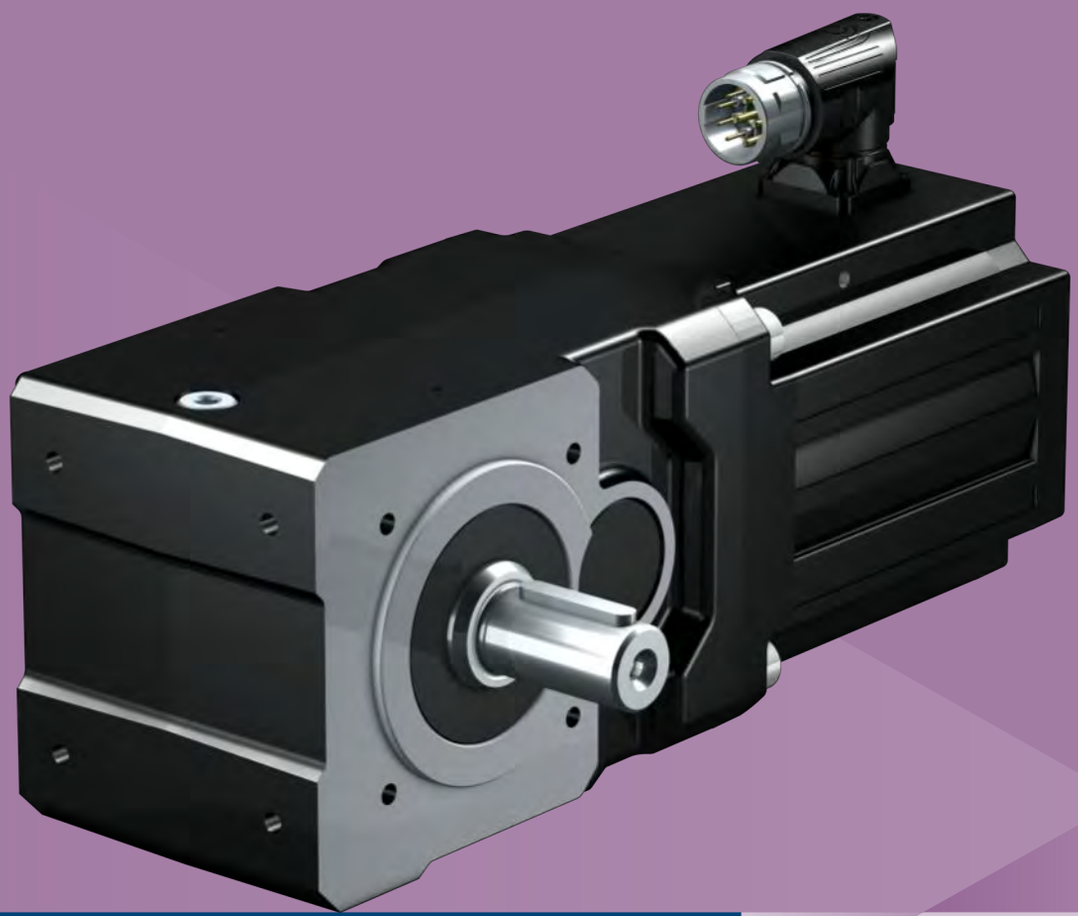


11 Helical bevel geared motors KL

11.1 Overview

Compact helical-geared right-angle geared motors

Features

Power density	★★☆☆☆
Backlash	★☆☆☆☆
Price category	€
Shaft load	★★☆☆☆
Smooth operation	★★☆☆☆
Torsional stiffness	★★☆☆☆
Mass moment of inertia	★★★★★
Helical gearing	✓
Maintenance-free	✓
Any installation position	✓
Small installation space	✓
FKM seal ring at the input	✓
Compact and dynamic due to direct motor attachment	✓

Key: ★☆☆☆☆ good | ★★★★★ excellent
€ Economy | €€€€€ Premium

Technical data

i	8 – 16
M_{2acc}	35 – 60 Nm
$\Delta\phi_2$	16 – 20 arcmin
η_{get}	≤ 97 %

11.2 Selection tables

The technical data specified in the selection tables applies to:

- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Drives with convection-cooled motors

An explanation of the formula symbols can be found in the Chapter [▷ 15.1].

n_{2N} [rpm]	M_{2N} [Nm]	$M_{2,0}$ [Nm]	a_{th}	S	Type	M_{2acc} [Nm]	M_{2NOT} [Nm]	i	i_{exakt}	n_{1max} DB [rpm]	n_{1max} ZB [rpm]	J_1 [10^{-4} kgm^2]	$\Delta\varphi_2$ [arcmin]	C_2 [Nm/ arcmin]	m [kg]
KL2 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 60 Nm)															
188	36	38	22	1.4	KL202_0160 LM401U	60	120	16.00	16/1	4000	6000	1.8	16	4.0	12
375	18	19	37	1.4	KL202_0080 LM401U	35	58	8.000	8/1	4000	6000	1.8	20	2.4	12

11.3 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 CAD models of our standard drives at http://cad.stoeber.de.

Combination options and the dimensions of forced ventilated geared motors can be found at http://cad.stoeber.de.

Tolerances

Axis height in accordance with DIN 747	Tolerance
Up to 50 mm	-0.4 mm
Up to 250 mm	-0.5 mm
Up to 630 mm	-0.6 mm

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

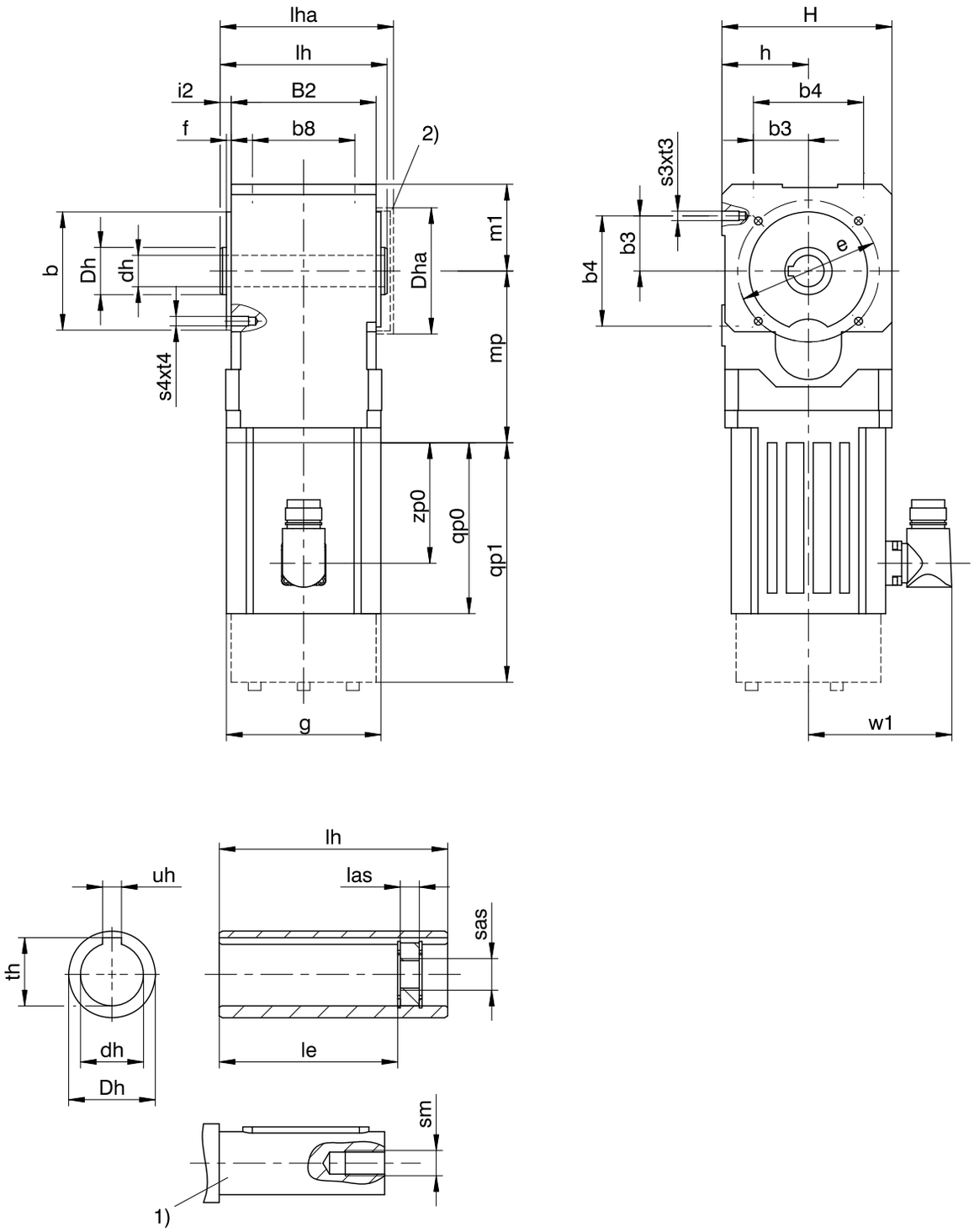
Centering holes in solid shafts in accordance with DIN 332-2, DR shape

Thread size	M4	M5	M6	M8	M10	M12	M16	M20	M24
Thread depth [mm]	10	12.5	16	19	22	28	36	42	50

Hollow shaft	Tolerance
Hollow shaft hole fit	ISO G7

Flange	Pilot tolerance
Up to 300 mm	ISO j6
Starting at 350 mm	ISO h6

11.3.1 A shaft design (hollow shaft), G housing design (pitch circle diameter)



qp0	Applies to motors without brake.	qp1	Applies to motors with brake.
1)	The length of the machine shaft must be at least 2.2 x ∅dh and the length of the feather key must be at least 2 x ∅dh.	2)	Cover (optional)

Dimensions of gear units

Type	Ødb	b3	b4	b8	B2	Ødh	Dh	Dha	Øe	f	h	H	i2	le	lh	las	lha	m1	s3	s4	sm	sas	t3	t4	th	uh
KL2	75_{j6}	35	70	65	92	20^{H7}	30	80	90	3	55	108	7	79.5	106	12	110	55	M6	M6	M6	M8	13	13	22.8	6^{JS9}

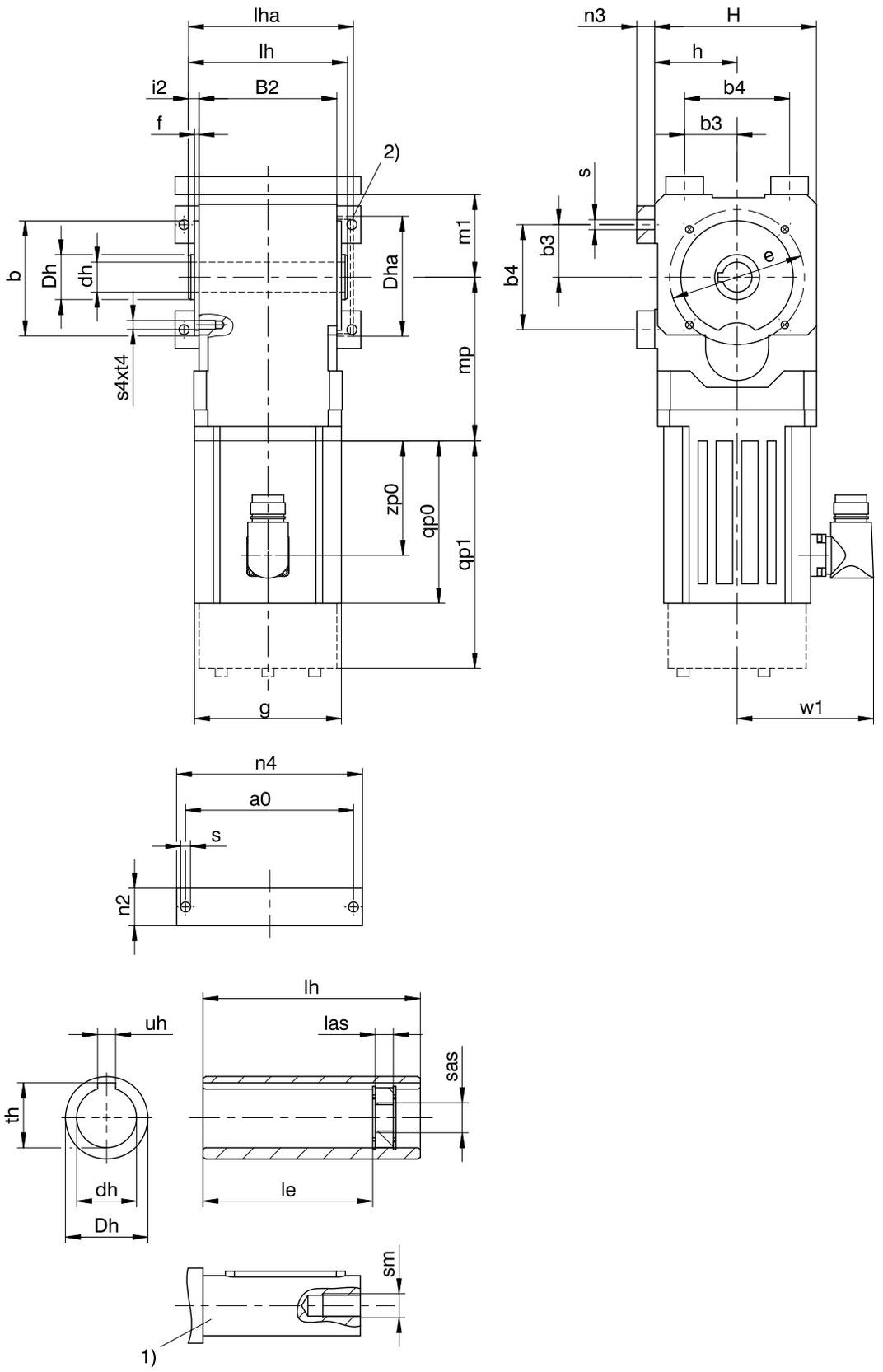
Dimensions of motors

Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.2 A shaft design (hollow shaft), NG housing design (base + pitch circle diameter)



qp0	Applies to motors without brake.	qp1	Applies to motors with brake.
1)	The length of the machine shaft must be at least 2.2 x ∅dh and the length of the feather key must be at least 2 x ∅dh.	2)	Cover (optional)

Dimensions of gear units

Type	a0	Øb	b3	b4	B2	Ødh	Dh	Dha	Øe	f	h	H	i2	le	lh	las	lha	m1	n2	n3	n4	Øs	s4	sm	sas	t4	th	uh
KL2	112	75_{j6}	35	70	92	20^{H7}	30	80	90	3	55	108	7	79.5	106	12	110	55	25	12	124	6.6	M6	M6	M8	13	22.8	6^{JS9}

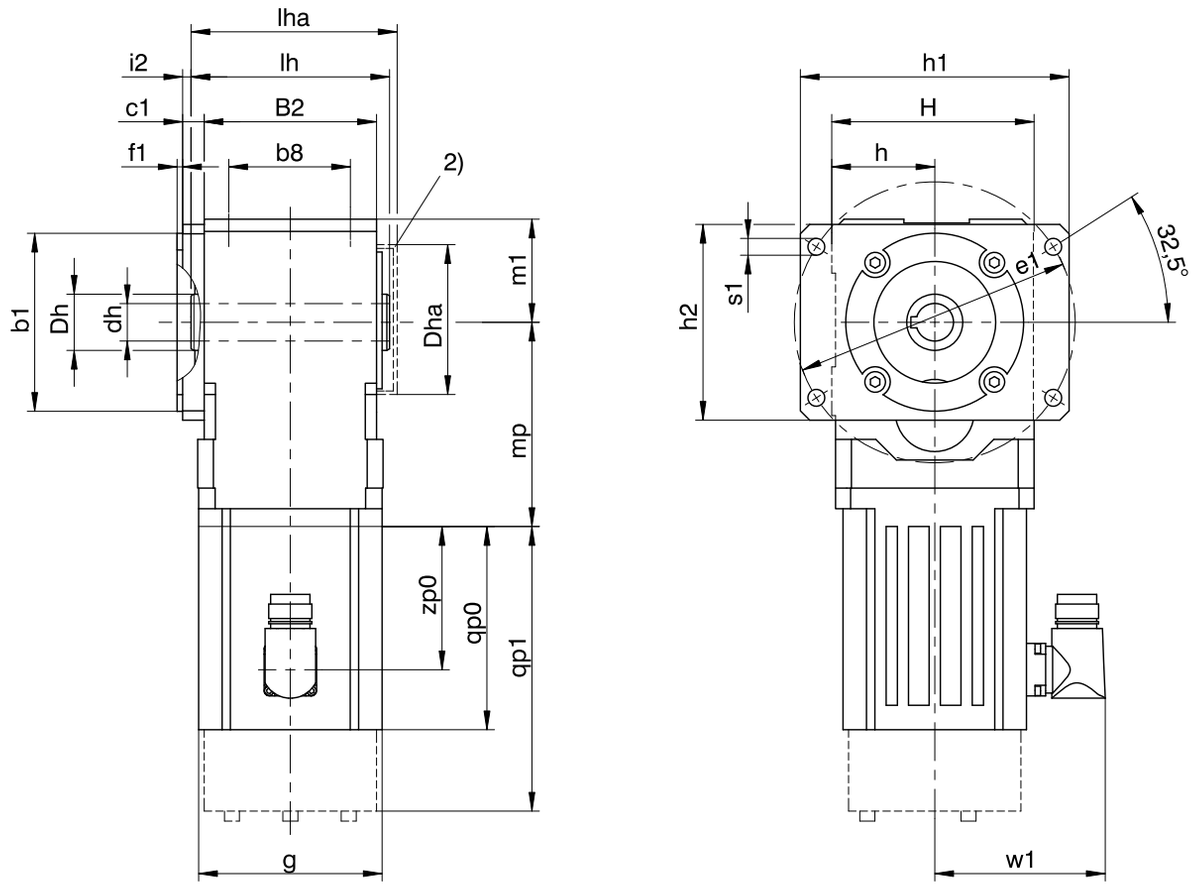
Dimensions of motors

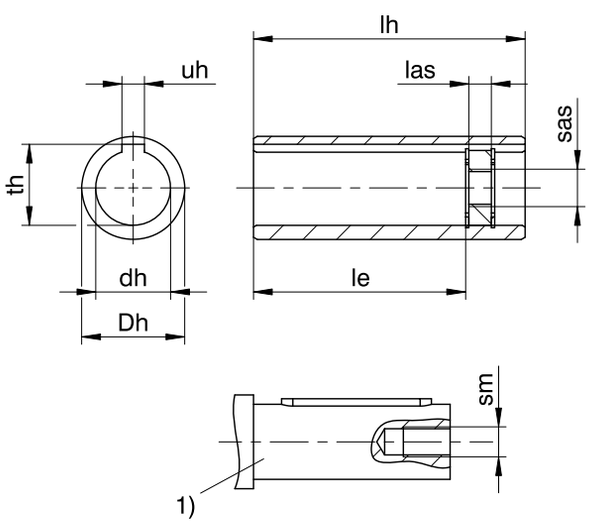
Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.3 A shaft design (hollow shaft), F housing design (flange)





qp0	Applies to motors without brake.	qp1	Applies to motors with brake.
1)	The length of the machine shaft must be at least 2.2 x ∅dh and the length of the feather key must be at least 2 x ∅dh.	2)	Cover (optional)

Dimensions of gear units

Type	Ø$b1$	$b8$	$B2$	$c1$	Ødh	Dh	Dha	Ø$e1$	$f1$	h	$h1$	$h2$	H	$i2$	le	lh	las	lha	$m1$	Ø$s1$	sm	sas	th	uh
KL2	95_{j6}	65	92	11.5	20^{H7}	30	80	150	3	55	143.5	104.5	108	4.5	79.5	106	12	110	55	9	M6	M8	22.8	6^{JS9}

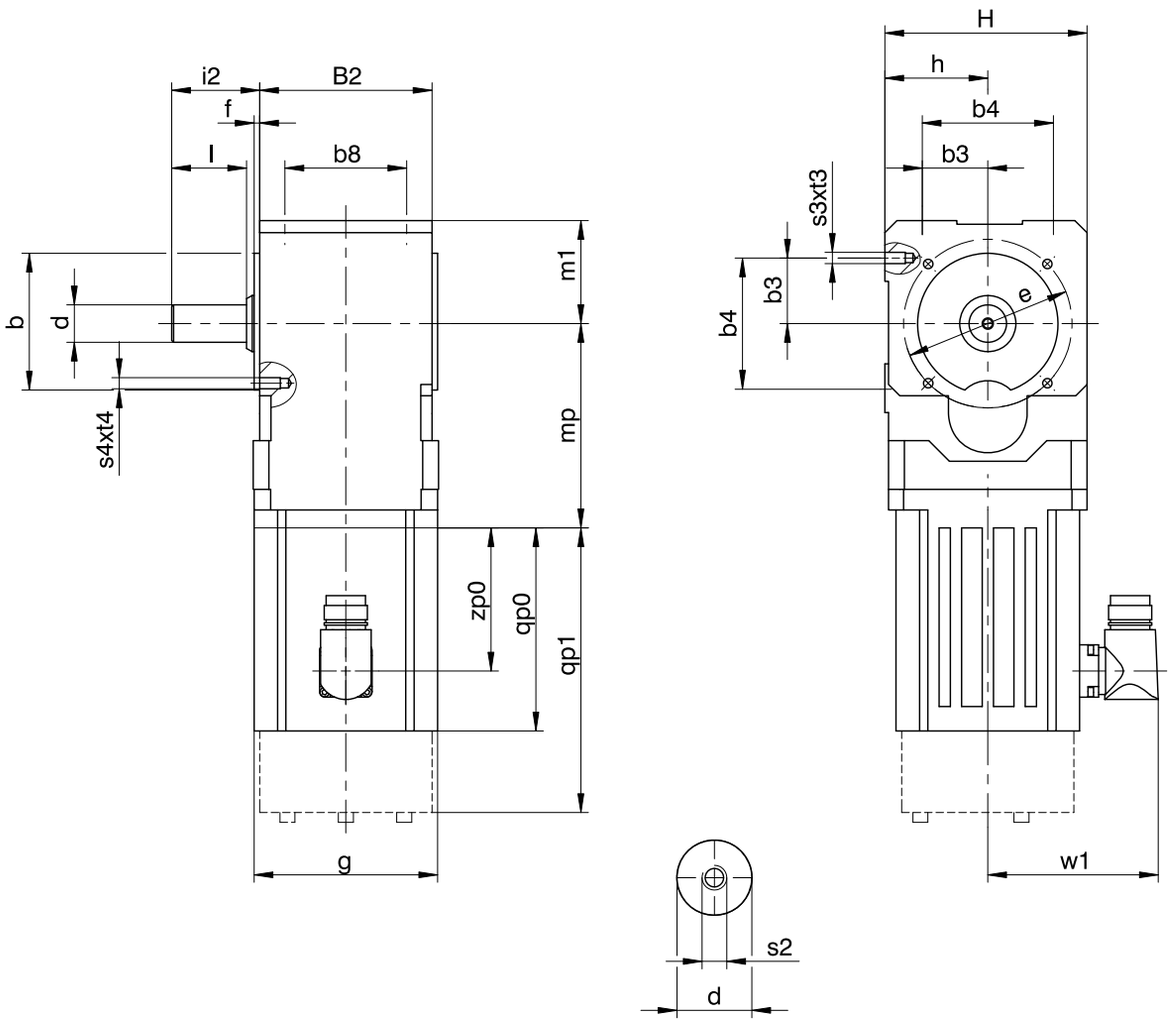
Dimensions of motors

Type	□g	$qp0$	$qp1$	$w1$	$zp0$
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.4 G shaft design (solid shaft without feather key), G housing design (pitch circle diameter)



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

Dimensions of gear units

Type	Øb	b3	b4	b8	B2	Ød	Øe	f	h	H	i2	l	m1	s2	s3	s4	t3	t4
KL2	75_{j6}	35	70	65	92	20_{k6}	90	3	55	108	47	40	55	M6	M6	M6	13	13

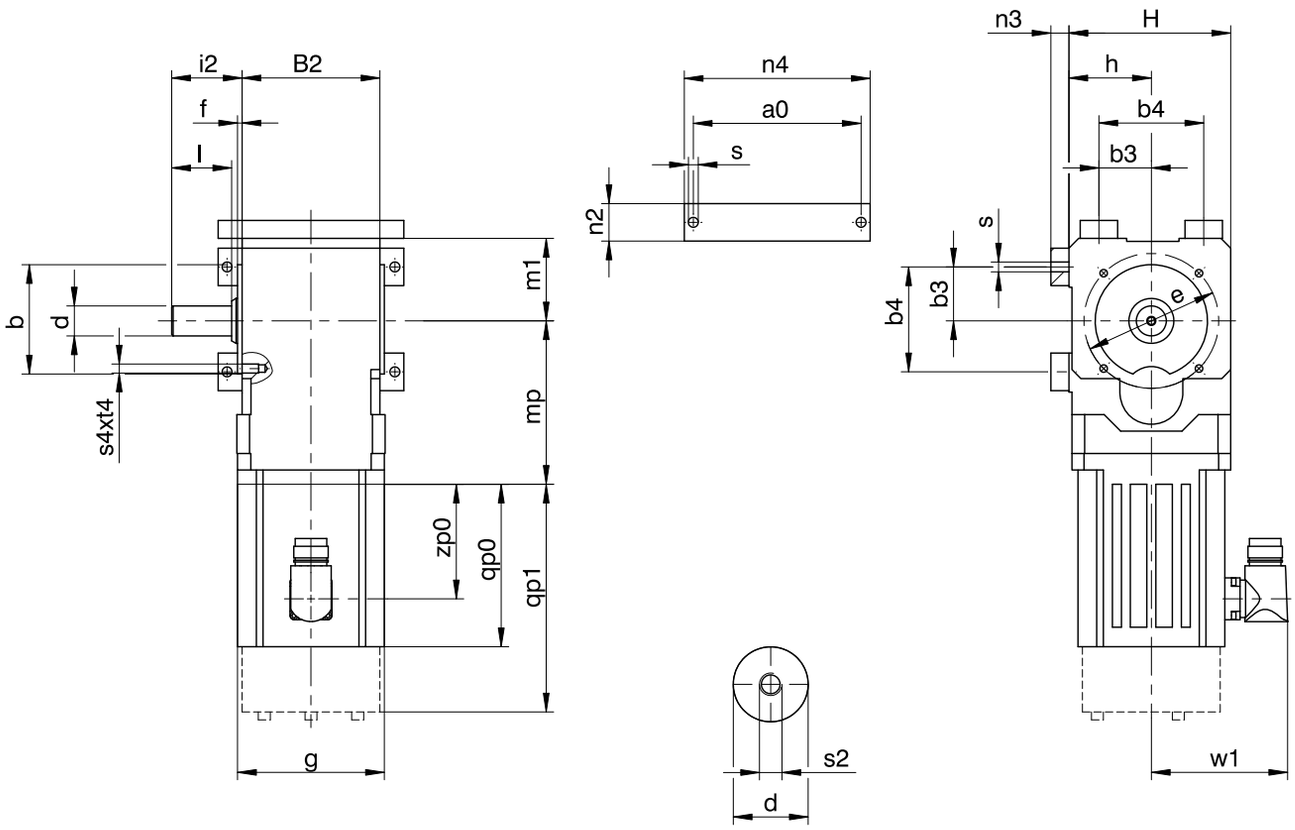
Dimensions of motors

Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.5 G shaft design (solid shaft without feather key), NG housing design (base + pitch circle diameter)



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

Dimensions of gear units

Type	a0	Øb	b3	b4	B2	Ød	Øe	f	h	H	i2	l	m1	n2	n3	n4	Øs	s2	s4	t4
KL2	112	75_{j6}	35	70	92	20_{k6}	90	3	55	108	47	40	55	25	12	124	6.6	M6	M6	13

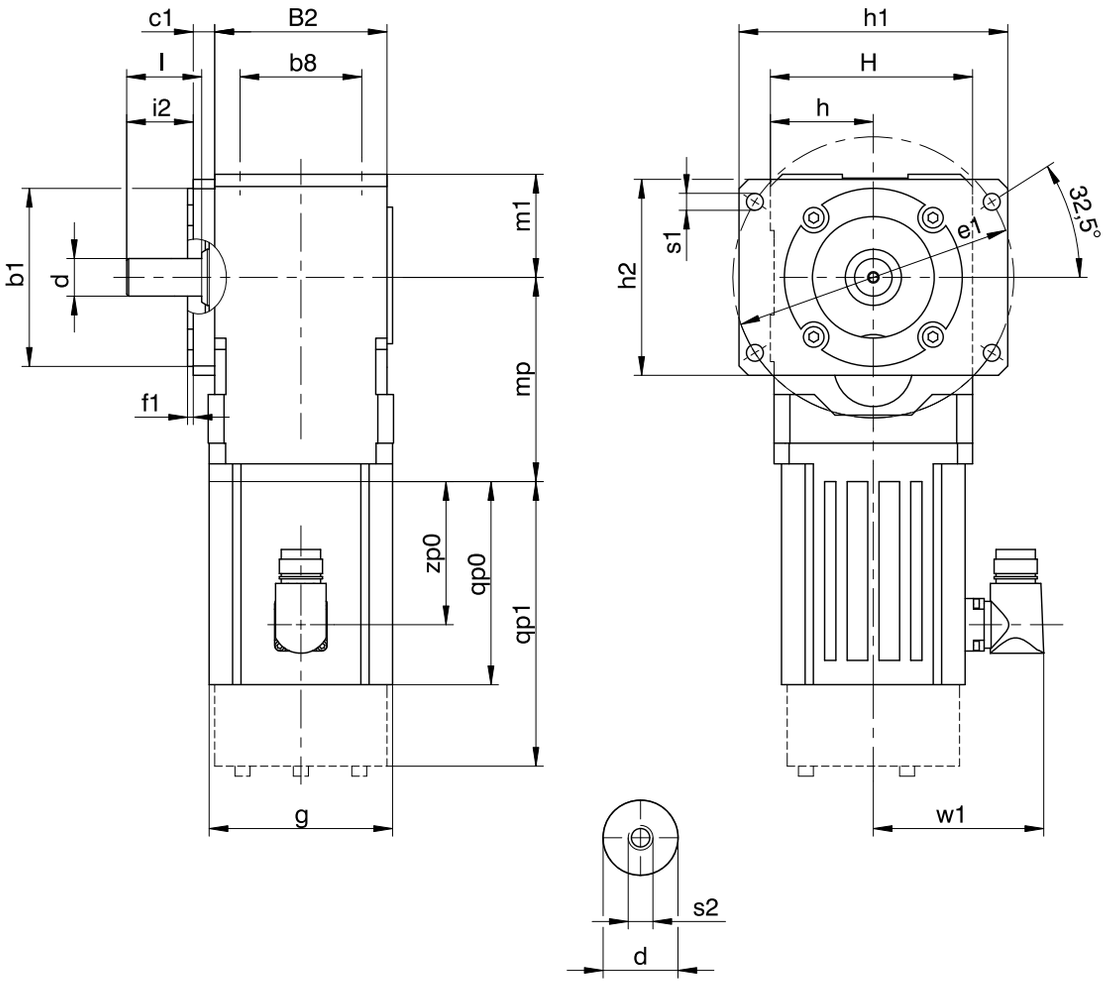
Dimensions of motors

Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.6 G shaft design (solid shaft without feather key), F housing design (flange)



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

Dimensions of gear units

Type	Øb1	b8	B2	c1	Ød	Øe1	f1	h	h1	h2	H	i2	l	m1	Øs1	s2
KL2	95_{j6}	65	92	11.5	20_{k6}	150	3	55	143.5	104.5	108	35.5	40	55	9	M6

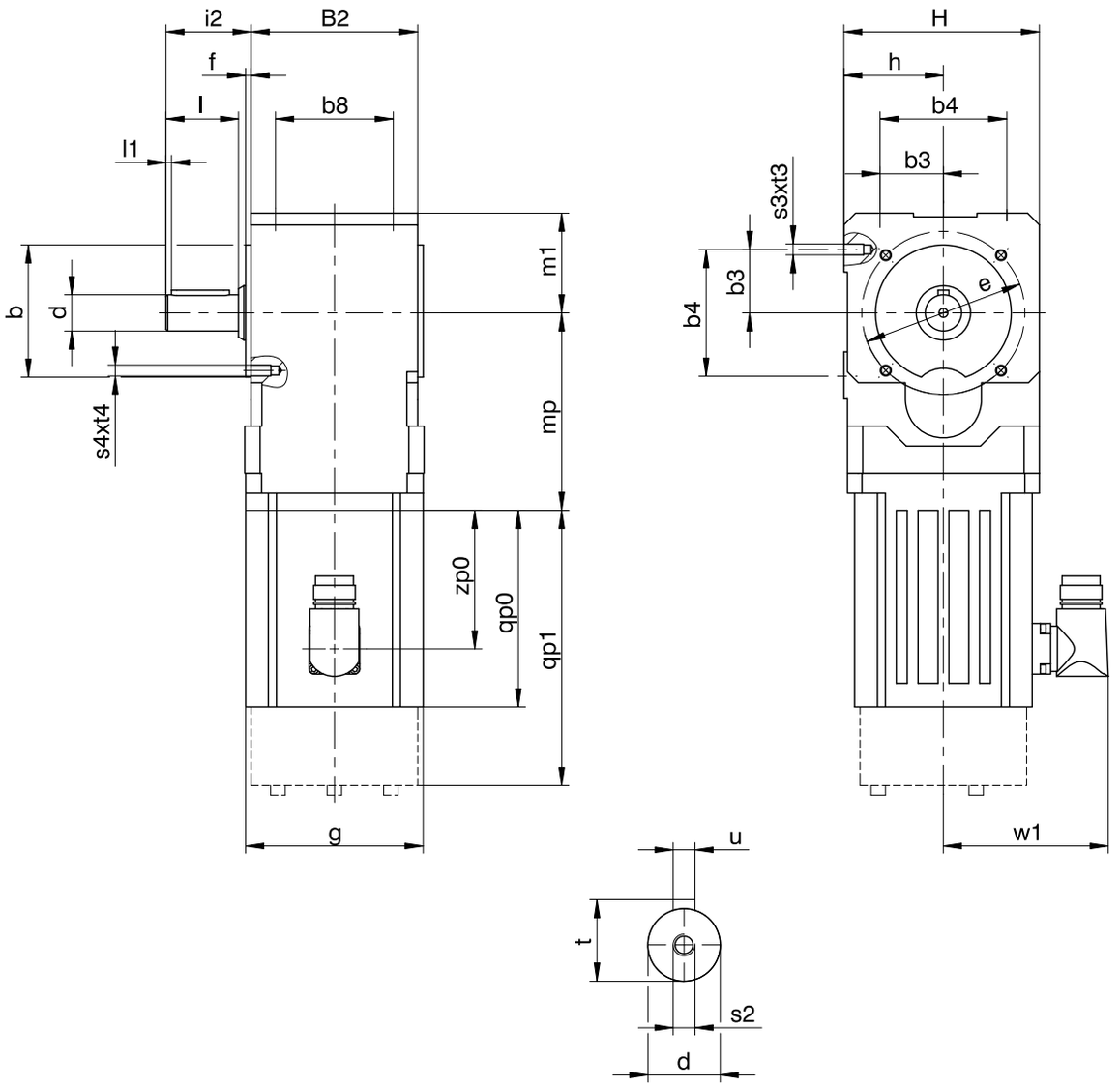
Dimensions of motors

Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.7 P shaft design (solid shaft with feather key), G housing design (pitch circle diameter)



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

Dimensions of gear units

Type	Øb	b3	b4	b8	B2	Ød	Øe	f	h	H	i2	l	l1	m1	s2	s3	s4	t	t3	t4	u
KL2	75_{j6}	35	70	65	92	20_{k6}	90	3	55	108	47	40	3	55	M6	M6	M6	22.5	13	13	A6×6×32

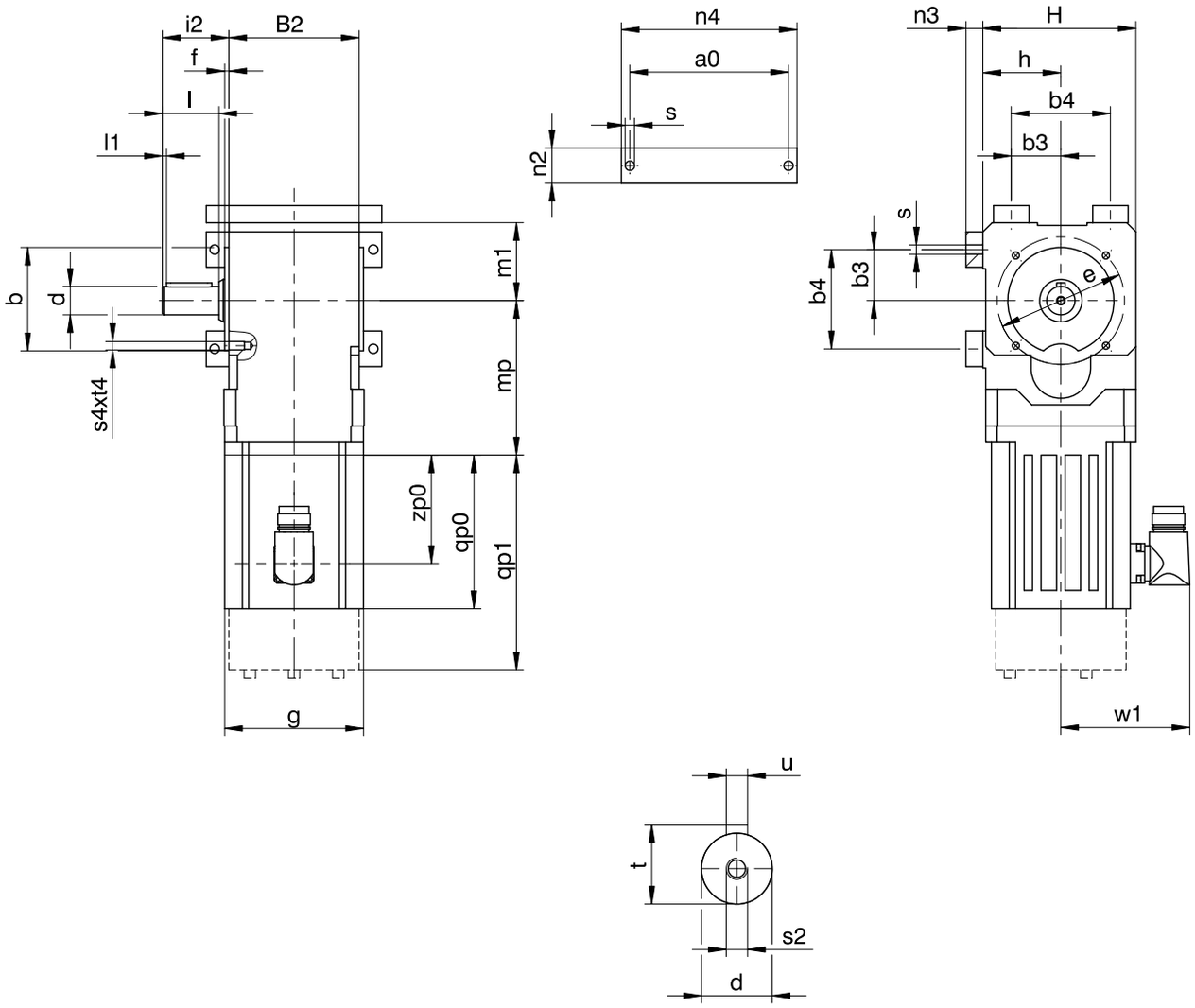
Dimensions of motors

Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.8 P shaft design (solid shaft with feather key), NG housing design (base + pitch circle diameter)



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

Dimensions of gear units

Type	a0	Øb	b3	b4	B2	Ød	Øe	f	h	H	i2	l	l1	m1	n2	n3	n4	Øs	s2	s4	t	t4	u
KL2	112	75_{j6}	35	70	92	20_{k6}	90	3	55	108	47	40	3	55	25	12	124	6.6	M6	M6	22.5	13	A6×6×32

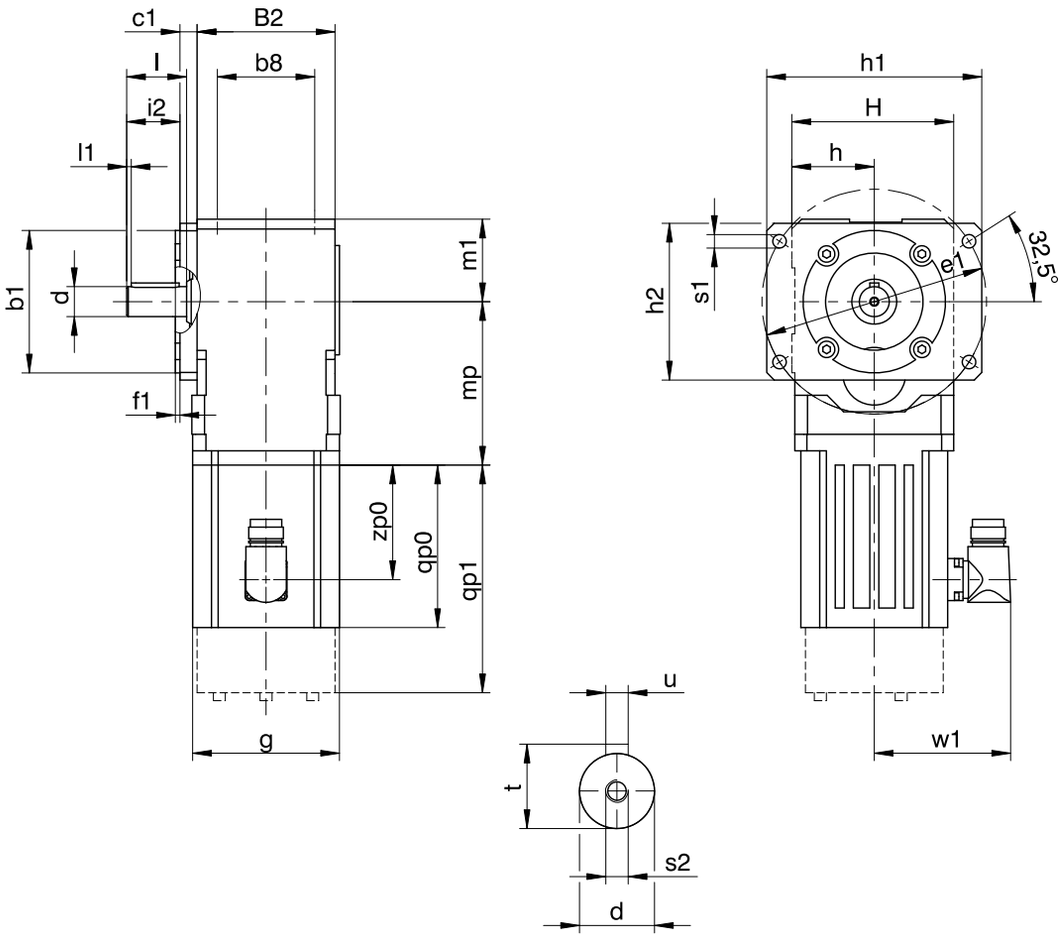
Dimensions of motors

Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.9 P shaft design (solid shaft with feather key), F housing design (flange)



qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

Dimensions of gear units

Type	Øb1	b8	B2	c1	Ød	Øe1	f1	h	h1	h2	H	i2	l	l1	m1	Øs1	s2	t	u
KL2	95_{j6}	65	92	11.5	20_{k6}	150	3	55	143.5	104.5	108	35.5	40	3	55	9	M6	22.5	A6×6×32

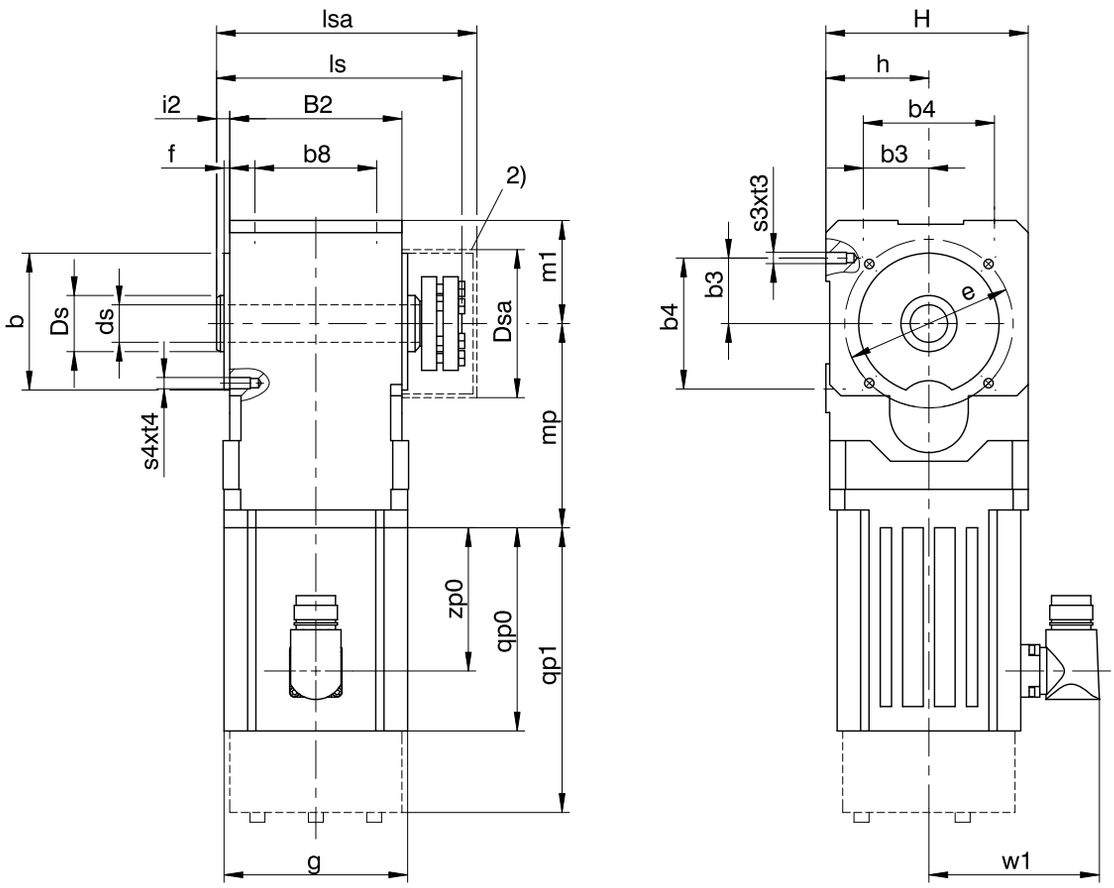
Dimensions of motors

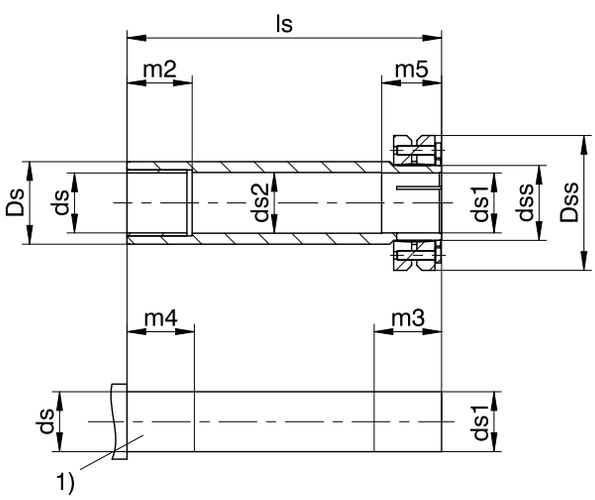
Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.10 S shaft design (hollow shaft with shrink disk), G housing design (pitch circle diameter)





qp0 Applies to motors without brake.

qp1 Applies to motors with brake.

1) Machine shaft: The dimension ls must meet or exceed the specified value.

2) Cover (optional)

Dimensions of gear units

Type	Øb	b3	b4	b8	B2	Ød	Ød1	Ød2	Ødss	ØDs	ØDsa	ØDss	Øe	f	h	H	i2	ls	lsa	m1	m2	m3	m4	m5	s3	s4	t3	t4
KL2	75_{j6}	35	70	65	92	20^{H7}	$20_{h6}{}^{H7}$	21.5	24	30	79	50	90	3	55	108	7	131	139	55	22	27	31	26	M6	M6	13	13

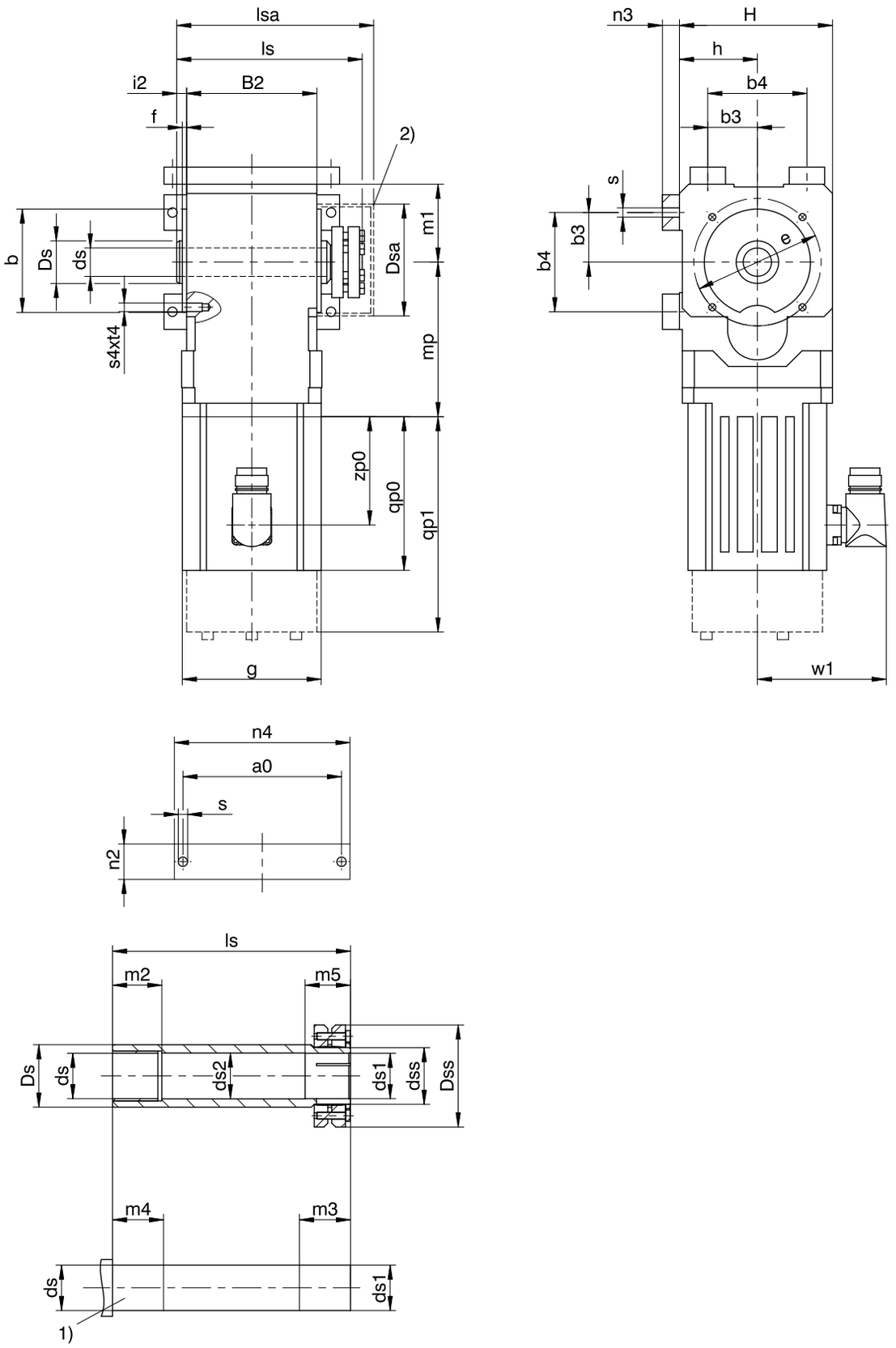
Dimensions of motors

Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.11 S shaft design (hollow shaft with shrink disk), NG housing design (base + pitch circle diameter)



qp0	Applies to motors without brake.	qp1	Applies to motors with brake.
1)	Machine shaft: The dimension ls must meet or exceed the specified value.	2)	Cover (optional)

Dimensions of gear units

Type	a0	Øb	b3	b4	B2	Øds	Øds1	Øds2	Ødss	ØDs	ØDsa	ØDss	Øe	f	h	H	i2	ls	lsa	m1	m2	m3	m4	m5	n2	n3	n4	Øs	s4	t4
KL2	112	75_{j6}	35	70	92	20^{H7}	$20_{h6}{}^{H7}$	21.5	24	30	79	50	90	3	55	108	7	131	139	55	22	27	31	26	25	12	124	6.6	M6	13

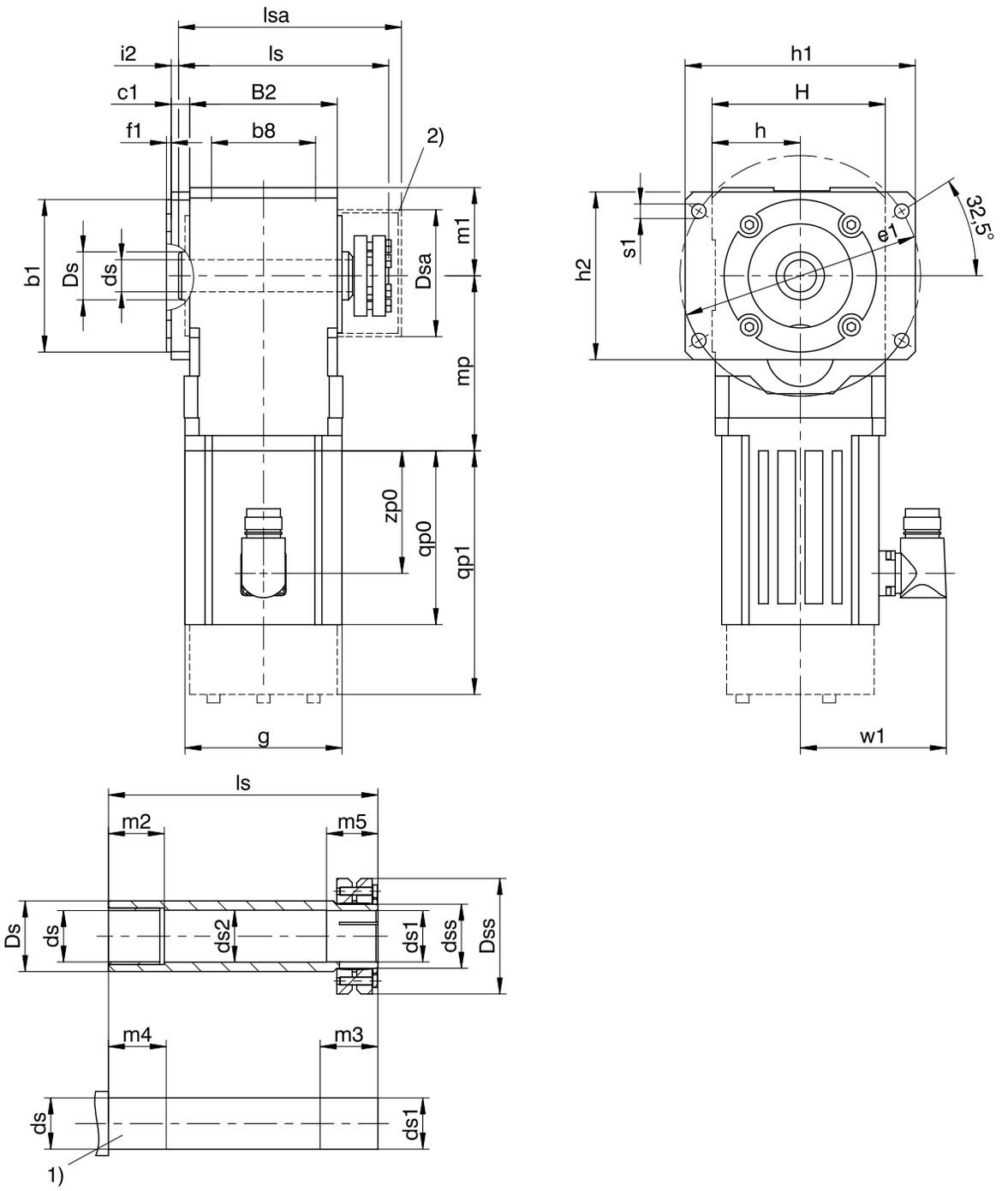
Dimensions of motors

Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.3.12 S shaft design (hollow shaft with shrink disk), F housing design (flange)



qp0	Applies to motors without brake.	qp1	Applies to motors with brake.
1)	Machine shaft: The dimension ls must meet or exceed the specified value.	2)	Cover (optional)

Dimensions of gear units

Type	Ødb1	b8	B2	c1	Øds	Ødds1	Ødds2	Ødss	ØDs	ØDsa	ØDss	Øe1	f1	h	h1	h2	H	i2	ls	lsa	m1	m2	m3	m4	m5	Øs1
KL2	95_{j6}	65	92	11.5	20^{H7}	$20_{h6}{}^{H7}$	21.5	24	30	79	50	150	3	55	143.5	104.5	108	4.5	131	139	55	22	27	31	26	9

Dimensions of motors

Type	□g	qp0	qp1	w1	zp0
LM401U	98	108.5	152	91	76.5

Dimensions of geared motors

Type	LM4
	mp
KL202	109

11.4 Type designation

In this chapter, you can find 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.

Sample code

KL	2	0	2	P	G	0080	LM401U

Explanation

Code	Designation	Design
KL	Type	Helical bevel gear unit
2	Size	2 (example)
0	Generation	Generation 0
2	Stages	Two-stage
A	Shaft	Hollow shaft with keyway
S		Hollow shaft with shrink disk
G		Solid shaft without feather key
P		Solid shaft with feather key
G	Housing	Pitch circle diameter
F		Flange
NG		Foot + pitch circle diameter
0080	Transmission ratio (i x 10)	i = 8 (example)
LM401U	Motor	LM Lean motor

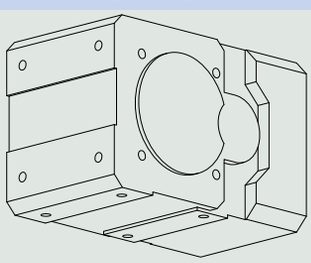
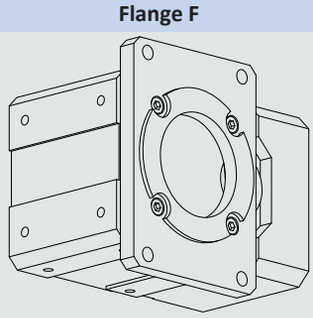
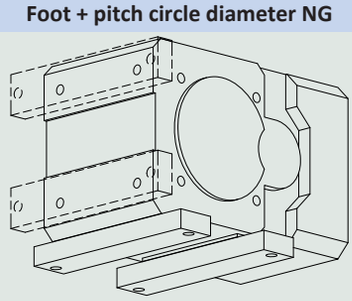
In order to complete the type designation, also specify:

- A detailed type designation of the motor, see the chapter [▷ 2]
- Attachment of solid shaft: gear unit side 3 or 4; solid shaft on both sides
- Attachment of hollow shaft with keyway: insertion side 3 or 4
- Attachment of hollow shaft with shrink disk: shrink disk on gear unit side 3 or 4
- Attachment of baseboards: gear unit side 1 or 5
- Attachment of flange: gear unit side 3 or 4
- Pitch circle diameter: gear unit side 3 or 4
- The position of the plug connector, see the chapter [▷ 11.5.6]

An explanation of the gear unit sides can be found in the chapter [▷ 11.5.4].

11.5 Product description

11.5.1 Housing design

Pitch circle diameter G	Flange F	Foot + pitch circle diameter NG
		

	G	F	NG
KL1	✓	✓	✓
KL2	✓	✓	✓

11.5.2 Combinatorial shaft/housing design

	Housing design			
Shaft design	**Code**	**G**	**F**	**NG**
Hollow shaft with keyway	**A**	AG	AF	ANG
Hollow shaft with shrink disk	**S**	SG	SF	SNG
Solid shaft without feather key	**G**	GG	GF	GNG
Solid shaft with feather key	**P**	PG	PF	PNG

11.5.3 Installation conditions

Hollow shaft

The hollow shaft hole tolerance is ISO H7. The tolerance of the machine shaft must be ISO k6.

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

Maximum deviation ≤ 0.03 mm.

For simpler assembly and disassembly of the machine shaft, the hollow shafts are equipped with a spiral groove (as a grease deposit).

A hardened, threaded dismounting disk is included in the scope of delivery. You also have the option to order the hollow shaft without a dismounting disk.

Hollow shaft with shrink disk

The tolerance of the hollow shaft hole is ISO H7.

The machine shaft must be ISO h9.

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

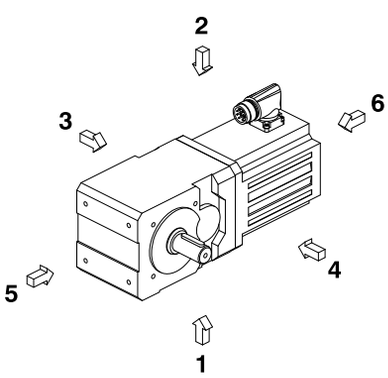
Possible materials:

- C45E +QT
- 42CrMo4

Attaching the gear unit on the machine side using the pitch circle diameter

The specified torques and forces only apply when attaching gear units at the machine side using screws of quality 10.9. In addition, the gear housing must be adjusted at the pilot (H7).

11.5.4 Gear unit sides



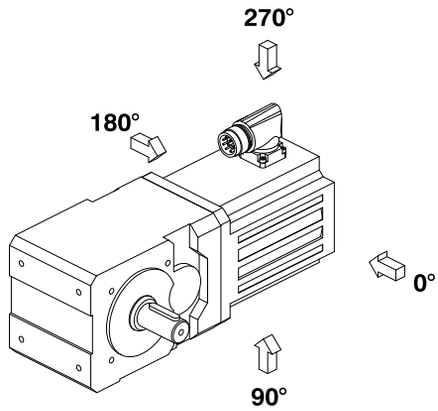
The numbers identify the gear unit sides.

11.5.5 Lubricants

STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

Lubricant filling quantities for gear units, document ID 441871, can be found online at http://www.stoeber.de

11.5.6 Position of the plug connector



In the standard version, the plug connector is attached in the 270° position.

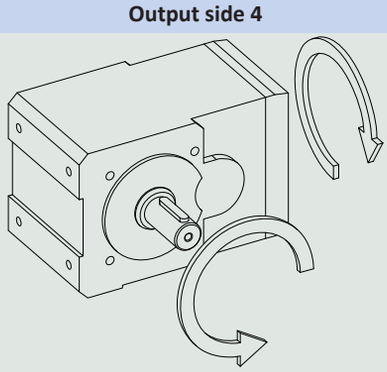
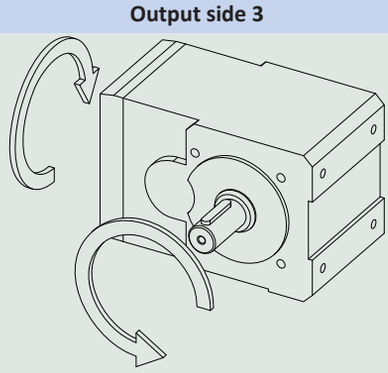
Indicate variations for your geared motor in the purchase order.

11.5.7 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 80 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU	Not suitable
Protection class: [1]	
Gear unit	IP65
Motor	IP56, optionally IP66

11.5.8 Direction of rotation

Solid shaft (P and G), solid shaft on both sides (P and G), hollow shaft with keyway (A)

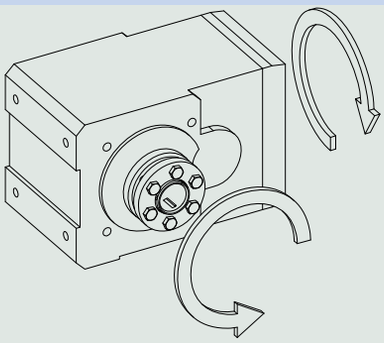
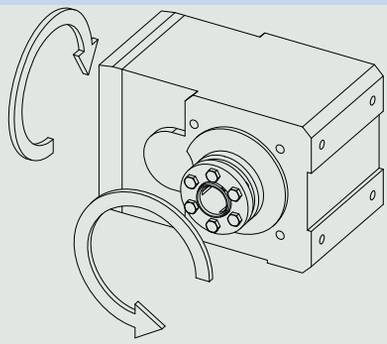
Output side 4	Output side 3
	

The specified directions of rotation also apply to gear units with hollow shaft (A) if the insertion side of the machine shaft corresponds to the side of the solid shaft that is shown.

The pictures show installation position EL1.

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

Hollow shaft with shrink disk (S)

Shrink disk side 4	Shrink disk side 3
	

The pictures show installation position EL1.

11.6 Project configuration

Project your drives using our SERVOsoft designing software. You can receive SERVOsoft for free from your adviser at one of our sales centers. Observe the limit conditions in this chapter to ensure a safe design for your drives.

An explanation of the formula symbols can be found in Chapter Symbols in formulas.

11.6.1 Calculation of the operating point

Check the following conditions for operating points other than the nominal point M_{2N} specified in the selection tables.

$$n_{1m^*} \leq \frac{n_{1maxDB}}{fB_T}$$

$$n_{1max^*} \leq \frac{n_{1maxZB}}{fB_T}$$

$$M_{2eff^*} \leq M_{2th}$$

$$M_{2acc^*} \leq M_{2acc}$$

$$M_{2NOT^*} \leq M_{2NOT}$$

$$M_{2eq^*} \leq M_{2N} \cdot \frac{S}{fB_{op} \cdot fB_t}$$

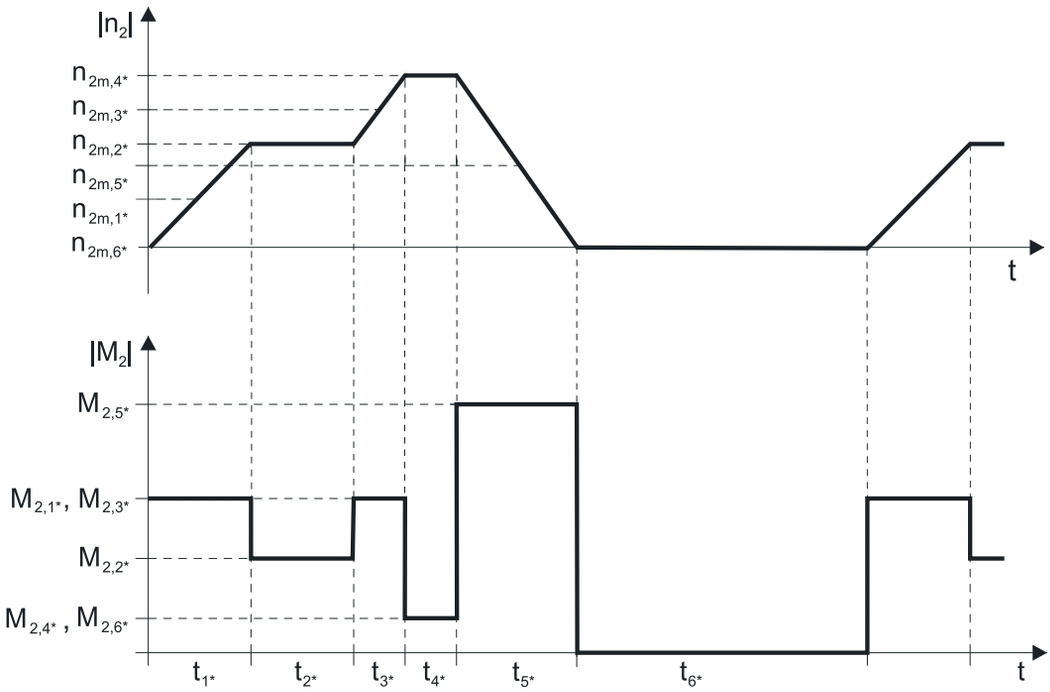
The values for n_{1maxDB}, n_{1maxZB}, M_{2acc}, M_{2NOT}, M_{2N} and S can be found in the selection tables.

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

Calculate the thermal limit torque M_{2th} for a duty cycle > 50%.

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 average input speed

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

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

If $t_{1^*} + \ldots + t_{5^*} \geq 20$ min, calculate n_{2m^*} without the rest phase t_{6^*}.

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 equivalent torque

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

Calculation of the thermal limit torque

Calculate the thermal limit torque M_{2th} for a duty cycle $ED_{20} > 50\%$ 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.)

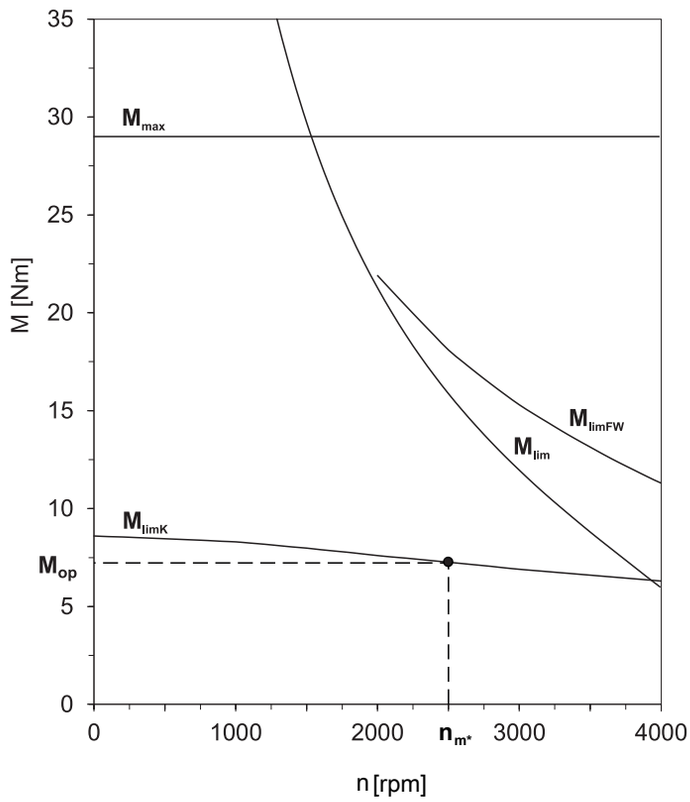
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0{,}9 - \frac{a_{th}}{1000} \cdot fB_T \cdot \left(\frac{n_{1m^*}}{1000}\right)^2$$

The values for i and a_{th} can be found in the selection tables.

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 curve of Chapter [▷ 2.3]. Note the size and nominal speed n_N 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 mode	fB_{op}
Uniform continuous operation	1.00
Cyclic operation	1.25
Reversing load cyclic operation	1.40

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

Temperature		fB_T
Motor cooling	**Surrounding temperature**	
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.

11.6.2 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)

11.6.2.1 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]	M_{2k100} [Nm]
KL1	20.0	380	1900	68
KL2	22.0	560	2800	118

For other output speeds, download diagrams at http://products.stoeber.de.

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

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

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

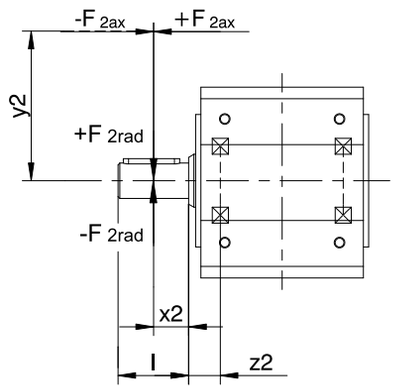


Fig. 1: Force application points for solid shaft

The specified values for $F_{2rad100}$ refer to force application on 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:

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

$$F_{2rad*} \leq F_{2radN}$$

$$F_{2ax*} \leq F_{2axN}$$

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.

11.6.2.2 A and S shaft design

Permitted shaft loads for A shaft design (hollow shaft with keyway)

Type	z_2 [mm]	F_{2ax100} [N]	$F_{2rad100}$ [N]	M_{2k100} [Nm]
KL1	18.5	250	1250	43
KL2	22.0	560	2800	118

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

Type	z_2 [mm]	F_{2ax100} [N]	$F_{2rad100}$ [N]	M_{2k100} [Nm]
KL1	18.5	250	1250	43
KL2	22.0	560	2800	118

For other output speeds, download diagrams at http://products.stoeber.de.

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

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

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

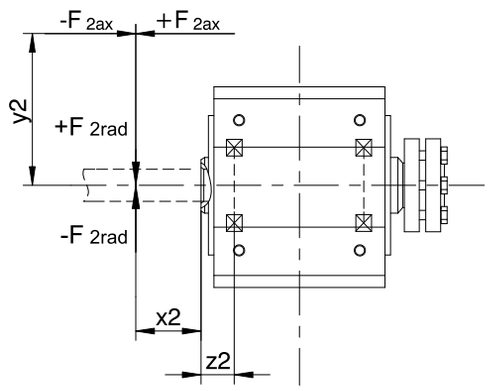


Fig. 2: Force application points for hollow shaft

You can determine the permitted radial forces from the permitted breakdown torque M_{2kN}. The actual radial forces may not exceed the permitted radial forces. The permitted radial forces are in relation to the end of the hollow shaft (x2 = 0).

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

$$F_{2ax*} \leq F_{2axN}$$

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.

11.6.3 Radial shaft seal rings

Leak-proofness

Our gear units are equipped with high-quality radial shaft seal rings and checked for leak-proofness. 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.

11.7 Additional documentation

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

Enter the ID of the documentation in the Search... field.

Documentation	ID
Operating manual for KL/KS/PHK/PHKX/PHQK/PK/PKX right-angle gear units and right-angle geared motors	443004_en
Lubricant filling quantities for gear units	441871