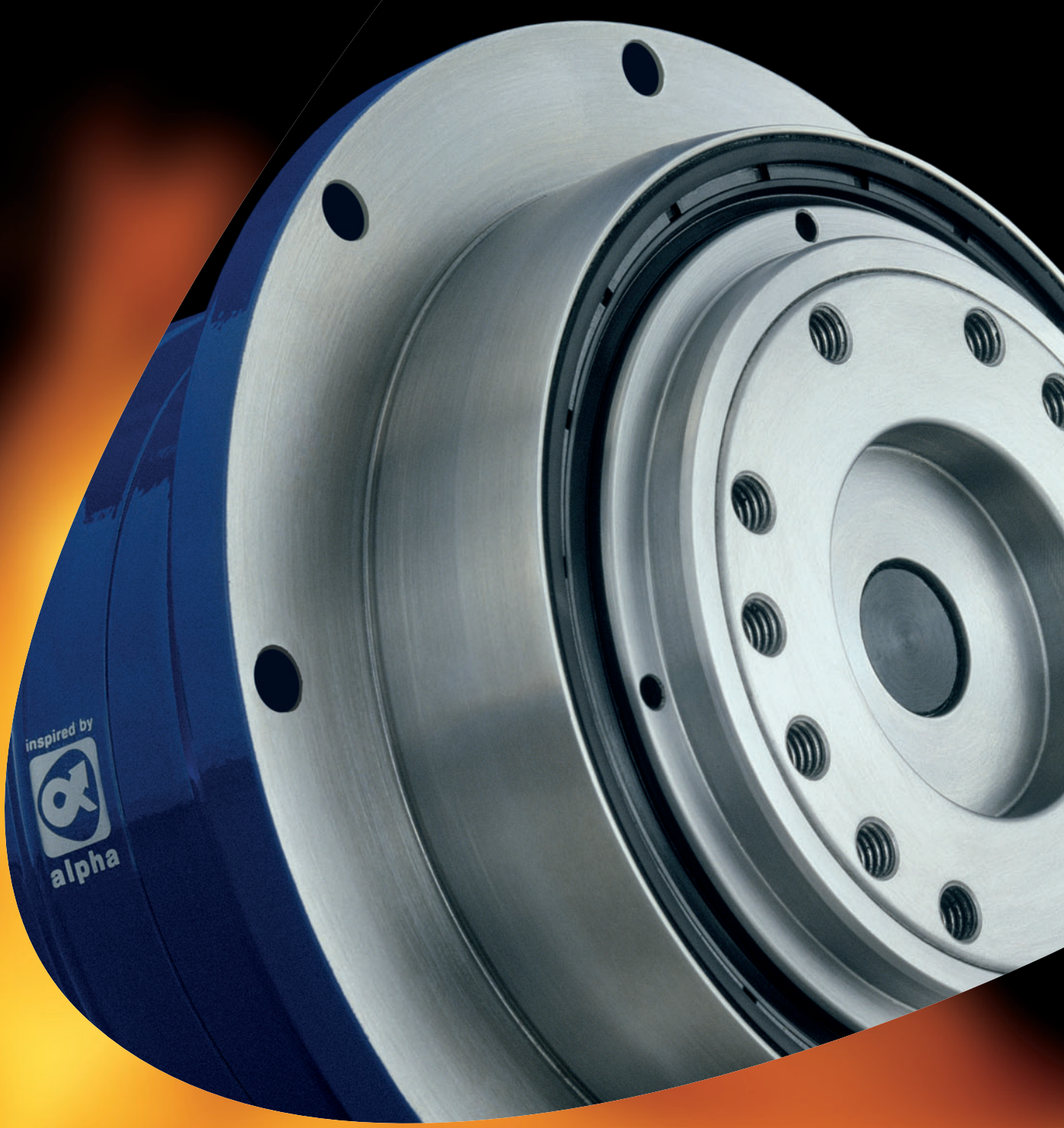


TP+ High Precision Performance

Low-Backlash Planetary Gearheads
TP+ and TP+ HIGH TORQUE®

alpha

a WITTENSTEIN AG company

TP+ - the ultimate in precision

The compact TP, low-backlash planetary gearhead from **alpha** has long enjoyed a worldwide reputation for extreme precision and intelligent design.

The market considers **alpha** to have always had its finger on the pulse, eager to forge ahead with new and innovative developments. The performance of the TP has now been enhanced to an unprecedented level.
The new generation bears the name **TP+** – plus stands for the added precision in cyclic or continuous duty.

TP+ is the outcome of a clear vision: to take the already outstanding TP gearhead and make it even more flexible, longer lasting, with more power and more dynamics in the tiniest possible space.

And because **alpha** is **alpha**, daunting challenges of this kind fire us up with enthusiasm time and time again. After all, it's our technology lead that assures you greater scope for greater creativity – and gives you that crucial market edge.

The winning traits of TP+

TP+ integrates all the familiar characteristics of the TP. Low backlash and high torsional stiffness are the key to **TP+**'s superior positioning accuracy, even in the micro range.

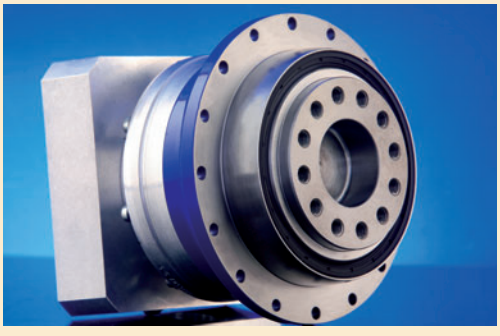
Yet the real distinguishing feature of our new gearhead generation is what we could term its **"moment of glory"** – up to 40% more torque than it's predecessor. The innovative tooth design and the harmonious perfection of all components make the **TP+** truly revolutionary.

No matter which **TP+** variant you choose, this compact power pack is guaranteed to be quieter and smoother than its classic forerunner: it takes four **TP+** gearheads to produce the same amount of noise as the already quiet TP.

If your application demands maximum power density, our **TP+ HIGH TORQUE** gearhead offers up to double the usual torque with almost no increase in installation space.

Inside **TP+ HIGH TORQUE** hides the strength of a giant. It easily combines **up to 100% additional torque** in the reduction ratio range **from i = 22 to i = 220** with unparalleled torsional stiffness.
TP+ HIGH TORQUE also boasts **up to 900% overload capacity and up to 110% more stiffness** than **TP+**.
The standard torsional backlash is less than one arcminute – and its uniformity is equally impressive.

99.9% reliability is a compelling argument!



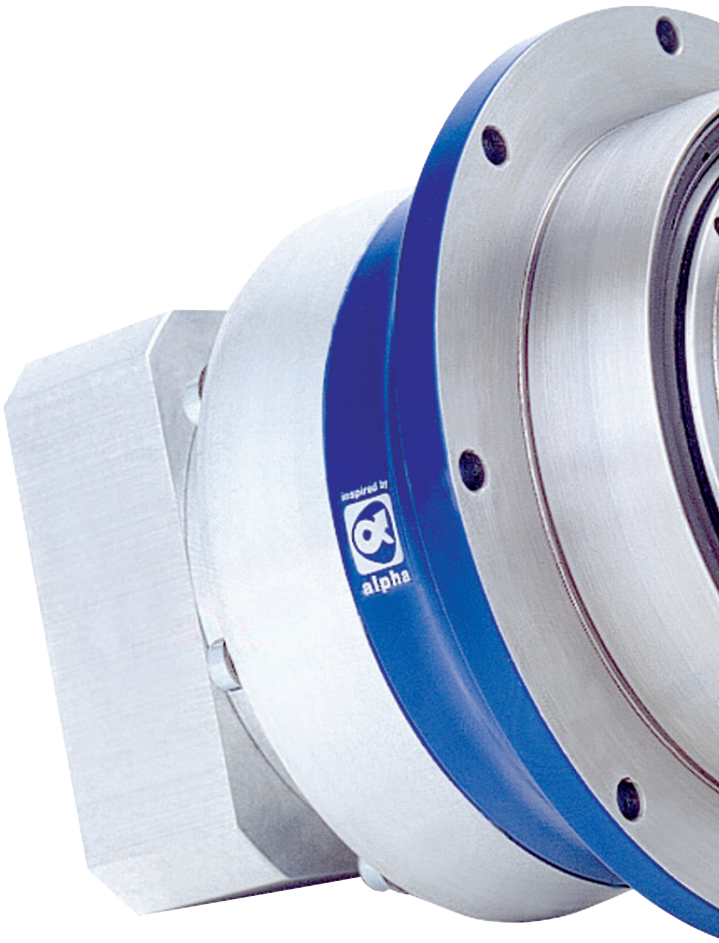
TP+ – the embodiment of the **alpha** philosophy

Higher power density

And the torque? Although the predecessor TP gearhead was a leading market performer, we have succeeded in increasing its torques by as much as 40 %. Pushing back limits – part of the alpha creed!

If your application demands even more torque, then **TP+ HIGH TORQUE** is the ideal answer – it lets you transmit up to double the usual torque value with almost no increase in installation space.

Pushing back limits – part of the alpha creed



Any mounting position

Whichever way you install it, your **TP+** always contains the same quantity of oil. It makes no difference to the **TP+** whether you mount it vertically or horizontally or with the output on top or on the bottom.

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, backed up by expert engineering services. A thousand employees worldwide are committed to our cause. alpha's home is in Germany – in Igersheim on the Romantic Road in northern Baden-Württemberg.

alpha is a member of the **WITTENSTEIN AG** 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.

WITTENSTEIN – being one with the future!

Helical gearing delivers: Smooth, quit running

The **TP+ "whispers"**. The helical toothed **TP+** is 6 dB(A) quieter than the classic spur toothed TP. These features are possible by incorporating the latest research in tooth geometry and dynamics. And we certainly don't have to spell out the added value you get from 64 decibels instead of 70. What's more, the **TP+** reduces vibration to virtual imperceptibility for amazingly smooth running.

Highest positioning accuracy

Where the TP is synonymous with compact precision, **TP+** stands for compact maximum precision. Backlash has been successfully curtailed even further compared to the TP gearhead. Your application benefits from superior positioning accuracy.

Since positioning accuracy is influenced not only by torsional backlash but also by torsional stiffness, the very best results are achieved with the ultra-stiff TP+ HIGH TORQUE. Its torsional stiffnesses exceed the already excellent values of the TP+ by up to 110%.

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 speedline®
speedline delivery if your production process can't wait. Dispatch of your alpha gearheads from our factory is guaranteed in just 24 or optionally 48 hours.
Our speedline delivery service has been operating successfully throughout Europe since 2004.

alpha

TP+ accelerates with the new **alpha speedline®**

Quick, simple and transparent – put on speed with alpha speedline®

Would you like to operate even more flexibly, translate your ideas into action more swiftly and take decisions at even shorter notice?

If so, then the alpha speedline® service is just what you're looking for. We promise to dispatch all gearheads in the standard SP+®, TP+ and LP+ series ex works at attractive terms in just 24 or 48 hours – in line with your specific requirements. Like all other alpha products, every speedline® order undergoes a 100% quality control. And thanks to our efficient logistics concept, the optimum route to your location is guaranteed.

In just 24 or 48 hours, your gearhead is ready in our factory.
Now also anywhere in Europe.

TP+ – the choice couldn't be simpler

The individual series are presented following on double pages: the left-hand pages are reserved for drawings and important dimensions, while the tables on the right list detailed technical data, clearly structured to show the **MF (TP+)** and **MA (TP+ HIGH TORQUE®)** versions, reduction ratios and key parameters.

Please don't hesitate to contact your personal alpha engineer at any time for competent advice and support.

Ask for the **TP+** – the low-backlash planetary gearhead for maximum power.

Gearheads: Fast selection

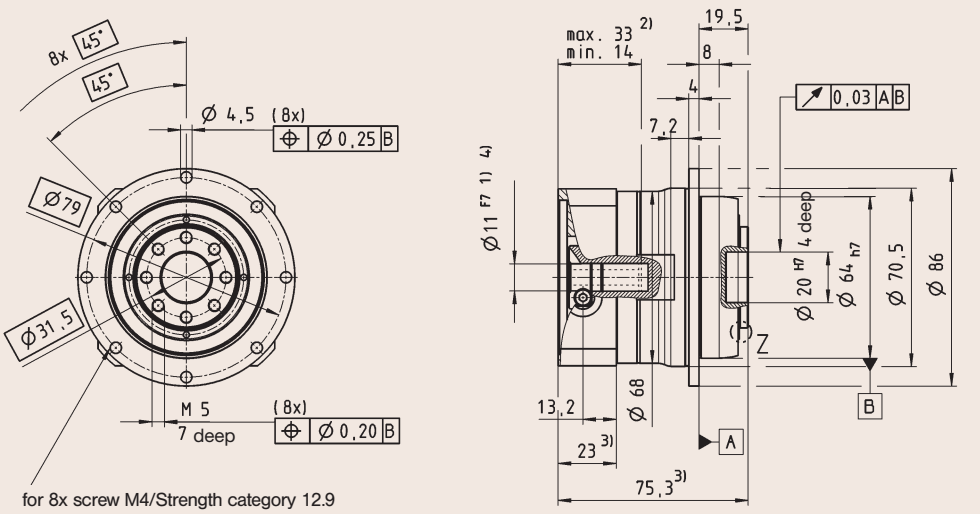
Size			004	010		025		050	
			MF+	MF+	MA+	MF+	MA+	MF+	MA+
Maximum acceleration torque	T_{2B}	Nm	32-50	80-130	230	250-380	480-530	500-750	950
Nominal output torque	T_{2N}	Nm	15-40	35-90	110-180	100-220	260-375	220-400	575-675
Emergency stop torque	T_{2NOT}	Nm	100	250	525	625	1200	1000-1250	2375
Maximum input speed	n_{1Max}	min^{-1}	6000	6000	6000	4500-6000	6000	4000-5000	5000
Nominal input speed	n_{1N}	min^{-1}	3300 - 5500	2600-4500	4000-4500	2300-4200	3500-4000	1900-3900	3000-3500
Page			8 - 11	12 - 15	16 - 17	18 - 21	22 - 23	24 - 27	28 - 29

Size			110		300		500	
			MF+	MA+	MF	MA	MF	MA
Maximum acceleration torque	T_{2B}	Nm	1300-2000	2000-3100	2800-3500	5300	4800-6000	10000
Nominal output torque	T_{2N}	Nm	700-1250	1400-1750	1600-2200	3100	2900-3700	6000
Emergency stop torque	T_{2NOT}	Nm	2750	6500	8750	13250	15000	25000
Maximum input speed	n_{1Max}	min^{-1}	3500-4000	4500	3000	3000	3000	3000
Nominal input speed	n_{1N}	min^{-1}	1400-3400	2500-3000	1600-2200	1500	1300-1800	1500
Page			30 - 33	34 - 35	38 - 39		40 - 41	

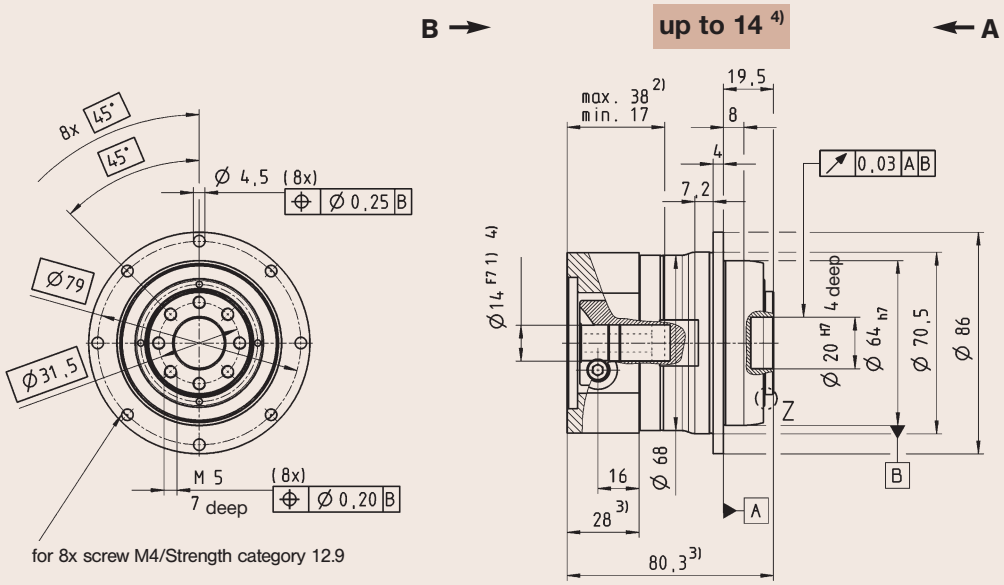
MF = Standard
MA = HIGH TORQUE®

Motor shaft diameter (mm)

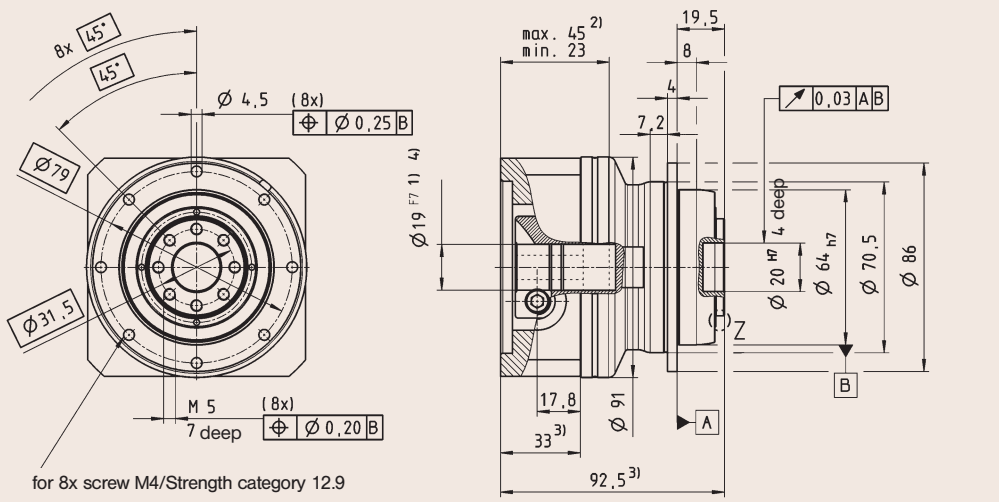
up to 11 4)



up to 14 4)



up to 19 4)



Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.
2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.
3) The dimensions depend on the motor.
4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).
5) Centering depth.

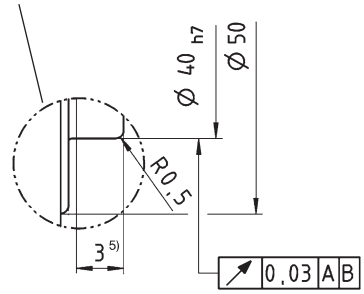
⚠ Motor mounting according to operating manual.

Technical data **TP+ 004** 1-stage

				1-stage			
Ratio [1]	**i**			**4**	**5**	**7**	**10**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm		50	50	50	35
Nominal output torque (n_1 = 3000 U/min) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm		28	28	28	18
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm		100	100	100	100
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}		3300	3300	4000	4000
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm		0,95	0,80	0,60	0,45
Max. input speed	n_{1Max}	min^{-1}		6000	6000	6000	6000
Torsional backlash	j_t	arcmin		Standard ≤ 4 / Reduced ≤ 2			
Torsional rigidity	C_{t21}	Nm/arcmin		-	11	10	9
Tilting rigidity	C_{2K}	Nm/arcmin		-			
Max. axial force ***	F_{2AMax}	N		1630			
Max. tilting moment	M_{2KMax}	Nm		91			
Efficiency at full load	η	%		97			
Weight incl. adapter plate	m	kg		1,4			
Noise level (n_1=3000 min^{-1}) ****	L_{PA}	dB(A)		≤ 58			
Max. permissible housing temperature		°C		+90			
Ambient temperature		°C		0 up to +40			
Lubrication				Lubricated for lifetime			
Paint				Blue RAL 5002			
Direction of rotation				Motor and gearhead same direction			
Type of protection				IP 65			
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$	11	0,18	0,15	0,12	0,10
			14	0,26	0,23	0,20	0,18
Clamping hub diameter (mm)			19	0,71	0,67	0,62	0,63

1) Other reduction ratios are optionally available. Please contact alpha.
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 14 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 10 (without load).

Z: Detail

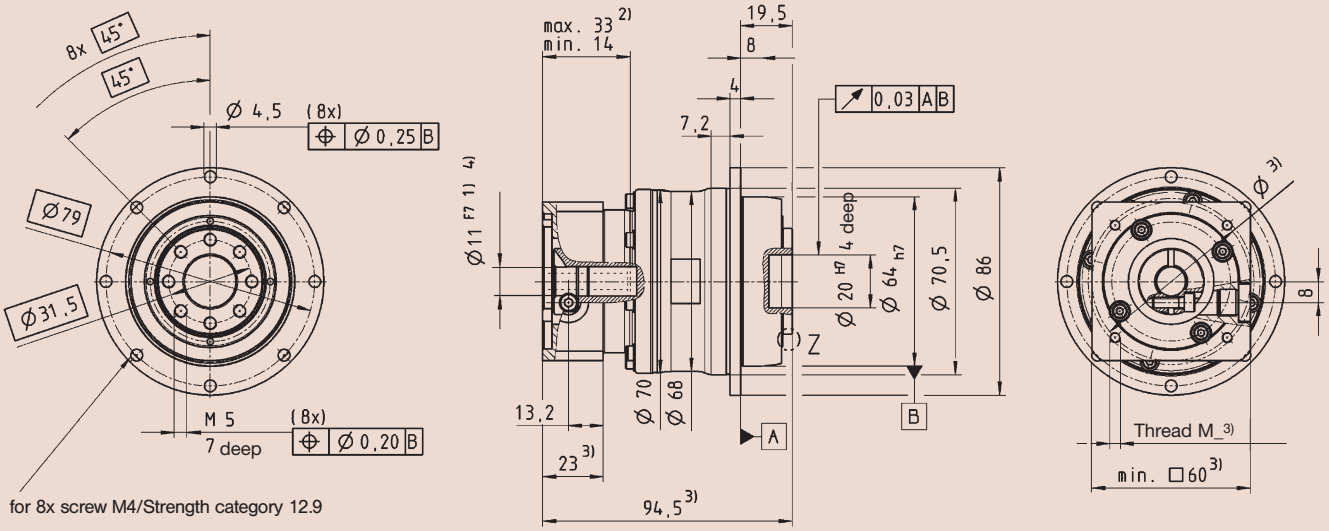


Conversion table

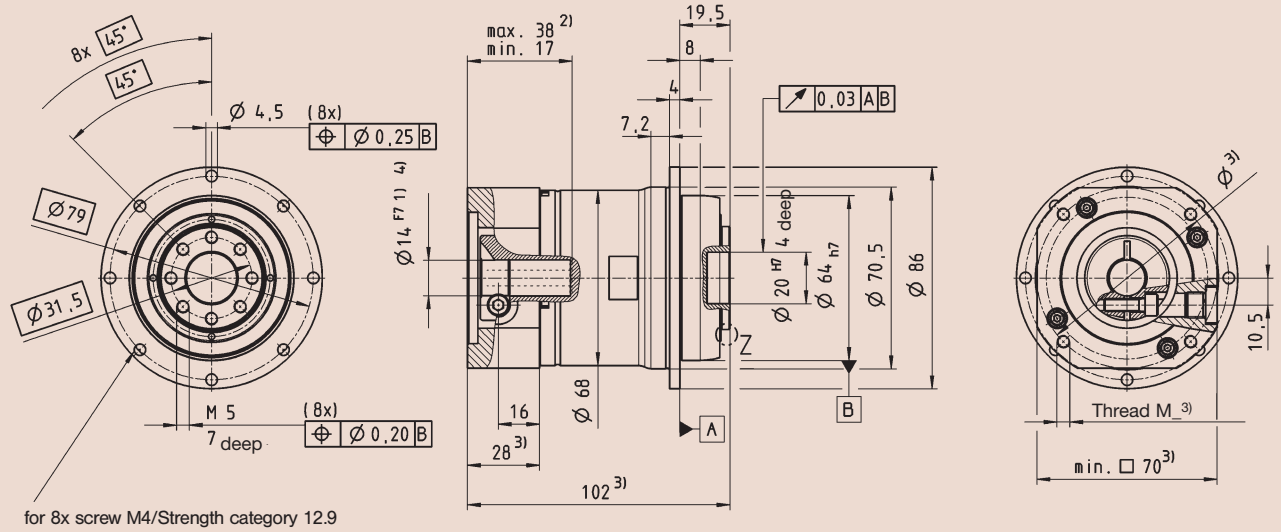
1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

View A | **Motor shaft diameter (mm)** | **View B**

B → **up to 11** [4] ← A



B → **up to 14** [4] ← A



Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.

3) The dimensions depend on the motor.

4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

5) Centering depth.

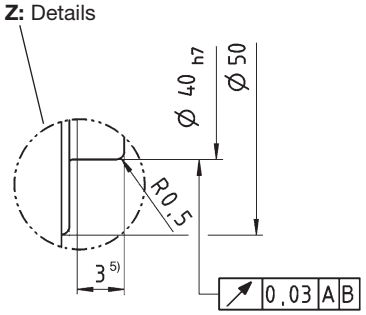
⚠ Motor mounting according to operating manual.

Technical data **TP+ 004** 2-stage

			2-stage											
Ratio [1]	**i**		**16**	**20**	**21**	**25**	**28**	**31**	**35**	**40**	**50**	**61**	**70**	**91**	**100**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	50	50	40	50	50	40	50	50	50	45	50	32	35
Nominal output torque (n_1 = 3000 U/min) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	40	40	30	40	40	30	40	40	40	30	40	15	18
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	100	100	100	100	100	100	100	100	100	100	100	100	100
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	4000	4000	4000	4000	4000	4000	4000	4000	4800	5500	5500	5500	5500
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	0,55	0,45	0,45	0,45	0,35	0,35	0,30	0,25	0,25	0,20	0,20	0,20	0,20
Maximum input speed	n_{1Max}	min^{-1}	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Torsional backlash	j_t	arcmin	Standard ≤ 4 / Reduced ≤ 2												
Torsional rigidity	C_{t21}	Nm/arcmin	10												
Tilting rigidity	C_{2K}	Nm/arcmin	-												
Max. axial force ***	F_{2AMax}	N	1630												
Max. tilting moment	M_{2KMax}	Nm	91												
Efficiency at full load	η	%	94												
Weight incl. adapter plate	m	kg	1,5												
Noise level (n_1=3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 58												
Max. permissible housing temperature		°C	+90												
Ambient temperature		°C	0 up to +40												
Lubrication			Lubricated for lifetime												
Paint			Blue RAL 5002												
Direction of rotation			Motor and gearhead same direction												
Type of protection			IP 65												
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$ 11	0,078	0,069	0,074	0,068	0,061	0,073	0,060	0,057	0,056	0,057	0,056	0,057	0,056
Clamping hub diameter (mm)		14	0,19	0,18	0,19	0,18	0,17	0,19	0,17	0,17	0,17	0,17	0,17	0,17	0,17

1) Other reduction ratios are optionally available. Please contact alpha.
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 11 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 16 (without load).

Z: Details

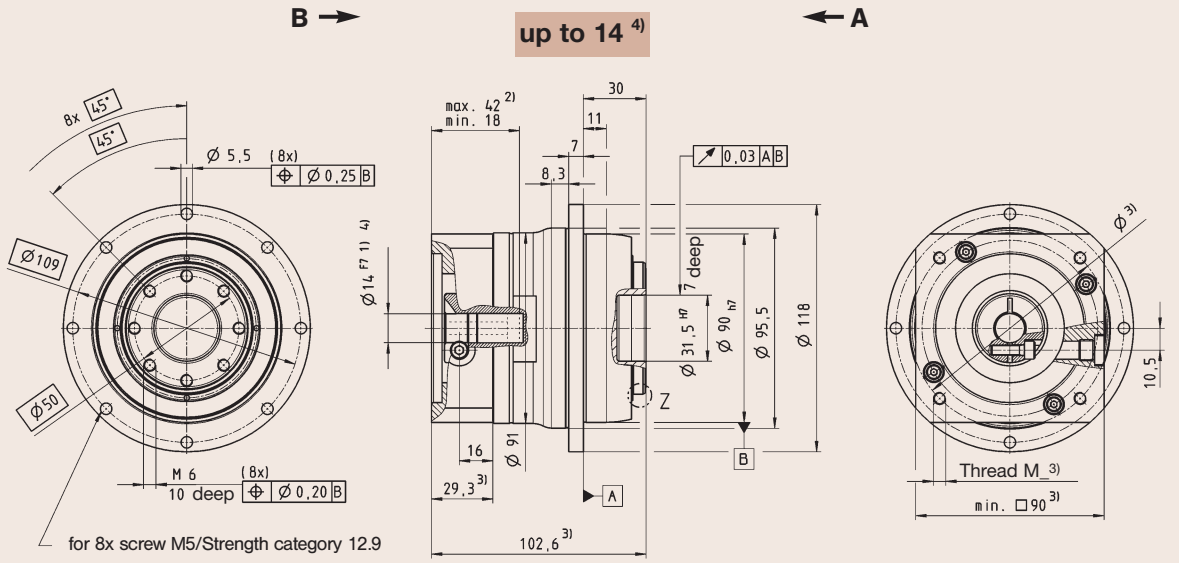


Conversion table

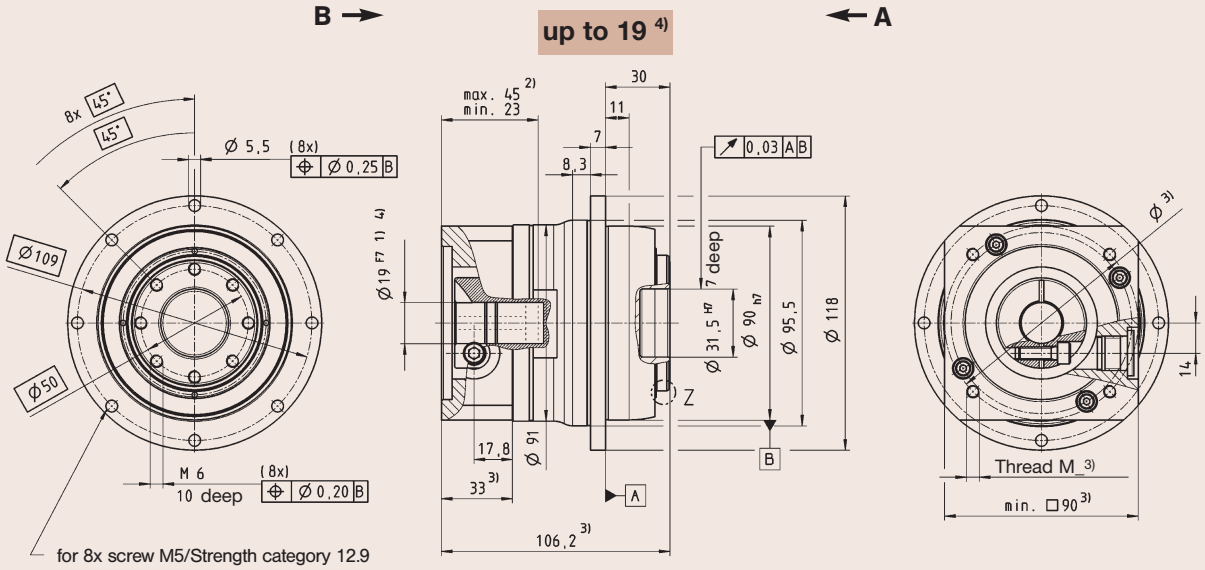
1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

View A | **Motor shaft diameter (mm)** | **View B**

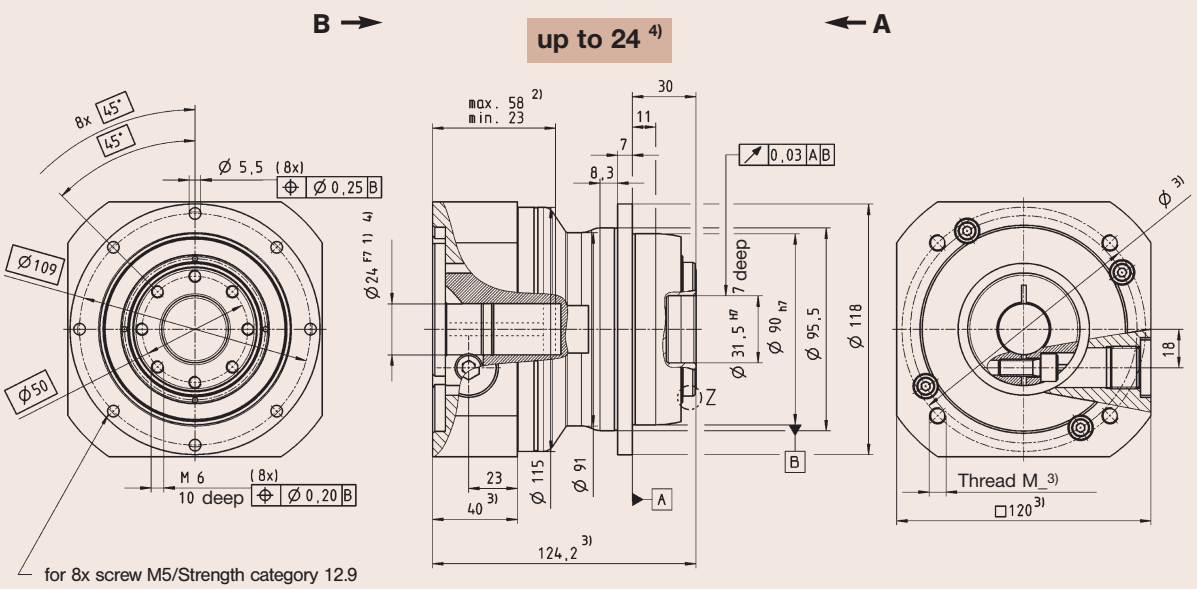
up to 14 [4]



up to 19 [4]



up to 24 [4]



Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.

3) The dimensions depend on the motor.

4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

5) Centering depth.

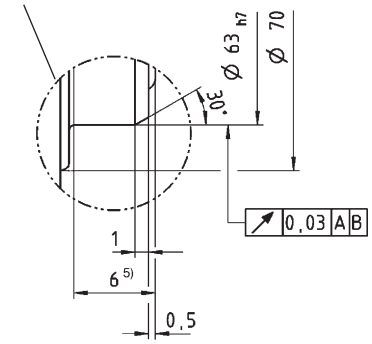
⚠ Motor mounting according to operating manual.

Technical data **TP+ 010** 1-stage

			1-stage			
Ratio [1]	**i**		**4**	**5**	**7**	**10**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	130	130	130	100
Nominal output torque (n_1 = 3000 U/min) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	75	75	75	60
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	250	250	250	250
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	2600	2900	3100	3100
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	1,60	1,30	1,0	0,70
Maximum input speed	n_{1Max}	min^{-1}	6000	6000	6000	6000
Torsional backlash	j_t	arcmin	Standard ≤ 3 / Reduced ≤ 1			
Torsional rigidity	C_{t21}	Nm/arcmin	-	31	30	24
Tilting rigidity	C_{2K}	Nm/arcmin	225			
Max. axial force ***	F_{2AMax}	N	2150			
Max. tilting moment	M_{2KMax}	Nm	235			
Efficiency at full load	η	%	97			
Weight incl. adapter plate	m	kg	3,8			
Noise level (n_1=3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 60			
Max. permissible housing temperature		°C	+90			
Ambient temperature		°C	0 up to +40			
Lubrication			Lubricated for lifetime			
Paint			Blue RAL 5002			
Direction of rotation			Motor and gearhead same direction			
Type of protection			IP 65			
Mass moment of inertia (referring to the drive) — Clamping hub diameter (mm) 14	J_1	$kgcm^2$	0,83	0,67	0,53	0,46
Mass moment of inertia (referring to the drive) — Clamping hub diameter (mm) 19	J_1	$kgcm^2$	1,08	0,92	0,77	0,70
Mass moment of inertia (referring to the drive) — Clamping hub diameter (mm) 24	J_1	$kgcm^2$	2,64	2,49	2,35	2,27

1) Other reduction ratios are optionally available. Please contact alpha.
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 19 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 10 (without load).

Z: Detail



Conversion table

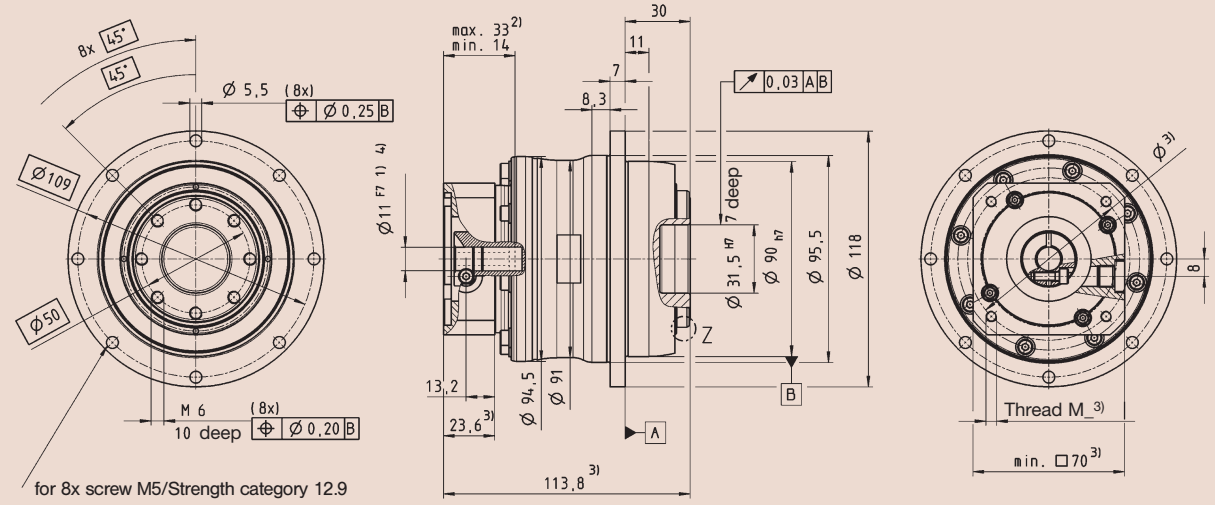
1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

View A

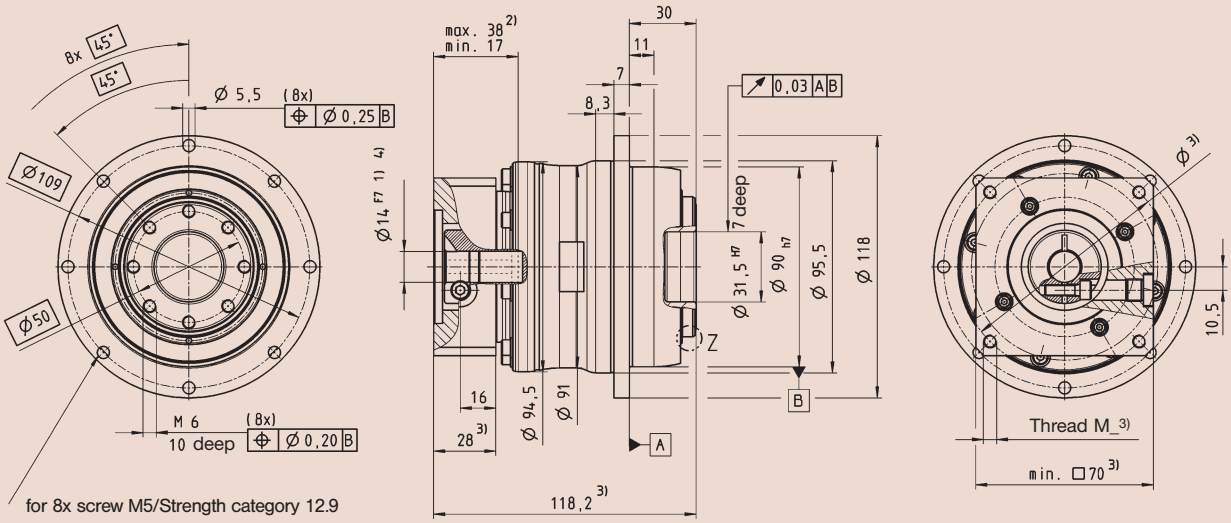
Motor shaft diameter (mm)

View B

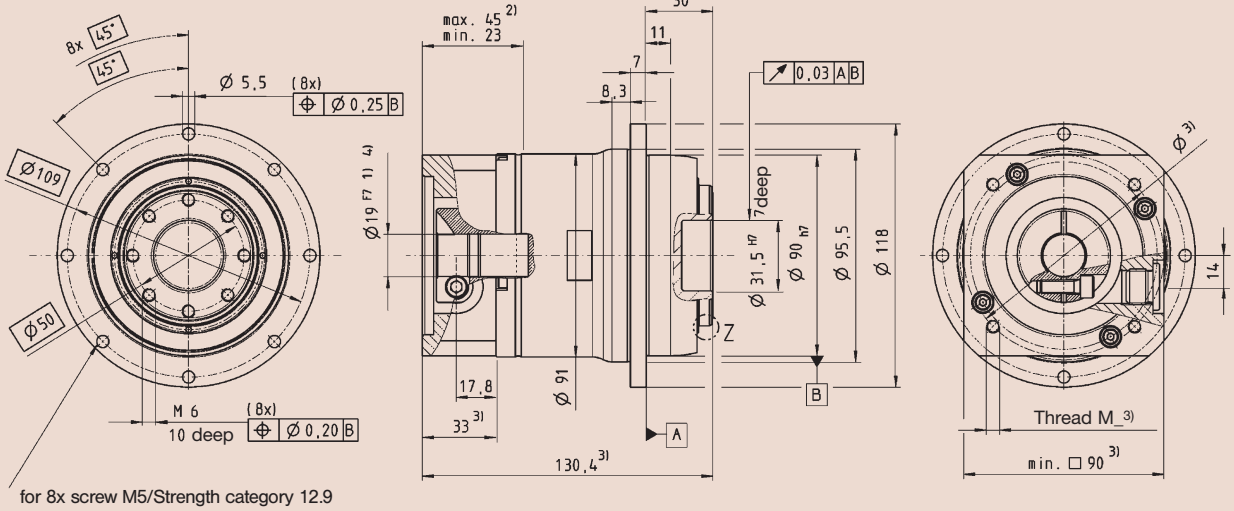
B → up to 11 [4] ← A



B → up to 14 [4] ← A



B → up to 19 [4] ← A



Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.

3) The dimensions depend on the motor.

4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

5) Centering depth.

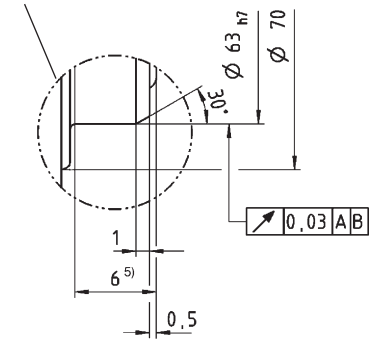
⚠ Motor mounting according to operating manual.

Technical data **TP+ 010** 2-stage

			2-stage											
Ratio [1]	**i**		**16**	**20**	**21**	**25**	**28**	**31**	**35**	**40**	**50**	**61**	**70**	**91**	**100**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	130	130	100	130	130	110	130	130	130	110	130	80	100
Nominal output torque (n_1 = 3000 U/min) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	90	90	80	90	90	70	90	80	90	70	90	35	60
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	250	250	250	250	250	250	250	250	250	250	250	250	250
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	3500	3500	3500	3500	3500	3500	3500	3500	3800	4500	4500	4500	4500
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	0,90	0,75	0,70	0,65	0,55	0,50	0,50	0,40	0,35	0,35	0,35	0,30	0,30
Maximum input speed	n_{1Max}	min^{-1}	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Torsional backlash	j_t	arcmin	Standard ≤ 3 / Reduced ≤ 1												
Torsional rigidity	C_{t21}	Nm/arcmin	33											21	-
Tilting rigidity	C_{2K}	Nm/arcmin	225												
Max. axial force ***	F_{2AMax}	N	2150												
Max. tilting moment	M_{2KMax}	Nm	235												
Efficiency at full load	η	%	94												
Weight incl. adapter plate	m	kg	3,6												
Noise level (n_1=3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 62												
Max. permissible housing temperature		°C	+90												
Ambient temperature		°C	0 up to +40												
Lubrication			Lubricated for lifetime												
Paint			Blue RAL 5002												
Direction of rotation			Motor and gearhead same direction												
Type of protection			IP 65												
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$													
Clamping hub diameter (mm)			11	0,18	0,13	0,14	0,13	0,11	0,14	0,11	0,10	0,10	0,10	0,10	0,10	0,10
			14	0,26	0,22	0,23	0,21	0,19	0,22	0,19	0,18	0,18	0,18	0,18	0,18	0,18
			19	0,70	0,66	0,67	0,66	0,62	0,67	0,62	0,62	0,62	0,63	0,62	0,62	0,62

1) Other reduction ratios are optionally available. Please contact alpha.
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 14 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 16 (without load).

Z: Detail



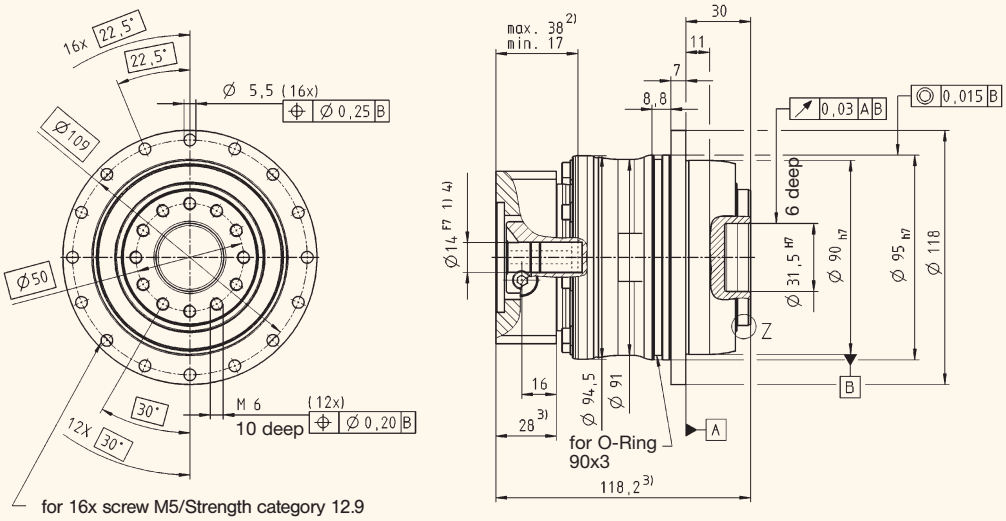
Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

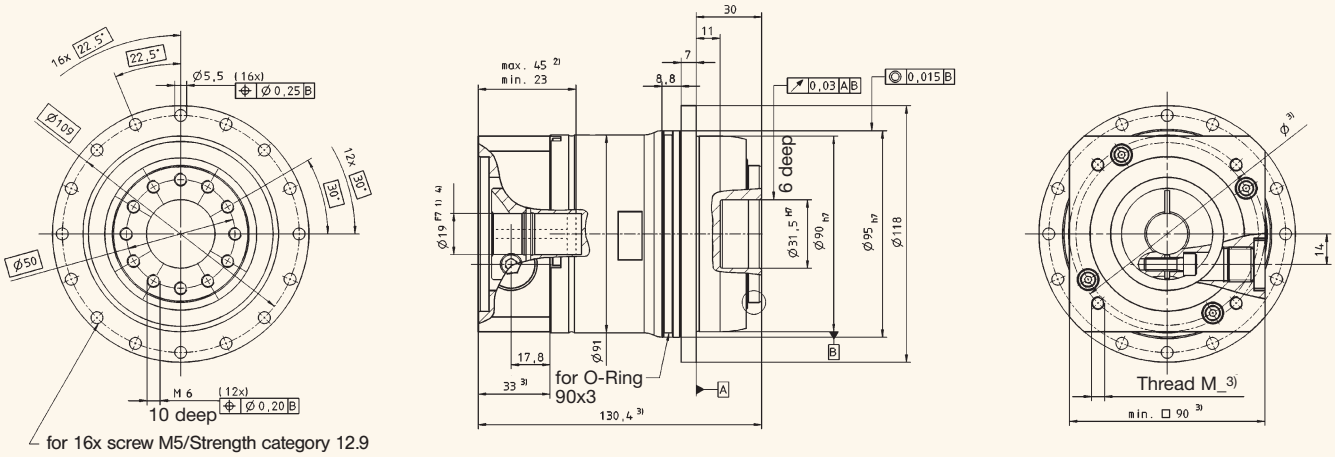
View A | Motor shaft diameter (mm) | View B

2-stage

B → up to 14 [4] ← A

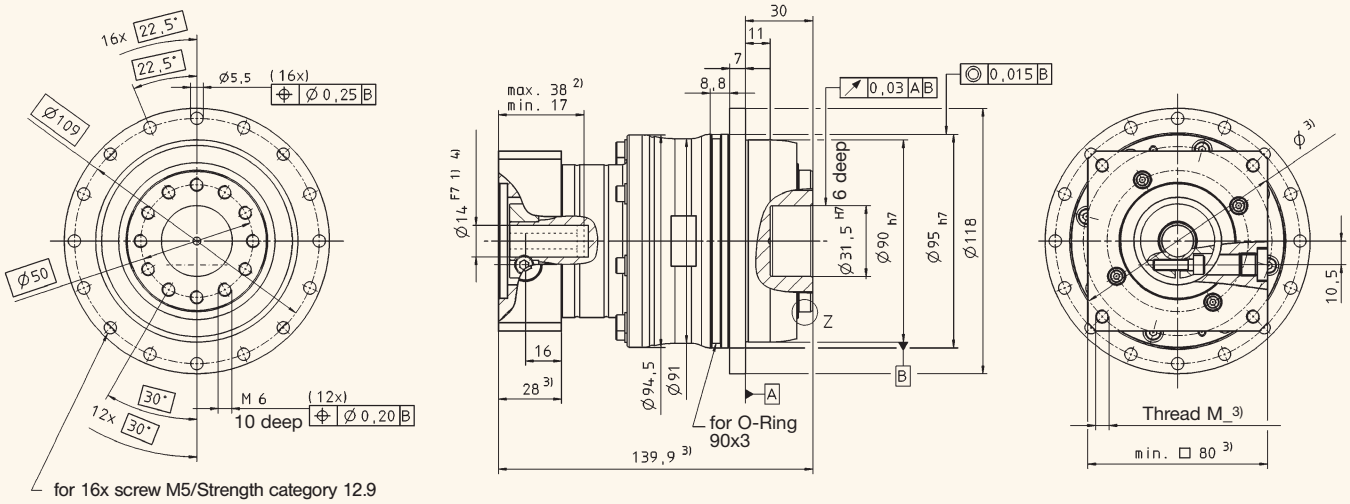


B → up to 19 [4] ← A



3-stage

B → up to 14 [4] ← A



Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.

3) The dimensions depend on the motor.

4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

5) Centering depth.

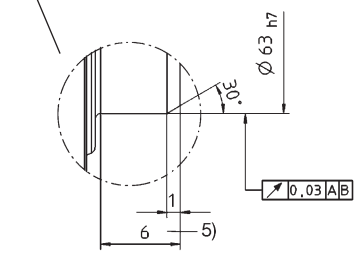
⚠ Motor mounting according to operating manual.

Technical data **TP+ 010** HIGH TORQUE®

			2-stage				3-stage			
Ratio	**i**		**22**	**27,5**	**38,5**	**55**	**88**	**110**	**154**	**220**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	230	230	230	230	230	230	230	230
Nominal output torque (n_1=3000 min^{-1}) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	150	150	180	110	180	180	180	180
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	525	525	525	525	525	525	525	525
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	4000	4000	4000	4000	4500	4500	4500	4500
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	0,42	-	-	-	-	0,23	-	-
Maximum input speed	n_{1Max}	min^{-1}	6000	6000	6000	6000	6000	6000	6000	6000
Max. Torsional backlash	j_t	arcmin	≤ 1				≤ 1			
Torsional rigidity	C_{t21}	Nm/arcmin	43	-	-	-	-	43	-	-
Tilting rigidity	C_{2K}	Nm/arcmin	225				225			
Max. axial force ***	F_{2AMax}	N	2150				2150			
Max. tilting moment (bei 100 min^{-1} im Abtrieb)	M_{2KMax}	Nm	400				400			
Efficiency at full load (bei T_{2B} und n_1=3000 min^{-1})	η	%	≤ 94				≤ 92			
Weight incl. adapter plate	m	kg	3,2				3,6			
Noise level (n_1= 3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 60				≤ 60			
Max. permissible housing temperature		°C	+90							
Ambient temperature		°C	0 up to +40							
Lubrication			Lubricated for lifetime							
Paint			Blue RAL 5002							
Direction of rotation			Motor and gearhead same direction							
Type of protection			IP 65							
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$ 14	0,21	0,18	0,16	0,14	0,16	0,15	0,14	0,13
Clamping hub diameter (mm)		19	0,52	0,50	0,47	0,46	-	-	-	-

* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 14 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 22 and i = 110 (without load).

Z: Detail



Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

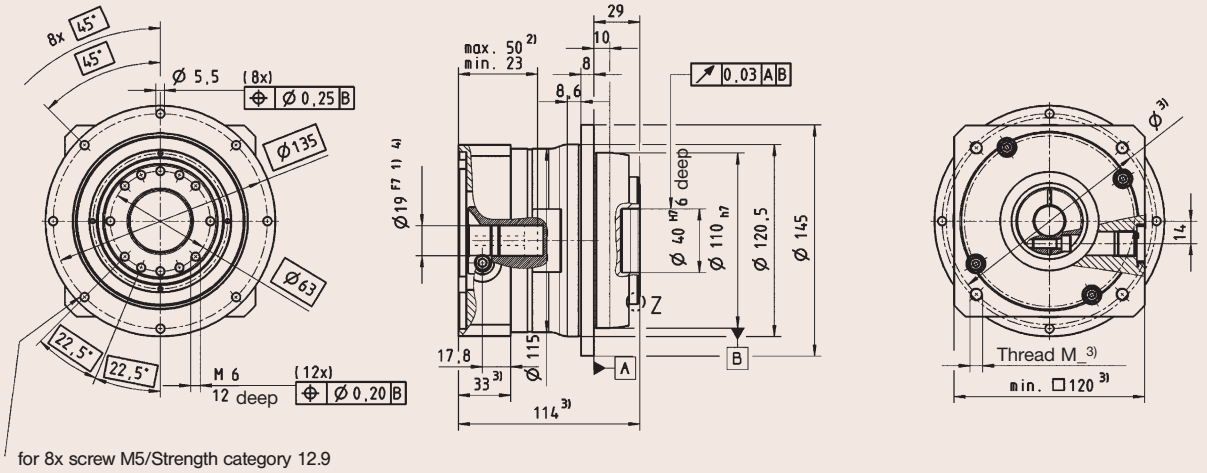
View A

Motor shaft diameter (mm)

View B

B → ← A

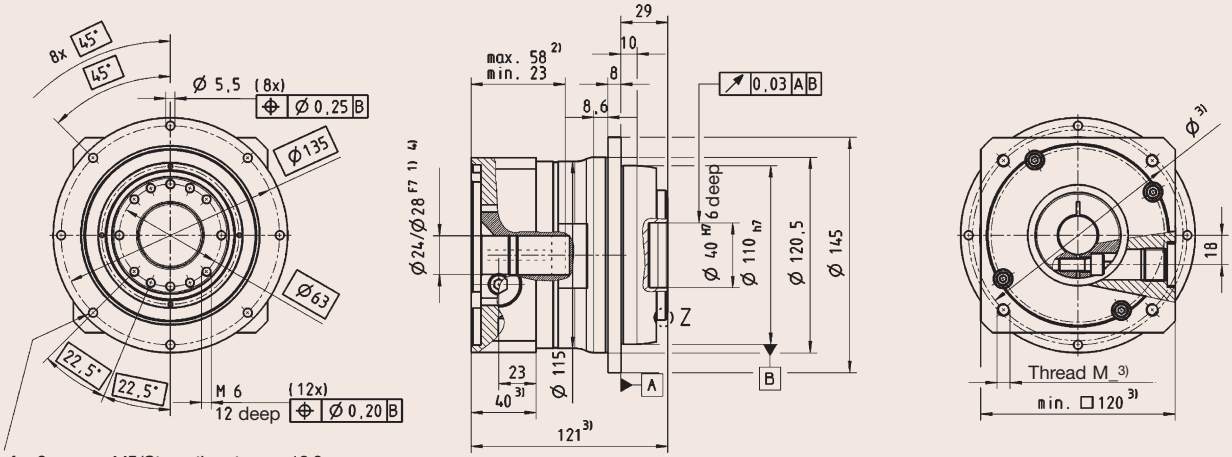
up to 19 [4]



for 8x screw M5/Strength category 12.9

B → ← A

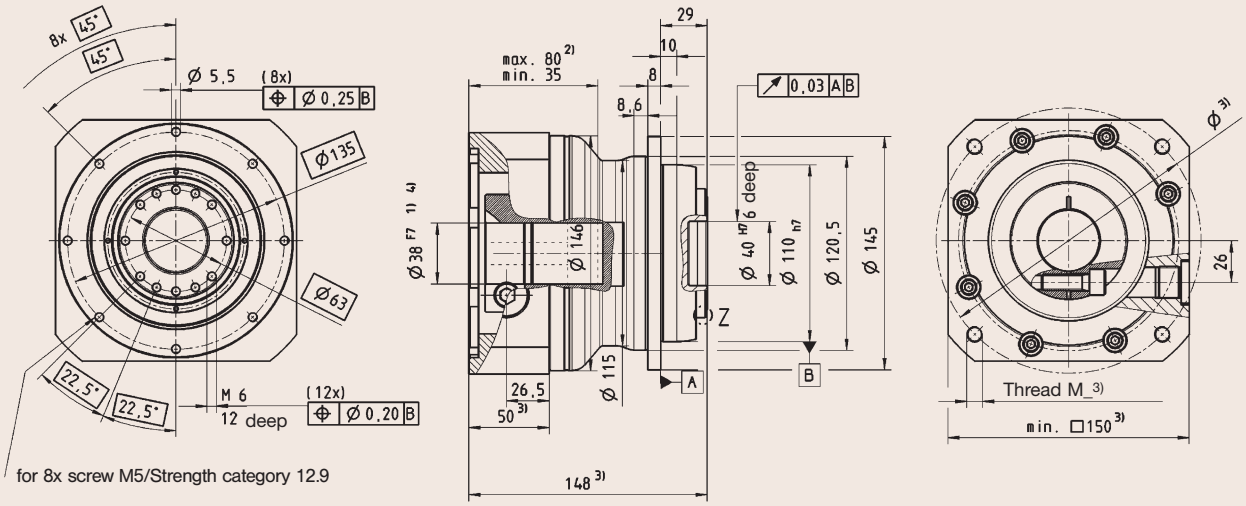
up to 24 und 28 [4]



for 8x screw M5/Strength category 12.9

B → ← A

up to 38 [4]



for 8x screw M5/Strength category 12.9

Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.

3) The dimensions depend on the motor.

4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

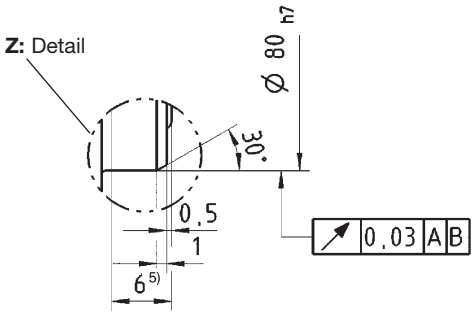
5) Centering depth.

⚠ Motor mounting according to operating manual.

Technical data **TP+ 025** 1-stage

			1-stage			
Ratio [1]	**i**		**4**	**5**	**7**	**10**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	350	380	330	265
Nominal output torque (n_1 = 3000 U/min) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	170	170	170	120
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	625	625	625	625
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	2300	2500	2500	2500
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	3,3	2,7	2,0	1,4
Maximum input speed	n_{1Max}	min^{-1}	4500	4500	4500	4500
Torsional backlash	j_t	arcmin	Standard ≤ 3 / Reduced ≤ 1			
Torsional rigidity	C_{t21}	Nm/arcmin	66	86	75	60
Tilting rigidity	C_{2K}	Nm/arcmin	550			
Max. axial force ***	F_{2AMax}	N	4150			
Max. tilting moment	M_{2KMax}	Nm	413			
Efficiency at full load	η	%	97			
Weight incl. adapter plate	m	kg	6,5			
Noise level (n_1=3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 64			
Max. permissible housing temperature		°C	+90			
Ambient temperature		°C	0 up to +40			
Lubrication			Lubricated for lifetime			
Paint			Blue RAL 5002			
Direction of rotation			Motor and gearhead same direction			
Type of protection			IP 65			
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$				
Clamping hub diameter (mm)		19	2,89	2,33	1,89	1,61
		24	3,71	3,15	2,77	2,45
		28	3,60	3,05	2,66	2,34
		38	10,6	10,1	9,52	9,24

1) Other reduction ratios are optionally available. Please contact alpha.
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 24 and 28 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 10 (without load).



Conversion table

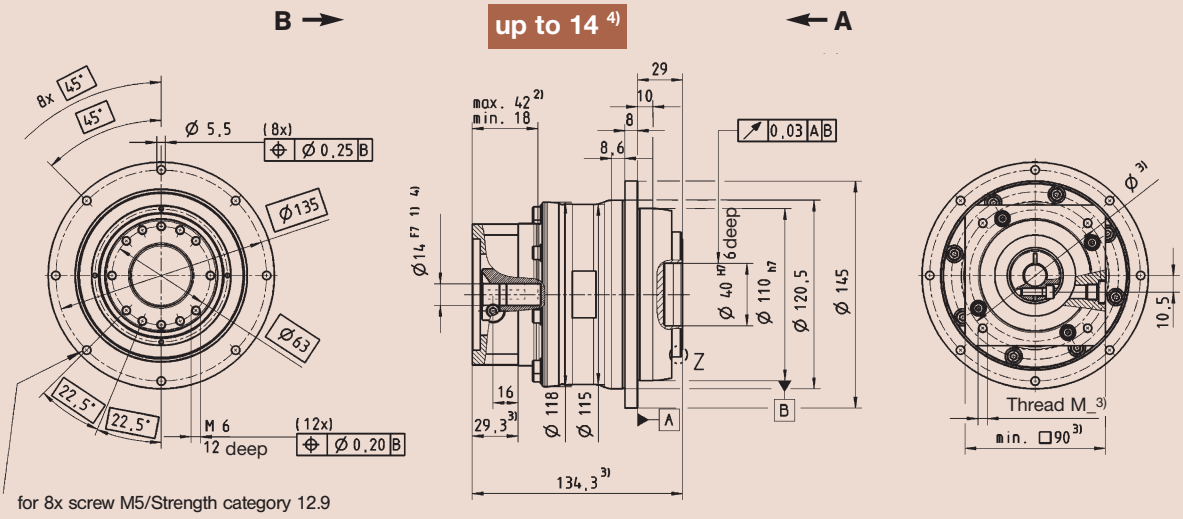
1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

View A

Motor shaft diameter (mm)

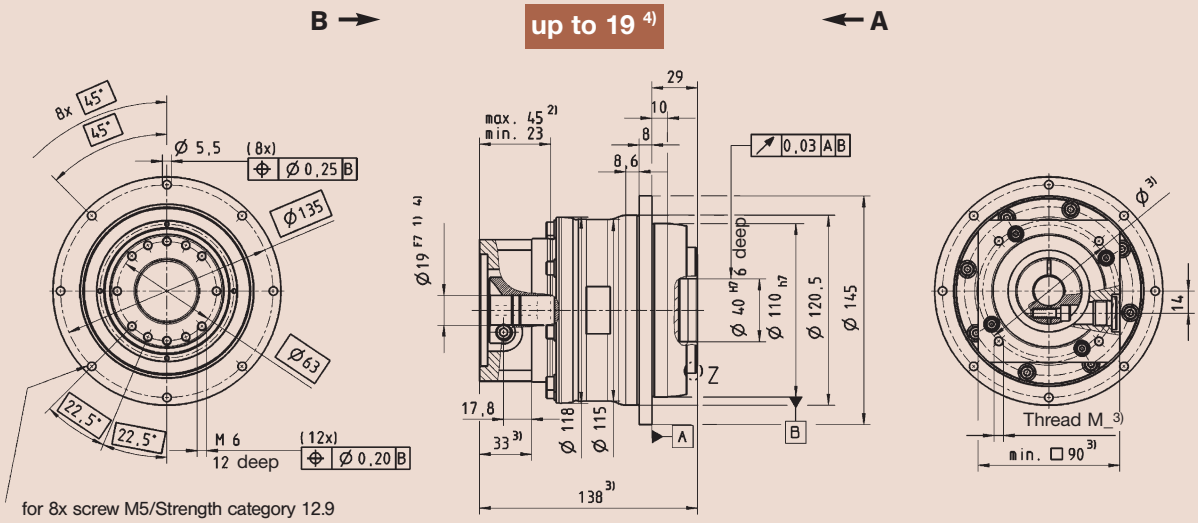
View B

up to 14 [4]



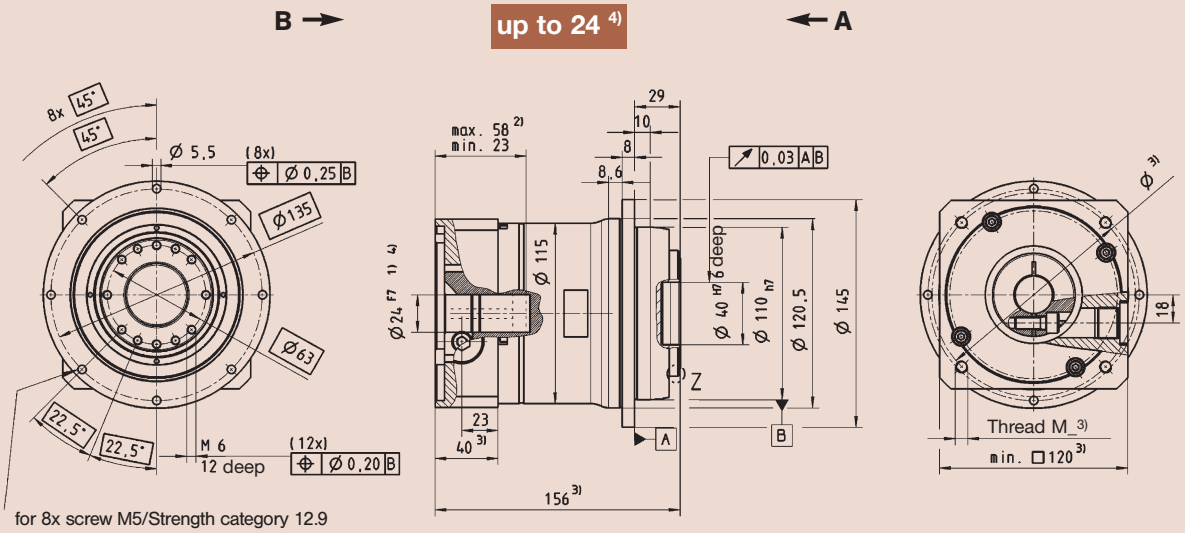
for 8x screw M5/Strength category 12.9

up to 19 [4]



for 8x screw M5/Strength category 12.9

up to 24 [4]



for 8x screw M5/Strength category 12.9

Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.

3) The dimensions depend on the motor.

4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

5) Centering depth.

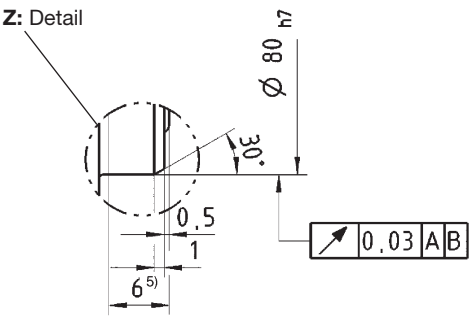
⚠ Motor mounting according to operating manual.

Technical data **TP+ 025** 2-stage

			2-stage											
Ratio [1]	**i**		**16**	**20**	**21**	**25**	**28**	**31**	**35**	**40**	**50**	**61**	**70**	**91**	**100**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	350	350	300	380	350	300	380	350	380	280	330	250	265
Nominal output torque (n_1 = 3000 U/min) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	200	210	170	200	210	190	220	200	220	170	200	100	120
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	625	625	625	625	625	625	625	625	625	625	625	625	625
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	2800	2800	2800	2800	2800	2800	2800	2800	3100	3500	3500	4200	4200
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	1,8	1,5	1,4	1,4	1,1	1,1	1,0	0,8	0,8	0,7	0,7	0,6	0,6
Maximum input speed	n_{1Max}	min^{-1}	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Torsional backlash	j_t	arcmin	Standard ≤ 3 / Reduced ≤ 1												
Torsional rigidity	C_{t21}	Nm/arcmin	75	-	80	-	-	54	80	75	80	-	70	55	60
Tilting rigidity	C_{2K}	Nm/arcmin	550												
Max. axial force ***	F_{2AMax}	N	4150												
Max. tilting moment	M_{2KMax}	Nm	413												
Efficiency at full load	η	%	94												
Weight incl. adapter plate	m	kg	6,7												
Noise level (n_1=3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 64												
Max. permissible housing temperature		°C	+90												
Ambient temperature		°C	0 up to +40												
Lubrication			Lubricated for lifetime												
Paint			Blue RAL 5002												
Direction of rotation			Motor and gearhead same direction												
Type of protection			IP 65												
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$	14	0,68	0,58	0,62	0,56	0,48	0,63	0,48	0,43	0,43	0,44	0,43	0,43	0,42
			19	0,93	0,83	0,87	0,81	0,72	0,88	0,71	0,68	0,68	0,69	0,67	0,68	0,67
Clamping hub diameter (mm)			24	2,49	2,39	2,43	2,38	2,30	2,44	2,29	2,25	2,25	2,26	2,24	2,25	2,24

1) Other reduction ratios are optionally available. Please contact alpha.
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 19 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 16 (without load).

Z: Detail



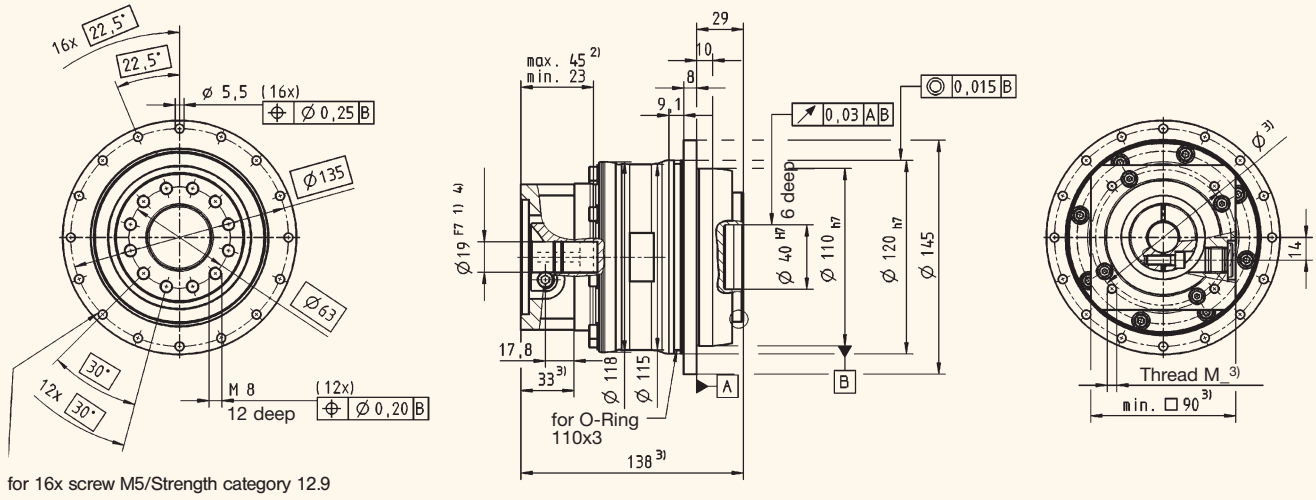
Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

View A | **Motor shaft diameter (mm)** | View B

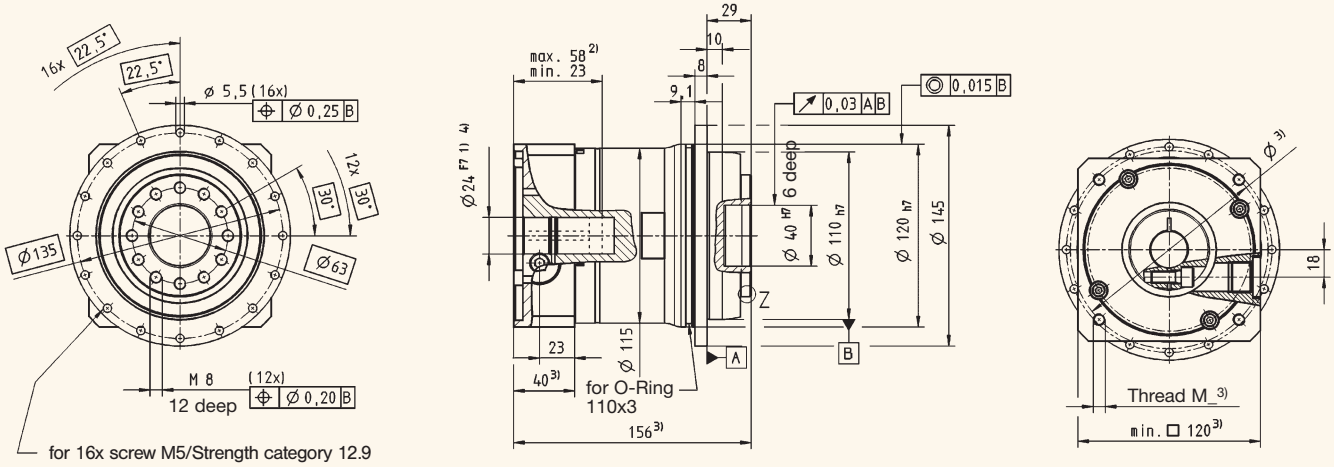
2-stage

B → | up to 19 [4] | ← A



for 16x screw M5/Strength category 12.9

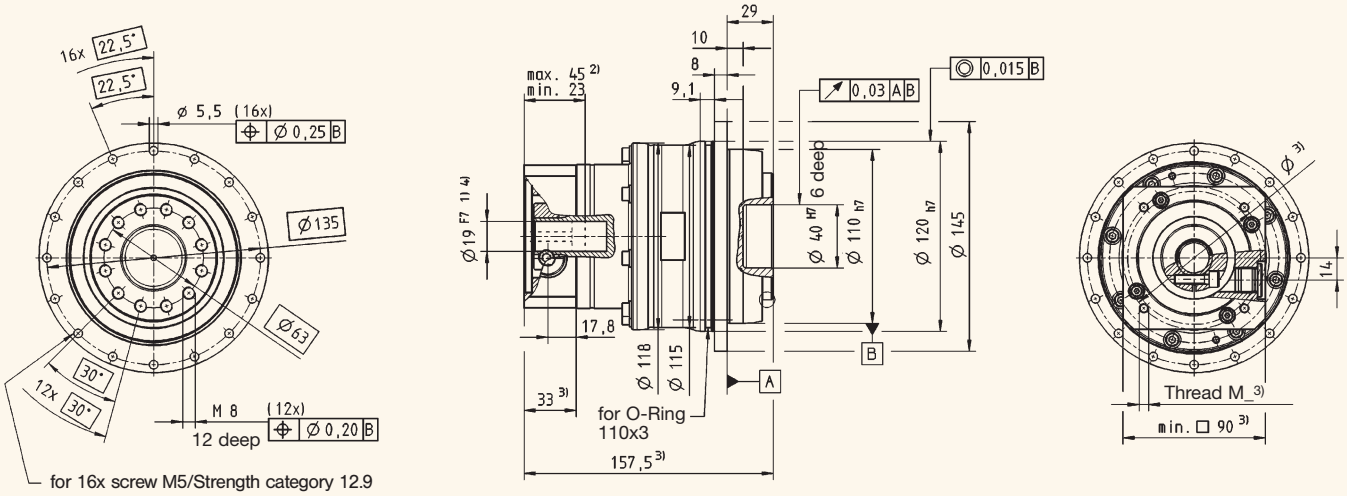
B → | up to 24 [4] | ← A



for 16x screw M5/Strength category 12.9

3-stage

B → | up to 19 [4] | ← A



for 16x screw M5/Strength category 12.9

Dimensions without specified tolerances ±1 mm.
1) Check motor shaft fit.
2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.
3) The dimensions depend on the motor.
4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).
5) Centering depth.

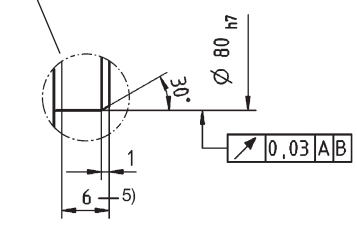
⚠ Motor mounting according to operating manual.

Technical data **TP+ 025** HIGH TORQUE®

			2-stage				3-stage				
Ratio	**i**		**22**	**27,5**	**38,5**	**55**	**66**	**88**	**110**	**154**	**220**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	530	530	530	530	480	480	480	480	480
Nominal output torque (n_1=3000 min^{-1}) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	320	350	375	375	260	260	260	260	260
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	1200	1200	1200	1200	1200	1200	1200	1200	1200
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	3500	3500	3500	3500	4000	4000	4000	4000	4000
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	1,0	-	-	-	-	-	0,5	-	-
Maximum input speed	n_{1Max}	min^{-1}	6000	6000	6000	6000	6000	6000	6000	6000	6000
Max. Torsional backlash	j_t	arcmin	≤ 1				≤ 1				
Torsional rigidity	C_{t21}	Nm/arcmin	100	-	-	-	-	-	95	-	-
Tilting rigidity	C_{2K}	Nm/arcmin	413				413				
Max. axial force ***	F_{2AMax}	N	4150				4150				
Max. tilting moment (bei 100 min^{-1} im Abtrieb)	M_{2KMax}	Nm	550				550				
Efficiency at full load (bei T_{2B} und n_1=3000 min^{-1})	η	%	≤ 94				≤ 92				
Weight incl. adapter plate	m	kg	5,6				6,1				
Noise level (n_1= 3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 62				≤ 62				
Max. permissible housing temperature		°C	+90								
Ambient temperature		°C	0 up to +40								
Lubrication			Lubricated for lifetime								
Paint			Blue RAL 5002								
Direction of rotation			Motor and gearhead same direction								
Type of protection			IP 65								
Mass moment of inertia (referring to the drive)	J_1	kgcm^2	19	0,87	0,70	0,60	0,55	0,63	0,56	0,53	0,51	0,50
Clamping hub diameter (mm)			24	2,39	2,22	2,12	2,07	-	-	-	-	-

* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 19 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 22 and i = 110 (without load).

Z: Detail

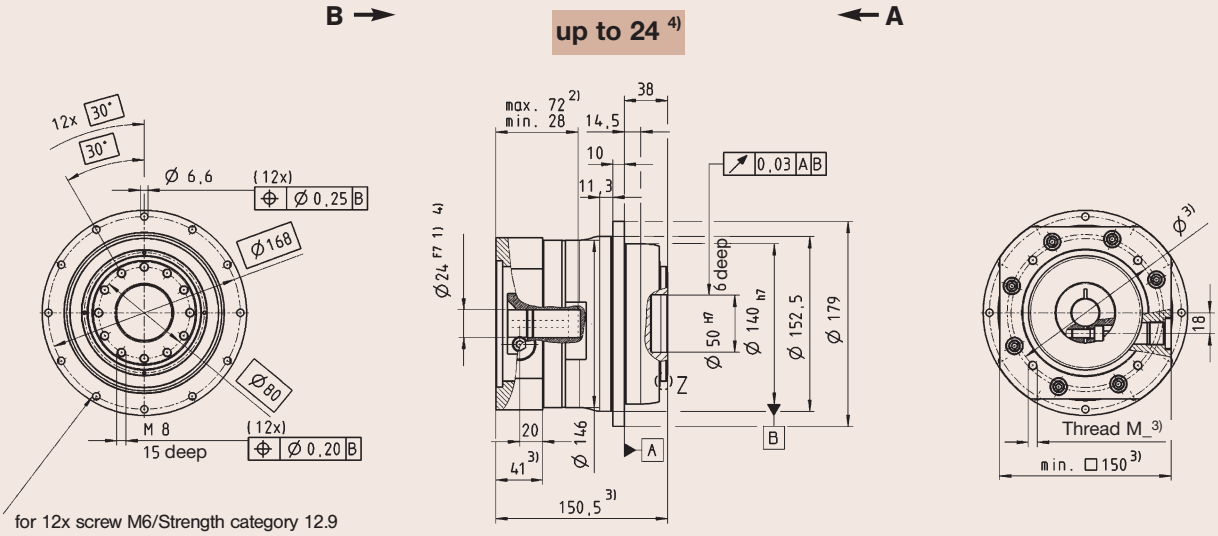


Conversion table

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

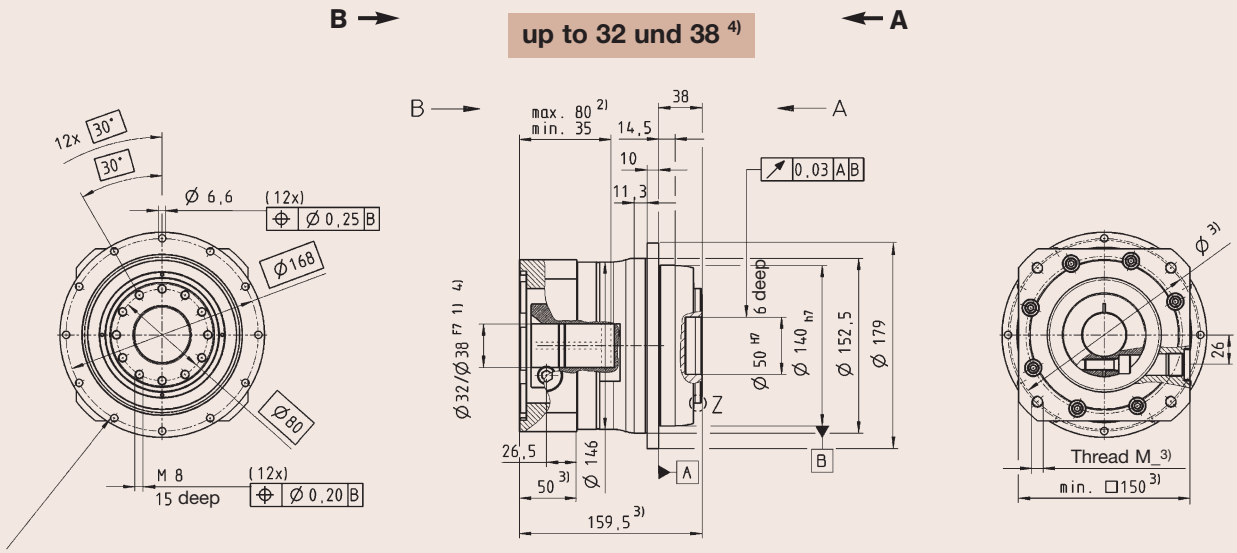
Motor shaft diameter (mm)

up to 24 [4]



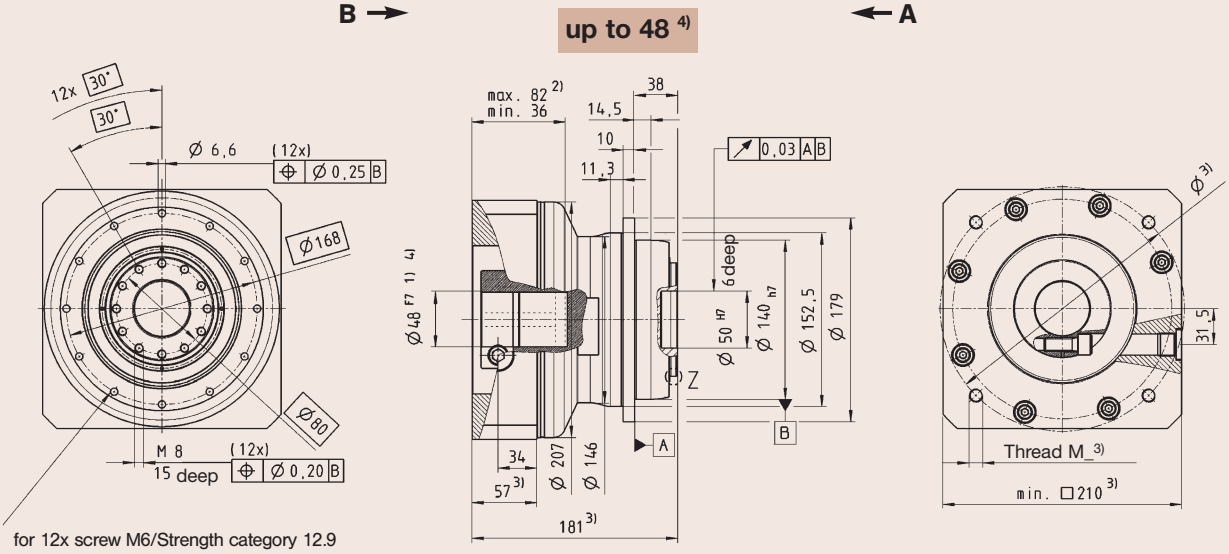
for 12x screw M6/Strength category 12.9

up to 32 und 38 [4]



for 12x screw M6/Strength category 12.9

up to 48 [4]



for 12x screw M6/Strength category 12.9

Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.

3) The dimensions depend on the motor.

4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

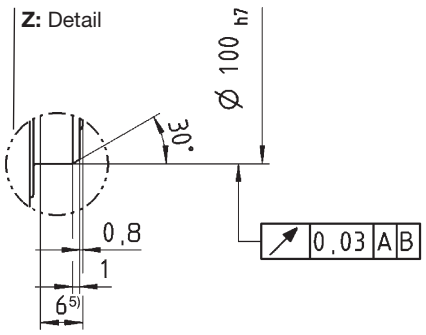
5) Centering depth.

⚠ Motor mounting according to operating manual.

Technical data **TP+ 050** 1-stage

			1-stage			
Ratio [1]	**i**		**4**	**5**	**7**	**10**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	700	700	700	540
Nominal output torque (n_1 = 3000 U/min) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	370	370	370	240
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	1250	1250	1250	1250
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	1900	2000	2500	2500
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	8,1	6,6	4,8	3,5
Maximum input speed	n_{1Max}	min^{-1}	4000	4000	4000	4000
Torsional backlash	j_t	arcmin	Standard ≤ 3 / Reduced ≤ 1			
Torsional rigidity	C_{t21}	Nm/arcmin	-	174	149	123
Tilting rigidity	C_{2K}	Nm/arcmin	560			
Max. axial force ***	F_{2AMax}	N	6130			
Max. tilting moment	M_{2KMax}	Nm	1295			
Efficiency at full load	η	%	97			
Weight incl. adapter plate	m	kg	14,0			
Noise level (n_1=3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 66			
Max. permissible housing temperature		°C	+90			
Ambient temperature		°C	0 up to +40			
Lubrication			Lubricated for lifetime			
Paint			Blue RAL 5002			
Direction of rotation			Motor and gearhead same direction			
Type of protection			IP 65			
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$				
Clamping hub diameter (mm)		24	10,0	8,4	6,9	6,0
		32	14,3	12,7	11,2	10,4
		38	14,0	12,4	10,9	10,1
		48	28,7	27,1	25,1	24,3

1) Other reduction ratios are optionally available. Please contact alpha.
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 32 and 38 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 10 (without load).



Conversion table

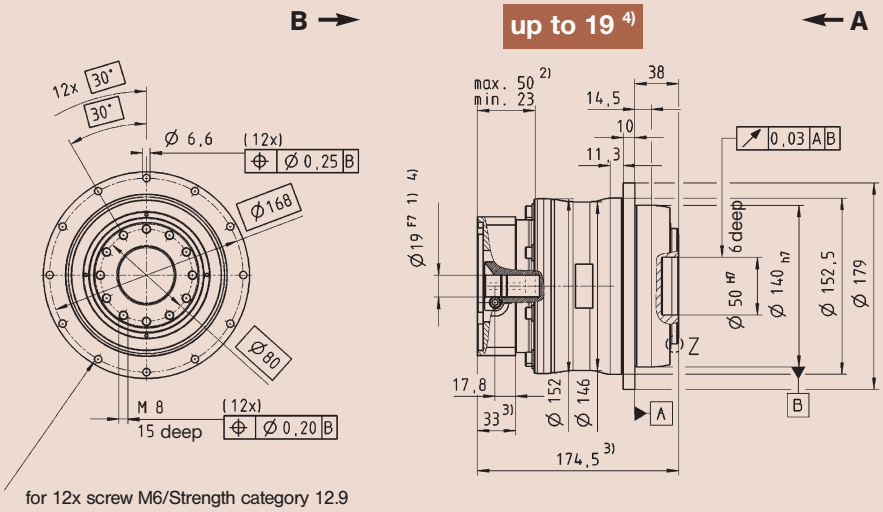
1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

View A

Motor shaft diameter (mm)

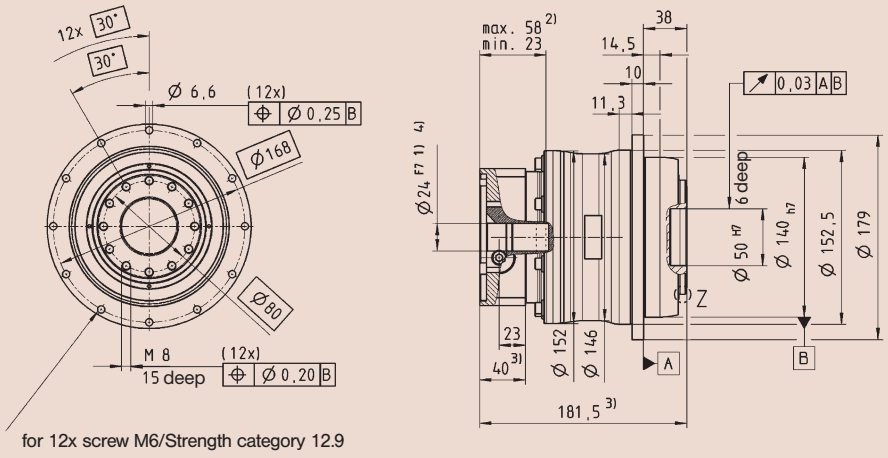
View B

up to 19 [4]



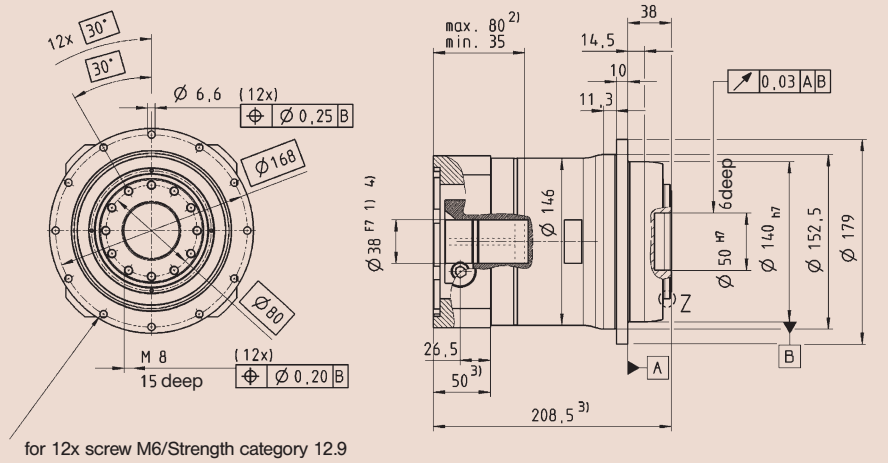
for 12x screw M6/Strength category 12.9

up to 24 [4]



for 12x screw M6/Strength category 12.9

up to 38 [4]



for 12x screw M6/Strength category 12.9

Dimensions without specified tolerances ±1 mm.

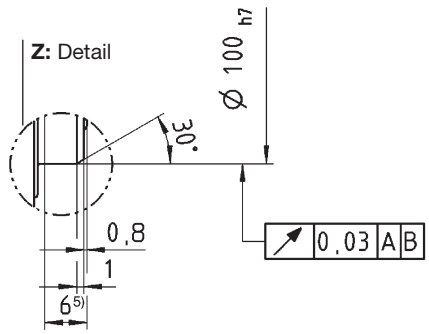
1) Check motor shaft fit.
2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.
3) The dimensions depend on the motor.
4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).
5) Centering depth.

⚠ Motor mounting according to operating manual.

Technical data **TP+ 050** 2-stage

			2-stage											
Ratio [1]	**i**		**16**	**20**	**21**	**25**	**28**	**31**	**35**	**40**	**50**	**61**	**70**	**91**	**100**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	750	750	600	750	750	620	750	750	750	550	700	500	540
Nominal output torque (n_1 = 3000 U/min) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	400	400	350	400	400	400	400	400	400	350	400	220	240
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	2900	2900	2900	2900	2900	2900	2900	2900	3200	3200	3200	3900	3900
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	4,2	3,4	3,3	3,1	2,5	2,4	2,3	1,8	1,7	1,5	1,5	1,4	1,3
Maximum input speed	n_{1Max}	min^{-1}	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
Torsional backlash	j_t	arcmin	Standard ≤ 3 / Reduced ≤ 1												
Torsional rigidity	C_{t21}	Nm/arcmin	170	175	-	180	180	-	180	170	180	123	-	100	125
Tilting rigidity	C_{2K}	Nm/arcmin	560												
Max. axial force ***	F_{2AMax}	N	6130												
Max. tilting moment	M_{2KMax}	Nm	1295												
Efficiency at full load	η	%	94												
Weight incl. adapter plate	m	kg	14,1												
Noise level (n_1=3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 70												
Max. permissible housing temperature		°C	+90												
Ambient temperature		°C	0 up to +40												
Lubrication			Lubricated for lifetime												
Paint			Blue RAL 5002												
Direction of rotation			Motor and gearhead same direction												
Type of protection			IP 65												
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$													
Clamping hub diameter (mm)			19	2,65	2,41	2,56	2,15	1,81	2,46	1,80	1,58	1,57	1,62	1,56	1,59	1,56
			24	3,47	3,24	3,38	2,97	2,69	3,28	2,68	2,41	2,41	2,46	2,40	2,43	2,39
			38	10,4	10,2	10,3	9,88	9,44	10,2	9,43	9,21	9,20	9,25	9,19	9,22	9,19

1) Other reduction ratios are optionally available. Please contact alpha.
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 24 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 16 (without load).



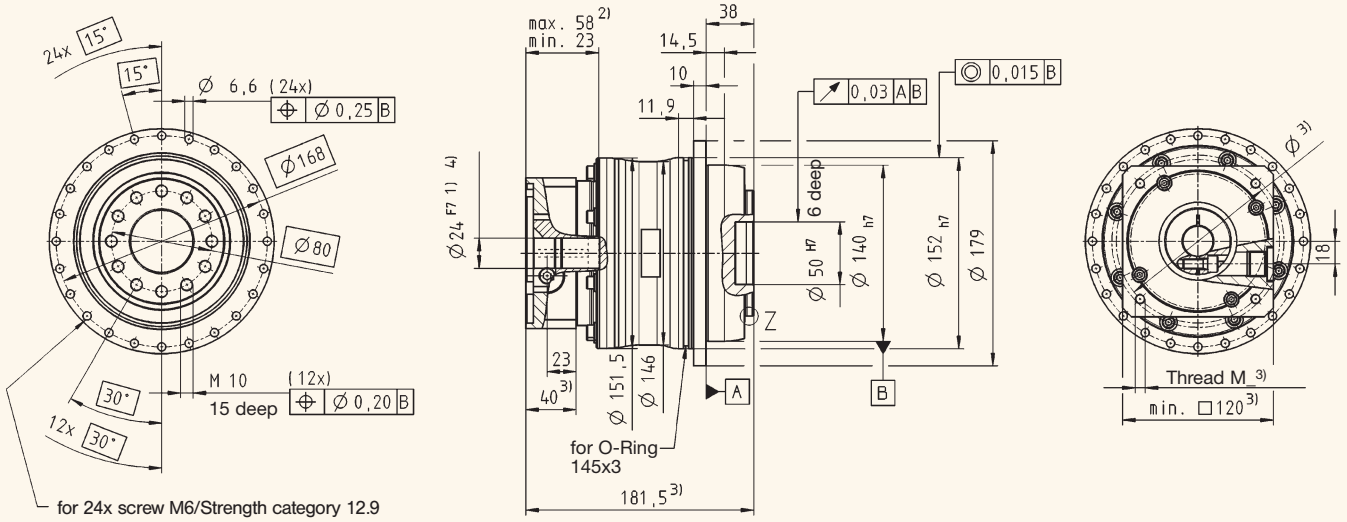
Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

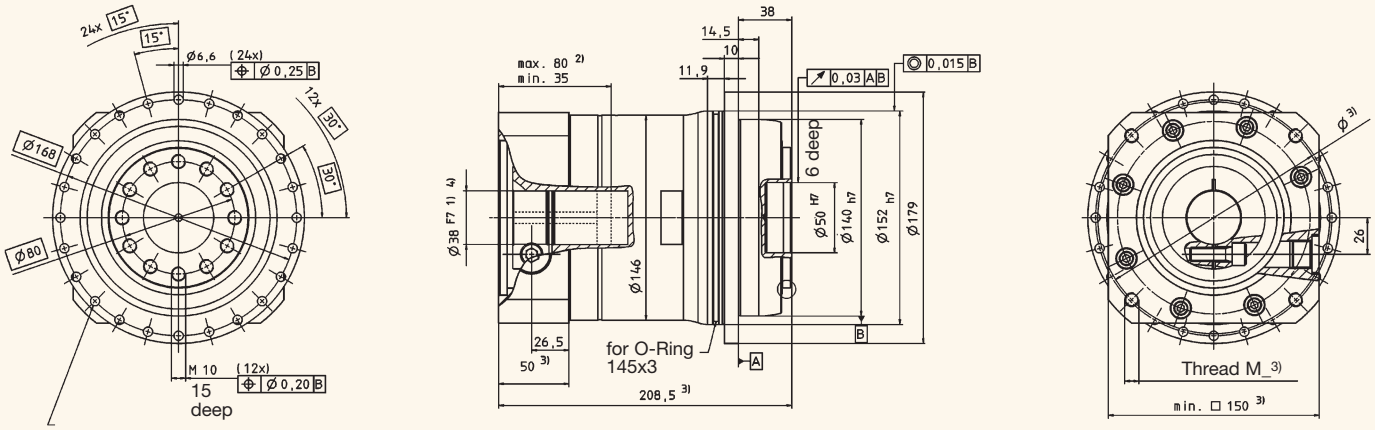
View A | Motor shaft diameter (mm) | View B

2-stage

B → up to 24 [4] ← A

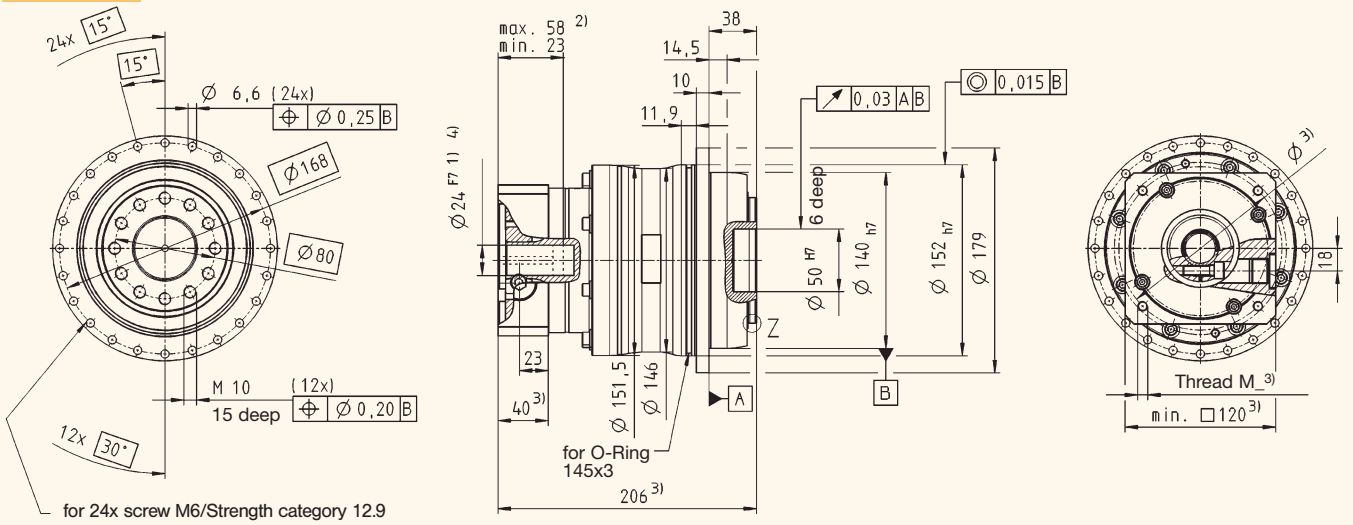


B → up to 38 [4] ← A



3-stage

B → up to 24 [4] ← A



Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.

3) The dimensions depend on the motor.

4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

5) Centering depth.

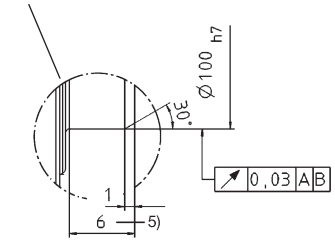
⚠ Motor mounting according to operating manual.

Technical data **TP+ 050** HIGH TORQUE®

			2-stage				3-stage				
Ratio	**i**		**22**	**27,5**	**38,5**	**55**	**66**	**88**	**110**	**154**	**220**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	950	950	950	950	950	950	950	950	950
Nominal output torque (n_1=3000 min^{-1}) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	575	600	650	675	675	675	675	675	675
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	2375	2375	2375	2375	2375	2375	2375	2375	2375
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	3000	3000	3000	3000	3500	3500	3500	3500	3500
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	2,7	-	-	-	-	-	1,1	-	-
Maximum input speed	n_{1Max}	min^{-1}	5000	5000	5000	5000	5000	5000	5000	5000	5000
Max. Torsional backlash	j_t	arcmin	≤ 1				≤ 1				
Torsional rigidity	C_{t21}	Nm/arcmin	220	-	-	-	-	-	200	-	-
Tilting rigidity	C_{2K}	Nm/arcmin	560				560				
Max. axial force ***	F_{2AMax}	N	6130				6130				
Max. tilting moment (bei 100 min^{-1} im Abtrieb)	M_{2KMax}	Nm	1300				1300				
Efficiency at full load (bei T_{2B} und n_1=3000 min^{-1})	η	%	≤ 94				≤ 92				
Weight incl. adapter plate	m	kg	12,5				13,4				
Noise level (n_1= 3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 64				≤ 64				
Max. permissible housing temperature		°C	+90								
Ambient temperature		°C	0 up to +40								
Lubrication			Lubricated for lifetime								
Paint			Blue RAL 5002								
Direction of rotation			Motor and gearhead same direction								
Type of protection			IP 65								
Mass moment of inertia (referring to the drive)	J_1	kgcm^2	24	3,8	3,3	3,0	2,8	2,6	2,4	2,2	2,1	2,1
Clamping hub diameter (mm)			38	10,7	10,3	9,9	9,7	-	-	-	-	-

* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 24 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 22 and i = 110 (without load).

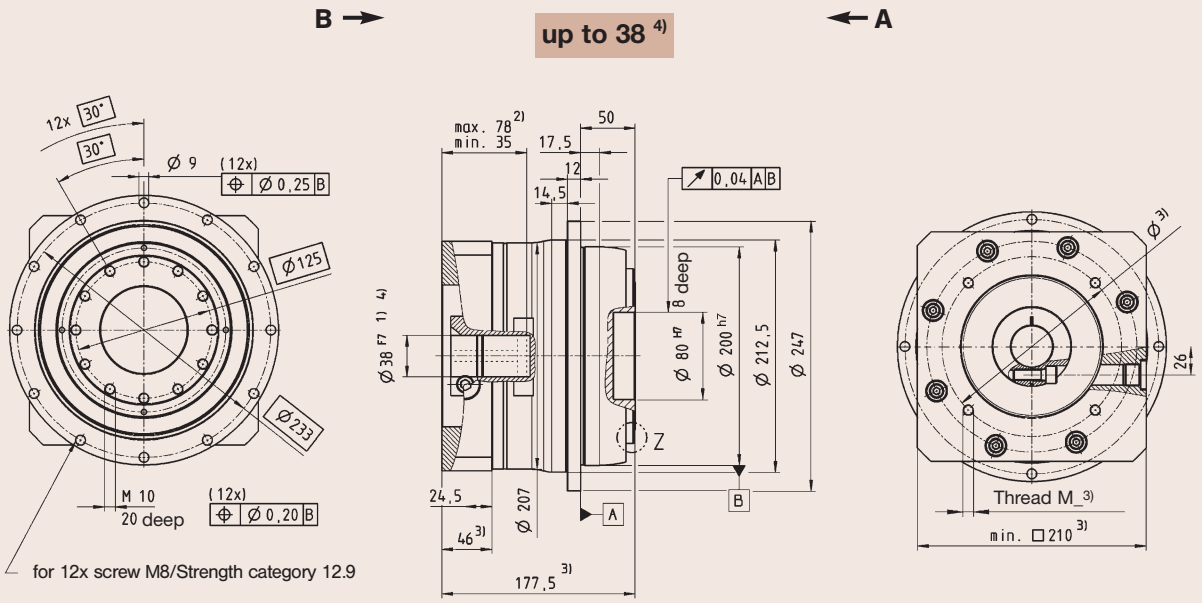
Z: Detail

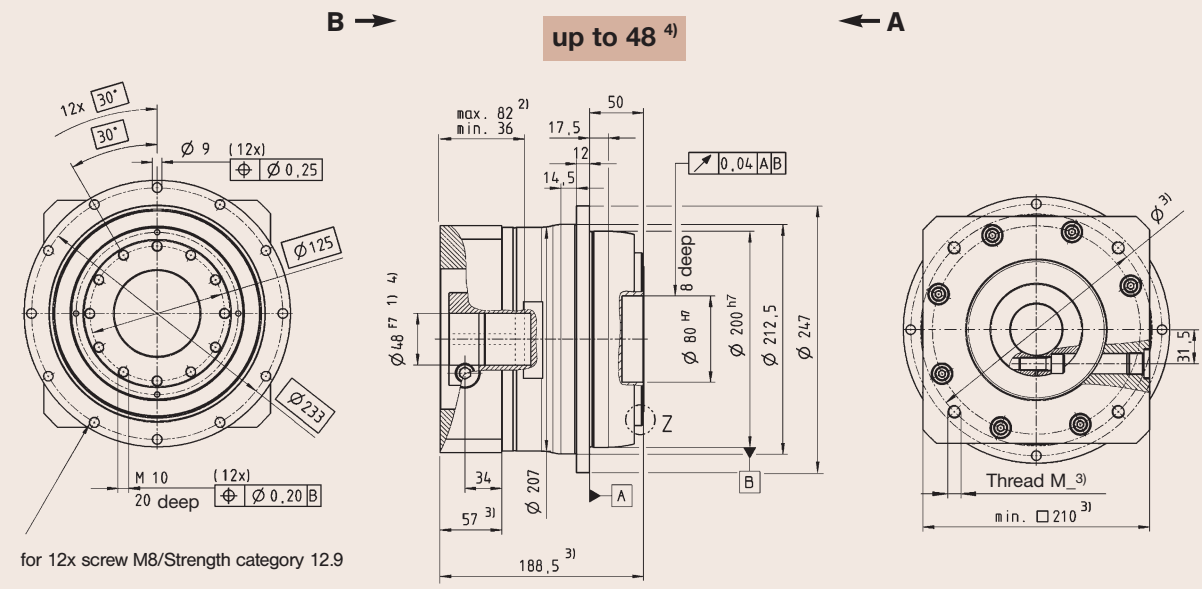


Conversion table

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

View A | **Motor shaft diameter (mm)** | **View B**





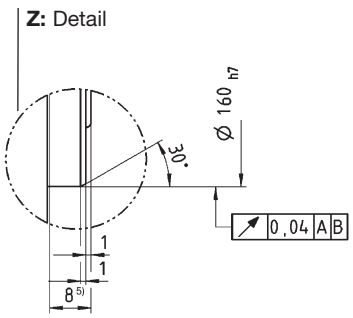
Dimensions without specified tolerances ±1 mm.
1) Check motor shaft fit.
2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.
3) The dimensions depend on the motor.
4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).
5) Centering depth.

⚠ Motor mounting according to operating manual.

Technical data **TP+ 110** 1-stage

				1-stage			
Ratio [1]	**i**			**4**	**5**	**7**	**10**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm		1600	1600	1600	1400
Nominal output torque (n_1 = 3000 U/min) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm		700	750	750	750
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm		2750	2750	2750	2750
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}		1400	1500	2000	2000
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm		15,6	12,7	9,4	7,0
Maximum input speed	n_{1Max}	min^{-1}		3500	3500	3500	3500
Torsional backlash	j_t	arcmin		Standard ≤ 3 / Reduced ≤ 1			
Torsional rigidity	C_{t21}	Nm/arcmin		-	619	520	480
Tilting rigidity	C_{2K}	Nm/arcmin		1452			
Max. axial force ***	F_{2AMax}	N		10050			
Max. tilting moment	M_{2KMax}	Nm		3064			
Efficiency at full load	η	%		97			
Weight incl. adapter plate	m	kg		30,0			
Noise level (n_1=3000 min^{-1}) ****	L_{PA}	dB(A)		≤ 70			
Max. permissible housing temperature		°C		+90			
Ambient temperature		°C		0 up to +40			
Lubrication				Lubricated for lifetime			
Paint				Blue RAL 5002			
Direction of rotation				Motor and gearhead same direction			
Type of protection				IP 65			
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$	38	46,3	36,4	27,6	22,8
Clamping hub diameter (mm)			48	52,4	42,5	33,5	28,7

1) Other reduction ratios are optionally available. Please contact alpha.
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 48 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 10 (without load).



Conversion table

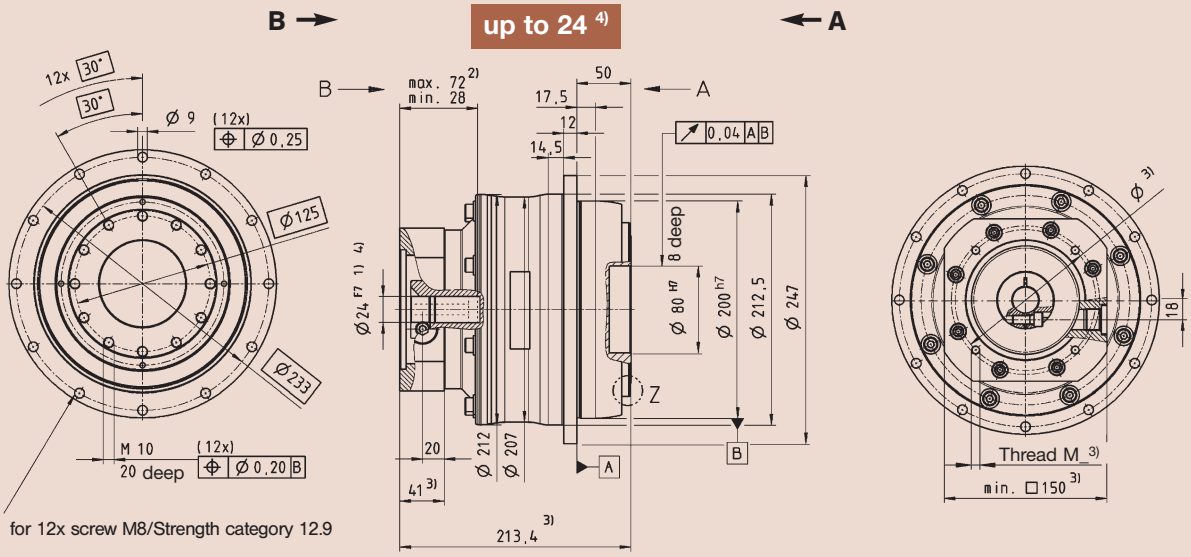
1 mm	=	0.039 in
1 Nm	=	8.85 in.lb
1 $kgcm^2$	=	8.85 x 10^{-4} in.lb.s^2
1 N	=	0.225 lb_f
1 kg	=	2.21 lb_m

View A

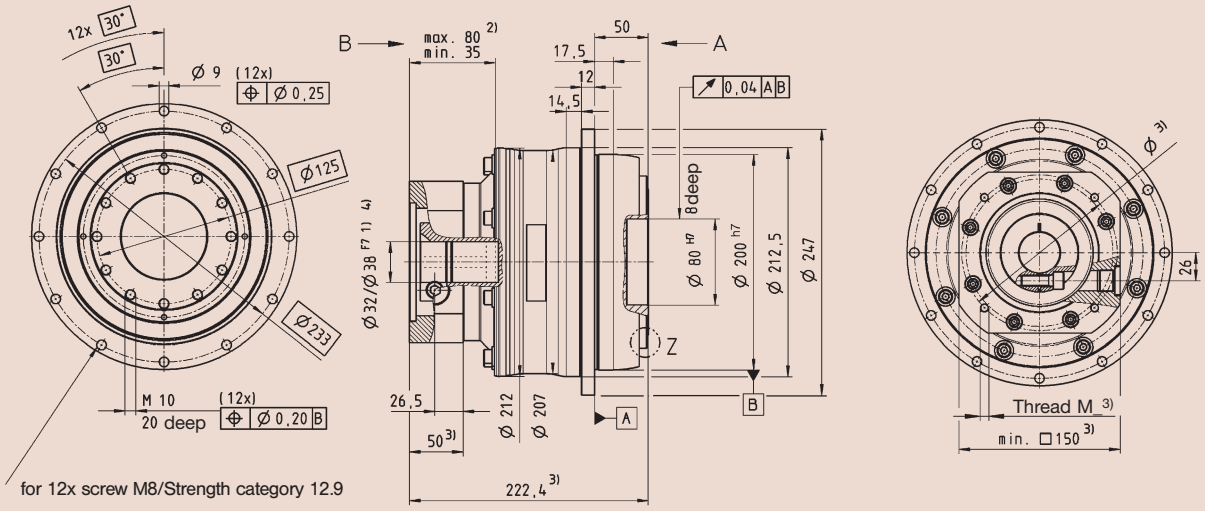
Motor shaft diameter (mm)

View B

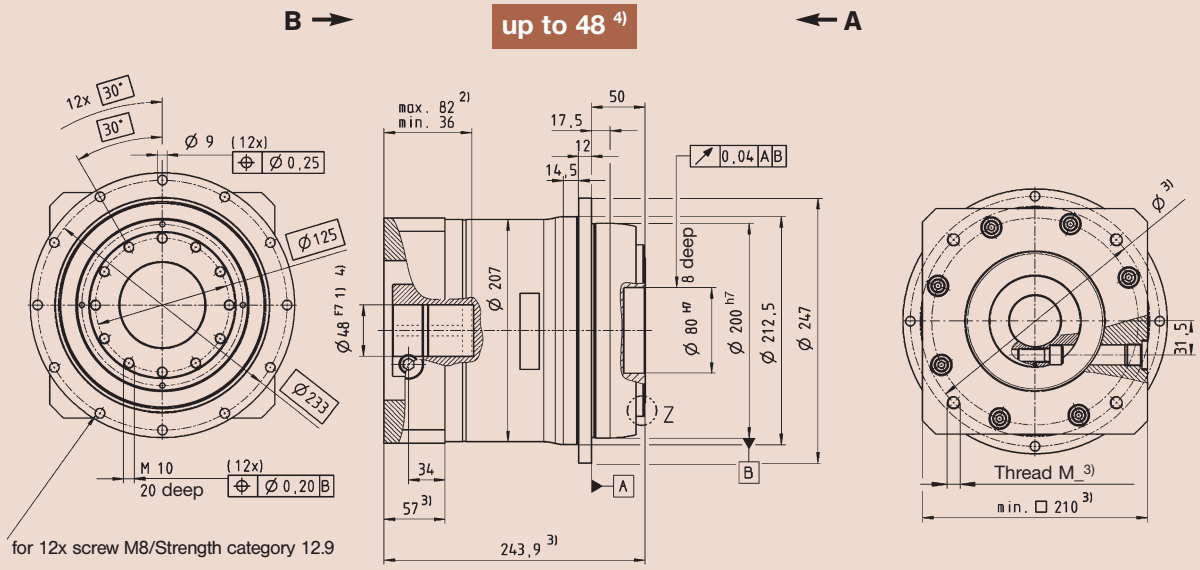
up to 24 [4]



up to 32 und 38 [4]



up to 48 [4]



Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.
2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.
3) The dimensions depend on the motor.
4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).
5) Centering depth.

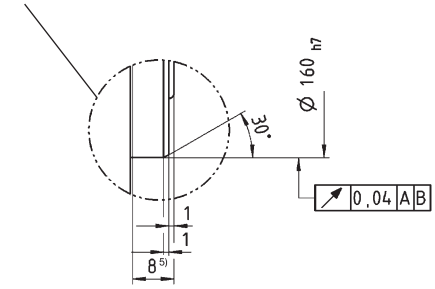
⚠ Motor mounting according to operating manual.

Technical data **TP+ 110** 2-stage

			2-stage											
Ratio [1]	**i**		**16**	**20**	**21**	**25**	**28**	**31**	**35**	**40**	**50**	**61**	**70**	**91**	**100**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	1600	1600	1400	1600	1600	1600	1600	1600	1600	1400	1600	1300	1400
Nominal output torque (n_1 = 3000 U/min) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	980	980	850	1050	1050	1250	1250	850	1050	1100	900	700	800
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	2750	2750	2750	2750	2750	2750	2750	2750	2750	2750	2750	2750	2750
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	2500	2500	2500	2500	2500	2500	2500	2500	2900	3200	3200	3400	3400
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	6,9	5,6	5,5	5,0	4,1	3,9	3,7	3,0	2,7	2,5	2,4	2,2	2,2
Maximum input speed	n_{1Max}	min^{-1}	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Torsional backlash	j_t	arcmin	Standard ≤ 3 / Reduced ≤ 1												
Torsional rigidity	C_{t21}	Nm/arcmin	-											400	-
Tilting rigidity	C_{2K}	Nm/arcmin	1452												
Max. axial force ***	F_{2AMax}	N	10050												
Max. tilting moment	M_{2KMax}	Nm	3064												
Efficiency at full load	η	%	94												
Weight incl. adapter plate	m	kg	34,0												
Noise level (n_1=3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 72												
Max. permissible housing temperature		°C	+90												
Ambient temperature		°C	0 up to +40												
Lubrication			Lubricated for lifetime												
Paint			Blue RAL 5002												
Direction of rotation			Motor and gearhead same direction												
Type of protection			IP 65												
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$	24	9,56	8,10	8,91	7,92	6,73	8,58	6,64	5,96	5,92	6,06	5,88	5,95	5,85
			32	13,9	12,4	13,2	12,2	11,1	12,9	11,0	10,3	10,3	10,4	10,2	10,3	10,2
Clamping hub diameter (mm)			38	13,6	12,1	12,9	11,9	10,8	12,6	10,7	10,0	10,0	10,1	9,93	10,0	9,91
			48	28,3	26,8	27,6	26,6	25,0	27,3	24,9	24,2	24,2	24,3	24,1	24,2	24,1

1) Other reduction ratios are optionally available. Please contact alpha.
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 32 and 38 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 16 (without load).

Z: Detail



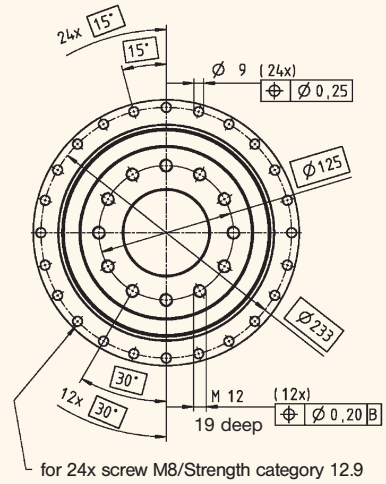
Conversion table

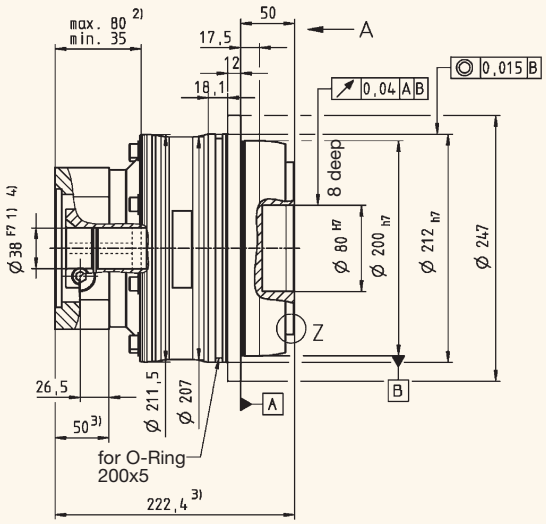
1 mm	=	0.039 in
1 Nm	=	8.85 in.lb
1 $kgcm^2$	=	8.85 x 10^{-4} in.lb.s^2
1 N	=	0.225 lb_f
1 kg	=	2.21 lb_m

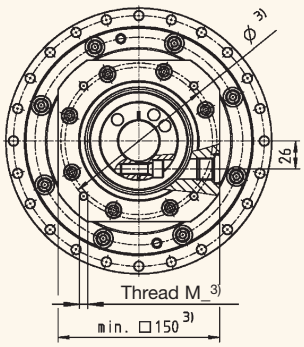
View A | Motor shaft diameter (mm) | View B

2-stage

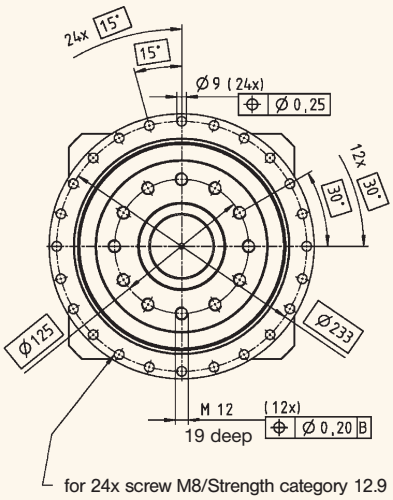
B → up to 38 [4] ← A

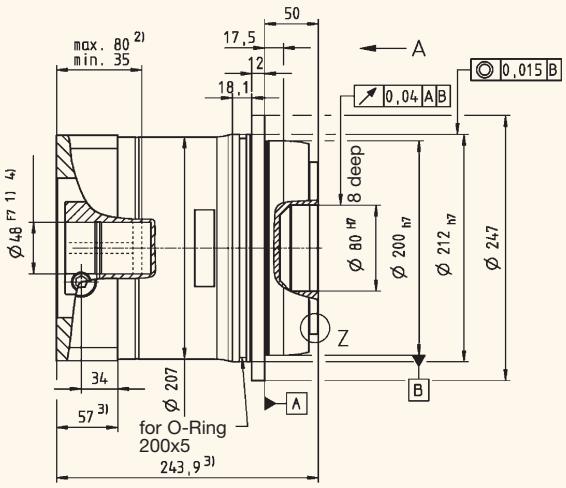


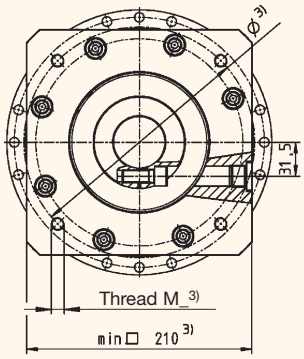




B → up to 48 [4] ← A

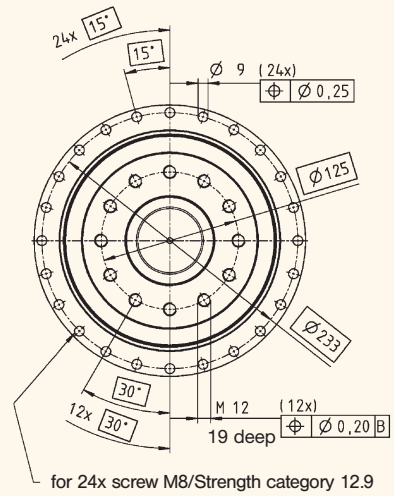


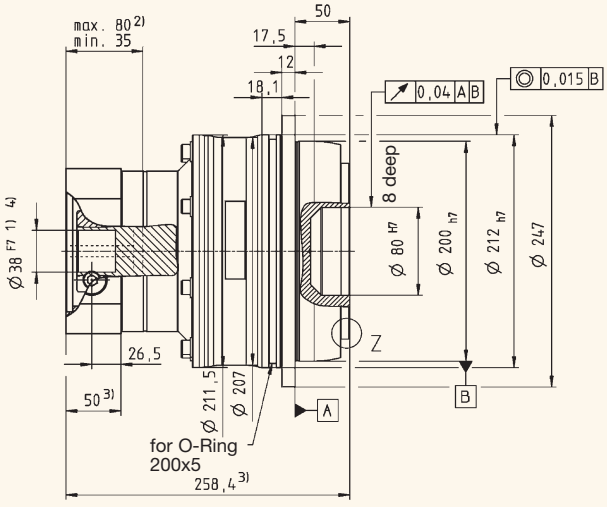


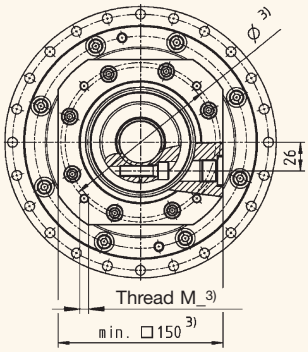


3-stage

B → up to 38 [4] ← A







Dimensions without specified tolerances ±1 mm.

1) Check motor shaft fit.

2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.

3) The dimensions depend on the motor.

4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

5) Centering depth.

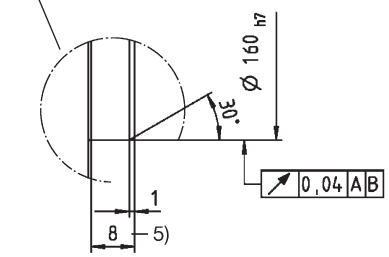
⚠ Motor mounting according to operating manual.

Technical data **TP+ 110** HIGH TORQUE®

			2-stage				3-stage				
Ratio	**i**		**22**	**27,5**	**38,5**	**55**	**66**	**88**	**110**	**154**	**220**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	3100	3100	3100	2000	2600	2600	2600	2600	2600
Nominal output torque (n_1=3000 min^{-1}) (Higher values possible if n1 = 2000 rpm)	T_{2N}	Nm	1570	1600	1650	1400	1600	1750	1750	1750	1750
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	6500	6500	6500	6500	6500	6500	6500	6500	6500
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	2500	2500	2500	2500	3000	3000	3000	3000	3000
Medial no-load running torque (n_1=3000 min^{-1}) (At 20 °C gearhead temperature) **	T_{012}	Nm	6,5	-	-	-	-	3,3	2,5	-	-
Maximum input speed	n_{1Max}	min^{-1}	4500	4500	4500	4500	4500	4500	4500	4500	4500
Max. Torsional backlash	j_t	arcmin	≤ 1				≤ 1				
Torsional rigidity	C_{t21}	Nm/arcmin	730	-	-	-	-	-	680	-	-
Tilting rigidity	C_{2K}	Nm/arcmin	1452				1452				
Max. axial force ***	F_{2AMax}	N	10050				10050				
Max. tilting moment (bei 100 min^{-1} im Abtrieb)	M_{2KMax}	Nm	3000				3000				
Efficiency at full load (bei T_{2B} und n_1=3000 min^{-1})	η	%	≤ 94				≤ 92				
Weight incl. adapter plate	m	kg	33,1				35,4				
Noise level (n_1= 3000 min^{-1}) ****	L_{PA}	dB(A)	≤ 66				≤ 66				
Max. permissible housing temperature		°C	+90								
Ambient temperature		°C	0 up to +40								
Lubrication			Lubricated for lifetime								
Paint			Blue RAL 5002								
Direction of rotation			Motor and gearhead same direction								
Type of protection			IP 65								
Mass moment of inertia (referring to the drive)	J_1	kgcm^2	38	16,6	15,2	13,9	13,1	13,8	10,2	9,8	9,5	9,2
Clamping hub diameter (mm)			48	31,4	29,9	28,7	28,0	-	-	-	-	-

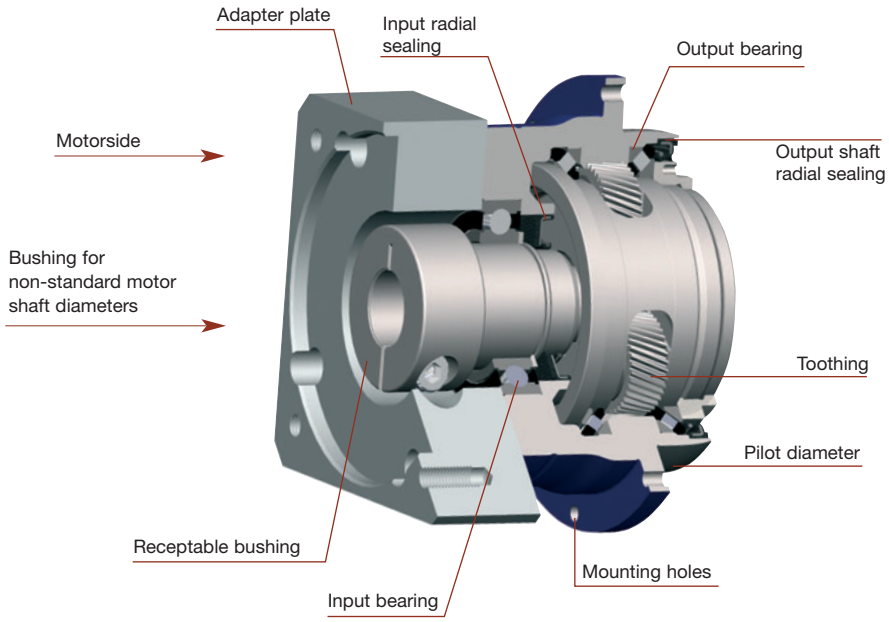
* Please reduce the n_{1N} speed at higher ambient temperatures.
** Applies to 38 mm clamping hub diameter
*** Referred to the centre of the flange.
**** Measured at a reduction ratio i = 22 and i = 110 (without load).

Z: Detail



Conversion table

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



Symbols and Index

Symbol	Unit	Designation
c	Nm/arcmin	Rigidity
F	N	Force
i	-	Ratio
j	arcmin	Backlash
J	kgcm²	Mass moment of inertia
L	h	Service life
M	Nm	Moment
n	rpm	Speed
η	%	Efficiency
T	Nm	Torque

Index

1	Input
2	Output
A/a	Axial
B/b	Acceleration
h	Hours
K/k	Tilt
m	Mass
Max/max	Maximum
Mot	Motor
N	Nominal
Not/not	Emergency stop
0	No-load running
R/r	Radial
t	Torsional

capital letters	Permissible values
small letters	Actual values

Quick 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®** servo/gearhead sizing software to design your drive train.

Cyclic operation S5
Number of cycles ≤ 1000/hour

Duty cycle
< 60 % and < 20 min.*

1. Using servomotor characteristic data, determine the maximum motor acceleration torque: T_{MaxMot} [Nm]
2. Determine maximum acceleration torque at the gearhead output: T_{2b} [Nm]
   $T_{2b} = T_{MaxMot} \bullet i$ (ratio)
3. Compare the maximum acceleration torque just calculated with the permissible acceleration torque (T_{2B}) for the selected gearhead.
   Requirement: $T_{2b} \leq T_{2B}$

   If not, choose another gear reducer.
4. Verify that the clamping hub diameter (table on page 42) is OK for the selected servomotor.
5. Compare the motor shaft length, L_{Mot} (mm), with the min. and max. clamping hub depth in the dimensional sketches.

Continuous operation S1

In case of continuous running applications, please contact alpha

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

TP 300/500

from the classic series

“Compact Precision”

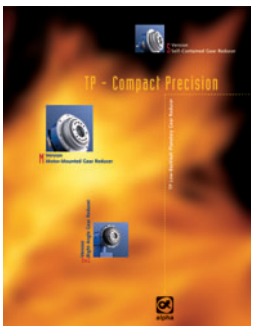
Superior positioning accuracy resulting from low torsional backlash and high torsional stiffness.

Simple, patented motor mounting with integrated thermal length compensation.

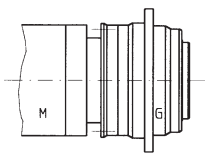
Ideally suited to highly dynamic **cyclic S5** operation due to the intelligent design.

Minimum backlash ≤ **3 arcmin** achieved using precision ground gearing without shimming.

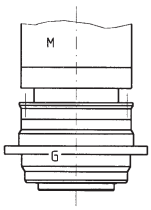
Any installation position. All units have lifelong lubrication.



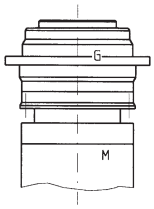
Mounting Position



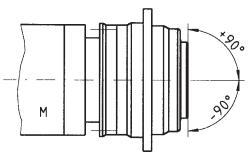
B5 - horizontal



V1 - vertical
with output shaft
facing downwards

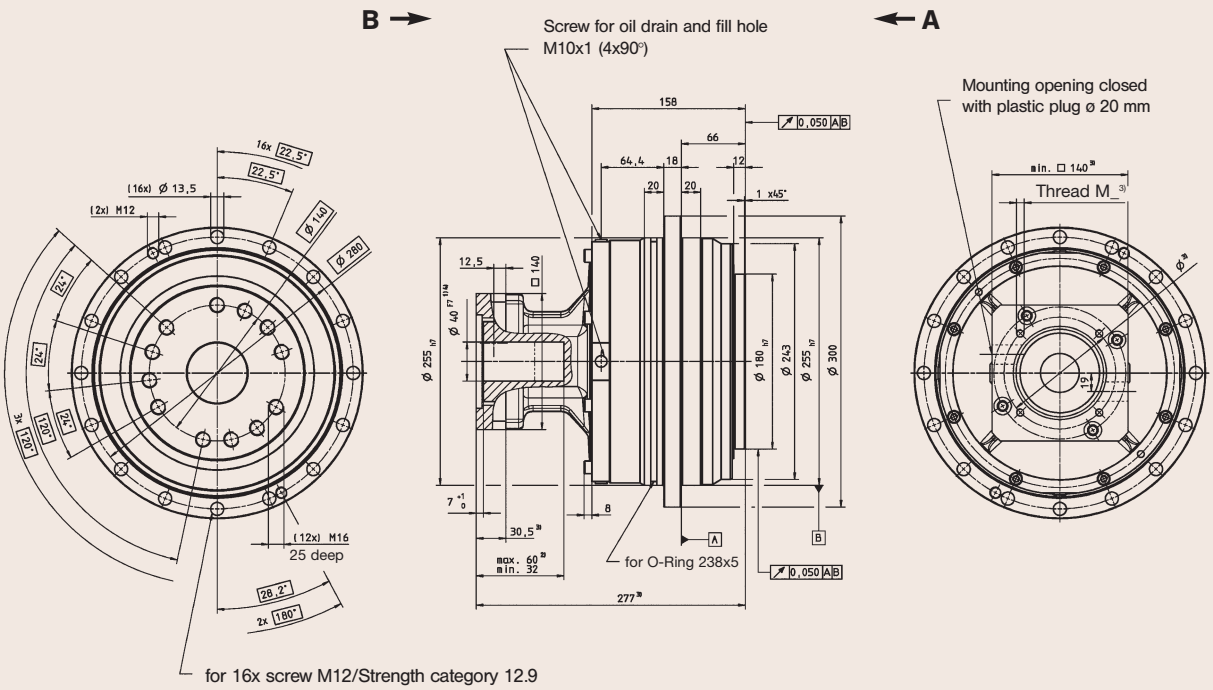


V3 - vertical
with output shaft
facing upwards



S - can be
pivoted ± 90° from
the horizontal

M = Motor
G = Gearhead



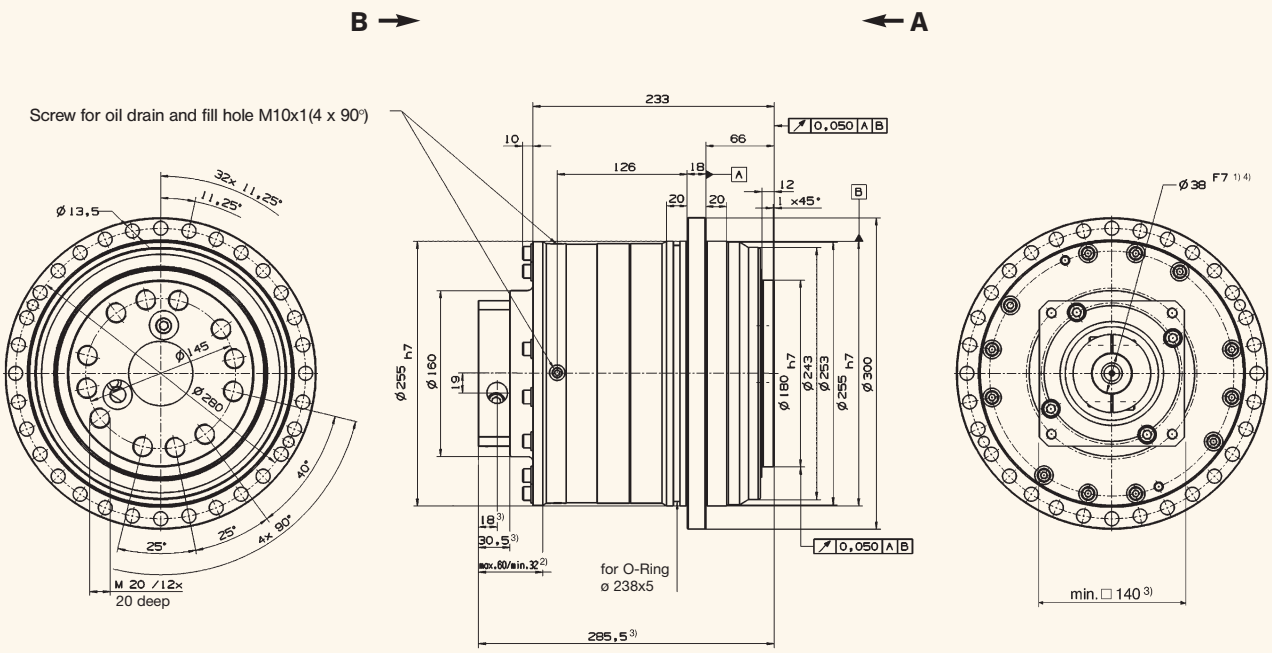
Dimensions without specified tolerances ±1 mm.
1) Check motor shaft fit.
2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.
3) The dimensions depend on the motor.
4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

⚠ Motor mounting according to operating manual.

Technical data **TP 300**

				2-stage		
Ratio		**i**		**31**	**61**	**91**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm		3500	2800	2800
Nominal output torque	T_{2N}	Nm		2200	1600	1600
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm		8750	8750	8750
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}		1600	1900	2200
Maximum input speed	n_{1Max}	min^{-1}		3000	3000	3000
Torsional backlash	j_t	arcmin		Standard ≤ 3		
Torsional rigidity	C_{t21}	Nm/arcmin		560		
Tilting rigidity (i = 31)	C_{2K}	Nm/arcmin		5560		
Max. axial force **	F_{2AMax}	N		33 000		
Max. tilting moment	M_{2KMax}	Nm		5900		
Efficiency at full load	η	%		≥ 93		
Weight incl. adapter plate	m	kg		55,0		
Noise level (n_1=3000 min^{-1})	L_{PA}	dB(A)		≤ 67		
Max. permissible housing temperature		°C		+90		
Ambient temperature		°C		-10 up to +40		
Lubrication				Synthetic oil		
Paint				Blue RAL 5002		
Mounting position				Please advise with order		
Type of protection				IP 64		
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$	35	15,0	12,2	12,0
Clamping hub diameter (mm)						

* For higher ambient temperature, reduce nominal input speed n_{1N}.
** In reference to the centre of the output shaft.



Dimensions without specified tolerances ±1 mm.
1) Check motor shaft fit.
2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.
3) The dimensions depend on the motor.
4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

⚠ Motor mounting according to operating manual.

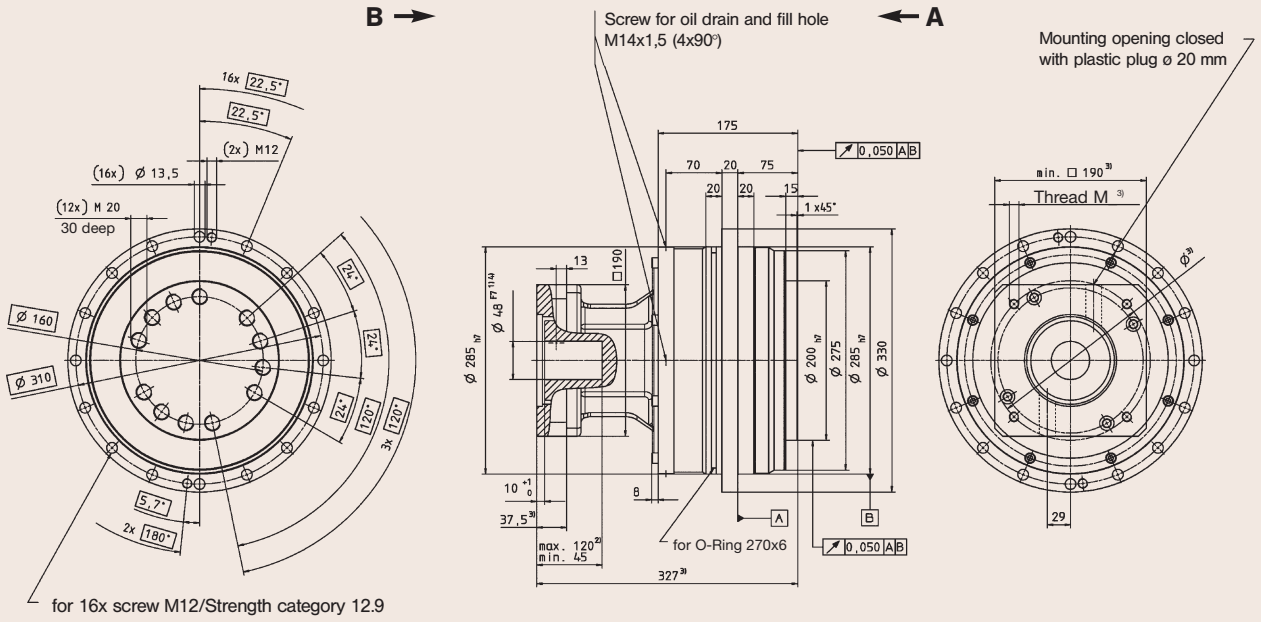
Technical data **TP 300** HIGH TORQUE®

			2-stage	3-stage
Ratio	**i**		**22**	**66/88/110/154/220**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	5300	5300
Nominal output torque	T_{2N}	Nm	3100	3100
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	13250	13250
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	1500	1500
Maximum input speed	n_{1Max}	min^{-1}	3000	3000
Torsional backlash	j_t	arcmin	Standard ≤ 3	
Torsional rigidity	C_{t21}	Nm/arcmin	840	
Tilting rigidity	C_{2K}	Nm/arcmin	5560	
Max. axial force **	F_{2AMax}	N	33000	
Max. tilting moment	M_{2KMax}	Nm	5900	
Efficiency at full load (bei T_{2B} und $n_1 = 3000\ min^{-1}$)	η	%	93	
Weight incl. adapter plate	m	kg	77	
Noise level (n_1=3000 min^{-1})	L_{PA}	dB(A)	≤ 69	
Max. permissible housing temperature		°C	+90	
Ambient temperature		°C	0 up to +40	
Lubrication			Synthetic oil	
Paint			Blue RAL 5002	
Mounting position			Please advise with order	
Type of protection			IP 64	
Mass moment of inertia (referring to the drive) **Clamping hub diameter (mm)**	J_1	$kgcm^2$ **38**	14,80	13,8 / 11,0 / 10,0 / 8,9 / 8,4

Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

* For higher ambient temperature, reduce nominal input speed n_{1N}.
** In reference to the centre of the output shaft.



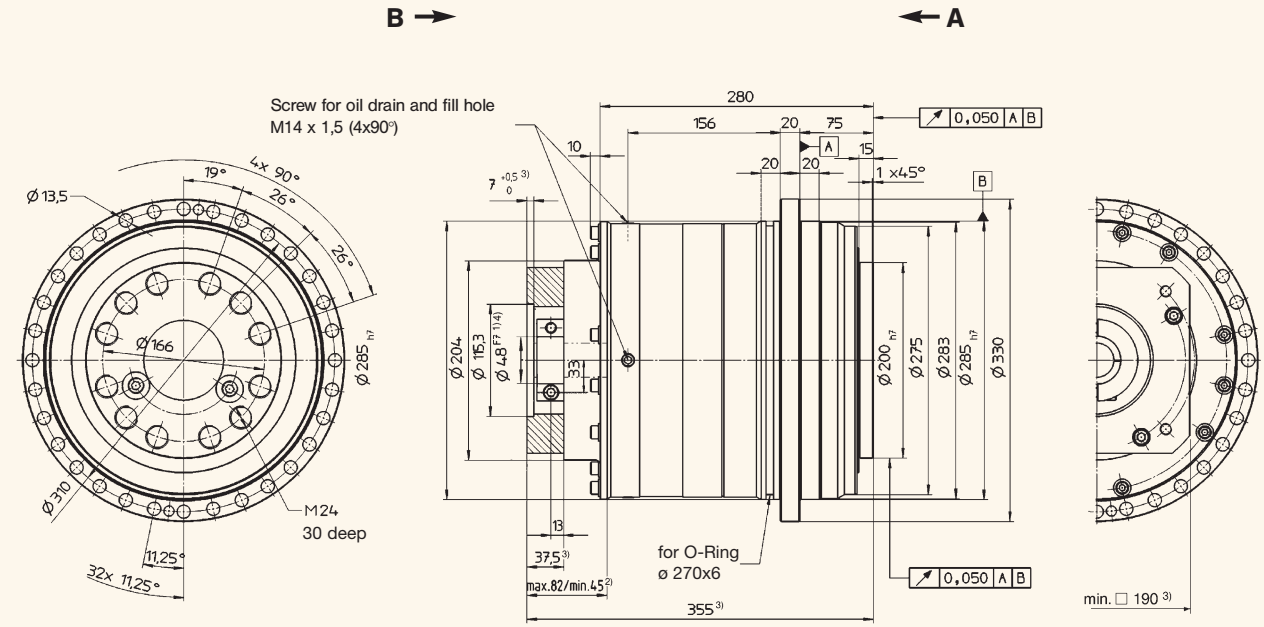
Dimensions without specified tolerances ±1 mm.
1) Check motor shaft fit.
2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.
3) The dimensions depend on the motor.
4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

⚠ Motor mounting according to operating manual.

Technical data **TP 500**

			2-stage		
Ratio	**i**		**31**	**61**	**91**
Max. acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	6000	4800	4800
Nominal output torque	T_{2N}	Nm	3700	2900	2900
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	15000	15000	15000
Nominal input speed (At 20 °C ambient temperature) *	n_{1N}	min^{-1}	1300	1500	1800
Maximum input speed	n_{1Max}	min^{-1}	3000	3000	3000
Torsional backlash	j_t	arcmin	Standard ≤ 3		
Torsional rigidity	C_{t21}	Nm/arcmin	736		
Tilting rigidity (i = 31)	C_{2K}	Nm/arcmin	9480		
Max. axial force **	F_{2AMax}	N	50 000		
Max. tilting moment	M_{2KMax}	Nm	8800		
Efficiency at full load	η	%	≥ 93		
Weight incl. adapter plate	m	kg	85,0		
Noise level (n_1=3000 min^{-1})	L_{PA}	dB(A)	≤ 69		
Max. permissible housing temperature		°C	+90		
Ambient temperature		°C	-10 up to +40		
Lubrication			Synthetic oil		
Paint			Blue RAL 5002		
Mounting position			Please advise with order		
Type of protection			IP 64		
Mass moment of inertia (referring to the drive) **Clamping hub diameter (mm)**	J_1	$kgcm^2$ 48	43,6	37,1	36,7

* For higher ambient temperature, reduce nominal input speed n_{1N}.
** In reference to the centre of the output shaft.



Dimensions without specified tolerances ±1 mm.
1) Check motor shaft fit.
2) Min./max. permissible motor shaft length. Longer motor shaft is possible. Please call alpha.
3) The dimensions depend on the motor.
4) Smaller motor shaft diameter is compensated by a bushing with at least 1 mm thickness (see page 42).

⚠ Motor mounting according to operating manual.

Technical data **TP 500** HIGH TORQUE®

				2-stage	3-stage
Ratio		**i**		**22**	**66/88/110/154/220**
Max. acceleration torque (max. 1000 cycles per hour)		T_{2B}	Nm	10000	10000
Nominal output torque		T_{2N}	Nm	6000	6000
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)		T_{2Not}	Nm	25000	25000
Nominal input speed (At 20 °C ambient temperature) *		n_{1N}	min^{-1}	1500	1500
Maximum input speed		n_{1Max}	min^{-1}	3000	3000
Torsional backlash		j_t	arcmin	Standard ≤ 3	
Torsional rigidity		C_{t21}	Nm/arcmin	1100	
Tilting rigidity		C_{2K}	Nm/arcmin	9480	
Max. axial force **		F_{2AMax}	N	50 000	
Max. tilting moment		M_{2KMax}	Nm	8800	
Efficiency at full load (bei T_{2B} und $n_1 = 3000\ min^{-1}$)		η	%	93	
Weight incl. adapter plate		m	kg	105	
Noise level (n_1=3000 min^{-1})		L_{PA}	dB(A)	≤ 69	
Max. permissible housing temperature			°C	+90	
Ambient temperature			°C	0 up to +40	
Lubrication				Synthetic oil	
Paint				Blue RAL 5002	
Mounting position				Please advise with order	
Type of protection				IP 64	
Mass moment of inertia (referring to the drive) **Clamping hub diameter (mm)**	J_1	kgcm²	**48**	47,5	50,2 / 38,5 / 31,9 / 26,2 / 23,2

Conversion table

1 mm	=	0.039 in
1 Nm	=	8.85 in.lb
1 $kgcm^2$	=	8.85 x 10^{-4} in.lb.s^2
1 N	=	0.225 lb_f
1 kg	=	2.21 lb_m

* For higher ambient temperature, reduce nominal input speed n_{1N}.
** In reference to the centre of the output shaft.

Ordering Key

Gearhead versions
M = motor-mounted gearhead

Stage number
1 = 1-stage
2 = 2-stage (MA)
3 = 3-stage (MA)

Form of output flange
0 = Standard flange
4 = Other

Backlash
0 = Reduced (only at MF)
1 = Standard

Mounting position
only for TP 300/500
(see page 38/37)

TP 010 S - M F 2 - 21 - 0 E 1 / Motor - V3

Gearhead type

Gearhead design
F = Standard
A = HIGH TORQUE®

Motor designation (manufacturer type code)

Clamping hub diameter See table

Ausführungscode
S = Standard
(TP+ und TP+ HIGH TORQUE)
_ = Standard
(TP 300/500)
X = Special gearhead

Ratio
TP+ MF 010S-110S
1-stage: 4/5/7/10
2-stage: 16/20/21/25/28/31/35/40/50/61/70/91/100
TP MF 300-500
2-stage: 31/61/91

Ratio
TP+ HIGH TORQUE MA 010S-110S
2-stage: 22/27,5/38,5/55
3-stage: 66*/88/110/154/220 *not for TP010S-MA
TP HIGH TORQUE MA 300-500
2-stage: 22
3-stage: 66/88/110/154/220

Clamping hub diameter TP+ | TP classic

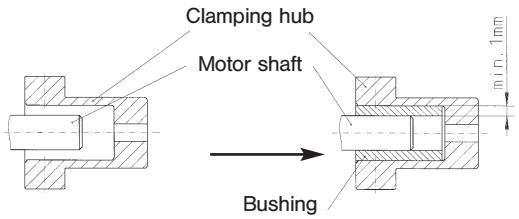
Gearhead stages	004	010		025		050		110		300		500	
Motor shaft ø (mm)*	1 / 2	1 / 2	2 / 3	1 / 2	2 / 3	1 / 2	2 / 3	1 / 2	2 / 3	2	2 / 3	2	2 / 3
	MF	MF	MA	MF	MA	MF	MA	MF	MA	MF	MA	MF	MA
11	B / B	- / B	-	- / -	-	-	-	-	-	-	-	-	-
14	C / C	C / C	C / C	- / C	-	-	-	-	-	-	-	-	-
19	E / +	E / E	E / +	E / E	E / E	- / E	-	-	-	-	-	-	-
24	+	G / +	+	G / G	G / +	G / G	G / G	- / G	-	-	-	-	-
28	+	+	+	H / +	+	- / -	- / +	- / -	-	-	-	-	-
32	+	+	+	- / +	+	I / -	- / +	- / I	-	-	-	-	-
35	+	+	+	- / +	+	- / -	- / +	- / -	-	1	-	-	-
38	+	+	+	K / +	+	K / K	K / +	K / K	K / K	+	1	-	-
48	+	+	+	+	+	M / +	+	M / M	M / +	+	+	1	1

- Select next larger diameter
+ Select next larger gearhead

* If your motor shaft diameter is not listed, add 2 mm to diameter and select next higher size.

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 1 mm.

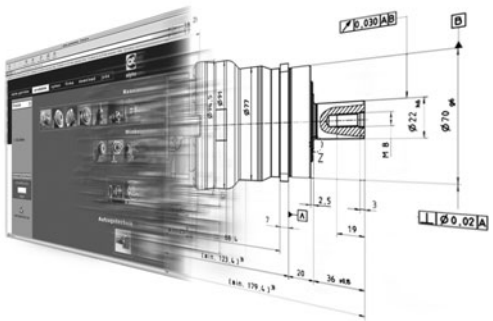


alpha's cymex® calculation software makes it easier than ever to size the most complex drive trains with just a few mouse clicks.

application – gearhead – motor

cymex® simplifies technical documentation, and customised engineering designs are possible at any time thanks to data in DXF format.

Use **cymex®**.
easy – quick – reliable



Additional **alpha** products

SP+® & SP+ HIGH SPEED® – The NEW Generation

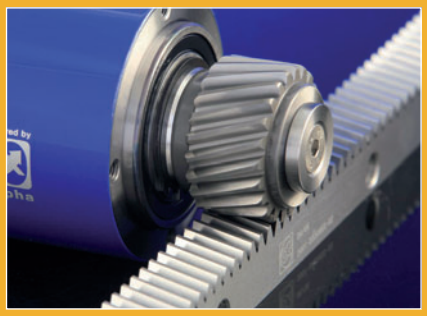
Low-backlash planetary gearheads with output shaft. Torsional backlash ≤ 1 arcmin.
Acceleration torque up to 3400 Nm.
SP+ HIGH SPEED best qualified for highest speed in continuous operation.

LP+ & LPB+ – Value Line

Low-backlash gearheads with output shaft for economical servo applications.
Torsional backlash ≤ 10 arcmin.
Acceleration torque up to 450 Nm.
Optional available as LPB+, with geared pulley mount.

alphira® – Precision Made Simple

Low backlash · high rigidity · alpha quality
Ideal for simple servo applications.
Acceleration torque up to 200 Nm.



Rack & Pinion System

PREMIUM CLASS
For exacting dynamics and precision requirements in high-end applications
SMART CLASS
For flexible mounting with more degrees of freedom in mid-range applications
VALUE CLASS
For standard linear tasks in economy applications

Hypoid Gearhead

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

Hypoid Planetary Gearhead

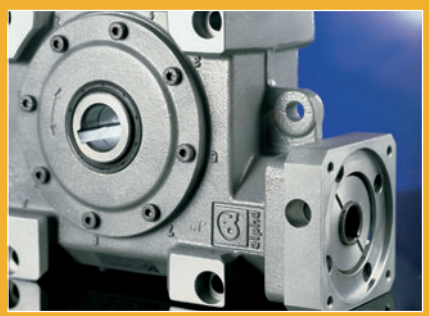
Right-angle planetary gearhead of highest precision and power density.
Torsional backlash ≤ 2 arcmin.
Acceleration torque up to 1600 Nm.
Output shaft variations: SPK+: smooth, keywayed, involute toothing to DIN 5480, TPK+: flange

TPM & TPMA - Servoactuators

Ultra-compact and highly precise brushless gear motors featuring high dynamics, high torsional stiffness and a backlash of just 1 to 3 arcmin.
Acceleration torque up to 2600 Nm.
Up to 60 % shorter overall length and much lower weight than conventional servomotor-gearhead designs.

Coupling – TL / BC / EC

Patented, backlash-free, compact and torsionally stiff metal bellows and safety couplings. Acceleration torque up to 10,000 Nm
Disengagement in 1 – 3 ms
Belt tension 100 – 12.000 N.
Self-adjusting

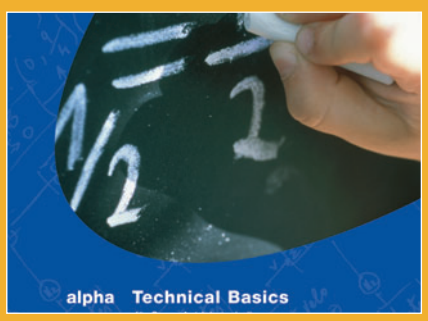


V - Drive®

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.

For further information, order your personal brochure from:
Phone +49 7931 493-0

or download the digital version:
www.alphagetriebe.de



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