

13 Helical worm geared motors

S

13.1 Overview

Compact helical-gear right-angle geared motors

Features

- Power density ★★★★★
- Backlash ★★★★★
- Price category €
- Shaft load ★★★★★
- Smooth operation ★★★★★
- Torsional stiffness ★★★★★
- Mass moment of inertia ★★★★★
- Helical gearing ✓
- FKM seal ring at the input ✓
- Reinforced output bearing ✓ (on request)
- Compact and dynamic due to direct motor attachment ✓

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

Technical data

i	6 – 456
M_{2acc}	25 – 960 Nm
$\Delta\phi_2$	
η_{get}	≤ 91 %

13.2 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
- Weight specification for installation position EL1, housing design G

An explanation of the formula symbols can be found in the Chapter [▶ 15.1](#).

n_{2N}	M_{2N}	$M_{2,0}$	a_{th}	S	Type	M_{2acc}	M_{2NOT}	i	i_{exakt}	n_{1maxDB} EL1,2	n_{1maxDB} EL3,4,5,6	n_{1maxZB}	J_1	C_2	m
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			[rpm]	[rpm]	[rpm]	[10 ⁻⁴ kgm ²]	[Nm/ arcmin]	[kg]
S0 ($n_{1N} = 3000$ rpm, $M_{2acc,max} = 87$ Nm)															
80	70	76	48	0.82	S002_0370 LM401U	87	120	37.32	1269/34	3000	3000	4500	1.8	5.5	11
101	56	61	40	0.94	S002_0300 LM401U	79	110	29.70	297/10	2800	2600	4500	1.8	5.5	11
128	48	51	33	1.3	S002_0230 LM401U	82	100	23.40	117/5	3000	3000	4500	1.7	4.4	11
156	39	42	30	1.4	S002_0195 LM401U	77	100	19.29	135/7	3000	3000	4500	1.7	4.4	11
201	31	33	25	1.7	S002_0150 LM401U	60	98	14.93	1269/85	3000	3000	4500	1.8	4.4	11
201	60	62	50	0.86	S002_0150 LM402U	77	100	14.93	1269/85	3000	3000	4500	3.1	4.4	12
253	25	27	22	1.9	S002_0120 LM401U	48	79	11.88	297/25	3000	2800	4500	1.8	4.4	11
253	48	50	42	0.97	S002_0120 LM402U	70	93	11.88	297/25	3000	2800	4500	3.2	4.4	12
312	20	22	18	2.1	S002_0096 LM401U	39	64	9.626	1107/115	3000	2800	4500	1.9	4.4	11
312	39	40	35	1.1	S002_0096 LM402U	64	85	9.626	1107/115	3000	2800	4500	3.2	4.4	12
312	53	55	48	0.80	S002_0096 LM403U	64	85	9.626	1107/115	3000	2800	4500	4.5	4.4	14
405	16	17	15	2.5	S002_0074 LM401U	30	50	7.400	37/5	2600	2300	3700	2.0	4.4	11
405	30	31	29	1.3	S002_0074 LM402U	58	77	7.400	37/5	2600	2300	3700	3.3	4.4	12
405	41	42	40	0.93	S002_0074 LM403U	58	77	7.400	37/5	2600	2300	3700	4.6	4.4	14
500	13	14	18	2.6	S002_0060 LM401U	25	41	6.000	6/1	2600	2300	3700	2.1	4.4	11
500	25	26	35	1.5	S002_0060 LM402U	53	73	6.000	6/1	2600	2300	3700	3.5	4.4	12
500	34	35	48	1.1	S002_0060 LM403U	55	73	6.000	6/1	2600	2300	3700	4.8	4.4	14
S1 ($n_{1N} = 3000$ rpm, $M_{2acc,max} = 190$ Nm)															
34	160	173	49	0.92	S102_0870 LM401U	190	290	87.30	873/10	3000	3000	4500	1.7	7.6	15
43	129	139	42	1.1	S102_0700 LM401U	190	280	69.75	279/4	3000	3000	4500	1.7	7.6	15
52	108	117	38	1.2	S102_0580 LM401U	190	260	57.86	405/7	3000	3000	4500	1.8	7.6	15
69	83	89	33	1.4	S102_0440 LM401U	160	240	43.68	1485/34	3000	2800	4500	1.8	7.6	15
86	71	76	25	1.7	S102_0350 LM401U	140	170	34.92	873/25	3000	3000	4500	1.7	5.8	15
86	139	143	50	0.85	S102_0350 LM402U	150	230	34.92	873/25	3000	3000	4500	3.1	5.8	16
108	57	61	24	2.1	S102_0280 LM401U	110	150	27.90	279/10	3000	3000	4500	1.7	5.8	15
108	111	115	46	1.1	S102_0280 LM402U	150	240	27.90	279/10	3000	3000	4500	3.1	5.8	16
130	47	51	23	2.4	S102_0230 LM401U	93	140	23.14	162/7	3000	3000	4500	1.8	5.8	15
130	93	96	44	1.2	S102_0230 LM402U	150	230	23.14	162/7	3000	3000	4500	3.1	5.8	16
130	126	130	60	0.90	S102_0230 LM403U	150	230	23.14	162/7	3000	3000	4500	4.4	5.8	18
172	36	39	21	2.6	S102_0175 LM401U	71	120	17.47	297/17	3000	3000	4500	1.8	5.8	15
172	71	73	41	1.4	S102_0175 LM402U	150	200	17.47	297/17	3000	3000	4500	3.2	5.8	16
172	96	99	56	1.0	S102_0175 LM403U	150	200	17.47	297/17	3000	3000	4500	4.5	5.8	18
214	29	31	20	2.6	S102_0140 LM401U	57	93	14.04	351/25	3000	3000	4500	1.9	5.8	15
214	57	59	39	1.5	S102_0140 LM402U	120	170	14.04	351/25	3000	3000	4500	3.2	5.8	16
214	78	80	53	1.1	S102_0140 LM403U	130	170	14.04	351/25	3000	3000	4500	4.5	5.8	18
261	24	26	19	2.6	S102_0115 LM401U	47	77	11.50	1323/115	3000	2600	4000	2.0	5.8	15
261	47	48	37	1.6	S102_0115 LM402U	100	150	11.50	1323/115	3000	2600	4000	3.3	5.8	16
261	64	66	50	1.2	S102_0115 LM403U	110	150	11.50	1323/115	3000	2600	4000	4.6	5.8	18
326	19	21	18	2.6	S102_0092 LM401U	38	62	9.200	46/5	3000	2600	4000	2.1	5.8	15
326	38	39	35	1.7	S102_0092 LM402U	82	130	9.200	46/5	3000	2600	4000	3.4	5.8	16
326	51	53	47	1.3	S102_0092 LM403U	96	130	9.200	46/5	3000	2600	4000	4.7	5.8	18
326	78	83	72	0.82	S102_0092 LM503U	96	130	9.200	46/5	3000	2600	4000	11	5.8	21
S2 ($n_{1N} = 3000$ rpm, $M_{2acc,max} = 360$ Nm)															
17	321	346	48	0.83	S202_1740 LM401U	360	530	174.4	1395/8	3000	3000	4500	1.7	11	22
17	311	336	46	0.96	S203_1720 LM401U	360	600	171.8	5499/32	3000	3000	4500	1.7	11	25
22	258	278	41	1.2	S202_1400 LM401U	360	560	139.5	279/2	3000	3000	4500	1.7	11	22
22	249	268	39	1.2	S203_1360 LM401U	360	590	136.3	28341/208	3000	3000	4500	1.7	11	25
26	216	233	37	1.3	S202_1160 LM401U	360	530	116.1	1161/10	3000	3000	4500	1.7	11	22
35	163	176	31	1.7	S202_0870 LM401U	320	440	86.79	1215/14	3000	3000	4500	1.8	11	22
35	319	329	62	0.85	S202_0870 LM402U	360	540	86.79	1215/14	3000	3000	4500	3.1	11	24
43	260	269	54	0.98	S202_0700 LM402U	360	510	70.20	351/5	3000	3000	4500	3.2	11	24
52	111	120	25	2.1	S202_0580 LM401U	220	350	58.22	1863/32	3000	3000	4500	1.9	11	22
52	218	224	48	1.1	S202_0580 LM402U	360	470	58.22	1863/32	3000	3000	4500	3.2	11	24

13.2 Selection tables 13 S helical worm geared motors

n_{2N}	M_{2N}	$M_{2,0}$	a_{ih}	S	Type	M_{2acc}	M_{2NOT}	i	i_{exakt}	n_{1maxDB}	n_{1maxDB}	n_{1maxZB}	J_1	C_2	m
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	$[10^{-4}]$ kgm ²	[Nm/ arcmin]	[kg]
S2 ($n_{1N} = 3000$ rpm, $M_{2acc,max} = 360$ Nm)															
52	296	304	66	0.80	S202_0580 LM403U	360	470	58.22	1863/32	3000	3000	4500	4.5	11	25
68	85	92	21	2.5	S202_0440 LM401U	170	270	43.88	351/8	3000	2700	4200	2.0	11	22
68	166	171	42	1.3	S202_0440 LM402U	310	420	43.88	351/8	3000	2700	4200	3.4	11	24
68	226	232	57	0.92	S202_0440 LM403U	310	420	43.88	351/8	3000	2700	4200	4.7	11	25
86	71	76	15	2.2	S202_0350 LM401U	140	190	34.71	243/7	3000	3000	4500	1.8	9.5	22
86	138	143	29	1.7	S202_0350 LM402U	300	470	34.71	243/7	3000	3000	4500	3.1	9.5	24
86	188	193	40	1.3	S202_0350 LM403U	310	470	34.71	243/7	3000	3000	4500	4.4	9.5	25
86	287	304	61	0.83	S202_0350 LM503U	310	470	34.71	243/7	3000	3000	4500	11	9.5	28
107	112	116	27	2.0	S202_0280 LM402U	240	450	28.08	702/25	3000	3000	4500	3.2	9.5	24
107	153	157	37	1.5	S202_0280 LM403U	310	450	28.08	702/25	3000	3000	4500	4.5	9.5	25
107	233	247	56	0.97	S202_0280 LM503U	310	450	28.08	702/25	3000	3000	4500	11	9.5	28
129	48	52	13	2.6	S202_0230 LM401U	94	150	23.29	1863/80	3000	3000	4500	1.9	9.5	22
129	94	97	26	2.3	S202_0230 LM402U	200	430	23.29	1863/80	3000	3000	4500	3.3	9.5	24
129	127	131	35	1.7	S202_0230 LM403U	270	430	23.29	1863/80	3000	3000	4500	4.6	9.5	25
129	194	206	53	1.1	S202_0230 LM503U	310	430	23.29	1863/80	3000	3000	4500	11	9.5	28
171	36	39	12	2.6	S202_0175 LM401U	71	120	17.55	351/20	3000	3000	4500	2.1	9.5	22
171	71	73	24	2.7	S202_0175 LM402U	150	380	17.55	351/20	3000	3000	4500	3.4	9.5	24
171	97	100	32	2.0	S202_0175 LM403U	200	380	17.55	351/20	3000	3000	4500	4.7	9.5	25
171	148	157	49	1.3	S202_0175 LM503U	280	380	17.55	351/20	3000	3000	4500	11	9.5	28
171	214	242	71	0.89	S202_0175 LM505U	280	380	17.55	351/20	3000	3000	4500	17	9.5	33
216	57	59	22	2.9	S202_0140 LM402U	120	330	13.92	1809/130	3000	3000	4500	3.6	9.5	24
216	77	79	30	2.1	S202_0140 LM403U	160	330	13.92	1809/130	3000	3000	4500	4.9	9.5	25
216	118	125	46	1.4	S202_0140 LM503U	250	330	13.92	1809/130	3000	3000	4500	11	9.5	28
216	171	193	66	0.97	S202_0140 LM505U	250	330	13.92	1809/130	3000	3000	4500	17	9.5	33
259	24	26	11	2.6	S202_0115 LM401U	48	78	11.60	58/5	2800	2500	3900	2.4	9.5	22
259	48	49	21	3.1	S202_0115 LM402U	100	290	11.60	58/5	2800	2500	3900	3.8	9.5	24
259	65	67	28	2.3	S202_0115 LM403U	140	290	11.60	58/5	2800	2500	3900	5.1	9.5	25
259	99	105	43	1.5	S202_0115 LM503U	220	290	11.60	58/5	2800	2500	3900	11	9.5	28
259	143	162	63	1.0	S202_0115 LM505U	220	290	11.60	58/5	2800	2500	3900	18	9.5	33
325	38	39	20	3.3	S202_0092 LM402U	82	250	9.232	1431/155	2800	2500	3900	4.1	9.5	24
325	52	53	27	2.4	S202_0092 LM403U	110	250	9.232	1431/155	2800	2500	3900	5.4	9.5	25
325	79	84	41	1.6	S202_0092 LM503U	170	250	9.232	1431/155	2800	2500	3900	11	9.5	28
325	115	130	59	1.1	S202_0092 LM505U	190	250	9.232	1431/155	2800	2500	3900	18	9.5	33
S3 ($n_{1N} = 3000$ rpm, $M_{2acc,max} = 660$ Nm)															
8.8	617	665	49	0.89	S303_3420 LM401U	660	1100	341.7	8883/26	3000	2700	4000	1.7	26	36
11	498	536	40	1.1	S303_2740 LM401U	660	1100	274.3	35109/128	3000	2700	4000	1.7	26	36
13	417	450	35	1.3	S303_2290 LM401U	660	1100	229.1	1833/8	3000	2700	4000	1.7	26	36
17	325	351	33	1.3	S302_1740 LM401U	510	630	174.4	1395/8	3000	2700	4000	1.7	26	31
18	313	337	27	1.8	S303_1700 LM401U	610	900	170.1	15651/92	3000	2700	4000	1.8	26	36
18	611	630	54	0.90	S303_1700 LM402U	660	900	170.1	15651/92	3000	2700	4000	3.1	26	38
21	514	530	48	1.1	S302_1400 LM402U	660	1080	139.9	1539/11	3000	2700	4000	3.1	26	33
22	254	273	24	2.1	S303_1370 LM401U	500	730	137.1	1645/12	3000	2700	4000	1.8	26	36
22	496	511	46	1.1	S303_1370 LM402U	580	730	137.1	1645/12	3000	2700	4000	3.1	26	38
26	429	442	42	1.2	S302_1160 LM402U	660	1060	116.1	1161/10	3000	2700	4000	3.2	26	33
26	583	600	57	0.91	S302_1160 LM403U	660	1060	116.1	1161/10	3000	2700	4000	4.5	26	35
34	326	336	36	1.5	S302_0870 LM402U	660	1010	87.23	1134/13	3000	2700	4000	3.3	26	33
34	443	455	49	1.1	S302_0870 LM403U	660	1010	87.23	1134/13	3000	2700	4000	4.6	26	35
43	264	272	32	1.8	S302_0700 LM402U	570	950	70.03	2241/32	3000	2700	4000	3.4	26	33
43	359	369	43	1.3	S302_0700 LM403U	660	950	70.03	2241/32	3000	2700	4000	4.7	26	35
43	547	580	66	0.87	S302_0700 LM503U	660	950	70.03	2241/32	3000	2700	4000	11	26	38
51	222	229	29	2.0	S302_0590 LM402U	480	900	58.50	117/2	3000	2700	4000	3.5	26	33
51	302	310	39	1.5	S302_0590 LM403U	630	900	58.50	117/2	3000	2700	4000	4.8	26	35
51	460	488	60	0.97	S302_0590 LM503U	660	900	58.50	117/2	3000	2700	4000	11	26	38
69	167	172	25	2.4	S302_0430 LM402U	360	790	43.44	999/23	2900	2400	3800	3.8	26	33
69	227	233	34	1.7	S302_0430 LM403U	480	790	43.44	999/23	2900	2400	3800	5.1	26	35
69	346	367	52	1.1	S302_0430 LM503U	590	790	43.44	999/23	2900	2400	3800	11	26	38
86	140	145	18	3.0	S302_0350 LM402U	300	750	34.89	2268/65	3000	3000	4000	3.3	20	33
86	191	196	24	2.2	S302_0350 LM403U	400	750	34.89	2268/65	3000	3000	4000	4.6	20	35
86	291	308	37	1.5	S302_0350 LM503U	520	750	34.89	2268/65	3000	3000	4000	11	20	38
86	420	477	53	1.0	S302_0350 LM505U	520	750	34.89	2268/65	3000	3000	4000	17	20	42
107	113	117	17	3.7	S302_0280 LM402U	240	640	28.01	2241/80	3000	3000	4000	3.5	20	33
107	154	158	23	2.7	S302_0280 LM403U	320	640	28.01	2241/80	3000	3000	4000	4.8	20	35
107	235	249	35	1.8	S302_0280 LM503U	510	640	28.01	2241/80	3000	3000	4000	11	20	38
107	339	385	50	1.2	S302_0280 LM505U	520	640	28.01	2241/80	3000	3000	4000	17	20	42

n_{2N}	M_{2N}	$M_{2,0}$	a_{ih}	S	Type	M_{2acc}	M_{2NOT}	i	i_{exakt}	n_{1maxDB}	n_{1maxDB}	n_{1maxZB}	J_1	C_2	m
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	$[10^{-4}]$ [kgm ²]	[Nm/ arcmin]	[kg]
S3 ($n_{1N} = 3000$ rpm, $M_{2acc,max} = 660$ Nm)															
128	95	98	17	4.2	S302_0230 LM402U	200	590	23.40	117/5	3000	3000	4000	3.6	20	33
128	129	133	23	3.1	S302_0230 LM403U	270	590	23.40	117/5	3000	3000	4000	4.9	20	35
128	197	209	35	2.0	S302_0230 LM503U	430	590	23.40	117/5	3000	3000	4000	11	20	38
128	285	323	51	1.4	S302_0230 LM505U	470	590	23.40	117/5	3000	3000	4000	17	20	42
128	414	458	73	0.96	S302_0230 LM704U	520	790	23.40	117/5	3000	3000	4000	37	20	48
173	71	73	17	4.9	S302_0175 LM402U	150	470	17.37	1998/115	3000	3000	4000	4.0	20	33
173	97	99	23	3.6	S302_0175 LM403U	200	470	17.37	1998/115	3000	3000	4000	5.3	20	35
173	147	156	35	2.4	S302_0175 LM503U	320	470	17.37	1998/115	3000	3000	4000	11	20	38
173	213	242	51	1.6	S302_0175 LM505U	370	470	17.37	1998/115	3000	3000	4000	18	20	42
173	310	343	74	1.1	S302_0175 LM704U	520	700	17.37	1998/115	3000	3000	4000	37	20	48
173	408	473	97	0.85	S302_0175 LM706U	520	700	17.37	1998/115	3000	3000	4000	55	20	55
214	78	81	23	3.8	S302_0140 LM403U	160	380	14.00	14/1	3000	3000	4000	5.7	20	35
214	120	127	35	2.5	S302_0140 LM503U	260	380	14.00	14/1	3000	3000	4000	12	20	38
214	173	196	51	1.7	S302_0140 LM505U	300	380	14.00	14/1	3000	3000	4000	18	20	42
214	251	278	74	1.2	S302_0140 LM704U	450	590	14.00	14/1	3000	3000	4000	38	20	48
214	331	383	98	0.90	S302_0140 LM706U	450	590	14.00	14/1	3000	3000	4000	55	20	55
257	66	67	23	3.8	S302_0115 LM403U	140	320	11.66	1458/125	2600	2300	3600	6.2	20	35
257	100	106	36	2.5	S302_0115 LM503U	220	320	11.66	1458/125	2600	2300	3600	12	20	38
257	145	164	52	1.7	S302_0115 LM505U	250	320	11.66	1458/125	2600	2300	3600	19	20	42
257	210	233	75	1.2	S302_0115 LM704U	370	490	11.66	1458/125	2600	2300	3600	38	20	48
257	277	321	98	0.89	S302_0115 LM706U	370	490	11.66	1458/125	2600	2300	3600	56	20	55
322	169	187	75	1.2	S302_0093 LM704U	300	390	9.310	270/29	2600	2300	3600	39	20	48
322	222	258	99	0.89	S302_0093 LM706U	300	390	9.310	270/29	2600	2300	3600	56	20	55
S4 ($n_{1N} = 3000$ rpm, $M_{2acc,max} = 960$ Nm)															
6.6	825	890	49	0.97	S403_4560 LM401U	960	1700	455.5	5922/13	2800	2600	4000	1.7	36	45
8.8	623	672	37	1.3	S403_3420 LM401U	960	1630	341.9	13677/40	2800	2600	4000	1.7	36	45
11	500	539	30	1.6	S403_2730 LM401U	960	1440	273.2	4371/16	2800	2600	4000	1.8	36	45
13	421	454	26	1.9	S403_2290 LM401U	830	1210	229.1	1833/8	2800	2600	4000	1.8	36	45
13	824	850	50	0.97	S403_2290 LM402U	960	1210	229.1	1833/8	2800	2600	4000	3.1	36	46
26	899	953	65	0.88	S402_1160 LM503U	960	1580	116.3	1512/13	2800	2600	4000	11	36	47
34	682	723	56	1.1	S402_0870 LM503U	960	1500	87.30	873/10	2800	2600	4000	11	36	47
43	550	583	49	1.3	S402_0700 LM503U	960	1410	69.75	279/4	2800	2600	4000	11	36	47
43	796	902	71	0.89	S402_0700 LM505U	960	1410	69.75	279/4	2800	2600	4000	17	36	51
51	465	492	44	1.4	S402_0590 LM503U	960	1330	58.50	117/2	2800	2600	4000	11	36	47
51	672	762	64	0.99	S402_0590 LM505U	960	1330	58.50	117/2	2800	2600	4000	18	36	51
86	292	309	26	2.0	S402_0350 LM503U	590	740	34.92	873/25	3000	3000	4000	11	29	47
86	422	478	38	1.4	S402_0350 LM505U	590	740	34.92	873/25	3000	3000	4000	17	29	51
86	613	678	55	1.0	S402_0350 LM704U	720	1200	34.92	873/25	3000	3000	4000	37	29	57
108	234	249	25	2.3	S402_0280 LM503U	510	680	27.90	279/10	3000	3000	4000	11	29	47
108	339	384	36	1.6	S402_0280 LM505U	550	680	27.90	279/10	3000	3000	4000	18	29	51
108	493	545	52	1.3	S402_0280 LM704U	720	1200	27.90	279/10	3000	3000	4000	37	29	57
128	198	209	25	2.5	S402_0230 LM503U	430	620	23.40	117/5	3000	3000	4000	11	29	47
128	286	324	36	1.7	S402_0230 LM505U	500	620	23.40	117/5	3000	3000	4000	18	29	51
128	415	460	52	1.4	S402_0230 LM704U	720	1200	23.40	117/5	3000	3000	4000	37	29	57
128	546	633	68	1.1	S402_0230 LM706U	720	1200	23.40	117/5	3000	3000	4000	55	29	64
172	313	346	51	1.7	S402_0175 LM704U	660	1060	17.49	612/35	2800	2500	3800	38	29	57
172	412	477	67	1.3	S402_0175 LM706U	720	1060	17.49	612/35	2800	2500	3800	55	29	64
215	251	278	51	1.8	S402_0140 LM704U	530	910	13.95	279/20	2800	2500	3800	39	29	57
215	331	383	67	1.4	S402_0140 LM706U	680	910	13.95	279/20	2800	2500	3800	56	29	64
259	209	232	50	1.8	S402_0115 LM704U	440	760	11.57	81/7	2400	2100	3200	40	29	57
259	276	319	66	1.4	S402_0115 LM706U	570	760	11.57	81/7	2400	2100	3200	57	29	64
323	169	187	50	1.8	S402_0093 LM704U	350	620	9.281	297/32	2400	2100	3200	41	29	57
323	222	258	66	1.4	S402_0093 LM706U	470	620	9.281	297/32	2400	2100	3200	58	29	64

13.3 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>.

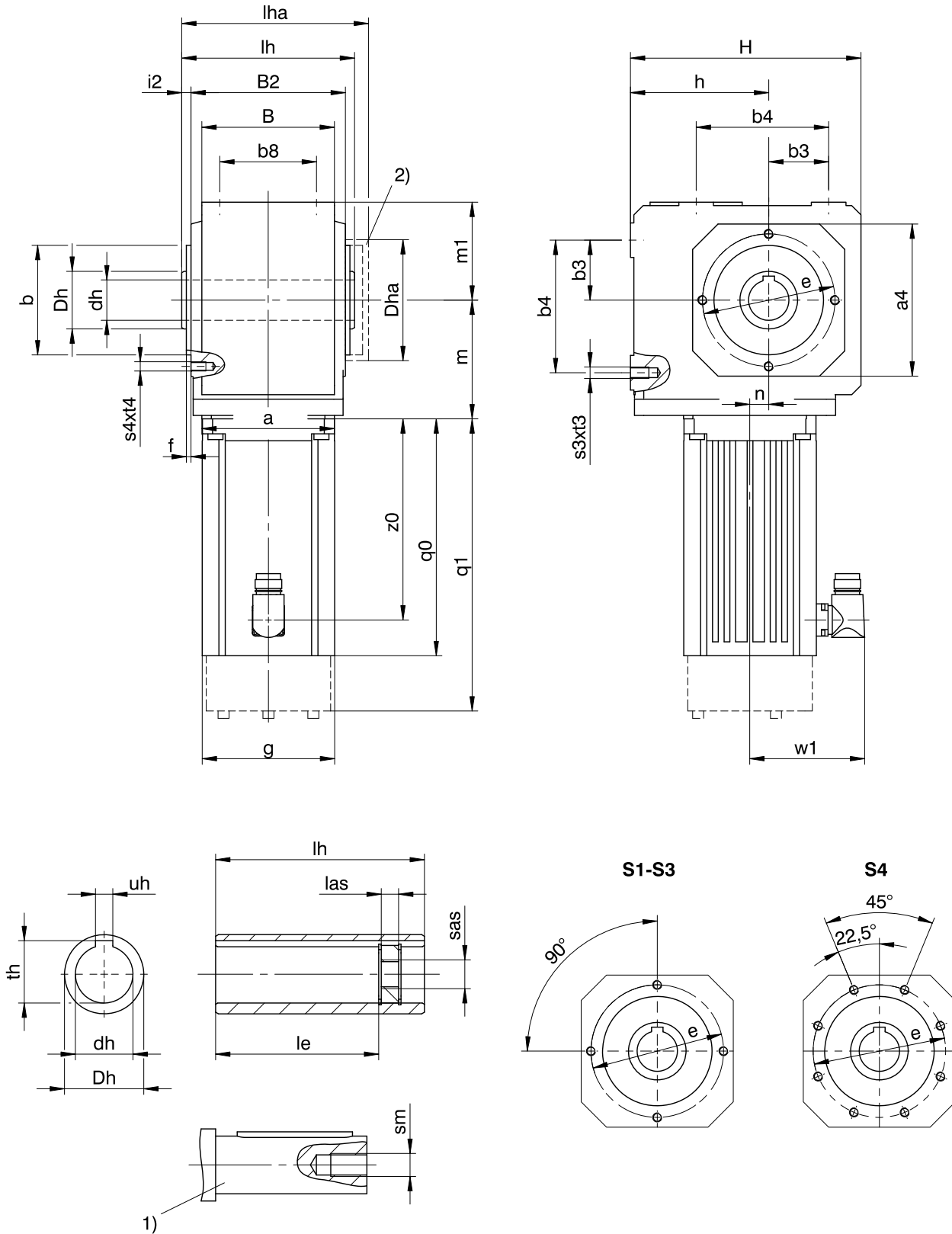
Tolerances

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 \varnothing fit \leq 50 mm	DIN 748-1, ISO k6
Shaft \varnothing 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 S1/K1 \varnothing 30: DIN 6885-3, low form
Flange	Pilot tolerance
Up to 300 mm	ISO j6
Starting at 350 mm	ISO h6

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

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



q0 Applies to motors without brake.

x Applies to encoders using an optical measuring method.

2) Cover (optional)

q1 Applies to motors with brake.

1) The length of the machine shaft must be at least $2.2 \times \varnothing dh$ and the length of the feather key must be at least $2 \times \varnothing dh$.

Dimensions of gear units

Type	a4	∅b	b3	b4	b8	B	B2	∅dh	∅Dh	□Dha	∅e	f	h	H	i2	le	lh	las	lha	m1	s3	s4	sm	sas	t3	t4	th	uh
S1	□105	75 ₆	40	90	70	90	106	20 ^{H7}	40	105	90	3.0	100	167	7.0	98.0	120	12	127.0	70	M8	M8	M6	M8	13	13	22.8	6 ^{JS9}
S1	□105	75 ₆	40	90	70	90	106	25 ^{H7}	40	105	90	3.0	100	167	7.0	98.0	120	12	127.0	70	M8	M8	M10	M12	13	13	28.3	8 ^{JS9}
S1	□105	75 ₆	40	90	70	90	106	30 ^{H7}	40	105	90	3.0	100	167	7.0	93.5	120	12	127.0	70	M8	M8	M10	M12	13	13	32	8 ^{JS9}
S2	□132	95 ₆	52	115	90	115	134	30 ^{H7}	50	132	115	4.0	120	200	8.0	123.5	150	12	157.0	85	M10	M8	M10	M12	16	13	33.3	8 ^{JS9}
S2	□132	95 ₆	52	115	90	115	134	35 ^{H7}	50	132	115	4.0	120	200	8.0	119.0	150	12	157.0	85	M10	M8	M12	M16	16	13	38.3	10 ^{JS9}
S3	□152	110 ₆	52	130	105	130	153	40 ^{H7}	55	152	130	3.5	140	233	7.5	136.5	168	12	177.5	100	M10	M10	M16	M20	16	16	43.3	12 ^{JS9}
S4	□145	110 ₆	67	155	120	148	173	50 ^{H7}	65	145	130	3.5	160	263	8.5	153.0	190	12	198.5	110	M12	M10	M16	M20	19	16	53.8	14 ^{JS9}

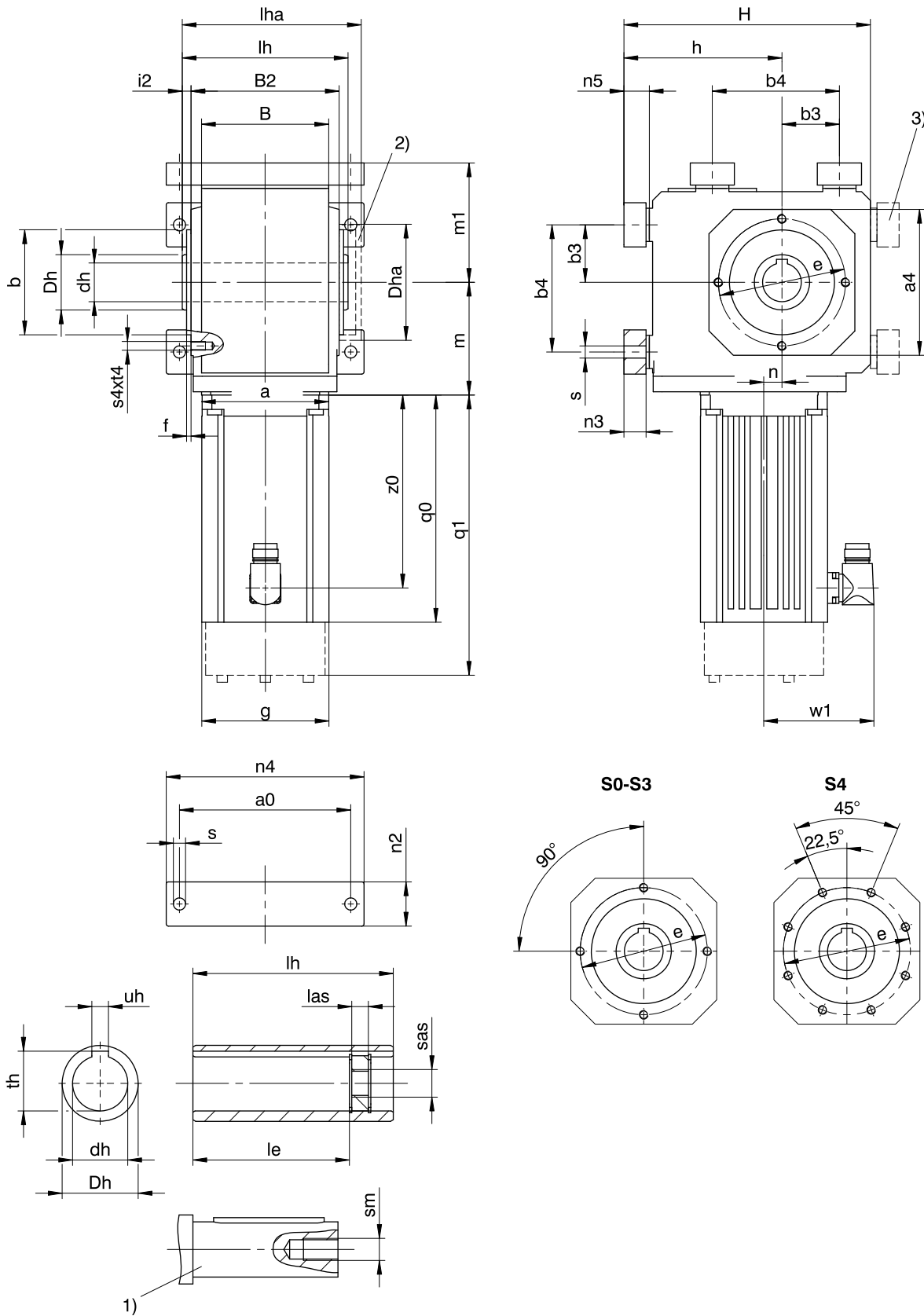
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S102	□98	83	14.0	□115	87	14.0	-	-	-
S202	□98	98	17.0	□115	102	17.0	-	-	-
S203	∅140	135	17.0	-	-	-	-	-	-
S302	∅140	113	25.5	□115	117	25.5	□145	119	25.5
S303	∅140	150	25.5	-	-	-	-	-	-
S402	-	-	-	∅160	129	30.0	□145	131	30.0
S403	∅140	162	30.0	-	-	-	-	-	-

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



- | | | | |
|-------|--|-------|---|
| q_0 | Applies to motors without brake. | q_1 | Applies to motors with brake. |
| x | Applies to encoders using an optical measuring method. | 1) | The length of the machine shaft must be at least $2.2 \times \varnothing dh$ and the length of the feather key must be at least $2 \times \varnothing dh$. |
| 2) | Cover (optional) | 3) | Only for S0 |

Dimensions of gear units

Type	a0	a4	∅b	b3	b4	B	B2	∅dh	∅Dh	□Dha	∅e	f	h	H	i2	le	lh	las	lha	m1	n2	n3	n4	n5	∅s	s4	sm	sas	t4	th	uh
S0	75	∅85	75 ₆	40	80	92	94	20 ^{H7}	40	102	90	3.0	80	143	7.0	86.0	108	12	113.0	63	22	9	92	9	6.6	M6	M6	M8	13	22.8	6 ^{JS9}
S0	75	∅85	75 ₆	40	80	92	94	25 ^{H7}	40	102	90	3.0	80	143	7.0	86.0	108	12	113.0	63	22	9	92	9	6.6	M6	M10	M12	13	28.3	8 ^{JS9}
S1	115	□105	75 ₆	40	90	90	106	20 ^{H7}	40	105	90	3.0	115	182	7.0	98.0	120	12	127.0	85	30	13	140	15	9.0	M8	M6	M8	13	22.8	6 ^{JS9}
S1	115	□105	75 ₆	40	90	90	106	25 ^{H7}	40	105	90	3.0	115	182	7.0	98.0	120	12	127.0	85	30	13	140	15	9.0	M8	M10	M12	13	28.3	8 ^{JS9}
S1	115	□105	75 ₆	40	90	90	106	30 ^{H7}	40	105	90	3.0	115	182	7.0	93.5	120	12	127.0	85	30	13	140	15	9.0	M8	M10	M12	13	32	8 ^{JS9}
S2	155	□132	95 ₆	52	115	115	134	30 ^{H7}	50	132	115	4.0	143	223	8.0	123.5	150	12	157.0	108	40	20	185	23	11.0	M8	M10	M12	13	33.3	8 ^{JS9}
S2	155	□132	95 ₆	52	115	115	134	35 ^{H7}	50	132	115	4.0	143	223	8.0	119.0	150	12	157.0	108	40	20	185	23	11.0	M8	M12	M16	13	38.3	10 ^{JS9}
S3	170	□152	110 ₆	52	130	130	153	40 ^{H7}	55	152	130	3.5	163	256	7.5	136.5	168	12	177.5	123	45	20	200	23	11.0	M10	M16	M20	16	43.3	12 ^{JS9}
S4	200	□145	110 ₆	67	155	148	173	50 ^{H7}	65	145	130	3.5	185	288	8.5	153.0	190	12	198.5	135	50	22	230	25	14.0	M10	M16	M20	16	53.8	14 ^{JS9}

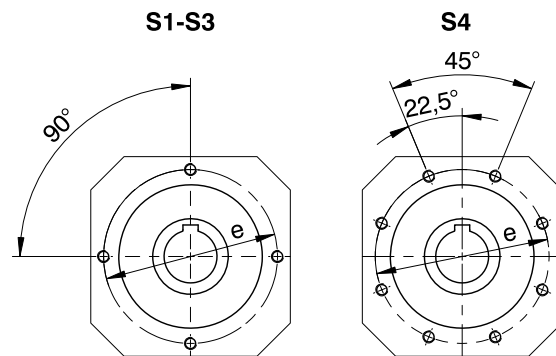
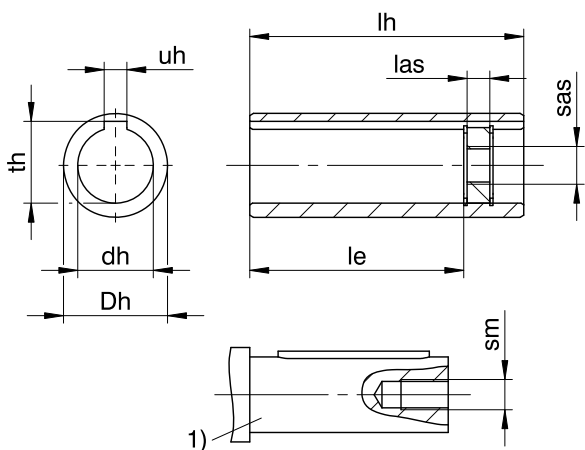
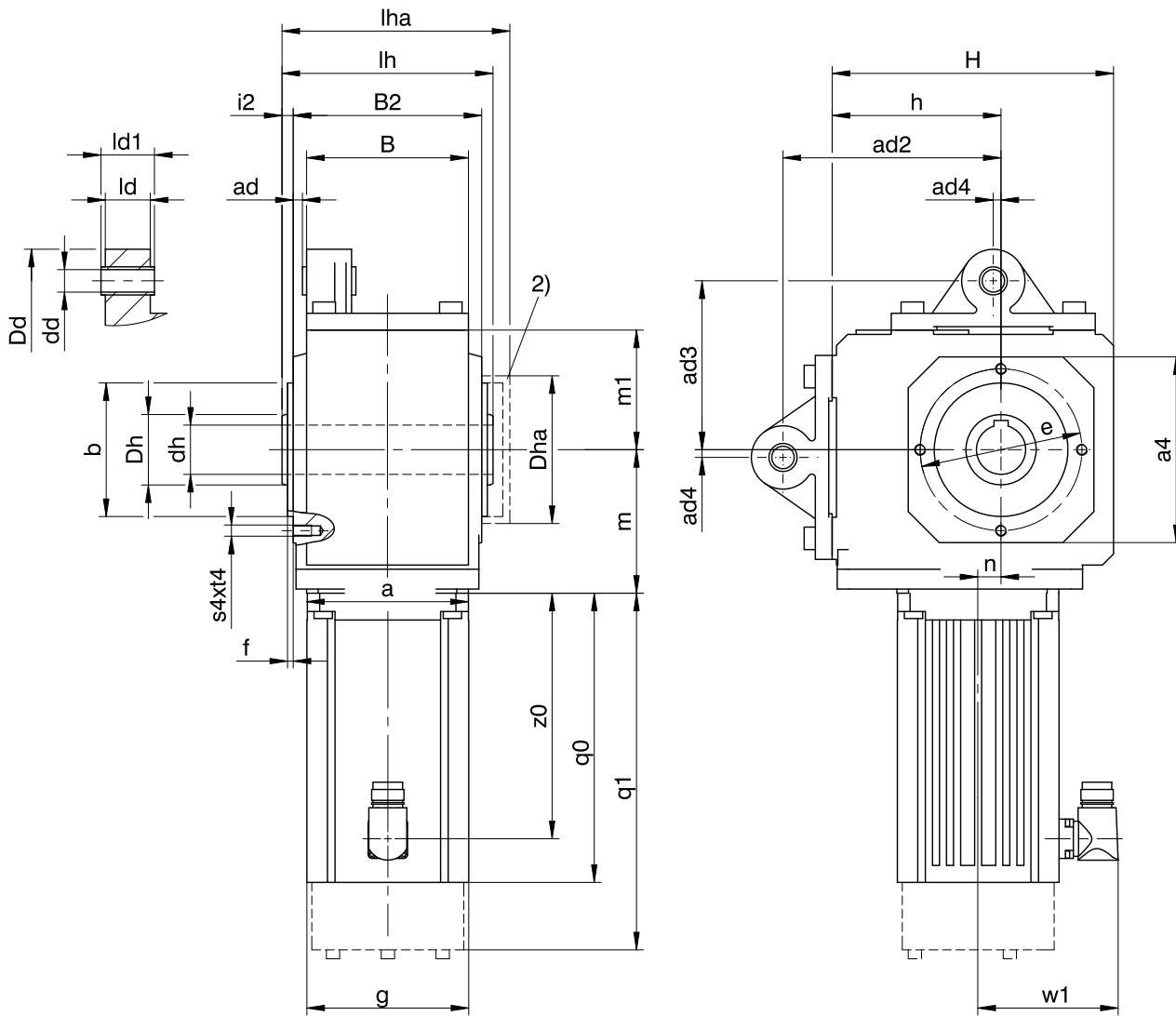
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S002	∅140	70	8.5	-	-	-	-	-	-
S102	□98	83	14.0	□115	87	14.0	-	-	-
S202	□98	98	17.0	□115	102	17.0	-	-	-
S203	∅140	135	17.0	-	-	-	-	-	-
S302	∅140	113	25.5	□115	117	25.5	□145	119	25.5
S303	∅140	150	25.5	-	-	-	-	-	-
S402	-	-	-	∅160	129	30.0	□145	131	30.0
S403	∅140	162	30.0	-	-	-	-	-	-

13.3.3 A shaft design (hollow shaft), GD housing design (pitch circle diameter + torque arm)



q_0 Applies to motors without brake.

x Applies to encoders using an optical measuring method.

2) Cover (optional)

q_1 Applies to motors with brake.

1) The length of the machine shaft must be at least $2.2 \times \varnothing dh$ and the length of the feather key must be at least $2 \times \varnothing dh$.

Dimensions of gear units

Type	a4	ad	ad2	ad3	ad4	Øb	B	B2	Ødd	Ødh	ØDd	ØDh	□Dha	Øe	f	h	H	i2	ld	ld1	le	lh	las	lha	m1	s4	sm	sas	t4	th	uh
S1	□105	6.0	130	100	5.0	75 ₆	90	106	12 ^{H9}	20 ^{H7}	43	40	105	90	3.0	100	167	7.0	24	28	98.0	120	12	127.0	70	M8	M6	M8	13	22.8	6 ^{JS9}
S1	□105	6.0	130	100	5.0	75 ₆	90	106	12 ^{H9}	25 ^{H7}	43	40	105	90	3.0	100	167	7.0	24	28	98.0	120	12	127.0	70	M8	M10	M12	13	28.3	8 ^{JS9}
S1	□105	6.0	130	100	5.0	75 ₆	90	106	12 ^{H9}	30 ^{H7}	43	40	105	90	3.0	100	167	7.0	24	28	93.5	120	12	127.0	70	M8	M10	M12	13	32	8 ^{JS9}
S2	□132	6.5	155	120	5.5	95 ₆	115	134	16 ^{H9}	30 ^{H7}	45	50	132	115	4.0	120	200	8.0	32	38	123.5	150	12	157.0	85	M8	M10	M12	13	33.3	8 ^{JS9}
S2	□132	6.5	155	120	5.5	95 ₆	115	134	16 ^{H9}	35 ^{H7}	45	50	132	115	4.0	120	200	8.0	32	38	119.0	150	12	157.0	85	M8	M12	M16	13	38.3	10 ^{JS9}
S3	□152	5.0	185	145	13.0	110 ₆	130	153	16 ^{H9}	40 ^{H7}	45	55	152	130	3.5	140	233	7.5	32	38	136.5	168	12	177.5	100	M10	M16	M20	16	43.3	12 ^{JS9}
S4	□145	9.5	220	170	10.5	110 ₆	148	173	20 ^{H9}	50 ^{H7}	55	65	145	130	3.5	160	263	8.5	40	46	153.0	190	12	198.5	110	M10	M16	M20	16	53.8	14 ^{JS9}

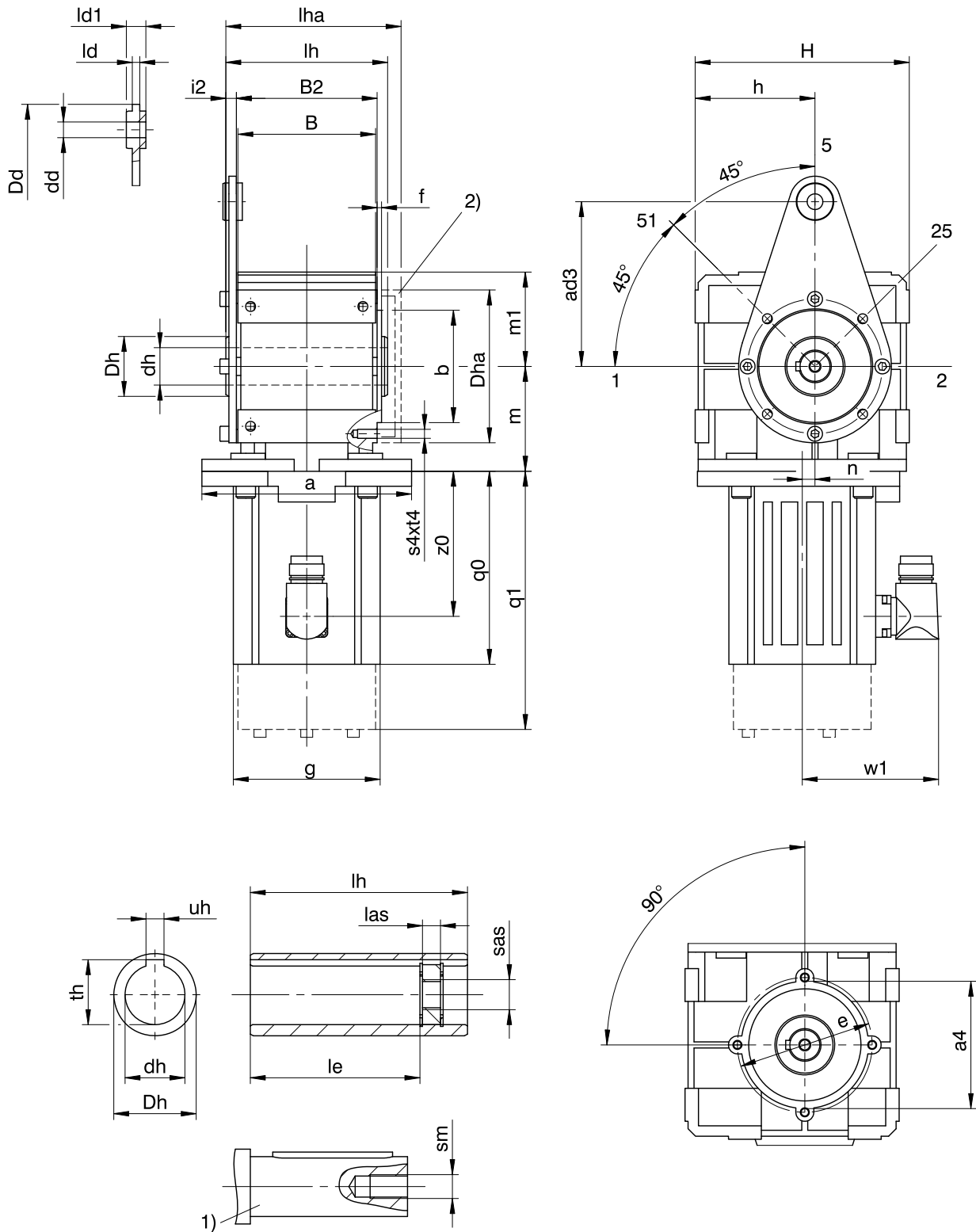
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S102	□98	83	14.0	□115	87	14.0	-	-	-
S202	□98	98	17.0	□115	102	17.0	-	-	-
S203	Ø140	135	17.0	-	-	-	-	-	-
S302	Ø140	113	25.5	□115	117	25.5	□145	119	25.5
S303	Ø140	150	25.5	-	-	-	-	-	-
S402	-	-	-	Ø160	129	30.0	□145	131	30.0
S403	Ø140	162	30.0	-	-	-	-	-	-

13.3.4 A shaft design (hollow shaft), NGD housing design (base + pitch circle diameter + torque arm)



q0 Applies to motors without brake.
 x Applies to encoders using an optical measuring method.
 2) Cover (optional)

q1 Applies to motors with brake.
 1) The length of the machine shaft must be at least $2.2 \times \varnothing dh$ and the length of the feather key must be at least $2 \times \varnothing dh$.

Dimensions of gear units

Type	a4	ad3	Øb	B	B2	Ødd	Ødh	ØDd	ØDh	□Dha	Øe	f	h	H	i2	ld	ld1	le	lh	las	lha	m1	s4	sm	sas	t4	th	uh
S0	Ø85	110	75 _p	92	94	10.5	20 ^{H7}	34	40	102	90	3	80	143	7	5	13	86	108	12	113	63	M6	M6	M8	13	22.8	6 ^{h9/g9}
S0	Ø85	110	75 _p	92	94	10.5	25 ^{H7}	34	40	102	90	3	80	143	7	5	13	86	108	12	113	63	M6	M10	M12	13	28.3	8 ^{h9/g9}

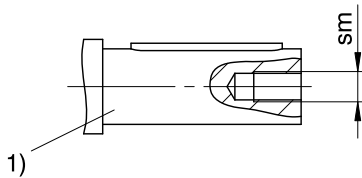
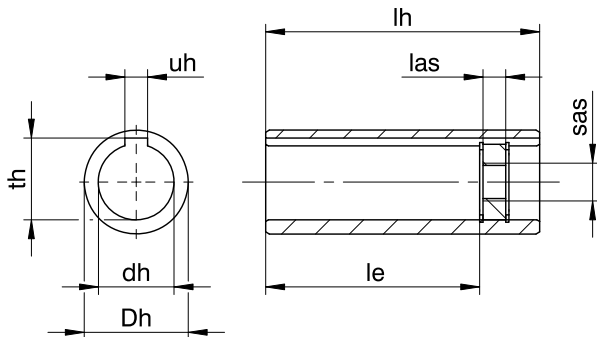
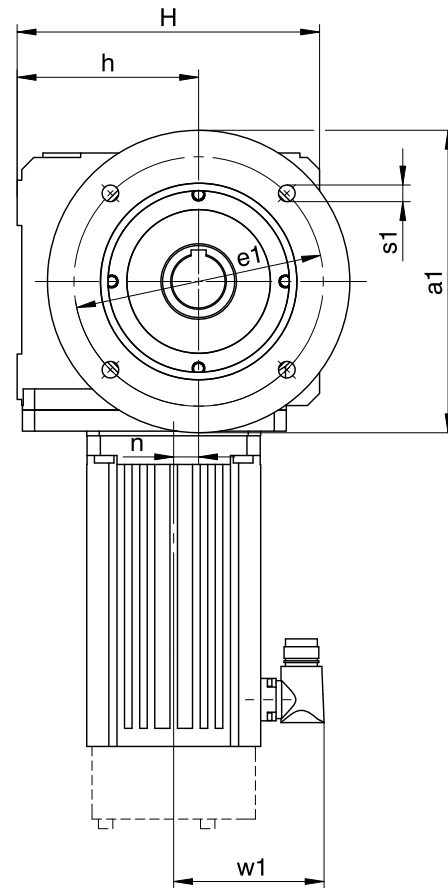
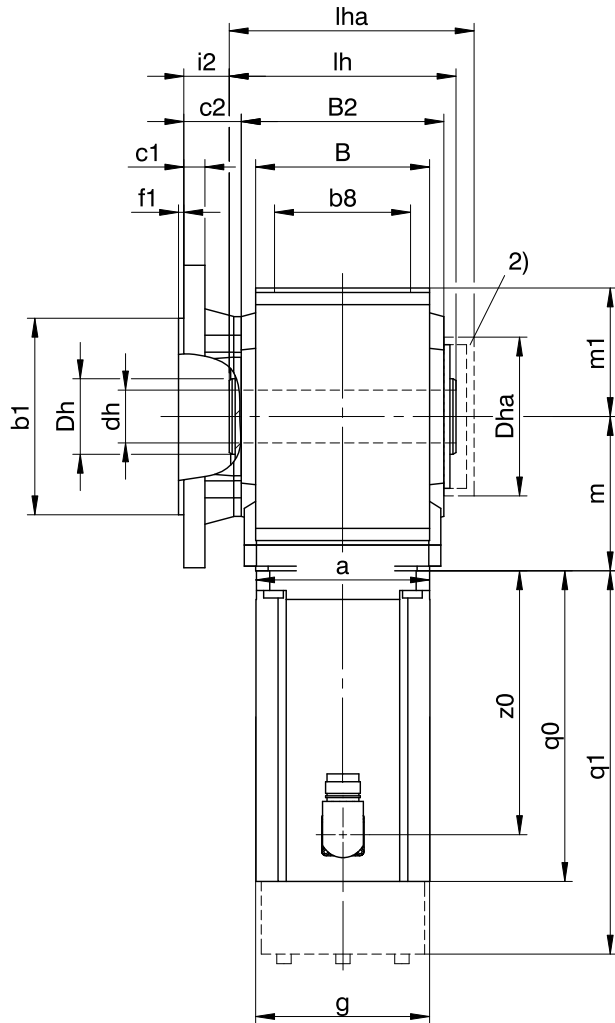
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129	172.5	91	97
LM402U	98	168	211.5	91	136
LM403U	98	199	242.5	91	167

Dimensions of geared motors

Type	a	LM4 m	n
S002	Ø140	70	8.5

13.3.5 A shaft design (hollow shaft), F housing design (round flange)



- q0 Applies to motors without brake.
- x Applies to encoders using an optical measuring method.
- 2) Cover (optional)

- q1 Applies to motors with brake.
- 1) The length of the machine shaft must be at least $2.2 \times \varnothing dh$ and the length of the feather key must be at least $2 \times \varnothing dh$.

Dimensions of gear units

Type	Øa1	Øb1	b8	B	B2	c1	c2	Ødh	ØDh	□Dha	Øe1	f1	h	H	i2	le	lh	las	lha	m1	Øs1	sm	sas	th	uh
S1	160	110 _{js}	70	90	106	10	32.0	20 ^{H7}	40	105	130	3.5	100	167	25.0	98.0	120	12	127.0	70	9	M6	M8	22.8	6 ^{JS9}
S1	160	110 _{js}	70	90	106	10	32.0	25 ^{H7}	40	105	130	3.5	100	167	25.0	98.0	120	12	127.0	70	9	M10	M12	28.3	8 ^{JS9}
S1	160	110 _{js}	70	90	106	10	32.0	30 ^{H7}	40	105	130	3.5	100	167	25.0	93.5	120	12	127.0	70	9	M10	M12	32.0	8 ^{JS9}
S2	200	130 _{js}	90	115	134	14	38.0	30 ^{H7}	50	132	165	3.5	120	200	30.0	123.5	150	12	157.0	85	11	M10	M12	33.3	8 ^{JS9}
S2	200	130 _{js}	90	115	134	14	38.0	35 ^{H7}	50	132	165	3.5	120	200	30.0	119.0	150	12	157.0	85	11	M12	M16	38.3	10 ^{JS9}
S3	250	180 _{js}	105	130	153	15	40.0	40 ^{H7}	55	152	215	4.0	140	233	32.5	136.5	168	12	177.5	100	14	M16	M20	43.3	12 ^{JS9}
S4	250	180 _{js}	120	148	173	15	39.5	50 ^{H7}	65	145	215	4.0	160	263	31.0	153.0	190	12	198.5	110	14	M16	M20	53.8	14 ^{JS9}

Dimensions of additional round flanges

Type	Øa1	Øb1	c1	Øe1	f1	Øs1
S1	140	95 _{js}	10	115	3.0	9
S2	160	110 _{js}	14	130	3.5	9

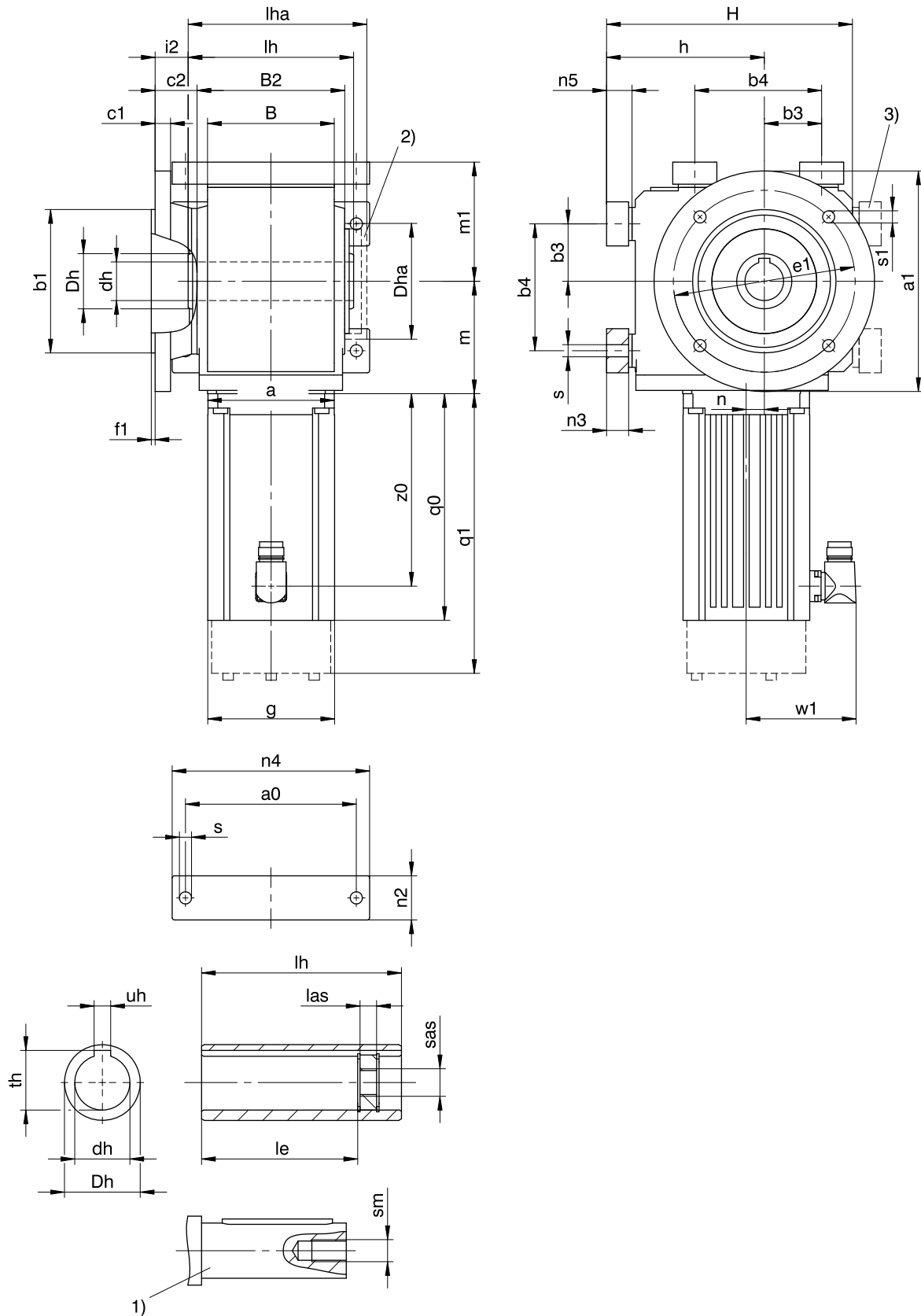
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S102	□98	83	14.0	□115	87	14.0	-	-	-
S202	□98	98	17.0	□115	102	17.0	-	-	-
S203	Ø140	135	17.0	-	-	-	-	-	-
S302	Ø140	113	25.5	□115	117	25.5	□145	119	25.5
S303	Ø140	150	25.5	-	-	-	-	-	-
S402	-	-	-	Ø160	129	30.0	□145	131	30.0
S403	Ø140	162	30.0	-	-	-	-	-	-

13.3.6 A shaft design (hollow shaft), NF housing design (base + round flange)



- | | | | |
|-------|--|-------|---|
| q_0 | Applies to motors without brake. | q_1 | Applies to motors with brake. |
| x | Applies to encoders using an optical measuring method. | 1) | The length of the machine shaft must be at least $2.2 \times \varnothing d_h$ and the length of the feather key must be at least $2 \times \varnothing d_h$. |
| 2) | Cover (optional) | 3) | Only for S0 |

Dimensions of gear units

Type	a0	Øa1	Øb1	b3	b4	B	B2	c1	c2	Ødh	ØDh	□Dha	Øe1	f1	h	H	i2	le	lh	las	lha	m1	n2	n3	n4	n5	Øs	Øs1	sm	sas	th	uh
S0	75	120	80 _{f6}	40	80	92	94	9	28.0	20 ^{H7}	40	102	100	3.0	80	143	7.0	86.0	108	12	113.0	72	22	9	92	9	6.6	6.6	M6	M8	22.8	6 ^{JS9}
S0	75	120	80 _{f6}	40	80	92	94	9	28.0	25 ^{H7}	40	102	100	3.0	80	143	7.0	86.0	108	12	113.0	72	22	9	92	9	6.6	6.6	M10	M12	28.3	8 ^{JS9}
S1	115	160	110 _{f6}	40	90	90	106	10	32.0	20 ^{H7}	40	105	130	3.5	115	182	7.0	98.0	120	12	127.0	85	30	13	140	15	9.0	9.0	M6	M8	22.8	6 ^{JS9}
S1	115	160	110 _{f6}	40	90	90	106	10	32.0	25 ^{H7}	40	105	130	3.5	115	182	7.0	98.0	120	12	127.0	85	30	13	140	15	9.0	9.0	M10	M12	28.3	8 ^{JS9}
S1	115	160	110 _{f6}	40	90	90	106	10	32.0	30 ^{H7}	40	105	130	3.5	115	182	7.0	93.5	120	12	127.0	85	30	13	140	15	9.0	9.0	M10	M12	32	8 ^{JS9}
S2	155	200	130 _{f6}	52	115	115	134	14	38.0	30 ^{H7}	50	132	165	3.5	143	223	8.0	123.5	150	12	157.0	108	40	20	185	23	11.0	11.0	M10	M12	33.3	8 ^{JS9}
S2	155	200	130 _{f6}	52	115	115	134	14	38.0	35 ^{H7}	50	132	165	3.5	143	223	8.0	119.0	150	12	157.0	108	40	20	185	23	11.0	11.0	M12	M16	38.3	10 ^{JS9}
S3	170	250	180 _{f6}	52	130	130	153	15	40.0	40 ^{H7}	55	152	215	4.0	163	256	7.5	136.5	168	12	177.5	123	45	20	200	23	11.0	14.0	M16	M20	43.3	12 ^{JS9}
S4	200	250	180 _{f6}	67	155	148	173	15	39.5	50 ^{H7}	65	145	215	4.0	185	288	8.5	153.0	190	12	198.5	135	50	22	230	25	14.0	14.0	M16	M20	53.8	14 ^{JS9}

Dimensions of additional round flanges

Type	Øa1	Øb1	c1	Øe1	f1	Øs1
S0	160	110 _{f6}	10	130	3.5	9
S1	140	95 _{f6}	10	115	3.0	9
S2	160	110 _{f6}	14	130	3.5	9

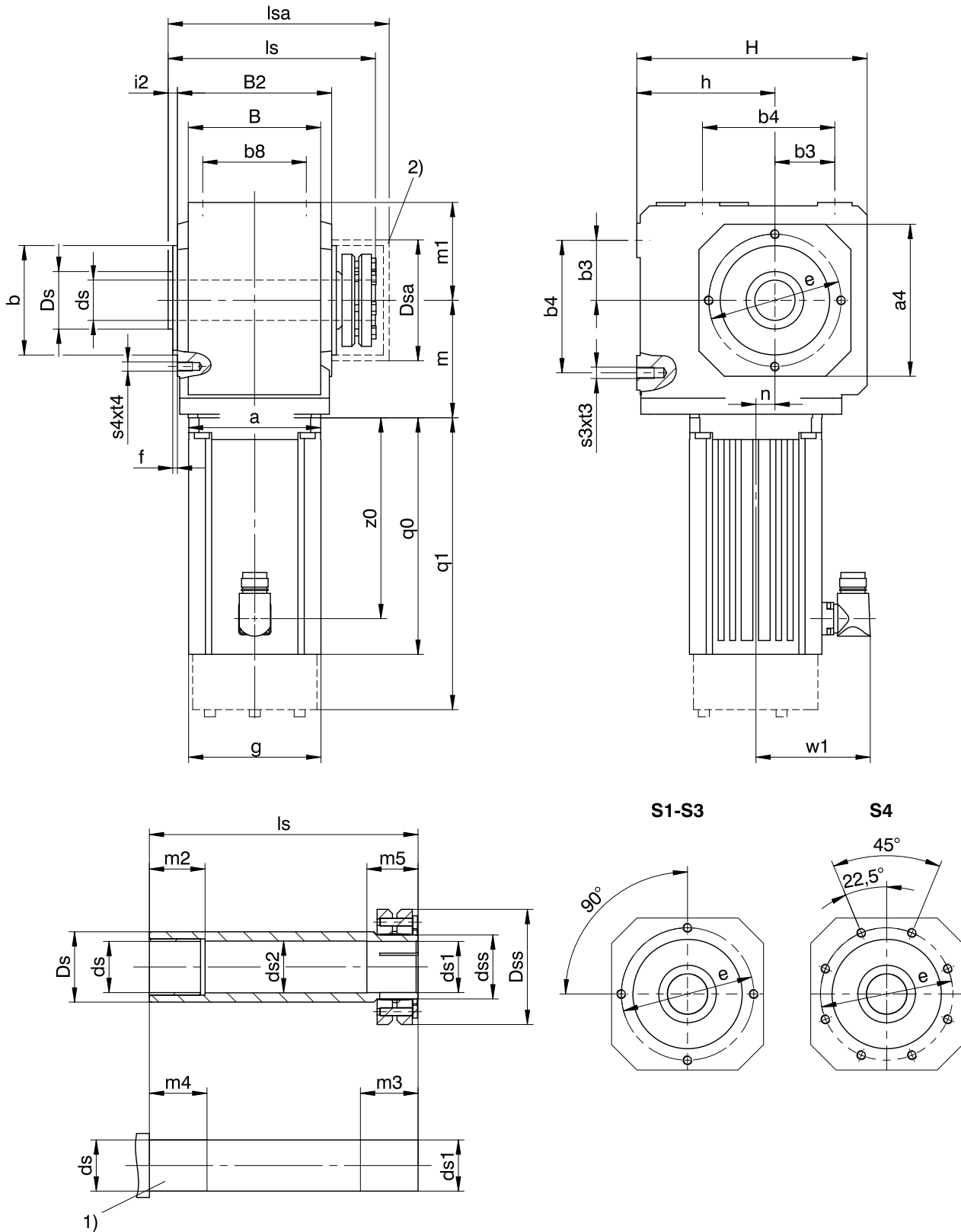
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S002	Ø140	70	8.5	-	-	-	-	-	-
S102	□98	83	14.0	□115	87	14.0	-	-	-
S202	□98	98	17.0	□115	102	17.0	-	-	-
S203	Ø140	135	17.0	-	-	-	-	-	-
S302	Ø140	113	25.5	□115	117	25.5	□145	119	25.5
S303	Ø140	150	25.5	-	-	-	-	-	-
S402	-	-	-	Ø160	129	30.0	□145	131	30.0
S403	Ø140	162	30.0	-	-	-	-	-	-

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



q0 Applies to motors without brake.

x Applies to encoders using an optical measuring method.

2) Cover (optional)

q1 Applies to motors with brake.

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

Dimensions of gear units

Type	a4	∅b	b3	b4	b8	B	B2	∅ds	∅ds1	∅ds2	∅dss	∅Ds	∅Dsa	∅Dss	∅e	f	h	H	i2	ls	lsa	m1	m2	m3	m4	m5	s3	s4	t3	t4
S1	□105	75 _{js}	40	90	70	90	106	25 _{h9}	25 _{h9} ^{H7}	25.5	30	40	80	60	90	3.0	100	167	7.0	149	163	70	20	34	25	29	M8	M8	13	13
S2	□132	95 _{js}	52	115	90	115	134	35 _{h9}	35 _{h9} ^{H7}	35.5	44	50	101	80	115	4.0	120	200	8.0	180	195	85	30	37	35	32	M10	M8	16	13
S3	□152	110 _{js}	52	130	105	130	153	40 _{h9}	40 _{h9} ^{H7}	40.5	50	55	114	88	130	3.5	140	233	7.5	200	222	100	40	39	45	34	M10	M10	16	16
S4	□145	110 _{js}	67	155	120	148	173	50 _{h9}	50 _{h9} ^{H7}	50.5	62	65	116	106	130	3.5	160	263	8.5	227	243	110	40	44	45	39	M12	M10	19	16

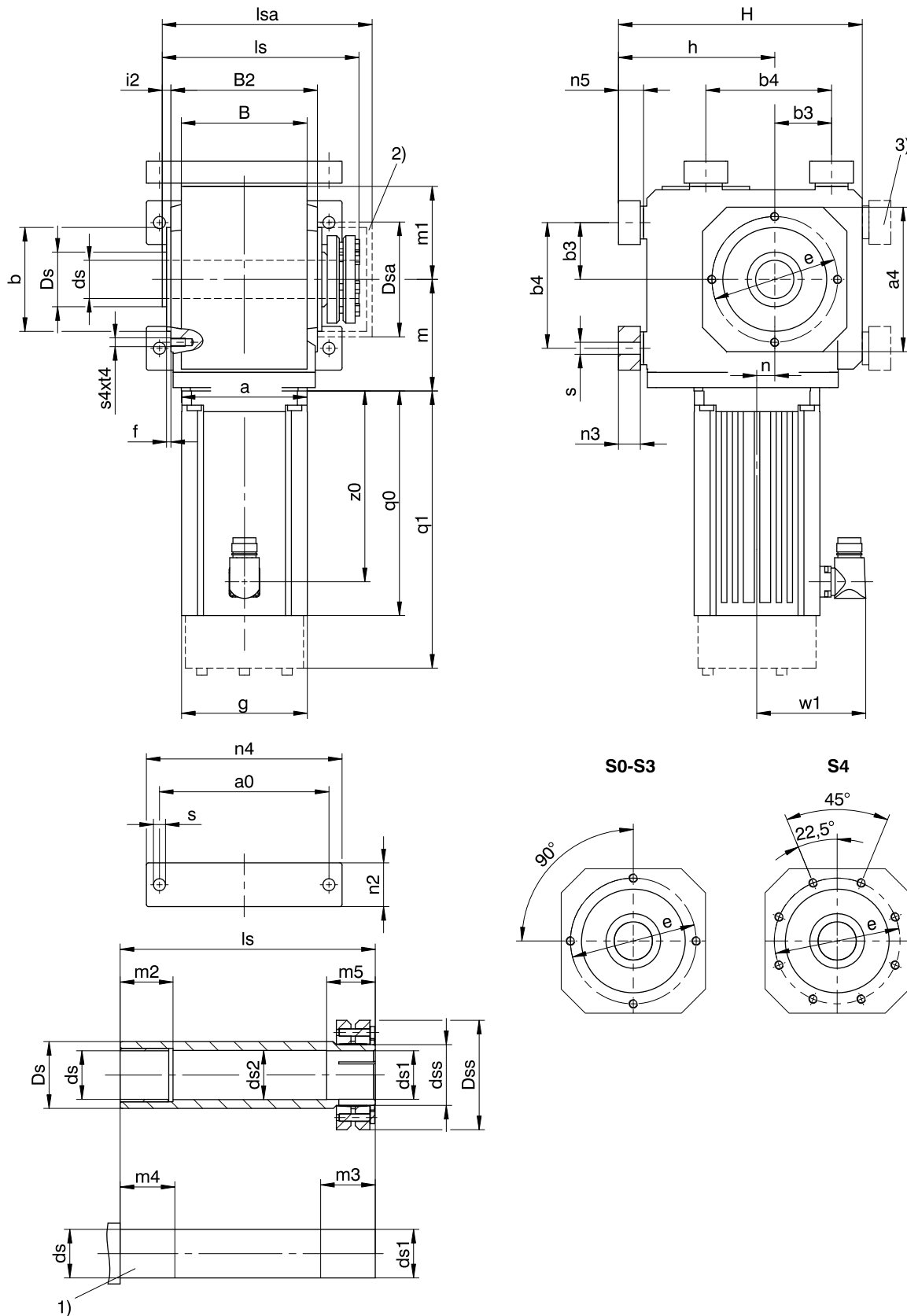
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S102	□98	83	14.0	□115	87	14.0	-	-	-
S202	□98	98	17.0	□115	102	17.0	-	-	-
S203	∅140	135	17.0	-	-	-	-	-	-
S302	∅140	113	25.5	□115	117	25.5	□145	119	25.5
S303	∅140	150	25.5	-	-	-	-	-	-
S402	-	-	-	∅160	129	30.0	□145	131	30.0
S403	∅140	162	30.0	-	-	-	-	-	-

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



- | | | | |
|----|--|----|---|
| q0 | Applies to motors without brake. | q1 | Applies to motors with brake. |
| x | Applies to encoders using an optical measuring method. | 1) | Machine shaft: The dimension l_s must meet or exceed the specified value. |
| 2) | Cover (optional) | 3) | Only for S0 |

Dimensions of gear units

Type	a0	a4	∅b	b3	b4	B	B2	∅ds	∅ds1	∅ds2	∅dss	∅Ds	∅Dsa	∅Dss	∅e	f	h	H	i2	ls	lsa	m1	m2	m3	m4	m5	n2	n3	n4	n5	∅s	s4	t4
S0	75	∅85	75 _{f6}	40	80	92	94	20 _{h9}	20 _{h9} ^{H7}	20.5	24	40	80	50	90	3.0	80	143	7.0	136	151	72	20	33	25	28	22	9	92	9	6.6	M6	13
S0	75	∅85	75 _{f6}	40	80	92	94	25 _{h9}	25 _{h9} ^{H7}	25.5	30	40	80	60	90	3.0	80	143	7.0	136	151	72	20	34	25	29	22	9	92	9	6.6	M6	13
S1	115	□105	75 _{f6}	40	90	90	106	25 _{h9}	25 _{h9} ^{H7}	25.5	30	40	80	60	90	3.0	115	182	7.0	149	163	85	20	34	25	29	30	13	140	15	9.0	M8	13
S2	155	□132	95 _{f6}	52	115	115	134	35 _{h9}	35 _{h9} ^{H7}	35.5	44	50	101	80	115	4.0	143	223	8.0	180	195	108	30	37	35	32	40	20	185	23	11.0	M8	13
S3	170	□152	110 _{f6}	52	130	130	153	40 _{h9}	40 _{h9} ^{H7}	40.5	50	55	114	88	130	3.5	163	256	7.5	200	222	123	40	39	45	34	45	20	200	23	11.0	M10	16
S4	200	□145	110 _{f6}	67	155	148	173	50 _{h9}	50 _{h9} ^{H7}	50.5	62	65	116	106	130	3.5	185	288	8.5	227	243	135	40	44	45	39	50	22	230	25	14.0	M10	16

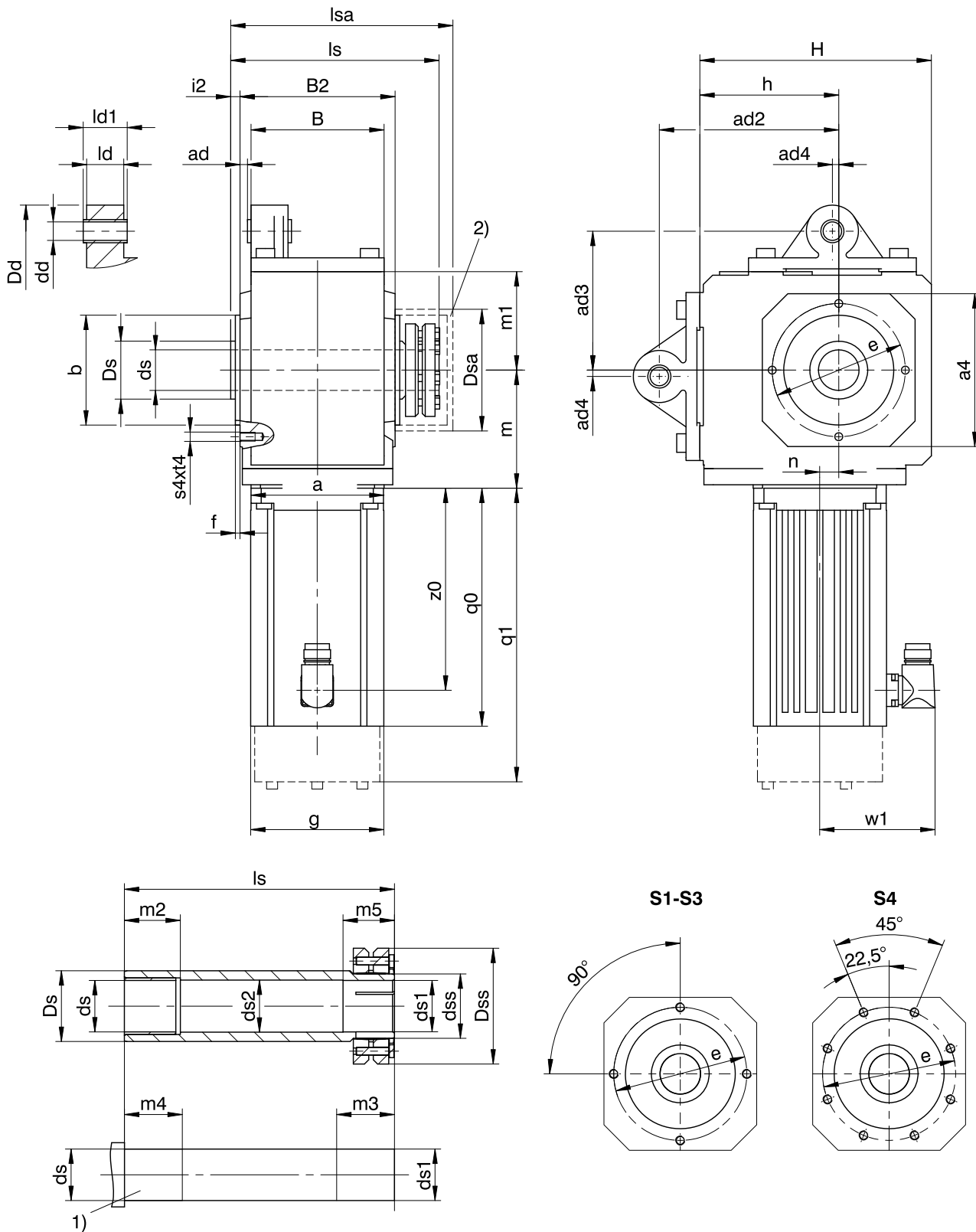
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S002	∅140	70	8.5	-	-	-	-	-	-
S102	□98	83	14.0	□115	87	14.0	-	-	-
S202	□98	98	17.0	□115	102	17.0	-	-	-
S203	∅140	135	17.0	-	-	-	-	-	-
S302	∅140	113	25.5	□115	117	25.5	□145	119	25.5
S303	∅140	150	25.5	-	-	-	-	-	-
S402	-	-	-	∅160	129	30.0	□145	131	30.0
S403	∅140	162	30.0	-	-	-	-	-	-

13.3.9 S shaft design (hollow shaft with shrink disk), GD housing design (pitch circle diameter + torque arm)



- q_0 Applies to motors without brake.
- q_1 Applies to motors with brake.
- x Applies to encoders using an optical measuring method.
- 1) Machine shaft: The dimension l_s must meet or exceed the specified value.
- 2) Cover (optional)

Dimensions of gear units

Type	a4	ad	ad2	ad3	ad4	Øb	B	B2	Ødd	Øds	Øds1	Øds2	Ødss	ØDd	ØDs	ØDsa	ØDss	Øe	f	h	H	i2	ld	ld1	ls	lsa	m1	m2	m3	m4	m5	s4	t4
S1	□105	6.0	130	100	5.0	75 _{g6}	90	106	12.0 ^{H9}	25 _{h9}	25 _{h9} ^{H7}	25.5	30	43	40	80	60	90	3.0	100	167	7.0	24	28	149	163	70	20	34	25	29	M8	13
S2	□132	6.5	155	120	5.5	95 _{g6}	115	134	16.0 ^{H9}	35 _{h9}	35 _{h9} ^{H7}	35.5	44	45	50	101	80	115	4.0	120	200	8.0	32	38	180	195	85	30	37	35	32	M8	13
S3	□152	5.0	185	145	13.0	110 _{g6}	130	153	16.0 ^{H9}	40 _{h9}	40 _{h9} ^{H7}	40.5	50	45	55	114	88	130	3.5	140	233	7.5	32	38	200	222	100	40	39	45	34	M10	16
S4	□145	9.5	220	170	10.5	110 _{g6}	148	173	20.0 ^{H9}	50 _{h9}	50 _{h9} ^{H7}	50.5	62	55	65	116	106	130	3.5	160	263	8.5	40	46	227	243	110	40	44	45	39	M10	16

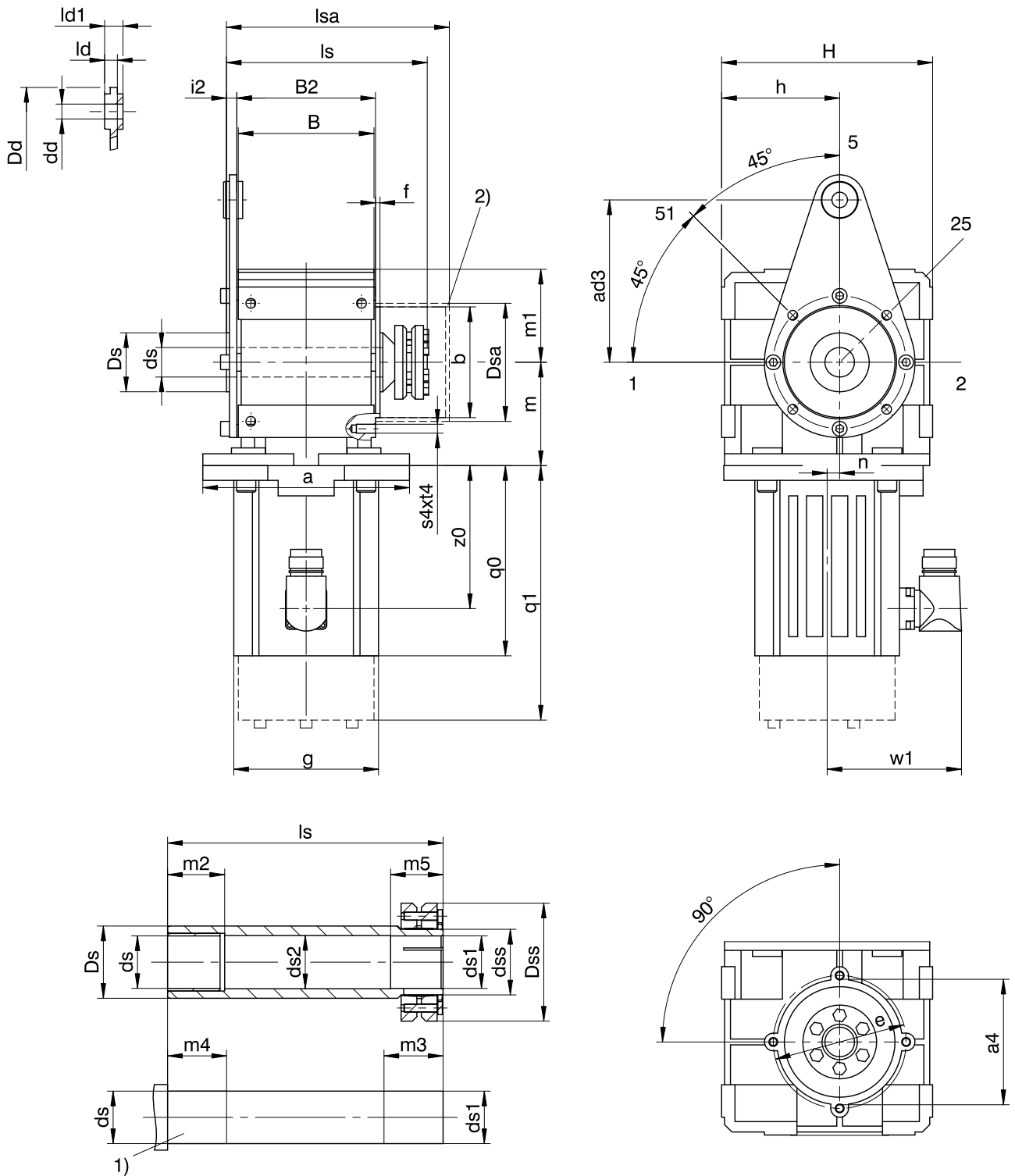
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S102	□98	83	14.0	□115	87	14.0	-	-	-
S202	□98	98	17.0	□115	102	17.0	-	-	-
S203	Ø140	135	17.0	-	-	-	-	-	-
S302	Ø140	113	25.5	□115	117	25.5	□145	119	25.5
S303	Ø140	150	25.5	-	-	-	-	-	-
S402	-	-	-	Ø160	129	30.0	□145	131	30.0
S403	Ø140	162	30.0	-	-	-	-	-	-

13.3.10 S shaft design (hollow shaft with shrink disk), NGD housing design (base + pitch circle diameter + torque arm)



q0 Applies to motors without brake.

x Applies to encoders using an optical measuring method.

2) Cover (optional)

q1 Applies to motors with brake.

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

Dimensions of gear units

Type	a4	ad3	Øb	B	B2	Ødd	Øds	Øds1	Øds2	Ødss	ØDd	ØDs	ØDsa	ØDss	Øe	f	h	H	i2	ld	ld1	ls	lsa	m1	m2	m3	m4	m5	s4	t4
S0	Ø85	110	75 _{js}	92	94	10.5	20 _{h9}	20 _{h9} ^{H7}	20.5	24	34	40	80	50	90	3	80	143	7	5	13	136	151	63	20	33	25	28	M6	13
S0	Ø85	110	75 _{js}	92	94	10.5	25 _{h9}	25 _{h9} ^{H7}	25.5	30	34	40	80	60	90	3	80	143	7	5	13	136	151	63	20	34	25	29	M6	13

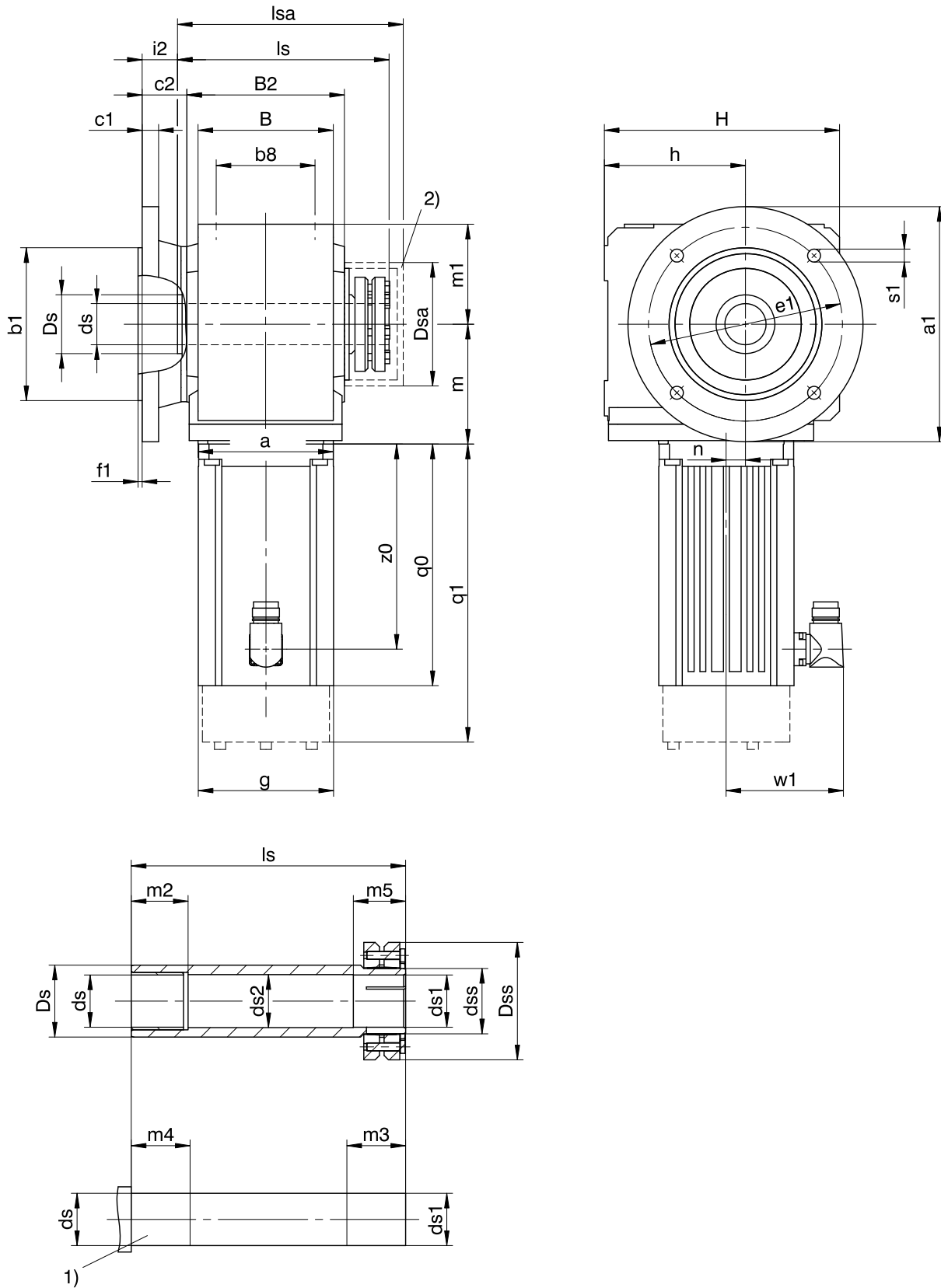
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129	172.5	91	97
LM402U	98	168	211.5	91	136
LM403U	98	199	242.5	91	167

Dimensions of geared motors

Type	a	LM4 m	n
S002	Ø140	70	8.5

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



q0 Applies to motors without brake.

x Applies to encoders using an optical measuring method.

2) Cover (optional)

q1 Applies to motors with brake.

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

Dimensions of gear units

Type	Øa1	Øb1	b8	B	B2	c1	c2	Øds	Øds1	Øds2	Ødss	ØDs	ØDsa	ØDss	Øe1	f1	h	H	i2	ls	lsa	m1	m2	m3	m4	m5	Øs1
S1	160	110 _{js}	70	90	106	10	32.0	25 _{h9}	25 _{h9} ^{H7}	25.5	30	40	80	60	130	3.5	100	167	25.0	149	163	70	20	34	25	29	9
S2	200	130 _{js}	90	115	134	14	38.0	35 _{h9}	35 _{h9} ^{H7}	35.5	44	50	101	80	165	3.5	120	200	30.0	180	195	85	30	37	35	32	11
S3	250	180 _{js}	105	130	153	15	40.0	40 _{h9}	40 _{h9} ^{H7}	40.5	50	55	114	88	215	4.0	140	233	32.5	200	222	100	40	39	45	34	14
S4	250	180 _{js}	120	148	173	15	39.5	50 _{h9}	50 _{h9} ^{H7}	50.5	62	65	116	106	215	4.0	160	263	31.0	227	243	110	40	44	45	39	14

Dimensions of additional round flanges

Type	Øa1	Øb1	c1	Øe1	f1	Øs1
S1	140	95 _{js}	10	115	3.0	9
S2	160	110 _{js}	14	130	3.5	9

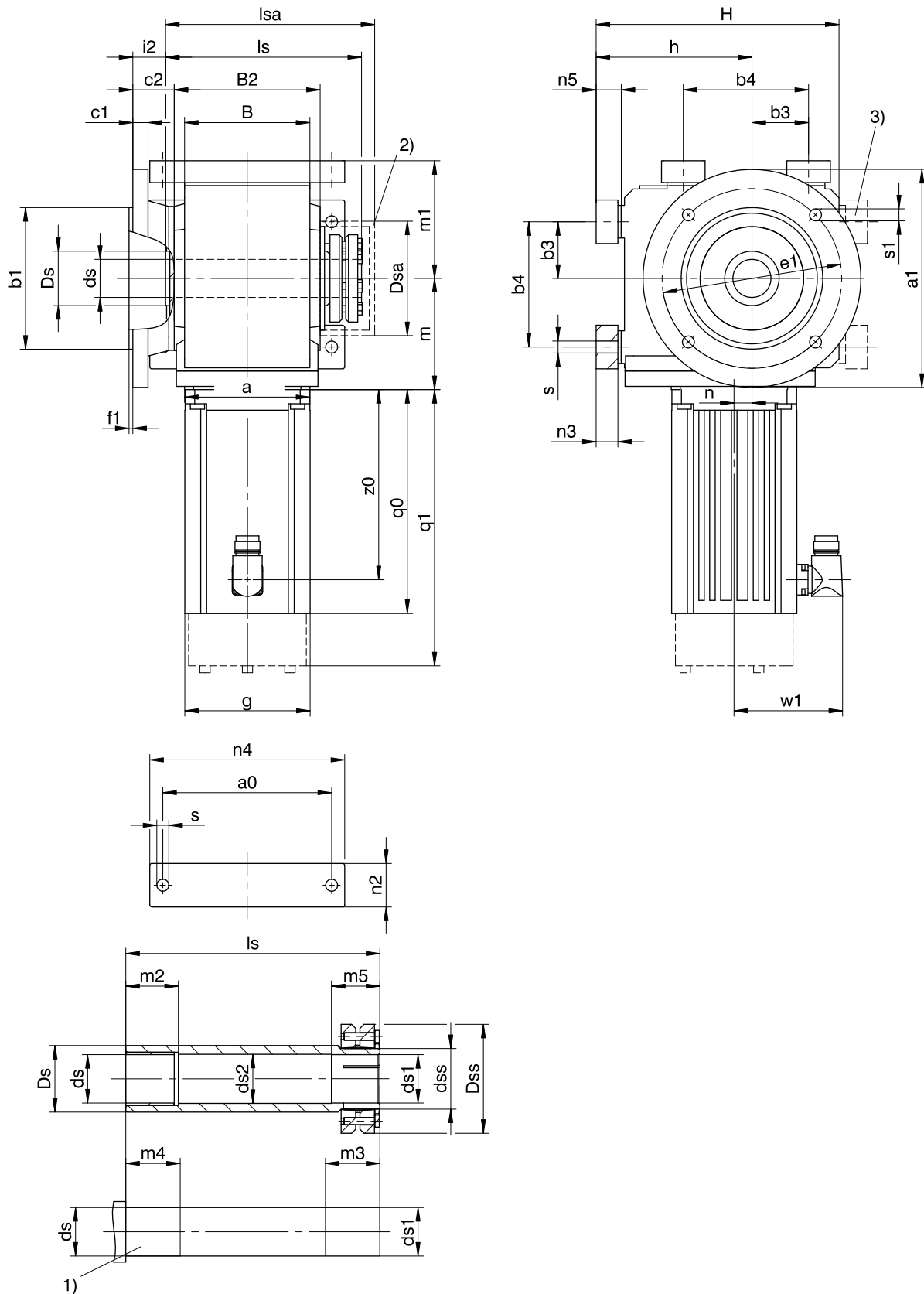
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S102	□98	83	14.0	□115	87	14.0	-	-	-
S202	□98	98	17.0	□115	102	17.0	-	-	-
S203	Ø140	135	17.0	-	-	-	-	-	-
S302	Ø140	113	25.5	□115	117	25.5	□145	119	25.5
S303	Ø140	150	25.5	-	-	-	-	-	-
S402	-	-	-	Ø160	129	30.0	□145	131	30.0
S403	Ø140	162	30.0	-	-	-	-	-	-

13.3.12 S shaft design (hollow shaft with shrink disk), NF housing design (base + round flange)



- q0 Applies to motors without brake.
- x Applies to encoders using an optical measuring method.
- 2) Cover (optional)

- q1 Applies to motors with brake.
- 1) Machine shaft: The dimension l_s must meet or exceed the specified value.
- 3) Only for S0

Dimensions of gear units

Type	a0	Øa1	Øb1	b3	b4	B	B2	c1	c2	Øds	Øds1	Øds2	Ødss	ØDs	ØDsa	ØDss	Øe1	f1	h	H	i2	ls	lsa	m1	m2	m3	m4	m5	n2	n3	n4	n5	Øs	Øs1
S0	75	120	80 _β	40	80	92	94	9	28.0	20 _{h9}	20 _{h9} ^{H7}	20.5	24	40	80	50	100	3.0	80	143	21.0	136	151	72	20	33	25	28	22	9	92	9	6.6	6.6
S0	75	120	80 _β	40	80	92	94	9	28.0	25 _{h9}	25 _{h9} ^{H7}	25.5	30	40	80	60	100	3.0	80	143	21.0	136	151	72	20	34	25	29	22	9	92	9	6.6	6.6
S1	115	160	110 _β	40	90	90	106	10	32.0	25 _{h9}	25 _{h9} ^{H7}	25.5	30	40	80	60	130	3.5	115	182	25.0	149	163	85	20	34	25	29	30	13	140	15	9.0	9.0
S2	155	200	130 _β	52	115	115	134	14	38.0	35 _{h9}	35 _{h9} ^{H7}	35.5	44	50	101	80	165	3.5	143	223	30.0	180	195	108	30	37	35	32	40	20	185	23	11.0	11.0
S3	170	250	180 _β	52	130	130	153	15	40.0	40 _{h9}	40 _{h9} ^{H7}	40.5	50	55	114	88	215	4.0	163	256	32.5	200	222	123	40	39	45	34	45	20	200	23	11.0	14.0
S4	200	250	180 _β	67	155	148	173	15	39.5	50 _{h9}	50 _{h9} ^{H7}	50.5	62	65	116	106	215	4.0	185	288	31.0	227	243	135	40	44	45	39	50	22	230	25	14.0	14.0

Dimensions of additional round flanges

Type	Øa1	Øb1	c1	Øe1	f1	Øs1
S0	160	110 _β	10	130	3.5	9
S1	140	95 _β	10	115	3.0	9
S2	160	110 _β	14	130	3.5	9

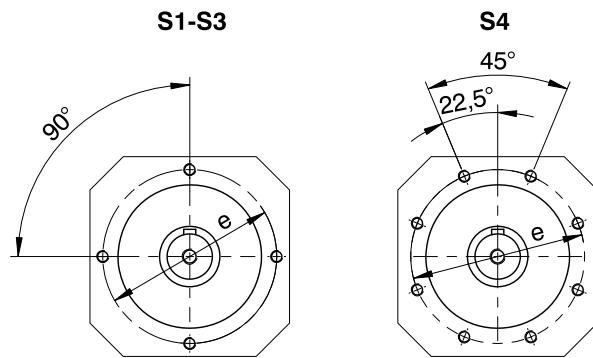
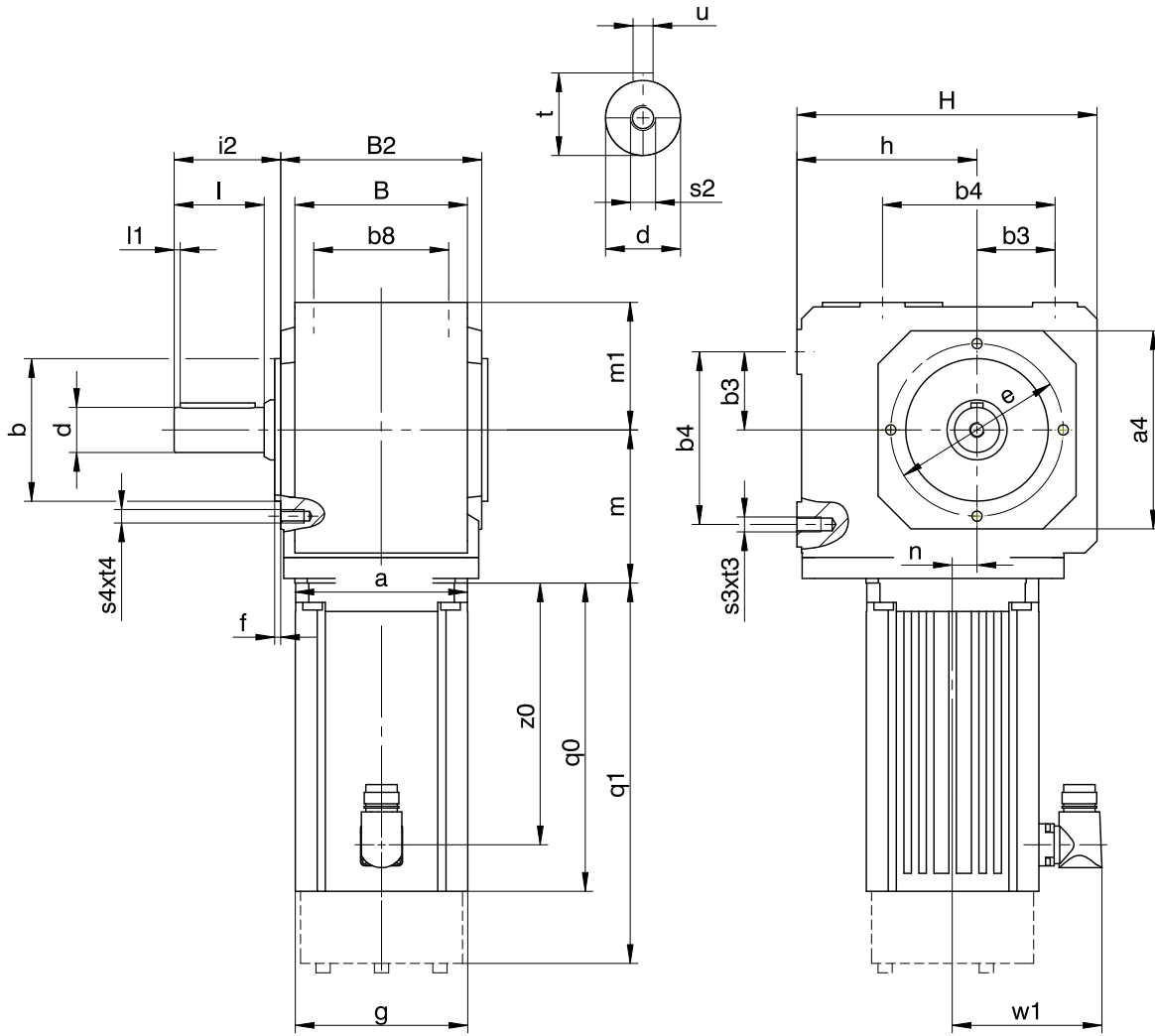
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S002	Ø140	70	8.5	-	-	-	-	-	-
S102	□98	83	14.0	□115	87	14.0	-	-	-
S202	□98	98	17.0	□115	102	17.0	-	-	-
S203	Ø140	135	17.0	-	-	-	-	-	-
S302	Ø140	113	25.5	□115	117	25.5	□145	119	25.5
S303	Ø140	150	25.5	-	-	-	-	-	-
S402	-	-	-	Ø160	129	30.0	□145	131	30.0
S403	Ø140	162	30.0	-	-	-	-	-	-

13.3.13 A shaft design (solid shaft), G housing design (pitch circle diameter)



q0 Applies to motors without brake.

x Applies to encoders using an optical measuring method.

q1 Applies to motors with brake.

- Solid shaft on both sides available.

Dimensions of gear units

Type	a4	∅b	b3	b4	b8	B	B2	∅d	∅e	f	h	H	i2	l	l1	m1	s2	s3	s4	t	t3	t4	u
S1	□105	75 _{js}	40	90	70	90	106	25 _{ks}	90	3.0	100	167	62.0	50	4	70	M10	M8	M8	28.0	13	13	A8×7×40
S2	□132	95 _{js}	52	115	90	115	134	30 _{ks}	115	4.0	120	200	71.0	60	4	85	M10	M10	M8	33.0	16	13	A8×7×50
S3	□152	110 _{js}	52	130	105	130	153	40 _{ks}	130	3.5	140	233	93.5	80	4	100	M16	M10	M10	43.0	16	16	A12×8×70
S4	□145	110 _{js}	67	155	120	148	173	45 _{ks}	130	3.5	160	263	103.5	90	4	110	M16	M12	M10	48.5	19	16	A14×9×80

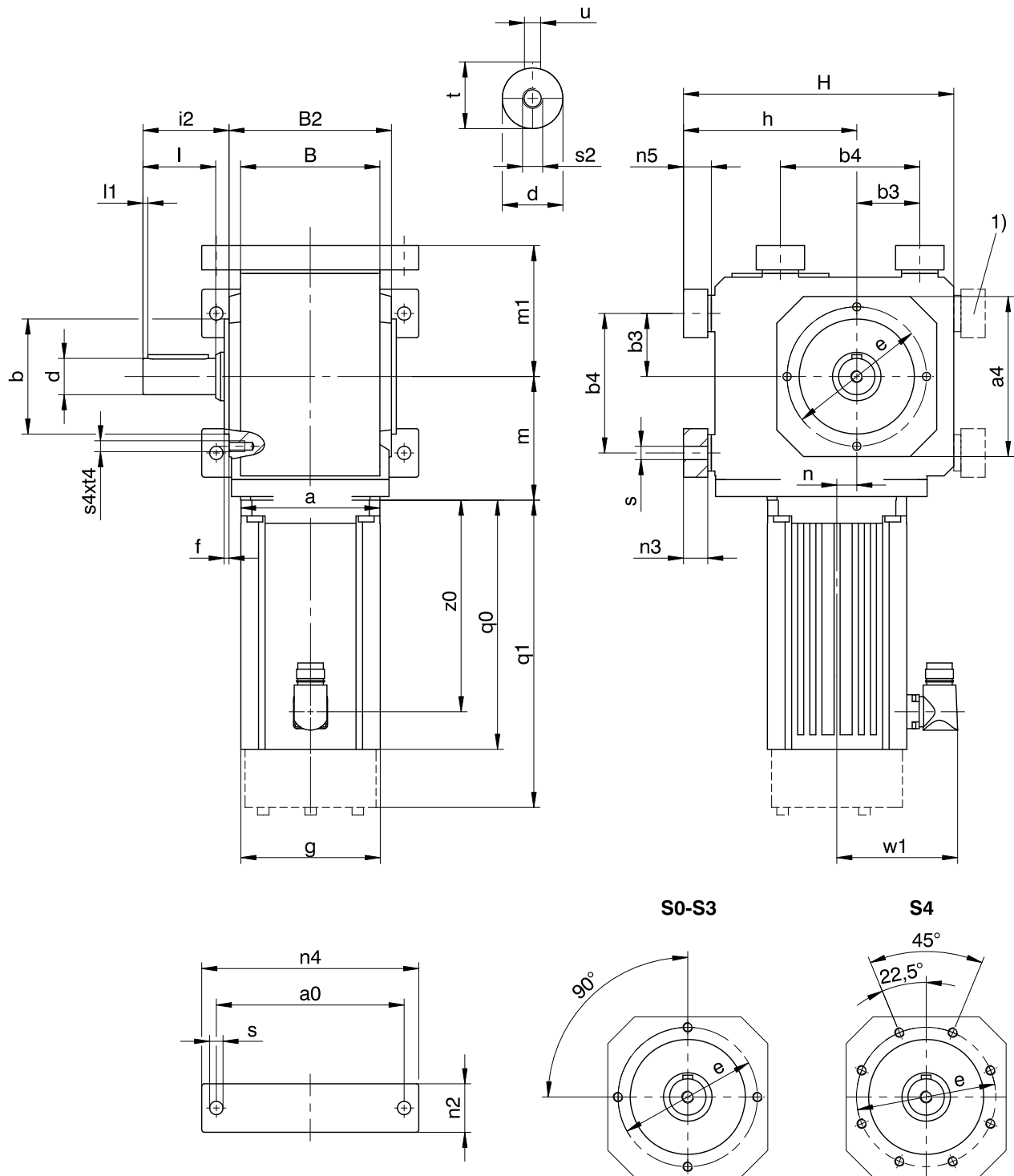
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S102	□98	83	14.0	□115	87	14.0	–	–	–
S202	□98	98	17.0	□115	102	17.0	–	–	–
S203	∅140	135	17.0	–	–	–	–	–	–
S302	∅140	113	25.5	□115	117	25.5	□145	119	25.5
S303	∅140	150	25.5	–	–	–	–	–	–
S402	–	–	–	∅160	129	30.0	□145	131	30.0
S403	∅140	162	30.0	–	–	–	–	–	–

13.3.14 V shaft design (solid shaft), NG housing design (base + pitch circle diameter)



q0 Applies to motors without brake.

x Applies to encoders using an optical measuring method.

- Solid shaft on both sides available.

q1 Applies to motors with brake.

1) Only for S0

Dimensions of gear units

Type	a0	a4	Øb	b3	b4	B	B2	Ød	Øe	f	h	H	i2	l	l1	m1	n2	n3	n4	n5	Øs	s2	s4	t	t4	u
S0	75	Ø85	75 _{js}	40	80	92	94	20 _{ks}	90	3.0	80	143	53.0	40	3	72	22	9	92	9	6.6	M6	M6	22.5	13	A6×6×32
S1	115	□105	75 _{js}	40	90	90	106	25 _{ks}	90	3.0	115	182	62.0	50	4	85	30	13	140	15	9.0	M10	M8	28.0	13	A8×7×40
S2	155	□132	95 _{js}	52	115	115	134	30 _{ks}	115	4.0	143	223	71.0	60	4	108	40	20	185	23	11.0	M10	M8	33.0	13	A8×7×50
S3	170	□152	110 _{js}	52	130	130	153	40 _{ks}	130	3.5	163	256	93.5	80	4	123	45	20	200	23	11.0	M16	M10	43.0	16	A12×8×70
S4	200	□145	110 _{js}	67	155	148	173	45 _{ks}	130	3.5	185	288	103.5	90	4	135	50	22	230	25	14.0	M16	M10	48.5	16	A14×9×80

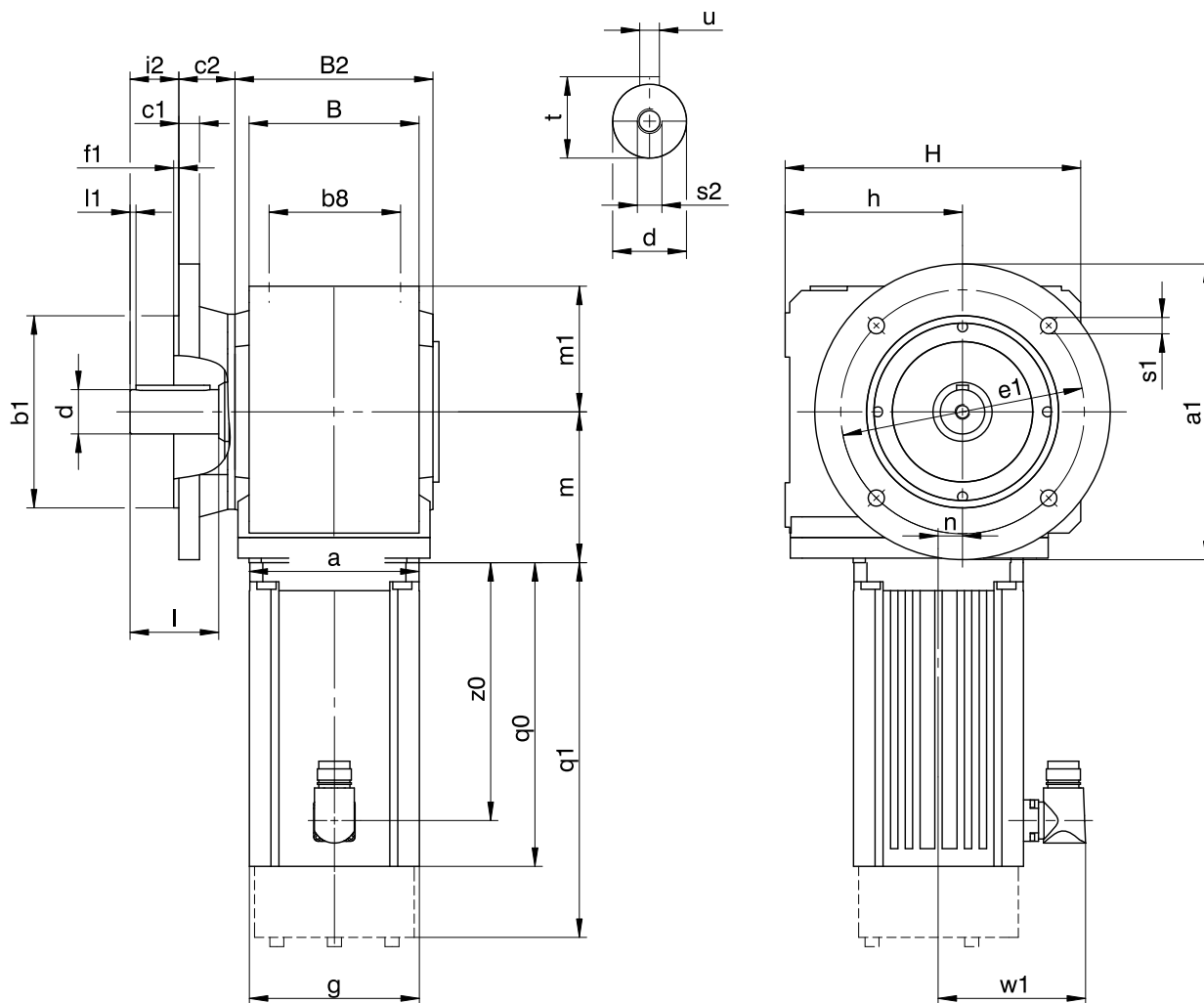
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S002	Ø140	70	8.5	–	–	–	–	–	–
S102	□98	83	14.0	□115	87	14.0	–	–	–
S202	□98	98	17.0	□115	102	17.0	–	–	–
S203	Ø140	135	17.0	–	–	–	–	–	–
S302	Ø140	113	25.5	□115	117	25.5	□145	119	25.5
S303	Ø140	150	25.5	–	–	–	–	–	–
S402	–	–	–	Ø160	129	30.0	□145	131	30.0
S403	Ø140	162	30.0	–	–	–	–	–	–

13.3.15 V shaft design (solid shaft), F housing design (round flange)



q0 Applies to motors without brake.

q1 Applies to motors with brake.

x Applies to encoders using an optical measuring method.

- Solid shaft on both sides available.

Dimensions of gear units

Type	Øa1	Øb1	b8	B	B2	c1	c2	Ød	Øe1	f1	h	H	i2	l	l1	m1	Øs1	s2	t	u
S1	160	110 _{f6}	70	90	106	10	32.0	25 _{k6}	130	3.5	100	167	30.0	50	4	70	9	M10	28.0	A8×7×40
S2	200	130 _{f6}	90	115	134	14	38.0	30 _{k6}	165	3.5	120	200	33.0	60	4	85	11	M10	33.0	A8×7×50
S3	250	180 _{f6}	105	130	153	15	40.0	40 _{k6}	215	4.0	140	233	53.5	80	4	100	14	M16	43.0	A12×8×70
S4	250	180 _{f6}	120	148	173	15	39.5	45 _{k6}	215	4.0	160	263	64.0	90	4	110	14	M16	48.5	A14×9×80

Dimensions of additional round flanges

Type	Øa1	Øb1	c1	Øe1	f1	Øs1
S1	140	95 _{f6}	10	115	3.0	9
S2	160	110 _{f6}	14	130	3.5	9

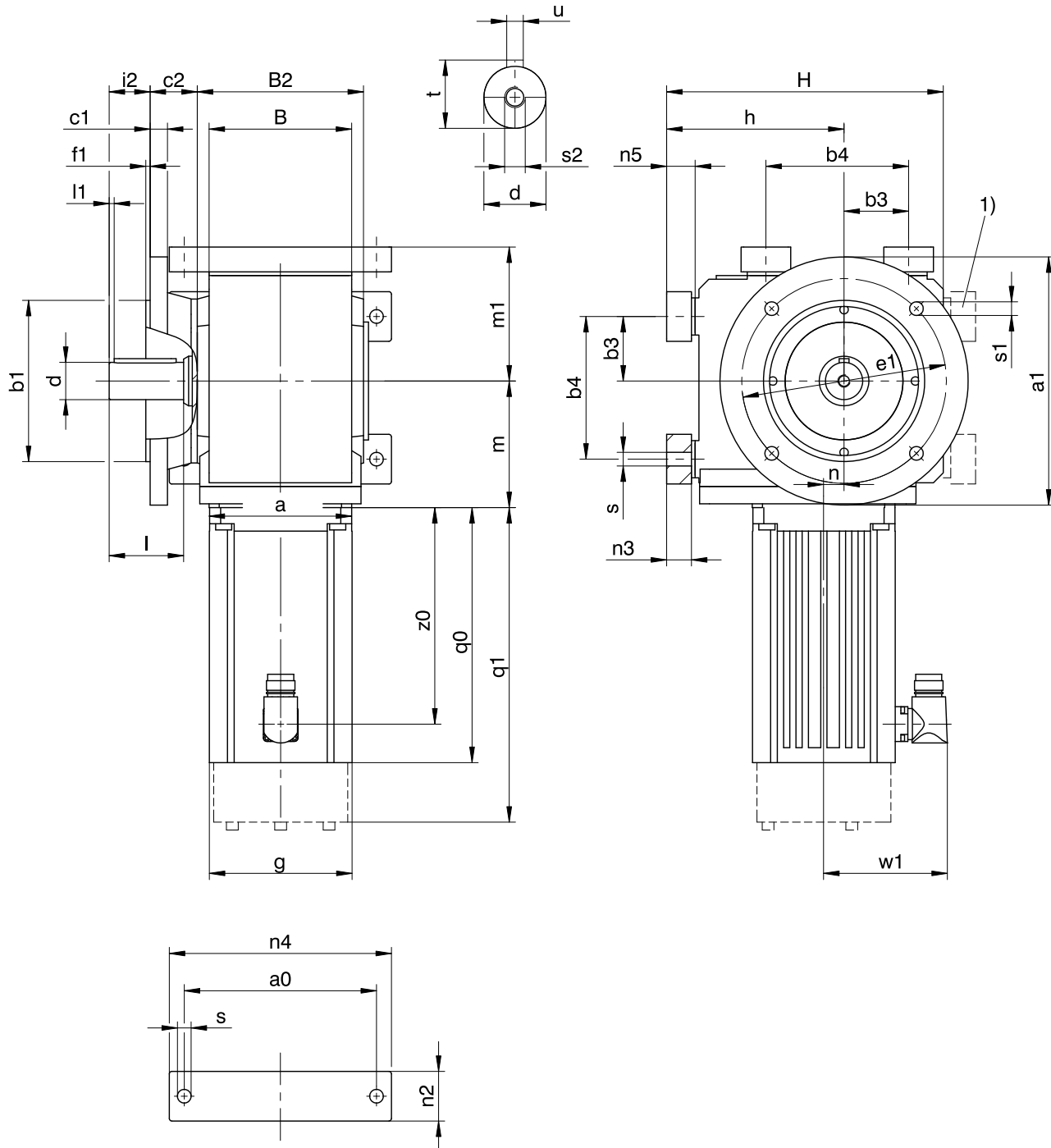
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S102	□98	83	14.0	□115	87	14.0	–	–	–
S202	□98	98	17.0	□115	102	17.0	–	–	–
S203	∅140	135	17.0	–	–	–	–	–	–
S302	∅140	113	25.5	□115	117	25.5	□145	119	25.5
S303	∅140	150	25.5	–	–	–	–	–	–
S402	–	–	–	∅160	129	30.0	□145	131	30.0
S403	∅140	162	30.0	–	–	–	–	–	–

13.3.16 V shaft design (solid shaft), NF housing design (base + round flange)



q0 Applies to motors without brake.

x Applies to encoders using an optical measuring method.

- Solid shaft on both sides available.

q1 Applies to motors with brake.

1) Only for S0

Dimensions of gear units

Type	a0	Øa1	Øb1	b3	b4	B	B2	c1	c2	Ød	Øe1	f1	h	H	i2	l	l1	m1	n2	n3	n4	n5	Øs	Øs1	s2	t	u
S0	75	120	80 _{js}	40	80	92	94	9	28.0	20 _{ks}	100	3.0	80	143	40.0	40	3	72	22	9	92	9	6.6	6.6	M6	22.5	A6×6×32
S1	115	160	110 _{js}	40	90	90	106	10	32.0	25 _{ks}	130	3.5	115	182	30.0	50	4	85	30	13	140	15	9.0	9.0	M10	28.0	A8×7×40
S2	155	200	130 _{js}	52	115	115	134	14	38.0	30 _{ks}	165	3.5	143	223	33.0	60	4	108	40	20	185	23	11.0	11.0	M10	33.0	A8×7×50
S3	170	250	180 _{js}	52	130	130	153	15	40.0	40 _{ks}	215	4.0	163	256	53.5	80	4	123	45	20	200	23	11.0	14.0	M16	43.0	A12×8×70
S4	200	250	180 _{js}	67	155	148	173	15	39.5	45 _{ks}	215	4.0	185	288	64.0	90	4	135	50	22	230	25	14.0	14.0	M16	48.5	A14×9×80

Dimensions of additional round flanges

Type	Øa1	Øb1	c1	Øe1	f1	Øs1
S0	160	110 _{js}	10	130	3.5	9
S1	140	95 _{js}	10	115	3.0	9
S2	160	110 _{js}	14	130	3.5	9

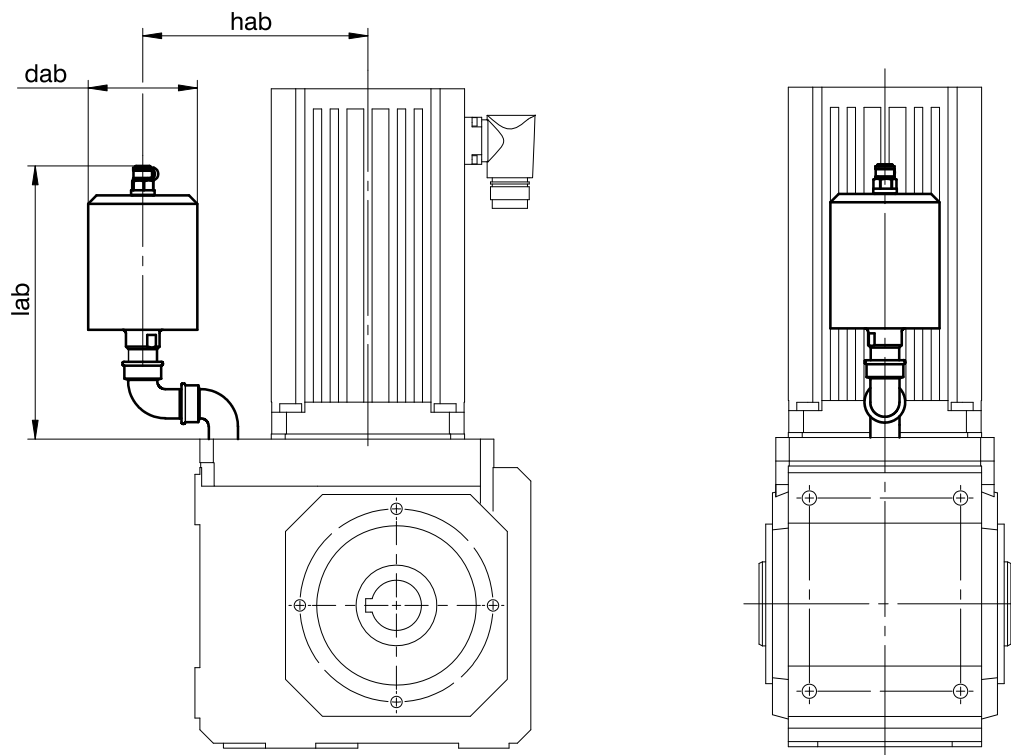
Dimensions of motors

Type	□g	q0	q1	w1	z0
LM401U	98	129.0	172.5	91.0	97.0
LM402U	98	168.0	211.5	91.0	136.0
LM403U	98	199.0	242.5	91.0	167.0
LM503U	115	205.5	253.5	100.0	175.0
LM505U	115	275.5	323.5	100.0	245.0
LM704U	145	259.5	318.5	115.0	227.0
LM706U	145	329.5	388.5	115.0	297.0

Dimensions of geared motors

Type	LM4			LM5			LM7		
	a	m	n	a	m	n	a	m	n
S002	Ø140	70	8.5	–	–	–	–	–	–
S102	□98	83	14.0	□115	87	14.0	–	–	–
S202	□98	98	17.0	□115	102	17.0	–	–	–
S203	Ø140	135	17.0	–	–	–	–	–	–
S302	Ø140	113	25.5	□115	117	25.5	□145	119	25.5
S303	Ø140	150	25.5	–	–	–	–	–	–
S402	–	–	–	Ø160	129	30.0	□145	131	30.0
S403	Ø140	162	30.0	–	–	–	–	–	–

13.3.17 Oil expansion tank



Dimensions

Type	LM4			LM5			LM7		
	dab	hab	lab	dab	hab	lab	dab	hab	lab
S102	65	113.0	161.0	65	130.0	156.5	–	–	–
S202	65	86.0	114.0	65	134.0	160.5	–	–	–
S302	65	97.5	138.0	65	97.5	113.5	65	145.0	161.0
S402	–	–	–	65	134.0	162.5	65	111.0	113.0

More information can be found in Chapter [13.6.4](#)

13.4 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

S	3	0	3	A	G	1700	LM401U
---	---	---	---	---	---	------	--------

Explanation

Code	Designation	Design
S	Type	Helical worm gear unit
3	Size	3 (example)
0	Generation	Generation 0
2	Stages	Two-stage
3		Three-stage
A	Shaft	Hollow shaft with keyway
S		Hollow shaft with shrink disk
V		Solid shaft
G	Housing	Pitch circle diameter
F		Round flange
NG		Foot + pitch circle diameter
NF		Foot + round flange
GD		Pitch circle diameter + torque arm
NGD		Foot + pitch circle diameter + torque arm
1700	Transmission ratio (i x 10)	i = 170 (example)
LM401U	Motor	LM Lean motor

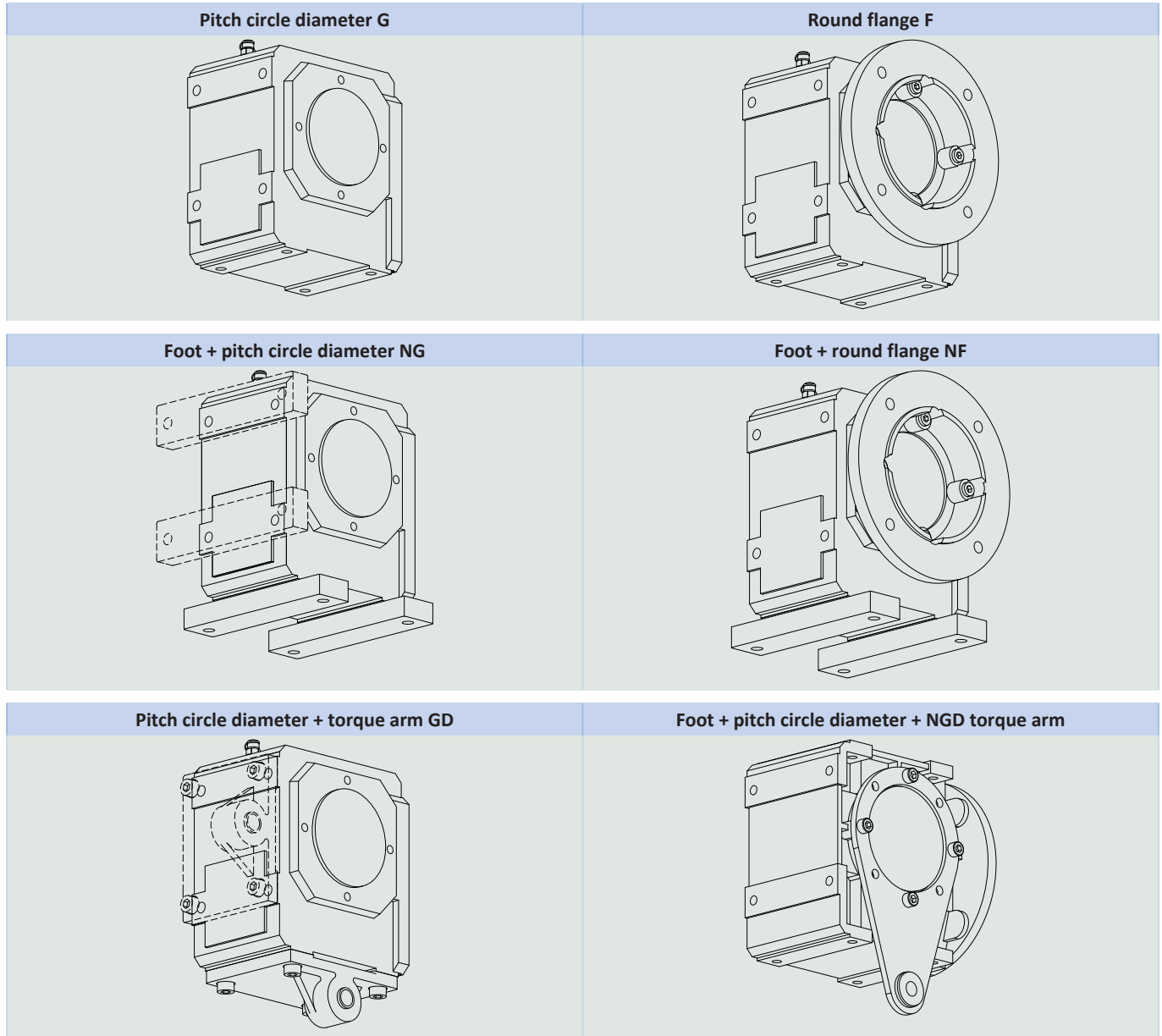
In order to complete the type designation, also specify:

- A detailed type designation of the motor, see Chapter [\[2 \]](#)
- The installation position, see Chapter [\[13.5.4 \]](#)
- 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
- Attachment of torque arm: torque arm:
 - S0: torque arm on gear unit side 3 or 4, eye on gear unit side 1, 2, 5, 25, 51
 - S1 – S4: torque arm on gear unit side 1 or 5, eye on gear unit side 3 or 4
- The position of the plug connector, see the chapter [\[13.5.6 \]](#)
- Oil expansion tank (recommended for gear units in installation position EL5), see the chapter [\[13.6.4 \]](#)
- Standard or reinforced output bearing

An explanation of the gear unit sides can be found in the chapter [\[13.5.4 \]](#).

13.5 Product description

13.5.1 Housing design



	G	F	NG	NF	GD	NGD
S0	-	-	✓	✓	-	✓
S1	✓	✓	✓	✓	✓	-
S2	✓	✓	✓	✓	✓	-
S3	✓	✓	✓	✓	✓	-
S4	✓	✓	✓	✓	✓	-

13.5.2 Combinatorial shaft/housing design

Shaft design	Housing design						
	Code	G	F	NG	NF	GD	NGD
Hollow shaft with keyway	A	AG	AF	ANG	ANF	AGD	ANGD
Hollow shaft with shrink disk	S	SG	SF	SNG	SNF	SGD	SNGD
Solid shaft	V	VG	VF	VNG	VNF	–	–

13.5.3 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/mm².

Possible materials:

- C45E +QT
- 42CrMo4

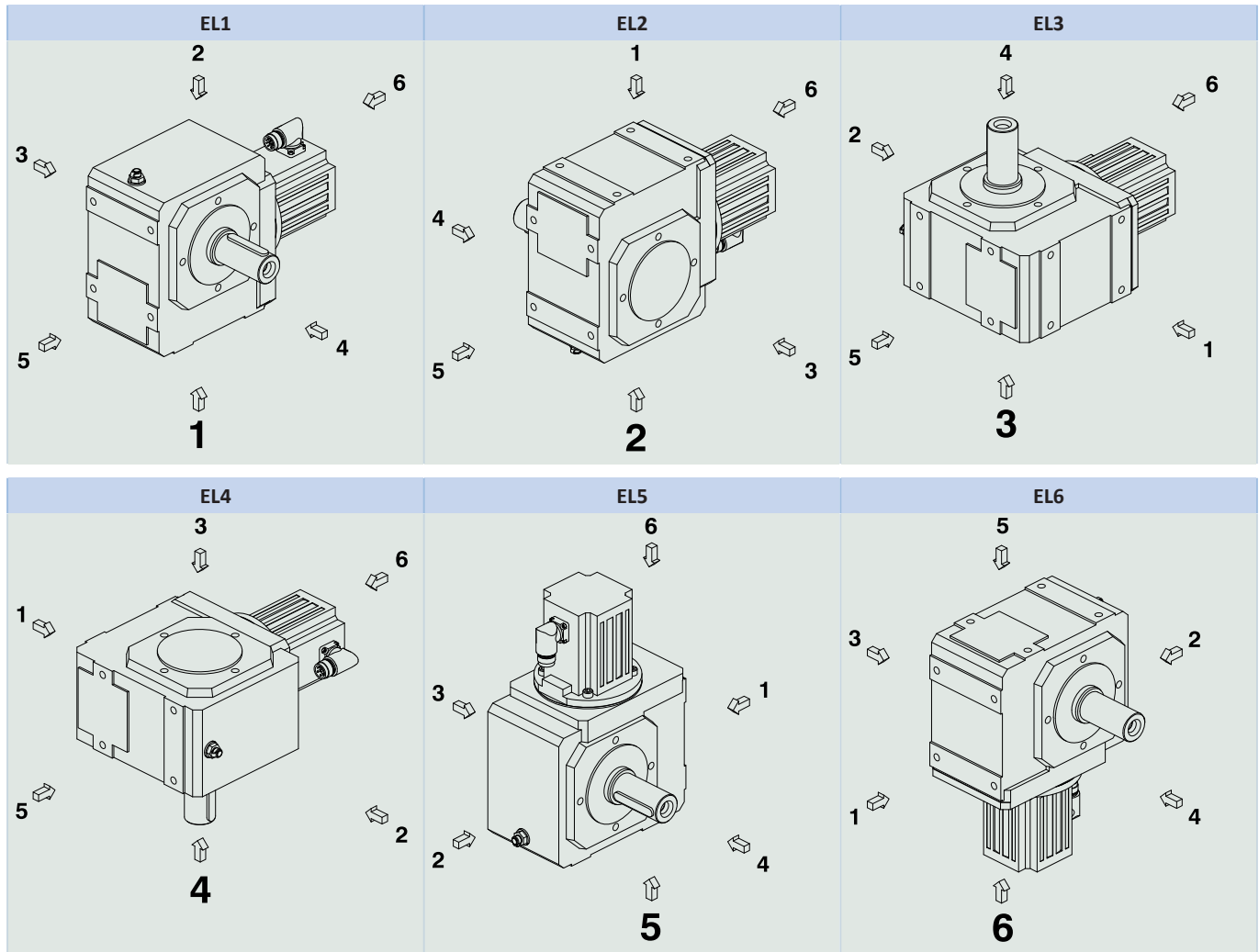
Attaching the gear unit on the machine side using the pitch circle diameter

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).

13.5.4 Installation positions

The following table shows the standard installation positions.

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



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

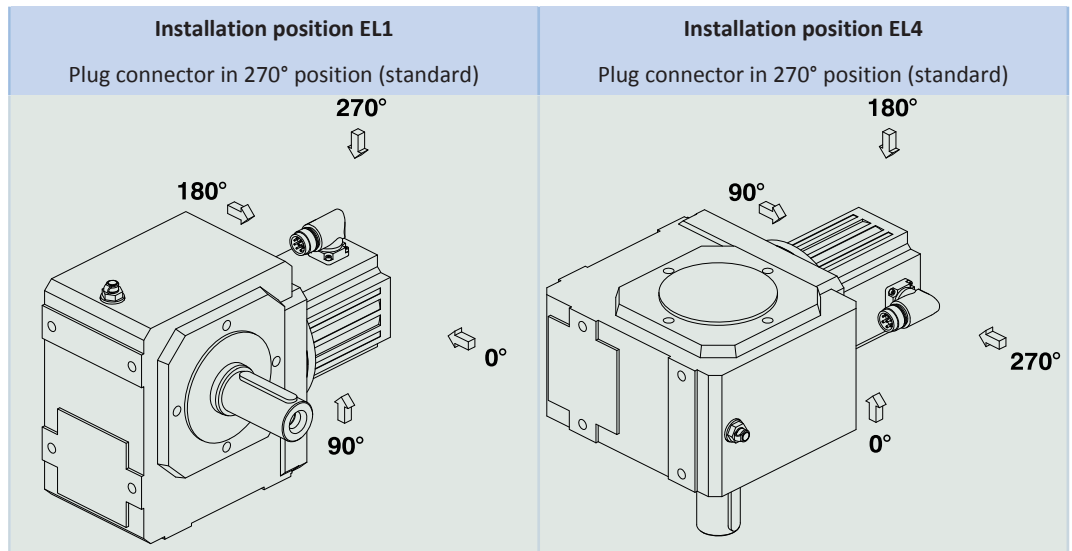
13.5.5 Lubricants

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 installation position.

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

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

13.5.6 Position of the plug connector



Indicate variations for your geared motor in the purchase order.

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

13.5.7 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

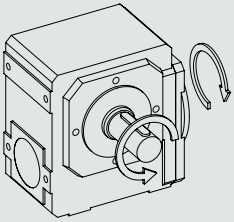
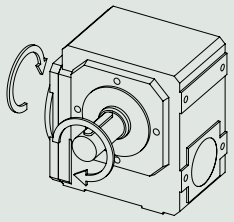
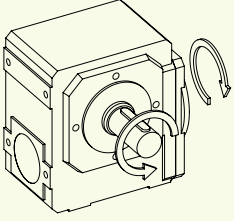
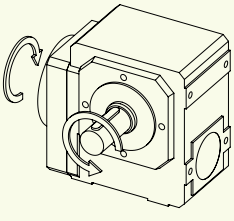
13.5.8 Maintenance

The instructions for maintenance can be found in the operating manual, ID 443027_en, at <http://www.stoebler.de/en/download>.

¹Observe the protection class of all the components.

13.5.9 Direction of rotation

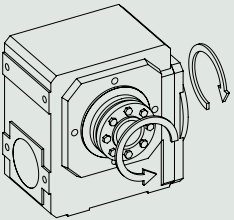
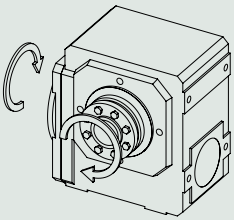
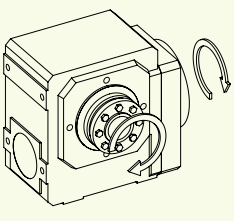
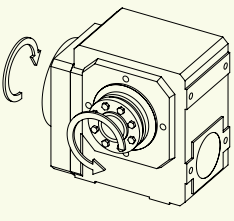
Solid shaft (V), solid shaft on both sides (V), hollow shaft with keyway (A)

Type	Output side 4	Output side 3
S002 – S402		
S203 – S403		

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.

Hollow shaft with shrink disk (S)

Type	Output side 4	Output side 3
S002 – S402		
S203 – S403		

The pictures show installation position EL1.

13.6 Project configuration

Project your drives using our SERVOfsoft designing software. You can receive SERVOfsoft 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.

13.6.1 Calculation of the operating point

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

For continuous operation in installation positions EL1, EL2:

$$n_{1m^*} \leq \frac{n_{1maxDBEL1,2}}{fB_T}$$

For continuous operation in installation positions EL3, EL4, EL5, EL6:

$$n_{1m^*} \leq \frac{n_{1\max\text{DBEL}3,4,5,6}}{fB_T}$$

For all installation positions:

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

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

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

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

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

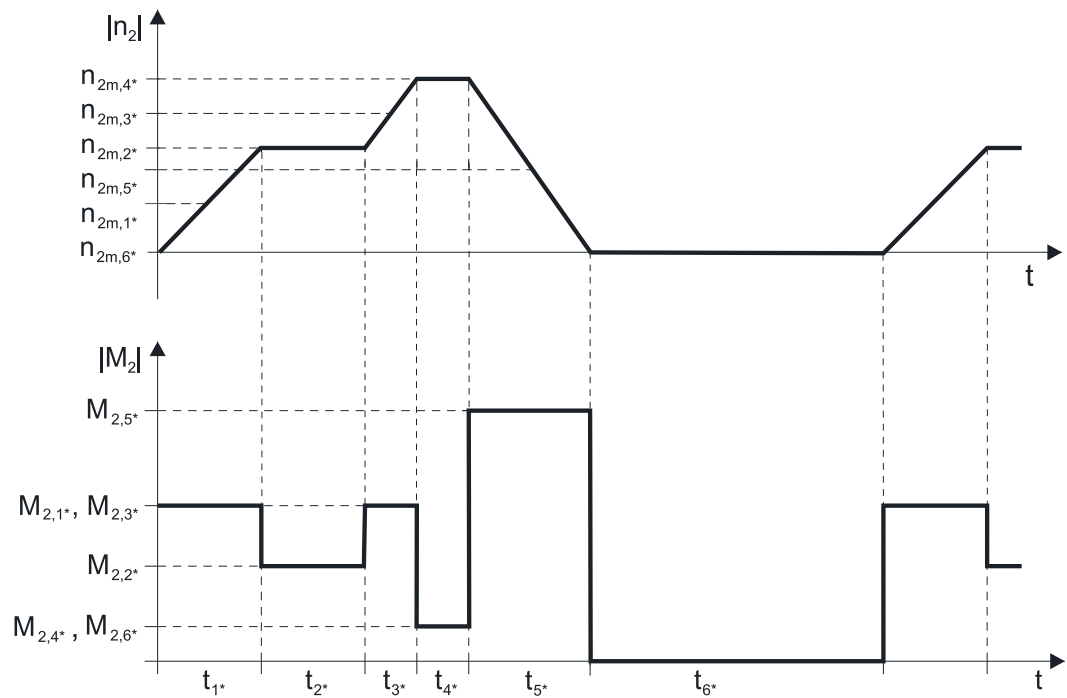
Refer to the selection tables for the values for $n_{1\max\text{DBEL}1,2}$ and $n_{1\max\text{DBEL}3,4,5,6}$, $n_{1\max\text{ZB}}$, $M_{2\text{acc}}$, $M_{2\text{NOT}}$, M_{2N} and S .

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 $M_{2\text{th}}$ 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

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

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

If $t_{1^*} + \dots + t_{5^*} \geq 20$ 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

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

Calculation of the actual equivalent torque

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

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.)

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

Ratio $i < 40$:

$$K_{mot,th} = 0,8 - \frac{a_{th}}{1000} \cdot athEL \cdot fB_T \cdot \left(\frac{n_{1m^*}}{1000}\right)^2$$

Ratio $40 < i \leq 100$:

$$K_{mot,th} = 0,7 - \frac{a_{th}}{1000} \cdot athEL \cdot fB_T \cdot \left(\frac{n_{1m^*}}{1000}\right)^2$$

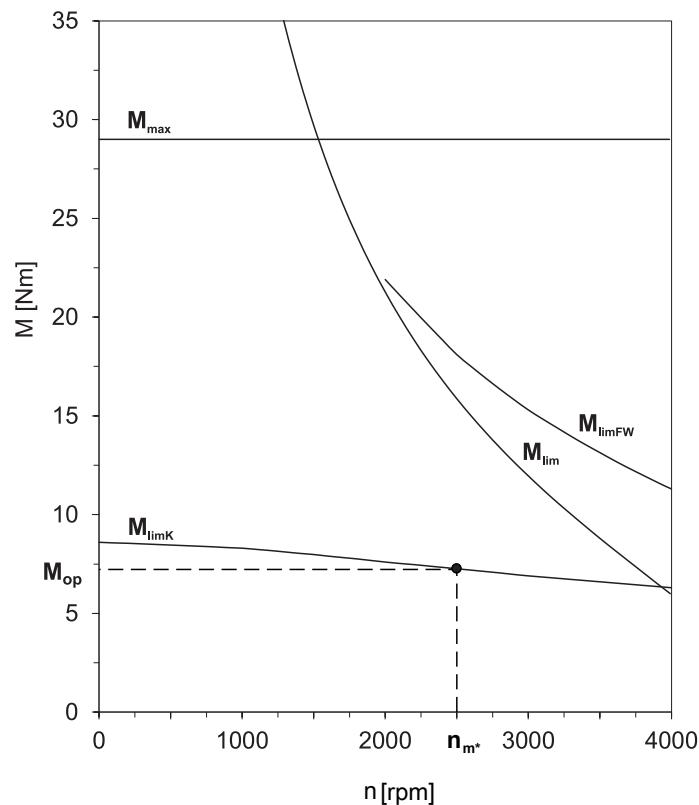
Ratio $i > 100$:

$$K_{mot,th} = 0,65 - \frac{a_{th}}{1000} \cdot athEL \cdot fB_T \cdot \left(\frac{n_{1m^*}}{1000}\right)^2$$

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 factors

Parameter a_{thEL}

Installation position		a_{thEL}
EL1, 2		1.0
EL3, 4, 5, 6		1.1
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.

13.6.2 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 $n_{2m^*} \leq 20$ rpm ($F_{2axN} = F_{2ax20}$; $F_{2radN} = F_{2rad20}$; $M_{2kN} = M_{2k20}$)
- Only if radial forces on the gear unit are stabilized by its pilots (housing, flange shaft)

13.6.2.1 V shaft design

Permitted shaft loads for V shaft design (solid shaft)

Type	z_2 [mm]	F_{2ax20} [N]	F_{2rad20} [N]	M_{2k20} [Nm]
S0	31.0	1050	3500	180
S1	37.0	1650	5000	350
S2	38.0	2400	7000	550
S3	46.0	3000	10000	900
S4	47.0	3900	13000	1200

Reduced values apply in the case of a V shaft design (solid shaft) in conjunction with an NF housing design (foot + round flange):

Type	z_2 [mm]	F_{2ax20} [N]	F_{2rad20} [N]	M_{2k20} [Nm]
S0	46.0	1050	2700	180

For the V solid shaft design on both sides, the values for F_{2rad20} and M_{2k20} must be multiplied by a factor of 0.7.

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

The following applies to output speeds $n_{2m^*} > 20$ rpm:

$$F_{2axN} = \frac{F_{2ax20}}{\sqrt[3]{\frac{n_{2m^*}}{20 \text{ rpm}}}} \quad F_{2radN} = \frac{F_{2rad20}}{\sqrt[3]{\frac{n_{2m^*}}{20 \text{ rpm}}}} \quad M_{2kN} = \frac{M_{2k20}}{\sqrt[3]{\frac{n_{2m^*}}{20 \text{ rpm}}}}$$

The values for F_{2ax20} , F_{2rad20} and M_{2k20} can be found in the table "Permitted shaft loads" in this chapter.

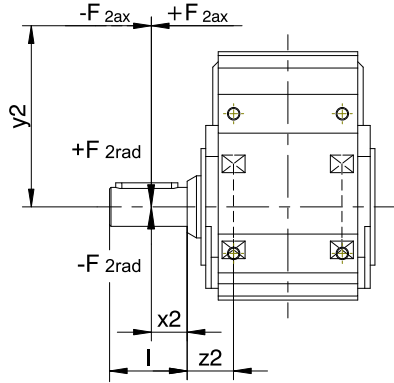


Fig. 1: Force application points for solid shaft

The specified values for F_{2rad20} are based on application of force at the middle 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.

13.6.2.2 A and S shaft design

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

Type	z_2 [mm]	F_{2ax20} [N]	F_{2rad20} [N]	M_{2k20} [Nm]
S0	25.0	1050	3500	150
S1	32.0	1650	5000	200
S2	35.0	1700	7000	350
S3	39.0	2100	10000	600
S4	40.0	2800	13000	800

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

Type	z_2 [mm]	F_{2ax20} [N]	F_{2rad20} [N]	M_{2k20} [Nm]
S0	25.0	1050	3500	150
S1	32.0	1650	5000	200
S2	35.0	1700	7000	350
S3	39.0	2100	10000	600
S4	40.0	2800	13000	800

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

The following applies to output speeds $n_{2m^*} > 20$ rpm:

$$F_{2axN} = \frac{F_{2ax20}}{\sqrt[3]{\frac{n_{2m^*}}{20 \text{ rpm}}}} \quad F_{2radN} = \frac{F_{2rad20}}{\sqrt[3]{\frac{n_{2m^*}}{20 \text{ rpm}}}} \quad M_{2kN} = \frac{M_{2k20}}{\sqrt[3]{\frac{n_{2m^*}}{20 \text{ rpm}}}}$$

The values for F_{2ax20} , F_{2rad20} and M_{2k20} can be found in the table "Permitted shaft loads" in this chapter.

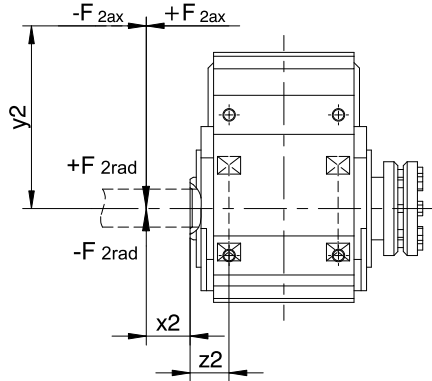


Fig. 2: Force application points for hollow shaft

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 ($x_2 = 0$).

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

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

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.

13.6.3 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.

13.6.4 Oil expansion tank

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

Notes

- We recommend using an oil expansion tank in installation position EL5 (additional cost) for fast running gear units with an input speed $n_1 > 1750$ rpm and gear ratios $i < 20$.
- It is not possible to use an oil expansion tank if the plug connector is at 90°!
- The oil expansion tank can only be used with certain sizes; see the chapter [▶ 13.3.17](#)

13.7 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 C/F/K/S gear units and gear motors	443027_en
Lubricant filling quantities for gear units	441871