

alpha rack & pinion system

WITTENSTEIN alpha rack and pinion systems – the perfect symbiosis of state-of-the-art technology and many years of experience.

Our specialist knowledge extends from the coupling of gearhead, motor, pinion and rack to complete system solutions.

30 years of experience in the fields of gearhead construction, toothing technology and the design of complete drive systems go into our rack and pinion systems.

For more detailed information, please visit: www.rack-pinion.com

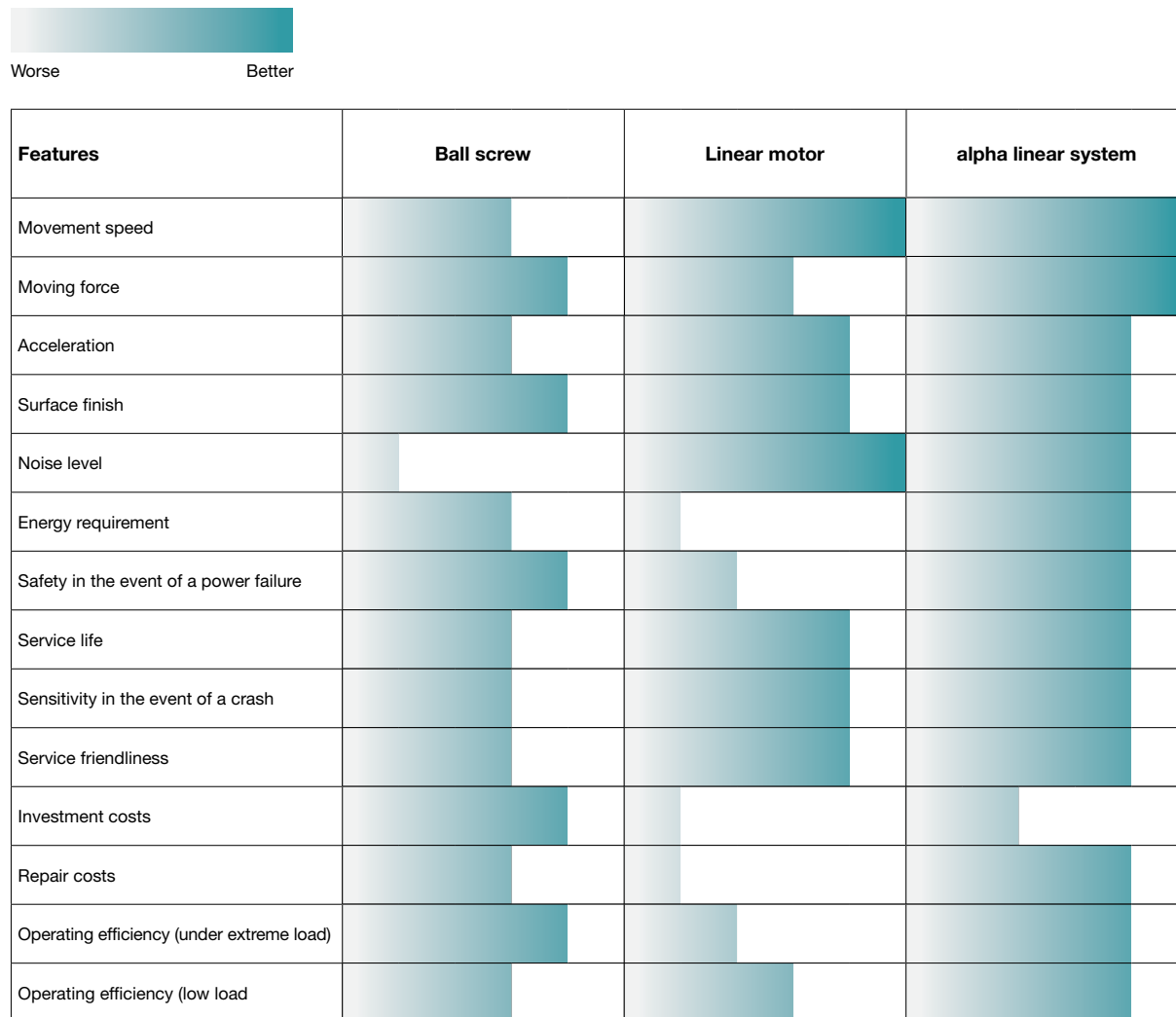


The alternative – not only for long distances

Rack and pinion combinations not only excel in applications involving long, precise movement paths. The 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 succeeded in opening up new areas of application for the old established system of gearhead, rack and pinion, while also setting new standards in terms of moving forces, power density and rigidity.

The alpha rack & pinion system in direct comparison with other linear systems



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



The alpha rack & pinion system compared



High Performance Linear System

Planetary gearhead RP+
High-performance pinion
High-performance rack

- Maximum degrees of freedom in design
- Cost reductions through downsizing
- Maximum power density
- Maximum precision in master/slave configuration
- Application e.g. for HSC milling machines or highly dynamic and precise handling applications

150% greater moving force*
100% higher power density*
50% higher system reliability*
50% less mounting effort*
15% more accurate positioning*

* Compared to industry standard

You can download the system catalog from
www.rack-pinion.com



Precision System

Planetary gearhead TP+
Premium Class+/
Premium Class RTP pinion
Premium Class rack

- Maximum positioning accuracy with single drive
- Cost reductions through omission of direct measuring systems possible
- Unsurpassed precision in master/slave configuration
- Applications e.g. for laser machines or milling machines



Performance Linear System

Planetary gearhead alpheno®
Premium Class+ pinion
Performance Class rack

- Maximum power output
- Added efficiency
- Compliance with the increased statutory requirements with regard to machine safety
- Maximum precision in master/slave configuration
- Application e.g. for updating existing wood, plastic/composite machining center designs or in automation

alpha rack and pinion system

In addition to the standard planetary gearheads, the relevant servo right-angle gearheads are of course also available for our rack and pinion systems. The range is completed by the integrated motor/gearhead units TPM+ and RPM+ from WITTENSTEIN motion control.

Please refer to the further information on servo right-angle gearheads in this catalog. To the actuators under
www.wittenstein-motion-control.de



The system quick selection
is available on the next two
pages:



Standard System

Planetary gearhead SP+
Standard Class RSP pinion
Value Class rack

- Adapted to linear standard applications in the mid-range area with medium/normal requirements for positioning accuracy
- Application e.g. for wood, plastic/ composite machining centers and in automation

Economy System

Planetary gearhead LP+
Planetary gearhead SP+
Value Class pinion
Value Class rack

- Adapted to linear applications in the economy segment with comparatively low requirements for positioning accuracy and moving force
- Applications e.g. for wood processing machines or in automation

Master/slave configuration – electrically clamped drives

The closed-loop control clamped drives enable a machine accuracy* of up to $< 5 \mu\text{m}$ to be achieved. This is regardless of the moving force, movement speed or axis length! Here, maximum precision can only be achieved through the optimal interaction between the individual components. Such accuracy is only possible for a system supplier such as WITTENSTEIN alpha GmbH.

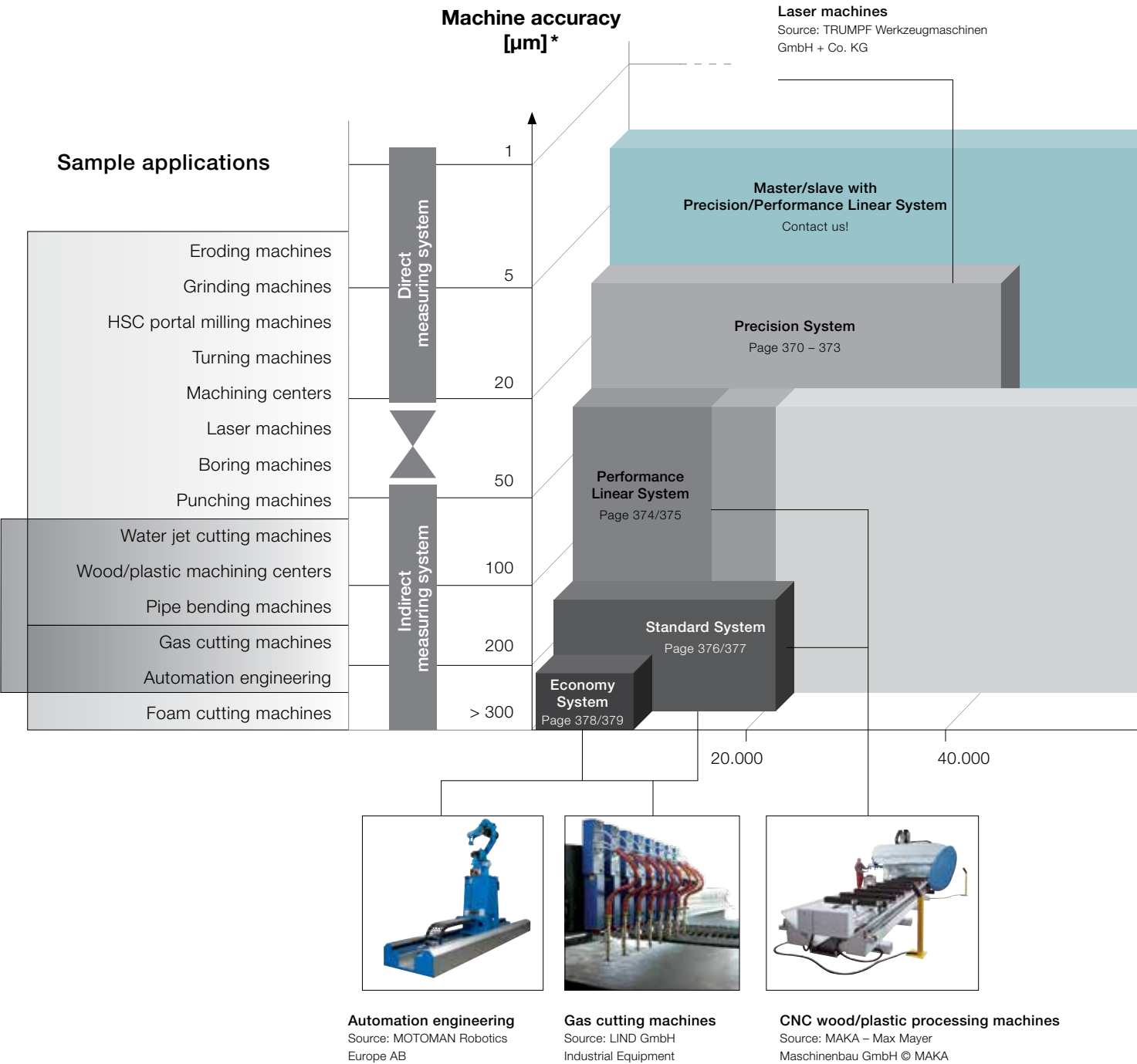
* depending on other parameters



Quick system selection – the right system for each application



Laser machines
Source: TRUMPF Werkzeugmaschinen GmbH + Co. KG





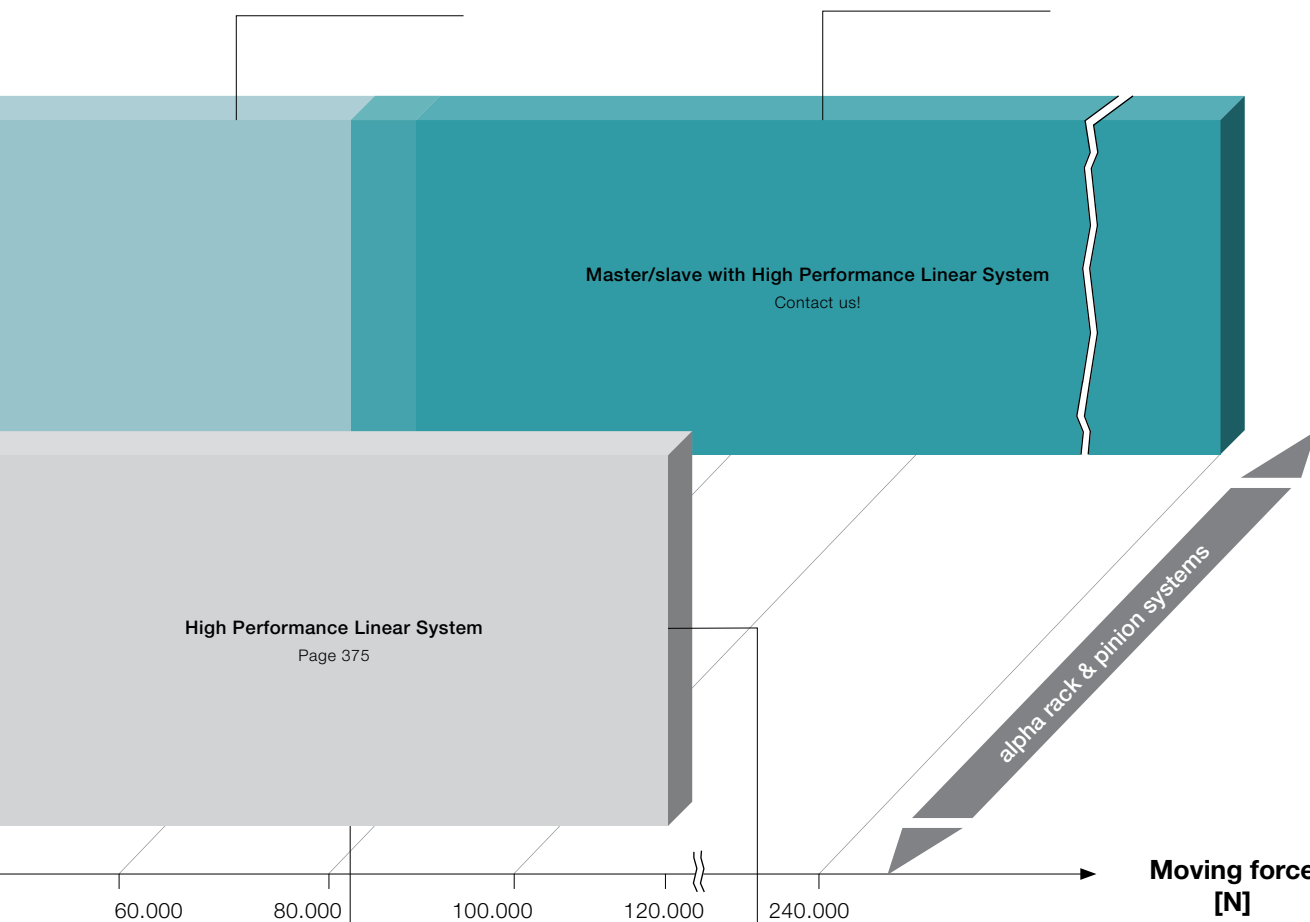
Profile machining centers

Source: Handtmann A-Punkt Automation GmbH



HSC portal milling machines

Source: F. Zimmermann GmbH



Pipe bending machines

Source: Wafios AG



Press transfer

Source: Strothmann
Machines & Handling GmbH

* depending on other parameters

Pinion versions for the system



Premium Class+ pinion

In conjunction with Precision and Performance Linear System

- High-precision and optimally designed toothing geometries for best possible power transmission, superior running and precision in application
- Innovative pinion/gearhead connection ensures:
 - Highest linear rigidity through the direct connection of pinions with small partial circle diameter
 - Maximum flexibility in pinion selection
 - Optimally dimensioned and rigid pinions
 - Compact drive design
- Factory assembled with marked high point
- In addition to our standard pinions for rack and pinion applications, we offer you further options for special applications, e.g. slew ring drives. Contact us!



Premium Class RTP pinion

In conjunction with Precision system

- High-precision and optimally designed toothing geometries for best possible power transmission, superior running and precision in application
- Adapted to the standard gearhead series with the proven TP+ output flange
- High movement speeds with low input speeds thanks to large pitch diameter
- Compact pinion/gearhead connection
- Factory assembled with marked high point



Standard Class RSP pinion

In conjunction with Standard system

- Precise toothing with optimally designed toothing geometry
- Positive involute connection between pinion and gearhead
- Compact design
- Factory assembled with marked high point

Factory assembled

All of our pinions are supplied factory assembled. For you, this results in the **following benefits:**

- Tested quality through 100% final inspection
- Highest quality and reliability, perfect setting of the tooth backlash between pinion and rack through aligned pinion and marked high point*
- Prevention of potential sources of error during assembly at your plant

*not for Value Class pinions

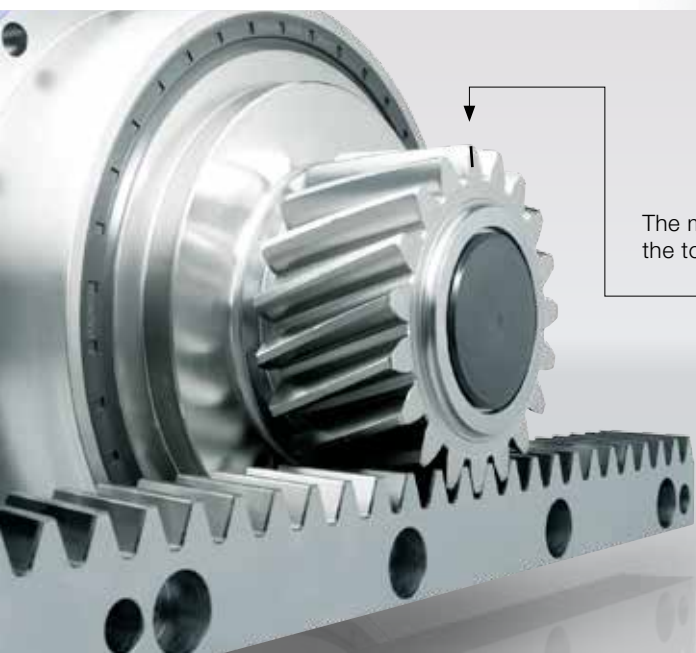
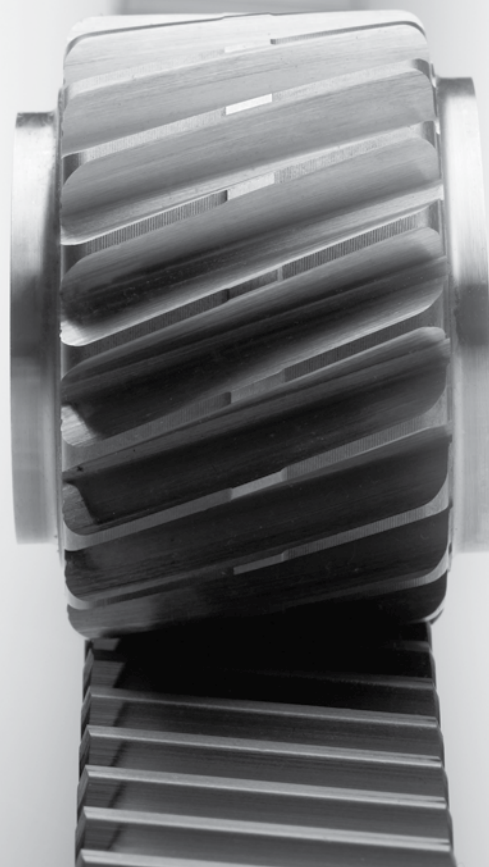




Value Class pinion

In conjunction with Economy system

- Precise toothing with optimally designed toothing geometry
- Low backlash shrink-fit/bonded connection with key as overload protection
- Factory-made shrink-fit/bonded connection ensures perfect seating of the pinion throughout the entire service life



The marked high point enables perfect setting of the tooth backlash between pinion and rack.

Rack versions for the system

Premium Class rack

In conjunction with Precision system

Solution for extremely dynamic, precision high-end-applications. For even greater precision: linear and gantry sorting possible. Contact us!

Your benefits:

- Best toothing quality ensures greatest precision, even in single-drive applications
- Up to a machine accuracy of approx. 30 µm, an indirect measuring system is sufficient in single-drive applications in conjunction with assorted racks

Performance Class rack

In conjunction with Performance Linear System

The solution for highly dynamic Mid-Range and precise high-end applications (with electrically clamped drives).

Your benefits:

- Significantly higher strength in the surface layer and in the core structure
- Higher permissible bending loads
- Maximum fatigue strength against vibration loads
- Maximum wear resistance

Where your requirements exceed these significantly, our High Performance Linear System is the right solution for you. Further information is available in the download area at www.rack-pinion.com

Value Class rack

In conjunction with Economy system

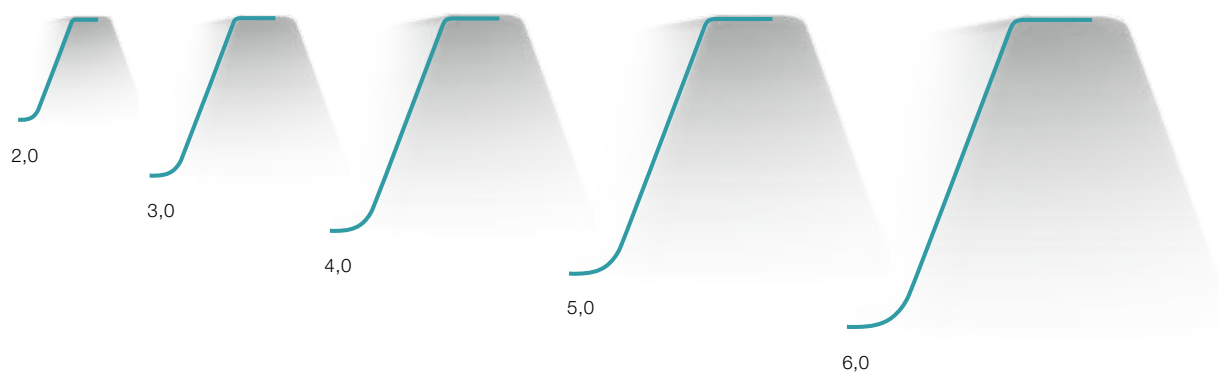
The cost-effective solution for mid-range and economy applications with comparatively low requirements for positioning accuracy and moving force. Helical teeth ensure the usual smooth running.

The right rack for all requirements

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 in conjunction with a matched gearhead and pinion.

Meeting your requirements without limits!





Tooth size comparison (DIN 867).



Premium Class rack

Module	p_t	L	z	a	a_1	B	d	$d_1^{b)}$	D	$f^{+0.5}$	h	h_b	h_D	H	I	I_1	L_1	m
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	1.99
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	1.32
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	0.65
3	10.00	500	50	35.0	430.0	29	10	7.7	15	2	26	9	9	29	62.5	125.0	10.3	2.80
3	10.00	250	25	35.0	180.0	29	10	7.7	15	2	26	9	9	29	62.5	125.0	10.3	1.39
4	13.33	507	38	18.3	460.0	39	12	9.7	18	3	35	12	11	39	62.5	125.0	13.8	5.11
5	16.67	500	30	37.5	425.0	49	14	11.7	20	3	34	12	13	39	62.5	125.0	17.4	6.05
6	20.00	500	25	37.5	425.0	59	18	15.7	26	3	43	16	17	49	62.5	125.0	20.9	9.01

All dimensions in [mm]

Cumulative pitch error $F_p = 12 \mu\text{m}$ for m2 (500 mm) and m3 (250 mm in length); $F_p = 15 \mu\text{m}$ for $m > 2$ Single pitch error $f_p = 3 \mu\text{m}$ ^{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 = Mass in kg

Performance Class rack

Module	p_t	L	z	a	a_1	B	d	$d_1^{b)}$	D	$f^{+0.5}$	h	h_b	h_D	H	I	I_1	L_1	m
2	6.67	1000	150	31.7	936.6	24	7	5.7	11	2	22	8	7	24	62.5	125.0	8.5	4.01
3	10.00	1000	100	35.0	930.0	29	10	7.7	15	2	26	9	9	29	62.5	125.0	10.3	5.64
4	13.33	1000	75	33.3	933.4	39	10	7.7	15	3	35	12	9	39	62.5	125.0	13.8	10.32
5	16.67	1000	60	37.5	925.0	49	14	11.7	20	3	34	12	13	39	62.5	125.0	17.4	12.23
6	20.00	1000	50	37.5	925.0	59	18	15.7	26	3	43	16	17	49	62.5	125.0	20.9	18.28

All dimensions in [mm]

Cumulative pitch error $F_p = 35 \mu\text{m}/1000 \text{ mm}$ Single pitch error $f_p = 8 \mu\text{m}$; $10 \mu\text{m}$ at m5 and m6^{b)} Recommended tolerance dimension: $6^{H7}/8^{H7}/10^{H7}/12^{H7}/16^{H7}/20^{H7}$ p_t = Reference circle pitch

z = Number of teeth

m = Mass in kg

Value Class rack

Module	p_t	L	z	a	a_1	B	d	$d_1^{b)}$	D	$f^{+0.5}$	h	h_b	h_D	H	I	I_1	L_1	m
2	6.67	1000	150	31.7	936.6	24	7	5.7	11	2	22	8	7	24	62.5	125.0	8.5	4.01
3	10.00	1000	100	35.0	930.0	29	10	7.7	15	2	26	9	9	29	62.5	125.0	10.3	5.64
4	13.33	1000	75	33.3	933.4	39	10	7.7	15	3	35	12	9	39	62.5	125.0	13.8	10.32
5	16.67	1000	60	37.5	925.0	49	14	11.7	20	3	34	12	13	39	62.5	125.0	17.4	12.23
6	20.00	1000	50	37.5	925.0	59	18	15.7	26	3	43	16	17	49	62.5	125.0	20.9	18.28

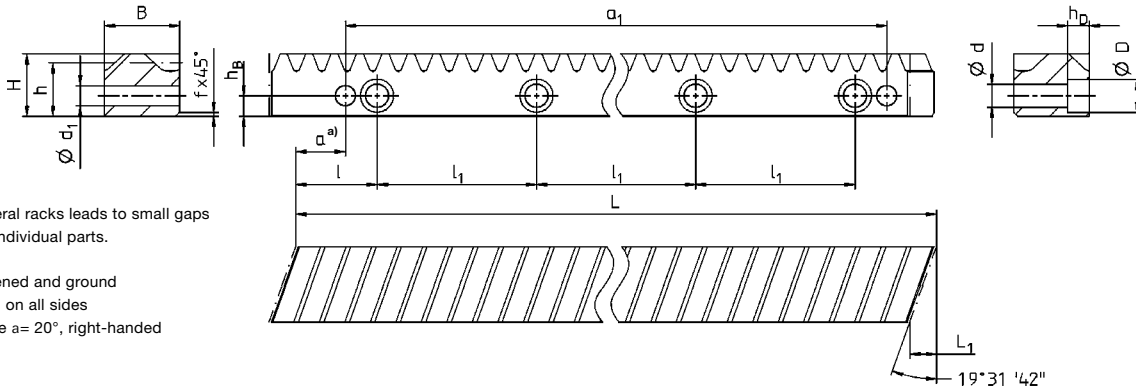
All dimensions in [mm]

Cumulative pitch error $F_p = 35 \mu\text{m}/1000 \text{ mm}$ Single pitch error $f_p = 8 \mu\text{m}$; $10 \mu\text{m}$ 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

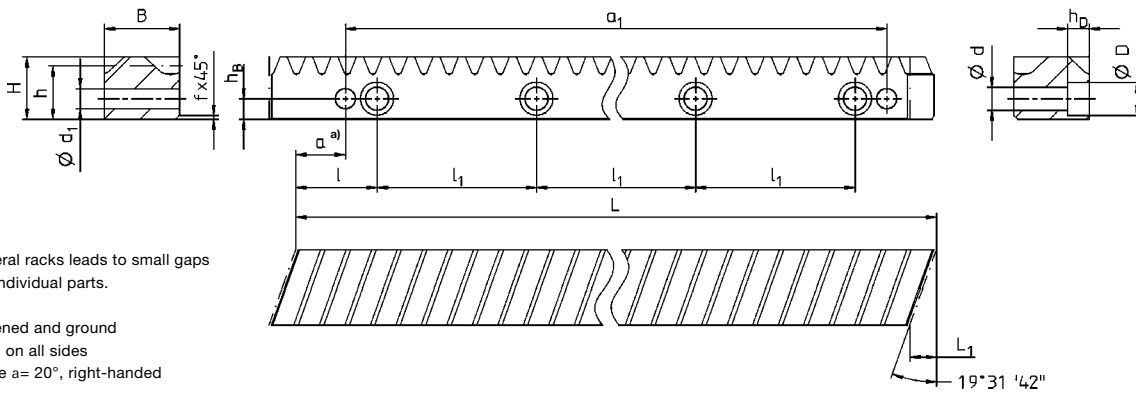
m = Mass in kg

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



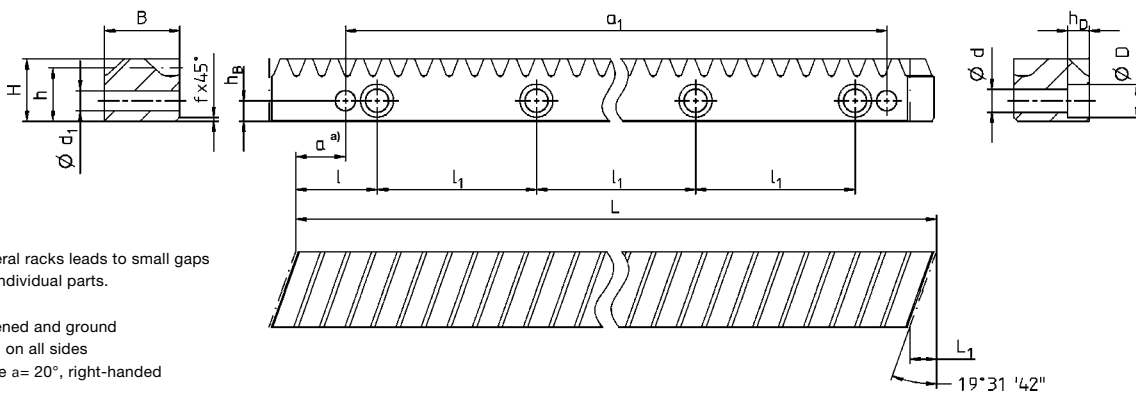
a) Installing several racks leads to small gaps between the individual parts.

Gearing hardened and ground
Profile ground on all sides
Pressure angle $a = 20^\circ$, 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 $a = 20^\circ$, 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 $a = 20^\circ$, right-handed

Planetary gearhead TP⁺ (HIGH TORQUE) / right-angle gearhead TPK⁺ (HIGH TORQUE) with Premium Class⁺ pinion and Premium Class rack (all pinions, pressure angle $\alpha=20^\circ$, inclination angle $\beta=19.5283^\circ$ left-handed)

Gearhead size ^{b)}	Module	z	A $\pm 0,3^{a)}$	b	B	d _a	d	x	L12	L13	x2	L15	L16	L17
TP ⁺ / TPK ⁺ 010	2	20	44.021	26	24	48.3	42.441	0.4	71.0	50.5	20.5	8.5	38.5	33.5
TP ⁺ / TPK ⁺ 025	2	20	44.021	26	24	48.3	42.441	0.4	73.5	53.0	24.0	12.0	41.0	33.5
	3	20	59.031	31	29	72.3	63.662	0.4	76.0	52.5	23.5	9.0	38.0	39.0
TP ⁺ / TPK ⁺ 050	3	20	59.031	31	29	72.3	63.662	0.4	89.5	66.0	28.0	13.5	51.5	39.0
	4	20	78.241	41	39	94.8	84.882	0.2	97.0	67.5	29.5	10.0	48.0	50.0
TP ⁺ / TPK ⁺ 110	4	20	78.241	41	39	94.8	84.882	0.2	112.5	83.0	33.0	13.5	63.5	50.0
	5	19	86.399	51	49	115.1	100.798	0.4	120.0	85.0	35.0	10.5	60.5	60.5
TP ⁺ / TPK ⁺ 300	5	19	86.399	51	49	115.1	100.798	0.4	139.0	104.0	38.0	13.5	79.5	60.5
	6	19	105.879	61	59	138.0	120.958	0.4	142.5	106.0	40.0	10.5	76.5	67.0
TP ⁺ / TPK ⁺ 500	6	19	105.879	61	59	138.0	120.958	0.4	155.0	118.5	43.5	14.0	89.0	67.0

All dimensions in [mm]

^{a)} Align mechanism recommended
(alignment dimension ± 0.3 mm)

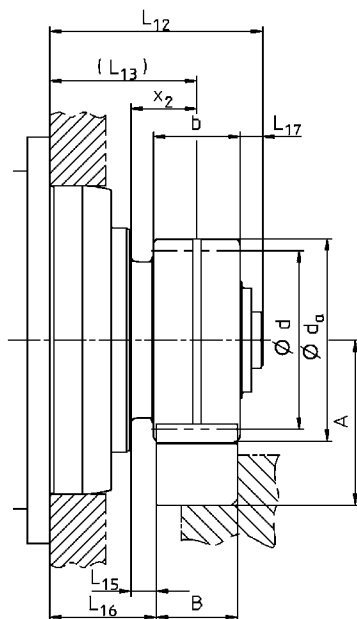
^{b)} Output type: 3 – system output

z = Number of teeth

d_a = Tip diameter

d = Partial circle diameter

x = Profile correction factor



Planetary gearhead TP⁺ / right-angle gearhead TPK⁺ with Premium Class⁺ pinion and Premium Class rack · Technical data for the smallest possible ratio

Gearhead size	Module	z	F_{2T}		T_{2B}		v_{Max}^*		m_{pinion}	
	[mm]		[N]	[lb _f]	[Nm]	[in.lb]	[m/min]	[in/sec]	[kg]	[lb _m]
TP ⁺ / TPK ⁺ 010	2	20	2285	514	48	429	200	131	0.4	0.8
TP ⁺ / TPK ⁺ 025	2	20	3270	736	69	614	150	98	0.4	0.8
	3	20	3193	718	102	900	225	148	1.0	2.1
TP ⁺ / TPK ⁺ 050	3	20	10401	2340	331	2930	200	131	1.0	2.1
	4	20	9983	2246	424	3750	267	175	1.9	4.3
TP ⁺ / TPK ⁺ 110	4	20	19889	4475	844	7471	233	153	1.9	4.3
	5	19	19308	4344	973	8613	277	182	3.1	6.8
TP ⁺ / TPK ⁺ 300	5	19	28155	6335	1419	12559	158	104	3.1	6.8
	6	19	27436	6173	1659	14686	190	125	5.8	12.8
TP ⁺ / TPK ⁺ 500	6	19	37228	8376	2252	19928	190	125	5.8	12.8

Technical data based on max. 1000 load cycles per hour.

Further gearhead/pinion combinations in cymex®.

* Depending on ratio

F_{2T} = Max. moving force

T_{2B} = Max. acceleration torque

z = Number of teeth

v_{max} = Max. movement speed

m_{pinion} = Pinion mass

Planetary gearhead TP⁺ HIGH TORQUE/ right-angle gearhead TPK⁺ HIGH TORQUE with Premium Class⁺ pinion and Premium Class rack · Technical data for the smallest possible ratio

Gearhead size	Module	z	F_{2T}		T_{2B}		v_{max}^*		m_{pinion}	
	[mm]		[N]	[lb _f]	[Nm]	[in.lb]	[m/min]	[in/sec]	[kg]	[lb _m]
TP ⁺ 010	2	20	3385	762	72	636	36	24	0.4	0.8
TP ⁺ / TPK ⁺ 025	2	20	4088	920	87	768	36	24	0.4	0.8
	3	20	3992	898	127	1125	55	36	1.0	2.1
TP ⁺ / TPK ⁺ 050	3	20	10401	2340	331	2930	45	30	1.0	2.1
	4	20	9983	2246	424	3750	61	40	1.9	4.3
TP ⁺ / TPK ⁺ 110	4	20	19889	4475	844	7471	55	36	1.9	4.3
	5	19	19308	4344	973	8613	65	43	3.1	6.8
TP ⁺ / TPK ⁺ 300	5	19	31051	6986	1565	13851	36	24	3.1	6.8
	6	19	30226	6801	1828	16180	43	28	5.8	12.8
TP ⁺ / TPK ⁺ 500	6	19	40189	9043	2431	21513	43	28	5.8	12.8

Technical data based on max. 1000 load cycles per hour.

Further gearhead/pinion combinations in cymex®.

* Depending on ratio

F_{2T} = Max. moving force

T_{2B} = Max. acceleration torque

z = Number of teeth

v_{max} = Max. movement speed

m_{pinion} = Pinion mass

Planetary gearhead TP⁺ / right-angle gearhead TK⁺/TPK⁺ with Premium Class RTP pinion and Premium Class rack (all pinions, pressure angle $\alpha=20^\circ$, inclination angle $\beta=19.5283^\circ$ left-handed)

Gearhead size ^{a)}	Module	z	A $\pm 0,3^{b)}$	b	B	d _a	d	x	L12	L13	x2	L15	L16
TP ⁺ /TK ⁺ /TPK ⁺ 004	2	26	50.4	26	24	61.0	55.174	0.4	45.5	32.5	13.0	1.0	20.5
TP ⁺ /TK ⁺ /TPK ⁺ 010	2	29	53.4	26	24	66.9	61.540	0.3	66.0	53.0	23.0	11.0	41.0
	2	33	57.6	26	24	75.4	70.028	0.3	56.0	43.0	13.0	1.0	31.0
	2	37	61.9	26	24	83.9	78.517	0.3	56.0	43.0	13.0	1.0	31.0
TP ⁺ /TK ⁺ /TPK ⁺ 025	2	35	59.7	26	24	79.7	74.272	0.3	65.0	52.0	23.0	11.0	40.0
	2	40	65.0	26	24	90.3	84.883	0.3	55.0	42.0	13.0	1.0	30.0
	2	45	70.2	26	24	100.6	95.493	0.22	55.0	42.0	13.0	1.0	30.0
TP ⁺ /TK ⁺ /TPK ⁺ 050	3	31	76.2	31	29	106.7	98.676	0.3	82.0	66.5	28.5	14.0	52.0
	3	35	82.6	31	29	119.4	111.409	0.3	69.0	53.5	15.5	1.0	39.0
	3	40	90.6	31	29	135.3	127.324	0.3	69.0	53.5	15.5	1.0	39.0
TP ⁺ /TK ⁺ /TPK ⁺ 110	4	38	116.6	41	39	171.4	161.277	0.25	91.0	70.5	20.5	1.0	51.0
TP ⁺ /TK ⁺ /TPK ⁺ 300	5	32	120.3	51	49	182.8	169.766	0.285	142.0	116.5	50.5	26.0	92.0
TP ⁺ /TK ⁺ /TPK ⁺ 500	6	31	143.4	61	59	213.0	197.352	0.295	171.0	140.5	65.5	36.0	111.0

All dimensions in [mm]

^{b)} Align mechanism recommended (alignment dimension ± 0.3 mm)

^{c)} Output type: 0 – Flange

z = Number of teeth

d_a = Tip diameter

d = Partial circle diameter

x = Profile correction factor

Planetary gearhead TP⁺ HIGH TORQUE / right-angle gearhead TPK⁺ HIGH TORQUE with Premium Class RTP pinion and Premium Class rack (all pinions, pressure angle $\alpha=20^\circ$, inclination angle $\beta=19.5283^\circ$ left-handed)

Gearhead size ^{a)}	Module	z	A $\pm 0,3^{b)}$	b	B	d _a	d	x	L12	L13	x2	L15	L16
TP ⁺ /TPK ⁺ 025	2	35	59.7	26	24	79.7	74.272	0.3	65.0	52.0	23.0	11.0	40.0
TP ⁺ /TPK ⁺ 050	3	31	76.2	31	29	106.7	98.676	0.3	82.0	66.5	28.5	14.0	52.0
	3	40	90.6	31	29	135.3	127.324	0.3	69.0	53.5	15.5	1.0	39.0
TP ⁺ /TPK ⁺ 110	4	40	119.9	41	39	177.9	169.766	0	91.0	70.5	20.5	1.0	51.0
TP ⁺ /TPK ⁺ 300	5	32	120.3	51	49	182.8	169.766	0.285	142.0	116.5	50.5	26.0	92.0

All dimensions in [mm]

^{b)} Align mechanism recommended (alignment dimension ± 0.3 mm)

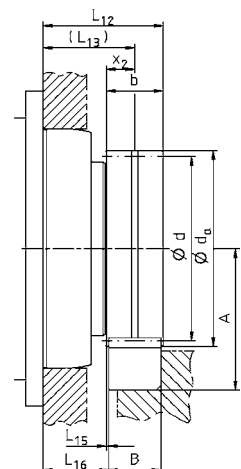
^{c)} Output type: 0 – Flange

z = Number of teeth

d_a = Tip diameter

d = Partial circle diameter

x = Profile correction factor



Planetary gearhead TP⁺ / right-angle gearhead TK⁺/TPK⁺ with Premium Class RTP pinion and Premium Class rack

Technical data for the smallest possible ratio

Gearhead size	Module	z	F_{2T}		T_{2B}		v_{max}^*		m_{pinion}	
	[mm]		[N]	[lb _p]	[Nm]	[in.lb]	[m/min]	[in/sec]	[kg]	[lb _m]
TP ⁺ / TK ⁺ / TPK ⁺ 004	2	26	1287	290	36	314	260	171	0.5	1.0
TP ⁺ / TK ⁺ / TPK ⁺ 010	2	29	2174	489	67	592	290	190	0.5	1.2
	2	33	2348	528	82	728	330	217	0.7	1.5
	2	37	2317	521	91	805	370	243	0.9	2.0
TP ⁺ / TK ⁺ / TPK ⁺ 025	2	35	3163	712	117	1040	263	172	0.7	1.6
	2	40	3377	760	143	1269	300	197	0.9	2.1
	2	45	3329	749	159	1407	338	221	1.3	2.8
TP ⁺ / TK ⁺ / TPK ⁺ 050	3	31	9882	2223	488	4315	310	203	1.6	3.6
	3	35	10817	2434	603	5333	350	230	1.9	4.3
	3	40	10575	2379	673	5959	400	262	2.7	5.9
TP ⁺ / TK ⁺ / TPK ⁺ 110	4	38	19842	4464	1600	14162	443	291	5.9	13.1
TP ⁺ / TK ⁺ / TPK ⁺ 300	5	32	25111	5650	2131	18865	267	175	7.7	16.9
TP ⁺ / TK ⁺ / TPK ⁺ 500	6	31	32174	7239	3175	28100	310	203	14.3	31.5

Technical data based on max. 1000 load cycles per hour.

Further gearhead/pinion combinations in cymex®.

* Depending on ratio

 F_{2T} = Max. moving force

 T_{2B} = Max. acceleration torque

z = Number of teeth

 v_{max} = Max. movement speed

 m_{pinion} = Pinion mass

Planetary gearhead TP⁺ HIGH TORQUE / right-angle gearhead TPK⁺ HIGH TORQUE with Premium Class RTP pinion and Premium Class rack

Technical data for the smallest possible ratio

Gearhead size	Module	z	F_{2T}		T_{2B}		v_{max}^*		m_{pinion}	
	[mm]	[]	[N]	[lb _p]	[Nm]	[in.lb]	[m/min]	[in/sec]	[kg]	[lb _m]
TP ⁺ / TPK ⁺ 025	2	40	4221	950	179	1586	73	48	0.9	2.1
TP ⁺ / TPK ⁺ 050	3	35	10817	2434	603	5333	79	52	1.9	4.3
	3	40	10575	2379	673	5959	91	60	2.7	5.9
TP ⁺ / TPK ⁺ 110	4	40	19692	4431	1672	14794	109	72	6.3	13.8
TP ⁺ / TPK ⁺ 300	5	32	27664	6224	2348	20783	85	56	7.7	16.9

Technical data based on max. 1000 load cycles per hour.

Further gearhead/pinion combinations in cymex®.

* Depending on ratio

 F_{2T} = Max. moving force

 T_{2B} = Max. acceleration torque

z = Number of teeth

 v_{max} = Max. movement speed

 m_{pinion} = Pinion mass

Performance Linear System – new performance dimensions

More performance
in less space!

The right linear drive system
for your application

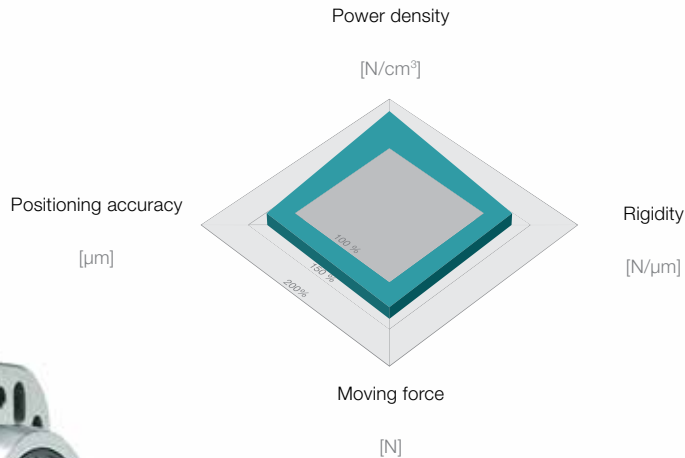
The Performance Linear System meets customer requirements for compact and efficient solutions of the highest quality. In addition to the extended design options, possibilities for the efficiency enhancement of existing applications are also available to users.

And there are plenty of customization options as well. Users can size and optimize the Performance package according to their requirements.

Performance Linear System – PLS*	Max. moving force [N]	Max. speed [m/min]
PLS 2.2	6000	200
PLS 3.2	9000	200
PLS 4.3	12000	200

*In conjunction with alpheno® Further versions available upon request

Comparison of technical data
between the industry standard
and the [Performance Linear System](#)



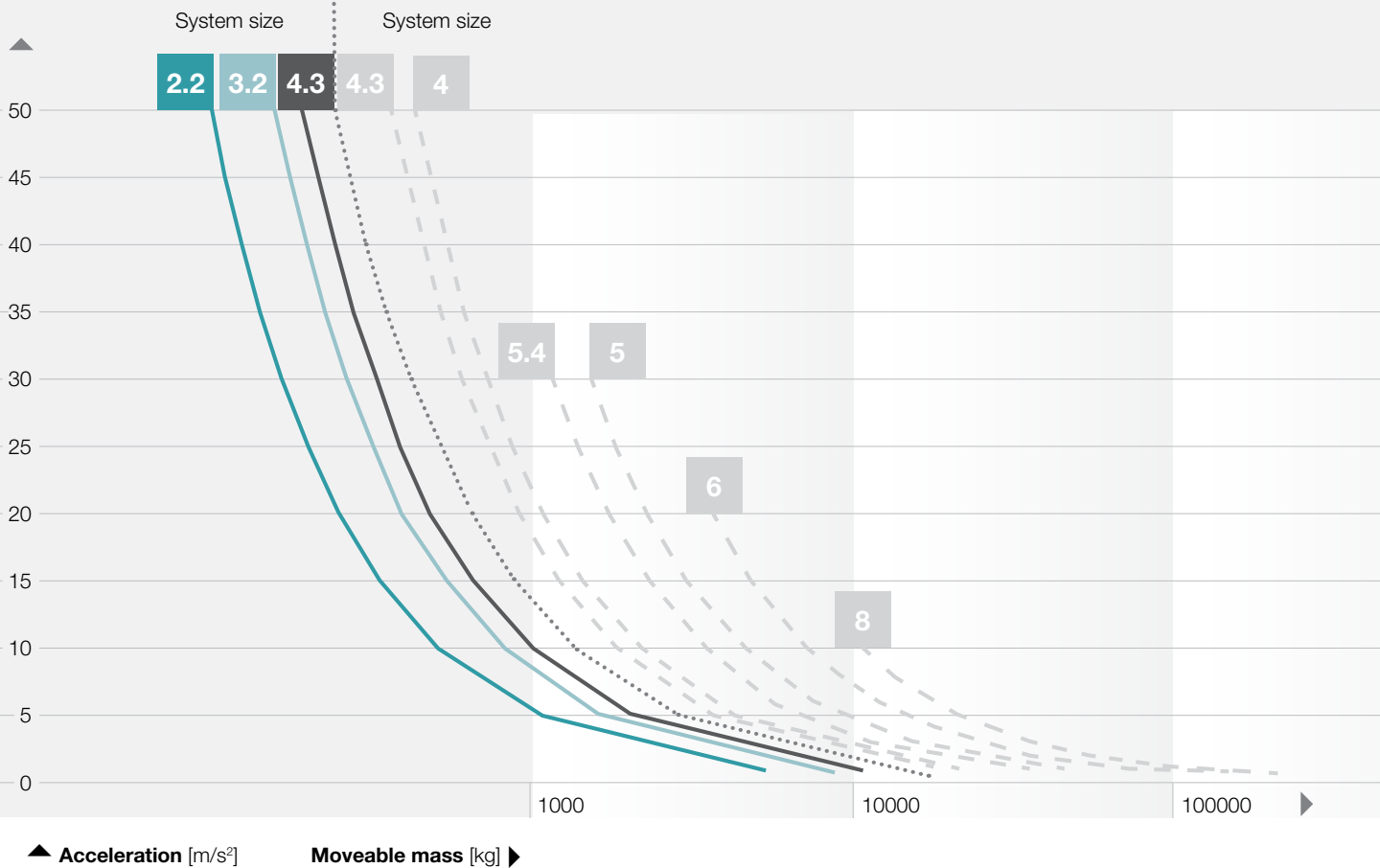
Performance Linear System
with a positioning accuracy of $< 5 \mu\text{m}$ and an efficiency of $\leq 97\%$.



Further information on the High Performance Linear System are available in the system catalog "High Performance Linear System" or on the Internet at www.rack-pinion.com

Quick system selection

Performance Linear System (PLS) ◀ ▶ High Performance Linear System (HPLS)



Planetary gearhead SP⁺/ right-angle gearhead SK⁺/ SPK⁺ with Standard Class RSP pinion and Value Class rack (all pinions, pressure angle $\alpha=20^\circ$, inclination angle $\beta=19.5283^\circ$ left-handed)

Gearhead size ^{b)}	Module	z	A $\pm 0,3^a)$	b	B	d _a	d	x	L12	L13	x2	L15	L16
SP ⁺ /SK ⁺ 060	2	15	38.9	26	24	38.0	31.831	0.5	52.0	39.0	19.0	7.0	27.0
	2	16	40.0	26	24	40.2	33.953	0.5	52.0	39.0	19.0	7.0	27.0
	2	18	41.9	26	24	44.0	38.197	0.4	52.0	39.0	19.0	7.0	27.0
SP ⁺ /SK ⁺ /SPK ⁺ 075	2	18	41.9	26	24	44.0	38.197	0.4	53.0	40.0	20.0	8.0	28.0
	2	20	44.0	26	24	48.3	42.441	0.4	53.0	40.0	20.0	8.0	28.0
	2	22	46.1	26	24	52.5	46.686	0.4	53.0	40.0	20.0	8.0	28.0
SP ⁺ /SK ⁺ /SPK ⁺ 100	2	23	47.2	26	24	54.6	48.808	0.4	64.0	51.0	21.0	9.0	39.0
	2	25	49.3	26	24	58.8	53.052	0.4	64.0	51.0	21.0	9.0	39.0
	2	27	51.2	26	24	62.7	57.296	0.3	64.0	51.0	21.0	9.0	39.0
SP ⁺ /SK ⁺ /SPK ⁺ 140	3	20	59.0	31	29	72.3	63.662	0.4	81.0	65.5	35.5	21.0	51.0
	3	22	62.2	31	29	78.6	70.028	0.4	81.0	65.5	35.5	21.0	51.0
	3	24	65.4	31	29	85.0	76.394	0.4	81.0	65.5	35.5	21.0	51.0
SP ⁺ /SK ⁺ /SPK ⁺ 180	4	20	79.0	41	39	96.3	84.883	0.4	84.0	63.5	33.5	14.0	44.0
SP ⁺ 210	4	25	89.4	41	39	117.0	106.103	0.34	103.0	82.5	44.5	25.0	63.0
SP ⁺ 240	5	24	99.4	51	49	141.0	127.324	0.35	113.0	87.5	47.5	23.0	63.0

All dimensions in [mm]

^{a)} Align mechanism recommended (alignment dimension ± 0.3 mm)

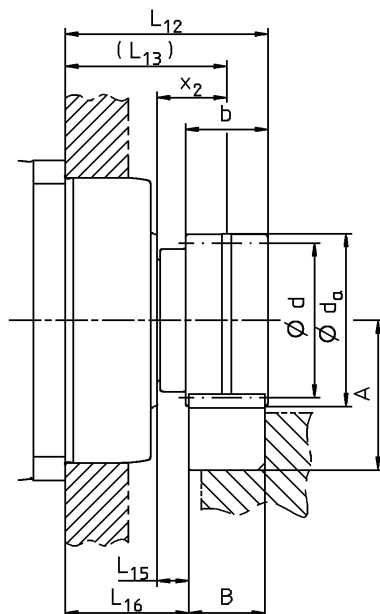
^{b)} Output type: 2 – Involute as per DIN5480;
also available with V-Drive worm gearhead

z = Number of teeth

d_a = Tip diameter

d = Partial circle diameter

x = Profile correction factor



Planetary gearhead SP⁺/ right-angle gearhead SK⁺/ SPK⁺ with Standard Class RSP pinion and Value Class rack · Technical data for the smallest possible ratio

Gearhead size	Module	z	F_{2T}		T_{2B}		v_{max}^*		m_{pinion}	
	[mm]		[N]	[lb _f]	[Nm]	[in.lb]	[m/min]	[in/sec]	[kg]	[lb _m]
SP ⁺ /SK ⁺ 060	2	15	2183	491	35	308	200	131	0.21	0.46
	2	16	2122	477	36	319	213	140	0.23	0.51
	2	18	2100	473	40	355	240	157	0.29	0.64
SP ⁺ /SK ⁺ /SPK ⁺ 075	2	18	3096	697	59	523	240	157	0.26	0.57
	2	20	3065	690	65	576	267	175	0.33	0.73
	2	22	3036	683	71	627	293	192	0.40	0.88
SP ⁺ /SK ⁺ /SPK ⁺ 100	2	23	4300	968	105	929	230	151	0.36	0.79
	2	25	4300	968	114	1010	250	164	0.46	1.01
	2	27	4300	968	123	1090	270	177	0.55	1.21
SP ⁺ /SK ⁺ /SPK ⁺ 140	3	20	8000	1800	255	2254	267	175	0.91	2.01
	3	22	8000	1800	280	2479	293	192	1.18	2.60
	3	24	7991	1798	305	2702	320	210	1.48	3.26
SP ⁺ /SK ⁺ /SPK ⁺ 180	4	20	11776	2650	500	4424	311	204	1.8	3.99
SP ⁺ 210	4	25	18531	4169	983	8701	278	182	2.8	6.17
SP ⁺ 240	5	24	27836	6263	1772	15684	333	219	4.9	10.80

Technical data based on max. 1000 load cycles per hour.
Further gearhead/pinion combinations in cymex®.

* Depending on ratio

F_{2T} = Max. moving force
 T_{2B} = Max. acceleration torque
z = Number of teeth
 v_{max} = Max. movement speed
 m_{pinion} = Pinion mass

Planetary gearhead LP⁺/ right-angle gearhead LK⁺/ LPK⁺ with Value Class pinion and rack

(all pinions, pressure angle $\alpha=20^\circ$, inclination angle $\beta=19.5283^\circ$ left-handed)

Gearhead size ^{b)}	Module	z	A $\pm 0,3^a)$	b	B	d _a	d	x	L12	L13	x2	L15	L16	L17
LP ⁺ / LK ⁺ / LPK ⁺ 070	2	18	41.899	26	24	43.7	38.197	0.4	42.0	27.0	19.0	7.0	15.0	2.0
LP ⁺ / LK ⁺ / LPK ⁺ 090	2	22	45.743	26	24	51.4	46.686	0.2	52.0	30.0	20.0	8.0	18.0	9.0
LP ⁺ / LK ⁺ / LPK ⁺ 120	2	26	49.587	26	24	59.1	55.174	0	77.5	33.0	21.0	9.0	21.0	31.5
LP ⁺ / LK ⁺ / LPK ⁺ 155	3	24	64.197	31	29	82.3	76.394	0	107.0	50.5	35.5	21.0	36.0	41.0

All dimensions in [mm]

^{a)} Align mechanism recommended (alignment dimension ± 0.3 mm)

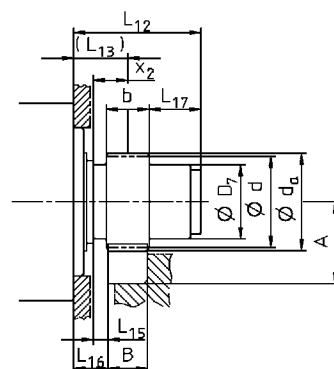
^{b)} Output type: 1 – Shaft with key

z = Number of teeth

d_a = Tip diameter

d = Partial circle diameter

x = Profile correction



Planetary gearhead SP⁺/ right-angle gearhead SK⁺/ SPK⁺ with Value Class pinion and rack

(all pinions, pressure angle $\alpha=20^\circ$, inclination angle $\beta=19.5283^\circ$ left-handed)

Gearhead size ^{b)}	Module	z	A $\pm 0,3^a)$	b	B	d _a	d	x	L12	L13	x2	L15	L16	L17
SP ⁺ / SK ⁺ 060	2	18	41.899	26	24	43.7	38.197	0.4	54.0	39.0	19.0	7.0	27.0	2.0
SP ⁺ / SK ⁺ / SPK ⁺ 075	2	22	45.743	26	24	51.4	46.686	0.2	62.0	40.0	20.0	8.0	28.0	9.0
SP ⁺ / SK ⁺ / SPK ⁺ 100	2	26	49.587	26	24	59.1	55.174	0	95.5	51.0	21.0	9.0	39.0	31.5
SP ⁺ / SK ⁺ / SPK ⁺ 140	3	24	64.197	31	29	82.3	76.394	0	122.0	65.5	35.5	21.0	51.0	41.0

All dimensions in [mm]

^{a)} Align mechanism recommended (alignment dimension ± 0.3 mm)

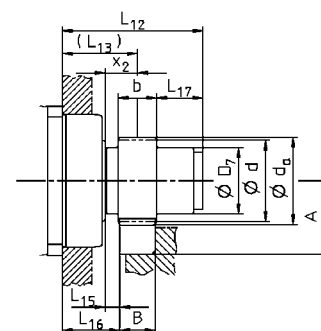
^{b)} Output type: 1 – Shaft with key, also available with V-Drive worm gearhead

z = Number of teeth

d_a = Tip diameter

d = Partial circle diameter

x = Profile correction



Planetary gearhead LP⁺/ right-angle gearhead LK⁺/ LPK⁺ with Value Class pinion and rack

Gearhead size	Module	z	F_{2T}		T_{2B}		v_{max}^*		m_{pinion}	
	[mm]		[N]	[lb _f]	[Nm]	[in.lb]	[m/min]	[in/sec]	[kg]	[lb _m]
LP ⁺ / LK ⁺ / LPK ⁺ 070	2	18	1360	306	26	230	240	157	0.28	0.62
LP ⁺ / LK ⁺ / LPK ⁺ 090	2	22	2270	511	53	469	293	192	0.41	0.90
LP ⁺ / LK ⁺ / LPK ⁺ 120	2	26	4300	968	119	1050	277	182	0.58	1.28
LP ⁺ / LK ⁺ / LPK ⁺ 155	3	24	7000	1575	267	2367	288	189	1.52	3.35

Technical data based on max. 1000 load cycles per hour.
Further gearhead/pinion combinations in cymex®.

* Depending on ratio

F_{2T} = Max. moving force
 T_{2B} = Max. acceleration torque
z = Number of teeth
 v_{max} = Max. movement speed
 m_{pinion} = Pinion mass

Planetary gearhead SP⁺/ right-angle gearhead SK⁺/ SPK⁺ with Value Class pinion and rack

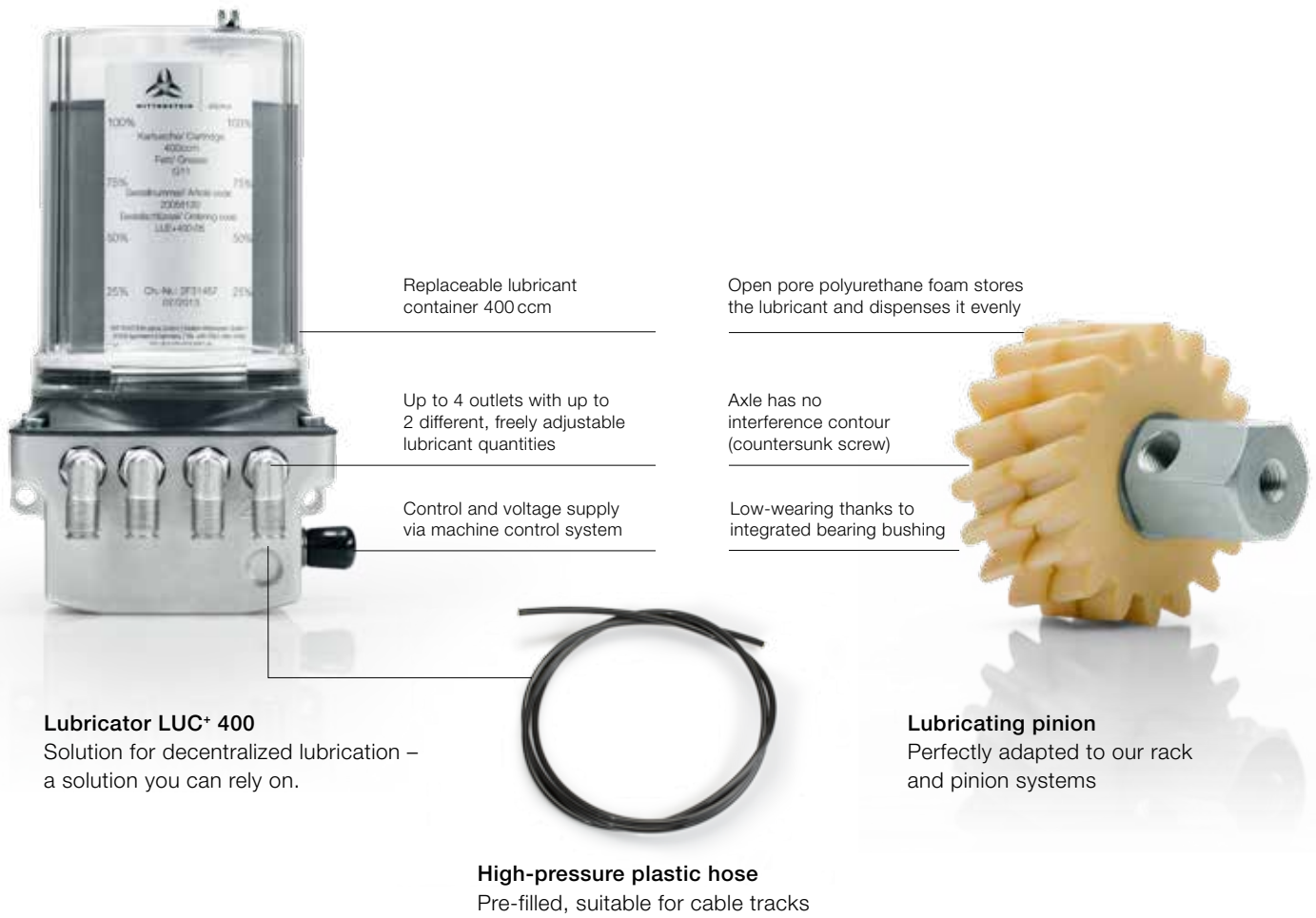
Gearhead size	Module	z	F_{2T}		T_{2B}		v_{max}^*		m_{pinion}	
	[mm]		[N]	[lb _f]	[Nm]	[in.lb]	[m/min]	[in/sec]	[kg]	[lb _m]
SP ⁺ / SK ⁺ 060	2	18	2100	473	40	355	240	157	0.28	0.62
SP ⁺ / SK ⁺ / SPK ⁺ 075	2	22	3036	683	71	627	293	192	0.41	0.90
SP ⁺ / SK ⁺ / SPK ⁺ 100	2	26	5635	1268	155	1376	260	171	0.58	1.28
SP ⁺ / SK ⁺ / SPK ⁺ 140	3	24	7991	1798	305	2702	320	210	1.52	3.35

Technical data based on max. 1000 load cycles per hour.
Further gearhead/pinion combinations in cymex®.

* Depending on ratio

F_{2T} = Max. moving force
 T_{2B} = Max. acceleration torque
z = Number of teeth
 v_{max} = Max. movement speed
 m_{pinion} = Pinion mass

alpha rack & pinion system accessory range – Lubrication



Lubricator LUC+ 400
Solution for decentralized lubrication – a solution you can rely on.

High-pressure plastic hose
Pre-filled, suitable for cable tracks

Lubricating pinion
Perfectly adapted to our rack and pinion systems

Perfect lubrication – for a perfect system

In order to achieve a long service life, our rack and pinion systems require adequate lubrication. We offer you suitable lubricating pinions, fastening axles, and lubricators, all adapted perfectly to our systems. The polyurethane foam lubricating pinion is supplied with a preset quantity of grease via a lubricator or central lubricating system. This ensures an optimal lubricating film on the rack and pinion. In addition to the supply of lubricant, the lubricating pinion also ensures cleaning of the open toothing.

Your benefits

- Greatly reduced maintenance costs:
 - Replaceable cartridge
 - Up to 16 lubrication points can be supplied with just one lubricator
 - Lubricating pinion has a long service life
- Can be fully integrated in the machine control system:
 - Direct control
 - Different error messages via PLC
- Lubricant quantities can be precisely adjusted to the application (minimal-quantity lubrication)
- Minimal current required
- Perfectly adapted for the lubrication of rack and pinion systems

Technical information on the LUC⁺ 400 lubricator

Technical data

Dimensions (W x H x D)	Max. 112x196x94 mm
Weight	1120 g
Lubricant volume	400 cm ³
Lubricant type	Grease up to NLGI 3
Method of operation	Piston pump
Operating pressure	Max. 70 bar
Metering volume/stroke	0.15 cm ³ (output/pulse signal)
No. of outlets	1, 2, 3, 4
Outlet	Rotating, right-angled hose connections 6 mm to 150 bar
Operating voltage	24 VDC
Current input	I _{max} during operation 350 mA (regular < 200 mA)
Fuse	350 mA (characteristic: medium slow-blow or slow-blow)
Protection class	IP 65
Operating temperature	-20°C to +70°C
Control	Integrated, microelectronic
Pressure monitoring	Integrated, electronic (system pressure measurement)
Fill level monitoring	Integrated; reed contact
Control connection	Connector; M12x1, 4-pole
Activation of progressive distributor	Suitable

Lubricator versions

Overview of lubricating sets	Outlets	Pump body	Lubricant	Scope of delivery of hoses	Article code
LUC+400-0511-02	1	1	WITTENSTEIN alpha G11	2 m	20058416
LUC+400-0521-02	2	1	WITTENSTEIN alpha G11	2 x 2 m	20058418
LUC+400-0531-02	3	2	WITTENSTEIN alpha G11	3 x 2 m	20058420
LUC+400-0541-02	4	2	WITTENSTEIN alpha G11	4 x 2 m	20058422
LUC+400-0551-02	2	2	WITTENSTEIN alpha G11	2 x 2 m	20058424

Lengths up to 10 m per outlet via hose connector 6-0 and LUH hose possible. Sets with 5 m hose length available on request.

Replacement cartridge and individual hoses

Designation	Thread	Model	Hose diameter/filling quantity	Article code
Hose 2m, G11 LUH-02-05 ^{a)}	-	2 m	6	20058134
Hose 5m, G11 LUH-05-05 ^{a)}	-	5 m	6	20058135
Hose connector 6-0	-	Straight	6	20058148
Replacement cartridge LUE+400-05	-	G11	400 cm ³	20058120
Grease gun cartridge LGC-400-05 ^{b)}	-	G11	400 cm ³	20058111

^{a)} Pre-filled hoses. Only use air-free, pre-filled hoses! ^{b)} For pre-greasing lubricating pinions, movement path

Hose connectors and splitters

Designation	Thread/connection	Model/no. of outlets	Hose diameter	Article code
Hose connection G1/4-6-0	G 1/4"	Straight	6	20058144
Hose connection M06-6-1	M6x1	Angled	6	20058145
Hose connection M1/8-6-1	G 1/8"	Angled	6	20058146
Hose connection G1/4-6-1	G 1/4"	Angled	6	20058147
Splitter LUS 2-0-NL	Plug-in	2	6	20058103
Splitter LUS 3-0-NL	Plug-in	3	6	20058104
Splitter LUS 4-0-NL	Plug-in	4	6	20058105

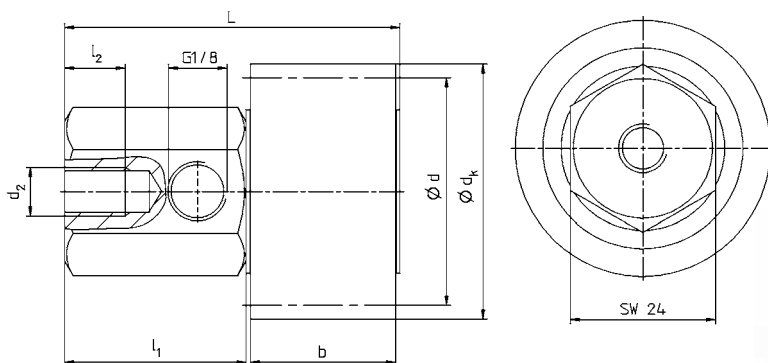
alpha rack & pinion system accessory range – Dimensions of lubricating pinion and fastening axles

Technical data of lubricating pinion set

The design options will dictate whether the rack or the output pinion should be lubricated. Lubrication via the output pinion is preferable owing to the better lubricant distribution.

Module	Number of teeth	Use	Order number	Order code	d	d _k	b	l ₁	l ₂	d ₂	L
2	18	Rack	20053903	LMT 200-PU-18L1-024-1	38,2	42,2	24	30	10	M8	55,4
		Pinion	20053904	LMT 200-PU-18R1-024-1							
3	18	Rack	20053905	LMT 300-PU-18L1-030-1	57,3	63,3	30	30	10	M8	61,4
		Pinion	20053906	LMT 300-PU-18R1-030-1							
4	18	Rack	20053907	LMT 400-PU-18L1-040-1	76,4	84,4	40	30	10	M8	71,4
		Pinion	20053908	LMT 400-PU-18R1-040-1							
5	17	Rack	20053909	LMT 500-PU-17L1-050-1	90,2	100,2	50	30	10	M8	81,4
		Pinion	20053910	LMT 500-PU-17R1-050-1							
6	17	Rack	20053911	LMT 600-PU-17L1-060-1	108,2	120,2	60	30	10	M8	91,4
		Pinion	20053912	LMT 600-PU-17R1-060-1							
8	17	Rack	20053913	LMT 800-PU-17L1-080-1	144,3	160,3	80	30	10	M8	111,4
		Pinion	20053914	LMT 800-PU-17R1-080-1							

Connector for hose Ø 6x4 mm included in scope of delivery. Lubricating pinions must be soaked in lubricant before operation.



**Lubricating
pinion for racks,
left-handed**

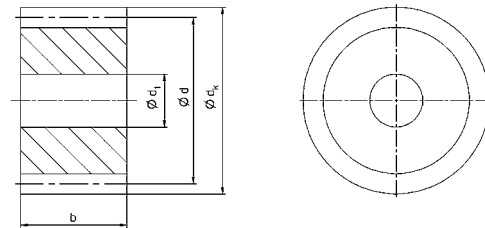


**Lubricating
pinion for gear wheels,
right-handed**

Lubricating pinion

Module	z	Use	d	d ₁	d _k	b	Order code	Article code
2	18 LH	Rack	38,2	12	42,2	24	RLU 200-PU-18L1-024	20053683
	18 RH	Pinion					RLU 200-PU-18R1-024	20053684
3	18 LH	Rack	57,3	12	63,3	30	RLU 300-PU-18L1-030	20053685
	18 RH	Pinion					RLU 300-PU-18R1-030	20053686
4	18 LH	Rack	76,4	12	84,4	40	RLU 400-PU-18L1-040	20053687
	18 RH	Pinion					RLU 400-PU-18R1-040	20053688
5	18 LH	Rack	90,2	20	100,2	50	RLU 500-PU-17L1-050	20053689
	18 RH	Pinion					RLU 500-PU-17R1-050	20053690
6	18 LH	Rack	108,2	20	120,2	60	RLU 600-PU-17L1-060	20053691
	18 RH	Pinion					RLU 600-PU-17R1-060	20053692
8	18 LH	Rack	144,3	20	160,3	80	RLU 800-PU-17L1-080	20053693
	18 RH	Pinion					RLU 800-PU-17R1-080	20053694

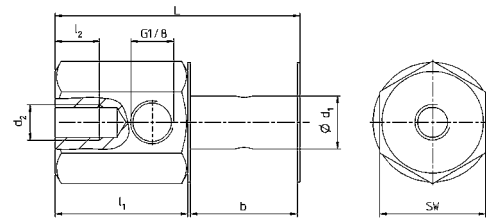
Lubricating pinions must be soaked in lubricant before operation.
Customized pinions: We also have solutions for your special requirements, please contact us!



Fastening axle, right-angle

Module	L	I ₁	I ₂	b	d ₁	d ₂	SW	Connection thread d ₃	Order code	Article code
2	55,4	30	10	24	12	M8	24	G1/8"	LAS-024-012-1	20053696
3	61,4	30	10	30	12	M8	24	G1/8"	LAS-030-012-1	20053698
4	71,4	30	10	40	12	M8	24	G1/8"	LAS-040-012-1	20053700
5	81,4	30	10	50	20	M8	24	G1/8"	LAS-050-020-1	20053702
6	91,4	30	10	60	20	M8	24	G1/8"	LAS-060-020-1	20053704
8	111,4	30	10	80	20	M8	24	G1/8"	LAS-080-020-1	20053706

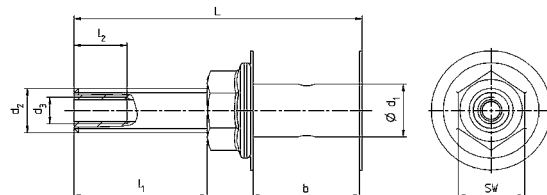
Connector for hose Ø 6 x 4 mm included in scope of delivery.



Fastening axle, straight

Module	L	I ₁	I ₂	b	d ₁	d ₂	SW	Connection thread d ₃	Order code	Article code
2	61	30	12	24	12	M10	15	M6	LAS-024-012-0	20053695
3	71	30	12	30	12	M10	15	M6	LAS-030-012-0	20053697
4	81	30	12	40	12	M10	15	M6	LAS-040-012-0	20053699
5	116	30	12	50	20	M16	24	G1/8"	LAS-050-020-0	20053701
6	126	30	12	60	20	M16	24	G1/8"	LAS-060-020-0	20053703
8	146	30	12	80	20	M16	24	G1/8"	LAS-080-020-0	20053705

Connector for hose Ø 6 x 4 mm included in scope of delivery.



alpha Rack & Pinion System accessory range – Lubrication

Lubricating pinion – general information

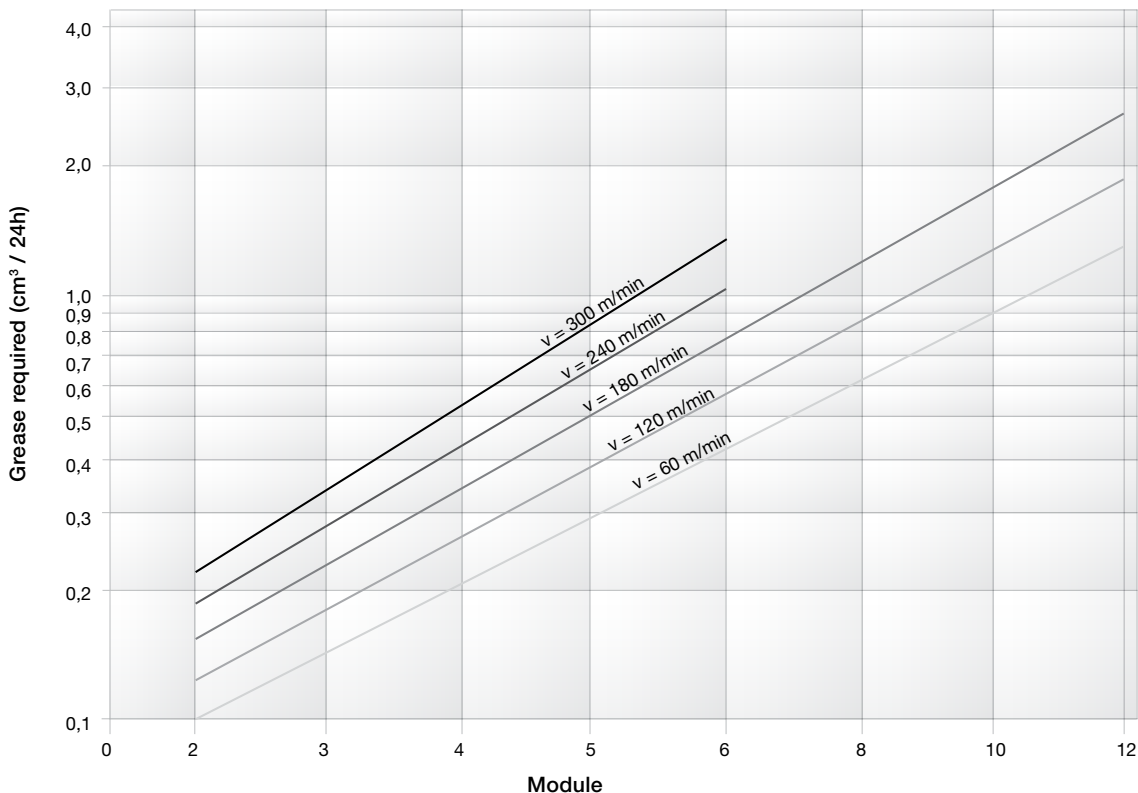
Due to the possibility of high moving forces and dynamics of the drives used, the open toothing of our rack and pinion drives must be lubricated. We recommend automatic re-lubrication using our polyurethane lubricating pinions.

Re-lubrication with the PU lubricating pinion ensures that the lubricant is applied to the toothing continuously and automatically. For this purpose, the lubricating pinion, which is adapted to the toothing of the pinion or rack, engages with the teeth, where it transfers the lubricant to the toothing torque-free.

The open-cell polyurethane foam ensures an optimal supply of the toothing with lubricant, even over extremely lengthy periods. The material partially stores the lubricant and dispenses minute amounts of it. This ensures that continuous lubrication and wear through insufficient lubrication is prevented.

In order to ensure full functionality of the lubricating pinion from the start of operation onwards and to prevent damage to the drive through dry starting, it must be pre-lubricated (ideally soak in the grease used for several hours)!

Chart for determining lubricant quantities depending on the module and movement speed



alpha rack & pinion system accessory range – Assembly jig

Assembly jig

You will need an assembly jig to align the transitions between the individual racks.



Module	L	Order codes	Order number
2	100	ZMT 200-PD5-100	20020582
3	100	ZMT 300-PD5-100	20021966
4	156	ZMT 400-PD5-156	20037466
5	156	ZMT 500-PD5-156	20037469
6	156	ZMT 600-PD5-156	20037470

Needle roller

High-precision needle rollers are required when making checks during and after assembly using the dial gauge.

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