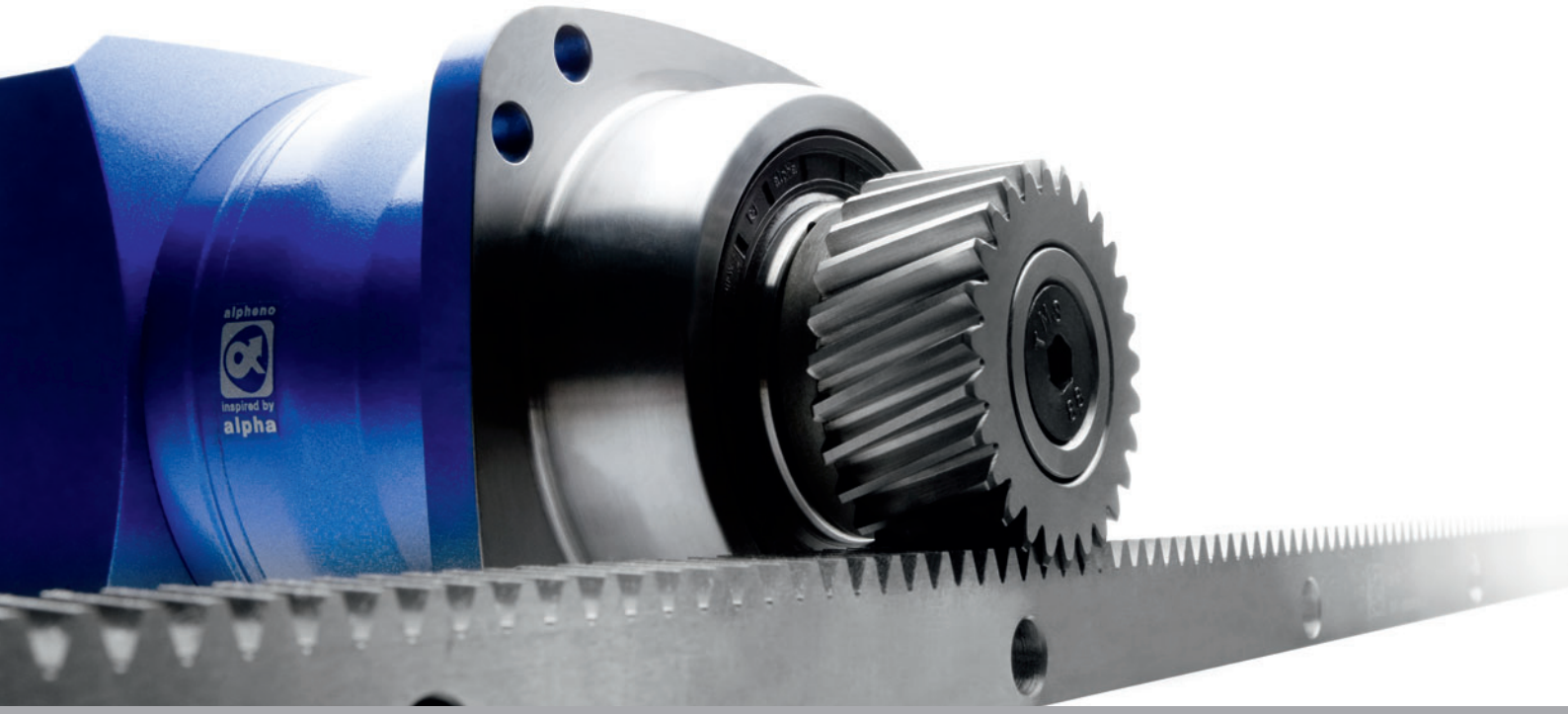
WITTENSTEIN

Wittenstein
Mechanical Systems

Putting you one step ahead of the rest: Mechanical systems by WITTENSTEIN alpha

More precise, more individual, more compact – mechanical systems by WITTENSTEIN alpha and numerous special applications have opened up a whole new range of possibilities. Maximizing performance. Achieving more. Progressing faster. Solution-oriented, individualized systems, compatible with all WITTENSTEIN alpha gearheads: alpha Rack & Pinion System, alpha IQ and couplings by WITTENSTEIN alpha.
Optimizing your company's plans for the future.



Mechanical systems

alpha Rack & Pinion System

Recognizing individuality. Benefiting from experience. Achieving harmony.
We are more than familiar with the combination of gearhead, motor and pinion. We are adding extra depth to our experience by developing mechanical systems with an outstanding capacity for integration. For maximum machine efficiency. Outstanding dynamics. Compact dimensions. Individual solutions that help bring you one step closer to achieving your ambitious goals.

alpha IQ

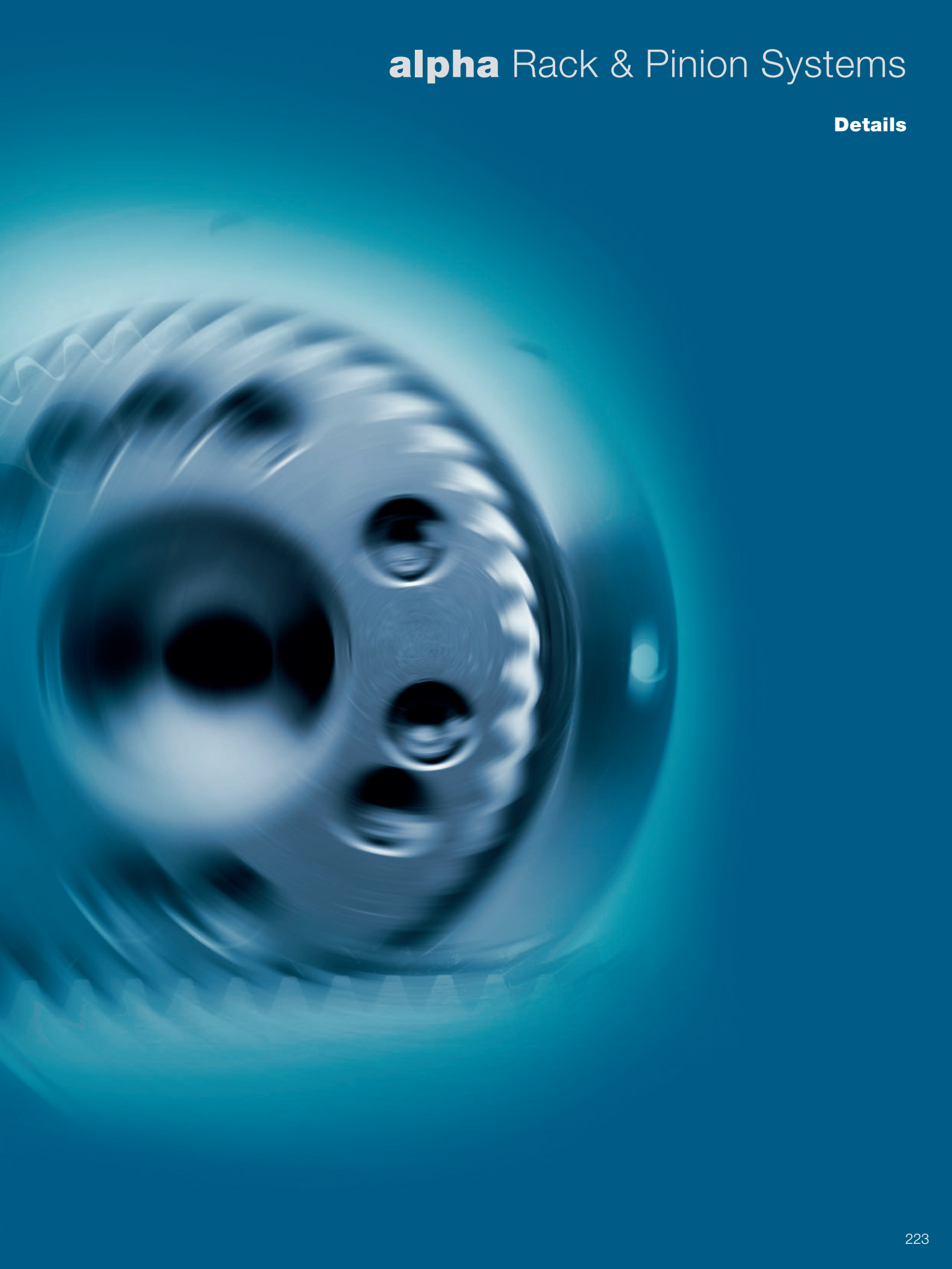
Achieving compatibility. Utilizing intelligence. Increasing efficiency.
A gearhead and measuring instrument in one system, fully compatible with all WITTENSTEIN alpha gearheads, continuous realtime data acquisition during operation – alpha IQ, the intelligent planetary gearhead. For continuous data acquisition and drive component monitoring, for increasing productivity and process stability. Innovative engineers are not the only ones getting excited about this system. Operating companies will have something to write home about too.

Couplings

Redefining movement. Refining transmission processes. Crossing boundaries.
For WITTENSTEIN alpha couplings, freedom of innovation means: A maximum acceleration torque of 10,000 Nm, disengagement within 1–3 ms and a belt tension of 100 to 12,000 N combined with absolute torsional rigidity, simple installation, a self-adjustment function and no maintenance. High-tech components for the harmonious transmission of power and movement – in all applications where improved performance means forward progress.

alpha Rack & Pinion System – a perfect combination of gearhead, pinion and rack – ranging from low-cost to high-end systems

Details



alpha Rack & Pinion System –
a **perfect symbiosis** of **state-of-the-art technology** and **many years of experience**.
alpha is the next generation of rack and pinion systems. Our specialist knowledge extends from the separate coupling of gearhead, motor, pinion and rack to complete system solutions.

The alternative – not only for long distances

Rack and pinion combinations do not only excel in applications involving long, precise movement paths.
The WITTENSTEIN alpha technology achieves an excellent degree of precision using an **electronic tensioning** system. The **high-precision manufacture** of individual components is an essential aspect here because manufacturers and users must be able to rely on the installed drives to achieve the level of accuracy required.

We offer the **highest levels of** precision, dynamics and rigidity as well as an extended service life that more than satisfy the demanding requirements of machine and system manufacturers. The result of our efforts is maximum performance across the board. WITTENSTEIN alpha has managed to move the old established system of rack and pinion **back into the fast lane**.

Always there for you.

If you are striving to achieve your objectives quickly and implement solutions efficiently and individually, then WITTENSTEIN alpha is the perfect partner for you.

Make a decision in favor of world-class technology that will give your customers a leading edge and help further consolidate your partnership together.

The **systems** and **applications**

Machine precision *

1 µm

Master/Slave: TP System output
with Premium Class+ pinion and Premium Class rack

5 µm

The right gearhead, rack and pinion **for every application** – from low-cost to high-end solutions. The positioning accuracy required in the application, the existing measuring system and the machine design essentially determine the configuration of linear systems and system combinations.

TP System output
with Premium Class+ pinion and Premium Class rack

20 µm

TP output
with Premium Class RTP pinion and Premium/Smart Class rack

50 µm

A real powerhouse with **a compact design**. Constant **rigidity** and outstanding **dynamics**. Easy to operate, quickly becomes indispensable. **Customized** to suit your specific application areas.

SP system output
with Premium Class+ pinion and Premium/Smart Class rack

100 µm

SP involute output
with Standard Class RSP pinion and Value/Smart Class rack

200 µm

Key output
with Value Class pinion and Value/Smart Class rack

>300 µm

* depending on other components.

Competent consultation

Staff at our **Technical Office** will be glad to answer any questions you may have about alpha Rack & Pinion Systems and your specific configurations. Give us a call!

HSC (High Speed Cutting) portal milling machines
Source: F. Zimmermann GmbH

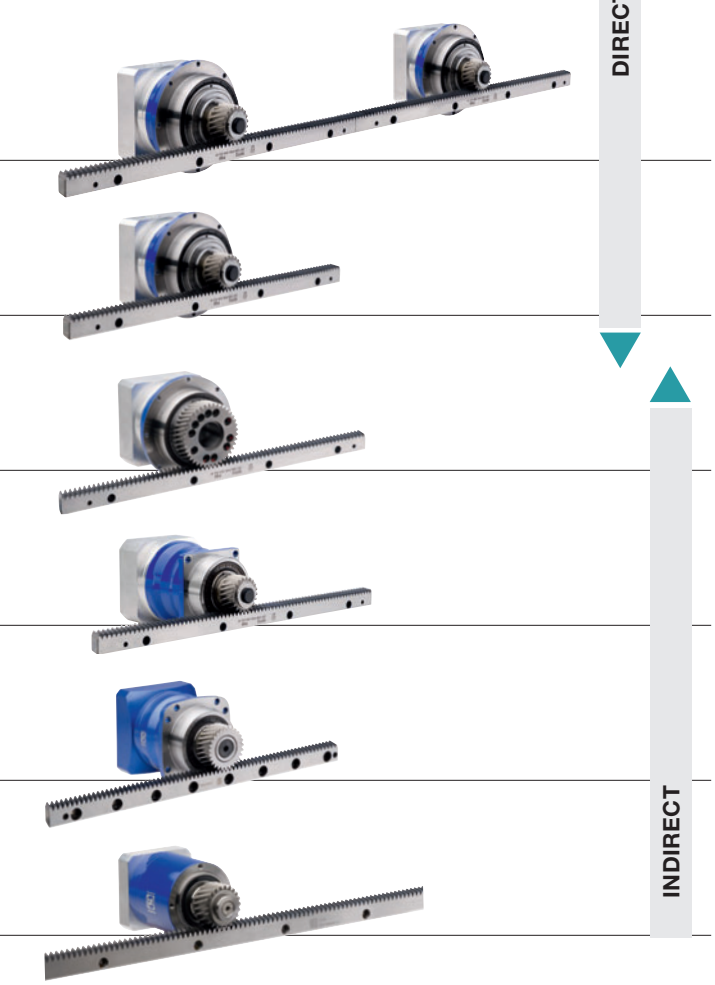
Profile machining centers
Source: Handtmann A-Punkt Automation GmbH

Laser machines
Source: TRUMPF Werkzeugmaschinen GmbH + Co. KG

Precision System

Eroding machines · Grinding machines · HSC portal milling machines · Turning machines · Machining centers · Boring machines · Laser machines · Punching machines

Measuring system



Precision+ System/ Precision System

P

for demanding requirements with regard to dynamics and accuracy in high-end applications.

Smart System

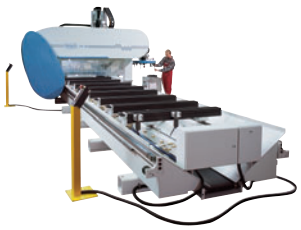
S

for positioning options with **more design freedom** in flexible applications.

Economy+ System/ Economy System

E

for standard linear applications in mid-range/ low-cost applications.



Wood, plastic/composite machining centers
Source: MAKA – Max Mayer Maschinenbau GmbH © MAKA

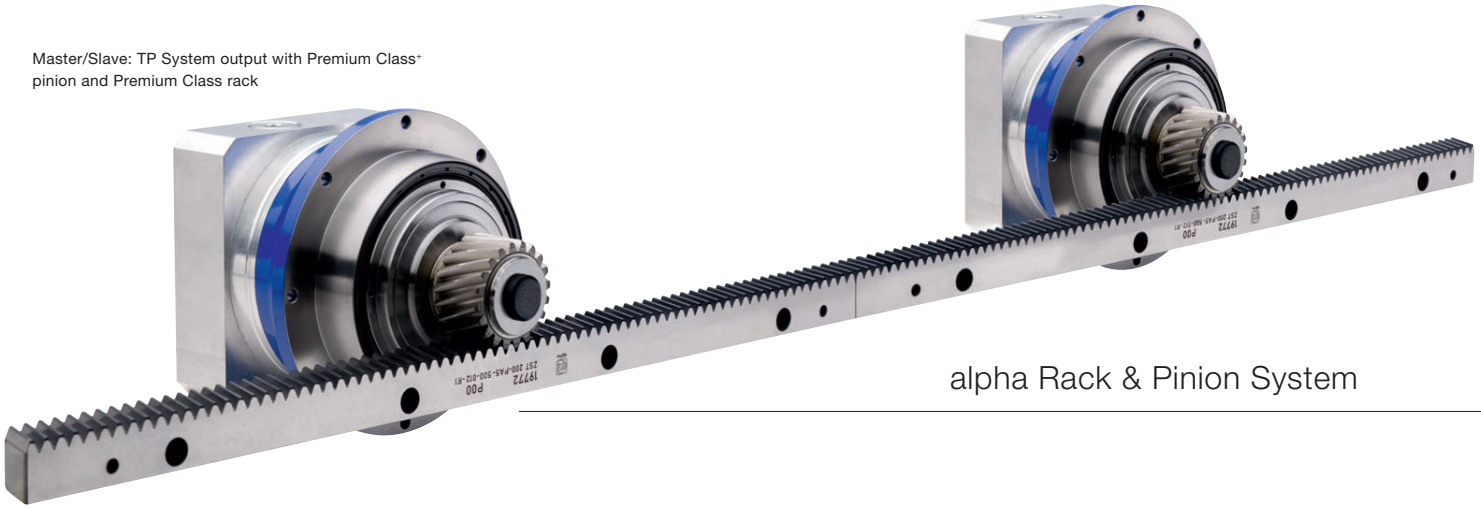
Gas cutting machines
Source: LIND GmbH Industrial Equipment

Robot arms in automation engineering
Source: MOTOMAN Robotics Europe AB

Smart System

Economy System

Water jet cutting machines · CNC wood/plastic processing machines · Gas cutting machines · Pipe bending machines · Foam cutting machines · Automation engineering



Master/Slave: TP System output with Premium Class+ pinion and Premium Class rack

alpha Rack & Pinion System – **the benefits for you**

Dynamic

- Maximum movement speed and acceleration with low moments of inertia.
- Extremely good control characteristics due to constant linear rigidity along the entire movement path.

Precise

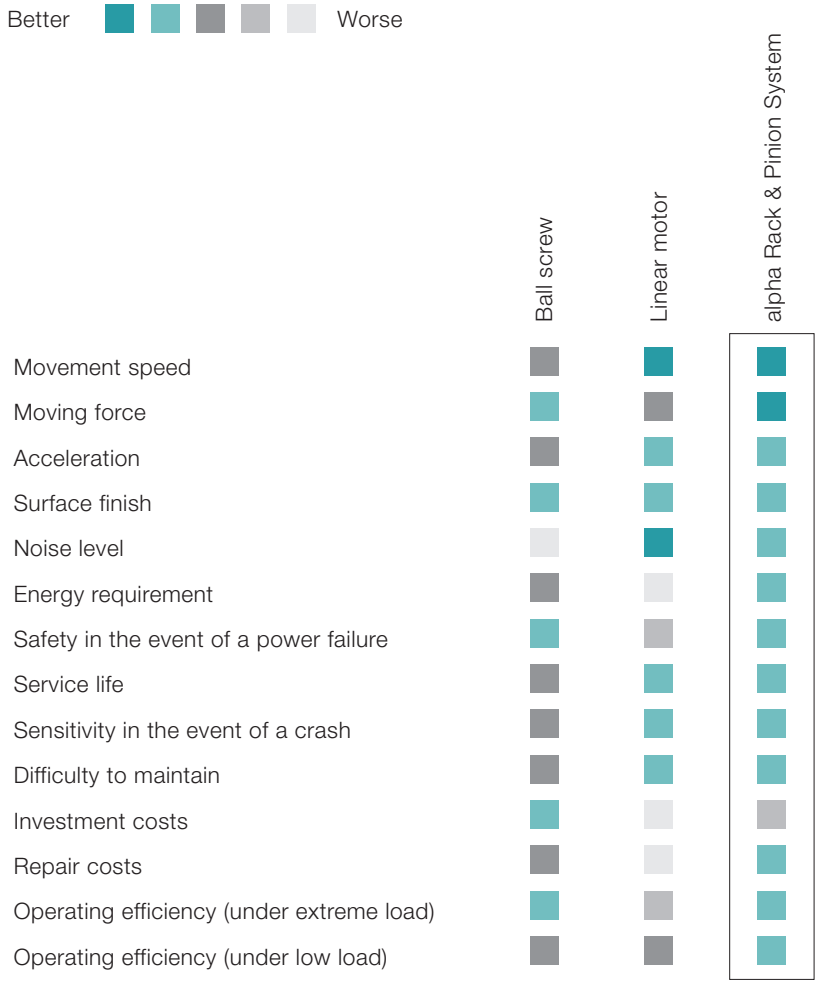
- New drive solutions with unique true running accuracy.
- Maximum positioning accuracy due to precision alignment of components.

Efficient

- Effortless operation.
- Minimal mounting space and high power density.
- Enormous savings potential due to high level of energy efficiency.

The right gearhead, rack and pinion for every application.

A direct comparison



The comparison is based on typical processes involved in machining large workpieces and machines with long movement paths.

In detail

Feel the dynamics.
Experience the precision.
Maximize efficiency.

Solution-oriented concepts, sophisticated development phases and perfect results. Helping you become a top performer.

alpha Rack & Pinion Systems will optimize your applications. Find out for yourself. Help your company **take giant strides towards achieving its goals.**

Three classes of rack – **unlimited possibilities**

The correct rack is an essential component in realizing your machine concepts. WITTENSTEIN alpha offers three classes of rack Premium Class, Value Class and Smart Class to find the right solution for your application requirements.

Have the freedom to implement your ideas!

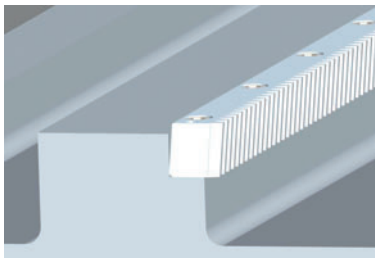
Precision System

Premium Class

Solution for **extremely dynamic, precision high-end** applications.

For greater precision: linear and gantry sorting possible.
Contact us!

Standard installation concept: permanent connection to mounting edge



Economy System

Value Class

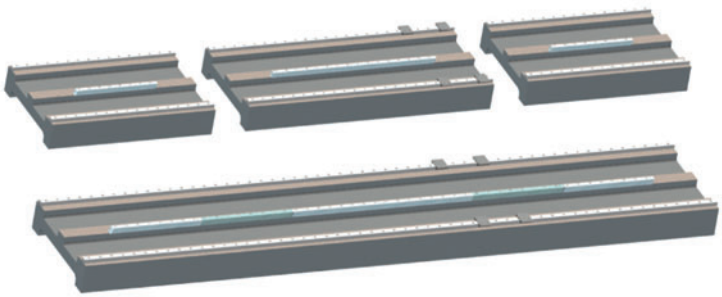
Solution for **mid-range and economy** applications.

New feature: free connection option

Smart System

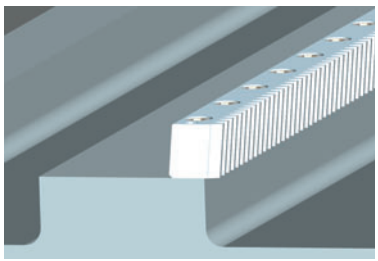
Smart Class

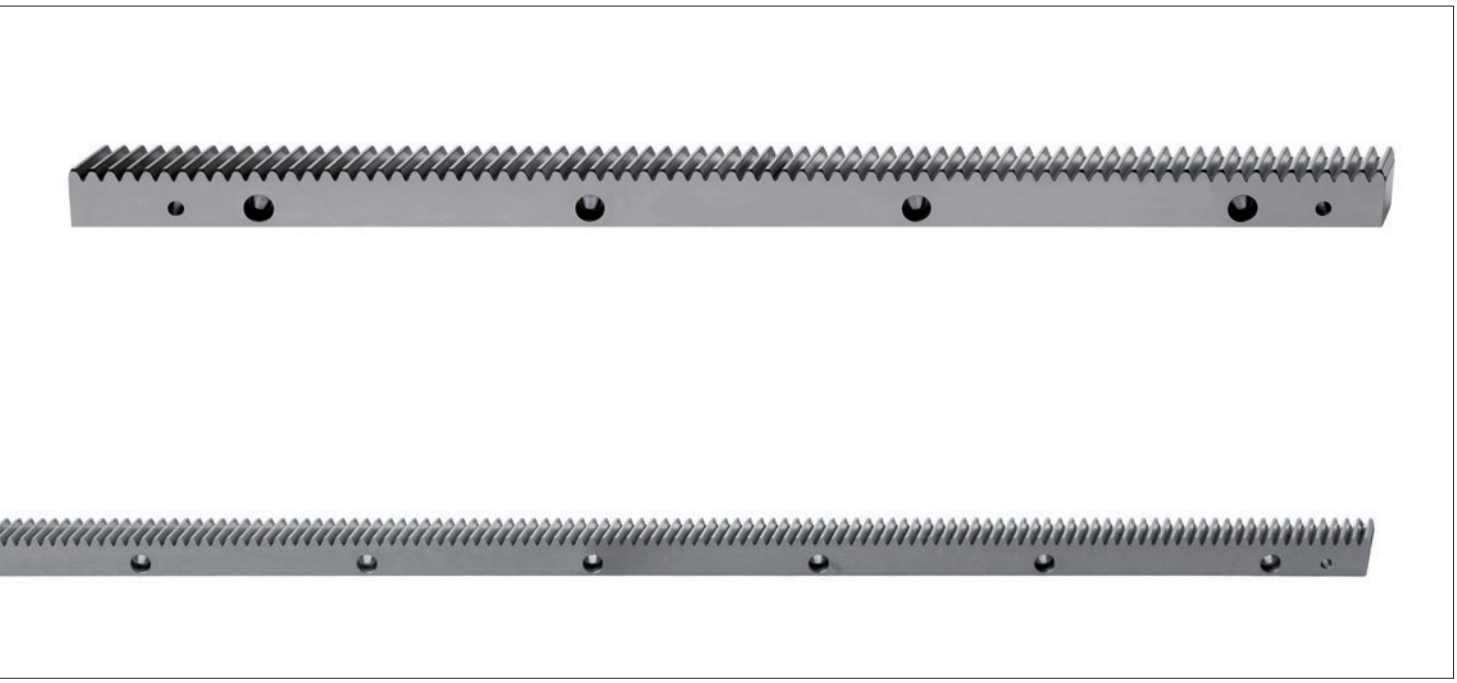
The flexible rack for applications **with no available mounting edge in the economy to mid-range** sector.



The flexible modular assembly concept makes the Smart Class rack a versatile all-rounder.

New: free connection without mounting edge





Extremely flexible concept

Free connection concept:
The absence of the mounting edge allows simple and uncomplicated mounting of the rack parallel to the machine guide.

Modular machine concept:
The 60 mm hole pattern and length of 480 mm **are compatible with the hole patterns on linear guides** produced by well-known manufacturers and enable the implementation of modular machine concepts.

Clearing the way for **unlimited movement paths.**

Premium Class rack

Module	p_t	L	z	a [a)]	a_1	B	d	d_1 [b)]	D	$f^{+0.5}$	h	h_B	h_D	H	l	l_1	L_1
2	6.67	500	75	31.7	436.6	24	7	5.7	11	2	22	8	7	24	62.5	125.0	8.5
2	6.67	333	50	31.7	269.9	24	7	5.7	11	2	22	8	7	24	62.5	104.2	8.5
2	6.67	167	25	31.7	103.3	24	7	5.7	11	2	22	8	7	24	62.5	41.7	8.5
3	10	500	50	35.0	430	29	10	7.7	15	2	26	9	9	29	62.5	125.0	10.3
3	10	250	25	35.0	180	29	10	7.7	15	2	26	9	9	29	62.5	125.0	10.3
4	13.33	507	38	18.3	460	39	12	9.7	18	3	35	12	11	39	62.5	125.0 [c)]	13.8
5	16.67	500	30	37.5	425	49	14	11.7	20	3	34	12	13	39	62.5	125.0	17.4
6	20	500	25	37.5	425	59	18	15.7	26	3	43	16	17	49	62.5	125.0	20.9

All dimensions in [mm]
Cumulative pitch error Fp: 12 µm for m2 and m3 (250 mm in length); Fp: 15 µm for m > 2
Single pitch error fp: 3 µm
[b)] Recommended tolerance dimension: $6^{H7}/8^{H7}/10^{H7}/12^{H7}/16^{H7}$
[c)] Hole spacing between two racks on module 4 is 131.67 mm.

p_t = Reference circle pitch
z = Number of teeth
m = Module

Value Class rack

Module	p_t	L	z	a [a)]	a_1	B	d	d_1 [b)]	D	$f^{+0.5}$	h	h_B	h_D	H	l	l_1	L_1
2	6.67	1000	150	31.7	936.6	24	7	5.7	11	2	22	8	7	24	62.5	125	8.5
3	10	1000	100	35	930	29	10	7.7	15	2	26	9	9	29	62.5	125	10.3
4	13.33	1000	75	33.3	933.4	39	10	7.7	15	3	35	12	9	39	62.5	125	13.8
5	16.67	1000	60	37.5	925	49	14	11.7	20	3	34	12	13	39	62.5	125	17.4
6	20	1000	50	37.5	925	59	18	15.7	26	3	43	16	17	49	62.5	125	20.9

All dimensions in [mm]
Cumulative pitch error Fp: 35 µm/1000 mm
Single pitch error fp: 8 µm; 10 µm at m5 and m6
[b)] Recommended tolerance dimension: $6^{H7}/8^{H7}/10^{H7}/12^{H7}/16^{H7}$

p_t = Reference circle pitch
z = Number of teeth
m = Module

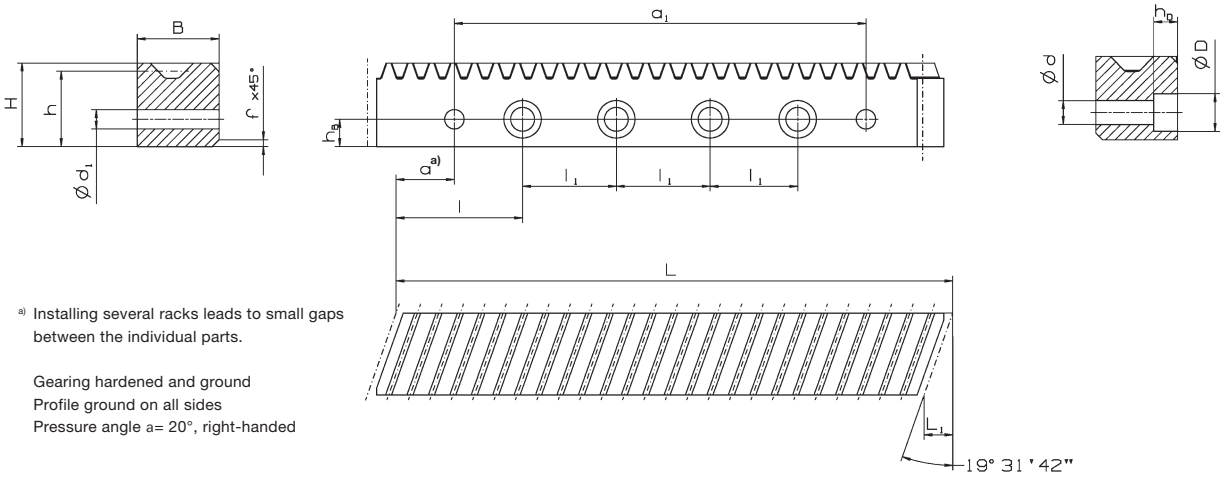
New feature: free connection option

Smart Class rack

Module	p_t	L	z	a [a)]	a_1	B	d	d_1 [b)]	D	$f^{+0.5}$	h	h_B	h_D	H	l	l_1	L_1
2	6.67	480	72	12	453	24	9	7.7	15	2	2	15.5	8.5	24.2	30	60	8.5
3	10	480	48	10.2	453	29	11	7.7	17	2	3	19.5	10.5	29.2	28.2	60	10.3
4	13.33	480	36	7	452	39	14	9.7	20	3	4	28	13	39.2	23	60	13.8

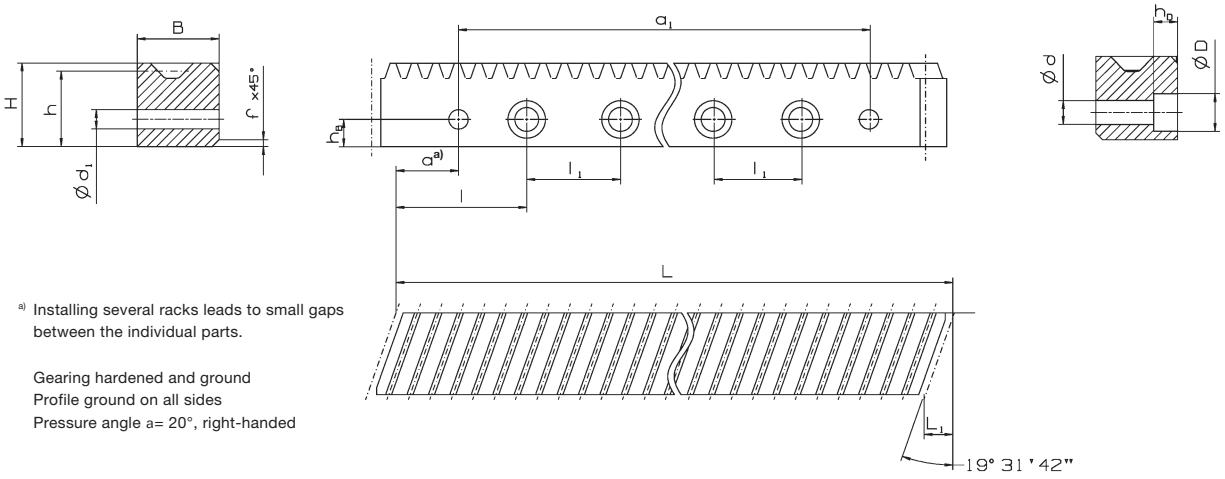
All dimensions in [mm]
Cumulative pitch error Fp: 30 µm/500 mm
Single pitch error fp: 6 µm
[b)] Recommended tolerance dimension: 8^{H7}, 10^{H7}

p_t = Reference pitch circle
z = Number of teeth
m = Module



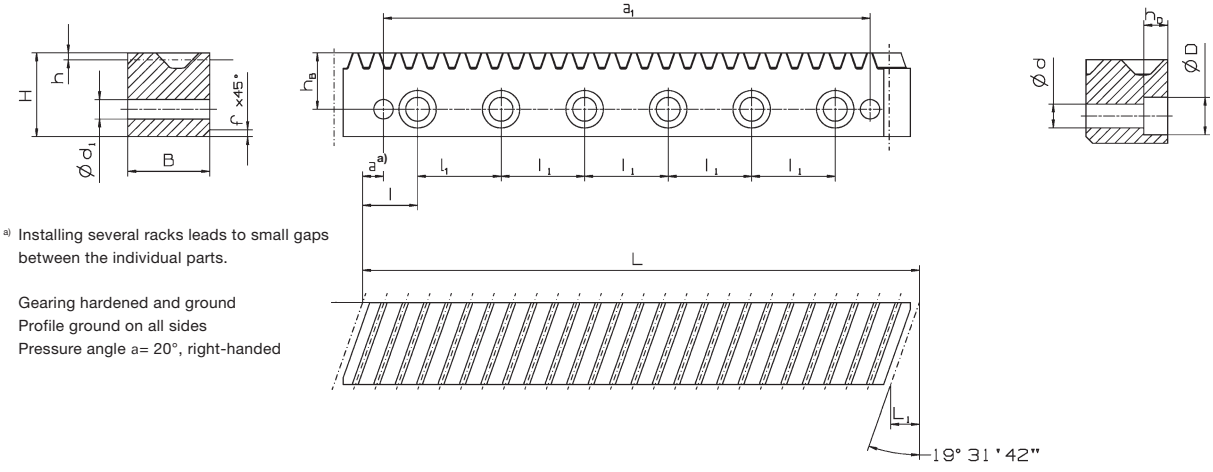
a) Installing several racks leads to small gaps between the individual parts.

Gearing hardened and ground
Profile ground on all sides
Pressure angle a= 20°, right-handed



a) Installing several racks leads to small gaps between the individual parts.

Gearing hardened and ground
Profile ground on all sides
Pressure angle a= 20°, right-handed



a) Installing several racks leads to small gaps between the individual parts.

Gearing hardened and ground
Profile ground on all sides
Pressure angle a= 20°, right-handed

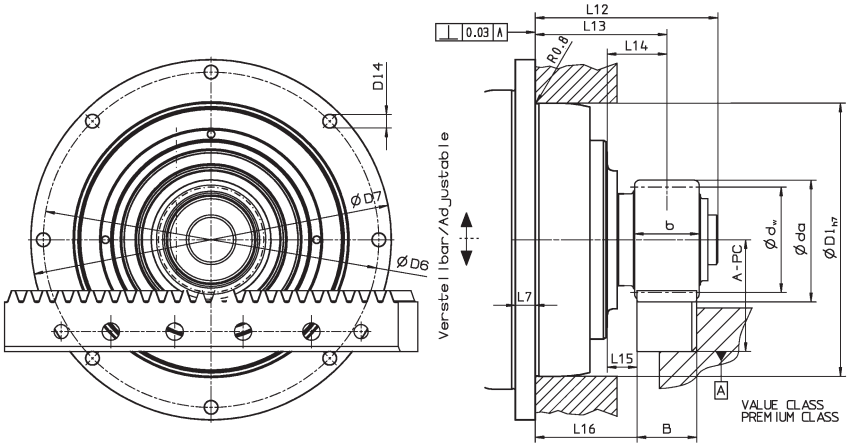
Premium Class+ pinion on TP system output with Premium Class rack

TP System output	Module	z	A-PC ±0.3 a)	b	B	d_a	d_w	$D1_{h7}$	D6	D7	D14	L7	L12	L13	L14	L15	L16
TP+ 010	2	20	44.0	26	24	48.3	42.441	90	109	118	5.5	7	71.0	50.5	20.5	8.5	38.5
TP+ 025 (MA, MF)	2	20	44.0	26	24	48.3	42.441	110	135	145	5.5	8	73.5	53.0	24.0	12.0	41.0
	2	40	64.4	26	24	89.2	84.883						73.5	53.0	24.0	12.0	41.0
	3	20	59.0	31	29	72.3	63.662						76.0	52.5	23.5	9.0	38.0
TP+ 050 (MA, MF)	2	40	64.4	26	24	89.2	84.883	140	168	179	6.6	10	87.0	66.5	28.5	16.5	54.5
	3	20	59.0	31	29	72.3	63.662						89.5	66.0	28.0	13.5	51.5
	3	34	80.1	31	29	114.5	108.226						90.5	66.0	28.0	13.5	51.5
	4	20	78.2	41	39	94.8	84.882						97.0	67.5	29.5	10.0	48.0
TP+ 110 (MA, MF)	3	34	80.1	31	29	114.5	108.226	200	233	247	9	12	106.0	81.5	31.5	17.0	67.0
	4	20	78.2	41	39	94.8	84.882						112.5	83.0	33.0	13.5	63.5
	4	30	98.7	41	39	135.6	127.324						112.5	83.0	33.0	13.5	63.5
	5	19	86.4	51	49	115.1	100.798						120.0	85.0	35.0	10.5	60.5
TP 300 (MA, MF)	4	30	98.7	41	39	135.6	127.324	255	280	300	13.5	18	131.5	102.0	36.0	16.5	82.5
	5	19	86.4	51	49	115.1	100.798						139.0	104.0	38.0	13.5	79.5
	5	30	113.6	51	49	169.4	159.155						135.0	104.0	38.0	13.5	79.5
	6	19	105.9	61	59	138.0	120.958						142.5	106.0	40.0	10.5	76.5
TP 500 (MA, MF)	5	30	113.6	51	49	169.4	159.155	285	310	330	13.5	20	147.5	116.5	41.5	17.0	92.0
	6	19	105.9	61	59	138.0	120.958						155.0	118.5	43.5	14.0	89.0
	6	28	132.1	61	59	190.5	178.254						154.0	118.5	43.5	14.0	89.0

All dimensions in [mm]
a) please contact us for precise dimensions; align mechanism recommended (alignment dimension ±0.3 mm)

z = Number of teeth
d_a = Tip diameter
d_w = Pitch diameter

MA = HIGH TORQUE
MF = Standard



True running accuracy < 10 µm (m2)

TP+ gearhead with **Premium Class+ pinion** on **TP system output** with **Premium Class rack**

· Technical data for the smallest available ratio

	Module	z	F_{2T} [N] (lb_f) MF i = 4	F_{2T} [N] (lb_f) MA i = 22	T_{2B} [Nm] (in.lb) MF i = 4	T_{2B} [Nm] (in.lb) MA i = 22	V_{Max} [m/min] (in/sec.) MF i = 4	V_{Max} [m/min] (in/sec) MA i = 22	m_{pinion} [kg] (lb_m)
TP+ 010	**2**	20	2400 (540)	2400 (540)	51 (452)	51 (452)	200 (132)	36 (24)	0.4 (0.9)
TP+ 025	**2**	20	3400 (765)	3400 (765)	72 (638)	72 (638)	150 (99)	36 (24)	0.4 (0.9)
	2	40	3400 (765)	3400 (765)	144 (1275)	144 (1275)	300 (197)	72 (48)	1.3 (2.9)
	3	20	3400 (765)	3400 (765)	108 (956)	108 (956)	225 (148)	54 (36)	1.0 (2.3)
TP+ 050	**2**	40	7100 (1598)	7100 (1598)	301 (2664)	301 (2664)	267 (176)	60 (40)	1.3 (2.9)
	3	20	11100 (2498)	11100 (2498)	353 (3125)	353 (3125)	200 (132)	45 (30)	1.0 (2.3)
	3	34	10800 (2430)	10800 (2430)	584 (5169)	584 (5169)	340 (224)	77 (51)	2.4 (5.4)
	4	20	10800 (2430)	10800 (2430)	458 (4054)	458 (4054)	267 (176)	60 (40)	2.0 (4.5)
TP+ 110	**3**	34	13000 (2925)	13000 (2925)	703 (6222)	703 (6222)	298 (196)	69 (46)	2.4 (5.3)
	4	20	21000 (4725)	21000 (4725)	891 (7886)	891 (7886)	233 (153)	54 (36)	2.0 (4.5)
	4	30	22000 (4950)	22000 (4950)	1401 (12399)	1401 (12399)	350 (230)	81 (54)	3.9 (8.7)
	5	19	21000 (4725)	21000 (4725)	1058 (9364)	1058 (9364)	277 (182)	64 (42)	3.1 (6.9)
	Module	**z**	**i = 5**	**i = 22**	**i = 5**	**i = 22**	**i = 5**	**i = 22**	
TP 300	**4**	30	22000 (4950)	22000 (4950)	1401 (12399)	1401 (12399)	200 (132)	54 (36)	3.9 (8.7)
	5	19	31000 (6975)	31000 (6975)	1562 (13824)	1562 (13824)	158 (104)	43 (29)	3.1 (6.9)
	5	30	30300 (6818)	30300 (6818)	2411 (21338)	2411 (21338)	250 (164)	68 (45)	10.4 (23)
	6	19	30500 (6863)	30500 (6863)	1845 (16329)	1845 (16329)	190 (125)	51 (34)	5.8 (12.9)
TP 500	**5**	30	34000 (7650)	34000 (7650)	2706 (23949)	2706 (23949)	220 (145)	68 (45)	10.4 (23)
	6	19	41000 (9225)	41000 (9225)	2480 (21948)	2480 (21948)	165 (109)	51 (34)	5.8 (12.9)
	6	28	41000 (9225)	41000 (9225)	3654 (32338)	3654 (32338)	245 (161)	76 (50)	14.5 (32.1)

Technical data based on 1000 load cycles per hour.
More combinations possible with cymex®

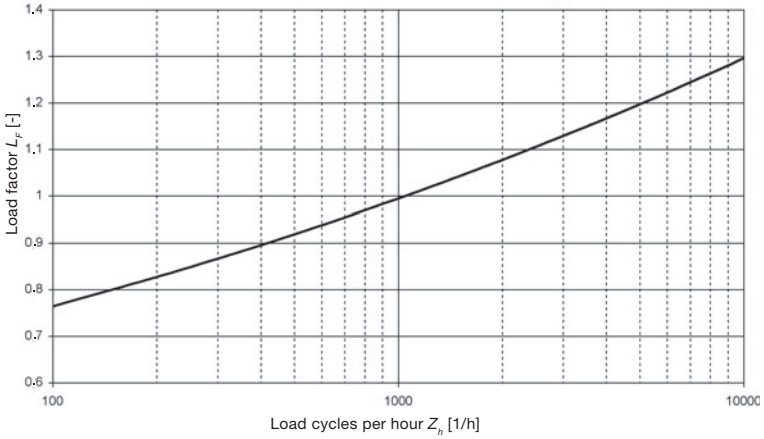
F_{2T} = Max. moving force
T_{2B} = Max. acceleration torque

MA = HIGH TORQUE
MF = Standard

In Z -axis without a balancing weight additional load changes can be caused due to additional movements in other axes.

Calculation including load factor:
$F_{2t} * L_F = F_{2t,\,LF} < F_{2T}$

Load factor for rack moving force



Premium Class RTP pinion on **TP output** with **Premium** and **Smart Class rack**

TP output	Module	z	A-PC ±0.3 b)	A-SC ±0.3 b)	b	B	d_a	d_w	$D5_{h7}$	D6	D7	D14	L4	L5	L7	L12	L16
TP⁺/TK⁺ 004	2	26	50.4	41.9	26	24	60.7	55.173	64	79	86	4.5	19.5	8	4	7.2	20.5
TP⁺/TK⁺/ TPK⁺ 010	2	29 a)	53.4	44.9	26	24	66.6	61.539	90	109	118	5.5	40	11	7	8.3	41
	2	33	57.6	49.1	26	24	75.1	70.028	90	109	118	5.5	30	11	7	8.3	31
	2	37	61.9	53.4	26	24	83.6	78.516	90	109	118	5.5	30	11	7	8.3	31
TP⁺/TK⁺/ TPK⁺ 025	2	35 a)	59.7	51.2	26	24	79.4	74.272	110	135	145	5.5	39	10	8	8.6	40
	2	40 c)	65.0	56.5	26	24	90.0	84.882	110	135	145	5.5	29	10	8	8.6	30
	2	45	70.2	61.7	26	24	100.2	95.493	110	135	145	5.5	29	10	8	8.6	30
TP⁺/TK⁺/ TPK⁺ 050	3	31 a)	76.2	66.7	31	29	106.4	98.676	140	168	179	6.6	51	14.5	10	11.3	52
	3	35 c)	82.6	73.1	31	29	119.1	111.408	140	168	179	6.6	38	14.5	10	11.3	39
	3	40 c)	90.6	81.1	31	29	135.0	127.324	140	168	179	6.6	38	14.5	10	11.3	39
TP⁺/TK⁺/ TPK⁺ 110	4	38	116.6	105.6	41	39	171.3	161.277	200	233	247	9	50	17.5	12	14.5	51
	4	40 d)	119.9	108.9	41	39	177.9	169.766	200	233	247	9	50	17.5	12	14.5	51
TP 300	5	32 a), c)	120.3	–	51	49	182.6	169.766	255	280	300	13.5	91	20	18	20	92
TP 500	6	31 a)	143.4	–	61	59	212.8	197.352	285	310	330	13.5	110	20	20	20	111

All dimensions in [mm]

a) with adapter flange

b) please contact us for precise dimensions; align mechanism recommended (alignment dimension ±0.3 mm)

c) also in combination with TP⁺ HIGH TORQUE

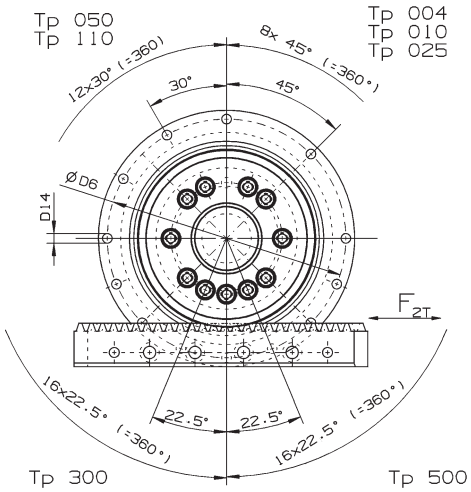
d) only in combination with TP⁺ HIGH TORQUE

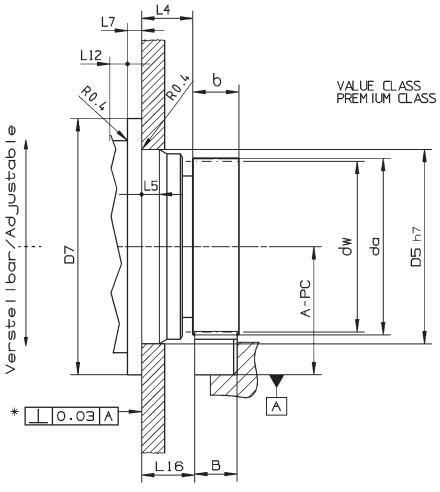
z = Number of teeth

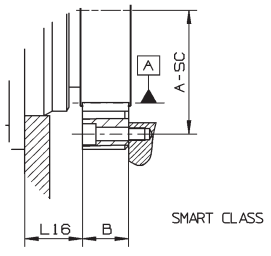
d_a = Tip diameter

d_w = Pitch diameter

True running accuracy < 10 µm (m2)







TP+ gearhead with Premium Class RTP pinion on TP output with Premium and Smart Class rack · Technical data for the smallest available ratio

	Module	z	F_{2T} [N] (lb_f) MF i = 4 (PC)	F_{2T} [N] (lb_f) MF i = 4 (SC)	F_{2T} [N] (lb_f) MA i = 22 (PC)	F_{2T} [N] (lb_f) MA i = 22 (SC)	T_{2B} [Nm] (in.lb) MF i = 4 (PC)	T_{2B} [Nm] (in.lb) MF i = 4 (SC)	T_{2B} [Nm] (in.lb) MA i = 22 (PC)	T_{2B} [Nm] (in.lb) MA i = 22 (SC)	V_{Max} [m/min] (in/sec) MF i = 4	V_{Max} [m/min] (in/sec) MA i = 22	m_{pinion} [kg] (lb_m)
TP+ 004	**2**	26	1400 (315)	1400 (315)	–	–	39 (346)	39 (346)	–	–	255 (168)	–	0.41 (0.91)
TP+ 010	**2**	29	2300 (518)	2300 (518)	–	–	71 (629)	71 (629)	–	–	290 (191)	–	0.45 (1)
	2	33	2550 (574)	2550 (574)	–	–	89 (788)	89 (788)	–	–	330 (217)	–	0.60 (1.33)
	2	37	2500 (563)	2500 (563)	–	–	98 (868)	98 (868)	–	–	370 (243)	–	0.80 (1.77)
TP+ 025	**2**	35	3400 (765)	3400 (765)	–	–	126 (1116)	126 (1116)	–	–	260 (171)	–	0.62 (1.38)
	2	40 [a]	3700 (833)	3700 (833)	3700 (833)	3700 (833)	157 (1390)	157 (1390)	157 (1390)	157 (1390)	300 (197)	72 (48)	0.85 (1.88)
	2	45	3600 (810)	3600 (810)	–	–	172 (1523)	172 (1523)	–	–	335 (220)	–	1.15 (2.55)
TP+ 050	**3**	31	10800 (24230)	9000 (2025)	–	–	533 (4718)	444 (3930)	–	–	310 (204)	–	1.40 (3.1)
	3	35 [a]	12000 (2700)	9000 (2025)	12000 (2700)	9000 (2025)	668 (5912)	501 (4434)	668 (5912)	501 (4434)	340 (224)	78 (52)	1.77 (3.92)
	3	40 [a]	12000 (2700)	9000 (2025)	12000 (2700)	9000 (2025)	764 (6762)	573 (5072)	764 (6762)	573 (5072)	390 (256)	90 (60)	2.50 (5.53)
TP+ 110	**4**	38	22000 (4950)	16000 (3600)	–	–	1774 (15700)	1290 (11417)	–	–	440 (289)	–	5.55 (12.27)
	4	40 [b]	–	–	22000 (4950)	16000 (3600)	–	–	1867 (16523)	1358 (12019)	–	108 (71)	5.24 (11.59)
	Module	**z**	**i = 5**		**i = 22**		**i = 5**		**i = 22**		**i = 5**	**i = 22**	
TP 300	**5**	32 [a]	28300 (6368)	–	28300 (6368)	–	2402 (21258)	–	2402 (21258)	–	265 (174)	72 (48)	6.47 (14.30)
TP 500	**6**	31	36400 (8190)	–	–	–	3592 (31790)	–	–	–	270 (178)	–	12.3 (27.19)

Technical data based on 1000 load cycles per hour.
More combinations possible with cymex®
[a] also in combination with TP+ HIGH TORQUE
[d] only in combination with TP+ HIGH TORQUE

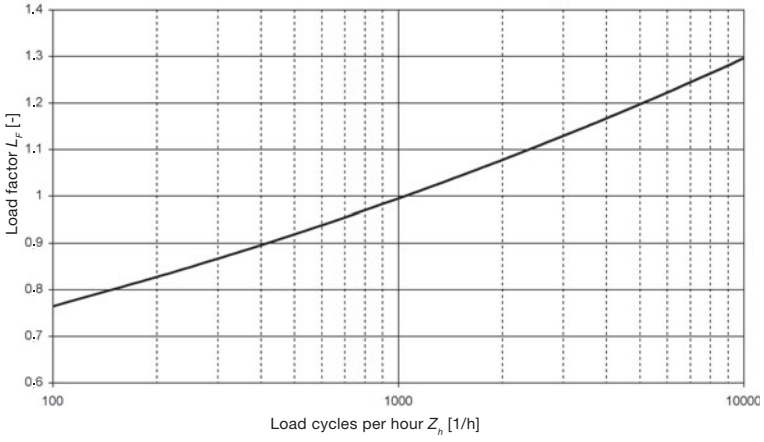
F_{2T} = Max. moving force
T_{2B} = Max. acceleration torque
SC = Smart Class
PC = Premium Class

MA = HIGH TORQUE
MF = Standard

In Z -axis without a balancing weight additional load changes can be caused due to additional movements in other axes.

Calculation including load factor:
$F_{2t} * L_F = F_{2t,\,LF} < F_{2T}$

Load factor for rack moving force



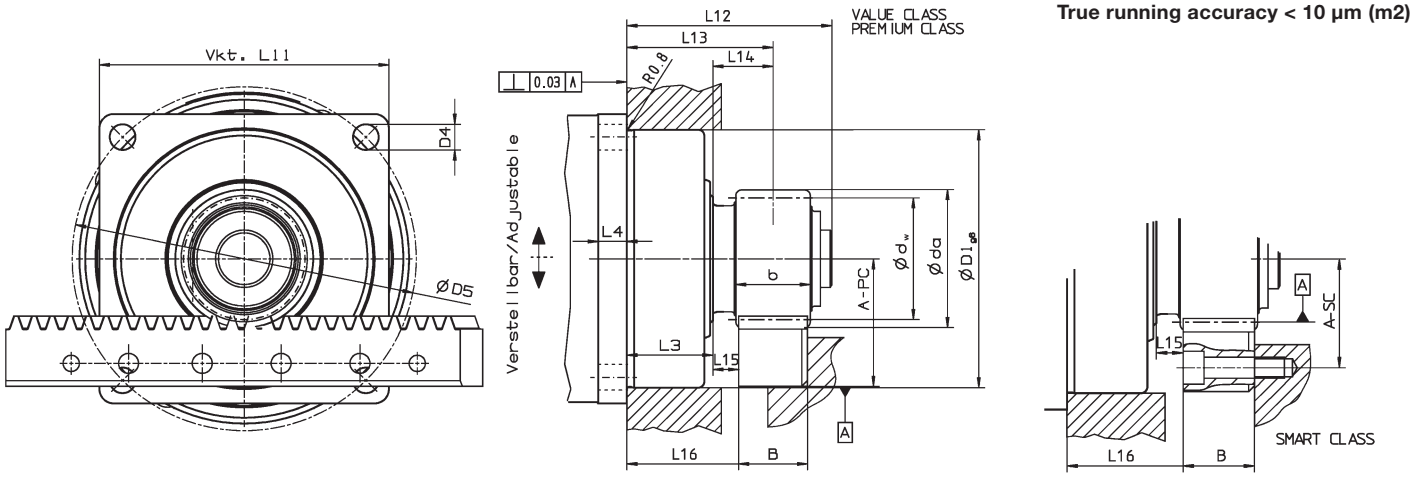
Premium Class+ pinion on **SP+ System output** with **Premium** and **Smart Class rack**

SP system output	Module	z	A-PC ±0,3[a]	A-SC ±0,3[a]	b	B	d_a	d_w	$D1_{g6}$	D4	D5	L3	L4	L11 ±1	L12	L13	L14	L15	L16
SP+ 075	**2**	20	44.0	35.5	26	24	48.3	42.441	70	6.6	85	20	7	76	61.0	40.5	20.5	8.5	28.5
SP+ 100	**2**	20	44.0	35.5	26	24	48.3	42.441	90	9	120	30	10	101	71.5	51.0	21.0	9	39
	2	40	64.4	55.9	26	24	89.2	84.883							71.0	51.0	21.0	9	39
	3	20	59.0	49.5	31	29	72.3	63.662							73.5	54.0	24.0	9.5	39.5
SP+ 140	**2**	40	64.4	55.9	26	24	89.2	84.883	130	11	165	30	12	141	75.0	54.5	24.5	12.5	42.5
	3	20	59.0	49.5	31	29	72.3	63.662							77.5	54.0	24.0	9.5	39.5
	3	34	80.1	70.6	31	29	114.5	108.226							77.0	54.0	24.0	9.5	39.5
	4	20	78.2	67.2	41	39	94.8	84.882							83.5	59.0	29.0	9.5	39.5
SP+ 180	**3**	34	80.1	70.6	31	29	114.5	108.226	160	13.5	215	30	15	182	82.0	57.5	27.5	13	43
	4	20	78.2	67.2	41	39	94.8	84.882							88.5	59.0	29.0	9.5	39.5
	4	30	98.7	87.7	41	39	135.6	127.324							87.0	59.0	29.0	9.5	39.5
	5	19	86.4	–	51	49	115.1	100.798							94.5	64.5	34.5	10	40
SP+ 210	**4**	30	98.7	87.7	41	39	135.6	127.324	180	17	250	38	17	215	99.9	70.4	32.5	13	50.9
	5	19	86.4	–	51	49	115.1	100.798							107.4	72.4	34.5	10	47.9
	5	30	113.6	–	51	49	169.4	159.155							105.9	72.4	34.5	10	47.9
	6	19	105.9	–	61	59	138.0	120.958							113.4	77.9	40.0	10.5	48.4
SP+ 240	**5**	30	113.6	–	51	49	169.4	159.155	200	17	290	40	20	242	109.9	78.9	39.0	14.5	54.4
	6	19	105.9	–	61	59	138.0	120.958							120.9	80.9	41.0	11.5	51.4
	6	28	132.1	_	61	59	190.5	178.254							119.9	80.9	41.0	11.5	51.4

All dimensions in [mm]

[a] please contact us for precise dimensions;
align mechanism recommended (alignment dimension ±0.3 mm)

z = Number of teeth
d_a = Tip diameter
d_w = Pitch diameter



True running accuracy < 10 µm (m2)

SP⁺ gearhead with **Premium⁺ pinion on SP⁺ system output** with **Premium and Smart Class rack** · Technical data for the smallest available ratio

	Module	z	F_{2T} [N] (lb_f) i = 4 (PC)	F_{2T} [N] (lb_f) i = 4 (SC)	F_{2T} [N] (lb_f) i = 16 (PC)	F_{2T} [N] (lb_f) i = 16 (SC)	T_{2B} [Nm] (in.lb) i = 4 (PC)	T_{2B} [Nm] (in.lb) i = 4 (SC)	T_{2B} [Nm] (in.lb) i = 16 (PC)	T_{2B} [Nm] (in.lb) i = 16 (SC)	V_{Max} [m/min] (in/sec) i = 4	V_{Max} [m/min] (in/sec) i = 16	m_{pinion} [kg] (lb_m)
SP⁺ 075	**2**	20	3300 (743)	3300 (743)	3300 (743)	3300 (743)	68 (602)	68 (602)	68 (602)	68 (602)	200 (132)	50 (33)	0.4 (0.89)
SP⁺ 100	**2**	20	6400 (1440)	5000 (1125)	6400 (1440)	5000 (1125)	136 (1204)	106 (939)	136 (1204)	106 (939)	150 (99)	37 (25)	0.4 (0.89)
	2	40	6100 (1373)	5000 (1125)	6100 (1373)	5000 (1125)	259 (2293)	212 (1877)	259 (2293)	212 (1877)	300 (197)	75 (50)	1.3 (2.88)
	3	20	6000 (1350)	6000 (1350)	6000 (1350)	6000 (1350)	191 (1691)	191 (1691)	191 (1691)	191 (1691)	225 (148)	56 (37)	1.0 (2.21)
SP⁺ 140	**2**	40	7100 (1598)	5000 (1125)	7100 (1598)	5000 (1125)	301 (2664)	212 (1877)	301 (2664)	212 (1877)	266 (175)	66 (44)	1.3 (2.88)
	3	20	10000 (2250)	9000 (2025)	10000 (2250)	9000 (2025)	318 (2815)	286 (2532)	318 (2815)	286 (2532)	200 (132)	50 (33)	1.0 (2.21)
	3	34	9800 (2205)	9000 (2025)	9800 (2205)	9000 (2025)	530 (4691)	487 (4310)	530 (4691)	487 (4310)	340 (224)	85 (56)	2.4 (5.31)
	4	20	9400 (2115)	9400 (2115)	9400 (2115)	9400 (2115)	399 (3532)	399 (3532)	399 (3532)	399 (3532)	266 (175)	66 (44)	2.0 (4.42)
SP⁺ 180	**3**	34	13600 (3060)	9000 (2025)	13600 (3060)	9000 (2025)	736 (6514)	487 (4310)	736 (6514)	487 (4310)	297 (195)	85 (56)	2.4 (5.31)
	4	20	13600 (3060)	13600 (3060)	13600 (3060)	13600 (3060)	577 (5107)	577 (5107)	577 (5107)	577 (5107)	233 (153)	66 (44)	2.0 (4.42)
	4	30	13200 (2970)	13200 (2970)	13200 (2970)	13200 (2970)	840 (7434)	840 (7434)	840 (7434)	840 (7434)	350 (230)	100 (66)	3.9 (8.62)
	5	19	12800 (2880)	–	12800 (2880)	–	645 (5709)	–	645 (5709)	–	277 (182)	78 (52)	3.1 (6.86)
SP⁺ 210	**4**	30	21700 (4883)	16000 (3600)	21700 (4883)	16000 (3600)	1381 (1222)	1019 (9019)	1381 (12222)	1019 (9019)	250 (164)	87 (58)	2.0 (4.42)
	5	19	21800 (4905)	–	21800 (4905)	–	1099 (9727)	–	1099 (9727)	–	197 (130)	69 (46)	3.9 (8.62)
	5	30	21000 (4725)	–	21000 (4725)	–	1671 (14789)	–	1671 (14789)	–	312 (205)	109 (72)	3.1 (6.86)
	6	19	20600 (4635)	–	20600 (4635)	–	1246 (11028)	–	1246 (11028)	–	237 (156)	83 (55)	10.4 (22.99)
SP⁺ 240	**5**	30	31700 (7133)	–	31700 (7133)	–	2523 (22329)	–	2523 (22329)	–	275 (181)	109 (72)	10.4 (22.99)
	6	19	32000 (7200)	–	32000 (7200)	–	1935 (17125)	–	1935 (17125)	–	209 (138)	83 (55)	5.8 (12.82)
	6	28	31000 (697)	–	31000 (6975)	–	2763 (24453)	–	2763 (24453)	–	308 (203)	122 (81)	14.5 (32.05)

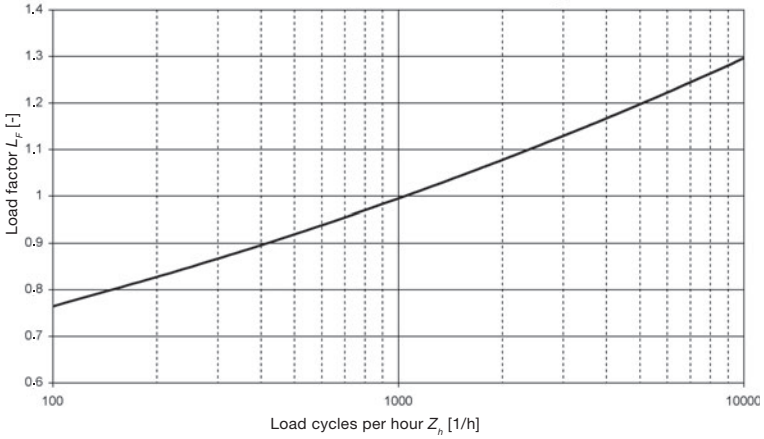
Technical data based on 1000 load cycles per hour.
More combinations possible with cymex®

F_{2T} = Max. moving force
T_{2B} = Max. acceleration torque

In Z -axis without a balancing weight additional load changes can be caused due to additional movements in other axes.

Calculation including load factor:
$F_{2t} * L_F = F_{2t,\,LF} < F_{2T}$

Load factor for rack moving force



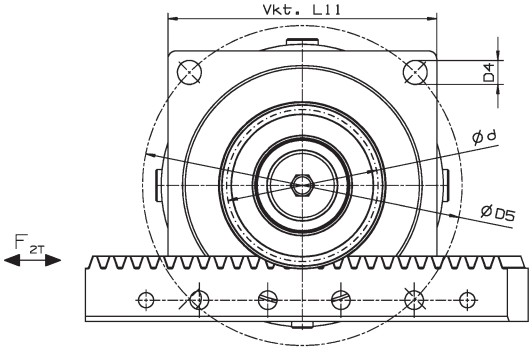
Standard Class RSP pinion with **SP involute output** with **Value** and **Smart Class rack**

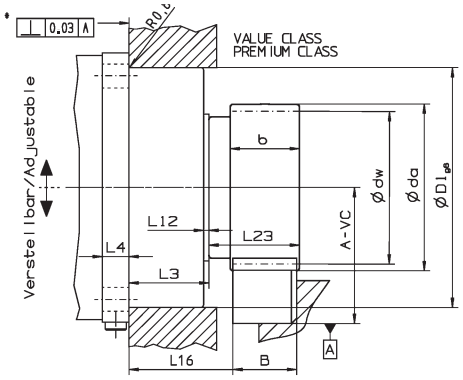
Output with SP involute toothing DIN5480	Module	z	A-VC ±0.3 a)	A-SC ±0.3 a)	b	B	d_a	d_w	$D1_{g6}$	D4	D5	L3	L4	L11 ± 1	L12	L16	L23
SP+/ SK+ 060	2	15	38.9	30.4	26	24	37.7	31.831	60	5.5	68	20	6	62	2	27	32
	2	16	40.0	31.5	26	24	39.9	33.953	60	5.5	68	20	6	62	2	27	32
	2	18	41.9	33.4	26	24	43.7	38.197	60	5.5	68	20	6	62	2	27	32
SP+/SK+/ SPK+ 075	2	18	41.9	33.4	26	24	43.7	38.197	70	6.6	85	20	7	76	2.5	28	33
	2	20	44.0	35.5	26	24	48.0	42.441	70	6.6	85	20	7	76	2.5	28	33
	2	22	46.1	37.6	26	24	52.2	46.685	70	6.6	85	20	7	76	2.5	28	33
SP+/SK+/ SPK+ 100	2	23	47.2	38.7	26	24	54.3	48.807	90	9	120	30	10	101	3	39	34
	2	25	49.3	40.8	26	24	58.5	53.051	90	9	120	30	10	101	3	39	34
	2	27	51.2	42.7	26	24	62.4	57.295	90	9	120	30	10	101	3	39	34
SP+/SK+/ SPK+ 140	3	20	59.0	49.5	31	29	72.0	63.662	130	11	165	30	12	141	3	51	51
	3	22	62.2	52.7	31	29	78.3	70.028	130	11	165	30	12	141	3	51	51
	3	24	65.4	55.9	31	29	84.7	76.394	130	11	165	30	12	141	3	51	51
SP+/SK+/ SPK+ 180	4	20	79.0	68.0	41	39	96.1	84.883	160	13.5	215	30	15	182	3	44	54
SP+ 210	4	25	89.4	78.4	41	39	116.8	106.103	180	17	250	38	17	215	3	63	65
SP+ 240	5	24	99.4	–	51	49	140.8	127.324	200	17	290	40	20	242	3	63	73

All dimensions in [mm]

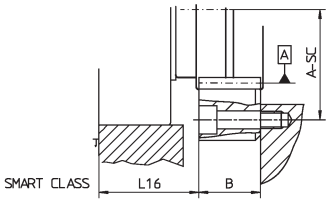
a) please contact us for precise dimensions;
align mechanism recommended (alignment dimension ± 0.3 mm)

z = Number of teeth
d_a = Tip diameter
d_w = Pitch diameter





True running accuracy < 40 µm



SP+ gearhead with **Standard Class RSP pinion** on **SP involute output** with **Value** and **Smart Class rack** · Technical data for the smallest available ratio

	Module	z	F_{2T} [N] (lb_f) i = 3 (VC)	F_{2T} [N] (lb_f) i = 3 (SC)	F_{2T} [N] (lb_f) i = 16 (VC)	F_{2T} [N] (lb_f) i = 16 (SC)	T_{2B} [Nm] (in.lb) i = 3 (VC)	T_{2B} [Nm] (in.lb) i = 3 (SC)	T_{2B} [Nm (in.lb)] i = 16 (VC)	T_{2B} [Nm] (in.lb) i = 16 (SC)	V_{Max} [m/min] (in/sec) i = 3	V_{Max} [m/min] (in/sec) i = 16	m_{pinion} [kg] (lb_m)
SP+ 060	**2**	15	1800 (405)	1800 (405)	2300 (518)	2300 (518)	29 (257)	29 (257)	37 (328)	37 (328)	200 (132)	37 (25)	0.18 (0.4)
	2	16	1700 (383)	1700 (383)	2300 (518)	2300 (518)	29 (257)	29 (257)	39 (346)	39 (346)	210 (138)	40 (27)	0.19 (0.42)
	2	18	1500 (338)	1500 (338)	2300 (518)	2300 (518)	29 (257)	29 (257)	44 (390)	44 (390)	240 (158)	45 (30)	0.23 (0.51)
SP+ 075	**2**	18	3300 (743)	3300 (743)	3300 (743)	3300 (743)	63 (558)	63 (558)	63 (558)	63 (558)	240 (158)	45 (30)	0.20 (0.45)
	2	20	3300 (743)	3300 (743)	3300 (743)	3300 (743)	70 (620)	70 (620)	70 (620)	70 (620)	260 (171)	50 (33)	0.26 (0.58)
	2	22	3300 (743)	3300 (743)	3300 (743)	3300 (743)	77 (682)	77 (682)	77 (682)	77 (682)	290 (191)	55 (37)	0.32 (0.71)
SP+ 100	**2**	23	4300 (968)	5000 (1125)	4300 (968)	5000 (1125)	105 (930)	122 (1080)	105 (930)	122 (1080)	230 (151)	43 (29)	0.29 (0.65)
	2	25	4300 (968)	5000 (1125)	4300 (968)	5000 (1125)	114 (1009)	133 (1178)	114 (1009)	133 (1178)	250 (164)	47 (31)	0.31 (0.69)
	2	27	4300 (968)	5000 (1125)	4300 (968)	5000 (1125)	123 (1089)	143 (1266)	123 (1089)	143 (1266)	270 (178)	51 (34)	0.46 (1.02)
SP+ 140	**3**	20	8000 (1800)	9000 (2025)	8000 (1800)	9000 (2025)	255 (2257)	286 (2532)	255 (2257)	286 (2532)	260 (171)	50 (33)	0.72 (1.60)
	3	22	8000 (1800)	9000 (2025)	8000 (1800)	9000 (2025)	280 (2478)	315 (2788)	280 (2478)	315 (2788)	290 (191)	55 (37)	0.98 (2.17)
	3	24	8000 (1800)	9000 (2025)	8000 (1800)	9000 (2025)	306 (2709)	344 (3045)	306 (2709)	344 (3045)	320 (210)	60 (40)	1.26 (2.79)
SP+ 180	**4**	20	13000 (2925)	13000 (2925)	13000 (2925)	13000 (2925)	552 (4886)	552 (4886)	552 (4886)	552 (4886)	310 (204)	66 (44)	1.38 (3.05)
SP+ 210	**4**	25	14000 (3150)	16000 (3600)	14000 (3150)	16000 (3600)	743 (6576)	849 (7514)	743 (6576)	849 (7514)	270 (178)	72 (48)	2.24 (4.96)
SP+ 240	**5**	24	22000 (4950)	–	22000 (4950)	–	1401 (12399)	–	1401 (12399)	–	290 (191)	87 (58)	3.96 (8.76)

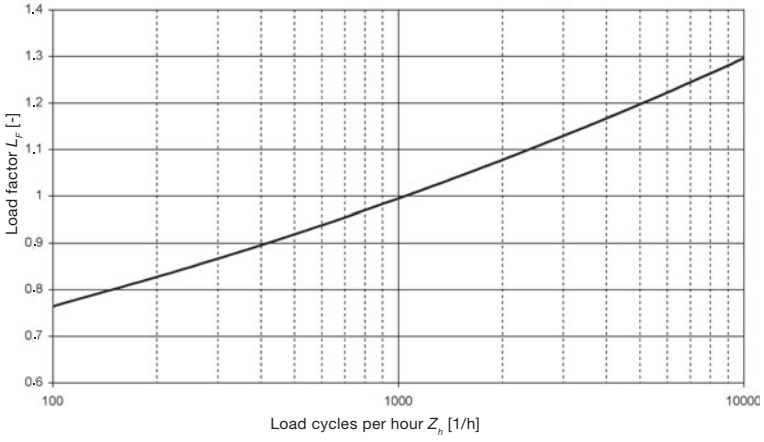
Technical data based on 1000 load cycles per hour.
More combinations possible with cymex®

F_{2T} = Max. moving force
T_{2B} = Max. acceleration torque
SC = Smart Class
VC = Value Class

In Z -axis without a balancing weight additional load changes can be caused due to additional movements in other axes.

Calculation including load factor:
$F_{2t} * L_F = F_{2t,\,LF} < F_{2T}$

Load factor for rack moving force

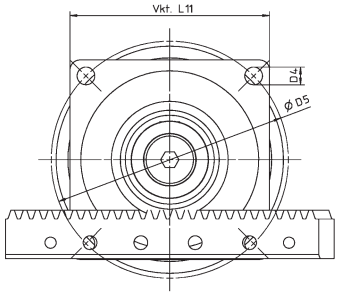


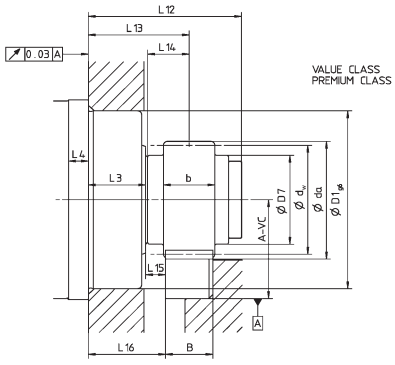
Value Class pinion (shrunk/bonded) on **shaft key** with **Value** and **Smart Class rack**

Key output	Module	z	A-VC ±0.3 a)	A-SC ±0.3 a)	b	B	d_a	d_w	$D1_{g6}$	D4	D5	D7	L3	L4	L11	L12	L13	L14	L15	L16
SP+/ SK+ 060	2	18	41.9	33.4	26	24	43.7	38.197	60	5.5	68	0	20	6	62	54	39	19	7	27
SP+/SK+/ SPK+ 075	2	22	45.7	37.2	26	24	51.4	46.686	70	6.6	85	40	20	7	76	62	40	20	8	28
SP+/SK+/ SPK+ 100	2	26	49.6	41.1	26	24	59.1	55.174	90	9	120	45	30	10	101	95.5	51	21	9	39
SP+/SK+/ SPK+ 140	3	24	64.2	54.7	31	29	82.3	76.395	130	11	165	58	30	12	141	122	65.5	35.5	21	51

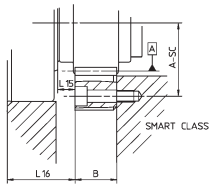
All dimensions in [mm]
a) please contact us for precise dimensions; align mechanism recommended (alignment dimension ± 0.3 mm)

z = Number of teeth
d_a = Tip diameter
d_w = Pitch diameter





True running accuracy < 40 µm

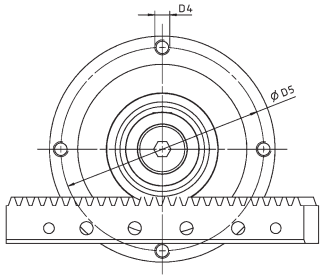


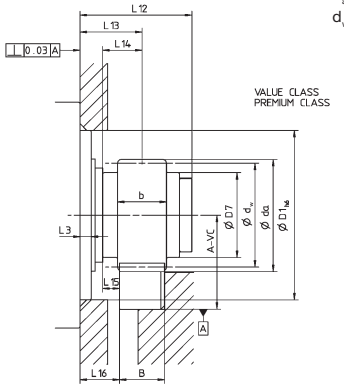
Value Class pinion (shrunk/bonded) on **shaft key** with **Value** and **Smart Class rack**

Key output	Module	z	A-VC ±0.3 a)	A-SC ±0.3 a)	b	B	d_a	d_w	$D1_{h6}$	D4	D5	D7	L3	L12	L13	L14	L15	L16
LP+/LK+/ LPK+ 070	2	18	41.9	33.4	26	24	43.7	38.197	52	M5	62	0	5	42	27	19	7	15
LP+/LK+/ LPK+ 090	2	22	45.7	37.2	26	24	51.4	46.686	68	M6	80	40	5	52	30	20	8	18
LP+/LK+/ LPK+ 120	2	26	49.6	41.1	26	24	59.1	55.174	90	M8	108	45	6	77.5	33	21	9	21
LP+/LK+/ LPK+ 155	3	24	64.2	54.7	31	29	82.3	76.395	120	M10	140	58	8	107	50.5	35.5	21	36

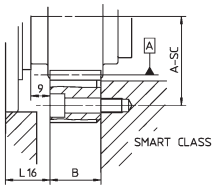
All dimensions in [mm]
a) please contact us for precise dimensions; align mechanism recommended (alignment dimension ± 0.3 mm)

z = Number of teeth
d_a = Tip diameter
d_w = Pitch diameter





True running accuracy < 40 µm



SP+ gearhead with Value Class pinion on shaft key with Value and Smart Class rack

	Ratio	Module	z	F_{2T} [N] (lb_f) (VC)	F_{2T} [N] (lb_f) (SC)	T_{2B} [Nm] (in.lb) (VC)	T_{2B} [Nm] (in.lb) (SC)	$F_{2T\,Not}$ [N] (lb_f)	$T_{2\,Not}$ [Nm] (lb_f)	V_{Max} [m/min] (in/sec) i = 5	V_{Max} [m/min] (in/sec) i = 25	m_{pinion} [kg] (lb_m)
SP+ 060	3	2	18	1550 (338)	1550 (349)	30 (266)	30 (266)	3000 (675)	57 (505)	–	–	0.3 (0.67)
	10, 100	2	18	1650 (372)	1650 (372)	32 (284)	32 (284)	3000 (675)	57 (505)	–	–	0.3 (0.67)
	4–7 / 16–70	2	18	2000 (450)	2000 (450)	38 (337)	38 (337)	3000 (675)	57 (505)	144 (95)	29 (20)	0.3 (0.67)
SP+ 075	All	2	22	3500 (788)	3500 (788)	82 (726)	82 (726)	5000 (1125)	117 (1036)	176 (116)	35 (23)	0.4 (0.89)
SP+ 100	All	2	26	4300 (968)	5000 (1125)	119 (1054)	138 (1222)	8500 (1913)	234 (2071)	156 (103)	31 (21)	0.6 (1.33)
SP+ 140	All	3	24	8000 (1800)	9000 (2025)	306 (2709)	344 (3045)	16000 (3600)	611 (5408)	192 (126)	38 (25)	1.6 (3.54)

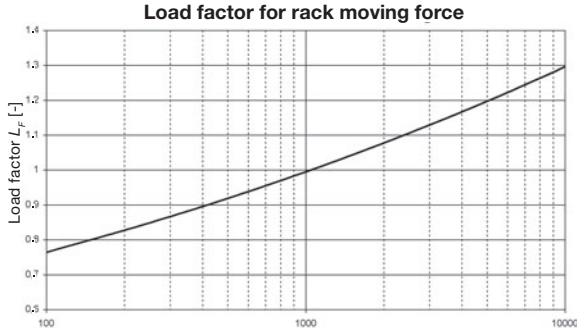
Technical data based on 1000 load cycles per hour.
More combinations possible with cymex®

F_{2T} = Max. moving force
T_{2B} = Max. acceleration torque
SC = Smart Class
VC = Value Class

In Z -axis without a balancing weight additional load changes can be caused due to additional movements in other axes.

Calculation including load factor:
$F_{2t} * L_F = F_{2t,\,LF} < F_{2T}$

Load factor for rack moving force



LP+ gearhead with Value Class pinion on shaft key with Value and Smart Class rack

	Ratio	Module	z	F_{2T} [N] (lb_f) (VC)	F_{2T} [N] (lb_f) (SC)	T_{2B} [Nm] (in.lb) (VC)	T_{2B} [Nm] (in.lb) (SC)	$F_{2T\,Not}$ [N] (lb_f)	$T_{2\,Not}$ [Nm] (lb_f)	V_{Max} [m/min] (in/sec) i = 5	V_{Max} [m/min] (in/sec) i = 25	m_{pinion} [kg] (lb_m)
LP+ 070	3, 10, 15, 30, 100	2	18	1700 (383)	1700 (383)	32 (284)	32 (284)	2700 (608)	52 (461)	–	–	0.3 (0.67)
	5, 7, 25, 50	2	18	1850 (417)	1850 (417)	35 (310)	35 (310)	2700 (608)	52 (461)	144 (95)	29 (20)	0.3 (0.67)
LP+ 090	3, 10, 15, 30, 100	2	22	3400 (765)	3400 (765)	79 (700)	79 (700)	4800 (1080)	112 (992)	–	–	0.4 (0.89)
	5, 7, 25, 50	2	22	3500 (788)	3500 (788)	82 (726)	82 (726)	4800 (1080)	112 (992)	176 (116)	35 (23)	0.4 (0.89)
LP+ 120	All	2	26	4100 (923)	4500 (1013)	113 (1001)	124 (1098)	7800 (1755)	215 (1903)	156 (103)	31 (21)	0.6 (1.33)
LP+ 155	All	3	24	6500 (1463)	7000 (1575)	248 (2195)	267 (2363)	14000 (3150)	535 (4735)	192 (126)	38 (25)	1.6 (3.54)

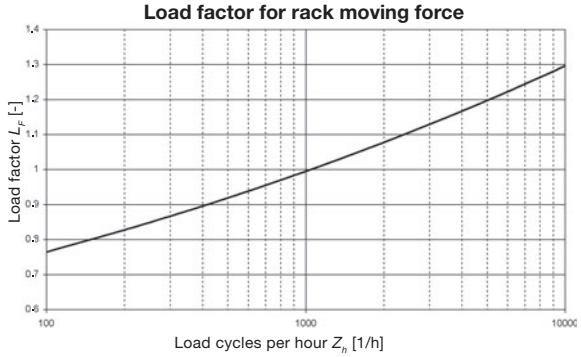
Technical data based on 1000 load cycles per hour.
More combinations possible with cymex®

F_{2T} = Max. moving force
T_{2B} = Max. acceleration torque
SC = Smart Class
VC = Value Class

In Z -axis without a balancing weight additional load changes can be caused due to additional movements in other axes.

Calculation including load factor:
$F_{2t} * L_F = F_{2t,\,LF} < F_{2T}$

Load factor for rack moving force



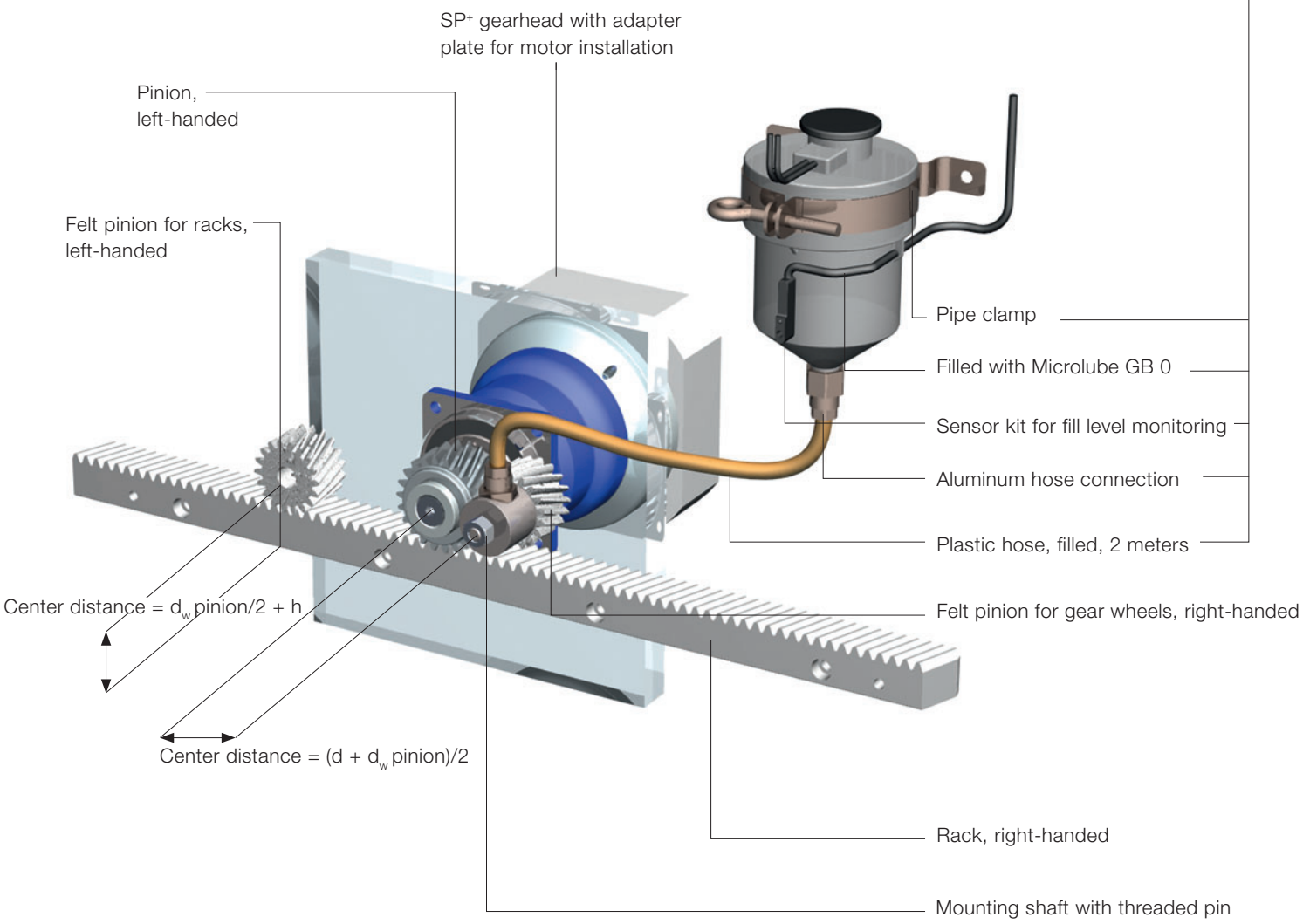
Perfect lubrication – **for a perfect system**

Efficient lubrication systems are essential in guaranteeing **a long service life** for our pinion and rack systems.
We offer you the right **felt pinions, fastening axles and lubricator sets,** adapted perfectly to our components. The lubricator supplies a preset quantity of grease to the felt pinion and guarantees a constant film of lubrication on the rack and pinion.

Complete lubrication system

Complete lubricator

Kit order number	Size
20021555	125
20022531	475



Replacement sensor for fill level monitoring

Lubricator type	Order number
125	20021557
475	20022535

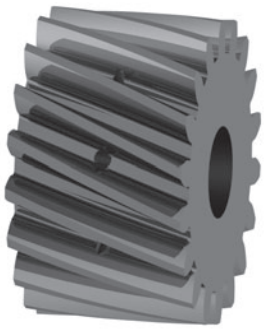
The **sensor kit for fill level monitoring** included in the lubricator set enables your machine to permanently monitor the fill level in the lubricator so you utilize it more efficiently.

Felt pinion, helical-toothed

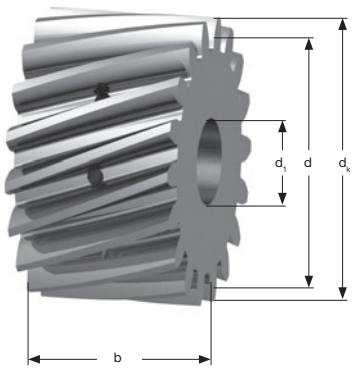
	Felt pinion							Fastening axle C					
	Module	Number of teeth	Order no.	d	d_1	d_k	b	Order no.	D	S	b	l	L
A	2	18 LH	20022364	38.2	12	42	25	20017836	30	M8	25.5	10	60
B	2	18 RH	20017681										
A	3	18 LH	20022359	57.3	12	63	30	20021477	30	M8	30.5	10	65
B	3	18 RH	20021473										
A	4	18 LH	20023115	76.4	12	84.4	40	20023119	30	M8	40.5	10	75
B	4	18 RH	20023106										
A	5	17 LH	20023116	90.2	20	100.2	50	20023120	50	M12	50.5	15	90
B	5	17 RH	20023111										
A	6	17 LH	20023117	108.2	20	120.2	60	20023121	50	M12	60.5	15	100
B	6	17 RH	20023113										

All dimensions in [mm]

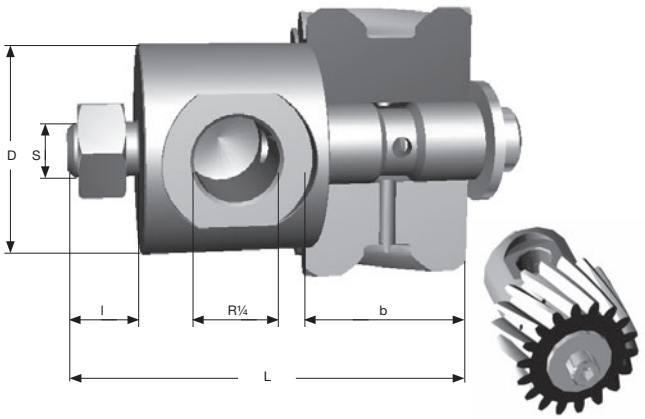
B Felt pinion for pinions, right-handed RH



A Felt pinion for Racks, left-handed LH



C Fastening axis for felt pinions

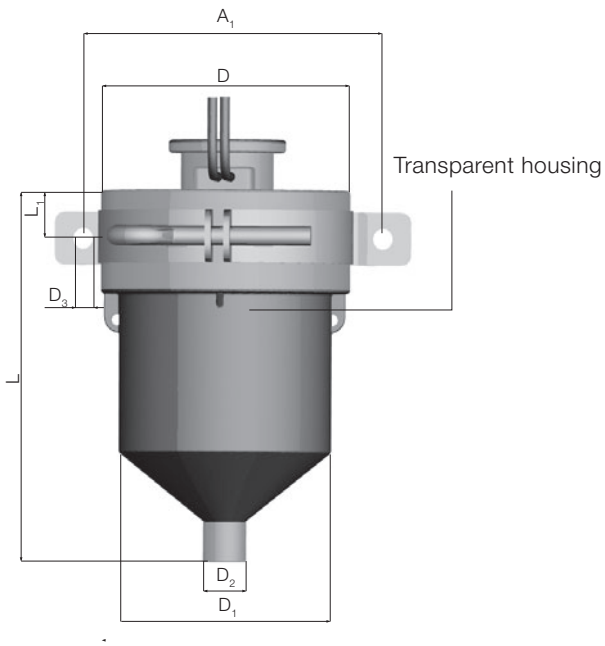


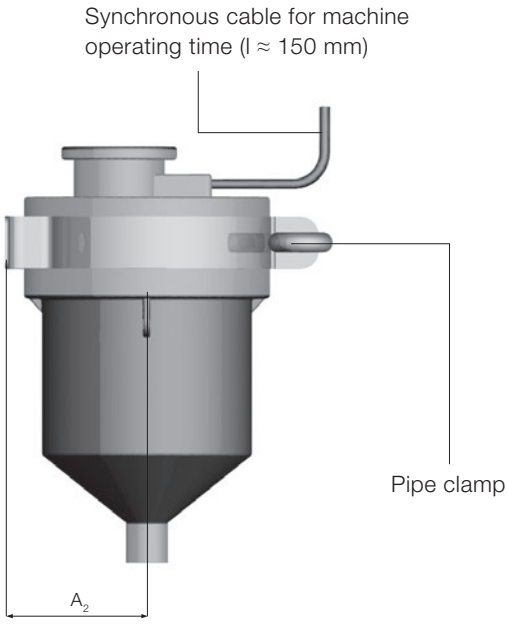
Dimensions of the lubricator

Kit order number	Size	D	D_1	D_2 [a]	D_3 [a]	L	L_1	A_1	A_2	Replacement lubricator [b]
20021555	125	80	68	R ¼″	6,5	114	13,5	95	48	20021556
20022531	475	115	103	R ½″	8,5	155	20	105	70	20022533

All dimensions in [mm]
[a] Lubricator connector
[b] No pipe clamp, hose, screw connection, synchronous cable or sensor kit

Nitrogen gas is generated in the electronically controlled lubricator. When the micro switches initiate the required dose, the nitrogen gas generated moves the piston continually. An emptying time of 1, 2, 3, 6, 12 or 18 months and individual lubricant quantities can be selected. Each product is supplied with detailed operating instructions.





Technical data of lubricator

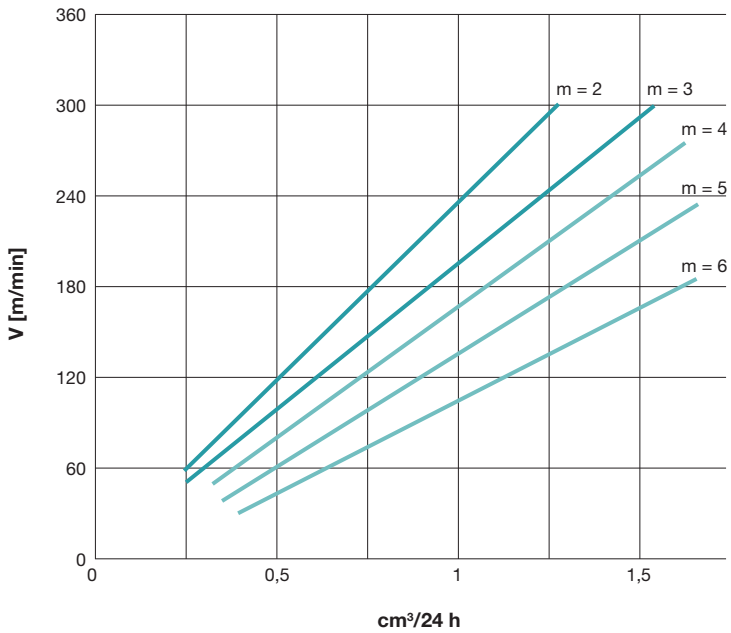
Lubricator type	125	475
Approx. capacity cm³	100	460
Connection thread	R ¼″	R ½″
Setting time	1, 2, 3, 6, 12 or 18 months	
Weight	370 g	1000 g
Pressure	0.2 to 3 bar	
Drive	2 x 1.5 V	4 x 1.5 V
Temperature range	10°C to 50°C	
Battery capacity	about 2000 mA/hr.	about 4000 mA/hr.
Battery consumption after 1 year	about 285 mA/hr.	about 800 mA/hr.
Grease filling	Klüber Microlube GB 0	
Accessories	Sensor, replacement lubricator	
Mounting position	Any	

Recommended lubrication

Depending on the conditions of use, it is possible to set the lubricator to various emptying times with a micro switch (1, 2, 3, 6,12 or 18 months).

Our recommendation for a constant movement speed of 90 m/min: for example, module 2: 0.175 to 0.35 cm³/day or module 3: 0.35 to 0.7 cm³/day

Grease dosing for felt pinion lubrication



Assembly accessories

You will need an assembly jig to align the transfers between the individual racks. You will also need a needle roller when making a final check with the dial gauge.

Assembly jig

Module	L	z	B	H	h
2	100	14	24	24	22
3	100	9	29	29	26
4	156	8	46	46	41
5	156	7	46	46	41
6	156	7	46	46	40

Needle roller

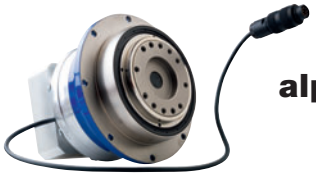
Module	Order number
2	20001001
3	20000049
4	20038001
5	20038002
6	20038003

Bolts and cylinder pins

(not included in the scope of delivery)

To fasten each rack, you will need bolts and cylinder pins specified in the table below. The length of the bolts and pins depends on the design of the machine bed.

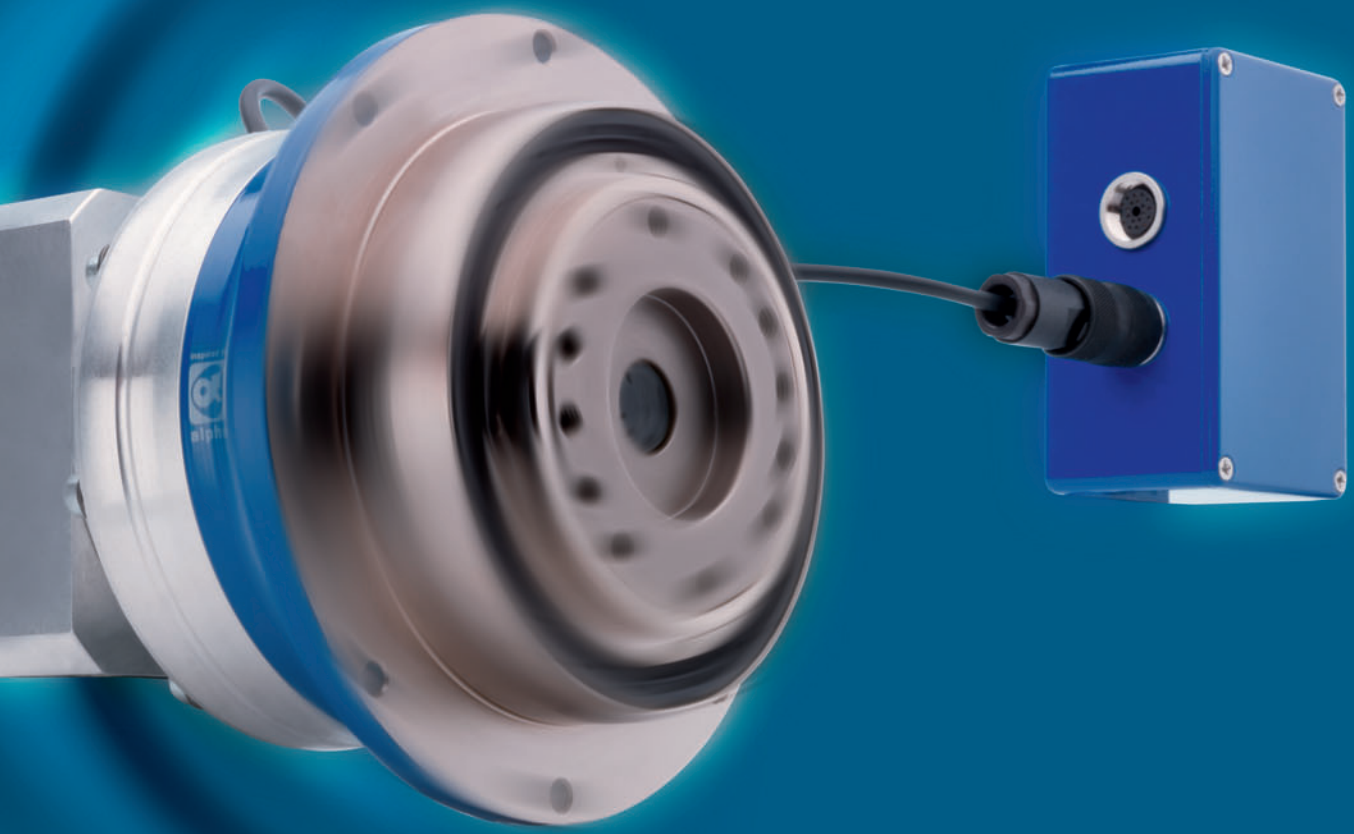
Module	Length	Class			Bolt DIN EN ISO 4762–12.9 (quantity x thread)	Tightening torque		Quantity x cylinder pin DIN EN ISO 2338 / DIN EN ISO 2338 / Cylinder pin with inner thread DIN7979 / DIN EN ISO 8735, form A
		Premium	Smart	Value		(Nm)	(in.lb)	
2	1000			x	8 x M6	16.5	(147)	2 x 6 m6
2	500	x			4 x M6	16.5	(147)	2 x 6 m6
2	480		x		8 x M8	40	(354)	2 x 8 m6
2	333	x			4 x M6	16.5	(147)	2 x 6 m6
2	167	x			2 x M6	16.5	(147)	2 x 6 m6
3	1000			x	8 x M8	40	(354)	2 x 8 m6
3	500	x			4 x M8	40	(354)	2 x 8 m6
3	480		x		8 x M10	81	(717)	2 x 10 m6
3	250	x			2 x M8	40	(354)	2 x 8 m6
4	1000			x	8 x M8	40	(354)	2 x 8 m6
4	507	x			4 x M10	81	(717)	2 x 10 m6
4	480		x		8 x M12	140	(1239)	2 x 10 m6
5	1000			x	8 x M12	140	(1239)	2 x 12 m6
5	500	x			4 x M12	140	(1239)	2 x 12 m6
6	1000			x	8 x M16	220	(1947)	2 x 16 m6
6	500	x			4 x M16	220	(1947)	2 x 16 m6



alpha IQ – WITTENSTEIN alpha gearbox with integrated sensors – helping you better understand your processes

alpha IQ

Details



Understanding processes through **intelligent sensor gearboxes**
– low backlash planetary gearboxes + integrated sensors

Sensor gearboxes allow you to measure, diagnose and assess process parameters directly, i.e. all mechanical loads processed by the gearbox can be measured at the output drive.

Sensor gearbox information

Gearbox
Low backlash planetary gearboxes of renowned WITTENSTEIN alpha quality

Sensors
Intelligent sensor technology integrated in the gearbox

Electronics box
Receives signals from the gearbox and serves as a communication and storage medium

Application areas of the sensor gearbox and **customer benefits**

Diagnosis

alpha IQ allows you to measure the forces generated in the existing application without modifying the machine design.
This measurement then forms the basis for optimization measures for the drive train design and allows you to select the **right drive system components** and verify calculations to save valuable resources.

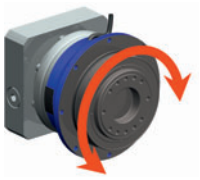
Process monitoring

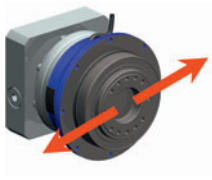
By measuring key parameters, sensor gearboxes provide a revealing insight into previously unknown process mechanisms.
A more accurate understanding of machine processes can be applied directly to **improve process stability**.

Process control

Measurements provide valuable information that can be used to control and optimize your manufacturing process in realtime.
This simple method for **optimizing processes** will impress your customers.

alpha IQ – Measured parameters


Torque


X direction


Y direction

Temperature

Software
Calibration or display and evaluation software

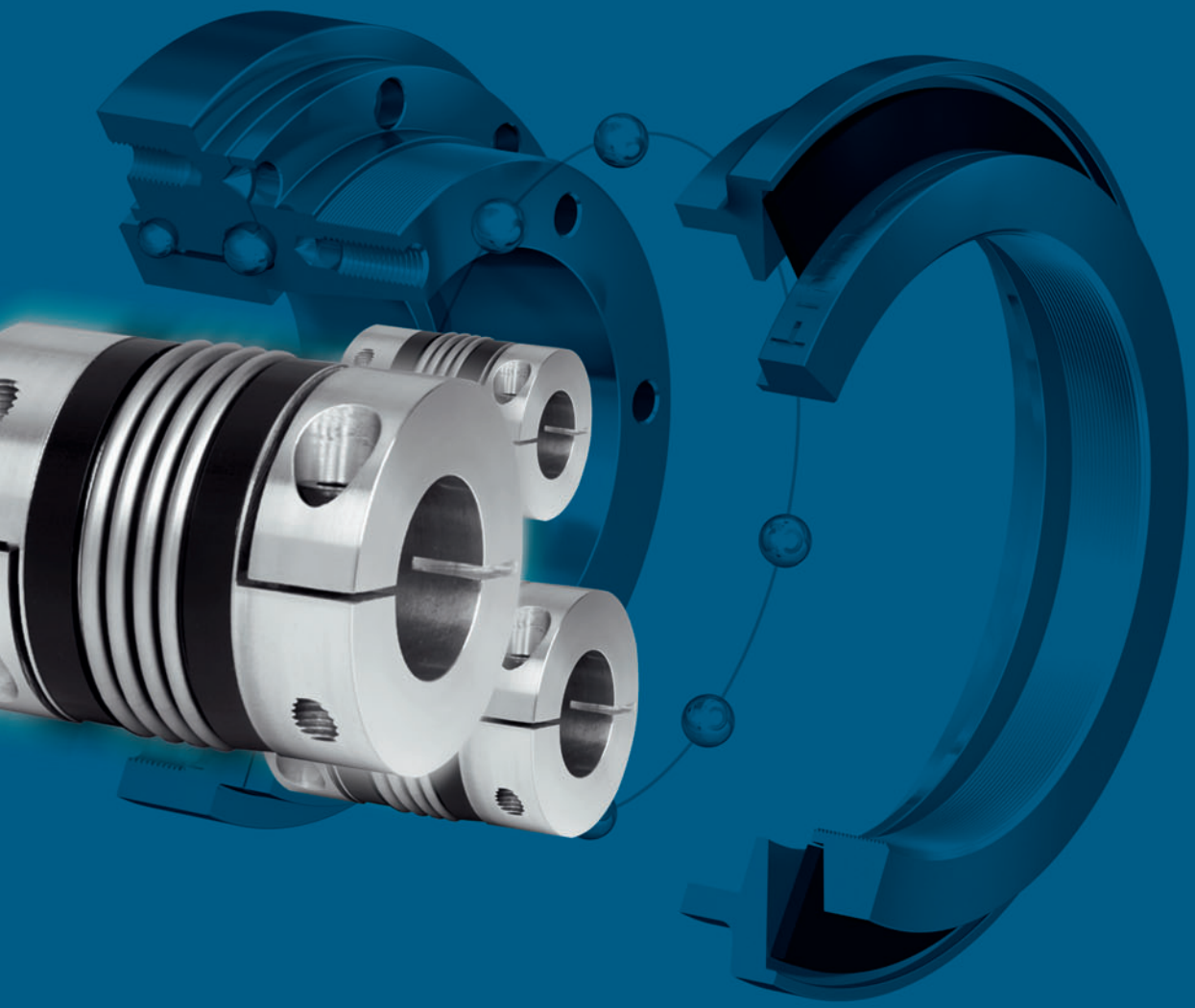
Interfaces
RS232, voltage interface, current interface and field buses via gateway

Gearbox types and sizes
SP⁺ 075, SP⁺ 100, SP⁺ 140
TP⁺ 010, TP⁺ 025, TP⁺ 050

Couplings – precision transmission of movement

Couplings

Details



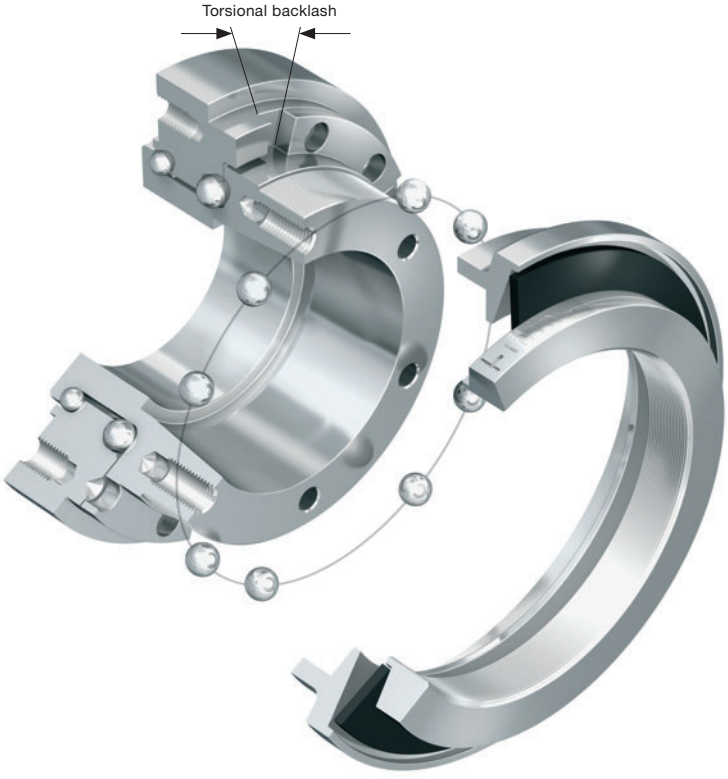
Safe torque limitation

Single position re-engagement – standard version

After the overload has been removed, the torque limiter can be re-engaged precisely 360 degrees from the original disengagement position.
A proven principle that guarantees synchronism. Signal in the event of an overload. Suitable for use in machine tools, packaging machines and automation systems.

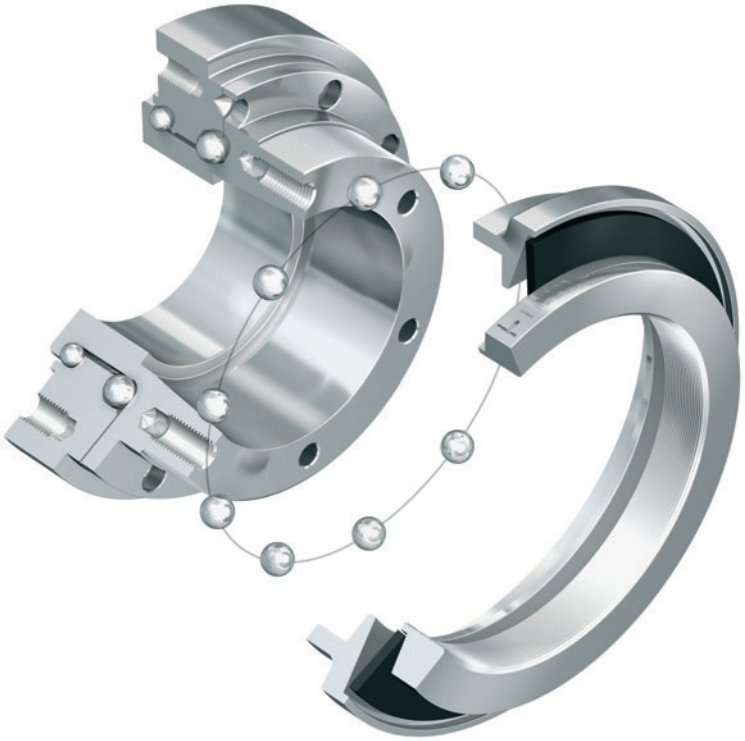
Load holding version

In the event of an overload, the drive and the drive elements are not separated or are only allowed limited rotation. Guaranteed load safety. Automatic engagement of the torque limiter after the torque level has dropped. Signal in the event of an overload. Suitable for use on presses or load-lifting equipment.



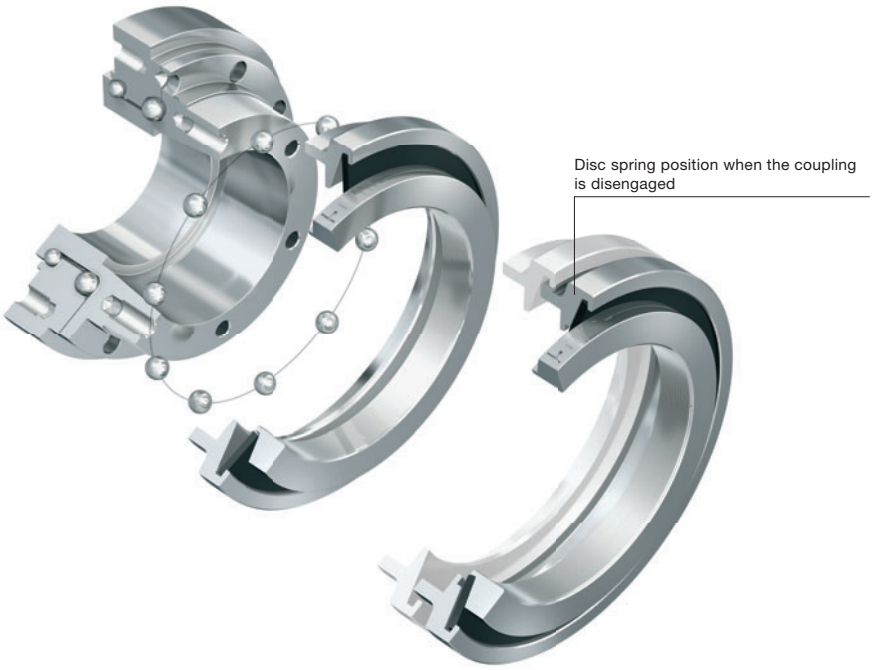
Multi-position version

Coupling re-engages automatically at the very next ball detent. The coupling is immediately ready for operation again at several points after an overload. Immediate availability of the machine or plant as soon as the overload has been removed. Signal in the event of an overload. Standard engagement after 60 degrees. Optional engagement after 30, 45, 60, 90 and 120 degrees.



Full disengagement version

Permanent separation of the drive and the drive elements in the event of an overload. Spring flips over completely. No residual friction. Torque limiter can be re-engaged manually (re-engagement possible every 60 degrees).

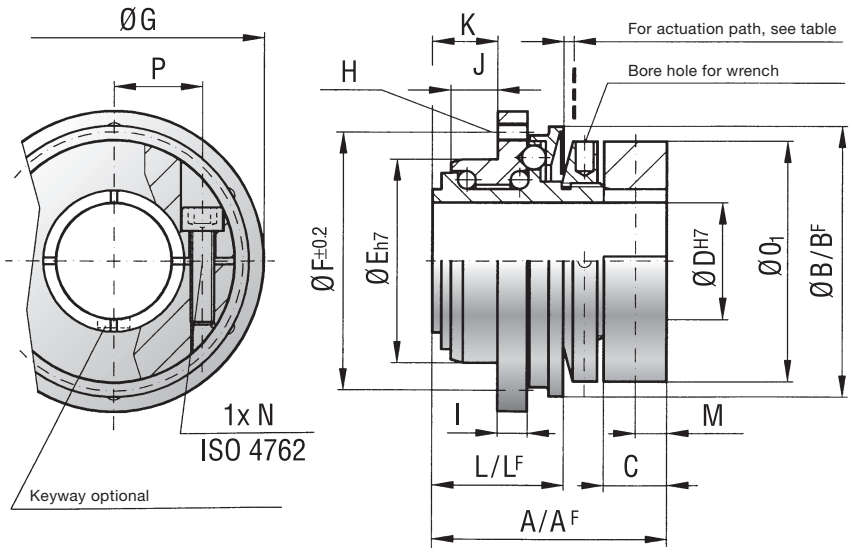


TL1 – Torque limiter

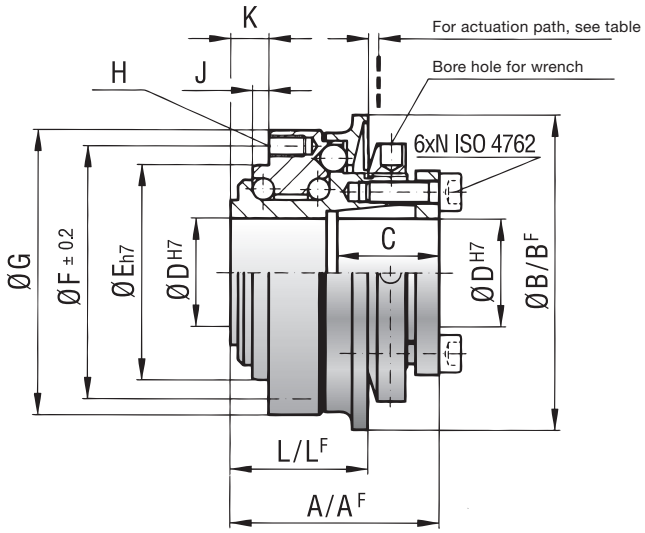
				Series													
				Miniature design series													
				1.5	2	4.5	10	15	30	60	150	200	300	500	800	1500	2500
Adjustment range from – to (approx. values)	T_{KN}	Nm	A	0.1–0.6	0.2–1.5	1–3	2–6	5–15	5–20	10–30	20–70	30–90	100–200	80–200	400–650	600–800	1500–2000
		in.lb		1-69	2-14	9-27	18-54	45-133	45-177	89-266	177-620	266-797	885-1770	708-1770	3540-5753	5310-7080	13275-17700
		Nm	B	0.4–1	0.5–2.2	2–4.5	4–12	12–25	10–30	25–80	45–150	60–160	150–240	200–350	500–800	700–1200	2000–2500
		in.lb		4-9	5-20	18-40	36-107	107-222	89-266	222-708	399-1328	531-1416	1328-2124	1770-3098	4425-7080	6195-10620	17700-22125
		Nm	C	0.8–2	1.5–3.5	3–7	7–18	20–40	20–60	50–115	80–225	140–280	220–440	320–650	650–950	1000–1800	2300–2800
		in.lb		8-18	14-31	27-62	62-160	177-354	177-531	443-1018	708-1992	1239-2478	1947-3894	2832-5753	5753-8408	8850-15930	20355-24780
		Nm	D	–	–	–	–	35–70	50–100	–	–	250–400	–	–	–	–	–
		in.lb						310-620	443-885			222-3540					
Adjustment range from – to (approx. values), full disengagement	T_{KN}	Nm	A	0.3–0.8	0.5–2	2.5–4.5	2–5	7–15	8–20	10–30	20–60	80–140	120–180	50–150	200–400	1000–1250	1400–2200
		in.lb		3-8	5-18	23-40	18-45	62-133	71-177	89-266	177-531	708-1239	1062-1593	443-1328	1770-3540	8850-11063	12390-19470
		Nm	B	0.6–1.3	–	–	4–10	–	16–30	20–40	40–80	130–200	160–300	100–300	450–850	1250–1500	1800–2700
		in.lb		6-12			36-89		142-266	177-354	354-708	1151-1770	1416-2655	885-2655	3983-7523	11063-13275	15930-23895
		Nm	C	–	–	–	8–15	–	–	30–60	80–150	–	–	250–500	–	–	–
		in.lb					71-133			266-531	708-1328			2213-4425			
Overall length	A	mm		23	28	32	39	40	50	54	58	63	70	84	95	109	146
Overall length, full disengagement	A^F	mm		23	28	32	39	40	50	54	58	66	73	88	95	117	152
Outer diameter of actuation ring	B	mm		23	29	35	45	55	65	73	92	99	120	135	152	174	242
Actuation ring Ø, full disengagement	B^F	mm		24	32	42	51.5	62	70	83	98	117	132	155	177	187	258
Clamping fit length	C	mm		7	8	11	11	19	22	27.5	32	32	41	41	49	61	80
Inner diameter from Ø to Ø H7	D	mm		4–8	4–12	5–14	6–20	8–22	12–22	12–29	15–37	20–44	25–56	25–56	30–60	35–70	50–100
Centering diameter h7	E	mm		14	22	25	34	40	47	55	68	75	82	90	100	125	168
Hole circle diameter ±0.2	F	mm		22	28	35	43	47	54	63	78	85	98	110	120	148	202
Flange diameter – 0.2	G	mm		26	32	40	50	53	63	72	87	98	112	128	140	165	240
Thread	H			4xM2	4xM2.5	6xM2.5	6xM3	6xM4	6xM5	6xM5	6xM6	6xM6	6xM8	6xM8	6xM10	6xM12	6xM16
Thread length	I	mm		3	4	4	5	6	8	9	10	10	10	12	15	16	24
Centering length – 0.2	J	mm		2.5	3.5	5	8	3	5	5	5	5	6	9	10	13.5	20
Distance	K	mm		5	6	8	11	8	11	11	12	12	15	21	19	25	34
Distance	L	mm		11	15	17	22	27	35	37	39	44	47	59	67	82	112
Distance, full disengagement	L^F	mm		11.5	16	18	24	27	37	39	41.5	47	51.5	62	75	91	120
Distance	M			2.5	4	4	5	–	–	–	–	–	–	–	–	–	–
Screws to ISO 4762	N			M2.5	M3	M4	M4	M4	M5	M5	M6	M6	M8	M8	M10	M12	M16
Tightening torque	N	Nm		1	2	4	4.5	4	6	8	12	14	18	25	40	70	120
		in.lb		9	18	36	40	36	54	71	107	124	160	222	354	620	1062
Outer diameter of clamping ring	O_1	mm		20	25	32	40	–	–	–	–	–	–	–	–	–	–
Diameter	O_2	mm		13	18	21	30	35	42	49	62	67	75	84	91	112	154
Diameter h7	O_3	mm		11	14	17	24	27	32	39	50	55	65	72	75	92	128
Distance between centers	P	mm		6.5	8	10	15	–	–	–	–	–	–	–	–	–	–
Distance	R	mm		1	1.3	1.5	1.5	2.5	2.5	2.5	2.5	3	3	4	4	4.5	6
Moment of inertia	J	10^{-3} kgm²		0.01	0.02	0.05	0.07	0.15	0.25	0.50	1.60	2.70	5.20	8.60	20	31.5	210
		in.lb.s².10^{-3}		0.0089	0.0177	0.0443	0.0620	0.1328	0.2213	0.4425	1.4161	2.3897	4.6024	7.6116	17.7014	27.8797	185.86
Approx. weight		kg		0.03	0.065	0.12	0.22	0.4	0.7	1.0	1.3	2.0	3.0	4.0	5.5	10	28
		lb		0.066	0.143	0.265	0.485	0.882	1.543	2.205	2.866	4.409	6.614	8.818	12.125	22.046	61.729
Actuation path		mm		0.7	0.8	0.8	1.2	1.5	1.5	1.7	1.9	2.2	2.2	2.2	2.2	3.0	3.0

A^F, B^F, L^F = Full disengagement version

Torque limiter TL1 (1.5 – 10)
With clamping hub



Torque limiter TL1 (15 – 2500)
With conical clamping hub



Torque limiter for timing belt and sprocket applications

Material:
High-strength, hardened steel.

Design:
Model TL1: 1.5 – 10 Nm (13.3 – 88.5 in.lb)
with split clamping hub.
Model TL1: 15 – 2500 Nm (132.8 – 22125 in.lb)
with conical clamping hub.

Temperature range: -30 to +120°C (-22 to 248°F)

Temperature peaks: up to +150°C (302°F)

Backlash:
Completely backlash-free as a result of the
frictional clamp connection and patented preload.

Service life:
These torque limiters are permanent and
maintenance-free as long as the performance limits are not
exceeded.

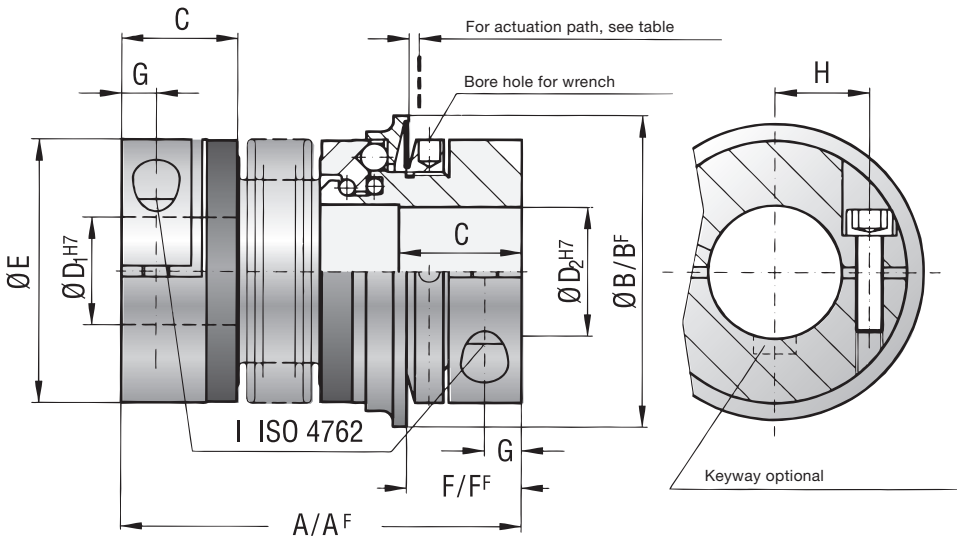
Fit tolerance: Tolerance between shaft and hub 0.01 – 0.05 mm

TL2 – Torque limiter

				Series																													
				1.5	2		4.5		10		15		30		60		80		150		200		300		500		800	1500
Length options (see ordering code)				A	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	A
Adjustment range from – to (approx. values)	T_{KN}	Nm	A	0.1–0.6	0.2–1.5		1–3		2–6		5–10		10–25		10–30		20–70		20–70		30–90		100–200		80–200		400–650	650–800
		in.lb		1-6	2-14		9-27		18-54		45-89		89-222		89-266		177-620		177-620		266-797		885-1770		708-1770		3540-5753	5753-7080
		Nm	B	0.4–1	0.5–2		3–6		4–12		8–20		20–40		25–28		30–90		45–150		60–160		150–240		200–350		500–800	700–1200
		in.lb		4-9	5-18		27-54		36-107		71-177		177-354		222-248		266-797		399-1328		531-1416		1328-2124		1770-3098		4425-7080	6195-10620
		Nm	C	0.8–1.5	–		–		–		–		–		–		–		80–180		120–240		200–320		300–500		650–850	1000–1800
		in.lb		8-14															708-1593		1062-2124		1770-2832		2655-4425		5753-7523	8850-15930
Adjustment range from – to (approx. values), full disengagement	T_{KN}	Nm	A	0.3–0.8	0.5–2		2.5–4.5		2–5		7–15		8–20		20–40		20–60		20–60		80–140		120–180		60–150		200–400	1000–1250
		in.lb		3-8	5-18		23-40		18-45		62-133		71-177		177-354		177-531		177-531		708-1239		1062-1593		531-1328		1770-3540	8850-11063
		Nm	B	0.6–1.3	–		–		5–10		–		16–30		30–60		40–80		40–80		130–200		180–300		100–300		450–800	1250–1500
		in.lb		6-12					45-89				142-266		266-531		354-708		354-708		1151-1770		1593-2655		885-2655		3983-7080	11063-13275
		Nm	C	–	–		–		–		–		–		–		–		80–150		–		–		250–500		–	–
		in.lb																	708-1328						2213-4425			
Overall length	A	mm		42	46	51	57	65	65	74	75	82	87	95	102	112	115	127	116	128	128	140	139	153	163	177	190	223
Overall length, full disengagement	A^F	mm		42	46	51	57	65	65	74	75	82	87	95	102	112	117	129	118	130	131	143	142	156	167	181	201	232
Actuation ring Ø	B	mm		23	29		35		45		55		65		73		92		92		99		120		135		152	174
Actuation ring Ø, full disengagement	B^F	mm		24	32		42		51.5		62		70		83		98		98		117		132		155		177	187
Fit length	C	mm		11	13		16		16		22		27		31		35		35		40		42		51		48	67
Inner diameter from Ø to Ø H7	D_1/D_2	mm		3–8	4–12		5–14		6–20		10–26		12–30		15–32		19–42		19–42		24–45		30–60		35–60		40–75	50–80
Outer diameter of coupling	E	mm		19	25		32		40		49		55		66		81		81		90		110		123		134	157
Distance	F	mm		12	13		15		17		19		24		30		31		31		35		35		45		50	65
Distance, full disengagement	F^F	mm		11.5	12		14		16		19		22		29		31		30		33		35		43		54	61
Distance	G	mm		3.5	4		5		5		6.5		7.5		9.5		11		11		12.5		13		17		18	22.5
Distance between centers	H	mm		6	8		10		15		17		19		23		27		27		31		39		41		2x48	2x55
Screws to ISO 4762	I			M2.5	M3		M4		M4		M5		M6		M8		M10		M10		M12		M12		M16		2xM16	2xM20
Tightening torque	I	Nm		1	2		4		4.5		8		15		40		50		70		120		130		200		250	470
		in.lb		9	18		36		40		71		133		354		443		620		1062		1151		1770		2213	4160
Approx. weight		kg		0.035	0.07		0.2		0.3		0.4		0.6		1.0		2.0		2.4		4.0		5.9		9.6		14	21
		lb		0.08	0.15		0.44		0.66		0.88		1.32		2.21		4.41		5.30		8.82		13.1		21.2		30.9	46.3
Moment of inertia	J	10^{-3} kgm²		0.01	0.01	0.01	0.02	0.02	0.06	0.07	0.10	0.15	0.27	0.32	0.75	0.80	1.80	1.90	2.50	2.80	5.10	5.30	11.5	11.8	22.8	23.0	42.0	83.0
		10^{-3} in.lb.s²		0.0089	0.0089	0.0089	0.0177	0.0177	0.0531	0.0620	0.0885	0.1328	0.2390	0.2832	0.6638	0.7081	1.59	1.68	2.21	2.48	45.1	46.9	10.2	10.4	20.2	20.4	37.2	73.5
Torsional rigidity	C_T	10^{-3} Nm/rad		0.7	1.2	1.3	7	5	9	8	20	15	39	28	76	55	129	85	175	110	191	140	420	350	510	500	780	1304
Lateral misalignment		mm		0.15	0.15	0.20	0.20	0.25	0.20	0.30	0.15	0.20	0.20	0.25	0.20	0.25	0.20	0.25	0.20	0.25	0.25	0.30	0.25	0.30	0.30	0.35	0.35	0.35
Angular misalignment		degrees		1	1	1.5	1.5	2	1.5	2	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1.5	2	1.5	2	2	2.5	2.5	2.5
Lateral spring stiffness		N/mm		70	40	30	290	45	280	145	475	137	900	270	1200	420	920	255	1550	435	2040	610	3750	1050	2500	840	2000	3600
Actuation path		mm		0.7	0.8		0.8		1.2		1.5		1.5		1.7		1.9		1.9		2.2		2.2		2.2		2.2	3.0

A^F, B^F, L^F = Full disengagement version
Smaller sizes on request

Torque limiter TL2
With clamping hub



Torque limiter for direct drives

Material:
Bellows made of highly flexible stainless steel. Safety section made of high-strength, hardened steel. Clamping hub material: up to series 80 aluminum and from series 150 steel.

Design:
With clamping hubs and a single lateral screw to ISO 4762.

Temperature range: -30 to +120°C (-22 to 248 °F)

Backlash:
Completely backlash-free as a result of the frictional clamp connection and patented preload.

Service life:
These torque limiters are permanent and maintenance-free as long as the performance limits are not exceeded.

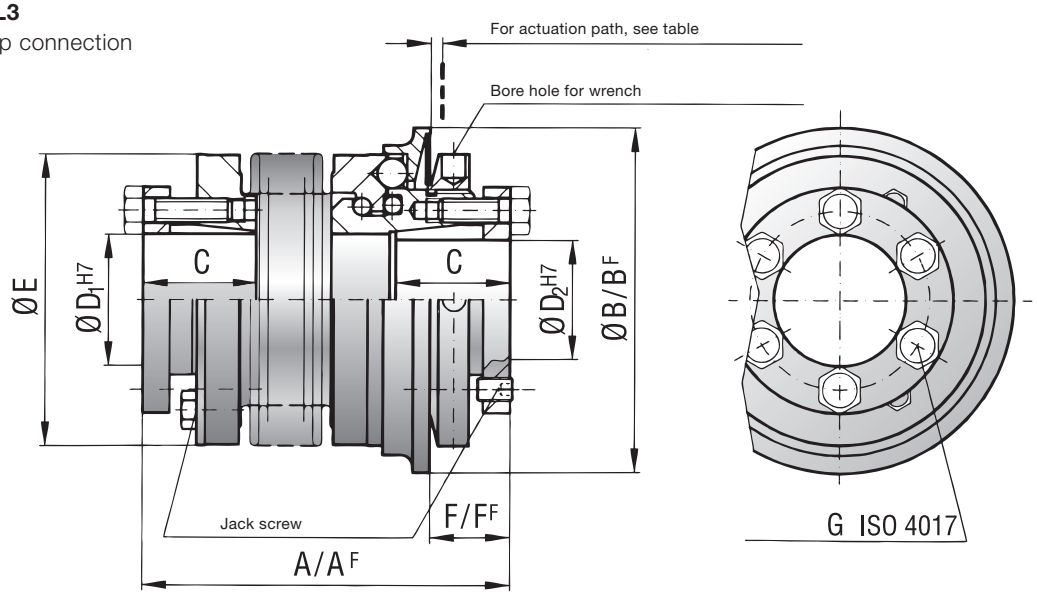
Fit tolerance: Tolerance between shaft and hub 0.01 – 0.05 mm

TL3 – Torque limiter

				Series																	
				15		30		60		150		200		300		500		800		1500	2500
Length options (see ordering code)				A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	A
Adjustment range from – to (approx. values)	T_{KN}	Nm	A	5–10		10–25		10–30		20–70		30–90		100–200		80–200		400–650		650–850	1500–2000
		in.lb		45-89		89-222		89-266		177-620		266-797		885-1770		708-1770		3540-5753		5753-7523	13275-17700
		Nm	B	8–20		20–40		25–80		45–150		60–160		150–240		200–350		500–800		700–1200	2000–2500
		in.lb		71-177		177-354		222-708		399-1328		531-1416		1328-2124		1770-3098		4425-7080		6195-10620	17700-22125
		Nm	C	–		–		–		80–200		140–280		220–400		300–500		600–900		1000–1800	2300–2800
		in.lb								708-1770		1239-2478		1947-3540		2655-4425		5310-7965		8850-15930	20355-24780
Adjustment range from to (approx. values), full engagement	T_{KN}	Nm	A	7–15		8–20		20–40		20–60		80–140		120–180		60–150		200–400		1000–1250	1400–2200
		in.lb		62-133		71-177		177-354		177-531		708-1239		1062-1593		531-1328		1770-3540		8850-11063	12390-19470
		Nm	B	–		16–30		30–60		40–80		130–200		180–300		100–300		450–800		1250–1500	1800–2700
		in.lb				142-266		266-531		354-708		1151-1770		1593-2655		885-2655		3983-7080		11063-13275	15930-23895
		Nm	C	–		–		–		80–150		–		–		250–500		–		–	–
		in.lb								708-1328						2213-4425					
Overall length	A	mm		62	69	72	80	84	94	93	105	99	111	114	128	123	136	151		175	246
Overall length, full disengagement	A^F	mm		62	69	72	80	84	94	93	105	102	114	117	131	127	140	151		184	252
Actuation ring Ø	B	mm		55		65		73		92		99		120		135		152		174	243
Actuation ring Ø, full disengagement	B^F	mm		62		70		83		98		117		132		155		177		187	258
Fit length	C	mm		19		22		27		32		32		41		41		49		61	80
Inner diameter from Ø to Ø H7	D_1/D_2	mm		10–22		12–23		12–29		15–37		20–44		25–56		25–60		30–60		35–70	50–100
Outer diameter of coupling	E	mm		49		55		66		81		90		110		123		133		157	200
Distance	F	mm		13		16		18		19		19		23		25		31		30	34
Distance, full disengagement	F^F	mm		13		14		17		18		17		20		22		20		26	31
6 x screws to ISO 4017	I			M4		M5		M5		M6		M6		M8		M8		M10		M12	M16
Tightening torque	I	Nm		4		6		8		12		14		18		25		40		70	120
		in.lb		36		54		71		107		124		160		222		354		620	1062
Approx. weight		kg		0.3		0.4		1.2		2.3		3.0		5.0		6.5		9.0		16.3	35
		lb		0.66		0.88		2.65		5.07		6.61		11.0		14.3		19.8		35.9	77.2
Moment of inertia	J	10^{-3} kgm²		0.10	0.15	0.28	0.30	0.75	0.80	1.90	2.00	2.80	3.00	5.50	6.00	11.0	12.8	20.00		42.00	257
		10^{-3} in.lb.s²		0.0885	0.1328	0.2478	0.2655	0.6638	0.7081	1.68	1.77	2.48	2.66	4.87	5.31	9.74	11.3	17.7		37.2	227.5
Torsional rigidity	C_T	10^3 Nm/rad		20	15	39	28	76	55	175	110	191	140	420	350	510	500	780		1304	3400
Lateral misalignment		mm		0.15	0.20	0.20	0.25	0.20	0.25	0.20	0.25	0.25	0.30	0.25	0.30	0.30	0.35	0.35		0.35	0.35
Angular misalignment		degrees		1	1.5	1	1.5	1	1.5	1	1.5	1.5	2	1.5	2	2	2.5	2.5		2.5	2.5
Lateral spring stiffness		N/mm		475	137	900	270	1200	380	1550	435	2040	610	3750	1050	2500	840	2000		3600	6070
Actuation path		mm		1.5		1.5		1.7		1.9		2.2		2.2		2.2		2.2		3	3

A^F, B^F, F^F = Full disengagement version

Torque limiter TL3
With conical clamp connection



Torque limiter for direct drives

Material:
Bellows made of highly flexible stainless steel. Safety section made of high-strength, hardened steel. Hub material: steel.

Design:
With split conical clamping hubs and captive jack screws.

Temperature range: -30 to +120°C (-22 to 248 °F)

Backlash:
Completely backlash-free as a result of the frictional clamp connection and patented preload.

Service life:
These torque limiters are permanent and maintenance-free as long as the performance limits are not exceeded.

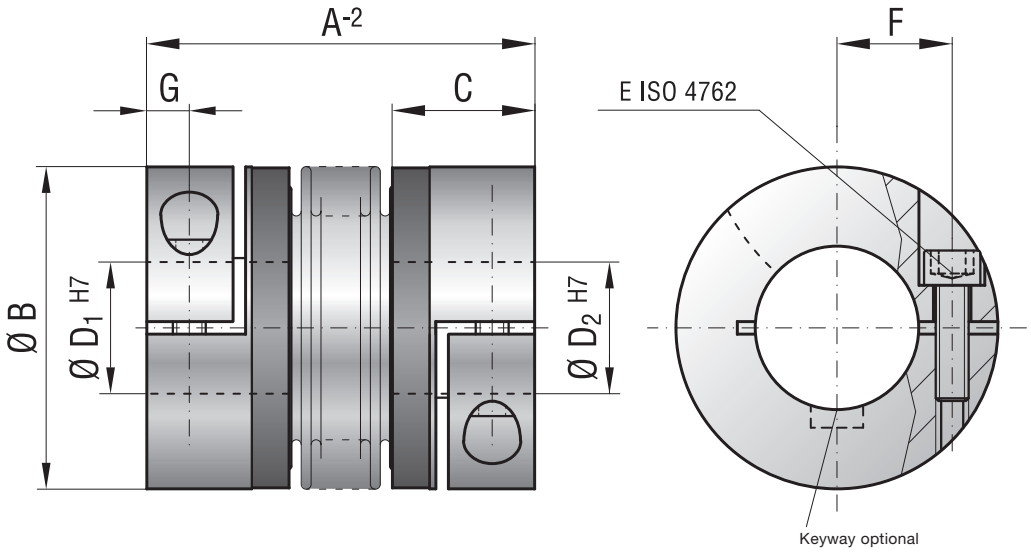
Fit tolerance: Tolerance between shaft and hub 0.01 – 0.05 mm

BC2 – Bellows coupling

			Series																			
			15		30		60		80		150		200		300		500		800	1500
Length options (see ordering code)			A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	A
Rated torque	T_{KN}	Nm	15		30		60		80		150		200		300		500		800	1500
		in.lb	133		266		531		708		1328		1770		2655		4425		7080	13275
Overall length	A	mm	59	66	69	77	83	93	94	106	95	107	105	117	111	125	133	146	140	166
Outer diameter	B	mm	49		55		66		81		81		90		110		124		134	157
Fit length	C	mm	22		27		31		36		36		41		43		51		45	55
Inner diameter from Ø to Ø H7	D_1/D_2	mm	8–28		10–30		12–32		14–42		19–42		22–45		24–60		35–60		40–75	50–80
Fastening screws to ISO 4762	E		M5		M6		M8		M10		M10		M12		M12		M16		2xM16[a]	2xM20[a]
Tightening torque of fastening screws	E	Nm	8		15		40		50		70		120		130		200		250	470
		in.lb	71		133		354		443		620		1062		1151		1770		2213	4160
Distance between centers	F	mm	17		19		23		27		27		31		39		41		2x48	2x55
Distance	G	mm	6.5		7.5		9.5		11		11		12.5		13		16.5		18	22.5
Moment of inertia	J	10^{-3} kgm²	0.05	0.07	0.12	0.13	0.32	0.35	0.8	0.85	1.9	2	3.2	3.4	7.6	7.9	14.3	14.6	16.2	43.5
		10^{-3} in.lb.s²	0.0443	0.0620	0.1062	0.1151	0.2832	0.3098	0.7081	0.7523	1.68	1.77	2.83	3.01	6.73	6.99	12.66	12.92	14.34	38.50
Hub material (standard) (steel on request)			Al		Al		Al		Al		Steel		Steel		Steel		Steel		Steel	Steel
Approx. weight		kg	0.16		0.26		0.48		0.8		1.85		2.65		4		6.3		5.7	11.5
		lb	0.353		0.573		1.764		1.764		4.079		5.842		8.818		13.889		12.566	25.353
Torsional rigidity	C_T	10^3 Nm/rad	20	15	39	28	76	55	129	85	175	110	191	140	450	350	510	500	780	1304
Axial misalignment 	*max. values*	mm	1	2	1	2	1.5	2	2	3	2	3	2	3	2.5	3.5	2.5	3.5	3.5	3.5
Lateral misalignment 	*max. values*	mm	0.15	0.2	0.2	0.25	0.2	0.25	0.2	0.25	0.2	0.25	0.25	0.3	0.25	0.3	0.3	0.35	0.35	0.35
Axial spring stiffness	C_a	N/mm	25	15	50	30	72	48	48	32	82	52	90	60	105	71	70	48	100	320
Lateral spring stiffness	C_r	N/mm	475	137	900	270	1200	420	920	290	1550	435	2040	610	3750	1050	2500	840	2000	3600

[a] Two screws per clamping hub, 180° apart
Max. angular misalignment 1.5°

Bellows coupling BC2
With clamping hub



Bellows coupling for direct drives

Material:
Bellows made of highly flexible stainless steel. Hub material: see table below.

Design:
With clamping hubs and a single lateral screw to ISO 4762. Any imbalance of the clamping hubs due to the design is compensated by balancing bores located on the hub interior.

Temperature range: -30 to +120°C (-22 to 248 °F)

Backlash:
Completely backlash-free as a result of the frictional clamp connection.

Service life:
These torque limiters are permanent and maintenance-free as long as the performance limits are not exceeded.

Fit tolerance: Tolerance between shaft and hub 0.01 – 0.05 mm

Speeds:
Up to 10,000 rpm / in excess of 10,000 rpm with finely balanced version.

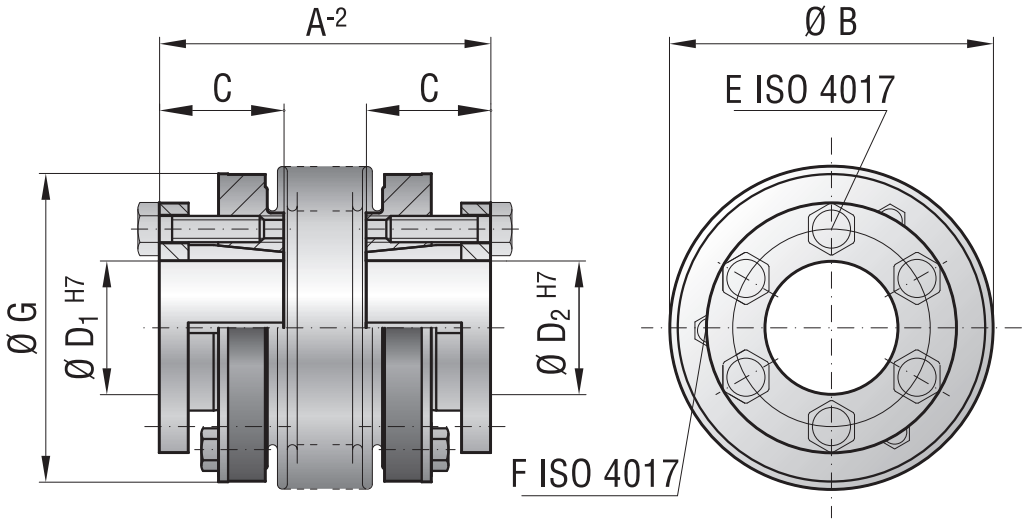
Brief overload: Acceptable up to 1.5 times the value specified.

BC3 – Bellows coupling

			Series																			
			15		30		60		150		200		300		500		800	1500	4000	6000	10000
Length options (see ordering code)			A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	A	A	A	A
Rated torque	T_{KN}	Nm	15		30		60		150		200		300		500		800	1500	4000	6000	10000
		in.lb	133		266		531		1328		1770		2655		4425		7080	13275	35400	53100	88500
Overall length without screw head	*A*	mm	48	55	57	65	66	76	75	87	78	90	89	103	97	110	114	141	195	210	217
Outer diameter	*B*	mm	49		55		66		81		90		110		124		133	157	200	253	303
Fit length	*C*	mm	19		22		27		32		32		41		41		50	61	80	85	92
Inner diameter from Ø to Ø H7	D_1/D_2	mm	10–22		12–23		12–29		15–38		15–44		24–56		24–60		30–60	35–70	50–100	60–140	70–180
6 x fastening screws to ISO 4017	*E*		M4		M5		M5		M6		M6		M8		M8		M10	M12	M16	M16	8xM16
Tightening torque of fastening screws	*E*	Nm	4		6		8		12		14		18		25		40	70	120	150	160
		in.lb	36		54		71		107		124		160		222		354	620	1062	1328	1416
3 x jack screws to ISO 4017	*F*		M4		M4		M5		M5		M6		M6		M6		M6	6xM8	6xM10	6xM10	8xM10
Outer diameter of hub	*G*	mm	49		55		66		81		90		110		122		116	135	180	246	295
Moment of inertia	*J*	10^{-3} kgm²	0.12	0.59	0.3	0.34	0.54	0.73	1.2	1.6	1.7	2.5	5.1	5.9	9.1	9.9	13.2	34.9	85.5	254	629
		10^{-3} in.lb.s²	0.1062	0.5222	0.2655	0.3009	0.4779	0.6461	1.06	1.41	1.50	2.21	4.51	5.22	8.05	8.76	11.7	30.9	75.7	224.8	556.7
Approx. weight		kg	0.25		0.4		0.8		1.2		1.8		3		4.2		5.6	8.2	23	32.6	45.5
		lb	0.551		0.882		1.76		2.65		3.97		6.61		9.33		12.3	18.1	50.7	71.9	100.3
Torsional rigidity	C_T	10^3 Nm/rad	20	15	39	28	76	55	175	110	191	140	450	350	510	500	780	1304	3400	5700	10950
Axial misalignment	*max. values*	mm	1	2	1	2	1.5	2	2	3	2	3	2.5	3.5	2.5	3.5	3.5	3.5	3.5	3	3
Lateral misalignment	*max. values*	mm	0.15	0.2	0.2	0.25	0.2	0.25	0.2	0.25	0.25	0.3	0.25	0.3	0.3	0.35	0.35	0.35	0.4	0.4	0.4
Axial spring stiffness	C_a	N/mm	25	15	50	30	72	48	82	52	90	60	105	71	70	48	100	320	565	1030	985
Lateral spring stiffness	C_r	N/mm	475	137	900	270	1200	420	1500	435	2040	610	3750	1050	2500	840	2000	3600	6070	19200	21800

Max. angular misalignment 1.5°

Bellows coupling BC3
With conical connection



Bellows coupling for direct drives

Material:
Bellows made of highly flexible stainless steel. Hub material: steel.

Design:
With split conical clamping hubs and strong, captive jack screws to ISO 4017.

Temperature range: -30 to +120°C (-22 to 248°F)

Backlash:
Completely backlash-free as a result of the frictional clamp connection.

Service life:
These torque limiters are permanent and maintenance-free as long as the performance limits are not exceeded.

Fit tolerance: Tolerance between shaft and hub 0.01 – 0.05 mm

Speeds:
Up to 10000 rpm / in excess of 10000 rpm with finely balanced version.

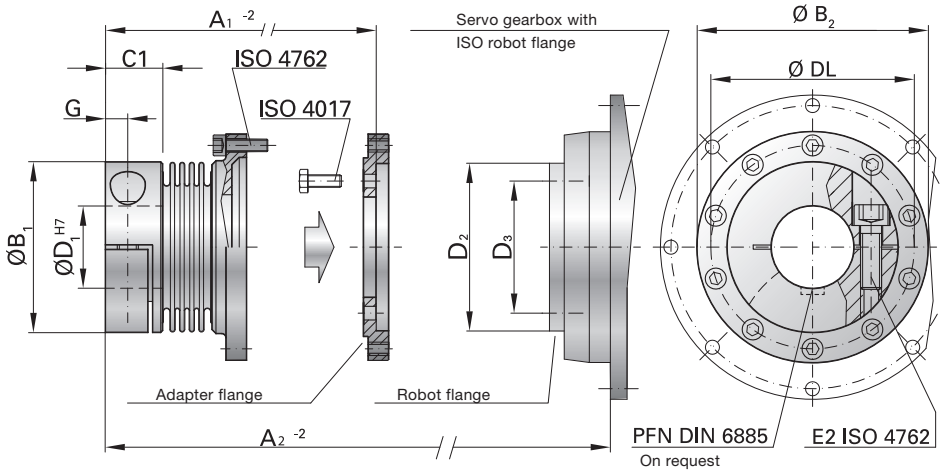
Brief overload: Acceptable up to 1.5 times the value specified.

BCT – Bellows coupling

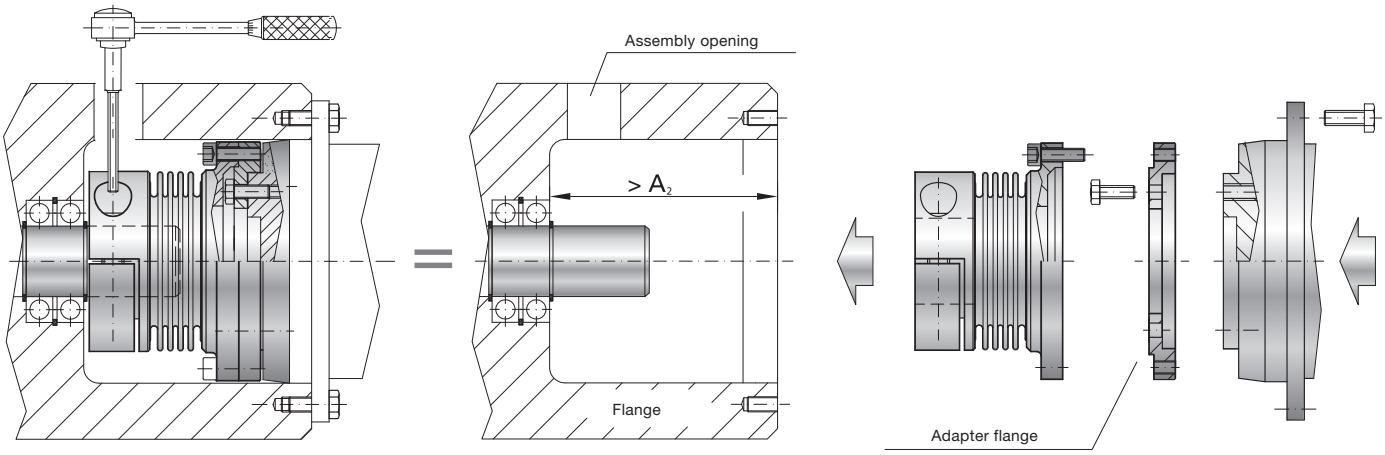
			Series				
			15	**60**	**150**	**300**	**1500**
Gearhead output type			TP004	TP010	TP025	TP050	TP110
Centering diameter	D_2	mm	40 h7	63 h7	80 h7	100 h7	160 h7
TP flange hole circle diameter / thread	D_3	mm	31.5 8 x M5	50 8 x M6	63 12 x M6	80 12 x M8	125 12 x M10
Nominal torque	T_{KN}	Nm	40	140	220	400	1570
		in.lb	354	1239	1947	3540	13895
Length 2	A_1	mm	49	67	72	90	140
Length installation space 2	A_2	mm	68	97	101	128	190
Hub diameter	B_1	mm	49	66	82	110	157
Flange diameter	B_2	mm	63.5	86.5	108	132	188
Fit length	C_1	mm	16.5	23	27.5	34	55
Possible inner diameter from Ø to Ø H7	D_1	mm	12 - 28	14 - 35	19 - 42	24 - 60	50 - 80
Hole circle diameter / Thread	DL	mm	56.5 10 x M4	76 10 x M5	97 10 x M6	120 12 x M6	170 16 x M8
Screws to ISO 4762	E		1 x M5	1 x M8	1 x M10	1 x M12	2 x M20
Tightening torque of fastening screw	E	Nm	8	45	80	120	470
		in.lb	71	399	708	1062	4160
Distance	G	mm	6.5	9.5	11	13	22.5
Approx. weight	I	kg	0.3	0.7	1	2.8	10
		lb	0.67	1.55	2.21	6.18	22.05
Moment of inertia	J	10^{-3} kgm²	0.15	0.65	1.3	5.5	45
		10^{-3} in.lb.s²	0.14	0.58	1.16	4.87	39.83
Axial misalignment 	Max. values mm		1	1.5	2	2.5	3
Lateral misalignment 	Max. values mm		0.25	0.25	0.25	0.25	0.2

Max. angular misalignment 1°

Low backlash metal bellows coupling BCT
With flange connection



Installation and removal



Bellows coupling for direct drives

Material:
Hub: Series 15-150 high-strength alu,
Series: 300-1500 steel,
Bellows: High-strength stainless steel,
Adapter flange: Steel

Design:
Load side: With clamping hubs and a single lateral screw to ISO 4762.
Gearbox side: With flange connection and separate adapter flange.

Temperature range: -30 to +120°C, (-22 to 248°F)

Fit tolerance: Tolerance between shaft and hub 0.01 – 0.05 mm

Speeds:
Up to 10000 rpm

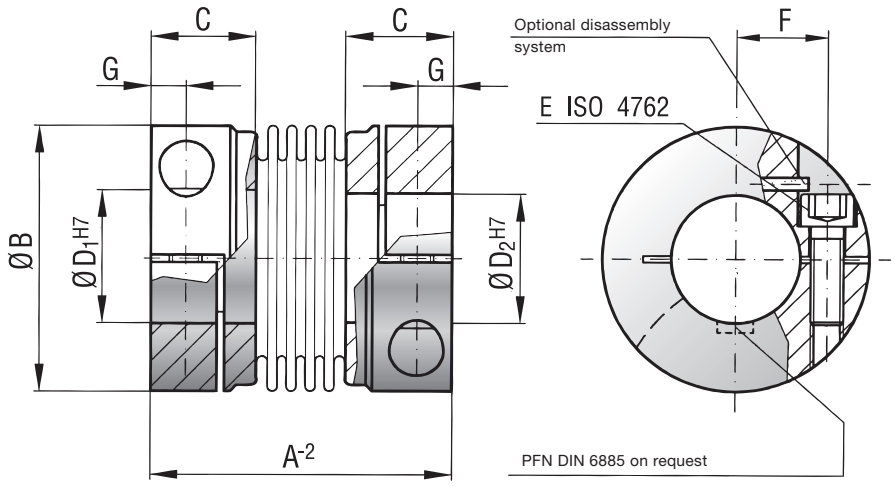
Non-standard applications:
Custom designs with different tolerances, keyways, non-standard material, bellows are available at short notice.

EC2 – Bellows coupling

			Series												
			2	4.5	10	15	30	60	80	150		300		500	
Length options see ordering code			A	A	A	A	A	A	A	A	B	A	B	A	B
Rated torque	T_{KN}	Nm	2	4.5	10	15	30	60	80	150		300		500	
		in.lb	18	40	89	133	266	531	708	1328		2655		4425	
Overall length	A	mm	30	40	44	58	68	79	92	92		109		114	
Outer diameter	B	mm	25	32	40	49	56	66	82	82		110		123	
Fit length	C	mm	10.5	13	13	21.5	26	28	32.5	32.5		41		42.5	
Inner diameter from Ø to Ø H7	D_1/D_2	mm	4–12.7	6–16	6–24	8–28	12–32	14–35	16–42	19–42		24–60		35–62	
Fastening screws to ISO 4762	E		M3	M4	M4	M5	M6	M8	M10	M10		M12		M16	
Tightening torque of fastening screw	E	Nm	2.3	4	4.5	8	15	40	70	85		120		200	
		in.lb	21	36	40	71	133	354	620	753		1062		1770	
Distance between centers	F	mm	8	11	14	17	20	23	27	27		39		41	
Distance	G	mm	4	5	5	6.5	7.5	9.5	11	11		13		17	
Moment of inertia	J	10^{-3} kgm²	0.002	0.007	0.016	0.065	0.12	0.3	0.75	1.8	0.8	7.5	3.8	11.7	4.9
		10^{-3} in.lb.s²	0.0018	0.0062	0.0142	0.0575	0.1062	0.2655	0.6638	1.59	0.71	6.64	3.36	10.36	4.34
Hub material			Al	Al	Al	Al	Al	Al	Al	Steel	Al	Steel	Al	Steel	Al
Approx. weight		kg	0.02	0.05	0.06	0.16	0.25	0.4	0.7	1.7	0.75	3.8	1.6	4.9	2.1
		lb	0.044	0.110	0.132	0.353	0.551	0.882	1.54	3.75	1.65	8.38	3.53	10.80	4.63
Torsional rigidity	C_T	10^3 Nm/rad	1.5	7	9	23	31	72	80	141		157		290	
Axial misalignment 	*max. values*	mm	0.5	1	1	1	1	1.5	2	2		2		2.5	
Lateral misalignment 	*max. values*	mm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		0.2		0.2	
Axial spring stiffness	C_a	N/mm	8	35	30	30	50	67	44	77		112		72	
Lateral spring stiffness	C_r	N/mm	50	350	320	315	366	679	590	960		2940		1450	

Max. angular misalignment 1°

Bellows coupling EC2
With clamping hub



Bellows coupling for direct drives

Material:
Bellows made of highly flexible stainless steel. Hub material: see table below.

Design:
With clamping hubs and a single lateral screw to ISO 4762.

Temperature range: -30 to +100°C (-22 to 212°F)

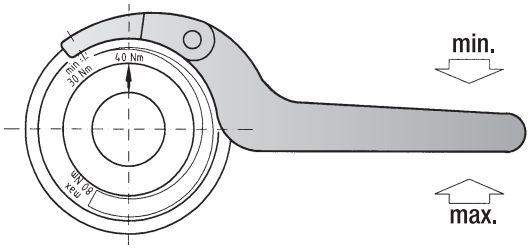
Backlash:
Completely backlash-free as a result of the frictional clamp connection.

Service life:
These torque limiters are permanent and maintenance-free as long as the performance limits are not exceeded.

Fit tolerance: Tolerance between shaft and hub 0.01 – 0.05 mm

Optional self-opening clamp system:
For expanding the bore hole during assembly or dismantling.

Torque adjusting wrench for DIN 1816 nuts

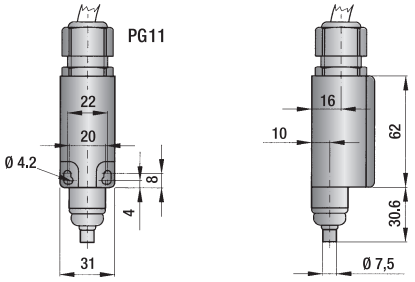


Smaller coupling sizes do not require a torque adjusting wrench. The adjusting nuts for the 1.5 / 2 / 4.5 / 10 series can be adjusted with a bolt or pin.

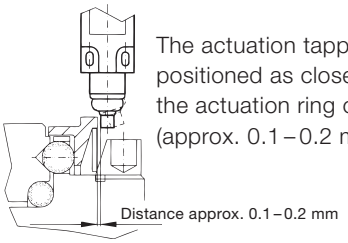
Series			Torque adjusting wrench
15			AC 20022992
20/30	40/60	80/150	AC 20022993
200			AC 20022994
300			AC 20022995
500			AC 20022996
800	1500	2500	AC 20022997

Mechanical limit switch (emergency cut-off)

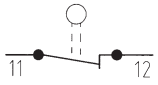
Dimension drawings



Important:
Always carry out a 100 % test of the switch function after assembly.



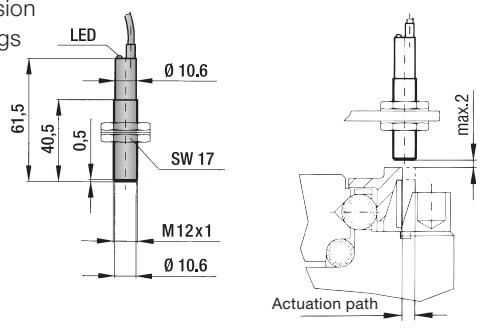
The actuation tappet should be positioned as close as possible to the actuation ring of the torque limiter (approx. 0.1 – 0.2 mm).

Technical data	
Max. voltage:	500 V AC
Max. constant current:	10 A
Degree of protection:	IP 65
Contact type:	NC contact (positive opening)
Ambient temperature:	-30 to +80 ‹C
Actuation:	Tappet (metal)
Circuit symbol:	

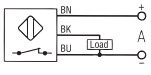
The mechanical limit switch is suitable for size 30 and above.

Proximity switch (emergency cut-off)

Dimension drawings



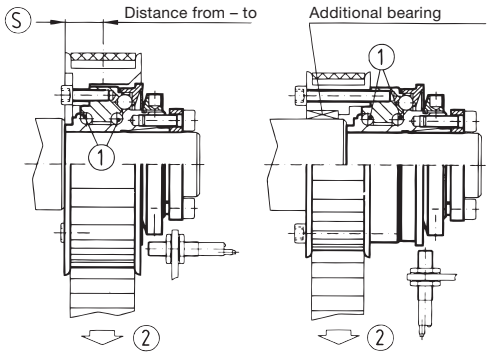
Important:
Always carry out a 100 % test of the switch function after assembly.

Technical data	
Voltage range:	10 to 30 V DC
Max. output current:	200 mA
Max. switching frequency:	800 Hz
Temperature range:	-25 to +70 °C
Degree of protection:	IP 67
Switch type:	PNP NC contact
Detection gap:	max. 2 mm
Circuit symbol:	

Assembly instructions for low backlash **torque limiters**

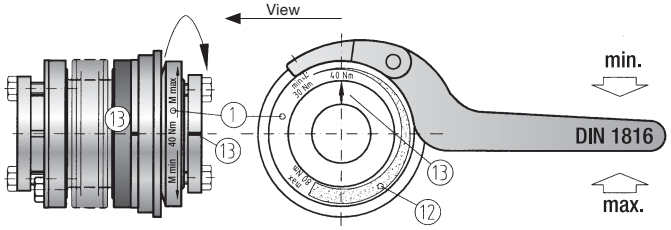
For the TL 1 – TL 3 models, the fit tolerance between the shaft and hub must be between 0.01 and 0.05 mm. Ensure that the coupling hub mounts smoothly on the shaft prior to assembly. Lightly oil the shaft prior to assembly. Do not use oils or grease with sliding additives (for example, MoS_2). Any keyways in the shaft will not affect the functioning of the clamp connection.

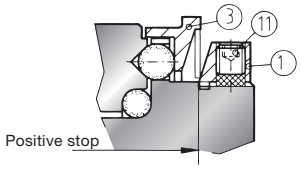
Model TL1 has an integrated **bearing (1)** for the attached component (for example, a pulley or sprocket wheel). Do not exceed the **maximum radial force (2)**, (see table). By centering the load between the **dimension (S)**, sufficient force is applied between the two balls and no separate bearings are required. Additional bearings are required for offset mounting. This is recommended, for example, if the attached component has a very small diameter or a very large width. Ball bearings, needle bearings or bushings can be used depending on the installation situation.



Series	1.5	2	4.5	10	15	30	60	150	200	300	500	800	1500	2500
Max. radial load capacity (N)	50	100	200	500	1400	1800	2300	3000	3500	4500	5600	8000	12000	20000
(S) from – to	3–6	5–8	5–11	6–14	7–17	10–24	10–24	12–24	12–26	12–28	16–38	16–42	20–50	28–60

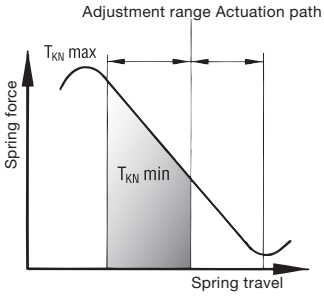
Adjustment of the disengagement torque





① Adjustment nut
⑪ Locking screw
③ Steel actuation ring
⑫ Adjustment range
⑬ Marking

WITTENSTEIN alpha torque limiters are factory adjusted to the specified disengagement torque, which is marked on the coupling. The adjustment range (min./max.) is indicated on the **adjustment nut (1)**. The customer can adjust the disengagement torque infinitely within the **adjustment range (12)** by varying the pretension of the disc springs. The adjustment range must not be exceeded during the adjustment process. After loosening the **lock screw (11)**, the disengagement torque can be adjusted using a suitable tool, e.g. a torque adjusting wrench to DIN 1816. The three locking screws (11) should then be tightened again.



Important!

WITTENSTEIN alpha torque limiters incorporate disc springs with special spring characteristics. Never exceed the max./min. range of the disengagement torque, which is located along the downward slope of this characteristic curve.