



## 17.1 Overview

High-performance precision right-angle planetary geared motors

### Technical data

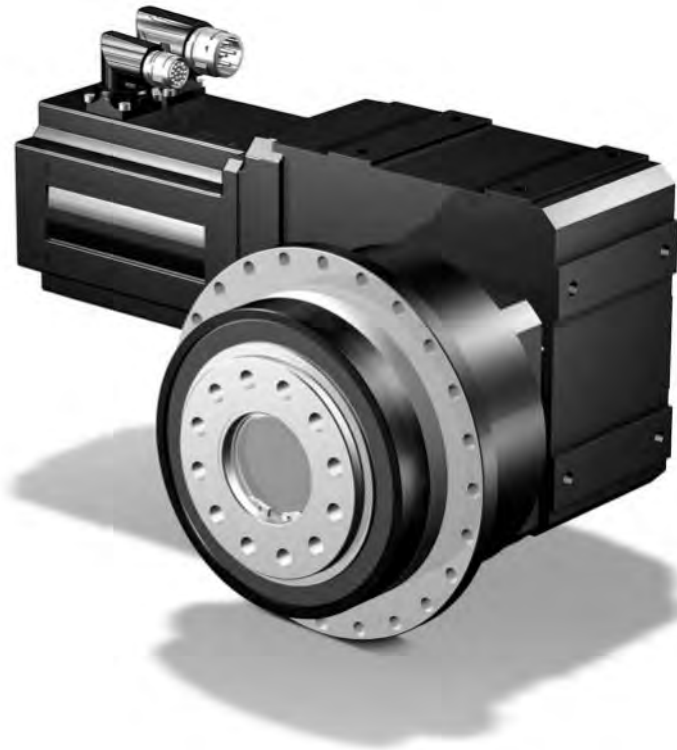
$i$	16 – 486
$M_{2acc}$	89 – 7500 Nm
$\Delta\varphi_2$	3.5 – 4.5 arcmin
$\eta$	$\leq 92 - 93 \%$

### Features

Power density	★★★★☆
Backlash	★★★★☆
Price category	€€€€
Shaft load	★★★★★
Smooth operation	★★★☆☆
Torsional stiffness	★★★★☆
Mass moment of inertia	★★★★★
Helical gearing	✓
Maintenance-free	✓
Continuous operation without cooling	✓
Pretensioned angular contact bearings at the output in an O-arrangement, ideally suited for helical-gear rack and pinion drives	✓
Compact and highly dynamic due to direct motor attachment	✓

Key: ★☆☆☆☆ good | ★★★★★ excellent

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## 17.2 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 (e.g. EZ401U)

You can calculate the technical data for drives with forced ventilated motors (for example EZ401B) at <http://products.stoeber.de>.

Formula symbol	Unit	Explanation
$a_{th}$	–	Parameter for calculating $K_{mot,th}$
$C_2$	Nm/ arcmin	Torsional stiffness of gear unit (final stiffness) relative to the gear unit output
$\Delta\varphi_2$	arcmin	Backlash at the output shaft with a blocked input
$\eta$	%	Efficiency
$i$	–	Gear ratio
$i_{exakt}$	–	Mathematically exact gear ratio
$J_1$	$10^{-4}kgm^2$	Mass moment of inertia relative to the gear unit input
$m$	kg	Weight
$M_{2,0}$	Nm	Stall torque on the gear unit output
$M_{2acc}$	Nm	Maximum permitted acceleration torque on the gear unit output
$M_{2acc,max}$	Nm	Maximum permitted acceleration torque of a group of geared motors whose size and nominal torque $n_{1N}$ are the same
$M_{2N}$	Nm	Nominal torque on the gear unit output (relative to $n_{1N}$ )
$M_{2NOT}$	Nm	Gear unit emergency-off torque on the gear unit output for max. 1000 load changes
$n_{1maxDBH}$	rpm	Maximum permitted input speed of the gear unit in continuous operation Installation positions EL1, EL2 (at surrounding temperature of 20 °C)
$n_{1maxDBV}$	rpm	Maximum permitted input speed of the gear unit in continuous operation Installation positions EL3, EL4, EL5, EL6 (at surrounding temperature of 20 °C)
$n_{1maxZB}$	$min^{-1}$	Maximum permitted input speed of the gear unit in cyclic operation (at surrounding temperature of 20 °C)
$n_{1N}$	$min^{-1}$	Nominal speed at the gear unit input
$n_{2N}$	$min^{-1}$	Nominal speed at the gear unit output
$S$	–	Load value: Quotient of gear unit and motor nominal torque without regard to the thermal performance limit. Represents a value for the reserve of the geared motor.

















## 17 PHK right-angle planetary geared motors

### 17.2 Selection tables



$n_{2N}$	$M_{2N}$	$M_{2.0}$	$a_{th}$	S	Type	$M_{2acc}$	$M_{2NOT}$	i	$i_{exakt}$	$n_{1max}$ DBH	$n_{1max}$ DBV	$n_{1max}$ ZB	$J_1$	$\Delta\phi_2$	$C_2$	m
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			[rpm]	[rpm]	[rpm]	[10 <sup>-4</sup> kgm <sup>2</sup> ]	[arcmin]	[Nm/ arcmin]	[kg]
<b>PH8K (<math>n_{1N} = 3000</math> rpm, <math>M_{2acc,max} = 1850</math> Nm)</b>																
13	454	480	8.1	2.2	PH821F0070 K202VF0340 EZ303U	1000	1360	235.3	12943/55	4000	3900	5500	0.49	3.5	248	51
13	614	657	11	1.6	PH821F0070 K202VF0340 EZ401U	1240	2250	235.3	12943/55	4000	3900	5500	1.0	3.5	248	53
13	343	363	10	2.3	PH821F0100 K202VF0230 EZ302U	1080	1760	231.8	14835/64	4000	3900	5500	0.53	3.5	244	51
13	447	473	13	1.8	PH821F0100 K202VF0230 EZ303U	1200	1760	231.8	14835/64	4000	3900	5500	0.64	3.5	244	51
13	604	648	18	1.3	PH821F0100 K202VF0230 EZ401U	1200	2400	231.8	14835/64	4000	3900	5500	1.2	3.5	244	53
13	342	362	4.8	2.7	PH821F0050 K302VF0460 EZ302U	920	1250	231.1	1849/8	3800	3500	5000	0.45	4	239	56
13	446	471	6.3	2.1	PH821F0050 K302VF0460 EZ303U	920	1250	231.1	1849/8	3800	3500	5000	0.56	4	239	56
13	603	646	8.5	1.8	PH821F0050 K302VF0460 EZ401U	1830	2660	231.1	1849/8	3800	3500	5000	1.1	4	239	58
13	925	1012	13	1.2	PH821F0050 K302VF0460 EZ501U	1850	2870	231.1	1849/8	3800	3500	5000	3.1	4	239	59
13	1012	1119	14	1.1	PH821F0050 K302VF0460 EZ402U	1850	2660	231.1	1849/8	3800	3500	5000	1.8	4	239	59
15	290	306	6.0	3.5	PH821F0070 K202VF0280 EZ302U	910	1470	195.7	3913/20	4000	3900	5500	0.47	3.5	248	51
15	377	399	7.8	2.7	PH821F0070 K202VF0280 EZ303U	1090	1470	195.7	3913/20	4000	3900	5500	0.58	3.5	248	51
15	510	547	10	2.0	PH821F0070 K202VF0280 EZ401U	1480	2760	195.7	3913/20	4000	3900	5500	1.1	3.5	248	53
15	783	856	16	1.3	PH821F0070 K202VF0280 EZ501U	1480	2770	195.7	3913/20	4000	3900	5500	3.1	3.5	248	54
15	856	947	18	1.2	PH821F0070 K202VF0280 EZ402U	1480	2760	195.7	3913/20	4000	3900	5500	1.8	3.5	248	54
17	260	275	5.8	3.2	PH821F0070 K202VF0250 EZ302U	820	1140	175.9	1935/11	4000	3900	5500	0.44	3.5	248	51
17	339	359	7.6	2.5	PH821F0070 K202VF0250 EZ303U	840	1140	175.9	1935/11	4000	3900	5500	0.55	3.5	248	51
17	459	491	10	2.2	PH821F0070 K202VF0250 EZ401U	1390	2190	175.9	1935/11	4000	3900	5500	1.1	3.5	248	53
17	704	770	16	1.4	PH821F0070 K202VF0250 EZ501U	1480	2770	175.9	1935/11	4000	3900	5500	3.0	3.5	248	54
17	770	852	17	1.3	PH821F0070 K202VF0250 EZ402U	1480	2190	175.9	1935/11	4000	3900	5500	1.8	3.5	248	54
17	259	273	9.5	3.1	PH821F0100 K202VF0175 EZ302U	810	1320	174.7	2795/16	3900	3500	5000	0.66	3.5	244	51
17	337	356	12	2.4	PH821F0100 K202VF0175 EZ303U	980	1320	174.7	2795/16	3900	3500	5000	0.77	3.5	244	51
17	455	488	17	1.8	PH821F0100 K202VF0175 EZ401U	1200	2400	174.7	2795/16	3900	3500	5000	1.3	3.5	244	53
17	699	765	26	1.1	PH821F0100 K202VF0175 EZ501U	1200	2400	174.7	2795/16	3900	3500	5000	3.3	3.5	244	54
17	765	846	28	1.0	PH821F0100 K202VF0175 EZ402U	1200	2400	174.7	2795/16	3900	3500	5000	2.0	3.5	244	54
17	257	272	4.5	3.4	PH821F0050 K302VF0350 EZ302U	810	1180	173.7	4515/26	3800	3500	5000	0.56	4	239	56
17	335	354	5.8	2.6	PH821F0050 K302VF0350 EZ303U	870	1180	173.7	4515/26	3800	3500	5000	0.67	4	239	56
17	453	485	7.9	2.4	PH821F0050 K302VF0350 EZ401U	1370	2220	173.7	4515/26	3800	3500	5000	1.2	4	239	58
17	695	760	12	1.6	PH821F0050 K302VF0350 EZ501U	1850	2870	173.7	4515/26	3800	3500	5000	3.2	4	239	59
17	760	841	13	1.4	PH821F0050 K302VF0350 EZ402U	1640	2220	173.7	4515/26	3800	3500	5000	1.9	4	239	59
18	240	254	5.7	3.8	PH821F0070 K202VF0230 EZ302U	760	1230	162.3	20769/128	4000	3900	5500	0.54	3.5	248	51
18	313	331	7.4	2.9	PH821F0070 K202VF0230 EZ303U	910	1230	162.3	20769/128	4000	3900	5500	0.65	3.5	248	51
18	423	453	10	2.4	PH821F0070 K202VF0230 EZ401U	1280	2460	162.3	20769/128	4000	3900	5500	1.2	3.5	248	53
18	650	710	15	1.5	PH821F0070 K202VF0230 EZ501U	1480	2770	162.3	20769/128	4000	3900	5500	3.1	3.5	248	54
18	710	786	17	1.4	PH821F0070 K202VF0230 EZ402U	1480	2460	162.3	20769/128	4000	3900	5500	1.9	3.5	248	54
21	211	223	5.5	3.7	PH821F0070 K202VF0200 EZ302U	660	1070	142.3	7826/55	4000	3900	5500	0.50	3.5	248	51
21	274	290	7.2	2.9	PH821F0070 K202VF0200 EZ303U	790	1070	142.3	7826/55	4000	3900	5500	0.61	3.5	248	51
21	371	397	9.7	2.7	PH821F0070 K202VF0200 EZ401U	1130	2010	142.3	7826/55	4000	3900	5500	1.1	3.5	248	53
21	570	623	15	1.8	PH821F0070 K202VF0200 EZ501U	1480	2770	142.3	7826/55	4000	3900	5500	3.1	3.5	248	54
21	623	689	16	1.6	PH821F0070 K202VF0200 EZ402U	1480	2010	142.3	7826/55	4000	3900	5500	1.8	3.5	248	54
21	914	1139	24	1.1	PH821F0070 K202VF0200 EZ404U	1480	2770	142.3	7826/55	4000	3900	5500	3.2	3.5	248	56
21	980	1060	26	1.0	PH821F0070 K202VF0200 EZ502U	1480	2770	142.3	7826/55	4000	3900	5500	5.4	3.5	248	55
21	980	1100	26	1.0	PH821F0070 K202VF0200 EZ701U	1480	2770	142.3	7826/55	4000	3900	5500	8.7	3.5	248	57
22	206	218	4.3	3.8	PH821F0050 K302VF0280 EZ302U	650	1060	139.4	17845/128	3800	3500	5000	0.67	4	239	56
22	269	284	5.5	2.9	PH821F0050 K302VF0280 EZ303U	780	1060	139.4	17845/128	3800	3500	5000	0.78	4	239	56
22	364	389	7.5	3.0	PH821F0050 K302VF0280 EZ401U	1100	2110	139.4	17845/128	3800	3500	5000	1.3	4	239	58
22	558	610	11	2.0	PH821F0050 K302VF0280 EZ501U	1850	2870	139.4	17845/128	3800	3500	5000	3.3	4	239	59
22	610	675	13	1.8	PH821F0050 K302VF0280 EZ402U	1560	2110	139.4	17845/128	3800	3500	5000	2.0	4	239	59
22	896	1116	18	1.2	PH821F0050 K302VF0280 EZ404U	1850	2870	139.4	17845/128	3800	3500	5000	3.4	4	239	61
22	961	1039	20	1.1	PH821F0050 K302VF0280 EZ502U	1850	2870	139.4	17845/128	3800	3500	5000	5.6	4	239	60
22	961	1078	20	1.1	PH821F0050 K302VF0280 EZ701U	1850	2870	139.4	17845/128	3800	3500	5000	8.9	4	239	62
22	205	217	8.9	3.8	PH821F0100 K202VF0140 EZ302U	640	1050	138.5	14405/104	3900	3500	5000	0.81	3.5	244	51
22	267	282	12	2.9	PH821F0100 K202VF0140 EZ303U	770	1050	138.5	14405/104	3900	3500	5000	0.92	3.5	244	51
22	361	387	16	2.2	PH821F0100 K202VF0140 EZ401U	1100	2100	138.5	14405/104	3900	3500	5000	1.5	3.5	244	53
22	555	606	26	1.4	PH821F0100 K202VF0140 EZ501U	1200	2400	138.5	14405/104	3900	3500	5000	3.4	3.5	244	54
22	606	671	26	1.3	PH821F0100 K202VF0140 EZ402U	1200	2100	138.5	14405/104	3900	3500	5000	2.2	3.5	244	54
25	181	191	5.3	3.8	PH821F0070 K202VF0175 EZ302U	570	930	122.3	3913/32	3900	3500	5000	0.67	3.5	248	51
25	236	249	6.9	2.9	PH821F0070 K202VF0175 EZ303U	680	930	122.3	3913/32	3900	3500	5000	0.78	3.5	248	51
25	319	342	9.3	3.1	PH821F0070 K202VF0175 EZ401U	970	1850	122.3	3913/32	3900	3500	5000	1.3	3.5	248	53

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## 17.2 Selection tables



$n_{2N}$	$M_{2N}$	$M_{2.0}$	$a_{in}$	S	Type	$M_{2acc}$	$M_{2NOT}$	$i$	$i_{exakt}$	$n_{1max}$	$n_{1max}$	$n_{1max}$	$J_1$	$\Delta\phi_2$	$C_2$	$m$
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			DBH	DBV	ZB	[10 <sup>-4</sup> kgm <sup>2</sup> ]	[arcmin]	[Nm/arcmin]	[kg]
<b>PH8K (<math>n_{1N} = 3000</math> rpm, <math>M_{2acc,max} = 1850</math> Nm)</b>																
25	490	535	14	2.0	PH821F0070 K202VF0175 EZ501U	1480	2770	122.3	3913/32	3900	3500	5000	3.3	3.5	248	54
25	535	592	16	1.9	PH821F0070 K202VF0175 EZ402U	1370	1850	122.3	3913/32	3900	3500	5000	2.0	3.5	248	54
25	786	979	23	1.3	PH821F0070 K202VF0175 EZ404U	1480	2770	122.3	3913/32	3900	3500	5000	3.4	3.5	248	56
25	843	911	25	1.2	PH821F0070 K202VF0175 EZ502U	1480	2770	122.3	3913/32	3900	3500	5000	5.6	3.5	248	55
25	843	945	25	1.2	PH821F0070 K202VF0175 EZ701U	1480	2770	122.3	3913/32	3900	3500	5000	8.9	3.5	248	57
25	175	185	5.3	3.8	PH821F0070 K202VF0170 EZ302U	550	890	118.0	20769/176	4000	3900	5500	0.58	3.5	248	51
25	227	241	6.8	2.9	PH821F0070 K202VF0170 EZ303U	660	890	118.0	20769/176	4000	3900	5500	0.69	3.5	248	51
25	308	330	9.2	3.3	PH821F0070 K202VF0170 EZ401U	930	1790	118.0	20769/176	4000	3900	5500	1.2	3.5	248	53
25	473	516	14	2.1	PH821F0070 K202VF0170 EZ501U	1480	2770	118.0	20769/176	4000	3900	5500	3.2	3.5	248	54
25	516	571	16	1.9	PH821F0070 K202VF0170 EZ402U	1320	1790	118.0	20769/176	4000	3900	5500	1.9	3.5	248	54
25	758	945	23	1.3	PH821F0070 K202VF0170 EZ404U	1480	2770	118.0	20769/176	4000	3900	5500	3.3	3.5	248	56
25	813	879	24	1.2	PH821F0070 K202VF0170 EZ502U	1480	2770	118.0	20769/176	4000	3900	5500	5.5	3.5	248	55
25	813	912	24	1.2	PH821F0070 K202VF0170 EZ701U	1480	2770	118.0	20769/176	4000	3900	5500	8.8	3.5	248	57
26	172	182	4.1	3.8	PH821F0050 K302VF0230 EZ302U	540	880	116.5	2795/24	3800	3500	5000	0.80	4	239	56
26	224	238	5.3	2.9	PH821F0050 K302VF0230 EZ303U	650	880	116.5	2795/24	3800	3500	5000	0.91	4	239	56
26	304	325	7.2	3.6	PH821F0050 K302VF0230 EZ401U	920	1770	116.5	2795/24	3800	3500	5000	1.4	4	239	58
26	466	510	11	2.4	PH821F0050 K302VF0230 EZ501U	1740	2870	116.5	2795/24	3800	3500	5000	3.4	4	239	59
26	510	564	12	2.2	PH821F0050 K302VF0230 EZ402U	1300	1770	116.5	2795/24	3800	3500	5000	2.1	4	239	59
26	748	933	18	1.5	PH821F0050 K302VF0230 EZ404U	1850	2870	116.5	2795/24	3800	3500	5000	3.5	4	239	61
26	803	868	19	1.4	PH821F0050 K302VF0230 EZ502U	1850	2870	116.5	2795/24	3800	3500	5000	5.7	4	239	60
26	803	900	19	1.4	PH821F0050 K302VF0230 EZ701U	1850	2870	116.5	2795/24	3800	3500	5000	9.0	4	239	62
26	1052	1204	25	1.0	PH821F0050 K302VF0230 EZ503U	1850	2870	116.5	2795/24	3800	3500	5000	8.1	4	239	62
26	171	181	8.5	3.8	PH821F0100 K202VF0115 EZ302U	540	870	115.5	6235/54	3500	3100	4500	0.98	3.5	244	51
26	223	235	11	2.9	PH821F0100 K202VF0115 EZ303U	650	870	115.5	6235/54	3500	3100	4500	1.1	3.5	244	51
26	301	323	15	2.7	PH821F0100 K202VF0115 EZ401U	910	1750	115.5	6235/54	3500	3100	4500	1.6	3.5	244	53
26	462	505	23	1.7	PH821F0100 K202VF0115 EZ501U	1200	2400	115.5	6235/54	3500	3100	4500	3.6	3.5	244	54
26	505	559	25	1.6	PH821F0100 K202VF0115 EZ402U	1200	1750	115.5	6235/54	3500	3100	4500	2.3	3.5	244	54
26	742	925	37	1.1	PH821F0100 K202VF0115 EZ404U	1200	2400	115.5	6235/54	3500	3100	4500	3.7	3.5	244	56
26	796	860	40	1.0	PH821F0100 K202VF0115 EZ502U	1200	2400	115.5	6235/54	3500	3100	4500	5.9	3.5	244	55
26	796	892	40	1.0	PH821F0100 K202VF0115 EZ701U	1200	2400	115.5	6235/54	3500	3100	4500	9.2	3.5	244	57
31	144	152	5.3	3.8	PH821F0070 K202VF0140 EZ302U	450	730	96.96	20167/208	3900	3500	5000	0.83	3.5	248	51
31	187	198	6.9	2.9	PH821F0070 K202VF0140 EZ303U	540	730	96.96	20167/208	3900	3500	5000	0.94	3.5	248	51
31	253	271	9.4	3.7	PH821F0070 K202VF0140 EZ401U	770	1470	96.96	20167/208	3900	3500	5000	1.5	3.5	248	53
31	388	424	14	2.4	PH821F0070 K202VF0140 EZ501U	1440	2770	96.96	20167/208	3900	3500	5000	3.4	3.5	248	54
31	424	469	16	2.2	PH821F0070 K202VF0140 EZ402U	1080	1470	96.96	20167/208	3900	3500	5000	2.2	3.5	248	54
31	623	776	23	1.5	PH821F0070 K202VF0140 EZ404U	1480	2770	96.96	20167/208	3900	3500	5000	3.5	3.5	248	56
31	668	722	25	1.4	PH821F0070 K202VF0140 EZ502U	1480	2770	96.96	20167/208	3900	3500	5000	5.7	3.5	248	55
31	668	749	25	1.4	PH821F0070 K202VF0140 EZ701U	1480	2770	96.96	20167/208	3900	3500	5000	9.0	3.5	248	57
31	876	1002	32	1.1	PH821F0070 K202VF0140 EZ503U	1480	2770	96.96	20167/208	3900	3500	5000	8.1	3.5	248	57
33	177	187	10	2.9	PH821F0100 K202VF0092 EZ303U	510	700	91.90	11395/124	3500	3100	4500	1.4	3.5	244	51
33	240	257	14	3.3	PH821F0100 K202VF0092 EZ401U	730	1390	91.90	11395/124	3500	3100	4500	1.9	3.5	244	53
33	368	402	22	2.2	PH821F0100 K202VF0092 EZ501U	1200	2400	91.90	11395/124	3500	3100	4500	3.9	3.5	244	54
33	402	445	24	2.0	PH821F0100 K202VF0092 EZ402U	1030	1390	91.90	11395/124	3500	3100	4500	2.6	3.5	244	54
33	590	736	35	1.4	PH821F0100 K202VF0092 EZ404U	1200	2400	91.90	11395/124	3500	3100	4500	3.9	3.5	244	56
33	633	685	38	1.3	PH821F0100 K202VF0092 EZ502U	1200	2400	91.90	11395/124	3500	3100	4500	6.2	3.5	244	55
33	633	710	38	1.3	PH821F0100 K202VF0092 EZ701U	1200	2400	91.90	11395/124	3500	3100	4500	9.5	3.5	244	57
34	132	139	5.4	3.8	PH821F0070 K202VF0125 EZ302U	410	670	88.94	3913/44	3900	3500	5000	0.74	3.5	248	51
34	171	181	7.0	2.9	PH821F0070 K202VF0125 EZ303U	500	670	88.94	3913/44	3900	3500	5000	0.85	3.5	248	51
34	232	248	9.4	3.9	PH821F0070 K202VF0125 EZ401U	700	1350	88.94	3913/44	3900	3500	5000	1.4	3.5	248	53
34	356	389	15	2.6	PH821F0070 K202VF0125 EZ501U	1330	2700	88.94	3913/44	3900	3500	5000	3.4	3.5	248	54
34	389	431	16	2.3	PH821F0070 K202VF0125 EZ402U	990	1350	88.94	3913/44	3900	3500	5000	2.1	3.5	248	54
34	571	712	23	1.6	PH821F0070 K202VF0125 EZ404U	1480	2700	88.94	3913/44	3900	3500	5000	3.4	3.5	248	56
34	613	663	25	1.5	PH821F0070 K202VF0125 EZ502U	1480	2700	88.94	3913/44	3900	3500	5000	5.7	3.5	248	55
34	613	687	25	1.5	PH821F0070 K202VF0125 EZ701U	1480	2770	88.94	3913/44	3900	3500	5000	9.0	3.5	248	57
34	803	919	33	1.1	PH821F0070 K202VF0125 EZ503U	1480	2700	88.94	3913/44	3900	3500	5000	8.0	3.5	248	57
35	225	242	6.6	4.3	PH821F0050 K302VF0175 EZ401U	680	1310	86.47	7955/92	3500	3100	5000	1.7	4	239	58
35	346	378	10	3.2	PH821F0050 K302VF0175 EZ501U	1290	2620	86.47	7955/92	3500	3100	5000	3.7	4	239	59
35	378	419	11	2.6	PH821F0050 K302VF0175 EZ402U	970	1310	86.47	7955/92	3500	3100	5000	2.4	4	239	59
35	556	692	16	2.0	PH821F0050 K302VF0175 EZ404U	1850	2620	86.47	7955/92	3500	3100	5000	3.8	4	239	61



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## 17.2 Selection tables



$n_{2N}$	$M_{2N}$	$M_{2,0}$	$a_{th}$	S	Type	$M_{2acc}$	$M_{2NOT}$	i	$i_{exakt}$	$n_{1max}$ DBH	$n_{1max}$ DBV	$n_{1max}$ ZB	$J_1$	$\Delta\phi_2$	$C_2$	m
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			[rpm]	[rpm]	[rpm]	[10 <sup>-4</sup> kgm <sup>2</sup> ]	[arcmin]	[Nm/ arcmin]	[kg]
<b>PH8K (<math>n_{1N} = 3000 \text{ rpm}</math>, <math>M_{2acc,max} = 1850 \text{ Nm}</math>)</b>																
35	596	644	18	1.8	PH821F0050 K302VF0175 EZ502U	1850	2620	86.47	7955/92	3500	3100	5000	6.0	4	239	60
35	596	668	18	1.8	PH821F0050 K302VF0175 EZ701U	1610	2870	86.47	7955/92	3500	3100	5000	9.3	4	239	62
35	781	894	23	1.4	PH821F0050 K302VF0175 EZ503U	1850	2620	86.47	7955/92	3500	3100	5000	8.4	4	239	62
35	966	1159	28	1.1	PH821F0050 K302VF0175 EZ702U	1850	2870	86.47	7955/92	3500	3100	5000	15	4	239	64
35	1087	1288	32	1.0	PH821F0050 K302VF0175 EZ505U	1850	2870	86.47	7955/92	3500	3100	5000	13	4	239	65
36	162	171	10	2.9	PH821F0100 K202VF0084 EZ303U	470	640	83.97	24940/297	3500	3100	4500	1.2	3.5	244	51
36	219	235	14	3.7	PH821F0100 K202VF0084 EZ401U	660	1270	83.97	24940/297	3500	3100	4500	1.8	3.5	244	53
36	336	368	21	2.4	PH821F0100 K202VF0084 EZ501U	1200	2400	83.97	24940/297	3500	3100	4500	3.7	3.5	244	54
36	368	407	23	2.2	PH821F0100 K202VF0084 EZ402U	940	1270	83.97	24940/297	3500	3100	4500	2.5	3.5	244	54
36	540	672	34	1.5	PH821F0100 K202VF0084 EZ404U	1200	2400	83.97	24940/297	3500	3100	4500	3.8	3.5	244	56
36	579	626	37	1.4	PH821F0100 K202VF0084 EZ502U	1200	2400	83.97	24940/297	3500	3100	4500	6.0	3.5	244	55
36	579	649	37	1.4	PH821F0100 K202VF0084 EZ701U	1200	2400	83.97	24940/297	3500	3100	4500	9.3	3.5	244	57
36	758	868	48	1.1	PH821F0100 K202VF0084 EZ503U	1200	2400	83.97	24940/297	3500	3100	4500	8.4	3.5	244	57
37	120	126	5.4	3.8	PH821F0070 K202VF0115 EZ302U	380	610	80.82	8729/108	3500	3100	4500	1.0	3.5	248	51
37	156	165	7.0	2.9	PH821F0070 K202VF0115 EZ303U	450	610	80.82	8729/108	3500	3100	4500	1.1	3.5	248	51
37	211	226	9.5	4.2	PH821F0070 K202VF0115 EZ401U	640	1220	80.82	8729/108	3500	3100	4500	1.6	3.5	248	53
37	324	354	15	2.7	PH821F0070 K202VF0115 EZ501U	1200	2450	80.82	8729/108	3500	3100	4500	3.6	3.5	248	54
37	354	391	16	2.5	PH821F0070 K202VF0115 EZ402U	900	1220	80.82	8729/108	3500	3100	4500	2.3	3.5	248	54
37	519	647	23	1.7	PH821F0070 K202VF0115 EZ404U	1480	2450	80.82	8729/108	3500	3100	4500	3.7	3.5	248	56
37	557	602	25	1.6	PH821F0070 K202VF0115 EZ502U	1480	2450	80.82	8729/108	3500	3100	4500	5.9	3.5	248	55
37	557	625	25	1.6	PH821F0070 K202VF0115 EZ701U	1480	2770	80.82	8729/108	3500	3100	4500	9.2	3.5	248	57
37	730	835	33	1.2	PH821F0070 K202VF0115 EZ503U	1480	2450	80.82	8729/108	3500	3100	4500	8.3	3.5	248	57
43	104	110	5.5	3.8	PH821F0070 K202VF0100 EZ302U	330	530	70.51	20167/286	3900	3500	5000	0.94	3.5	248	51
43	136	144	7.1	2.9	PH821F0070 K202VF0100 EZ303U	390	530	70.51	20167/286	3900	3500	5000	1.1	3.5	248	51
43	184	197	9.6	4.3	PH821F0070 K202VF0100 EZ401U	560	1070	70.51	20167/286	3900	3500	5000	1.6	3.5	248	53
43	282	309	15	3.0	PH821F0070 K202VF0100 EZ501U	1050	2140	70.51	20167/286	3900	3500	5000	3.6	3.5	248	54
43	309	341	16	2.6	PH821F0070 K202VF0100 EZ402U	790	1070	70.51	20167/286	3900	3500	5000	2.3	3.5	248	54
43	453	565	24	1.9	PH821F0070 K202VF0100 EZ404U	1480	2140	70.51	20167/286	3900	3500	5000	3.6	3.5	248	56
43	486	525	25	1.7	PH821F0070 K202VF0100 EZ502U	1480	2140	70.51	20167/286	3900	3500	5000	5.9	3.5	248	55
43	486	545	25	1.7	PH821F0070 K202VF0100 EZ701U	1310	2770	70.51	20167/286	3900	3500	5000	9.2	3.5	248	57
43	637	729	33	1.3	PH821F0070 K202VF0100 EZ503U	1480	2140	70.51	20167/286	3900	3500	5000	8.2	3.5	248	57
43	788	946	41	1.1	PH821F0070 K202VF0100 EZ702U	1480	2770	70.51	20167/286	3900	3500	5000	14	3.5	248	59
43	279	305	9.7	3.9	PH821F0050 K302VF0140 EZ501U	1040	2110	69.68	7525/108	3500	3100	5000	4.0	4	239	59
43	448	558	16	2.5	PH821F0050 K302VF0140 EZ404U	1560	2110	69.68	7525/108	3500	3100	5000	4.1	4	239	61
43	480	519	17	2.3	PH821F0050 K302VF0140 EZ502U	1560	2110	69.68	7525/108	3500	3100	5000	6.3	4	239	60
43	480	539	17	2.3	PH821F0050 K302VF0140 EZ701U	1300	2870	69.68	7525/108	3500	3100	5000	9.6	4	239	62
43	629	720	22	1.7	PH821F0050 K302VF0140 EZ503U	1560	2110	69.68	7525/108	3500	3100	5000	8.7	4	239	62
43	779	934	27	1.4	PH821F0050 K302VF0140 EZ702U	1850	2870	69.68	7525/108	3500	3100	5000	15	4	239	64
43	876	1038	30	1.3	PH821F0050 K302VF0140 EZ505U	1850	2870	69.68	7525/108	3500	3100	5000	13	4	239	65
43	1071	1350	37	1.0	PH821F0050 K302VF0140 EZ703U	1850	2870	69.68	7525/108	3500	3100	5000	23	4	239	66
45	129	136	9.7	2.9	PH821F0100 K202VF0067 EZ303U	370	510	66.83	22790/341	3500	3100	4500	1.6	3.5	244	51
45	174	187	13	4.3	PH821F0100 K202VF0067 EZ401U	530	1010	66.83	22790/341	3500	3100	4500	2.1	3.5	244	53
45	268	292	20	3.0	PH821F0100 K202VF0067 EZ501U	1000	2030	66.83	22790/341	3500	3100	4500	4.1	3.5	244	54
45	292	324	22	2.6	PH821F0100 K202VF0067 EZ402U	750	1010	66.83	22790/341	3500	3100	4500	2.8	3.5	244	54
45	429	535	32	1.9	PH821F0100 K202VF0067 EZ404U	1200	2030	66.83	22790/341	3500	3100	4500	4.2	3.5	244	56
45	461	498	35	1.7	PH821F0100 K202VF0067 EZ502U	1200	2030	66.83	22790/341	3500	3100	4500	6.4	3.5	244	55
45	461	517	35	1.7	PH821F0100 K202VF0067 EZ701U	1200	2400	66.83	22790/341	3500	3100	4500	9.7	3.5	244	57
45	604	691	45	1.3	PH821F0100 K202VF0067 EZ503U	1200	2030	66.83	22790/341	3500	3100	4500	8.8	3.5	244	57
45	747	896	56	1.1	PH821F0100 K202VF0067 EZ702U	1200	2400	66.83	22790/341	3500	3100	4500	15	3.5	244	59
47	124	131	7.2	2.9	PH821F0070 K202VF0092 EZ303U	360	490	64.33	15953/248	3500	3100	4500	1.4	3.5	248	51
47	168	180	9.7	4.3	PH821F0070 K202VF0092 EZ401U	510	980	64.33	15953/248	3500	3100	4500	1.9	3.5	248	53
47	258	282	15	3.2	PH821F0070 K202VF0092 EZ501U	960	1950	64.33	15953/248	3500	3100	4500	3.9	3.5	248	54
47	282	312	16	2.6	PH821F0070 K202VF0092 EZ402U	720	980	64.33	15953/248	3500	3100	4500	2.6	3.5	248	54
47	413	515	24	2.0	PH821F0070 K202VF0092 EZ404U	1440	1950	64.33	15953/248	3500	3100	4500	4.0	3.5	248	56
47	443	479	26	1.8	PH821F0070 K202VF0092 EZ502U	1440	1950	64.33	15953/248	3500	3100	4500	6.2	3.5	248	55
47	443	497	26	1.8	PH821F0070 K202VF0092 EZ701U	1200	2770	64.33	15953/248	3500	3100	4500	9.5	3.5	248	57
47	581	665	34	1.4	PH821F0070 K202VF0092 EZ503U	1440	1950	64.33	15953/248	3500	3100	4500	8.6	3.5	248	57
47	719	863	42	1.1	PH821F0070 K202VF0092 EZ702U	1480	2770	64.33	15953/248	3500	3100	4500	15	3.5	248	59
47	809	958	47	1.0	PH821F0070 K202VF0092 EZ505U	1480	2770	64.33	15953/248	3500	3100	4500	13	3.5	248	60

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## 17.2 Selection tables



**STÖBER**

$n_{2N}$	$M_{2N}$	$M_{2.0}$	$a_{in}$	S	Type	$M_{2acc}$	$M_{2NOT}$	i	$i_{exakt}$	$n_{1max}$	$n_{1max}$	$n_{1max}$	$J_1$	$\Delta\phi_2$	$C_2$	m
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			DBH	DBV	ZB	[10 <sup>-4</sup> kgm <sup>2</sup> ]	[arcmin]	[Nm/ arcmin]	[kg]
<b>PH8K (<math>n_{1N} = 3000 \text{ rpm}</math>, <math>M_{2acc,max} = 1850 \text{ Nm}</math>)</b>																
50	156	168	13	4.3	PH821F0100 K202VF0060 EZ401U	470	910	60.00	60/1	3000	2600	4000	2.7	3.5	244	53
50	240	263	20	3.3	PH821F0100 K202VF0060 EZ501U	890	1820	60.00	60/1	3000	2600	4000	4.7	3.5	244	54
50	263	291	21	2.6	PH821F0100 K202VF0060 EZ402U	670	910	60.00	60/1	3000	2600	4000	3.4	3.5	244	54
50	386	480	31	2.1	PH821F0100 K202VF0060 EZ404U	1200	1820	60.00	60/1	3000	2600	4000	4.8	3.5	244	56
50	413	447	34	1.9	PH821F0100 K202VF0060 EZ502U	1200	1820	60.00	60/1	3000	2600	4000	7.0	3.5	244	55
50	413	464	34	1.9	PH821F0100 K202VF0060 EZ701U	1120	2400	60.00	60/1	3000	2600	4000	10	3.5	244	57
50	542	620	44	1.5	PH821F0100 K202VF0060 EZ503U	1200	1820	60.00	60/1	3000	2600	4000	9.4	3.5	244	57
50	670	805	55	1.2	PH821F0100 K202VF0060 EZ702U	1200	2400	60.00	60/1	3000	2600	4000	16	3.5	244	59
50	754	894	61	1.1	PH821F0100 K202VF0060 EZ505U	1200	2400	60.00	60/1	3000	2600	4000	14	3.5	244	60
51	113	120	7.2	2.9	PH821F0070 K202VF0084 EZ303U	330	450	58.78	17458/297	3500	3100	4500	1.3	3.5	248	51
51	153	164	9.8	4.3	PH821F0070 K202VF0084 EZ401U	470	890	58.78	17458/297	3500	3100	4500	1.8	3.5	248	53
51	235	257	15	3.4	PH821F0070 K202VF0084 EZ501U	880	1780	58.78	17458/297	3500	3100	4500	3.8	3.5	248	54
51	257	285	16	2.6	PH821F0070 K202VF0084 EZ402U	660	890	58.78	17458/297	3500	3100	4500	2.5	3.5	248	54
51	378	471	24	2.1	PH821F0070 K202VF0084 EZ404U	1310	1780	58.78	17458/297	3500	3100	4500	3.9	3.5	248	56
51	405	438	26	2.0	PH821F0070 K202VF0084 EZ502U	1310	1780	58.78	17458/297	3500	3100	4500	6.1	3.5	248	55
51	405	454	26	2.0	PH821F0070 K202VF0084 EZ701U	1090	2770	58.78	17458/297	3500	3100	4500	9.4	3.5	248	57
51	531	608	34	1.5	PH821F0070 K202VF0084 EZ503U	1310	1780	58.78	17458/297	3500	3100	4500	8.5	3.5	248	57
51	657	788	42	1.2	PH821F0070 K202VF0084 EZ702U	1480	2770	58.78	17458/297	3500	3100	4500	15	3.5	248	59
51	739	876	47	1.1	PH821F0070 K202VF0084 EZ505U	1480	2770	58.78	17458/297	3500	3100	4500	13	3.5	248	60
52	232	254	9.2	4.7	PH821F0050 K302VF0115 EZ501U	860	1760	58.05	1161/20	3200	2800	4200	4.4	4	239	59
52	373	465	15	3.0	PH821F0050 K302VF0115 EZ404U	1300	1760	58.05	1161/20	3200	2800	4200	4.5	4	239	61
52	400	432	16	2.8	PH821F0050 K302VF0115 EZ502U	1300	1760	58.05	1161/20	3200	2800	4200	6.7	4	239	60
52	400	449	16	2.8	PH821F0050 K302VF0115 EZ701U	1080	2870	58.05	1161/20	3200	2800	4200	10	4	239	62
52	524	600	21	2.1	PH821F0050 K302VF0115 EZ503U	1300	1760	58.05	1161/20	3200	2800	4200	9.1	4	239	62
52	649	778	26	1.7	PH821F0050 K302VF0115 EZ702U	1850	2870	58.05	1161/20	3200	2800	4200	15	4	239	64
52	730	865	29	1.5	PH821F0050 K302VF0115 EZ505U	1850	2870	58.05	1161/20	3200	2800	4200	14	4	239	65
52	892	1124	35	1.2	PH821F0050 K302VF0115 EZ703U	1850	2870	58.05	1161/20	3200	2800	4200	23	4	239	66
58	207	227	19	3.9	PH821F0100 K202VF0052 EZ501U	770	1570	51.77	21070/407	3000	2600	4000	4.7	3.5	244	54
58	333	415	30	2.4	PH821F0100 K202VF0052 EZ404U	1160	1570	51.77	21070/407	3000	2600	4000	4.7	3.5	244	56
58	357	386	32	2.2	PH821F0100 K202VF0052 EZ502U	1160	1570	51.77	21070/407	3000	2600	4000	7.0	3.5	244	55
58	357	400	32	2.2	PH821F0100 K202VF0052 EZ701U	960	2400	51.77	21070/407	3000	2600	4000	10	3.5	244	57
58	468	535	43	1.7	PH821F0100 K202VF0052 EZ503U	1160	1570	51.77	21070/407	3000	2600	4000	9.3	3.5	244	57
58	578	694	53	1.4	PH821F0100 K202VF0052 EZ702U	1200	2400	51.77	21070/407	3000	2600	4000	15	3.5	244	59
58	651	771	59	1.2	PH821F0100 K202VF0052 EZ505U	1200	2400	51.77	21070/407	3000	2600	4000	14	3.5	244	60
60	200	218	15	3.8	PH821F0070 K202VF0071 EZ501U	740	1510	49.83	14749/296	3000	2600	4000	4.4	3.5	248	54
60	320	399	24	2.3	PH821F0070 K202VF0071 EZ404U	1110	1510	49.83	14749/296	3000	2600	4000	4.5	3.5	248	56
60	343	371	26	2.2	PH821F0070 K202VF0071 EZ502U	1110	1510	49.83	14749/296	3000	2600	4000	6.7	3.5	248	55
60	343	385	26	2.2	PH821F0070 K202VF0071 EZ701U	930	2770	49.83	14749/296	3000	2600	4000	10	3.5	248	57
60	450	515	34	1.7	PH821F0070 K202VF0071 EZ503U	1110	1510	49.83	14749/296	3000	2600	4000	9.1	3.5	248	57
60	557	668	42	1.4	PH821F0070 K202VF0071 EZ702U	1420	2770	49.83	14749/296	3000	2600	4000	15	3.5	248	59
60	626	742	48	1.2	PH821F0070 K202VF0071 EZ505U	1420	2770	49.83	14749/296	3000	2600	4000	14	3.5	248	60
64	90	95	7.4	2.9	PH821F0070 K202VF0067 EZ303U	260	350	46.78	15953/341	3500	3100	4500	1.7	3.5	248	51
64	122	131	10	4.3	PH821F0070 K202VF0067 EZ401U	370	710	46.78	15953/341	3500	3100	4500	2.2	3.5	248	53
64	187	205	15	3.9	PH821F0070 K202VF0067 EZ501U	700	1420	46.78	15953/341	3500	3100	4500	4.2	3.5	248	54
64	205	227	17	2.6	PH821F0070 K202VF0067 EZ402U	520	710	46.78	15953/341	3500	3100	4500	2.9	3.5	248	54
64	301	375	25	2.4	PH821F0070 K202VF0067 EZ404U	1050	1420	46.78	15953/341	3500	3100	4500	4.2	3.5	248	56
64	322	349	26	2.3	PH821F0070 K202VF0067 EZ502U	1050	1420	46.78	15953/341	3500	3100	4500	6.5	3.5	248	55
64	322	362	26	2.3	PH821F0070 K202VF0067 EZ701U	870	2770	46.78	15953/341	3500	3100	4500	9.8	3.5	248	57
64	423	484	35	1.7	PH821F0070 K202VF0067 EZ503U	1050	1420	46.78	15953/341	3500	3100	4500	8.8	3.5	248	57
64	523	627	43	1.4	PH821F0070 K202VF0067 EZ702U	1390	2770	46.78	15953/341	3500	3100	4500	15	3.5	248	59
64	588	697	48	1.3	PH821F0070 K202VF0067 EZ505U	1390	2770	46.78	15953/341	3500	3100	4500	13	3.5	248	60
64	719	906	59	1.0	PH821F0070 K202VF0067 EZ703U	1390	2770	46.78	15953/341	3500	3100	4500	23	3.5	248	61
65	298	371	15	3.5	PH821F0050 K302VF0093 EZ404U	1040	1400	46.34	5375/116	3200	2800	4200	5.1	4	239	61
65	319	345	16	3.2	PH821F0050 K302VF0093 EZ502U	1040	1400	46.34	5375/116	3200	2800	4200	7.3	4	239	60
65	319	358	16	3.2	PH821F0050 K302VF0093 EZ701U	860	2870	46.34	5375/116	3200	2800	4200	11	4	239	62
65	419	479	21	2.5	PH821F0050 K302VF0093 EZ503U	1040	1400	46.34	5375/116	3200	2800	4200	9.7	4	239	62
65	518	621	26	2.0	PH821F0050 K302VF0093 EZ702U	1770	2870	46.34	5375/116	3200	2800	4200	16	4	239	64
65	582	690	29	1.8	PH821F0050 K302VF0093 EZ505U	1850	2870	46.34	5375/116	3200	2800	4200	14	4	239	65
65	712	897	36	1.4	PH821F0050 K302VF0093 EZ703U	1850	2870	46.34	5375/116	3200	2800	4200	24	4	239	66



# 17 PHK right-angle planetary geared motors

## 17.2 Selection tables



n <sub>2N</sub>	M <sub>2N</sub>	M <sub>2,0</sub>	a <sub>th</sub>	S	Type	M <sub>2acc</sub>	M <sub>2NOT</sub>	i	i <sub>exakt</sub>	n <sub>1max</sub> DBH	n <sub>1max</sub> DBV	n <sub>1max</sub> ZB	J <sub>1</sub>	Δφ <sub>2</sub>	C <sub>2</sub>	m
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			[rpm]	[rpm]	[rpm]	[10 <sup>-4</sup> kgm <sup>2</sup> ]	[arcmin]	[Nm/ arcmin]	[kg]
<b>PH8K (n<sub>1N</sub> = 3000 rpm, M<sub>2acc,max</sub> = 1850 Nm)</b>																
71	110	117	10	4.3	PH821F0070 K202VF0060 EZ401U	330	640	42.00	42/1	3000	2600	4000	2.8	3.5	248	53
71	168	184	15	4.2	PH821F0070 K202VF0060 EZ501U	630	1270	42.00	42/1	3000	2600	4000	4.8	3.5	248	54
71	184	203	17	2.6	PH821F0070 K202VF0060 EZ402U	470	640	42.00	42/1	3000	2600	4000	3.5	3.5	248	54
71	270	336	25	2.6	PH821F0070 K202VF0060 EZ404U	940	1270	42.00	42/1	3000	2600	4000	4.9	3.5	248	56
71	289	313	27	2.5	PH821F0070 K202VF0060 EZ502U	940	1270	42.00	42/1	3000	2600	4000	7.1	3.5	248	55
71	289	325	27	2.5	PH821F0070 K202VF0060 EZ701U	780	2770	42.00	42/1	3000	2600	4000	10	3.5	248	57
71	379	434	35	1.9	PH821F0070 K202VF0060 EZ503U	940	1270	42.00	42/1	3000	2600	4000	9.5	3.5	248	57
71	469	563	43	1.5	PH821F0070 K202VF0060 EZ702U	1340	2770	42.00	42/1	3000	2600	4000	16	3.5	248	59
71	528	626	48	1.3	PH821F0070 K202VF0060 EZ505U	1340	2770	42.00	42/1	3000	2600	4000	14	3.5	248	60
71	645	813	59	1.1	PH821F0070 K202VF0060 EZ703U	1340	2770	42.00	42/1	3000	2600	4000	24	3.5	248	61
75	104	112	12	4.3	PH821F0100 K202VF0040 EZ401U	320	610	40.00	40/1	3000	2600	4000	3.6	3.5	244	53
75	160	175	18	5.0	PH821F0100 K202VF0040 EZ501U	600	1210	40.00	40/1	3000	2600	4000	5.5	3.5	244	54
75	175	194	19	2.6	PH821F0100 K202VF0040 EZ402U	450	610	40.00	40/1	3000	2600	4000	4.3	3.5	244	54
75	257	320	28	3.1	PH821F0100 K202VF0040 EZ404U	890	1210	40.00	40/1	3000	2600	4000	5.6	3.5	244	56
75	276	298	30	2.9	PH821F0100 K202VF0040 EZ502U	890	1210	40.00	40/1	3000	2600	4000	7.8	3.5	244	55
75	276	309	30	2.9	PH821F0100 K202VF0040 EZ701U	740	2400	40.00	40/1	3000	2600	4000	11	3.5	244	57
75	361	413	40	2.2	PH821F0100 K202VF0040 EZ503U	890	1210	40.00	40/1	3000	2600	4000	10	3.5	244	57
75	447	536	49	1.8	PH821F0100 K202VF0040 EZ702U	1200	2400	40.00	40/1	3000	2600	4000	16	3.5	244	59
75	503	596	56	1.6	PH821F0100 K202VF0040 EZ505U	1200	2400	40.00	40/1	3000	2600	4000	15	3.5	244	60
75	615	775	68	1.3	PH821F0100 K202VF0040 EZ703U	1200	2400	40.00	40/1	3000	2600	4000	24	3.5	244	61
81	255	286	16	3.7	PH821F0050 K302VF0074 EZ701U	690	2800	36.96	2365/64	2700	2300	3800	11	4	239	62
81	413	496	27	2.3	PH821F0050 K302VF0074 EZ702U	1410	2800	36.96	2365/64	2700	2300	3800	17	4	239	64
81	465	551	30	2.1	PH821F0050 K302VF0074 EZ505U	1800	2800	36.96	2365/64	2700	2300	3800	15	4	239	65
81	568	716	37	1.7	PH821F0050 K302VF0074 EZ703U	1800	2800	36.96	2365/64	2700	2300	3800	25	4	239	66
83	145	159	16	4.7	PH821F0070 K202VF0052 EZ501U	540	1100	36.24	14749/407	3000	2600	4000	4.8	3.5	248	54
83	233	290	25	2.9	PH821F0070 K202VF0052 EZ404U	810	1100	36.24	14749/407	3000	2600	4000	4.9	3.5	248	56
83	250	270	27	2.7	PH821F0070 K202VF0052 EZ502U	810	1100	36.24	14749/407	3000	2600	4000	7.1	3.5	248	55
83	250	280	27	2.7	PH821F0070 K202VF0052 EZ701U	670	2750	36.24	14749/407	3000	2600	4000	10	3.5	248	57
83	327	375	35	2.1	PH821F0070 K202VF0052 EZ503U	810	1100	36.24	14749/407	3000	2600	4000	9.5	3.5	248	57
83	405	486	44	1.7	PH821F0070 K202VF0052 EZ702U	1280	2750	36.24	14749/407	3000	2600	4000	16	3.5	248	59
83	456	540	49	1.5	PH821F0070 K202VF0052 EZ505U	1280	2750	36.24	14749/407	3000	2600	4000	14	3.5	248	60
83	557	702	60	1.2	PH821F0070 K202VF0052 EZ703U	1280	2750	36.24	14749/407	3000	2600	4000	24	3.5	248	61
98	80	85	10	4.3	PH821F0070 K202VF0044 EZ401U	240	460	30.55	336/11	3000	2600	4000	3.4	3.5	248	53
98	122	134	16	2.8	PH821F0070 K202VF0044 EZ501U	340	460	30.55	336/11	3000	2600	4000	5.4	3.5	248	54
98	134	148	17	2.6	PH821F0070 K202VF0044 EZ402U	340	460	30.55	336/11	3000	2600	4000	4.1	3.5	248	54
98	196	245	25	3.3	PH821F0070 K202VF0044 EZ404U	680	930	30.55	336/11	3000	2600	4000	5.5	3.5	248	56
98	211	228	27	3.0	PH821F0070 K202VF0044 EZ502U	680	930	30.55	336/11	3000	2600	4000	7.7	3.5	248	55
98	211	236	27	3.0	PH821F0070 K202VF0044 EZ701U	570	2310	30.55	336/11	3000	2600	4000	11	3.5	248	57
98	276	316	36	2.3	PH821F0070 K202VF0044 EZ503U	680	930	30.55	336/11	3000	2600	4000	10	3.5	248	57
98	341	410	44	1.9	PH821F0070 K202VF0044 EZ702U	1170	2310	30.55	336/11	3000	2600	4000	16	3.5	248	59
98	384	455	50	1.7	PH821F0070 K202VF0044 EZ505U	1210	2310	30.55	336/11	3000	2600	4000	15	3.5	248	60
98	469	592	61	1.4	PH821F0070 K202VF0044 EZ703U	1210	2310	30.55	336/11	3000	2600	4000	24	3.5	248	61
100	193	240	16	3.5	PH821F0050 K302VF0060 EZ404U	670	910	30.00	30/1	2700	2300	3800	6.9	4	239	61
100	207	223	17	3.2	PH821F0050 K302VF0060 EZ502U	670	910	30.00	30/1	2700	2300	3800	9.1	4	239	60
100	207	232	17	4.3	PH821F0050 K302VF0060 EZ701U	560	2270	30.00	30/1	2700	2300	3800	12	4	239	62
100	271	310	22	2.5	PH821F0050 K302VF0060 EZ503U	670	910	30.00	30/1	2700	2300	3800	11	4	239	62
100	335	402	27	2.7	PH821F0050 K302VF0060 EZ702U	1150	2270	30.00	30/1	2700	2300	3800	18	4	239	64
100	377	447	30	2.4	PH821F0050 K302VF0060 EZ505U	1680	2270	30.00	30/1	2700	2300	3800	16	4	239	65
100	461	581	37	1.9	PH821F0050 K302VF0060 EZ703U	1680	2270	30.00	30/1	2700	2300	3800	26	4	239	66
100	595	844	48	1.5	PH821F0050 K302VF0060 EZ705U	1680	2870	30.00	30/1	2700	2300	3800	38	4	239	72
107	73	78	10	4.3	PH821F0070 K202VF0040 EZ401U	220	420	28.00	28/1	3000	2600	4000	3.8	3.5	248	53
107	112	123	16	2.8	PH821F0070 K202VF0040 EZ501U	310	420	28.00	28/1	3000	2600	4000	5.8	3.5	248	54
107	123	136	17	2.6	PH821F0070 K202VF0040 EZ402U	310	420	28.00	28/1	3000	2600	4000	4.5	3.5	248	54
107	180	224	26	3.4	PH821F0070 K202VF0040 EZ404U	630	850	28.00	28/1	3000	2600	4000	5.9	3.5	248	56
107	193	209	27	3.2	PH821F0070 K202VF0040 EZ502U	630	850	28.00	28/1	3000	2600	4000	8.1	3.5	248	55
107	193	216	27	3.2	PH821F0070 K202VF0040 EZ701U	520	2120	28.00	28/1	3000	2600	4000	11	3.5	248	57
107	253	289	36	2.5	PH821F0070 K202VF0040 EZ503U	630	850	28.00	28/1	3000	2600	4000	10	3.5	248	57
107	313	375	45	2.0	PH821F0070 K202VF0040 EZ702U	1070	2120	28.00	28/1	3000	2600	4000	17	3.5	248	59
107	352	417	50	1.8	PH821F0070 K202VF0040 EZ505U	1170	2120	28.00	28/1	3000	2600	4000	15	3.5	248	60

**PHK**



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## 17.2 Selection tables



$n_{2N}$	$M_{2N}$	$M_{2.0}$	$a_m$	S	Type	$M_{zacc}$	$M_{zNOT}$	i	$i_{exakt}$	$n_{1max}$	$n_{1max}$	$n_{1max}$	$J_1$	$\Delta\phi_2$	$C_2$	m
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			DBH	DBV	ZB	[ $10^{-4}$ kgm <sup>2</sup> ]	[arcmin]	[Nm/arcmin]	[kg]
<b>PH8K (n<sub>1N</sub> = 3000 rpm, M<sub>zacc,max</sub> = 1850 Nm)</b>																
107	430	542	61	1.4	PH821F0070 K202VF0040 EZ703U	1170	2120	28.00	28/1	3000	2600	4000	24	3.5	248	61
112	185	208	17	4.6	PH821F0050 K302VF0054 EZ701U	500	2040	26.88	215/8	2700	2300	3800	12	4	239	62
112	300	360	27	2.9	PH821F0050 K302VF0054 EZ702U	1030	2040	26.88	215/8	2700	2300	3800	17	4	239	64
112	338	400	31	2.5	PH821F0050 K302VF0054 EZ505U	1500	2040	26.88	215/8	2700	2300	3800	16	4	239	65
112	413	521	38	2.1	PH821F0050 K302VF0054 EZ703U	1500	2040	26.88	215/8	2700	2300	3800	25	4	239	66
150	223	268	28	3.5	PH821F0050 K302VF0040 EZ702U	760	1520	20.00	20/1	2700	2300	3800	20	4	239	64
150	251	298	31	3.1	PH821F0050 K302VF0040 EZ505U	1120	1520	20.00	20/1	2700	2300	3800	18	4	239	65
150	307	387	38	2.5	PH821F0050 K302VF0040 EZ703U	1120	1520	20.00	20/1	2700	2300	3800	28	4	239	66
150	397	562	50	2.0	PH821F0050 K302VF0040 EZ705U	1470	2870	20.00	20/1	2700	2300	3800	40	4	239	72
188	179	215	28	3.5	PH821F0040 K302VF0040 EZ702U	610	1210	16.00	16/1	2700	2300	3800	20	4	186	64
188	201	238	31	3.1	PH821F0040 K302VF0040 EZ505U	890	1210	16.00	16/1	2700	2300	3800	19	4	186	65
188	246	310	38	2.5	PH821F0040 K302VF0040 EZ703U	890	1210	16.00	16/1	2700	2300	3800	28	4	186	66
188	317	450	50	2.0	PH821F0040 K302VF0040 EZ705U	1170	2310	16.00	16/1	2700	2300	3800	40	4	186	72
<b>PH8K (n<sub>1N</sub> = 4500 rpm, M<sub>zacc,max</sub> = 1850 Nm)</b>																
52	765	1232	23	1.4	PH821F0050 K302VF0175 EZ505U	1850	2870	86.47	7955/92	3500	3100	5000	13	4	239	65
64	624	1005	37	1.2	PH821F0070 K202VF0100 EZ505U	1480	2770	70.51	20167/286	3900	3500	5000	13	3.5	248	60
65	616	993	23	1.7	PH821F0050 K302VF0140 EZ505U	1850	2870	69.68	7525/108	3500	3100	5000	13	4	239	65
65	785	1298	29	1.3	PH821F0050 K302VF0140 EZ703U	1850	2870	69.68	7525/108	3500	3100	5000	23	4	239	66
70	569	917	38	1.3	PH821F0070 K202VF0092 EZ505U	1480	2770	64.33	15953/248	3500	3100	4500	13	3.5	248	60
77	520	837	38	1.3	PH821F0070 K202VF0084 EZ505U	1480	2770	58.78	17458/297	3500	3100	4500	13	3.5	248	60
77	662	1095	48	1.0	PH821F0070 K202VF0084 EZ703U	1480	2770	58.78	17458/297	3500	3100	4500	22	3.5	248	61
96	414	667	39	1.6	PH821F0070 K202VF0067 EZ505U	1390	2770	46.78	15953/341	3500	3100	4500	13	3.5	248	60
96	527	871	49	1.2	PH821F0070 K202VF0067 EZ703U	1390	2770	46.78	15953/341	3500	3100	4500	23	3.5	248	61
<b>PH9K (n<sub>1N</sub> = 2000 rpm, M<sub>zacc,max</sub> = 4500 Nm)</b>																
41	1957	2961	60	1.5	PH931F0060 K513VF0081 EZ805U	4500	9000	48.80	17081/350	1900	1800	3000	147	4	730	132
49	1628	2463	48	1.7	PH931F0040 K513VF0100 EZ805U	3840	7500	40.60	203/5	1900	1800	3000	144	4.5	525	132
61	1305	1974	48	1.9	PH931F0040 K513VF0081 EZ805U	3840	6480	32.54	17081/525	1900	1800	3000	148	4.5	525	132
<b>PH9K (n<sub>1N</sub> = 3000 rpm, M<sub>zacc,max</sub> = 4500 Nm)</b>																
6.4	1837	2008	12	1.6	PH931F0060 K513VF0780 EZ501U	4500	8840	465.6	26071/56	3400	3000	4500	3.3	4	730	91
7.7	1528	1670	11	2.0	PH931F0060 K513VF0650 EZ501U	4500	7950	387.3	25172/65	3400	3000	4500	3.5	4	730	91
7.7	2630	2843	19	1.1	PH931F0060 K513VF0650 EZ502U	4500	7950	387.3	25172/65	3400	3000	4500	5.8	4	730	93
7.7	2630	2950	19	1.1	PH931F0060 K513VF0650 EZ701U	4500	9000	387.3	25172/65	3400	3000	4500	9.1	4	730	95
10	1140	1246	10	2.6	PH931F0060 K513VF0480 EZ501U	4240	6760	289.0	8091/28	3400	3000	4500	3.9	4	730	91
10	1962	2122	17	1.5	PH931F0060 K513VF0480 EZ502U	4500	6760	289.0	8091/28	3400	3000	4500	6.2	4	730	93
10	1962	2201	17	1.5	PH931F0060 K513VF0480 EZ701U	4500	9000	289.0	8091/28	3400	3000	4500	9.5	4	730	95
10	2572	2944	23	1.2	PH931F0060 K513VF0480 EZ503U	4500	6760	289.0	8091/28	3400	3000	4500	8.6	4	730	94
13	912	997	9.4	3.3	PH931F0060 K513VF0390 EZ501U	3390	6270	231.2	8091/35	3400	3000	4500	4.4	4	730	91
13	1570	1697	16	1.9	PH931F0060 K513VF0390 EZ502U	4500	6270	231.2	8091/35	3400	3000	4500	6.7	4	730	93
13	1570	1761	16	1.9	PH931F0060 K513VF0390 EZ701U	4240	9000	231.2	8091/35	3400	3000	4500	10	4	730	95
13	2058	2355	21	1.5	PH931F0060 K513VF0390 EZ503U	4500	6270	231.2	8091/35	3400	3000	4500	9.0	4	730	94
13	2546	3055	26	1.2	PH931F0060 K513VF0390 EZ702U	4500	9000	231.2	8091/35	3400	3000	4500	15	4	730	97
13	2864	3395	30	1.0	PH931F0060 K513VF0390 EZ505U	4500	9000	231.2	8091/35	3400	3000	4500	14	4	730	97
15	1317	1477	15	2.3	PH931F0060 K513VF0320 EZ701U	3560	9000	193.8	62031/320	3400	3000	4500	10	4	730	95
15	2135	2562	25	1.4	PH931F0060 K513VF0320 EZ702U	4500	9000	193.8	62031/320	3400	3000	4500	16	4	730	97
15	2402	2846	28	1.2	PH931F0060 K513VF0320 EZ505U	4500	9000	193.8	62031/320	3400	3000	4500	14	4	730	97
21	992	1113	14	3.0	PH931F0060 K513VF0240 EZ701U	2680	9000	146.1	11687/80	2800	2500	4000	11	4	730	95
21	1609	1931	23	1.9	PH931F0060 K513VF0240 EZ702U	4500	9000	146.1	11687/80	2800	2500	4000	17	4	730	97
21	1810	2145	26	1.7	PH931F0060 K513VF0240 EZ505U	4500	9000	146.1	11687/80	2800	2500	4000	15	4	730	97
21	2212	2789	32	1.4	PH931F0060 K513VF0240 EZ703U	4500	9000	146.1	11687/80	2800	2500	4000	25	4	730	99
26	789	885	13	3.8	PH931F0060 K513VF0195 EZ701U	2130	8670	116.1	27869/240	2800	2500	4000	13	4	730	95
26	1279	1535	21	2.3	PH931F0060 K513VF0195 EZ702U	4370	8670	116.1	27869/240	2800	2500	4000	18	4	730	97
26	1439	1705	24	2.1	PH931F0060 K513VF0195 EZ505U	4500	8670	116.1	27869/240	2800	2500	4000	16	4	730	97
26	1758	2217	29	1.7	PH931F0060 K513VF0195 EZ703U	4500	8670	116.1	27869/240	2800	2500	4000	26	4	730	99
26	2270	3218	38	1.3	PH931F0060 K513VF0195 EZ705U	4500	9000	116.1	27869/240	2800	2500	4000	38	4	730	105
31	656	736	13	4.6	PH931F0060 K513VF0160 EZ701U	1770	7210	96.56	26071/270	2300	2200	3600	14	4	730	95
31	1063	1276	20	2.8	PH931F0060 K513VF0160 EZ702U	3630	7210	96.56	26071/270	2300	2200	3600	19	4	730	97
31	1196	1418	23	2.5	PH931F0060 K513VF0160 EZ505U	4500	7210	96.56	26071/270	2300	2200	3600	18	4	730	97
31	1462	1843	28	2.1	PH931F0060 K513VF0160 EZ703U	4500	7210	96.56	26071/270	2300	2200	3600	27	4	730	99
31	1888	2676	36	1.6	PH931F0060 K513VF0160 EZ705U	4500	9000	96.56	26071/270	2300	2200	3600	39	4	730	105



## 17 PHK right-angle planetary geared motors

### 17.2 Selection tables



$n_{2N}$	$M_{2N}$	$M_{2,0}$	$a_{th}$	S	Type	$M_{2acc}$	$M_{2NOT}$	$i$	$i_{exakt}$	$n_{1max}$ DBH	$n_{1max}$ DBV	$n_{1max}$ ZB	$J_1$	$\Delta\phi_2$	$C_2$	m
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			[rpm]	[rpm]	[rpm]	[10 <sup>-4</sup> kgm <sup>2</sup> ]	[arcmin]	[Nm/ arcmin]	[kg]
<b>PH9K (n<sub>1N</sub> = 3000 rpm, M<sub>2acc,max</sub> = 4500 Nm)</b>																
31	1976	3288	38	1.5	PH931F0060 K513VF0160 EZ802U	4500	9000	96.56	26071/270	2300	2200	3600	63	4	730	113
39	1502	2130	34	2.0	PH931F0060 K513VF0130 EZ705U	4500	9000	76.85	1537/20	2300	2200	3600	42	4	730	105
39	1573	2617	35	1.9	PH931F0060 K513VF0130 EZ802U	4500	9000	76.85	1537/20	2300	2200	3600	66	4	730	113
39	1876	3399	42	1.6	PH931F0060 K513VF0130 EZ803U	4500	9000	76.85	1537/20	2300	2200	3600	91	4	730	119
49	1190	1688	31	2.5	PH931F0060 K513VF0100 EZ705U	4500	9000	60.90	609/10	1900	1800	3000	45	4	730	105
49	1246	2074	33	2.4	PH931F0060 K513VF0100 EZ802U	4500	9000	60.90	609/10	1900	1800	3000	69	4	730	113
49	1487	2694	39	2.0	PH931F0060 K513VF0100 EZ803U	4500	9000	60.90	609/10	1900	1800	3000	94	4	730	119
61	954	1353	29	3.1	PH931F0060 K513VF0081 EZ705U	4500	9000	48.80	17081/350	1900	1800	3000	49	4	730	105
61	999	1662	31	3.0	PH931F0060 K513VF0081 EZ802U	4480	9000	48.80	17081/350	1900	1800	3000	73	4	730	113
61	1191	2159	37	2.5	PH931F0060 K513VF0081 EZ803U	4500	9000	48.80	17081/350	1900	1800	3000	98	4	730	119
74	794	1125	27	3.0	PH931F0040 K513VF0100 EZ705U	3840	7500	40.60	203/5	1900	1800	3000	45	4.5	525	105
74	831	1382	28	2.8	PH931F0040 K513VF0100 EZ802U	3730	7500	40.60	203/5	1900	1800	3000	69	4.5	525	113
74	991	1796	33	2.4	PH931F0040 K513VF0100 EZ803U	3840	7500	40.60	203/5	1900	1800	3000	95	4.5	525	119
92	636	902	27	3.4	PH931F0040 K513VF0081 EZ705U	3110	6480	32.54	17081/525	1900	1800	3000	49	4.5	525	105
92	666	1108	28	3.3	PH931F0040 K513VF0081 EZ802U	2990	6480	32.54	17081/525	1900	1800	3000	73	4.5	525	113
92	794	1439	33	2.8	PH931F0040 K513VF0081 EZ803U	3840	6480	32.54	17081/525	1900	1800	3000	99	4.5	525	119
<b>PH9K (n<sub>1N</sub> = 4500 rpm, M<sub>2acc,max</sub> = 4500 Nm)</b>																
19	2016	3246	21	1.5	PH931F0060 K513VF0390 EZ505U	4500	9000	231.2	8091/35	3400	3000	4500	14	4	730	97
23	1690	2722	20	1.8	PH931F0060 K513VF0320 EZ505U	4500	9000	193.8	62031/320	3400	3000	4500	14	4	730	97
<b>PH10K (n<sub>1N</sub> = 2000 rpm, M<sub>2acc,max</sub> = 7500 Nm)</b>																
21	3818	5776	49	1.3	PH1031F0060 K613VF0160 EZ805U	7500	15000	95.21	54839/576	2200	2000	3200	143	4	1210	177
26	3039	4597	45	1.6	PH1031F0060 K613VF0125 EZ805U	7500	15000	75.77	9699/128	2200	2000	3200	147	4	1210	177
33	2419	3659	42	2.1	PH1031F0060 K613VF0100 EZ805U	7500	15000	60.32	92659/1536	1800	1700	2900	153	4	1210	177
41	1951	2951	40	2.5	PH1031F0060 K613VF0081 EZ805U	7500	15000	48.64	255285/5248	1800	1700	2900	161	4	1210	177
<b>PH10K (n<sub>1N</sub> = 3000 rpm, M<sub>2acc,max</sub> = 7500 Nm)</b>																
6.6	1803	1971	7.6	2.8	PH1031F0060 K613VF0760 EZ501U	6710	9380	456.8	380091/832	3100	2800	4000	3.7	4	1210	136
6.6	3103	3354	13	1.6	PH1031F0060 K613VF0760 EZ502U	6920	9380	456.8	380091/832	3100	2800	4000	6.0	4	1210	137
6.6	3103	3480	13	1.6	PH1031F0060 K613VF0760 EZ701U	7500	15000	456.8	380091/832	3100	2800	4000	9.3	4	1210	139
6.6	4067	4654	17	1.2	PH1031F0060 K613VF0760 EZ503U	6920	9380	456.8	380091/832	3100	2800	4000	8.4	4	1210	139
7.8	1509	1649	7.2	3.3	PH1031F0060 K613VF0640 EZ501U	5610	8300	382.3	391437/1024	3100	2800	4000	4.0	4	1210	136
7.8	2596	2807	12	1.9	PH1031F0060 K613VF0640 EZ502U	6120	8300	382.3	391437/1024	3100	2800	4000	6.3	4	1210	137
7.8	2596	2912	12	1.9	PH1031F0060 K613VF0640 EZ701U	7020	15000	382.3	391437/1024	3100	2800	4000	9.6	4	1210	139
7.8	3403	3894	16	1.5	PH1031F0060 K613VF0640 EZ503U	6120	8300	382.3	391437/1024	3100	2800	4000	8.7	4	1210	139
7.8	4210	5052	20	1.2	PH1031F0060 K613VF0640 EZ702U	7500	15000	382.3	391437/1024	3100	2800	4000	15	4	1210	142
7.8	4736	5613	23	1.1	PH1031F0060 K613VF0640 EZ505U	7500	15000	382.3	391437/1024	3100	2800	4000	13	4	1210	142
10	1945	2181	11	2.6	PH1031F0060 K613VF0480 EZ701U	5260	14340	286.4	119133/416	3100	2800	4000	10	4	1210	139
10	3154	3785	19	1.6	PH1031F0060 K613VF0480 EZ702U	7500	14340	286.4	119133/416	3100	2800	4000	16	4	1210	142
10	3548	4205	21	1.4	PH1031F0060 K613VF0480 EZ505U	7500	14340	286.4	119133/416	3100	2800	4000	14	4	1210	142
10	4337	5467	25	1.2	PH1031F0060 K613VF0480 EZ703U	7500	14340	286.4	119133/416	3100	2800	4000	24	4	1210	144
13	1561	1751	11	3.2	PH1031F0060 K613VF0380 EZ701U	4220	13590	229.9	470859/2048	3100	2800	4000	11	4	1210	139
13	2532	3038	17	2.0	PH1031F0060 K613VF0380 EZ702U	7500	13590	229.9	470859/2048	3100	2800	4000	16	4	1210	142
13	2849	3376	20	1.8	PH1031F0060 K613VF0380 EZ505U	7500	13590	229.9	470859/2048	3100	2800	4000	15	4	1210	142
13	3482	4389	24	1.4	PH1031F0060 K613VF0380 EZ703U	7500	13590	229.9	470859/2048	3100	2800	4000	24	4	1210	144
16	1298	1456	10	3.9	PH1031F0060 K613VF0320 EZ701U	3510	12520	191.1	391437/2048	3100	2800	4000	12	4	1210	139
16	2105	2526	16	2.4	PH1031F0060 K613VF0320 EZ702U	7190	12520	191.1	391437/2048	3100	2800	4000	17	4	1210	142
16	2368	2807	18	2.1	PH1031F0060 K613VF0320 EZ505U	7500	12520	191.1	391437/2048	3100	2800	4000	16	4	1210	142
16	2894	3649	23	1.7	PH1031F0060 K613VF0320 EZ703U	7500	12520	191.1	391437/2048	3100	2800	4000	25	4	1210	144
16	3736	5297	29	1.3	PH1031F0060 K613VF0320 EZ705U	7500	15000	191.1	391437/2048	3100	2800	4000	38	4	1210	149
21	1586	1904	15	3.2	PH1031F0060 K613VF0240 EZ702U	5420	10760	144.0	73749/512	2600	2300	3600	19	4	1210	142
21	1785	2115	17	2.8	PH1031F0060 K613VF0240 EZ505U	7500	10760	144.0	73749/512	2600	2300	3600	18	4	1210	142
21	2181	2750	21	2.3	PH1031F0060 K613VF0240 EZ703U	7500	10760	144.0	73749/512	2600	2300	3600	27	4	1210	144
21	2816	3992	27	1.8	PH1031F0060 K613VF0240 EZ705U	7500	15000	144.0	73749/512	2600	2300	3600	40	4	1210	149
21	2948	4904	28	1.7	PH1031F0060 K613VF0240 EZ802U	7500	15000	144.0	73749/512	2600	2300	3600	64	4	1210	157
26	1255	1506	14	4.0	PH1031F0060 K613VF0190 EZ702U	4290	8510	114.0	51057/448	2600	2300	3600	22	4	1210	142
26	1412	1673	16	3.5	PH1031F0060 K613VF0190 EZ505U	6280	8510	114.0	51057/448	2600	2300	3600	20	4	1210	142
26	1726	2176	19	2.9	PH1031F0060 K613VF0190 EZ703U	6280	8510	114.0	51057/448	2600	2300	3600	29	4	1210	144
26	2228	3159	25	2.2	PH1031F0060 K613VF0190 EZ705U	7500	15000	114.0	51057/448	2600	2300	3600	42	4	1210	149
26	2332	3880	26	2.1	PH1031F0060 K613VF0190 EZ802U	7500	15000	114.0	51057/448	2600	2300	3600	66	4	1210	157
26	2782	5041	31	1.8	PH1031F0060 K613VF0190 EZ803U	7500	15000	114.0	51057/448	2600	2300	3600	91	4	1210	164

PHK

# 17 PHK right-angle planetary geared motors

## 17.2 Selection tables



$n_{2N}$	$M_{2N}$	$M_{2,0}$	$a_{in}$	S	Type	$M_{2acc}$	$M_{2NOT}$	i	$i_{exakt}$	$n_{1max}$ DBH	$n_{1max}$ DBV	$n_{1max}$ ZB	$J_1$	$\Delta\phi_2$	$C_2$	m
[rpm]	[Nm]	[Nm]				[Nm]	[Nm]			[rpm]	[rpm]	[rpm]	[10 <sup>-4</sup> kgm <sup>2</sup> ]	[arcmin]	[Nm/ arcmin]	[kg]
<b>PH10K (<math>n_{1N} = 3000</math> rpm, <math>M_{2acc,max} = 7500</math> Nm)</b>																
32	1861	2639	24	2.7	PH1031F0060 K613VF0160 EZ705U	7500	15000	95.21	54839/576	2200	2000	3200	44	4	1210	149
32	1949	3242	25	2.6	PH1031F0060 K613VF0160 EZ802U	7500	15000	95.21	54839/576	2200	2000	3200	68	4	1210	157
32	2324	4212	30	2.2	PH1031F0060 K613VF0160 EZ803U	7500	15000	95.21	54839/576	2200	2000	3200	94	4	1210	164
40	1481	2100	22	3.4	PH1031F0060 K613VF0125 EZ705U	7230	15000	75.77	9699/128	2200	2000	3200	48	4	1210	149
40	1551	2580	23	3.2	PH1031F0060 K613VF0125 EZ802U	6950	15000	75.77	9699/128	2200	2000	3200	73	4	1210	157
40	1850	3352	28	2.7	PH1031F0060 K613VF0125 EZ803U	7500	15000	75.77	9699/128	2200	2000	3200	98	4	1210	164





## 17.3 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.

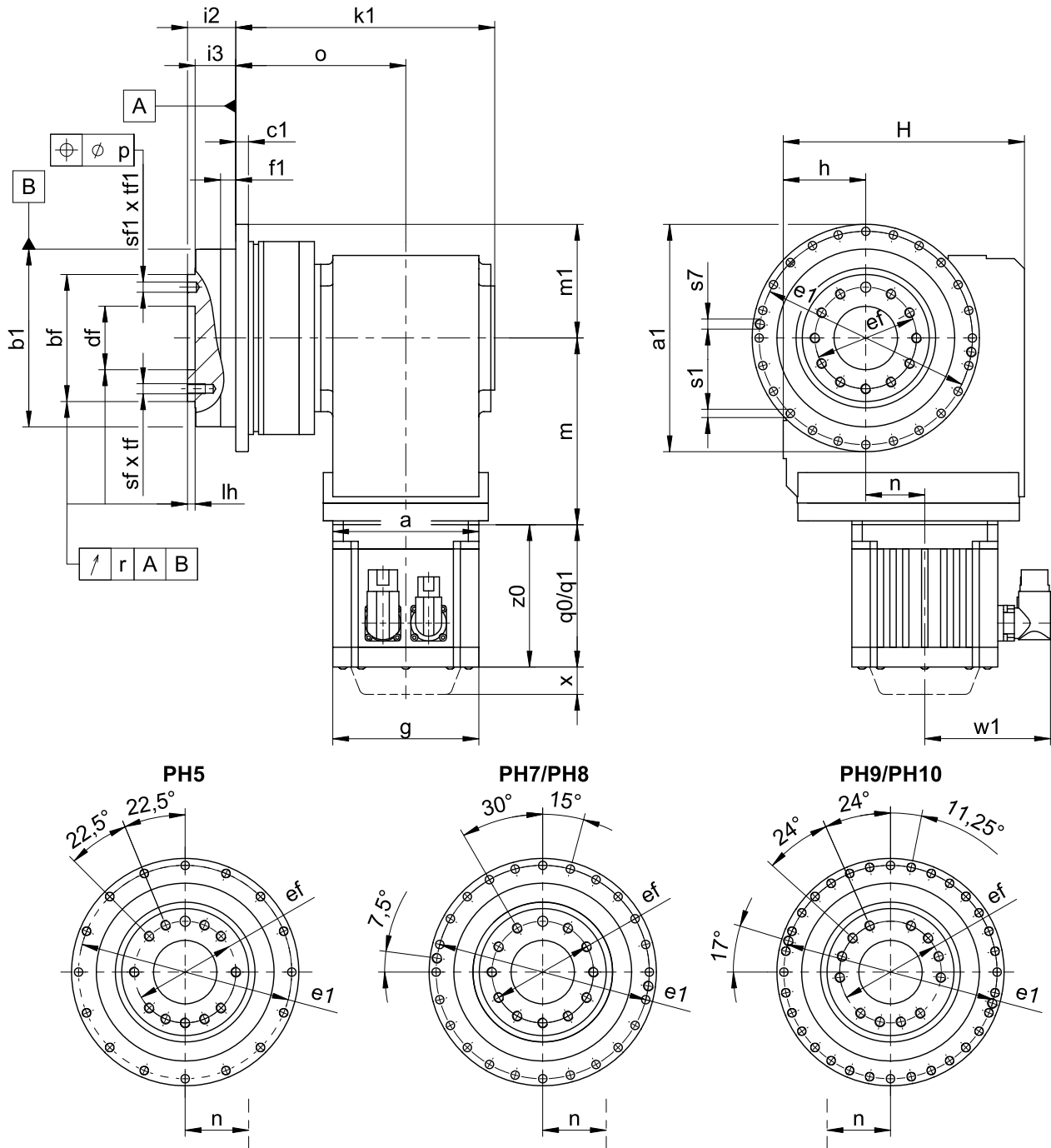
We reserve the right to make dimensional changes due to ongoing technical development.

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>.



### 17.3.1 F shaft design (flange shaft)



q0	Applies to motors without brake.	q1	Applies to motors with brake.
x	Applies to encoders using an optical measuring concept.	w1	For variation for One Cable Solution (OCS), see Chapter <a href="#">[ 22.4 ]</a>

#### Dimensions of gear units

Type	$\varnothing a_1$	$\varnothing b_1$	$\varnothing bf$	c1	$\varnothing df$	$\varnothing e_1$	$\varnothing ef$	f1	h	H	i2	i3	k1	lh	m1	o	p	r	$\varnothing s_1$	s7	sf	$\varnothing sf_1$	tf	tf1
PH521_K102_	145 <sub>h7</sub>	110 <sub>h7</sub>	80 <sub>h7</sub>	8	40 <sup>H6</sup>	135	63	10	60	160	29	23	172.0	6	60	116.0	0.02	0.020	5.5	-	M6	6 <sup>H7</sup>	11	7
PH721_K102_	179 <sub>h7</sub>	140 <sub>h7</sub>	100 <sub>h7</sub>	10	50 <sup>H6</sup>	168	80	12	60	160	38	32	176.0	6	60	120.0	0.02	0.025	6.6	-	M8	8 <sup>H7</sup>	14	7
PH721_K202_	179 <sub>h7</sub>	140 <sub>h7</sub>	100 <sub>h7</sub>	10	50 <sup>H6</sup>	168	80	12	65	190	38	32	204.0	6	65	134.0	0.02	0.025	6.6	-	M8	8 <sup>H7</sup>	14	7
PH821_K202_	247 <sub>h7</sub>	200 <sub>h7</sub>	160 <sub>h7</sub>	12	80 <sup>H6</sup>	233	125	15	65	190	50	42	234.5	8	65	164.5	0.02	0.030	9.0	M10	M10	10 <sup>H7</sup>	18	10
PH821_K302_	247 <sub>h7</sub>	200 <sub>h7</sub>	160 <sub>h7</sub>	12	80 <sup>H6</sup>	233	125	15	75	213	50	42	248.0	8	75	172.0	0.02	0.030	9.0	M10	M10	10 <sup>H7</sup>	18	10
PH931_K513_	300	255 <sub>h7</sub>	180 <sub>h7</sub>	18	90 <sup>H6</sup>	280	140	20	160	260	66	55	326.0	12	100	230.0	-	0.030	13.5	M8	M16	-	24	-
PH1031_K613_	330	285 <sub>h7</sub>	200 <sub>h7</sub>	20	95 <sup>H6</sup>	310	160	20	190	310	75	60	353.5	10	120	250.0	-	0.040	13.5	M10	M20	-	30	-



**Dimensions of motors**

Type	□g	q0	q1	w1	x	z0
EZ301U	72	114.0	154.0	55.5	21	78.5
EZ302U	72	136.0	176.0	55.5	21	100.5
EZ303U	72	158.0	198.0	55.5	21	122.5
EZ401U	98	118.5	167.0	91.0	22	76.5
EZ402U	98	143.5	192.0	91.0	22	101.5
EZ404U	98	193.5	242.0	91.0	22	151.5
EZ501U	115	112.0	166.5	100.0	22	77.5
EZ502U	115	137.0	191.5	100.0	22	102.5
EZ503U	115	162.0	216.5	100.0	22	127.5
EZ505U	115	212.0	266.5	100.0	22	177.5
EZ701U	145	125.0	184.0	115.0	22	87.0
EZ702U	145	150.0	209.0	115.0	22	112.0
EZ703U	145	175.0	234.0	115.0	22	137.0
EZ705U	145	230.0	289.0	134.0	22	188.0
EZ802U	190	232.5	309.5	156.5	22	178.5
EZ803U	190	273.5	350.5	156.5	22	219.5
EZ805U	190	355.5	432.5	156.5	22	301.5

**Dimensions of geared motors**

Type	EZ3			EZ4			EZ5			EZ7			EZ8		
	a	m	n	a	m	n	a	m	n	a	m	n	a	m	n
PH521_K102_	□72	124	36.0	□98	124	36.0	□115	128	36.0	□145	130	36.0	-	-	-
PH721_K102_	□72	124	36.0	□98	124	36.0	□115	128	36.0	□145	130	36.0	-	-	-
PH721_K202_	□72	143	46.0	□98	143	46.0	□115	147	46.0	□145	149	46.0	-	-	-
PH821_K202_	□72	143	46.0	□98	143	46.0	□115	147	46.0	□145	149	46.0	-	-	-
PH821_K302_	∅140	163	52.5	∅140	163	52.5	□115	167	52.5	□145	169	52.5	-	-	-
PH931_K513_	-	-	-	-	-	-	∅160	172	15.0	□145	174	15.0	□190	177	15.0
PH1031_K613_	-	-	-	-	-	-	∅160	191	18.0	∅200	193	18.0	□190	196	18.0



## 17.4 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

<b>PH</b>	<b>7</b>	<b>2</b>	<b>1</b>	<b>F</b>	<b>0100</b>	<b>K102VF</b>	<b>0115</b>	<b>EZ302U</b>
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### Explanation

Code	Designation	Design
<b>PH</b>	Type	Planetary gear unit
<b>7</b>	Size	7 (example)
<b>2</b>	Generation	Generation 2
<b>3</b>		Generation 3
<b>1</b>	Stages	Single-stage
<b>F</b>	Shaft	Flange shaft
<b>0100</b>	Transmission ratio of output (i x 10)	i = 10 (example)
<b>K102VF</b>	Input	K1 right-angle geared motor (example)
<b>0115</b>	Transmission ratio of input (i x 10)	i = 11.5 (example)
<b>EZ302U</b>	Motor	EZ synchronous servo motor

### In order to complete the type designation, also specify:

- A detailed type designation of the motor, see Chapter [\[▶ 22\]](#)
- The installation position, see Chapter [\[▶ 17.5.2\]](#)
- Output gear unit side 3 or 4, see Chapter [\[▶ 17.5.2\]](#)
- Radial shaft seal rings at the output made of FKM or NBR, see Chapter [\[▶ 17.6.3\]](#)
- The position of the plug connectors, see Chapter [\[▶ 17.5.4\]](#)
- For reverse operation of the output shaft at  $\pm 20^\circ$  to  $\pm 90^\circ$  and horizontal installation, note Chapter [\[▶ 17.6.4\]](#)

## 17.5 Product description

### 17.5.1 Installation conditions

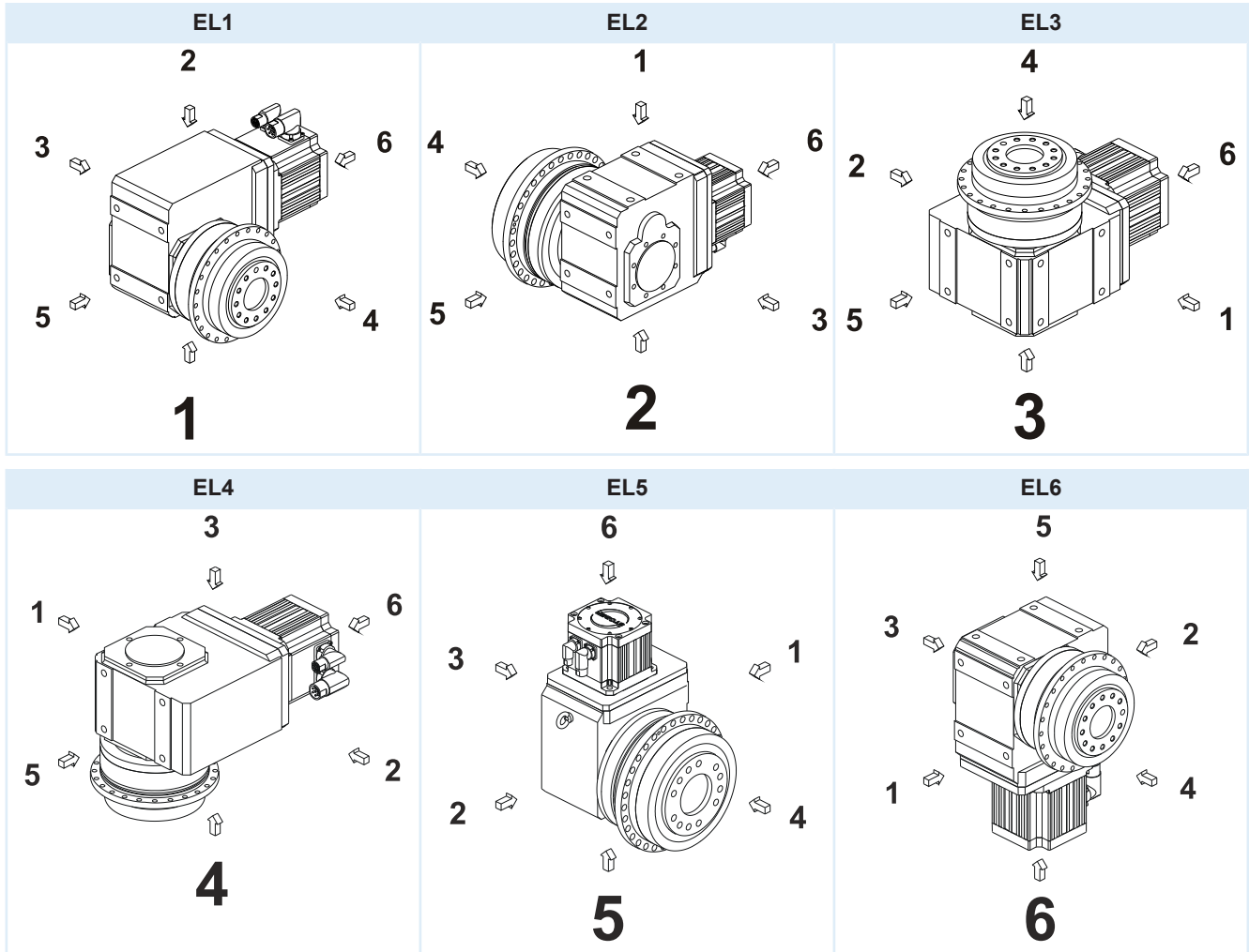
The specified torques and forces only apply when attaching gear units on the machine side using screws of quality 12.9. In addition, the gear housing must be adjusted at pilot  $\varnothing b1$  (H7).



## 17.5.2 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.

## 17.5.3 Lubricants

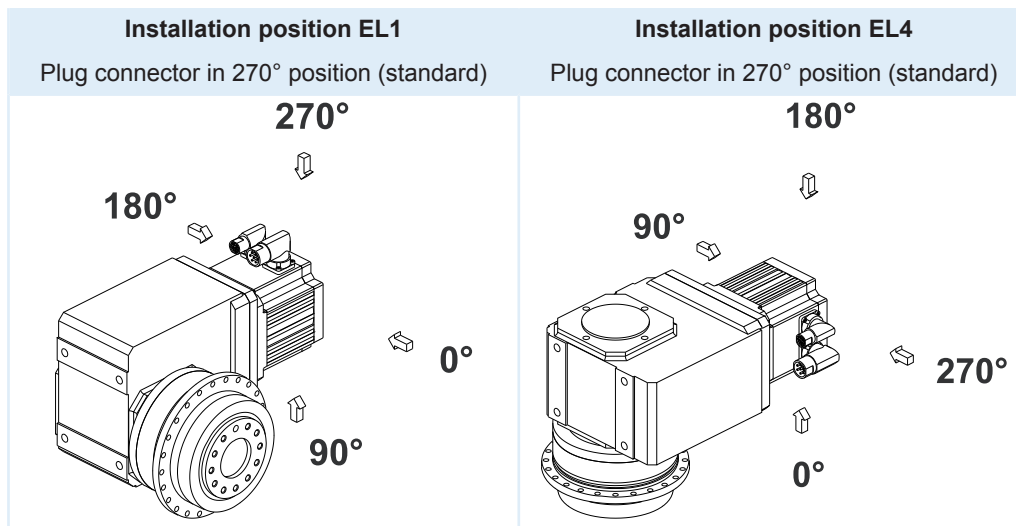
STOBER fills the gear units with the amount and type of lubricant specified on the nameplate. The filling volume and the structure of the gear units depend on the installation position.

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.stoeber.de>



### 17.5.4 Position of the plug connectors



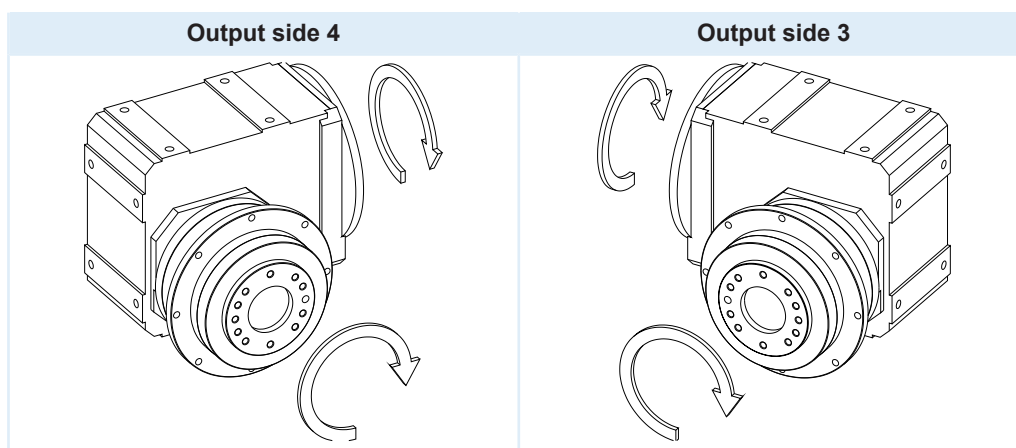
Indicate variations for your geared motor in the purchase order.

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

### 17.5.5 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 90 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU	Not suitable
<b>Protection class:</b> <sup>1</sup>	
Gear unit	IP65
Motor	IP56, optionally IP66

### 17.5.6 Direction of rotation



The pictures show installation position EL1.

<sup>1</sup> Observe the protection class of all the components.



## 17.6 Project configuration

Project your drive 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.

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

Formula symbol	Unit	Explanation
$a_{th}$	–	Parameter for calculating $K_{mot,th}$
$a_{thEL}$	–	Parameters for calculating $K_{mot,th}$ (dependent on the installation position)
ED	%	Duty cycle relative to 20 minutes
$fB_{op}$	–	Operating mode operating factor
$fB_t$	–	Run-time operating factor
$fB_T$	–	Temperature operating factor
$F_{2ax}^*$	N	Actual axial force at the gear unit output
$F_{2ax,eq}^*$	N	Actual equivalent axial force on the gear unit output
$F_{2ax100}$	N	Permitted axial force at the gear unit output for $n_{2m} \leq 100$ rpm
$F_{2axN}$	N	Permitted nominal axial force at the gear unit output
$F_{2rad,acc}$	N	Permitted radial acceleration force at the gear unit output
$F_{2rad,acc}^*$	N	Actual radial acceleration force at the gear unit output
$F_{2rad,acc,1}^*$	N	Actual radial acceleration force at the gear unit output in the first time segment
$F_{2rad,acc,n}^*$	N	Actual radial acceleration force at the gear unit output in the n-th time segment
$F_{2rad,eq}^*$	N	Actual equivalent force at the gear unit output
$F_{2rad100}$	N	Permitted radial force at the gear unit output for $n_{2m} \leq 100$ rpm
$F_{2radN}$	N	Permitted nominal radial force at the gear unit output
i	–	Gear ratio
$K_{mot,th}$	–	Factor for determining the thermal limit torque
l	mm	Length of the output shaft
$L_{10h}$	h	Bearing service life
$M_{op}$	Nm	Torque of motor at the operating point from the motor characteristic curve at $n_{1m}^*$
$ M_2 $	Nm	Amount of torque on the output
$M_{2,1}^* - M_{2,6}^*$	Nm	Actual torque in the respective time segment (1 to 6)
$M_{2,n}^*$	Nm	Actual torque in the n-th time segment
$M_{2acc}$	Nm	Maximum permitted acceleration torque on the gear unit output
$M_{2acc}^*$	Nm	Actual acceleration torque on the gear unit output
$M_{2eff}^*$	Nm	Actual effective torque on the gear unit output
$M_{2eq}^*$	Nm	Equivalent torque present on the gear unit output
$M_{2k100}$	Nm	Permitted breakdown torque on the gear unit output for $n_{2m} \leq 100$ rpm
$M_{2kN}$	Nm	Permitted nominal breakdown torque on the gear unit output
$M_{2k}^*$	Nm	Actual breakdown torque on the gear unit output
$M_{2k,acc}$	Nm	Permitted acceleration breakdown torque on the gear unit output



Formula symbol	Unit	Explanation
$M_{2k,acc}^*$	Nm	Actual acceleration breakdown torque on the gear unit output
$M_{2k,acc,1}^*$	Nm	Actual acceleration breakdown torque on the gear unit output in the first time segment
$M_{2k,acc,n}^*$	Nm	Actual acceleration breakdown torque on the gear unit output in the n-th time segment
$M_{2k,eq}^*$	Nm	Actual equivalent breakdown torque on the gear unit output
$M_{2N}$	Nm	Nominal torque on the gear unit output (relative to $n_{1N}$ )
$M_{2NOT}$	Nm	Gear unit emergency-off torque on the gear unit output for max. 1000 load changes
$M_{2NOT}^*$	Nm	Actual emergency off torque for the gear unit on the gear unit output
$M_{2th}$	Nm	Thermal limit torque on the gear unit output
$n_{1m}^*$	rpm	Actual average input speed
$n_{1max}^*$	rpm	Actual maximum input speed
$n_{1maxDBH}$	rpm	Maximum permitted input speed of the gear unit in continuous operation Installation positions EL1, EL2
$n_{1maxDBV}$	rpm	Maximum permitted input speed of the gear unit in continuous operation Installation positions EL3, EL4, EL5, EL6
$n_{1maxZB}$	min <sup>-1</sup>	Maximum permitted input speed of the gear unit in cyclic operation
$ n_2 $	rpm	Value of output speed
$n_{2m}^*$	rpm	Actual average output speed
$n_{2m,1}^* - n_{2m,6}^*$	rpm	Actual average output speed in the respective time segment (1 to 6)
$n_{2m,n}^*$	rpm	Actual average output speed in the n-th time segment
$t$	s	Time
$t_1^* - t_6^*$	s	Duration of the respective time segment (1 to 6)
$t_n^*$	s	Duration of the n-th time segment
$S$	–	Load value: Quotient of gear unit and motor nominal torque without regard to the thermal performance limit. Represents a value for the reserve of the geared motor.
$x_2$	mm	Distance of the shaft shoulder to the force application point
$y_2$	mm	Distance of the shaft axis to the axial force application point
$z_2$	mm	Distance of the shaft shoulder to the middle of the output bearing

### 17.6.1 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:**

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





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

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

For all installation positions:

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

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

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

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

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

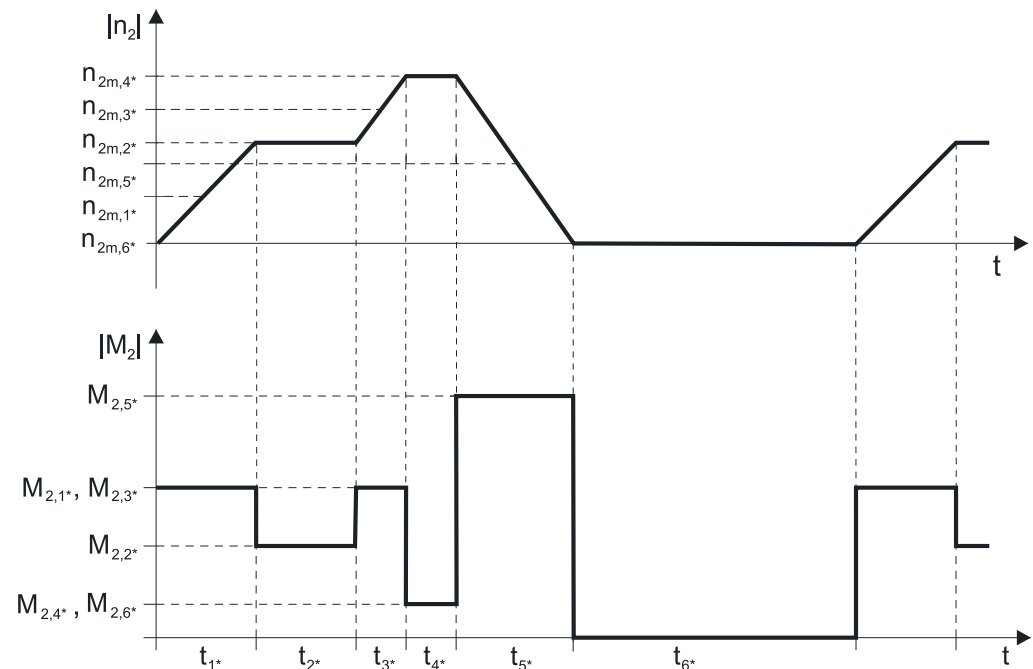
The values for  $n_{1\max DBH}$  and  $n_{1\max DBV}$ ,  $n_{1\max ZB}$ ,  $M_{2\text{acc}}$ ,  $M_{2\text{NOT}}$ ,  $M_{2N}$  and  $S$  can be found in the selection tables.

The values for  $fB_T$ ,  $fB_{\text{op}}$  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 cycle sequence

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



PHK

#### 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  $t_1^* + \dots + t_5^* \geq 20 \text{ min}$ , 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**

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

**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  $ED > 50\%$  and the actual average input speed  $n_{1m^*}$ . (At  $K_{mot,th} \leq 0$  you must reduce the average input speed  $n_{1m^*}$  accordingly or select another geared motor size.)

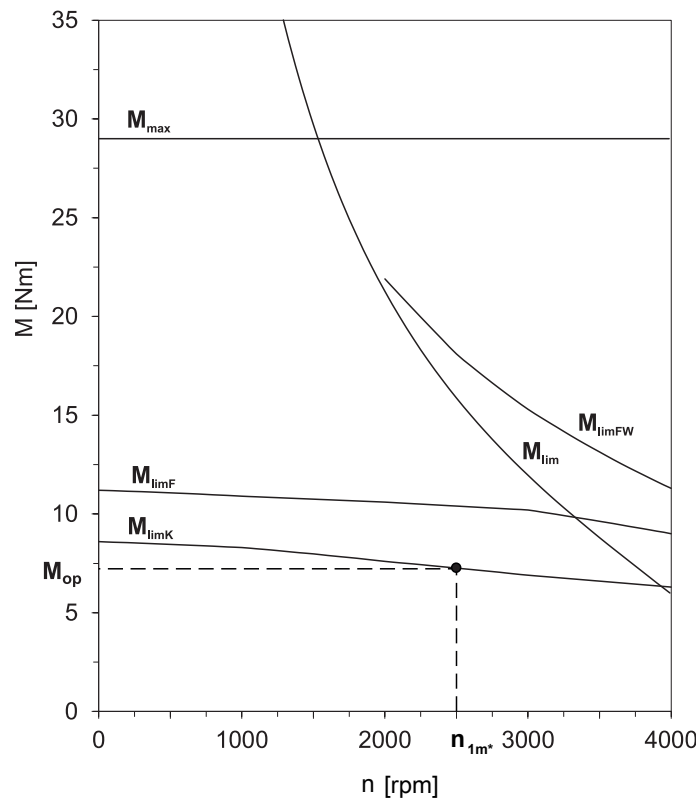
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

$$K_{mot,th} = 0,93 - \frac{a_{th}}{1000} \cdot athEL \cdot fB_T \cdot \left(\frac{n_{1m^*}}{1000}\right)^2$$

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

The values for  $athEL$  and  $fB_T$  can be found in the corresponding tables 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 [ 22.3]. Note the size, nominal speed  $n_N$  and cooling type of the motor. The figure below shows an example of reading the torque  $M_{op}$  of a motor with convection cooling at the operating point.





### Operating factors

#### 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 $\leq 8$ h		1.00
Daily run time $\leq 16$ h		1.15
Daily run time $\leq 24$ h		1.20
Temperature		$fB_T$
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20$ °C	0.9
	$\leq 30$ °C	1.0
	$\leq 40$ °C	1.15
Motor with convection cooling	$\leq 20$ °C	1.0
	$\leq 30$ °C	1.1
	$\leq 40$ °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.

## 17.6.2 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 transverse forces on the gear unit are supported via its pilots (housing, flange shaft)

#### Permitted shaft loads

Type	$z_2$ [mm]	$F_{2ax100}$ [N]	$F_{2rad100}$ [N]	$F_{2rad,acc}$ [N]	$M_{2k100}$ [Nm]	$M_{2k,acc}$ [Nm]
PH3	62.0	1650	1613	1613	100	100
PH4	84.0	2150	3095	3571	260	300
PH5	97.0	4150	4536	4897	440	475
PH7	88.0	6150	17045	17045	1500	1500
PH8	126.0	10050	27778	27778	3500	3500
PH9	155.0	33000	48387	70968	7500	11000
PH10	171.0	50000	51462	73099	8800	12500



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

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

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

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

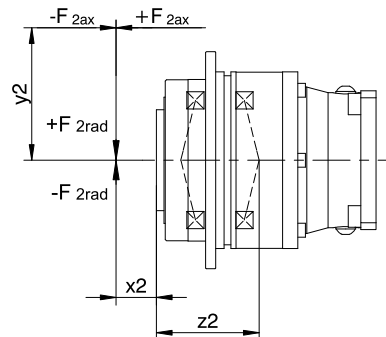


Fig. 1: Force application points

The permitted transverse forces can be determined from the permitted breakdown torque  $M_{2kN}$  and  $M_{2k,acc}$ . The actual transverse forces must not exceed the permitted transverse forces. The permitted transverse forces are based on the end of the hollow shaft ( $x_2 = 0$ ).

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

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  $F_{2ax100}$ ,  $F_{2rad100}$  and  $M_{2k100}$  by a factor of two.

Also note the calculation for equivalent values:

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

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

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

The following apply to the bearing service life  $L_{10h}$  (duty cycle  $\leq 40\%$ ):

$$L_{10h} > 10000 \text{ h with } 1 < M_{2kN}/M_{2k^*} < 1.25$$

$$L_{10h} > 20000 \text{ h with } 1.25 < M_{2kN}/M_{2k^*} < 1.5$$

$$L_{10h} > 30000 \text{ h with } 1.5 < M_{2kN}/M_{2k^*}$$

For different duty cycles:

$$L_{10h} > L_{10h(ED=40\%)} \cdot \frac{40\%}{ED}$$



### 17.6.3 Recommendation for radial shaft seal rings

For a duty cycle > 60%, we recommend radial shaft seal rings made of FKM.

Properties:

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

#### **Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leak-proofness. However, a leak cannot be fully ruled out over the length of use of the gear unit. If you use the 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.

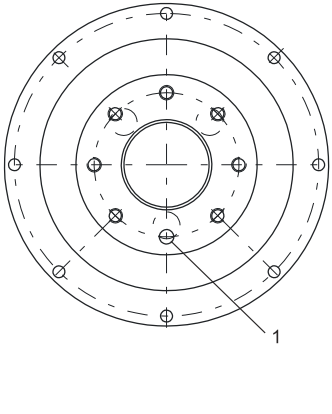
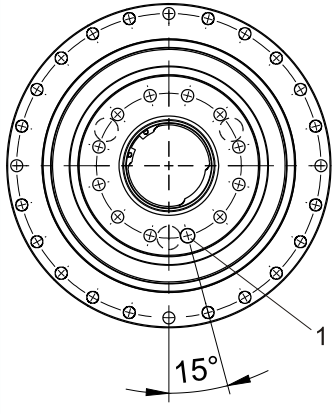
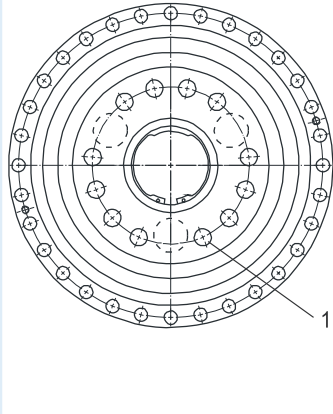


### 17.6.4 Reverse operation

To ensure lubrication of circulating geared parts during cyclic reverse operation from  $\pm 20^\circ$  to  $\pm 90^\circ$ , pay careful attention to the position of the output shaft if the gear unit is installed horizontally as shown in the images below.

The images show the center position of reverse operation.

Cyclic reverse operation  $\leq \pm 20^\circ$  on request.

Sizes 3, 4, 5, 8	Size 7	Sizes 9, 10
		
1 Position of the positioning hole: bottom	1 Position of the positioning hole: as shown in the image	1 Position of the fastening thread: as shown in the image

## 17.7 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 planetary gear units and motors	441957
Lubricant filling quantities for gear units	441871