

# Rack and pinion drives

In cooperation with





## **Rack and pinion drives**

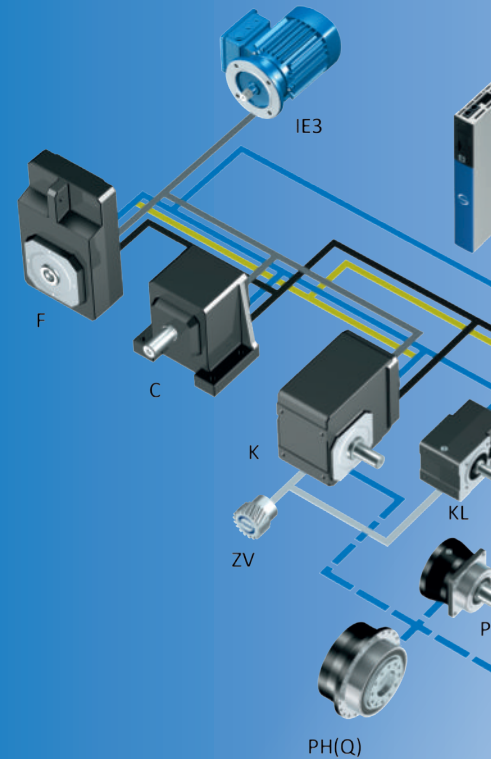
## One partner. All the possibilities.

STOBER has developed and produced excellent drive technology since 1934 and is active internationally with around 1000 employees at 12 locations. STOBER impresses machine manufacturers in wide-ranging industries and markets around the world with tailor-made, highly efficient drive systems for demanding movements.



"Our vision is to be the preferred partner for perfect movement."

- Rainer Wegener, CEO of STÖBER Antriebstechnik.



### Rack and pinion drives – what you can expect!

From high flexibility to high force, the innovative system concept for rack and pinion drives from STOBER means compact, easy-to-use systems that are ready to install and adapted to various demands regarding load capacity and precision. Learn more about our special highlights: the very flexible and efficient ZV series as well as the ZTRS series with supporting bearing holder – for maximum feed force! It could not be more diverse.

## At home in the world of demanding motion

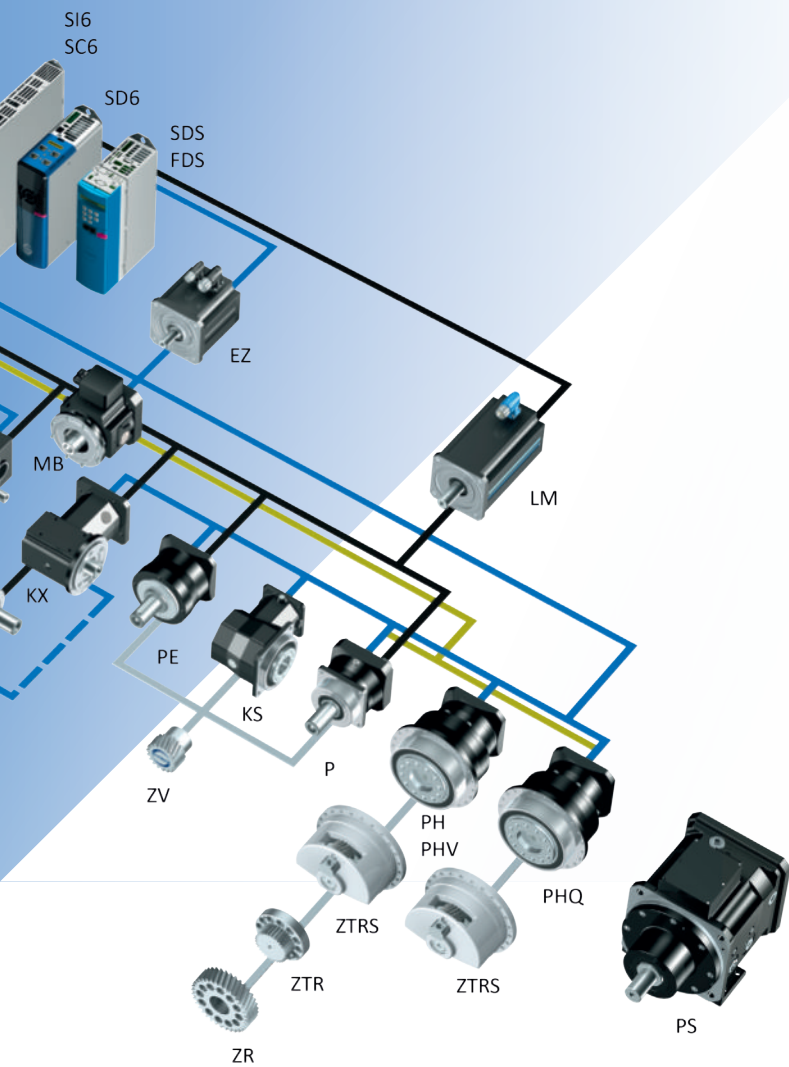
Gear units

Geared motors

Motors

Cables and drive controllers





## Everything from a single source.

The STOBER drive system consisting of gear units, motors, cables and drive controllers has a modular design and is freely scalable—for tailor-made, compact and powerful machine concepts. It can be adapted to your individual requirements and combined as needed in nearly all industries and applications areas.

We check every single component and how it works together with others, taking on the responsibility for the complete drive train. For you, this means that one contact partner, certified operating safety and maximum availability are guaranteed.

### Need special solutions?

Numerous one-of-a-kind product highlights and project-related adjustments make it possible. With a holistic approach to your specific task, we work together on individualized solutions that are optimally coordinated to your requirements. Dedicated and solution-oriented in the support of your visions and projects.

### STOBER moves integrally and precisely.

We put ideas in motion with passion and a great deal of dedication. In the process, we rely on our decades of experience and an exceptionally broad range of products. Our customers benefit from precise, practical system solutions with uncompromising quality and expert individual consultation.



## STOBER moves as a team and with personality.

As a family-owned company, it is very important to us to maintain close relationships and treat each other with trust. We put people first.

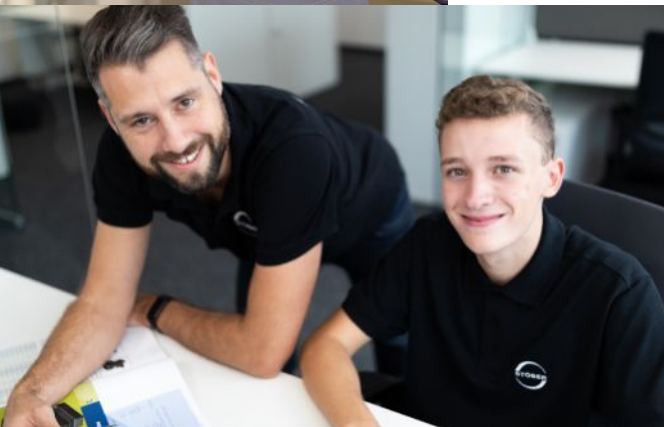
We are committed to the well-being of our employees, identify with the expectations of our customers, and show personal commitment to mutual success.



"We have installed gear units, motors and drive controllers from STOBER in nearly all our systems. STOBER supports us in new projects from the first stroke of a pencil in the design phase until commissioning. Our years of cooperation are shaped by openness and honesty and emanate a rather special spirit. The technical consulting, the support—that is real, experienced partnership"

- Jürgen Leicht, Managing Partner of Leicht Stanzautomation.





### **Working together. Worldwide. Successfully.**

With an eye to the future, STOBER is facing the challenges of digitalization and investing in integrated solutions and a strong global presence in production, sales and service. STOBER China was founded at the end of 2019. As a result, we are present in more than 40 countries around in the world at 12 locations and with 80 service partners.



**STOBER drives  
Systems technology  
Taicang, China.**

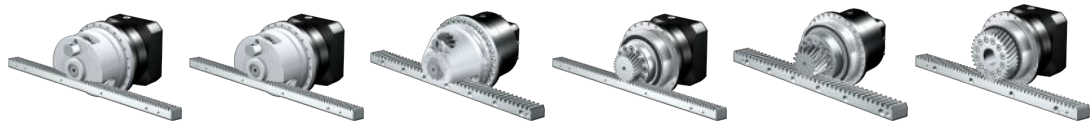


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# 1 Selection tool

## 1.1 Rack and pinion drives



Product chapter  
Chapter number

	ZTRSPH	ZTRSPHQ	ZTRSPHV	ZTRPH	ZTRPHV	ZRPH
	<a href="#">[ &gt; 2 ]</a>	<a href="#">[ &gt; 3 ]</a>	<a href="#">[ &gt; 4 ]</a>	<a href="#">[ &gt; 5 ]</a>	<a href="#">[ &gt; 6 ]</a>	<a href="#">[ &gt; 7 ]</a>

### Technical data

$m_n$	3 – 8 mm	8 mm	5 – 8 mm	2 – 6 mm	5 – 6 mm	2 – 4 mm
$z$	15 – 32	19	15 – 20	12 – 32	16 – 19	30 – 40
$F_{f2acc}$	20 – 79 kN	124 kN	67 – 77 kN	6.5 – 67 kN	56 – 67 kN	3.1 – 16 kN
$v_{f2maxZB}$	0.2 – 4.7 m/s	0.06 – 1.1 m/s	0.21 – 0.49 m/s	0.11 – 4.7 m/s	0.2 – 0.39 m/s	0.29 – 6.7 m/s
$\Delta s$	8 – 56 $\mu$ m	70 $\mu$ m	15 – 56 $\mu$ m	4 – 44 $\mu$ m	15 – 44 $\mu$ m	10 – 56 $\mu$ m

An explanation of the formula symbols can be found in the chapter [\[ > 13.1 \]](#).

### 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
Bearing design						
Standard	✓	✓	✓	✓	✓	✓
Reinforced				✓ (PH3 – PH5)		✓ (PH3 – PH5)
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	ZVPE
Chapter number	[ 8 ]	[ 9 ]

### Technical data

$m_n$	2 – 4 mm	2 – 3 mm
$z$	16 – 25	16 – 25
$F_{f2acc}$	1.7 – 15 kN	1.7 – 6.1 kN
$v_{f2maxZB}$	0.14 – 5.3 m/s	0.14 – 4.5 m/s
$\Delta s$	8 – 44 $\mu$ m	40 – 83 $\mu$ m

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

### Features

Power density	★★★★☆	★★★★☆
Linear backlash	★★★★★	★★★★☆
Price category	€€	€
Smooth operation	★★★★☆	★★★★☆
Linear rigidity	★★★★☆	★★★★☆
Mass moment of inertia	★★★★☆	★★★★☆
Key	★★★★☆ good   ★★★★★ excellent € Economy   €€€€€ Premium	
<b>Pinion gearing</b>		
Helical gearing	✓	✓
Gearing quality	6	6
<b>Bearing design</b>		
Standard	✓	✓
Axially reinforced	✓	

### 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

ZVKS

ZVKL

ZVK

Chapter number

[ > 10]

[ > 11]

[ > 12]

### Technical data

$m_n$	2 – 4 mm	2 mm	2 – 4 mm
$z$	18 – 25	16 – 20	18 – 25
$F_{f2acc}$	3.2 – 11 kN	1.3 – 2.7 kN	2.7 – 15 kN
$v_{f2maxZB}$	0.07 – 3 m/s	0.33 – 3.3 m/s	0.06 – 3.8 m/s
$\Delta s$	37 – 44 $\mu\text{m}$	99 – 123 $\mu\text{m}$	12 – 111 $\mu\text{m}$

An explanation of the formula symbols can be found in the chapter [ > 13.1].

### Features

Power density	★★★☆☆	★★☆☆☆	★☆☆☆☆
Linear backlash	★★★☆☆	★☆☆☆☆	★★★★☆
Price category	€€€	€	€
Smooth operation	★★★★☆	★★☆☆☆	★★★★☆
Linear rigidity	★★★☆☆	★☆☆☆☆	★☆☆☆☆
Mass moment of inertia	★★★★☆	★★★★☆	★★★★☆
Key	★☆☆☆☆ good   ★★★★★ excellent € Economy   €€€€€ Premium		
<b>Pinion gearing</b>			
Helical gearing	✓	✓	✓
Gearing quality	6	6	6

### 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



## 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

$m_n$	3 – 8 mm
$z$	15 – 32
$F_{f2acc}$	20 – 79 kN
$V_{f2maxZB}$	0.2 – 4.7 m/s
$\Delta s$	8 – 56 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 [▶ 2.5.4](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For rack and pinion drives with reduced backlash, higher feed forces are possible. For this and all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

i	Type	n <sub>1maxDB</sub> [rpm]	n <sub>1maxZB</sub> [rpm]	d <sub>MW</sub> [mm]	v <sub>ZmaxZB</sub> [m/s]	Δs [μm]	Δs <sub>red</sub> [μm]	C <sub>lin</sub> [N/μm]	m <sub>n</sub> [mm]	z	d <sub>0</sub> [mm]	F <sub>F2N</sub> [kN]	F <sub>F2acc</sub> [kN]	F <sub>F2NOT</sub> [kN]	M <sub>2acc</sub> [Nm]
<b>ZTRS3PH7 (F<sub>F2acc,max</sub> = 20 kN)</b>															
4.000	ZTRS317SPH731_0040 ME	1900	4000	≤38	2.83	24	8	184	3	17	54.1	11	20	41	553
4.000	ZTRS317SPH731_0040 MEL	1900	4000	≤48	2.83	24	8	186	3	17	54.1	11	20	41	553
5.000	ZTRS317SPH731_0050 ME	2200	5000	≤38	2.83	24	8	181	3	17	54.1	12	20	41	553
5.000	ZTRS317SPH731_0050 MEL	2200	5000	≤48	2.83	24	8	182	3	17	54.1	12	20	41	553
7.000	ZTRS317SPH731_0070 ME	2500	5000	≤38	2.02	24	8	174	3	17	54.1	14	20	41	553
7.000	ZTRS317SPH731_0070 MEL	2500	5000	≤48	2.02	24	8	175	3	17	54.1	14	20	41	553
10.00	ZTRS317SPH731_0100 ME	2500	5000	≤38	1.42	24	8	163	3	17	54.1	13	20	41	553
10.00	ZTRS317SPH731_0100 MEL	2500	5000	≤48	1.42	24	8	163	3	17	54.1	13	20	41	553
16.00	ZTRS317SPH732_0160 ME	3000	6000	≤32	1.06	24	8	183	3	17	54.1	17	20	41	553
16.00	ZTRS317SPH732_0160 MEL	3000	6000	≤38	1.06	24	8	183	3	17	54.1	17	20	41	553
20.00	ZTRS317SPH732_0200 ME	3000	6000	≤32	0.85	24	8	180	3	17	54.1	17	20	41	553
20.00	ZTRS317SPH732_0200 MEL	3000	6000	≤38	0.85	24	8	180	3	17	54.1	17	20	41	553
25.00	ZTRS317SPH732_0250 ME	3500	7000	≤32	0.79	24	8	180	3	17	54.1	18	20	41	553
25.00	ZTRS317SPH732_0250 MEL	3500	7000	≤38	0.79	24	8	180	3	17	54.1	18	20	41	553
28.00	ZTRS317SPH732_0280 ME	3700	7000	≤32	0.71	24	8	182	3	17	54.1	20	20	41	553
28.00	ZTRS317SPH732_0280 MEL	3700	7000	≤38	0.71	24	8	182	3	17	54.1	20	20	41	553
35.00	ZTRS317SPH732_0350 ME	3700	7000	≤32	0.57	24	8	179	3	17	54.1	20	20	41	553
35.00	ZTRS317SPH732_0350 MEL	3700	7000	≤38	0.57	24	8	179	3	17	54.1	20	20	41	553
40.00	ZTRS317SPH732_0400 ME	3700	7000	≤32	0.50	24	8	179	3	17	54.1	20	20	41	553
40.00	ZTRS317SPH732_0400 MEL	3700	7000	≤38	0.50	24	8	179	3	17	54.1	20	20	41	553
50.00	ZTRS317SPH732_0500 ME	3700	7000	≤32	0.40	24	8	178	3	17	54.1	20	20	41	553
50.00	ZTRS317SPH732_0500 MEL	3700	7000	≤38	0.40	24	8	178	3	17	54.1	20	20	41	553
70.00	ZTRS317SPH732_0700 ME	3700	7000	≤32	0.28	24	8	173	3	17	54.1	20	20	41	553
70.00	ZTRS317SPH732_0700 MEL	3700	7000	≤38	0.28	24	8	173	3	17	54.1	20	20	41	553
100.0	ZTRS317SPH732_1000 ME	3700	7000	≤32	0.20	24	8	162	3	17	54.1	16	20	41	550
100.0	ZTRS317SPH732_1000 MEL	3700	7000	≤38	0.20	24	8	162	3	17	54.1	16	20	41	550
<b>ZTRS3PH8 (F<sub>F2acc,max</sub> = 28 kN)</b>															
4.000	ZTRS332SPH831_0040 ME	1400	3500	≤48	4.67	44	15	229	3	32	101.9	17	28	47	1412
4.000	ZTRS332SPH831_0040 MEL	1400	3500	≤60	4.67	44	15	235	3	32	101.9	17	28	55	1412
5.000	ZTRS332SPH831_0050 ME	1600	4000	≤48	4.27	44	15	232	3	32	101.9	22	28	55	1412
5.000	ZTRS332SPH831_0050 MEL	1600	4000	≤60	4.27	44	15	236	3	32	101.9	22	28	55	1412
7.000	ZTRS332SPH831_0070 ME	2000	4000	≤48	3.05	44	15	217	3	32	101.9	20	28	55	1412
7.000	ZTRS332SPH831_0070 MEL	2000	4000	≤60	3.05	44	15	219	3	32	101.9	20	28	55	1412
10.00	ZTRS332SPH831_0100 ME	2200	4000	≤48	2.13	44	15	195	3	32	101.9	17	27	55	1392
10.00	ZTRS332SPH831_0100 MEL	2200	4000	≤60	2.13	44	15	196	3	32	101.9	17	27	55	1392
16.00	ZTRS332SPH832_0160 ME	2500	4500	≤38	1.50	44	15	225	3	32	101.9	22	28	55	1412
16.00	ZTRS332SPH832_0160 MEL	2500	4500	≤48	1.50	44	15	226	3	32	101.9	22	28	55	1412
20.00	ZTRS332SPH832_0200 ME	2500	4500	≤38	1.20	44	15	230	3	32	101.9	25	28	55	1412
20.00	ZTRS332SPH832_0200 MEL	2500	4500	≤48	1.20	44	15	230	3	32	101.9	25	28	55	1412
25.00	ZTRS332SPH832_0250 ME	2700	5500	≤38	1.17	44	15	229	3	32	101.9	26	28	55	1412
25.00	ZTRS332SPH832_0250 MEL	2700	5500	≤48	1.17	44	15	230	3	32	101.9	26	28	55	1412
28.00	ZTRS332SPH832_0280 ME	3000	6000	≤38	1.14	44	15	223	3	32	101.9	22	28	55	1412
28.00	ZTRS332SPH832_0280 MEL	3000	6000	≤48	1.14	44	15	223	3	32	101.9	22	28	55	1412
35.00	ZTRS332SPH832_0350 ME	3000	6000	≤38	0.91	44	15	228	3	32	101.9	28	28	55	1412
35.00	ZTRS332SPH832_0350 MEL	3000	6000	≤48	0.91	44	15	228	3	32	101.9	28	28	55	1412
40.00	ZTRS332SPH832_0400 ME	3000	6000	≤38	0.80	44	15	219	3	32	101.9	22	28	55	1412
40.00	ZTRS332SPH832_0400 MEL	3000	6000	≤48	0.80	44	15	219	3	32	101.9	22	28	55	1412
50.00	ZTRS332SPH832_0500 ME	3000	6000	≤38	0.64	44	15	225	3	32	101.9	28	28	55	1412
50.00	ZTRS332SPH832_0500 MEL	3000	6000	≤48	0.64	44	15	225	3	32	101.9	28	28	55	1412

2.2 Selection tables 2 ZTRSPH rack and pinion drives

i	Type	n <sub>1maxDB</sub> [rpm]	n <sub>1maxZB</sub> [rpm]	d <sub>MW</sub> [mm]	v <sub>Z2maxZB</sub> [m/s]	Δs [μm]	Δs <sub>red</sub> [μm]	C <sub>lin</sub> [N/μm]	m <sub>n</sub> [mm]	z	d <sub>0</sub> [mm]	F <sub>T2N</sub> [kN]	F <sub>T2acc</sub> [kN]	F <sub>T2NOT</sub> [kN]	M <sub>2acc</sub> [Nm]
<b>ZTRS3PH8 (F<sub>T2acc,max</sub> = 28 kN)</b>															
70.00	ZTRS332SPH832_0700 ME	3000	6000	≤38	0.46	44	15	214	3	32	101.9	28	28	55	1412
70.00	ZTRS332SPH832_0700 MEL	3000	6000	≤48	0.46	44	15	214	3	32	101.9	28	28	55	1412
100.0	ZTRS332SPH832_1000 ME	3000	6000	≤38	0.32	44	15	194	3	32	101.9	21	27	54	1380
100.0	ZTRS332SPH832_1000 MEL	3000	6000	≤48	0.32	44	15	194	3	32	101.9	21	27	54	1380
<b>ZTRS4PH8 (F<sub>T2acc,max</sub> = 45 kN)</b>															
4.000	ZTRS420SPH831_0040 ME	1400	3500	≤48	3.89	37	12	282	4	20	84.9	21	43	57	1820
4.000	ZTRS420SPH831_0040 MEL	1400	3500	≤60	3.89	37	12	288	4	20	84.9	21	43	70	1820
5.000	ZTRS420SPH831_0050 ME	1600	4000	≤48	3.56	37	12	285	4	20	84.9	26	45	70	1929
5.000	ZTRS420SPH831_0050 MEL	1600	4000	≤60	3.56	37	12	289	4	20	84.9	26	45	70	1929
7.000	ZTRS420SPH831_0070 ME	2000	4000	≤48	2.54	37	12	269	4	20	84.9	24	45	70	1929
7.000	ZTRS420SPH831_0070 MEL	2000	4000	≤60	2.54	37	12	271	4	20	84.9	24	45	70	1929
10.00	ZTRS420SPH831_0100 ME	2200	4000	≤48	1.78	37	12	245	4	20	84.9	20	33	66	1392
10.00	ZTRS420SPH831_0100 MEL	2200	4000	≤60	1.78	37	12	246	4	20	84.9	20	33	66	1392
16.00	ZTRS420SPH832_0160 ME	2500	4500	≤38	1.25	37	12	278	4	20	84.9	26	45	70	1929
16.00	ZTRS420SPH832_0160 MEL	2500	4500	≤48	1.25	37	12	279	4	20	84.9	26	45	70	1929
20.00	ZTRS420SPH832_0200 ME	2500	4500	≤38	1.00	37	12	283	4	20	84.9	29	45	70	1929
20.00	ZTRS420SPH832_0200 MEL	2500	4500	≤48	1.00	37	12	283	4	20	84.9	29	45	70	1929
25.00	ZTRS420SPH832_0250 ME	2700	5500	≤38	0.98	37	12	282	4	20	84.9	31	45	70	1929
25.00	ZTRS420SPH832_0250 MEL	2700	5500	≤48	0.98	37	12	283	4	20	84.9	31	45	70	1929
28.00	ZTRS420SPH832_0280 ME	3000	6000	≤38	0.95	37	12	276	4	20	84.9	26	45	70	1929
28.00	ZTRS420SPH832_0280 MEL	3000	6000	≤48	0.95	37	12	276	4	20	84.9	26	45	70	1929
35.00	ZTRS420SPH832_0350 ME	3000	6000	≤38	0.76	37	12	281	4	20	84.9	34	45	70	1929
35.00	ZTRS420SPH832_0350 MEL	3000	6000	≤48	0.76	37	12	281	4	20	84.9	34	45	70	1929
40.00	ZTRS420SPH832_0400 ME	3000	6000	≤38	0.67	37	12	271	4	20	84.9	26	45	70	1920
40.00	ZTRS420SPH832_0400 MEL	3000	6000	≤48	0.67	37	12	271	4	20	84.9	26	45	70	1920
50.00	ZTRS420SPH832_0500 ME	3000	6000	≤38	0.53	37	12	278	4	20	84.9	37	45	70	1929
50.00	ZTRS420SPH832_0500 MEL	3000	6000	≤48	0.53	37	12	278	4	20	84.9	37	45	70	1929
70.00	ZTRS420SPH832_0700 ME	3000	6000	≤38	0.38	37	12	266	4	20	84.9	33	44	70	1848
70.00	ZTRS420SPH832_0700 MEL	3000	6000	≤48	0.38	37	12	266	4	20	84.9	33	44	70	1848
100.0	ZTRS420SPH832_1000 ME	3000	6000	≤38	0.27	37	12	244	4	20	84.9	25	33	65	1380
100.0	ZTRS420SPH832_1000 MEL	3000	6000	≤48	0.27	37	12	244	4	20	84.9	25	33	65	1380
<b>ZTRS5PH8 (F<sub>T2acc,max</sub> = 49 kN)</b>															
4.000	ZTRS516SPH831_0040 ME	1400	3500	≤48	3.89	37	12	292	5	16	84.9	21	43	57	1820
4.000	ZTRS516SPH831_0040 MEL	1400	3500	≤60	3.89	37	12	299	5	16	84.9	21	43	70	1820
5.000	ZTRS516SPH831_0050 ME	1600	4000	≤48	3.56	37	12	296	5	16	84.9	26	49	70	2100
5.000	ZTRS516SPH831_0050 MEL	1600	4000	≤60	3.56	37	12	300	5	16	84.9	26	49	70	2100
7.000	ZTRS516SPH831_0070 ME	2000	4000	≤48	2.54	37	12	279	5	16	84.9	24	47	70	2000
7.000	ZTRS516SPH831_0070 MEL	2000	4000	≤60	2.54	37	12	281	5	16	84.9	24	47	70	2000
10.00	ZTRS516SPH831_0100 ME	2200	4000	≤48	1.78	37	12	253	5	16	84.9	20	33	66	1392
10.00	ZTRS516SPH831_0100 MEL	2200	4000	≤60	1.78	37	12	254	5	16	84.9	20	33	66	1392
16.00	ZTRS516SPH832_0160 ME	2500	4500	≤38	1.25	37	12	289	5	16	84.9	26	47	70	2000
16.00	ZTRS516SPH832_0160 MEL	2500	4500	≤48	1.25	37	12	289	5	16	84.9	26	47	70	2000
20.00	ZTRS516SPH832_0200 ME	2500	4500	≤38	1.00	37	12	293	5	16	84.9	29	49	70	2100
20.00	ZTRS516SPH832_0200 MEL	2500	4500	≤48	1.00	37	12	294	5	16	84.9	29	49	70	2100
25.00	ZTRS516SPH832_0250 ME	2700	5500	≤38	0.98	37	12	293	5	16	84.9	31	49	70	2100
25.00	ZTRS516SPH832_0250 MEL	2700	5500	≤48	0.98	37	12	293	5	16	84.9	31	49	70	2100
28.00	ZTRS516SPH832_0280 ME	3000	6000	≤38	0.95	37	12	286	5	16	84.9	26	47	70	2000
28.00	ZTRS516SPH832_0280 MEL	3000	6000	≤48	0.95	37	12	286	5	16	84.9	26	47	70	2000
35.00	ZTRS516SPH832_0350 ME	3000	6000	≤38	0.76	37	12	292	5	16	84.9	34	49	70	2100
35.00	ZTRS516SPH832_0350 MEL	3000	6000	≤48	0.76	37	12	292	5	16	84.9	34	49	70	2100
40.00	ZTRS516SPH832_0400 ME	3000	6000	≤38	0.67	37	12	281	5	16	84.9	26	45	70	1920
40.00	ZTRS516SPH832_0400 MEL	3000	6000	≤48	0.67	37	12	281	5	16	84.9	26	45	70	1920
50.00	ZTRS516SPH832_0500 ME	3000	6000	≤38	0.53	37	12	289	5	16	84.9	37	49	70	2100
50.00	ZTRS516SPH832_0500 MEL	3000	6000	≤48	0.53	37	12	289	5	16	84.9	37	49	70	2100
70.00	ZTRS516SPH832_0700 ME	3000	6000	≤38	0.38	37	12	275	5	16	84.9	33	44	70	1848
70.00	ZTRS516SPH832_0700 MEL	3000	6000	≤48	0.38	37	12	275	5	16	84.9	33	44	70	1848
100.0	ZTRS516SPH832_1000 ME	3000	6000	≤38	0.27	37	12	252	5	16	84.9	25	33	65	1380
100.0	ZTRS516SPH832_1000 MEL	3000	6000	≤48	0.27	37	12	252	5	16	84.9	25	33	65	1380
<b>ZTRS5PH9 (F<sub>T2acc,max</sub> = 77 kN)</b>															
12.00	ZTRS520SPH942_0120 ME	1800	3000	≤48	1.39	46	15	396	5	20	106.1	56	77	132	4075
12.00	ZTRS520SPH942_0120 MEL	1800	3000	≤60	1.39	46	15	398	5	20	106.1	56	77	154	4075
16.00	ZTRS520SPH942_0160 ME	2000	3500	≤48	1.22	46	15	395	5	20	106.1	57	77	154	4075
16.00	ZTRS520SPH942_0160 MEL	2000	3500	≤60	1.22	46	15	396	5	20	106.1	57	77	154	4075
18.00	ZTRS520SPH942_0180 ME	1800	3000	≤48	0.93	46	15	389	5	20	106.1	57	77	154	4075
18.00	ZTRS520SPH942_0180 MEL	1800	3000	≤60	0.93	46	15	390	5	20	106.1	57	77	154	4075
20.00	ZTRS520SPH942_0200 ME	2500	4000	≤48	1.11	46	15	394	5	20	106.1	57	77	154	4075

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{ZmaxZB}$	$\Delta s$	$\Delta s_{red}$	$C_{lin}$	$m_n$	z	$d_0$	$F_{t2N}$	$F_{t2acc}$	$F_{t2NOT}$	$M_{2acc}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu$ m]	[ $\mu$ m]	[N/ $\mu$ m]	[mm]		[mm]	[kN]	[kN]	[kN]	[Nm]
<b>ZTRS5PH9 (<math>F_{t2acc,max} = 77</math> kN)</b>															
20.00	ZTRS520SPH942_0200 MEL	2500	4000	$\leq 60$	1.11	46	15	395	5	20	106.1	57	77	154	4075
24.00	ZTRS520SPH942_0240 ME	2000	3500	$\leq 48$	0.81	46	15	388	5	20	106.1	57	77	154	4075
24.00	ZTRS520SPH942_0240 MEL	2000	3500	$\leq 60$	0.81	46	15	388	5	20	106.1	57	77	154	4075
28.00	ZTRS520SPH942_0280 ME	2800	4500	$\leq 48$	0.89	46	15	391	5	20	106.1	66	77	154	4075
28.00	ZTRS520SPH942_0280 MEL	2800	4500	$\leq 60$	0.89	46	15	392	5	20	106.1	66	77	154	4075
30.00	ZTRS520SPH942_0300 ME	2500	4000	$\leq 48$	0.74	46	15	388	5	20	106.1	62	77	154	4075
30.00	ZTRS520SPH942_0300 MEL	2500	4000	$\leq 60$	0.74	46	15	388	5	20	106.1	62	77	154	4075
32.00	ZTRS520SPH942_0320 ME	2800	4500	$\leq 48$	0.78	46	15	387	5	20	106.1	60	77	154	4075
32.00	ZTRS520SPH942_0320 MEL	2800	4500	$\leq 60$	0.78	46	15	388	5	20	106.1	60	77	154	4075
40.00	ZTRS520SPH942_0400 ME	2800	4500	$\leq 48$	0.63	46	15	383	5	20	106.1	60	77	154	4075
40.00	ZTRS520SPH942_0400 MEL	2800	4500	$\leq 60$	0.63	46	15	383	5	20	106.1	60	77	154	4075
42.00	ZTRS520SPH942_0420 ME	2800	4500	$\leq 48$	0.60	46	15	387	5	20	106.1	66	77	154	4075
42.00	ZTRS520SPH942_0420 MEL	2800	4500	$\leq 60$	0.60	46	15	387	5	20	106.1	66	77	154	4075
48.00	ZTRS520SPH942_0480 ME	2800	4500	$\leq 48$	0.52	46	15	385	5	20	106.1	66	77	154	4075
48.00	ZTRS520SPH942_0480 MEL	2800	4500	$\leq 60$	0.52	46	15	385	5	20	106.1	66	77	154	4075
60.00	ZTRS520SPH942_0600 ME	2800	4500	$\leq 48$	0.42	46	15	383	5	20	106.1	66	77	154	4075
60.00	ZTRS520SPH942_0600 MEL	2800	4500	$\leq 60$	0.42	46	15	383	5	20	106.1	66	77	154	4075
<b>ZTRS6PH9 (<math>F_{t2acc,max} = 77</math> kN)</b>															
12.00	ZTRS620SPH942_0120 ME	1800	3000	$\leq 48$	1.67	56	19	370	6	20	127.3	47	72	110	4600
12.00	ZTRS620SPH942_0120 MEL	1800	3000	$\leq 60$	1.67	56	19	373	6	20	127.3	47	72	145	4600
16.00	ZTRS620SPH942_0160 ME	2000	3500	$\leq 48$	1.46	56	19	368	6	20	127.3	47	77	147	4919
16.00	ZTRS620SPH942_0160 MEL	2000	3500	$\leq 60$	1.46	56	19	370	6	20	127.3	47	77	150	4919
18.00	ZTRS620SPH942_0180 ME	1800	3000	$\leq 48$	1.11	56	19	361	6	20	127.3	47	77	150	4919
18.00	ZTRS620SPH942_0180 MEL	1800	3000	$\leq 60$	1.11	56	19	362	6	20	127.3	47	77	150	4919
20.00	ZTRS620SPH942_0200 ME	2500	4000	$\leq 48$	1.33	56	19	368	6	20	127.3	47	77	150	4919
20.00	ZTRS620SPH942_0200 MEL	2500	4000	$\leq 60$	1.33	56	19	368	6	20	127.3	47	77	150	4919
24.00	ZTRS620SPH942_0240 ME	2000	3500	$\leq 48$	0.97	56	19	360	6	20	127.3	47	77	150	4919
24.00	ZTRS620SPH942_0240 MEL	2000	3500	$\leq 60$	0.97	56	19	361	6	20	127.3	47	77	150	4919
28.00	ZTRS620SPH942_0280 ME	2800	4500	$\leq 48$	1.07	56	19	364	6	20	127.3	55	77	150	4919
28.00	ZTRS620SPH942_0280 MEL	2800	4500	$\leq 60$	1.07	56	19	365	6	20	127.3	55	77	150	4919
30.00	ZTRS620SPH942_0300 ME	2500	4000	$\leq 48$	0.89	56	19	360	6	20	127.3	52	77	150	4919
30.00	ZTRS620SPH942_0300 MEL	2500	4000	$\leq 60$	0.89	56	19	360	6	20	127.3	52	77	150	4919
32.00	ZTRS620SPH942_0320 ME	2800	4500	$\leq 48$	0.94	56	19	359	6	20	127.3	50	72	145	4600
32.00	ZTRS620SPH942_0320 MEL	2800	4500	$\leq 60$	0.94	56	19	360	6	20	127.3	50	72	145	4600
40.00	ZTRS620SPH942_0400 ME	2800	4500	$\leq 48$	0.75	56	19	354	6	20	127.3	50	72	145	4600
40.00	ZTRS620SPH942_0400 MEL	2800	4500	$\leq 60$	0.75	56	19	354	6	20	127.3	50	72	145	4600
42.00	ZTRS620SPH942_0420 ME	2800	4500	$\leq 48$	0.71	56	19	359	6	20	127.3	55	77	150	4919
42.00	ZTRS620SPH942_0420 MEL	2800	4500	$\leq 60$	0.71	56	19	359	6	20	127.3	55	77	150	4919
48.00	ZTRS620SPH942_0480 ME	2800	4500	$\leq 48$	0.63	56	19	356	6	20	127.3	55	77	150	4919
48.00	ZTRS620SPH942_0480 MEL	2800	4500	$\leq 60$	0.63	56	19	356	6	20	127.3	55	77	150	4919
60.00	ZTRS620SPH942_0600 ME	2800	4500	$\leq 48$	0.50	56	19	354	6	20	127.3	55	77	150	4919
60.00	ZTRS620SPH942_0600 MEL	2800	4500	$\leq 60$	0.50	56	19	354	6	20	127.3	55	77	150	4919
<b>ZTRS8PH9 (<math>F_{t2acc,max} = 79</math> kN)</b>															
12.00	ZTRS815SPH942_0120 ME	1800	3000	$\leq 48$	1.67	56	19	389	8	15	127.3	47	72	110	4600
12.00	ZTRS815SPH942_0120 MEL	1800	3000	$\leq 60$	1.67	56	19	391	8	15	127.3	47	72	145	4600
16.00	ZTRS815SPH942_0160 ME	2000	3500	$\leq 48$	1.46	56	19	386	8	15	127.3	47	79	147	5000
16.00	ZTRS815SPH942_0160 MEL	2000	3500	$\leq 60$	1.46	56	19	388	8	15	127.3	47	79	150	5000
18.00	ZTRS815SPH942_0180 ME	1800	3000	$\leq 48$	1.11	56	19	378	8	15	127.3	47	79	150	5000
18.00	ZTRS815SPH942_0180 MEL	1800	3000	$\leq 60$	1.11	56	19	379	8	15	127.3	47	79	150	5000
20.00	ZTRS815SPH942_0200 ME	2500	4000	$\leq 48$	1.33	56	19	385	8	15	127.3	47	79	150	5000
20.00	ZTRS815SPH942_0200 MEL	2500	4000	$\leq 60$	1.33	56	19	386	8	15	127.3	47	79	150	5000
24.00	ZTRS815SPH942_0240 ME	2000	3500	$\leq 48$	0.97	56	19	377	8	15	127.3	47	79	150	5000
24.00	ZTRS815SPH942_0240 MEL	2000	3500	$\leq 60$	0.97	56	19	378	8	15	127.3	47	79	150	5000
28.00	ZTRS815SPH942_0280 ME	2800	4500	$\leq 48$	1.07	56	19	382	8	15	127.3	55	79	150	5000
28.00	ZTRS815SPH942_0280 MEL	2800	4500	$\leq 60$	1.07	56	19	382	8	15	127.3	55	79	150	5000
30.00	ZTRS815SPH942_0300 ME	2500	4000	$\leq 48$	0.89	56	19	377	8	15	127.3	52	79	150	5000
30.00	ZTRS815SPH942_0300 MEL	2500	4000	$\leq 60$	0.89	56	19	377	8	15	127.3	52	79	150	5000
32.00	ZTRS815SPH942_0320 ME	2800	4500	$\leq 48$	0.94	56	19	376	8	15	127.3	50	72	145	4600
32.00	ZTRS815SPH942_0320 MEL	2800	4500	$\leq 60$	0.94	56	19	377	8	15	127.3	50	72	145	4600
40.00	ZTRS815SPH942_0400 ME	2800	4500	$\leq 48$	0.75	56	19	371	8	15	127.3	50	72	145	4600
40.00	ZTRS815SPH942_0400 MEL	2800	4500	$\leq 60$	0.75	56	19	371	8	15	127.3	50	72	145	4600
42.00	ZTRS815SPH942_0420 ME	2800	4500	$\leq 48$	0.71	56	19	375	8	15	127.3	55	79	150	5000
42.00	ZTRS815SPH942_0420 MEL	2800	4500	$\leq 60$	0.71	56	19	376	8	15	127.3	55	79	150	5000
48.00	ZTRS815SPH942_0480 ME	2800	4500	$\leq 48$	0.63	56	19	373	8	15	127.3	55	79	150	5000
48.00	ZTRS815SPH942_0480 MEL	2800	4500	$\leq 60$	0.63	56	19	373	8	15	127.3	55	79	150	5000

2.2 Selection tables 2 ZTRSPH rack and pinion drives

i	Type	$n_{1maxDB}$ [rpm]	$n_{1maxZB}$ [rpm]	$d_{MW}$ [mm]	$v_{f2maxZB}$ [m/s]	$\Delta s$ [ $\mu$ m]	$\Delta s_{red}$ [ $\mu$ m]	$C_{in}$ [N/ $\mu$ m]	$m_n$ [mm]	z	$d_0$ [mm]	$F_{f2N}$ [kN]	$F_{f2acc}$ [kN]	$F_{f2NOT}$ [kN]	$M_{2acc}$ [Nm]
<b>ZTRS8PH9 (<math>F_{f2acc,max} = 79</math> kN)</b>															
60.00	ZTRS815SPH942_0600 ME	2800	4500	$\leq 48$	0.50	56	19	371	8	15	127.3	55	79	150	5000
60.00	ZTRS815SPH942_0600 MEL	2800	4500	$\leq 60$	0.50	56	19	371	8	15	127.3	55	79	150	5000



## 2.3 Dimensional drawings

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

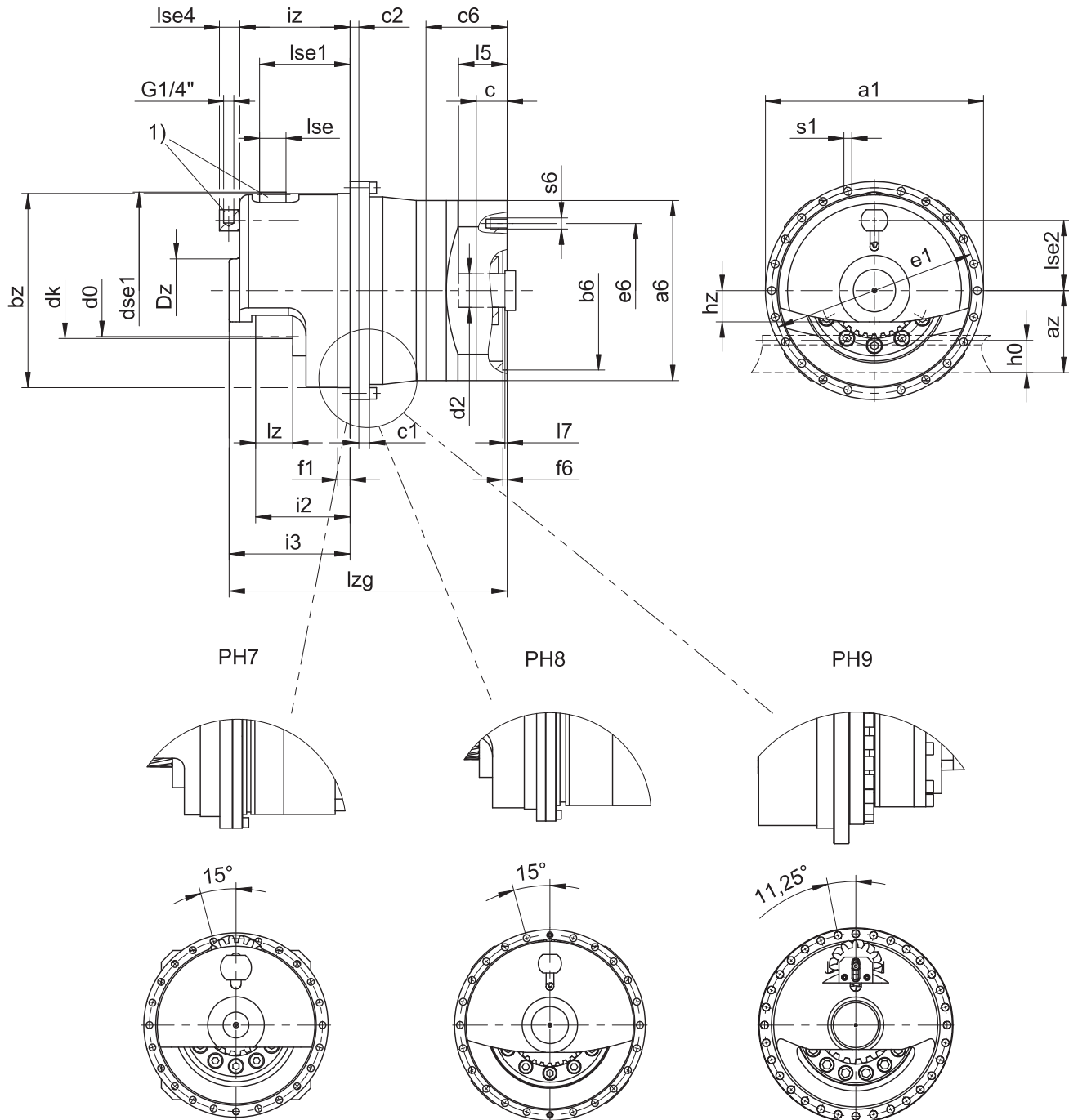
Dimension  $az$  in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

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 <https://configurator.stoeber.de/en-US/>.



1) Felt gear for lubrication (option)



## 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
ZTRS317SPH7_	3	179	53.06	156 <sub>h7</sub>	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
ZTRS332SPH8_	3	247	76.93	220 <sub>h7</sub>	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 <sub>h7</sub>	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 <sub>h7</sub>	12	10	84.88	94.8	78.6	72	233	14.5	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 <sub>h7</sub>	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
ZTRS620SPH9_	6	346	106.66	300 <sub>h7</sub>	18	18	127.32	139.3	94.2	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 <sub>h7</sub>	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

## Example dimensions for the motor connection + total length

Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZTRS3_PH731_ME	130 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	234.5	M10
ZTRS3_PH732_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	272.5	M8
ZTRS3_PH831_ME	180 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	315.0	M12
ZTRS4_PH831_ME	180 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	315.0	M12
ZTRS5_PH831_ME	180 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	325.0	M12
ZTRS3_PH832_ME	130 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	360.0	M10
ZTRS4_PH832_ME	130 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	360.0	M10
ZTRS5_PH832_ME	130 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	370.0	M10
ZTRS5_PH942_ME	180 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	465.5	M12
ZTRS6_PH942_ME	180 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	475.5	M12
ZTRS8_PH942_ME	180 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	491.2	M12

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6, l5 and lzg are also lengthened accordingly.**

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

## 2.4 Type designation

This chapter shows you 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.

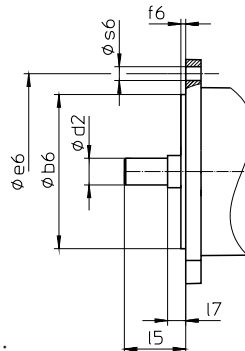
### Example code

Z	TRS	3	17	S	PH	7	3	1	S	F	S	S	0050	ME
---	-----	---	----	---	----	---	---	---	---	---	---	---	------	----

### 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 gear for lubrication
PH	Type	Planetary gear unit
7	Size	7 (example)
3	Generation	Generation 3
4		Generation 4
1	Stages	Single-stage
2		Two-stage
S	Housing	Standard
F	Shaft	Flange shaft
S	Bearing	Standard bearing
V		Reinforced bearing (PH3 – PH5)
S	Backlash	Standard
R		Reduced
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
MF		Motor adapter with FlexiAdapt coupling
MB <sup>1</sup>		ServoStop motor adapter with brake

To complete the type designation, also specify the following in your order:



- Motor type or motor dimensions:  
To choose a suitable motor connection, use the STOEBER Configurator at <https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.
- Position of the gear rack, see the chapter [▶ 2.5.7]
- Radial shaft seal rings at the output made of NBR or FKM (option), 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 on request

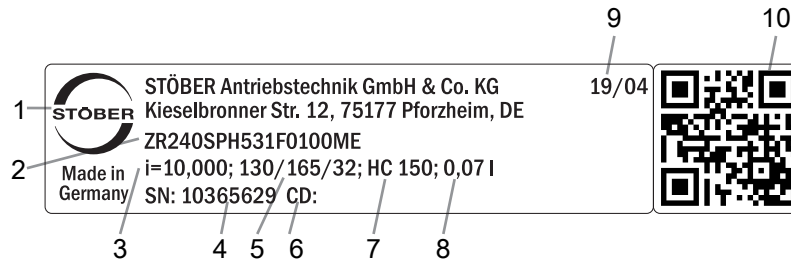
22 <sup>1</sup>You can find more details in the catalog for the ServoStop servo gear unit with brake, ID 443234.

- Double seal for motor adapter (option)
- Socket wrench insert for mounting the motor on the gear unit using the ME/MEL/MF motor adapter (option)

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 [▶ 2.5.1].

## 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>

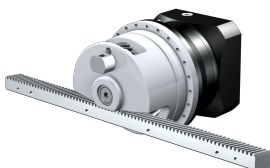
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 2.5 Product description

### 2.5.1 Input options

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

Motor adapter



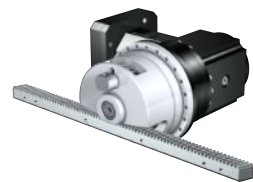
Catalog ID 443137\_en

EZ synchronous servo motor



Catalog ID 443286\_en

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

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 2.5.2 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 clamp coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- 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

## 2.5.3 Motor adapter with FlexiAdapt coupling (MF)

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

**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
- Motor shaft decoupled from axial forces
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- Error-free, thanks to exact centering of the motor



Fig. 2: FlexiAdapt coupling

## 2.5.4 Gear rack

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

Also note the project configuration of the gear rack on the Atlanta pages.

## 2.5.5 Installation conditions

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

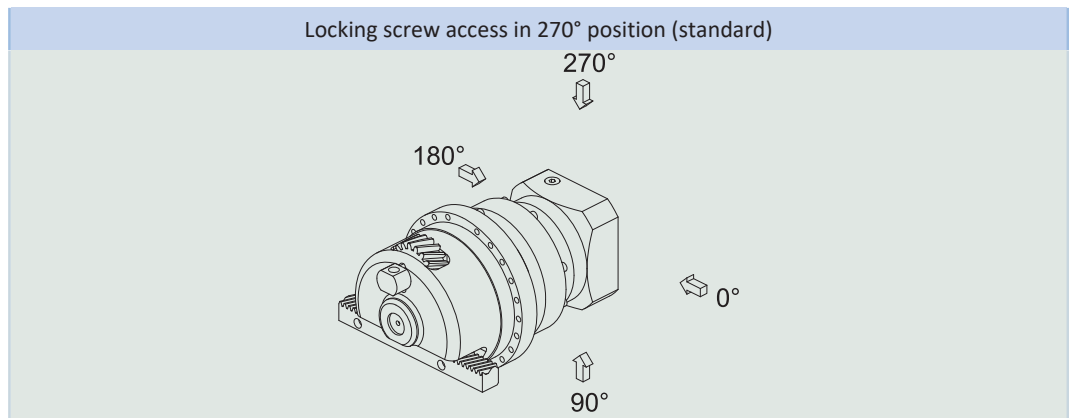
- When the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing$ bz. The machine-side fit must be H7.

## 2.5.6 Lubricants

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

You will receive lubricants for use in the food industry upon request.

## 2.5.7 Position of locking screw access



The access hole 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 order.

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

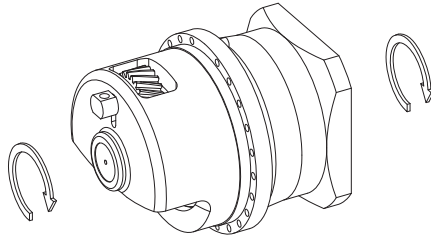
## 2.5.8 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	$\leq 90$ °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable.
Protection class: <sup>2</sup>	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

<sup>2</sup> Observe the protection class of all the components.

## 2.5.9 Direction of rotation

The input and output rotate in the same direction.



## 2.6 Project configuration

Project your drives using our SERVOfsoft designing software. Download SERVOfsoft for free at <https://www.stoeber.de/en/ServoSoft>.

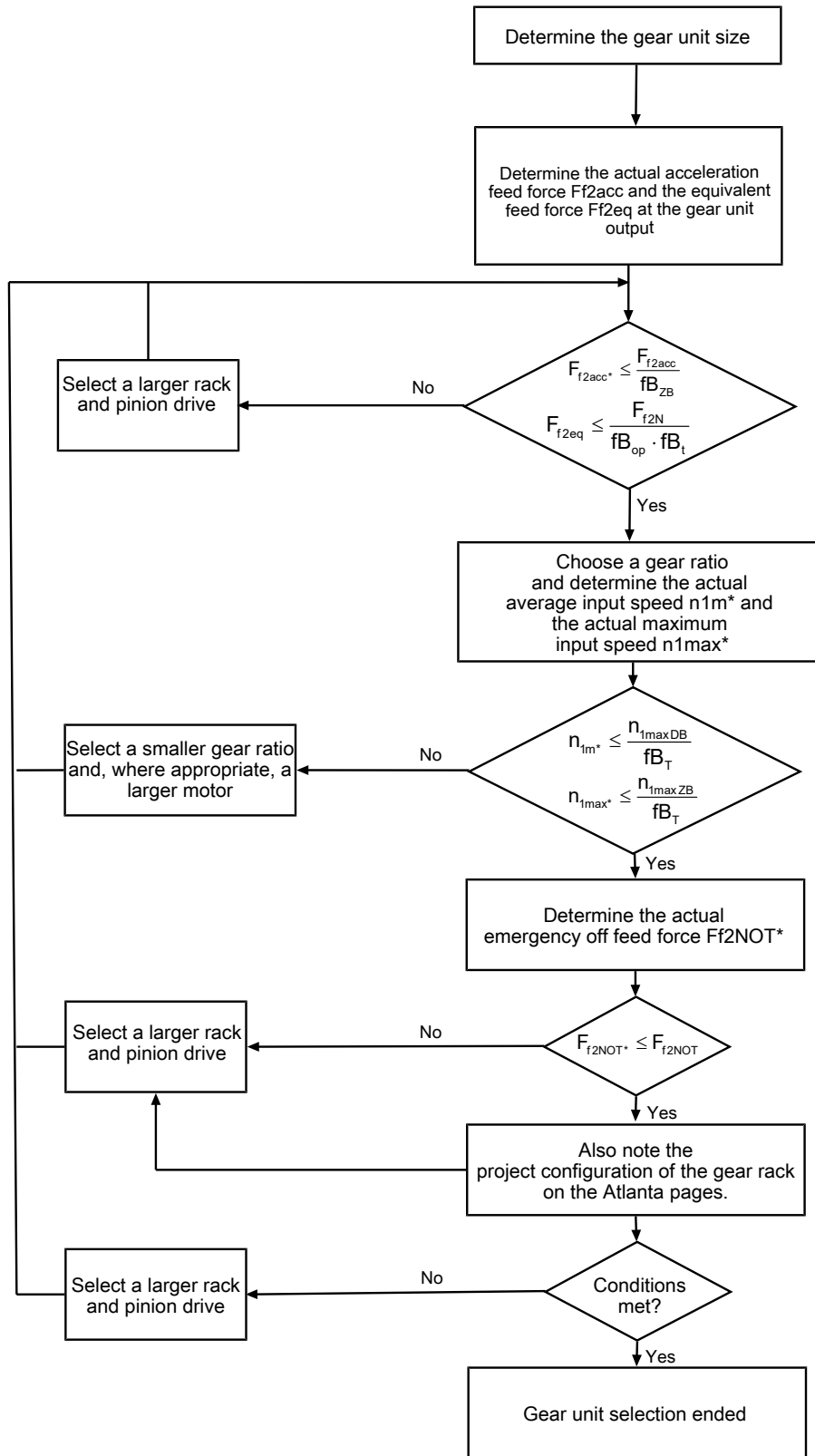
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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 [▶ 13.1].

### 2.6.1 Drive selection

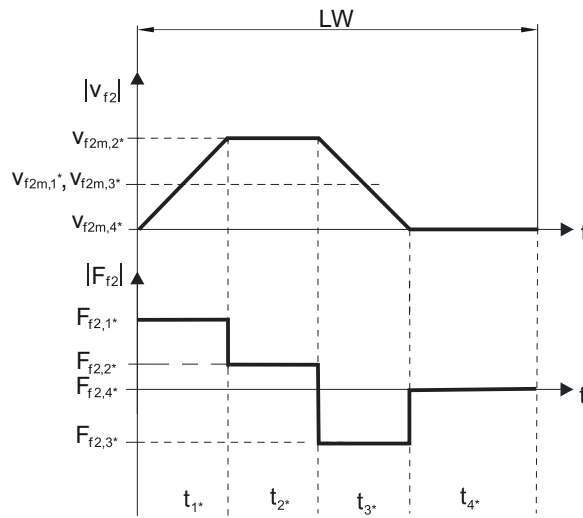


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_T$  and  $fb_{zB}$  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**

$$n_{im*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

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**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Operating factors**

<b>Operating mode</b>	<b>fB<sub>op</sub></b>
Uniform continuous operation	1.00
Cyclic operation	1.00
Reversing load cyclic operation	1.00
<b>Run time</b>	<b>fB<sub>t</sub></b>
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
<b>Cyclic operation</b>	<b>fB<sub>ZB</sub></b>
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15



Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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

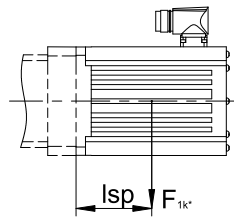
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

## 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:

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



Type	$M_{1k}$ [Nm]
PH331_ME	20
PH332_ME	10
PH431_ME	40
PH432_ME	20
PH531_ME	80
PH532_ME	40
PH731_ME	200
PH732_ME	80
PH831_ME	400
PH832_ME	200
PH942_ME	400
PH1042_ME	400

The values also apply to the MEL and MF motor adapters.

### 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 in 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 leaks. 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/downloads/>

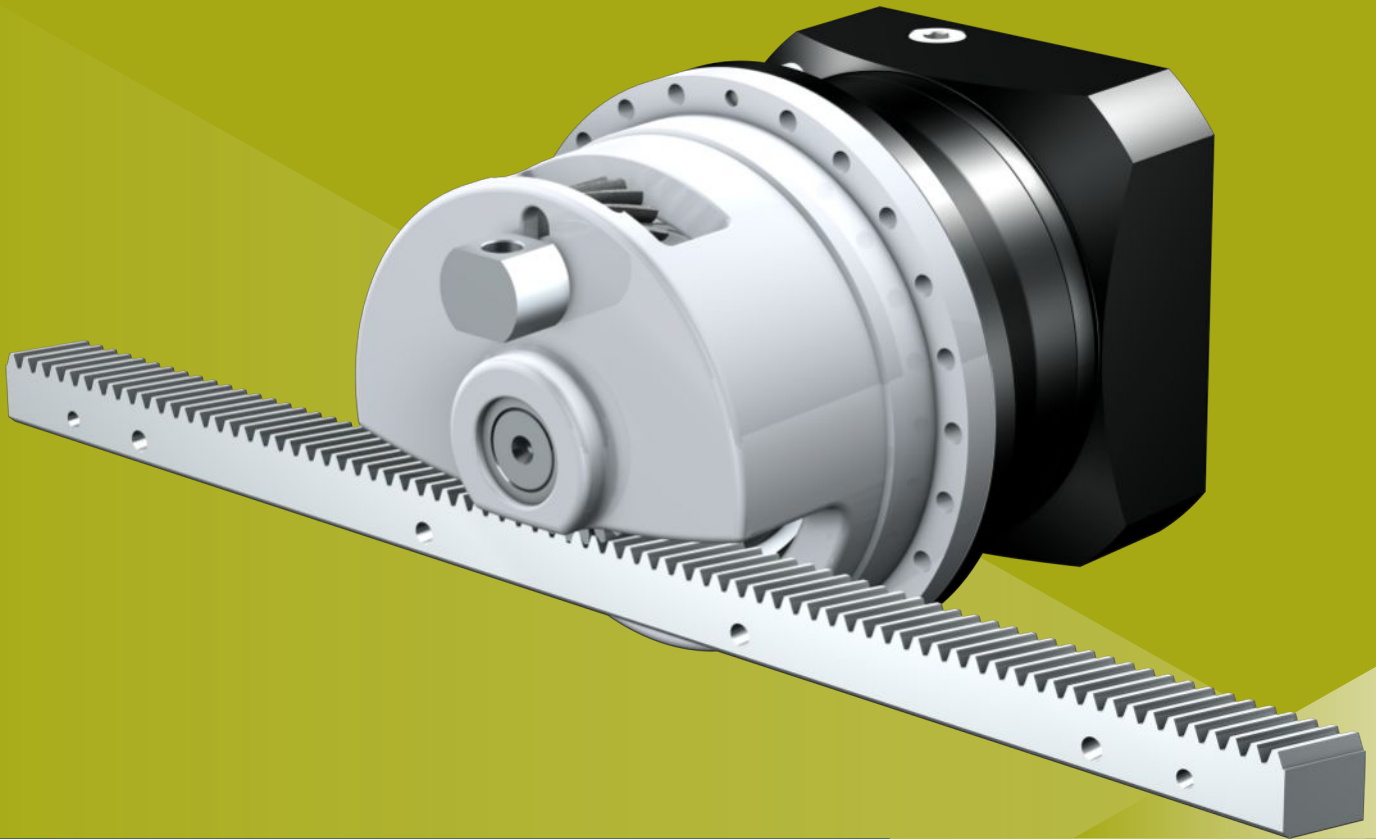
Enter the ID of the documentation in the Search term field.

Documentation	ID
Operating manual gear units, geared motors PH33 – PH83, PH94 – PH104	443354_de
Operating manual for gear racks (Atlanta)	442455

# 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 mm
$z$	19
$F_{f2acc}$	124 kN
$V_{f2maxZB}$	0.06 – 1.1 m/s
$\Delta s$	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 <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

i	Type	$n_{1maxDB}$ [rpm]	$n_{1maxZB}$ [rpm]	$d_{MW}$ [mm]	$v_{f2maxZB}$ [m/s]	$\Delta s$ [μm]	$\Delta s_{red}$ [μm]	$C_{lin}$ [N/μm]	$m_n$ [mm]	z	$d_0$ [mm]	$F_{f2N}$ [kN]	$F_{f2acc}$ [kN]	$F_{f2NOT}$ [kN]	$M_{2acc}$ [Nm]
<b>ZTRS8PHQ10 (<math>F_{f2acc,max} = 124</math> kN)</b>															
24.00	ZTRS819SPHQ1042_0240 ME	1800	3000	≤60	1.06	70	–	341	8	19	161.3	65	124	240	10000
30.00	ZTRS819SPHQ1042_0300 ME	2000	3500	≤60	0.99	70	–	340	8	19	161.3	66	124	240	10000
42.00	ZTRS819SPHQ1042_0420 ME	2300	4000	≤60	0.80	70	–	339	8	19	161.3	66	124	240	10000
60.00	ZTRS819SPHQ1042_0600 ME	2500	4000	≤60	0.56	70	–	335	8	19	161.3	66	124	240	10000
96.00	ZTRS819SPHQ1043_0960 ME	2000	3500	≤48	0.31	70	–	340	8	19	161.3	66	124	240	10000
96.00	ZTRS819SPHQ1043_0960 MEL	2000	3500	≤60	0.31	70	–	340	8	19	161.3	66	124	240	10000
120.0	ZTRS819SPHQ1043_1200 ME	2000	3500	≤48	0.25	70	–	340	8	19	161.3	66	124	240	10000
120.0	ZTRS819SPHQ1043_1200 MEL	2000	3500	≤60	0.25	70	–	340	8	19	161.3	66	124	240	10000
150.0	ZTRS819SPHQ1043_1500 ME	2500	4000	≤48	0.23	70	–	340	8	19	161.3	66	124	240	10000
150.0	ZTRS819SPHQ1043_1500 MEL	2500	4000	≤60	0.23	70	–	340	8	19	161.3	66	124	240	10000
168.0	ZTRS819SPHQ1043_1680 ME	2800	4500	≤48	0.23	70	–	340	8	19	161.3	66	124	240	10000
168.0	ZTRS819SPHQ1043_1680 MEL	2800	4500	≤60	0.23	70	–	340	8	19	161.3	66	124	240	10000
210.0	ZTRS819SPHQ1043_2100 ME	2800	4500	≤48	0.18	70	–	340	8	19	161.3	66	124	240	10000
210.0	ZTRS819SPHQ1043_2100 MEL	2800	4500	≤60	0.18	70	–	340	8	19	161.3	66	124	240	10000
240.0	ZTRS819SPHQ1043_2400 ME	2800	4500	≤48	0.16	70	–	340	8	19	161.3	66	124	240	10000
240.0	ZTRS819SPHQ1043_2400 MEL	2800	4500	≤60	0.16	70	–	340	8	19	161.3	66	124	240	10000
300.0	ZTRS819SPHQ1043_3000 ME	2800	4500	≤48	0.13	70	–	340	8	19	161.3	66	124	240	10000
300.0	ZTRS819SPHQ1043_3000 MEL	2800	4500	≤60	0.13	70	–	340	8	19	161.3	66	124	240	10000
420.0	ZTRS819SPHQ1043_4200 ME	2800	4500	≤48	0.09	70	–	339	8	19	161.3	66	124	240	10000
420.0	ZTRS819SPHQ1043_4200 MEL	2800	4500	≤60	0.09	70	–	339	8	19	161.3	66	124	240	10000
600.0	ZTRS819SPHQ1043_6000 ME	2800	4500	≤48	0.06	70	–	335	8	19	161.3	66	124	240	10000
600.0	ZTRS819SPHQ1043_6000 MEL	2800	4500	≤60	0.06	70	–	335	8	19	161.3	66	124	240	10000

### 3.3 Dimensional drawings

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

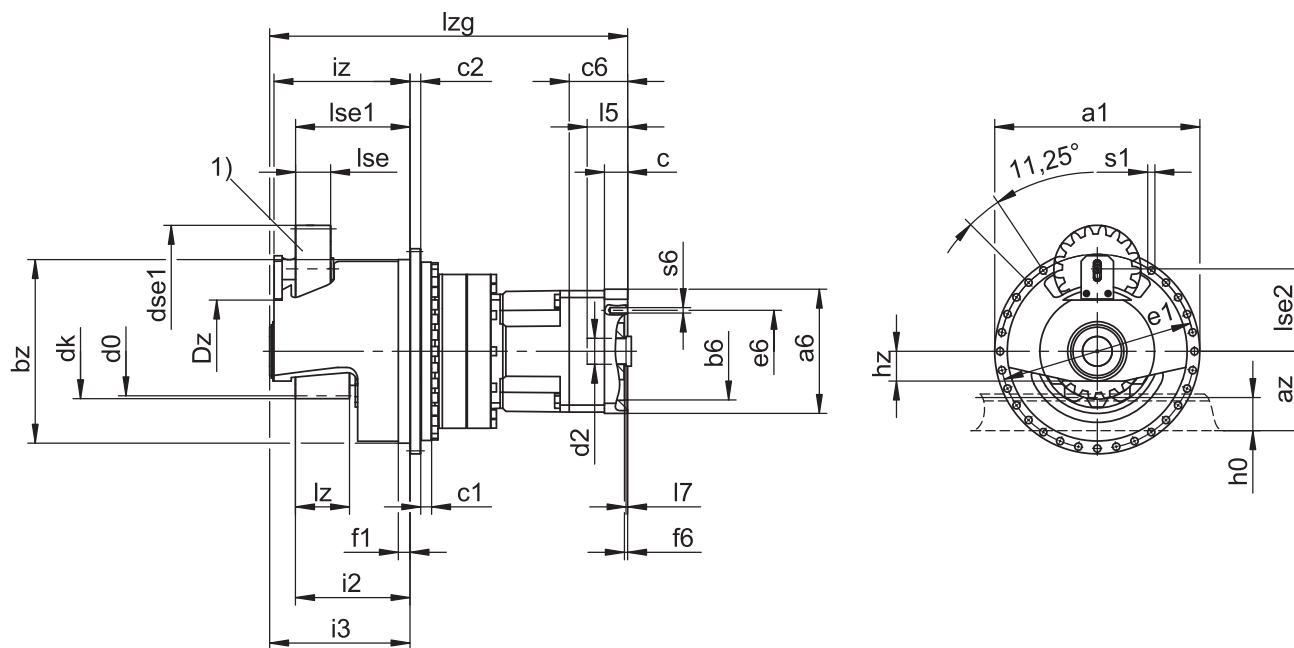
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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

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 <https://configurator.stoeber.de/en-US/>.



1) Felt gear for lubrication (option)

#### 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 <sub>h7</sub>	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

#### Example dimensions for the motor connection + total length

Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZTRS8_PHQ1042_ME	180 <sup>H7</sup>	215	60	85	230	43	91.5	6.0	10.5	581.5	M12
ZTRS8_PHQ1043_ME	180 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	662.5	M12

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6, l5 and lzg are also lengthened accordingly.**

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

## 3.4 Type designation

This chapter shows you 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.

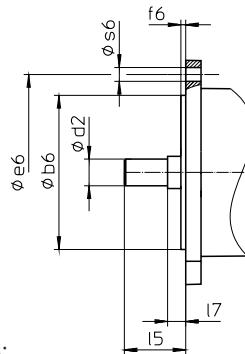
### Example code

Z	TRS	8	19	S	PHQ	10	4	3	S	F	S	S	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 gear for lubrication
PHQ	Type	Planetary gear unit
10	Size	10 (example)
4	Generation	Generation 4
2	Stages	Two-stage
3		Three-stage
S	Housing	Standard
F	Shaft	Flange shaft
S	Bearing	Standard bearing
S	Backlash	Standard
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
MB <sup>1</sup>		ServoStop motor adapter with brake

To complete the type designation, also specify the following in your order:



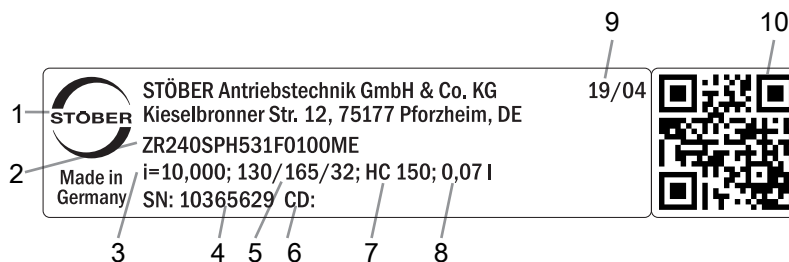
- Motor type or motor dimensions:  
To choose a suitable motor connection, use the STOEGER Configurator at <https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.
- Mounting position (for three-stage gear units), see the chapter [▶ 3.5.6]
- Position of the gear rack, see the chapter [▶ 3.5.7]
- Radial shaft seal rings at the output made of NBR or FKM (option), 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 on request
- Double seal for motor adapter (option)
- Socket wrench insert for mounting the motor on the gear unit using the ME/MEL motor adapter (optional)

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 [▶ 3.5.1].

<sup>1</sup>You can find more details in the catalog for ServoStop servo gear unit with brake ID 443234.

### 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>

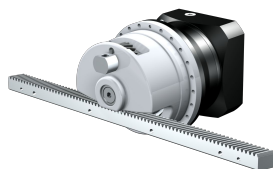
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 3.5 Product description

### 3.5.1 Input options

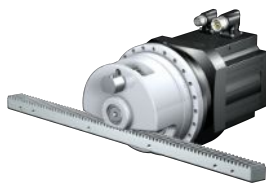
In this chapter, you will find all available input options:

Motor adapter



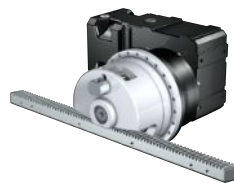
Catalog ID 443137\_en

EZ synchronous servo motor



Catalog ID 443286\_en

K right-angle input with ME motor adapter



On request

MB motor adapter



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.



## 3.5.2 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 clamp coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design

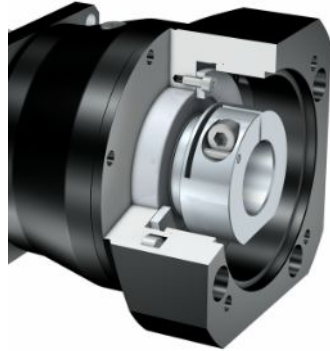


Fig. 1: EasyAdapt coupling

## 3.5.3 Gear rack

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

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 the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear 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.

You will receive lubricants for use in the food industry upon request.

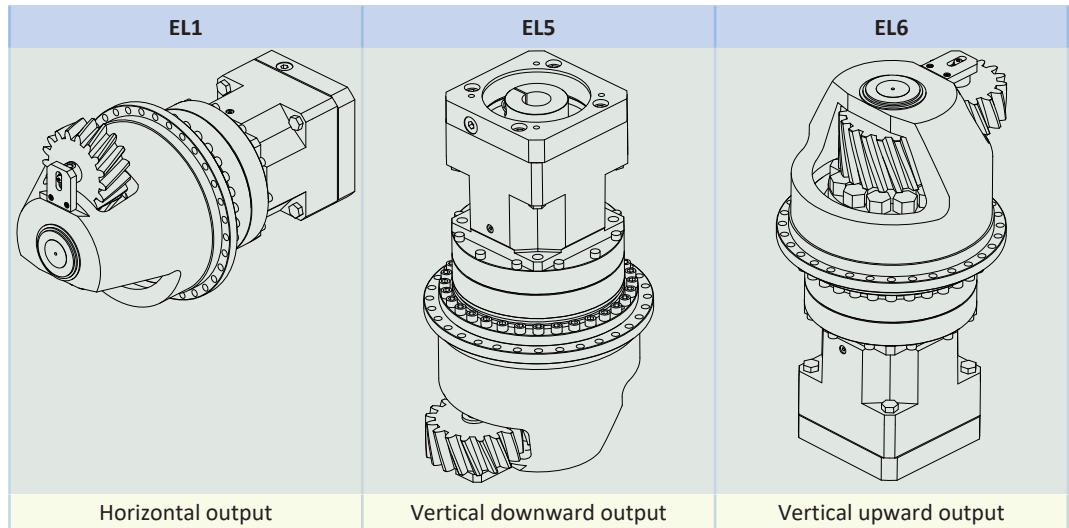
### 3.5.5.1 Rack and pinion drive lubrication

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

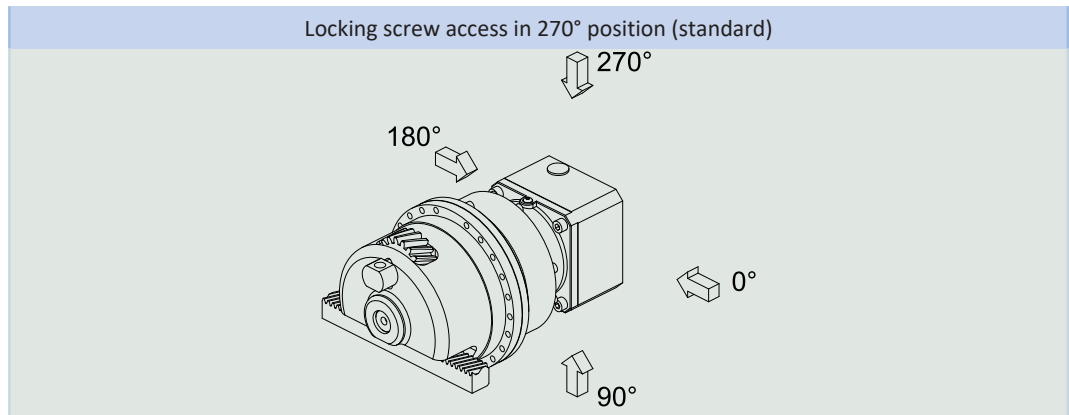
### 3.5.6 Mounting positions

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 hole 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 order.

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

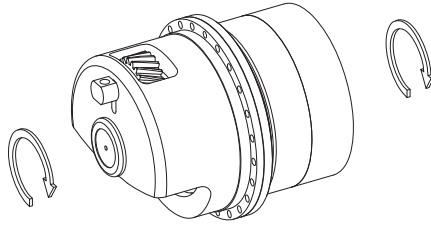
### 3.5.8 Other product features

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: <sup>2</sup>	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

<sup>2</sup>Observe the protection class of all the components.

### 3.5.9 Direction of rotation

The input and output rotate in the same direction.



## 3.6 Project configuration

Project your drives using our SERVOSOFT designing software. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

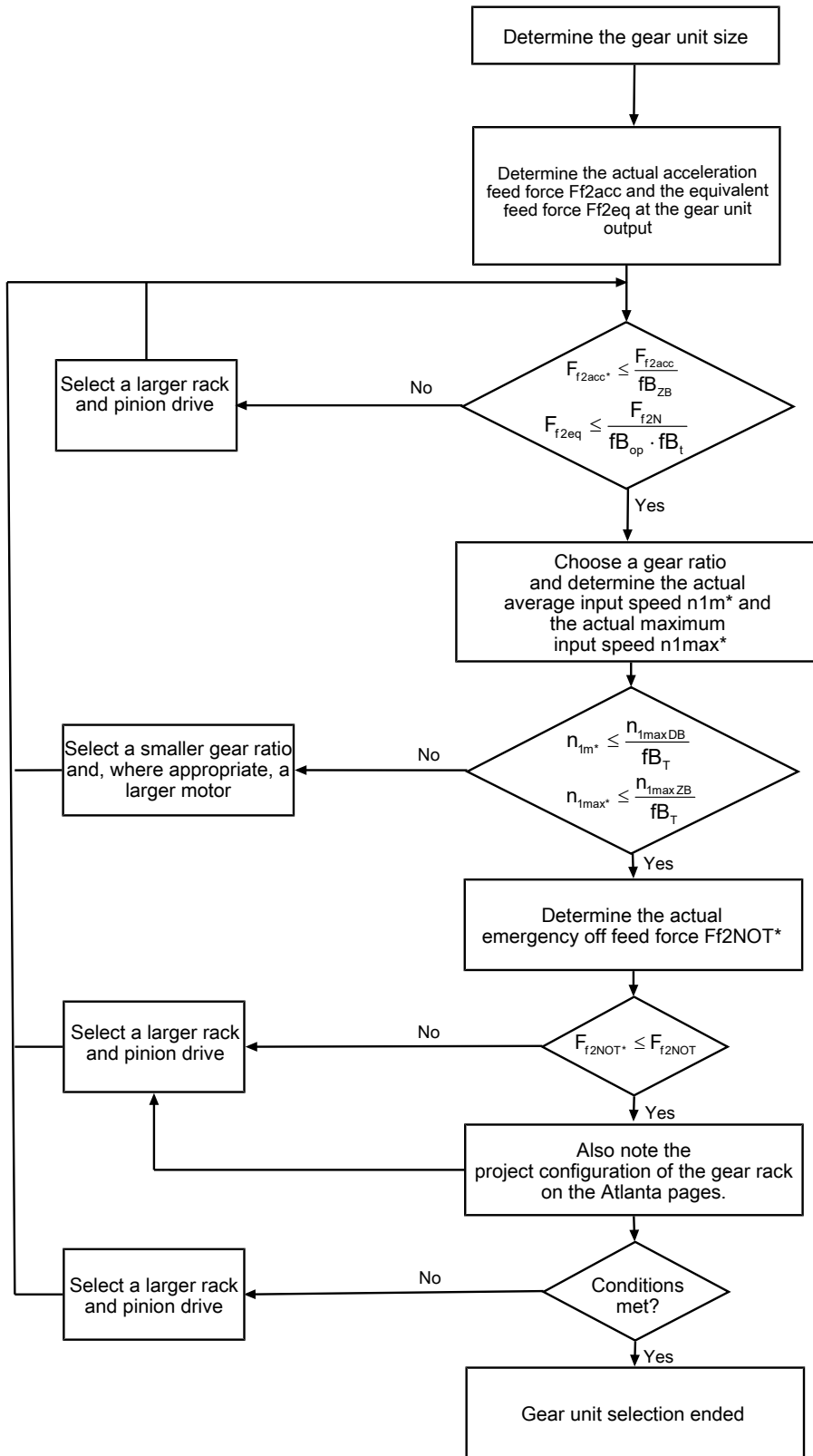
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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 [▶ 13.1](#).

### 3.6.1 Drive selection

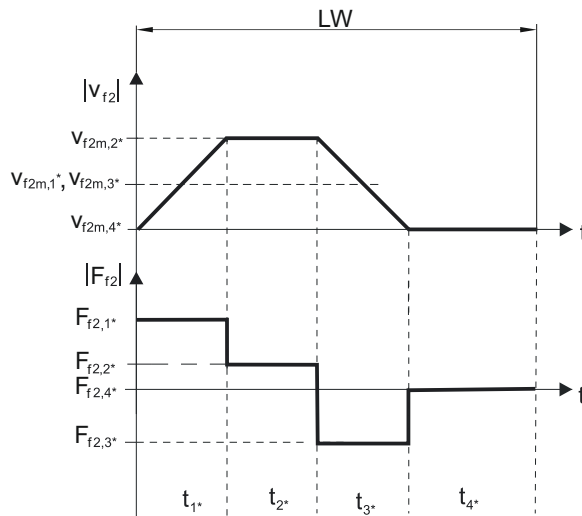


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_T$  and  $fb_{zB}$  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**

$$n_{fm}^* = \frac{v_{f2m}^* \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m}^* = \frac{|v_{f2m,1}^*| \cdot t_1^* + \dots + |v_{f2m,n}^*| \cdot t_n^*}{t_1^* + \dots + t_n^*}$$

If  $t_1^* + \dots + t_3^* \geq 6$  min, determine  $v_{2m}^*$  without the rest phase  $t_4^*$ .

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**

$$F_{f2eq}^* = \sqrt[3]{\frac{|v_{f2m,1}^*| \cdot t_1^* \cdot |F_{f2,1}^*|^3 + \dots + |v_{f2m,n}^*| \cdot t_n^* \cdot |F_{f2,n}^*|^3}{|v_{f2m,1}^*| \cdot t_1^* + \dots + |v_{f2m,n}^*| \cdot t_n^*}}$$

**Operating factors**

<b>Operating mode</b>	<b>fB<sub>op</sub></b>
Uniform continuous operation	1.00
Cyclic operation	1.00
Reversing load cyclic operation	1.00
<b>Run time</b>	<b>fB<sub>t</sub></b>
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
<b>Cyclic operation</b>	<b>fB<sub>ZB</sub></b>
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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**

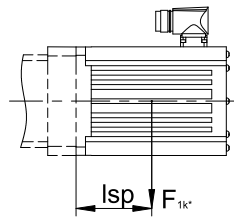
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

### 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:

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



Type	$M_{1k}$ [Nm]
PHQ431_ME	40
PHQ432_ME	20
PHQ531_ME	80
PHQ532_ME	40
PHQ731_ME	200
PHQ732_ME	80
PHQ733_ME	40
PHQ831_ME	400
PHQ832_ME	200
PHQ833_ME	80
PHQ942_ME	400
PHQ943_ME	200
PHQ1042_ME	800
PHQ1043_ME	400
PHQ1142_ME	1200
PHQ1143_ME	400
PHQ1242_ME	1800
PHQ1243_ME	800

The values also apply to the MEL and MF motor adapters.

### 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 in 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 leaks. 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/downloads/>

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

Documentation	ID
Operating manual gear units, geared motors PHQ43 – PHQ83, PHQ94 – PHQ124	443353_de
Operating manual for gear racks (Atlanta)	442455

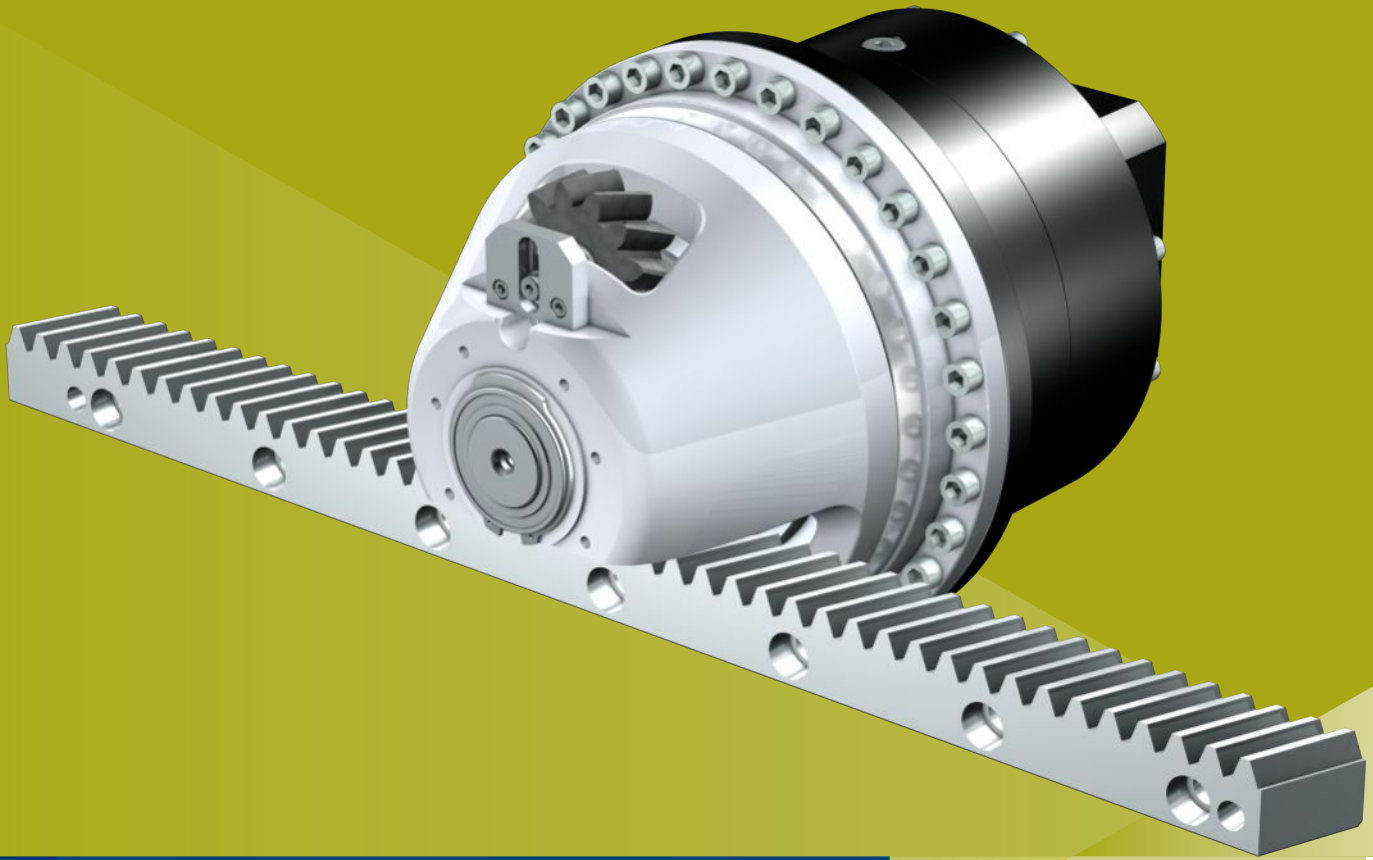




## 4 ZTRSPHV rack and pinion drives

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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 – 8 mm
$z$	15 – 20
$F_{f2acc}$	67 – 77 kN
$V_{f2maxZB}$	0.21 – 0.49 m/s
$\Delta s$	15 – 56 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 <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

i	Type	$n_{1\max DB}$ [rpm]	$n_{1\max ZB}$ [rpm]	$d_{MW}$ [mm]	$v_{f2\max ZB}$ [m/s]	$\Delta s$ [μm]	$\Delta s_{red}$ [μm]	$C_{lin}$ [N/μm]	$m_n$ [mm]	z	$d_0$ [mm]	$F_{f2N}$ [kN]	$F_{f2acc}$ [kN]	$F_{f2NOT}$ [kN]	$M_{2acc}$ [Nm]
<b>ZTRS5PHV9 (<math>F_{f2acc,max} = 77</math> kN)</b>															
61.00	ZTRS520SPHV943_0610 ME	2500	4500	≤38	0.41	46	15	356	5	20	106.1	47	77	154	4075
61.00	ZTRS520SPHV943_0610 MEL	2500	4500	≤48	0.41	46	15	356	5	20	106.1	47	77	154	4075
91.00	ZTRS520SPHV943_0910 ME	2500	4500	≤38	0.28	46	15	355	5	20	106.1	47	77	154	4075
91.00	ZTRS520SPHV943_0910 MEL	2500	4500	≤48	0.28	46	15	355	5	20	106.1	47	77	154	4075
121.0	ZTRS520SPHV943_1210 ME	2500	4500	≤38	0.21	46	15	350	5	20	106.1	47	77	154	4075
121.0	ZTRS520SPHV943_1210 MEL	2500	4500	≤48	0.21	46	15	350	5	20	106.1	47	77	154	4075
<b>ZTRS6PHV9 (<math>F_{f2acc,max} = 67</math> kN)</b>															
61.00	ZTRS620SPHV943_0610 ME	2500	4500	≤38	0.49	56	19	322	6	20	127.3	39	67	141	4250
61.00	ZTRS620SPHV943_0610 MEL	2500	4500	≤48	0.49	56	19	322	6	20	127.3	39	67	141	4250
91.00	ZTRS620SPHV943_0910 ME	2500	4500	≤38	0.33	56	19	320	6	20	127.3	39	67	141	4250
91.00	ZTRS620SPHV943_0910 MEL	2500	4500	≤48	0.33	56	19	320	6	20	127.3	39	67	141	4250
121.0	ZTRS620SPHV943_1210 ME	2500	4500	≤38	0.25	56	19	314	6	20	127.3	39	67	141	4250
121.0	ZTRS620SPHV943_1210 MEL	2500	4500	≤48	0.25	56	19	314	6	20	127.3	39	67	141	4250
<b>ZTRS8PHV9 (<math>F_{f2acc,max} = 67</math> kN)</b>															
61.00	ZTRS815SPHV943_0610 ME	2500	4500	≤38	0.49	56	19	335	8	15	127.3	39	67	141	4250
61.00	ZTRS815SPHV943_0610 MEL	2500	4500	≤48	0.49	56	19	336	8	15	127.3	39	67	141	4250
91.00	ZTRS815SPHV943_0910 ME	2500	4500	≤38	0.33	56	19	334	8	15	127.3	39	67	141	4250
91.00	ZTRS815SPHV943_0910 MEL	2500	4500	≤48	0.33	56	19	334	8	15	127.3	39	67	141	4250
121.0	ZTRS815SPHV943_1210 ME	2500	4500	≤38	0.25	56	19	327	8	15	127.3	39	67	141	4250
121.0	ZTRS815SPHV943_1210 MEL	2500	4500	≤48	0.25	56	19	327	8	15	127.3	39	67	141	4250

### 4.3 Dimensional drawings

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

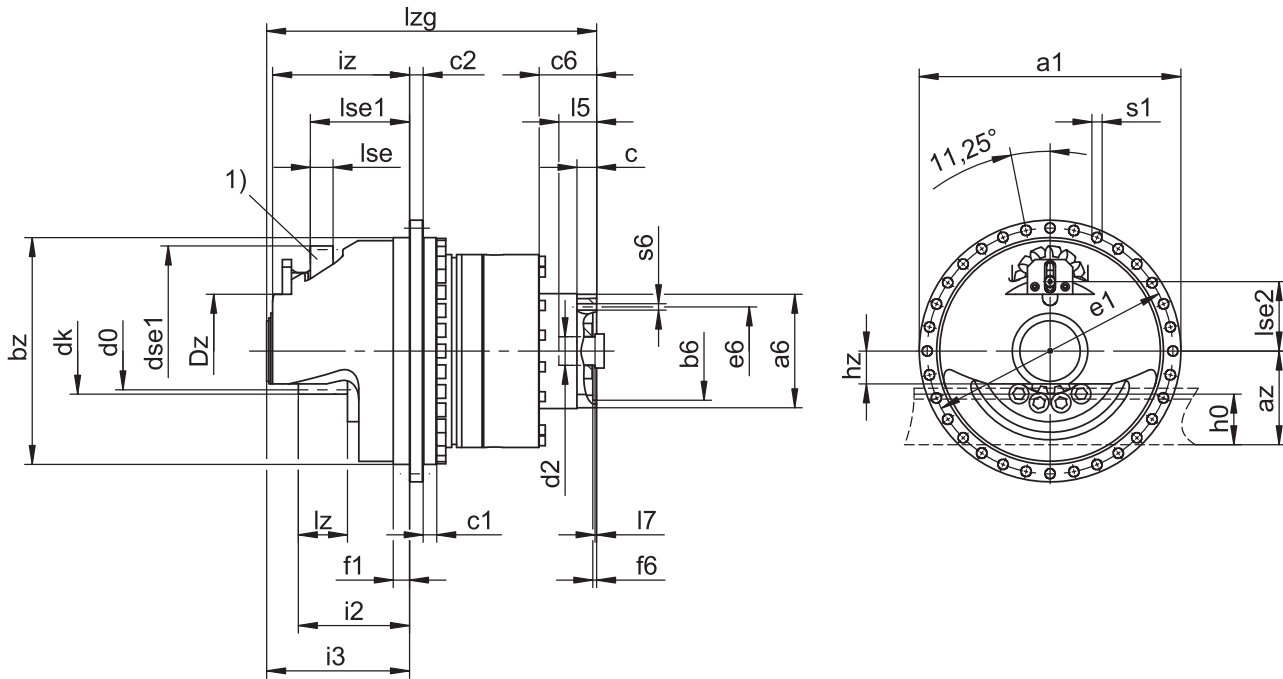
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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

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 <https://configurator.stoeber.de/en-US/>.



1) Felt gear for lubrication (option)

#### 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 <sub>h7</sub>	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
ZTRS620SPHV9_	6	346	106.66	300 <sub>h7</sub>	18	18	127.32	139.3	94.2	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 <sub>h7</sub>	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

#### Example dimensions for the motor connection + total length

Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZTRS5_PHV9_ME	130 <sup>H7</sup>	165	38	61	150	26	66	5.5	4.5	425.0	M10
ZTRS6_PHV9_ME	130 <sup>H7</sup>	165	38	61	150	26	66	5.5	4.5	435.0	M10
ZTRS8_PHV9_ME	130 <sup>H7</sup>	165	38	61	150	26	66	5.5	4.5	450.7	M10

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6, l5 and lzg are also lengthened accordingly.**

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

## 4.4 Type designation

This chapter shows you 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.

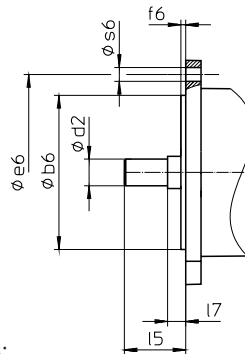
### Example code

Z	TRS	6	20	S	PHV	9	4	3	S	F	S	S	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 gear for lubrication
PHV	Type	Planetary gear unit
9	Size	9 (example)
4	Generation	Generation 4
3	Stages	Three-stage
S	Housing	Standard
F	Shaft	Flange shaft
S	Bearing	Standard bearing
S	Backlash	Standard
R		Reduced (PHV9)
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
MB <sup>1</sup>		ServoStop motor adapter with brake

To complete the type designation, also specify the following in your order:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOEBER Configurator at

<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

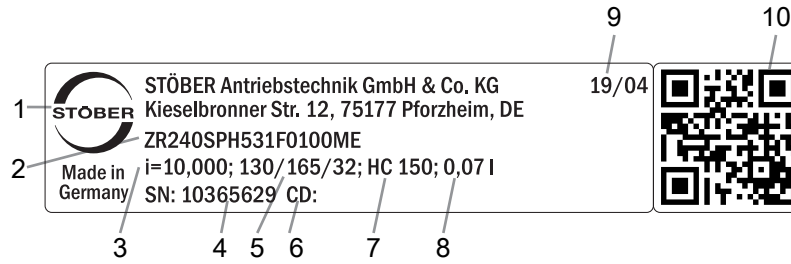
- Position of the gear rack, see the chapter [▶ 4.5.6]
- Radial shaft seal rings at the output made of NBR or FKM (option), see the chapter [▶ 4.6.3]
- Radial runout  $\leq 10 \mu\text{m}$  (optional)
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request
- Double seal for motor adapter (option)
- Socket wrench insert for mounting the motor on the gear unit using the ME/MEL motor adapter (optional)

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 [▶ 4.5.1].

<sup>1</sup>You can find more details in the catalog for ServoStop servo gear unit with brake ID 443234.

### 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>

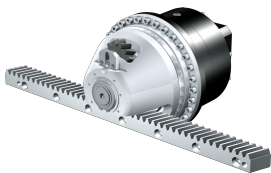
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 4.5 Product description

### 4.5.1 Input options

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

Motor adapter



Catalog ID 443137\_en

EZ synchronous servo motor



Catalog ID 443286\_en

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 4.5.2 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 clamp coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- Error-free, thanks to exact centering of the motor
- For reduced backlash, the motor shaft bearing must have an axially backlash-free design

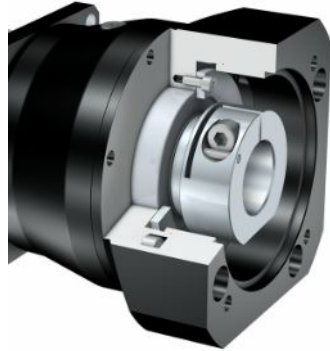


Fig. 1: EasyAdapt coupling

## 4.5.3 Gear rack

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

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 the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing_{bz}$ . The machine-side fit must be H7.

## 4.5.5 Lubricants

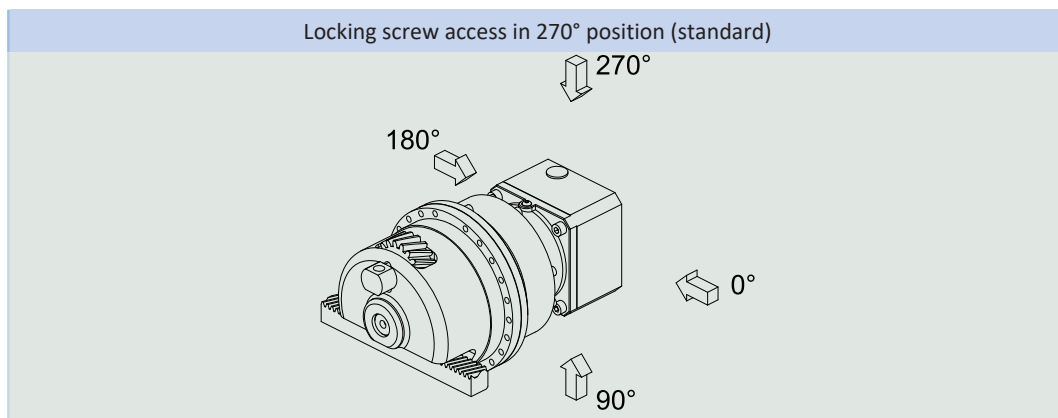
STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

You will receive lubricants for use in the food industry upon request.

### 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 hole 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 order.

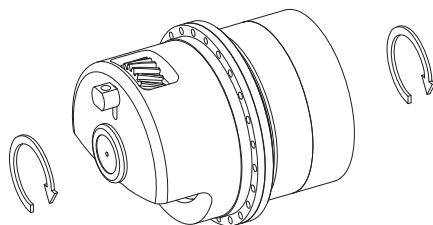
Note that the access hole for the motor coupling locking screw also rotates when the gear rack is rotated to another position.

### 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: <sup>2</sup>	
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. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

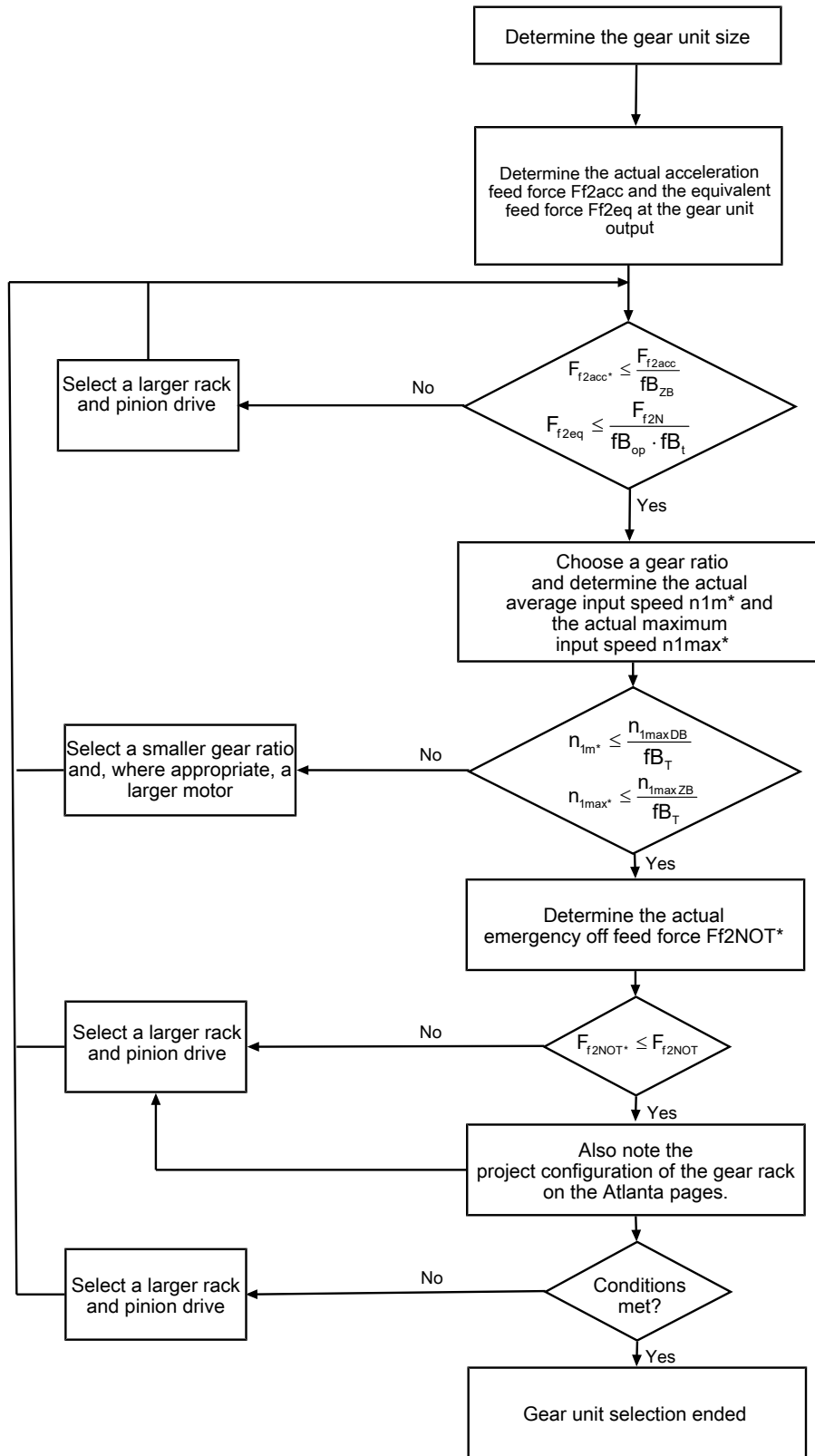
The formula symbols for values actually present in the application are marked with \*.

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

<sup>2</sup>Observe the protection class of all the components.



### 4.6.1 Drive selection

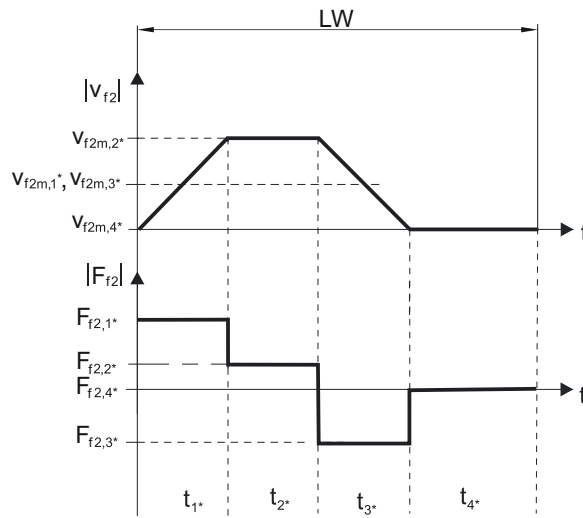


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{zB}$  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**

$$n_{im}^* = \frac{v_{f2m}^* \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m}^* = \frac{|v_{f2m,1}^*| \cdot t_1^* + \dots + |v_{f2m,n}^*| \cdot t_n^*}{t_1^* + \dots + t_n^*}$$

If \$t\_1^\* + \dots + t\_3^\* \ge 6\$ min, determine \$v\_{2m}^\*\$ without the rest phase \$t\_4^\*\$.

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**

$$F_{f2eq}^* = \sqrt[3]{\frac{|v_{f2m,1}^*| \cdot t_1^* \cdot |F_{f2,1}^*|^3 + \dots + |v_{f2m,n}^*| \cdot t_n^* \cdot |F_{f2,n}^*|^3}{|v_{f2m,1}^*| \cdot t_1^* + \dots + |v_{f2m,n}^*| \cdot t_n^*}}$$

**Operating factors**

<b>Operating mode</b>	<b>\$fB_{op}\$</b>
Uniform continuous operation	1.00
Cyclic operation	1.00
Reversing load cyclic operation	1.00
<b>Run time</b>	<b>\$fB_t\$</b>
Daily runtime \$\le 8\$ h	1.00
Daily runtime \$\le 16\$ h	1.15
Daily runtime \$\le 24\$ h	1.20
<b>Cyclic operation</b>	<b>\$fB_{zB}\$</b>
\$\le 1000\$ load changes/hour (LW/h)	1.00
\$> 1000\$ load changes/hour (LW/h)	1.15

Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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**

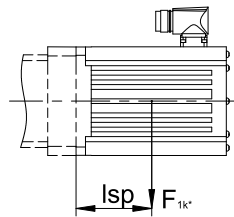
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

## 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:

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



Type	$M_{1k}$ [Nm]
PHV943_ME	200
PHV1043_ME	400

The values also apply to the MEL motor adapter.

## 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 in 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 leaks. 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/downloads/>

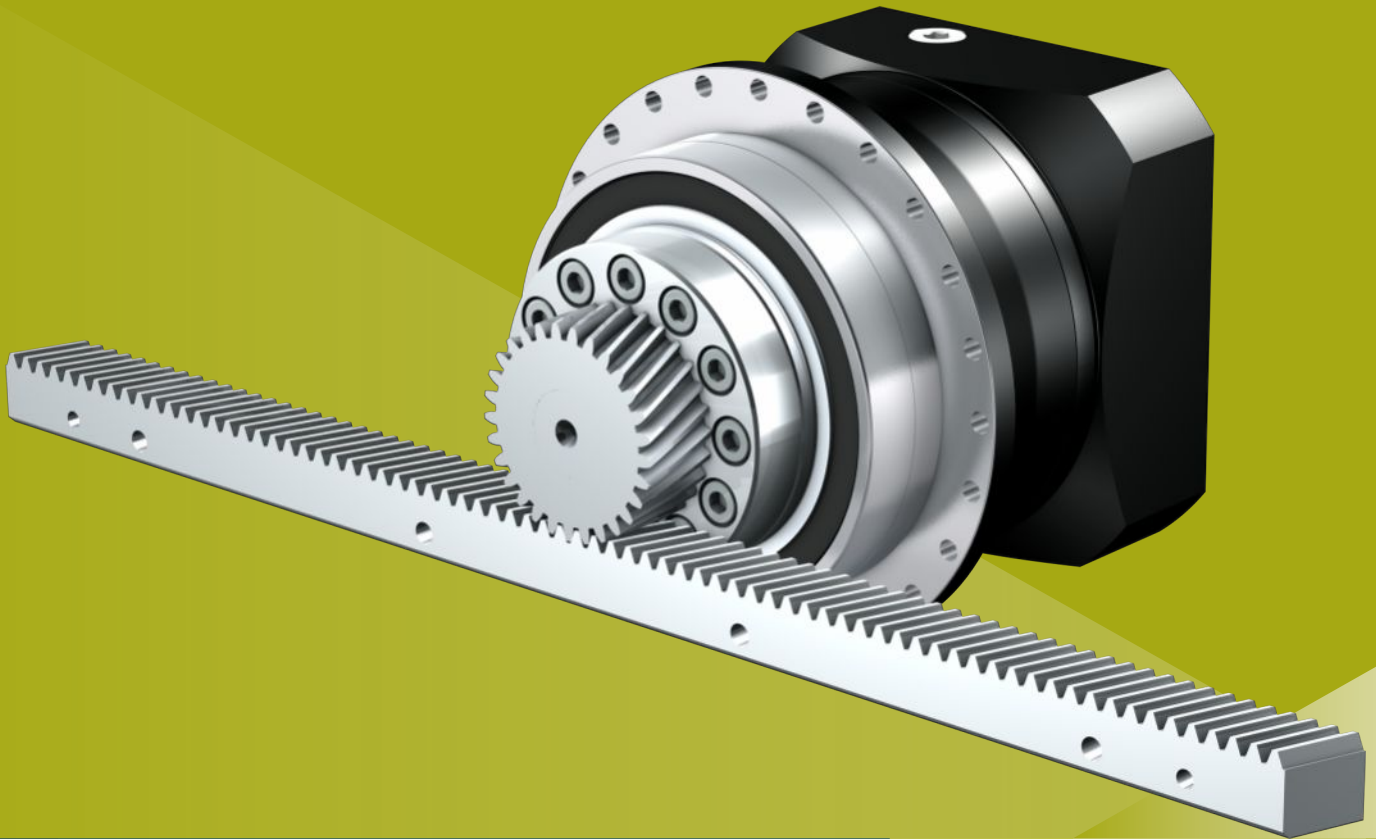
Enter the ID of the documentation in the Search term field.

Documentation	ID
Operating manual gear units, geared motors PHV94 – PHV104	443355_en
Operating manual for gear racks (Atlanta)	442455

# 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 $\leq 10 \mu\text{m}$ (optional)	✓
Reinforced output bearing (PH3 – PH5)	✓ (optional)

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

#### Technical data

$m_n$	2 – 6 mm
$z$	12 – 32
$F_{f2acc}$	6.5 – 67 kN
$v_{f2maxZB}$	0.11 – 4.7 m/s
$\Delta s$	4 – 44 $\mu\text{m}$

## 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 [▶ 5.5.4](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For rack and pinion drives with reduced backlash or reinforced bearings (PH3 – PH5), higher feed forces are possible. For this and all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

i	Type	$n_{1\max DB}$ [rpm]	$n_{1\max ZB}$ [rpm]	$d_{MW}$ [mm]	$v_{f2\max ZB}$ [m/s]	$\Delta s$ [μm]	$\Delta s_{red}$ [μm]	$C_{lin}$ [N/μm]	$m_n$ [mm]	z	$d_0$ [mm]	$F_{f2N}$ [kN]	$F_{f2acc}$ [kN]	$F_{f2NOT}$ [kN]	$M_{2acc}$ [Nm]
<b>ZTR2PH4 (<math>F_{f2acc,max} = 6,7</math> kN)</b>															
4.000	ZTR212SPH431_0040 ME	2600	5000	≤24	1.67	11	4	98	2	12	25.5	2.3	6.7	11	85
4.000	ZTR212SPH431_0040 MEL	2600	5000	≤32	1.67	11	4	98	2	12	25.5	2.3	6.7	11	85
4.000	ZTR216SPH431_0040 ME	2600	5000	≤24	2.22	15	5	93	2	16	34.0	2.3	6.7	9.2	114
4.000	ZTR216SPH431_0040 MEL	2600	5000	≤32	2.22	15	5	93	2	16	34.0	2.3	6.7	9.2	114
5.000	ZTR212SPH431_0050 ME	3000	6000	≤24	1.60	11	4	98	2	12	25.5	2.4	6.7	11	85
5.000	ZTR212SPH431_0050 MEL	3000	6000	≤32	1.60	11	4	98	2	12	25.5	2.4	6.7	11	85
5.000	ZTR216SPH431_0050 ME	3000	6000	≤24	2.13	15	5	92	2	16	34.0	2.4	6.7	9.2	114
5.000	ZTR216SPH431_0050 MEL	3000	6000	≤32	2.13	15	5	92	2	16	34.0	2.4	6.7	9.2	114
7.000	ZTR212SPH431_0070 ME	3200	6000	≤24	1.14	11	4	96	2	12	25.5	2.7	6.7	11	85
7.000	ZTR212SPH431_0070 MEL	3200	6000	≤32	1.14	11	4	96	2	12	25.5	2.7	6.7	11	85
7.000	ZTR216SPH431_0070 ME	3200	6000	≤24	1.52	15	5	89	2	16	34.0	2.7	6.7	9.2	114
7.000	ZTR216SPH431_0070 MEL	3200	6000	≤32	1.52	15	5	89	2	16	34.0	2.7	6.7	9.2	114
10.00	ZTR212SPH431_0100 ME	3500	7000	≤24	0.93	11	4	90	2	12	25.5	3.1	6.7	11	85
10.00	ZTR212SPH431_0100 MEL	3500	7000	≤32	0.93	11	4	90	2	12	25.5	3.1	6.7	11	85
10.00	ZTR216SPH431_0100 ME	3500	7000	≤24	1.24	15	5	81	2	16	34.0	3.1	6.7	9.2	114
10.00	ZTR216SPH431_0100 MEL	3500	7000	≤32	1.24	15	5	81	2	16	34.0	3.1	6.7	9.2	114
16.00	ZTR212SPH432_0160 ME	4000	8000	≤19	0.67	11	4	96	2	12	25.5	3.6	6.7	11	85
16.00	ZTR212SPH432_0160 MEL	4000	8000	≤24	0.67	11	4	96	2	12	25.5	3.6	6.7	11	85
16.00	ZTR216SPH432_0160 ME	4000	8000	≤19	0.89	15	5	89	2	16	34.0	3.6	6.7	9.2	114
16.00	ZTR216SPH432_0160 MEL	4000	8000	≤24	0.89	15	5	89	2	16	34.0	3.6	6.7	9.2	114
20.00	ZTR212SPH432_0200 ME	4000	8000	≤19	0.53	11	4	96	2	12	25.5	3.9	6.7	11	85
20.00	ZTR212SPH432_0200 MEL	4000	8000	≤24	0.53	11	4	96	2	12	25.5	3.9	6.7	11	85
20.00	ZTR216SPH432_0200 ME	4000	8000	≤19	0.71	15	5	90	2	16	34.0	3.9	6.7	9.2	114
20.00	ZTR216SPH432_0200 MEL	4000	8000	≤24	0.71	15	5	90	2	16	34.0	3.9	6.7	9.2	114
25.00	ZTR212SPH432_0250 ME	4500	8000	≤19	0.43	11	4	97	2	12	25.5	4.2	6.7	11	85
25.00	ZTR212SPH432_0250 MEL	4500	8000	≤24	0.43	11	4	97	2	12	25.5	4.2	6.7	11	85
25.00	ZTR216SPH432_0250 ME	4500	8000	≤19	0.57	15	5	91	2	16	34.0	4.2	6.7	9.2	114
25.00	ZTR216SPH432_0250 MEL	4500	8000	≤24	0.57	15	5	91	2	16	34.0	4.2	6.7	9.2	114
28.00	ZTR212SPH432_0280 ME	4500	8000	≤19	0.38	11	4	96	2	12	25.5	4.2	6.7	11	85
28.00	ZTR212SPH432_0280 MEL	4500	8000	≤24	0.38	11	4	96	2	12	25.5	4.2	6.7	11	85
28.00	ZTR216SPH432_0280 ME	4500	8000	≤19	0.51	15	5	90	2	16	34.0	4.2	6.7	9.2	114
28.00	ZTR216SPH432_0280 MEL	4500	8000	≤24	0.51	15	5	90	2	16	34.0	4.2	6.7	9.2	114
35.00	ZTR212SPH432_0350 ME	4500	8000	≤19	0.31	11	4	97	2	12	25.5	4.2	6.7	11	85
35.00	ZTR212SPH432_0350 MEL	4500	8000	≤24	0.31	11	4	97	2	12	25.5	4.2	6.7	11	85
35.00	ZTR216SPH432_0350 ME	4500	8000	≤19	0.41	15	5	90	2	16	34.0	4.2	6.7	9.2	114
35.00	ZTR216SPH432_0350 MEL	4500	8000	≤24	0.41	15	5	90	2	16	34.0	4.2	6.7	9.2	114
40.00	ZTR212SPH432_0400 ME	4500	8000	≤19	0.27	11	4	96	2	12	25.5	4.2	6.7	11	85
40.00	ZTR212SPH432_0400 MEL	4500	8000	≤24	0.27	11	4	96	2	12	25.5	4.2	6.7	11	85
40.00	ZTR216SPH432_0400 ME	4500	8000	≤19	0.36	15	5	89	2	16	34.0	4.2	6.7	9.2	114
40.00	ZTR216SPH432_0400 MEL	4500	8000	≤24	0.36	15	5	89	2	16	34.0	4.2	6.7	9.2	114
50.00	ZTR212SPH432_0500 ME	4500	8000	≤19	0.21	11	4	96	2	12	25.5	4.2	6.7	11	85
50.00	ZTR212SPH432_0500 MEL	4500	8000	≤24	0.21	11	4	96	2	12	25.5	4.2	6.7	11	85
50.00	ZTR216SPH432_0500 ME	4500	8000	≤19	0.28	15	5	90	2	16	34.0	4.2	6.7	9.2	114
50.00	ZTR216SPH432_0500 MEL	4500	8000	≤24	0.28	15	5	90	2	16	34.0	4.2	6.7	9.2	114
70.00	ZTR212SPH432_0700 ME	4500	8000	≤19	0.15	11	4	94	2	12	25.5	4.2	6.7	11	85
70.00	ZTR212SPH432_0700 MEL	4500	8000	≤24	0.15	11	4	94	2	12	25.5	4.2	6.7	11	85
70.00	ZTR216SPH432_0700 ME	4500	8000	≤19	0.20	15	5	87	2	16	34.0	4.2	6.7	9.2	114
70.00	ZTR216SPH432_0700 MEL	4500	8000	≤24	0.20	15	5	87	2	16	34.0	4.2	6.7	9.2	114
100.0	ZTR212SPH432_1000 ME	4500	8000	≤19	0.11	11	4	89	2	12	25.5	4.2	6.7	11	85
100.0	ZTR212SPH432_1000 MEL	4500	8000	≤24	0.11	11	4	89	2	12	25.5	4.2	6.7	11	85

5.2 Selection tables 5 ZTRPH rack and pinion drives

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{f2maxZB}$	$\Delta s$	$\Delta s_{red}$	$C_{lin}$	$m_n$	z	$d_0$	$F_{f2N}$	$F_{f2acc}$	$F_{f2NOT}$	$M_{2acc}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu$ m]	[ $\mu$ m]	[N/ $\mu$ m]	[mm]						
<b>ZTR2PH4 (<math>F_{f2acc,max} = 6,7</math> kN)</b>															
100.0	ZTR216SPH432_1000 ME	4500	8000	$\leq 19$	0.14	15	5	79	2	16	34.0	4.2	6.5	9.2	110
100.0	ZTR216SPH432_1000 MEL	4500	8000	$\leq 24$	0.14	15	5	79	2	16	34.0	4.2	6.5	9.2	110
<b>ZTR2PH5 (<math>F_{f2acc,max} = 11</math> kN)</b>															
4.000	ZTR219SPH531_0040 ME	2200	5000	$\leq 32$	2.64	18	6	94	2	19	40.3	3.3	10	15	210
4.000	ZTR219SPH531_0040 MEL	2200	5000	$\leq 38$	2.64	18	6	94	2	19	40.3	3.3	10	15	210
4.000	ZTR223SPH531_0040 ME	2200	5000	$\leq 32$	3.19	21	7	91	2	23	48.8	3.3	11	14	259
4.000	ZTR223SPH531_0040 MEL	2200	5000	$\leq 38$	3.19	21	7	91	2	23	48.8	3.3	11	14	259
5.000	ZTR219SPH531_0050 ME	2500	5500	$\leq 32$	2.32	18	6	94	2	19	40.3	3.6	10	15	210
5.000	ZTR219SPH531_0050 MEL	2500	5500	$\leq 38$	2.32	18	6	94	2	19	40.3	3.6	10	15	210
5.000	ZTR223SPH531_0050 ME	2500	5500	$\leq 32$	2.81	21	7	91	2	23	48.8	3.6	11	14	259
5.000	ZTR223SPH531_0050 MEL	2500	5500	$\leq 38$	2.81	21	7	91	2	23	48.8	3.6	11	14	259
7.000	ZTR219SPH531_0070 ME	3000	6000	$\leq 32$	1.81	18	6	92	2	19	40.3	4.0	10	15	210
7.000	ZTR219SPH531_0070 MEL	3000	6000	$\leq 38$	1.81	18	6	92	2	19	40.3	4.0	10	15	210
7.000	ZTR223SPH531_0070 ME	3000	6000	$\leq 32$	2.19	21	7	87	2	23	48.8	4.0	11	14	259
7.000	ZTR223SPH531_0070 MEL	3000	6000	$\leq 38$	2.19	21	7	87	2	23	48.8	4.0	11	14	259
10.000	ZTR219SPH531_0100 ME	3300	6500	$\leq 32$	1.37	18	6	87	2	19	40.3	4.5	10	15	210
10.000	ZTR219SPH531_0100 MEL	3300	6500	$\leq 38$	1.37	18	6	87	2	19	40.3	4.5	10	15	210
10.000	ZTR223SPH531_0100 ME	3300	6500	$\leq 32$	1.66	21	7	81	2	23	48.8	4.5	11	14	259
10.000	ZTR223SPH531_0100 MEL	3300	6500	$\leq 38$	1.66	21	7	81	2	23	48.8	4.5	11	14	259
16.000	ZTR219SPH532_0160 ME	3500	7000	$\leq 24$	0.92	18	6	93	2	19	40.3	5.3	10	15	210
16.000	ZTR219SPH532_0160 MEL	3500	7000	$\leq 32$	0.92	18	6	93	2	19	40.3	5.3	10	15	210
16.000	ZTR223SPH532_0160 ME	3500	7000	$\leq 24$	1.12	21	7	89	2	23	48.8	5.3	11	14	259
16.000	ZTR223SPH532_0160 MEL	3500	7000	$\leq 32$	1.12	21	7	89	2	23	48.8	5.3	11	14	259
20.000	ZTR219SPH532_0200 ME	3500	7000	$\leq 24$	0.74	18	6	93	2	19	40.3	5.7	10	15	210
20.000	ZTR219SPH532_0200 MEL	3500	7000	$\leq 32$	0.74	18	6	93	2	19	40.3	5.7	10	15	210
20.000	ZTR223SPH532_0200 ME	3500	7000	$\leq 24$	0.89	21	7	90	2	23	48.8	5.7	11	14	259
20.000	ZTR223SPH532_0200 MEL	3500	7000	$\leq 32$	0.89	21	7	90	2	23	48.8	5.7	11	14	259
25.000	ZTR219SPH532_0250 ME	3700	7500	$\leq 24$	0.63	18	6	93	2	19	40.3	6.1	10	15	210
25.000	ZTR219SPH532_0250 MEL	3700	7500	$\leq 32$	0.63	18	6	93	2	19	40.3	6.1	10	15	210
25.000	ZTR223SPH532_0250 ME	3700	7500	$\leq 24$	0.77	21	7	89	2	23	48.8	6.1	11	14	259
25.000	ZTR223SPH532_0250 MEL	3700	7500	$\leq 32$	0.77	21	7	89	2	23	48.8	6.1	11	14	259
28.000	ZTR219SPH532_0280 ME	4000	8000	$\leq 24$	0.60	18	6	92	2	19	40.3	6.1	10	15	210
28.000	ZTR219SPH532_0280 MEL	4000	8000	$\leq 32$	0.60	18	6	92	2	19	40.3	6.1	10	15	210
28.000	ZTR223SPH532_0280 ME	4000	8000	$\leq 24$	0.73	21	7	88	2	23	48.8	6.1	11	14	259
28.000	ZTR223SPH532_0280 MEL	4000	8000	$\leq 32$	0.73	21	7	88	2	23	48.8	6.1	11	14	259
35.000	ZTR219SPH532_0350 ME	4000	8000	$\leq 24$	0.48	18	6	93	2	19	40.3	6.1	10	15	210
35.000	ZTR219SPH532_0350 MEL	4000	8000	$\leq 32$	0.48	18	6	93	2	19	40.3	6.1	10	15	210
35.000	ZTR223SPH532_0350 ME	4000	8000	$\leq 24$	0.58	21	7	89	2	23	48.8	6.1	11	14	259
35.000	ZTR223SPH532_0350 MEL	4000	8000	$\leq 32$	0.58	21	7	89	2	23	48.8	6.1	11	14	259
40.000	ZTR219SPH532_0400 ME	4000	8000	$\leq 24$	0.42	18	6	92	2	19	40.3	6.1	10	15	210
40.000	ZTR219SPH532_0400 MEL	4000	8000	$\leq 32$	0.42	18	6	92	2	19	40.3	6.1	10	15	210
40.000	ZTR223SPH532_0400 ME	4000	8000	$\leq 24$	0.51	21	7	87	2	23	48.8	6.1	11	14	259
40.000	ZTR223SPH532_0400 MEL	4000	8000	$\leq 32$	0.51	21	7	87	2	23	48.8	6.1	11	14	259
50.000	ZTR219SPH532_0500 ME	4000	8000	$\leq 24$	0.34	18	6	92	2	19	40.3	6.1	10	15	210
50.000	ZTR219SPH532_0500 MEL	4000	8000	$\leq 32$	0.34	18	6	92	2	19	40.3	6.1	10	15	210
50.000	ZTR223SPH532_0500 ME	4000	8000	$\leq 24$	0.41	21	7	88	2	23	48.8	6.1	11	14	259
50.000	ZTR223SPH532_0500 MEL	4000	8000	$\leq 32$	0.41	21	7	88	2	23	48.8	6.1	11	14	259
70.000	ZTR219SPH532_0700 ME	4000	8000	$\leq 24$	0.24	18	6	91	2	19	40.3	6.1	10	15	210
70.000	ZTR219SPH532_0700 MEL	4000	8000	$\leq 32$	0.24	18	6	91	2	19	40.3	6.1	10	15	210
70.000	ZTR223SPH532_0700 ME	4000	8000	$\leq 24$	0.29	21	7	86	2	23	48.8	6.1	11	14	259
70.000	ZTR223SPH532_0700 MEL	4000	8000	$\leq 32$	0.29	21	7	86	2	23	48.8	6.1	11	14	259
100.0	ZTR219SPH532_1000 ME	4000	8000	$\leq 24$	0.17	18	6	86	2	19	40.3	6.1	10	15	210
100.0	ZTR219SPH532_1000 MEL	4000	8000	$\leq 32$	0.17	18	6	86	2	19	40.3	6.1	10	15	210
100.0	ZTR223SPH532_1000 ME	4000	8000	$\leq 24$	0.20	21	7	80	2	23	48.8	6.1	11	14	259
100.0	ZTR223SPH532_1000 MEL	4000	8000	$\leq 32$	0.20	21	7	80	2	23	48.8	6.1	11	14	259
<b>ZTR3PH5 (<math>F_{f2acc,max} = 9,9</math> kN)</b>															
4.000	ZTR314SPH531_0040 ME	2200	5000	$\leq 32$	2.92	19	6	88	3	14	44.6	3.3	9.9	14	221
4.000	ZTR314SPH531_0040 MEL	2200	5000	$\leq 38$	2.92	19	6	88	3	14	44.6	3.3	9.9	14	221
5.000	ZTR314SPH531_0050 ME	2500	5500	$\leq 32$	2.57	19	6	88	3	14	44.6	3.5	9.9	14	221
5.000	ZTR314SPH531_0050 MEL	2500	5500	$\leq 38$	2.57	19	6	88	3	14	44.6	3.5	9.9	14	221
7.000	ZTR314SPH531_0070 ME	3000	6000	$\leq 32$	2.00	19	6	85	3	14	44.6	3.9	9.9	14	221
7.000	ZTR314SPH531_0070 MEL	3000	6000	$\leq 38$	2.00	19	6	85	3	14	44.6	3.9	9.9	14	221
10.000	ZTR314SPH531_0100 ME	3300	6500	$\leq 32$	1.52	19	6	80	3	14	44.6	4.4	9.9	14	221
10.000	ZTR314SPH531_0100 MEL	3300	6500	$\leq 38$	1.52	19	6	80	3	14	44.6	4.4	9.9	14	221
16.000	ZTR314SPH532_0160 ME	3500	7000	$\leq 24$	1.02	19	6	87	3	14	44.6	5.2	9.9	14	221
16.000	ZTR314SPH532_0160 MEL	3500	7000	$\leq 32$	1.02	19	6	87	3	14	44.6	5.2	9.9	14	221



i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{f2maxZB}$	$\Delta s$	$\Delta s_{red}$	$C_{lin}$	$m_n$	z	$d_0$	$F_{f2N}$	$F_{f2acc}$	$F_{f2NOT}$	$M_{2acc}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu$ m]	[ $\mu$ m]	[N/ $\mu$ m]	[mm]		[mm]	[kN]	[kN]	[kN]	[Nm]
<b>ZTR3PH5 (<math>F_{f2acc,max} = 9,9</math> kN)</b>															
20.00	ZTR314SPH532_0200 ME	3500	7000	≤24	0.82	19	6	87	3	14	44.6	5.6	9.9	14	221
20.00	ZTR314SPH532_0200 MEL	3500	7000	≤32	0.82	19	6	87	3	14	44.6	5.6	9.9	14	221
25.00	ZTR314SPH532_0250 ME	3700	7500	≤24	0.70	19	6	87	3	14	44.6	6.0	9.9	14	221
25.00	ZTR314SPH532_0250 MEL	3700	7500	≤32	0.70	19	6	87	3	14	44.6	6.0	9.9	14	221
28.00	ZTR314SPH532_0280 ME	4000	8000	≤24	0.67	19	6	86	3	14	44.6	6.0	9.9	14	221
28.00	ZTR314SPH532_0280 MEL	4000	8000	≤32	0.67	19	6	86	3	14	44.6	6.0	9.9	14	221
35.00	ZTR314SPH532_0350 ME	4000	8000	≤24	0.53	19	6	87	3	14	44.6	6.0	9.9	14	221
35.00	ZTR314SPH532_0350 MEL	4000	8000	≤32	0.53	19	6	87	3	14	44.6	6.0	9.9	14	221
40.00	ZTR314SPH532_0400 ME	4000	8000	≤24	0.47	19	6	85	3	14	44.6	6.0	9.9	14	221
40.00	ZTR314SPH532_0400 MEL	4000	8000	≤32	0.47	19	6	85	3	14	44.6	6.0	9.9	14	221
50.00	ZTR314SPH532_0500 ME	4000	8000	≤24	0.37	19	6	86	3	14	44.6	6.0	9.9	14	221
50.00	ZTR314SPH532_0500 MEL	4000	8000	≤32	0.37	19	6	86	3	14	44.6	6.0	9.9	14	221
70.00	ZTR314SPH532_0700 ME	4000	8000	≤24	0.27	19	6	84	3	14	44.6	6.0	9.9	14	221
70.00	ZTR314SPH532_0700 MEL	4000	8000	≤32	0.27	19	6	84	3	14	44.6	6.0	9.9	14	221
100.0	ZTR314SPH532_1000 ME	4000	8000	≤24	0.19	19	6	80	3	14	44.6	6.0	9.9	14	221
100.0	ZTR314SPH532_1000 MEL	4000	8000	≤32	0.19	19	6	80	3	14	44.6	6.0	9.9	14	221
<b>ZTR2PH7 (<math>F_{f2acc,max} = 15</math> kN)</b>															
4.000	ZTR223SPH731_0040 ME	1900	4000	≤38	2.56	21	7	119	2	23	48.8	8.7	15	29	356
4.000	ZTR223SPH731_0040 MEL	1900	4000	≤48	2.56	21	7	120	2	23	48.8	8.7	15	29	356
5.000	ZTR223SPH731_0050 ME	2200	5000	≤38	2.56	21	7	118	2	23	48.8	9.4	15	29	356
5.000	ZTR223SPH731_0050 MEL	2200	5000	≤48	2.56	21	7	119	2	23	48.8	9.4	15	29	356
7.000	ZTR223SPH731_0070 ME	2500	5000	≤38	1.83	21	7	116	2	23	48.8	10	15	29	356
7.000	ZTR223SPH731_0070 MEL	2500	5000	≤48	1.83	21	7	116	2	23	48.8	10	15	29	356
10.00	ZTR223SPH731_0100 ME	2500	5000	≤38	1.28	21	7	112	2	23	48.8	12	15	29	356
10.00	ZTR223SPH731_0100 MEL	2500	5000	≤48	1.28	21	7	112	2	23	48.8	12	15	29	356
16.00	ZTR223SPH732_0160 ME	3000	6000	≤32	0.96	21	7	119	2	23	48.8	14	15	29	356
16.00	ZTR223SPH732_0160 MEL	3000	6000	≤38	0.96	21	7	119	2	23	48.8	14	15	29	356
20.00	ZTR223SPH732_0200 ME	3000	6000	≤32	0.77	21	7	118	2	23	48.8	15	15	29	356
20.00	ZTR223SPH732_0200 MEL	3000	6000	≤38	0.77	21	7	118	2	23	48.8	15	15	29	356
25.00	ZTR223SPH732_0250 ME	3500	7000	≤32	0.72	21	7	118	2	23	48.8	15	15	29	356
25.00	ZTR223SPH732_0250 MEL	3500	7000	≤38	0.72	21	7	118	2	23	48.8	15	15	29	356
28.00	ZTR223SPH732_0280 ME	3700	7000	≤32	0.64	21	7	118	2	23	48.8	15	15	29	356
28.00	ZTR223SPH732_0280 MEL	3700	7000	≤38	0.64	21	7	118	2	23	48.8	15	15	29	356
35.00	ZTR223SPH732_0350 ME	3700	7000	≤32	0.51	21	7	118	2	23	48.8	15	15	29	356
35.00	ZTR223SPH732_0350 MEL	3700	7000	≤38	0.51	21	7	118	2	23	48.8	15	15	29	356
40.00	ZTR223SPH732_0400 ME	3700	7000	≤32	0.45	21	7	118	2	23	48.8	15	15	29	356
40.00	ZTR223SPH732_0400 MEL	3700	7000	≤38	0.45	21	7	118	2	23	48.8	15	15	29	356
50.00	ZTR223SPH732_0500 ME	3700	7000	≤32	0.36	21	7	117	2	23	48.8	15	15	29	356
50.00	ZTR223SPH732_0500 MEL	3700	7000	≤38	0.36	21	7	117	2	23	48.8	15	15	29	356
70.00	ZTR223SPH732_0700 ME	3700	7000	≤32	0.26	21	7	115	2	23	48.8	15	15	29	356
70.00	ZTR223SPH732_0700 MEL	3700	7000	≤38	0.26	21	7	115	2	23	48.8	15	15	29	356
100.0	ZTR223SPH732_1000 ME	3700	7000	≤32	0.18	21	7	111	2	23	48.8	15	15	29	356
100.0	ZTR223SPH732_1000 MEL	3700	7000	≤38	0.18	21	7	111	2	23	48.8	15	15	29	356
<b>ZTR3PH7 (<math>F_{f2acc,max} = 19</math> kN)</b>															
4.000	ZTR316SPH731_0040 ME	1900	4000	≤38	2.67	22	7	118	3	16	50.9	8.5	17	30	446
4.000	ZTR316SPH731_0040 MEL	1900	4000	≤48	2.67	22	7	119	3	16	50.9	8.5	17	30	446
4.000	ZTR319SPH731_0040 ME	1900	4000	≤38	3.17	26	9	115	3	19	60.5	8.5	19	26	565
4.000	ZTR319SPH731_0040 MEL	1900	4000	≤48	3.17	26	9	116	3	19	60.5	8.5	19	26	565
5.000	ZTR316SPH731_0050 ME	2200	5000	≤38	2.67	22	7	117	3	16	50.9	9.2	17	30	446
5.000	ZTR316SPH731_0050 MEL	2200	5000	≤48	2.67	22	7	118	3	16	50.9	9.2	17	30	446
5.000	ZTR319SPH731_0050 ME	2200	5000	≤38	3.17	26	9	113	3	19	60.5	9.1	19	26	565
5.000	ZTR319SPH731_0050 MEL	2200	5000	≤48	3.17	26	9	114	3	19	60.5	9.1	19	26	565
7.000	ZTR316SPH731_0070 ME	2500	5000	≤38	1.91	22	7	115	3	16	50.9	10	17	30	446
7.000	ZTR316SPH731_0070 MEL	2500	5000	≤48	1.91	22	7	115	3	16	50.9	10	17	30	446
7.000	ZTR319SPH731_0070 ME	2500	5000	≤38	2.26	26	9	110	3	19	60.5	10	19	26	565
7.000	ZTR319SPH731_0070 MEL	2500	5000	≤48	2.26	26	9	110	3	19	60.5	10	19	26	565
10.00	ZTR316SPH731_0100 ME	2500	5000	≤38	1.33	22	7	110	3	16	50.9	12	17	30	446
10.00	ZTR316SPH731_0100 MEL	2500	5000	≤48	1.33	22	7	110	3	16	50.9	12	17	30	446
10.00	ZTR319SPH731_0100 ME	2500	5000	≤38	1.58	26	9	104	3	19	60.5	12	19	26	565
10.00	ZTR319SPH731_0100 MEL	2500	5000	≤48	1.58	26	9	104	3	19	60.5	12	19	26	565
16.00	ZTR316SPH732_0160 ME	3000	6000	≤32	1.00	22	7	118	3	16	50.9	14	17	30	446
16.00	ZTR316SPH732_0160 MEL	3000	6000	≤38	1.00	22	7	118	3	16	50.9	14	17	30	446
16.00	ZTR319SPH732_0160 ME	3000	6000	≤32	1.19	26	9	114	3	19	60.5	13	19	26	565
16.00	ZTR319SPH732_0160 MEL	3000	6000	≤38	1.19	26	9	114	3	19	60.5	13	19	26	565
20.00	ZTR316SPH732_0200 ME	3000	6000	≤32	0.80	22	7	117	3	16	50.9	15	17	30	446
20.00	ZTR316SPH732_0200 MEL	3000	6000	≤38	0.80	22	7	117	3	16	50.9	15	17	30	446

5.2 Selection tables 5 ZTRPH rack and pinion drives

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{f2maxZB}$	$\Delta s$	$\Delta s_{red}$	$C_{lin}$	$m_n$	$z$	$d_0$	$F_{f2N}$	$F_{f2acc}$	$F_{f2NOT}$	$M_{2acc}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu m$ ]	[ $\mu m$ ]	[N/ $\mu m$ ]	[mm]		[mm]	[kN]	[kN]	[kN]	[Nm]
<b>ZTR3PH7 (<math>F_{f2acc,max} = 19</math> kN)</b>															
20.00	ZTR319SPH732_0200 ME	3000	6000	≤32	0.95	26	9	113	3	19	60.5	15	19	26	565
20.00	ZTR319SPH732_0200 MEL	3000	6000	≤38	0.95	26	9	113	3	19	60.5	15	19	26	565
25.00	ZTR316SPH732_0250 ME	3500	7000	≤32	0.75	22	7	117	3	16	50.9	16	17	30	446
25.00	ZTR316SPH732_0250 MEL	3500	7000	≤38	0.75	22	7	117	3	16	50.9	16	17	30	446
25.00	ZTR319SPH732_0250 ME	3500	7000	≤32	0.89	26	9	113	3	19	60.5	16	19	26	565
25.00	ZTR319SPH732_0250 MEL	3500	7000	≤38	0.89	26	9	113	3	19	60.5	16	19	26	565
28.00	ZTR316SPH732_0280 ME	3700	7000	≤32	0.67	22	7	117	3	16	50.9	16	17	30	446
28.00	ZTR316SPH732_0280 MEL	3700	7000	≤38	0.67	22	7	117	3	16	50.9	16	17	30	446
28.00	ZTR319SPH732_0280 ME	3700	7000	≤32	0.79	26	9	114	3	19	60.5	16	19	26	565
28.00	ZTR319SPH732_0280 MEL	3700	7000	≤38	0.79	26	9	114	3	19	60.5	16	19	26	565
35.00	ZTR316SPH732_0350 ME	3700	7000	≤32	0.53	22	7	117	3	16	50.9	16	17	30	446
35.00	ZTR316SPH732_0350 MEL	3700	7000	≤38	0.53	22	7	117	3	16	50.9	16	17	30	446
35.00	ZTR319SPH732_0350 ME	3700	7000	≤32	0.63	26	9	113	3	19	60.5	16	19	26	565
35.00	ZTR319SPH732_0350 MEL	3700	7000	≤38	0.63	26	9	113	3	19	60.5	16	19	26	565
40.00	ZTR316SPH732_0400 ME	3700	7000	≤32	0.47	22	7	116	3	16	50.9	16	17	30	446
40.00	ZTR316SPH732_0400 MEL	3700	7000	≤38	0.47	22	7	116	3	16	50.9	16	17	30	446
40.00	ZTR319SPH732_0400 ME	3700	7000	≤32	0.55	26	9	113	3	19	60.5	16	19	26	565
40.00	ZTR319SPH732_0400 MEL	3700	7000	≤38	0.55	26	9	113	3	19	60.5	16	19	26	565
50.00	ZTR316SPH732_0500 ME	3700	7000	≤32	0.37	22	7	116	3	16	50.9	16	17	30	446
50.00	ZTR316SPH732_0500 MEL	3700	7000	≤38	0.37	22	7	116	3	16	50.9	16	17	30	446
50.00	ZTR319SPH732_0500 ME	3700	7000	≤32	0.44	26	9	112	3	19	60.5	16	19	26	565
50.00	ZTR319SPH732_0500 MEL	3700	7000	≤38	0.44	26	9	112	3	19	60.5	16	19	26	565
70.00	ZTR316SPH732_0700 ME	3700	7000	≤32	0.27	22	7	114	3	16	50.9	16	17	30	446
70.00	ZTR316SPH732_0700 MEL	3700	7000	≤38	0.27	22	7	114	3	16	50.9	16	17	30	446
70.00	ZTR319SPH732_0700 ME	3700	7000	≤32	0.32	26	9	109	3	19	60.5	16	19	26	565
70.00	ZTR319SPH732_0700 MEL	3700	7000	≤38	0.32	26	9	109	3	19	60.5	16	19	26	565
100.0	ZTR316SPH732_1000 ME	3700	7000	≤32	0.19	22	7	110	3	16	50.9	16	17	30	446
100.0	ZTR316SPH732_1000 MEL	3700	7000	≤38	0.19	22	7	110	3	16	50.9	16	17	30	446
100.0	ZTR319SPH732_1000 ME	3700	7000	≤32	0.22	26	9	104	3	19	60.5	14	18	26	550
100.0	ZTR319SPH732_1000 MEL	3700	7000	≤38	0.22	26	9	104	3	19	60.5	14	18	26	550
<b>ZTR4PH7 (<math>F_{f2acc,max} = 18</math> kN)</b>															
4.000	ZTR412SPH731_0040 ME	1900	4000	≤38	2.67	22	7	114	4	12	50.9	8.2	18	28	459
4.000	ZTR412SPH731_0040 MEL	1900	4000	≤48	2.67	22	7	115	4	12	50.9	8.2	18	28	459
5.000	ZTR412SPH731_0050 ME	2200	5000	≤38	2.67	22	7	113	4	12	50.9	8.8	18	28	459
5.000	ZTR412SPH731_0050 MEL	2200	5000	≤48	2.67	22	7	114	4	12	50.9	8.8	18	28	459
7.000	ZTR412SPH731_0070 ME	2500	5000	≤38	1.91	22	7	111	4	12	50.9	9.9	18	28	459
7.000	ZTR412SPH731_0070 MEL	2500	5000	≤48	1.91	22	7	111	4	12	50.9	9.9	18	28	459
10.00	ZTR412SPH731_0100 ME	2500	5000	≤38	1.33	22	7	107	4	12	50.9	11	18	28	459
10.00	ZTR412SPH731_0100 MEL	2500	5000	≤48	1.33	22	7	107	4	12	50.9	11	18	28	459
16.00	ZTR412SPH732_0160 ME	3000	6000	≤32	1.00	22	7	114	4	12	50.9	13	18	28	459
16.00	ZTR412SPH732_0160 MEL	3000	6000	≤38	1.00	22	7	114	4	12	50.9	13	18	28	459
20.00	ZTR412SPH732_0200 ME	3000	6000	≤32	0.80	22	7	113	4	12	50.9	14	18	28	459
20.00	ZTR412SPH732_0200 MEL	3000	6000	≤38	0.80	22	7	113	4	12	50.9	14	18	28	459
25.00	ZTR412SPH732_0250 ME	3500	7000	≤32	0.75	22	7	113	4	12	50.9	15	18	28	459
25.00	ZTR412SPH732_0250 MEL	3500	7000	≤38	0.75	22	7	113	4	12	50.9	15	18	28	459
28.00	ZTR412SPH732_0280 ME	3700	7000	≤32	0.67	22	7	114	4	12	50.9	15	18	28	459
28.00	ZTR412SPH732_0280 MEL	3700	7000	≤38	0.67	22	7	114	4	12	50.9	15	18	28	459
35.00	ZTR412SPH732_0350 ME	3700	7000	≤32	0.53	22	7	113	4	12	50.9	15	18	28	459
35.00	ZTR412SPH732_0350 MEL	3700	7000	≤38	0.53	22	7	113	4	12	50.9	15	18	28	459
40.00	ZTR412SPH732_0400 ME	3700	7000	≤32	0.47	22	7	113	4	12	50.9	15	18	28	459
40.00	ZTR412SPH732_0400 MEL	3700	7000	≤38	0.47	22	7	113	4	12	50.9	15	18	28	459
50.00	ZTR412SPH732_0500 ME	3700	7000	≤32	0.37	22	7	112	4	12	50.9	15	18	28	459
50.00	ZTR412SPH732_0500 MEL	3700	7000	≤38	0.37	22	7	112	4	12	50.9	15	18	28	459
70.00	ZTR412SPH732_0700 ME	3700	7000	≤32	0.27	22	7	110	4	12	50.9	15	18	28	459
70.00	ZTR412SPH732_0700 MEL	3700	7000	≤38	0.27	22	7	110	4	12	50.9	15	18	28	459
100.0	ZTR412SPH732_1000 ME	3700	7000	≤32	0.19	22	7	107	4	12	50.9	15	18	28	459
100.0	ZTR412SPH732_1000 MEL	3700	7000	≤38	0.19	22	7	107	4	12	50.9	15	18	28	459
<b>ZTR3PH8 (<math>F_{f2acc,max} = 25</math> kN)</b>															
4.000	ZTR332SPH831_0040 ME	1400	3500	≤48	4.67	44	15	184	3	32	101.9	17	25	44	1294
4.000	ZTR332SPH831_0040 MEL	1400	3500	≤60	4.67	44	15	188	3	32	101.9	17	25	44	1294
5.000	ZTR332SPH831_0050 ME	1600	4000	≤48	4.27	44	15	186	3	32	101.9	21	25	44	1294
5.000	ZTR332SPH831_0050 MEL	1600	4000	≤60	4.27	44	15	188	3	32	101.9	21	25	44	1294
7.000	ZTR332SPH831_0070 ME	2000	4000	≤48	3.05	44	15	176	3	32	101.9	20	25	44	1294
7.000	ZTR332SPH831_0070 MEL	2000	4000	≤60	3.05	44	15	177	3	32	101.9	20	25	44	1294
10.00	ZTR332SPH831_0100 ME	2200	4000	≤48	2.13	44	15	161	3	32	101.9	17	25	44	1294
10.00	ZTR332SPH831_0100 MEL	2200	4000	≤60	2.13	44	15	162	3	32	101.9	17	25	44	1294

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{f2maxZB}$	$\Delta s$	$\Delta s_{red}$	$C_{lin}$	$m_n$	z	$d_0$	$F_{f2N}$	$F_{f2acc}$	$F_{f2NOT}$	$M_{2acc}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu m$ ]	[ $\mu m$ ]	[N/ $\mu m$ ]	[mm]		[mm]	[kN]	[kN]	[kN]	[Nm]
<b>ZTR3PH8 (<math>F_{f2acc,max} = 25</math> kN)</b>															
16.00	ZTR332SPH832_0160 ME	2500	4500	≤38	1.50	44	15	182	3	32	101.9	22	25	44	1294
16.00	ZTR332SPH832_0160 MEL	2500	4500	≤48	1.50	44	15	182	3	32	101.9	22	25	44	1294
20.00	ZTR332SPH832_0200 ME	2500	4500	≤38	1.20	44	15	184	3	32	101.9	25	25	44	1294
20.00	ZTR332SPH832_0200 MEL	2500	4500	≤48	1.20	44	15	185	3	32	101.9	25	25	44	1294
25.00	ZTR332SPH832_0250 ME	2700	5500	≤38	1.17	44	15	184	3	32	101.9	25	25	44	1294
25.00	ZTR332SPH832_0250 MEL	2700	5500	≤48	1.17	44	15	184	3	32	101.9	25	25	44	1294
28.00	ZTR332SPH832_0280 ME	3000	6000	≤38	1.14	44	15	180	3	32	101.9	22	25	44	1294
28.00	ZTR332SPH832_0280 MEL	3000	6000	≤48	1.14	44	15	180	3	32	101.9	22	25	44	1294
35.00	ZTR332SPH832_0350 ME	3000	6000	≤38	0.91	44	15	183	3	32	101.9	25	25	44	1294
35.00	ZTR332SPH832_0350 MEL	3000	6000	≤48	0.91	44	15	184	3	32	101.9	25	25	44	1294
40.00	ZTR332SPH832_0400 ME	3000	6000	≤38	0.80	44	15	177	3	32	101.9	22	25	44	1294
40.00	ZTR332SPH832_0400 MEL	3000	6000	≤48	0.80	44	15	177	3	32	101.9	22	25	44	1294
50.00	ZTR332SPH832_0500 ME	3000	6000	≤38	0.64	44	15	182	3	32	101.9	25	25	44	1294
50.00	ZTR332SPH832_0500 MEL	3000	6000	≤48	0.64	44	15	182	3	32	101.9	25	25	44	1294
70.00	ZTR332SPH832_0700 ME	3000	6000	≤38	0.46	44	15	174	3	32	101.9	25	25	44	1294
70.00	ZTR332SPH832_0700 MEL	3000	6000	≤48	0.46	44	15	174	3	32	101.9	25	25	44	1294
100.0	ZTR332SPH832_1000 ME	3000	6000	≤38	0.32	44	15	161	3	32	101.9	21	25	44	1294
100.0	ZTR332SPH832_1000 MEL	3000	6000	≤48	0.32	44	15	161	3	32	101.9	21	25	44	1294
<b>ZTR4PH8 (<math>F_{f2acc,max} = 36</math> kN)</b>															
4.000	ZTR417SPH831_0040 ME	1400	3500	≤48	3.31	31	10	217	4	17	72.2	20	35	55	1263
4.000	ZTR417SPH831_0040 MEL	1400	3500	≤60	3.31	31	10	220	4	17	72.2	20	35	55	1263
4.000	ZTR420SPH831_0040 ME	1400	3500	≤48	3.89	37	12	207	4	20	84.9	20	36	50	1511
4.000	ZTR420SPH831_0040 MEL	1400	3500	≤60	3.89	37	12	210	4	20	84.9	20	36	50	1511
5.000	ZTR417SPH831_0050 ME	1600	4000	≤48	3.02	31	10	218	4	17	72.2	21	35	55	1263
5.000	ZTR417SPH831_0050 MEL	1600	4000	≤60	3.02	31	10	220	4	17	72.2	21	35	55	1263
5.000	ZTR420SPH831_0050 ME	1600	4000	≤48	3.56	37	12	209	4	20	84.9	21	36	50	1511
5.000	ZTR420SPH831_0050 MEL	1600	4000	≤60	3.56	37	12	211	4	20	84.9	21	36	50	1511
7.000	ZTR417SPH831_0070 ME	2000	4000	≤48	2.16	31	10	211	4	17	72.2	24	35	55	1263
7.000	ZTR417SPH831_0070 MEL	2000	4000	≤60	2.16	31	10	212	4	17	72.2	24	35	55	1263
7.000	ZTR420SPH831_0070 ME	2000	4000	≤48	2.54	37	12	200	4	20	84.9	24	36	50	1511
7.000	ZTR420SPH831_0070 MEL	2000	4000	≤60	2.54	37	12	201	4	20	84.9	24	36	50	1511
10.00	ZTR417SPH831_0100 ME	2200	4000	≤48	1.51	31	10	200	4	17	72.2	24	35	55	1263
10.00	ZTR417SPH831_0100 MEL	2200	4000	≤60	1.51	31	10	201	4	17	72.2	24	35	55	1263
10.00	ZTR420SPH831_0100 ME	2200	4000	≤48	1.78	37	12	187	4	20	84.9	20	33	50	1392
10.00	ZTR420SPH831_0100 MEL	2200	4000	≤60	1.78	37	12	187	4	20	84.9	20	33	50	1392
16.00	ZTR417SPH832_0160 ME	2500	4500	≤38	1.06	31	10	215	4	17	72.2	30	35	55	1263
16.00	ZTR417SPH832_0160 MEL	2500	4500	≤48	1.06	31	10	216	4	17	72.2	30	35	55	1263
16.00	ZTR420SPH832_0160 ME	2500	4500	≤38	1.25	37	12	205	4	20	84.9	26	36	50	1511
16.00	ZTR420SPH832_0160 MEL	2500	4500	≤48	1.25	37	12	206	4	20	84.9	26	36	50	1511
20.00	ZTR417SPH832_0200 ME	2500	4500	≤38	0.85	31	10	217	4	17	72.2	34	35	55	1263
20.00	ZTR417SPH832_0200 MEL	2500	4500	≤48	0.85	31	10	218	4	17	72.2	34	35	55	1263
20.00	ZTR420SPH832_0200 ME	2500	4500	≤38	1.00	37	12	208	4	20	84.9	29	36	50	1511
20.00	ZTR420SPH832_0200 MEL	2500	4500	≤48	1.00	37	12	208	4	20	84.9	29	36	50	1511
25.00	ZTR417SPH832_0250 ME	2700	5500	≤38	0.83	31	10	217	4	17	72.2	35	35	55	1263
25.00	ZTR417SPH832_0250 MEL	2700	5500	≤48	0.83	31	10	217	4	17	72.2	35	35	55	1263
25.00	ZTR420SPH832_0250 ME	2700	5500	≤38	0.98	37	12	208	4	20	84.9	31	36	50	1511
25.00	ZTR420SPH832_0250 MEL	2700	5500	≤48	0.98	37	12	208	4	20	84.9	31	36	50	1511
28.00	ZTR417SPH832_0280 ME	3000	6000	≤38	0.81	31	10	214	4	17	72.2	30	35	55	1263
28.00	ZTR417SPH832_0280 MEL	3000	6000	≤48	0.81	31	10	215	4	17	72.2	30	35	55	1263
28.00	ZTR420SPH832_0280 ME	3000	6000	≤38	0.95	37	12	204	4	20	84.9	26	36	50	1511
28.00	ZTR420SPH832_0280 MEL	3000	6000	≤48	0.95	37	12	204	4	20	84.9	26	36	50	1511
35.00	ZTR417SPH832_0350 ME	3000	6000	≤38	0.65	31	10	217	4	17	72.2	35	35	55	1263
35.00	ZTR417SPH832_0350 MEL	3000	6000	≤48	0.65	31	10	217	4	17	72.2	35	35	55	1263
35.00	ZTR420SPH832_0350 ME	3000	6000	≤38	0.76	37	12	207	4	20	84.9	34	36	50	1511
35.00	ZTR420SPH832_0350 MEL	3000	6000	≤48	0.76	37	12	207	4	20	84.9	34	36	50	1511
40.00	ZTR417SPH832_0400 ME	3000	6000	≤38	0.57	31	10	212	4	17	72.2	30	35	55	1263
40.00	ZTR417SPH832_0400 MEL	3000	6000	≤48	0.57	31	10	212	4	17	72.2	30	35	55	1263
40.00	ZTR420SPH832_0400 ME	3000	6000	≤38	0.67	37	12	201	4	20	84.9	26	36	50	1511
40.00	ZTR420SPH832_0400 MEL	3000	6000	≤48	0.67	37	12	202	4	20	84.9	26	36	50	1511
50.00	ZTR417SPH832_0500 ME	3000	6000	≤38	0.45	31	10	215	4	17	72.2	35	35	55	1263
50.00	ZTR417SPH832_0500 MEL	3000	6000	≤48	0.45	31	10	215	4	17	72.2	35	35	55	1263
50.00	ZTR420SPH832_0500 ME	3000	6000	≤38	0.53	37	12	205	4	20	84.9	36	36	50	1511
50.00	ZTR420SPH832_0500 MEL	3000	6000	≤48	0.53	37	12	205	4	20	84.9	36	36	50	1511
70.00	ZTR417SPH832_0700 ME	3000	6000	≤38	0.32	31	10	210	4	17	72.2	35	35	55	1263
70.00	ZTR417SPH832_0700 MEL	3000	6000	≤48	0.32	31	10	210	4	17	72.2	35	35	55	1263
70.00	ZTR420SPH832_0700 ME	3000	6000	≤38	0.38	37	12	199	4	20	84.9	33	36	50	1511

5.2 Selection tables 5 ZTRPH rack and pinion drives

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{f2maxZB}$	$\Delta s$	$\Delta s_{red}$	$C_{lin}$	$m_n$	z	$d_0$	$F_{f2N}$	$F_{f2acc}$	$F_{f2NOT}$	$M_{2acc}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu m$ ]	[ $\mu m$ ]	[N/ $\mu m$ ]	[mm]		[mm]	[kN]	[kN]	[kN]	[Nm]
<b>ZTR4PH8 (F<sub>f2acc,max</sub> = 36 kN)</b>															
70.00	ZTR420SPH832_0700 MEL	3000	6000	≤48	0.38	37	12	199	4	20	84.9	33	36	50	1511
100.0	ZTR417SPH832_1000 ME	3000	6000	≤38	0.23	31	10	200	4	17	72.2	29	35	55	1263
100.0	ZTR417SPH832_1000 MEL	3000	6000	≤48	0.23	31	10	200	4	17	72.2	29	35	55	1263
100.0	ZTR420SPH832_1000 ME	3000	6000	≤38	0.27	37	12	186	4	20	84.9	25	33	50	1380
100.0	ZTR420SPH832_1000 MEL	3000	6000	≤48	0.27	37	12	186	4	20	84.9	25	33	50	1380
<b>ZTR5PH8 (F<sub>f2acc,max</sub> = 34 kN)</b>															
4.000	ZTR518SPH831_0040 ME	1400	3500	≤48	4.38	42	14	202	5	18	95.5	18	34	44	1621
4.000	ZTR518SPH831_0040 MEL	1400	3500	≤60	4.38	42	14	206	5	18	95.5	18	34	44	1621
5.000	ZTR518SPH831_0050 ME	1600	4000	≤48	4.00	42	14	204	5	18	95.5	20	34	44	1621
5.000	ZTR518SPH831_0050 MEL	1600	4000	≤60	4.00	42	14	207	5	18	95.5	20	34	44	1621
7.000	ZTR518SPH831_0070 ME	2000	4000	≤48	2.86	42	14	194	5	18	95.5	21	34	44	1621
7.000	ZTR518SPH831_0070 MEL	2000	4000	≤60	2.86	42	14	195	5	18	95.5	21	34	44	1621
10.00	ZTR518SPH831_0100 ME	2200	4000	≤48	2.00	42	14	178	5	18	95.5	18	29	44	1392
10.00	ZTR518SPH831_0100 MEL	2200	4000	≤60	2.00	42	14	179	5	18	95.5	18	29	44	1392
16.00	ZTR518SPH832_0160 ME	2500	4500	≤38	1.41	42	14	200	5	18	95.5	23	34	44	1621
16.00	ZTR518SPH832_0160 MEL	2500	4500	≤48	1.41	42	14	200	5	18	95.5	23	34	44	1621
20.00	ZTR518SPH832_0200 ME	2500	4500	≤38	1.13	42	14	203	5	18	95.5	26	34	44	1621
20.00	ZTR518SPH832_0200 MEL	2500	4500	≤48	1.13	42	14	203	5	18	95.5	26	34	44	1621
25.00	ZTR518SPH832_0250 ME	2700	5500	≤38	1.10	42	14	203	5	18	95.5	27	34	44	1621
25.00	ZTR518SPH832_0250 MEL	2700	5500	≤48	1.10	42	14	203	5	18	95.5	27	34	44	1621
28.00	ZTR518SPH832_0280 ME	3000	6000	≤38	1.07	42	14	198	5	18	95.5	23	34	44	1621
28.00	ZTR518SPH832_0280 MEL	3000	6000	≤48	1.07	42	14	198	5	18	95.5	23	34	44	1621
35.00	ZTR518SPH832_0350 ME	3000	6000	≤38	0.86	42	14	202	5	18	95.5	30	34	44	1621
35.00	ZTR518SPH832_0350 MEL	3000	6000	≤48	0.86	42	14	202	5	18	95.5	30	34	44	1621
40.00	ZTR518SPH832_0400 ME	3000	6000	≤38	0.75	42	14	195	5	18	95.5	23	34	44	1621
40.00	ZTR518SPH832_0400 MEL	3000	6000	≤48	0.75	42	14	195	5	18	95.5	23	34	44	1621
50.00	ZTR518SPH832_0500 ME	3000	6000	≤38	0.60	42	14	200	5	18	95.5	33	34	44	1621
50.00	ZTR518SPH832_0500 MEL	3000	6000	≤48	0.60	42	14	200	5	18	95.5	33	34	44	1621
70.00	ZTR518SPH832_0700 ME	3000	6000	≤38	0.43	42	14	192	5	18	95.5	30	34	44	1621
70.00	ZTR518SPH832_0700 MEL	3000	6000	≤48	0.43	42	14	192	5	18	95.5	30	34	44	1621
100.0	ZTR518SPH832_1000 ME	3000	6000	≤38	0.30	42	14	177	5	18	95.5	22	29	44	1380
100.0	ZTR518SPH832_1000 MEL	3000	6000	≤48	0.30	42	14	177	5	18	95.5	22	29	44	1380
<b>ZTR6PH8 (F<sub>f2acc,max</sub> = 33 kN)</b>															
4.000	ZTR615SPH831_0040 ME	1400	3500	≤48	4.38	42	14	203	6	15	95.5	18	33	44	1577
4.000	ZTR615SPH831_0040 MEL	1400	3500	≤60	4.38	42	14	207	6	15	95.5	18	33	44	1577
5.000	ZTR615SPH831_0050 ME	1600	4000	≤48	4.00	42	14	205	6	15	95.5	20	33	44	1577
5.000	ZTR615SPH831_0050 MEL	1600	4000	≤60	4.00	42	14	208	6	15	95.5	20	33	44	1577
7.000	ZTR615SPH831_0070 ME	2000	4000	≤48	2.86	42	14	195	6	15	95.5	21	33	44	1577
7.000	ZTR615SPH831_0070 MEL	2000	4000	≤60	2.86	42	14	196	6	15	95.5	21	33	44	1577
10.00	ZTR615SPH831_0100 ME	2200	4000	≤48	2.00	42	14	179	6	15	95.5	18	29	44	1392
10.00	ZTR615SPH831_0100 MEL	2200	4000	≤60	2.00	42	14	179	6	15	95.5	18	29	44	1392
16.00	ZTR615SPH832_0160 ME	2500	4500	≤38	1.41	42	14	201	6	15	95.5	23	33	44	1577
16.00	ZTR615SPH832_0160 MEL	2500	4500	≤48	1.41	42	14	201	6	15	95.5	23	33	44	1577
20.00	ZTR615SPH832_0200 ME	2500	4500	≤38	1.13	42	14	204	6	15	95.5	26	33	44	1577
20.00	ZTR615SPH832_0200 MEL	2500	4500	≤48	1.13	42	14	204	6	15	95.5	26	33	44	1577
25.00	ZTR615SPH832_0250 ME	2700	5500	≤38	1.10	42	14	203	6	15	95.5	27	33	44	1577
25.00	ZTR615SPH832_0250 MEL	2700	5500	≤48	1.10	42	14	204	6	15	95.5	27	33	44	1577
28.00	ZTR615SPH832_0280 ME	3000	6000	≤38	1.07	42	14	199	6	15	95.5	23	33	44	1577
28.00	ZTR615SPH832_0280 MEL	3000	6000	≤48	1.07	42	14	199	6	15	95.5	23	33	44	1577
35.00	ZTR615SPH832_0350 ME	3000	6000	≤38	0.86	42	14	203	6	15	95.5	30	33	44	1577
35.00	ZTR615SPH832_0350 MEL	3000	6000	≤48	0.86	42	14	203	6	15	95.5	30	33	44	1577
40.00	ZTR615SPH832_0400 ME	3000	6000	≤38	0.75	42	14	196	6	15	95.5	23	33	44	1577
40.00	ZTR615SPH832_0400 MEL	3000	6000	≤48	0.75	42	14	196	6	15	95.5	23	33	44	1577
50.00	ZTR615SPH832_0500 ME	3000	6000	≤38	0.60	42	14	201	6	15	95.5	33	33	44	1577
50.00	ZTR615SPH832_0500 MEL	3000	6000	≤48	0.60	42	14	201	6	15	95.5	33	33	44	1577
70.00	ZTR615SPH832_0700 ME	3000	6000	≤38	0.43	42	14	193	6	15	95.5	30	33	44	1577
70.00	ZTR615SPH832_0700 MEL	3000	6000	≤48	0.43	42	14	193	6	15	95.5	30	33	44	1577
100.0	ZTR615SPH832_1000 ME	3000	6000	≤38	0.30	42	14	178	6	15	95.5	22	29	44	1380
100.0	ZTR615SPH832_1000 MEL	3000	6000	≤48	0.30	42	14	178	6	15	95.5	22	29	44	1380
<b>ZTR5PH9 (F<sub>f2acc,max</sub> = 67 kN)</b>															
12.00	ZTR519SPH942_0120 ME	1800	3000	≤48	1.32	44	15	306	5	19	100.8	42	67	133	3360
12.00	ZTR519SPH942_0120 MEL	1800	3000	≤60	1.32	44	15	307	5	19	100.8	42	67	133	3360
16.00	ZTR519SPH942_0160 ME	2000	3500	≤48	1.15	44	15	305	5	19	100.8	47	67	133	3360
16.00	ZTR519SPH942_0160 MEL	2000	3500	≤60	1.15	44	15	306	5	19	100.8	47	67	133	3360
18.00	ZTR519SPH942_0180 ME	1800	3000	≤48	0.88	44	15	302	5	19	100.8	49	67	133	3360
18.00	ZTR519SPH942_0180 MEL	1800	3000	≤60	0.88	44	15	302	5	19	100.8	49	67	133	3360

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{f2maxZB}$	$\Delta s$	$\Delta s_{red}$	$C_{lin}$	$m_n$	z	$d_0$	$F_{f2N}$	$F_{f2acc}$	$F_{f2NOT}$	$M_{2acc}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu$ m]	[ $\mu$ m]	[N/ $\mu$ m]	[mm]		[mm]	[kN]	[kN]	[kN]	[Nm]
<b>ZTR5PH9 (<math>F_{f2acc,max} = 67</math> kN)</b>															
20.00	ZTR519SPH942_0200 ME	2500	4000	≤48	1.06	44	15	305	5	19	100.8	50	67	133	3360
20.00	ZTR519SPH942_0200 MEL	2500	4000	≤60	1.06	44	15	305	5	19	100.8	50	67	133	3360
24.00	ZTR519SPH942_0240 ME	2000	3500	≤48	0.77	44	15	302	5	19	100.8	53	67	133	3360
24.00	ZTR519SPH942_0240 MEL	2000	3500	≤60	0.77	44	15	302	5	19	100.8	53	67	133	3360
28.00	ZTR519SPH942_0280 ME	2800	4500	≤48	0.85	44	15	303	5	19	100.8	54	67	133	3360
28.00	ZTR519SPH942_0280 MEL	2800	4500	≤60	0.85	44	15	304	5	19	100.8	54	67	133	3360
30.00	ZTR519SPH942_0300 ME	2500	4000	≤48	0.70	44	15	301	5	19	100.8	54	67	133	3360
30.00	ZTR519SPH942_0300 MEL	2500	4000	≤60	0.70	44	15	302	5	19	100.8	54	67	133	3360
32.00	ZTR519SPH942_0320 ME	2800	4500	≤48	0.74	44	15	301	5	19	100.8	54	67	133	3360
32.00	ZTR519SPH942_0320 MEL	2800	4500	≤60	0.74	44	15	301	5	19	100.8	54	67	133	3360
40.00	ZTR519SPH942_0400 ME	2800	4500	≤48	0.59	44	15	299	5	19	100.8	54	67	133	3360
40.00	ZTR519SPH942_0400 MEL	2800	4500	≤60	0.59	44	15	299	5	19	100.8	54	67	133	3360
42.00	ZTR519SPH942_0420 ME	2800	4500	≤48	0.57	44	15	301	5	19	100.8	54	67	133	3360
42.00	ZTR519SPH942_0420 MEL	2800	4500	≤60	0.57	44	15	301	5	19	100.8	54	67	133	3360
48.00	ZTR519SPH942_0480 ME	2800	4500	≤48	0.50	44	15	300	5	19	100.8	54	67	133	3360
48.00	ZTR519SPH942_0480 MEL	2800	4500	≤60	0.50	44	15	300	5	19	100.8	54	67	133	3360
60.00	ZTR519SPH942_0600 ME	2800	4500	≤48	0.40	44	15	299	5	19	100.8	54	67	133	3360
60.00	ZTR519SPH942_0600 MEL	2800	4500	≤60	0.40	44	15	299	5	19	100.8	54	67	133	3360
<b>ZTR6PH9 (<math>F_{f2acc,max} = 56</math> kN)</b>															
12.00	ZTR616SPH942_0120 ME	1800	3000	≤48	1.33	44	15	312	6	16	101.9	42	56	112	2844
12.00	ZTR616SPH942_0120 MEL	1800	3000	≤60	1.33	44	15	313	6	16	101.9	42	56	112	2844
16.00	ZTR616SPH942_0160 ME	2000	3500	≤48	1.17	44	15	311	6	16	101.9	46	56	112	2844
16.00	ZTR616SPH942_0160 MEL	2000	3500	≤60	1.17	44	15	312	6	16	101.9	46	56	112	2844
18.00	ZTR616SPH942_0180 ME	1800	3000	≤48	0.89	44	15	308	6	16	101.9	48	56	112	2844
18.00	ZTR616SPH942_0180 MEL	1800	3000	≤60	0.89	44	15	308	6	16	101.9	48	56	112	2844
20.00	ZTR616SPH942_0200 ME	2500	4000	≤48	1.07	44	15	311	6	16	101.9	49	56	112	2844
20.00	ZTR616SPH942_0200 MEL	2500	4000	≤60	1.07	44	15	311	6	16	101.9	49	56	112	2844
24.00	ZTR616SPH942_0240 ME	2000	3500	≤48	0.78	44	15	308	6	16	101.9	53	56	112	2844
24.00	ZTR616SPH942_0240 MEL	2000	3500	≤60	0.78	44	15	308	6	16	101.9	53	56	112	2844
28.00	ZTR616SPH942_0280 ME	2800	4500	≤48	0.86	44	15	310	6	16	101.9	53	56	112	2844
28.00	ZTR616SPH942_0280 MEL	2800	4500	≤60	0.86	44	15	310	6	16	101.9	53	56	112	2844
30.00	ZTR616SPH942_0300 ME	2500	4000	≤48	0.71	44	15	307	6	16	101.9	53	56	112	2844
30.00	ZTR616SPH942_0300 MEL	2500	4000	≤60	0.71	44	15	308	6	16	101.9	53	56	112	2844
32.00	ZTR616SPH942_0320 ME	2800	4500	≤48	0.75	44	15	307	6	16	101.9	53	56	112	2844
32.00	ZTR616SPH942_0320 MEL	2800	4500	≤60	0.75	44	15	307	6	16	101.9	53	56	112	2844
40.00	ZTR616SPH942_0400 ME	2800	4500	≤48	0.60	44	15	305	6	16	101.9	53	56	112	2844
40.00	ZTR616SPH942_0400 MEL	2800	4500	≤60	0.60	44	15	305	6	16	101.9	53	56	112	2844
42.00	ZTR616SPH942_0420 ME	2800	4500	≤48	0.57	44	15	307	6	16	101.9	53	56	112	2844
42.00	ZTR616SPH942_0420 MEL	2800	4500	≤60	0.57	44	15	307	6	16	101.9	53	56	112	2844
48.00	ZTR616SPH942_0480 ME	2800	4500	≤48	0.50	44	15	306	6	16	101.9	53	56	112	2844
48.00	ZTR616SPH942_0480 MEL	2800	4500	≤60	0.50	44	15	306	6	16	101.9	53	56	112	2844
60.00	ZTR616SPH942_0600 ME	2800	4500	≤48	0.40	44	15	305	6	16	101.9	53	56	112	2844
60.00	ZTR616SPH942_0600 MEL	2800	4500	≤60	0.40	44	15	305	6	16	101.9	53	56	112	2844



## 5.3 Dimensional drawings

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

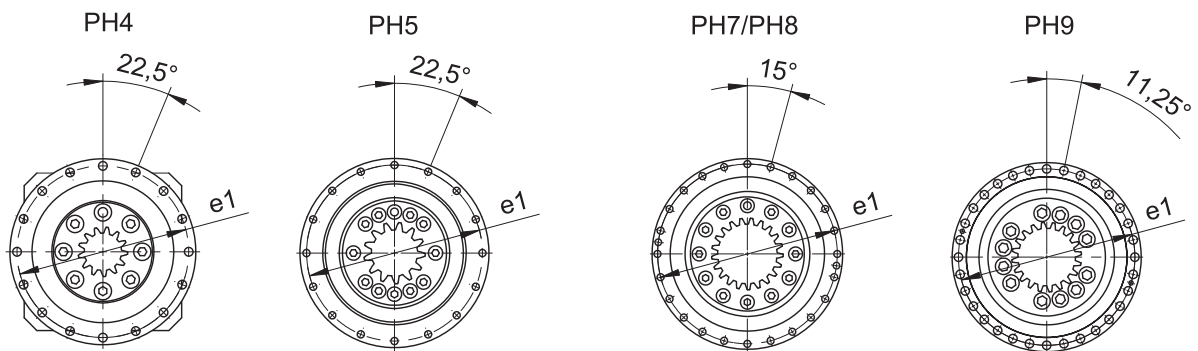
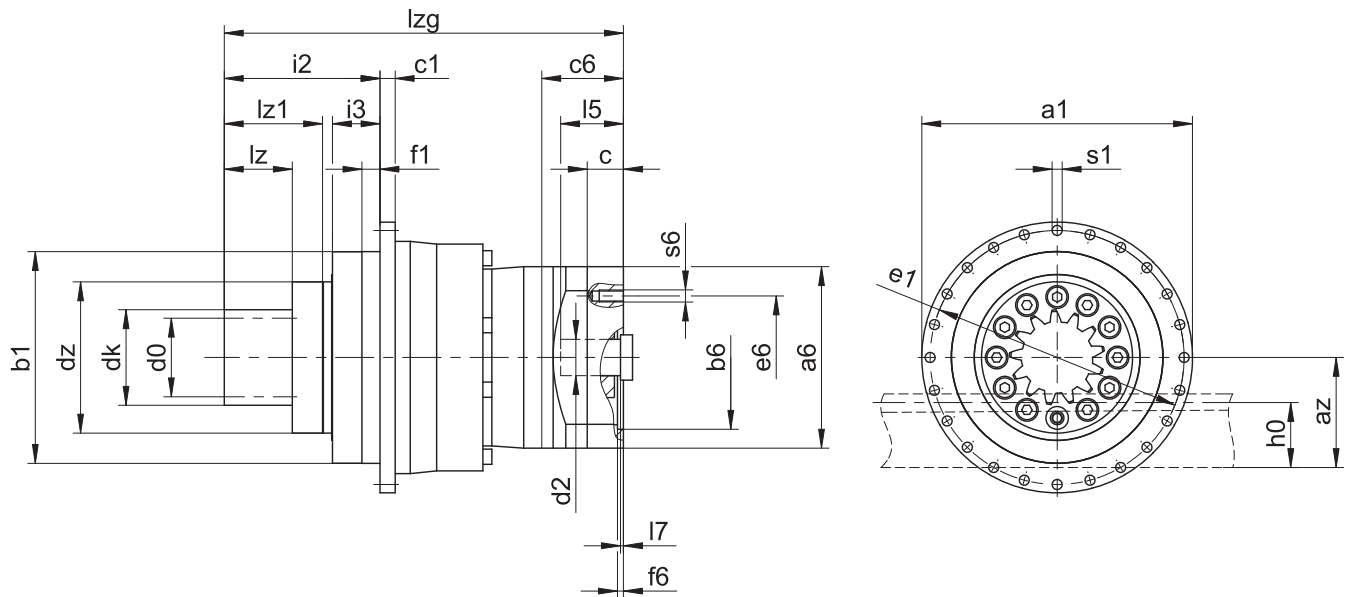
Dimension  $az$  in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

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 <https://configurator.stoeber.de/en-US/>.



## Output dimensions

Type	mn	Øa1	az	Øb1	c1	d0	dk	dz	Øe1	f1	h0	i2	i3	lz	lz1	Øs1	x
ZTR212SPH4_	2	118 <sub>h7</sub>	35.73	90 <sub>h7</sub>	7	25.47	31.5	63	109	10	22	71.0	23.5	26.0	41.0	5.5	0.50
ZTR216SPH4_	2	118 <sub>h7</sub>	38.98	90 <sub>h7</sub>	7	33.95	38.0	63	109	10	22	71.0	23.5	26.0	41.0	5.5	0.00
ZTR219SPH5_	2	145 <sub>h7</sub>	42.16	110 <sub>h7</sub>	8	40.32	44.3	80	135	12	22	70.0	22.5	26.0	41.0	5.5	0.00
ZTR223SPH5_	2	145 <sub>h7</sub>	46.40	110 <sub>h7</sub>	8	48.81	52.8	80	135	12	22	70.0	22.5	26.0	41.0	5.5	0.00
ZTR314SPH5_	3	145 <sub>h7</sub>	49.18	110 <sub>h7</sub>	8	44.56	52.4	80	135	12	26	76.5	22.5	32.5	47.5	5.5	0.30
ZTR223SPH7_	2	179 <sub>h7</sub>	46.40	140 <sub>h7</sub>	10	48.81	52.8	100	168	12	22	84.0	31.5	26.0	46.0	6.6	0.00
ZTR316SPH7_	3	179 <sub>h7</sub>	51.46	140 <sub>h7</sub>	10	50.93	56.9	100	168	12	26	90.5	31.5	32.5	52.5	6.6	0.00
ZTR319SPH7_	3	179 <sub>h7</sub>	56.24	140 <sub>h7</sub>	10	60.48	66.5	100	168	12	26	90.5	31.5	32.5	52.5	6.6	0.00
ZTR412SPH7_	4	179 <sub>h7</sub>	62.46	140 <sub>h7</sub>	10	50.93	62.9	100	168	12	35	103.0	31.5	45.0	65.0	6.6	0.50
ZTR332SPH8_	3	247 <sub>h7</sub>	76.93	200 <sub>h7</sub>	12	101.86	107.9	148	233	15	26	107.5	41.5	32.5	57.5	9.0	0.00
ZTR417SPH8_	4	247 <sub>h7</sub>	71.08	200 <sub>h7</sub>	12	72.15	80.2	148	233	15	35	120.0	41.5	45.0	70.0	9.0	0.00
ZTR420SPH8_	4	247 <sub>h7</sub>	77.44	200 <sub>h7</sub>	12	84.88	92.9	148	233	15	35	120.0	41.5	45.0	70.0	9.0	0.00
ZTR518SPH8_	5	247 <sub>h7</sub>	81.75	200 <sub>h7</sub>	12	95.49	105.5	148	233	15	34	130.0	41.5	55.0	80.0	9.0	0.00
ZTR615SPH8_	6	247 <sub>h7</sub>	90.75	200 <sub>h7</sub>	12	95.49	107.5	148	233	15	43	140.0	41.5	65.0	90.0	9.0	0.00
ZTR519SPH9_	5	300	84.40	255 <sub>h7</sub>	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 <sub>h7</sub>	18	101.86	113.9	187	280	20	43	165.0	54.0	65.0	99.0	13.5	0.00

## Example dimensions for the motor connection + total length

Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZTR2_PH431_ME	95.0 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	154.5	M8
ZTR2_PH432_ME	60.0 <sup>H7</sup>	75	19	41	75	18	41.5	3.5	4.0	191.5	M5
ZTR2_PH531_ME	110.0 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	173.0	M8
ZTR3_PH531_ME	110.0 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	179.5	M8
ZTR2_PH532_ME	95.0 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	202.0	M8
ZTR3_PH532_ME	95.0 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	208.5	M8
ZTR2_PH731_ME	130.0 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	207.0	M10
ZTR3_PH731_ME	130.0 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	213.5	M10
ZTR4_PH731_ME	130.0 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	226.0	M10
ZTR2_PH732_ME	110.0 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	245.0	M8
ZTR3_PH732_ME	110.0 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	251.5	M8
ZTR4_PH732_ME	110.0 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	264.0	M8
ZTR3_PH831_ME	180.0 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	275.5	M12
ZTR4_PH831_ME	180.0 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	288.0	M12
ZTR5_PH831_ME	180.0 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	298.0	M12
ZTR6_PH831_ME	180.0 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	308.0	M12
ZTR3_PH832_ME	130.0 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	320.5	M10
ZTR4_PH832_ME	130.0 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	333.0	M10
ZTR5_PH832_ME	130.0 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	343.0	M10
ZTR6_PH832_ME	130.0 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	353.0	M10
ZTR5_PH942_ME	180.0 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	423.5	M12
ZTR6_PH942_ME	180.0 <sup>H7</sup>	215	48	83	204	35	80.5	5.5	8.5	433.5	M12

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6, l5 and lzg are also lengthened accordingly.**

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



## 5.4 Type designation

This chapter shows you 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.

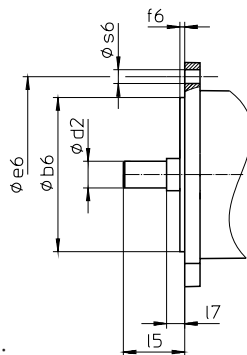
### Example code

Z	TR	3	19	S	PH	7	3	1	S	F	S	S	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)
3	Generation	Generation 3
4		Generation 4
1	Stages	Single-stage
2		Two-stage
S	Housing	Standard
F	Shaft	Flange shaft
S	Bearing	Standard bearing
V		Reinforced bearing (PH3 – PH5)
S	Backlash	Standard
R		Reduced
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
MF		Motor adapter with FlexiAdapt coupling
MB <sup>1</sup>		ServoStop motor adapter with brake

To complete the type designation, also specify the following in your order:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBER Configurator at

<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

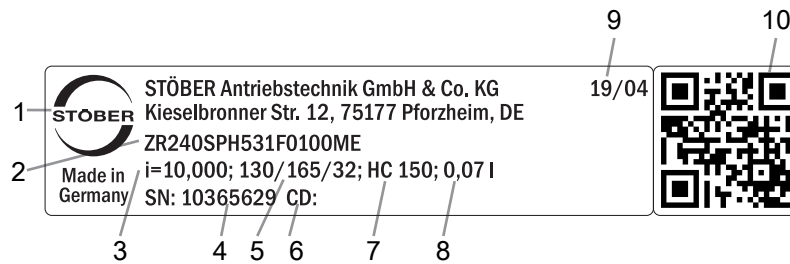
- Radial shaft seal rings at the output made of NBR or FKM (option), see the chapter [▶ 5.6.3]
- Radial runout  $\leq 10 \mu\text{m}$  (optional)
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request
- PH531, PH7 – PH9: Double seal for motor adapter (option)
- Socket wrench insert for mounting the motor on the gear unit using the ME/MEL/MF motor adapter (option)

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 [▶ 5.5.1].

## 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 Input options

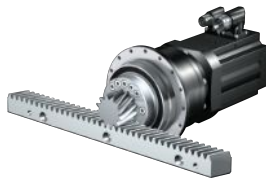
In this chapter, you will find all available input options:

Motor adapter



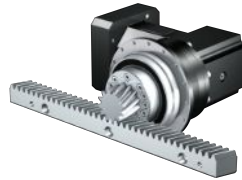
Catalog ID 443137\_en

EZ synchronous servo motor



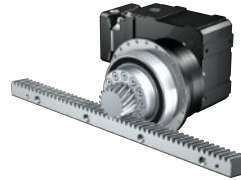
Catalog ID 443286\_en

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

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 5.5.2 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 clamp coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- 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

## 5.5.3 Motor adapter with FlexiAdapt coupling (MF)

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

**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
- Motor shaft decoupled from axial forces
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- Error-free, thanks to exact centering of the motor



Fig. 2: FlexiAdapt coupling

## 5.5.4 Gear rack

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

Also note the project configuration of the gear rack on the Atlanta pages.

## 5.5.5 Installation conditions

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

- When the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing$ bz. The machine-side fit must be H7.

## 5.5.6 Lubricants

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

You will receive lubricants for use in the food industry upon request.

### 5.5.6.1 Rack and pinion drive lubrication

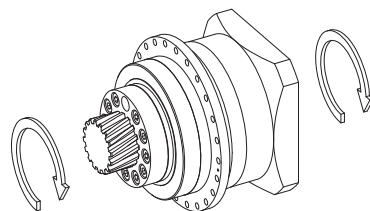
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 5.5.7 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	$\leq 90$ °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable.
Protection class: <sup>2</sup>	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

## 5.5.8 Direction of rotation

The input and output rotate in the same direction.



<sup>2</sup> Observe the protection class of all the components.

## 5.6 Project configuration

Project your drives using our SERVOfsoft designing software. Download SERVOfsoft for free at <https://www.stoeber.de/en/ServoSoft>.

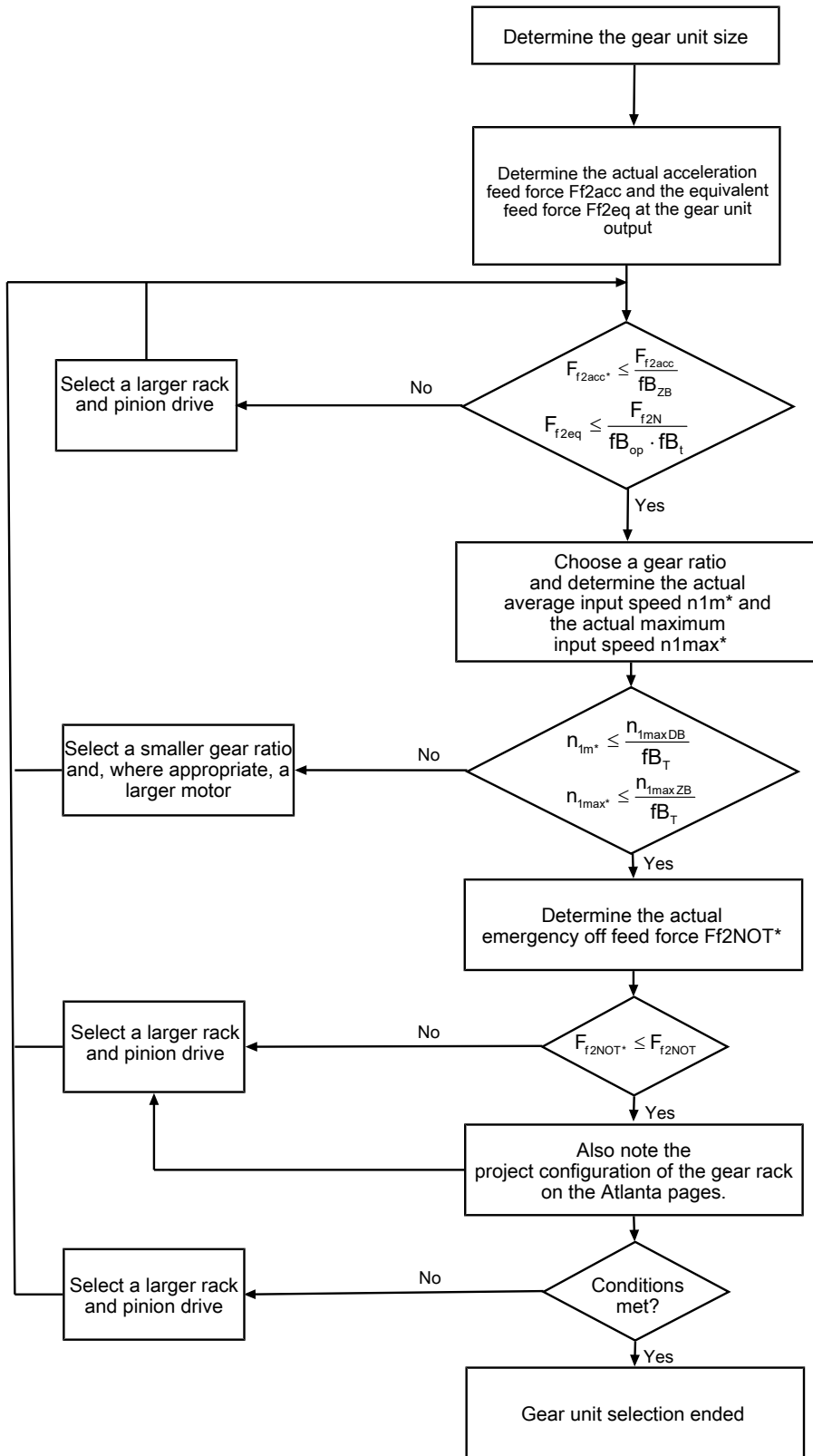
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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 [▶ 13.1](#).

### 5.6.1 Drive selection

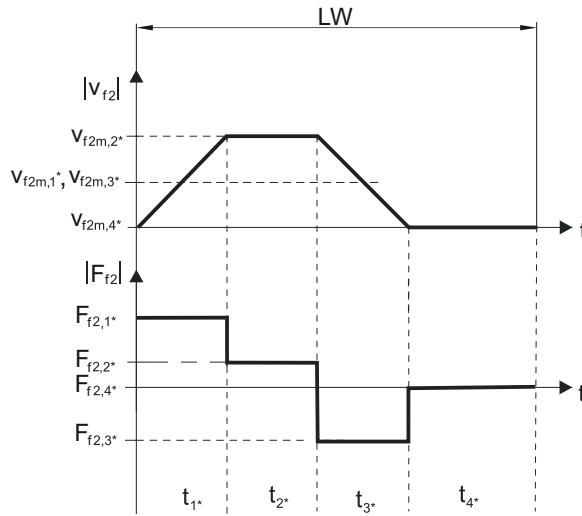


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_T$  and  $fb_{zB}$  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**

$$n_{im} = \frac{v_{f2m} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m} = \frac{|v_{f2m,1}| \cdot t_1 + \dots + |v_{f2m,n}| \cdot t_n}{t_1 + \dots + t_n}$$

If  $t_1 + \dots + t_3 \geq 6$  min, determine  $v_{2m}$  without the rest phase  $t_4$ .

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**

$$F_{f2eq} = \sqrt[3]{\frac{|v_{f2m,1}| \cdot t_1 \cdot |F_{f2,1}|^3 + \dots + |v_{f2m,n}| \cdot t_n \cdot |F_{f2,n}|^3}{|v_{f2m,1}| \cdot t_1 + \dots + |v_{f2m,n}| \cdot t_n}}$$

**Operating factors**

<b>Operating mode</b>	<b>fB<sub>op</sub></b>
Uniform continuous operation	1.00
Cyclic operation	1.00
Reversing load cyclic operation	1.00
<b>Run time</b>	<b>fB<sub>t</sub></b>
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
<b>Cyclic operation</b>	<b>fB<sub>ZB</sub></b>
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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**

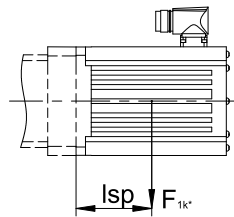
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

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



Type	$M_{1k}$ [Nm]
PH331_ME	20
PH332_ME	10
PH431_ME	40
PH432_ME	20
PH531_ME	80
PH532_ME	40
PH731_ME	200
PH732_ME	80
PH831_ME	400
PH832_ME	200
PH942_ME	400
PH1042_ME	400

The values also apply to the MEL and MF motor adapters.

## 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 in 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 leaks. 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/downloads/>

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

Documentation	ID
Operating manual gear units, geared motors PH33 – PH83, PH94 – PH104	443354_de
Operating manual for gear racks (Atlanta)	442455

## 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 – 6 mm
$z$	16 – 19
$F_{f2acc}$	56 – 67 kN
$V_{f2maxZB}$	0.2 – 0.39 m/s
$\Delta s$	15 – 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 <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1].

i	Type	$n_{1maxDB}$ [rpm]	$n_{1maxZB}$ [rpm]	$d_{MW}$ [mm]	$v_{f2maxZB}$ [m/s]	$\Delta s$ [μm]	$\Delta s_{red}$ [μm]	$C_{lin}$ [N/μm]	$m_n$ [mm]	z	$d_0$ [mm]	$F_{f2N}$ [kN]	$F_{f2acc}$ [kN]	$F_{f2NOT}$ [kN]	$M_{2acc}$ [Nm]
<b>ZTR5PHV9 (<math>F_{f2acc,max} = 67</math> kN)</b>															
61.00	ZTR519SPHV943_0610 ME	2500	4500	≤38	0.39	44	15	284	5	19	100.8	50	67	133	3360
61.00	ZTR519SPHV943_0610 MEL	2500	4500	≤48	0.39	44	15	284	5	19	100.8	50	67	133	3360
91.00	ZTR519SPHV943_0910 ME	2500	4500	≤38	0.26	44	15	283	5	19	100.8	50	67	133	3360
91.00	ZTR519SPHV943_0910 MEL	2500	4500	≤48	0.26	44	15	283	5	19	100.8	50	67	133	3360
121.0	ZTR519SPHV943_1210 ME	2500	4500	≤38	0.20	44	15	280	5	19	100.8	50	67	133	3360
121.0	ZTR519SPHV943_1210 MEL	2500	4500	≤48	0.20	44	15	280	5	19	100.8	50	67	133	3360
<b>ZTR6PHV9 (<math>F_{f2acc,max} = 56</math> kN)</b>															
61.00	ZTR616SPHV943_0610 ME	2500	4500	≤38	0.39	44	15	289	6	16	101.9	49	56	112	2844
61.00	ZTR616SPHV943_0610 MEL	2500	4500	≤48	0.39	44	15	289	6	16	101.9	49	56	112	2844
91.00	ZTR616SPHV943_0910 ME	2500	4500	≤38	0.26	44	15	288	6	16	101.9	49	56	112	2844
91.00	ZTR616SPHV943_0910 MEL	2500	4500	≤48	0.26	44	15	288	6	16	101.9	49	56	112	2844
121.0	ZTR616SPHV943_1210 ME	2500	4500	≤38	0.20	44	15	285	6	16	101.9	49	56	112	2844
121.0	ZTR616SPHV943_1210 MEL	2500	4500	≤48	0.20	44	15	285	6	16	101.9	49	56	112	2844

## 6.3 Dimensional drawings

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

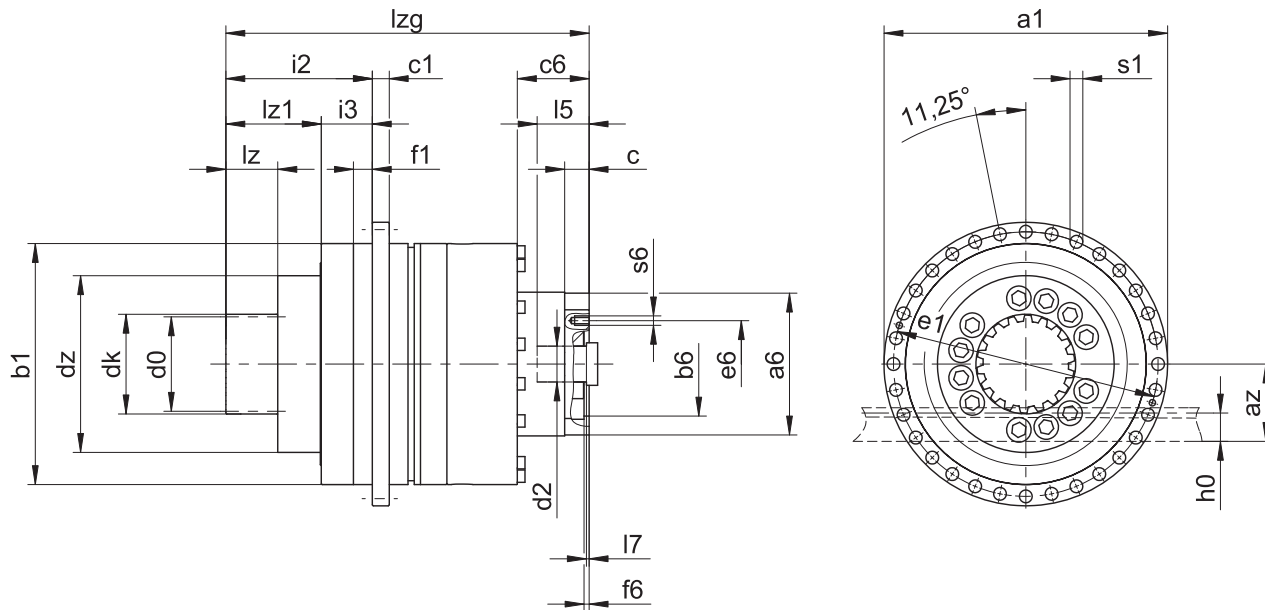
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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

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 <https://configurator.stoeber.de/en-US/>.



### Output dimensions

Type	mn	$\varnothing a_1$	az	$\varnothing b_1$	c1	d0	dk	dz	$\varnothing e_1$	f1	h0	i2	i3	lz	lz1	$\varnothing s_1$	x
ZTR519SPHV9_	5	300	84.40	255 <sub>h7</sub>	18	100.80	110.8	187	280	20	34	155	54	55	101	13.5	0.0
ZTR616SPHV9_	6	300	93.93	255 <sub>h7</sub>	18	101.86	113.9	187	280	20	43	165	54	65	111	13.5	0.0

### Example dimensions for the motor connection + total length

Type	$\varnothing b_6$	$\varnothing e_6$	$\varnothing d_{2max}$	l5	$\square a_6$	c	c6	f6	l7	l <sub>zg</sub>	s6
ZTR5_PHV9_ME	130.0 <sup>H7</sup>	165	38	61	150	26	66	5.5	4.5	383	M10
ZTR6_PHV9_ME	130.0 <sup>H7</sup>	165	38	61	150	26	66	5.5	4.5	393	M10

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6, l5 and l<sub>zg</sub> are also lengthened accordingly.**

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

## 6.4 Type designation

This chapter shows you 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.

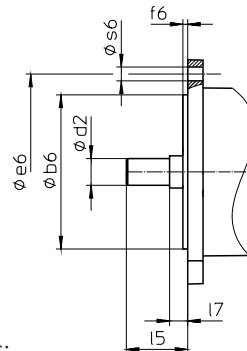
### Example code

Z	TR	6	16	S	PHV	9	4	3	S	F	S	S	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")
PHV	Type	Planetary gear unit
9	Size	9 (example)
4	Generation	Generation 4
3	Stages	Three-stage
S	Housing	Standard
F	Shaft	Flange shaft
S	Bearing	Standard bearing
S	Backlash	Standard
R		Reduced (PHV9)
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
MB <sup>1</sup>		ServoStop motor adapter with brake

To complete the type designation, also specify the following in your order:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at

<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

- Radial shaft seal rings at the output made of NBR or FKM (option), 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 on request
- Double seal for motor adapter (option)
- Socket wrench insert for mounting the motor on the gear unit using the ME/MEL motor adapter (optional)

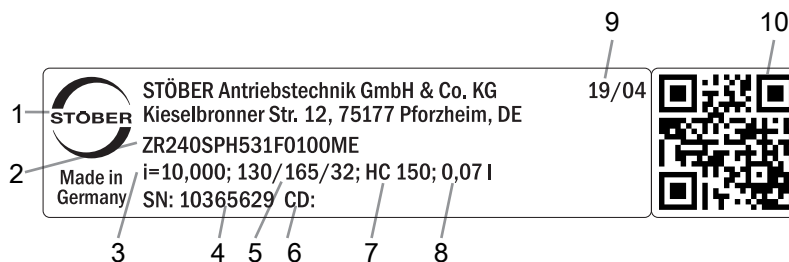
In this product catalog, you will find all the information about rack and pinion drives with a motor adapter.

All input options available upon request are listed in the chapter [▶ 6.5.1](#).

<sup>1</sup>You can find more details in the catalog for ServoStop servo gear unit with brake ID 443234.

## 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>

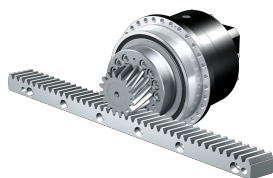
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 6.5 Product description

### 6.5.1 Input options

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

Motor adapter



Catalog ID 443137\_en

EZ synchronous servo motor



Catalog ID 443286\_en

The corresponding catalogs can be found at <http://www.stoeber.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

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](mailto:sales@stober.de).

## 6.5.2 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 clamp coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- 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

## 6.5.3 Gear rack

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

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 the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing$ bz. 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.

You will receive lubricants for use in the food industry upon request.

### 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.

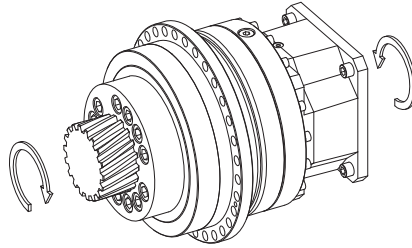


## 6.5.6 Other product features

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: <sup>2</sup>	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

## 6.5.7 Direction of rotation

The input and output rotate in the same direction.



## 6.6 Project configuration

Project your drives using our SERVOSOFT designing software. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

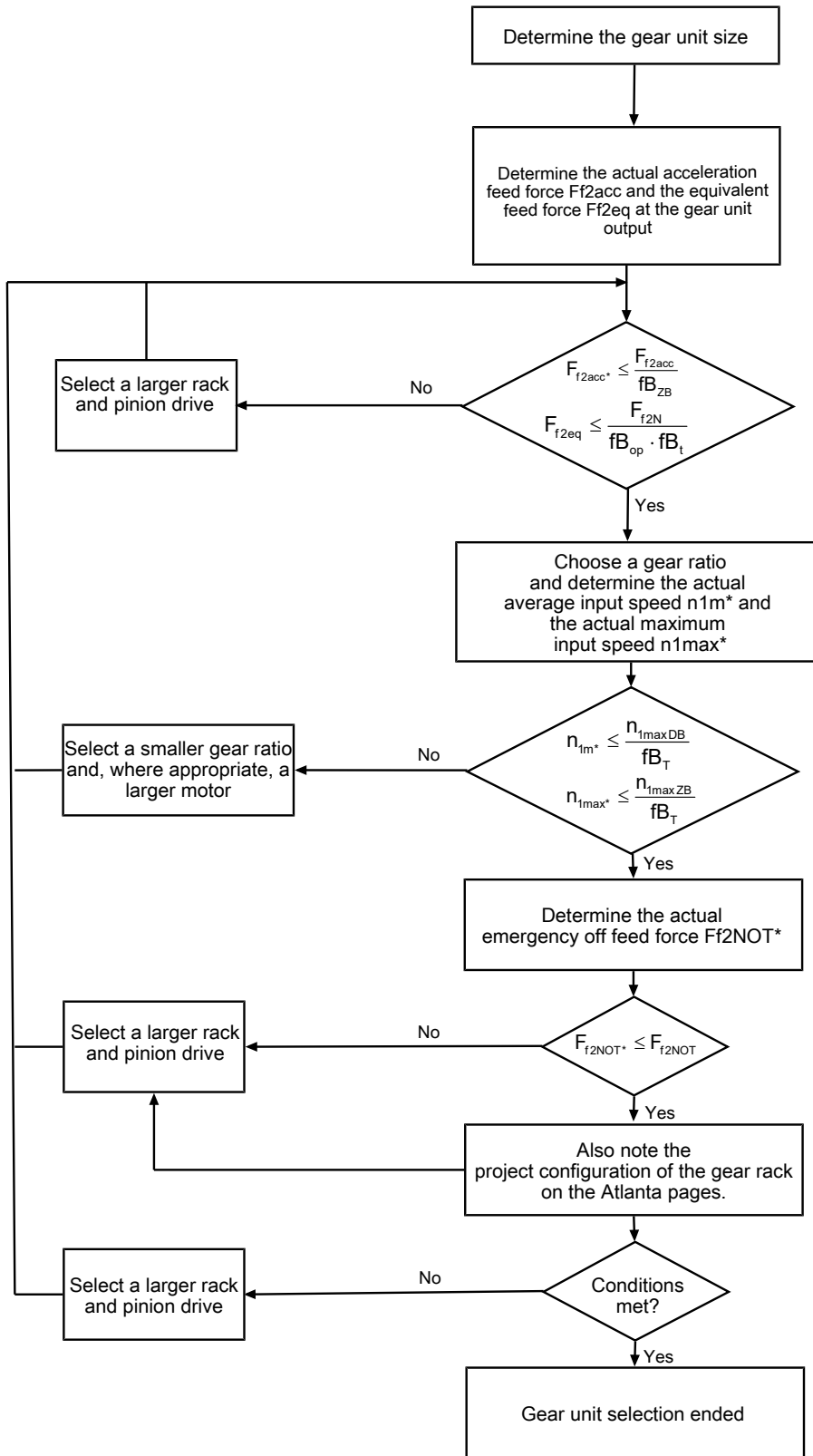
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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 [▶ 13.1](#).

### 6.6.1 Drive selection

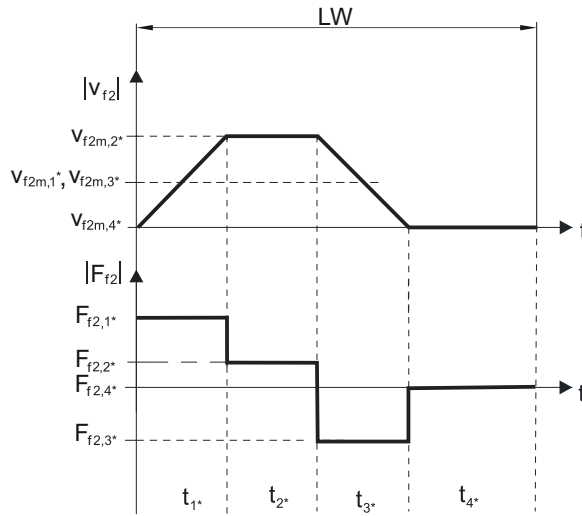


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_T$  and  $fb_{zB}$  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**

$$n_{im} = \frac{v_{f2m} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m} = \frac{|v_{f2m,1}| \cdot t_1 + \dots + |v_{f2m,n}| \cdot t_n}{t_1 + \dots + t_n}$$

If  $t_1 + \dots + t_3 \geq 6$  min, determine  $v_{2m}$  without the rest phase  $t_4$ .

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**

$$F_{f2eq} = \sqrt[3]{\frac{|v_{f2m,1}| \cdot t_1 \cdot |F_{f2,1}|^3 + \dots + |v_{f2m,n}| \cdot t_n \cdot |F_{f2,n}|^3}{|v_{f2m,1}| \cdot t_1 + \dots + |v_{f2m,n}| \cdot t_n}}$$

**Operating factors**

<b>Operating mode</b>	<b>fB<sub>op</sub></b>
Uniform continuous operation	1.00
Cyclic operation	1.00
Reversing load cyclic operation	1.00
<b>Run time</b>	<b>fB<sub>t</sub></b>
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
<b>Cyclic operation</b>	<b>fB<sub>ZB</sub></b>
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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**

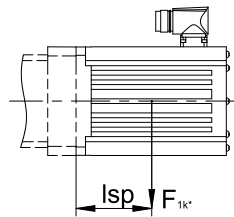
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

## 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:

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



Type	$M_{1k}$ [Nm]
PHV943_ME	200
PHV1043_ME	400

The values also apply to the MEL motor adapter.

## 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 in 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 leaks. 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/downloads/>

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

Documentation	ID
Operating manual gear units, geared motors PHV94 – PHV104	443355_en
Operating manual for gear racks (Atlanta)	442455

# 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	✓
Reinforced output bearing (PH3 – PH5)	✓ (optional)

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

#### Technical data

$m_n$	2 – 4 mm
$z$	30 – 40
$F_{f2acc}$	3.1 – 16 kN
$v_{f2maxZB}$	0.29 – 6.7 m/s
$\Delta s$	10 – 56 $\mu\text{m}$

## 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 [▶ 7.5.4](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration for thermal limiting performance

For rack and pinion drives with reduced backlash or reinforced bearings (PH3 – PH5), higher feed forces are possible. For this and all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

i	Type	$n_{1\max DB}$ [rpm]	$n_{1\max ZB}$ [rpm]	$d_{MW}$ [mm]	$v_{f2\max ZB}$ [m/s]	$\Delta s$ [μm]	$\Delta s_{red}$ [μm]	$C_{lin}$ [N/μm]	$m_n$ [mm]	z	$d_0$ [mm]	$F_{f2N}$ [kN]	$F_{f2acc}$ [kN]	$F_{f2NOT}$ [kN]	$M_{2acc}$ [Nm]
<b>ZR2PH4 (<math>F_{f2acc,max} = 4,9</math> kN)</b>															
4.000	ZR233SPH431_0040 ME	2600	5000	≤24	4.58	31	10	48	2	33	70.0	2.5	3.9	6.4	136
4.000	ZR233SPH431_0040 MEL	2600	5000	≤32	4.58	31	10	48	2	33	70.0	2.5	3.9	6.4	136
5.000	ZR233SPH431_0050 ME	3000	6000	≤24	4.40	31	10	47	2	33	70.0	2.6	4.9	6.4	172
5.000	ZR233SPH431_0050 MEL	3000	6000	≤32	4.40	31	10	47	2	33	70.0	2.6	4.9	6.4	172
7.000	ZR233SPH431_0070 ME	3200	6000	≤24	3.14	31	10	44	2	33	70.0	2.6	4.6	6.4	160
7.000	ZR233SPH431_0070 MEL	3200	6000	≤32	3.14	31	10	44	2	33	70.0	2.6	4.6	6.4	160
10.00	ZR233SPH431_0100 ME	3500	7000	≤24	2.57	31	10	36	2	33	70.0	2.1	3.3	6.4	115
10.00	ZR233SPH431_0100 MEL	3500	7000	≤32	2.57	31	10	36	2	33	70.0	2.1	3.3	6.4	115
16.00	ZR233SPH432_0160 ME	4000	8000	≤19	1.83	31	10	44	2	33	70.0	2.6	4.6	6.4	160
16.00	ZR233SPH432_0160 MEL	4000	8000	≤24	1.83	31	10	44	2	33	70.0	2.6	4.6	6.4	160
20.00	ZR233SPH432_0200 ME	4000	8000	≤19	1.47	31	10	45	2	33	70.0	2.7	4.3	6.4	150
20.00	ZR233SPH432_0200 MEL	4000	8000	≤24	1.47	31	10	45	2	33	70.0	2.7	4.3	6.4	150
25.00	ZR233SPH432_0250 ME	4500	8000	≤19	1.17	31	10	45	2	33	70.0	2.9	4.6	6.4	161
25.00	ZR233SPH432_0250 MEL	4500	8000	≤24	1.17	31	10	45	2	33	70.0	2.9	4.6	6.4	161
28.00	ZR233SPH432_0280 ME	4500	8000	≤19	1.05	31	10	45	2	33	70.0	2.7	4.6	6.4	160
28.00	ZR233SPH432_0280 MEL	4500	8000	≤24	1.05	31	10	45	2	33	70.0	2.7	4.6	6.4	160
35.00	ZR233SPH432_0350 ME	4500	8000	≤19	0.84	31	10	45	2	33	70.0	3.1	4.6	6.4	160
35.00	ZR233SPH432_0350 MEL	4500	8000	≤24	0.84	31	10	45	2	33	70.0	3.1	4.6	6.4	160
40.00	ZR233SPH432_0400 ME	4500	8000	≤19	0.73	31	10	44	2	33	70.0	3.1	4.4	6.4	155
40.00	ZR233SPH432_0400 MEL	4500	8000	≤24	0.73	31	10	44	2	33	70.0	3.1	4.4	6.4	155
50.00	ZR233SPH432_0500 ME	4500	8000	≤19	0.59	31	10	44	2	33	70.0	3.4	4.5	6.4	159
50.00	ZR233SPH432_0500 MEL	4500	8000	≤24	0.59	31	10	44	2	33	70.0	3.4	4.5	6.4	159
70.00	ZR233SPH432_0700 ME	4500	8000	≤19	0.42	31	10	42	2	33	70.0	3.4	4.5	6.4	158
70.00	ZR233SPH432_0700 MEL	4500	8000	≤24	0.42	31	10	42	2	33	70.0	3.4	4.5	6.4	158
100.0	ZR233SPH432_1000 ME	4500	8000	≤19	0.29	31	10	34	2	33	70.0	2.4	3.1	6.3	110
100.0	ZR233SPH432_1000 MEL	4500	8000	≤24	0.29	31	10	34	2	33	70.0	2.4	3.1	6.3	110
<b>ZR2PH5 (<math>F_{f2acc,max} = 8,1</math> kN)</b>															
4.000	ZR240SPH531_0040 ME	2200	5000	≤32	5.56	37	12	77	2	40	84.9	3.6	8.1	10	345
4.000	ZR240SPH531_0040 MEL	2200	5000	≤38	5.56	37	12	78	2	40	84.9	3.6	8.1	10	345
5.000	ZR240SPH531_0050 ME	2500	5500	≤32	4.89	37	12	77	2	40	84.9	3.9	8.1	10	345
5.000	ZR240SPH531_0050 MEL	2500	5500	≤38	4.89	37	12	78	2	40	84.9	3.9	8.1	10	345
7.000	ZR240SPH531_0070 ME	3000	6000	≤32	3.81	37	12	71	2	40	84.9	4.4	8.1	10	345
7.000	ZR240SPH531_0070 MEL	3000	6000	≤38	3.81	37	12	71	2	40	84.9	4.4	8.1	10	345
10.00	ZR240SPH531_0100 ME	3300	6500	≤32	2.89	37	12	59	2	40	84.9	4.2	6.8	10	288
10.00	ZR240SPH531_0100 MEL	3300	6500	≤38	2.89	37	12	59	2	40	84.9	4.2	6.8	10	288
16.00	ZR240SPH532_0160 ME	3500	7000	≤24	1.94	37	12	74	2	40	84.9	5.4	8.1	10	345
16.00	ZR240SPH532_0160 MEL	3500	7000	≤32	1.94	37	12	74	2	40	84.9	5.4	8.1	10	345
20.00	ZR240SPH532_0200 ME	3500	7000	≤24	1.56	37	12	75	2	40	84.9	5.9	8.1	10	345
20.00	ZR240SPH532_0200 MEL	3500	7000	≤32	1.56	37	12	75	2	40	84.9	5.9	8.1	10	345
25.00	ZR240SPH532_0250 ME	3700	7500	≤24	1.33	37	12	75	2	40	84.9	6.1	8.1	10	345
25.00	ZR240SPH532_0250 MEL	3700	7500	≤32	1.33	37	12	75	2	40	84.9	6.1	8.1	10	345
28.00	ZR240SPH532_0280 ME	4000	8000	≤24	1.27	37	12	73	2	40	84.9	5.7	8.1	10	345
28.00	ZR240SPH532_0280 MEL	4000	8000	≤32	1.27	37	12	73	2	40	84.9	5.7	8.1	10	345
35.00	ZR240SPH532_0350 ME	4000	8000	≤24	1.02	37	12	74	2	40	84.9	6.7	8.1	10	345
35.00	ZR240SPH532_0350 MEL	4000	8000	≤32	1.02	37	12	74	2	40	84.9	6.7	8.1	10	345
40.00	ZR240SPH532_0400 ME	4000	8000	≤24	0.89	37	12	70	2	40	84.9	6.1	8.1	10	345
40.00	ZR240SPH532_0400 MEL	4000	8000	≤32	0.89	37	12	70	2	40	84.9	6.1	8.1	10	345
50.00	ZR240SPH532_0500 ME	4000	8000	≤24	0.71	37	12	73	2	40	84.9	6.7	8.1	10	345
50.00	ZR240SPH532_0500 MEL	4000	8000	≤32	0.71	37	12	73	2	40	84.9	6.7	8.1	10	345
70.00	ZR240SPH532_0700 ME	4000	8000	≤24	0.51	37	12	68	2	40	84.9	6.7	8.1	10	345
70.00	ZR240SPH532_0700 MEL	4000	8000	≤32	0.51	37	12	68	2	40	84.9	6.7	8.1	10	345



7.2 Selection tables 7 ZRPH rack and pinion drives

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{ZmaxZB}$	$\Delta s$	$\Delta s_{red}$	$C_{lin}$	$m_n$	z	$d_0$	$F_{fzN}$	$F_{fzacc}$	$F_{fzNOT}$	$M_{Zacc}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu$ m]	[ $\mu$ m]	[N/ $\mu$ m]	[mm]						
<b>ZR2PH5 (<math>F_{fzacc,max} = 8,1</math> kN)</b>															
100.0	ZR240SPH532_1000 ME	4000	8000	$\leq 24$	0.36	37	12	58	2	40	84.9	5.2	6.8	10	288
100.0	ZR240SPH532_1000 MEL	4000	8000	$\leq 32$	0.36	37	12	58	2	40	84.9	5.2	6.8	10	288
<b>ZR3PH5 (<math>F_{fzacc,max} = 7,7</math> kN)</b>															
4.000	ZR330SPH531_0040 ME	2200	5000	$\leq 32$	6.25	42	14	62	3	30	95.5	3.6	7.4	9.6	355
4.000	ZR330SPH531_0040 MEL	2200	5000	$\leq 38$	6.25	42	14	62	3	30	95.5	3.6	7.4	9.6	355
5.000	ZR330SPH531_0050 ME	2500	5500	$\leq 32$	5.50	42	14	62	3	30	95.5	3.8	7.7	9.6	368
5.000	ZR330SPH531_0050 MEL	2500	5500	$\leq 38$	5.50	42	14	62	3	30	95.5	3.8	7.7	9.6	368
7.000	ZR330SPH531_0070 ME	3000	6000	$\leq 32$	4.29	42	14	57	3	30	95.5	4.3	7.7	9.6	368
7.000	ZR330SPH531_0070 MEL	3000	6000	$\leq 38$	4.29	42	14	57	3	30	95.5	4.3	7.7	9.6	368
10.00	ZR330SPH531_0100 ME	3300	6500	$\leq 32$	3.25	42	14	47	3	30	95.5	3.8	6.0	9.6	288
10.00	ZR330SPH531_0100 MEL	3300	6500	$\leq 38$	3.25	42	14	47	3	30	95.5	3.8	6.0	9.6	288
16.00	ZR330SPH532_0160 ME	3500	7000	$\leq 24$	2.19	42	14	59	3	30	95.5	4.8	7.4	9.6	355
16.00	ZR330SPH532_0160 MEL	3500	7000	$\leq 32$	2.19	42	14	59	3	30	95.5	4.8	7.4	9.6	355
20.00	ZR330SPH532_0200 ME	3500	7000	$\leq 24$	1.75	42	14	60	3	30	95.5	5.2	7.7	9.6	368
20.00	ZR330SPH532_0200 MEL	3500	7000	$\leq 32$	1.75	42	14	60	3	30	95.5	5.2	7.7	9.6	368
25.00	ZR330SPH532_0250 ME	3700	7500	$\leq 24$	1.50	42	14	60	3	30	95.5	5.4	7.7	9.6	368
25.00	ZR330SPH532_0250 MEL	3700	7500	$\leq 32$	1.50	42	14	60	3	30	95.5	5.4	7.7	9.6	368
28.00	ZR330SPH532_0280 ME	4000	8000	$\leq 24$	1.43	42	14	58	3	30	95.5	5.0	7.4	9.6	355
28.00	ZR330SPH532_0280 MEL	4000	8000	$\leq 32$	1.43	42	14	58	3	30	95.5	5.0	7.4	9.6	355
35.00	ZR330SPH532_0350 ME	4000	8000	$\leq 24$	1.14	42	14	60	3	30	95.5	6.1	7.7	9.6	368
35.00	ZR330SPH532_0350 MEL	4000	8000	$\leq 32$	1.14	42	14	60	3	30	95.5	6.1	7.7	9.6	368
40.00	ZR330SPH532_0400 ME	4000	8000	$\leq 24$	1.00	42	14	56	3	30	95.5	5.4	7.4	9.6	355
40.00	ZR330SPH532_0400 MEL	4000	8000	$\leq 32$	1.00	42	14	56	3	30	95.5	5.4	7.4	9.6	355
50.00	ZR330SPH532_0500 ME	4000	8000	$\leq 24$	0.80	42	14	58	3	30	95.5	6.2	7.7	9.6	368
50.00	ZR330SPH532_0500 MEL	4000	8000	$\leq 32$	0.80	42	14	58	3	30	95.5	6.2	7.7	9.6	368
70.00	ZR330SPH532_0700 ME	4000	8000	$\leq 24$	0.57	42	14	55	3	30	95.5	6.0	7.7	9.6	368
70.00	ZR330SPH532_0700 MEL	4000	8000	$\leq 32$	0.57	42	14	55	3	30	95.5	6.0	7.7	9.6	368
100.0	ZR330SPH532_1000 ME	4000	8000	$\leq 24$	0.40	42	14	46	3	30	95.5	4.6	6.0	9.6	288
100.0	ZR330SPH532_1000 MEL	4000	8000	$\leq 32$	0.40	42	14	46	3	30	95.5	4.6	6.0	9.6	288
<b>ZR3PH7 (<math>F_{fzacc,max} = 16</math> kN)</b>															
4.000	ZR335SPH731_0040 ME	1900	4000	$\leq 38$	5.83	49	16	105	3	35	111.4	7.9	15	19	840
4.000	ZR335SPH731_0040 MEL	1900	4000	$\leq 48$	5.83	49	16	108	3	35	111.4	7.9	15	19	840
4.000	ZR340SPH731_0040 ME	1900	4000	$\leq 38$	6.67	56	19	93	3	40	127.3	6.9	13	17	840
4.000	ZR340SPH731_0040 MEL	1900	4000	$\leq 48$	6.67	56	19	95	3	40	127.3	6.9	13	17	840
5.000	ZR335SPH731_0050 ME	2200	5000	$\leq 38$	5.83	49	16	101	3	35	111.4	7.9	16	19	869
5.000	ZR335SPH731_0050 MEL	2200	5000	$\leq 48$	5.83	49	16	103	3	35	111.4	7.9	16	19	869
5.000	ZR340SPH731_0050 ME	2200	5000	$\leq 38$	6.67	56	19	89	3	40	127.3	6.9	14	17	879
5.000	ZR340SPH731_0050 MEL	2200	5000	$\leq 48$	6.67	56	19	90	3	40	127.3	6.9	14	17	879
7.000	ZR335SPH731_0070 ME	2500	5000	$\leq 38$	4.17	49	16	93	3	35	111.4	7.9	16	19	869
7.000	ZR335SPH731_0070 MEL	2500	5000	$\leq 48$	4.17	49	16	93	3	35	111.4	7.9	16	19	869
7.000	ZR340SPH731_0070 ME	2500	5000	$\leq 38$	4.76	56	19	80	3	40	127.3	6.9	14	17	869
7.000	ZR340SPH731_0070 MEL	2500	5000	$\leq 48$	4.76	56	19	81	3	40	127.3	6.9	14	17	869
10.00	ZR335SPH731_0100 ME	2500	5000	$\leq 38$	2.92	49	16	80	3	35	111.4	6.3	10	19	575
10.00	ZR335SPH731_0100 MEL	2500	5000	$\leq 48$	2.92	49	16	80	3	35	111.4	6.3	10	19	575
10.00	ZR340SPH731_0100 ME	2500	5000	$\leq 38$	3.33	56	19	68	3	40	127.3	5.5	9.0	17	575
10.00	ZR340SPH731_0100 MEL	2500	5000	$\leq 48$	3.33	56	19	68	3	40	127.3	5.5	9.0	17	575
16.00	ZR335SPH732_0160 ME	3000	6000	$\leq 32$	2.19	49	16	104	3	35	111.4	8.1	13	19	740
16.00	ZR335SPH732_0160 MEL	3000	6000	$\leq 38$	2.19	49	16	104	3	35	111.4	8.1	13	19	740
16.00	ZR340SPH732_0160 ME	3000	6000	$\leq 32$	2.50	56	19	91	3	40	127.3	7.1	12	17	740
16.00	ZR340SPH732_0160 MEL	3000	6000	$\leq 38$	2.50	56	19	91	3	40	127.3	7.1	12	17	740
20.00	ZR335SPH732_0200 ME	3000	6000	$\leq 32$	1.75	49	16	100	3	35	111.4	8.3	14	19	805
20.00	ZR335SPH732_0200 MEL	3000	6000	$\leq 38$	1.75	49	16	100	3	35	111.4	8.3	14	19	805
20.00	ZR340SPH732_0200 ME	3000	6000	$\leq 32$	2.00	56	19	87	3	40	127.3	7.2	13	17	805
20.00	ZR340SPH732_0200 MEL	3000	6000	$\leq 38$	2.00	56	19	88	3	40	127.3	7.2	13	17	805
25.00	ZR335SPH732_0250 ME	3500	7000	$\leq 32$	1.63	49	16	100	3	35	111.4	9.0	16	19	866
25.00	ZR335SPH732_0250 MEL	3500	7000	$\leq 38$	1.63	49	16	100	3	35	111.4	9.0	16	19	866
25.00	ZR340SPH732_0250 ME	3500	7000	$\leq 32$	1.87	56	19	87	3	40	127.3	7.9	14	17	866
25.00	ZR340SPH732_0250 MEL	3500	7000	$\leq 38$	1.87	56	19	87	3	40	127.3	7.9	14	17	866
28.00	ZR335SPH732_0280 ME	3700	7000	$\leq 32$	1.46	49	16	102	3	35	111.4	9.7	14	19	770
28.00	ZR335SPH732_0280 MEL	3700	7000	$\leq 38$	1.46	49	16	102	3	35	111.4	9.7	14	19	770
28.00	ZR340SPH732_0280 ME	3700	7000	$\leq 32$	1.67	56	19	89	3	40	127.3	8.5	12	17	770
28.00	ZR340SPH732_0280 MEL	3700	7000	$\leq 38$	1.67	56	19	89	3	40	127.3	8.5	12	17	770
35.00	ZR335SPH732_0350 ME	3700	7000	$\leq 32$	1.17	49	16	99	3	35	111.4	9.7	16	19	866
35.00	ZR335SPH732_0350 MEL	3700	7000	$\leq 38$	1.17	49	16	99	3	35	111.4	9.7	16	19	866
35.00	ZR340SPH732_0350 ME	3700	7000	$\leq 32$	1.33	56	19	87	3	40	127.3	8.5	14	17	866
35.00	ZR340SPH732_0350 MEL	3700	7000	$\leq 38$	1.33	56	19	87	3	40	127.3	8.5	14	17	866

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{f2maxZB}$	$\Delta s$	$\Delta s_{red}$	$C_{lin}$	$m_n$	z	$d_0$	$F_{f2N}$	$F_{f2acc}$	$F_{f2NOT}$	$M_{2acc}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu$ m]	[ $\mu$ m]	[N/ $\mu$ m]	[mm]						
<b>ZR3PH7 (<math>F_{f2acc,max} = 16</math> kN)</b>															
40.00	ZR335SPH732_0400 ME	3700	7000	$\leq 32$	1.02	49	16	99	3	35	111.4	9.7	14	19	770
40.00	ZR335SPH732_0400 MEL	3700	7000	$\leq 38$	1.02	49	16	99	3	35	111.4	9.7	14	19	770
40.00	ZR340SPH732_0400 ME	3700	7000	$\leq 32$	1.17	56	19	86	3	40	127.3	8.5	12	17	770
40.00	ZR340SPH732_0400 MEL	3700	7000	$\leq 38$	1.17	56	19	86	3	40	127.3	8.5	12	17	770
50.00	ZR335SPH732_0500 ME	3700	7000	$\leq 32$	0.82	49	16	97	3	35	111.4	11	15	19	830
50.00	ZR335SPH732_0500 MEL	3700	7000	$\leq 38$	0.82	49	16	97	3	35	111.4	11	15	19	830
50.00	ZR340SPH732_0500 ME	3700	7000	$\leq 32$	0.93	56	19	85	3	40	127.3	9.4	13	17	830
50.00	ZR340SPH732_0500 MEL	3700	7000	$\leq 38$	0.93	56	19	85	3	40	127.3	9.4	13	17	830
70.00	ZR335SPH732_0700 ME	3700	7000	$\leq 32$	0.58	49	16	91	3	35	111.4	11	15	19	809
70.00	ZR335SPH732_0700 MEL	3700	7000	$\leq 38$	0.58	49	16	91	3	35	111.4	11	15	19	809
70.00	ZR340SPH732_0700 ME	3700	7000	$\leq 32$	0.67	56	19	78	3	40	127.3	9.4	13	17	809
70.00	ZR340SPH732_0700 MEL	3700	7000	$\leq 38$	0.67	56	19	78	3	40	127.3	9.4	13	17	809
100.0	ZR335SPH732_1000 ME	3700	7000	$\leq 32$	0.41	49	16	79	3	35	111.4	7.6	9.9	19	550
100.0	ZR335SPH732_1000 MEL	3700	7000	$\leq 38$	0.41	49	16	79	3	35	111.4	7.6	9.9	19	550
100.0	ZR340SPH732_1000 ME	3700	7000	$\leq 32$	0.47	56	19	67	3	40	127.3	6.6	8.6	17	550
100.0	ZR340SPH732_1000 MEL	3700	7000	$\leq 38$	0.47	56	19	67	3	40	127.3	6.6	8.6	17	550
<b>ZR4PH7 (<math>F_{f2acc,max} = 14</math> kN)</b>															
4.000	ZR430SPH731_0040 ME	1900	4000	$\leq 38$	6.67	56	19	91	4	30	127.3	6.9	13	17	840
4.000	ZR430SPH731_0040 MEL	1900	4000	$\leq 48$	6.67	56	19	93	4	30	127.3	6.9	13	17	840
5.000	ZR430SPH731_0050 ME	2200	5000	$\leq 38$	6.67	56	19	87	4	30	127.3	6.9	14	17	882
5.000	ZR430SPH731_0050 MEL	2200	5000	$\leq 48$	6.67	56	19	88	4	30	127.3	6.9	14	17	882
7.000	ZR430SPH731_0070 ME	2500	5000	$\leq 38$	4.76	56	19	79	4	30	127.3	6.9	14	17	869
7.000	ZR430SPH731_0070 MEL	2500	5000	$\leq 48$	4.76	56	19	79	4	30	127.3	6.9	14	17	869
10.00	ZR430SPH731_0100 ME	2500	5000	$\leq 38$	3.33	56	19	67	4	30	127.3	5.5	9.0	17	575
10.00	ZR430SPH731_0100 MEL	2500	5000	$\leq 48$	3.33	56	19	67	4	30	127.3	5.5	9.0	17	575
16.00	ZR430SPH732_0160 ME	3000	6000	$\leq 32$	2.50	56	19	89	4	30	127.3	7.1	12	17	740
16.00	ZR430SPH732_0160 MEL	3000	6000	$\leq 38$	2.50	56	19	89	4	30	127.3	7.1	12	17	740
20.00	ZR430SPH732_0200 ME	3000	6000	$\leq 32$	2.00	56	19	86	4	30	127.3	7.2	13	17	805
20.00	ZR430SPH732_0200 MEL	3000	6000	$\leq 38$	2.00	56	19	86	4	30	127.3	7.2	13	17	805
25.00	ZR430SPH732_0250 ME	3500	7000	$\leq 32$	1.87	56	19	86	4	30	127.3	7.9	14	17	866
25.00	ZR430SPH732_0250 MEL	3500	7000	$\leq 38$	1.87	56	19	86	4	30	127.3	7.9	14	17	866
28.00	ZR430SPH732_0280 ME	3700	7000	$\leq 32$	1.67	56	19	88	4	30	127.3	8.5	12	17	770
28.00	ZR430SPH732_0280 MEL	3700	7000	$\leq 38$	1.67	56	19	88	4	30	127.3	8.5	12	17	770
35.00	ZR430SPH732_0350 ME	3700	7000	$\leq 32$	1.33	56	19	85	4	30	127.3	8.5	14	17	866
35.00	ZR430SPH732_0350 MEL	3700	7000	$\leq 38$	1.33	56	19	85	4	30	127.3	8.5	14	17	866
40.00	ZR430SPH732_0400 ME	3700	7000	$\leq 32$	1.17	56	19	85	4	30	127.3	8.5	12	17	770
40.00	ZR430SPH732_0400 MEL	3700	7000	$\leq 38$	1.17	56	19	85	4	30	127.3	8.5	12	17	770
50.00	ZR430SPH732_0500 ME	3700	7000	$\leq 32$	0.93	56	19	83	4	30	127.3	9.4	13	17	830
50.00	ZR430SPH732_0500 MEL	3700	7000	$\leq 38$	0.93	56	19	83	4	30	127.3	9.4	13	17	830
70.00	ZR430SPH732_0700 ME	3700	7000	$\leq 32$	0.67	56	19	77	4	30	127.3	9.4	13	17	809
70.00	ZR430SPH732_0700 MEL	3700	7000	$\leq 38$	0.67	56	19	77	4	30	127.3	9.4	13	17	809
100.0	ZR430SPH732_1000 ME	3700	7000	$\leq 32$	0.47	56	19	66	4	30	127.3	6.6	8.6	17	550
100.0	ZR430SPH732_1000 MEL	3700	7000	$\leq 38$	0.47	56	19	66	4	30	127.3	6.6	8.6	17	550

## 7.3 Dimensional drawings

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

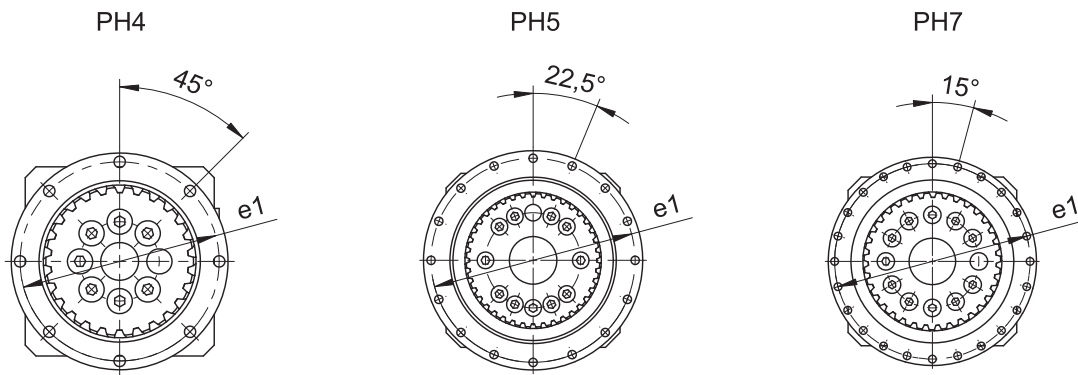
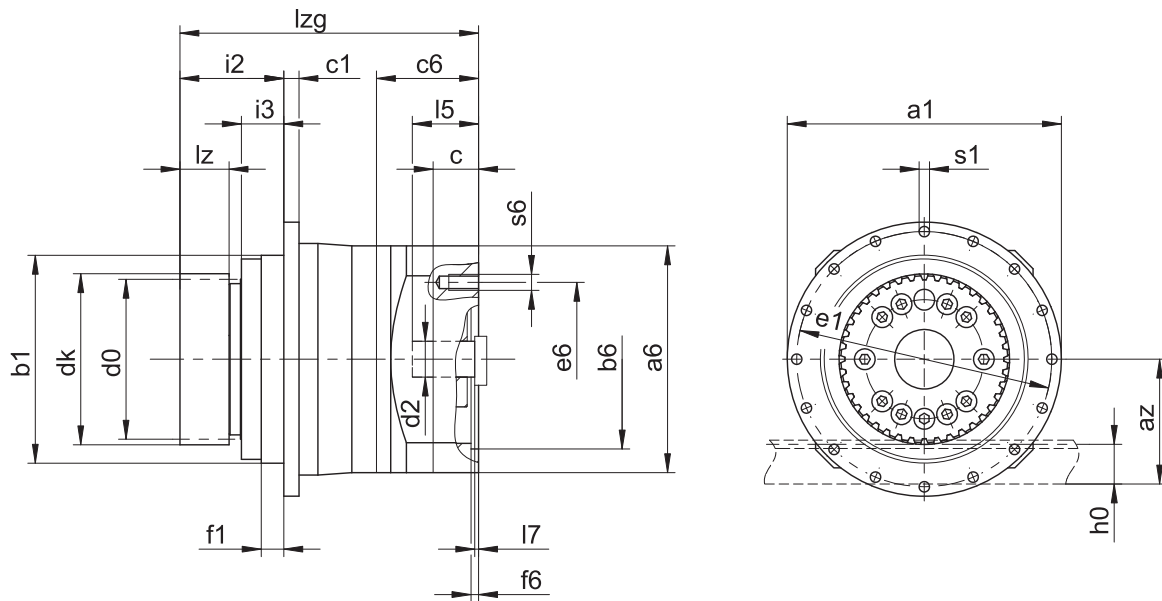
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

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 <https://configurator.stoeber.de/en-US/>.



### 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
ZR233SPH4_	2	118 <sub>h7</sub>	57.80	90 <sub>h7</sub>	7	70.03	75.0	109	10	56.0	22	23.5	26	5.5	0.39
ZR240SPH5_	2	145 <sub>h7</sub>	65.20	110 <sub>h7</sub>	8	84.88	90.0	135	12	55.0	22	22.5	26	5.5	0.38
ZR330SPH5_	3	145 <sub>h7</sub>	73.75	110 <sub>h7</sub>	8	95.49	101.5	135	12	64.0	26	22.5	35	5.5	0.00
ZR335SPH7_	3	179 <sub>h7</sub>	82.80	140 <sub>h7</sub>	10	111.41	119.0	168	12	69.0	26	31.5	31	6.6	0.37
ZR340SPH7_	3	179 <sub>h7</sub>	90.80	140 <sub>h7</sub>	10	127.32	135.0	168	12	69.0	26	31.5	31	6.6	0.38
ZR430SPH7_	4	179 <sub>h7</sub>	98.66	140 <sub>h7</sub>	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	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZR233SPH431_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	139.5	M8
ZR233SPH432_ME	60 <sup>H7</sup>	75	19	41	75	18	41.5	3.5	4.0	176.5	M5
ZR240SPH531_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	158.0	M8
ZR330SPH531_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	167.0	M8
ZR240SPH532_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	187.0	M8
ZR330SPH532_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	196.0	M8
ZR335SPH731_ME	130 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	192.0	M10
ZR340SPH731_ME	130 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	192.0	M10
ZR430SPH731_ME	130 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	206.0	M10
ZR335SPH732_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	230.0	M8
ZR340SPH732_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	230.0	M8
ZR430SPH732_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	244.0	M8

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6, l5 and lzg are also lengthened accordingly.**

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

## 7.4 Type designation

This chapter shows you 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.

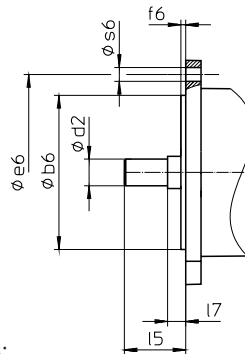
### Example code

Z	R	3	30	S	PH	5	3	2	S	F	S	S	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)
3	Generation	Generation 3
1	Stages	Single-stage
2		Two-stage
S	Housing	Standard
F	Shaft	Flange shaft
S	Bearing	Standard bearing
V		Reinforced bearing (PH3 – PH5)
S	Backlash	Standard
R		Reduced
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
MF		Motor adapter with FlexiAdapt coupling
MB <sup>1</sup>		ServoStop motor adapter with brake

To complete the type designation, also specify the following in your order:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBER Configurator at

<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

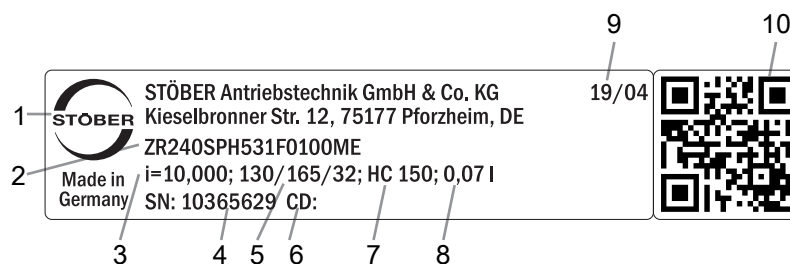
- Radial shaft seal rings at the output made of NBR or FKM (option), see the chapter [▶ 7.6.3]
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request
- PH531, PH7: Double seal for motor adapter (option)
- Socket wrench insert for mounting the motor on the gear unit using the ME/MEL/MF motor adapter (option)

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 [▶ 7.5.1].

96 <sup>1</sup>You can find more details in the catalog for the ServoStop servo gear unit with brake, ID 443234.

## 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 Input options

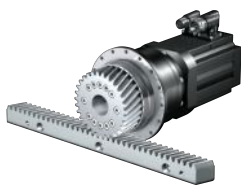
In this chapter, you will find all available input options:

Motor adapter



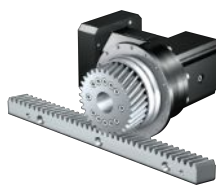
Catalog ID 443137\_en

EZ synchronous servo motor



Catalog ID 443286\_en

KX right-angle input with MF motor adapter



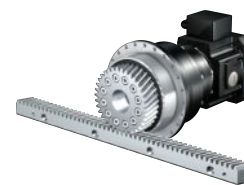
On request

K right-angle input with ME motor adapter



On request

MB motor adapter



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

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](mailto:sales@stober.de).

## 7.5.2 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 clamp coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- 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

## 7.5.3 Motor adapter with FlexiAdapt coupling (MF)

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

**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
- Motor shaft decoupled from axial forces
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- Error-free, thanks to exact centering of the motor



Fig. 2: FlexiAdapt coupling

## 7.5.4 Gear rack

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

Also note the project configuration of the gear rack on the Atlanta pages.

## 7.5.5 Installation conditions

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

- When the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot  $\varnothing$ bz. The machine-side fit must be H7.

## 7.5.6 Lubricants

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

You will receive lubricants for use in the food industry upon request.

### 7.5.6.1 Rack and pinion drive lubrication

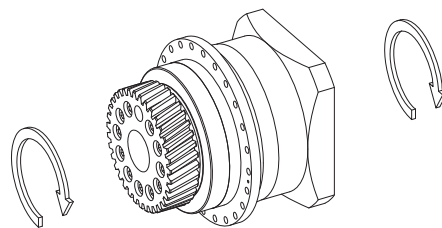
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 7.5.7 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	$\leq 90$ °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable.
Protection class: <sup>2</sup>	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

## 7.5.8 Direction of rotation

The input and output rotate in the same direction.



<sup>2</sup>Observe the protection class of all the components.



## 7.6 Project configuration

Project your drives using our SERVOnsoft designing software. Download SERVOnsoft for free at <https://www.stoeber.de/en/ServoSoft>.

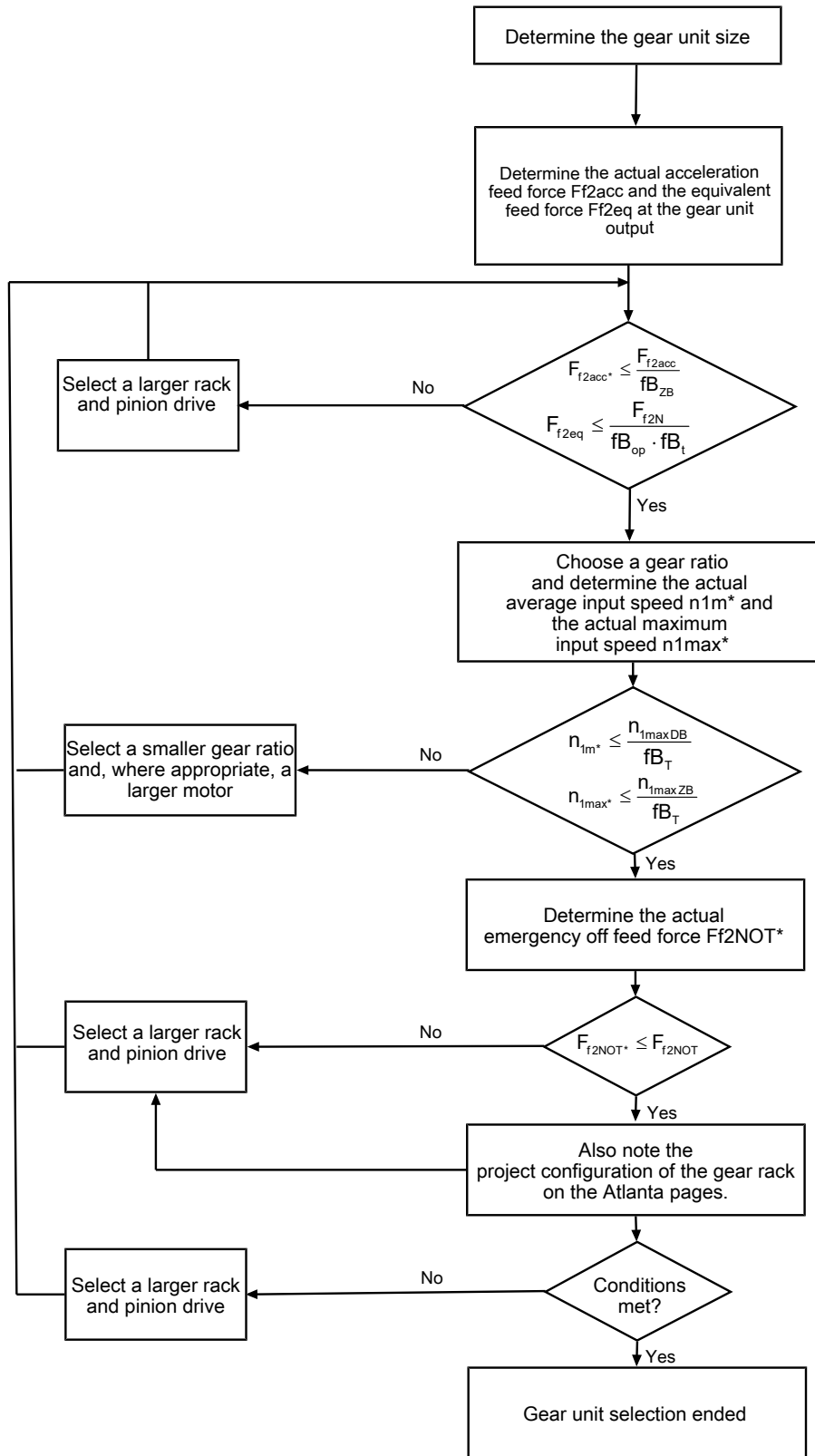
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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 [▶ 13.1](#).

### 7.6.1 Drive selection

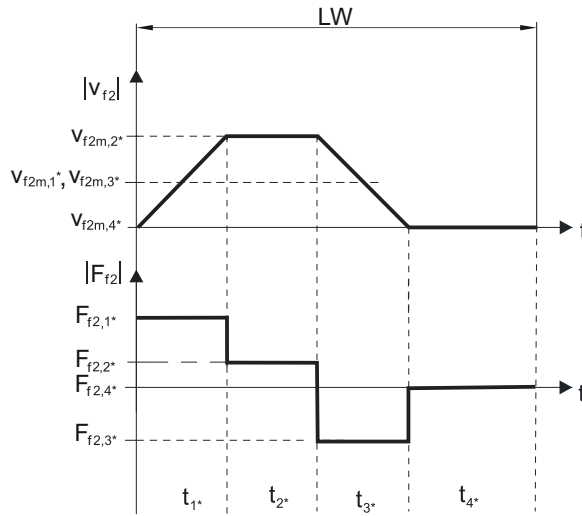


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ .

The values for  $f_{B_T}$ ,  $f_{B_{op}}$ ,  $f_{B_t}$  and  $f_{B_{zB}}$  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**

$$n_{im}^* = \frac{v_{f2m}^* \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m}^* = \frac{|v_{f2m,1}^*| \cdot t_1^* + \dots + |v_{f2m,n}^*| \cdot t_n^*}{t_1^* + \dots + t_n^*}$$

If  $t_1^* + \dots + t_3^* \geq 6$  min, determine  $v_{2m}^*$  without the rest phase  $t_4^*$ .

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**

$$F_{f2eq}^* = \sqrt[3]{\frac{|v_{f2m,1}^*| \cdot t_1^* \cdot |F_{f2,1}^*|^3 + \dots + |v_{f2m,n}^*| \cdot t_n^* \cdot |F_{f2,n}^*|^3}{|v_{f2m,1}^*| \cdot t_1^* + \dots + |v_{f2m,n}^*| \cdot t_n^*}}$$

**Operating factors**

<b>Operating mode</b>	<b><math>fB_{op}</math></b>
Uniform continuous operation	1.00
Cyclic operation	1.00
Reversing load cyclic operation	1.00
<b>Run time</b>	<b><math>fB_t</math></b>
Daily runtime $\leq 8$ h	1.00
Daily runtime $\leq 16$ h	1.15
Daily runtime $\leq 24$ h	1.20
<b>Cyclic operation</b>	<b><math>fB_{zB}</math></b>
$\leq 1000$ load changes/hour (LW/h)	1.00
$> 1000$ load changes/hour (LW/h)	1.15

Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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

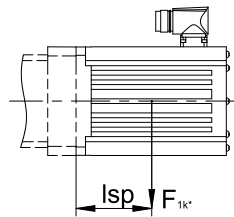
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

## 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:

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



Type	$M_{1k}$ [Nm]
PH331_ME	20
PH332_ME	10
PH431_ME	40
PH432_ME	20
PH531_ME	80
PH532_ME	40
PH731_ME	200
PH732_ME	80
PH831_ME	400
PH832_ME	200
PH942_ME	400
PH1042_ME	400

The values also apply to the MEL and MF motor adapters.

### 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 in 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 leaks. 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/downloads/>

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

Documentation	ID
Operating manual gear units, geared motors PH33 – PH83, PH94 – PH104	443354_de
Operating manual for gear racks (Atlanta)	442455

## 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 6 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓

Key ★☆☆☆☆ good | ★★★★★ excellent

€ Economy | €€€€€ Premium

#### Technical data

$m_n$	2 – 4 mm
$z$	16 – 25
$F_{f2acc}$	1.7 – 15 kN
$v_{f2maxZB}$	0.14 – 5.3 m/s
$\Delta s$	8 – 44 $\mu\text{m}$

## 8.2 Selection tables

The technical data specified in the selection tables applies to:

- Pinion position E with bearing design S (standard)
- Pinion position S with bearing design D (axially reinforced, option)
- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 8.5.4]
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- $C_{lin}$ : Pinion position S with bearing design D (axially reinforced, option)

Higher feed forces are possible for rack and pinion drives with reduced backlash, reinforced bearing D (axially reinforced) or pinion position S. You can find this and all other technical data, as well as other combinations of the pinion position and bearing design, at <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1].

i	Type	$n_{1maxDB}$ [rpm]	$n_{1maxZB}$ [rpm]	$d_{MW}$ [mm]	$v_{ZmaxZB}$ [m/s]	$\Delta s$ [μm]	$\Delta s_{red}$ [μm]	$C_{lin}$ [N/ μm]	$m_n$ [mm]	z	$d_0$ [mm]	$F_{ZN,S}$ [kN]	$F_{ZN,E}$ [kN]	$F_{ZaccS}$ [kN]	$F_{ZaccE}$ [kN]	$F_{ZNOT,S}$ [kN]	$F_{ZNOT,E}$ [kN]	$M_{ZaccS}$ [Nm]	$M_{ZaccE}$ [Nm]
<b>ZV2P3 (<math>F_{Zacc,max} = 2,0 \text{ kN}</math>)</b>																			
3.000	ZV216S_P331_0030 ME	3500	7000	≤19	4.15	20	10	16	2	16	34.0	1.8	1.5	2.0	1.7	4.0	3.3	34	28
3.000	ZV216S_P331_0030 MEL	3500	7000	≤24	4.15	20	10	16	2	16	34.0	1.8	1.5	2.0	1.7	4.0	3.3	34	28
4.000	ZV216S_P331_0040 ME	4000	8000	≤19	3.56	20	10	16	2	16	34.0	2.0	1.6	2.0	1.7	4.0	3.3	34	28
4.000	ZV216S_P331_0040 MEL	4000	8000	≤24	3.56	20	10	16	2	16	34.0	2.0	1.6	2.0	1.7	4.0	3.3	34	28
5.000	ZV216S_P331_0050 ME	4500	8000	≤19	2.84	20	10	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
5.000	ZV216S_P331_0050 MEL	4500	8000	≤24	2.84	20	10	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
7.000	ZV216S_P331_0070 ME	5000	8000	≤19	2.03	20	10	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
7.000	ZV216S_P331_0070 MEL	5000	8000	≤24	2.03	20	10	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
8.000	ZV216S_P331_0080 ME	5000	8000	≤19	1.78	20	10	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
8.000	ZV216S_P331_0080 MEL	5000	8000	≤24	1.78	20	10	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
10.00	ZV216S_P331_0100 ME	5500	8000	≤19	1.42	20	10	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
10.00	ZV216S_P331_0100 MEL	5500	8000	≤24	1.42	20	10	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
12.00	ZV216S_P332_0120 ME	5500	8000	≤14	1.19	25	15	15	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
12.00	ZV216S_P332_0120 MEL	5500	8000	≤19	1.19	25	15	15	2	16	34.0	1.8	1.7	2.0	1.7	4.0	3.3	34	28
16.00	ZV216S_P332_0160 ME	5500	8000	≤14	0.89	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
16.00	ZV216S_P332_0160 MEL	5500	8000	≤19	0.89	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
20.00	ZV216S_P332_0200 ME	5500	8000	≤14	0.71	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
20.00	ZV216S_P332_0200 MEL	5500	8000	≤19	0.71	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
25.00	ZV216S_P332_0250 ME	6000	8000	≤14	0.57	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
25.00	ZV216S_P332_0250 MEL	6000	8000	≤19	0.57	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
28.00	ZV216S_P332_0280 ME	6000	8000	≤14	0.51	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
28.00	ZV216S_P332_0280 MEL	6000	8000	≤19	0.51	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
32.00	ZV216S_P332_0320 ME	5500	8000	≤14	0.44	25	15	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
32.00	ZV216S_P332_0320 MEL	5500	8000	≤19	0.44	25	15	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
35.00	ZV216S_P332_0350 ME	6000	8000	≤14	0.41	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
35.00	ZV216S_P332_0350 MEL	6000	8000	≤19	0.41	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
40.00	ZV216S_P332_0400 ME	6000	8000	≤14	0.36	25	15	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
40.00	ZV216S_P332_0400 MEL	6000	8000	≤19	0.36	25	15	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
50.00	ZV216S_P332_0500 ME	6000	8000	≤14	0.28	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
50.00	ZV216S_P332_0500 MEL	6000	8000	≤19	0.28	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
56.00	ZV216S_P332_0560 ME	6000	8000	≤14	0.25	25	15	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
56.00	ZV216S_P332_0560 MEL	6000	8000	≤19	0.25	25	15	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
70.00	ZV216S_P332_0700 ME	6000	8000	≤14	0.20	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
70.00	ZV216S_P332_0700 MEL	6000	8000	≤19	0.20	25	15	16	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
80.00	ZV216S_P332_0800 ME	6000	8000	≤14	0.18	25	15	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
80.00	ZV216S_P332_0800 MEL	6000	8000	≤19	0.18	25	15	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
100.0	ZV216S_P332_1000 ME	6000	8000	≤14	0.14	25	15	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
100.0	ZV216S_P332_1000 MEL	6000	8000	≤19	0.14	25	15	15	2	16	34.0	2.0	1.7	2.0	1.7	4.0	3.3	34	28
<b>ZV2P4 (<math>F_{Zacc,max} = 4,8 \text{ kN}</math>)</b>																			
3.000	ZV220S_P431_0030 ME	3000	6000	≤24	4.44	25	12	25	2	20	42.4	2.4	2.2	4.7	3.2	9.4	6.3	100	67
3.000	ZV220S_P431_0030 MEL	3000	6000	≤32	4.44	25	12	25	2	20	42.4	2.4	2.2	4.7	3.2	9.4	6.3	100	67
4.000	ZV220S_P431_0040 ME	3300	6500	≤24	3.61	25	12	26	2	20	42.4	3.8	2.4	4.8	3.2	9.7	6.3	102	67
4.000	ZV220S_P431_0040 MEL	3300	6500	≤32	3.61	25	12	26	2	20	42.4	3.8	2.4	4.8	3.2	9.7	6.3	102	67
5.000	ZV220S_P431_0050 ME	3700	7000	≤24	3.11	25	12	26	2	20	42.4	4.1	2.6	4.8	3.2	9.7	6.3	102	67



8.2 Selection tables 8 ZVP rack and pinion drives

i	Type	n <sub>1maxDB</sub> [rpm]	n <sub>1maxZB</sub> [rpm]	d <sub>MW</sub> [mm]	v <sub>12maxZB</sub> [m/s]	Δs [μm]	Δs <sub>red</sub> [μm]	C <sub>lin</sub> [N/ μm]	m <sub>n</sub> [mm]	z	d <sub>0</sub> [mm]	F <sub>12N,S</sub> [kN]	F <sub>12N,E</sub> [kN]	F <sub>12accS</sub> [kN]	F <sub>12accE</sub> [kN]	F <sub>12NOT,S</sub> [kN]	F <sub>12NOT,E</sub> [kN]	M <sub>2accS</sub> [Nm]	M <sub>2accE</sub> [Nm]
<b>ZV2P4 (F<sub>12acc,max</sub> = 4,8 kN)</b>																			
5.000	ZV220S_P431_0050 MEL	3700	7000	≤32	3.11	25	12	26	2	20	42.4	4.1	2.6	4.8	3.2	9.7	6.3	102	67
7.000	ZV220S_P431_0070 ME	4000	8000	≤24	2.54	25	12	25	2	20	42.4	4.2	2.9	4.8	3.2	9.7	6.3	102	67
7.000	ZV220S_P431_0070 MEL	4000	8000	≤32	2.54	25	12	25	2	20	42.4	4.2	2.9	4.8	3.2	9.7	6.3	102	67
8.000	ZV220S_P431_0080 ME	4000	8000	≤24	2.22	25	12	24	2	20	42.4	3.8	3.1	4.8	3.2	9.7	6.3	102	67
8.000	ZV220S_P431_0080 MEL	4000	8000	≤32	2.22	25	12	24	2	20	42.4	3.8	3.1	4.8	3.2	9.7	6.3	102	67
10.00	ZV220S_P431_0100 ME	4000	8000	≤24	1.78	25	12	23	2	20	42.4	3.5	3.2	4.8	3.2	9.7	6.3	102	67
10.00	ZV220S_P431_0100 MEL	4000	8000	≤32	1.78	25	12	23	2	20	42.4	3.5	3.2	4.8	3.2	9.7	6.3	102	67
12.00	ZV220S_P432_0120 ME	3500	7000	≤19	1.30	31	19	25	2	20	42.4	2.8	2.8	4.7	3.2	9.4	6.3	100	67
12.00	ZV220S_P432_0120 MEL	3500	7000	≤24	1.30	31	19	25	2	20	42.4	2.8	2.8	4.7	3.2	9.4	6.3	100	67
16.00	ZV220S_P432_0160 ME	4000	8000	≤19	1.11	31	19	25	2	20	42.4	4.2	3.2	4.8	3.2	9.7	6.3	102	67
16.00	ZV220S_P432_0160 MEL	4000	8000	≤24	1.11	31	19	25	2	20	42.4	4.2	3.2	4.8	3.2	9.7	6.3	102	67
20.00	ZV220S_P432_0200 ME	4000	8000	≤19	0.89	31	19	25	2	20	42.4	4.5	3.2	4.8	3.2	9.7	6.3	102	67
20.00	ZV220S_P432_0200 MEL	4000	8000	≤24	0.89	31	19	25	2	20	42.4	4.5	3.2	4.8	3.2	9.7	6.3	102	67
25.00	ZV220S_P432_0250 ME	4500	8000	≤19	0.71	31	19	25	2	20	42.4	4.7	3.2	4.8	3.2	9.7	6.3	102	67
25.00	ZV220S_P432_0250 MEL	4500	8000	≤24	0.71	31	19	25	2	20	42.4	4.7	3.2	4.8	3.2	9.7	6.3	102	67
28.00	ZV220S_P432_0280 ME	4500	8000	≤19	0.64	31	19	25	2	20	42.4	4.5	3.2	4.8	3.2	9.7	6.3	102	67
28.00	ZV220S_P432_0280 MEL	4500	8000	≤24	0.64	31	19	25	2	20	42.4	4.5	3.2	4.8	3.2	9.7	6.3	102	67
32.00	ZV220S_P432_0320 ME	4000	8000	≤19	0.56	31	19	24	2	20	42.4	4.2	3.2	4.8	3.2	9.7	6.3	102	67
32.00	ZV220S_P432_0320 MEL	4000	8000	≤24	0.56	31	19	24	2	20	42.4	4.2	3.2	4.8	3.2	9.7	6.3	102	67
35.00	ZV220S_P432_0350 ME	4500	8000	≤19	0.51	31	19	25	2	20	42.4	4.8	3.2	4.8	3.2	9.7	6.3	102	67
35.00	ZV220S_P432_0350 MEL	4500	8000	≤24	0.51	31	19	25	2	20	42.4	4.8	3.2	4.8	3.2	9.7	6.3	102	67
40.00	ZV220S_P432_0400 ME	5000	8000	≤19	0.44	31	19	25	2	20	42.4	4.1	3.2	4.8	3.2	9.7	6.3	102	67
40.00	ZV220S_P432_0400 MEL	5000	8000	≤24	0.44	31	19	25	2	20	42.4	4.1	3.2	4.8	3.2	9.7	6.3	102	67
50.00	ZV220S_P432_0500 ME	5000	8000	≤19	0.36	31	19	25	2	20	42.4	4.8	3.2	4.8	3.2	9.7	6.3	102	67
50.00	ZV220S_P432_0500 MEL	5000	8000	≤24	0.36	31	19	25	2	20	42.4	4.8	3.2	4.8	3.2	9.7	6.3	102	67
56.00	ZV220S_P432_0560 ME	5000	8000	≤19	0.32	31	19	24	2	20	42.4	4.2	3.2	4.8	3.2	9.7	6.3	102	67
56.00	ZV220S_P432_0560 MEL	5000	8000	≤24	0.32	31	19	24	2	20	42.4	4.2	3.2	4.8	3.2	9.7	6.3	102	67
70.00	ZV220S_P432_0700 ME	5000	8000	≤19	0.25	31	19	25	2	20	42.4	4.6	3.2	4.8	3.2	9.7	6.3	102	67
70.00	ZV220S_P432_0700 MEL	5000	8000	≤24	0.25	31	19	25	2	20	42.4	4.6	3.2	4.8	3.2	9.7	6.3	102	67
80.00	ZV220S_P432_0800 ME	5000	8000	≤19	0.22	31	19	24	2	20	42.4	4.2	3.2	4.8	3.2	9.7	6.3	102	67
80.00	ZV220S_P432_0800 MEL	5000	8000	≤24	0.22	31	19	24	2	20	42.4	4.2	3.2	4.8	3.2	9.7	6.3	102	67
100.0	ZV220S_P432_1000 ME	5000	8000	≤19	0.18	31	19	23	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	102	67
100.0	ZV220S_P432_1000 MEL	5000	8000	≤24	0.18	31	19	23	2	20	42.4	4.0	3.2	4.8	3.2	9.7	6.3	102	67
<b>ZV2P5 (F<sub>12acc,max</sub> = 9,6 kN)</b>																			
3.000	ZV225S_P531_0030 ME	2500	5000	≤32	4.63	23	8	36	2	25	53.1	4.5	2.7	7.5	5.1	15	10	200	135
3.000	ZV225S_P531_0030 MEL	2500	5000	≤38	4.63	23	8	36	2	25	53.1	4.5	2.7	7.5	5.1	15	10	200	135
4.000	ZV225S_P531_0040 ME	3000	6000	≤32	4.17	23	8	37	2	25	53.1	5.9	3.0	9.6	5.1	19	10	255	135
4.000	ZV225S_P531_0040 MEL	3000	6000	≤38	4.17	23	8	37	2	25	53.1	5.9	3.0	9.6	5.1	19	10	255	135
5.000	ZV225S_P531_0050 ME	3500	7000	≤32	3.89	23	8	37	2	25	53.1	6.4	3.2	9.6	5.1	19	10	255	135
5.000	ZV225S_P531_0050 MEL	3500	7000	≤38	3.89	23	8	37	2	25	53.1	6.4	3.2	9.6	5.1	19	10	255	135
7.000	ZV225S_P531_0070 ME	3700	7000	≤32	2.78	23	8	36	2	25	53.1	7.2	3.6	9.6	5.1	19	10	255	135
7.000	ZV225S_P531_0070 MEL	3700	7000	≤38	2.78	23	8	36	2	25	53.1	7.2	3.6	9.6	5.1	19	10	255	135
8.000	ZV225S_P531_0080 ME	3700	7000	≤32	2.43	23	8	34	2	25	53.1	7.5	3.8	9.6	5.1	19	10	255	135
8.000	ZV225S_P531_0080 MEL	3700	7000	≤38	2.43	23	8	34	2	25	53.1	7.5	3.8	9.6	5.1	19	10	255	135
10.00	ZV225S_P531_0100 ME	3700	7000	≤32	1.94	23	8	34	2	25	53.1	6.8	4.1	9.6	5.1	19	10	255	135
10.00	ZV225S_P531_0100 MEL	3700	7000	≤38	1.94	23	8	34	2	25	53.1	6.8	4.1	9.6	5.1	19	10	255	135
12.00	ZV225S_P532_0120 ME	3000	6000	≤24	1.39	31	15	36	2	25	53.1	4.5	4.3	7.5	5.1	15	10	200	135
12.00	ZV225S_P532_0120 MEL	3000	6000	≤32	1.39	31	15	36	2	25	53.1	4.5	4.3	7.5	5.1	15	10	200	135
16.00	ZV225S_P532_0160 ME	3500	7000	≤24	1.22	31	15	36	2	25	53.1	8.3	4.8	9.6	5.1	19	10	255	135
16.00	ZV225S_P532_0160 MEL	3500	7000	≤32	1.22	31	15	36	2	25	53.1	8.3	4.8	9.6	5.1	19	10	255	135
20.00	ZV225S_P532_0200 ME	3500	7000	≤24	0.97	31	15	36	2	25	53.1	9.4	5.1	9.6	5.1	19	10	255	135
20.00	ZV225S_P532_0200 MEL	3500	7000	≤32	0.97	31	15	36	2	25	53.1	9.4	5.1	9.6	5.1	19	10	255	135
25.00	ZV225S_P532_0250 ME	3700	7000	≤24	0.78	31	15	36	2	25	53.1	9.6	5.1	9.6	5.1	19	10	255	135
25.00	ZV225S_P532_0250 MEL	3700	7000	≤32	0.78	31	15	36	2	25	53.1	9.6	5.1	9.6	5.1	19	10	255	135
28.00	ZV225S_P532_0280 ME	4000	8000	≤24	0.79	31	15	36	2	25	53.1	8.7	5.1	9.6	5.1	19	10	255	135
28.00	ZV225S_P532_0280 MEL	4000	8000	≤32	0.79	31	15	36	2	25	53.1	8.7	5.1	9.6	5.1	19	10	255	135
32.00	ZV225S_P532_0320 ME	3500	7000	≤24	0.61	31	15	34	2	25	53.1	9.0	5.1	9.6	5.1	19	10	255	135
32.00	ZV225S_P532_0320 MEL	3500	7000	≤32	0.61	31	15	34	2	25	53.1	9.0	5.1	9.6	5.1	19	10	255	135
35.00	ZV225S_P532_0350 ME	4000	8000	≤24	0.64	31	15	36	2	25	53.1	9.6	5.1	9.6	5.1	19	10	255	135
35.00	ZV225S_P532_0350 MEL	4000	8000	≤32	0.64	31	15	36	2	25	53.1	9.6	5.1	9.6	5.1	19	10	255	135
40.00	ZV225S_P532_0400 ME	4000	8000	≤24	0.56	31	15	36	2	25	53.1	8.1	5.1	9.6	5.1	19	10	255	135
40.00	ZV225S_P532_0400 MEL	4000	8000	≤32	0.56	31	15	36	2	25	53.1	8.1	5.1	9.6	5.1	19	10	255	135
50.00	ZV225S_P532_0500 ME	4000	8000	≤24	0.44	31	15	36	2	25	53.1	9.6	5.1	9.6	5.1	19	10	255	135
50.00	ZV225S_P532_0500 MEL	4000	8000	≤32	0.44	31	15	36	2	25	53.1	9.6	5.1	9.6	5.1	19	10	255	135
56.00	ZV225S_P532_0560 ME	4000	8000	≤24	0.40	31	15	34	2	25	53.1	8.3	5.1	9.6	5.1	19	10	255	135

i	Type	n <sub>1maxDB</sub> [rpm]	n <sub>1maxZB</sub> [rpm]	d <sub>MW</sub> [mm]	v <sub>2maxZB</sub> [m/s]	Δs [μm]	Δs <sub>red</sub> [μm]	C <sub>lin</sub> [N/ μm]	m <sub>n</sub> [mm]	z	d <sub>0</sub> [mm]	F <sub>2N,S</sub> [kN]	F <sub>2N,E</sub> [kN]	F <sub>2accS</sub> [kN]	F <sub>2accE</sub> [kN]	F <sub>2NOT,S</sub> [kN]	F <sub>2NOT,E</sub> [kN]	M <sub>2accS</sub> [Nm]	M <sub>2accE</sub> [Nm]
<b>ZV2P5 (F<sub>2acc,max</sub> = 9,6 kN)</b>																			
56.00	ZV225S_P532_0560 MEL	4000	8000	≤32	0.40	31	15	34	2	25	53.1	8.3	5.1	9.6	5.1	19	10	255	135
70.00	ZV225S_P532_0700 ME	4200	8000	≤24	0.32	31	15	36	2	25	53.1	9.6	5.1	9.6	5.1	19	10	255	135
70.00	ZV225S_P532_0700 MEL	4200	8000	≤32	0.32	31	15	36	2	25	53.1	9.6	5.1	9.6	5.1	19	10	255	135
80.00	ZV225S_P532_0800 ME	4200	8000	≤24	0.28	31	15	34	2	25	53.1	8.3	5.1	9.6	5.1	19	10	255	135
80.00	ZV225S_P532_0800 MEL	4200	8000	≤32	0.28	31	15	34	2	25	53.1	8.3	5.1	9.6	5.1	19	10	255	135
100.00	ZV225S_P532_1000 ME	4200	8000	≤24	0.22	31	15	34	2	25	53.1	8.3	5.1	9.6	5.1	19	10	255	135
100.00	ZV225S_P532_1000 MEL	4200	8000	≤32	0.22	31	15	34	2	25	53.1	8.3	5.1	9.6	5.1	19	10	255	135
<b>ZV3P5 (F<sub>2acc,max</sub> = 11 kN)</b>																			
3.000	ZV318S_P531_0030 ME	2500	5000	≤32	5.00	25	8	38	3	18	57.3	4.2	2.8	7.0	5.2	14	10	200	150
3.000	ZV318S_P531_0030 MEL	2500	5000	≤38	5.00	25	8	38	3	18	57.3	4.2	2.8	7.0	5.2	14	10	200	150
4.000	ZV318S_P531_0040 ME	3000	6000	≤32	4.50	25	8	38	3	18	57.3	5.8	3.1	10	5.2	21	10	300	150
4.000	ZV318S_P531_0040 MEL	3000	6000	≤38	4.50	25	8	38	3	18	57.3	5.8	3.1	10	5.2	21	10	300	150
5.000	ZV318S_P531_0050 ME	3500	7000	≤32	4.20	25	8	38	3	18	57.3	6.3	3.3	11	5.2	21	10	302	150
5.000	ZV318S_P531_0050 MEL	3500	7000	≤38	4.20	25	8	38	3	18	57.3	6.3	3.3	11	5.2	21	10	302	150
7.000	ZV318S_P531_0070 ME	3700	7000	≤32	3.00	25	8	37	3	18	57.3	7.0	3.7	11	5.2	21	10	302	150
7.000	ZV318S_P531_0070 MEL	3700	7000	≤38	3.00	25	8	37	3	18	57.3	7.0	3.7	11	5.2	21	10	302	150
8.000	ZV318S_P531_0080 ME	3700	7000	≤32	2.63	25	8	34	3	18	57.3	7.0	3.8	10	5.2	21	10	296	150
8.000	ZV318S_P531_0080 MEL	3700	7000	≤38	2.63	25	8	34	3	18	57.3	7.0	3.8	10	5.2	21	10	296	150
10.00	ZV318S_P531_0100 ME	3700	7000	≤32	2.10	25	8	35	3	18	57.3	6.3	4.1	10	5.2	20	10	288	150
10.00	ZV318S_P531_0100 MEL	3700	7000	≤38	2.10	25	8	35	3	18	57.3	6.3	4.1	10	5.2	20	10	288	150
12.00	ZV318S_P532_0120 ME	3000	6000	≤34	1.50	33	17	37	3	18	57.3	4.2	4.2	7.0	5.2	14	10	200	150
12.00	ZV318S_P532_0120 MEL	3000	6000	≤32	1.50	33	17	37	3	18	57.3	4.2	4.2	7.0	5.2	14	10	200	150
16.00	ZV318S_P532_0160 ME	3500	7000	≤24	1.31	33	17	38	3	18	57.3	7.7	4.8	10	5.2	21	10	300	150
16.00	ZV318S_P532_0160 MEL	3500	7000	≤32	1.31	33	17	38	3	18	57.3	7.7	4.8	10	5.2	21	10	300	150
20.00	ZV318S_P532_0200 ME	3500	7000	≤24	1.05	33	17	38	3	18	57.3	8.7	5.2	11	5.2	21	10	302	150
20.00	ZV318S_P532_0200 MEL	3500	7000	≤32	1.05	33	17	38	3	18	57.3	8.7	5.2	11	5.2	21	10	302	150
25.00	ZV318S_P532_0250 ME	3700	7000	≤24	0.84	33	17	38	3	18	57.3	9.1	5.2	11	5.2	21	10	302	150
25.00	ZV318S_P532_0250 MEL	3700	7000	≤32	0.84	33	17	38	3	18	57.3	9.1	5.2	11	5.2	21	10	302	150
28.00	ZV318S_P532_0280 ME	4000	8000	≤24	0.86	33	17	37	3	18	57.3	8.1	5.2	10	5.2	21	10	300	150
28.00	ZV318S_P532_0280 MEL	4000	8000	≤32	0.86	33	17	37	3	18	57.3	8.1	5.2	10	5.2	21	10	300	150
32.00	ZV318S_P532_0320 ME	3500	7000	≤24	0.66	33	17	35	3	18	57.3	8.4	5.2	11	5.2	21	10	302	150
32.00	ZV318S_P532_0320 MEL	3500	7000	≤32	0.66	33	17	35	3	18	57.3	8.4	5.2	11	5.2	21	10	302	150
35.00	ZV318S_P532_0350 ME	4000	8000	≤24	0.69	33	17	38	3	18	57.3	9.4	5.2	11	5.2	21	10	302	150
35.00	ZV318S_P532_0350 MEL	4000	8000	≤32	0.69	33	17	38	3	18	57.3	9.4	5.2	11	5.2	21	10	302	150
40.00	ZV318S_P532_0400 ME	4000	8000	≤24	0.60	33	17	37	3	18	57.3	7.5	5.2	10	5.2	21	10	300	150
40.00	ZV318S_P532_0400 MEL	4000	8000	≤32	0.60	33	17	37	3	18	57.3	7.5	5.2	10	5.2	21	10	300	150
50.00	ZV318S_P532_0500 ME	4000	8000	≤24	0.48	33	17	37	3	18	57.3	9.4	5.2	11	5.2	21	10	302	150
50.00	ZV318S_P532_0500 MEL	4000	8000	≤32	0.48	33	17	37	3	18	57.3	9.4	5.2	11	5.2	21	10	302	150
56.00	ZV318S_P532_0560 ME	4000	8000	≤24	0.43	33	17	35	3	18	57.3	7.7	5.2	10	5.2	20	10	288	150
56.00	ZV318S_P532_0560 MEL	4000	8000	≤32	0.43	33	17	35	3	18	57.3	7.7	5.2	10	5.2	20	10	288	150
70.00	ZV318S_P532_0700 ME	4200	8000	≤24	0.34	33	17	37	3	18	57.3	9.2	5.2	11	5.2	21	10	302	150
70.00	ZV318S_P532_0700 MEL	4200	8000	≤32	0.34	33	17	37	3	18	57.3	9.2	5.2	11	5.2	21	10	302	150
80.00	ZV318S_P532_0800 ME	4200	8000	≤24	0.30	33	17	35	3	18	57.3	7.7	5.2	10	5.2	20	10	288	150
80.00	ZV318S_P532_0800 MEL	4200	8000	≤32	0.30	33	17	35	3	18	57.3	7.7	5.2	10	5.2	20	10	288	150
100.00	ZV318S_P532_1000 ME	4200	8000	≤24	0.24	33	17	35	3	18	57.3	7.7	5.2	10	5.2	20	10	288	150
100.00	ZV318S_P532_1000 MEL	4200	8000	≤32	0.24	33	17	35	3	18	57.3	7.7	5.2	10	5.2	20	10	288	150
<b>ZV3P7 (F<sub>2acc,max</sub> = 14 kN)</b>																			
3.000	ZV322S_P731_0030 ME	2200	4000	≤38	4.89	31	10	46	3	22	70.0	6.2	3.7	14	7.0	28	14	498	245
3.000	ZV322S_P731_0030 MEL	2200	4000	≤48	4.89	31	10	46	3	22	70.0	6.2	3.7	14	7.0	28	14	498	245
4.000	ZV322S_P731_0040 ME	2500	5000	≤38	4.58	31	10	46	3	22	70.0	6.8	4.1	14	7.0	28	14	498	245
4.000	ZV322S_P731_0040 MEL	2500	5000	≤48	4.58	31	10	46	3	22	70.0	6.8	4.1	14	7.0	28	14	498	245
5.000	ZV322S_P731_0050 ME	2700	5500	≤38	4.03	31	10	46	3	22	70.0	7.3	4.4	14	7.0	28	14	498	245
5.000	ZV322S_P731_0050 MEL	2700	5500	≤48	4.03	31	10	46	3	22	70.0	7.3	4.4	14	7.0	28	14	498	245
7.000	ZV322S_P731_0070 ME	3000	6000	≤38	3.14	31	10	45	3	22	70.0	8.2	4.9	14	7.0	28	14	498	245
7.000	ZV322S_P731_0070 MEL	3000	6000	≤48	3.14	31	10	45	3	22	70.0	8.2	4.9	14	7.0	28	14	498	245
8.000	ZV322S_P731_0080 ME	3000	6000	≤38	2.75	31	10	45	3	22	70.0	8.6	5.2	14	7.0	28	14	498	245
8.000	ZV322S_P731_0080 MEL	3000	6000	≤48	2.75	31	10	45	3	22	70.0	8.6	5.2	14	7.0	28	14	498	245
10.00	ZV322S_P731_0100 ME	3000	6000	≤38	2.20	31	10	44	3	22	70.0	9.3	5.6	14	7.0	28	14	498	245
10.00	ZV322S_P731_0100 MEL	3000	6000	≤48	2.20	31	10	44	3	22	70.0	9.3	5.6	14	7.0	28	14	498	245
12.00	ZV322S_P732_0120 ME	2500	5000	≤32	1.53	41	20	45	3	22	70.0	8.4	5.9	14	7.0	28	14	498	245
12.00	ZV322S_P732_0120 MEL	2500	5000	≤38	1.53	41	20	45	3	22	70.0	8.4	5.9	14	7.0	28	14	498	245
16.00	ZV322S_P732_0160 ME	3000	6000	≤32	1.38	41	20	46	3	22	70.0	11	6.5	14	7.0	28	14	498	245
16.00	ZV322S_P732_0160 MEL	3000	6000	≤38	1.38	41	20	46	3	22	70.0	11	6.5	14	7.0	28	14	498	245
20.00	ZV322S_P732_0200 ME	3000	6000	≤32	1.10	41	20	46	3	22	70.0	12	7.0	14	7.0	28	14	498	245
20.00	ZV322S_P732_0200 MEL	3000	6000	≤38	1.10	41	20	46	3	22	70.0	12	7.0	14	7.0	28	14	498	245

8.2 Selection tables 8 ZVP rack and pinion drives

i	Type	n <sub>1maxDB</sub> [rpm]	n <sub>1maxZB</sub> [rpm]	d <sub>MW</sub> [mm]	v <sub>12maxZB</sub> [m/s]	Δs [μm]	Δs <sub>red</sub> [μm]	C <sub>lin</sub> [N/ μm]	m <sub>n</sub> [mm]	z	d <sub>0</sub> [mm]	F <sub>12N,S</sub> [kN]	F <sub>12N,E</sub> [kN]	F <sub>12accS</sub> [kN]	F <sub>12accE</sub> [kN]	F <sub>12NOT,S</sub> [kN]	F <sub>12NOT,E</sub> [kN]	M <sub>2accS</sub> [Nm]	M <sub>2accE</sub> [Nm]
<b>ZV3P7 (F<sub>12acc,max</sub> = 14 kN)</b>																			
25.00	ZV322S_P732_0250 ME	3500	7000	≤32	1.03	41	20	46	3	22	70.0	13	7.0	14	7.0	28	14	498	245
25.00	ZV322S_P732_0250 MEL	3500	7000	≤38	1.03	41	20	46	3	22	70.0	13	7.0	14	7.0	28	14	498	245
28.00	ZV322S_P732_0280 ME	3700	7000	≤32	0.92	41	20	46	3	22	70.0	13	7.0	14	7.0	28	14	498	245
28.00	ZV322S_P732_0280 MEL	3700	7000	≤38	0.92	41	20	46	3	22	70.0	13	7.0	14	7.0	28	14	498	245
32.00	ZV322S_P732_0320 ME	3000	6000	≤32	0.69	41	20	45	3	22	70.0	13	7.0	14	7.0	28	14	498	245
32.00	ZV322S_P732_0320 MEL	3000	6000	≤38	0.69	41	20	45	3	22	70.0	13	7.0	14	7.0	28	14	498	245
35.00	ZV322S_P732_0350 ME	3700	7000	≤32	0.73	41	20	46	3	22	70.0	13	7.0	14	7.0	28	14	498	245
35.00	ZV322S_P732_0350 MEL	3700	7000	≤38	0.73	41	20	46	3	22	70.0	13	7.0	14	7.0	28	14	498	245
40.00	ZV322S_P732_0400 ME	3700	7000	≤32	0.64	41	20	46	3	22	70.0	13	7.0	14	7.0	28	14	498	245
40.00	ZV322S_P732_0400 MEL	3700	7000	≤38	0.64	41	20	46	3	22	70.0	13	7.0	14	7.0	28	14	498	245
50.00	ZV322S_P732_0500 ME	3700	7000	≤32	0.51	41	20	46	3	22	70.0	13	7.0	14	7.0	28	14	498	245
50.00	ZV322S_P732_0500 MEL	3700	7000	≤38	0.51	41	20	46	3	22	70.0	13	7.0	14	7.0	28	14	498	245
56.00	ZV322S_P732_0560 ME	3700	7000	≤32	0.46	41	20	45	3	22	70.0	13	7.0	14	7.0	28	14	498	245
56.00	ZV322S_P732_0560 MEL	3700	7000	≤38	0.46	41	20	45	3	22	70.0	13	7.0	14	7.0	28	14	498	245
70.00	ZV322S_P732_0700 ME	3700	7000	≤32	0.37	41	20	45	3	22	70.0	13	7.0	14	7.0	28	14	498	245
70.00	ZV322S_P732_0700 MEL	3700	7000	≤38	0.37	41	20	45	3	22	70.0	13	7.0	14	7.0	28	14	498	245
80.00	ZV322S_P732_0800 ME	3700	7000	≤32	0.32	41	20	45	3	22	70.0	13	7.0	14	7.0	28	14	498	245
80.00	ZV322S_P732_0800 MEL	3700	7000	≤38	0.32	41	20	45	3	22	70.0	13	7.0	14	7.0	28	14	498	245
100.0	ZV322S_P732_1000 ME	3700	7000	≤32	0.26	41	20	44	3	22	70.0	12	7.0	14	7.0	28	14	498	245
100.0	ZV322S_P732_1000 MEL	3700	7000	≤38	0.26	41	20	44	3	22	70.0	12	7.0	14	7.0	28	14	498	245
<b>ZV4P7 (F<sub>12acc,max</sub> = 15 kN)</b>																			
3.000	ZV418S_P731_0030 ME	2200	4000	≤38	5.33	33	11	48	4	18	76.4	6.0	3.8	13	7.3	26	15	500	280
3.000	ZV418S_P731_0030 MEL	2200	4000	≤48	5.33	33	11	49	4	18	76.4	6.0	3.8	13	7.3	26	15	500	280
4.000	ZV418S_P731_0040 ME	2500	5000	≤38	5.00	33	11	49	4	18	76.4	6.6	4.2	15	7.3	31	15	589	280
4.000	ZV418S_P731_0040 MEL	2500	5000	≤48	5.00	33	11	49	4	18	76.4	6.6	4.2	15	7.3	31	15	589	280
5.000	ZV418S_P731_0050 ME	2700	5500	≤38	4.40	33	11	49	4	18	76.4	7.1	4.5	15	7.3	31	15	589	280
5.000	ZV418S_P731_0050 MEL	2700	5500	≤48	4.40	33	11	49	4	18	76.4	7.1	4.5	15	7.3	31	15	589	280
7.000	ZV418S_P731_0070 ME	3000	6000	≤38	3.43	33	11	48	4	18	76.4	8.0	5.1	15	7.3	31	15	589	280
7.000	ZV418S_P731_0070 MEL	3000	6000	≤48	3.43	33	11	48	4	18	76.4	8.0	5.1	15	7.3	31	15	589	280
8.000	ZV418S_P731_0080 ME	3000	6000	≤38	3.00	33	11	47	4	18	76.4	8.3	5.3	15	7.3	31	15	589	280
8.000	ZV418S_P731_0080 MEL	3000	6000	≤48	3.00	33	11	47	4	18	76.4	8.3	5.3	15	7.3	31	15	589	280
10.00	ZV418S_P731_0100 ME	3000	6000	≤38	2.40	33	11	46	4	18	76.4	9.0	5.7	15	7.3	30	15	575	280
10.00	ZV418S_P731_0100 MEL	3000	6000	≤48	2.40	33	11	46	4	18	76.4	9.0	5.7	15	7.3	30	15	575	280
12.00	ZV418S_P732_0120 ME	2500	5000	≤32	1.67	44	22	48	4	18	76.4	7.7	6.0	13	7.3	26	15	500	280
12.00	ZV418S_P732_0120 MEL	2500	5000	≤38	1.67	44	22	48	4	18	76.4	7.7	6.0	13	7.3	26	15	500	280
16.00	ZV418S_P732_0160 ME	3000	6000	≤32	1.50	44	22	49	4	18	76.4	11	6.7	15	7.3	31	15	589	280
16.00	ZV418S_P732_0160 MEL	3000	6000	≤38	1.50	44	22	49	4	18	76.4	11	6.7	15	7.3	31	15	589	280
20.00	ZV418S_P732_0200 ME	3000	6000	≤32	1.20	44	22	49	4	18	76.4	11	7.2	15	7.3	31	15	589	280
20.00	ZV418S_P732_0200 MEL	3000	6000	≤38	1.20	44	22	49	4	18	76.4	11	7.2	15	7.3	31	15	589	280
25.00	ZV418S_P732_0250 ME	3500	7000	≤32	1.12	44	22	49	4	18	76.4	12	7.3	15	7.3	31	15	589	280
25.00	ZV418S_P732_0250 MEL	3500	7000	≤38	1.12	44	22	49	4	18	76.4	12	7.3	15	7.3	31	15	589	280
28.00	ZV418S_P732_0280 ME	3700	7000	≤32	1.00	44	22	49	4	18	76.4	12	7.3	15	7.3	31	15	589	280
28.00	ZV418S_P732_0280 MEL	3700	7000	≤38	1.00	44	22	49	4	18	76.4	12	7.3	15	7.3	31	15	589	280
32.00	ZV418S_P732_0320 ME	3000	6000	≤32	0.75	44	22	47	4	18	76.4	12	7.3	15	7.3	31	15	589	280
32.00	ZV418S_P732_0320 MEL	3000	6000	≤38	0.75	44	22	47	4	18	76.4	12	7.3	15	7.3	31	15	589	280
35.00	ZV418S_P732_0350 ME	3700	7000	≤32	0.80	44	22	49	4	18	76.4	12	7.3	15	7.3	31	15	589	280
35.00	ZV418S_P732_0350 MEL	3700	7000	≤38	0.80	44	22	49	4	18	76.4	12	7.3	15	7.3	31	15	589	280
40.00	ZV418S_P732_0400 ME	3700	7000	≤32	0.70	44	22	48	4	18	76.4	12	7.3	15	7.3	31	15	589	280
40.00	ZV418S_P732_0400 MEL	3700	7000	≤38	0.70	44	22	48	4	18	76.4	12	7.3	15	7.3	31	15	589	280
50.00	ZV418S_P732_0500 ME	3700	7000	≤32	0.56	44	22	49	4	18	76.4	12	7.3	15	7.3	31	15	589	280
50.00	ZV418S_P732_0500 MEL	3700	7000	≤38	0.56	44	22	49	4	18	76.4	12	7.3	15	7.3	31	15	589	280
56.00	ZV418S_P732_0560 ME	3700	7000	≤32	0.50	44	22	47	4	18	76.4	12	7.3	15	7.3	31	15	589	280
56.00	ZV418S_P732_0560 MEL	3700	7000	≤38	0.50	44	22	47	4	18	76.4	12	7.3	15	7.3	31	15	589	280
70.00	ZV418S_P732_0700 ME	3700	7000	≤32	0.40	44	22	48	4	18	76.4	12	7.3	15	7.3	31	15	589	280
70.00	ZV418S_P732_0700 MEL	3700	7000	≤38	0.40	44	22	48	4	18	76.4	12	7.3	15	7.3	31	15	589	280
80.00	ZV418S_P732_0800 ME	3700	7000	≤32	0.35	44	22	47	4	18	76.4	12	7.3	15	7.3	31	15	589	280
80.00	ZV418S_P732_0800 MEL	3700	7000	≤38	0.35	44	22	47	4	18	76.4	12	7.3	15	7.3	31	15	589	280
100.0	ZV418S_P732_1000 ME	3700	7000	≤32	0.28	44	22	46	4	18	76.4	11	7.3	14	7.3	29	15	550	280
100.0	ZV418S_P732_1000 MEL	3700	7000	≤38	0.28	44	22	46	4	18	76.4	11	7.3	14	7.3	29	15	550	280

## 8.3 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:  $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

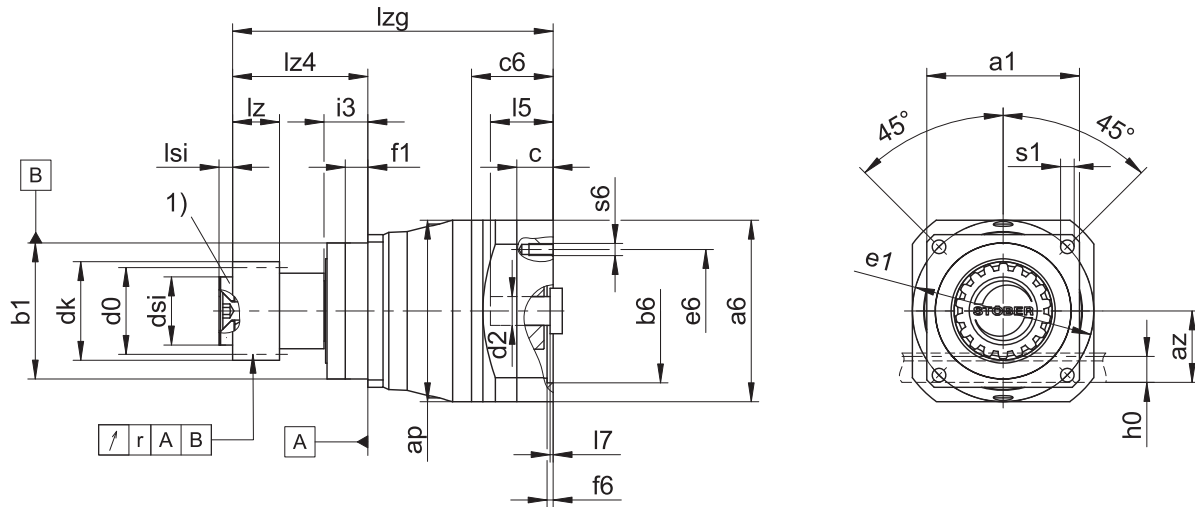
The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

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 <https://configurator.stoeber.de/en-US/>.

### 8.3.1 Pinion position E



1) Axial locking (optional)

- The radial runout specification applies only to the reinforced bearing D.

#### Output dimensions

Type	mn	□a1	ap	az	Øb1	Ød0	Ødk	Ødsi	Øe1	f1	h0	i3	lz	lz4	lsi	r	Øs1	x
ZV216SEP331_	2	72	72	39.98	60 <sub>h6</sub>	33.95	39.81	25	75	7.5	22	19	26	49.5	4	0.025	5.5	0.5
ZV216SEP332_	2	72	75	39.98	60 <sub>h6</sub>	33.95	39.81	25	75	7.5	22	19	26	49.5	4	0.025	5.5	0.5
ZV220SEP431_	2	76	98	44.02	70 <sub>h6</sub>	42.44	47.90	30	85	7.5	22	19	26	57.5	6	0.025	6.6	0.4
ZV220SEP432_	2	76	100	44.02	70 <sub>h6</sub>	42.44	47.90	30	85	7.5	22	19	26	57.5	6	0.025	6.6	0.4
ZV225SEP531_	2	101	115	49.33	90 <sub>h6</sub>	53.05	58.52	45	120	15.0	22	29	26	89.5	8	0.030	9.0	0.4
ZV225SEP532_	2	101	120	49.33	90 <sub>h6</sub>	53.05	58.52	45	120	15.0	22	29	26	89.5	8	0.030	9.0	0.4
ZV318SEP531_	3	101	115	55.55	90 <sub>h6</sub>	57.30	65.01	45	120	15.0	26	29	31	89.5	8	0.030	9.0	0.3
ZV318SEP532_	3	101	120	55.55	90 <sub>h6</sub>	57.30	65.01	45	120	15.0	26	29	31	89.5	8	0.030	9.0	0.3
ZV322SEP731_	3	144	150	62.21	130 <sub>h6</sub>	70.03	78.35	55	165	3.5	26	29	31	113.5	10	0.035	11.0	0.4
ZV322SEP732_	3	144	150	62.21	130 <sub>h6</sub>	70.03	78.35	55	165	3.5	26	29	31	113.5	10	0.035	11.0	0.4
ZV418SEP731_	4	144	150	74.40	130 <sub>h6</sub>	76.40	86.77	55	165	3.5	35	29	41	113.5	10	0.035	11.0	0.3
ZV418SEP732_	4	144	150	74.40	130 <sub>h6</sub>	76.40	86.77	55	165	3.5	35	29	41	113.5	10	0.035	11.0	0.3

#### Example dimensions for the motor connection + total length

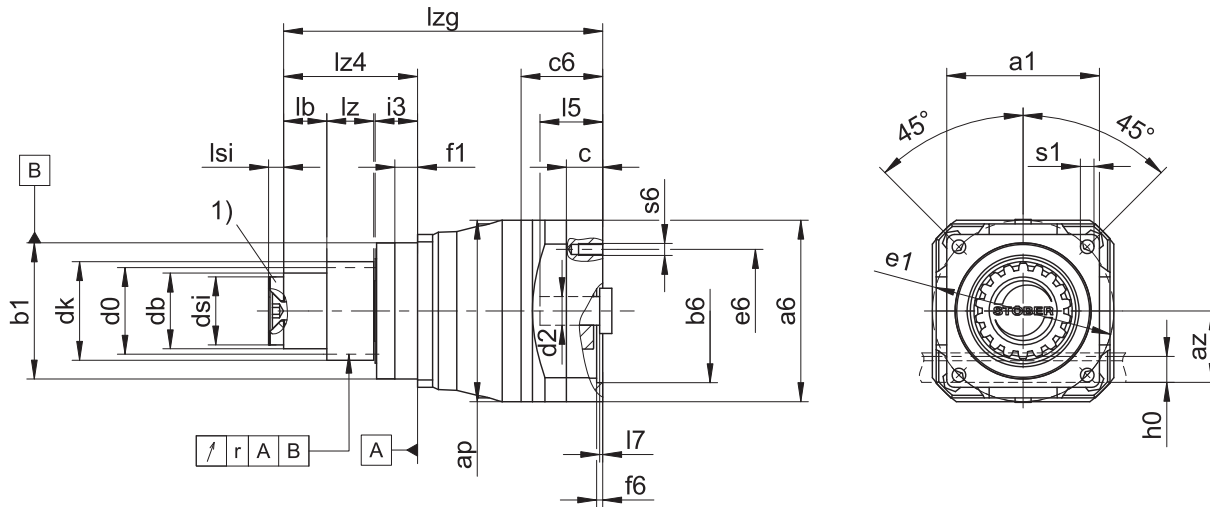
Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZV_P331_ME	60 <sup>H7</sup>	75	19	41	75	18	41.5	3.5	4.0	147.0	M5
ZV_P332_ME	40 <sup>H7</sup>	63	14	30	55	15	32.0	3.5	3.0	164.5	M5
ZV_P431_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	167.0	M8
ZV_P432_ME	60 <sup>H7</sup>	75	19	41	75	18	41.5	3.5	4.0	204.0	M5
ZV_P531_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	212.0	M8
ZV_P532_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	241.0	M8
ZV_P731_ME	130 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	266.0	M10
ZV_P732_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	304.0	M8

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6, l5 and lzg are also lengthened accordingly.**

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

### 8.3.2 Pinion position S



1) Axial locking (optional)

- The radial runout specification applies only to the reinforced bearing D.

#### Output dimensions

Type	mn	□a1	ap	az	Øb1	Ød0	Ødb	Ødk	Ødsi	Øe1	f1	h0	i3	lb	lz	lz4	lsi	r	Øs1	x
ZV216SSP331_	2	72	72	39.98	60 <sub>h6</sub>	34.0	30	39.81	25	75	7.5	22	18	4.5	26	49.5	4	0.025	5.5	0.5
ZV216SSP332_	2	72	75	39.98	60 <sub>h6</sub>	34.0	30	39.81	25	75	7.5	22	18	4.5	26	49.5	4	0.025	5.5	0.5
ZV220SSP431_	2	76	98	44.02	70 <sub>h6</sub>	42.4	38	47.90	30	85	7.5	22	18	12.5	26	57.5	6	0.025	6.6	0.4
ZV220SSP432_	2	76	100	44.02	70 <sub>h6</sub>	42.4	38	47.90	30	85	7.5	22	18	12.5	26	57.5	6	0.025	6.6	0.4
ZV225SSP531_	2	101	115	49.33	90 <sub>h6</sub>	53.1	50	58.52	45	120	15.0	22	28	34.5	26	89.5	8	0.030	9.0	0.4
ZV225SSP532_	2	101	120	49.33	90 <sub>h6</sub>	53.1	50	58.52	45	120	15.0	22	28	34.5	26	89.5	8	0.030	9.0	0.4
ZV318SSP531_	3	101	115	55.55	90 <sub>h6</sub>	57.3	50	65.01	45	120	15.0	26	28	29.5	31	89.5	8	0.030	9.0	0.3
ZV318SSP532_	3	101	120	55.55	90 <sub>h6</sub>	57.3	50	65.01	45	120	15.0	26	28	29.5	31	89.5	8	0.030	9.0	0.3
ZV322SSP731_	3	144	150	62.21	130 <sub>h6</sub>	70.0	62	78.35	55	165	3.5	26	28	53.5	31	113.5	10	0.035	11.0	0.4
ZV322SSP732_	3	144	150	62.21	130 <sub>h6</sub>	70.0	62	78.35	55	165	3.5	26	28	53.5	31	113.5	10	0.035	11.0	0.4
ZV418SSP731_	4	144	150	74.40	130 <sub>h6</sub>	76.4	62	86.77	55	165	3.5	35	28	43.5	41	113.5	10	0.035	11.0	0.3
ZV418SSP732_	4	144	150	74.40	130 <sub>h6</sub>	76.4	62	86.77	55	165	3.5	35	28	43.5	41	113.5	10	0.035	11.0	0.3

#### Example dimensions for the motor connection + total length

Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZV_P331_ME	60 <sup>H7</sup>	75	19	41	75	18	41.5	3.5	4.0	147.0	M5
ZV_P332_ME	40 <sup>H7</sup>	63	14	30	55	15	32.0	3.5	3.0	164.5	M5
ZV_P431_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	167.0	M8
ZV_P432_ME	60 <sup>H7</sup>	75	19	41	75	18	41.5	3.5	4.0	204.0	M5
ZV_P531_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	212.0	M8
ZV_P532_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	241.0	M8
ZV_P731_ME	130 <sup>H7</sup>	165	38	61	150	26	66.0	5.5	4.5	266.0	M10
ZV_P732_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	304.0	M8

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6, l5 and lzg are also lengthened accordingly.**

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

## 8.4 Type designation

This chapter shows you 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.

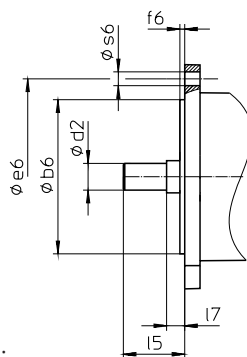
### Example code

Z	V	3	22	S	S	P	7	3	1	S	P	S	S	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)
3	Generation	Generation 3
1	Stages	Single-stage
2		Two-stage
S	Housing	Standard
P	Shaft	Solid shaft with feather key
S	Bearing	Standard bearing
D		Axially reinforced bearing
S	Backlash	Standard
R		Reduced
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
MF		Motor adapter with FlexiAdapt coupling
MB <sup>1</sup>		ServoStop motor adapter with brake

To complete the type designation, also specify the following in your order:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBER Configurator at

<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

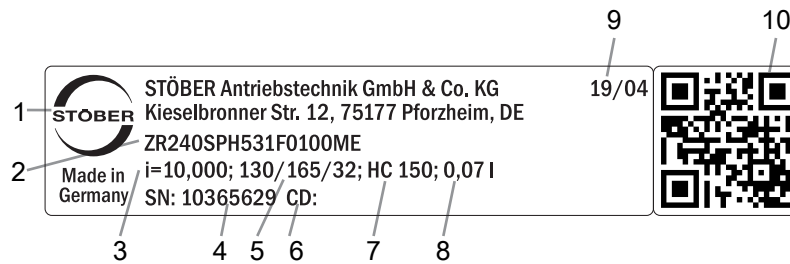
- Radial shaft seal rings at the output made of NBR or FKM (option), see the chapter [▶ 8.6.3]
- For axial locking (optional), see the chapter [▶ 8.3]
- Reverse operation of the output shaft from  $\pm 20^\circ$  to  $\pm 90^\circ$  for horizontal installation on request
- P531, P7: Double seal for motor adapter (option)
- Socket wrench insert for mounting the motor on the gear unit using the ME/MEL/MF motor adapter (option)

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 [▶ 8.5.1].



## 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:

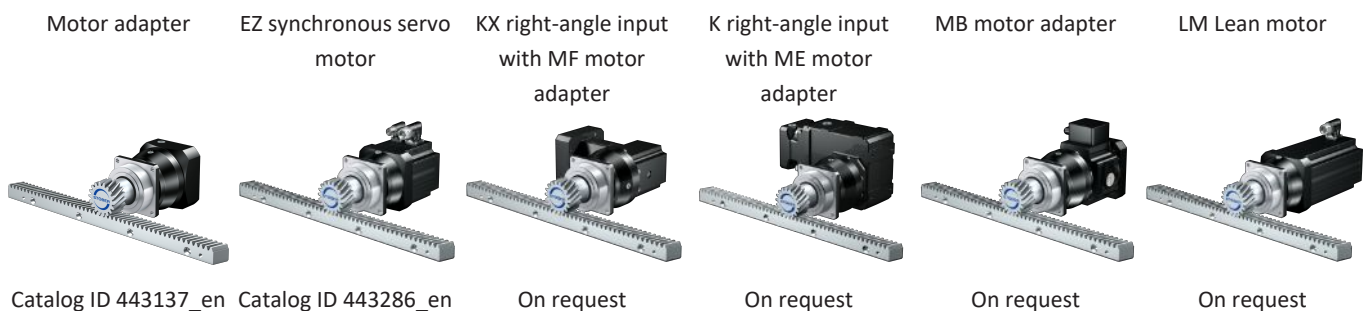
<https://id.stober.com>

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 Input options

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



The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.



## 8.5.2 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 clamp coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- 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

## 8.5.3 Motor adapter with FlexiAdapt coupling (MF)

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

**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
- Motor shaft decoupled from axial forces
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- Error-free, thanks to exact centering of the motor



Fig. 2: FlexiAdapt coupling

## 8.5.4 Gear rack

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 6.

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

Also note the project configuration of the gear rack on the Atlanta pages.

### 8.5.4.1 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: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

## 8.5.5 Installation conditions

The specified torques and forces only apply when gear units are fastened on the machine side using screws of strength class 12.9. In addition, the gear housings must be adjusted at the pilot. The machine-side fit must be H7.

## 8.5.6 Lubricants

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

You will receive lubricants for use in the food industry upon request.

### 8.5.6.1 Rack and pinion drive lubrication

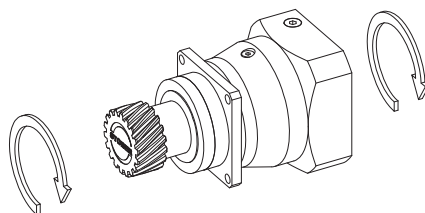
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 8.5.7 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: <sup>2</sup>	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

## 8.5.8 Direction of rotation

The input and output rotate in the same direction.



<sup>2</sup> Observe the protection class of all the components.

## 8.6 Project configuration

Project your drives using our SERVOnsoft designing software. Download SERVOnsoft for free at <https://www.stoeber.de/en/ServoSoft>.

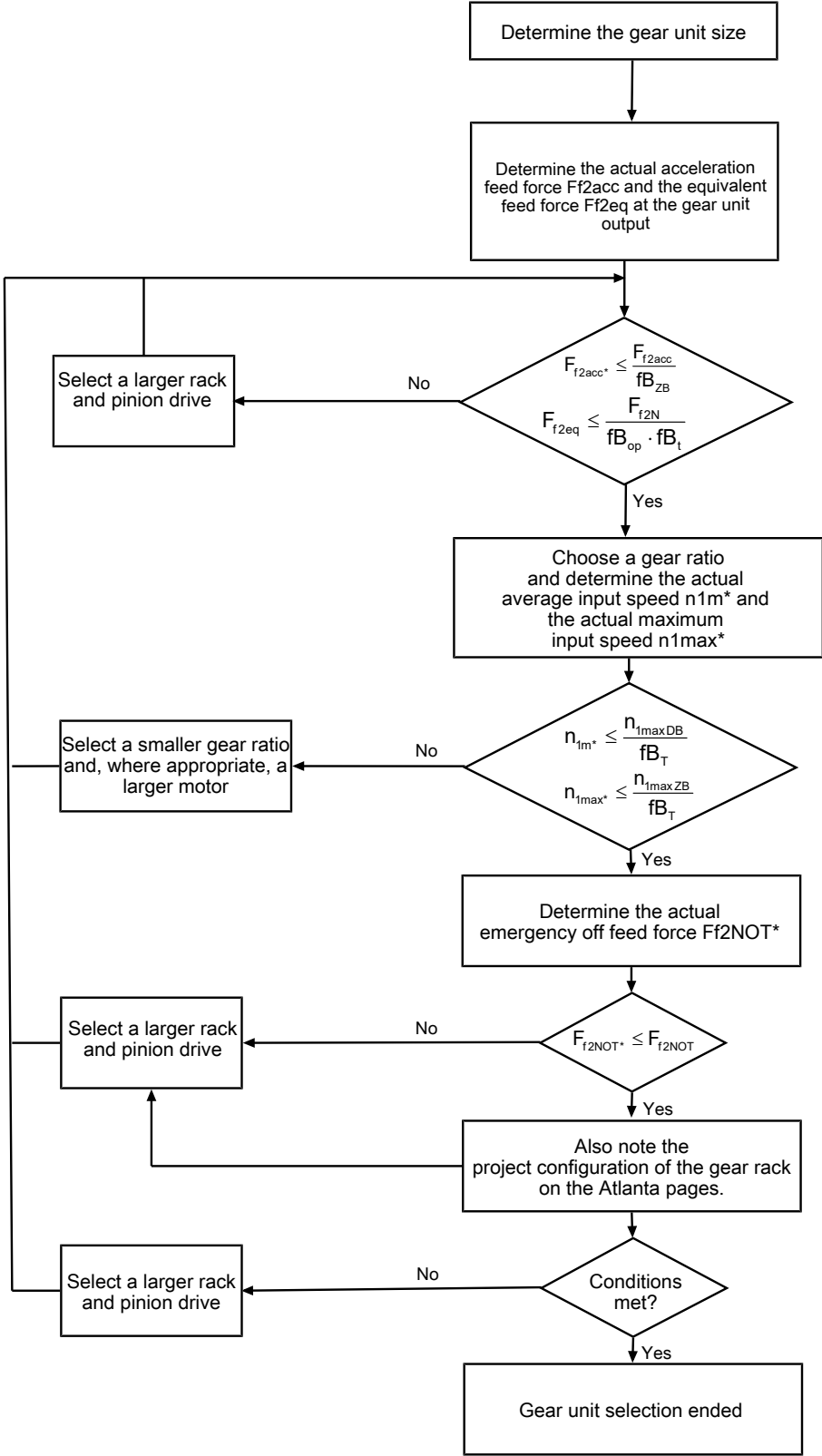
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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 [▶ 13.1](#).

8.6.1 Drive selection

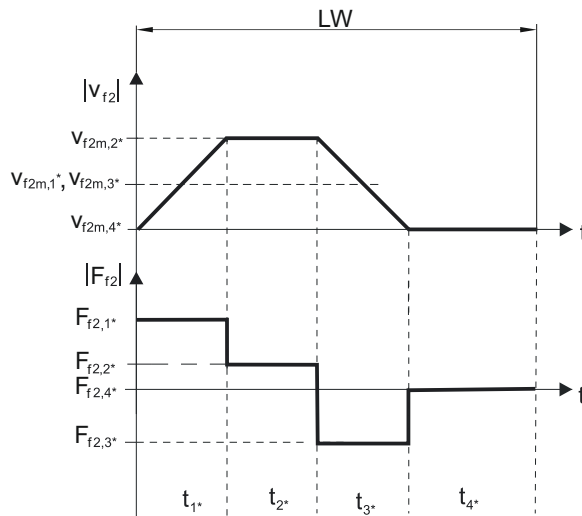


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{ZB}$  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**

$$n_{fm*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

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**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Operating factors**

<b>Operating mode</b>	<b>fB<sub>op</sub></b>
Uniform continuous operation	1.00
Cyclic operation	1.00
Reversing load cyclic operation	1.00
<b>Run time</b>	<b>fB<sub>t</sub></b>
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
<b>Cyclic operation</b>	<b>fB<sub>ZB</sub></b>
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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**

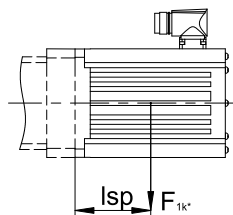
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

### 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:

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



Type	$M_{1k}$ [Nm]
P231_ME	10
P232_ME	10
P331_ME	20
P332_ME	10
P431_ME	40
P432_ME	20
P531_ME	80
P532_ME	40
P731_ME	200
P732_ME	80
P831_ME	400
P832_ME	200
P931_ME	800
P932_ME	400

The values also apply to the MEL and MF motor adapters.

### 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 in 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 leaks. 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/downloads/>

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

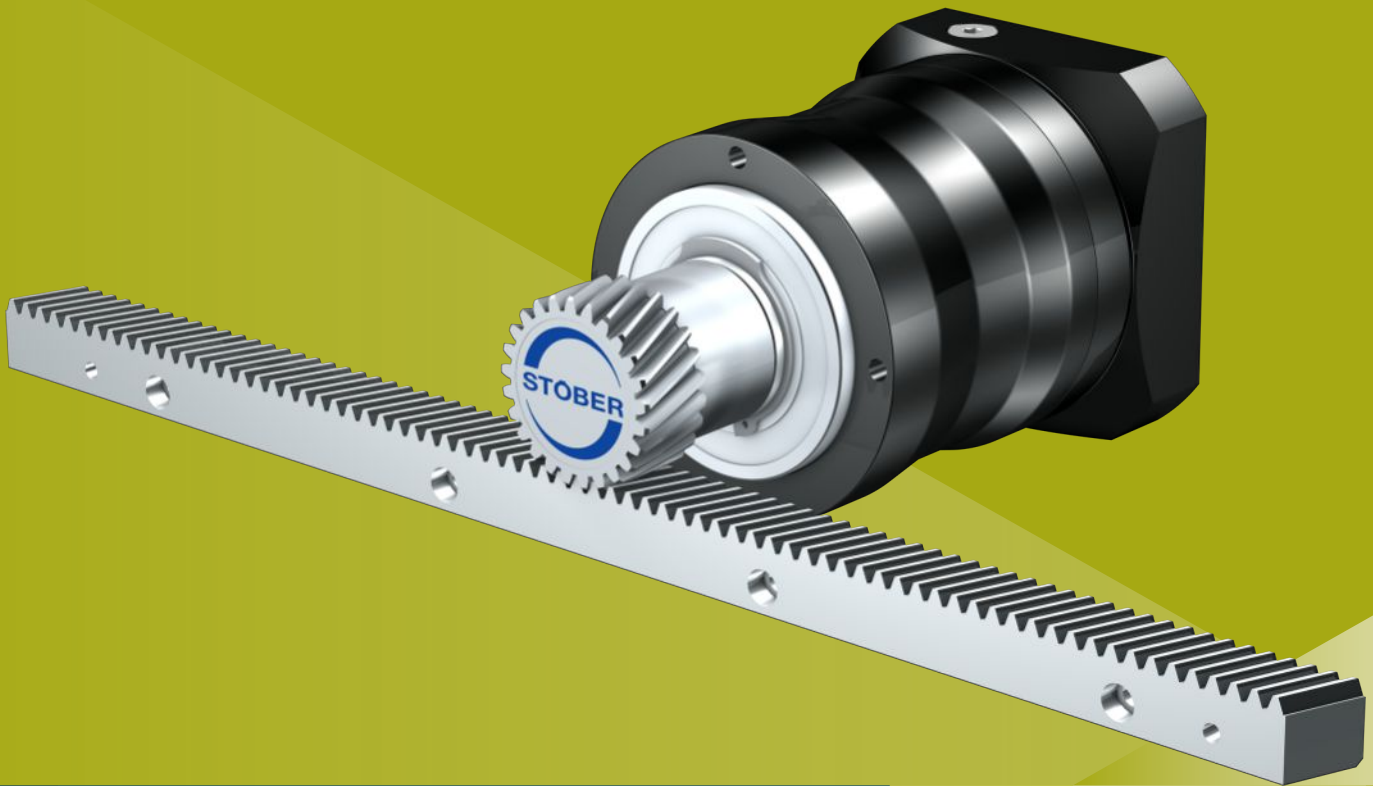
Documentation	ID
Operating manual gear units, geared motors P23 – P93	443356_en
Operating manual for gear racks (Atlanta)	442455

## 9 ZVPE rack and pinion drives

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## 9 Rack and pinion drives

# ZVPE

### 9.1 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 6 (DIN 3962)	✓
Helical gearing	✓
Case-hardened and smoothed	✓

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

#### Technical data

$m_n$	2 – 3 mm
$z$	16 – 25
$F_{f2acc}$	1.7 – 6.1 kN
$v_{f2maxZB}$	0.14 – 4.5 m/s
$\Delta s$	40 – 83 $\mu\text{m}$

## 9.2 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 [▶ 9.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- $C_{lin}$ : Pinion position S

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

i	Type	$n_{1maxDB}$ [rpm]	$n_{1maxZB}$ [rpm]	$d_{MW}$ [mm]	$v_{f2maxZB}$ [m/s]	$\Delta s$ [μm]	$C_{lin}$ [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]
<b>ZV2PE3 (<math>F_{f2acc,max} = 1,9 \text{ kN}</math>)</b>																		
3.000	ZV216S_PE321_0030 ME	3500	6000	≤19	3.56	40	6.2	2	16	34.0	1.2	1.2	1.9	1.7	3.8	3.4	32	29
3.000	ZV216S_PE321_0030 MEL	3500	6000	≤24	3.56	40	6.2	2	16	34.0	1.2	1.2	1.9	1.7	3.8	3.4	32	29
4.000	ZV216S_PE321_0040 ME	3700	7000	≤19	3.11	40	6.4	2	16	34.0	1.4	1.4	1.9	1.7	3.8	3.4	32	29
4.000	ZV216S_PE321_0040 MEL	3700	7000	≤24	3.11	40	6.4	2	16	34.0	1.4	1.4	1.9	1.7	3.8	3.4	32	29
5.000	ZV216S_PE321_0050 ME	3700	7000	≤19	2.49	40	6.4	2	16	34.0	1.5	1.5	1.9	1.7	3.8	3.4	32	29
5.000	ZV216S_PE321_0050 MEL	3700	7000	≤24	2.49	40	6.4	2	16	34.0	1.5	1.5	1.9	1.7	3.8	3.4	32	29
7.000	ZV216S_PE321_0070 ME	4000	7000	≤19	1.78	40	6.4	2	16	34.0	1.5	1.5	1.9	1.7	3.8	3.4	32	29
7.000	ZV216S_PE321_0070 MEL	4000	7000	≤24	1.78	40	6.4	2	16	34.0	1.5	1.5	1.9	1.7	3.8	3.4	32	29
10.00	ZV216S_PE321_0100 ME	4000	7000	≤19	1.24	40	6.3	2	16	34.0	1.5	1.5	1.9	1.7	3.8	3.4	32	29
10.00	ZV216S_PE321_0100 MEL	4000	7000	≤24	1.24	40	6.3	2	16	34.0	1.5	1.5	1.9	1.7	3.8	3.4	32	29
16.00	ZV216S_PE322_0160 ME	4000	8000	≤14	0.89	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
16.00	ZV216S_PE322_0160 MEL	4000	8000	≤19	0.89	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
20.00	ZV216S_PE322_0200 ME	4000	8000	≤14	0.71	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
20.00	ZV216S_PE322_0200 MEL	4000	8000	≤19	0.71	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
25.00	ZV216S_PE322_0250 ME	4000	8000	≤14	0.57	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
25.00	ZV216S_PE322_0250 MEL	4000	8000	≤19	0.57	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
28.00	ZV216S_PE322_0280 ME	4000	8000	≤14	0.51	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
28.00	ZV216S_PE322_0280 MEL	4000	8000	≤19	0.51	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
35.00	ZV216S_PE322_0350 ME	4000	8000	≤14	0.41	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
35.00	ZV216S_PE322_0350 MEL	4000	8000	≤19	0.41	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
40.00	ZV216S_PE322_0400 ME	4500	8000	≤14	0.36	49	6.3	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
40.00	ZV216S_PE322_0400 MEL	4500	8000	≤19	0.36	49	6.3	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
50.00	ZV216S_PE322_0500 ME	4500	8000	≤14	0.28	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
50.00	ZV216S_PE322_0500 MEL	4500	8000	≤19	0.28	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
70.00	ZV216S_PE322_0700 ME	4500	8000	≤14	0.20	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
70.00	ZV216S_PE322_0700 MEL	4500	8000	≤19	0.20	49	6.4	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
100.0	ZV216S_PE322_1000 ME	4500	8000	≤14	0.14	49	6.3	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
100.0	ZV216S_PE322_1000 MEL	4500	8000	≤19	0.14	49	6.3	2	16	34.0	1.8	1.7	1.9	1.7	3.8	3.4	32	29
<b>ZV2PE4 (<math>F_{f2acc,max} = 2,7 \text{ kN}</math>)</b>																		
3.000	ZV220S_PE421_0030 ME	3000	5500	≤24	4.07	49	9.8	2	20	42.4	1.7	1.4	2.7	2.1	5.4	4.3	58	45
3.000	ZV220S_PE421_0030 MEL	3000	5500	≤32	4.07	49	9.9	2	20	42.4	1.7	1.4	2.7	2.1	5.4	4.3	58	45
4.000	ZV220S_PE421_0040 ME	3400	6000	≤24	3.33	49	10	2	20	42.4	1.9	1.6	2.7	2.1	5.4	4.3	58	45
4.000	ZV220S_PE421_0040 MEL	3400	6000	≤32	3.33	49	10	2	20	42.4	1.9	1.6	2.7	2.1	5.4	4.3	58	45
5.000	ZV220S_PE421_0050 ME	3400	6000	≤24	2.67	49	10	2	20	42.4	2.0	1.7	2.7	2.1	5.4	4.3	58	45
5.000	ZV220S_PE421_0050 MEL	3400	6000	≤32	2.67	49	10	2	20	42.4	2.0	1.7	2.7	2.1	5.4	4.3	58	45
7.000	ZV220S_PE421_0070 ME	3600	6000	≤24	1.91	49	9.9	2	20	42.4	2.2	1.9	2.7	2.1	5.4	4.3	58	45
7.000	ZV220S_PE421_0070 MEL	3600	6000	≤32	1.91	49	9.9	2	20	42.4	2.2	1.9	2.7	2.1	5.4	4.3	58	45
10.00	ZV220S_PE421_0100 ME	3600	6000	≤24	1.33	49	9.7	2	20	42.4	2.5	2.1	2.7	2.1	5.4	4.3	58	45
10.00	ZV220S_PE421_0100 MEL	3600	6000	≤32	1.33	49	9.7	2	20	42.4	2.5	2.1	2.7	2.1	5.4	4.3	58	45
16.00	ZV220S_PE422_0160 ME	3700	7000	≤19	0.97	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
16.00	ZV220S_PE422_0160 MEL	3700	7000	≤24	0.97	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
20.00	ZV220S_PE422_0200 ME	3700	7000	≤19	0.78	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
20.00	ZV220S_PE422_0200 MEL	3700	7000	≤24	0.78	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
25.00	ZV220S_PE422_0250 ME	3700	7000	≤19	0.62	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
25.00	ZV220S_PE422_0250 MEL	3700	7000	≤24	0.62	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
28.00	ZV220S_PE422_0280 ME	4000	7000	≤19	0.56	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
28.00	ZV220S_PE422_0280 MEL	4000	7000	≤24	0.56	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
35.00	ZV220S_PE422_0350 ME	4000	7000	≤19	0.44	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
35.00	ZV220S_PE422_0350 MEL	4000	7000	≤24	0.44	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
40.00	ZV220S_PE422_0400 ME	4000	7000	≤19	0.39	62	9.9	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45

9.2 Selection tables 9 ZVPE rack and pinion drives

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{fzmaxZB}$	$\Delta s$	$C_{lin}$	$m_n$	$z$	$d_0$	$F_{fzN,S}$	$F_{fzN,E}$	$F_{fzaccS}$	$F_{fzaccE}$	$F_{fzNOT,S}$	$F_{fzNOT,E}$	$M_{2accS}$	$M_{2accE}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu m$ ]	[N/ $\mu m$ ]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]	[Nm]
<b>ZV2PE4 (<math>F_{fzacc,max} = 2,7 \text{ kN}</math>)</b>																		
40.00	ZV220S_PE422_0400 MEL	4000	7000	≤24	0.39	62	9.9	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
50.00	ZV220S_PE422_0500 ME	4000	7000	≤19	0.31	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
50.00	ZV220S_PE422_0500 MEL	4000	7000	≤24	0.31	62	10	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
70.00	ZV220S_PE422_0700 ME	4000	7000	≤19	0.22	62	9.7	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
70.00	ZV220S_PE422_0700 MEL	4000	7000	≤24	0.22	62	9.7	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
100.0	ZV220S_PE422_1000 ME	4000	7000	≤19	0.16	62	9.7	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
100.0	ZV220S_PE422_1000 MEL	4000	7000	≤24	0.16	62	9.7	2	20	42.4	2.7	2.1	2.7	2.1	5.4	4.3	58	45
<b>ZV2PE5 (<math>F_{fzacc,max} = 6,1 \text{ kN}</math>)</b>																		
3.000	ZV225S_PE521_0030 ME	2500	4500	≤32	4.17	62	13	2	25	53.1	3.4	2.8	6.1	3.8	12	7.6	162	101
3.000	ZV225S_PE521_0030 MEL	2500	4500	≤38	4.17	62	13	2	25	53.1	3.4	2.8	6.1	3.8	12	7.6	162	101
4.000	ZV225S_PE521_0040 ME	2600	5000	≤32	3.47	62	13	2	25	53.1	4.5	3.1	6.1	3.8	12	7.6	162	101
4.000	ZV225S_PE521_0040 MEL	2600	5000	≤38	3.47	62	13	2	25	53.1	4.5	3.1	6.1	3.8	12	7.6	162	101
5.000	ZV225S_PE521_0050 ME	2600	5000	≤32	2.78	62	13	2	25	53.1	4.9	3.3	6.1	3.8	12	7.6	162	101
5.000	ZV225S_PE521_0050 MEL	2600	5000	≤38	2.78	62	13	2	25	53.1	4.9	3.3	6.1	3.8	12	7.6	162	101
7.000	ZV225S_PE521_0070 ME	2800	5000	≤32	1.98	62	13	2	25	53.1	4.9	3.7	6.1	3.8	12	7.6	162	101
7.000	ZV225S_PE521_0070 MEL	2800	5000	≤38	1.98	62	13	2	25	53.1	4.9	3.7	6.1	3.8	12	7.6	162	101
10.00	ZV225S_PE521_0100 ME	3000	5000	≤32	1.39	62	13	2	25	53.1	4.9	3.8	6.1	3.8	12	7.6	162	101
10.00	ZV225S_PE521_0100 MEL	3000	5000	≤38	1.39	62	13	2	25	53.1	4.9	3.8	6.1	3.8	12	7.6	162	101
16.00	ZV225S_PE522_0160 ME	3400	6000	≤24	1.04	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
16.00	ZV225S_PE522_0160 MEL	3400	6000	≤32	1.04	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
20.00	ZV225S_PE522_0200 ME	3400	6000	≤24	0.83	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
20.00	ZV225S_PE522_0200 MEL	3400	6000	≤32	0.83	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
25.00	ZV225S_PE522_0250 ME	3400	6000	≤24	0.67	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
25.00	ZV225S_PE522_0250 MEL	3400	6000	≤32	0.67	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
28.00	ZV225S_PE522_0280 ME	3600	6000	≤24	0.60	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
28.00	ZV225S_PE522_0280 MEL	3600	6000	≤32	0.60	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
35.00	ZV225S_PE522_0350 ME	3600	6000	≤24	0.48	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
35.00	ZV225S_PE522_0350 MEL	3600	6000	≤32	0.48	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
40.00	ZV225S_PE522_0400 ME	3600	6000	≤24	0.42	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
40.00	ZV225S_PE522_0400 MEL	3600	6000	≤32	0.42	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
50.00	ZV225S_PE522_0500 ME	3600	6000	≤24	0.33	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
50.00	ZV225S_PE522_0500 MEL	3600	6000	≤32	0.33	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
70.00	ZV225S_PE522_0700 ME	3600	6000	≤24	0.24	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
70.00	ZV225S_PE522_0700 MEL	3600	6000	≤32	0.24	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
100.0	ZV225S_PE522_1000 ME	3600	6000	≤24	0.17	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
100.0	ZV225S_PE522_1000 MEL	3600	6000	≤32	0.17	77	13	2	25	53.1	6.0	3.8	6.1	3.8	12	7.6	162	101
<b>ZV3PE5 (<math>F_{fzacc,max} = 5,8 \text{ kN}</math>)</b>																		
3.000	ZV318S_PE521_0030 ME	2500	4500	≤32	4.50	67	14	3	18	57.3	3.1	2.9	5.8	3.9	12	7.8	166	111
3.000	ZV318S_PE521_0030 MEL	2500	4500	≤38	4.50	67	14	3	18	57.3	3.1	2.9	5.8	3.9	12	7.8	166	111
4.000	ZV318S_PE521_0040 ME	2600	5000	≤32	3.75	67	14	3	18	57.3	4.3	3.2	5.8	3.9	12	7.8	166	111
4.000	ZV318S_PE521_0040 MEL	2600	5000	≤38	3.75	67	14	3	18	57.3	4.3	3.2	5.8	3.9	12	7.8	166	111
5.000	ZV318S_PE521_0050 ME	2600	5000	≤32	3.00	67	14	3	18	57.3	4.5	3.4	5.8	3.9	12	7.8	166	111
5.000	ZV318S_PE521_0050 MEL	2600	5000	≤38	3.00	67	14	3	18	57.3	4.5	3.4	5.8	3.9	12	7.8	166	111
7.000	ZV318S_PE521_0070 ME	2800	5000	≤32	2.14	67	14	3	18	57.3	4.5	3.8	5.8	3.9	12	7.8	166	111
7.000	ZV318S_PE521_0070 MEL	2800	5000	≤38	2.14	67	14	3	18	57.3	4.5	3.8	5.8	3.9	12	7.8	166	111
10.00	ZV318S_PE521_0100 ME	3000	5000	≤32	1.50	67	14	3	18	57.3	4.5	3.9	5.8	3.9	12	7.8	166	111
10.00	ZV318S_PE521_0100 MEL	3000	5000	≤38	1.50	67	14	3	18	57.3	4.5	3.9	5.8	3.9	12	7.8	166	111
16.00	ZV318S_PE522_0160 ME	3400	6000	≤24	1.13	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
16.00	ZV318S_PE522_0160 MEL	3400	6000	≤32	1.13	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
20.00	ZV318S_PE522_0200 ME	3400	6000	≤24	0.90	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
20.00	ZV318S_PE522_0200 MEL	3400	6000	≤32	0.90	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
25.00	ZV318S_PE522_0250 ME	3400	6000	≤24	0.72	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
25.00	ZV318S_PE522_0250 MEL	3400	6000	≤32	0.72	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
28.00	ZV318S_PE522_0280 ME	3600	6000	≤24	0.64	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
28.00	ZV318S_PE522_0280 MEL	3600	6000	≤32	0.64	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
35.00	ZV318S_PE522_0350 ME	3600	6000	≤24	0.51	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
35.00	ZV318S_PE522_0350 MEL	3600	6000	≤32	0.51	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
40.00	ZV318S_PE522_0400 ME	3600	6000	≤24	0.45	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
40.00	ZV318S_PE522_0400 MEL	3600	6000	≤32	0.45	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
50.00	ZV318S_PE522_0500 ME	3600	6000	≤24	0.36	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
50.00	ZV318S_PE522_0500 MEL	3600	6000	≤32	0.36	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
70.00	ZV318S_PE522_0700 ME	3600	6000	≤24	0.26	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
70.00	ZV318S_PE522_0700 MEL	3600	6000	≤32	0.26	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
100.0	ZV318S_PE522_1000 ME	3600	6000	≤24	0.18	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111
100.0	ZV318S_PE522_1000 MEL	3600	6000	≤32	0.18	83	14	3	18	57.3	5.6	3.9	5.8	3.9	12	7.8	166	111

## 9.3 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:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

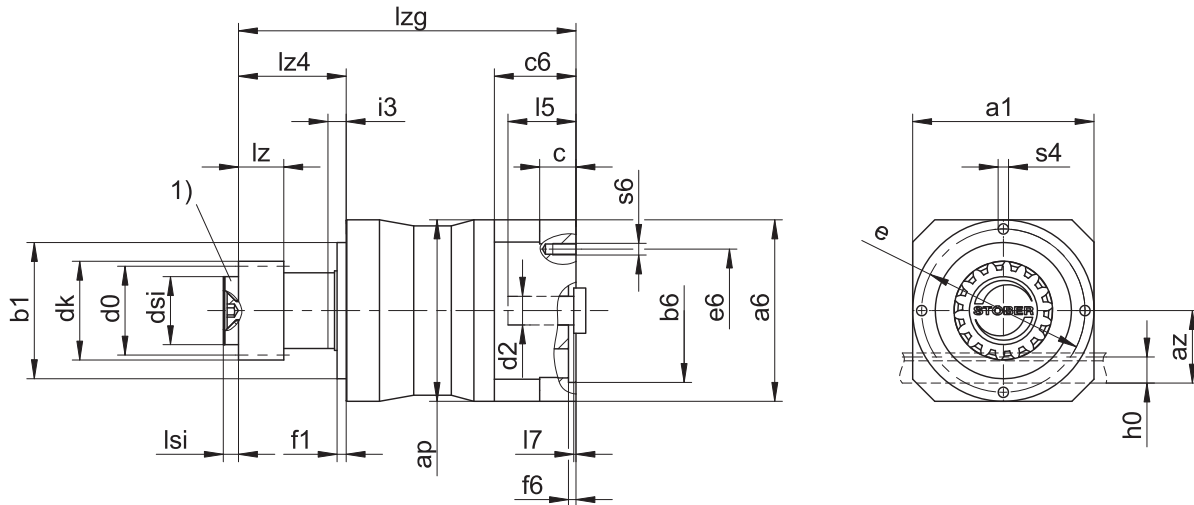
The pinion of the rack and pinion drive is helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

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 <https://configurator.stoeber.de/en-US/>.

### 9.3.1 Pinion position E



1) Axial locking (optional)

#### Output dimensions

Type	mn	Øa1	ap	az	Øb1	Ød0	Ødk	Ødsi	Øe	f1	h0	i3	lz	lz4	lsi	Øs4	x
ZV216SEPE321_	2	70	72	39.98	52 <sub>h6</sub>	33.95	39.81	25	62	5	22	7	26	37.5	4	M5	0.5
ZV216SEPE322_	2	70	75	39.98	52 <sub>h6</sub>	33.95	39.81	25	62	5	22	7	26	37.5	4	M5	0.5
ZV220SEPE421_	2	90	98	44.02	68 <sub>h6</sub>	42.44	47.90	30	80	5	22	10	26	48.5	6	M6	0.4
ZV220SEPE422_	2	90	100	44.02	68 <sub>h6</sub>	42.44	47.90	30	80	5	22	10	26	48.5	6	M6	0.4
ZV225SEPE521_	2	120	120	49.33	90 <sub>h6</sub>	53.05	58.52	45	108	6	22	12	26	72.5	8	M8	0.4
ZV318SEPE521_	3	120	120	55.55	90 <sub>h6</sub>	57.30	65.01	45	108	6	26	12	31	72.5	8	M8	0.3
ZV225SEPE522_	2	120	120	49.33	90 <sub>h6</sub>	53.05	58.52	45	108	6	22	12	26	72.5	8	M8	0.4
ZV318SEPE522_	3	120	120	55.55	90 <sub>h6</sub>	57.30	65.01	45	108	6	26	12	31	72.5	8	M8	0.3

#### Example dimensions for the motor connection + total length

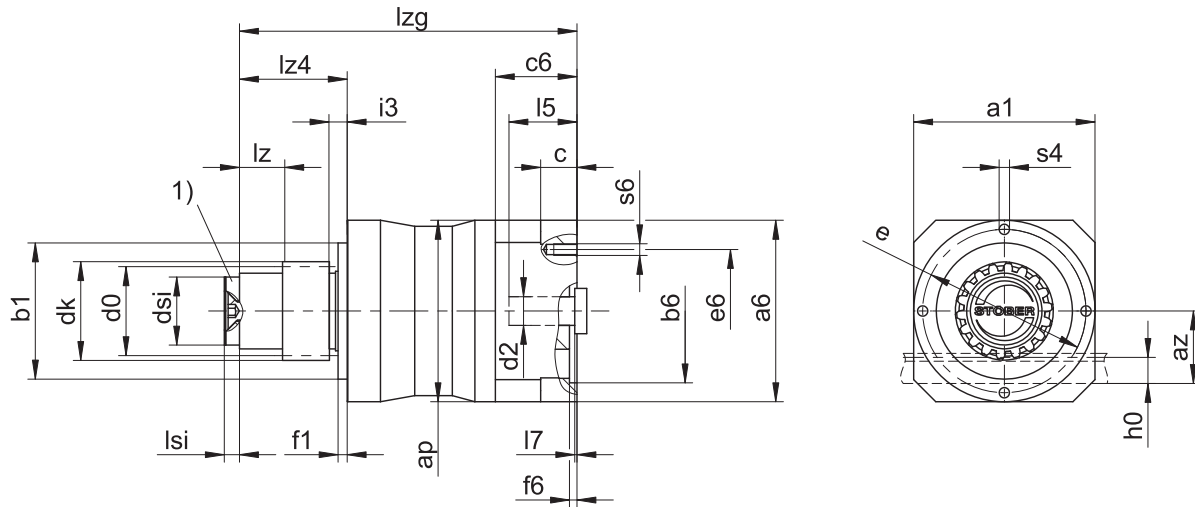
Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZV_PE321_ME	60 <sup>H7</sup>	75	19	41	75	18	41.5	3.5	4.0	152.0	M5
ZV_PE322_ME	40 <sup>H7</sup>	63	14	30	55	15	32.0	3.5	3.0	169.5	M5
ZV_PE421_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	169.5	M8
ZV_PE422_ME	60 <sup>H7</sup>	75	19	41	75	18	41.5	3.5	4.0	206.5	M5
ZV_PE521_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	224.5	M8
ZV_PE522_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	253.5	M8

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6, l5 and lzg are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEBER Configurator at <https://configurator.stoeber.de/en-US/>. 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	Øa1	ap	az	Øb1	Ød0	Ødb	Ødk	Ødsi	Øe	f1	h0	i3	lb	lz	lz4	lsi	Øs4	x
ZV216SSPE321_	2	70	72	39.98	52 <sub>h6</sub>	33.95	30	39.81	25	62	5	22	7	4.5	26	37.5	4	M5	0.5
ZV216SSPE322_	2	70	75	39.98	52 <sub>h6</sub>	33.95	30	39.81	25	62	5	22	7	4.5	26	37.5	4	M5	0.5
ZV220SSPE421_	2	90	98	44.02	68 <sub>h6</sub>	42.44	38	47.90	30	80	5	22	10	12.5	26	48.5	6	M6	0.4
ZV220SSPE422_	2	90	100	44.02	68 <sub>h6</sub>	42.44	38	47.90	30	80	5	22	10	12.5	26	48.5	6	M6	0.4
ZV225SSPE521_	2	120	120	49.33	90 <sub>h6</sub>	53.05	50	58.52	45	108	6	22	12	34.5	26	72.5	8	M8	0.4
ZV318SSPE521_	3	120	120	55.55	90 <sub>h6</sub>	57.30	50	65.01	45	108	6	26	12	29.5	31	72.5	8	M8	0.3
ZV225SSPE522_	2	120	120	49.33	90 <sub>h6</sub>	53.05	50	58.52	45	108	6	22	12	34.5	26	72.5	8	M8	0.4
ZV318SSPE522_	3	120	120	55.55	90 <sub>h6</sub>	57.30	50	65.01	45	108	6	26	12	29.5	31	72.5	8	M8	0.3

#### Example dimensions for the motor connection + total length

Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZV_PE321_ME	60 <sup>H7</sup>	75	19	41	75	18	41.5	3.5	4.0	152.0	M5
ZV_PE322_ME	40 <sup>H7</sup>	63	14	30	55	15	32.0	3.5	3.0	169.5	M5
ZV_PE421_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	169.5	M8
ZV_PE422_ME	60 <sup>H7</sup>	75	19	41	75	18	41.5	3.5	4.0	206.5	M5
ZV_PE521_ME	110 <sup>H7</sup>	130	32	51	120	24	54.0	4.0	4.5	224.5	M8
ZV_PE522_ME	95 <sup>H7</sup>	115	24	41	100	21	42.5	4.0	3.5	253.5	M8

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6, l5 and lzg are also lengthened accordingly.**

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

## 9.4 Type designation

This chapter shows you 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.

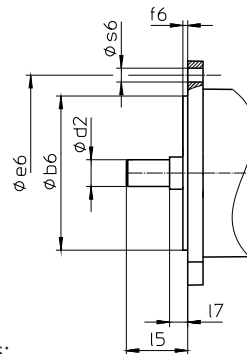
### Example code

Z	V	2	20	S	S	PE	4	2	1	S	P	S	S	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)
2	Generation	Generation 2
1	Stages	Single-stage
2		Two-stage
S	Housing	Standard
P	Shaft	Solid shaft with feather key
S	Bearing	Standard bearing
S	Backlash	Standard
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

To complete the type designation, also specify the following in your order:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at

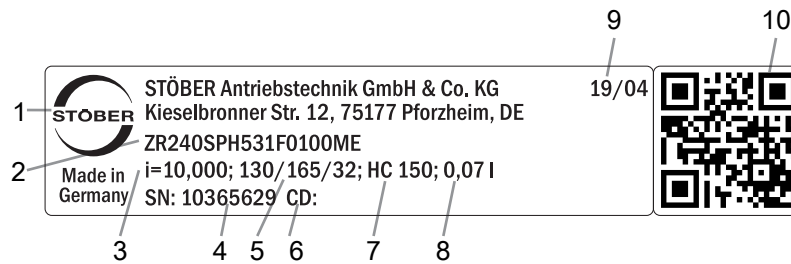
<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

- For axial locking (optional), see the chapter [▶ 9.3]
- Socket wrench insert for mounting the motor on the gear unit using the ME/MEL motor adapter (optional)

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 [▶ 9.5.1].

## 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 Input options

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

ME motor adapter



Catalog ID 443137\_en

EZ synchronous servo motor



Catalog ID 443286\_en

LM Lean motor



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.



## 9.5.2 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 clamp coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- 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

## 9.5.3 Gear rack

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 6.

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

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 tothing is flush with the shaft end (Pos. E)
- The tothing is flush with the shaft shoulder (Pos. S: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

## 9.5.4 Installation conditions

The specified torques and forces only apply when gear units are fastened on the machine side using screws of strength class 10.9. In addition, the gear 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.

You will receive lubricants for use in the food industry upon request.

### 9.5.5.1 Rack and pinion drive lubrication

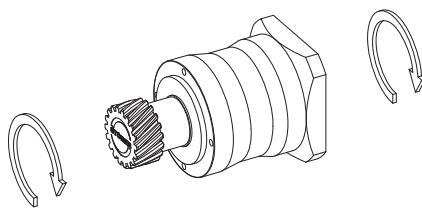
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

## 9.5.6 Other product features

Feature	Value
Max. permitted gear unit temperature (on the surface of the gear unit)	≤ 80 °C
Paint	Black RAL 9005
(ATEX) Directive 2014/34/EU (optional)	Not suitable
Protection class: <sup>1</sup>	
Planetary gear unit	IP64
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 SERVOSOFT designing software. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

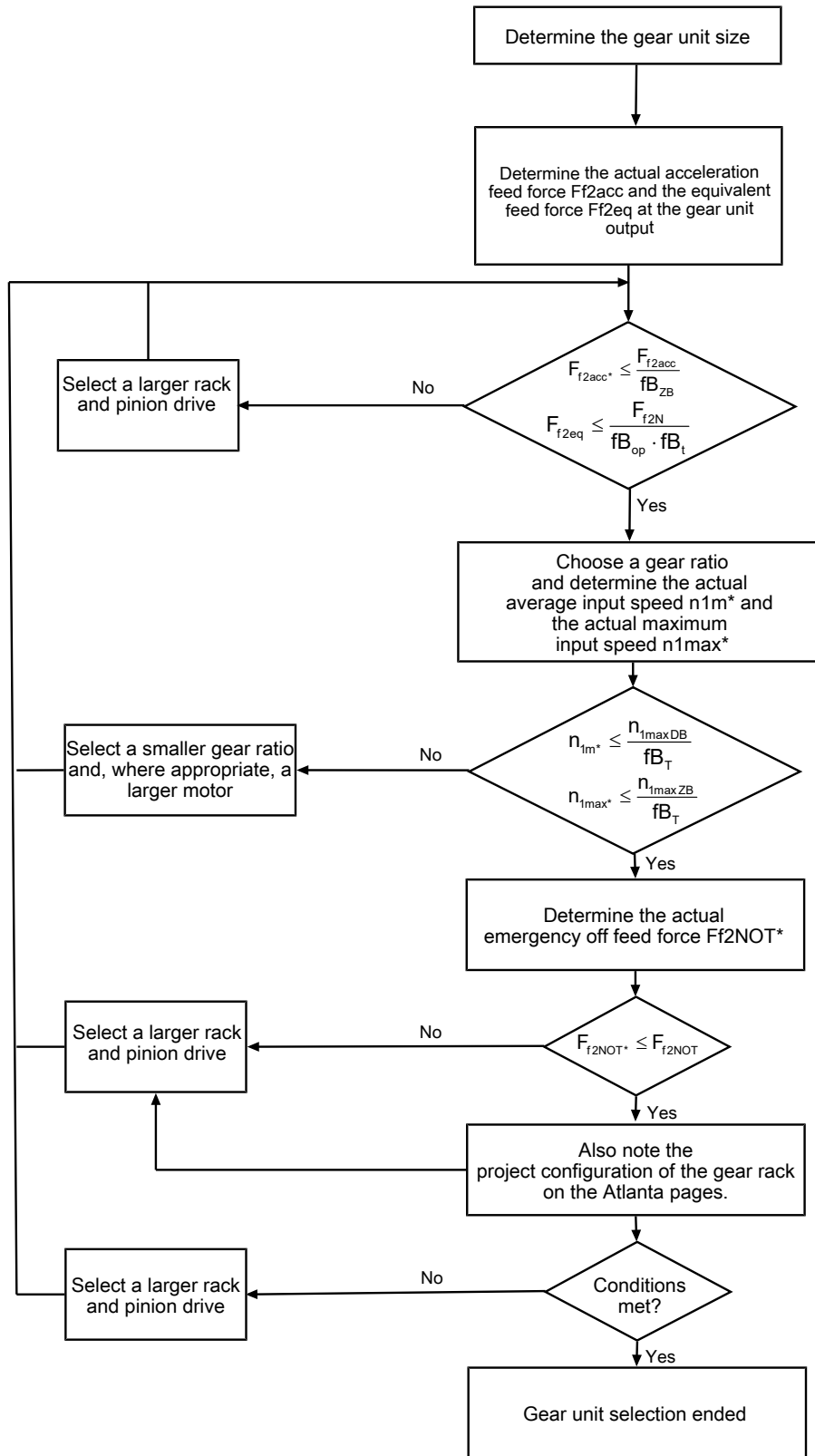
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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 [▶ 13.1](#).

### 9.6.1 Drive selection

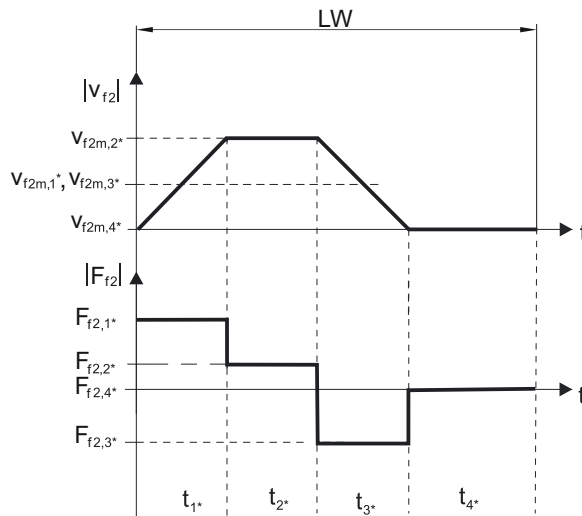


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for  $f_{B_T}$ ,  $f_{B_{op}}$ ,  $f_{B_t}$  and  $f_{B_{ZB}}$  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**

$$n_{fm*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

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**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Operating factors**

<b>Operating mode</b>	<b>fB<sub>op</sub></b>
Uniform continuous operation	1.00
Cyclic operation	1.00
Reversing load cyclic operation	1.00
<b>Run time</b>	<b>fB<sub>t</sub></b>
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
<b>Cyclic operation</b>	<b>fB<sub>ZB</sub></b>
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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**

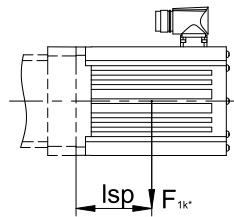
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

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



Type	$M_{1k}$ [Nm]
PE221_ME	10
PE222_ME	10
PE321_ME	20
PE322_ME	10
PE421_ME	40
PE422_ME	20
PE521_ME	80
PE522_ME	40

The values also apply to the MEL motor adapter.

### 9.6.3 Radial shaft seal rings

**Leak-proofness**

Our gear units are equipped with high-quality radial shaft seal rings and checked for leaks. 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/downloads/>

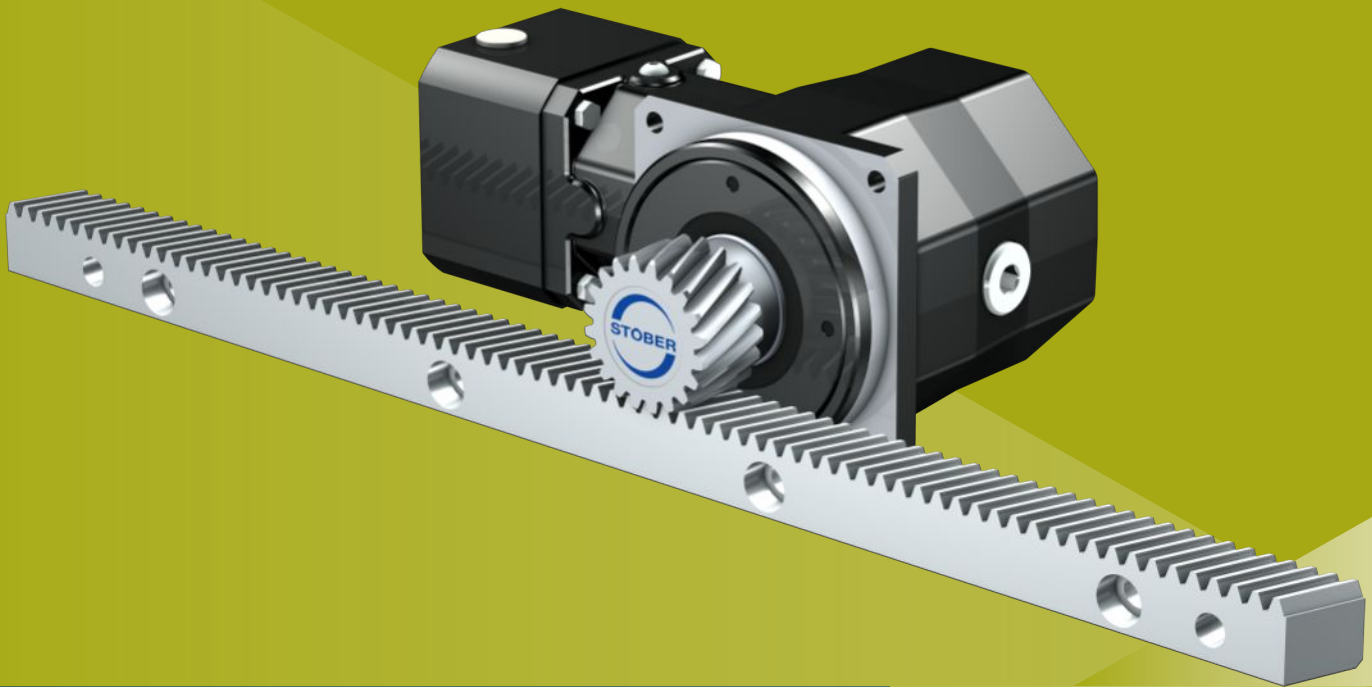
Enter the ID of the documentation in the Search term field.

Documentation	ID
Operating manual for PE22 – PE52 planetary gear units and planetary geared motors	443252_en
Operating manual for gear racks (Atlanta)	442455

# 10 ZVKS rack and pinion drives

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# 10

## Rack and pinion drives

# ZVKS

### 10.1 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 6 (DIN 3962) ✓
- Helical gearing ✓
- Case-hardened and smoothed ✓

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

#### Technical data

$m_n$	2 – 4 mm
$z$	18 – 25
$F_{f2acc}$	3.2 – 11 kN
$V_{f2maxZB}$	0.07 – 3 m/s
$\Delta s$	37 – 44 $\mu m$

## 10.2 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 [▶ 10.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- $C_{in}$ : Pinion position S

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

i	Type	$n_{1maxDB}$ [rpm]	$n_{1maxZB}$ [rpm]	$d_{MW}$ [mm]	$v_{f2maxZB}$ [m/s]	$\Delta s$ [μm]	$C_{in}$ [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]
<b>ZV2KS4 (<math>F_{f2acc,max} = 4,2 \text{ kN}</math>)</b>																		
6.000	ZV220S_KS402_0060 ME	3000	6000	≤19	2.22	37	35	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	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	37	36	2	20	42.4	2.8	2.8	4.2	3.2	6.6	6.4	90	68
<b>ZV2KS5 (<math>F_{f2acc,max} = 7,5 \text{ kN}</math>)</b>																		
6.000	ZV225S_KS502_0060 ME	2500	5500	≤24	2.55	39	45	2	25	53.1	3.8	3.8	7.5	5.0	11	10	200	134
6.000	ZV225S_KS502_0060 MEL	2500	5500	≤32	2.55	39	45	2	25	53.1	3.8	3.8	7.5	5.0	11	10	200	134
8.000	ZV225S_KS502_0080 ME	2800	6000	≤24	2.08	39	45	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
8.000	ZV225S_KS502_0080 MEL	2800	6000	≤32	2.08	39	45	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
10.00	ZV225S_KS502_0100 ME	3000	6000	≤24	1.67	39	45	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
10.00	ZV225S_KS502_0100 MEL	3000	6000	≤32	1.67	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
14.00	ZV225S_KS502_0140 ME	3200	6000	≤24	1.19	39	45	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
14.00	ZV225S_KS502_0140 MEL	3200	6000	≤32	1.19	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
20.00	ZV225S_KS502_0200 ME	3500	6000	≤24	0.83	39	46	2	25	53.1	4.5	4.5	7.5	5.0	11	10	200	134
20.00	ZV225S_KS502_0200 MEL	3500	6000	≤32	0.83	39	46	2	25	53.1	4.5	4.5	7.5	5.0	11	10	200	134
24.00	ZV225S_KS503_0240 ME	3100	6000	≤19	0.69	39	46	2	25	53.1	3.8	3.8	7.5	5.0	11	10	200	134
24.00	ZV225S_KS503_0240 MEL	3100	6000	≤24	0.69	39	46	2	25	53.1	3.8	3.8	7.5	5.0	11	10	200	134
32.00	ZV225S_KS503_0320 ME	3100	6000	≤19	0.52	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
32.00	ZV225S_KS503_0320 MEL	3100	6000	≤24	0.52	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
40.00	ZV225S_KS503_0400 ME	3100	6000	≤19	0.42	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
40.00	ZV225S_KS503_0400 MEL	3100	6000	≤24	0.42	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
50.00	ZV225S_KS503_0500 ME	3500	6000	≤19	0.33	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
50.00	ZV225S_KS503_0500 MEL	3500	6000	≤24	0.33	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
70.00	ZV225S_KS503_0700 ME	4200	6000	≤19	0.24	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
70.00	ZV225S_KS503_0700 MEL	4200	6000	≤24	0.24	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
80.00	ZV225S_KS503_0800 ME	4200	6000	≤19	0.21	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134



10.2 Selection tables 10 ZVKS rack and pinion drives

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{f2maxZB}$	$\Delta s$	$C_{lin}$	$m_n$	$z$	$d_0$	$F_{f2N,S}$	$F_{f2N,E}$	$F_{f2accS}$	$F_{f2accE}$	$F_{f2NOT,S}$	$F_{f2NOT,E}$	$M_{2accS}$	$M_{2accE}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu m$ ]	[N/ $\mu m$ ]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]	[Nm]
<b>ZV2KS5 (<math>F_{f2acc,max} = 7,5</math> kN)</b>																		
80.00	ZV225S_KS503_0800 MEL	4200	6000	≤24	0.21	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
100.0	ZV225S_KS503_1000 ME	4200	6000	≤19	0.17	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
100.0	ZV225S_KS503_1000 MEL	4200	6000	≤24	0.17	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
140.0	ZV225S_KS503_1400 ME	4200	6000	≤19	0.12	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
140.0	ZV225S_KS503_1400 MEL	4200	6000	≤24	0.12	39	46	2	25	53.1	4.7	4.7	7.5	5.0	11	10	200	134
200.0	ZV225S_KS503_2000 ME	4200	6000	≤19	0.08	39	46	2	25	53.1	4.5	4.5	7.5	5.0	11	10	200	134
200.0	ZV225S_KS503_2000 MEL	4200	6000	≤24	0.08	39	46	2	25	53.1	4.5	4.5	7.5	5.0	11	10	200	134
<b>ZV3KS5 (<math>F_{f2acc,max} = 7,0</math> kN)</b>																		
6.000	ZV318S_KS502_0060 ME	2500	5500	≤24	2.75	42	43	3	18	57.3	3.5	3.5	7.0	5.2	10	10	200	148
6.000	ZV318S_KS502_0060 MEL	2500	5500	≤32	2.75	42	43	3	18	57.3	3.5	3.5	7.0	5.2	10	10	200	148
8.000	ZV318S_KS502_0080 ME	2800	6000	≤24	2.25	42	43	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
8.000	ZV318S_KS502_0080 MEL	2800	6000	≤32	2.25	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
10.00	ZV318S_KS502_0100 ME	3000	6000	≤24	1.80	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
10.00	ZV318S_KS502_0100 MEL	3000	6000	≤32	1.80	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
14.00	ZV318S_KS502_0140 ME	3200	6000	≤24	1.29	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
14.00	ZV318S_KS502_0140 MEL	3200	6000	≤32	1.29	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
20.00	ZV318S_KS502_0200 ME	3500	6000	≤24	0.90	42	44	3	18	57.3	4.2	4.2	7.0	5.2	10	10	200	148
20.00	ZV318S_KS502_0200 MEL	3500	6000	≤32	0.90	42	44	3	18	57.3	4.2	4.2	7.0	5.2	10	10	200	148
24.00	ZV318S_KS503_0240 ME	3100	6000	≤19	0.75	42	44	3	18	57.3	3.5	3.5	7.0	5.2	10	10	200	148
24.00	ZV318S_KS503_0240 MEL	3100	6000	≤24	0.75	42	44	3	18	57.3	3.5	3.5	7.0	5.2	10	10	200	148
32.00	ZV318S_KS503_0320 ME	3100	6000	≤19	0.56	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
32.00	ZV318S_KS503_0320 MEL	3100	6000	≤24	0.56	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
40.00	ZV318S_KS503_0400 ME	3100	6000	≤19	0.45	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
40.00	ZV318S_KS503_0400 MEL	3100	6000	≤24	0.45	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
50.00	ZV318S_KS503_0500 ME	3500	6000	≤19	0.36	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
50.00	ZV318S_KS503_0500 MEL	3500	6000	≤24	0.36	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
70.00	ZV318S_KS503_0700 ME	4200	6000	≤19	0.26	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
70.00	ZV318S_KS503_0700 MEL	4200	6000	≤24	0.26	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
80.00	ZV318S_KS503_0800 ME	4200	6000	≤19	0.23	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
80.00	ZV318S_KS503_0800 MEL	4200	6000	≤24	0.23	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
100.0	ZV318S_KS503_1000 ME	4200	6000	≤19	0.18	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
100.0	ZV318S_KS503_1000 MEL	4200	6000	≤24	0.18	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
140.0	ZV318S_KS503_1400 ME	4200	6000	≤19	0.13	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
140.0	ZV318S_KS503_1400 MEL	4200	6000	≤24	0.13	42	44	3	18	57.3	4.4	4.4	7.0	5.2	10	10	200	148
200.0	ZV318S_KS503_2000 ME	4200	6000	≤19	0.09	42	44	3	18	57.3	4.2	4.2	7.0	5.2	10	10	200	148
200.0	ZV318S_KS503_2000 MEL	4200	6000	≤24	0.09	42	44	3	18	57.3	4.2	4.2	7.0	5.2	10	10	200	148
<b>ZV3KS7 (<math>F_{f2acc,max} = 11</math> kN)</b>																		
6.000	ZV322S_KS702_0060 ME	2100	4500	≤32	2.75	41	66	3	22	70.0	6.9	6.4	11	6.4	17	13	400	223
6.000	ZV322S_KS702_0060 MEL	2100	4500	≤38	2.75	41	67	3	22	70.0	6.9	6.4	11	6.4	17	13	400	223
8.000	ZV322S_KS702_0080 ME	2500	5000	≤32	2.29	41	67	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
8.000	ZV322S_KS702_0080 MEL	2500	5000	≤38	2.29	41	67	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
10.00	ZV322S_KS702_0100 ME	2800	6000	≤32	2.20	41	67	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
10.00	ZV322S_KS702_0100 MEL	2800	6000	≤38	2.20	41	67	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
14.00	ZV322S_KS702_0140 ME	3000	6000	≤32	1.57	41	67	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
14.00	ZV322S_KS702_0140 MEL	3000	6000	≤38	1.57	41	67	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
20.00	ZV322S_KS702_0200 ME	3200	6000	≤32	1.10	41	67	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
20.00	ZV322S_KS702_0200 MEL	3200	6000	≤38	1.10	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
24.00	ZV322S_KS703_0240 ME	3000	6000	≤24	0.92	41	67	3	22	70.0	6.9	6.4	11	6.4	17	13	400	223
24.00	ZV322S_KS703_0240 MEL	3000	6000	≤32	0.92	41	68	3	22	70.0	6.9	6.4	11	6.4	17	13	400	223
32.00	ZV322S_KS703_0320 ME	3000	6000	≤24	0.69	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
32.00	ZV322S_KS703_0320 MEL	3000	6000	≤32	0.69	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
40.00	ZV322S_KS703_0400 ME	3000	6000	≤24	0.55	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
40.00	ZV322S_KS703_0400 MEL	3000	6000	≤32	0.55	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
50.00	ZV322S_KS703_0500 ME	3200	6000	≤24	0.44	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
50.00	ZV322S_KS703_0500 MEL	3200	6000	≤32	0.44	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
70.00	ZV322S_KS703_0700 ME	3500	6000	≤24	0.31	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
70.00	ZV322S_KS703_0700 MEL	3500	6000	≤32	0.31	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
80.00	ZV322S_KS703_0800 ME	4000	6000	≤24	0.28	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
80.00	ZV322S_KS703_0800 MEL	4000	6000	≤32	0.28	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
100.0	ZV322S_KS703_1000 ME	4000	6000	≤24	0.22	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
100.0	ZV322S_KS703_1000 MEL	4000	6000	≤32	0.22	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
140.0	ZV322S_KS703_1400 ME	4000	6000	≤24	0.16	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
140.0	ZV322S_KS703_1400 MEL	4000	6000	≤32	0.16	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
200.0	ZV322S_KS703_2000 ME	4000	6000	≤24	0.11	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223
200.0	ZV322S_KS703_2000 MEL	4000	6000	≤32	0.11	41	68	3	22	70.0	7.1	6.4	11	6.4	17	13	400	223

i	Type	$n_{1maxDB}$	$n_{1maxZB}$	$d_{MW}$	$v_{f2maxZB}$	$\Delta s$	$C_{lin}$	$m_n$	$z$	$d_0$	$F_{f2N,S}$	$F_{f2N,E}$	$F_{f2accS}$	$F_{f2accE}$	$F_{f2NOT,S}$	$F_{f2NOT,E}$	$M_{2accS}$	$M_{2accE}$
		[rpm]	[rpm]	[mm]	[m/s]	[ $\mu m$ ]	[N/ $\mu m$ ]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]	[Nm]
<b>ZV4KS7 (<math>F_{f2acc,max} = 10\text{ kN}</math>)</b>																		
6.000	ZV418S_KS702_0060 ME	2100	4500	≤32	3.00	44	64	4	18	76.4	6.3	6.3	10	6.7	16	13	400	256
6.000	ZV418S_KS702_0060 MEL	2100	4500	≤38	3.00	44	65	4	18	76.4	6.3	6.3	10	6.7	16	13	400	256
8.000	ZV418S_KS702_0080 ME	2500	5000	≤32	2.50	44	65	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
8.000	ZV418S_KS702_0080 MEL	2500	5000	≤38	2.50	44	65	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
10.00	ZV418S_KS702_0100 ME	2800	6000	≤32	2.40	44	65	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
10.00	ZV418S_KS702_0100 MEL	2800	6000	≤38	2.40	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
14.00	ZV418S_KS702_0140 ME	3000	6000	≤32	1.71	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
14.00	ZV418S_KS702_0140 MEL	3000	6000	≤38	1.71	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
20.00	ZV418S_KS702_0200 ME	3200	6000	≤32	1.20	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
20.00	ZV418S_KS702_0200 MEL	3200	6000	≤38	1.20	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
24.00	ZV418S_KS703_0240 ME	3000	6000	≤24	1.00	44	66	4	18	76.4	6.3	6.3	10	6.7	16	13	400	256
24.00	ZV418S_KS703_0240 MEL	3000	6000	≤32	1.00	44	66	4	18	76.4	6.3	6.3	10	6.7	16	13	400	256
32.00	ZV418S_KS703_0320 ME	3000	6000	≤24	0.75	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
32.00	ZV418S_KS703_0320 MEL	3000	6000	≤32	0.75	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
40.00	ZV418S_KS703_0400 ME	3000	6000	≤24	0.60	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
40.00	ZV418S_KS703_0400 MEL	3000	6000	≤32	0.60	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
50.00	ZV418S_KS703_0500 ME	3200	6000	≤24	0.48	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
50.00	ZV418S_KS703_0500 MEL	3200	6000	≤32	0.48	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
70.00	ZV418S_KS703_0700 ME	3500	6000	≤24	0.34	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
70.00	ZV418S_KS703_0700 MEL	3500	6000	≤32	0.34	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
80.00	ZV418S_KS703_0800 ME	4000	6000	≤24	0.30	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
80.00	ZV418S_KS703_0800 MEL	4000	6000	≤32	0.30	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
100.0	ZV418S_KS703_1000 ME	4000	6000	≤24	0.24	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
100.0	ZV418S_KS703_1000 MEL	4000	6000	≤32	0.24	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
140.0	ZV418S_KS703_1400 ME	4000	6000	≤24	0.17	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
140.0	ZV418S_KS703_1400 MEL	4000	6000	≤32	0.17	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
200.0	ZV418S_KS703_2000 ME	4000	6000	≤24	0.12	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256
200.0	ZV418S_KS703_2000 MEL	4000	6000	≤32	0.12	44	66	4	18	76.4	6.5	6.5	10	6.7	16	13	400	256

## 10.3 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:  $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

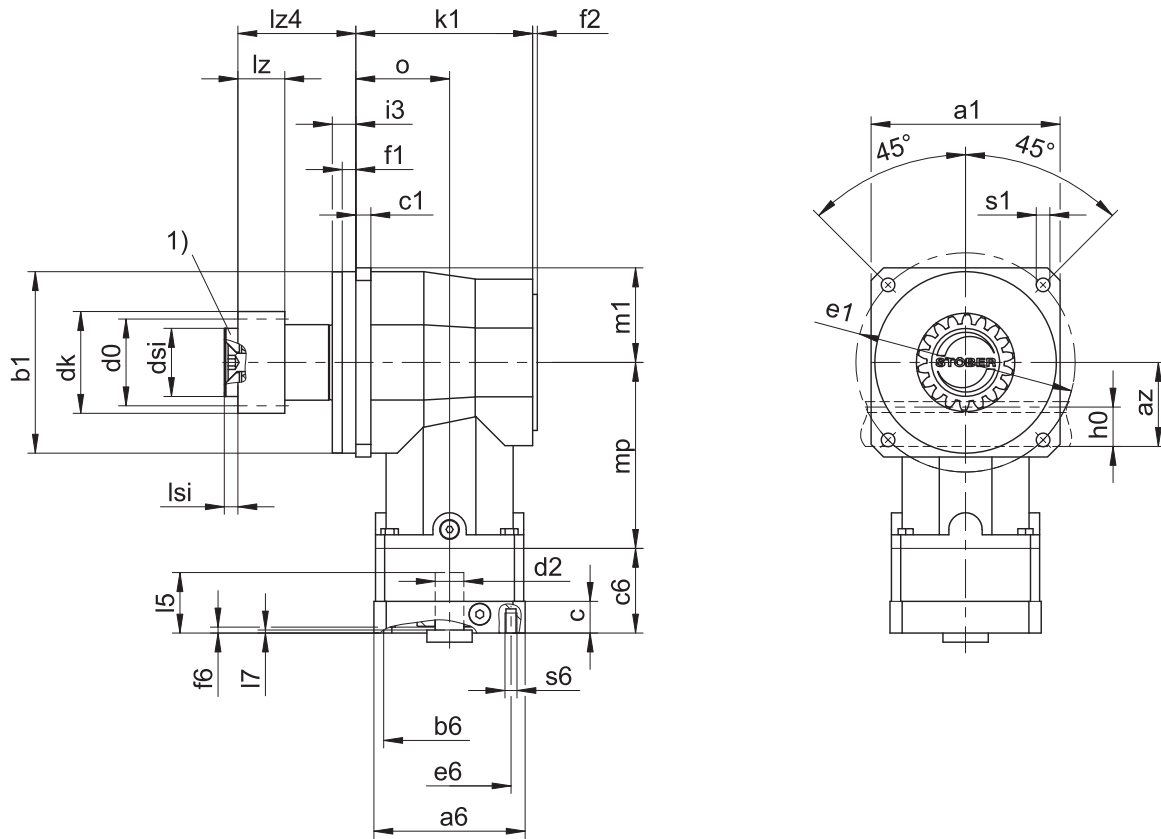
The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

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 <https://configurator.stoeber.de/en-US/>.

### 10.3.1 Pinion position E



1) Axial locking (optional)

#### Output dimensions

Type	mn	a1	az	Øb1	c1	Ød0	Ødk	Ødsi	Øe1	f1	f2	h0	i3	k1	l3	l4	lsi	mp	m1	o	Øs1	x
ZV220SEKS402_	2	101	44.02	95 <sub>h6</sub>	10	42.44	47.90	30	120	8	3	22	14.0	101	26	54.5	6	104.0	50.5	53	6.6	0.4
ZV220SEKS403_	2	101	44.02	95 <sub>h6</sub>	10	42.44	47.90	30	120	8	3	22	14.0	101	26	54.5	6	144.0	50.5	53	6.6	0.4
ZV225SEKS502_	2	125	49.33	120 <sub>h6</sub>	10	53.05	58.52	45	145	9	3	22	15.5	117	26	78.0	8	123.0	62.5	62	9.0	0.4
ZV225SEKS503_	2	125	49.33	120 <sub>h6</sub>	10	53.05	58.52	45	145	9	3	22	15.5	117	26	78.0	8	172.0	62.5	62	9.0	0.4
ZV318SEKS502_	3	125	55.55	120 <sub>h6</sub>	10	57.30	65.01	45	145	9	3	26	15.5	117	31	78.0	8	123.0	62.5	62	9.0	0.3
ZV318SEKS503_	3	125	55.55	120 <sub>h6</sub>	10	57.30	65.01	45	145	9	3	26	15.5	117	31	78.0	8	172.0	62.5	62	9.0	0.3
ZV322SEKS702_	3	155	62.21	150 <sub>h6</sub>	15	70.03	78.35	55	180	10	3	26	20.0	145	31	107.5	10	151.0	77.5	78	11.0	0.4
ZV322SEKS703_	3	155	62.21	150 <sub>h6</sub>	15	70.03	78.35	55	180	10	3	26	20.0	145	31	107.5	10	205.5	77.5	78	11.0	0.4
ZV418SEKS702_	4	155	74.40	150 <sub>h6</sub>	15	76.40	86.77	55	180	10	3	35	20.0	145	41	107.5	10	151.0	77.5	78	11.0	0.3
ZV418SEKS703_	4	155	74.40	150 <sub>h6</sub>	15	76.40	86.77	55	180	10	3	35	20.0	145	41	107.5	10	205.5	77.5	78	11.0	0.3

#### Example dimensions for the motor connection

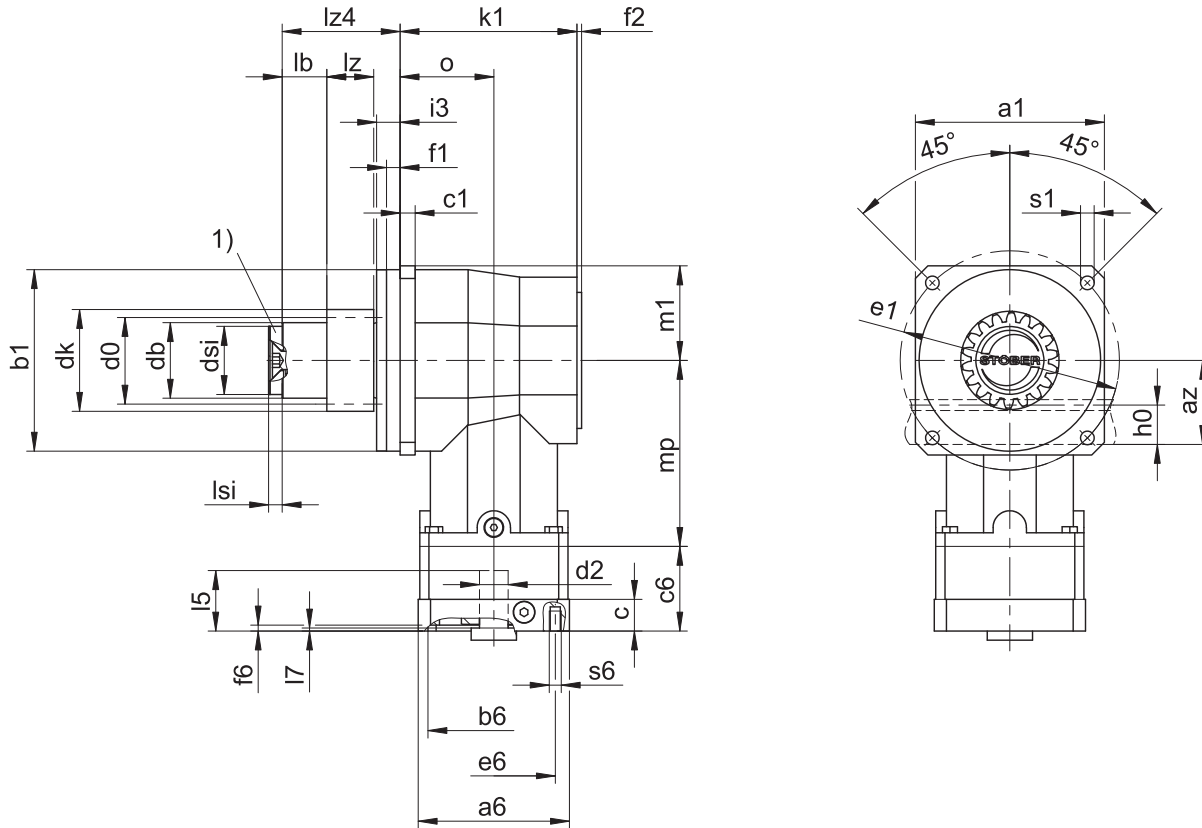
Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	s6
ZV_KS402_ME	60 <sup>H7</sup>	75	19	40	75	18	51.5	3.5	3.0	M5
ZV_KS403_ME	40 <sup>H7</sup>	63	14	30	55	15	32.0	3.5	3.0	M5
ZV_KS502_ME	95 <sup>H7</sup>	115	24	42	100	21	56.0	4.0	3.0	M8
ZV_KS503_ME	60 <sup>H7</sup>	75	19	40	75	18	51.5	3.5	3.0	M5
ZV_KS702_ME	110 <sup>H7</sup>	130	32	50	120	24	67.5	4.0	3.5	M8
ZV_KS703_ME	95 <sup>H7</sup>	115	24	42	100	21	56.0	4.0	3.0	M8

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6 and l5 are also lengthened accordingly.**

You will find additional motor connection dimensions for motor adapters ME and MEL in our STOEGER Configurator at <https://configurator.stoeber.de/en-US/>. 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	a1	az	Øb1	c1	Ød0	Ødb	Ødk	Ødsi	Øe1	f1	f2	h0	i3	k1	lb	lz	lz4	lsi	mp	m1	o	Øs1	x
ZV220SSKS402_	2	101	44.02	95 <sub>h6</sub>	10	42.44	38	47.90	30	120	8	3	22	14.0	101	12.5	26	54.5	6	104.0	50.5	53	6.6	0.4
ZV220SSKS403_	2	101	44.02	95 <sub>h6</sub>	10	42.44	38	47.90	30	120	8	3	22	14.0	101	12.5	26	54.5	6	144.0	50.5	53	6.6	0.4
ZV225SSKS502_	2	125	49.33	120 <sub>h6</sub>	10	53.05	50	58.52	45	145	9	3	22	15.5	117	34.5	26	78.0	8	123.0	62.5	62	9.0	0.4
ZV225SSKS503_	2	125	49.33	120 <sub>h6</sub>	10	53.05	50	58.52	45	145	9	3	22	15.5	117	34.5	26	78.0	8	172.0	62.5	62	9.0	0.4
ZV318SSKS502_	3	125	55.55	120 <sub>h6</sub>	10	57.30	50	65.01	45	145	9	3	26	15.5	117	29.5	31	78.0	8	123.0	62.5	62	9.0	0.3
ZV318SSKS503_	3	125	55.55	120 <sub>h6</sub>	10	57.30	50	65.01	45	145	9	3	26	15.5	117	29.5	31	78.0	8	172.0	62.5	62	9.0	0.3
ZV322SSKS702_	3	155	62.21	150 <sub>h6</sub>	15	70.03	62	78.35	55	180	10	3	26	20.0	145	53.5	31	107.5	10	151.0	77.5	78	11.0	0.4
ZV322SSKS703_	3	155	62.21	150 <sub>h6</sub>	15	70.03	62	78.35	55	180	10	3	26	20.0	145	53.5	31	107.5	10	205.5	77.5	78	11.0	0.4
ZV418SSKS702_	4	155	74.40	150 <sub>h6</sub>	15	76.40	62	86.77	55	180	10	3	35	20.0	145	43.5	41	107.5	10	151.0	77.5	78	11.0	0.3
ZV418SSKS703_	4	155	74.40	150 <sub>h6</sub>	15	76.40	62	86.77	55	180	10	3	35	20.0	145	43.5	41	107.5	10	205.5	77.5	78	11.0	0.3

**Example dimensions for the motor connection**

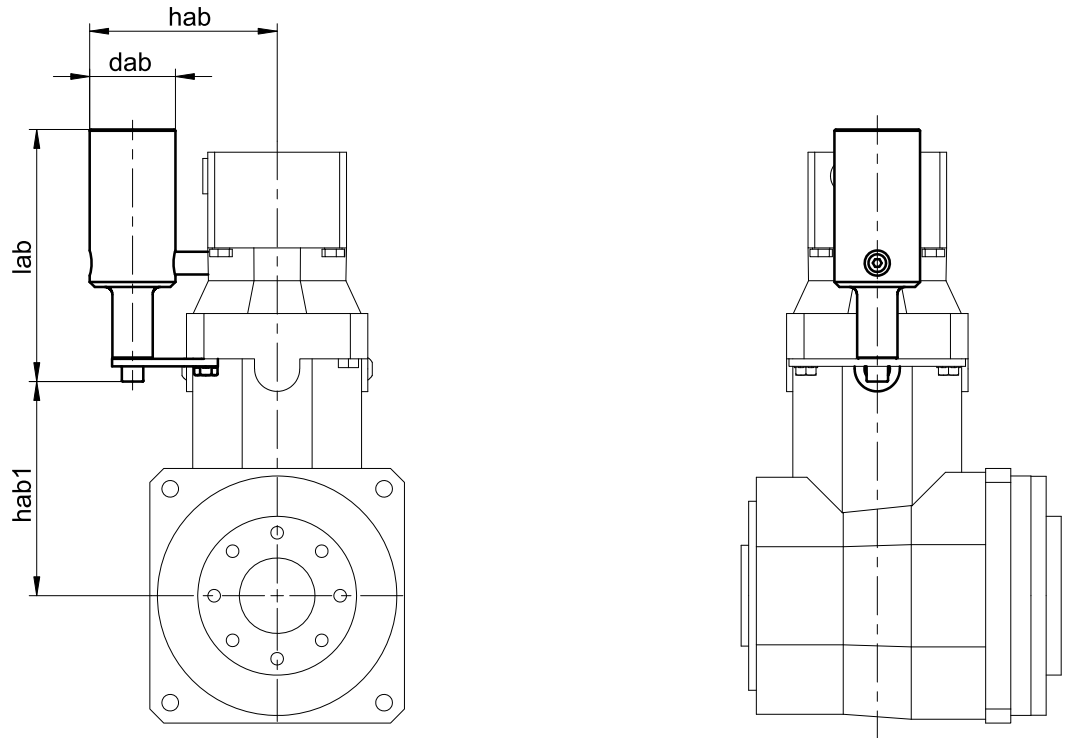
Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	s6
ZV_KS402_ME	60 <sup>H7</sup>	75	19	40	75	18	51.5	3.5	3.0	M5
ZV_KS403_ME	40 <sup>H7</sup>	63	14	30	55	15	32.0	3.5	3.0	M5
ZV_KS502_ME	95 <sup>H7</sup>	115	24	42	100	21	56.0	4.0	3.0	M8
ZV_KS503_ME	60 <sup>H7</sup>	75	19	40	75	18	51.5	3.5	3.0	M5
ZV_KS702_ME	110 <sup>H7</sup>	130	32	50	120	24	67.5	4.0	3.5	M8
ZV_KS703_ME	95 <sup>H7</sup>	115	24	42	100	21	56.0	4.0	3.0	M8

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6 and l5 are also lengthened accordingly.**

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

### 10.3.3 Oil expansion tank



**Dimensions**

Type	dab	lab	hab	hab1
ZV_KS403_	34	100	74.5	85
ZV_KS503_	39	122	92.0	105
ZV_KS703_	49	134	109.5	132

More information can be found in the chapter [▶ 10.6.4](#)

## 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.

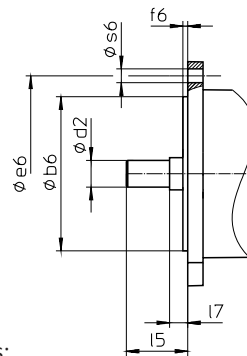
### Example code

Z	V	2	20	S	S	KS	4	0	2	P	F	0080	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
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
F	Housing	Standard
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

To complete the type designation, also specify the following in your order:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at

<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

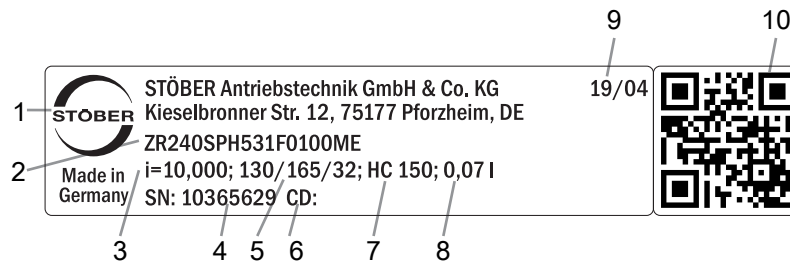
- Mounting position, see the chapter [▶ 10.5.5]
- The position of locking screw access, see the chapter [▶ 10.5.7]
- Radial shaft seal rings at the output, made of NBR or FKM (optional), see the chapter [▶ 10.6.3]
- Attachment of oil expansion tank (optional) on gear unit side 1 or 2 (required without exception for three-stage gear units in mounting position EL5), see the chapter [▶ 10.6.4]
- 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 [▶ 10.5.1].

## 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 Input options

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

ME motor adapter



Catalog ID 443137\_en

EZ synchronous servo motor



Catalog ID 443286\_en

The corresponding catalogs can be found at <http://www.stoeber.de/en/downloads/>

Enter the ID of the catalog in the Search term field.



## 10.5.2 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 clamp coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- 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

## 10.5.3 Gear rack

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 6.

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

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 tothing is flush with the shaft end (Pos. E)
- The tothing is flush with the shaft shoulder (Pos. S: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

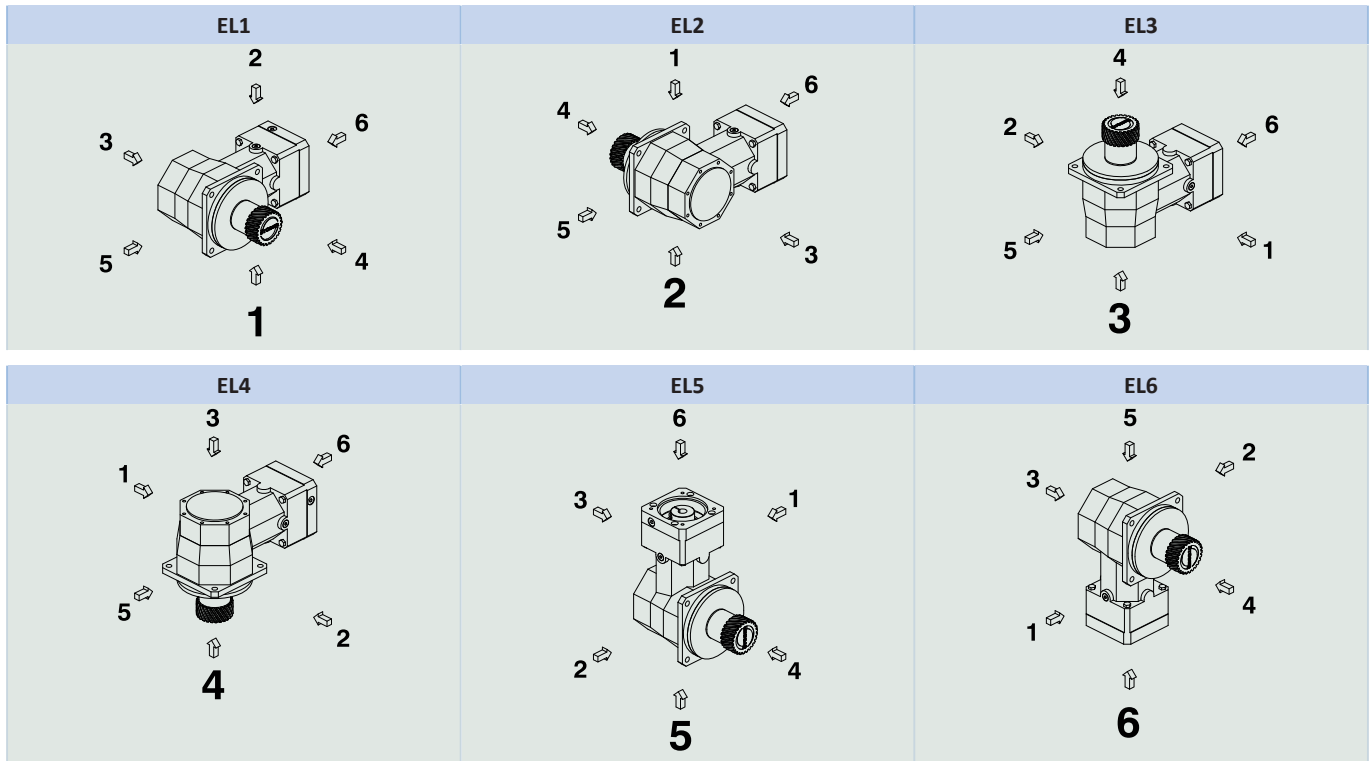
## 10.5.4 Installation conditions

The specified torques and forces only apply when gear units are fastened on the machine side using screws of strength class 10.9. In addition, the gear housings must be adjusted at the pilot. The machine-side fit must be H7.

## 10.5.5 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.

## 10.5.6 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.

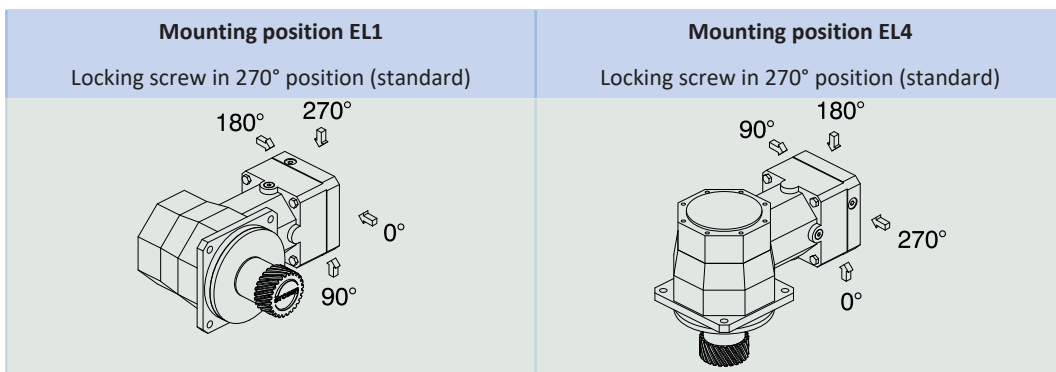
Only install the gear units in the intended mounting position! Reposition the gear units only after consulting STOBER. Otherwise, STOBER assumes no liability for the gear units.

You will receive lubricants for use in the food industry upon request.

### 10.5.6.1 Rack and pinion drive lubrication

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

### 10.5.7 Position of locking screw access



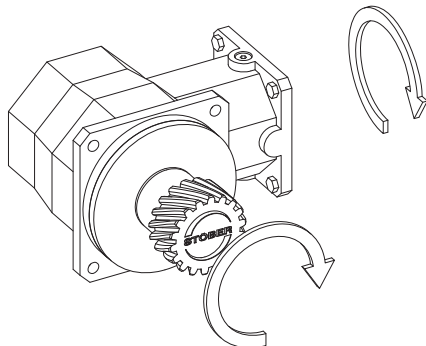
Indicate variations for your gear unit in the order.

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

### 10.5.8 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: <sup>1</sup>	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

### 10.5.9 Direction of rotation



The pictures show mounting position EL1.

## 10.6 Project configuration

Project your drives using our SERVOSOFT designing software. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

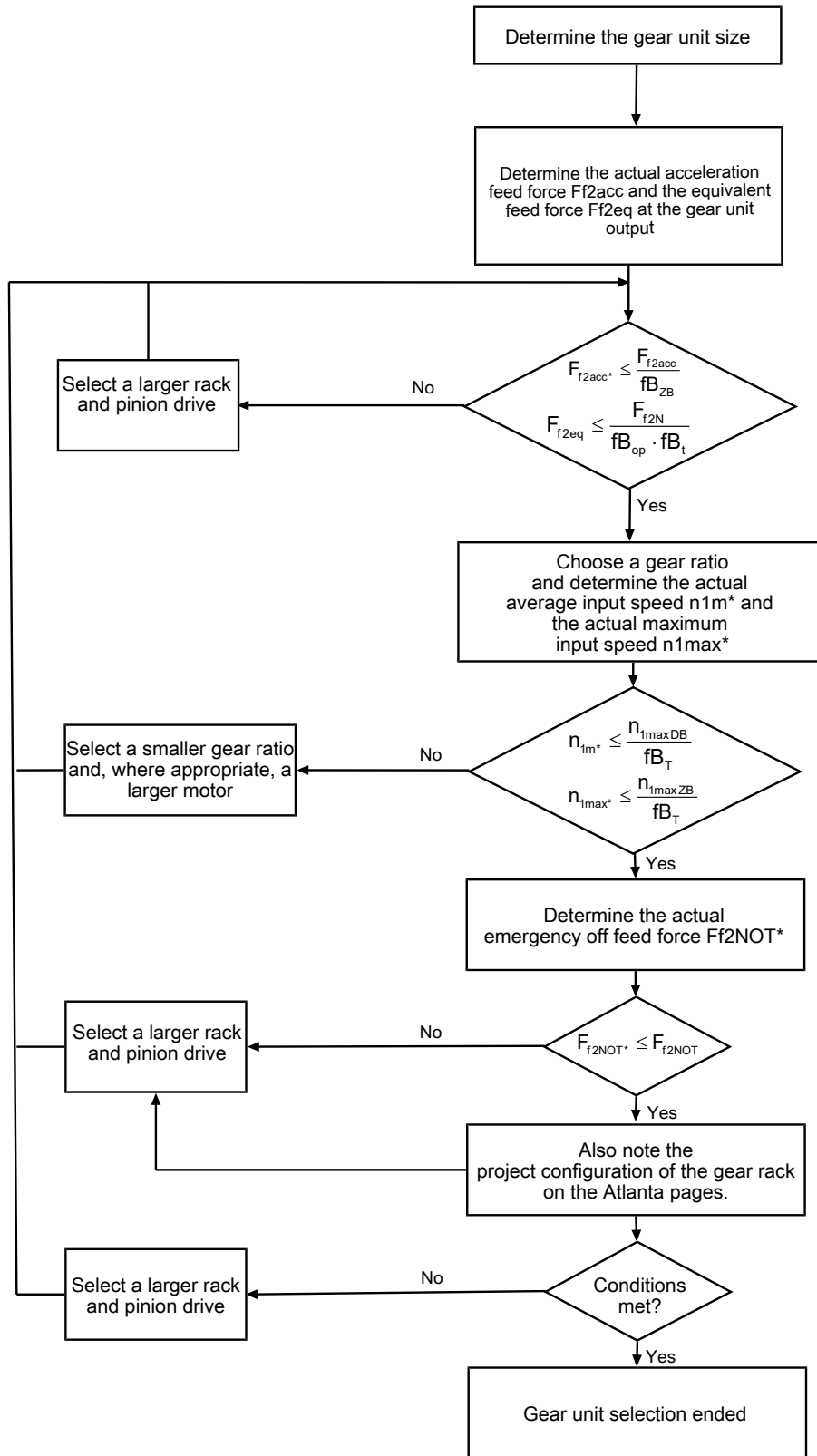
In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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 [▶ 13.1](#).

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

### 10.6.1 Drive selection

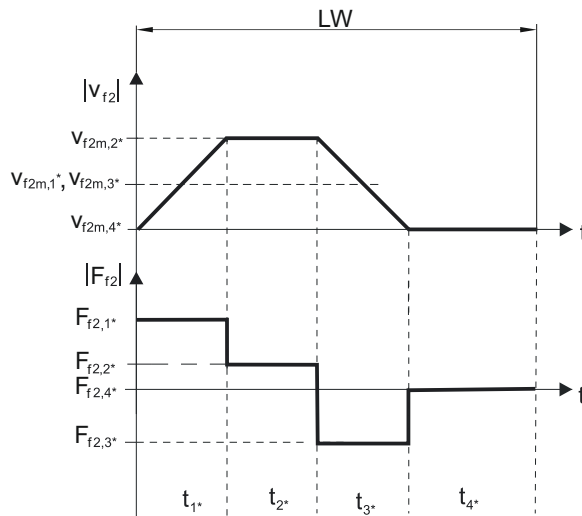


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for  $f_{B_T}$ ,  $f_{B_{op}}$ ,  $f_{B_t}$  and  $f_{B_{ZB}}$  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**

$$n_{fm*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

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**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Operating factors**

<b>Operating mode</b>	<b>fB<sub>op</sub></b>
Uniform continuous operation	1.00
Cyclic operation	1.00
Reversing load cyclic operation	1.00
<b>Run time</b>	<b>fB<sub>t</sub></b>
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
<b>Cyclic operation</b>	<b>fB<sub>ZB</sub></b>
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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**

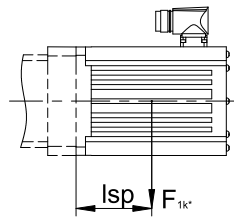
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

### 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:

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



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

The values also apply to the MEL motor adapter.

### 10.6.3 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 in 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 leaks. 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.

## 10.6.4 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 order.
- Note that mounting an oil expansion tank is not possible with every motor adapter (collision between motor adapter and oil expansion tank).

## 10.7 Additional documentation

Additional documentation related to the product can be found at

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

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

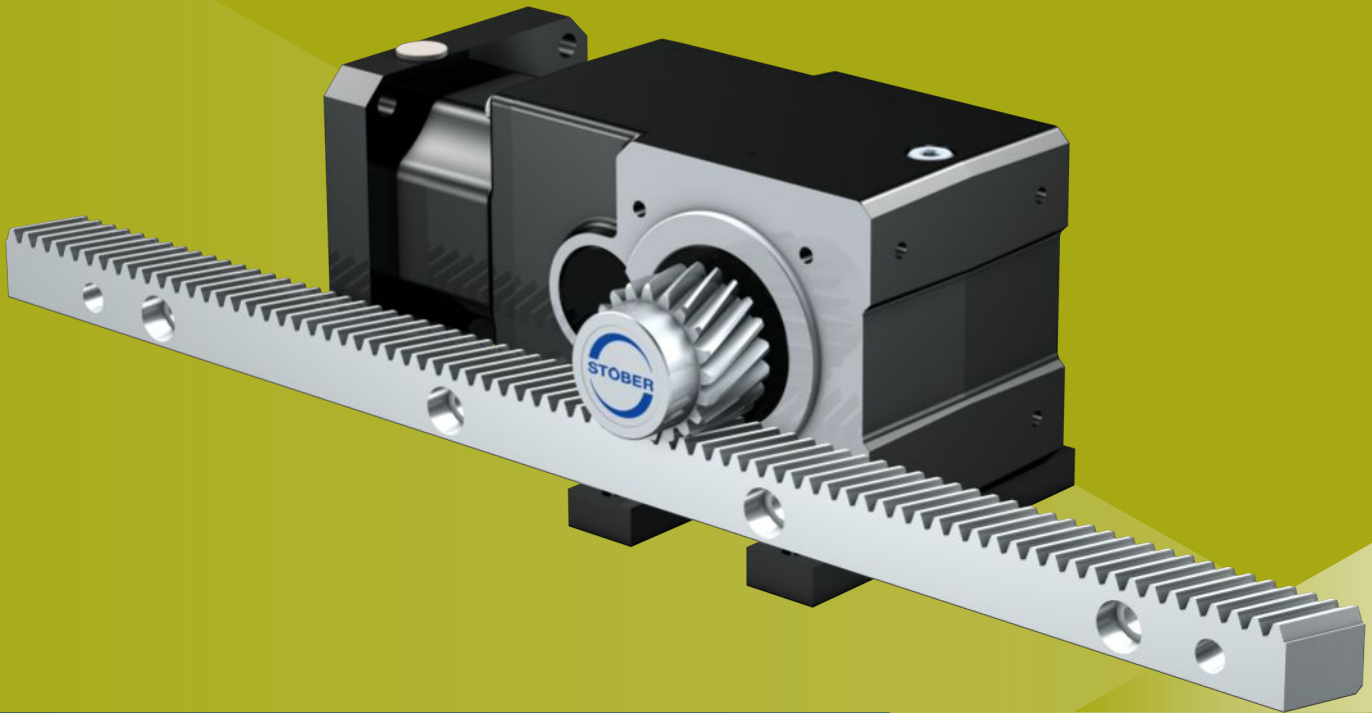
Documentation	ID
Operating manual gear units, geared motors KS	443362_en
Operating manual for gear racks (Atlanta)	442455

# 11 ZVKL rack and pinion drives

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# 11

## Rack and pinion drives

# ZVKL

### 11.1 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 6 (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 – 2.7 kN
$v_{f2maxzB}$	0.33 – 3.3 m/s
$\Delta s$	99 – 123 $\mu\text{m}$

## 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 of the thermal limiting performance
- $C_{fin}$ : Pinion position S

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

i	Type	$n_{1maxDB}$ [rpm]	$n_{1maxZB}$ [rpm]	$d_{MW}$ [mm]	$v_{f2maxZB}$ [m/s]	$\Delta s$ [μm]	$C_{fin}$ [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]
<b>ZV2KL1 (<math>F_{v2acc,max} = 1,5 \text{ kN}</math>)</b>																		
4.000	ZV216S_KL102_0040 MQ	3500	6000	≤16	2.67	123	4.6	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	6000	≤16	1.33	99	5.4	2	16	34.0	1.3	1.3	1.5	1.5	3.1	3.0	26	26
16.00	ZV216S_KL102_0160 MQ	4000	6000	≤16	0.67	99	5.5	2	16	34.0	1.5	1.5	1.5	1.5	3.1	3.0	26	26
32.00	ZV216S_KL102_0320 MQ	4000	6000	≤16	0.33	99	5.4	2	16	34.0	1.5	1.5	1.5	1.5	3.1	3.0	26	26
<b>ZV2KL2 (<math>F_{v2acc,max} = 2,7 \text{ kN}</math>)</b>																		
4.000	ZV220S_KL202_0040 MQ	3500	6000	≤19	3.33	123	7.5	2	20	42.4	1.5	1.4	2.3	2.3	3.9	3.9	50	50
8.000	ZV220S_KL202_0080 MQ	3500	6000	≤19	1.67	99	10	2	20	42.4	1.9	1.8	2.7	2.5	5.4	5.0	57	53
16.00	ZV220S_KL202_0160 MQ	4000	6000	≤19	0.83	99	11	2	20	42.4	2.4	2.2	2.7	2.5	5.4	5.0	57	53
32.00	ZV220S_KL202_0320 MQ	4000	6000	≤19	0.42	99	9.9	2	20	42.4	2.4	2.4	2.7	2.5	5.4	5.0	57	53

## 11.3 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:  $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

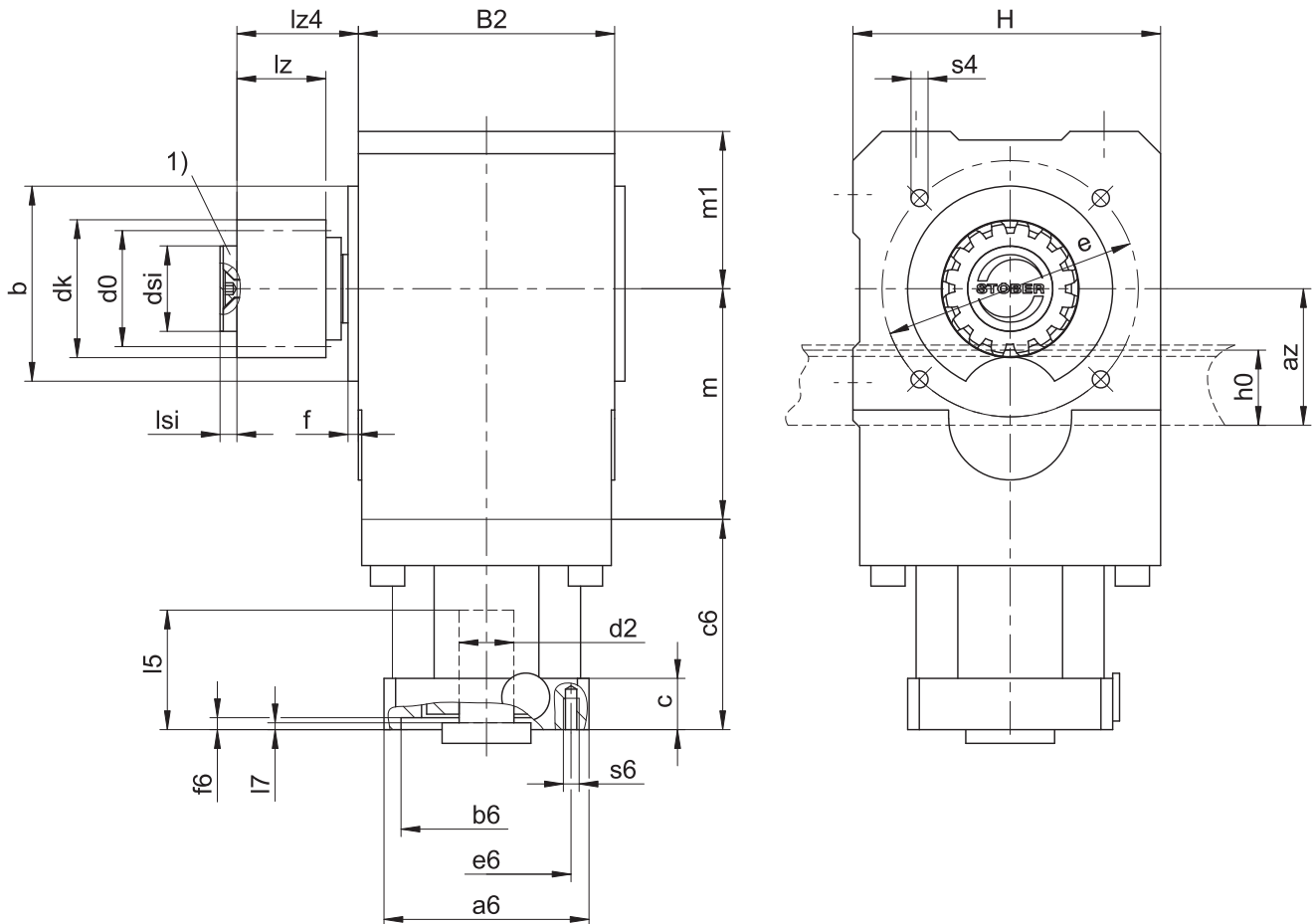
The pinion of the rack and pinion drive is helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

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 <https://configurator.stoeber.de/en-US/>.

### 11.3.1 Pinion position E



1) Axial locking (optional)

#### Output dimensions

Type	mn	az	$\varnothing b$	B2	$\varnothing d_0$	$\varnothing dk$	$\varnothing dsi$	$\varnothing e$	f	$h_0$	H	$l_z$	$l_{z4}$	$l_{si}$	m	$m_1$	$s_4$	x
ZV216SEKL1_	2	39.98	$60_{\frac{p}{6}}$	75	33.95	39.81	25	75	3	22	90	26	35.5	5	67.5	46	M6	0.5
ZV220SEKL2_	2	44.02	$75_{\frac{p}{6}}$	92	42.44	47.90	30	90	3	22	108	26	44.5	7	88.5	55	M6	0.4

#### Example dimensions for the motor connection

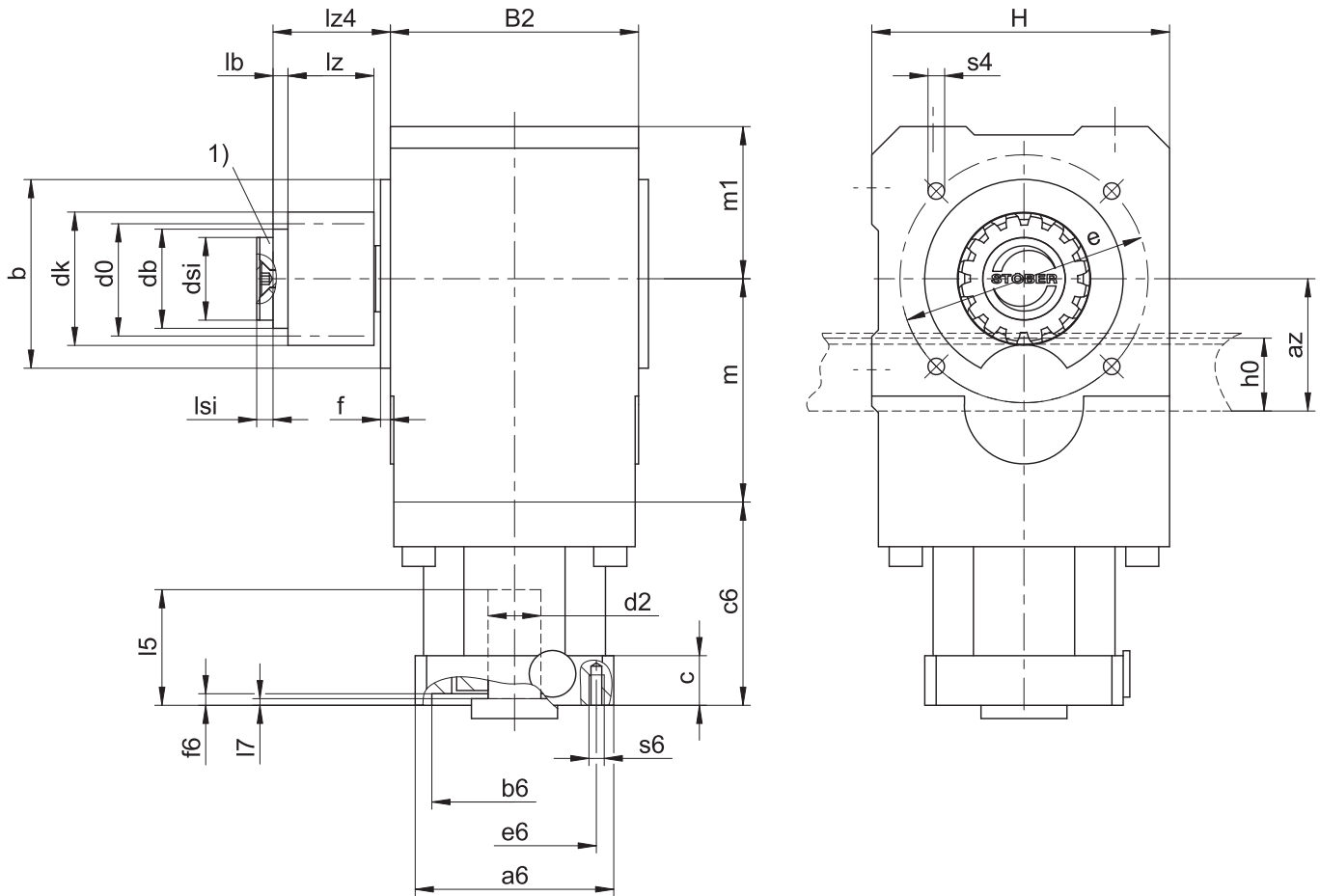
Type	$\varnothing b_6$	$\varnothing e_6$	$\varnothing d_{2max}$	$l_5$	$\square a_6$	c	$c_6$	$f_6$	$l_7$	$s_6$
ZV2_KL102_MQ	$40^{H7}$	63	16	30	55	15	61.5	3.5	3	M5
ZV2_KL202_MQ	$60^{H7}$	75	19	40	75	18	69.5	3.5	3	M5

In the table above, you will find example dimensions for the motor connection for the MQ motor adapter.

**Note that when dimension c is lengthened, dimensions  $c_6$  and  $l_5$  are lengthened accordingly.**

You will find additional motor connection dimensions for the MQ motor adapter in our STOEGER Configurator at <https://configurator.stoeber.de/en-US/>. 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	az	Øb	B2	Ød0	Ødb	Ødk	Ødsi	Øe	f	h0	H	lb	lz	lz4	lsi	m	m1	s4	x
ZV216SSKL1_	2	39.98	60 <sub>js</sub>	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 <sub>js</sub>	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

Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	s6
ZV2_KL102_MQ	40 <sup>H7</sup>	63	16	30	55	15	61.5	3.5	3	M5
ZV2_KL202_MQ	60 <sup>H7</sup>	75	19	40	75	18	69.5	3.5	3	M5

In the table above, you will find example dimensions for the motor connection for the MQ motor adapter.

**Note that when dimension c is lengthened, dimensions c6 and l5 are lengthened accordingly.**

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

## 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.

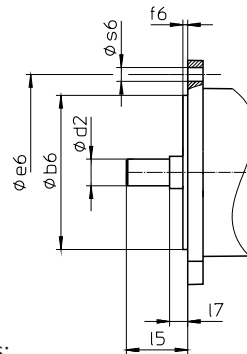
### Example code

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

To complete the type designation, also specify the following in your order:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at

<https://configurator.stoeber.de/en-US/> 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 [▶ 11.5.7](#)
- For axial locking (optional), see the chapter [▶ 11.3](#)

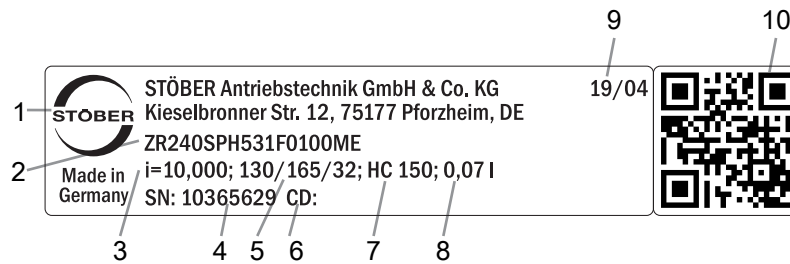
An explanation of the gear unit sides can be found in the chapter [▶ 11.5.5](#)

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 [▶ 11.5.1](#).

## 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 Input options

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

MQ motor adapter



Catalog ID 443137\_en

EZ synchronous servo motor



Catalog ID 443286\_en

LM Lean motor



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

## 11.5.2 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 (jaw 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 selection of motor shaft diameters and lengths
- Error-free, thanks to exact centering of the motor

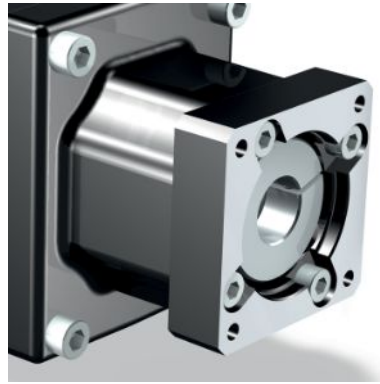


Fig. 1: Backlash-free plug-in coupling

## 11.5.3 Gear rack

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 6.

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

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:

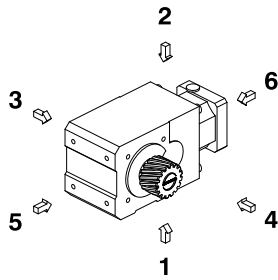
- The toothing is flush with the shaft end (Pos. E)
- The toothing is flush with the shaft shoulder (Pos. S: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

## 11.5.4 Installation conditions

The specified torques and forces only apply when gear units are fastened on the machine side using screws of strength class 10.9. In addition, the gear housings must be adjusted at the pilot. The machine-side fit must be H7.

### 11.5.5 Gear unit sides



The numbers identify the gear unit sides.

### 11.5.6 Lubricants

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

You will receive lubricants for use in the food industry upon request.

#### 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

Mounting position EL1	Mounting position EL4
Locking screw in 270° position (standard)	Locking screw in 270° position (standard)

Indicate variations for your gear unit in the order.

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

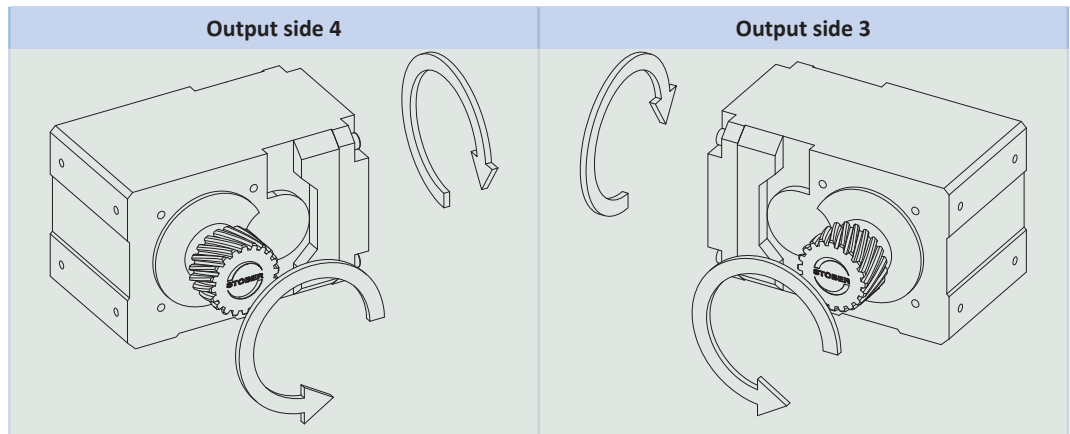
### 11.5.8 Other product features

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

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



## 11.5.9 Direction of rotation



The pictures show mounting position EL1.

## 11.6 Project configuration

Project your drives using our SERVOSOFT designing software. Download SERVOSOFT for free at <https://www.stoeber.de/en/ServoSoft>.

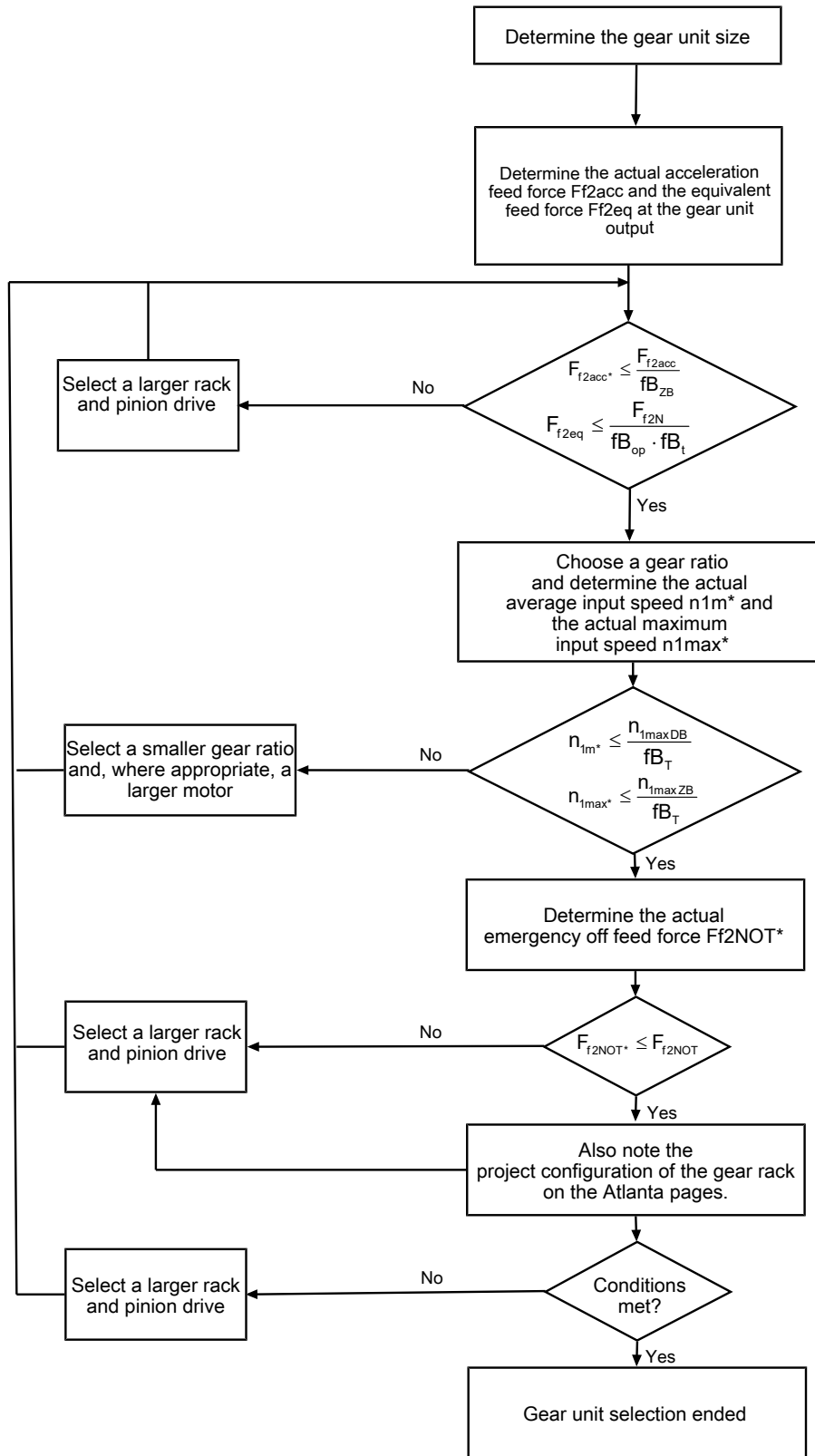
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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 [▶ 13.1](#).

### 11.6.1 Drive selection

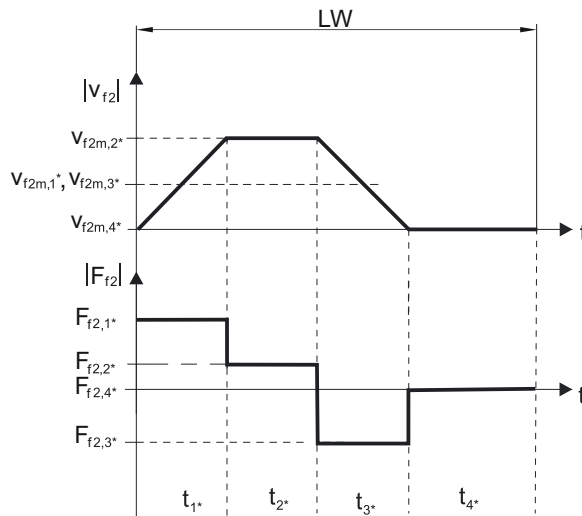


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for  $fb_T$ ,  $fb_{op}$ ,  $fb_t$  and  $fb_{ZB}$  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**

$$n_{fm*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m*} = \frac{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}{t_{1*} + \dots + t_{n*}}$$

If  $t_{1*} + \dots + t_{3*} \geq 6$  min, determine  $v_{2m*}$  without the rest phase  $t_{4*}$ .

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**

$$F_{f2eq*} = \sqrt[3]{\frac{|v_{f2m,1*}| \cdot t_{1*} \cdot |F_{f2,1*}|^3 + \dots + |v_{f2m,n*}| \cdot t_{n*} \cdot |F_{f2,n*}|^3}{|v_{f2m,1*}| \cdot t_{1*} + \dots + |v_{f2m,n*}| \cdot t_{n*}}}$$

**Operating factors**

<b>Operating mode</b>	<b>fB<sub>op</sub></b>
Uniform continuous operation	1.00
Cyclic operation	1.25
Reversing load cyclic operation	1.40
<b>Run time</b>	<b>fB<sub>t</sub></b>
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
<b>Cyclic operation</b>	<b>fB<sub>ZB</sub></b>
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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**

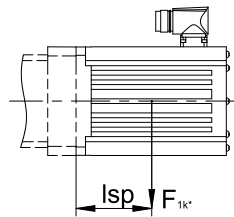
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

## 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 STOEBER gear unit. You can find information for how to do that in this chapter.

Calculate the actual breakdown torque as follows:

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



Type	$M_{1k}$ [Nm]
KL1_MQ	15
KL2_MQ	20

## 11.7 Additional documentation

Additional documentation related to the product can be found at

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

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

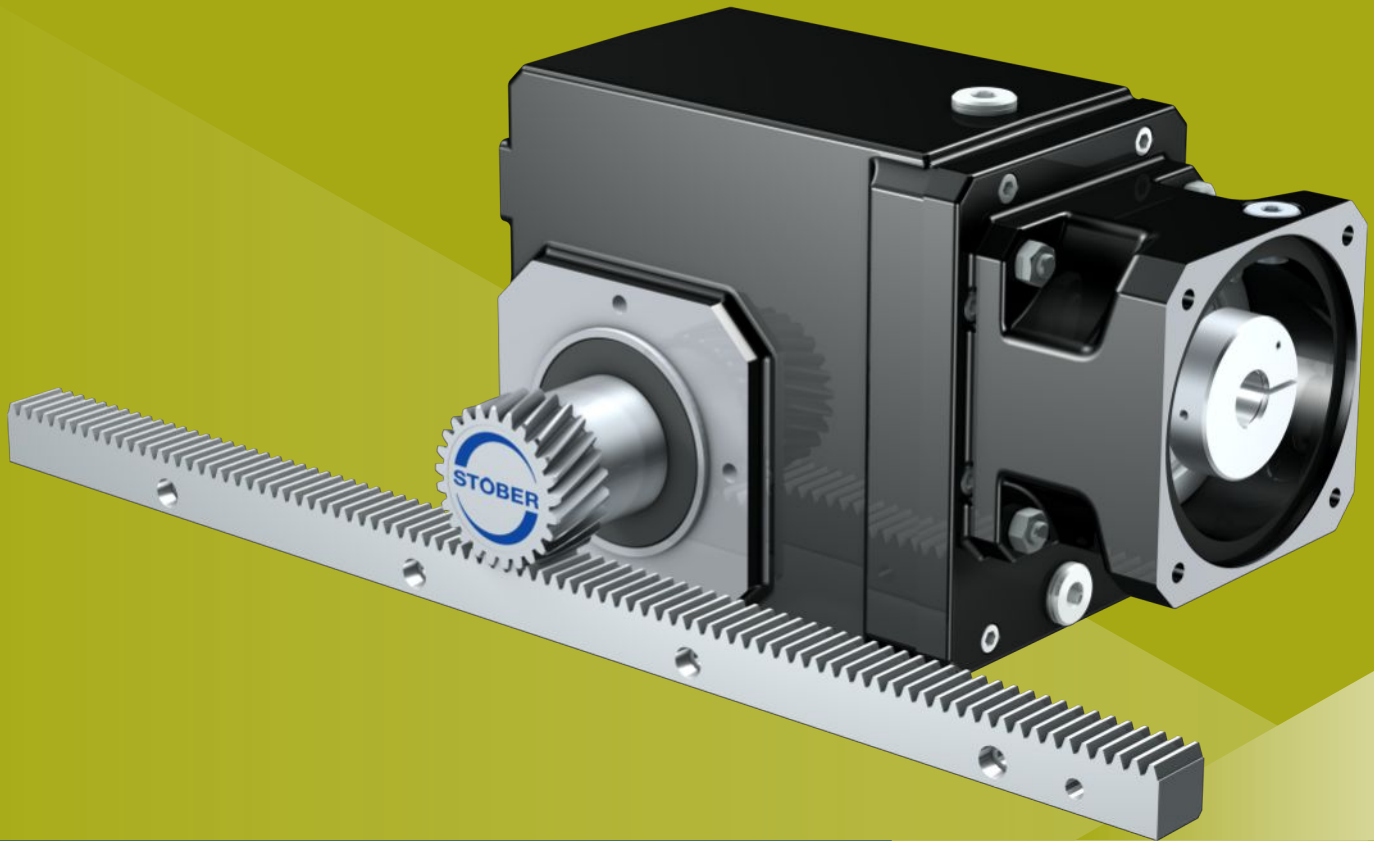
Documentation	ID
Operating manual gear units, geared motors KL	443363_en
Operating manual for gear racks (Atlanta)	442455



# 12 ZVK rack and pinion drives

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# 12

## Rack and pinion drives

# ZVK

### 12.1 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 6 (DIN 3962) ✓
- Helical gearing ✓
- Case-hardened and smoothed ✓

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

#### Technical data

$m_n$	2 – 4 mm
$z$	18 – 25
$F_{f2acc}$	2.7 – 15 kN
$v_{f2maxZB}$	0.06 – 3.8 m/s
$\Delta s$	12 – 111 $\mu\text{m}$

## 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 [▶ 12.5.4](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration of the thermal limiting performance
- C<sub>lin</sub>: Pinion position S

For all other technical data, refer to <https://configurator.stoeber.de/en-US/>.

An explanation of the formula symbols can be found in the chapter [▶ 13.1](#).

i	Type	n <sub>1maxDB</sub>		n <sub>1maxZV</sub>	d <sub>MW</sub>	v <sub>f2maxZB</sub>	Δs	Δs <sub>redII</sub>	Δs <sub>redI</sub>	C <sub>lin</sub>	m <sub>n</sub>	z	d <sub>0</sub>	F <sub>f2N,S</sub>	F <sub>f2N,E</sub>	F <sub>f2accS</sub>	F <sub>f2accE</sub>	F <sub>f2NOT,S</sub>	F <sub>f2NOT,E</sub>	M <sub>2accS</sub>	M <sub>2accE</sub>
		EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	[mm]	[m/s]	[μm]	[μm]	[μm]	[N/ μm]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]	[Nm]
<b>ZV2K1 (F<sub>v2acc,max</sub> = 4,9 kN)</b>																					
4.000	ZV220S_K102_0040 ME10	3300	2800	5000	≤19	2.78	74	37	–	17	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	5000	≤24	2.78	74	37	–	17	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	5000	≤19	2.00	74	37	–	17	2	20	42.4	3.4	3.2	4.9	3.2	7.6	6.4	105	68
5.568	ZV220S_K102_0056 ME20	3300	2800	5000	≤24	2.00	74	37	–	17	2	20	42.4	3.4	3.2	4.9	3.2	7.6	6.4	105	68
6.000	ZV220S_K102_0060 ME10	3300	2800	5000	≤19	1.85	74	37	–	17	2	20	42.4	3.5	3.2	4.9	3.2	8.2	6.4	105	68
6.000	ZV220S_K102_0060 ME20	3300	2800	5000	≤24	1.85	74	37	–	17	2	20	42.4	3.5	3.2	4.9	3.2	8.2	6.4	105	68
6.644	ZV220S_K102_0066 ME10	3600	3300	5500	≤19	1.84	74	37	–	17	2	20	42.4	3.6	3.2	4.9	3.2	9.1	6.4	105	68
6.644	ZV220S_K102_0066 ME20	3600	3300	5500	≤24	1.84	74	37	–	17	2	20	42.4	3.6	3.2	4.9	3.2	9.1	6.4	105	68
8.309	ZV220S_K102_0083 ME10	3600	3300	5500	≤19	1.47	74	37	–	17	2	20	42.4	3.9	3.2	4.9	3.2	9.9	6.4	105	68
8.309	ZV220S_K102_0083 ME20	3600	3300	5500	≤24	1.47	74	37	–	17	2	20	42.4	3.9	3.2	4.9	3.2	9.9	6.4	105	68
9.249	ZV220S_K102_0092 ME10	3600	3300	5500	≤19	1.32	74	37	–	17	2	20	42.4	4.1	3.2	4.9	3.2	9.9	6.4	105	68
9.249	ZV220S_K102_0092 ME20	3600	3300	5500	≤24	1.32	74	37	–	17	2	20	42.4	4.1	3.2	4.9	3.2	9.9	6.4	105	68
10.14	ZV220S_K102_0100 ME10	4000	3800	6000	≤19	1.32	74	37	–	17	2	20	42.4	4.2	3.2	4.9	3.2	9.9	6.4	105	68
10.14	ZV220S_K102_0100 ME20	3700	3700	6000	≤24	1.32	74	37	–	17	2	20	42.4	4.2	3.2	4.9	3.2	9.9	6.4	105	68
11.57	ZV220S_K102_0115 ME10	3600	3300	5500	≤19	1.06	74	37	–	17	2	20	42.4	4.4	3.2	4.9	3.2	9.9	6.4	105	68
11.57	ZV220S_K102_0115 ME20	3600	3300	5500	≤24	1.06	74	37	–	17	2	20	42.4	4.4	3.2	4.9	3.2	9.9	6.4	105	68
12.62	ZV220S_K102_0125 ME10	4000	3800	6000	≤19	1.06	74	37	–	17	2	20	42.4	4.5	3.2	4.9	3.2	9.9	6.4	105	68
12.62	ZV220S_K102_0125 ME20	3700	3700	6000	≤24	1.06	74	37	–	17	2	20	42.4	4.5	3.2	4.9	3.2	9.9	6.4	105	68
14.11	ZV220S_K102_0140 ME10	4000	3800	6000	≤19	0.95	74	37	–	17	2	20	42.4	4.7	3.2	4.9	3.2	9.9	6.4	105	68
14.11	ZV220S_K102_0140 ME20	3700	3700	6000	≤24	0.95	74	37	–	17	2	20	42.4	4.7	3.2	4.9	3.2	9.9	6.4	105	68
16.71	ZV220S_K102_0165 ME10	4000	4000	7000	≤19	0.93	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
16.71	ZV220S_K102_0165 ME20	3700	3700	6000	≤24	0.80	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
17.56	ZV220S_K102_0175 ME10	4000	3800	6000	≤19	0.76	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
17.56	ZV220S_K102_0175 ME20	3700	3700	6000	≤24	0.76	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
20.15	ZV220S_K102_0200 ME10	4000	4000	7000	≤19	0.77	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
20.15	ZV220S_K102_0200 ME20	3700	3700	6000	≤24	0.66	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
23.27	ZV220S_K102_0230 ME10	4000	4000	7000	≤19	0.67	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
23.27	ZV220S_K102_0230 ME20	3700	3700	6000	≤24	0.57	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
25.22	ZV220S_K102_0250 ME10	4000	4000	7000	≤19	0.62	74	37	–	17	2	20	42.4	4.5	3.2	4.9	3.2	9.1	6.4	105	68
25.22	ZV220S_K102_0250 ME20	3700	3700	6000	≤24	0.53	74	37	–	17	2	20	42.4	4.5	3.2	4.9	3.2	9.1	6.4	105	68
28.05	ZV220S_K102_0280 ME10	4000	4000	7000	≤19	0.56	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
28.05	ZV220S_K102_0280 ME20	3700	3700	6000	≤24	0.48	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
33.71	ZV220S_K102_0340 ME10	4000	4000	7000	≤19	0.46	74	37	–	17	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	7000	≤19	0.44	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
35.11	ZV220S_K102_0350 ME20	3700	3700	6000	≤24	0.38	74	37	–	17	2	20	42.4	4.9	3.2	4.9	3.2	9.9	6.4	105	68
40.30	ZV220S_K102_0400 ME10	4000	4000	7000	≤19	0.39	74	37	–	17	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	7000	≤19	0.33	74	37	–	17	2	20	42.4	4.8	3.2	4.9	3.2	9.6	6.4	105	68
50.31	ZV220S_K102_0500 ME10	4000	4000	7000	≤19	0.31	74	37	–	17	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	7000	≤19	0.28	74	37	–	17	2	20	42.4	4.0	3.2	4.8	3.2	8.1	6.4	103	68
70.03	ZV220S_K102_0700 ME10	4000	4000	7000	≤19	0.22	74	37	–	17	2	20	42.4	3.3	3.2	3.9	3.2	6.6	6.4	83	68
<b>ZV2K2 (F<sub>v2acc,max</sub> = 8,3 kN)</b>																					
4.000	ZV225S_K202_0040 ME20	3000	2600	4500	≤32	3.13	77	39	12	23	2	25	53.1	4.4	4.4	6.6	5.2	11	10	174	138
4.000	ZV225S_K202_0040 ME30	3000	2600	4500	≤38	3.13	77	39	12	23	2	25	53.1	4.4	4.4	6.6	5.2	11	10	174	138
4.364	ZV225S_K202_0044 ME10	3000	2600	4500	≤19	2.86	77	39	12	23	2	25	53.1	3.8	3.8	3.8	3.8	4.8	4.8	102	102
4.364	ZV225S_K202_0044 ME20	3000	2600	4500	≤32	2.86	77	39	12	23	2	25	53.1	4.5	4.5	6.8	5.2	12	10	180	138
4.364	ZV225S_K202_0044 ME30	3000	2600	4500	≤38	2.86	77	39	12	24	2	25	53.1	4.5	4.5	6.8	5.2	12	10	180	138
5.177	ZV225S_K202_0052 ME20	3000	2600	4500	≤32	2.41	77	39	12	23	2	25	53.1	4.8	4.8	7.2	5.2	14	10	190	138
5.177	ZV225S_K202_0052 ME30	3000	2600	4500	≤38	2.41	77	39	12	24	2	25	53.1	4.8	4.8	7.2	5.2	14	10	190	138



12.2 Selection tables 12 ZVK rack and pinion drives

i	Type	n <sub>1maxDB</sub>		n <sub>1maxZV</sub>	d <sub>MW</sub>	v <sub>ZmaxZB</sub>	Δs	Δs <sub>redII</sub>	Δs <sub>redI</sub>	C <sub>lin</sub>	m <sub>n</sub>	z	d <sub>0</sub>	F <sub>ZN,S</sub>	F <sub>ZN,E</sub>	F <sub>ZaccS</sub>	F <sub>ZaccE</sub>	F <sub>ZNOT,S</sub>	F <sub>ZNOT,E</sub>	M <sub>2accS</sub>	M <sub>2accE</sub>
		EL1,2 [rpm]	EL3,4,5,6 [rpm]																		
<b>ZV2K2 (F<sub>v2acc,max</sub> = 8,3 kN)</b>																					
6.000	ZV225S_K202_0060 ME10	3000	2600	4500	≤19	2.08	77	39	12	23	2	25	53.1	5.0	5.0	5.3	5.2	6.6	6.6	140	138
6.000	ZV225S_K202_0060 ME20	3000	2600	4500	≤32	2.08	77	39	12	24	2	25	53.1	5.0	5.0	7.5	5.2	15	10	200	138
6.000	ZV225S_K202_0060 ME30	3000	2600	4500	≤38	2.08	77	39	12	24	2	25	53.1	5.0	5.0	7.5	5.2	15	10	200	138
6.683	ZV225S_K202_0067 ME10	3500	3100	5000	≤19	2.08	77	39	12	23	2	25	53.1	5.1	5.1	5.9	5.2	7.3	7.3	156	138
6.683	ZV225S_K202_0067 ME20	3500	3100	5000	≤32	2.08	77	39	12	24	2	25	53.1	5.2	5.2	7.8	5.2	15	10	207	138
6.683	ZV225S_K202_0067 ME30	3500	3100	5000	≤38	2.08	77	39	12	24	2	25	53.1	5.2	5.2	7.8	5.2	15	10	207	138
7.118	ZV225S_K202_0071 ME20	3000	2600	4500	≤32	1.76	77	39	12	24	2	25	53.1	5.3	5.2	8.0	5.2	15	10	211	138
7.118	ZV225S_K202_0071 ME30	3000	2600	4500	≤38	1.76	77	39	12	24	2	25	53.1	5.3	5.2	8.0	5.2	15	10	211	138
8.397	ZV225S_K202_0084 ME10	3500	3100	5000	≤19	1.65	77	39	12	23	2	25	53.1	5.6	5.2	7.4	5.2	9.2	9.2	196	138
8.397	ZV225S_K202_0084 ME20	3500	3100	5000	≤32	1.65	77	39	12	24	2	25	53.1	5.6	5.2	8.3	5.2	15	10	220	138
8.397	ZV225S_K202_0084 ME30	3500	3100	5000	≤38	1.65	77	39	12	24	2	25	53.1	5.6	5.2	8.3	5.2	15	10	220	138
9.190	ZV225S_K202_0092 ME10	3500	3100	5000	≤19	1.51	77	39	12	23	2	25	53.1	5.8	5.2	8.1	5.2	10	10	214	138
9.190	ZV225S_K202_0092 ME20	3500	3100	5000	≤32	1.51	77	39	12	24	2	25	53.1	5.8	5.2	8.3	5.2	15	10	220	138
9.190	ZV225S_K202_0092 ME30	3500	3100	5000	≤38	1.51	77	39	12	24	2	25	53.1	5.8	5.2	8.3	5.2	15	10	220	138
10.07	ZV225S_K202_0100 ME10	3900	3500	5500	≤19	1.52	77	39	12	23	2	25	53.1	5.9	5.2	8.3	5.2	11	10	220	138
10.07	ZV225S_K202_0100 ME20	3700	3500	5500	≤32	1.52	77	39	12	24	2	25	53.1	6.0	5.2	8.3	5.2	15	10	220	138
10.07	ZV225S_K202_0100 ME30	3500	3500	5000	≤38	1.38	77	39	12	24	2	25	53.1	6.0	5.2	8.3	5.2	15	10	220	138
11.55	ZV225S_K202_0115 ME10	3500	3100	5000	≤19	1.20	77	39	12	23	2	25	53.1	6.2	5.2	8.3	5.2	13	10	220	138
11.55	ZV225S_K202_0115 ME20	3500	3100	5000	≤32	1.20	77	39	12	24	2	25	53.1	6.2	5.2	8.3	5.2	15	10	220	138
11.55	ZV225S_K202_0115 ME30	3500	3100	5000	≤38	1.20	77	39	12	24	2	25	53.1	6.2	5.2	8.3	5.2	15	10	220	138
12.71	ZV225S_K202_0125 ME10	3900	3500	5500	≤19	1.20	77	39	12	24	2	25	53.1	6.3	5.2	8.3	5.2	14	10	220	138
12.71	ZV225S_K202_0125 ME20	3700	3500	5500	≤32	1.20	77	39	12	24	2	25	53.1	6.4	5.2	8.3	5.2	15	10	220	138
12.71	ZV225S_K202_0125 ME30	3500	3500	5000	≤38	1.09	77	39	12	24	2	25	53.1	6.4	5.2	8.3	5.2	15	10	220	138
13.85	ZV225S_K202_0140 ME10	3900	3500	5500	≤19	1.10	77	39	12	24	2	25	53.1	6.6	5.2	8.3	5.2	15	10	220	138
13.85	ZV225S_K202_0140 ME20	3700	3500	5500	≤32	1.10	77	39	12	24	2	25	53.1	6.6	5.2	8.3	5.2	15	10	220	138
13.85	ZV225S_K202_0140 ME30	3500	3500	5000	≤38	1.00	77	39	12	24	2	25	53.1	6.6	5.2	8.3	5.2	15	10	220	138
16.86	ZV225S_K202_0170 ME10	4000	3900	6500	≤19	1.07	77	39	12	24	2	25	53.1	6.7	5.2	8.3	5.2	15	10	220	138
16.86	ZV225S_K202_0170 ME20	3700	3700	6000	≤32	0.99	77	39	12	24	2	25	53.1	7.1	5.2	8.3	5.2	15	10	220	138
16.86	ZV225S_K202_0170 ME30	3500	3500	5000	≤38	0.82	77	39	12	24	2	25	53.1	7.1	5.2	8.3	5.2	15	10	220	138
17.47	ZV225S_K202_0175 ME10	3900	3500	5500	≤19	0.88	77	39	12	24	2	25	53.1	7.2	5.2	8.3	5.2	15	10	220	138
17.47	ZV225S_K202_0175 ME20	3700	3500	5500	≤32	0.88	77	39	12	24	2	25	53.1	7.2	5.2	8.3	5.2	15	10	220	138
17.47	ZV225S_K202_0175 ME30	3500	3500	5000	≤38	0.80	77	39	12	24	2	25	53.1	7.2	5.2	8.3	5.2	15	10	220	138
20.33	ZV225S_K202_0200 ME10	4000	3900	6500	≤19	0.89	77	39	12	24	2	25	53.1	6.9	5.2	8.3	5.2	15	10	220	138
20.33	ZV225S_K202_0200 ME20	3700	3700	6000	≤24	0.82	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
23.18	ZV225S_K202_0230 ME10	4000	3900	6500	≤19	0.78	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
23.18	ZV225S_K202_0230 ME20	3700	3700	6000	≤32	0.72	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
23.18	ZV225S_K202_0230 ME30	3500	3500	5000	≤38	0.60	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
25.13	ZV225S_K202_0250 ME10	4000	3900	6500	≤19	0.72	77	39	12	24	2	25	53.1	7.1	5.2	8.3	5.2	15	10	220	138
25.13	ZV225S_K202_0250 ME20	3700	3700	6000	≤24	0.66	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
27.95	ZV225S_K202_0280 ME10	4000	3900	6500	≤19	0.65	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
27.95	ZV225S_K202_0280 ME20	3700	3700	6000	≤24	0.60	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
33.62	ZV225S_K202_0340 ME10	4000	3900	6500	≤19	0.54	77	39	12	24	2	25	53.1	5.8	5.2	7.0	5.2	12	10	185	138
33.62	ZV225S_K202_0340 ME20	3700	3700	6000	≤24	0.50	77	39	12	24	2	25	53.1	5.8	5.2	7.0	5.2	12	10	185	138
34.55	ZV225S_K202_0350 ME10	4000	3900	6500	≤19	0.52	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
34.55	ZV225S_K202_0350 ME20	3700	3700	6000	≤24	0.48	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
39.45	ZV225S_K203_0390 ME10	4000	3900	6500	≤19	0.46	77	46	19	24	2	25	53.1	7.5	5.2	7.6	5.2	9.5	9.5	202	138
40.39	ZV225S_K202_0400 ME10	4000	3900	6500	≤19	0.45	77	39	12	24	2	25	53.1	4.4	4.4	5.2	5.2	7.4	7.4	139	138
45.22	ZV225S_K203_0450 ME10	4000	3900	6500	≤19	0.40	77	46	19	24	2	25	53.1	7.5	5.2	8.3	5.2	11	10	220	138
46.23	ZV225S_K202_0460 ME10	4000	3900	6500	≤19	0.39	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
46.23	ZV225S_K202_0460 ME20	3700	3700	6000	≤24	0.36	77	39	12	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
49.76	ZV225S_K203_0500 ME10	4000	3900	6500	≤19	0.36	77	46	19	24	2	25	53.1	7.5	5.2	8.3	5.2	12	10	220	138
50.49	ZV225S_K202_0500 ME10	4000	3900	6500	≤19	0.36	77	39	12	24	2	25	53.1	3.6	3.6	4.4	4.4	6.9	6.9	116	116
54.25	ZV225S_K203_0540 ME10	4000	3900	6500	≤19	0.33	77	46	19	24	2	25	53.1	7.5	5.2	8.3	5.2	13	10	220	138
55.54	ZV225S_K202_0560 ME10	4000	3900	6500	≤19	0.33	77	39	12	24	2	25	53.1	6.0	5.2	7.2	5.2	10	10	191	138
66.03	ZV225S_K203_0660 ME10	4000	3900	6500	≤19	0.27	77	46	19	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
68.42	ZV225S_K203_0680 ME10	4000	3900	6500	≤19	0.26	77	46	19	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
69.43	ZV225S_K202_0690 ME10	4000	3900	6500	≤19	0.26	77	39	12	24	2	25	53.1	5.0	5.0	6.0	5.2	9.5	9.5	159	138
79.62	ZV225S_K203_0800 ME10	4000	3900	6500	≤19	0.23	77	46	19	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
90.79	ZV225S_K203_0910 ME10	4000	3900	6500	≤19	0.20	77	46	19	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
109.5	ZV225S_K203_1090 ME10	4000	3900	6500	≤19	0.17	77	46	19	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
135.3	ZV225S_K203_1350 ME10	4000	3900	6500	≤19	0.13	77	46	19	24	2	25	53.1	7.5	5.2	8.3	5.2	15	10	220	138
181.0	ZV225S_K203_1810 ME10	4000	3900	6500	≤19	0.10															

i	Type	n <sub>1maxDB</sub>		n <sub>1maxZV</sub>	d <sub>MW</sub>	v <sub>f2maxZB</sub>	Δs	Δs <sub>redII</sub>	Δs <sub>redI</sub>	C <sub>lin</sub>	m <sub>n</sub>	z	d <sub>0</sub>	F <sub>f2N,S</sub>	F <sub>f2N,E</sub>	F <sub>f2accS</sub>	F <sub>f2accE</sub>	F <sub>f2NOT,S</sub>	F <sub>f2NOT,E</sub>	M <sub>2accS</sub>	M <sub>2accE</sub>
		EL1,2 [rpm]	EL3,4,5,6 [rpm]																		
<b>ZV3K2 (F<sub>v2acc,max</sub> = 7,7 kN)</b>																					
4.000	ZV318S_K202_0040 ME20	3000	2600	4500	≤32	3.38	83	42	12	22	3	18	57.3	4.1	4.1	6.1	5.4	10	10	174	154
4.000	ZV318S_K202_0040 ME30	3000	2600	4500	≤38	3.38	83	42	12	23	3	18	57.3	4.1	4.1	6.1	5.4	10	10	174	154
4.364	ZV318S_K202_0044 ME10	3000	2600	4500	≤19	3.09	83	42	12	22	3	18	57.3	3.5	3.5	3.5	3.5	4.4	4.4	102	102
4.364	ZV318S_K202_0044 ME20	3000	2600	4500	≤32	3.09	83	42	12	23	3	18	57.3	4.2	4.2	6.3	5.4	11	11	180	154
4.364	ZV318S_K202_0044 ME30	3000	2600	4500	≤38	3.09	83	42	12	23	3	18	57.3	4.2	4.2	6.3	5.4	11	11	180	154
5.177	ZV318S_K202_0052 ME20	3000	2600	4500	≤32	2.61	83	42	12	23	3	18	57.3	4.4	4.4	6.6	5.4	13	11	190	154
5.177	ZV318S_K202_0052 ME30	3000	2600	4500	≤38	2.61	83	42	12	23	3	18	57.3	4.4	4.4	6.6	5.4	13	11	190	154
6.000	ZV318S_K202_0060 ME10	3000	2600	4500	≤19	2.25	83	42	12	22	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	4500	≤32	2.25	83	42	12	23	3	18	57.3	4.6	4.6	7.0	5.4	14	11	200	154
6.000	ZV318S_K202_0060 ME30	3000	2600	4500	≤38	2.25	83	42	12	23	3	18	57.3	4.6	4.6	7.0	5.4	14	11	200	154
6.683	ZV318S_K202_0067 ME10	3500	3100	5000	≤19	2.24	83	42	12	22	3	18	57.3	4.7	4.7	5.4	5.4	6.8	6.8	156	154
6.683	ZV318S_K202_0067 ME20	3500	3100	5000	≤32	2.24	83	42	12	23	3	18	57.3	4.8	4.8	7.2	5.4	14	11	207	154
6.683	ZV318S_K202_0067 ME30	3500	3100	5000	≤38	2.24	83	42	12	23	3	18	57.3	4.8	4.8	7.2	5.4	14	11	207	154
7.118	ZV318S_K202_0071 ME20	3000	2600	4500	≤32	1.90	83	42	12	23	3	18	57.3	4.9	4.9	7.4	5.4	14	11	211	154
7.118	ZV318S_K202_0071 ME30	3000	2600	4500	≤38	1.90	83	42	12	23	3	18	57.3	4.9	4.9	7.4	5.4	14	11	211	154
8.397	ZV318S_K202_0084 ME10	3500	3100	5000	≤19	1.79	83	42	12	22	3	18	57.3	5.2	5.2	6.8	5.4	8.5	8.5	196	154
8.397	ZV318S_K202_0084 ME20	3500	3100	5000	≤32	1.79	83	42	12	23	3	18	57.3	5.2	5.2	7.7	5.4	14	11	220	154
8.397	ZV318S_K202_0084 ME30	3500	3100	5000	≤38	1.79	83	42	12	23	3	18	57.3	5.2	5.2	7.7	5.4	14	11	220	154
9.190	ZV318S_K202_0092 ME10	3500	3100	5000	≤19	1.63	83	42	12	23	3	18	57.3	5.4	5.4	7.5	5.4	9.3	9.3	214	154
9.190	ZV318S_K202_0092 ME20	3500	3100	5000	≤32	1.63	83	42	12	23	3	18	57.3	5.4	5.4	7.7	5.4	14	11	220	154
9.190	ZV318S_K202_0092 ME30	3500	3100	5000	≤38	1.63	83	42	12	23	3	18	57.3	5.4	5.4	7.7	5.4	14	11	220	154
10.07	ZV318S_K202_0100 ME10	3900	3500	5500	≤19	1.64	83	42	12	23	3	18	57.3	5.4	5.4	7.7	5.4	10	10	220	154
10.07	ZV318S_K202_0100 ME20	3700	3500	5500	≤32	1.64	83	42	12	23	3	18	57.3	5.5	5.4	7.7	5.4	14	11	220	154
10.07	ZV318S_K202_0100 ME30	3500	3500	5000	≤38	1.49	83	42	12	23	3	18	57.3	5.5	5.4	7.7	5.4	14	11	220	154
11.55	ZV318S_K202_0115 ME10	3500	3100	5000	≤19	1.30	83	42	12	23	3	18	57.3	5.8	5.4	7.7	5.4	12	11	220	154
11.55	ZV318S_K202_0115 ME20	3500	3100	5000	≤32	1.30	83	42	12	23	3	18	57.3	5.8	5.4	7.7	5.4	14	11	220	154
11.55	ZV318S_K202_0115 ME30	3500	3100	5000	≤38	1.30	83	42	12	23	3	18	57.3	5.8	5.4	7.7	5.4	14	11	220	154
12.71	ZV318S_K202_0125 ME10	3900	3500	5500	≤19	1.30	83	42	12	23	3	18	57.3	5.9	5.4	7.7	5.4	13	11	220	154
12.71	ZV318S_K202_0125 ME20	3700	3500	5500	≤32	1.30	83	42	12	23	3	18	57.3	6.0	5.4	7.7	5.4	14	11	220	154
12.71	ZV318S_K202_0125 ME30	3500	3500	5000	≤38	1.18	83	42	12	23	3	18	57.3	6.0	5.4	7.7	5.4	14	11	220	154
13.85	ZV318S_K202_0140 ME10	3900	3500	5500	≤19	1.19	83	42	12	23	3	18	57.3	6.1	5.4	7.7	5.4	14	11	220	154
13.85	ZV318S_K202_0140 ME20	3700	3500	5500	≤32	1.19	83	42	12	23	3	18	57.3	6.1	5.4	7.7	5.4	14	11	220	154
13.85	ZV318S_K202_0140 ME30	3500	3500	5000	≤38	1.08	83	42	12	23	3	18	57.3	6.1	5.4	7.7	5.4	14	11	220	154
16.86	ZV318S_K202_0170 ME10	4000	3900	6500	≤19	1.16	83	42	12	23	3	18	57.3	6.2	5.4	7.7	5.4	14	11	220	154
16.86	ZV318S_K202_0170 ME20	3700	3700	6000	≤32	1.07	83	42	12	23	3	18	57.3	6.6	5.4	7.7	5.4	14	11	220	154
16.86	ZV318S_K202_0170 ME30	3500	3500	5000	≤38	0.89	83	42	12	23	3	18	57.3	6.6	5.4	7.7	5.4	14	11	220	154
17.47	ZV318S_K202_0175 ME10	3900	3500	5500	≤19	0.95	83	42	12	23	3	18	57.3	6.6	5.4	7.7	5.4	14	11	220	154
17.47	ZV318S_K202_0175 ME20	3700	3500	5500	≤32	0.95	83	42	12	23	3	18	57.3	6.6	5.4	7.7	5.4	14	11	220	154
17.47	ZV318S_K202_0175 ME30	3500	3500	5000	≤38	0.86	83	42	12	23	3	18	57.3	6.6	5.4	7.7	5.4	14	11	220	154
20.33	ZV318S_K202_0200 ME10	4000	3900	6500	≤19	0.96	83	42	12	23	3	18	57.3	6.4	5.4	7.7	5.4	14	11	220	154
20.33	ZV318S_K202_0200 ME20	3700	3700	6000	≤24	0.89	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
23.18	ZV318S_K202_0230 ME10	4000	3900	6500	≤19	0.84	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
23.18	ZV318S_K202_0230 ME20	3700	3700	6000	≤32	0.78	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
23.18	ZV318S_K202_0230 ME30	3500	3500	5000	≤38	0.65	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
25.13	ZV318S_K202_0250 ME10	4000	3900	6500	≤19	0.78	83	42	12	23	3	18	57.3	6.5	5.4	7.7	5.4	14	11	220	154
25.13	ZV318S_K202_0250 ME20	3700	3700	6000	≤24	0.72	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
27.95	ZV318S_K202_0280 ME10	4000	3900	6500	≤19	0.70	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
27.95	ZV318S_K202_0280 ME20	3700	3700	6000	≤24	0.64	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
33.62	ZV318S_K202_0340 ME10	4000	3900	6500	≤19	0.58	83	42	12	23	3	18	57.3	5.4	5.4	6.5	5.4	11	11	185	154
33.62	ZV318S_K202_0340 ME20	3700	3700	6000	≤24	0.54	83	42	12	23	3	18	57.3	5.4	5.4	6.5	5.4	11	11	185	154
34.55	ZV318S_K202_0350 ME10	4000	3900	6500	≤19	0.56	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
34.55	ZV318S_K202_0350 ME20	3700	3700	6000	≤24	0.52	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
39.45	ZV318S_K203_0390 ME10	4000	3900	6500	≤19	0.49	83	50	21	23	3	18	57.3	7.0	5.4	7.1	5.4	8.8	8.8	202	154
40.39	ZV318S_K202_0400 ME10	4000	3900	6500	≤19	0.48	83	42	12	23	3	18	57.3	4.0	4.0	4.8	4.8	6.9	6.9	139	139
45.22	ZV318S_K203_0450 ME10	4000	3900	6500	≤19	0.43	83	50	21	23	3	18	57.3	7.0	5.4	7.7	5.4	10	10	220	154
46.23	ZV318S_K202_0460 ME10	4000	3900	6500	≤19	0.42	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
46.23	ZV318S_K202_0460 ME20	3700	3700	6000	≤24	0.39	83	42	12	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
49.76	ZV318S_K203_0500 ME10	4000	3900	6500	≤19	0.39	83	50	21	23	3	18	57.3	7.0	5.4	7.7	5.4	11	11	220	154
50.49	ZV318S_K202_0500 ME10	4000	3900	6500	≤19	0.39	83	42	12	23	3	18	57.3	3.4	3.4	4.0	4.0	6.4	6.4	116	116
54.25	ZV318S_K203_0540 ME10	4000	3900	6500	≤19	0.36	83	50	21	23	3	18	57.3	7.0	5.4	7.7	5.4	12	11	220	154
55.54	ZV318S_K202_0560 ME10	4000	3900	6500	≤19	0.35	83	42	12	23	3	18	57.3	5.5	5.4	6.7	5.4	9.4	9.4	191	154
66.03	ZV318S_K203_0660 ME10	4000	3900	6500	≤19																

12.2 Selection tables 12 ZVK rack and pinion drives

i	Type	n <sub>1maxDB</sub>		n <sub>1maxZV</sub>	d <sub>MW</sub>	v <sub>f2maxZB</sub>	Δs	Δs <sub>redll</sub>	Δs <sub>redl</sub>	C <sub>lin</sub>	m <sub>n</sub>	z	d <sub>0</sub>	F <sub>f2N,S</sub>	F <sub>f2N,E</sub>	F <sub>f2accS</sub>	F <sub>f2accE</sub>	F <sub>f2NOT,S</sub>	F <sub>f2NOT,E</sub>	M <sub>2accS</sub>	M <sub>2accE</sub>
		EL1,2 [rpm]	EL3,4,5,6 [rpm]																		
<b>ZV3K2 (F<sub>v2acc,max</sub> = 7,7 kN)</b>																					
79.62	ZV318S_K203_0800 ME10	4000	3900	6500	≤19	0.25	83	50	21	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
90.79	ZV318S_K203_0910 ME10	4000	3900	6500	≤19	0.22	83	50	21	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
109.5	ZV318S_K203_1090 ME10	4000	3900	6500	≤19	0.18	83	50	21	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
135.3	ZV318S_K203_1350 ME10	4000	3900	6500	≤19	0.14	83	50	21	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
181.0	ZV318S_K203_1810 ME10	4000	3900	6500	≤19	0.11	83	50	21	23	3	18	57.3	7.0	5.4	7.7	5.4	14	11	220	154
217.5	ZV318S_K203_2180 ME10	4000	3900	6500	≤19	0.09	83	50	21	23	3	18	57.3	5.5	5.4	6.7	5.4	9.4	9.4	191	154
271.9	ZV318S_K203_2720 ME10	4000	3900	6500	≤19	0.07	83	50	21	23	3	18	57.3	4.6	4.6	5.5	5.4	8.8	8.8	159	154
<b>ZV2K3 (F<sub>v2acc,max</sub> = 10 kN)</b>																					
4.000	ZV225S_K302_0040 ME20	2700	2300	4000	≤32	2.78	77	31	12	30	2	25	53.1	7.7	5.2	8.8	5.2	11	10	233	137
4.000	ZV225S_K302_0040 ME30	2700	2300	4000	≤38	2.78	77	31	12	30	2	25	53.1	7.7	5.2	10	5.2	21	10	276	137
4.364	ZV225S_K302_0044 ME20	2700	2300	4000	≤32	2.55	77	31	12	30	2	25	53.1	7.9	5.2	9.6	5.2	12	10	254	137
4.364	ZV225S_K302_0044 ME30	2700	2300	4000	≤38	2.55	77	31	12	30	2	25	53.1	7.9	5.2	10	5.2	21	10	276	137
5.375	ZV225S_K302_0054 ME20	2700	2300	4000	≤32	2.07	77	31	12	30	2	25	53.1	8.5	5.2	10	5.2	15	10	276	137
5.375	ZV225S_K302_0054 ME30	2700	2300	4000	≤38	2.07	77	31	12	30	2	25	53.1	8.5	5.2	10	5.2	15	10	276	137
6.000	ZV225S_K302_0060 ME20	2700	2300	4000	≤32	1.85	77	31	12	30	2	25	53.1	8.8	5.2	10	5.2	16	10	276	137
6.000	ZV225S_K302_0060 ME30	2700	2300	4000	≤38	1.85	77	31	12	30	2	25	53.1	8.8	5.2	10	5.2	21	10	276	137
6.740	ZV225S_K302_0067 ME20	3200	2800	4500	≤32	1.86	77	31	12	30	2	25	53.1	9.1	5.2	10	5.2	18	10	276	137
6.740	ZV225S_K302_0067 ME30	3200	2800	4500	≤38	1.86	77	31	12	30	2	25	53.1	9.1	5.2	10	5.2	18	10	276	137
7.391	ZV225S_K302_0074 ME20	2700	2300	4000	≤32	1.50	77	31	12	30	2	25	53.1	9.4	5.2	10	5.2	20	10	276	137
7.391	ZV225S_K302_0074 ME30	2700	2300	4000	≤38	1.50	77	31	12	30	2	25	53.1	9.4	5.2	10	5.2	20	10	276	137
8.444	ZV225S_K302_0084 ME10	3200	2800	4500	≤19	1.48	77	31	12	30	2	25	53.1	6.4	5.2	7.4	5.2	9.3	9.3	197	137
8.444	ZV225S_K302_0084 ME20	3200	2800	4500	≤32	1.48	77	31	12	30	2	25	53.1	9.9	5.2	10	5.2	21	10	276	137
8.444	ZV225S_K302_0084 ME30	3200	2800	4500	≤38	1.48	77	31	12	30	2	25	53.1	9.9	5.2	10	5.2	21	10	276	137
9.267	ZV225S_K302_0093 ME20	3200	2800	4500	≤32	1.35	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
9.267	ZV225S_K302_0093 ME30	3200	2800	4500	≤38	1.35	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
10.14	ZV225S_K302_0100 ME10	3500	3100	5000	≤19	1.37	77	31	12	30	2	25	53.1	6.6	5.2	8.9	5.2	11	10	236	137
10.14	ZV225S_K302_0100 ME20	3500	3100	5000	≤32	1.37	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
10.14	ZV225S_K302_0100 ME30	3500	3100	5000	≤38	1.37	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
11.61	ZV225S_K302_0115 ME10	3200	2800	4500	≤19	1.08	77	31	12	30	2	25	53.1	8.8	5.2	10	5.2	13	10	270	137
11.61	ZV225S_K302_0115 ME20	3200	2800	4500	≤32	1.08	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
11.61	ZV225S_K302_0115 ME30	3200	2800	4500	≤38	1.08	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
12.58	ZV225S_K302_0125 ME10	3500	3100	5000	≤19	1.10	77	31	12	30	2	25	53.1	7.0	5.2	10	5.2	14	10	276	137
12.58	ZV225S_K302_0125 ME20	3500	3100	5000	≤32	1.10	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
12.58	ZV225S_K302_0125 ME30	3500	3100	5000	≤38	1.10	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
13.94	ZV225S_K302_0140 ME10	3500	3100	5000	≤19	1.00	77	31	12	30	2	25	53.1	9.1	5.2	10	5.2	15	10	276	137
13.94	ZV225S_K302_0140 ME20	3500	3100	5000	≤32	1.00	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
13.94	ZV225S_K302_0140 ME30	3500	3100	5000	≤38	1.00	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
16.94	ZV225S_K302_0170 ME10	3800	3500	6000	≤19	0.98	77	31	12	30	2	25	53.1	7.4	5.2	10	5.2	18	10	276	137
16.94	ZV225S_K302_0170 ME20	3700	3500	6000	≤32	0.98	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
16.94	ZV225S_K302_0170 ME30	3500	3500	5000	≤38	0.82	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
17.29	ZV225S_K302_0175 ME10	3500	3100	5000	≤19	0.80	77	31	12	30	2	25	53.1	9.7	5.2	10	5.2	19	10	276	137
17.29	ZV225S_K302_0175 ME20	3500	3100	5000	≤32	0.80	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
17.29	ZV225S_K302_0175 ME30	3500	3100	5000	≤38	0.80	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
20.28	ZV225S_K302_0200 ME10	3800	3500	6000	≤19	0.82	77	31	12	30	2	25	53.1	7.9	5.2	10	5.2	19	10	276	137
20.28	ZV225S_K302_0200 ME20	3700	3500	6000	≤32	0.82	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
20.28	ZV225S_K302_0200 ME30	3500	3500	5000	≤38	0.69	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
23.29	ZV225S_K302_0230 ME10	3800	3500	6000	≤19	0.72	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
23.29	ZV225S_K302_0230 ME20	3700	3500	6000	≤32	0.72	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
23.29	ZV225S_K302_0230 ME30	3500	3500	5000	≤38	0.60	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
25.26	ZV225S_K302_0250 ME10	3800	3500	6000	≤19	0.66	77	31	12	30	2	25	53.1	8.0	5.2	10	5.2	21	10	276	137
25.26	ZV225S_K302_0250 ME20	3700	3500	6000	≤24	0.66	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
27.88	ZV225S_K302_0280 ME10	3800	3500	6000	≤19	0.60	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
27.88	ZV225S_K302_0280 ME20	3700	3500	6000	≤32	0.60	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
27.88	ZV225S_K302_0280 ME30	3500	3500	5000	≤38	0.50	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
32.65	ZV225S_K303_0330 ME20	3700	3500	6000	≤24	0.51	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
33.62	ZV225S_K302_0340 ME10	3800	3500	6000	≤19	0.50	77	31	12	30	2	25	53.1	8.3	5.2	10	5.2	19	10	276	137
33.62	ZV225S_K302_0340 ME20	3700	3500	6000	≤24	0.50	77	31	12	30	2	25	53.1	9.4	5.2	10	5.2	19	10	276	137
34.73	ZV225S_K302_0350 ME10	3800	3500	6000	≤19	0.48	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
34.73	ZV225S_K302_0350 ME20	3700	3500	6000	≤24	0.48	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
35.83	ZV225S_K303_0360 ME20	3700	3500	6000	≤24	0.47	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
39.19	ZV225S_K303_0390 ME20	3700	3500	6000	≤24	0.43	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
40.51	ZV225S_K302_0410 ME10	3800	3500	6000	≤19	0.41	77	31	12	30	2	25	53.1	7.3	5.2	8.7	5.2	15	10	231	137
40.51	ZV225S_K302_0410 ME20	3700	3500	6000	≤24	0.41	77	31	12	30	2										

i	Type	n <sub>1maxDB</sub>		n <sub>1maxZV</sub>	d <sub>MW</sub>	v <sub>f2maxZB</sub>	Δs	Δs <sub>redII</sub>	Δs <sub>redI</sub>	C <sub>lin</sub>	m <sub>n</sub>	z	d <sub>0</sub>	F <sub>f2N,S</sub>	F <sub>f2N,E</sub>	F <sub>f2accS</sub>	F <sub>f2accE</sub>	F <sub>f2NOT,S</sub>	F <sub>f2NOT,E</sub>	M <sub>2accS</sub>	M <sub>2accE</sub>
		EL1,2 [rpm]	EL3,4,5,6 [rpm]																		
<b>ZV2K3 (F<sub>v2acc,max</sub> = 10 kN)</b>																					
46.23	ZV225S_K302_0460 ME10	3800	3500	6000	≤19	0.36	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
46.23	ZV225S_K302_0460 ME20	3700	3500	6000	≤24	0.36	77	31	12	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
48.63	ZV225S_K303_0490 ME20	3700	3500	6000	≤24	0.34	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
49.26	ZV225S_K303_0490 ME10	3800	3500	6000	≤19	0.34	77	39	19	30	2	25	53.1	9.5	5.2	9.5	5.2	12	10	253	137
50.49	ZV225S_K302_0500 ME10	3800	3500	6000	≤19	0.33	77	31	12	30	2	25	53.1	5.8	5.2	6.5	5.2	8.2	8.2	173	137
53.88	ZV225S_K303_0540 ME20	3700	3500	6000	≤24	0.31	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
54.58	ZV225S_K303_0550 ME10	3800	3500	6000	≤19	0.31	77	39	19	30	2	25	53.1	10	5.2	10	5.2	13	10	276	137
55.71	ZV225S_K302_0560 ME10	3800	3500	6000	≤19	0.30	77	31	12	30	2	25	53.1	10	5.2	10	5.2	20	10	276	137
55.71	ZV225S_K302_0560 ME20	3700	3500	6000	≤24	0.30	77	31	12	30	2	25	53.1	10	5.2	10	5.2	20	10	276	137
65.50	ZV225S_K303_0650 ME20	3700	3500	6000	≤24	0.25	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
66.35	ZV225S_K303_0660 ME10	3800	3500	6000	≤19	0.25	77	39	19	30	2	25	53.1	10	5.2	10	5.2	16	10	276	137
66.87	ZV225S_K303_0670 ME20	3700	3500	6000	≤24	0.25	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
67.73	ZV225S_K303_0680 ME10	3800	3500	6000	≤19	0.25	77	39	19	30	2	25	53.1	10	5.2	10	5.2	16	10	276	137
69.43	ZV225S_K302_0690 ME10	3800	3500	6000	≤19	0.24	77	31	12	30	2	25	53.1	8.0	5.2	9.0	5.2	11	10	238	137
78.41	ZV225S_K303_0780 ME20	3700	3500	6000	≤24	0.21	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
79.42	ZV225S_K303_0790 ME10	3800	3500	6000	≤19	0.21	77	39	19	30	2	25	53.1	10	5.2	10	5.2	19	10	276	137
90.06	ZV225S_K303_0900 ME20	3700	3500	6000	≤24	0.19	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
91.23	ZV225S_K303_0910 ME10	3800	3500	6000	≤19	0.18	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
107.8	ZV225S_K303_1080 ME20	3700	3500	6000	≤24	0.16	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
109.2	ZV225S_K303_1090 ME10	3800	3500	6000	≤19	0.15	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
134.3	ZV225S_K303_1340 ME20	3700	3500	6000	≤24	0.12	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
136.0	ZV225S_K303_1360 ME10	3800	3500	6000	≤19	0.12	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
178.7	ZV225S_K303_1790 ME20	3700	3500	6000	≤24	0.09	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
181.0	ZV225S_K303_1810 ME10	3800	3500	6000	≤19	0.09	77	39	19	30	2	25	53.1	10	5.2	10	5.2	21	10	276	137
218.2	ZV225S_K303_2180 ME10	3800	3500	6000	≤19	0.08	77	39	19	30	2	25	53.1	10	5.2	10	5.2	20	10	276	137
271.9	ZV225S_K303_2720 ME10	3800	3500	6000	≤19	0.06	77	39	19	30	2	25	53.1	8.0	5.2	9.0	5.2	11	10	238	137
<b>ZV3K3 (F<sub>v2acc,max</sub> = 11 kN)</b>																					
4.000	ZV318S_K302_0040 ME20	2700	2300	4000	≤32	3.00	83	33	12	29	3	18	57.3	7.1	5.3	8.1	5.3	10	10	233	153
4.000	ZV318S_K302_0040 ME30	2700	2300	4000	≤38	3.00	83	33	12	30	3	18	57.3	7.1	5.3	11	5.3	22	11	306	153
4.364	ZV318S_K302_0044 ME20	2700	2300	4000	≤32	2.75	83	33	12	29	3	18	57.3	7.3	5.3	8.9	5.3	11	11	254	153
4.364	ZV318S_K302_0044 ME30	2700	2300	4000	≤38	2.75	83	33	12	30	3	18	57.3	7.3	5.3	11	5.3	22	11	308	153
5.375	ZV318S_K302_0054 ME20	2700	2300	4000	≤32	2.23	83	33	12	30	3	18	57.3	7.8	5.3	11	5.3	14	11	308	153
5.375	ZV318S_K302_0054 ME30	2700	2300	4000	≤38	2.23	83	33	12	30	3	18	57.3	7.8	5.3	11	5.3	14	11	308	153
6.000	ZV318S_K302_0060 ME20	2700	2300	4000	≤32	2.00	83	33	12	30	3	18	57.3	8.1	5.3	11	5.3	15	11	308	153
6.000	ZV318S_K302_0060 ME30	2700	2300	4000	≤38	2.00	83	33	12	30	3	18	57.3	8.1	5.3	11	5.3	22	11	308	153
6.740	ZV318S_K302_0067 ME20	3200	2800	4500	≤32	2.00	83	33	12	30	3	18	57.3	8.5	5.3	11	5.3	17	11	308	153
6.740	ZV318S_K302_0067 ME30	3200	2800	4500	≤38	2.00	83	33	12	30	3	18	57.3	8.5	5.3	11	5.3	17	11	308	153
7.391	ZV318S_K302_0074 ME20	2700	2300	4000	≤32	1.62	83	33	12	30	3	18	57.3	8.7	5.3	11	5.3	19	11	308	153
7.391	ZV318S_K302_0074 ME30	2700	2300	4000	≤38	1.62	83	33	12	30	3	18	57.3	8.7	5.3	11	5.3	19	11	308	153
8.444	ZV318S_K302_0084 ME10	3200	2800	4500	≤19	1.60	83	33	12	29	3	18	57.3	5.9	5.3	6.9	5.3	8.6	8.6	197	153
8.444	ZV318S_K302_0084 ME20	3200	2800	4500	≤32	1.60	83	33	12	30	3	18	57.3	9.1	5.3	11	5.3	21	11	308	153
8.444	ZV318S_K302_0084 ME30	3200	2800	4500	≤38	1.60	83	33	12	30	3	18	57.3	9.1	5.3	11	5.3	21	11	308	153
9.267	ZV318S_K302_0093 ME20	3200	2800	4500	≤32	1.46	83	33	12	30	3	18	57.3	9.4	5.3	11	5.3	22	11	308	153
9.267	ZV318S_K302_0093 ME30	3200	2800	4500	≤38	1.46	83	33	12	30	3	18	57.3	9.4	5.3	11	5.3	22	11	308	153
10.14	ZV318S_K302_0100 ME10	3500	3100	5000	≤19	1.48	83	33	12	30	3	18	57.3	6.1	5.3	8.2	5.3	10	10	236	153
10.14	ZV318S_K302_0100 ME20	3500	3100	5000	≤32	1.48	83	33	12	30	3	18	57.3	9.7	5.3	11	5.3	22	11	308	153
10.14	ZV318S_K302_0100 ME30	3500	3100	5000	≤38	1.48	83	33	12	30	3	18	57.3	9.7	5.3	11	5.3	22	11	308	153
11.61	ZV318S_K302_0115 ME10	3200	2800	4500	≤19	1.16	83	33	12	30	3	18	57.3	8.1	5.3	9.4	5.3	12	11	270	153
11.61	ZV318S_K302_0115 ME20	3200	2800	4500	≤32	1.16	83	33	12	30	3	18	57.3	10	5.3	11	5.3	22	11	308	153
11.61	ZV318S_K302_0115 ME30	3200	2800	4500	≤38	1.16	83	33	12	30	3	18	57.3	10	5.3	11	5.3	22	11	308	153
12.58	ZV318S_K302_0125 ME10	3500	3100	5000	≤19	1.19	83	33	12	30	3	18	57.3	6.5	5.3	10	5.3	13	11	293	153
12.58	ZV318S_K302_0125 ME20	3500	3100	5000	≤32	1.19	83	33	12	30	3	18	57.3	10	5.3	11	5.3	22	11	308	153
12.58	ZV318S_K302_0125 ME30	3500	3100	5000	≤38	1.19	83	33	12	30	3	18	57.3	10	5.3	11	5.3	22	11	308	153
13.94	ZV318S_K302_0140 ME10	3500	3100	5000	≤19	1.08	83	33	12	30	3	18	57.3	8.4	5.3	11	5.3	14	11	308	153
13.94	ZV318S_K302_0140 ME20	3500	3100	5000	≤32	1.08	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
13.94	ZV318S_K302_0140 ME30	3500	3100	5000	≤38	1.08	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
16.94	ZV318S_K302_0170 ME10	3800	3500	6000	≤19	1.06	83	33	12	30	3	18	57.3	6.9	5.3	11	5.3	16	11	308	153
16.94	ZV318S_K302_0170 ME20	3700	3500	6000	≤32	1.06	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
16.94	ZV318S_K302_0170 ME30	3500	3500	5000	≤38	0.89	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
17.29	ZV318S_K302_0175 ME10	3500	3100	5000	≤19	0.87	83	33	12	30	3	18	57.3	9.0	5.3	11	5.3	18	11	308	153
17.29	ZV318S_K302_0175 ME20	3500	3100	5000	≤32	0.87	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
17.29	ZV318S_K302_0175 ME30	3500	3100	5000	≤38	0.87	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
20.28	ZV318S_K302_0200 ME10	3800	3500	6000	≤19	0.89	83	33	12	30	3	18	57								



12.2 Selection tables 12 ZVK rack and pinion drives

i	Type	n <sub>1maxDB</sub>		n <sub>1maxZV</sub>	d <sub>MW</sub>	v <sub>2maxZB</sub>	Δs	Δs <sub>redll</sub>	Δs <sub>redll</sub>	C <sub>lin</sub>	m <sub>n</sub>	z	d <sub>0</sub>	F <sub>2N,S</sub>	F <sub>2N,E</sub>	F <sub>2accS</sub>	F <sub>2accE</sub>	F <sub>2NOT,S</sub>	F <sub>2NOT,E</sub>	M <sub>2accS</sub>	M <sub>2accE</sub>
		EL1,2 [rpm]	EL3,4,5,6 [rpm]																		
<b>ZV3K3 (F<sub>v2acc,max</sub> = 11 kN)</b>																					
20.28	ZV318S_K302_0200 ME30	3500	3500	5000	≤38	0.74	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
23.29	ZV318S_K302_0230 ME10	3800	3500	6000	≤19	0.77	83	33	12	30	3	18	57.3	9.5	5.3	11	5.3	22	11	308	153
23.29	ZV318S_K302_0230 ME20	3700	3500	6000	≤32	0.77	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
23.29	ZV318S_K302_0230 ME30	3500	3500	5000	≤38	0.64	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
25.26	ZV318S_K302_0250 ME10	3800	3500	6000	≤19	0.71	83	33	12	30	3	18	57.3	7.4	5.3	11	5.3	21	11	308	153
25.26	ZV318S_K302_0250 ME20	3700	3500	6000	≤24	0.71	83	33	12	30	3	18	57.3	11	5.3	11	5.3	21	11	308	153
27.88	ZV318S_K302_0280 ME10	3800	3500	6000	≤19	0.65	83	33	12	30	3	18	57.3	10	5.3	11	5.3	22	11	308	153
27.88	ZV318S_K302_0280 ME20	3700	3500	6000	≤32	0.65	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
27.88	ZV318S_K302_0280 ME30	3500	3500	5000	≤38	0.54	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
32.65	ZV318S_K303_0330 ME20	3700	3500	6000	≤24	0.55	83	42	21	30	3	18	57.3	11	5.3	11	5.3	20	11	308	153
33.62	ZV318S_K302_0340 ME10	3800	3500	6000	≤19	0.54	83	33	12	30	3	18	57.3	7.7	5.3	10	5.3	17	11	300	153
33.62	ZV318S_K302_0340 ME20	3700	3500	6000	≤24	0.54	83	33	12	30	3	18	57.3	8.7	5.3	10	5.3	17	11	300	153
34.73	ZV318S_K302_0350 ME10	3800	3500	6000	≤19	0.52	83	33	12	30	3	18	57.3	10	5.3	11	5.3	22	11	308	153
34.73	ZV318S_K302_0350 ME20	3700	3500	6000	≤24	0.52	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
35.83	ZV318S_K303_0360 ME20	3700	3500	6000	≤24	0.50	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
39.19	ZV318S_K303_0390 ME20	3700	3500	6000	≤24	0.46	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
40.51	ZV318S_K302_0410 ME10	3800	3500	6000	≤19	0.44	83	33	12	30	3	18	57.3	6.7	5.3	8.1	5.3	13	11	231	153
40.51	ZV318S_K302_0410 ME20	3700	3500	6000	≤24	0.44	83	33	12	30	3	18	57.3	6.7	5.3	8.1	5.3	13	11	231	153
44.89	ZV318S_K303_0450 ME20	3700	3500	6000	≤24	0.40	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
46.23	ZV318S_K302_0460 ME10	3800	3500	6000	≤19	0.39	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
46.23	ZV318S_K302_0460 ME20	3700	3500	6000	≤24	0.39	83	33	12	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
48.63	ZV318S_K303_0490 ME20	3700	3500	6000	≤24	0.37	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
49.26	ZV318S_K303_0490 ME10	3800	3500	6000	≤19	0.37	83	42	21	30	3	18	57.3	8.8	5.3	8.8	5.3	11	11	253	153
50.49	ZV318S_K302_0500 ME10	3800	3500	6000	≤19	0.36	83	33	12	30	3	18	57.3	5.4	5.3	6.0	5.3	7.6	7.6	173	153
53.88	ZV318S_K303_0540 ME20	3700	3500	6000	≤24	0.33	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
54.58	ZV318S_K303_0550 ME10	3800	3500	6000	≤19	0.33	83	42	21	30	3	18	57.3	9.8	5.3	9.8	5.3	12	11	280	153
55.71	ZV318S_K302_0560 ME10	3800	3500	6000	≤19	0.32	83	33	12	30	3	18	57.3	9.2	5.3	11	5.3	18	11	308	153
55.71	ZV318S_K302_0560 ME20	3700	3500	6000	≤24	0.32	83	33	12	30	3	18	57.3	9.2	5.3	11	5.3	18	11	308	153
65.50	ZV318S_K303_0650 ME20	3700	3500	6000	≤24	0.28	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
66.35	ZV318S_K303_0660 ME10	3800	3500	6000	≤19	0.27	83	42	21	30	3	18	57.3	11	5.3	11	5.3	15	11	308	153
66.87	ZV318S_K303_0670 ME20	3700	3500	6000	≤24	0.27	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
67.73	ZV318S_K303_0680 ME10	3800	3500	6000	≤19	0.27	83	42	21	30	3	18	57.3	11	5.3	11	5.3	15	11	308	153
69.43	ZV318S_K302_0690 ME10	3800	3500	6000	≤19	0.26	83	33	12	30	3	18	57.3	7.4	5.3	8.3	5.3	10	10	238	153
78.41	ZV318S_K303_0780 ME20	3700	3500	6000	≤24	0.23	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
79.42	ZV318S_K303_0790 ME10	3800	3500	6000	≤19	0.23	83	42	21	30	3	18	57.3	11	5.3	11	5.3	18	11	308	153
90.06	ZV318S_K303_0900 ME20	3700	3500	6000	≤24	0.20	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
91.23	ZV318S_K303_0910 ME10	3800	3500	6000	≤19	0.20	83	42	21	30	3	18	57.3	11	5.3	11	5.3	20	11	308	153
107.8	ZV318S_K303_1080 ME20	3700	3500	6000	≤24	0.17	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
109.2	ZV318S_K303_1090 ME10	3800	3500	6000	≤19	0.17	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
134.3	ZV318S_K303_1340 ME20	3700	3500	6000	≤24	0.13	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
136.0	ZV318S_K303_1360 ME10	3800	3500	6000	≤19	0.13	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
178.7	ZV318S_K303_1790 ME20	3700	3500	6000	≤24	0.10	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
181.0	ZV318S_K303_1810 ME10	3800	3500	6000	≤19	0.10	83	42	21	30	3	18	57.3	11	5.3	11	5.3	22	11	308	153
218.2	ZV318S_K303_2180 ME10	3800	3500	6000	≤19	0.08	83	42	21	30	3	18	57.3	9.2	5.3	11	5.3	18	11	308	153
271.9	ZV318S_K303_2720 ME10	3800	3500	6000	≤19	0.07	83	42	21	30	3	18	57.3	7.4	5.3	8.3	5.3	10	10	238	153
<b>ZV3K4 (F<sub>v2acc,max</sub> = 15 kN)</b>																					
4.000	ZV322S_K402_0040 ME30	2600	2200	3800	≤38	3.48	102	41	15	34	3	22	70.0	8.7	6.6	13	6.6	22	13	459	232
4.000	ZV322S_K402_0040 ME40	2600	2200	3800	≤48	3.48	102	41	15	34	3	22	70.0	8.7	6.6	13	6.6	22	13	459	232
4.364	ZV322S_K402_0044 ME30	2600	2200	3800	≤38	3.19	102	41	15	34	3	22	70.0	9.0	6.6	13	6.6	24	13	472	232
4.364	ZV322S_K402_0044 ME40	2600	2200	3800	≤48	3.19	102	41	15	34	3	22	70.0	9.0	6.6	13	6.6	24	13	472	232
5.422	ZV322S_K402_0054 ME30	2600	2200	3800	≤38	2.57	102	41	15	34	3	22	70.0	9.7	6.6	14	6.6	30	13	508	232
5.422	ZV322S_K402_0054 ME40	2600	2200	3800	≤48	2.57	102	41	15	34	3	22	70.0	9.7	6.6	14	6.6	30	13	508	232
6.000	ZV322S_K402_0060 ME30	2600	2200	3800	≤38	2.32	102	41	15	34	3	22	70.0	10	6.6	15	6.6	31	13	525	232
6.000	ZV322S_K402_0060 ME40	2600	2200	3800	≤48	2.32	102	41	15	34	3	22	70.0	10	6.6	15	6.6	31	13	525	232
6.719	ZV322S_K402_0067 ME20	3000	2600	4500	≤32	2.46	102	41	15	34	3	22	70.0	10	6.6	11	6.6	14	13	391	232
6.719	ZV322S_K402_0067 ME30	3000	2600	4500	≤38	2.46	102	41	15	34	3	22	70.0	10	6.6	15	6.6	31	13	540	232
6.719	ZV322S_K402_0067 ME40	3000	2600	4500	≤48	2.46	102	41	15	34	3	22	70.0	10	6.6	15	6.6	31	13	540	232
7.456	ZV322S_K402_0075 ME30	2600	2200	3800	≤38	1.87	102	41	15	34	3	22	70.0	11	6.6	15	6.6	31	13	540	232
7.456	ZV322S_K402_0075 ME40	2600	2200	3800	≤48	1.87	102	41	15	34	3	22	70.0	11	6.6	15	6.6	31	13	540	232
8.377	ZV322S_K402_0084 ME20	3000	2600	4500	≤32	1.97	102	41	15	34	3	22	70.0	11	6.6	14	6.6	17	13	488	232
8.377	ZV322S_K402_0084 ME30	3000	2600	4500	≤38	1.97	102	41	15	34	3	22	70.0	11	6.6	15	6.6	31	13	540	232
8.377	ZV322S_K402_0084 ME40	3000	2600	4500	≤48	1.97	102	41	15	34	3	22	70.0	11	6.6	15	6.6	31	13	540	232
9.238	ZV322S_K402_0092 ME20	3000	2600	4500	≤32	1.79	102	41	15	34	3	22									

i	Type	n <sub>1maxDB</sub>		n <sub>1maxZV</sub>	d <sub>MW</sub>	v <sub>f2maxZB</sub>	Δs	Δs <sub>red1l</sub>	Δs <sub>red1r</sub>	C <sub>in</sub>	m <sub>n</sub>	z	d <sub>0</sub>	F <sub>f2N,S</sub>	F <sub>f2N,E</sub>	F <sub>f2accS</sub>	F <sub>f2accE</sub>	F <sub>f2NOT,S</sub>	F <sub>f2NOT,E</sub>	M <sub>2accS</sub>	M <sub>2accE</sub>
		EL1,2 [rpm]	EL3,4,5,6 [rpm]																		
<b>ZV3K4 (F<sub>v2acc,max</sub> = 15 kN)</b>																					
9.238	ZV322S_K402_0092 ME40	3000	2600	4500	≤48	1.79	102	41	15	34	3	22	70.0	12	6.6	15	6.6	31	13	540	232
10.10	ZV322S_K402_0100 ME20	3400	3000	5000	≤32	1.82	102	41	15	34	3	22	70.0	12	6.6	15	6.6	21	13	540	232
10.10	ZV322S_K402_0100 ME30	3400	3000	5000	≤38	1.82	102	41	15	34	3	22	70.0	12	6.6	15	6.6	31	13	540	232
10.10	ZV322S_K402_0100 ME40	3000	3000	4500	≤48	1.63	102	41	15	34	3	22	70.0	12	6.6	15	6.6	31	13	540	232
11.52	ZV322S_K402_0115 ME20	3000	2600	4500	≤32	1.43	102	41	15	34	3	22	70.0	12	6.6	15	6.6	24	13	540	232
11.52	ZV322S_K402_0115 ME30	3000	2600	4500	≤38	1.43	102	41	15	34	3	22	70.0	12	6.6	15	6.6	31	13	540	232
11.52	ZV322S_K402_0115 ME40	3000	2600	4500	≤48	1.43	102	41	15	34	3	22	70.0	12	6.6	15	6.6	31	13	540	232
12.66	ZV322S_K402_0125 ME20	3400	3000	5000	≤32	1.45	102	41	15	34	3	22	70.0	13	6.6	15	6.6	25	13	540	232
12.66	ZV322S_K402_0125 ME30	3400	3000	5000	≤38	1.45	102	41	15	34	3	22	70.0	13	6.6	15	6.6	31	13	540	232
12.66	ZV322S_K402_0125 ME40	3000	3000	4500	≤48	1.30	102	41	15	34	3	22	70.0	13	6.6	15	6.6	31	13	540	232
13.89	ZV322S_K402_0140 ME20	3400	3000	5000	≤32	1.32	102	41	15	34	3	22	70.0	13	6.6	15	6.6	29	13	540	232
13.89	ZV322S_K402_0140 ME30	3400	3000	5000	≤38	1.32	102	41	15	34	3	22	70.0	13	6.6	15	6.6	31	13	540	232
13.89	ZV322S_K402_0140 ME40	3000	3000	4500	≤48	1.19	102	41	15	34	3	22	70.0	13	6.6	15	6.6	31	13	540	232
16.94	ZV322S_K402_0170 ME20	3600	3300	5500	≤32	1.19	102	41	15	34	3	22	70.0	14	6.6	15	6.6	29	13	540	232
16.94	ZV322S_K402_0170 ME30	3500	3300	5000	≤38	1.08	102	41	15	34	3	22	70.0	14	6.6	15	6.6	31	13	540	232
16.94	ZV322S_K402_0170 ME40	3000	3000	4500	≤48	0.97	102	41	15	34	3	22	70.0	14	6.6	15	6.6	31	13	540	232
17.41	ZV322S_K402_0175 ME20	3400	3000	5000	≤32	1.05	102	41	15	34	3	22	70.0	14	6.6	15	6.6	31	13	540	232
17.41	ZV322S_K402_0175 ME30	3400	3000	5000	≤38	1.05	102	41	15	34	3	22	70.0	14	6.6	15	6.6	31	13	540	232
17.41	ZV322S_K402_0175 ME40	3000	3000	4500	≤48	0.95	102	41	15	34	3	22	70.0	14	6.6	15	6.6	31	13	540	232
20.20	ZV322S_K402_0200 ME20	3600	3300	5500	≤32	1.00	102	41	15	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
20.20	ZV322S_K402_0200 ME30	3500	3300	5000	≤38	0.91	102	41	15	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
23.29	ZV322S_K402_0230 ME20	3600	3300	5500	≤32	0.87	102	41	15	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
23.29	ZV322S_K402_0230 ME30	3500	3300	5000	≤38	0.79	102	41	15	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
23.29	ZV322S_K402_0230 ME40	3000	3000	4500	≤48	0.71	102	41	15	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
25.28	ZV322S_K402_0250 ME20	3600	3300	5500	≤32	0.80	102	41	15	34	3	22	70.0	14	6.6	15	6.6	29	13	540	232
25.28	ZV322S_K402_0250 ME30	3500	3300	5000	≤38	0.73	102	41	15	34	3	22	70.0	14	6.6	15	6.6	29	13	540	232
27.77	ZV322S_K402_0280 ME20	3600	3300	5500	≤32	0.73	102	41	15	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
27.77	ZV322S_K402_0280 ME30	3500	3300	5000	≤38	0.66	102	41	15	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
32.39	ZV322S_K403_0320 ME20	3600	3300	5500	≤24	0.62	102	51	25	34	3	22	70.0	13	6.6	13	6.6	16	13	458	232
33.68	ZV322S_K402_0340 ME20	3600	3300	5500	≤24	0.60	102	41	15	34	3	22	70.0	11	6.6	13	6.6	20	13	467	232
34.76	ZV322S_K402_0350 ME20	3600	3300	5500	≤32	0.58	102	41	15	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
34.76	ZV322S_K402_0350 ME30	3500	3300	5000	≤38	0.53	102	41	15	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
35.72	ZV322S_K403_0360 ME20	3600	3300	5500	≤24	0.57	102	51	25	34	3	22	70.0	14	6.6	14	6.6	18	13	505	232
39.05	ZV322S_K403_0390 ME20	3600	3300	5500	≤24	0.52	102	51	25	34	3	22	70.0	15	6.6	15	6.6	20	13	540	232
40.51	ZV322S_K402_0410 ME20	3600	3300	5500	≤24	0.50	102	41	15	34	3	22	70.0	8.8	6.6	11	6.6	18	13	370	232
44.54	ZV322S_K403_0450 ME20	3600	3300	5500	≤24	0.45	102	51	25	34	3	22	70.0	15	6.6	15	6.6	22	13	540	232
46.31	ZV322S_K402_0460 ME20	3600	3300	5500	≤24	0.44	102	41	15	34	3	22	70.0	15	6.6	15	6.6	28	13	540	232
48.94	ZV322S_K403_0490 ME20	3600	3300	5500	≤24	0.41	102	51	25	34	3	22	70.0	15	6.6	15	6.6	25	13	540	232
50.43	ZV322S_K402_0500 ME20	3600	3300	5500	≤24	0.40	102	41	15	34	3	22	70.0	7.7	6.6	9.2	6.6	15	13	323	232
53.69	ZV322S_K403_0540 ME20	3600	3300	5500	≤24	0.38	102	51	25	34	3	22	70.0	15	6.6	15	6.6	27	13	540	232
55.71	ZV322S_K402_0560 ME20	3600	3300	5500	≤24	0.36	102	41	15	34	3	22	70.0	12	6.6	15	6.6	24	13	508	232
65.50	ZV322S_K403_0650 ME20	3600	3300	5500	≤24	0.31	102	51	25	34	3	22	70.0	15	6.6	15	6.6	29	13	540	232
66.35	ZV322S_K403_0660 ME10	3600	3300	5500	≤19	0.30	102	51	25	34	3	22	70.0	9.7	6.6	9.7	6.6	12	12	340	232
67.30	ZV322S_K403_0670 ME20	3600	3300	5500	≤24	0.30	102	51	25	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
69.34	ZV322S_K402_0690 ME20	3600	3300	5500	≤24	0.29	102	41	15	34	3	22	70.0	11	6.6	13	6.6	21	13	445	232
78.10	ZV322S_K403_0780 ME20	3600	3300	5500	≤24	0.26	102	51	25	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
79.11	ZV322S_K403_0790 ME10	3600	3300	5500	≤19	0.26	102	51	25	34	3	22	70.0	12	6.6	12	6.6	14	13	406	232
90.06	ZV322S_K403_0900 ME20	3600	3300	5500	≤24	0.22	102	51	25	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
91.23	ZV322S_K403_0910 ME10	3600	3300	5500	≤19	0.22	102	51	25	34	3	22	70.0	13	6.6	13	6.6	17	13	468	232
107.4	ZV322S_K403_1070 ME20	3600	3300	5500	≤24	0.19	102	51	25	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
108.8	ZV322S_K403_1090 ME10	3600	3300	5500	≤19	0.19	102	51	25	34	3	22	70.0	15	6.6	15	6.6	20	13	540	232
134.4	ZV322S_K403_1340 ME20	3600	3300	5500	≤24	0.15	102	51	25	34	3	22	70.0	15	6.6	15	6.6	31	13	540	232
136.1	ZV322S_K403_1360 ME10	3600	3300	5500	≤19	0.15	102	51	25	34	3	22	70.0	15	6.6	15	6.6	23	13	540	232
179.1	ZV322S_K403_1790 ME20	3600	3300	5500	≤24	0.11	102	51	25	34	3	22	70.0	15	6.6	15	6.6	28	13	540	232
181.4	ZV322S_K403_1810 ME10	3600	3300	5500	≤19	0.11	102	51	25	34	3	22	70.0	15	6.6	15	6.6	28	13	540	232
215.4	ZV322S_K403_2150 ME20	3600	3300	5500	≤24	0.09	102	51	25	34	3	22	70.0	12	6.6	15	6.6	24	13	508	232
218.2	ZV322S_K403_2180 ME10	3600	3300	5500	≤19	0.09	102	51	25	34	3	22	70.0	12	6.6	15	6.6	24	13	508	232
271.6	ZV322S_K403_2720 ME10	3600	3300	5500	≤19	0.07	102	51	25	34	3	22	70.0	11	6.6	13	6.6	21	13	445	232
<b>ZV4K4 (F<sub>v2acc,max</sub> = 15 kN)</b>																					
4.000	ZV418S_K402_0040 ME30	2600	2200	3800	≤38	3.80	111	44	17	33	4	18	76.4	8.0	6.9	12	6.9	20	14	459	265
4.000	ZV418S_K402_0040 ME40	2600	2200	3800	≤48	3.80	111	44	17	33	4	18	76.4	8.0	6.9	12	6.9	20	14	459	265
4.364	ZV418S_K402_0044 ME30	2600	2200	3800	≤38	3.48	111	44	17	33	4	18	76.4	8.2	6.9	12	6.9	22	14	472	265
4.364	ZV418S_K402_0044 ME40	2600	2200	3800	≤48	3.48	111	44													

12.2 Selection tables 12 ZVK rack and pinion drives

i	Type	n <sub>1maxDB</sub>		n <sub>1maxZV</sub>	d <sub>MW</sub>	v <sub>f2maxZB</sub>	Δs	Δs <sub>redll</sub>	Δs <sub>redl</sub>	C <sub>lin</sub>	m <sub>n</sub>	z	d <sub>0</sub>	F <sub>f2N,S</sub>	F <sub>f2N,E</sub>	F <sub>f2accS</sub>	F <sub>f2accE</sub>	F <sub>f2NOT,S</sub>	F <sub>f2NOT,E</sub>	M <sub>2accS</sub>	M <sub>2accE</sub>
		EL1,2 [rpm]	EL3,4,5,6 [rpm]																		
<b>ZV4K4 (F<sub>v2acc,max</sub> = 15 kN)</b>																					
5.422	ZV418S_K402_0054 ME40	2600	2200	3800	≤48	2.80	111	44	17	34	4	18	76.4	8.9	6.9	13	6.9	28	14	508	265
6.000	ZV418S_K402_0060 ME30	2600	2200	3800	≤38	2.53	111	44	17	34	4	18	76.4	9.2	6.9	14	6.9	29	14	525	265
6.000	ZV418S_K402_0060 ME40	2600	2200	3800	≤48	2.53	111	44	17	34	4	18	76.4	9.2	6.9	14	6.9	29	14	525	265
6.719	ZV418S_K402_0067 ME20	3000	2600	4500	≤32	2.68	111	44	17	33	4	18	76.4	9.5	6.9	10	6.9	13	13	391	265
6.719	ZV418S_K402_0067 ME30	3000	2600	4500	≤38	2.68	111	44	17	34	4	18	76.4	9.5	6.9	14	6.9	29	14	545	265
6.719	ZV418S_K402_0067 ME40	3000	2600	4500	≤48	2.68	111	44	17	34	4	18	76.4	9.5	6.9	14	6.9	29	14	545	265
7.456	ZV418S_K402_0075 ME30	2600	2200	3800	≤38	2.04	111	44	17	34	4	18	76.4	9.9	6.9	15	6.9	29	14	564	265
7.456	ZV418S_K402_0075 ME40	2600	2200	3800	≤48	2.04	111	44	17	34	4	18	76.4	9.9	6.9	15	6.9	29	14	564	265
8.377	ZV418S_K402_0084 ME20	3000	2600	4500	≤32	2.15	111	44	17	34	4	18	76.4	10	6.9	13	6.9	16	14	488	265
8.377	ZV418S_K402_0084 ME30	3000	2600	4500	≤38	2.15	111	44	17	34	4	18	76.4	10	6.9	15	6.9	29	14	573	265
8.377	ZV418S_K402_0084 ME40	3000	2600	4500	≤48	2.15	111	44	17	34	4	18	76.4	10	6.9	15	6.9	29	14	573	265
9.238	ZV418S_K402_0092 ME20	3000	2600	4500	≤32	1.95	111	44	17	34	4	18	76.4	11	6.9	14	6.9	18	14	538	265
9.238	ZV418S_K402_0092 ME30	3000	2600	4500	≤38	1.95	111	44	17	34	4	18	76.4	11	6.9	15	6.9	29	14	573	265
9.238	ZV418S_K402_0092 ME40	3000	2600	4500	≤48	1.95	111	44	17	34	4	18	76.4	11	6.9	15	6.9	29	14	573	265
10.10	ZV418S_K402_0100 ME20	3400	3000	5000	≤32	1.98	111	44	17	34	4	18	76.4	11	6.9	15	6.9	19	14	573	265
10.10	ZV418S_K402_0100 ME30	3400	3000	5000	≤38	1.98	111	44	17	34	4	18	76.4	11	6.9	15	6.9	29	14	573	265
10.10	ZV418S_K402_0100 ME40	3000	3000	4500	≤48	1.78	111	44	17	34	4	18	76.4	11	6.9	15	6.9	29	14	573	265
11.52	ZV418S_K402_0115 ME20	3000	2600	4500	≤32	1.56	111	44	17	34	4	18	76.4	11	6.9	15	6.9	22	14	573	265
11.52	ZV418S_K402_0115 ME30	3000	2600	4500	≤38	1.56	111	44	17	34	4	18	76.4	11	6.9	15	6.9	29	14	573	265
11.52	ZV418S_K402_0115 ME40	3000	2600	4500	≤48	1.56	111	44	17	34	4	18	76.4	11	6.9	15	6.9	29	14	573	265
12.66	ZV418S_K402_0125 ME20	3400	3000	5000	≤32	1.58	111	44	17	34	4	18	76.4	12	6.9	15	6.9	23	14	573	265
12.66	ZV418S_K402_0125 ME30	3400	3000	5000	≤38	1.58	111	44	17	34	4	18	76.4	12	6.9	15	6.9	29	14	573	265
12.66	ZV418S_K402_0125 ME40	3000	3000	4500	≤48	1.42	111	44	17	34	4	18	76.4	12	6.9	15	6.9	29	14	573	265
13.89	ZV418S_K402_0140 ME20	3400	3000	5000	≤32	1.44	111	44	17	34	4	18	76.4	12	6.9	15	6.9	26	14	573	265
13.89	ZV418S_K402_0140 ME30	3400	3000	5000	≤38	1.44	111	44	17	34	4	18	76.4	12	6.9	15	6.9	29	14	573	265
13.89	ZV418S_K402_0140 ME40	3000	3000	4500	≤48	1.30	111	44	17	34	4	18	76.4	12	6.9	15	6.9	29	14	573	265
16.94	ZV418S_K402_0170 ME20	3600	3300	5500	≤32	1.30	111	44	17	34	4	18	76.4	13	6.9	15	6.9	27	14	573	265
16.94	ZV418S_K402_0170 ME30	3500	3300	5000	≤38	1.18	111	44	17	34	4	18	76.4	13	6.9	15	6.9	29	14	573	265
16.94	ZV418S_K402_0170 ME40	3000	3000	4500	≤48	1.06	111	44	17	34	4	18	76.4	13	6.9	15	6.9	29	14	573	265
17.41	ZV418S_K402_0175 ME20	3400	3000	5000	≤32	1.15	111	44	17	34	4	18	76.4	13	6.9	15	6.9	29	14	573	265
17.41	ZV418S_K402_0175 ME30	3400	3000	5000	≤38	1.15	111	44	17	34	4	18	76.4	13	6.9	15	6.9	29	14	573	265
17.41	ZV418S_K402_0175 ME40	3000	3000	4500	≤48	1.03	111	44	17	34	4	18	76.4	13	6.9	15	6.9	29	14	573	265
20.20	ZV418S_K402_0200 ME20	3600	3300	5500	≤32	1.09	111	44	17	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
20.20	ZV418S_K402_0200 ME30	3500	3300	5000	≤38	0.99	111	44	17	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
23.29	ZV418S_K402_0230 ME20	3600	3300	5500	≤32	0.95	111	44	17	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
23.29	ZV418S_K402_0230 ME30	3500	3300	5000	≤38	0.86	111	44	17	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
23.29	ZV418S_K402_0230 ME40	3000	3000	4500	≤48	0.77	111	44	17	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
25.28	ZV418S_K402_0250 ME20	3600	3300	5500	≤32	0.87	111	44	17	34	4	18	76.4	13	6.9	15	6.9	26	14	573	265
25.28	ZV418S_K402_0250 ME30	3500	3300	5000	≤38	0.79	111	44	17	34	4	18	76.4	13	6.9	15	6.9	26	14	573	265
27.77	ZV418S_K402_0280 ME20	3600	3300	5500	≤32	0.79	111	44	17	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
27.77	ZV418S_K402_0280 ME30	3500	3300	5000	≤38	0.72	111	44	17	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
32.39	ZV418S_K403_0320 ME20	3600	3300	5500	≤24	0.68	111	56	28	34	4	18	76.4	12	6.9	12	6.9	15	14	458	265
33.68	ZV418S_K402_0340 ME20	3600	3300	5500	≤24	0.65	111	44	17	34	4	18	76.4	10	6.9	12	6.9	19	14	467	265
34.76	ZV418S_K402_0350 ME20	3600	3300	5500	≤32	0.63	111	44	17	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
34.76	ZV418S_K402_0350 ME30	3500	3300	5000	≤38	0.58	111	44	17	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
35.72	ZV418S_K403_0360 ME20	3600	3300	5500	≤24	0.62	111	56	28	34	4	18	76.4	13	6.9	13	6.9	17	14	505	265
39.05	ZV418S_K403_0390 ME20	3600	3300	5500	≤24	0.56	111	56	28	34	4	18	76.4	14	6.9	14	6.9	18	14	552	265
40.51	ZV418S_K402_0410 ME20	3600	3300	5500	≤24	0.54	111	44	17	34	4	18	76.4	8.1	6.9	9.7	6.9	16	14	370	265
44.54	ZV418S_K403_0450 ME20	3600	3300	5500	≤24	0.49	111	56	28	34	4	18	76.4	14	6.9	15	6.9	21	14	573	265
46.31	ZV418S_K402_0460 ME20	3600	3300	5500	≤24	0.48	111	44	17	34	4	18	76.4	14	6.9	15	6.9	26	14	573	265
48.94	ZV418S_K403_0490 ME20	3600	3300	5500	≤24	0.45	111	56	28	34	4	18	76.4	14	6.9	15	6.9	23	14	573	265
50.43	ZV418S_K402_0500 ME20	3600	3300	5500	≤24	0.44	111	44	17	34	4	18	76.4	7.1	6.9	8.5	6.9	14	14	323	265
53.69	ZV418S_K403_0540 ME20	3600	3300	5500	≤24	0.41	111	56	28	34	4	18	76.4	14	6.9	15	6.9	25	14	573	265
55.71	ZV418S_K402_0560 ME20	3600	3300	5500	≤24	0.40	111	44	17	34	4	18	76.4	11	6.9	13	6.9	22	14	508	265
65.50	ZV418S_K403_0650 ME20	3600	3300	5500	≤24	0.34	111	56	28	34	4	18	76.4	14	6.9	15	6.9	27	14	573	265
66.35	ZV418S_K403_0660 ME10	3600	3300	5500	≤19	0.33	111	56	28	34	4	18	76.4	8.9	6.9	8.9	6.9	11	11	340	265
67.30	ZV418S_K403_0670 ME20	3600	3300	5500	≤24	0.33	111	56	28	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
69.34	ZV418S_K402_0690 ME20	3600	3300	5500	≤24	0.32	111	44	17	34	4	18	76.4	9.7	6.9	12	6.9	19	14	445	265
78.10	ZV418S_K403_0780 ME20	3600	3300	5500	≤24	0.28	111	56	28	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
79.11	ZV418S_K403_0790 ME10	3600	3300	5500	≤19	0.28	111	56	28	34	4	18	76.4	11	6.9	11	6.9	13	13	406	265
90.06	ZV418S_K403_0900 ME20	3600	3300	5500	≤24	0.24	111	56	28	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
91.23	ZV418S_K403_0910 ME10	3600	3300	5500	≤19	0.24	111	56	28	34	4	18	76.4	1							

i	Type	n <sub>1maxDB</sub>		n <sub>1maxZV</sub>	d <sub>MW</sub>	v <sub>2maxZB</sub>	Δs	Δs <sub>redII</sub>	Δs <sub>redI</sub>	C <sub>lin</sub>	m <sub>n</sub>	z	d <sub>0</sub>	F <sub>f2N,S</sub>	F <sub>f2N,E</sub>	F <sub>f2accS</sub>	F <sub>f2accE</sub>	F <sub>f2NOT,S</sub>	F <sub>f2NOT,E</sub>	M <sub>2accS</sub>	M <sub>2accE</sub>
		EL1,2 [rpm]	EL3,4,5,6 [rpm]																		
<b>ZV4K4 (F<sub>v2acc,max</sub> = 15 kN)</b>																					
134.4	ZV418S_K403_1340 ME20	3600	3300	5500	≤24	0.16	111	56	28	34	4	18	76.4	14	6.9	15	6.9	29	14	573	265
136.1	ZV418S_K403_1360 ME10	3600	3300	5500	≤19	0.16	111	56	28	34	4	18	76.4	14	6.9	15	6.9	21	14	573	265
179.1	ZV418S_K403_1790 ME20	3600	3300	5500	≤24	0.12	111	56	28	34	4	18	76.4	14	6.9	15	6.9	26	14	573	265
181.4	ZV418S_K403_1810 ME10	3600	3300	5500	≤19	0.12	111	56	28	34	4	18	76.4	14	6.9	15	6.9	26	14	573	265
215.4	ZV418S_K403_2150 ME20	3600	3300	5500	≤24	0.10	111	56	28	34	4	18	76.4	11	6.9	13	6.9	22	14	508	265
218.2	ZV418S_K403_2180 ME10	3600	3300	5500	≤19	0.10	111	56	28	34	4	18	76.4	11	6.9	13	6.9	22	14	508	265
271.6	ZV418S_K403_2720 ME10	3600	3300	5500	≤19	0.08	111	56	28	34	4	18	76.4	9.7	6.9	12	6.9	19	14	445	265





## 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:  $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

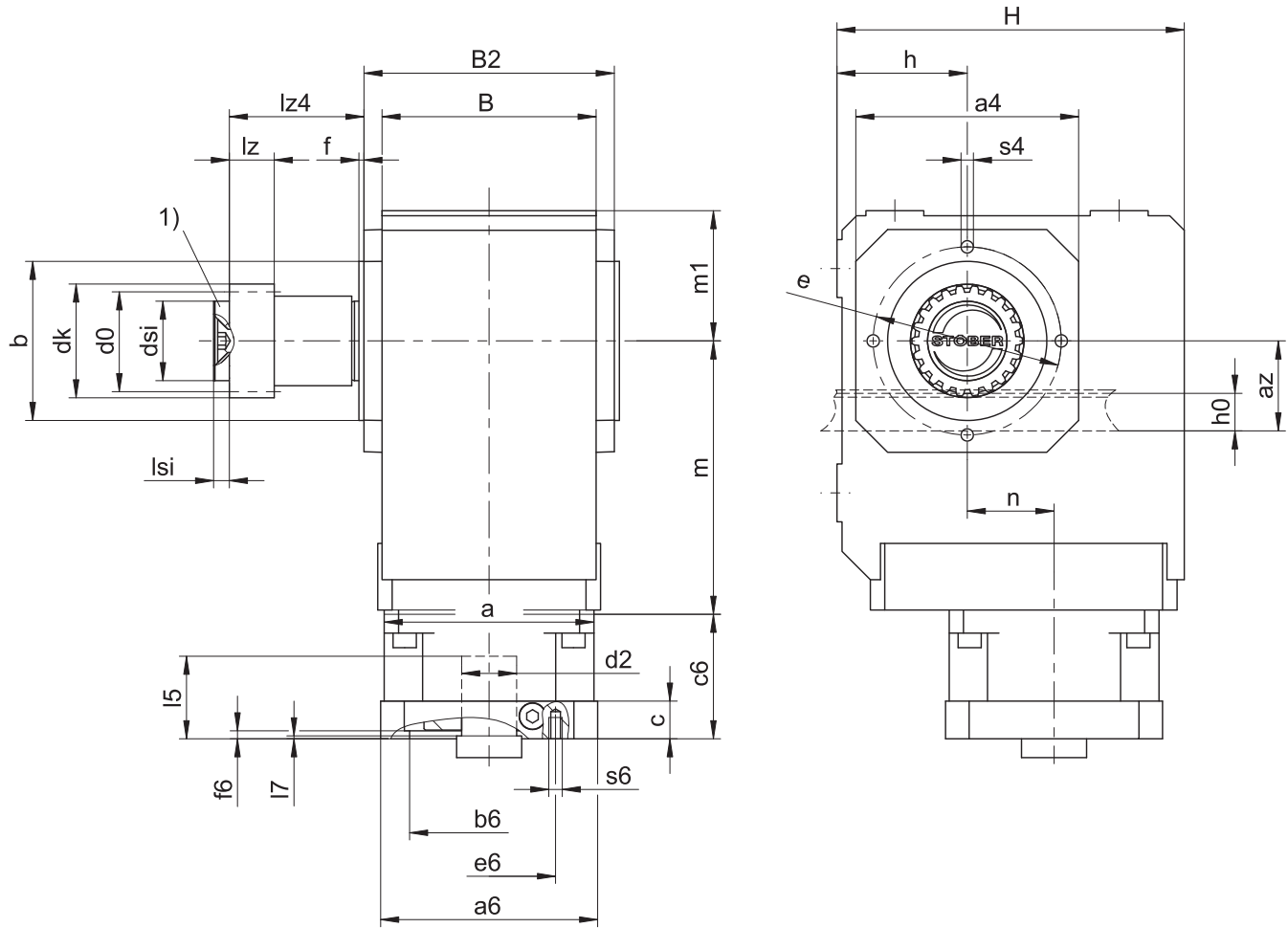
The pinion of the rack and pinion drive is helical (left-hand  $19^\circ 31' 42''$ ). The pinion gearing quality is 5.

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 <https://configurator.stoeber.de/en-US/>.

### 12.3.1 Pinion position E



1) Axial locking (optional)

#### Output dimensions

Type	mn	az	□a4	Øb	B	B2	Ød0	Ødk	Ødsi	Øe	f	h	h0	H	l <sub>z</sub>	l <sub>z4</sub>	l <sub>si</sub>	m1	s4	x
ZV220SEK102_	2	44.02	105	75 <sub>β</sub>	90	106	42.44	47.90	30	90	3.0	60	22	160	26	50.5	6	60	M8	0.4
ZV225SEK202_	2	49.33	116	82 <sub>β</sub>	115	134	53.05	58.52	45	100	3.0	65	22	190	26	67.5	8	65	M8	0.4
ZV225SEK203_	2	49.33	116	82 <sub>β</sub>	115	134	53.05	58.52	45	100	3.0	65	22	190	26	67.5	8	65	M8	0.4
ZV318SEK202_	3	55.55	116	82 <sub>β</sub>	115	134	57.30	65.01	45	100	3.0	65	26	190	31	67.5	8	65	M8	0.3
ZV318SEK203_	3	55.55	116	82 <sub>β</sub>	115	134	57.30	65.01	45	100	3.0	65	26	190	31	67.5	8	65	M8	0.3
ZV225SEK302_	2	49.33	132	95 <sub>β</sub>	130	146	53.05	58.52	45	115	3.0	75	22	213	26	68.5	8	75	M8	0.4
ZV225SEK303_	2	49.33	132	95 <sub>β</sub>	130	146	53.05	58.52	45	115	3.0	75	22	213	26	68.5	8	75	M8	0.4
ZV318SEK302_	3	55.55	132	95 <sub>β</sub>	130	146	57.30	65.01	45	115	3.0	75	26	213	31	68.5	8	75	M8	0.3
ZV318SEK303_	3	55.55	132	95 <sub>β</sub>	130	146	57.30	65.01	45	115	3.0	75	26	213	31	68.5	8	75	M8	0.3
ZV322SEK402_	3	62.21	152	110 <sub>β</sub>	148	173	70.03	78.35	55	130	3.5	90	26	240	31	93.0	10	90	M10	0.4
ZV322SEK403_	3	62.21	152	110 <sub>β</sub>	148	173	70.03	78.35	55	130	3.5	90	26	240	31	93.0	10	90	M10	0.4
ZV418SEK402_	4	74.40	152	110 <sub>β</sub>	148	173	76.40	86.77	55	130	3.5	90	35	240	41	93.0	10	90	M10	0.3
ZV418SEK403_	4	74.40	152	110 <sub>β</sub>	148	173	76.40	86.77	55	130	3.5	90	35	240	41	93.0	10	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

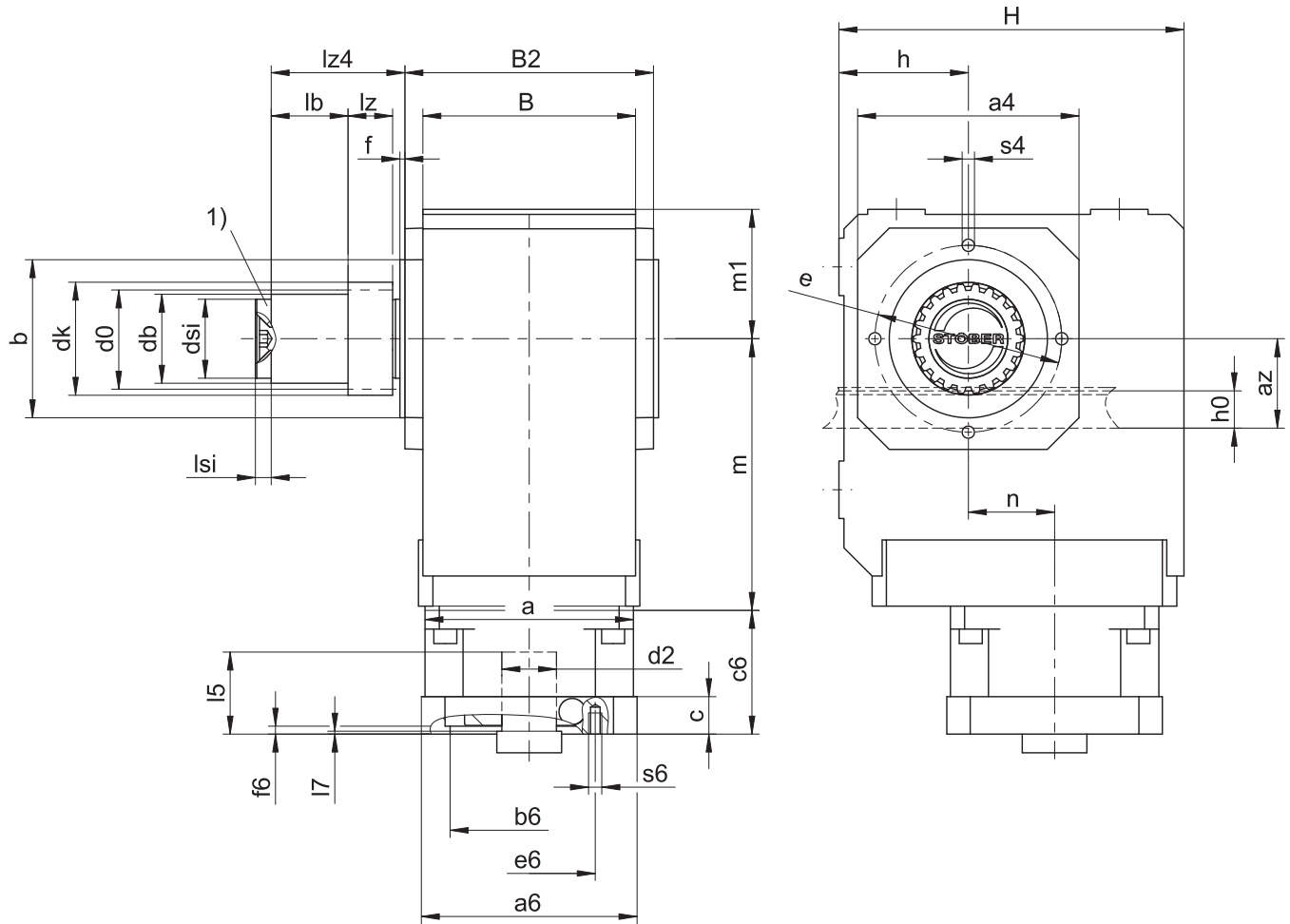
Type	∅b6	∅e6	∅d2max	l5	□a6	c	c6	f6	l7	s6
ME10	95 <sup>H7</sup>	115	19	41	100	21	61	4.0	3.0	M8
ME20	110 <sup>H7</sup>	130	32	53	120	24	74	4.0	3.5	M8
ME30	130 <sup>H7</sup>	165	38	62	150	26	86	5.5	4.5	M10
ME40	180 <sup>H7</sup>	215	48	82	204	35	123	5.5	5.5	M12

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6 and l5 are also lengthened accordingly.**

You will find additional motor connection dimensions for the ME motor adapter in our STOBBER Configurator at <https://configurator.stoeber.de/en-US/>. 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	□a4	Øb	B	B2	Ød0	Ødb	Ødk	Ødsi	Øe	f	h	h0	H	lb	lz	lz4	lsi	m1	Øs4	x
ZV220SSK102_	2	44.02	105	75 <sub>f6</sub>	90	106	42.44	38	47.90	30	90	3.0	60	22	160	12.5	26	50.5	6	60	M8	0.4
ZV225SSK202_	2	49.33	116	82 <sub>f6</sub>	115	134	53.05	50	58.52	45	100	3.0	65	22	190	34.5	26	67.5	8	65	M8	0.4
ZV225SSK203_	2	49.33	116	82 <sub>f6</sub>	115	134	53.05	50	58.52	45	100	3.0	65	22	190	34.5	26	67.5	8	65	M8	0.4
ZV318SSK202_	3	55.55	116	82 <sub>f6</sub>	115	134	57.30	50	65.01	45	100	3.0	65	26	190	29.5	31	67.5	8	65	M8	0.3
ZV318SSK203_	3	55.55	116	82 <sub>f6</sub>	115	134	57.30	50	65.01	45	100	3.0	65	26	190	29.5	31	67.5	8	65	M8	0.3
ZV225SSK302_	2	49.33	132	95 <sub>f6</sub>	130	146	53.05	50	58.52	45	115	3.0	75	22	213	34.5	26	68.5	8	75	M8	0.4
ZV225SSK303_	2	49.33	132	95 <sub>f6</sub>	130	146	53.05	50	58.52	45	115	3.0	75	22	213	34.5	26	68.5	8	75	M8	0.4
ZV318SSK302_	3	55.55	132	95 <sub>f6</sub>	130	146	57.30	50	65.01	45	115	3.0	75	26	213	29.5	31	68.5	8	75	M8	0.3
ZV318SSK303_	3	55.55	132	95 <sub>f6</sub>	130	146	57.30	50	65.01	45	115	3.0	75	26	213	29.5	31	68.5	8	75	M8	0.3
ZV322SSK402_	3	62.21	152	110 <sub>f6</sub>	148	173	70.03	62	78.35	55	130	3.5	90	26	240	53.5	31	93.0	10	90	M10	0.4
ZV322SSK403_	3	62.21	152	110 <sub>f6</sub>	148	173	70.03	62	78.35	55	130	3.5	90	26	240	53.5	31	93.0	10	90	M10	0.4
ZV418SSK402_	4	74.40	152	110 <sub>f6</sub>	148	173	76.40	62	86.77	55	130	3.5	90	35	240	43.5	41	93.0	10	90	M10	0.3
ZV418SSK403_	4	74.40	152	110 <sub>f6</sub>	148	173	76.40	62	86.77	55	130	3.5	90	35	240	43.5	41	93.0	10	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	∅b6	∅e6	∅d2max	l5	□a6	c	c6	f6	l7	s6
ME10	95 <sup>H7</sup>	115	19	41	100	21	61	4.0	3.0	M8
ME20	110 <sup>H7</sup>	130	32	53	120	24	74	4.0	3.5	M8
ME30	130 <sup>H7</sup>	165	38	62	150	26	86	5.5	4.5	M10
ME40	180 <sup>H7</sup>	215	48	82	204	35	123	5.5	5.5	M12

In the table above, you will find example dimensions for the motor connection for the ME motor adapter.

**Note that when dimension c is lengthened, dimensions c6 and l5 are also lengthened accordingly.**

You will find additional motor connection dimensions for the ME motor adapter in our STOBBER Configurator at <https://configurator.stoeber.de/en-US/>. 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.

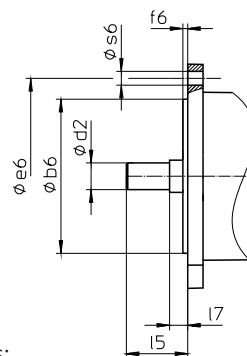
### Example code

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
0084	Transmission ratio (i x 10 rounded)	$i = 8.377$ (example)
ME30	Motor adapter	ME30 motor adapter (example) with EasyAdapt coupling
MQ		Square motor adapter with backlash-free plug-in coupling
MB <sup>1</sup>		ServoStop motor adapter with brake

To complete the type designation, also specify the following in your order:



- Motor type or motor dimensions:

To choose a suitable motor connection, use the STOBBER Configurator at

<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

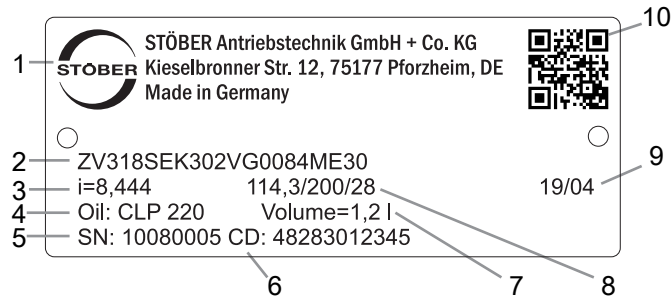
- Mounting position, see the chapter [▶ 12.5.6]
- Attachment of solid shaft: gear unit side 3 or 4
- Pitch circle diameter: gear unit side 3 or 4
- Backlash: Standard/class II/class I. Backlash class II and class I for an additional charge.
- For axial locking (optional), see the chapter [▶ 12.3]
- Position of locking screw access, see the chapter [▶ 12.5.8]
- ZV\_K102\_, ZV\_K202\_, ZV\_K302\_, ZV\_K402\_: Pinion lock for motor adapter (optional)
- Double seal for ME motor adapter (optional)

An explanation of the gear unit sides can be found in the chapter [▶ 12.5.6]

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 [▶ 12.5.1].

## 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	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)

### 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>

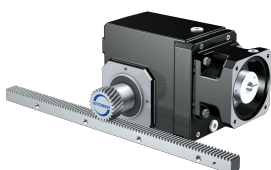
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

## 12.5 Product description

### 12.5.1 Input options

This chapter shows you all available input options:

ME motor adapter



Catalog ID 443137\_en

EZ synchronous servo motor



Catalog ID 443286\_en

MB motor adapter



On request

LM Lean motor



On request

The corresponding catalogs can be found at <http://www.stober.de/en/downloads/>

Enter the ID of the catalog in the Search term field.

You can also acquire rack and pinion drives with low-backlash K gear units on request. To do so, send us an e-mail at [sales@stober.de](mailto:sales@stober.de).



## 12.5.2 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, patented clamp coupling with expanding function
- Lowest mass moments of inertia for the highest dynamics
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- Error-free, thanks to exact centering of the motor



Fig. 1: EasyAdapt coupling

## 12.5.3 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 (jaw coupling).

**Properties:**

- Fast and easy motor attachment
- Removal of the motor possible in any position
- With integrated thermal length compensation, compensates for linear expansion of the motor shaft
- Motor shaft decoupled from axial forces
- Balanced for smooth running without vibration, even at high speeds
- Large selection of motor shaft diameters and lengths
- Error-free, thanks to exact centering of the motor



Fig. 2: Backlash-free plug-in coupling

For all technical data and combinations with our gear units, refer to <https://configurator.stoeber.de/en-US/>.

## 12.5.4 Gear rack

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 6.

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

Also note the project configuration of the gear rack on the Atlanta pages.

### 12.5.4.1 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: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

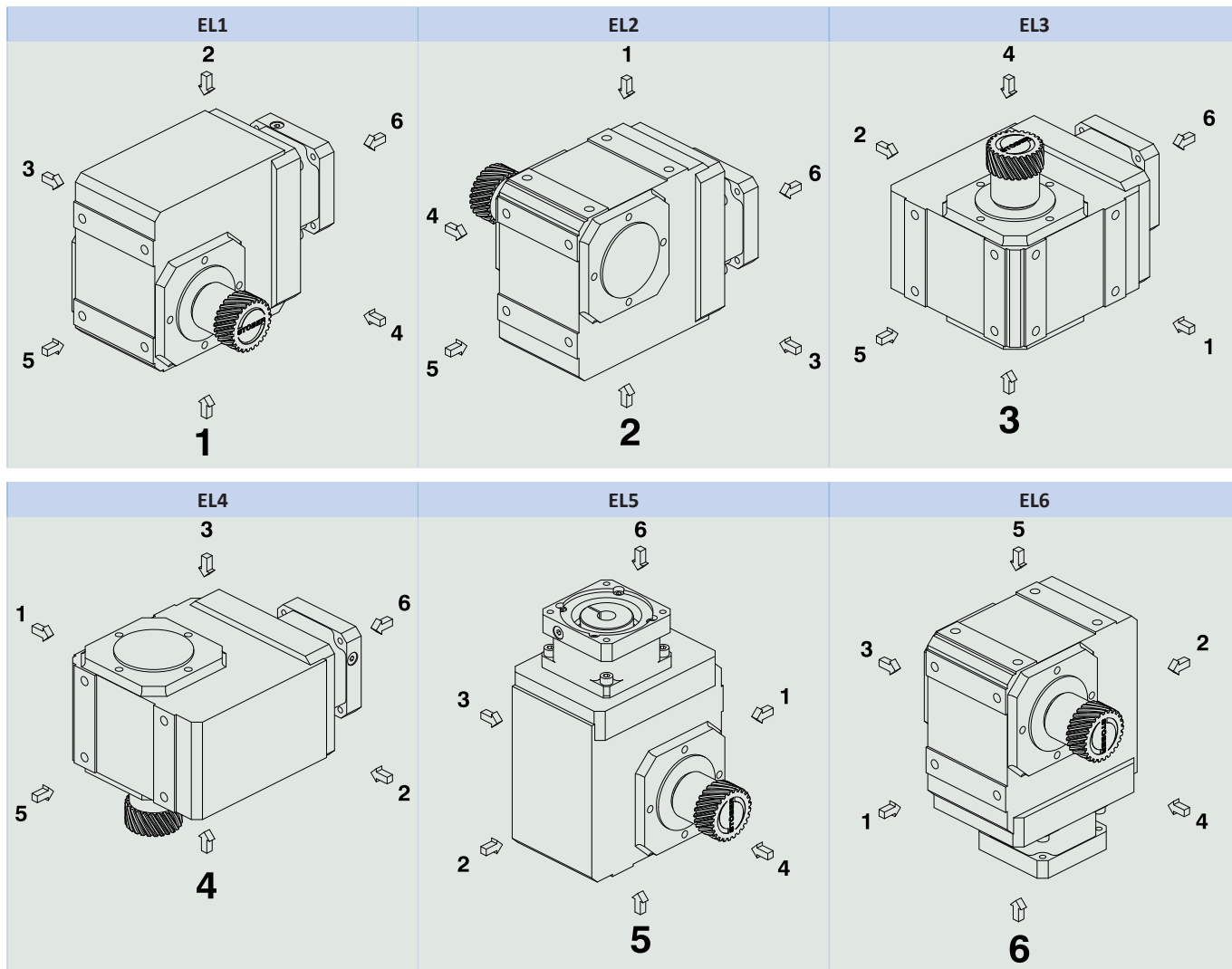
## 12.5.5 Installation conditions

The specified torques and forces only apply when gear units are fastened on the machine side using screws of strength class 10.9. In addition, the gear housings must be adjusted at the pilot. The machine-side fit must be H7.

## 12.5.6 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.

## 12.5.7 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.

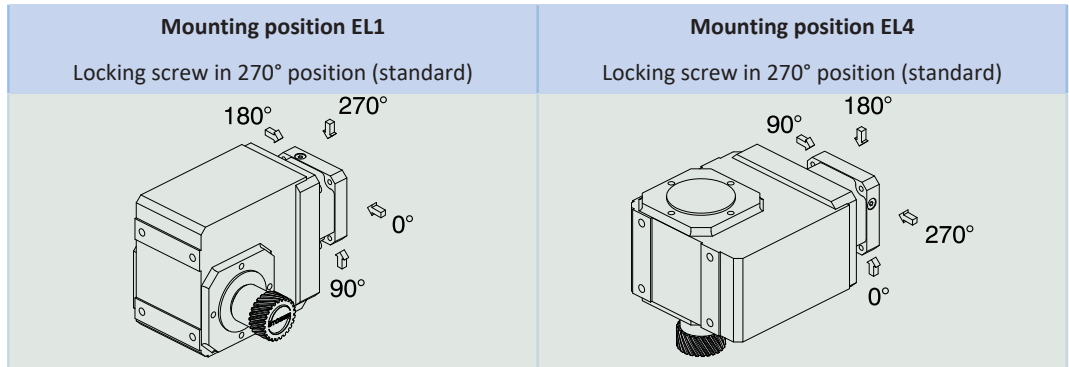
Only install the gear units in the intended mounting position! Reposition the gear units only after consulting STOBER. Otherwise, STOBER assumes no liability for the gear units.

You will receive lubricants for use in the food industry upon request.

### 12.5.7.1 Rack and pinion drive lubrication

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

### 12.5.8 Position of locking screw access



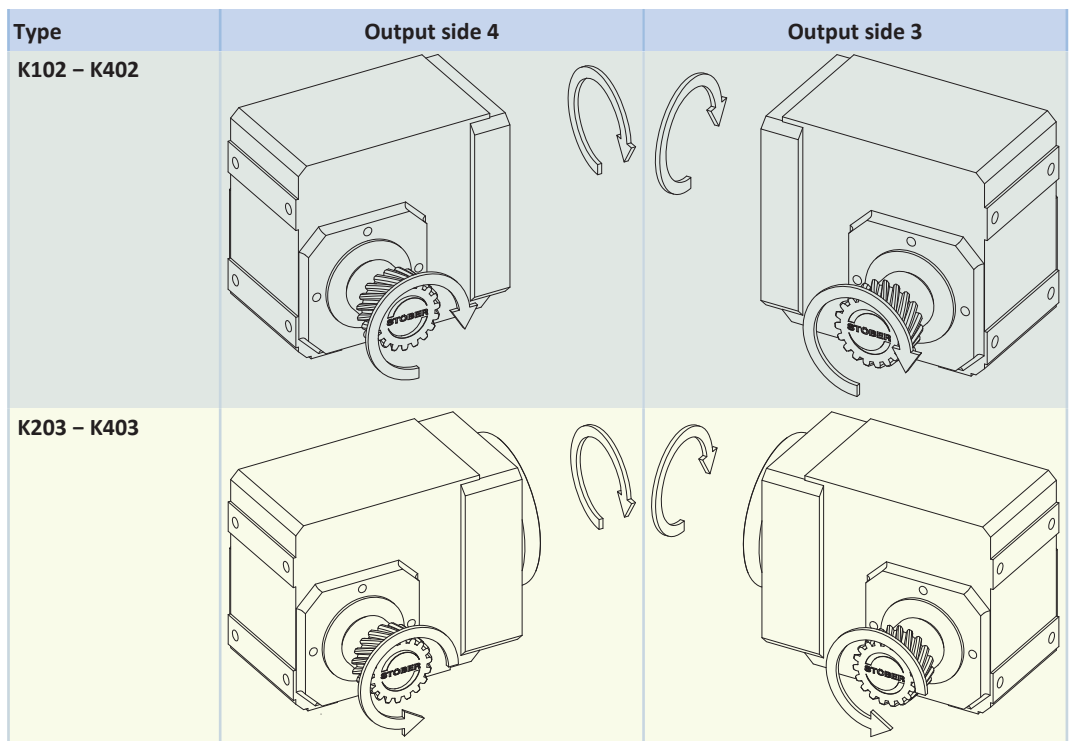
Indicate variations for your gear unit in the order.

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

### 12.5.9 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: <sup>2</sup>	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

### 12.5.10 Direction of rotation



The pictures show mounting position EL1.

<sup>2</sup> Observe the protection class of all the components.

## 12.6 Project configuration

Project your drives using our SERVOnsoft designing software. Download SERVOnsoft for free at <https://www.stoeber.de/en/ServoSoft>.

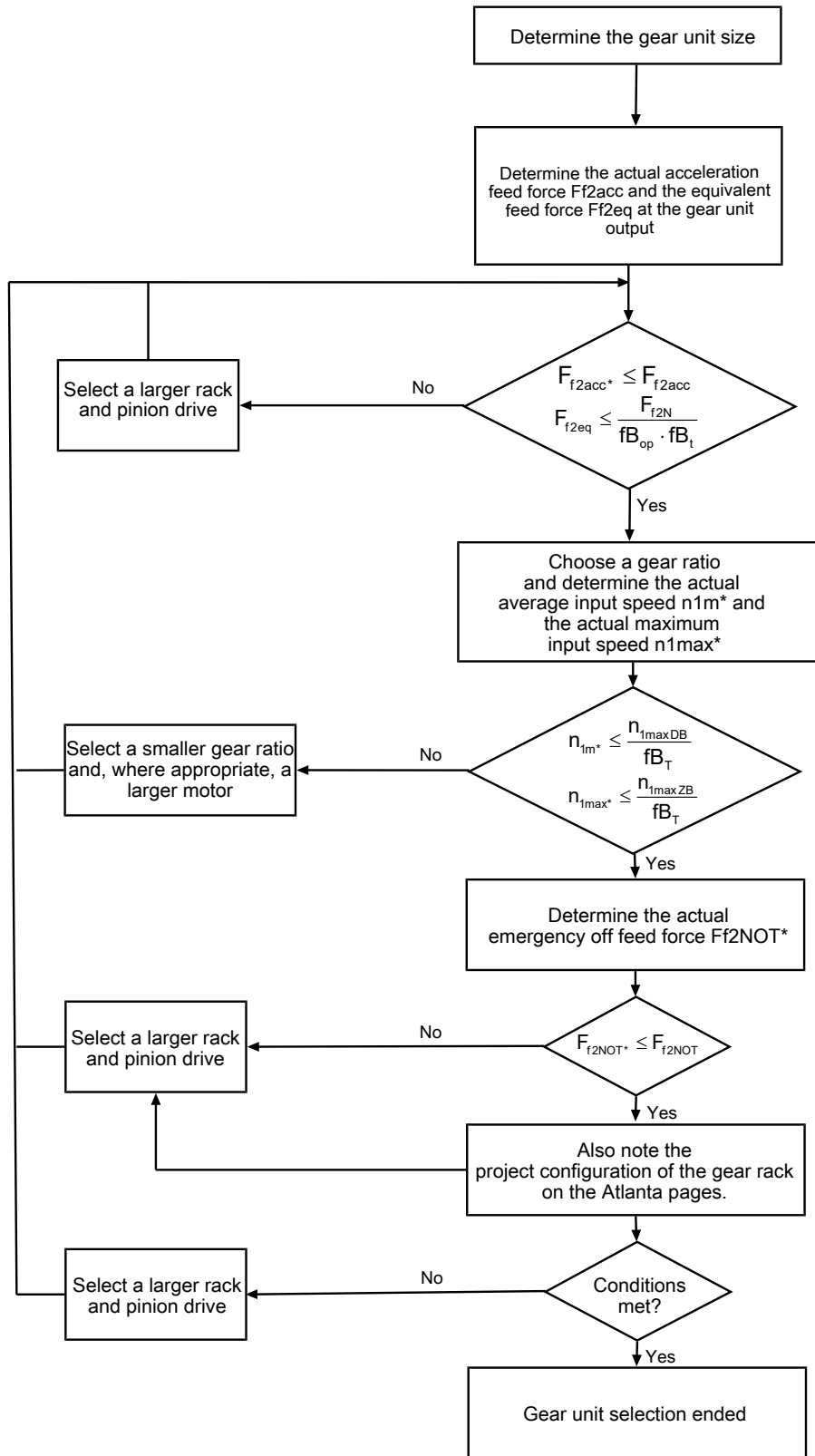
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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 [▶ 13.1](#).

### 12.6.1 Drive selection

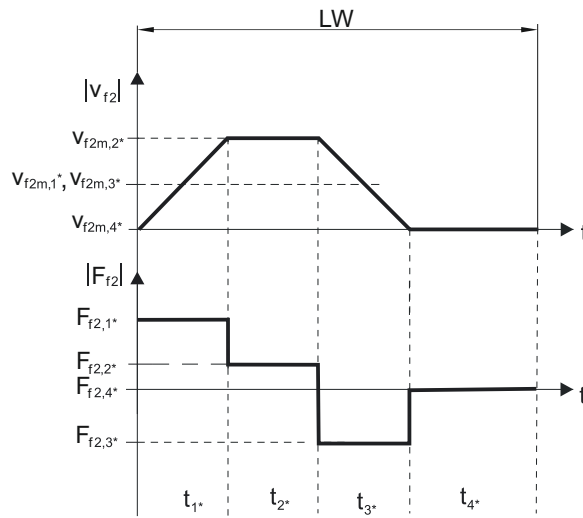


Refer to the selection tables for the values for  $i$ ,  $n_{1maxDB}$ ,  $n_{1maxZB}$ ,  $F_{f2acc}$ ,  $F_{f2N}$  and  $F_{f2NOT}$ . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

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**

$$n_{im} = \frac{v_{f2m} \cdot i}{d_0 \cdot \pi}$$

$$v_{f2m} = \frac{|v_{f2m,1}| \cdot t_1 + \dots + |v_{f2m,n}| \cdot t_n}{t_1 + \dots + t_n}$$

If  $t_1 + \dots + t_3 \geq 6$  min, determine  $v_{2m}$  without the rest phase  $t_4$ .

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**

$$F_{f2eq} = \sqrt[3]{\frac{|v_{f2m,1}| \cdot t_1 \cdot |F_{f2,1}|^3 + \dots + |v_{f2m,n}| \cdot t_n \cdot |F_{f2,n}|^3}{|v_{f2m,1}| \cdot t_1 + \dots + |v_{f2m,n}| \cdot t_n}}$$

**Operating factors**

Operating mode	$fB_{op}$
Uniform continuous operation	1.00
Cyclic operation	1.25
Reversing load cyclic operation	1.40

Run time	$fB_t$
Daily runtime $\leq 8$ h	1.00
Daily runtime $\leq 16$ h	1.15
Daily runtime $\leq 24$ h	1.20

Temperature		$f_{B_T}$
<b>Motor cooling</b>	<b>Surrounding temperature</b>	
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**

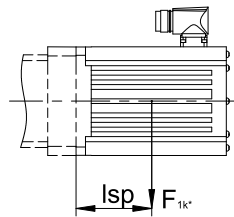
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces ( $F_{f2acc}$ ,  $F_{f2NOT}$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

## 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:

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



Type	$M_{1k}$ [Nm]
ME10	25
ME20	60
ME30	125
ME40	250
ME50	600

## 12.7 Additional documentation

Additional documentation related to the product can be found at

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

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

Documentation	ID
Operating manual gear units, geared motors K	443364_en
Operating manual for gear racks (Atlanta)	442455





# 13 Appendix

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## 13.1 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
$\Delta s$	mm	Linear backlash resulting from the backlash of the gear unit
$\Delta s_{red}$	mm	Reduced 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_{f2} $	kN	Absolute value of feed force at output
$F_{f2,1}^* - F_{f2,4}^*$	kN	Existing feed force in the respective time segment (1 to 4)
$F_{f2,n}^*$	kN	Existing feed force in the nth time segment
$fB_{op}$	–	Operating mode operating factor
$fB_t$	–	Runtime 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 of the gear unit at the gear unit output for a maximum of 1000 load changes
$F_{f2NOT}^*$	kN	Actual emergency off feed force at the gear unit output
$F_{f2NOT,E}$	kN	Emergency off feed force of the gear unit at the gear unit output for a maximum of 1000 load changes, pinion position E
$F_{f2NOT,S}$	kN	Emergency off feed force of the gear unit at the gear unit output for a maximum of 1000 load changes, pinion position S
$F_L^*$	N	Existing load force
$i$	–	Gear ratio
$m^*$	kg	Mass to be accelerated
$M_{1k}$	Nm	Permitted tilting torque at the gear unit input
$M_{1k}^*$	Nm	Existing tilting 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
$n_{1,m}^*$	rpm	Actual average input speed
$n_{1,max}^*$	rpm	Actual maximum input speed
$n_{1,maxDB}$	$min^{-1}$	Maximum permitted input speed of the gear unit in continuous operation
$n_{1,maxDBEL1,2}$	rpm	Maximum permitted input speed of the gear unit in continuous operation Mounting positions EL1, EL2
$n_{1,maxDBEL3,4,5,6}$	rpm	Maximum permitted input speed of the gear unit in continuous operation Mounting positions EL3, EL4, EL5, EL6
$n_{1,maxZB}$	$min^{-1}$	Maximum permitted input speed of the gear unit in cyclic operation
$t$	s	Time
$t_{1}^* - t_{4}^*$	s	Duration of the respective time segment (1 to 4)
$t_n^*$	s	Duration of the n-th time segment
$ v_{f2} $	m/s	Absolute value of feed velocity

Symbol	Unit	Explanation
$v_{f2m}^*$	m/s	Actual average feed velocity
$v_{f2m,1}^* - v_{f2m,4}^*$	m/s	Actual average feed velocity in the respective time segment (1 to 4)
$v_{f2m,n}^*$	m/s	Actual average feed velocity in the nth 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

## 13.2 Trademarks

The following names are trademarks or registered trademarks of STÖBER:

EasyAdapt®	EasyAdapt® is a registered trademark of STÖBER Antriebstechnik GmbH + Co. KG
FlexiAdapt®	FlexiAdapt® is a registered trademark of STÖBER Antriebstechnik GmbH + Co. KG

## 13.3 Sales terms and delivery conditions

You can find our current sales terms and delivery conditions at <http://www.stoeber.de/en/gtc>.

## 13.4 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/downloads/>.

### ATLANTA gear racks

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

<http://atlantagmbh.de/>



## 13.5 ATLANTA product catalog pages

The following pages include an excerpt from the product catalog of ATLANTA Antriebssysteme.



ATLANTA Antriebssysteme GmbH  
Carl-Benz-Str. 16  
74321 Bietigheim-Bissingen  
Germany  
Tel. +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  $m = 820$  kg  
 speed  $v = 2$  m/s  
 acceleration time  $t_b = 1$  s  
 acceleration due to gravity  $g = 9,81$  m/s<sup>2</sup>  
 coefficient of friction  $\mu = 0,1$   
 load factor  $K_A = 1,5$   
 life-time factor  $f_n = 1,05$  (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  $F_{uTab}$  :  
 rack C45, ind. hardened, Q10, straight tooth, module 3,  
 pinion 16MnCr5, case hardened, 20 teeth  
 page ZB-40 with  $F_{uTab} = 11,5$  kN

$$F_{u\text{ per.}} = \frac{F_{uTab}}{K_A \cdot S_B \cdot f_n \cdot L_{KH\beta}}$$

$$F_{u\text{ per.}} = \frac{11,5 \text{ kN}}{1,5 \cdot 1,4 \cdot 1,05 \cdot 1,5} = 3,47 \text{ kN}$$

#### Condition

$F_{u\text{ per.}} > F_u$  ;  $3,47 \text{ kN} > 2,44 \text{ kN}$  => 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  $m =$  \_\_\_\_\_ kg  
 speed  $v =$  \_\_\_\_\_ m/s  
 acceleration time  $t_b =$  \_\_\_\_\_ s  
 acceleration due to gravity  $g = 9,81$  m/s<sup>2</sup>  
 coefficient of friction  $\mu =$  \_\_\_\_\_  
 load factor  $K_A =$  \_\_\_\_\_  
 life-time factor  $f_n =$  \_\_\_\_\_  
 safety coefficient  $S_B =$  \_\_\_\_\_  
 linear load distribution factor  $L_{KH\beta} =$  \_\_\_\_\_

#### Calculation process

$$a = \frac{v}{t_b} \quad a =$$
 \_\_\_\_\_ = \_\_\_\_\_ m/s<sup>2</sup>

$$F_u = \frac{m \cdot g \cdot \mu + m \cdot a}{1000} ; F_u =$$
 \_\_\_\_\_ = \_\_\_\_\_ kN

permissible feed force  $F_{uTab}$

$$F_{u\text{ per.}} = \frac{F_{uTab}}{K_A \cdot S_B \cdot f_n \cdot L_{KH\beta}}$$

$$F_{u\text{ per.}} =$$
 \_\_\_\_\_ = \_\_\_\_\_ kN

#### Condition

$F_{u\text{ per.}} > F_u$  ; \_\_\_\_\_ kN > \_\_\_\_\_ kN => 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	$f_n = 1,1 \text{ (cont. lubrication)}$
safety coefficient	$S_B = 1,4$
linear load distribution factor	$L_{KH\beta} = 1,2$

**Calculation process**

$$a = \frac{v}{t_b} \quad a = \frac{1,08}{0,27} = 4 \text{ m/s}^2$$

$$F_u = \frac{m \cdot g + m \cdot a}{1000} \quad F_u = \frac{300 \cdot 9,81 + 300 \cdot 4}{1000} = 4,1 \text{ kN}$$

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**

$$F_{u \text{ per.}} > F_u ; 5,18 \text{ kN} > 4,1 \text{ kN} \quad \Rightarrow \text{ fulfilled}$$

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**

$$a = \frac{v}{t_b} \quad a = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ m/s}^2$$

$$F_u = \frac{m \cdot g + m \cdot a}{1000} \quad F_{u \text{ req.}} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ kN}$$

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**

$$F_{u \text{ per.}} > F_u ; \underline{\hspace{2cm}} \text{ kN} > \underline{\hspace{2cm}} \text{ kN} \quad \Rightarrow \text{ fulfilled}$$



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



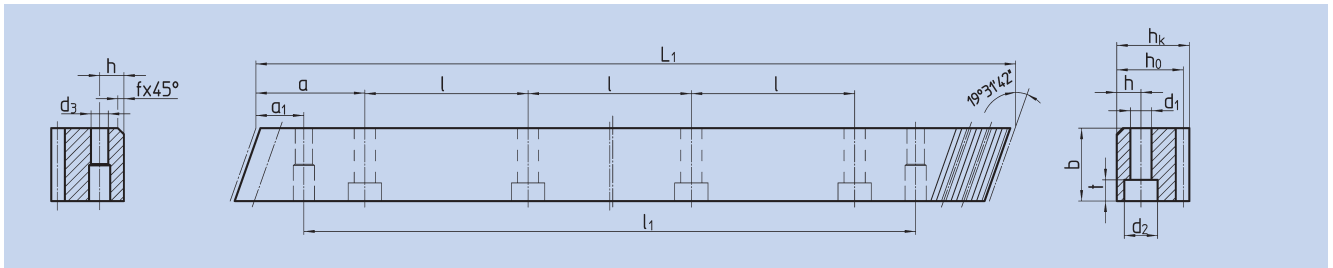
Class	ATLANTA Quality	Module	Total pitch error <sup>1)</sup> (±µm/m)	Tooth thickness tolerance (µm)	max. length (mm)	Max. feed force per pinion contact <sup>2)</sup> kN	Applications (examples)
<b>HPR</b>  High Precision Rack	6	2	34	-20	1000	19,5	<b>Wood, plastic, composite, aluminium working machines</b>
		3	34	-20	1000	31,0	
		4	34	-20	1000	60,0	
	6	1,5	34	-20	1000	9,0	<b>Machine tools, integratable racks, water cutting machines, tube bending systems, plasma cutting machines</b>
		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	
		8	34	-20	1920	191,0	
	10	34	-20	1500	287,0		
		12	34	-20	1000	409,0	
	7	2	52	-36	2000	15,5	<b>Wood working machines, linear axes with high requirement for a smooth running</b>
		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	
<b>PR</b>  Precision Rack	8	2	60	-59	2000	13,5	<b>Portals, handling linear axes</b>
		3	60	-59	2000	24,5	
		4	60	-59	2000	44,0	
		5	60	-59	2000	64,5	
		6	60	-59	2000	90,5	
	8	2	100	-110	2000	8,0	<b>Linear axes</b>
		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 6**



Order code	Module	L <sub>1</sub>	N° of teeth	b	h <sub>k</sub>	h <sub>0</sub>	f	a	l	N° of holes	h	d <sub>1</sub>	d <sub>2</sub>	t	a <sub>1</sub>	l <sub>1</sub>	d <sub>3</sub>	
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 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 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

**Total pitch error**     $GT_f/1000 \leq 0,034 \text{ mm,}$   
 $GT_f/1500 \leq 0,041 \text{ mm } (\Delta 0,027 \text{ mm}/1000),$   
 $GT_f/2000 \leq 0,044 \text{ mm } (\Delta 0,022 \text{ mm}/1000).$

- Teeth hardened with the ATLANTA high performance hardening process and ground
- case hardening steel acc. ATLANTA-Standard
- ground on all sides after hardening

**Mounting racks, see Atlanta Servo Drive catalogue.**

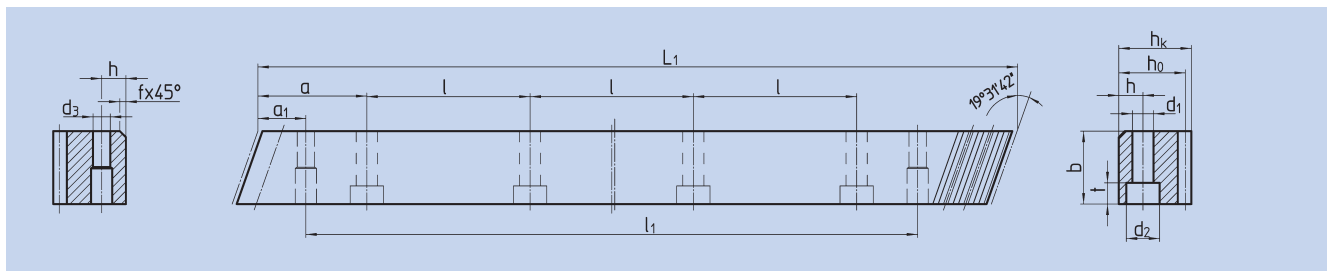
**To achieve precision rack joints, we recommend our patented assembly kit, see Atlanta Servo Drive catalogue.**

**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 <sub>1</sub>	N° of teeth	b	h <sub>k</sub>	h <sub>0</sub>	f	a	l	N° of holes	h	d <sub>1</sub>	d <sub>2</sub>	t	a <sub>1</sub>	l <sub>1</sub>	d <sub>3</sub>	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	16	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 <sup>2)</sup>	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 <sup>1)</sup>	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	43	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	43	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	43	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	53	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	53	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	53	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.

**Total pitch error**     $GT_f/1000 \leq 0,034 \text{ mm}$ ,  
 $GT_f/1500 \leq 0,041 \text{ mm} (\Delta 0,027 \text{ mm}/1000)$ ,  
 $GT_f/2000 \leq 0,044 \text{ mm} (\Delta 0,022 \text{ mm}/1000)$ .

- 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.**

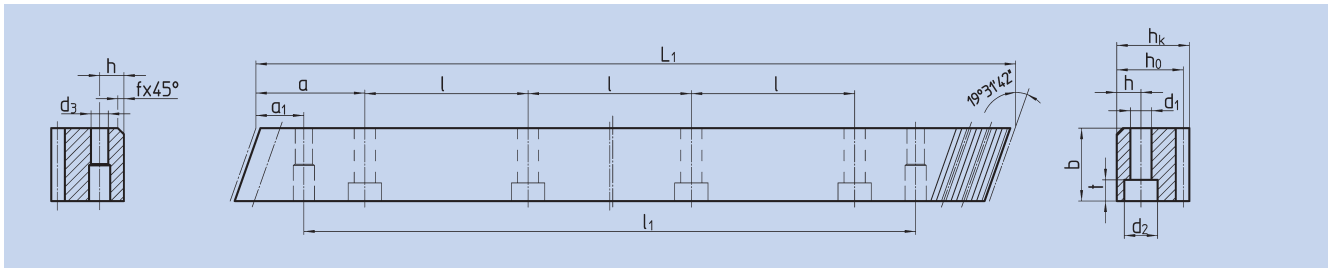
**To achieve precision rack joints, we recommend our patented assembly kit, see Atlanta Servo Drive catalogue.**

**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 <sub>1</sub>	N° of teeth	b* <sup>0,4</sup>	h <sub>k</sub>	h <sub>0</sub>	f	a	l	N° of holes	h	d <sub>1</sub>	d <sub>2</sub>	t	a <sub>1</sub>	l <sub>1</sub>	d <sub>3</sub>	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 <sup>1)</sup>	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).

**Total pitch error**     $GT_f/1000 \leq 0,052 \text{ mm}$ ,  
 $GT_f/1500 \leq 0,062 \text{ mm} (\Delta 0,042 \text{ mm}/1000)$ ,  
 $GT_f/2000 \leq 0,068 \text{ mm} (\Delta 0,034 \text{ mm}/1000)$ .

- Teeth hardened with the ATLANTA high performance hardening process and ground
- heat-treatable steel acc. ATLANTA-Standard
- ground on all sides after hardening

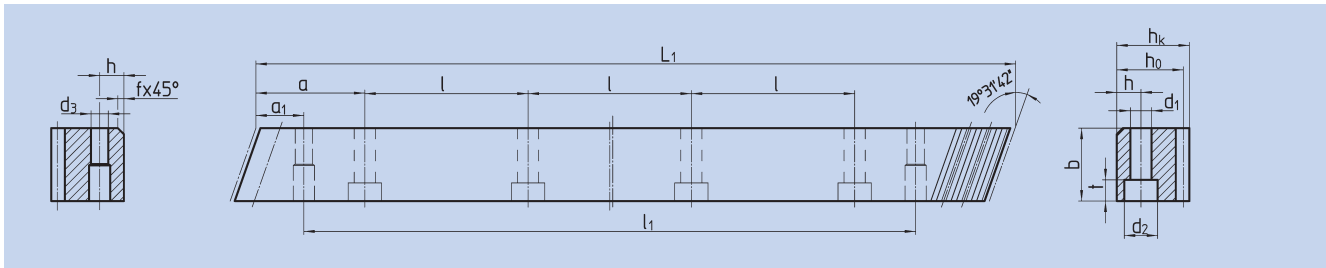
**Mounting racks, see Atlanta Servo Drive catalogue.**


**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 <sub>1</sub>	N° of teeth	b <sup>+0,4</sup>	h <sub>k</sub>	h <sub>0</sub>	f	a	l	N° of holes	h	d <sub>1</sub>	d <sub>2</sub>	t	a <sub>1</sub>	l <sub>1</sub>	d <sub>3</sub>	
29 20 108	2	1000,00	150	24	24	22	2	62,5	125	8	8	7	11	7	31,7	936,6	5,7	4,12
29 20 158	2	1500,00	225	24	24	22	2	62,5	125	12	8	7	11	7	31,7	1486,6	5,7	6,15
29 20 208	2	2000,00	300	24	24	22	2	62,5	125	16	8	7	11	7	31,7	1936,6	5,7	8,00
29 30 108	3	1000,00	100	29	29	26	2	62,5	125	8	9	10	15	9	35,0	930,0	7,7	5,70
29 30 158	3	1500,00	150	29	29	26	2	62,5	125	12	9	10	15	9	35,0	1430,0	7,7	8,90
29 30 208	3	2000,00	200	29	29	26	2	62,5	125	16	9	10	15	9	35,0	1930,0	7,7	11,20
29 40 108	4	1000,00	75	39	39	35	2	62,5	125	8	12	14	20	13	33,3	933,4	11,7	10,10
29 40 158 <sup>1)</sup>	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 40 208	4	2000,00	150	39	39	35	2	62,5	125	16	12	14	20	13	33,3	1933,4	11,7	20,16
29 50 108	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 50 208	5	2000,00	120	49	39	34	2,5	62,5	125	16	12	14	20	13	37,5	1925,0	11,7	24,52
29 60 108	6	1000,00	50	59	49	43	2,5	62,5	125	8	16	18	26	17	37,5	925,0	15,7	18,25
29 60 208	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

1) This racks could be used for continuous linking only with the left side (see sketch).

**Total pitch error**     $GT_f/1000 \leq 0,060 \text{ mm}$ ,  
 $GT_f/1500 \leq 0,072 \text{ mm} (\triangleq 0,048 \text{ mm}/1000)$   
 $GT_f/2000 \leq 0,078 \text{ mm} (\triangleq 0,039 \text{ mm}/1000)$ .

- Teeth hardened with the ATLANTA high performance hardening process and ground
- heat-treatable steel acc. ATLANTA-Standard
- ground on all sides after hardening

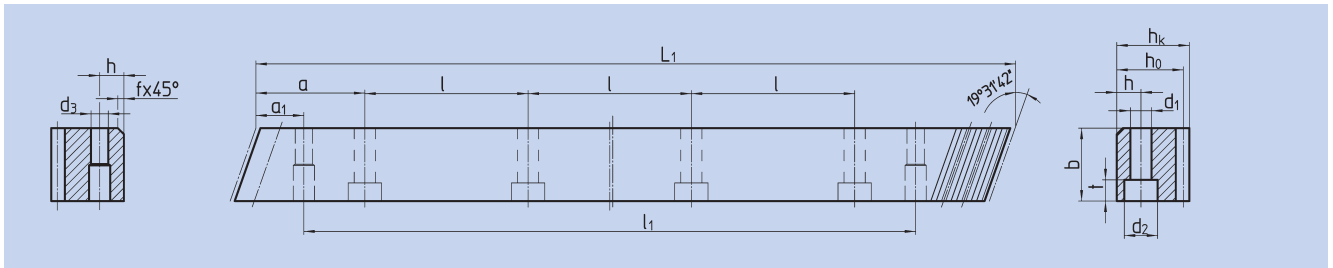
**Mounting racks, see Atlanta Servo Drive catalogue.**

**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, 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 <sub>1</sub>	N° of teeth	b <sub>0,5</sub>	h <sub>k</sub>	h <sub>0</sub>	f	a	l	N° of holes	h	d <sub>1</sub>	d <sub>2</sub>	t	a <sub>1</sub>	l <sub>1</sub>	d <sub>3</sub>	kg
<b>38 21 100</b>	2	1000,00	150	25	24	22	2	62,5	125	8	8	7	11	7	31,7	936,6	5,7	4,30
<b>38 20 100</b>	2	1000,00	150	25	24	22	2	without mounting holes										4,30
<b>38 21 200</b>	2	2000,00	300	25	24	22	2	62,5	125	16	8	7	11	7	31,7	1936,6	5,7	8,60
<b>38 20 200</b>	2	2000,00	300	25	24	22	2	without mounting holes										8,60
<b>38 31 100</b>	3	1000,00	100	30	29	26	2	62,5	125	8	9	10	15	9	35,0	930,0	7,7	6,10
<b>38 30 100</b>	3	1000,00	100	30	29	26	2	without mounting holes										6,10
<b>38 31 200</b>	3	2000,00	200	30	29	26	2	62,5	125	16	9	10	15	9	35,0	1930,0	7,7	12,20
<b>38 30 200</b>	3	2000,00	200	30	29	26	2	without mounting holes										12,20
<b>38 41 100</b>	4	1000,00	75	40	39	35	2	62,5	125	8	12	10	15	9	33,3	933,4	7,7	10,90
<b>38 40 100</b>	4	1000,00	75	40	39	35	2	without mounting holes										10,90
<b>38 41 200</b>	4	2000,00	150	40	39	35	2	62,5	125	16	12	10	15	9	33,3	1933,4	7,7	21,80
<b>38 40 200</b>	4	2000,00	150	40	39	35	2	without mounting holes										21,80

**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.**





Rack and pinion drive – calculation and selection – module 2 – helical tooth system

Rack	HPR		PR		BR				
	6	7	8	9	10				
ATLANTA-Quality	heat-treatable steel according ATLANTA-standard								
Rack	material	high performance hardening process		quenched + tempered		soft			
	heat treatment	16MnCr5	16MnCr5	16MnCr5	C45	16MnCr5	high performance hardening process		
Pinion	material	16MnCr5	16MnCr5	16MnCr5	C45	16MnCr5	C45		
	heat treatment	case hardened	case hardened	case hardened	ind. hardened	case hardened	ind. hardened		
No. of pinion teeth <sup>1)</sup>	pitch circle dia.	maximum feed force (values are only valid for material according ATLANTA-standard)							
		8,0 kN	6,0 kN	5,0 kN	2,0 kN	1,0 kN	0,6 kN	3,5 kN	2,5 kN
12	25,46 mm	8,0 kN	6,0 kN	5,0 kN	2,0 kN	1,0 kN	0,6 kN	3,5 kN	2,5 kN
13	27,59 mm	8,5 kN	6,0 kN	5,5 kN	2,0 kN	1,0 kN	0,6 kN	4,0 kN	2,5 kN
14	29,71 mm	10,0 kN	7,5 kN	6,5 kN	2,5 kN	1,0 kN	0,7 kN	4,5 kN	3,0 kN
15	31,83 mm	11,0 kN	8,0 kN	7,0 kN	2,5 kN	1,5 kN	0,8 kN	5,0 kN	3,5 kN
16	33,95 mm	12,0 kN	9,0 kN	7,5 kN	3,0 kN	2,0 kN	0,9 kN	5,5 kN	3,5 kN
17	36,08 mm	13,0 kN	9,5 kN	8,0 kN	3,0 kN	1,5 kN	1,0 kN	6,0 kN	4,0 kN
18	38,20 mm	13,5 kN	10,0 kN	8,5 kN	3,5 kN	1,5 kN	1,0 kN	6,5 kN	4,0 kN
19	40,32 mm	14,5 kN	10,5 kN	9,0 kN	3,5 kN	2,0 kN	1,0 kN	7,0 kN	4,5 kN
20	42,44 mm	15,5 kN	11,5 kN	9,5 kN	4,0 kN	2,0 kN	1,0 kN	7,0 kN	4,5 kN
21	44,56 mm	16,0 kN	12,0 kN	10,5 kN	4,0 kN	2,0 kN	1,0 kN	7,5 kN	5,0 kN
22	46,69 mm	17,0 kN	12,5 kN	11,0 kN	4,0 kN	2,0 kN	1,0 kN	8,0 kN	5,5 kN
23	48,81 mm	17,5 kN	13,0 kN	11,5 kN	4,5 kN	2,5 kN	1,0 kN	8,5 kN	5,5 kN
24	50,93 mm	18,0 kN	13,5 kN	12,0 kN	4,5 kN	2,5 kN	1,0 kN	8,5 kN	5,5 kN
25	53,05 mm	18,5 kN	14,5 kN	12,5 kN	5,0 kN	3,0 kN	1,5 kN	9,0 kN	5,5 kN
26	55,17 mm	18,5 kN	15,0 kN	13,0 kN	5,0 kN	3,0 kN	1,5 kN	9,0 kN	5,5 kN
27	57,30 mm	18,5 kN	15,0 kN	13,0 kN	5,5 kN	3,5 kN	1,5 kN	9,0 kN	5,5 kN
28	59,42 mm	18,5 kN	15,0 kN	13,0 kN	5,5 kN	3,5 kN	1,5 kN	9,5 kN	5,5 kN
29	61,54 mm	18,5 kN	15,0 kN	13,0 kN	6,0 kN	3,5 kN	1,5 kN	9,5 kN	5,5 kN
30	63,66 mm	18,5 kN	15,0 kN	13,0 kN	6,0 kN	3,0 kN	1,5 kN	9,5 kN	6,0 kN
31	65,78 mm	19,0 kN	15,5 kN	13,0 kN	6,0 kN	3,0 kN	1,5 kN	9,5 kN	6,0 kN
32	67,91 mm	19,0 kN	15,5 kN	13,0 kN	6,5 kN	3,5 kN	1,5 kN	9,5 kN	6,0 kN
33	70,03 mm	19,0 kN	15,5 kN	13,5 kN	6,5 kN	3,5 kN	2,0 kN	9,5 kN	6,0 kN
34	72,15 mm	19,0 kN	15,5 kN	13,5 kN	7,0 kN	3,5 kN	2,0 kN	9,5 kN	6,0 kN
35	74,27 mm	19,0 kN	15,5 kN	13,5 kN	7,0 kN	3,5 kN	2,0 kN	9,5 kN	6,0 kN
36	76,39 mm	19,0 kN	15,5 kN	13,5 kN	7,5 kN	4,0 kN	2,0 kN	9,5 kN	6,0 kN
37	78,52 mm	19,0 kN	15,5 kN	13,5 kN	7,5 kN	4,0 kN	2,0 kN	9,5 kN	6,0 kN
38	80,64 mm	19,0 kN	15,5 kN	13,5 kN	7,5 kN	4,0 kN	2,0 kN	9,5 kN	6,0 kN
39	82,76 mm	19,0 kN	15,5 kN	13,5 kN	8,0 kN	4,0 kN	2,0 kN	9,5 kN	6,0 kN
40	84,88 mm	19,5 kN	15,5 kN	13,5 kN	8,0 kN	4,0 kN	2,0 kN	9,5 kN	6,0 kN

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue

1) check availability (chapter ZA)  
2) according ATLANTA-standard





# Rack and pinion drive – calculation and selection – module 4 – helical tooth system

Rack	HPR			PR			BR					
	6	7	8	9	10							
ATLANTA-Quality	heat-treatable steel according ATLANTA-standard											
Rack	material	case hardening steel <sup>2)</sup>	high performance hardening process						soft		high performance hardening process	
	heat treatment	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	C45	C45	C45	
Pinion	material	case hardened	case hardened	case hardened	case hardened	case hardened	case hardened	case hardened	ind. hardened	soft	case hardened	ind. hardened
	heattreatment	case hardened	case hardened	case hardened	case hardened	case hardened	case hardened	case hardened	ind. hardened	soft	case hardened	ind. hardened
No. of pinion teeth <sup>1)</sup>	pitch circle dia.	maximum feed force (values are only valid for material according ATLANTA-standard)										
		24,0 kN	18,0 kN	17,5 kN	15,0 kN	6,0 kN	5,0 kN	3,0 kN	2,0 kN	11,0 kN	11,0 kN	9,5 kN
12	50,93 mm	28,0 kN	20,5 kN	20,5 kN	17,5 kN	7,0 kN	5,5 kN	3,5 kN	2,5 kN	13,0 kN	11,0 kN	9,5 kN
13	55,17 mm	32,5 kN	24,0 kN	24,0 kN	20,5 kN	8,0 kN	6,5 kN	4,0 kN	3,0 kN	15,0 kN	13,0 kN	11,0 kN
14	59,42 mm	37,0 kN	27,5 kN	27,5 kN	23,5 kN	9,5 kN	7,5 kN	5,0 kN	3,5 kN	17,0 kN	15,0 kN	12,5 kN
15	63,66 mm	39,5 kN	29,5 kN	29,5 kN	25,0 kN	10,0 kN	8,0 kN	5,0 kN	3,5 kN	18,5 kN	17,0 kN	14,5 kN
16	67,91 mm	42,0 kN	31,5 kN	31,0 kN	26,5 kN	10,5 kN	8,5 kN	5,5 kN	4,0 kN	19,5 kN	18,5 kN	15,5 kN
17	72,15 mm	45,0 kN	33,5 kN	33,0 kN	28,5 kN	11,5 kN	9,0 kN	5,5 kN	4,0 kN	21,0 kN	20,0 kN	17,5 kN
18	76,39 mm	47,5 kN	35,5 kN	35,0 kN	30,0 kN	12,0 kN	10,0 kN	6,0 kN	4,5 kN	22,5 kN	22,5 kN	19,0 kN
19	80,64 mm	50,0 kN	37,0 kN	37,0 kN	31,5 kN	13,0 kN	10,5 kN	6,5 kN	4,5 kN	23,5 kN	23,5 kN	20,0 kN
20	84,88 mm	53,0 kN	39,0 kN	39,0 kN	33,5 kN	13,5 kN	11,0 kN	7,0 kN	5,0 kN	25,0 kN	25,0 kN	21,0 kN
21	89,13 mm	55,5 kN	41,0 kN	41,0 kN	35,0 kN	14,0 kN	11,5 kN	7,5 kN	5,0 kN	26,0 kN	26,0 kN	22,0 kN
22	93,37 mm	56,5 kN	43,0 kN	43,0 kN	37,0 kN	15,0 kN	12,0 kN	7,5 kN	5,5 kN	27,5 kN	27,5 kN	23,0 kN
23	97,62 mm	57,0 kN	45,0 kN	45,0 kN	38,5 kN	15,5 kN	12,5 kN	8,0 kN	5,5 kN	28,5 kN	28,5 kN	23,5 kN
24	101,86 mm	57,5 kN	47,0 kN	47,0 kN	40,0 kN	16,0 kN	13,0 kN	8,0 kN	6,0 kN	30,0 kN	30,0 kN	23,5 kN
25	106,10 mm	58,0 kN	49,0 kN	49,0 kN	42,0 kN	17,0 kN	13,5 kN	8,5 kN	6,0 kN	30,5 kN	30,5 kN	24,0 kN
26	110,35 mm	58,5 kN	49,5 kN	49,5 kN	42,0 kN	17,5 kN	14,5 kN	9,0 kN	6,5 kN	31,0 kN	31,0 kN	24,0 kN
27	114,59 mm	58,5 kN	49,5 kN	49,5 kN	42,0 kN	18,5 kN	15,0 kN	9,5 kN	6,5 kN	31,0 kN	31,0 kN	24,0 kN
28	118,84 mm	58,5 kN	50,0 kN	50,0 kN	42,5 kN	19,0 kN	15,5 kN	9,5 kN	7,0 kN	31,0 kN	31,0 kN	24,0 kN
29	123,08 mm	58,5 kN	50,0 kN	50,0 kN	42,5 kN	19,5 kN	16,0 kN	10,0 kN	7,0 kN	31,0 kN	31,0 kN	24,0 kN
30	127,32 mm	59,0 kN	50,0 kN	50,0 kN	42,5 kN	20,5 kN	16,5 kN	10,5 kN	7,5 kN	31,0 kN	31,0 kN	24,5 kN
31	131,57 mm	59,0 kN	50,5 kN	50,5 kN	43,0 kN	21,0 kN	17,0 kN	11,0 kN	7,5 kN	31,5 kN	31,5 kN	24,5 kN
32	135,81 mm	59,5 kN	50,5 kN	50,5 kN	43,0 kN	22,0 kN	17,5 kN	11,0 kN	8,0 kN	31,5 kN	31,5 kN	24,5 kN
33	140,06 mm	59,5 kN	50,5 kN	50,5 kN	43,0 kN	22,5 kN	18,0 kN	11,5 kN	8,0 kN	31,5 kN	31,5 kN	24,5 kN
34	144,30 mm	59,5 kN	51,0 kN	51,0 kN	43,5 kN	23,0 kN	19,0 kN	12,0 kN	8,5 kN	31,5 kN	31,5 kN	24,5 kN
35	148,54 mm	59,5 kN	51,0 kN	51,0 kN	43,5 kN	24,0 kN	19,5 kN	12,0 kN	8,5 kN	31,5 kN	31,5 kN	24,5 kN
36	152,79 mm	59,5 kN	51,0 kN	51,0 kN	43,5 kN	24,5 kN	20,0 kN	12,5 kN	9,0 kN	31,5 kN	31,5 kN	24,5 kN
37	157,03 mm	59,5 kN	51,5 kN	51,5 kN	43,5 kN	25,5 kN	20,5 kN	13,0 kN	9,0 kN	32,0 kN	32,0 kN	24,5 kN
38	161,28 mm	59,5 kN	51,5 kN	51,5 kN	43,5 kN	26,0 kN	21,0 kN	13,5 kN	9,5 kN	32,0 kN	32,0 kN	24,5 kN
39	165,52 mm	60,0 kN	51,5 kN	51,5 kN	44,0 kN	27,0 kN	21,5 kN	13,5 kN	10,0 kN	32,0 kN	32,0 kN	24,5 kN
40	169,77 mm	60,0 kN	51,5 kN	51,5 kN	44,0 kN	27,0 kN	21,5 kN	13,5 kN	10,0 kN	32,0 kN	32,0 kN	24,5 kN

1) check availability (chapter ZA)  
 2) according ATLANTA-standard  
 Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



Rack and pinion drive – calculation and selection – module 5 – helical tooth system

Rack	HPR		PR	BR				
ATLANTA-Quality	6	7	8	9	10			
Rack	heat-treatable steel according ATLANTA-standard							
	material	high performance hardening process		high performance hardening process				
	heat treatment	16MnCr5	16MnCr5	16MnCr5	C45			
Pinion	material	case hardened	case hardened	case hardened	ind. hardened			
	heat treatment	case hardened	case hardened	soft	case hardened			
No. of pinion teeth <sup>1)</sup>	maximum feed force (values are only valid for material according ATLANTA-standard)							
	pitch circle dia.	16MnCr5	16MnCr5	16MnCr5	16MnCr5	C45		
12	63,66 mm	28,0 kN	28,0 kN	23,5 kN	5,0 kN	3,5 kN	17,5 kN	15,0 kN
13	68,97 mm	32,5 kN	32,5 kN	27,5 kN	5,5 kN	4,0 kN	20,5 kN	17,5 kN
14	74,27 mm	37,5 kN	37,5 kN	32,0 kN	6,5 kN	4,5 kN	23,5 kN	20,0 kN
15	79,58 mm	43,0 kN	43,0 kN	36,5 kN	7,5 kN	5,5 kN	27,0 kN	23,0 kN
16	84,88 mm	46,0 kN	46,0 kN	39,0 kN	8,0 kN	5,5 kN	29,0 kN	24,5 kN
17	90,19 mm	49,5 kN	49,5 kN	42,0 kN	8,5 kN	6,0 kN	31,0 kN	26,0 kN
18	95,49 mm	52,5 kN	52,5 kN	44,5 kN	9,0 kN	6,5 kN	33,0 kN	28,0 kN
19	100,80 mm	55,5 kN	55,5 kN	47,0 kN	9,5 kN	7,0 kN	35,0 kN	29,5 kN
20	106,10 mm	58,5 kN	58,5 kN	49,5 kN	10,5 kN	7,5 kN	37,0 kN	31,0 kN
21	111,41 mm	61,5 kN	61,5 kN	52,5 kN	11,0 kN	7,5 kN	39,0 kN	33,0 kN
22	116,71 mm	65,0 kN	65,0 kN	55,0 kN	11,5 kN	8,0 kN	41,0 kN	34,5 kN
23	122,02 mm	68,0 kN	68,0 kN	57,5 kN	12,0 kN	8,5 kN	43,0 kN	36,5 kN
24	127,32 mm	71,0 kN	71,0 kN	60,5 kN	12,5 kN	9,0 kN	45,0 kN	37,0 kN
25	132,63 mm	74,5 kN	74,5 kN	63,0 kN	13,0 kN	9,5 kN	47,0 kN	37,0 kN
26	137,93 mm	75,0 kN	75,0 kN	63,5 kN	13,5 kN	10,0 kN	48,0 kN	37,5 kN
27	143,24 mm	75,5 kN	75,5 kN	64,0 kN	14,0 kN	10,0 kN	48,0 kN	37,5 kN
28	148,54 mm	75,5 kN	75,5 kN	64,0 kN	15,0 kN	10,5 kN	48,5 kN	38,0 kN
29	153,85 mm	76,0 kN	76,0 kN	64,5 kN	15,5 kN	11,0 kN	48,5 kN	38,0 kN
30	159,16 mm	76,0 kN	76,0 kN	64,5 kN	16,0 kN	11,5 kN	49,0 kN	38,0 kN

1) check availability (chapter ZA)

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



Rack and pinion drive – calculation and selection – module 6 – helical tooth system

Rack	HPR			PR			BR			
	6	7	8	9	10					
ATLANTA-Quality										
Rack	heat-treatable steel according ATLANTA-standard									
Pinion	material	high performance hardening process			soft			high performance hardening process		
	heat treatment	16MnCr5	16MnCr5	16MnCr5	16MnCr5	C45	16MnCr5	C45		
Pinion	material	case hardened			case hardened			case hardened		
	heat treatment	case hardened	case hardened	case hardened	case hardened	soft	case hardened	ind. hardened		
No. of pinion teeth <sup>1)</sup>	pitch circle dia.	maximum feed force (values are only valid for material according ATLANTA-standard)								
		40,5 kN	40,5 kN	33,5 kN	7,0 kN	5,0 kN	25,5 kN	21,5 kN		
12	76,39 mm	47,0 kN	47,0 kN	39,0 kN	8,0 kN	6,0 kN	29,5 kN	25,0 kN		
13	82,76 mm	54,5 kN	54,5 kN	45,5 kN	9,5 kN	7,0 kN	34,5 kN	29,0 kN		
14	89,13 mm	62,5 kN	62,5 kN	52,0 kN	11,0 kN	8,0 kN	39,0 kN	33,0 kN		
15	95,49 mm	67,0 kN	67,0 kN	55,5 kN	11,5 kN	8,5 kN	42,0 kN	35,5 kN		
16	101,86 mm	71,5 kN	71,5 kN	59,5 kN	12,5 kN	9,0 kN	45,0 kN	38,0 kN		
17	108,23 mm	76,0 kN	76,0 kN	63,0 kN	13,5 kN	9,5 kN	47,5 kN	40,5 kN		
18	114,59 mm	80,5 kN	80,5 kN	67,0 kN	14,0 kN	10,0 kN	50,5 kN	43,0 kN		
19	120,96 mm	85,0 kN	85,0 kN	70,5 kN	15,0 kN	10,5 kN	53,5 kN	45,0 kN		
20	127,32 mm	89,5 kN	89,5 kN	74,5 kN	15,5 kN	11,5 kN	56,5 kN	47,5 kN		
21	133,69 mm	94,0 kN	94,0 kN	78,0 kN	16,5 kN	12,0 kN	59,0 kN	50,0 kN		
22	140,06 mm	98,5 kN	98,5 kN	82,0 kN	17,5 kN	12,5 kN	62,0 kN	52,5 kN		
23	146,42 mm	103,0 kN	103,0 kN	85,5 kN	18,0 kN	13,0 kN	65,0 kN	53,0 kN		
24	152,79 mm	107,0 kN	107,0 kN	89,0 kN	19,0 kN	13,5 kN	66,5 kN	53,5 kN		
25	159,16 mm	107,5 kN	107,5 kN	89,5 kN	20,0 kN	14,0 kN	66,5 kN	53,5 kN		
26	165,52 mm	108,0 kN	108,0 kN	89,5 kN	20,5 kN	15,0 kN	67,0 kN	54,0 kN		
27	171,89 mm	108,0 kN	108,0 kN	90,0 kN	21,5 kN	15,5 kN	67,0 kN	54,0 kN		
28	178,25 mm	108,5 kN	108,5 kN	90,5 kN	22,0 kN	16,0 kN	67,5 kN	54,5 kN		
29	184,62 mm	109,0 kN	109,0 kN	90,5 kN	23,0 kN	16,5 kN	67,5 kN	54,5 kN		
30	190,99 mm									

1) check availability (chapter ZA)

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



# Rack and pinion drive – calculation and selection – module 8 – helical tooth system

Rack	HPR			BR		
	6	7	9	10	10	10
ATLANTA-Quality	heat-treatable steel according ATLANTA-standard					
Rack	material	high performance hardening process	soft	high performance hardening process	high performance hardening process	
Pinion	material	16MnCr5	16MnCr5	C45	16MnCr5	C45
	heat treatment	case hardened	case hardened	soft	case hardened	ind. hardened
No. of pinion teeth <sup>1)</sup>	pitch circle dia.	maximum feed force (values are only valid for material according ATLANTA-standard)				
		101,86 mm	72,5 kN	12,5 kN	9,0 kN	45,5 kN
12	110,35 mm	84,5 kN	15,0 kN	10,5 kN	53,0 kN	44,5 kN
13	118,84 mm	97,5 kN	17,0 kN	12,5 kN	61,5 kN	52,0 kN
14	127,32 mm	111,5 kN	19,5 kN	14,0 kN	70,0 kN	59,5 kN
15	135,81 mm	119,5 kN	21,0 kN	15,0 kN	75,0 kN	63,5 kN
16	144,30 mm	127,5 kN	22,5 kN	16,0 kN	80,0 kN	67,5 kN
17	152,79 mm	135,5 kN	24,0 kN	17,0 kN	85,0 kN	72,0 kN
18	161,28 mm	143,5 kN	25,5 kN	18,0 kN	90,0 kN	76,5 kN
19	169,77 mm	151,5 kN	27,0 kN	19,5 kN	95,5 kN	80,5 kN
20	178,25 mm	160,0 kN	28,5 kN	20,5 kN	100,5 kN	85,0 kN
21	186,74 mm	168,0 kN	29,5 kN	21,5 kN	105,5 kN	89,0 kN
22	195,23 mm	176,0 kN	31,0 kN	22,5 kN	110,5 kN	92,5 kN
23	203,72 mm	184,0 kN	32,5 kN	23,5 kN	115,5 kN	93,0 kN
24	212,21 mm	187,0 kN	34,0 kN	24,5 kN	116,5 kN	93,5 kN
25	220,70 mm	188,0 kN	35,5 kN	25,5 kN	117,0 kN	94,0 kN
26	229,18 mm	189,0 kN	37,0 kN	26,5 kN	117,5 kN	94,5 kN
27	237,67 mm	189,5 kN	38,5 kN	27,5 kN	117,5 kN	95,0 kN
28	246,16 mm	190,5 kN	40,0 kN	28,5 kN	118,0 kN	95,0 kN
29	254,65 mm	191,0 kN	41,5 kN	29,5 kN	118,5 kN	95,5 kN
30						

1) check availability (chapter ZA)

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



# Rack and pinion drive – calculation and selection – module 10 – helical tooth system

Rack	HPR			BR			
	6	7	9	10	10	10	
ATLANTA-Quality	heat-treatable steel according ATLANTA-standard						
Rack	material	high performance hardening process	soft	high performance hardening process			
Pinion	heat treatment	16MnCr5	16MnCr5	C45	16MnCr5	C45	
	material	case hardened	case hardened	soft	case hardened	ind. hardened	
No. of pinion teeth <sup>1)</sup>	pitch circle dia.	maximum feed force (values are only valid for material according ATLANTA-standard)					
		114,0 kN	114,0 kN	20,0 kN	14,5 kN	71,5 kN	60,5 kN
12	127,32 mm	132,5 kN	132,5 kN	23,5 kN	16,5 kN	83,0 kN	70,0 kN
13	137,93 mm	153,5 kN	153,5 kN	27,0 kN	19,5 kN	96,0 kN	81,5 kN
14	148,54 mm	175,0 kN	175,0 kN	31,0 kN	22,0 kN	109,5 kN	93,0 kN
15	159,16 mm	187,5 kN	187,5 kN	33,0 kN	24,0 kN	117,5 kN	99,5 kN
16	169,77 mm	200,0 kN	200,0 kN	35,5 kN	25,5 kN	125,5 kN	106,0 kN
17	180,38 mm	212,5 kN	212,5 kN	37,5 kN	27,0 kN	133,5 kN	113,0 kN
18	190,99 mm	225,5 kN	225,5 kN	40,0 kN	28,5 kN	141,5 kN	119,5 kN
19	201,60 mm	238,0 kN	237,5 kN	42,0 kN	30,5 kN	149,5 kN	126,0 kN
20	212,21 mm	250,5 kN	250,5 kN	44,5 kN	32,0 kN	157,0 kN	133,0 kN
21	222,82 mm	263,0 kN	263,0 kN	46,5 kN	33,5 kN	165,0 kN	140,0 kN
22	233,43 mm	276,0 kN	276,0 kN	49,0 kN	35,0 kN	173,0 kN	142,0 kN
23	244,04 mm	285,5 kN	285,5 kN	51,0 kN	37,0 kN	178,0 kN	143,0 kN
24	254,65 mm	287,0 kN	287,0 kN	53,5 kN	38,5 kN	178,5 kN	143,5 kN
25	265,26 mm						

<sup>1)</sup> check availability (chapter ZA)

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



Rack		HPR	BR
ATLANTA-Quality		6	10
Rack	material	heat-treatable steel according ATLANTA-standard	
	heat treatment	high performance hardening process	
Pinion	material	16MnCr5	C45
	heat treatment	case hardened	case hardened ind. hardened
No. of pinion teeth <sup>1)</sup>	pitch circle dia.	maximum feed force (values are only valid for material according ATLANTA-standard)	
12	152,79 mm	163,0 kN	101,0 kN
13	165,52 mm	189,5 kN	117,5 kN
14	178,25 mm	219,0 kN	136,0 kN
15	190,99 mm	249,5 kN	155,0 kN
16	203,72 mm	267,0 kN	166,0 kN
17	216,45 mm	285,5 kN	177,0 kN
18	229,18 mm	303,0 kN	188,5 kN
19	241,92 mm	321,0 kN	199,5 kN
20	254,65 mm	339,0 kN	210,5 kN
21	267,38 mm	357,0 kN	222,0 kN
22	280,11 mm	375,0 kN	233,0 kN
23	292,85 mm	393,5 kN	244,5 kN
24	305,58 mm	407,5 kN	251,0 kN
25	318,31 mm	409,0 kN	252,5 kN

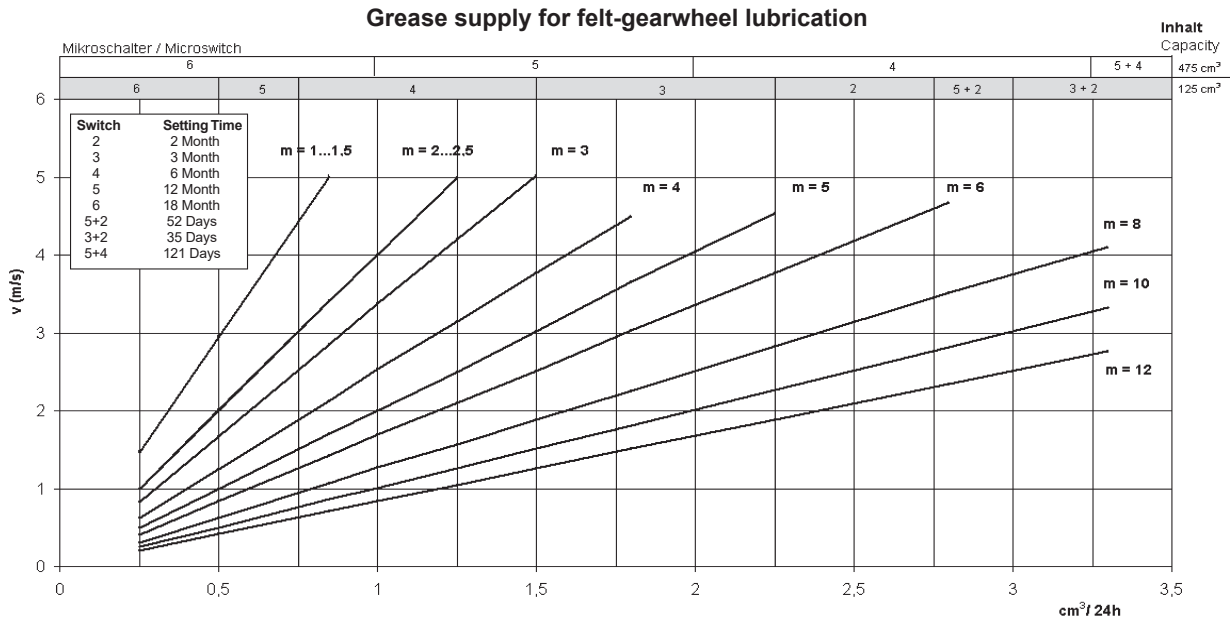
1) check availability (chapter ZA)

Maximum permissible feed forces – description see page ZA-23 ATLANTA Servo catalogue



## Lubrication of rack and pinion drives

When lubricating rack and pinion drives by means of a felt gearwheel and electronically controlled lubricator the optimal grease supply can be seen from the diagram below. For lubrication with sliding brush use the next higher switch position. If, for example, micro-switch position 4 is chosen for felt-gearwheel lubrication, choose 3 for sliding-brush lubrication at the same speed and with the same module.



## Pressure build-up

Set all micro-switches to „ON“. Pressure build-up time 6–8 hours. Then set the desired time. The micro-switch 7 must be always on. Before starting up the lubricator the connecting hose between felt wheel and lubricator should be filled and the felt wheel soaked with grease.

## Battery exchange

The guaranteed service life of the battery is 1 year. Then the battery should be replaced. Although the control lamp may still flash it is possible that the battery capacity has already decreased. The lubricator can also be operated by means of external power supply via an intermediate relay.

## Recommended lubricants for rack drives:

Felt-gear lubrication: Klüber Microlube GB 0  
**Order code 65 90 002 (1 kg)**  
 Klüber Structovis AHD  
**Order code 65 90 003 (1 kg)**

Sliding brush lubrication: Klüber Microlube GB 0  
**Order code 65 90 002 (1 kg)**

## Furthermore the following lubricants have been tested with good results.

Oest Langzeitfett LT 200  
 BP Energ grease LS EP 00  
 DEA Glissando 6833 EP 00  
 Fuchs Lubritech Gearmaster ZSA  
 Molykote G-Rapid plus 3694





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