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

www.rack-pinion.com

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.

For further informations please visit our website: **www.rack-pinion.com**

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

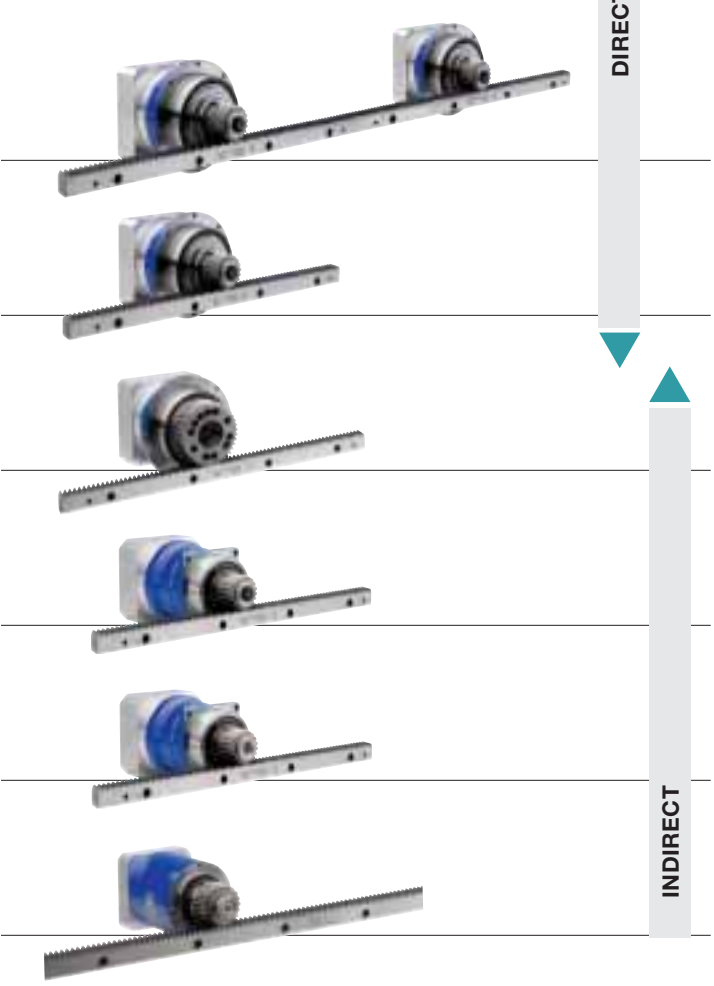
Profile machining centers
Source: Handtmann A-Punkt Automation GmbH

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

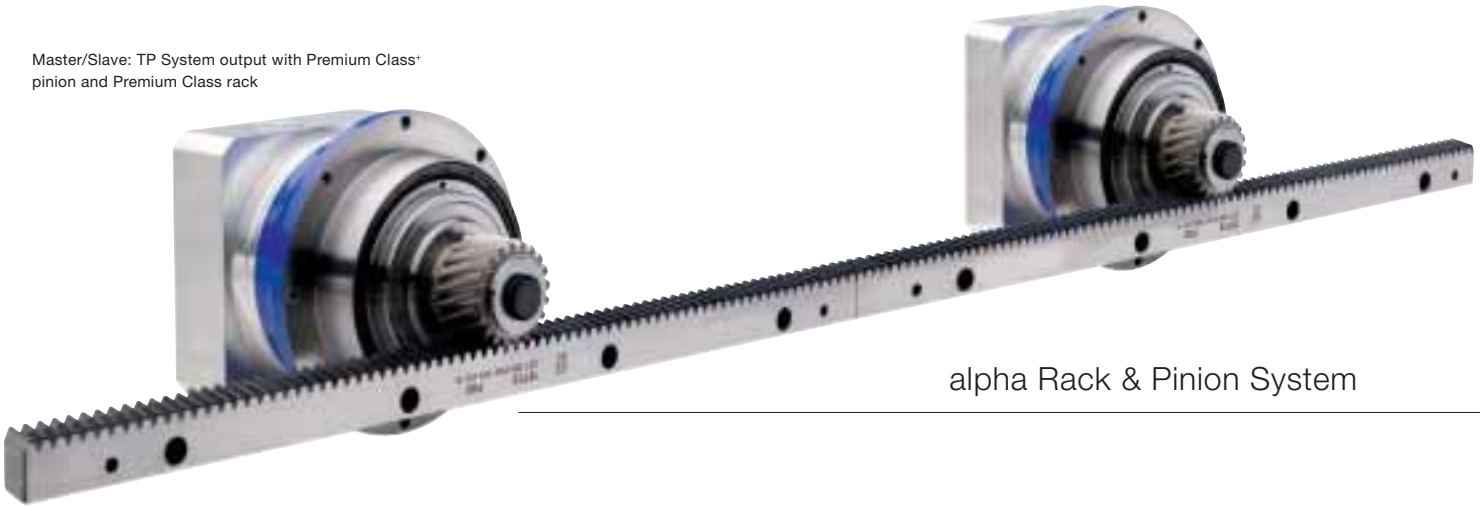
Gas cutting machines
Source: LIND GmbH Industrial Equipment

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

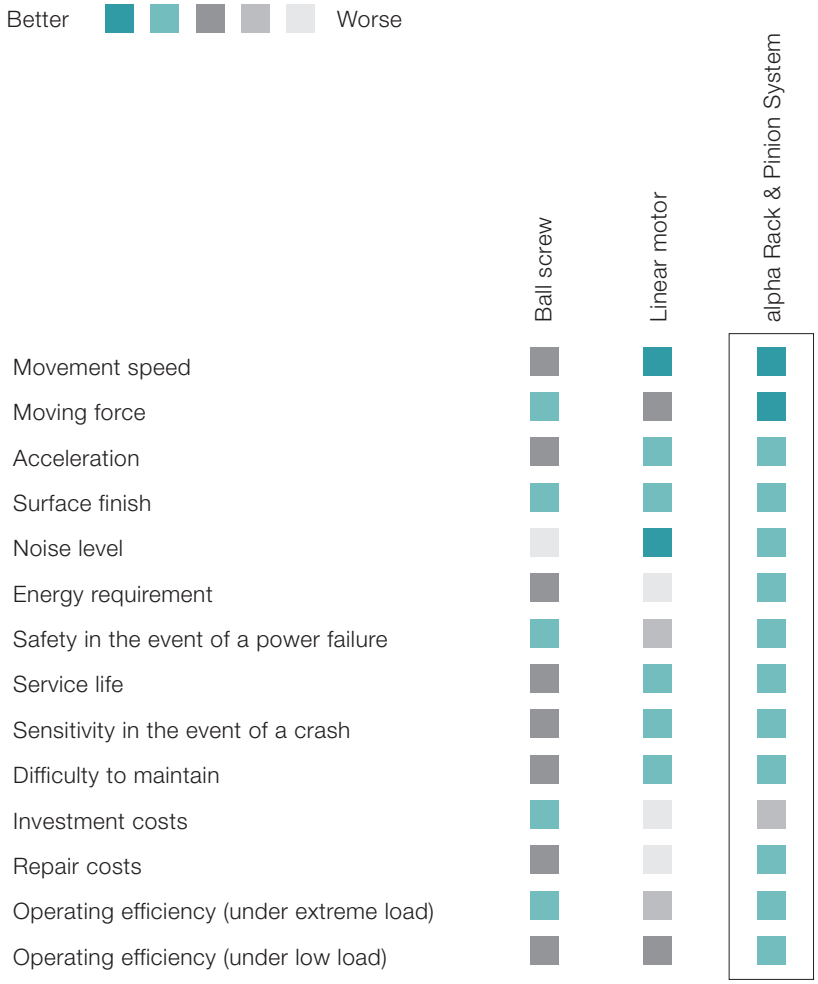
- New drive solutions with unique true running accuracy.
- Maximum positioning accuracy due to precision alignment of components.

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.

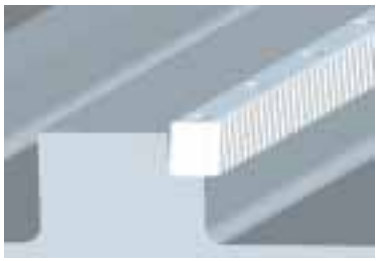
For greater precision: linear and gantry sorting possible.
Contact us!

Economy System

Value Class

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

Standard installation concept: permanent connection to mounting edge



Smart System

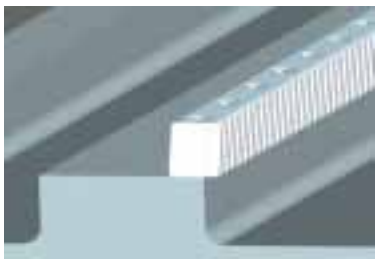
New feature: free connection option

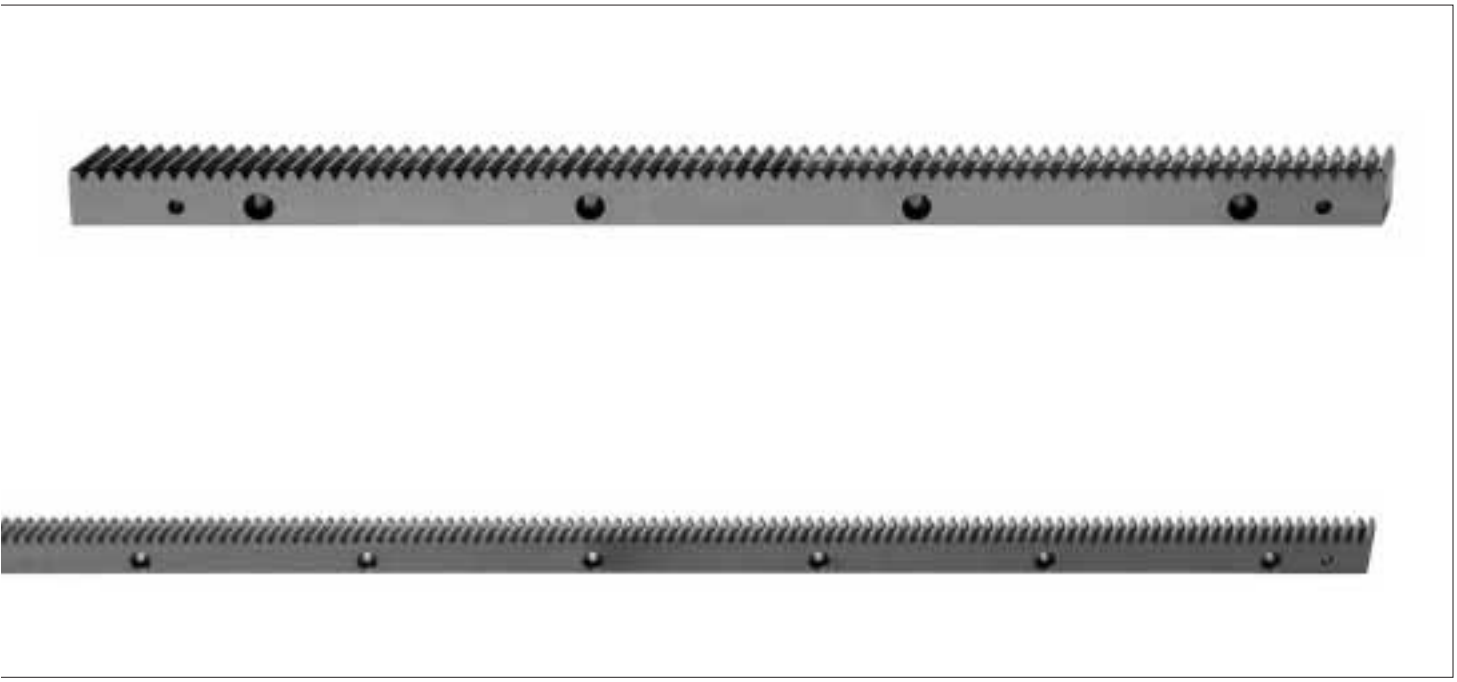
Smart Class

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 (500 mm) 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

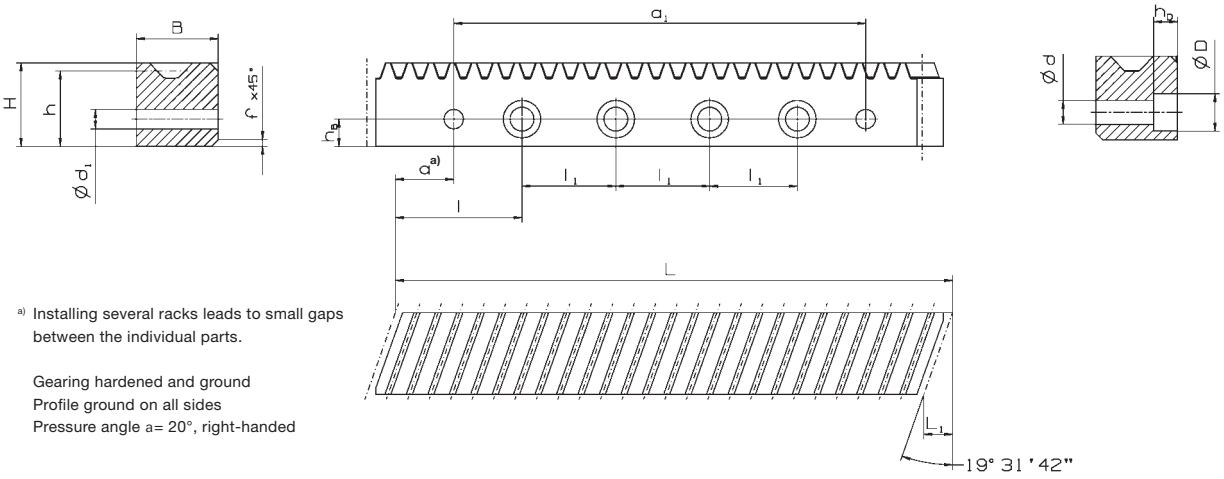
Smart Class rack

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}

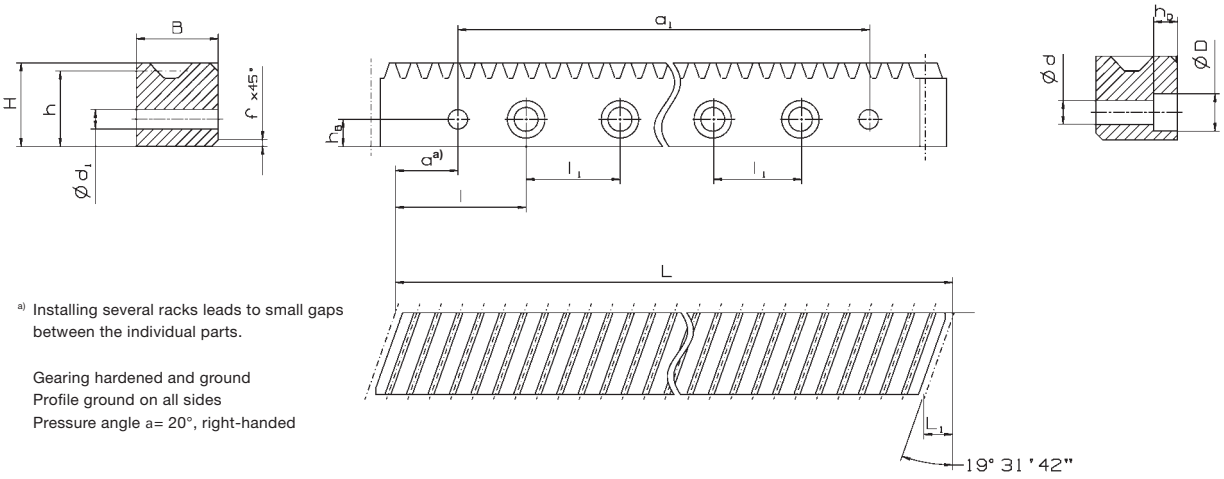
p_t = Reference pitch circle
z = Number of teeth
m = Module

Please refer to the operating instructions available at **www.wittenstein-alpha.de/en/** for instructions on assembly and design of the machine bed



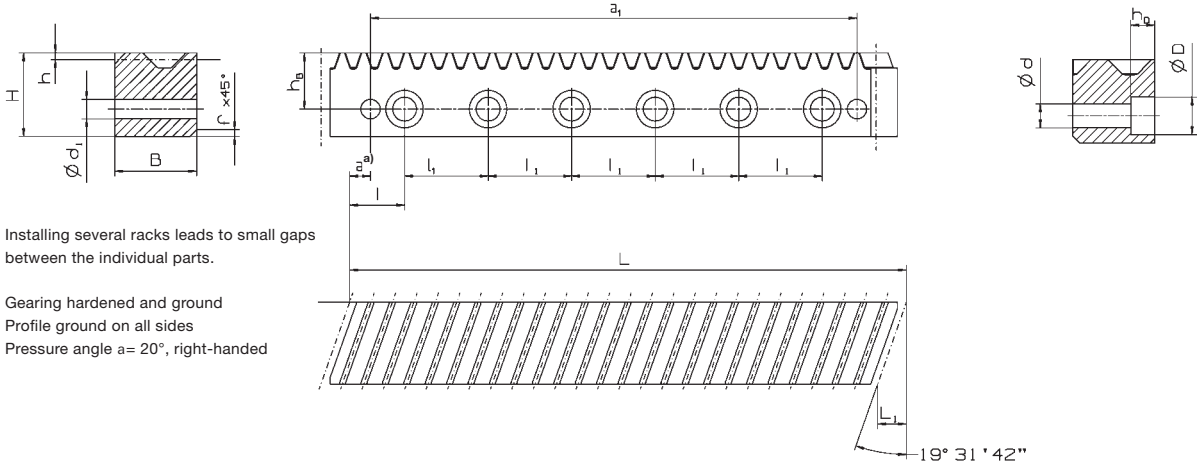
a) Installing several racks leads to small gaps between the individual parts.

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**

(all pinions, pressure angle α=20°, inclination angle β=19,5283° left-handed)

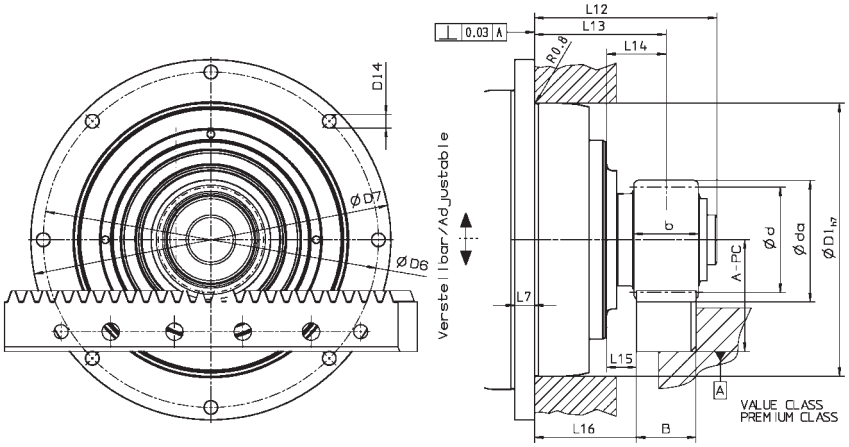
TP System output	Module	z	A-PC ±0.3 a)	b	B	d_a	d	x	$D1_{h7}$	D6	D7	D14	L7	L12	L13	L14	L15	L16
TP+ 010 (MA, MF)	2	20	44.0	26	24	48.3	42.441	0.4	90	109	118	5.5	7	71.0	50.5	20.5	8.5	38.5
TP+ 025 (MA, MF)	2	20	44.0	26	24	48.3	42.441	0.4	110	135	145	5.5	8	73.5	53.0	24.0	12.0	41.0
	2	40	64.4	26	24	89.2	84.883	0						73.5	53.0	24.0	12.0	41.0
	3	20	59.0	31	29	72.3	63.662	0.4						76.0	52.5	23.5	9.0	38.0
TP+ 050 (MA, MF)	2	40	64.4	26	24	89.2	84.883	0	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	0.4						89.5	66.0	28.0	13.5	51.5
	3	34	80.1	31	29	114.5	108.226	0						90.5	66.0	28.0	13.5	51.5
	4	20	78.2	41	39	94.8	84.882	0.2						97.0	67.5	29.5	10.0	48.0
TP+ 110 (MA, MF)	3	34	80.1	31	29	114.5	108.226	0	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	0.2						112.5	83.0	33.0	13.5	63.5
	4	30	98.7	41	39	135.6	127.324	0						112.5	83.0	33.0	13.5	63.5
	5	19	86.4	51	49	115.1	100.798	0.4						120.0	85.0	35.0	10.5	60.5
TP+ 300 (MA, MF)	4	30	98.7	41	39	135.6	127.324	0	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	0.4						139.0	104.0	38.0	13.5	79.5
	5	30	113.6	51	49	169.4	159.155	0						135.0	104.0	38.0	13.5	79.5
	6	19	105.9	61	59	138.0	120.958	0.4						142.5	106.0	40.0	10.5	76.5
TP+ 500 (MA, MF)	5	30	113.6	51	49	169.4	159.155	0	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	0.4						155.0	118.5	43.5	14.0	89.0
	6	28	132.1	61	59	190.5	178.254	0						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 = Partial circle diameter
x = Profile correction

MA = HIGH TORQUE
MF = Standard



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 = 20**	**i = 22**	**i = 20**	**i = 22**	**i = 20**	**i = 22**	
TP+ 300	4	30	22000 (4950)	22000 (4950)	1401 (12399)	1401 (12399)	70 (46)	54 (36)	3.9 (8.7)
	5	19	31000 (6975)	32000 (7200)	1562 (13824)	1646 (14568)	55 (36)	43 (29)	3.1 (6.9)
	5	30	30300 (6818)	30800 (6930)	2411 (21338)	2501 (22136)	88 (58)	68 (45)	10.4 (23)
	6	19	30500 (6863)	30800 (6930)	1845 (16329)	1901 (16825)	67 (44)	51 (34)	5.8 (12.9)
TP+ 500	5	30	34000 (7650)	34000 (7650)	2706 (23949)	2706 (23949)	88 (58)	68 (45)	10.4 (23)
	6	19	41000 (9225)	41600 (9360)	2480 (21948)	2570 (22747)	67 (44)	51 (34)	5.8 (12.9)
	6	28	41000 (9225)	41000 (9225)	3654 (32338)	3654 (32338)	98 (64)	76 (50)	14.5 (32.1)

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

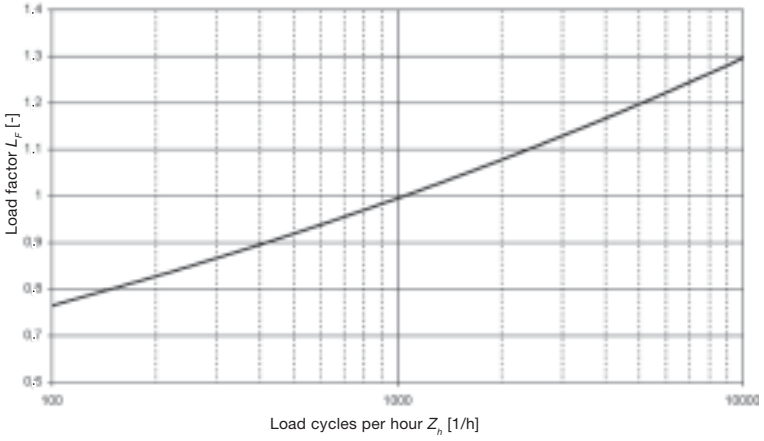
F_{2T} = Max. moving force
T_{2B} = Max. acceleration torque

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**

(all pinions, pressure angle α=20°, inclination angle β=19,5283° left-handed)

TP output	Module	z	A-PC ±0,3 [b]	A-SC ±0,3 [b]	b	B	d_a	d	x	$D5_{h7}$	D6	D7	D14	L4	L5	L7	L12	L16
TP+/TK+ 004	2	26	50.4	41.9	26	24	60.7	55.173	0.4	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	0.3	90	109	118	5.5	40	11	7	8.3	41
	2	33	57.6	49.1	26	24	75.1	70.028	0.3	90	109	118	5.5	30	11	7	8.3	31
	2	37	61.9	53.4	26	24	83.6	78.516	0.3	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	0.3	110	135	145	5.5	39	10	8	8.6	40
	2	40 [c]	65.0	56.5	26	24	90.0	84.882	0.3	110	135	145	5.5	29	10	8	8.6	30
	2	45	70.2	61.7	26	24	100.2	95.493	0.22	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	0.3	140	168	179	6.6	51	14.5	10	11.3	52
	3	35 [c]	82.6	73.1	31	29	119.1	111.409	0.3	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	0.3	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	0.25	200	233	247	9	50	17.5	12	14.5	51
	4	40 [d]	119.9	108.9	41	39	177.9	169.766	0	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	0.285	255	280	300	13.5	91	20	18	20	92
TP+ 500	6	31 [a]	143.4	–	61	59	212.8	197.352	0.295	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

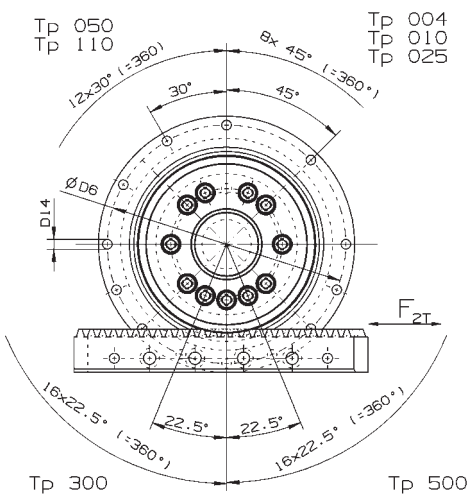
[d] only in combination with TP+ HIGH TORQUE

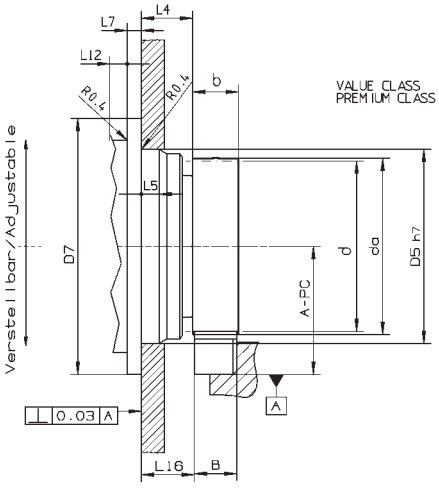
z = Number of teeth

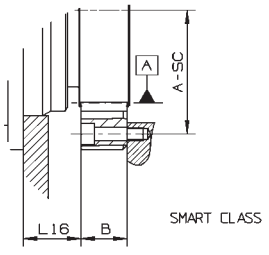
d_a = Tip diameter

d = Partial circle diameter

x = Profile correction







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 = 20**		**i = 22**		**i = 20**		**i = 22**		**i = 20**	**i = 22**	
TP+ 300	5	32 [a]	28300 (6368)	–	28300 (6368)	–	2402 (21258)	–	2402 (21258)	–	93 (61)	72 (48)	6.47 (14.30)
TP+ 500	6	31	36400 (8190)	–	–	–	3592 (31790)	–	–	–	108 (71)	–	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

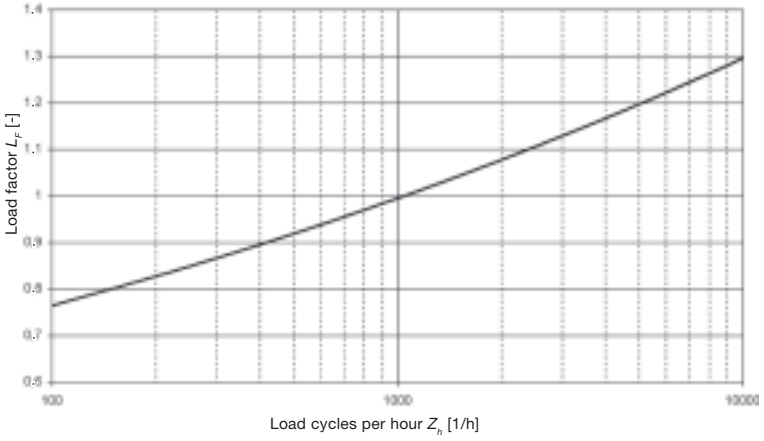
F_{2T} = Max. moving force
T_{2B} = Max. acceleration torque
SC = Smart Class
PC = Premium Class

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**

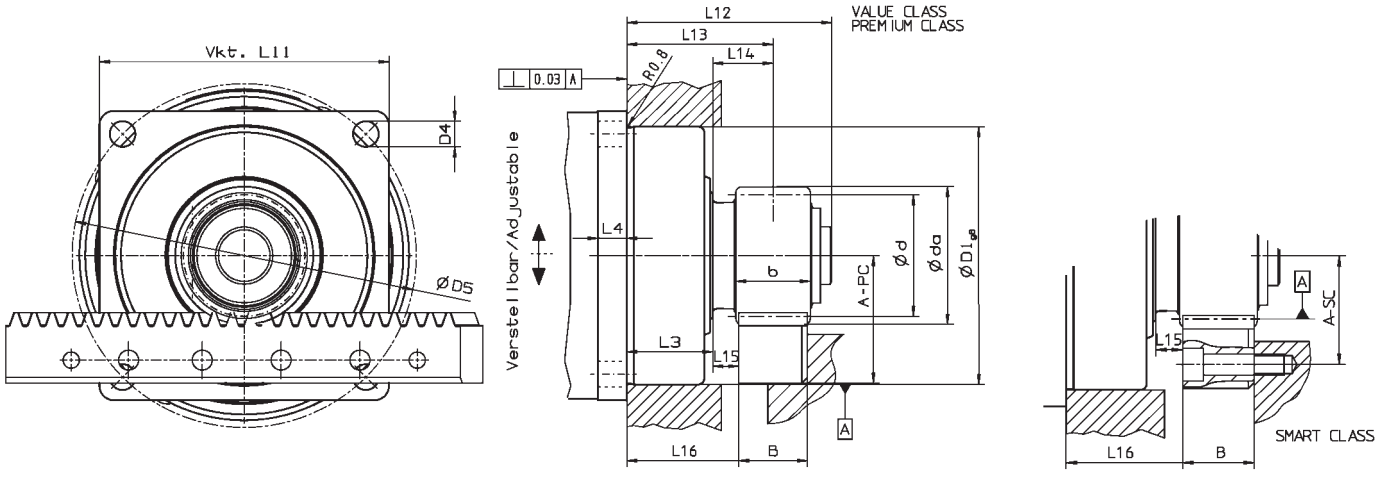
(all pinions, pressure angle α=20°, inclination angle β=19,5283° left-handed)

SP system output	Module	z	A-PC ±0,3[a]	A-SC ±0,3[a]	b	B	d_a	d	x	$D1_{g6}$	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	0.4	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	0.4	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	0							71.0	51.0	21.0	9	39
	3	20	59.0	49.5	31	29	72.3	63.662	0.4							73.5	54.0	24.0	9.5	39.5
SP⁺ 140	**2**	40	64.4	55.9	26	24	89.2	84.883	0	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	0.4							77.5	54.0	24.0	9.5	39.5
	3	34	80.1	70.6	31	29	114.5	108.226	0							77.0	54.0	24.0	9.5	39.5
	4	20	78.2	67.2	41	39	94.8	84.882	0.2							83.5	59.0	29.0	9.5	39.5
SP⁺ 180	**3**	34	80.1	70.6	31	29	114.5	108.226	0	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	0.2							88.5	59.0	29.0	9.5	39.5
	4	30	98.7	87.7	41	39	135.6	127.324	0							87.0	59.0	29.0	9.5	39.5
	5	19	86.4	–	51	49	115.1	100.798	0.4							94.5	64.5	34.5	10	40
SP⁺ 210	**4**	30	98.7	87.7	41	39	135.6	127.324	0	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	0.4							107.4	72.4	34.5	10	47.9
	5	30	113.6	–	51	49	169.4	159.155	0							105.9	72.4	34.5	10	47.9
	6	19	105.9	–	61	59	138.0	120.958	0.4							113.4	77.9	40.0	10.5	48.4
SP⁺ 240	**5**	30	113.6	–	51	49	169.4	159.155	0	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	0.4							120.9	80.9	41.0	11.5	51.4
	6	28	132.1	_	61	59	190.5	178.254	0							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 = Partial circle diameter
x = Profile correction



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)

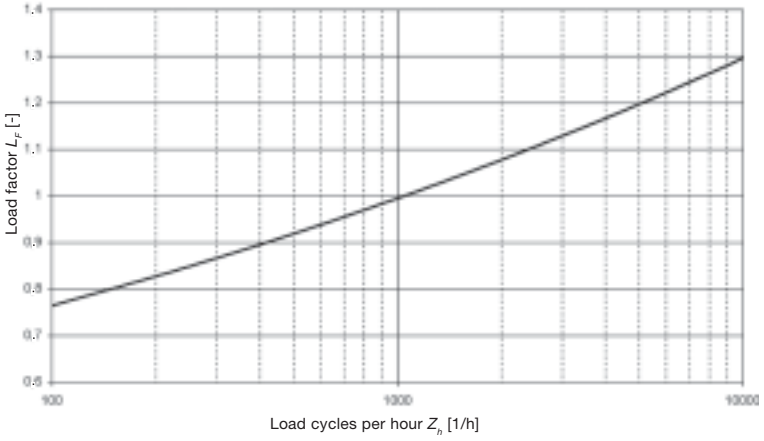
Technical data based on 1000 load cycles per hour.
More combinations possible with cymex®

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**

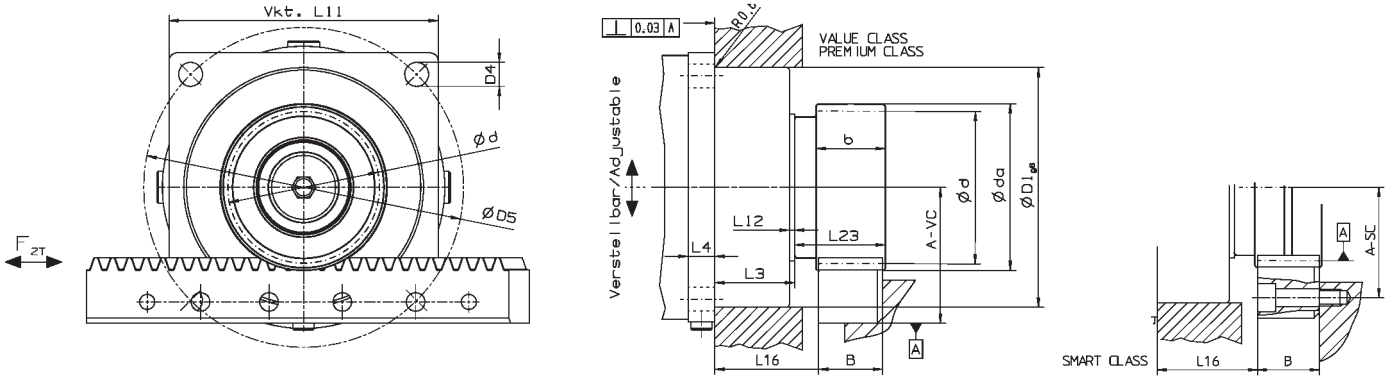
(all pinions, pressure angle α=20°, inclination angle β=19,5283° left-handed)

Output with SP involute toothing DIN5480	Module	z	A-VC ±0.3 [a]	A-SC ±0.3 [a]	b	B	d_a	d	x	$D1_{g6}$	D4	D5	L3	L4	L11 ± 1	L12	L16	L23
SP+/ SK+ 060	2	15	38.9	30.4	26	24	37.8	31.831	0.5	60	5.5	68	20	6	62	2	27	32
	2	16	40.0	31.5	26	24	40.0	33.953	0.5	60	5.5	68	20	6	62	2	27	32
	2	18	41.9	33.4	26	24	43.8	38.197	0.4	60	5.5	68	20	6	62	2	27	32
SP+/SK+/ SPK+ 075 VDS 050	2	18	41.9	33.4	26	24	43.8	38.197	0.4	70	6.6	85	20	7	76	2.5	28	33
	2	20	44.0	35.5	26	24	48.1	42.441	0.4	70	6.6	85	20	7	76	2.5	28	33
	2	22	46.1	37.6	26	24	52.3	46.686	0.4	70	6.6	85	20	7	76	2.5	28	33
SP+/SK+/ SPK+ 100 VDS 063	2	23	47.2	38.7	26	24	54.4	48.808	0.4	90	9	120	30	10	101	3	39	34
	2	25	49.3	40.8	26	24	58.6	53.052	0.4	90	9	120	30	10	101	3	39	34
	2	27	51.2	42.7	26	24	62.5	57.296	0.3	90	9	120	30	10	101	3	39	34
SP+/SK+/ SPK+ 140 VDS 080	3	20	59.0	49.5	31	29	71.7	63.662	0.4	130	11	165	30	12	141	3	51	51
	3	22	62.2	52.7	31	29	78.3	70.028	0.4	130	11	165	30	12	141	3	51	51
	3	24	65.4	55.9	31	29	84.7	76.394	0.4	130	11	165	30	12	141	3	51	51
SP+/SK+/ SPK+ 180 VDS 100	4	20	79.0	68.0	41	39	96.1	84.883	0.4	160	13.5	215	30	15	182	3	44	54
SP+ 210	4	25	89.4	78.4	41	39	116.8	106.103	0.34	180	17	250	38	17	215	3	63	65
SP+ 240	5	24	99.4	–	51	49	140.8	127.324	0.35	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 = Partial circle diameter
x = Profile correction



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)

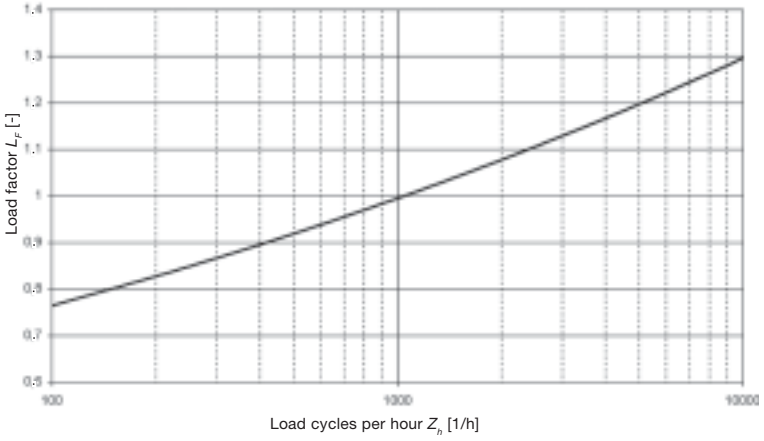
Technical data based on 1000 load cycles per hour.
More combinations possible with cymex®

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**

(all pinions, pressure angle α=20°, inclination angle β=19,5283° left-handed)

Key output	Module	z	A-VC ±0.3 a)	A-SC ±0.3 a)	b	B	d_a	d	x	$D1_{g6}$	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	0.4	60	5.5	68	0	20	6	62	54	39	19	7	27
SP+/SK+/ SPK+ 075 VDS 050	**2**	22	45.7	37.2	26	24	51.4	46.686	0.2	70	6.6	85	40	20	7	76	62	40	20	8	28
SP+/SK+/ SPK+ 100 VDS 063	**2**	26	49.6	41.1	26	24	59.1	55.174	0	90	9	120	45	30	10	101	95.5	51	21	9	39
SP+/SK+/ SPK+ 140 VDS 080	**3**	24	64.2	54.7	31	29	82.3	76.395	0	130	11	165	58	30	12	141	122	65.5	35.5	21	51

All dimensions in [mm]

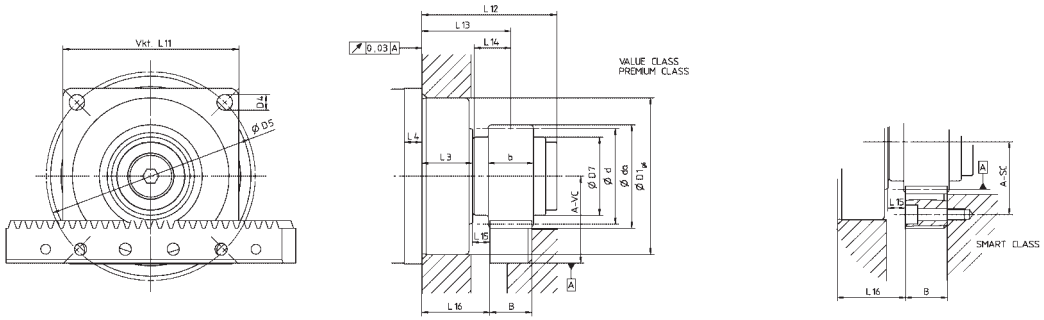
a) please contact us for precise dimensions; align mechanism recommended (alignment dimension ±0.3 mm)

z = Number of teeth

d_a = Tip diameter

d = Partial circle diameter

x = Profile correction



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

(all pinions, pressure angle α=20°, inclination angle β = 19,5283° left-handed)

Key output	Module	z	A-VC ±0.3 a)	A-SC ±0.3 a)	b	B	d_a	d	x	$D1_{h6}$	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	0.4	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	0.2	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	0	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	0	120	M10	140	58	8	107	50.5	35.5	21	36

All dimensions in [mm]

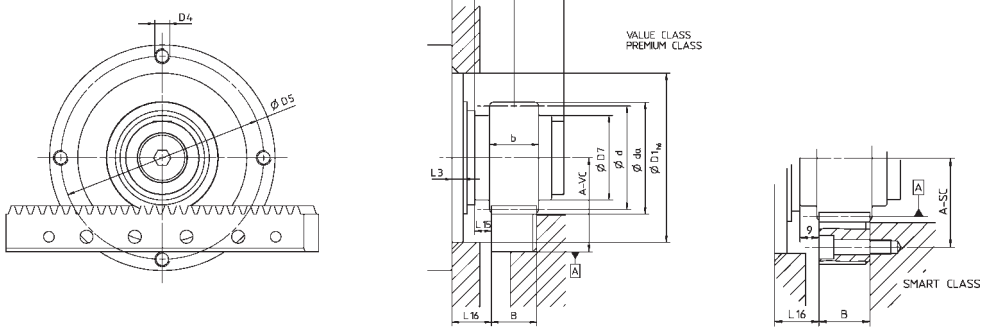
a) please contact us for precise dimensions; align mechanism recommended (alignment dimension ±0.3 mm)

z = Number of teeth

d_a = Tip diameter

d =Partial circle diameter

x = Profile correction



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)

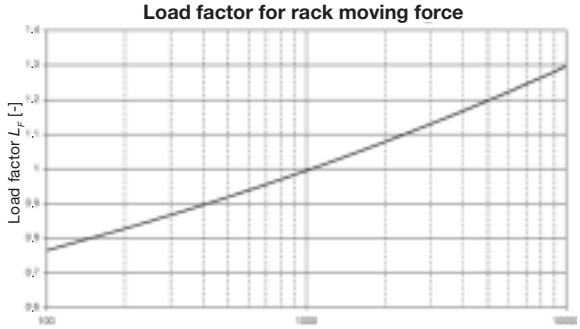
Technical data based on 1000 load cycles per hour.
More combinations possible with cymex®

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)

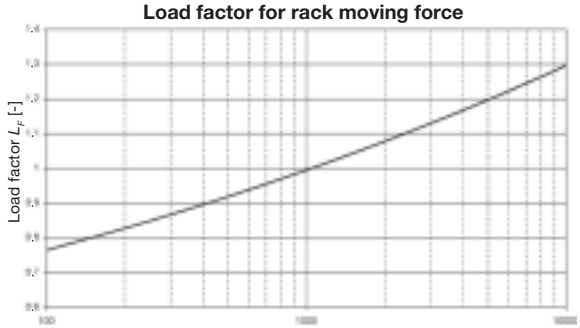
Technical data based on 1000 load cycles per hour.
More combinations possible with cymex®

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



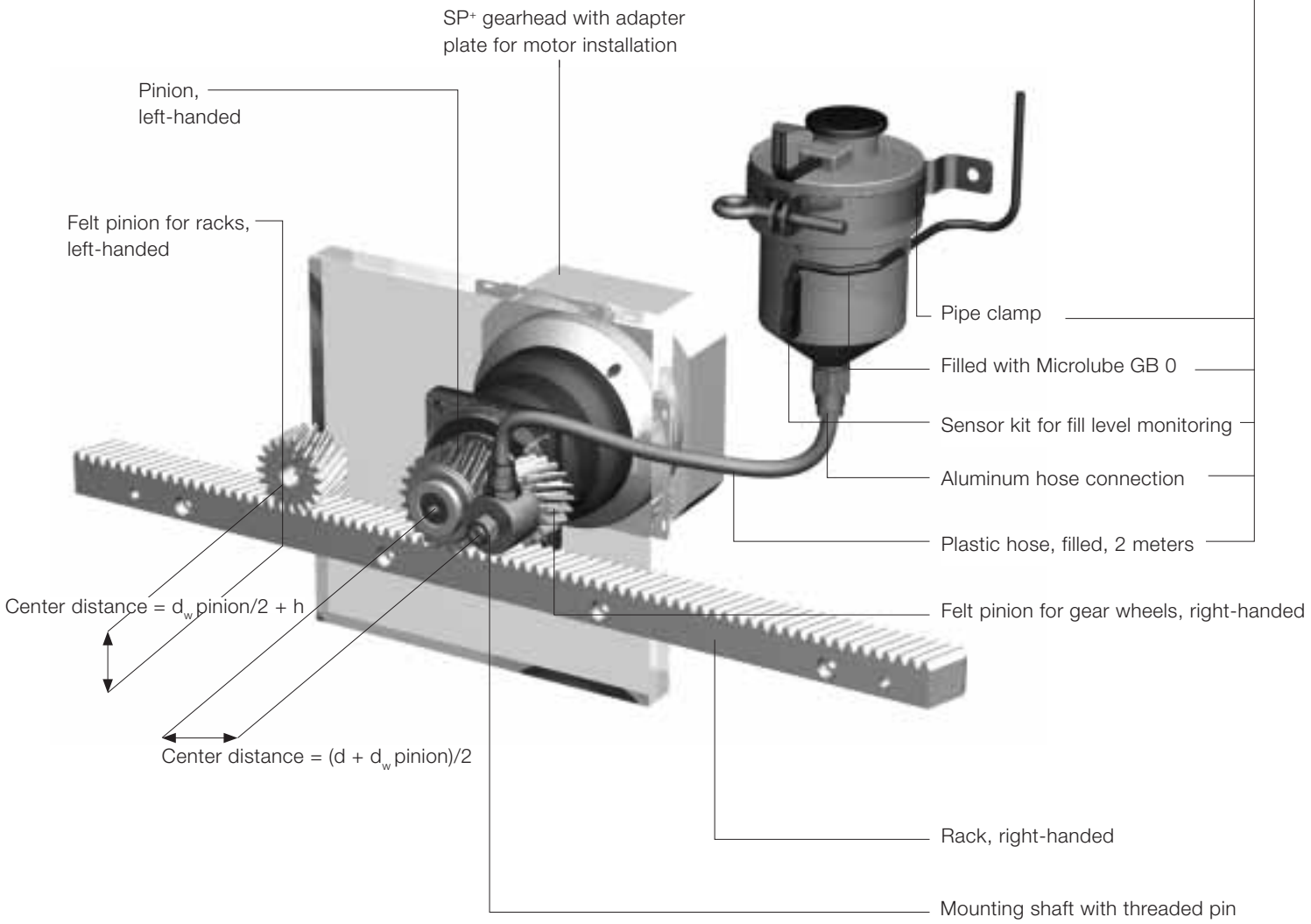
Perfect lubrication – **for a perfect system**

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 lubricator

Kit order number	Size
20021555	125
20022531	475

Complete lubrication system



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.

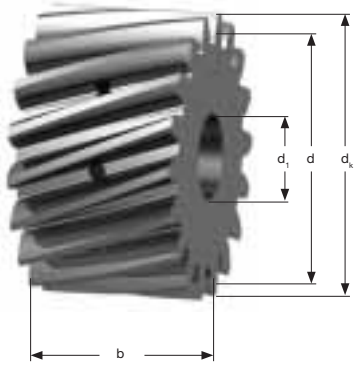
Felt pinion, helical-toothed

	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										

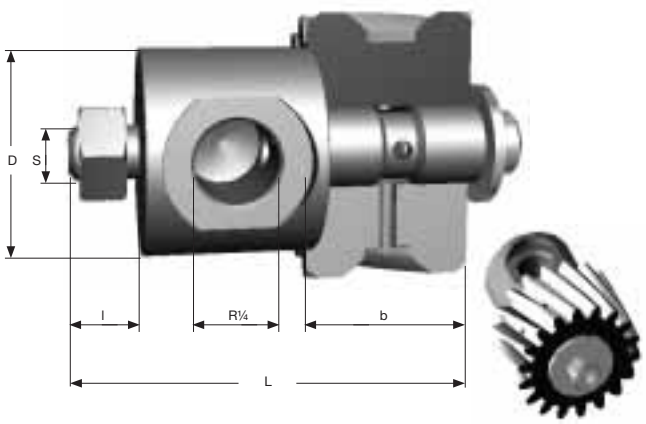
All dimensions in [mm]

B Felt pinion for pinions, right-handed RH

A Felt pinion for Racks, left-handed LH



C Fastening axis for felt pinions

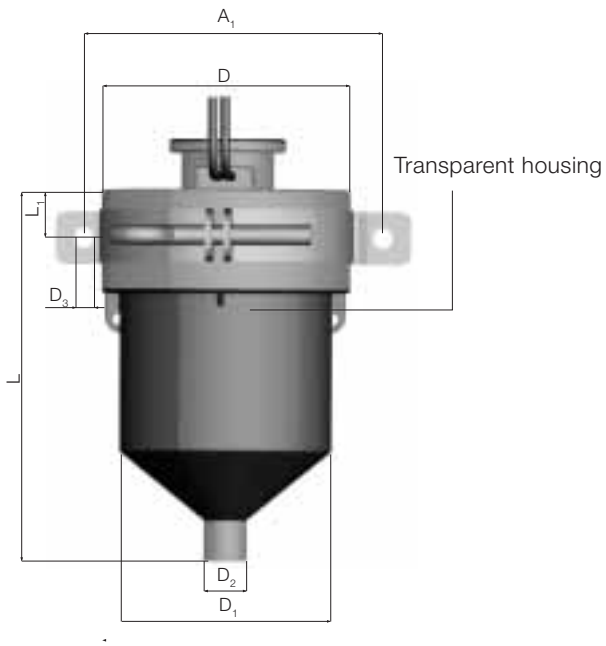


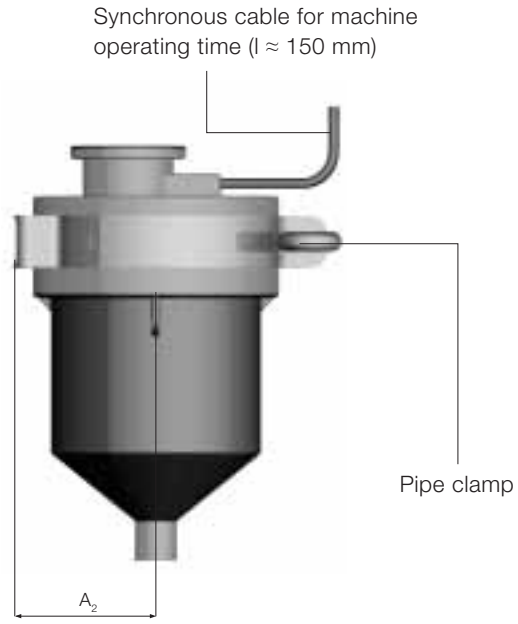
Dimensions of the lubricator

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

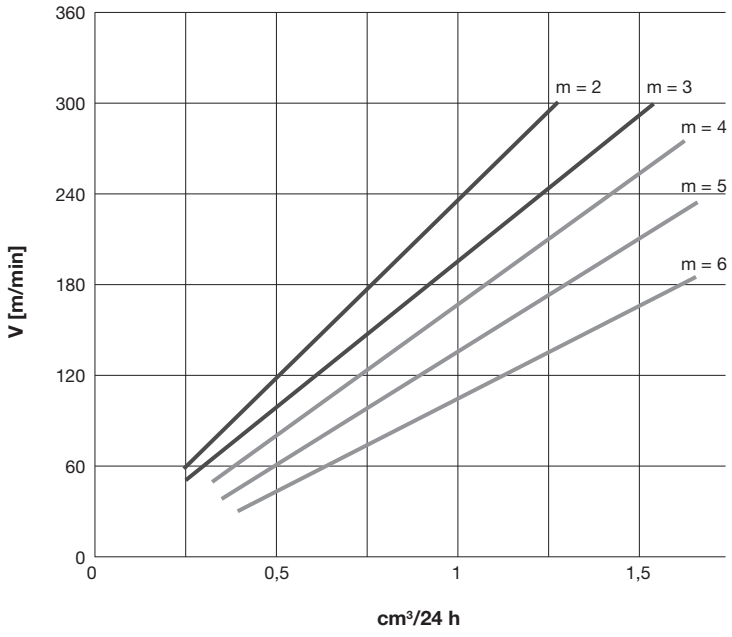
Lubricator type	125	475
Approx. capacity cm³	100	460
Connection thread	R ¼″	R ½″
Setting time	1, 2, 3, 6, 12 or 18 months	
Weight	370 g	1000 g
Pressure	0.2 to 3 bar	
Drive	2 x 1.5 V	4 x 1.5 V
Temperature range	10°C to 50°C	
Battery capacity	about 2000 mAh	about 4000 mAh
Battery consumption after 1 year	about 285 mAh	about 800 mAh
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		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