

# Operating manual

## EZ, EZF, EZH, EZHD, EZHP synchronous servo motors / EZS, EZM synchronous servo motors for screw drive



STÖBER ANTRIEBSTECHNIK GmbH & Co. KG  
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These operating instructions contain information about the transport, installation and commissioning of STÖBER EZ, EZF, EZH, EZHD, EZHP synchronous servo motors and EZS, EZM synchronous servo motors for screw drive.

For further details, see catalogs SMS-EZ (ID 442212) and EZS/EZM synchronous servo motors for screw drive (ID 442416).

In the event of any unclear points, we recommend that you contact STÖBER with the model designation and serial number, or have the installation and maintenance work carried out by a STÖBER service partner.

### 1 Operation in accordance with its intended use

Synchronous servo motors must be used exclusively for operating machines and systems together with servo inverters.

Stay within the limits defined by the technical data.

Do not use synchronous servo motors in potentially explosive atmospheres.

For reasons of operational safety, motors may only be used for the single application for which they were projected.

Any overload on the drives is considered unintended use.

The information and instructions in these operating instructions must be precisely followed to ensure that claims submitted under the warranty will be honored. If modifications are made to motors, warranty claims will be rendered void.

Comply with the safety instructions in these operating instructions and in all supplementary documents for the synchronous servo motor and other components such as gear units and servo inverters.



### 2 Technical data

The technical data for synchronous servo motors, geared motors and servo inverters that are used is indicated on the relevant nameplates.

Designs:	IMB5, IMV1, IMV3 (DIN EN 60034-7)
Protection class:	EZ, EZF, EZHD: IP56 EZHP: IP56 / IP66 (option) EZH: IP54 EZS, EZM: IP40 (DIN EN 60529)
Protection class:	I
Thermal class:	155 (F) (DIN EN 60034 / VDE 0530) 155 °C, heating $\Delta T = 100$ K
Surrounding temperature:	-15 °C to +40 °C (with water cooling +5 °C to +40 °C)
Installation altitude:	up to 1000 meters above sea level
Cooling:	For IC 410 convection cooling; or optional IC 416 convection cooling with forced ventilation (DIN EN 60034-6), see 2.4.1; or optionally for water cooling in the A-side motor flange, see 2.4.2
Surface:	Black matte as per RAL 9005 Please note! Repainting will change the thermal properties and therefore the performance limits of synchronous servo motors.
Vibration intensity:	as per DIN EN 60034-14 degree N (half wedge balancing for shafts with key).
Winding:	Connection wires: U (U1) - black, V (V1) - blue, W (W1) - red.
Connection method:	see motor connection diagrams

#### Acceleration / shock load in operation:

The following value for the shock load indicates the value up to which the motor can be operated without loss of functionality: 50 m/s<sup>2</sup> (5 g), 6 ms (maximum value as per DIN EN 60068-2-27).

Brace the motor connection cable close to the motor so that vibrations of the cable are not transferred to the motor.

When connecting the motors to drive units such as gear units or pumps, take into consideration the permissible shock loads and tilting torques of the units.



#### Information

If brakes are installed, the holding torques may be reduced by the shock load!

#### NOTICE

#### Damage to the motor.

- ▶ Prevent undue force on the motor such as impact, shock, pressure or high acceleration.

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### 2.1 Thermal winding protection

Synchronous servo motors are equipped with a thermistor (PTC thermistor) in the standard configuration. You can optionally select the KTY 84-130 as thermal winding protection.

Make note of the information specified in the SMS-EZ catalog and in the commissioning instructions for the servo inverter.

#### CAUTION!

##### Overheating of the motor!

If the thermal winding protection is not connected, the motor may overheat as a result.

Possible consequences: destruction of the motor, danger of fire.

- ▶ You must also take precautions to ensure that no hazard could occur after the thermal winding protection has responded and the motor has then cooled off by unintentional automatic switching on of the motor again!

Always connect to the thermal winding protection. If the thermal winding protection is not connected, the warranty is rendered void!

#### 2.1.1 Thermal winding protection PTC

##### NOTICE

**The PTC thermistor is a low-voltage sensor with max. 7.5 V<sub>DC</sub> connection voltage.**

Higher voltages will cause the thermistor and motor winding to be destroyed.

Always connect to the thermistor. If the drive controller has no option for PTC evaluation, appropriate triggering devices must be used for this purpose.

#### 2.1.2 Thermal winding protection KTY (optional)

Synchronous servo motors can optionally be equipped with a temperature-dependent KTY 84-130 resistor as a temperature sensor in a winding. On the KTY the resistance changes in proportion to the temperature of the winding.

The continuous sensor current  $i_{\text{cont}} = 2\text{mA}$ .

##### NOTICE

**When making the KTY connection make certain the polarity is correct! The installed KTY protects the synchronous servo motors against overload only to a limited degree. For this reason the I2t monitoring parameter should be set to "WARNING".**

- ▶ Avoid currents >4mA in the KTY circuit, as these could result in excessively high self-heating of the temperature sensor and damage to its insulation and to the motor winding.

#### CAUTION!

##### ESD/EGB safety information

This product contains components that can be damaged or destroyed by electrostatic discharges.

- ▶ Always avoid directly touching the pin contacts with your fingers!

### 2.2 Encoder systems

Synchronous servo motors have an encoder system integrated into the motor for motor commutation and recording of position. Two-pole resolvers are possible as well as absolute encoders in various versions.

Note the relevant motor connection diagram and the details on the motor nameplate. The encoder systems have been set to the respective servo inverters in the factory.

#### WARNING!

**Changes to the factory settings of encoder systems may result in uncontrolled startup or vibrating movements of the motor shaft.**

- ▶ Therefore the factory settings must not be changed.

#### CAUTION!

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### 2.3 Holding brake (optional)

A brake with permanent magnet excitation can be installed to serve as a holding brake.

Power supply:  $24 V_{DC} \pm 5\%$  smoothed.

The air gap of the brakes cannot be readjusted.



**An incorrect connection can cause the brake and motor to be destroyed.**

- Please note when connecting the brake the associated motor connection plan.

#### 2.3.1 Brakes on gravity-loaded vertical axes



**Unintentional lowering or falling of unsecured gravity-loaded vertical axes can lead to serious personal injuries or even death!**

- The holding brake of the motor does not provide adequate safety for person in the hazardous area around gravity-loaded vertical axes. Therefore the machine manufacturer must take additional measures to minimize risks (for example by providing a mechanical substructure for maintenance work).

Check brake functionality for gravity-loaded vertical axes by performing a cyclic brake test. To do this load the brake with 1.3 times the load torque. Make certain while doing this that the suspended load of the vertical axis is already exerting torque on the motor when it is at a standstill. Take this into consideration when supplying power to the motor.

#### 2.3.2 Testing holding brake



##### Information

The brake must only be tested at a motor speed of max. 20 rpm!

After making the connection check functionality and measure the holding torque of the holding brake.

Please note, that the brake types are not defined as working brakes. Therefore braking from full speed during emergency stops (power failure or dangerous situations) and braking while setup mode is active are only permitted within the defined limits. For further details refer to catalog SMS-EZ.

To ensure that the brakes receive the full braking torque, they are ground according to a special grinding cycles after final assembly of the motors. If a brake is not required to exert any friction over an extended period of time, the friction factor may change as a result. This can occur due to accumulations of flash rust or vapors resulting from the high motor temperature. Slight material distortion may also occur as a result of major fluctuations in temperature. All of these factors affect the braking torque.

If the brake does not exhibit the required braking torque, it must be reground.

To do this, drive the motor as well at max. 20 rpm. Release and close the brake once per second so that the motor is required to work against the closed brake for about 0.7 seconds. After about 20 cycles perform the process in the

reverse direction of rotation. In some circumstances you may need to perform this process several times until the nominal holding torque of the brake has been reestablished. If the braking torque has not been reestablished after the grinding process is repeated four times, other factors may also be responsible (for example reaching the wear limit). Options for automatically integrating a grinding routine, if available, are described in the documentation for the relevant servo inverter

### 2.4 Motor cooling



**Overheating of the motor!**

Reduced cooling, for example due to accumulation of dirt or fan failure, will cause the motor to overheat, thereby resulting in damage and/or destruction of the winding.

- Therefore check the functionality of the external fan during commissioning and at regular intervals thereafter.

#### 2.4.1 Forced-air cooling (optional)

External ventilation is optional and can also be retrofitted due to the modular layout. This makes it possible to optimize drives subsequently. Technical data can be found on the nameplate and in the SMS-EZ catalog in the Motor section.

#### 2.4.2 Water cooling (optional)

##### NOTICE

**Material damage!**

To prevent damage to the synchronous servo motor or your machine, please observe the following:

- Comply with the coolant specifications described in this chapter.
- The nominal data for synchronous servo motors with water cooling refers to water as a coolant. If another coolant is used, you will have to determine the nominal data again.
- Coolant with fresh water from the public supply grid with coolants, lubricants or cutting agents from the machining process is not permitted.
- If the temperature of the coolant is lower than the surrounding temperature, interrupt the supply of coolant when the motor is stopped for extended times to prevent condensation water from forming.

##### Cooling circuit specification

Feature	Description
Coolant	Water
Temperature at inlet	+5 °C to +40 °C (max. 5 K below the surrounding temperature)
Cooling circuit	Closed, with recooling unit
Cleanliness	Clear, with no suspended matter or dirt (use particle filter $\leq 100 \mu\text{m}$ if necessary)
pH value	6.5 – 7.5
Hardness	1.43 – 2.5 mmol/l

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Feature	Description
Salinity	NaCl < 100 ppm, demineralized
Anticorrosive	Maximum percentage 25 %, neutral relative to AlCuMgPb F38, GG-220HB
Operating pressure	≤ 3.5 bar (provide a pressure relief valve in the supply line)
Flow rate	EZ4 – EZ5: 6 l/min ( 4.5 l/min) EZ7 – EZ8: 7.5 l/min ( 5.0 l/min)

### 3 Safety information

Also follow the instructions in the operating manuals as well as applicable national, local and system-specific requirements.

#### WARNING!

- Danger of electrical shock if unpainted parts conducting voltage are touched.

- Moving and rotating parts can cause injuries

- Touching the gear unit and motor housing may cause burns (surface temperatures of over 100°C are possible)

- ▶ The machine manufacturer must provide suitable protective measures. The connector or terminal box cover of the motor must remain closed during operation. All work on the drive must only be performed when no current is present.

#### WARNING!

Incorrect operation, improper use, insufficient maintenance or unauthorized removal of required covers can result in severe injuries or material damage!

#### 3.1 Personnel requirements

All work on the electrical equipment of the drive units must be performed by qualified electricians. Installation, maintenance and repairs of mechanical parts must be performed by fitters, industrial mechanics or persons with comparable qualifications.

#### 3.2 In the event of disruptions

##### NOTICE

Changes compared to normal operation indicate that the function has been impaired. This includes:

- Higher power consumption, temperatures or vibrations
- unusual noises or odors
- Leaks on the gear unit
- Monitoring devices responding

- ▶ If any of these occur shut down the machine as quickly as possible and notify the responsible qualified specialist without delay.

##### NOTICE

The heat produced while a motor is in operation must be dissipated into the surrounding air as efficiently as possible.

Reduced heat dissipation is frequently the reason why temperature monitoring devices respond.

Accumulations of dirt reduce the performance of the motor.

- ▶ Therefore remove dirt that has settled on the surface of the motor regularly.

#### 3.3 Safety during installation and maintenance

##### NOTICE

Damage to the motor.

- ▶ Prevent undue force on the motor such as impact, shock, pressure or high acceleration.

#### WARNING!

Risk of injury due to moving parts.

- ▶ The machine manufacturer must provide suitable protective measures for personnel who must work in the travel range of a motor within a system or machine, especially under raised loads.

#### 3.4 Safe function and EMC of the drive system

The drive controller, cable and motor must be matched to each other. Each product has specific electrical properties in and of itself that may affect other products. Unsuitable matches can therefore result in impermissibly high voltage peaks on the motor or drive controller, which could destroy the motor and cause malfunctions in the system. Legal requirements for EMC (electromagnetic compatibility) must also be observed.

STÖBER offers a product line of matching cables to ensure this with suitable shielding technology and cable layout for the power connection and the various encoder systems. Using other connection cables and drive controllers may result in voiding of any claims made under the warranty.

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### 3.5 EZF, EZH, EZHD, EZHP synchronous servo motors

#### NOTICE

**The hollow shaft of the motors moves in relation to the supply elements passing through during operation.**

- ▶ The supply elements must be protected so they do not scrape against the hollow shaft.



#### CAUTION!

**The hollow shaft can heat up to 100°C in operation.**

- ▶ Observe the temperature for the supply elements that pass through.

### 3.6 Servo spindle motors EZS/EZM

#### NOTICE

**Destruction of the spindle system!**

Removing the spindle shaft from the spindle nut will cause the system to be destroyed and will void the warranty.

- ▶ Never remove the spindle shaft from the spindle nut!



#### WARNING!

**Risk of injury due to moving parts!**

Make certain before commissioning that

- ▶ the spindle shaft and motor are installed in the machine before you place the drive in operation.
- ▶ no persons will be endangered by the axial movement of the spindle shaft or slide.
- ▶ no one touches the spindle shaft by coming in physical contact with it.



#### WARNING!

**Crushing due to contact with the spindle shaft!**

Turning the spindle shaft manually with your hand can lead to crushing injuries.

- ▶ Never turn the spindle shaft manually.



#### CAUTION!

**When EZM synchronous servo motors for screw drives are in operation the spindle shaft moves axially in reference to the motor.**

- ▶ Fix the spindle shaft in place and install it in the machine.
- ▶ Screw the motor together with the machine or moving slide.
- ▶ Make certain there are no objects in the axial movement range of the slide or spindle shaft.

### 4 Transport, storage and preservation

The motors must not be exposed to acceleration levels or working times of more than 300 m/s<sup>2</sup> (30 g) as an individual shock load during transport as per EN 60 068-2-27. The values for operation apply to long-term shock loads.

When transporting the motors make certain not to damage the shafts and bearings with impacts.

The motors may only be stored in enclosed, dry rooms. Storage in open air areas with a roof is only permitted for brief periods. Protect the motors from all damaging environmental effects and mechanical damage.

If you will be storing or transporting the system in which a synchronous servo motor with water cooling is installed below +3 °C, drain the water completely out of the cooling circuit in advance.

Avoid extreme temperature fluctuations with high relative humidity when the motors are being stored temporarily to prevent formation of water from condensation. If long-term storage is planned, protect the bare parts of the motor against corrosion. Before placing a motor in operation again, have the winding checked for its insulation resistance by an electrical specialist.

Do not use the fan cover for transport or storage of the motors. For transport, use the eyebolts on the motors, together with suitable slings.

Eyebolts are provided only for lifting the motor without additional attachments. When you remove the eyebolts after installation, the threaded holes must be permanently closed corresponding to the protection type of the motors.

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### 5 Mounting

Completely remove all corrosion protection on the shaft ends prior to installation.

#### NOTICE

**The lip seals of the shaft seal rings can be damaged by the use of solvents.**

- ▶ When removing the corrosion protection, make sure that the lip seals of the shaft seal rings do not come into contact with solvents.

#### Mount the threaded spindle on the EZS motor:

1. Degrease the threaded spindle in the area where it comes into contact with the clamping unit.
2. Insert the threaded spindle through the clamping set in the hole of the motor shaft.
3. The wrench size and the tightening torque that corresponds to the size of your EZS motor can be found in the table Tab. 5-1:
4. Tighten the hexagonal screws of the clamping unit successively in several tightening sequences (approx. 1/4 revolution per sequence) properly with a torque wrench until all of them are tightened to the prescribed tightening torque. Make sure that both spring washers lie parallel to each other (maximum permitted deviation 0.2 mm).

	EZS5	EZS7
Thread	M5	M6
Strength class	8.8	10.9
Wrench size [mm]	8	10
Tightening torque [Nm]	5	12

Tab. 5-1: Assembly information for clamping units

### 6 Commissioning

Electrical connections provided by the customer must comply with applicable regulations.

#### Note:

The electrical connection diagram and safety regulations are with the delivery documents of the motor. Comply exactly with the information and safety regulations therein.



#### WARNING!

#### Danger of injury from moving parts.

Before commissioning the drive unit, ensure that...

- ▶ no one will be endangered by startup of the machine.
- ▶ all protective guards and safety equipment have been properly installed, also for a test run!
- ▶ the drive unit is not blocked.
- ▶ the brakes have been bled.
- ▶ the direction of rotation is correct.
- ▶ components mounted on the power take-off end are sufficiently secured against centrifugal force (e.g. fitting keys, coupling elements, etc.)

### 7 Maintenance

#### 7.1 Servo spindle motors EZS/EZM

Axial angular ball bearings are installed on the A-side in the EZS and EZM motors that directly absorb the threaded spindle forces. These axial angular ball bearings are greased with lithium soap grease GA28 at the factory. Under certain application conditions, for example after a prolonged downtime or for high humidity, relubrication may be required. Mineral-based grease is suitable for relubrication, for example Arcanol Multitop.

Protect the threaded spindle against dirt.

### 8 Troubleshooting

In the event of a malfunction of the drive unit, call the STÖBER service department at 07231 582-1190 (-1191, -1224, -1225) in order to locate the nearest STÖBER service partner for further action.

**In urgent cases outside of normal business hours, you can call the STÖBER 24-hour service hotline at 01805 786323 / 01805 STOEBER**

### 9 Spare parts

Include the following when ordering replacement parts:

- item no. of the part according to the replacement parts list
- model designation according to the rating plate
- serial number according to rating plate

You can reach the STÖBER replacement parts service by phone: 07231 582-1190 (-1191, -1224, -1225), or fax: 07231 582-1010.

Important notice: The replacement parts lists are not assembly instructions! They are not binding for assembly of the gear unit. Use only original replacement parts from Stöber. Otherwise we will provide no guarantee and will assume no liability for resulting damages!

### 10 Disposal

This product contains recyclable materials. Observe local applicable regulations for disposal.