19.4 Dimensional drawings

In this chapter, you can find the dimensions of the motors.

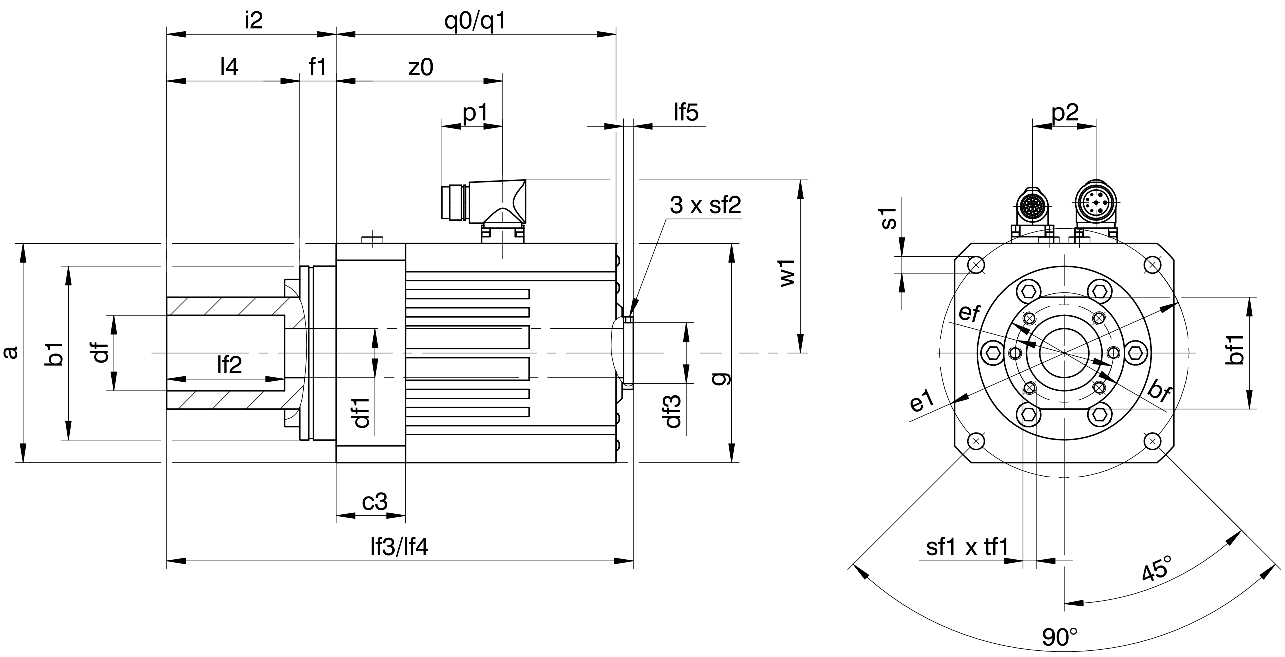
Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

We reserve the right to make dimensional changes due to ongoing technical development.

You can download 3D models of our standard drives at https://configurator.stoeber.de/en-US/.

In this chapter, the dimensions p1 and w1 for standard motor designs are presented. In designs for connection to drive controllers of third-party manufacturers, dimensions p1 and w1 may differ. You can find more details at https://configurator.stoeber.de/en-US/.

19.4.1 EZM motors



q0, lf3 Applies to motors without holding brake.

q1, lf4 Applies to motors with holding brake.

Type	□a	∅b1	∅bf	bf1	c3	∅df	∅df1	∅df3	∅e1	∅ef	f1	□g	i2	l4	lf2	lf3	lf4	lf5	p1	p2	q0	q1	∅s1	sf1	sf2	tf1	w1	z0
EZM511U	115	$90_{-0,01}$	62	59	37	40^{JS6}	25.5	32.3	130	51	24	115	98	74	66	279.0	333.0	4.4	40	36	170.1	225.4	9	M6	M3	12	100	95.5
EZM512U	115	$90_{-0,01}$	62	59	37	40^{JS6}	25.5	32.3	130	51	24	115	98	74	66	304.0	358.3	4.4	40	36	195.1	250.4	9	M6	M3	12	100	120.5
EZM513U	115	$90_{-0,01}$	62	59	37	40^{JS6}	25.5	32.3	130	51	24	115	98	74	66	329.0	383.3	4.4	40	36	220.1	275.4	9	M6	M3	12	100	145.5
EZM711U	145	$115_{-0,01}$	80	74	46	50^{JS6}	32.5	40.3	165	65	24	145	112	88	79	308.6	368.6	5.2	40	42	185.2	245.2	11	M8	M4	14	115	110.2
EZM712U	145	$115_{-0,01}$	80	74	46	50^{JS6}	32.5	40.3	165	65	24	145	112	88	79	333.6	393.6	5.2	40	42	210.2	270.2	11	M8	M4	14	115	135.2
EZM713U	145	$115_{-0,01}$	80	74	46	50^{JS6}	32.5	40.3	165	65	24	145	112	88	79	358.6	418.6	5.2	40	42	235.2	295.2	11	M8	M4	14	115	160.2
EZM711U	145	$115_{-0,01}$	86	80	46	56^{JS6}	32.5	40.3	165	71	24	145	112	88	79	308.6	368.6	5.2	40	42	185.2	245.2	11	M8	M4	14	115	110.2
EZM712U	145	$115_{-0,01}$	86	80	46	56^{JS6}	32.5	40.3	165	71	24	145	112	88	79	333.6	393.6	5.2	40	42	210.2	270.2	11	M8	M4	14	115	135.2
EZM713U	145	$115_{-0,01}$	86	80	46	56^{JS6}	32.5	40.3	165	71	24	145	112	88	79	358.6	418.6	5.2	40	42	235.2	295.2	11	M8	M4	14	115	160.2

19.5 Type designation

Example code

EZM	5	1	1	U	S	AD	B1	O	097

Explanation

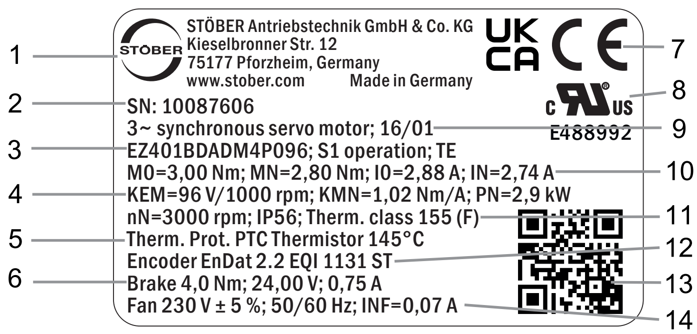
Code	Designation	Design
EZM	Type	Synchronous servo motor for screw drives
5	Motor size	5 (example)
1	Generation	1
1	Length	1 (example)
U	Cooling	Convection cooling
S	Design	Standard
AD	Drive controller	SD6 (example)
B1	Encoder	EnDat 2.2 EBI 135 EnDat 2.2 (example)
O	Brake	Without holding brake
P		Permanent magnet holding brake
097	Voltage constant K_{EM}	97 V/1000 rpm (example)

Notes

- In Chapter [▹ 19.6.6], you can find information about available encoders.
- In Chapter [▹ 19.6.6.3], you can find information about connecting synchronous servo motors to other drive controllers from STOBER.
- In Chapter [▹ 21], you can find information about options for connecting STOBER synchronous servo motors to drive controllers from other manufacturers.

19.5.1 Nameplate

An example nameplate of an EZ401 synchronous servo motor is explained in the figure below.



Line	Value	Description
1	STÖBER Antriebstechnik GmbH + Co. KG	Logo and address of the manufacturer
2	Ser. No. 10087606	Serial number of the motor
3	EZ401BDADM4P096 S1 operation TE	Type designation Operating mode Protection class in accordance with UL1004
4	KEM=96 V/1000 rpm KMN=1.02 Nm/A PN=2.9 kW	Voltage constant Torque constant Nominal power
5	Therm. prot. of PTC thermistor 145 °C	Type of temperature sensor
6	Brake 4.0 Nm 24.00 V 0.75 A	Holding brake (optional) Static braking torque at 100 °C Nominal voltage (DC) of the holding brake Nominal current of the holding brake at 20 °C
7	CE UKCA	CE mark UKCA mark

Line	Value	Description
8	cURus E488992	cURus test symbol, registered under UL number E488992 (optional)
9	3~ synchronous servo motor 16/01	Motor type: Three-phase synchronous servo motor Date of manufacture (year/calendar week)
10	M0=3.00 Nm MN=2.80 Nm I0=2.88 A IN=2.74 A	Stall torque Nominal torque Stall current Nominal current
11	nN=3000 rpm IP56 Therm. class 155 (F)	Nominal speed Protection class Thermal class
12	EnDat 2.2 EQI 1131 ST encoder	Encoder model
13	QR code	Link to product information
14	Fan 230 V ± 5%; 50/60 Hz INF = 0.07 A	Forced ventilation unit (optional) Nominal voltage of the forced ventilation unit Nominal current of the forced ventilation unit

19.6 Product description

19.6.1 General features

Feature	EZM5	EZM7
Maximum threaded spindle diameter ∅dkg [mm]	25.00	32.00
Pitch of threaded spindle P_{st}	5 – 25	5 – 32
Pilot ∅Dkg [mm]	40	50/56
Bolt circle ∅ekg [mm]	51	65/71
Nominal speed n_N [rpm]	3000	3000
Bearing type[1]	INA ZKLF 3590-2Z[2]	INA ZKLF 50115-2Z[3]
Maximum bearing speed n_{la} [rpm]	3800	3000
Axial bearing load rating, dynamic C_{dyn} [N]	41000	46500
Axial rigidity C_{ax} [N/µm]	500	770
Protection class	IP40	IP40
Thermal class	155 (F) in accordance with EN 60034-1 (155 °C, heating Δϑ = 100 K)	
Surface[4]	Matte black as per RAL 9005	
Noise level	Limit values in accordance with EN 60034-9	
Cooling	IC 410 convection cooling	

19.6.2 Electrical features

General electrical features of the motor are described in this chapter. Details can be found in the "Selection tables" chapter.

Feature	Description
DC link voltage	DC 540 V (max. 620 V) on STOBER drive controllers
Winding	Three-phase, single-tooth coil design
Circuit	Star, center not led through
Protection class	I (protective grounding) in accordance with EN 61140
Impulse voltage insulation class (IVIC)	C in accordance with DIN EN 60034-18-41 (inverter connection voltage 0 – 480 V ± 10%)
Number of pole pairs	7

[1] Axial angular contact ball bearing for screw drives, grease-lubricated, can be relubricated
[2] Or comparable products from other providers
[3] Or comparable products from other providers
[4] Repainting the motor will change the thermal properties and therefore the performance limits.

19.6.3 Ambient conditions

Standard ambient conditions for transport, storage and operation of the motor are described in this chapter.

Feature	Description
Surrounding temperature for transport/storage	−30 °C to +85 °C
Surrounding temperature for operation	−15 °C to +40 °C
Relative humidity	5% to 95%, no condensation
Installation altitude	≤ 1000 m above sea level
Shock load	≤ 50 m/s^2 (5 g), 6 ms in accordance with EN 60068-2-27

Notes

- STOBER synchronous servo motors are not suitable for potentially explosive atmospheres.
- Secure the power cables close to the motor so that vibrations of the cable do not place impermissible loads on the motor plug connector.
- Note that the braking torques of the holding brake (optional) may be reduced by shock loading.
- At operating temperatures below 0 °C, note that the discs of the holding brake (optional) may ice up.

19.6.4 Threaded nut

The driven threaded nut (stationary mounting of threaded spindle) has the following advantages compared to the driven threaded spindle (stationary mounting of threaded nut):

- Higher axial velocity can be achieved with long threaded spindles because the swinging of the threaded spindle is less problematic.
- Drastic reduction in the power loss of the threaded spindle bearing because the stretching forces of the threaded spindle do not have to be channeled through the bearing.
- Liquid cooling of the threaded spindle is easier.
- Increased axial rigidity and torsional rigidity of the threaded spindle (especially with a high pitch/diameter ratio) because the axial forces and torques at both ends of the threaded spindle can be channeled to the surrounding structure.

19.6.4.1 Lubrication of the threaded nut

As the system makes supplying lubricant to the driven threaded nut difficult, it should be lubricated via the threaded spindle. The following options are available for this purpose.

- For threaded nut with axial motion: using a lubrication channel in the threaded spindle that is implemented axially parallel up to the tool change position of the threaded nut. Lubricant can be injected into the threaded nut through a cross-hole if it is correctly aligned in this position. The amount of lubricant is generally sufficient until the next tool change without any problems.
- For threaded spindle with axial motion: using lubrication brushes attached to the machine that are connected to the lubrication supply and dispense the lubricant to the threaded spindle as it moves axially.

Lubricants that enter into the inside of the motor can impair the function of the holding brake and encoder. Therefore, take the protection class of the synchronous servo motor into account when configuring your screw drive, especially when installing the synchronous servo motor vertically with the A side on top. For detailed information about lubricating the screw drive, contact your screw drive manufacturer.

19.6.5 Threaded spindle

The design of the EZM motor allows for the threaded spindle of the screw drive to be guided through the entire length of the motor. Contact between the threaded spindle and motor shaft during operation is not permitted. The dimensions of the EZM motor are designed so that they can incorporate threaded spindles with a maximum outer diameter that does not exceed the nominal diameter. Be aware when selecting your screw drive that there are spindle nut/threaded spindle combinations for which the maximum threaded spindle diameter exceeds the nominal diameter of the threaded nut or spindle nut. In this case, the attachment of the screw drive to the EZM motor is not permitted (also see the maximum threaded spindle diameter Ødkg feature in Chapter General features).

19.6.6 Encoders

STOBER synchronous servo motors can be designed with different encoder models. The following chapters include information for choosing the optimal encoder for your application.

19.6.6.1 Selection tool for EnDat interface

The following table offers a selection tool for the EnDat interface of absolute encoders.

Feature	EnDat 2.1	EnDat 2.2
Short cycle times	★★☆	★★★
Transfer of additional information along with the position value	–	✓
Expanded power supply range	★★☆	★★★
Key: ★★☆ = good, ★★★ = very good		

19.6.6.2 EnDat encoders

In this chapter, you can find detailed technical data for encoder models that can be selected with EnDat interface.

Encoders with EnDat 2.2 interface

Encoder model	Code	Measuring method	Recordable revolutions	Resolution	Position values per revolution	MTTF [years]	PHF [h]
EnDat 2.2 EBI 135	B1	Inductive	65536	19 bit	524288	> 57	$\leq 2 \times 10^{-6}$
EnDat 2.2 ECI 119-G2	C9	Inductive	–	19 bit	524288	> 57	$\leq 2 \times 10^{-6}$

Encoders with EnDat 2.1 interface

Encoder model	Code	Measuring method	Recordable revolutions	Resolution	Position values per revolution	Periods per revolution	MTTF [years]	PHF [h]
EnDat 2.1 ECI 119	C4	Inductive	–	19 bit	524288	Sin/cos 32	> 57	$\leq 2 \times 10^{-6}$

Notes

- The encoder code is a part of the type designation of the motor.
- Multiple revolutions of the motor shaft can be recorded only using multi-turn encoders.
- The EnDat 2.2 EBI 135 encoder requires an external buffer battery so that absolute position information is retained after the power supply is turned off (AES option for STOBER drive controllers).
- MTTF = Average time before dangerous failure. MTTF values greater than 100 years were reduced in accordance with DIN EN ISO 13849.
- PFH = Probability of a dangerous failure per hour

19.6.6.3 Possible combinations with drive controllers

The following table shows the options for combining STOBER drive controllers with selectable encoder models.

Drive controller		**SDS 5000**	**MDS 5000**	**SDS 5000/ MDS 5000**	**SD6**		**SI6**	**SC6**
Drive controller code		AA	AB	AC	AD	AE	**AP**	**AU**
Connection plan ID		442305	442306	442307	442450	442451	**442771**	**443052**
Encoder	**Encoder code**							
EnDat 2.2 EBI 135	B1	✓	✓	–	✓	–	✓	✓
EnDat 2.2 ECI 119-G2	C9	✓	✓	–	✓	–	✓	✓
EnDat 2.1 ECI 119	C4	–	–	✓	–	✓	–	–

Notes

- The drive controller and encoder codes are a part of the type designation of the motor (see the "Type designation" chapter).
- In Chapter [▸ 21], you can find information about options for connecting STOBER synchronous servo motors to drive controllers from other manufacturers.

19.6.7 Temperature sensor

In this chapter, you can find technical data for the temperature sensors that are installed in STOBER synchronous servo motors for implementing thermal winding protection. To prevent damage to the motor, always monitor the temperature sensor with appropriate devices that will turn off the motor if the maximum permitted winding temperature is exceeded.

Some encoders feature integrated temperature monitoring, the warning and switch-off thresholds of which may overlap with the corresponding values set for the temperature sensor in the drive controller. In some cases, this may result in an instance where an encoder with internal temperature monitoring forces the motor to shut down, even before the motor has reached its nominal data.

You can find information about the electrical connection of the temperature sensor in the "Connection method" chapter.

19.6.7.1 PTC thermistor

The PTC thermistor is installed as a standard temperature sensor in STOBER synchronous servo motors.

The PTC thermistor is a triple thermistor in accordance with DIN 44082 that can be used for monitoring the temperature of each winding phase. The resistance values in the following table and curve refer to a single thermistor in accordance with DIN 44081. These values must be multiplied by 3 for a triple thermistor in accordance with DIN 44082.

Feature	Description
Nominal response temperature ϑ_{NAT}	145 °C ± 5 K
Resistance R −20 °C up to ϑ_{NAT} − 20 K	≤ 250 Ω
Resistance R with ϑ_{NAT} − 5 K	≤ 550 Ω
Resistance R with ϑ_{NAT} + 5 K	≥ 1330 Ω
Resistance R with ϑ_{NAT} + 15 K	≥ 4000 Ω
Operating voltage	≤ DC 7.5 V
Thermal response time	< 5 s
Thermal class	155 (F) in accordance with EN 60034-1 (155 °C, heating Δϑ = 100 K)

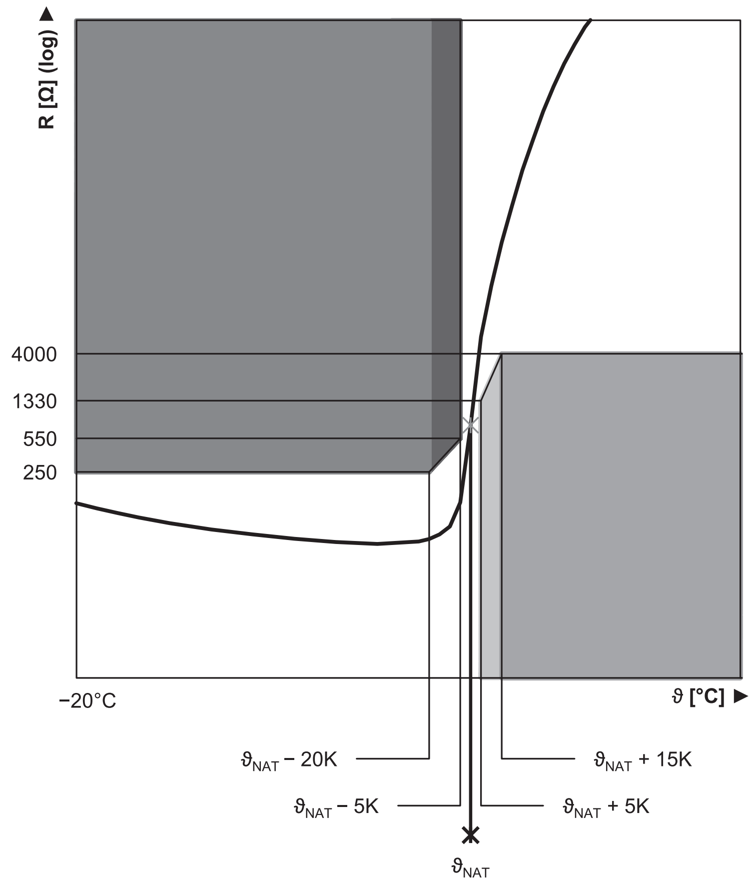


Fig. 2: PTC thermistor curve (single thermistor)

19.6.7.2 Pt1000 temperature sensor

STOBER synchronous servo motors are available in versions with a Pt1000 temperature sensor. The Pt1000 is a temperature-dependent resistor that has a resistance curve with a linear relationship with temperature. As a result, the Pt1000 allows for measurements of the winding temperature. These measurements are limited to one phase of the motor winding, however. In order to adequately protect the motor from exceeding the maximum permitted winding temperature, use a i²t model in the drive controller to monitor the winding temperature.

Avoid exceeding the specified measurement current so that the measured values are not falsified due to self-heating of the temperature sensor.

Feature	Description
Measurement current (constant)	2 mA
Resistance R for ϑ = 0 °C	1000 Ω
Resistance R for ϑ = 80 °C	1300 Ω
Resistance R for ϑ = 150 °C	1570 Ω

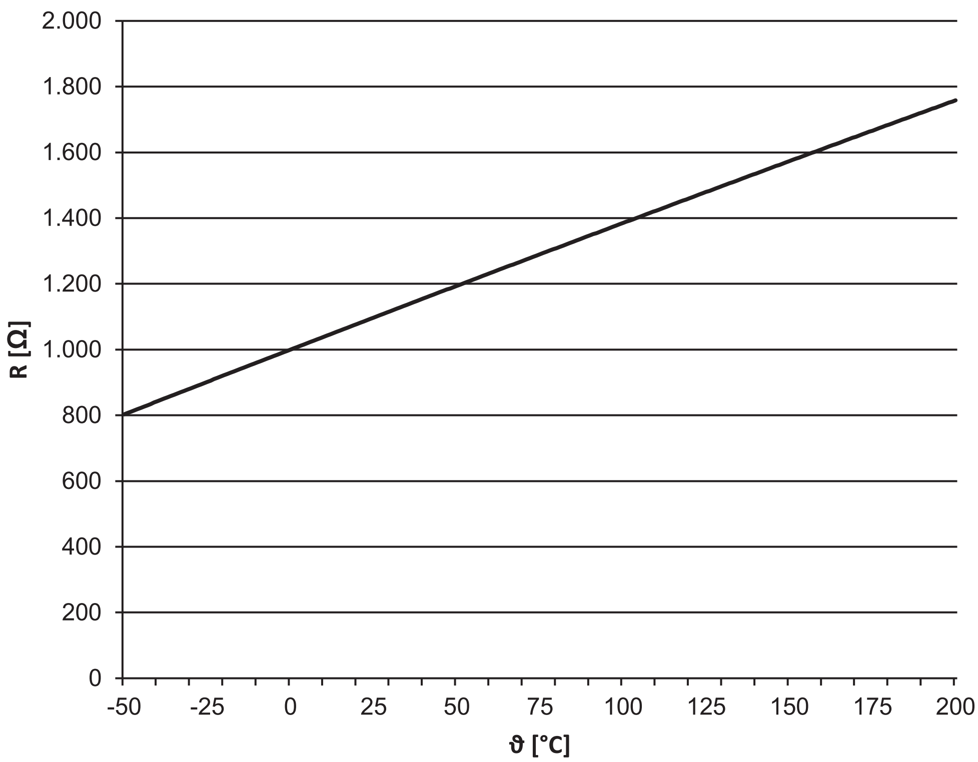


Fig. 3: Pt1000 temperature sensor characteristic curve

19.6.8 Cooling

An EZM motor is cooled by convection cooling (IC 410 in accordance with EN 60034-6).

19.6.9 Holding brake

STOBER synchronous servo motors can be equipped with a backlash-free holding brake using permanent magnets in order to secure the motor shaft when at a standstill. The holding brake engages automatically if the voltage drops.

The holding brake is designed for a high number of operations (B_{10} = 10 million operations, B_{10d} = 20 million operations).

Nominal voltage of permanent magnet holding brake: DC 24 V ± 5%, smoothed.

Observe the following during project configuration:

- The holding brake is designed to keep the motor shaft from moving. Activate braking processes during operation using the corresponding electrical functions of the drive controller. In exceptional circumstances, the holding brake can be used for braking from full speed (following a power failure or when setting up the machine). The maximum permitted work done by friction $W_{B,Rmax/h}$ may not be exceeded.
- Note that the braking torque M_{Bdyn} may initially be up to 50% less when braking from full speed. As a result, the braking effect has a delayed action and braking distances become longer.
- Regularly perform a brake test to ensure the functional safety of the brakes. Details can be found in the documentation of the motor and the drive controller.
- Connect a varistor of type S14 K35 (or comparable) in parallel to the brake coil to protect your machine from switching surges. (Not necessary for connecting the holding brake to STOBER drive controllers of the 5th and 6th generation with a BRS/BRM brake module).
- The holding brake of the motor does not offer adequate safety for persons in the hazardous area of gravity-loaded vertical axes. Therefore take additional measures to minimize risk, e.g. by providing a mechanical substructure for maintenance work.
- Take into consideration voltage losses in the connection cables that connect the voltage source to the holding brake connections.
- The holding torque of the brake can be reduced by shock loading. Information about shock loading can be found in the "Ambient conditions" chapter.
- At operating temperatures from −15 °C to 0 °C, a cold holding brake in the released state may cause operating noises. As the temperature of the holding brake increases, these noises decrease such that operating noises are not heard when using holding brake at operating temperature in the released state.

Calculation of work done by friction per braking process

$$W_{B,R/B} = \frac{J_{tot} \cdot n^2}{182.4} \cdot \frac{M_{Bdyn}}{M_{Bdyn} \pm M_L}, \quad M_{Bdyn} > M_L$$

The sign of M_L is positive if the movement runs vertically upwards or horizontally and it is negative if the movement runs vertically down.

Calculation of the stop time

$$t_{dec} = 2.66 \cdot t_{1B} + \frac{n \cdot J_{tot}}{9.55 \cdot M_{Bdyn}}$$

Switching behavior

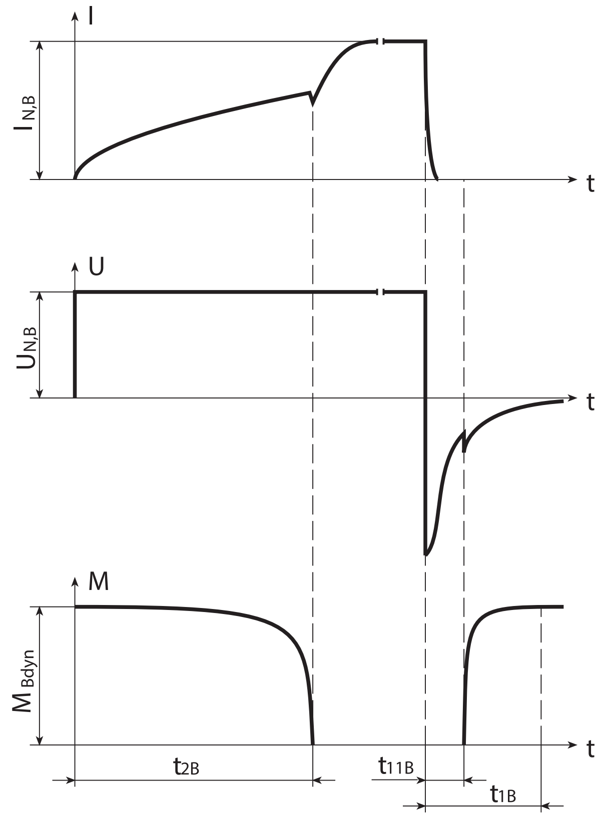


Fig. 4: Holding brake – Switching behavior

Technical data

Type	M_{Bstat} [Nm]	M_{Bdyn} [Nm]	$I_{N,B}$ [A]	$W_{B,Rmax/h}$ [kJ/h]	N_{Bstop}	J_{Bstop} [kgcm²]	$W_{B,Rlim}$ [kJ]	t_{2B} [ms]	t_{11B} [ms]	t_{1B} [ms]	$x_{B,N}$ [mm]	ΔJ_B [kgcm²]	Δm_B [kg]
EZM511	18	15	1.1	11.0	2100	52.5	550	55	3.0	30	0.3	5.970	2.50
EZM512	18	15	1.1	11.0	1850	59.1	550	55	3.0	30	0.3	5.970	2.50
EZM513	18	15	1.1	11.0	1700	65.5	550	55	3.0	30	0.3	5.970	2.50
EZM711	28	25	1.1	25.0	1900	149	1400	120	4.0	40	0.4	14.100	4.33
EZM712	28	25	1.1	25.0	1650	168	1400	120	4.0	40	0.4	14.100	4.33
EZM713	28	25	1.1	25.0	1500	186	1400	120	4.0	40	0.4	14.100	4.33

19.6.10 Connection method

The following chapters describe the connection technology of STOBER synchronous servo motors in the standard version on STOBER drive controllers. You can find further information relating to the drive controller type that was specified in your order in the connection plan that is delivered with every synchronous servo motor.

In Chapter [▹ 21], you can find information about options for connecting STOBER synchronous servo motors to drive controllers from other manufacturers.

19.6.10.1 Connection of the motor housing to the grounding conductor system

Connect the motor housing to the grounding conductor system of the machine in order to prevent personal injury and faulty triggering of residual current protective devices.

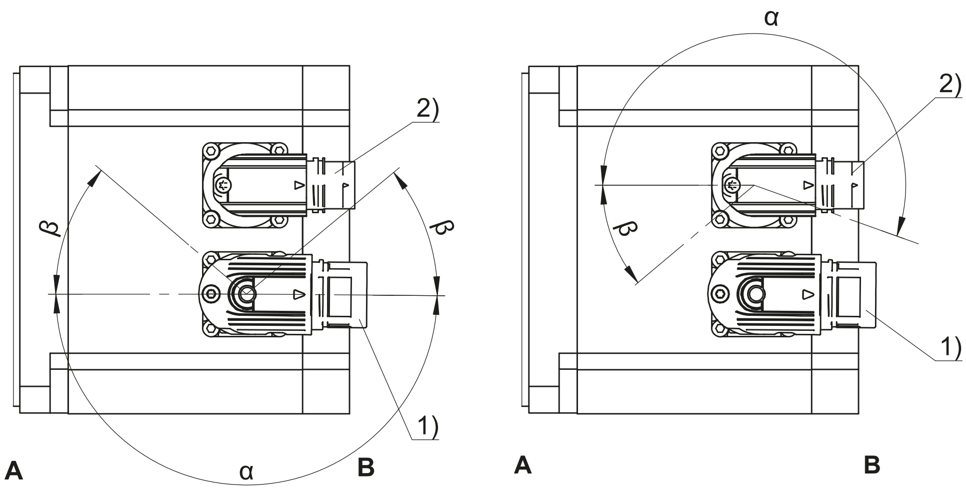
All attachment parts required for the connection of the grounding conductor to the motor housing are delivered with the motor. The grounding screw of the motor is identified with the symbol ⏚ in accordance with IEC 60417-DB. The cross-section of the grounding conductor has to be at least as large as the cross-section of the lines in the power connection.

19.6.10.2 Plug connectors

STOBER synchronous servo motors are equipped with rotatable quick-lock plug connectors in the standard version. Details can be found in this chapter.

The figures represent the position of the plug connectors upon delivery.

Turning ranges of plug connectors



1	Power plug connector	2	Encoder plug connector
A	Attachment or output side of the motor	B	Rear side of the motor

Power plug connector features

Motor type	Size	Connection	Turning range	
			α	β
EZM	con.23	Quick lock	180°	40°

Encoder plug connector features

Motor type	Size	Connection	Turning range	
			α	β
EZM	con.17	Quick lock	195°	35°

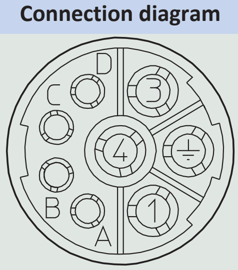
Notes

- The number after "con." indicates the approximate external thread diameter of the plug connector in mm (for example, con.23 designates a plug connector with an external thread diameter of about 23 mm).
- In turning range β, the power or encoder plug connectors can be turned only if doing so does not cause them to collide.

19.6.10.3 Connection assignment of the power plug connector

The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

Plug connector size con.23

Connection diagram	Pin	Connection	Color
	1	U phase	BK
	3	V phase	BU
	4	W phase	RD
	A	Brake +	RD
	B	Brake –	BK
	C	Temperature sensor +	
	D	Temperature sensor –	
	⏚	Grounding conductor	GNYE

19.6.10.4 Connection assignment of the encoder plug connector

The size and connection assignment of the encoder plug connectors depend on the model of encoder installed and the size of the motor. The colors of the connecting wires inside the motor are specified in accordance with IEC 60757.

EnDat 2.1/2.2 digital encoders, plug connector size con.17

Connection diagram	Pin	Connection	Color
	1	Clock +	VT
	2	Up sense	BNGN
	3		
	4		
	5	Data –	PK
	6	Data +	GY
	7		
	8	Clock –	YE
	9		
	10	0 V GND	WHGN
	11		
	12	Up +	BNGN

EnDat 2.2 digital encoder with battery buffering, plug connector size con.17

Connection diagram	Pin	Connection	Color
	1	Clock +	VT
	2	UBatt +	BU
	3	UBatt –	WH
	4		
	5	Data –	PK
	6	Data +	GY
	7		
	8	Clock –	YE
	9		
	10	0 V GND	WHGN
	11		
	12	Up +	BNGN
	UBatt+ = DC 3.6 V for encoder model EBI in combination with the AES option of STOBER drive controllers		

EnDat 2.1 encoder with sin/cos incremental signals, plug connector size con.17

Connection diagram	Pin	Connection	Color
	1	Up sense	BU
	2		
	3		
	4	0 V sense	WH
	5		
	6		
	7	Up +	BNGN
	8	Clock +	VT
	9	Clock –	YE
	10	0 V GND	WHGN
	11		
	12	B + (Sin +)	BUBK
	13	B – (Sin –)	RDBK
	14	Data +	GY
	15	A + (Cos +)	GNBK
	16	A – (Cos –)	YEBK
	17	Data –	PK

19.7 Project configuration

Information about drive project configuration can be found in the following chapters. For safe operation, be sure to comply with the following limit values during the project configuration for your drive:

- Permitted mechanical load of the shrink ring that connects the motor shaft to the threaded spindle (see the chapter Design of the screw drive)
- Permitted thermal load of the motor (see the chapter Calculation of the operating point)
- Permitted bearing load and achievable service life (see the chapter Calculation of the service life).

An explanation of the formula symbols can be found in Chapter [▸ 23.1].

19.7.1 Design of the screw drive

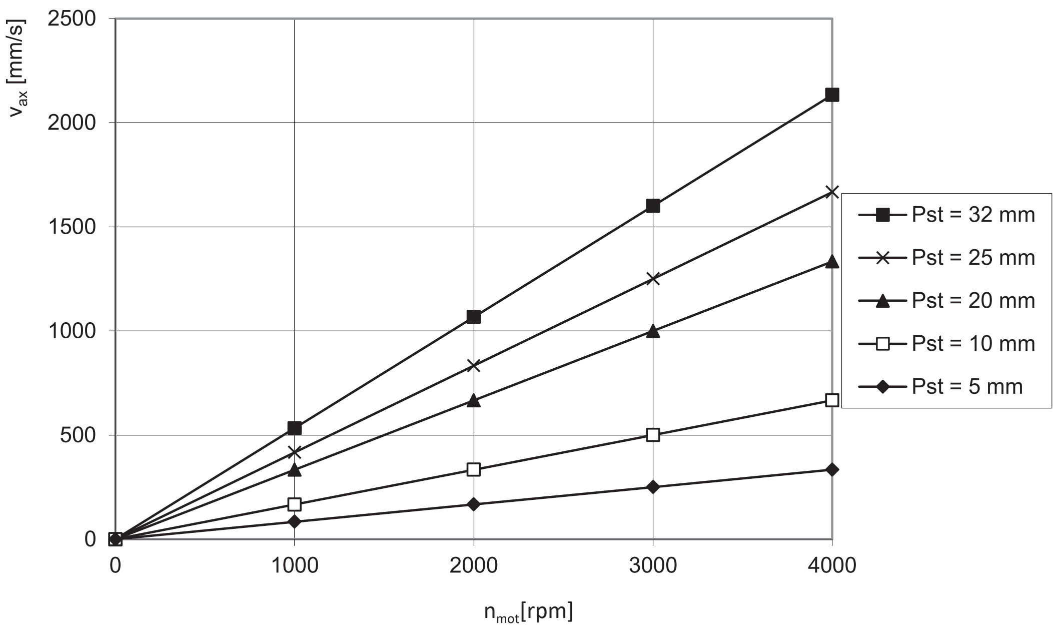
You can use the information below to select a suitable synchronous servo motor for your screw drive. For detailed design information on the screw drive, please contact the screw drive manufacturer.

Axial velocity

The axial velocity of a screw drive can be calculated as follows:

$$v_{ax} = \frac{n_{mot} \cdot P_{st}}{60}$$

The following diagram represents the characteristic curves of screw drives with common pitches that can be implemented with STOBER synchronous servo motors for screw drives.



Axial force

The axial force of a screw drive can be calculated as follows:

$$F_{ax} = \frac{2000 \cdot M \cdot \pi \cdot \eta_{gt}}{P_{st}}$$

You can use the following table to select a motor type / screw drive pitch combination. The axial forces in the table are calculated for M_0 and η_{gt} = 0.9.

	M_0 [Nm]	F_{ax0} P_{st}=5 [N]	F_{ax0} P_{st}=10 [N]	F_{ax0} P_{st}=15 [N]	F_{ax0} P_{st}=20 [N]	F_{ax0} P_{st}=25 [N]	F_{ax0} P_{st}=32 [N]
EZM501U	4.3	4807	2403	1602	1202	961	751
EZM502U	7.6	8539	4269	2846	2135	1708	1334
EZM503U	10.6	11988	5994	3996	2997	2398	1873
EZM511U	4.3	4807	2403	1602	1202	961	751
EZM512U	7.6	8539	4269	2846	2135	1708	1334
EZM513U	10.6	11988	5994	3996	2997	2398	1873
EZM701U	7.3	8256	4128	2752	2064	1651	1290
EZM702U	12.9	14590	7295	4863	3647	2918	2280
EZM703U	18.9	21375	10688	7125	5344	4275	3340
EZM711U	7.3	8256	4128	2752	2064	1651	1290
EZM712U	13.0	14646	7323	4882	3662	2929	2288
EZM713U	18.9	21375	10688	7125	5344	4275	3340

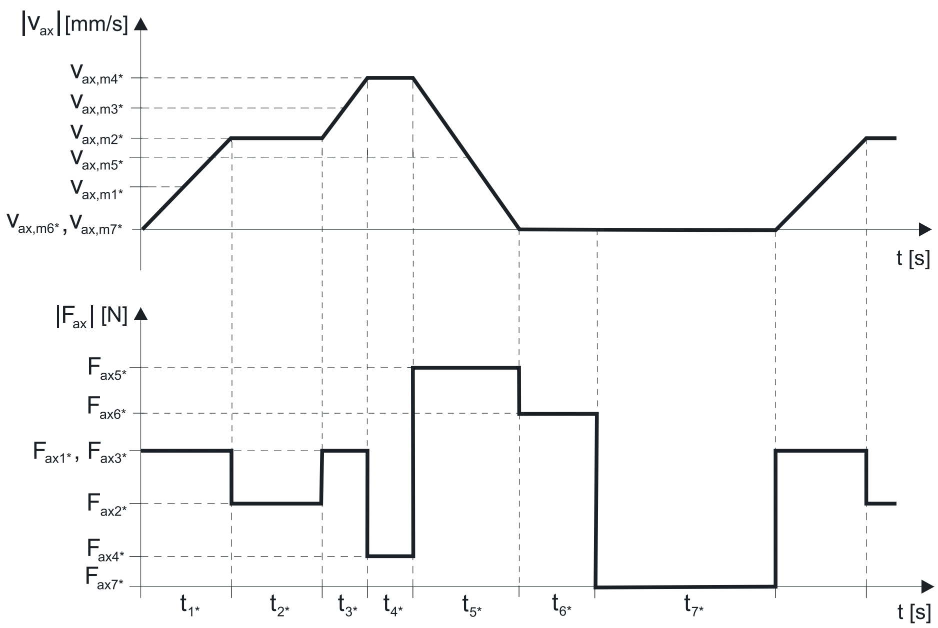
If the synchronous servo motor at absolute standstill (n_{mot}=0) must hold the load using its torque, the following formula defines the permitted axial force:

$$F_{ax0,abs} \leq 0.6 \cdot \frac{2000 \cdot M_0 \cdot \pi \cdot \eta_{gt}}{P_{st}}$$

19.7.2 Calculation of the operating point

In this chapter, you can find information needed to calculate the operating point.

The following calculations refer to a representation of the power delivered at the motor shaft based on the following example:



Calculation of the actual average axial velocity

$$v_{ax,m*} = \frac{|v_{ax,m1*}| \cdot t_{1*} + \ldots + |v_{ax,mn*}| \cdot t_{n*}}{t_{1*} + \ldots + t_{n*}}$$

If t_{1*} + ... + t_{6*} ≥ 6 min, determine $v_{ax,m*}$ without the rest phase t_{7*}.

Calculation of the actual average speed

$$n_{m*} = \frac{v_{ax,m*} \cdot 60}{P_{st}}$$

Check the condition $n_{m*} \leq n_N$ and adjust the parameters as needed.

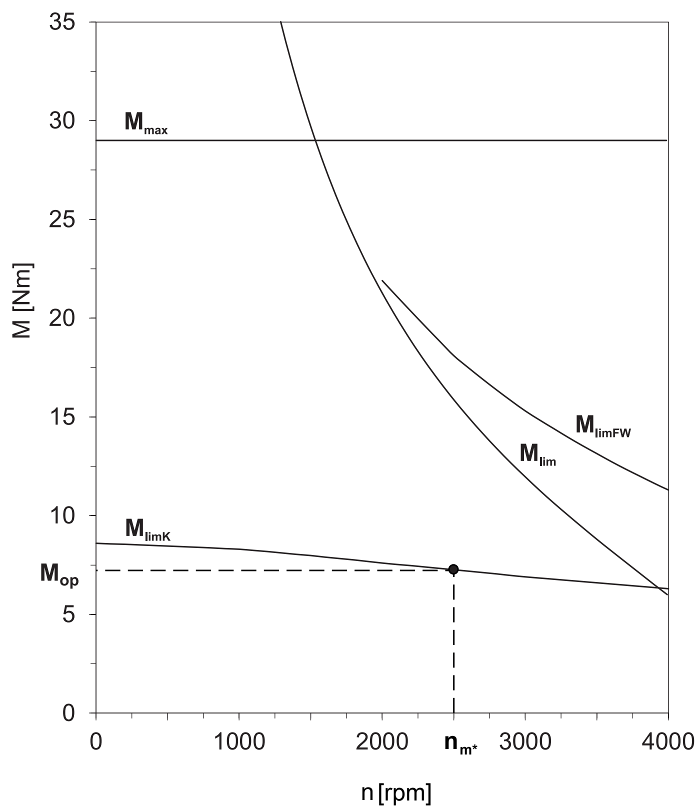
Calculation of the actual effective axial force

$$F_{ax,eff*} = \sqrt{\frac{t_{1*} \cdot F_{ax1*}^2 + \ldots + t_{n*} \cdot F_{ax,n*}^2}{t_{1*} + \ldots + t_{n*}}}$$

Calculation of the actual effective torque

$$M_{eff*} = \frac{F_{ax,eff*} \cdot P_{st}}{2000 \cdot \pi \cdot \eta_{gt}}$$

You can find the value for the torque of the motor at operating point M_{op} with the determined average input speed n_{m*} in the motor characteristic curve in the chapter [▶ 19.3]. In doing so, keep the size of the motor in mind. The figure below shows an example of reading the torque M_{op} of a motor at the operating point.



Check the condition: $M_{eff*} \leq M_{op}$ and adjust the parameters as needed.

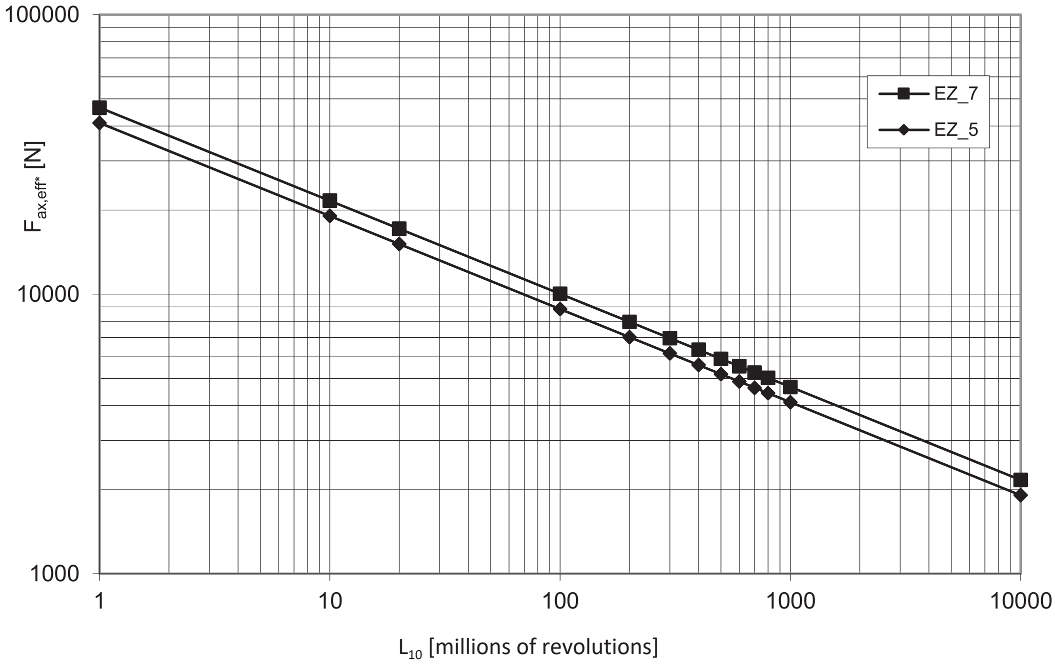
19.7.3 Calculation of the bearing service life

The service life of the axial angular contact ball bearing of a STOBER synchronous servo motor for screw drives is generally longer than the service life of the screw drive bearing.

You can calculate the service life of the axial angular contact ball bearing as follows (the value for C_{dyn} can be found in the "General features" chapter):

$$L_{10} = \left(\frac{C_{dyn}}{F_{ax,eff^*}} \right)^3 \cdot 10^6$$

The following diagram shows the bearing service life L_{10}.



$$L_{10h} = \frac{L_{10}}{n_{m^*} \cdot 60}$$

19.8 Further information

19.8.1 Directives and standards

STOBER synchronous servo motors meet the requirements of the following directives and standards:

- (Low Voltage) Directive 2014/35/EU
- EN 60034-1:2010 + Cor.:2010
- EN 60034-5:2001 + A1:2007
- EN 60034-6:1993

19.8.2 Identifiers and test symbols

STOBER synchronous servo motors have the following identifiers and test symbols:

CE mark: The product meets the requirements of EU directives.

UKCA mark: The product meets the requirements of UK directives.

cURus test symbol "Servo and Stepper Motors – Component"; registered under UL number E488992 with Underwriters Laboratories USA (optional).

19.8.3 Additional documentation

Additional documentation related to the product can be found at
http://www.stoeber.de/en/downloads/

Enter the ID of the documentation in the Search field.

Documentation	ID
Operating manual for EZ synchronous servo motors	443032_en