BSH AC Servo Motor Operation Manual V1.3, 12.2008





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This manual is part of the product.

Read and observe this manual.

Keep this manual.

Pass on this manual and all documents pertaining to the product to all users of the product.

In particular, read and observe all safety notes (see 2 Notes for working safely with the product).

Not all products are available in every country. Our current catalog provides information about product availability.

We reserve the right to make changes that lead to technological improvements.

All specifications are technical data. We the manufacturer are not liable if there are deviations from this technical data in practical application.

Most of the product names are also to be understood as trademarks of their respective owners even when they are not explicitly identified as such.

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1 About this manual

1.1 Introduction

Read and observe this manual before you work on the motor for the first time. Take particular note of the safety instructions. As described in section 2.2, only those persons who meet the "Selection and qualification of employees" are allowed to work on the motor.

This manual is intended to help you use the motor and its intended applications safely and properly. By observing this manual, you will help to

- avoid risks,
- · reduce repair costs and down times of the motor,
- increase the life span of the motor
- and increase reliability of the motor.



A copy of this manual must always be available for personnel who are entrusted to work on the motor

Symbols, designator and display format of safety notes

This manual divides the safety instructions into four various categories.

Hazards and possible results will be categorized using a certain combination of symbols and signal words.

Symbol / Signal word	Meaning
▲ DANGER	Indicates an immediate hazardous situation that can lead to death or serious injury if the safety regulations are not observed.
▲ WARNING	Indicates a potentially hazardous situation that can lead to serious injury or death if the safety regulations are not observed.
▲ CAUTION	Indicates a potentially hazardous situation that may result in bodily harm if the safety regulations are not followed.
CAUTION	Indicates a potentially dangerous situation that may result in property damage if the safety regulations are not observed.

The following symbols and designators are used in this document:

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Symbol/Character	Meaning
	Information Symbol: After this symbol, you will find important instructions and useful tips on using the components.
	Marker: After this symbol, you will find references for further information.
•	Prerequisite symbol: This symbol indicates a prerequisite you have to fulfill before you start to implement an instruction.
•	Activity symbol: After this symbol, you will find an instruction. Follow the instructions in sequence from top to bottom.
✓	Result symbol: The text after this symbol contains the result of an action.
•	First level bullet point
-	Second level bullet point
	Orientation aid: Information serving as an orientation aid regarding the section's contents follows this symbol.
bold	If the descriptive text contains keywords , such as parameters, they are highlighted in bold.
IBufSelect: AXIS_BUF_SELECTION; (* Buffer Auswahl *)	Program code is written in a different font.

2

Notes for working safely with the product



The motor is are state of the art and conform to recognized technical safety regulations. Nevertheless the use of the motor can present a hazard to life and limb or cause property damage. The following section contains general requirements for safe work with the motor. Each person who uses or works on the motor must read and follow these requirements.

2.1 Proper use

Use The motor is intended to be installed in a machine or assembled with other components to form a machine or system.

What do you Proper use includes that you observe the following points and need to observe? the resulting rules:

- The regulative, warning and instruction signs on the connected components and in the switching cabinet
- The warning instructions on the motor on the connected components and in the switch cabinet
- The inspection and maintenance instructions
- The operating instructions of the other components
- All other documentation

Flawless Operate the motor only when they are in a flawless technical State condition. Observe the regulations, act with safety and hazards in mind If circumstances occur that impact safety or cause changes in the operating performance of of the motor, switch the motor off immediately and contact the responsible service staff.

Only original Use only the options and mounting parts specified in the docuequipment mentation and no third-party devices or components that are not must be used expressly approved by Schneider. Do not change the motor inappropriately.

Protection Before installing, provide for appropriate protective devices in measures compliance with the local and national standards. Do not comprovide for mission components without accordant protective devices. After installation, commissioning or repair, test the protective devices used.

Installation You may only use them in accordance with the installation and and operating operating conditions described in the documentation. The operambient ating conditions at the installation location must be checked and maintained in accordance with the required technical data (performance data and ambient conditions). Commissioning is prohibited until it is guaranteed that the usable machine or system in which the motor is installed meets all requirements of EC Directive 98/37/EC (machinery directive).

> In addition, the following standards, directives and regulations are to be observed:

- DIN EN 60204 Safety of machinery: Electrical equipment of machines
- DIN EN 292 Part 1 and Part 2 Safety of machinery: Basic Concepts, General Principles for Design
- DIN EN 50178 Electronic equipment for use in high-current electrical systems
- EMC directive 2004/108/EG
- The generally applicable local and national safety and accident prevention regulations.
- The rules and regulations on accident prevention and environmental protection that apply in the country where the product is used
- The applicable laws and ordinances

Selection and qualification of personnel

2.2

Target Audience This manual is geared exclusively toward technically qualified of this manual personnel, who have detailed knowledge in the field of automation technology. The description is mainly for construction and application engineers from the engineering and electro-technics division as well as service and commissioning engineers.

Specialist or Work on the motor may only be carried out by qualified profestrained sional or by trained staff under the instruction and supervision of staff a qualified person in accordance with electrical regulations. Professionals are those persons who, as a result of their training, knowledge, and experience and knowledge of the pertinent regulations, can

- evaluate the transferred work,
- recognize the meaning of the safety instructions and implement them consistently.
- recognize possible hazards and
- take appropriate safety measures.

2.3 Residual risks



Health risks arising from the motor have been reduced by means of safety technology and design engineering. However a residual risk remains, since the motor works with electrical voltage and electrical currents.



If activities involve residual risks, a warning instruction is made at the appropriate points. The note details the potential hazard and its effects and describes preventative measures to avoid it.

Mounting and handling

A WARNING

CRUSHING, SHEARING, CUTTING AND HITTING DURING HANDLING

- Observe the general construction and safety regulations for handling and mounting.
- Use suitable mounting and transport equipment correctly and use special tools if necessary.
- Prevent clamping and crushing by taking appropriate precautions.
- Cover edges and angles to protect against cutting damage.
- Wear suitable protective clothing (e.g. safety goggles, safety boots, protective gloves) if necessary.
- Do not stand under suspended loads.

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

High leakage current

A DANGER

HIGH LEAKAGE CURRENT GREATER THAN 3.5 MA AC

 Make sure that the device is firmly connected to the power supply (in accordance with DIN EN 50178 - Equipment of High-Voltage Systems).

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

Touching hot surfaces



As warning against housing temperatures of the motor exceeding 70°C during nominal operation, the symbol shown here is affixed on the motor.

A WARNING

HOT SURFACES UP TO 100 °C

- Wear safety gloves or wait until the surface temperature has cooled to allow safe contact!
- Attach protective cover or touch guard.

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

Touching electrical parts

DANGER

ELECTRIC SHOCK, FIRE OR EXPLOSION CAUSED BY HIGH VOLTAGE

- Observe the general construction and safety regulations for working on high-current electrical systems.
- After installation, check the firm connection of the ground conductor to all electrical units to ensure that connection complies with the connection diagram.
- Always make sure that the ground conductor is connected when operating electrical components.
- Before working on electrical equipment with a voltage greater than 50 volts, the main switch has to be in the "OFF" position and secured, so it cannot be restarted.
- Disconnect devices with a voltage greater than 30 V rms or 42,2 V DC from the power supply before working on electrical parts.
- Wait at least 5 minutes after switching off before accessing the components.
- Before working on the equipment, discharge the DC bus and use a voltage meter to make sure that there is no voltage.
- Do not touch the electrical connection points of the components when the device is switched on.
- Make sure that the drives are at a standstill because potentially fatal voltage can occur on the motor lines in generator operation.
- Before enabling the device, safely cover the live components to prevent contact.
- Disconnect power connector cables only when the system is deactivated.
- Plug in power connector cables only when the system is deactivated.
- Provide for protection against indirect contact (DIN EN 50178, Section 5.3.2).
- If you are not using prefabricated Cable, check that the assignment of the new cables complies with the connection diagram of the machine manufacturer.

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

Protection against magnetic and electromagnetic fields

WARNING

RISK GROUPS IN THE IMMEDIATE VICINITY OF MAGNETIC AND ELECTROMAGNETIC FIELDS

 Do not allow personnel with pacemakers or similar sensitive implants to work in the immediate vicinity of live conductors and motor permanent magnets.

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

Dangerous movements

There can be different causes of dangerous movements:

- Missing or faulty homing of the robot mechanics
- Wiring or cabling errors
- Errors in the application program
- Component errors
- Error in the measured value and signal transmitter
- Operation error

Personal safety must be guaranteed by primary equipment monitoring or measures. Don't just rely on the internal monitoring of the drive components. Monitoring or measures should be implemented based on the specific characteristics of the equipment, in line with a risk and error analysis. This includes the valid safety regulations for the equipment.

A DANGER

DANGEROUS MOVEMENTS

- Prevent entry to a danger zone, e.g. by means protective fencing, mesh guards, protective covers, or light barriers.
- Ensure the protective devices are properly dimensioned.
- Under no circumstances must the technical safety devices be removed.
- Do not make any modifications to a protective device that may put it out of operation.
- Protect existing work stations against unauthorized operation.
- Effectively restrict access to the control terminals to allow access only to authorized persons.
- Position EMERGENCY OFF switches so that they are easily accessible and can be reached guickly.
- Check the functionality of EMERGENCY OFF equipment before start-up and during maintenance periods.
- Prevent unintentional start-ups by disconnecting the drives from power supply using the EMERGENCY OFF circuit or using a safe start-up lock out.
- Before accessing the drives or entering the danger zone, safely bring the drives to a stop.
- While working on the system, power down the electrical equipment using the main switch and prevent it from being switched back on.
- Secure the system from being switched back on before working on it.
- Avoid operating high-frequency, remote control, and radio devices close to the system electronics and their feed lines.
- Prior to the initial start-up, check the system and the installation for possible malfunctions in all usage scenarios.
- If necessary, carry out a special EMC check of the system.

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

3 System overview

3.1 Features of the servo motors

The high dynamic brushless synchronous AC Servo Motors of the BSH series are permanently energized machines that are specially designed for high dynamic positioning tasks.

The low internal moment of inertia in comparison to other AC Servo Motors not only ensures excellent acceleration values in connection with high load capacity, it also lowers energy consumption and heat loss resulting in the motor.

The rotor position is determined using an integrated measuring system. The brushless principle described above makes the drives extremely robust and low-maintenance.

The motors have the following features:

- High operating reliability
- · Low-maintenance
- Overload protection using an integrated temperature sensor (external evaluation required)
- High power density
- High dynamic response
- High overload capability
- Large torque range
- Sinusoidal EMC
- High-voltage technology = low currents
- · Low mass moment of inertia
- Motor connections use round connector or terminal box
- Fast and simple commissioning thanks to the electronic type plate in the SinCos encoder

3.2 Designs

Motor feedback

- SinCos encoder single turn
- SinCos multiturn encoder

Brake

- No holding brake (standard)
- With holding brake (optional) for securing the axis in the deactivated motor

Output shaft

- Smooth shaft (standard)
- Shaft with round-ended feather key (optional)

Connection system

- Straight connectors
- Angled connectors
- Terminal box (only BSH-205 2, BSH-205 3)

Transport, storage, unpacking

4.1 **Transport**

- Avoid heavy shocks and/or vibrations during transport.
- Befor the installation, check the drive system for visible
- Damaged drive systems must neither be installed nor put into operation.

4.2 Storage

- Store devices in a clean, dry room.
- Make sure that the air temperature at the storage location is between - 25 °C and +70 °C.
- Make sure that the temperature variations at the storage location are a not more than maximum 30 K per hour.



For further information on the environmental conditions.

4.3 Unpacking

- Remove the packaging.
- Check that delivery is complete.
- Check the delivered goods for transport damage.

4.4 Type plate



Figure 4-1: Type plate on the BSH Motor

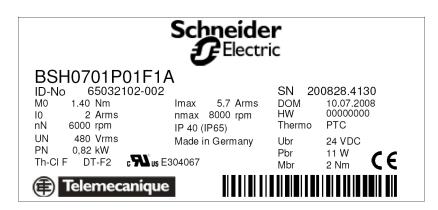


Figure 4-2: Type plate of a BSH Motor

Label	Meaning
BSH-055 3 P 3 1 F 2 A	Order designation
ID no.	Manufacturer-internal code
P _n	Rated power
U _{max}	Maximum rated level of supply voltage
I _{max}	Peak current
n _{max}	Maximum speed of rotation
M_0	Standstill torque
K _t	Torque constant
K _e	EMC Electromagnetic constant
SN	Serial Number
IP	Protection class
Th Cl.	Insulation material class of the motor
UBr	Rated brake voltage
PBr	Rated brake power
DOM	Date of manufacture
CE	CE mark
cURus (symbol)	UL label
Exxxxxx	UL approval number
Thermo	Design of the temperature sensor
VT	Variable torque
VPWM	Variable pulse width modulation (operation only
	on drive control device with variable pulse width
	modulation; no mains operation)

Table 4-1: Explanation of the type plate

5

Installation and maintenance

5.1 Initial start-up



Operate the BSH Motor only on a Servo Amplifier Lexium 05, Lexium 15 or Lexium 32.

How to check the shipment and the installation location:

Testing ▶

- Check that delivery is complete.
- Check device for sound condition.
 Only operate undamaged devices.
- Check data against type plates.

CAUTION

SYSTEM FAULTS OR FAILURES DUE TO ELECTROMAGNETIC FIELDS

 Use mains filters and motor filters in accordance with the combination of the servo amplifier/motor, cable length and mains or motor filter..

Failure to follow these instructions can result in equipment damage.

- Observe requirements for the installation location.
- Observe requirements for the protection class and the EMC rules.

How to check the brake (if any):

- Step 1: Make sure that the motor is off-circuit.
 - Try to turn the motor shaft manually.
 - ✓ When off-circuit, it should not be possible to turn the shaft, or at least you should feel a very high resistance.
 - ✓ If the shaft can be turned without "perceptible" resistance, the brake is defective.
- Step 2: ► Connect the control voltage to bleed the brake (pins A and B for P30 connector; pins + and for P70 connector).
 - Try to turn the motor shaft manually.
 - ✓ When the control voltage is connected, you should be able to turn the shaft.



Regrind the holding brake if a motor was stored for over 2 years before mounting.

How to regrind the holding brake:

A DANGER

HIGH VOLTAGE

Grind the holding brake only when the motor is removed.

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

- Move motor manually when the holding brake is closed by approx. 50 revolutions.
 - ✓ The holding brake is now ready for operation.
- Then install motor.

A DANGER

ELECTRIC SHOCK

- Do not operate the motor without a potential adjustment except on AC networks with a grounded neutral.
- Make sure that the voltage of the external motor supply lead is less than 300 $V_{\rm rms}$.

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

How to wire the motor:

- Connect devices, beginning with the ground conductor.
- Check if the terminals are securely fastened and the necessary cable cross sections are correct.

A DANGER

HIGH LEAKAGE CURRENT GREATER THAN 3.5 MA AC

 Make sure that the device is firmly connected to the power supply (in accordance with DIN EN 50178 - Equipment of High-Voltage Systems).

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

► Tighten the locking nut with a tightening torque of 2 Nm for the power connector P30 (1) (7 - 8 Nm for P70) and 2.5 Nm for the signal connector (3).



Figure 5-1: Electrical connections BSH Motor

1	Brake/temperature/motor connection
2	Additional ground connection
3	Encoder Connection

- ► Check that shielding is completely correct.
- ▶ Eliminate the possibility of short circuits and interruptions.
- ► Check the continuity of the protective conductor system.

How to connect the motor to the protective conductor:

Option 1: ►
(recommended configuration)

Connect the motor with the protective conductor system using the additional grounding connection on the motor flange (1).

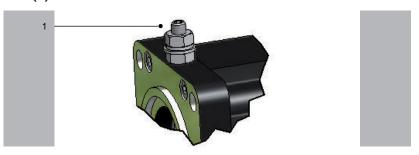


Figure 5-2: Ground connection on the motor

- Connection cross section of the grounding conductor appropriate for the mains connection-wiring has to be chosen for the connected upstream servo amplifier of the motor.
 (DIN EN 60204-1:2006, Section 5.2 Table 1).
- ▶ Use a grounding conductor with a minimum connection cross-section of 4 mm² (DIN EN 61800-5-1:2008, section 4.3.5.4).
- Option 2: ► Connect the motor to the grounded machine bed immediately above the motor flange.

► The size of the connection should be such that the ampacity is not impaired by mechanical, chemical or electromechanical factors.



According to DIN EN 60204-1:2006 Section 18.2, the correct grounding of the motor has to be checked respectively proven on the completely installed machine at the installation location at all times.

How to finish the initial start-up:

- Check safety functions such as the EMERGENCY OFF switch.
- Resume system operation according to the operating manual (from the packaging machine manufacturer and servo amplifier).

Configuration, programming, diagnosis



The motor is algined by the manufacturer. The customer need not perform any aligning.

CAUTION

TO LOW VELOCITY

TO SMALL ROTATION ANGLE

- Do not operate the motor for an extended period of time at a very low velocity, as this would increase wear and prevent the motor from reaching the specified service life..
- Do not operate the motor for an extended period of time with an angle of rotation of less than 100°, as this would increase wear and prevent the motor from reaching the specified service life...

Failure to follow these instructions can result in equipment damage.



The respective servo amplifier documentation tells you how to adjust a servo amplifier to a BSH Motor.



Error diagnosis and monitoring of operating statuses are executed within the controls. See also the relevant descriptions for these.

5.3 EMC Rules

To control and regulate the motors, the mains voltage is stored by rectification in the DC bus of the servo amplifier. This stored energy is supplied to the motor by targeted switching on and off using six semiconductor switches. The steep increase/decrease in voltage places considerable demands on the dielectric strength of the motor winding. An important additional aspect to observe is the electromagnetic compatibility (EMC) with other system components. The high rate of change of the clocked voltage generates harmonics of great intensity up into the high frequency range.

CAUTION

SYSTEM FAULTS OR FAILURES DUE TO ELECTROMAGNETIC FIELDS

- During installation, select the HF grounding option with the lowest ohm load (e.g. an uncoated mounting plate on the switching cabinet).
- Ensure largest possible contact surface area (skin effect).
- If necessary remove any existing paint to ensure contact.
- Lay the grounding in a star configuration from the Central-Earthing-Point.
- Current loops of earthing are prohibited and can cause unnecessary interference.
- Only use shielded cables.
- Supply large-area shielding bridges.
- Do not connect shields via the PIN contacts of connectors.
- Observe the circuit suggestions.
- Shorten the motor cables to a minimal length.
- Do not lay any cable loops in the switching cabinet.
- In conjunction with electronic controllers, do not switch inductive loads without suitable interference suppression.
- Provide for suitable interference suppression. For direct current operation, this is achieved by using recovery diodes and protector type-based, industry-standard quenching circuits during alternating current activity.
- Arrange the interference suppression immediately at the point of inductivity, as otherwise even more interference may be generated by the shock of the switching current on the interference suppression lines.
- Avoid sources of interference instead of eliminating the effects of existing interference.
- Do not arrange contacts with unsuppressed inductive loads in one room with the described components contained in this manual. The same applies for connection lines that do not lead suppressed, switched inductances and lines that run parallel to them.
- Isolate the controller from such interference sources using a Faraday cage (separately partitioned switching cabinet).
- Mains filters and motor filters may by used depending on the combination of the servo amplifier/motor and the cable length.

Failure to follow these instructions can result in equipment damage.

Maintenance, repair, cleaning

5.4.1

Cleaning



The standard cooling method of the motor is by natural convection. Therefore, keep the motor surfaces free from dirt.

How to remove dust and foreign objects from the motor:

- Switch motor voltage free.
- Remove motor.

CAUTION

LIQUIDS CAN SEEP IN DUE TO IMPROPER CLEANING

• Use cleaning processes appropriate to the protection class of the motor.

Failure to follow these instructions can result in equipment damage.

► Then blow out motor with dry pressurized air (max. 1 bar).

Device replacement

CAUTION

FAULTY REPLACEMENT OR OPENING OF THE MOTOR

- Do not open motor to put it into operation or replace it.
- In addition to the following instructions, you must observe the machine manufacturer's specifications when replacing the motor.

Failure to follow these instructions can result in equipment damage.

CAUTION

ELECTROSTATIC DISCHARGE

- Touch circuit boards only on edges.
- Do not touch any of the circuit points or components.
- Discharge any existing static charge by touching a grounded metallic surface such as a grounded housing.
- Prevent electrostatic charges; e.g., by wearing appropriate clothing.

Failure to follow these instructions can result in equipment damage.

A DANGER

ELECTRIC SHOCK, FIRE OR EXPLOSION CAUSED BY HIGH VOLTAGE

- Observe the general construction and safety regulations for working on high-current electrical systems.
- After installation, check the firm connection of the ground conductor to all electrical units to ensure that connection complies with the connection diagram.
- Always make sure that the ground conductor is connected when operating electrical components.
- Before working on electrical equipment with a voltage greater than 50 volts, the main switch has to be in the "OFF" position and secured, so it cannot be restarted.
- Disconnect devices with a voltage greater than 30 V rms or 42,2 V DC from the power supply before working on electrical parts.
- Wait at least 5 minutes after switching off before accessing the components.
- Before working on the equipment, discharge the DC bus and use a voltage meter to make sure that there is no voltage.
- Do not touch the electrical connection points of the components when the device is switched on.
- Make sure that the drives are at a standstill because potentially fatal voltage can occur on the motor lines in generator operation.
- Before enabling the device, safely cover the live components to prevent contact.
- Disconnect power connector cables only when the system is deactivated.
- Plug in power connector cables only when the system is deactivated.
- Provide for protection against indirect contact (DIN EN 50178, Section 5.3.2).
- If you are not using prefabricated Cable, check that the assignment of the new cables complies with the connection diagram of the machine manufacturer.

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

5.5.1 BSH

How to replace the motor:

- Take preliminary measures.
- Put main switch in "OFF" position to free system of voltage.
- Prevent main switch from being switched back on.

CAUTION

MECHANICAL FORCE TO THE ENCODER SYSTEM

- Prevent impacts on the motor shaft when removing and attaching couplings to the motor shaft, as this could damage the encoder.
- Use appropriate tools, such as an extractor.
- Avoid mechanical damage to the coating of the motor housing.
- Do not use any cleaning fluid, as this will damage the motor's aluminum housing.

Failure to follow these instructions can result in equipment damage.

WARNING

UNINTENTIONAL AXIS MOVEMENTS DUE TO LOSS OF REFERENCES IN CASE OF A MOTOR REPLACEMENT

 For servo axes with indirect distance measuring systems, restore the reference to the machine coordinate system via the motor encoder every time a motor is replaced.

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

- Replace the drive according to the machine manufacturer's specifications.
- ► Connect earth cable and tighten with a 2.8Nm torque.

CAUTION

INSUFFICIENT SHIELDING/GROUNDING

Operate the drive only with fixed cover and cable gland.

Failure to follow these instructions can result in equipment damage.

- Connect additional grounding.
- Execute the motor grounding for the second grounding connection as well.
- Make sure that the grounding resistance does not exceed 0.1 Ohm.

Cable replacement

A DANGER

ELECTRIC SHOCK, FIRE OR EXPLOSION CAUSED BY HIGH VOLTAGE

- Observe the general construction and safety regulations for working on high-current electrical systems.
- After installation, check the firm connection of the ground conductor to all electrical units to ensure that connection complies with the connection diagram.
- Always make sure that the ground conductor is connected when operating electrical components.
- Before working on electrical equipment with a voltage greater than 50 volts, the main switch has to be in the "OFF" position and secured, so it cannot be restarted.
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- Provide for protection against indirect contact (DIN EN 50178, Section 5.3.2).
- If you are not using prefabricated Cable, check that the assignment of the new cables complies with the connection diagram of the machine manufacturer.

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

Replacing cables

- Put main switch in "OFF" position to free system of voltage.
- Prevent main switch from being switched back on.
- Exchange the cable according to the machine manufacturer's specifications.

6

Technical data

6.1

Definition of technical data

Abbre- viation	Unit	Explanation				
Io	[A _{rms}]	Standstill current Standstill current Effective value of the motor current at standstill torque M0				
I _N	[A _{rms}]	Rated current Effective value of the motor current at rated torque M _N				
I _{max}	[A _{rms}]	reak current Ifective value of the motor current at peak torque M _{max}				
J _M	[kgcm ²]	Rotor moment of inertia The rotor inertia refers to a motor without brake.				
k _T	[Nm/A _{rms}]	Torque constant Quotient from standstill torque M ₀ and standstill current I ₀ (at 120 °C winding temperature)				
m	[kg]	Mass Motor mass without brake and without fan Motor mass without brake and without fan				
M ₀	[Nm]	Standstill torque; continuous torque (100% ED) at 5 min ⁻¹ At an ambient temperature of 40 °C and a winding temperature of 120 °C				
M _N	[Nm]	Rated torque, continuous torque (100% ED) at n_N Due to motor speed-dependent losses less than M_0 . At an ambient temperature of 40 °C and a winding temperature of 120 °C.				
M _{max}	[Nm]	Peak Torque The maximum torque that the servo motor can briefly deliver to the output shaft.				
n _N	[min-1]	Rated motor speed				
n _{max}	[min-1]	Mechanical limit velocity				
P _N	[kW]	Mechanical rated power (power delivered to the shaft) At the rated motor speed and load with the rated torque				
R _{U-V, 20}	[Ω]	Resistance of a motor winding Resistance between two phases at a winding temperature of 20 °C.				
L _{U-V}	[mH]	Winding inductance between two phases				
k _E	[V _{rms} /kmin ⁻¹]	Voltage constant; induced voltage between two phases at 1000 min ⁻¹				
V	[m/s ²]	Maximum vibration (all directions)				
Υ	[m/s ²]	Maximum shock (all directions)				
T_TK	[°C]	Response limit temperature sensor				
t _{th}	[min]	Thermal time constant				
р		Pole pair number				

Table 6-1: Physical sizes with units and explanations

Mounting arrangement and protection class

The drive protection class depends on the mounting arrangement. The mounting flange for all drive types is designed in such a way that the installation type is possible according to the types of construction IM B5 (mounting flange with through hole). By the DIN 42950 Part 1 (Edition 08.77) the drives can be mounted to the machine according to the following listing types.:

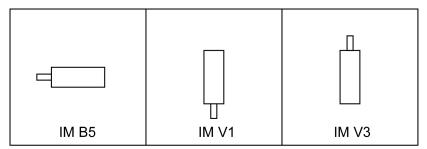


Figure 6-1: Drive installations

CAUTION

IMPERMISSIBLE MOUNTING POSITION AND PENETRATING LIQUIDS

• Liquids must be prevented from remaining on the motor shaft over an extended period of time when mounting the motor in the mounting position IM V3.

Failure to follow these instructions can result in equipment damage.



It also cannot be ruled out that liquids penetrate the motor housing along the motor shaft even if a shaft sealing ring has been installed.

Motor part	Protection class (according to EN 60529)	Mounting position (conforming to DIN 42 950)
Shaft	IP 54 IP 50 IP65 (with optional shaft sealing ring) / mounting position IM V3 shaft seal	IM B5, IM V1 IM V3 -
Surface/connections	IP65 (with optional shaft sealing ring) / mounting position IM V3 shaft seal	IM V3, IM V1, IM B5

Table 6-2: Protection class of BSH Motor

Motor shaft and bearings

Design of the shaft end

Smooth With a non-positive connection, torque transmission must be Shaft end achieved only by surface pressure. That ensures safe power (Standard) transmission without backlash.

Shaft end with round-ended feather key Shaft connections with feather keys are positive. The feather key according to DIN 6885 seating can deflect under continuous strain with changing torques and prolonged reverse operation, causing backlash. As a result, rotational quality is reduced due to backlash. Increasing deformation can lead to the feather key breaking and damage to the shaft. This type of shaft nub connection is only suitable for low requirements. Therefore, we recommend using smooth shaft ends.

Bearing

The B-side bearing is designed as a fixed bearing and the A-side bearing (shaft output) as a floating bearing.

Permissible shaft load

In case of technical correct use, the life of drives is limited by the bearing life. The customer may not replace the bearing, as the measuring systems integrated in the drive must then be reinitialized.

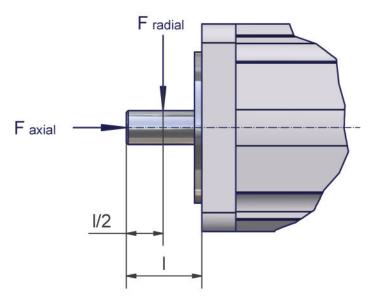


Figure 6-2: Definition of shaft load

			1	i I		İ	1	
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 6-3: Permissible radial force F_{radial} [N]

Basis for calculation:

The permissible axial force $F_{\text{radial}}[N]$ is calculated according to:

$$F_{axial} = 0.2 \times F_{radial}$$

- Nominal bearing life L_{10h} = 20,000 h for a shaft without feather key nut (for operating hours at a 10% failure probability)
- Ambient temperature = 40 °C (approx. 100 °C storage temperature)
- Peak torque = 10 % ED
- Nominal torque = 100 % ED

Holding brake (optional)



To hold the axes without play during standstill or when the system is deactivated, you can order the servo motors with a holding brake. The permanent magnetic brake is a continuous surface unit with which the force of the permanent magnetic field is used for generating the braking effect (system opens electromagnetically).

Operating principle of the holding brake The permanent magnetic field is compensated by an electromagnetic field for cancelling the braking effect. Safe release without detent torque that is independent of the mounting position is ensured by a steel spring. In addition to frictionless axial armature movement, it also offers the transmission of braking torque without backlash. The motors are provided with a varistor for reducing excess voltage when the brake is engaged.

DANGER

JAMMING/SHEARING OF BODY PARTS DUE TO DANGER-OUS MOVEMENT

- The holding brake alone does not ensure protection to per-
- To ensure persons are protected, higher-level constructive measures such as mesh guards or a second brake are nec-

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

CAUTION

PREMATURE WEAR DUE TO ENGAGING OF THE HOLDING BRAKE WHILE MACHINERY IS IN MOTION

- Use the holding brake only when the axis is at a standstill.
- Use the holding brake to brake an axis only in EMERGEN-CY STOP situations.
- The number of emergency stops is limited by the size of the external mass used.

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



The times mentioned in the following apply when switching in the direct current circuit, when the motor is warm, and at the rated voltage. The disconnection time is the period from the activation of the current to the dying out of the torque to 10% the rated torque of the brake. The coupling time counts as the period from when the current is switched off to the attainment of the rated torque.

The holding brake is designed differently for each series:

Technical data of the holding brake of the BSH-055

Parameters	BSH-055 1 xxx Fx	BSH-055 2 xxx Fx	BSH-055 3 xxx Fx	Unit
Static holding torque at 120 °C	0.8	0.8	0.8	[Nm]
Coupling time	6	6	6	[ms]
Disconnection time	12	12	12	[ms]
Mass Motor mass without brake and without fan	0.08	0.08	0.08	[kg]
Moment of inertia	0.0213	0.0213	0.0213	[kgcm2]
Rated output	10	10	10	[W]
Rated voltage	24 +6/-10%	24 +6/-10%	24 +6/-10%	[VDC]

Table 6-4: Technical data of the holding brake of the BSH-055

Technical data of the holding brake of the BSH-070

Parameters	BSH-070 1 xxx Fx	BSH-070 2 xxx Fx	BSH-070 3 xxx Fx	Unit
Static holding torque at 120 °C	2.0	2.0	3.0	[Nm]
Coupling time	8	8	15	[ms]
Disconnection time	25	25	35	[ms]
Mass Motor mass without brake and without fan	0.22	0.22	0.32	[kg]
Moment of inertia	0.072	0.072	0.227	[kgcm2]
Rated output	11	11	12	[W]
Rated voltage	24 +6/-10%	24 +6/-10%	24 +6/-10%	[VDC]

Table 6-5: Technical data of the holding brake of the BSH-070

Technical data of the holding brake of the BSH-100

Parameters	BSH-100 1 xxx Fx	BSH-100 2 xxx Fx	BSH-100 3 xxx Fx	BSH-100 4 xxx Fx	Unit
Static holding torque at 120 °C	9.0	9.0	9.0	12.0	[Nm]
Coupling time	20	20	20	20	[ms]
Disconnection time	40	40	40	45	[ms]
Mass Motor mass without brake and without fan	0.45	0.45	0.45	0.69	[kg]
Moment of inertia	0.618	0.618	0.618	1.025	[kgcm2]
Rated output	18	18	18	17	[W]
Rated voltage	24 +6/-10%	24 +6/-10%	24 +6/-10%	24 +6/-10%	[VDC]

Table 6-6: Technical data of the holding brake of the BSH-100

Technical data of the holding brake of the BSH-140

Parameters	BSH-140 1 xxx Fx	BSH-140 2 xxx Fx	BSH-140 3 xxx Fx	BSH-140 4 xxx Fx	Unit
Static holding torque at 120 °C	23.0	23.0	36.0	36.0	[Nm]
Coupling time	40	40	45	45	[ms]
Disconnection time	50	50	100	100	[ms]
Mass Motor mass without brake and without fan	1.1	1.1	1.79	1.79	[kg]
Moment of inertia	1.8	1.8	5.5	5.5	[kgcm2]
Rated output	24	24	26	26	[W]
Rated voltage	24 +6/-10%	24 +6/-10%	24 +6/-10%	24 +6/-10%	[VDC]

Table 6-7: Technical data of the holding brake of the BSH-140

Technical data of the holding brake of the BSH-205

Parameters	BSH-205 1 xxx Fx	BSH-205 2 xxx Fx	BSH-205 3 xxx Fx	Unit
Static holding torque at 120 °C	80.0	80.0	80.0	[Nm]
Coupling time	50	50	50	[ms]
Disconnection time	200	200	200	[ms]
Mass Motor mass without brake and without fan	3.6	3.6	3.6	[kg]
Moment of inertia	16	16	16	[kgcm2]
Rated output	40	40	40	[W]
Rated voltage	24 +6/-10%	24 +6/-10%	24 +6/-10%	[VDC]

Table 6-8: Technical data of the holding brake of the BSH-205

6.5

Ambient conditions

Procedure	Parameters	Value	Basis
Operation	Class 3K3		IEC/EN 60721-3-3
	Ambient temperature	+5°C+40°C	
	(from 0 to 1000 m above sea level)	(At higher temperatures	
		rated current reduction	
		by 1% per °C)	
	Humidity	Class F (conforming to	
		DIN 40040)	
	Condensation	no	
	Icing	no	
	Another water	no	
	Class 3M6		
	Oscillations	20 m/s ² (all directions in	
		space)	
	Shock	250 m/s ²	
Transport	Class 2K3		IEC/EN 60721-3-2
	Ambient temperature	-25°C+70°C	
	Relative humidity	5% 95%	
	Condensation	no	
	Icing	no	
	Another water	no	
Long time storage in	Class 1K4	<u> </u>	IEC/EN 60721-3-1
Transport	Ambient temperature	-25°C+55°C	
packaging	Relative humidity	10% 100%	
	Condensation	no	
	Icing	no	
	Another water	no	

Table 6-9: Ambient conditions BSH Servo motor

6.5.1

Power reduction depending on ambient temperature



If you operate the motors outside the specified rated data, the motors may be damaged. The following section describes the ambient temperature.



When operating the motor. make sure that power loss (heat) from the motor is diverted sufficiently. If the structure is thermally isolated or convection cooling is insufficient, reduce the motor power accordingly.

Increased The specified ambient temperature for the motor is 40 °C. At an *ambient* increased ambient temperature up to a maximum of 55 °C, the *temperature* rated current drops by 1% per °C.

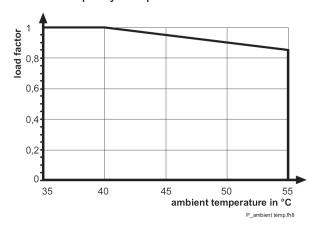


Figure 6-3: Power reduction at increased ambient temperature

In the limit range of 40 °C to 55 °C, the performance data is multiplied by the determined load factor for the ambient temperature.

6.5.2

Power reduction depending on geographic altitude of installation



If you operate the motors outside the specified rated data, the motors may be damaged. The following section describes the geographic installation altitude factors.

Low In environments lower than 1000 meters above sea level, no Air pressure rated value power losses with the motors are expected based on the different air pressure ratio. At altitudes greater than 1000 meters above sea level and less than 3000 meters above sea level, available performance drops as shown in the diagram below.

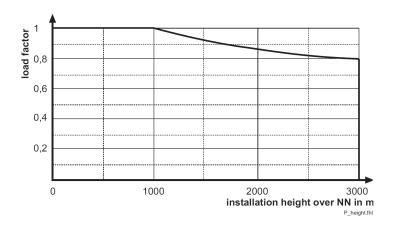


Figure 6-4: Power reduction when the installation altitude is exceeded

In the limit range of 1000 m to 3000 m, the performance data is multiplied by the load factor determined for the installation altitude.



You must multiply both load factors by the power values when reducing the power that resulted from both causes.

6.6 Data tables

6.6.1 General technical features

Designation	Description
Motor type	Permanent magnet energized three-phase synchronous servomotor
Magnet material	Neodymium iron boron (NdFeB)
Isolation class (according to DIN VDE 0530)	Heat class F (155 °C)
Lubricant (according to FDA standard for servo motors)	Klübersynth UH1 64-62 food safe gearbox grease
Cooling	Self-Cooling
Motor coating, approval	Powder coating, acrylic resin-based
	Motor coating RAL 9005
Temperature monitoring	Three-core PTC thermistor in the stator winding, switching temperature 130 °C
Shaft end	Cylindrical shaft end according to DIN 748 with/without round-ended feather key
Rotational accuracy, concentricity,	Tolerance N (normal)
Axial runout (according to DIN 42 955)	
Balancing quality (according to DIN ISO 1940)	G 2.5
Installed measuring system	SinCos® SKS 36, SKM 36 with Hiperface® interface
Connection system	Round connector
	- straight (IP67)
	- angular, pivoted (IP67)
	- terminal box

6.6.2 BSH-055

Parameters	Abbreviation	BSF	I-055 1	I	3SH-05	5 2		BSH-055 3		
Winding variant		Р	Т	M	Р	Т	М	Р	Т	
General data			•			•				
Standstill torque	M ₀ [Nm]	0.5			0.8			1.2		
Peak Torque	M _{max} [Nm]	1.5		2.5			3.5	3.5		
Mains voltage U _N = 115 V										
Rated motor speed	n _N [min ⁻¹]	2000	4000	1000	2000	4000	1000	2000	4000	
Rated torque	M _N [Nm]	0.50	0.50	0.77	0.77	0.75	1.14	1.13	1.10	
Rated power	P _N [kW]	0.10	0.21	0.08	0.16	0.31	0.12	0.24	0.46	
Mains voltage U _N = 230 V										
Rated motor speed	n _N [min ⁻¹]	4000	8000	2000	4000	8000	2000	4000	8000	
Rated torque	M _N [Nm]	0.50	0.48	0.77	0.75	0.72	1.13	1.10	1.05	
Rated power	P _N [kW]	0.21	0.40	0.16	0.31	0.60	0.24	0.46	0.88	
Mains voltage U _N = 400 V										
Rated motor speed	n _N [min ⁻¹]	8000	-	4000	8000	-	4000	8000	-	
Rated torque	M _N [Nm]	0.48	-	0.75	0.72	-	1.10	1.05	-	
Rated power	P _N [kW]	0.40	-	0.31	0.60	-	0.46	0.88	-	
Electrical data										
Pole pair number	р	3		3			3			
Torque constant (120 °C)	k _T [Nm/A _{rms}]	0.68	0.36	1.33	0.70	0.36	1.33	0.70	0.39	
Resistance of a motor winding Phase-Phase (20°C)	R _{U-V} [Ohm]	41.8	12.2	60.2	17.4	5.2	38.4	10.4	3.1	
Winding inductivity Phase-Phase	L _{U-V} [mH]	71.5	20.8	122.0	35.3	10.6	92.2	25.0	7.4	
Counter electromotive force Phase-Phase (20°C)	k _E [V _{rms} /kmin ⁻¹]	40	22	74	40	22	79	41	22	
Standstill current	I ₀ [A _{rms}]	0.73	1.40	0.60	1.20	2.20	0.90	1.70	3.10	
Rated current	I _N [A _{rms}]	0.62	1.10	0.60	1.10	2.00	0.70	1.35	2.50	
Peak current	I _{max} [A _{rms}]	2.9	5.4	2.6	4.8	8.8	3.4	6.5	11.9	
Mechanical data				-	-					
Mechanical limit velocity	n _{max} [min ⁻¹]	9000		9000			9000			
Moment of inertia of the rotor	J _M [kgcm ²]	0.059		0.096			0.134			
Mass (without brake)	m [kg]	1.2	+				1.8			
Thermal data		<u> </u>		'			-			
Thermal time constant	t _{th} [min]	21		26			33			
Response limit of thermal contact (PTC)	ct T _{TK} [°C]	130			130		130			
Isolation class		F		F			F			
			CE		CE		CE			

Table 6-10: Technical data of BSH-055

6.6.3 BSH-070

Parameters	Abbreviation	В	SH-070) 1	В	SH-070	2	BSH-070 3			
Winding variant		М	Р	Т	М	Р	Т	М	Р	Т	
General data									•		
Standstill torque	M ₀ [Nm]	1.4	1.4 2.2			2.2			3.1		
Peak Torque	M _{max} [Nm]	3.5			7.6			11.3			
Mains voltage U _N = 115 V											
Rated motor 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 = 230 V											
Rated motor speed	n _N [min ⁻¹]	1500	3000	6000	1500	3000	6000	1500	3000	6000	
Rated torque	M _N [Nm]	1.40	1.40	1.30	2.15	2.10	1.90	2.95	2.80	2.30	
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 = 400 V											
Rated motor speed	n _N [min ⁻¹]	3000	6000	-	3000	6000	-	3000	6000	-	
Rated torque	M _N [Nm]	1.40	1.30	-	2.10	1.90	-	2.80	2.30	-	
Rated power	P _N [kW]	0.44	0.82	-	0.66	1.19	-	0.88	1.45	-	
Electrical data		-	-	-	!		-	!	-	-	
Pole pair number	р	3			3			3			
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	
Resistance of a motor winding Phase-Phase (20°C)	R _{U-V} [Ohm]	35.40	10.40	3.30	16.40	4.20	1.50	10.20	2.70	0.91	
Winding inductivity Phase-Phase	L _{U-V} [mH]	131.9	38.8	12.3	74.1	19.0	6.7	49.2	13.0	4.4	
Counter electromotive force Phase-Phase (20°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	
Peak current	I _{max} [A _{rms}]	3.1	5.7	10.1	6.0	11.8	19.9	8.7	17.0	29.2	
Mechanical data											
Mechanical limit velocity	n _{max} [min ⁻¹]	8000			8000			8000			
Moment of inertia of the rotor	J _M [kgcm²]	0.25	0.25		0.41			0.58			
Mass (without brake)	m [kg]	2.1			2.8			3.6			
Thermal data											
Thermal time constant	t _{th} [min]	35			38			51			
Response limit of thermal contact (PTC)	T _{TK} [°C]	130	130		130			130			
Isolation class		F			F			F			
Approvals		CE			CE			CE			

Table 6-11: Technical data of BSH-070

6.6.4 BSH-100

Parameters	Abbrevia- tion	В	SH-100	0 1	В	SH-100) 2	BSH-100 3			BSH-100 4		
Winding variant		М	Р	Т	М	Р	Т	М	Р	Т	М	Р	Т
General data													
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 = 115 V													
Rated motor speed	n _N [min ⁻¹]	625	1250	2500	500	1000	2000	500	1000	2000	375	750	1500
Rated torque	M _N [Nm]	3.2	3.15	3.0	5.7	5.5	5.2	7.8	7.5	7.0	10.0	9.9	9.5
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 = 230 V													
Rated motor 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 = 400 V													
Rated motor 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	-
Electrical data													
Pole pair number	р	4			4			4			4		
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
Resistance of a motor winding Phase-Phase (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 inductivity Phase-Phase	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
Counter electromotive force Phase-Phase (20°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
Peak 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
Mechanical data													
Mechanical limit velocity	n _{max} [min ⁻¹]	6000			6000			6000			6000		•
Moment of inertia of the rotor	J _M [kgcm²]	1.40			2.31			3.22			4.22		
Mass (without brake)	m [kg]	4.3			5.8			7.5		,	9.2		
Thermal data			•	,	,		,		,			,	
Thermal time constant	t _{th} [min]	44			48			56			58		
Response limit of thermal contact (PTC)	T _{TK} [°C]	130			130			130			130		
Isolation class		F			F			F			F		
Approvals	of BCU 100	CE			CE			CE			CE		

Table 6-12: Technical data of BSH-100

6.6.5 BSH-140

Parameters	Abbreviation	В	SH-140) 1	BSH-140 2			BSH-	140 3	BSH-140 4	
Winding variant		М	Р	Т	М	Р	Т	М	Р	М	Р
General data											
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 = 115 V											
Rated motor speed	n _N [min ⁻¹]	375	750	1500	375	750	1500	375	750	375	750
Rated torque	M _N [Nm]	11.0	10.95	10.60	19.10	18.60	17.10	26.30	24.70	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 = 230 V											
Rated motor speed	n _N [min ⁻¹]	750	1500	3000	750	1500	3000	750	1500	750	1500
Rated torque	M _N [Nm]	10.95	10.60	9.20	18.60	17.10	12.30	24.70	21.20	30.20	26.30
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 = 400 V											
Rated motor 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
Electrical data					ı		i	i			1
Pole pair number	р	5			5			5		5	
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
Resistance of a motor winding Phase-Phase (20°C)	R _{U-V} [Ohm]	5.30	1.41	0.44	2.32	0.60	0.21	1.52	0.40	1.12	0.28
Winding inductivity Phase-Phase	L _{U-V} [mH]	58.10	15.60	4.90	28.60	7.40	2.54	19.40	5.10	15.60	3.90
Counter electromotive force Phase-Phase (20°C)	k _E [V _{rms} / kmin ⁻¹]	193	100	56	199	101	59	205	105	208	104
Standstill current	I ₀ [A _{rms}]	4.00	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
Peak 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
Mechanical data											
Mechanical limit velocity	n _{max} [min ⁻¹]	4000			4000			4000		4000	
Moment of inertia of the rotor	J _M [kgcm ²]	7.41			12.68			17.94		23.70	
Mass (without brake)	m [kg]	11.9		16.6			21.3		26.0		
Thermal data									•		
Thermal time constant	t _{th} [min]	64			74			79		83	
Response limit of thermal contact (PTC)	T _{TK} [°C]	130			130			130		130	
Isolation class		F			F			F		F	
Approvals		CE			CE			CE		CE	

Table 6-13: Technical data of BSH-140

6.6.6 BSH-205

Parameters	Abbreviation	BS	H-205 1	BS	H-205 2	BS	H-205 3	
Winding variant		М	Р	М	Р	М	Р	
General data			'		'			
Standstill torque	M ₀ [Nm]	36.9		64.9	64.9			
Peak Torque	M _{max} [Nm]	110		220		330		
Mains voltage U _N = 115 V								
Rated motor speed	n _N [min ⁻¹]	375	750	250	500	250	500	
Rated torque	M _N [Nm]	34.4	31.9	63.5	61.6	89.9	84.9	
Rated power	P _N [kW]	1.35	2.51	1.66	3.23	2.35	4.45	
Mains voltage U _N = 230 V								
Rated motor speed	n _N [min ⁻¹]	750	1500	500	1000	500	1000	
Rated torque	M _N [Nm]	31.9	27.0	61.6	56	84.9	74.4	
Rated power	P _N [kW]	2.51	4.24	3.23	5.86	4.45	7.79	
Mains voltage U _N = 400 V								
Rated motor speed	n _N [min ⁻¹]	1500	3000	1000	2000	1000	2000	
Rated torque	M _N [Nm]	27.0	17.5	56.0	38.1	74.4	50.7	
Rated power	P _N [kW]	4.24	5.5	5.86	7.98	7.79	10.62	
Electrical data								
Pole pair number	р	5		5		5		
Torque constant (120 °C)	k _T [Nm/A _{rms}]	3.38	1.75	4.93	2.52	5.69	2.84	
Resistance of a motor winding Phase-Phase (20°C)	R _{U-V} [Ohm]	1.2	0.3	1.1	0.3	0.8	0.2	
Winding inductivity Phase-Phase	L _{U-V} [mH]	21.4	5.8	21.8	5.7	16.0	4.0	
Counter electromotive force Phase-Phase (20°C)	k _E [V _{rms} /kmin ⁻¹]	225	116	316	162	344	172	
Standstill current	I ₀ [A _{rms}]	10.9	21.0	13.2	25.7	16.6	33.2	
Rated current	I _N [A _{rms}]	9.2	11.5	11.5	17.8	15.0	20.4	
Peak current	I _{max} [A _{rms}]	45.2	87.2	49.6	96.8	68.0	136.1	
Mechanical data								
Mechanical limit velocity	n _{max} [min ⁻¹]	3800		3800		3800		
Moment of inertia of the rotor	J _M [kgcm²]	71.4		129.0		190.0		
Mass (without brake)	m [kg]	35		50		67		
Thermal data					,			
Thermal time constant	t _{th} [min]	73		88		101		
Response limit of thermal contact (PTC)	T _{TK} [°C]	130	130		130		130	
Isolation class	F	F		F		F		
Approvals	CE	CE		CE		CE		

Table 6-14: Technical data of BSH-205

6.6.7 Encoder

SinCos® (SKS36) single turn

Parameters	Value	Unit
Resolution	Dependent on the controller	
Number of sine/cosine periods	128	Per revolution
Absolute measuring range	1	Revolutions
Error limits of the digital absolute value	+/-5.3	Angular minutes
Error limits when evaluating the 128 signals (integral non-linearity)	+/-1.3	Angular minutes
Signal form	Sine	
Supply voltage	7 12	Volts
Recommended supply voltage	8	Volts
Supply current	Max. 60 (without load)	Milliamperes

Table 6-15: Technical data of the SinCos encoder (SKS-36)

SinCos® (SKM36) multiturn

Parameters	Value	Unit
Resolution	Dependent on the controller	
Number of sine/cosine periods	128	Per revolution
Absolute measuring range	4096	Revolutions
Error limits of the digital absolute value	+/-5.3	Angular minutes
Error limits when evaluating the 128 signals (integral non-linearity)	+/-1.3	Angular minutes
Signal form	Sine	
Supply voltage	7 12	Volts
Recommended supply voltage	8	Volts
Supply current	Max. 60 (without load)	Milliamperes

Table 6-16: Technical data of the SinCos® encoder (SKM-36)

6.7

Electrical connections

6.7.1

Motor and brake cable

Connection power P30 (size 1)



Pin	Designation	Meaning	Range		
1	U	Output	3 AC 0 - 480 V		
2	PE	Shielding	-		
3	W	Output	3 AC 0 - 480 V		
4	V	Output	3 AC 0 - 480 V		
Α	Brake +	Brake	DC 24 V		
В	Brake -	Brake	DC 0 V		
С	-	Not used	-		
D	-	Not used	-		

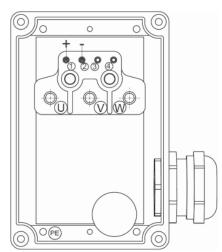
Table 6-17: Connection for power and brake (BSH-055 ... BSH-140)

Connection power P70 (size 1.5)



Pin	Designation	Meaning	Range
U	U	Output	3 AC 0 - 480 V
PE	PE	Shielding	-
W	W	Output	3 AC 0 - 480 V
٧	V	Output	3 AC 0 - 480 V
+	Brake +	Brake	DC 24 V
-	Brake -	Brake	DC 0 V

Table 6-18: Connection for power and brake (BSH-140 2T, BSH-140 4P, BSH-205)



Pin	Designation	Meaning	Range
U	U	Output	3 AC 0 - 480 V
PE	PE	Shielding	-
W	W	Output	3 AC 0 - 480 V
V	V	Output	3 AC 0 - 480 V
1	Brake +	Brake	DC 24 V
2	Brake -	Brake	DC 0 V
3	-	Not used	-
4	-	Not used	-

Table 6-19: Connection for power and brake (BSH-205 2 / 205 3)

6.7.2

Temperature and encoder connection



Pin	Designation	Meaning	Range
1	PTC sensor	Temperature	-
2	PTC sensor	Temperature	-
3	-	Not used	-
4	REF SIN	Reference Signal Sinus	-
5	REF COS	Reference Signal Cosinus	-
6	RS 485 +	Parameter channel +	-
7	RS 485 -	Parameter channel -	-
8	SIN +	Sinus trace	-
9	COS +	Cosine track	-
10	U	Supply voltage	DC 712 V
11	GND	Supply voltage	DC 0 V
12	-	Not used	-

Table 6-20: Connection for encoder and temperature

6.8 Dimensions

6.8.1 BSH-055

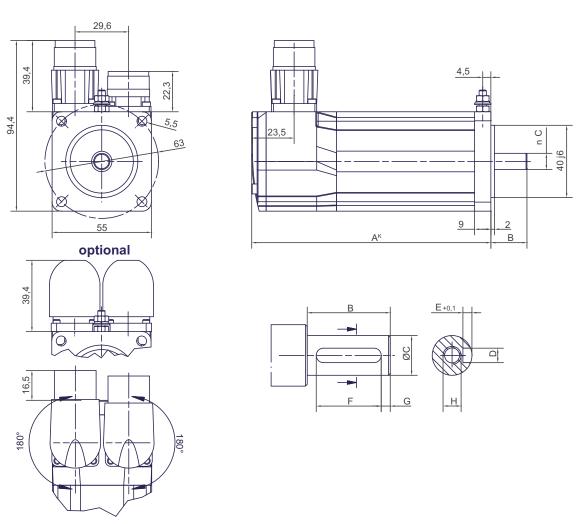


Figure 6-5: Dimension diagram for BSH-055

Dimensions	BSH-055 1	BSH-055 2	BSH-055 3
A (with brake)	132.5 (159)	154.5 (181)	176.5 (203)
В	20	20	20
С	9 k6	9 k6	9 k6
D	3 N9	3 N9	3 N9
E	1.8	1.8	1.8
F	12	12	12
G	4	4	4
Н	DIN 332-D M3	DIN 332-D M3	DIN 332-D M3
Feather key (N9)	DIN 6885-A3x3x12	DIN 6885-A3x3x12	DIN 6885-A3x3x12

Table 6-21: Dimensions of BSH-055 (dimension specifications in mm)

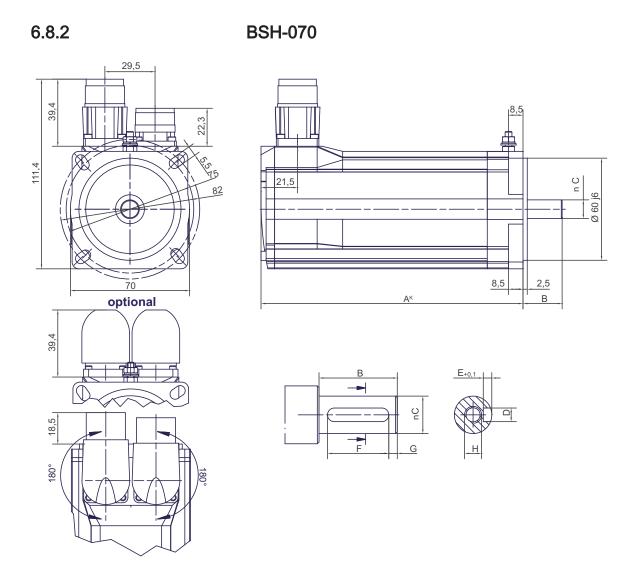


Figure 6-6: Dimension diagram for BSH-070

Dimensions	BSH-070 1	BSH-070 2	BSH-070 3
A (with brake)	154 (179.5)	187 (212.5)	220 (254)
В	23	23	30
С	11 k6	11 k6	14 k6
D	4 N9	4 N9	5 N9
E	2.5	2.5	3
F	18	18	20
G	2.5	2.5	5
Н	DIN 332-D M4	DIN 332-D M4	DIN 332-D M5
Feather key (N9)	DIN 6885-A4x4x18	DIN 6885-A4x4x18	DIN 6885-A5x5x20

Table 6-22: Dimensions of BSH-070 (dimension specifications in mm)



BSH-100

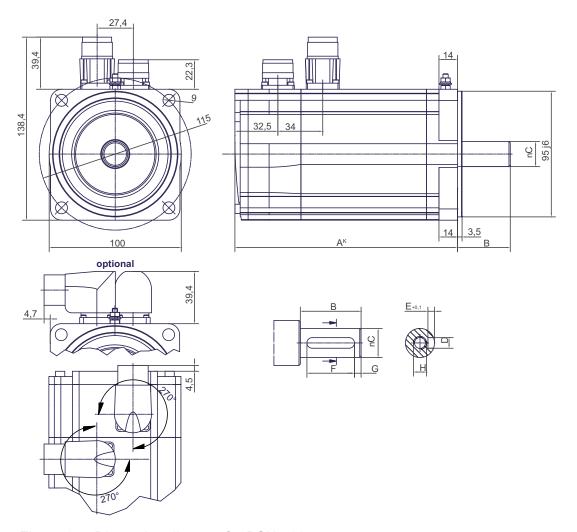


Figure 6-7: Dimension diagram for BSH-100

Dimensions	BSH-100 1	BSH-100 2	BSH-100 3	BSH-100 4
A (with brake)	168.5 (199.5)	204.5 (235.5)	240.5 (271.5)	276.5 (307.5)
В	40	40	40	50
С	19 k6	19 k6	19 k6	24 k6
D	6 N9 mm	6 N9	6 N9	8 N9
E	3.5	3.5	3.5	4
F	30	30	30	40
G	5	5	5	5
Н	DIN 332-D M6	DIN 332-D M6	DIN 332-D M6	DIN 332-D M8
Feather key (N9)	DIN 6885-A6x6x30	DIN 6885-A6x6x30	DIN 6885-A6x6x30	DIN 6885-A8x7x40

Table 6-23: Dimensions of BSH-100 (dimension specifications in mm)

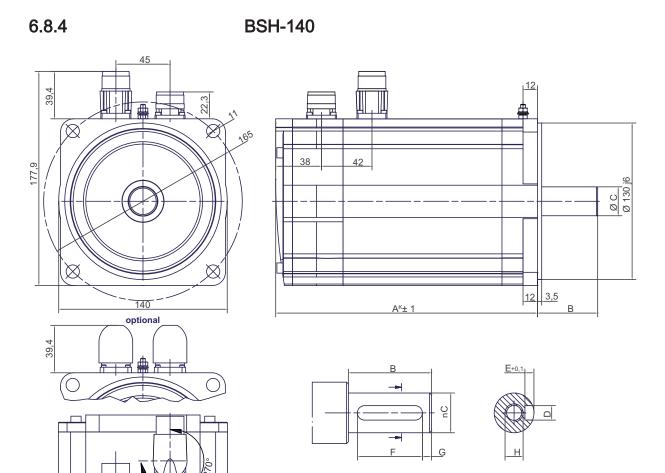


Figure 6-8: Dimensional drawing for BSH-140 1 (M, P, T); BSH-140 2 (M, P); BSH-140 3 (M, P); BSH-140 4 (M)

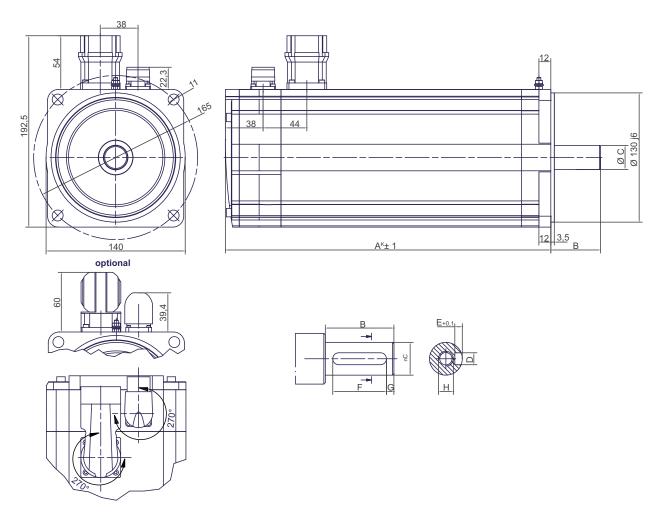


Figure 6-9: Dimensional drawing for BSH-140 2 (T); BSH-140 4 (P)

Dimensions	BSH-140 1	BSH-140 2	BSH-140 3	BSH-140 4
A (with brake)	217.5 (255.5)	272.5 (310.5)	327.5 (365.5)	382.5 (420.5)
В	50	50	50	50
С	24 k6	24 k6	24 k6	24 k6
D	8 N9	8 N9	8 N9	8 N9
E	4	4	4	4
F	40	40	40	40
G	5	5	5	5
Н	DIN 332-D M8	DIN 332-D M8	DIN 332-D M8	DIN 332-D M8
Feather key (N9)	DIN 6885-A8x7x40	DIN 6885-A8x7x40	DIN 6885-A8x7x40	DIN 6885-A8x7x40

Table 6-24: Dimensions of BSH-140 (dimension specifications in mm)

6.8.5 BSH-205

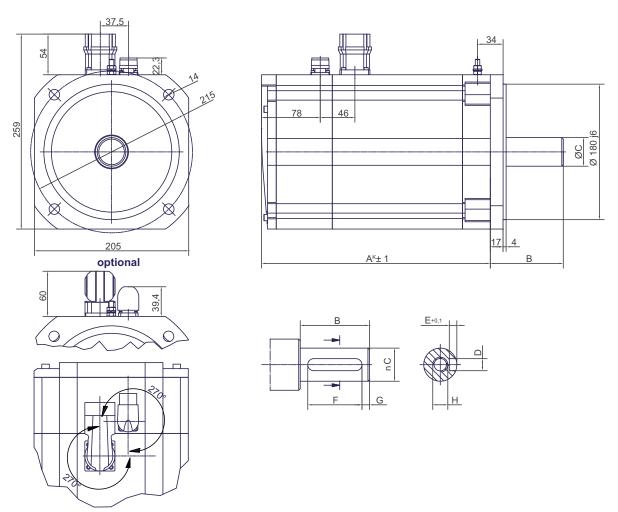
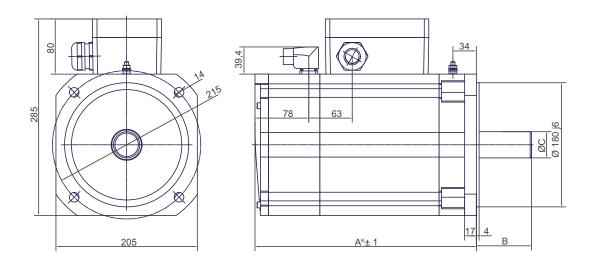


Figure 6-10: Dimensional drawing for BSH-205 1, BSH-205 2, BSH-205 3 with connector variant



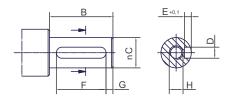


Figure 6-11: Dimensional drawing for BSH-205 2, 205 3 with optional terminal box

Dimensions	BSH-205 1	BSH-205 2	BSH-205 3
A (with brake)	321 (370.5)	405 (454.5)	489 (538.5)
В	80	80	80
С	38 k6	38 k6	38 k6
D	10 N9	10 N9	10 N9
E	5	5	5
F	70	70	70
G	5	5	5
Н	DIN 332-D M12	DIN 332-D M12	DIN 332-D M12
Feather key (N9)	DIN 6885-A10x8x70	DIN 6885-A10x8x70	DIN 6885-A10x8x70

Table 6-25: Dimensions of the BSH-205 (dimension specifications in mm)

7 Appendix

7.1 Conformity declaration

No. DTN XXX/08.05
Manufacturer DriveTech GmbH

Address Dillberg 16

97828 Marktheidenfeld

Designation AC servomotor

Typ(es): BSH - 055 / 070 / 100 / 140 / 205

Directives We hereby declare that the products specified here comply with the re-

quirements of the aforementioned EC Directive in concept, design and in the versions released on the market. Any modification of the product without

our consent renders this declaration invalid.

Low voltage directive (73/23/EC)

Applicable harmonized standards Adjustable speed electrical power drive systems–part 5-1: Requirements for

electrical, thermal and functional safety

(IEC 61800-5-1:2003-02);

German edition EN 61800-5-1:2003

Rotating electrical machines - Part 1: Measurement and operating behav-

ior

(IEC 60034-1:2004);

German edition EN 60034-1:2004

Applicable national standards and techni- UL 1004

cal specifications, in particular: Project documentation

Year Marktheidenfeld, Germany, August 12, 2005

Frank Heinrich, Managing Director

Frank Veinin

7.2 Modifications

06/2005

Revisions

04/2006

Technical data revised

04/2007

- Technical data revised
- Type plates changed
- Various corrective actions

12/2008

- Restructuring of documentation
- Safety instructions revised
- Front page revised
- Revising the Dimensional drawings
- Layout revised
- · Chapter "Initial installation" revised

7.3 Accessories and spare parts



An overview of accessories for BSH Motors can be found in the "Lexium 05 AC servo amplifier product manual", chapter "Accessories and spare parts".



You can also find further information on the options in the catalog at www.schneider-electric.com (Products and Services, Automation & Control, Motion & Drives, Lexium05, Download, Catalog: Motion Control Catalogue V1.0).

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