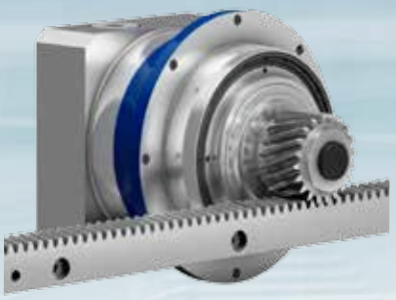
System solutions

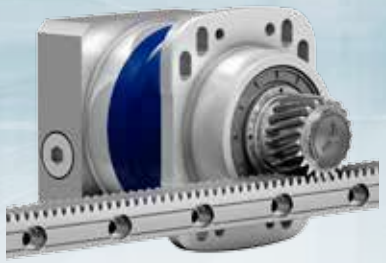
alpha rack & pinion system
Precise rack and pinion drives tailored to your applications

We provide you with an optimum system solution comprising a gearhead, rack and pinion precisely tailored to your requirements. A selected range of accessories for lubrication and mounting complete the linear system.

High Performance Linear System



Precision System



Performance Linear System

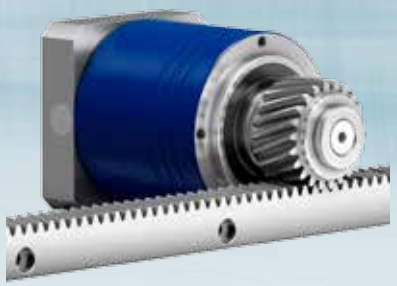
Your benefits:

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

Precise
- Drive solutions with unique true running accuracy
- Maximum positioning accuracy due to precision alignment of components

Efficient
- Effortless commissioning
- Minimal mounting space and high power density
- Huge savings potential

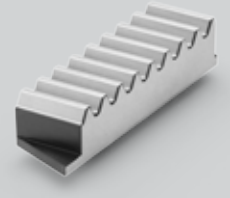
Standard System



Economy System

Accessories

Lubrication



Assembly jig

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.

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

Worse — Better

Features	Ball screw	Linear motor	alpha linear system
Movement speed			
Moving force			
Acceleration			
Surface finish			
Noise level			
Energy requirement			
Safety in the event of a power failure			
Service life			
Sensitivity in the event of a crash			
Service friendliness			
Investment costs			
Repair costs			
Operating efficiency (under extreme load)			
Operating efficiency (low load			

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*

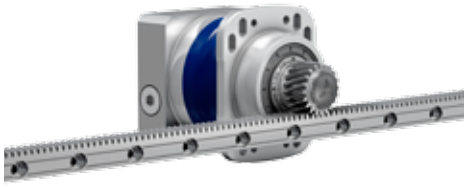
* Compared to industry standard

You can download the system catalog from
www.wittenstein-alpha.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

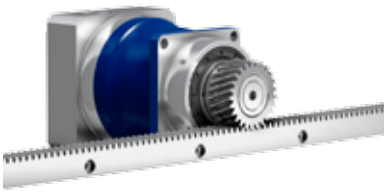
Planetary gearhead alpheno®
Premium Class+ pinion
Performance Class rack

- 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 µm 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

Machine accuracy [µm]*

Sample applications

- Eroding machines
- Grinding machines
- HSC portal milling machines
- Turning machines
- Machining centers
- Laser machines
- Boring machines
- Punching machines
- Water jet cutting machines
- Wood/plastic machining centers
- Pipe bending machines
- Gas cutting machines
- Automation engineering
- Foam cutting machines

Direct measuring system

Indirect measuring system

1
5
20
50
100
200
> 300

Master/slave with Precision/Performance Linear System
Contact us!

Precision System
Page 378 – 381

Performance Linear System
Page 382/383

Standard System
Page 384/385

Economy System
Page 386/387

20.000

40.000

Automation engineering
Source: MOTOMAN Robotics Europe AB

Gas cutting machines
Source: LIND GmbH Industrial Equipment

CNC wood/plastic processing machines
Source: MAKA – Max Mayer Maschinenbau GmbH © MAKA

Profile machining centers
Source: Handtmann A-Punkt Automation GmbH

HSC portal milling machines
Source: F. Zimmermann GmbH

Master/slave with High Performance Linear System
Contact us!

High Performance Linear System
Page 383

alpha rack & pinion systems

60.000 80.000 100.000 120.000 240.000

Moving force [N]

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:**

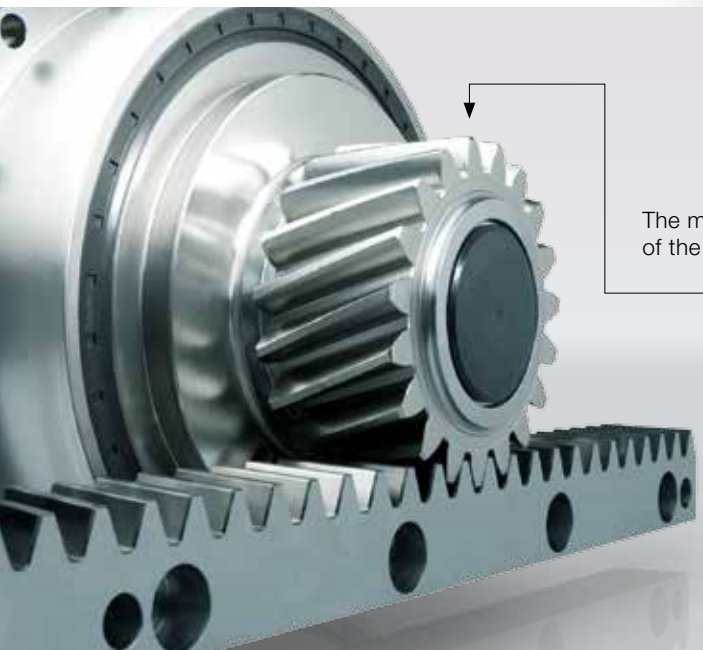
- Tested quality through 100% final inspection
- Highest quality and reliability, perfect setting of the tooth backlash between pinion and rack through aligned pinion and marked high point*
- Prevention of potential sources of error during assembly at your plant

*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.wittenstein-alpha.com**

Value Class rack

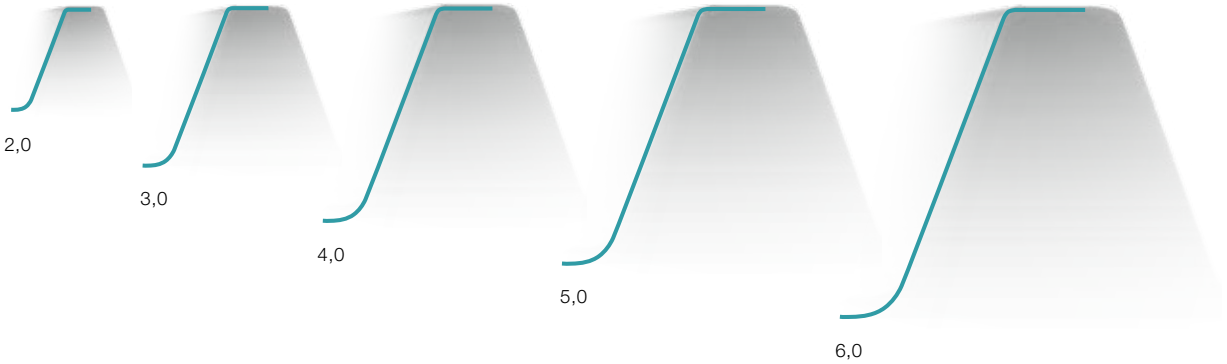
In conjunction with Economy system

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!



Toothing 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	l	l_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]
[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	l	l_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]
[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

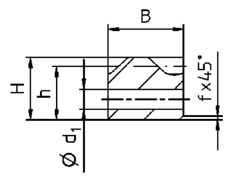
Value Class rack

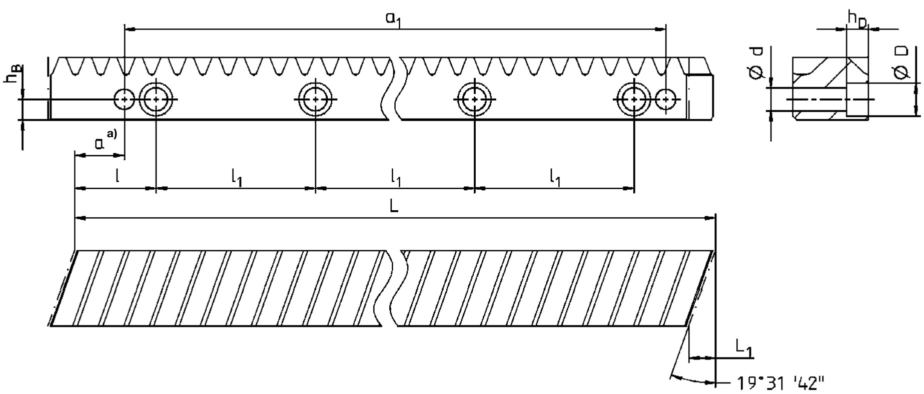
Module	p_t	L	z	a	a_1	B	d	d_1 [b)]	D	$f^{+0,5}$	h	h_B	h_D	H	l	l_1	L_1	m
2	6.67	1000	150	31.7	936.6	24	7	5.7	11	2	22	8	7	24	62.5	125.0	8.5	4.01
3	10.00	1000	100	35.0	930.0	29	10	7.7	15	2	26	9	9	29	62.5	125.0	10.3	5.64
4	13.33	1000	75	33.3	933.4	39	10	7.7	15	3	35	12	9	39	62.5	125.0	13.8	10.32
5	16.67	1000	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]
[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

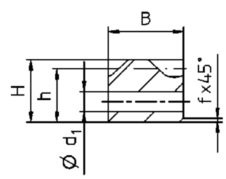
Please refer to the operating instructions available at **www.wittenstein-alpha.com** for instructions on assembly and design of the machine bed

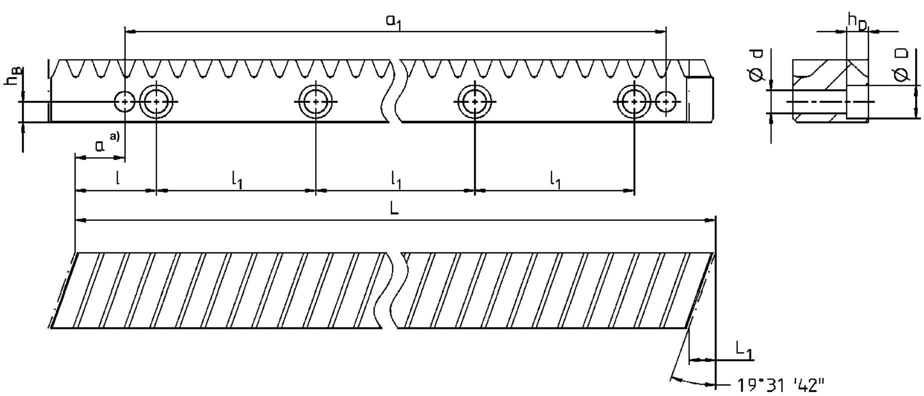




a) Installing several racks leads to small gaps between the individual parts.

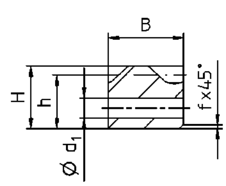
Gearing hardened and ground
Profile ground on all sides
Pressure angle a= 20°, right-handed

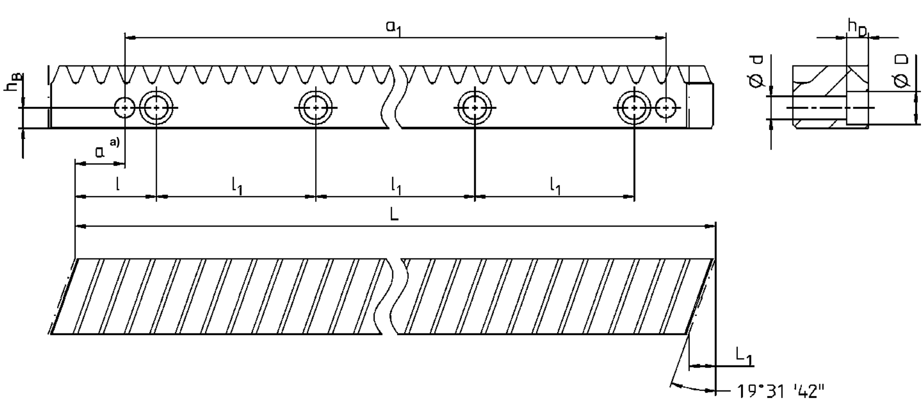




a) Installing several racks leads to small gaps between the individual parts.

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

Planetary gearhead TP+ (HIGH TORQUE) / right-angle gearhead TPK+ (HIGH TORQUE) with Premium Class+ pinion and Premium Class rack (all pinions, pressure angle α=20°, inclination angle β=19.5283° left-handed)

Gearhead size [b]	Module	z	A ±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	7.5
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	7.5
	3	20	59.031	31	29	72.3	63.662	0.4	76.0	52.5	23.5	9.0	38.0	8.0
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	8.0
	4	20	78.241	41	39	94.8	84.882	0.2	97.0	67.5	29.5	10.0	48.0	9.0
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	9.0
	5	19	86.399	51	49	115.1	100.798	0.4	120.0	85.0	35.0	10.5	60.5	9.5
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	9.5
	6	19	105.879	61	59	138.0	120.958	0.4	146.5	106.0	40.0	10.5	76.5	10
TP+ / TPK+ 500	6	19	105.879	61	59	138.0	120.958	0.4	155.5	115.0	43.5	14.0	89.0	10

All dimensions in [mm]

[a] Align mechanism recommended (alignment dimension ± 0.3 mm)

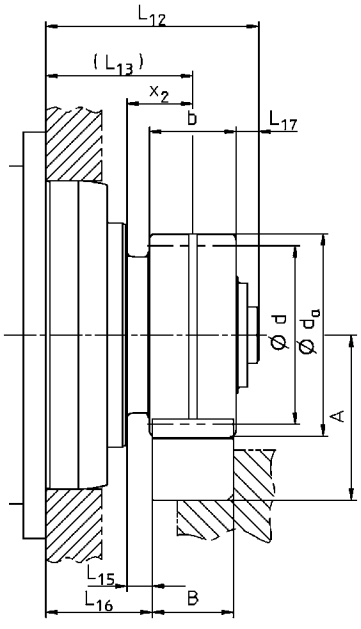
[b] Output type: 3 – system output

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 α=20°,inclination angle β=19.5283° left-handed)

Gearhead size [c]	Module	z	A ±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+/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+/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

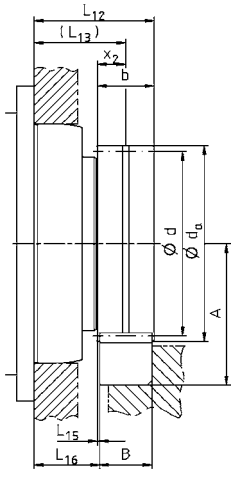
z = Number of teeth
d_a = Tip diameter
d = Partial circle diameter
x = Profile correction factor

Planetary gearhead TP+ HIGH TORQUE / right-angle gearhead TPK+ HIGH TORQUE with Premium Class RTP pinion and Premium Class rack (all pinions, pressure angle α=20°,inclination angle β=19.5283° left-handed)

Gearhead size [c]	Module	z	A ±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	149.0	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_f]	[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+/ TPK+ 300	5	32	25111	5650	2131	18865	267	175	7.7	16.9
TP+/ 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_f]	[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 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.
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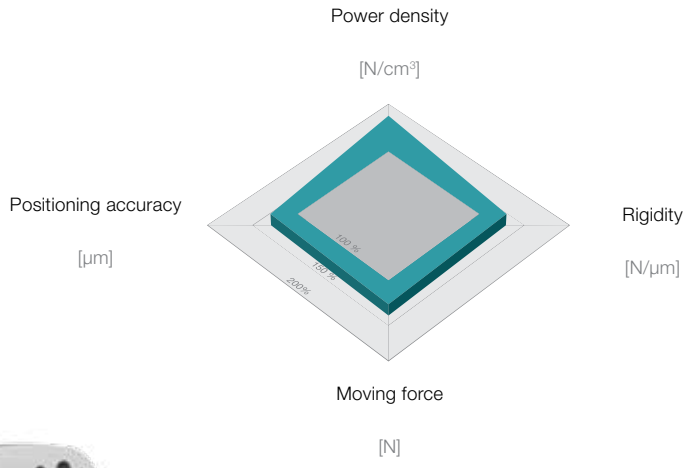
The right linear drive system for your application

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 µm and an efficiency of ≤ 97%.

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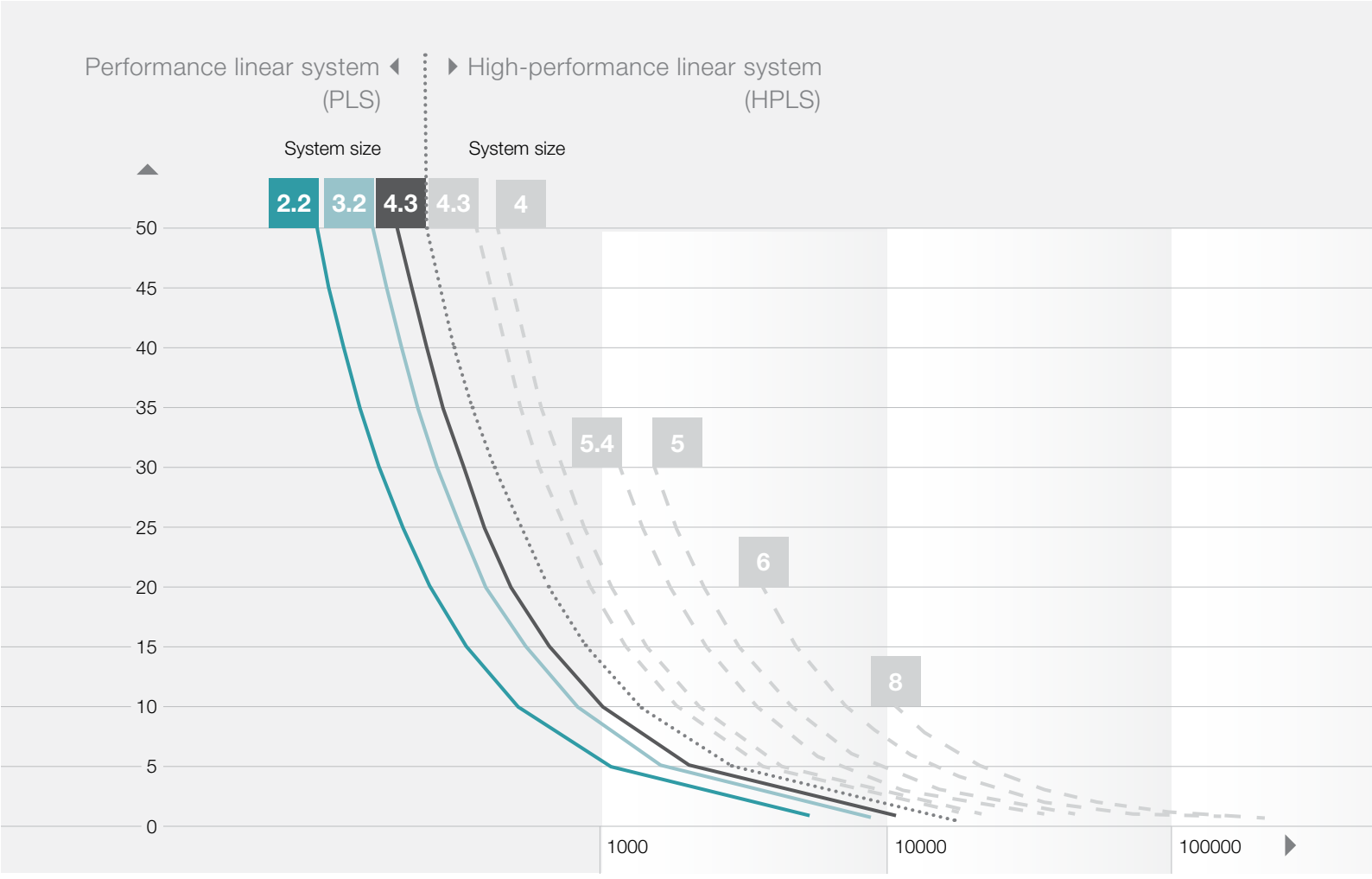
Quick system selection



Planetary gearhead SP+/ right-angle gearhead SK+/ SPK+ with Standard Class RSP pinion and Value Class rack (all pinions, pressure angle α=20°, inclination angle β=19.5283° left-handed)

Gearhead size [b]	Module	z	A ±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)

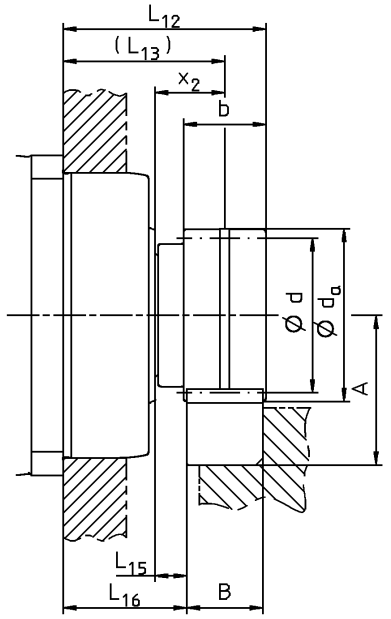
[b] Output type: 2 – Involute as per DIN5480; also available with V-Drive worm gearhead

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	14000	3150	742	6567	278	182	2.8	6.17
SP+ 240	5	24	22000	4950	1400	12391	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 α=20°, inclination angle β=19.5283° left-handed)

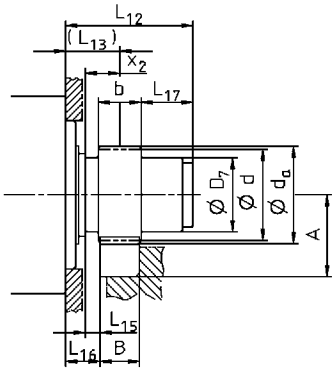
Gearhead size [b]	Module	z	A ±0,3 [a]	b	B	d_a	d	x	L12	L13	x2	L15	L16	L17
LP+/ LK+/ LPK+ 070	2	18	41.899	26	24	43.7	38.197	0.4	42.0	27.0	19.0	7.0	15.0	2.0
LP+/ LK+/ LPK+ 090	2	22	45.743	26	24	51.4	46.686	0.2	52.0	30.0	20.0	8.0	18.0	9.0
LP+/ LK+/ LPK+ 120	2	26	49.587	26	24	59.1	55.174	0	77.5	33.0	21.0	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 α=20°, inclination angle β=19.5283° left-handed)

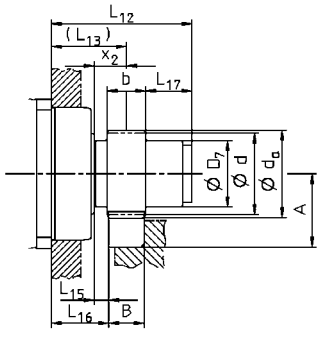
Gearhead size [b]	Module	z	A ±0,3 [a]	b	B	d_a	d	x	L12	L13	x2	L15	L16	L17
SP+/ SK+ 060	2	18	41.899	26	24	43.7	38.197	0.4	54.0	39.0	19.0	7.0	27.0	2.0
SP+/ SK+/ SPK+ 075	2	22	45.743	26	24	51.4	46.686	0.2	62.0	40.0	20.0	8.0	28.0	9.0
SP+/ SK+/ SPK+ 100	2	26	49.587	26	24	59.1	55.174	0	95.5	51.0	21.0	9.0	39.0	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	4300	968	119	1053	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