

Rack and pinion drives

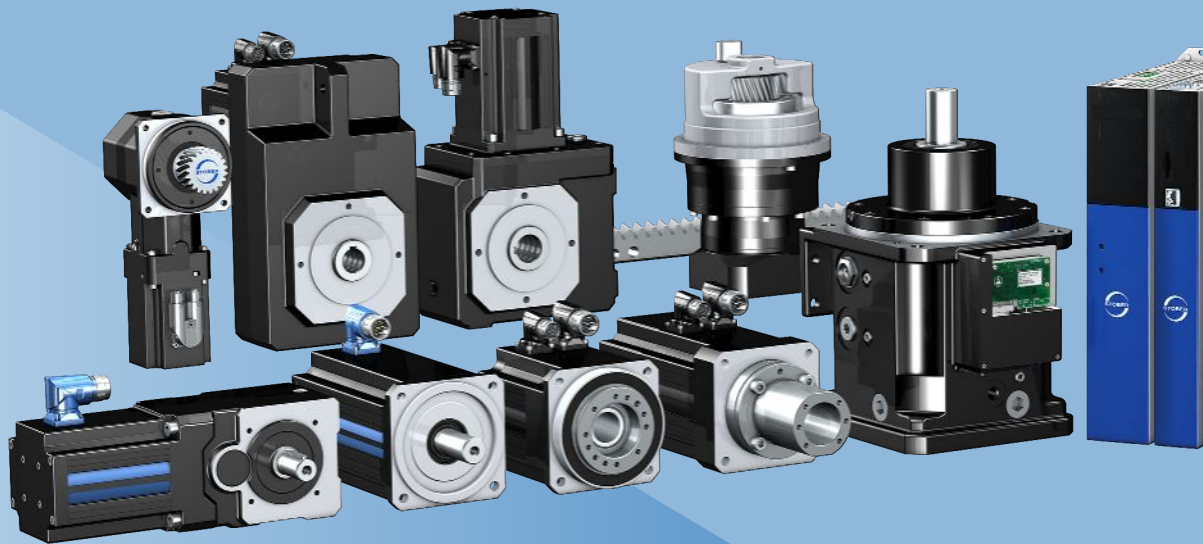
In cooperation with



Rack and pinion drives

STOBER drive technology for perfectionists

Sooner or later, design engineers never satisfied with the second-best solution end up at STOBER. That is because they can find everything here, with the broadest range of all imaginable drive technology components. Available with the highest level of design granularity to satisfy any individualized requirements perfectly. And the result is a complete STOBER system, from the gear rack and geared motor to open-loop or closed-loop control to intuitive project configuration software. With open interfaces based on established industry standards and reliably functioning communication between the individual components. The STOBER system also includes a complete package of services and practical support. Find out more on the following pages.



You can put your trust in STOBER

STOBER has been building excellent drive technology for more than 80 years. As a medium-sized, owner-operated company, STOBER understands the needs of its customers. Our company is down-to-earth, innovative, dynamic and focused on the customer. Our customers can find certified experts in every area, whether in research and development, production, technical consultation or design support. This goes beyond the technical qualifications. It also includes an equal measure of dedication, dependability and friendly, clear communication.







STOBER in motion

Despite our sense of tradition, we always enjoy something new. We continue to push ourselves forward and to refine our products further. We do this by implementing suggestions from real-world use, giving due consideration to customer requests and constantly seeking out even better solutions. This is all made possible by the competitive spirit with which we face every exciting challenge. The strong STOBER team spirit provides for productive collaboration. Both at work and outside the company doors. Our customers benefit from the extraordinary constancy of our employee base. This provides the astounding result where we can provide contacts familiar with a customer's industry and who can identify with a customer's needs.





The team that works well together wins

STOBER supplies the complete system: controller, automation, geared motors

STOBER has its roots in developing and building geared motors. We have also been developing and manufacturing drive controllers for decades. These STOBER components form drive systems with dependable functionality thanks to their plug-and-play design. Electronics and mechanical systems that speak the same language are critical for this. They understand each other without any adapters. All of the system components can recognize each other by their "electronic nameplate."



Systematic quality assurance

We check every single component and how it works together with others. Mass-producers are not able to do that. We assume responsibility for the complete system. This means certified operational reliability and the highest machine availability are guaranteed.

Technical system advantages

The STOBER system is flexible. One example is the freedom to choose between drive-based mode and controller-based mode. Or the feature allowing you to combine drive controllers in a multi-axis drive system and stand-alone controllers with special functions as you wish. This allows the modular design and free scalability of a drive system. This enables full utilization of capacity.



STOBER engineering software

Our AS6 engineering software based on Codesys plays a leading role in the STOBER system. The AS6 has a whole series of new and useful features integrated into it that make your work easier in every phase of the project. Comprehensive libraries provide direct access to STOBER products from every level of the drive system. You can find detailed technical information and have ready access to presets for standard functions.



STOBER is your partner

Our role does not end with the delivery of hardware and software. If you like, we will accompany and support you throughout your entire project. You can call on programming manpower at STOBER. Our experienced Codesys professionals will be happy to handle tricky special tasks or help you find the right template. This is even possible if components from other manufacturers are part of the bigger picture. You have direct, one-on-one contact with your project engineer. Your personal contact understands your needs and works with you to find the ideal solution.



You receive quick, professional feedback using the 24-hour hotline. You are not a number—you are our priority. We at STOBER do not have anything like a "service ticket."

Geographic proximity is also an intrinsic part of this personal contact. STOBER has four customer support centers throughout Germany. These support centers provide you with a high level of decision-making expertise. Your contacts have technical experience. And STOBER is international. We have 10 subsidiaries across 3 continents. This is also a valuable part of being near to our customers.

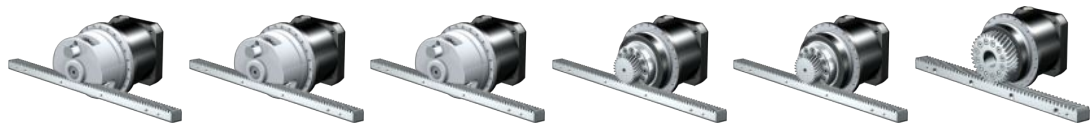


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1 Selection tool

1.1 Rack and pinion drives



Product chapter	ZTRSPH	ZTRSPHQ	ZTRSPHV	ZTRPH	ZTRPHV	ZRPH
Chapter number	[> 2]	[> 3]	[> 4]	[> 5]	[> 6]	[> 7]

Technical data

m_n	2 – 10 mm	8 – 10 mm	5 – 10 mm	2 – 8 mm	5 – 8 mm	2 – 4 mm
z	15 – 32	15 – 19	15 – 20	12 – 32	12 – 19	26 – 45
F_{f2acc}	16 – 94 kN	124 – 126 kN	61 – 94 kN	5.8 – 67 kN	56 – 67 kN	1.7 – 13 kN
$v_{f2maxZB}$	0.17 – 4.7 m/s	0.06 – 1.1 m/s	0.2 – 0.62 m/s	0.09 – 4.7 m/s	0.19 – 0.39 m/s	0.23 – 6.7 m/s
Δs	21 – 70 μ m	69 – 70 μ m	44 – 70 μ m	11 – 44 μ m	42 – 44 μ m	31 – 56 μ m

An explanation of the formula symbols can be found in the chapter [\[> 14.1 \]](#).

Features

Power density	★★★★★	★★★★★	★★★★★	★★★★☆	★★★★☆	★★★☆☆
Linear backlash	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★☆☆
Price category	€€€€€	€€€€€	€€€€€	€€€€	€€€€	€€€
Smooth operation	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Linear rigidity	★★★★★	★★★★★	★★★★★	★★★★☆	★★★★☆	★★★☆☆
Mass moment of inertia	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆
Key:	★★★★☆☆ good ★★★★★★ excellent € Economy €€€€€ Premium					

Pinion gearing						
Helical gearing	✓	✓	✓	✓	✓	✓
Gearing quality	5	5	5	5	5	5
Accessories						
Felt gear	✓	✓	✓	✓	✓	

ATLANTA gear racks

All gear racks suitable for our products are available from our cooperation partner, Atlanta.

<http://atlantagmbh.de/>

1 Selection tool

1.1 Rack and pinion drives



Product chapter

ZVP

ZVPA

ZVPE

Chapter number

[8]

[9]

[10]

Technical data

m_n	2 – 4 mm	2 – 4 mm	2 – 3 mm
z	16 – 25	16 – 25	16 – 25
F_{f2acc}	2 – 15 kN	2 – 15 kN	2 – 6.3 kN
$v_{f2maxZB}$	0.14 – 4.9 m/s	0.14 – 4.9 m/s	0.11 – 4.5 m/s
Δs	20 – 44 μm	8 – 22 μm	40 – 83 μm

An explanation of the formula symbols can be found in the chapter [14.1].

Features

Power density	★★★☆☆	★★★☆☆	★★☆☆☆
Linear backlash	★★★★☆	★★★★★	★★☆☆☆
Price category	€€	€€€	€
Smooth operation	★★★★☆	★★★★★	★★★☆☆
Linear rigidity	★★★☆☆	★★★☆☆	★★☆☆☆
Mass moment of inertia	★★★★☆	★★★★★	★★★★☆
Key:	★★☆☆☆☆ good ★★★★★★ excellent € Economy €€€€€ Premium		

Pinion gearing			
Helical gearing	✓	✓	✓
Gearing quality	7	7	7
Bearing design			
Standard	✓		✓
Axially reinforced	✓	✓	

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<http://atlantagmbh.de/>

1 Selection tool

1.1 Rack and pinion drives



Product chapter

ZVKS

ZVKL

ZVK

Chapter number

[> 11]

[> 12]

[> 13]

Technical data

m_n	2 – 4 mm	2 mm	2 – 4 mm
z	18 – 25	16 – 20	18 – 25
F_{f2acc}	4.2 – 11 kN	1.3 – 2.9 kN	1.6 – 15 kN
$v_{f2maxZB}$	0.07 – 3 m/s	0.33 – 2.8 m/s	0.05 – 3.5 m/s
Δs	31 – 44 μm	99 – 123 μm	12 – 111 μm

An explanation of the formula symbols can be found in the chapter [> 14.1].

Features

Power density	★★★☆☆	★★☆☆☆	★☆☆☆☆
Linear backlash	★★★☆☆	★☆☆☆☆	★★★★☆
Price category	€€€	€	€
Smooth operation	★★★★☆	★★☆☆☆	★★★★☆
Linear rigidity	★★★☆☆	★☆☆☆☆	★☆☆☆☆
Mass moment of inertia	★★★★☆	★★★★☆	★★★★☆
Key:	★☆☆☆☆ good ★★★★★ excellent € Economy €€€€€ Premium		

Pinion gearing			
Helical gearing	✓	✓	✓
Gearing quality	7	7	7

ATLANTA gear racks

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<http://atlantagmbh.de/>

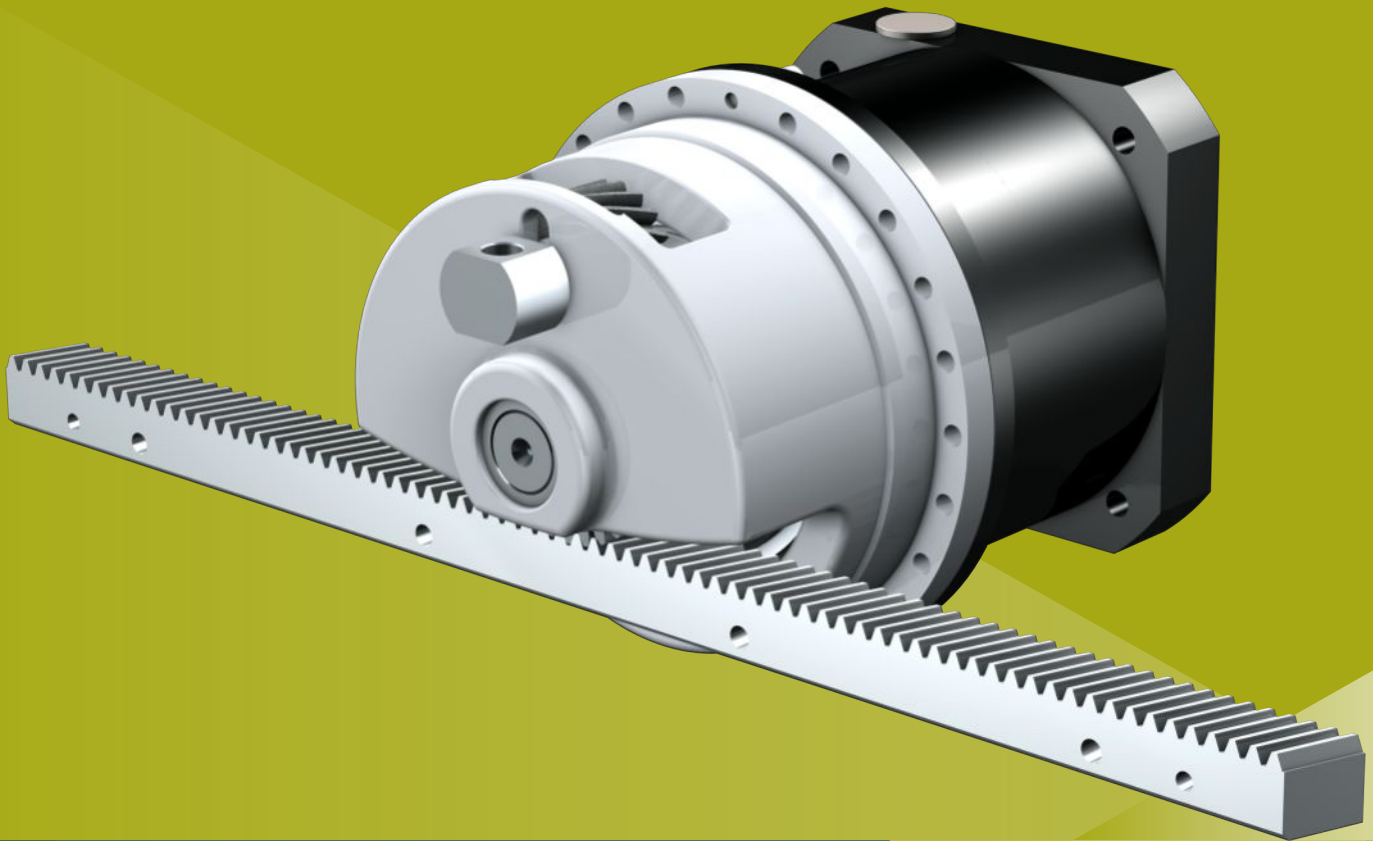
1 Selection tool

1.1 Rack and pinion drives

2 ZTRSPH rack and pinion drives

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2 Rack and pinion drives

ZTRSPH

2.1 Overview

High-performance precision planetary gear units with supporting bearing holder

Features

Power density	★★★★★
Linear clearance	★★★★☆
Price category	€€€€€
Smooth operation	★★★★☆
Linear rigidity	★★★★★
Mass moment of inertia	★★★★☆
Ready-to-install drive solution	✓
Pinion gearing quality 5 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓
Radial runout ≤ 10 μm (optional)	✓

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

Technical data

m_n	2 – 10 mm
z	15 – 32
F_{f2acc}	16 – 94 kN
$V_{f2maxZB}$	0.17 – 4.7 m/s
Δs	21 – 70 μm

2.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 2.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [mm]	C_{lin} [N/μm]	m_n [mm]	z	d_0 [mm]	F_{f2N} [kN]	F_{f2acc} [kN]	F_{f2NOT} [kN]	M_{2acc} [Nm]
ZTRS2PH7 ($F_{f2acc,max} = 16$ kN)														
4.000	ZTRS223SPH721_0040 ME	1900	4000	≤38	2.56	0.021	173	2	23	48.8	7.1	16	32	390
4.000	ZTRS223SPH721_0040 MEL	1900	4000	≤48	2.56	0.021	177	2	23	48.8	7.1	16	32	390
5.000	ZTRS223SPH721_0050 ME	2200	5000	≤38	2.56	0.021	176	2	23	48.8	7.6	16	32	390
5.000	ZTRS223SPH721_0050 MEL	2200	5000	≤48	2.56	0.021	179	2	23	48.8	7.6	16	32	390
7.000	ZTRS223SPH721_0070 ME	2500	5000	≤38	1.83	0.021	174	2	23	48.8	8.5	16	32	390
7.000	ZTRS223SPH721_0070 MEL	2500	5000	≤48	1.83	0.021	175	2	23	48.8	8.5	16	32	390
10.000	ZTRS223SPH721_0100 ME	3000	5000	≤38	1.28	0.021	164	2	23	48.8	9.6	16	32	390
10.000	ZTRS223SPH721_0100 MEL	3000	5000	≤48	1.28	0.021	165	2	23	48.8	9.6	16	32	390
16.000	ZTRS223SPH722_0160 ME	3000	5000	≤32	0.80	0.021	170	2	23	48.8	11	16	32	390
16.000	ZTRS223SPH722_0160 MEL	3000	5000	≤38	0.80	0.021	171	2	23	48.8	11	16	32	390
20.000	ZTRS223SPH722_0200 ME	3000	5000	≤32	0.64	0.021	174	2	23	48.8	12	16	32	390
20.000	ZTRS223SPH722_0200 MEL	3000	5000	≤38	0.64	0.021	174	2	23	48.8	12	16	32	390
25.000	ZTRS223SPH722_0250 ME	3500	6000	≤32	0.61	0.021	174	2	23	48.8	13	16	32	390
25.000	ZTRS223SPH722_0250 MEL	3500	6000	≤38	0.61	0.021	174	2	23	48.8	13	16	32	390
28.000	ZTRS223SPH722_0280 ME	3700	6500	≤32	0.59	0.021	169	2	23	48.8	13	16	32	390
28.000	ZTRS223SPH722_0280 MEL	3700	6500	≤38	0.59	0.021	170	2	23	48.8	13	16	32	390
35.000	ZTRS223SPH722_0350 ME	3700	6500	≤32	0.48	0.021	174	2	23	48.8	13	16	32	390
35.000	ZTRS223SPH722_0350 MEL	3700	6500	≤38	0.48	0.021	174	2	23	48.8	13	16	32	390
40.000	ZTRS223SPH722_0400 ME	3700	6500	≤32	0.42	0.021	168	2	23	48.8	13	16	32	390
40.000	ZTRS223SPH722_0400 MEL	3700	6500	≤38	0.42	0.021	168	2	23	48.8	13	16	32	390
50.000	ZTRS223SPH722_0500 ME	3700	6500	≤32	0.33	0.021	173	2	23	48.8	13	16	32	390
50.000	ZTRS223SPH722_0500 MEL	3700	6500	≤38	0.33	0.021	173	2	23	48.8	13	16	32	390
70.000	ZTRS223SPH722_0700 ME	3700	6500	≤32	0.24	0.021	173	2	23	48.8	13	16	32	390
70.000	ZTRS223SPH722_0700 MEL	3700	6500	≤38	0.24	0.021	173	2	23	48.8	13	16	32	390
100.000	ZTRS223SPH722_1000 ME	3700	6500	≤32	0.17	0.021	164	2	23	48.8	12	16	32	390
100.000	ZTRS223SPH722_1000 MEL	3700	6500	≤38	0.17	0.021	164	2	23	48.8	12	16	32	390
ZTRS3PH7 ($F_{f2acc,max} = 20$ kN)														
4.000	ZTRS317SPH721_0040 ME	1900	4000	≤38	2.83	0.024	170	3	17	54.1	7.0	20	36	550
4.000	ZTRS317SPH721_0040 MEL	1900	4000	≤48	2.83	0.024	174	3	17	54.1	7.0	20	36	550
5.000	ZTRS317SPH721_0050 ME	2200	5000	≤38	2.83	0.024	173	3	17	54.1	7.5	20	36	550
5.000	ZTRS317SPH721_0050 MEL	2200	5000	≤48	2.83	0.024	176	3	17	54.1	7.5	20	36	550
7.000	ZTRS317SPH721_0070 ME	2500	5000	≤38	2.02	0.024	170	3	17	54.1	8.4	20	36	550
7.000	ZTRS317SPH721_0070 MEL	2500	5000	≤48	2.02	0.024	172	3	17	54.1	8.4	20	36	550
10.000	ZTRS317SPH721_0100 ME	3000	5000	≤38	1.42	0.024	159	3	17	54.1	9.5	18	36	500
10.000	ZTRS317SPH721_0100 MEL	3000	5000	≤48	1.42	0.024	160	3	17	54.1	9.5	18	36	500
16.000	ZTRS317SPH722_0160 ME	3000	5000	≤32	0.89	0.024	166	3	17	54.1	11	20	36	550
16.000	ZTRS317SPH722_0160 MEL	3000	5000	≤38	0.89	0.024	167	3	17	54.1	11	20	36	550
20.000	ZTRS317SPH722_0200 ME	3000	5000	≤32	0.71	0.024	171	3	17	54.1	12	20	36	550
20.000	ZTRS317SPH722_0200 MEL	3000	5000	≤38	0.71	0.024	171	3	17	54.1	12	20	36	550
25.000	ZTRS317SPH722_0250 ME	3500	6000	≤32	0.68	0.024	171	3	17	54.1	13	20	36	550
25.000	ZTRS317SPH722_0250 MEL	3500	6000	≤38	0.68	0.024	171	3	17	54.1	13	20	36	550
28.000	ZTRS317SPH722_0280 ME	3700	6500	≤32	0.66	0.024	165	3	17	54.1	13	20	36	550
28.000	ZTRS317SPH722_0280 MEL	3700	6500	≤38	0.66	0.024	165	3	17	54.1	13	20	36	550
35.000	ZTRS317SPH722_0350 ME	3700	6500	≤32	0.53	0.024	170	3	17	54.1	13	20	36	550
35.000	ZTRS317SPH722_0350 MEL	3700	6500	≤38	0.53	0.024	170	3	17	54.1	13	20	36	550
40.000	ZTRS317SPH722_0400 ME	3700	6500	≤32	0.46	0.024	164	3	17	54.1	13	20	36	550
40.000	ZTRS317SPH722_0400 MEL	3700	6500	≤38	0.46	0.024	164	3	17	54.1	13	20	36	550
50.000	ZTRS317SPH722_0500 ME	3700	6500	≤32	0.37	0.024	169	3	17	54.1	13	20	36	550
50.000	ZTRS317SPH722_0500 MEL	3700	6500	≤38	0.37	0.024	169	3	17	54.1	13	20	36	550
70.000	ZTRS317SPH722_0700 ME	3700	6500	≤32	0.26	0.024	169	3	17	54.1	13	20	36	550

i	Type	n_{1maxDB}	n_{1maxZB}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	F_{f2N}	F_{f2acc}	F_{f2NOT}	M_{2acc}
		[rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/μm]	[mm]						
ZTRS4PH8 ($F_{f2acc,max} = 45$ kN)														
16.00	ZTRS420SPH822_0160 MEL	2500	4500	≤48	1.25	0.037	269	4	20	84.9	26	45	56	1900
20.00	ZTRS420SPH822_0200 ME	2500	4500	≤38	1.00	0.037	270	4	20	84.9	29	45	56	1900
20.00	ZTRS420SPH822_0200 MEL	2500	4500	≤48	1.00	0.037	271	4	20	84.9	29	45	56	1900
25.00	ZTRS420SPH822_0250 ME	3000	5500	≤38	0.98	0.037	275	4	20	84.9	29	45	56	1900
25.00	ZTRS420SPH822_0250 MEL	3000	5500	≤48	0.98	0.037	276	4	20	84.9	29	45	56	1900
28.00	ZTRS420SPH822_0280 ME	3300	6000	≤38	0.95	0.037	266	4	20	84.9	26	45	56	1900
28.00	ZTRS420SPH822_0280 MEL	3300	6000	≤48	0.95	0.037	267	4	20	84.9	26	45	56	1900
35.00	ZTRS420SPH822_0350 ME	3300	6000	≤38	0.76	0.037	270	4	20	84.9	29	45	56	1900
35.00	ZTRS420SPH822_0350 MEL	3300	6000	≤48	0.76	0.037	270	4	20	84.9	29	45	56	1900
40.00	ZTRS420SPH822_0400 ME	3300	6000	≤38	0.67	0.037	264	4	20	84.9	26	45	56	1900
40.00	ZTRS420SPH822_0400 MEL	3300	6000	≤48	0.67	0.037	264	4	20	84.9	26	45	56	1900
50.00	ZTRS420SPH822_0500 ME	3300	6000	≤38	0.53	0.037	268	4	20	84.9	29	45	56	1900
50.00	ZTRS420SPH822_0500 MEL	3300	6000	≤48	0.53	0.037	268	4	20	84.9	29	45	56	1900
70.00	ZTRS420SPH822_0700 ME	3300	6000	≤38	0.38	0.037	265	4	20	84.9	24	38	56	1600
70.00	ZTRS420SPH822_0700 MEL	3300	6000	≤48	0.38	0.037	265	4	20	84.9	24	38	56	1600
100.0	ZTRS420SPH822_1000 ME	3300	6000	≤38	0.27	0.037	235	4	20	84.9	19	28	56	1200
100.0	ZTRS420SPH822_1000 MEL	3300	6000	≤48	0.27	0.037	235	4	20	84.9	19	28	56	1200
ZTRS5PH8 ($F_{f2acc,max} = 43$ kN)														
4.000	ZTRS516SPH821_0040 ME	1500	3500	≤48	3.89	0.037	273	5	16	84.9	18	38	54	1600
4.000	ZTRS516SPH821_0040 MEL	1500	3500	≤55	3.89	0.037	299	5	16	84.9	18	38	54	1600
5.000	ZTRS516SPH821_0050 ME	1700	4000	≤48	3.56	0.037	277	5	16	84.9	19	40	54	1700
5.000	ZTRS516SPH821_0050 MEL	1700	4000	≤55	3.56	0.037	294	5	16	84.9	19	40	54	1700
7.000	ZTRS516SPH821_0070 ME	2000	4000	≤48	2.54	0.037	272	5	16	84.9	22	38	54	1600
7.000	ZTRS516SPH821_0070 MEL	2000	4000	≤55	2.54	0.037	282	5	16	84.9	22	38	54	1600
10.00	ZTRS516SPH821_0100 ME	2500	4000	≤48	1.78	0.037	242	5	16	84.9	19	28	54	1200
10.00	ZTRS516SPH821_0100 MEL	2500	4000	≤55	1.78	0.037	246	5	16	84.9	19	28	54	1200
16.00	ZTRS516SPH822_0160 ME	2500	4500	≤38	1.25	0.037	277	5	16	84.9	26	43	54	1840
16.00	ZTRS516SPH822_0160 MEL	2500	4500	≤48	1.25	0.037	279	5	16	84.9	26	43	54	1840
20.00	ZTRS516SPH822_0200 ME	2500	4500	≤38	1.00	0.037	280	5	16	84.9	29	43	54	1840
20.00	ZTRS516SPH822_0200 MEL	2500	4500	≤48	1.00	0.037	281	5	16	84.9	29	43	54	1840
25.00	ZTRS516SPH822_0250 ME	3000	5500	≤38	0.98	0.037	286	5	16	84.9	29	43	54	1840
25.00	ZTRS516SPH822_0250 MEL	3000	5500	≤48	0.98	0.037	287	5	16	84.9	29	43	54	1840
28.00	ZTRS516SPH822_0280 ME	3300	6000	≤38	0.95	0.037	276	5	16	84.9	26	43	54	1840
28.00	ZTRS516SPH822_0280 MEL	3300	6000	≤48	0.95	0.037	277	5	16	84.9	26	43	54	1840
35.00	ZTRS516SPH822_0350 ME	3300	6000	≤38	0.76	0.037	279	5	16	84.9	29	43	54	1840
35.00	ZTRS516SPH822_0350 MEL	3300	6000	≤48	0.76	0.037	280	5	16	84.9	29	43	54	1840
40.00	ZTRS516SPH822_0400 ME	3300	6000	≤38	0.67	0.037	273	5	16	84.9	26	43	54	1840
40.00	ZTRS516SPH822_0400 MEL	3300	6000	≤48	0.67	0.037	274	5	16	84.9	26	43	54	1840
50.00	ZTRS516SPH822_0500 ME	3300	6000	≤38	0.53	0.037	278	5	16	84.9	29	43	54	1840
50.00	ZTRS516SPH822_0500 MEL	3300	6000	≤48	0.53	0.037	278	5	16	84.9	29	43	54	1840
70.00	ZTRS516SPH822_0700 ME	3300	6000	≤38	0.38	0.037	274	5	16	84.9	24	38	54	1600
70.00	ZTRS516SPH822_0700 MEL	3300	6000	≤48	0.38	0.037	274	5	16	84.9	24	38	54	1600
100.0	ZTRS516SPH822_1000 ME	3300	6000	≤38	0.27	0.037	243	5	16	84.9	19	28	54	1200
100.0	ZTRS516SPH822_1000 MEL	3300	6000	≤48	0.27	0.037	243	5	16	84.9	19	28	54	1200
ZTRS5PH9 ($F_{f2acc,max} = 77$ kN)														
12.00	ZTRS520SPH932_0120 ME	1800	3000	≤48	1.39	0.046	388	5	20	106.1	39	77	127	4080
12.00	ZTRS520SPH932_0120 MEL	1800	3000	≤60	1.39	0.046	396	5	20	106.1	39	77	127	4080
16.00	ZTRS520SPH932_0160 ME	2200	3500	≤48	1.22	0.046	391	5	20	106.1	43	77	154	4080
16.00	ZTRS520SPH932_0160 MEL	2200	3500	≤60	1.22	0.046	395	5	20	106.1	43	77	154	4080
18.00	ZTRS520SPH932_0180 ME	1800	3000	≤48	0.93	0.046	385	5	20	106.1	45	77	154	4080
18.00	ZTRS520SPH932_0180 MEL	1800	3000	≤60	0.93	0.046	389	5	20	106.1	45	77	154	4080
20.00	ZTRS520SPH932_0200 ME	2500	4000	≤48	1.11	0.046	391	5	20	106.1	47	77	154	4080
20.00	ZTRS520SPH932_0200 MEL	2500	4000	≤60	1.11	0.046	394	5	20	106.1	47	77	154	4080
24.00	ZTRS520SPH932_0240 ME	2200	3500	≤48	0.81	0.046	386	5	20	106.1	50	77	154	4080
24.00	ZTRS520SPH932_0240 MEL	2200	3500	≤60	0.81	0.046	388	5	20	106.1	50	77	154	4080
28.00	ZTRS520SPH932_0280 ME	2800	4500	≤48	0.89	0.046	389	5	20	106.1	50	77	154	4080
28.00	ZTRS520SPH932_0280 MEL	2800	4500	≤55	0.89	0.046	391	5	20	106.1	50	77	154	4080
30.00	ZTRS520SPH932_0300 ME	2500	4000	≤48	0.74	0.046	386	5	20	106.1	50	77	154	4080
30.00	ZTRS520SPH932_0300 MEL	2500	4000	≤60	0.74	0.046	388	5	20	106.1	50	77	154	4080
32.00	ZTRS520SPH932_0320 ME	2800	4500	≤48	0.78	0.046	386	5	20	106.1	50	77	154	4080
32.00	ZTRS520SPH932_0320 MEL	2800	4500	≤55	0.78	0.046	387	5	20	106.1	50	77	154	4080
40.00	ZTRS520SPH932_0400 ME	2800	4500	≤48	0.63	0.046	381	5	20	106.1	50	77	154	4080
40.00	ZTRS520SPH932_0400 MEL	2800	4500	≤55	0.63	0.046	382	5	20	106.1	50	77	154	4080
42.00	ZTRS520SPH932_0420 ME	2800	4500	≤48	0.60	0.046	386	5	20	106.1	50	77	154	4080
42.00	ZTRS520SPH932_0420 MEL	2800	4500	≤55	0.60	0.046	386	5	20	106.1	50	77	154	4080
48.00	ZTRS520SPH932_0480 ME	2800	4500	≤48	0.52	0.046	384	5	20	106.1	50	77	154	4080

i	Type	n_{1maxDB}	n_{1maxZB}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	F_{f2N}	F_{f2acc}	F_{f2NOT}	M_{2acc}
		[rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/ μ m]	[mm]		[mm]	[kN]	[kN]	[kN]	[Nm]
ZTRS8PH9 ($F_{f2acc,max} = 79$ kN)														
30.00	ZTRS815SPH932_0300 MEL	2500	4000	≤60	0.89	0.056	377	8	15	127.3	47	71	141	4500
32.00	ZTRS815SPH932_0320 ME	2800	4500	≤48	0.94	0.056	375	8	15	127.3	47	72	141	4610
32.00	ZTRS815SPH932_0320 MEL	2800	4500	≤55	0.94	0.056	377	8	15	127.3	47	72	141	4610
40.00	ZTRS815SPH932_0400 ME	2800	4500	≤48	0.75	0.056	368	8	15	127.3	42	72	141	4610
40.00	ZTRS815SPH932_0400 MEL	2800	4500	≤55	0.75	0.056	369	8	15	127.3	42	72	141	4610
42.00	ZTRS815SPH932_0420 ME	2800	4500	≤48	0.71	0.056	374	8	15	127.3	47	71	141	4500
42.00	ZTRS815SPH932_0420 MEL	2800	4500	≤55	0.71	0.056	375	8	15	127.3	47	71	141	4500
48.00	ZTRS815SPH932_0480 ME	2800	4500	≤48	0.63	0.056	372	8	15	127.3	47	71	141	4500
48.00	ZTRS815SPH932_0480 MEL	2800	4500	≤55	0.63	0.056	373	8	15	127.3	47	71	141	4500
60.00	ZTRS815SPH932_0600 ME	2800	4500	≤48	0.50	0.056	369	8	15	127.3	47	71	141	4500
60.00	ZTRS815SPH932_0600 MEL	2800	4500	≤55	0.50	0.056	370	8	15	127.3	47	71	141	4500
ZTRS8PH10 ($F_{f2acc,max} = 93$ kN)														
18.00	ZTRS819SPH1032_0180 ME	1800	3000	≤48	1.41	0.070	316	8	19	161.3	57	86	125	6910
18.00	ZTRS819SPH1032_0180 MEL	1800	3000	≤60	1.41	0.070	322	8	19	161.3	57	86	125	6910
24.00	ZTRS819SPH1032_0240 ME	2200	3500	≤48	1.23	0.070	318	8	19	161.3	57	93	167	7500
24.00	ZTRS819SPH1032_0240 MEL	2200	3500	≤60	1.23	0.070	321	8	19	161.3	57	93	167	7500
30.00	ZTRS819SPH1032_0300 ME	2500	4000	≤48	1.13	0.070	318	8	19	161.3	62	93	186	7500
30.00	ZTRS819SPH1032_0300 MEL	2500	4000	≤60	1.13	0.070	320	8	19	161.3	62	93	186	7500
42.00	ZTRS819SPH1032_0420 ME	2800	4500	≤48	0.91	0.070	317	8	19	161.3	62	93	186	7500
42.00	ZTRS819SPH1032_0420 MEL	2800	4500	≤55	0.91	0.070	318	8	19	161.3	62	93	186	7500
48.00	ZTRS819SPH1032_0480 ME	2800	4500	≤48	0.79	0.070	315	8	19	161.3	57	86	171	6910
48.00	ZTRS819SPH1032_0480 MEL	2800	4500	≤55	0.79	0.070	316	8	19	161.3	57	86	171	6910
60.00	ZTRS819SPH1032_0600 ME	2800	4500	≤48	0.63	0.070	311	8	19	161.3	50	86	171	6910
60.00	ZTRS819SPH1032_0600 MEL	2800	4500	≤55	0.63	0.070	312	8	19	161.3	50	86	171	6910
ZTRS10PH10 ($F_{f2acc,max} = 94$ kN)														
18.00	ZTRS1015SPH1032_0180 ME	1800	3000	≤48	1.39	0.069	340	10	15	159.2	58	87	127	6910
18.00	ZTRS1015SPH1032_0180 MEL	1800	3000	≤60	1.39	0.069	346	10	15	159.2	58	87	127	6910
24.00	ZTRS1015SPH1032_0240 ME	2200	3500	≤48	1.22	0.069	342	10	15	159.2	58	94	169	7500
24.00	ZTRS1015SPH1032_0240 MEL	2200	3500	≤60	1.22	0.069	346	10	15	159.2	58	94	169	7500
30.00	ZTRS1015SPH1032_0300 ME	2500	4000	≤48	1.11	0.069	342	10	15	159.2	63	94	188	7500
30.00	ZTRS1015SPH1032_0300 MEL	2500	4000	≤60	1.11	0.069	345	10	15	159.2	63	94	188	7500
42.00	ZTRS1015SPH1032_0420 ME	2800	4500	≤48	0.89	0.069	341	10	15	159.2	63	94	188	7500
42.00	ZTRS1015SPH1032_0420 MEL	2800	4500	≤55	0.89	0.069	342	10	15	159.2	63	94	188	7500
48.00	ZTRS1015SPH1032_0480 ME	2800	4500	≤48	0.78	0.069	338	10	15	159.2	58	87	174	6910
48.00	ZTRS1015SPH1032_0480 MEL	2800	4500	≤55	0.78	0.069	340	10	15	159.2	58	87	174	6910
60.00	ZTRS1015SPH1032_0600 ME	2800	4500	≤48	0.63	0.069	335	10	15	159.2	51	87	174	6910
60.00	ZTRS1015SPH1032_0600 MEL	2800	4500	≤55	0.63	0.069	335	10	15	159.2	51	87	174	6910

2.3 Dimensional drawings

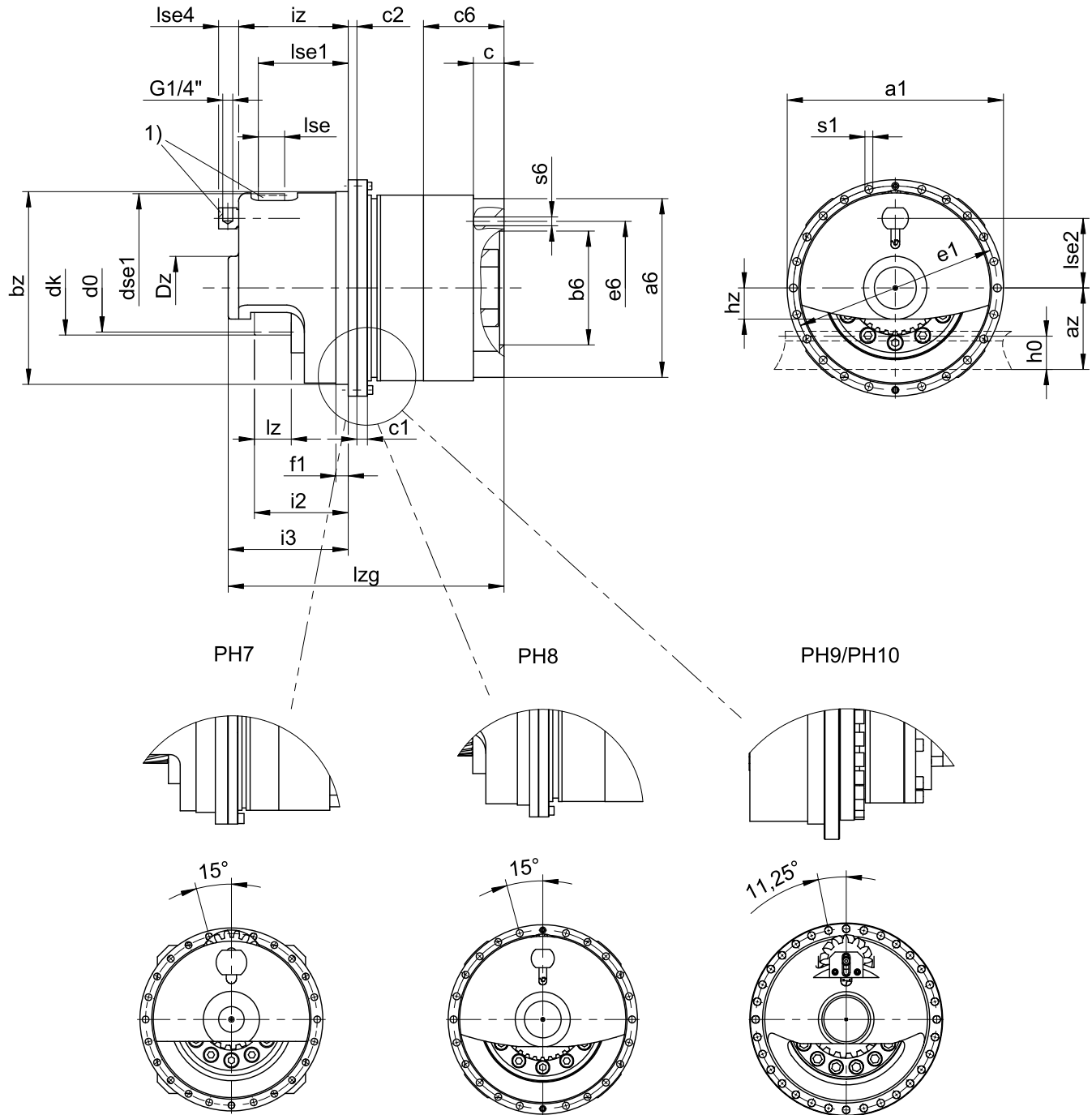
In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

Dimension a_z in the tables of dimensions applies to Atlanta gear racks. In general: $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.



1) Felt pinion for lubrication (optional)

Output dimensions

Type	mn	Øa1	az	Øbz	c1	c2	d0	dk	dse1	Dz	Øe1	f1	i2	i3	iz	h0	hz	lz	lse	lse1	lse2	lse4	Øs1	x
ZTRS223SPH7_	2	179	46.40	156 _{h7}	10	12	48.81	52.8	42.4	55	168	19.0	72.0	93.0	83.0	22	21.5	26.0	25	73.7	43.5	23.0	6.6	0.0
ZTRS317SPH7_	3	179	53.06	156 _{h7}	10	12	54.11	60.1	63.6	55	168	19.0	78.5	99.5	89.5	26	21.5	32.5	25	75.2	55.7	23.0	6.6	0.0
ZTRS326SPH8_	3	247	67.38	220 _{h7}	12	10	82.76	88.6	63.6	72	233	14.0	107.0	137.0	125.0	26	35.5	42.0	30	102.6	70.0	23.0	9.0	0.0
ZTRS332SPH8_	3	247	76.93	220 _{h7}	12	10	101.86	107.9	63.6	72	233	14.0	107.0	137.0	125.0	26	35.5	42.0	30	102.6	79.5	23.0	9.0	0.0
ZTRS420SPH8_	4	247	77.44	220 _{h7}	12	10	84.88	92.8	62.8	72	233	14.0	110.0	137.0	125.0	35	35.5	45.0	30	98.6	68.9	23.0	9.0	0.0
ZTRS516SPH8_	5	247	76.44	220 _{h7}	12	10	84.88	94.8	78.6	72	233	14.0	120.0	147.0	135.0	34	35.5	55.0	30	109.6	76.5	23.0	9.0	0.0
ZTRS520SPH9_	5	346	87.05	300 _{h7}	18	18	106.10	116.1	78.6	100	325	21.5	137.0	179.0	171.0	34	45.0	55.0	30	131.1	87.1	–	13.5	0.0
ZTRS616SPH9_	6	346	93.93	300 _{h7}	18	18	101.86	113.8	94.2	100	325	21.5	147.0	189.0	181.0	43	43.5	65.0	30	131.1	91.8	–	13.5	0.0
ZTRS620SPH9_	6	346	106.66	300 _{h7}	18	18	127.32	139.3	94.3	100	325	21.5	147.0	189.0	181.0	43	43.5	65.0	30	131.1	104.8	–	13.5	0.0
ZTRS815SPH9_	8	346	136.66	300 _{h7}	18	18	127.32	147.3	160.0	110	325	21.5	162.0	204.7	196.5	71	55.0	80.0	65	162.0	137.7	5.5	13.5	0.3
ZTRS819SPH10_	8	380	151.64	340 _{h7}	20	20	161.28	177.3	160.0	110	360	21.5	212.0	260.0	251.9	71	55.0	100.0	65	211.7	152.8	–	13.5	0.0
ZTRS1015SPH10_	10	380	171.08	340 _{h7}	20	20	159.16	184.2	157.3	110	360	21.5	212.0	260.0	251.9	89	55.0	100.0	65	211.7	151.1	–	13.5	0.3

Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZTRS2_PH721_	150	130.0 ^{H7}	165	26	76	231.0	M10
ZTRS3_PH721_	150	130.0 ^{H7}	165	26	76	237.5	M10
ZTRS2_PH722_	120	110.0 ^{H7}	130	24	67.5	284.5	M8
ZTRS3_PH722_	120	110.0 ^{H7}	130	24	67.5	291.0	M8
ZTRS3_PH821_	204	180.0 ^{H7}	215	35	92	315.0	M12
ZTRS4_PH821_	204	180.0 ^{H7}	215	35	92	315.0	M12
ZTRS5_PH821_	204	180.0 ^{H7}	215	35	92	325.0	M12
ZTRS3_PH822_	150	130.0 ^{H7}	165	26	80	378.0	M10
ZTRS4_PH822_	150	130.0 ^{H7}	165	26	80	378.0	M10
ZTRS5_PH822_	150	130.0 ^{H7}	165	26	80	388.0	M10
ZTRS5_PH932_	204	180.0 ^{H7}	215	35	94	515.5	M12
ZTRS6_PH932_	204	180.0 ^{H7}	215	35	94	525.5	M12
ZTRS8_PH932_	204	180.0 ^{H7}	215	35	94	541.2	M12
ZTRS8_PH1032_	204	180.0 ^{H7}	215	35	94	606.0	M12
ZTRS10_PH1032_	204	180.0 ^{H7}	215	35	94	606.0	M12

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEGER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

2.4 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.

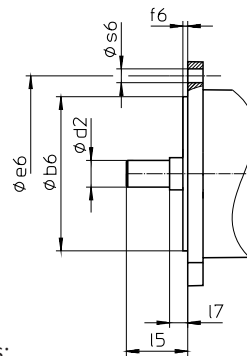
Sample code

Z	TRS	3	17	S	PH	7	2	1	F	0050	ME
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Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
TRS	Design	Screwed flange pinion with supporting bearing holder
3	Module	$m_n = 3$ (example)
17	Number of teeth	$z = 17$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
SF		Helical (left-hand 19° 31' 42") with felt pinion for lubrication
PH	Type	Planetary gear unit
7	Size	7 (example)
2	Generation	Generation 2
1	Stages	Single-stage
2		Two-stage
F	Shaft	Flange shaft
0050	Transmission ratio ($i \times 10$)	$i = 5$ (example)
ME	Motor adapter	Motor adapter with EasyAdapt® coupling
MEL		Motor adapter with EasyAdapt® coupling for large motors

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

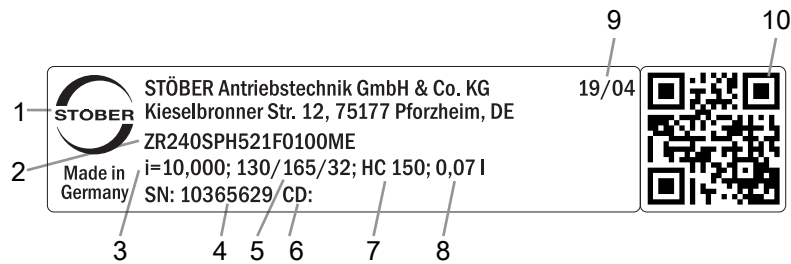
To choose a suitable motor connection, use the STOEGER Configurator at <http://configurator.stoeber.de> and choose your motor or the dimensions of the motor connection.

- For the position of the gear rack, see the chapter [▶ 2.5.6]
- For radial shaft seal rings at the output made of NBR or FKM, see the chapter [▶ 2.6.3]
- Radial runout $\leq 10 \mu\text{m}$ (optional)
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation upon request

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter. All input options available upon request are listed in the chapter [▶ 2.5.2].

2.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

2.4.1.1 Supporting documents

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

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

2.5 Product description

2.5.1 Motor adapter with EasyAdapt® coupling (ME/MEL)

In this chapter, you will find a description of the EasyAdapt® coupling.

Properties:

- Fast and easy motor attachment
- One-piece, rugged coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design

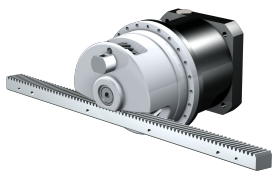


Fig. 1: EasyAdapt® coupling

2.5.2 Input options

In this chapter, you will find all available input options:

ME motor adapter



<http://www.stoeber.de/en/ZTRSPHME>

KX right-angle input with MF motor adapter



On request

K right-angle input with ME motor adapter



On request

MB motor adapter



On request

EZ synchronous servo motor



On request

You can also acquire rack and pinion drives with low-backlash PHA gear units upon request. To do so, send us an e-mail at sales@stober.de.

2.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	6	16MnCr5 inductively hardened
5	5	16MnCr5 inductively hardened
6 – 10	6	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

2.5.4 Installation conditions

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

- When using screws with quality 12.9 for machine-side attachment of the gear unit housing
- When the gear unit housings are adjusted at pilot \varnothing bz. The machine-side fit must be H7.

2.5.5 Lubricants

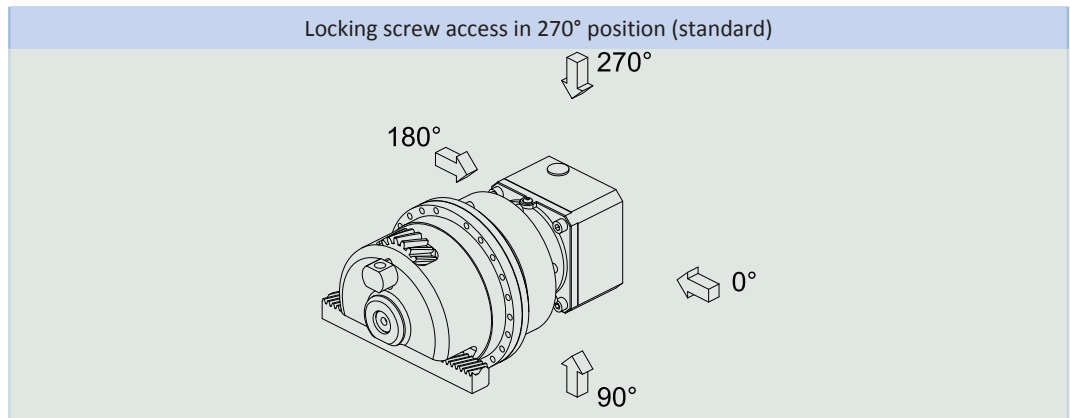
STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stober.de/en/download>. Enter the ID of the documentation in the Search... field.

2.5.5.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

2.5.6 Position of locking screw access



The access opening for the motor coupling locking screw in the standard version is in the 270° position. Indicate variations for your rack and pinion drive in the purchase order.

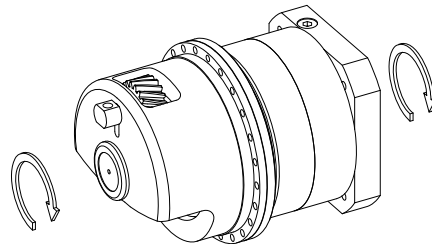
Note that the access opening for the motor coupling locking screw also rotates when the gear rack is rotated to another position.

2.5.7 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 (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

2.5.8 Direction of rotation

The input and output rotate in the same direction.



2.6 Project configuration

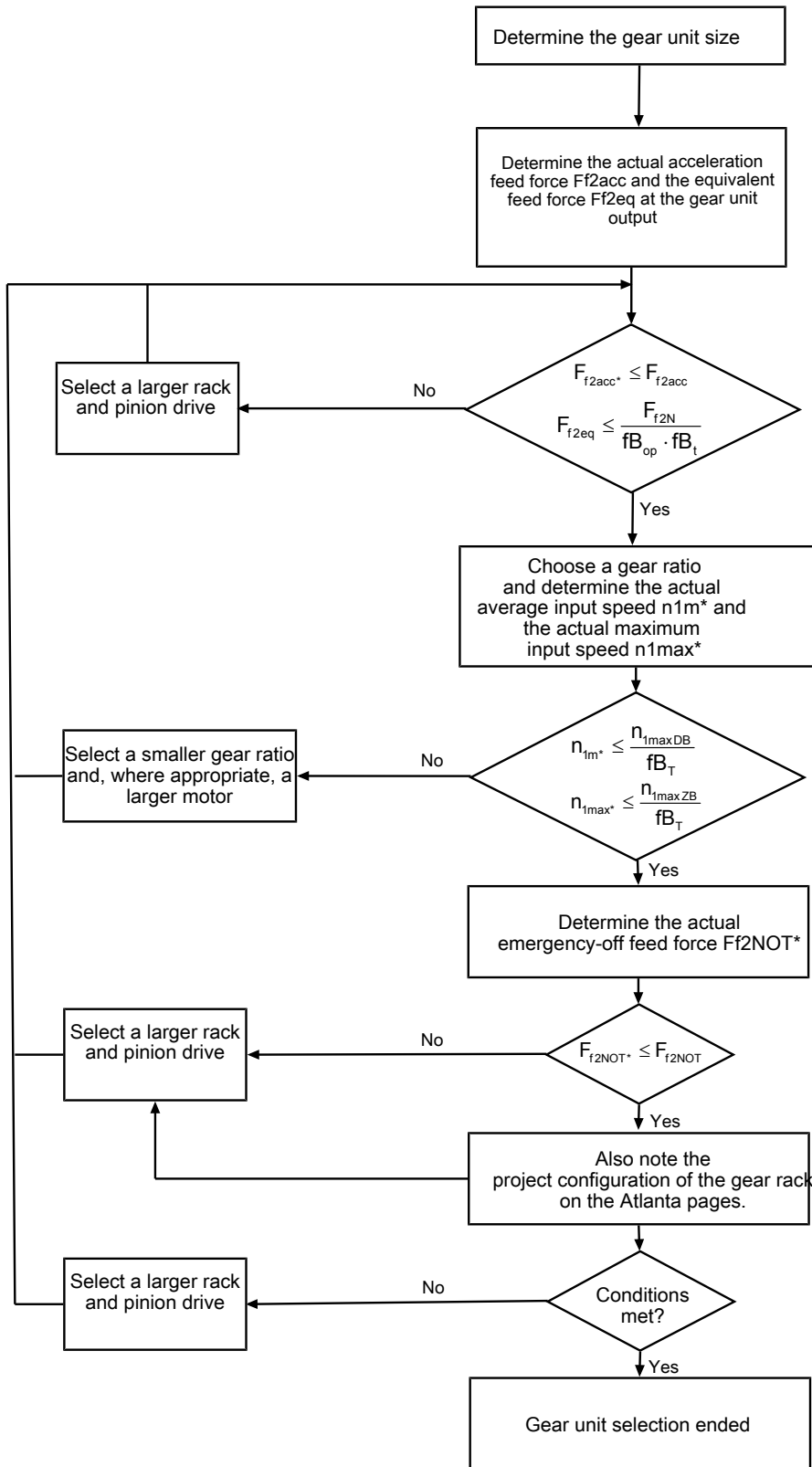
Project your drives using our SERVOSoft designing software. You can receive SERVOSoft for free from your adviser at one of our sales centers. Observe the limit conditions in this chapter to ensure a safe design for your drives.

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

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

¹Observe the protection class of all the components.

2.6.1 Drive selection

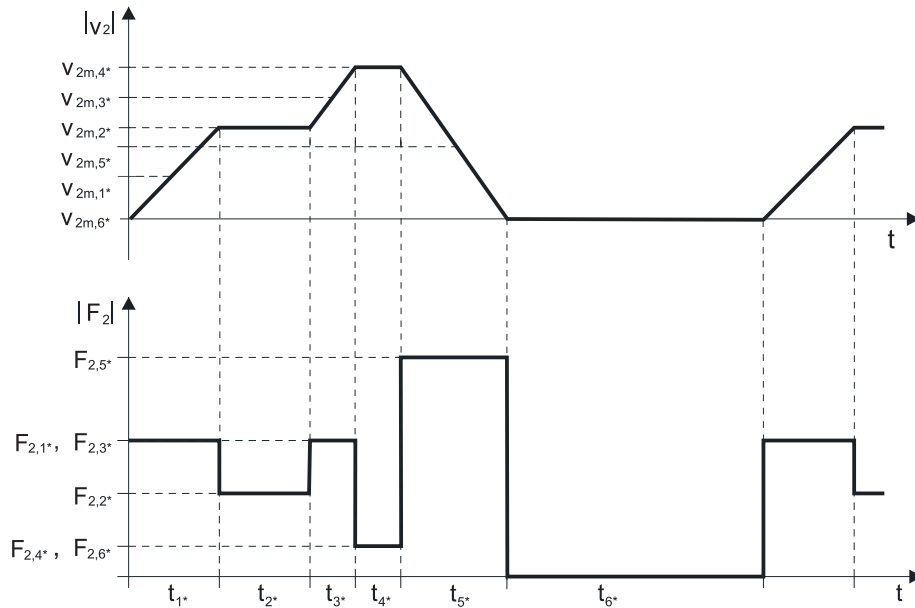


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

The values for fb_T , fb_{op} and fb_t can be found in the corresponding tables in this chapter.

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

$$F_{f2acc} = m \cdot a + F_L$$

Calculation of the actual average input speed

$$n_{1m} = \frac{v_{2m} \cdot i}{d_0 \cdot \pi}$$

$$v_{2m} = \frac{|v_{2m,1}| \cdot t_1 + \dots + |v_{2m,n}| \cdot t_n}{t_1 + \dots + t_n}$$

If \$t_1 + \dots + t_5 \ge 10\$ min, determine \$v_{2m}\$ without the rest phase \$t_6\$.

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT} = m \cdot a_{NOT} + F_L$$

Calculation of the actual equivalent feed force

$$F_{f2eq} = \sqrt[3]{\frac{|v_{2m,1}| \cdot t_1 \cdot |F_{2,1}|^3 + \dots + |v_{2m,n}| \cdot t_n \cdot |F_{2,n}|^3}{|v_{2m,1}| \cdot t_1 + \dots + |v_{2m,n}| \cdot t_n}}$$

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 \$\le 8\$ h		1.00
Daily run time \$\le 16\$ h		1.15
Daily run time \$\le 24\$ h		1.20
Temperature		\$fB_T\$
Motor cooling	Surrounding temperature	
Motor with forced ventilation	\$\le 20\$ °C	0.9
	\$\le 30\$ °C	1.0
	\$\le 40\$ °C	1.15
Motor with convection cooling	\$\le 20\$ °C	1.0
	\$\le 30\$ °C	1.1
	\$\le 40\$ °C	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

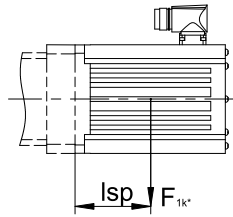
2.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
PH321_ME	20
PH322_ME	10
PH421_ME	40
PH422_ME	20
PH521_ME	80
PH522_ME	40
PH721_ME	200
PH722_ME	80
PH821_ME	400
PH822_ME	200
PH932_ME	400
PH1032_ME	400

2.6.3 Recommendation for radial shaft seal rings

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

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance 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 a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

2.7 Additional documentation

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

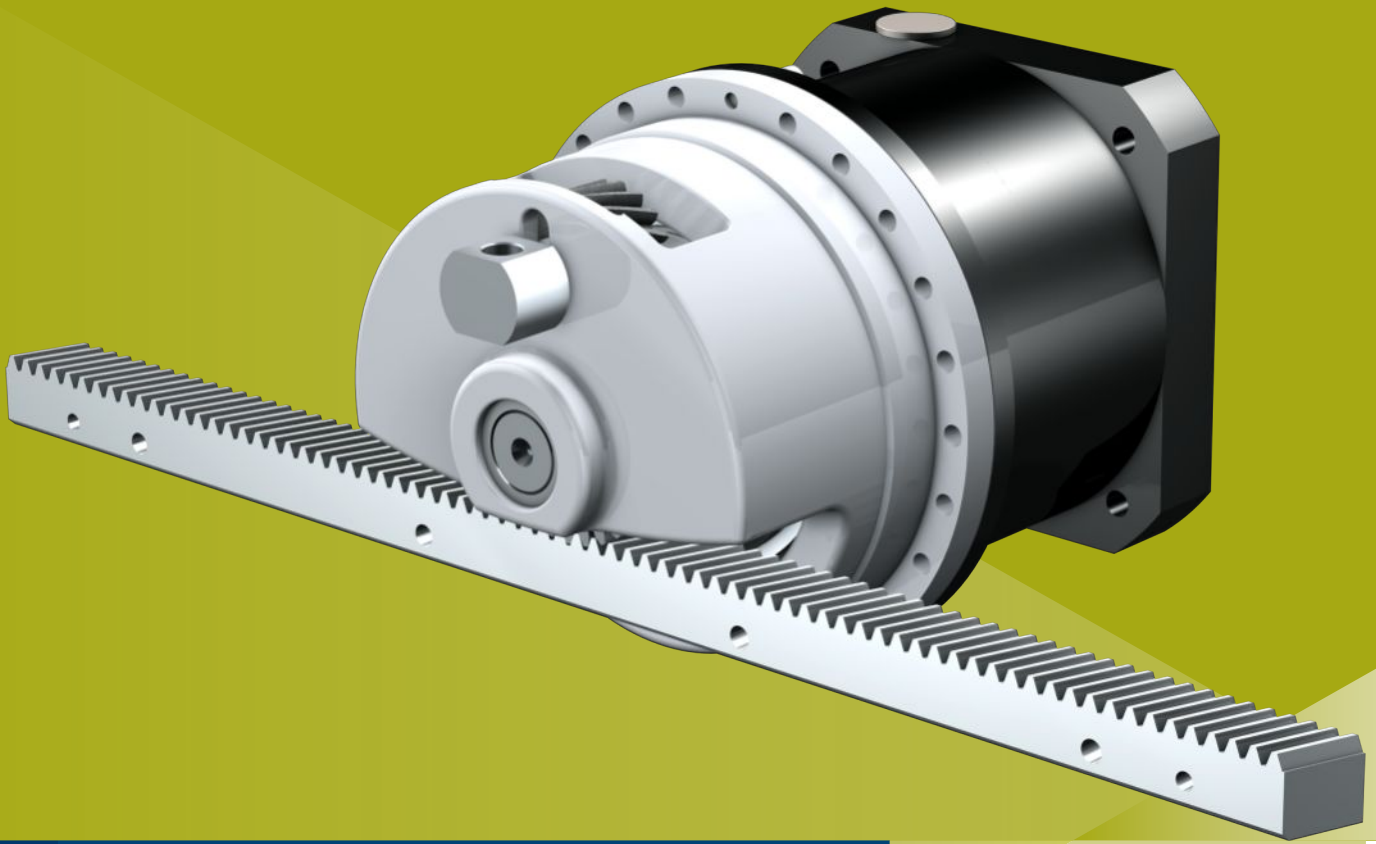
Enter the ID of the documentation in the Search... field.

Documentation	ID
Operating manual Rack and Pinion Drives (Atlanta)	442455
Operating manual for P/PA/PE/PH/PHA/PHQ/PHQA/PHV/PHVA planetary gear units and planetary geared motors	443029_en
Lubricant filling quantities for gear units	441871

3 ZTRSPHQ rack and pinion drives

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3 Rack and pinion drives

ZTRSPHQ

3.1 Overview

Quattro-Power precision planetary gear units with supporting bearing holder

Features

Power density	★★★★★
Linear clearance	★★★★☆
Price category	€€€€€
Smooth operation	★★★★☆
Linear rigidity	★★★★★
Mass moment of inertia	★★★★☆
Ready-to-install drive solution	✓
Pinion gearing quality 5 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓
Radial runout ≤ 10 μm (optional)	✓

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

Technical data

m_n	8 – 10 mm
z	15 – 19
F_{f2acc}	124 – 126 kN
$v_{f2maxZB}$	0.06 – 1.1 m/s
Δs	69 – 70 μm

3.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 3.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [mm]	C_{lin} [N/μm]	m_n [mm]	z	d_0 [mm]	F_{f2N} [kN]	F_{f2acc} [kN]	F_{f2NOT} [kN]	M_{2acc} [Nm]
ZTRS8PHQ10 ($F_{f2acc,max} = 124$ kN)														
24.00	ZTRS819SPHQ1032_0240 ME	2000	3000	≤60	1.06	0.070	340	8	19	161.3	65	124	240	10000
30.00	ZTRS819SPHQ1032_0300 ME	2200	3500	≤60	0.99	0.070	340	8	19	161.3	66	124	240	10000
42.00	ZTRS819SPHQ1032_0420 ME	2500	4000	≤60	0.80	0.070	339	8	19	161.3	66	124	240	10000
60.00	ZTRS819SPHQ1032_0600 ME	2500	4000	≤60	0.56	0.070	335	8	19	161.3	66	124	240	10000
96.00	ZTRS819SPHQ1033_0960 ME	2200	3500	≤48	0.31	0.070	340	8	19	161.3	66	124	240	10000
96.00	ZTRS819SPHQ1033_0960 MEL	2200	3500	≤60	0.31	0.070	340	8	19	161.3	66	124	240	10000
120.0	ZTRS819SPHQ1033_1200 ME	2200	3500	≤48	0.25	0.070	340	8	19	161.3	66	124	240	10000
120.0	ZTRS819SPHQ1033_1200 MEL	2200	3500	≤60	0.25	0.070	340	8	19	161.3	66	124	240	10000
150.0	ZTRS819SPHQ1033_1500 ME	2500	4000	≤48	0.23	0.070	340	8	19	161.3	66	124	240	10000
150.0	ZTRS819SPHQ1033_1500 MEL	2500	4000	≤60	0.23	0.070	340	8	19	161.3	66	124	240	10000
168.0	ZTRS819SPHQ1033_1680 ME	2800	4500	≤48	0.23	0.070	340	8	19	161.3	66	124	240	10000
168.0	ZTRS819SPHQ1033_1680 MEL	2800	4500	≤55	0.23	0.070	340	8	19	161.3	66	124	240	10000
210.0	ZTRS819SPHQ1033_2100 ME	2800	4500	≤48	0.18	0.070	340	8	19	161.3	66	124	240	10000
210.0	ZTRS819SPHQ1033_2100 MEL	2800	4500	≤55	0.18	0.070	340	8	19	161.3	66	124	240	10000
240.0	ZTRS819SPHQ1033_2400 ME	2800	4500	≤48	0.16	0.070	340	8	19	161.3	66	124	240	10000
240.0	ZTRS819SPHQ1033_2400 MEL	2800	4500	≤55	0.16	0.070	340	8	19	161.3	66	124	240	10000
300.0	ZTRS819SPHQ1033_3000 ME	2800	4500	≤48	0.13	0.070	340	8	19	161.3	66	124	240	10000
300.0	ZTRS819SPHQ1033_3000 MEL	2800	4500	≤55	0.13	0.070	340	8	19	161.3	66	124	240	10000
420.0	ZTRS819SPHQ1033_4200 ME	2800	4500	≤48	0.09	0.070	339	8	19	161.3	66	124	240	10000
420.0	ZTRS819SPHQ1033_4200 MEL	2800	4500	≤55	0.09	0.070	339	8	19	161.3	66	124	240	10000
600.0	ZTRS819SPHQ1033_6000 ME	2800	4500	≤48	0.06	0.070	335	8	19	161.3	66	124	240	10000
600.0	ZTRS819SPHQ1033_6000 MEL	2800	4500	≤55	0.06	0.070	335	8	19	161.3	66	124	240	10000
ZTRS10PHQ10 ($F_{f2acc,max} = 126$ kN)														
24.00	ZTRS1015SPHQ1032_0240 ME	2000	3000	≤60	1.04	0.069	367	10	15	159.2	65	126	250	10000
30.00	ZTRS1015SPHQ1032_0300 ME	2200	3500	≤60	0.97	0.069	367	10	15	159.2	66	126	250	10000
42.00	ZTRS1015SPHQ1032_0420 ME	2500	4000	≤60	0.79	0.069	366	10	15	159.2	66	126	250	10000
60.00	ZTRS1015SPHQ1032_0600 ME	2500	4000	≤60	0.56	0.069	362	10	15	159.2	66	126	250	10000
96.00	ZTRS1015SPHQ1033_0960 ME	2200	3500	≤48	0.30	0.069	367	10	15	159.2	66	126	250	10000
96.00	ZTRS1015SPHQ1033_0960 MEL	2200	3500	≤60	0.30	0.069	367	10	15	159.2	66	126	250	10000
120.0	ZTRS1015SPHQ1033_1200 ME	2200	3500	≤48	0.24	0.069	367	10	15	159.2	66	126	250	10000
120.0	ZTRS1015SPHQ1033_1200 MEL	2200	3500	≤60	0.24	0.069	367	10	15	159.2	66	126	250	10000
150.0	ZTRS1015SPHQ1033_1500 ME	2500	4000	≤48	0.22	0.069	367	10	15	159.2	66	126	250	10000
150.0	ZTRS1015SPHQ1033_1500 MEL	2500	4000	≤60	0.22	0.069	367	10	15	159.2	66	126	250	10000
168.0	ZTRS1015SPHQ1033_1680 ME	2800	4500	≤48	0.22	0.069	367	10	15	159.2	66	126	250	10000
168.0	ZTRS1015SPHQ1033_1680 MEL	2800	4500	≤55	0.22	0.069	367	10	15	159.2	66	126	250	10000
210.0	ZTRS1015SPHQ1033_2100 ME	2800	4500	≤48	0.18	0.069	367	10	15	159.2	66	126	250	10000
210.0	ZTRS1015SPHQ1033_2100 MEL	2800	4500	≤55	0.18	0.069	367	10	15	159.2	66	126	250	10000
240.0	ZTRS1015SPHQ1033_2400 ME	2800	4500	≤48	0.16	0.069	367	10	15	159.2	66	126	250	10000
240.0	ZTRS1015SPHQ1033_2400 MEL	2800	4500	≤55	0.16	0.069	367	10	15	159.2	66	126	250	10000
300.0	ZTRS1015SPHQ1033_3000 ME	2800	4500	≤48	0.13	0.069	367	10	15	159.2	66	126	250	10000
300.0	ZTRS1015SPHQ1033_3000 MEL	2800	4500	≤55	0.13	0.069	367	10	15	159.2	66	126	250	10000
420.0	ZTRS1015SPHQ1033_4200 ME	2800	4500	≤48	0.09	0.069	366	10	15	159.2	66	126	250	10000
420.0	ZTRS1015SPHQ1033_4200 MEL	2800	4500	≤55	0.09	0.069	366	10	15	159.2	66	126	250	10000
600.0	ZTRS1015SPHQ1033_6000 ME	2800	4500	≤48	0.06	0.069	362	10	15	159.2	66	126	250	10000
600.0	ZTRS1015SPHQ1033_6000 MEL	2800	4500	≤55	0.06	0.069	362	10	15	159.2	66	126	250	10000

3.3 Dimensional drawings

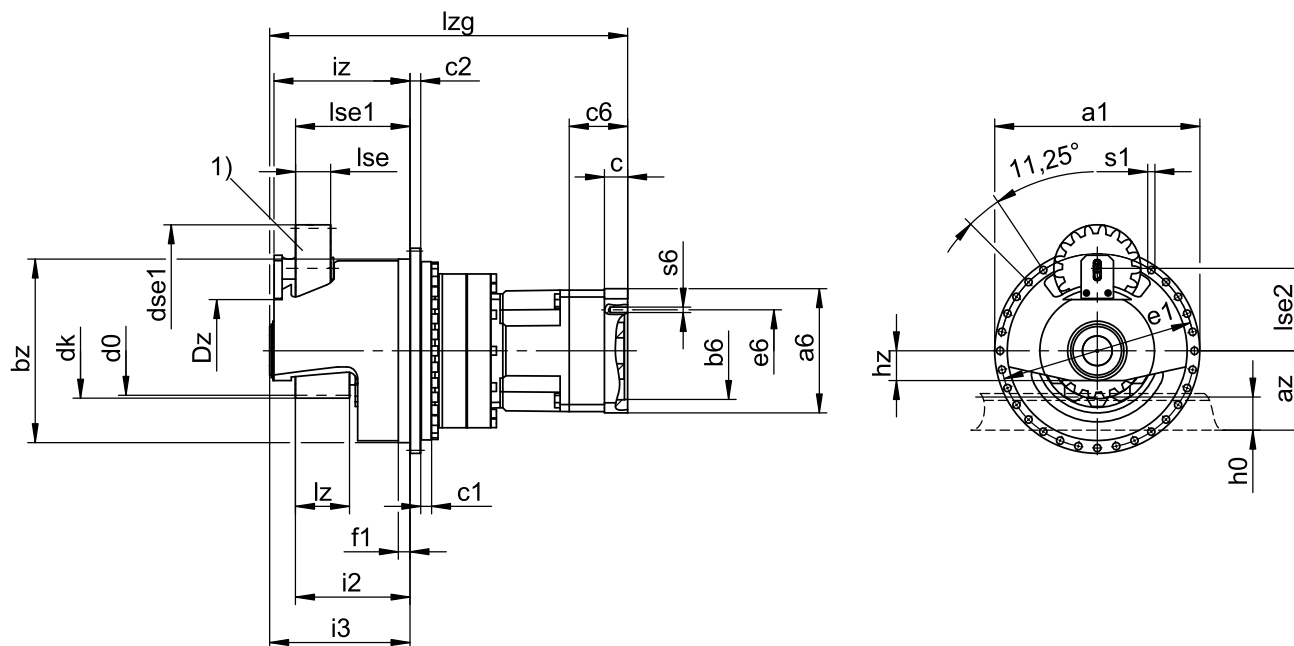
In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.



1) Felt pinion for lubrication (optional)

Output dimensions

Type	mn	Øa1	az	Øbz	c1	c2	d0	dk	dse1	Dz	Øe1	f1	i2	i3	iz	h0	hz	lz	lse	lse1	lse2	Øs1	x
ZTRS819SPHQ10_	8	380	151.64	340 _{h7}	20	20	161.28	177.3	160.0	110	360	21.5	212	260	251.9	71	55	100	65	211.7	152.8	13.5	0.00
ZTRS1015SPHQ10_	10	380	171.08	340 _{h7}	20	20	159.16	184.2	157.3	110	360	21.5	212	260	251.9	89	55	100	65	211.7	151.1	13.5	0.25

Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZTRS8_PHQ1032_	230	180 ^{H7}	215	43	108	653	M12
ZTRS10_PHQ1032_	230	180 ^{H7}	215	43	108	653	M12
ZTRS8_PHQ1033_	204	180 ^{H7}	215	35	94	733	M12
ZTRS10_PHQ1033_	204	180 ^{H7}	215	35	94	733	M12

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEBER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

3.4 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.

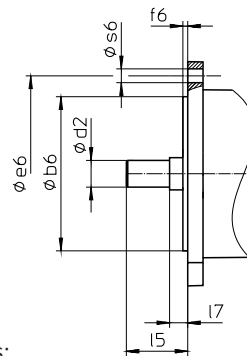
Sample code

Z	TRS	8	19	S	PHQ	10	3	3	F	1680	ME
---	-----	---	----	---	-----	----	---	---	---	------	----

Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
TRS	Design	Screwed flange pinion with supporting bearing holder
8	Module	$m_n = 8$ (example)
19	Number of teeth	$z = 19$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
SF		Helical (left-hand 19° 31' 42") with felt pinion for lubrication
PHQ	Type	Planetary gear unit
10	Size	10 (example)
3	Generation	Generation 3
2	Stages	Two-stage
3		Three-stage
F	Shaft	Flange shaft
1680	Transmission ratio ($i \times 10$)	$i = 168$ (example)
ME	Motor adapter	Motor adapter with EasyAdapt® coupling
MEL		Motor adapter with EasyAdapt® coupling for large motors

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

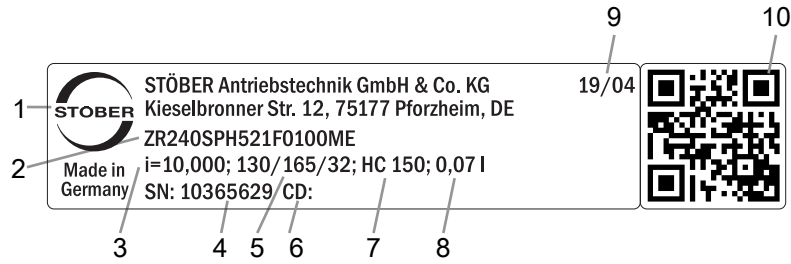
To choose a suitable motor connection, use the STOBBER Configurator at <http://configurator.stoeber.de> and choose your motor or the dimensions of the motor connection.

- For the mounting position (for 3-stage gear units), see the chapter [▶ 3.5.6]
- For the position of the gear rack, see chapter [▶ 3.5.7]
- For radial shaft seal rings at the output made of NBR or FKM, see the chapter [▶ 3.6.3]
- Radial runout $\leq 10 \mu\text{m}$ (optional)
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation upon request

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter. All input options available upon request are listed in the chapter [▶ 3.5.2].

3.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

3.4.1.1 Supporting documents

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

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

3.5 Product description

3.5.1 Motor adapter with EasyAdapt® coupling (ME/MEL)

In this chapter, you will find a description of the EasyAdapt® coupling.

Properties:

- Fast and easy motor attachment
- One-piece, rugged coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design

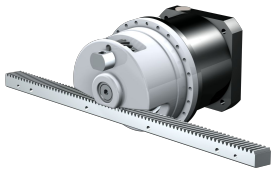


Fig. 1: EasyAdapt® coupling

3.5.2 Input options

In this chapter, you will find all available input options:

ME motor adapter



<http://www.stoeber.de/en/ZTRSPHQME>

K right-angle input with ME motor adapter



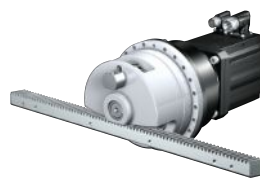
On request

MB motor adapter



On request

EZ synchronous servo motor



On request

You can also acquire rack and pinion drives with low-backlash PHQA gear units upon request. To do so, send us an e-mail at sales@stober.de.

3.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	6	16MnCr5 inductively hardened
5	5	16MnCr5 inductively hardened
6 – 10	6	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

3.5.4 Installation conditions

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

- When using screws with quality 12.9 for machine-side attachment of the gear unit housing
- When the gear unit housings are adjusted at pilot \varnothing bz. The machine-side fit must be H7.

3.5.5 Lubricants

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

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

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stoeber.de/en/download>. Enter the ID of the documentation in the Search... field.

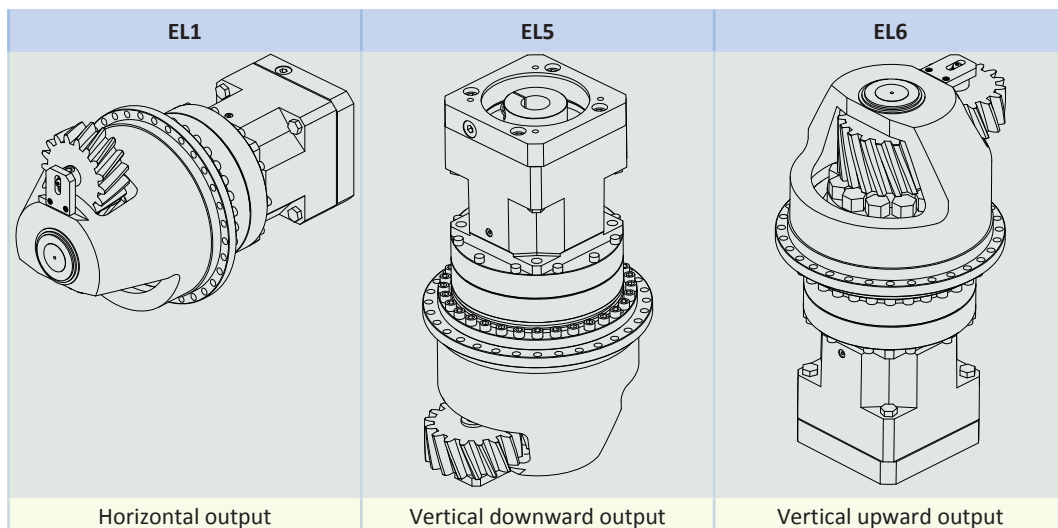
3.5.5.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

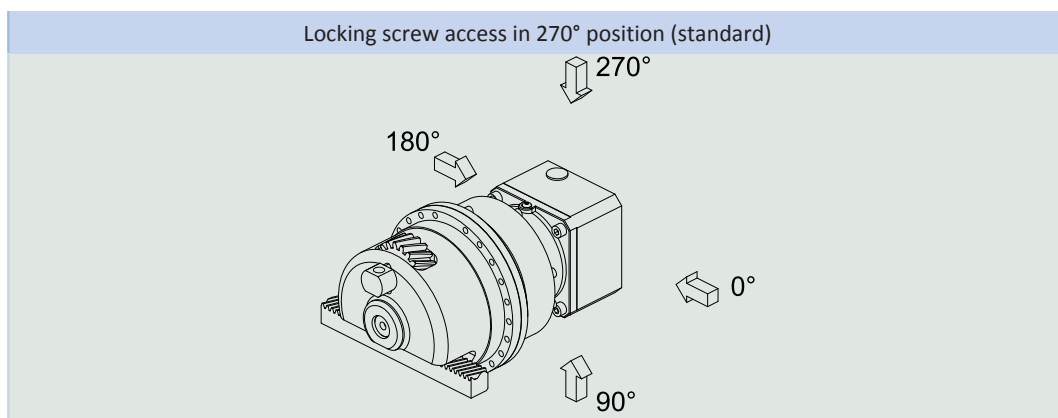
3.5.6 Mounting positions

The following table shows the standard mounting positions.

Please indicate the mounting position when ordering 3-stage gear units.



3.5.7 Position of locking screw access



The access opening for the motor coupling locking screw in the standard version is in the 270° position. Indicate variations for your rack and pinion drive in the purchase order.

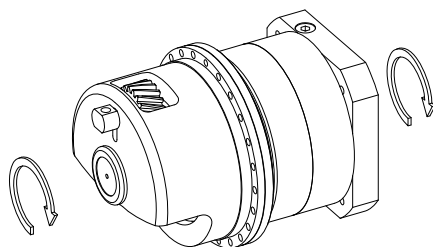
Note that the access opening for the motor coupling locking screw also rotates when the gear rack is rotated to another position.

3.5.8 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 (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

3.5.9 Direction of rotation

The input and output rotate in the same direction.



¹Observe the protection class of all the components.

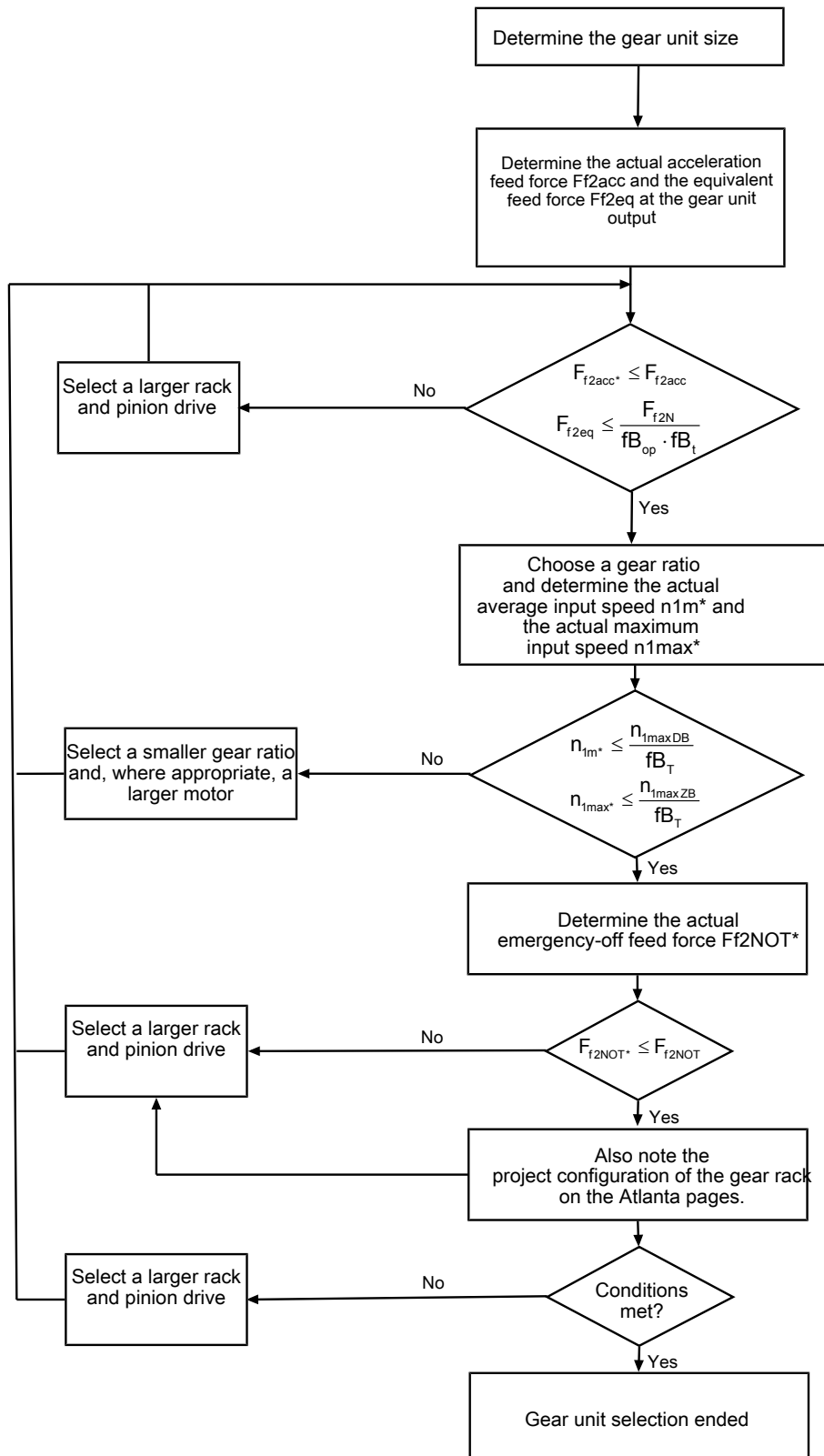
3.6 Project configuration

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

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

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

3.6.1 Drive selection

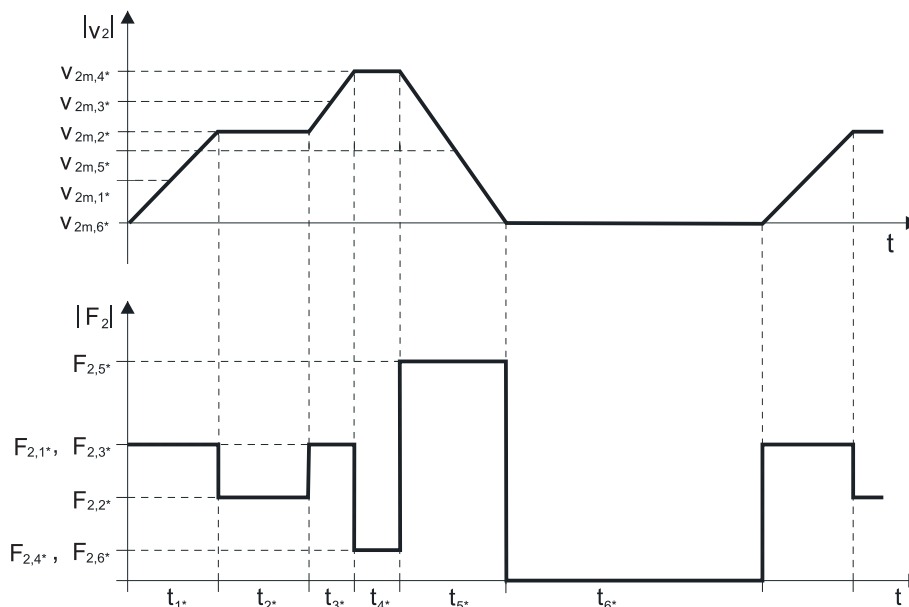


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

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

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

$$F_{f2acc} = m \cdot a + F_L$$

Calculation of the actual average input speed

$$n_{1m} = \frac{V_{2m} \cdot i}{d_0 \cdot \pi}$$

$$V_{2m} = \frac{|V_{2m,1}| \cdot t_1 + \dots + |V_{2m,n}| \cdot t_n}{t_1 + \dots + t_n}$$

If $t_1 + \dots + t_5 \geq 10$ min, determine v_{2m} without the rest phase t_6 .

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT} = m \cdot a_{NOT} + F_L$$

Calculation of the actual equivalent feed force

$$F_{f2eq} = \sqrt[3]{\frac{|V_{2m,1}| \cdot t_1 \cdot |F_{2,1}|^3 + \dots + |V_{2m,n}| \cdot t_n \cdot |F_{2,n}|^3}{|V_{2m,1}| \cdot t_1 + \dots + |V_{2m,n}| \cdot t_n}}$$

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		f_{B_T}
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20\text{ °C}$	0.9
	$\leq 30\text{ °C}$	1.0
	$\leq 40\text{ °C}$	1.15
Motor with convection cooling	$\leq 20\text{ °C}$	1.0
	$\leq 30\text{ °C}$	1.1
	$\leq 40\text{ °C}$	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

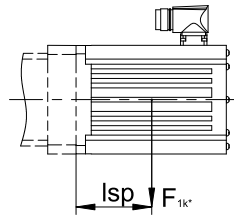
3.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
PHQ421_ME	40
PHQ422_ME	20
PHQ521_ME	80
PHQ522_ME	40
PHQ721_ME	200
PHQ722_ME	80
PHQ723_ME	40
PHQ822_ME	200
PHQ823_ME	80
PHQ932_ME	400
PHQ933_ME	200
PHQ1032_ME	800
PHQ1033_ME	400
PHQ1133_ME	400
PHQ1233_ME	800

3.6.3 Recommendation for radial shaft seal rings

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

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance 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 a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

3.7 Additional documentation

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

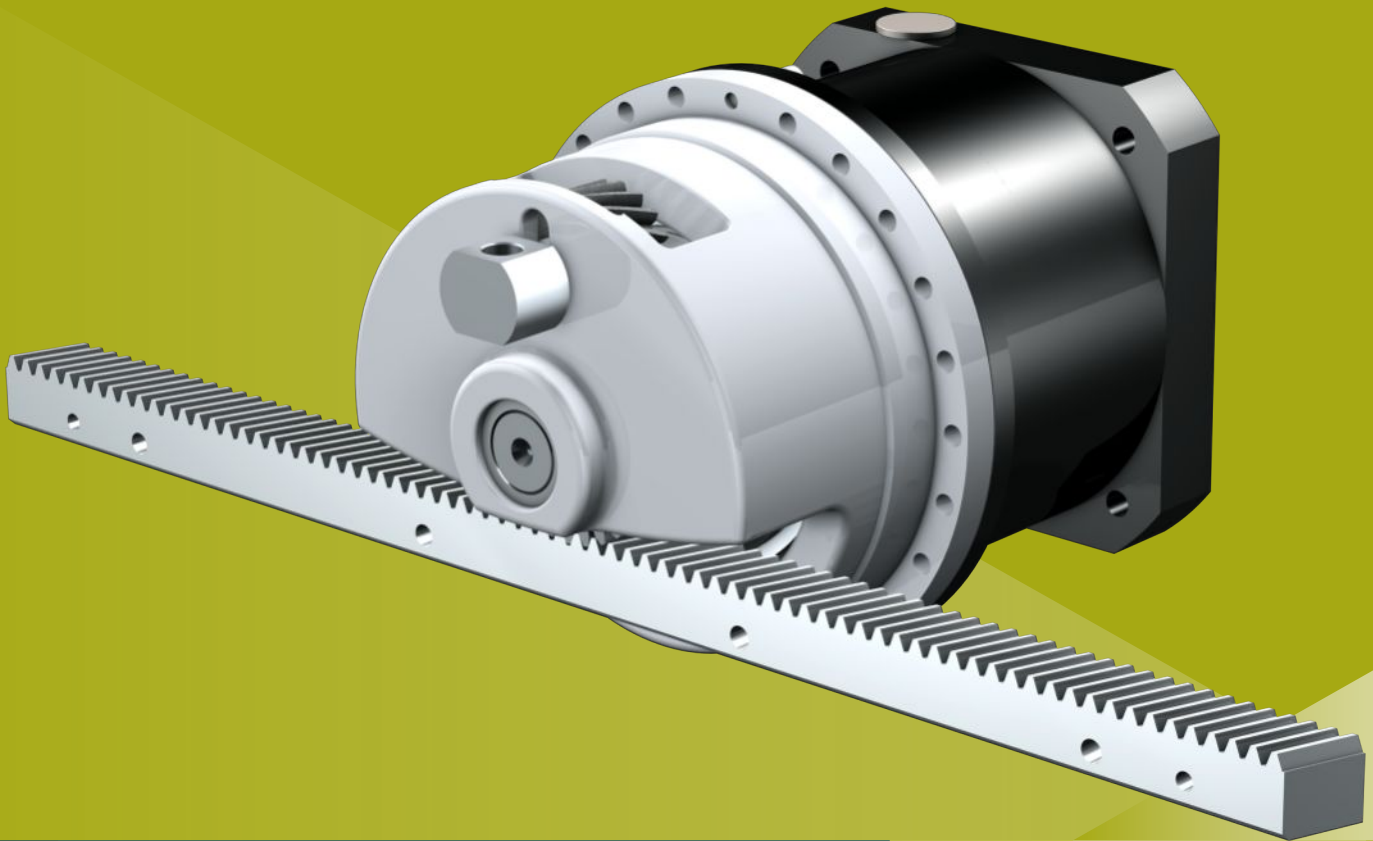
Enter the ID of the documentation in the Search... field.

Documentation	ID
Operating manual Rack and Pinion Drives (Atlanta)	442455
Operating manual for P/PA/PE/PH/PHA/PHQ/PHQA/PHV/PHVA planetary gear units and planetary geared motors	443029_en
Lubricant filling quantities for gear units	441871

4 ZTRSPHV rack and pinion drives

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4 Rack and pinion drives

ZTRSPHV

4.1 Overview

High-performance precision planetary gear units with supporting bearing holder

Features

Power density	★★★★★
Linear clearance	★★★★☆
Price category	€€€€€
Smooth operation	★★★★☆
Linear rigidity	★★★★★
Mass moment of inertia	★★★★☆
Ready-to-install drive solution	✓
Pinion gearing quality 5 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓
Radial runout ≤ 10 μm (optional)	✓

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

Technical data

m_n	5 – 10 mm
z	15 – 20
F_{f2acc}	61 – 94 kN
$V_{f2maxZB}$	0.2 – 0.62 m/s
Δs	44 – 70 μm

4.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 4.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [mm]	C_{lin} [N/μm]	m_n [mm]	z	d_0 [mm]	F_{f2N} [kN]	F_{f2acc} [kN]	F_{f2NOT} [kN]	M_{2acc} [Nm]
ZTRS5PHV9 ($F_{f2acc,max} = 77$ kN)														
61.00	ZTRS520SPHV933_0610 ME	2500	4500	≤38	0.41	0.046	356	5	20	106.1	47	77	154	4080
61.00	ZTRS520SPHV933_0610 MEL	2500	4500	≤48	0.41	0.046	356	5	20	106.1	47	77	154	4080
91.00	ZTRS520SPHV933_0910 ME	2500	4500	≤38	0.28	0.046	355	5	20	106.1	47	77	154	4080
91.00	ZTRS520SPHV933_0910 MEL	2500	4500	≤48	0.28	0.046	355	5	20	106.1	47	77	154	4080
121.0	ZTRS520SPHV933_1210 ME	2500	4500	≤38	0.21	0.046	350	5	20	106.1	47	77	154	4080
121.0	ZTRS520SPHV933_1210 MEL	2500	4500	≤48	0.21	0.046	350	5	20	106.1	47	77	154	4080
ZTRS6PHV9 ($F_{f2acc,max} = 67$ kN)														
61.00	ZTRS616SPHV933_0610 ME	2500	4500	≤38	0.39	0.044	377	6	16	101.9	49	61	122	3100
61.00	ZTRS616SPHV933_0610 MEL	2500	4500	≤48	0.39	0.044	377	6	16	101.9	49	61	122	3100
61.00	ZTRS620SPHV933_0610 ME	2500	4500	≤38	0.49	0.056	321	6	20	127.3	39	67	141	4250
61.00	ZTRS620SPHV933_0610 MEL	2500	4500	≤48	0.49	0.056	322	6	20	127.3	39	67	141	4250
91.00	ZTRS616SPHV933_0910 ME	2500	4500	≤38	0.26	0.044	375	6	16	101.9	49	61	122	3100
91.00	ZTRS616SPHV933_0910 MEL	2500	4500	≤48	0.26	0.044	376	6	16	101.9	49	61	122	3100
91.00	ZTRS620SPHV933_0910 ME	2500	4500	≤38	0.33	0.056	320	6	20	127.3	39	67	141	4250
91.00	ZTRS620SPHV933_0910 MEL	2500	4500	≤48	0.33	0.056	320	6	20	127.3	39	67	141	4250
121.0	ZTRS616SPHV933_1210 ME	2500	4500	≤38	0.20	0.044	370	6	16	101.9	49	61	122	3100
121.0	ZTRS616SPHV933_1210 MEL	2500	4500	≤48	0.20	0.044	370	6	16	101.9	49	61	122	3100
121.0	ZTRS620SPHV933_1210 ME	2500	4500	≤38	0.25	0.056	314	6	20	127.3	39	67	141	4250
121.0	ZTRS620SPHV933_1210 MEL	2500	4500	≤48	0.25	0.056	314	6	20	127.3	39	67	141	4250
ZTRS8PHV9 ($F_{f2acc,max} = 67$ kN)														
61.00	ZTRS815SPHV933_0610 ME	2500	4500	≤38	0.49	0.056	335	8	15	127.3	39	67	141	4250
61.00	ZTRS815SPHV933_0610 MEL	2500	4500	≤48	0.49	0.056	335	8	15	127.3	39	67	141	4250
91.00	ZTRS815SPHV933_0910 ME	2500	4500	≤38	0.33	0.056	333	8	15	127.3	39	67	141	4250
91.00	ZTRS815SPHV933_0910 MEL	2500	4500	≤48	0.33	0.056	333	8	15	127.3	39	67	141	4250
121.0	ZTRS815SPHV933_1210 ME	2500	4500	≤38	0.25	0.056	327	8	15	127.3	39	67	141	4250
121.0	ZTRS815SPHV933_1210 MEL	2500	4500	≤48	0.25	0.056	327	8	15	127.3	39	67	141	4250
ZTRS8PHV10 ($F_{f2acc,max} = 93$ kN)														
61.00	ZTRS819SPHV1033_0610 ME	2500	4500	≤48	0.62	0.070	293	8	19	161.3	50	93	186	7500
61.00	ZTRS819SPHV1033_0610 MEL	2500	4500	≤55	0.62	0.070	294	8	19	161.3	50	93	186	7500
91.00	ZTRS819SPHV1033_0910 ME	2500	4500	≤48	0.42	0.070	291	8	19	161.3	50	93	186	7500
91.00	ZTRS819SPHV1033_0910 MEL	2500	4500	≤55	0.42	0.070	291	8	19	161.3	50	93	186	7500
ZTRS10PHV10 ($F_{f2acc,max} = 94$ kN)														
61.00	ZTRS1015SPHV1033_0610 ME	2500	4500	≤48	0.62	0.069	314	10	15	159.2	50	94	188	7500
61.00	ZTRS1015SPHV1033_0610 MEL	2500	4500	≤55	0.62	0.069	315	10	15	159.2	50	94	188	7500
91.00	ZTRS1015SPHV1033_0910 ME	2500	4500	≤48	0.41	0.069	312	10	15	159.2	50	94	188	7500
91.00	ZTRS1015SPHV1033_0910 MEL	2500	4500	≤55	0.41	0.069	312	10	15	159.2	50	94	188	7500

4.3 Dimensional drawings

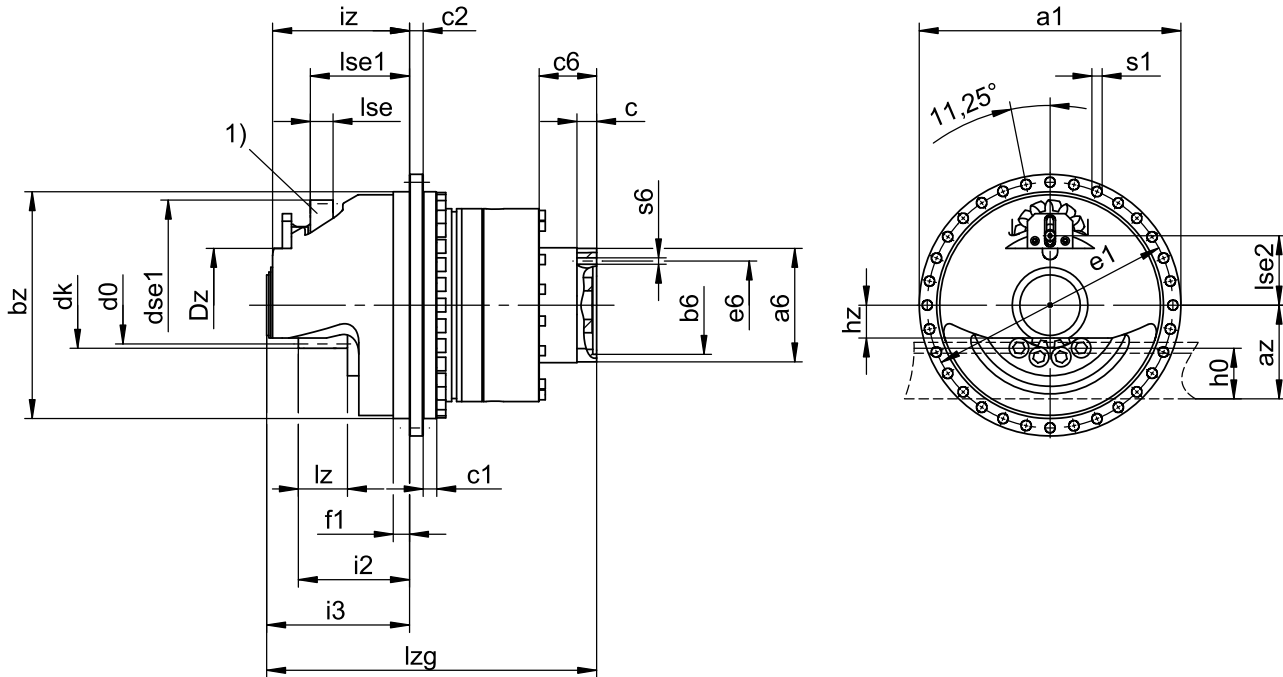
In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.



1) Felt pinion for lubrication (optional)

Output dimensions

Type	mn	Øa1	az	Øbz	c1	c2	d0	dk	dse1	Dz	Øe1	f1	i2	i3	iz	h0	hz	lz	lse	lse1	lse2	Øs1	x
ZTRS520SPHV9_	5	346	87.05	300 _{h7}	18	18	106.10	116.1	78.6	100	325	21.5	137.0	179.0	171.0	34	45.0	55	30	131.1	87.1	13.5	0.0
ZTRS616SPHV9_	6	346	93.93	300 _{h7}	18	18	101.86	113.8	94.2	100	325	21.5	147.0	189.0	181.0	43	43.5	65	30	131.1	91.8	13.5	0.0
ZTRS620SPHV9_	6	346	106.66	300 _{h7}	18	18	127.32	139.3	94.3	100	325	21.5	147.0	189.0	181.0	43	43.5	65	30	131.1	104.8	13.5	0.0
ZTRS815SPHV9_	8	346	136.66	300 _{h7}	18	18	127.32	147.3	160.0	110	325	21.5	162.0	204.7	196.5	71	55.0	80	65	162.0	137.7	13.5	0.3
ZTRS819SPHV10_	8	380	151.64	340 _{h7}	20	20	161.28	177.3	160.0	110	360	21.5	212.0	260.0	251.9	71	55.0	100	65	211.7	152.8	13.5	0.0
ZTRS1015SPHV10_	10	380	171.08	340 _{h7}	20	20	159.16	184.2	157.3	110	360	21.5	212.0	260.0	251.9	89	55.0	100	65	211.7	151.1	13.5	0.3

Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZTRS5_PHV9_	150	130 ^{H7}	165	26	76	352.0	M10
ZTRS6_PHV9_	150	130 ^{H7}	165	26	76	362.0	M10
ZTRS8_PHV9_	150	130 ^{H7}	165	26	76	377.7	M10
ZTRS8_PHV10_	204	180 ^{H7}	215	35	92	457.0	M12
ZTRS10_PHV10_	204	180 ^{H7}	215	35	92	457.0	M12

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEBER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

4.4 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.

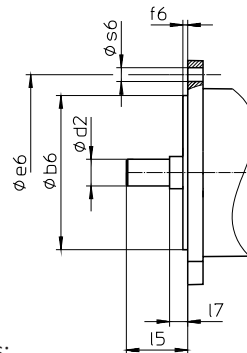
Sample code

Z	TRS	6	20	S	PHV	9	3	3	F	0910	ME
---	-----	---	----	---	-----	---	---	---	---	------	----

Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
TRS	Design	Screwed flange pinion with supporting bearing holder
6	Module	$m_n = 6$ (example)
20	Number of teeth	$z = 20$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
SF		Helical (left-hand 19° 31' 42") with felt pinion for lubrication
PHV	Type	Planetary gear unit
9	Size	9 (example)
3	Generation	Generation 3
3	Stages	Three-stage
F	Shaft	Flange shaft
0910	Transmission ratio ($i \times 10$)	$i = 91$ (example)
ME	Motor adapter	Motor adapter with EasyAdapt® coupling
MEL		Motor adapter with EasyAdapt® coupling for large motors

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at <http://configurator.stoeber.de> and choose your motor or the dimensions of the motor connection.

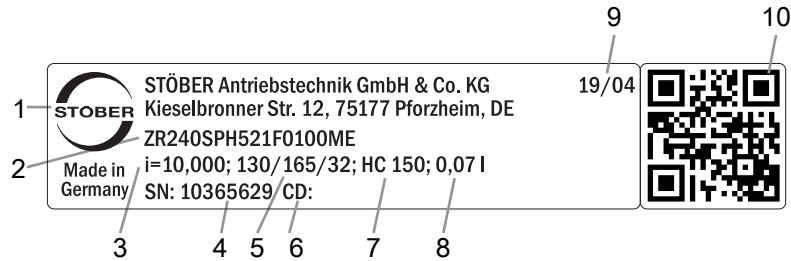
- For the position of the gear rack, see the chapter [▶ 4.5.6]
- For radial shaft seal rings at the output made of NBR or FKM, see the chapter [▶ 4.6.3]
- Radial runout $\leq 10 \mu\text{m}$ (optional)
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation upon request

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter.

All input options available upon request are listed in the chapter [▶ 4.5.2].

4.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

4.4.1.1 Supporting documents

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

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

4.5 Product description

4.5.1 Motor adapter with EasyAdapt® coupling (ME/MEL)

In this chapter, you will find a description of the EasyAdapt® coupling.

Properties:

- Fast and easy motor attachment
- One-piece, rugged coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design

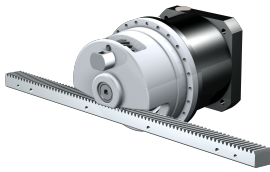


Fig. 1: EasyAdapt® coupling

4.5.2 Input options

In this chapter, you will find all available input options:

ME motor adapter



<http://www.stoeber.de/en/ZTRSPHVME>

MB motor adapter



On request

EZ synchronous servo motor



On request

You can also acquire rack and pinion drives with low-backlash PHVA gear units upon request. To do so, send us an e-mail at sales@stober.de.

4.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	6	16MnCr5 inductively hardened
5	5	16MnCr5 inductively hardened
6 – 10	6	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

4.5.4 Installation conditions

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

- When using screws with quality 12.9 for machine-side attachment of the gear unit housing
- When the gear unit housings are adjusted at pilot \varnothing bz. The machine-side fit must be H7.

4.5.5 Lubricants

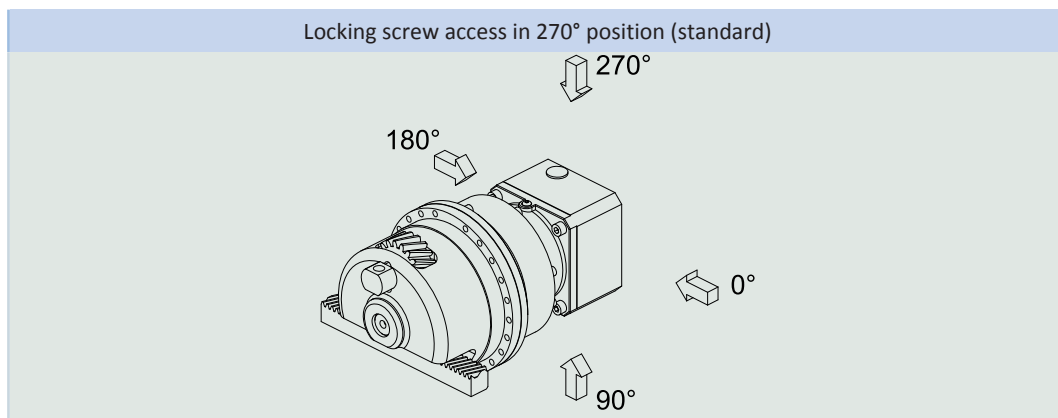
STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stoeb.de/en/download>. Enter the ID of the documentation in the Search... field.

4.5.5.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

4.5.6 Position of locking screw access



The access opening for the motor coupling locking screw in the standard version is in the 270° position. Indicate variations for your rack and pinion drive in the purchase order.

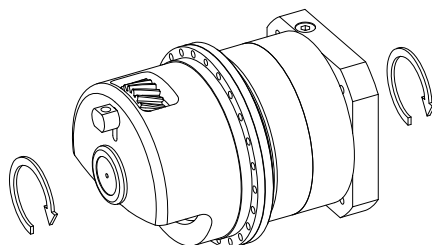
Note that the access opening for the motor coupling locking screw also rotates when the gear rack is rotated to another position.

4.5.7 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 (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

4.5.8 Direction of rotation

The input and output rotate in the same direction.



4.6 Project configuration

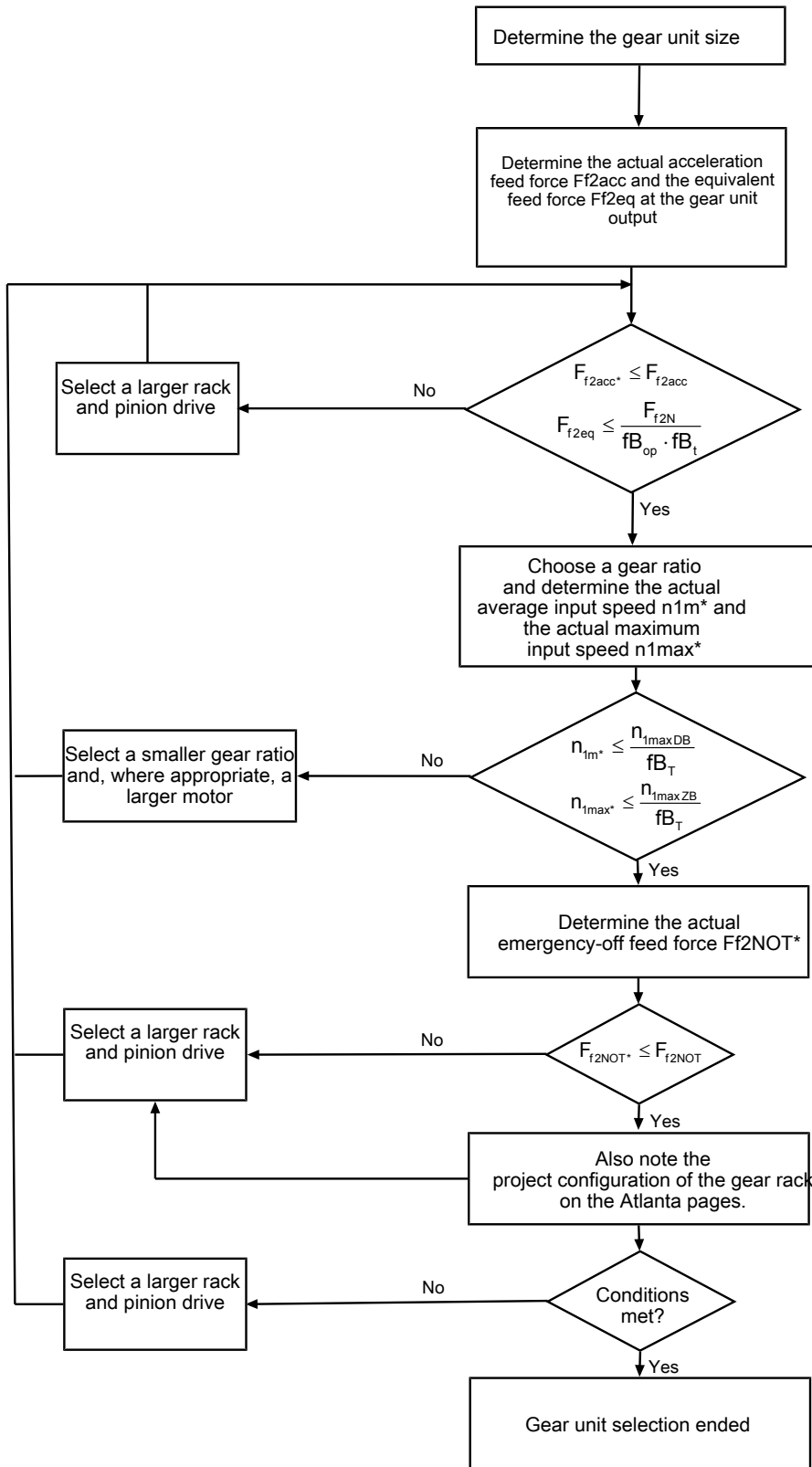
Project your drives using our SERVOSoft designing software. You can receive SERVOSoft for free from your adviser at one of our sales centers. Observe the limit conditions in this chapter to ensure a safe design for your drives.

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

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

¹Observe the protection class of all the components.

4.6.1 Drive selection

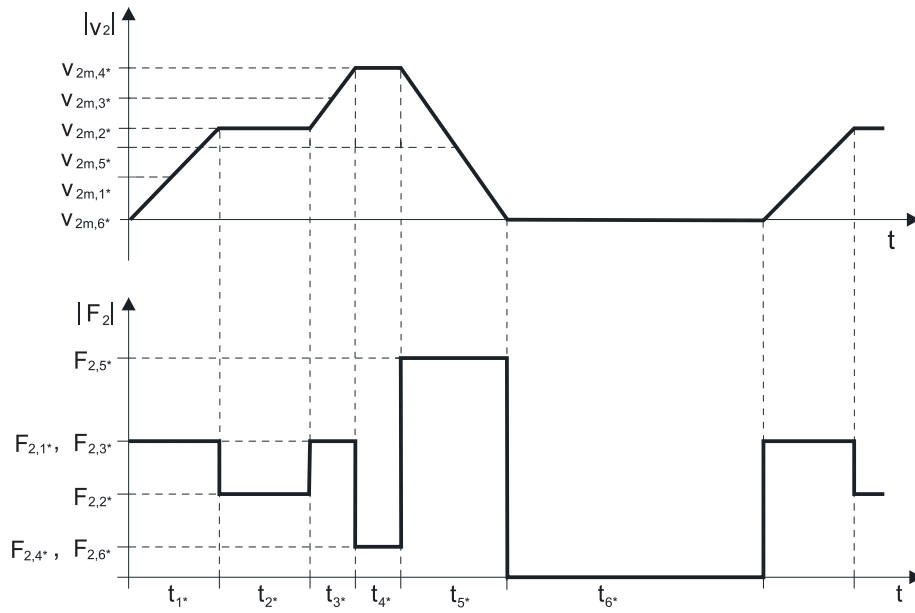


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

The values for fb_T , fb_{op} and fb_t can be found in the corresponding tables in this chapter.

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

Calculation of the actual average input speed

$$n_{im*} = \frac{v_{2m*} \cdot i}{d_0 \cdot \pi}$$

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

If $t_{1*} + \dots + t_{5*} \geq 10 \text{ min}$, determine v_{2m*} without the rest phase t_{6*} .

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

Calculation of the actual equivalent feed force

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{2m,1*}| \cdot t_{1*} \cdot |F_{2,1*}|^3 + \dots + |v_{2m,n*}| \cdot t_{n*} \cdot |F_{2,n*}|^3}{|v_{2m,1*}| \cdot t_{1*} + \dots + |v_{2m,n*}| \cdot t_{n*}}}$$

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 $\leq 8 \text{ h}$	1.00
Daily run time $\leq 16 \text{ h}$	1.15
Daily run time $\leq 24 \text{ h}$	1.20

Temperature		f_{B_T}
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20\text{ °C}$	0.9
	$\leq 30\text{ °C}$	1.0
	$\leq 40\text{ °C}$	1.15
Motor with convection cooling	$\leq 20\text{ °C}$	1.0
	$\leq 30\text{ °C}$	1.1
	$\leq 40\text{ °C}$	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

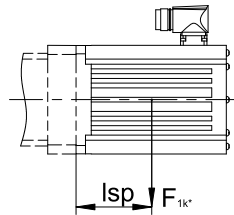
4.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
PHV933_ME	200
PHV1033_ME	400

4.6.3 Recommendation for radial shaft seal rings

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

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance 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 a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

4.7 Additional documentation

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

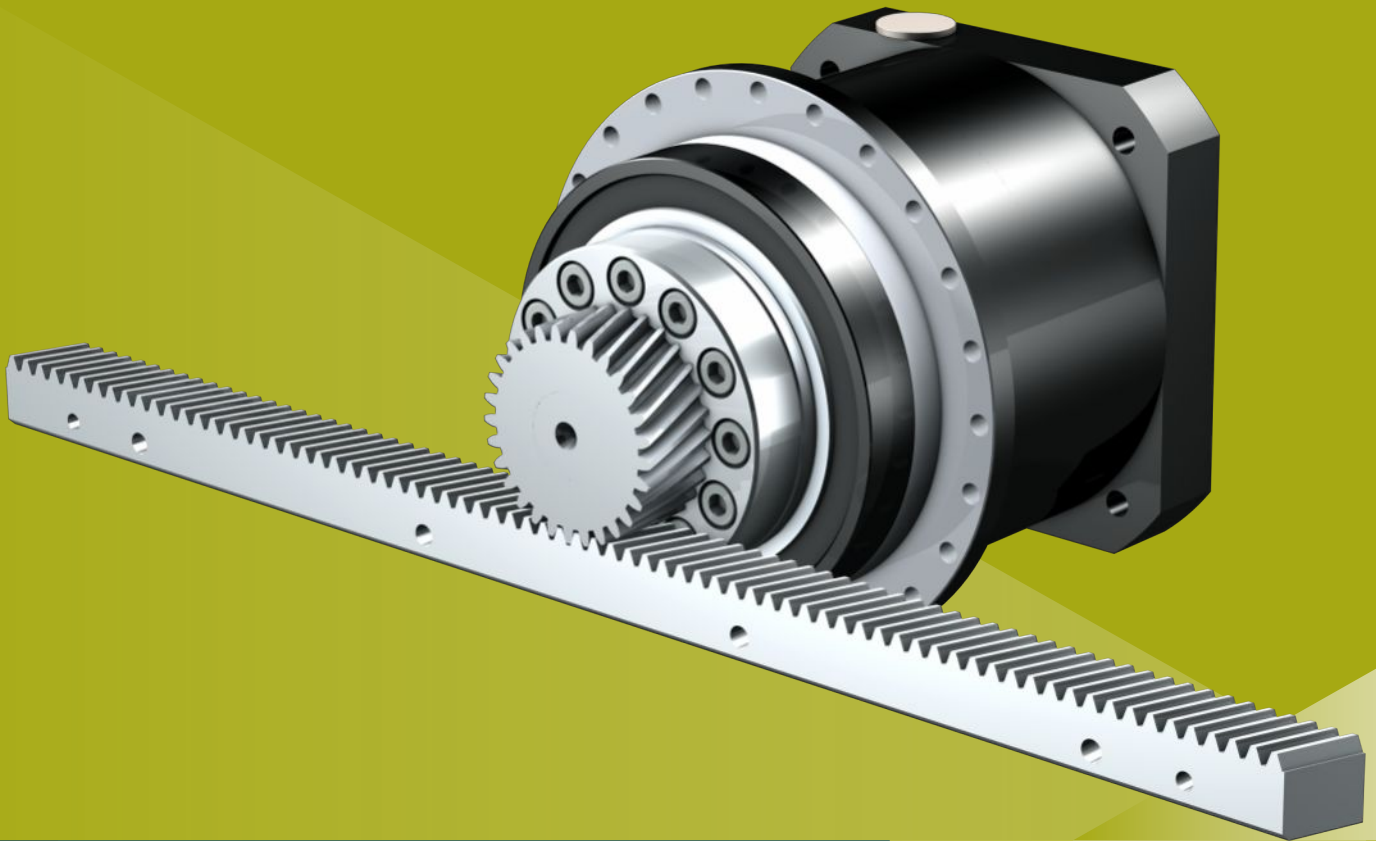
Enter the ID of the documentation in the Search... field.

Documentation	ID
Operating manual Rack and Pinion Drives (Atlanta)	442455
Operating manual for P/PA/PE/PH/PHA/PHQ/PHQA/PHV/PHVA planetary gear units and planetary geared motors	443029_en
Lubricant filling quantities for gear units	441871

5 ZTRPH rack and pinion drives

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5 Rack and pinion drives

ZTRPH

5.1 Overview

High-performance precision planetary gear units with screwed flange pinion

Features

Power density	★★★★☆
Linear clearance	★★★★☆
Price category	€€€€
Smooth operation	★★★★☆
Linear rigidity	★★★★☆
Mass moment of inertia	★★★★☆
Ready-to-install drive solution	✓
Pinion gearing quality 5 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓
Radial runout ≤ 10 μm (optional)	✓

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

Technical data

m_n	2 – 8 mm
z	12 – 32
F_{f2acc}	5.8 – 67 kN
$v_{f2maxzB}$	0.09 – 4.7 m/s
Δs	11 – 44 μm

5.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 5.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{fzmaxZB}$ [m/s]	Δs [mm]	C_{lin} [N/μm]	m_n [mm]	z	d_0 [mm]	F_{fzN} [kN]	F_{fzacc} [kN]	F_{fzNOT} [kN]	M_{2acc} [Nm]
ZTR2PH4 ($F_{fzacc,max} = 6,7$ kN)														
4.000	ZTR212SPH421_0040 ME	2300	5000	≤24	1.67	0.011	97	2	12	25.5	1.7	6.7	8.5	85
4.000	ZTR212SPH421_0040 MEL	2300	5000	≤32	1.67	0.011	98	2	12	25.5	1.7	6.7	8.5	85
4.000	ZTR216SPH421_0040 ME	2300	5000	≤24	2.22	0.015	91	2	16	34.0	1.7	5.8	7.3	99
4.000	ZTR216SPH421_0040 MEL	2300	5000	≤32	2.22	0.015	92	2	16	34.0	1.7	5.8	7.3	99
5.000	ZTR212SPH421_0050 ME	2700	6000	≤24	1.60	0.011	97	2	12	25.5	1.9	6.7	8.5	85
5.000	ZTR212SPH421_0050 MEL	2700	6000	≤32	1.60	0.011	98	2	12	25.5	1.9	6.7	8.5	85
5.000	ZTR216SPH421_0050 ME	2700	6000	≤24	2.13	0.015	91	2	16	34.0	1.9	5.8	7.3	99
5.000	ZTR216SPH421_0050 MEL	2700	6000	≤32	2.13	0.015	92	2	16	34.0	1.9	5.8	7.3	99
7.000	ZTR212SPH421_0070 ME	3200	6000	≤24	1.14	0.011	96	2	12	25.5	2.1	6.7	8.5	85
7.000	ZTR212SPH421_0070 MEL	3200	6000	≤32	1.14	0.011	96	2	12	25.5	2.1	6.7	8.5	85
7.000	ZTR216SPH421_0070 ME	3200	6000	≤24	1.52	0.015	89	2	16	34.0	2.1	5.8	7.3	99
7.000	ZTR216SPH421_0070 MEL	3200	6000	≤32	1.52	0.015	89	2	16	34.0	2.1	5.8	7.3	99
10.000	ZTR212SPH421_0100 ME	3500	6000	≤24	0.80	0.011	90	2	12	25.5	2.4	6.7	8.5	85
10.000	ZTR212SPH421_0100 MEL	3500	6000	≤32	0.80	0.011	90	2	12	25.5	2.4	6.7	8.5	85
10.000	ZTR216SPH421_0100 ME	3500	6000	≤24	1.07	0.015	80	2	16	34.0	2.4	5.8	7.3	99
10.000	ZTR216SPH421_0100 MEL	3500	6000	≤32	1.07	0.015	80	2	16	34.0	2.4	5.8	7.3	99
16.000	ZTR212SPH422_0160 ME	3700	6500	≤19	0.54	0.011	94	2	12	25.5	2.8	6.7	8.5	85
16.000	ZTR212SPH422_0160 MEL	3700	6500	≤24	0.54	0.011	94	2	12	25.5	2.8	6.7	8.5	85
16.000	ZTR216SPH422_0160 ME	3700	6500	≤19	0.72	0.015	86	2	16	34.0	2.8	5.8	7.3	99
16.000	ZTR216SPH422_0160 MEL	3700	6500	≤24	0.72	0.015	86	2	16	34.0	2.8	5.8	7.3	99
20.000	ZTR212SPH422_0200 ME	3700	6500	≤19	0.43	0.011	95	2	12	25.5	3.0	6.7	8.5	85
20.000	ZTR212SPH422_0200 MEL	3700	6500	≤24	0.43	0.011	95	2	12	25.5	3.0	6.7	8.5	85
20.000	ZTR216SPH422_0200 ME	3700	6500	≤19	0.58	0.015	88	2	16	34.0	3.0	5.8	7.3	99
20.000	ZTR216SPH422_0200 MEL	3700	6500	≤24	0.58	0.015	88	2	16	34.0	3.0	5.8	7.3	99
25.000	ZTR212SPH422_0250 ME	4000	7000	≤19	0.37	0.011	95	2	12	25.5	3.2	6.7	8.5	85
25.000	ZTR212SPH422_0250 MEL	4000	7000	≤24	0.37	0.011	95	2	12	25.5	3.2	6.7	8.5	85
25.000	ZTR216SPH422_0250 ME	4000	7000	≤19	0.50	0.015	88	2	16	34.0	3.2	5.8	7.3	99
25.000	ZTR216SPH422_0250 MEL	4000	7000	≤24	0.50	0.015	88	2	16	34.0	3.2	5.8	7.3	99
28.000	ZTR212SPH422_0280 ME	4500	8000	≤19	0.38	0.011	93	2	12	25.5	3.2	6.7	8.5	85
28.000	ZTR212SPH422_0280 MEL	4500	8000	≤24	0.38	0.011	93	2	12	25.5	3.2	6.7	8.5	85
28.000	ZTR216SPH422_0280 ME	4500	8000	≤19	0.51	0.015	85	2	16	34.0	3.2	5.8	7.3	99
28.000	ZTR216SPH422_0280 MEL	4500	8000	≤24	0.51	0.015	85	2	16	34.0	3.2	5.8	7.3	99
35.000	ZTR212SPH422_0350 ME	4500	8000	≤19	0.31	0.011	95	2	12	25.5	3.2	6.7	8.5	85
35.000	ZTR212SPH422_0350 MEL	4500	8000	≤24	0.31	0.011	95	2	12	25.5	3.2	6.7	8.5	85
35.000	ZTR216SPH422_0350 ME	4500	8000	≤19	0.41	0.015	87	2	16	34.0	3.2	5.8	7.3	99
35.000	ZTR216SPH422_0350 MEL	4500	8000	≤24	0.41	0.015	87	2	16	34.0	3.2	5.8	7.3	99
40.000	ZTR212SPH422_0400 ME	4500	8000	≤19	0.27	0.011	92	2	12	25.5	3.2	6.7	8.5	85
40.000	ZTR212SPH422_0400 MEL	4500	8000	≤24	0.27	0.011	92	2	12	25.5	3.2	6.7	8.5	85
40.000	ZTR216SPH422_0400 ME	4500	8000	≤19	0.36	0.015	84	2	16	34.0	3.2	5.8	7.3	99
40.000	ZTR216SPH422_0400 MEL	4500	8000	≤24	0.36	0.015	84	2	16	34.0	3.2	5.8	7.3	99
50.000	ZTR212SPH422_0500 ME	4500	8000	≤19	0.21	0.011	94	2	12	25.5	3.2	6.7	8.5	85
50.000	ZTR212SPH422_0500 MEL	4500	8000	≤24	0.21	0.011	94	2	12	25.5	3.2	6.7	8.5	85
50.000	ZTR216SPH422_0500 ME	4500	8000	≤19	0.28	0.015	87	2	16	34.0	3.2	5.8	7.3	99
50.000	ZTR216SPH422_0500 MEL	4500	8000	≤24	0.28	0.015	87	2	16	34.0	3.2	5.8	7.3	99
70.000	ZTR212SPH422_0700 ME	4500	8000	≤19	0.15	0.011	94	2	12	25.5	3.2	6.7	8.5	85
70.000	ZTR212SPH422_0700 MEL	4500	8000	≤24	0.15	0.011	94	2	12	25.5	3.2	6.7	8.5	85
70.000	ZTR216SPH422_0700 ME	4500	8000	≤19	0.20	0.015	86	2	16	34.0	3.2	5.8	7.3	99
70.000	ZTR216SPH422_0700 MEL	4500	8000	≤24	0.20	0.015	86	2	16	34.0	3.2	5.8	7.3	99
100.0	ZTR212SPH422_1000 ME	4500	8000	≤19	0.11	0.011	89	2	12	25.5	3.2	6.7	8.5	85
100.0	ZTR212SPH422_1000 MEL	4500	8000	≤24	0.11	0.011	89	2	12	25.5	3.2	6.7	8.5	85
100.0	ZTR216SPH422_1000 ME	4500	8000	≤19	0.14	0.015	79	2	16	34.0	3.2	5.8	7.3	99
100.0	ZTR216SPH422_1000 MEL	4500	8000	≤24	0.14	0.015	79	2	16	34.0	3.2	5.8	7.3	99

5.2 Selection tables 5 ZTRPH rack and pinion drives

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{f2maxZB} [m/s]	Δs [mm]	C _{lin} [N/μm]	m _n [mm]	z	d ₀ [mm]	F _{f2N} [kN]	F _{f2acc} [kN]	F _{f2NOT} [kN]	M _{2acc} [Nm]
ZTR2PH5 (F _{f2acc,max} = 10 kN)														
4.000	ZTR212SPH521_0040 ME	2200	5000	≤32	1.67	0.011	94	2	12	25.5	2.5	6.7	13	85
4.000	ZTR212SPH521_0040 MEL	2200	5000	≤38	1.67	0.011	95	2	12	25.5	2.5	6.7	13	85
4.000	ZTR219SPH521_0040 ME	2200	5000	≤32	2.64	0.018	92	2	19	40.3	2.5	10	13	210
4.000	ZTR219SPH521_0040 MEL	2200	5000	≤38	2.64	0.018	93	2	19	40.3	2.5	10	13	210
4.000	ZTR223SPH521_0040 ME	2200	5000	≤32	3.19	0.021	88	2	23	48.8	2.5	9.2	11	220
4.000	ZTR223SPH521_0040 MEL	2200	5000	≤38	3.19	0.021	90	2	23	48.8	2.5	9.2	11	220
5.000	ZTR212SPH521_0050 ME	2500	5500	≤32	1.47	0.011	94	2	12	25.5	2.7	6.7	13	85
5.000	ZTR212SPH521_0050 MEL	2500	5500	≤38	1.47	0.011	95	2	12	25.5	2.7	6.7	13	85
5.000	ZTR219SPH521_0050 ME	2500	5500	≤32	2.32	0.018	93	2	19	40.3	2.7	10	13	210
5.000	ZTR219SPH521_0050 MEL	2500	5500	≤38	2.32	0.018	93	2	19	40.3	2.7	10	13	210
5.000	ZTR223SPH521_0050 ME	2500	5500	≤32	2.81	0.021	88	2	23	48.8	2.7	9.2	11	220
5.000	ZTR223SPH521_0050 MEL	2500	5500	≤38	2.81	0.021	90	2	23	48.8	2.7	9.2	11	220
7.000	ZTR212SPH521_0070 ME	3000	6000	≤32	1.14	0.011	94	2	12	25.5	3.0	6.7	13	85
7.000	ZTR212SPH521_0070 MEL	3000	6000	≤38	1.14	0.011	94	2	12	25.5	3.0	6.7	13	85
7.000	ZTR219SPH521_0070 ME	3000	6000	≤32	1.81	0.018	91	2	19	40.3	3.0	10	13	210
7.000	ZTR219SPH521_0070 MEL	3000	6000	≤38	1.81	0.018	91	2	19	40.3	3.0	10	13	210
7.000	ZTR223SPH521_0070 ME	3000	6000	≤32	2.19	0.021	86	2	23	48.8	3.0	9.2	11	220
7.000	ZTR223SPH521_0070 MEL	3000	6000	≤38	2.19	0.021	87	2	23	48.8	3.0	9.2	11	220
10.00	ZTR212SPH521_0100 ME	3300	6000	≤32	0.80	0.011	92	2	12	25.5	3.3	6.7	13	85
10.00	ZTR212SPH521_0100 MEL	3300	6000	≤38	0.80	0.011	92	2	12	25.5	3.3	6.7	13	85
10.00	ZTR219SPH521_0100 ME	3300	6000	≤32	1.27	0.018	87	2	19	40.3	3.3	10	13	210
10.00	ZTR219SPH521_0100 MEL	3300	6000	≤38	1.27	0.018	87	2	19	40.3	3.3	10	13	210
10.00	ZTR223SPH521_0100 ME	3300	6000	≤32	1.53	0.021	81	2	23	48.8	3.3	9.2	11	220
10.00	ZTR223SPH521_0100 MEL	3300	6000	≤38	1.53	0.021	81	2	23	48.8	3.3	9.2	11	220
16.00	ZTR212SPH522_0160 ME	3300	6000	≤24	0.50	0.011	93	2	12	25.5	3.9	6.7	13	85
16.00	ZTR212SPH522_0160 MEL	3300	6000	≤32	0.50	0.011	93	2	12	25.5	3.9	6.7	13	85
16.00	ZTR219SPH522_0160 ME	3300	6000	≤24	0.79	0.018	89	2	19	40.3	3.9	10	13	210
16.00	ZTR219SPH522_0160 MEL	3300	6000	≤32	0.79	0.018	90	2	19	40.3	3.9	10	13	210
16.00	ZTR223SPH522_0160 ME	3300	6000	≤24	0.96	0.021	84	2	23	48.8	3.9	9.2	11	220
16.00	ZTR223SPH522_0160 MEL	3300	6000	≤32	0.96	0.021	85	2	23	48.8	3.9	9.2	11	220
20.00	ZTR212SPH522_0200 ME	3300	6000	≤24	0.40	0.011	94	2	12	25.5	4.2	6.7	13	85
20.00	ZTR212SPH522_0200 MEL	3300	6000	≤32	0.40	0.011	94	2	12	25.5	4.2	6.7	13	85
20.00	ZTR219SPH522_0200 ME	3300	6000	≤24	0.63	0.018	91	2	19	40.3	4.2	10	13	210
20.00	ZTR219SPH522_0200 MEL	3300	6000	≤32	0.63	0.018	91	2	19	40.3	4.2	10	13	210
20.00	ZTR223SPH522_0200 ME	3300	6000	≤24	0.77	0.021	86	2	23	48.8	4.2	9.2	11	220
20.00	ZTR223SPH522_0200 MEL	3300	6000	≤32	0.77	0.021	86	2	23	48.8	4.2	9.2	11	220
25.00	ZTR212SPH522_0250 ME	3700	6500	≤24	0.35	0.011	94	2	12	25.5	4.5	6.7	13	85
25.00	ZTR212SPH522_0250 MEL	3700	6500	≤32	0.35	0.011	94	2	12	25.5	4.5	6.7	13	85
25.00	ZTR219SPH522_0250 ME	3700	6500	≤24	0.55	0.018	91	2	19	40.3	4.5	10	13	210
25.00	ZTR219SPH522_0250 MEL	3700	6500	≤32	0.55	0.018	91	2	19	40.3	4.5	10	13	210
25.00	ZTR223SPH522_0250 ME	3700	6500	≤24	0.66	0.021	86	2	23	48.8	4.5	9.2	11	220
25.00	ZTR223SPH522_0250 MEL	3700	6500	≤32	0.66	0.021	86	2	23	48.8	4.5	9.2	11	220
28.00	ZTR212SPH522_0280 ME	4000	7000	≤24	0.33	0.011	93	2	12	25.5	4.5	6.7	13	85
28.00	ZTR212SPH522_0280 MEL	4000	7000	≤32	0.33	0.011	93	2	12	25.5	4.5	6.7	13	85
28.00	ZTR219SPH522_0280 ME	4000	7000	≤24	0.53	0.018	89	2	19	40.3	4.5	10	13	210
28.00	ZTR219SPH522_0280 MEL	4000	7000	≤32	0.53	0.018	89	2	19	40.3	4.5	10	13	210
28.00	ZTR223SPH522_0280 ME	4000	7000	≤24	0.64	0.021	83	2	23	48.8	4.5	9.2	11	220
28.00	ZTR223SPH522_0280 MEL	4000	7000	≤32	0.64	0.021	83	2	23	48.8	4.5	9.2	11	220
35.00	ZTR212SPH522_0350 ME	4000	7000	≤24	0.27	0.011	93	2	12	25.5	4.5	6.7	13	85
35.00	ZTR212SPH522_0350 MEL	4000	7000	≤32	0.27	0.011	94	2	12	25.5	4.5	6.7	13	85
35.00	ZTR219SPH522_0350 ME	4000	7000	≤24	0.42	0.018	90	2	19	40.3	4.5	10	13	210
35.00	ZTR219SPH522_0350 MEL	4000	7000	≤32	0.42	0.018	90	2	19	40.3	4.5	10	13	210
35.00	ZTR223SPH522_0350 ME	4000	7000	≤24	0.51	0.021	86	2	23	48.8	4.5	9.2	11	220
35.00	ZTR223SPH522_0350 MEL	4000	7000	≤32	0.51	0.021	86	2	23	48.8	4.5	9.2	11	220
40.00	ZTR212SPH522_0400 ME	4000	7000	≤24	0.23	0.011	93	2	12	25.5	4.5	6.7	13	85
40.00	ZTR212SPH522_0400 MEL	4000	7000	≤32	0.23	0.011	93	2	12	25.5	4.5	6.7	13	85
40.00	ZTR219SPH522_0400 ME	4000	7000	≤24	0.37	0.018	88	2	19	40.3	4.5	10	13	210
40.00	ZTR219SPH522_0400 MEL	4000	7000	≤32	0.37	0.018	88	2	19	40.3	4.5	10	13	210
40.00	ZTR223SPH522_0400 ME	4000	7000	≤24	0.45	0.021	83	2	23	48.8	4.5	9.2	11	220
40.00	ZTR223SPH522_0400 MEL	4000	7000	≤32	0.45	0.021	83	2	23	48.8	4.5	9.2	11	220
50.00	ZTR212SPH522_0500 ME	4000	7000	≤24	0.19	0.011	93	2	12	25.5	4.5	6.7	13	85
50.00	ZTR212SPH522_0500 MEL	4000	7000	≤32	0.19	0.011	93	2	12	25.5	4.5	6.7	13	85
50.00	ZTR219SPH522_0500 ME	4000	7000	≤24	0.30	0.018	90	2	19	40.3	4.5	10	13	210
50.00	ZTR219SPH522_0500 MEL	4000	7000	≤32	0.30	0.018	90	2	19	40.3	4.5	10	13	210
50.00	ZTR223SPH522_0500 ME	4000	7000	≤24	0.36	0.021	85	2	23	48.8	4.5	9.2	11	220
50.00	ZTR223SPH522_0500 MEL	4000	7000	≤32	0.36	0.021	85	2	23	48.8	4.5	9.2	11	220
70.00	ZTR212SPH522_0700 ME	4000	7000	≤24	0.13	0.011	93	2	12	25.5	4.5	6.7	13	85

i	Type	n_{1maxDB}	n_{1maxZB}	d_{MW}	$v_{fzmaxZB}$	Δs	C_{lin}	m_n	z	d_0	F_{fzN}	F_{fzacc}	F_{fzNOT}	M_{zacc}
		[rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/ μ m]	[mm]						
ZTR2PH5 ($F_{fzacc,max} = 10\text{ kN}$)														
70.00	ZTR212SPH522_0700 MEL	4000	7000	≤32	0.13	0.011	93	2	12	25.5	4.5	6.7	13	85
70.00	ZTR219SPH522_0700 ME	4000	7000	≤24	0.21	0.018	90	2	19	40.3	4.5	10	13	210
70.00	ZTR219SPH522_0700 MEL	4000	7000	≤32	0.21	0.018	90	2	19	40.3	4.5	10	13	210
70.00	ZTR223SPH522_0700 ME	4000	7000	≤24	0.26	0.021	85	2	23	48.8	4.5	9.2	11	220
70.00	ZTR223SPH522_0700 MEL	4000	7000	≤32	0.26	0.021	85	2	23	48.8	4.5	9.2	11	220
100.0	ZTR212SPH522_1000 ME	4000	7000	≤24	0.09	0.011	92	2	12	25.5	4.5	6.7	13	85
100.0	ZTR212SPH522_1000 MEL	4000	7000	≤32	0.09	0.011	92	2	12	25.5	4.5	6.7	13	85
100.0	ZTR219SPH522_1000 ME	4000	7000	≤24	0.15	0.018	86	2	19	40.3	4.5	10	13	210
100.0	ZTR219SPH522_1000 MEL	4000	7000	≤32	0.15	0.018	86	2	19	40.3	4.5	10	13	210
100.0	ZTR223SPH522_1000 ME	4000	7000	≤24	0.18	0.021	80	2	23	48.8	4.5	9.2	11	220
100.0	ZTR223SPH522_1000 MEL	4000	7000	≤32	0.18	0.021	80	2	23	48.8	4.5	9.2	11	220
ZTR3PH5 ($F_{fzacc,max} = 10\text{ kN}$)														
4.000	ZTR312SPH521_0040 ME	2200	5000	≤32	2.50	0.017	88	3	12	38.2	2.4	10	13	190
4.000	ZTR312SPH521_0040 MEL	2200	5000	≤38	2.50	0.017	89	3	12	38.2	2.4	10	13	190
4.000	ZTR314SPH521_0040 ME	2200	5000	≤32	2.92	0.019	86	3	14	44.6	2.4	9.3	12	210
4.000	ZTR314SPH521_0040 MEL	2200	5000	≤38	2.92	0.019	87	3	14	44.6	2.4	9.3	12	210
5.000	ZTR312SPH521_0050 ME	2500	5500	≤32	2.20	0.017	88	3	12	38.2	2.6	10	13	190
5.000	ZTR312SPH521_0050 MEL	2500	5500	≤38	2.20	0.017	89	3	12	38.2	2.6	10	13	190
5.000	ZTR314SPH521_0050 ME	2500	5500	≤32	2.57	0.019	86	3	14	44.6	2.6	9.3	12	210
5.000	ZTR314SPH521_0050 MEL	2500	5500	≤38	2.57	0.019	87	3	14	44.6	2.6	9.3	12	210
7.000	ZTR312SPH521_0070 ME	3000	6000	≤32	1.71	0.017	87	3	12	38.2	2.9	10	13	190
7.000	ZTR312SPH521_0070 MEL	3000	6000	≤38	1.71	0.017	87	3	12	38.2	2.9	10	13	190
7.000	ZTR314SPH521_0070 ME	3000	6000	≤32	2.00	0.019	85	3	14	44.6	2.9	9.3	12	210
7.000	ZTR314SPH521_0070 MEL	3000	6000	≤38	2.00	0.019	85	3	14	44.6	2.9	9.3	12	210
10.00	ZTR312SPH521_0100 ME	3300	6000	≤32	1.20	0.017	83	3	12	38.2	3.2	10	13	190
10.00	ZTR312SPH521_0100 MEL	3300	6000	≤38	1.20	0.017	84	3	12	38.2	3.2	10	13	190
10.00	ZTR314SPH521_0100 ME	3300	6000	≤32	1.40	0.019	80	3	14	44.6	3.2	9.3	12	210
10.00	ZTR314SPH521_0100 MEL	3300	6000	≤38	1.40	0.019	80	3	14	44.6	3.2	9.3	12	210
16.00	ZTR312SPH522_0160 ME	3300	6000	≤24	0.75	0.017	86	3	12	38.2	3.8	10	13	190
16.00	ZTR312SPH522_0160 MEL	3300	6000	≤32	0.75	0.017	86	3	12	38.2	3.8	10	13	190
16.00	ZTR314SPH522_0160 ME	3300	6000	≤24	0.88	0.019	83	3	14	44.6	3.8	9.3	12	210
16.00	ZTR314SPH522_0160 MEL	3300	6000	≤32	0.88	0.019	83	3	14	44.6	3.8	9.3	12	210
20.00	ZTR312SPH522_0200 ME	3300	6000	≤24	0.60	0.017	87	3	12	38.2	4.1	10	13	190
20.00	ZTR312SPH522_0200 MEL	3300	6000	≤32	0.60	0.017	87	3	12	38.2	4.1	10	13	190
20.00	ZTR314SPH522_0200 ME	3300	6000	≤24	0.70	0.019	84	3	14	44.6	4.1	9.3	12	210
20.00	ZTR314SPH522_0200 MEL	3300	6000	≤32	0.70	0.019	84	3	14	44.6	4.1	9.3	12	210
25.00	ZTR312SPH522_0250 ME	3700	6500	≤24	0.52	0.017	87	3	12	38.2	4.4	10	13	190
25.00	ZTR312SPH522_0250 MEL	3700	6500	≤32	0.52	0.017	87	3	12	38.2	4.4	10	13	190
25.00	ZTR314SPH522_0250 ME	3700	6500	≤24	0.61	0.019	84	3	14	44.6	4.4	9.3	12	210
25.00	ZTR314SPH522_0250 MEL	3700	6500	≤32	0.61	0.019	84	3	14	44.6	4.4	9.3	12	210
28.00	ZTR312SPH522_0280 ME	4000	7000	≤24	0.50	0.017	85	3	12	38.2	4.4	10	13	190
28.00	ZTR312SPH522_0280 MEL	4000	7000	≤32	0.50	0.017	85	3	12	38.2	4.4	10	13	190
28.00	ZTR314SPH522_0280 ME	4000	7000	≤24	0.58	0.019	82	3	14	44.6	4.4	9.3	12	210
28.00	ZTR314SPH522_0280 MEL	4000	7000	≤32	0.58	0.019	82	3	14	44.6	4.4	9.3	12	210
35.00	ZTR312SPH522_0350 ME	4000	7000	≤24	0.40	0.017	87	3	12	38.2	4.4	10	13	190
35.00	ZTR312SPH522_0350 MEL	4000	7000	≤32	0.40	0.017	87	3	12	38.2	4.4	10	13	190
35.00	ZTR314SPH522_0350 ME	4000	7000	≤24	0.47	0.019	84	3	14	44.6	4.4	9.3	12	210
35.00	ZTR314SPH522_0350 MEL	4000	7000	≤32	0.47	0.019	84	3	14	44.6	4.4	9.3	12	210
40.00	ZTR312SPH522_0400 ME	4000	7000	≤24	0.35	0.017	85	3	12	38.2	4.4	10	13	190
40.00	ZTR312SPH522_0400 MEL	4000	7000	≤32	0.35	0.017	85	3	12	38.2	4.4	10	13	190
40.00	ZTR314SPH522_0400 ME	4000	7000	≤24	0.41	0.019	81	3	14	44.6	4.4	9.3	12	210
40.00	ZTR314SPH522_0400 MEL	4000	7000	≤32	0.41	0.019	82	3	14	44.6	4.4	9.3	12	210
50.00	ZTR312SPH522_0500 ME	4000	7000	≤24	0.28	0.017	86	3	12	38.2	4.4	10	13	190
50.00	ZTR312SPH522_0500 MEL	4000	7000	≤32	0.28	0.017	86	3	12	38.2	4.4	10	13	190
50.00	ZTR314SPH522_0500 ME	4000	7000	≤24	0.33	0.019	83	3	14	44.6	4.4	9.3	12	210
50.00	ZTR314SPH522_0500 MEL	4000	7000	≤32	0.33	0.019	83	3	14	44.6	4.4	9.3	12	210
70.00	ZTR312SPH522_0700 ME	4000	7000	≤24	0.20	0.017	86	3	12	38.2	4.4	10	13	190
70.00	ZTR312SPH522_0700 MEL	4000	7000	≤32	0.20	0.017	86	3	12	38.2	4.4	10	13	190
70.00	ZTR314SPH522_0700 ME	4000	7000	≤24	0.23	0.019	83	3	14	44.6	4.4	9.3	12	210
70.00	ZTR314SPH522_0700 MEL	4000	7000	≤32	0.23	0.019	83	3	14	44.6	4.4	9.3	12	210
100.0	ZTR312SPH522_1000 ME	4000	7000	≤24	0.14	0.017	83	3	12	38.2	4.4	10	13	190
100.0	ZTR312SPH522_1000 MEL	4000	7000	≤32	0.14	0.017	83	3	12	38.2	4.4	10	13	190
100.0	ZTR314SPH522_1000 ME	4000	7000	≤24	0.16	0.019	80	3	14	44.6	4.4	9.3	12	210
100.0	ZTR314SPH522_1000 MEL	4000	7000	≤32	0.16	0.019	80	3	14	44.6	4.4	9.3	12	210

5.2 Selection tables 5 ZTRPH rack and pinion drives

i	Type	n_{1maxDB}	n_{1maxZB}	d_{MW}	$v_{fzmaxZB}$	Δs	C_{lin}	m_n	z	d_0	F_{fzN}	F_{fzacc}	F_{fzNOT}	M_{2acc}
		[rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/μm]	[mm]						
ZTR2PH7 ($F_{fzacc,max} = 15 \text{ kN}$)														
4.000	ZTR212SPH721_0040 ME	1900	4000	≤38	1.33	0.011	116	2	12	25.5	6.7	6.7	13	85
4.000	ZTR212SPH721_0040 MEL	1900	4000	≤48	1.33	0.011	117	2	12	25.5	6.7	6.7	13	85
4.000	ZTR223SPH721_0040 ME	1900	4000	≤38	2.56	0.021	114	2	23	48.8	7.0	15	28	360
4.000	ZTR223SPH721_0040 MEL	1900	4000	≤48	2.56	0.021	116	2	23	48.8	7.0	15	28	360
5.000	ZTR212SPH721_0050 ME	2200	5000	≤38	1.33	0.011	116	2	12	25.5	6.7	6.7	13	85
5.000	ZTR212SPH721_0050 MEL	2200	5000	≤48	1.33	0.011	117	2	12	25.5	6.7	6.7	13	85
5.000	ZTR223SPH721_0050 ME	2200	5000	≤38	2.56	0.021	115	2	23	48.8	7.6	15	28	360
5.000	ZTR223SPH721_0050 MEL	2200	5000	≤48	2.56	0.021	116	2	23	48.8	7.6	15	28	360
7.000	ZTR212SPH721_0070 ME	2500	5000	≤38	0.95	0.011	116	2	12	25.5	6.7	6.7	13	85
7.000	ZTR212SPH721_0070 MEL	2500	5000	≤48	0.95	0.011	116	2	12	25.5	6.7	6.7	13	85
7.000	ZTR223SPH721_0070 ME	2500	5000	≤38	1.83	0.021	114	2	23	48.8	8.5	15	28	360
7.000	ZTR223SPH721_0070 MEL	2500	5000	≤48	1.83	0.021	115	2	23	48.8	8.5	15	28	360
10.000	ZTR212SPH721_0100 ME	3000	5000	≤38	0.67	0.011	115	2	12	25.5	6.7	6.7	13	85
10.000	ZTR212SPH721_0100 MEL	3000	5000	≤48	0.67	0.011	115	2	12	25.5	6.7	6.7	13	85
10.000	ZTR223SPH721_0100 ME	3000	5000	≤38	1.28	0.021	110	2	23	48.8	9.6	15	28	360
10.000	ZTR223SPH721_0100 MEL	3000	5000	≤48	1.28	0.021	110	2	23	48.8	9.6	15	28	360
16.000	ZTR212SPH722_0160 ME	3000	5000	≤32	0.42	0.011	116	2	12	25.5	6.7	6.7	13	85
16.000	ZTR212SPH722_0160 MEL	3000	5000	≤38	0.42	0.011	116	2	12	25.5	6.7	6.7	13	85
16.000	ZTR223SPH722_0160 ME	3000	5000	≤32	0.80	0.021	113	2	23	48.8	11	15	28	360
16.000	ZTR223SPH722_0160 MEL	3000	5000	≤38	0.80	0.021	113	2	23	48.8	11	15	28	360
20.000	ZTR212SPH722_0200 ME	3000	5000	≤32	0.33	0.011	116	2	12	25.5	6.7	6.7	13	85
20.000	ZTR212SPH722_0200 MEL	3000	5000	≤38	0.33	0.011	116	2	12	25.5	6.7	6.7	13	85
20.000	ZTR223SPH722_0200 ME	3000	5000	≤32	0.64	0.021	115	2	23	48.8	12	15	28	360
20.000	ZTR223SPH722_0200 MEL	3000	5000	≤38	0.64	0.021	115	2	23	48.8	12	15	28	360
25.000	ZTR212SPH722_0250 ME	3500	6000	≤32	0.32	0.011	116	2	12	25.5	6.7	6.7	13	85
25.000	ZTR212SPH722_0250 MEL	3500	6000	≤38	0.32	0.011	116	2	12	25.5	6.7	6.7	13	85
25.000	ZTR223SPH722_0250 ME	3500	6000	≤32	0.61	0.021	115	2	23	48.8	13	15	28	360
25.000	ZTR223SPH722_0250 MEL	3500	6000	≤38	0.61	0.021	115	2	23	48.8	13	15	28	360
28.000	ZTR212SPH722_0280 ME	3700	6500	≤32	0.31	0.011	116	2	12	25.5	6.7	6.7	13	85
28.000	ZTR212SPH722_0280 MEL	3700	6500	≤38	0.31	0.011	116	2	12	25.5	6.7	6.7	13	85
28.000	ZTR223SPH722_0280 ME	3700	6500	≤32	0.59	0.021	113	2	23	48.8	13	15	28	360
28.000	ZTR223SPH722_0280 MEL	3700	6500	≤38	0.59	0.021	113	2	23	48.8	13	15	28	360
35.000	ZTR212SPH722_0350 ME	3700	6500	≤32	0.25	0.011	116	2	12	25.5	6.7	6.7	13	85
35.000	ZTR212SPH722_0350 MEL	3700	6500	≤38	0.25	0.011	116	2	12	25.5	6.7	6.7	13	85
35.000	ZTR223SPH722_0350 ME	3700	6500	≤32	0.48	0.021	114	2	23	48.8	13	15	28	360
35.000	ZTR223SPH722_0350 MEL	3700	6500	≤38	0.48	0.021	114	2	23	48.8	13	15	28	360
40.000	ZTR212SPH722_0400 ME	3700	6500	≤32	0.22	0.011	116	2	12	25.5	6.7	6.7	13	85
40.000	ZTR212SPH722_0400 MEL	3700	6500	≤38	0.22	0.011	116	2	12	25.5	6.7	6.7	13	85
40.000	ZTR223SPH722_0400 ME	3700	6500	≤32	0.42	0.021	112	2	23	48.8	13	15	28	360
40.000	ZTR223SPH722_0400 MEL	3700	6500	≤38	0.42	0.021	112	2	23	48.8	13	15	28	360
50.000	ZTR212SPH722_0500 ME	3700	6500	≤32	0.17	0.011	116	2	12	25.5	6.7	6.7	13	85
50.000	ZTR212SPH722_0500 MEL	3700	6500	≤38	0.17	0.011	116	2	12	25.5	6.7	6.7	13	85
50.000	ZTR223SPH722_0500 ME	3700	6500	≤32	0.33	0.021	114	2	23	48.8	13	15	28	360
50.000	ZTR223SPH722_0500 MEL	3700	6500	≤38	0.33	0.021	114	2	23	48.8	13	15	28	360
70.000	ZTR212SPH722_0700 ME	3700	6500	≤32	0.12	0.011	116	2	12	25.5	6.7	6.7	13	85
70.000	ZTR212SPH722_0700 MEL	3700	6500	≤38	0.12	0.011	116	2	12	25.5	6.7	6.7	13	85
70.000	ZTR223SPH722_0700 ME	3700	6500	≤32	0.24	0.021	114	2	23	48.8	13	15	28	360
70.000	ZTR223SPH722_0700 MEL	3700	6500	≤38	0.24	0.021	114	2	23	48.8	13	15	28	360
100.000	ZTR212SPH722_1000 ME	3700	6500	≤32	0.09	0.011	115	2	12	25.5	6.7	6.7	13	85
100.000	ZTR212SPH722_1000 MEL	3700	6500	≤38	0.09	0.011	115	2	12	25.5	6.7	6.7	13	85
100.000	ZTR223SPH722_1000 ME	3700	6500	≤32	0.17	0.021	110	2	23	48.8	12	15	28	360
100.000	ZTR223SPH722_1000 MEL	3700	6500	≤38	0.17	0.021	110	2	23	48.8	12	15	28	360
ZTR3PH7 ($F_{fzacc,max} = 19 \text{ kN}$)														
4.000	ZTR316SPH721_0040 ME	1900	4000	≤38	2.67	0.022	113	3	16	50.9	6.8	17	26	450
4.000	ZTR316SPH721_0040 MEL	1900	4000	≤48	2.67	0.022	115	3	16	50.9	6.8	17	26	450
4.000	ZTR319SPH721_0040 ME	1900	4000	≤38	3.17	0.026	108	3	19	60.5	6.8	19	23	560
4.000	ZTR319SPH721_0040 MEL	1900	4000	≤48	3.17	0.026	110	3	19	60.5	6.8	19	23	560
5.000	ZTR316SPH721_0050 ME	2200	5000	≤38	2.67	0.022	114	3	16	50.9	7.3	17	26	450
5.000	ZTR316SPH721_0050 MEL	2200	5000	≤48	2.67	0.022	115	3	16	50.9	7.3	17	26	450
5.000	ZTR319SPH721_0050 ME	2200	5000	≤38	3.17	0.026	110	3	19	60.5	7.3	19	23	560
5.000	ZTR319SPH721_0050 MEL	2200	5000	≤48	3.17	0.026	111	3	19	60.5	7.3	19	23	560
7.000	ZTR316SPH721_0070 ME	2500	5000	≤38	1.91	0.022	113	3	16	50.9	8.2	17	26	450
7.000	ZTR316SPH721_0070 MEL	2500	5000	≤48	1.91	0.022	114	3	16	50.9	8.2	17	26	450
7.000	ZTR319SPH721_0070 ME	2500	5000	≤38	2.26	0.026	108	3	19	60.5	8.2	19	23	560
7.000	ZTR319SPH721_0070 MEL	2500	5000	≤48	2.26	0.026	109	3	19	60.5	8.2	19	23	560
10.000	ZTR316SPH721_0100 ME	3000	5000	≤38	1.33	0.022	108	3	16	50.9	9.3	17	26	450

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{fzmaxZB}$ [m/s]	Δs [mm]	C_{lin} [N/μm]	m_n [mm]	z	d_0 [mm]	F_{fzN} [kN]	F_{fzacc} [kN]	F_{fzNOT} [kN]	M_{zacc} [Nm]
ZTR3PH7 ($F_{fzacc,max} = 19$ kN)														
10.00	ZTR316SPH721_0100 MEL	3000	5000	≤48	1.33	0.022	109	3	16	50.9	9.3	17	26	450
10.00	ZTR319SPH721_0100 ME	3000	5000	≤38	1.58	0.026	102	3	19	60.5	9.3	17	23	500
10.00	ZTR319SPH721_0100 MEL	3000	5000	≤48	1.58	0.026	103	3	19	60.5	9.3	17	23	500
16.00	ZTR316SPH722_0160 ME	3000	5000	≤32	0.83	0.022	112	3	16	50.9	11	17	26	450
16.00	ZTR316SPH722_0160 MEL	3000	5000	≤38	0.83	0.022	112	3	16	50.9	11	17	26	450
16.00	ZTR319SPH722_0160 ME	3000	5000	≤32	0.99	0.026	106	3	19	60.5	11	19	23	560
16.00	ZTR319SPH722_0160 MEL	3000	5000	≤38	0.99	0.026	106	3	19	60.5	11	19	23	560
20.00	ZTR316SPH722_0200 ME	3000	5000	≤32	0.67	0.022	113	3	16	50.9	12	17	26	450
20.00	ZTR316SPH722_0200 MEL	3000	5000	≤38	0.67	0.022	113	3	16	50.9	12	17	26	450
20.00	ZTR319SPH722_0200 ME	3000	5000	≤32	0.79	0.026	108	3	19	60.5	12	19	23	560
20.00	ZTR319SPH722_0200 MEL	3000	5000	≤38	0.79	0.026	109	3	19	60.5	12	19	23	560
25.00	ZTR316SPH722_0250 ME	3500	6000	≤32	0.64	0.022	113	3	16	50.9	13	17	26	450
25.00	ZTR316SPH722_0250 MEL	3500	6000	≤38	0.64	0.022	113	3	16	50.9	13	17	26	450
25.00	ZTR319SPH722_0250 ME	3500	6000	≤32	0.76	0.026	108	3	19	60.5	13	19	23	560
25.00	ZTR319SPH722_0250 MEL	3500	6000	≤38	0.76	0.026	108	3	19	60.5	13	19	23	560
28.00	ZTR316SPH722_0280 ME	3700	6500	≤32	0.62	0.022	111	3	16	50.9	13	17	26	450
28.00	ZTR316SPH722_0280 MEL	3700	6500	≤38	0.62	0.022	111	3	16	50.9	13	17	26	450
28.00	ZTR319SPH722_0280 ME	3700	6500	≤32	0.74	0.026	106	3	19	60.5	13	19	23	560
28.00	ZTR319SPH722_0280 MEL	3700	6500	≤38	0.74	0.026	106	3	19	60.5	13	19	23	560
35.00	ZTR316SPH722_0350 ME	3700	6500	≤32	0.50	0.022	113	3	16	50.9	13	17	26	450
35.00	ZTR316SPH722_0350 MEL	3700	6500	≤38	0.50	0.022	113	3	16	50.9	13	17	26	450
35.00	ZTR319SPH722_0350 ME	3700	6500	≤32	0.59	0.026	108	3	19	60.5	13	19	23	560
35.00	ZTR319SPH722_0350 MEL	3700	6500	≤38	0.59	0.026	108	3	19	60.5	13	19	23	560
40.00	ZTR316SPH722_0400 ME	3700	6500	≤32	0.43	0.022	111	3	16	50.9	13	17	26	450
40.00	ZTR316SPH722_0400 MEL	3700	6500	≤38	0.43	0.022	111	3	16	50.9	13	17	26	450
40.00	ZTR319SPH722_0400 ME	3700	6500	≤32	0.52	0.026	105	3	19	60.5	13	19	23	560
40.00	ZTR319SPH722_0400 MEL	3700	6500	≤38	0.52	0.026	105	3	19	60.5	13	19	23	560
50.00	ZTR316SPH722_0500 ME	3700	6500	≤32	0.35	0.022	113	3	16	50.9	13	17	26	450
50.00	ZTR316SPH722_0500 MEL	3700	6500	≤38	0.35	0.022	113	3	16	50.9	13	17	26	450
50.00	ZTR319SPH722_0500 ME	3700	6500	≤32	0.41	0.026	108	3	19	60.5	13	19	23	560
50.00	ZTR319SPH722_0500 MEL	3700	6500	≤38	0.41	0.026	108	3	19	60.5	13	19	23	560
70.00	ZTR316SPH722_0700 ME	3700	6500	≤32	0.25	0.022	113	3	16	50.9	13	17	26	450
70.00	ZTR316SPH722_0700 MEL	3700	6500	≤38	0.25	0.022	113	3	16	50.9	13	17	26	450
70.00	ZTR319SPH722_0700 ME	3700	6500	≤32	0.29	0.026	108	3	19	60.5	13	19	23	560
70.00	ZTR319SPH722_0700 MEL	3700	6500	≤38	0.29	0.026	108	3	19	60.5	13	19	23	560
100.0	ZTR316SPH722_1000 ME	3700	6500	≤32	0.17	0.022	108	3	16	50.9	12	17	26	450
100.0	ZTR316SPH722_1000 MEL	3700	6500	≤38	0.17	0.022	108	3	16	50.9	12	17	26	450
100.0	ZTR319SPH722_1000 ME	3700	6500	≤32	0.21	0.026	102	3	19	60.5	9.9	17	23	500
100.0	ZTR319SPH722_1000 MEL	3700	6500	≤38	0.21	0.026	102	3	19	60.5	9.9	17	23	500
ZTR4PH7 ($F_{fzacc,max} = 19$ kN)														
4.000	ZTR412SPH721_0040 ME	1900	4000	≤38	2.67	0.022	109	4	12	50.9	6.4	19	24	490
4.000	ZTR412SPH721_0040 MEL	1900	4000	≤48	2.67	0.022	111	4	12	50.9	6.4	19	24	490
5.000	ZTR412SPH721_0050 ME	2200	5000	≤38	2.67	0.022	111	4	12	50.9	6.9	19	24	490
5.000	ZTR412SPH721_0050 MEL	2200	5000	≤48	2.67	0.022	112	4	12	50.9	6.9	19	24	490
7.000	ZTR412SPH721_0070 ME	2500	5000	≤38	1.91	0.022	110	4	12	50.9	7.8	19	24	490
7.000	ZTR412SPH721_0070 MEL	2500	5000	≤48	1.91	0.022	110	4	12	50.9	7.8	19	24	490
10.00	ZTR412SPH721_0100 ME	3000	5000	≤38	1.33	0.022	105	4	12	50.9	8.7	19	24	490
10.00	ZTR412SPH721_0100 MEL	3000	5000	≤48	1.33	0.022	106	4	12	50.9	8.7	19	24	490
16.00	ZTR412SPH722_0160 ME	3000	5000	≤32	0.83	0.022	108	4	12	50.9	10	19	24	490
16.00	ZTR412SPH722_0160 MEL	3000	5000	≤38	0.83	0.022	108	4	12	50.9	10	19	24	490
20.00	ZTR412SPH722_0200 ME	3000	5000	≤32	0.67	0.022	110	4	12	50.9	11	19	24	490
20.00	ZTR412SPH722_0200 MEL	3000	5000	≤38	0.67	0.022	110	4	12	50.9	11	19	24	490
25.00	ZTR412SPH722_0250 ME	3500	6000	≤32	0.64	0.022	110	4	12	50.9	12	19	24	490
25.00	ZTR412SPH722_0250 MEL	3500	6000	≤38	0.64	0.022	110	4	12	50.9	12	19	24	490
28.00	ZTR412SPH722_0280 ME	3700	6500	≤32	0.62	0.022	108	4	12	50.9	12	19	24	490
28.00	ZTR412SPH722_0280 MEL	3700	6500	≤38	0.62	0.022	108	4	12	50.9	12	19	24	490
35.00	ZTR412SPH722_0350 ME	3700	6500	≤32	0.50	0.022	110	4	12	50.9	12	19	24	490
35.00	ZTR412SPH722_0350 MEL	3700	6500	≤38	0.50	0.022	110	4	12	50.9	12	19	24	490
40.00	ZTR412SPH722_0400 ME	3700	6500	≤32	0.43	0.022	107	4	12	50.9	12	19	24	490
40.00	ZTR412SPH722_0400 MEL	3700	6500	≤38	0.43	0.022	107	4	12	50.9	12	19	24	490
50.00	ZTR412SPH722_0500 ME	3700	6500	≤32	0.35	0.022	109	4	12	50.9	12	19	24	490
50.00	ZTR412SPH722_0500 MEL	3700	6500	≤38	0.35	0.022	109	4	12	50.9	12	19	24	490
70.00	ZTR412SPH722_0700 ME	3700	6500	≤32	0.25	0.022	109	4	12	50.9	12	19	24	490
70.00	ZTR412SPH722_0700 MEL	3700	6500	≤38	0.25	0.022	109	4	12	50.9	12	19	24	490
100.0	ZTR412SPH722_1000 ME	3700	6500	≤32	0.17	0.022	105	4	12	50.9	12	19	24	490
100.0	ZTR412SPH722_1000 MEL	3700	6500	≤38	0.17	0.022	105	4	12	50.9	12	19	24	490

5.2 Selection tables 5 ZTRPH rack and pinion drives

i	Type	$n_{1\max\text{DB}}$ [rpm]	$n_{1\max\text{ZB}}$ [rpm]	d_{MW} [mm]	$v_{fz\max\text{ZB}}$ [m/s]	Δs [mm]	C_{lin} [N/ μm]	m_n [mm]	z	d_0 [mm]	F_{fzN} [kN]	$F_{fz\text{acc}}$ [kN]	$F_{fz\text{NOT}}$ [kN]	$M_{2\text{acc}}$ [Nm]
ZTR3PH8 ($F_{fz\text{acc,max}} = 25 \text{ kN}$)														
4.000	ZTR319SPH821_0040 ME	1500	3500	≤ 48	2.77	0.026	209	3	19	60.5	17	21	42	640
4.000	ZTR319SPH821_0040 MEL	1500	3500	≤ 55	2.77	0.026	217	3	19	60.5	17	21	42	640
4.000	ZTR326SPH821_0040 ME	1500	3500	≤ 48	3.79	0.036	191	3	26	82.8	17	25	45	1030
4.000	ZTR326SPH821_0040 MEL	1500	3500	≤ 55	3.79	0.036	203	3	26	82.8	17	25	45	1030
4.000	ZTR332SPH821_0040 ME	1500	3500	≤ 48	4.67	0.044	173	3	32	101.9	17	25	39	1290
4.000	ZTR332SPH821_0040 MEL	1500	3500	≤ 55	4.67	0.044	188	3	32	101.9	17	25	39	1290
5.000	ZTR319SPH821_0050 ME	1700	4000	≤ 48	2.53	0.026	210	3	19	60.5	18	21	42	640
5.000	ZTR319SPH821_0050 MEL	1700	4000	≤ 55	2.53	0.026	215	3	19	60.5	18	21	42	640
5.000	ZTR326SPH821_0050 ME	1700	4000	≤ 48	3.47	0.036	193	3	26	82.8	18	25	45	1030
5.000	ZTR326SPH821_0050 MEL	1700	4000	≤ 55	3.47	0.036	201	3	26	82.8	18	25	45	1030
5.000	ZTR332SPH821_0050 ME	1700	4000	≤ 48	4.27	0.044	175	3	32	101.9	18	25	39	1290
5.000	ZTR332SPH821_0050 MEL	1700	4000	≤ 55	4.27	0.044	185	3	32	101.9	18	25	39	1290
7.000	ZTR319SPH821_0070 ME	2000	4000	≤ 48	1.81	0.026	209	3	19	60.5	20	21	42	640
7.000	ZTR319SPH821_0070 MEL	2000	4000	≤ 55	1.81	0.026	212	3	19	60.5	20	21	42	640
7.000	ZTR326SPH821_0070 ME	2000	4000	≤ 48	2.48	0.036	191	3	26	82.8	20	25	45	1030
7.000	ZTR326SPH821_0070 MEL	2000	4000	≤ 55	2.48	0.036	196	3	26	82.8	20	25	45	1030
7.000	ZTR332SPH821_0070 ME	2000	4000	≤ 48	3.05	0.044	172	3	32	101.9	20	25	39	1290
7.000	ZTR332SPH821_0070 MEL	2000	4000	≤ 55	3.05	0.044	178	3	32	101.9	20	25	39	1290
10.000	ZTR319SPH821_0100 ME	2500	4000	≤ 48	1.27	0.026	199	3	19	60.5	21	21	42	640
10.000	ZTR319SPH821_0100 MEL	2500	4000	≤ 55	1.27	0.026	201	3	19	60.5	21	21	42	640
10.000	ZTR326SPH821_0100 ME	2500	4000	≤ 48	1.73	0.036	176	3	26	82.8	19	25	45	1030
10.000	ZTR326SPH821_0100 MEL	2500	4000	≤ 55	1.73	0.036	178	3	26	82.8	19	25	45	1030
10.000	ZTR332SPH821_0100 ME	2500	4000	≤ 48	2.13	0.044	155	3	32	101.9	16	24	39	1200
10.000	ZTR332SPH821_0100 MEL	2500	4000	≤ 55	2.13	0.044	157	3	32	101.9	16	24	39	1200
16.000	ZTR319SPH822_0160 ME	2500	4500	≤ 38	0.89	0.026	210	3	19	60.5	21	21	42	640
16.000	ZTR319SPH822_0160 MEL	2500	4500	≤ 48	0.89	0.026	211	3	19	60.5	21	21	42	640
16.000	ZTR326SPH822_0160 ME	2500	4500	≤ 38	1.22	0.036	193	3	26	82.8	25	25	45	1030
16.000	ZTR326SPH822_0160 MEL	2500	4500	≤ 48	1.22	0.036	194	3	26	82.8	25	25	45	1030
16.000	ZTR332SPH822_0160 ME	2500	4500	≤ 38	1.50	0.044	175	3	32	101.9	22	25	39	1290
16.000	ZTR332SPH822_0160 MEL	2500	4500	≤ 48	1.50	0.044	176	3	32	101.9	22	25	39	1290
20.000	ZTR319SPH822_0200 ME	2500	4500	≤ 38	0.71	0.026	211	3	19	60.5	21	21	42	640
20.000	ZTR319SPH822_0200 MEL	2500	4500	≤ 48	0.71	0.026	212	3	19	60.5	21	21	42	640
20.000	ZTR326SPH822_0200 ME	2500	4500	≤ 38	0.98	0.036	195	3	26	82.8	25	25	45	1030
20.000	ZTR326SPH822_0200 MEL	2500	4500	≤ 48	0.98	0.036	195	3	26	82.8	25	25	45	1030
20.000	ZTR332SPH822_0200 ME	2500	4500	≤ 38	1.20	0.044	177	3	32	101.9	25	25	39	1290
20.000	ZTR332SPH822_0200 MEL	2500	4500	≤ 48	1.20	0.044	177	3	32	101.9	25	25	39	1290
25.000	ZTR319SPH822_0250 ME	3000	5500	≤ 38	0.70	0.026	213	3	19	60.5	21	21	42	640
25.000	ZTR319SPH822_0250 MEL	3000	5500	≤ 48	0.70	0.026	213	3	19	60.5	21	21	42	640
25.000	ZTR326SPH822_0250 ME	3000	5500	≤ 38	0.95	0.036	197	3	26	82.8	25	25	45	1030
25.000	ZTR326SPH822_0250 MEL	3000	5500	≤ 48	0.95	0.036	198	3	26	82.8	25	25	45	1030
25.000	ZTR332SPH822_0250 ME	3000	5500	≤ 38	1.17	0.044	180	3	32	101.9	25	25	39	1290
25.000	ZTR332SPH822_0250 MEL	3000	5500	≤ 48	1.17	0.044	180	3	32	101.9	25	25	39	1290
28.000	ZTR319SPH822_0280 ME	3300	6000	≤ 38	0.68	0.026	210	3	19	60.5	21	21	42	640
28.000	ZTR319SPH822_0280 MEL	3300	6000	≤ 48	0.68	0.026	210	3	19	60.5	21	21	42	640
28.000	ZTR326SPH822_0280 ME	3300	6000	≤ 38	0.93	0.036	193	3	26	82.8	25	25	45	1030
28.000	ZTR326SPH822_0280 MEL	3300	6000	≤ 48	0.93	0.036	193	3	26	82.8	25	25	45	1030
28.000	ZTR332SPH822_0280 ME	3300	6000	≤ 38	1.14	0.044	174	3	32	101.9	22	25	39	1290
28.000	ZTR332SPH822_0280 MEL	3300	6000	≤ 48	1.14	0.044	175	3	32	101.9	22	25	39	1290
35.000	ZTR319SPH822_0350 ME	3300	6000	≤ 38	0.54	0.026	211	3	19	60.5	21	21	42	640
35.000	ZTR319SPH822_0350 MEL	3300	6000	≤ 48	0.54	0.026	211	3	19	60.5	21	21	42	640
35.000	ZTR326SPH822_0350 ME	3300	6000	≤ 38	0.74	0.036	194	3	26	82.8	25	25	45	1030
35.000	ZTR326SPH822_0350 MEL	3300	6000	≤ 48	0.74	0.036	195	3	26	82.8	25	25	45	1030
35.000	ZTR332SPH822_0350 ME	3300	6000	≤ 38	0.91	0.044	176	3	32	101.9	25	25	39	1290
35.000	ZTR332SPH822_0350 MEL	3300	6000	≤ 48	0.91	0.044	177	3	32	101.9	25	25	39	1290
40.000	ZTR319SPH822_0400 ME	3300	6000	≤ 38	0.48	0.026	209	3	19	60.5	21	21	42	640
40.000	ZTR319SPH822_0400 MEL	3300	6000	≤ 48	0.48	0.026	209	3	19	60.5	21	21	42	640
40.000	ZTR326SPH822_0400 ME	3300	6000	≤ 38	0.65	0.036	191	3	26	82.8	25	25	45	1030
40.000	ZTR326SPH822_0400 MEL	3300	6000	≤ 48	0.65	0.036	192	3	26	82.8	25	25	45	1030
40.000	ZTR332SPH822_0400 ME	3300	6000	≤ 38	0.80	0.044	173	3	32	101.9	22	25	39	1290
40.000	ZTR332SPH822_0400 MEL	3300	6000	≤ 48	0.80	0.044	173	3	32	101.9	22	25	39	1290
50.000	ZTR319SPH822_0500 ME	3300	6000	≤ 38	0.38	0.026	211	3	19	60.5	21	21	42	640
50.000	ZTR319SPH822_0500 MEL	3300	6000	≤ 48	0.38	0.026	211	3	19	60.5	21	21	42	640
50.000	ZTR326SPH822_0500 ME	3300	6000	≤ 38	0.52	0.036	193	3	26	82.8	25	25	45	1030
50.000	ZTR326SPH822_0500 MEL	3300	6000	≤ 48	0.52	0.036	194	3	26	82.8	25	25	45	1030
50.000	ZTR332SPH822_0500 ME	3300	6000	≤ 38	0.64	0.044	175	3	32	101.9	25	25	39	1290
50.000	ZTR332SPH822_0500 MEL	3300	6000	≤ 48	0.64	0.044	175	3	32	101.9	25	25	39	1290
70.000	ZTR319SPH822_0700 ME	3300	6000	≤ 38	0.27	0.026	210	3	19	60.5	21	21	42	640

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{fzmaxZB}$ [m/s]	Δs [mm]	C_{lin} [N/ μ m]	m_n [mm]	z	d_0 [mm]	F_{fzN} [kN]	F_{fzacc} [kN]	F_{fzNOT} [kN]	M_{2acc} [Nm]
ZTR3PH8 ($F_{fzacc,max} = 25$ kN)														
70.00	ZTR319SPH822_0700 MEL	3300	6000	≤48	0.27	0.026	210	3	19	60.5	21	21	42	640
70.00	ZTR326SPH822_0700 ME	3300	6000	≤38	0.37	0.036	192	3	26	82.8	24	25	45	1030
70.00	ZTR326SPH822_0700 MEL	3300	6000	≤48	0.37	0.036	192	3	26	82.8	24	25	45	1030
70.00	ZTR332SPH822_0700 ME	3300	6000	≤38	0.46	0.044	173	3	32	101.9	20	25	39	1290
70.00	ZTR332SPH822_0700 MEL	3300	6000	≤48	0.46	0.044	174	3	32	101.9	20	25	39	1290
100.0	ZTR319SPH822_1000 ME	3300	6000	≤38	0.19	0.026	200	3	19	60.5	21	21	42	640
100.0	ZTR319SPH822_1000 MEL	3300	6000	≤48	0.19	0.026	200	3	19	60.5	21	21	42	640
100.0	ZTR326SPH822_1000 ME	3300	6000	≤38	0.26	0.036	177	3	26	82.8	19	25	45	1030
100.0	ZTR326SPH822_1000 MEL	3300	6000	≤48	0.26	0.036	177	3	26	82.8	19	25	45	1030
100.0	ZTR332SPH822_1000 ME	3300	6000	≤38	0.32	0.044	155	3	32	101.9	16	24	39	1200
100.0	ZTR332SPH822_1000 MEL	3300	6000	≤48	0.32	0.044	155	3	32	101.9	16	24	39	1200
ZTR4PH8 ($F_{fzacc,max} = 35$ kN)														
4.000	ZTR417SPH821_0040 ME	1500	3500	≤48	3.31	0.031	209	4	17	72.2	16	35	47	1260
4.000	ZTR417SPH821_0040 MEL	1500	3500	≤55	3.31	0.031	220	4	17	72.2	16	35	47	1260
4.000	ZTR419SPH821_0040 ME	1500	3500	≤48	3.69	0.035	201	4	19	80.6	16	35	44	1420
4.000	ZTR419SPH821_0040 MEL	1500	3500	≤55	3.69	0.035	214	4	19	80.6	16	35	44	1420
4.000	ZTR420SPH821_0040 ME	1500	3500	≤48	3.89	0.037	197	4	20	84.9	16	34	42	1440
4.000	ZTR420SPH821_0040 MEL	1500	3500	≤55	3.89	0.037	210	4	20	84.9	16	34	42	1440
5.000	ZTR417SPH821_0050 ME	1700	4000	≤48	3.02	0.031	211	4	17	72.2	17	35	47	1260
5.000	ZTR417SPH821_0050 MEL	1700	4000	≤55	3.02	0.031	218	4	17	72.2	17	35	47	1260
5.000	ZTR419SPH821_0050 ME	1700	4000	≤48	3.38	0.035	204	4	19	80.6	17	35	44	1420
5.000	ZTR419SPH821_0050 MEL	1700	4000	≤55	3.38	0.035	211	4	19	80.6	17	35	44	1420
5.000	ZTR420SPH821_0050 ME	1700	4000	≤48	3.56	0.037	200	4	20	84.9	17	34	42	1440
5.000	ZTR420SPH821_0050 MEL	1700	4000	≤55	3.56	0.037	208	4	20	84.9	17	34	42	1440
7.000	ZTR417SPH821_0070 ME	2000	4000	≤48	2.16	0.031	209	4	17	72.2	19	35	47	1260
7.000	ZTR417SPH821_0070 MEL	2000	4000	≤55	2.16	0.031	213	4	17	72.2	19	35	47	1260
7.000	ZTR419SPH821_0070 ME	2000	4000	≤48	2.41	0.035	201	4	19	80.6	19	35	44	1420
7.000	ZTR419SPH821_0070 MEL	2000	4000	≤55	2.41	0.035	206	4	19	80.6	19	35	44	1420
7.000	ZTR420SPH821_0070 ME	2000	4000	≤48	2.54	0.037	197	4	20	84.9	19	34	42	1440
7.000	ZTR420SPH821_0070 MEL	2000	4000	≤55	2.54	0.037	202	4	20	84.9	19	34	42	1440
10.000	ZTR417SPH821_0100 ME	2500	4000	≤48	1.51	0.031	195	4	17	72.2	22	33	47	1200
10.000	ZTR417SPH821_0100 MEL	2500	4000	≤55	1.51	0.031	197	4	17	72.2	22	33	47	1200
10.000	ZTR419SPH821_0100 ME	2500	4000	≤48	1.69	0.035	186	4	19	80.6	20	30	44	1200
10.000	ZTR419SPH821_0100 MEL	2500	4000	≤55	1.69	0.035	188	4	19	80.6	20	30	44	1200
10.000	ZTR420SPH821_0100 ME	2500	4000	≤48	1.78	0.037	181	4	20	84.9	19	28	42	1200
10.000	ZTR420SPH821_0100 MEL	2500	4000	≤55	1.78	0.037	183	4	20	84.9	19	28	42	1200
16.000	ZTR417SPH822_0160 ME	2500	4500	≤38	1.06	0.031	211	4	17	72.2	25	35	47	1260
16.000	ZTR417SPH822_0160 MEL	2500	4500	≤48	1.06	0.031	212	4	17	72.2	25	35	47	1260
16.000	ZTR419SPH822_0160 ME	2500	4500	≤38	1.19	0.035	203	4	19	80.6	25	35	44	1420
16.000	ZTR419SPH822_0160 MEL	2500	4500	≤48	1.19	0.035	204	4	19	80.6	25	35	44	1420
16.000	ZTR420SPH822_0160 ME	2500	4500	≤38	1.25	0.037	199	4	20	84.9	25	34	42	1440
16.000	ZTR420SPH822_0160 MEL	2500	4500	≤48	1.25	0.037	200	4	20	84.9	25	34	42	1440
20.000	ZTR417SPH822_0200 ME	2500	4500	≤38	0.85	0.031	212	4	17	72.2	27	35	47	1260
20.000	ZTR417SPH822_0200 MEL	2500	4500	≤48	0.85	0.031	212	4	17	72.2	27	35	47	1260
20.000	ZTR419SPH822_0200 ME	2500	4500	≤38	0.95	0.035	205	4	19	80.6	27	35	44	1420
20.000	ZTR419SPH822_0200 MEL	2500	4500	≤48	0.95	0.035	205	4	19	80.6	27	35	44	1420
20.000	ZTR420SPH822_0200 ME	2500	4500	≤38	1.00	0.037	201	4	20	84.9	27	34	42	1440
20.000	ZTR420SPH822_0200 MEL	2500	4500	≤48	1.00	0.037	202	4	20	84.9	27	34	42	1440
25.000	ZTR417SPH822_0250 ME	3000	5500	≤38	0.83	0.031	214	4	17	72.2	30	35	47	1260
25.000	ZTR417SPH822_0250 MEL	3000	5500	≤48	0.83	0.031	215	4	17	72.2	30	35	47	1260
25.000	ZTR419SPH822_0250 ME	3000	5500	≤38	0.93	0.035	208	4	19	80.6	30	35	44	1420
25.000	ZTR419SPH822_0250 MEL	3000	5500	≤48	0.93	0.035	208	4	19	80.6	30	35	44	1420
25.000	ZTR420SPH822_0250 ME	3000	5500	≤38	0.98	0.037	204	4	20	84.9	29	34	42	1440
25.000	ZTR420SPH822_0250 MEL	3000	5500	≤48	0.98	0.037	204	4	20	84.9	29	34	42	1440
28.000	ZTR417SPH822_0280 ME	3300	6000	≤38	0.81	0.031	210	4	17	72.2	30	35	47	1260
28.000	ZTR417SPH822_0280 MEL	3300	6000	≤48	0.81	0.031	211	4	17	72.2	30	35	47	1260
28.000	ZTR419SPH822_0280 ME	3300	6000	≤38	0.91	0.035	203	4	19	80.6	27	35	44	1420
28.000	ZTR419SPH822_0280 MEL	3300	6000	≤48	0.91	0.035	203	4	19	80.6	27	35	44	1420
28.000	ZTR420SPH822_0280 ME	3300	6000	≤38	0.95	0.037	199	4	20	84.9	26	34	42	1440
28.000	ZTR420SPH822_0280 MEL	3300	6000	≤48	0.95	0.037	199	4	20	84.9	26	34	42	1440
35.000	ZTR417SPH822_0350 ME	3300	6000	≤38	0.65	0.031	212	4	17	72.2	30	35	47	1260
35.000	ZTR417SPH822_0350 MEL	3300	6000	≤48	0.65	0.031	212	4	17	72.2	30	35	47	1260
35.000	ZTR419SPH822_0350 ME	3300	6000	≤38	0.72	0.035	205	4	19	80.6	30	35	44	1420
35.000	ZTR419SPH822_0350 MEL	3300	6000	≤48	0.72	0.035	205	4	19	80.6	30	35	44	1420
35.000	ZTR420SPH822_0350 ME	3300	6000	≤38	0.76	0.037	201	4	20	84.9	29	34	42	1440
35.000	ZTR420SPH822_0350 MEL	3300	6000	≤48	0.76	0.037	201	4	20	84.9	29	34	42	1440

5.2 Selection tables 5 ZTRPH rack and pinion drives

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{fzmaxZB} [m/s]	Δs [mm]	C _{lin} [N/μm]	m _n [mm]	z	d ₀ [mm]	F _{fzN} [kN]	F _{fzacc} [kN]	F _{fzNOT} [kN]	M _{2acc} [Nm]
ZTR4PH8 (F_{fzacc,max} = 35 kN)														
40.00	ZTR417SPH822_0400 ME	3300	6000	≤38	0.57	0.031	209	4	17	72.2	30	35	47	1260
40.00	ZTR417SPH822_0400 MEL	3300	6000	≤48	0.57	0.031	209	4	17	72.2	30	35	47	1260
40.00	ZTR419SPH822_0400 ME	3300	6000	≤38	0.63	0.035	201	4	19	80.6	27	35	44	1420
40.00	ZTR419SPH822_0400 MEL	3300	6000	≤48	0.63	0.035	202	4	19	80.6	27	35	44	1420
40.00	ZTR420SPH822_0400 ME	3300	6000	≤38	0.67	0.037	197	4	20	84.9	26	34	42	1440
40.00	ZTR420SPH822_0400 MEL	3300	6000	≤48	0.67	0.037	198	4	20	84.9	26	34	42	1440
50.00	ZTR417SPH822_0500 ME	3300	6000	≤38	0.45	0.031	211	4	17	72.2	30	35	47	1260
50.00	ZTR417SPH822_0500 MEL	3300	6000	≤48	0.45	0.031	211	4	17	72.2	30	35	47	1260
50.00	ZTR419SPH822_0500 ME	3300	6000	≤38	0.51	0.035	204	4	19	80.6	30	35	44	1420
50.00	ZTR419SPH822_0500 MEL	3300	6000	≤48	0.51	0.035	204	4	19	80.6	30	35	44	1420
50.00	ZTR420SPH822_0500 ME	3300	6000	≤38	0.53	0.037	200	4	20	84.9	29	34	42	1440
50.00	ZTR420SPH822_0500 MEL	3300	6000	≤48	0.53	0.037	200	4	20	84.9	29	34	42	1440
70.00	ZTR417SPH822_0700 ME	3300	6000	≤38	0.32	0.031	210	4	17	72.2	28	35	47	1260
70.00	ZTR417SPH822_0700 MEL	3300	6000	≤48	0.32	0.031	210	4	17	72.2	28	35	47	1260
70.00	ZTR419SPH822_0700 ME	3300	6000	≤38	0.36	0.035	202	4	19	80.6	25	35	44	1420
70.00	ZTR419SPH822_0700 MEL	3300	6000	≤48	0.36	0.035	202	4	19	80.6	25	35	44	1420
70.00	ZTR420SPH822_0700 ME	3300	6000	≤38	0.38	0.037	198	4	20	84.9	24	34	42	1440
70.00	ZTR420SPH822_0700 MEL	3300	6000	≤48	0.38	0.037	198	4	20	84.9	24	34	42	1440
100.0	ZTR417SPH822_1000 ME	3300	6000	≤38	0.23	0.031	196	4	17	72.2	22	33	47	1200
100.0	ZTR417SPH822_1000 MEL	3300	6000	≤48	0.23	0.031	196	4	17	72.2	22	33	47	1200
100.0	ZTR419SPH822_1000 ME	3300	6000	≤38	0.25	0.035	186	4	19	80.6	20	30	44	1200
100.0	ZTR419SPH822_1000 MEL	3300	6000	≤48	0.25	0.035	186	4	19	80.6	20	30	44	1200
100.0	ZTR420SPH822_1000 ME	3300	6000	≤38	0.27	0.037	181	4	20	84.9	19	28	42	1200
100.0	ZTR420SPH822_1000 MEL	3300	6000	≤48	0.27	0.037	181	4	20	84.9	19	28	42	1200
ZTR5PH8 (F_{fzacc,max} = 34 kN)														
4.000	ZTR512SPH821_0040 ME	1500	3500	≤48	2.92	0.028	219	5	12	63.7	16	34	49	1070
4.000	ZTR512SPH821_0040 MEL	1500	3500	≤55	2.92	0.028	228	5	12	63.7	16	34	49	1070
4.000	ZTR516SPH821_0040 ME	1500	3500	≤48	3.89	0.037	201	5	16	84.9	16	33	41	1390
4.000	ZTR516SPH821_0040 MEL	1500	3500	≤55	3.89	0.037	215	5	16	84.9	16	33	41	1390
4.000	ZTR518SPH821_0040 ME	1500	3500	≤48	4.38	0.042	190	5	18	95.5	16	30	38	1450
4.000	ZTR518SPH821_0040 MEL	1500	3500	≤55	4.38	0.042	206	5	18	95.5	16	30	38	1450
5.000	ZTR512SPH821_0050 ME	1700	4000	≤48	2.67	0.028	221	5	12	63.7	17	34	49	1070
5.000	ZTR512SPH821_0050 MEL	1700	4000	≤55	2.67	0.028	227	5	12	63.7	17	34	49	1070
5.000	ZTR516SPH821_0050 ME	1700	4000	≤48	3.56	0.037	204	5	16	84.9	17	33	41	1390
5.000	ZTR516SPH821_0050 MEL	1700	4000	≤55	3.56	0.037	213	5	16	84.9	17	33	41	1390
5.000	ZTR518SPH821_0050 ME	1700	4000	≤48	4.00	0.042	193	5	18	95.5	17	30	38	1450
5.000	ZTR518SPH821_0050 MEL	1700	4000	≤55	4.00	0.042	203	5	18	95.5	17	30	38	1450
7.000	ZTR512SPH821_0070 ME	2000	4000	≤48	1.91	0.028	219	5	12	63.7	19	34	49	1070
7.000	ZTR512SPH821_0070 MEL	2000	4000	≤55	1.91	0.028	223	5	12	63.7	19	34	49	1070
7.000	ZTR516SPH821_0070 ME	2000	4000	≤48	2.54	0.037	201	5	16	84.9	19	33	41	1390
7.000	ZTR516SPH821_0070 MEL	2000	4000	≤55	2.54	0.037	206	5	16	84.9	19	33	41	1390
7.000	ZTR518SPH821_0070 ME	2000	4000	≤48	2.86	0.042	190	5	18	95.5	19	30	38	1450
7.000	ZTR518SPH821_0070 MEL	2000	4000	≤55	2.86	0.042	196	5	18	95.5	19	30	38	1450
10.00	ZTR512SPH821_0100 ME	2500	4000	≤48	1.33	0.028	207	5	12	63.7	21	34	49	1070
10.00	ZTR512SPH821_0100 MEL	2500	4000	≤55	1.33	0.028	209	5	12	63.7	21	34	49	1070
10.00	ZTR516SPH821_0100 ME	2500	4000	≤48	1.78	0.037	184	5	16	84.9	19	28	41	1200
10.00	ZTR516SPH821_0100 MEL	2500	4000	≤55	1.78	0.037	186	5	16	84.9	19	28	41	1200
10.00	ZTR518SPH821_0100 ME	2500	4000	≤48	2.00	0.042	171	5	18	95.5	17	25	38	1200
10.00	ZTR518SPH821_0100 MEL	2500	4000	≤55	2.00	0.042	173	5	18	95.5	17	25	38	1200
16.00	ZTR512SPH822_0160 ME	2500	4500	≤38	0.94	0.028	221	5	12	63.7	25	34	49	1070
16.00	ZTR512SPH822_0160 MEL	2500	4500	≤48	0.94	0.028	221	5	12	63.7	25	34	49	1070
16.00	ZTR516SPH822_0160 ME	2500	4500	≤38	1.25	0.037	204	5	16	84.9	25	33	41	1390
16.00	ZTR516SPH822_0160 MEL	2500	4500	≤48	1.25	0.037	205	5	16	84.9	25	33	41	1390
16.00	ZTR518SPH822_0160 ME	2500	4500	≤38	1.41	0.042	193	5	18	95.5	23	30	38	1450
16.00	ZTR518SPH822_0160 MEL	2500	4500	≤48	1.41	0.042	194	5	18	95.5	23	30	38	1450
20.00	ZTR512SPH822_0200 ME	2500	4500	≤38	0.75	0.028	222	5	12	63.7	27	34	49	1070
20.00	ZTR512SPH822_0200 MEL	2500	4500	≤48	0.75	0.028	222	5	12	63.7	27	34	49	1070
20.00	ZTR516SPH822_0200 ME	2500	4500	≤38	1.00	0.037	205	5	16	84.9	27	33	41	1390
20.00	ZTR516SPH822_0200 MEL	2500	4500	≤48	1.00	0.037	206	5	16	84.9	27	33	41	1390
20.00	ZTR518SPH822_0200 ME	2500	4500	≤38	1.13	0.042	195	5	18	95.5	26	30	38	1450
20.00	ZTR518SPH822_0200 MEL	2500	4500	≤48	1.13	0.042	195	5	18	95.5	26	30	38	1450
25.00	ZTR512SPH822_0250 ME	3000	5500	≤38	0.73	0.028	224	5	12	63.7	29	34	49	1070
25.00	ZTR512SPH822_0250 MEL	3000	5500	≤48	0.73	0.028	224	5	12	63.7	29	34	49	1070
25.00	ZTR516SPH822_0250 ME	3000	5500	≤38	0.98	0.037	208	5	16	84.9	29	33	41	1390
25.00	ZTR516SPH822_0250 MEL	3000	5500	≤48	0.98	0.037	209	5	16	84.9	29	33	41	1390
25.00	ZTR518SPH822_0250 ME	3000	5500	≤38	1.10	0.042	198	5	18	95.5	26	30	38	1450

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{fzmaxZB}$ [m/s]	Δs [mm]	C_{lin} [N/ μ m]	m_n [mm]	z	d_0 [mm]	F_{fzN} [kN]	F_{fzacc} [kN]	F_{fzNOT} [kN]	M_{2acc} [Nm]
ZTR5PH8 ($F_{fzacc,max} = 34$ kN)														
25.00	ZTR518SPH822_0250 MEL	3000	5500	≤48	1.10	0.042	199	5	18	95.5	26	30	38	1450
28.00	ZTR512SPH822_0280 ME	3300	6000	≤38	0.71	0.028	220	5	12	63.7	29	34	49	1070
28.00	ZTR512SPH822_0280 MEL	3300	6000	≤48	0.71	0.028	221	5	12	63.7	29	34	49	1070
28.00	ZTR516SPH822_0280 ME	3300	6000	≤38	0.95	0.037	203	5	16	84.9	26	33	41	1390
28.00	ZTR516SPH822_0280 MEL	3300	6000	≤48	0.95	0.037	203	5	16	84.9	26	33	41	1390
28.00	ZTR518SPH822_0280 ME	3300	6000	≤38	1.07	0.042	192	5	18	95.5	23	30	38	1450
28.00	ZTR518SPH822_0280 MEL	3300	6000	≤48	1.07	0.042	193	5	18	95.5	23	30	38	1450
35.00	ZTR512SPH822_0350 ME	3300	6000	≤38	0.57	0.028	222	5	12	63.7	29	34	49	1070
35.00	ZTR512SPH822_0350 MEL	3300	6000	≤48	0.57	0.028	222	5	12	63.7	29	34	49	1070
35.00	ZTR516SPH822_0350 ME	3300	6000	≤38	0.76	0.037	205	5	16	84.9	29	33	41	1390
35.00	ZTR516SPH822_0350 MEL	3300	6000	≤48	0.76	0.037	205	5	16	84.9	29	33	41	1390
35.00	ZTR518SPH822_0350 ME	3300	6000	≤38	0.86	0.042	194	5	18	95.5	26	30	38	1450
35.00	ZTR518SPH822_0350 MEL	3300	6000	≤48	0.86	0.042	195	5	18	95.5	26	30	38	1450
40.00	ZTR512SPH822_0400 ME	3300	6000	≤38	0.50	0.028	219	5	12	63.7	29	34	49	1070
40.00	ZTR512SPH822_0400 MEL	3300	6000	≤48	0.50	0.028	219	5	12	63.7	29	34	49	1070
40.00	ZTR516SPH822_0400 ME	3300	6000	≤38	0.67	0.037	201	5	16	84.9	26	33	41	1390
40.00	ZTR516SPH822_0400 MEL	3300	6000	≤48	0.67	0.037	202	5	16	84.9	26	33	41	1390
40.00	ZTR518SPH822_0400 ME	3300	6000	≤38	0.75	0.042	190	5	18	95.5	23	30	38	1450
40.00	ZTR518SPH822_0400 MEL	3300	6000	≤48	0.75	0.042	191	5	18	95.5	23	30	38	1450
50.00	ZTR512SPH822_0500 ME	3300	6000	≤38	0.40	0.028	221	5	12	63.7	29	34	49	1070
50.00	ZTR512SPH822_0500 MEL	3300	6000	≤48	0.40	0.028	221	5	12	63.7	29	34	49	1070
50.00	ZTR516SPH822_0500 ME	3300	6000	≤38	0.53	0.037	204	5	16	84.9	29	33	41	1390
50.00	ZTR516SPH822_0500 MEL	3300	6000	≤48	0.53	0.037	204	5	16	84.9	29	33	41	1390
50.00	ZTR518SPH822_0500 ME	3300	6000	≤38	0.60	0.042	193	5	18	95.5	26	30	38	1450
50.00	ZTR518SPH822_0500 MEL	3300	6000	≤48	0.60	0.042	193	5	18	95.5	26	30	38	1450
70.00	ZTR512SPH822_0700 ME	3300	6000	≤38	0.29	0.028	220	5	12	63.7	29	34	49	1070
70.00	ZTR512SPH822_0700 MEL	3300	6000	≤48	0.29	0.028	220	5	12	63.7	29	34	49	1070
70.00	ZTR516SPH822_0700 ME	3300	6000	≤38	0.38	0.037	202	5	16	84.9	24	33	41	1390
70.00	ZTR516SPH822_0700 MEL	3300	6000	≤48	0.38	0.037	202	5	16	84.9	24	33	41	1390
70.00	ZTR518SPH822_0700 ME	3300	6000	≤38	0.43	0.042	191	5	18	95.5	21	30	38	1450
70.00	ZTR518SPH822_0700 MEL	3300	6000	≤48	0.43	0.042	191	5	18	95.5	21	30	38	1450
100.0	ZTR512SPH822_1000 ME	3300	6000	≤38	0.20	0.028	208	5	12	63.7	25	34	49	1070
100.0	ZTR512SPH822_1000 MEL	3300	6000	≤48	0.20	0.028	208	5	12	63.7	25	34	49	1070
100.0	ZTR516SPH822_1000 ME	3300	6000	≤38	0.27	0.037	184	5	16	84.9	19	28	41	1200
100.0	ZTR516SPH822_1000 MEL	3300	6000	≤48	0.27	0.037	184	5	16	84.9	19	28	41	1200
100.0	ZTR518SPH822_1000 ME	3300	6000	≤38	0.30	0.042	171	5	18	95.5	17	25	38	1200
100.0	ZTR518SPH822_1000 MEL	3300	6000	≤48	0.30	0.042	171	5	18	95.5	17	25	38	1200
ZTR6PH8 ($F_{fzacc,max} = 30$ kN)														
4.000	ZTR615SPH821_0040 ME	1500	3500	≤48	4.38	0.042	191	6	15	95.5	15	30	37	1410
4.000	ZTR615SPH821_0040 MEL	1500	3500	≤55	4.38	0.042	207	6	15	95.5	15	30	37	1410
5.000	ZTR615SPH821_0050 ME	1700	4000	≤48	4.00	0.042	194	6	15	95.5	16	30	37	1410
5.000	ZTR615SPH821_0050 MEL	1700	4000	≤55	4.00	0.042	204	6	15	95.5	16	30	37	1410
7.000	ZTR615SPH821_0070 ME	2000	4000	≤48	2.86	0.042	191	6	15	95.5	18	30	37	1410
7.000	ZTR615SPH821_0070 MEL	2000	4000	≤55	2.86	0.042	197	6	15	95.5	18	30	37	1410
10.00	ZTR615SPH821_0100 ME	2500	4000	≤48	2.00	0.042	172	6	15	95.5	17	25	37	1200
10.00	ZTR615SPH821_0100 MEL	2500	4000	≤55	2.00	0.042	174	6	15	95.5	17	25	37	1200
16.00	ZTR615SPH822_0160 ME	2500	4500	≤38	1.41	0.042	194	6	15	95.5	23	30	37	1410
16.00	ZTR615SPH822_0160 MEL	2500	4500	≤48	1.41	0.042	195	6	15	95.5	23	30	37	1410
20.00	ZTR615SPH822_0200 ME	2500	4500	≤38	1.13	0.042	195	6	15	95.5	26	30	37	1410
20.00	ZTR615SPH822_0200 MEL	2500	4500	≤48	1.13	0.042	196	6	15	95.5	26	30	37	1410
25.00	ZTR615SPH822_0250 ME	3000	5500	≤38	1.10	0.042	199	6	15	95.5	26	30	37	1410
25.00	ZTR615SPH822_0250 MEL	3000	5500	≤48	1.10	0.042	199	6	15	95.5	26	30	37	1410
28.00	ZTR615SPH822_0280 ME	3300	6000	≤38	1.07	0.042	193	6	15	95.5	23	30	37	1410
28.00	ZTR615SPH822_0280 MEL	3300	6000	≤48	1.07	0.042	193	6	15	95.5	23	30	37	1410
35.00	ZTR615SPH822_0350 ME	3300	6000	≤38	0.86	0.042	195	6	15	95.5	26	30	37	1410
35.00	ZTR615SPH822_0350 MEL	3300	6000	≤48	0.86	0.042	195	6	15	95.5	26	30	37	1410
40.00	ZTR615SPH822_0400 ME	3300	6000	≤38	0.75	0.042	191	6	15	95.5	23	30	37	1410
40.00	ZTR615SPH822_0400 MEL	3300	6000	≤48	0.75	0.042	191	6	15	95.5	23	30	37	1410
50.00	ZTR615SPH822_0500 ME	3300	6000	≤38	0.60	0.042	194	6	15	95.5	26	30	37	1410
50.00	ZTR615SPH822_0500 MEL	3300	6000	≤48	0.60	0.042	194	6	15	95.5	26	30	37	1410
70.00	ZTR615SPH822_0700 ME	3300	6000	≤38	0.43	0.042	192	6	15	95.5	21	30	37	1410
70.00	ZTR615SPH822_0700 MEL	3300	6000	≤48	0.43	0.042	192	6	15	95.5	21	30	37	1410
100.0	ZTR615SPH822_1000 ME	3300	6000	≤38	0.30	0.042	172	6	15	95.5	17	25	37	1200
100.0	ZTR615SPH822_1000 MEL	3300	6000	≤48	0.30	0.042	172	6	15	95.5	17	25	37	1200

5.2 Selection tables 5 ZTRPH rack and pinion drives

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{fzmaxZB} [m/s]	Δs [mm]	C _{lin} [N/μm]	m _n [mm]	z	d ₀ [mm]	F _{fzN} [kN]	F _{fzacc} [kN]	F _{fzNOT} [kN]	M _{2acc} [Nm]
ZTR5PH9 (F_{fzacc,max} = 67 kN)														
12.00	ZTR518SPH932_0120 ME	1800	3000	≤48	1.25	0.042	306	5	18	95.5	35	63	126	3000
12.00	ZTR518SPH932_0120 MEL	1800	3000	≤60	1.25	0.042	311	5	18	95.5	35	63	126	3000
12.00	ZTR519SPH932_0120 ME	1800	3000	≤48	1.32	0.044	301	5	19	100.8	35	67	127	3360
12.00	ZTR519SPH932_0120 MEL	1800	3000	≤60	1.32	0.044	306	5	19	100.8	35	67	127	3360
16.00	ZTR518SPH932_0160 ME	2200	3500	≤48	1.09	0.042	308	5	18	95.5	38	63	126	3000
16.00	ZTR518SPH932_0160 MEL	2200	3500	≤60	1.09	0.042	310	5	18	95.5	38	63	126	3000
16.00	ZTR519SPH932_0160 ME	2200	3500	≤48	1.15	0.044	303	5	19	100.8	38	67	127	3360
16.00	ZTR519SPH932_0160 MEL	2200	3500	≤60	1.15	0.044	306	5	19	100.8	38	67	127	3360
18.00	ZTR518SPH932_0180 ME	1800	3000	≤48	0.83	0.042	305	5	18	95.5	40	63	126	3000
18.00	ZTR518SPH932_0180 MEL	1800	3000	≤60	0.83	0.042	307	5	18	95.5	40	63	126	3000
18.00	ZTR519SPH932_0180 ME	1800	3000	≤48	0.88	0.044	300	5	19	100.8	40	67	127	3360
18.00	ZTR519SPH932_0180 MEL	1800	3000	≤60	0.88	0.044	302	5	19	100.8	40	67	127	3360
20.00	ZTR518SPH932_0200 ME	2500	4000	≤48	1.00	0.042	308	5	18	95.5	41	63	126	3000
20.00	ZTR518SPH932_0200 MEL	2500	4000	≤60	1.00	0.042	309	5	18	95.5	41	63	126	3000
20.00	ZTR519SPH932_0200 ME	2500	4000	≤48	1.06	0.044	303	5	19	100.8	41	67	127	3360
20.00	ZTR519SPH932_0200 MEL	2500	4000	≤60	1.06	0.044	305	5	19	100.8	41	67	127	3360
24.00	ZTR518SPH932_0240 ME	2200	3500	≤48	0.73	0.042	306	5	18	95.5	44	63	126	3000
24.00	ZTR518SPH932_0240 MEL	2200	3500	≤60	0.73	0.042	307	5	18	95.5	44	63	126	3000
24.00	ZTR519SPH932_0240 ME	2200	3500	≤48	0.77	0.044	301	5	19	100.8	44	67	127	3360
24.00	ZTR519SPH932_0240 MEL	2200	3500	≤60	0.77	0.044	302	5	19	100.8	44	67	127	3360
28.00	ZTR518SPH932_0280 ME	2800	4500	≤48	0.80	0.042	307	5	18	95.5	45	63	126	3000
28.00	ZTR518SPH932_0280 MEL	2800	4500	≤55	0.80	0.042	308	5	18	95.5	45	63	126	3000
28.00	ZTR519SPH932_0280 ME	2800	4500	≤48	0.85	0.044	302	5	19	100.8	45	67	127	3360
28.00	ZTR519SPH932_0280 MEL	2800	4500	≤55	0.85	0.044	303	5	19	100.8	45	67	127	3360
30.00	ZTR518SPH932_0300 ME	2500	4000	≤48	0.67	0.042	306	5	18	95.5	45	63	126	3000
30.00	ZTR518SPH932_0300 MEL	2500	4000	≤60	0.67	0.042	306	5	18	95.5	45	63	126	3000
30.00	ZTR519SPH932_0300 ME	2500	4000	≤48	0.70	0.044	301	5	19	100.8	45	67	127	3360
30.00	ZTR519SPH932_0300 MEL	2500	4000	≤60	0.70	0.044	301	5	19	100.8	45	67	127	3360
32.00	ZTR518SPH932_0320 ME	2800	4500	≤48	0.70	0.042	305	5	18	95.5	45	63	126	3000
32.00	ZTR518SPH932_0320 MEL	2800	4500	≤55	0.70	0.042	306	5	18	95.5	45	63	126	3000
32.00	ZTR519SPH932_0320 ME	2800	4500	≤48	0.74	0.044	301	5	19	100.8	45	67	127	3360
32.00	ZTR519SPH932_0320 MEL	2800	4500	≤55	0.74	0.044	301	5	19	100.8	45	67	127	3360
40.00	ZTR518SPH932_0400 ME	2800	4500	≤48	0.56	0.042	303	5	18	95.5	45	63	126	3000
40.00	ZTR518SPH932_0400 MEL	2800	4500	≤55	0.56	0.042	303	5	18	95.5	45	63	126	3000
40.00	ZTR519SPH932_0400 ME	2800	4500	≤48	0.59	0.044	298	5	19	100.8	45	67	127	3360
40.00	ZTR519SPH932_0400 MEL	2800	4500	≤55	0.59	0.044	298	5	19	100.8	45	67	127	3360
42.00	ZTR518SPH932_0420 ME	2800	4500	≤48	0.54	0.042	305	5	18	95.5	45	63	126	3000
42.00	ZTR518SPH932_0420 MEL	2800	4500	≤55	0.54	0.042	306	5	18	95.5	45	63	126	3000
42.00	ZTR519SPH932_0420 ME	2800	4500	≤48	0.57	0.044	300	5	19	100.8	45	67	127	3360
42.00	ZTR519SPH932_0420 MEL	2800	4500	≤55	0.57	0.044	301	5	19	100.8	45	67	127	3360
48.00	ZTR518SPH932_0480 ME	2800	4500	≤48	0.47	0.042	305	5	18	95.5	45	63	126	3000
48.00	ZTR518SPH932_0480 MEL	2800	4500	≤55	0.47	0.042	305	5	18	95.5	45	63	126	3000
48.00	ZTR519SPH932_0480 ME	2800	4500	≤48	0.50	0.044	300	5	19	100.8	45	67	127	3360
48.00	ZTR519SPH932_0480 MEL	2800	4500	≤55	0.50	0.044	300	5	19	100.8	45	67	127	3360
60.00	ZTR518SPH932_0600 ME	2800	4500	≤48	0.38	0.042	303	5	18	95.5	45	63	126	3000
60.00	ZTR518SPH932_0600 MEL	2800	4500	≤55	0.38	0.042	304	5	18	95.5	45	63	126	3000
60.00	ZTR519SPH932_0600 ME	2800	4500	≤48	0.40	0.044	298	5	19	100.8	45	67	127	3360
60.00	ZTR519SPH932_0600 MEL	2800	4500	≤55	0.40	0.044	299	5	19	100.8	45	67	127	3360
ZTR6PH9 (F_{fzacc,max} = 56 kN)														
12.00	ZTR616SPH932_0120 ME	1800	3000	≤48	1.33	0.044	307	6	16	101.9	34	56	112	2840
12.00	ZTR616SPH932_0120 MEL	1800	3000	≤60	1.33	0.044	312	6	16	101.9	34	56	112	2840
16.00	ZTR616SPH932_0160 ME	2200	3500	≤48	1.17	0.044	309	6	16	101.9	38	56	112	2840
16.00	ZTR616SPH932_0160 MEL	2200	3500	≤60	1.17	0.044	312	6	16	101.9	38	56	112	2840
18.00	ZTR616SPH932_0180 ME	1800	3000	≤48	0.89	0.044	306	6	16	101.9	39	56	112	2840
18.00	ZTR616SPH932_0180 MEL	1800	3000	≤60	0.89	0.044	308	6	16	101.9	39	56	112	2840
20.00	ZTR616SPH932_0200 ME	2500	4000	≤48	1.07	0.044	309	6	16	101.9	40	56	112	2840
20.00	ZTR616SPH932_0200 MEL	2500	4000	≤60	1.07	0.044	311	6	16	101.9	40	56	112	2840
24.00	ZTR616SPH932_0240 ME	2200	3500	≤48	0.78	0.044	307	6	16	101.9	43	56	112	2840
24.00	ZTR616SPH932_0240 MEL	2200	3500	≤60	0.78	0.044	308	6	16	101.9	43	56	112	2840
28.00	ZTR616SPH932_0280 ME	2800	4500	≤48	0.86	0.044	308	6	16	101.9	44	56	112	2840
28.00	ZTR616SPH932_0280 MEL	2800	4500	≤55	0.86	0.044	309	6	16	101.9	44	56	112	2840
30.00	ZTR616SPH932_0300 ME	2500	4000	≤48	0.71	0.044	307	6	16	101.9	44	56	112	2840
30.00	ZTR616SPH932_0300 MEL	2500	4000	≤60	0.71	0.044	307	6	16	101.9	44	56	112	2840
32.00	ZTR616SPH932_0320 ME	2800	4500	≤48	0.75	0.044	306	6	16	101.9	44	56	112	2840
32.00	ZTR616SPH932_0320 MEL	2800	4500	≤55	0.75	0.044	307	6	16	101.9	44	56	112	2840
40.00	ZTR616SPH932_0400 ME	2800	4500	≤48	0.60	0.044	304	6	16	101.9	44	56	112	2840

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{fzmaxZB}$ [m/s]	Δs [mm]	C_{lin} [N/ μ m]	m_n [mm]	z	d_0 [mm]	F_{fzN} [kN]	F_{fzacc} [kN]	F_{fzNOT} [kN]	M_{2acc} [Nm]
ZTR6PH9 ($F_{fzacc,max} = 56$ kN)														
40.00	ZTR616SPH932_0400 MEL	2800	4500	≤ 55	0.60	0.044	304	6	16	101.9	44	56	112	2840
42.00	ZTR616SPH932_0420 ME	2800	4500	≤ 48	0.57	0.044	306	6	16	101.9	44	56	112	2840
42.00	ZTR616SPH932_0420 MEL	2800	4500	≤ 55	0.57	0.044	307	6	16	101.9	44	56	112	2840
48.00	ZTR616SPH932_0480 ME	2800	4500	≤ 48	0.50	0.044	305	6	16	101.9	44	56	112	2840
48.00	ZTR616SPH932_0480 MEL	2800	4500	≤ 55	0.50	0.044	306	6	16	101.9	44	56	112	2840
60.00	ZTR616SPH932_0600 ME	2800	4500	≤ 48	0.40	0.044	304	6	16	101.9	44	56	112	2840
60.00	ZTR616SPH932_0600 MEL	2800	4500	≤ 55	0.40	0.044	304	6	16	101.9	44	56	112	2840
ZTR6PH10 ($F_{fzacc,max} = 56$ kN)														
18.00	ZTR616SPH1032_0180 ME	1800	3000	≤ 48	0.89	0.044	262	6	16	101.9	36	56	112	2840
18.00	ZTR616SPH1032_0180 MEL	1800	3000	≤ 60	0.89	0.044	263	6	16	101.9	36	56	112	2840
24.00	ZTR616SPH1032_0240 ME	2200	3500	≤ 48	0.78	0.044	262	6	16	101.9	40	56	112	2840
24.00	ZTR616SPH1032_0240 MEL	2200	3500	≤ 60	0.78	0.044	263	6	16	101.9	40	56	112	2840
30.00	ZTR616SPH1032_0300 ME	2500	4000	≤ 48	0.71	0.044	262	6	16	101.9	40	56	112	2840
30.00	ZTR616SPH1032_0300 MEL	2500	4000	≤ 60	0.71	0.044	263	6	16	101.9	40	56	112	2840
42.00	ZTR616SPH1032_0420 ME	2800	4500	≤ 48	0.57	0.044	262	6	16	101.9	40	56	112	2840
42.00	ZTR616SPH1032_0420 MEL	2800	4500	≤ 55	0.57	0.044	262	6	16	101.9	40	56	112	2840
48.00	ZTR616SPH1032_0480 ME	2800	4500	≤ 48	0.50	0.044	261	6	16	101.9	40	56	112	2840
48.00	ZTR616SPH1032_0480 MEL	2800	4500	≤ 55	0.50	0.044	262	6	16	101.9	40	56	112	2840
60.00	ZTR616SPH1032_0600 ME	2800	4500	≤ 48	0.40	0.044	260	6	16	101.9	40	56	112	2840
60.00	ZTR616SPH1032_0600 MEL	2800	4500	≤ 55	0.40	0.044	261	6	16	101.9	40	56	112	2840
ZTR8PH10 ($F_{fzacc,max} = 60$ kN)														
18.00	ZTR812SPH1032_0180 ME	1800	3000	≤ 48	0.89	0.044	261	8	12	101.9	35	60	121	3080
18.00	ZTR812SPH1032_0180 MEL	1800	3000	≤ 60	0.89	0.044	263	8	12	101.9	35	60	121	3080
24.00	ZTR812SPH1032_0240 ME	2200	3500	≤ 48	0.78	0.044	262	8	12	101.9	38	60	121	3080
24.00	ZTR812SPH1032_0240 MEL	2200	3500	≤ 60	0.78	0.044	263	8	12	101.9	38	60	121	3080
30.00	ZTR812SPH1032_0300 ME	2500	4000	≤ 48	0.71	0.044	262	8	12	101.9	39	60	121	3080
30.00	ZTR812SPH1032_0300 MEL	2500	4000	≤ 60	0.71	0.044	262	8	12	101.9	39	60	121	3080
42.00	ZTR812SPH1032_0420 ME	2800	4500	≤ 48	0.57	0.044	261	8	12	101.9	39	60	121	3080
42.00	ZTR812SPH1032_0420 MEL	2800	4500	≤ 55	0.57	0.044	262	8	12	101.9	39	60	121	3080
48.00	ZTR812SPH1032_0480 ME	2800	4500	≤ 48	0.50	0.044	261	8	12	101.9	39	60	121	3080
48.00	ZTR812SPH1032_0480 MEL	2800	4500	≤ 55	0.50	0.044	261	8	12	101.9	39	60	121	3080
60.00	ZTR812SPH1032_0600 ME	2800	4500	≤ 48	0.40	0.044	260	8	12	101.9	39	60	121	3080
60.00	ZTR812SPH1032_0600 MEL	2800	4500	≤ 55	0.40	0.044	260	8	12	101.9	39	60	121	3080

5.3 Dimensional drawings

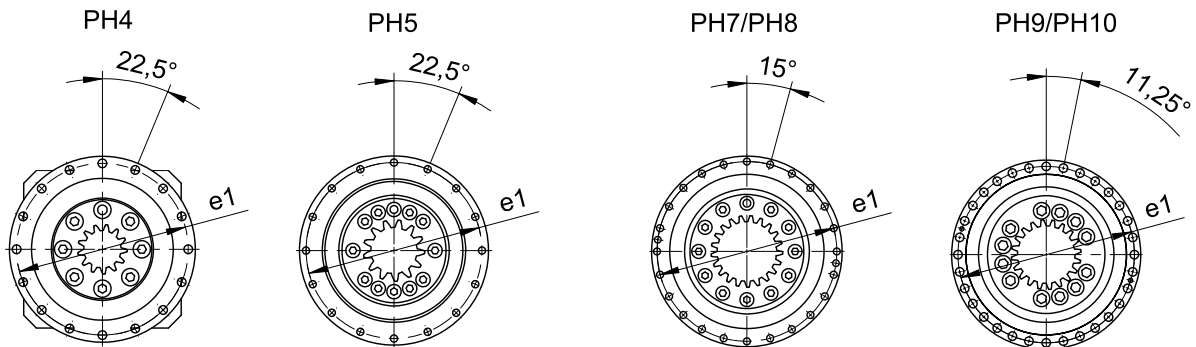
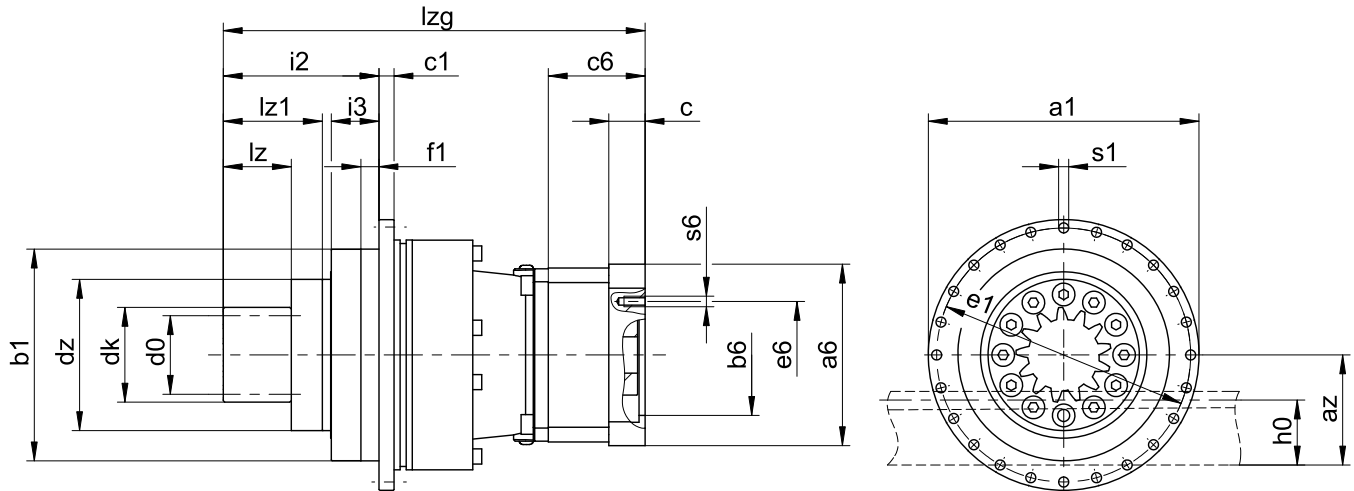
In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

Dimension a_z in the tables of dimensions applies to Atlanta gear racks. In general: $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.



Output dimensions

Type	mn	Øa1	az	Øb1	c1	d0	dk	dz	Øe1	f1	h0	i2	i3	lz	lz1	Øs1	x
ZTR212SPH4_	2	118 _{h7}	35.73	90 _{h7}	7	25.47	31.5	63	109	10	22	71.0	23.5	26.0	41.0	5.5	0.50
ZTR216SPH4_	2	118 _{h7}	38.98	90 _{h7}	7	33.95	38.0	63	109	10	22	71.0	23.5	26.0	41.0	5.5	0.00
ZTR212SPH5_	2	145 _{h7}	35.73	110 _{h7}	8	25.47	31.5	80	135	10	22	70.0	22.5	26.0	41.0	5.5	0.50
ZTR219SPH5_	2	145 _{h7}	42.16	110 _{h7}	8	40.32	44.3	80	135	10	22	70.0	22.5	26.0	41.0	5.5	0.00
ZTR223SPH5_	2	145 _{h7}	46.40	110 _{h7}	8	48.81	52.8	80	135	10	22	70.0	22.5	26.0	41.0	5.5	0.00
ZTR312SPH5_	3	145 _{h7}	46.60	110 _{h7}	8	38.20	47.2	80	135	10	26	76.5	22.5	32.5	47.5	5.5	0.50
ZTR314SPH5_	3	145 _{h7}	49.18	110 _{h7}	8	44.56	52.4	80	135	10	26	76.5	22.5	32.5	47.5	5.5	0.30
ZTR212SPH7_	2	179 _{h7}	35.73	140 _{h7}	10	25.47	31.5	100	168	12	22	84.0	31.5	26.0	46.0	6.6	0.50
ZTR223SPH7_	2	179 _{h7}	46.40	140 _{h7}	10	48.81	52.8	100	168	12	22	84.0	31.5	26.0	46.0	6.6	0.00
ZTR316SPH7_	3	179 _{h7}	51.46	140 _{h7}	10	50.93	56.9	100	168	12	26	90.5	31.5	32.5	52.5	6.6	0.00
ZTR319SPH7_	3	179 _{h7}	56.24	140 _{h7}	10	60.48	66.5	100	168	12	26	90.5	31.5	32.5	52.5	6.6	0.00
ZTR412SPH7_	4	179 _{h7}	62.46	140 _{h7}	10	50.93	62.9	100	168	12	35	103.0	31.5	45.0	65.0	6.6	0.50
ZTR319SPH8_	3	247 _{h7}	56.24	200 _{h7}	12	60.48	66.5	148	233	15	26	107.5	41.5	32.5	57.5	9.0	0.00
ZTR326SPH8_	3	247 _{h7}	67.38	200 _{h7}	12	82.76	88.8	148	233	15	26	107.5	41.5	32.5	57.5	9.0	0.00
ZTR332SPH8_	3	247 _{h7}	76.93	200 _{h7}	12	101.86	107.9	148	233	15	26	107.5	41.5	32.5	57.5	9.0	0.00
ZTR417SPH8_	4	247 _{h7}	71.08	200 _{h7}	12	72.15	80.2	148	233	15	35	120.0	41.5	45.0	70.0	9.0	0.00
ZTR419SPH8_	4	247 _{h7}	75.76	200 _{h7}	12	80.64	89.5	148	233	15	35	120.0	41.5	45.0	70.0	9.0	0.11
ZTR420SPH8_	4	247 _{h7}	77.44	200 _{h7}	12	84.88	92.9	148	233	15	35	120.0	41.5	45.0	70.0	9.0	0.00
ZTR512SPH8_	5	247 _{h7}	68.33	200 _{h7}	12	63.66	78.7	148	233	15	34	130.0	41.5	55.0	80.0	9.0	0.50
ZTR516SPH8_	5	247 _{h7}	76.44	200 _{h7}	12	84.88	94.9	148	233	15	34	130.0	41.5	55.0	80.0	9.0	0.00
ZTR518SPH8_	5	247 _{h7}	81.75	200 _{h7}	12	95.49	105.5	148	233	15	34	130.0	41.5	55.0	80.0	9.0	0.00
ZTR615SPH8_	6	247 _{h7}	90.75	200 _{h7}	12	95.49	107.5	148	233	15	43	140.0	41.5	65.0	90.0	9.0	0.00
ZTR518SPH9_	5	300	81.75	255 _{h7}	18	95.49	105.5	187	280	20	34	155.0	54.0	55.0	89.0	13.5	0.00
ZTR519SPH9_	5	300	84.40	255 _{h7}	18	100.80	110.8	187	280	20	34	155.0	54.0	55.0	89.0	13.5	0.00
ZTR616SPH9_	6	300	93.93	255 _{h7}	18	101.86	113.9	187	280	20	43	165.0	54.0	65.0	99.0	13.5	0.00
ZTR616SPH10_	6	330	93.93	285 _{h7}	20	101.86	113.9	210	310	20	43	185.0	60.0	65.0	110.0	13.5	0.00
ZTR812SPH10_	8	330	125.93	285 _{h7}	20	101.86	125.9	210	310	20	71	205.0	60.0	85.0	130.0	13.5	0.50

Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZTR2_PH421_	100	95.0 ^{H7}	115	21	56.0	163.0	M8
ZTR2_PH422_	75	60.0 ^{H7}	75	18	51.5	205.5	M5
ZTR2_PH521_	120	110.0 ^{H7}	130	24	67.5	178.5	M8
ZTR3_PH521_	120	110.0 ^{H7}	130	24	67.5	185.0	M8
ZTR2_PH522_	100	95.0 ^{H7}	115	21	56.0	221.5	M8
ZTR3_PH522_	100	95.0 ^{H7}	115	21	56.0	228.0	M8
ZTR2_PH721_	150	130.0 ^{H7}	165	26	76.0	210.0	M10
ZTR3_PH721_	150	130.0 ^{H7}	165	26	76.0	216.5	M10
ZTR4_PH721_	150	130.0 ^{H7}	165	26	76.0	229.0	M10
ZTR2_PH722_	120	110.0 ^{H7}	130	24	67.5	263.5	M8
ZTR3_PH722_	120	110.0 ^{H7}	130	24	67.5	270.0	M8
ZTR4_PH722_	120	110.0 ^{H7}	130	24	67.5	282.5	M8
ZTR3_PH821_	204	180.0 ^{H7}	215	35	92.0	275.5	M12
ZTR4_PH821_	204	180.0 ^{H7}	215	35	92.0	288.0	M12
ZTR5_PH821_	204	180.0 ^{H7}	215	35	92.0	298.0	M12
ZTR6_PH821_	204	180.0 ^{H7}	215	35	92.0	308.0	M12
ZTR3_PH822_	150	130.0 ^{H7}	165	26	80.0	338.5	M10
ZTR4_PH822_	150	130.0 ^{H7}	165	26	80.0	351.0	M10
ZTR5_PH822_	150	130.0 ^{H7}	165	26	80.0	361.0	M10
ZTR6_PH822_	150	130.0 ^{H7}	165	26	80.0	371.0	M10
ZTR5_PH932_	204	180.0 ^{H7}	215	35	94.0	473.5	M12
ZTR6_PH932_	204	180.0 ^{H7}	215	35	94.0	483.5	M12
ZTR6_PH1032_	204	180.0 ^{H7}	215	35	94.0	511.0	M12
ZTR8_PH1032_	204	180.0 ^{H7}	215	35	94.0	531.0	M12

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEGER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

5.4 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.

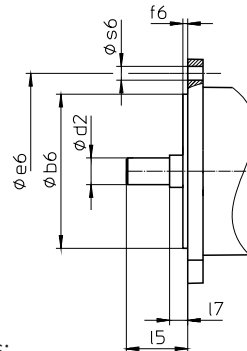
Sample code

Z	TR	3	19	S	PH	7	2	1	F	0050	ME
---	----	---	----	---	----	---	---	---	---	------	----

Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
TR	Design	Screwed flange pinion
3	Module	$m_n = 3$ (example)
19	Number of teeth	$z = 19$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
PH	Type	Planetary gear unit
7	Size	7 (example)
2	Generation	Generation 2
1	Stages	Single-stage
2		Two-stage
F	Shaft	Flange shaft
0050	Transmission ratio ($i \times 10$)	$i = 5$ (example)
ME	Motor adapter	Motor adapter with EasyAdapt® coupling
MEL		Motor adapter with EasyAdapt® coupling for large motors

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

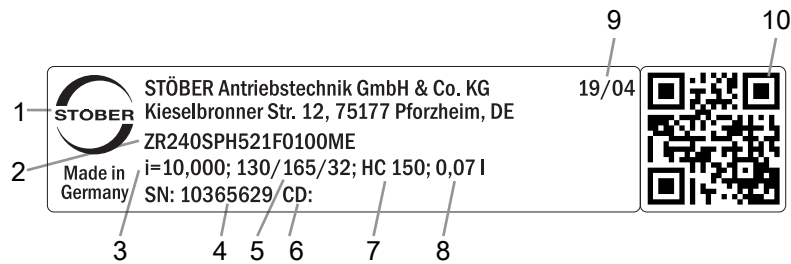
To choose a suitable motor connection, use the STOBER Configurator at <http://configurator.stoeber.de> and choose your motor or the dimensions of the motor connection.

- For radial shaft seal rings at the output made of NBR or FKM, see the chapter [▶ 5.6.3]
- Radial runout $\leq 10 \mu\text{m}$ (optional)
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation upon request

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter. All input options available upon request are listed in the chapter [▶ 5.5.2].

5.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

5.4.1.1 Supporting documents

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

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

5.5 Product description

5.5.1 Motor adapter with EasyAdapt® coupling (ME/MEL)

In this chapter, you will find a description of the EasyAdapt® coupling.

Properties:

- Fast and easy motor attachment
- One-piece, rugged coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design

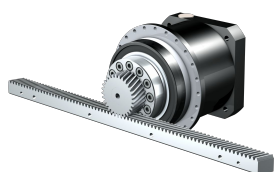


Fig. 1: EasyAdapt® coupling

5.5.2 Input options

In this chapter, you will find all available input options:

ME motor adapter



<http://www.stoeber.de/en/ZTRPHME>

KX right-angle input with MF motor adapter



On request

K right-angle input with ME motor adapter



On request

MB motor adapter



On request

EZ synchronous servo motor



On request

You can also acquire rack and pinion drives with low-backlash PHA gear units upon request. To do so, send us an e-mail at sales@stober.de.

5.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	6	16MnCr5 inductively hardened
5	5	16MnCr5 inductively hardened
6 – 10	6	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

5.5.4 Installation conditions

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

- When using screws with quality 12.9 for machine-side attachment of the gear unit housing
- When the gear unit housings are adjusted at pilot \varnothing bz. The machine-side fit must be H7.

5.5.5 Lubricants

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

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stoeber.de/en/download>. Enter the ID of the documentation in the Search... field.

5.5.5.1 Rack and pinion drive lubrication

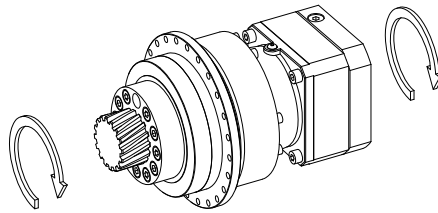
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

5.5.6 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 90 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

5.5.7 Direction of rotation

The input and output rotate in the same direction.



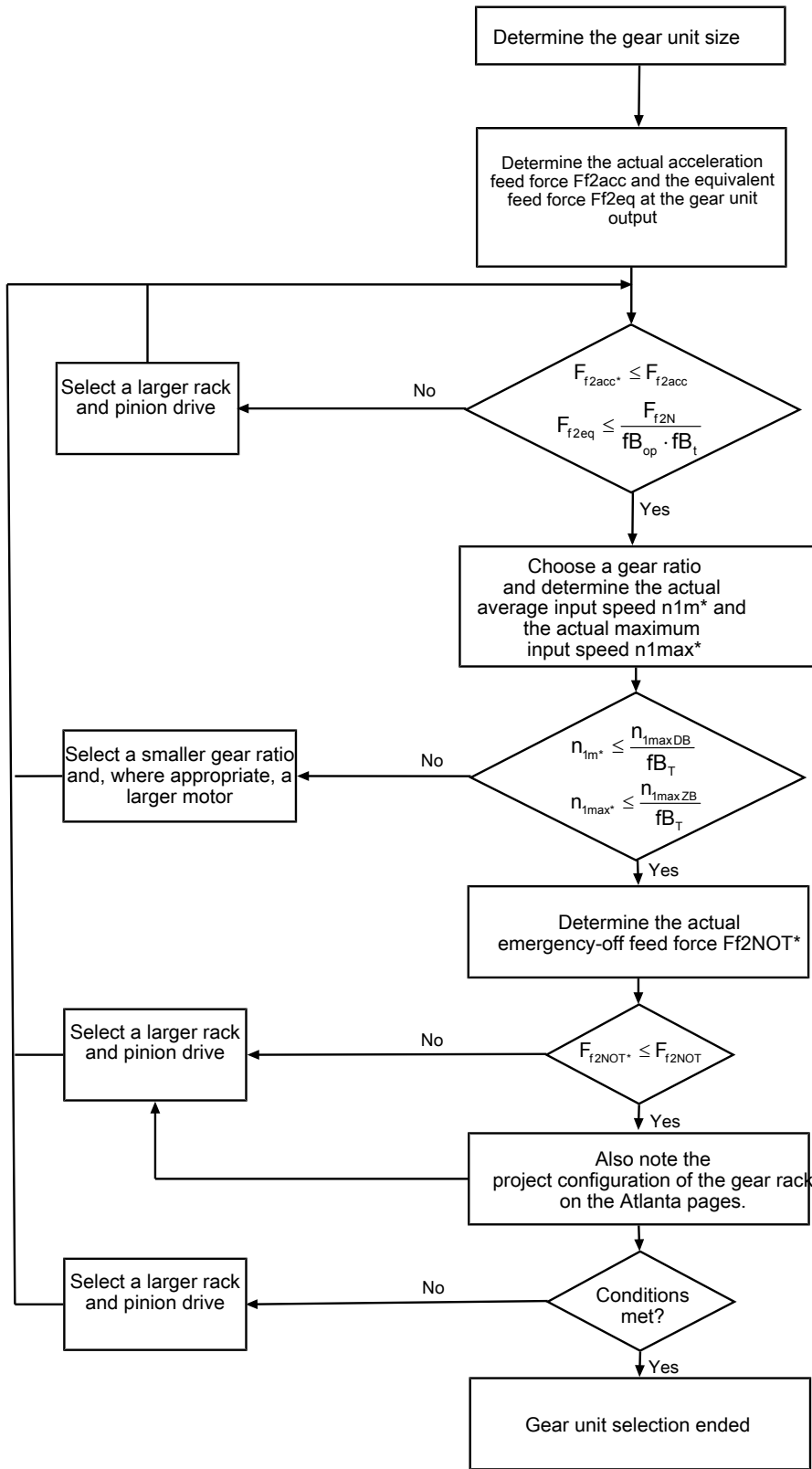
5.6 Project configuration

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

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

An explanation of the formula symbols can be found in the chapter [\[▶ 14.1\]](#).

5.6.1 Drive selection

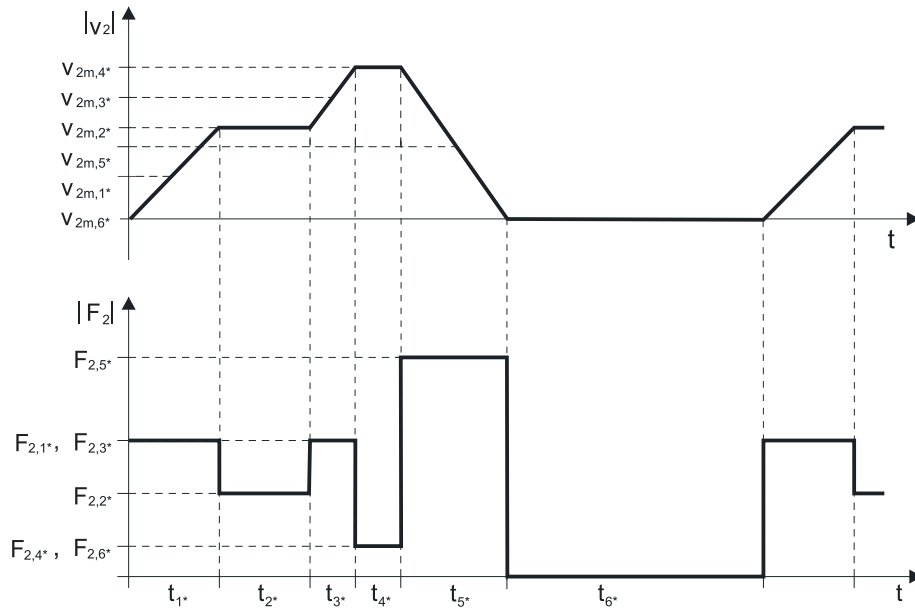


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

The values for fb_T , fb_{op} and fb_t can be found in the corresponding tables in this chapter.

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

$$F_{f2acc*} = m \cdot a^* + F_L$$

Calculation of the actual average input speed

$$n_{1m*} = \frac{v_{2m*} \cdot i}{d_0 \cdot \pi}$$

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

If $t_{1*} + \dots + t_{5*} \geq 10 \text{ min}$, determine v_{2m*} without the rest phase t_{6*} .

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_L$$

Calculation of the actual equivalent feed force

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{2m,1*}| \cdot t_{1*} \cdot |F_{2,1*}|^3 + \dots + |v_{2m,n*}| \cdot t_{n*} \cdot |F_{2,n*}|^3}{|v_{2m,1*}| \cdot t_{1*} + \dots + |v_{2m,n*}| \cdot t_{n*}}}$$

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 $\leq 8 \text{ h}$		1.00
Daily run time $\leq 16 \text{ h}$		1.15
Daily run time $\leq 24 \text{ h}$		1.20
Temperature		fB_T
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20 \text{ }^\circ\text{C}$	0.9
	$\leq 30 \text{ }^\circ\text{C}$	1.0
	$\leq 40 \text{ }^\circ\text{C}$	1.15
Motor with convection cooling	$\leq 20 \text{ }^\circ\text{C}$	1.0
	$\leq 30 \text{ }^\circ\text{C}$	1.1
	$\leq 40 \text{ }^\circ\text{C}$	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

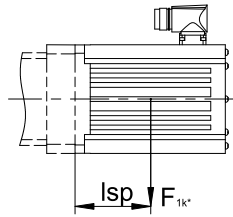
5.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
PH321_ME	20
PH322_ME	10
PH421_ME	40
PH422_ME	20
PH521_ME	80
PH522_ME	40
PH721_ME	200
PH722_ME	80
PH821_ME	400
PH822_ME	200
PH932_ME	400
PH1032_ME	400

5.6.3 Recommendation for radial shaft seal rings

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

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance 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 a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

5.7 Additional documentation

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

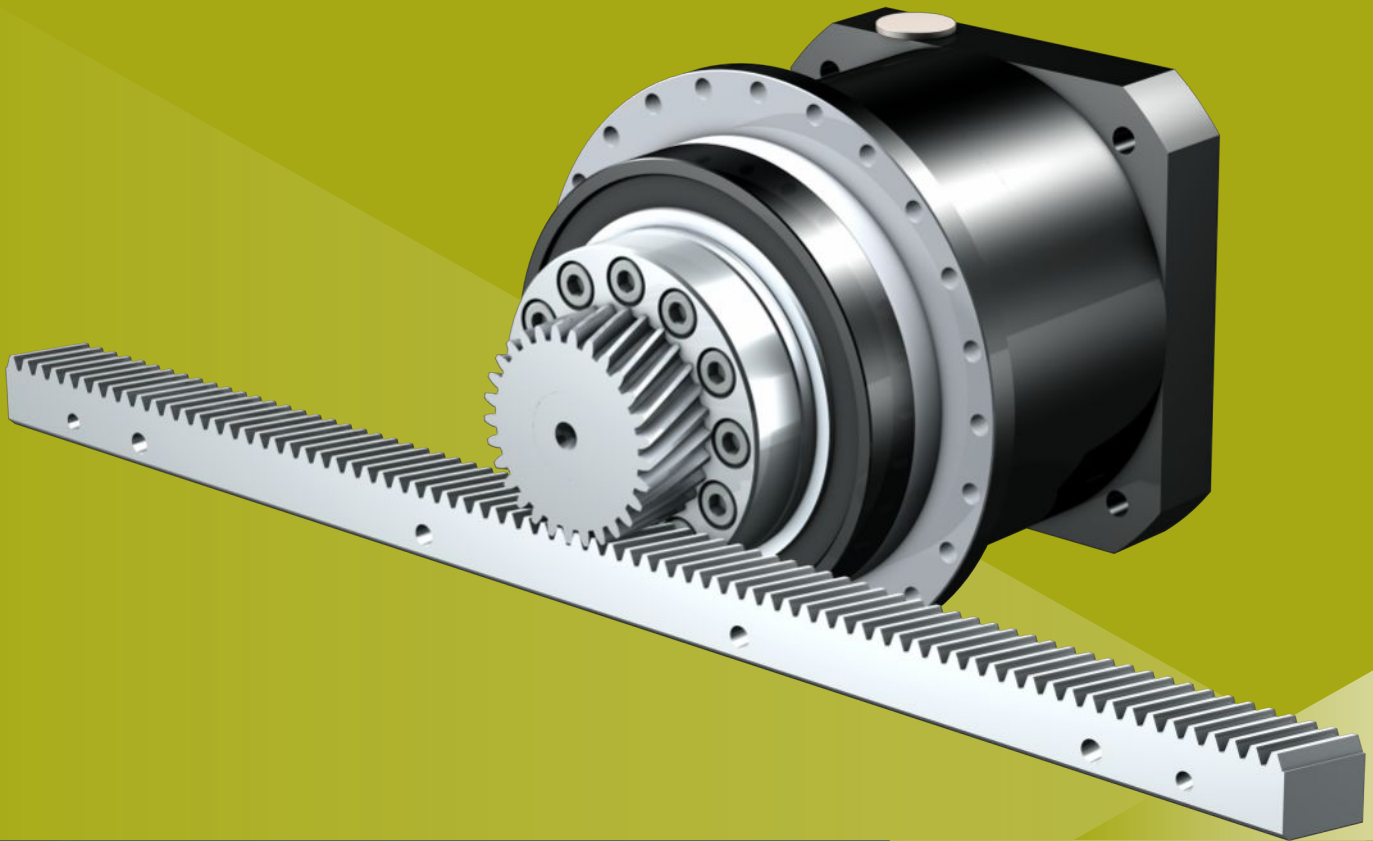
Enter the ID of the documentation in the Search... field.

Documentation	ID
Operating manual Rack and Pinion Drives (Atlanta)	442455
Operating manual for P/PA/PE/PH/PHA/PHQ/PHQA/PHV/PHVA planetary gear units and planetary geared motors	443029_en
Lubricant filling quantities for gear units	441871

6 ZTRPHV rack and pinion drives

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6 Rack and pinion drives

ZTRPHV

6.1 Overview

High-performance precision planetary gear units with screwed flange pinion

Features

Power density	★★★★☆
Linear clearance	★★★★☆
Price category	€€€€
Smooth operation	★★★★☆
Linear rigidity	★★★★☆
Mass moment of inertia	★★★★☆
Ready-to-install drive solution	✓
Pinion gearing quality 5 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓
Radial runout ≤ 10 μm (optional)	✓

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

Technical data

m_n	5 – 8 mm
z	12 – 19
F_{f2acc}	56 – 67 kN
$v_{f2maxzB}$	0.19 – 0.39 m/s
Δs	42 – 44 μm

6.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 6.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [mm]	C_{in} [N/μm]	m_n [mm]	z	d_0 [mm]	F_{f2N} [kN]	F_{f2acc} [kN]	F_{f2NOT} [kN]	M_{2acc} [Nm]
ZTR5PHV9 ($F_{f2acc,max} = 67$ kN)														
61.00	ZTR518SPHV933_0610 ME	2500	4500	≤38	0.37	0.042	290	5	18	95.5	45	63	126	3000
61.00	ZTR518SPHV933_0610 MEL	2500	4500	≤48	0.37	0.042	290	5	18	95.5	45	63	126	3000
61.00	ZTR519SPHV933_0610 ME	2500	4500	≤38	0.39	0.044	284	5	19	100.8	45	67	127	3360
61.00	ZTR519SPHV933_0610 MEL	2500	4500	≤48	0.39	0.044	284	5	19	100.8	45	67	127	3360
91.00	ZTR518SPHV933_0910 ME	2500	4500	≤38	0.25	0.042	289	5	18	95.5	45	63	126	3000
91.00	ZTR518SPHV933_0910 MEL	2500	4500	≤48	0.25	0.042	289	5	18	95.5	45	63	126	3000
91.00	ZTR519SPHV933_0910 ME	2500	4500	≤38	0.26	0.044	283	5	19	100.8	45	67	127	3360
91.00	ZTR519SPHV933_0910 MEL	2500	4500	≤48	0.26	0.044	283	5	19	100.8	45	67	127	3360
121.0	ZTR518SPHV933_1210 ME	2500	4500	≤38	0.19	0.042	286	5	18	95.5	45	63	126	3000
121.0	ZTR518SPHV933_1210 MEL	2500	4500	≤48	0.19	0.042	286	5	18	95.5	45	63	126	3000
121.0	ZTR519SPHV933_1210 ME	2500	4500	≤38	0.20	0.044	280	5	19	100.8	45	67	127	3360
121.0	ZTR519SPHV933_1210 MEL	2500	4500	≤48	0.20	0.044	280	5	19	100.8	45	67	127	3360
ZTR6PHV9 ($F_{f2acc,max} = 56$ kN)														
61.00	ZTR616SPHV933_0610 ME	2500	4500	≤38	0.39	0.044	289	6	16	101.9	44	56	112	2840
61.00	ZTR616SPHV933_0610 MEL	2500	4500	≤48	0.39	0.044	289	6	16	101.9	44	56	112	2840
91.00	ZTR616SPHV933_0910 ME	2500	4500	≤38	0.26	0.044	288	6	16	101.9	44	56	112	2840
91.00	ZTR616SPHV933_0910 MEL	2500	4500	≤48	0.26	0.044	288	6	16	101.9	44	56	112	2840
121.0	ZTR616SPHV933_1210 ME	2500	4500	≤38	0.20	0.044	285	6	16	101.9	44	56	112	2840
121.0	ZTR616SPHV933_1210 MEL	2500	4500	≤48	0.20	0.044	285	6	16	101.9	44	56	112	2840
ZTR6PHV10 ($F_{f2acc,max} = 56$ kN)														
61.00	ZTR616SPHV1033_0610 ME	2500	4500	≤48	0.39	0.044	255	6	16	101.9	40	56	112	2840
61.00	ZTR616SPHV1033_0610 MEL	2500	4500	≤55	0.39	0.044	255	6	16	101.9	40	56	112	2840
91.00	ZTR616SPHV1033_0910 ME	2500	4500	≤48	0.26	0.044	254	6	16	101.9	40	56	112	2840
91.00	ZTR616SPHV1033_0910 MEL	2500	4500	≤55	0.26	0.044	255	6	16	101.9	40	56	112	2840
ZTR8PHV10 ($F_{f2acc,max} = 60$ kN)														
61.00	ZTR812SPHV1033_0610 ME	2500	4500	≤48	0.39	0.044	255	8	12	101.9	39	60	121	3080
61.00	ZTR812SPHV1033_0610 MEL	2500	4500	≤55	0.39	0.044	255	8	12	101.9	39	60	121	3080
91.00	ZTR812SPHV1033_0910 ME	2500	4500	≤48	0.26	0.044	254	8	12	101.9	39	60	121	3080
91.00	ZTR812SPHV1033_0910 MEL	2500	4500	≤55	0.26	0.044	254	8	12	101.9	39	60	121	3080

6.3 Dimensional drawings

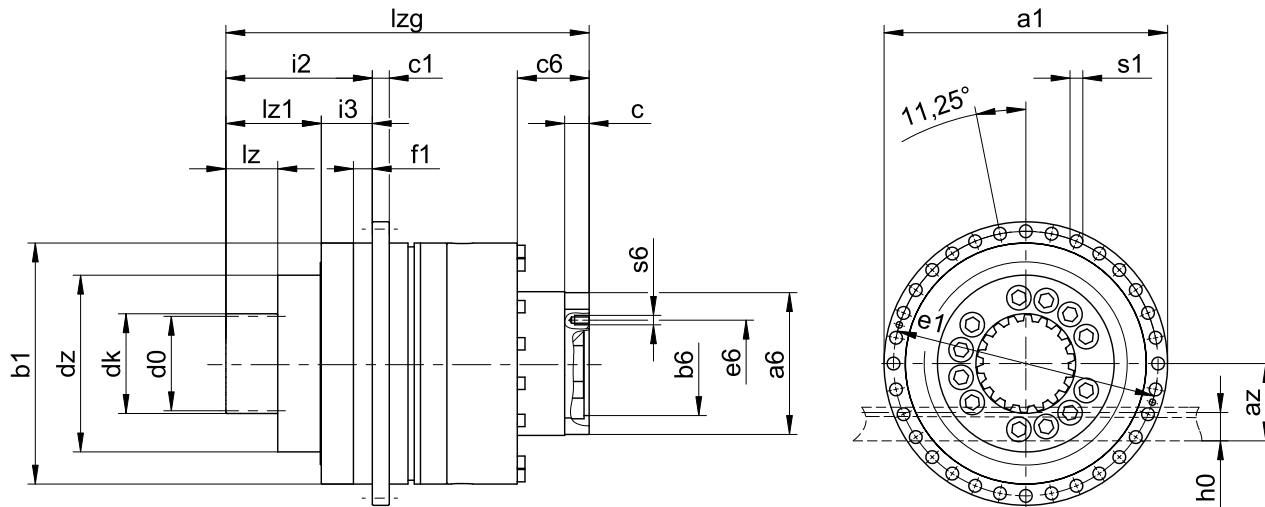
In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.



Output dimensions

Type	mn	Øa1	az	Øb1	c1	d0	dk	dz	Øe1	f1	h0	i2	i3	lz	lz1	Øs1	x
ZTR518SPHV9_	5	300	81.75	255 _{h7}	18	95.49	105.5	187	280	20	34	155	54	55	89	13.5	0.0
ZTR519SPHV9_	5	300	84.40	255 _{h7}	18	100.80	110.8	187	280	20	34	155	54	55	89	13.5	0.0
ZTR616SPHV9_	6	300	93.93	255 _{h7}	18	101.86	113.9	187	280	20	43	165	54	65	99	13.5	0.0
ZTR616SPHV10_	6	330	93.93	285 _{h7}	20	101.86	113.9	210	310	20	43	185	60	65	110	13.5	0.0
ZTR812SPHV10_	8	330	125.93	285 _{h7}	20	101.86	125.9	210	310	20	71	205	60	85	130	13.5	0.5

Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZTR5_PHV9_	150	110.0 ^{H7}	130	26	76	384.5	M8
ZTR6_PHV9_	150	110.0 ^{H7}	130	26	76	394.5	M8
ZTR6_PHV10_	204	130.0 ^{H7}	165	35	92	452.0	M10
ZTR8_PHV10_	204	130.0 ^{H7}	165	35	92	472.0	M10

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEBER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

6.4 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.

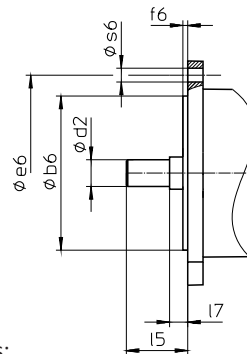
Sample code

Z	TR	6	16	S	PHV	9	3	3	F	0910	ME
---	----	---	----	---	-----	---	---	---	---	------	----

Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
TR	Design	Screwed flange pinion
6	Module	$m_n = 6$ (example)
16	Number of teeth	$z = 16$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
PH	Type	Planetary gear unit
9	Size	9 (example)
3	Generation	Generation 3
3	Stages	Three-stage
F	Shaft	Flange shaft
0910	Transmission ratio ($i \times 10$)	$i = 91$ (example)
ME	Motor adapter	Motor adapter with EasyAdapt® coupling
MEL		Motor adapter with EasyAdapt® coupling for large motors

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at <http://configurator.stoerber.de> and choose your motor or the dimensions of the motor connection.

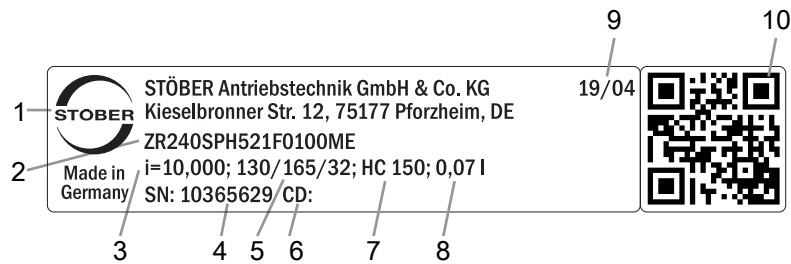
- For radial shaft seal rings at the output made of NBR or FKM, see the chapter [▶ 6.6.3]
- Radial runout $\leq 10 \mu\text{m}$ (optional)
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation upon request

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter.

All input options available upon request are listed in the chapter [▶ 6.5.2].

6.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

6.4.1.1 Supporting documents

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

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

6.5 Product description

6.5.1 Motor adapter with EasyAdapt® coupling (ME/MEL)

In this chapter, you will find a description of the EasyAdapt® coupling.

Properties:

- Fast and easy motor attachment
- One-piece, rugged coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design



Fig. 1: EasyAdapt® coupling

6.5.2 Input options

In this chapter, you will find all available input options:

ME motor adapter



<http://www.stoerber.de/en/ZTRPHVME>

MB motor adapter



On request

EZ synchronous servo motor



On request

You can also acquire rack and pinion drives with low-backlash PHVA gear units upon request. To do so, send us an e-mail at sales@stoerber.de.

6.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	6	16MnCr5 inductively hardened
5	5	16MnCr5 inductively hardened
6 – 10	6	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

6.5.4 Installation conditions

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

- When using screws with quality 12.9 for machine-side attachment of the gear unit housing
- When the gear unit housings are adjusted at pilot \varnothing z. The machine-side fit must be H7.

6.5.5 Lubricants

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

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stoerber.de/en/download>. Enter the ID of the documentation in the Search... field.

6.5.5.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

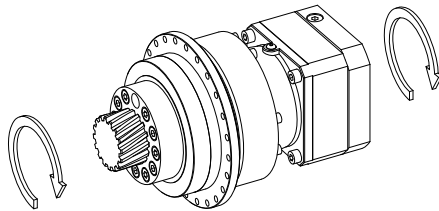
6.5.6 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 90 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

¹ Observe the protection class of all the components.

6.5.7 Direction of rotation

The input and output rotate in the same direction.



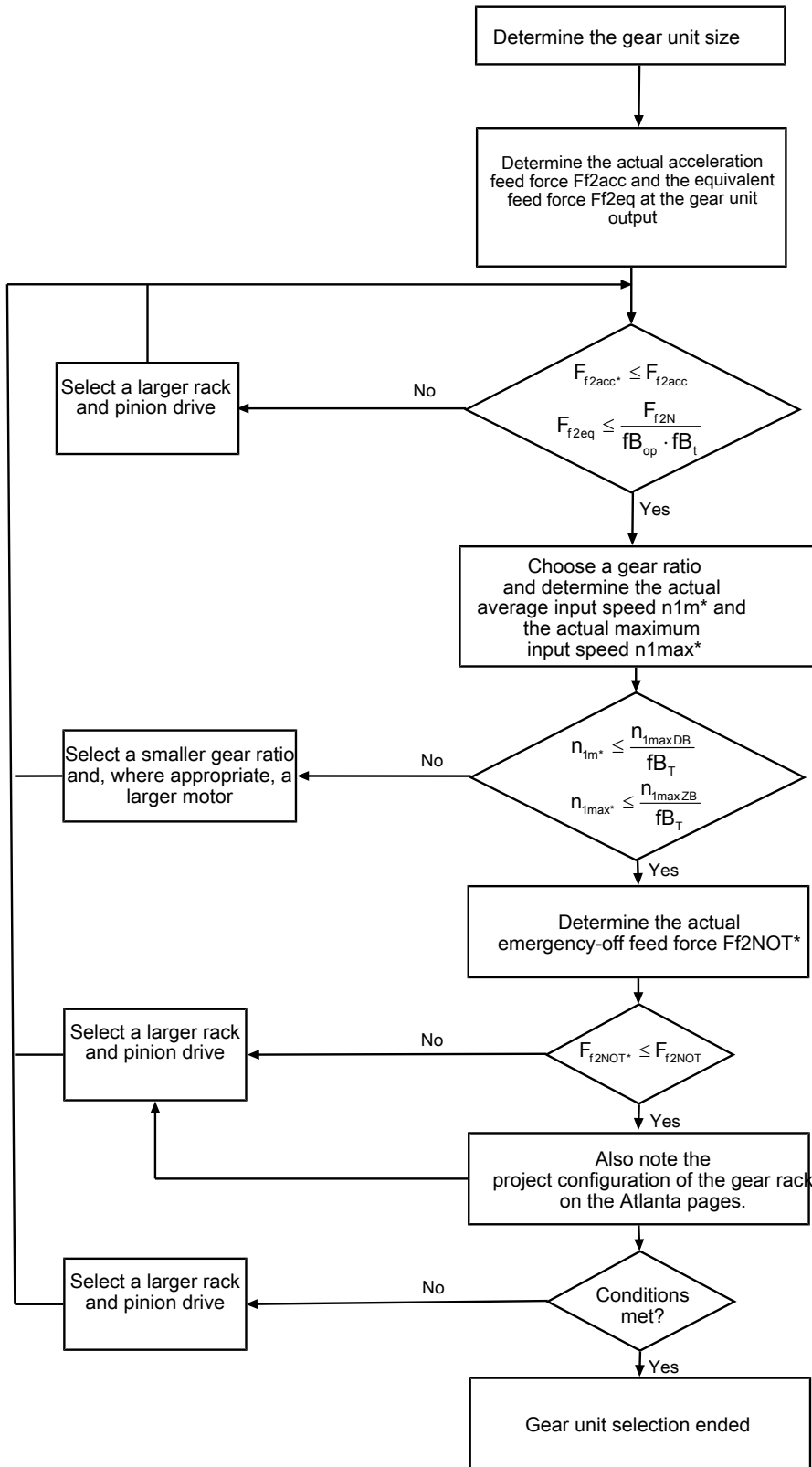
6.6 Project configuration

Project your drives using our SERVOnsoft designing software. You can receive SERVOnsoft 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 *.

An explanation of the formula symbols can be found in the chapter [\[▶ 14.1\]](#).

6.6.1 Drive selection

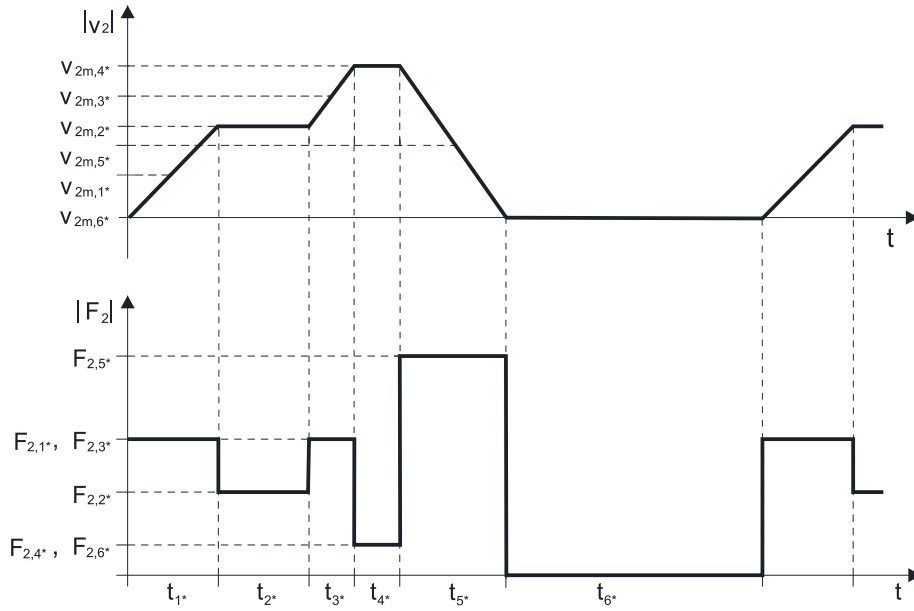


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

The values for fb_T , fb_{op} and fb_t can be found in the corresponding tables in this chapter.

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

Calculation of the actual average input speed

$$n_{1m*} = \frac{v_{2m*} \cdot i}{d_0 \cdot \pi}$$

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

If $t_{1*} + \dots + t_{5*} \geq 10 \text{ min}$, determine v_{2m*} without the rest phase t_{6*} .

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

Calculation of the actual equivalent feed force

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{2m,1*}| \cdot t_{1*} \cdot |F_{2,1*}|^3 + \dots + |v_{2m,n*}| \cdot t_{n*} \cdot |F_{2,n*}|^3}{|v_{2m,1*}| \cdot t_{1*} + \dots + |v_{2m,n*}| \cdot t_{n*}}}$$

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 $\leq 8 \text{ h}$	1.00
Daily run time $\leq 16 \text{ h}$	1.15
Daily run time $\leq 24 \text{ h}$	1.20

Temperature		f_{B_T}
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20\text{ °C}$	0.9
	$\leq 30\text{ °C}$	1.0
	$\leq 40\text{ °C}$	1.15
Motor with convection cooling	$\leq 20\text{ °C}$	1.0
	$\leq 30\text{ °C}$	1.1
	$\leq 40\text{ °C}$	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

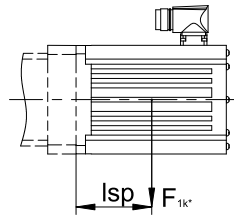
6.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
PHV933_ME	200
PHV1033_ME	400

6.6.3 Recommendation for radial shaft seal rings

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

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance 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 a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

6.7 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 Rack and Pinion Drives (Atlanta)	442455
Operating manual for P/PA/PE/PH/PHA/PHQ/PHQA/PHV/PHVA planetary gear units and planetary geared motors	443029_en
Lubricant filling quantities for gear units	441871

7 ZRPH rack and pinion drives

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7 Rack and pinion drives

ZRPH

7.1 Overview

High-performance precision planetary gear units with screwed pinion

Features

Power density	★★★★☆
Linear clearance	★★★★☆
Price category	€€€
Smooth operation	★★★★☆
Linear rigidity	★★★★☆
Mass moment of inertia	★★★★☆
Ready-to-install drive solution	✓
Pinion gearing quality 5 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓

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

Technical data

m_n	2 – 4 mm
z	26 – 45
F_{f2acc}	1.7 – 13 kN
$v_{f2maxzB}$	0.23 – 6.7 m/s
Δs	31 – 56 μm

7.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 7.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [mm]	C_{lin} [N/μm]	m_n [mm]	z	d_0 [mm]	F_{f2N} [kN]	F_{f2acc} [kN]	F_{f2NOT} [kN]	M_{2acc} [Nm]
ZR2PH3 ($F_{f2acc,max} = 2,2$ kN)														
5.000	ZR226SPH321_0050 ME	3000	6000	≤19	3.47	0.032	31	2	26	55.2	1.1	2.2	2.8	61
5.000	ZR226SPH321_0050 MEL	3000	6000	≤24	3.47	0.032	33	2	26	55.2	1.1	2.2	2.8	61
5.000	ZR227SPH321_0050 ME	3000	6000	≤19	3.60	0.033	27	2	27	57.3	1.1	2.1	2.6	59
5.000	ZR227SPH321_0050 MEL	3000	6000	≤24	3.60	0.033	28	2	27	57.3	1.1	2.1	2.6	59
7.000	ZR226SPH321_0070 ME	3500	6000	≤19	2.48	0.032	30	2	26	55.2	1.3	2.2	2.8	60
7.000	ZR226SPH321_0070 MEL	3500	6000	≤24	2.48	0.032	31	2	26	55.2	1.3	2.2	2.8	60
7.000	ZR227SPH321_0070 ME	3500	6000	≤19	2.57	0.033	26	2	27	57.3	1.2	2.1	2.6	59
7.000	ZR227SPH321_0070 MEL	3500	6000	≤24	2.57	0.033	27	2	27	57.3	1.2	2.1	2.6	59
10.00	ZR226SPH321_0100 ME	3800	6000	≤19	1.73	0.032	27	2	26	55.2	1.1	1.8	2.8	50
10.00	ZR226SPH321_0100 MEL	3800	6000	≤24	1.73	0.032	28	2	26	55.2	1.1	1.8	2.8	50
10.00	ZR227SPH321_0100 ME	3800	6000	≤19	1.80	0.033	24	2	27	57.3	1.0	1.7	2.6	50
10.00	ZR227SPH321_0100 MEL	3800	6000	≤24	1.80	0.033	24	2	27	57.3	1.0	1.7	2.6	50
20.00	ZR226SPH322_0200 ME	4500	8000	≤14	1.16	0.032	32	2	26	55.2	1.6	2.2	2.8	61
20.00	ZR226SPH322_0200 MEL	4500	8000	≤19	1.16	0.032	32	2	26	55.2	1.6	2.2	2.8	61
20.00	ZR227SPH322_0200 ME	4500	8000	≤14	1.20	0.033	28	2	27	57.3	1.6	2.1	2.6	59
20.00	ZR227SPH322_0200 MEL	4500	8000	≤19	1.20	0.033	28	2	27	57.3	1.6	2.1	2.6	59
25.00	ZR226SPH322_0250 ME	4500	8000	≤14	0.92	0.032	32	2	26	55.2	1.6	2.2	2.8	61
25.00	ZR226SPH322_0250 MEL	4500	8000	≤19	0.92	0.032	32	2	26	55.2	1.6	2.2	2.8	61
25.00	ZR227SPH322_0250 ME	4500	8000	≤14	0.96	0.033	28	2	27	57.3	1.6	2.1	2.6	59
25.00	ZR227SPH322_0250 MEL	4500	8000	≤19	0.96	0.033	28	2	27	57.3	1.6	2.1	2.6	59
28.00	ZR226SPH322_0280 ME	4500	8000	≤14	0.83	0.032	32	2	26	55.2	1.6	2.2	2.8	60
28.00	ZR226SPH322_0280 MEL	4500	8000	≤19	0.83	0.032	32	2	26	55.2	1.6	2.2	2.8	60
28.00	ZR227SPH322_0280 ME	4500	8000	≤14	0.86	0.033	28	2	27	57.3	1.6	2.1	2.6	59
28.00	ZR227SPH322_0280 MEL	4500	8000	≤19	0.86	0.033	28	2	27	57.3	1.6	2.1	2.6	59
35.00	ZR226SPH322_0350 ME	4500	8000	≤14	0.66	0.032	32	2	26	55.2	1.6	2.2	2.8	61
35.00	ZR226SPH322_0350 MEL	4500	8000	≤19	0.66	0.032	32	2	26	55.2	1.6	2.2	2.8	61
35.00	ZR227SPH322_0350 ME	4500	8000	≤14	0.69	0.033	28	2	27	57.3	1.6	2.1	2.6	59
35.00	ZR227SPH322_0350 MEL	4500	8000	≤19	0.69	0.033	28	2	27	57.3	1.6	2.1	2.6	59
40.00	ZR226SPH322_0400 ME	4500	8000	≤14	0.58	0.032	30	2	26	55.2	1.1	1.8	2.8	50
40.00	ZR226SPH322_0400 MEL	4500	8000	≤19	0.58	0.032	30	2	26	55.2	1.1	1.8	2.8	50
40.00	ZR227SPH322_0400 ME	4500	8000	≤14	0.60	0.033	26	2	27	57.3	1.0	1.7	2.6	50
40.00	ZR227SPH322_0400 MEL	4500	8000	≤19	0.60	0.033	26	2	27	57.3	1.0	1.7	2.6	50
50.00	ZR226SPH322_0500 ME	4500	8000	≤14	0.46	0.032	32	2	26	55.2	1.6	2.2	2.8	61
50.00	ZR226SPH322_0500 MEL	4500	8000	≤19	0.46	0.032	32	2	26	55.2	1.6	2.2	2.8	61
50.00	ZR227SPH322_0500 ME	4500	8000	≤14	0.48	0.033	27	2	27	57.3	1.6	2.1	2.6	59
50.00	ZR227SPH322_0500 MEL	4500	8000	≤19	0.48	0.033	28	2	27	57.3	1.6	2.1	2.6	59
70.00	ZR226SPH322_0700 ME	4500	8000	≤14	0.33	0.032	32	2	26	55.2	1.6	2.2	2.8	60
70.00	ZR226SPH322_0700 MEL	4500	8000	≤19	0.33	0.032	32	2	26	55.2	1.6	2.2	2.8	60
70.00	ZR227SPH322_0700 ME	4500	8000	≤14	0.34	0.033	28	2	27	57.3	1.6	2.1	2.6	59
70.00	ZR227SPH322_0700 MEL	4500	8000	≤19	0.34	0.033	28	2	27	57.3	1.6	2.1	2.6	59
100.0	ZR226SPH322_1000 ME	4500	8000	≤14	0.23	0.032	30	2	26	55.2	1.1	1.8	2.8	50
100.0	ZR226SPH322_1000 MEL	4500	8000	≤19	0.23	0.032	30	2	26	55.2	1.1	1.8	2.8	50
100.0	ZR227SPH322_1000 ME	4500	8000	≤14	0.24	0.033	26	2	27	57.3	1.0	1.7	2.6	50
100.0	ZR227SPH322_1000 MEL	4500	8000	≤19	0.24	0.033	26	2	27	57.3	1.0	1.7	2.6	50
ZR2PH4 ($F_{f2acc,max} = 3,7$ kN)														
4.000	ZR233SPH421_0040 ME	2300	5000	≤24	4.58	0.031	46	2	33	70.0	2.0	3.7	5.8	130
4.000	ZR233SPH421_0040 MEL	2300	5000	≤32	4.58	0.031	47	2	33	70.0	2.0	3.7	5.8	130
4.000	ZR236SPH421_0040 ME	2300	5000	≤24	5.00	0.033	39	2	36	76.4	1.9	3.4	5.2	130
4.000	ZR236SPH421_0040 MEL	2300	5000	≤32	5.00	0.033	40	2	36	76.4	1.9	3.4	5.2	130
4.000	ZR237SPH421_0040 ME	2300	5000	≤24	5.14	0.034	41	2	37	78.5	2.0	3.3	5.3	130
4.000	ZR237SPH421_0040 MEL	2300	5000	≤32	5.14	0.034	42	2	37	78.5	2.0	3.3	5.3	130
5.000	ZR233SPH421_0050 ME	2700	6000	≤24	4.40	0.031	46	2	33	70.0	2.2	3.7	5.8	130

7.2 Selection tables 7 ZRPH rack and pinion drives

i	Type	n_{1maxDB}	n_{1maxZB}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	F_{f2N}	F_{f2acc}	F_{f2NOT}	M_{zacc}
		[rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/μm]	[mm]						
ZR2PH4 ($F_{f2acc,max} = 3,7$ kN)														
5.000	ZR233SPH421_0050 MEL	2700	6000	≤32	4.40	0.031	47	2	33	70.0	2.2	3.7	5.8	130
5.000	ZR236SPH421_0050 ME	2700	6000	≤24	4.80	0.033	39	2	36	76.4	2.1	3.4	5.2	130
5.000	ZR236SPH421_0050 MEL	2700	6000	≤32	4.80	0.033	39	2	36	76.4	2.1	3.4	5.2	130
5.000	ZR237SPH421_0050 ME	2700	6000	≤24	4.93	0.034	41	2	37	78.5	2.2	3.3	5.3	130
5.000	ZR237SPH421_0050 MEL	2700	6000	≤32	4.93	0.034	42	2	37	78.5	2.2	3.3	5.3	130
7.000	ZR233SPH421_0070 ME	3200	6000	≤24	3.14	0.031	43	2	33	70.0	2.4	3.1	5.8	110
7.000	ZR233SPH421_0070 MEL	3200	6000	≤32	3.14	0.031	44	2	33	70.0	2.4	3.1	5.8	110
7.000	ZR236SPH421_0070 ME	3200	6000	≤24	3.43	0.033	36	2	36	76.4	2.3	2.9	5.2	110
7.000	ZR236SPH421_0070 MEL	3200	6000	≤32	3.43	0.033	37	2	36	76.4	2.3	2.9	5.2	110
7.000	ZR237SPH421_0070 ME	3200	6000	≤24	3.52	0.034	38	2	37	78.5	2.3	2.8	5.3	110
7.000	ZR237SPH421_0070 MEL	3200	6000	≤32	3.52	0.034	39	2	37	78.5	2.3	2.8	5.3	110
10.000	ZR233SPH421_0100 ME	3500	6000	≤24	2.20	0.031	35	2	33	70.0	1.7	2.9	5.7	100
10.000	ZR233SPH421_0100 MEL	3500	6000	≤32	2.20	0.031	36	2	33	70.0	1.7	2.9	5.7	100
10.000	ZR236SPH421_0100 ME	3500	6000	≤24	2.40	0.033	30	2	36	76.4	1.6	2.6	5.2	100
10.000	ZR236SPH421_0100 MEL	3500	6000	≤32	2.40	0.033	30	2	36	76.4	1.6	2.6	5.2	100
10.000	ZR237SPH421_0100 ME	3500	6000	≤24	2.47	0.034	31	2	37	78.5	1.5	2.5	5.1	100
10.000	ZR237SPH421_0100 MEL	3500	6000	≤32	2.47	0.034	31	2	37	78.5	1.5	2.5	5.1	100
16.000	ZR233SPH422_0160 ME	3700	6500	≤19	1.49	0.031	41	2	33	70.0	2.6	3.7	5.8	130
16.000	ZR233SPH422_0160 MEL	3700	6500	≤24	1.49	0.031	41	2	33	70.0	2.6	3.7	5.8	130
16.000	ZR236SPH422_0160 ME	3700	6500	≤19	1.63	0.033	34	2	36	76.4	2.4	3.4	5.2	130
16.000	ZR236SPH422_0160 MEL	3700	6500	≤24	1.63	0.033	34	2	36	76.4	2.4	3.4	5.2	130
16.000	ZR237SPH422_0160 ME	3700	6500	≤19	1.67	0.034	36	2	37	78.5	2.3	3.3	5.3	130
16.000	ZR237SPH422_0160 MEL	3700	6500	≤24	1.67	0.034	36	2	37	78.5	2.3	3.3	5.3	130
20.000	ZR233SPH422_0200 ME	3700	6500	≤19	1.19	0.031	43	2	33	70.0	2.6	3.7	5.8	130
20.000	ZR233SPH422_0200 MEL	3700	6500	≤24	1.19	0.031	43	2	33	70.0	2.6	3.7	5.8	130
20.000	ZR236SPH422_0200 ME	3700	6500	≤19	1.30	0.033	36	2	36	76.4	2.4	3.4	5.2	130
20.000	ZR236SPH422_0200 MEL	3700	6500	≤24	1.30	0.033	36	2	36	76.4	2.4	3.4	5.2	130
20.000	ZR237SPH422_0200 ME	3700	6500	≤19	1.34	0.034	38	2	37	78.5	2.3	3.3	5.3	130
20.000	ZR237SPH422_0200 MEL	3700	6500	≤24	1.34	0.034	38	2	37	78.5	2.3	3.3	5.3	130
25.000	ZR233SPH422_0250 ME	4000	7000	≤19	1.03	0.031	43	2	33	70.0	2.6	3.7	5.8	130
25.000	ZR233SPH422_0250 MEL	4000	7000	≤24	1.03	0.031	43	2	33	70.0	2.6	3.7	5.8	130
25.000	ZR236SPH422_0250 ME	4000	7000	≤19	1.12	0.033	36	2	36	76.4	2.4	3.4	5.2	130
25.000	ZR236SPH422_0250 MEL	4000	7000	≤24	1.12	0.033	36	2	36	76.4	2.4	3.4	5.2	130
25.000	ZR237SPH422_0250 ME	4000	7000	≤19	1.15	0.034	38	2	37	78.5	2.3	3.3	5.3	130
25.000	ZR237SPH422_0250 MEL	4000	7000	≤24	1.15	0.034	38	2	37	78.5	2.3	3.3	5.3	130
28.000	ZR233SPH422_0280 ME	4500	8000	≤19	1.05	0.031	40	2	33	70.0	2.6	3.7	5.8	130
28.000	ZR233SPH422_0280 MEL	4500	8000	≤24	1.05	0.031	40	2	33	70.0	2.6	3.7	5.8	130
28.000	ZR236SPH422_0280 ME	4500	8000	≤19	1.14	0.033	33	2	36	76.4	2.4	3.4	5.2	130
28.000	ZR236SPH422_0280 MEL	4500	8000	≤24	1.14	0.033	33	2	36	76.4	2.4	3.4	5.2	130
28.000	ZR237SPH422_0280 ME	4500	8000	≤19	1.18	0.034	35	2	37	78.5	2.3	3.3	5.3	130
28.000	ZR237SPH422_0280 MEL	4500	8000	≤24	1.18	0.034	35	2	37	78.5	2.3	3.3	5.3	130
35.000	ZR233SPH422_0350 ME	4500	8000	≤19	0.84	0.031	42	2	33	70.0	2.6	3.7	5.8	130
35.000	ZR233SPH422_0350 MEL	4500	8000	≤24	0.84	0.031	42	2	33	70.0	2.6	3.7	5.8	130
35.000	ZR236SPH422_0350 ME	4500	8000	≤19	0.91	0.033	35	2	36	76.4	2.4	3.4	5.2	130
35.000	ZR236SPH422_0350 MEL	4500	8000	≤24	0.91	0.033	35	2	36	76.4	2.4	3.4	5.2	130
35.000	ZR237SPH422_0350 ME	4500	8000	≤19	0.94	0.034	37	2	37	78.5	2.3	3.3	5.3	130
35.000	ZR237SPH422_0350 MEL	4500	8000	≤24	0.94	0.034	37	2	37	78.5	2.3	3.3	5.3	130
40.000	ZR233SPH422_0400 ME	4500	8000	≤19	0.73	0.031	39	2	33	70.0	2.6	3.7	5.8	130
40.000	ZR233SPH422_0400 MEL	4500	8000	≤24	0.73	0.031	39	2	33	70.0	2.6	3.7	5.8	130
40.000	ZR236SPH422_0400 ME	4500	8000	≤19	0.80	0.033	33	2	36	76.4	2.4	3.4	5.2	130
40.000	ZR236SPH422_0400 MEL	4500	8000	≤24	0.80	0.033	33	2	36	76.4	2.4	3.4	5.2	130
40.000	ZR237SPH422_0400 ME	4500	8000	≤19	0.82	0.034	34	2	37	78.5	2.3	3.3	5.3	130
40.000	ZR237SPH422_0400 MEL	4500	8000	≤24	0.82	0.034	34	2	37	78.5	2.3	3.3	5.3	130
50.000	ZR233SPH422_0500 ME	4500	8000	≤19	0.59	0.031	41	2	33	70.0	2.6	3.7	5.8	130
50.000	ZR233SPH422_0500 MEL	4500	8000	≤24	0.59	0.031	41	2	33	70.0	2.6	3.7	5.8	130
50.000	ZR236SPH422_0500 ME	4500	8000	≤19	0.64	0.033	35	2	36	76.4	2.4	3.4	5.2	130
50.000	ZR236SPH422_0500 MEL	4500	8000	≤24	0.64	0.033	35	2	36	76.4	2.4	3.4	5.2	130
50.000	ZR237SPH422_0500 ME	4500	8000	≤19	0.66	0.034	36	2	37	78.5	2.3	3.3	5.3	130
50.000	ZR237SPH422_0500 MEL	4500	8000	≤24	0.66	0.034	36	2	37	78.5	2.3	3.3	5.3	130
70.000	ZR233SPH422_0700 ME	4500	8000	≤19	0.42	0.031	41	2	33	70.0	2.6	3.1	5.8	110
70.000	ZR233SPH422_0700 MEL	4500	8000	≤24	0.42	0.031	41	2	33	70.0	2.6	3.1	5.8	110
70.000	ZR236SPH422_0700 ME	4500	8000	≤19	0.46	0.033	34	2	36	76.4	2.4	2.9	5.2	110
70.000	ZR236SPH422_0700 MEL	4500	8000	≤24	0.46	0.033	34	2	36	76.4	2.4	2.9	5.2	110
70.000	ZR237SPH422_0700 ME	4500	8000	≤19	0.47	0.034	36	2	37	78.5	2.3	2.8	5.3	110
70.000	ZR237SPH422_0700 MEL	4500	8000	≤24	0.47	0.034	36	2	37	78.5	2.3	2.8	5.3	110
100.0	ZR233SPH422_1000 ME	4500	8000	≤19	0.29	0.031	35	2	33	70.0	1.7	2.9	5.7	100
100.0	ZR233SPH422_1000 MEL	4500	8000	≤24	0.29	0.031	35	2	33	70.0	1.7	2.9	5.7	100

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{f2maxZB} [m/s]	Δs [mm]	C _{lin} [N/μm]	m _n [mm]	z	d ₀ [mm]	F _{f2N} [kN]	F _{f2acc} [kN]	F _{f2NOT} [kN]	M _{2acc} [Nm]
ZR2PH4 (F_{f2acc,max} = 3,7 kN)														
100.0	ZR236SPH422_1000 ME	4500	8000	≤19	0.32	0.033	29	2	36	76.4	1.6	2.6	5.2	100
100.0	ZR236SPH422_1000 MEL	4500	8000	≤24	0.32	0.033	29	2	36	76.4	1.6	2.6	5.2	100
100.0	ZR237SPH422_1000 ME	4500	8000	≤19	0.33	0.034	30	2	37	78.5	1.5	2.5	5.1	100
100.0	ZR237SPH422_1000 MEL	4500	8000	≤24	0.33	0.034	30	2	37	78.5	1.5	2.5	5.1	100
ZR2PH5 (F_{f2acc,max} = 7,5 kN)														
4.000	ZR240SPH521_0040 ME	2200	5000	≤32	5.56	0.037	71	2	40	84.9	2.8	7.5	9.9	320
4.000	ZR240SPH521_0040 MEL	2200	5000	≤38	5.56	0.037	75	2	40	84.9	2.8	7.5	9.9	320
4.000	ZR245SPH521_0040 ME	2200	5000	≤32	6.25	0.042	64	2	45	95.5	2.8	6.7	8.9	320
4.000	ZR245SPH521_0040 MEL	2200	5000	≤38	6.25	0.042	67	2	45	95.5	2.8	6.7	8.9	320
5.000	ZR240SPH521_0050 ME	2500	5500	≤32	4.89	0.037	73	2	40	84.9	3.0	7.5	9.9	320
5.000	ZR240SPH521_0050 MEL	2500	5500	≤38	4.89	0.037	75	2	40	84.9	3.0	7.5	9.9	320
5.000	ZR245SPH521_0050 ME	2500	5500	≤32	5.50	0.042	65	2	45	95.5	3.0	6.7	8.9	320
5.000	ZR245SPH521_0050 MEL	2500	5500	≤38	5.50	0.042	67	2	45	95.5	3.0	6.7	8.9	320
7.000	ZR240SPH521_0070 ME	3000	6000	≤32	3.81	0.037	69	2	40	84.9	3.4	6.4	9.9	270
7.000	ZR240SPH521_0070 MEL	3000	6000	≤38	3.81	0.037	70	2	40	84.9	3.4	6.4	9.9	270
7.000	ZR245SPH521_0070 ME	3000	6000	≤32	4.29	0.042	61	2	45	95.5	3.4	5.7	8.9	270
7.000	ZR245SPH521_0070 MEL	3000	6000	≤38	4.29	0.042	62	2	45	95.5	3.4	5.7	8.9	270
10.00	ZR240SPH521_0100 ME	3300	6000	≤32	2.67	0.037	59	2	40	84.9	3.3	5.9	9.9	250
10.00	ZR240SPH521_0100 MEL	3300	6000	≤38	2.67	0.037	59	2	40	84.9	3.3	5.9	9.9	250
10.00	ZR245SPH521_0100 ME	3300	6000	≤32	3.00	0.042	51	2	45	95.5	2.9	5.2	8.9	250
10.00	ZR245SPH521_0100 MEL	3300	6000	≤38	3.00	0.042	52	2	45	95.5	2.9	5.2	8.9	250
16.00	ZR240SPH522_0160 ME	3300	6000	≤24	1.67	0.037	65	2	40	84.9	4.4	7.5	9.9	320
16.00	ZR240SPH522_0160 MEL	3300	6000	≤32	1.67	0.037	65	2	40	84.9	4.4	7.5	9.9	320
16.00	ZR245SPH522_0160 ME	3300	6000	≤24	1.88	0.042	57	2	45	95.5	4.4	6.7	8.9	320
16.00	ZR245SPH522_0160 MEL	3300	6000	≤32	1.88	0.042	57	2	45	95.5	4.4	6.7	8.9	320
20.00	ZR240SPH522_0200 ME	3300	6000	≤24	1.33	0.037	68	2	40	84.9	4.8	7.5	9.9	320
20.00	ZR240SPH522_0200 MEL	3300	6000	≤32	1.33	0.037	68	2	40	84.9	4.8	7.5	9.9	320
20.00	ZR245SPH522_0200 ME	3300	6000	≤24	1.50	0.042	60	2	45	95.5	4.6	6.7	8.9	320
20.00	ZR245SPH522_0200 MEL	3300	6000	≤32	1.50	0.042	61	2	45	95.5	4.6	6.7	8.9	320
25.00	ZR240SPH522_0250 ME	3700	6500	≤24	1.16	0.037	68	2	40	84.9	5.2	7.5	9.9	320
25.00	ZR240SPH522_0250 MEL	3700	6500	≤32	1.16	0.037	68	2	40	84.9	5.2	7.5	9.9	320
25.00	ZR245SPH522_0250 ME	3700	6500	≤24	1.30	0.042	60	2	45	95.5	4.6	6.7	8.9	320
25.00	ZR245SPH522_0250 MEL	3700	6500	≤32	1.30	0.042	60	2	45	95.5	4.6	6.7	8.9	320
28.00	ZR240SPH522_0280 ME	4000	7000	≤24	1.11	0.037	63	2	40	84.9	4.9	7.5	9.9	320
28.00	ZR240SPH522_0280 MEL	4000	7000	≤32	1.11	0.037	63	2	40	84.9	4.9	7.5	9.9	320
28.00	ZR245SPH522_0280 ME	4000	7000	≤24	1.25	0.042	55	2	45	95.5	4.4	6.7	8.9	320
28.00	ZR245SPH522_0280 MEL	4000	7000	≤32	1.25	0.042	56	2	45	95.5	4.4	6.7	8.9	320
35.00	ZR240SPH522_0350 ME	4000	7000	≤24	0.89	0.037	67	2	40	84.9	5.2	7.5	9.9	320
35.00	ZR240SPH522_0350 MEL	4000	7000	≤32	0.89	0.037	67	2	40	84.9	5.2	7.5	9.9	320
35.00	ZR245SPH522_0350 ME	4000	7000	≤24	1.00	0.042	59	2	45	95.5	4.6	6.7	8.9	320
35.00	ZR245SPH522_0350 MEL	4000	7000	≤32	1.00	0.042	59	2	45	95.5	4.6	6.7	8.9	320
40.00	ZR240SPH522_0400 ME	4000	7000	≤24	0.78	0.037	62	2	40	84.9	4.9	7.5	9.9	320
40.00	ZR240SPH522_0400 MEL	4000	7000	≤32	0.78	0.037	62	2	40	84.9	4.9	7.5	9.9	320
40.00	ZR245SPH522_0400 ME	4000	7000	≤24	0.88	0.042	54	2	45	95.5	4.4	6.7	8.9	320
40.00	ZR245SPH522_0400 MEL	4000	7000	≤32	0.88	0.042	54	2	45	95.5	4.4	6.7	8.9	320
50.00	ZR240SPH522_0500 ME	4000	7000	≤24	0.62	0.037	66	2	40	84.9	5.2	7.5	9.9	320
50.00	ZR240SPH522_0500 MEL	4000	7000	≤32	0.62	0.037	66	2	40	84.9	5.2	7.5	9.9	320
50.00	ZR245SPH522_0500 ME	4000	7000	≤24	0.70	0.042	58	2	45	95.5	4.6	6.7	8.9	320
50.00	ZR245SPH522_0500 MEL	4000	7000	≤32	0.70	0.042	58	2	45	95.5	4.6	6.7	8.9	320
70.00	ZR240SPH522_0700 ME	4000	7000	≤24	0.44	0.037	66	2	40	84.9	4.9	6.4	9.9	270
70.00	ZR240SPH522_0700 MEL	4000	7000	≤32	0.44	0.037	66	2	40	84.9	4.9	6.4	9.9	270
70.00	ZR245SPH522_0700 ME	4000	7000	≤24	0.50	0.042	58	2	45	95.5	4.4	5.7	8.9	270
70.00	ZR245SPH522_0700 MEL	4000	7000	≤32	0.50	0.042	58	2	45	95.5	4.4	5.7	8.9	270
100.0	ZR240SPH522_1000 ME	4000	7000	≤24	0.31	0.037	58	2	40	84.9	3.3	5.9	9.9	250
100.0	ZR240SPH522_1000 MEL	4000	7000	≤32	0.31	0.037	58	2	40	84.9	3.3	5.9	9.9	250
100.0	ZR245SPH522_1000 ME	4000	7000	≤24	0.35	0.042	50	2	45	95.5	2.9	5.2	8.9	250
100.0	ZR245SPH522_1000 MEL	4000	7000	≤32	0.35	0.042	50	2	45	95.5	2.9	5.2	8.9	250
ZR3PH5 (F_{f2acc,max} = 6,7 kN)														
4.000	ZR330SPH521_0040 ME	2200	5000	≤32	6.25	0.042	57	3	30	95.5	2.6	6.7	8.5	320
4.000	ZR330SPH521_0040 MEL	2200	5000	≤38	6.25	0.042	60	3	30	95.5	2.6	6.7	8.5	320
5.000	ZR330SPH521_0050 ME	2500	5500	≤32	5.50	0.042	58	3	30	95.5	2.8	6.7	8.5	320
5.000	ZR330SPH521_0050 MEL	2500	5500	≤38	5.50	0.042	60	3	30	95.5	2.8	6.7	8.5	320
7.000	ZR330SPH521_0070 ME	3000	6000	≤32	4.29	0.042	55	3	30	95.5	3.2	5.7	8.5	270
7.000	ZR330SPH521_0070 MEL	3000	6000	≤38	4.29	0.042	56	3	30	95.5	3.2	5.7	8.5	270
10.00	ZR330SPH521_0100 ME	3300	6000	≤32	3.00	0.042	47	3	30	95.5	2.9	5.2	8.5	250
10.00	ZR330SPH521_0100 MEL	3300	6000	≤38	3.00	0.042	47	3	30	95.5	2.9	5.2	8.5	250

7.2 Selection tables 7 ZRPH rack and pinion drives

i	Type	n_{1maxDB}	n_{1maxZB}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	F_{f2N}	F_{f2acc}	F_{f2NOT}	M_{2acc}
		[rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/μm]	[mm]						
ZR3PH5 ($F_{f2acc,max} = 6,7 \text{ kN}$)														
16.00	ZR330SPH522_0160 ME	3300	6000	≤24	1.88	0.042	52	3	30	95.5	4.2	6.7	8.5	320
16.00	ZR330SPH522_0160 MEL	3300	6000	≤32	1.88	0.042	52	3	30	95.5	4.2	6.7	8.5	320
20.00	ZR330SPH522_0200 ME	3300	6000	≤24	1.50	0.042	55	3	30	95.5	4.5	6.7	8.5	320
20.00	ZR330SPH522_0200 MEL	3300	6000	≤32	1.50	0.042	55	3	30	95.5	4.5	6.7	8.5	320
25.00	ZR330SPH522_0250 ME	3700	6500	≤24	1.30	0.042	55	3	30	95.5	4.6	6.7	8.5	320
25.00	ZR330SPH522_0250 MEL	3700	6500	≤32	1.30	0.042	55	3	30	95.5	4.6	6.7	8.5	320
28.00	ZR330SPH522_0280 ME	4000	7000	≤24	1.25	0.042	51	3	30	95.5	4.4	6.7	8.5	320
28.00	ZR330SPH522_0280 MEL	4000	7000	≤32	1.25	0.042	51	3	30	95.5	4.4	6.7	8.5	320
35.00	ZR330SPH522_0350 ME	4000	7000	≤24	1.00	0.042	54	3	30	95.5	4.6	6.7	8.5	320
35.00	ZR330SPH522_0350 MEL	4000	7000	≤32	1.00	0.042	54	3	30	95.5	4.6	6.7	8.5	320
40.00	ZR330SPH522_0400 ME	4000	7000	≤24	0.88	0.042	49	3	30	95.5	4.4	6.7	8.5	320
40.00	ZR330SPH522_0400 MEL	4000	7000	≤32	0.88	0.042	50	3	30	95.5	4.4	6.7	8.5	320
50.00	ZR330SPH522_0500 ME	4000	7000	≤24	0.70	0.042	53	3	30	95.5	4.6	6.7	8.5	320
50.00	ZR330SPH522_0500 MEL	4000	7000	≤32	0.70	0.042	53	3	30	95.5	4.6	6.7	8.5	320
70.00	ZR330SPH522_0700 ME	4000	7000	≤24	0.50	0.042	53	3	30	95.5	4.4	5.7	8.5	270
70.00	ZR330SPH522_0700 MEL	4000	7000	≤32	0.50	0.042	53	3	30	95.5	4.4	5.7	8.5	270
100.0	ZR330SPH522_1000 ME	4000	7000	≤24	0.35	0.042	46	3	30	95.5	2.9	5.2	8.5	250
100.0	ZR330SPH522_1000 MEL	4000	7000	≤32	0.35	0.042	46	3	30	95.5	2.9	5.2	8.5	250
ZR3PH7 ($F_{f2acc,max} = 13 \text{ kN}$)														
4.000	ZR335SPH721_0040 ME	1900	4000	≤38	5.83	0.049	88	3	35	111.4	7.9	13	19	700
4.000	ZR335SPH721_0040 MEL	1900	4000	≤48	5.83	0.049	93	3	35	111.4	7.9	13	19	700
4.000	ZR340SPH721_0040 ME	1900	4000	≤38	6.67	0.056	75	3	40	127.3	6.9	11	17	700
4.000	ZR340SPH721_0040 MEL	1900	4000	≤48	6.67	0.056	80	3	40	127.3	6.9	11	17	700
5.000	ZR335SPH721_0050 ME	2200	5000	≤38	5.83	0.049	91	3	35	111.4	7.9	13	19	700
5.000	ZR335SPH721_0050 MEL	2200	5000	≤48	5.83	0.049	95	3	35	111.4	7.9	13	19	700
5.000	ZR340SPH721_0050 ME	2200	5000	≤38	6.67	0.056	79	3	40	127.3	6.9	11	17	700
5.000	ZR340SPH721_0050 MEL	2200	5000	≤48	6.67	0.056	82	3	40	127.3	6.9	11	17	700
7.000	ZR335SPH721_0070 ME	2500	5000	≤38	4.17	0.049	88	3	35	111.4	7.9	12	19	650
7.000	ZR335SPH721_0070 MEL	2500	5000	≤48	4.17	0.049	90	3	35	111.4	7.9	12	19	650
7.000	ZR340SPH721_0070 ME	2500	5000	≤38	4.76	0.056	76	3	40	127.3	6.9	10	17	650
7.000	ZR340SPH721_0070 MEL	2500	5000	≤48	4.76	0.056	78	3	40	127.3	6.9	10	17	650
10.00	ZR335SPH721_0100 ME	3000	5000	≤38	2.92	0.049	76	3	35	111.4	5.4	9.0	18	500
10.00	ZR335SPH721_0100 MEL	3000	5000	≤48	2.92	0.049	77	3	35	111.4	5.4	9.0	18	500
10.00	ZR340SPH721_0100 ME	3000	5000	≤38	3.33	0.056	64	3	40	127.3	4.7	7.9	16	500
10.00	ZR340SPH721_0100 MEL	3000	5000	≤48	3.33	0.056	65	3	40	127.3	4.7	7.9	16	500
16.00	ZR335SPH722_0160 ME	3000	5000	≤32	1.82	0.049	84	3	35	111.4	7.9	13	19	700
16.00	ZR335SPH722_0160 MEL	3000	5000	≤38	1.82	0.049	84	3	35	111.4	7.9	13	19	700
16.00	ZR340SPH722_0160 ME	3000	5000	≤32	2.08	0.056	72	3	40	127.3	6.9	11	17	700
16.00	ZR340SPH722_0160 MEL	3000	5000	≤38	2.08	0.056	72	3	40	127.3	6.9	11	17	700
20.00	ZR335SPH722_0200 ME	3000	5000	≤32	1.46	0.049	89	3	35	111.4	7.9	13	19	700
20.00	ZR335SPH722_0200 MEL	3000	5000	≤38	1.46	0.049	89	3	35	111.4	7.9	13	19	700
20.00	ZR340SPH722_0200 ME	3000	5000	≤32	1.67	0.056	76	3	40	127.3	6.9	11	17	700
20.00	ZR340SPH722_0200 MEL	3000	5000	≤38	1.67	0.056	77	3	40	127.3	6.9	11	17	700
25.00	ZR335SPH722_0250 ME	3500	6000	≤32	1.40	0.049	89	3	35	111.4	7.9	13	19	700
25.00	ZR335SPH722_0250 MEL	3500	6000	≤38	1.40	0.049	89	3	35	111.4	7.9	13	19	700
25.00	ZR340SPH722_0250 ME	3500	6000	≤32	1.60	0.056	76	3	40	127.3	6.9	11	17	700
25.00	ZR340SPH722_0250 MEL	3500	6000	≤38	1.60	0.056	77	3	40	127.3	6.9	11	17	700
28.00	ZR335SPH722_0280 ME	3700	6500	≤32	1.35	0.049	83	3	35	111.4	7.9	13	19	700
28.00	ZR335SPH722_0280 MEL	3700	6500	≤38	1.35	0.049	83	3	35	111.4	7.9	13	19	700
28.00	ZR340SPH722_0280 ME	3700	6500	≤32	1.55	0.056	70	3	40	127.3	6.9	11	17	700
28.00	ZR340SPH722_0280 MEL	3700	6500	≤38	1.55	0.056	71	3	40	127.3	6.9	11	17	700
35.00	ZR335SPH722_0350 ME	3700	6500	≤32	1.08	0.049	88	3	35	111.4	7.9	13	19	700
35.00	ZR335SPH722_0350 MEL	3700	6500	≤38	1.08	0.049	88	3	35	111.4	7.9	13	19	700
35.00	ZR340SPH722_0350 ME	3700	6500	≤32	1.24	0.056	76	3	40	127.3	6.9	11	17	700
35.00	ZR340SPH722_0350 MEL	3700	6500	≤38	1.24	0.056	76	3	40	127.3	6.9	11	17	700
40.00	ZR335SPH722_0400 ME	3700	6500	≤32	0.95	0.049	81	3	35	111.4	7.9	13	19	700
40.00	ZR335SPH722_0400 MEL	3700	6500	≤38	0.95	0.049	81	3	35	111.4	7.9	13	19	700
40.00	ZR340SPH722_0400 ME	3700	6500	≤32	1.08	0.056	69	3	40	127.3	6.9	11	17	700
40.00	ZR340SPH722_0400 MEL	3700	6500	≤38	1.08	0.056	69	3	40	127.3	6.9	11	17	700
50.00	ZR335SPH722_0500 ME	3700	6500	≤32	0.76	0.049	87	3	35	111.4	7.9	13	19	700
50.00	ZR335SPH722_0500 MEL	3700	6500	≤38	0.76	0.049	87	3	35	111.4	7.9	13	19	700
50.00	ZR340SPH722_0500 ME	3700	6500	≤32	0.87	0.056	75	3	40	127.3	6.9	11	17	700
50.00	ZR340SPH722_0500 MEL	3700	6500	≤38	0.87	0.056	75	3	40	127.3	6.9	11	17	700
70.00	ZR335SPH722_0700 ME	3700	6500	≤32	0.54	0.049	87	3	35	111.4	7.9	12	19	650
70.00	ZR335SPH722_0700 MEL	3700	6500	≤38	0.54	0.049	87	3	35	111.4	7.9	12	19	650
70.00	ZR340SPH722_0700 ME	3700	6500	≤32	0.62	0.056	74	3	40	127.3	6.9	10	17	650

i	Type	n_{1maxDB}	n_{1maxZB}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	F_{f2N}	F_{f2acc}	F_{f2NOT}	M_{2acc}
		[rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/μm]	[mm]						
ZR3PH7 ($F_{f2acc,max} = 13$ kN)														
70.0	ZR340SPH722_0700 MEL	3700	6500	≤38	0.62	0.056	74	3	40	127.3	6.9	10	17	650
100.0	ZR335SPH722_1000 ME	3700	6500	≤32	0.38	0.049	76	3	35	111.4	5.4	9.0	18	500
100.0	ZR335SPH722_1000 MEL	3700	6500	≤38	0.38	0.049	76	3	35	111.4	5.4	9.0	18	500
100.0	ZR340SPH722_1000 ME	3700	6500	≤32	0.43	0.056	64	3	40	127.3	4.7	7.9	16	500
100.0	ZR340SPH722_1000 MEL	3700	6500	≤38	0.43	0.056	64	3	40	127.3	4.7	7.9	16	500
ZR4PH7 ($F_{f2acc,max} = 11$ kN)														
4.000	ZR430SPH721_0040 ME	1900	4000	≤38	6.67	0.056	74	4	30	127.3	6.9	11	16	700
4.000	ZR430SPH721_0040 MEL	1900	4000	≤48	6.67	0.056	79	4	30	127.3	6.9	11	16	700
5.000	ZR430SPH721_0050 ME	2200	5000	≤38	6.67	0.056	77	4	30	127.3	6.9	11	16	700
5.000	ZR430SPH721_0050 MEL	2200	5000	≤48	6.67	0.056	81	4	30	127.3	6.9	11	16	700
7.000	ZR430SPH721_0070 ME	2500	5000	≤38	4.76	0.056	74	4	30	127.3	6.9	10	16	650
7.000	ZR430SPH721_0070 MEL	2500	5000	≤48	4.76	0.056	76	4	30	127.3	6.9	10	16	650
10.00	ZR430SPH721_0100 ME	3000	5000	≤38	3.33	0.056	63	4	30	127.3	4.7	7.9	16	500
10.00	ZR430SPH721_0100 MEL	3000	5000	≤48	3.33	0.056	64	4	30	127.3	4.7	7.9	16	500
16.00	ZR430SPH722_0160 ME	3000	5000	≤32	2.08	0.056	70	4	30	127.3	6.9	11	16	700
16.00	ZR430SPH722_0160 MEL	3000	5000	≤38	2.08	0.056	71	4	30	127.3	6.9	11	16	700
20.00	ZR430SPH722_0200 ME	3000	5000	≤32	1.67	0.056	75	4	30	127.3	6.9	11	16	700
20.00	ZR430SPH722_0200 MEL	3000	5000	≤38	1.67	0.056	75	4	30	127.3	6.9	11	16	700
25.00	ZR430SPH722_0250 ME	3500	6000	≤32	1.60	0.056	75	4	30	127.3	6.9	11	16	700
25.00	ZR430SPH722_0250 MEL	3500	6000	≤38	1.60	0.056	75	4	30	127.3	6.9	11	16	700
28.00	ZR430SPH722_0280 ME	3700	6500	≤32	1.55	0.056	69	4	30	127.3	6.9	11	16	700
28.00	ZR430SPH722_0280 MEL	3700	6500	≤38	1.55	0.056	70	4	30	127.3	6.9	11	16	700
35.00	ZR430SPH722_0350 ME	3700	6500	≤32	1.24	0.056	74	4	30	127.3	6.9	11	16	700
35.00	ZR430SPH722_0350 MEL	3700	6500	≤38	1.24	0.056	74	4	30	127.3	6.9	11	16	700
40.00	ZR430SPH722_0400 ME	3700	6500	≤32	1.08	0.056	68	4	30	127.3	6.9	11	16	700
40.00	ZR430SPH722_0400 MEL	3700	6500	≤38	1.08	0.056	68	4	30	127.3	6.9	11	16	700
50.00	ZR430SPH722_0500 ME	3700	6500	≤32	0.87	0.056	73	4	30	127.3	6.9	11	16	700
50.00	ZR430SPH722_0500 MEL	3700	6500	≤38	0.87	0.056	73	4	30	127.3	6.9	11	16	700
70.00	ZR430SPH722_0700 ME	3700	6500	≤32	0.62	0.056	73	4	30	127.3	6.9	10	16	650
70.00	ZR430SPH722_0700 MEL	3700	6500	≤38	0.62	0.056	73	4	30	127.3	6.9	10	16	650
100.0	ZR430SPH722_1000 ME	3700	6500	≤32	0.43	0.056	63	4	30	127.3	4.7	7.9	16	500
100.0	ZR430SPH722_1000 MEL	3700	6500	≤38	0.43	0.056	63	4	30	127.3	4.7	7.9	16	500

7.3 Dimensional drawings

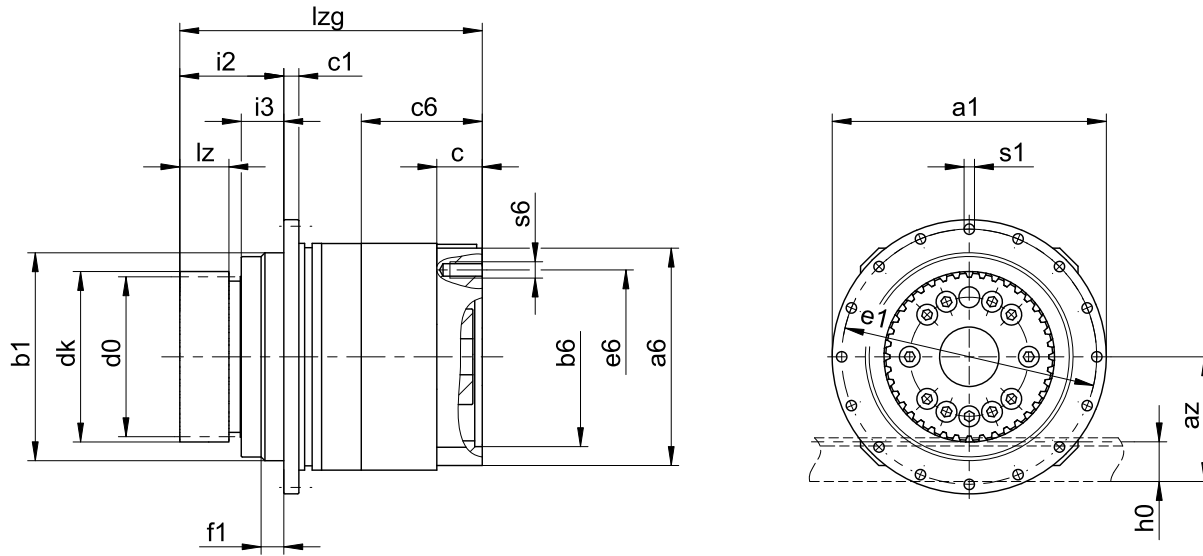
In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

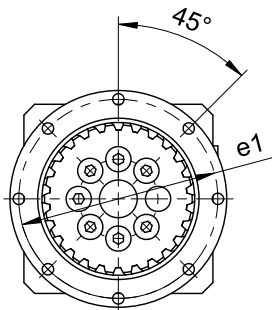
Dimensions can exceed the specifications of ISO 2768-mK due to casting tolerances or accumulation of individual tolerances.

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

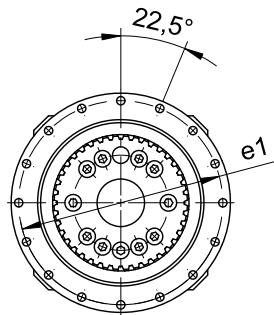
You can download 3D models of our standard drives at <http://configurator.stoeber.de>.



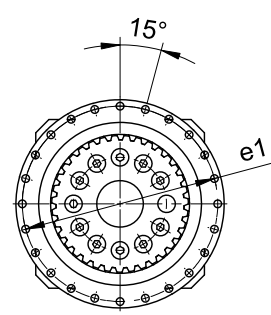
PH3/PH4



PH5



PH7



Output dimensions

Type	mn	$\varnothing a_1$	az	$\varnothing b_1$	c1	d0	dk	$\varnothing e_1$	f1	i2	h0	i3	lz	$\varnothing s_1$	x
ZR226SPH3_	2	86 _{h7}	50.40	64 _{h7}	4	55.17	60.5	79	7	45.5	22	16.0	26	4.5	0.41
ZR227SPH3_	2	86 _{h7}	50.65	64 _{h7}	4	57.30	61.3	79	7	49.5	22	16.0	30	4.5	0.00
ZR233SPH4_	2	118 _{h7}	57.80	90 _{h7}	7	70.03	75.0	109	10	56.0	22	23.5	26	5.5	0.39
ZR236SPH4_	2	118 _{h7}	60.20	90 _{h7}	7	76.40	80.4	109	10	60.0	22	23.5	30	5.5	0.00
ZR237SPH4_	2	118 _{h7}	62.10	90 _{h7}	7	78.52	83.5	109	10	56.0	22	23.5	26	5.5	0.42
ZR240SPH5_	2	145 _{h7}	65.20	110 _{h7}	8	84.88	90.0	135	10	55.0	22	22.5	26	5.5	0.38
ZR245SPH5_	2	145 _{h7}	70.40	110 _{h7}	8	95.49	100.0	135	10	55.0	22	22.5	26	5.5	0.33
ZR330SPH5_	3	145 _{h7}	73.75	110 _{h7}	8	95.49	101.5	135	10	64.0	26	22.5	35	5.5	0.00
ZR335SPH7_	3	179 _{h7}	82.80	140 _{h7}	10	111.41	119.0	168	12	69.0	26	31.5	31	6.6	0.37
ZR340SPH7_	3	179 _{h7}	90.80	140 _{h7}	10	127.32	135.0	168	12	69.0	26	31.5	31	6.6	0.38
ZR430SPH7_	4	179 _{h7}	98.66	140 _{h7}	10	127.32	135.3	168	12	83.0	35	31.5	45	6.6	0.00

Example dimensions for the motor connection + total length

Type	□a6	∅b6	∅e6	c	c6	l _{zg}	s6
ZR226SPH321_	75	60 ^{H7}	75	18	51.5	127.5	M5
ZR227SPH321_	75	60 ^{H7}	75	18	51.5	131.5	M5
ZR226SPH322_	55	40 ^{H7}	63	15	32.0	145.0	M5
ZR227SPH322_	55	40 ^{H7}	63	15	32.0	149.0	M5
ZR233SPH421_	100	95 ^{H7}	115	21	56.0	148.0	M8
ZR236SPH421_	100	95 ^{H7}	115	21	56.0	152.0	M8
ZR237SPH421_	100	95 ^{H7}	115	21	56.0	148.0	M8
ZR233SPH422_	75	60 ^{H7}	75	18	51.5	190.5	M5
ZR236SPH422_	75	60 ^{H7}	75	18	51.5	194.5	M5
ZR237SPH422_	75	60 ^{H7}	75	18	51.5	190.5	M5
ZR240SPH521_	120	110 ^{H7}	130	24	67.5	163.5	M8
ZR245SPH521_	120	110 ^{H7}	130	24	67.5	163.5	M8
ZR330SPH521_	120	110 ^{H7}	130	24	67.5	172.5	M8
ZR240SPH522_	100	95 ^{H7}	115	21	56.0	206.5	M8
ZR245SPH522_	100	95 ^{H7}	115	21	56.0	206.5	M8
ZR330SPH522_	100	95 ^{H7}	115	21	56.0	215.5	M8
ZR335SPH721_	150	130 ^{H7}	165	26	76.0	195.0	M10
ZR340SPH721_	150	130 ^{H7}	165	26	76.0	195.0	M10
ZR430SPH721_	150	130 ^{H7}	165	26	76.0	209.0	M10
ZR335SPH722_	120	110 ^{H7}	130	24	67.5	248.5	M8
ZR340SPH722_	120	110 ^{H7}	130	24	67.5	248.5	M8
ZR430SPH722_	120	110 ^{H7}	130	24	67.5	262.5	M8

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and l_{zg} are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEGER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

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.

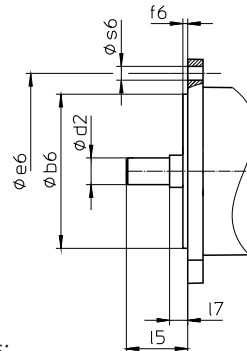
Sample code

Z	R	3	30	S	PH	5	2	2	F	0280	ME
---	---	---	----	---	----	---	---	---	---	------	----

Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
R	Design	Screwed pinion
3	Module	$m_n = 3$ (example)
30	Number of teeth	$z = 30$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
PH	Type	Planetary gear unit
5	Size	5 (example)
2	Generation	Generation 2
1	Stages	Single-stage
2		Two-stage
F	Shaft	Flange shaft
0280	Transmission ratio ($i \times 10$)	$i = 28$ (example)
ME	Motor adapter	Motor adapter with EasyAdapt® coupling
MEL		Motor adapter with EasyAdapt® coupling for large motors

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

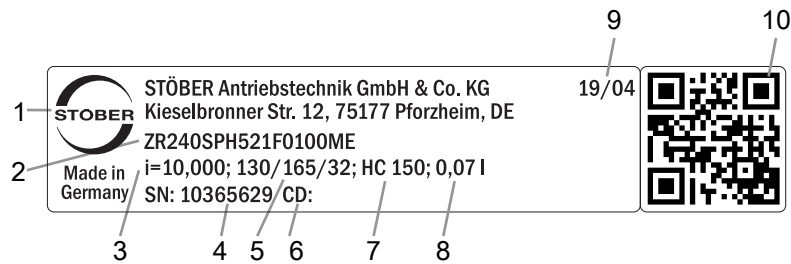
To choose a suitable motor connection, use the STOBER Configurator at <http://configurator.stoeber.de> and choose your motor or the dimensions of the motor connection.

- For radial shaft seal rings at the output made of NBR or FKM, see the chapter [▶ 7.6.3]
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation upon request

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter. All input options available upon request are listed in the chapter [▶ 7.5.2].

7.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

7.4.1.1 Supporting documents

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

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

7.5 Product description

7.5.1 Motor adapter with EasyAdapt® coupling (ME/MEL)

In this chapter, you will find a description of the EasyAdapt® coupling.

Properties:

- Fast and easy motor attachment
- One-piece, rugged coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design



Fig. 1: EasyAdapt® coupling

7.5.2 Input options

In this chapter, you will find all available input options:

ME motor adapter



<http://www.stoerber.de/en/ZRPHME>

KX right-angle input with MF motor adapter



On request

K right-angle input with ME motor adapter



On request

MB motor adapter



On request

EZ synchronous servo motor



On request

You can also acquire rack and pinion drives with low-backlash PHA gear units upon request. To do so, send us an e-mail at sales@stoerber.de.

7.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	6	16MnCr5 inductively hardened
5	5	16MnCr5 inductively hardened
6 – 10	6	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

7.5.4 Installation conditions

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

- When using screws with quality 12.9 for machine-side attachment of the gear unit housing
- When the gear unit housings are adjusted at pilot \varnothing bz. The machine-side fit must be H7.

7.5.5 Lubricants

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

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stoerber.de/en/download>. Enter the ID of the documentation in the Search... field.

7.5.5.1 Rack and pinion drive lubrication

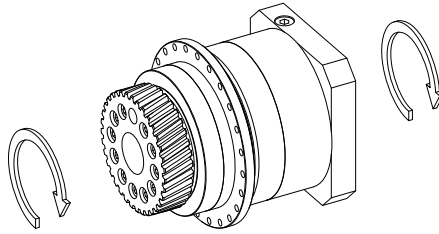
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

7.5.6 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 90 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

7.5.7 Direction of rotation

The input and output rotate in the same direction.



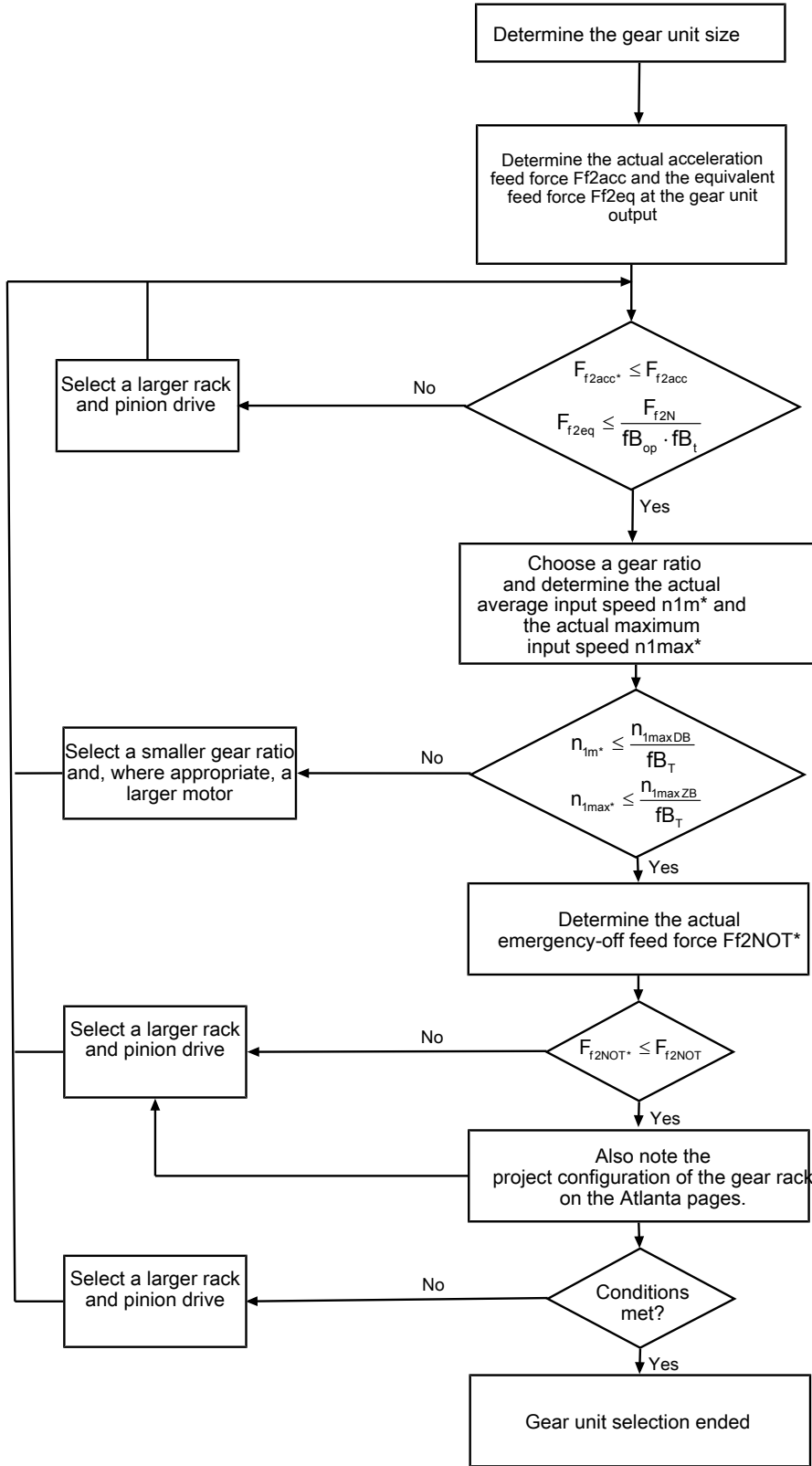
7.6 Project configuration

Project your drives using our SERVOnsoft designing software. You can receive SERVOnsoft 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 *.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#)].

7.6.1 Drive selection

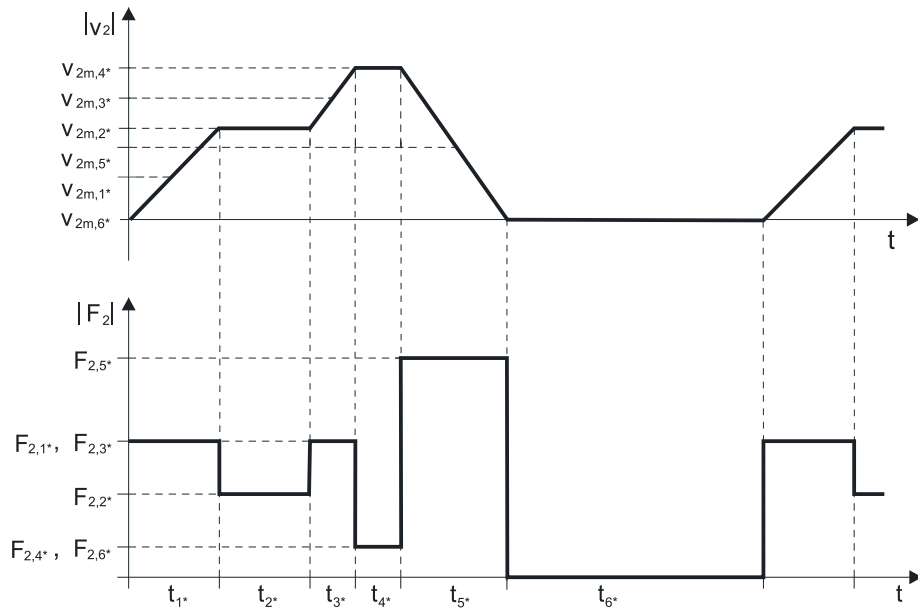


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

The values for fb_T , fb_{op} and fb_t can be found in the corresponding tables in this chapter.

Example of cyclic operation

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

**Calculation of the actual maximum acceleration feed force**

$$F_{f2acc^*} = m \cdot a^* + F_{L^*}$$

Calculation of the actual average input speed

$$n_{1m^*} = \frac{v_{2m^*} \cdot i}{d_0 \cdot \pi}$$

$$v_{2m^*} = \frac{|v_{2m,1^*}| \cdot t_1^* + \dots + |v_{2m,n^*}| \cdot t_n^*}{t_1^* + \dots + t_n^*}$$

If \$t_1^* + \dots + t_5^* \ge 10\$ min, determine \$v_{2m^*}\$ without the rest phase \$t_6^*\$.

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT^*} = m \cdot a_{NOT^*} + F_{L^*}$$

Calculation of the actual equivalent feed force

$$F_{f2eq^*} = \sqrt[3]{\frac{|v_{2m,1^*}| \cdot t_1^* \cdot |F_{2,1^*}|^3 + \dots + |v_{2m,n^*}| \cdot t_n^* \cdot |F_{2,n^*}|^3}{|v_{2m,1^*}| \cdot t_1^* + \dots + |v_{2m,n^*}| \cdot t_n^*}}$$

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 \$\le 8\$ h	1.00
Daily run time \$\le 16\$ h	1.15
Daily run time \$\le 24\$ h	1.20

Temperature		f_{B_T}
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20\text{ °C}$	0.9
	$\leq 30\text{ °C}$	1.0
	$\leq 40\text{ °C}$	1.15
Motor with convection cooling	$\leq 20\text{ °C}$	1.0
	$\leq 30\text{ °C}$	1.1
	$\leq 40\text{ °C}$	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

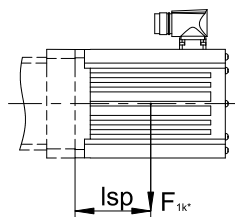
7.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
PH321_ME	20
PH322_ME	10
PH421_ME	40
PH422_ME	20
PH521_ME	80
PH522_ME	40
PH721_ME	200
PH722_ME	80
PH821_ME	400
PH822_ME	200
PH932_ME	400
PH1032_ME	400

7.6.3 Recommendation for radial shaft seal rings

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

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance 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 a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

7.7 Additional documentation

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

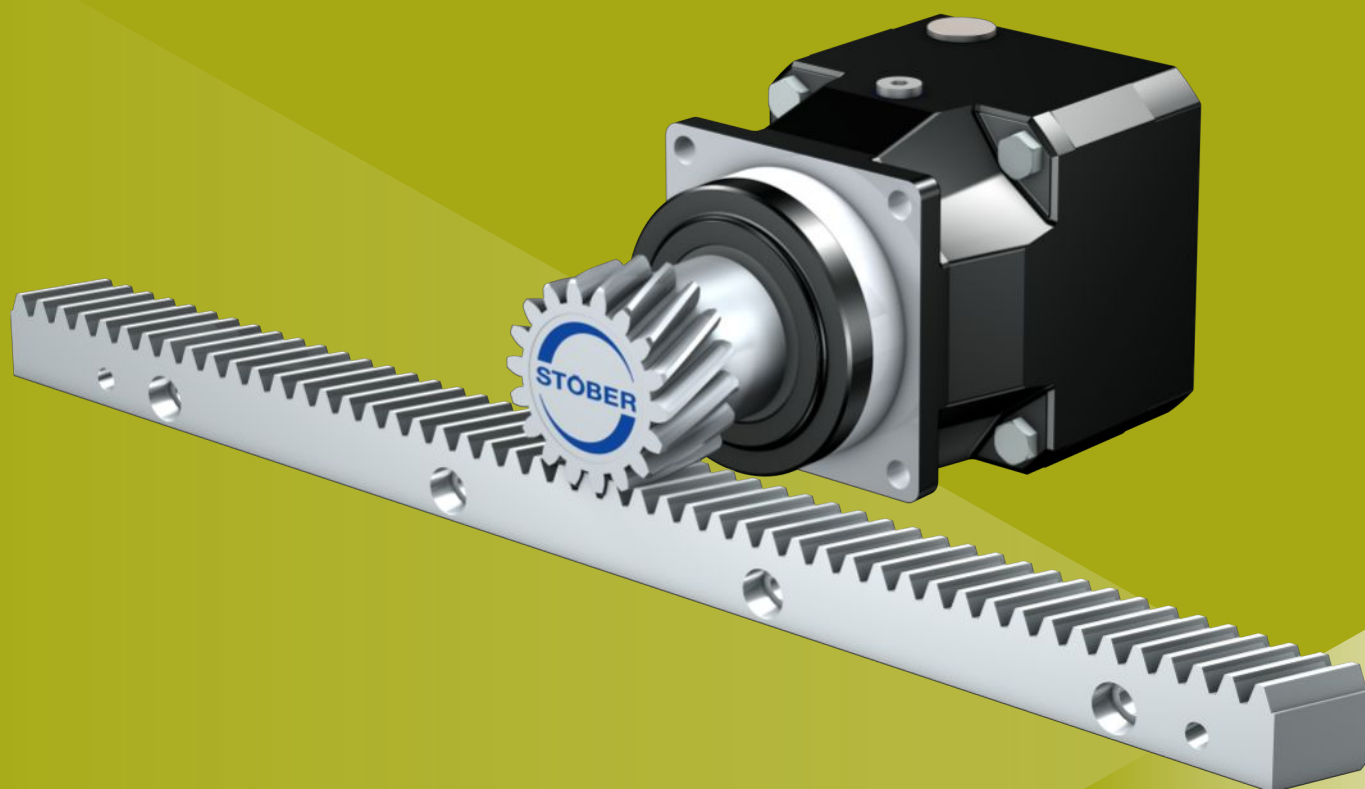
Enter the ID of the documentation in the Search... field.

Documentation	ID
Operating manual Rack and Pinion Drives (Atlanta)	442455
Operating manual for P/PA/PE/PH/PHA/PHQ/PHQA/PHV/PHVA planetary gear units and planetary geared motors	443029_en
Lubricant filling quantities for gear units	441871

8 ZVP rack and pinion drives

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8 Rack and pinion drives

ZVP

8.1 Overview

Precision planetary gear units with plug-on pinion

Features

Power density	★★★★☆
Linear clearance	★★★★☆
Price category	€€
Smooth operation	★★★★☆
Linear rigidity	★★★★☆
Mass moment of inertia	★★★★☆
Ready-to-install drive solution	✓
Pinion gearing quality 7 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓

Key: ★☆☆☆☆ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

Technical data

m_n	2 – 4 mm
z	16 – 25
F_{f2acc}	2 – 15 kN
$v_{f2maxzB}$	0.14 – 4.9 m/s
Δs	20 – 44 μm

8.2 Selection tables

The technical data specified in the selection tables applies to:

- Pinion position E with bearing design R (standard)
- Pinion position S with bearing design D (axially reinforced)
- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 8.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data as well as other combinations of pinion position and bearing design, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{f2maxZB} [m/s]	Δs [mm]	C _{lin} [N/ μm]	m _n [mm]	z	d ₀ [mm]	F _{f2N,S} [kN]	F _{f2N,E} [kN]	F _{f2accS} [kN]	F _{f2accE} [kN]	F _{f2NOT,S} [kN]	F _{f2NOT,E} [kN]	M _{2accS} [Nm]	M _{2accE} [Nm]
ZV2P3 (F_{f2acc,max} = 2,0 kN)																		
3.000	ZV216S_P321_0030 ME	3500	6000	≤19	3.56	0.020	52	2	16	34.0	1.8	1.6	2.0	1.7	4.0	3.3	34	28
3.000	ZV216S_P321_0030 MEL	3500	6000	≤24	3.56	0.020	56	2	16	34.0	1.8	1.6	2.0	1.7	4.0	3.3	34	28
4.000	ZV216S_P321_0040 ME	3700	6500	≤19	2.89	0.020	51	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
4.000	ZV216S_P321_0040 MEL	3700	6500	≤24	2.89	0.020	53	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
5.000	ZV216S_P321_0050 ME	4000	7000	≤19	2.49	0.020	51	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
5.000	ZV216S_P321_0050 MEL	4000	7000	≤24	2.49	0.020	52	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
7.000	ZV216S_P321_0070 ME	4500	8000	≤19	2.03	0.020	45	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
7.000	ZV216S_P321_0070 MEL	4500	8000	≤24	2.03	0.020	46	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
8.000	ZV216S_P321_0080 ME	4500	8000	≤19	1.78	0.020	44	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
8.000	ZV216S_P321_0080 MEL	4500	8000	≤24	1.78	0.020	44	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
10.00	ZV216S_P321_0100 ME	4500	8000	≤19	1.42	0.020	42	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
10.00	ZV216S_P321_0100 MEL	4500	8000	≤24	1.42	0.020	42	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
12.00	ZV216S_P322_0120 ME	4000	8000	≤14	1.19	0.025	45	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
12.00	ZV216S_P322_0120 MEL	4000	8000	≤19	1.19	0.025	45	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
16.00	ZV216S_P322_0160 ME	4500	8000	≤14	0.89	0.025	47	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
16.00	ZV216S_P322_0160 MEL	4500	8000	≤19	0.89	0.025	47	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
20.00	ZV216S_P322_0200 ME	4500	8000	≤14	0.71	0.025	48	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
20.00	ZV216S_P322_0200 MEL	4500	8000	≤19	0.71	0.025	48	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
25.00	ZV216S_P322_0250 ME	4500	8000	≤14	0.57	0.025	48	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
25.00	ZV216S_P322_0250 MEL	4500	8000	≤19	0.57	0.025	48	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
28.00	ZV216S_P322_0280 ME	4500	8000	≤14	0.51	0.025	47	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
28.00	ZV216S_P322_0280 MEL	4500	8000	≤19	0.51	0.025	47	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
32.00	ZV216S_P322_0320 ME	4500	8000	≤14	0.44	0.025	43	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
32.00	ZV216S_P322_0320 MEL	4500	8000	≤19	0.44	0.025	43	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
35.00	ZV216S_P322_0350 ME	4500	8000	≤14	0.41	0.025	48	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
35.00	ZV216S_P322_0350 MEL	4500	8000	≤19	0.41	0.025	48	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
40.00	ZV216S_P322_0400 ME	4500	8000	≤14	0.36	0.025	46	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
40.00	ZV216S_P322_0400 MEL	4500	8000	≤19	0.36	0.025	46	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
50.00	ZV216S_P322_0500 ME	4500	8000	≤14	0.28	0.025	47	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
50.00	ZV216S_P322_0500 MEL	4500	8000	≤19	0.28	0.025	48	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
56.00	ZV216S_P322_0560 ME	4500	8000	≤14	0.25	0.025	43	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
56.00	ZV216S_P322_0560 MEL	4500	8000	≤19	0.25	0.025	43	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
70.00	ZV216S_P322_0700 ME	4500	8000	≤14	0.20	0.025	44	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
70.00	ZV216S_P322_0700 MEL	4500	8000	≤19	0.20	0.025	44	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
80.00	ZV216S_P322_0800 ME	4500	8000	≤14	0.18	0.025	43	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
80.00	ZV216S_P322_0800 MEL	4500	8000	≤19	0.18	0.025	43	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
100.0	ZV216S_P322_1000 ME	4500	8000	≤14	0.14	0.025	42	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
100.0	ZV216S_P322_1000 MEL	4500	8000	≤19	0.14	0.025	42	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
ZV2P4 (F_{f2acc,max} = 4,8 kN)																		
3.000	ZV220S_P421_0030 ME	3000	5500	≤24	4.07	0.025	72	2	20	42.4	2.4	2.1	4.7	3.2	9.7	6.3	100	67
3.000	ZV220S_P421_0030 MEL	3000	5500	≤32	4.07	0.025	74	2	20	42.4	2.4	2.1	4.7	3.2	9.7	6.3	100	67
4.000	ZV220S_P421_0040 ME	3300	6000	≤24	3.33	0.025	72	2	20	42.4	3.8	2.3	4.8	3.2	9.7	6.3	100	67
4.000	ZV220S_P421_0040 MEL	3300	6000	≤32	3.33	0.025	73	2	20	42.4	3.8	2.3	4.8	3.2	9.7	6.3	100	67
5.000	ZV220S_P421_0050 ME	3700	6500	≤24	2.89	0.025	71	2	20	42.4	4.0	2.5	4.8	3.2	9.7	6.3	100	67
5.000	ZV220S_P421_0050 MEL	3700	6500	≤32	2.89	0.025	72	2	20	42.4	4.0	2.5	4.8	3.2	9.7	6.3	100	67
7.000	ZV220S_P421_0070 ME	4000	7000	≤24	2.22	0.025	64	2	20	42.4	4.0	2.7	4.8	3.2	9.7	6.3	100	67
7.000	ZV220S_P421_0070 MEL	4000	7000	≤32	2.22	0.025	64	2	20	42.4	4.0	2.7	4.8	3.2	9.7	6.3	100	67

8.2 Selection tables 8 ZVP rack and pinion drives

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{f2maxZB} [m/s]	Δs [mm]	C _{lin} [N/ μm]	m _n [mm]	z	d ₀ [mm]	F _{f2N,S} [kN]	F _{f2N,E} [kN]	F _{f2accS} [kN]	F _{f2accE} [kN]	F _{f2NOT,S} [kN]	F _{f2NOT,E} [kN]	M _{2accS} [Nm]	M _{2accE} [Nm]
ZV2P4 (F_{f2acc,max} = 4,8 kN)																		
8.000	ZV220S_P421_0080 ME	4000	7000	≤24	1.94	0.025	61	2	20	42.4	3.8	2.9	4.7	3.2	9.4	6.3	100	67
8.000	ZV220S_P421_0080 MEL	4000	7000	≤32	1.94	0.025	61	2	20	42.4	3.8	2.9	4.7	3.2	9.4	6.3	100	67
10.00	ZV220S_P421_0100 ME	4000	7000	≤24	1.56	0.025	58	2	20	42.4	2.8	2.8	4.7	3.2	9.4	6.3	100	67
10.00	ZV220S_P421_0100 MEL	4000	7000	≤32	1.56	0.025	59	2	20	42.4	2.8	2.8	4.7	3.2	9.4	6.3	100	67
12.00	ZV220S_P422_0120 ME	3500	6500	≤19	1.20	0.031	63	2	20	42.4	2.4	2.4	4.7	3.2	9.7	6.3	100	67
12.00	ZV220S_P422_0120 MEL	3500	6500	≤24	1.20	0.031	64	2	20	42.4	2.4	2.4	4.7	3.2	9.7	6.3	100	67
16.00	ZV220S_P422_0160 ME	3700	6500	≤19	0.90	0.031	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
16.00	ZV220S_P422_0160 MEL	3700	6500	≤24	0.90	0.031	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
20.00	ZV220S_P422_0200 ME	3700	6500	≤19	0.72	0.031	68	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
20.00	ZV220S_P422_0200 MEL	3700	6500	≤24	0.72	0.031	68	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
25.00	ZV220S_P422_0250 ME	4000	7000	≤19	0.62	0.031	68	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
25.00	ZV220S_P422_0250 MEL	4000	7000	≤24	0.62	0.031	68	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
28.00	ZV220S_P422_0280 ME	4500	8000	≤19	0.64	0.031	66	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
28.00	ZV220S_P422_0280 MEL	4500	8000	≤24	0.64	0.031	66	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
32.00	ZV220S_P422_0320 ME	3700	6500	≤19	0.45	0.031	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
32.00	ZV220S_P422_0320 MEL	3700	6500	≤24	0.45	0.031	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
35.00	ZV220S_P422_0350 ME	4500	8000	≤19	0.51	0.031	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
35.00	ZV220S_P422_0350 MEL	4500	8000	≤24	0.51	0.031	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
40.00	ZV220S_P422_0400 ME	4500	8000	≤19	0.44	0.031	65	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
40.00	ZV220S_P422_0400 MEL	4500	8000	≤24	0.44	0.031	65	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
50.00	ZV220S_P422_0500 ME	4500	8000	≤19	0.36	0.031	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
50.00	ZV220S_P422_0500 MEL	4500	8000	≤24	0.36	0.031	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
56.00	ZV220S_P422_0560 ME	4500	8000	≤19	0.32	0.031	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
56.00	ZV220S_P422_0560 MEL	4500	8000	≤24	0.32	0.031	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
70.00	ZV220S_P422_0700 ME	4500	8000	≤19	0.25	0.031	62	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
70.00	ZV220S_P422_0700 MEL	4500	8000	≤24	0.25	0.031	62	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
80.00	ZV220S_P422_0800 ME	4500	8000	≤19	0.22	0.031	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
80.00	ZV220S_P422_0800 MEL	4500	8000	≤24	0.22	0.031	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
100.0	ZV220S_P422_1000 ME	4500	8000	≤19	0.18	0.031	58	2	20	42.4	2.8	2.8	4.7	3.2	9.4	6.3	100	67
100.0	ZV220S_P422_1000 MEL	4500	8000	≤24	0.18	0.031	58	2	20	42.4	2.8	2.8	4.7	3.2	9.4	6.3	100	67
ZV2P5 (F_{f2acc,max} = 9,6 kN)																		
3.000	ZV225S_P521_0030 ME	2500	4500	≤32	4.17	0.023	110	2	25	53.1	4.5	3.0	7.5	5.1	17	10	200	130
3.000	ZV225S_P521_0030 MEL	2500	4500	≤38	4.17	0.023	116	2	25	53.1	4.5	3.0	7.5	5.1	17	10	200	130
4.000	ZV225S_P521_0040 ME	3000	5000	≤32	3.47	0.023	107	2	25	53.1	6.3	3.3	9.6	5.1	19	10	260	130
4.000	ZV225S_P521_0040 MEL	3000	5000	≤38	3.47	0.023	110	2	25	53.1	6.3	3.3	9.6	5.1	19	10	260	130
5.000	ZV225S_P521_0050 ME	3500	6000	≤32	3.33	0.023	107	2	25	53.1	6.8	3.5	9.6	5.1	19	10	260	130
5.000	ZV225S_P521_0050 MEL	3500	6000	≤38	3.33	0.023	109	2	25	53.1	6.8	3.5	9.6	5.1	19	10	260	130
7.000	ZV225S_P521_0070 ME	3700	6500	≤32	2.58	0.023	100	2	25	53.1	7.6	3.9	9.6	5.1	19	10	260	130
7.000	ZV225S_P521_0070 MEL	3700	6500	≤38	2.58	0.023	101	2	25	53.1	7.6	3.9	9.6	5.1	19	10	260	130
8.000	ZV225S_P521_0080 ME	3700	6500	≤32	2.26	0.023	95	2	25	53.1	7.5	4.1	9.4	5.1	19	10	250	130
8.000	ZV225S_P521_0080 MEL	3700	6500	≤38	2.26	0.023	96	2	25	53.1	7.5	4.1	9.4	5.1	19	10	250	130
10.00	ZV225S_P521_0100 ME	3700	6500	≤32	1.81	0.023	93	2	25	53.1	5.3	4.4	9.4	5.1	19	10	250	130
10.00	ZV225S_P521_0100 MEL	3700	6500	≤38	1.81	0.023	94	2	25	53.1	5.3	4.4	9.4	5.1	19	10	250	130
12.00	ZV225S_P522_0120 ME	3000	6000	≤24	1.39	0.031	99	2	25	53.1	4.5	4.5	7.5	5.1	17	10	200	130
12.00	ZV225S_P522_0120 MEL	3000	6000	≤32	1.39	0.031	100	2	25	53.1	4.5	4.5	7.5	5.1	17	10	200	130
16.00	ZV225S_P522_0160 ME	3300	6000	≤24	1.04	0.031	101	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
16.00	ZV225S_P522_0160 MEL	3300	6000	≤32	1.04	0.031	101	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
20.00	ZV225S_P522_0200 ME	3300	6000	≤24	0.83	0.031	103	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
20.00	ZV225S_P522_0200 MEL	3300	6000	≤32	0.83	0.031	103	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
25.00	ZV225S_P522_0250 ME	3700	6500	≤24	0.72	0.031	103	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
25.00	ZV225S_P522_0250 MEL	3700	6500	≤32	0.72	0.031	103	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
28.00	ZV225S_P522_0280 ME	4000	7000	≤24	0.69	0.031	99	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
28.00	ZV225S_P522_0280 MEL	4000	7000	≤32	0.69	0.031	99	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
32.00	ZV225S_P522_0320 ME	3300	6000	≤24	0.52	0.031	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
32.00	ZV225S_P522_0320 MEL	3300	6000	≤32	0.52	0.031	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
35.00	ZV225S_P522_0350 ME	4000	7000	≤24	0.56	0.031	102	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
35.00	ZV225S_P522_0350 MEL	4000	7000	≤32	0.56	0.031	102	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
40.00	ZV225S_P522_0400 ME	4000	7000	≤24	0.49	0.031	98	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
40.00	ZV225S_P522_0400 MEL	4000	7000	≤32	0.49	0.031	98	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
50.00	ZV225S_P522_0500 ME	4000	7000	≤24	0.39	0.031	101	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
50.00	ZV225S_P522_0500 MEL	4000	7000	≤32	0.39	0.031	101	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
56.00	ZV225S_P522_0560 ME	4000	7000	≤24	0.35	0.031	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
56.00	ZV225S_P522_0560 MEL	4000	7000	≤32	0.35	0.031	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
70.00	ZV225S_P522_0700 ME	4000	7000	≤24	0.28	0.031	98	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
70.00	ZV225S_P522_0700 MEL	4000	7000	≤32	0.28	0.031	98	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{fzmaxZB} [m/s]	Δs [mm]	C _{lin} [N/ μm]	m _n [mm]	z	d ₀ [mm]	F _{fzN,S} [kN]	F _{fzN,E} [kN]	F _{fzaccS} [kN]	F _{fzaccE} [kN]	F _{fzNOT,S} [kN]	F _{fzNOT,E} [kN]	M _{2accS} [Nm]	M _{2accE} [Nm]
ZV2P5 (F_{fzacc,max} = 9,6 kN)																		
80.00	ZV225S_P522_0800 ME	4000	7000	≤24	0.24	0.031	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
80.00	ZV225S_P522_0800 MEL	4000	7000	≤32	0.24	0.031	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
100.0	ZV225S_P522_1000 ME	4000	7000	≤24	0.19	0.031	92	2	25	53.1	5.3	5.1	9.4	5.1	19	10	250	130
100.0	ZV225S_P522_1000 MEL	4000	7000	≤32	0.19	0.031	92	2	25	53.1	5.3	5.1	9.4	5.1	19	10	250	130
ZV3P5 (F_{fzacc,max} = 10 kN)																		
3.000	ZV318S_P521_0030 ME	2500	4500	≤32	4.50	0.025	102	3	18	57.3	4.2	3.0	7.0	5.2	16	10	200	150
3.000	ZV318S_P521_0030 MEL	2500	4500	≤38	4.50	0.025	108	3	18	57.3	4.2	3.0	7.0	5.2	16	10	200	150
4.000	ZV318S_P521_0040 ME	3000	5000	≤32	3.75	0.025	99	3	18	57.3	6.2	3.3	10	5.2	21	10	300	150
4.000	ZV318S_P521_0040 MEL	3000	5000	≤38	3.75	0.025	102	3	18	57.3	6.2	3.3	10	5.2	21	10	300	150
5.000	ZV318S_P521_0050 ME	3500	6000	≤32	3.60	0.025	99	3	18	57.3	6.6	3.6	10	5.2	21	10	300	150
5.000	ZV318S_P521_0050 MEL	3500	6000	≤38	3.60	0.025	101	3	18	57.3	6.6	3.6	10	5.2	21	10	300	150
7.000	ZV318S_P521_0070 ME	3700	6500	≤32	2.79	0.025	92	3	18	57.3	7.3	4.0	9.4	5.2	21	10	270	150
7.000	ZV318S_P521_0070 MEL	3700	6500	≤38	2.79	0.025	93	3	18	57.3	7.3	4.0	9.4	5.2	21	10	270	150
8.000	ZV318S_P521_0080 ME	3700	6500	≤32	2.44	0.025	88	3	18	57.3	7.0	4.2	8.7	5.2	17	10	250	150
8.000	ZV318S_P521_0080 MEL	3700	6500	≤38	2.44	0.025	88	3	18	57.3	7.0	4.2	8.7	5.2	17	10	250	150
10.00	ZV318S_P521_0100 ME	3700	6500	≤32	1.95	0.025	85	3	18	57.3	4.9	4.5	8.7	5.2	17	10	250	150
10.00	ZV318S_P521_0100 MEL	3700	6500	≤38	1.95	0.025	86	3	18	57.3	4.9	4.5	8.7	5.2	17	10	250	150
12.00	ZV318S_P522_0120 ME	3000	6000	≤24	1.50	0.033	92	3	18	57.3	4.2	4.2	7.0	5.2	16	10	200	150
12.00	ZV318S_P522_0120 MEL	3000	6000	≤32	1.50	0.033	92	3	18	57.3	4.2	4.2	7.0	5.2	16	10	200	150
16.00	ZV318S_P522_0160 ME	3300	6000	≤24	1.13	0.033	93	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
16.00	ZV318S_P522_0160 MEL	3300	6000	≤32	1.13	0.033	93	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
20.00	ZV318S_P522_0200 ME	3300	6000	≤24	0.90	0.033	95	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
20.00	ZV318S_P522_0200 MEL	3300	6000	≤32	0.90	0.033	95	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
25.00	ZV318S_P522_0250 ME	3700	6500	≤24	0.78	0.033	95	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
25.00	ZV318S_P522_0250 MEL	3700	6500	≤32	0.78	0.033	95	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
28.00	ZV318S_P522_0280 ME	4000	7000	≤24	0.75	0.033	91	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
28.00	ZV318S_P522_0280 MEL	4000	7000	≤32	0.75	0.033	91	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
32.00	ZV318S_P522_0320 ME	3300	6000	≤24	0.56	0.033	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
32.00	ZV318S_P522_0320 MEL	3300	6000	≤32	0.56	0.033	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
35.00	ZV318S_P522_0350 ME	4000	7000	≤24	0.60	0.033	94	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
35.00	ZV318S_P522_0350 MEL	4000	7000	≤32	0.60	0.033	94	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
40.00	ZV318S_P522_0400 ME	4000	7000	≤24	0.53	0.033	90	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
40.00	ZV318S_P522_0400 MEL	4000	7000	≤32	0.53	0.033	90	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
50.00	ZV318S_P522_0500 ME	4000	7000	≤24	0.42	0.033	93	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
50.00	ZV318S_P522_0500 MEL	4000	7000	≤32	0.42	0.033	93	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
56.00	ZV318S_P522_0560 ME	4000	7000	≤24	0.38	0.033	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
56.00	ZV318S_P522_0560 MEL	4000	7000	≤32	0.38	0.033	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
70.00	ZV318S_P522_0700 ME	4000	7000	≤24	0.30	0.033	90	3	18	57.3	7.3	5.2	9.4	5.2	21	10	270	150
70.00	ZV318S_P522_0700 MEL	4000	7000	≤32	0.30	0.033	90	3	18	57.3	7.3	5.2	9.4	5.2	21	10	270	150
80.00	ZV318S_P522_0800 ME	4000	7000	≤24	0.26	0.033	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
80.00	ZV318S_P522_0800 MEL	4000	7000	≤32	0.26	0.033	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
100.0	ZV318S_P522_1000 ME	4000	7000	≤24	0.21	0.033	85	3	18	57.3	4.9	4.9	8.7	5.2	17	10	250	150
100.0	ZV318S_P522_1000 MEL	4000	7000	≤32	0.21	0.033	85	3	18	57.3	4.9	4.9	8.7	5.2	17	10	250	150
ZV3P7 (F_{fzacc,max} = 14 kN)																		
3.000	ZV322S_P721_0030 ME	2200	3700	≤38	4.52	0.031	117	3	22	70.0	6.1	3.1	14	6.4	28	13	500	220
3.000	ZV322S_P721_0030 MEL	2200	3700	≤48	4.52	0.031	124	3	22	70.0	6.1	3.1	14	6.4	28	13	500	220
4.000	ZV322S_P721_0040 ME	2500	4500	≤38	4.13	0.031	118	3	22	70.0	6.7	3.5	14	6.4	28	13	500	220
4.000	ZV322S_P721_0040 MEL	2500	4500	≤48	4.13	0.031	121	3	22	70.0	6.7	3.5	14	6.4	28	13	500	220
5.000	ZV322S_P721_0050 ME	3000	5500	≤38	4.03	0.031	117	3	22	70.0	7.2	3.7	14	6.4	28	13	500	220
5.000	ZV322S_P721_0050 MEL	3000	5500	≤48	4.03	0.031	119	3	22	70.0	7.2	3.7	14	6.4	28	13	500	220
7.000	ZV322S_P721_0070 ME	3300	6000	≤38	3.14	0.031	115	3	22	70.0	8.0	4.2	14	6.4	28	13	500	220
7.000	ZV322S_P721_0070 MEL	3300	6000	≤48	3.14	0.031	116	3	22	70.0	8.0	4.2	14	6.4	28	13	500	220
8.000	ZV322S_P721_0080 ME	3300	6000	≤38	2.75	0.031	112	3	22	70.0	8.4	4.4	14	6.4	28	13	500	220
8.000	ZV322S_P721_0080 MEL	3300	6000	≤48	2.75	0.031	113	3	22	70.0	8.4	4.4	14	6.4	28	13	500	220
10.00	ZV322S_P721_0100 ME	3300	6000	≤38	2.20	0.031	107	3	22	70.0	8.6	4.7	14	6.4	28	13	500	220
10.00	ZV322S_P721_0100 MEL	3300	6000	≤48	2.20	0.031	108	3	22	70.0	8.6	4.7	14	6.4	28	13	500	220
12.00	ZV322S_P722_0120 ME	2500	5000	≤32	1.53	0.041	113	3	22	70.0	8.0	5.0	14	6.4	28	13	500	220
12.00	ZV322S_P722_0120 MEL	2500	5000	≤38	1.53	0.041	113	3	22	70.0	8.0	5.0	14	6.4	28	13	500	220
16.00	ZV322S_P722_0160 ME	3000	5000	≤32	1.15	0.041	115	3	22	70.0	11	5.5	14	6.4	28	13	500	220
16.00	ZV322S_P722_0160 MEL	3000	5000	≤38	1.15	0.041	115	3	22	70.0	11	5.5	14	6.4	28	13	500	220
20.00	ZV322S_P722_0200 ME	3000	5000	≤32	0.92	0.041	115	3	22	70.0	11	5.9	14	6.4	28	13	500	220
20.00	ZV322S_P722_0200 MEL	3000	5000	≤38	0.92	0.041	115	3	22	70.0	11	5.9	14	6.4	28	13	500	220
25.00	ZV322S_P722_0250 ME	3500	6000	≤32	0.88	0.041	115	3	22	70.0	12	6.4	14	6.4	28	13	500	220
25.00	ZV322S_P722_0250 MEL	3500	6000	≤38	0.88	0.041	115	3	22	70.0	12	6.4	14	6				

8.2 Selection tables 8 ZVP rack and pinion drives

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [mm]	C_{lin} [N/ μm]	m_n [mm]	z	d_0 [mm]	$F_{f2N,S}$ [kN]	$F_{f2N,E}$ [kN]	F_{f2accS} [kN]	F_{f2accE} [kN]	$F_{f2NOT,S}$ [kN]	$F_{f2NOT,E}$ [kN]	M_{2accS} [Nm]	M_{2accE} [Nm]
ZV3P7 ($F_{f2acc,max} = 14$ kN)																		
28.00	ZV322S_P722_0280 MEL	3700	6500	≤38	0.85	0.041	114	3	22	70.0	12	6.4	14	6.4	28	13	500	220
32.00	ZV322S_P722_0320 ME	3000	5000	≤32	0.57	0.041	112	3	22	70.0	11	6.4	14	6.4	28	13	500	220
32.00	ZV322S_P722_0320 MEL	3000	5000	≤38	0.57	0.041	112	3	22	70.0	11	6.4	14	6.4	28	13	500	220
35.00	ZV322S_P722_0350 ME	3700	6500	≤32	0.68	0.041	115	3	22	70.0	12	6.4	14	6.4	28	13	500	220
35.00	ZV322S_P722_0350 MEL	3700	6500	≤38	0.68	0.041	115	3	22	70.0	12	6.4	14	6.4	28	13	500	220
40.00	ZV322S_P722_0400 ME	3700	6500	≤32	0.60	0.041	113	3	22	70.0	12	6.4	14	6.4	28	13	500	220
40.00	ZV322S_P722_0400 MEL	3700	6500	≤38	0.60	0.041	113	3	22	70.0	12	6.4	14	6.4	28	13	500	220
50.00	ZV322S_P722_0500 ME	3700	6500	≤32	0.48	0.041	114	3	22	70.0	12	6.4	14	6.4	28	13	500	220
50.00	ZV322S_P722_0500 MEL	3700	6500	≤38	0.48	0.041	114	3	22	70.0	12	6.4	14	6.4	28	13	500	220
56.00	ZV322S_P722_0560 ME	3700	6500	≤32	0.43	0.041	112	3	22	70.0	11	6.4	14	6.4	28	13	500	220
56.00	ZV322S_P722_0560 MEL	3700	6500	≤38	0.43	0.041	112	3	22	70.0	11	6.4	14	6.4	28	13	500	220
70.00	ZV322S_P722_0700 ME	3700	6500	≤32	0.34	0.041	114	3	22	70.0	12	6.4	14	6.4	28	13	500	220
70.00	ZV322S_P722_0700 MEL	3700	6500	≤38	0.34	0.041	114	3	22	70.0	12	6.4	14	6.4	28	13	500	220
80.00	ZV322S_P722_0800 ME	3700	6500	≤32	0.30	0.041	112	3	22	70.0	11	6.4	14	6.4	28	13	500	220
80.00	ZV322S_P722_0800 MEL	3700	6500	≤38	0.30	0.041	112	3	22	70.0	11	6.4	14	6.4	28	13	500	220
100.0	ZV322S_P722_1000 ME	3700	6500	≤32	0.24	0.041	107	3	22	70.0	8.6	6.4	14	6.4	28	13	500	220
100.0	ZV322S_P722_1000 MEL	3700	6500	≤38	0.24	0.041	107	3	22	70.0	8.6	6.4	14	6.4	28	13	500	220
ZV4P7 ($F_{f2acc,max} = 15$ kN)																		
3.000	ZV418S_P721_0030 ME	2200	3700	≤38	4.93	0.033	108	4	18	76.4	5.8	3.2	13	6.5	26	13	500	250
3.000	ZV418S_P721_0030 MEL	2200	3700	≤48	4.93	0.033	115	4	18	76.4	5.8	3.2	13	6.5	27	13	500	250
4.000	ZV418S_P721_0040 ME	2500	4500	≤38	4.50	0.033	108	4	18	76.4	6.4	3.6	15	6.5	30	13	570	250
4.000	ZV418S_P721_0040 MEL	2500	4500	≤48	4.50	0.033	112	4	18	76.4	6.4	3.6	15	6.5	30	13	570	250
5.000	ZV418S_P721_0050 ME	3000	5500	≤38	4.40	0.033	107	4	18	76.4	6.9	3.8	15	6.5	30	13	570	250
5.000	ZV418S_P721_0050 MEL	3000	5500	≤48	4.40	0.033	110	4	18	76.4	6.9	3.8	15	6.5	30	13	570	250
7.000	ZV418S_P721_0070 ME	3300	6000	≤38	3.43	0.033	105	4	18	76.4	7.7	4.3	15	6.5	30	13	570	250
7.000	ZV418S_P721_0070 MEL	3300	6000	≤48	3.43	0.033	107	4	18	76.4	7.7	4.3	15	6.5	30	13	570	250
8.000	ZV418S_P721_0080 ME	3300	6000	≤38	3.00	0.033	103	4	18	76.4	8.1	4.5	13	6.5	26	13	500	250
8.000	ZV418S_P721_0080 MEL	3300	6000	≤48	3.00	0.033	104	4	18	76.4	8.1	4.5	13	6.5	26	13	500	250
10.00	ZV418S_P721_0100 ME	3300	6000	≤38	2.40	0.033	98	4	18	76.4	7.9	4.8	13	6.5	26	13	500	250
10.00	ZV418S_P721_0100 MEL	3300	6000	≤48	2.40	0.033	98	4	18	76.4	7.9	4.8	13	6.5	26	13	500	250
12.00	ZV418S_P722_0120 ME	2500	5000	≤32	1.67	0.044	103	4	18	76.4	7.3	5.1	13	6.5	27	13	500	250
12.00	ZV418S_P722_0120 MEL	2500	5000	≤38	1.67	0.044	104	4	18	76.4	7.3	5.1	13	6.5	27	13	500	250
16.00	ZV418S_P722_0160 ME	3000	5000	≤32	1.25	0.044	105	4	18	76.4	10	5.6	15	6.5	30	13	570	250
16.00	ZV418S_P722_0160 MEL	3000	5000	≤38	1.25	0.044	106	4	18	76.4	10	5.6	15	6.5	30	13	570	250
20.00	ZV418S_P722_0200 ME	3000	5000	≤32	1.00	0.044	106	4	18	76.4	11	6.1	15	6.5	30	13	570	250
20.00	ZV418S_P722_0200 MEL	3000	5000	≤38	1.00	0.044	106	4	18	76.4	11	6.1	15	6.5	30	13	570	250
25.00	ZV418S_P722_0250 ME	3500	6000	≤32	0.96	0.044	106	4	18	76.4	12	6.5	15	6.5	30	13	570	250
25.00	ZV418S_P722_0250 MEL	3500	6000	≤38	0.96	0.044	106	4	18	76.4	12	6.5	15	6.5	30	13	570	250
28.00	ZV418S_P722_0280 ME	3700	6500	≤32	0.93	0.044	105	4	18	76.4	12	6.5	15	6.5	30	13	570	250
28.00	ZV418S_P722_0280 MEL	3700	6500	≤38	0.93	0.044	105	4	18	76.4	12	6.5	15	6.5	30	13	570	250
32.00	ZV418S_P722_0320 ME	3000	5000	≤32	0.63	0.044	103	4	18	76.4	10	6.5	13	6.5	26	13	500	250
32.00	ZV418S_P722_0320 MEL	3000	5000	≤38	0.63	0.044	103	4	18	76.4	10	6.5	13	6.5	26	13	500	250
35.00	ZV418S_P722_0350 ME	3700	6500	≤32	0.74	0.044	105	4	18	76.4	12	6.5	15	6.5	30	13	570	250
35.00	ZV418S_P722_0350 MEL	3700	6500	≤38	0.74	0.044	105	4	18	76.4	12	6.5	15	6.5	30	13	570	250
40.00	ZV418S_P722_0400 ME	3700	6500	≤32	0.65	0.044	104	4	18	76.4	12	6.5	15	6.5	30	13	570	250
40.00	ZV418S_P722_0400 MEL	3700	6500	≤38	0.65	0.044	104	4	18	76.4	12	6.5	15	6.5	30	13	570	250
50.00	ZV418S_P722_0500 ME	3700	6500	≤32	0.52	0.044	104	4	18	76.4	12	6.5	15	6.5	30	13	570	250
50.00	ZV418S_P722_0500 MEL	3700	6500	≤38	0.52	0.044	104	4	18	76.4	12	6.5	15	6.5	30	13	570	250
56.00	ZV418S_P722_0560 ME	3700	6500	≤32	0.46	0.044	103	4	18	76.4	10	6.5	13	6.5	26	13	500	250
56.00	ZV418S_P722_0560 MEL	3700	6500	≤38	0.46	0.044	103	4	18	76.4	10	6.5	13	6.5	26	13	500	250
70.00	ZV418S_P722_0700 ME	3700	6500	≤32	0.37	0.044	104	4	18	76.4	12	6.5	15	6.5	30	13	570	250
70.00	ZV418S_P722_0700 MEL	3700	6500	≤38	0.37	0.044	104	4	18	76.4	12	6.5	15	6.5	30	13	570	250
80.00	ZV418S_P722_0800 ME	3700	6500	≤32	0.33	0.044	103	4	18	76.4	10	6.5	13	6.5	26	13	500	250
80.00	ZV418S_P722_0800 MEL	3700	6500	≤38	0.33	0.044	103	4	18	76.4	10	6.5	13	6.5	26	13	500	250
100.0	ZV418S_P722_1000 ME	3700	6500	≤32	0.26	0.044	97	4	18	76.4	7.9	6.5	13	6.5	26	13	500	250
100.0	ZV418S_P722_1000 MEL	3700	6500	≤38	0.26	0.044	97	4	18	76.4	7.9	6.5	13	6.5	26	13	500	250

8.3 Dimensional drawings

In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

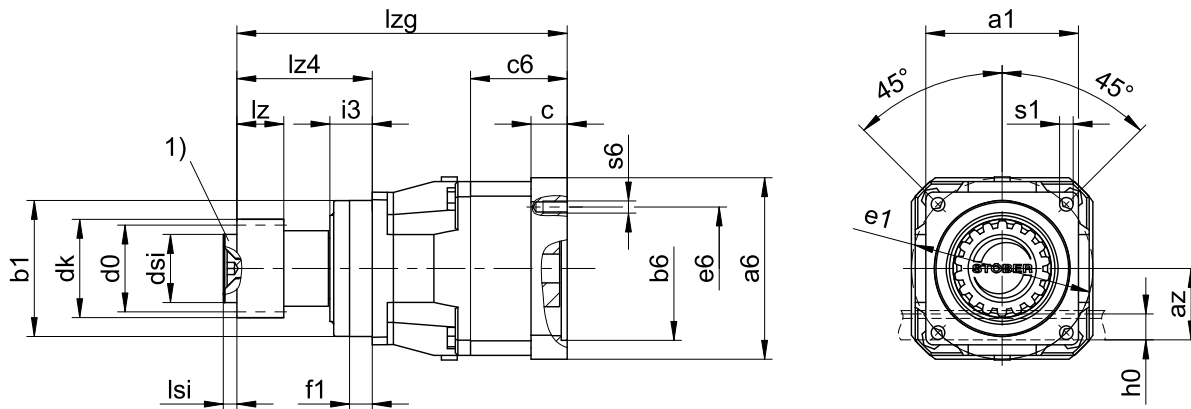
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.

8.3.1 Pinion position E



1) Axial locking (optional)

Output dimensions

Type	mn	□a1	az	Øb1	Ød0	Ødk	Ødsi	Øe1	f1	h0	i3	lz	lz4	lsi	Øs1	x
ZV216SEP3_	2	72	39.98	60 _{h6}	33.95	39.81	25	75	7.5	22	19	26	49.5	5	5.5	0.5
ZV220SEP4_	2	76	44.02	70 _{h6}	42.44	47.90	30	85	7.5	22	19	26	57.5	7	6.6	0.4
ZV225SEP5_	2	101	49.33	90 _{h6}	53.05	58.52	45	120	15.0	22	29	26	89.5	9	9.0	0.4
ZV318SEP5_	3	101	55.55	90 _{h6}	57.30	65.01	45	120	15.0	26	29	31	89.5	9	9.0	0.3
ZV322SEP7_	3	144	62.21	130 _{h6}	70.03	78.35	55	165	3.5	26	29	31	113.5	11	11.0	0.4
ZV418SEP7_	4	144	74.40	130 _{h6}	76.40	86.77	55	165	3.5	35	29	41	113.5	11	11.0	0.3

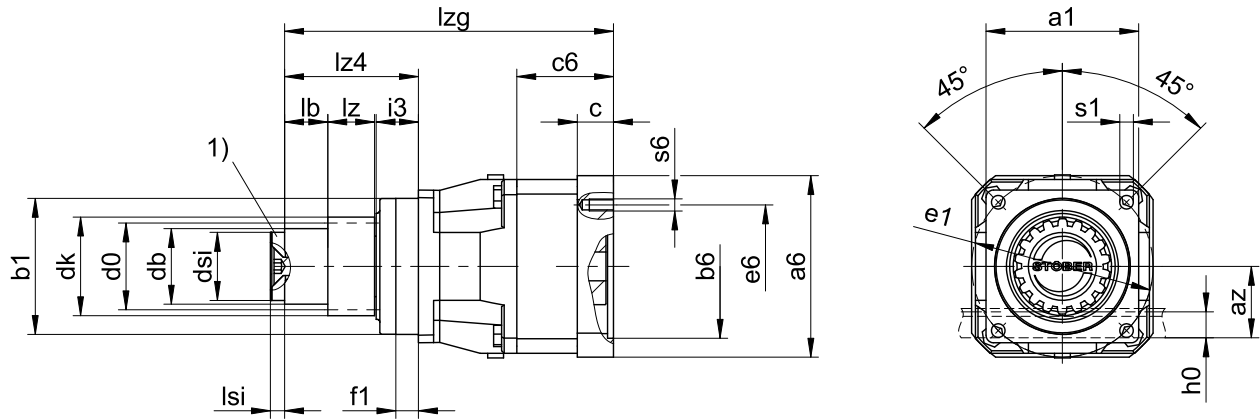
Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZV_P321_	75	60 ^{H7}	75	18	51.5	154.5	M5
ZV_P322_	55	40 ^{H7}	63	15	32.0	175.0	M5
ZV_P421_	100	95 ^{H7}	115	21	56.0	175.5	M8
ZV_P422_	75	60 ^{H7}	75	18	51.5	220.0	M5
ZV_P521_	120	110 ^{H7}	130	24	67.5	222.0	M8
ZV_P522_	100	95 ^{H7}	115	21	56.0	265.0	M8
ZV_P721_	150	130 ^{H7}	165	26	80.0	273.5	M10
ZV_P722_	120	110 ^{H7}	130	24	67.5	323.0	M8

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c_6 and l_{zg} are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEGER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

8.3.2 Pinion position S



1) Axial locking (optional)

Output dimensions

Type	mn	□a1	az	Øb1	Ød0	Ødb	Ødk	Ødsi	Øe1	f1	h0	i3	lb	lz	lz4	lsi	Øs1	x
ZV216SSP3_	2	72	39.98	60 _{h6}	34.0	30	39.81	25	75	7.5	22	18	4.5	26	49.5	5	5.5	0.5
ZV220SSP4_	2	76	44.02	70 _{h6}	42.4	38	47.90	30	85	7.5	22	18	12.5	26	57.5	7	6.6	0.4
ZV225SSP5_	2	101	49.33	90 _{h6}	53.1	50	58.52	45	120	15.0	22	28	34.5	26	89.5	9	9.0	0.4
ZV318SSP5_	3	101	55.55	90 _{h6}	57.3	50	65.01	45	120	15.0	26	28	29.5	31	89.5	9	9.0	0.3
ZV322SSP7_	3	144	62.21	130 _{h6}	70.0	62	78.35	55	165	3.5	26	28	53.5	31	113.5	11	11.0	0.4
ZV418SSP7_	4	144	74.40	130 _{h6}	76.4	62	86.77	55	165	3.5	35	28	43.5	41	113.5	11	11.0	0.3

Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZV_P321_	75	60 ^{H7}	75	18	51.5	154.5	M5
ZV_P322_	55	40 ^{H7}	63	15	32.0	175.0	M5
ZV_P421_	100	95 ^{H7}	115	21	56.0	175.5	M8
ZV_P422_	75	60 ^{H7}	75	18	51.5	220.0	M5
ZV_P521_	120	110 ^{H7}	130	24	67.5	222.0	M8
ZV_P522_	100	95 ^{H7}	115	21	56.0	265.0	M8
ZV_P721_	150	130 ^{H7}	165	26	80.0	273.5	M10
ZV_P722_	120	110 ^{H7}	130	24	67.5	323.0	M8

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEGER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

8.4 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.

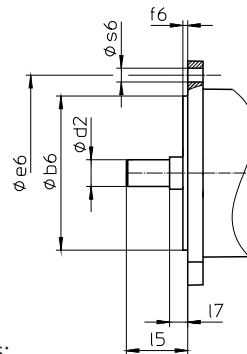
Sample code

Z	V	3	22	S	S	P	7	2	1	S	P	R	0050	ME
---	---	---	----	---	---	---	---	---	---	---	---	---	------	----

Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
V	Design	Plug-on pinion
3	Module	$m_n = 3$ (example)
22	Number of teeth	$z = 22$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
E	Pinion position	Shaft end
S		Shaft shoulder
P	Type	Planetary gear unit
7	Size	7 (example)
2	Generation	Generation 2
1	Stages	Single-stage
2		Two-stage
S	Housing	Standard
P	Shaft	Solid shaft with feather key
R	Bearing	Standard bearing
D		Axially reinforced bearing
0050	Transmission ratio ($i \times 10$)	$i = 5$ (example)
ME	Motor adapter	Motor adapter with EasyAdapt® coupling
MEL		Motor adapter with EasyAdapt® coupling for large motors

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at <http://configurator.stoeber.de> and choose your motor or the dimensions of the motor connection.

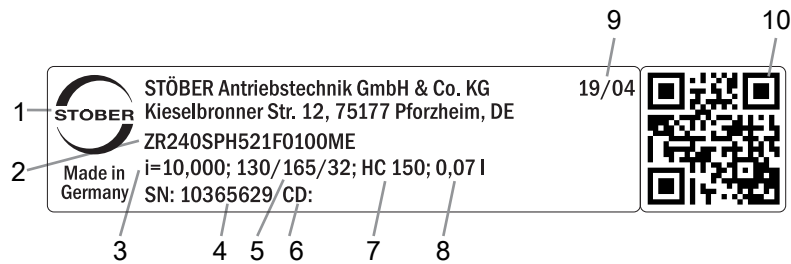
- For radial shaft seal rings at the output made of NBR or FKM, see the chapter [▶ 8.6.3]
- For axial locking (optional), see the chapter [▶ 8.3]
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation upon request

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter.

All input options available upon request are listed in the chapter [▶ 8.5.2].

8.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

8.4.1.1 Supporting documents

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

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

8.5 Product description

8.5.1 Motor adapter with EasyAdapt® coupling (ME/MEL)

In this chapter, you will find a description of the EasyAdapt® coupling.

Properties:

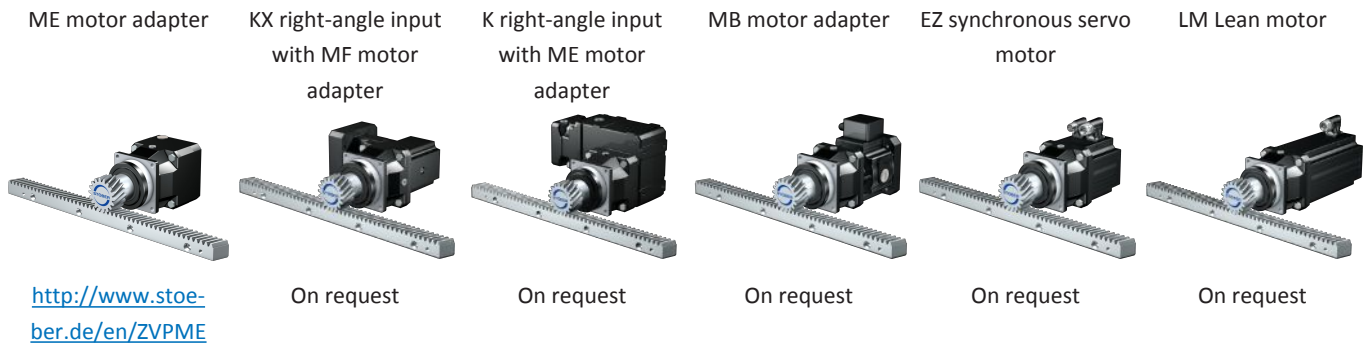
- Fast and easy motor attachment
- One-piece, rugged coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design



Fig. 1: EasyAdapt® coupling

8.5.2 Input options

In this chapter, you will find all available input options:



8.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 7.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	8	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

8.5.3.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S)

Please specify the desired attachment position when placing your purchase order.

8.5.4 Installation conditions

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

8.5.5 Lubricants

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

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stober.de/en/download>. Enter the ID of the documentation in the Search... field.

8.5.5.1 Rack and pinion drive lubrication

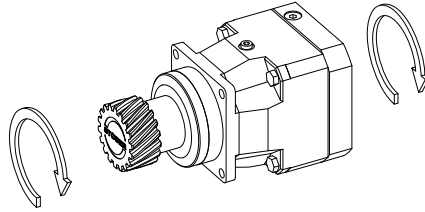
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

8.5.6 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 90 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

8.5.7 Direction of rotation

The input and output rotate in the same direction.



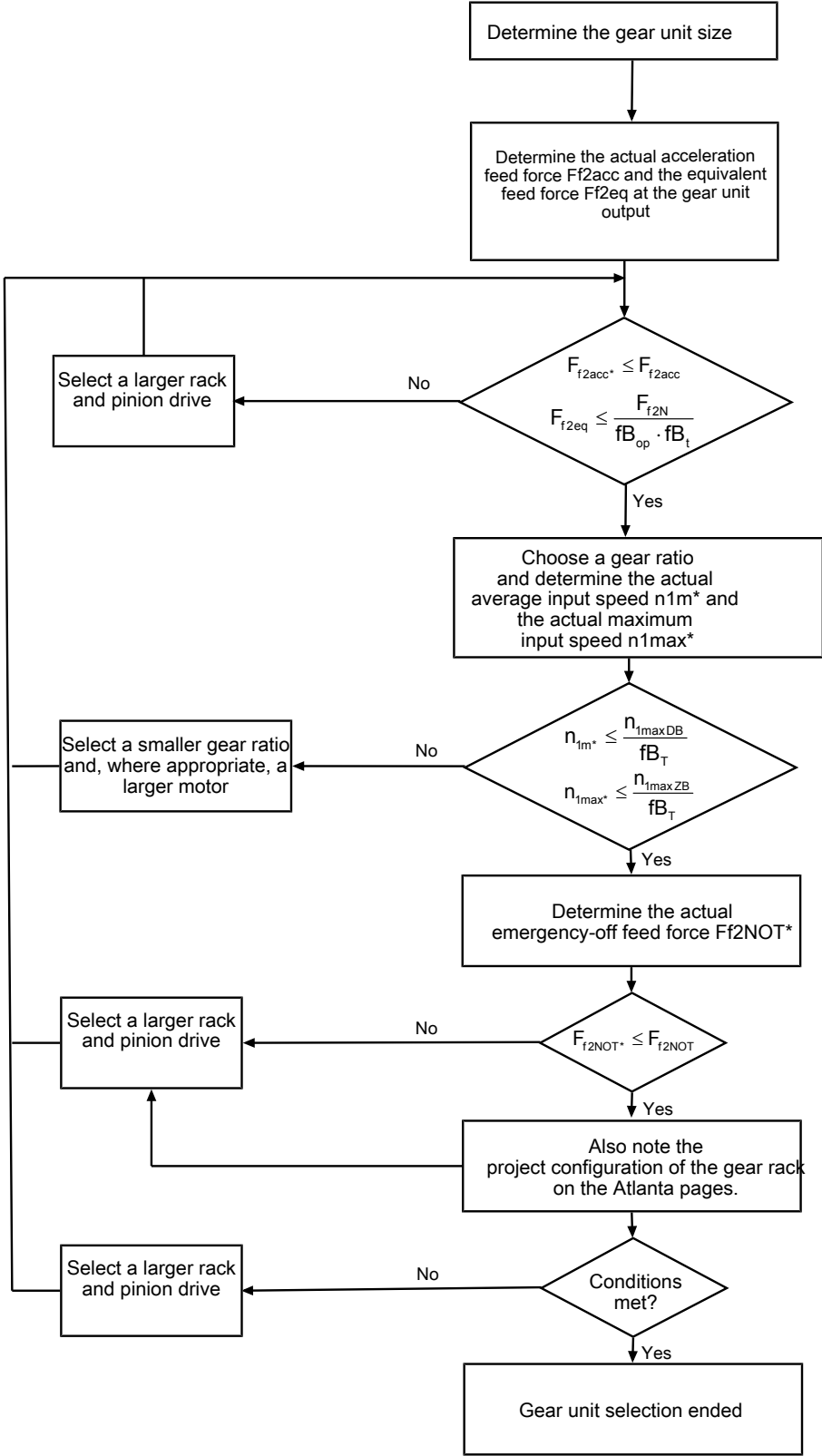
8.6 Project configuration

Project your drives using our SERVOnsoft designing software. You can receive SERVOnsoft 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 *.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

8.6.1 Drive selection

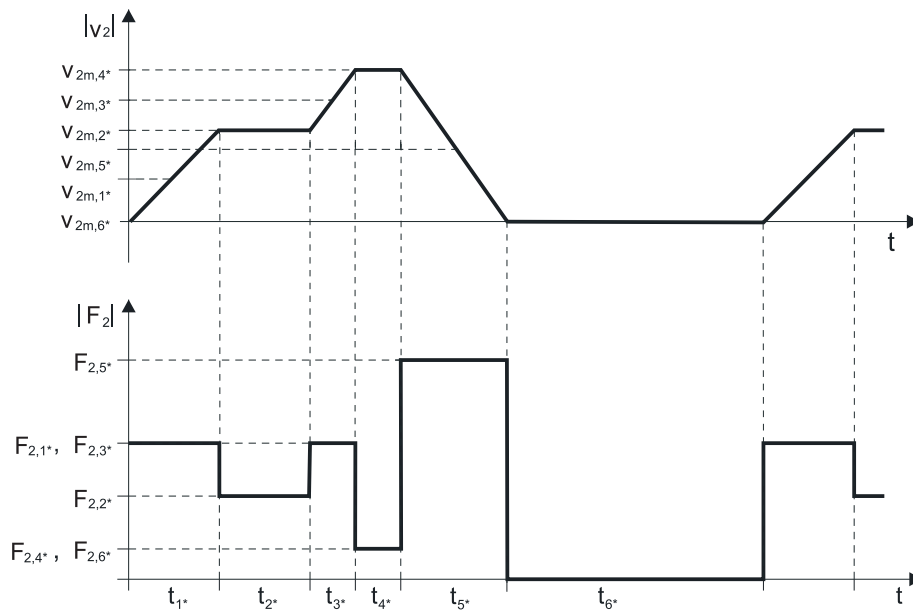


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for fb_T , fb_{op} and fb_t can be found in the corresponding tables in this chapter.

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

$$F_{f2acc^*} = m \cdot a^* + F_{L^*}$$

Calculation of the actual average input speed

$$n_{1m^*} = \frac{v_{2m^*} \cdot i}{d_0 \cdot \pi}$$

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

If $t_{1^*} + \dots + t_{5^*} \geq 10 \text{ min}$, determine v_{2m^*} without the rest phase t_{6^*} .

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT^*} = m \cdot a_{NOT^*} + F_{L^*}$$

Calculation of the actual equivalent feed force

$$F_{f2eq^*} = \sqrt[3]{\frac{|v_{2m,1^*}| \cdot t_{1^*} \cdot |F_{2,1^*}|^3 + \dots + |v_{2m,n^*}| \cdot t_{n^*} \cdot |F_{2,n^*}|^3}{|v_{2m,1^*}| \cdot t_{1^*} + \dots + |v_{2m,n^*}| \cdot t_{n^*}}}$$

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 $\leq 8 \text{ h}$	1.00
Daily run time $\leq 16 \text{ h}$	1.15
Daily run time $\leq 24 \text{ h}$	1.20

Temperature		f_{B_T}
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20\text{ °C}$	0.9
	$\leq 30\text{ °C}$	1.0
	$\leq 40\text{ °C}$	1.15
Motor with convection cooling	$\leq 20\text{ °C}$	1.0
	$\leq 30\text{ °C}$	1.1
	$\leq 40\text{ °C}$	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

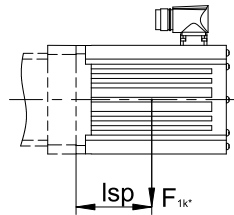
8.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
P221_ME	10
P222_ME	10
P321_ME	20
P322_ME	10
P421_ME	40
P422_ME	20
P521_ME	80
P522_ME	40
P721_ME	200
P722_ME	80
P821_ME	400
P822_ME	200
P921_ME	800
P922_ME	400

8.6.3 Recommendation for radial shaft seal rings

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

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance 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 a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

8.7 Additional documentation

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

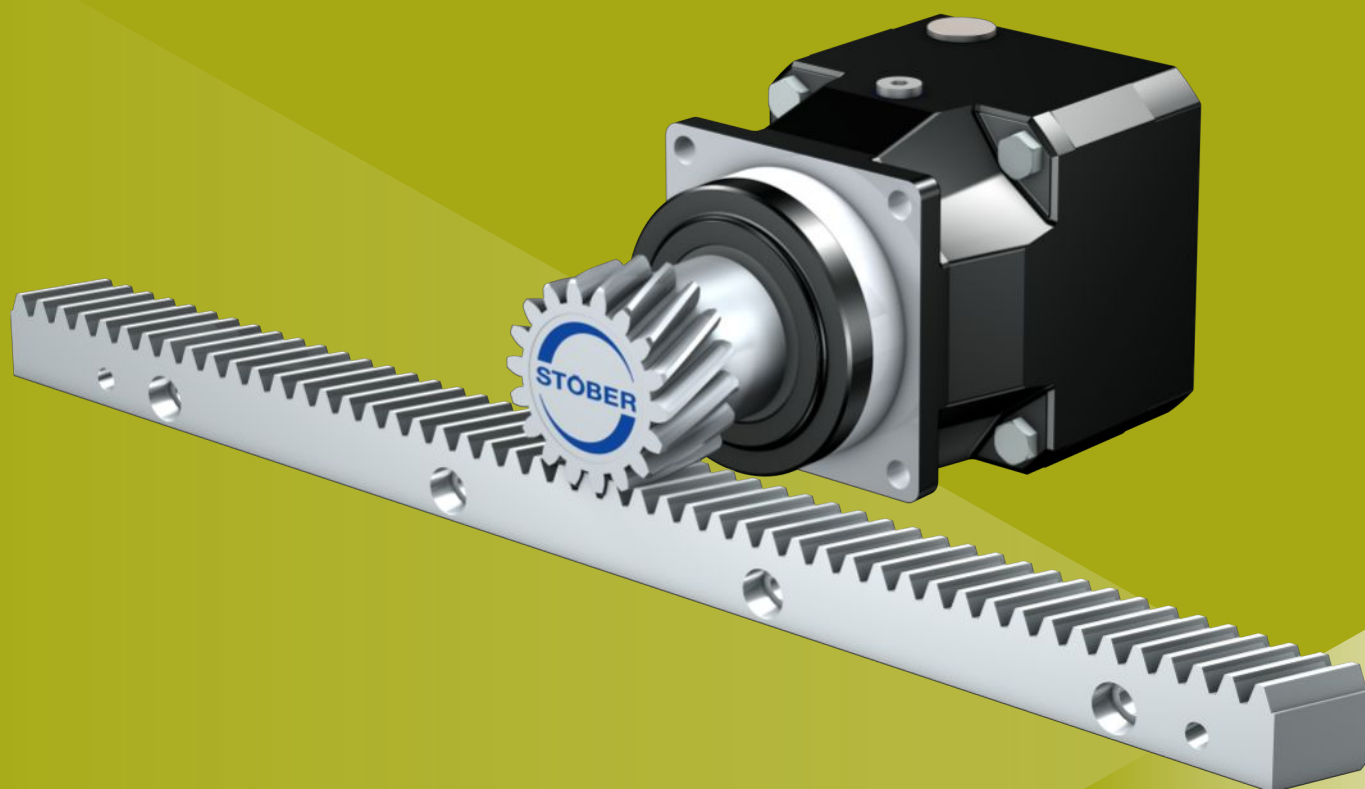
Enter the ID of the documentation in the Search... field.

Documentation	ID
Operating manual Rack and Pinion Drives (Atlanta)	442455
Operating manual for P/PA/PE/PH/PHA/PHQ/PHQA/PHV/PHVA planetary gear units and planetary geared motors	443029_en
Lubricant filling quantities for gear units	441871

9 ZVPA rack and pinion drives

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9 Rack and pinion drives

ZVPA

9.1 Overview

Low-backlash precision planetary gear units with plug-on pinion

Features

Power density	★★★★☆
Linear clearance	★★★★★
Price category	€€€
Smooth operation	★★★★★
Linear rigidity	★★★★☆
Mass moment of inertia	★★★★☆
Ready-to-install drive solution	✓
Pinion gearing quality 7 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓

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

Technical data

m_n	2 – 4 mm
z	16 – 25
F_{f2acc}	2 – 15 kN
$v_{f2maxZB}$	0.14 – 4.9 m/s
Δs	8 – 22 μm

9.2 Selection tables

The technical data specified in the selection tables applies to:

- Bearing design D (axially reinforced)
- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 9.5.3]
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1].

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [mm]	C_{lin} [N/ μm]	m_n [mm]	z	d_0 [mm]	$F_{f2N,S}$ [kN]	$F_{f2N,E}$ [kN]	F_{f2accS} [kN]	F_{f2accE} [kN]	$F_{f2NOT,S}$ [kN]	$F_{f2NOT,E}$ [kN]	M_{2accS} [Nm]	M_{2accE} [Nm]
ZV2PA3 ($F_{f2acc,max} = 2,0 \text{ kN}$)																		
3.000	ZV216S_PA321_0030 MF	3500	6000	≤19	3.56	0.010	52	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
3.000	ZV216S_PA321_0030 MFL	3500	6000	≤24	3.56	0.010	56	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
4.000	ZV216S_PA321_0040 MF	3700	6500	≤19	2.89	0.010	51	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
4.000	ZV216S_PA321_0040 MFL	3700	6500	≤24	2.89	0.010	53	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
5.000	ZV216S_PA321_0050 MF	4000	7000	≤19	2.49	0.010	51	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
5.000	ZV216S_PA321_0050 MFL	4000	7000	≤24	2.49	0.010	52	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
7.000	ZV216S_PA321_0070 MF	4500	8000	≤19	2.03	0.010	45	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
7.000	ZV216S_PA321_0070 MFL	4500	8000	≤24	2.03	0.010	46	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
8.000	ZV216S_PA321_0080 MF	4500	8000	≤19	1.78	0.010	44	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
8.000	ZV216S_PA321_0080 MFL	4500	8000	≤24	1.78	0.010	44	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
10.00	ZV216S_PA321_0100 MF	4500	8000	≤19	1.42	0.010	42	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
10.00	ZV216S_PA321_0100 MFL	4500	8000	≤24	1.42	0.010	42	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
12.00	ZV216S_PA322_0120 MF	4500	8000	≤14	1.19	0.015	45	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
16.00	ZV216S_PA322_0160 MF	4500	8000	≤14	0.89	0.015	47	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
20.00	ZV216S_PA322_0200 MF	4500	8000	≤14	0.71	0.015	48	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
25.00	ZV216S_PA322_0250 MF	4500	8000	≤14	0.57	0.015	48	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
28.00	ZV216S_PA322_0280 MF	4500	8000	≤14	0.51	0.015	47	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
32.00	ZV216S_PA322_0320 MF	4500	8000	≤14	0.44	0.015	43	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
35.00	ZV216S_PA322_0350 MF	4500	8000	≤14	0.41	0.015	48	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
40.00	ZV216S_PA322_0400 MF	4500	8000	≤14	0.36	0.015	46	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
50.00	ZV216S_PA322_0500 MF	4500	8000	≤14	0.28	0.015	47	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
56.00	ZV216S_PA322_0560 MF	4500	8000	≤14	0.25	0.015	43	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
70.00	ZV216S_PA322_0700 MF	4500	8000	≤14	0.20	0.015	44	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
80.00	ZV216S_PA322_0800 MF	4500	8000	≤14	0.18	0.015	43	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
100.0	ZV216S_PA322_1000 MF	4500	8000	≤14	0.14	0.015	42	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
ZV2PA4 ($F_{f2acc,max} = 4,8 \text{ kN}$)																		
3.000	ZV220S_PA421_0030 MF	3000	5500	≤24	4.07	0.012	72	2	20	42.4	2.4	2.4	4.7	3.2	9.7	6.3	100	67
3.000	ZV220S_PA421_0030 MFL	3000	5500	≤32	4.07	0.012	74	2	20	42.4	2.4	2.4	4.7	3.2	9.7	6.3	100	67
4.000	ZV220S_PA421_0040 MF	3300	6000	≤24	3.33	0.012	72	2	20	42.4	3.8	3.2	4.8	3.2	9.7	6.3	100	67
4.000	ZV220S_PA421_0040 MFL	3300	6000	≤32	3.33	0.012	73	2	20	42.4	3.8	3.2	4.8	3.2	9.7	6.3	100	67
5.000	ZV220S_PA421_0050 MF	3700	6500	≤24	2.89	0.012	71	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
5.000	ZV220S_PA421_0050 MFL	3700	6500	≤32	2.89	0.012	72	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
7.000	ZV220S_PA421_0070 MF	4000	7000	≤24	2.22	0.012	64	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
7.000	ZV220S_PA421_0070 MFL	4000	7000	≤32	2.22	0.012	64	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
8.000	ZV220S_PA421_0080 MF	4000	7000	≤24	1.94	0.012	61	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
8.000	ZV220S_PA421_0080 MFL	4000	7000	≤32	1.94	0.012	61	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
10.00	ZV220S_PA421_0100 MF	4000	7000	≤24	1.56	0.012	58	2	20	42.4	2.8	2.8	4.7	3.2	9.4	6.3	100	67
10.00	ZV220S_PA421_0100 MFL	4000	7000	≤32	1.56	0.012	59	2	20	42.4	2.8	2.8	4.7	3.2	9.4	6.3	100	67
12.00	ZV220S_PA422_0120 MF	3700	6500	≤19	1.20	0.019	63	2	20	42.4	2.4	2.4	4.7	3.2	9.7	6.3	100	67
12.00	ZV220S_PA422_0120 MFL	3700	6500	≤24	1.20	0.019	64	2	20	42.4	2.4	2.4	4.7	3.2	9.7	6.3	100	67
16.00	ZV220S_PA422_0160 MF	3700	6500	≤19	0.90	0.019	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
16.00	ZV220S_PA422_0160 MFL	3700	6500	≤24	0.90	0.019	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
20.00	ZV220S_PA422_0200 MF	3700	6500	≤19	0.72	0.019	68	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
20.00	ZV220S_PA422_0200 MFL	3700	6500	≤24	0.72	0.019	68	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
25.00	ZV220S_PA422_0250 MF	4000	7000	≤19	0.62	0.019	68	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
25.00	ZV220S_PA422_0250 MFL	4000	7000	≤24	0.62	0.019	68	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
28.00	ZV220S_PA422_0280 MF	4500	8000	≤19	0.64	0.019	66	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
28.00	ZV220S_PA422_0280 MFL	4500	8000	≤24	0.64	0.019	66	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
32.00	ZV220S_PA422_0320 MF	3700	6500	≤19	0.45	0.019	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67

9.2 Selection tables 9 ZVPA rack and pinion drives

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{2maxZB} [m/s]	Δs [mm]	C _{lin} [N/ μm]	m _n [mm]	z	d ₀ [mm]	F _{f2N,S} [kN]	F _{f2N,E} [kN]	F _{f2accS} [kN]	F _{f2accE} [kN]	F _{f2NOT,S} [kN]	F _{f2NOT,E} [kN]	M _{2accS} [Nm]	M _{2accE} [Nm]
ZV2PA4 (F_{f2acc,max} = 4,8 kN)																		
32.00	ZV220S_PA422_0320 MFL	3700	6500	≤24	0.45	0.019	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
35.00	ZV220S_PA422_0350 MF	4500	8000	≤19	0.51	0.019	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
35.00	ZV220S_PA422_0350 MFL	4500	8000	≤24	0.51	0.019	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
40.00	ZV220S_PA422_0400 MF	4500	8000	≤19	0.44	0.019	65	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
40.00	ZV220S_PA422_0400 MFL	4500	8000	≤24	0.44	0.019	65	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
50.00	ZV220S_PA422_0500 MF	4500	8000	≤19	0.36	0.019	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
50.00	ZV220S_PA422_0500 MFL	4500	8000	≤24	0.36	0.019	67	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
56.00	ZV220S_PA422_0560 MF	4500	8000	≤19	0.32	0.019	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
56.00	ZV220S_PA422_0560 MFL	4500	8000	≤24	0.32	0.019	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
70.00	ZV220S_PA422_0700 MF	4500	8000	≤19	0.25	0.019	62	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
70.00	ZV220S_PA422_0700 MFL	4500	8000	≤24	0.25	0.019	62	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	100	67
80.00	ZV220S_PA422_0800 MF	4500	8000	≤19	0.22	0.019	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
80.00	ZV220S_PA422_0800 MFL	4500	8000	≤24	0.22	0.019	60	2	20	42.4	3.8	3.2	4.7	3.2	9.4	6.3	100	67
100.0	ZV220S_PA422_1000 MF	4500	8000	≤19	0.18	0.019	58	2	20	42.4	2.8	2.8	4.7	3.2	9.4	6.3	100	67
100.0	ZV220S_PA422_1000 MFL	4500	8000	≤24	0.18	0.019	58	2	20	42.4	2.8	2.8	4.7	3.2	9.4	6.3	100	67
ZV2PA5 (F_{f2acc,max} = 9,6 kN)																		
3.000	ZV225S_PA521_0030 MF	2500	4500	≤32	4.17	0.008	110	2	25	53.1	4.5	4.4	7.5	5.1	17	10	200	130
3.000	ZV225S_PA521_0030 MFL	2500	4500	≤38	4.17	0.008	116	2	25	53.1	4.5	4.4	7.5	5.1	17	10	200	130
4.000	ZV225S_PA521_0040 MF	3000	5000	≤32	3.47	0.008	107	2	25	53.1	6.4	4.8	9.6	5.1	19	10	260	130
4.000	ZV225S_PA521_0040 MFL	3000	5000	≤38	3.47	0.008	110	2	25	53.1	6.4	4.8	9.6	5.1	19	10	260	130
5.000	ZV225S_PA521_0050 MF	3500	6000	≤32	3.33	0.008	107	2	25	53.1	6.9	5.1	9.6	5.1	19	10	260	130
5.000	ZV225S_PA521_0050 MFL	3500	6000	≤38	3.33	0.008	109	2	25	53.1	6.9	5.1	9.6	5.1	19	10	260	130
7.000	ZV225S_PA521_0070 MF	3700	6500	≤32	2.58	0.008	100	2	25	53.1	7.7	5.1	9.6	5.1	19	10	260	130
7.000	ZV225S_PA521_0070 MFL	3700	6500	≤38	2.58	0.008	101	2	25	53.1	7.7	5.1	9.6	5.1	19	10	260	130
8.000	ZV225S_PA521_0080 MF	3700	6500	≤32	2.26	0.008	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
8.000	ZV225S_PA521_0080 MFL	3700	6500	≤38	2.26	0.008	96	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
10.000	ZV225S_PA521_0100 MF	3700	6500	≤32	1.81	0.008	93	2	25	53.1	5.3	5.1	9.4	5.1	19	10	250	130
10.000	ZV225S_PA521_0100 MFL	3700	6500	≤38	1.81	0.008	94	2	25	53.1	5.3	5.1	9.4	5.1	19	10	250	130
12.000	ZV225S_PA522_0120 MF	3300	6000	≤24	1.39	0.015	99	2	25	53.1	4.5	4.5	7.5	5.1	17	10	200	130
12.000	ZV225S_PA522_0120 MFL	3300	6000	≤32	1.39	0.015	100	2	25	53.1	4.5	4.5	7.5	5.1	17	10	200	130
16.000	ZV225S_PA522_0160 MF	3300	6000	≤24	1.04	0.015	101	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
16.000	ZV225S_PA522_0160 MFL	3300	6000	≤32	1.04	0.015	101	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
20.000	ZV225S_PA522_0200 MF	3300	6000	≤24	0.83	0.015	103	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
20.000	ZV225S_PA522_0200 MFL	3300	6000	≤32	0.83	0.015	103	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
25.000	ZV225S_PA522_0250 MF	3700	6500	≤24	0.72	0.015	103	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
25.000	ZV225S_PA522_0250 MFL	3700	6500	≤32	0.72	0.015	103	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
28.000	ZV225S_PA522_0280 MF	4000	7000	≤24	0.69	0.015	99	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
28.000	ZV225S_PA522_0280 MFL	4000	7000	≤32	0.69	0.015	99	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
32.000	ZV225S_PA522_0320 MF	3300	6000	≤24	0.52	0.015	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
32.000	ZV225S_PA522_0320 MFL	3300	6000	≤32	0.52	0.015	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
35.000	ZV225S_PA522_0350 MF	4000	7000	≤24	0.56	0.015	102	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
35.000	ZV225S_PA522_0350 MFL	4000	7000	≤32	0.56	0.015	102	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
40.000	ZV225S_PA522_0400 MF	4000	7000	≤24	0.49	0.015	98	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
40.000	ZV225S_PA522_0400 MFL	4000	7000	≤32	0.49	0.015	98	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
50.000	ZV225S_PA522_0500 MF	4000	7000	≤24	0.39	0.015	101	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
50.000	ZV225S_PA522_0500 MFL	4000	7000	≤32	0.39	0.015	101	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
56.000	ZV225S_PA522_0560 MF	4000	7000	≤24	0.35	0.015	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
56.000	ZV225S_PA522_0560 MFL	4000	7000	≤32	0.35	0.015	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
70.000	ZV225S_PA522_0700 MF	4000	7000	≤24	0.28	0.015	98	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
70.000	ZV225S_PA522_0700 MFL	4000	7000	≤32	0.28	0.015	98	2	25	53.1	7.9	5.1	9.6	5.1	19	10	260	130
80.000	ZV225S_PA522_0800 MF	4000	7000	≤24	0.24	0.015	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
80.000	ZV225S_PA522_0800 MFL	4000	7000	≤32	0.24	0.015	95	2	25	53.1	7.5	5.1	9.4	5.1	19	10	250	130
100.0	ZV225S_PA522_1000 MF	4000	7000	≤24	0.19	0.015	92	2	25	53.1	5.3	5.1	9.4	5.1	19	10	250	130
100.0	ZV225S_PA522_1000 MFL	4000	7000	≤32	0.19	0.015	92	2	25	53.1	5.3	5.1	9.4	5.1	19	10	250	130
ZV3PA5 (F_{f2acc,max} = 10 kN)																		
3.000	ZV318S_PA521_0030 MF	2500	4500	≤32	4.50	0.008	102	3	18	57.3	4.2	4.2	7.0	5.2	16	10	200	150
3.000	ZV318S_PA521_0030 MFL	2500	4500	≤38	4.50	0.008	108	3	18	57.3	4.2	4.2	7.0	5.2	16	10	200	150
4.000	ZV318S_PA521_0040 MF	3000	5000	≤32	3.75	0.008	99	3	18	57.3	6.2	4.9	10	5.2	21	10	300	150
4.000	ZV318S_PA521_0040 MFL	3000	5000	≤38	3.75	0.008	102	3	18	57.3	6.2	4.9	10	5.2	21	10	300	150
5.000	ZV318S_PA521_0050 MF	3500	6000	≤32	3.60	0.008	99	3	18	57.3	6.7	5.2	10	5.2	21	10	300	150
5.000	ZV318S_PA521_0050 MFL	3500	6000	≤38	3.60	0.008	101	3	18	57.3	6.7	5.2	10	5.2	21	10	300	150
7.000	ZV318S_PA521_0070 MF	3700	6500	≤32	2.79	0.008	92	3	18	57.3	7.3	5.2	9.4	5.2	21	10	270	150
7.000	ZV318S_PA521_0070 MFL	3700	6500	≤38	2.79	0.008	93	3	18	57.3	7.3	5.2	9.4	5.2	21	10	270	150
8.000	ZV318S_PA521_0080 MF	3700	6500	≤32	2.44	0.008	88	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
8.000	ZV318S_PA521_0080 MFL	3700	6500	≤38	2.44	0.008	88	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{2maxZB} [m/s]	Δs [mm]	C _{lin} [N/ μm]	m _n [mm]	z	d ₀ [mm]	F _{f2N,S} [kN]	F _{f2N,E} [kN]	F _{f2accS} [kN]	F _{f2accE} [kN]	F _{f2NOT,S} [kN]	F _{f2NOT,E} [kN]	M _{2accS} [Nm]	M _{2accE} [Nm]
ZV3PA5 (F_{f2acc,max} = 10 kN)																		
10.00	ZV318S_PA521_0100 MF	3700	6500	≤32	1.95	0.008	85	3	18	57.3	4.9	4.9	8.7	5.2	17	10	250	150
10.00	ZV318S_PA521_0100 MFL	3700	6500	≤38	1.95	0.008	86	3	18	57.3	4.9	4.9	8.7	5.2	17	10	250	150
12.00	ZV318S_PA522_0120 MF	3300	6000	≤24	1.50	0.017	92	3	18	57.3	4.2	4.2	7.0	5.2	16	10	200	150
12.00	ZV318S_PA522_0120 MFL	3300	6000	≤32	1.50	0.017	92	3	18	57.3	4.2	4.2	7.0	5.2	16	10	200	150
16.00	ZV318S_PA522_0160 MF	3300	6000	≤24	1.13	0.017	93	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
16.00	ZV318S_PA522_0160 MFL	3300	6000	≤32	1.13	0.017	93	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
20.00	ZV318S_PA522_0200 MF	3300	6000	≤24	0.90	0.017	95	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
20.00	ZV318S_PA522_0200 MFL	3300	6000	≤32	0.90	0.017	95	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
25.00	ZV318S_PA522_0250 MF	3700	6500	≤24	0.78	0.017	95	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
25.00	ZV318S_PA522_0250 MFL	3700	6500	≤32	0.78	0.017	95	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
28.00	ZV318S_PA522_0280 MF	4000	7000	≤24	0.75	0.017	91	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
28.00	ZV318S_PA522_0280 MFL	4000	7000	≤32	0.75	0.017	91	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
32.00	ZV318S_PA522_0320 MF	3300	6000	≤24	0.56	0.017	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
32.00	ZV318S_PA522_0320 MFL	3300	6000	≤32	0.56	0.017	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
35.00	ZV318S_PA522_0350 MF	4000	7000	≤24	0.60	0.017	94	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
35.00	ZV318S_PA522_0350 MFL	4000	7000	≤32	0.60	0.017	94	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
40.00	ZV318S_PA522_0400 MF	4000	7000	≤24	0.53	0.017	90	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
40.00	ZV318S_PA522_0400 MFL	4000	7000	≤32	0.53	0.017	90	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
50.00	ZV318S_PA522_0500 MF	4000	7000	≤24	0.42	0.017	93	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
50.00	ZV318S_PA522_0500 MFL	4000	7000	≤32	0.42	0.017	93	3	18	57.3	7.3	5.2	10	5.2	21	10	300	150
56.00	ZV318S_PA522_0560 MF	4000	7000	≤24	0.38	0.017	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
56.00	ZV318S_PA522_0560 MFL	4000	7000	≤32	0.38	0.017	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
70.00	ZV318S_PA522_0700 MF	4000	7000	≤24	0.30	0.017	90	3	18	57.3	7.3	5.2	9.4	5.2	21	10	270	150
70.00	ZV318S_PA522_0700 MFL	4000	7000	≤32	0.30	0.017	90	3	18	57.3	7.3	5.2	9.4	5.2	21	10	270	150
80.00	ZV318S_PA522_0800 MF	4000	7000	≤24	0.26	0.017	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
80.00	ZV318S_PA522_0800 MFL	4000	7000	≤32	0.26	0.017	87	3	18	57.3	7.0	5.2	8.7	5.2	17	10	250	150
100.0	ZV318S_PA522_1000 MF	4000	7000	≤24	0.21	0.017	85	3	18	57.3	4.9	4.9	8.7	5.2	17	10	250	150
100.0	ZV318S_PA522_1000 MFL	4000	7000	≤32	0.21	0.017	85	3	18	57.3	4.9	4.9	8.7	5.2	17	10	250	150
ZV3PA7 (F_{f2acc,max} = 14 kN)																		
3.000	ZV322S_PA721_0030 MF	2200	3700	≤38	4.52	0.010	117	3	22	70.0	6.1	4.3	14	7.0	28	14	500	240
3.000	ZV322S_PA721_0030 MFL	2200	3700	≤48	4.52	0.010	124	3	22	70.0	6.1	4.3	14	7.0	28	14	500	240
4.000	ZV322S_PA721_0040 MF	2500	4500	≤38	4.13	0.010	118	3	22	70.0	6.7	4.7	14	7.0	28	14	500	240
4.000	ZV322S_PA721_0040 MFL	2500	4500	≤48	4.13	0.010	121	3	22	70.0	6.7	4.7	14	7.0	28	14	500	240
5.000	ZV322S_PA721_0050 MF	3000	5500	≤38	4.03	0.010	117	3	22	70.0	7.3	5.1	14	7.0	28	14	500	240
5.000	ZV322S_PA721_0050 MFL	3000	5500	≤48	4.03	0.010	119	3	22	70.0	7.3	5.1	14	7.0	28	14	500	240
7.000	ZV322S_PA721_0070 MF	3300	6000	≤38	3.14	0.010	115	3	22	70.0	8.1	5.7	14	7.0	28	14	500	240
7.000	ZV322S_PA721_0070 MFL	3300	6000	≤48	3.14	0.010	116	3	22	70.0	8.1	5.7	14	7.0	28	14	500	240
8.000	ZV322S_PA721_0080 MF	3300	6000	≤38	2.75	0.010	112	3	22	70.0	8.5	5.9	14	7.0	28	14	500	240
8.000	ZV322S_PA721_0080 MFL	3300	6000	≤48	2.75	0.010	113	3	22	70.0	8.5	5.9	14	7.0	28	14	500	240
10.00	ZV322S_PA721_0100 MF	3300	6000	≤38	2.20	0.010	107	3	22	70.0	8.6	6.4	14	7.0	28	14	500	240
10.00	ZV322S_PA721_0100 MFL	3300	6000	≤48	2.20	0.010	108	3	22	70.0	8.6	6.4	14	7.0	28	14	500	240
12.00	ZV322S_PA722_0120 MF	3000	5000	≤32	1.53	0.020	113	3	22	70.0	8.0	6.8	14	7.0	28	14	500	240
12.00	ZV322S_PA722_0120 MFL	3000	5000	≤38	1.53	0.020	113	3	22	70.0	8.0	6.8	14	7.0	28	14	500	240
16.00	ZV322S_PA722_0160 MF	3000	5000	≤32	1.15	0.020	115	3	22	70.0	11	7.0	14	7.0	28	14	500	240
16.00	ZV322S_PA722_0160 MFL	3000	5000	≤38	1.15	0.020	115	3	22	70.0	11	7.0	14	7.0	28	14	500	240
20.00	ZV322S_PA722_0200 MF	3000	5000	≤32	0.92	0.020	115	3	22	70.0	12	7.0	14	7.0	28	14	500	240
20.00	ZV322S_PA722_0200 MFL	3000	5000	≤38	0.92	0.020	115	3	22	70.0	12	7.0	14	7.0	28	14	500	240
25.00	ZV322S_PA722_0250 MF	3500	6000	≤32	0.88	0.020	115	3	22	70.0	12	7.0	14	7.0	28	14	500	240
25.00	ZV322S_PA722_0250 MFL	3500	6000	≤38	0.88	0.020	115	3	22	70.0	12	7.0	14	7.0	28	14	500	240
28.00	ZV322S_PA722_0280 MF	3700	6500	≤32	0.85	0.020	114	3	22	70.0	12	7.0	14	7.0	28	14	500	240
28.00	ZV322S_PA722_0280 MFL	3700	6500	≤38	0.85	0.020	114	3	22	70.0	12	7.0	14	7.0	28	14	500	240
32.00	ZV322S_PA722_0320 MF	3000	5000	≤32	0.57	0.020	112	3	22	70.0	11	7.0	14	7.0	28	14	500	240
32.00	ZV322S_PA722_0320 MFL	3000	5000	≤38	0.57	0.020	112	3	22	70.0	11	7.0	14	7.0	28	14	500	240
35.00	ZV322S_PA722_0350 MF	3700	6500	≤32	0.68	0.020	115	3	22	70.0	12	7.0	14	7.0	28	14	500	240
35.00	ZV322S_PA722_0350 MFL	3700	6500	≤38	0.68	0.020	115	3	22	70.0	12	7.0	14	7.0	28	14	500	240
40.00	ZV322S_PA722_0400 MF	3700	6500	≤32	0.60	0.020	113	3	22	70.0	12	7.0	14	7.0	28	14	500	240
40.00	ZV322S_PA722_0400 MFL	3700	6500	≤38	0.60	0.020	113	3	22	70.0	12	7.0	14	7.0	28	14	500	240
50.00	ZV322S_PA722_0500 MF	3700	6500	≤32	0.48	0.020	114	3	22	70.0	12	7.0	14	7.0	28	14	500	240
50.00	ZV322S_PA722_0500 MFL	3700	6500	≤38	0.48	0.020	114	3	22	70.0	12	7.0	14	7.0	28	14	500	240
56.00	ZV322S_PA722_0560 MF	3700	6500	≤32	0.43	0.020	112	3	22	70.0	11	7.0	14	7.0	28	14	500	240
56.00	ZV322S_PA722_0560 MFL	3700	6500	≤38	0.43	0.020	112	3	22	70.0	11	7.0	14	7.0	28	14	500	240
70.00	ZV322S_PA722_0700 MF	3700	6500	≤32	0.34	0.020	114	3	22	70.0	12	7.0	14	7.0	28	14	500	240
70.00	ZV322S_PA722_0700 MFL	3700	6500	≤38	0.34	0.020	114	3	22	70.0	12	7.0	14	7.0	28	14	500	240
80.00	ZV322S_PA722_0800 MF	3700	6500	≤32	0.30	0.020	112	3	22	70.0	11	7.0	14	7.0	28	14	500	240
80.00	ZV322S_PA722_0800 MFL	3700	6500	≤38	0.30	0.020	112	3	22	70.0	11	7.0	14	7.0	28	14	500	240

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	v_{2maxZB} [m/s]	Δs [mm]	C_{lin} [N/ μm]	m_n [mm]	z	d_0 [mm]	$F_{f2N,S}$ [kN]	$F_{f2N,E}$ [kN]	F_{f2accS} [kN]	F_{f2accE} [kN]	$F_{f2NOT,S}$ [kN]	$F_{f2NOT,E}$ [kN]	M_{2accS} [Nm]	M_{2accE} [Nm]
ZV3PA7 ($F_{f2acc,max} = 14$ kN)																		
100.0	ZV322S_PA722_1000 MF	3700	6500	≤ 32	0.24	0.020	107	3	22	70.0	8.6	7.0	14	7.0	28	14	500	240
100.0	ZV322S_PA722_1000 MFL	3700	6500	≤ 38	0.24	0.020	107	3	22	70.0	8.6	7.0	14	7.0	28	14	500	240
ZV4PA7 ($F_{f2acc,max} = 15$ kN)																		
3.000	ZV418S_PA721_0030 MF	2200	3700	≤ 38	4.93	0.011	108	4	18	76.4	5.9	4.4	13	7.3	26	15	500	280
3.000	ZV418S_PA721_0030 MFL	2200	3700	≤ 48	4.93	0.011	115	4	18	76.4	5.9	4.4	13	7.3	27	15	500	280
4.000	ZV418S_PA721_0040 MF	2500	4500	≤ 38	4.50	0.011	108	4	18	76.4	6.5	4.8	15	7.3	30	15	570	280
4.000	ZV418S_PA721_0040 MFL	2500	4500	≤ 48	4.50	0.011	112	4	18	76.4	6.5	4.8	15	7.3	30	15	570	280
5.000	ZV418S_PA721_0050 MF	3000	5500	≤ 38	4.40	0.011	107	4	18	76.4	7.0	5.2	15	7.3	30	15	570	280
5.000	ZV418S_PA721_0050 MFL	3000	5500	≤ 48	4.40	0.011	110	4	18	76.4	7.0	5.2	15	7.3	30	15	570	280
7.000	ZV418S_PA721_0070 MF	3300	6000	≤ 38	3.43	0.011	105	4	18	76.4	7.8	5.8	15	7.3	30	15	570	280
7.000	ZV418S_PA721_0070 MFL	3300	6000	≤ 48	3.43	0.011	107	4	18	76.4	7.8	5.8	15	7.3	30	15	570	280
8.000	ZV418S_PA721_0080 MF	3300	6000	≤ 38	3.00	0.011	103	4	18	76.4	8.2	6.1	13	7.3	26	15	500	280
8.000	ZV418S_PA721_0080 MFL	3300	6000	≤ 48	3.00	0.011	104	4	18	76.4	8.2	6.1	13	7.3	26	15	500	280
10.000	ZV418S_PA721_0100 MF	3300	6000	≤ 38	2.40	0.011	98	4	18	76.4	7.9	6.6	13	7.3	26	15	500	280
10.000	ZV418S_PA721_0100 MFL	3300	6000	≤ 48	2.40	0.011	98	4	18	76.4	7.9	6.6	13	7.3	26	15	500	280
12.000	ZV418S_PA722_0120 MF	3000	5000	≤ 32	1.67	0.022	103	4	18	76.4	7.3	7.0	13	7.3	27	15	500	280
12.000	ZV418S_PA722_0120 MFL	3000	5000	≤ 38	1.67	0.022	104	4	18	76.4	7.3	7.0	13	7.3	27	15	500	280
16.000	ZV418S_PA722_0160 MF	3000	5000	≤ 32	1.25	0.022	105	4	18	76.4	10	7.3	15	7.3	30	15	570	280
16.000	ZV418S_PA722_0160 MFL	3000	5000	≤ 38	1.25	0.022	106	4	18	76.4	10	7.3	15	7.3	30	15	570	280
20.000	ZV418S_PA722_0200 MF	3000	5000	≤ 32	1.00	0.022	106	4	18	76.4	11	7.3	15	7.3	30	15	570	280
20.000	ZV418S_PA722_0200 MFL	3000	5000	≤ 38	1.00	0.022	106	4	18	76.4	11	7.3	15	7.3	30	15	570	280
25.000	ZV418S_PA722_0250 MF	3500	6000	≤ 32	0.96	0.022	106	4	18	76.4	12	7.3	15	7.3	30	15	570	280
25.000	ZV418S_PA722_0250 MFL	3500	6000	≤ 38	0.96	0.022	106	4	18	76.4	12	7.3	15	7.3	30	15	570	280
28.000	ZV418S_PA722_0280 MF	3700	6500	≤ 32	0.93	0.022	105	4	18	76.4	12	7.3	15	7.3	30	15	570	280
28.000	ZV418S_PA722_0280 MFL	3700	6500	≤ 38	0.93	0.022	105	4	18	76.4	12	7.3	15	7.3	30	15	570	280
32.000	ZV418S_PA722_0320 MF	3000	5000	≤ 32	0.63	0.022	103	4	18	76.4	10	7.3	13	7.3	26	15	500	280
32.000	ZV418S_PA722_0320 MFL	3000	5000	≤ 38	0.63	0.022	103	4	18	76.4	10	7.3	13	7.3	26	15	500	280
35.000	ZV418S_PA722_0350 MF	3700	6500	≤ 32	0.74	0.022	105	4	18	76.4	12	7.3	15	7.3	30	15	570	280
35.000	ZV418S_PA722_0350 MFL	3700	6500	≤ 38	0.74	0.022	105	4	18	76.4	12	7.3	15	7.3	30	15	570	280
40.000	ZV418S_PA722_0400 MF	3700	6500	≤ 32	0.65	0.022	104	4	18	76.4	12	7.3	15	7.3	30	15	570	280
40.000	ZV418S_PA722_0400 MFL	3700	6500	≤ 38	0.65	0.022	104	4	18	76.4	12	7.3	15	7.3	30	15	570	280
50.000	ZV418S_PA722_0500 MF	3700	6500	≤ 32	0.52	0.022	104	4	18	76.4	12	7.3	15	7.3	30	15	570	280
50.000	ZV418S_PA722_0500 MFL	3700	6500	≤ 38	0.52	0.022	104	4	18	76.4	12	7.3	15	7.3	30	15	570	280
56.000	ZV418S_PA722_0560 MF	3700	6500	≤ 32	0.46	0.022	103	4	18	76.4	10	7.3	13	7.3	26	15	500	280
56.000	ZV418S_PA722_0560 MFL	3700	6500	≤ 38	0.46	0.022	103	4	18	76.4	10	7.3	13	7.3	26	15	500	280
70.000	ZV418S_PA722_0700 MF	3700	6500	≤ 32	0.37	0.022	104	4	18	76.4	12	7.3	15	7.3	30	15	570	280
70.000	ZV418S_PA722_0700 MFL	3700	6500	≤ 38	0.37	0.022	104	4	18	76.4	12	7.3	15	7.3	30	15	570	280
80.000	ZV418S_PA722_0800 MF	3700	6500	≤ 32	0.33	0.022	103	4	18	76.4	10	7.3	13	7.3	26	15	500	280
80.000	ZV418S_PA722_0800 MFL	3700	6500	≤ 38	0.33	0.022	103	4	18	76.4	10	7.3	13	7.3	26	15	500	280
100.000	ZV418S_PA722_1000 MF	3700	6500	≤ 32	0.26	0.022	97	4	18	76.4	7.9	7.3	13	7.3	26	15	500	280
100.000	ZV418S_PA722_1000 MFL	3700	6500	≤ 38	0.26	0.022	97	4	18	76.4	7.9	7.3	13	7.3	26	15	500	280

9.3 Dimensional drawings

In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

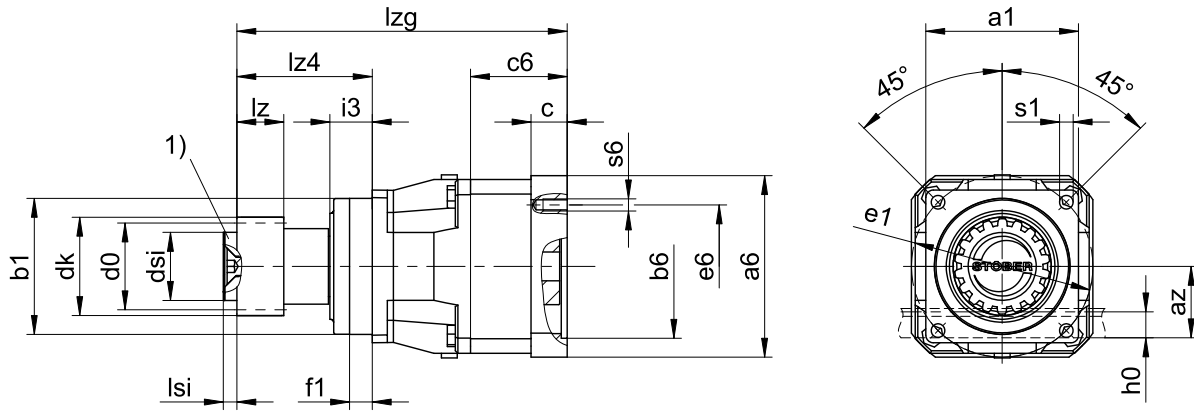
Dimension a_z in the tables of dimensions applies to Atlanta gear racks. In general: $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.

9.3.1 Pinion position E



1) Axial locking (optional)

Output dimensions

Type	mn	□a1	az	Øb1	Ød0	Ødk	Ødsi	Øe1	f1	h0	i3	lz	lz4	lsi	Øs1	x
ZV216SEPA3_	2	72	39.98	60 _{h6}	33.95	39.81	25	75	7.5	22	19	26	49.5	5	5.5	0.5
ZV220SEPA4_	2	76	44.02	70 _{h6}	42.44	47.90	30	85	7.5	22	19	26	57.5	7	6.6	0.4
ZV225SEPA5_	2	101	49.33	90 _{h6}	53.05	58.52	45	120	15.0	22	29	26	89.5	9	9.0	0.4
ZV318SEPA5_	3	101	55.55	90 _{h6}	57.30	65.01	45	120	15.0	26	29	31	89.5	9	9.0	0.3
ZV322SEPA7_	3	144	62.21	130 _{h6}	70.03	78.35	55	165	3.5	26	29	31	113.5	11	11.0	0.4
ZV418SEPA7_	4	144	74.40	130 _{h6}	76.40	86.77	55	165	3.5	35	29	41	113.5	11	11.0	0.3

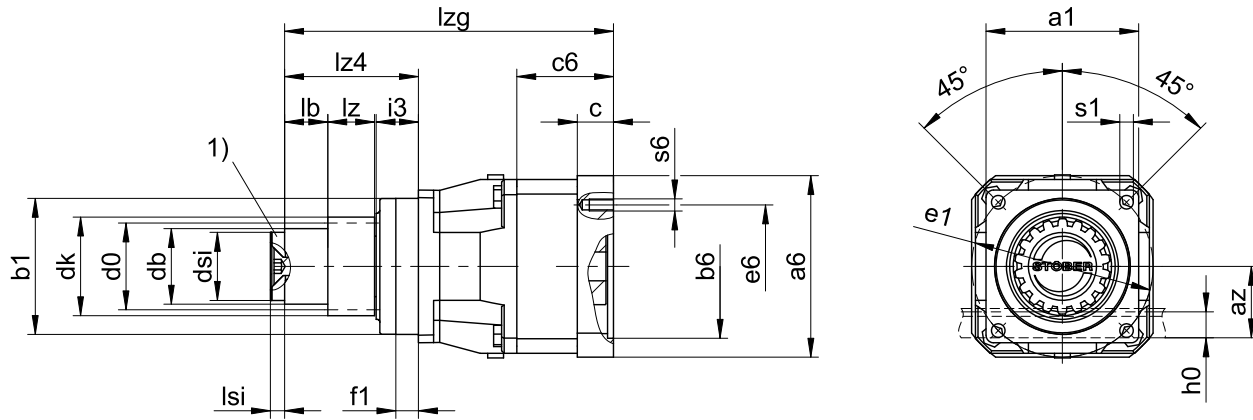
Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZV_PA321_	75	60 ^{H7}	75	18	51.5	154.5	M5
ZV_PA322_	55	40 ^{H7}	63	15	36.0	179.0	M5
ZV_PA421_	100	95 ^{H7}	115	21	56.0	175.5	M8
ZV_PA422_	75	60 ^{H7}	75	18	51.5	220.0	M5
ZV_PA521_	120	110 ^{H7}	130	24	67.5	222.0	M8
ZV_PA522_	100	95 ^{H7}	115	21	56.0	265.0	M8
ZV_PA721_	150	130 ^{H7}	165	26	78.0	271.5	M10
ZV_PA722_	120	110 ^{H7}	130	24	67.5	323.0	M8

In the table above, you will find example dimensions for the motor connection for motor adapter MF. **Note that when dimension c is lengthened, dimensions c6 and lzg are lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters MF and MFL in our STOEBER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

9.3.2 Pinion position S



1) Axial locking (optional)

Output dimensions

Type	mn	□a1	az	Øb1	Ød0	Ødb	Ødk	Ødsi	Øe1	f1	h0	i3	lb	lz	lz4	lsi	Øs1	x
ZV216SSPA3_	2	72	39.98	60 _{h6}	33.95	30	39.81	25	75	7.5	22	18	4.5	26	49.5	5	5.5	0.5
ZV220SSPA4_	2	76	44.02	70 _{h6}	42.44	38	47.90	30	85	7.5	22	18	12.5	26	57.5	7	6.6	0.4
ZV225SSPA5_	2	101	49.33	90 _{h6}	53.05	50	58.52	45	120	15.0	22	28	34.5	26	89.5	9	9.0	0.4
ZV318SSPA5_	3	101	55.55	90 _{h6}	57.30	50	65.01	45	120	15.0	26	28	29.5	31	89.5	9	9.0	0.3
ZV322SSPA7_	3	144	62.21	130 _{h6}	70.03	62	78.35	55	165	3.5	26	28	53.5	31	113.5	11	11.0	0.4
ZV418SSPA7_	4	144	74.40	130 _{h6}	76.40	62	86.77	55	165	3.5	35	28	43.5	41	113.5	11	11.0	0.3

Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZV_PA321_	75	60 ^{H7}	75	18	51.5	154.5	M5
ZV_PA322_	55	40 ^{H7}	63	15	36.0	179.0	M5
ZV_PA421_	100	95 ^{H7}	115	21	56.0	175.5	M8
ZV_PA422_	75	60 ^{H7}	75	18	51.5	220.0	M5
ZV_PA521_	120	110 ^{H7}	130	24	67.5	222.0	M8
ZV_PA522_	100	95 ^{H7}	115	21	56.0	265.0	M8
ZV_PA721_	150	130 ^{H7}	165	26	78.0	271.5	M10
ZV_PA722_	120	110 ^{H7}	130	24	67.5	323.0	M8

In the table above, you will find example dimensions for the motor connection for motor adapter MF. **Note that when dimension c is lengthened, dimensions c6 and lzg are lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters MF and MFL in our STOEGER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

9.4 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.

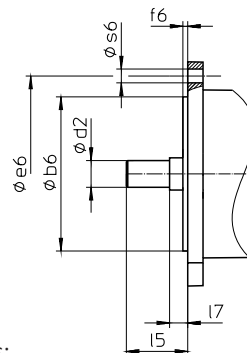
Sample code

Z	V	3	22	S	S	PA	7	2	1	S	P	D	0050	MF
---	---	---	----	---	---	----	---	---	---	---	---	---	------	----

Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
V	Design	Plug-on pinion
3	Module	$m_n = 3$ (example)
22	Number of teeth	$z = 22$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
E	Pinion position	Shaft end
S		Shaft shoulder
PA	Type	Low-backlash planetary gear unit
7	Size	7 (example)
2	Generation	Generation 2
1	Stages	Single-stage
2		Two-stage
S	Housing	Standard
P	Shaft	Solid shaft with feather key
D	Bearing	Axially reinforced bearing
0050	Transmission ratio ($i \times 10$)	$i = 5$ (example)
MF	Motor adapter	Motor adapter with FlexiAdapt® coupling
MFL		Motor adapter with FlexiAdapt® coupling for large motors

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at <http://configurator.stoeber.de> and choose your motor or the dimensions of the motor connection.

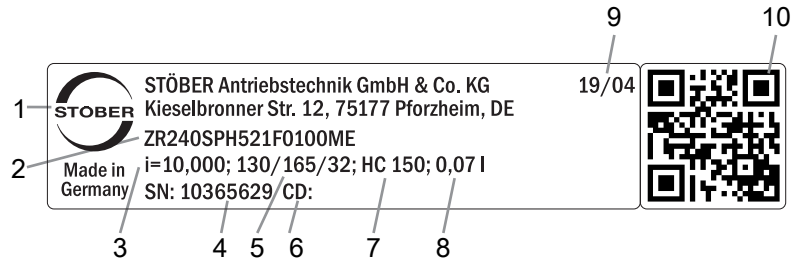
- For axial locking (optional), see the chapter [▶ 9.3]
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation upon request

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter.

All input options available upon request are listed in the chapter [▶ 9.5.2].

9.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

9.4.1.1 Supporting documents

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

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

9.5 Product description

9.5.1 Motor adapter with FlexiAdapt® coupling (MF/MFL)

Properties:

- Fast and easy motor attachment
- Rugged, laser-welded bellow coupling with expanding function
- With integrated thermal length compensation, compensates for linear expansion of the motor shaft
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor

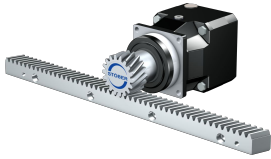


Fig. 1: FlexiAdapt® coupling

9.5.2 Input options

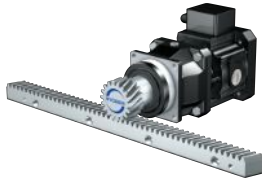
In this chapter, you will find all available input options:

MF motor adapter



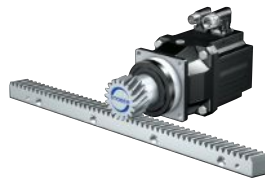
<http://www.stoeber.de/en/ZVPAMF>

MB motor adapter



On request

EZ synchronous servo motor



On request

9.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 7.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	8	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

9.5.3.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S)

Please specify the desired attachment position when placing your purchase order.

9.5.4 Installation conditions

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

9.5.5 Lubricants

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

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stoeber.de/en/download>. Enter the ID of the documentation in the Search... field.

9.5.5.1 Rack and pinion drive lubrication

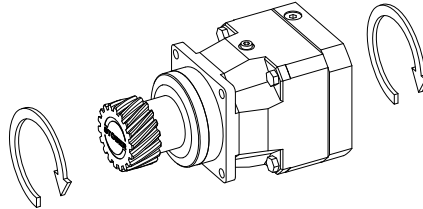
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

9.5.6 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 90 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

9.5.7 Direction of rotation

The input and output rotate in the same direction.



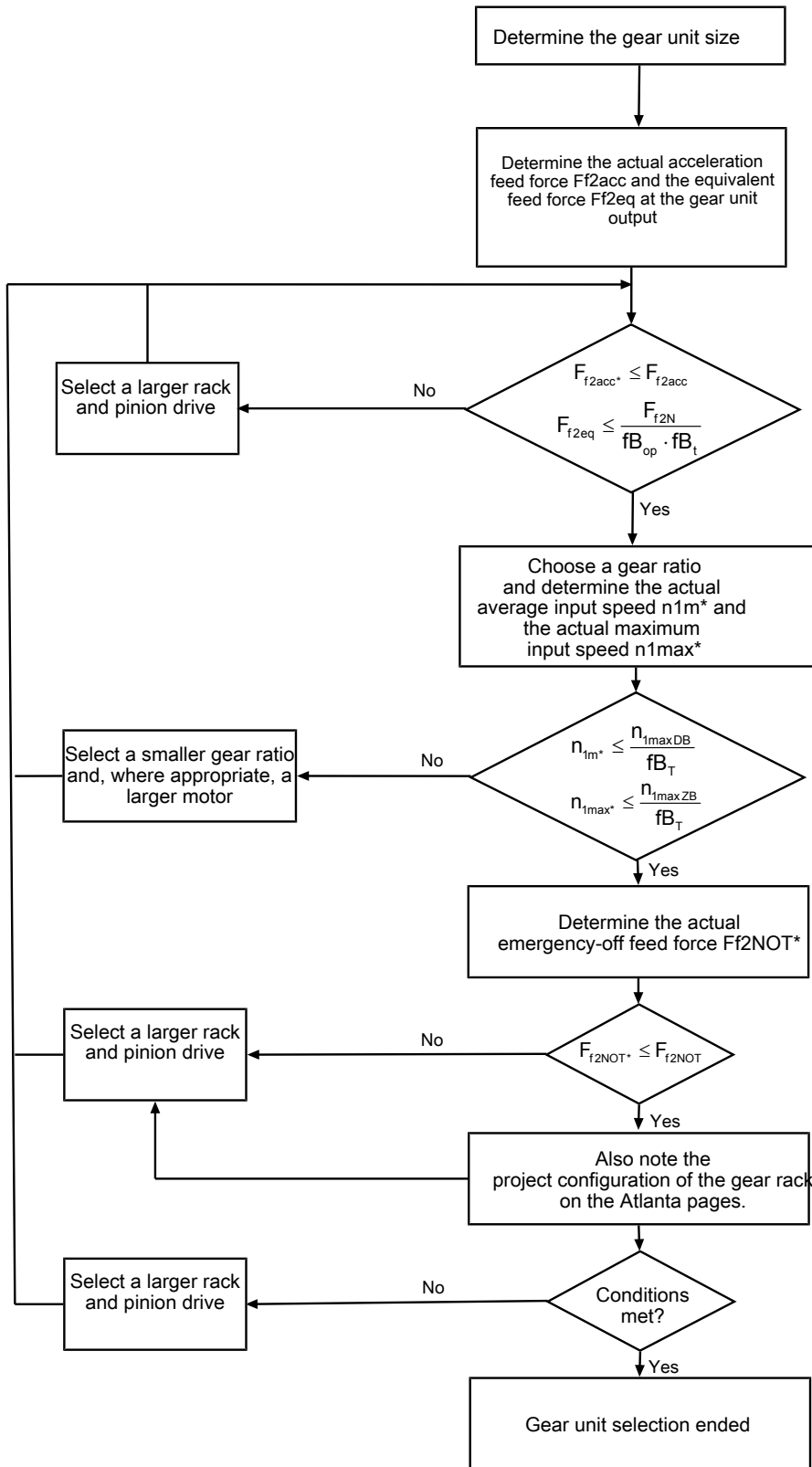
9.6 Project configuration

Project your drives using our SERVOnsoft designing software. You can receive SERVOnsoft 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 *.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

9.6.1 Drive selection

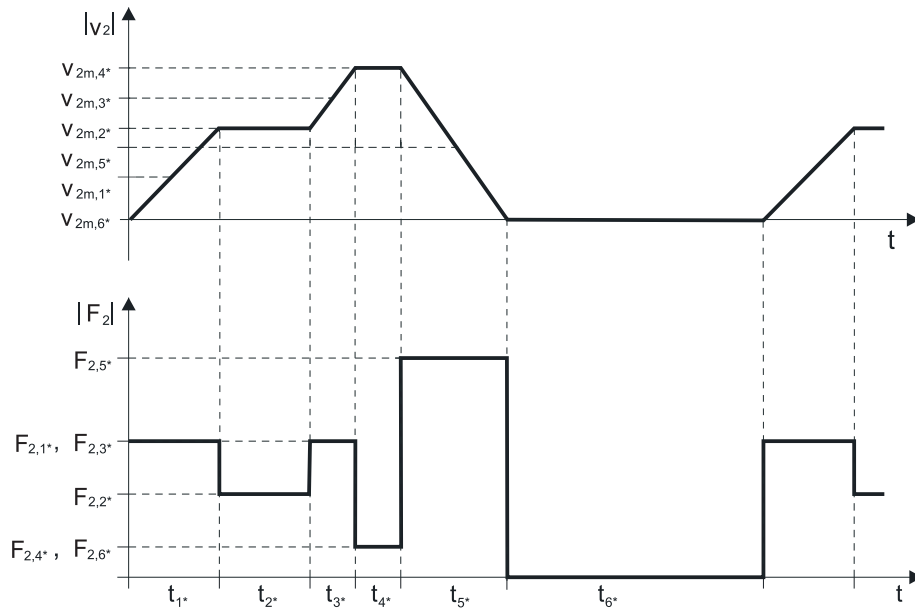


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for fb_T , fb_{op} and fb_t can be found in the corresponding tables in this chapter.

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

$$F_{f2acc*} = m \cdot a^* + F_{L*}$$

Calculation of the actual average input speed

$$n_{im*} = \frac{v_{2m*} \cdot i}{d_0 \cdot \pi}$$

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

If $t_{1*} + \dots + t_{5*} \geq 10 \text{ min}$, determine v_{2m*} without the rest phase t_{6*} .

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_{L*}$$

Calculation of the actual equivalent feed force

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{2m,1*}| \cdot t_{1*} \cdot |F_{2,1*}|^3 + \dots + |v_{2m,n*}| \cdot t_{n*} \cdot |F_{2,n*}|^3}{|v_{2m,1*}| \cdot t_{1*} + \dots + |v_{2m,n*}| \cdot t_{n*}}}$$

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 $\leq 8 \text{ h}$	1.00
Daily run time $\leq 16 \text{ h}$	1.15
Daily run time $\leq 24 \text{ h}$	1.20

Temperature		f_{B_T}
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20\text{ }^\circ\text{C}$	0.9
	$\leq 30\text{ }^\circ\text{C}$	1.0
	$\leq 40\text{ }^\circ\text{C}$	1.15
Motor with convection cooling	$\leq 20\text{ }^\circ\text{C}$	1.0
	$\leq 30\text{ }^\circ\text{C}$	1.1
	$\leq 40\text{ }^\circ\text{C}$	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

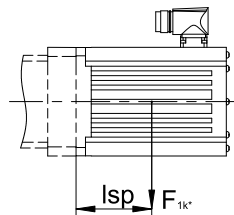
9.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
PA321_MF	20
PA322_MF	10
PA421_MF	40
PA422_MF	20
PA521_MF	80
PA522_MF	40
PA721_MF	200
PA722_MF	80
PA821_MF	400
PA822_MF	200

9.6.3 Radial shaft seal rings

Leak-proofness

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

9.7 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 Rack and Pinion Drives (Atlanta)	442455
Operating manual for P/PA/PE/PH/PHA/PHQ/PHQA/PHV/PHVA planetary gear units and planetary geared motors	443029_en
Lubricant filling quantities for gear units	441871

10 ZVPE rack and pinion drives

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10

Rack and pinion drives

ZVPE

10.1 Overview

Cost-efficient planetary gear units with plug-on pinion

Features

- Power density ★★☆☆☆
- Linear clearance ★★☆☆☆
- Price category €
- Smooth operation ★★☆☆☆
- Linear rigidity ★★☆☆☆
- Mass moment of inertia ★★☆☆☆
- Ready-to-install drive solution ✓
- Pinion gearing quality 7 (DIN 3962) ✓
- Helical gearing ✓
- Case-hardened and smoothed ✓

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

Technical data

m_n	2 – 3 mm
z	16 – 25
F_{f2acc}	2 – 6.3 kN
$v_{f2maxzB}$	0.11 – 4.5 m/s
Δs	40 – 83 μm

10.2 Selection tables

The technical data specified in the selection tables applies to:

- Bearing design R (standard)
- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 10.5.3]
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1].

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{2maxZB} [m/s]	Δs [mm]	C _{lin} [N/ μm]	m _n [mm]	z	d ₀ [mm]	F _{t2N,S} [kN]	F _{t2N,E} [kN]	F _{t2accS} [kN]	F _{t2accE} [kN]	F _{t2NOT,S} [kN]	F _{t2NOT,E} [kN]	M _{2accS} [Nm]	M _{2accE} [Nm]
ZV2PE3 (F_{t2acc,max} = 2,0 kN)																		
3.000	ZV216S_PE311_0030 ME	3500	6000	≤19	3.56	0.040	36	2	16	34.0	1.2	1.2	2.0	1.7	3.8	3.4	35	29
3.000	ZV216S_PE311_0030 MEL	3500	6000	≤24	3.56	0.040	37	2	16	34.0	1.2	1.2	2.0	1.7	3.8	3.4	35	29
4.000	ZV216S_PE311_0040 ME	3700	6000	≤19	2.67	0.040	42	2	16	34.0	1.3	1.3	2.0	1.7	4.1	3.4	35	29
4.000	ZV216S_PE311_0040 MEL	3700	6000	≤24	2.67	0.040	44	2	16	34.0	1.3	1.3	2.0	1.7	4.1	3.4	35	29
5.000	ZV216S_PE311_0050 ME	3700	6000	≤19	2.13	0.040	42	2	16	34.0	1.4	1.4	2.0	1.7	4.1	3.4	35	29
5.000	ZV216S_PE311_0050 MEL	3700	6000	≤24	2.13	0.040	43	2	16	34.0	1.4	1.4	2.0	1.7	4.1	3.4	35	29
7.000	ZV216S_PE311_0070 ME	4000	6000	≤19	1.52	0.040	40	2	16	34.0	1.4	1.4	2.0	1.7	4.1	3.4	35	29
7.000	ZV216S_PE311_0070 MEL	4000	6000	≤24	1.52	0.040	41	2	16	34.0	1.4	1.4	2.0	1.7	4.1	3.4	35	29
10.00	ZV216S_PE311_0100 ME	4000	6000	≤19	1.07	0.040	37	2	16	34.0	1.1	1.1	2.0	1.7	4.1	3.4	35	29
10.00	ZV216S_PE311_0100 MEL	4000	6000	≤24	1.07	0.040	37	2	16	34.0	1.1	1.1	2.0	1.7	4.1	3.4	35	29
12.00	ZV216S_PE312_0120 ME	3700	6000	≤19	0.89	0.049	44	2	16	34.0	1.8	1.7	2.0	1.7	4.1	3.4	35	29
15.00	ZV216S_PE312_0150 ME	3700	6000	≤19	0.71	0.049	43	2	16	34.0	1.4	1.4	2.0	1.7	4.1	3.4	35	29
16.00	ZV216S_PE312_0160 ME	3700	6000	≤19	0.67	0.049	44	2	16	34.0	1.8	1.7	2.0	1.7	4.1	3.4	35	29
20.00	ZV216S_PE312_0200 ME	3700	6000	≤19	0.53	0.049	44	2	16	34.0	1.8	1.7	2.0	1.7	4.1	3.4	35	29
25.00	ZV216S_PE312_0250 ME	3700	6000	≤19	0.43	0.049	43	2	16	34.0	1.4	1.4	2.0	1.7	4.1	3.4	35	29
28.00	ZV216S_PE312_0280 ME	4000	6000	≤19	0.38	0.049	44	2	16	34.0	1.8	1.7	2.0	1.7	4.1	3.4	35	29
35.00	ZV216S_PE312_0350 ME	4000	6000	≤19	0.31	0.049	43	2	16	34.0	1.4	1.4	2.0	1.7	4.1	3.4	35	29
40.00	ZV216S_PE312_0400 ME	4000	6000	≤19	0.27	0.049	44	2	16	34.0	1.8	1.7	2.0	1.7	4.1	3.4	35	29
50.00	ZV216S_PE312_0500 ME	4000	6000	≤19	0.21	0.049	43	2	16	34.0	1.4	1.4	2.0	1.7	4.1	3.4	35	29
70.00	ZV216S_PE312_0700 ME	4000	6000	≤19	0.15	0.049	41	2	16	34.0	1.4	1.4	2.0	1.7	4.1	3.4	35	29
100.0	ZV216S_PE312_1000 ME	4000	6000	≤19	0.11	0.049	37	2	16	34.0	1.2	1.2	2.0	1.7	4.1	3.4	35	29
ZV2PE4 (F_{t2acc,max} = 2,8 kN)																		
3.000	ZV220S_PE411_0030 ME	3000	5500	≤24	4.07	0.049	73	2	20	42.4	1.9	1.5	2.8	2.2	5.7	4.4	60	47
3.000	ZV220S_PE411_0030 MEL	3000	5500	≤32	4.07	0.049	75	2	20	42.4	1.9	1.5	2.8	2.2	5.7	4.4	60	47
4.000	ZV220S_PE411_0040 ME	3400	6000	≤24	3.33	0.049	79	2	20	42.4	2.1	1.6	2.8	2.2	5.7	4.4	60	47
4.000	ZV220S_PE411_0040 MEL	3400	6000	≤32	3.33	0.049	80	2	20	42.4	2.1	1.6	2.8	2.2	5.7	4.4	60	47
5.000	ZV220S_PE411_0050 ME	3400	6000	≤24	2.67	0.049	76	2	20	42.4	2.2	1.7	2.8	2.2	5.7	4.4	60	47
5.000	ZV220S_PE411_0050 MEL	3400	6000	≤32	2.67	0.049	77	2	20	42.4	2.2	1.7	2.8	2.2	5.7	4.4	60	47
7.000	ZV220S_PE411_0070 ME	3600	6000	≤24	1.91	0.049	72	2	20	42.4	2.4	1.9	2.8	2.2	5.7	4.4	60	47
7.000	ZV220S_PE411_0070 MEL	3600	6000	≤32	1.91	0.049	73	2	20	42.4	2.4	1.9	2.8	2.2	5.7	4.4	60	47
10.00	ZV220S_PE411_0100 ME	3600	6000	≤24	1.33	0.049	65	2	20	42.4	2.1	2.1	2.8	2.2	5.7	4.4	60	47
10.00	ZV220S_PE411_0100 MEL	3600	6000	≤32	1.33	0.049	65	2	20	42.4	2.1	2.1	2.8	2.2	5.7	4.4	60	47
12.00	ZV220S_PE412_0120 ME	3400	5500	≤24	1.02	0.062	82	2	20	42.4	2.8	2.2	2.8	2.2	5.7	4.4	60	47
15.00	ZV220S_PE412_0150 ME	3400	6000	≤24	0.89	0.062	77	2	20	42.4	2.4	2.2	2.8	2.2	5.7	4.4	60	47
16.00	ZV220S_PE412_0160 ME	3400	6000	≤24	0.83	0.062	83	2	20	42.4	2.8	2.2	2.8	2.2	5.7	4.4	60	47
20.00	ZV220S_PE412_0200 ME	3400	6000	≤24	0.67	0.062	82	2	20	42.4	2.8	2.2	2.8	2.2	5.7	4.4	60	47
25.00	ZV220S_PE412_0250 ME	3400	6000	≤24	0.53	0.062	77	2	20	42.4	2.4	2.2	2.8	2.2	5.7	4.4	60	47
28.00	ZV220S_PE412_0280 ME	3600	6000	≤24	0.48	0.062	82	2	20	42.4	2.8	2.2	2.8	2.2	5.7	4.4	60	47
35.00	ZV220S_PE412_0350 ME	3600	6000	≤24	0.38	0.062	77	2	20	42.4	2.4	2.2	2.8	2.2	5.7	4.4	60	47
40.00	ZV220S_PE412_0400 ME	3600	6000	≤24	0.33	0.062	81	2	20	42.4	2.8	2.2	2.8	2.2	5.7	4.4	60	47
50.00	ZV220S_PE412_0500 ME	3600	6000	≤24	0.27	0.062	77	2	20	42.4	2.4	2.2	2.8	2.2	5.7	4.4	60	47
70.00	ZV220S_PE412_0700 ME	3600	6000	≤24	0.19	0.062	73	2	20	42.4	2.4	2.2	2.8	2.2	5.7	4.4	60	47
100.0	ZV220S_PE412_1000 ME	3600	6000	≤24	0.13	0.062	65	2	20	42.4	2.1	2.1	2.8	2.2	5.7	4.4	60	47
ZV2PE5 (F_{t2acc,max} = 6,3 kN)																		
3.000	ZV225S_PE511_0030 ME	2500	4500	≤32	4.17	0.062	107	2	25	53.1	3.4	2.7	6.3	3.9	13	7.8	170	100
3.000	ZV225S_PE511_0030 MEL	2500	4500	≤38	4.17	0.062	112	2	25	53.1	3.4	2.7	6.3	3.9	13	7.8	170	100
4.000	ZV225S_PE511_0040 ME	2600	5000	≤32	3.47	0.062	112	2	25	53.1	4.9	3.0	6.3	3.9	13	7.8	170	100
4.000	ZV225S_PE511_0040 MEL	2600	5000	≤38	3.47	0.062	116	2	25	53.1	4.9	3.0	6.3	3.9	13	7.8	170	100
5.000	ZV225S_PE511_0050 ME	2600	5000	≤32	2.78	0.062	112	2	25	53.1	4.9	3.3	6.3	3.9	13	7.8	170	100

10.2 Selection tables 10 ZVPE rack and pinion drives

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	v_{2maxZB} [m/s]	Δs [mm]	C_{lin} [N/ μm]	m_n [mm]	z	d_0 [mm]	$F_{f2N,S}$ [kN]	$F_{f2N,E}$ [kN]	F_{f2accS} [kN]	F_{f2accE} [kN]	$F_{f2NOT,S}$ [kN]	$F_{f2NOT,E}$ [kN]	M_{2accS} [Nm]	M_{2accE} [Nm]
ZV2PE5 ($F_{f2acc,max} = 6,3$ kN)																		
5.000	ZV225S_PE511_0050 MEL	2600	5000	≤38	2.78	0.062	115	2	25	53.1	4.9	3.3	6.3	3.9	13	7.8	170	100
7.000	ZV225S_PE511_0070 ME	2800	5000	≤32	1.98	0.062	108	2	25	53.1	4.9	3.6	6.3	3.9	13	7.8	170	100
7.000	ZV225S_PE511_0070 MEL	2800	5000	≤38	1.98	0.062	109	2	25	53.1	4.9	3.6	6.3	3.9	13	7.8	170	100
10.00	ZV225S_PE511_0100 ME	3000	5000	≤32	1.39	0.062	99	2	25	53.1	4.1	3.9	6.3	3.9	13	7.8	170	100
10.00	ZV225S_PE511_0100 MEL	3000	5000	≤38	1.39	0.062	100	2	25	53.1	4.1	3.9	6.3	3.9	13	7.8	170	100
12.00	ZV225S_PE512_0120 ME	2500	4500	≤32	1.04	0.077	120	2	25	53.1	6.0	3.9	6.3	3.9	13	7.8	170	100
15.00	ZV225S_PE512_0150 ME	2500	4500	≤32	0.83	0.077	115	2	25	53.1	4.9	3.9	6.3	3.9	13	7.8	170	100
16.00	ZV225S_PE512_0160 ME	2600	5000	≤32	0.87	0.077	120	2	25	53.1	6.0	3.9	6.3	3.9	13	7.8	170	100
20.00	ZV225S_PE512_0200 ME	2600	5000	≤32	0.69	0.077	120	2	25	53.1	6.0	3.9	6.3	3.9	13	7.8	170	100
25.00	ZV225S_PE512_0250 ME	2600	5000	≤32	0.56	0.077	116	2	25	53.1	4.9	3.9	6.3	3.9	13	7.8	170	100
28.00	ZV225S_PE512_0280 ME	2800	5000	≤32	0.50	0.077	120	2	25	53.1	6.0	3.9	6.3	3.9	13	7.8	170	100
35.00	ZV225S_PE512_0350 ME	2800	5000	≤32	0.40	0.077	116	2	25	53.1	4.9	3.9	6.3	3.9	13	7.8	170	100
40.00	ZV225S_PE512_0400 ME	3000	5000	≤32	0.35	0.077	119	2	25	53.1	6.0	3.9	6.3	3.9	13	7.8	170	100
50.00	ZV225S_PE512_0500 ME	3000	5000	≤32	0.28	0.077	115	2	25	53.1	4.9	3.9	6.3	3.9	13	7.8	170	100
70.00	ZV225S_PE512_0700 ME	3000	5000	≤32	0.20	0.077	110	2	25	53.1	4.9	3.9	6.3	3.9	13	7.8	170	100
100.0	ZV225S_PE512_1000 ME	3000	5000	≤32	0.14	0.077	100	2	25	53.1	4.1	3.9	6.3	3.9	13	7.8	170	100
ZV3PE5 ($F_{f2acc,max} = 6,1$ kN)																		
3.000	ZV318S_PE511_0030 ME	2500	4500	≤32	4.50	0.067	99	3	18	57.3	3.1	2.8	6.1	4.0	12	8.0	170	110
3.000	ZV318S_PE511_0030 MEL	2500	4500	≤38	4.50	0.067	104	3	18	57.3	3.1	2.8	6.1	4.0	12	8.0	170	110
4.000	ZV318S_PE511_0040 ME	2600	5000	≤32	3.75	0.067	104	3	18	57.3	4.5	3.1	6.1	4.0	12	8.0	170	110
4.000	ZV318S_PE511_0040 MEL	2600	5000	≤38	3.75	0.067	108	3	18	57.3	4.5	3.1	6.1	4.0	12	8.0	170	110
5.000	ZV318S_PE511_0050 ME	2600	5000	≤32	3.00	0.067	105	3	18	57.3	4.5	3.3	6.1	4.0	12	8.0	170	110
5.000	ZV318S_PE511_0050 MEL	2600	5000	≤38	3.00	0.067	107	3	18	57.3	4.5	3.3	6.1	4.0	12	8.0	170	110
7.000	ZV318S_PE511_0070 ME	2800	5000	≤32	2.14	0.067	100	3	18	57.3	4.5	3.7	6.1	4.0	12	8.0	170	110
7.000	ZV318S_PE511_0070 MEL	2800	5000	≤38	2.14	0.067	101	3	18	57.3	4.5	3.7	6.1	4.0	12	8.0	170	110
10.00	ZV318S_PE511_0100 ME	3000	5000	≤32	1.50	0.067	91	3	18	57.3	3.8	3.8	6.1	4.0	12	8.0	170	110
10.00	ZV318S_PE511_0100 MEL	3000	5000	≤38	1.50	0.067	92	3	18	57.3	3.8	3.8	6.1	4.0	12	8.0	170	110
12.00	ZV318S_PE512_0120 ME	2500	4500	≤32	1.13	0.083	112	3	18	57.3	5.6	4.0	6.1	4.0	12	8.0	170	110
15.00	ZV318S_PE512_0150 ME	2500	4500	≤32	0.90	0.083	108	3	18	57.3	4.5	4.0	6.1	4.0	12	8.0	170	110
16.00	ZV318S_PE512_0160 ME	2600	5000	≤32	0.94	0.083	112	3	18	57.3	5.6	4.0	6.1	4.0	12	8.0	170	110
20.00	ZV318S_PE512_0200 ME	2600	5000	≤32	0.75	0.083	112	3	18	57.3	5.6	4.0	6.1	4.0	12	8.0	170	110
25.00	ZV318S_PE512_0250 ME	2600	5000	≤32	0.60	0.083	108	3	18	57.3	4.5	4.0	6.1	4.0	12	8.0	170	110
28.00	ZV318S_PE512_0280 ME	2800	5000	≤32	0.54	0.083	112	3	18	57.3	5.6	4.0	6.1	4.0	12	8.0	170	110
35.00	ZV318S_PE512_0350 ME	2800	5000	≤32	0.43	0.083	108	3	18	57.3	4.5	4.0	6.1	4.0	12	8.0	170	110
40.00	ZV318S_PE512_0400 ME	3000	5000	≤32	0.38	0.083	111	3	18	57.3	5.6	4.0	6.1	4.0	12	8.0	170	110
50.00	ZV318S_PE512_0500 ME	3000	5000	≤32	0.30	0.083	107	3	18	57.3	4.5	4.0	6.1	4.0	12	8.0	170	110
70.00	ZV318S_PE512_0700 ME	3000	5000	≤32	0.21	0.083	102	3	18	57.3	4.5	4.0	6.1	4.0	12	8.0	170	110
100.0	ZV318S_PE512_1000 ME	3000	5000	≤32	0.15	0.083	92	3	18	57.3	3.8	3.8	6.1	4.0	12	8.0	170	110

10.3 Dimensional drawings

In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

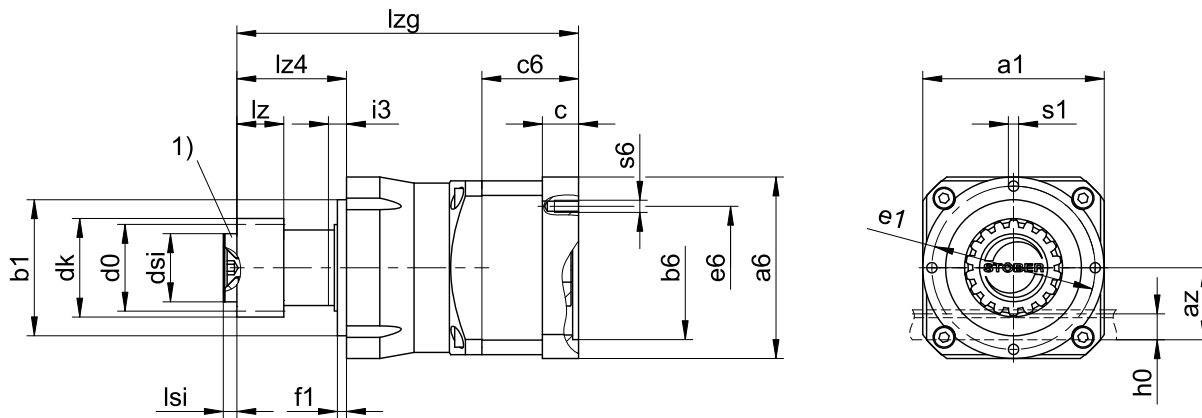
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.

10.3.1 Pinion position E



1) Axial locking (optional)

Output dimensions

Type	mn	Øa1	az	Øb1	Ød0	Ødk	Ødsi	Øe1	f1	h0	i3	lz	lz4	lsi	Øs1	x
ZV216SEPE3_	2	72	39.98	52 _{h6}	33.95	39.81	25	62	5	22	7	26	37.5	5	M5	0.5
ZV220SEPE4_	2	98	44.02	68 _{h6}	42.44	47.90	30	80	5	22	10	26	48.5	7	M6	0.4
ZV225SEPE5_	2	115	49.33	90 _{h6}	53.05	58.52	45	108	6	22	12	26	72.5	9	M8	0.4
ZV318SEPE5_	3	115	55.55	90 _{h6}	57.30	65.01	45	108	6	26	12	31	72.5	9	M8	0.3

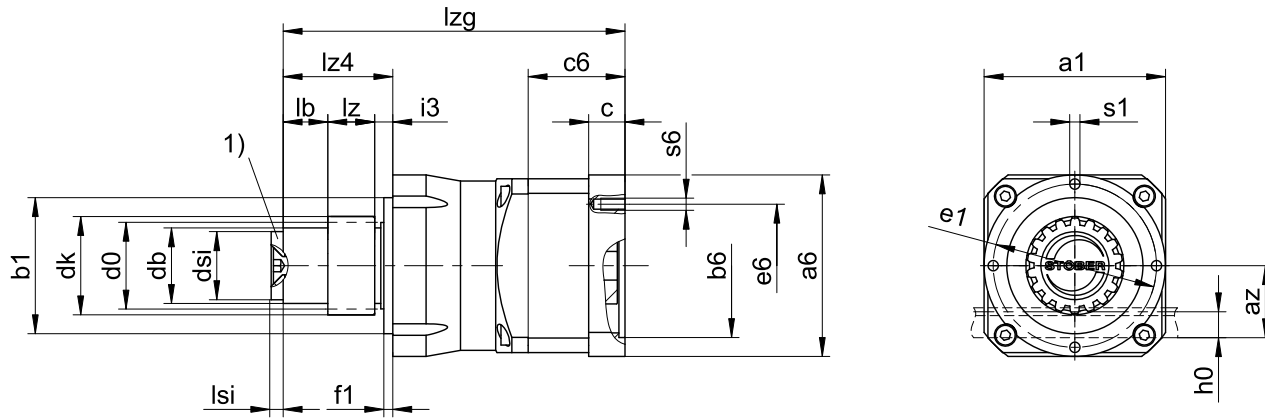
Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZV_PE311_	75	60 ^{H7}	75	18	51.5	155.0	M5
ZV_PE312_	75	60 ^{H7}	75	18	51.5	187.5	M5
ZV_PE411_	100	95 ^{H7}	115	21	56.0	175.5	M8
ZV_PE412_	100	95 ^{H7}	115	21	56.0	213.5	M8
ZV_PE511_	120	110 ^{H7}	130	24	67.5	229.5	M8
ZV_PE512_	120	110 ^{H7}	130	24	67.5	275.0	M8

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

10.3.2 Pinion position S



1) Axial locking (optional)

Output dimensions

Type	mn	Øa1	az	Øb1	Ød0	Ødb	Ødk	Ødsi	Øe1	f1	h0	i3	lb	lz	lz4	lsi	Øs1	x
ZV216SSPE3_	2	72	39.98	52 _{h6}	33.95	30	39.81	25	62	5	22	7	4.5	26	37.5	5	M5	0.5
ZV220SSPE4_	2	98	44.02	68 _{h6}	42.44	38	47.90	30	80	5	22	10	12.5	26	48.5	7	M6	0.4
ZV225SSPE5_	2	115	49.33	90 _{h6}	53.05	50	58.52	45	108	6	22	12	34.5	26	72.5	9	M8	0.4
ZV318SSPE5_	3	115	55.55	90 _{h6}	57.30	50	65.01	45	108	6	26	12	29.5	31	72.5	9	M8	0.3

Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	lzg	s6
ZV_PE311_	75	60 ^{H7}	75	18	51.5	155.0	M5
ZV_PE312_	75	60 ^{H7}	75	18	51.5	187.5	M5
ZV_PE411_	100	95 ^{H7}	115	21	56.0	175.5	M8
ZV_PE412_	100	95 ^{H7}	115	21	56.0	213.5	M8
ZV_PE511_	120	110 ^{H7}	130	24	67.5	229.5	M8
ZV_PE512_	120	110 ^{H7}	130	24	67.5	275.0	M8

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEGER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

10.4 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.

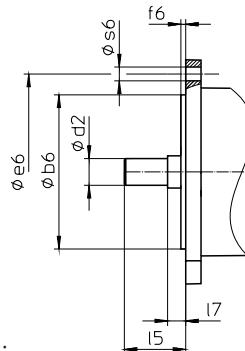
Sample code

Z	V	2	20	S	S	PE	4	1	1	S	P	R	0050	ME
---	---	---	----	---	---	----	---	---	---	---	---	---	------	----

Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
V	Design	Plug-on pinion
2	Module	$m_n = 2$ (example)
20	Number of teeth	$z = 20$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
E	Pinion position	Shaft end
S		Shaft shoulder
PE	Type	Planetary gear unit
4	Size	4 (example)
1	Generation	Generation 1
1	Stages	Single-stage
2		Two-stage
S	Housing	Standard
P	Shaft	Solid shaft with feather key
R	Bearing	Standard bearing
0050	Transmission ratio (i x 10)	i = 5 (example)
ME	Motor adapter	Motor adapter with EasyAdapt® coupling
MEL		Motor adapter with EasyAdapt® coupling for large motors

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at <http://configurator.stoeber.de> and choose your motor or the dimensions of the motor connection.

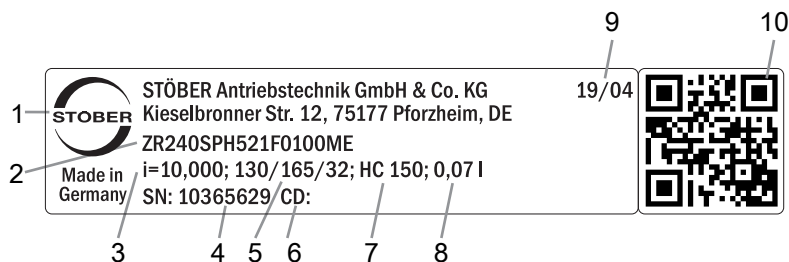
- For axial locking (optional), see the chapter [▶ 10.3]

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter.

All input options available upon request are listed in the chapter [▶ 10.5.2].

10.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

10.4.1.1 Supporting documents

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

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

10.5 Product description

10.5.1 Motor adapter with EasyAdapt® coupling (ME/MEL)

In this chapter, you will find a description of the EasyAdapt® coupling.

Properties:

- Fast and easy motor attachment
- One-piece, rugged coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design



Fig. 1: EasyAdapt® coupling

10.5.2 Input options

In this chapter, you will find all available input options:

ME motor adapter



<http://www.stoeber.de/en/ZVPEME>

EZ synchronous servo motor



On request

LM Lean motor



On request

10.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 7.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	8	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

10.5.3.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S)

Please specify the desired attachment position when placing your purchase order.

10.5.4 Installation conditions

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

10.5.5 Lubricants

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

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stoeber.de/en/download>. Enter the ID of the documentation in the Search... field.

10.5.5.1 Rack and pinion drive lubrication

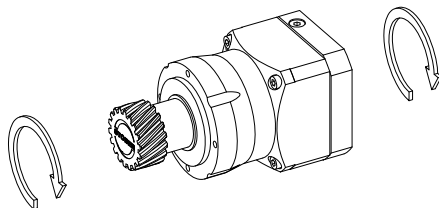
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

10.5.6 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 80 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable
Protection class: ¹	
Planetary gear unit	IP64
Pinion/gear rack	IPXX

10.5.7 Direction of rotation

The input and output rotate in the same direction.



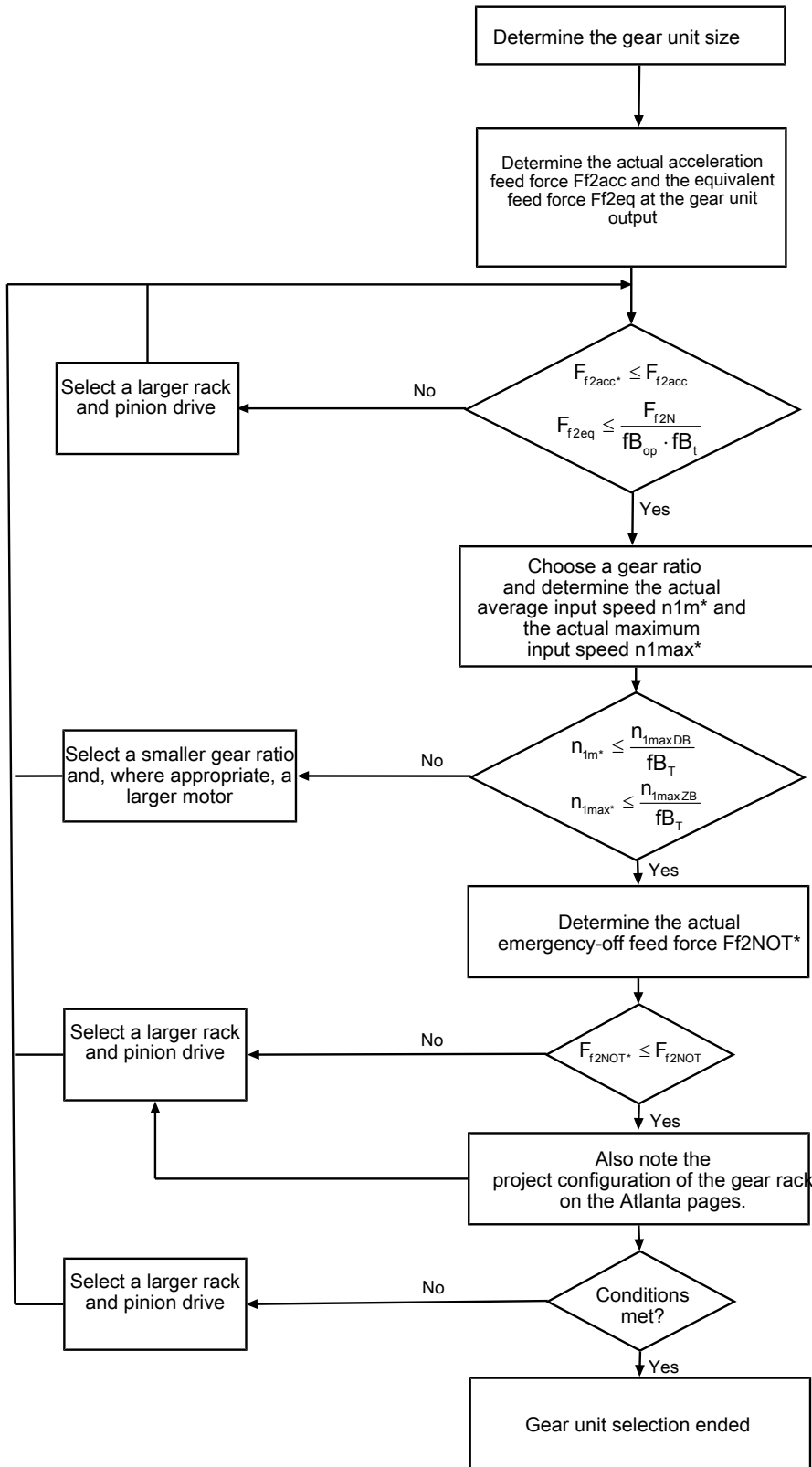
10.6 Project configuration

Project your drives using our SERVOnsoft designing software. You can receive SERVOnsoft 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 *.

An explanation of the formula symbols can be found in the chapter [\[▶ 14.1\]](#).

10.6.1 Drive selection

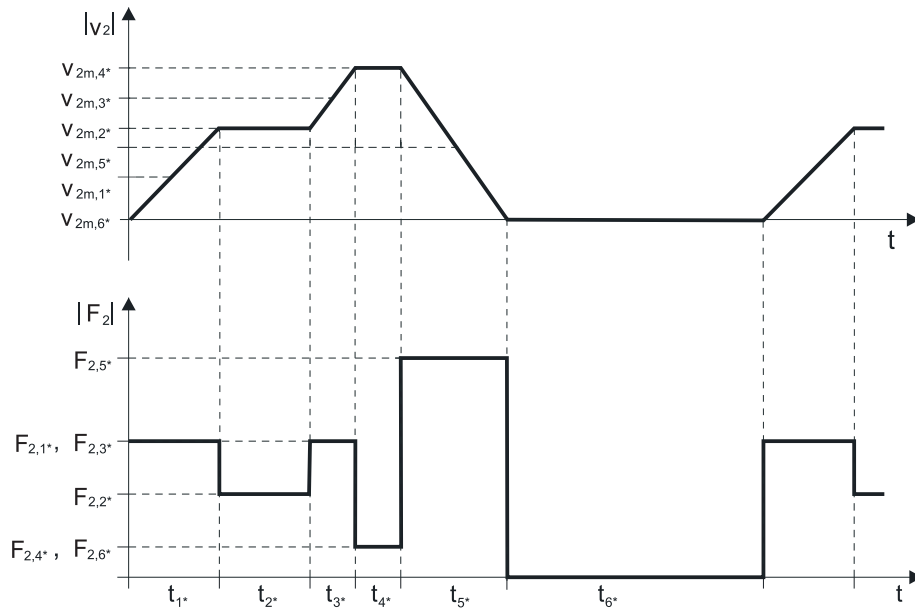


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for fb_T , fb_{op} and fb_t can be found in the corresponding tables in this chapter.

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

$$F_{f2acc*} = m \cdot a^* + F_L^*$$

Calculation of the actual average input speed

$$n_{1m*} = \frac{v_{2m*} \cdot i}{d_0 \cdot \pi}$$

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

If $t_{1*} + \dots + t_{5*} \geq 10 \text{ min}$, determine v_{2m*} without the rest phase t_{6*} .

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_L^*$$

Calculation of the actual equivalent feed force

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{2m,1*}| \cdot t_{1*} \cdot |F_{2,1*}|^3 + \dots + |v_{2m,n*}| \cdot t_{n*} \cdot |F_{2,n*}|^3}{|v_{2m,1*}| \cdot t_{1*} + \dots + |v_{2m,n*}| \cdot t_{n*}}}$$

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 $\leq 8 \text{ h}$	1.00
Daily run time $\leq 16 \text{ h}$	1.15
Daily run time $\leq 24 \text{ h}$	1.20

Temperature		f_{B_T}
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20\text{ °C}$	0.9
	$\leq 30\text{ °C}$	1.0
	$\leq 40\text{ °C}$	1.15
Motor with convection cooling	$\leq 20\text{ °C}$	1.0
	$\leq 30\text{ °C}$	1.1
	$\leq 40\text{ °C}$	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

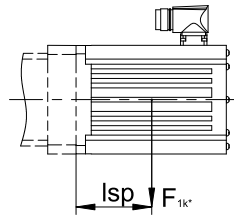
10.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
PE211_ME	10
PE212_ME	10
PE311_ME	20
PE312_ME	20
PE411_ME	40
PE412_ME	40
PE511_ME	80
PE512_ME	80

10.6.3 Radial shaft seal rings

Leak-proofness

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

10.7 Additional documentation

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

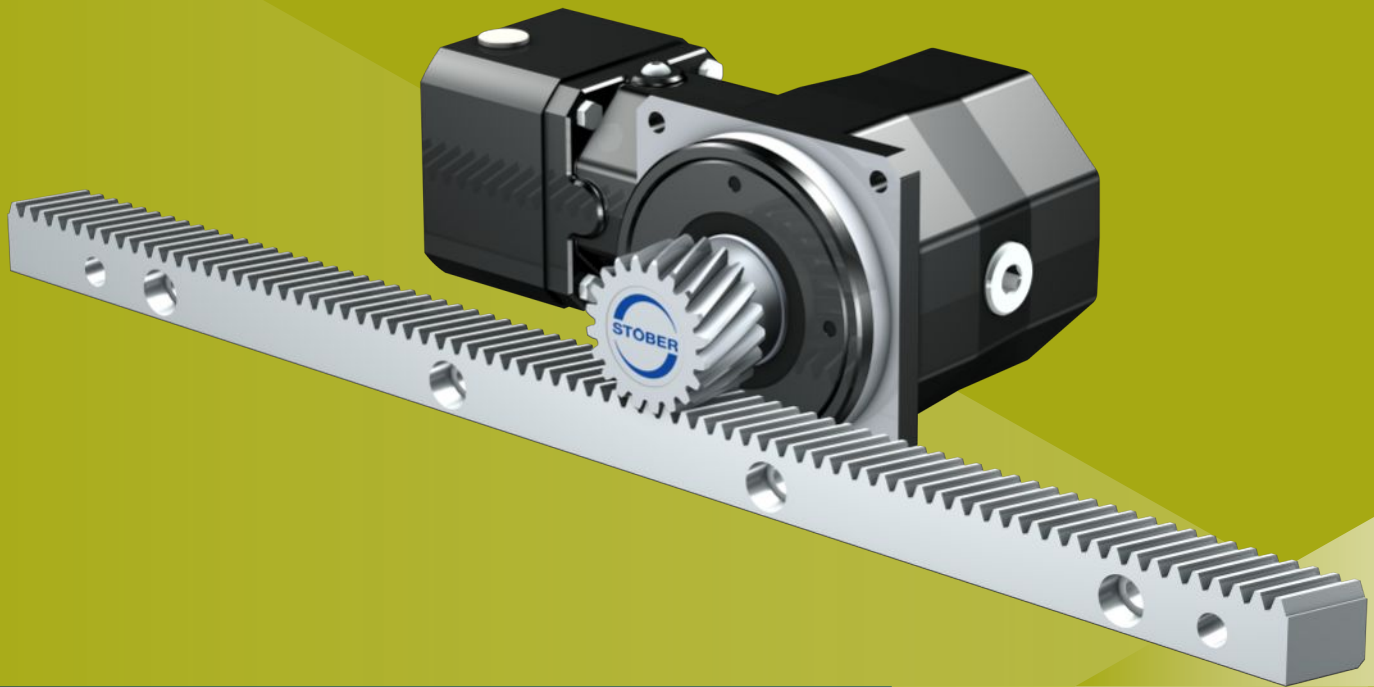
Enter the ID of the documentation in the Search... field.

Documentation	ID
Operating manual Rack and Pinion Drives (Atlanta)	442455
Operating manual for P/PA/PE/PH/PHA/PHQ/PHQA/PHV/PHVA planetary gear units and planetary geared motors	443029_en
Lubricant filling quantities for gear units	441871

11 ZVKS rack and pinion drives

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11

Rack and pinion drives

ZVKS

11.1 Overview

Right-angle servo gear units with plug-on pinion

Features

- Power density ★★★★★
- Linear clearance ★★★★★
- Price category €€€
- Smooth operation ★★★★★
- Linear rigidity ★★★★★
- Mass moment of inertia ★★★★★
- Ready-to-install drive solution ✓
- Pinion gearing quality 7 (DIN 3962) ✓
- Helical gearing ✓
- Case-hardened and smoothed ✓

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

Technical data

m_n	2 – 4 mm
z	18 – 25
F_{f2acc}	4.2 – 11 kN
$v_{f2maxzB}$	0.07 – 3 m/s
Δs	31 – 44 μm

11.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 11.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [mm]	C_{lin} [N/ μm]	m_n [mm]	z	d_0 [mm]	$F_{f2N,S}$ [kN]	$F_{f2N,E}$ [kN]	F_{f2accS} [kN]	F_{f2accE} [kN]	$F_{f2NOT,S}$ [kN]	$F_{f2NOT,E}$ [kN]	M_{2accS} [Nm]	M_{2accE} [Nm]
ZV2KS4 ($F_{f2acc,max} = 4,2 \text{ kN}$)																		
6.000	ZV220S_KS402_0060 ME	3000	6000	≤19	2.22	0.037	54	2	20	42.4	2.8	2.8	4.2	3.2	6.6	6.4	90	68
6.000	ZV220S_KS402_0060 MEL	3000	6000	≤24	2.22	0.037	55	2	20	42.4	2.8	2.8	4.2	3.2	6.6	6.4	90	68
8.000	ZV220S_KS402_0080 ME	3500	6000	≤19	1.67	0.037	55	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
8.000	ZV220S_KS402_0080 MEL	3500	6000	≤24	1.67	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
10.00	ZV220S_KS402_0100 ME	3800	6000	≤19	1.33	0.037	55	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
10.00	ZV220S_KS402_0100 MEL	3800	6000	≤24	1.33	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
14.00	ZV220S_KS402_0140 ME	4000	6000	≤19	0.95	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
14.00	ZV220S_KS402_0140 MEL	4000	6000	≤24	0.95	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
20.00	ZV220S_KS402_0200 ME	4000	6000	≤19	0.67	0.037	56	2	20	42.4	2.8	2.8	4.2	3.2	6.6	6.4	90	68
20.00	ZV220S_KS402_0200 MEL	4000	6000	≤24	0.67	0.037	56	2	20	42.4	2.8	2.8	4.2	3.2	6.6	6.4	90	68
24.00	ZV220S_KS403_0240 ME	3500	6000	≤14	0.56	0.037	56	2	20	42.4	2.8	2.8	4.2	3.2	6.6	6.4	90	68
24.00	ZV220S_KS403_0240 MEL	3500	6000	≤19	0.56	0.037	56	2	20	42.4	2.8	2.8	4.2	3.2	6.6	6.4	90	68
32.00	ZV220S_KS403_0320 ME	3500	6000	≤14	0.42	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
32.00	ZV220S_KS403_0320 MEL	3500	6000	≤19	0.42	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
40.00	ZV220S_KS403_0400 ME	3500	6000	≤14	0.33	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
40.00	ZV220S_KS403_0400 MEL	3500	6000	≤19	0.33	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
50.00	ZV220S_KS403_0500 ME	4000	6000	≤14	0.27	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
50.00	ZV220S_KS403_0500 MEL	4000	6000	≤19	0.27	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
70.00	ZV220S_KS403_0700 ME	4500	6000	≤14	0.19	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
70.00	ZV220S_KS403_0700 MEL	4500	6000	≤19	0.19	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
80.00	ZV220S_KS403_0800 ME	4500	6000	≤14	0.17	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
80.00	ZV220S_KS403_0800 MEL	4500	6000	≤19	0.17	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
100.0	ZV220S_KS403_1000 ME	4500	6000	≤14	0.13	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
100.0	ZV220S_KS403_1000 MEL	4500	6000	≤19	0.13	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
140.0	ZV220S_KS403_1400 ME	4500	6000	≤14	0.10	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
140.0	ZV220S_KS403_1400 MEL	4500	6000	≤19	0.10	0.037	56	2	20	42.4	3.1	3.1	4.2	3.2	6.6	6.4	90	68
200.0	ZV220S_KS403_2000 ME	4500	6000	≤14	0.07	0.037	56	2	20	42.4	2.8	2.8	4.2	3.2	6.6	6.4	90	68
200.0	ZV220S_KS403_2000 MEL	4500	6000	≤19	0.07	0.037	56	2	20	42.4	2.8	2.8	4.2	3.2	6.6	6.4	90	68
ZV2KS5 ($F_{f2acc,max} = 7,5 \text{ kN}$)																		
6.000	ZV225S_KS502_0060 ME	2500	5500	≤24	2.55	0.039	67	2	25	53.1	3.8	3.8	7.5	5.0	11	10	200	130
6.000	ZV225S_KS502_0060 MEL	2500	5500	≤32	2.55	0.039	68	2	25	53.1	3.8	3.8	7.5	5.0	11	10	200	130
8.000	ZV225S_KS502_0080 ME	2800	6000	≤24	2.08	0.039	68	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
8.000	ZV225S_KS502_0080 MEL	2800	6000	≤32	2.08	0.039	68	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
10.00	ZV225S_KS502_0100 ME	3000	6000	≤24	1.67	0.039	68	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
10.00	ZV225S_KS502_0100 MEL	3000	6000	≤32	1.67	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
14.00	ZV225S_KS502_0140 ME	3200	6000	≤24	1.19	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
14.00	ZV225S_KS502_0140 MEL	3200	6000	≤32	1.19	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
20.00	ZV225S_KS502_0200 ME	3500	6000	≤24	0.83	0.039	69	2	25	53.1	4.5	4.5	7.5	5.0	11	10	200	130
20.00	ZV225S_KS502_0200 MEL	3500	6000	≤32	0.83	0.039	69	2	25	53.1	4.5	4.5	7.5	5.0	11	10	200	130
24.00	ZV225S_KS503_0240 ME	3100	6000	≤19	0.69	0.039	69	2	25	53.1	3.8	3.8	7.5	5.0	11	10	200	130
24.00	ZV225S_KS503_0240 MEL	3100	6000	≤24	0.69	0.039	69	2	25	53.1	3.8	3.8	7.5	5.0	11	10	200	130
32.00	ZV225S_KS503_0320 ME	3100	6000	≤19	0.52	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
32.00	ZV225S_KS503_0320 MEL	3100	6000	≤24	0.52	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
40.00	ZV225S_KS503_0400 ME	3100	6000	≤19	0.42	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
40.00	ZV225S_KS503_0400 MEL	3100	6000	≤24	0.42	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
50.00	ZV225S_KS503_0500 ME	3500	6000	≤19	0.33	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
50.00	ZV225S_KS503_0500 MEL	3500	6000	≤24	0.33	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
70.00	ZV225S_KS503_0700 ME	4200	6000	≤19	0.24	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
70.00	ZV225S_KS503_0700 MEL	4200	6000	≤24	0.24	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
80.00	ZV225S_KS503_0800 ME	4200	6000	≤19	0.21	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
80.00	ZV225S_KS503_0800 MEL	4200	6000	≤24	0.21	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130

11.2 Selection tables 11 ZVKS rack and pinion drives

i	Type	n _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{ZmaxZB} [m/s]	Δs [mm]	C _{lin} [N/ μm]	m _n [mm]	z	d ₀ [mm]	F _{f2N,S} [kN]	F _{f2N,E} [kN]	F _{f2accS} [kN]	F _{f2accE} [kN]	F _{f2NOT,S} [kN]	F _{f2NOT,E} [kN]	M _{2accS} [Nm]	M _{2accE} [Nm]
ZV2KS5 (F_{f2acc,max} = 7,5 kN)																		
100.0	ZV225S_KS503_1000 ME	4200	6000	≤19	0.17	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
100.0	ZV225S_KS503_1000 MEL	4200	6000	≤24	0.17	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
140.0	ZV225S_KS503_1400 ME	4200	6000	≤19	0.12	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
140.0	ZV225S_KS503_1400 MEL	4200	6000	≤24	0.12	0.039	69	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	130
200.0	ZV225S_KS503_2000 ME	4200	6000	≤19	0.08	0.039	69	2	25	53.1	4.5	4.5	7.5	5.0	11	10	200	130
200.0	ZV225S_KS503_2000 MEL	4200	6000	≤24	0.08	0.039	69	2	25	53.1	4.5	4.5	7.5	5.0	11	10	200	130
ZV3KS5 (F_{f2acc,max} = 7,0 kN)																		
6.000	ZV318S_KS502_0060 ME	2500	5500	≤24	2.75	0.042	60	3	18	57.3	3.5	3.5	7.0	5.2	10	10	200	150
6.000	ZV318S_KS502_0060 MEL	2500	5500	≤32	2.75	0.042	61	3	18	57.3	3.5	3.5	7.0	5.2	10	10	200	150
8.000	ZV318S_KS502_0080 ME	2800	6000	≤24	2.25	0.042	61	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
8.000	ZV318S_KS502_0080 MEL	2800	6000	≤32	2.25	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
10.00	ZV318S_KS502_0100 ME	3000	6000	≤24	1.80	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
10.00	ZV318S_KS502_0100 MEL	3000	6000	≤32	1.80	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
14.00	ZV318S_KS502_0140 ME	3200	6000	≤24	1.29	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
14.00	ZV318S_KS502_0140 MEL	3200	6000	≤32	1.29	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
20.00	ZV318S_KS502_0200 ME	3500	6000	≤24	0.90	0.042	62	3	18	57.3	4.2	4.2	7.0	5.2	10	10	200	150
20.00	ZV318S_KS502_0200 MEL	3500	6000	≤32	0.90	0.042	62	3	18	57.3	4.2	4.2	7.0	5.2	10	10	200	150
24.00	ZV318S_KS503_0240 ME	3100	6000	≤19	0.75	0.042	62	3	18	57.3	3.5	3.5	7.0	5.2	10	10	200	150
24.00	ZV318S_KS503_0240 MEL	3100	6000	≤24	0.75	0.042	62	3	18	57.3	3.5	3.5	7.0	5.2	10	10	200	150
32.00	ZV318S_KS503_0320 ME	3100	6000	≤19	0.56	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
32.00	ZV318S_KS503_0320 MEL	3100	6000	≤24	0.56	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
40.00	ZV318S_KS503_0400 ME	3100	6000	≤19	0.45	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
40.00	ZV318S_KS503_0400 MEL	3100	6000	≤24	0.45	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
50.00	ZV318S_KS503_0500 ME	3500	6000	≤19	0.36	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
50.00	ZV318S_KS503_0500 MEL	3500	6000	≤24	0.36	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
70.00	ZV318S_KS503_0700 ME	4200	6000	≤19	0.26	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
70.00	ZV318S_KS503_0700 MEL	4200	6000	≤24	0.26	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
80.00	ZV318S_KS503_0800 ME	4200	6000	≤19	0.23	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
80.00	ZV318S_KS503_0800 MEL	4200	6000	≤24	0.23	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
100.0	ZV318S_KS503_1000 ME	4200	6000	≤19	0.18	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
100.0	ZV318S_KS503_1000 MEL	4200	6000	≤24	0.18	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
140.0	ZV318S_KS503_1400 ME	4200	6000	≤19	0.13	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
140.0	ZV318S_KS503_1400 MEL	4200	6000	≤24	0.13	0.042	62	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	150
200.0	ZV318S_KS503_2000 ME	4200	6000	≤19	0.09	0.042	62	3	18	57.3	4.2	4.2	7.0	5.2	10	10	200	150
200.0	ZV318S_KS503_2000 MEL	4200	6000	≤24	0.09	0.042	62	3	18	57.3	4.2	4.2	7.0	5.2	10	10	200	150
ZV3KS7 (F_{f2acc,max} = 11 kN)																		
6.000	ZV322S_KS702_0060 ME	2100	4500	≤32	2.75	0.041	91	3	22	70.0	6.9	6.4	11	6.4	17	13	400	220
6.000	ZV322S_KS702_0060 MEL	2100	4500	≤38	2.75	0.041	93	3	22	70.0	6.9	6.4	11	6.4	17	13	400	220
8.000	ZV322S_KS702_0080 ME	2500	5000	≤32	2.29	0.041	93	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
8.000	ZV322S_KS702_0080 MEL	2500	5000	≤38	2.29	0.041	94	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
10.00	ZV322S_KS702_0100 ME	2800	6000	≤32	2.20	0.041	94	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
10.00	ZV322S_KS702_0100 MEL	2800	6000	≤38	2.20	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
14.00	ZV322S_KS702_0140 ME	3000	6000	≤32	1.57	0.041	94	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
14.00	ZV322S_KS702_0140 MEL	3000	6000	≤38	1.57	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
20.00	ZV322S_KS702_0200 ME	3200	6000	≤32	1.10	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
20.00	ZV322S_KS702_0200 MEL	3200	6000	≤38	1.10	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
24.00	ZV322S_KS703_0240 ME	3000	6000	≤24	0.92	0.041	95	3	22	70.0	6.9	6.4	11	6.4	17	13	400	220
24.00	ZV322S_KS703_0240 MEL	3000	6000	≤32	0.92	0.041	95	3	22	70.0	6.9	6.4	11	6.4	17	13	400	220
32.00	ZV322S_KS703_0320 ME	3000	6000	≤24	0.69	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
32.00	ZV322S_KS703_0320 MEL	3000	6000	≤32	0.69	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
40.00	ZV322S_KS703_0400 ME	3000	6000	≤24	0.55	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
40.00	ZV322S_KS703_0400 MEL	3000	6000	≤32	0.55	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
50.00	ZV322S_KS703_0500 ME	3200	6000	≤24	0.44	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
50.00	ZV322S_KS703_0500 MEL	3200	6000	≤32	0.44	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
70.00	ZV322S_KS703_0700 ME	3500	6000	≤24	0.31	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
70.00	ZV322S_KS703_0700 MEL	3500	6000	≤32	0.31	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
80.00	ZV322S_KS703_0800 ME	4000	6000	≤24	0.28	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
80.00	ZV322S_KS703_0800 MEL	4000	6000	≤32	0.28	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
100.0	ZV322S_KS703_1000 ME	4000	6000	≤24	0.22	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
100.0	ZV322S_KS703_1000 MEL	4000	6000	≤32	0.22	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
140.0	ZV322S_KS703_1400 ME	4000	6000	≤24	0.16	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
140.0	ZV322S_KS703_1400 MEL	4000	6000	≤32	0.16	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
200.0	ZV322S_KS703_2000 ME	4000	6000	≤24	0.11	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220
200.0	ZV322S_KS703_2000 MEL	4000	6000	≤32	0.11	0.041	95	3	22	70.0	7.1	6.4	11	6.4	17	13	400	220

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [mm]	C_{lin} [N/ μm]	m_n [mm]	z	d_0 [mm]	$F_{f2N,S}$ [kN]	$F_{f2N,E}$ [kN]	F_{f2accS} [kN]	F_{f2accE} [kN]	$F_{f2NOT,S}$ [kN]	$F_{f2NOT,E}$ [kN]	M_{2accS} [Nm]	M_{2accE} [Nm]
ZV4KS7 ($F_{f2acc,max} = 10 \text{ kN}$)																		
6.000	ZV418S_KS702_0060 ME	2100	4500	≤32	3.00	0.044	82	4	18	76.4	6.3	6.3	10	6.7	16	13	400	260
6.000	ZV418S_KS702_0060 MEL	2100	4500	≤38	3.00	0.044	84	4	18	76.4	6.3	6.3	10	6.7	16	13	400	260
8.000	ZV418S_KS702_0080 ME	2500	5000	≤32	2.50	0.044	84	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
8.000	ZV418S_KS702_0080 MEL	2500	5000	≤38	2.50	0.044	85	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
10.00	ZV418S_KS702_0100 ME	2800	6000	≤32	2.40	0.044	85	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
10.00	ZV418S_KS702_0100 MEL	2800	6000	≤38	2.40	0.044	85	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
14.00	ZV418S_KS702_0140 ME	3000	6000	≤32	1.71	0.044	85	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
14.00	ZV418S_KS702_0140 MEL	3000	6000	≤38	1.71	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
20.00	ZV418S_KS702_0200 ME	3200	6000	≤32	1.20	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
20.00	ZV418S_KS702_0200 MEL	3200	6000	≤38	1.20	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
24.00	ZV418S_KS703_0240 ME	3000	6000	≤24	1.00	0.044	86	4	18	76.4	6.3	6.3	10	6.7	16	13	400	260
24.00	ZV418S_KS703_0240 MEL	3000	6000	≤32	1.00	0.044	86	4	18	76.4	6.3	6.3	10	6.7	16	13	400	260
32.00	ZV418S_KS703_0320 ME	3000	6000	≤24	0.75	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
32.00	ZV418S_KS703_0320 MEL	3000	6000	≤32	0.75	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
40.00	ZV418S_KS703_0400 ME	3000	6000	≤24	0.60	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
40.00	ZV418S_KS703_0400 MEL	3000	6000	≤32	0.60	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
50.00	ZV418S_KS703_0500 ME	3200	6000	≤24	0.48	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
50.00	ZV418S_KS703_0500 MEL	3200	6000	≤32	0.48	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
70.00	ZV418S_KS703_0700 ME	3500	6000	≤24	0.34	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
70.00	ZV418S_KS703_0700 MEL	3500	6000	≤32	0.34	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
80.00	ZV418S_KS703_0800 ME	4000	6000	≤24	0.30	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
80.00	ZV418S_KS703_0800 MEL	4000	6000	≤32	0.30	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
100.0	ZV418S_KS703_1000 ME	4000	6000	≤24	0.24	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
100.0	ZV418S_KS703_1000 MEL	4000	6000	≤32	0.24	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
140.0	ZV418S_KS703_1400 ME	4000	6000	≤24	0.17	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
140.0	ZV418S_KS703_1400 MEL	4000	6000	≤32	0.17	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
200.0	ZV418S_KS703_2000 ME	4000	6000	≤24	0.12	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260
200.0	ZV418S_KS703_2000 MEL	4000	6000	≤32	0.12	0.044	86	4	18	76.4	6.5	6.5	10	6.7	16	13	400	260

11.3 Dimensional drawings

In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

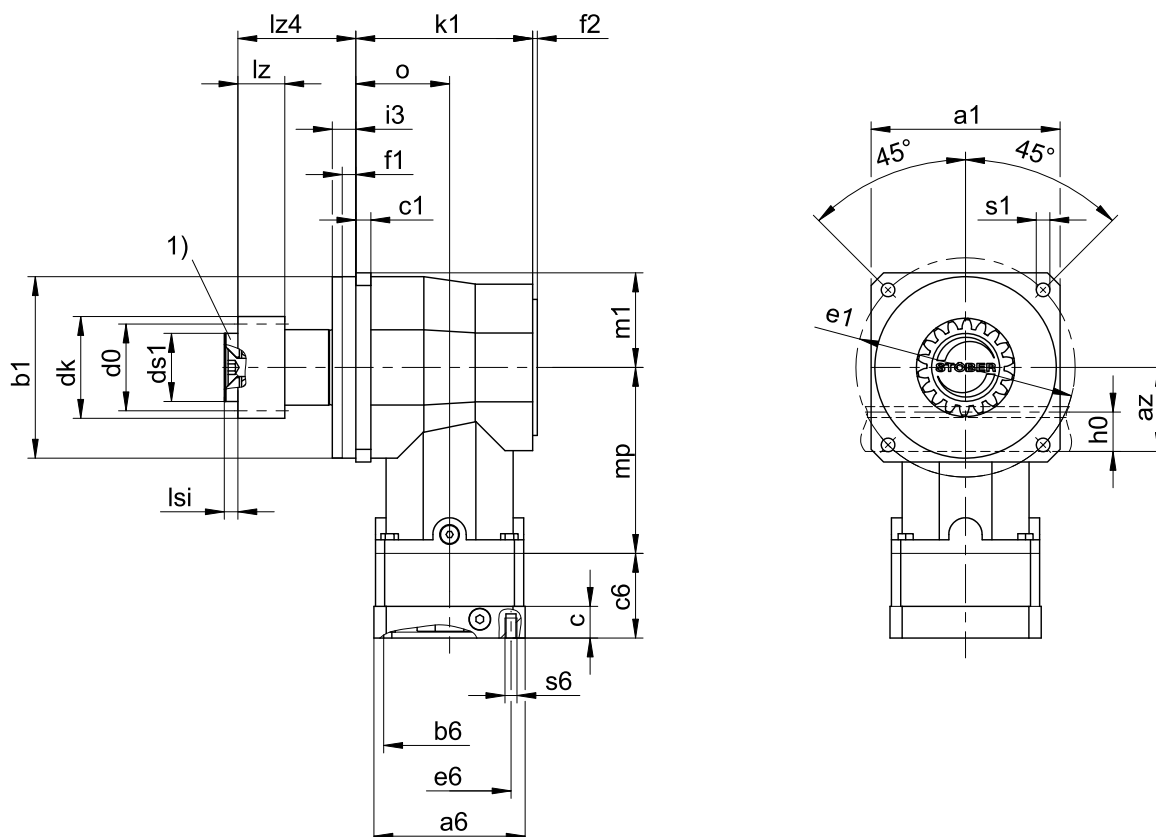
Dimension a_z in the tables of dimensions applies to Atlanta gear racks. In general: $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.

11.3.1 Pinion position E



1) Axial locking (optional)

Output dimensions

Type	mn	a1	az	Øb1	c1	Ød0	Ødk	Ødsi	Øe1	f1	f2	h0	i3	k1	lz	lz4	lsi	mp	m1	o	Øs1	x
ZV220SEKS402_	2	101	44.02	95 _{h6}	10	42.44	47.90	30	120	8	3	22	14.0	101	26	54.5	7	104.0	50.5	53	6.6	0.4
ZV220SEKS403_	2	101	44.02	95 _{h6}	10	42.44	47.90	30	120	8	3	22	14.0	101	26	54.5	7	144.0	50.5	53	6.6	0.4
ZV225SEKS502_	2	125	49.33	120 _{h6}	10	53.05	58.52	45	145	9	3	22	15.5	117	26	78.0	9	123.0	62.5	62	9.0	0.4
ZV225SEKS503_	2	125	49.33	120 _{h6}	10	53.05	58.52	45	145	9	3	22	15.5	117	26	78.0	9	172.0	62.5	62	9.0	0.4
ZV318SEKS502_	3	125	55.55	120 _{h6}	10	57.30	65.01	45	145	9	3	26	15.5	117	31	78.0	9	123.0	62.5	62	9.0	0.3
ZV318SEKS503_	3	125	55.55	120 _{h6}	10	57.30	65.01	45	145	9	3	26	15.5	117	31	78.0	9	172.0	62.5	62	9.0	0.3
ZV322SEKS702_	3	155	62.21	150 _{h6}	15	70.03	78.35	55	180	10	3	26	20.0	145	31	107.5	11	151.0	77.5	78	11.0	0.4
ZV322SEKS703_	3	155	62.21	150 _{h6}	15	70.03	78.35	55	180	10	3	26	20.0	145	31	107.5	11	205.5	77.5	78	11.0	0.4
ZV418SEKS702_	4	155	74.40	150 _{h6}	15	76.40	86.77	55	180	10	3	35	20.0	145	41	107.5	11	151.0	77.5	78	11.0	0.3
ZV418SEKS703_	4	155	74.40	150 _{h6}	15	76.40	86.77	55	180	10	3	35	20.0	145	41	107.5	11	205.5	77.5	78	11.0	0.3

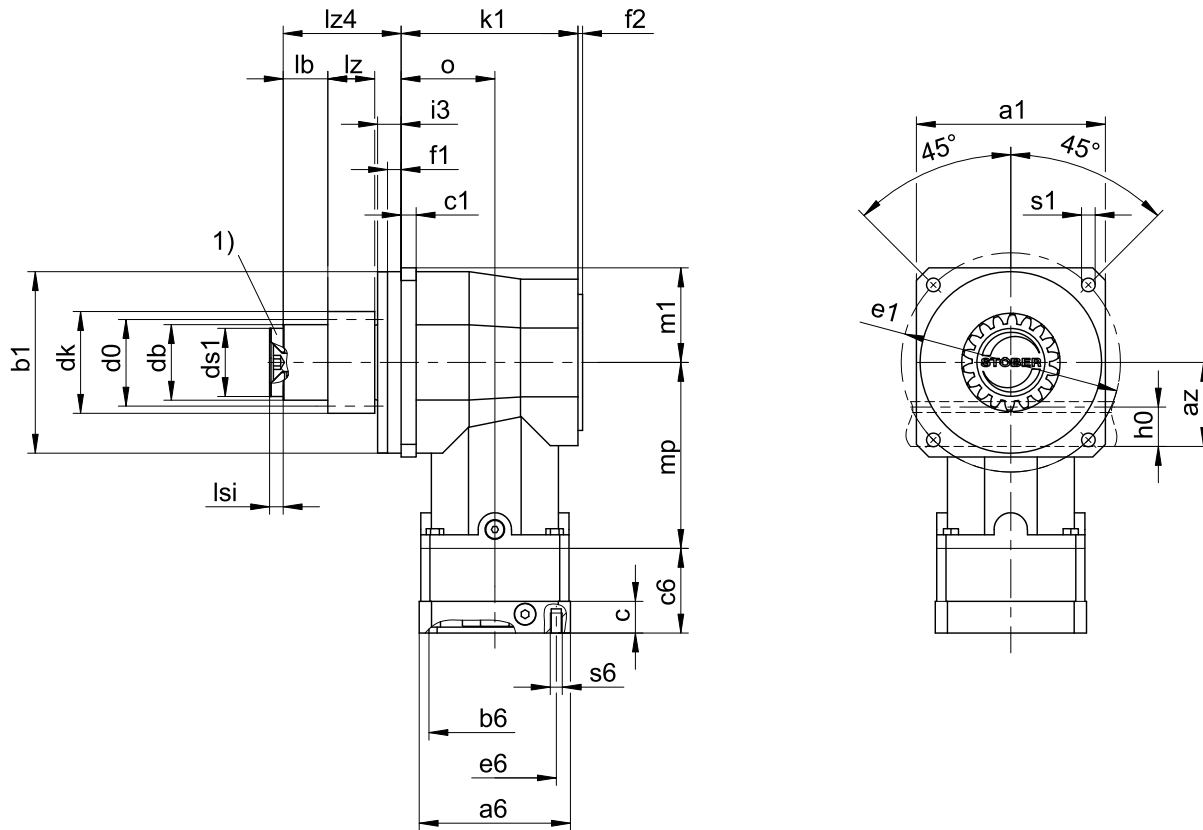
Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	s6
ZV_KS402_	75	60 ^{H7}	75	18	51.5	M5
ZV_KS403_	55	40 ^{H7}	63	15	32.0	M5
ZV_KS502_	100	95 ^{H7}	115	21	56.0	M8
ZV_KS503_	75	60 ^{H7}	75	18	51.5	M5
ZV_KS702_	120	110 ^{H7}	130	24	67.5	M8
ZV_KS703_	100	95 ^{H7}	115	21	56.0	M8

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEGER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

11.3.2 Pinion position S



1) Axial locking (optional)

Output dimensions

Type	mn	a1	az	Øb1	c1	Ød0	Ødb	Ødk	Øds1	Øe1	f1	f2	h0	i3	k1	lb	lz	lz4	lsi	mp	m1	o	Øs1	x
ZV220SSKS402_	2	101	44.02	95 _{h6}	10	42.44	38	47.90	30	120	8	3	22	14.0	101	12.5	26	54.5	7	104.0	50.5	53	6.6	0.4
ZV220SSKS403_	2	101	44.02	95 _{h6}	10	42.44	38	47.90	30	120	8	3	22	14.0	101	12.5	26	54.5	7	144.0	50.5	53	6.6	0.4
ZV225SSKS502_	2	125	49.33	120 _{h6}	10	53.05	50	58.52	45	145	9	3	22	15.5	117	34.5	26	78.0	9	123.0	62.5	62	9.0	0.4
ZV225SSKS503_	2	125	49.33	120 _{h6}	10	53.05	50	58.52	45	145	9	3	22	15.5	117	34.5	26	78.0	9	172.0	62.5	62	9.0	0.4
ZV318SSKS502_	3	125	55.55	120 _{h6}	10	57.30	50	65.01	45	145	9	3	26	15.5	117	29.5	31	78.0	9	123.0	62.5	62	9.0	0.3
ZV318SSKS503_	3	125	55.55	120 _{h6}	10	57.30	50	65.01	45	145	9	3	26	15.5	117	29.5	31	78.0	9	172.0	62.5	62	9.0	0.3
ZV322SSKS702_	3	155	62.21	150 _{h6}	15	70.03	62	78.35	55	180	10	3	26	20.0	145	53.5	31	107.5	11	151.0	77.5	78	11.0	0.4
ZV322SSKS703_	3	155	62.21	150 _{h6}	15	70.03	62	78.35	55	180	10	3	26	20.0	145	53.5	31	107.5	11	205.5	77.5	78	11.0	0.4
ZV418SSKS702_	4	155	74.40	150 _{h6}	15	76.40	62	86.77	55	180	10	3	35	20.0	145	43.5	41	107.5	11	151.0	77.5	78	11.0	0.3
ZV418SSKS703_	4	155	74.40	150 _{h6}	15	76.40	62	86.77	55	180	10	3	35	20.0	145	43.5	41	107.5	11	205.5	77.5	78	11.0	0.3

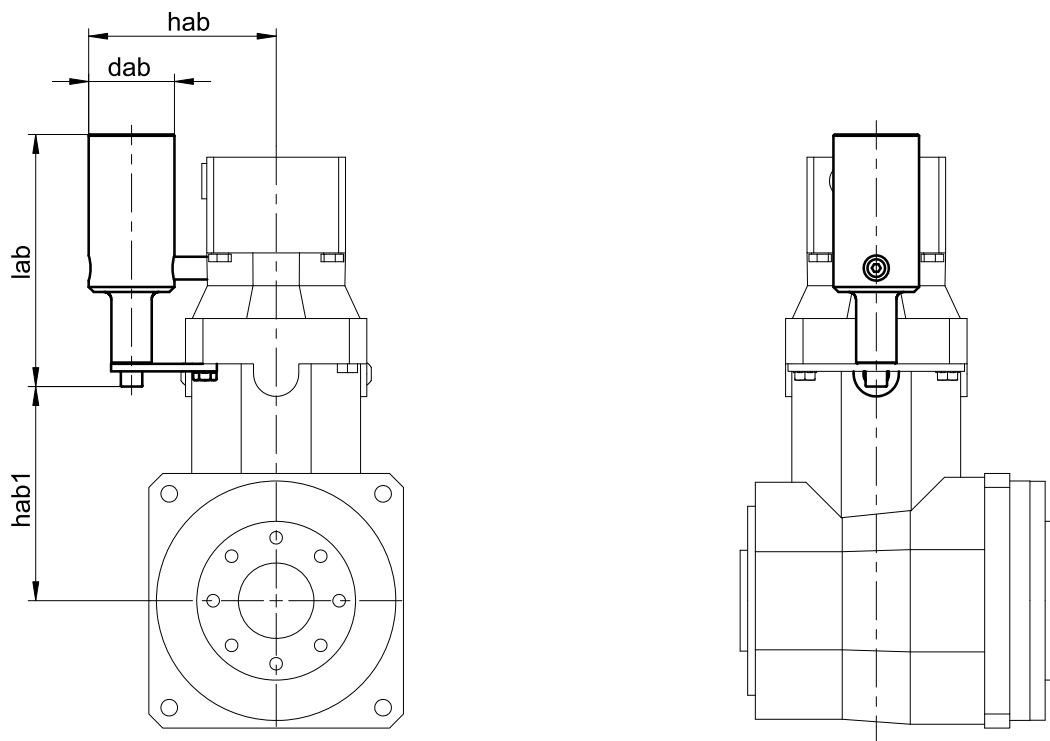
Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	a6	c	c6	s6
ZV_KS402_	75	60 ^{H7}	75	18	51.5	M5	
ZV_KS403_	55	40 ^{H7}	63	15	32.0	M5	
ZV_KS502_	100	95 ^{H7}	115	21	56.0	M8	
ZV_KS503_	75	60 ^{H7}	75	18	51.5	M5	
ZV_KS702_	120	110 ^{H7}	130	24	67.5	M8	
ZV_KS703_	100	95 ^{H7}	115	21	56.0	M8	

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOBER Configurator at <http://configurator.stoerber.de>. Here, you can directly download a 3D model of your drive.

11.3.3 Oil expansion tank



Dimensions

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

More information can be found in chapter [\[11.6.4 \]](#)

11.4 Type designation

In this chapter, you can find an explanation of the type designation with the associated options.

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

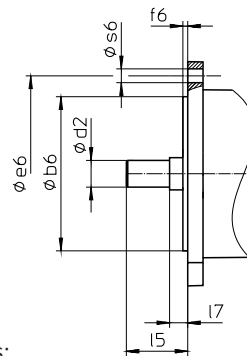
Sample code

Z	V	2	20	S	S	KS	4	0	2	P	G	0080	ME
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Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
V	Design	Plug-on pinion
2	Module	$m_n = 2$ (example)
20	Number of teeth	$z = 20$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
E	Pinion position	Shaft end
S		Shaft shoulder
KS	Type	Right-angle servo gear unit
4	Size	4 (example)
0	Generation	Generation 0
2	Stages	Two-stage
3		Three-stage
P	Shaft	Solid shaft with feather key
G	Housing	Pitch circle diameter
0080	Transmission ratio ($i \times 10$)	$i = 8$ (example)
ME	Motor adapter	Motor adapter with EasyAdapt® coupling
MEL		Motor adapter with EasyAdapt® coupling for large motors

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

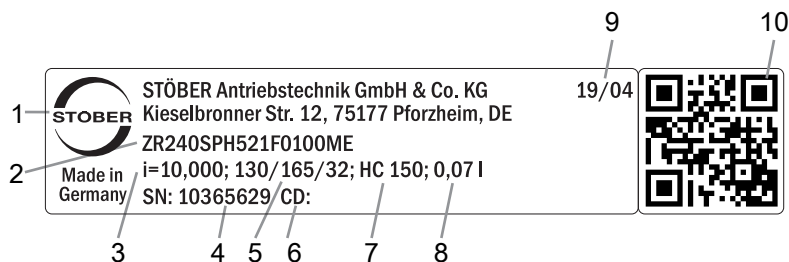
To choose a suitable motor connection, use the STOBBER Configurator at <http://configurator.stober.de> and choose your motor or the dimensions of the motor connection.

- For the mounting position, see the chapter [▶ 11.5.5]
- For the position of locking screw access, see the chapter [▶ 11.5.7]
- For radial shaft seal rings at the output made of NBR or FKM, see the chapter [▶ 11.6.3]
- For attachment of oil expansion tank on gear unit side 1 or 2 (required without exception for 3-stage gear units in mounting position EL5), see the chapter [▶ 11.6.4]
- For axial locking (optional), see the chapter [▶ 11.3]

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter. All input options available upon request are listed in the chapter [▶ 11.5.2].

11.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

11.4.1.1 Supporting documents

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

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

11.5 Product description

11.5.1 Motor adapter with EasyAdapt® coupling (ME/MEL)

In this chapter, you will find a description of the EasyAdapt® coupling.

Properties:

- Fast and easy motor attachment
- One-piece, rugged coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design

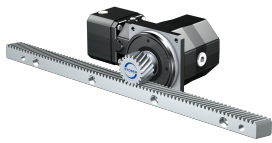


Fig. 1: EasyAdapt® coupling

11.5.2 Input options

In this chapter, you will find all available input options:

ME motor adapter



<http://www.stoeber.de/en/ZVKSME>

EZ synchronous servo motor



On request

11.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 7.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	8	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

11.5.3.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

- The tothing is flush with the shaft end (Pos. E)
- The tothing is flush with the shaft shoulder (Pos. S)

Please specify the desired attachment position when placing your purchase order.

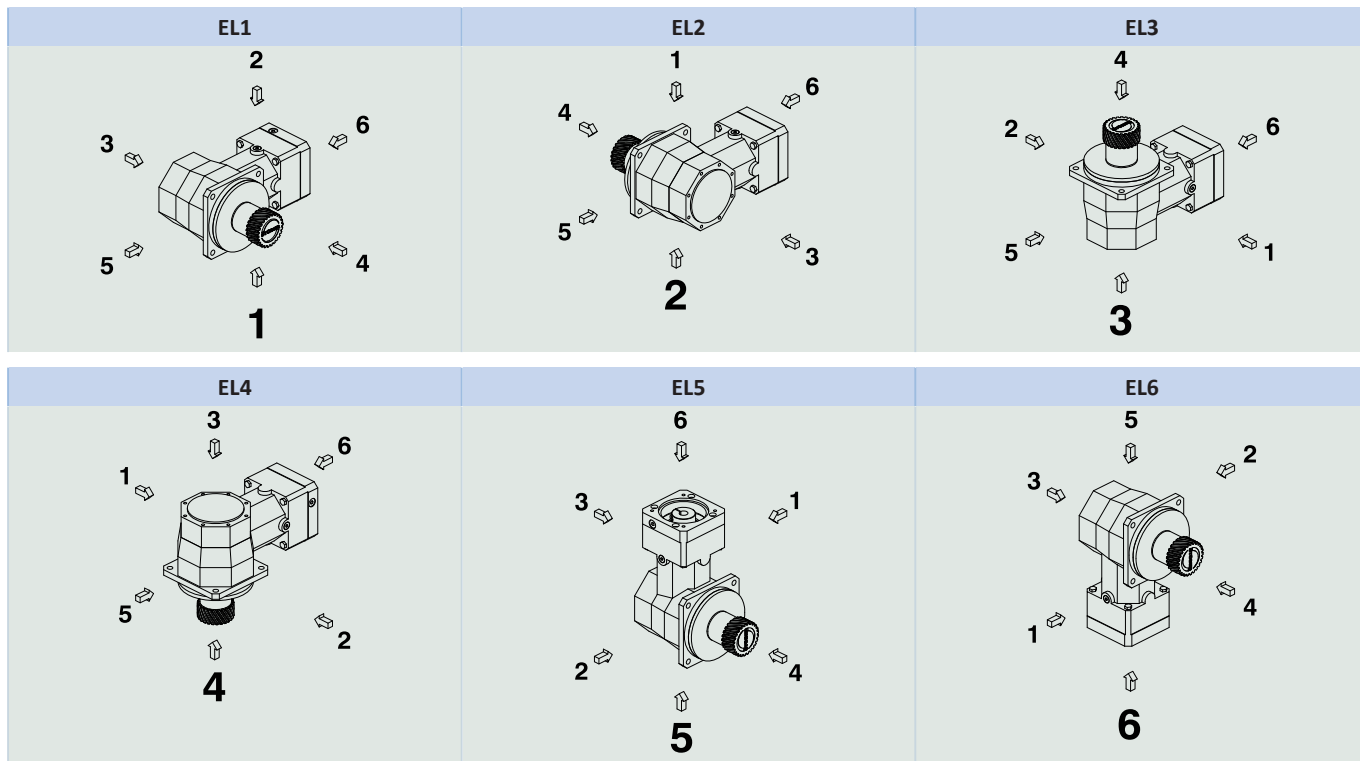
11.5.4 Installation conditions

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

11.5.5 Mounting positions

The following table shows the standard mounting positions.

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



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

11.5.6 Lubricants

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

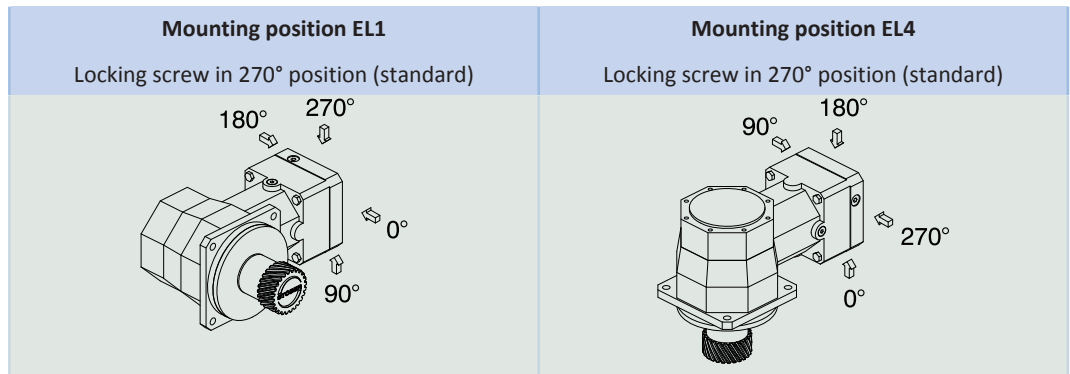
Only install the gear units in the intended mounting position! Reposition the gear units only after consulting STOBER. Otherwise, STOBER assumes no liability for the gear units.

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stober.de/en/download>. Enter the ID of the documentation in the Search... field.

11.5.6.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

11.5.7 Position of locking screw access



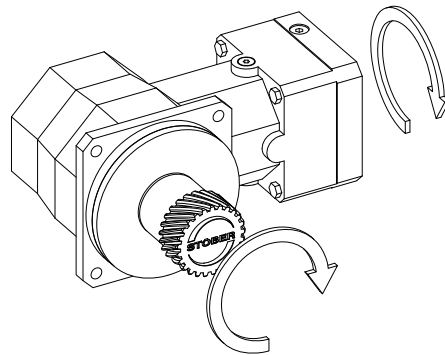
Indicate variations for your gear unit in the purchase order.

Note that the access opening for the locking screw also rotates when the gear unit is rotated to another mounting position.

11.5.8 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 (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

11.5.9 Direction of rotation



The pictures show mounting position EL1.

11.6 Project configuration

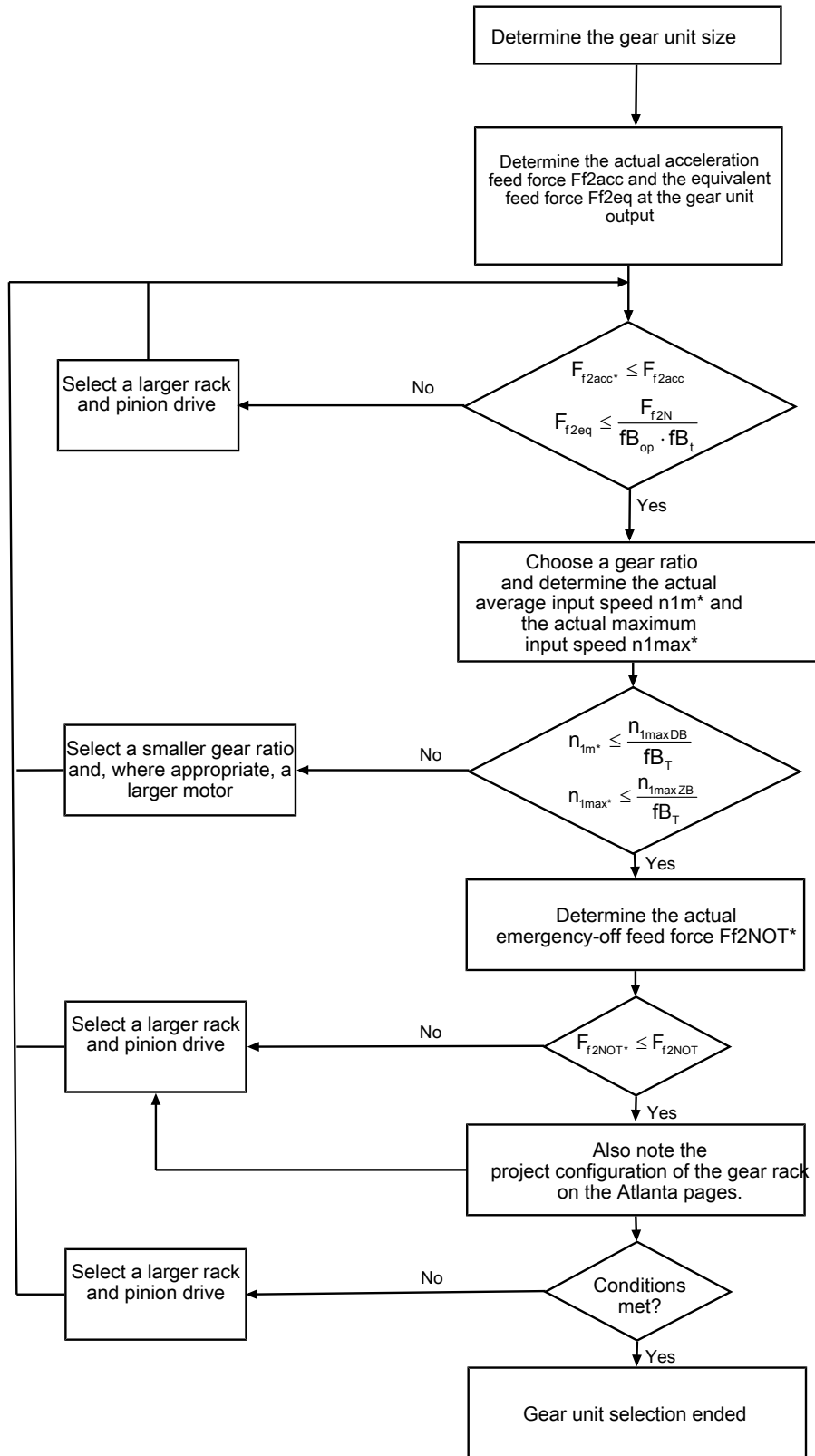
Project your drives using our SERVOfsoft designing software. You can receive SERVOfsoft for free from your adviser at one of our sales centers. Observe the limit conditions in this chapter to ensure a safe design for your drives.

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

An explanation of the formula symbols can be found in the chapter [\[▶ 14.1\]](#).

¹Observe the protection class of all the components.

11.6.1 Drive selection

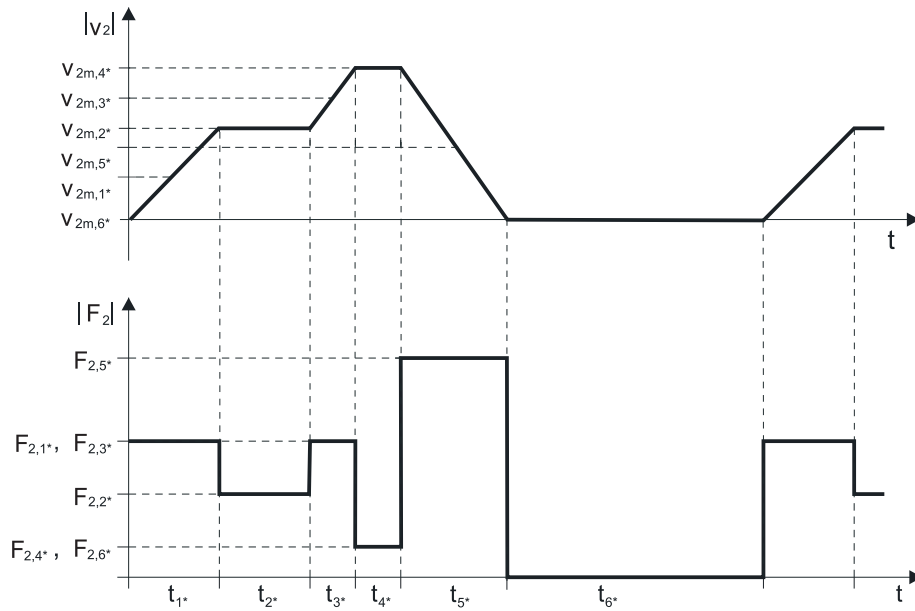


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for fb_T , fb_{op} and fb_t can be found in the corresponding tables in this chapter.

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

$$F_{f2acc^*} = m \cdot a^* + F_{L^*}$$

Calculation of the actual average input speed

$$n_{1m^*} = \frac{v_{2m^*} \cdot i}{d_0 \cdot \pi}$$

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

If \$t_{1^*} + \dots + t_{5^*} \ge 10\$ min, determine \$v_{2m^*}\$ without the rest phase \$t_{6^*}\$.

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT^*} = m \cdot a_{NOT^*} + F_{L^*}$$

Calculation of the actual equivalent feed force

$$F_{f2eq^*} = \sqrt[3]{\frac{|v_{2m,1^*}| \cdot t_{1^*} \cdot |F_{2,1^*}|^3 + \dots + |v_{2m,n^*}| \cdot t_{n^*} \cdot |F_{2,n^*}|^3}{|v_{2m,1^*}| \cdot t_{1^*} + \dots + |v_{2m,n^*}| \cdot t_{n^*}}}$$

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 \$\le 8\$ h	1.00
Daily run time \$\le 16\$ h	1.15
Daily run time \$\le 24\$ h	1.20

Temperature		f_{B_T}
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20\text{ }^\circ\text{C}$	0.9
	$\leq 30\text{ }^\circ\text{C}$	1.0
	$\leq 40\text{ }^\circ\text{C}$	1.15
Motor with convection cooling	$\leq 20\text{ }^\circ\text{C}$	1.0
	$\leq 30\text{ }^\circ\text{C}$	1.1
	$\leq 40\text{ }^\circ\text{C}$	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

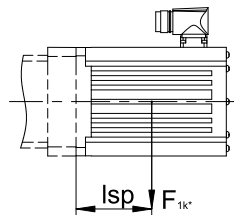
11.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
KS402_ME	20
KS403_ME	10
KS502_ME	40
KS503_ME	20
KS702_ME	80
KS703_ME	40

11.6.3 Recommendation for radial shaft seal rings

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

Properties:

- Excellent temperature resistance
- High chemical stability
- Very good resistance to aging
- Excellent resistance 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 a gear unit. If you use a gear unit with goods incompatible with the lubricant, you must take measures to prevent direct contact with the gear unit lubricant in case of a leak.

11.6.4 Oil expansion tank

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

Notes

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

11.7 Additional documentation

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

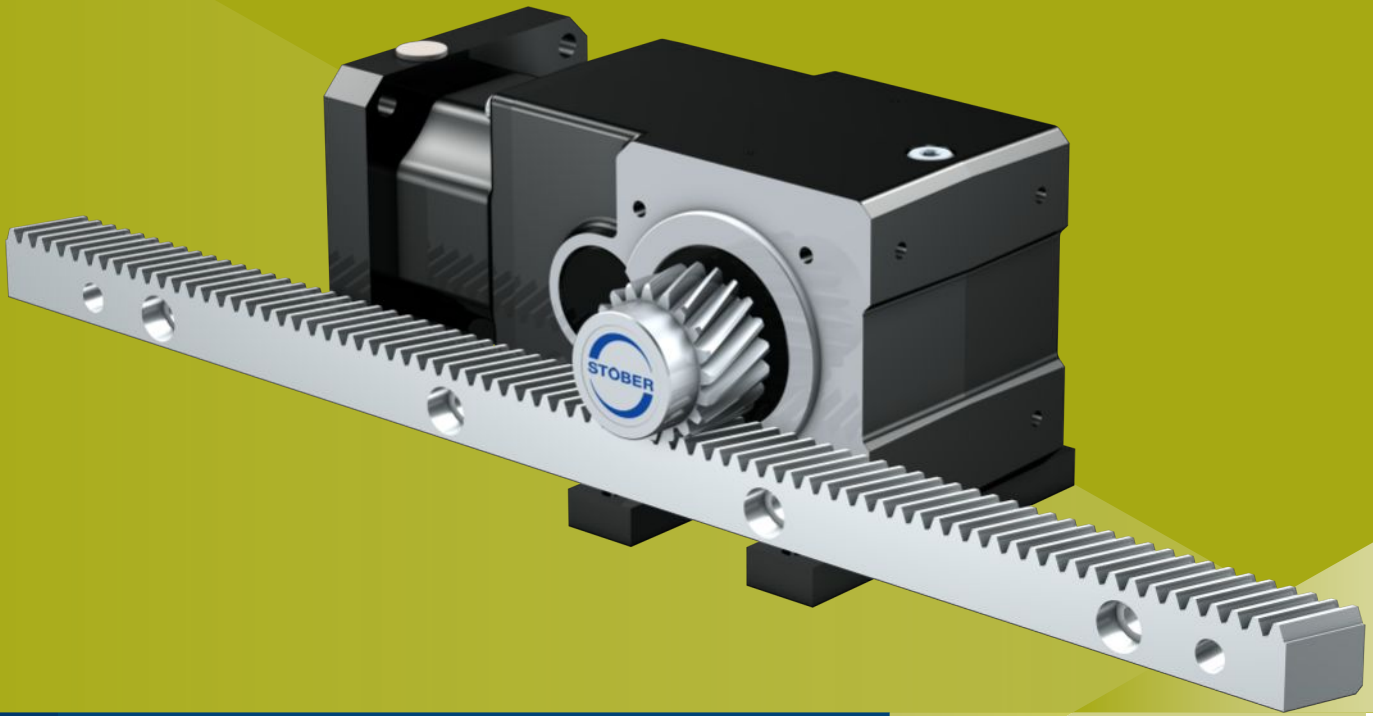
Enter the ID of the documentation in the Search... field.

Operating manual Rack and Pinion Drives (Atlanta)	442455
Operating manual for KL/KS/PHK/PHKX/PHQK/PK/PKX right-angle gear units and right-angle geared motors	443004_en
Lubricant filling quantities for gear units	441871

12 ZVKL rack and pinion drives

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12

Rack and pinion drives

ZVKL

12.1 Overview

Compact right-angle gear units with plug-on pinion

Features

- Power density ★★★★★
- Linear clearance ★★★★★
- Price category €
- Smooth operation ★★★★★
- Linear rigidity ★★★★★
- Mass moment of inertia ★★★★★
- Ready-to-install drive solution ✓
- Pinion gearing quality 7 (DIN 3962) ✓
- Helical gearing ✓
- Case-hardened and smoothed ✓

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

Technical data

m_n	2 mm
z	16 – 20
F_{f2acc}	1.3 – 2.9 kN
$v_{f2maxzB}$	0.33 – 2.8 m/s
Δs	99 – 123 μm

12.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 12.5.3]
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1].

i	Type	n_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [mm]	C_{fln} [N/ μm]	m_n [mm]	z	d_0 [mm]	$F_{f2N,S}$ [kN]	$F_{f2N,E}$ [kN]	F_{f2accS} [kN]	F_{f2accE} [kN]	$F_{f2NOT,S}$ [kN]	$F_{f2NOT,E}$ [kN]	M_{2accS} [Nm]	M_{2accE} [Nm]
ZV2KL1 ($F_{v2acc,max} = 1,6 \text{ kN}$)																		
4.000	ZV216S_KL102_0040 MQ	3500	5000	≤16	2.22	0.123	11	2	16	34.0	0.9	0.9	1.3	1.3	1.7	1.7	22	22
8.000	ZV216S_KL102_0080 MQ	3500	5000	≤16	1.11	0.099	18	2	16	34.0	1.4	1.3	1.6	1.5	3.2	3.1	27	26
16.00	ZV216S_KL102_0160 MQ	4000	6000	≤16	0.67	0.099	20	2	16	34.0	1.5	1.5	1.6	1.5	3.2	3.1	27	26
32.00	ZV216S_KL102_0320 MQ	4000	6000	≤16	0.33	0.099	19	2	16	34.0	1.5	1.5	1.6	1.5	3.2	3.1	27	26
ZV2KL2 ($F_{v2acc,max} = 2,9 \text{ kN}$)																		
4.000	ZV220S_KL202_0040 MQ	3500	5000	≤19	2.78	0.123	13	2	20	42.4	1.6	1.4	2.2	2.2	2.7	2.7	47	47
8.000	ZV220S_KL202_0080 MQ	3500	5000	≤19	1.39	0.099	25	2	20	42.4	2.0	1.7	2.8	2.6	5.5	5.2	60	55
16.00	ZV220S_KL202_0160 MQ	4000	6000	≤19	0.83	0.099	28	2	20	42.4	2.4	2.2	2.8	2.6	5.7	5.2	60	55
32.00	ZV220S_KL202_0320 MQ	4000	6000	≤19	0.42	0.099	23	2	20	42.4	2.4	2.4	2.9	2.6	5.8	5.2	62	55

12.3 Dimensional drawings

In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

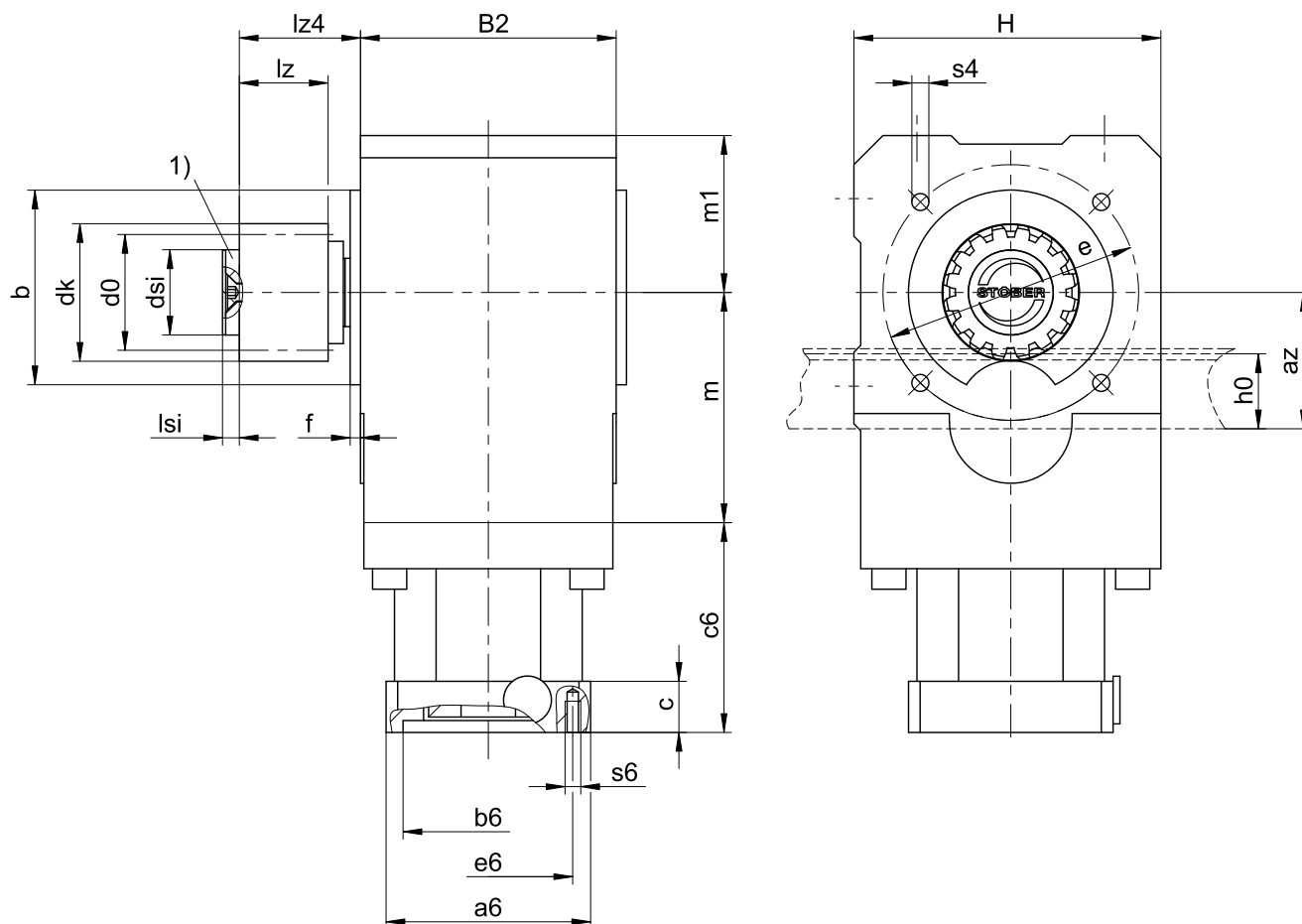
Dimension a_z in the tables of dimensions applies to Atlanta gear racks. In general: $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.

12.3.1 Pinion position E



1) Axial locking (optional)

Output dimensions

Type	mn	az	$\varnothing b$	B2	$\varnothing d0$	$\varnothing dk$	$\varnothing dsi$	$\varnothing e$	f	h0	H	lz	lz4	lsi	m	m1	s4	x
ZV216SEKL1_	2	39.98	60_6	75	33.95	39.81	25	75	3.0	22	90	26	35.5	5	67.5	46	M6	0.5
ZV220SEKL2_	2	44.02	75_6	92	42.44	47.90	30	90	3.0	22	108	26	44.5	7	88.5	55	M6	0.4

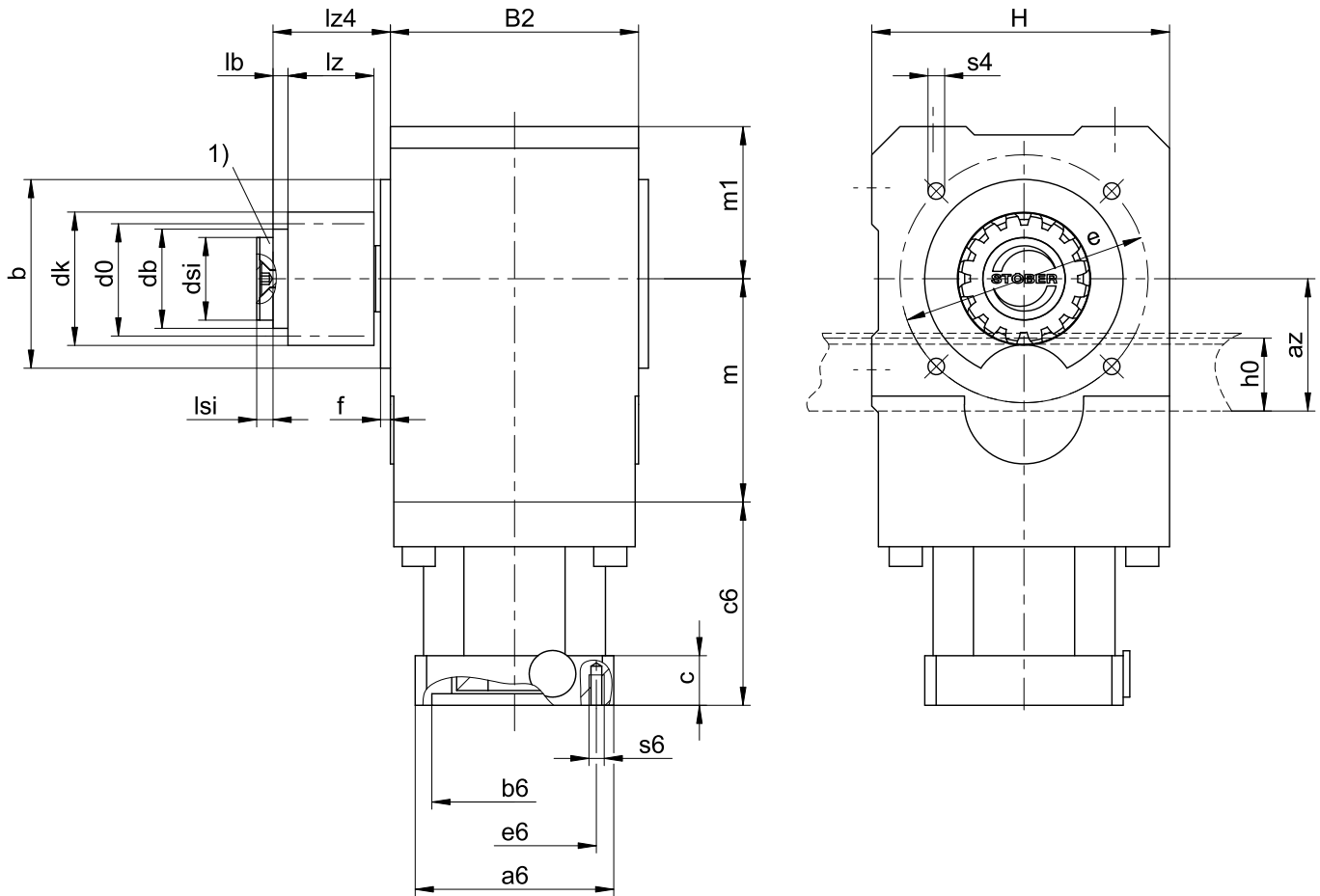
Example dimensions for the motor connection + total length

Type	$\square a6$	$\varnothing b6$	$\varnothing e6$	c	c6	s6
ZV2_KL102_	55	40^{H7}	63	15	61.5	M5
ZV2_KL202_	75	60^{H7}	75	18	69.5	M5

In the table above, you will find example dimensions for the motor connection for motor adapter MQ. **Note that when dimension c is lengthened, dimensions c6 and lzg are lengthened accordingly.**

You will find additional motor connection dimensions for motor adapter MQ in our STOEGER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

12.3.2 Pinion position S



1) Axial locking (optional)

Output dimensions

Type	mn	az	Øb	B2	Ød0	Ødb	Ødk	Ødsi	Øe	f	h0	H	lb	lz	lz4	lsi	m	m1	s4	x
ZV216SSKL1_	2	39.98	60 _β	75	33.95	30	39.81	25	75	3	22	90	4.5	26	35.5	5	67.5	46	M6	0.5
ZV220SSKL2_	2	44.02	75 _β	92	42.44	38	47.90	30	90	3	22	108	12.5	26	44.5	7	88.5	55	M6	0.4

Example dimensions for the motor connection + total length

Type	□a6	Øb6	Øe6	c	c6	s6
ZV2_KL102_	55	40 ^{H7}	63	15	61.5	M5
ZV2_KL202_	75	60 ^{H7}	75	18	69.5	M5

In the table above, you will find example dimensions for the motor connection for motor adapter MQ. **Note that when dimension c is lengthened, dimensions c6 and lzg are lengthened accordingly.**

You will find additional motor connection dimensions for motor adapter MQ in our STOBER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

12.4 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.

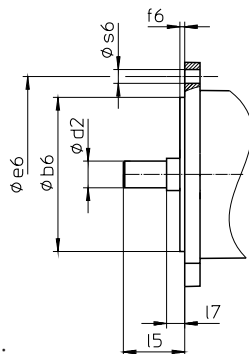
Sample code

Z	V	2	20	S	S	KL	2	0	2	P	G	0080	MQ
---	---	---	----	---	---	----	---	---	---	---	---	------	----

Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
V	Design	Plug-on pinion
2	Module	$m_n = 2$ (example)
20	Number of teeth	$z = 20$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
E	Pinion position	Shaft end
S		Shaft shoulder
KL	Type	Helical bevel gear unit
2	Size	2 (example)
0	Generation	Generation 0
2	Stages	Two-stage
P	Shaft	Solid shaft with feather key
G	Housing	Pitch circle diameter
0080	Transmission ratio ($i \times 10$)	$i = 8$ (example)
MQ	Motor adapter	Square motor adapter with backlash-free plug-in coupling

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at <http://configurator.stoeber.de> and choose your motor or the dimensions of the motor connection.

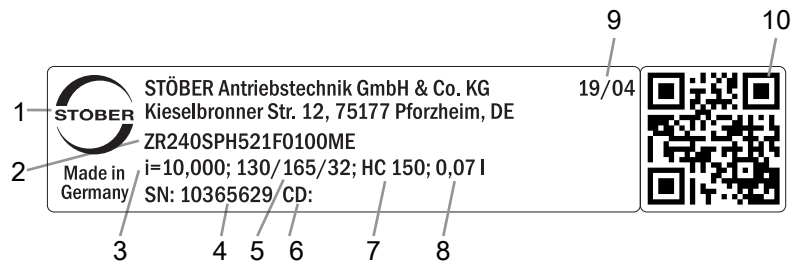
- Attachment of solid shaft: gear unit side 3 or 4
- Pitch circle diameter: gear unit side 3 or 4
- For the position of locking screw access, see the chapter [▶ 12.5.7]
- For axial locking (optional), see the chapter [▶ 12.3]

An explanation of the gear unit sides can be found in the chapter [▶ 12.5.5]

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter. All input options available upon request are listed in the chapter [▶ 12.5.2].

12.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

12.4.1.1 Supporting documents

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

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

12.5 Product description

12.5.1 Square motor adapter with backlash-free plug-in coupling (MQ)

In this chapter, you will find a description of the backlash-free plug-in coupling.

Properties:

- Fast and easy motor attachment
- With integrated thermal length compensation, compensates for linear expansion of the motor shaft
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor

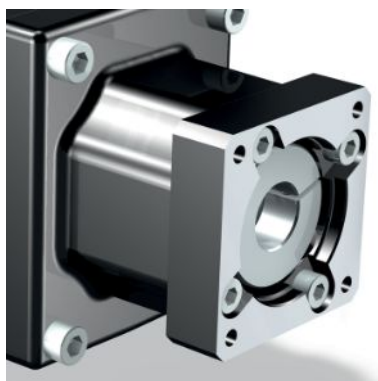


Fig. 1: Backlash-free plug-in coupling

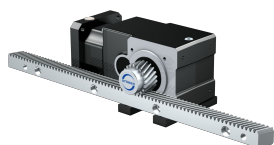
12.5.2 Input options

In this chapter, you will find all available input options:

MQ motor adapter

EZ synchronous servo motor

LM Lean motor



<http://www.stoeber.de/en/ZVKLMQ>

On request

On request

12.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 7.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	8	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

12.5.3.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

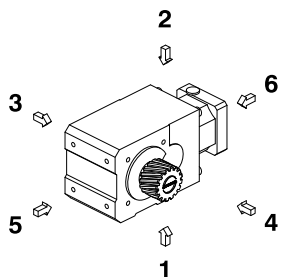
- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S)

Please specify the desired attachment position when placing your purchase order.

12.5.4 Installation conditions

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

12.5.5 Gear unit sides



The numbers identify the gear unit sides.

12.5.6 Lubricants

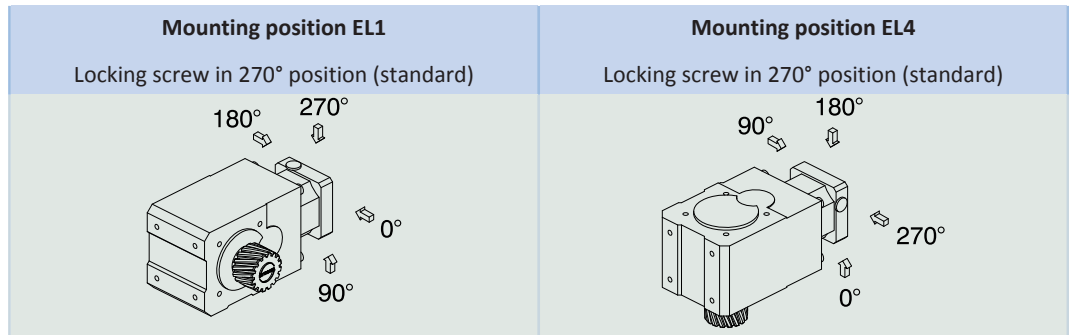
STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stoeber.de/en/download>. Enter the ID of the documentation in the Search... field.

12.5.6.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

12.5.7 Position of locking screw access



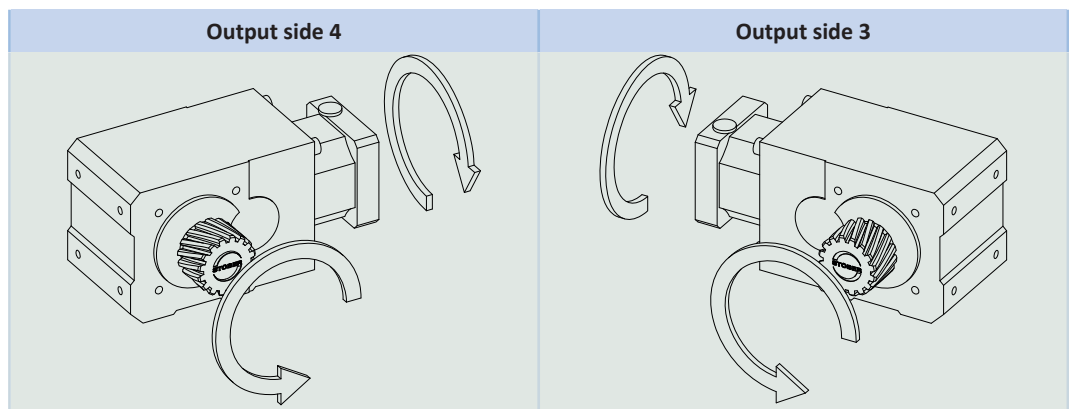
Indicate variations for your gear unit in the purchase order.

Note that the access opening for the locking screw also rotates when the gear unit is rotated to another mounting position.

12.5.8 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 80 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

12.5.9 Direction of rotation



The pictures show mounting position EL1.

12.6 Project configuration

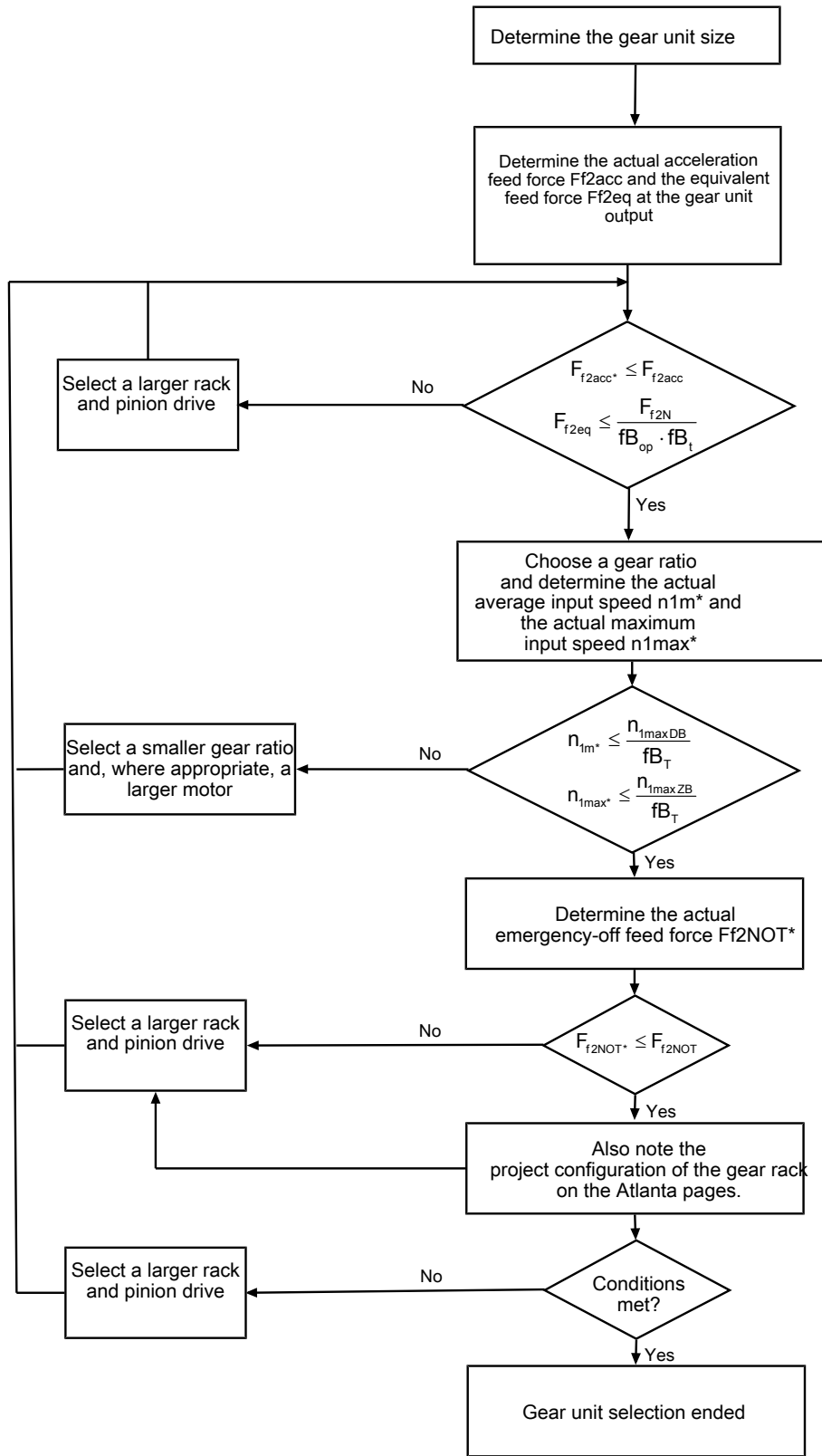
Project your drives using our SERVOSOFT designing software. You can receive SERVOSOFT for free from your adviser at one of our sales centers. Observe the limit conditions in this chapter to ensure a safe design for your drives.

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

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

¹ Observe the protection class of all the components.

12.6.1 Drive selection

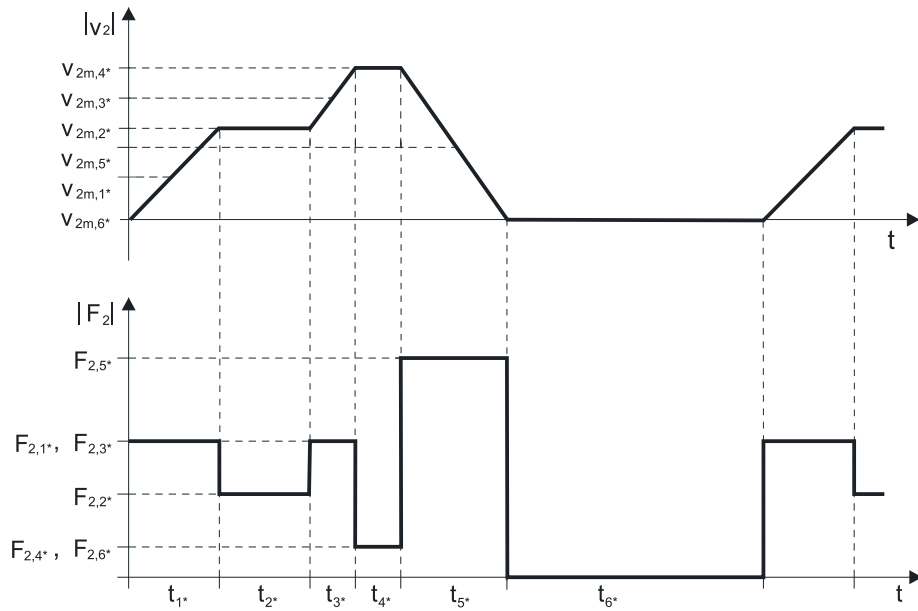


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for fb_T , fb_{op} and fb_t can be found in the corresponding tables in this chapter.

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

$$F_{f2acc^*} = m \cdot a^* + F_{L^*}$$

Calculation of the actual average input speed

$$n_{1m^*} = \frac{v_{2m^*} \cdot i}{d_0 \cdot \pi}$$

$$v_{2m^*} = \frac{|v_{2m,1^*}| \cdot t_1^* + \dots + |v_{2m,n^*}| \cdot t_n^*}{t_1^* + \dots + t_n^*}$$

If \$t_1^* + \dots + t_5^* \ge 10\$ min, determine \$v_{2m^*}\$ without the rest phase \$t_6^*\$.

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT^*} = m \cdot a_{NOT^*} + F_{L^*}$$

Calculation of the actual equivalent feed force

$$F_{f2eq^*} = \sqrt[3]{\frac{|v_{2m,1^*}| \cdot t_1^* \cdot |F_{2,1^*}|^3 + \dots + |v_{2m,n^*}| \cdot t_n^* \cdot |F_{2,n^*}|^3}{|v_{2m,1^*}| \cdot t_1^* + \dots + |v_{2m,n^*}| \cdot t_n^*}}$$

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 \$\le 8\$ h	1.00
Daily run time \$\le 16\$ h	1.15
Daily run time \$\le 24\$ h	1.20

Temperature		f_{B_T}
Motor cooling	Surrounding temperature	
Motor with forced ventilation	$\leq 20\text{ }^\circ\text{C}$	0.9
	$\leq 30\text{ }^\circ\text{C}$	1.0
	$\leq 40\text{ }^\circ\text{C}$	1.15
Motor with convection cooling	$\leq 20\text{ }^\circ\text{C}$	1.0
	$\leq 30\text{ }^\circ\text{C}$	1.1
	$\leq 40\text{ }^\circ\text{C}$	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT}) in the selection tables.

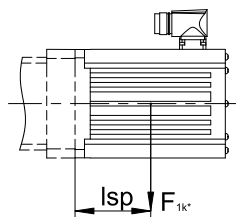
12.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOEBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
KL1_MQ	15
KL2_MQ	20

12.7 Additional documentation

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

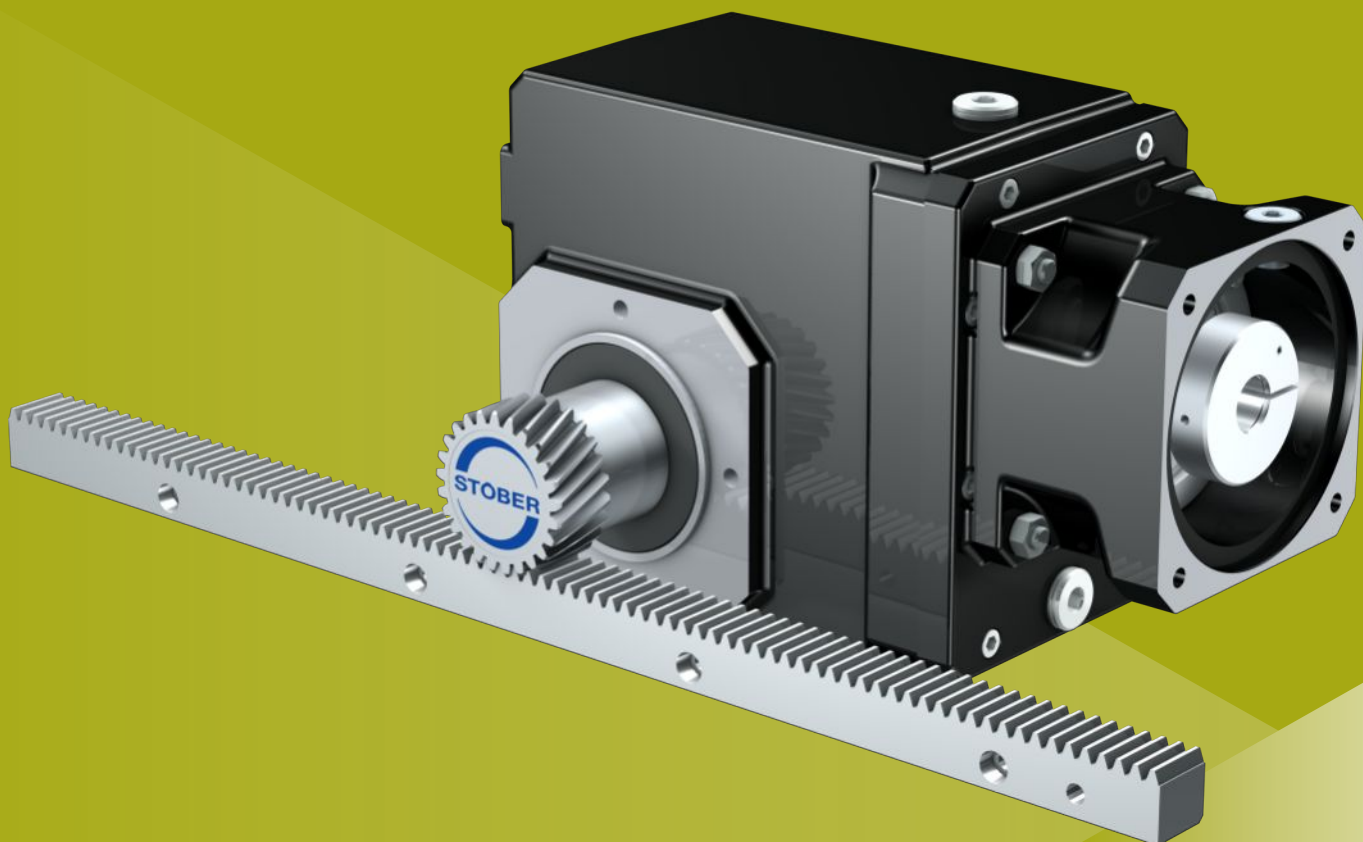
Enter the ID of the documentation in the Search... field.

Operating manual Rack and Pinion Drives (Atlanta)	442455
Operating manual for KL/KS/PHK/PHKX/PHQK/PK/PKX right-angle gear units and right-angle geared motors	443004_en
Lubricant filling quantities for gear units	441871

13 ZVK rack and pinion drives

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13 Rack and pinion drives

ZVK

13.1 Overview

Highly rigid right-angle gear units with plug-on pinion

Features

Power density	★☆☆☆☆
Linear clearance	★★★★☆
Price category	€
Smooth operation	★★★★☆
Linear rigidity	★☆☆☆☆
Mass moment of inertia	★★★★☆
Ready-to-install drive solution	✓
Pinion gearing quality 7 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓

Key: ★☆☆☆☆ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

Technical data

m_n	2 – 4 mm
z	18 – 25
F_{f2acc}	1.6 – 15 kN
$v_{f2maxZB}$	0.05 – 3.5 m/s
Δs	12 – 111 μm

13.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 13.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For all other technical data, refer to <http://configurator.stoeber.de>.

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

i	Type	n _{1maxDB} <small>EL1,2</small> [rpm]	n _{1maxDB} <small>EL3,4,5,6</small> [rpm]	n _{1maxZV} [rpm]	d _{MW} [mm]	v _{f2maxZB} [m/s]	Δs [mm]	C _{fln} [N/ μm]	m _n [mm]	z	d ₀ [mm]	F _{f2N,S} [kN]	F _{f2N,E} [kN]	F _{f2accS} [kN]	F _{f2accE} [kN]	F _{f2NOT,S} [kN]	F _{f2NOT,E} [kN]	M _{2accS} [Nm]	M _{2accE} [Nm]
ZV2K1 (F_{v2acc,max} = 4,9 kN)																			
4.000	ZV220S_K102_0040 ME10	3300	2800	4500	≤19	2.50	0.074	43	2	20	42.4	3.1	3.1	4.4	3.2	5.5	5.5	93	68
4.000	ZV220S_K102_0040 ME20	3300	2800	4500	≤24	2.50	0.074	45	2	20	42.4	3.1	3.1	4.4	3.2	5.5	5.5	93	68
5.568	ZV220S_K102_0056 ME10	3300	2800	4500	≤19	1.80	0.074	45	2	20	42.4	3.4	3.2	4.9	3.2	7.6	6.4	100	68
5.568	ZV220S_K102_0056 ME20	3300	2800	4500	≤24	1.80	0.074	45	2	20	42.4	3.4	3.2	4.9	3.2	7.6	6.4	100	68
6.000	ZV220S_K102_0060 ME10	3300	2800	4500	≤19	1.67	0.074	45	2	20	42.4	3.5	3.2	4.9	3.2	8.2	6.4	100	68
6.000	ZV220S_K102_0060 ME20	3300	2800	4500	≤24	1.67	0.074	45	2	20	42.4	3.5	3.2	4.9	3.2	8.2	6.4	100	68
6.644	ZV220S_K102_0066 ME10	3600	3300	5000	≤19	1.67	0.074	45	2	20	42.4	3.6	3.2	4.9	3.2	9.1	6.4	100	68
6.644	ZV220S_K102_0066 ME20	3500	3300	5000	≤24	1.67	0.074	46	2	20	42.4	3.6	3.2	4.9	3.2	9.1	6.4	100	68
8.309	ZV220S_K102_0083 ME10	3600	3300	5000	≤19	1.34	0.074	45	2	20	42.4	3.9	3.2	4.9	3.2	9.9	6.4	100	68
8.309	ZV220S_K102_0083 ME20	3500	3300	5000	≤24	1.34	0.074	46	2	20	42.4	3.9	3.2	4.9	3.2	9.9	6.4	100	68
9.249	ZV220S_K102_0092 ME10	3600	3300	5000	≤19	1.20	0.074	46	2	20	42.4	4.1	3.2	4.9	3.2	9.9	6.4	100	68
9.249	ZV220S_K102_0092 ME20	3500	3300	5000	≤24	1.20	0.074	46	2	20	42.4	4.1	3.2	4.9	3.2	9.9	6.4	100	68
10.14	ZV220S_K102_0100 ME10	4000	3800	5500	≤19	1.21	0.074	46	2	20	42.4	4.2	3.2	4.9	3.2	9.9	6.4	100	68
10.14	ZV220S_K102_0100 ME20	3500	3500	5000	≤24	1.10	0.074	46	2	20	42.4	4.2	3.2	4.9	3.2	9.9	6.4	100	68
11.57	ZV220S_K102_0115 ME10	3600	3300	5000	≤19	0.96	0.074	46	2	20	42.4	4.4	3.2	4.9	3.2	9.9	6.4	100	68
11.57	ZV220S_K102_0115 ME20	3500	3300	5000	≤24	0.96	0.074	46	2	20	42.4	4.4	3.2	4.9	3.2	9.9	6.4	100	68
12.62	ZV220S_K102_0125 ME10	4000	3800	5500	≤19	0.97	0.074	46	2	20	42.4	4.5	3.2	4.9	3.2	9.9	6.4	100	68
12.62	ZV220S_K102_0125 ME20	3500	3500	5000	≤24	0.88	0.074	46	2	20	42.4	4.5	3.2	4.9	3.2	9.9	6.4	100	68
14.11	ZV220S_K102_0140 ME10	4000	3800	5500	≤19	0.87	0.074	46	2	20	42.4	4.7	3.2	4.9	3.2	9.9	6.4	100	68
14.11	ZV220S_K102_0140 ME20	3500	3500	5000	≤24	0.79	0.074	46	2	20	42.4	4.7	3.2	4.9	3.2	9.9	6.4	100	68
16.71	ZV220S_K102_0165 ME10	4000	4000	6000	≤19	0.80	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
16.71	ZV220S_K102_0165 ME20	3500	3500	5000	≤24	0.67	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
17.56	ZV220S_K102_0175 ME10	4000	3800	5500	≤19	0.70	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
17.56	ZV220S_K102_0175 ME20	3500	3500	5000	≤24	0.63	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
20.15	ZV220S_K102_0200 ME10	4000	4000	6000	≤19	0.66	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
20.15	ZV220S_K102_0200 ME20	3500	3500	5000	≤24	0.55	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
23.27	ZV220S_K102_0230 ME10	4000	4000	6000	≤19	0.57	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
23.27	ZV220S_K102_0230 ME20	3500	3500	5000	≤24	0.48	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
25.22	ZV220S_K102_0250 ME10	4000	4000	6000	≤19	0.53	0.074	46	2	20	42.4	4.5	3.2	4.9	3.2	9.1	6.4	100	68
25.22	ZV220S_K102_0250 ME20	3500	3500	5000	≤24	0.44	0.074	46	2	20	42.4	4.5	3.2	4.9	3.2	9.1	6.4	100	68
28.05	ZV220S_K102_0280 ME10	4000	4000	6000	≤19	0.48	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
28.05	ZV220S_K102_0280 ME20	3500	3500	5000	≤24	0.40	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
33.71	ZV220S_K102_0340 ME10	4000	4000	6000	≤19	0.40	0.074	46	2	20	42.4	3.4	3.2	4.1	3.2	6.9	6.4	88	68
35.11	ZV220S_K102_0350 ME10	4000	4000	6000	≤19	0.38	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
35.11	ZV220S_K102_0350 ME20	3500	3500	5000	≤24	0.32	0.074	46	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	100	68
40.30	ZV220S_K102_0400 ME10	4000	4000	6000	≤19	0.33	0.074	46	2	20	42.4	2.9	2.9	3.5	3.2	5.8	5.8	74	68
46.92	ZV220S_K102_0470 ME10	4000	4000	6000	≤19	0.28	0.074	46	2	20	42.4	4.8	3.2	4.9	3.2	9.6	6.4	100	68
50.31	ZV220S_K102_0500 ME10	4000	4000	6000	≤19	0.27	0.074	46	2	20	42.4	2.4	2.4	2.8	2.8	4.7	4.7	60	60
56.10	ZV220S_K102_0560 ME10	4000	4000	6000	≤19	0.24	0.074	46	2	20	42.4	4.0	3.2	4.8	3.2	8.1	6.4	100	68
70.03	ZV220S_K102_0700 ME10	4000	4000	6000	≤19	0.19	0.074	46	2	20	42.4	3.3	3.2	3.9	3.2	6.6	6.4	83	68
ZV2K2 (F_{v2acc,max} = 8,3 kN)																			
4.000	ZV225S_K202_0040 ME10	3000	2600	4000	≤19	2.78	0.077	41	2	25	53.1	1.8	1.8	1.8	1.8	2.2	2.2	47	47
4.000	ZV225S_K202_0040 ME20	3000	2600	4000	≤32	2.78	0.077	45	2	25	53.1	4.4	4.4	6.6	5.2	11	10	170	140
4.000	ZV225S_K202_0040 ME30	3000	2600	4000	≤38	2.78	0.077	46	2	25	53.1	4.4	4.4	6.6	5.2	11	10	170	140
4.364	ZV225S_K202_0044 ME10	3000	2600	4000	≤19	2.55	0.077	43	2	25	53.1	3.8	3.8	3.8	3.8	4.8	4.8	100	100
4.364	ZV225S_K202_0044 ME20	3000	2600	4000	≤32	2.55	0.077	45	2	25	53.1	4.5	4.5	6.8	5.2	12	10	180	140
4.364	ZV225S_K202_0044 ME30	3000	2600	4000	≤38	2.55	0.077	46	2	25	53.1	4.5	4.5	6.8	5.2	12	10	180	140
5.177	ZV225S_K202_0052 ME20	3000	2600	4000	≤32	2.15	0.077	46	2	25	53.1	4.8	4.8	7.2	5.2	14	10	190	140
5.177	ZV225S_K202_0052 ME30	3000	2600	4000	≤38	2.15	0.077	46	2	25	53.1	4.8	4.8	7.2	5.2	14	10	190	140
6.000	ZV225S_K202_0060 ME10	3000	2600	4000	≤19	1.85	0.077	44	2	25	53.1	5.0	5.0	5.3	5.2	6.6	6.6	140	140

13.2 Selection tables 13 ZVK rack and pinion drives

i	Type	n_{1maxDB}	n_{1maxDB}	n_{1maxZV}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	$F_{f2N,S}$	$F_{f2N,E}$	F_{f2accS}	F_{f2accE}	$F_{f2NOT,S}$	$F_{f2NOT,E}$	M_{2accS}	M_{2accE}
		EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/ μm]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]
ZV2K2 ($F_{v2acc,max} = 8,3 \text{ kN}$)																			
6.000	ZV225S_K202_0060 ME20	3000	2600	4000	≤32	1.85	0.077	46	2	25	53.1	5.0	5.0	7.5	5.2	15	10	200	140
6.000	ZV225S_K202_0060 ME30	3000	2600	4000	≤38	1.85	0.077	46	2	25	53.1	5.0	5.0	7.5	5.2	15	10	200	140
6.683	ZV225S_K202_0067 ME10	3500	3100	4500	≤19	1.87	0.077	45	2	25	53.1	5.2	5.2	5.9	5.2	7.3	7.3	160	140
6.683	ZV225S_K202_0067 ME20	3500	3100	4500	≤32	1.87	0.077	46	2	25	53.1	5.2	5.2	7.8	5.2	15	10	210	140
6.683	ZV225S_K202_0067 ME30	3500	3100	4000	≤38	1.66	0.077	46	2	25	53.1	5.2	5.2	7.8	5.2	15	10	210	140
7.118	ZV225S_K202_0071 ME20	3000	2600	4000	≤32	1.56	0.077	46	2	25	53.1	5.3	5.2	8.0	5.2	15	10	210	140
7.118	ZV225S_K202_0071 ME30	3000	2600	4000	≤38	1.56	0.077	46	2	25	53.1	5.3	5.2	8.0	5.2	15	10	210	140
8.397	ZV225S_K202_0084 ME10	3500	3100	4500	≤19	1.49	0.077	45	2	25	53.1	5.6	5.2	7.4	5.2	9.2	9.2	200	140
8.397	ZV225S_K202_0084 ME20	3500	3100	4500	≤32	1.49	0.077	46	2	25	53.1	5.6	5.2	8.3	5.2	15	10	220	140
8.397	ZV225S_K202_0084 ME30	3500	3100	4000	≤38	1.32	0.077	46	2	25	53.1	5.6	5.2	8.3	5.2	15	10	220	140
9.190	ZV225S_K202_0092 ME10	3500	3100	4500	≤19	1.36	0.077	45	2	25	53.1	5.8	5.2	8.1	5.2	10	10	210	140
9.190	ZV225S_K202_0092 ME20	3500	3100	4500	≤32	1.36	0.077	46	2	25	53.1	5.8	5.2	8.3	5.2	15	10	220	140
9.190	ZV225S_K202_0092 ME30	3500	3100	4000	≤38	1.21	0.077	46	2	25	53.1	5.8	5.2	8.3	5.2	15	10	220	140
10.07	ZV225S_K202_0100 ME10	3900	3500	5000	≤19	1.38	0.077	45	2	25	53.1	6.0	5.2	8.3	5.2	11	10	220	140
10.07	ZV225S_K202_0100 ME20	3500	3500	5000	≤32	1.38	0.077	46	2	25	53.1	6.0	5.2	8.3	5.2	15	10	220	140
10.07	ZV225S_K202_0100 ME30	3500	3500	4000	≤38	1.10	0.077	46	2	25	53.1	6.0	5.2	8.3	5.2	15	10	220	140
11.55	ZV225S_K202_0115 ME10	3500	3100	4500	≤19	1.08	0.077	46	2	25	53.1	6.2	5.2	8.3	5.2	13	10	220	140
11.55	ZV225S_K202_0115 ME20	3500	3100	4500	≤32	1.08	0.077	46	2	25	53.1	6.2	5.2	8.3	5.2	15	10	220	140
11.55	ZV225S_K202_0115 ME30	3500	3100	4000	≤38	0.96	0.077	46	2	25	53.1	6.2	5.2	8.3	5.2	15	10	220	140
12.71	ZV225S_K202_0125 ME10	3900	3500	5000	≤19	1.09	0.077	46	2	25	53.1	6.4	5.2	8.3	5.2	14	10	220	140
12.71	ZV225S_K202_0125 ME20	3500	3500	5000	≤32	1.09	0.077	46	2	25	53.1	6.4	5.2	8.3	5.2	15	10	220	140
12.71	ZV225S_K202_0125 ME30	3500	3500	4000	≤38	0.88	0.077	46	2	25	53.1	6.4	5.2	8.3	5.2	15	10	220	140
13.85	ZV225S_K202_0140 ME10	3900	3500	5000	≤19	1.00	0.077	46	2	25	53.1	6.6	5.2	8.3	5.2	15	10	220	140
13.85	ZV225S_K202_0140 ME20	3500	3500	5000	≤32	1.00	0.077	46	2	25	53.1	6.6	5.2	8.3	5.2	15	10	220	140
13.85	ZV225S_K202_0140 ME30	3500	3500	4000	≤38	0.80	0.077	46	2	25	53.1	6.6	5.2	8.3	5.2	15	10	220	140
16.86	ZV225S_K202_0170 ME10	4000	3900	5500	≤19	0.91	0.077	46	2	25	53.1	6.9	5.2	8.3	5.2	15	10	220	140
16.86	ZV225S_K202_0170 ME20	3500	3500	5000	≤32	0.82	0.077	46	2	25	53.1	7.1	5.2	8.3	5.2	15	10	220	140
16.86	ZV225S_K202_0170 ME30	3500	3500	4000	≤38	0.66	0.077	46	2	25	53.1	7.1	5.2	8.3	5.2	15	10	220	140
17.47	ZV225S_K202_0175 ME10	3900	3500	5000	≤19	0.80	0.077	46	2	25	53.1	7.2	5.2	8.3	5.2	15	10	220	140
17.47	ZV225S_K202_0175 ME20	3500	3500	5000	≤32	0.80	0.077	46	2	25	53.1	7.2	5.2	8.3	5.2	15	10	220	140
17.47	ZV225S_K202_0175 ME30	3500	3500	4000	≤38	0.64	0.077	46	2	25	53.1	7.2	5.2	8.3	5.2	15	10	220	140
20.33	ZV225S_K202_0200 ME10	4000	3900	5500	≤19	0.75	0.077	46	2	25	53.1	7.0	5.2	8.3	5.2	15	10	220	140
20.33	ZV225S_K202_0200 ME20	3500	3500	5000	≤24	0.68	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
23.18	ZV225S_K202_0230 ME10	4000	3900	5500	≤19	0.66	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
23.18	ZV225S_K202_0230 ME20	3500	3500	5000	≤32	0.60	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
23.18	ZV225S_K202_0230 ME30	3500	3500	4000	≤38	0.48	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
25.13	ZV225S_K202_0250 ME10	4000	3900	5500	≤19	0.61	0.077	46	2	25	53.1	7.2	5.2	8.3	5.2	15	10	220	140
25.13	ZV225S_K202_0250 ME20	3500	3500	5000	≤24	0.55	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
27.95	ZV225S_K202_0280 ME10	4000	3900	5500	≤19	0.55	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
27.95	ZV225S_K202_0280 ME20	3500	3500	5000	≤24	0.50	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
33.62	ZV225S_K202_0340 ME10	4000	3900	5500	≤19	0.45	0.077	46	2	25	53.1	5.8	5.2	7.0	5.2	12	10	180	140
33.62	ZV225S_K202_0340 ME20	3500	3500	5000	≤24	0.41	0.077	46	2	25	53.1	5.8	5.2	7.0	5.2	12	10	180	140
34.55	ZV225S_K202_0350 ME10	4000	3900	5500	≤19	0.44	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
34.55	ZV225S_K202_0350 ME20	3500	3500	5000	≤24	0.40	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
39.45	ZV225S_K203_0390 ME10	4000	3900	5500	≤19	0.39	0.077	46	2	25	53.1	7.5	5.2	7.6	5.2	9.5	9.5	200	140
40.39	ZV225S_K202_0400 ME10	4000	3900	5500	≤19	0.38	0.077	46	2	25	53.1	4.4	4.4	5.2	5.2	7.5	7.5	140	140
45.22	ZV225S_K203_0450 ME10	4000	3900	5500	≤19	0.34	0.077	46	2	25	53.1	7.5	5.2	8.2	5.2	11	10	220	140
46.23	ZV225S_K202_0460 ME10	4000	3900	5500	≤19	0.33	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
46.23	ZV225S_K202_0460 ME20	3500	3500	5000	≤24	0.30	0.077	46	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	140
49.76	ZV225S_K203_0500 ME10	4000	3900	5500	≤19	0.31	0.077	46	2	25	53.1	7.5	5.2	8.2	5.2	12	10	220	140
50.49	ZV225S_K202_0500 ME10	4000	3900	5500	≤19	0.30	0.077	46	2	25	53.1	3.6	3.6	4.4	4.4	7.3	7.3	120	120
54.25	ZV225S_K203_0540 ME10	4000	3900	5500	≤19	0.28	0.077	46	2	25	53.1	7.5	5.2	8.2	5.2	13	10	220	140
55.54	ZV225S_K202_0560 ME10	4000	3900	5500	≤19	0.28	0.077	46	2	25	53.1	6.0	5.2	7.2	5.2	10	10	190	140
66.03	ZV225S_K203_0660 ME10	4000	3900	5500	≤19	0.23	0.077	46	2	25	53.1	7.5	5.2	8.2	5.2	15	10	220	140
68.42	ZV225S_K203_0680 ME10	4000	3900	5500	≤19	0.22	0.077	46	2	25	53.1	7.5	5.2	8.2	5.2	15	10	220	140
69.43	ZV225S_K202_0690 ME10	4000	3900	5500	≤19	0.22	0.077	46	2	25	53.1	5.0	5.0	6.0	5.2	10	10	160	140
79.62	ZV225S_K203_0800 ME10	4000	3900	5500	≤19	0.19	0.077	46	2	25	53.1	7.5	5.2	8.2	5.2	15	10	220	140
90.79	ZV225S_K203_0910 ME10	4000	3900	5500	≤19	0.17	0.077	46	2	25	53.1	7.5	5.2	8.2	5.2	15	10	220	140
109.5	ZV225S_K203_1090 ME10	4000	3900	5500	≤19	0.14	0.077	46	2	25	53.1	7.5	5.2	8.2	5.2	15	10	220	140
135.3	ZV225S_K203_1350 ME10	4000	3900	5500	≤19	0.11	0.077	46	2	25	53.1	7.5	5.2	8.2	5.2	15	10	220	140
181.0	ZV225S_K203_1810 ME10	4000	3900	5500	≤19	0.08	0.077	46	2	25	53.1	7.5	5.2	8.2	5.2	15	10	220	140
217.5	ZV225S_K203_2180 ME10	4000	3900	5500	≤19	0.07	0.077	46	2	25	53.1	6.0	5.2	7.2	5.2	10	10	190	140
271.9	ZV225S_K203_2720 ME10	4000	3900	5500	≤19	0.06	0.077	46	2	25	53.1	5.0	5.0	6.0	5.2	10	10	160	140

i	Type	n_{1maxDB}	n_{1maxDB}	n_{1maxZV}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	$F_{f2N,S}$	$F_{f2N,E}$	$F_{f2acc,S}$	$F_{f2acc,E}$	$F_{f2NOT,S}$	$F_{f2NOT,E}$	$M_{2acc,S}$	$M_{2acc,E}$
		EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/ μm]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]	[Nm]
ZV3K2 ($F_{v2acc,max} = 7,7$ kN)																			
4.000	ZV318S_K202_0040 ME10	3000	2600	4000	≤19	3.00	0.083	37	3	18	57.3	1.6	1.6	1.6	1.6	2.0	2.0	47	47
4.000	ZV318S_K202_0040 ME20	3000	2600	4000	≤32	3.00	0.083	40	3	18	57.3	4.1	4.1	6.1	5.4	10	10	170	150
4.000	ZV318S_K202_0040 ME30	3000	2600	4000	≤38	3.00	0.083	40	3	18	57.3	4.1	4.1	6.1	5.4	10	10	170	150
4.364	ZV318S_K202_0044 ME10	3000	2600	4000	≤19	2.75	0.083	38	3	18	57.3	3.5	3.5	3.5	3.5	4.4	4.4	100	100
4.364	ZV318S_K202_0044 ME20	3000	2600	4000	≤32	2.75	0.083	40	3	18	57.3	4.2	4.2	6.3	5.4	11	11	180	150
4.364	ZV318S_K202_0044 ME30	3000	2600	4000	≤38	2.75	0.083	40	3	18	57.3	4.2	4.2	6.3	5.4	11	11	180	150
5.177	ZV318S_K202_0052 ME20	3000	2600	4000	≤32	2.32	0.083	40	3	18	57.3	4.4	4.4	6.6	5.4	13	11	190	150
5.177	ZV318S_K202_0052 ME30	3000	2600	4000	≤38	2.32	0.083	41	3	18	57.3	4.4	4.4	6.6	5.4	13	11	190	150
6.000	ZV318S_K202_0060 ME10	3000	2600	4000	≤19	2.00	0.083	39	3	18	57.3	4.6	4.6	4.9	4.9	6.1	6.1	140	140
6.000	ZV318S_K202_0060 ME20	3000	2600	4000	≤32	2.00	0.083	40	3	18	57.3	4.6	4.6	7.0	5.4	14	11	200	150
6.000	ZV318S_K202_0060 ME30	3000	2600	4000	≤38	2.00	0.083	41	3	18	57.3	4.6	4.6	7.0	5.4	14	11	200	150
6.683	ZV318S_K202_0067 ME10	3500	3100	4500	≤19	2.02	0.083	39	3	18	57.3	4.8	4.8	5.4	5.4	6.8	6.8	160	150
6.683	ZV318S_K202_0067 ME20	3500	3100	4500	≤32	2.02	0.083	41	3	18	57.3	4.8	4.8	7.2	5.4	14	11	210	150
6.683	ZV318S_K202_0067 ME30	3500	3100	4000	≤38	1.80	0.083	41	3	18	57.3	4.8	4.8	7.2	5.4	14	11	210	150
7.118	ZV318S_K202_0071 ME20	3000	2600	4000	≤32	1.69	0.083	41	3	18	57.3	4.9	4.9	7.4	5.4	14	11	210	150
7.118	ZV318S_K202_0071 ME30	3000	2600	4000	≤38	1.69	0.083	41	3	18	57.3	4.9	4.9	7.4	5.4	14	11	210	150
8.397	ZV318S_K202_0084 ME10	3500	3100	4500	≤19	1.61	0.083	40	3	18	57.3	5.2	5.2	6.8	5.4	8.5	8.5	200	150
8.397	ZV318S_K202_0084 ME20	3500	3100	4500	≤32	1.61	0.083	41	3	18	57.3	5.2	5.2	7.7	5.4	14	11	220	150
8.397	ZV318S_K202_0084 ME30	3500	3100	4000	≤38	1.43	0.083	41	3	18	57.3	5.2	5.2	7.7	5.4	14	11	220	150
9.190	ZV318S_K202_0092 ME10	3500	3100	4500	≤19	1.47	0.083	40	3	18	57.3	5.4	5.4	7.5	5.4	9.3	9.3	210	150
9.190	ZV318S_K202_0092 ME20	3500	3100	4500	≤32	1.47	0.083	41	3	18	57.3	5.4	5.4	7.7	5.4	14	11	220	150
9.190	ZV318S_K202_0092 ME30	3500	3100	4000	≤38	1.31	0.083	41	3	18	57.3	5.4	5.4	7.7	5.4	14	11	220	150
10.07	ZV318S_K202_0100 ME10	3900	3500	5000	≤19	1.49	0.083	40	3	18	57.3	5.5	5.4	7.7	5.4	10	10	220	150
10.07	ZV318S_K202_0100 ME20	3500	3500	5000	≤32	1.49	0.083	41	3	18	57.3	5.5	5.4	7.7	5.4	14	11	220	150
10.07	ZV318S_K202_0100 ME30	3500	3500	4000	≤38	1.19	0.083	41	3	18	57.3	5.5	5.4	7.7	5.4	14	11	220	150
11.55	ZV318S_K202_0115 ME10	3500	3100	4500	≤19	1.17	0.083	40	3	18	57.3	5.8	5.4	7.7	5.4	12	11	220	150
11.55	ZV318S_K202_0115 ME20	3500	3100	4500	≤32	1.17	0.083	41	3	18	57.3	5.8	5.4	7.7	5.4	14	11	220	150
11.55	ZV318S_K202_0115 ME30	3500	3100	4000	≤38	1.04	0.083	41	3	18	57.3	5.8	5.4	7.7	5.4	14	11	220	150
12.71	ZV318S_K202_0125 ME10	3900	3500	5000	≤19	1.18	0.083	40	3	18	57.3	6.0	5.4	7.7	5.4	13	11	220	150
12.71	ZV318S_K202_0125 ME20	3500	3500	5000	≤32	1.18	0.083	41	3	18	57.3	6.0	5.4	7.7	5.4	14	11	220	150
12.71	ZV318S_K202_0125 ME30	3500	3500	4000	≤38	0.94	0.083	41	3	18	57.3	6.0	5.4	7.7	5.4	14	11	220	150
13.85	ZV318S_K202_0140 ME10	3900	3500	5000	≤19	1.08	0.083	41	3	18	57.3	6.1	5.4	7.7	5.4	14	11	220	150
13.85	ZV318S_K202_0140 ME20	3500	3500	5000	≤32	1.08	0.083	41	3	18	57.3	6.1	5.4	7.7	5.4	14	11	220	150
13.85	ZV318S_K202_0140 ME30	3500	3500	4000	≤38	0.87	0.083	41	3	18	57.3	6.1	5.4	7.7	5.4	14	11	220	150
16.86	ZV318S_K202_0170 ME10	4000	3900	5500	≤19	0.98	0.083	41	3	18	57.3	6.4	5.4	7.7	5.4	14	11	220	150
16.86	ZV318S_K202_0170 ME20	3500	3500	5000	≤32	0.89	0.083	41	3	18	57.3	6.6	5.4	7.7	5.4	14	11	220	150
16.86	ZV318S_K202_0170 ME30	3500	3500	4000	≤38	0.71	0.083	41	3	18	57.3	6.6	5.4	7.7	5.4	14	11	220	150
17.47	ZV318S_K202_0175 ME10	3900	3500	5000	≤19	0.86	0.083	41	3	18	57.3	6.6	5.4	7.7	5.4	14	11	220	150
17.47	ZV318S_K202_0175 ME20	3500	3500	5000	≤32	0.86	0.083	41	3	18	57.3	6.6	5.4	7.7	5.4	14	11	220	150
17.47	ZV318S_K202_0175 ME30	3500	3500	4000	≤38	0.69	0.083	41	3	18	57.3	6.6	5.4	7.7	5.4	14	11	220	150
20.33	ZV318S_K202_0200 ME10	4000	3900	5500	≤19	0.81	0.083	41	3	18	57.3	6.5	5.4	7.7	5.4	14	11	220	150
20.33	ZV318S_K202_0200 ME20	3500	3500	5000	≤24	0.74	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
23.18	ZV318S_K202_0230 ME10	4000	3900	5500	≤19	0.71	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
23.18	ZV318S_K202_0230 ME20	3500	3500	5000	≤32	0.65	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
23.18	ZV318S_K202_0230 ME30	3500	3500	4000	≤38	0.52	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
25.13	ZV318S_K202_0250 ME10	4000	3900	5500	≤19	0.66	0.083	41	3	18	57.3	6.7	5.4	7.7	5.4	14	11	220	150
25.13	ZV318S_K202_0250 ME20	3500	3500	5000	≤24	0.60	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
27.95	ZV318S_K202_0280 ME10	4000	3900	5500	≤19	0.59	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
27.95	ZV318S_K202_0280 ME20	3500	3500	5000	≤24	0.54	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
33.62	ZV318S_K202_0340 ME10	4000	3900	5500	≤19	0.49	0.083	41	3	18	57.3	5.4	5.4	6.5	5.4	11	11	180	150
33.62	ZV318S_K202_0340 ME20	3500	3500	5000	≤24	0.45	0.083	41	3	18	57.3	5.4	5.4	6.5	5.4	11	11	180	150
34.55	ZV318S_K202_0350 ME10	4000	3900	5500	≤19	0.48	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
34.55	ZV318S_K202_0350 ME20	3500	3500	5000	≤24	0.43	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
39.45	ZV318S_K203_0390 ME10	4000	3900	5500	≤19	0.42	0.083	41	3	18	57.3	7.0	5.4	7.1	5.4	8.8	8.8	200	150
40.39	ZV318S_K202_0400 ME10	4000	3900	5500	≤19	0.41	0.083	41	3	18	57.3	4.0	4.0	4.8	4.8	7.0	7.0	140	140
45.22	ZV318S_K203_0450 ME10	4000	3900	5500	≤19	0.37	0.083	41	3	18	57.3	7.0	5.4	7.6	5.4	10	10	220	150
46.23	ZV318S_K202_0460 ME10	4000	3900	5500	≤19	0.36	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
46.23	ZV318S_K202_0460 ME20	3500	3500	5000	≤24	0.32	0.083	41	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	150
49.76	ZV318S_K203_0500 ME10	4000	3900	5500	≤19	0.33	0.083	41	3	18	57.3	7.0	5.4	7.6	5.4	11	11	220	150
50.49	ZV318S_K202_0500 ME10	4000	3900	5500	≤19	0.33	0.083	41	3	18	57.3	3.4	3.4	4.0	4.0	6.7	6.7	120	120
54.25	ZV318S_K203_0540 ME10	4000	3900	5500	≤19	0.30	0.083	41	3	18	57.3	7.0	5.4	7.6	5.4	12	11	220	150
55.54	ZV318S_K202_0560 ME10	4000	3900	5500	≤19	0.30	0.083	41	3	18	57.3	5.5	5.4	6.7	5.4	9.6	9.6	190	150
66.03	ZV318S_K203_0660 ME10	4000	3900	5500	≤19	0.25	0.083	41	3	18	57.3	7.0	5.4	7.6	5.4	14	11	220	150
68.42	ZV318S_K203_0680 ME10	4000	3900	5500	≤19	0.24	0.083	41	3	18	57.3	7.0	5.4	7.6	5.4	14	11	220	150

13.2 Selection tables 13 ZVK rack and pinion drives

i	Type	n_{1maxDB}	n_{1maxDB}	n_{1maxZV}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	$F_{f2N,S}$	$F_{f2N,E}$	F_{f2accS}	F_{f2accE}	$F_{f2NOT,S}$	$F_{f2NOT,E}$	M_{2accS}	M_{2accE}
		EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/ μm]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]
ZV3K2 (F_{v2acc,max} = 7,7 kN)																			
69.43	ZV318S_K202_0690 ME10	4000	3900	5500	≤19	0.24	0.083	41	3	18	57.3	4.6	4.6	5.5	5.4	9.2	9.2	160	150
79.62	ZV318S_K203_0800 ME10	4000	3900	5500	≤19	0.21	0.083	41	3	18	57.3	7.0	5.4	7.6	5.4	14	11	220	150
90.79	ZV318S_K203_0910 ME10	4000	3900	5500	≤19	0.18	0.083	41	3	18	57.3	7.0	5.4	7.6	5.4	14	11	220	150
109.5	ZV318S_K203_1090 ME10	4000	3900	5500	≤19	0.15	0.083	41	3	18	57.3	7.0	5.4	7.6	5.4	14	11	220	150
135.3	ZV318S_K203_1350 ME10	4000	3900	5500	≤19	0.12	0.083	41	3	18	57.3	7.0	5.4	7.6	5.4	14	11	220	150
181.0	ZV318S_K203_1810 ME10	4000	3900	5500	≤19	0.09	0.083	41	3	18	57.3	7.0	5.4	7.6	5.4	14	11	220	150
217.5	ZV318S_K203_2180 ME10	4000	3900	5500	≤19	0.08	0.083	41	3	18	57.3	5.5	5.4	6.7	5.4	9.6	9.6	190	150
271.9	ZV318S_K203_2720 ME10	4000	3900	5500	≤19	0.06	0.083	41	3	18	57.3	4.6	4.6	5.5	5.4	9.2	9.2	160	150
ZV2K3 (F_{v2acc,max} = 10 kN)																			
4.000	ZV225S_K302_0040 ME20	2700	2300	3800	≤32	2.64	0.077	65	2	25	53.1	6.9	5.2	8.8	5.2	11	10	230	140
4.000	ZV225S_K302_0040 ME30	2700	2300	3800	≤38	2.64	0.077	67	2	25	53.1	6.9	5.2	10	5.2	21	10	280	140
4.364	ZV225S_K302_0044 ME20	2700	2300	3800	≤32	2.42	0.077	66	2	25	53.1	7.1	5.2	9.6	5.2	12	10	250	140
4.364	ZV225S_K302_0044 ME30	2700	2300	3800	≤38	2.42	0.077	67	2	25	53.1	7.1	5.2	10	5.2	21	10	280	140
5.375	ZV225S_K302_0054 ME20	2700	2300	3800	≤32	1.96	0.077	66	2	25	53.1	7.6	5.2	10	5.2	15	10	280	140
5.375	ZV225S_K302_0054 ME30	2700	2300	3800	≤38	1.96	0.077	67	2	25	53.1	7.6	5.2	10	5.2	15	10	280	140
6.000	ZV225S_K302_0060 ME20	2700	2300	3800	≤32	1.76	0.077	66	2	25	53.1	7.9	5.2	10	5.2	16	10	280	140
6.000	ZV225S_K302_0060 ME30	2700	2300	3800	≤38	1.76	0.077	67	2	25	53.1	7.9	5.2	10	5.2	21	10	280	140
6.740	ZV225S_K302_0067 ME20	3200	2800	4200	≤32	1.73	0.077	67	2	25	53.1	8.2	5.2	10	5.2	18	10	280	140
6.740	ZV225S_K302_0067 ME30	3200	2800	4000	≤38	1.65	0.077	67	2	25	53.1	8.2	5.2	10	5.2	18	10	280	140
7.391	ZV225S_K302_0074 ME20	2700	2300	3800	≤32	1.43	0.077	67	2	25	53.1	8.5	5.2	10	5.2	20	10	280	140
7.391	ZV225S_K302_0074 ME30	2700	2300	3800	≤38	1.43	0.077	67	2	25	53.1	8.5	5.2	10	5.2	20	10	280	140
8.444	ZV225S_K302_0084 ME10	3200	2800	4200	≤19	1.38	0.077	65	2	25	53.1	6.5	5.2	7.4	5.2	9.3	9.3	200	140
8.444	ZV225S_K302_0084 ME20	3200	2800	4200	≤32	1.38	0.077	67	2	25	53.1	8.9	5.2	10	5.2	21	10	280	140
8.444	ZV225S_K302_0084 ME30	3200	2800	4000	≤38	1.32	0.077	67	2	25	53.1	8.9	5.2	10	5.2	21	10	280	140
9.267	ZV225S_K302_0093 ME20	3200	2800	4200	≤32	1.26	0.077	67	2	25	53.1	9.2	5.2	10	5.2	21	10	280	140
9.267	ZV225S_K302_0093 ME30	3200	2800	4000	≤38	1.20	0.077	67	2	25	53.1	9.2	5.2	10	5.2	21	10	280	140
10.14	ZV225S_K302_0100 ME10	3500	3100	5000	≤19	1.37	0.077	66	2	25	53.1	6.8	5.2	8.9	5.2	11	10	240	140
10.14	ZV225S_K302_0100 ME20	3500	3100	5000	≤32	1.37	0.077	67	2	25	53.1	9.5	5.2	10	5.2	21	10	280	140
10.14	ZV225S_K302_0100 ME30	3500	3100	4000	≤38	1.10	0.077	67	2	25	53.1	9.5	5.2	10	5.2	21	10	280	140
11.61	ZV225S_K302_0115 ME10	3200	2800	4200	≤19	1.01	0.077	66	2	25	53.1	9.0	5.2	10	5.2	13	10	270	140
11.61	ZV225S_K302_0115 ME20	3200	2800	4200	≤32	1.01	0.077	67	2	25	53.1	9.9	5.2	10	5.2	21	10	280	140
11.61	ZV225S_K302_0115 ME30	3200	2800	4000	≤38	0.96	0.077	67	2	25	53.1	9.9	5.2	10	5.2	21	10	280	140
12.58	ZV225S_K302_0125 ME10	3500	3100	5000	≤19	1.10	0.077	66	2	25	53.1	7.2	5.2	10	5.2	14	10	280	140
12.58	ZV225S_K302_0125 ME20	3500	3100	5000	≤32	1.10	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
12.58	ZV225S_K302_0125 ME30	3500	3100	4000	≤38	0.88	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
13.94	ZV225S_K302_0140 ME10	3500	3100	5000	≤19	1.00	0.077	67	2	25	53.1	9.3	5.2	10	5.2	15	10	280	140
13.94	ZV225S_K302_0140 ME20	3500	3100	5000	≤32	1.00	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
13.94	ZV225S_K302_0140 ME30	3500	3100	4000	≤38	0.80	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
16.94	ZV225S_K302_0170 ME10	3800	3500	5000	≤19	0.82	0.077	67	2	25	53.1	7.6	5.2	10	5.2	18	10	280	140
16.94	ZV225S_K302_0170 ME20	3500	3500	5000	≤32	0.82	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
16.94	ZV225S_K302_0170 ME30	3500	3500	4000	≤38	0.66	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
17.29	ZV225S_K302_0175 ME10	3500	3100	5000	≤19	0.80	0.077	67	2	25	53.1	9.9	5.2	10	5.2	19	10	280	140
17.29	ZV225S_K302_0175 ME20	3500	3100	5000	≤32	0.80	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
17.29	ZV225S_K302_0175 ME30	3500	3100	4000	≤38	0.64	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
20.28	ZV225S_K302_0200 ME10	3800	3500	5000	≤19	0.69	0.077	67	2	25	53.1	8.0	5.2	10	5.2	19	10	280	140
20.28	ZV225S_K302_0200 ME20	3500	3500	5000	≤32	0.69	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
20.28	ZV225S_K302_0200 ME30	3500	3500	4000	≤38	0.55	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
23.29	ZV225S_K302_0230 ME10	3800	3500	5000	≤19	0.60	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
23.29	ZV225S_K302_0230 ME20	3500	3500	5000	≤32	0.60	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
23.29	ZV225S_K302_0230 ME30	3500	3500	4000	≤38	0.48	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
25.26	ZV225S_K302_0250 ME10	3800	3500	5000	≤19	0.55	0.077	67	2	25	53.1	8.2	5.2	10	5.2	21	10	280	140
25.26	ZV225S_K302_0250 ME20	3500	3500	5000	≤24	0.55	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
27.88	ZV225S_K302_0280 ME10	3800	3500	5000	≤19	0.50	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
27.88	ZV225S_K302_0280 ME20	3500	3500	5000	≤32	0.50	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
27.88	ZV225S_K302_0280 ME30	3500	3500	4000	≤38	0.40	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
32.65	ZV225S_K303_0330 ME20	3500	3500	5000	≤24	0.43	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
33.62	ZV225S_K302_0340 ME10	3800	3500	5000	≤19	0.41	0.077	67	2	25	53.1	8.5	5.2	10	5.2	19	10	280	140
33.62	ZV225S_K302_0340 ME20	3500	3500	5000	≤24	0.41	0.077	67	2	25	53.1	9.4	5.2	10	5.2	19	10	280	140
34.73	ZV225S_K302_0350 ME10	3800	3500	5000	≤19	0.40	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
34.73	ZV225S_K302_0350 ME20	3500	3500	5000	≤24	0.40	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
35.83	ZV225S_K303_0360 ME20	3500	3500	5000	≤24	0.39	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
39.19	ZV225S_K303_0390 ME20	3500	3500	5000	≤24	0.35	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
40.51	ZV225S_K302_0410 ME10	3800	3500	5000	≤19	0.34	0.077	67	2	25	53.1	7.3	5.2	8.7	5.2	15	10	230	140
40.51	ZV225S_K302_0410 ME20	3500	3500	5000	≤24	0.34	0.077	67	2	25	53.1	7.3	5.2	8.7	5.2	15	10	230	140

i	Type	$n_{1\max DB}$	$n_{1\max DB}$	$n_{1\max ZV}$	d_{MW}	$v_{f2\max ZB}$	Δs	C_{lin}	m_n	z	d_0	$F_{f2N,S}$	$F_{f2N,E}$	$F_{f2acc,S}$	$F_{f2acc,E}$	$F_{f2NOT,S}$	$F_{f2NOT,E}$	$M_{2acc,S}$	$M_{2acc,E}$
		EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/ μm]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]
ZV2K3 ($F_{v2acc,max} = 10 \text{ kN}$)																			
44.89	ZV225S_K303_0450 ME20	3500	3500	5000	≤24	0.31	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
46.23	ZV225S_K302_0460 ME10	3800	3500	5000	≤19	0.30	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
46.23	ZV225S_K302_0460 ME20	3500	3500	5000	≤24	0.30	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
48.63	ZV225S_K303_0490 ME20	3500	3500	5000	≤24	0.29	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
49.26	ZV225S_K303_0490 ME10	3800	3500	5000	≤19	0.28	0.077	67	2	25	53.1	9.5	5.2	9.5	5.2	12	10	250	140
50.49	ZV225S_K302_0500 ME10	3800	3500	5000	≤19	0.28	0.077	67	2	25	53.1	5.8	5.2	6.7	5.2	8.4	8.4	180	140
53.88	ZV225S_K303_0540 ME20	3500	3500	5000	≤24	0.26	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
54.58	ZV225S_K303_0550 ME10	3800	3500	5000	≤19	0.25	0.077	67	2	25	53.1	10	5.2	10	5.2	13	10	280	140
55.71	ZV225S_K302_0560 ME10	3800	3500	5000	≤19	0.25	0.077	67	2	25	53.1	10	5.2	10	5.2	20	10	280	140
55.71	ZV225S_K302_0560 ME20	3500	3500	5000	≤24	0.25	0.077	67	2	25	53.1	10	5.2	10	5.2	20	10	280	140
65.50	ZV225S_K303_0650 ME20	3500	3500	5000	≤24	0.21	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
66.35	ZV225S_K303_0660 ME10	3800	3500	5000	≤19	0.21	0.077	67	2	25	53.1	10	5.2	10	5.2	16	10	280	140
66.87	ZV225S_K303_0670 ME20	3500	3500	5000	≤24	0.21	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
67.73	ZV225S_K303_0680 ME10	3800	3500	5000	≤19	0.21	0.077	67	2	25	53.1	10	5.2	10	5.2	16	10	280	140
69.43	ZV225S_K302_0690 ME10	3800	3500	5000	≤19	0.20	0.077	67	2	25	53.1	8.0	5.2	9.3	5.2	12	10	250	140
78.41	ZV225S_K303_0780 ME20	3500	3500	5000	≤24	0.18	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
79.42	ZV225S_K303_0790 ME10	3800	3500	5000	≤19	0.18	0.077	67	2	25	53.1	10	5.2	10	5.2	19	10	280	140
90.06	ZV225S_K303_0900 ME20	3500	3500	5000	≤24	0.15	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
91.23	ZV225S_K303_0910 ME10	3800	3500	5000	≤19	0.15	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
107.8	ZV225S_K303_1080 ME20	3500	3500	5000	≤24	0.13	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
109.2	ZV225S_K303_1090 ME10	3800	3500	5000	≤19	0.13	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
134.3	ZV225S_K303_1340 ME20	3500	3500	5000	≤24	0.10	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
136.0	ZV225S_K303_1360 ME10	3800	3500	5000	≤19	0.10	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
178.7	ZV225S_K303_1790 ME20	3500	3500	5000	≤24	0.08	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
181.0	ZV225S_K303_1810 ME10	3800	3500	5000	≤19	0.08	0.077	67	2	25	53.1	10	5.2	10	5.2	21	10	280	140
218.2	ZV225S_K303_2180 ME10	3800	3500	5000	≤19	0.06	0.077	67	2	25	53.1	10	5.2	10	5.2	20	10	280	140
271.9	ZV225S_K303_2720 ME10	3800	3500	5000	≤19	0.05	0.077	67	2	25	53.1	8.0	5.2	9.3	5.2	12	10	250	140
ZV3K3 ($F_{v2acc,max} = 11 \text{ kN}$)																			
4.000	ZV318S_K302_0040 ME20	2700	2300	3800	≤32	2.85	0.083	59	3	18	57.3	6.8	5.3	8.1	5.3	10	10	230	150
4.000	ZV318S_K302_0040 ME30	2700	2300	3800	≤38	2.85	0.083	60	3	18	57.3	6.8	5.3	11	5.3	22	11	310	150
4.364	ZV318S_K302_0044 ME20	2700	2300	3800	≤32	2.61	0.083	59	3	18	57.3	7.0	5.3	8.9	5.3	11	11	250	150
4.364	ZV318S_K302_0044 ME30	2700	2300	3800	≤38	2.61	0.083	60	3	18	57.3	7.0	5.3	11	5.3	22	11	310	150
5.375	ZV318S_K302_0054 ME20	2700	2300	3800	≤32	2.12	0.083	59	3	18	57.3	7.5	5.3	11	5.3	14	11	310	150
5.375	ZV318S_K302_0054 ME30	2700	2300	3800	≤38	2.12	0.083	60	3	18	57.3	7.5	5.3	11	5.3	14	11	310	150
6.000	ZV318S_K302_0060 ME20	2700	2300	3800	≤32	1.90	0.083	60	3	18	57.3	7.8	5.3	11	5.3	15	11	310	150
6.000	ZV318S_K302_0060 ME30	2700	2300	3800	≤38	1.90	0.083	60	3	18	57.3	7.8	5.3	11	5.3	22	11	310	150
6.740	ZV318S_K302_0067 ME20	3200	2800	4200	≤32	1.87	0.083	60	3	18	57.3	8.1	5.3	11	5.3	17	11	310	150
6.740	ZV318S_K302_0067 ME30	3200	2800	4000	≤38	1.78	0.083	60	3	18	57.3	8.1	5.3	11	5.3	17	11	310	150
7.391	ZV318S_K302_0074 ME20	2700	2300	3800	≤32	1.54	0.083	60	3	18	57.3	8.3	5.3	11	5.3	19	11	310	150
7.391	ZV318S_K302_0074 ME30	2700	2300	3800	≤38	1.54	0.083	60	3	18	57.3	8.3	5.3	11	5.3	19	11	310	150
8.444	ZV318S_K302_0084 ME10	3200	2800	4200	≤19	1.49	0.083	59	3	18	57.3	6.0	5.3	6.9	5.3	8.6	8.6	200	150
8.444	ZV318S_K302_0084 ME20	3200	2800	4200	≤32	1.49	0.083	60	3	18	57.3	8.7	5.3	11	5.3	21	11	310	150
8.444	ZV318S_K302_0084 ME30	3200	2800	4000	≤38	1.42	0.083	60	3	18	57.3	8.7	5.3	11	5.3	21	11	310	150
9.267	ZV318S_K302_0093 ME20	3200	2800	4200	≤32	1.36	0.083	60	3	18	57.3	9.0	5.3	11	5.3	22	11	310	150
9.267	ZV318S_K302_0093 ME30	3200	2800	4000	≤38	1.30	0.083	60	3	18	57.3	9.0	5.3	11	5.3	22	11	310	150
10.14	ZV318S_K302_0100 ME10	3500	3100	5000	≤19	1.48	0.083	59	3	18	57.3	6.3	5.3	8.2	5.3	10	10	240	150
10.14	ZV318S_K302_0100 ME20	3500	3100	5000	≤32	1.48	0.083	60	3	18	57.3	9.3	5.3	11	5.3	22	11	310	150
10.14	ZV318S_K302_0100 ME30	3500	3100	4000	≤38	1.18	0.083	60	3	18	57.3	9.3	5.3	11	5.3	22	11	310	150
11.61	ZV318S_K302_0115 ME10	3200	2800	4200	≤19	1.09	0.083	60	3	18	57.3	8.3	5.3	9.4	5.3	12	11	270	150
11.61	ZV318S_K302_0115 ME20	3200	2800	4200	≤32	1.09	0.083	60	3	18	57.3	9.7	5.3	11	5.3	22	11	310	150
11.61	ZV318S_K302_0115 ME30	3200	2800	4000	≤38	1.03	0.083	60	3	18	57.3	9.7	5.3	11	5.3	22	11	310	150
12.58	ZV318S_K302_0125 ME10	3500	3100	5000	≤19	1.19	0.083	60	3	18	57.3	6.7	5.3	10	5.3	13	11	290	150
12.58	ZV318S_K302_0125 ME20	3500	3100	5000	≤32	1.19	0.083	60	3	18	57.3	10	5.3	11	5.3	22	11	310	150
12.58	ZV318S_K302_0125 ME30	3500	3100	4000	≤38	0.95	0.083	61	3	18	57.3	10	5.3	11	5.3	22	11	310	150
13.94	ZV318S_K302_0140 ME10	3500	3100	5000	≤19	1.08	0.083	60	3	18	57.3	8.6	5.3	11	5.3	14	11	310	150
13.94	ZV318S_K302_0140 ME20	3500	3100	5000	≤32	1.08	0.083	60	3	18	57.3	10	5.3	11	5.3	22	11	310	150
13.94	ZV318S_K302_0140 ME30	3500	3100	4000	≤38	0.86	0.083	61	3	18	57.3	10	5.3	11	5.3	22	11	310	150
16.94	ZV318S_K302_0170 ME10	3800	3500	5000	≤19	0.89	0.083	60	3	18	57.3	7.1	5.3	11	5.3	16	11	310	150
16.94	ZV318S_K302_0170 ME20	3500	3500	5000	≤32	0.89	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
16.94	ZV318S_K302_0170 ME30	3500	3500	4000	≤38	0.71	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
17.29	ZV318S_K302_0175 ME10	3500	3100	5000	≤19	0.87	0.083	60	3	18	57.3	9.2	5.3	11	5.3	18	11	310	150
17.29	ZV318S_K302_0175 ME20	3500	3100	5000	≤32	0.87	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
17.29	ZV318S_K302_0175 ME30	3500	3100	4000	≤38	0.69	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
20.28	ZV318S_K302_0200 ME10	3800	3500	5000	≤19	0.74	0.083	60	3	18	57.3	7.4	5.3	11	5.3	18	11	310	150

13.2 Selection tables 13 ZVK rack and pinion drives

i	Type	n_{1maxDB}	n_{1maxDB}	n_{1maxZV}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	$F_{f2N,S}$	$F_{f2N,E}$	F_{f2accS}	F_{f2accE}	$F_{f2NOT,S}$	$F_{f2NOT,E}$	M_{2accS}	M_{2accE}
		EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/ μm]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]
ZV3K3 ($F_{v2acc,max} = 11 \text{ kN}$)																			
20.28	ZV318S_K302_0200 ME20	3500	3500	5000	≤32	0.74	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
20.28	ZV318S_K302_0200 ME30	3500	3500	4000	≤38	0.59	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
23.29	ZV318S_K302_0230 ME10	3800	3500	5000	≤19	0.64	0.083	60	3	18	57.3	9.7	5.3	11	5.3	22	11	310	150
23.29	ZV318S_K302_0230 ME20	3500	3500	5000	≤32	0.64	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
23.29	ZV318S_K302_0230 ME30	3500	3500	4000	≤38	0.52	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
25.26	ZV318S_K302_0250 ME10	3800	3500	5000	≤19	0.59	0.083	60	3	18	57.3	7.6	5.3	11	5.3	21	11	310	150
25.26	ZV318S_K302_0250 ME20	3500	3500	5000	≤24	0.59	0.083	61	3	18	57.3	11	5.3	11	5.3	21	11	310	150
27.88	ZV318S_K302_0280 ME10	3800	3500	5000	≤19	0.54	0.083	60	3	18	57.3	10	5.3	11	5.3	22	11	310	150
27.88	ZV318S_K302_0280 ME20	3500	3500	5000	≤32	0.54	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
27.88	ZV318S_K302_0280 ME30	3500	3500	4000	≤38	0.43	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
32.65	ZV318S_K303_0330 ME20	3500	3500	5000	≤24	0.46	0.083	61	3	18	57.3	11	5.3	11	5.3	20	11	310	150
33.62	ZV318S_K302_0340 ME10	3800	3500	5000	≤19	0.45	0.083	60	3	18	57.3	7.8	5.3	10	5.3	17	11	300	150
33.62	ZV318S_K302_0340 ME20	3500	3500	5000	≤24	0.45	0.083	61	3	18	57.3	8.7	5.3	10	5.3	17	11	300	150
34.73	ZV318S_K302_0350 ME10	3800	3500	5000	≤19	0.43	0.083	61	3	18	57.3	10	5.3	11	5.3	22	11	310	150
34.73	ZV318S_K302_0350 ME20	3500	3500	5000	≤24	0.43	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
35.83	ZV318S_K303_0360 ME20	3500	3500	5000	≤24	0.42	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
39.19	ZV318S_K303_0390 ME20	3500	3500	5000	≤24	0.38	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
40.51	ZV318S_K302_0410 ME10	3800	3500	5000	≤19	0.37	0.083	61	3	18	57.3	6.7	5.3	8.1	5.3	13	11	230	150
40.51	ZV318S_K302_0410 ME20	3500	3500	5000	≤24	0.37	0.083	61	3	18	57.3	6.7	5.3	8.1	5.3	13	11	230	150
44.89	ZV318S_K303_0450 ME20	3500	3500	5000	≤24	0.33	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
46.23	ZV318S_K302_0460 ME10	3800	3500	5000	≤19	0.32	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
46.23	ZV318S_K302_0460 ME20	3500	3500	5000	≤24	0.32	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
48.63	ZV318S_K303_0490 ME20	3500	3500	5000	≤24	0.31	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
49.26	ZV318S_K303_0490 ME10	3800	3500	5000	≤19	0.31	0.083	61	3	18	57.3	8.8	5.3	8.8	5.3	11	11	250	150
50.49	ZV318S_K302_0500 ME10	3800	3500	5000	≤19	0.30	0.083	61	3	18	57.3	5.4	5.3	6.2	5.3	7.8	7.8	180	150
53.88	ZV318S_K303_0540 ME20	3500	3500	5000	≤24	0.28	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
54.58	ZV318S_K303_0550 ME10	3800	3500	5000	≤19	0.28	0.083	61	3	18	57.3	9.8	5.3	9.8	5.3	12	11	280	150
55.71	ZV318S_K302_0560 ME10	3800	3500	5000	≤19	0.27	0.083	61	3	18	57.3	9.2	5.3	11	5.3	18	11	310	150
55.71	ZV318S_K302_0560 ME20	3500	3500	5000	≤24	0.27	0.083	61	3	18	57.3	9.2	5.3	11	5.3	18	11	310	150
65.50	ZV318S_K303_0650 ME20	3500	3500	5000	≤24	0.23	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
66.35	ZV318S_K303_0660 ME10	3800	3500	5000	≤19	0.23	0.083	61	3	18	57.3	11	5.3	11	5.3	15	11	310	150
66.87	ZV318S_K303_0670 ME20	3500	3500	5000	≤24	0.22	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
67.73	ZV318S_K303_0680 ME10	3800	3500	5000	≤19	0.22	0.083	61	3	18	57.3	11	5.3	11	5.3	15	11	310	150
69.43	ZV318S_K302_0690 ME10	3800	3500	5000	≤19	0.22	0.083	61	3	18	57.3	7.4	5.3	8.6	5.3	11	11	250	150
78.41	ZV318S_K303_0780 ME20	3500	3500	5000	≤24	0.19	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
79.42	ZV318S_K303_0790 ME10	3800	3500	5000	≤19	0.19	0.083	61	3	18	57.3	11	5.3	11	5.3	18	11	310	150
90.06	ZV318S_K303_0900 ME20	3500	3500	5000	≤24	0.17	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
91.23	ZV318S_K303_0910 ME10	3800	3500	5000	≤19	0.16	0.083	61	3	18	57.3	11	5.3	11	5.3	20	11	310	150
107.8	ZV318S_K303_1080 ME20	3500	3500	5000	≤24	0.14	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
109.2	ZV318S_K303_1090 ME10	3800	3500	5000	≤19	0.14	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
134.3	ZV318S_K303_1340 ME20	3500	3500	5000	≤24	0.11	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
136.0	ZV318S_K303_1360 ME10	3800	3500	5000	≤19	0.11	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
178.7	ZV318S_K303_1790 ME20	3500	3500	5000	≤24	0.08	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
181.0	ZV318S_K303_1810 ME10	3800	3500	5000	≤19	0.08	0.083	61	3	18	57.3	11	5.3	11	5.3	22	11	310	150
218.2	ZV318S_K303_2180 ME10	3800	3500	5000	≤19	0.07	0.083	61	3	18	57.3	9.2	5.3	11	5.3	18	11	310	150
271.9	ZV318S_K303_2720 ME10	3800	3500	5000	≤19	0.06	0.083	61	3	18	57.3	7.4	5.3	8.6	5.3	11	11	250	150
ZV3K4 ($F_{v2acc,max} = 15 \text{ kN}$)																			
4.000	ZV322S_K402_0040 ME30	2600	2200	3500	≤38	3.21	0.102	72	3	22	70.0	8.7	6.6	13	6.6	22	13	460	230
4.000	ZV322S_K402_0040 ME40	2600	2200	3500	≤48	3.21	0.102	72	3	22	70.0	8.7	6.6	13	6.6	22	13	460	230
4.364	ZV322S_K402_0044 ME30	2600	2200	3500	≤38	2.94	0.102	72	3	22	70.0	9.0	6.6	13	6.6	24	13	470	230
4.364	ZV322S_K402_0044 ME40	2600	2200	3500	≤48	2.94	0.102	72	3	22	70.0	9.0	6.6	13	6.6	24	13	470	230
5.422	ZV322S_K402_0054 ME30	2600	2200	3500	≤38	2.37	0.102	73	3	22	70.0	9.7	6.6	14	6.6	30	13	510	230
5.422	ZV322S_K402_0054 ME40	2600	2200	3500	≤48	2.37	0.102	73	3	22	70.0	9.7	6.6	14	6.6	30	13	510	230
6.000	ZV322S_K402_0060 ME30	2600	2200	3500	≤38	2.14	0.102	73	3	22	70.0	10	6.6	15	6.6	31	13	520	230
6.000	ZV322S_K402_0060 ME40	2600	2200	3500	≤48	2.14	0.102	73	3	22	70.0	10	6.6	15	6.6	31	13	520	230
6.719	ZV322S_K402_0067 ME20	3000	2600	4000	≤32	2.18	0.102	72	3	22	70.0	10	6.6	11	6.6	14	13	390	230
6.719	ZV322S_K402_0067 ME30	3000	2600	4000	≤38	2.18	0.102	73	3	22	70.0	10	6.6	15	6.6	31	13	540	230
6.719	ZV322S_K402_0067 ME40	3000	2600	3500	≤48	1.91	0.102	73	3	22	70.0	10	6.6	15	6.6	31	13	540	230
7.456	ZV322S_K402_0075 ME30	2600	2200	3500	≤38	1.72	0.102	73	3	22	70.0	11	6.6	15	6.6	31	13	540	230
7.456	ZV322S_K402_0075 ME40	2600	2200	3500	≤48	1.72	0.102	73	3	22	70.0	11	6.6	15	6.6	31	13	540	230
8.377	ZV322S_K402_0084 ME20	3000	2600	4000	≤32	1.75	0.102	73	3	22	70.0	11	6.6	14	6.6	17	13	490	230
8.377	ZV322S_K402_0084 ME30	3000	2600	4000	≤38	1.75	0.102	73	3	22	70.0	11	6.6	15	6.6	31	13	540	230
8.377	ZV322S_K402_0084 ME40	3000	2600	3500	≤48	1.53	0.102	73	3	22	70.0	11	6.6	15	6.6	31	13	540	230
9.238	ZV322S_K402_0092 ME20	3000	2600	4000	≤32	1.59	0.102	73	3	22	70.0	12	6.6	15	6.6	19	13	540	230

i	Type	n _{1maxDB}	n _{1maxDB}	n _{1maxZV}	d _{MW}	v _{f2maxZB}	Δs	C _{lin}	m _n	z	d ₀	F _{f2N,S}	F _{f2N,E}	F _{f2accS}	F _{f2accE}	F _{f2NOT,S}	F _{f2NOT,E}	M _{2accS}	M _{2accE}	
		EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/ μm]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]	[Nm]
ZV3K4 (F_{v2acc,max} = 15 kN)																				
9.238	ZV322S_K402_0092 ME30	3000	2600	4000	≤38	1.59	0.102	73	3	22	70.0	12	6.6	15	6.6	31	13	540	230	
9.238	ZV322S_K402_0092 ME40	3000	2600	3500	≤48	1.39	0.102	73	3	22	70.0	12	6.6	15	6.6	31	13	540	230	
10.10	ZV322S_K402_0100 ME20	3400	3000	4500	≤32	1.63	0.102	73	3	22	70.0	12	6.6	15	6.6	21	13	540	230	
10.10	ZV322S_K402_0100 ME30	3400	3000	4000	≤38	1.45	0.102	73	3	22	70.0	12	6.6	15	6.6	31	13	540	230	
10.10	ZV322S_K402_0100 ME40	3000	3000	3500	≤48	1.27	0.102	73	3	22	70.0	12	6.6	15	6.6	31	13	540	230	
11.52	ZV322S_K402_0115 ME20	3000	2600	4000	≤32	1.27	0.102	73	3	22	70.0	12	6.6	15	6.6	24	13	540	230	
11.52	ZV322S_K402_0115 ME30	3000	2600	4000	≤38	1.27	0.102	74	3	22	70.0	12	6.6	15	6.6	31	13	540	230	
11.52	ZV322S_K402_0115 ME40	3000	2600	3500	≤48	1.11	0.102	73	3	22	70.0	12	6.6	15	6.6	31	13	540	230	
12.66	ZV322S_K402_0125 ME20	3400	3000	4500	≤32	1.30	0.102	73	3	22	70.0	13	6.6	15	6.6	25	13	540	230	
12.66	ZV322S_K402_0125 ME30	3400	3000	4000	≤38	1.16	0.102	74	3	22	70.0	13	6.6	15	6.6	31	13	540	230	
12.66	ZV322S_K402_0125 ME40	3000	3000	3500	≤48	1.01	0.102	74	3	22	70.0	13	6.6	15	6.6	31	13	540	230	
13.89	ZV322S_K402_0140 ME20	3400	3000	4500	≤32	1.19	0.102	73	3	22	70.0	13	6.6	15	6.6	29	13	540	230	
13.89	ZV322S_K402_0140 ME30	3400	3000	4000	≤38	1.06	0.102	74	3	22	70.0	13	6.6	15	6.6	31	13	540	230	
13.89	ZV322S_K402_0140 ME40	3000	3000	3500	≤48	0.92	0.102	74	3	22	70.0	13	6.6	15	6.6	31	13	540	230	
16.94	ZV322S_K402_0170 ME20	3500	3300	5000	≤32	1.08	0.102	73	3	22	70.0	14	6.6	15	6.6	29	13	540	230	
16.94	ZV322S_K402_0170 ME30	3500	3300	4000	≤38	0.87	0.102	74	3	22	70.0	14	6.6	15	6.6	31	13	540	230	
16.94	ZV322S_K402_0170 ME40	3000	3000	3500	≤48	0.76	0.102	74	3	22	70.0	14	6.6	15	6.6	31	13	540	230	
17.41	ZV322S_K402_0175 ME20	3400	3000	4500	≤32	0.95	0.102	73	3	22	70.0	14	6.6	15	6.6	31	13	540	230	
17.41	ZV322S_K402_0175 ME30	3400	3000	4000	≤38	0.84	0.102	74	3	22	70.0	14	6.6	15	6.6	31	13	540	230	
17.41	ZV322S_K402_0175 ME40	3000	3000	3500	≤48	0.74	0.102	74	3	22	70.0	14	6.6	15	6.6	31	13	540	230	
20.20	ZV322S_K402_0200 ME20	3500	3300	5000	≤32	0.91	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
20.20	ZV322S_K402_0200 ME30	3500	3300	4000	≤38	0.73	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
23.29	ZV322S_K402_0230 ME20	3500	3300	5000	≤32	0.79	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
23.29	ZV322S_K402_0230 ME30	3500	3300	4000	≤38	0.63	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
23.29	ZV322S_K402_0230 ME40	3000	3000	3500	≤48	0.55	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
25.28	ZV322S_K402_0250 ME20	3500	3300	5000	≤32	0.73	0.102	74	3	22	70.0	14	6.6	15	6.6	29	13	540	230	
25.28	ZV322S_K402_0250 ME30	3500	3300	4000	≤38	0.58	0.102	74	3	22	70.0	14	6.6	15	6.6	29	13	540	230	
27.77	ZV322S_K402_0280 ME20	3500	3300	5000	≤32	0.66	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
27.77	ZV322S_K402_0280 ME30	3500	3300	4000	≤38	0.53	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
32.39	ZV322S_K403_0320 ME20	3500	3300	5000	≤24	0.57	0.102	74	3	22	70.0	13	6.6	13	6.6	16	13	460	230	
33.68	ZV322S_K402_0340 ME20	3500	3300	5000	≤24	0.54	0.102	74	3	22	70.0	11	6.6	13	6.6	20	13	470	230	
34.76	ZV322S_K402_0350 ME20	3500	3300	5000	≤32	0.53	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
34.76	ZV322S_K402_0350 ME30	3500	3300	4000	≤38	0.42	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
35.72	ZV322S_K403_0360 ME20	3500	3300	5000	≤24	0.51	0.102	74	3	22	70.0	14	6.6	14	6.6	18	13	510	230	
39.05	ZV322S_K403_0390 ME20	3500	3300	5000	≤24	0.47	0.102	74	3	22	70.0	15	6.6	15	6.6	20	13	540	230	
40.51	ZV322S_K402_0410 ME20	3500	3300	5000	≤24	0.45	0.102	74	3	22	70.0	8.8	6.6	11	6.6	18	13	370	230	
44.54	ZV322S_K403_0450 ME20	3500	3300	5000	≤24	0.41	0.102	74	3	22	70.0	15	6.6	15	6.6	22	13	540	230	
46.31	ZV322S_K402_0460 ME20	3500	3300	5000	≤24	0.40	0.102	74	3	22	70.0	15	6.6	15	6.6	28	13	540	230	
48.94	ZV322S_K403_0490 ME20	3500	3300	5000	≤24	0.38	0.102	74	3	22	70.0	15	6.6	15	6.6	25	13	540	230	
50.43	ZV322S_K402_0500 ME20	3500	3300	5000	≤24	0.36	0.102	74	3	22	70.0	7.7	6.6	9.2	6.6	15	13	320	230	
53.69	ZV322S_K403_0540 ME20	3500	3300	5000	≤24	0.34	0.102	74	3	22	70.0	15	6.6	15	6.6	27	13	540	230	
55.71	ZV322S_K402_0560 ME20	3500	3300	5000	≤24	0.33	0.102	74	3	22	70.0	12	6.6	15	6.6	24	13	510	230	
65.50	ZV322S_K403_0650 ME20	3500	3300	5000	≤24	0.28	0.102	74	3	22	70.0	15	6.6	15	6.6	29	13	540	230	
66.35	ZV322S_K403_0660 ME10	3600	3300	5000	≤19	0.28	0.102	74	3	22	70.0	9.7	6.6	9.7	6.6	12	12	340	230	
67.30	ZV322S_K403_0670 ME20	3500	3300	5000	≤24	0.27	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
69.34	ZV322S_K402_0690 ME20	3500	3300	5000	≤24	0.26	0.102	74	3	22	70.0	11	6.6	13	6.6	21	13	440	230	
78.10	ZV322S_K403_0780 ME20	3500	3300	5000	≤24	0.24	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
79.11	ZV322S_K403_0790 ME10	3600	3300	5000	≤19	0.23	0.102	74	3	22	70.0	12	6.6	12	6.6	14	13	410	230	
90.06	ZV322S_K403_0900 ME20	3500	3300	5000	≤24	0.20	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
91.23	ZV322S_K403_0910 ME10	3600	3300	5000	≤19	0.20	0.102	74	3	22	70.0	13	6.6	13	6.6	17	13	470	230	
107.4	ZV322S_K403_1070 ME20	3500	3300	5000	≤24	0.17	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
108.8	ZV322S_K403_1090 ME10	3600	3300	5000	≤19	0.17	0.102	74	3	22	70.0	15	6.6	15	6.6	20	13	540	230	
134.4	ZV322S_K403_1340 ME20	3500	3300	5000	≤24	0.14	0.102	74	3	22	70.0	15	6.6	15	6.6	31	13	540	230	
136.1	ZV322S_K403_1360 ME10	3600	3300	5000	≤19	0.14	0.102	74	3	22	70.0	15	6.6	15	6.6	23	13	540	230	
179.1	ZV322S_K403_1790 ME20	3500	3300	5000	≤24	0.10	0.102	74	3	22	70.0	15	6.6	15	6.6	28	13	540	230	
181.4	ZV322S_K403_1810 ME10	3600	3300	5000	≤19	0.10	0.102	74	3	22	70.0	15	6.6	15	6.6	28	13	540	230	
215.4	ZV322S_K403_2150 ME20	3500	3300	5000	≤24	0.09	0.102	74	3	22	70.0	12	6.6	15	6.6	24	13	510	230	
218.2	ZV322S_K403_2180 ME10	3600	3300	5000	≤19	0.08	0.102	74	3	22	70.0	12	6.6	15	6.6	24	13	510	230	
271.6	ZV322S_K403_2720 ME10	3600	3300	5000	≤19	0.07	0.102	74	3	22	70.0	11	6.6	13	6.6	21	13	440	230	
ZV4K4 (F_{v2acc,max} = 15 kN)																				
4.000	ZV418S_K402_0040 ME30	2600	2200	3500	≤38	3.50	0.111	64	4	18	76.4	8.0	6.8	12	6.9	20	14	460	270	
4.000	ZV418S_K402_0040 ME40	2600	2200	3500	≤48	3.50	0.111	64	4	18	76.4	8.0	6.8	12	6.9	20	14	460	270	
4.364	ZV418S_K402_0044 ME30	2600	2200	3500	≤38	3.21	0.111	64	4	18	76.4	8.2	6.9	12	6.9	22	14	470	270	
4.364	ZV418S_K402_0044 ME40	2600	2200	3500	≤48	3.21	0.111	64	4	18	76.4	8.2	6.9	12	6.9	22	14	470	270	

13.2 Selection tables 13 ZVK rack and pinion drives

i	Type	n_{1maxDB}	n_{1maxDB}	n_{1maxZV}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	$F_{f2N,S}$	$F_{f2N,E}$	F_{f2accS}	F_{f2accE}	$F_{f2NOT,S}$	$F_{f2NOT,E}$	M_{2accS}	M_{2accE}
		EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/ μm]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]
ZV4K4 ($F_{v2acc,max} = 15 \text{ kN}$)																			
5.422	ZV418S_K402_0054 ME30	2600	2200	3500	≤38	2.58	0.111	65	4	18	76.4	8.9	6.9	13	6.9	28	14	510	270
5.422	ZV418S_K402_0054 ME40	2600	2200	3500	≤48	2.58	0.111	64	4	18	76.4	8.9	6.9	13	6.9	28	14	510	270
6.000	ZV418S_K402_0060 ME30	2600	2200	3500	≤38	2.33	0.111	65	4	18	76.4	9.2	6.9	14	6.9	29	14	520	270
6.000	ZV418S_K402_0060 ME40	2600	2200	3500	≤48	2.33	0.111	65	4	18	76.4	9.2	6.9	14	6.9	29	14	520	270
6.719	ZV418S_K402_0067 ME20	3000	2600	4000	≤32	2.38	0.111	64	4	18	76.4	9.5	6.9	10	6.9	13	13	390	270
6.719	ZV418S_K402_0067 ME30	3000	2600	4000	≤38	2.38	0.111	65	4	18	76.4	9.5	6.9	14	6.9	29	14	550	270
6.719	ZV418S_K402_0067 ME40	3000	2600	3500	≤48	2.08	0.111	65	4	18	76.4	9.5	6.9	14	6.9	29	14	550	270
7.456	ZV418S_K402_0075 ME30	2600	2200	3500	≤38	1.88	0.111	65	4	18	76.4	9.9	6.9	15	6.9	29	14	560	270
7.456	ZV418S_K402_0075 ME40	2600	2200	3500	≤48	1.88	0.111	65	4	18	76.4	9.9	6.9	15	6.9	29	14	560	270
8.377	ZV418S_K402_0084 ME20	3000	2600	4000	≤32	1.91	0.111	64	4	18	76.4	10	6.9	13	6.9	16	14	490	270
8.377	ZV418S_K402_0084 ME30	3000	2600	4000	≤38	1.91	0.111	65	4	18	76.4	10	6.9	15	6.9	29	14	570	270
8.377	ZV418S_K402_0084 ME40	3000	2600	3500	≤48	1.67	0.111	65	4	18	76.4	10	6.9	15	6.9	29	14	570	270
9.238	ZV418S_K402_0092 ME20	3000	2600	4000	≤32	1.73	0.111	65	4	18	76.4	11	6.9	14	6.9	18	14	540	270
9.238	ZV418S_K402_0092 ME30	3000	2600	4000	≤38	1.73	0.111	65	4	18	76.4	11	6.9	15	6.9	29	14	570	270
9.238	ZV418S_K402_0092 ME40	3000	2600	3500	≤48	1.52	0.111	65	4	18	76.4	11	6.9	15	6.9	29	14	570	270
10.10	ZV418S_K402_0100 ME20	3400	3000	4500	≤32	1.78	0.111	65	4	18	76.4	11	6.9	15	6.9	19	14	570	270
10.10	ZV418S_K402_0100 ME30	3400	3000	4000	≤38	1.58	0.111	65	4	18	76.4	11	6.9	15	6.9	29	14	570	270
10.10	ZV418S_K402_0100 ME40	3000	3000	3500	≤48	1.39	0.111	65	4	18	76.4	11	6.9	15	6.9	29	14	570	270
11.52	ZV418S_K402_0115 ME20	3000	2600	4000	≤32	1.39	0.111	65	4	18	76.4	11	6.9	15	6.9	22	14	570	270
11.52	ZV418S_K402_0115 ME30	3000	2600	4000	≤38	1.39	0.111	65	4	18	76.4	11	6.9	15	6.9	29	14	570	270
11.52	ZV418S_K402_0115 ME40	3000	2600	3500	≤48	1.22	0.111	65	4	18	76.4	11	6.9	15	6.9	29	14	570	270
12.66	ZV418S_K402_0125 ME20	3400	3000	4500	≤32	1.42	0.111	65	4	18	76.4	12	6.9	15	6.9	23	14	570	270
12.66	ZV418S_K402_0125 ME30	3400	3000	4000	≤38	1.26	0.111	65	4	18	76.4	12	6.9	15	6.9	29	14	570	270
12.66	ZV418S_K402_0125 ME40	3000	3000	3500	≤48	1.11	0.111	65	4	18	76.4	12	6.9	15	6.9	29	14	570	270
13.89	ZV418S_K402_0140 ME20	3400	3000	4500	≤32	1.30	0.111	65	4	18	76.4	12	6.9	15	6.9	26	14	570	270
13.89	ZV418S_K402_0140 ME30	3400	3000	4000	≤38	1.15	0.111	65	4	18	76.4	12	6.9	15	6.9	29	14	570	270
13.89	ZV418S_K402_0140 ME40	3000	3000	3500	≤48	1.01	0.111	65	4	18	76.4	12	6.9	15	6.9	29	14	570	270
16.94	ZV418S_K402_0170 ME20	3500	3300	5000	≤32	1.18	0.111	65	4	18	76.4	13	6.9	15	6.9	27	14	570	270
16.94	ZV418S_K402_0170 ME30	3500	3300	4000	≤38	0.95	0.111	65	4	18	76.4	13	6.9	15	6.9	29	14	570	270
16.94	ZV418S_K402_0170 ME40	3000	3000	3500	≤48	0.83	0.111	65	4	18	76.4	13	6.9	15	6.9	29	14	570	270
17.41	ZV418S_K402_0175 ME20	3400	3000	4500	≤32	1.03	0.111	65	4	18	76.4	13	6.9	15	6.9	29	14	570	270
17.41	ZV418S_K402_0175 ME30	3400	3000	4000	≤38	0.92	0.111	65	4	18	76.4	13	6.9	15	6.9	29	14	570	270
17.41	ZV418S_K402_0175 ME40	3000	3000	3500	≤48	0.80	0.111	65	4	18	76.4	13	6.9	15	6.9	29	14	570	270
20.20	ZV418S_K402_0200 ME20	3500	3300	5000	≤32	0.99	0.111	65	4	18	76.4	14	6.9	15	6.9	29	14	570	270
20.20	ZV418S_K402_0200 ME30	3500	3300	4000	≤38	0.79	0.111	65	4	18	76.4	14	6.9	15	6.9	29	14	570	270
23.29	ZV418S_K402_0230 ME20	3500	3300	5000	≤32	0.86	0.111	65	4	18	76.4	14	6.9	15	6.9	29	14	570	270
23.29	ZV418S_K402_0230 ME30	3500	3300	4000	≤38	0.69	0.111	65	4	18	76.4	14	6.9	15	6.9	29	14	570	270
23.29	ZV418S_K402_0230 ME40	3000	3000	3500	≤48	0.60	0.111	65	4	18	76.4	14	6.9	15	6.9	29	14	570	270
25.28	ZV418S_K402_0250 ME20	3500	3300	5000	≤32	0.79	0.111	65	4	18	76.4	13	6.9	15	6.9	26	14	570	270
25.28	ZV418S_K402_0250 ME30	3500	3300	4000	≤38	0.63	0.111	65	4	18	76.4	13	6.9	15	6.9	26	14	570	270
27.77	ZV418S_K402_0280 ME20	3500	3300	5000	≤32	0.72	0.111	65	4	18	76.4	14	6.9	15	6.9	29	14	570	270
27.77	ZV418S_K402_0280 ME30	3500	3300	4000	≤38	0.58	0.111	65	4	18	76.4	14	6.9	15	6.9	29	14	570	270
32.39	ZV418S_K403_0320 ME20	3500	3300	5000	≤24	0.62	0.111	65	4	18	76.4	12	6.9	12	6.9	15	14	460	270
33.68	ZV418S_K402_0340 ME20	3500	3300	5000	≤24	0.59	0.111	65	4	18	76.4	10	6.9	12	6.9	19	14	470	270
34.76	ZV418S_K402_0350 ME20	3500	3300	5000	≤32	0.58	0.111	65	4	18	76.4	14	6.9	15	6.9	29	14	570	270
34.76	ZV418S_K402_0350 ME30	3500	3300	4000	≤38	0.46	0.111	65	4	18	76.4	14	6.9	15	6.9	29	14	570	270
35.72	ZV418S_K403_0360 ME20	3500	3300	5000	≤24	0.56	0.111	65	4	18	76.4	13	6.9	13	6.9	17	14	510	270
39.05	ZV418S_K403_0390 ME20	3500	3300	5000	≤24	0.51	0.111	65	4	18	76.4	14	6.9	14	6.9	18	14	550	270
40.51	ZV418S_K402_0410 ME20	3500	3300	5000	≤24	0.49	0.111	65	4	18	76.4	8.1	6.9	9.7	6.9	16	14	370	270
44.54	ZV418S_K403_0450 ME20	3500	3300	5000	≤24	0.45	0.111	65	4	18	76.4	14	6.9	15	6.9	21	14	570	270
46.31	ZV418S_K402_0460 ME20	3500	3300	5000	≤24	0.43	0.111	65	4	18	76.4	14	6.9	15	6.9	26	14	570	270
48.94	ZV418S_K403_0490 ME20	3500	3300	5000	≤24	0.41	0.111	65	4	18	76.4	14	6.9	15	6.9	23	14	570	270
50.43	ZV418S_K402_0500 ME20	3500	3300	5000	≤24	0.40	0.111	65	4	18	76.4	7.1	6.9	8.5	6.9	14	14	320	270
53.69	ZV418S_K403_0540 ME20	3500	3300	5000	≤24	0.37	0.111	65	4	18	76.4	14	6.9	15	6.9	25	14	570	270
55.71	ZV418S_K402_0560 ME20	3500	3300	5000	≤24	0.36	0.111	65	4	18	76.4	11	6.9	13	6.9	22	14	510	270
65.50	ZV418S_K403_0650 ME20	3500	3300	5000	≤24	0.31	0.111	65	4	18	76.4	14	6.9	15	6.9	27	14	570	270
66.35	ZV418S_K403_0660 ME10	3600	3300	5000	≤19	0.30	0.111	65	4	18	76.4	8.9	6.9	8.9	6.9	11	11	340	270
67.30	ZV418S_K403_0670 ME20	3500	3300	5000	≤24	0.30	0.111	65	4	18	76.4	14	6.9	15	6.9	28	14	570	270
69.34	ZV418S_K402_0690 ME20	3500	3300	5000	≤24	0.29	0.111	65	4	18	76.4	9.7	6.9	12	6.9	19	14	440	270
78.10	ZV418S_K403_0780 ME20	3500	3300	5000	≤24	0.26	0.111	65	4	18	76.4	14	6.9	15	6.9	28	14	570	270
79.11	ZV418S_K403_0790 ME10	3600	3300	5000	≤19	0.25	0.111	65	4	18	76.4	11	6.9	11	6.9	13	13	410	270
90.06	ZV418S_K403_0900 ME20	3500	3300	5000	≤24	0.22	0.111	65	4	18	76.4	14	6.9	15	6.9	28	14	570	270
91.23	ZV418S_K403_0910 ME10	3600	3300	5000	≤19	0.22	0.111	65	4	18	76.4	12	6.9	12	6.9	15	14	470	270
107.4	ZV418S_K403_1070 ME20	3500	3300	5000	≤24	0.19	0.111	65	4	18	76.4	14	6.9	15	6.9	28	14	570	270

i	Type	n_{1maxDB}	n_{1maxDB}	n_{1maxZV}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	$F_{f2N,S}$	$F_{f2N,E}$	F_{f2accS}	F_{f2accE}	$F_{f2NOT,S}$	$F_{f2NOT,E}$	M_{2accS}	M_{2accE}
		EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	[mm]	[m/s]	[mm]	[N/ μm]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]
ZV4K4 ($F_{v2acc,max} = 15 \text{ kN}$)																			
108.8	ZV418S_K403_1090 ME10	3600	3300	5000	≤ 19	0.18	0.111	65	4	18	76.4	14	6.9	15	6.9	18	14	560	270
134.4	ZV418S_K403_1340 ME20	3500	3300	5000	≤ 24	0.15	0.111	65	4	18	76.4	14	6.9	15	6.9	28	14	570	270
136.1	ZV418S_K403_1360 ME10	3600	3300	5000	≤ 19	0.15	0.111	65	4	18	76.4	14	6.9	15	6.9	21	14	570	270
179.1	ZV418S_K403_1790 ME20	3500	3300	5000	≤ 24	0.11	0.111	65	4	18	76.4	14	6.9	15	6.9	26	14	570	270
181.4	ZV418S_K403_1810 ME10	3600	3300	5000	≤ 19	0.11	0.111	65	4	18	76.4	14	6.9	15	6.9	26	14	570	270
215.4	ZV418S_K403_2150 ME20	3500	3300	5000	≤ 24	0.09	0.111	65	4	18	76.4	11	6.9	13	6.9	22	14	510	270
218.2	ZV418S_K403_2180 ME10	3600	3300	5000	≤ 19	0.09	0.111	65	4	18	76.4	11	6.9	13	6.9	22	14	510	270
271.6	ZV418S_K403_2720 ME10	3600	3300	5000	≤ 19	0.07	0.111	65	4	18	76.4	9.7	6.9	12	6.9	19	14	440	270

13.3 Dimensional drawings

In this chapter, you can find the dimensions of the rack and pinion drives with motor adapter.

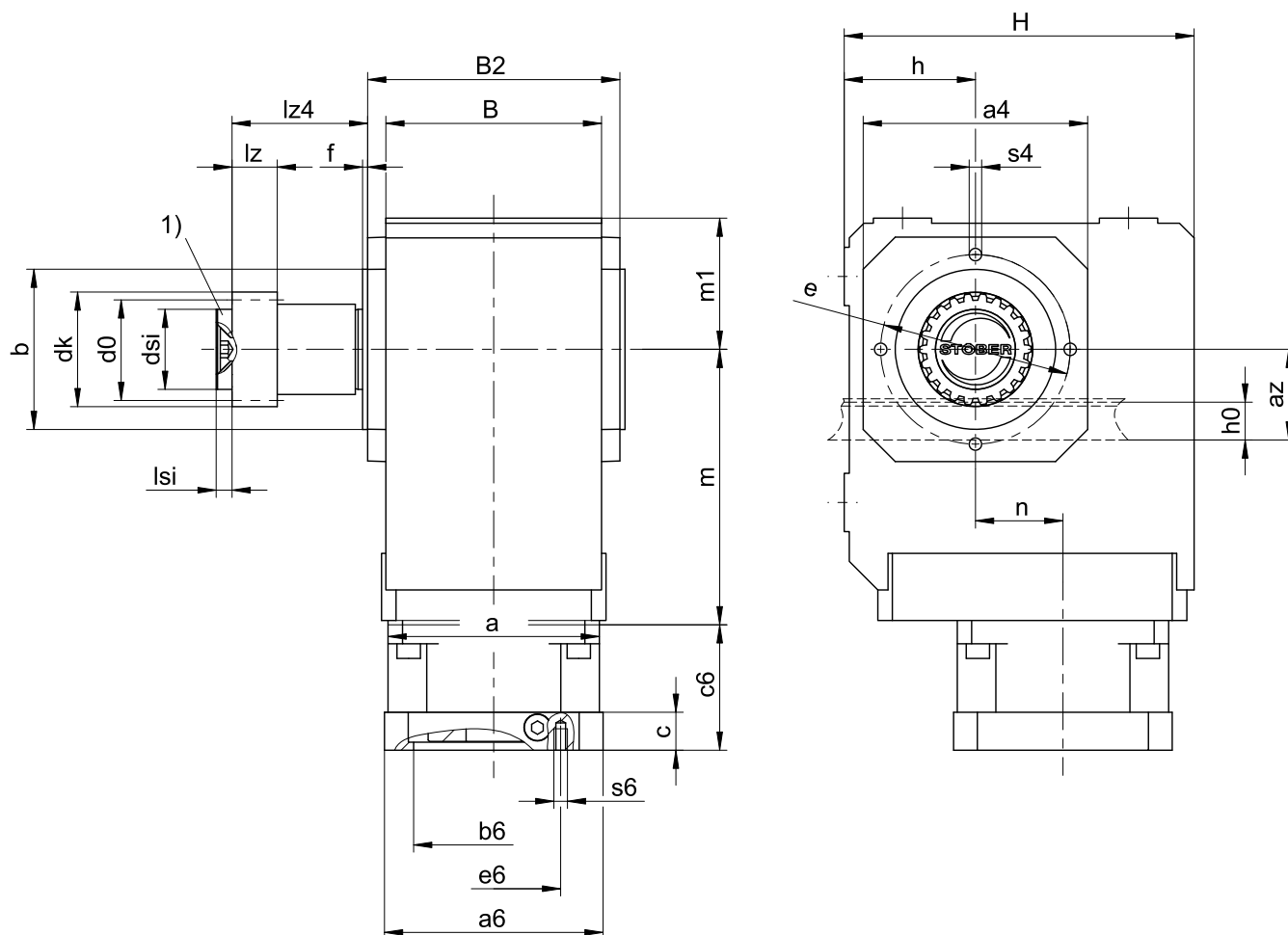
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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

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

You can download 3D models of our standard drives at <http://configurator.stoeber.de>.

13.3.1 Pinion position E



1) Axial locking (optional)

Output dimensions

Type	mn	az	□a4	Øb	B	B2	Ød0	Ødk	Ødsi	Øe	f	h	h0	H	lz	lz4	lsi	m1	s4	x
ZV220SEK102_	2	44.02	105	75 _β	90	106	42.44	47.90	30	90	3.0	60	22	160	26	50.5	7	60	M8	0.4
ZV225SEK202_	2	49.33	116	82 _β	115	134	53.05	58.52	45	100	3.0	65	22	190	26	67.5	9	65	M8	0.4
ZV225SEK203_	2	49.33	116	82 _β	115	134	53.05	58.52	45	100	3.0	65	22	190	26	67.5	9	65	M8	0.4
ZV318SEK202_	3	55.55	116	82 _β	115	134	57.30	65.01	45	100	3.0	65	26	190	31	67.5	9	65	M8	0.3
ZV318SEK203_	3	55.55	116	82 _β	115	134	57.30	65.01	45	100	3.0	65	26	190	31	67.5	9	65	M8	0.3
ZV225SEK302_	2	49.33	132	95 _β	130	146	53.05	58.52	45	115	3.0	75	22	213	26	68.5	9	75	M8	0.4
ZV225SEK303_	2	49.33	132	95 _β	130	146	53.05	58.52	45	115	3.0	75	22	213	26	68.5	9	75	M8	0.4
ZV318SEK302_	3	55.55	132	95 _β	130	146	57.30	65.01	45	115	3.0	75	26	213	31	68.5	9	75	M8	0.3
ZV318SEK303_	3	55.55	132	95 _β	130	146	57.30	65.01	45	115	3.0	75	26	213	31	68.5	9	75	M8	0.3
ZV322SEK402_	3	62.21	152	110 _β	148	173	70.03	78.35	55	130	3.5	90	26	240	31	93.0	11	90	M10	0.4
ZV322SEK403_	3	62.21	152	110 _β	148	173	70.03	78.35	55	130	3.5	90	26	240	31	93.0	11	90	M10	0.4
ZV418SEK402_	4	74.40	152	110 _β	148	173	76.40	86.77	55	130	3.5	90	35	240	41	93.0	11	90	M10	0.3
ZV418SEK403_	4	74.40	152	110 _β	148	173	76.40	86.77	55	130	3.5	90	35	240	41	93.0	11	90	M10	0.3

Type	ME10			ME20			ME30			ME40		
	a	m	n	a	m	n	a	m	n	a	m	n
ZV220SEK102_	□98	124	36.0	□115	128	36.0	–	–	–	–	–	–
ZV225SEK202_	□98	143	46.0	□115	147	46.0	□145	149	46.0	–	–	–
ZV225SEK203_	∅140	180	46.0	–	–	–	–	–	–	–	–	–
ZV225SEK302_	∅140	163	52.5	□115	167	52.5	□145	169	52.5	–	–	–
ZV225SEK303_	∅140	200	52.5	∅160	210	16.0	–	–	–	–	–	–
ZV318SEK202_	□98	143	46.0	□115	147	46.0	□145	149	46.0	–	–	–
ZV318SEK203_	∅140	180	46.0	–	–	–	–	–	–	–	–	–
ZV318SEK302_	∅140	163	52.5	□115	167	52.5	□145	169	52.5	–	–	–
ZV318SEK303_	∅140	200	52.5	∅160	210	16.0	–	–	–	–	–	–
ZV322SEK402_	–	–	–	∅160	187	60.0	□145	189	60.0	□190	192	60.0
ZV322SEK403_	∅140	220	60.0	∅160	230	23.0	–	–	–	–	–	–
ZV418SEK402_	–	–	–	∅160	187	60.0	□145	189	60.0	□190	192	60.0
ZV418SEK403_	∅140	220	60.0	∅160	230	23.0	–	–	–	–	–	–

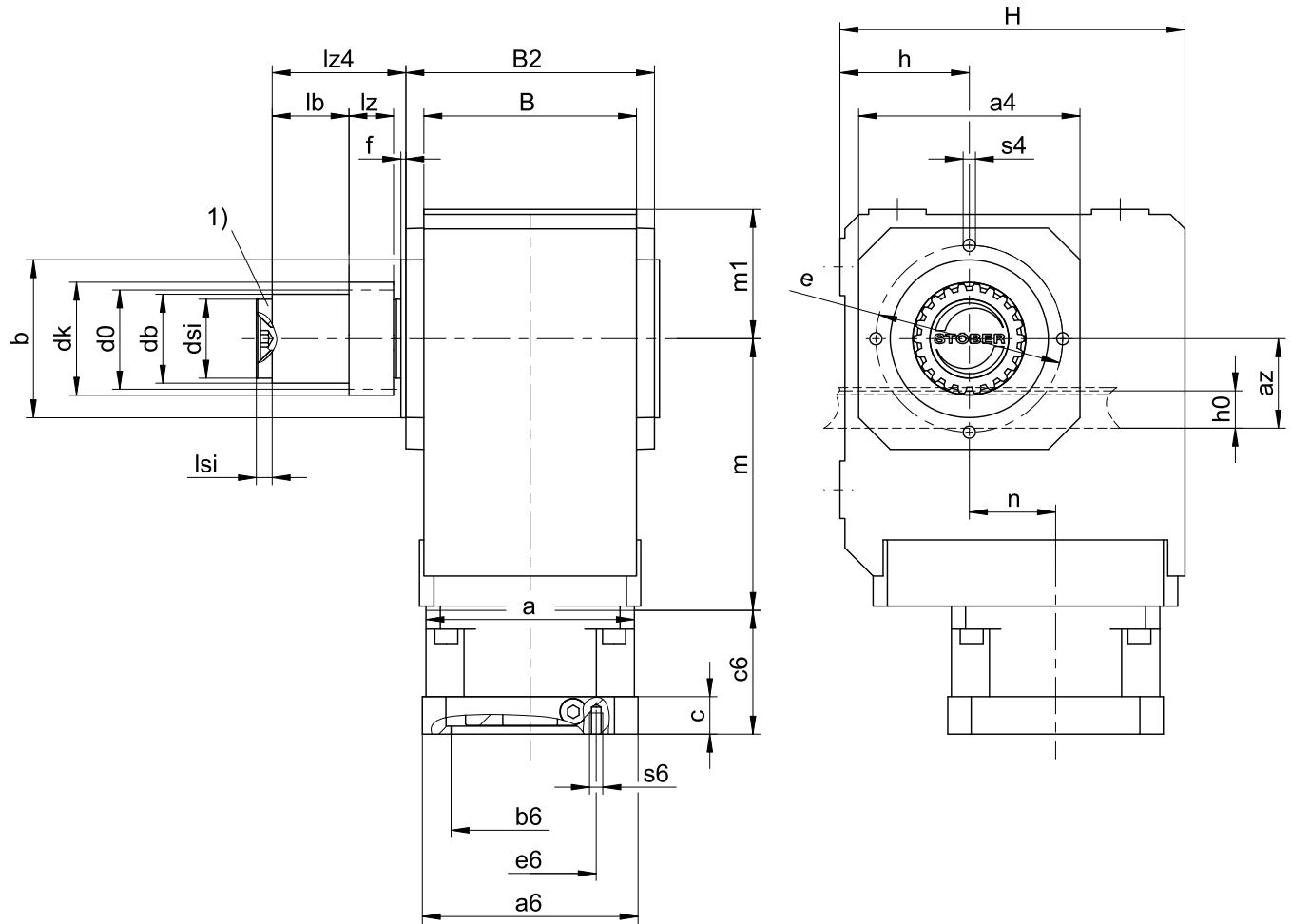
Example dimensions for the motor connection

Type	□a6	∅b6	∅e6	c	c6	s6
ME10	100	95 ^{H7}	115	21	56	M8
ME20	120	110 ^{H7}	130	24	74	M8
ME30	150	130 ^{H7}	165	26	86	M10
ME40	204	180 ^{H7}	215	35	123	M12

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapter ME in our STÖBER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

13.3.2 Pinion position S



1) Axial locking (optional)

Output dimensions

Type	mn	az	□a4	Øb	B	B2	Ød0	Ødb	Ødk	Ødsi	Øe	f1	h	h0	H	lb	lz	lz4	lsi	m1	Øs4	x
ZV220SSK102_	2	44.02	105	75 _{f6}	90	106	42.44	38	47.90	30	90	3.0	60	22	160	12.5	26	50.5	7	60	M8	0.4
ZV225SSK202_	2	49.33	116	82 _{f6}	115	134	53.05	50	58.52	45	100	3.0	65	22	190	34.5	26	67.5	9	65	M8	0.4
ZV225SSK203_	2	49.33	116	82 _{f6}	115	134	53.05	50	58.52	45	100	3.0	65	22	190	34.5	26	67.5	9	65	M8	0.4
ZV318SSK202_	3	55.55	116	82 _{f6}	115	134	57.30	50	65.01	45	100	3.0	65	26	190	29.5	31	67.5	9	65	M8	0.3
ZV318SSK203_	3	55.55	116	82 _{f6}	115	134	57.30	50	65.01	45	100	3.0	65	26	190	29.5	31	67.5	9	65	M8	0.3
ZV225SSK302_	2	49.33	132	95 _{f6}	130	146	53.05	50	58.52	45	115	3.0	75	22	213	34.5	26	68.5	9	75	M8	0.4
ZV225SSK303_	2	49.33	132	95 _{f6}	130	146	53.05	50	58.52	45	115	3.0	75	22	213	34.5	26	68.5	9	75	M8	0.4
ZV318SSK302_	3	55.55	132	95 _{f6}	130	146	57.30	50	65.01	45	115	3.0	75	26	213	29.5	31	68.5	9	75	M8	0.3
ZV318SSK303_	3	55.55	132	95 _{f6}	130	146	57.30	50	65.01	45	115	3.0	75	26	213	29.5	31	68.5	9	75	M8	0.3
ZV322SSK402_	3	62.21	152	110 _{f6}	148	173	70.03	62	78.35	55	130	3.5	90	26	240	53.5	31	93.0	11	90	M10	0.4
ZV322SSK403_	3	62.21	152	110 _{f6}	148	173	70.03	62	78.35	55	130	3.5	90	26	240	53.5	31	93.0	11	90	M10	0.4
ZV418SSK402_	4	74.40	152	110 _{f6}	148	173	76.40	62	86.77	55	130	3.5	90	35	240	43.5	41	93.0	11	90	M10	0.3
ZV418SSK403_	4	74.40	152	110 _{f6}	148	173	76.40	62	86.77	55	130	3.5	90	35	240	43.5	41	93.0	11	90	M10	0.3

Type	ME10			ME20			ME30			ME40		
	a	m	n	a	m	n	a	m	n	a	m	n
ZV2_K102_	□98	124	36.0	□115	128	36.0	–	–	–	–	–	–
ZV2_K202_	□98	143	46.0	□115	147	46.0	□145	149	46.0	–	–	–
ZV2_K203_	∅140	180	46.0	–	–	–	–	–	–	–	–	–
ZV2_K302_	∅140	163	52.5	□115	167	52.5	□145	169	52.5	–	–	–
ZV2_K303_	∅140	200	52.5	∅160	210	16.0	–	–	–	–	–	–
ZV3_K202_	□98	143	46.0	□115	147	46.0	□145	149	46.0	–	–	–
ZV3_K203_	∅140	180	46.0	–	–	–	–	–	–	–	–	–
ZV3_K302_	∅140	163	52.5	□115	167	52.5	□145	169	52.5	–	–	–
ZV3_K303_	∅140	200	52.5	∅160	210	16.0	–	–	–	–	–	–
ZV3_K402_	–	–	–	∅160	187	60.0	□145	189	60.0	□190	192	60.0
ZV3_K403_	∅140	220	60.0	∅160	230	23.0	–	–	–	–	–	–
ZV4_K402_	–	–	–	∅160	187	60.0	□145	189	60.0	□190	192	60.0
ZV4_K403_	∅140	220	60.0	∅160	230	23.0	–	–	–	–	–	–

Example dimensions for the motor connection

Type	□a6	∅b6	∅e6	c	c6	s6
ME10	100	95 ^{H7}	115	21	56	M8
ME20	120	110 ^{H7}	130	24	74	M8
ME30	150	130 ^{H7}	165	26	86	M10
ME40	204	180 ^{H7}	215	35	123	M12

In the table above, you will find example dimensions for the motor connection for motor adapter ME. **Note that when dimension c is lengthened, dimensions c6 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapter ME in our STOBBER Configurator at <http://configurator.stoeber.de>. Here, you can directly download a 3D model of your drive.

13.4 Type designation

In this chapter, you can find an explanation of the type designation with the associated options.

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

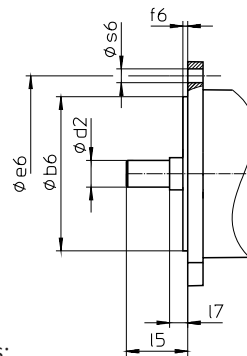
Sample code

Z	V	3	22	S	S	K	4	0	2	V	G	0084	ME30
---	---	---	----	---	---	---	---	---	---	---	---	------	------

Explanation

Code	Designation	Design
Z	Type	Rack and pinion drive
V	Design	Plug-on pinion
3	Module	$m_n = 3$ (example)
22	Number of teeth	$z = 22$ (example)
S	Toothing	Helical (left-hand 19° 31' 42")
E	Pinion position	Shaft end
S		Shaft shoulder
K	Type	Helical bevel gear unit
4	Size	4 (example)
0	Generation	Generation 0
1		Generation 1
2	Stages	Two-stage
3		Three-stage
V	Shaft	Solid shaft
G	Housing	Pitch circle diameter
0080	Transmission ratio (i x 10 rounded)	$i = 8.377$ (example)
ME30	Motor adapter	Motor adapter ME30 (example) with EasyAdapt® coupling

In order to complete the type designation, also specify:



- Motor type or motor dimensions:

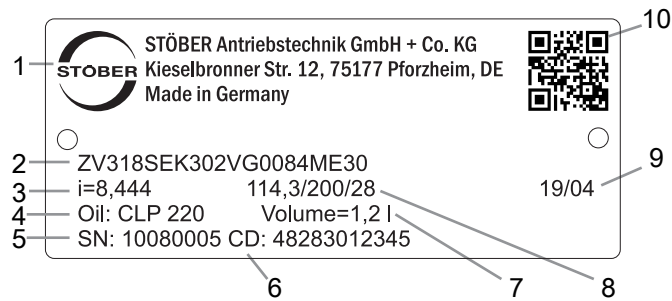
To choose a suitable motor connection, use the STOBBER Configurator at <http://configurator.stoerber.de> and choose your motor or the dimensions of the motor connection.
- For the mounting position, see the chapter [▶ 13.5.5](#)
- Attachment of solid shaft: gear unit side 3 or 4
- Pitch circle diameter: gear unit side 3 or 4
- Backlash: standard/class II/class I. Backlash class II and class I for an additional charge. Backlash class I with reduced input speeds (see the "Drive selection" chapter) and only possible in conjunction with synthetic oil.
- For axial locking (optional), see the chapter [▶ 13.3](#)
- For the position of locking screw access, see the chapter [▶ 13.5.7](#)
- Pinion lock for motor adapter (optional)
- Double seal for motor adapter MSS1 HS (optional)

An explanation of the gear unit sides can be found in the chapter [▶ 13.5.5](#)

In this product catalog, you will find all the information about rack and pinion drives with a motor adapter. All input options available upon request are listed in the chapter [▶ 13.5.2](#).

13.4.1 Nameplate

An example gear unit nameplate is explained in the figure below.



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

13.4.1.1 Supporting documents

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

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

13.5 Product description

13.5.1 Motor adapter with EasyAdapt® coupling (ME)

In this chapter, you will find a description of the EasyAdapt® coupling.

Properties:

- Fast and easy motor attachment
- Rugged coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large motor shaft diameter range
- Error-free, thanks to exact centering of the motor

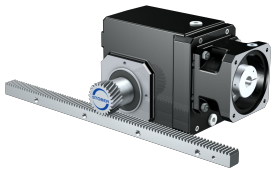


Fig. 1: EasyAdapt® coupling

13.5.2 Input options

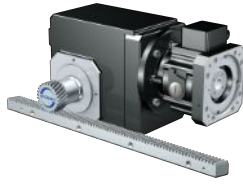
In this chapter, you will find all available input options:

ME motor adapter



<http://www.stoeber.de/en/ZVKME>

MB motor adapter



On request

EZ synchronous servo motor



On request

LM Lean motor



On request

You can also acquire rack and pinion drives with low-backlash K gear units upon request. To do so, send us an e-mail at sales@stober.de.

13.5.3 Toothing

The technical data specified in the Selection tables chapter applies only to gear rack combinations with the following characteristics:

The pinion of the rack and pinion drive is case-hardened and helical (left-hand 19° 31' 42"). The pinion gearing quality is 7.

The corresponding gear rack must have a right-hand design (19° 31' 42") and possess the following characteristics:

Module m_n [mm]	Minimum gear rack quality	Gear rack material
2 – 4	8	C45 inductively hardened

For other combinations, also note the project configuration of the gear rack on the Atlanta pages.

13.5.3.1 Pinion position

The pinion can be fastened to the shaft in two different attachment positions:

- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S)

Please specify the desired attachment position when placing your purchase order.

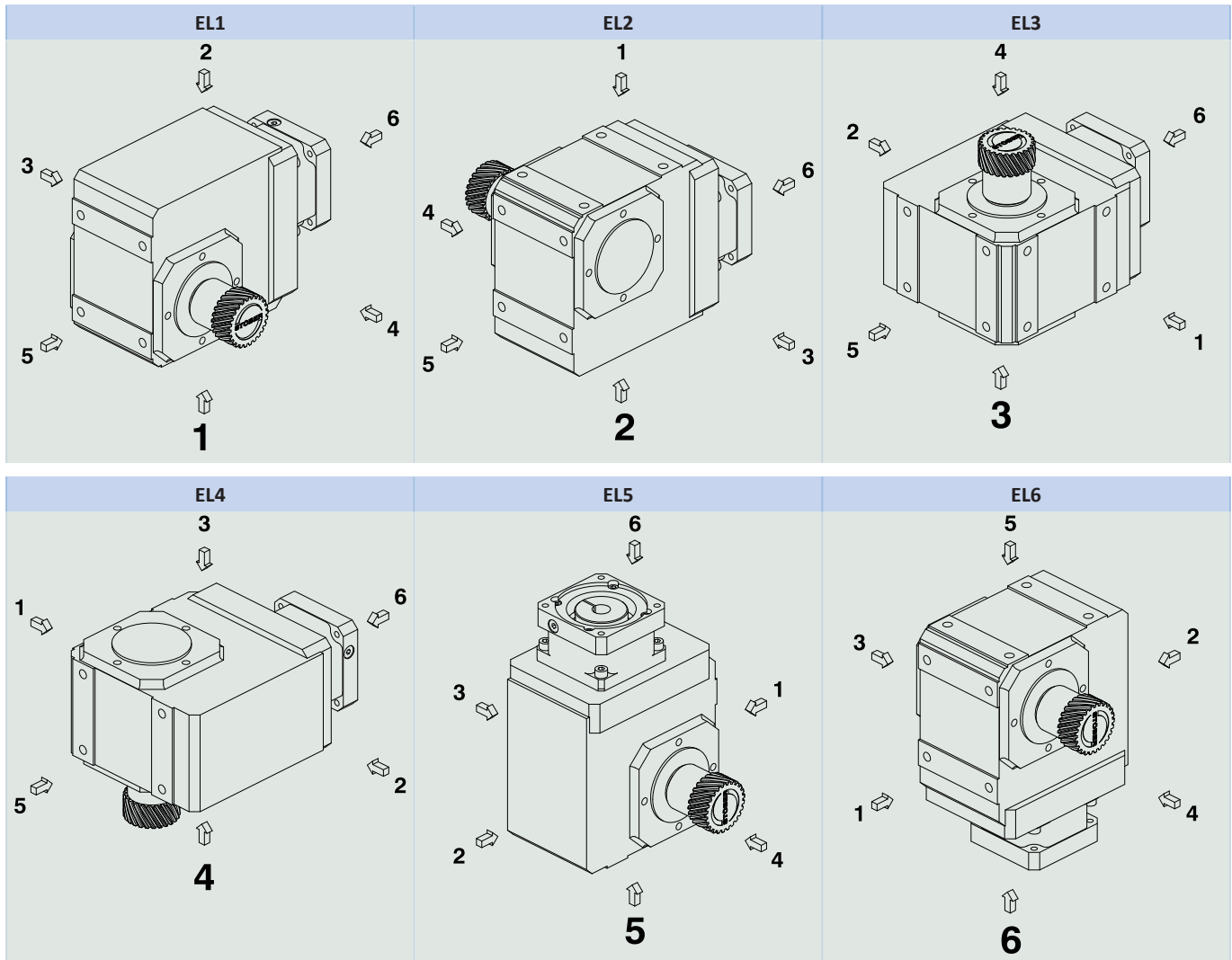
13.5.4 Installation conditions

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

13.5.5 Mounting positions

The following table shows the standard mounting positions.

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



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

13.5.6 Lubricants

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

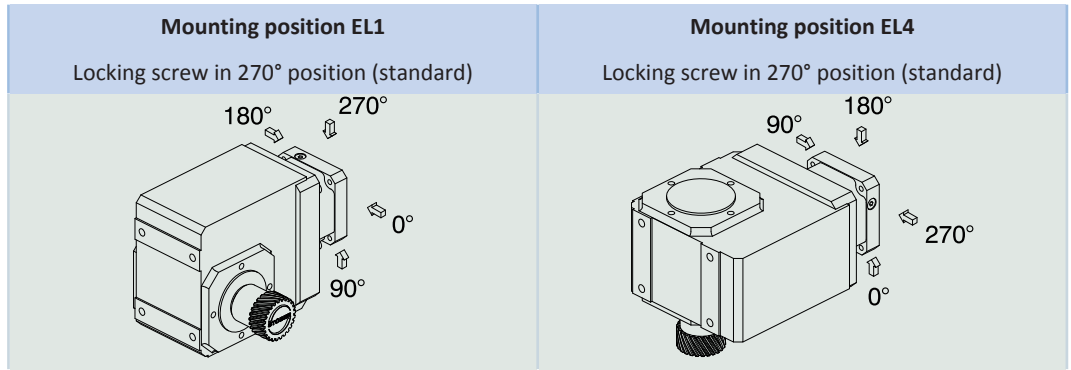
Only install the gear units in the intended mounting position! Reposition the gear units only after consulting STOBER. Otherwise, STOBER assumes no liability for the gear units.

Lubricant filling quantities for gear units, document ID 441871, can be found online at <http://www.stober.de/en/download>. Enter the ID of the documentation in the Search... field.

13.5.6.1 Rack and pinion drive lubrication

Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

13.5.7 Position of locking screw access



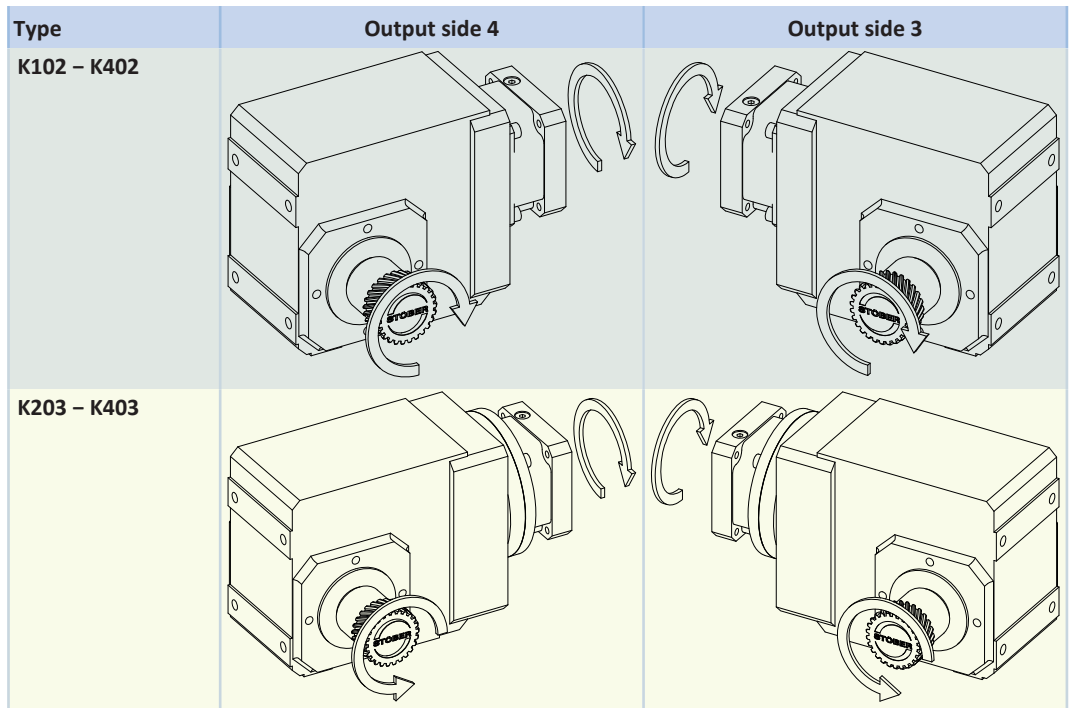
Indicate variations for your gear unit in the purchase order.

Note that the access opening for the locking screw also rotates when the gear unit is rotated to another mounting position.

13.5.8 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 80 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable.
Protection class: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

13.5.9 Direction of rotation



The pictures show mounting position EL1.

¹ Observe the protection class of all the components.

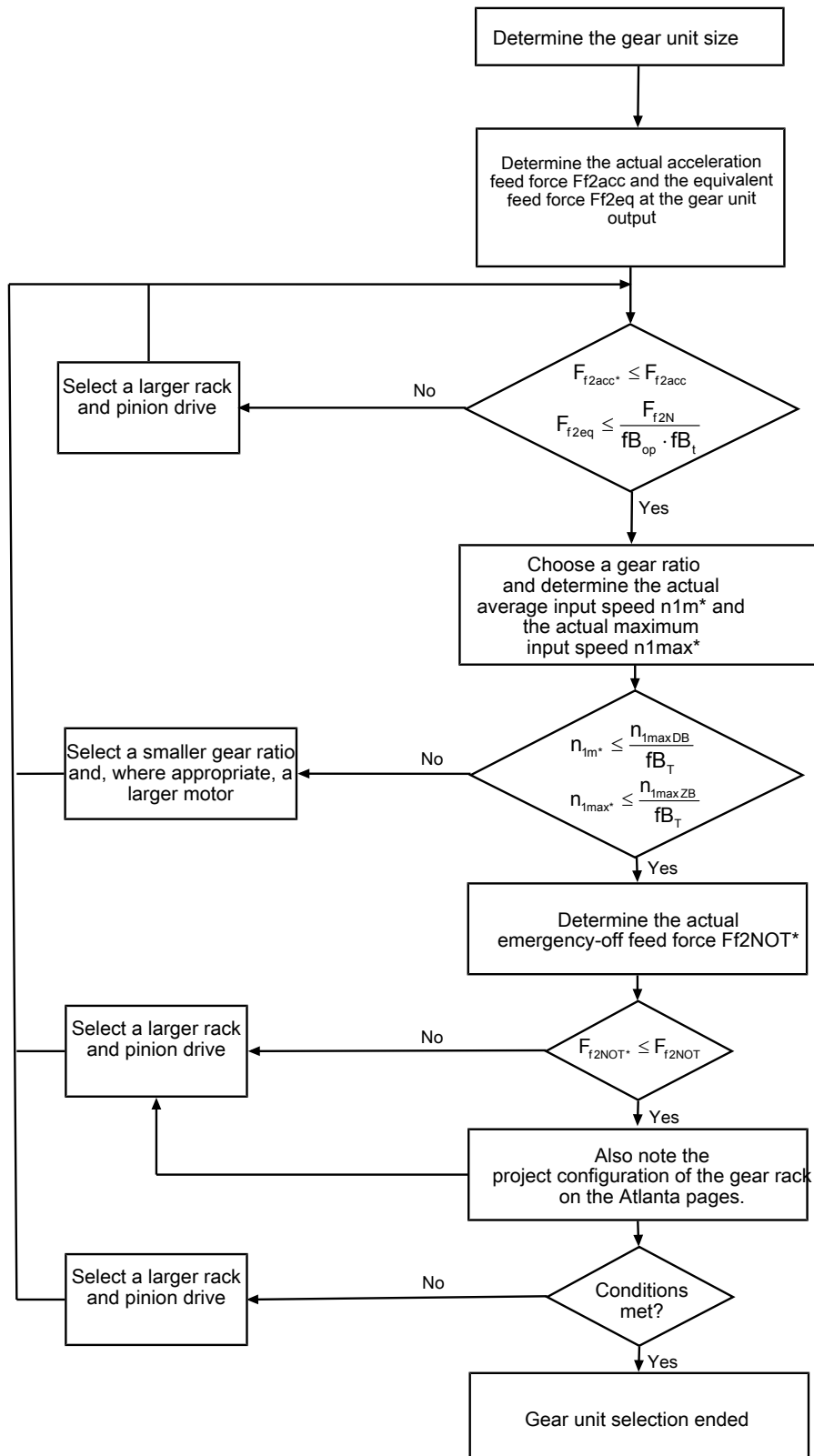
13.6 Project configuration

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

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

An explanation of the formula symbols can be found in the chapter [▶ 14.1](#).

13.6.1 Drive selection



Notes

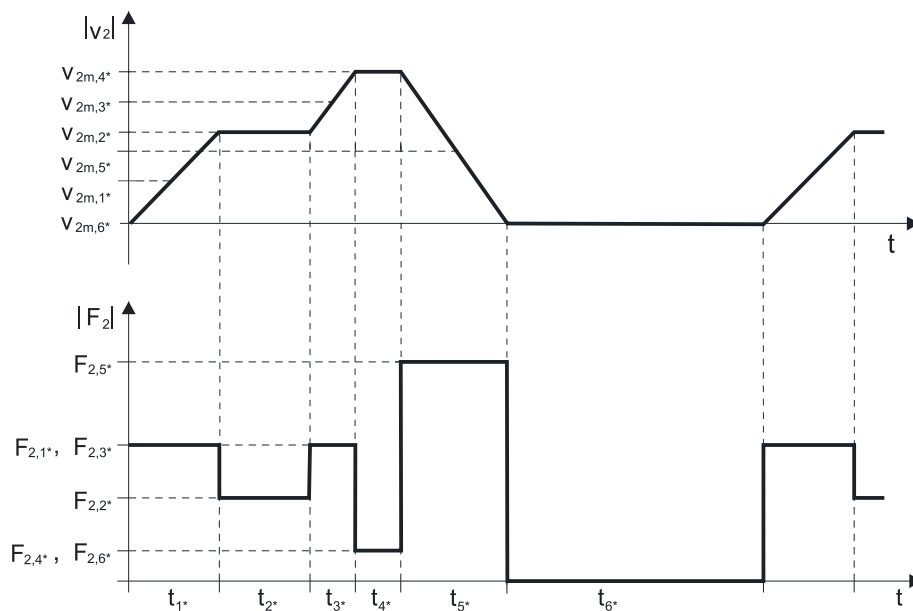
Note that for gear units with backlash class I, the maximum permitted input speed of the gear unit in continuous operation is reduced by 20%.

Refer to the selection tables for the values for i , $n_{1\max DB}$, $n_{1\max ZB}$, F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

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

Example of cyclic operation

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


Calculation of the actual maximum acceleration feed force

$$F_{f2acc*} = m \cdot a^* + F_L^*$$

Calculation of the actual average input speed

$$n_{1m*} = \frac{v_{2m*} \cdot i}{d_0 \cdot \pi}$$

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

If $t_{1*} + \dots + t_{5*} \geq 10$ min, determine v_{2m*} without the rest phase t_{6*} .

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

Calculation of the actual emergency-off feed force

$$F_{f2NOT*} = m \cdot a_{NOT*} + F_L^*$$

Calculation of the actual equivalent feed force

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{2m,1*}| \cdot t_{1*} \cdot |F_{2,1*}|^3 + \dots + |v_{2m,n*}| \cdot t_{n*} \cdot |F_{2,n*}|^3}{|v_{2m,1*}| \cdot t_{1*} + \dots + |v_{2m,n*}| \cdot t_{n*}}}$$

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	0.9
	≤ 30 °C	1.0
	≤ 40 °C	1.15
Motor with convection cooling	≤ 20 °C	1.0
	≤ 30 °C	1.1
	≤ 40 °C	1.25

Notes

- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{12acc} , F_{12NOT}) in the selection tables.

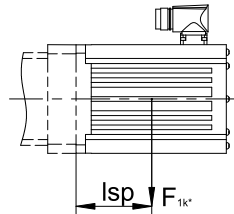
13.6.2 Permitted breakdown torques at the gear unit input

For a horizontal mounting position of the motor, verify that the permitted breakdown torque at the gear unit input is not exceeded before installation on a STOBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

$$M_{1k^*} = F_{1k^*} \times l_{sp}$$

The actual breakdown torque M_{1k^*} must not exceed the maximum permitted breakdown torque M_{1k} .



Type	M_{1k} [Nm]
ME10	25
ME20	60
ME30	125
ME40	250
ME50	600

13.7 Additional documentation

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

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

Operating manual Rack and Pinion Drives (Atlanta)	442455
Operating manual for C/F/K/S gear units and gear motors	443027_en
Lubricant filling quantities for gear units	441871

14 Appendix

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14.1 Formula symbols

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

Symbol	Unit	Explanation
a^*	m/s^2	Acceleration
a_{NOT}^*	m/s^2	Emergency-off acceleration
C_{lin}	$N/\mu m$	Total linear spring rigidity
d_o	mm	Pitch circle diameter
d_{MW}	mm	Motor shaft diameter
Δs	mm	Linear backlash resulting from the backlash of the gear unit
F_{1k}^*	N	Static and dynamic loads present in the application from the weight of the motor, mass acceleration and vibrations at the gear unit input
$ F_2 $	kN	Amount of force at the output
$F_{2,1}^* - F_{2,6}^*$	kN	Actual force in the respective time segment (1 to 6)
$F_{2,n}^*$	kN	Actual force in the n-th time segment
fB_{op}	–	Operating mode operating factor
fB_t	–	Run-time operating factor
fB_T	–	Temperature operating factor
F_{f2acc}	kN	Permitted acceleration feed force at the gear unit output
F_{f2acc}^*	N	Actual acceleration feed force at the gear unit output
F_{f2accE}	kN	Permitted acceleration feed force at the gear unit output, pinion position E
F_{f2accS}	kN	Permitted acceleration feed force at the gear unit output, pinion position S
F_{f2eq}	kN	Equivalent feed force at the gear unit output
F_{f2eq}^*	kN	Actual equivalent feed force at the gear unit output
F_{f2N}	kN	Nominal feed force at the gear unit output for $n_1 = 500$ rpm
$F_{f2N,E}$	kN	Nominal feed force at the gear unit output for $n_1 = 500$ rpm, pinion position E
$F_{f2N,S}$	kN	Nominal feed force at the gear unit output for $n_1 = 500$ rpm, pinion position S
F_{f2NOT}	kN	Emergency-off feed force at the gear unit output for a maximum of 1000 load changes (the values apply only to a pinned gear rack)
F_{f2NOT}^*	kN	Actual emergency-off feed force at the gear unit output
$F_{f2NOT,E}$	kN	Emergency-off feed force at the gear unit output for a maximum of 1000 load changes, pinion position E (the values apply only to a pinned gear rack)
$F_{f2NOT,S}$	kN	Emergency-off feed force at the gear unit output for a maximum of 1000 load changes, pinion position S (the values apply only to a pinned gear rack)
F_{stat}^*	N	Actual static force at the output
i	–	Gear ratio
m^*	kg	Mass to be accelerated
M_{1k}	Nm	Permitted breakdown torque at the gear unit input
M_{1k}^*	Nm	Existing breakdown torque on the gear unit input
M_{2acc}	Nm	Maximum permitted acceleration torque on the gear unit output
M_{2accE}	Nm	Maximum permitted acceleration torque at the gear unit output, pinion position E
M_{2accS}	Nm	Maximum permitted acceleration torque at the gear unit output, pinion position S
m_n	mm	Module
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
$n_{1maxDBEL1,2}$	rpm	Maximum permitted input speed of the gear unit in continuous operation Mounting positions EL1, EL2
$n_{1maxDBEL3,4,5,6}$	rpm	Maximum permitted input speed of the gear unit in continuous operation Mounting positions EL3, EL4, EL5, EL6
n_{1maxZB}	min^{-1}	Maximum permitted input speed of the gear unit in cyclic operation
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
$ v_2 $	m/s	Amount of output speed
v_{2m}^*	m/s	Actual average output speed

Symbol	Unit	Explanation
$v_{2m,1^*} - v_{2m,6^*}$	m/s	Actual average output speed in the respective time segment (1 to 6)
v_{2m,n^*}	m/s	Actual average output speed in the n-th time segment
$v_{f2maxZB}$	m/s	Maximum feed velocity at the gear unit output at n_{1maxZB}
x	mm	Profile offset factor
z	–	Number of teeth

14.2 Sales terms and delivery conditions

You can find our current sales terms and delivery conditions at <http://www.stoeber.de/en/gtc>.

14.3 Publication details

Product catalog for rack and pinion drives ID 443137_en.

You can find current versions of PDF files online at <http://www.stoeber.de/en/download>.

ATLANTA gear racks

All gear racks suitable for our products are available from our cooperation partner, Atlanta.

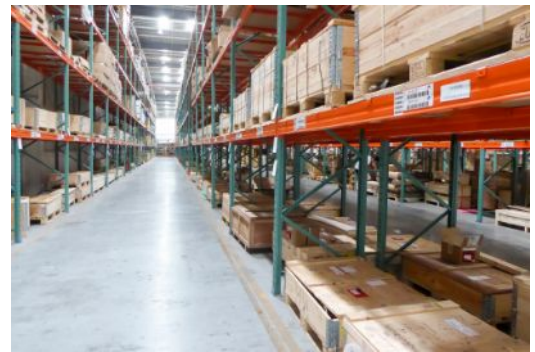
<http://atlantagmbh.de/>

14.4 ATLANTA product catalog pages

The following pages include an excerpt from the product catalog of ATLANTA Antriebssysteme.



ATLANTA Antriebssysteme
E. Seidenspinner GmbH & Co. KG
Carl-Benz-Str. 16
74301 Bietigheim-Bissingen
Germany
Phone: +49 7142 7001-0
info@atlantagmbh.de
www.atlantagmbh.de





The values given in the load table are based upon uniform, smooth operation, $K_{H\beta}=1,0$ and reliable grease lubrication. Since, in practice, the applications are very diverse, it is important to consider the given conditions by using appropriate factors S_B , K_A , $L_{K\beta}$ and f_n (see below).

Formulas for determining the tangential force

$$a = \frac{v}{t_b} \quad [\text{m/s}^2]$$

$$F_u = \frac{m \cdot g + m \cdot a}{1000} \quad (\text{for lifting axle}) \quad [\text{kN}]$$

$$F_u = \frac{m \cdot g \cdot \mu + m \cdot a}{1000} \quad (\text{for driving axle}) \quad [\text{kN}]$$

$$F_{u \text{ perm.}} = \frac{F_{u \text{ tab}}}{K_A \cdot S_B \cdot f_n \cdot L_{K\beta}} \quad [\text{kN}]$$

Formula dimensions see page ZD-3

The condition $F_u < F_{u \text{ perm.}}$ must be fulfilled.

Load factor K_A

Drive	Type of load from the machines to be driven		
	uniform	medium shocks	heavy shocks
uniform	1,00	1,25	1,75
light shocks	1,25	1,50	2,00
medium shocks	1,50	1,75	2,25

Safety coefficient S_B

The safety coefficient should be allowed for according to experience ($S_B = 1.25 \div 1.50$). This is valid for rack drives with one drive / rack line. For multiple drives on one rack line, as well as for preloaded drives, this safety coefficient have to be increased. In case of doubts please contact our technical service.

Life-time factor f_n

considering of the peripheral speed of the pinion and lubrication.

Lubrication		contin.	daily	monthly
Peripheral speed of gearing				
m/sec	m/min			
0,5	30	0,85	0,95	
1,0	60	0,95	1,10	from
1,5	90	1,00	1,20	3
2,0	120	1,05	1,30	to
3,0	180	1,10	1,50	10
5,0	300	1,25	1,90	

Linear load distribution factor $L_{K\beta}$

The linear load distribution factor considers the contact stress, while it describes unintegrated load distribution over the tooth width ($L_{K\beta} = \sqrt{K_{H\beta}}$).

- $L_{K\beta} = 1,1$ for counter bearing, e.g. Torque Supporter
- = 1,2 for preloaded bearings on the output shaft e.g. Atlanta Ht-, HP- and E-servo worm gear unit, BG-bevel gear unit
- = 1,5 for unpreloaded bearings on the output shaft e.g. Atlanta B-servo worm gear unit





Calculation example

Values given

⊗ travelling operation

mass to be moved $m = 820 \text{ kg}$
 speed $v = 2 \text{ m/s}$
 acceleration time $t_b = 1 \text{ s}$
 acceleration due to gravity $g = 9,81 \text{ m/s}^2$
 coefficient of friction $\mu = 0,1$
 load factor $K_A = 1,5$
 life-time factor $f_n = 1,05 \text{ (cont. lubrication)}$
 safety coefficient $S_B = 1,4$
 linear load distribution factor $L_{KH\beta} = 1,5$

Calculation process

$$a = \frac{v}{t_b} \quad a = \frac{2}{1} = 2 \text{ m/s}^2$$

$$F_u = \frac{m \cdot g \cdot \mu + m \cdot a}{1000}$$

$$F_u = \frac{820 \cdot 9,81 \cdot 0,1 + 820 \cdot 2}{1000} = 2,44 \text{ kN}$$

permissible feed force $F_{u \text{ Tab}}$:
 rack C45, ind. hardened, Q10, straight tooth, module 3,
 pinion 16MnCr5, case hardened, 20 teeth
 page ZB-40 with $F_{u \text{ Tab}} = 11,5 \text{ kN}$

$$F_{u \text{ per.}} = \frac{F_{u \text{ Tab}}}{K_A \cdot S_B \cdot f_n \cdot L_{KH\beta}} ;$$

$$F_{u \text{ per.}} = \frac{11,5 \text{ kN}}{1,5 \cdot 1,4 \cdot 1,05 \cdot 1,5} = 3,47 \text{ kN}$$

Condition

$$F_{u \text{ per.}} > F_u ; 3,47 \text{ kN} > 2,44 \text{ kN} \quad => \text{fulfilled}$$

Result: Rack 27 30 101 Page ZB-13

Pinion 24 35 220 Page ZB-23
 case hardened

Your calculation

Values given

⊗ travelling operation

mass to be moved $m = \underline{\hspace{2cm}} \text{ kg}$
 speed $v = \underline{\hspace{2cm}} \text{ m/s}$
 acceleration time $t_b = \underline{\hspace{2cm}} \text{ s}$
 acceleration due to gravity $g = \underline{9,81} \text{ m/s}^2$
 coefficient of friction $\mu = \underline{\hspace{2cm}}$
 load factor $K_A = \underline{\hspace{2cm}}$
 life-time factor $f_n = \underline{\hspace{2cm}}$
 safety coefficient $S_B = \underline{\hspace{2cm}}$
 linear load distribution factor $L_{KH\beta} = \underline{\hspace{2cm}}$

Calculation process

$$a = \frac{v}{t_b} \quad a = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ m/s}^2$$

$$F_u = \frac{m \cdot g \cdot \mu + m \cdot a}{1000} ; F_u = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ kN}$$

permissible feed force $F_{u \text{ Tab}}$

$$F_{u \text{ per.}} = \frac{F_{u \text{ Tab}}}{K_A \cdot S_B \cdot f_n \cdot L_{KH\beta}} ;$$

$$F_{u \text{ per.}} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ kN}$$

Condition

$$F_{u \text{ per.}} > F_u ; \underline{\hspace{2cm}} \text{ kN} > \underline{\hspace{2cm}} \text{ kN} \quad => \text{fulfilled}$$





Calculation example

Values given

⊗ travelling operation

mass to be moved $m = 300 \text{ kg}$
 speed $v = 1,08 \text{ m/s}$
 acceleration time $t_b = 0,27 \text{ s}$
 acceleration due to gravity $g = 9,81 \text{ m/s}^2$
 load factor $K_A = 1,2$
 life-time factor $f_n = 1,1$ (cont. lubrication)
 safety coefficient $S_B = 1,4$
 linear load distribution factor $L_{KH\beta} = 1,2$

Calculation process

Results

$$a = \frac{v}{t_b} \quad a = \frac{1,08}{0,27} = 4 \text{ m/s}^2$$

$$F_u = \frac{m \cdot g + m \cdot a}{1000} \quad F_u = \frac{300 \cdot 9,81 + 300 \cdot 4}{1000} = 4,1 \text{ kN}$$

permissible feed force $F_{u \text{ Tab}}$:
 rack C45, ind. hardened, Q6, helical tooth, module 2,
 pinion 16MnCr5, case hardened, 20 teeth
 page ZA-31 with $F_{u \text{ Tab}} = 11,5 \text{ kN}$

$$F_{u \text{ per.}} = \frac{F_{u \text{ Tab}}}{K_A \cdot S_B \cdot f_n \cdot L_{KH\beta}} ; F_{u \text{ per.}} = \frac{11,5 \text{ kN}}{1,2 \cdot 1,4 \cdot 1,1 \cdot 1,2} = 5,18 \text{ kN}$$

Condition

$$F_{u \text{ per.}} > F_u ; 5,18 \text{ kN} > 4,1 \text{ kN} \Rightarrow \text{fulfilled}$$

Result: Rack 29 20 105 Page ZA-7
 Pinion 24 29 520 Page ZA-24

Your calculation

Values given

⊗ travelling operation

mass to be moved $m = \underline{\hspace{2cm}} \text{ kg}$
 speed $v = \underline{\hspace{2cm}} \text{ m/s}$
 acceleration time $t_b = \underline{\hspace{2cm}} \text{ s}$
 acceleration due to gravity $g = \underline{9,81} \text{ m/s}^2$
 load factor $K_A = \underline{\hspace{2cm}}$
 life-time factor $f_n = \underline{\hspace{2cm}}$
 safety coefficient $S_B = \underline{\hspace{2cm}}$
 linear load distribution factor $L_{KH\beta} = \underline{\hspace{2cm}}$

Calculation process

Results

$$a = \frac{v}{t_b} \quad a = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ m/s}^2$$

$$F_u = \frac{m \cdot g + m \cdot a}{1000} \quad F_{u \text{ req.}} = \frac{\hspace{2cm}}{1000} = \underline{\hspace{2cm}} \text{ kN}$$

permissible feed force $F_{u \text{ Tab}}$

$$F_{u \text{ per.}} = \frac{F_{u \text{ Tab}}}{K_A \cdot S_B \cdot f_n \cdot L_{KH\beta}} ; F_{u \text{ per.}} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ kN}$$

Condition

$$F_{u \text{ per.}} > F_u ; \underline{\hspace{2cm}} \text{ kN} > \underline{\hspace{2cm}} \text{ kN} \Rightarrow \text{fulfilled}$$





Module 1,0



Module 1,25



Module 1,5



Module 2,0



Module 2,5



Module 3,0



Module 4,0



Module 5,0



Module 6,0



Module 8,0



Module 10,0



Module 12,0





Class	ATLANTA Quality	Module	Total pitch error ¹⁾ (± μm/m)	Tooth thickness tolerance (μm)	max. length (mm)	Max. feed force per pinion contact ²⁾ kN	Applications (examples)
UHPR	3	5	12	-13	1000	76,5	High precision machine tools with electrical preload
		6	12	-13	1000	109,0	
		8	12	-13	960	191,0	
		10	12	-13	1000	287,5	
		12	12	-13	1000	409,0	
Ultra High Precision Rack	5	3	26	-15	1000	31,0	Machine tools, lifting axes, multiple pinion contact
		4	26	-15	1000	60,0	
		5	26	-15	1000	92,0	
		6	26	-15	1000	131,5	
HPR	6	2	34	-20	2000	19,5	Wood, plastic, composite, aluminium working machines
		3	34	-20	2000	31,0	
		4	34	-20	2000	60,0	
	6	1,5	34	-20	1000	9,0	Machine tools, integratable racks, water cutting machines, tube bending systems, plasma cutting machines
		2	34	-20	2000	15,5	
		3	34	-20	2000	28,5	
		4	34	-20	2000	51,5	
		5	34	-20	2000	76,0	
		6	34	-20	2000	109,0	
	High Precision Rack	8	34	-20	1920	191,0	
		10	34	-20	1500	287,0	
		12	34	-20	1000	409,0	
PR	8	2	52	-36	2000	15,5	Wood working machines, linear axes with high requirement for a smooth running
		3	52	-36	2000	28,5	
		4	52	-36	2000	51,5	
		5	52	-36	2000	76,0	
		6	52	-36	2000	109,0	
		8	52	-36	1920	191,0	
		10	52	-36	1500	287,0	
Precision Rack	8	2	60	-59	2000	13,5	Portals, handling linear axes
		3	60	-59	2000	24,5	
		4	60	-59	2000	44,0	
		5	60	-59	2000	64,5	
		8	100	-110	2000	8,0	
3	100	-110	2000	14,0			
4	100	-110	2000	27,0			

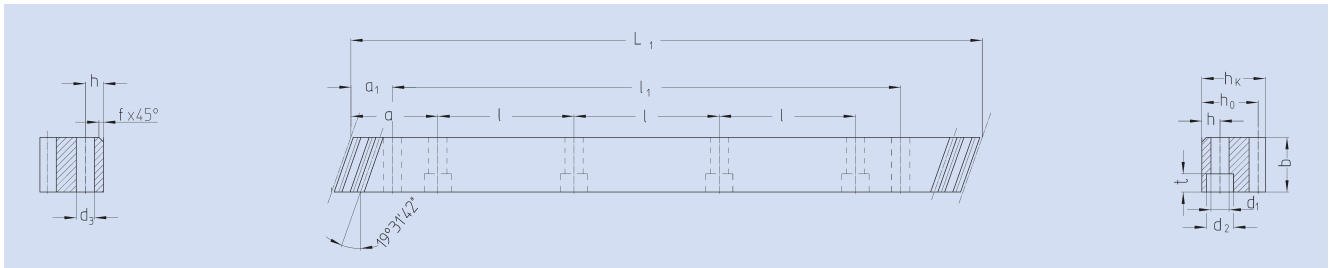
1) Values available for 1000 mm. Other total pitch errors for other length, see detailed description (ATLANTA Servo Drive catalogue).

2) Values are only valid for special steel according ATLANTA-Standard.

When using the maximum capacity of the teeth, or multiple pinions in contact, the mounting screw loads must be checked separately! Please ask ATLANTA for advice!



ATLANTA-Quality 3



Order code	Module	L ₁	N° of teeth	b	h _k	h ₀	f	a	l	N° of holes	h	d ₁	d ₂	t	a ₁	l ₁	d ₃	kg
48 50 105	5	1000,00	60	49	39	34	2,5	62,5	125	8	12	13,5	20	13	37,5	925	11,7	12,15
48 60 105	6	1000,00	50	59	49	43	2,5	62,5	125	8	16	17,5	26	17	37,5	925	15,7	18,10
48 80 105	8	960,00	36	79	79	71	2,5	60,0	120	8	25	22,0	33	21	120,0	720	19,7	42,50
48 10 105	10	1000,00	30	99	99	89	2,5	62,5	125	8	32	33,0	48	32	125,0	750	19,7	68,70
48 12 105	12	1000,00	25	120	120	108	2,5	40,0	125	8	40	39,0	58	38	102,5	750	19,7	111,00

Total pitch error $GT_f/1000 \leq 0,012 \text{ mm}$

- Teeth hardened with the ATLANTA high performance hardening process and ground
- heat-treatable steel according ATLANTA-Standard
- ground on all sides after hardening
- signed with effective total pitch error (20 °C)

Inspection measurement data available as an option.

To achieve precision rack joints, we recommend our patented assembly kit, see Atlanta Servo Drive catalogue.

For lubrication of racks & pinions we recommend our automatic lubrication system, see Atlanta Servo Drive catalogue.

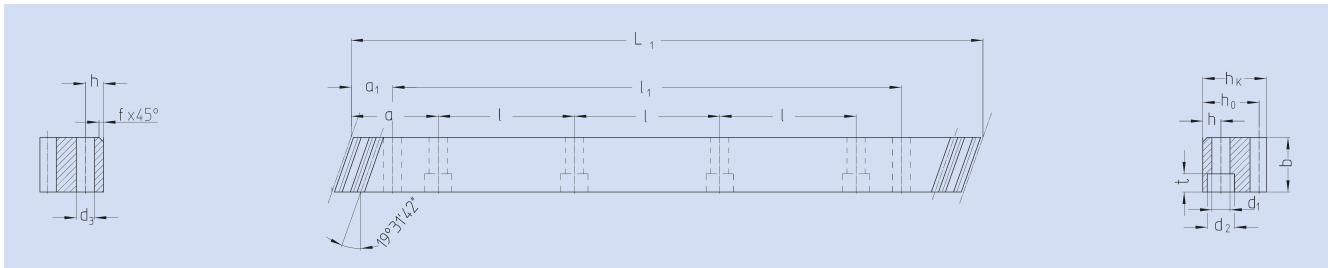
For the calculation and selection of the rack & pinion drive, see calculation sample in the Atlanta Servo Drive catalogue.


Screws for rack mounting, see Atlanta Servo Drive catalogue.



ATLANTA-Quality 5

StrongLine



Order code	Module	L_1	N° of teeth	b	h_k	h_0	f	a	l	N° of holes	h	d_1	d_2	t	a_1	l_1	d_3	
29 35 100	3	1000,00	100	29	29	26	2,0	62,5	125	8	10	12	17,5	11	27,5	945	11,7	5,9
29 45 100	4	1000,00	75	39	39	35	2,0	62,5	125	8	13	16	23,0	15	30,0	940	15,7	10,7
29 55 100	5	1000,00	60	49	49	44	2,5	62,5	125	8	15	18	26,0	17	34,5	931	15,7	16,3
29 65 100	6	1000,00	50	59	59	53	2,5	62,5	125	8	20	22	33,0	21	97,5	1805	19,7	24,5

Total pitch error $GT_f/1000 \leq 0,026 \text{ mm}$,

- Teeth case hardened and ground
- case hardening steel according ATLANTA-Standard
- ground on all sides after hardening
- signed with effective total pitch error (20 °C)

Inspection measurement data available as an option.

Mounting racks, see Atlanta Servo Drive catalogue.

To achieve precision rack joints, we recommend our patented assembly kit, see Atlanta Servo Drive catalogue.

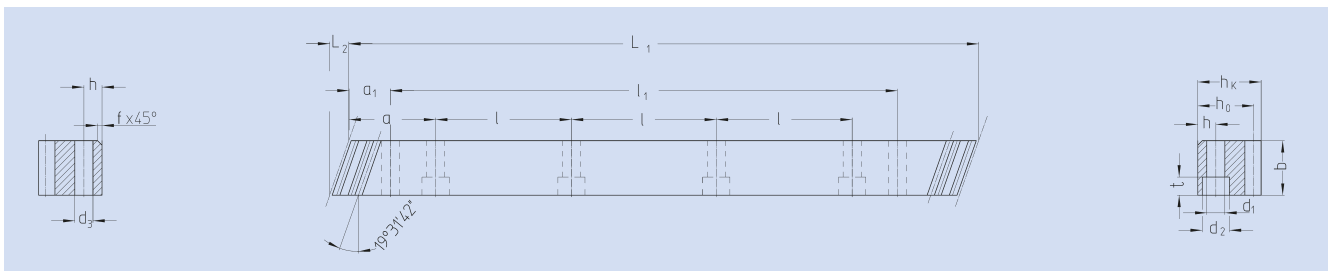
For lubrication of racks & pinions we recommend our automatic lubrication system, see Atlanta Servo Drive catalogue.

For the calculation and selection of the rack & pinion drive, see calculation sample in the Atlanta Servo Drive catalogue.

Screws for rack mounting, see Atlanta Servo Drive catalogue.



ATLANTA-Quality 6



Order code	Module	L ₁	N° of teeth	b	h _k	h ₀	f	a	l	N° of holes	h	d ₁	d ₂	t	a ₁	l ₁	d ₃	kg
29 20 100	2	1000,00	150	24	24	22	2	62,5	125	8	8	7	11	7	31,7	936,6	5,7	4,10
29 20 150	2	1500,00	225	24	24	22	2	62,5	125	12	8	7	11	7	31,7	1436,6	5,7	6,15
29 20 200	2	2000,00	300	24	24	22	2	62,5	125	16	8	7	11	7	31,7	1936,6	5,7	8,20
29 30 100	3	1000,00	100	29	29	26	2	62,5	125	8	9	10	15	9	35,0	930,0	7,7	5,90
29 30 150	3	1500,00	150	29	29	26	2	62,5	125	12	9	10	15	9	35,0	1430,0	7,7	8,85
29 30 200	3	2000,00	200	29	29	26	2	62,5	125	16	9	10	15	9	35,0	1930,0	7,7	11,80
29 40 100 ²⁾	4	1000,00	75	39	39	35	2	62,5	125	8	12	10	15	9	33,3	933,4	7,7	10,70
29 42 100	4	1000,00	75	39	39	35	2	62,5	125	8	12	14	20	13	33,3	933,4	11,7	10,70
29 42 150 ¹⁾	4	1506,67	113	39	39	35	2	62,5	125	12	12	14	20	13	33,3	1433,4	11,7	16,00
29 42 200	4	2000,00	150	39	39	35	2	62,5	125	16	12	14	20	13	33,3	1933,4	11,7	21,40

- 1) This racks could be used for continous linking only with the left side (see sketch).
- 2) The screw joint limits the feed force.

500 mm and other length on request.

Total pitch error $GT_f/1000 \leq 0,034$ mm,
 $GT_f/1500 \leq 0,041$ mm ($\Delta \leq 0,027$ mm/1000),
 $GT_f/2000 \leq 0,044$ mm ($\Delta \leq 0,022$ mm/1000).

- Teeth hardened with the ATLANTA high performance hardening process and ground
- heat-treatable steel acc. ATLANTA-Standard, carburized
- ground on all sides after hardening

Mounting racks, see Atlanta Servo Drive catalogue.

To achieve precision rack joints, we recommend our patented assembly kit, see Atlanta Servo Drive catalogue.

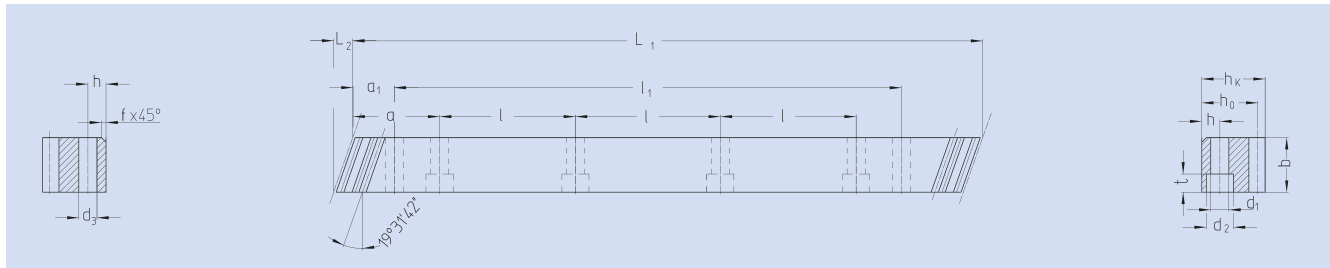
For lubrication of racks & pinions we recommend our automatic lubrication system, see Atlanta Servo Drive catalogue.

For the calculation and selection of the rack & pinion drive, see calculation sample in the Atlanta Servo Drive catalogue.

Screws for rack mounting, see Atlanta Servo Drive catalogue.



ATLANTA-Quality 6



Order code	Module	L ₁	N° of teeth	b	h _k	h ₀	f	a	l	N° of holes	h	d ₁	d ₂	t	a ₁	l ₁	d ₃	kg
29 15 105	1,5	1000,00	200	19	19	17,5	2,0	62,5	125	8	8	7	11	7	31,7	936,6	5,7	2,60
29 20 105	2	1000,00	150	24	24	22	2,0	62,5	125	8	8	7	11	7	31,7	936,6	5,7	4,10
29 20 155	2	1500,00	225	24	24	22	2,0	62,5	125	12	8	7	11	7	31,7	1436,6	5,7	6,15
29 20 205	2	2000,00	300	24	24	22	2,0	62,5	125	16	8	7	11	7	31,7	1936,6	5,7	8,20
29 30 105	3	1000,00	100	29	29	26	2,0	62,5	125	8	9	10	15	9	35,0	930,0	7,7	5,90
29 30 155	3	1500,00	150	29	29	26	2,0	62,5	125	12	9	10	15	9	35,0	1430,0	7,7	8,85
29 30 205	3	2000,00	200	29	29	26	2,0	62,5	125	16	9	10	15	9	35,0	1930,0	7,7	11,80
29 40 105 ²⁾	4	1000,00	75	39	39	35	2,0	62,5	125	8	12	10	15	9	33,3	933,4	7,7	10,70
29 42 105	4	1000,00	75	39	39	35	2,0	62,5	125	8	12	14	20	13	33,3	933,4	11,7	10,70
29 42 155 ¹⁾	4	1506,67	113	39	39	35	2,0	62,5	125	12	12	14	20	13	33,3	1433,4	11,7	16,05
29 40 205	4	2000,00	150	39	39	35	2,0	62,5	125	16	12	10	15	9	33,3	1933,4	7,7	21,40
29 42 205	4	2000,00	150	39	39	35	2,0	62,5	125	16	12	14	20	13	33,3	1933,4	11,7	21,40
29 50 105	5	1000,00	60	49	49	34	2,5	62,5	125	8	12	14	20	13	37,5	925,0	11,7	13,00
29 50 155	5	1500,00	90	49	49	34	2,5	62,5	125	12	12	14	20	13	37,5	1425,0	11,7	19,50
29 50 205	5	2000,00	120	49	49	34	2,5	62,5	125	16	12	14	20	13	37,5	1925,0	11,7	26,00
29 60 105	6	1000,00	50	59	59	43	2,5	62,5	125	8	16	18	26	17	37,5	925,0	15,7	18,10
29 60 155	6	1500,00	75	59	59	43	2,5	62,5	125	12	16	18	26	17	37,5	1425,0	15,7	27,10
29 60 205	6	2000,00	100	59	59	43	2,5	62,5	125	16	16	18	26	17	37,5	1925,0	15,7	36,20
29 80 105	8	960,00	36	79	79	71	2,5	60,0	120	8	25	22	33	21	120,0	720,0	19,7	42,50
29 80 155	8	1440,00	54	79	79	71	2,5	60,0	120	12	25	22	33	21	120,0	1200,0	19,7	63,80
29 80 205	8	1920,00	72	79	79	71	2,5	60,0	120	16	25	22	33	21	120,0	1680,0	19,7	85,00
29 10 105	10	1000,00	30	99	99	89	2,5	62,5	125	8	32	33	48	32	125,0	750,0	19,7	68,72
29 10 155	10	1500,00	45	99	99	89	2,5	62,5	125	12	32	33	48	32	125,0	1250,0	19,7	103,00
29 12 105	12	1000,00	25	120	120	108	2,5	40,0	125	8	40	39	58	38	125,0	750,0	19,7	111,00

- 1) This racks could be used for continuous linking only with the left side (see sketch).
- 2) The screw joint limits the feed force.

500 mm and other length on request.

Total pitch error $GT_f/1000 \leq 0,034 \text{ mm,}$
 $GT_f/1500 \leq 0,041 \text{ mm } (\triangleq 0,027 \text{ mm}/1000),$
 $GT_f/2000 \leq 0,044 \text{ mm } (\triangleq 0,022 \text{ mm}/1000).$

- Teeth hardened with the ATLANTA high performance hardening process and ground
- heat-treatable steel acc. ATLANTA-Standard, carburized
- ground on all sides after hardening

Mounting racks, see Atlanta Servo Drive catalogue.

To achieve precision rack joints, we recommend our patented assembly kit, see Atlanta Servo Drive catalogue.

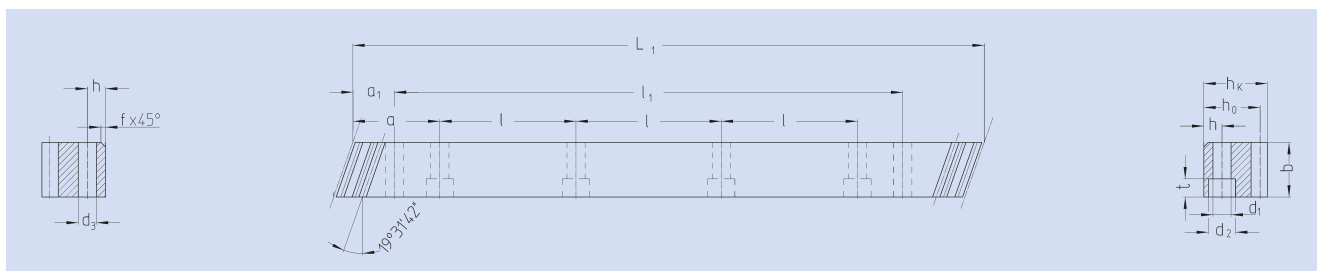
For lubrication of racks & pinions we recommend our automatic lubrication system, see Atlanta Servo Drive catalogue.

For the calculation and selection of the rack & pinion drive, see calculation sample in the Atlanta Servo Drive catalogue.

Screws for rack mounting, see Atlanta Servo Drive catalogue.



ATLANTA-Quality 7



Order code	Module	L ₁	N° of teeth	b ^{+0,4}	h _k	h ₀	f	a	l	N° of holes	h	d ₁	d ₂	t	a ₁	l ₁	d ₃	kg
29 20 107	2	1000,00	150	24	24	22	2	62,5	125	8	8	7	11	7	31,7	936,6	5,7	4,10
29 20 157	2	1500,00	225	24	24	22	2	62,5	125	12	8	7	11	7	31,7	1436,6	5,7	6,15
29 20 207	2	2000,00	300	24	24	22	2	62,5	125	16	8	7	11	7	31,7	1936,6	5,7	8,20
29 30 107	3	1000,00	100	29	29	26	2	62,5	125	8	9	10	15	9	35,0	930,0	7,7	5,90
29 30 157	3	1500,00	150	29	29	26	2	62,5	125	12	9	10	15	9	35,0	1430,0	7,7	8,85
29 30 207	3	2000,00	200	29	29	26	2	62,5	125	16	9	10	15	9	35,0	1930,0	7,7	11,80
29 40 107	4	1000,00	75	39	39	35	2	62,5	125	8	12	14	20	13	33,3	933,4	11,7	10,70
29 40 157 ¹⁾	4	1506,67	113	39	39	35	2	62,5	125	12	12	14	20	13	33,3	1433,0	11,7	16,00
29 40 207	4	2000,00	150	39	39	35	2	62,5	125	16	12	14	20	13	33,3	1933,4	11,7	21,40
29 50 107	5	1000,00	60	49	39	34	2,5	62,5	125	8	12	14	20	13	37,5	925,0	11,7	13,00
29 50 157	5	1500,00	90	49	39	34	2,5	62,5	125	12	12	14	20	13	37,5	1425,0	11,7	19,50
29 50 207	5	2000,00	120	49	39	34	2,5	62,5	125	16	12	14	20	13	37,5	1925,0	11,7	26,00
29 60 107	6	1000,00	50	59	49	43	2,5	62,5	125	8	16	18	26	17	37,5	925,0	15,7	18,10
29 60 157	6	1500,00	75	59	49	43	2,5	62,5	125	12	16	18	26	17	37,5	1425,0	15,7	27,10
29 60 207	6	2000,00	100	59	49	43	2,5	62,5	125	16	16	18	26	17	37,5	1925,0	15,7	36,20
29 80 107	8	960,00	36	79	79	71	2,5	60,0	120	8	25	22	33	21	120,0	720,0	19,7	42,50
29 80 157	8	1440,00	54	79	79	71	2,5	60,0	120	12	25	22	33	21	120,0	1200,0	19,7	65,00
29 80 207	8	1920,00	72	79	79	71	2,5	60,0	120	16	25	22	33	21	120,0	1680,0	19,7	85,00
29 10 107	10	1000,00	30	99	99	89	2,5	62,5	125	8	32	33	48	32	125,0	750,0	19,7	68,72
29 10 157	10	1500,00	45	99	99	89	2,5	62,5	125	12	32	33	48	32	125,0	1250,0	19,7	104,00

1) This racks could be used for continuous linking only with the left side (see sketch).

500 mm and other length on request.

Total pitch error $GT_f/1000 \leq 0,052$ mm,
 $GT_f/1500 \leq 0,062$ mm ($\Delta \pm 0,042$ mm/1000),
 $GT_f/2000 \leq 0,068$ mm ($\Delta \pm 0,034$ mm/1000).

- Teeth hardened with the ATLANTA high performance hardening process and ground
- heat-treatable steel acc. ATLANTA-Standard, carburized
- ground on all sides after hardening

Mounting racks, see Atlanta Servo Drive catalogue.

To achieve precision rack joints, we recommend our patented rack assembly kit, see Atlanta Servo Drive catalogue.

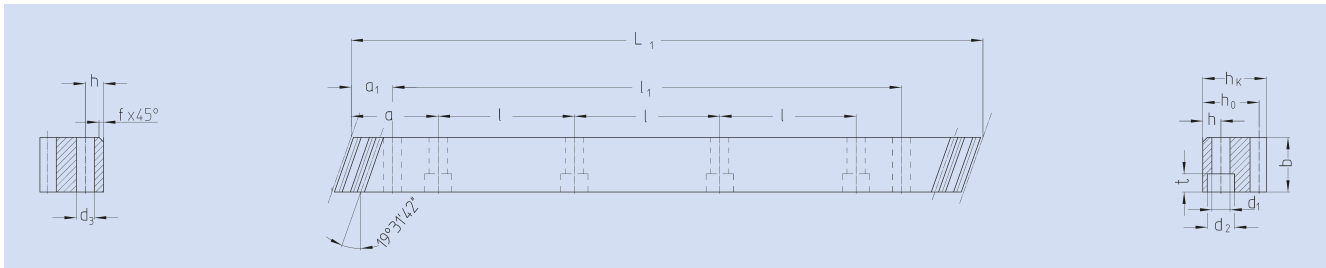
For lubrication of racks & pinions, we recommend our automatic lubrication systems, Atlanta Servo Drive catalogue.

For the calculation and selection of the rack & pinion drive, see Atlanta Servo Drive catalogue.

Screws for rack mounting, see Atlanta Servo Drive catalogue.



ATLANTA-Quality 8



Order code	Module	L_1	N° of teeth	$b^{+0,4}$	h_k	h_0	f	a	l	N° of holes	h	d_1	d_2	t	a_1	l_1	d_3	kg
39 20 108	2	1000,00	150	25	24	22	2	62,5	125	8	8	7	11	7	31,7	936,6	5,7	4,10
39 20 208	2	2000,00	300	25	24	22	2	62,5	125	16	8	7	11	7	31,7	1936,6	5,7	8,40
39 30 108	3	1000,00	100	30	29	26	2	62,5	125	8	9	10	15	9	35,0	930,0	7,7	5,90
39 30 208	3	2000,00	200	30	29	26	2	62,5	125	16	9	10	15	9	35,0	1930,0	7,7	12,00
39 40 108	4	1000,00	75	40	39	35	2	62,5	125	8	12	14	20	13	33,3	933,4	11,7	10,70
39 40 208	4	2000,00	150	40	39	35	2	62,5	125	16	12	14	20	13	33,3	1933,4	11,7	21,00
39 50 108	5	1000,00	60	50	39	34	2,5	62,5	125	8	12	14	20	13	37,5	925,0	11,7	13,00
39 50 208	5	2000,00	120	50	39	34	2,5	62,5	125	16	12	14	20	13	37,5	1925,0	11,7	26,00

500 mm and other length on request.
Without bores on request.

Total pitch error $GT_f/1000 \leq 0,060$ mm,
 $GT_f/2000 \leq 0,078$ mm ($\leq 0,039$ mm/1000).

- Teeth hardened with the ATLANTA high performance hardening process and ground
- heat-treatable, bright steel according ATLANTA-Standard

Mounting racks, see Atlanta Servo Drive catalogue.

To achieve precision rack joints, we recommend our patented rack assembly kit, see Atlanta Servo Drive catalogue.

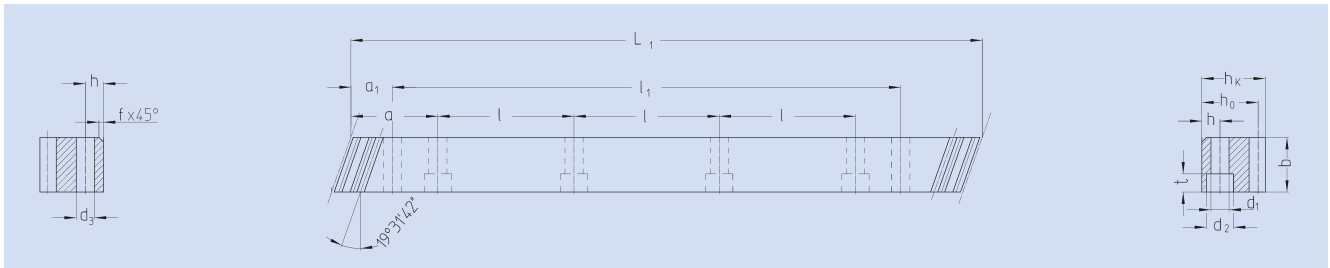
For lubrication of racks & pinions, we recommend our automatic lubrication systems, see Atlanta Servo Drive catalogue.

For the calculation and selection of the rack & pinion drive, see Atlanta Servo Drive catalogue.

Screws for rack mounting, see Atlanta Servo Drive catalogue.



ATLANTA-Quality 8



Order code	Module	L_1	N° of teeth	$b_{0,5}$	h_k	h_0	f	a	l	N° of holes	h	d_1	d_2	t	a_1	l_1	d_3	kg
38 21 100	2	1000,00	150	25	24	22	2	62,5	125	8	8	7	11	7	31,7	936,6	5,7	4,30
38 20 100	2	1000,00	150	25	24	22	2	62,5	125	without mounting holes								4,30
38 21 200	2	2000,00	300	25	24	22	2	62,5	125	16	8	7	11	7	31,7	1936,6	5,7	8,60
38 20 200	2	2000,00	300	25	24	22	2	62,5	125	without mounting holes								8,60
38 31 100	3	1000,00	100	30	29	26	2	62,5	125	8	9	10	15	9	35,0	930,0	7,7	6,10
38 30 100	3	1000,00	100	30	29	26	2	62,5	125	without mounting holes								6,10
38 31 200	3	2000,00	200	30	29	26	2	62,5	125	16	9	10	15	9	35,0	1930,0	7,7	12,20
38 30 200	3	2000,00	200	30	29	26	2	62,5	125	without mounting holes								12,20
38 41 100	4	1000,00	75	40	39	35	2	62,5	125	8	12	10	15	9	33,3	933,4	7,7	10,90
38 40 100	4	1000,00	75	40	39	35	2	62,5	125	without mounting holes								10,90
38 41 200	4	2000,00	150	40	39	35	2	62,5	125	16	12	10	15	9	33,3	1933,4	7,7	21,80
38 40 200	4	2000,00	150	40	39	35	2	62,5	125	without mounting holes								21,80

500 mm and other length on request.

Total pitch error $GT_f/1000 \leq 0,100$ mm,
 $GT_f/2000 \leq 0,200$ mm.

- Milled teeth, quenched and tempered
- heat-treatable steel according ATLANTA-Standard
- bright steel, backside machined

Mounting racks, see Atlanta Servo Drive catalogue.

To achieve precision rack joints, we recommend our patented rack assembly kit, Atlanta Servo Drive catalogue.

For lubrication of racks & pinions, we recommend our automatic lubrication systems, see Atlanta Servo Drive catalogue.

For the calculation and selection of the rack & pinion drive, see Atlanta Servo Drive catalogue.

Screws for rack mounting, see Atlanta Servo Drive catalogue.



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