

Technical Documentation



BSH AC Servo Motor USA

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Important information

The servo motors described here are products for general use that conform to the state of the art in technology. However, motors and drive controllers that are not specifically designed for safety functions are not approved for applications where the functioning of the drive could endanger persons. The possibility of unexpected or unbraked movements can never be totally excluded without additional safety equipment. For this reason personnel must never be in the danger zone of the motors unless additional suitable safety equipment prevents any personal danger. This applies to operation of the machine during production and also to all service and maintenance work on motors and the machine. The machine design must ensure personal safety. Suitable measures for prevention of property damage are also required.

For more information see the chapter on safety.

Not all product types are available in all countries. Please see the current catalogue for the availability of products.

We reserve the right to make technical changes.

All information refers to specifications and not to assured properties.

Most product designations are registered trademarks of their proprietors, even when not specifically noted.

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1 On this manual

1.1 Introduction

Before using the motor for the first time, you should familiarize yourself with this operating manual.

In particular, observe the safety notes described in chapter 2.

Only persons who meet the criteria for "Selection and Qualification of Staff" (see chapter 2.4) are allowed to work on the motors.

One copy of this manual has to be available for staff working on the motors with access at any time.

This manual is to help you use the motor safely and expertly and to use it as directed.

Observe this manual. This will help to avoid risks, reduce repair costs and down times and increase the lifetime and reliability of the products.

You also need to observe the valid rules for the prevention of accidents and for environmental protection in the country and place where the device is used.

1.2 Symbols, Signs and Forms of Depiction

The following symbols and signs are used in this document:



Depiction	Meaning
■	First level enumeration sign.
–	Second level enumeration sign.
▶	Action symbol: The text following this symbol includes an instruction for action. Execute the instruction actions in the given order, from top to bottom.
✓	Result symbol: The text following this symbol contains the result of an action.
<i>Italics</i>	If the describing text contains special terms (e.g. parameters) these are written in italics.
Serif font	If the manual contains program code, this is marked by Serif font.
	Information symbol: This symbol marks notes and useful tips for using the product.
	Safety Alert Symbol: Safety notes can be found in the relevant places. They are marked by this symbol.

Table 1.1 Symbols, signs and forms of depiction

2 General Safety Notes

This chapter contains general requirements for working safely. Every person using Telemecanique components or working on Telemecanique components has to read and observe these general safety notes.

If activities involve a residual risk, you will find a clear note in the respective places. The note describes the risk that may occur and preventive measures to avoid that risk.

2.1 Basics

The motor is built according to the state of technology and generally accepted safety rules. Nevertheless, its use may cause a risk to life and limb or material damage if:

- you do not use the motor as directed
- work on the motor is not done by experts or instructed staff
- you inexpertly alter or modify the motor
- you fail to test the protective measures in place after installation, commissioning or servicing
- you do not observe the safety notes and regulations.

Only operate the motor in perfect technical condition, as directed, with regard to safety and risks and observe this manual.

The proper operation of the motor requires appropriate transport, storage, mounting and installation as well as careful maintenance.

In case of any circumstances that impair the safety and cause changes in the operating behavior, immediately bring the motor to a stop and inform the service staff in charge.

In addition to this manual, observe

- the prohibiting, warning and mandatory signs on the motor, the connected components and in the switching cabinet
- the relevant laws and regulations
- the operating manuals of the other components
- the universally valid local and national rules for safety and the prevention of accidents.

2.2 Depiction of Safety Notes

Risk categories

Safety notes and general information are indicated by hazard messages in the manual. In addition there are symbols and instructions affixed to the product that warn of possible hazards and help to operate the product safely.

Depending on the seriousness of the hazard, the messages are divided into three hazard categories.

DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death, serious injury, or equipment damage.

WARNING

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

CAUTION

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

2.3 Use as Directed

The motor is designed as a drive component for installation in a machine or for combination with other components to form a machine/plant. The motor may only be used under the installation and operating conditions described in this documentation. You must use the accessories and ancillary parts (components, cables, etc.) mentioned in the documentation. You must not use any foreign objects or components that are not explicitly approved by Schneider Electric.

Use as directed also means that you

- observe the operating manuals and other documentations (see appendix)
- observe the inspection and service instructions.

Use other than directed The operating conditions at the place where the device is used must be checked on the basis of the given technical data (performance information and ambient conditions) and observed.

Commissioning is prohibited unless it is guaranteed that the applicable machine or plant in which the motor is installed is in its entirety compliant with the EC directive 98/37/EC (machine directive).

In addition, the following norms, directives and rules need to be observed:

- DIN EN 60204 Safety of machines: Electrical equipment of machines.
- DIN EN 292 part 1 and part 2 Safety of machines: Basics, general design rules.
- DIN EN 50178 Equipment of high-voltage plants with electronic operating means.
- EMC directive 89/336/EEC

2.4 Selection and Qualification of Staff

This manual is aimed exclusively at technically qualified staff with detailed knowledge in the field of automation technology.

Only qualified staff can recognize the significance of safety notes and implement them accordingly.

This manual is aimed in particular at design and application engineers in the fields of mechanical and electrical engineering, service and commissioning engineers.

Working on electrical equipment Work on electrical equipment must only be done by qualified electricians or by instructed staff supervised by an electrician according to the electrotechnical rules.

An electrician is a person who, due to his vocational training, know-how and experience as well as knowledge of the valid regulations, is able to:

- evaluate the work he is supposed to do
- identify potential risks
- implement suitable safety measures.

2.5 Residual Risks

The motors reflects the current technical standard. Nevertheless, there is a residual risk, since the motors work with electrical current and voltage. We minimized the health risk for people by means of appropriate construction and safety technology.

2.5.1 Installation and Handling

▲ WARNING

EQUIPMENT HANDLING HAZARD

- Observe the universally valid construction and safety rules for handling and installation.
- Use suitable installation and transport facilities and use them professionally. If necessary, use special tools.
- Take precautions against squeezing.
- If necessary, use suitable protective clothing (e.g. safety glasses, safety shoes, protective gloves).
- Do not stay under suspended loads.
- Remove any leaking liquids from the floor immediately to avoid skidding.

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

2.5.2 Protection against Touching Electrical Parts

Touching parts carrying a voltage of 50 Volts or higher can be dangerous. When electric appliances are operated, certain parts of these appliances inevitably carry a dangerous voltage.

⚠ DANGER**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Observe the universally valid construction and safety rules for working on high-voltage units.
- After installation, check the fixed connection of the earth conductor on all electric appliances according to the connection plan.
- Operation, even for short-term measuring and test purposes, is only permitted with an earth conductor firmly connected to all electric components. Otherwise high voltages may occur on the casing.
- Before accessing electric parts with voltages exceeding 50 Volts, disconnect the unit from mains or power supply and lock it out. Make sure that the motor is in stand still. After switching off, wait for at least 6 minutes before touching any components.
- Do not touch electrical connections of the components while the unit is on.
- Before switching on the unit, cover all voltage carrying parts to prevent accidental contact.
- Provide for protection against indirect touching (DIN EN 50178 / 1998 section 5.3.2).
- Be sure the power connector is covered (no possible contact to active parts) when motor is external driven.

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

⚠ DANGER**LEAKAGE CURRENT HAZARD**

- The leakage current is greater than 3.5 mA.
- Ground equipment solidly.

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

2.5.3 Potentially Dangerous Movements

There can be different causes for potentially dangerous movements:

- mistakes in wiring or cable connection
- software errors
- faulty components
- errors in measuring value and signal encoders
- operating mistakes

The monitoring functions in the driving components to a large extent rule out malfunction. For your protection, you must not rely on these functions alone. Until the controls installed become effective, you should anticipate faulty movement of the motor, which can vary depending on the kind of malfunction and the operating state. Personal protection must be ensured by additional measures superior to the plant. These are planned by the equipment manufacturer with regard to the specific circumstances of the equipment and after a risk and error analysis. The safety provisions of the equipment are taken into account.

▲ WARNING

UNINTENDED EQUIPMENT OPERATION

- No persons are allowed within the motion range of the machine. This is to be ensured by means of devices like protective fences, grids, covers or photoelectric barriers.
- The fences and covers must be sufficiently strong to withstand the maximum possible motion energy.
- The emergency stop switch must be located very close to the operator. Check the operation of the emergency stop before starting up the plant.
- Secure against unintentional start by enabling the mains contactor of the drives via an emergency off circuit or by means of the function 'Power removal'.
- Before accessing the danger zone, bring the motors to a safe conditions.
- To intervene on the equipment, power must be turned off and locked out.
- Avoid operating high-frequency, remote-control and radio devices in the vicinity of the plant's electronics and connecting wires. If the use of those devices is inevitable, check system and plant for possible malfunctions before first operation. In some cases a special EMC check may be necessary.

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

3 Overview

3.1 In General

The highly dynamic synchronous AC servo motors are permanent field synchronous machines designed especially for highly dynamic positioning tasks.

The low moment of inertia compared with other AC servo motors in combination with the high overload tolerance not only ensures excellent acceleration values, but also reduces energy consumption and stray heat of the motor.

The torque is generated by the stator coil fed by a sinusoidal three-phase current system in combination with the magnetic field excited by the rotor magnets.

The generation of the rotary current system depends on the rotor position in the digital servo motor or the positioning motor controller.

For that purpose, the rotor position is monitored by a SINCOS encoder.

3.2 Features of the servo motors

The BSH motors are characterised by the following features:

- High equipment dependability
- Maintenance-free operation
- Overload protection (by motor temperature monitoring)
- High performance data
- High dynamics
- High overload capacity
- Large torque area
- sinusoidal EMF
- High volt technique = low currents
- Low mass-moment of inertia
- Motor link and feedback system over connectors
- Simple and fast commissioning (by electronic motor identification)

3.3 Versions

Motor feedback

- SinCos encoder singleturn (standard)
- SinCos encoder multiturn (option)

Holding brake

- without brake (standard)
- with brake (option) to hold axis when in vertical position or when the axis is powerless.

Shaft

- Smooth shaft (standard)
- Shaft with key (option)

Connection system

- Straight connectors (standard)
- right angle connectors

4 Transportation, Storage, Unpacking

4.1 Transportation

- ▶ Avoid shocks.
- ▶ Immediately check units for transport damage and inform your transport company, if necessary.

4.2 Storage

- ▶ Store units in a clean, dry place.

Storage conditions:

- air temperature between - 25 °C and + 70 °C.
- temperature fluctuations max. 30 K per hour.

4.3 Unpacking

- ▶ Check whether the delivery is complete.
- ▶ Check all units for transport damage.

Type plate

The type plate contains all necessary motor information:



Figure 4.1 type plate at the BSH motor

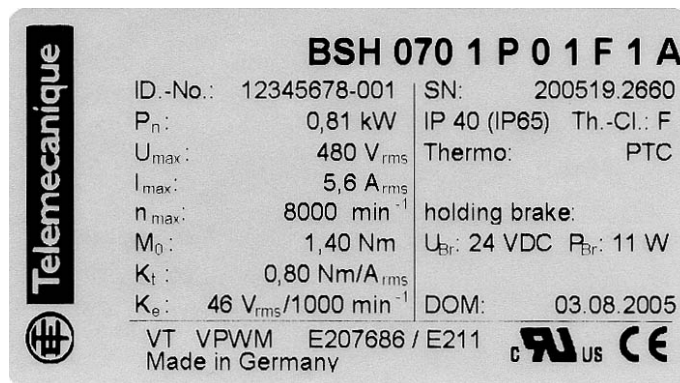


Figure 4.2 Name plate of a BSH motor

	Meaning
BSH 070 1 P 0 1 F 1 A	Motor type, see type code
ID.-No.	
P_n	nominal power
U_{max}	r.m.s. value of converter voltage
I_{max}	r.m.s. value of current
n_{max}	max. speed
M_0	nominal torque at standstill
K_t	torque constant
K_e	voltage constant
SN	serial number
IP	protection class
Th-Cl	insulation class
Thermo	terminal protection
U_{Br}	Brake - nominal voltage
P_{Br}	Brake - nominal power
DOM	date of manufacture
VT	variable torque
VPWM	variable PWM
Exxxxx ...	UL - file number
cUL	cUR mark
CE	CE mark

Table 4.1 Explanation of name plate

5 Maintenance

5.1 Exchanging Units

To commission or exchange the motor, it is not necessary to open the device. Keep in mind that the warrentee expires when opening the motor.

In addition to the notes below, please observe the information of the machine producer when exchanging the motor.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Before working on electrical units, disconnect from mains supply and secure against being switched on accidentally.
- The motors must be stopped because life-threatening voltages can occur on the motor cables of servo motors in generator operation.
- Do not disconnect connector plugs while they are carrying voltage.
- Connect or disconnect main power cable to motor only when no voltage is present on unit and verify that the motor is at stop

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

⚠ CAUTION

ELECTROSTATIC DISCHARGE

- Only touch the boards by the edges. Do not touch any connections or components.
- Before touching the boards, discharge any possible static charge. For this purpose, touch an earthed metal surface, e.g. the casing.
- Do not place the boards on a metal surface.
- Avoid the creation of electro static charge by the use of appropriate clothing, carpets and furniture and by moving the boards as little as possible.

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

Exchange motor



NOTE

If motors were stored longer than 2 years, the holding brake has to be re-surfaced before you use it. See also "holding brake (option)" on page 6-28.

- ▶ Open the main switch.
- ▶ Secure against accendential switch-on.

CAUTION**IMPROPER MECHANICAL FORCE**

- Do not apply impact load to motor shaft when removing or installing a coupling to the motor shaft.
- Use suitable tools such as gear pullers, etc.

Failure to follow these instructions can result in damage to the encoder.

⚠ WARNING**UNINTENDED EQUIPMENT OPERATION**

- When the encoder is used to define a reference point, exchanging the motor will lose the reference information. The reference point must be re-established, otherwise the movement will end at the wrong position.

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

- ▶ Exchange motor as described by the machine manufacturer.

Exchange cable

- ▶ Lift the main switch
- ▶ Secure against accidental switch-on

⚠ DANGER**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Connect or disconnect cables only when there is no voltage on the system.
- Connect cables only under clean and dry conditions.
- If locally assembled cables are used, ensure that all connections are correct and secure before using cables.

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

- ▶ Exchange the cables considering the specification of the machine manufacturer.

5.2 Cleaning

If installed appropriately, the devices are to a large extent maintenance-free.

CAUTION**LIQUID PENETRATION**

- Do not clean motor with high pressure liquid cleaners.
- Use cleaning methods suitable for the protection class of the motor.

Failure to follow these instructions can result in damage to the motor.

5.3 EMC Rules

Observe the following EMC rules:

- Choose the earthing (grounding) option with the lowest possible resistance (e.g. unpainted mounting panel of the switching cabinet) for installation.
- Contact the largest possible surface. If necessary, remove existing paint to achieve large-surface contact.
- From the Central Earthing Point (CEP), lay earthing wires to the respective connections in a star structure. Earthing circuits are not permitted and can cause unnecessary distortions.
- Use shielded cables only.
- Only large-surface shield transitions are admissible.
- Shields must not be contacted via pin contacts of connector plugs.
- Equip switching devices such as relays and contactors with interference suppressors or spark suppressors, etc..
- Do not use motor cables longer than necessary.
- Do not lay cable loops inside the switching cabinet.
- Separate the motor cables from control cables.

5.4 Commissioning

How to proceed when commissioning:

Only operate the motor with Lexium 05 controller!

- Unpack and check** ▶ Remove packaging.
- ▶ Check devices for damage. Only undamaged devices may be put into operation.
 - ▶ Check shipment for completeness.
 - ▶ Check data using the type plates.

See also chapter Transportation, Storage, Unpacking.

- Installation** ▶ Observe requirements for the place of installation.
- ▶ Observe requirements for protection type and EMC rules.
 - ▶ Install devices.

See also chapter Maintenance.

⚠ DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH
<ul style="list-style-type: none"> • Do not operate the motor on corner grounded systems. • Use only on system voltages less than 300 volts rms. <p>Failure to follow these instructions will result in death or serious injury.</p>

CAUTION
IMPROPER CONNECTOR HANDLING
<ul style="list-style-type: none"> • Do not permanently move the connectors of the motor. • Do not move the connectors of the motor more than five times. <p>Failure to follow these instructions can result in connector damage.</p>

- Electrical connection** ▶ Plug connectors only when drive is deenergized.
- ▶ Fasten cap nut with tightening torque of 2Nm (18 lb-in) for the power connector and 2.5Nm (22 lb-in) for the signal connector.
 - ▶ Check the condition of the shield; rule out short-circuits and interruptions.

See also chapter Technical Data and Maintenance.

- Check safety functions** ▶ Check function of the brake (if any).
- ▶ In operation check brake function minimum once a year.
 - ▶ Check EMERGENCY OFF chain and EMERGENCY OFF limit switch.

⚠ DANGER**IMPROPER MOUNTING ON KEYED SHAFT**

- Do not operate the motor without fully equipped belt pulley, or
- Ensure that the shaft to collar connection is completely secured.

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

Continue commissioning the plant ▶ Continue commissioning the plant according to the operating manuals (packaging machine producer and servo drive).

5.5 Configuration / Programming / Diagnosis

The motors are adjusted. The customer does not need to execute alignment.

To ensure the live time of the bearing make sure not to operate the motor continuously with rotation angles less than 100° or very low speed.

The adjustment of the servo drives to the motors is to be inferred from the documentation of the respective servo drive.

See also the documentation of the servo drive.

Error diagnosis and monitoring of the operating conditions is executed into the controllers.

See programing reference manual for appropriate descriptions.

5.6 Order Numbers

5.6.1 BSH Servo Motor

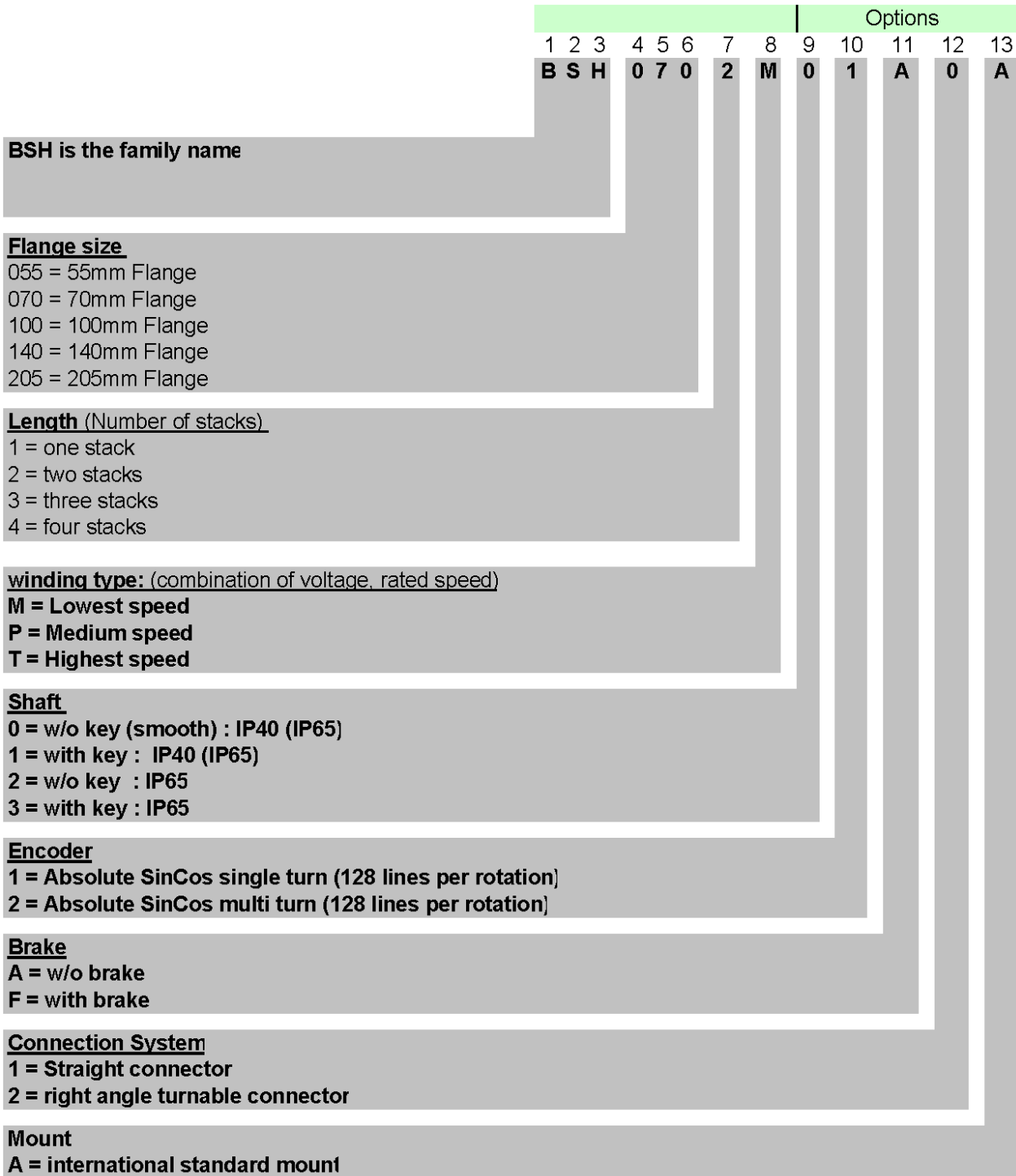


Figure 5.1 Type key legend for BSH Servo Motor

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6 Technical Data

6.1 General Technical Data

Designation	Description
Motor type	Rotary synchronous servomotor, permanently excited
Magnetic material	Neodymium-iron-boron (NdFeB)
Insulation system (according to DIN VDE 0530)	Heat class F (155 °C)
Mounting orientation (according to IN 42 950)	IM B5, IM V1, IM V3
Protection class (according to EN 60529)	IP40 (IP65 with an optional shaft seal)
Cooling	Self cooling, rated ambient temperature up to 40 °C
Temperature monitoring	Three-code posistor in the stator coil, switching temperature 130 °C
Shaft end	Cylindrical shaft end according to DIN 748 without key way (with key as an option)
Concentric accuracy, coaxiality, axial run (according to DIN 42 955)	Tolerance N (normal)
Balancing class (according to DIN ISO 1940)	G 2.5
Built-in measuring system	SinCos [®] SKS 36 or SKM 36 (single - or multiterm version with Hiperface [®] Interface)
Connection system	Cylindrical Connectors (IP67) straight

Table 6.1 General Technical Data

6.1.1 Definitions and Physical Correlations

Abbrev.	Unit	Definition
I_0	[A _{rms}]	standstill current of the motor effective value of the motor current at standstill torque M_0
I_N	[A _{rms}]	rated current of the motor effective value of the motor current at rated torque M_N
I_{max}	[A _{rms}]	peak current of the motor effective value of the motor current at peak torque M_{max}
J_M	[kgcm ²]	rotor moment of inertia the rotor moment of inertia refers to a motor without brake
k_T	[Nm/A _{rms}]	torque constant of the motor ratio of standstill torque M_0 and standstill current I_0 (at 120°C winding temperature).
m	[kg]	weight motor weight without brake and without fan
M_0	[Nm]	standstill torque of the motor permanent torque (100% ED) at speed 5 min ⁻¹ . With an ambient temperature of 40 °C and a winding overtemperature of 80 °C.
M_N	[Nm]	rated motor torque permanent torque (100% ED) at rated speed n_N . Due to the speed-related losses, it is less than M_0 . With an ambient temperature of 40 °C and a winding overtemperature of 80 °C.
M_{max}	[Nm]	peak motor torque maximum torque which a servo motor can deliver on the working shaft for a short time
n_N	[min ⁻¹]	rated motor speed speed that can be used at rated torque. Idling speed and mechanical limit speed of the servo motor are higher
P_N	[kW]	rated mechanical power rated mechanical power of the servo motor according to rated speed n_N and rated torque M_N .
R_{U-V}	[Ω]	resistance of a motor winding resistance of a motor winding between two phases at a winding temperature of 20 °C).
L_{U-V}	[mH]	winding inductivity between two phases
k_E	[V _{rms} /kmin ⁻¹]	Voltage constant
V	[m/s ²]	Maximum vibration (all directions)
S	[m/s ²]	Maximum shock (all directions)
T_{TK}	[°C]	Switching point of PTC

Table 6.2 Definitions and Physical Correlations

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6.1.2 Ambient conditions, approbations

Parameter	Value
permissible ambient temperature from 0 to 1000 m above sea level (NN)	0 - 40 °C with higher temperatures, power reduction by 1% per °C
air humidity	class F according to DIN 40040
insulation class	F
agency approvals	UL / cUL / CE
When operating the motor be sure to dissipate enough heat. On thermal isolated mounting reduce power of the motor.	

Table 6.3 Ambient conditions, approbations

6.1.2.1 Reduced performance in case of higher ambient temperature and / or lower air pressure

If you operate the motors outside the specified nominal data, the motors may be damaged. The effects of ambient temperature and installation height are described below.

Increased ambient temperature The maximum ambient temperature allowed for the BSH motor is 40°C. If the ambient temperature rises to a maximum of 55°C, the rated current drops by 1% for each °C.

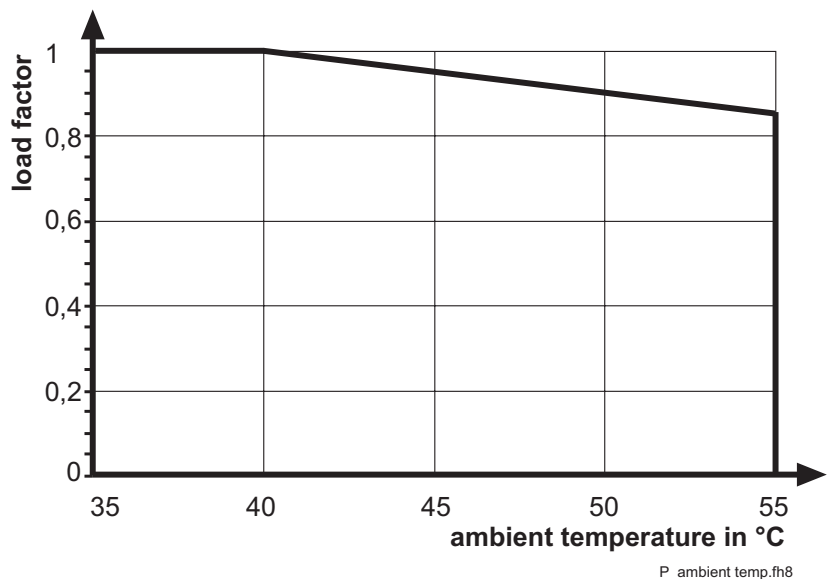


Figure 6.1 Reduced performance in case of higher ambient temperature

In the border range from 40°C to 55°C, multiply the performance data with the load factor you determined for the ambient temperature.

Low air pressure In environments less than 1000 meters above the sea level, no noteworthy performance reduction due to air pressure is to be expected for BSH motors. For heights greater than 1000 meters above the sea level, note the performance data set forth in the diagram below.

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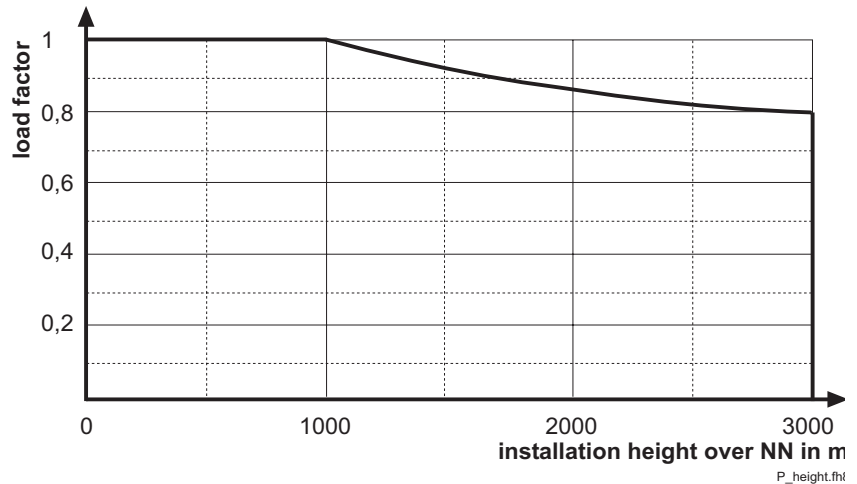


Figure 6.2 Reduced performance when exceeding the installation height

In the threshold from 1000 m to 3000 m, multiply the performance data with the load factor you determined for the installation height.

In case of a performance reduction resulting from both causes, multiply the two load factors with the performance values.

6.1.3 Protection class

The protection class of the BSH motor depends on the position in which it is mounted.

All motor types have a fixing flange that makes it possible to install them according to method B5 (fixing flange with through holes).

According to DIN 42950 part 1 (edition 08.77), the motors can be mounted on the machine as follows:




Structural shape	Admissible mounting positions according to DIN IEC 34-7		
B05	 IM B5	 IM V1	 IM V3

Figure 6.3 Mounting positions of the motor

CAUTION
<p>INCORRECT MOUNTING POSITION</p> <ul style="list-style-type: none"> Remove any liquid from motor shaft after mounting motor in IM V3 position. Prevent liquid from entering motor casing when motor is mounted in IM V3 position. <p>Failure to follow these instructions can result in motor damage.</p>

Motor part	Protection class	Mounting position
shaft	IP 40 IP 54 IP 65 (optional with shaft sealing)	IM V3 IM B5, IM V1 IM B5, IM V1, IM V3
surface / connectors	IP 65	

Table 6.4 Protection means of BSH motors

6.1.4 Motor shaft and bearing

6.1.4.1 Execution of the shaft end

Smooth With a frictional connection, torque transmission must be achieved by **shaft end (standard)** pressure only. This ensures a safe load transmission without play.

Shaft end with round-ended feather key according to DIN 6885 Shaft connections with keyed shaft are form-fit. Under continuous duty with variable torque rates or high reversing activity, the position of the round-ended feather key may deflect. This reduces the quality of smooth running (a play develops!). Increasing deformation may cause the round-ended feather key to break and thus damage the shaft. For this reason, this kind of shaft-hub connection is suitable only for low strain. We recommend using smooth shaft ends.

6.1.4.2 Bearing

The bearing on the B side is a fixed bearing, on the A side is a loose bearing.

6.1.4.3 Admissible shaft strain

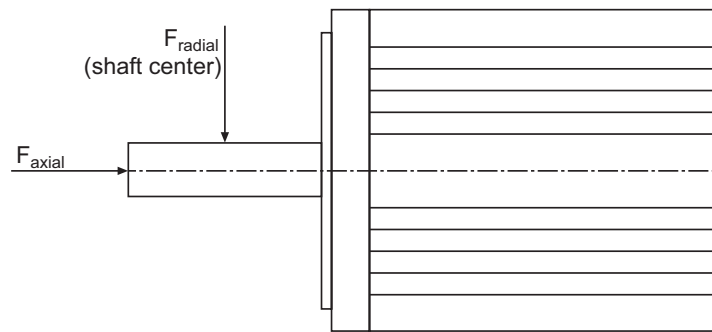


Figure 6.4 Definition of shaft strain

Motor	1000 min ⁻¹	2000 min ⁻¹	3000 min ⁻¹	4000 min ⁻¹	5000 min ⁻¹	6000 min ⁻¹	7000 min ⁻¹	8000 min ⁻¹
BSH 055 1	340	270	240	220	200	190	180	170
BSH 055 2	370	290	260	230	220	200	190	190
BSH 055 3	390	310	270	240	230	210	200	190
BSH 070 1	660	520	460	410	380	360	-	-
BSH 070 2	710	560	490	450	410	390	-	-
BSH 070 3	730	580	510	460	430	400	-	-
BSH 100 1	900	720	630	570	530	-	-	-
BSH 100 2	990	790	690	620	-	-	-	-
BSH 100 3	1050	830	730	660	-	-	-	-
BSH 100 4	1070	850	740	-	-	-	-	-
BSH 140 1	2210	1760	1530	-	-	-	-	-
BSH 140 2	2430	1930	1680	-	-	-	-	-
BSH 140 3	2560	2030	1780	-	-	-	-	-
BSH 140 4	2660	2110	1840	-	-	-	-	-
BSH 205 1	3730	2960	2580	-	-	-	-	-
BSH 205 2	4200	3330	2910	-	-	-	-	-
BSH 205 3	4500	3570	3120	-	-	-	-	-

Table 6.5 Admissible radial force F_{radial} [N]

Basis for calculation:

20.000 hours of operation as rated bearing life L_{10h} for a smooth shaft.

admissible axial force F_{axial} [N]

$$F_{axial} = 0,2 \times F_{radial}$$



NOTE

For equivalent values in pounds, multiply the value in newtons by 0.225

6.1.5 Encoders

6.1.5.1 SinCos (SKS36) Singleturn

Parameter	Value	Unit
Resolution	depends on controller	
Number of revolutions	1	
Measurement range absolute „singleturn“	1	revolution
Error limit of the digital absolute value depending on the controller	+/-5.3	angular minutes
Precision of the incremental position evaluation	+/-1.3	angular minutes
Pulse shape	sinus	
Supply voltage	7 ... 12	V
Recommended supply voltage	8	V
Supply current	max. 60 (without load)	mA

Table 6.6 Technical data of the SinCos encoder (SKS)

6.1.5.2 SinCos (SKM36) Multiturn

Parameter	Value	Unit
Resolution	depends on controller	
Number of revolutions	4096	
Measurement range absolute „singleturn“	1	revolution
Error limit of the digital absolute value depending on the controller	+/-5.3	angular minutes
Precision of the incremental position evaluation	+/-1.3	angular minutes
Pulse shape	sinus	
Supply voltage	7 ... 12	V
Recommended supply voltage	8	V
Supply current	max. 60 (without load)	mA

Table 6.7 Technical data of the SinCos encoder (SKS)

6.1.6 Holding brake (optional)

To hold the axis without play in standstill or while the Servo drive is powerless, the servo motors can be equipped with a holding brake. The permanent magnet brake is a unifacial device that uses the power of a permanent magnetic field to generate brake power (electromagnetic normally closed system).

To release the brake, the permanent magnetic field is superseded by an electromagnetic field. Releasing the brake without residual movement, regardless of the mounting position, is ensured by use of a steel spring. In addition to friction-free axial armature movement, the spring also provides for play-free transmission of the brake moment.

⚠ WARNING
<p>UNINTENDED EQUIPMENT MOVEMENT</p> <ul style="list-style-type: none"> • Do not rely only on the holding brake to ensure personnel protection. • For personnel protection, provide additional measures such as a protective grid or a mechanical brake in addition to the holding brake. <p>Failure to follow these instructions can result in death, serious injury or equipment damage.</p>

⚠ WARNING
<p>IMPROPER USE OF HOLDING BRAKE</p> <ul style="list-style-type: none"> • Use the correct brake controller (see catalog Lexium 05). • Only use holding brake during standstill. • Only use holding brake to stop motor rotation in “EMERGENCY STOP” situations. <p>Failure to follow these instructions can result in death, serious injury or equipment damage.</p>

The motors must not be operated against the closed brake. An emergency stop of the motor (i.e. the brake drops while the motor is running) is only allowed in exceptional cases, if the following conditions are met:

The times are valid for direct current, regular operating temperature and rated voltage. *Release time* is the time from switching on the power to the point when the torque has reduced to 10% of the rated torque. *Engage time* is the time from switching off the power until the rated torque is reached.

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The holding brake is dimensioned differently for each motor series:

	BSH 055 1 xxx Fx	BSH 055 2 xxx Fx	BSH 055 3 xxx Fx	Unit
holding moment	0.8	0.8	0.8	[Nm]
connection time	6	6	6	[ms]
separation time	12	12	12	[ms]
Weight	0.08	0.08	0.08	[kg]
moment of inertia	0.0213	0.0213	0.0213	[kgcm ²]
rated power	10	10	10	[W]
rated voltage	24 +6/-10%	24 +6/-10%	24 +6/-10%	[V] DC

Table 6.8 Technical data of the holding brake of the BSH 055 motor

	BSH 070 1 xxx Fx	BSH 070 2 xxx Fx	BSH 070 3 xxx Fx	Unit
holding moment	2.0	2.0	3.0	[Nm]
connection time	8	8	15	[ms]
separation time	25	25	35	[ms]
Weight	0.45	0.45	0.32	[kg]
moment of inertia	0.072	0.072	0.227	[kgcm ²]
rated power	11	11	12	[W]
rated voltage	24 +6/-10%	24 +6/-10%	24 +6/-10%	[V] DC

Table 6.9 Technical data of the holding brake of the BSH 070 motor

	BSH 100 1 xxx Fx	BSH 100 2 xxx Fx	BSH 100 3 xxx Fx	BSH 100 4 xxx Fx	Unit
holding moment	9.0	9.0	9.0	12.0	[Nm]
connection time	18	18	18	20	[ms]
separation time	40	40	40	45	[ms]
Weight	0.45	0.45	0.45	0.69	[kg]
moment of inertia	0.618	0.618	0.618	1.025	[kgcm ²]
rated power	18	18	18	17	[W]
rated voltage	24 +6/-10%	24 +6/-10%	24 +6/-10%	24 +6/-10%	[V] DC

Table 6.10 Technical data of the holding brake of the BSH 100 motor

	BSH 140 1 xxx Fx	BSH 140 2 xxx Fx	BSH 140 3 xxx Fx	BSH 140 4 xxx Fx	Unit
holding moment	23.0	23.0	36.0	36.0	[Nm]
connection time	25	25	30	30	[ms]
separation time	50	50	100	100	[ms]
Weight	1.10	1.10	1.79	1.79	[kg]
moment of inertia	1.150	1.150	5.500	5.500	[kgcm ²]
rated power	24	24	26	26	[W]
rated voltage	24 +6/-10%	24 +6/-10%	24 +6/-10%	24 +6/-10%	[V] DC

Table 6.11 Technical data of the holding brake of the BSH 140 motor

	BSH 205 1 xxx Fx	BSH 205 2 xxx Fx	BSH 205 3 xxx Fx	Unit
holding moment	80.0	80.0	80.0	[Nm]
connection time	50	50	50	[ms]
separation time	200	200	200	[ms]
Weight	3.60	3.60	3.60	[kg]
moment of inertia	16.000	16.000	16.000	[kgcm ²]
rated power	40	40	40	[W]
rated voltage	24 +6/-10%	24 +6/-10%	24 +6/-10%	[V] DC

Table 6.12 Technical data of the holding brake of the BSH 205 motor

6.1.6.1 Holding brake grind in

If the motors are equipped with a holding brake and were already stored for more than 2 years before the assembly, the holding brake has to be ground in before you use it.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Only grind in teh holding brake when the system is fully assembled.
- Rotating the motor can induce high voltages on the terminals. Ensure that the terminals cannot be touched during the grinding operation.

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

- ▶ In addition turn the motor by hand for approx. 50 revolutions in the closed state of the holding brake.
- ✓ The holding brake is now ready for use.

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6.1.7 Technical Data in Detail

Reference Data	Symbol [Unit]	BSH 055 1			BSH 055 2			BSH 055 3		
		M	P	T	M	P	T	M	P	T
Technical data - general										
Standstill torque	M_0 [Nm]	0.5			0.8			1.2		
Peak torque	M_{max} [Nm]	1.5			2.5			3.5		
Mains voltage $U_N = 115V$										
Rated speed	n_N [min ⁻¹]	1000	2000	4000	1000	2000	4000	1000	2000	4000
Rated torque	M_N [Nm]	0.50	0.50	0.50	0.77	0.77	0.75	1.14	1.13	1.10
Rated power	P_N [kW]	0.05	0.10	0.21	0.08	0.16	0.31	0.12	0.24	0.46
Mains voltage $U_N = 230V$										
Rated speed	n_N [min ⁻¹]	2000	4000	8000	2000	4000	8000	2000	4000	8000
Rated torque	M_N [Nm]	0.50	0.50	0.48	0.77	0.75	0.72	1.13	1.10	1.05
Rated power	P_N [kW]	0.10	0.21	0.40	0.16	0.31	0.60	0.24	0.46	0.88
Mains voltage $U_N = 400V$										
Rated speed	n_N [min ⁻¹]	4000	8000	-	4000	8000	-	4000	8000	-
Rated torque	M_N [Nm]	0.50	0.48	-	0.75	0.72	-	1.10	1.05	-
Rated power	P_N [kW]	0.21	0.40	-	0.31	0.60	-	0.46	0.88	-
Technical data - electrical										
Number polepairs	p	3			3			3		
Winding connection		Y			Y			Y		
Torque constant (120°C)	k_T [Nm/A _{rms}]	1.25	0.68	0.36	1.33	0.70	0.36	1.33	0.70	0.39
Winding resistance Ph-Ph (20°C)	R_{U-V} [Ω]	142.8	41.8	12.2	60.2	17.4	5.2	38.4	10.4	3.1
Winding inductance Ph-Ph	L_{U-V} [mH]	244.2	71.5	20.8	122.0	35.3	10.6	92.2	25.0	7.4
Voltage constant Ph-Ph (120°C)	k_E [V _{rms} /kmin ⁻¹]	74	40	22	74	40	22	79	41	22
Standstill current	I_0 [A _{rms}]	0.4	0.73	1.4	0.6	1.2	2.2	0.9	1.7	3.1
Rated current	I_N [A _{rms}]	0.3	0.62	1.1	0.6	1.1	2.0	0.7	1.35	2.5
Maximum current	I_{max} [A _{rms}]	1.6	2.9	5.4	2.6	4.8	8.8	3.4	6.5	11.9
Technical data - mechanical										
Mechanical limit speed	n_{max} [min ⁻¹]	9000			9000			9000		
Rotor moment of inertia	J_M [kgcm ²]	0.059			0.096			0.134		
Maximum shock (all directions)	S [m/s ²]	200			200			200		
Maximum vibration (all directions)	V [m/s ²]	50			50			50		
Weight	m [kg]	1.2			1.5			1.8		
Technical data -thermal										
Switching point of PTC	T_{TK} [°C]	130			130			130		

Table 6.13 Technical data BSH 055

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Reference Data	Symbol [Unit]	BSH 070 1			BSH 070 2			BSH 070 3		
		M	P	T	M	P	T	M	P	T
Technical data - general										
Standstill torque	M_0 [Nm]	1.4			2.2			3.1		
Peak torque	M_{max} [Nm]	3.5			7.6			11.3		
Mains voltage $U_N = 115V$										
Rated speed	n_N [min ⁻¹]	750	1500	3000	750	1500	3000	750	1500	3000
Rated torque	M_N [Nm]	1.40	1.40	1.40	2.20	2.15	2.10	3.05	2.95	2.80
Rated power	P_N [kW]	0.11	0.22	0.44	0.17	0.34	0.66	0.24	0.46	0.88
Mains voltage $U_N = 230V$										
Rated speed	n_N [min ⁻¹]	1500	3000	6000	1500	3000	6000	1500	3000	6000
Rated torque	M_N [Nm]	1.4	1.4	1.3	2.15	2.1	1.9	2.95	2.8	2.3
Rated power	P_N [kW]	0.22	0.44	0.82	0.34	0.66	1.19	0.46	0.88	1.45
Mains voltage $U_N = 400V$										
Rated speed	n_N [min ⁻¹]	3000	6000	-	3000	6000	-	3000	6000	-
Rated torque	M_N [Nm]	1.4	1.3	-	2.1	1.9	-	2.8	2.3	-
Rated power	P_N [kW]	0.44	0.82	-	0.66	1.19	-	0.88	1.45	-
Technical data - electrical										
Number polepairs	p	3			3			3		
Winding connection		Y			Y			Y		
Torque constant (120°C)	k_T [Nm/A _{rms}]	1.40	0.80	0.44	1.47	0.77	0.45	1.48	0.78	0.44
Winding resistance Ph-Ph (20°C)	R_{U-V} [Ω]	35.4	10.4	3.3	16.4	4.2	1.5	10.2	2.7	0.91
Winding inductance Ph-Ph	L_{U-V} [mH]	131.9	38.8	12.3	74.1	19.0	6.7	49.2	13.0	4.4
Voltage constant Ph-Ph (120°C)	k_E [V _{rms} /kmin ⁻¹]	85	46	26	95	48	28	95	49	29
Standstill current	I_0 [A _{rms}]	1.0	1.8	3.2	1.5	2.9	4.9	2.1	4.1	7.0
Rated current	I_N [A _{rms}]	0.9	1.6	2.8	1.5	2.6	4.4	1.9	3.0	5.2
Maximum current	I_{max} [A _{rms}]	3.1	5.7	10.1	6.0	11.8	19.9	8.7	17.0	29.2
Technical data - mechanical										
Mechanical limit speed	n_{max} [min ⁻¹]	8000			8000			8000		
Rotor moment of inertia	J_M [kgcm ²]	0.25			0.41			0.58		
Maximum shock (all directions)	S [m/s ²]	200			200			200		
Maximum vibration (all directions)	V [m/s ²]	50			50			50		
Weight	m [kg]	2.1			2.8			3.6		
Technical data -thermal										
Switching point of PTC	T_{TK} [°C]	130			130			130		

Table 6.14 Technical data BSH 070

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Reference Data	Symbol [Unit]	BSH 100 1			BSH 100 2			BSH 100 3			BSH 100 4		
		M	P	T	M	P	T	M	P	T	M	P	T
Technical data - general													
Standstill torque	M_0 [Nm]	3.3			5.8			8.0			10.0		
Peak torque	M_{max} [Nm]	9.6			18.3			28.3			40.5		
Mains voltage $U_N = 115V$													
Rated speed	n_N [min^{-1}]	625	1250	2500	500	1000	2000	500	1000	2000	375	750	1500
Rated torque	M_N [Nm]	3.20	3.15	3.00	5.70	5.50	5.20	7.80	7.50	7.00	10.00	9.90	9.50
Rated power	P_N [kW]	0.21	0.41	0.79	0.30	0.58	1.09	0.41	0.79	1.47	0.39	0.78	1.49
Mains voltage $U_N = 230V$													
Rated speed	n_N [min^{-1}]	1250	2500	5000	1000	2000	4000	1000	2000	4000	750	1500	3000
Rated torque	M_N [Nm]	3.15	3.00	2.70	5.50	5.20	4.60	7.50	7.00	5.70	9.90	9.50	7.90
Rated power	P_N [kW]	0.41	0.79	1.41	0.58	1.09	1.93	0.79	1.47	2.39	0.78	1.49	2.48
Mains voltage $U_N = 400V$													
Rated speed	n_N [min^{-1}]	2500	5000	-	2000	4000	-	2000	4000	-	1500	3000	-
Rated torque	M_N [Nm]	3.0	2.7	-	5.2	4.6	-	7.0	5.7	-	9.5	7.9	-
Rated power	P_N [kW]	0.79	1.41	-	1.09	1.93	-	1.47	2.39	-	1.49	2.48	-
Technical data - electrical													
Number polepairs	p	4			4			4			4		
Winding connection		Y			Y			Y			Y		
Torque constant (120°C)	k_T [Nm/A _{rms}]	1.83	0.89	0.45	2.32	1.21	0.59	2.35	1.22	0.59	3.13	1.62	0.79
Winding resistance Ph-Ph (20°C)	R_{U-V} [Ω]	13.9	3.8	0.87	8.6	2.4	0.56	5.3	1.43	0.34	6.7	1.81	0.43
Winding inductance Ph-Ph	L_{U-V} [mH]	64.3	17.6	4.0	45.7	12.7	3.0	32.5	8.8	2.09	43.6	11.8	2.8
Voltage constant Ph-Ph (120°C)	k_E [V _{rms} /kmin ⁻¹]	115	60	29	146	77	37	148	77	38	198	103	50
Standstill current	I_0 [A _{rms}]	1.8	3.5	7.3	2.5	4.8	9.9	3.4	6.6	13.5	3.2	6.2	12.7
Rated current	I_N [A _{rms}]	1.6	2.8	5.9	2.3	3.8	7.9	3.1	4.9	10.1	3.2	5.3	10.9
Maximum current	I_{max} [A _{rms}]	6.3	12.0	25.1	9.0	17.1	35.4	14.7	28.3	58.1	16.8	32.3	66.3
Technical data - mechanical													
Mechanical limit speed	n_{max} [min^{-1}]	6000			6000			6000			6000		
Rotor moment of inertia	J_M [kgcm ²]	1.40			2.31			3.22			4.22		
Maximum shock (all directions)	S [m/s ²]	200			200			200			200		
Maximum vibration (all directions)	V [m/s ²]	50			50			50			50		
Weight	m [kg]	4.3			5.8			7.5			9.2		
Technical data -thermal													
Switching point of PTC	T_{TK} [°C]	130			130			130			130		

Table 6.15 Technical data BSH 100

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Reference Data	Symbol [Unit]	BSH 140 1			BSH 140 2			BSH 140 3		BSH 140 4	
		M	P	T	M	P	T	M	P	M	P
Technical data - general											
Standstill torque	M_0 [Nm]	11.1			19.5			27.8		33.4	
Peak torque	M_{max} [Nm]	27.0			60.1			90.2		131.9	
Mains voltage $U_N = 115V$											
Rated speed	n_N [min ⁻¹]	375	750	1500	375	750	1500	375	750	375	750
Rated torque	M_N [Nm]	11.0	10.95	10.6	19.1	18.6	12.1	26.3	24.7	31.9	30.2
Rated power	P_N [kW]	0.43	0.86	1.67	0.75	1.46	2.69	1.03	1.94	1.25	2.37
Mains voltage $U_N = 230V$											
Rated speed	n_N [min ⁻¹]	750	1500	3000	750	1500	3000	750	1500	750	1500
Rated torque	M_N [Nm]	10.95	10.6	9.2	18.6	17.1	12.3	24.7	21.2	30.2	26.3
Rated power	P_N [kW]	0.86	1.67	2.89	1.46	2.69	3.86	1.94	3.33	2.37	4.13
Mains voltage $U_N = 400V$											
Rated speed	n_N [min ⁻¹]	1500	3000	-	1500	3000	-	1500	3000	1500	3000
Rated torque	M_N [Nm]	10.6	9.2	-	17.1	12.3	-	21.2	12.9	26.3	16.1
Rated power	P_N [kW]	1.67	2.89	-	2.69	3.86	-	3.33	4.05	4.13	5.06
Technical data - electrical											
Number polepairs	p	5			5			5		5	
Winding connection		Y			Y			Y		Y	
Torque constant (120°C)	k_T [Nm/A _{rms}]	2.78	1.43	0.80	2.91	1.47	0.87	3.09	1.58	3.12	1.57
Winding resistance Ph-Ph (20°C)	R_{U-V} [Ω]	5.3	1.41	0.44	2.32	0.6	0.21	1.52	0.4	1.12	0.28
Winding inductance Ph-Ph	L_{U-V} [mH]	58.1	15.6	4.9	28.6	7.4	2.54	19.4	5.1	15.6	3.9
Voltage constant Ph-Ph (120°C)	k_E [V _{rms} /kmin ⁻¹]	193	100	56	199	101	59	205	105	208	104
Standstill current	I_0 [A _{rms}]	4.0	7.8	13.9	6.7	13.2	22.5	9.0	17.6	10.7	21.3
Rated current	I_N [A _{rms}]	4.0	6.8	12.1	6.3	8.9	15.2	7.3	8.7	9.0	11.0
Maximum current	I_{max} [A _{rms}]	10.8	20.8	37.1	22.4	44.1	75.2	31.3	61.0	47.8	95.6
Technical data - mechanical											
Mechanical limit speed	n_{max} [min ⁻¹]	4000			4000			4000		4000	
Rotor moment of inertia	J_M [kgcm ²]	7.41			12.68			17.94		23.70	
Maximum shock (all directions)	S [m/s ²]	200			200			200		200	
Maximum vibration (all directions)	V [m/s ²]	50			50			50		50	
Weight	m [kg]	11.9			16.6			21.3		26	
Technical data -thermal											
Switching point of PTC	T_{TK} [°C]	130			130			130		130	

Table 6.16 Technical data BSH 140

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Reference Data	Symbol [Unit]	BSH 205 1		BSH 205 2		BSH 205 3	
		M	P	M	P	M	P
Technical data - general							
Standstill torque	M_0 [Nm]	34.4		62.5		88.0	
Peak torque	M_{max} [Nm]	110		220.0		330.0	
Mains voltage $U_N = 115V$							
Rated speed	n_N [min^{-1}]	375	750	250	500	250	500
Rated torque	M_N [Nm]	32.9	31.4	60.4	57.9	84.34	80.2
Rated power	P_N [kW]	1.29	2.47	1.58	3.03	2.21	4.2
Mains voltage $U_N = 230V$							
Rated speed	n_N [min^{-1}]	750	1500	500	1000	500	1000
Rated torque	M_N [Nm]	31.4	28.2	57.9	51.7	80.2	70.45
Rated power	P_N [kW]	2.47	4.43	3.03	5.41	4.2	7.38
Mains voltage $U_N = 400V$							
Rated speed	n_N [min^{-1}]	1500	3000	1000	2000	1000	2000
Rated torque	M_N [Nm]	28.2	21.0	51.7	34.0	70.45	45.0
Rated power	P_N [kW]	4.43	6.6	5.41	7.12	7.38	9.42
Technical data - electrical							
Number polepairs	p	5		5		5	
Winding connection		Y		Y		Y	
Torque constant (120°C)	k_T [Nm/A _{rms}]	3.1	1.6	5.04	2.58	5.5	2.76
Winding resistance Ph-Ph (20°C)	R_{U-V} [Ω]	1.1	0.3	1.1	0.3	0.8	0.2
Winding inductance Ph-Ph	L_{U-V} [mH]	21.3	5.7	20.6	5.4	16.8	4.2
Voltage constant Ph-Ph (120°C)	k_E [V _{rms} /kmin ⁻¹]	200	104	314	161	344	172
Standstill current	I_0 [A _{rms}]	11.1	21.5	12.4	24.2	16	31.9
Rated current	I_N [A _{rms}]	9.1	13.1	10.2	13.2	14	17.9
Maximum current	I_{max} [A _{rms}]	40.4	78.1	49.6	96.8	68	136.1
Technical data - mechanical							
Mechanical limit speed	n_{max} [min^{-1}]	3800		3800		3800	
Rotor moment of inertia	J_M [kgcm ²]	71.4		129		190	
Maximum shock (all directions)	S [m/s^2]	200		200		200	
Maximum vibration (all directions)	V [m/s^2]	50		50		50	
Weight	m [kg]	33		44		67	
Technical data -thermal							
Switching point of PTC	T_{TK} [°C]	130		130		130	

Table 6.17 Technical data BSH 205

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6.2 Electrical Connections

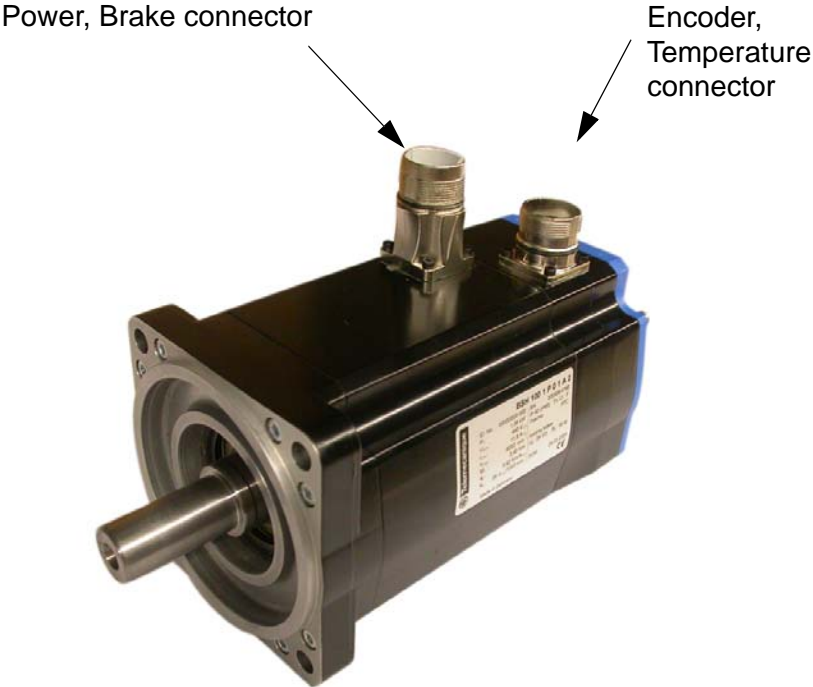
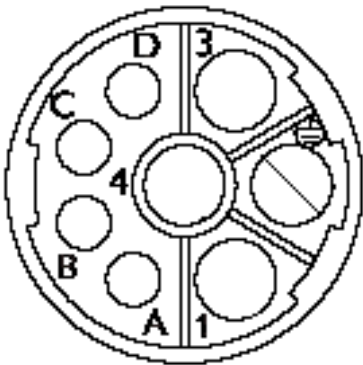


Figure 6.5 Overview of connections with BSH motor

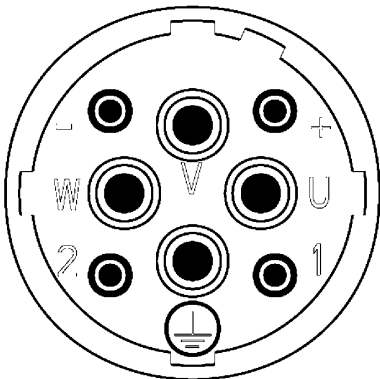
6.2.1 Motor Cable Connector



Pin	Designation (lead no.)	Meaning	Range
1	U	power	3 AC 0 - 480V
2	PE	shield	
3	W	power	3 AC 0 - 480V
4	V	power	3 AC 0 - 480V
A	brake +	brake	DC 24V
B	brake -	brake	DC 0V
C	-	not assigned	
D	-	not assigned	

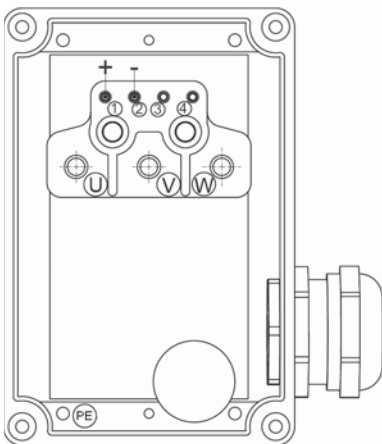
Table 6.18 Power, Brake Connector (BSH 055 ... BSH 140)

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Pin	Designation (lead no.)	Meaning	Range
U	U	power	3 AC 0 - 480V
PE	PE	shield	
W	W	power	3 AC 0 - 480V
V	V	power	3 AC 0 - 480V
+	brake +	brake	DC 24V
-	brake -	brake	DC 0V
	-	not assigned	
	-	not assigned	

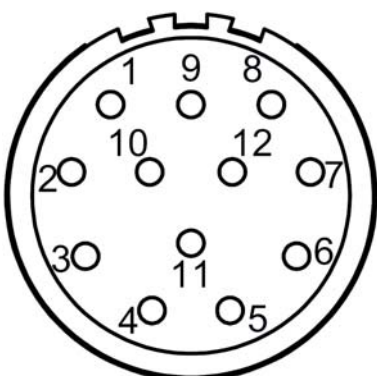
Table 6.19 Power, Brake Connector (BSH 2051)



Pin	Designation (lead no.)	Meaning	Range
U	U	power	3 AC 0 - 480V
PE	PE	shield	
W	W	power	3 AC 0 - 480V
V	V	power	3 AC 0 - 480V
1	brake +	brake	DC 24V
2	brake -	brake	DC 0V
3	-	not assigned	
4	-	not assigned	

Table 6.20 Power, Brake Connector (BSH 2052 and BSH 2053)

6.2.2 Brake / Temperature / Encoder connector



Pin	Designation (lead no.)	Meaning	Range
1	Sensor PTC	Temperature	
2	Sensor PTC	Temperature	
3	-	not assigned	
4	REF SIN	REF signal	
5	REF COS	REF signal	
6	Data +	RS 485	
7	Data -	RS 485	
8	SIN +		
9	COS +		
10	U	power	DC 7 - 12V
11	GND	Ground	DC 0V
12	-	not assigned	

Table 6.21 Encoder, Temperature connector

BLMT00008, V1.1, 04.2007

6.3 Dimensions

6.3.1 BSH motor

6.3.1.1 BSH 055

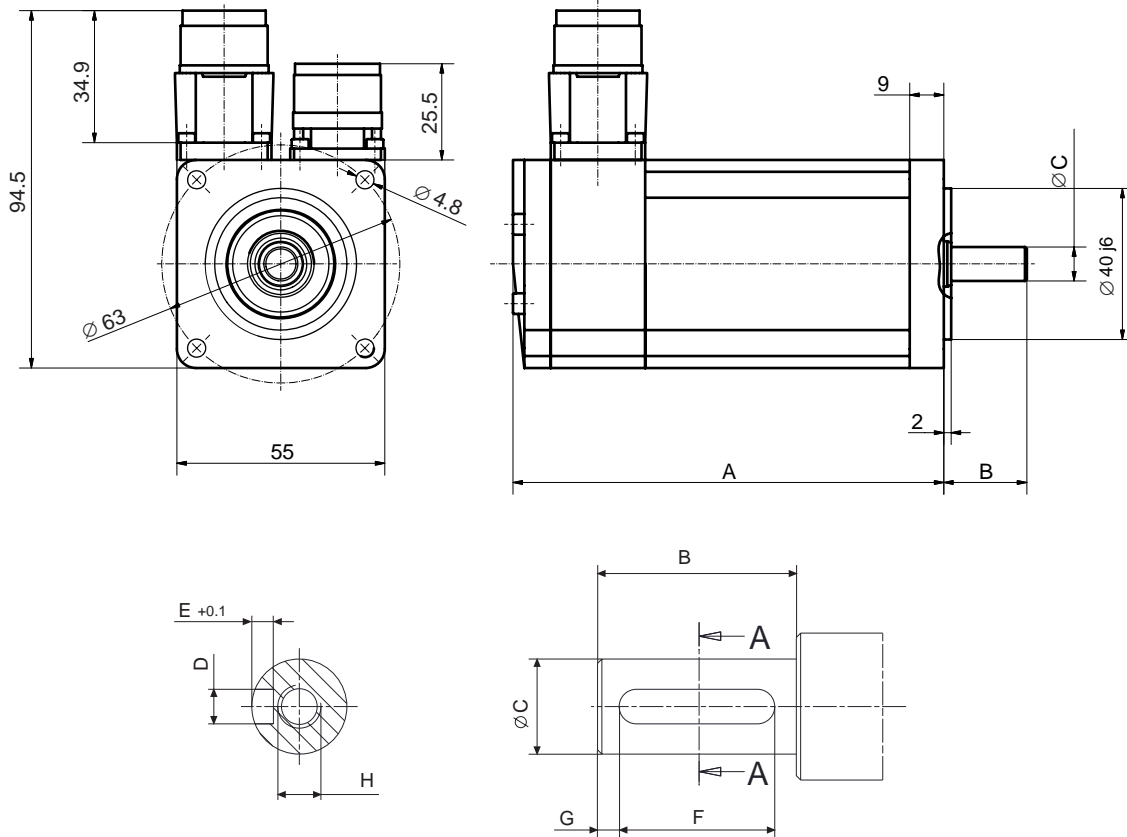


Figure 6.6 Dimensional drawing of BSH 055

Dimensions	BSH 055 1	BSH 055 2	BSH 055 3
A (without brake)	132.5 mm	154.5 mm	176.5mm
A (with brake)	159 mm	181 mm	203 mm

Table 6.22 Length of BSH 055

Dimensions	BSH 055 1	BSH 055 2	BSH 055 3
B	20 mm	20 mm	20 mm
C	9 k6 mm	9 k6 mm	9 k6 mm
D	3 N9 mm	3 N9 mm	3 N9 mm
E	1.8 mm	1.8 mm	1.8 mm
F	12 mm	12 mm	12 mm
G	4 mm	4 mm	4 mm
H	DIN 332-D M3	DIN 332-D M3	DIN 332-D M3
key way (N9)	DIN 6885-A3x3x12	DIN 6885-A3x3x12	DIN 6885-A3x3x12

Table 6.23 Shaft dimensions of BSH 055

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6.3.1.2 BSH 070

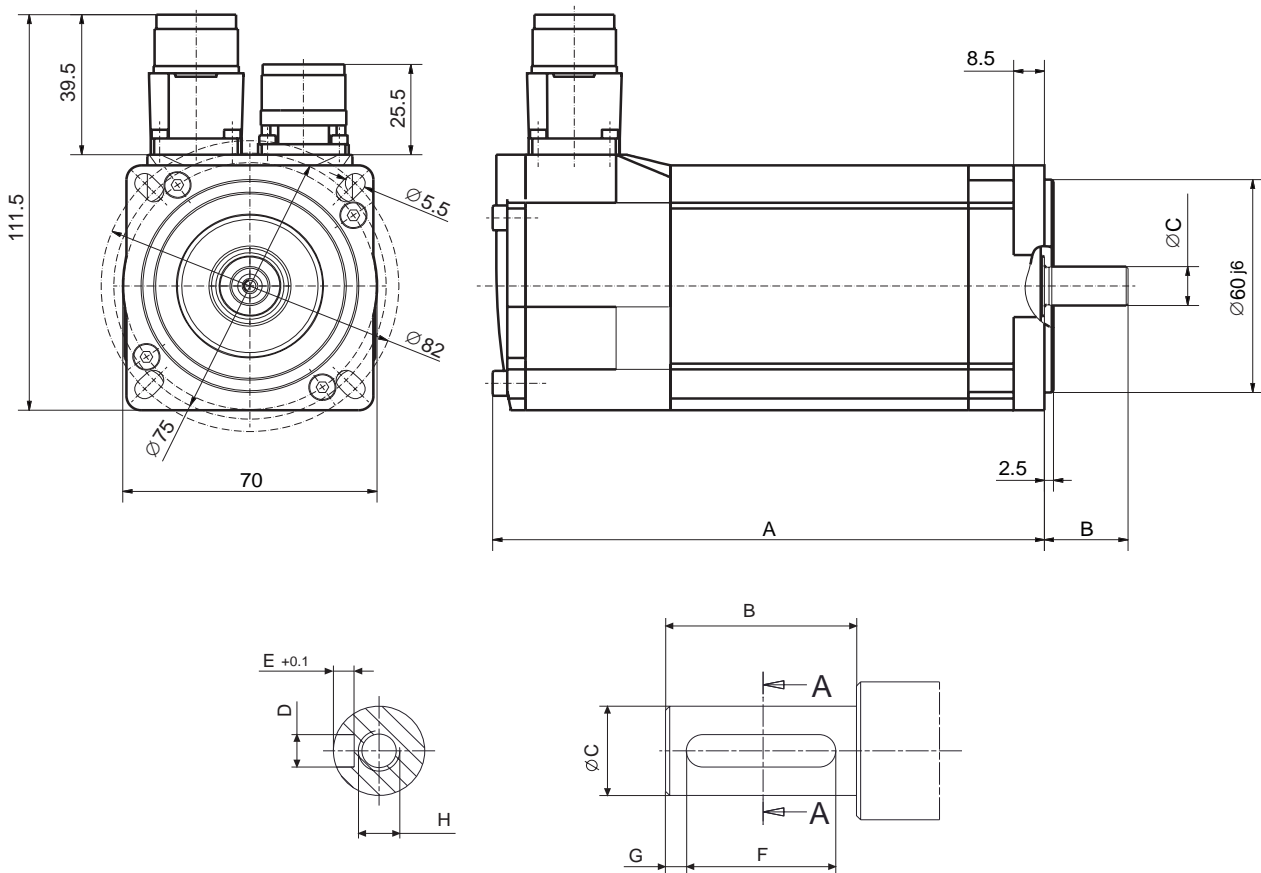


Figure 6.7 Dimensional drawing of BSH 070

Dimensions	BSH 070 1	BSH 070 2	BSH 070 3
A (without brake)	154 mm	187 mm	220 mm
A (with brake)	179.5 mm	212.5 mm	254 mm

Table 6.24 Length of BSH 070

Dimensions	BSH 070 1	BSH 070 2	BSH 070 3
B	23 mm	23 mm	30 mm
C	11 k6 mm	11 k6 mm	14 k6 mm
D	4 N9 mm	4 N9 mm	5 N9 mm
E	2.5 mm	2.5 mm	3 mm
F	18 mm	18 mm	20 mm
G	2.5 mm	2.5 mm	5 mm
H	DIN 332-D M4	DIN 332-D M4	DIN 332-D M5
key way (N9)	DIN 6885-A4x4x18	DIN 6885-A4x4x18	DIN 6885-A5x5x20

Table 6.25 Shaft dimensions of BSH 070

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6.3.1.3 BSH 100

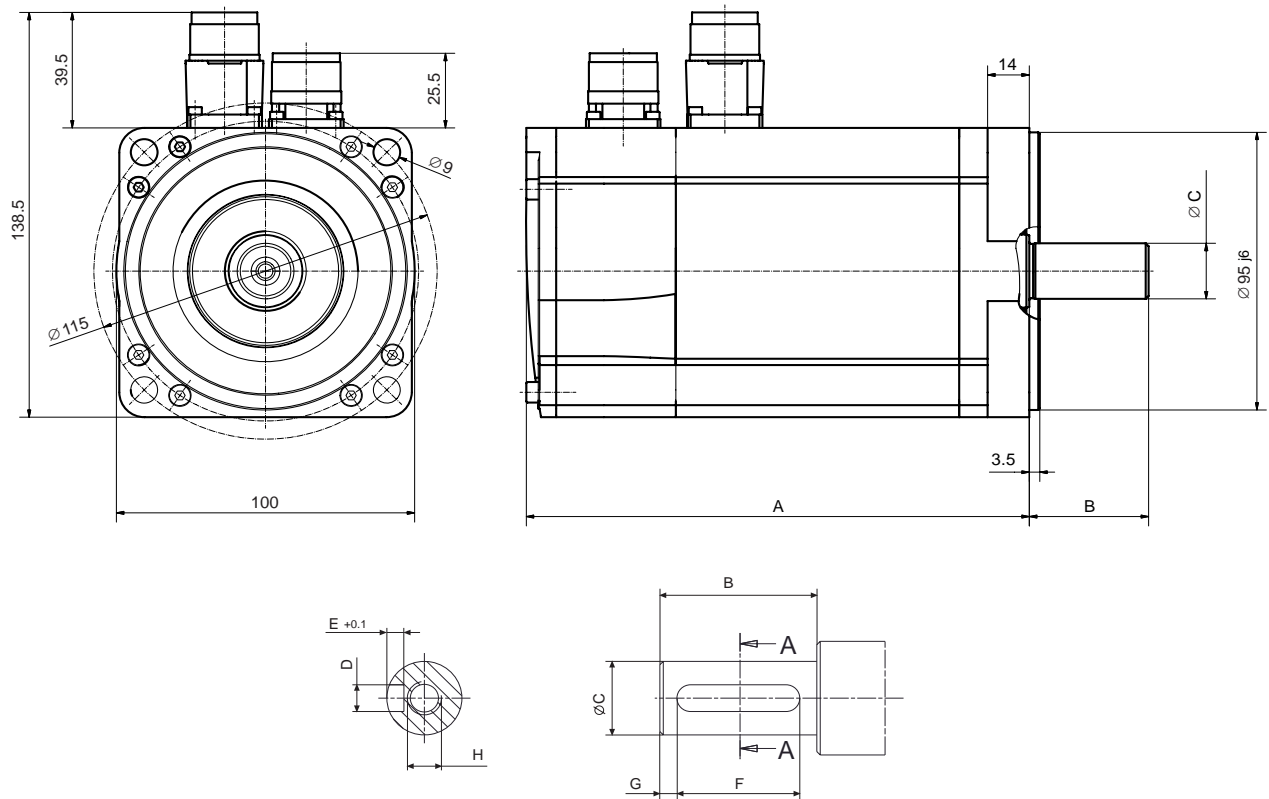


Figure 6.8 Dimensional drawing of BSH 100

Dimensions	BSH 100 1	BSH 100 2	BSH 100 3	BSH 100 4
A (without brake)	168.5 mm	204.5 mm	240.5 mm	276.5 mm
A (with brake)	199.5 mm	235.5 mm	271.5 mm	307.5 mm

Table 6.26 Length of BSH 100

Dimensions	BSH 100 1	BSH 100 2	BSH 100 3	BSH 100 3
B	40 mm	40 mm	40 mm	50 mm
C	19 k6 mm	19 k6 mm	19 k6 mm	24 k6 mm
D	6 N9 mm	6 N9 mm	6 N9 mm	8 N9 mm
E	3.5 mm	3.5 mm	3.5 mm	4 mm
F	30 mm	30 mm	30 mm	40 mm
G	5 mm	5 mm	5 mm	5 mm
H	DIN 332-D M6	DIN 332-D M6	DIN 332-D M6	DIN 332-D M8
key way (N9)	DIN 6885-A6x6x30	DIN 6885-A6x6x30	DIN 6885-A6x6x30	DIN 6885-A8x7x40

Table 6.27 Shaft dimensions of BSH 100

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6.3.1.4 BSH 140

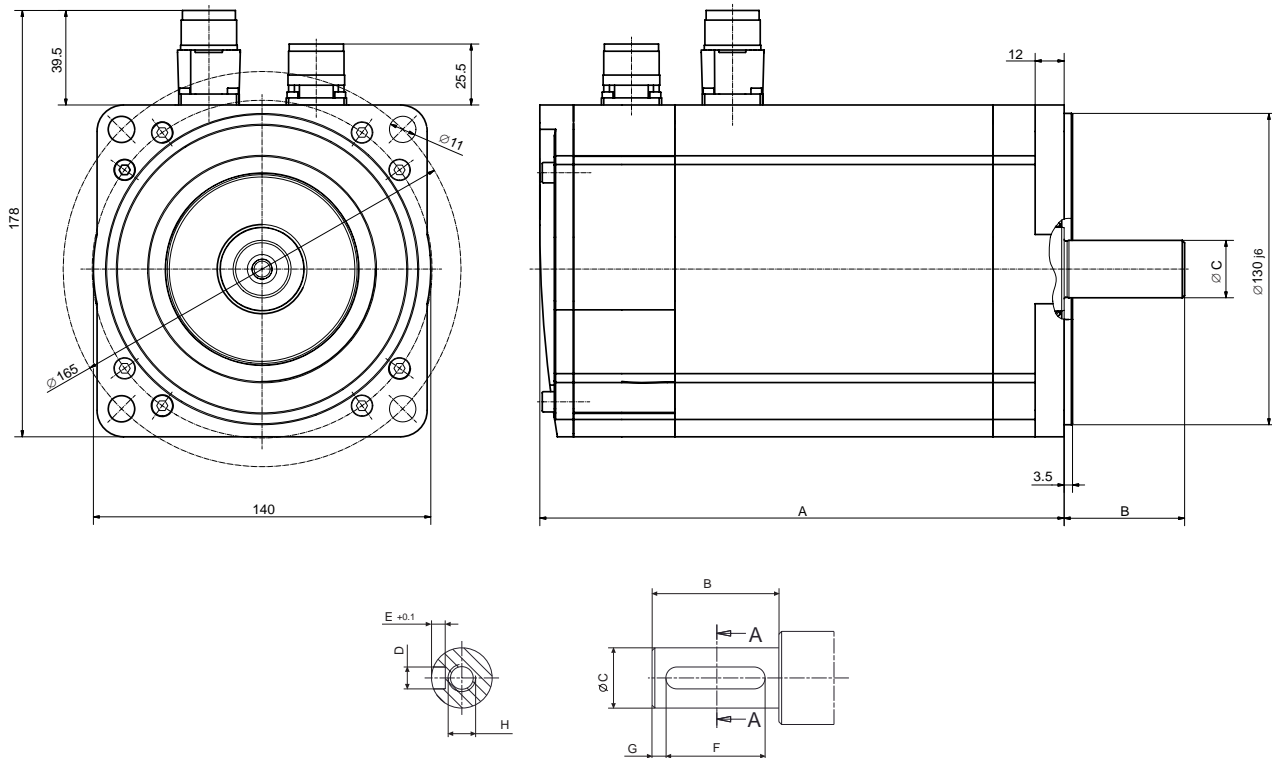


Figure 6.9 Dimensional drawing of BSH 140

Dimensions	BSH 140 1	BSH 140 2	BSH 140 3	BSH 140 4
A (without brake)	217.5 mm	272.5 mm	327.5 mm	382.5 mm
A (with brake)	255.5 mm	310.5 mm	365.5 mm	420.5 mm

Table 6.28 Length of BSH 140

Dimensions	BSH 140 1	BSH 140 2	BSH 140 3	BSH 140 3
B	50 mm	50 mm	50 mm	50 mm
C	24 k6 mm	24 k6 mm	24 k6 mm	24 k6 mm
D	8 N9 mm	8 N9 mm	8 N9 mm	8 N9 mm
E	4 mm	4 mm	4 mm	4 mm
F	40 mm	40 mm	40 mm	40 mm
G	5 mm	5 mm	5 mm	5 mm
H	DIN 332-D M8	DIN 332-D M8	DIN 332-D M8	DIN 332-D M8
key way (N9)	DIN 6885-A8x7x40	DIN 6885-A8x7x40	DIN 6885-A8x7x40	DIN 6885-A8x7x40

Table 6.29 Shaft dimensions of BSH 140

6.3.1.5 BSH 205

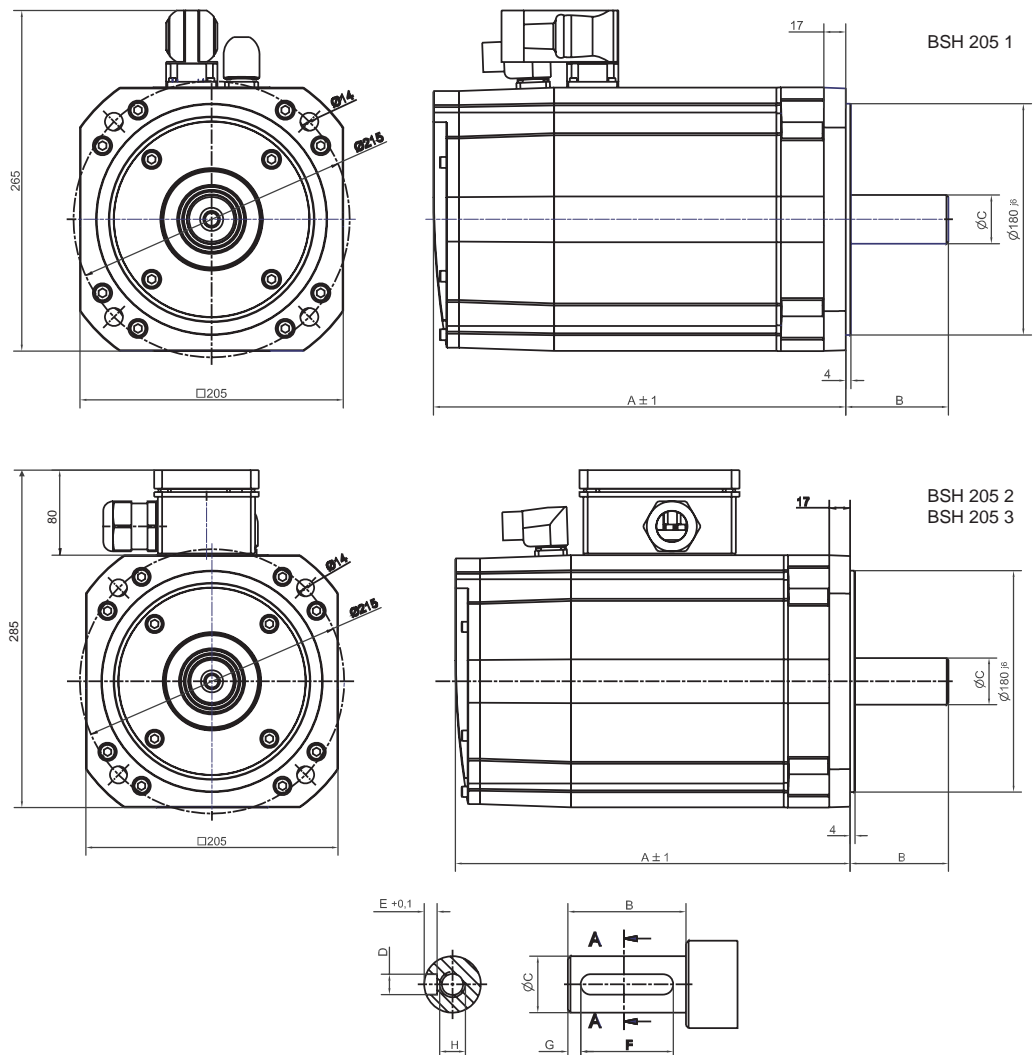


Figure 6.10 Dimensional drawing of BSH 205

Dimensions	BSH 205 1	BSH 205 2	BSH 205 3
A (without brake)	321 mm	405	489
A (with brake)	370.5 mm	454.5	538.5

Table 6.30 Length of BSH 205

Dimensions	BSH 205 1	BSH 205 2	BSH 205 3
B	80 mm	80 mm	80 mm
C	38 k6 mm	38 k6 mm	38 k6 mm
D	10 P9 mm	10 P9 mm	10 P9 mm
E	5 mm	5 mm	5 mm
F	70 mm	70 mm	70 mm
G	5 mm	5 mm	5 mm
H	DIN 332-D M12	DIN 332-D M12	DIN 332-D M12
key way (N9)	DIN 6885-A10x8x70	DIN 6885-A10x8x70	DIN 6885-A10x8x70

Table 6.31 Shaft dimensions of BSH 205

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