



TK+/TPK+ – The NEW Precision

TK+ Low-Backlash Hollow-Shaft Flange Gearhead
TPK+ Low-Backlash Right-Angle Gearhead

2006 - I



alpha

a WITTENSTEIN AG company



TK+/TPK+ – The key to a new design freedom

The new right-angled gearheads **TK+/TPK+** from alpha brings you a new innovation potential – for your machine productivity as well as possible design solutions. Its combination of an ISO robot flange and a hollow-shaft in the same unit gives you a maximum of design freedom – for turntables, grippers, tool changers and tilting axes. With the **TK+/TPK+** you can even build your own linear actuator using standard servo motors.

The **TPK+** offers for higher ratios extra-high positioning precision and power density, which opens up yet another host of innovation opportunities: lighter and faster travelling axes, replacement of cam turntables, increased robot productivity on the 7th axis, downsized positioning drives, and much more.

With the hypoid gear technology of the **TK+/TPK+**, we have overcome the traditional limitations of bevel gears. With the + we bring you more torque, a lower noise level and increased productivity.

Let yourself be inspired.

Your advantages at a glance:

High-speed continuous operation in packaging machinery.

Dynamic cyclic operation in automation applications.

Optimal smooth running in printing and converting machinery.

Our system solution alpha rack & pinion in combination with the **TK+/TPK+** is optimal for handling automation as well as the 7 axis for industrial robots.

With the advanced **TK+/TPK+** right-angle gearhead we offer you new technical and economical opportunities to suit your creativity.



TK+/TPK+ – opens new doors

Higher productivity

Do you demand maximum productivity from your machine?

With up to 200 % more torque and 100 % higher speeds than comparable products, the TK+/TPK+ offers the optimum performance for maximum output.

Simple and convenient

From an optimised design with our cymex software, to our patented alpha motor mounting system and identical oil flow rates for all mounting orientations: the TK+/TPK+ pulls out all the stops to make your job as easy as possible.



Cutting edge innovations – made by alpha

We have been developing, manufacturing and distributing low-backlash planetary gearheads, servo right-angled gearheads, complete drive units and planetary elevator machines with an integrated servo motor since 1984.

Profit from our comprehensive service package: from individual components to complete systems, supported by our competent engineering services. Nearly thousand employees worldwide get involved with offering this service to you. alpha's headquarters are on the "Romantic Road" in Igersheim / Germany.

alpha is a member of the WITTENSTEIN AG Group which has rightly established a name for itself with numerous innovations in industries such as aerospace and simulation, medical technology, elevator drives and Formula One racing.

Extraordinarily robust

The TK⁺/TPK⁺ is extremely reliable thanks to its ultra-rugged overall design and 100 % alpha inspection – "fit it and forget it". With integrated thermal length compensation, the TK⁺/TPK⁺ also maximises the service life of your servo motor in high-speed continuous duty.

Compact and totally flexible

A right-angle drive with the TK⁺/TPK⁺ makes your machine more compact. With reduction ratios from $i = 3$ to $i = 100$ (TK⁺) and $i = 12$ to $i = 100$ (TPK⁺) with the TP⁺ output – the industry standard from alpha – it represents an attractive alternative for almost any design concept.

Reliable and precise

The low torsional backlash and high torsional stiffness of the TK⁺/TPK⁺ assure the positioning accuracy of your drives and therefore the precision of your machines, even in highly dynamic operations with up to 50,000 cycles/hour.

TPK⁺

Leaders of the pack

We are driven by a desire to enhance our customers' success with products and systems from alpha. We set benchmarks when it comes to precision, performance and durability. Our trailblazing technology gives our customers an edge in their respective market sectors. Place your trust in premium quality and total reliability from alpha. Choose world class engineering – the foundation for strong partnerships and added value that is passed on to your customers.

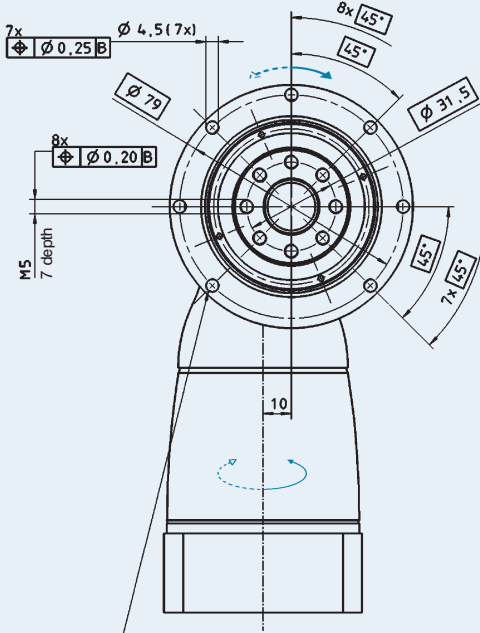
alpha benefits at a glance:

- **Record-breaking lifespan**
Extremely long service life resulting from intelligent design, latest synthetic lubrication technology, exclusive sealing technology, and incredibly strong output bearings.
- **Motor mounting is almost foolproof**
Simple and reliable mounting in a single step.
- **Top quality from alpha**
In-house development and manufacture of all products combined with a pioneering spirit and an insatiable urge to improve.

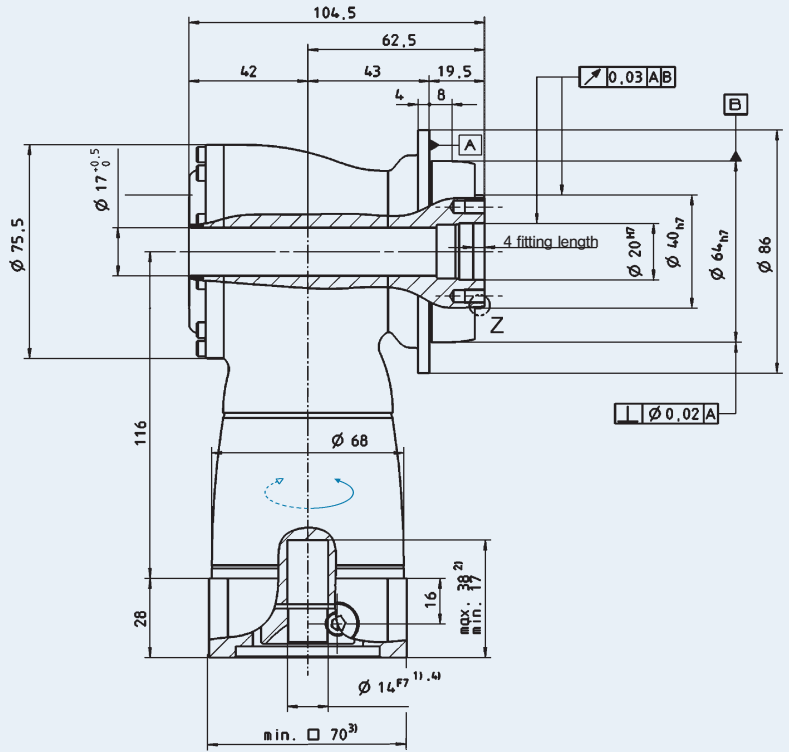


alpha

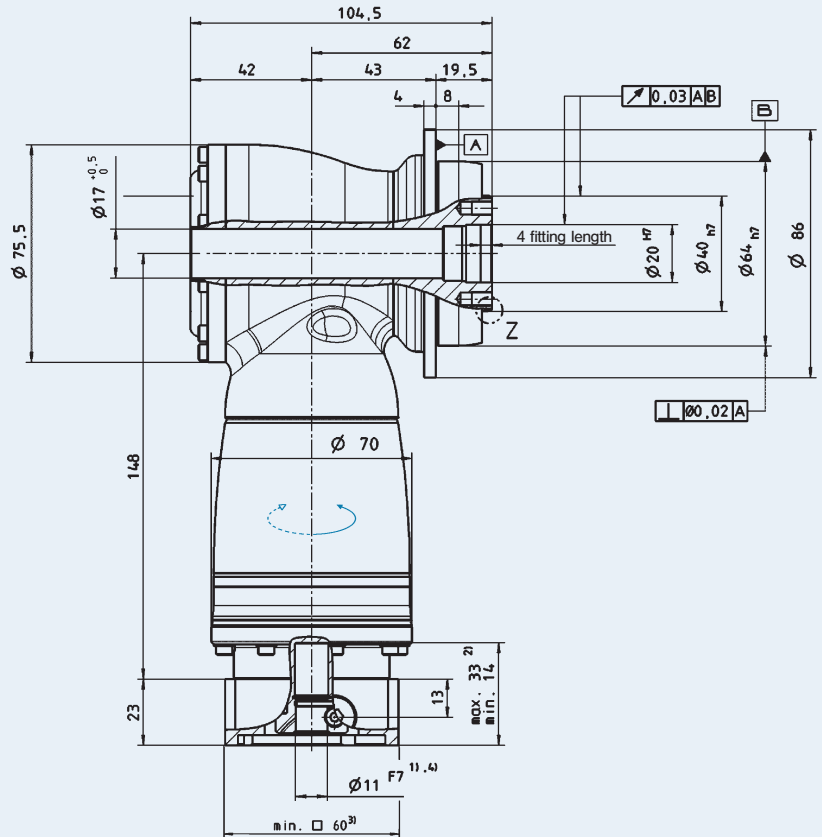
1-stage



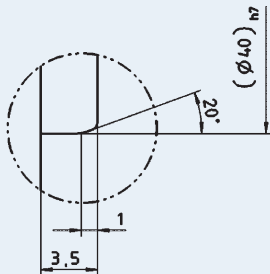
For 7x screw M4 / strength category 12.9



2-stage



Z: Detail



Non-toleranced dimensions ±1 mm

- 1) Check motor shaft fit.
- 2) Min./max. permissible motor shaft length. Longer motor shafts are possible on request: please contact alpha.
- 3) Dimensions depend on motor.
- 4) Smaller motor shaft diameters possible using a bushing with a minimum wall thickness of 1 mm (see page 26).

▲ Motor mounting in accordance with Operating Manual

Technical Data TK+ 004

			1-stage					2-stage									
Ratio	i		3	4	5	7	10	12	16	20	25	28	35	40	50	70	100
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	30	30	30	25	20	30	30	30	30	30	30	30	30	25	20
Nominal output torque	T_{2N}	Nm	22	22	22	20	15	22	22	22	22	22	22	22	22	20	15
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	40	50	50	45	40	50	50	50	50	50	50	50	50	45	40
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min ⁻¹	2200	2400	2700	2700	2700	4400	4400	4400	4400	4400	4400	4400	4800	5500	5500
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N,cym}$	min ⁻¹	2700	3100	3600	3100	3100	For higher mean speeds, contact alpha									
No-load running torque ($n_1=3000$ rpm) *** (At 20 °C gearhead temperature)	T_{012}	Nm	1.4	1.3	1.2	1.4	1.3	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
Max. input speed	n_{1Max}	min ⁻¹	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Torsional backlash	j_t	arcmin	≤ 5														
Torsional stiffness	C_{t21}	Nm/arcmin	2.6	2.8	3.0	2.6	2.3	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.0	2.6	2.3
Max. axial force ****	F_{2AMax}	N	2400														
Max. radial force ****	F_{2RMMax}	N	2700														
Max. tilting moment	M_{2KMMax}	Nm	251														
Efficiency at full load	η	%	96					94									
Service life (see alpha's "Technical Basics" catalogue for calculation)	L_h	h	≥ 20,000														
Weight (incl. adapter plate)	m	kg	2.9					3.2									
Noise level ($n_1=3000$ min ⁻¹) *****	L_{PA}	dB(A)	≤ 64														
Max. permissible housing temperature		°C	+90														
Ambient temperature		°C	0 to +40														
Lubrication			Synthetic gear oil														
Paint			Blue RAL 5002														
Direction of rotation			Input and output sides in opposite direction														
Type of protection			IP 65														
Mass moment of inertia (referring to the drive)	J_1	kgcm ²	0.57	0.46	0.41	0.37	0.35	0.09	0.09	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06

* Higher mean speeds are possible at reduced nominal torque.

** Please reduce the speed at higher ambient temperatures.

*** No load running torque decrease in operation.

**** In reference to the centre of the output flange

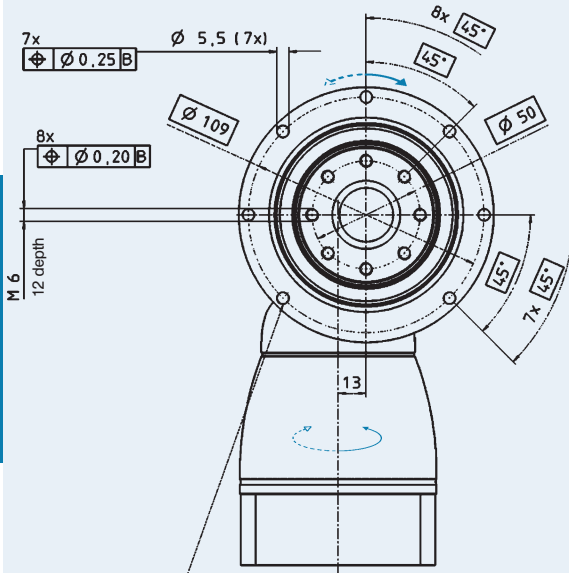
***** Measured at ratio $i = 5$ (without load)

Please contact alpha for information about S1 operating conditions (continuous duty).

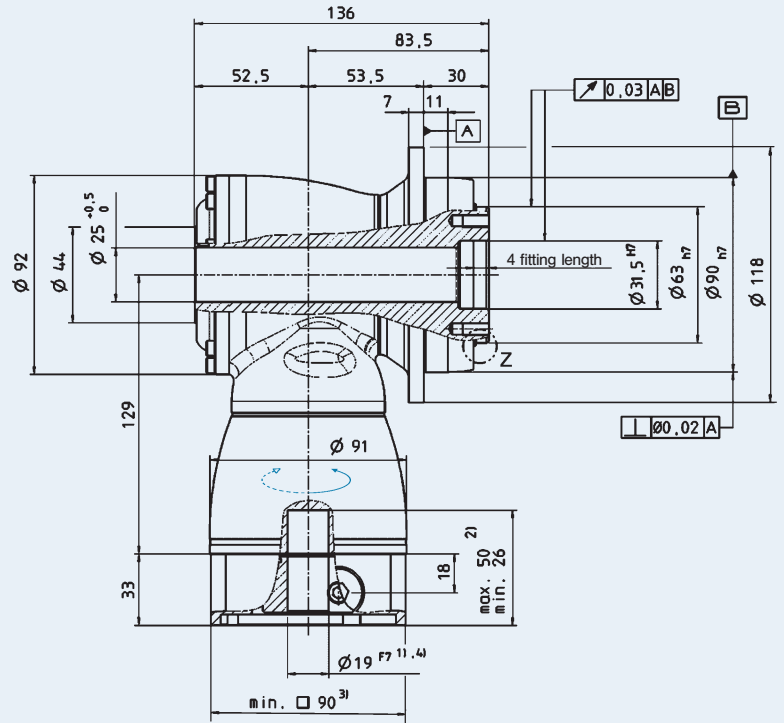
Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 kgcm ²	= 8.85×10^{-4} in.lb.s ²
1 N	= 0.225 lb _f
1 kg	= 2.21 lb _m

1-stage

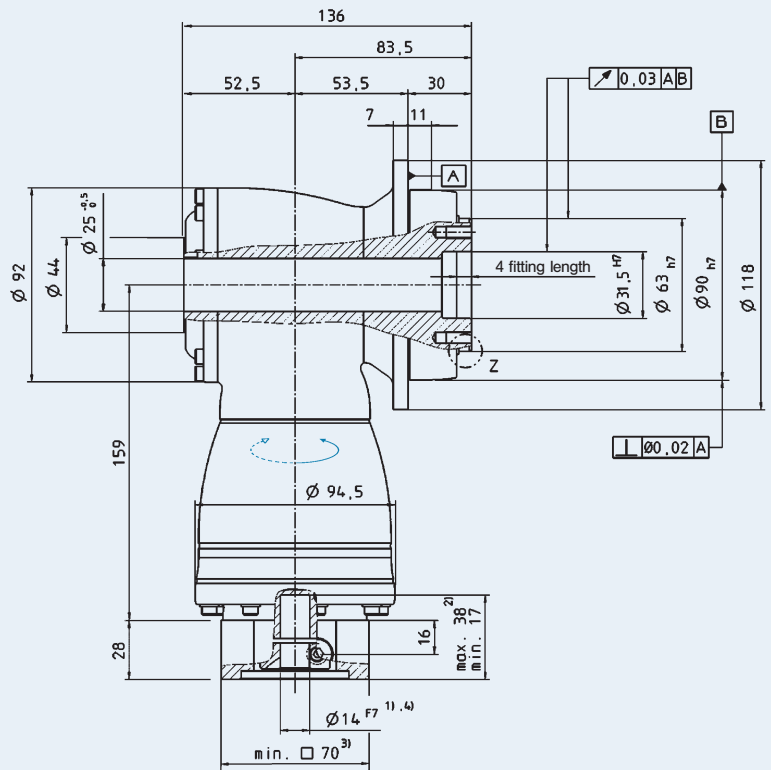
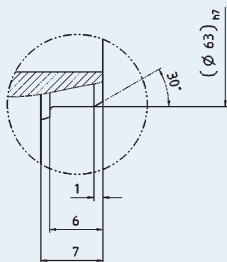


For 7x screw M5 / strength category 12.9



2-stage

Z: Detail




Non-toleranced dimensions ± 1 mm

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shafts are possible on request: please contact alpha.

3) Dimensions depend on motor.

4) Smaller motor shaft diameters possible using a bushing with a minimum wall thickness of 1 mm (see page 26).

 Motor mounting in accordance with Operating Manual

Technical Data TK+ 010

			1-stage					2-stage											
Ratio	i		3	4	5	7	10	12	16	20	25	28	35	40	50	70	100		
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	70	70	70	60	50	70	70	70	70	70	70	70	70	60	50		
Nominal output torque	T_{2N}	Nm	50	50	50	45	40	50	50	50	50	50	50	50	50	45	40		
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	95	115	115	110	100	115	115	115	115	115	115	115	115	110	100		
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min ⁻¹	2100	2200	2500	2500	2500	3500	3500	3500	3500	3500	3500	3500	3800	4500	4500		
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N,cym}$	min ⁻¹	2700	3100	3600	3100	3100	For higher mean speeds, contact alpha											
No-load running torque ($n_1=3000$ rpm) *** (At 20 °C gearhead temperature)	T_{012}	Nm	2.4	2.0	1.8	2.4	2.2	0.4	0.4	0.3	0.3	0.3	0.3	0.1	0.1	0.1	0.1		
Max. input speed	n_{1Max}	min ⁻¹	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000		
Torsional backlash	j_t	arcmin	≤ 4																
Torsional stiffness	C_{t21}	Nm/arcmin	6	7	8	8	8	7	7	7	7	7	7	7	8	8	8		
Max. axial force ****	F_{2AMax}	N	3400																
Max. radial force ****	F_{2RMMax}	N	4000																
Max. tilting moment	M_{2KMax}	Nm	437																
Efficiency at full load	η	%	96					94											
Service life (see alpha's "Technical Basics" catalogue for calculation)	L_h	h	≥ 20,000																
Weight (incl. adapter plate)	m	kg	5.3					6.1											
Noise level ($n_1=3000$ min ⁻¹) *****	L_{PA}	dB(A)	≤ 66																
Max. permissible housing temperature		°C	+90																
Ambient temperature		°C	0 to +40																
Lubrication			Synthetic gear oil																
Paint			Blue RAL 5002																
Direction of rotation			Input and output sides in opposite direction																
Type of protection			IP 65																
Mass moment of inertia (referring to the drive)	J_1	kgcm ²	1.81	1.39	1.18	1.02	0.93	0.31	0.28	0.24	0.23	0.21	0.19	0.18	0.18	0.18	0.18		

- * Higher mean speeds are possible at reduced nominal torque.
- ** Please reduce the speed at higher ambient temperatures.
- *** No load running torque decrease in operation.
- **** In reference to the centre of the output flange
- ***** Measured at ratio $i = 5$ (without load)

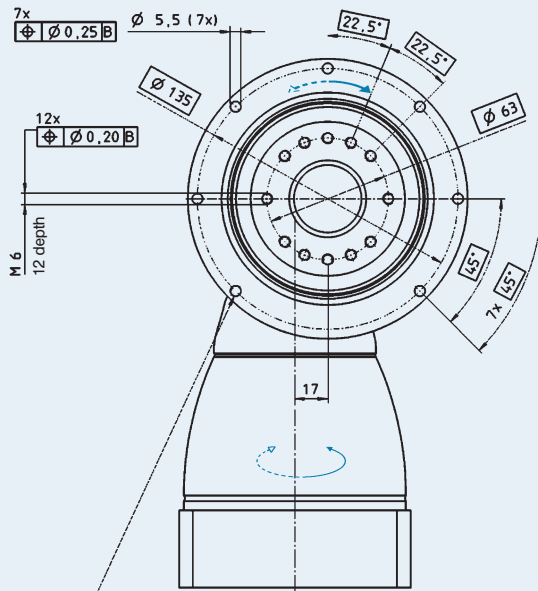
Please contact alpha for information about S1 operating conditions (continuous duty).

Conversion table

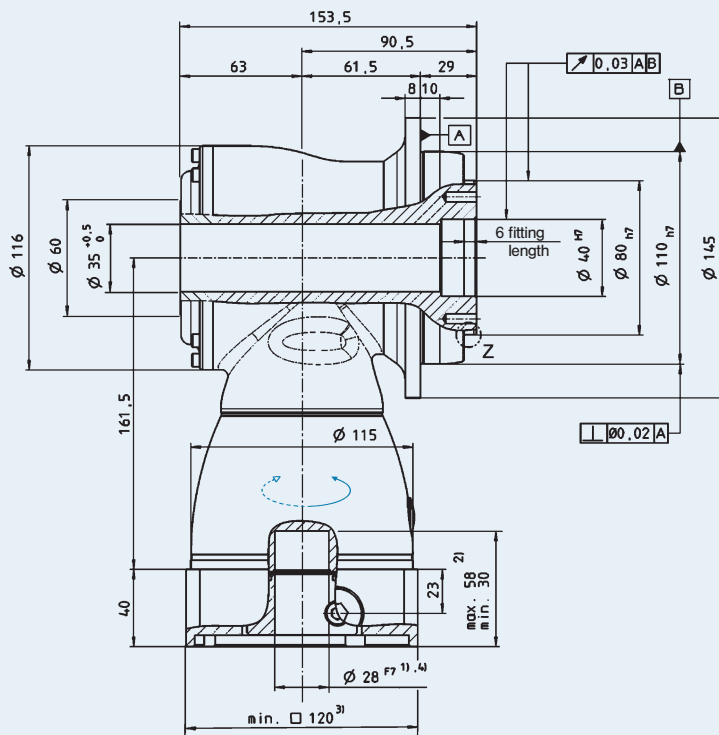
1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 kgcm ²	= 8.85×10^{-4} in.lb.s ²
1 N	= 0.225 lb _f
1 kg	= 2.21 lb _m



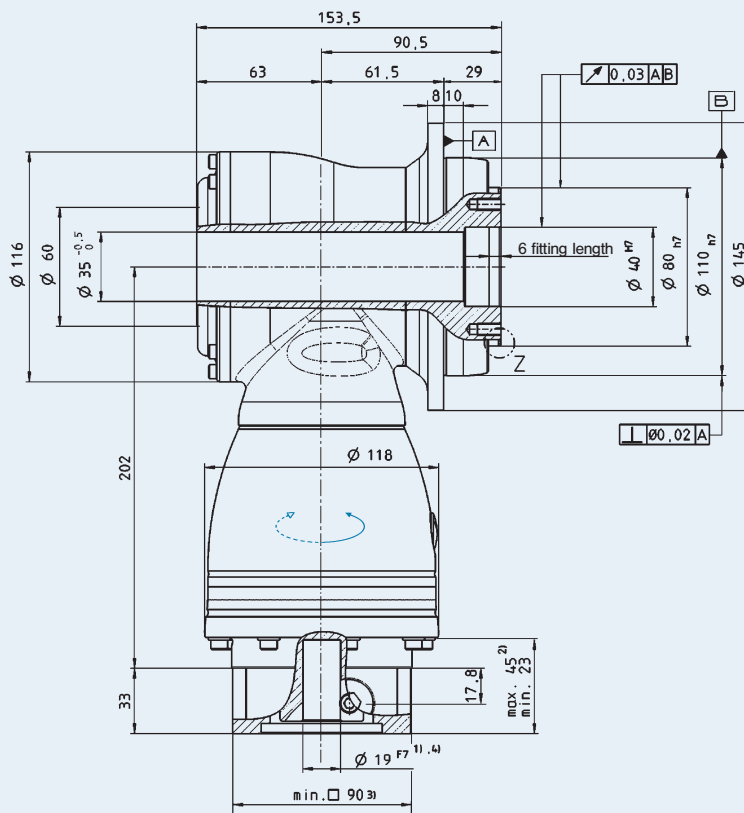
1-stage



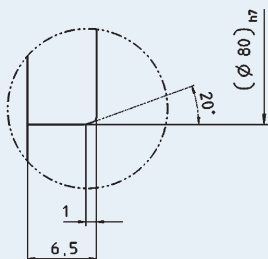
For 7x screw M5 / strength category 12.9



2-stage



Z: Detail



Non-toleranced dimensions ± 1 mm

- 1) Check motor shaft fit.
- 2) Min./max. permissible motor shaft length. Longer motor shafts are possible on request: please contact alpha.
- 3) Dimensions depend on motor.
- 4) Smaller motor shaft diameters possible using a bushing with a minimum wall thickness of 1 mm (see page 26).

 Motor mounting in accordance with Operating Manual

Technical Data TK+ 025			1-stage					2-stage									
Ratio	i		3	4	5	7	10	12	16	20	25	28	35	40	50	70	100
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	170	170	170	145	125	170	170	170	170	170	170	170	170	145	125
Nominal output torque	T_{2N}	Nm	100	100	100	90	80	100	100	100	100	100	100	100	100	90	80
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	220	260	260	255	250	260	260	260	260	260	260	260	260	255	250
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min ⁻¹	2000	2100	2400	2200	2200	3100	3100	3100	3100	3100	3100	3100	3500	4200	4200
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N,cym}$	min ⁻¹	2700	3000	3400	3000	3000	For higher mean speeds, contact alpha									
No-load running torque ($n_1=3000$ rpm) *** (At 20 °C gearhead temperature)	T_{012}	Nm	4.6	3.6	2.8	4.2	3.4	0.7	0.7	0.6	0.5	0.5	0.4	0.2	0.2	0.2	0.2
Max. input speed	n_{1Max}	min ⁻¹	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500
Torsional backlash	j_t	arcmin	≤ 4														
Torsional stiffness	C_{t21}	Nm/arcmin	12	13	16	16	16	13	13	13	13	13	13	13	16	16	16
Max. axial force ****	F_{2AMax}	N	5700														
Max. radial force ****	F_{2RMax}	N	6300														
Max. tilting moment	M_{2KMMax}	Nm	833														
Efficiency at full load	η	%	96					94									
Service life (see alpha's "Technical Basics" catalogue for calculation)	L_h	h	≥ 20,000														
Weight (incl. adapter plate)	m	kg	8.9					10.6									
Noise level ($n_1=3000$ min ⁻¹) *****	L_{PA}	dB(A)	≤ 66														
Max. permissible housing temperature		°C	+90														
Ambient temperature		°C	0 to +40														
Lubrication			Synthetic gear oil														
Paint			Blue RAL 5002														
Direction of rotation			Input and output sides in opposite direction														
Type of protection			IP 65														
Mass moment of inertia (referring to the drive)	J_1	kgcm ²	5.46	4.26	3.63	3.13	2.87	1.08	1.01	0.88	0.85	0.76	0.75	0.70	0.69	0.69	0.68

* Higher mean speeds are possible at reduced nominal torque.

** Please reduce the speed at higher ambient temperatures.

*** No load running torque decrease in operation.

**** In reference to the centre of the output flange

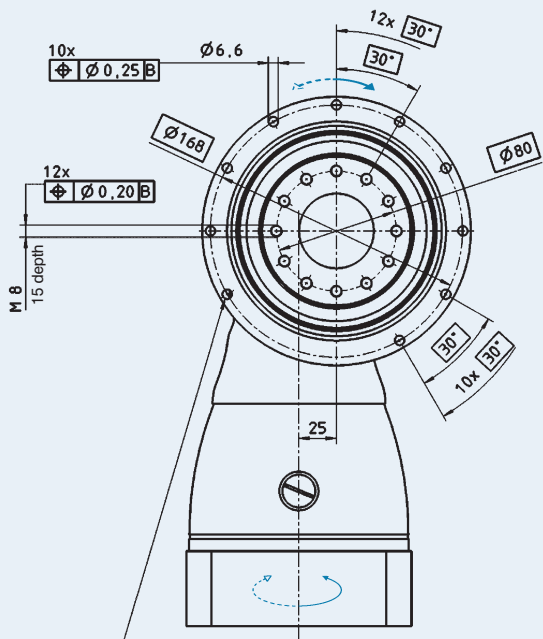
***** Measured at ratio $i = 5$ (without load)

Please contact alpha for information about S1 operating conditions (continuous duty).

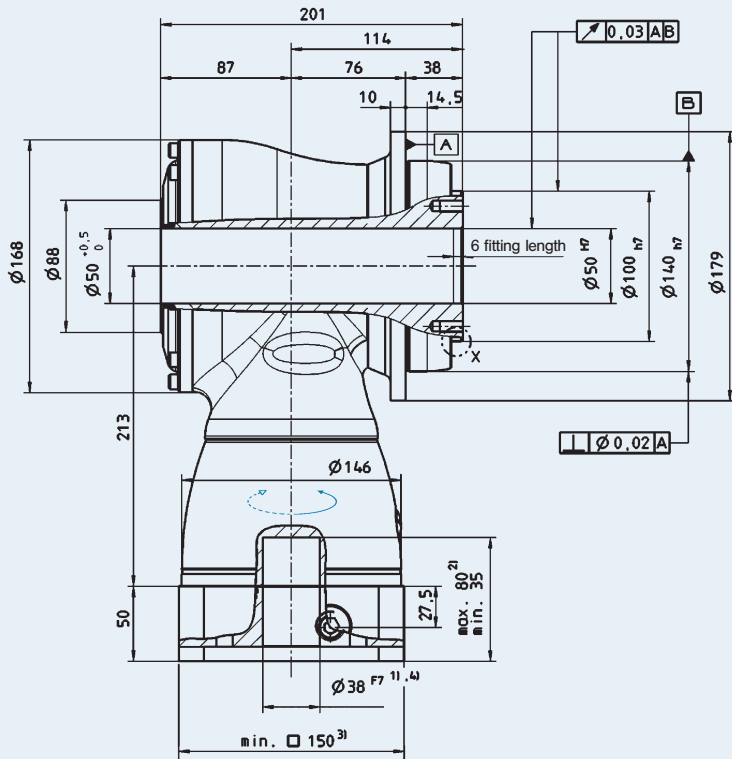
Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 kgcm ²	= 8.85×10^{-4} in.lb.s ²
1 N	= 0.225 lb _f
1 kg	= 2.21 lb _m

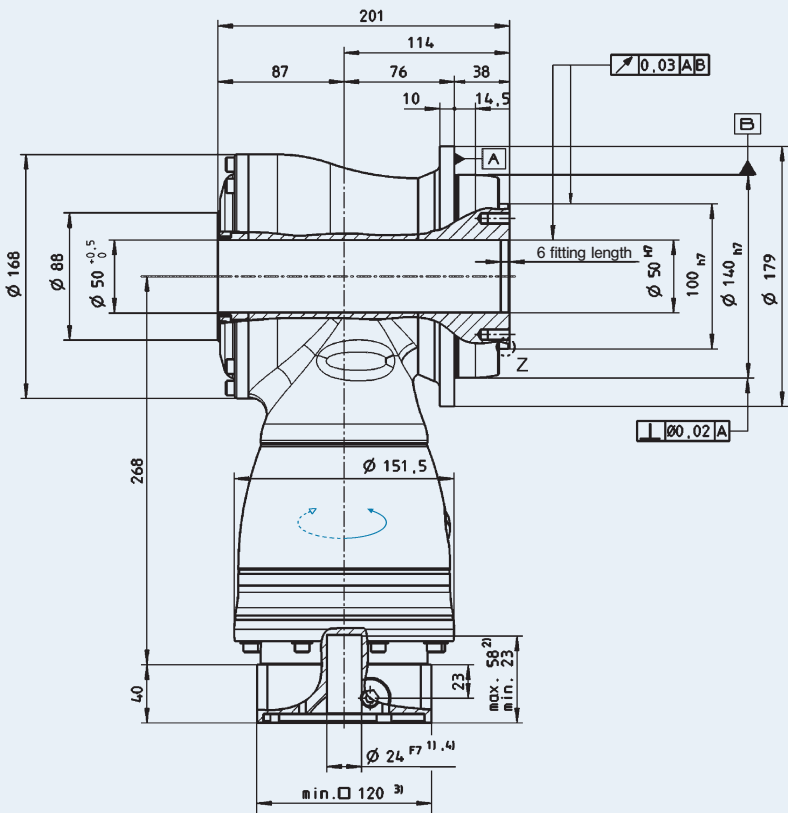
1-stage



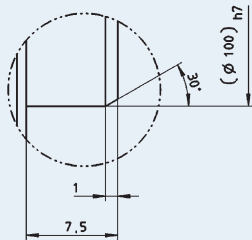
For 10x screw M6 / strength category 12.9



2-stage



Z: Detail



Non-toleranced dimensions ±1 mm

- 1) Check motor shaft fit.
- 2) Min./max. permissible motor shaft length. Longer motor shafts are possible on request: please contact alpha.
- 3) Dimensions depend on motor.
- 4) Smaller motor shaft diameters possible using a bushing with a minimum wall thickness of 1 mm (see page 26).

▲ Motor mounting in accordance with Operating Manual

Technical Data TK+ 050			1-stage					2-stage									
Ratio	i		3	4	5	7	10	12	16	20	25	28	35	40	50	70	100
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	300	300	300	250	210	300	300	300	300	300	300	300	300	250	210
Nominal output torque	T_{2N}	Nm	190	190	190	175	160	190	190	190	190	190	190	190	190	175	160
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	400	500	500	450	400	500	500	500	500	500	500	500	500	450	400
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min ⁻¹	1700	1800	2000	1800	1800	2900	2900	2900	2900	2900	2900	2900	3200	3200	3900
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N,cym}$	min ⁻¹	2200	2500	2800	2500	2500	For higher mean speeds, contact alpha									
No-load running torque ($n_1=3000$ rpm) *** (At 20 °C gearhead temperature)	T_{012}	Nm	8.4	6.2	5.4	9.0	6.6	1.7	1.1	0.8	0.6	0.6	0.5	0.5	0.4	0.4	0.4
Max. input speed	n_{1Max}	min ⁻¹	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500
Torsional backlash	j_t	arcmin	≤ 4														
Torsional stiffness	C_{t21}	Nm/arcmin	36	40	46	44	42	40	40	40	40	40	40	40	46	44	42
Max. axial force ****	F_{2AMax}	N	9900														
Max. radial force ****	F_{2RMMax}	N	9500														
Max. tilting moment	M_{2KMMax}	Nm	1692														
Efficiency at full load	η	%	96					94									
Service life (see alpha's "Technical Basics" catalogue for calculation)	L_h	h	≥ 20,000														
Weight (incl. adapter plate)	m	kg	22					26									
Noise level ($n_1=3000$ min ⁻¹) *****	L_{PA}	dB(A)	≤ 68														
Max. permissible housing temperature		°C	+90														
Ambient temperature		°C	0 to +40														
Lubrication			Synthetic gear oil														
Paint			Blue RAL 5002														
Direction of rotation			Input and output sides in opposite direction														
Type of protection			IP 65														
Mass moment of inertia (referring to the drive)	J_1	kgcm ²	28.4	21.0	17.6	14.7	13.1	4.4	4.0	3.4	3.2	2.8	2.8	2.5	2.5	2.4	2.4

* Higher mean speeds are possible at reduced nominal torque.

** Please reduce the speed at higher ambient temperatures.

*** No load running torque decrease in operation.

**** In reference to the centre of the output flange

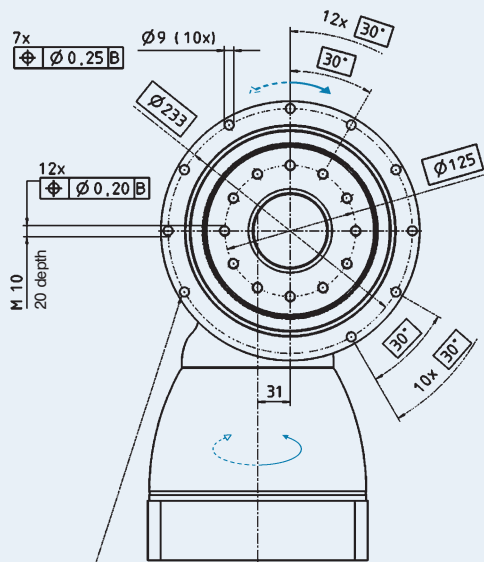
***** Measured at ratio $i = 5$ (without load)

Please contact alpha for information about S1 operating conditions (continuous duty).

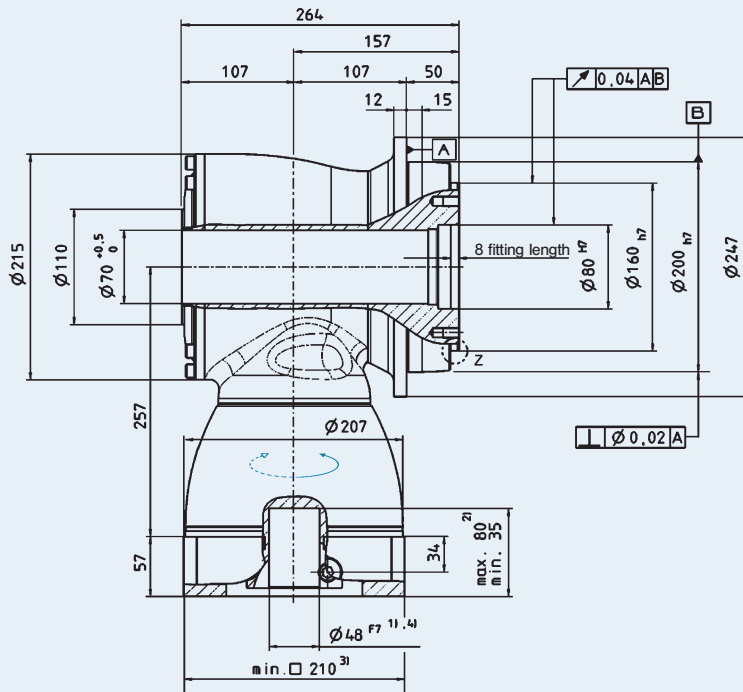
Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 kgcm ²	= 8.85×10^{-4} in.lb.s ²
1 N	= 0.225 lb _f
1 kg	= 2.21 lb _m

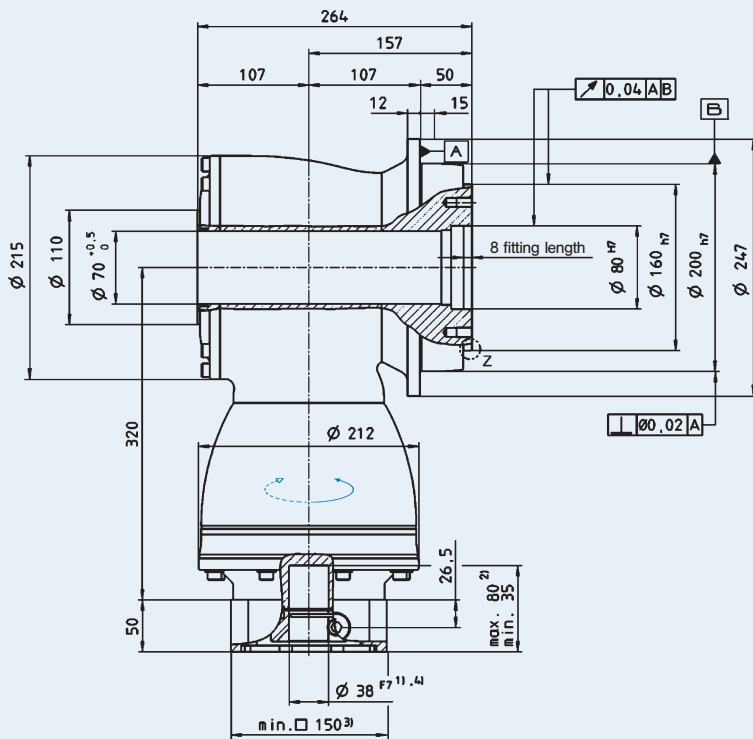
1-stage



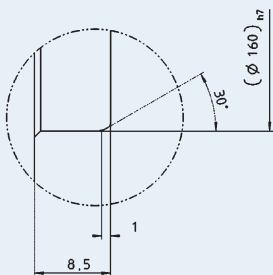
For 10x screw M8 / strength category 12.9



2-stage



Z: Detail



Non-toleranced dimensions ± 1 mm

- 1) Check motor shaft fit.
- 2) Min./max. permissible motor shaft length. Longer motor shafts are possible on request: please contact alpha.
- 3) Dimensions depend on motor.
- 4) Smaller motor shaft diameters possible using a bushing with a minimum wall thickness of 1 mm (see page 26).

▲ Motor mounting in accordance with Operating Manual

Technical Data TK+ 110			1-stage					2-stage									
Ratio	i		3	4	5	7	10	12	16	20	25	28	35	40	50	70	100
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	640	640	640	550	470	640	640	640	640	640	640	640	640	550	470
Nominal output torque	T_{2N}	Nm	400	400	400	380	360	400	400	400	400	400	400	400	400	380	360
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	900	1050	1050	970	900	1050	1050	1050	1050	1050	1050	1050	1050	970	900
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min ⁻¹	1400	1600	1800	1600	1600	2700	2700	2700	2700	2700	2700	2700	2900	3200	3400
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N,cym}$	min ⁻¹	1800	2100	2500	2200	2200	For higher mean speeds, contact alpha									
No-load running torque ($n_1=3000$ rpm) *** (At 20 °C gearhead temperature)	T_{012}	Nm	17.5	14.5	12.0	18.0	15.0	3.6	2.8	2.2	1.9	1.6	1.4	1.1	1.1	1.1	1.1
Max. input speed	n_{1Max}	min ⁻¹	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Torsional backlash	j_t	arcmin	≤ 4														
Torsional stiffness	C_{t21}	Nm/arcmin	76	87	99	97	96	87	87	87	87	87	87	87	99	97	96
Max. axial force ****	F_{2AMax}	N	14200														
Max. radial force ****	F_{2RMMax}	N	14700														
Max. tilting moment	M_{2KMMax}	Nm	3213														
Efficiency at full load	η	%	96					94									
Service life (see alpha's "Technical Basics" catalogue for calculation)	L_h	h	≥ 20,000														
Weight (incl. adapter plate)	m	kg	48					54									
Noise level ($n_1=3000$ min ⁻¹) *****	L_{PA}	dB(A)	≤ 68														
Max. permissible housing temperature		°C	+90														
Ambient temperature		°C	0 to +40														
Lubrication			Synthetic gear oil														
Paint			Blue RAL 5002														
Direction of rotation			Input and output sides in opposite direction														
Type of protection			IP 65														
Mass moment of inertia (referring to the drive)	J_1	kgcm ²	96.5	64.6	50.5	38.2	31.8	16.8	14.8	12.9	12.3	11.2	10.9	10.3	10.1	10.0	9.9

* Higher mean speeds are possible at reduced nominal torque.

** Please reduce the speed at higher ambient temperatures.

*** No load running torque decrease in operation.

**** In reference to the centre of the output flange

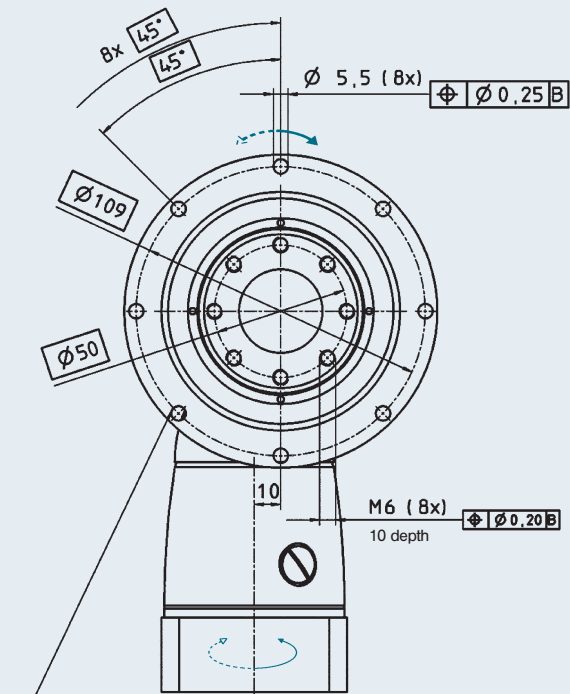
***** Measured at ratio $i=5$ (without load)

Please contact alpha for information about S1 operating conditions (continuous duty).

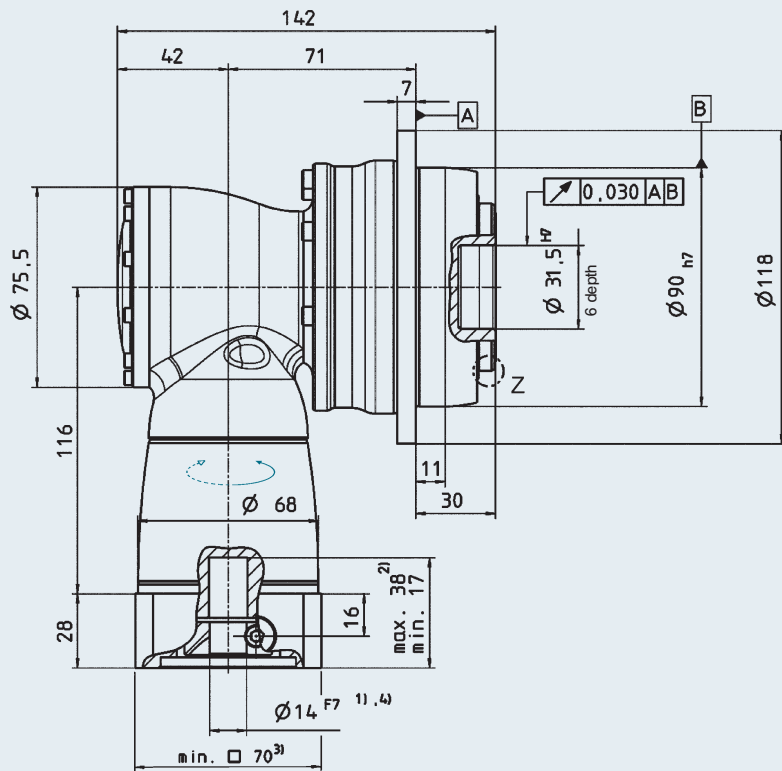
Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 kgcm ²	= 8.85×10^{-4} in.lb.s ²
1 N	= 0.225 lb _f
1 kg	= 2.21 lb _m

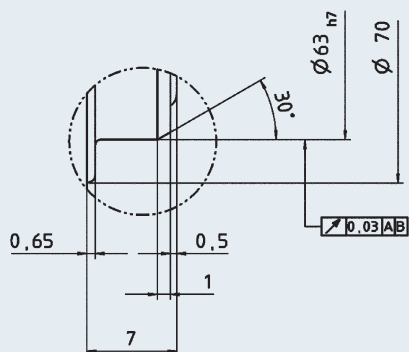
2-stage



For 8x screw M5 / strength category 12.9



Z: Detail



Non-toleranced dimensions ± 1 mm

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shafts are possible on request: please contact alpha.

3) Dimensions depend on motor.

4) Smaller motor shaft diameters possible using a bushing with a minimum wall thickness of 1 mm (see page 26).

Motor mounting in accordance with Operating Manual

Technicat Data TPK+ 010 2-stage

			2-stage									
Ratio *	i		12	16	20	25	28	35	40	50	70	100
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	120	120	130	130	130	125	80	100	130	100
Nominal output torque	T_{2N}	Nm	75	75	75	75	75	75	60	75	75	60
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	160	160	200	200	250	175	120	150	210	200
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min ⁻¹	2000	2400	2400	2700	2400	2500	2500	2500	2500	2500
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N.cym}$	min ⁻¹	3000	3400	3400	3800	3400	3200	3200	3200	3200	3200
No-load running torque ($n_1=3000$ rpm) T_{012} (At 20 °C gearhead temperature)		Nm	1.5	1.3	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3
Max. input speed	n_{1Max}	min ⁻¹	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Torsional backlash	j_t	arcmin	Standard ≤ 6 / Reduced ≤ 4									
Torsional stiffness	C_{t21}	Nm/arcmin	-	-	-	-	-	-	-	-	-	22
Max. axial force ***	F_{2AMax}	N	2150									
Max. tilting moment	M_{2KMax}	Nm	235									
Efficiency at full load	η	%	94									
Service life (see alpha's "Technical Basics" catalogue for calculation)	L_h	h	$\geq 20,000$									
Weight (incl. ADP)	m	kg	5.2									
Noise level ($n_1=3000$ min ⁻¹) ****	L_{PA}	dB(A)	≤ 66									
Max. permissible housing temperature		°C	+ 90									
Ambient temperature		°C	0 to +40									
Lubrication			Synthetic gear oil									
Paint			Blue RAL 5002									
Direction of rotation			Input and output sides in opposite direction									
Type of protection			IP 65									
Mass moment of inertia (referring to the drive)	J_1	kgcm ²	0.55	0.46	0.44	0.39	0.43	0.36	0.34	0.34	0.34	0.34

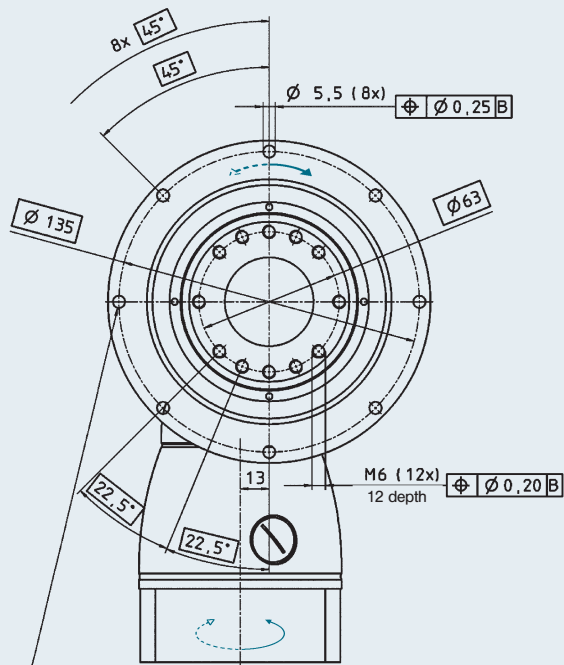
- * Higher mean speeds are possible at reduced nominal torque.
- ** Please reduce the speed at higher ambient temperatures.
- *** In reference to the centre of the output flange.
- **** Measured at ratio $i = 40$ (without load).

Please contact alpha for the optimal sizing in case of continuous running conditions.

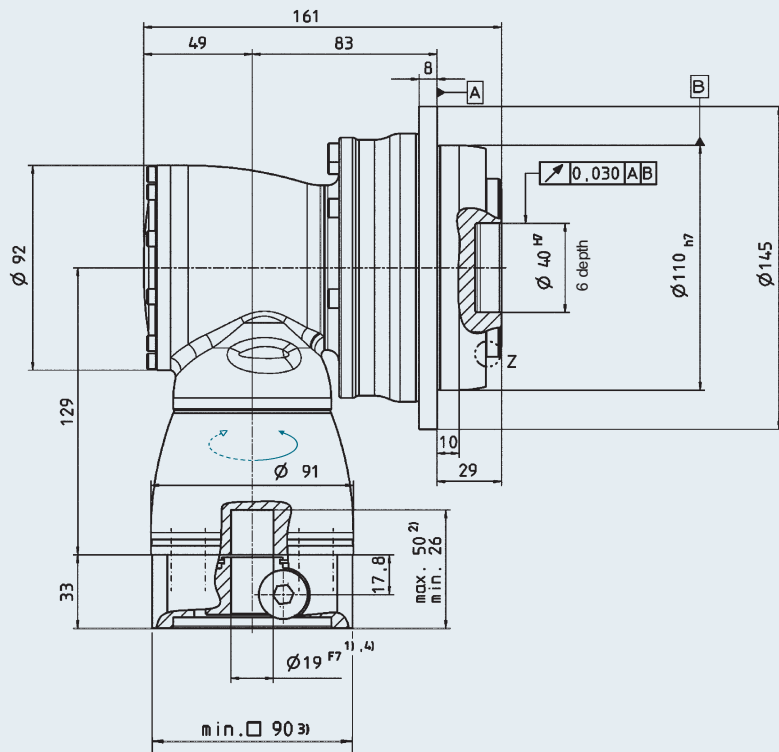
Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 kgcm ²	= 8.85×10^{-4} in.lb.s ²
1 N	= 0.225 lb _f
1 kg	= 2.21 lb _m

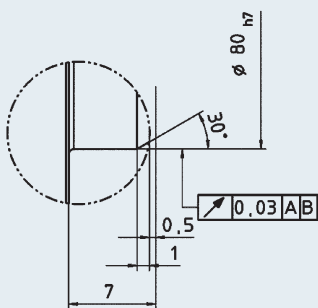
2-stage



For 8x screw M5 / strength category 12.9



Z: Detail



Non-toleranced dimensions ±1 mm

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shafts are possible on request: please contact alpha.

3) Dimensions depend on motor.

4) Smaller motor shaft diameters possible using a bushing with a minimum wall thickness of 1 mm (see page 26).

⚠ Motor mounting in accordance with Operating Manual

Technical Data TPK+ 025 2-stage

			2-stage									
Ratio *	i		12	16	20	25	28	35	40	50	70	100
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	280	280	350	350	330	300	200	250	330	265
Nominal output torque	T_{2N}	Nm	170	170	170	170	170	170	160	170	170	120
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	400	400	500	500	625	500	400	500	625	500
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min ⁻¹	2000	2400	2400	2700	2400	2500	2500	2500	2500	2500
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N,cym}$	min ⁻¹	3000	3400	3400	3800	3400	3200	3200	3200	3200	3200
No-load running torque ($n_1=3000$ rpm) T_{012} (At 20 °C gearhead temperature)		Nm	2.5	2.1	2.0	1.8	2.0	2.2	2.0	2.0	2.0	2.0
Max. input speed	n_{1Max}	min ⁻¹	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Torsional backlash	j_t	arcmin	Standard ≤ 4 / Reduced ≤ 2									
Torsional stiffness	C_{t21}	Nm/arcmin	-	-	-	-	-	-	-	-	-	-
Max. axial force ***	F_{2AMax}	N	4150									
Max. tilting moment	M_{2KMax}	Nm	413									
Efficiency at full load	η	%	94									
Service life (see alpha's "Technical Basics" catalogue for calculation)	L_h	h	$\geq 20,000$									
Weight (incl. ADP)	m	kg	9.0									
Noise level ($n_1=3000$ min ⁻¹) ****	L_{PA}	dB(A)	≤ 68									
Max. permissible housing temperature		°C	+ 90									
Ambient temperature		°C	0 to +40									
Lubrication			Synthetic gear oil									
Paint			Blue RAL 5002									
Direction of rotation			Input and output sides in opposite direction									
Type of protection			IP 65									
Mass moment of inertia (referring to the drive)	J_1	kgcm ²	1.43	1.18	1.16	1.04	1.14	0.94	0.89	0.89	0.89	0.89

- * Higher mean speeds are possible at reduced nominal torque.
- ** Please reduce the speed at higher ambient temperatures.
- *** In reference to the centre of the output flange.
- **** Measured at ratio $i = 40$ (without load).

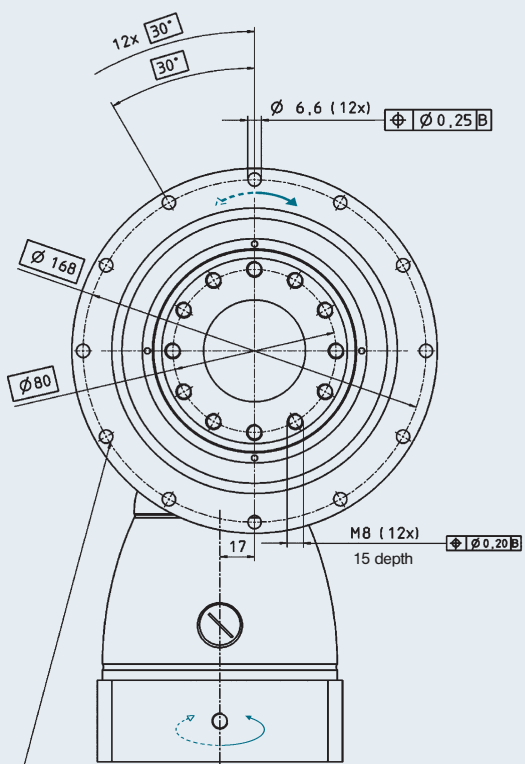
Please contact alpha for the optimal sizing in case of continuous running conditions.

Conversion table

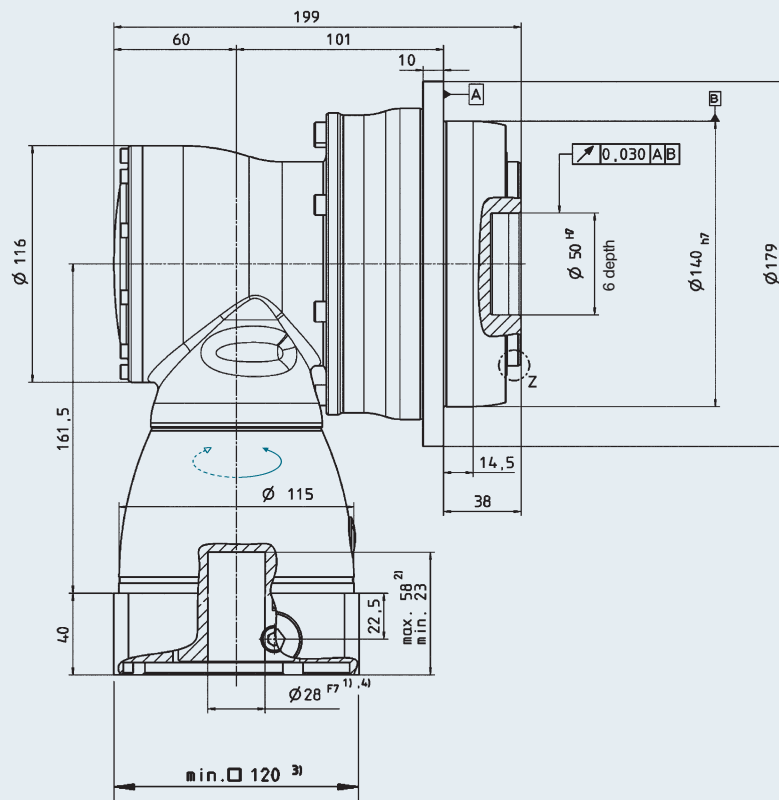
1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 kgcm ²	= 8.85×10^{-4} in.lb.s ²
1 N	= 0.225 lb _f
1 kg	= 2.21 lb _m



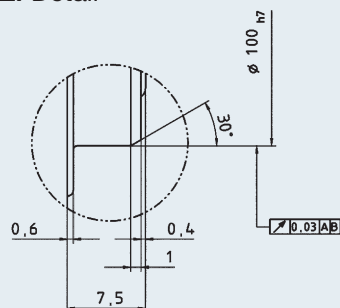
2-stage



For 12x screw M6 / strength category 12.9



Z: Detail



Non-toleranced dimensions ± 1 mm

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shafts are possible on request: please contact alpha.

3) Dimensions depend on motor.

4) Smaller motor shaft diameters possible using a bushing with a minimum wall thickness of 1 mm (see page 26).

⚠ Motor mounting in accordance with Operating Manual

Technical Data TPK+ 050 2-stage

			2-stage									
Ratio *	i		12	16	20	25	28	35	40	50	70	100
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	680	680	700	700	700	700	500	625	700	540
Nominal output torque	T_{2N}	Nm	370	370	370	370	370	370	320	370	370	240
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	1000	1000	1250	1250	1250	1250	1000	1250	1250	1000
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min ⁻¹	1900	2300	2300	2600	2300	2300	2300	2300	2300	2300
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N,cym}$	min ⁻¹	2700	3100	3100	2500	3100	3000	3000	3000	3000	3000
No-load running torque ($n_1=3000$ rpm) T_{012} (At 20 °C gearhead temperature)		Nm	4.0	3.7	3.6	2.8	3.5	3.9	3.1	3.1	3.1	3.1
Max. input speed	n_{1Max}	min ⁻¹	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500
Torsional backlash	j_t	arcmin	Standard ≤ 4 / Reduced ≤ 2									
Torsional stiffness	C_{t21}	Nm/arcmin	-	-	-	-	-	-	-	-	-	124
Max. axial force ***	F_{2AMax}	N	6130									
Max. tilting moment	M_{2KMax}	Nm	1295									
Efficiency at full load	η	%	94									
Service life (see alpha's "Technical Basics" catalogue for calculation)	L_h	h	$\geq 20,000$									
Weight (incl. ADP)	m	kg	17.0									
Noise level ($n_1=3000$ min ⁻¹) ****	L_{PA}	dB(A)	≤ 68									
Max. permissible housing temperature		°C	+ 90									
Ambient temperature		°C	0 to +40									
Lubrication			Synthetic gear oil									
Paint			Blue RAL 5002									
Direction of rotation			Input and output sides in opposite direction									
Type of protection			IP 65									
Mass moment of inertia (referring to the drive)	J_1	kgcm ²	4.56	3.76	3.71	3.28	3.66	2.95	2.79	2.78	2.77	2.77

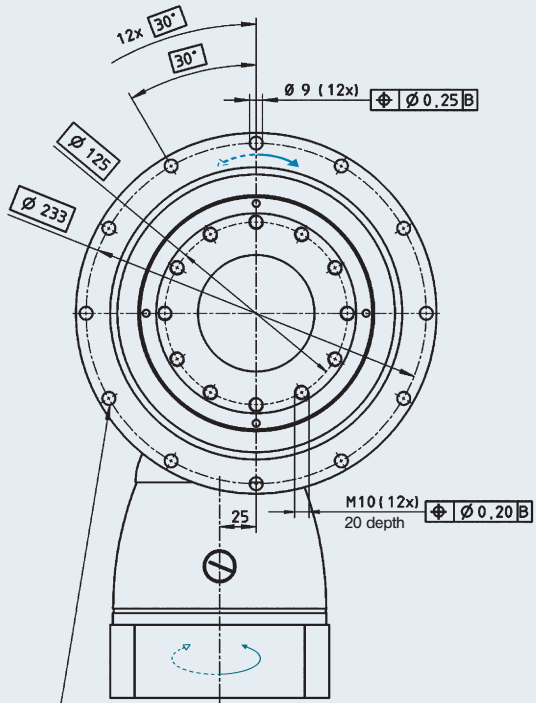
- * Higher mean speeds are possible at reduced nominal torque.
- ** Please reduce the speed at higher ambient temperatures.
- *** In reference to the centre of the output flange.
- **** Measured at ratio $i = 40$ (without load).

Please contact alpha for the optimal sizing in case of continuous running conditions.

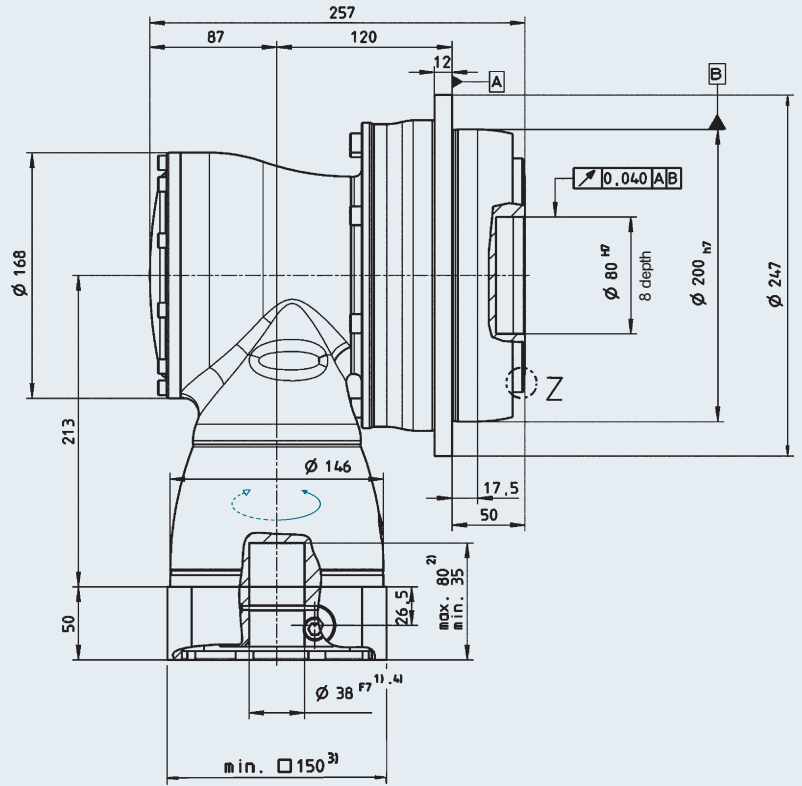
Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 kgcm ²	= 8.85×10^{-4} in.lb.s ²
1 N	= 0.225 lb _f
1 kg	= 2.21 lb _m

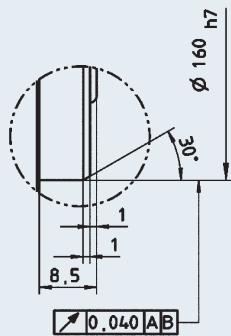
2-stage



For 12x screw M8 / strength category 12.9



Z: Detail



Non-toleranced dimensions ±1 mm

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shafts are possible on request: please contact alpha.

3) Dimensions depend on motor.

4) Smaller motor shaft diameters possible using a bushing with a minimum wall thickness of 1 mm (see page 26).

▲ Motor mounting in accordance with Operating Manual

Technical Data TPK+ 110 2-stage

			2-stage									
Ratio *	i		12	16	20	25	28	35	40	50	70	100
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	1200	1200	1500	1500	1600	1250	840	1050	1470	1400
Nominal output torque	T_{2N}	Nm	700	700	750	750	750	750	640	750	750	750
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	1600	1600	2000	2000	2750	2000	1600	2000	2750	2200
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min ⁻¹	1600	1900	1900	2100	1900	2100	2100	2100	2100	2100
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N,cym}$	min ⁻¹	2300	2600	2600	2800	2600	3000	3000	3000	3000	3000
No-load running torque ($n_1=3000$ rpm) T_{012} (At 20 °C gearhead temperature)		Nm	9.0	6.5	6.5	5.5	6.0	8.0	6.0	6.0	6.0	6.0
Max. input speed	n_{1Max}	min ⁻¹	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500
Torsional backlash	j_t	arcmin	Standard ≤ 4 / Reduced ≤ 2									
Torsional stiffness	C_{t21}	Nm/arcmin	-	-	-	-	-	-	-	-	-	-
Max. axial force ***	F_{2AMax}	N	10050									
Max. tilting moment	M_{2KMax}	Nm	3064									
Efficiency at full load	η	%	94									
Service life (see alpha's "Technical Basics" catalogue for calculation)	L_h	h	$\geq 20,000$									
Weight (incl. ADP)	m	kg	41.0									
Noise level ($n_1=3000$ min ⁻¹) ****	L_{PA}	dB(A)	≤ 70									
Max. permissible housing temperature		°C	+ 90									
Ambient temperature		°C	0 to +40									
Lubrication			Synthetic gear oil									
Paint			Blue RAL 5002									
Direction of rotation			Input and output sides in opposite direction									
Type of protection			IP 65									
Mass moment of inertia (referring to the drive)	J_1	kgcm ²	24.3	19.0	18.7	16.1	18.5	13.9	12.8	12.7	12.7	12.7

* Higher mean speeds are possible at reduced nominal torque.

** Please reduce the speed at higher ambient temperatures.

*** In reference to the centre of the output flange.

**** Measured at ratio $i = 40$ (without load).

Please contact alpha for the optimal sizing in case of continuous running conditions.

Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 kgcm ²	= 8.85×10^{-4} in.lb.s ²
1 N	= 0.225 lb _f
1 kg	= 2.21 lb _m

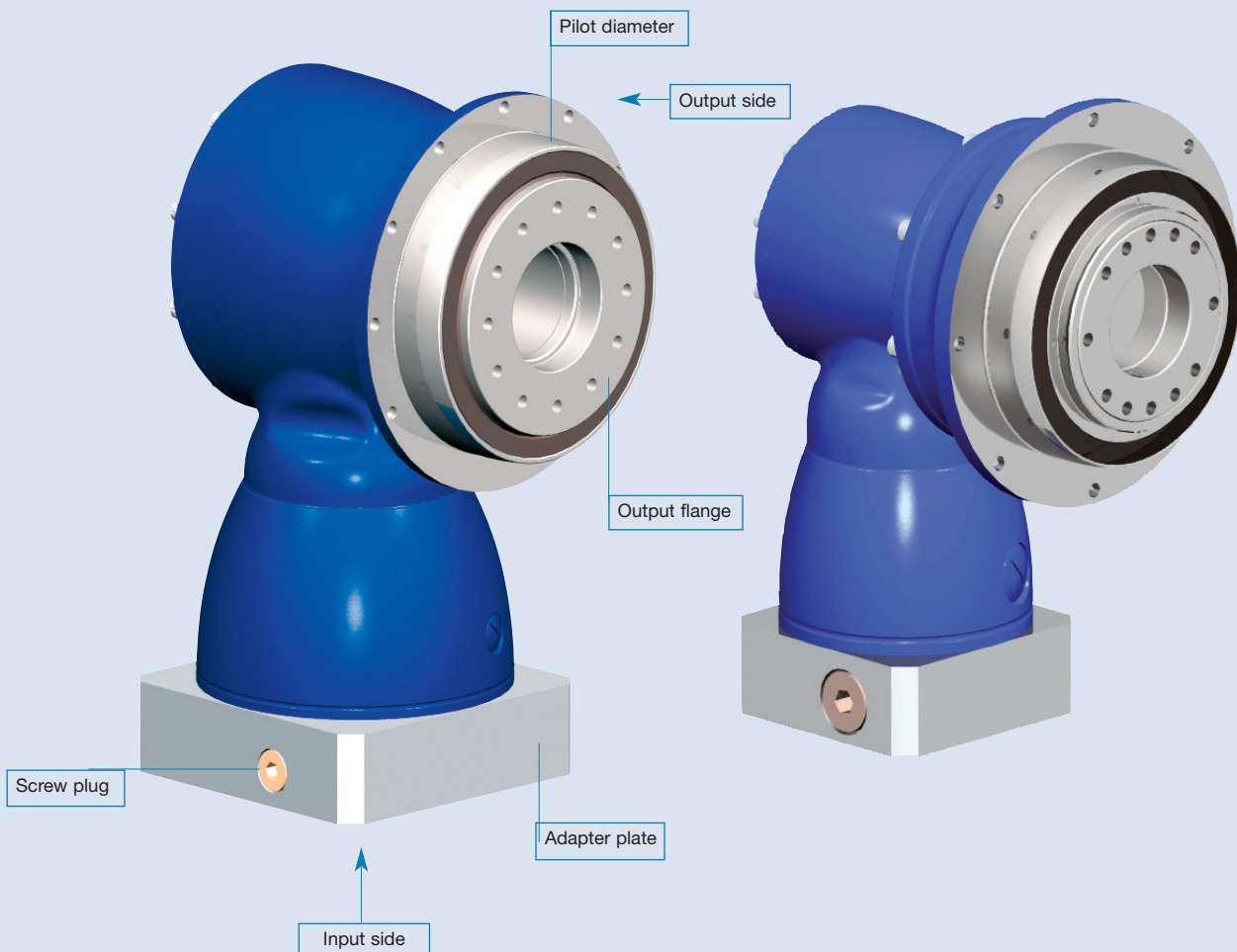
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Symbols and Index

Symbol	Unit	Designation
C	Nm	rigidity
F	N	force
i	-	ratio
j	arcmin	backlash
J	kgcm ²	mass moment of inertia
L	h	service life
M	Nm	moment
n	min ⁻¹	speed
η	%	efficiency
T	Nm	torque

Index

1	input
2	output
A/a	axial
B/b	acceleration
h	hours
K/k	tilt
m	mean
Max/max	maximum
Mot	motor
N	nominal
Not/not	emergency stop
0	no-load running
R/r	radial
t	torsional

capital letters
small letters

permissible values
actual values

Quick Gear Selection

The following chart can be used to quickly select a gearhead. However, for best results, we recommend that you utilise the gearhead selection charts in the **alpha Technical Basics** catalogue (can be downloaded from www.alphagetriebe.com) or use alpha's **cymex® 3.0** servo/gearhead sizing software to design your drive train.

<p>Cyclic operation S5 Number of cycles ≤ 1000/hour</p> <p>Duty cycle < 60 % and < 20 min.*</p>	<ol style="list-style-type: none"> Using servomotor characteristic data, determine the maximum motor acceleration torque: $T_{MaxMot} [Nm]$ Determine maximum acceleration torque at the gearhead output: $T_{2b} [Nm]$ $T_{2b} = T_{MaxMot} \cdot i$ (ratio) Compare the maximum acceleration torque just calculated with the permissible acceleration torque (T_{2B}) for the selected gearhead from pages 6-23. Requirement: $T_{2b} \leq T_{2B}$ If not, choose another gear reducer. 	<ol style="list-style-type: none"> Verify that the clamping hub diameter (table on page 26) is OK for the selected servomotor. Compare the motor shaft length, L_{Mot} (mm), with the min. and max. clamping hub depth in the dimensional sketches (pages 6-23).
<p>Continuous Operation S1</p>	<p>In case of continuous running applications, please contact alpha</p>	

* General guidelines for most applications. Contact alpha if assistance is needed for special cases.

Ordering key

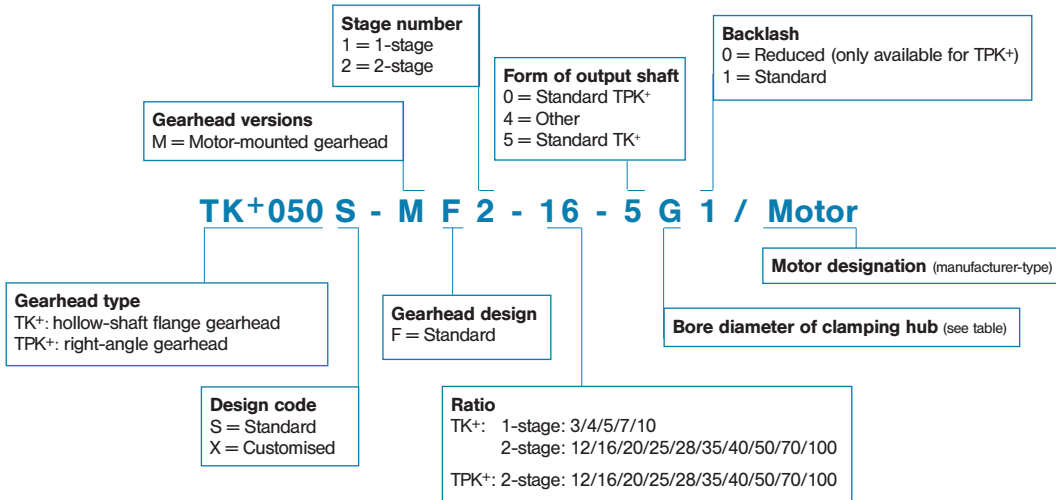


Table of clamping hub diameters

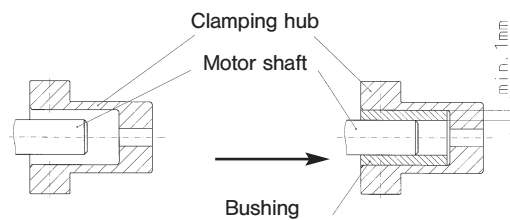
Gearhead stages	TK+					TPK+			
	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	2	2	2	2
Motor shaft diameter (mm)*	004	010	025	050	110	010	025	050	110
11	- / B	- / -	- / -	- / -	- / -	-	-	-	-
14	C / +	- / C	- / -	- / -	- / -	C	-	-	-
19	E** / +	E / +	- / E	- / -	- / -	E**	E	-	-
24	+ / +	- / +	- / +	- / G	- / -	+	-	-	-
28	+ / +	H** / +	H / +	- / +	- / -	+	H**	H	-
38	+ / +	+ / +	K** / +	K / +	- / K	+	+	K**	K
48	+ / +	+ / +	+ / +	M** / +	M / +	+	+	+	M**

- Select next higher letter
+ Select next larger gearhead

* If your motor shaft diameter is not listed, add 2 mm to diameter and select next higher size.
** Geometry not shown in the drawings; dimensions available upon request.

Bushing

If the diameters of the motor shaft and the clamping hub do not match, a bushing is used. Minimum wall thickness of the bushing is 1mm.

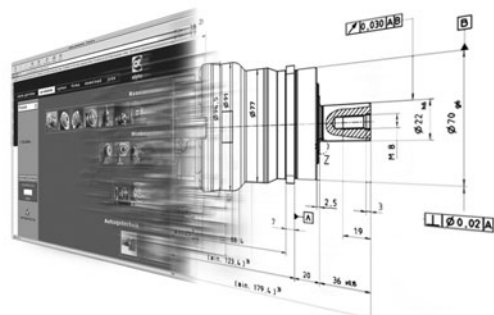


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application – gearhead – motor

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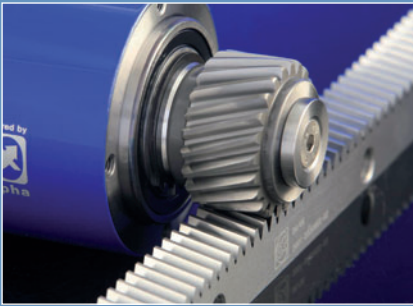
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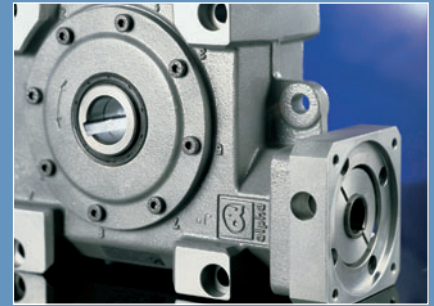
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Right-angle gearhead of highest precision and compactness. Torsional backlash ≤ 4 arcmin. Acceleration torque up to 640 Nm. Output shaft variations: SK+: smooth, keywayed, involute toothing to DIN 5480, TK+: flange HG+: hollow shaft



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Right-angle gearhead – short and compact. Torsional backlash ≤ 3 arcmin. Acceleration torque up to 718 Nm. Options output: VDS: smooth, keywayed, involute toothing to DIN 5480, VDT: flange VDH: hollow shaft smooth or keywayed.



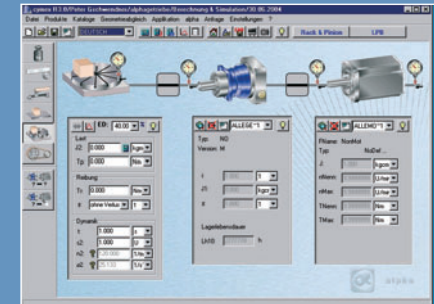
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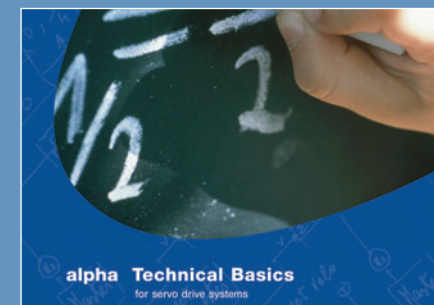
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