9.3 Dimensional drawings

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

There is a dimensional drawing for every possible shaft/housing design, each with the tables for gear unit dimensions, motor dimensions and geared motor dimensions.

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/.

Combination options and the dimensions of forced ventilated geared motors can also be found at https://configurator.stoeber.de/en-US/.

Tolerances

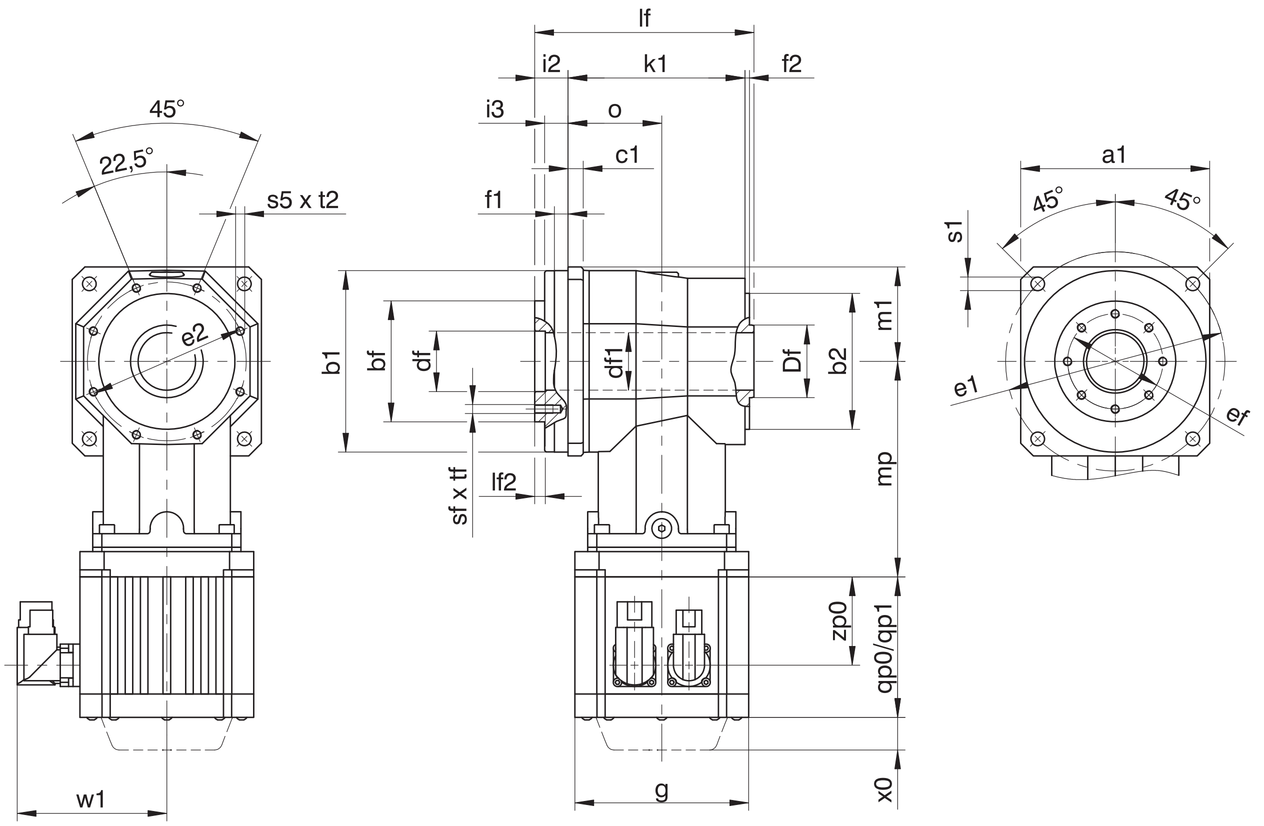
Solid shaft	Tolerance
Shaft ∅ fit ≤ 50 mm	DIN 748-1, ISO k6
Shaft ∅ fit > 50 mm	DIN 748-1, ISO m6
Feather keys	DIN 6885-1, high form A

Hollow shaft	Tolerance
Hollow shaft hole fit	ISO H7
Feather keys	DIN 6885-1, high form

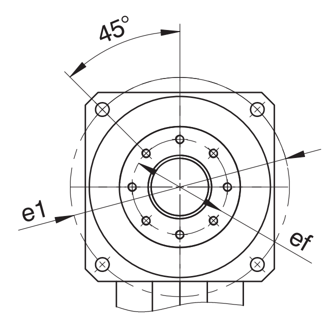
Centering holes in solid shafts in accordance with DIN 332-2, DR shape

Thread size	M8	M12	M16
Thread depth	19	28	36

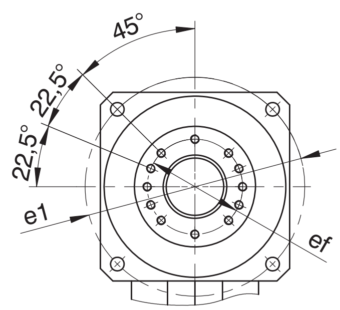
9.3.1 F shaft design (flange hollow shaft)



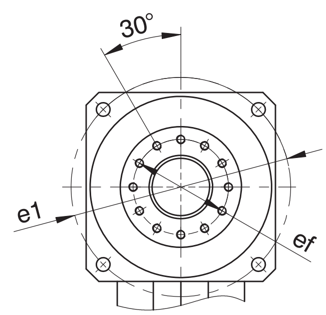
KS4



KS5



KS7



qp0	Applies to motors without brake.
qp1	Applies to motors with brake.
x0	EZ2: Applies only to motors with brake and encoders using an optical or inductive measuring method EZ3 – EZ8: Applies to encoders using an optical measuring method
w1	Different for the One Cable Solution (OCS), see the chapter [▷ 17.4]

Dimensions of gear units

Type	□a1	∅b1	∅b2	bf	c1	∅df	∅df1	∅Df	∅e1	∅e2	ef	f1	f2	i2	i3	k1	lf	lf2	m1	o	∅s1	s5	sf	t2	tf
KS402	101	95_{h6}	75_{h6}	63_{h7}	10	31.5^{H7}	30	40_{d9}	120	88	50	8	3	20	14.0	104	127	6.0	50.5	53	6.6	M5	M6	9	11
KS403	101	95_{h6}	75_{h6}	63_{h7}	10	31.5^{H7}	30	40_{d9}	120	88	50	8	3	20	14.0	104	127	6.0	50.5	53	6.6	M5	M6	9	11
KS502	125	120_{h6}	90_{h6}	80_{h7}	10	40.0^{H7}	38	48_{d9}	145	105	63	9	3	22	15.5	120	145	6.5	62.5	62	9.0	M6	M6	11	12
KS503	125	120_{h6}	90_{h6}	80_{h7}	10	40.0^{H7}	38	48_{d9}	145	105	63	9	3	22	15.5	120	145	6.5	62.5	62	9.0	M6	M6	11	12
KS702	155	150_{h6}	110_{h6}	100_{h7}	15	50.0^{H7}	49	60_{d9}	180	130	80	10	3	27	20.0	148	178	7.0	77.5	78	11.0	M8	M8	14	15
KS703	155	150_{h6}	110_{h6}	100_{h7}	15	50.0^{H7}	49	60_{d9}	180	130	80	10	3	27	20.0	148	178	7.0	77.5	78	11.0	M8	M8	14	15

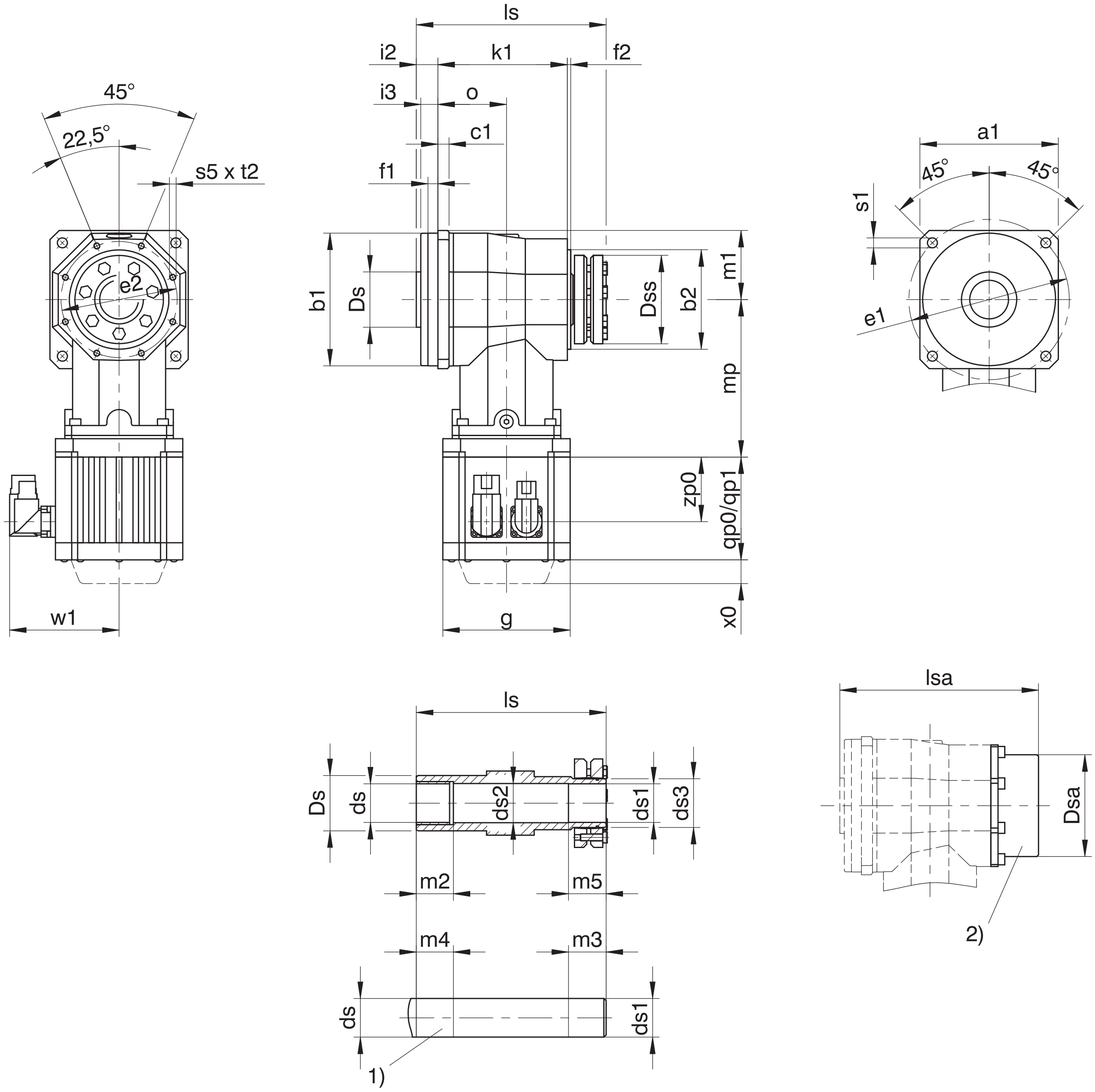
Dimensions of motors

Type	□g	qp0	qp1	w1	x0	zp0
EZ202U	55	141	150.0	47.0	25	86.0
EZ203U	55	159	168.0	47.0	25	104.0
EZ301U	72	90	130.0	55.5	21	54.5
EZ302U	72	112	152.0	55.5	21	76.5
EZ303U	72	134	174.0	55.5	21	98.5
EZ401U	98	98	146.5	91.0	22	56.0
EZ402U	98	123	171.5	91.0	22	81.0
EZ404U	98	173	221.5	91.0	22	131.0
EZ501U	115	93	147.5	100.0	22	58.5
EZ502U	115	118	172.5	100.0	22	83.5
EZ503U	115	143	197.5	100.0	22	108.5
EZ505U	115	193	247.5	100.0	22	158.5
EZ701U	145	102	161.0	115.0	22	64.0
EZ702U	145	127	186.0	115.0	22	89.0
EZ703U	145	152	211.0	115.0	22	114.0
EZ705U	145	207	266.0	134.0	22	165.0
EZ802U	190	197	274.0	156.5	22	143.0

Dimensions of geared motors

Type	EZ2	EZ3	EZ4	EZ5	EZ7	EZ8
	mp	mp	mp	mp	mp	mp
KS402	–	124.0	120.5	123.0	–	–
KS403	150.5	164.0	–	–	–	–
KS502	–	–	140.0	142.5	148.5	–
KS503	–	192.0	188.5	191.0	–	–
KS702	–	–	–	167.0	173.0	188.0
KS703	–	–	222.5	225.0	231.0	–

9.3.2 S shaft design (hollow shaft with shrink disk)



qp0	Applies to motors without brake.	qp1	Applies to motors with brake.
x0	EZ2: Applies only to motors with brake and encoders using an optical or inductive measuring method EZ3 – EZ8: Applies to encoders using an optical measuring method	w1	Different for the One Cable Solution (OCS), see the chapter [▷ 17.4]
1)	Machine shaft: The dimension ls must be met.	2)	Cover (optional)

Dimensions of gear units

Type	□a1	∅b1	∅b2	c1	∅ds	∅ds1	∅ds2	∅ds3	∅Ds	∅Dsa	∅Dss	∅e1	∅e2	f1	f2	i2	i3	k1	ls	lsa	m1	m2	m3	m4	m5	o	∅s1	s5	t2
KS402	101	95_{h6}	75_{h6}	10	25_{h6}	25_{h6}^{H7}	25.5	30	40	72	60	120	88	8	3	18.0	14.0	104	151.0	158.0	50.5	20	34	25	29	53	6.6	M5	9
KS403	101	95_{h6}	75_{h6}	10	25_{h6}	25_{h6}^{H7}	25.5	30	40	72	60	120	88	8	3	18.0	14.0	104	151.0	158.0	50.5	20	34	25	29	53	6.6	M5	9
KS502	125	120_{h6}	90_{h6}	10	35_{h6}	35_{h6}^{H7}	35.5	44	50	92	80	145	105	9	3	19.5	15.5	120	171.5	179.5	62.5	30	39	35	34	62	9.0	M6	11
KS503	125	120_{h6}	90_{h6}	10	35_{h6}	35_{h6}^{H7}	35.5	44	50	92	80	145	105	9	3	19.5	15.5	120	171.5	179.5	62.5	30	39	35	34	62	9.0	M6	11
KS702	155	150_{h6}	110_{h6}	15	45_{h6}	45_{h6}^{H7}	45.5	55	65	112	100	180	130	10	3	24.0	20.0	148	211.0	218.0	77.5	40	42	45	37	78	11.0	M8	14
KS703	155	150_{h6}	110_{h6}	15	45_{h6}	45_{h6}^{H7}	45.5	55	65	112	100	180	130	10	3	24.0	20.0	148	211.0	218.0	77.5	40	42	45	37	78	11.0	M8	14

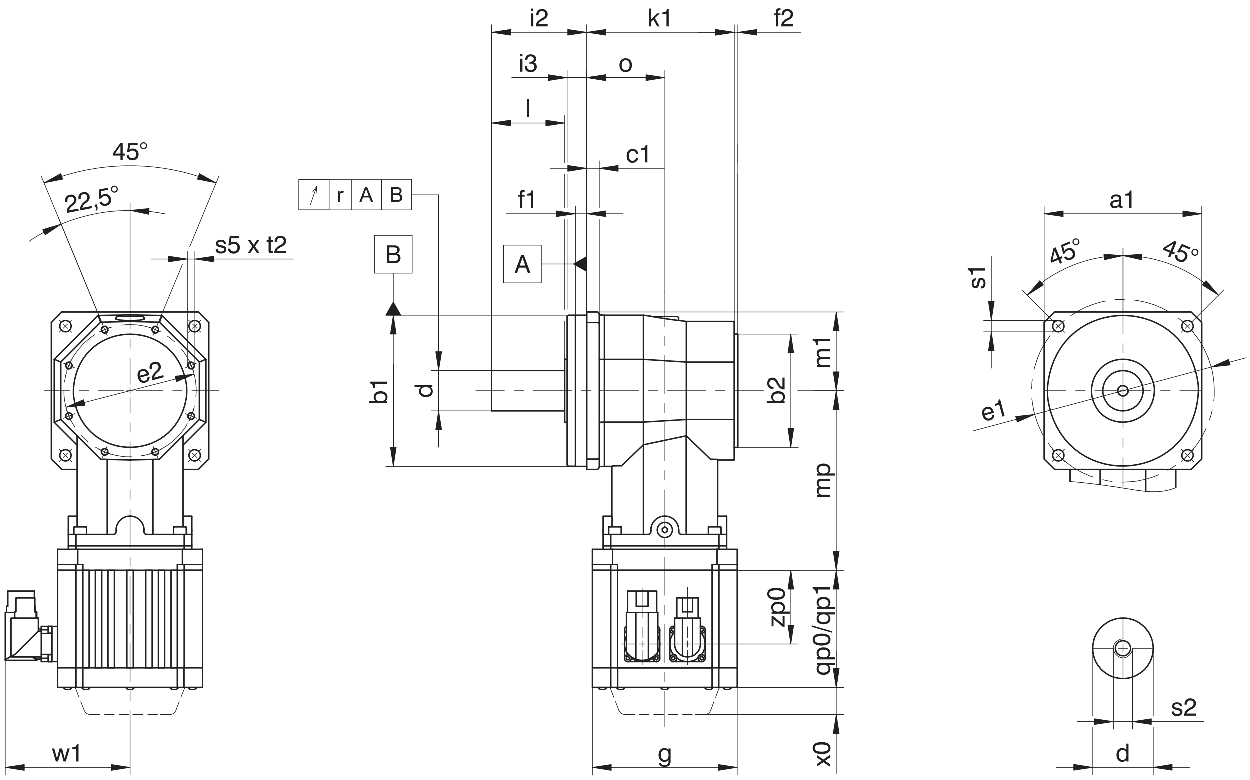
Dimensions of motors

Type	□g	qp0	qp1	w1	x0	zp0
EZ202U	55	141	150.0	47.0	25	86.0
EZ203U	55	159	168.0	47.0	25	104.0
EZ301U	72	90	130.0	55.5	21	54.5
EZ302U	72	112	152.0	55.5	21	76.5
EZ303U	72	134	174.0	55.5	21	98.5
EZ401U	98	98	146.5	91.0	22	56.0
EZ402U	98	123	171.5	91.0	22	81.0
EZ404U	98	173	221.5	91.0	22	131.0
EZ501U	115	93	147.5	100.0	22	58.5
EZ502U	115	118	172.5	100.0	22	83.5
EZ503U	115	143	197.5	100.0	22	108.5
EZ505U	115	193	247.5	100.0	22	158.5
EZ701U	145	102	161.0	115.0	22	64.0
EZ702U	145	127	186.0	115.0	22	89.0
EZ703U	145	152	211.0	115.0	22	114.0
EZ705U	145	207	266.0	134.0	22	165.0
EZ802U	190	197	274.0	156.5	22	143.0

Dimensions of geared motors

Type	EZ2	EZ3	EZ4	EZ5	EZ7	EZ8
	mp	mp	mp	mp	mp	mp
KS402	–	124.0	120.5	123.0	–	–
KS403	150.5	164.0	–	–	–	–
KS502	–	–	140.0	142.5	148.5	–
KS503	–	192.0	188.5	191.0	–	–
KS702	–	–	–	167.0	173.0	188.0
KS703	–	–	222.5	225.0	231.0	–

9.3.3 G shaft design (solid shaft without feather key)



qp0	Applies to motors without brake.	qp1	Applies to motors with brake.
x0	EZ2: Applies only to motors with brake and encoders using an optical or inductive measuring method EZ3 – EZ8: Applies to encoders using an optical measuring method	w1	Different for the One Cable Solution (OCS), see the chapter [▹ 17.4]

Dimensions of gear units

Type	□a1	Øb1	Øb2	c1	Ød	Øe1	Øe2	f1	f2	i2	i3	l	k1	m1	o	r	Øs1	s2	s5	t2
KS402	101	95_{h6}	75_{h6}	10	22_{k6}	120	88	8	3	52.0	14.0	36	104	50.5	53	0.020	6.6	M8	M5	9
KS403	101	95_{h6}	75_{h6}	10	22_{k6}	120	88	8	3	52.0	14.0	36	104	50.5	53	0.020	6.6	M8	M5	9
KS502	125	120_{h6}	90_{h6}	10	32_{k6}	145	105	9	3	75.5	15.5	58	120	62.5	62	0.020	9.0	M12	M6	11
KS503	125	120_{h6}	90_{h6}	10	32_{k6}	145	105	9	3	75.5	15.5	58	120	62.5	62	0.020	9.0	M12	M6	11
KS702	155	150_{h6}	110_{h6}	15	40_{k6}	180	130	10	3	105.0	20.0	82	148	77.5	78	0.025	11.0	M16	M8	14
KS703	155	150_{h6}	110_{h6}	15	40_{k6}	180	130	10	3	105.0	20.0	82	148	77.5	78	0.025	11.0	M16	M8	14

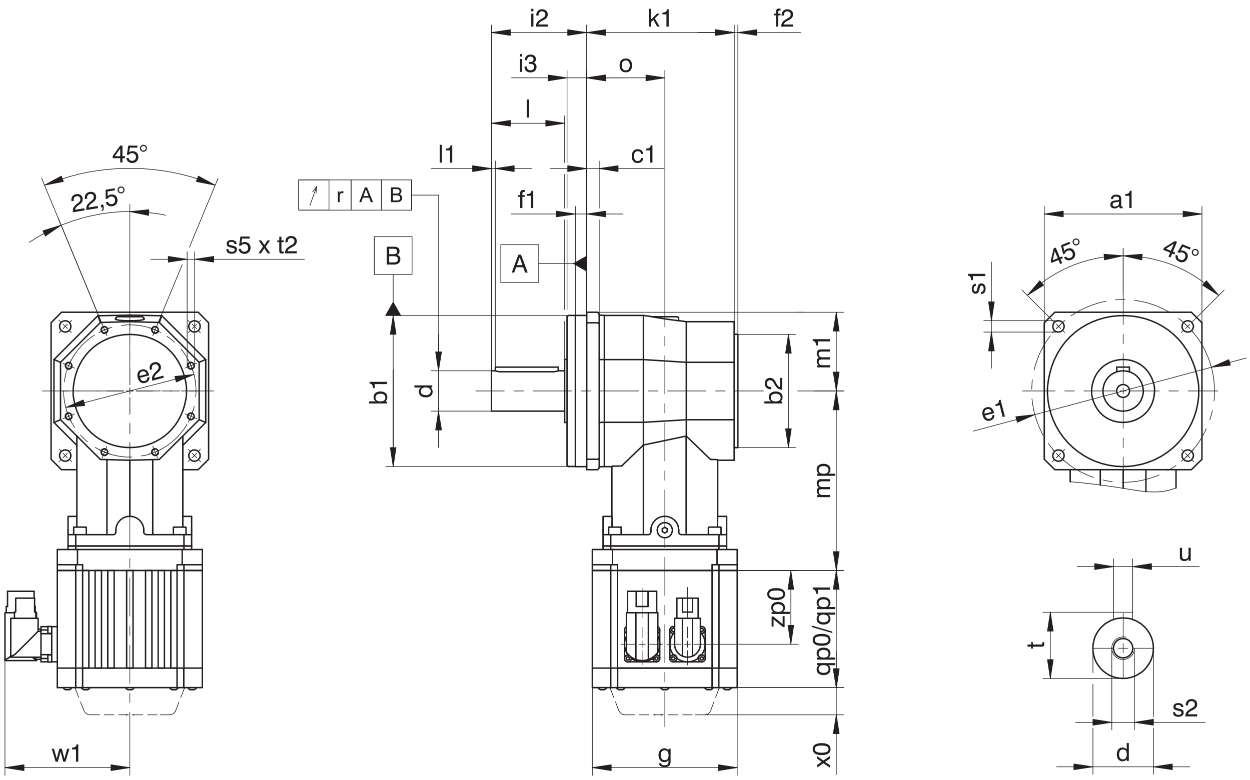
Dimensions of motors

Type	□g	qp0	qp1	w1	x0	zp0
EZ202U	55	141	150.0	47.0	25	86.0
EZ203U	55	159	168.0	47.0	25	104.0
EZ301U	72	90	130.0	55.5	21	54.5
EZ302U	72	112	152.0	55.5	21	76.5
EZ303U	72	134	174.0	55.5	21	98.5
EZ401U	98	98	146.5	91.0	22	56.0
EZ402U	98	123	171.5	91.0	22	81.0
EZ404U	98	173	221.5	91.0	22	131.0
EZ501U	115	93	147.5	100.0	22	58.5
EZ502U	115	118	172.5	100.0	22	83.5
EZ503U	115	143	197.5	100.0	22	108.5
EZ505U	115	193	247.5	100.0	22	158.5
EZ701U	145	102	161.0	115.0	22	64.0
EZ702U	145	127	186.0	115.0	22	89.0
EZ703U	145	152	211.0	115.0	22	114.0
EZ705U	145	207	266.0	134.0	22	165.0
EZ802U	190	197	274.0	156.5	22	143.0

Dimensions of geared motors

Type	EZ2 mp	EZ3 mp	EZ4 mp	EZ5 mp	EZ7 mp	EZ8 mp
KS402	–	124.0	120.5	123.0	–	–
KS403	150.5	164.0	–	–	–	–
KS502	–	–	140.0	142.5	148.5	–
KS503	–	192.0	188.5	191.0	–	–
KS702	–	–	–	167.0	173.0	188.0
KS703	–	–	222.5	225.0	231.0	–

9.3.4 P shaft design (solid shaft with feather key)



qp0	Applies to motors without brake.	qp1	Applies to motors with brake.
x0	EZ2: Applies only to motors with brake and encoders using an optical or inductive measuring method EZ3 – EZ8: Applies to encoders using an optical measuring method	w1	Different for the One Cable Solution (OCS), see the chapter [▷ 17.4]

Dimensions of gear units

Type	□a1	Øb1	Øb2	c1	Ød	Øe1	Øe2	f1	f2	i2	i3	l	l1	k1	m1	o	r	Øs1	s2	s5	t	t2	u
KS402	101	95_{h6}	75_{h6}	10	22_{k6}	120	88	8	3	52.0	14.0	36	3	104	50.5	53	0.020	6.6	M8	M5	24.5	9	A6×6×28
KS403	101	95_{h6}	75_{h6}	10	22_{k6}	120	88	8	3	52.0	14.0	36	3	104	50.5	53	0.020	6.6	M8	M5	24.5	9	A6×6×28
KS502	125	120_{h6}	90_{h6}	10	32_{k6}	145	105	9	3	75.5	15.5	58	3	120	62.5	62	0.020	9.0	M12	M6	35.0	11	A10×8×50
KS503	125	120_{h6}	90_{h6}	10	32_{k6}	145	105	9	3	75.5	15.5	58	3	120	62.5	62	0.020	9.0	M12	M6	35.0	11	A10×8×50
KS702	155	150_{h6}	110_{h6}	15	40_{k6}	180	130	10	3	105.0	20.0	82	4	148	77.5	78	0.025	11.0	M16	M8	43.0	14	A12×8×70
KS703	155	150_{h6}	110_{h6}	15	40_{k6}	180	130	10	3	105.0	20.0	82	4	148	77.5	78	0.025	11.0	M16	M8	43.0	14	A12×8×70

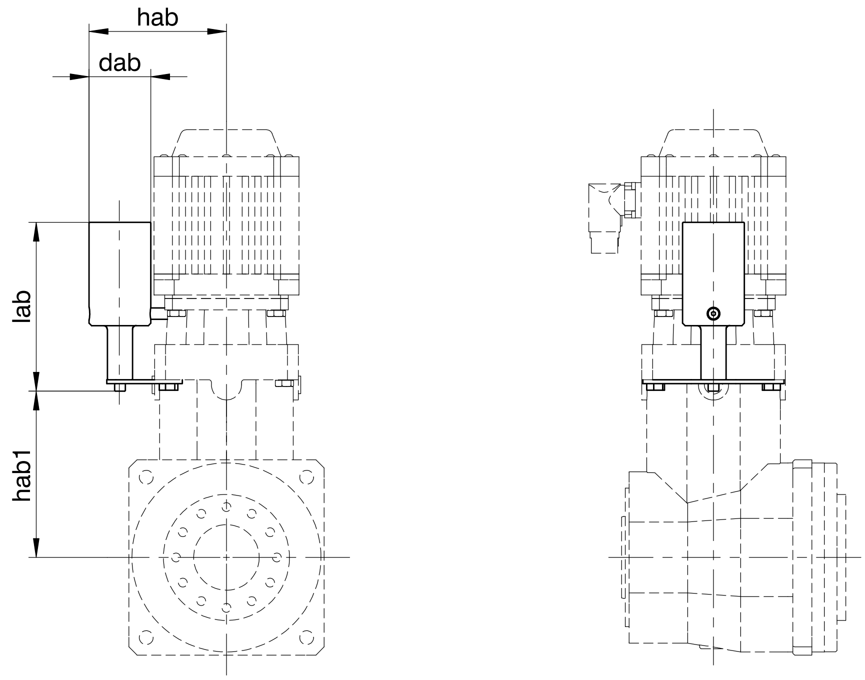
Dimensions of motors

Type	□g	qp0	qp1	w1	x0	zp0
EZ202U	55	141	150.0	47.0	25	86.0
EZ203U	55	159	168.0	47.0	25	104.0
EZ301U	72	90	130.0	55.5	21	54.5
EZ302U	72	112	152.0	55.5	21	76.5
EZ303U	72	134	174.0	55.5	21	98.5
EZ401U	98	98	146.5	91.0	22	56.0
EZ402U	98	123	171.5	91.0	22	81.0
EZ404U	98	173	221.5	91.0	22	131.0
EZ501U	115	93	147.5	100.0	22	58.5
EZ502U	115	118	172.5	100.0	22	83.5
EZ503U	115	143	197.5	100.0	22	108.5
EZ505U	115	193	247.5	100.0	22	158.5
EZ701U	145	102	161.0	115.0	22	64.0
EZ702U	145	127	186.0	115.0	22	89.0
EZ703U	145	152	211.0	115.0	22	114.0
EZ705U	145	207	266.0	134.0	22	165.0
EZ802U	190	197	274.0	156.5	22	143.0

Dimensions of geared motors

Type	EZ2 mp	EZ3 mp	EZ4 mp	EZ5 mp	EZ7 mp	EZ8 mp
KS402	–	124.0	120.5	123.0	–	–
KS403	150.5	164.0	–	–	–	–
KS502	–	–	140.0	142.5	148.5	–
KS503	–	192.0	188.5	191.0	–	–
KS702	–	–	–	167.0	173.0	188.0
KS703	–	–	222.5	225.0	231.0	–

9.3.5 Oil expansion tank



Dimensions

Type	EZ2				EZ3				EZ4				EZ5			
	dab	lab	hab	hab1	dab	lab	hab	hab1	dab	lab	hab	hab1	dab	lab	hab	hab1
KS403	34	100	74.5	85	34	100	74.5	85	–	–	–	–	–	–	–	–
KS503	–	–	–	–	39	122	92.0	105	39	122	92.0	105	–	–	–	–
KS703	–	–	–	–	–	–	–	–	49	134	109.5	132	49	134	109.5	132

More information can be found in Chapter [▸ 9.6.5]

9.4 Type designation

This chapter shows you an explanation of the type designation with the associated options.

Additional ordering information not included in the type designation can be found at the end of the chapter.

Example code

KS	5	0	2	G	F	0200	EZ401U

Explanation

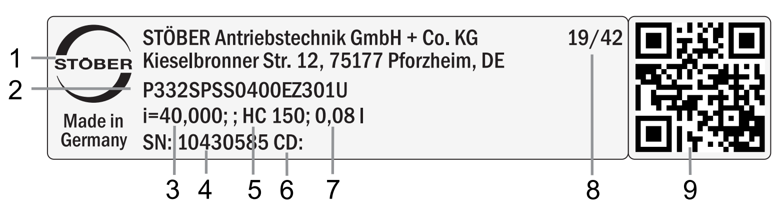
Code	Designation	Design
KS	Type	Right-angle servo gear unit
5	Size	5 (example)
0	Generation	Generation 0
2	Stages	Two-stage
3		Three-stage
F	Shaft	Flange hollow shaft
S		Hollow shaft with shrink ring
G		Solid shaft without feather key
P		Solid shaft with feather key
F	Housing	Standard
0200	Transmission ratio (i x 10)	i = 20 (example)
EZ401U	Motor	EZ synchronous servo motor

To complete the type designation, also specify the following in your order:

- For a detailed type designation of the motor, see the chapter [17]
- Mounting position, see the chapter [9.5.3]
- Radial shaft seal rings at the output made of NBR or FKM (option), see the chapter [9.6.4]
- Position of the plug connectors, see the chapter [9.5.5]
- Attachment of oil expansion tank (option) on gear unit side 1 or 2 (required without exception for three-stage gear units in mounting position EL5), see the chapter [9.6.5]

9.4.1 Nameplate

An example geared motor nameplate is explained in the figure below.



Code	Designation
1	Name of manufacturer
2	Type designation
3	Gear ratio of the gear unit
4	Serial number of the gear unit
5	Lubricant specification
6	Customer-specific data
7	Lubricant fill volume
8	Date of manufacture (year/calendar week)
9	QR code (link to product information)

9.4.1.1 Supporting documents

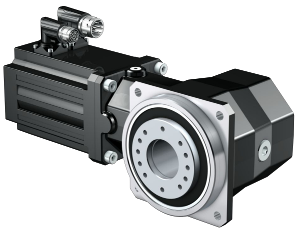
You can view or download supporting documents for the product by reading off the serial number on the nameplate of the product and entering it at the following address online:
https://id.stober.com

Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

9.5 Product description

9.5.1 Input options

EZ synchronous servo motor



Catalog ID 442437_en

The corresponding catalogs can be found at http://www.stoeber.de/en/downloads/

Enter the ID of the catalog in the Search term field.

9.5.2 Installation conditions

Take care to align the machine shaft with the gear unit hollow shaft when attaching the gear unit.

Maximum deviation ≤ 0.03 mm.

Hollow shaft with shrink ring

The tolerance of the hollow shaft hole is ISO H7.

The machine shaft must be ISO h6.

Select a material for the machine shaft with a permitted surface pressure of $p \geq 325$ N/mm^2.

Possible materials:

- C45E +QT
- 42CrMo4

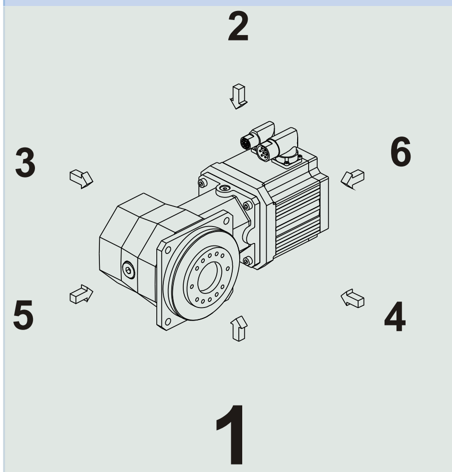
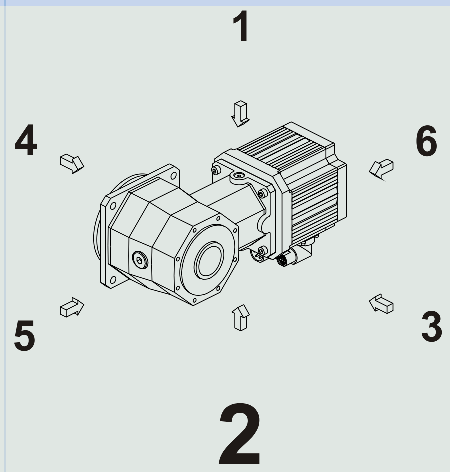
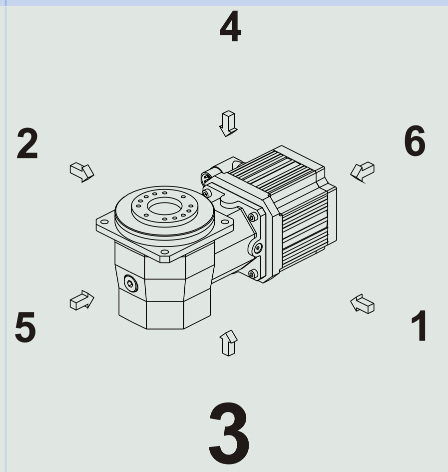
The torque and force values listed in this catalog are valid under the following conditions:

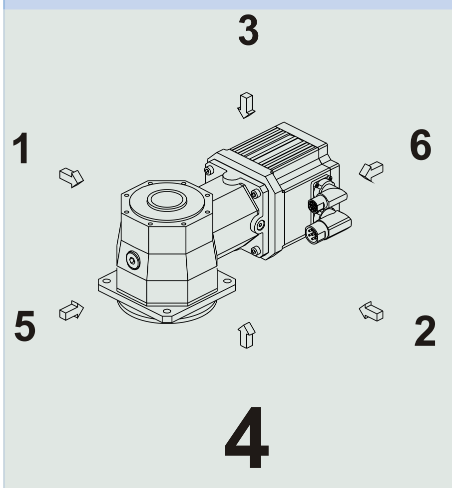
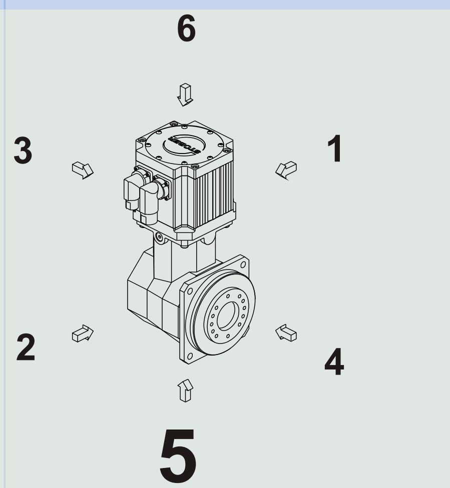
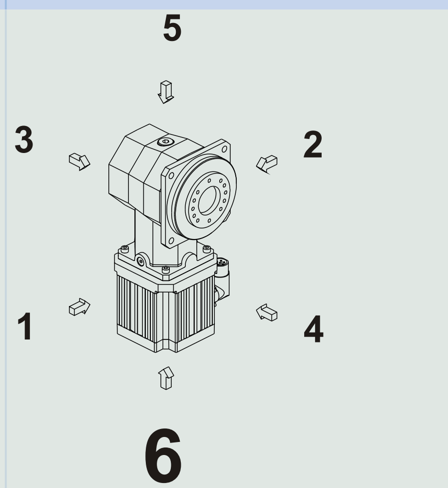
- When the flange hollow shaft and gear housing are fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot øb1. The machine-side fit must be H7.
- When the flange hollow shaft is adjusted using the connecting element at pilot øbf or ødf

9.5.3 Mounting positions

The following table shows the standard mounting positions.

The numbers identify the gear unit sides. The mounting position is defined by the gear side facing downwards.

EL1	EL2	EL3
		

EL4	EL5	EL6
		

Since the lubricant filling volume of the gear unit depends on the mounting position, the mounting position must be specified when ordering.

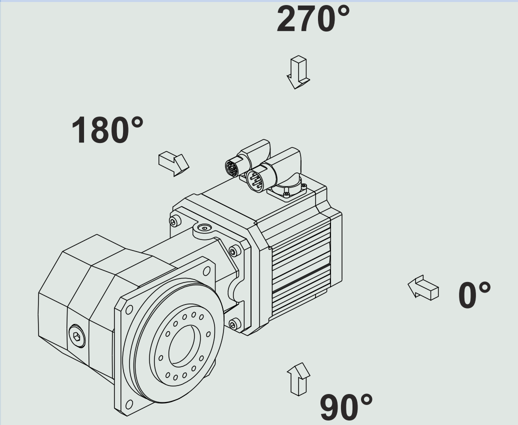
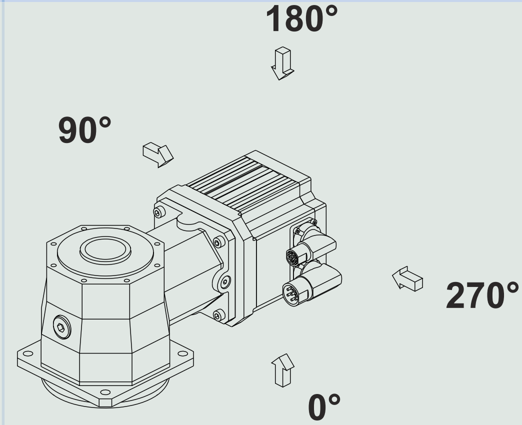
9.5.4 Lubricants

STOBER fills the gear units with the amount and type of lubricant specified on the nameplate. The filling volume and the structure of the gear units depend on the mounting position.

Only install the gear units in the intended mounting position! Reposition the gear units only after consulting STOBER. Otherwise, STOBER assumes no liability for the gear units.

You will receive lubricants for use in the food industry upon request.

9.5.5 Position of the plug connectors

Mounting position EL1 Plug connector in 270° position (standard)	**Mounting position EL4** Plug connector in 270° position (standard)
	

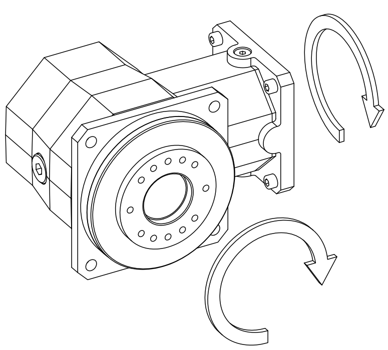
Indicate variations for your geared motor in the order.

Note that the plug connector position rotates along with the geared motor if the geared motor is in another mounting position.

9.5.6 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 90 °C
Paint	Black RAL 9005
Explosion-proof design in accordance with (ATEX) Directive 2014/34/EU (optional)	Not available
Efficiency:	
η_{get} two-stage	95%
η_{get} three-stage	93%
Protection class:[1]	
Gear unit	IP65
Motor	IP56, optionally IP66

9.5.7 Direction of rotation



The pictures show mounting position EL1.

[1] Observe the protection class of all the components.

9.6 Project configuration

Project your drives using our SERVOsoft designing software. Download SERVOsoft for free at https://www.stoeber.de/en/ServoSoft.

It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

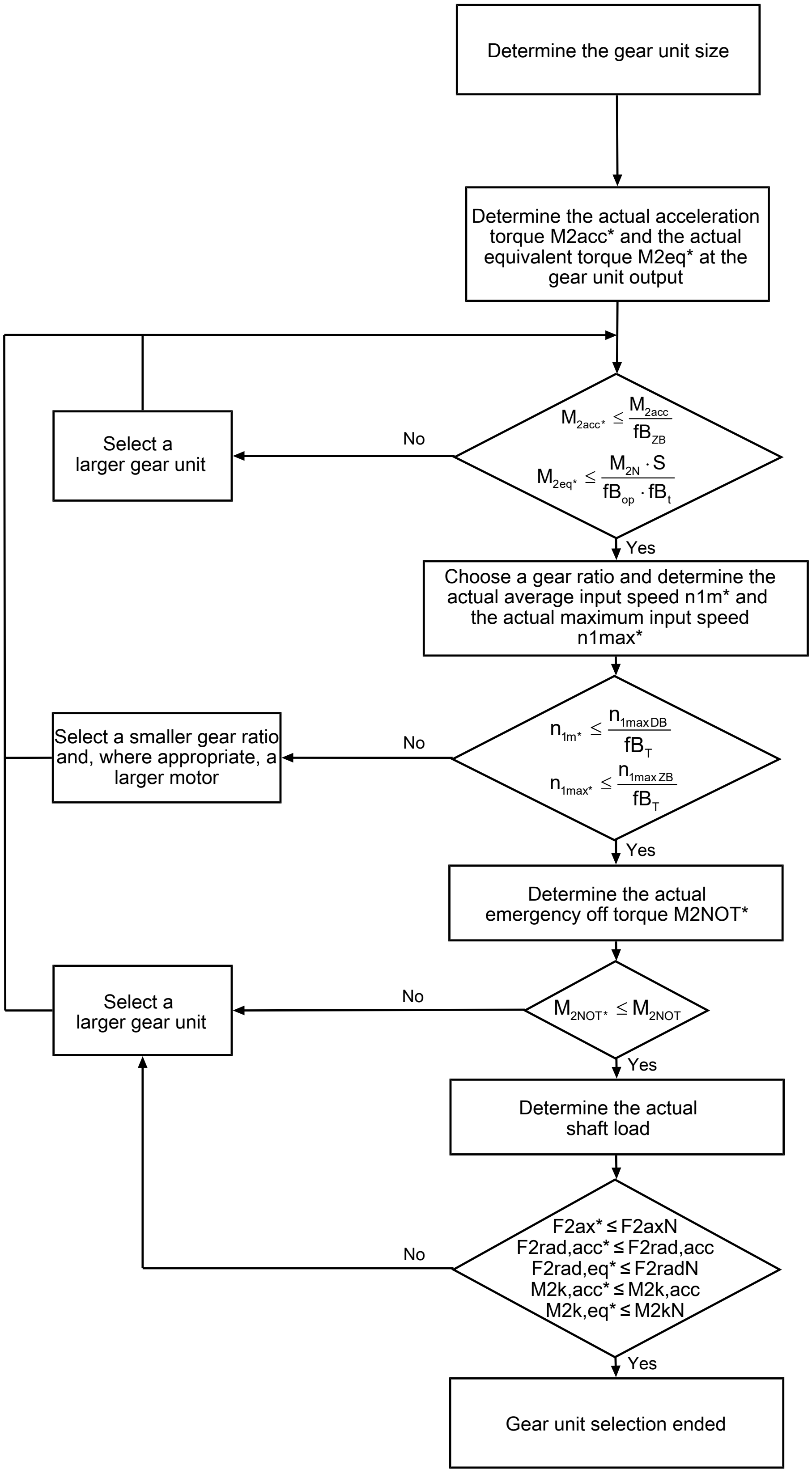
In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

An explanation of the formula symbols can be found in Chapter [▸ 20.1].

The formula symbols for values actually present in the application are marked with *.

9.6.1 Drive selection

Drive selection for gear units

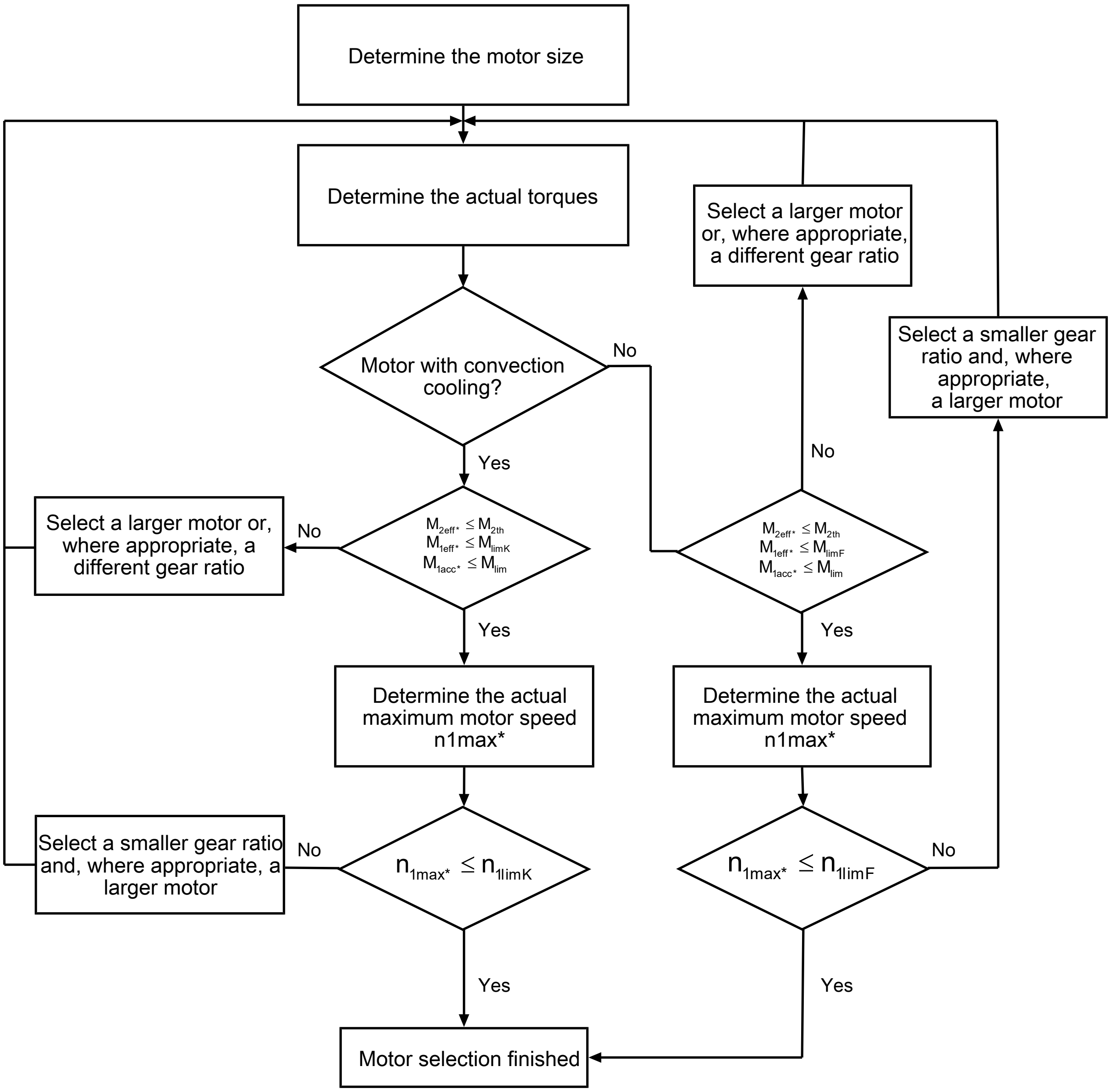


Calculate the forces and tilting torques in the chapter Permitted shaft loads.

Refer to the selection tables for the values for i, n_{1maxDB}, n_{1maxZB}, M_{2acc}, M_{2NOT}, M_{2N} and S.

The values for fB_T, fB_{op}, fB_t and fB_{ZB} can be found in the corresponding tables in this chapter.

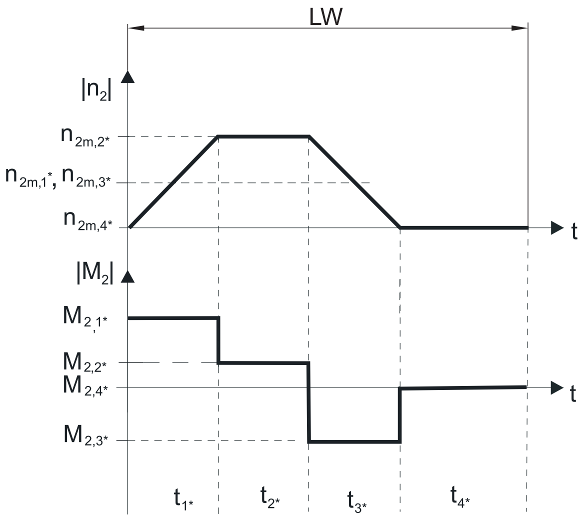
Drive selection for motors



The value for M_{lim}, M_{limK}, M_{limF}, n_{1limK} and n_{1limF} can be found in the motor characteristic curve in the chapter [▷ 17.3]. Note the size, nominal speed n_N and cooling type of the motor.

Example of cyclic operation

The following calculations are based on a representation of the power taken from the output based in accordance with the following example:



Calculation of the actual maximum acceleration torques

$$M_{2acc*} = J_{tot} \cdot \frac{\Delta n_2}{9{,}55 \cdot \Delta t} + M_{L*}$$

$$M_{1acc*} = \frac{M_{2acc*}}{i \cdot \eta_{get}} + J_1 \cdot \frac{\Delta n_1}{9{,}55 \cdot \Delta t}$$

Calculation of the actual average input speed

$$n_{1m*} = n_{2m*} \cdot i$$

$$n_{2m*} = \frac{|n_{2m,1*}| \cdot t_{1*} + \ldots + |n_{2m,n*}| \cdot t_{n*}}{t_{1*} + \ldots + t_{n*}}$$

If $t_{1*} + \ldots + t_{3*} \geq 6$ min, calculate n_{2m*} without the rest phase t_{4*}.

The values for the ratio i can be found in the selection tables.

Calculation of the actual effective torque

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

Calculation of the actual emergency-off torque

$$M_{2NOT*} = J_{tot} \cdot \frac{\Delta n_2}{9.55 \cdot \Delta t} + M_{L*}$$

Calculation of the actual equivalent torque

$$M_{2eq*} = \sqrt[3]{\frac{|n_{2m,1*}| \cdot t_{1*} \cdot |M_{2,1*}^{\ 3}| + \ldots + |n_{2m,n*}| \cdot t_{n*} \cdot |M_{2,n*}^{\ 3}|}{|n_{2m,1*}| \cdot t_{1*} + \ldots + |n_{2m,n*}| \cdot t_{n*}}}$$

Calculation of the thermal limit torque

Calculate the thermal limit torque M_{2th} for a duty cycle ED_{10} > 50% and the actual average input speed n_{1m*}. (At $K_{mot,th} \leq 0$ you must reduce the average input speed n_{1m*} accordingly or select another geared motor size.)

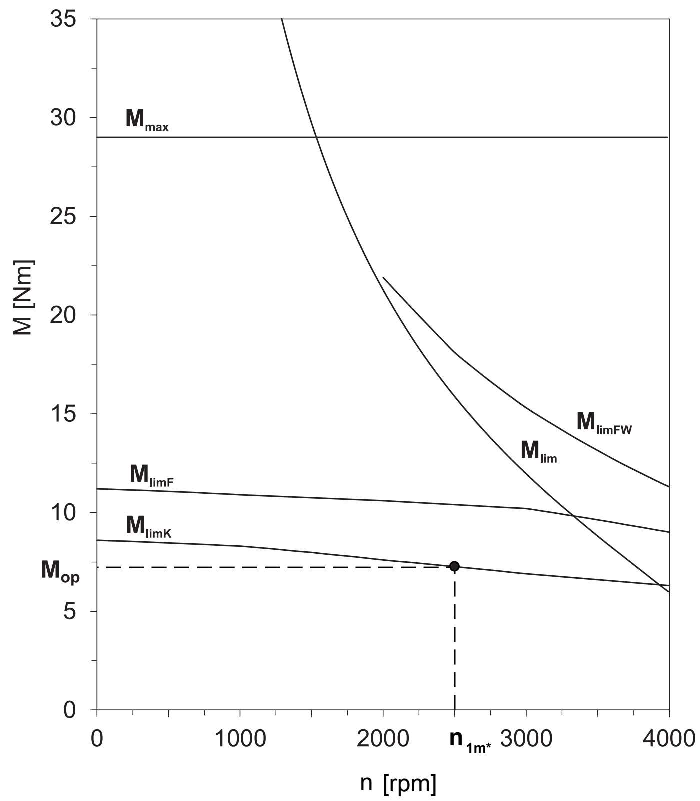
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0{,}93 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m*}}{1000}\right)^3$$

Refer to the selection tables for the values of i and a_{th}.

The values for fB_T can be found in the corresponding table in this chapter.

The value for the torque of the motor at operating point M_{op} with the determined average input speed n_{1m*} can be found in the motor characteristic curve in the chapter [▶ 17.3]. Note the size, nominal speed n_N and cooling type of the motor. The figure below shows an example of reading the torque M_{op} of a motor with convection cooling at the operating point.



Operating factors

Operating mode	fB_{op}
Uniform continuous operation	1.00
Cyclic operation	1.00
Reversing load cyclic operation	1.00

Run time	fB_t
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20

Cyclic operation	fB_{ZB}
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

Temperature		fB_T
Motor cooling	**Surrounding temperature**	
Motor with forced ventilation	≤ 20 °C	0.9
	≤ 30 °C	1.0
	≤ 40 °C	1.15
Motor with convection cooling	≤ 20 °C	1.0
	≤ 30 °C	1.1
	≤ 40 °C	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded. Doing so may result in damage to the geared motor.
- For braking from full speed (for example when the power fails or when setting up the machine), note the permitted gear unit torques (M_{2acc}, M_{2NOT}) in the selection tables.

9.6.2 Permitted shaft loads for the output shaft

The values specified in the tables apply to the permitted shaft loads:

- For shaft dimensions in accordance with the catalog
- For output speeds $n_{2m*} \leq 100$ rpm ($F^{2axN} = F_{2ax100}$; $F_{2radN} = F_{2rad100}$; $M_{2kN} = M_{2k100}$)
- Only if radial forces on the gear unit are stabilized by its pilots (housing, flange shaft)

9.6.2.1 F shaft design

Permitted shaft loads for F shaft design (flange hollow shaft)

Type	z_2 [mm]	F_{2ax100} [N]	$F_{2rad100}$ [N]	$F_{2rad,acc}$ [N]	M_{2k100} [Nm]	$M_{2k,acc}$ [Nm]
KS4	38.0	4000	6842	10263	260	390
KS5	45.0	6000	12222	18333	550	825
KS7	55.0	10000	16727	25091	920	1380

For other output speeds, download diagrams at https://configurator.stoeber.de/en-US/.

The following applies to output speeds $n_{2m*} > 100$ rpm:

$$F_{2axN} = \frac{F_{2ax100}}{\sqrt[3]{\dfrac{n_{2m*}}{100\ \text{rpm}}}} \qquad F_{2radN} = \frac{F_{2rad100}}{\sqrt[3]{\dfrac{n_{2m*}}{100\ \text{rpm}}}} \qquad M_{2kN} = \frac{M_{2k100}}{\sqrt[3]{\dfrac{n_{2m*}}{100\ \text{rpm}}}}$$

The values for F_{2ax100}, $F_{2rad100}$ and M_{2k100} can be found in the table "Permitted shaft loads" in this chapter.

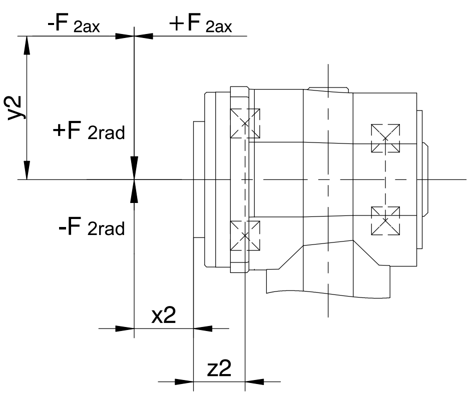


Fig. 1: Force application points for flange hollow shaft

You can determine the permitted radial forces from the permitted tilting torque M_{2kN} and $M_{2k,acc}$. The actual radial forces may not exceed the permitted radial forces. The permitted radial forces pertain to the shaft end (x2 = 0).

$$M_{2k,acc*} = \frac{F_{2ax*} \cdot y_2 + F_{2rad,acc*} \cdot (x_2 + z_2)}{1000}$$

For applications with multiple axial and/or radial forces, you must add the forces as vectors.

In the event of EMERGENCY OFF operation (max. 1000 load changes), you can multiply the permitted forces and torques for F_{2ax20}, F_{2rad20} and M_{2k20} by a factor of two.

Also note the calculation for equivalent values:

$$M_{2k,eq*} = \sqrt[3]{\frac{|n_{2m,1*}| \cdot t_{1*} \cdot |M_{2k,acc,1*}|^3 + \ldots + |n_{2m,n*}| \cdot t_{n*} \cdot |M_{2k,acc,n*}|^3}{|n_{2m,1*}| \cdot t_{1*} + \ldots + |n_{2m,n*}| \cdot t_{n*}}}$$

$$F_{2rad,eq*} = \sqrt[3]{\frac{|n_{2m,1*}| \cdot t_{1*} \cdot |F_{2rad,acc,1*}|^3 + \ldots + |n_{2m,n*}| \cdot t_{n*} \cdot |F_{2rad,acc,n*}|^3}{|n_{2m,1*}| \cdot t_{1*} + \ldots + |n_{2m,n*}| \cdot t_{n*}}}$$

9.6.2.2 S shaft design

Permitted shaft loads for S shaft design (hollow shaft with shrink ring)

Type	z_2 [mm]	F_{2ax100} [N]	$F_{2rad100}$ [N]	$F_{2rad,acc}$ [N]	M_{2k100} [Nm]	$M_{2k,acc}$ [Nm]
KS4	36.0	4000	5000	5000	260	260
KS5	42.0	6000	8000	8000	550	550
KS7	52.0	10000	10000	10000	920	920

For other output speeds, download diagrams at https://configurator.stoeber.de/en-US/.

The following applies to output speeds n_{2m^*} > 100 rpm:

$$F_{2axN} = \frac{F_{2ax100}}{\sqrt[3]{\frac{n_{2m^*}}{100\,\text{rpm}}}} \qquad F_{2radN} = \frac{F_{2rad100}}{\sqrt[3]{\frac{n_{2m^*}}{100\,\text{rpm}}}} \qquad M_{2kN} = \frac{M_{2k100}}{\sqrt[3]{\frac{n_{2m^*}}{100\,\text{rpm}}}}$$

The values for F_{2ax100}, $F_{2rad100}$ and M_{2k100} can be found in the table "Permitted shaft loads" in this chapter.

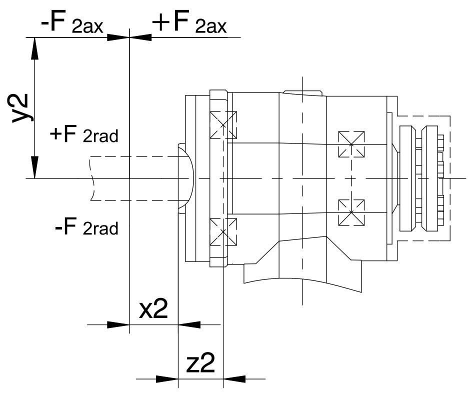


Fig. 2: Force application points for the hollow shaft with shrink ring

You can determine the permitted radial forces from the permitted tilting torque M_{2kN} and $M_{2k,acc}$. The actual radial forces may not exceed the permitted radial forces. The permitted radial forces pertain to the shaft end (x2 = 0).

$$M_{2k,acc^*} = \frac{2 \cdot F_{2ax^*} \cdot y_2 + F_{2rad,acc^*} \cdot (x_2 + z_2)}{1000}$$

For applications with multiple axial and/or radial forces, you must add the forces as vectors.

In the event of EMERGENCY OFF operation (max. 1000 load changes), you can multiply the permitted forces and torques for F_{2ax20}, F_{2rad20} and M_{2k20} by a factor of two.

Also note the calculation for equivalent values:

$$M_{2k,eq^*} = \sqrt[3]{\frac{|n_{2m,1^*}| \cdot t_{1^*} \cdot |M_{2k,acc,1^*}{}^3| + \ldots + |n_{2m,n^*}| \cdot t_{n^*} \cdot |M_{2k,acc,n^*}{}^3|}{|n_{2m,1^*}| \cdot t_{1^*} + \ldots + |n_{2m,n^*}| \cdot t_{n^*}}}$$

$$F_{2rad,eq^*} = \sqrt[3]{\frac{|n_{2m,1^*}| \cdot t_{1^*} \cdot |F_{2rad,acc,1^*}{}^3| + \ldots + |n_{2m,n^*}| \cdot t_{n^*} \cdot |F_{2rad,acc,n^*}{}^3|}{|n_{2m,1^*}| \cdot t_{1^*} + \ldots + |n_{2m,n^*}| \cdot t_{n^*}}}$$

9.6.2.3 G and P shaft designs

Permitted shaft loads for G and P shaft designs (solid shaft)

Type	z_2 [mm]	F_{2ax100} [N]	$F_{2rad100}$ [N]	$F_{2rad,acc}$ [N]	M_{2k100} [Nm]	$M_{2k,acc}$ [Nm]
KS4	34.0	4000	5000	5000	260	260
KS5	40.0	6000	8000	8000	550	550
KS7	51.0	10000	10000	10000	920	920

For other output speeds, download diagrams at https://configurator.stoeber.de/en-US/.

The following applies to output speeds n_{2m*} > 100 rpm:

$$F_{2axN} = \frac{F_{2ax100}}{\sqrt[3]{\frac{n_{2m*}}{100\ \text{rpm}}}} \qquad F_{2radN} = \frac{F_{2rad100}}{\sqrt[3]{\frac{n_{2m*}}{100\ \text{rpm}}}} \qquad M_{2kN} = \frac{M_{2k100}}{\sqrt[3]{\frac{n_{2m*}}{100\ \text{rpm}}}}$$

The values for F_{2ax100}, $F_{2rad100}$ and M_{2k100} can be found in the table "Permitted shaft loads" in this chapter.

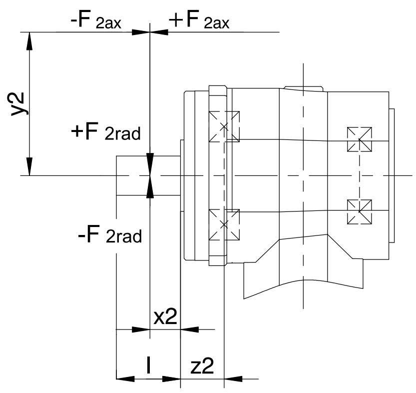


Fig. 3: Force application points for solid shaft

The specified values for $F_{2rad100}$ and $F_{2rad,acc}$ refer to an application of force at the center of the output shaft: x_2 = l/2.

Shaft dimensions can be found in the "Dimensional drawings" chapter.

The following applies to other force application points:

$$M_{2k,acc*} = \frac{2 \cdot F_{2ax*} \cdot y_2 + F_{2rad,acc*} \cdot (x_2 + z_2)}{1000}$$

For applications with multiple axial and/or radial forces, you must add the forces as vectors.

In the event of EMERGENCY OFF operation (max. 1000 load changes), you can multiply the permitted forces and torques for F_{2ax20}, F_{2rad20} and M_{2k20} by a factor of two.

Also note the calculation for equivalent values:

$$M_{2k,eq*} = \sqrt[3]{\frac{|n_{2m,1*}| \cdot t_{1*} \cdot |M_{2k,acc,1*}{}^3| + \ldots + |n_{2m,n*}| \cdot t_{n*} \cdot |M_{2k,acc,n*}{}^3|}{|n_{2m,1*}| \cdot t_{1*} + \ldots + |n_{2m,n*}| \cdot t_{n*}}}$$

$$F_{2rad,eq*} = \sqrt[3]{\frac{|n_{2m,1*}| \cdot t_{1*} \cdot |F_{2rad,acc,1*}{}^3| + \ldots + |n_{2m,n*}| \cdot t_{n*} \cdot |F_{2rad,acc,n*}{}^3|}{|n_{2m,1*}| \cdot t_{1*} + \ldots + |n_{2m,n*}| \cdot t_{n*}}}$$

9.6.3 Torsional stiffness

The torsional stiffness C_2 depends on the shaft design. Details for the F shaft design can be found in the selection tables.

Details regarding the G, P and S shaft designs can be found in the following table:

	Torsional stiffness C_2 G and P shaft designs	Torsional stiffness C_2 S shaft design
KS4	6.5	7.1
KS5	15	16
KS7	32	36

9.6.4 Recommendation for radial shaft seal rings

For a duty cycle > 60% and higher surrounding temperatures, we recommend radial shaft seal rings made of FKM at the output.

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance in oils and greases
- For use in the food, beverage and pharmaceutical industries

Leak-proofness

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. However, a leak cannot be fully ruled out over the length of use of a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

9.6.5 Oil expansion tank

The gear units have a higher fill level in mounting position EL5. The oil expansion tank prevents oil from escaping out of the gear unit.

Notes

- Three-stage KS gear units in mounting position EL5 can be used only in combination with an oil expansion tank!
- It is not possible to use an oil expansion tank if the plug connector and oil expansion tank are on the same side!
- Please specify the attachment side (gear unit side 1 or 2) in the order.
- Note that mounting an oil expansion tank is not possible with every motor adapter (collision between motor adapter and oil expansion tank).

9.7 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 term field.

Documentation	ID
Operating manual gear units, geared motors KS	443362_en