Mechanical interface - mounting	A = International IEC Standard B = International IEC standard and fan cooling								

1) In the case of mounting position IM V3 (drive shaft vertical, shaft end up), the motor only has degree of protection IP50.
 2) The maximum permissible speed of rotation is limited to 6000 rpm by the shaft sealing ring. Separate accessories allow you to obtain degree of protection IP67. See chapter "6 Accessories and spare parts".

If you have questions concerning the type code, contact your Schneider Electric sales office.

Designation customized version

In the case of a customized version, position 8 of the type code is an "S". The subsequent number defines the customized version. Example: B•••••S1234

Contact your machine vendor if you have questions concerning customized versions.

2 Technical Data

This chapter contains information on the ambient conditions and on the mechanical and electrical properties of the product family and the accessories.

2.1 General characteristics

Motor type	AC synchronous servo motor	
Number of pairs of poles	5	
Degree of protection motor housing	IP65	As per IEC 60034-5
Degree of protection shaft bushing without shaft sealing ring	IP54 ¹⁾	As per IEC 60034-5
Degree of protection shaft bushing with shaft sealing ring	IP65 ^{1) 2)}	As per IEC 60034-5
Degree of protection with IP67 kit	IP67 ¹⁾	As per IEC 60034-5
Degree of protection with fan	IP20	As per IEC 60034-5
Thermal class	F (155 C°)	As per IEC 60034-1
Vibration grade	A	As per IEC 60034-14
Test voltage	> 2400 Vac	As per IEC 60034-1
Maximum permissible winding voltage	BMH••••T 240 Vac BMH••••P 480 Vac	
Maximum voltage to ground	280 Vac	
Perpendicularity	normal class	As per IEC 60072-1, DIN 42955
Housing color	Black RAL 9005	
Overvoltage category	III	As per IEC 61800-5-1
Protection class ³⁾	I	As per IEC 61140, EN 50178

- 1) With shaft sealing ring: the maximum speed of rotation is limited to 6000 rpm; shaft sealing ring with initial lubrication, if the seal runs dry, this increases friction and reduces service life.
- 2) In the case of mounting position IM V3 (drive shaft vertical, shaft end up), the motor only has degree of protection IP50. The degree of protection only relates to the motor itself, not to mounted components such as, for example, a gearbox.
- 3) The signals of the holding brake at CN1 and the signals at CN2 meet the PELV requirements.

Compatibility with foreign substances The motor has been tested for compatibility with many known substances and with the latest available knowledge. Nonetheless, you must perform a compatibility test prior to using a foreign substance.

Climatic environmental conditions transportation and storage The environment during transportation and storage must be dry and free from dust.

The storage time is primarily limited by the service life of the lubricants in the bearings. Do not store the product for more than 36 months and periodically operate the motor.

If the holding brake is not used for an extended period of time, parts of the holding brake may corrode. Corrosion reduces the holding torque. See *"Inspecting/breaking in the holding brake"* in chapter *"7 Service, maintenance and disposal"*.

Temperature	°C (°F)	-40 ... 70 (-40 ... 158)
Relative humidity (non-condensing)	%	≤75
Set of class combinations as per IEC 60721-3-2		IE 21

Climatic environmental conditions operation

Ambient temperature ^{1) 2)} (no icing, non-condensing)	°C (°F)	-20 ... 40 (-4 ... 104)
Ambient temperature with current derating of 1% per °C (per 1.8 °F) ^{1) 2)}	°C (°F)	40 ... 60 (104 ... 140)
Relative humidity (non-condensing)	%	5 ... 85
Class as per IEC 60721-3-3		3K3, 3Z12, 3Z2, 3B2, 3C1, 3M6
Installation altitude ³⁾	m (ft)	<1000 (<3281)
Installation altitude with current reduction of 1% per 100 m (328 ft) at altitudes of more than 1000 m (3281 ft) ³⁾	m (ft)	1000 ... 3000 (3281 ... 9843)

- 1) Limit values with flanged motor (steel plate, height and width = 2.5 * motor flange, 10 mm (0.39 in) thickness, centered hole).
- 2) BMH1904•••••B: The fan, which is delivered with the motor, is required for operation. For more information, refer to chapter "3.6 Mounting and connecting the fan (BMH1904•••••B only)".
- 3) The installation altitude is defined in terms of altitude above mean sea level.

Vibration and shock BMH070 ... 190

Vibration, sinusoidal	Type test with 10 runs as per IEC 60068-2-6 0.15 mm (10 ... 60 Hz) 20 m/s ² (60 ... 500 Hz)
Shock, semi-sinusoidal	Type test with 3 shocks in each direction as per IEC 60068-2-27 150 m/s ² (11 ms)

Vibration and shock BMH205

Vibration, sinusoidal	Type test with 10 runs as per IEC 60068-2-6 0.35 mm (10 ... 60 Hz) 50 m/s ² (60 ... 150 Hz)
Shock, semi-sinusoidal	Type test with 3 shocks in each direction as per IEC 60068-2-27 200 m/s ² (6 ms)

Service life

Nominal bearing service life $L_{10h}^{1)}$	h	20000
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1) Operating hours at a probability of failure of 10%

The service life of the motors when operated correctly is limited primarily by the service life of the rolling bearing.

The following operating conditions significantly reduce the service life:

- Installation altitude >1000 m (3281 ft) above mean sea level
- Rotary movements exclusively within a fixed angle of <100°
- Operation under vibration load >20 m/s²
- Allowing sealing rings to run dry
- Contact of the seals with aggressive substances

Shaft sealing ring / degree of protection

The motors can be equipped with an optional shaft sealing ring. With a shaft sealing ring, they have degree of protection IP65. The shaft sealing ring limits the maximum speed of rotation to 6000 rpm.

Note the following:

- The shaft sealing ring is factory-pre-lubricated.
- If the seals run dry, this increases friction and greatly reduces the service life of the sealing rings.

Compressed air connection

The compressed air generates a permanent overpressure inside the motor. This overpressure inside the motor is used to obtain degree of protection IP67.

Compressed air must also be available when the system is switched off, for example to maintain the required degree of protection during cleaning work. When the compressed air is switched off, the degree of protection is decreased to IP65. The degree of protection only relates to the motor itself, not to mounted components such as, for example, a gearbox.

Special compressed air must be used:

Nominal pressure	bar (psi)	0.1 ... 0.3 (1.45 ... 4.35)
Maximum air pressure	bar (psi)	0.4 (5.8)
Permissible humidity	%	20 ... 30
Other properties of the compressed air		Free from dust, free from oil

Tightening torque and property class of screws used

Tightening torque of housing screws M3	Nm (lb•in)	1 (8.85)
Tightening torque of housing screws M4	Nm (lb•in)	1.5 (13.28)
Tightening torque of housing screws M5	Nm (lb•in)	5 (44.3)
Tightening torque protective ground conductor M4 (BMH070 ... 140)	Nm (lb•in)	2.9 (25.7)
Tightening torque protective ground conductor M6 (BMH190)	Nm (lb•in)	6 (53.1)
Tightening torque protective ground conductor M6 (BMH205)	Nm (lb•in)	9.9 (87.3)
Property class of the screws		8.8

Approved drives You may use drives that are approved for the BMH motor family (for example, LXM32). When selecting, consider the type and amount of the mains voltage. Inquire for additional drives that can be used to operate BMH motors. Note that the BMH motor does not have a conventional temperature sensor.

2.2 Motor-specific data

2.2.1 BMH070

BMH...		0701		0702		0703	
Winding		P	T	P	T	P	T
Technical data - general							
Continuous stall torque M_0 ^{1) 2)}	Nm (lb-in)	1.40 (12.39)	1.40 (12.39)	2.48 (21.95)	2.48 (21.95)	3.40 (30.09)	3.40 (30.09)
Peak torque M_{max}	Nm (lb-in)	4.20 (37.17)	4.20 (37.17)	7.44 (65.85)	7.44 (65.85)	10.20 (90.28)	10.20 (90.28)
With supply voltage $U_n = 115 \text{ Vac}$ ¹⁾							
Nominal speed of rotation n_N	rpm	1250	2500	1250	2500	1250	2000
Nominal torque M_N	Nm (lb-in)	1.38 (12.21)	1.35 (11.95)	2.37 (20.98)	2.27 (20.09)	3.18 (28.15)	3.05 (26.99)
Nominal current I_N	A_{rms}	1.75	2.75	2.82	4.92	3.56	4.98
Nominal power P_N	kW	0.18	0.35	0.31	0.59	0.42	0.64
With supply voltage $U_n = 230 \text{ Vac}$ ¹⁾							
Nominal speed of rotation n_N	rpm	3000	5000	3000	5000	2500	4000
Nominal torque M_N	Nm (lb-in)	1.34 (11.86)	1.31 (11.59)	2.23 (19.74)	2.06 (18.23)	2.96 (26.20)	2.70 (23.90)
Nominal current I_N	A_{rms}	1.75	2.76	2.70	4.46	3.47	4.41
Nominal power P_N	kW	0.42	0.68	0.70	1.08	0.75	1.13
With supply voltage $U_n = 400 \text{ Vac}$ ¹⁾							
Nominal speed of rotation n_N	rpm	5500	-	5500	-	5000	-
Nominal torque M_N	Nm (lb-in)	1.30 (11.51)	-	2.01 (17.79)	-	2.53 (22.39)	-
Nominal current I_N	A_{rms}	1.65	-	2.39	-	2.91	-
Nominal power P_N	kW	0.75	-	1.16	-	1.32	-
With supply voltage $U_n = 480 \text{ Vac}$ ¹⁾							
Nominal speed of rotation n_N	rpm	7000	-	7000	-	6500	-
Nominal torque M_N	Nm (lb-in)	1.27 (11.24)	-	1.89 (16.73)	-	2.26 (20.00)	-
Nominal current I_N	A_{rms}	1.70	-	2.36	-	2.74	-
Nominal power P_N	kW	0.93	-	1.38	-	1.54	-

1) Conditions for performance data: Mounted to steel plate (2.5 * flange dimension)² area, 10 mm (0.39 in) thickness, centered hole.

2) M_0 = Continuous stall torque at 20 rpm and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%.

BMH...		0701		0702		0703	
Winding		P	T	P	T	P	T
Technical data - electrical							
Maximum current I_{max}	A_{rms}	5.97	9.56	9.65	17.64	12.57	17.84
Continuous stall current I_0	A_{rms}	1.78	2.85	2.94	5.38	3.91	5.55
Voltage constant $k_{EU-V}^{1)}$	V_{rms}	48.5	30.3	51.7	28.3	53.4	37.6
Torque constant $k_t^{2)}$	Nm/A	0.79	0.49	0.84	0.46	0.87	0.61
Winding resistance R_{20U-V}	Ω	8.61	3.47	3.79	1.15	2.54	1.24
Winding inductance L_{qU-V}	mH	20.70	8.09	11.78	3.52	8.35	4.14
Winding inductance L_{dU-V}	mH	20.70	8.09	11.78	3.52	8.35	4.14
Technical data - mechanical							
Maximum speed of rotation n_{max}	rpm	8000	8000	8000	8000	8000	8000
Rotor inertia without holding brake J_M	kgcm ²	0.59	0.59	1.13	1.13	1.67	1.67
Rotor inertia with holding brake J_M	kgcm ²	0.70	0.70	1.24	1.24	1.78	1.78
Mass without holding brake m	kg	1.60	1.60	2.30	2.30	3.00	3.00
Mass with holding brake m	kg	2.60	2.60	3.30	3.30	4.00	4.00

1) RMS value at 1000 rpm and 20 °C (68 °F).

2) At $n = 20$ rpm and 100% duty cycle.

2.2.2 BMH100

BMH...		1001		1002		1003	
Winding		P	T	P	T	P	T
Technical data - general							
Continuous stall torque M_0 ^{1) 2)}	Nm (lb-in)	3.40 (30.09)	3.40 (30.09)	6.0 (53.10)	6.1 (53.99)	9.0 (79.66)	7.5 (66.38)
Peak torque M_{max}	Nm (lb-in)	10.20 (90.28)	10.20 (90.28)	18.00 (159.31)	18.30 (161.97)	27.00 (238.97)	25.50 (225.69)
With supply voltage $U_n = 115 \text{ Vac}^{1)}$							
Nominal speed of rotation n_N	rpm	1000	1750	1000	1750	1000	1500
Nominal torque M_N	Nm (lb-in)	3.30 (29.21)	3.20 (28.32)	5.67 (50.18)	5.75 (50.89)	8.45 (74.79)	7.88 (69.74)
Nominal current I_N	A_{rms}	3.07	4.85	4.81	8.26	7.30	9.40
Nominal power P_N	kW	0.35	0.58	0.59	1.05	0.88	1.24
With supply voltage $U_n = 230 \text{ Vac}^{1)}$							
Nominal speed of rotation n_N	rpm	2000	4000	2000	3500	2500	3000
Nominal torque M_N	Nm (lb-in)	3.20 (28.32)	2.90 (25.67)	5.33 (47.17)	4.80 (42.48)	7.63 (67.53)	7.25 (64.17)
Nominal current I_N	A_{rms}	2.99	4.50	4.58	7.00	6.70	8.80
Nominal power P_N	kW	0.67	1.20	1.12	1.76	2.00	2.28
With supply voltage $U_n = 400 \text{ Vac}^{1)}$							
Nominal speed of rotation n_N	rpm	4000	-	4000	-	4000	-
Nominal torque M_N	Nm (lb-in)	3.00 (26.55)	-	4.67 (41.33)	-	6.00 (53.10)	-
Nominal current I_N	A_{rms}	2.83	-	4.10	-	5.30	-
Nominal power P_N	kW	1.26	-	1.95	-	2.50	-
With supply voltage $U_n = 480 \text{ Vac}^{1)}$							
Nominal speed of rotation n_N	rpm	5000	-	5000	-	5000	-
Nominal torque M_N	Nm (lb-in)	2.90 (25.67)	-	4.20 (37.17)	-	4.78 (42.31)	-
Nominal current I_N	A_{rms}	2.75	-	3.73	-	4.30	-
Nominal power P_N	kW	1.52	-	2.27	-	2.50	-

- 1) Conditions for performance data: Mounted to steel plate, 300 mm (11.8 in) * 300 mm (11.8 in) area, 20 mm (0.79 in) thickness, centered hole.
 2) M_0 = Continuous stall torque at 20 rpm and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%.

BMH...		1001		1002		1003	
Winding		P	T	P	T	P	T
Technical data - electrical							
Maximum current I_{max}	A_{rms}	11.20	18.20	17.50	30.00	26.71	34.70
Continuous stall current I_0	A_{rms}	3.15	5.11	5.04	8.65	7.69	8.80
Voltage constant $k_{EU-V}^{1)}$	V_{rms}	70.30	43.00	78.00	46.10	77.95	56.00
Torque constant $k_t^{2)}$	Nm/A	1.09	0.67	1.19	0.71	1.17	0.85
Winding resistance R_{20U-V}	Ω	4.12	1.58	1.97	0.68	1.08	0.61
Winding inductance L_{qU-V}	mH	14.90	5.44	8.24	2.84	5.23	2.71
Winding inductance L_{dU-V}	mH	13.15	4.78	7.35	2.52	4.62	2.40
Technical data - mechanical							
Maximum speed of rotation n_{max}	rpm	6000	6000	6000	6000	6000	6000
Rotor inertia without holding brake J_M	kgcm ²	3.19	3.19	6.28	6.28	9.37	9.37
Rotor inertia with holding brake J_M	kgcm ²	3.68	3.68	6.77	6.77	10.30	10.30
Mass without holding brake m	kg	3.34	3.34	4.92	4.92	6.50	6.50
Mass with holding brake m	kg	4.80	4.80	6.38	6.38	8.15	8.15

1) RMS value at 1000 rpm and 20 °C (68 °F).

2) At $n = 20$ rpm and 100% duty cycle.

2.2.3 BMH140

BMH...		1401	1402	1403
Winding		P	P	P
Technical data - general				
Continuous stall torque M_0 ^{1) 2)}	Nm (lb-in)	10.0 (88.51)	16.8 (148.7)	22.5 (199.1)
Peak torque M_{max}	Nm (lb-in)	30.00 (265.5)	50.40 (446.1)	72.00 (637.3)
With supply voltage $U_n = 115 \text{ Vac}$ ¹⁾				
Nominal speed of rotation n_N	rpm	1000	1000	750
Nominal torque M_N	Nm (lb-in)	9.08 (80.36)	14.90 (131.9)	21.50 (190.3)
Nominal current I_N	A_{rms}	8.04	12.35	15.70
Nominal power P_N	kW	0.95	1.56	1.69
With supply voltage $U_n = 230 \text{ Vac}$ ¹⁾				
Nominal speed of rotation n_N	rpm	2000	2000	1750
Nominal torque M_N	Nm (lb-in)	8.30 (73.46)	13.10 (115.9)	18.12 (160.4)
Nominal current I_N	A_{rms}	7.48	11.09	13.51
Nominal power P_N	kW	1.74	2.73	3.32
With supply voltage $U_n = 400 \text{ Vac}$ or $U_n = 480 \text{ Vac}$ ¹⁾				
Nominal speed of rotation n_N	rpm	3500	3000	3000
Nominal torque M_N	Nm (lb-in)	7.14 (63.19)	11.30 (100.0)	13.92 (123.2)
Nominal current I_N	A_{rms}	6.62	9.77	10.65
Nominal power P_N	kW	2.62	3.55	4.37

- 1) Conditions for performance data: Mounted to steel plate, 400 mm (15.7 in) * 400 mm (15.7 in) area, 10 mm (0.39 in) thickness, centered hole.
- 2) M_0 = Continuous stall torque at 20 rpm and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%.

BMH...		1401	1402	1403
Winding		P	P	P
Technical data - electrical				
Maximum current I_{max}	A_{rms}	29.80	46.20	57.66
Continuous stall current I_0	A_{rms}	8.60	13.55	16.20
Voltage constant $k_{EU-V}^{1)}$	V_{rms}	75.60	82.50	92.50
Torque constant $k_t^{2)}$	Nm/A	1.15	1.23	1.39
Winding resistance R_{20U-V}	Ω	0.86	0.42	0.32
Winding inductance L_{qU-V}	mH	9.32	5.20	4.33
Winding inductance L_{dU-V}	mH	8.11	4.56	3.87
Technical data - mechanical				
Maximum speed of rotation n_{max}	rpm	4000	4000	4000
Rotor inertia without holding brake J_M	kgcm ²	16.46	32.00	47.54
Rotor inertia with holding brake J_M	kgcm ²	17.96	33.50	50.27
Mass without holding brake m	kg	8.00	12.00	16.00
Mass with holding brake m	kg	10.30	14.30	18.53

1) RMS value at 1000 rpm and 20 °C (68 °F).

2) At $n = 20$ rpm and 100% duty cycle.

2.2.4 BMH190

BMH...		1901	1902	1903	1904.....A	1904.....B
Winding		P	P	P	P	P
Technical data - general						
Continuous stall torque M_0 ^{1) 2)}	Nm (lb-in)	30.0 (265.5)	48.0 (424.8)	65.0 (575.3)	100 (885.1)	100 (885.1)
Peak torque M_{max}	Nm (lb-in)	90 (796.6)	144 (1275)	195 (1726)	230 (2036)	230 (2036)
With supply voltage $U_n = 400$ Vac or $U_n = 480$ Vac ¹⁾						
Nominal speed of rotation n_N	rpm	3000	2000	2000	2000	2000
Nominal torque M_N	Nm (lb-in)	16.50 (146.0)	29.00 (256.7)	37.00 (327.5)	46.80 (414.2)	76.40 (676.2)
Nominal current I_N	A_{rms}	14.00	19.30	21.30	19.60	32.00
Nominal power P_N	kW	5.18	6.07	7.75	9.80	16.00

- 1) Conditions for performance data: Mounted to steel plate, 550 mm (21.7 in) * 550 mm (21.7 in) area, 30 mm (1.18 in) thickness, centered hole.
- 2) M_0 = Continuous stall torque at 20 rpm and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%.

BMH...		1901	1902	1903	1904.....A	1904.....B
Winding		P	P	P	P	P
Technical data - electrical						
Maximum current I_{max}	A_{rms}	89.6	114.0	124.5	100.0	100.0
Continuous stall current I_0	A_{rms}	23.2	30.8	36.1	40.0	40.0
Voltage constant k_{EU-V} ¹⁾	V_{rms}	87.6	108.3	129.2	168.0	168.0
Torque constant k_t ²⁾	Nm/A	1.30	1.56	1.80	2.50	2.50
Winding resistance R_{20U-V}	Ω	0.24	0.15	0.13	0.16	0.16
Winding inductance L_{qU-V}	mH	5.48	3.86	3.62	4.74	4.74
Winding inductance L_dU-V	mH	5.23	3.73	3.43	4.51	4.51
Technical data - mechanical						
Maximum speed of rotation n_{max}	rpm	4000	4000	3500	3000	3000
Rotor inertia without holding brake J_M	kgcm ²	67.7	130.1	194.1	276.7	276.7
Rotor inertia with holding brake J_M	kgcm ²	71.8	144.8	208.8	298.2	298.2
Mass without holding brake m	kg	19	31	43	55.8	57.4
Mass with holding brake m	kg	20.5	32.5	44.5	62.6	64.2

- 1) RMS value at 1000 rpm and 20 °C (68 °F).
- 2) At $n = 20$ rpm and 100% duty cycle.

019844113749, V2.1, 03.2016

2.2.5 BMH205

BMH...		2051	2052	2053
Winding		P	P	P
Technical data - general				
Continuous stall torque M_0 ^{1) 2)}	Nm (lb·in)	34.4 (304.5)	62.5 (553.2)	88 (778.9)
Peak torque M_{max}	Nm (lb·in)	110 (973.6)	220 (1947)	330 (2921)
With supply voltage $U_n = 115 \text{ Vac}^1)$				
Nominal speed of rotation n_N	rpm	750	500	500
Nominal torque M_N	Nm (lb·in)	31.4 (277.9)	57.9 (512.5)	80.2 (709.8)
Nominal current I_N	A_{rms}	19.6	22.4	30.8
Nominal power P_N	kW	2.47	3.03	4.20
With supply voltage $U_n = 230 \text{ Vac}^1)$				
Nominal speed of rotation n_N	rpm	1500	1000	1000
Nominal torque M_N	Nm (lb·in)	28.2 (249.6)	51.7 (457.6)	70.4 (623.1)
Nominal current I_N	A_{rms}	17.6	20.0	26.4
Nominal power P_N	kW	4.43	5.41	7.38
With supply voltage $U_n = 400 \text{ Vac}^1)$				
Nominal speed of rotation n_N	rpm	3000	2000	2000
Nominal torque M_N	Nm (lb·in)	21.0 (185.9)	34.0 (300.9)	45.0 (398.3)
Nominal current I_N	A_{rms}	13.1	13.2	17.9
Nominal power P_N	kW	6.60	7.12	9.40
With supply voltage $U_n = 480 \text{ Vac}^1)$				
Nominal speed of rotation n_N	rpm	3600	2400	2000
Nominal torque M_N	Nm (lb·in)	17.9 (158.4)	24.9 (220.4)	45.0 (398.3)
Nominal current I_N	A_{rms}	11.2	9.7	17.9
Nominal power P_N	kW	6.75	6.26	9.40

1) Conditions for performance data: Mounted to steel plate (2.5 * flange dimension)² area, 10 mm (0.39 in) thickness, centered hole.

2) M_0 = Continuous stall torque at 20 rpm and 100% duty cycle; at speeds of rotation of < 20 rpm the continuous stall torque is reduced to 87%.

BMH...		2051	2052	2053
Winding		P	P	P
Technical data - electrical				
Maximum current I_{max}	A_{rms}	78.1	96.8	136.1
Continuous stall current I_0	A_{rms}	21.5	24.2	31.8
Voltage constant $k_{EU-V}^{1)}$	V_{rms}	104	161	172
Torque constant $k_t^{2)}$	Nm/A	1.6	2.58	2.76
Winding resistance R_{20U-V}	Ω	0.3	0.3	0.2
Winding inductance L_{QU-V}	mH	5.9	5.6	4.3
Winding inductance L_{dU-V}	mH	5.6	5.2	4.0
Technical data - mechanical				
Maximum speed of rotation n_{max}	rpm	3800	3800	3800
Rotor inertia without holding brake J_M	kgcm ²	71.4	129	190
Rotor inertia with holding brake J_M	kgcm ²	87.4	145	206
Mass without holding brake m	kg	33	44	67
Mass with holding brake m	kg	37.9	48.9	70.6

1) RMS value at 1000 rpm and 20 °C (68 °F).
 2) At $n = 20$ rpm and 100% duty cycle.

2.3 Dimensions

Dimensions BMH070

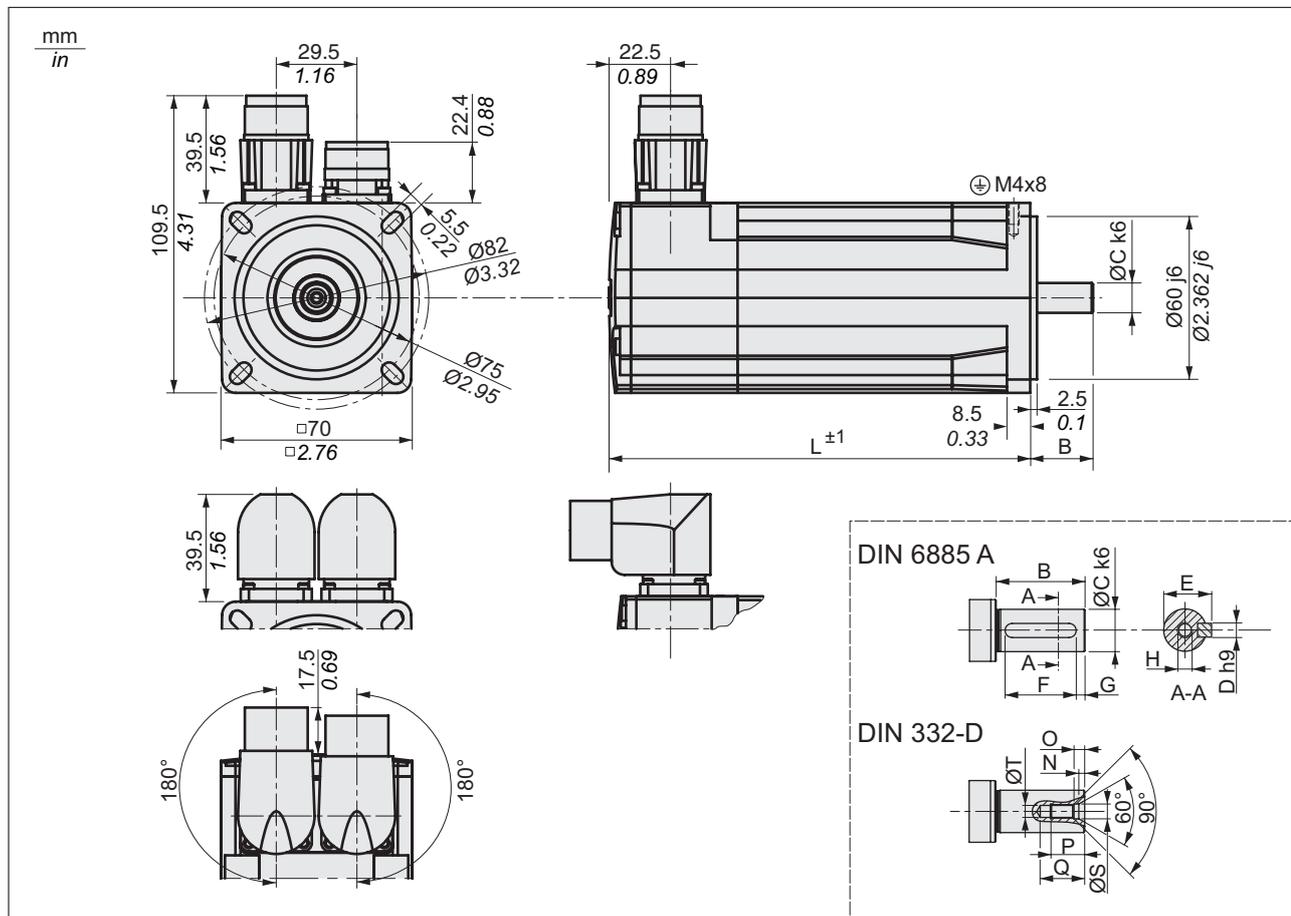


Figure 4: Dimensions BMH070

BMH...		0701	0702	0703
L	Length without holding brake	mm (in) 122 (4.80)	154 (6.06)	186 (7.32)
L	Length with holding brake	mm (in) 161(6.34)	193 (7.60)	225 (8.86)
B	Shaft length	mm (in) 23 (0.91)	23 (0.91)	30 (1.18)
C	Shaft diameter	mm (in) 11 (0.433)	11 (0.433)	14 (0.551)
D	Width of parallel key	mm (in) 4 (0.157)	4 (0.157)	5 (0.197)
E	Shaft width with parallel key	mm (in) 12.5 (0.49)	12.5 (0.49)	16 (0.63)
F	Length of parallel key	mm (in) 18 (0.71)	18 (0.71)	20 (0.79)
G	Distance parallel key to shaft end	mm (in) 2.5 (0.10)	2.5 (0.10)	5 (0.20)
	Parallel key	DIN 6885-A4x4x18	DIN 6885-A4x4x18	DIN 6885-A4x4x20
H	Female thread of shaft	M4	M4	M5
N		mm (in) 2.1 (0.08)	2.1 (0.08)	2.4 (0.09)
O		mm (in) 3.2 (0.13)	3.2 (0.13)	4 (0.16)
P		mm (in) 10 (0.39)	10 (0.39)	12.5 (0.49)
Q		mm (in) 14 (0.55)	14 (0.55)	17 (0.67)
S		mm (in) 4.3 (0.17)	4.3 (0.17)	5.3 (0.21)
T		mm (in) 3.3 (0.13)	3.3 (0.13)	4.2 (0.17)

Dimensions BMH100

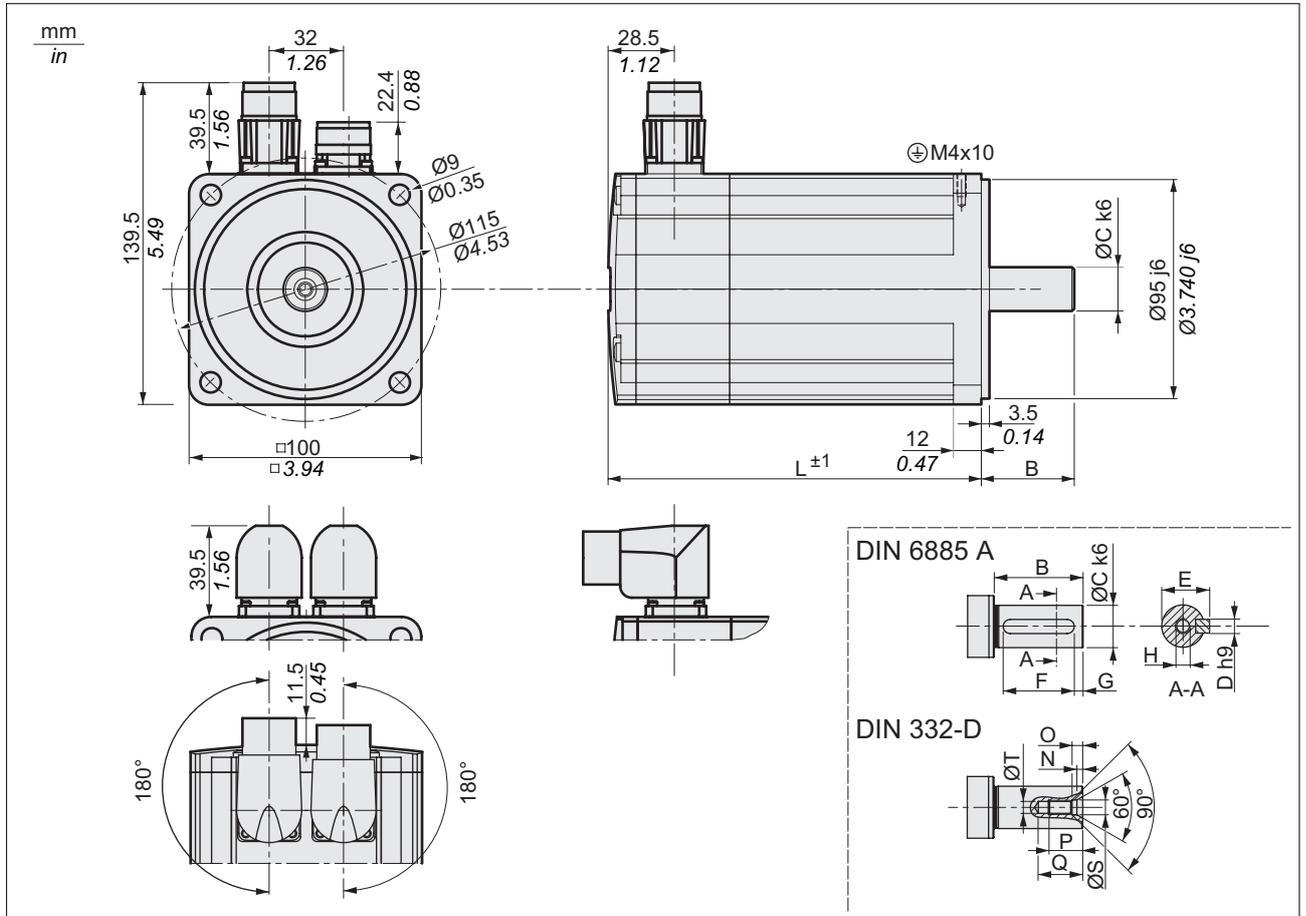


Figure 5: Dimensions BMH100

BMH...			1001	1002	1003
L	Length without holding brake	mm (in)	128.6 (5.06)	160.6 (6.32)	192.6 (7.58)
L	Length with holding brake	mm (in)	170.3 (6.7)	202.3 (7.96)	234.3 (9.22)
B	Shaft length	mm (in)	40 (1.57)	40 (1.57)	40 (1.57)
C	Shaft diameter	mm (in)	19 (0.748)	19 (0.748)	19 (0.748)
D	Width of parallel key	mm (in)	6 (0.236)	6 (0.236)	6 (0.236)
E	Shaft width with parallel key	mm (in)	21.5 (0.85)	21.5 (0.85)	21.5 (0.85)
F	Length of parallel key	mm (in)	30 (1.18)	30 (1.18)	30 (1.18)
G	Distance parallel key to shaft end	mm (in)	5 (0.2)	5 (0.2)	5 (0.2)
	Parallel key		DIN 6885-A6x6x30	DIN 6885-A6x6x30	DIN 6885-A6x6x30
H	Female thread of shaft		M6	M6	M6
N		mm (in)	2.8 (0.11)	2.8 (0.11)	2.8 (0.11)
O		mm (in)	5 (0.2)	5 (0.2)	5 (0.2)
P		mm (in)	16 (0.63)	16 (0.63)	16 (0.63)
Q		mm (in)	21 (0.83)	21 (0.83)	21 (0.83)
S		mm (in)	6.4 (0.25)	6.4 (0.25)	6.4 (0.25)
T		mm (in)	5 (0.2)	5 (0.2)	5 (0.2)

019844113749, V2.1, 03.2016

Dimensions BMH190.....A

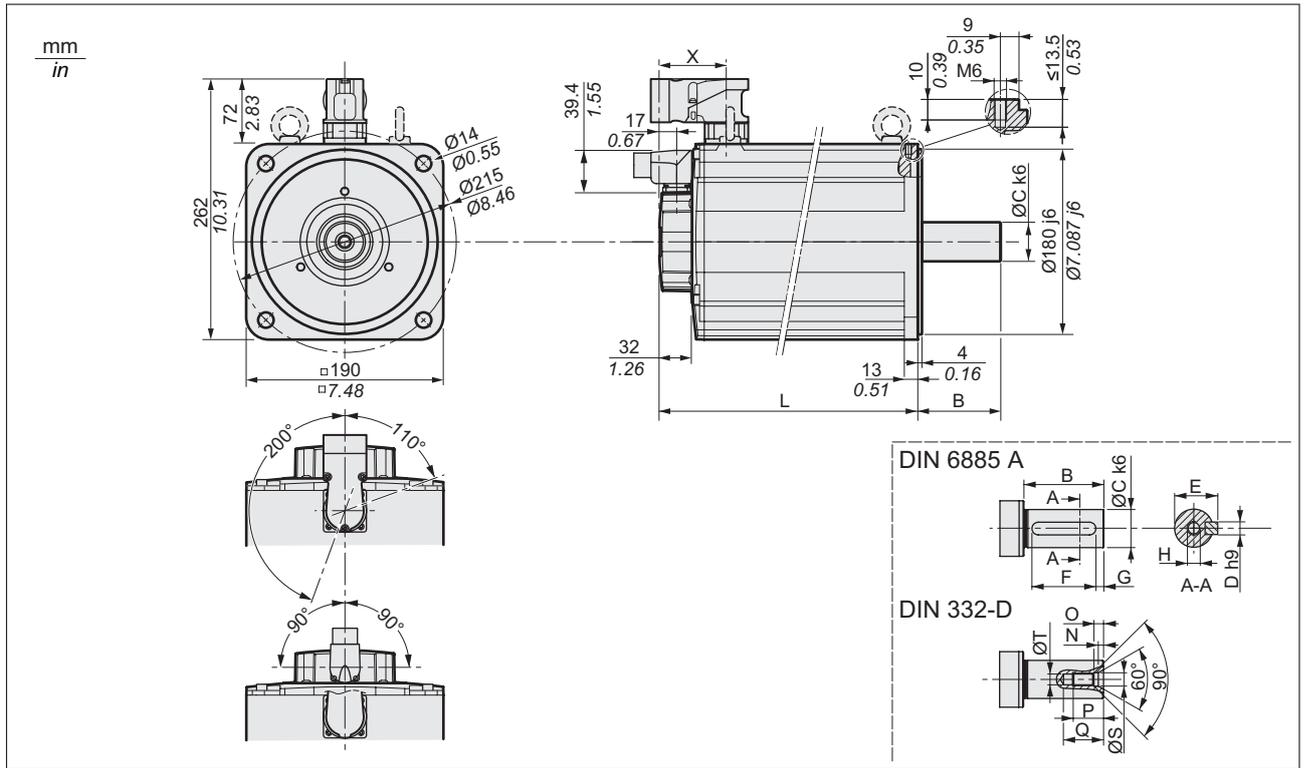


Figure 7: Dimensions BMH190.....A

BMH...			1901	1902	1903	1904.....A
L	Length without holding brake	mm (in)	190 (7.48)	250 (9.84)	310 (12.2)	383 (15.08)
L	Length with holding brake	mm (in)	248 (9.76)	308 (12.13)	368 (14.49)	456 (17.95)
X	Length without holding brake	mm (in)	65 (2.56)	65 (2.56)	65 (2.56)	65 (2.56)
X	Length with holding brake	mm (in)	123 (4.84)	123 (4.84)	123 (4.84)	123 (4.84)
B	Shaft length	mm (in)	80 (3.15)	80 (3.15)	80 (3.15)	80 (3.15)
C	Shaft diameter	mm (in)	38 (1.496)	38 (1.496)	38 (1.496)	38 (1.496)
D	Width of parallel key	mm (in)	10 (0.394)	10 (0.394)	10 (0.394)	10 (0.394)
E	Shaft width with parallel key	mm (in)	41 (1.61)	41 (1.61)	41 (1.61)	41 (1.61)
F	Length of parallel key	mm (in)	70 (2.76)	70 (2.76)	70 (2.76)	70 (2.76)
G	Distance parallel key to shaft end	mm (in)	5 (0.2)	5 (0.2)	5 (0.2)	5 (0.2)
	Parallel key		DIN 6885-A10x8x70	DIN 6885-A10x8x70	DIN 6885-A10x8x70	DIN 6885-A10x8x70
H	Female thread of shaft		M12	M12	M12	M12
N		mm (in)	4.4 (0.17)	4.4 (0.17)	4.4 (0.17)	4.4 (0.17)
O		mm (in)	9.5 (0.37)	9.5 (0.37)	9.5 (0.37)	9.5 (0.37)
P		mm (in)	28 (1.1)	28 (1.1)	28 (1.1)	28 (1.1)
Q		mm (in)	37 (1.46)	37 (1.46)	37 (1.46)	37 (1.46)
S		mm (in)	13 (0.51)	13 (0.51)	13 (0.51)	13 (0.51)
T		mm (in)	10.2 (0.4)	10.2 (0.4)	10.2 (0.4)	10.2 (0.4)

019844113749, V2.1, 03.2016

Dimensions BMH1904.....B

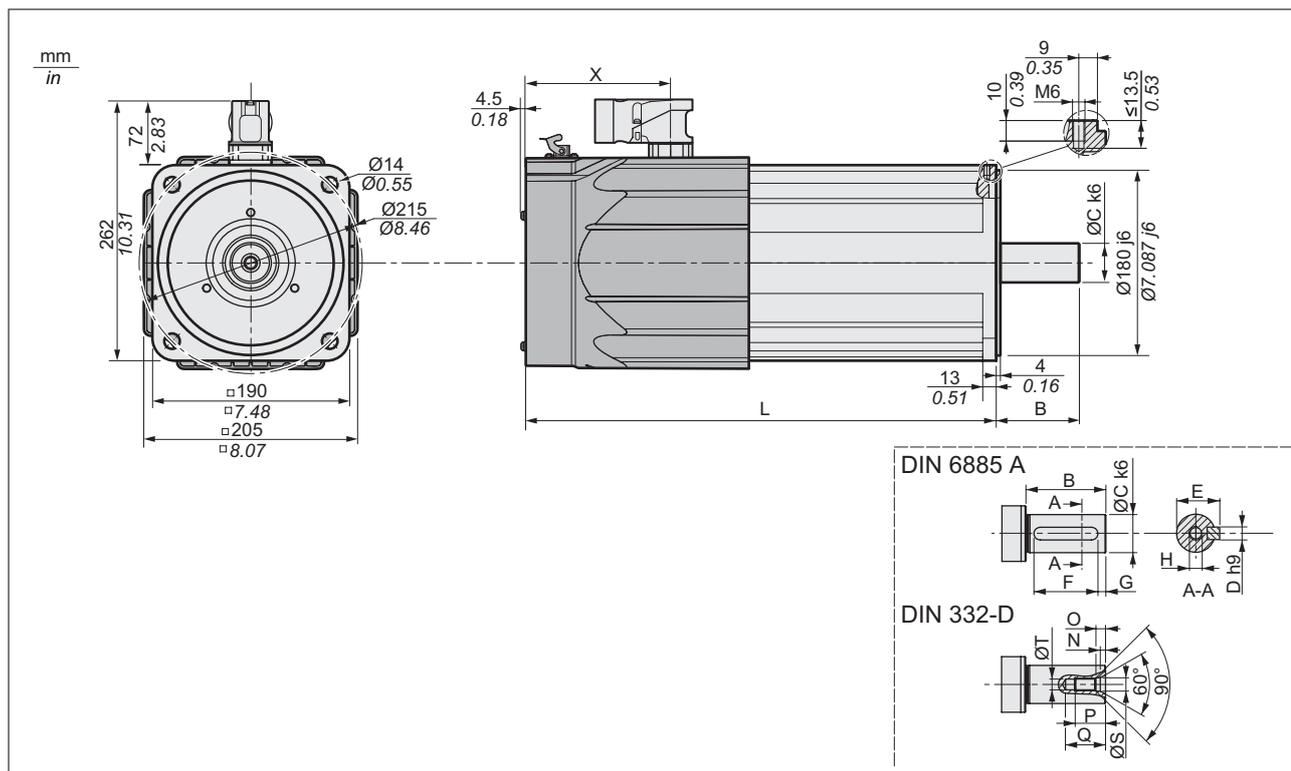


Figure 8: Dimensions BMH1904.....B

BMH...		1904.....B	
L	Length without holding brake	mm (in)	449.5 (17.70)
L	Length with holding brake	mm (in)	523 (20.59)
X	Length without holding brake	mm (in)	135 (5.31)
X	Length with holding brake	mm (in)	193.5 (7.62)
B	Shaft length	mm (in)	80 (3.15)
C	Shaft diameter	mm (in)	38 (1.496)
D	Width of parallel key	mm (in)	10 (0.398)
E	Shaft width with parallel key	mm (in)	41 (1.61)
F	Length of parallel key	mm (in)	70 (2.76)
G	Distance parallel key to shaft end	mm (in)	5 (0.2)
	Parallel key		DIN 6885-A10x8x70
H	Female thread of shaft		M12
N		mm (in)	4.4 (0.17)
O		mm (in)	9.5 (0.37)
P		mm (in)	28 (1.1)
Q		mm (in)	37 (1.46)
S		mm (in)	13 (0.51)
T		mm (in)	10.2 (0.4)

Dimensions BMH205

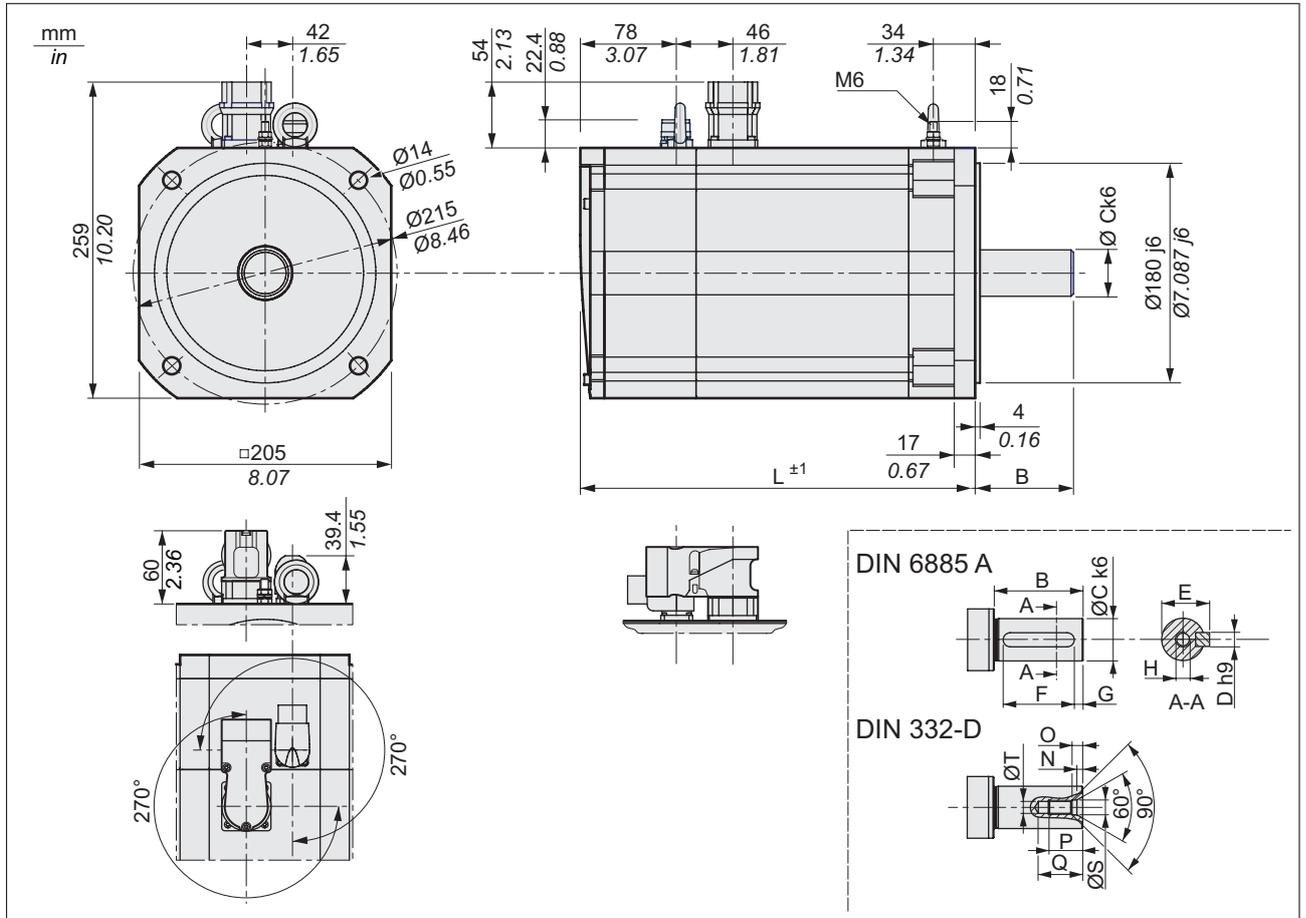


Figure 9: Dimensions BMH205

BMH...			2051	2052	2053
L	Length without holding brake	mm (in)	321 (12.64)	405 (15.94)	489 (19.25)
L	Length with holding brake	mm (in)	370.5 (14.57)	454.5 (17.89)	538.5 (21.20)
B	Shaft length	mm (in)	80 (3.15)	80 (3.15)	80 (3.15)
C	Shaft diameter	mm (in)	38 (1.496)	38 (1.496)	38 (1.496)
D	Width of parallel key	mm (in)	10 (0.398)	10 (0.398)	10 (0.398)
E	Shaft width with parallel key	mm (in)	41 (1.61)	41 (1.61)	41 (1.61)
F	Length of parallel key	mm (in)	70 (2.76)	70 (2.76)	70 (2.76)
G	Distance parallel key to shaft end	mm (in)	5 (0.2)	5 (0.2)	5 (0.2)
	Parallel key		DIN 6885-A10x8x70	DIN 6885-A10x8x70	DIN 6885-A10x8x70
H	Female thread of shaft		M12	M12	M12
N		mm (in)	4.4 (0.17)	4.4 (0.17)	4.4 (0.17)
O		mm (in)	9.5 (0.37)	9.5 (0.37)	9.5 (0.37)
P		mm (in)	28 (1.1)	28 (1.1)	28 (1.1)
Q		mm (in)	37 (1.46)	37 (1.46)	37 (1.46)
S		mm (in)	13 (0.51)	13 (0.51)	13 (0.51)
T		mm (in)	10.2 (0.4)	10.2 (0.4)	10.2 (0.4)

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2.4 Shaft-specific data

2.4.1 Force for pressing on

If the maximum permissible forces at the motor shaft are exceeded, this will result in premature wear of the bearing or shaft breakage.

⚠ WARNING
UNINTENDED EQUIPMENT OPERATION DUE TO MECHANICAL DAMAGE TO THE MOTOR
<ul style="list-style-type: none"> • Do not exceed the maximum permissible axial and radial forces at the motor shaft. • Protect the motor shaft from impact. • Do not exceed the maximum permissible axial force when pressing components onto the motor shaft.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Maximum force during pressing on

The force applied during pressing on must not exceed the maximum permissible axial force, see chapter "2.4.2 Shaft load". Applying assembly paste to the shaft and the component to be mounted reduces friction and mechanical impact on the surfaces.

If the shaft has a thread, use it to press on the component to be mounted. This way there is no axial force acting on the rolling bearing.

It is also possible to shrink-fit, clamp or glue the component to be mounted.

The following table shows the maximum permissible axial force F_A at standstill.

BMH...		070	100	140	190	205
Maximum axial force F_A at standstill	N (lb)	80 (18)	160 (36)	300 (65)	500 (112)	740 (165)

2.4.2 Shaft load

The following conditions apply:

- The permissible force applied during pressing on must not be exceed.
- Radial and axial limit loads must not be applied simultaneously
- Nominal bearing service life in operating hours at a probability of failure of 10% ($L_{10h} = 20000$ hours)
- Mean speed of rotation $n = 4000$ rpm
- Ambient temperature = $40\text{ }^{\circ}\text{C}$ ($104\text{ }^{\circ}\text{F}$)
- Peak torque = Duty types S3 - S8, 10% duty cycle
- Nominal torque = Duty type S1, 100% duty cycle

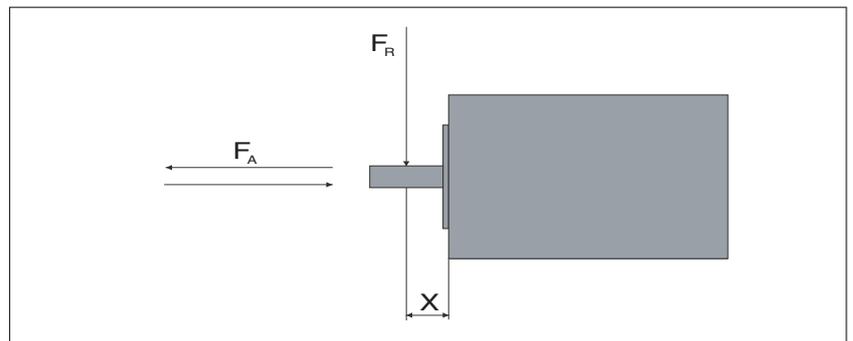


Figure 10: Shaft load

The point of application of the forces depends on the motor size:

Motor version		Values for "X"
BMH0701 and BMH0702	mm (in)	11.5 (0.45)
BMH0703	mm (in)	15 (0.59)
BMH100	mm (in)	20 (0.76)
BMH140	mm (in)	25 (0.98)
BMH190	mm (in)	40 (1.57)
BMH205	mm (in)	40 (1.57)

The following table shows the maximum radial shaft load F_R .

BMH...		0701	0702	0703	1001	1002	1003	1401	1402	1403
1000 rpm	N (lb)	660 (148)	710 (160)	730 (164)	900 (202)	990 (223)	1050 (236)	1930 (434)	2240 (544)	2420 (544)
2000 rpm	N (lb)	520 (117)	560 (126)	580 (130)	720 (162)	790 (178)	830 (187)	1530 (344)	1780 (400)	1920 (432)
3000 rpm	N (lb)	460 (103)	490 (110)	510 (115)	630 (142)	690 (155)	730 (164)	1340 (301)	1550 (348)	1670 (375)
4000 rpm	N (lb)	410 (92)	450 (101)	460 (103)	570 (128)	620 (139)	660 (148)	-	-	-
5000 rpm	N (lb)	380 (85)	410 (92)	430 (97)	530 (119)	580 (130)	610 (137)	-	-	-
6000 rpm	N (lb)	360 (81)	390 (88)	400 (90)	-	-	-	-	-	-

BMH...		1901	1902	1903	1904	2051	2052	2053
1000 rpm	N (lb)	2900 (652)	3200 (719)	3300 (742)	3800 (854)	3730 (839)	4200 (944)	4500 (1012)
2000 rpm	N (lb)	2750 (618)	3100 (697)	3250 (731)	3700 (832)	2960 (665)	3330 (749)	3570 (803)
3000 rpm	N (lb)	2650 (596)	3000 (674)	3150 (708)	3600 (809)	2580 (580)	2910 (654)	3120 (701)
4000 rpm	N (lb)	2600 (585)	2950 (663)	3100 (697)	3500 (787)	-	-	-

The following table shows the maximum axial shaft load F_A .

BMH...		0701	0702	0703	1001	1002	1003	1401	1402	1403
1000 rpm	N (lb)	132 (30)	142 (32)	146 (33)	180 (40)	198 (45)	210 (47)	386 (87)	448 (109)	484 (109)
2000 rpm	N (lb)	104 (23)	112 (25)	116 (26)	144 (32)	158 (36)	166 (37)	306 (69)	356 (86)	384 (86)
3000 rpm	N (lb)	92 (21)	98 (22)	102 (23)	126 (28)	138 (31)	146 (33)	268 (60)	310 (75)	334 (75)
4000 rpm	N (lb)	82 (18)	90 (20)	92 (21)	114 (26)	124 (28)	132 (30)	-	-	-
5000 rpm	N (lb)	76 (17)	82 (18)	86 (19)	106 (24)	116 (26)	122 (27)	-	-	-
6000 rpm	N (lb)	72 (16)	78 (18)	80 (18)	-	-	-	-	-	-

BMH...		1901	1902	1903	1904	2051	2052	2053
1000 rpm	N (lb)	580 (130)	640 (144)	660 (148)	760 (171)	746	840	900
2000 rpm	N (lb)	550 (124)	620 (139)	650 (146)	740 (166)	592	666	714
3000 rpm	N (lb)	530 (119)	600 (135)	630 (142)	720 (162)	516	582	624
4000 rpm	N (lb)	520 (117)	590 (133)	620 (139)	700 (157)	-	-	-

If the maximum permissible forces at the motor shaft are exceeded, this will result in premature wear of the bearing or shaft breakage.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION DUE TO MECHANICAL DAMAGE TO THE MOTOR

- Do not exceed the maximum permissible axial and radial forces at the motor shaft.
- Protect the motor shaft from impact.
- Do not exceed the maximum permissible axial force when pressing components onto the motor shaft.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

2.5 Options

2.5.1 Encoder

The motors are equipped with a SinCos encoder. The drive can access the electronic nameplate via the Hiperface interface for commissioning.

The signals meet the PELV requirements.

SKS36 Singleturn

This motor encoder measures an absolute value within one revolution at start-up and continues to count incrementally from this point.

Resolution in increments	Depending on evaluation
Resolution per revolution	128 sin/cos periods
Measuring range absolute	1 revolution
Accuracy of the digital absolute value ¹⁾	$\pm 0.0889^\circ$
Accuracy of the incremental position	$\pm 0.0222^\circ$
Signal shape	Sinusoidal
Supply voltage	7 ... 12 Vdc
Maximum supply current	60 mA (without load)
Maximum angular acceleration	200,000 rad/s ²

1) Depending on the evaluation through the drive, the accuracy may be increased by including the incremental position in the calculation of the absolute value. In this case, the accuracy corresponds to the incremental position.

SKM36 Multiturn

This motor encoder measures an absolute value within 4096 revolutions at start-up and continues to count incrementally from this point.

Resolution in increments	Depending on evaluation
Resolution per revolution	128 sin/cos periods
Measuring range absolute	4096 revolutions
Accuracy of the digital absolute value ¹⁾	$\pm 0.0889^\circ$
Accuracy of the incremental position	$\pm 0.0222^\circ$
Signal shape	Sinusoidal
Supply voltage	7 ... 12 Vdc
Maximum supply current	60 mA (without load)
Maximum angular acceleration	200,000 rad/s ²

1) Depending on the evaluation through the drive, the accuracy may be increased by including the incremental position in the calculation of the absolute value. In this case, the accuracy corresponds to the incremental position.

SEK37 Singleturn This motor encoder measures an absolute value within one revolution at start-up and continues to count incrementally from this point.

Resolution in increments	Depending on evaluation
Resolution per revolution	16 sin/cos periods
Measuring range absolute	1 revolution
Accuracy of position	$\pm 0.08^\circ$
Signal shape	Sinusoidal
Supply voltage	7 ... 12 Vdc
Maximum supply current	50 mA (without load)

SEL37 Multiturn This motor encoder measures an absolute value within 4096 revolutions at start-up and continues to count incrementally from this point.

Resolution in increments	Depending on evaluation
Resolution per revolution	16 sin/cos periods
Measuring range absolute	4096 revolutions
Accuracy of position	$\pm 0.08^\circ$
Signal shape	Sinusoidal
Supply voltage	7 ... 12 Vdc
Maximum supply current	50 mA (without load)

2.5.2 Holding brake

BMH...		070	1001, 1002	1003	1401, 1402	1403	1901	1902, 1903	1904, 205
Holding torque ¹⁾	Nm (lb·in)	3.0 (26.55)	5.5 (48.68)	9 (79.66)	18 (159.3)	23 (203.6)	32 (283.2)	60 (531.0)	80 (708.1)
Holding brake release time	ms	80	70	90	100	100	200	220	200
Holding brake application time	ms	17	30	40	52	60	60	50	50
Nominal voltage	Vdc	24 +5/-15%							24 +6/-10%
Nominal power (electrical pull-in power)	W	7	12	18	18	19	23	25	40
Maximum speed of rotation during braking of moving loads	rpm	3000							
Maximum number of decelerations during braking of moving loads and 3000 rpm		500							
Maximum number of decelerations during braking of moving loads per hour (at even distribu- tion)		20							
Maximum kinetic energy that can be transformed into heat per deceleration during braking of moving loads	J	130	150	150	550	550	850	850	21000

1) The holding brake is broken-in at the factory. If the holding brake is not used for an extended period of time, parts of the holding brake may corrode. Corrosion reduces the holding torque. See "Inspecting/breaking in the holding brake" in chapter "7 Service, maintenance and disposal".

For a description of the controller, see chapter "3.5.3 Holding brake connection".

2.5.3 Fan (BMH1904.....B only)

BMH...		1904.....B
Nominal voltage	Vdc	24
Nominal voltage range	Vdc	16 ... 30
Input current	A	1.4
Input power	W	34
Nominal speed of rotation	rpm	4400
Sound pressure level	dB(A)	56

2.6 Conditions for UL 1004-1, UL 1004-6 and CSA 22.2 No. 100

PELV power supply Use only power supply units that are approved for overvoltage category III.

Wiring Use at least 60/75 °C (140/167 °F) copper conductors.

2.7 Certifications

Product certifications:

Certified by	Assigned number
UL	File E208613

2.8 Declaration of conformity

The declaration of conformity can be downloaded from the Internet at:

<http://www.schneider-electric.com/download>

3 Installation

DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system.
- Ground the drive system before applying voltage.
- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
- The cross section of the protective ground conductor must comply with the applicable standards.
- Do not consider cable shields to be protective ground conductors.

Failure to follow these instructions will result in death or serious injury.

DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

- Keep foreign objects from getting into the product.
- Verify the correct seating of seals and cable entries in order to avoid contamination such as deposits and humidity.

Failure to follow these instructions will result in death or serious injury.

Motors are very heavy relative to their size. The great mass of the motor can cause injuries and damage.

WARNING

HEAVY AND/OR FALLING PARTS

- Use a suitable crane or other suitable lifting gear for mounting the motor if this is required by the weight of the motor.
- Use the necessary personal protective equipment (for example, protective shoes, protective glasses and protective gloves).
- Mount the motor so that it cannot come loose (use of securing screws with appropriate tightening torque), especially in cases of fast acceleration or continuous vibration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Motors can generate strong local electrical and magnetic fields. This can cause interference in sensitive devices.

⚠ WARNING**ELECTROMAGNETIC FIELDS**

- Keep persons with electronic medical implants, such as pace-makers, away from the motor.
- Do not place electromagnetically sensitive devices in the vicinity of the motor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The metal surfaces of the product may exceed 70 °C (158 °F) during operation.

⚠ WARNING**HOT SURFACES**

- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ CAUTION**IMPROPER APPLICATION OF FORCES**

- Do not use the motor as a step to climb into or onto the machine.
- Do not use the motor as a load-bearing part.
- Use hazard labels and guards on your machine to help prevent the improper application of forces on the motor.

Failure to follow these instructions can result in injury or equipment damage.

3.1 Overview of procedure

Chapter	Page
"3.2 Electromagnetic compatibility (EMC)"	51
"3.3 Before mounting"	54
"3.4 Mounting the motor "	60
"3.5 Electrical installation"	65

3.2 Electromagnetic compatibility (EMC)

The measures for electromagnetic compatibility (EMC) are intended to minimize electromagnetic interference of the device and interference caused by the device that affects the environment. Such measures include measures to reduce interference and emission as well as to increase immunity.

Electromagnetic compatibility hinges to a great extent on the individual components used in the system. The EMC measures described in this manual may help to comply with the requirements of IEC 61800-3. You must comply with all EMC regulations of the country in which the product is operated. Also, respect any special EMC regulations that may apply at the installation site (for example, residential environments or airports).

Signal interference can cause unexpected responses of the drive system and of other equipment in the vicinity of the drive system.

⚠ WARNING
<p>SIGNAL AND EQUIPMENT INTERFERENCE</p> <ul style="list-style-type: none"> • Install the wiring in accordance with the EMC requirements described in the present document. • Verify compliance with the EMC requirements described in the present document. • Verify compliance with all EMC regulations and requirements applicable in the country in which the product is to be operated and with all EMC regulations and requirements applicable at the installation site. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

Motor and encoder cables

In terms of EMC, motor cables are especially critical since they are particularly prone to causing interference.

When planning the wiring, take into account the fact that the motor cable must be routed separately. The motor cable must be separate from mains cables or signal cables (for example, limit switches). Use only pre-assembled cables or cables that comply with the specifications and implement the EMC measures described below.

EMC measures	Effect
Keep cables as short as possible. Do not install unnecessary cable loops, use short cables from the central grounding point in the control cabinet to the external ground connection.	Reduces capacitive and inductive interference.
Ensure that there is a ground connection between the motor flange and the mounting surface on the machine (no paint, oil and grease or any insulating material between the motor flange and the mounting surface on the machine).	Reduces emissions, increases immunity.
Connect large surface areas of cable shields, use cable clamps and ground straps.	Reduces emissions.
Do not install switching elements in motor cables or encoder cables.	Reduces interference.
Route the motor cable separately from mains cables and signal cables (for example, for limit switches), for example by using shielding plates or by keeping the cables apart from each other at a distance of at least 20 cm (5.08 in).	Reduces mutual interference
Route the motor cable and encoder cable without cutting them. ¹⁾	Reduces emission.

1) If a cable is cut for the installation, take appropriate measures for uninterrupted shielding (such as a metal housing) at the point of the cut. Connect a large area of the cable shield to the metal housing at both ends of the cut.



Pre-assembled motor cables with various lengths are available for the drive solutions. Contact your local sales office.

Pre-assembled connection cables (accessories)

Using pre-assembled cables helps to reduce the possibility of wiring errors. See chapter "6 Accessories and spare parts".

Place the female connector of the motor cable onto the motor connector and tighten the union nut. Proceed in the same manner with the connection cable of the encoder system. Connect the motor cable and the encoder cable to the drive according to the wiring diagram of the drive.

Equipotential bonding conductors

Potential differences can result in excessive currents on the cable shields. Use equipotential bonding conductors to reduce currents on the cable shields. The equipotential bonding conductor must be rated for the maximum current.

⚠ WARNING**UNINTENDED EQUIPMENT OPERATION**

- Ground cable shields for all fast I/O, analog I/O, and communication signals at a single point. ¹⁾
- Route communications and I/O cables separately from power cables.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- 1) Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

3.3 Before mounting

Inspecting the product

- ▶ Verify the product version by means of the type code on the nameplate. See chapter "1.3 Nameplate" and chapter "1.4 Type code".
- ▶ Prior to mounting, inspect the product for visible damage.

Damaged products may cause electric shock or unintended equipment operation.

⚠ ⚠ DANGER

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

- Do not use damaged products.
- Keep foreign objects (such as chips, screws or wire clippings) from getting into the product.

Failure to follow these instructions will result in death or serious injury.

Contact your local Schneider Electric sales office if you detect any damage whatsoever to the products.

Inspecting the holding brake (option)

See chapter "7.2 Maintenance", section "Inspecting/breaking in the holding brake".

Cleaning the shaft

The shaft extensions are factory-treated with an anti-corrosive. If output components are glued to the shaft, the anti-corrosive must be removed and the shaft cleaned. If required, use a grease removal agent as specified by the glue manufacturer. If the glue manufacturer does not provide information on grease removal, acetone may be used.

- ▶ Remove the anti-corrosive. Avoid direct contact of the skin and the sealing material with the anti-corrosive or the cleaning agent.

Mounting surface for flange

The mounting surface must be stable, clean, deburred and low-vibration. Ensure that the mounting surface is itself grounded, and that a potential exists between the motor flange and the mounting surface.

⚠ ⚠ DANGER

ELECTRIC SHOCK CAUSED BY INSUFFICIENT GROUNDING

- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of the entire drive system.
- Ground the drive system before applying voltage.
- Do not use conduits as protective ground conductors; use a protective ground conductor inside the conduit.
- The cross section of the protective ground conductor must comply with the applicable standards.
- Do not consider cable shields to be protective ground conductors.

Failure to follow these instructions will result in death or serious injury.

- ▶ Verify that the mounting surface meets all requirements in terms of dimensions and tolerances. See chapter "2.3 Dimensions" for dimensions.

019844113749, V2.1, 03.2016

Conductor cross sections according to method of installation

The following sections describe the conductor cross sections for two methods of installation:

- Method of installation B2:
Cables in conduits or cable trunking systems
- Method of installation E:
Cables on open cable trays

Cross section in mm ² (AWG) ¹⁾	Current-carrying capacity with method of installation B2 in A ²⁾	Current carrying capacity with method of installation E in A ²⁾
0.75 (18)	8.5	10.4
1 (16)	10.1	12.4
1.5 (14)	13.1	16.1
2.5 (12)	17.4	22
4 (10)	23	30
6 (8)	30	37
10 (6)	40	52
16 (4)	54	70
25 (2)	70	88

1) See chapter "6 Accessories and spare parts" for available cables.
 2) Values as per IEC 60204-1 for continuous operation, copper conductors and ambient air temperature 40°C (104 °F); see IEC 60204-1 for additional information.

Note the derating factors for grouping of cables and correction factors for other ambient conditions (IEC 60204-1).

The conductors must have a sufficiently large cross section so that the upstream fuse can trip.

In the case of longer cables, it may be necessary to use a greater conductor cross section to reduce the energy losses.

Cable specifications Using pre-assembled cables helps to reduce the possibility of wiring errors. See chapter "6 Accessories and spare parts".

The genuine accessories have the following properties:

Cables with connectors		VW3M5101	VW3M5102	VW3M5103	VW3M5105	VW3M5104
Cable jacket, insulation		PUR orange (RAL 2003), polypropylene (PP)				
Capacitance Wire/wire Wire/shield	pF/m pF/m	80 135	80 150	90 150	85 150	100 160
Number of contacts (shielded)		4 x 1.5 mm ² + 2 x 1 mm ²	4 x 2.5 mm ² + 2 x 1 mm ²	4 x 4 mm ² + 2 x 1 mm ²	4 x 6 mm ² + 2 x 1 mm ²	4 x 10 mm ² + 2 x 1 mm ²
Connection version		Motor end 8-pin circular connector M23, other cable end open		Motor end 8-pin circular connector M40, other cable end open		
Cable diameter	mm (in)	12 ± 0.2 (0.47 ± 0.01)	14.3 ± 0.3 (0.55 ± 0.01)	16.3 ± 0.3 (0.64 ± 0.01)	18.8 ± 0.4 (0.74 ± 0.02)	23.5 ± 0.6 (0.93 ± 0.02)
Minimum bend radius with permanently installed connection		5 times the cable diameter				
Minimum bend radius with flexible installation		7.5 times the cable diameter			10 times the cable diameter	
Nominal voltage Motor phases Holding brake	V	600 300				
Maximum orderable length	m (ft)	75 (246)				
Permissible temperature range during operation with permanently installed connection	°C (°F)	-40 ... 80 (-40 ... 176)				
Permissible temperature range during operation with flexible installation	°C (°F)	-20 ... 80 (-4 ... 176)				
Certifications / declaration of conformity		CE, DESINA				

Cables without connectors		VW3M5301	VW3M5302	VW3M5303	VW3M5305	VW3M5304
Cable jacket, insulation		PUR orange (RAL 2003), polypropylene (PP)				
Capacitance Wire/wire	pF/m	80	80	90	85	100
Wire/shield	pF/m	135	150	150	150	160
Number of contacts (shielded)		4 x 1.5 mm ² + 2 x 1 mm ²	4 x 2.5 mm ² + 2 x 1 mm ²	4 x 4 mm ² + 2 x 1 mm ²	4 x 6 mm ² + 2 x 1 mm ²	4 x 10 mm ² + 2 x 1 mm ²
Connection version		Both cable ends open				
Cable diameter	mm (in)	12 ± 0.2 (0.47 ± 0.01)	14.3 ± 0.3 (0.55 ± 0.01)	16.3 ± 0.3 (0.64 ± 0.01)	18.8 ± 0.4 (0.74 ± 0.02)	23.5 ± 0.6 (0.93 ± 0.02)
Minimum bend radius with permanently installed connection		5 times the cable diameter				
Minimum bend radius with flexible installation		7.5 times the cable diameter			10 times the cable diameter	
Nominal voltage Motor phases Holding brake	V	600 300				
Maximum orderable length	m (ft)	100 (328)				
Permissible temperature range during operation with permanently installed connection	°C (°F)	-40 ... 80 (-40 ... 176)				
Permissible temperature range during operation with flexible installation	°C (°F)	-20 ... 80 (-4 ... 176)				
Certifications / declaration of conformity		CE, c-UR-us, DESINA				

Cables with connectors		VW3M8102
Cable jacket, insulation		PUR green (RAL 6018), polypropylene (PP)
Capacitance	pF/m	Approx. 135 (wire/wire)
Number of contacts (shielded)		[3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)]
Connection version		Motor end 12-pin circular connector M23, device end 10-pin connector RJ45
Cable diameter	mm (in)	6.8 ± 0.2 (0.27 ± 0.1)
Minimum bend radius	mm (in)	68 (2.68)
Nominal voltage	V	300
Maximum orderable length	m (ft)	75 (246)
Permissible temperature range during operation fixed: moving:	°C (°F) °C (°F)	-40 ... 90 (-40 ... 194) -20 ... 80 (-4 ... 176)
Certifications / declaration of conformity		DESINA

019844113749, V2.1, 03.2016

Cables without connectors		VW3M8222
Cable jacket, insulation		PUR green (RAL 6018), polypropylene (PP)
Capacitance	pF/m	Approx. 135 (wire/wire)
Number of contacts (shielded)		[3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)]
Connection version		Both cable ends open
Cable diameter	mm (in)	6.8 ± 0.2 (0.27 ± 0.1)
Minimum bend radius	mm (in)	68 (2.68)
Nominal voltage	V	300
Maximum orderable length	m (ft)	100 (328)
Permissible temperature range during operation		
fixed:	°C (°F)	-40 ... 90 (-40 ... 194)
moving:	°C (°F)	-20 ... 80 (-4 ... 176)
Certifications / declaration of conformity		c-UR-us, DESINA

Space for connectors

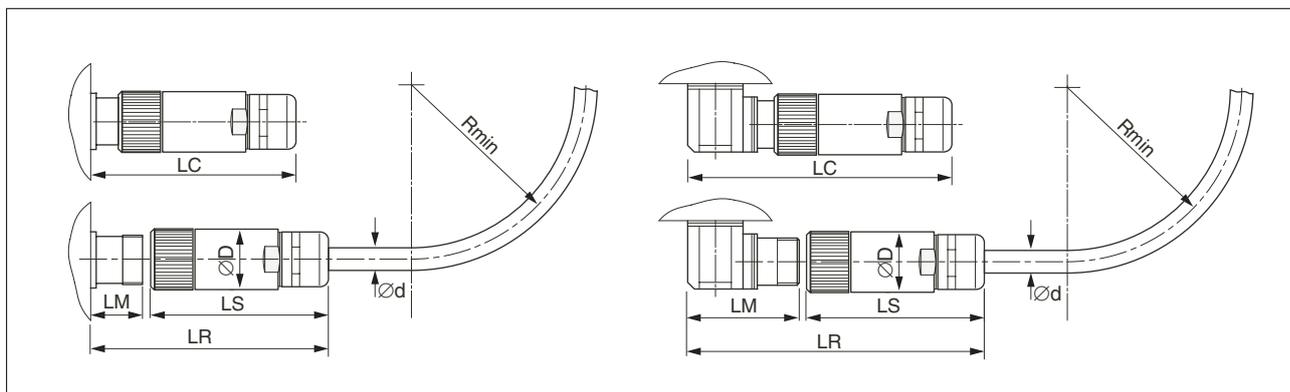


Figure 11: Connector installation space

Dimensions		Motor connectors straight BMH070 ... 140	Motor connectors straight BMH205	Encoder connector straight
D	mm (in)	28 (1.10)	46 (1.81)	26 (1.02)
LS	mm (in)	76 (2.99)	100 (3.94)	51 (2.01)
LR	mm (in)	117 (4.61)	155 (6.10)	76 (2.99)
LC	mm (in)	100 (3.94)	145 (5.71)	60 (2.36)
LM	mm (in)	40 (1.57)	54 (2.13)	23 (0.91)

Dimensions		Motor connectors angular BMH070 ... 140	Motor connectors angular BMH190 ... 205	Encoder connector angular
D	mm (in)	28 (1.10)	46 (1.81)	26 (1.02)
LS	mm (in)	76 (2.99)	100 (3.94)	51 (2.01)
LR	mm (in)	132 (5.20)	191 (7.52)	105 (4.13)
LC	mm (in)	114 (4.49)	170 (6.69)	89 (3.50)
LM	mm (in)	55 (2.17)	91 (3.58)	52 (2.05)

Dimensions		Motor cables BMH070 ... 140	Motor cables BMH190 ... 205	Encoder cables
d	mm (in)	18 (0.71)	25 (0.98)	18 (0.71)
R _{min}	mm (in)	90 (3.54)	125 (4.92)	68 (2.68)

3.4 Mounting the motor

Electrostatic discharge to the shaft may cause incorrect operation of the encoder system and result in unanticipated motor movements and damage to the bearing.

⚠ WARNING
UNINTENDED MOVEMENT CAUSED BY ELECTROSTATIC DISCHARGE
Use conductive components such as antistatic belts or other suitable measures to avoid static charge by motion.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

If the permissible ambient conditions are not respected, external substances from the environment may penetrate the product and cause unintended movement or equipment damage.

⚠ WARNING
UNINTENDED MOVEMENT
<ul style="list-style-type: none">• Verify that the ambient conditions are respected.• Do not allow seals to run dry.• Keep liquids from getting to the shaft bushing (for example, in mounting position IM V3).• Do not expose the shaft sealing rings and cable entries of the motor to the direct spray of a pressure washer.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

The metal surfaces of the product may exceed 70 °C (158 °F) during operation.

⚠ WARNING
HOT SURFACES
<ul style="list-style-type: none">• Avoid unprotected contact with hot surfaces.• Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.• Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTICE

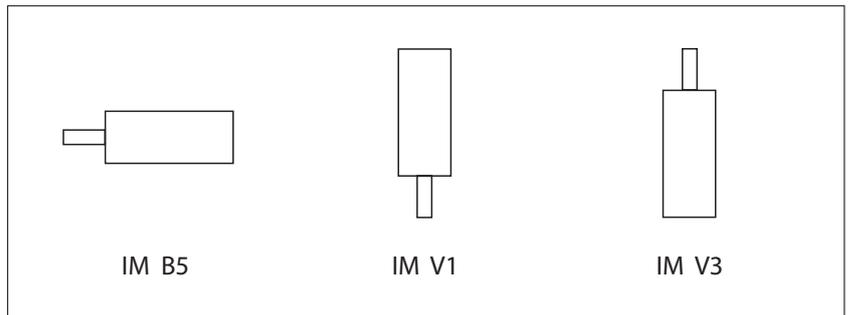
FORCES APPLIED TO THE REAR SIDE OF THE MOTOR

- Do not place the motor on the rear side.
- Protect the rear side of the motor from impact.
- Do not lift motors via the rear side.
- Lift motors equipped with eyebolts only via the eyebolts.

Failure to follow these instructions can result in equipment damage.

Mounting position

The following mounting positions are defined and permissible as per IEC 60034-7:



Special characteristics BMH190

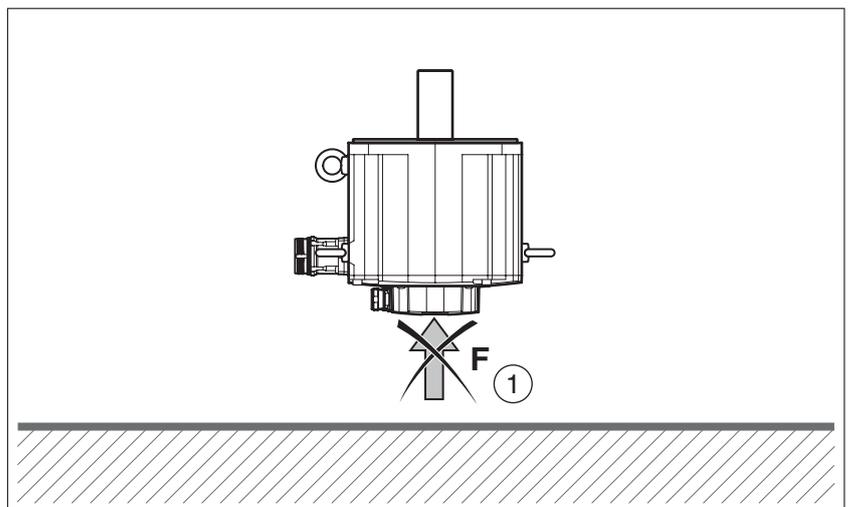
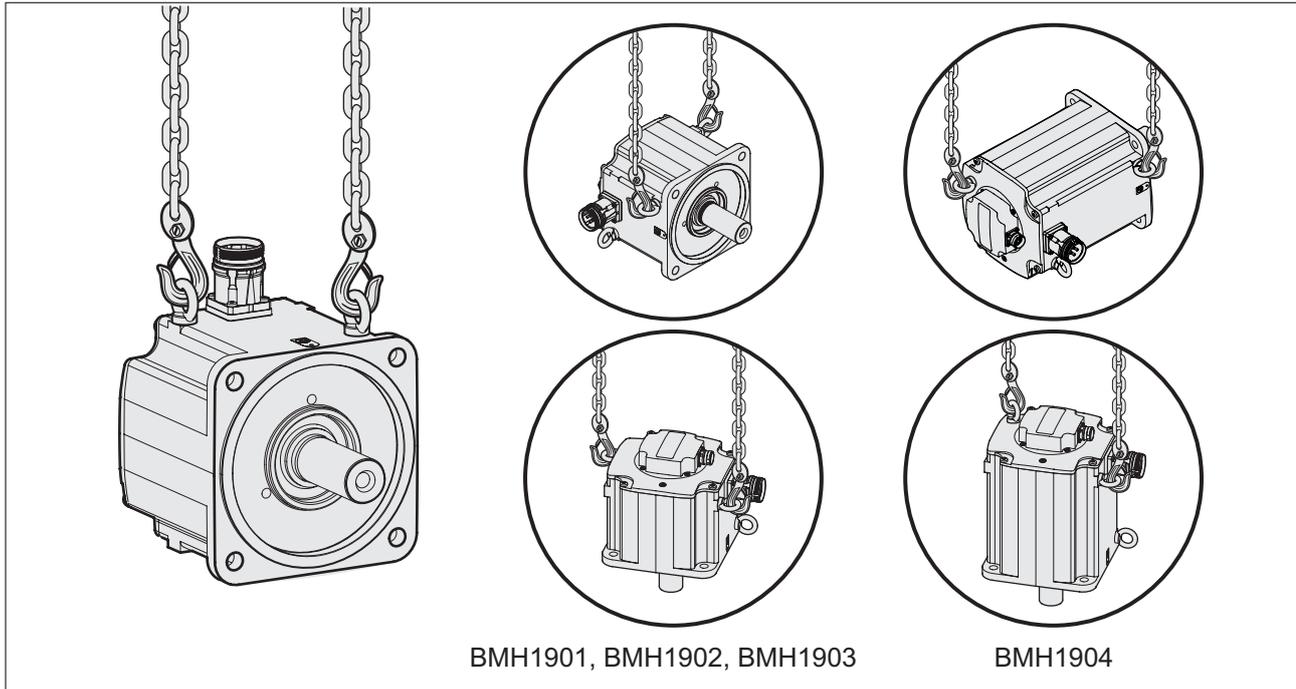


Figure 12: BMH190 rear side of motor

- (1) Protect the rear side of the motor from application of forces.
 Consider the mass of the product when mounting the motor. It may be necessary to use suitable lifting gear.



Mounting

When the motor is mounted to the mounting surface, it must be accurately aligned axially and radially and make even contact with the mounting surface. All mounting screws must be tightened with the specified tightening torque. No uneven mechanical load must be applied when the mounting screws are tightened. See chapter "2 Technical Data" for data, dimensions and degrees of protection (IP).

Mounting output components

Output components such as pulleys and couplings must be mounted with suitable equipment and tools. Motor and output component must be accurately aligned both axially and radially. If the motor and the output component are not accurately aligned, this will cause runout and premature wear.

The maximum axial and radial forces acting on the shaft must not exceed the maximum shaft load values specified, see chapter "2.4.2 Shaft load".

If the maximum permissible forces at the motor shaft are exceeded, this results in premature wear of the bearing, shaft breakage or damage to the encoder.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION DUE TO MECHANICAL DAMAGE TO THE MOTOR

- Do not exceed the maximum permissible axial and radial forces at the motor shaft.
- Protect the motor shaft from impact.
- Do not exceed the maximum permissible axial force when pressing components onto the motor shaft.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

3.4.1 Installation and connection of IP67 kit (accessory)

The IP67 kit is used to connect compressed air to the motor. Degree of protection IP65 is a prerequisite for the use of the IP67 kit. The compressed air generates a permanent overpressure inside the motor. This overpressure inside the motor is used to obtain degree of protection IP67.

Note the special requirements in terms of the compressed air in chapter "2 Technical Data".

Installation: BMH070, BMH100, BMH140 and BMH205

When the IP67 kit is installed, the existing cover is replaced by the cover of the IP67 kit. The O-ring is also replaced (shipped with the IP67 kit).

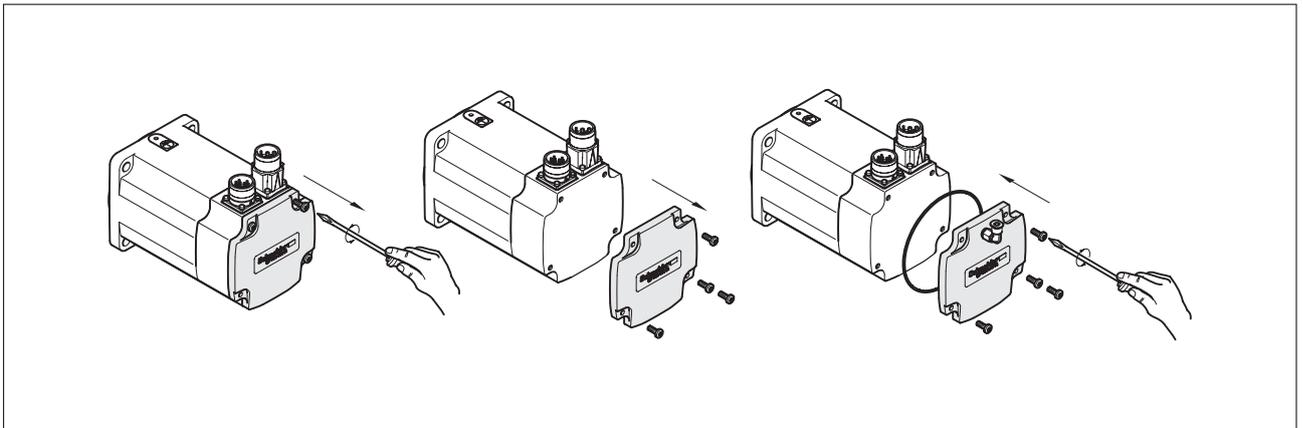


Figure 13: Installation IP67 Kit

- ▶ Loosen the 4 housing screws of the cover.
- ▶ Remove the cover and the O-ring
- ▶ Verify proper seat of the O-ring in the cover of the IP67 kit.

To facilitate mounting of the new O-ring, you may slightly grease the O-ring to hold it in place.

- ▶ Fasten the cover of the IP67 kit with the 4 housing screws.

Tightening torque of housing screws M3	Nm (lb•in)	1 (8.85)
Tightening torque of housing screws M4	Nm (lb•in)	1.5 (13.28)
Tightening torque of housing screws M5	Nm (lb•in)	5 (44.3)

- ▶ Verify the tightening torque of the compressed air connection:

Tightening torque compressed air connection	Nm (lb•in)	0.6 (5.31)
---	------------	------------

Installation: BMH190 For installation, the existing screw plug is replaced by an L-shaped push-in fitting. See page 87 for sources of supply of the L-shaped push-in fitting.

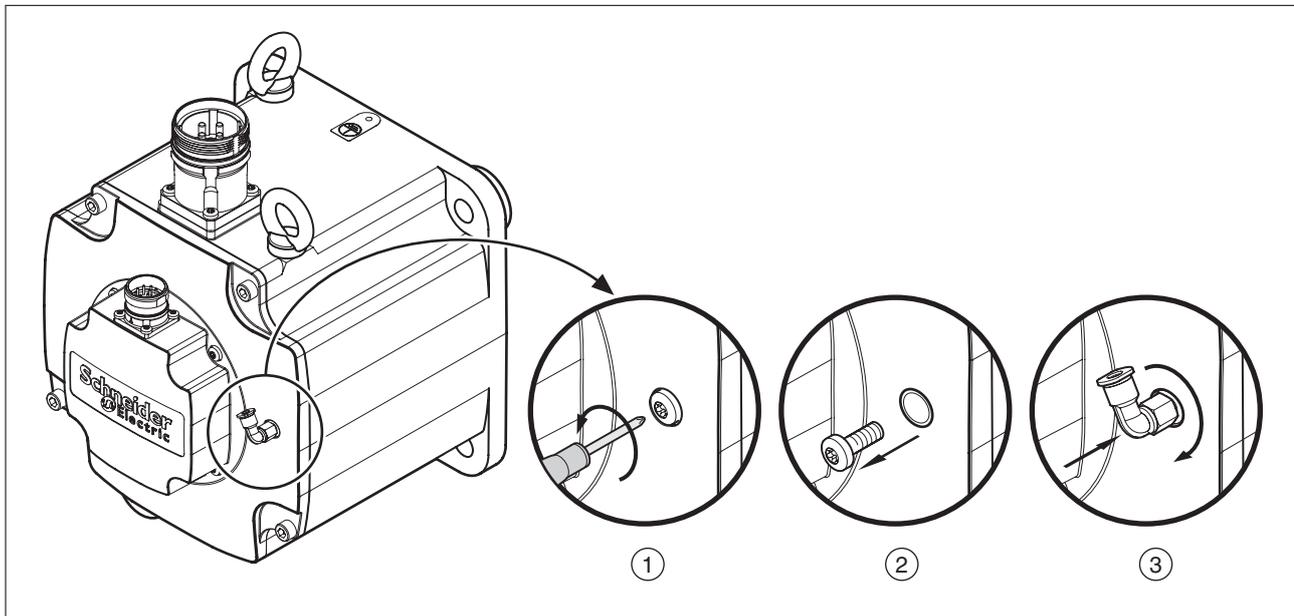


Figure 14: Installation L-shaped push-in fitting BMH190

- ▶ (1) and (2): Remove the screw plug.
- ▶ (3) Screw the L-shaped push-in fitting into the thread.
- ▶ Verify proper seat of the L-shaped push-in fitting.
- ▶ Verify the tightening torque of the L-shaped push-in fitting:

Tightening torque L-shaped push-in fitting	Nm (lb•in)	0.6 (5.31)
--	------------	------------

Compressed air connection The compressed air connection of the L-shaped push-in fitting is designed for compressed air hoses made of standard plastic with a nominal diameter of 4 mm.

Compressed air monitoring Use a compressed air monitor.

3.5 Electrical installation

3.5.1 Connectors and connector assignments

Connection overview

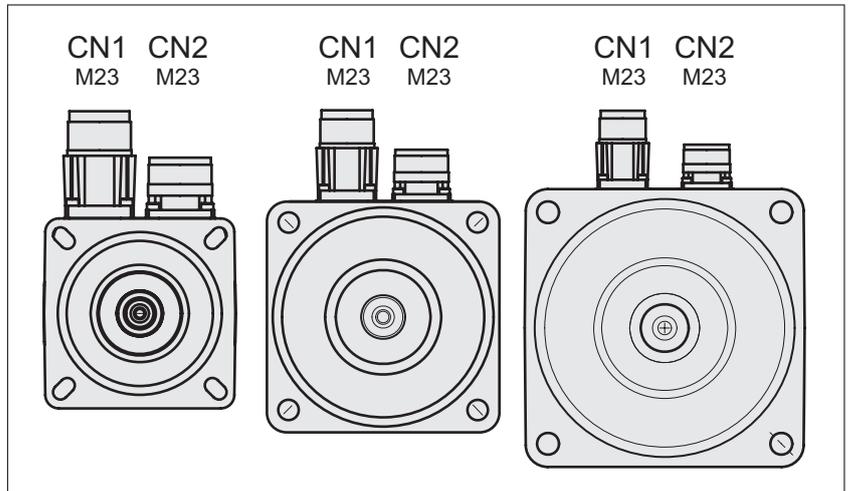


Figure 15: Connection overview BMH070, BMH100 and BMH140

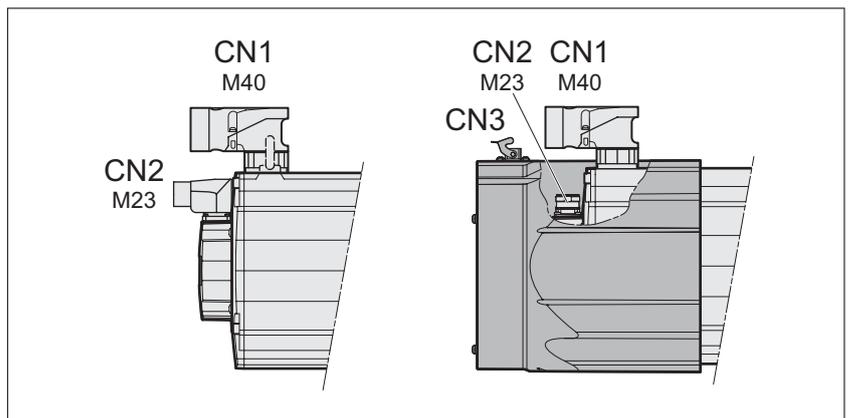


Figure 16: Connection overview BMH1904.....A and BMH1904.....B

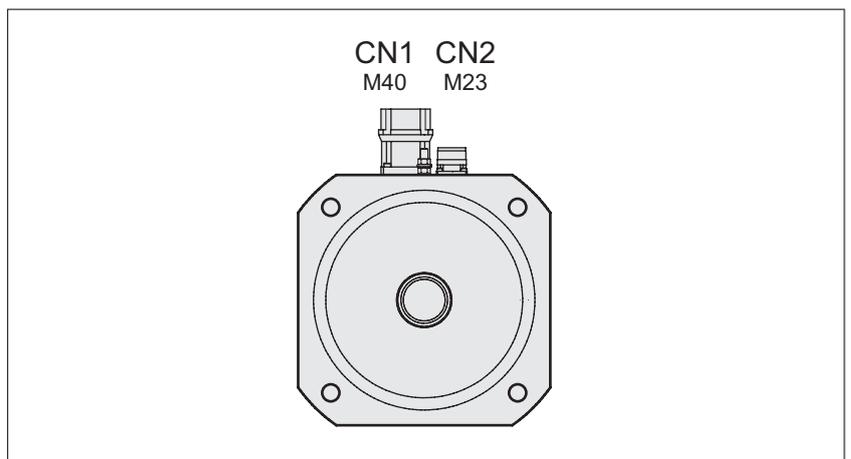


Figure 17: Connection overview BMH205

CN1 motor connection M23 Motor connector for connection of the motor phases and the holding brake.

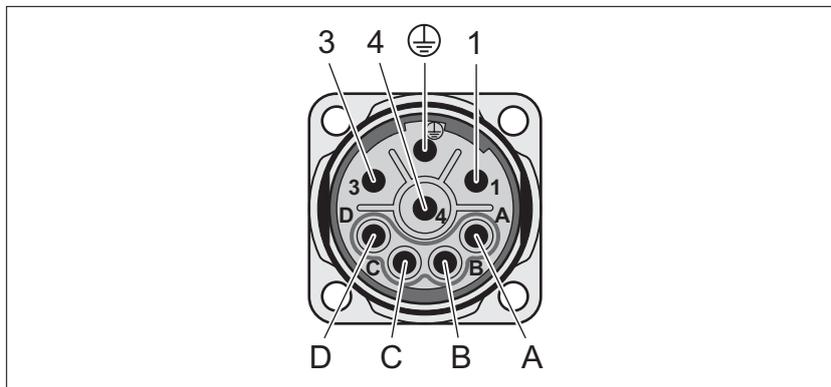


Figure 18: Pin assignment motor connection M23

See chapter "6.2 Connectors" for suitable mating connectors.

The signals of the holding brake meet the PELV requirements.

Pin	Assignment	Meaning
1	U	Motor phase U
⊕	PE	Protective ground conductor
3	W	Motor phase W
4	V	Motor phase V
A	BR+	Supply voltage holding brake 24 Vdc
B	BR-	Reference potential holding brake 0 Vdc
C	Reserved	Reserved
D	Reserved	Reserved
	SHLD	Shield (to connector housing)

CN1 motor connection M40 Motor connector for connection of the motor phases and the holding brake.

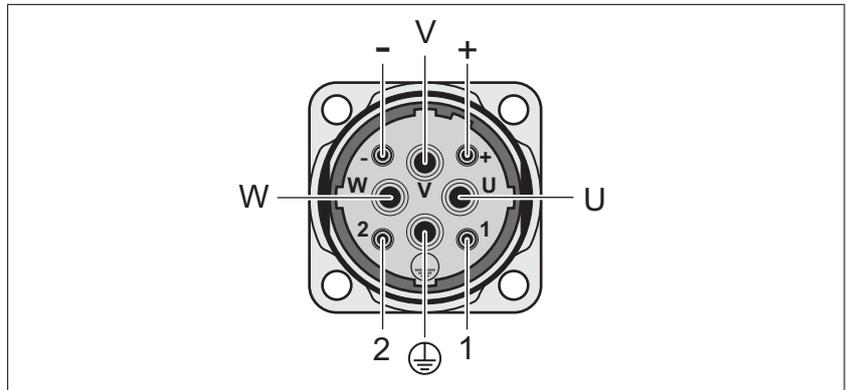


Figure 19: Pin assignment motor connection M40

See chapter "6.2 Connectors" for suitable mating connectors.

The signals of the holding brake meet the PELV requirements.

Pin	Assignment	Meaning
U	U	Motor phase U
⊕	PE	Protective ground conductor
W	W	Motor phase W
V	V	Motor phase V
+	BR+	Supply voltage holding brake 24 Vdc
-	BR-	Reference potential holding brake 0 Vdc
1	Reserved	Reserved
2	Reserved	Reserved
	SHLD	Shield (to connector housing)

CN2 encoder connection M23

Encoder connector for connection of the SinCos encoder (singleturn and multiturn)

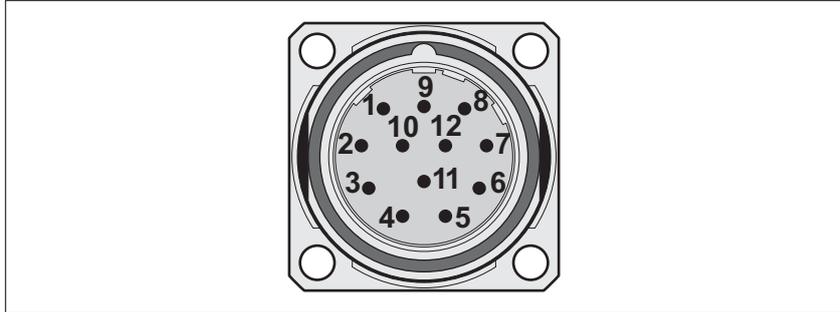


Figure 20: Pin assignment encoder connector

See chapter "6.2 Connectors" for suitable mating connectors.

The signals meet the PELV requirements.

Pin	Signal	Meaning	Pair ¹⁾
1	Reserved	Reserved	6
2	Reserved	Reserved	5
3	Reserved	Reserved	5
4	REFSIN_OUT	Reference for sine signal, 2.5 V	1
5	REFCOS_OUT	Reference for cosine signal, 2.5V	2
6	DATA	Receive data, transmit data	3
7	$\overline{\text{DATA}}$	Receive data and transmit data, inverted	3
8	SIN_OUT	Sine signal	1
9	COS_OUT	Cosine signal	2
10	ENC+10V	7 ... 12 V supply voltage	6
11	ENC_0V	Reference potential ²⁾	4
12	Reserved	Reserved	4
	SHLD	Shield (to connector housing)	

1) Signal pairs must be twisted

2) The ENC_0V connection of the supply voltage has no connection to the encoder housing.

CN3 fan connection Fan connector for connecting the fan.

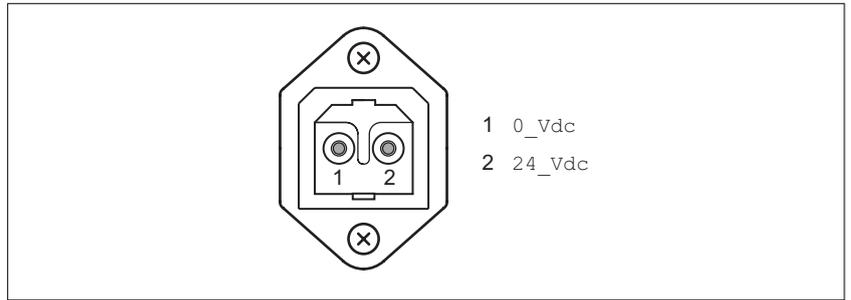


Figure 21: Pin assignment fan connector

The signals meet the PELV requirements.

Pin	Signal	Meaning
1	0_Vdc	Reference potential fan 0 Vdc
2	24_Vdc	Supply voltage fan 24 Vdc

A mating socket is provided with the fan.

Type: Hirschmann STAK 200

3.5.2 Power and encoder connection

High voltages may be present at the motor connection. The motor itself generates voltage when the motor shaft is rotated. AC voltage can couple voltage to unused conductors in the motor cable.

DANGER

ELECTRIC SHOCK

- Verify that no voltage is present prior to performing any type of work on the drive system.
- Block the motor shaft to prevent rotation prior to performing any type of work on the drive system.
- Insulate both ends of unused conductors of the motor cable.
- Only touch the motor shaft or the mounted output components if all power has been disconnected.
- Verify compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.

Failure to follow these instructions will result in death or serious injury.

The motor is designed for operation via a drive. Connecting the motor directly to AC voltage will damage the motor and can cause fires.

DANGER

FIRE HAZARD DUE TO INCORRECT CONNECTION

Only connect the motor to a matching, approved drive in the way described in the present documentation.

Failure to follow these instructions will result in death or serious injury.

Drive systems may perform unintended movements if unapproved combinations of drive and motor are used. Even if motors are similar, different adjustment of the encoder system may be a source of hazards. Even if the connectors for motor connection and encoder connection match mechanically, this does not imply that the motor is approved for use.

WARNING

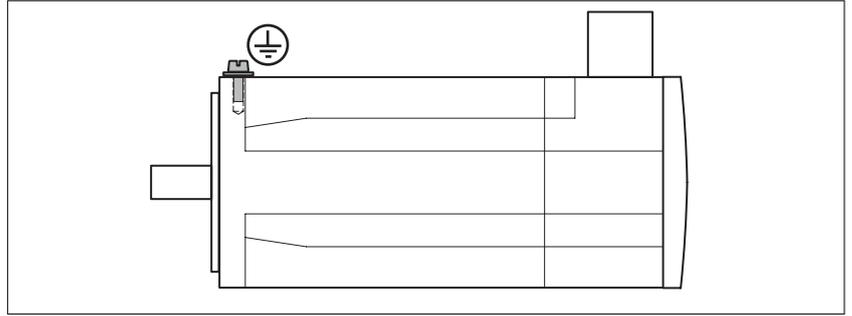
UNINTENDED MOVEMENT

Only use approved combinations of drive and motor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

See chapter "2.1 General characteristics" for approved drives.

Protective ground conductor connection



- ▶ Ground the motor via a grounding screw if grounding via the flange and the protective ground conductor of the motor cable is not sufficient. Use parts with suitable corrosion protection. Note the required tightening torque and the property class of the grounding screw, see page 24.

Assembling cables Insulate unused wires individually.

- ▶ Note the EMC requirements for motor cables and encoder cables, page 52.
- ▶ Use equipotential bonding conductors for equipotential bonding.

Follow the procedure and note the dimensions in "Dimensions for motor connector M23".

Depending on the motor size, different connector sizes are used for the motor connection CN1. BMH070, BMH100 and BMH140 have an M23 connection. BMH190 and BMH205 have an M40 connection. The encoder connection CN2 is identical irrespective of the motor size.

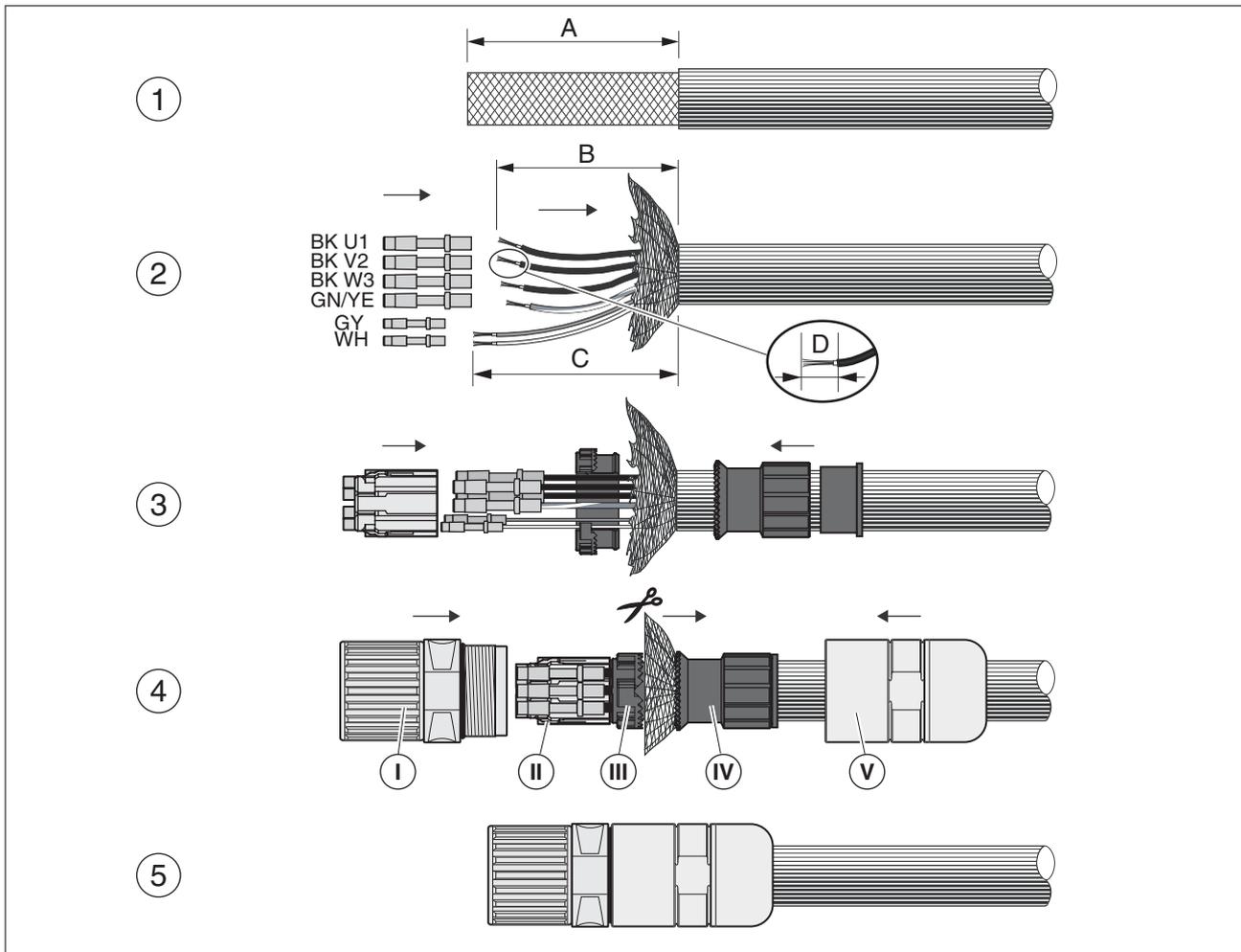


Figure 22: Assembling motor cables with M23 motor connector

- ▶ (1) Strip the cable jacket; length as specified (see table below).
- ▶ Open the shielding braid and slide it back over the outer cable jacket.
- ▶ Shorten the inner cable jacket.
- ▶ (2) Shorten the wires to the specified length (see table below) and crimp them to the connector.

If possible, also connect unused wires. This improves EMC. Wires that are not connected must be insulated at both ends.

- ▶ (3) Push part (V) and part (IV) onto the cable. Snap the contacts into part (II). Open the side of part (III) and enclose the wires using this part.
- ▶ (4) Slide part (III) behind the shielding braid and insert part (II) into part (I). Arrange the shielding braid as shown. Push part (I) and part (III) together and shorten the shielding braid.
- ▶ Screw part (IV) onto part (I) all the way to the stop.

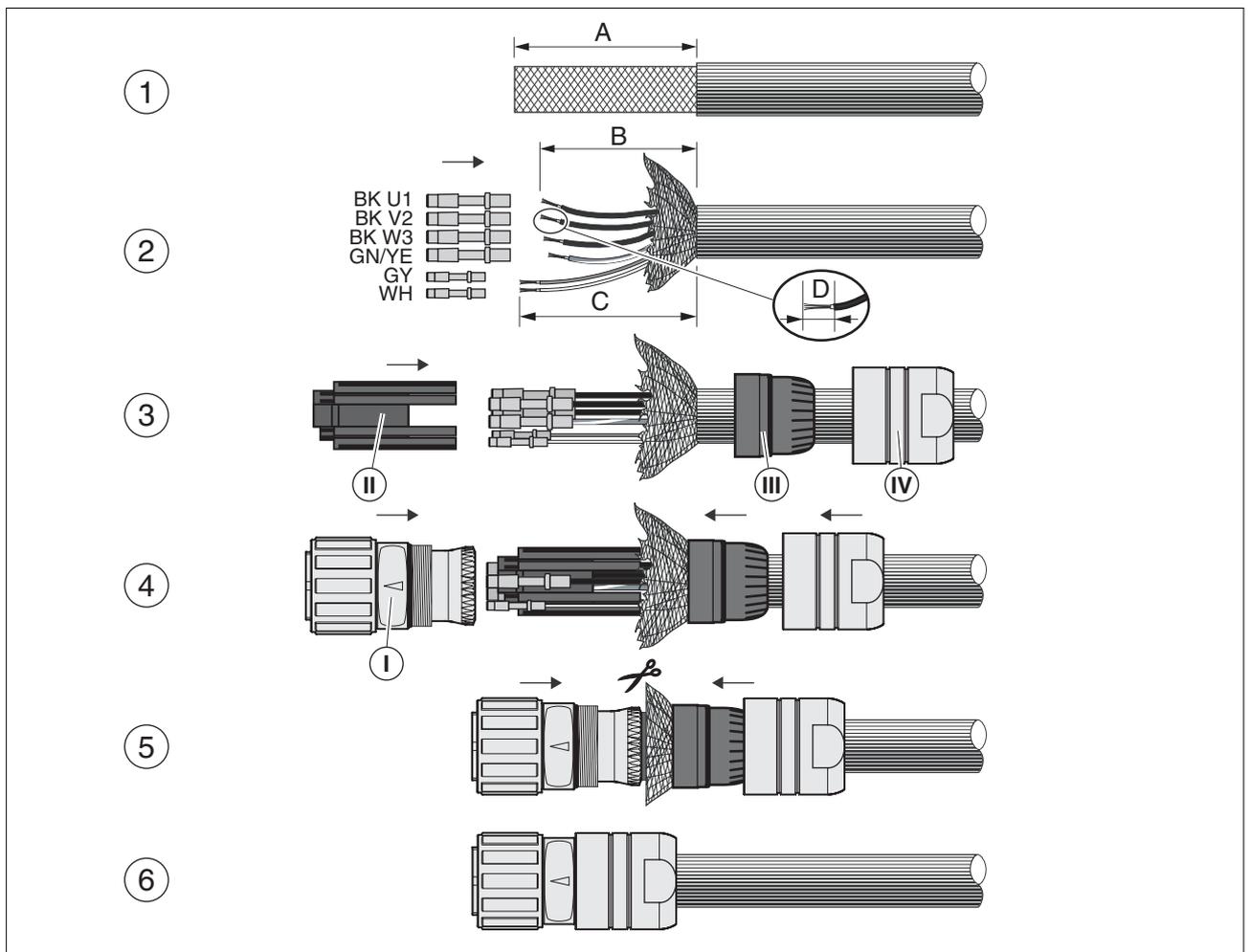


Figure 23: Assembling motor cables with M40 motor connector

- ▶ (1) Strip the cable jacket; length as specified (see table below).
- ▶ Open the shielding braid and slide it back over the outer cable jacket.
- ▶ Shorten the inner cable jacket.
- ▶ (2) Shorten the wires to the specified length (see table below) and crimp them to the connector.

If possible, also connect unused wires. This improves EMC. Wires that are not connected must be insulated at both ends.

- ▶ (3) Push part (IV) and part (III) onto the cable. Snap the contacts laterally into part (II).
- ▶ (4) Slide part (III) behind the shielding braid and insert part (II) into part (I).
- ▶ (5) Arrange the shielding braid as shown. Push part (I) and part (III) together and shorten the shielding braid.
- ▶ Screw part (IV) onto part (I) all the way to the stop.

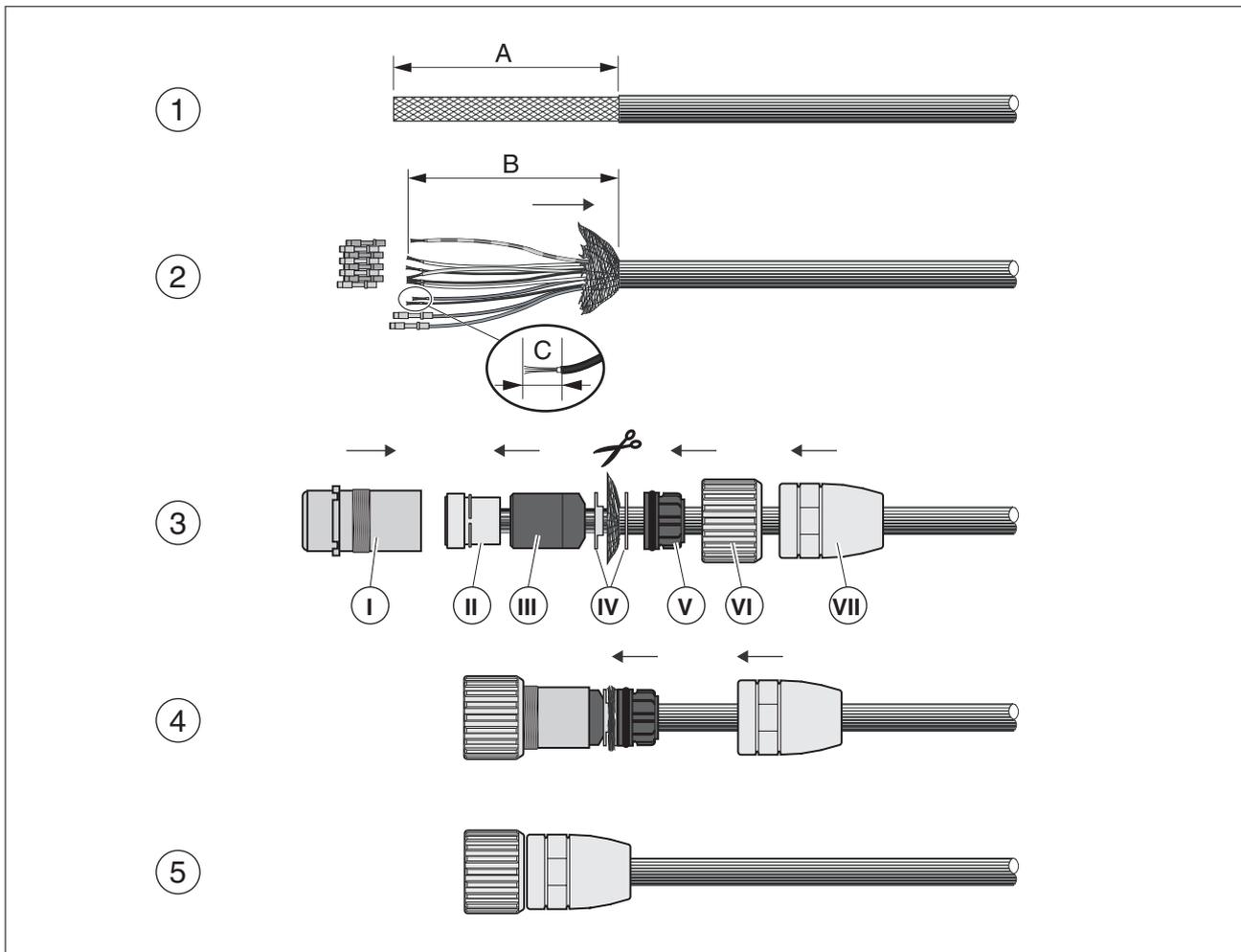


Figure 24: Assembling encoder cables with M23 encoder connector

- ▶ (1) Strip the cable jacket; length as specified (see table below).
- ▶ Open the shielding braid and slide it back over the outer cable jacket.
- ▶ Shorten the inner cable jacket.
- ▶ (2) Shorten the wires to the specified length (see table below) and crimp them to the connector.

If possible, also connect unused wires. This improves EMC. Wires that are not connected must be insulated at both ends.

- ▶ (3) Push part (VII) and part (VI) onto the cable. The cable entry contains rubber seals of various sizes for different cable diameters. Use rubber seals matching the diameter of the cable. Enclose the shield with part (IV). Snap the contacts into part (II). Open part (III) at the side and enclose part (II) as well as the rear part of the contacts with it. Slide part (II) into part (I).
- ▶ (4) Slide part (IV) behind the shielding braid. Slide part (VI) over part (I).
- ▶ Screw part (IV) onto part (I) all the way to the stop.

Dimensions for motor connector M23

	Motor phases 1.5 mm² / 2.5 mm²	Holding brake 1 mm²
Stripping length A	40 mm (1.57 in)	40 mm (1.57 in)
Stripping length B	36 mm (1.42 in)	-
Stripping length C	-	40 mm (1.57 in)
Stripping length D	8 mm (0.31 in)	4.5 mm (0.18 in)
Crimp contact	SF-7QS2000	SF-6AS2000
Crimping tool	SF-Z0025	SF-Z0025

Dimensions for motor connector M40

	Motor phases 4 mm²	Motor phases 6 mm² / 10 mm²	Holding brake 1 mm²
Stripping length A	40 mm (1.57 in)	40 mm (1.57 in)	40 mm (1.57 in)
Stripping length B	36 mm (1.42 in)	36 mm (1.42 in)	-
Stripping length C	-	-	40 mm (1.57 in)
Stripping length D	10 mm (0.39 in)	10 mm (0.39 in)	4.5 mm (0.18 in)
Crimp contact	SM-36KS002	SM-36KS004	SF-7NS2000
Crimping tool	SF-Z0025	SF-Z0026	SF-Z0025

Dimensions for encoder connector M23

	Encoder 0.14 mm² / 0.34 mm²
Stripping length A	28 mm (1.1 in)
Stripping length B	28 mm (1.1 in)
Stripping length C	4.5 mm (0.18 in)
Crimp contact	RC-12S2000
Crimping tool	RC-Z2514

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Connecting the cables Incorrect installation of the cable may damage the insulation. Broken conductors in the cable or improperly connected connectors may promote arcing within the cable.

⚠ ⚠ DANGER**ELECTRIC SHOCK, ARC FLASH AND FIRE CAUSED BY INCORRECT INSTALLATION OF THE CABLE**

- Disconnect all power before plugging in or unplugging the connectors.
- Verify correct pin assignment of the connectors according to the specifications in this chapter before connecting the cables.
- Verify that the connectors are properly inserted and locked before applying power.
- Avoid forces or movements of the cable at the cable entries.

Failure to follow these instructions will result in death or serious injury.

- ▶ Place the female connector of the motor cable onto the motor connector and tighten the union nut. Proceed in the same manner with the connection cable of the encoder system.

Keep the connection cables from being twisted when tightening the union nut.

- ▶ Connect the motor cable and the encoder cable to the drive according to the wiring diagram of the drive.
- ▶ Ground the shield to a large surface area. See the product manual of the drive for information on connecting the shield.

3.5.3 Holding brake connection

Applying the holding brake while the motor is running will cause excessive wear and loss of the braking force.

⚠ WARNING
LOSS OF BRAKING FORCE DUE TO WEAR OR HIGH TEMPERATURE
<ul style="list-style-type: none"> • Do not use the holding brake as a service brake. • Do not exceed the maximum number of brake applications and the kinetic energy during braking of moving loads.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

See chapter "2.5.2 Holding brake" for technical data on braking while the load moves.

Releasing the holding brake can cause an unintended movement, for example, lowering of the load in the case of vertical axes.

⚠ WARNING
UNINTENDED MOVEMENT
<ul style="list-style-type: none"> • Verify that there are no persons or obstacles in the zone of operation when performing a test of the holding brake. • Take appropriate measures to avoid damage caused by falling or lowering loads or other unintended movements.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

If the voltage is incorrect, the holding brake cannot be released which causes wear. If the voltage is higher than the specified voltage, the holding brake may be re-applied. If the voltage polarity is incorrect, the holding brake cannot be released.

⚠ WARNING
MISOPERATION OF THE HOLDING BRAKE CAUSED BY INCORRECT VOLTAGE
<ul style="list-style-type: none"> • Verify that the specified voltage is available at the holding brake connection. • Use a properly rated voltage-sensing device for measuring.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

A motor with a holding brake requires a suitable holding brake controller which releases the brake when the power stage is enabled and locks the motor shaft when the power stage is disabled.

Cable specifications

- Minimum wire cross section: 2 * 1.0 mm² (AWG 16)
- Maximum cable length: See product manual of the drive.

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3.6 Mounting and connecting the fan (BMH1904•••••B only)

The motor BMH1904•••••B is shipped with a fan. The motor may only be operated with this fan.

NOTE: The motor and fan combination is no longer IP65 with the fan installed.

NOTICE
REDUCED DEGREE OF PROTECTION
The motor and fan must be installed in a suitable environment conducive to IP20 installed product.
Failure to follow these instructions can result in equipment damage.

If the motor is operated without a properly working fan, the motor overheats and power to the motor is removed.

If the fan is not mounted to the motor, the fan wheel is accessible.

⚠ WARNING
ROTATING FAN WHEEL
Only activate the fan after the fan has been mounted to the motor.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Prerequisites for mounting the fan

The motor must have been mounted and the electrical installation must have been completed.

A free space of at least 50 mm (1.97 in) is required between air inlet grid and other components. The air inflow and air outflow must not be obstructed.

Mounting

The fan is pushed onto the motor and mounted to the motor with 2 housing screws.

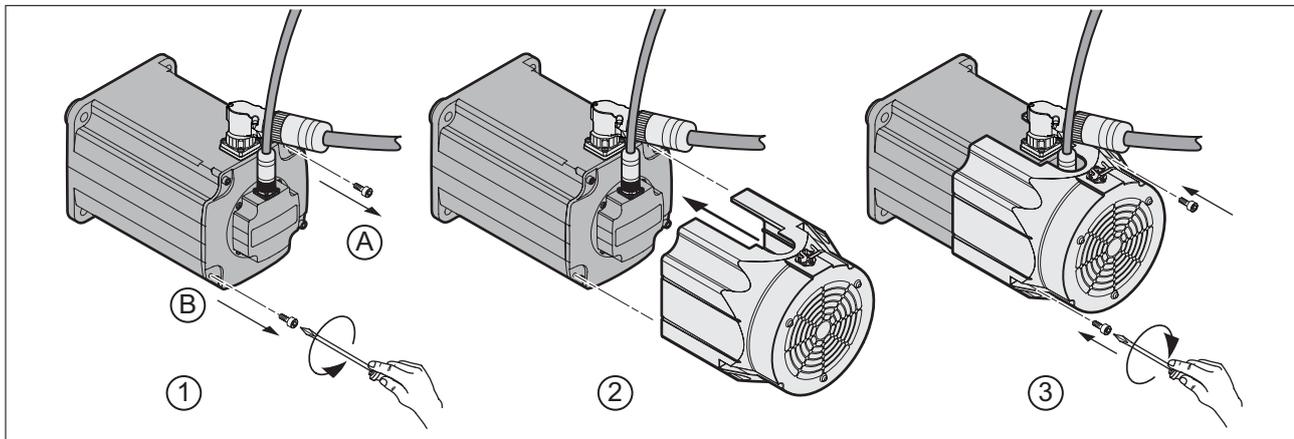


Figure 25: Mounting the fan

- (1) Loosen the 2 housing screws A and B.
- (2) Push the fan onto the motor.
- (3) Fasten the fan with the 2 housing screws M6.
Tightening torque of housing screws: 6 Nm (53.1 lb•in)

Cable specifications

Number of wires		2
Minimum conductor cross section	mm ² (AWG)	0.5 (20)
Maximum connection cross section	mm ² (AWG)	1.5 (16)
Cable diameter	mm (in)	4 ... 6.5 (0.16 ... 0.26)

Assembling cables

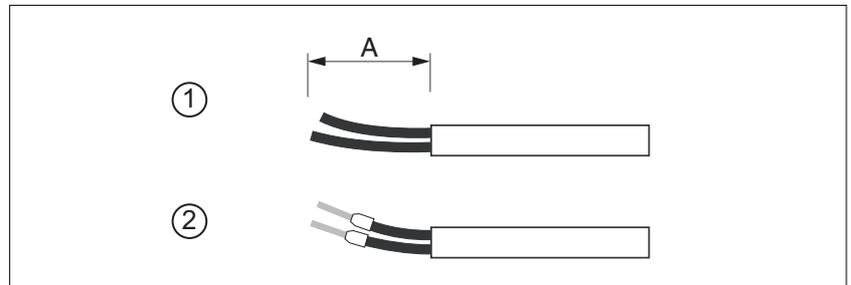


Figure 26: Assembling the fan cable

- (1) Strip the cable jacket; length as specified.
- (2) Install wire ferrules at the wire ends

Stripping length A	mm (in)	25 (0.98)
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For pin assignment see chapter "3.5.1 Connectors and connector assignments".

Electrical connection

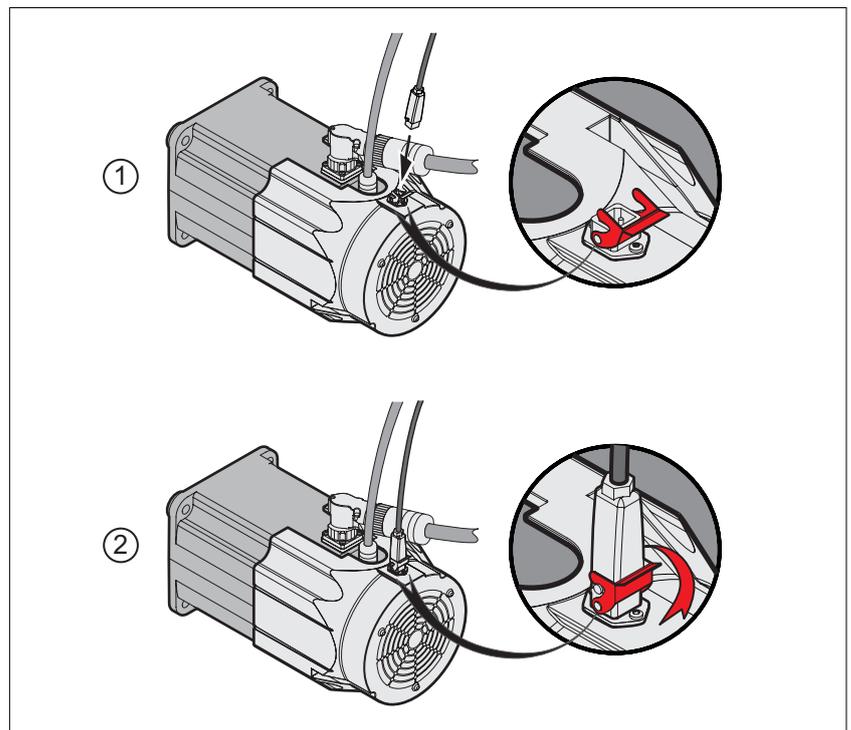


Figure 27: Electrical connection of the fan

- (1) Plug the socket of the fan supply onto the fan connection CN3.
- (2) Lock the socket.

4 Commissioning

  DANGER
ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION <ul style="list-style-type: none"> • Keep foreign objects from getting into the product. • Verify the correct seating of seals and cable entries in order to avoid contamination such as deposits and humidity. <p>Failure to follow these instructions will result in death or serious injury.</p>

Drive systems may perform unanticipated movements because of incorrect connection or other errors.

 WARNING
UNINTENDED MOVEMENT <ul style="list-style-type: none"> • Verify proper wiring. • Only start the system if there are no persons or obstructions in the zone of operation. • Perform the first test runs without coupled loads. • Only touch the motor shaft or the mounted output components if all power has been disconnected. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

Drive systems may perform unintended movements if unapproved combinations of drive and motor are used. Even if motors are similar, different adjustment of the encoder system may be a source of hazards. Even if the connectors for motor connection and encoder connection match mechanically, this does not imply that the motor is approved for use.

 WARNING
UNINTENDED MOVEMENT <p>Only use approved combinations of drive and motor.</p> <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

See chapter "2.1 General characteristics" for approved drives.

Rotating parts may cause injuries and may catch clothing or hair. Loose parts or parts that are out of balance may be ejected.

⚠ WARNING

MOVING, UNGUARDED EQUIPMENT

Verify that rotating parts cannot cause injuries or equipment damage.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The motor may move, tip and fall as a result of incorrect or insufficient mounting.

⚠ WARNING

FALLING PARTS

Mount the motor so that it cannot come loose (use of securing screws with appropriate tightening torque), especially in cases of fast acceleration or continuous vibration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The metal surfaces of the product may exceed 70 °C (158 °F) during operation.

⚠ WARNING

HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Motors can generate strong local electrical and magnetic fields. This can cause interference in sensitive devices.

⚠ WARNING

ELECTROMAGNETIC FIELDS

- Keep persons with electronic medical implants, such as pacemakers, away from the motor.
- Do not place electromagnetically sensitive devices in the vicinity of the motor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ CAUTION**IMPROPER APPLICATION OF FORCES**

- Do not use the motor as a step to climb into or onto the machine.
- Do not use the motor as a load-bearing part.
- Use hazard labels and guards on your machine to help prevent the improper application of forces on the motor.

Failure to follow these instructions can result in injury or equipment damage.

Verifying installation

Prior to commissioning, verify correct installation.

- ▶ Verify proper mechanical installation.
- ▶ Verify proper electrical installation.
- Did you connect all protective ground conductors?
- Did you properly connect and install all cables and connectors?
- Did you tighten the cable glands properly?
- ▶ Verify ambient conditions.
- Does the installation meet the ambient conditions specified?
- Is the heat dissipation sufficient?
- ▶ Verify the output components.
- Have the installed output components been balanced and accurately aligned?
- ▶ Verify the parallel key at the shaft end of the motor.
- If you have a motor with a parallel key groove and parallel key, the parallel key must not be inserted during commissioning without output component or it must be appropriately secured.
- ▶ Verify the function of the holding brake.
- Is the holding brake able to hold the maximum load?
- Is the holding brake released prior to the start of a movement?

5 Diagnostics and troubleshooting

5.1 Mechanical problems

Problem	Cause	Troubleshooting
Excessive heat	Overload	Reduce load
	Holding brake not released	Verify that the holding brake controller operates properly
	Heavy pollution	Clean the motor Clean air inlet grid and air outlet.
Whistling or knocking noise	Rolling bearings	Contact your sales office
Grinding noise	Rotating output component grinds	Align output component
Radial oscillation	Poor alignment of output component	Align output component
	Output component out of balance	Balance output component
	Shaft bent	Contact your sales office
	Resonance with machine bed	Suppress resonance
Axial oscillation	Poor alignment of output component	Align output component
	Damage to the output component	Repair/replace output component
	Resonance with machine bed	Suppress resonance

5.2 Electrical problems

Problem	Cause	Troubleshooting
Motor does not start or has difficulty starting	Overload	Reduce load
	Unsuitable settings for the drive	Correct drive settings
	Cable damaged	Replace damaged cables
Excessive heat	Overload	Reduce power
	Fan inoperative	Verify connection
Heat at the terminals or connectors	Poor contact	Tighten the terminals / connectors with the specified tightening torque

6 Accessories and spare parts

6.1 IP67 Kit

Degree of protection IP65 (shaft sealing ring) is a prerequisite for the use of the IP67 kit.

Description	Reference
IP67 kit for size 070, cover with compressed air connection, O-ring, 4 screws	VW3M2301
IP67 kit for size 100, cover with compressed air connection, O-ring, 4 screws	VW3M2302
IP67 kit for size 140, cover with compressed air connection, O-ring, 4 screws	VW3M2303
IP67 kit for size 205, cover with compressed air connection, O-ring, 4 screws	VW3M2304
L-shaped push-in fitting, to be acquired from Festo	QSML-B-M3-4-20

6.2 Connectors

Description	Reference
Encoder connector (cable end) for motor M23, 5 pcs	VW3M8214
Encoder connector (cable end) for drive RJ45 (10 pins), 5 pcs	VW3M2208
Motor connector (cable end) M23, 1.5 ... 2.5 mm ² , 5 pcs	VW3M8215
Motor connector (cable end) M40, 4 mm ² , 5 pcs	VW3M8217
Motor connector (cable end) M40, 6...10 mm ² , 5 pcs	VW3M8218

Tools The tools required for cable assembly can be ordered directly from the manufacturer.

- Crimping tool for encoder connector M23:
Coninvers SF-Z0025, SF-Z0026
www.coninvers.com
- Crimping tool for power connector M23/M40:
Coninvers RC-Z2514
www.coninvers.com
- Crimping tools for encoder connector RJ45 10 pins:
Yamaichi Y-ConTool-11, Y-ConTool-20, Y-ConTool-30
www.yamaichi.com

6.3 Motor cables

6.3.1 Motor cables 1.5 mm²

Description	Reference
Motor cable 1.5 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R15
Motor cable 3 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R30
Motor cable 5 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R50
Motor cable 10 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R100
Motor cable 15 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R150
Motor cable 20 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R200
Motor cable 25 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R250
Motor cable 50 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R500
Motor cable 75 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5101R750
Motor cable 25 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5301R250
Motor cable 50 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5301R500
Motor cable 100 m, [(4 x 1.5 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5301R1000

6.3.2 Motor cables 2.5 mm²

Description	Reference
Motor cable 3 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R30
Motor cable 5 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R50
Motor cable 10 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R100
Motor cable 15 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R150
Motor cable 20 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R200
Motor cable 25 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R250
Motor cable 50 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R500
Motor cable 75 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3M5102R750
Motor cable 25 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5302R250
Motor cable 50 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5302R500
Motor cable 100 m, [(4 x 2.5 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5302R1000

6.3.3 Motor cables 4 mm²

Description	Reference
Motor cable 3 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R30
Motor cable 5 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R50
Motor cable 10 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R100
Motor cable 15 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R150
Motor cable 20 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R200
Motor cable 25 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R250
Motor cable 50 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R500
Motor cable 75 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5103R750
Motor cable 25 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5303R250
Motor cable 50 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5303R500
Motor cable 100 m, [(4 x 4 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5303R1000

6.3.4 Motor cables 6 mm²

Description	Reference
Motor cable 3 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R30
Motor cable 5 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R50
Motor cable 10 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R100
Motor cable 15 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R150
Motor cable 20 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R200
Motor cable 25 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R250
Motor cable 50 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R500
Motor cable 75 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5105R750
Motor cable 25 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5305R250
Motor cable 50 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5305R500
Motor cable 100 m, [(4 x 6 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5305R1000

6.3.5 Motor cables 10 mm²

Description	Reference
Motor cable 3 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R30
Motor cable 5 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R50
Motor cable 10 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R100
Motor cable 15 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R150
Motor cable 20 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R200
Motor cable 25 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R250
Motor cable 50 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R500
Motor cable 75 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3M5104R750
Motor cable 25 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5304R250
Motor cable 50 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5304R500
Motor cable 100 m, [(4 x 10 mm ²) + (2 x 1 mm ²)] shielded; both cable ends open	VW3M5304R1000

6.4 Encoder cables

Description	Reference
Encoder cable 1.5 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R15
Encoder cable 3 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R30
Encoder cable 5 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R50
Encoder cable 10 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R100
Encoder cable 15 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R150
Encoder cable 20 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R200
Encoder cable 25 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R250
Encoder cable 50 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R500
Encoder cable 75 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3M8102R750
Encoder cable 25 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; both cable ends open	VW3M8222R250
Encoder cable 50 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; both cable ends open	VW3M8222R500
Encoder cable 100 m, [3 x (2 x 0.14 mm ²) + (2 x 0.34 mm ²)] shielded; both cable ends open	VW3M8222R1000

7 Service, maintenance and disposal

7.1 Service address



If you have any questions please contact your sales office. Your sales office staff will be happy to give you the name of a customer service office in your area.

<http://www.schneider-electric.com>

7.2 Maintenance

There are no user-serviceable parts within the motor. Either replace the complete motor, or contact Schneider Electric.

The product may only be repaired by a Schneider Electric customer service center.

Repairs cannot be made with the device installed.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software and hardware components approved by Schneider Electric for use with this equipment.
- Do not attempt to service this equipment outside of authorized Schneider Electric service centers.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Use only the accessories and mounting parts specified in the documentation and no third-party devices or components that have not been expressly approved by Schneider Electric. Do not modify the equipment.

Include the following points in the maintenance plan of your machine.

Connections and fastening

- ▶ Inspect all connection cables and connectors regularly for damage. Replace damaged cables immediately.
- ▶ Verify that all output elements are firmly seated.
- ▶ Tighten all mechanical and electrical threaded connections to the specified torque.

Lubricating the shaft sealing ring

In the case of motors with shaft sealing ring, lubricant must be applied to the space between the sealing lip of the shaft sealing ring and the shaft with a suitable non-metallic tool. If the shaft sealing rings are allowed to run dry, the service life of the shaft sealing rings will be significantly reduced.

Cleaning If the permissible ambient conditions are not respected, external substances from the environment may penetrate the product and cause unintended movement or equipment damage.

▲ **WARNING**

UNINTENDED MOVEMENT

- Verify that the ambient conditions are respected.
- Do not allow seals to run dry.
- Keep liquids from getting to the shaft bushing (for example, in mounting position IM V3).
- Do not expose the shaft sealing rings and cable entries of the motor to the direct spray of a pressure washer.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Clean dust and dirt off the product at regular intervals. Insufficient heat dissipation to the ambient air may excessively increase the temperature.

Motors are not suitable for cleaning with a pressure washer. The high pressure may force water into the motor.

Care must be taken with cleaning products as some active agents may have deleterious effects on plastics and welds. When using solvents or cleaning agents, verify that the cables, cable entry seals, O-rings and motor paint are not damaged.

NOTICE

CORROSION CAUSED BY CLEANING AGENTS

- Before using a cleaning agent, carry out a compatibility test in relation to the cleaning agent and the component affected.
- Do not use alkaline detergent.
- Do not use any chloride-containing cleaning agents.
- Do not use any sulfuric acid containing detergent.

Failure to follow these instructions can result in equipment damage.

Inspecting/breaking in the holding brake

The holding brake is broken-in at the factory. If the holding brake is not used for an extended period of time, parts of the holding brake may corrode. Corrosion reduces the holding torque.

If the holding brake does not have the holding torque indicated in the technical data, it must be broken in again.

- The motor is dismantled. The holding brake is applied.
- ▶ Measure the holding torque of the holding brake using a torque wrench.
- ▶ If the holding torque of the holding brake considerably differs from the specified values, manually rotate the motor shaft by 25 rotations in both directions. See chapter "2.5.2 Holding brake" for the values.
- ▶ Repeat the process up to 3 times, until you can restore the original holding torque.

Contact your Schneider Electric sales office if the original holding torque is not restored.

Replacing the rolling bearing

When the rolling bearing is replaced, the motor is partially demagnetized and loses power.

<i>NOTICE</i>
<p>INOPERABLE EQUIPMENT</p> <p>Do not replace the rolling bearing.</p> <p>Failure to follow these instructions can result in equipment damage.</p>

For all service matters, contact your Schneider Electric representative.

7.3 Replacing the motor

If you replace the motor, the absolute position of the encoder is no longer valid.

▲ WARNING

UNINTENDED MOVEMENT DUE TO INCORRECT ABSOLUTE POSITION

Set the new absolute position of the encoder after having replaced the motor.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

- ▶ Power off all supply voltages. Verify that no voltages are present.
- ▶ Label all connections.
- ▶ Uninstall the product.
- ▶ Note the identification number and the serial number shown on the product nameplate for later identification.
- ▶ Install the new product as per chapter "3 Installation".
- ▶ Commission the product as per chapter "4 Commissioning".

7.4 Shipping, storage, disposal

Respect the ambient conditions in chapter "2.1 General characteristics".

Shipping The product must be protected against shocks during transportation. If possible, use the original packaging for shipping.

Storage The product may only be stored in spaces where the specified permissible ambient conditions are met.
Protect the product from dust and dirt.

Disposal The product consists of various materials that can be recycled. Dispose of the product in accordance with local regulations.

Visit <http://www.schneider-electric.com/green-premium> for information and documents on environmental protection as per ISO 14025 such as:

- EoLi (Product End-of-Life Instructions)
- PEP (Product Environmental Profile)

Glossary



Terms and Abbreviations

See chapter " *Terminology Derived from Standards*" for information on the pertinent standards on which many terms are based. Some terms and abbreviations may have specific meanings with regard to the standards.

<i>Axial forces</i>	Tension or compression forces acting longitudinally on the shaft
<i>Centering collar</i>	Centering device at the motor flange that allows for accurate motor mounting.
<i>Degree of protection</i>	The degree of protection is a standardized specification for electrical equipment that describes the protection against the ingress of foreign objects and water (for example: IP 20).
<i>DOM</i>	Date of manufacturing: The nameplate of the product shows the date of manufacture in the format DD.MM.YY or in the format DD.MM.YYYY. For example: 31.12.11 corresponds to December 31, 2011 31.12.2011 corresponds to December 31, 2011
<i>Drive system</i>	System consisting of controller, drive and motor.
<i>EMC</i>	Electromagnetic compatibility
<i>Encoder</i>	Sensor that converts a measured distance or angle into an electrical signal. This signal is evaluated by the drive to determine the actual position of a shaft (rotor) or a driving unit.
<i>Length</i>	In the type code, the length is defined in terms of the number of stacks.
<i>PELV</i>	Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41
<i>Radial forces</i>	Forces that act radially on the shaft
<i>Size</i>	In the type code, the size is defined in terms of the flange size.

Table of figures



1)	Nameplate BMH070 and BMH100	16
2)	Nameplate BMH140 and BMH190	17
3)	Nameplate BMH205	18
4)	Dimensions BMH070	34
5)	Dimensions BMH100	35
6)	Dimensions BMH140	36
7)	Dimensions BMH190A	37
8)	Dimensions BMH1904B	38
9)	Dimensions BMH205	39
10)	Shaft load	41
11)	Connector installation space	59
12)	BMH190 rear side of motor	61
13)	Installation IP67 Kit	63
14)	Installation L-shaped push-in fitting BMH190	64
15)	Connection overview BMH070, BMH100 and BMH140	65
16)	Connection overview BMH1904A and BMH1904B	65
17)	Connection overview BMH205	65
18)	Pin assignment motor connection M23	66
19)	Pin assignment motor connection M40	67
20)	Pin assignment encoder connector	68
21)	Pin assignment fan connector	69
22)	Assembling motor cables with M23 motor connector	72
23)	Assembling motor cables with M40 motor connector	73
24)	Assembling encoder cables with M23 encoder connector	74
25)	Mounting the fan	78
26)	Assembling the fan cable	79
27)	Electrical connection of the fan	79

Index



A	Abbreviations 101 Accessories and spare parts 87 Approved drives 24	E	EMC 51 Motor cable and encoder cable 52 Encoder 44 Connection 70 Multiturn 44, 44, 45 Singleturn 45 Encoder cable EMC requirements 52 Environmental conditions Operation 22 Equipotential bonding conductors 52
C	Cable assembly Power 72 Cable specifications 56 Holding brake 77, 79 Certifications 47 Commissioning 81 Connecting the motor cable 76 Connection Holding brake 77 Motor 70 Power 70 Connector Installation 65 Connector assignments 65	F	Force for pressing on 40
D	Degree of protection 23 Diagnostics 85 dimensional drawing, see dimensions Dimensions 34 Disposal 95, 99 DOM 101	G	General characteristics 21 Glossary 101
		H	Hazard categories 5 Holding brake 46 Connection 77
		I	Installation 49 Intended use 6 Introduction 15
		M	Maintenance 95

Manuals		R	
Source	13		Replacing the motor
Maximum force during pressing on	40	S	
Motor			Safety Information
Connection	70		Service
Motor cable			Service address
Assembly	72		Shaft sealing ring
EMC requirements	52		Shaft-specific data
motor connection CN1	66, 67		Shipping
Motor-specific data	25		SinCos Multiturn
Mounting position	61		SinCos Singleturn
Multiturn	44, 44, 45		Singleturn
N			Source
Name plate	16		Manuals
O			Storage
Options	44	T	
Overview			Technical data
Procedure for electrical installation	51		Terms
P			Tightening torques
PELV power supply UL	46		Screws
Power			Troubleshooting
Connection	70		Type code
Power connection CN1	66, 67	U	
Pressing on			UL, conditions for
Maximum force	40		PELV power supply
Property class			Wiring
Screws	24	W	
Q			Wiring UL
Qualification of personnel	6		