

# Operating manual

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



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These operating instructions contain information about the transport, installation and commissioning of STÖBER EZ, EZHD, EZHP synchronous servo motors and EZS, EZM synchronous servo motors for screw drive.

For further details, see the catalog with the ID 442437.

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<br>(DIN EN 60034-7)                                                                                                                                                                     |
| Protection class:        | EZ, EZHD: IP56<br>EZHP: IP56 / IP66 (option)<br>EZS, EZM: IP40<br>(DIN EN 60529)                                                                                                                         |
| Protection class:        | I                                                                                                                                                                                                        |
| Thermal class:           | 155 (F) (DIN EN 60034 / VDE 0530)<br>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;<br>or optional IC 416 convection cooling<br>with forced ventilation (DIN EN 60034-6), see 2.4.1;<br>or optionally for water cooling in the A-side motor flange, see 2.4.2 |
| Surface:                 | Black matte as per RAL 9005<br>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<br>(half wedge balancing for shafts with key).                                                                                                                           |
| Winding:                 | Three-phase, single-tooth design                                                                                                                                                                         |
| 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!



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## 2.1 Temperature sensor

STÖBER synchronous servo motors are equipped with a PTC thermistor to realize thermal winding protection as standard. The Pt1000 temperature sensor can be chosen as an option. The Pt1000 replaces the previously available KTY 84-130 that is only available for a limited time. The type of installed temperature sensor is stated on the nameplate of the motor. Make note of the additional information specified in the STÖBER catalog and in the commissioning instructions for the drive controller.



### CAUTION!

#### Motor damage, fire risk!

If the winding temperature of the motor is not adequately monitored, motor damage and fires may result. Claims under the warranty are then void.

- Always connect the installed temperature sensor to an appropriate triggering unit so that the motor is switched off if the maximum permitted winding temperature is exceeded.

You must 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!

### 2.1.1 PTC thermistor

The PTC thermistor is designed as a triplet. All three phases of the motor winding are therefore monitored.

### NOTICE

#### Damage to the PTC thermistor due to high connection voltage.

- Make sure that the maximum connection voltage of the PTC thermistor is below 7.5 V DC.

### 2.1.2 Temperature sensor Pt1000

Optionally the temperature-dependent resistor Pt1000 can be installed as a temperature sensor in one phase of the motor winding. The resistance of the Pt1000 is proportional to the temperature of the motor winding. Make sure that the Pt1000 temperature sensor only protects the motor to a limited degree before overload. For this reason, parameterize the I2t monitoring of the drive controller to "WARNING".

### NOTICE

#### Falsification of the measured value due to self-heating of the temperature sensor for a sensor current > 4 mA.

Ensure a constant sensor current of 2 mA.

### 2.1.3 Temperature sensor KTY

Optionally the temperature-dependent resistor KTY 84-130 can be installed as a temperature sensor in one phase of the motor winding. The resistance of the KTY is proportional to the temperature of the motor winding.

Make sure that the KTY temperature sensor only protects the motor to a limited degree before overload. For this reason, parameterize the I2t monitoring of the drive controller to "WARNING".

Ensure a constant sensor current of 2 mA.

### NOTICE

#### Damage to the temperature sensor!

- Prevent sensor currents > 4mA that can cause unacceptably high self-heating of the temperature sensor as well as damage to its insulation and at the motor winding.
- Pay attention to the polarity of the connections that are described in the supplied connection plan when connecting the temperature sensor KTY.
- Do not touch your fingers on the connector contacts of the motor because the temperature sensor can get damaged due to electrostatic discharge.

## 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!

#### 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!

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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.



#### CAUTION!

**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



#### WARNING!

**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

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 also reduce the performance of the motor.

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

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

Forced 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 in the nameplate of the motor and in the relevant STÖBER catalog.



#### CAUTION!

#### 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.

#### 2.4.2 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.

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## 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 ≤ 100 µm if necessary) |
| pH value             | 6.5 – 7.5                                                                           |
| Hardness             | 1.43 – 2.5 mmol/l                                                                   |
| 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)<br>EZ7 – EZ8: 7.5 l/min ( 5.0 l/min)                |

## 2.5 Warning labels on the motor

Warning labels are attached to the motor. Over time, these warning labels can become dirty or illegible for other reasons. Keep the warning labels in good, legible condition. Replace damaged warning labels.



Warning of high electrical voltage. Do not connect or disconnect the plug connectors until after the motor is de-energized. Only perform work on the motor when the motor shaft is at a standstill.



The surface of the motor can reach high temperatures during operation. Do not touch the motor during operation or immediately afterward.

## 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

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

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

In this case, stop the drive as quickly as possible and contact STÖBER Service.

## 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 Synchronous servo motors EZHD, EZHP

### 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



### WARNING!

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

Check the following before commissioning:

- Are the spindle shaft and the motor properly installed in the machine?
- Are no persons at risk by the axial movement of the spindle shaft or slide?
- Can no one touch 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.

### 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!



### 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 Transportation and storage

### 4.1 Transportation

Use the ring screws in the motor housing for vertical transport of the motors. Sling the motors without ring screw with a suitable support cable directly on the gear unit housing. Note that ring screw are only intended for vertical transport of the motors without additional attachments. In addition sling the motor attachments and make sure that there is no diagonal pull. If the ring screws are removed after assembly, permanently seal the threaded holes according to the protection class of the motor.

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

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.

#### Motors with forced-cooling fan

For a motor with a forced-cooling fan, make sure that the motor is not supported on the cover of the forced-cooling fan or connected to it.

#### Motors with water cooling

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.

### 4.2 Storage

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.

When temporarily storing motors, prevent extreme temperature fluctuations at high humidity so that no condensation water forms.

#### Long-term storage

If long-term storage is planned, protect motor parts that are not painted against corrosion. Before placing a motor in operation again, have the winding checked for its insulation resistance by an electrical specialist.

## 5 Mounting

### 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.

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

### NOTICE

**Damage to the bearing raceway and encoder.**

- Mount the motor/geared motor correctly without knocking the shafts or housing.



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## 5.1 Assembly of the motors/geared motors EZHD/EZHP

The motors/geared motors can be operated in any installation position. Mount the motors/geared motors on an even, vibration-reducing and torsion resistant substructure. Use screws of strength class 10.9 to fasten.

Fit the motors/geared motors on the pilot.

Make sure that the permitted shear and axial forces are not exceeded during assembly.

## 5.2 Assembly of the threaded spindle on the EZS motor

**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!

**If the motor is in operation while plug connectors are being disconnected, electric arcs can cause severe injury or even death.**

Do not connect or disconnect the plug connectors until after the motor is deenergized.



### WARNING!

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

Before switching on the drive, check the following:

- ▶ Are no persons in danger due to start-up?
- ▶ Is all protection and safety equipment properly installed, in test operation too?
- ▶ Is the drive not blocked?
- ▶ Are the brakes released?
- ▶ Is the direction of rotation of the drive correct?
- ▶ Are components attached to the output such as feather keys or coupling elements adequately secured against centrifugal forces?

## 7 Maintenance

### 7.1 EZHP synchronous servo geared motors with hollow shaft

The planetary gear unit of the synchronous servo geared motor with hollow shaft is provided with life-long lubrication and does not need maintenance. The specification and filling quantity of the lubricant is given on the nameplate of the planetary gear unit.

### 7.2 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.