

Rack and pinion drives

In cooperation with



STÖBER

Rack and pinion drives

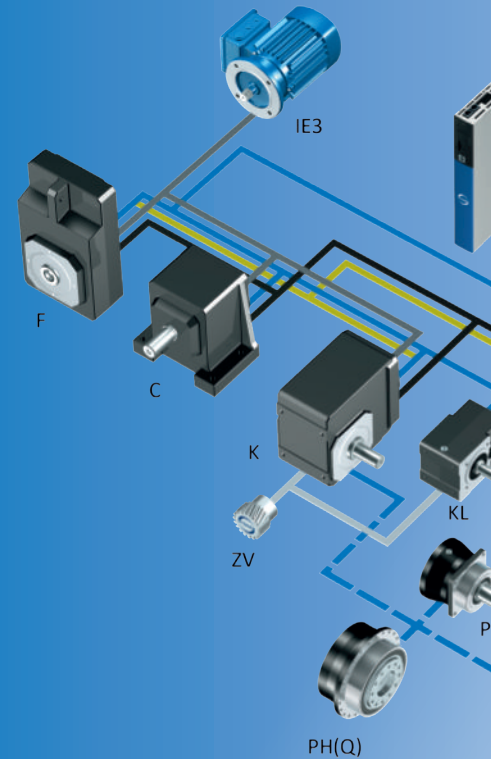
One partner. All the possibilities.

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.

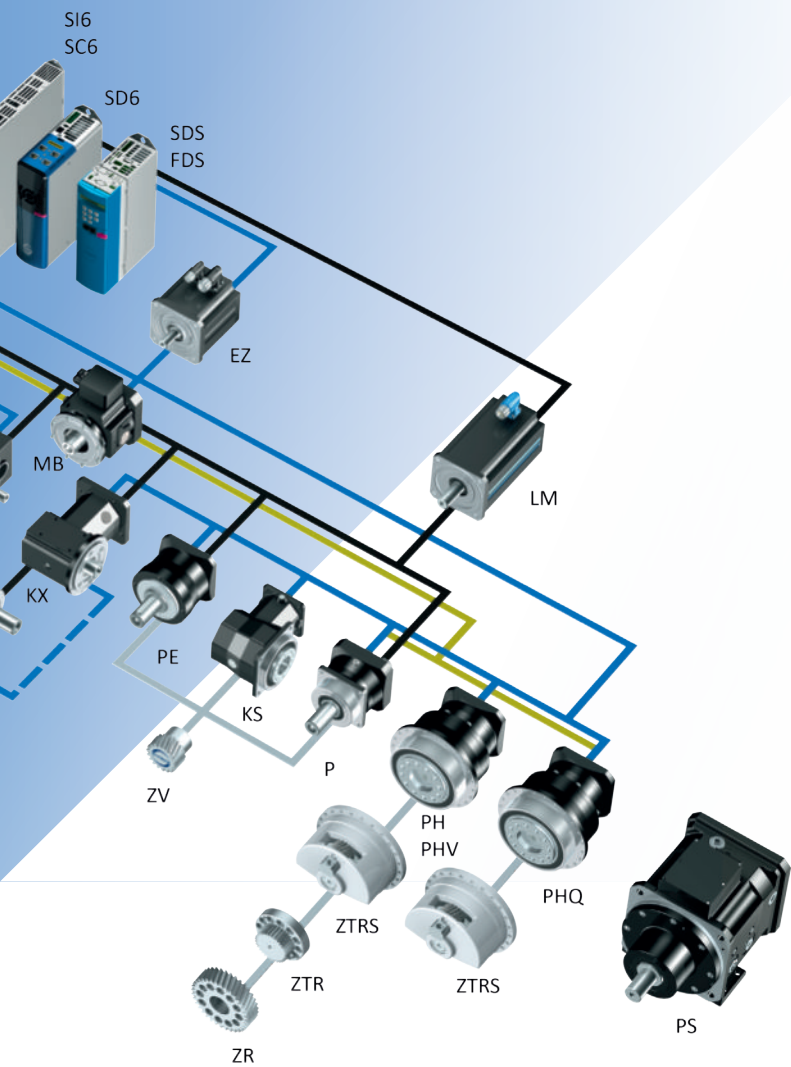
At home in the world of demanding motion

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.**

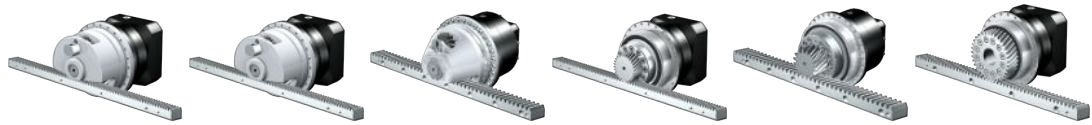


Table of contents

■	1	Selection tool.....	9
■	2	ZTRSPH rack and pinion drives	13
■	3	ZTRSPHQ rack and pinion drives	31
■	4	ZTRSPHV rack and pinion drives.....	45
■	5	ZTRPH rack and pinion drives.....	57
■	6	ZTRPHV rack and pinion drives	77
■	7	ZRPH rack and pinion drives	89
■	8	ZVP rack and pinion drives.....	105
■	9	ZVPE rack and pinion drives	123
■	10	ZVKS rack and pinion drives	137
■	11	ZVKL rack and pinion drives.....	155
■	12	ZVK rack and pinion drives.....	169
■	13	Appendix	197

1 Selection tool

1.1 Rack and pinion drives



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

Technical data

m_n	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
Δs	8 – 56 μ m	70 μ m	15 – 56 μ m	4 – 44 μ m	15 – 44 μ m	10 – 56 μ 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
Δs	8 – 44 μ m	40 – 83 μ 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	6	6
Bearing design		
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
Δs	37 – 44 μm	99 – 123 μm	12 – 111 μm

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	6	6	6

ATLANTA gear racks

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

<http://atlantagmbh.de/>

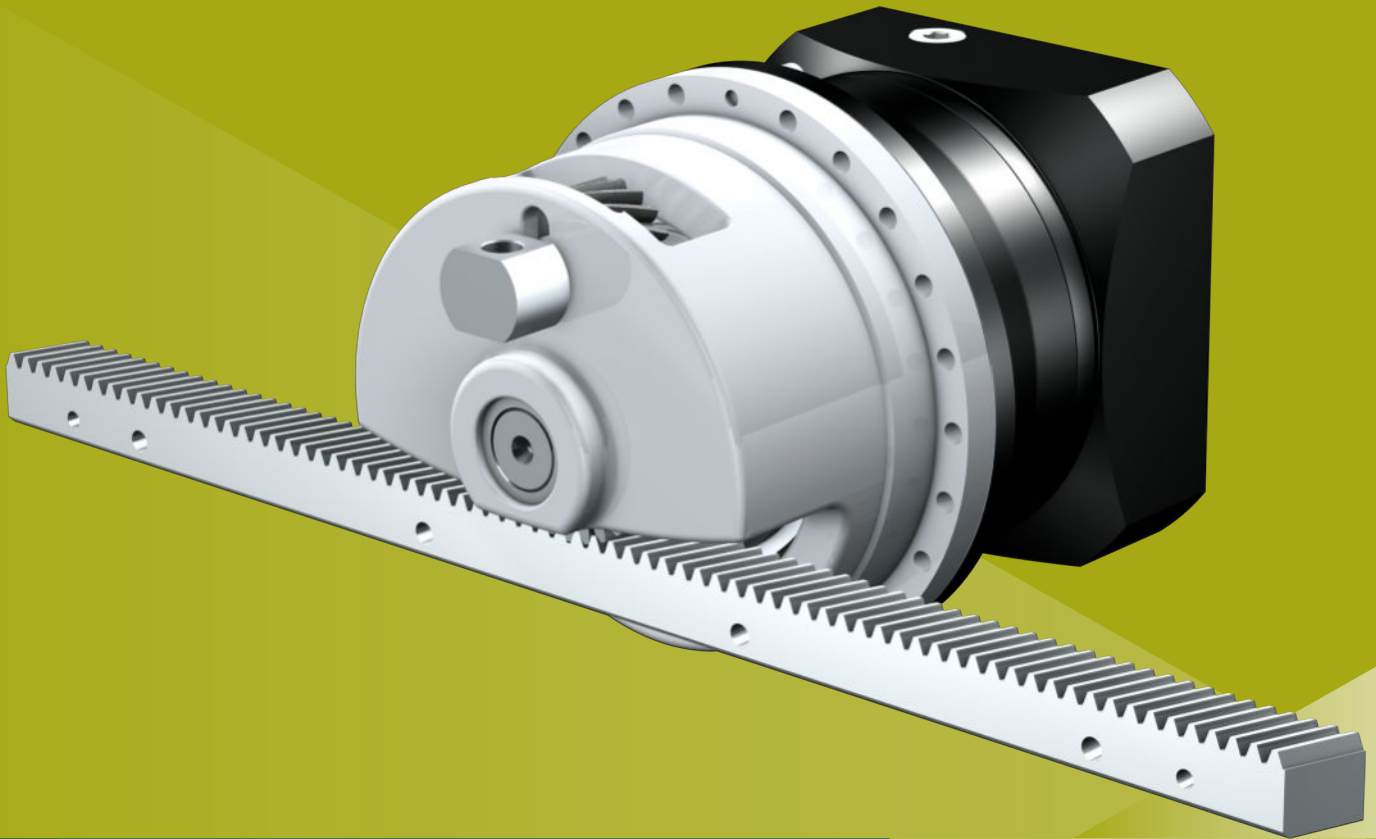
1 Selection tool

1.1 Rack and pinion drives

2 ZTRSPH rack and pinion drives

Table of contents

2.1	Overview	14
2.2	Selection tables	15
2.3	Dimensional drawings	20
2.4	Type designation	22
2.4.1	Nameplate	23
2.5	Product description	23
2.5.1	Input options	23
2.5.2	Motor adapter with EasyAdapt coupling (ME/MEL)	24
2.5.3	Motor adapter with FlexiAdapt coupling (MF)	24
2.5.4	Gear rack	25
2.5.5	Installation conditions	25
2.5.6	Lubricants	25
2.5.7	Position of locking screw access	25
2.5.8	Other product features	25
2.5.9	Direction of rotation	26
2.6	Project configuration	26
2.6.1	Drive selection	27
2.6.2	Permitted breakdown torques at the gear unit input	29
2.6.3	Recommendation for radial shaft seal rings	30
2.7	Additional documentation	30



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
Δs	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_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	v_{ZmaxZB} [m/s]	Δs [μm]	Δs_{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]
ZTRS3PH7 ($F_{f2acc,max} = 20$ kN)															
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
ZTRS3PH8 ($F_{f2acc,max} = 28$ kN)															
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_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [μm]	Δs_{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]
ZTRS8PH9 ($F_{f2acc,max} = 79$ kN)															
60.00	ZTRS815SPH942_0600 ME	2800	4500	≤48	0.50	56	19	371	8	15	127.3	55	79	150	5000
60.00	ZTRS815SPH942_0600 MEL	2800	4500	≤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.

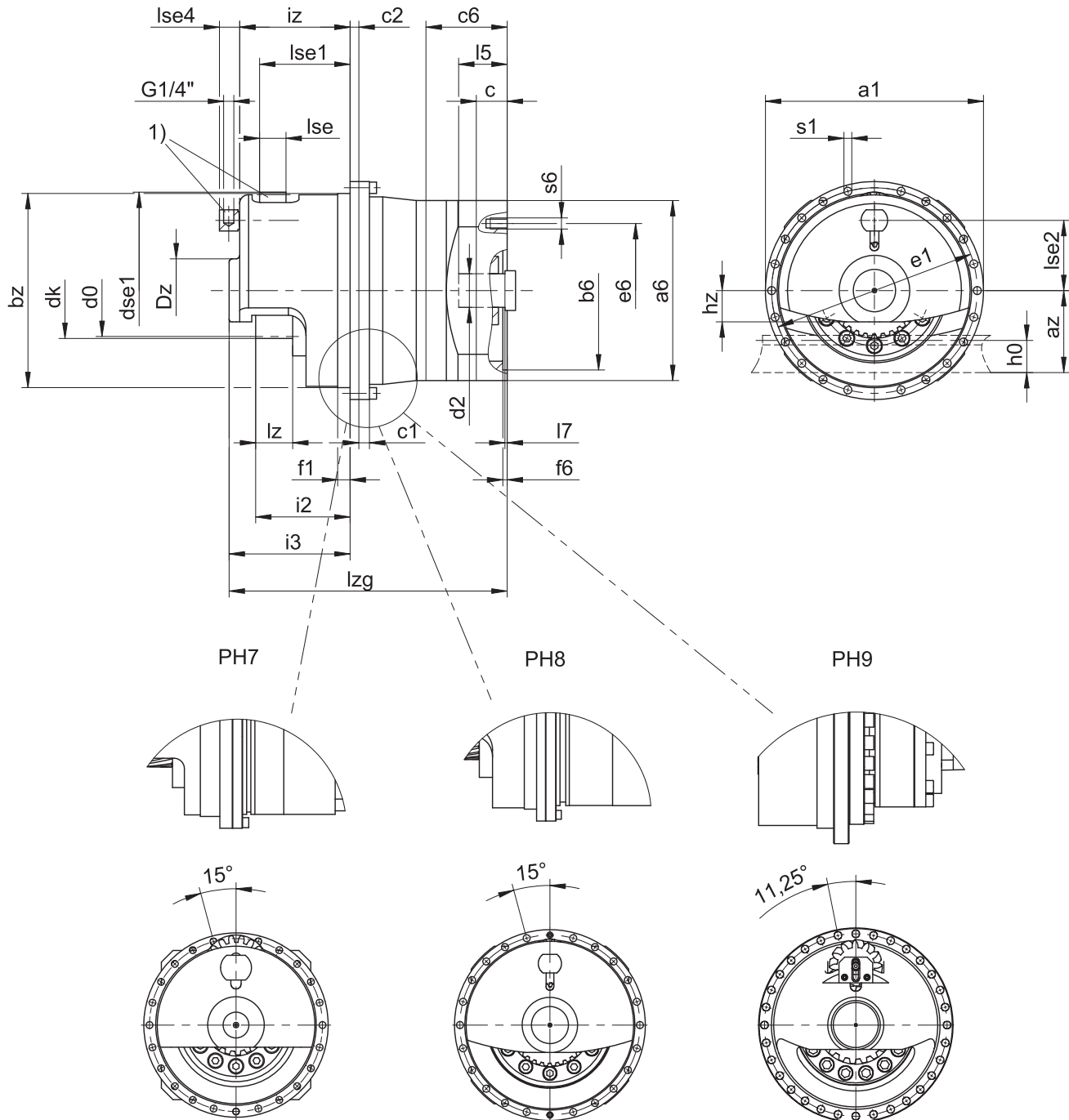
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

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/>.



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 _{h7}	10	12	54.11	60.1	63.6	55	168	19.0	78.5	99.5	89.5	26	21.5	32.5	25	75.2	55.7	23.0	6.6	0.0
ZTRS332SPH8_	3	247	76.93	220 _{h7}	12	10	101.86	107.9	63.6	72	233	14.0	107.0	137.0	125.0	26	35.5	42.0	30	102.6	79.5	23.0	9.0	0.0
ZTRS420SPH8_	4	247	77.44	220 _{h7}	12	10	84.88	92.8	62.8	72	233	14.0	110.0	137.0	125.0	35	35.5	45.0	30	98.6	68.9	23.0	9.0	0.0
ZTRS516SPH8_	5	247	76.44	220 _{h7}	12	10	84.88	94.8	78.6	72	233	14.5	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 _{h7}	18	18	106.10	116.1	78.6	100	325	21.5	137.0	179.0	171.0	34	45.0	55.0	30	131.1	87.1	–	13.5	0.0
ZTRS620SPH9_	6	346	106.66	300 _{h7}	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 _{h7}	18	18	127.32	147.3	160.0	110	325	21.5	162.0	204.7	196.5	71	55.0	80.0	65	162.0	137.7	5.5	13.5	0.3

Example dimensions for the motor connection + total length

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

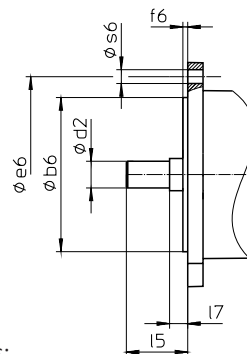
Example code

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	Toothing	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	Generation 4
1	Stages	Single-stage
2	Stages	Two-stage
S	Housing	Standard
F	Shaft	Flange shaft
S	Bearing	Standard bearing
V	Bearing	Reinforced bearing (PH3 – PH5)
S	Backlash	Standard
R	Backlash	Reduced
0050	Transmission ratio ($i \times 10$)	$i = 5$ (example)
ME	Motor adapter	Motor adapter with EasyAdapt coupling
MEL	Motor adapter	Motor adapter with EasyAdapt coupling for large motors
MF	Motor adapter	Motor adapter with FlexiAdapt coupling
MB ¹	Motor adapter	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.

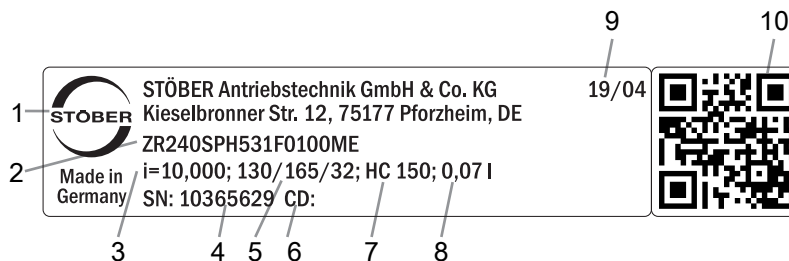
- Position of the gear rack, see the chapter [▶ 2.5.7]
- Radial shaft seal rings at the output made of NBR or FKM (option), see the chapter [▶ 2.6.3]
- Radial runout $\leq 10 \mu\text{m}$ (optional)
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation on request

- 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>

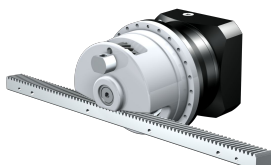
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

2.5 Product description

2.5.1 Input options

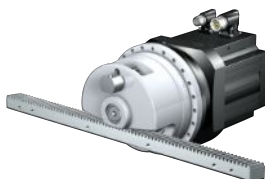
In this chapter, you will find all available input options:

Motor adapter



Catalog ID 443137_en

EZ synchronous servo motor



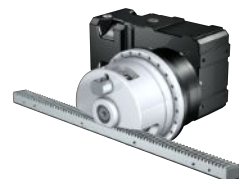
Catalog ID 443286_en

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:

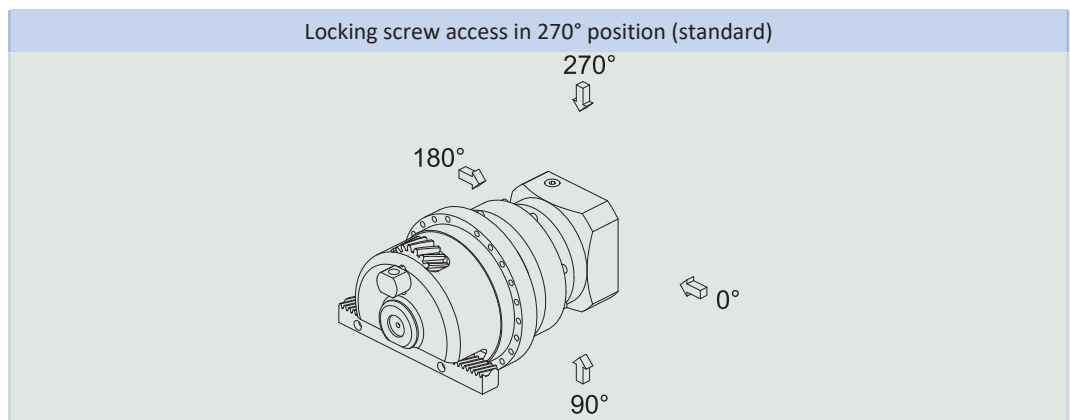
- When the gear housing is fastened on the machine side using screws of strength class 12.9
- When the gear housings are adjusted at pilot \varnothing bz. The machine-side fit must be H7.

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.

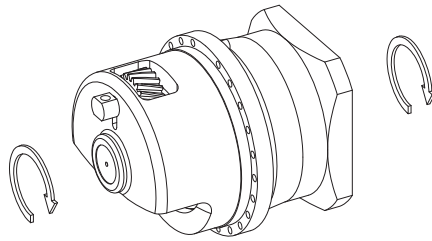
2.5.8 Other product features

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

²Observe 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>.

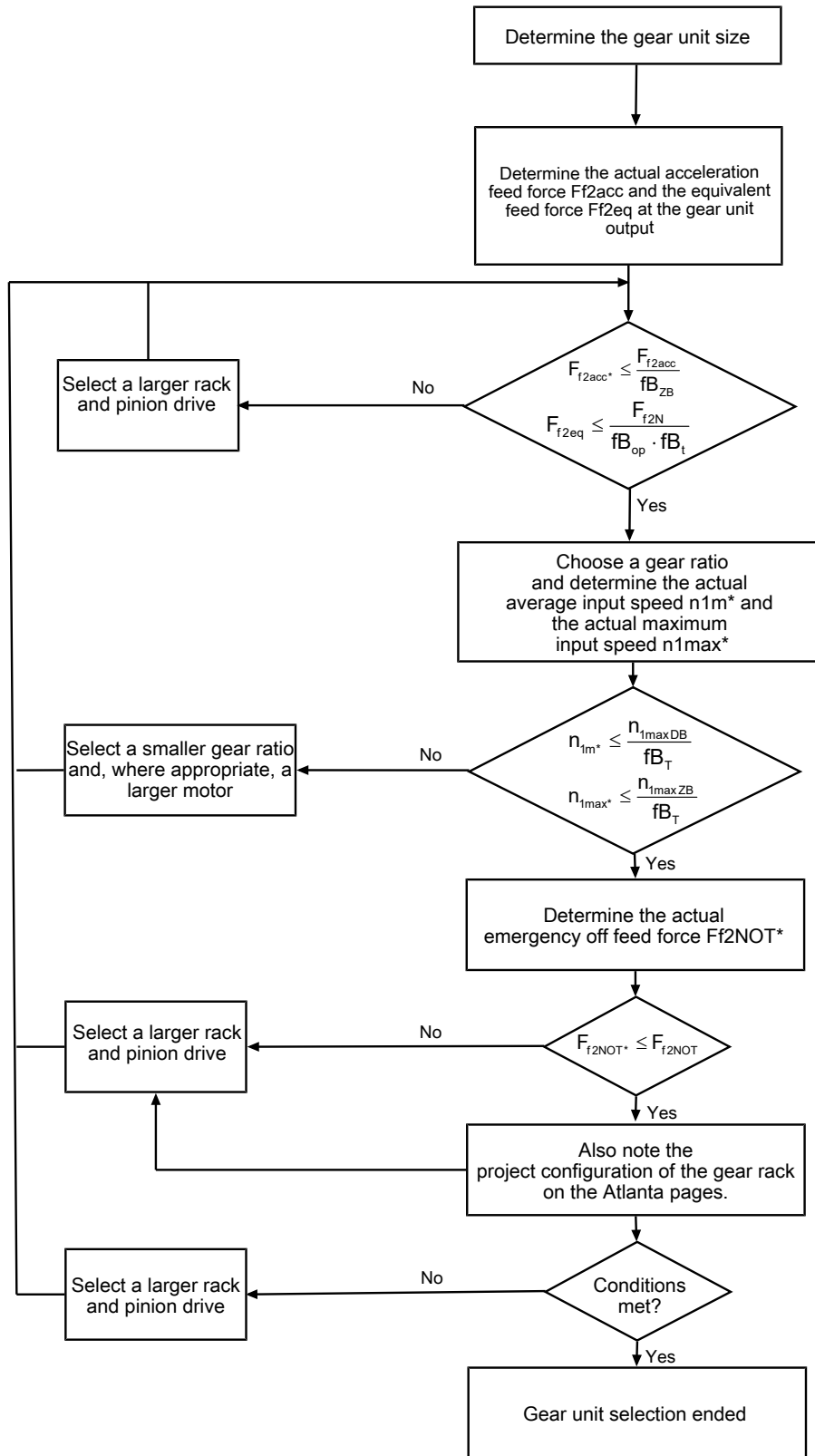
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

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

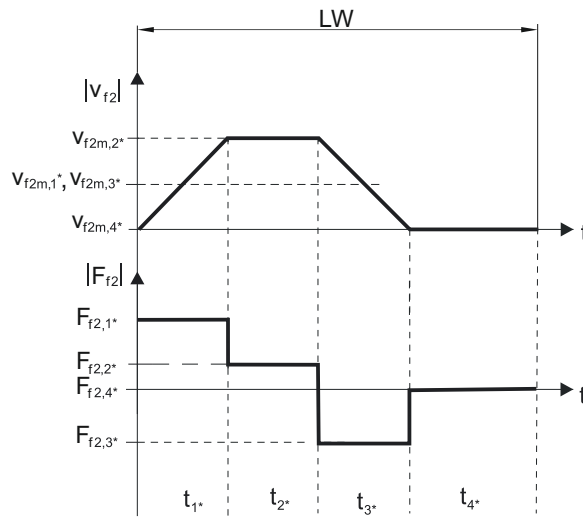


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

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

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

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

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	1.00
Reversing load cyclic operation	1.00
Run time	fB_t
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
Cyclic operation	fB_{ZB}
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

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

Notes

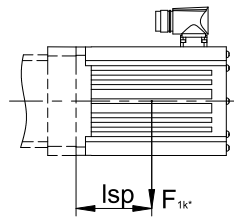
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

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/>

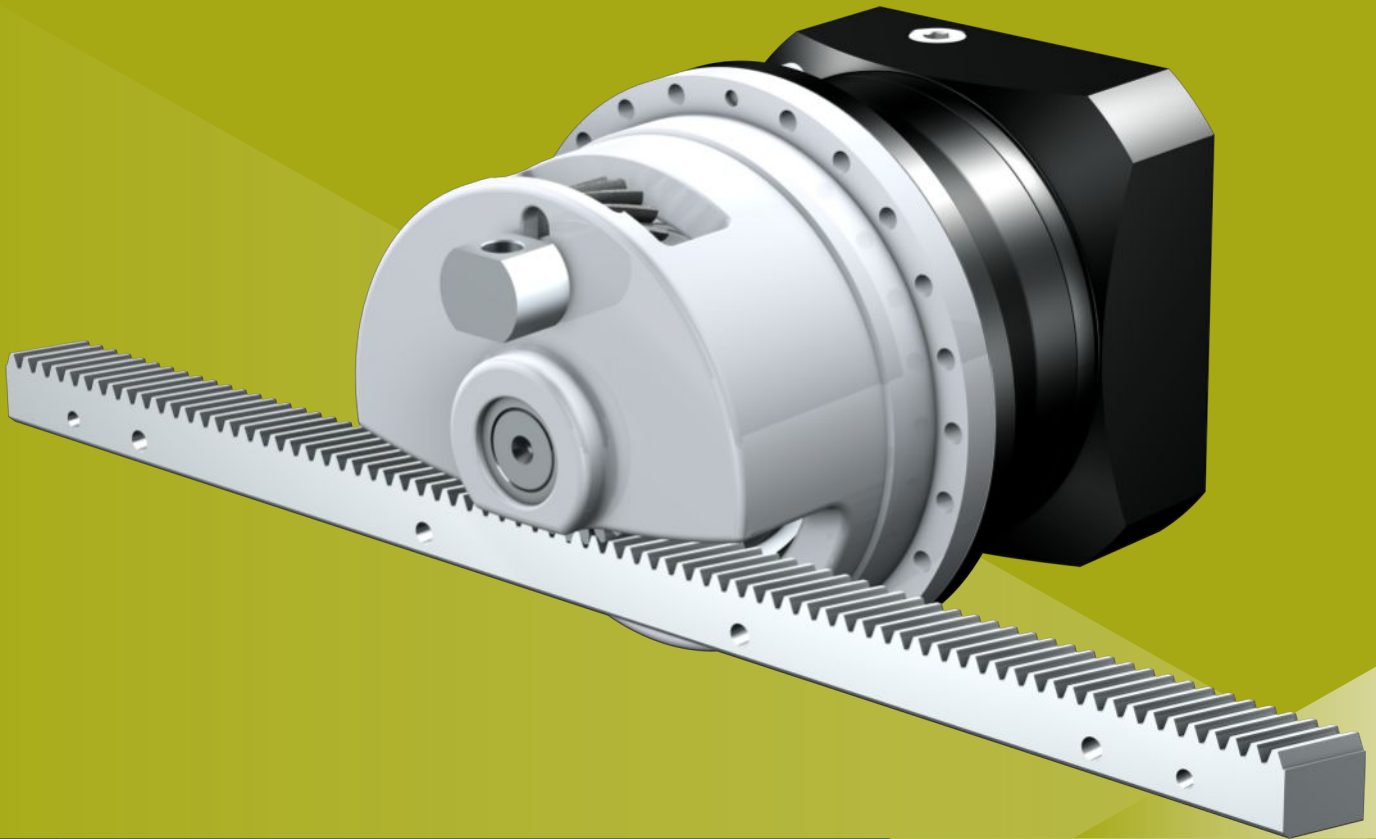
Enter the ID of the documentation in the Search term field.

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

Table of contents

3.1	Overview	32
3.2	Selection tables	33
3.3	Dimensional drawings	34
3.4	Type designation	35
3.4.1	Nameplate	36
3.5	Product description	36
3.5.1	Input options	36
3.5.2	Motor adapter with EasyAdapt coupling (ME/MEL)	37
3.5.3	Gear rack	37
3.5.4	Installation conditions	37
3.5.5	Lubricants	37
3.5.6	Mounting positions	38
3.5.7	Position of locking screw access	38
3.5.8	Other product features	38
3.5.9	Direction of rotation	39
3.6	Project configuration	39
3.6.1	Drive selection	40
3.6.2	Permitted breakdown torques at the gear unit input	42
3.6.3	Recommendation for radial shaft seal rings	43
3.7	Additional documentation	43



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
Δs	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]	Δs [μm]	Δs_{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]
ZTRS8PHQ10 ($F_{f2acc,max} = 124$ kN)															
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.

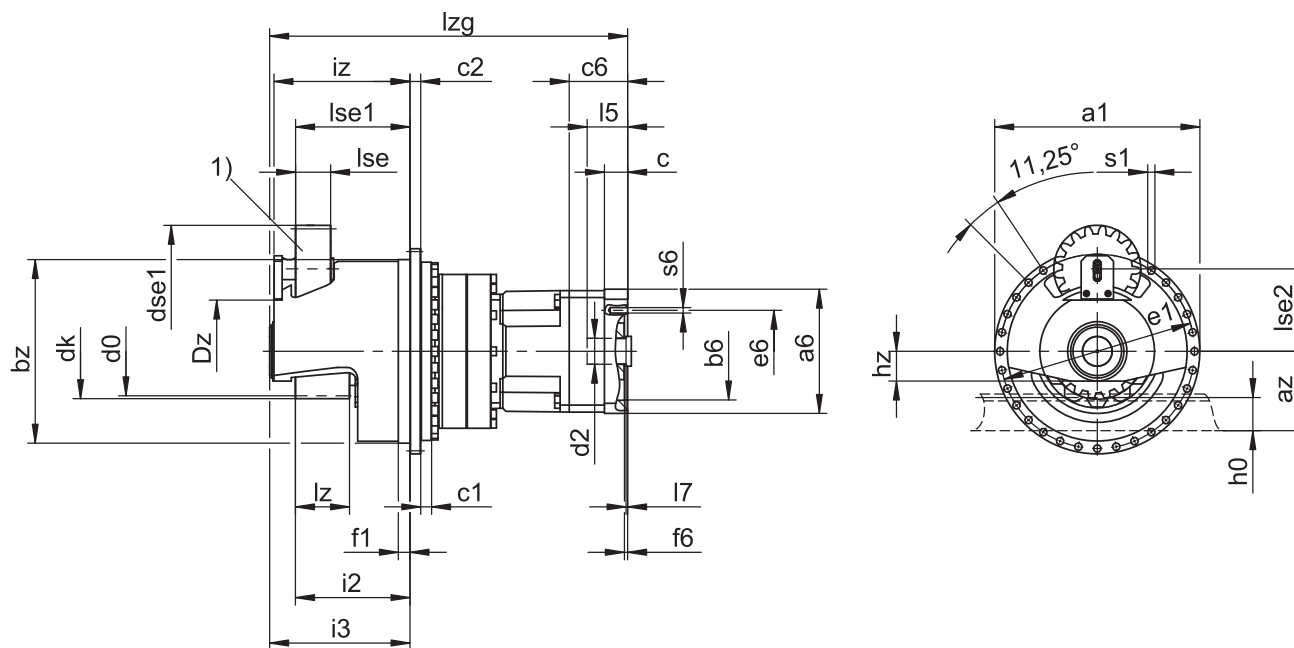
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

The pinion of the rack and pinion drive is helical (left-hand $19^\circ 31' 42''$). 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	Øs1	x
ZTRS819SPHQ10_	8	380	151.64	340 _{h7}	20	20	161.28	177.3	160.0	110	360	21.5	212	260	251.9	71	55	100	65	211.7	152.8	13.5	0.00

Example dimensions for the motor connection + total length

Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZTRS8_PHQ1042_ME	180 ^{H7}	215	60	85	230	43	91.5	6.0	10.5	581.5	M12
ZTRS8_PHQ1043_ME	180 ^{H7}	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.

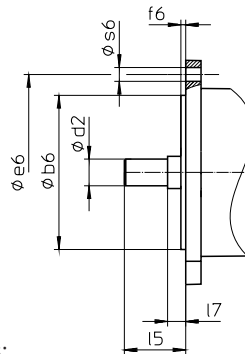
Example code

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 ¹		ServoStop motor adapter with brake

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



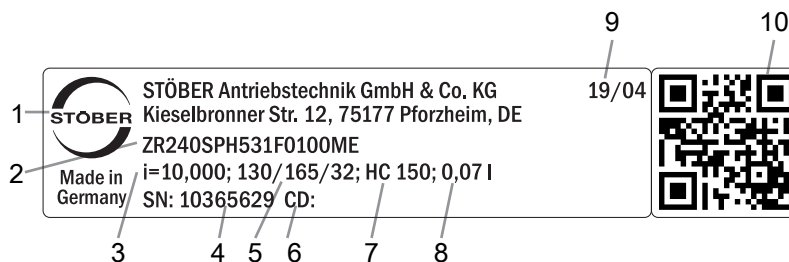
- Motor type or motor dimensions:
To choose a suitable motor connection, use the STOBER Configurator at <https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.
- Mounting position (for three-stage gear units), see the chapter [▶ 3.5.6]
- Position of the 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].

¹You 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>

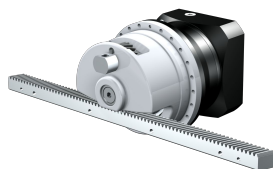
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

3.5 Product description

3.5.1 Input options

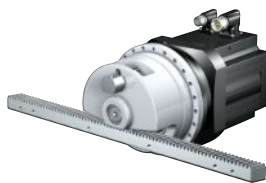
In this chapter, you will find all available input options:

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.

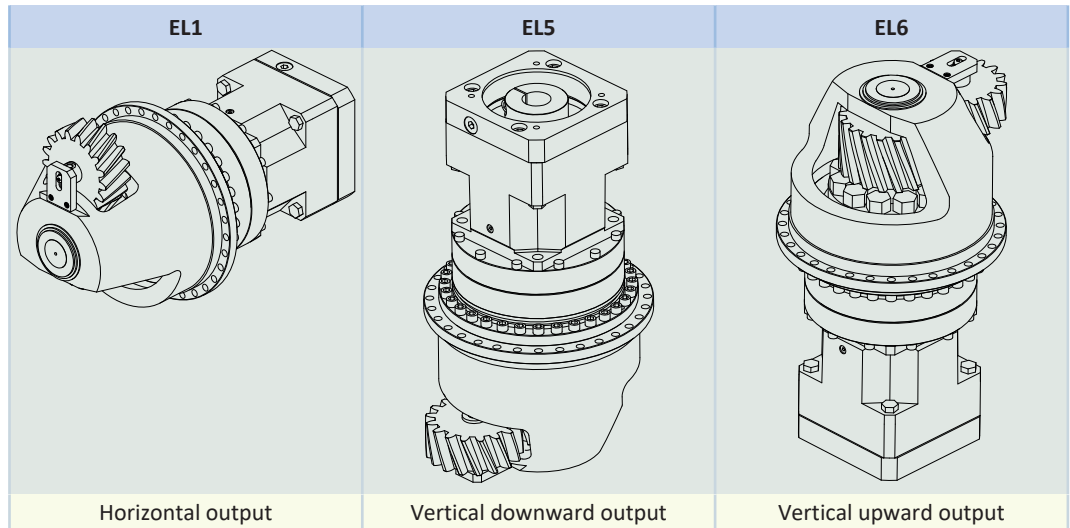
3.5.5.1 Rack and pinion drive lubrication

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

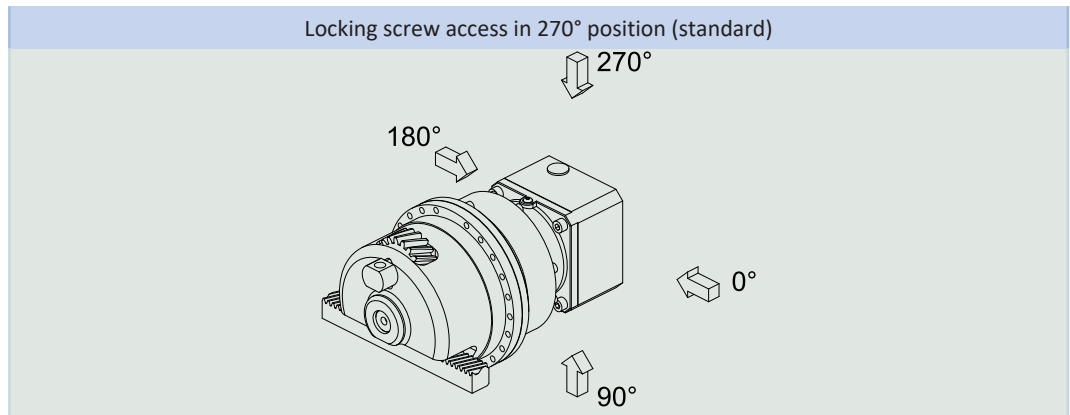
3.5.6 Mounting positions

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.

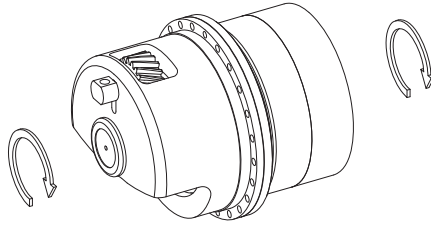
3.5.8 Other product features

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: ²	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

²Observe 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 SERVOnsoft designing software. Download SERVOnsoft for free at <https://www.stoeber.de/en/ServoSoft>.

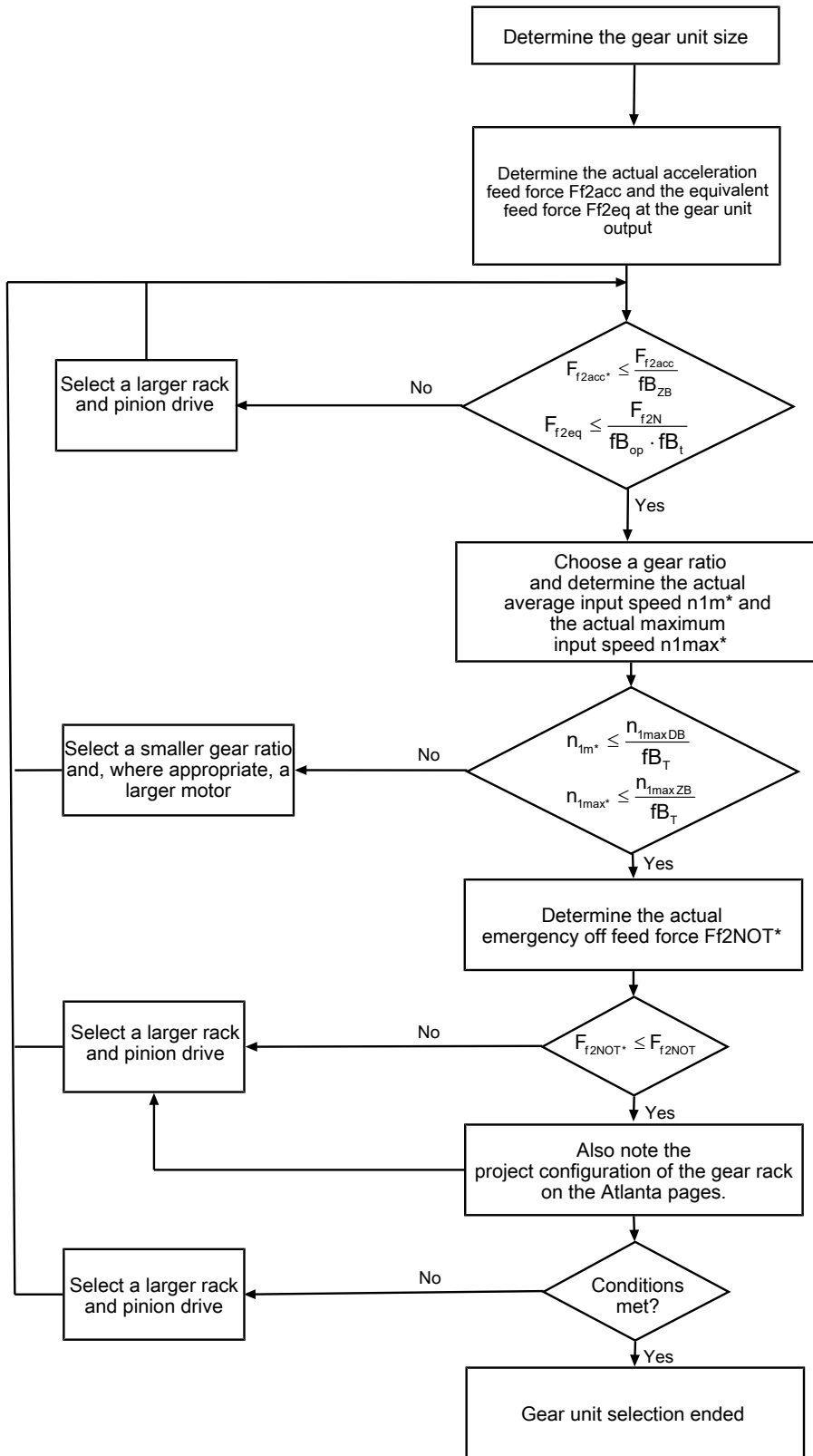
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

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](#).

3.6.1 Drive selection

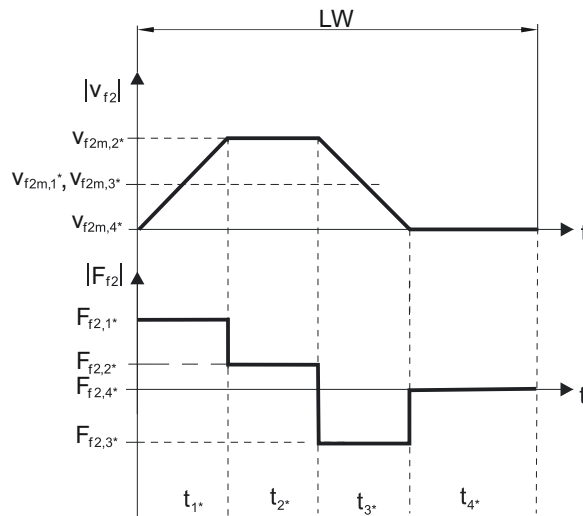


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

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

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

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

If $t_{1*} + \dots + t_{3*} \geq 6 \text{ min}$, 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	1.00
Reversing load cyclic operation	1.00
Run time	fB_t
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
Cyclic operation	fB_{ZB}
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

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

Notes

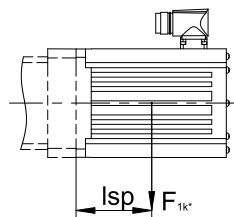
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

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/>

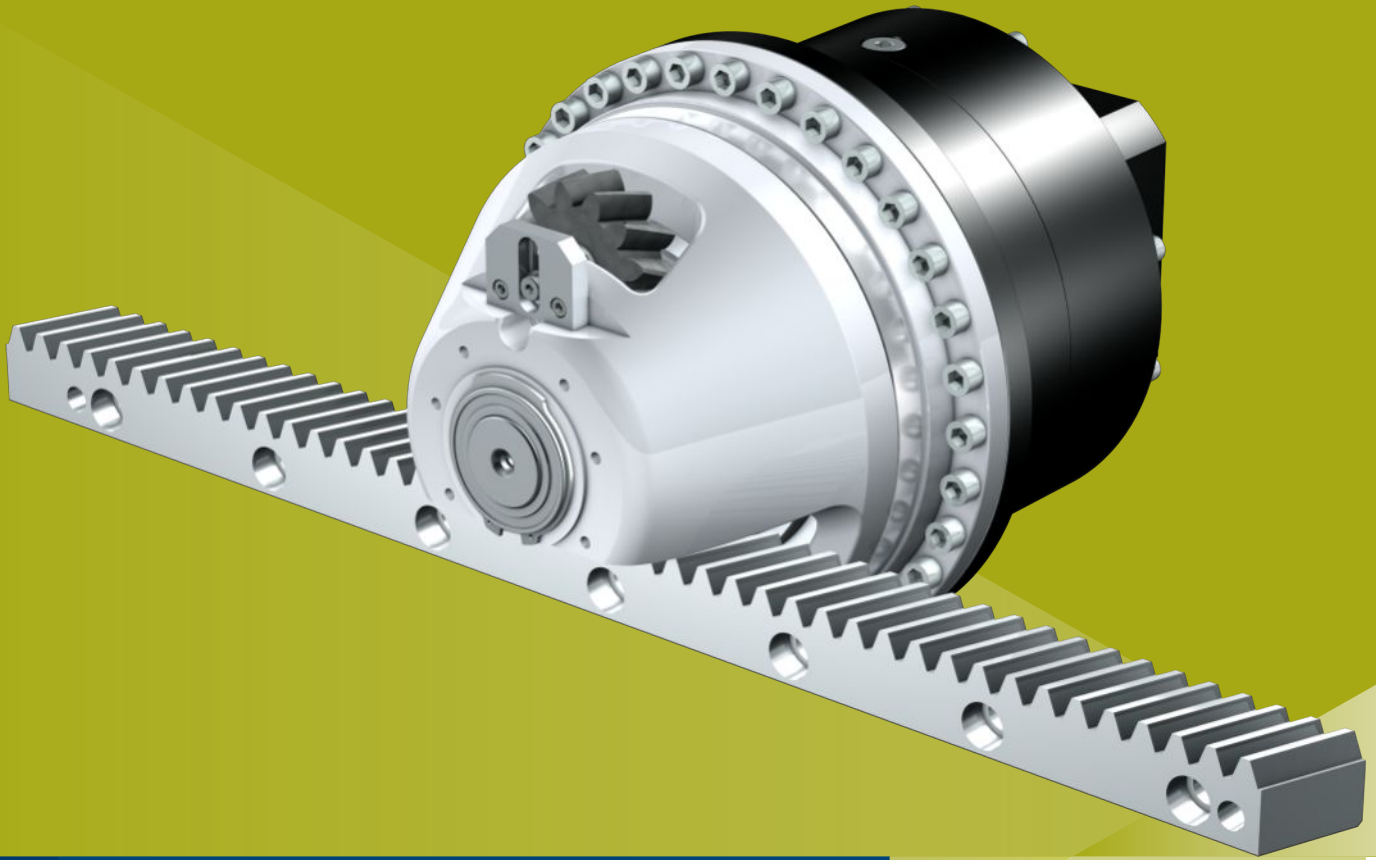
Enter the ID of the documentation in the Search term field.

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

Table of contents

4.1	Overview	46
4.2	Selection tables	47
4.3	Dimensional drawings	48
4.4	Type designation	49
4.4.1	Nameplate	50
4.5	Product description	50
4.5.1	Input options	50
4.5.2	Motor adapter with EasyAdapt coupling (ME/MEL)	51
4.5.3	Gear rack	51
4.5.4	Installation conditions	51
4.5.5	Lubricants	51
4.5.6	Position of locking screw access	52
4.5.7	Other product features	52
4.5.8	Direction of rotation	52
4.6	Project configuration	52
4.6.1	Drive selection	53
4.6.2	Permitted breakdown torques at the gear unit input	55
4.6.3	Recommendation for radial shaft seal rings	55
4.7	Additional documentation	56



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
Δs	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]	Δs [μm]	Δs_{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]
ZTRS5PHV9 ($F_{f2acc,max} = 77$ kN)															
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
ZTRS6PHV9 ($F_{f2acc,max} = 67$ kN)															
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
ZTRS8PHV9 ($F_{f2acc,max} = 67$ kN)															
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.

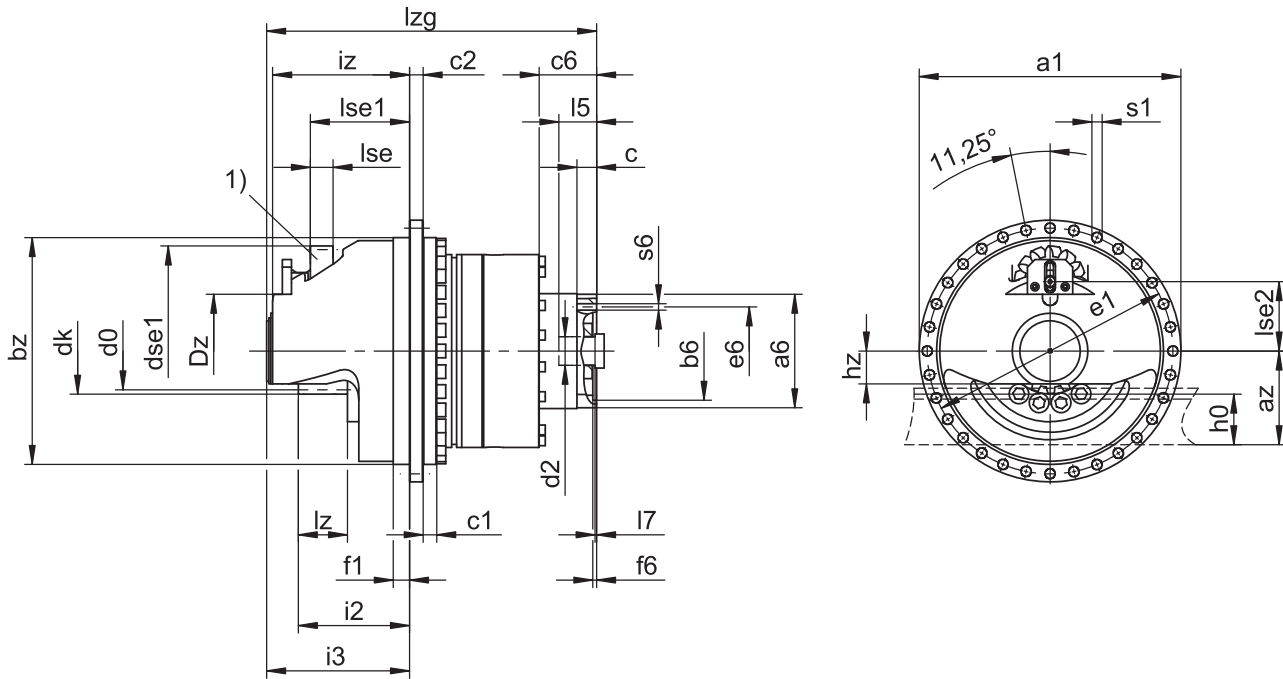
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

The pinion of the rack and pinion drive is helical (left-hand $19^\circ 31' 42''$). 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	Øs1	x
ZTRS520SPHV9_	5	346	87.05	300 _{h7}	18	18	106.10	116.1	78.6	100	325	21.5	137.0	179.0	171.0	34	45.0	55	30	131.1	87.1	13.5	0.0
ZTRS620SPHV9_	6	346	106.66	300 _{h7}	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 _{h7}	18	18	127.32	147.3	160.0	110	325	21.5	162.0	204.7	196.5	71	55.0	80	65	162.0	137.7	13.5	0.3

Example dimensions for the motor connection + total length

Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZTRS5_PHV9_ME	130 ^{H7}	165	38	61	150	26	66	5.5	4.5	425.0	M10
ZTRS6_PHV9_ME	130 ^{H7}	165	38	61	150	26	66	5.5	4.5	435.0	M10
ZTRS8_PHV9_ME	130 ^{H7}	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 STOBER 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.

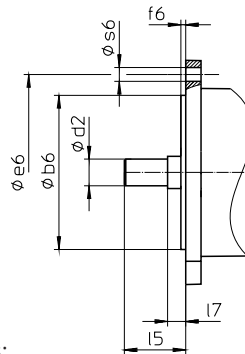
Example code

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 ¹		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.

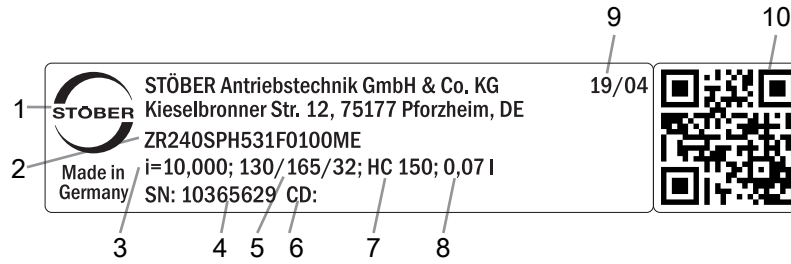
- Position of the gear rack, see the chapter [▶ 4.5.6]
- Radial shaft seal rings at the output made of NBR or FKM (option), see the chapter [▶ 4.6.3]
- Radial runout $\leq 10 \mu\text{m}$ (optional)
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation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

¹You 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>

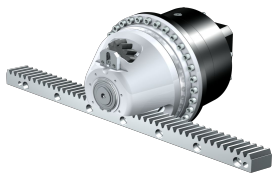
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

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

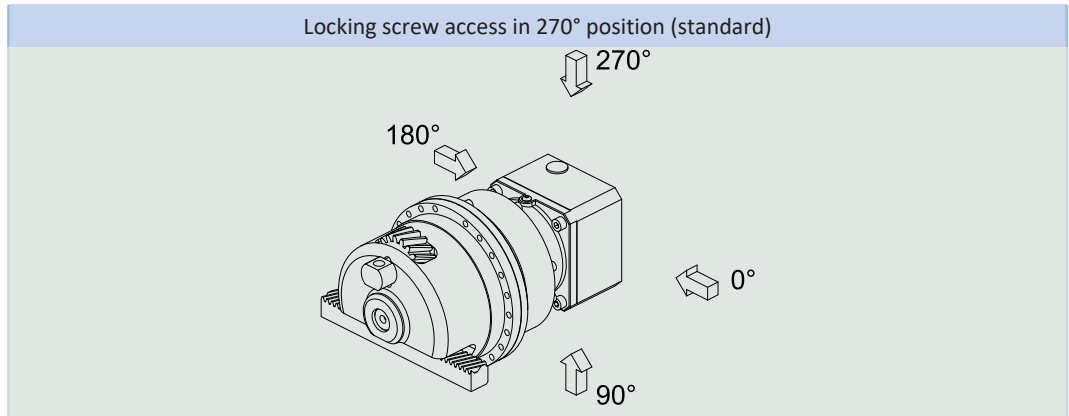
STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

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.

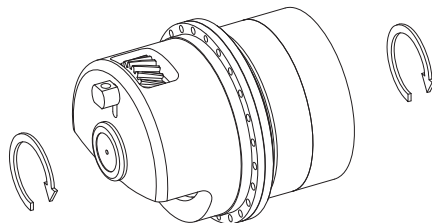
Note that the access hole for the motor coupling locking screw also rotates when the gear rack is rotated to another position.

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: ²	
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>.

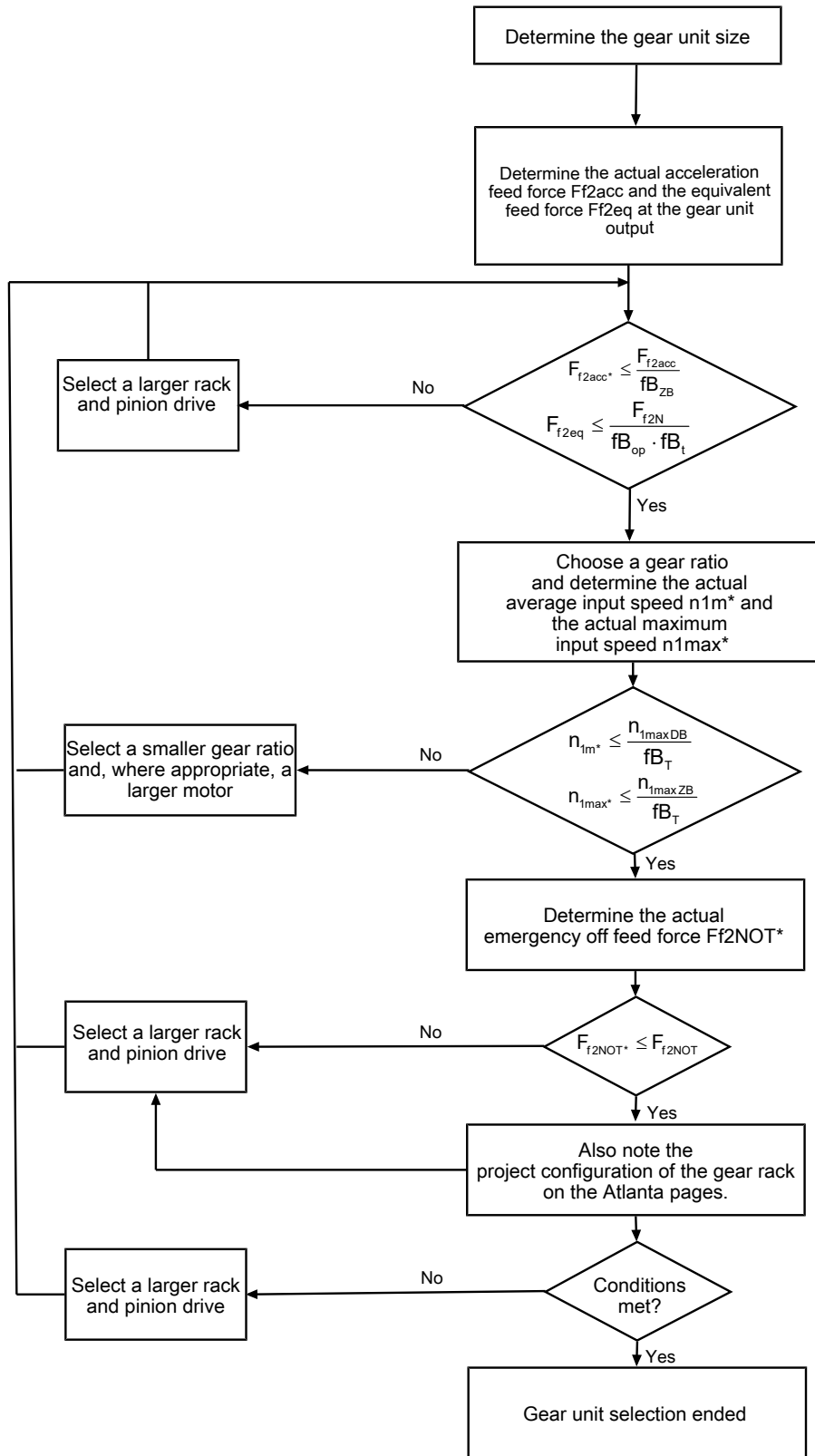
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

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](#).

4.6.1 Drive selection

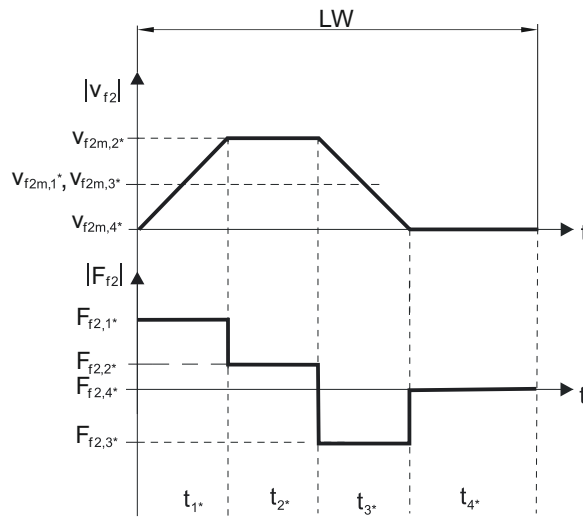


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

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

$$n_{1m} = \frac{v_{f2m} \cdot i}{d_0 \cdot \pi}$$

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

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	1.00
Reversing load cyclic operation	1.00
Run time	fB_t
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
Cyclic operation	fB_{ZB}
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

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

Notes

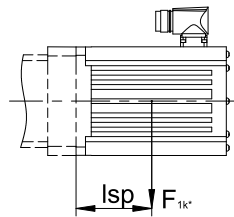
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

4.6.2 Permitted breakdown torques at the gear unit input

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

Calculate the actual breakdown torque as follows:

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



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/>

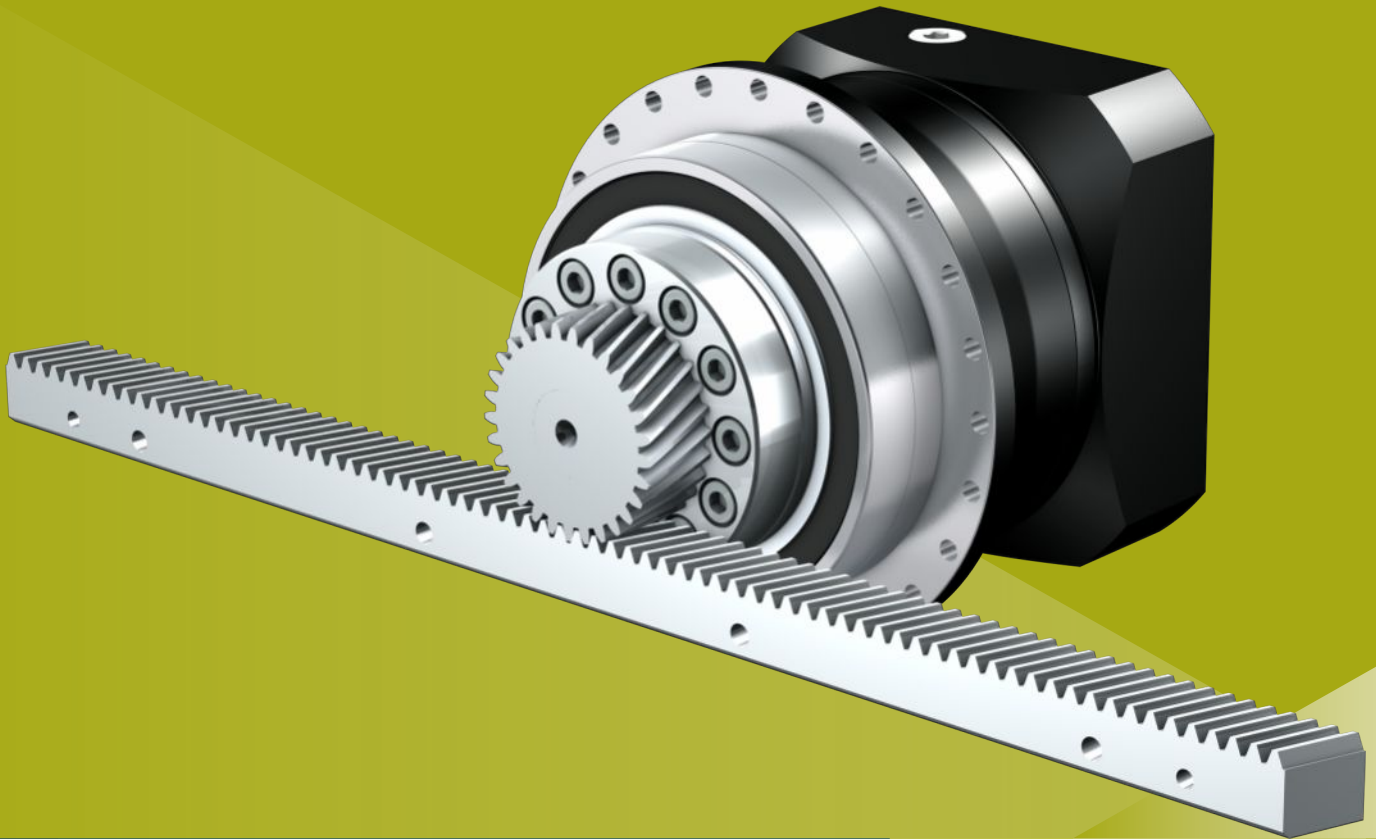
Enter the ID of the documentation in the Search term field.

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

Table of contents

5.1	Overview	58
5.2	Selection tables	59
5.3	Dimensional drawings	66
5.4	Type designation	68
5.4.1	Nameplate	69
5.5	Product description	69
5.5.1	Input options	69
5.5.2	Motor adapter with EasyAdapt coupling (ME/MEL)	70
5.5.3	Motor adapter with FlexiAdapt coupling (MF)	70
5.5.4	Gear rack	71
5.5.5	Installation conditions	71
5.5.6	Lubricants	71
5.5.7	Other product features	71
5.5.8	Direction of rotation	71
5.6	Project configuration	72
5.6.1	Drive selection	73
5.6.2	Permitted breakdown torques at the gear unit input	75
5.6.3	Recommendation for radial shaft seal rings	75
5.7	Additional documentation	76



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
Δs	4 – 44 μm

5.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 5.5.4](#)
- 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 _{1maxDB} [rpm]	n _{1maxZB} [rpm]	d _{MW} [mm]	v _{f2maxZB} [m/s]	Δs [μm]	Δs _{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]
ZTR2PH4 (F_{f2acc,max} = 6,7 kN)															
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

i	Type	n_{1maxDB}	n_{1maxZB}	d_{MW}	$v_{f2maxZB}$	Δs	Δs_{red}	C_{lin}	m_n	z	d_0	F_{f2N}	F_{f2acc}	F_{f2NOT}	M_{2acc}
		[rpm]	[rpm]	[mm]	[m/s]	[μ m]	[μ m]	[N/ μ m]	[mm]		[mm]	[kN]	[kN]	[kN]	[Nm]
ZTR5PH9 ($F_{f2acc,max} = 67$ kN)															
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
ZTR6PH9 ($F_{f2acc,max} = 56$ kN)															
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.

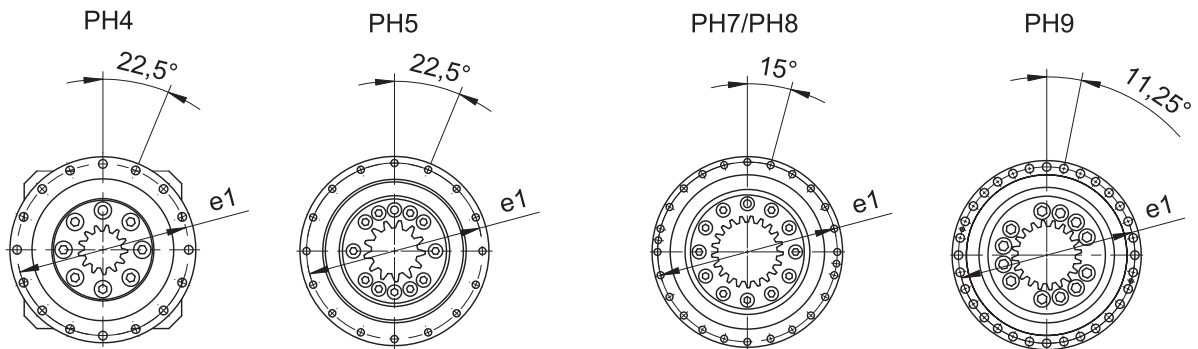
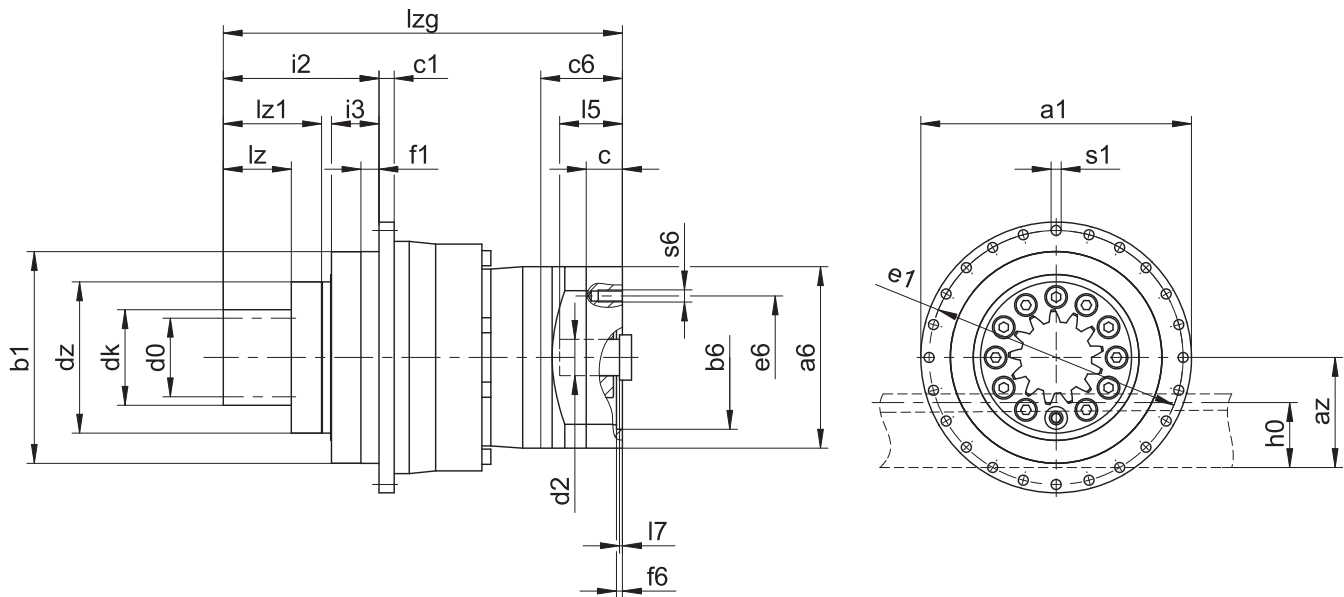
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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 _{h7}	35.73	90 _{h7}	7	25.47	31.5	63	109	10	22	71.0	23.5	26.0	41.0	5.5	0.50
ZTR216SPH4_	2	118 _{h7}	38.98	90 _{h7}	7	33.95	38.0	63	109	10	22	71.0	23.5	26.0	41.0	5.5	0.00
ZTR219SPH5_	2	145 _{h7}	42.16	110 _{h7}	8	40.32	44.3	80	135	12	22	70.0	22.5	26.0	41.0	5.5	0.00
ZTR223SPH5_	2	145 _{h7}	46.40	110 _{h7}	8	48.81	52.8	80	135	12	22	70.0	22.5	26.0	41.0	5.5	0.00
ZTR314SPH5_	3	145 _{h7}	49.18	110 _{h7}	8	44.56	52.4	80	135	12	26	76.5	22.5	32.5	47.5	5.5	0.30
ZTR223SPH7_	2	179 _{h7}	46.40	140 _{h7}	10	48.81	52.8	100	168	12	22	84.0	31.5	26.0	46.0	6.6	0.00
ZTR316SPH7_	3	179 _{h7}	51.46	140 _{h7}	10	50.93	56.9	100	168	12	26	90.5	31.5	32.5	52.5	6.6	0.00
ZTR319SPH7_	3	179 _{h7}	56.24	140 _{h7}	10	60.48	66.5	100	168	12	26	90.5	31.5	32.5	52.5	6.6	0.00
ZTR412SPH7_	4	179 _{h7}	62.46	140 _{h7}	10	50.93	62.9	100	168	12	35	103.0	31.5	45.0	65.0	6.6	0.50
ZTR332SPH8_	3	247 _{h7}	76.93	200 _{h7}	12	101.86	107.9	148	233	15	26	107.5	41.5	32.5	57.5	9.0	0.00
ZTR417SPH8_	4	247 _{h7}	71.08	200 _{h7}	12	72.15	80.2	148	233	15	35	120.0	41.5	45.0	70.0	9.0	0.00
ZTR420SPH8_	4	247 _{h7}	77.44	200 _{h7}	12	84.88	92.9	148	233	15	35	120.0	41.5	45.0	70.0	9.0	0.00
ZTR518SPH8_	5	247 _{h7}	81.75	200 _{h7}	12	95.49	105.5	148	233	15	34	130.0	41.5	55.0	80.0	9.0	0.00
ZTR615SPH8_	6	247 _{h7}	90.75	200 _{h7}	12	95.49	107.5	148	233	15	43	140.0	41.5	65.0	90.0	9.0	0.00
ZTR519SPH9_	5	300	84.40	255 _{h7}	18	100.80	110.8	187	280	20	34	155.0	54.0	55.0	89.0	13.5	0.00
ZTR616SPH9_	6	300	93.93	255 _{h7}	18	101.86	113.9	187	280	20	43	165.0	54.0	65.0	99.0	13.5	0.00

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 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	154.5	M8
ZTR2_PH432_ME	60.0 ^{H7}	75	19	41	75	18	41.5	3.5	4.0	191.5	M5
ZTR2_PH531_ME	110.0 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	173.0	M8
ZTR3_PH531_ME	110.0 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	179.5	M8
ZTR2_PH532_ME	95.0 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	202.0	M8
ZTR3_PH532_ME	95.0 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	208.5	M8
ZTR2_PH731_ME	130.0 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	207.0	M10
ZTR3_PH731_ME	130.0 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	213.5	M10
ZTR4_PH731_ME	130.0 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	226.0	M10
ZTR2_PH732_ME	110.0 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	245.0	M8
ZTR3_PH732_ME	110.0 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	251.5	M8
ZTR4_PH732_ME	110.0 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	264.0	M8
ZTR3_PH831_ME	180.0 ^{H7}	215	48	83	204	35	80.5	5.5	8.5	275.5	M12
ZTR4_PH831_ME	180.0 ^{H7}	215	48	83	204	35	80.5	5.5	8.5	288.0	M12
ZTR5_PH831_ME	180.0 ^{H7}	215	48	83	204	35	80.5	5.5	8.5	298.0	M12
ZTR6_PH831_ME	180.0 ^{H7}	215	48	83	204	35	80.5	5.5	8.5	308.0	M12
ZTR3_PH832_ME	130.0 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	320.5	M10
ZTR4_PH832_ME	130.0 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	333.0	M10
ZTR5_PH832_ME	130.0 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	343.0	M10
ZTR6_PH832_ME	130.0 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	353.0	M10
ZTR5_PH942_ME	180.0 ^{H7}	215	48	83	204	35	80.5	5.5	8.5	423.5	M12
ZTR6_PH942_ME	180.0 ^{H7}	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 STOBER 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.

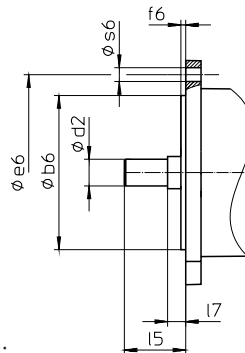
Example code

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 ¹		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

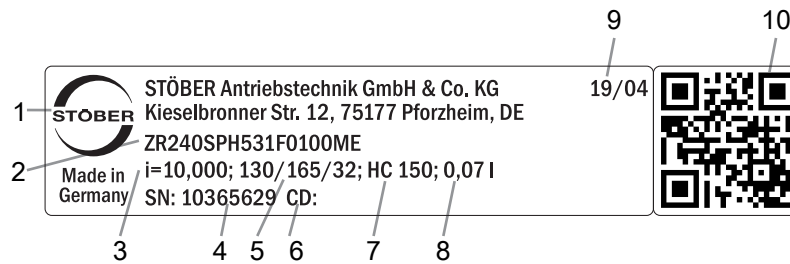
<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

- 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

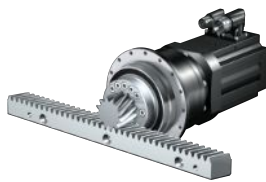
In this chapter, you will find all available input options:

Motor adapter



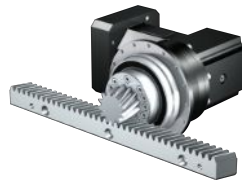
Catalog ID 443137_en

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

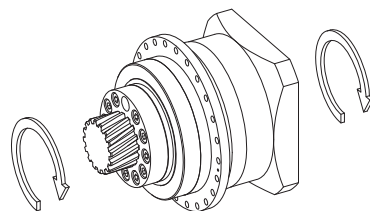
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

5.5.7 Other product features

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

5.5.8 Direction of rotation

The input and output rotate in the same direction.



²Observe the protection class of all the components.

5.6 Project configuration

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

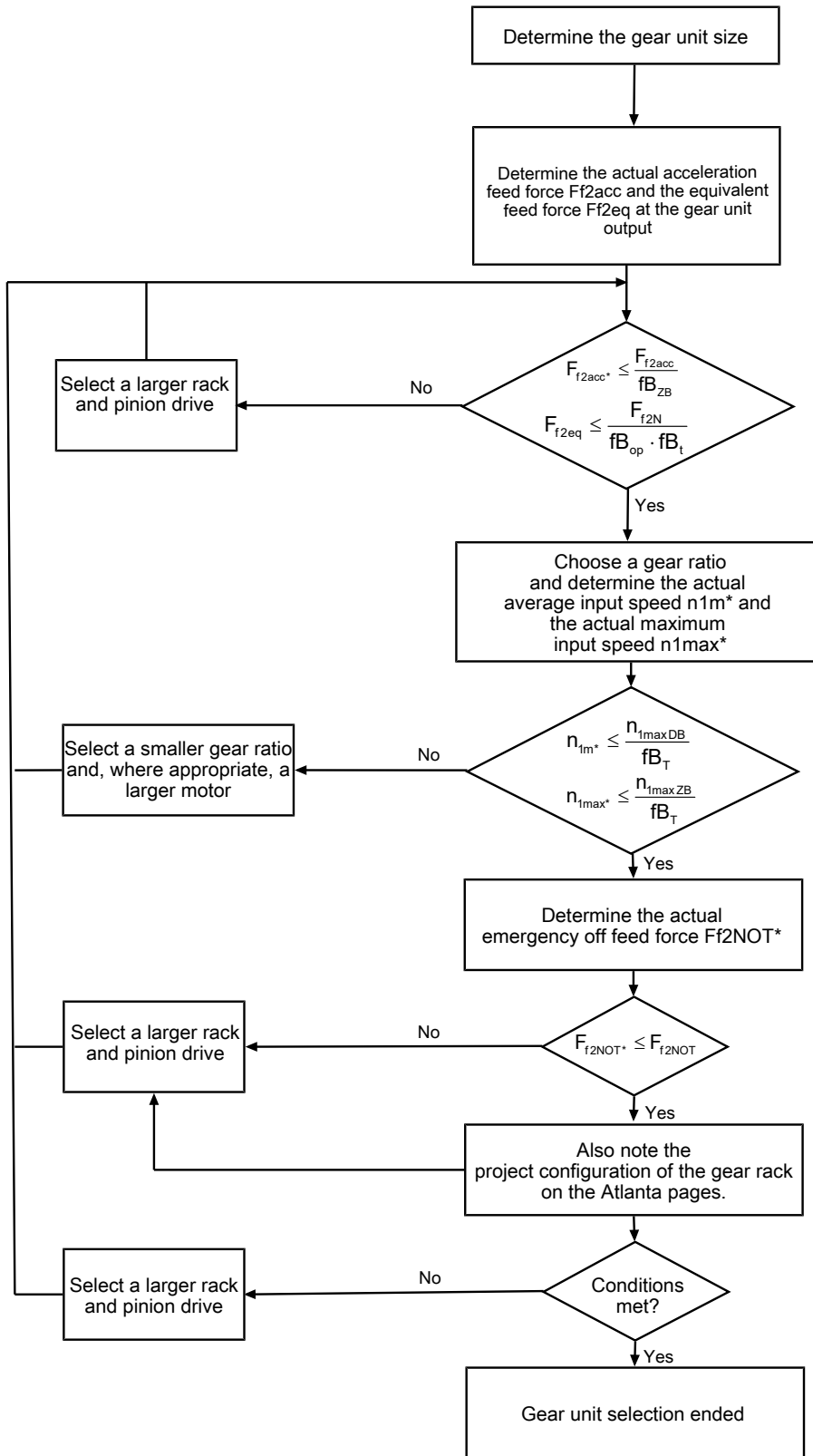
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

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](#).

5.6.1 Drive selection

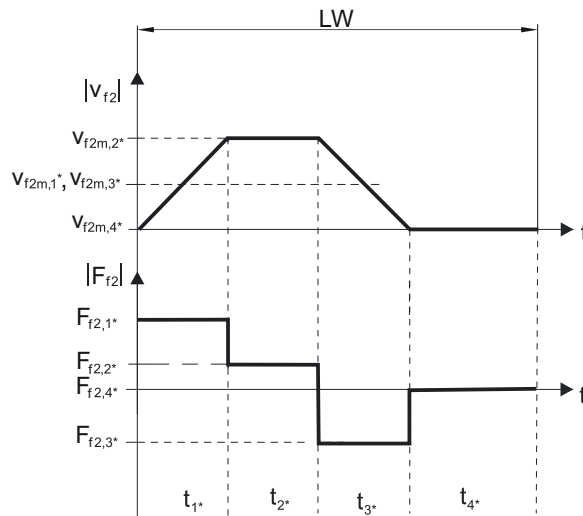


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

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

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

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

Notes

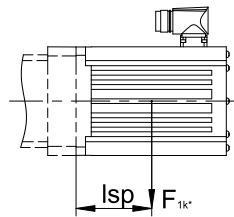
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

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

Table of contents

6.1	Overview	78
6.2	Selection tables	79
6.3	Dimensional drawings	80
6.4	Type designation	81
6.4.1	Nameplate	82
6.5	Product description	82
6.5.1	Input options	82
6.5.2	Motor adapter with EasyAdapt coupling (ME/MEL)	83
6.5.3	Gear rack	83
6.5.4	Installation conditions	83
6.5.5	Lubricants	83
6.5.6	Other product features	84
6.5.7	Direction of rotation	84
6.6	Project configuration	84
6.6.1	Drive selection	85
6.6.2	Permitted breakdown torques at the gear unit input	87
6.6.3	Recommendation for radial shaft seal rings	87
6.7	Additional documentation	88



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
Δs	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]	Δs [μm]	Δs_{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]
ZTR5PHV9 ($F_{f2acc,max} = 67$ kN)															
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
ZTR6PHV9 ($F_{f2acc,max} = 56$ kN)															
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.

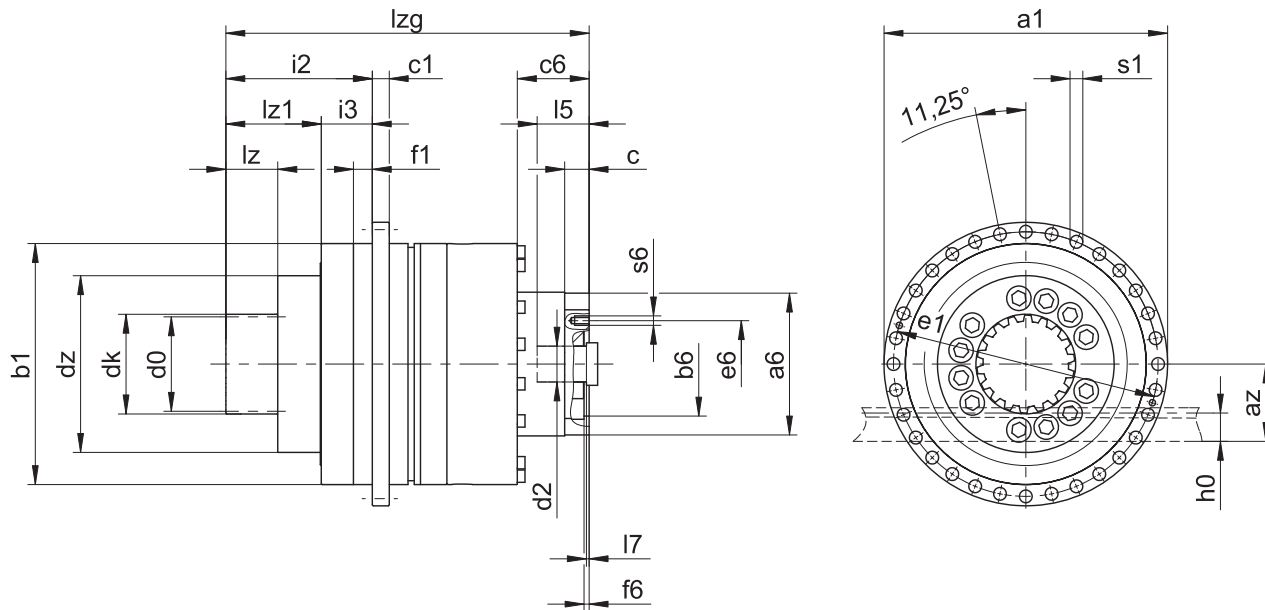
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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	Øa1	az	Øb1	c1	d0	dk	dz	Øe1	f1	h0	i2	i3	lz	lz1	Øs1	x
ZTR519SPHV9_	5	300	84.40	255 _{h7}	18	100.80	110.8	187	280	20	34	155	54	55	101	13.5	0.0
ZTR616SPHV9_	6	300	93.93	255 _{h7}	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	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZTR5_PHV9_ME	130.0 ^{H7}	165	38	61	150	26	66	5.5	4.5	383	M10
ZTR6_PHV9_ME	130.0 ^{H7}	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 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.

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.

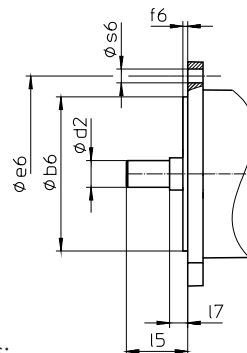
Example code

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 ¹		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.

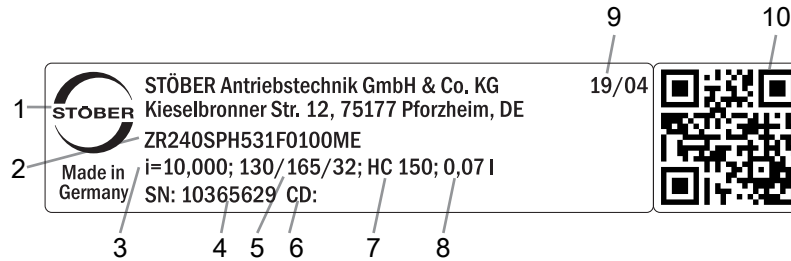
- Radial shaft seal rings at the output made of NBR or FKM (option), see the chapter [▶ 6.6.3](#)
- Radial runout $\leq 10 \mu\text{m}$ (optional)
- Reverse operation of the output shaft from $\pm 20^\circ$ to $\pm 90^\circ$ for horizontal installation on request
- Double seal for motor adapter (option)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

¹You 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>

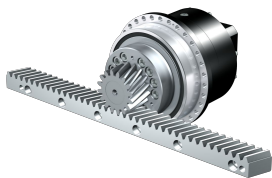
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

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.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 PHVA gear units upon request. To do so, send us an e-mail at 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

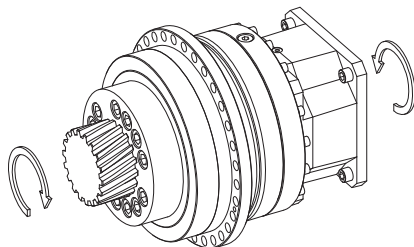
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

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: ²	
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>.

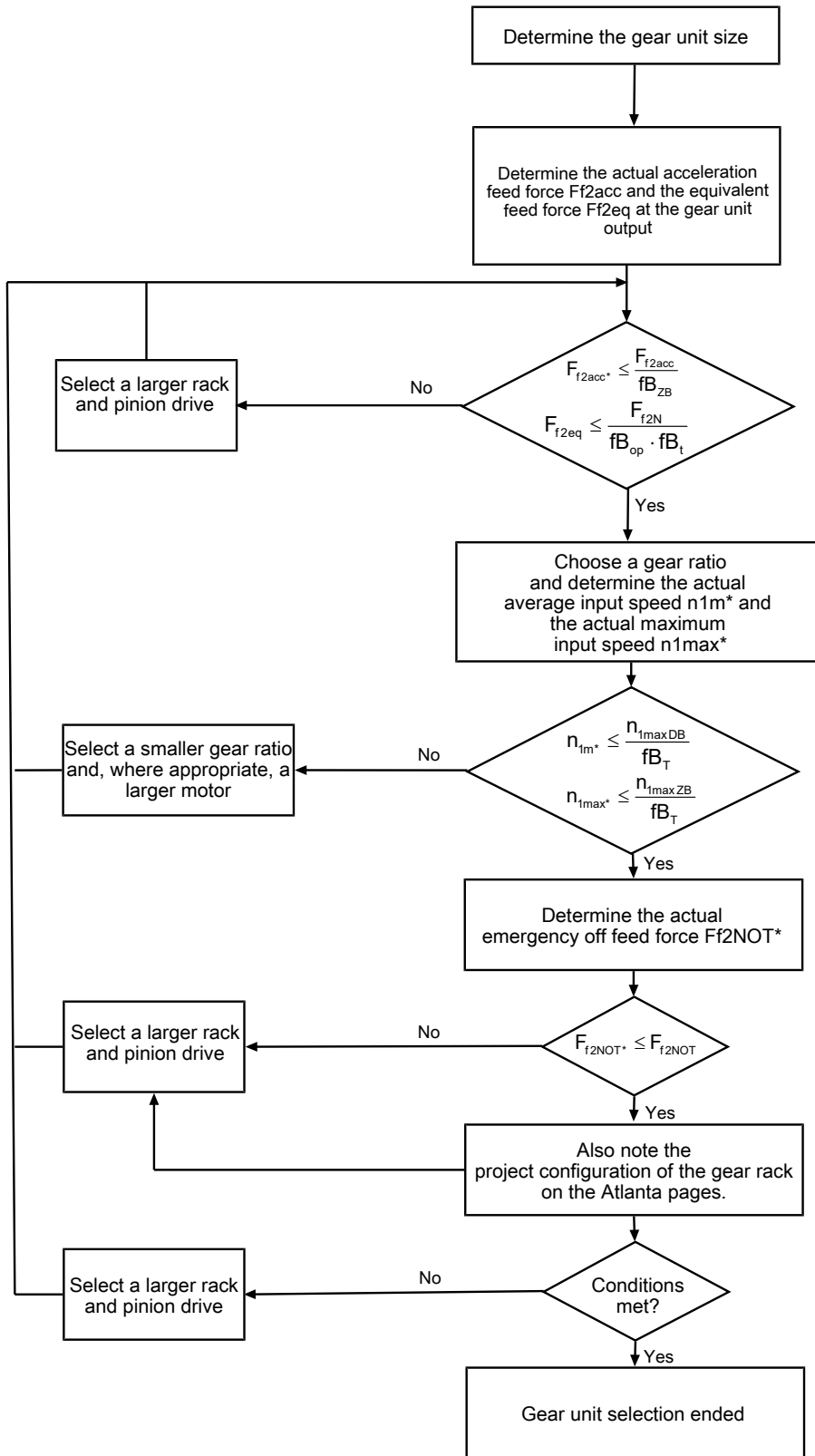
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

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

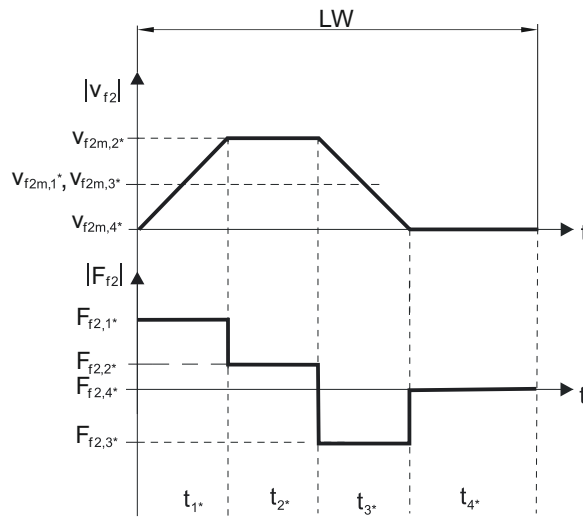


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

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

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

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

Notes

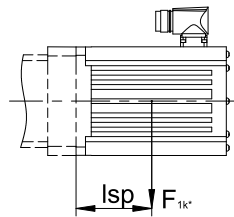
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

6.6.2 Permitted breakdown torques at the gear unit input

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

Calculate the actual breakdown torque as follows:

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



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

Table of contents

7.1	Overview	90
7.2	Selection tables	91
7.3	Dimensional drawings	94
7.4	Type designation	96
7.4.1	Nameplate	97
7.5	Product description	97
7.5.1	Input options	97
7.5.2	Motor adapter with EasyAdapt coupling (ME/MEL)	98
7.5.3	Motor adapter with FlexiAdapt coupling (MF)	98
7.5.4	Gear rack	99
7.5.5	Installation conditions	99
7.5.6	Lubricants	99
7.5.7	Other product features	99
7.5.8	Direction of rotation	99
7.6	Project configuration	100
7.6.1	Drive selection	101
7.6.2	Permitted breakdown torques at the gear unit input	103
7.6.3	Recommendation for radial shaft seal rings	104
7.7	Additional documentation	104



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
Δs	10 – 56 μm

7.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 7.5.4](#)
- 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_{1maxDB} [rpm]	n_{1maxZB} [rpm]	d_{MW} [mm]	$v_{f2maxZB}$ [m/s]	Δs [μ m]	Δs_{red} [μ m]	C_{lin} [N/ μ m]	m_n [mm]	z	d_0 [mm]	F_{f2N} [kN]	F_{f2acc} [kN]	F_{f2NOT} [kN]	M_{2acc} [Nm]
ZR2PH4 ($F_{f2acc,max} = 4,9$ kN)															
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
ZR2PH5 ($F_{f2acc,max} = 8,1$ kN)															
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

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

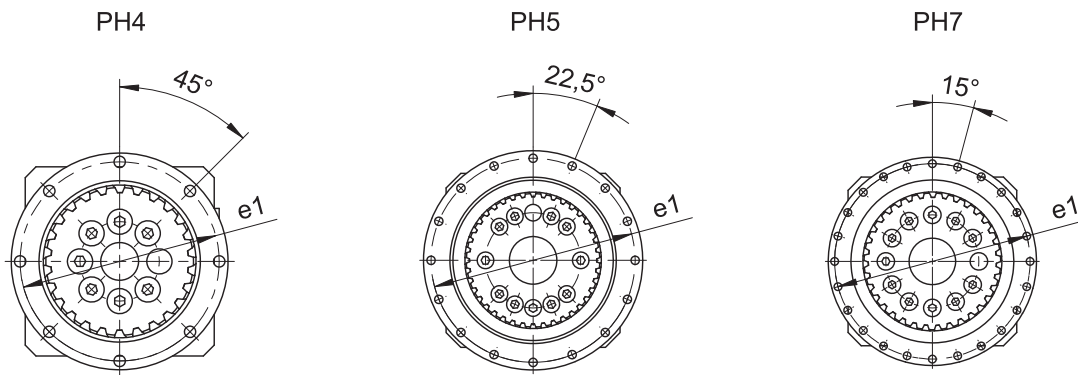
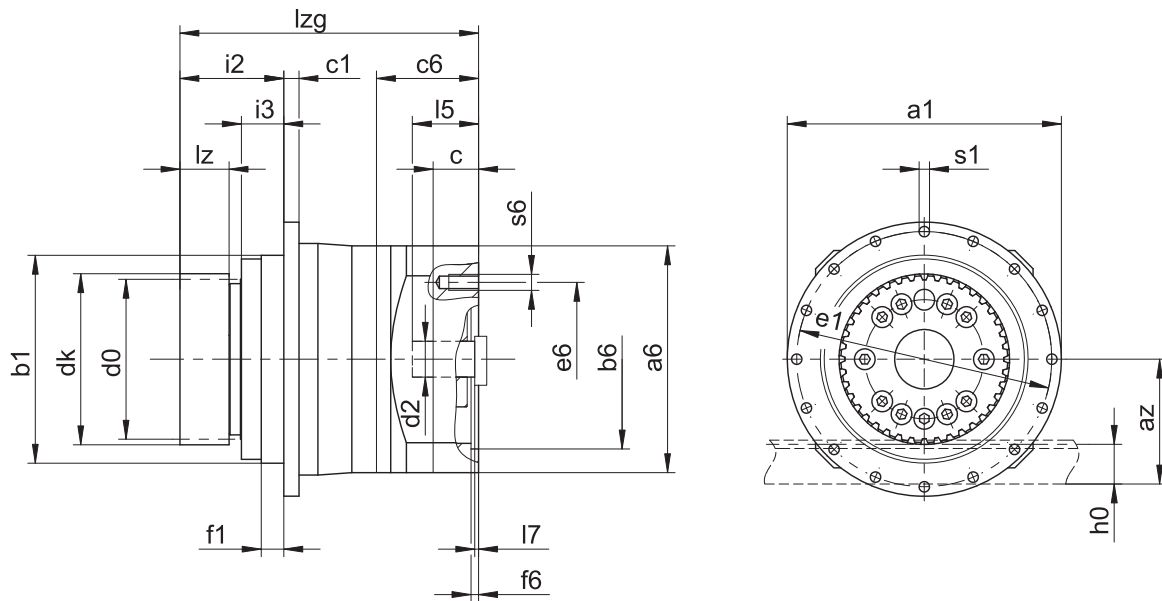
Dimension az in the tables of dimensions applies to Atlanta gear racks. In general: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

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 _{h7}	57.80	90 _{h7}	7	70.03	75.0	109	10	56.0	22	23.5	26	5.5	0.39
ZR240SPH5_	2	145 _{h7}	65.20	110 _{h7}	8	84.88	90.0	135	12	55.0	22	22.5	26	5.5	0.38
ZR330SPH5_	3	145 _{h7}	73.75	110 _{h7}	8	95.49	101.5	135	12	64.0	26	22.5	35	5.5	0.00
ZR335SPH7_	3	179 _{h7}	82.80	140 _{h7}	10	111.41	119.0	168	12	69.0	26	31.5	31	6.6	0.37
ZR340SPH7_	3	179 _{h7}	90.80	140 _{h7}	10	127.32	135.0	168	12	69.0	26	31.5	31	6.6	0.38
ZR430SPH7_	4	179 _{h7}	98.66	140 _{h7}	10	127.32	135.3	168	12	83.0	35	31.5	45	6.6	0.00

Example dimensions for the motor connection + total length

Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZR233SPH431_ME	95 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	139.5	M8
ZR233SPH432_ME	60 ^{H7}	75	19	41	75	18	41.5	3.5	4.0	176.5	M5
ZR240SPH531_ME	110 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	158.0	M8
ZR330SPH531_ME	110 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	167.0	M8
ZR240SPH532_ME	95 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	187.0	M8
ZR330SPH532_ME	95 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	196.0	M8
ZR335SPH731_ME	130 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	192.0	M10
ZR340SPH731_ME	130 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	192.0	M10
ZR430SPH731_ME	130 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	206.0	M10
ZR335SPH732_ME	110 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	230.0	M8
ZR340SPH732_ME	110 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	230.0	M8
ZR430SPH732_ME	110 ^{H7}	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.

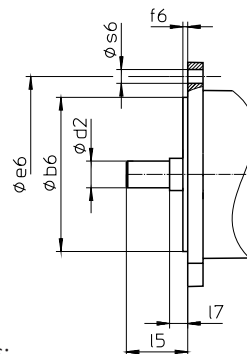
Example code

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 ¹		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

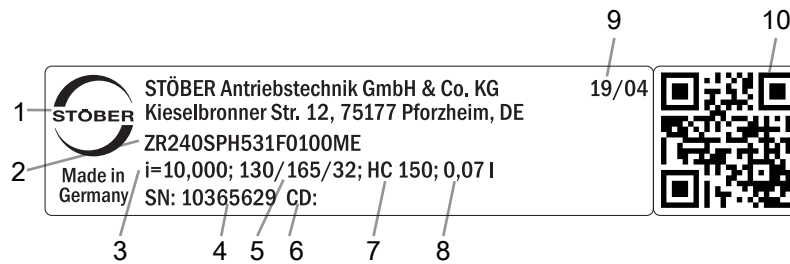
<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

- 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].

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>

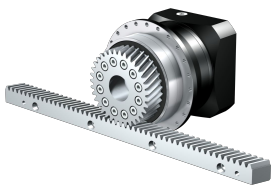
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

7.5 Product description

7.5.1 Input options

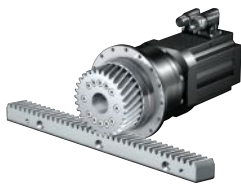
In this chapter, you will find all available input options:

Motor adapter



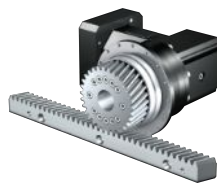
Catalog ID 443137_en

EZ synchronous servo motor



Catalog ID 443286_en

KX right-angle input with MF motor adapter



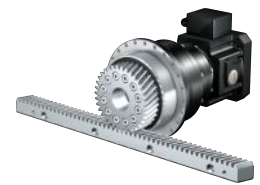
On request

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.

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

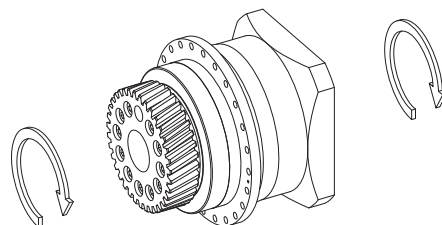
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

7.5.7 Other product features

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

7.5.8 Direction of rotation

The input and output rotate in the same direction.



²Observe 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>.

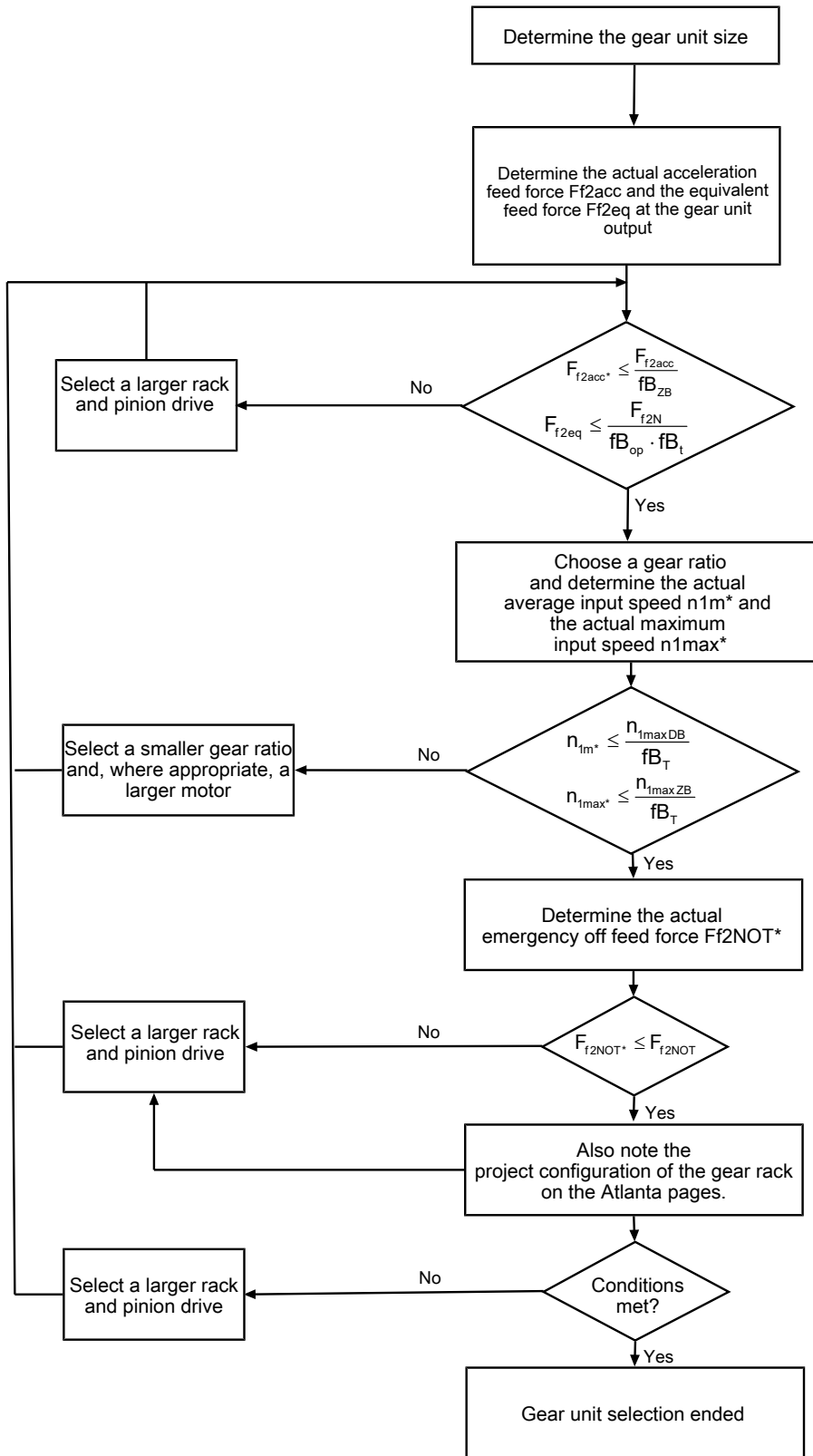
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

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

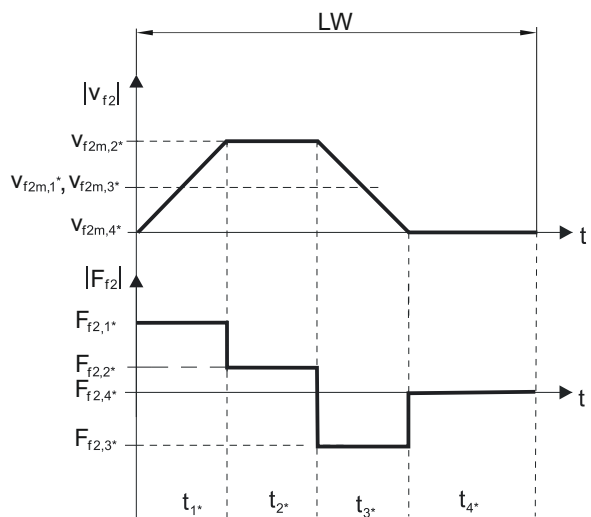


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} .

The values for 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

$$n_{1m}^* = \frac{v_{f2m}^* \cdot i}{d_0 \cdot \pi}$$

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

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

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

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

Notes

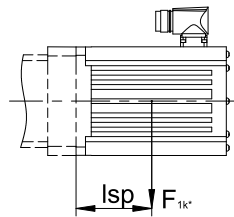
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

7.6.2 Permitted breakdown torques at the gear unit input

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

Calculate the actual breakdown torque as follows:

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



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

Table of contents

8.1	Overview	106
8.2	Selection tables	107
8.3	Dimensional drawings	111
8.3.1	Pinion position E	112
8.3.2	Pinion position S	113
8.4	Type designation	114
8.4.1	Nameplate	115
8.5	Product description	115
8.5.1	Input options	115
8.5.2	Motor adapter with EasyAdapt coupling (ME/MEL)	116
8.5.3	Motor adapter with FlexiAdapt coupling (MF)	116
8.5.4	Gear rack	117
8.5.5	Installation conditions	117
8.5.6	Lubricants	117
8.5.7	Other product features	117
8.5.8	Direction of rotation	117
8.6	Project configuration	118
8.6.1	Drive selection	119
8.6.2	Permitted breakdown torques at the gear unit input	121
8.6.3	Recommendation for radial shaft seal rings	122
8.7	Additional documentation	122



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
Δs	8 – 44 μm

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]	$v_{Z2maxZB}$ [m/s]	Δs [μm]	Δs_{red} [μm]	C_{lin} [N/ μm]	m_n [mm]	z	d_0 [mm]	$F_{Z2N,S}$ [kN]	$F_{Z2N,E}$ [kN]	F_{Z2accS} [kN]	F_{Z2accE} [kN]	$F_{Z2NOT,S}$ [kN]	$F_{Z2NOT,E}$ [kN]	M_{Z2accS} [Nm]	M_{Z2accE} [Nm]
ZV2P3 ($F_{Z2acc,max} = 2,0 \text{ kN}$)																			
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
ZV2P4 ($F_{Z2acc,max} = 4,8 \text{ kN}$)																			
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

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

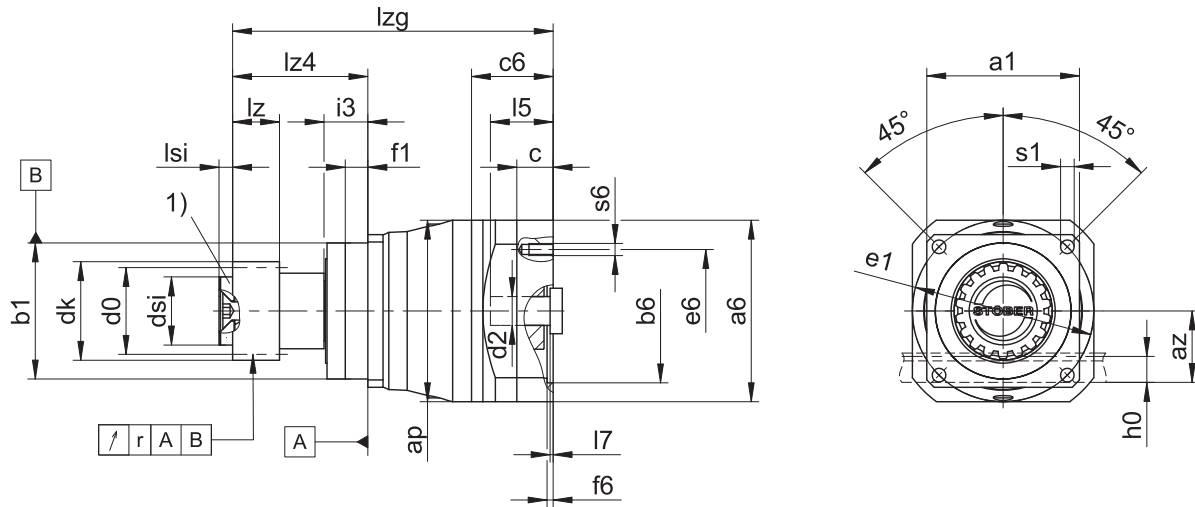
The pinion of the rack and pinion drive is helical (left-hand $19^\circ 31' 42''$). The pinion gearing quality is 5.

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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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

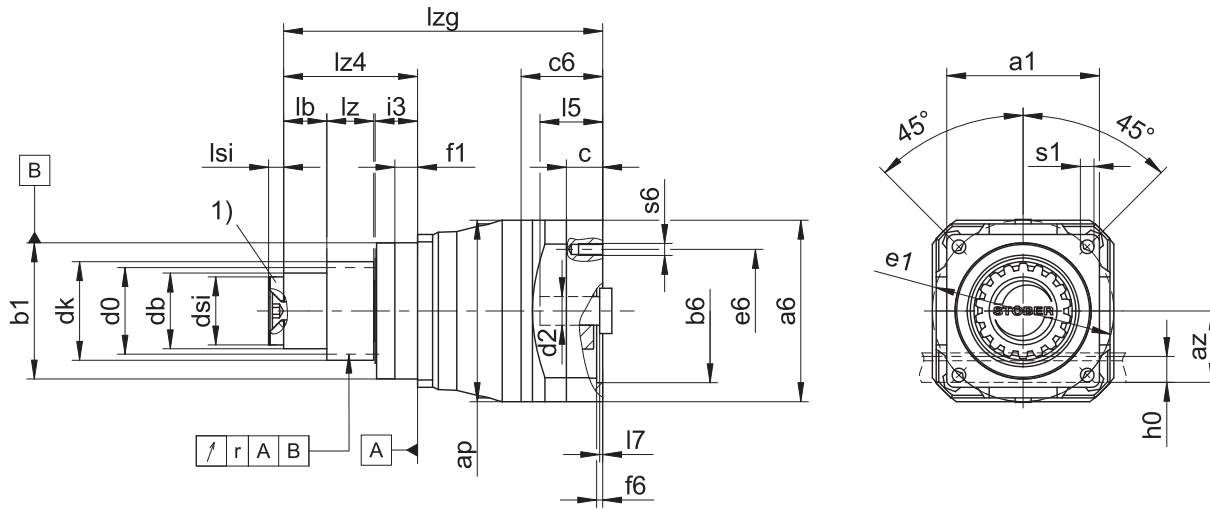
Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	lzg	s6
ZV_P331_ME	60 ^{H7}	75	19	41	75	18	41.5	3.5	4.0	147.0	M5
ZV_P332_ME	40 ^{H7}	63	14	30	55	15	32.0	3.5	3.0	164.5	M5
ZV_P431_ME	95 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	167.0	M8
ZV_P432_ME	60 ^{H7}	75	19	41	75	18	41.5	3.5	4.0	204.0	M5
ZV_P531_ME	110 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	212.0	M8
ZV_P532_ME	95 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	241.0	M8
ZV_P731_ME	130 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	266.0	M10
ZV_P732_ME	110 ^{H7}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 ^{H7}	75	19	41	75	18	41.5	3.5	4.0	147.0	M5
ZV_P332_ME	40 ^{H7}	63	14	30	55	15	32.0	3.5	3.0	164.5	M5
ZV_P431_ME	95 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	167.0	M8
ZV_P432_ME	60 ^{H7}	75	19	41	75	18	41.5	3.5	4.0	204.0	M5
ZV_P531_ME	110 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	212.0	M8
ZV_P532_ME	95 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	241.0	M8
ZV_P731_ME	130 ^{H7}	165	38	61	150	26	66.0	5.5	4.5	266.0	M10
ZV_P732_ME	110 ^{H7}	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.

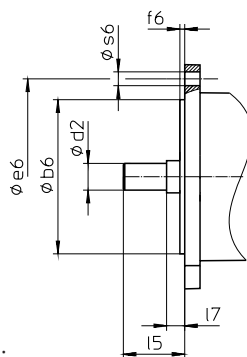
Example code

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 ¹		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

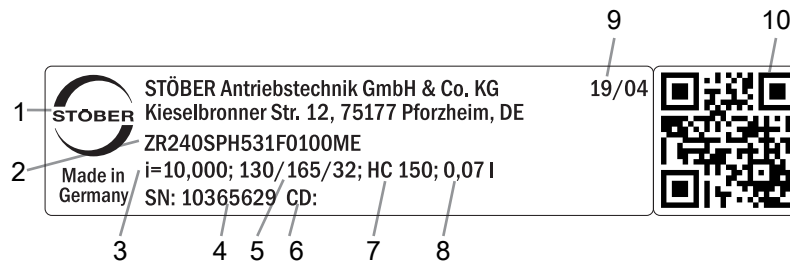
<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

- 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:

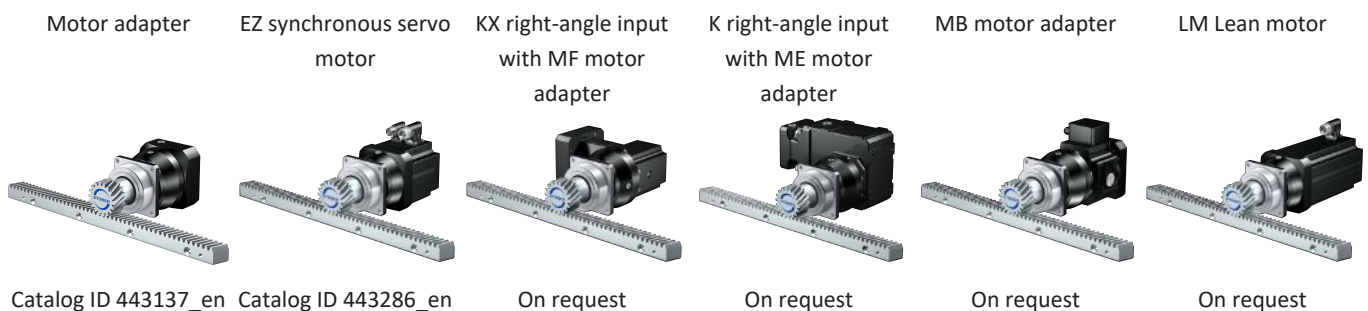
<https://id.stober.com>

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

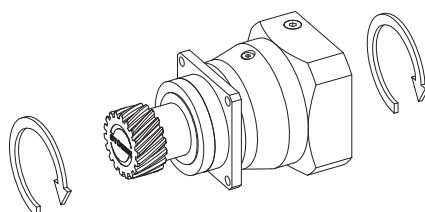
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

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: ²	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

8.5.8 Direction of rotation

The input and output rotate in the same direction.



²Observe 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>.

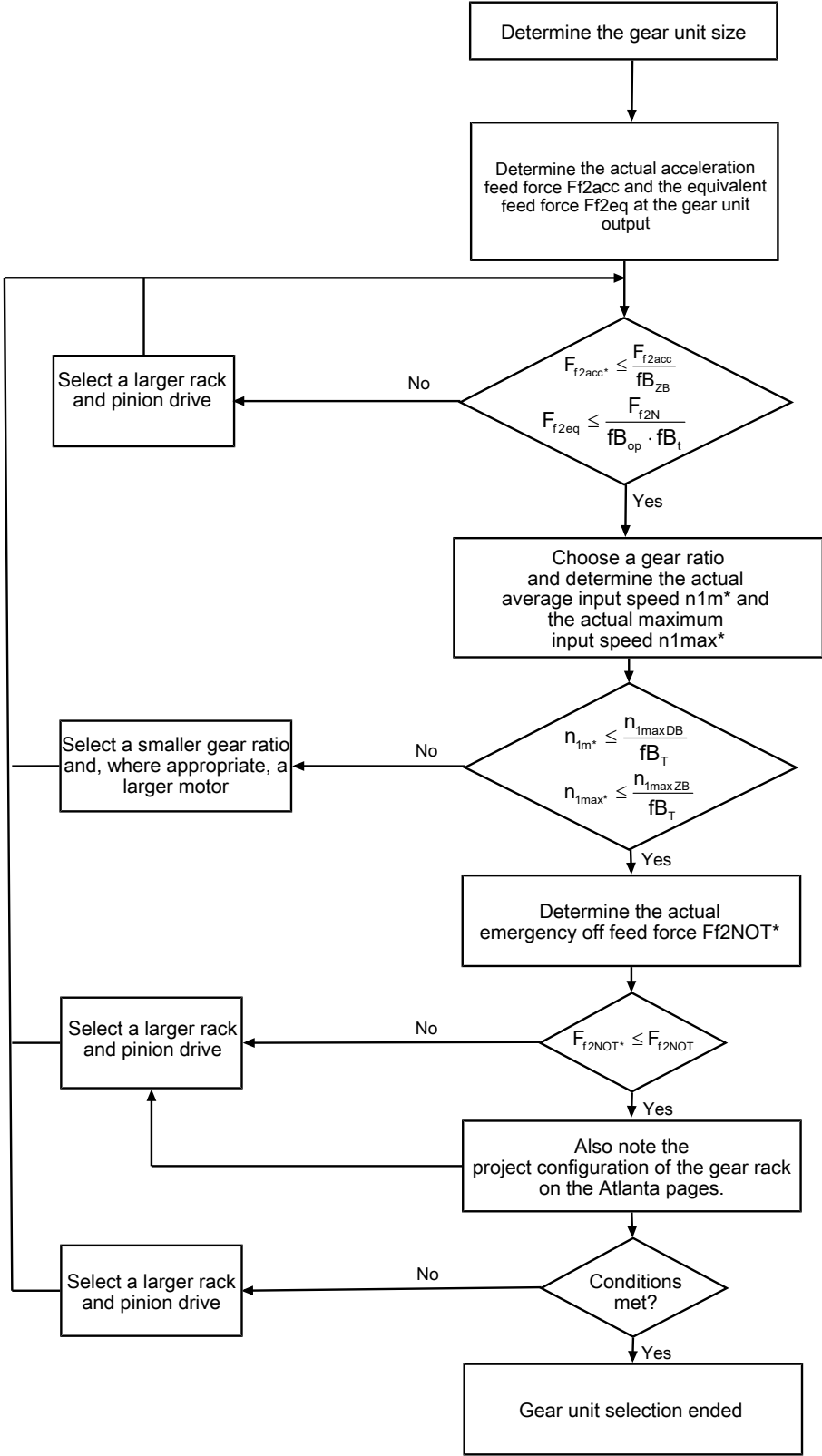
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

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

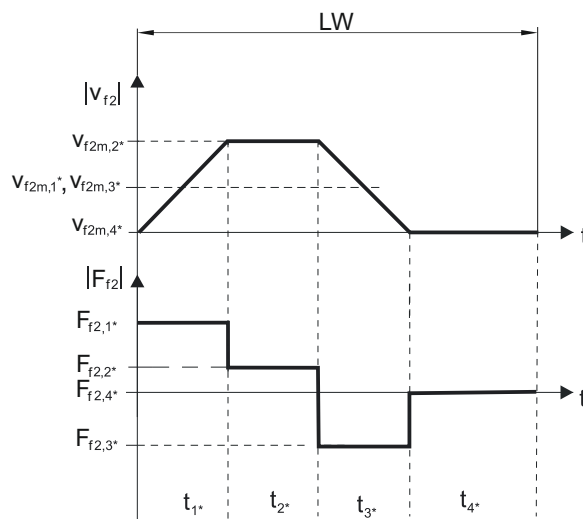


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

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

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

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

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	1.00
Reversing load cyclic operation	1.00
Run time	fB_t
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
Cyclic operation	fB_{ZB}
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

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

Notes

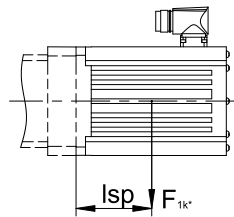
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

8.6.2 Permitted breakdown torques at the gear unit input

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

Calculate the actual breakdown torque as follows:

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



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/>

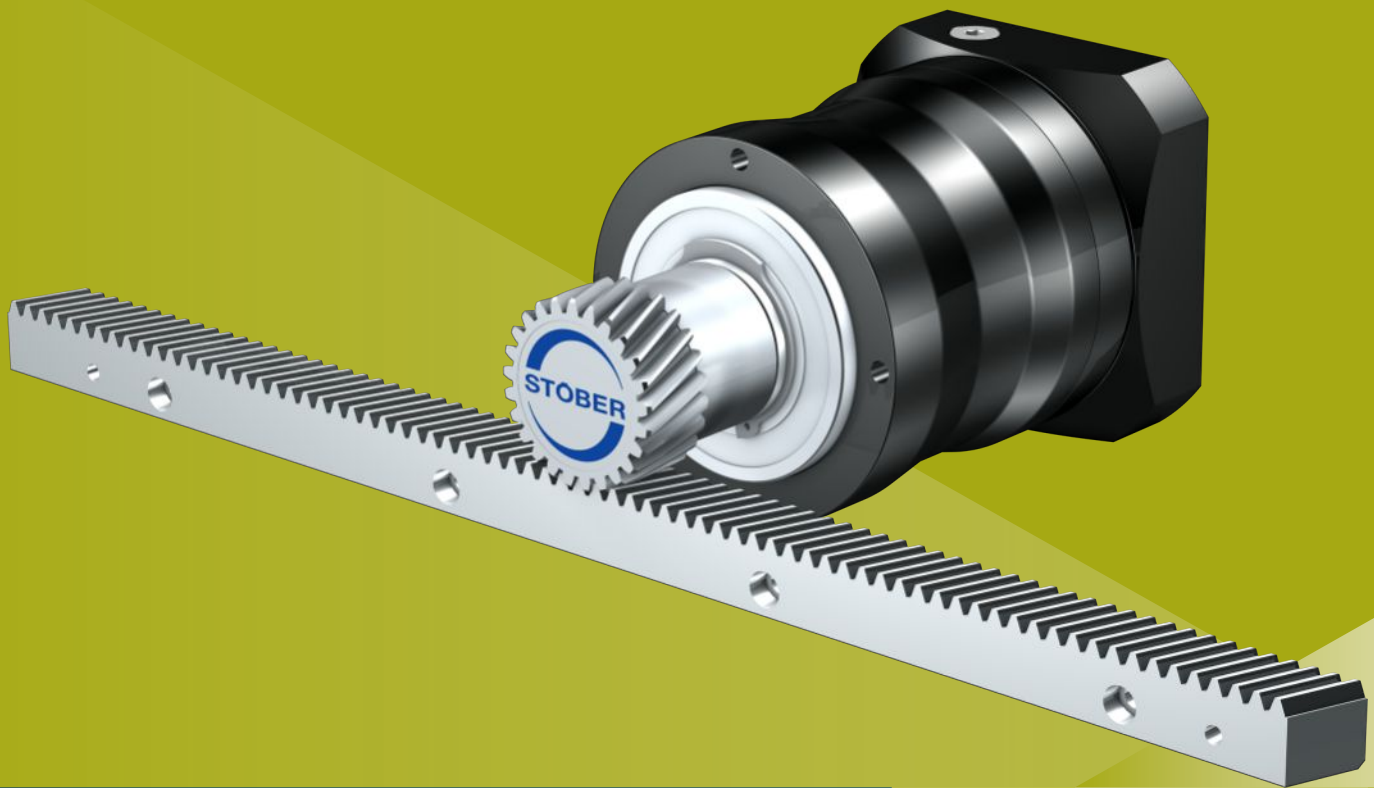
Enter the ID of the documentation in the Search term field.

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

Table of contents

9.1	Overview	124
9.2	Selection tables	125
9.3	Dimensional drawings	127
9.3.1	Pinion position E	127
9.3.2	Pinion position S	128
9.4	Type designation	129
9.4.1	Nameplate	130
9.5	Product description	130
9.5.1	Input options	130
9.5.2	Motor adapter with EasyAdapt coupling (ME/MEL)	131
9.5.3	Gear rack	131
9.5.4	Installation conditions	131
9.5.5	Lubricants	132
9.5.6	Other product features	132
9.5.7	Direction of rotation	132
9.6	Project configuration	132
9.6.1	Drive selection	133
9.6.2	Permitted breakdown torques at the gear unit input	135
9.6.3	Radial shaft seal rings	135
9.7	Additional documentation	136



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
Δs	40 – 83 μm

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

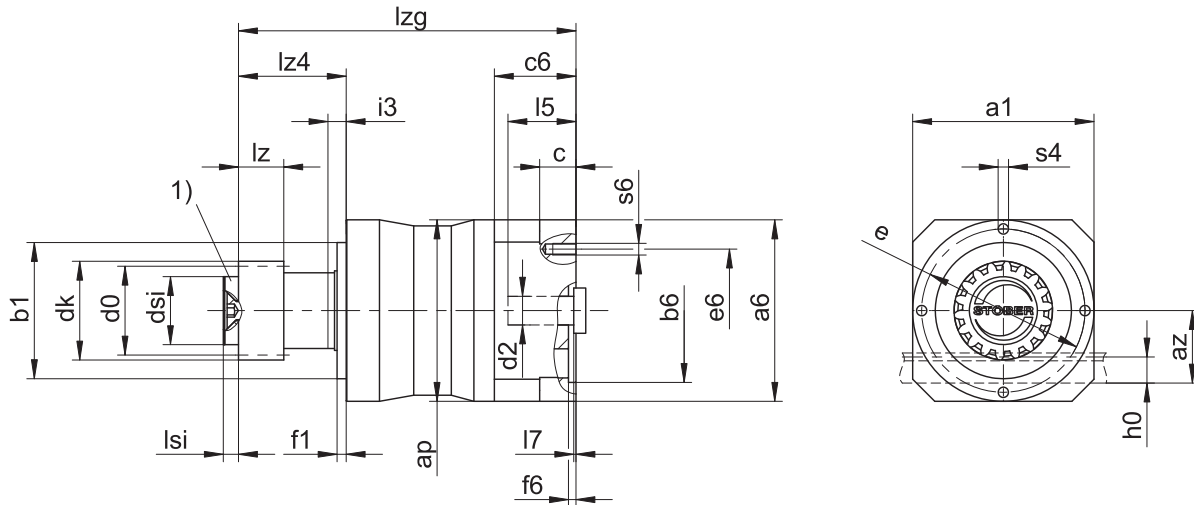
The pinion of the rack and pinion drive is helical (left-hand $19^\circ 31' 42''$). The pinion gearing quality is 5.

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/>.

9.3.1 Pinion position E



1) Axial locking (optional)

Output dimensions

Type	mn	$\varnothing a1$	ap	az	$\varnothing b1$	$\varnothing d0$	$\varnothing dk$	$\varnothing dsi$	$\varnothing e$	f1	h0	i3	lz	lz4	lsi	$\varnothing s4$	x
ZV216SEPE321_	2	70	72	39.98	52_{h6}	33.95	39.81	25	62	5	22	7	26	37.5	4	M5	0.5
ZV216SEPE322_	2	70	75	39.98	52_{h6}	33.95	39.81	25	62	5	22	7	26	37.5	4	M5	0.5
ZV220SEPE421_	2	90	98	44.02	68_{h6}	42.44	47.90	30	80	5	22	10	26	48.5	6	M6	0.4
ZV220SEPE422_	2	90	100	44.02	68_{h6}	42.44	47.90	30	80	5	22	10	26	48.5	6	M6	0.4
ZV225SEPE521_	2	120	120	49.33	90_{h6}	53.05	58.52	45	108	6	22	12	26	72.5	8	M8	0.4
ZV318SEPE521_	3	120	120	55.55	90_{h6}	57.30	65.01	45	108	6	26	12	31	72.5	8	M8	0.3
ZV225SEPE522_	2	120	120	49.33	90_{h6}	53.05	58.52	45	108	6	22	12	26	72.5	8	M8	0.4
ZV318SEPE522_	3	120	120	55.55	90_{h6}	57.30	65.01	45	108	6	26	12	31	72.5	8	M8	0.3

Example dimensions for the motor connection + total length

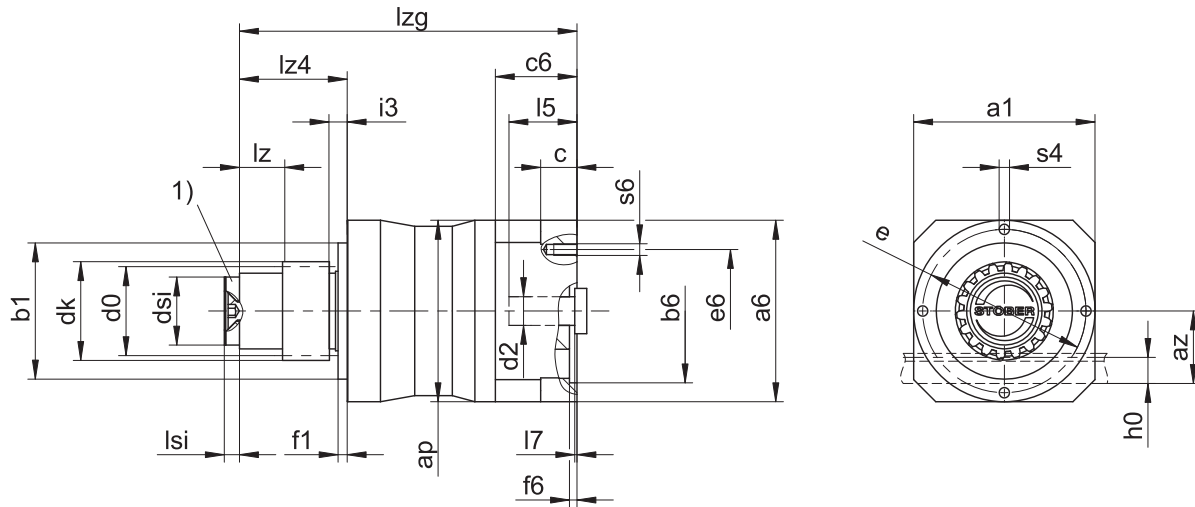
Type	$\varnothing b6$	$\varnothing e6$	$\varnothing d2max$	l5	$\square a6$	c	c6	f6	l7	l _{zg}	s6
ZV_PE321_ME	60^{H7}	75	19	41	75	18	41.5	3.5	4.0	152.0	M5
ZV_PE322_ME	40^{H7}	63	14	30	55	15	32.0	3.5	3.0	169.5	M5
ZV_PE421_ME	95^{H7}	115	24	41	100	21	42.5	4.0	3.5	169.5	M8
ZV_PE422_ME	60^{H7}	75	19	41	75	18	41.5	3.5	4.0	206.5	M5
ZV_PE521_ME	110^{H7}	130	32	51	120	24	54.0	4.0	4.5	224.5	M8
ZV_PE522_ME	95^{H7}	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 l_{zg} 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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 ^{H7}	75	19	41	75	18	41.5	3.5	4.0	152.0	M5
ZV_PE322_ME	40 ^{H7}	63	14	30	55	15	32.0	3.5	3.0	169.5	M5
ZV_PE421_ME	95 ^{H7}	115	24	41	100	21	42.5	4.0	3.5	169.5	M8
ZV_PE422_ME	60 ^{H7}	75	19	41	75	18	41.5	3.5	4.0	206.5	M5
ZV_PE521_ME	110 ^{H7}	130	32	51	120	24	54.0	4.0	4.5	224.5	M8
ZV_PE522_ME	95 ^{H7}	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.

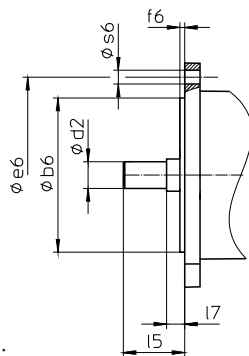
Example code

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

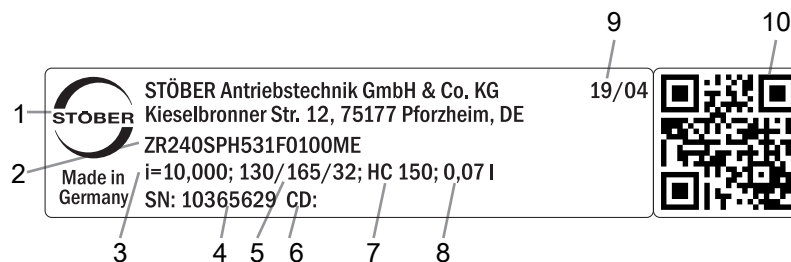
<https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.

- 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>

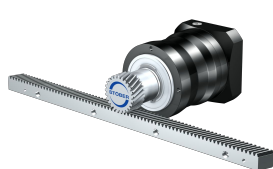
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

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

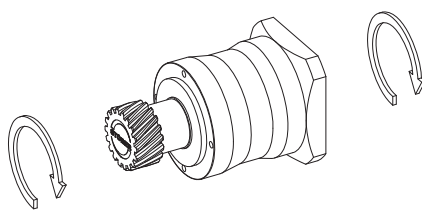
Make sure the rack and pinion drive has permanent lubrication with the lubricants specified in the Atlanta product catalog.

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: ¹	
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>.

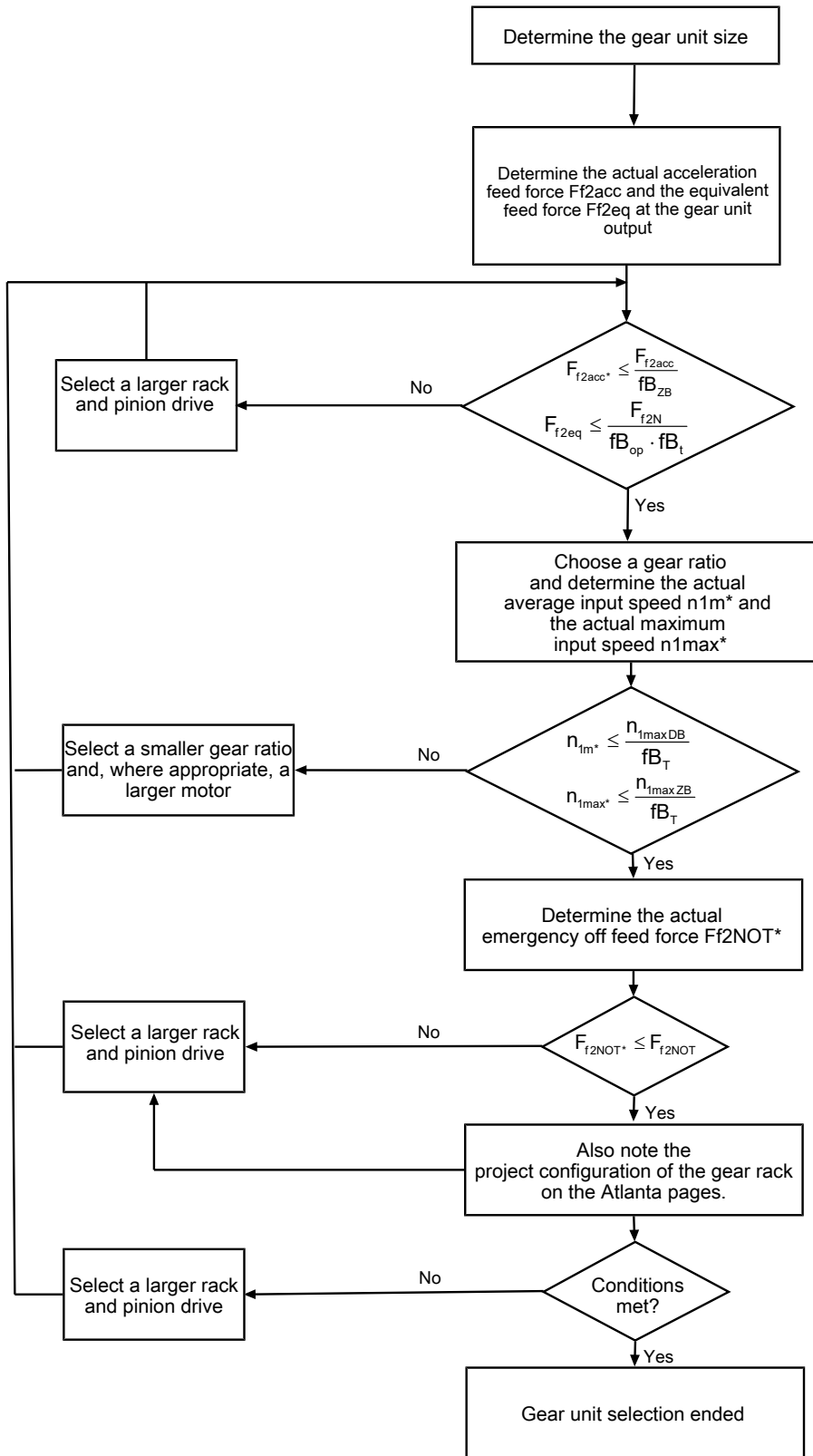
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

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

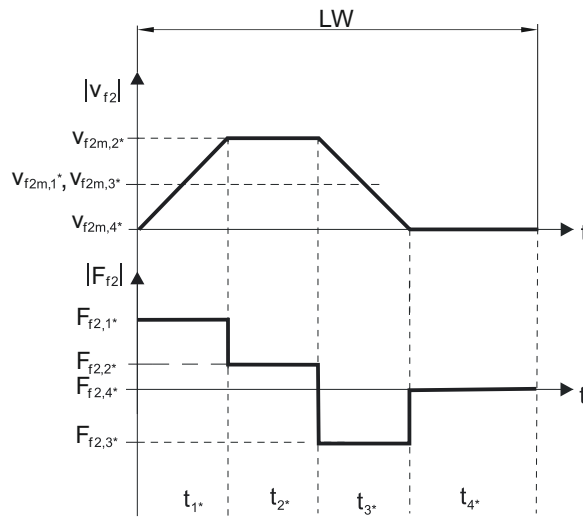


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for 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

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

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

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	1.00
Reversing load cyclic operation	1.00
Run time	fB_t
Daily runtime ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
Cyclic operation	fB_{ZB}
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

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

Notes

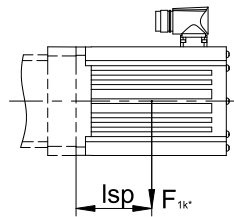
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

9.6.2 Permitted breakdown torques at the gear unit input

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

Calculate the actual breakdown torque as follows:

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



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/>

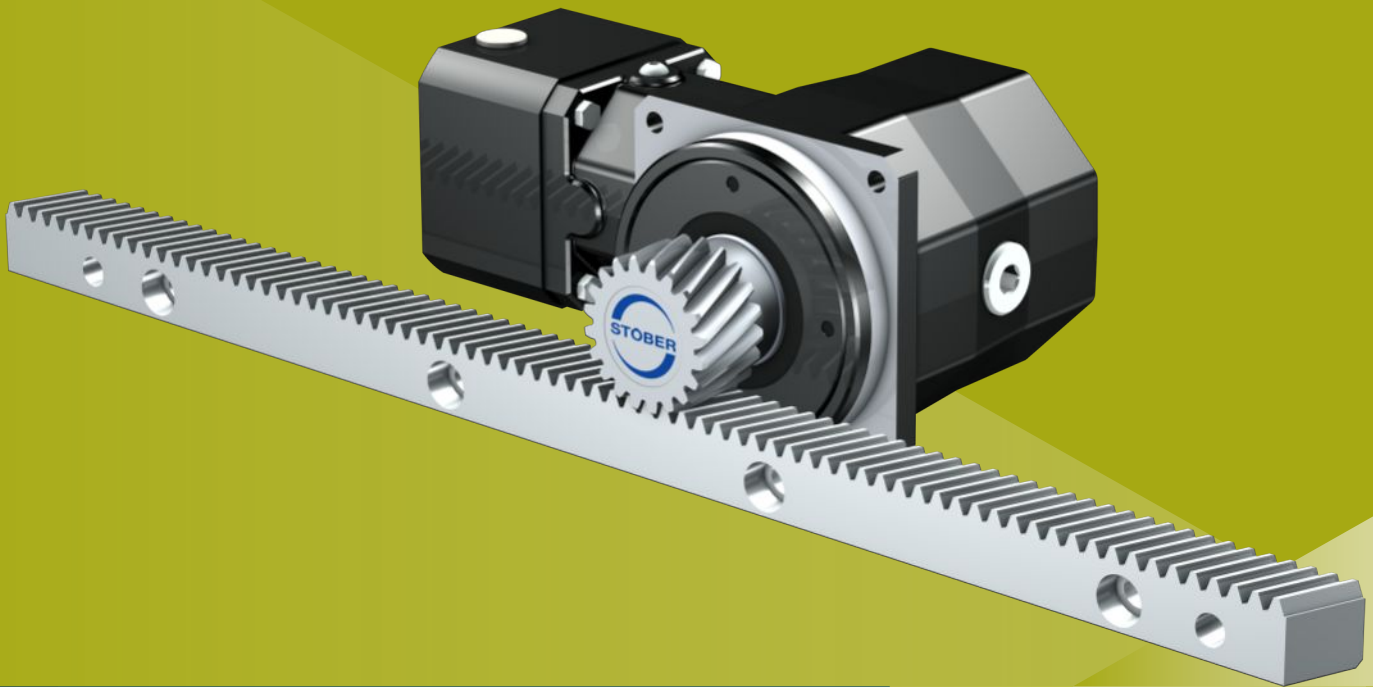
Enter the ID of the documentation in the Search term field.

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

Table of contents

10.1 Overview	138
10.2 Selection tables	139
10.3 Dimensional drawings	142
10.3.1 Pinion position E	143
10.3.2 Pinion position S	144
10.3.3 Oil expansion tank	145
10.4 Type designation	146
10.4.1 Nameplate	147
10.5 Product description	147
10.5.1 Input options	147
10.5.2 Motor adapter with EasyAdapt coupling (ME/MEL)	148
10.5.3 Gear rack	148
10.5.4 Installation conditions	148
10.5.5 Mounting positions	149
10.5.6 Lubricants	149
10.5.7 Position of locking screw access	150
10.5.8 Other product features	150
10.5.9 Direction of rotation	150
10.6 Project configuration	150
10.6.1 Drive selection	151
10.6.2 Permitted breakdown torques at the gear unit input	153
10.6.3 Recommendation for radial shaft seal rings	153
10.6.4 Oil expansion tank	154
10.7 Additional documentation	154



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
Δs	37 – 44 μm

i	Type	n_{1maxDB}	n_{1maxZB}	d_{MW}	$v_{f2maxZB}$	Δs	C_{lin}	m_n	z	d_0	$F_{f2N,S}$	$F_{f2N,E}$	F_{f2accS}	F_{f2accE}	$F_{f2NOT,S}$	$F_{f2NOT,E}$	M_{2accS}	M_{2accE}
		[rpm]	[rpm]	[mm]	[m/s]	[μm]	[N/ μm]	[mm]		[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]	[Nm]
ZV4KS7 ($F_{f2acc,max} = 10$ kN)																		
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: $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

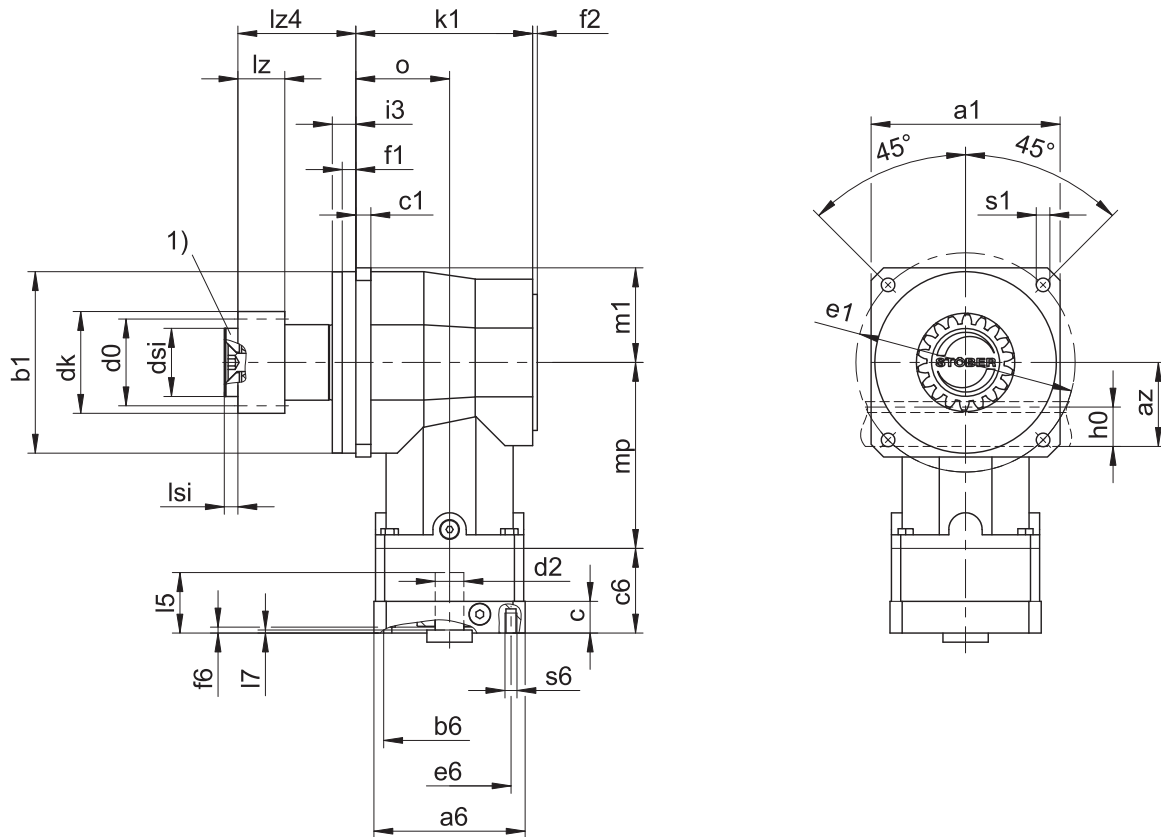
The pinion of the rack and pinion drive is helical (left-hand $19^\circ 31' 42''$). The pinion gearing quality is 5.

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	lz	lz4	lsi	mp	m1	o	Øs1	x
ZV220SEKS402_	2	101	44.02	95 _{h6}	10	42.44	47.90	30	120	8	3	22	14.0	101	26	54.5	6	104.0	50.5	53	6.6	0.4
ZV220SEKS403_	2	101	44.02	95 _{h6}	10	42.44	47.90	30	120	8	3	22	14.0	101	26	54.5	6	144.0	50.5	53	6.6	0.4
ZV225SEKS502_	2	125	49.33	120 _{h6}	10	53.05	58.52	45	145	9	3	22	15.5	117	26	78.0	8	123.0	62.5	62	9.0	0.4
ZV225SEKS503_	2	125	49.33	120 _{h6}	10	53.05	58.52	45	145	9	3	22	15.5	117	26	78.0	8	172.0	62.5	62	9.0	0.4
ZV318SEKS502_	3	125	55.55	120 _{h6}	10	57.30	65.01	45	145	9	3	26	15.5	117	31	78.0	8	123.0	62.5	62	9.0	0.3
ZV318SEKS503_	3	125	55.55	120 _{h6}	10	57.30	65.01	45	145	9	3	26	15.5	117	31	78.0	8	172.0	62.5	62	9.0	0.3
ZV322SEKS702_	3	155	62.21	150 _{h6}	15	70.03	78.35	55	180	10	3	26	20.0	145	31	107.5	10	151.0	77.5	78	11.0	0.4
ZV322SEKS703_	3	155	62.21	150 _{h6}	15	70.03	78.35	55	180	10	3	26	20.0	145	31	107.5	10	205.5	77.5	78	11.0	0.4
ZV418SEKS702_	4	155	74.40	150 _{h6}	15	76.40	86.77	55	180	10	3	35	20.0	145	41	107.5	10	151.0	77.5	78	11.0	0.3
ZV418SEKS703_	4	155	74.40	150 _{h6}	15	76.40	86.77	55	180	10	3	35	20.0	145	41	107.5	10	205.5	77.5	78	11.0	0.3

Example dimensions for the motor connection

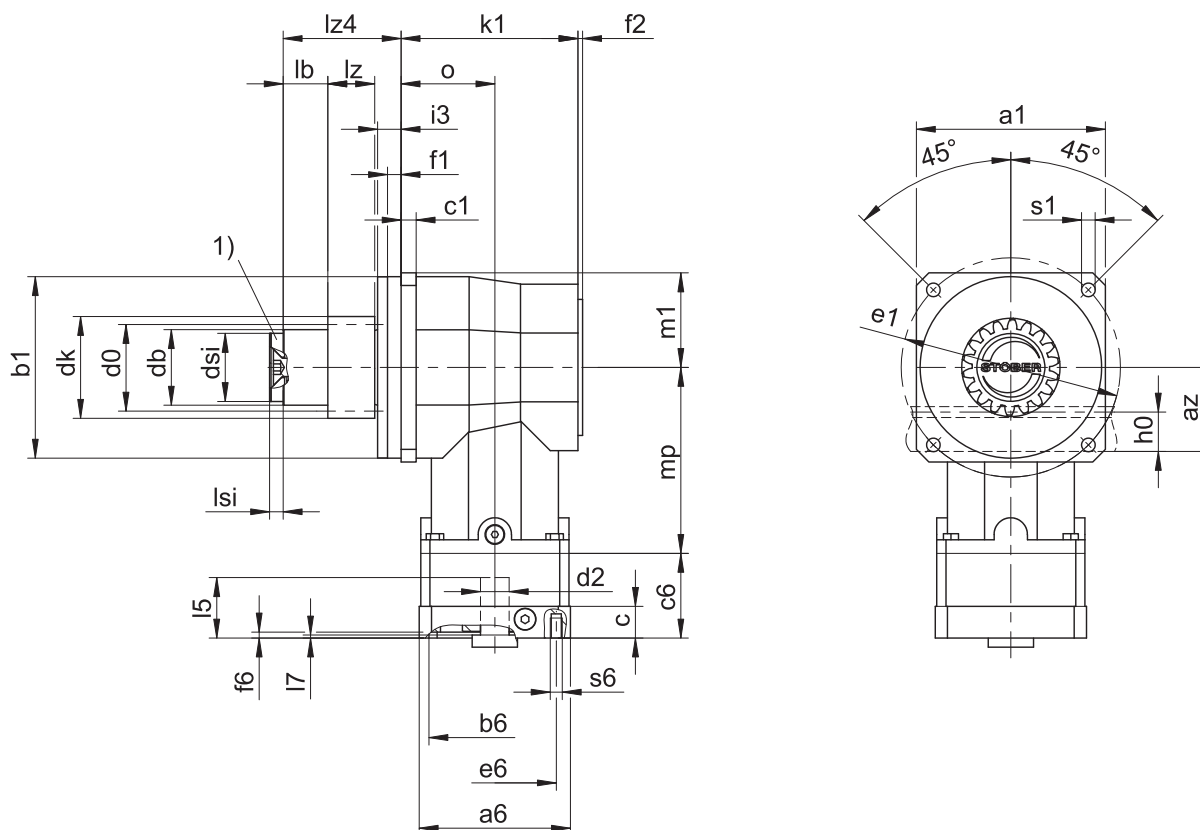
Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	s6
ZV_KS402_ME	60 ^{H7}	75	19	40	75	18	51.5	3.5	3.0	M5
ZV_KS403_ME	40 ^{H7}	63	14	30	55	15	32.0	3.5	3.0	M5
ZV_KS502_ME	95 ^{H7}	115	24	42	100	21	56.0	4.0	3.0	M8
ZV_KS503_ME	60 ^{H7}	75	19	40	75	18	51.5	3.5	3.0	M5
ZV_KS702_ME	110 ^{H7}	130	32	50	120	24	67.5	4.0	3.5	M8
ZV_KS703_ME	95 ^{H7}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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 _{h6}	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

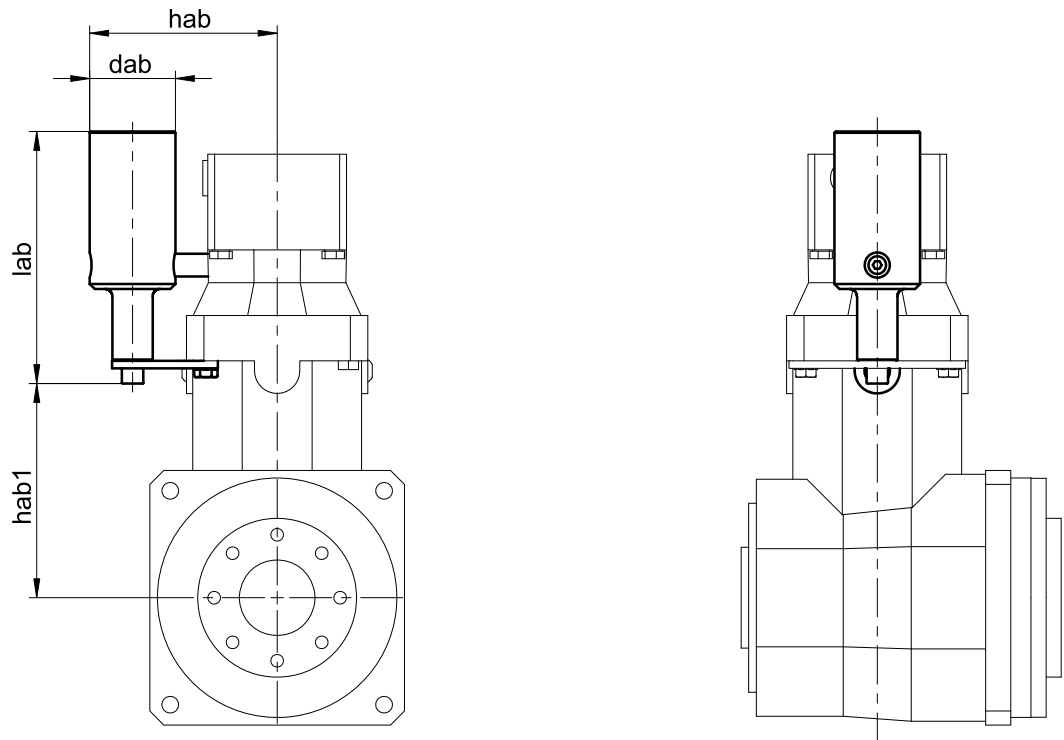
Type	Øb6	Øe6	Ød2max	l5	□a6	c	c6	f6	l7	s6
ZV_KS402_ME	60 ^{H7}	75	19	40	75	18	51.5	3.5	3.0	M5
ZV_KS403_ME	40 ^{H7}	63	14	30	55	15	32.0	3.5	3.0	M5
ZV_KS502_ME	95 ^{H7}	115	24	42	100	21	56.0	4.0	3.0	M8
ZV_KS503_ME	60 ^{H7}	75	19	40	75	18	51.5	3.5	3.0	M5
ZV_KS702_ME	110 ^{H7}	130	32	50	120	24	67.5	4.0	3.5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

10.3.3 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.

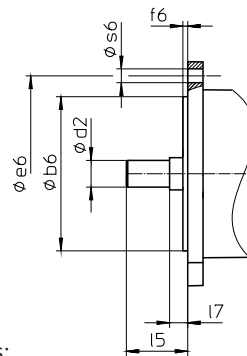
Example code

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:

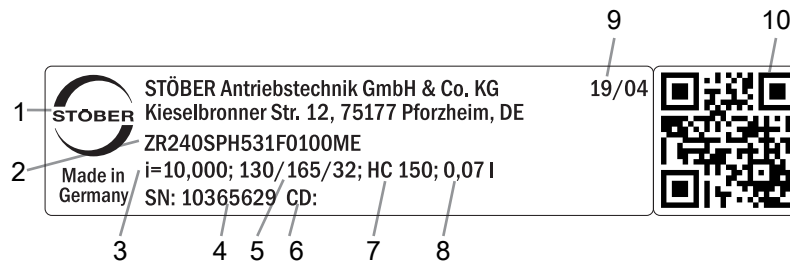


- Motor type or motor dimensions:
To choose a suitable motor connection, use the STOBBER Configurator at <https://configurator.stoeber.de/en-US/> and choose your motor or the dimensions of the motor connection.
- Mounting position, see the chapter [▶ 10.5.5]
- The position of locking screw access, see 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

EZ synchronous servo motor



Catalog ID 443137_en

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.

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.

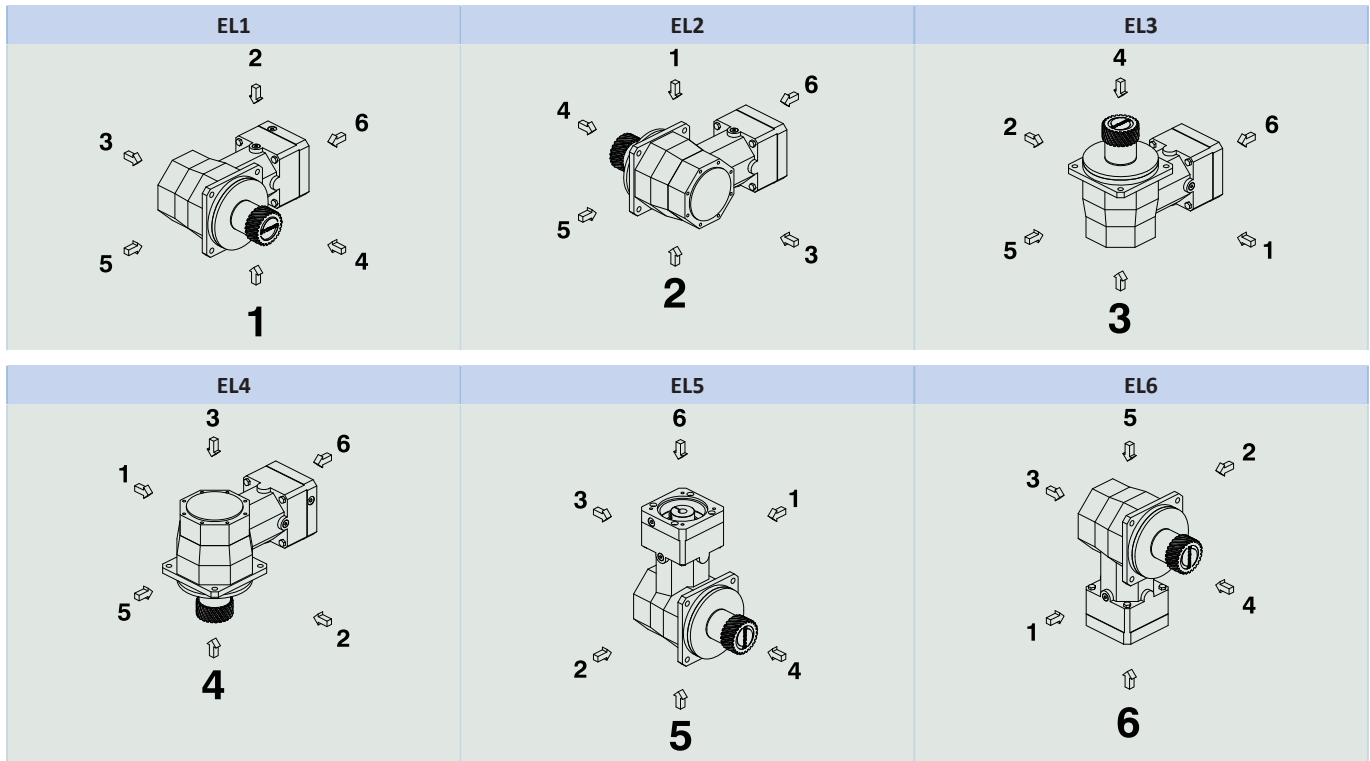
10.5.4 Installation conditions

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.

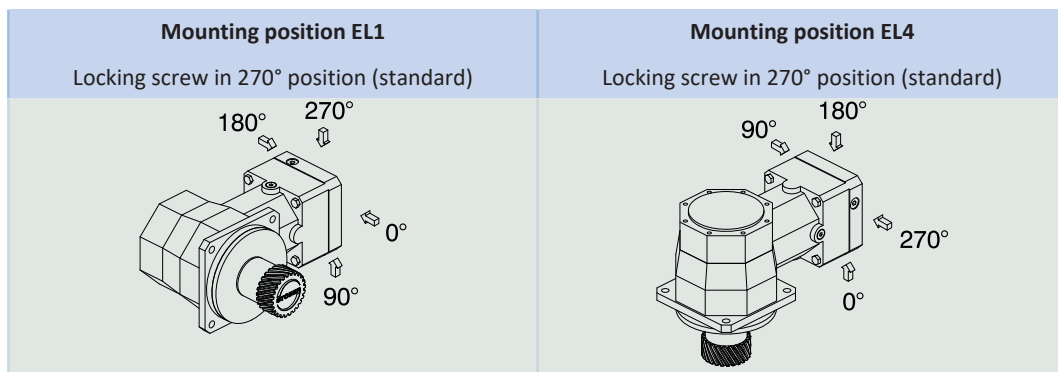
Only install the gear units in the intended mounting position! Reposition the gear units only after consulting STOBER. Otherwise, STOBER assumes no liability for the gear units.

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



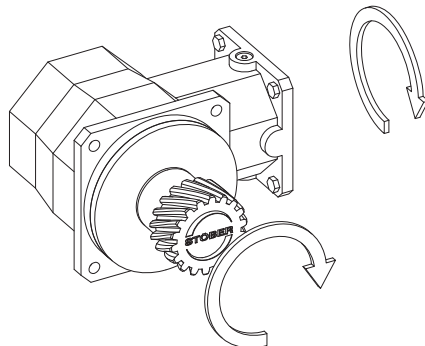
Indicate variations for your gear unit in the order.

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: ¹	
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.

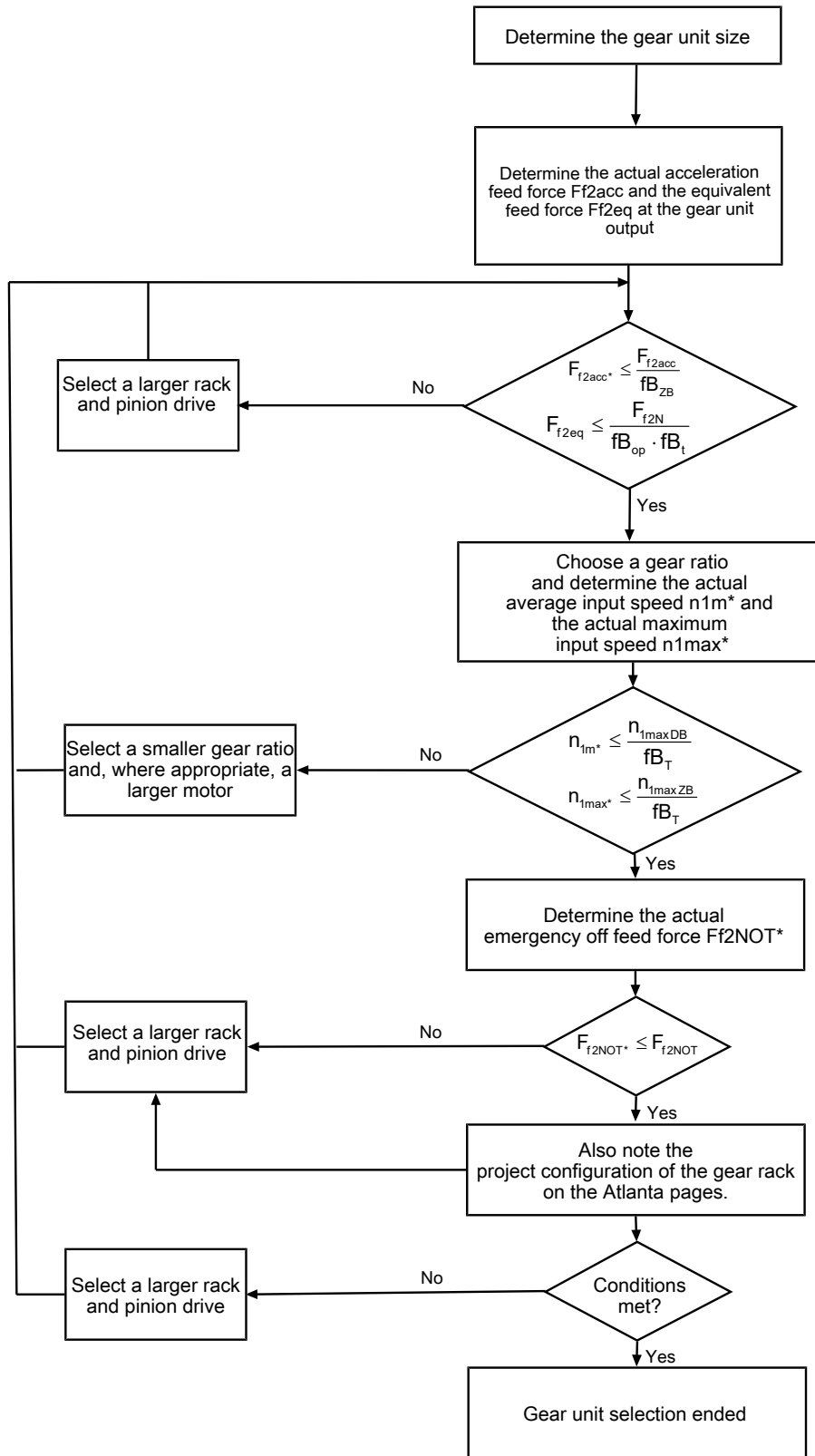
In this chapter, only limit values for specific operating points can be taken into consideration for manual drive selection.

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](#).

¹Observe the protection class of all the components.

10.6.1 Drive selection

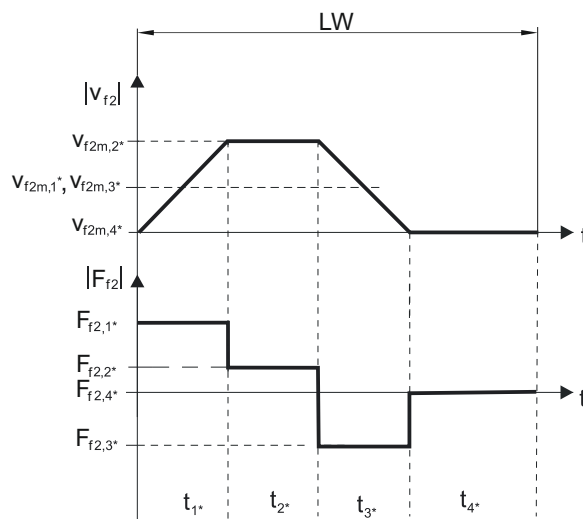


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for 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

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

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

Notes

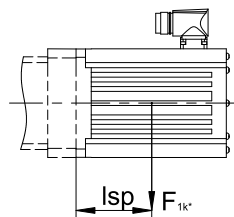
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

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

Calculate the actual breakdown torque as follows:

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



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/>

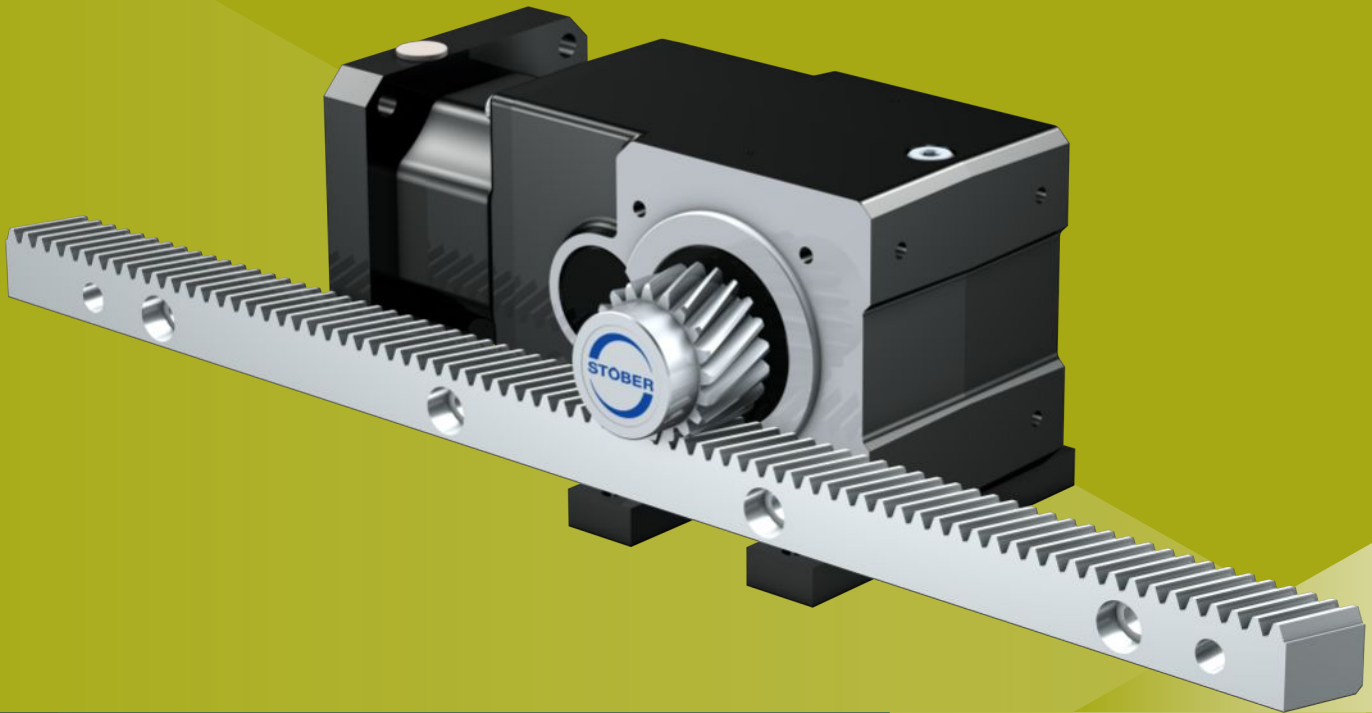
Enter the ID of the documentation in the Search term field.

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

11 ZVKL rack and pinion drives

Table of contents

11.1 Overview	156
11.2 Selection tables	157
11.3 Dimensional drawings	158
11.3.1 Pinion position E	158
11.3.2 Pinion position S	159
11.4 Type designation	160
11.4.1 Nameplate	161
11.5 Product description	161
11.5.1 Input options	161
11.5.2 Square motor adapter with backlash-free plug-in coupling (MQ)	162
11.5.3 Gear rack	162
11.5.4 Installation conditions	162
11.5.5 Gear unit sides	163
11.5.6 Lubricants	163
11.5.7 Position of locking screw access	163
11.5.8 Other product features	163
11.5.9 Direction of rotation	164
11.6 Project configuration	164
11.6.1 Drive selection	165
11.6.2 Permitted breakdown torques at the gear unit input	167
11.7 Additional documentation	167



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
Δs	99 – 123 μm

11.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 11.5.3](#)
- Installation altitudes up to 1000 m above sea level
- Surrounding temperatures from 0 °C to 40 °C
- Without consideration 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]	Δs [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]
ZV2KL1 ($F_{v2acc,max} = 1,5 \text{ kN}$)																		
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
ZV2KL2 ($F_{v2acc,max} = 2,7 \text{ kN}$)																		
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: $az = \frac{1}{2} d_0 + h_0 + x \cdot mn$

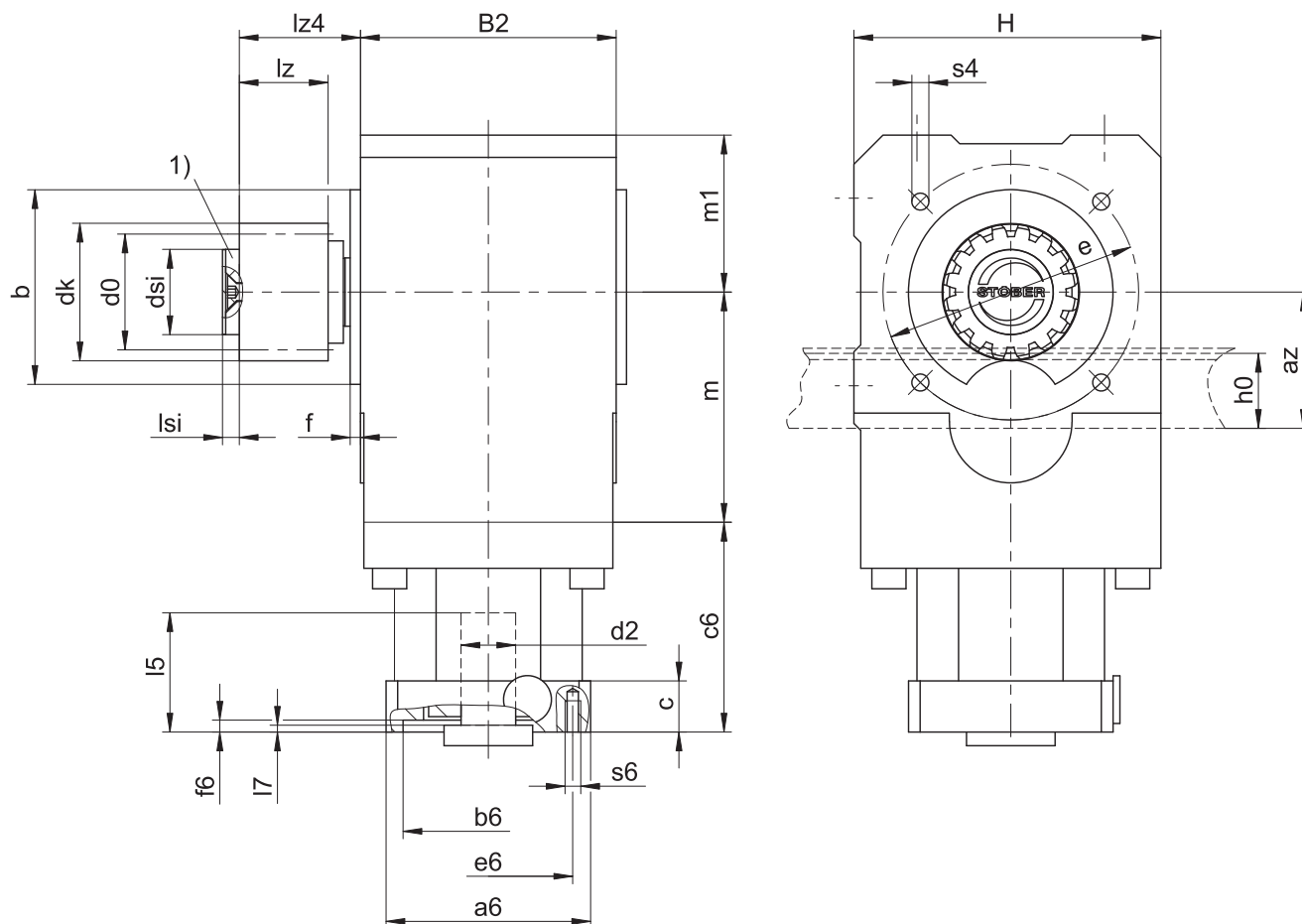
The pinion of the rack and pinion drive is helical (left-hand 19° 31' 42"). The pinion gearing quality is 5.

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	$\varnothing d_0$	$\varnothing dk$	$\varnothing d_{si}$	$\varnothing e$	f	h0	H	l _z	l _{z4}	l _{si}	m	m1	s4	x
ZV216SEKL1_	2	39.98	60 _{f6}	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 _{f6}	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

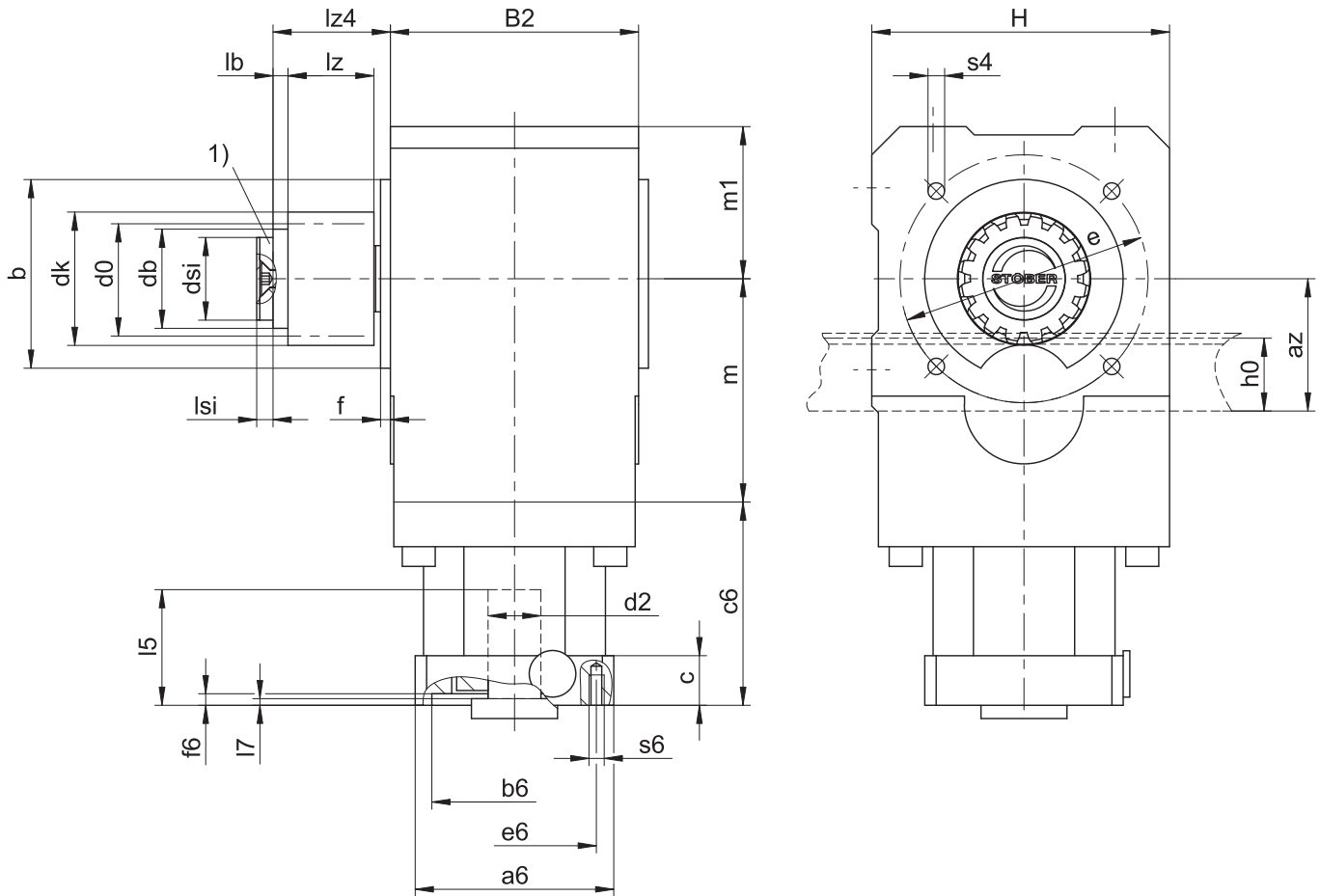
Type	$\varnothing b6$	$\varnothing e6$	$\varnothing d_{2max}$	l5	$\square a6$	c	c6	f6	l7	s6
ZV2_KL102_MQ	40 ^{H7}	63	16	30	55	15	61.5	3.5	3	M5
ZV2_KL202_MQ	60 ^{H7}	75	19	40	75	18	69.5	3.5	3	M5

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 c6 and l5 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 _{js}	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 _{js}	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 ^{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 c6 and l5 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.

11.4 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.

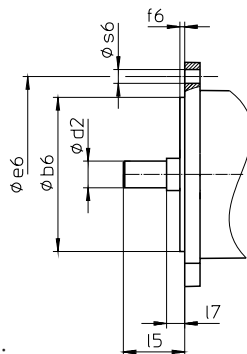
Example code

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](#)

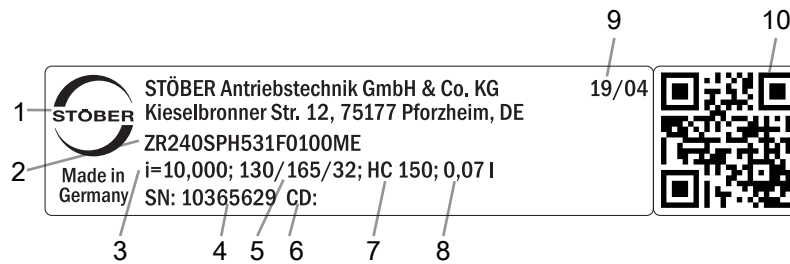
An explanation of the gear unit sides can be found in the chapter [▶ 11.5.5](#)

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>

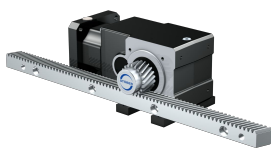
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

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:

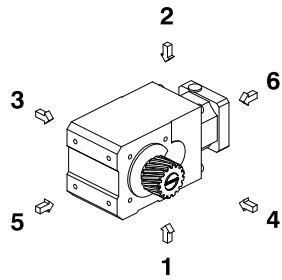
- The tothing is flush with the shaft end (Pos. E)
- The tothing is flush with the shaft shoulder (Pos. S: For higher permitted feed forces, see the Selection tables chapter)

Please specify the desired attachment position when placing your order.

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

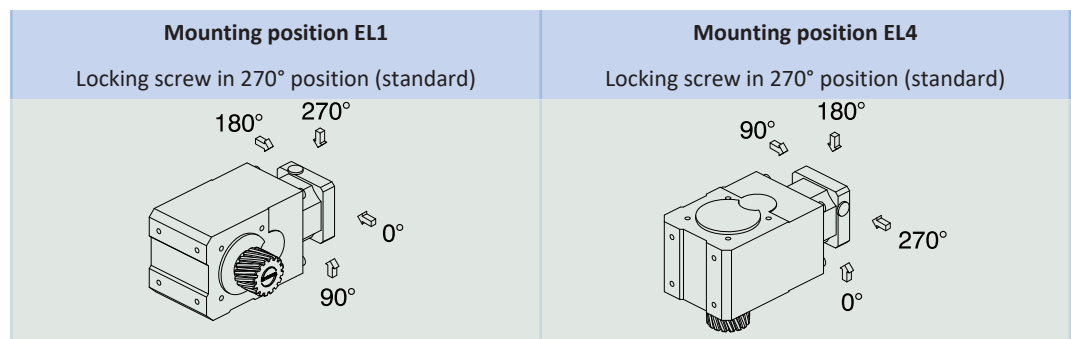
STOBER fills the gear units with the amount and type of lubricant specified on the nameplate.

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



Indicate variations for your gear unit in the order.

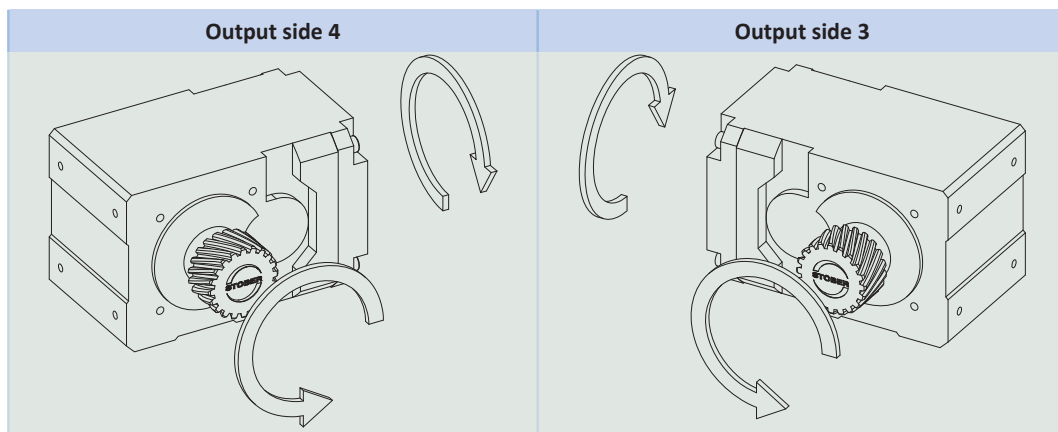
Note that the access hole for the locking screw also rotates when the gear unit is rotated to another mounting position.

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: ¹	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

¹ 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 SERVOnsoft designing software. Download SERVOnsoft for free at <https://www.stoeber.de/en/ServoSoft>.

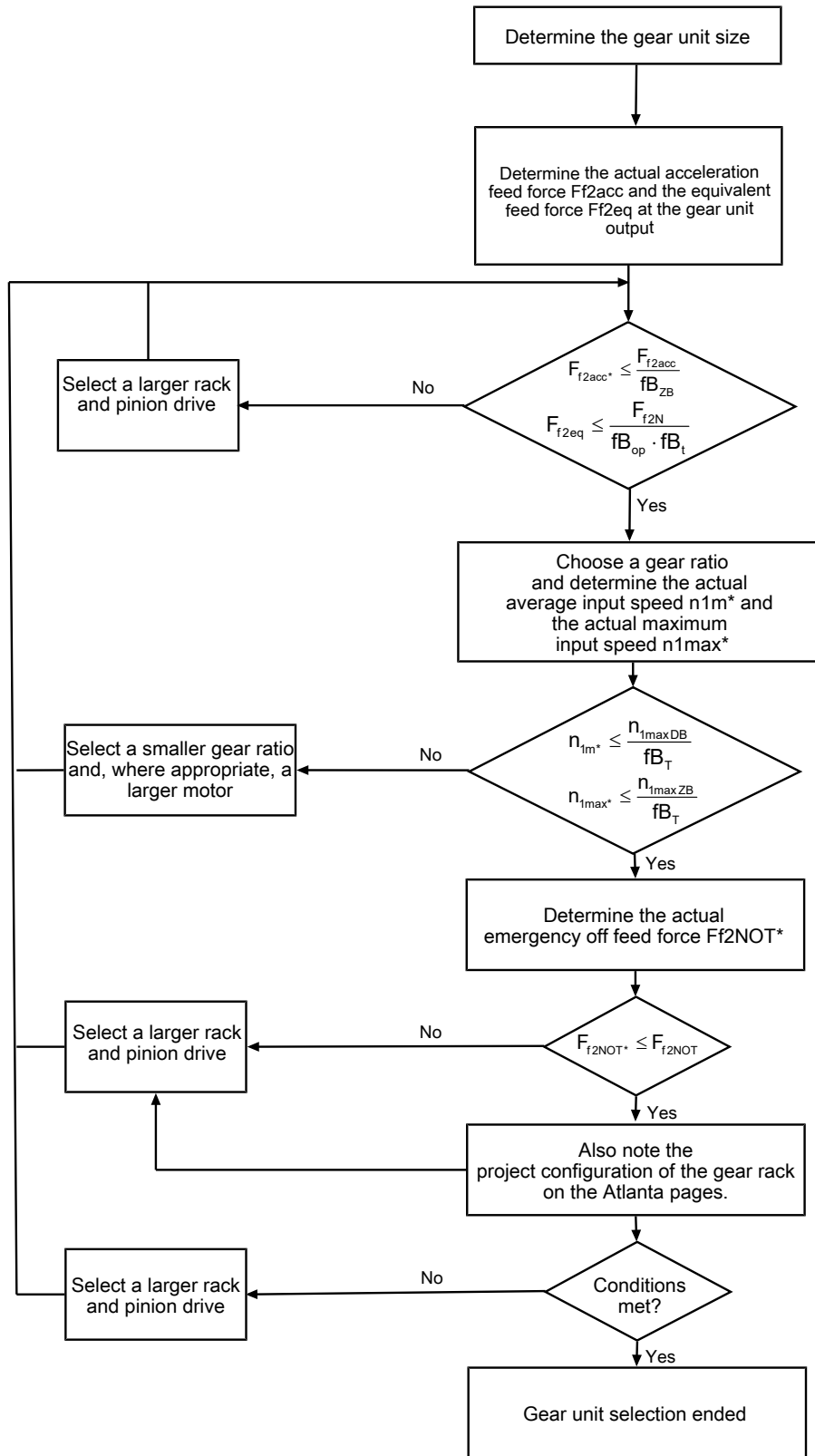
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

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](#).

11.6.1 Drive selection

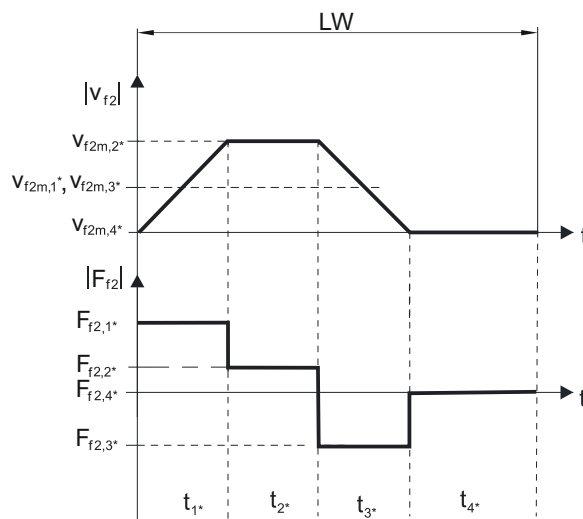


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

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

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

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

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 ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20
Cyclic operation	fB_{ZB}
≤ 1000 load changes/hour (LW/h)	1.00
> 1000 load changes/hour (LW/h)	1.15

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

Notes

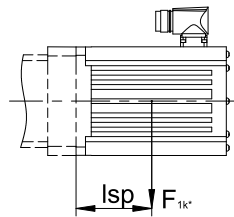
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

11.6.2 Permitted breakdown torques at the gear unit input

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

Calculate the actual breakdown torque as follows:

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



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/>

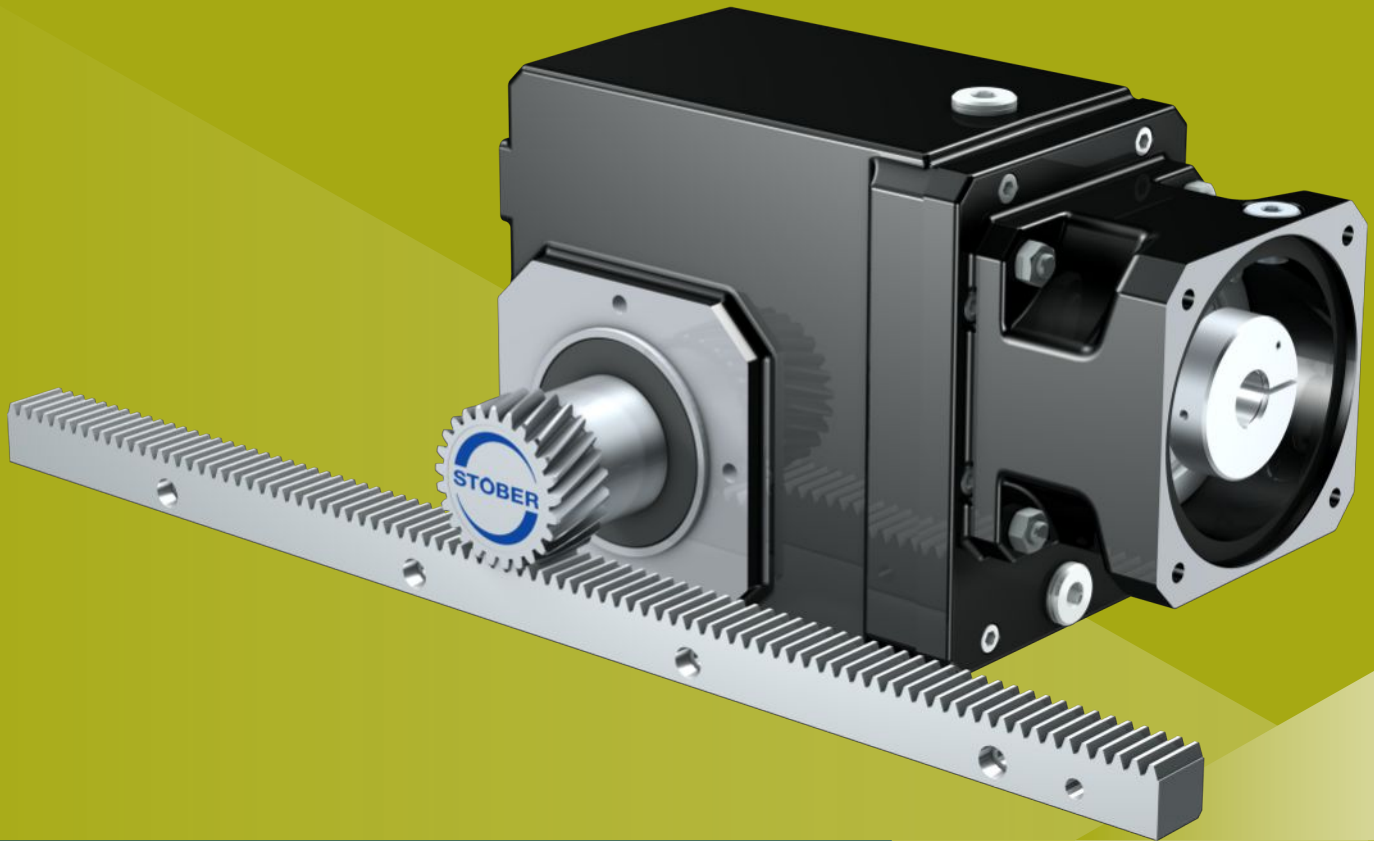
Enter the ID of the documentation in the Search term field.

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

12 ZVK rack and pinion drives

Table of contents

12.1 Overview	170
12.2 Selection tables	171
12.3 Dimensional drawings	181
12.3.1 Pinion position E	182
12.3.2 Pinion position S	184
12.4 Type designation	186
12.4.1 Nameplate	187
12.5 Product description	187
12.5.1 Input options	187
12.5.2 Motor adapter with EasyAdapt coupling (ME)	188
12.5.3 Square motor adapter with backlash-free plug-in coupling (MQ)	188
12.5.4 Gear rack	189
12.5.5 Installation conditions	189
12.5.6 Mounting positions	190
12.5.7 Lubricants	190
12.5.8 Position of locking screw access	191
12.5.9 Other product features	191
12.5.10 Direction of rotation	191
12.6 Project configuration	192
12.6.1 Drive selection	193
12.6.2 Permitted breakdown torques at the gear unit input	195
12.7 Additional documentation	195



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
Δs	12 – 111 μm

12.2 Selection tables

The technical data specified in the selection tables applies to:

- De-energized installation
- Permanent lubrication with the lubricants specified in the Atlanta product catalog
- Material combinations as described in the chapter [▶ 12.5.4](#)
- 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

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}		n_{1maxZV}	d_{MW}	$v_{f2maxZB}$	Δs	Δs_{redII}	Δs_{redI}	C_{lin}	m_n	z	d_0	$F_{f2N,S}$	$F_{f2N,E}$	F_{f2accS}	F_{f2accE}	$F_{f2NOT,S}$	$F_{f2NOT,E}$	M_{2accS}	M_{2accE}
		EL1,2 [rpm]	EL3,4,5,6 [rpm]																		
ZV2K1 ($F_{v2acc,max} = 4,9 \text{ kN}$)																					
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
ZV2K2 ($F_{v2acc,max} = 8,3 \text{ kN}$)																					
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

i	Type	n _{1maxDB}		n _{1maxZV}	d _{MW}	v _{2maxZB}	Δs	Δs _{redII}	Δs _{redI}	C _{lin}	m _n	z	d ₀	F _{f2N,S}	F _{f2N,E}	F _{f2accS}	F _{f2accE}	F _{f2NOT,S}	F _{f2NOT,E}	M _{2accS}	M _{2accE}
		EL1,2 [rpm]	EL3,4,5,6 [rpm]	[rpm]	[mm]	[m/s]	[μm]	[μm]	[μm]	[N/ μm]	[mm]	[mm]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[kN]	[Nm]
ZV4K4 (F_{v2acc,max} = 15 kN)																					
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: $a_z = \frac{1}{2} d_0 + h_0 + x \cdot m_n$

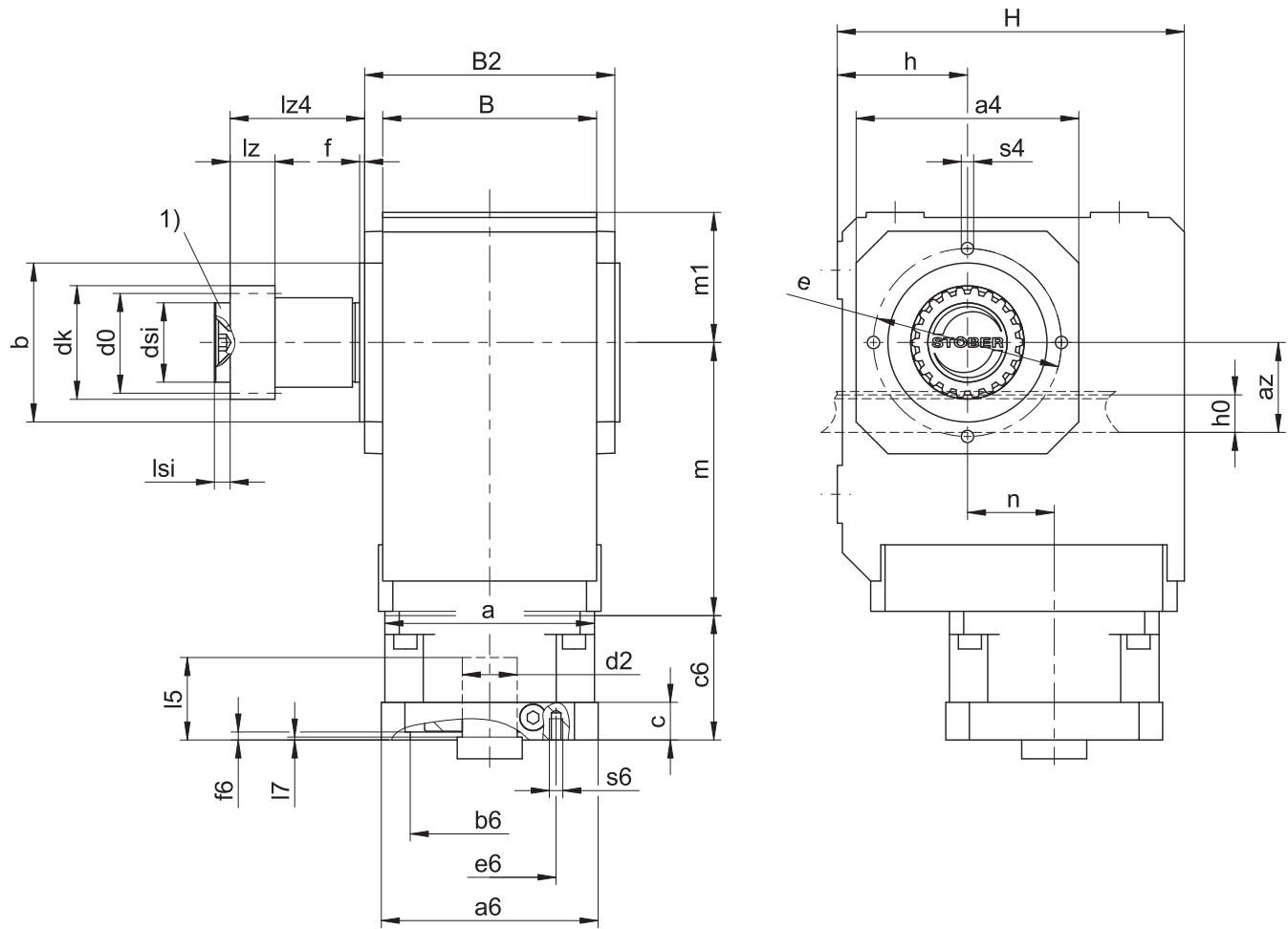
The pinion of the rack and pinion drive is helical (left-hand $19^\circ 31' 42''$). The pinion gearing quality is 5.

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 _z	l _{z4}	l _{si}	m1	s4	x
ZV220SEK102_	2	44.02	105	75 _β	90	106	42.44	47.90	30	90	3.0	60	22	160	26	50.5	6	60	M8	0.4
ZV225SEK202_	2	49.33	116	82 _β	115	134	53.05	58.52	45	100	3.0	65	22	190	26	67.5	8	65	M8	0.4
ZV225SEK203_	2	49.33	116	82 _β	115	134	53.05	58.52	45	100	3.0	65	22	190	26	67.5	8	65	M8	0.4
ZV318SEK202_	3	55.55	116	82 _β	115	134	57.30	65.01	45	100	3.0	65	26	190	31	67.5	8	65	M8	0.3
ZV318SEK203_	3	55.55	116	82 _β	115	134	57.30	65.01	45	100	3.0	65	26	190	31	67.5	8	65	M8	0.3
ZV225SEK302_	2	49.33	132	95 _β	130	146	53.05	58.52	45	115	3.0	75	22	213	26	68.5	8	75	M8	0.4
ZV225SEK303_	2	49.33	132	95 _β	130	146	53.05	58.52	45	115	3.0	75	22	213	26	68.5	8	75	M8	0.4
ZV318SEK302_	3	55.55	132	95 _β	130	146	57.30	65.01	45	115	3.0	75	26	213	31	68.5	8	75	M8	0.3
ZV318SEK303_	3	55.55	132	95 _β	130	146	57.30	65.01	45	115	3.0	75	26	213	31	68.5	8	75	M8	0.3
ZV322SEK402_	3	62.21	152	110 _β	148	173	70.03	78.35	55	130	3.5	90	26	240	31	93.0	10	90	M10	0.4
ZV322SEK403_	3	62.21	152	110 _β	148	173	70.03	78.35	55	130	3.5	90	26	240	31	93.0	10	90	M10	0.4
ZV418SEK402_	4	74.40	152	110 _β	148	173	76.40	86.77	55	130	3.5	90	35	240	41	93.0	10	90	M10	0.3
ZV418SEK403_	4	74.40	152	110 _β	148	173	76.40	86.77	55	130	3.5	90	35	240	41	93.0	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

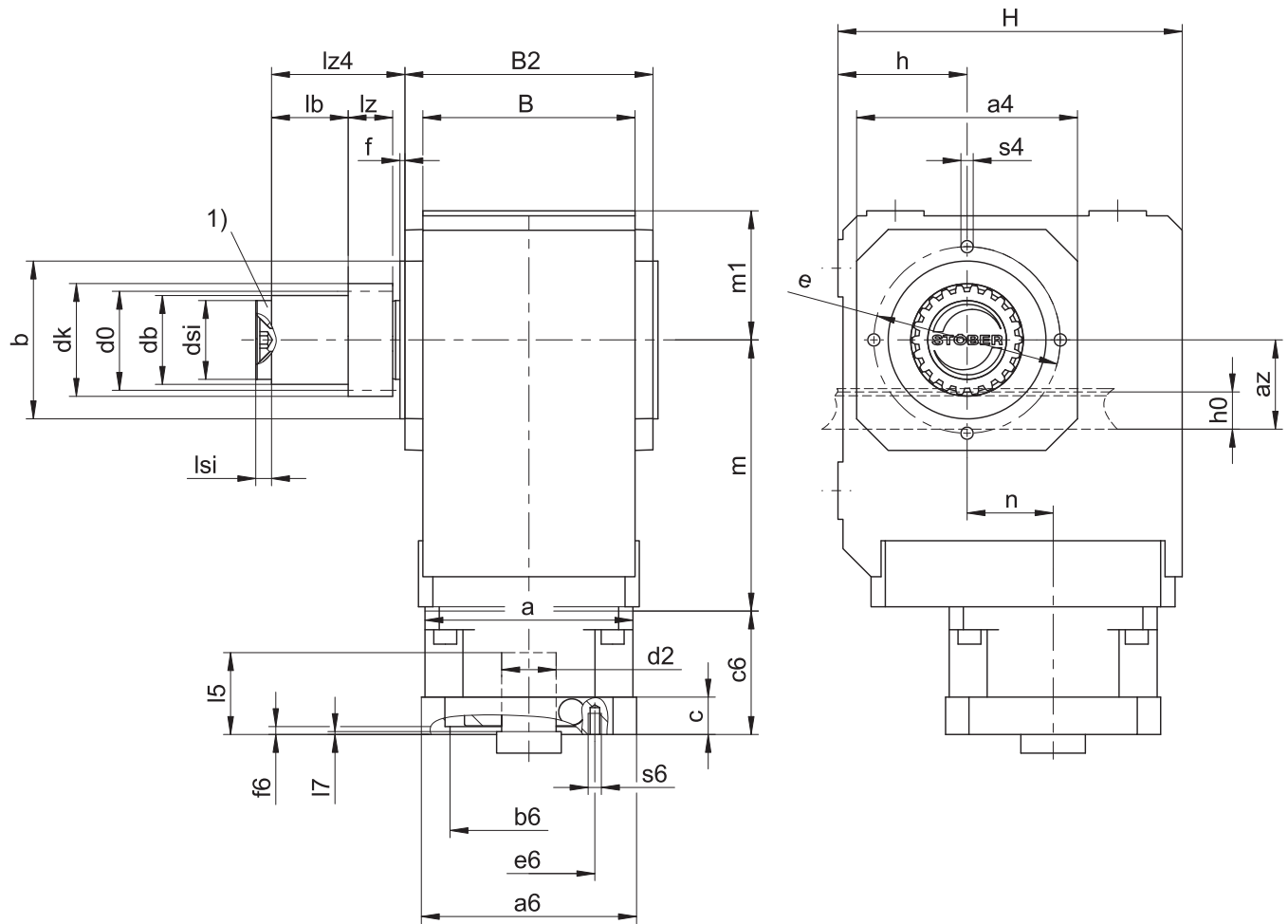
Type	∅b6	∅e6	∅d2max	l5	□a6	c	c6	f6	l7	s6
ME10	95 ^{H7}	115	19	41	100	21	61	4.0	3.0	M8
ME20	110 ^{H7}	130	32	53	120	24	74	4.0	3.5	M8
ME30	130 ^{H7}	165	38	62	150	26	86	5.5	4.5	M10
ME40	180 ^{H7}	215	48	82	204	35	123	5.5	5.5	M12

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 _{f6}	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 _{f6}	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 _{f6}	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 _{f6}	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 _{f6}	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 _{f6}	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 _{f6}	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 _{f6}	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 _{f6}	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 _{f6}	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 _{f6}	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 _{f6}	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 _{f6}	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 ^{H7}	115	19	41	100	21	61	4.0	3.0	M8
ME20	110 ^{H7}	130	32	53	120	24	74	4.0	3.5	M8
ME30	130 ^{H7}	165	38	62	150	26	86	5.5	4.5	M10
ME40	180 ^{H7}	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 STÖBER 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.

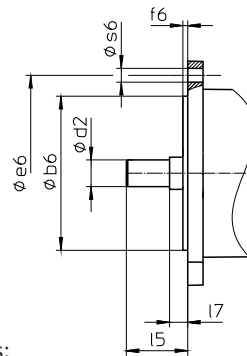
Example code

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 ¹		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.

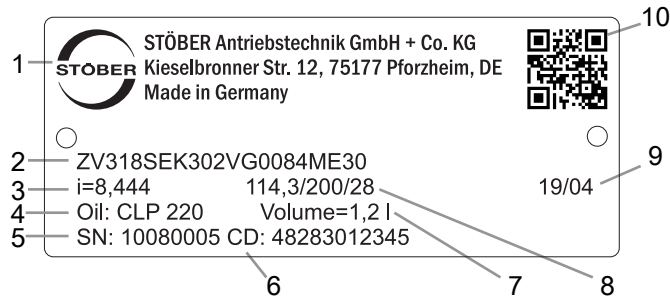
- Mounting position, see the chapter [▶ 12.5.6]
- Attachment of solid shaft: gear unit side 3 or 4
- Pitch circle diameter: gear unit side 3 or 4
- Backlash: Standard/class II/class I. Backlash class II and class I for an additional charge.
- For axial locking (optional), see the chapter [▶ 12.3]
- Position 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>

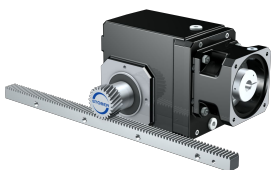
Alternatively, you can use a suitable mobile device to scan in the QR code on the nameplate of the product in order to be linked to the supporting documents.

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.

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

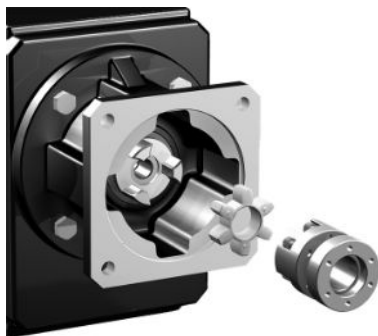


Fig. 2: Backlash-free plug-in coupling

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.

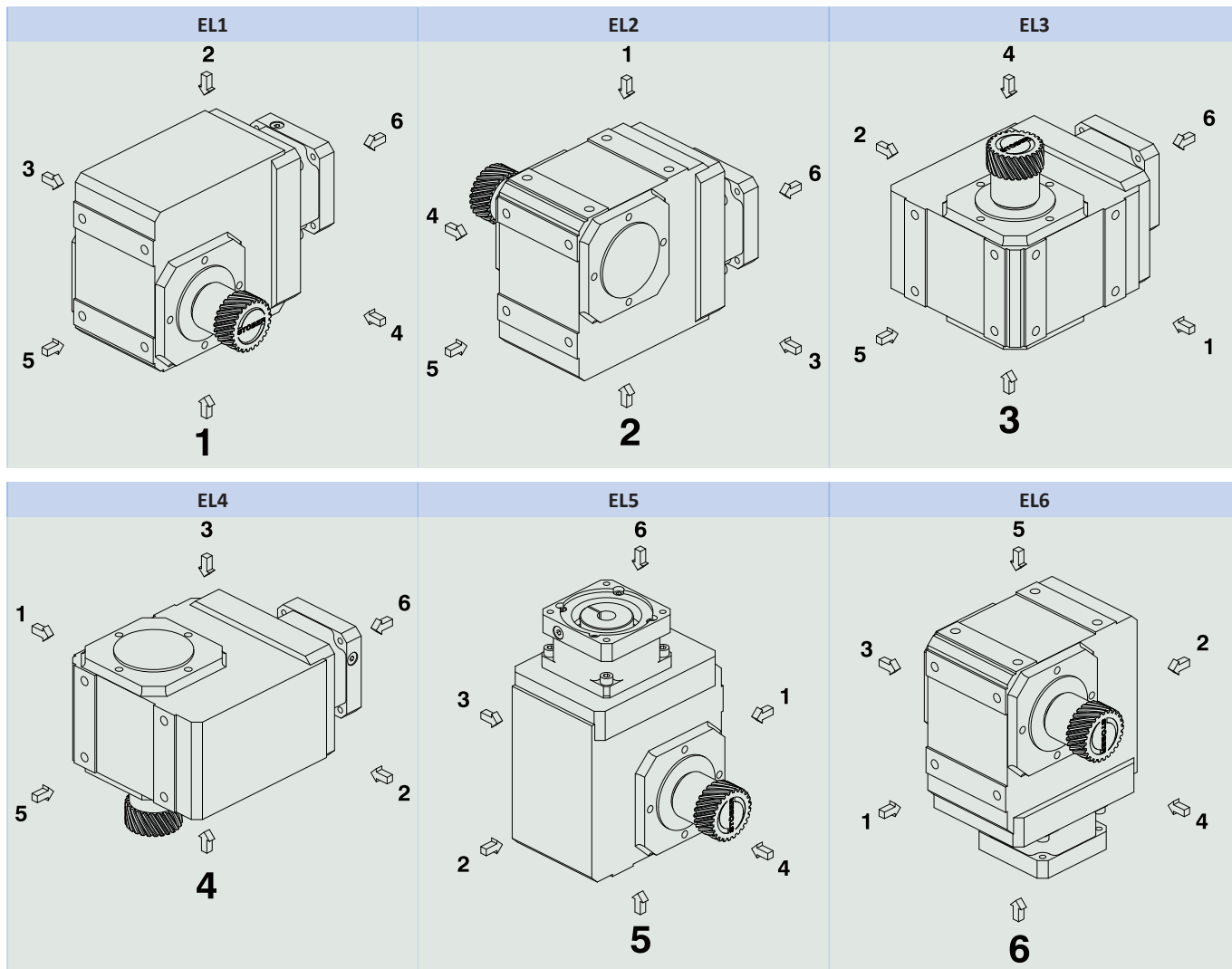
12.5.5 Installation conditions

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.

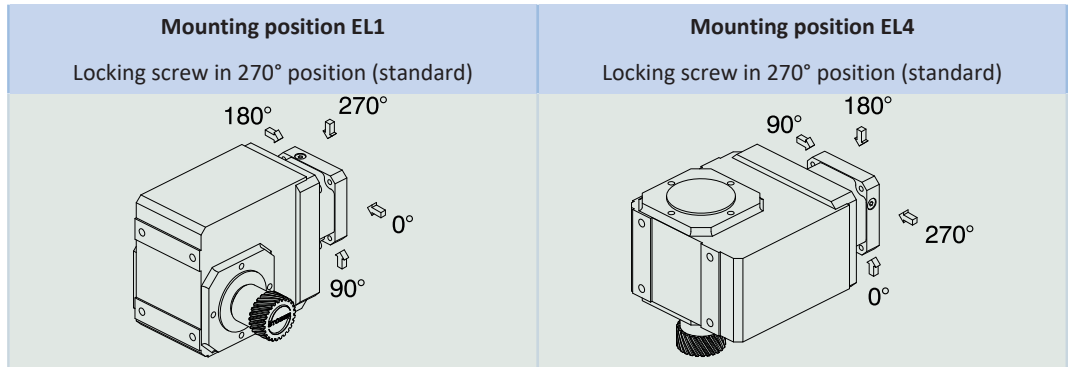
Only install the gear units in the intended mounting position! Reposition the gear units only after consulting STOBER. Otherwise, STOBER assumes no liability for the gear units.

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



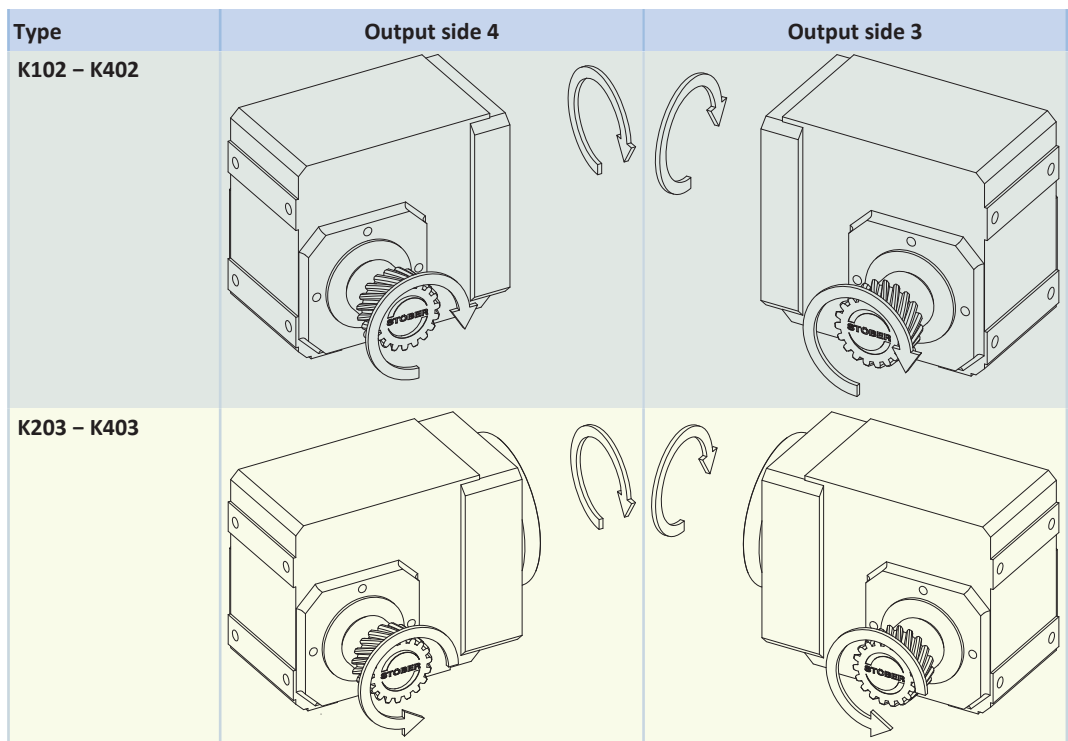
Indicate variations for your gear unit in the order.

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: ²	
Planetary gear unit	IP65
Pinion/gear rack	IPXX

12.5.10 Direction of rotation



The pictures show mounting position EL1.

²Observe 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>.

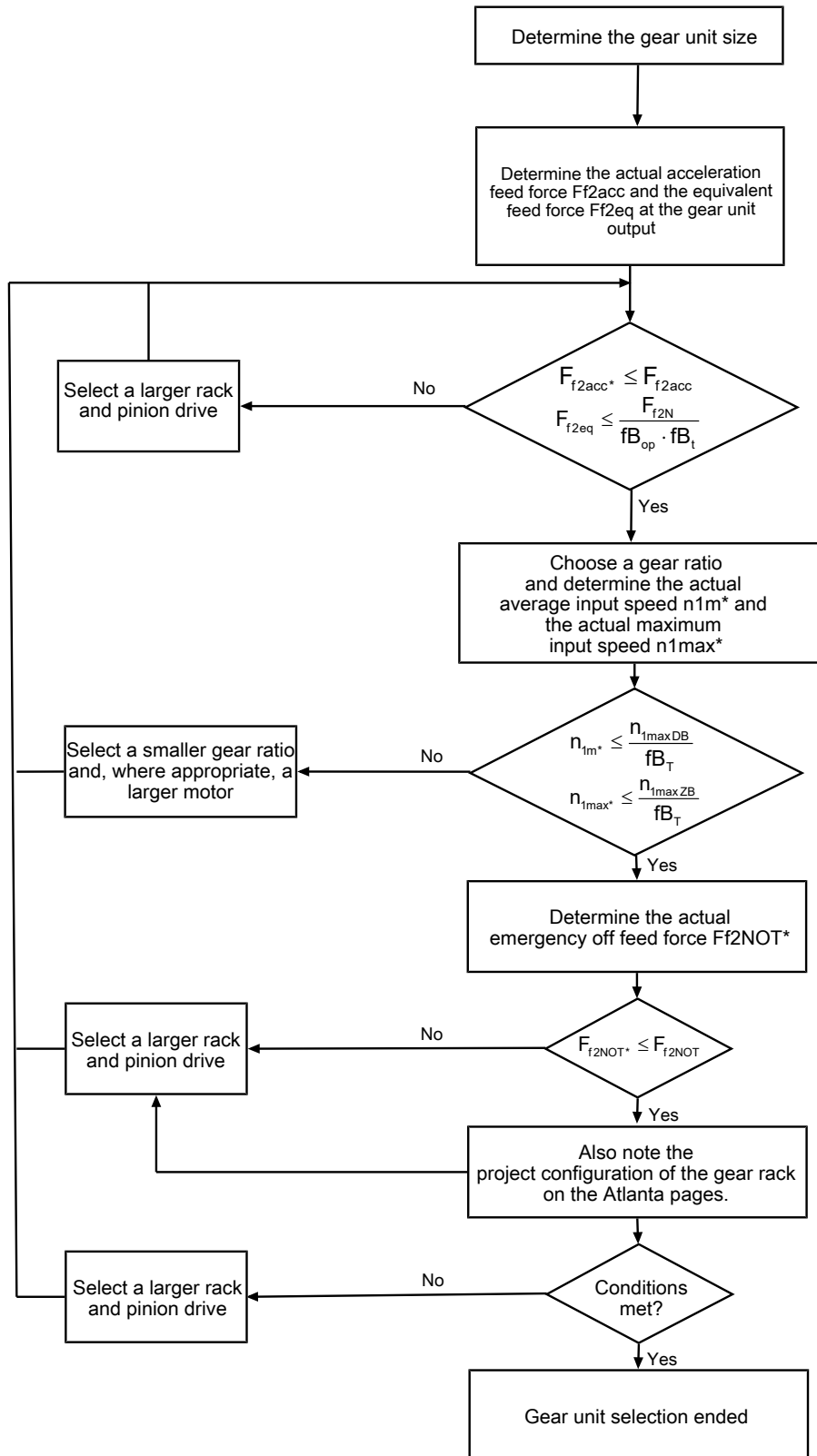
It is the most convenient and reliable method of drive selection, as the entire torque/speed curve of the application is displayed and evaluated here in the curve of the geared motor.

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

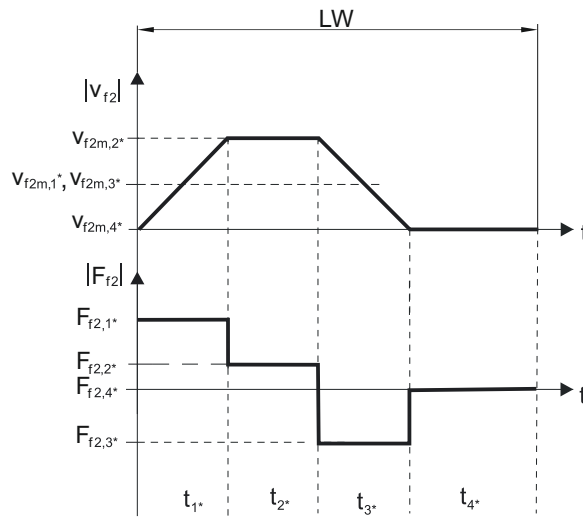


Refer to the selection tables for the values for i , n_{1maxDB} , n_{1maxZB} , F_{f2acc} , F_{f2N} and F_{f2NOT} . The forces depend on the pinion position (E or S). The speeds are partially dependent on the mounting position.

The values for f_{B_T} , $f_{B_{op}}$ and f_{B_t} can be found in the corresponding tables in this chapter.

Example of cyclic operation

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



Calculation of the actual maximum acceleration feed force

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

Calculation of the actual average input speed

$$n_{1m*} = \frac{v_{f2m*} \cdot i}{d_0 \cdot \pi}$$

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

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 ≤ 8 h	1.00
Daily runtime ≤ 16 h	1.15
Daily runtime ≤ 24 h	1.20

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

Notes

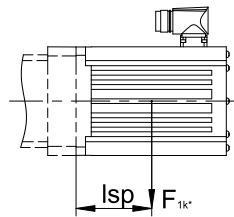
- The maximum permitted gear unit temperature (see the "Other product features" chapter) must not be exceeded, as that could result in damage.
- For braking from full speed (for example, when the power fails or when setting up the machine), note the permitted gear unit feed forces (F_{f2acc} , F_{f2NOT})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

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

Table of contents

13.1 Formula symbols	198
13.2 Trademarks	199
13.3 Sales terms and delivery conditions	199
13.4 Publication details	199
13.5 ATLANTA product catalog pages	201

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
Δs	mm	Linear backlash resulting from the backlash of the gear unit
Δs_{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_{1m}^*	rpm	Actual average input speed
n_{1max}^*	rpm	Actual maximum input speed
n_{1maxDB}	min^{-1}	Maximum permitted input speed of the gear unit in continuous operation
$n_{1maxDBEL1,2}$	rpm	Maximum permitted input speed of the gear unit in continuous operation Mounting positions EL1, EL2
$n_{1maxDBEL3,4,5,6}$	rpm	Maximum permitted input speed of the gear unit in continuous operation Mounting positions EL3, EL4, EL5, EL6
n_{1maxZB}	min^{-1}	Maximum permitted input speed of the gear unit in cyclic operation
t	s	Time
$t_{1}^* - t_{4}^*$	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.

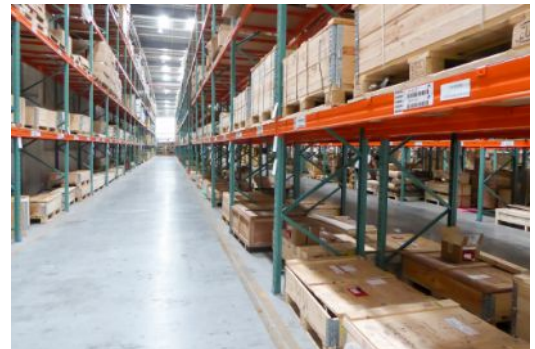
<http://atlantagmbh.de/>

13.5 ATLANTA product catalog pages

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



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74321 Bietigheim-Bissingen
Germany
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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/s²
 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

$$F_{u\text{ per.}} > F_u ; 3,47 \text{ kN} > 2,44 \text{ kN} \quad => \text{fulfilled}$$

Result: Rack 27 30 101 Page ZB-13
 Pinion 24 35 220 Page ZB-23
 case hardened

Your calculation

Values given

⊗ travelling operation

mass to be moved $m =$ _____ kg
 speed $v =$ _____ m/s
 acceleration time $t_b =$ _____ s
 acceleration due to gravity $g = 9,81$ m/s²
 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/s²

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



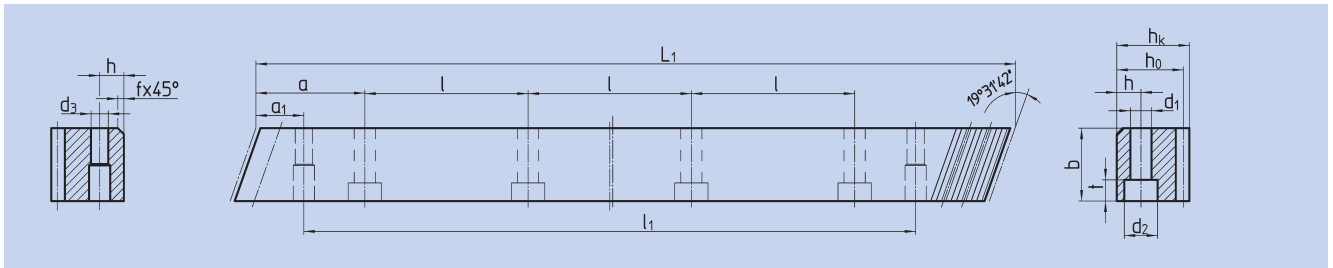
Class	ATLANTA Quality	Module	Total pitch error ¹⁾ (±µm/m)	Tooth thickness tolerance (µm)	max. length (mm)	Max. feed force per pinion contact ²⁾ kN	Applications (examples)
HPR High Precision Rack	6	2	34	-20	1000	19,5	Wood, plastic, composite, aluminium working machines
		3	34	-20	1000	31,0	
		4	34	-20	1000	60,0	
	6	1,5	34	-20	1000	9,0	Machine tools, integratable racks, water cutting machines, tube bending systems, plasma cutting machines
		2	34	-20	2000	15,5	
		3	34	-20	2000	28,5	
		4	34	-20	2000	51,5	
		5	34	-20	2000	76,0	
		6	34	-20	2000	109,0	
		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	Wood working machines, linear axes with high requirement for a smooth running
		3	52	-36	2000	28,5	
		4	52	-36	2000	51,5	
		5	52	-36	2000	76,0	
		6	52	-36	2000	109,0	
		8	52	-36	1920	191,0	
		10	52	-36	1500	287,0	
PR Precision Rack	8	2	60	-59	2000	13,5	Portals, handling linear axes
		3	60	-59	2000	24,5	
		4	60	-59	2000	44,0	
		5	60	-59	2000	64,5	
		6	60	-59	2000	90,5	
	8	2	100	-110	2000	8,0	Linear axes
		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 ₁	N° of teeth	b	h _k	h ₀	f	a	l	N° of holes	h	d ₁	d ₂	t	a ₁	l ₁	d ₃	
29 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.

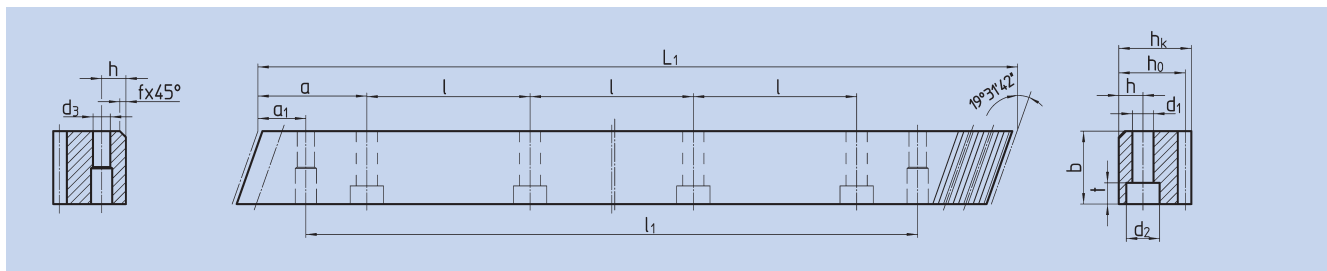
To achieve precision rack joints, we recommend our patented assembly kit, see Atlanta Servo Drive catalogue.

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 ₁	N° of teeth	b	h _k	h ₀	f	a	l	N° of holes	h	d ₁	d ₂	t	a ₁	l ₁	d ₃	kg
29 15 105	1,5	1000,00	200	19	19	17,5	2,0	62,5	125	8	8	7	11	7	31,7	936,6	5,7	2,60
29 20 105	2	1000,00	150	24	24	22	2,0	62,5	125	8	8	7	11	7	31,7	936,6	5,7	4,10
29 20 155	2	1500,00	225	24	24	22	2,0	62,5	125	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 ²⁾	4	1000,00	75	39	39	35	2,0	62,5	125	8	12	10	15	9	33,3	933,4	7,7	10,70
29 42 105	4	1000,00	75	39	39	35	2,0	62,5	125	8	12	14	20	13	33,3	933,4	11,7	10,70
29 42 155 ¹⁾	4	1506,67	113	39	39	35	2,0	62,5	125	12	12	14	20	13	33,3	1433,4	11,7	16,05
29 40 205	4	2000,00	150	39	39	35	2,0	62,5	125	16	12	10	15	9	33,3	1933,4	7,7	21,40
29 42 205	4	2000,00	150	39	39	35	2,0	62,5	125	16	12	14	20	13	33,3	1933,4	11,7	21,40
29 50 105	5	1000,00	60	49	49	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

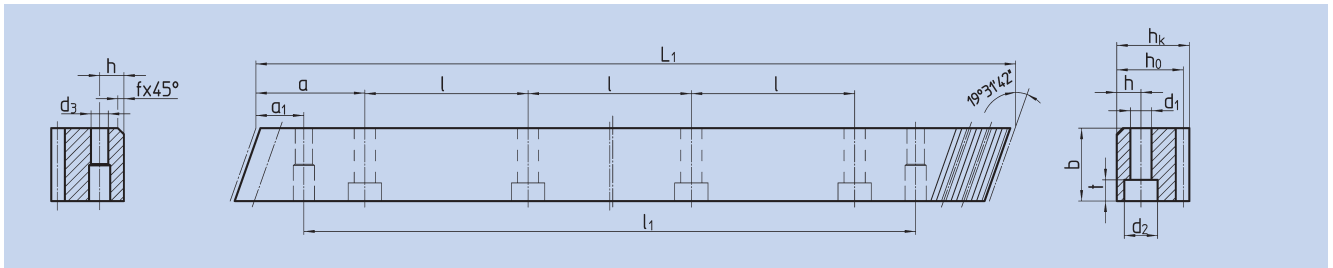
Mounting racks, see Atlanta Servo Drive catalogue.

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 ₁	N° of teeth	b ^{+0,4}	h _k	h ₀	f	a	l	N° of holes	h	d ₁	d ₂	t	a ₁	l ₁	d ₃	kg
29 20 107	2	1000,00	150	24	24	22	2	62,5	125	8	8	7	11	7	31,7	936,6	5,7	4,10
29 20 157	2	1500,00	225	24	24	22	2	62,5	125	12	8	7	11	7	31,7	1436,6	5,7	6,15
29 20 207	2	2000,00	300	24	24	22	2	62,5	125	16	8	7	11	7	31,7	1936,6	5,7	8,20
29 30 107	3	1000,00	100	29	29	26	2	62,5	125	8	9	10	15	9	35,0	930,0	7,7	5,90
29 30 157	3	1500,00	150	29	29	26	2	62,5	125	12	9	10	15	9	35,0	1430,0	7,7	8,85
29 30 207	3	2000,00	200	29	29	26	2	62,5	125	16	9	10	15	9	35,0	1930,0	7,7	11,80
29 40 107	4	1000,00	75	39	39	35	2	62,5	125	8	12	14	20	13	33,3	933,4	11,7	10,70
29 40 157 ¹⁾	4	1506,67	113	39	39	35	2	62,5	125	12	12	14	20	13	33,3	1433,0	11,7	16,00
29 40 207	4	2000,00	150	39	39	35	2	62,5	125	16	12	14	20	13	33,3	1933,4	11,7	21,40
29 50 107	5	1000,00	60	49	39	34	2,5	62,5	125	8	12	14	20	13	37,5	925,0	11,7	13,00
29 50 157	5	1500,00	90	49	39	34	2,5	62,5	125	12	12	14	20	13	37,5	1425,0	11,7	19,50
29 50 207	5	2000,00	120	49	39	34	2,5	62,5	125	16	12	14	20	13	37,5	1925,0	11,7	26,00
29 60 107	6	1000,00	50	59	49	43	2,5	62,5	125	8	16	18	26	17	37,5	925,0	15,7	18,10
29 60 157	6	1500,00	75	59	49	43	2,5	62,5	125	12	16	18	26	17	37,5	1425,0	15,7	27,10
29 60 207	6	2000,00	100	59	49	43	2,5	62,5	125	16	16	18	26	17	37,5	1925,0	15,7	36,20
29 80 107	8	960,00	36	79	79	71	2,5	60,0	120	8	25	22	33	21	120,0	720,0	19,7	42,50
29 80 157	8	1440,00	54	79	79	71	2,5	60,0	120	12	25	22	33	21	120,0	1200,0	19,7	65,00
29 80 207	8	1920,00	72	79	79	71	2,5	60,0	120	16	25	22	33	21	120,0	1680,0	19,7	85,00
29 10 107	10	1000,00	30	99	99	89	2,5	62,5	125	8	32	33	48	32	125,0	750,0	19,7	68,72
29 10 157	10	1500,00	45	99	99	89	2,5	62,5	125	12	32	33	48	32	125,0	1250,0	19,7	104,00

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

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

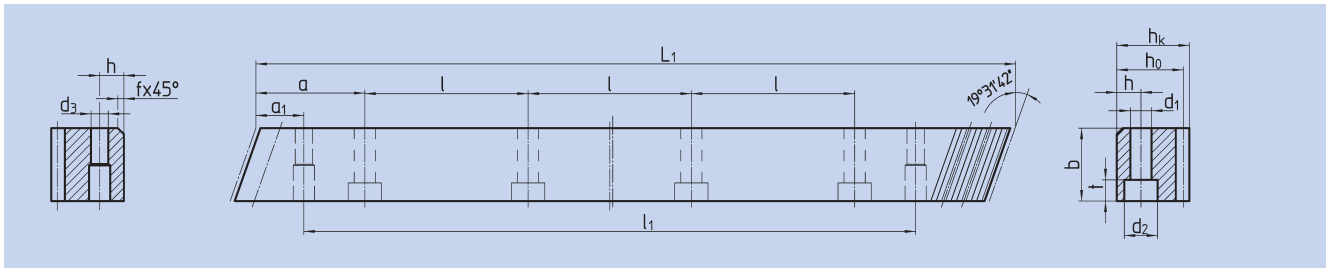
Mounting racks, see Atlanta Servo Drive catalogue.


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 ₁	N° of teeth	b ^{+0,4}	h _k	h ₀	f	a	l	N° of holes	h	d ₁	d ₂	t	a ₁	l ₁	d ₃	
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 ¹⁾	4	1506,67	113	39	39	35	2	62,5	125	12	12	14	20	13	33,3	1433,4	11,7	16,00
29 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 $GT_f/1000 \leq 0,060 \text{ mm}$,
 $GT_f/1500 \leq 0,072 \text{ mm}$ ($\Delta \pm 0,048 \text{ mm}/1000$)
 $GT_f/2000 \leq 0,078 \text{ mm}$ ($\Delta \pm 0,039 \text{ mm}/1000$).

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

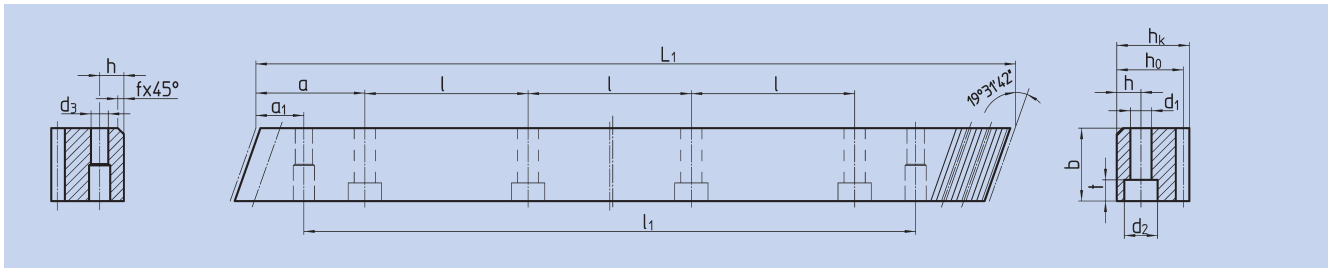
Mounting racks, see Atlanta Servo Drive catalogue.

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 ₁	N° of teeth	b _{0,5}	h _k	h ₀	f	a	l	N° of holes	h	d ₁	d ₂	t	a ₁	l ₁	d ₃	kg
38 21 100	2	1000,00	150	25	24	22	2	62,5	125	8	8	7	11	7	31,7	936,6	5,7	4,30
38 20 100	2	1000,00	150	25	24	22	2	without mounting holes										4,30
38 21 200	2	2000,00	300	25	24	22	2	62,5	125	16	8	7	11	7	31,7	1936,6	5,7	8,60
38 20 200	2	2000,00	300	25	24	22	2	without mounting holes										8,60
38 31 100	3	1000,00	100	30	29	26	2	62,5	125	8	9	10	15	9	35,0	930,0	7,7	6,10
38 30 100	3	1000,00	100	30	29	26	2	without mounting holes										6,10
38 31 200	3	2000,00	200	30	29	26	2	62,5	125	16	9	10	15	9	35,0	1930,0	7,7	12,20
38 30 200	3	2000,00	200	30	29	26	2	without mounting holes										12,20
38 41 100	4	1000,00	75	40	39	35	2	62,5	125	8	12	10	15	9	33,3	933,4	7,7	10,90
38 40 100	4	1000,00	75	40	39	35	2	without mounting holes										10,90
38 41 200	4	2000,00	150	40	39	35	2	62,5	125	16	12	10	15	9	33,3	1933,4	7,7	21,80
38 40 200	4	2000,00	150	40	39	35	2	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	case hardening steel ²⁾	high performance hardening process				high performance hardening process		
	heat treatment	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5		
Pinion	material	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5		
	heat treatment	case hardened	case hardened	case hardened	case hardened	case hardened	case hardened		
No. of pinion teeth ¹⁾	pitch circle dia.	maximum feed force (values are only valid for material according ATLANTA-standard)							
		8,0 kN	6,0 kN	6,0 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	6,0 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	6,0 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	7,5 kN	2,5 kN	1,5 kN	0,7 kN	4,5 kN	3,0 kN
15	31,83 mm	11,0 kN	8,0 kN	8,0 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	9,0 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	9,5 kN	3,0 kN	2,0 kN	1,0 kN	6,0 kN	4,0 kN
18	38,20 mm	13,5 kN	10,0 kN	10,0 kN	3,5 kN	2,0 kN	1,0 kN	6,5 kN	4,0 kN
19	40,32 mm	14,5 kN	10,5 kN	10,5 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	11,5 kN	4,0 kN	2,5 kN	1,0 kN	7,0 kN	4,5 kN
21	44,56 mm	16,0 kN	12,0 kN	12,0 kN	4,0 kN	2,5 kN	1,0 kN	7,5 kN	5,0 kN
22	46,69 mm	17,0 kN	12,5 kN	12,5 kN	4,0 kN	2,5 kN	1,0 kN	8,0 kN	5,5 kN
23	48,81 mm	17,5 kN	13,0 kN	13,0 kN	4,5 kN	3,0 kN	1,0 kN	8,5 kN	5,5 kN
24	50,93 mm	18,0 kN	13,5 kN	13,5 kN	4,5 kN	3,0 kN	1,0 kN	8,5 kN	5,5 kN
25	53,05 mm	18,5 kN	14,5 kN	14,5 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	15,0 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	15,0 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	15,0 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	15,0 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	15,0 kN	6,0 kN	4,0 kN	1,5 kN	9,5 kN	6,0 kN
31	65,78 mm	19,0 kN	15,5 kN	15,5 kN	6,0 kN	4,0 kN	1,5 kN	9,5 kN	6,0 kN
32	67,91 mm	19,0 kN	15,5 kN	15,5 kN	6,5 kN	4,0 kN	1,5 kN	9,5 kN	6,0 kN
33	70,03 mm	19,0 kN	15,5 kN	15,5 kN	6,5 kN	4,0 kN	2,0 kN	9,5 kN	6,0 kN
34	72,15 mm	19,0 kN	15,5 kN	15,5 kN	7,0 kN	4,5 kN	2,0 kN	9,5 kN	6,0 kN
35	74,27 mm	19,0 kN	15,5 kN	15,5 kN	7,0 kN	4,5 kN	2,0 kN	9,5 kN	6,0 kN
36	76,39 mm	19,0 kN	15,5 kN	15,5 kN	7,5 kN	4,5 kN	2,0 kN	9,5 kN	6,0 kN
37	78,52 mm	19,0 kN	15,5 kN	15,5 kN	7,5 kN	5,0 kN	2,0 kN	9,5 kN	6,0 kN
38	80,64 mm	19,0 kN	15,5 kN	15,5 kN	7,5 kN	5,0 kN	2,0 kN	9,5 kN	6,0 kN
39	82,76 mm	19,0 kN	15,5 kN	15,5 kN	8,0 kN	5,0 kN	2,0 kN	9,5 kN	6,0 kN
40	84,88 mm	19,5 kN	15,5 kN	15,5 kN	8,0 kN	5,0 kN	2,0 kN	9,5 kN	6,0 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 3 – helical tooth system

Rack	HPR		PR		BR					
	6	7	8	9	10					
ATLANTA-Quality	heat-treatable steel according ATLANTA-standard									
Rack	material	case hardened steel ²⁾	high performance hardening process				high performance hardening process			
	heat treatment	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5			
Pinion	material	case hardened	case hardened	case hardened	case hardened	case hardened	case hardened			
	heat treatment	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5			
No. of pinion teeth ¹⁾	pitch circle dia.	maximum feed force (values are only valid for material according ATLANTA-standard)								
		13,0 kN	9,5 kN	8,0 kN	3,0 kN	2,5 kN	1,5 kN	1,0 kN	5,5 kN	5,0 kN
12	38,20 mm	13,0 kN	9,5 kN	8,0 kN	3,0 kN	2,5 kN	1,5 kN	1,0 kN	5,5 kN	5,0 kN
13	41,38 mm	15,0 kN	11,0 kN	9,0 kN	3,5 kN	3,0 kN	1,5 kN	1,5 kN	6,5 kN	6,0 kN
14	44,56 mm	18,0 kN	13,0 kN	11,0 kN	4,5 kN	3,5 kN	2,0 kN	1,5 kN	8,0 kN	7,5 kN
15	47,75 mm	19,5 kN	14,5 kN	12,0 kN	5,0 kN	4,0 kN	2,5 kN	2,0 kN	9,0 kN	8,0 kN
16	50,93 mm	21,0 kN	15,5 kN	13,0 kN	5,0 kN	4,5 kN	2,5 kN	2,0 kN	9,5 kN	8,5 kN
17	54,11 mm	22,5 kN	16,5 kN	14,0 kN	5,5 kN	4,5 kN	2,5 kN	2,0 kN	10,0 kN	9,0 kN
18	57,30 mm	24,0 kN	17,5 kN	14,5 kN	6,0 kN	5,0 kN	3,0 kN	2,0 kN	11,0 kN	10,0 kN
19	60,48 mm	25,5 kN	19,0 kN	15,5 kN	6,0 kN	5,5 kN	3,0 kN	2,5 kN	11,5 kN	10,5 kN
20	63,66 mm	27,0 kN	20,0 kN	16,5 kN	6,5 kN	5,5 kN	3,0 kN	2,5 kN	12,0 kN	11,0 kN
21	66,85 mm	28,5 kN	21,0 kN	17,5 kN	7,0 kN	6,0 kN	3,5 kN	2,5 kN	13,0 kN	11,5 kN
22	70,03 mm	29,5 kN	22,0 kN	18,5 kN	7,5 kN	6,5 kN	3,5 kN	2,5 kN	13,5 kN	12,0 kN
23	73,21 mm	29,5 kN	23,0 kN	19,0 kN	7,5 kN	6,5 kN	4,0 kN	3,0 kN	14,0 kN	13,0 kN
24	76,39 mm	29,5 kN	24,0 kN	20,0 kN	8,0 kN	7,0 kN	4,0 kN	3,0 kN	15,0 kN	13,0 kN
25	79,58 mm	30,0 kN	25,0 kN	21,0 kN	8,5 kN	7,5 kN	4,0 kN	3,0 kN	15,5 kN	13,0 kN
26	82,76 mm	30,0 kN	26,5 kN	22,0 kN	8,5 kN	7,5 kN	4,5 kN	3,5 kN	16,0 kN	13,0 kN
27	85,94 mm	30,0 kN	27,5 kN	22,5 kN	9,0 kN	8,0 kN	4,5 kN	3,5 kN	17,0 kN	13,5 kN
28	89,13 mm	30,5 kN	27,5 kN	23,5 kN	9,5 kN	8,0 kN	4,5 kN	3,5 kN	17,0 kN	13,5 kN
29	92,31 mm	30,5 kN	27,5 kN	23,5 kN	10,0 kN	8,5 kN	5,0 kN	4,0 kN	17,0 kN	13,5 kN
30	95,49 mm	30,5 kN	27,5 kN	24,0 kN	10,0 kN	9,0 kN	5,0 kN	4,0 kN	17,5 kN	13,5 kN
31	98,68 mm	30,5 kN	28,0 kN	24,0 kN	10,5 kN	9,0 kN	5,5 kN	4,0 kN	17,5 kN	13,5 kN
32	101,86 mm	30,5 kN	28,0 kN	24,0 kN	11,0 kN	9,5 kN	5,5 kN	4,0 kN	17,5 kN	13,5 kN
33	105,04 mm	31,0 kN	28,0 kN	24,0 kN	11,5 kN	10,0 kN	5,5 kN	4,5 kN	17,5 kN	13,5 kN
34	108,23 mm	31,0 kN	28,0 kN	24,0 kN	11,5 kN	10,0 kN	6,0 kN	4,5 kN	17,5 kN	13,5 kN
35	111,41 mm	31,0 kN	28,0 kN	24,0 kN	12,0 kN	10,5 kN	6,0 kN	4,5 kN	17,5 kN	13,5 kN
36	114,59 mm	31,0 kN	28,5 kN	24,5 kN	12,5 kN	11,0 kN	6,0 kN	5,0 kN	17,5 kN	13,5 kN
37	117,77 mm	31,0 kN	28,5 kN	24,5 kN	13,0 kN	11,0 kN	6,5 kN	5,0 kN	17,5 kN	13,5 kN
38	120,96 mm	31,0 kN	28,5 kN	24,5 kN	13,0 kN	11,5 kN	6,5 kN	5,0 kN	17,5 kN	13,5 kN
39	124,14 mm	31,0 kN	28,5 kN	24,5 kN	13,5 kN	11,5 kN	7,0 kN	5,0 kN	17,5 kN	13,5 kN
40	127,32 mm	31,0 kN	28,5 kN	24,5 kN	14,0 kN	12,0 kN	7,0 kN	5,5 kN	17,5 kN	13,5 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 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 ²⁾	high performance hardening process							soft	high performance hardening process
	heat treatment	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	C45	C45	
Pinion	material	case hardened	case hardened	case hardened	case hardened	case hardened	case hardened	case hardened	ind. hardened	case hardened	
	heattreatment	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	16MnCr5	C45	C45	
No. of pinion teeth ¹⁾	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	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
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	12,5 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	14,5 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	15,5 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	16,5 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	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	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	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	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	7,0 kN	5,0 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	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	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	23,5 kN
25	106,10 mm	57,5 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	24,0 kN
26	110,35 mm	58,0 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	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	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	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	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	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	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	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	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	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	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	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	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	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	24,5 kN
40	169,77 mm										

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	material	heat-treatable steel according ATLANTA-standard						
	heat treatment	high performance hardening process		high performance hardening process				
Pinion	material	16MnCr5	16MnCr5	16MnCr5	C45			
	heat treatment	case hardened	case hardened	case hardened	ind. hardened			
No. of pinion teeth ¹⁾	pitch circle dia.	maximum feed force (values are only valid for material according ATLANTA-standard)						
		28,0 kN	28,0 kN	23,5 kN	5,0 kN	3,5 kN	17,5 kN	15,0 kN
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	material	heat-treatable steel according ATLANTA-standard					
	heat treatment	high performance hardening process		soft		high performance hardening process	
Pinion	material	16MnCr5	16MnCr5	16MnCr5	C45	16MnCr5	
	heat treatment	case hardened	case hardened	case hardened	soft	case hardened	
No. of pinion teeth ¹⁾	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	21,5 kN
12	76,39 mm	47,0 kN	47,0 kN	39,0 kN	8,0 kN	6,0 kN	25,5 kN
13	82,76 mm	54,5 kN	54,5 kN	45,5 kN	9,5 kN	7,0 kN	29,0 kN
14	89,13 mm	62,5 kN	62,5 kN	52,0 kN	11,0 kN	8,0 kN	33,0 kN
15	95,49 mm	67,0 kN	67,0 kN	55,5 kN	11,5 kN	8,5 kN	35,5 kN
16	101,86 mm	71,5 kN	71,5 kN	59,5 kN	12,5 kN	9,0 kN	38,0 kN
17	108,23 mm	76,0 kN	76,0 kN	63,0 kN	13,5 kN	9,5 kN	40,5 kN
18	114,59 mm	80,5 kN	80,5 kN	67,0 kN	14,0 kN	10,0 kN	43,0 kN
19	120,96 mm	85,0 kN	85,0 kN	70,5 kN	15,0 kN	10,5 kN	45,0 kN
20	127,32 mm	89,5 kN	89,5 kN	74,5 kN	15,5 kN	11,5 kN	47,5 kN
21	133,69 mm	94,0 kN	94,0 kN	78,0 kN	16,5 kN	12,0 kN	50,0 kN
22	140,06 mm	98,5 kN	98,5 kN	82,0 kN	17,5 kN	12,5 kN	52,5 kN
23	146,42 mm	103,0 kN	103,0 kN	85,5 kN	18,0 kN	13,0 kN	53,0 kN
24	152,79 mm	107,0 kN	107,0 kN	89,0 kN	19,0 kN	13,5 kN	53,5 kN
25	159,16 mm	107,5 kN	107,5 kN	89,5 kN	20,0 kN	14,0 kN	53,5 kN
26	165,52 mm	108,0 kN	108,0 kN	89,5 kN	20,5 kN	15,0 kN	54,0 kN
27	171,89 mm	108,0 kN	108,0 kN	90,0 kN	21,5 kN	15,5 kN	54,0 kN
28	178,25 mm	108,5 kN	108,5 kN	90,5 kN	22,0 kN	16,0 kN	54,5 kN
29	184,62 mm	109,0 kN	109,0 kN	90,5 kN	23,0 kN	16,5 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
	heat treatment	16MnCr5	16MnCr5	16MnCr5	C45	C45	C45
Pinion	material	case hardened			case hardened	soft	ind. hardened
	heat treatment	case hardened	case hardened	case hardened	soft	soft	ind. hardened
No. of pinion teeth ¹⁾	pitch circle dia.	maximum feed force (values are only valid for material according ATLANTA-standard)					
		101,86 mm	72,5 kN	72,5 kN	12,5 kN	9,0 kN	45,5 kN
13	110,35 mm	84,5 kN	84,5 kN	15,0 kN	10,5 kN	53,0 kN	44,5 kN
14	118,84 mm	97,5 kN	97,5 kN	17,0 kN	12,5 kN	61,5 kN	52,0 kN
15	127,32 mm	111,5 kN	111,5 kN	19,5 kN	14,0 kN	70,0 kN	59,5 kN
16	135,81 mm	119,5 kN	119,5 kN	21,0 kN	15,0 kN	75,0 kN	63,5 kN
17	144,30 mm	127,5 kN	127,5 kN	22,5 kN	16,0 kN	80,0 kN	67,5 kN
18	152,79 mm	135,5 kN	135,5 kN	24,0 kN	17,0 kN	85,0 kN	72,0 kN
19	161,28 mm	143,5 kN	143,5 kN	25,5 kN	18,0 kN	90,0 kN	76,5 kN
20	169,77 mm	151,5 kN	151,5 kN	27,0 kN	19,5 kN	95,5 kN	80,5 kN
21	178,25 mm	160,0 kN	159,5 kN	28,5 kN	20,5 kN	100,5 kN	85,0 kN
22	186,74 mm	168,0 kN	167,5 kN	29,5 kN	21,5 kN	105,5 kN	89,0 kN
23	195,23 mm	176,0 kN	176,0 kN	31,0 kN	22,5 kN	110,5 kN	92,5 kN
24	203,72 mm	184,0 kN	184,0 kN	32,5 kN	23,5 kN	115,5 kN	93,0 kN
25	212,21 mm	187,0 kN	187,0 kN	34,0 kN	24,5 kN	116,5 kN	93,5 kN
26	220,70 mm	188,0 kN	188,0 kN	35,5 kN	25,5 kN	117,0 kN	94,0 kN
27	229,18 mm	189,0 kN	188,5 kN	37,0 kN	26,5 kN	117,5 kN	94,5 kN
28	237,67 mm	189,5 kN	189,5 kN	38,5 kN	27,5 kN	117,5 kN	95,0 kN
29	246,16 mm	190,5 kN	190,5 kN	40,0 kN	28,5 kN	118,0 kN	95,0 kN
30	254,65 mm	191,0 kN	191,0 kN	41,5 kN	29,5 kN	118,5 kN	95,5 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 10 – helical tooth system

Rack	HPR			BR			
	6	7	9	10	9	10	
ATLANTA-Quality	heat-treatable steel according ATLANTA-standard						
Rack	material	high performance hardening process	soft	high performance hardening process	C45		
Pinion	material	16MnCr5	16MnCr5	16MnCr5	16MnCr5	C45	
	heat treatment	case hardened	case hardened	case hardened	case hardened	ind. hardened	
No. of pinion teeth ¹⁾	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						

¹⁾ check availability (chapter ZA)

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



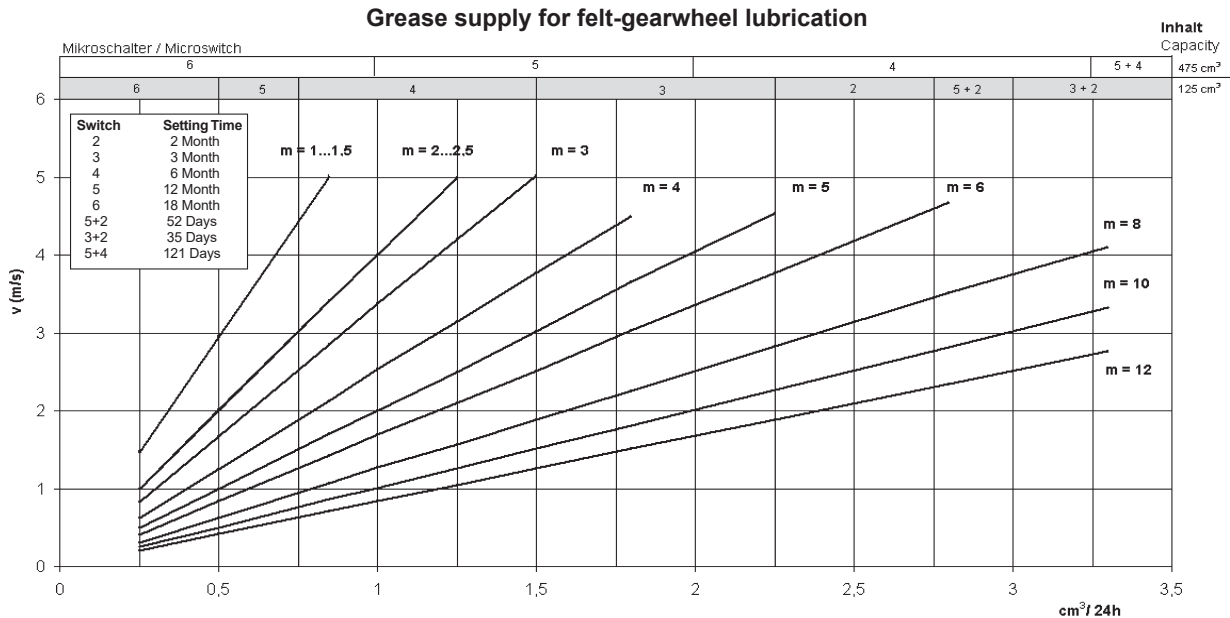
Rack		HPR	BR
ATLANTA-Quality		6	10
Rack	material	heat-treatable steel according ATLANTA-standard	
	heat treatment	high performance hardening process	
Pinion	material	16MnCr5	C45
	heat treatment	case hardened	case hardened ind. hardened
No. of pinion teeth ¹⁾	pitch circle dia.	maximum feed force (values 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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