7.1 Overview

Quattro-Power for maximum power density

Technical data

i	5.5 – 600
M_{2acc}	84 – 10000 Nm
$\Delta\varphi_2$	1 – 1.5 arcmin
η	≤ 90 – 96 %

Features

Power density	★★★★★
Backlash	★★★★★
Price category	€€€€€
Shaft load	★★★★★
Smooth operation	★★★★★
Torsional stiffness	★★★★★
Mass moment of inertia	★★★★★
Helical gearing	✓
Maintenance-free	✓
Any installation position (single/two stage)	✓
High power density (four-stage planetary system)	✓
Continuous operation without cooling (FKM seal ring at the input and output)	✓
Pretensioned angular contact bearings at the output in an O-arrangement, ideally suited for helical-geared rack and pinion drives	✓
Compact and highly dynamic due to direct motor attachment	✓

Key: ★☆☆☆☆ good | ★★★★★ excellent

7.2 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. EZ401**U**)

You can calculate the technical data for drives with forced ventilated motors (for example EZ401**B**) 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
η	%	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_{1maxDB}	min^{-1}	Maximum permitted input speed of the gear unit in continuous operation
		(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.

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n_{2N} [rpm]	M_{2N} [Nm]	$M_{2,0}$ [Nm]	a_{th}	S	Type	M_{2acc} [Nm]	M_{2NOT} [Nm]	i	i_{exakt}	n_{1max} DB [rpm]	n_{1max} ZB [rpm]	J_1 [10^{-4} kgm²]	$\Delta\varphi_2$ [arcmin]	C_2 [Nm/ arcmin]	m [kg]
PHQA4 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 170 Nm)															
55	48	49	0.6	2.5	PHQA422F0550 EZ301U	140	300	55.00	55/1	4500	8000	0.21	1	35	5.3
55	81	86	1.0	1.5	PHQA422F0550 EZ302U	170	300	55.00	55/1	4500	8000	0.31	1	35	5.9
55	106	112	1.4	1.1	PHQA422F0550 EZ303U	170	300	55.00	55/1	4500	8000	0.42	1	35	6.4
78	33	34	0.7	3.6	PHQA422F0390 EZ301U	100	300	38.50	77/2	4500	8000	0.24	1	37	5.3
78	57	60	1.3	2.1	PHQA422F0390 EZ302U	170	300	38.50	77/2	4500	8000	0.34	1	37	5.9
78	74	78	1.6	1.6	PHQA422F0390 EZ303U	170	300	38.50	77/2	4500	8000	0.45	1	37	6.4
78	100	107	2.2	1.2	PHQA422F0390 EZ401U	170	300	38.50	77/2	4500	8000	0.98	1	37	7.8
109	41	43	1.5	3.0	PHQA422F0280 EZ302U	130	300	27.50	55/2	4000	7000	0.38	1	37	5.9
109	53	56	1.9	2.3	PHQA422F0280 EZ303U	170	300	27.50	55/2	4000	7000	0.49	1	37	6.4
109	72	77	2.6	1.7	PHQA422F0280 EZ401U	170	300	27.50	55/2	4000	7000	1.0	1	37	7.8
109	110	120	4.0	1.1	PHQA422F0280 EZ501U	170	300	27.50	55/2	4000	7000	3.0	1	37	8.8
136	33	34	1.7	3.7	PHQA422F0220 EZ302U	100	300	22.00	22/1	3700	6500	0.44	1	37	5.9
136	42	45	2.2	2.8	PHQA422F0220 EZ303U	140	300	22.00	22/1	3700	6500	0.55	1	37	6.4
136	57	61	2.9	2.1	PHQA422F0220 EZ401U	170	300	22.00	22/1	3700	6500	1.1	1	37	7.8
136	88	96	4.5	1.4	PHQA422F0220 EZ501U	170	300	22.00	22/1	3700	6500	3.1	1	37	8.8
136	96	106	4.9	1.2	PHQA422F0220 EZ402U	170	300	22.00	22/1	3700	6500	1.8	1	37	8.9
545	23	25	4.8	4.2	PHQA421F0055 EZ501U	84	300	5.500	11/2	2000	6000	3.2	1	42	7.5
545	36	45	7.7	2.6	PHQA421F0055 EZ404U	150	300	5.500	11/2	2000	6000	3.2	1	42	9.7
545	39	42	8.2	2.4	PHQA421F0055 EZ502U	160	300	5.500	11/2	2000	6000	5.5	1	42	9.0
545	51	59	11	1.9	PHQA421F0055 EZ503U	170	300	5.500	11/2	2000	6000	7.8	1	42	11
545	71	84	15	1.3	PHQA421F0055 EZ505U	170	300	5.500	11/2	2000	6000	12	1	42	13
PHQA4 (n_{1N} = 6000 rpm, $M_{2acc,max}$ = 170 Nm)															
109	46	49	0.6	2.4	PHQA422F0550 EZ301U	140	300	55.00	55/1	4500	8000	0.21	1	35	5.3
109	77	86	1.1	1.4	PHQA422F0550 EZ302U	170	300	55.00	55/1	4500	8000	0.31	1	35	5.9
109	100	115	1.4	1.1	PHQA422F0550 EZ303U	170	300	55.00	55/1	4500	8000	0.42	1	35	6.4
156	32	34	0.7	3.8	PHQA422F0390 EZ301U	100	300	38.50	77/2	4500	8000	0.24	1	37	5.3
156	54	60	1.2	2.2	PHQA422F0390 EZ302U	170	300	38.50	77/2	4500	8000	0.34	1	37	5.9
156	70	81	1.5	1.7	PHQA422F0390 EZ303U	170	300	38.50	77/2	4500	8000	0.45	1	37	6.4
156	82	100	1.8	1.5	PHQA422F0390 EZ401U	170	300	38.50	77/2	4500	8000	0.98	1	37	7.8
218	38	43	1.4	3.1	PHQA422F0280 EZ302U	130	300	27.50	55/2	4000	7000	0.38	1	37	5.9
218	50	58	1.8	2.4	PHQA422F0280 EZ303U	170	300	27.50	55/2	4000	7000	0.49	1	37	6.4
218	59	72	2.1	2.0	PHQA422F0280 EZ401U	170	300	27.50	55/2	4000	7000	1.0	1	37	7.8
218	87	113	3.2	1.4	PHQA422F0280 EZ501U	170	300	27.50	55/2	4000	7000	3.0	1	37	8.8
218	90	125	3.3	1.3	PHQA422F0280 EZ402U	170	300	27.50	55/2	4000	7000	1.7	1	37	8.9
273	31	34	1.6	3.9	PHQA422F0220 EZ302U	100	300	22.00	22/1	3700	6500	0.44	1	37	5.9
273	40	46	2.0	3.0	PHQA422F0220 EZ303U	140	300	22.00	22/1	3700	6500	0.55	1	37	6.4
273	47	57	2.4	2.6	PHQA422F0220 EZ401U	170	300	22.00	22/1	3700	6500	1.1	1	37	7.8
273	70	90	3.5	1.7	PHQA422F0220 EZ501U	170	300	22.00	22/1	3700	6500	3.1	1	37	8.8
273	72	100	3.6	1.7	PHQA422F0220 EZ402U	170	300	22.00	22/1	3700	6500	1.8	1	37	8.9
1091	18	23	4.8	4.2	PHQA421F0055 EZ501U	84	300	5.500	11/2	2000	6000	3.2	1	42	7.5
1091	27	41	7.3	2.8	PHQA421F0055 EZ502U	160	300	5.500	11/2	2000	6000	5.5	1	42	9.0
1091	31	44	8.1	2.5	PHQA421F0055 EZ404U	150	300	5.500	11/2	2000	6000	3.2	1	42	9.7
1091	33	56	8.7	2.3	PHQA421F0055 EZ503U	170	300	5.500	11/2	2000	6000	7.8	1	42	11
PHQA5 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 430 Nm)															
55	143	153	0.9	1.9	PHQA522F0550 EZ401U	430	800	55.00	55/1	4000	7000	0.97	1	87	11
55	220	240	1.4	1.3	PHQA522F0550 EZ501U	430	800	55.00	55/1	4000	7000	2.9	1	87	12
55	240	266	1.5	1.2	PHQA522F0550 EZ402U	430	800	55.00	55/1	4000	7000	1.7	1	87	12
78	100	107	1.0	2.8	PHQA522F0390 EZ401U	300	800	38.50	77/2	4000	7000	1.0	1	92	11
78	154	168	1.6	1.8	PHQA522F0390 EZ501U	430	800	38.50	77/2	4000	7000	3.0	1	92	12
78	168	186	1.8	1.7	PHQA522F0390 EZ402U	430	800	38.50	77/2	4000	7000	1.7	1	92	12
78	247	308	2.6	1.1	PHQA522F0390 EZ404U	430	800	38.50	77/2	4000	7000	3.1	1	92	14
78	265	286	2.8	1.1	PHQA522F0390 EZ502U	430	800	38.50	77/2	4000	7000	5.3	1	92	13
109	72	77	1.2	3.9	PHQA522F0280 EZ401U	220	800	27.50	55/2	3700	6500	1.1	1	94	11
109	110	120	1.9	2.5	PHQA522F0280 EZ501U	410	800	27.50	55/2	3700	6500	3.1	1	94	12
109	120	133	2.1	2.3	PHQA522F0280 EZ402U	410	800	27.50	55/2	3700	6500	1.8	1	94	12
109	176	220	3.1	1.6	PHQA522F0280 EZ404U	430	800	27.50	55/2	3700	6500	3.2	1	94	14
109	189	205	3.3	1.5	PHQA522F0280 EZ502U	430	800	27.50	55/2	3700	6500	5.4	1	94	13
109	189	212	3.3	1.5	PHQA522F0280 EZ701U	430	800	27.50	55/2	3700	6500	8.7	1	94	15
109	248	284	4.3	1.1	PHQA522F0280 EZ503U	430	800	27.50	55/2	3700	6500	7.8	1	94	15

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n_{2N} [rpm]	M_{2N} [Nm]	$M_{2,0}$ [Nm]	a_{th}	S	Type	M_{2acc} [Nm]	M_{2NOT} [Nm]	i	i_{exakt}	n_{1max} DB [rpm]	n_{1max} ZB [rpm]	J_1 [10^{-4} kgm²]	$\Delta\varphi_2$ [arcmin]	C_2 [Nm/ arcmin]	m [kg]
PHQA5 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 430 Nm)															
136	57	61	1.4	4.9	PHQA522F0220 EZ401U	170	800	22.00	22/1	3300	6000	1.2	1	95	11
136	88	96	2.1	3.2	PHQA522F0220 EZ501U	330	800	22.00	22/1	3300	6000	3.2	1	95	12
136	96	106	2.3	2.9	PHQA522F0220 EZ402U	330	800	22.00	22/1	3300	6000	1.9	1	95	12
136	141	176	3.4	2.0	PHQA522F0220 EZ404U	430	800	22.00	22/1	3300	6000	3.3	1	95	14
136	151	164	3.7	1.8	PHQA522F0220 EZ502U	430	800	22.00	22/1	3300	6000	5.5	1	95	13
136	151	170	3.7	1.8	PHQA522F0220 EZ701U	410	800	22.00	22/1	3300	6000	8.8	1	95	15
136	198	227	4.8	1.4	PHQA522F0220 EZ503U	430	800	22.00	22/1	3300	6000	7.9	1	95	15
136	246	295	6.0	1.1	PHQA522F0220 EZ702U	430	800	22.00	22/1	3300	6000	14	1	95	18
136	276	327	6.7	1.0	PHQA522F0220 EZ505U	430	800	22.00	22/1	3300	6000	12	1	95	18
545	63	76	6.4	3.5	PHQA521F0055 EZ702U	220	800	5.500	11/2	2500	5500	15	1	107	15
545	71	84	7.2	3.1	PHQA521F0055 EZ505U	350	800	5.500	11/2	2500	5500	13	1	107	15
545	87	110	8.8	2.6	PHQA521F0055 EZ703U	340	800	5.500	11/2	2500	5500	22	1	107	17
545	112	159	11	2.0	PHQA521F0055 EZ705U	430	800	5.500	11/2	2500	5500	35	1	107	23
PHQA5 (n_{1N} = 4500 rpm, $M_{2acc,max}$ = 430 Nm)															
205	194	313	4.7	1.4	PHQA522F0220 EZ505U	430	800	22.00	22/1	3300	6000	12	1	95	18
818	50	81	5.8	3.9	PHQA521F0055 EZ505U	350	800	5.500	11/2	2500	5500	13	1	107	15
818	64	106	7.3	3.0	PHQA521F0055 EZ703U	340	800	5.500	11/2	2500	5500	22	1	107	17
818	87	158	10	2.2	PHQA521F0055 EZ705U	430	800	5.500	11/2	2500	5500	35	1	107	23
PHQA5 (n_{1N} = 6000 rpm, $M_{2acc,max}$ = 430 Nm)															
109	118	143	0.9	1.9	PHQA522F0550 EZ401U	430	800	55.00	55/1	4000	7000	0.97	1	87	11
109	174	225	1.4	1.3	PHQA522F0550 EZ501U	430	800	55.00	55/1	4000	7000	2.9	1	87	12
109	179	251	1.4	1.2	PHQA522F0550 EZ402U	430	800	55.00	55/1	4000	7000	1.7	1	87	12
156	82	100	0.9	3.4	PHQA522F0390 EZ401U	300	800	38.50	77/2	4000	7000	1.0	1	92	11
156	122	158	1.3	2.3	PHQA522F0390 EZ501U	430	800	38.50	77/2	4000	7000	3.0	1	92	12
156	125	175	1.3	2.2	PHQA522F0390 EZ402U	430	800	38.50	77/2	4000	7000	1.7	1	92	12
156	186	279	1.9	1.5	PHQA522F0390 EZ502U	430	800	38.50	77/2	4000	7000	5.3	1	92	13
156	208	301	2.2	1.3	PHQA522F0390 EZ404U	430	800	38.50	77/2	4000	7000	3.1	1	92	14
218	59	72	1.0	4.8	PHQA522F0280 EZ401U	220	800	27.50	55/2	3700	6500	1.1	1	94	11
218	87	113	1.5	3.2	PHQA522F0280 EZ501U	410	800	27.50	55/2	3700	6500	3.1	1	94	12
218	90	125	1.6	3.1	PHQA522F0280 EZ402U	410	800	27.50	55/2	3700	6500	1.8	1	94	12
218	133	199	2.3	2.1	PHQA522F0280 EZ502U	430	800	27.50	55/2	3700	6500	5.4	1	94	13
218	133	202	2.3	2.1	PHQA522F0280 EZ701U	430	800	27.50	55/2	3700	6500	8.7	1	94	15
218	148	215	2.6	1.9	PHQA522F0280 EZ404U	430	800	27.50	55/2	3700	6500	3.2	1	94	14
218	159	271	2.7	1.8	PHQA522F0280 EZ503U	430	800	27.50	55/2	3700	6500	7.8	1	94	15
273	70	90	1.7	4.0	PHQA522F0220 EZ501U	330	800	22.00	22/1	3300	6000	3.2	1	95	12
273	72	100	1.7	3.9	PHQA522F0220 EZ402U	330	800	22.00	22/1	3300	6000	1.9	1	95	12
273	106	160	2.6	2.6	PHQA522F0220 EZ502U	430	800	22.00	22/1	3300	6000	5.5	1	95	13
273	106	162	2.6	2.6	PHQA522F0220 EZ701U	410	800	22.00	22/1	3300	6000	8.8	1	95	15
273	119	172	2.9	2.4	PHQA522F0220 EZ404U	430	800	22.00	22/1	3300	6000	3.3	1	95	14
273	127	217	3.1	2.2	PHQA522F0220 EZ503U	430	800	22.00	22/1	3300	6000	7.9	1	95	15
273	147	293	3.6	1.9	PHQA522F0220 EZ702U	430	800	22.00	22/1	3300	6000	14	1	95	18
PHQA7 (n_{1N} = 2000 rpm, $M_{2acc,max}$ = 950 Nm)															
364	231	349	9.5	2.8	PHQA721F0055 EZ805U	950	1900	5.500	11/2	2200	5000	135	1	235	55
PHQA7 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 950 Nm)															
14	554	594	0.2	1.2	PHQA723F2200 EZ401U	950	1900	220.0	220/1	4000	7000	0.99	1	202	19
16	485	520	0.2	1.3	PHQA723F1930 EZ401U	950	1900	192.5	385/2	4000	7000	1.0	1	203	19
19	388	416	0.3	1.7	PHQA723F1540 EZ401U	950	1900	154.0	154/1	4000	7000	1.0	1	203	19
19	596	651	0.4	1.1	PHQA723F1540 EZ501U	950	1900	154.0	154/1	4000	7000	3.0	1	203	20
22	347	371	0.3	1.9	PHQA723F1380 EZ401U	950	1900	137.5	275/2	3700	6500	1.2	1	204	19
22	532	582	0.4	1.2	PHQA723F1380 EZ501U	950	1900	137.5	275/2	3700	6500	3.1	1	204	20
22	582	644	0.5	1.1	PHQA723F1380 EZ402U	950	1900	137.5	275/2	3700	6500	1.9	1	204	20
27	277	297	0.3	2.3	PHQA723F1100 EZ401U	840	1900	110.0	110/1	3300	6000	1.3	1	204	19
27	426	465	0.5	1.5	PHQA723F1100 EZ501U	950	1900	110.0	110/1	3300	6000	3.3	1	204	20
27	465	515	0.5	1.4	PHQA723F1100 EZ402U	950	1900	110.0	110/1	3300	6000	2.0	1	204	20
34	222	238	0.3	2.9	PHQA723F0880 EZ401U	670	1900	88.00	88/1	3300	6000	1.3	1	204	19
34	341	372	0.5	1.9	PHQA723F0880 EZ501U	950	1900	88.00	88/1	3300	6000	3.3	1	204	20
34	372	412	0.6	1.7	PHQA723F0880 EZ402U	950	1900	88.00	88/1	3300	6000	2.0	1	204	20
34	546	681	0.9	1.2	PHQA723F0880 EZ404U	950	1900	88.00	88/1	3300	6000	3.4	1	204	22
34	586	634	0.9	1.1	PHQA723F0880 EZ502U	950	1900	88.00	88/1	3300	6000	5.6	1	204	22

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n_{2N} [rpm]	M_{2N} [Nm]	$M_{2,0}$ [Nm]	a_{th}	S	Type	M_{2acc} [Nm]	M_{2NOT} [Nm]	i	i_{exakt}	n_{1max} DB [rpm]	n_{1max} ZB [rpm]	J_1 [10^{-4} kgm²]	$\Delta\varphi_2$ [arcmin]	C_2 [Nm/ arcmin]	m [kg]
PHQA7 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 950 Nm)															
34	586	657	0.9	1.1	PHQA723F0880 EZ701U	950	1900	88.00	88/1	3300	6000	8.9	1	204	23
55	220	240	0.7	2.9	PHQA722F0550 EZ501U	820	1900	55.00	55/1	3700	6500	3.1	1	195	18
55	379	409	1.2	1.7	PHQA722F0550 EZ502U	950	1900	55.00	55/1	3700	6500	5.4	1	195	19
55	379	425	1.2	1.7	PHQA722F0550 EZ701U	950	1900	55.00	55/1	3700	6500	8.7	1	195	21
55	496	568	1.6	1.3	PHQA722F0550 EZ503U	950	1900	55.00	55/1	3700	6500	7.8	1	195	21
78	154	168	0.8	4.2	PHQA722F0390 EZ501U	570	1900	38.50	77/2	3700	6500	3.3	1	203	18
78	265	286	1.4	2.5	PHQA722F0390 EZ502U	950	1900	38.50	77/2	3700	6500	5.6	1	203	19
78	265	297	1.4	2.5	PHQA722F0390 EZ701U	720	1900	38.50	77/2	3700	6500	8.9	1	203	21
78	347	397	1.9	1.9	PHQA722F0390 EZ503U	950	1900	38.50	77/2	3700	6500	8.0	1	203	21
78	430	516	2.3	1.5	PHQA722F0390 EZ702U	950	1900	38.50	77/2	3700	6500	14	1	203	23
78	483	573	2.6	1.3	PHQA722F0390 EZ505U	950	1900	38.50	77/2	3700	6500	13	1	203	23
109	189	205	1.7	3.4	PHQA722F0280 EZ502U	790	1900	27.50	55/2	3500	6000	5.9	1	206	19
109	189	212	1.7	3.4	PHQA722F0280 EZ701U	510	1900	27.50	55/2	3500	6000	9.2	1	206	21
109	248	284	2.2	2.6	PHQA722F0280 EZ503U	950	1900	27.50	55/2	3500	6000	8.3	1	206	21
109	307	368	2.8	2.1	PHQA722F0280 EZ702U	950	1900	27.50	55/2	3500	6000	14	1	206	23
109	345	409	3.1	1.9	PHQA722F0280 EZ505U	950	1900	27.50	55/2	3500	6000	13	1	206	23
109	422	532	3.8	1.5	PHQA722F0280 EZ703U	950	1900	27.50	55/2	3500	6000	22	1	206	25
136	151	164	1.9	4.3	PHQA722F0220 EZ502U	630	1900	22.00	22/1	3000	5000	6.4	1	207	19
136	151	170	1.9	4.3	PHQA722F0220 EZ701U	410	1900	22.00	22/1	3000	5000	9.7	1	207	21
136	198	227	2.5	3.3	PHQA722F0220 EZ503U	880	1900	22.00	22/1	3000	5000	8.8	1	207	21
136	246	295	3.1	2.6	PHQA722F0220 EZ702U	840	1900	22.00	22/1	3000	5000	15	1	207	23
136	276	327	3.5	2.4	PHQA722F0220 EZ505U	950	1900	22.00	22/1	3000	5000	13	1	207	23
136	338	426	4.2	1.9	PHQA722F0220 EZ703U	950	1900	22.00	22/1	3000	5000	23	1	207	25
136	436	618	5.5	1.5	PHQA722F0220 EZ705U	950	1900	22.00	22/1	3000	5000	35	1	207	31
545	118	196	5.6	4.8	PHQA721F0055 EZ802U	530	1900	5.500	11/2	2200	5000	61	1	235	36
545	140	254	6.6	4.0	PHQA721F0055 EZ803U	770	1900	5.500	11/2	2200	5000	86	1	235	42
PHQA7 (n_{1N} = 4500 rpm, $M_{2acc,max}$ = 950 Nm)															
117	340	548	1.8	1.9	PHQA722F0390 EZ505U	950	1900	38.50	77/2	3700	6500	13	1	203	23
117	433	716	2.3	1.5	PHQA722F0390 EZ703U	950	1900	38.50	77/2	3700	6500	22	1	203	25
164	243	391	2.2	2.7	PHQA722F0280 EZ505U	950	1900	27.50	55/2	3500	6000	13	1	206	23
164	309	512	2.8	2.1	PHQA722F0280 EZ703U	950	1900	27.50	55/2	3500	6000	22	1	206	25
205	194	313	2.4	3.3	PHQA722F0220 EZ505U	950	1900	22.00	22/1	3000	5000	13	1	207	23
205	215	706	2.7	3.0	PHQA722F0220 EZ802U	950	1900	22.00	22/1	3000	5000	59	1	207	39
205	248	409	3.1	2.6	PHQA722F0220 EZ703U	950	1900	22.00	22/1	3000	5000	23	1	207	25
205	336	614	4.2	1.9	PHQA722F0220 EZ705U	950	1900	22.00	22/1	3000	5000	35	1	207	31
PHQA7 (n_{1N} = 6000 rpm, $M_{2acc,max}$ = 950 Nm)															
22	569	693	0.2	1.1	PHQA723F2750 EZ401U	950	1900	275.0	275/1	4000	7000	0.99	1	202	19
27	455	554	0.2	1.4	PHQA723F2200 EZ401U	950	1900	220.0	220/1	4000	7000	0.99	1	202	19
31	398	485	0.2	1.6	PHQA723F1930 EZ401U	950	1900	192.5	385/2	4000	7000	1.0	1	203	19
39	319	388	0.2	2.0	PHQA723F1540 EZ401U	950	1900	154.0	154/1	4000	7000	1.0	1	203	19
39	471	610	0.3	1.4	PHQA723F1540 EZ501U	950	1900	154.0	154/1	4000	7000	3.0	1	203	20
39	485	679	0.3	1.3	PHQA723F1540 EZ402U	950	1900	154.0	154/1	4000	7000	1.7	1	203	20
44	285	347	0.2	2.3	PHQA723F1380 EZ401U	950	1900	137.5	275/2	3700	6500	1.2	1	204	19
44	421	545	0.3	1.5	PHQA723F1380 EZ501U	950	1900	137.5	275/2	3700	6500	3.1	1	204	20
44	433	606	0.3	1.5	PHQA723F1380 EZ402U	950	1900	137.5	275/2	3700	6500	1.9	1	204	20
55	228	277	0.3	2.9	PHQA723F1100 EZ401U	840	1900	110.0	110/1	3300	6000	1.3	1	204	19
55	337	436	0.4	1.9	PHQA723F1100 EZ501U	950	1900	110.0	110/1	3300	6000	3.3	1	204	20
55	347	485	0.4	1.9	PHQA723F1100 EZ402U	950	1900	110.0	110/1	3300	6000	2.0	1	204	20
68	182	222	0.3	3.6	PHQA723F0880 EZ401U	670	1900	88.00	88/1	3300	6000	1.3	1	204	19
68	269	348	0.4	2.4	PHQA723F0880 EZ501U	950	1900	88.00	88/1	3300	6000	3.3	1	204	20
68	277	388	0.4	2.3	PHQA723F0880 EZ402U	950	1900	88.00	88/1	3300	6000	2.0	1	204	20
68	412	618	0.6	1.6	PHQA723F0880 EZ502U	950	1900	88.00	88/1	3300	6000	5.6	1	204	22
68	412	626	0.6	1.6	PHQA723F0880 EZ701U	950	1900	88.00	88/1	3300	6000	8.9	1	204	23
68	459	665	0.7	1.4	PHQA723F0880 EZ404U	950	1900	88.00	88/1	3300	6000	3.4	1	204	22
109	174	225	0.7	2.9	PHQA722F0550 EZ501U	820	1900	55.00	55/1	3700	6500	3.1	1	195	18
109	266	399	1.1	1.9	PHQA722F0550 EZ502U	950	1900	55.00	55/1	3700	6500	5.4	1	195	19
109	266	404	1.1	1.9	PHQA722F0550 EZ701U	950	1900	55.00	55/1	3700	6500	8.7	1	195	21
109	317	542	1.3	1.6	PHQA722F0550 EZ503U	950	1900	55.00	55/1	3700	6500	7.8	1	195	21
109	368	731	1.5	1.4	PHQA722F0550 EZ702U	950	1900	55.00	55/1	3700	6500	14	1	195	23

n_{2N} [rpm]	M_{2N} [Nm]	$M_{2,0}$ [Nm]	a_{th}	S	Type	M_{2acc} [Nm]	M_{2NOT} [Nm]	i	i_{exakt}	n_{1max} DB [rpm]	n_{1max} ZB [rpm]	J_1 [10^{-4} kgm²]	$\Delta\varphi_2$ [arcmin]	C_2 [Nm/ arcmin]	m [kg]
PHQA7 (n_{1N} = 6000 rpm, $M_{2acc,max}$ = 950 Nm)															
156	186	279	1.0	3.5	PHQA722F0390 EZ502U	950	1900	38.50	77/2	3700	6500	5.6	1	203	19
156	186	283	1.0	3.5	PHQA722F0390 EZ701U	720	1900	38.50	77/2	3700	6500	8.9	1	203	21
156	222	380	1.2	2.9	PHQA722F0390 EZ503U	950	1900	38.50	77/2	3700	6500	8.0	1	203	21
156	258	512	1.4	2.5	PHQA722F0390 EZ702U	950	1900	38.50	77/2	3700	6500	14	1	203	23
218	133	199	1.2	4.9	PHQA722F0280 EZ502U	790	1900	27.50	55/2	3500	6000	5.9	1	206	19
218	133	202	1.2	4.9	PHQA722F0280 EZ701U	510	1900	27.50	55/2	3500	6000	9.2	1	206	21
218	159	271	1.4	4.1	PHQA722F0280 EZ503U	950	1900	27.50	55/2	3500	6000	8.3	1	206	21
218	184	366	1.7	3.5	PHQA722F0280 EZ702U	950	1900	27.50	55/2	3500	6000	14	1	206	23
PHQA8 (n_{1N} = 2000 rpm, $M_{2acc,max}$ = 2600 Nm)															
73	1118	1691	4.1	1.5	PHQA822F0280 EZ805U	2600	4400	27.50	55/2	3000	5500	135	1	656	82
91	894	1352	4.6	1.9	PHQA822F0220 EZ805U	2600	4400	22.00	22/1	2500	4500	137	1	661	82
PHQA8 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 2600 Nm)															
7.8	1490	1629	0.1	1.1	PHQA823F3850 EZ501U	2600	4400	385.0	385/1	3700	6500	3.1	1	635	46
11	1064	1163	0.1	1.6	PHQA823F2750 EZ501U	2600	4400	275.0	275/1	3700	6500	3.1	1	643	46
14	851	931	0.1	2.0	PHQA823F2200 EZ501U	2600	4400	220.0	220/1	3700	6500	3.1	1	641	46
14	1465	1584	0.2	1.2	PHQA823F2200 EZ502U	2600	4400	220.0	220/1	3700	6500	5.4	1	641	47
14	1465	1643	0.2	1.2	PHQA823F2200 EZ701U	2600	4400	220.0	220/1	3700	6500	8.7	1	641	49
16	745	814	0.1	2.3	PHQA823F1930 EZ501U	2600	4400	192.5	385/2	3700	6500	3.3	1	645	46
16	1282	1386	0.3	1.3	PHQA823F1930 EZ502U	2600	4400	192.5	385/2	3700	6500	5.6	1	645	47
16	1282	1438	0.3	1.3	PHQA823F1930 EZ701U	2600	4400	192.5	385/2	3700	6500	8.9	1	645	49
16	1681	1923	0.3	1.0	PHQA823F1930 EZ503U	2600	4400	192.5	385/2	3700	6500	8.0	1	645	49
19	596	651	0.2	2.9	PHQA823F1540 EZ501U	2220	4400	154.0	154/1	3700	6500	3.3	1	645	46
19	1026	1109	0.3	1.7	PHQA823F1540 EZ502U	2600	4400	154.0	154/1	3700	6500	5.6	1	645	47
19	1026	1150	0.3	1.7	PHQA823F1540 EZ701U	2600	4400	154.0	154/1	3700	6500	8.9	1	645	49
19	1344	1538	0.4	1.3	PHQA823F1540 EZ503U	2600	4400	154.0	154/1	3700	6500	8.0	1	645	49
19	1663	1996	0.5	1.0	PHQA823F1540 EZ702U	2600	4400	154.0	154/1	3700	6500	14	1	645	51
22	532	582	0.2	3.2	PHQA823F1380 EZ501U	1980	4400	137.5	275/2	3500	6000	3.6	1	646	46
22	916	990	0.3	1.9	PHQA823F1380 EZ502U	2600	4400	137.5	275/2	3500	6000	5.9	1	646	47
22	916	1027	0.3	1.9	PHQA823F1380 EZ701U	2480	4400	137.5	275/2	3500	6000	9.2	1	646	49
22	1200	1374	0.4	1.4	PHQA823F1380 EZ503U	2600	4400	137.5	275/2	3500	6000	8.3	1	646	49
22	1485	1782	0.5	1.1	PHQA823F1380 EZ702U	2600	4400	137.5	275/2	3500	6000	14	1	646	51
22	1671	1980	0.6	1.0	PHQA823F1380 EZ505U	2600	4400	137.5	275/2	3500	6000	13	1	646	51
27	426	465	0.2	4.0	PHQA823F1100 EZ501U	1580	4400	110.0	110/1	3500	6000	4.1	1	647	46
27	733	792	0.3	2.3	PHQA823F1100 EZ502U	2600	4400	110.0	110/1	3500	6000	6.4	1	647	47
27	733	822	0.3	2.3	PHQA823F1100 EZ701U	1980	4400	110.0	110/1	3500	6000	9.7	1	647	49
27	960	1099	0.4	1.8	PHQA823F1100 EZ503U	2600	4400	110.0	110/1	3500	6000	8.8	1	647	49
27	1188	1426	0.6	1.4	PHQA823F1100 EZ702U	2600	4400	110.0	110/1	3500	6000	15	1	647	51
27	1337	1584	0.6	1.3	PHQA823F1100 EZ505U	2600	4400	110.0	110/1	3500	6000	13	1	647	51
34	341	372	0.2	5.0	PHQA823F0880 EZ501U	1270	4400	88.00	88/1	3000	5000	4.2	1	647	46
34	586	634	0.4	2.9	PHQA823F0880 EZ502U	2460	4400	88.00	88/1	3000	5000	6.5	1	647	47
34	586	657	0.4	2.9	PHQA823F0880 EZ701U	1580	4400	88.00	88/1	3000	5000	9.8	1	647	49
34	768	879	0.5	2.2	PHQA823F0880 EZ503U	2600	4400	88.00	88/1	3000	5000	8.9	1	647	49
34	950	1140	0.6	1.8	PHQA823F0880 EZ702U	2600	4400	88.00	88/1	3000	5000	15	1	647	51
34	1069	1267	0.7	1.6	PHQA823F0880 EZ505U	2600	4400	88.00	88/1	3000	5000	13	1	647	51
34	1307	1647	0.8	1.3	PHQA823F0880 EZ703U	2600	4400	88.00	88/1	3000	5000	23	1	647	53
55	379	425	0.6	3.7	PHQA822F0550 EZ701U	1020	4400	55.00	55/1	3300	6000	9.2	1	615	44
55	614	737	1.0	2.3	PHQA822F0550 EZ702U	2100	4400	55.00	55/1	3300	6000	14	1	615	47
55	844	1064	1.4	1.6	PHQA822F0550 EZ703U	2600	4400	55.00	55/1	3300	6000	22	1	615	49
55	1089	1545	1.8	1.3	PHQA822F0550 EZ705U	2600	4400	55.00	55/1	3300	6000	35	1	615	54
55	1141	1898	1.8	1.2	PHQA822F0550 EZ802U	2600	4400	55.00	55/1	3300	6000	59	1	615	63
78	430	516	1.0	4.0	PHQA822F0390 EZ702U	1470	4400	38.50	77/2	3300	6000	15	1	643	47
78	591	745	1.3	2.9	PHQA822F0390 EZ703U	2330	4400	38.50	77/2	3300	6000	23	1	643	49
78	763	1081	1.7	2.2	PHQA822F0390 EZ705U	2600	4400	38.50	77/2	3300	6000	35	1	643	54
78	798	1328	1.8	2.1	PHQA822F0390 EZ802U	2600	4400	38.50	77/2	3300	6000	59	1	643	63
109	422	532	1.6	4.0	PHQA822F0280 EZ703U	1660	4400	27.50	55/2	3000	5500	24	1	656	49
109	545	772	2.0	3.1	PHQA822F0280 EZ705U	2600	4400	27.50	55/2	3000	5500	37	1	656	54
109	570	949	2.1	3.0	PHQA822F0280 EZ802U	2560	4400	27.50	55/2	3000	5500	61	1	656	63
109	680	1233	2.5	2.5	PHQA822F0280 EZ803U	2600	4400	27.50	55/2	3000	5500	86	1	656	69
136	436	618	2.3	3.9	PHQA822F0220 EZ705U	2130	4400	22.00	22/1	2500	4500	38	1	661	54

STÖBER

n_{2N} [rpm]	M_{2N} [Nm]	$M_{2,0}$ [Nm]	a_{th}	S	Type	M_{2acc} [Nm]	M_{2NOT} [Nm]	i	i_{exakt}	n_{1max} DB [rpm]	n_{1max} ZB [rpm]	J_1 [10^{-4} kgm²]	$\Delta\varphi_2$ [arcmin]	C_2 [Nm/ arcmin]	m [kg]
PHQA8 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 2600 Nm)															
136	456	759	2.4	3.7	PHQA822F0220 EZ802U	2050	4400	22.00	22/1	2500	4500	63	1	661	63
136	544	986	2.8	3.1	PHQA822F0220 EZ803U	2600	4400	22.00	22/1	2500	4500	88	1	661	69
PHQA8 (n_{1N} = 4500 rpm, $M_{2acc,max}$ = 2600 Nm)															
33	1176	1893	0.4	1.4	PHQA823F1380 EZ505U	2600	4400	137.5	275/2	3500	6000	13	1	646	51
41	941	1515	0.4	1.8	PHQA823F1100 EZ505U	2600	4400	110.0	110/1	3500	6000	13	1	647	51
41	1198	1980	0.6	1.4	PHQA823F1100 EZ703U	2600	4400	110.0	110/1	3500	6000	23	1	647	53
51	752	1212	0.5	2.3	PHQA823F0880 EZ505U	2600	4400	88.00	88/1	3000	5000	13	1	647	51
51	958	1584	0.6	1.8	PHQA823F0880 EZ703U	2600	4400	88.00	88/1	3000	5000	23	1	647	53
82	537	1765	1.0	2.3	PHQA822F0550 EZ802U	2600	4400	55.00	55/1	3300	6000	59	1	615	63
82	619	1023	1.1	2.0	PHQA822F0550 EZ703U	2600	4400	55.00	55/1	3300	6000	22	1	615	49
82	839	1535	1.5	1.4	PHQA822F0550 EZ705U	2600	4400	55.00	55/1	3300	6000	35	1	615	54
117	376	1235	0.8	4.5	PHQA822F0390 EZ802U	2600	4400	38.50	77/2	3300	6000	59	1	643	63
117	433	716	1.0	3.9	PHQA822F0390 EZ703U	2330	4400	38.50	77/2	3300	6000	23	1	643	49
117	587	1074	1.3	2.9	PHQA822F0390 EZ705U	2600	4400	38.50	77/2	3300	6000	35	1	643	54
164	419	767	1.6	4.1	PHQA822F0280 EZ705U	2600	4400	27.50	55/2	3000	5500	37	1	656	54
PHQA8 (n_{1N} = 6000 rpm, $M_{2acc,max}$ = 2600 Nm)															
16	1178	1525	0.1	1.4	PHQA823F3850 EZ501U	2600	4400	385.0	385/1	3700	6500	3.1	1	635	46
22	842	1089	0.1	2.0	PHQA823F2750 EZ501U	2600	4400	275.0	275/1	3700	6500	3.1	1	643	46
22	1287	1931	0.2	1.3	PHQA823F2750 EZ502U	2600	4400	275.0	275/1	3700	6500	5.4	1	643	47
22	1287	1955	0.2	1.3	PHQA823F2750 EZ701U	2600	4400	275.0	275/1	3700	6500	8.7	1	643	49
27	673	871	0.1	2.5	PHQA823F2200 EZ501U	2600	4400	220.0	220/1	3700	6500	3.1	1	641	46
27	1030	1544	0.2	1.7	PHQA823F2200 EZ502U	2600	4400	220.0	220/1	3700	6500	5.4	1	641	47
27	1030	1564	0.2	1.7	PHQA823F2200 EZ701U	2600	4400	220.0	220/1	3700	6500	8.7	1	641	49
31	589	762	0.1	2.9	PHQA823F1930 EZ501U	2600	4400	192.5	385/2	3700	6500	3.3	1	645	46
31	901	1351	0.2	1.9	PHQA823F1930 EZ502U	2600	4400	192.5	385/2	3700	6500	5.6	1	645	47
31	901	1369	0.2	1.9	PHQA823F1930 EZ701U	2600	4400	192.5	385/2	3700	6500	8.9	1	645	49
31	1074	1836	0.2	1.6	PHQA823F1930 EZ503U	2600	4400	192.5	385/2	3700	6500	8.0	1	645	49
39	471	610	0.1	3.6	PHQA823F1540 EZ501U	2220	4400	154.0	154/1	3700	6500	3.3	1	645	46
39	721	1081	0.2	2.4	PHQA823F1540 EZ502U	2600	4400	154.0	154/1	3700	6500	5.6	1	645	47
39	721	1095	0.2	2.4	PHQA823F1540 EZ701U	2600	4400	154.0	154/1	3700	6500	8.9	1	645	49
39	859	1469	0.2	2.0	PHQA823F1540 EZ503U	2600	4400	154.0	154/1	3700	6500	8.0	1	645	49
39	998	1982	0.3	1.7	PHQA823F1540 EZ702U	2600	4400	154.0	154/1	3700	6500	14	1	645	51
44	421	545	0.1	4.0	PHQA823F1380 EZ501U	1980	4400	137.5	275/2	3500	6000	3.6	1	646	46
44	644	965	0.2	2.6	PHQA823F1380 EZ502U	2600	4400	137.5	275/2	3500	6000	5.9	1	646	47
44	644	978	0.2	2.6	PHQA823F1380 EZ701U	2480	4400	137.5	275/2	3500	6000	9.2	1	646	49
44	767	1312	0.3	2.2	PHQA823F1380 EZ503U	2600	4400	137.5	275/2	3500	6000	8.3	1	646	49
44	891	1770	0.3	1.9	PHQA823F1380 EZ702U	2600	4400	137.5	275/2	3500	6000	14	1	646	51
55	515	772	0.2	3.3	PHQA823F1100 EZ502U	2600	4400	110.0	110/1	3500	6000	6.4	1	647	47
55	515	782	0.2	3.3	PHQA823F1100 EZ701U	1980	4400	110.0	110/1	3500	6000	9.7	1	647	49
55	614	1049	0.3	2.8	PHQA823F1100 EZ503U	2600	4400	110.0	110/1	3500	6000	8.8	1	647	49
55	713	1416	0.3	2.4	PHQA823F1100 EZ702U	2600	4400	110.0	110/1	3500	6000	15	1	647	51
109	266	404	0.5	4.1	PHQA822F0550 EZ701U	1020	4400	55.00	55/1	3300	6000	9.2	1	615	44
109	368	731	0.7	3.0	PHQA822F0550 EZ702U	2100	4400	55.00	55/1	3300	6000	14	1	615	47
PHQA9 (n_{1N} = 2000 rpm, $M_{2acc,max}$ = 6000 Nm)															
28	2832	4283	1.2	1.3	PHQA933F0720 EZ805U	6000	12000	72.00	72/1	2200	4500	139	1	1205	127
33	2438	3688	1.4	1.6	PHQA932F0600 EZ805U	6000	12000	60.00	60/1	2800	4500	135	1	1149	119
48	1707	2582	1.6	2.2	PHQA932F0420 EZ805U	6000	12000	42.00	42/1	2800	4500	138	1	1195	119
67	1219	1844	1.9	3.1	PHQA932F0300 EZ805U	5720	12000	30.00	30/1	2500	4000	143	1	1214	119
83	975	1475	2.1	3.9	PHQA932F0240 EZ805U	4580	12000	24.00	24/1	2200	3500	150	1	1225	119
PHQA9 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 6000 Nm)															
7.1	2797	3137	0.1	1.4	PHQA933F4200 EZ701U	6000	12000	420.0	420/1	3300	6000	9.1	1	1184	90
10	1998	2241	0.1	1.9	PHQA933F3000 EZ701U	5400	12000	300.0	300/1	3300	6000	9.1	1	1196	90
10	3240	3888	0.2	1.2	PHQA933F3000 EZ702U	6000	12000	300.0	300/1	3300	6000	14	1	1196	92
13	1598	1793	0.1	2.4	PHQA933F2400 EZ701U	4320	12000	240.0	240/1	3300	6000	9.2	1	1198	90
13	2592	3110	0.2	1.5	PHQA933F2400 EZ702U	6000	12000	240.0	240/1	3300	6000	14	1	1198	92
13	3564	4493	0.2	1.1	PHQA933F2400 EZ703U	6000	12000	240.0	240/1	3300	6000	22	1	1198	94
14	1399	1569	0.1	2.7	PHQA933F2100 EZ701U	3780	12000	210.0	210/1	3300	6000	9.8	1	1200	90
14	2268	2722	0.2	1.7	PHQA933F2100 EZ702U	6000	12000	210.0	210/1	3300	6000	15	1	1200	92
14	3119	3931	0.3	1.2	PHQA933F2100 EZ703U	6000	12000	210.0	210/1	3300	6000	23	1	1200	94

n_{2N} [rpm]	M_{2N} [Nm]	$M_{2,0}$ [Nm]	a_{th}	S	Type	M_{2acc} [Nm]	M_{2NOT} [Nm]	i	i_{exakt}	n_{1max} DB [rpm]	n_{1max} ZB [rpm]	J_1 [10^{-4} kgm²]	$\Delta\varphi_2$ [arcmin]	C_2 [Nm/ arcmin]	m [kg]
PHQA9 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 6000 Nm)															
18	1119	1255	0.1	3.4	PHQA933F1680 EZ701U	3020	12000	168.0	168/1	3300	6000	9.9	1	1204	90
18	1814	2177	0.2	2.1	PHQA933F1680 EZ702U	6000	12000	168.0	168/1	3300	6000	15	1	1204	92
18	2495	3145	0.3	1.5	PHQA933F1680 EZ703U	6000	12000	168.0	168/1	3300	6000	23	1	1204	94
18	3221	4566	0.4	1.2	PHQA933F1680 EZ705U	6000	12000	168.0	168/1	3300	6000	35	1	1204	100
20	999	1121	0.1	3.8	PHQA933F1500 EZ701U	2700	12000	150.0	150/1	3000	5500	11	1	1202	90
20	1620	1944	0.2	2.3	PHQA933F1500 EZ702U	5540	12000	150.0	150/1	3000	5500	16	1	1202	92
20	2228	2808	0.3	1.7	PHQA933F1500 EZ703U	6000	12000	150.0	150/1	3000	5500	24	1	1202	94
20	2876	4077	0.4	1.3	PHQA933F1500 EZ705U	6000	12000	150.0	150/1	3000	5500	37	1	1202	100
25	799	896	0.2	4.8	PHQA933F1200 EZ701U	2160	12000	120.0	120/1	2500	4500	13	1	1203	90
25	1296	1555	0.3	2.9	PHQA933F1200 EZ702U	4430	12000	120.0	120/1	2500	4500	18	1	1203	92
25	1782	2246	0.4	2.1	PHQA933F1200 EZ703U	6000	12000	120.0	120/1	2500	4500	26	1	1203	94
25	2300	3262	0.5	1.7	PHQA933F1200 EZ705U	6000	12000	120.0	120/1	2500	4500	38	1	1203	100
25	2408	4007	0.5	1.6	PHQA933F1200 EZ802U	6000	12000	120.0	120/1	2500	4500	62	1	1203	108
31	1037	1244	0.3	3.7	PHQA933F0960 EZ702U	3540	12000	96.00	96/1	2500	4500	18	1	1207	92
31	1426	1797	0.4	2.7	PHQA933F0960 EZ703U	5620	12000	96.00	96/1	2500	4500	26	1	1207	94
31	1840	2609	0.5	2.1	PHQA933F0960 EZ705U	6000	12000	96.00	96/1	2500	4500	39	1	1207	100
31	1927	3205	0.5	2.0	PHQA933F0960 EZ802U	6000	12000	96.00	96/1	2500	4500	63	1	1207	108
31	2298	4164	0.6	1.7	PHQA933F0960 EZ803U	6000	12000	96.00	96/1	2500	4500	88	1	1207	114
42	778	933	0.3	4.9	PHQA933F0720 EZ702U	2660	12000	72.00	72/1	2200	4500	20	1	1205	92
42	1069	1348	0.5	3.6	PHQA933F0720 EZ703U	4210	12000	72.00	72/1	2200	4500	28	1	1205	94
42	1380	1957	0.6	2.8	PHQA933F0720 EZ705U	6000	12000	72.00	72/1	2200	4500	41	1	1205	100
42	1445	2404	0.6	2.6	PHQA933F0720 EZ802U	6000	12000	72.00	72/1	2200	4500	65	1	1205	108
42	1724	3123	0.7	2.2	PHQA933F0720 EZ803U	6000	12000	72.00	72/1	2200	4500	90	1	1205	114
50	1244	2070	0.7	2.8	PHQA932F0600 EZ802U	5580	12000	60.00	60/1	2800	4500	61	1	1149	100
50	1484	2690	0.9	2.4	PHQA932F0600 EZ803U	6000	12000	60.00	60/1	2800	4500	86	1	1149	106
71	871	1449	0.8	4.4	PHQA932F0420 EZ802U	3910	12000	42.00	42/1	2800	4500	63	1	1195	100
71	1039	1883	1.0	3.7	PHQA932F0420 EZ803U	5660	12000	42.00	42/1	2800	4500	89	1	1195	106
PHQA9 (n_{1N} = 4500 rpm, $M_{2acc,max}$ = 6000 Nm)															
19	2614	4320	0.2	1.5	PHQA933F2400 EZ703U	6000	12000	240.0	240/1	3300	6000	22	1	1198	94
21	2287	3780	0.2	1.7	PHQA933F2100 EZ703U	6000	12000	210.0	210/1	3300	6000	23	1	1200	94
27	1830	3024	0.2	2.1	PHQA933F1680 EZ703U	6000	12000	168.0	168/1	3300	6000	23	1	1204	94
27	2480	4536	0.3	1.5	PHQA933F1680 EZ705U	6000	12000	168.0	168/1	3300	6000	35	1	1204	100
30	1634	2700	0.2	2.3	PHQA933F1500 EZ703U	6000	12000	150.0	150/1	3000	5500	24	1	1202	94
30	2214	4050	0.3	1.7	PHQA933F1500 EZ705U	6000	12000	150.0	150/1	3000	5500	37	1	1202	100
38	1134	3726	0.2	3.4	PHQA933F1200 EZ802U	6000	12000	120.0	120/1	2500	4500	62	1	1203	108
38	1307	2160	0.3	2.9	PHQA933F1200 EZ703U	6000	12000	120.0	120/1	2500	4500	26	1	1203	94
38	1771	3240	0.3	2.1	PHQA933F1200 EZ705U	6000	12000	120.0	120/1	2500	4500	38	1	1203	100
47	907	2981	0.2	4.2	PHQA933F0960 EZ802U	6000	12000	96.00	96/1	2500	4500	63	1	1207	108
47	1045	1728	0.3	3.6	PHQA933F0960 EZ703U	5620	12000	96.00	96/1	2500	4500	26	1	1207	94
47	1417	2592	0.4	2.7	PHQA933F0960 EZ705U	6000	12000	96.00	96/1	2500	4500	39	1	1207	100
63	784	1296	0.3	4.8	PHQA933F0720 EZ703U	4210	12000	72.00	72/1	2200	4500	28	1	1205	94
63	1063	1944	0.4	3.6	PHQA933F0720 EZ705U	6000	12000	72.00	72/1	2200	4500	41	1	1205	100
PHQA9 (n_{1N} = 6000 rpm, $M_{2acc,max}$ = 6000 Nm)															
10	2808	4266	0.1	1.4	PHQA933F6000 EZ701U	6000	12000	600.0	600/1	3300	6000	9.1	1	1145	90
14	1966	2986	0.1	1.9	PHQA933F4200 EZ701U	6000	12000	420.0	420/1	3300	6000	9.1	1	1184	90
20	1404	2133	0.1	2.7	PHQA933F3000 EZ701U	5400	12000	300.0	300/1	3300	6000	9.1	1	1196	90
20	1944	3861	0.1	2.0	PHQA933F3000 EZ702U	6000	12000	300.0	300/1	3300	6000	14	1	1196	92
25	1123	1706	0.1	3.4	PHQA933F2400 EZ701U	4320	12000	240.0	240/1	3300	6000	9.2	1	1198	90
25	1555	3089	0.1	2.4	PHQA933F2400 EZ702U	6000	12000	240.0	240/1	3300	6000	14	1	1198	92
29	983	1493	0.1	3.9	PHQA933F2100 EZ701U	3780	12000	210.0	210/1	3300	6000	9.8	1	1200	90
29	1361	2703	0.1	2.8	PHQA933F2100 EZ702U	6000	12000	210.0	210/1	3300	6000	15	1	1200	92
36	786	1194	0.1	4.8	PHQA933F1680 EZ701U	3020	12000	168.0	168/1	3300	6000	9.9	1	1204	90
36	1089	2162	0.1	3.5	PHQA933F1680 EZ702U	6000	12000	168.0	168/1	3300	6000	15	1	1204	92
PHQA10 (n_{1N} = 2000 rpm, $M_{2acc,max}$ = 10000 Nm)															
17	4720	7139	0.6	1.4	PHQA1033F1200 EZ805U	10000	20000	120.0	120/1	2200	3500	150	1.5	2062	166
21	3776	5711	0.6	1.7	PHQA1033F0960 EZ805U	10000	20000	96.00	96/1	2200	3500	152	1.5	2068	166
PHQA10 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 10000 Nm)															
14	4215	7012	0.2	1.5	PHQA1033F2100 EZ802U	10000	20000	210.0	210/1	2800	4500	63	1.5	2059	147
18	3372	5610	0.3	1.9	PHQA1033F1680 EZ802U	10000	20000	168.0	168/1	2800	4500	64	1.5	2064	147

n_{2N} [rpm]	M_{2N} [Nm]	$M_{2,0}$ [Nm]	a_{th}	S	Type	M_{2acc} [Nm]	M_{2NOT} [Nm]	i	i_{exakt}	n_{1max} DB [rpm]	n_{1max} ZB [rpm]	J_1 [10^{-4} kgm²]	$\Delta\varphi_2$ [arcmin]	C_2 [Nm/ arcmin]	m [kg]
PHQA10 (n_{1N} = 3000 rpm, $M_{2acc,max}$ = 10000 Nm)															
18	4022	7288	0.3	1.6	PHQA1033F1680 EZ803U	10000	20000	168.0	168/1	2800	4500	89	1.5	2064	153
20	3011	5009	0.3	2.2	PHQA1033F1500 EZ802U	10000	20000	150.0	150/1	2500	4000	69	1.5	2061	147
20	3591	6507	0.3	1.8	PHQA1033F1500 EZ803U	10000	20000	150.0	150/1	2500	4000	94	1.5	2061	153
25	2408	4007	0.3	2.7	PHQA1033F1200 EZ802U	10000	20000	120.0	120/1	2200	3500	76	1.5	2062	147
25	2873	5206	0.4	2.3	PHQA1033F1200 EZ803U	10000	20000	120.0	120/1	2200	3500	101	1.5	2062	153
31	1927	3205	0.3	3.4	PHQA1033F0960 EZ802U	8640	20000	96.00	96/1	2200	3500	77	1.5	2068	147
31	2298	4164	0.4	2.8	PHQA1033F0960 EZ803U	10000	20000	96.00	96/1	2200	3500	102	1.5	2068	153
PHQA10 (n_{1N} = 4500 rpm, $M_{2acc,max}$ = 10000 Nm)															
19	2268	7452	0.1	2.9	PHQA1033F2400 EZ802U	10000	20000	240.0	240/1	2800	4500	61	1.5	2056	147
21	1985	6521	0.1	3.3	PHQA1033F2100 EZ802U	10000	20000	210.0	210/1	2800	4500	63	1.5	2059	147
27	1588	5216	0.1	4.1	PHQA1033F1680 EZ802U	10000	20000	168.0	168/1	2800	4500	64	1.5	2064	147

7.3 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.

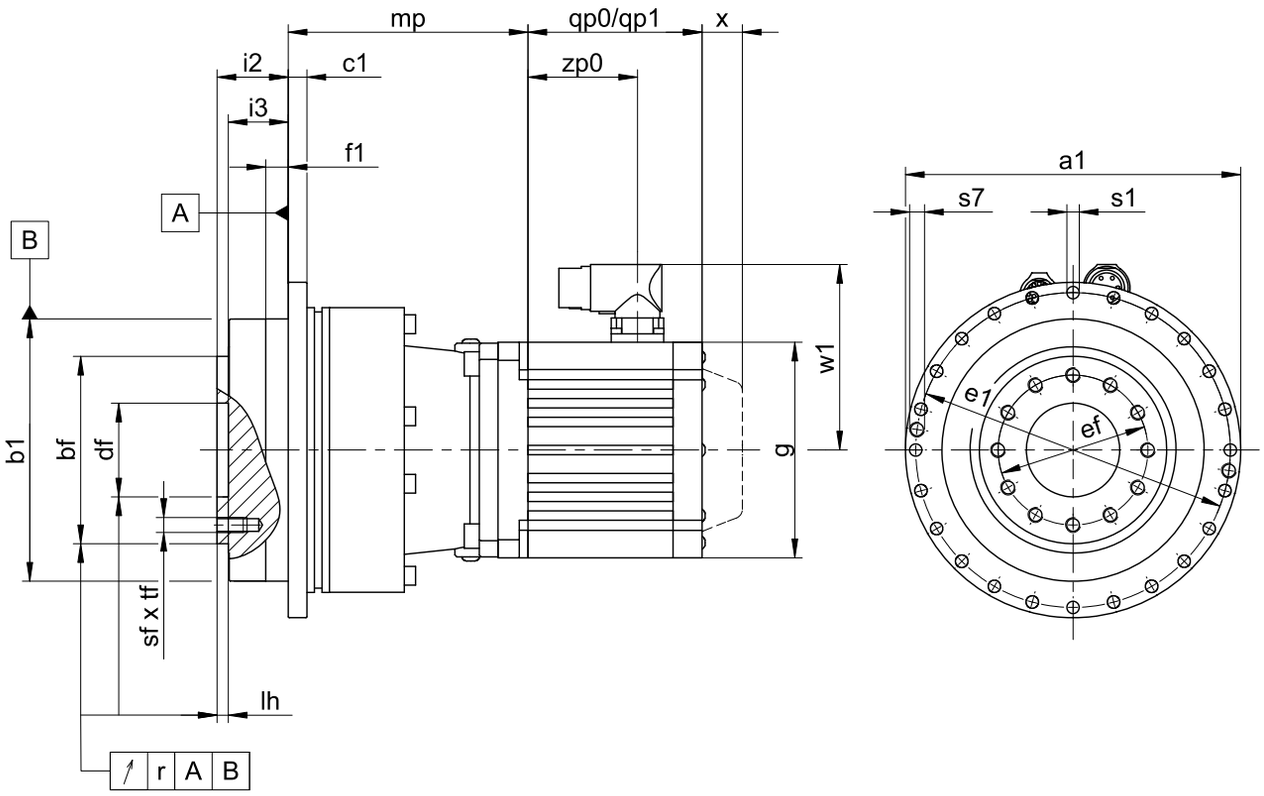
Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

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

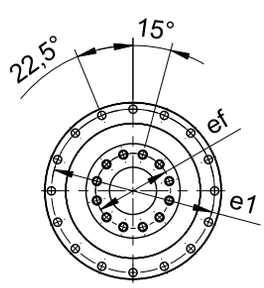
You can download CAD models of our standard drives at http://cad.stoeber.de.

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

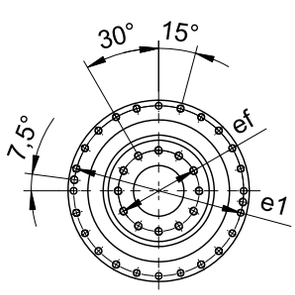
7.3.1 F shaft design (flange shaft)



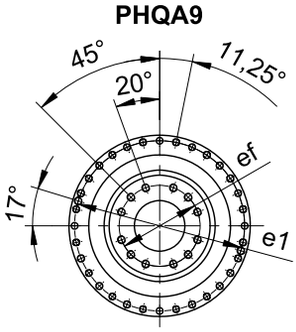
PHQA4/PHQA5



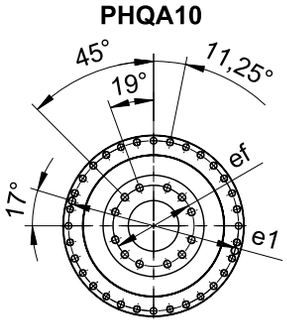
PHQA7/PHQA8



PHQA9



PHQA10



qp0	Applies to motors without brake.	qp1	Applies to motors with brake.
x	Applies to encoders using an optical measuring concept.	w1	For variation for One Cable Solution (OCS), see Chapter [▷ 22.4]

Dimensions of gear units

Type	Øa1	Øb1	Øbf	c1	Ødf	Øe1	Øef	f1	i2	i3	lh	r	Øs1	s7	sf	tf
PHQA421	118_{h7}	90_{h7}	63_{h7}	7	31.5^{H6}	109	50	10	30	24	6	0.020	5.5	–	M6	11
PHQA422	118_{h7}	90_{h7}	63_{h7}	7	31.5^{H6}	109	50	10	30	24	6	0.020	5.5	–	M6	11
PHQA521	145_{h7}	110_{h7}	80_{h7}	8	40.0^{H6}	135	63	10	29	23	6	0.020	5.5	–	M8	11
PHQA522	145_{h7}	110_{h7}	80_{h7}	8	40.0^{H6}	135	63	10	29	23	6	0.020	5.5	–	M8	11
PHQA721	179_{h7}	140_{h7}	100_{h7}	10	50.0^{H6}	168	80	12	38	32	6	0.025	6.6	–	M10	14
PHQA722	179_{h7}	140_{h7}	100_{h7}	10	50.0^{H6}	168	80	12	38	32	6	0.025	6.6	–	M10	16
PHQA723	179_{h7}	140_{h7}	100_{h7}	10	50.0^{H6}	168	80	12	38	32	6	0.025	6.6	–	M10	16
PHQA822	247_{h7}	200_{h7}	160_{h7}	12	80.0^{H6}	233	125	15	50	42	8	0.030	9.0	M10	M12	17
PHQA823	247_{h7}	200_{h7}	160_{h7}	12	80.0^{H6}	233	125	15	50	42	8	0.030	9.0	M10	M12	17
PHQA932	300	255_{h7}	180_{h7}	18	90.0^{H6}	280	145	20	66	55	12	0.030	13.5	M8	M20	28
PHQA933	300	255_{h7}	180_{h7}	18	90.0^{H6}	280	145	20	66	55	12	0.030	13.5	M8	M20	28
PHQA1033	330	285_{h7}	200_{h7}	20	95.0^{H6}	310	166	20	75	60	10	0.040	13.5	M10	M24	35

Dimensions of motors

Type	□g	qp0	qp1	w1	x	zp0
EZ301U	72	90	130.0	55.5	21	54.5
EZ302U	72	112	152.0	55.5	21	76.5
EZ303U	72	134	174.0	55.5	21	98.5
EZ401U	98	98	146.5	91.0	22	56.0
EZ402U	98	123	171.5	91.0	22	81.0
EZ404U	98	173	221.5	91.0	22	131.0
EZ501U	115	93	147.5	100.0	22	58.5
EZ502U	115	118	172.5	100.0	22	83.5
EZ503U	115	143	197.5	100.0	22	108.5
EZ505U	115	193	247.5	100.0	22	158.5
EZ701U	145	102	161.0	115.0	22	64.0
EZ702U	145	127	186.0	115.0	22	89.0
EZ703U	145	152	211.0	115.0	22	114.0
EZ705U	145	207	266.0	134.0	22	165.0
EZ802U	190	197	274.0	156.5	22	143.0
EZ803U	190	238	315.0	156.5	22	184.0
EZ805U	190	320	397.0	156.5	22	266.0

Dimensions of geared motors

Type	EZ3	EZ4	EZ5	EZ7	EZ8
	mp	mp	mp	mp	mp
PHQA421	–	51.0	53.5	–	–
PHQA422	103.0	99.5	102.0	–	–
PHQA521	–	–	57.0	63.0	–
PHQA522	–	112.5	115.0	121.0	–
PHQA721	–	–	–	–	77.0
PHQA722	–	–	128.0	134.0	149.0
PHQA723	–	183.5	186.0	192.0	–
PHQA822	–	–	–	169.0	184.0
PHQA823	–	–	229.0	235.0	–
PHQA932	–	–	–	–	249.5
PHQA933	–	–	–	319.0	334.0
PHQA1033	–	–	–	–	394.0

7.4 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

PHQA	7	2	2	F	0550	EZ501U

Explanation

Code	Designation	Design
PHQA	Type	Low-backlash planetary gear unit
7	Size	7 (example)
2 3	Generation	Generation 2 Generation 3
1 **2** 3	Stages	Single-stage Two-stage Three-stage
F	Shaft	Flange shaft
0550	Transmission ratio (i x 10)	i = 55 (example)
EZ501U	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 (for three-stage gear units), see Chapter [▸ 7.5.2]
- For reverse operation of the output shaft at ± 20° to ± 90° and horizontal installation, note Chapter [▸ 7.6.4]

7.5 Product description

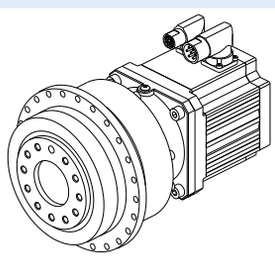
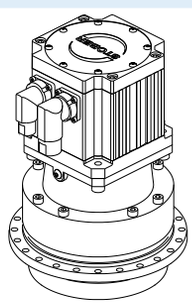
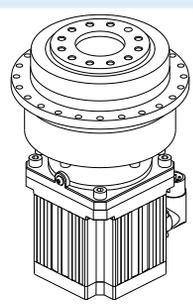
7.5.1 Installation conditions

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 Øb1 (H7).

7.5.2 Installation positions

The following table shows the standard installation positions.

Please indicate the installation position when ordering three-stage geared motors.

EL1	EL5	EL6
		
Horizontal output	Vertical downward output	Vertical upward output

7.5.3 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.

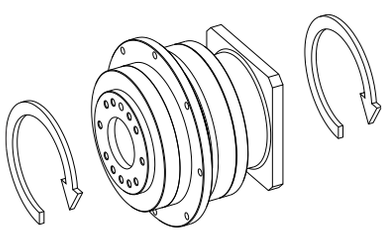
Lubricant filling quantities for gear units, document ID 441871, can be found online at http://www.stoeber.de

7.5.4 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
Protection class: [1] Gear unit Motor	 IP65 IP56, optionally IP66

7.5.5 Direction of rotation

The input and output rotate in the same direction.



7.6 Project configuration

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

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

Formula symbol	Unit	Explanation
a_{th}	–	Parameter for calculating $K_{mot,th}$
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

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

Formula symbol	Unit	Explanation
$F_{2rad,acc*}$	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
$M_{2k,acc*}$	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_{1maxDB}	min^{-1}	Maximum permitted input speed of the gear unit in continuous operation
n_{1maxZB}	min^{-1}	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

Formula symbol	Unit	Explanation
$n_{2m,1*} – n_{2m,6*}$	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

7.6.1 Calculation of the operating point

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

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

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

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

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

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

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

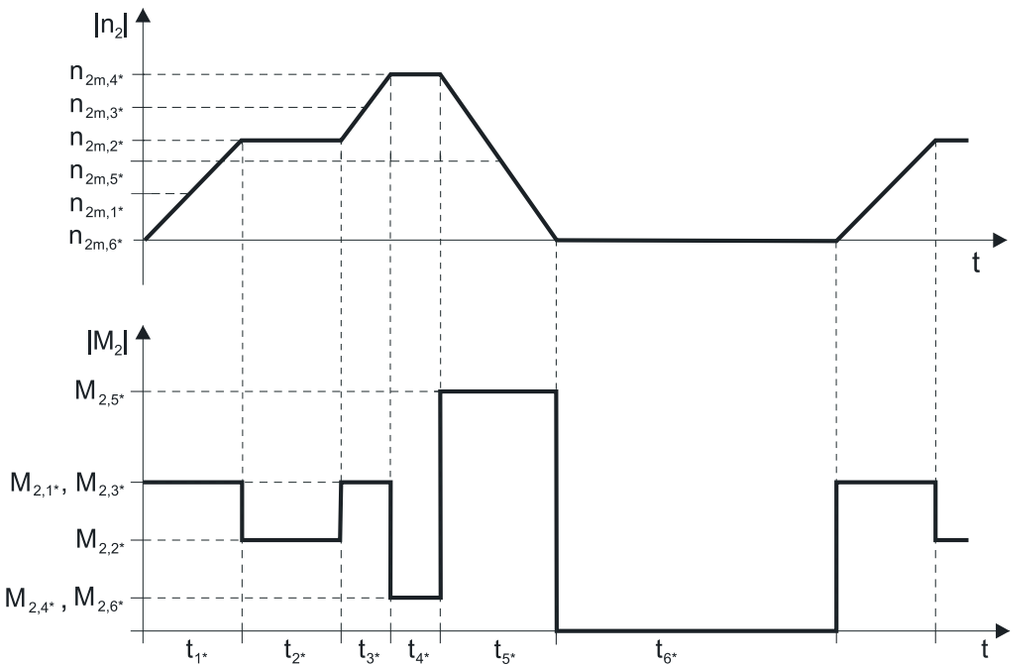
The values for n_{1maxDB}, n_{1maxZB}, M_{2acc}, M_{2NOT}, M_{2N} and S can be found in the selection tables.

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

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

Example of cycle sequence

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



Calculation of the actual average input speed

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

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

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

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

Calculation of the actual effective torque

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

Calculation of the actual equivalent torque

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

Calculation of the thermal limit torque

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

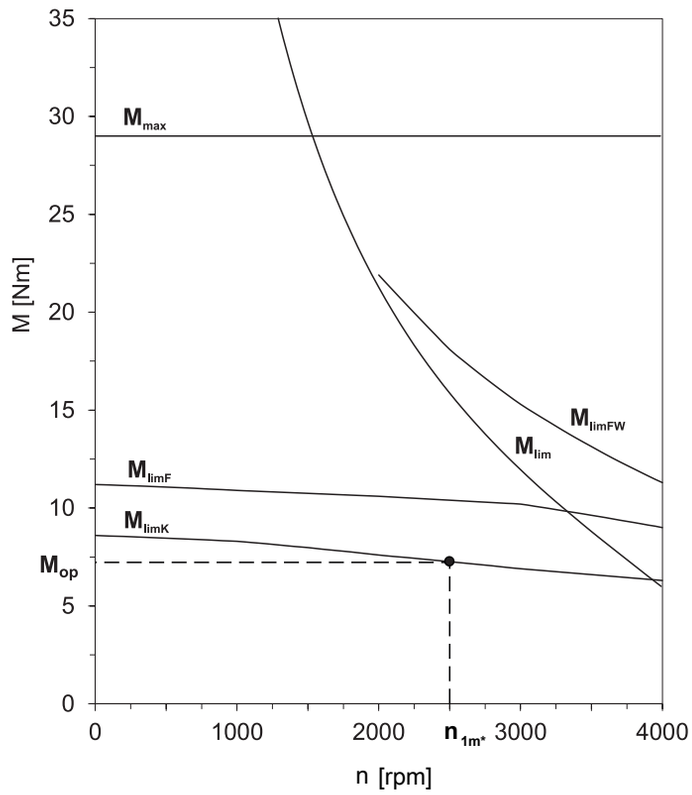
$$M_{2th} = M_{op} \cdot i \cdot K_{mot,th}$$

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

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 [▷ 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

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

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 forced ventilation	≤ 20 °C ≤ 30 °C ≤ 40 °C	0.9 1.0 1.15
Motor with convection cooling	≤ 20 °C ≤ 30 °C ≤ 40 °C	1.0 1.1 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.

7.6.2 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]
PHQA4	84.0	2150	3095	3929	260	330
PHQA5	97.0	4150	4536	4897	440	475
PHQA7	88.0	6150	17045	17045	1500	1500
PHQA8	126.0	10050	27778	33333	3500	4200
PHQA9	155.0	33000	48387	70968	7500	11000
PHQA10	171.0	50000	51462	73099	8800	12500
PHQA11	231.0	60000	47619	60606	11000	14000

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

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

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

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

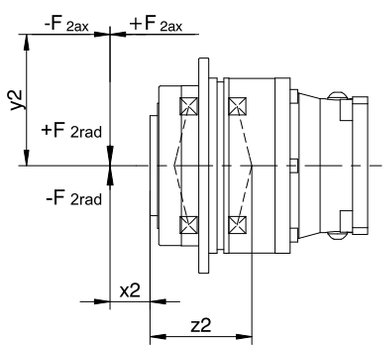


Fig. 1: Force application points

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 (x2 = 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:

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

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

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

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

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

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

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

For different duty cycles:

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

7.6.3 Radial shaft seal rings

Leak-proofness

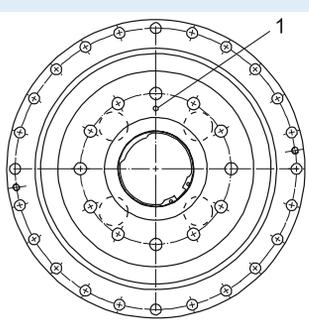
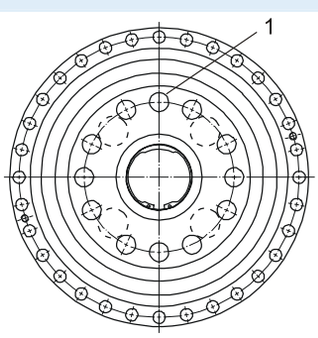
Our gear units are equipped with high-quality radial shaft seal rings and checked for leak-proofness. However, a leak cannot be fully ruled out over the length of use of the gear unit. If you use the gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact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

7.6.4 Reverse operation

To ensure lubrication for circulating gearing parts during cyclic reverse operation from ± 20° to ± 90°, pay careful attention to the position of the output shaft for the horizontal installation of the gear unit, as shown in the diagrams below.

The images show the center position of reverse operation.

Cyclic reverse operation ≤ ± 20° on request.

PHQA4 – PHQA8	PHQA9 – PHQA10
	
1 Position of the mark: top	1 Position of the fastening thread: as shown in the image

7.7 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