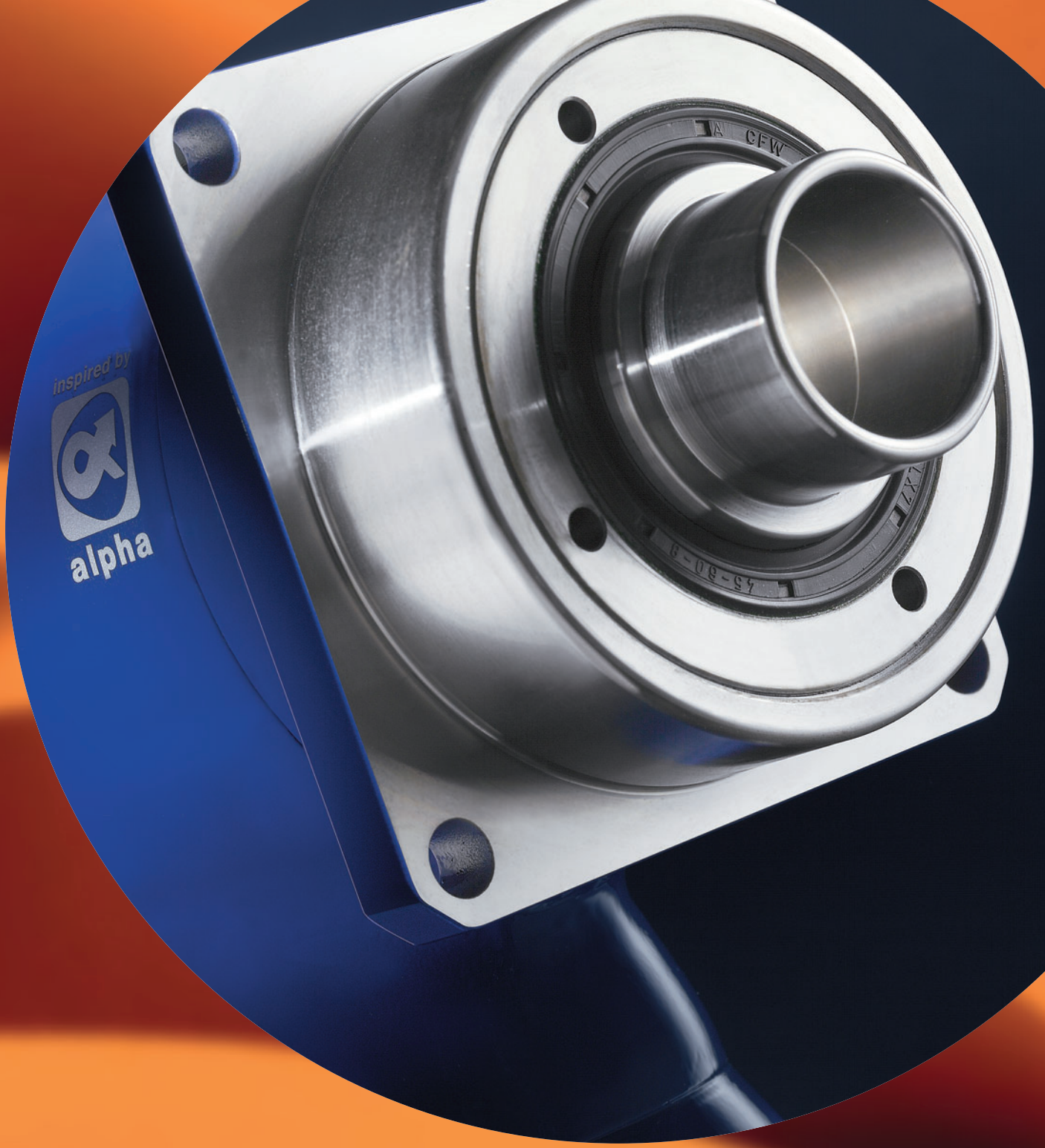


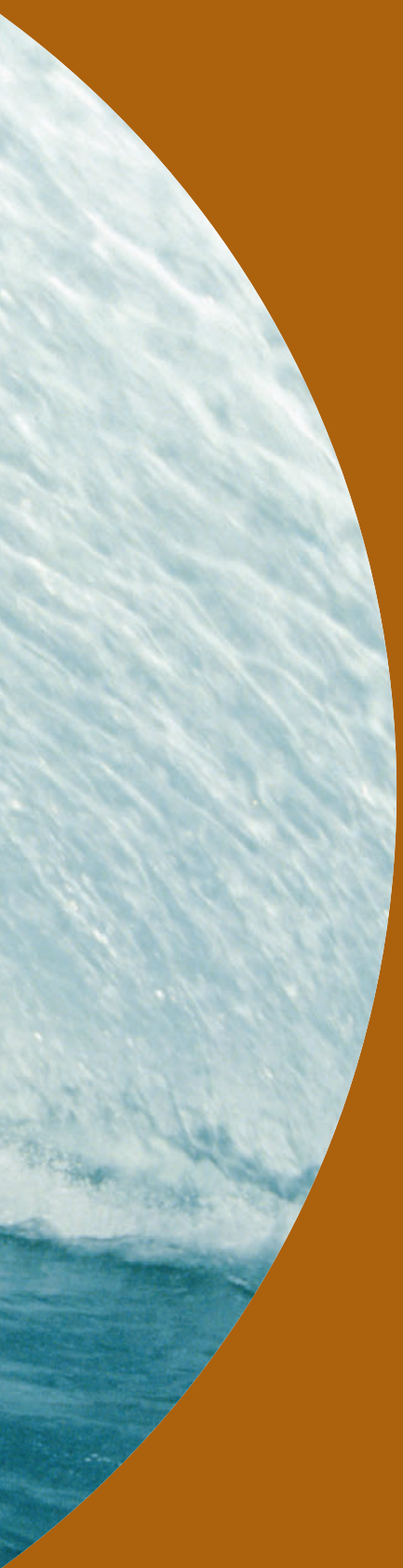
HG+ The NEW Hollow-Shaft Precision

Low-Backlash Hollow-Shaft Gearhead

2006 - I

alpha

a WITTENSTEIN AG company



HG+ The perfect hollow-shaft

Space, speed, power and dynamic force – **HG+** has everything that a hollow-shaft gear needs. The NEW Hollow-Shaft Gearhead combines typical virtues of **alpha** such as smooth running, torsional rigidity and convenient mounting with precision and innovative technology.

The result is top performance right down the line, for **HG+** has the biggest hollow-shaft diameter in relation to it's overall size.

Miniaturisation is the goal of alpha.

We have taken a huge step towards achieving that goal with the new **HG+**.

The advantage?
More power in less space.

But that is not all:
HG+ goes even further and opens up completely new applications with its hollow shaft on both sides.

Typically alpha!

HG+ – The hollow-shaft gear that everyone has been waiting for

Higher Productivity

You want maximum productivity from your machine? With up to 200% more torque and 100% higher speed than comparable products, the **HG+** offers ideal conditions for maximum output.

Simple and Convenient

HG+ makes your life easier – from optimum design with our **cymex®** software through to our patented alpha motor mounting and universal mounting for all versions.

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, several hundred employees worldwide are committed to our cause with operations in the US, UK, France, Italy, Belgium and Japan. 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.

Extremely Robust

The highly robust overall construction and 100 % alpha inspection make the **HG+** extremely reliable – **"mount and forget".** Integrated thermal expansion compensation is a standard feature which helps the **HG+** maximise the service life of your servomotor in high-speed continuous operations.

Totally Flexible

You need more engineering freedom when designing your machine?
The two-sided hollow-shaft with the particularly large bore diameter and the well-known SP flange mounting allows new drive solutions and concepts.

Reliable and Precise

The low torsional backlash and high torsional rigidity of the **HG+** assures the positioning accuracy of your drives and also the precision of your machines – even in highly dynamic operations with up to 50 000 cycles per hour.

alpha benefits at a glance:

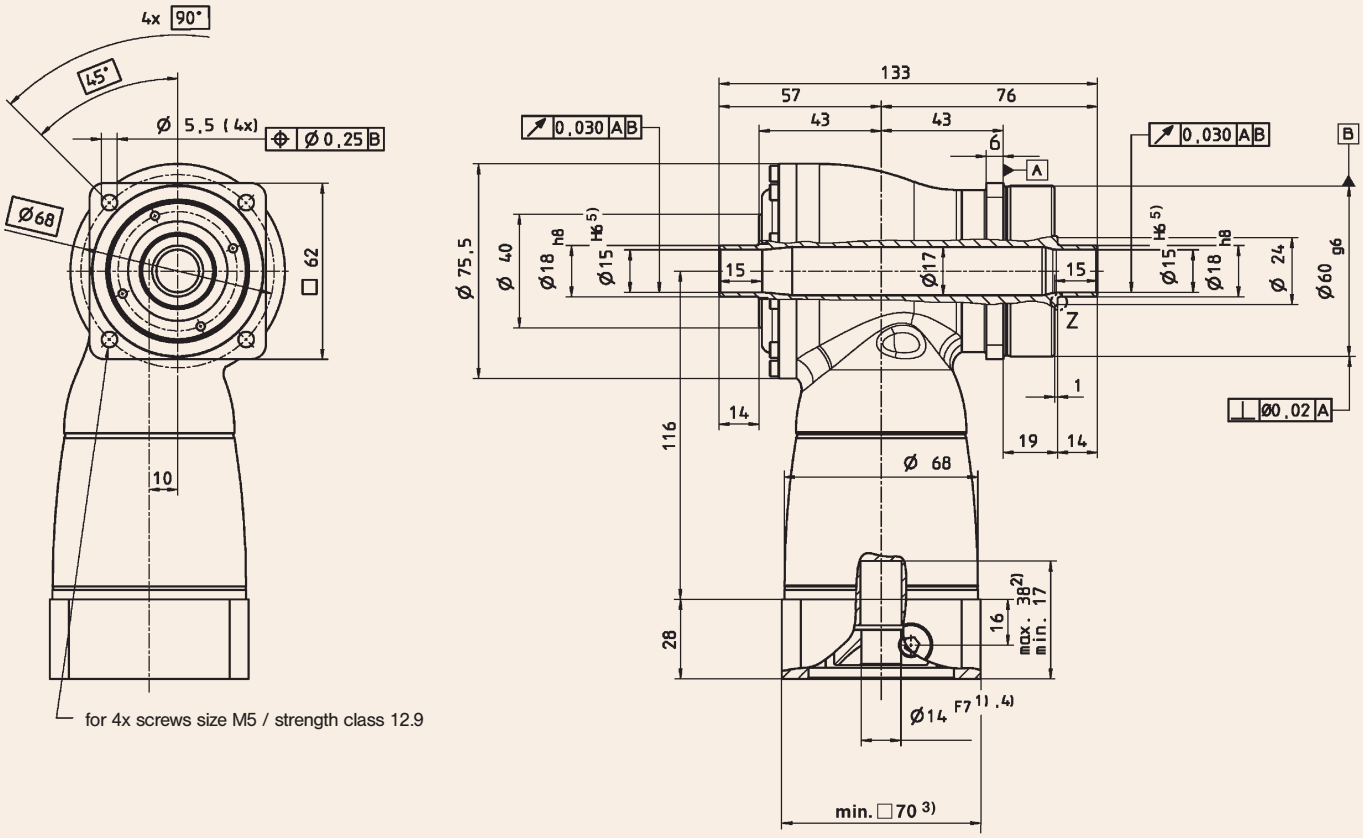
- **Record-breaking lifespan**
  Extremely long service life resulting from intelligent design, latest synthetic lubrication technology, exclusive sealing technology, and incredibly strong output bearings.
- **Motor mounting is almost foolproof**
  Simple and reliable mounting in a single step.
- **Top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

Leaders of the pack

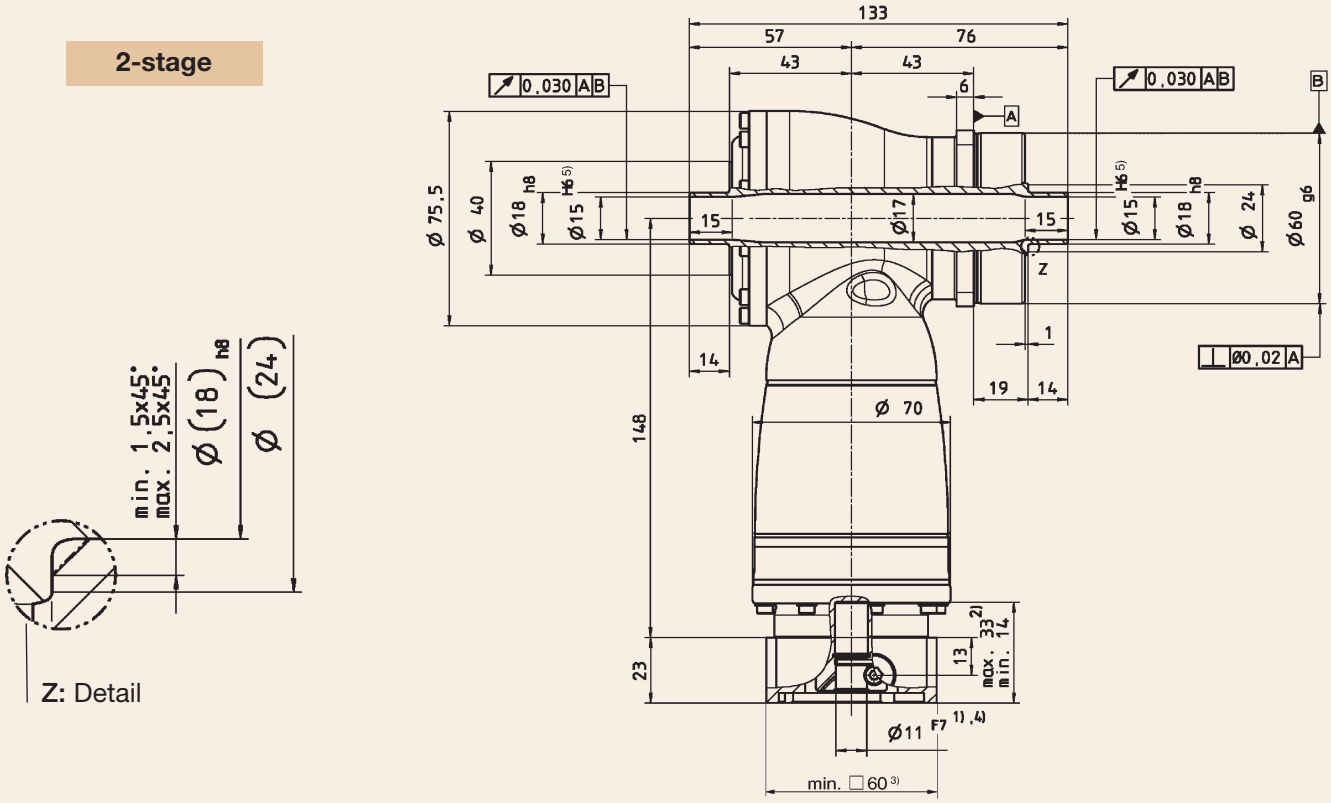
We are driven by a desire to enhance our customers' success with products and systems from alpha. We set benchmarks when it comes to precision, performance and durability. Our trailblazing technology gives our customers an edge in their respective market sectors. Place your trust in premium quality and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

alpha

1-stage



2-stage



Non-toleranced dimensions ±1 mm

1) Check motor shaft fit.

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

3) Dimensions depend on motor.

4) Smaller motor shaft diameter possible with bushing with minimum wall thickness of 1 mm (see page 20).

5) Tolerance h6 for shaft to be mounted.

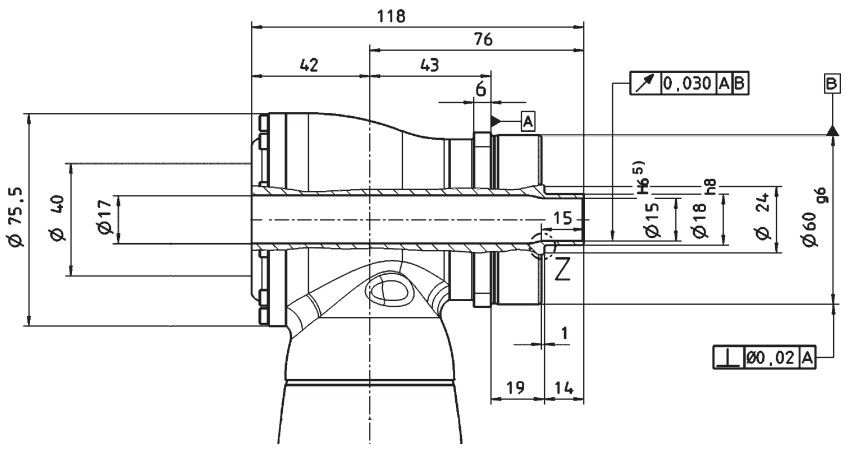
⚠ Motor mounting in accordance with operating manual.

Technical Specifications **HG+ 060**

			1-stage					2-stage								
Ratio	**i**		**3**	**4**	**5**	**7**	**10**	**16**	**20**	**25**	**28**	**35**	**40**	**50**	**70**	**100**
Maximum acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	30	30	30	25	20	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	20	15
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	40	40	40	35	30	40	40	40	40	40	40	40	35	30
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min^{-1}	2800	2800	2800	2800	2800	4400	4400	4400	4400	4400	4400	4800	5500	5500
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N.cym}$	min^{-1}	3300	3600	3600	4000	4000	For higher mean speeds, contact alpha								
No-load running torque (n_1=3000 rpm) (At 20 °C gearhead temperature)	T_{012}	Nm	1.2	1.1	1.0	1.1	1.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
Maximum input speed	n_{1Max}	min^{-1}	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Torsional backlash	j_t	arcmin	≤ 4													
Torsional rigidity	C_{t21}	Nm/arcmin	2.2													
Max. axial force ***	F_{2AMax}	N	2300													
Max. radial force ***	F_{2RMax}	N	2600													
Max. tilting moment	M_{2KMax}	Nm	251													
Efficiency at full load	η	%	96					94								
Service life (For calculation, see alpha Technical Basics catalog)	L_h	h	> 20 000													
Weight (incl. adaptor)	m	kg	2.9					2.9								
Noise level (n_1=3000 rpm) ****	L_{PA}	dB(A)	≤ 64													
Max. permissible housing temperature		°C	+90													
Ambient temperature		°C	0 up to +40													
Lubrication			Synthetic gear oil													
Paint			Blue RAL 5002													
Direction of rotation			Input and output sides in opposite directions													
Type of protection			IP 65													
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$	0.52	0.44	0.40	0.36	0.34	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.
** The speed must be reduced at higher ambient temperature.
*** Acting at the centre of the output shaft
**** Measured with gear ratio i = 5.

Optional Version: one-sided hollow-shaft

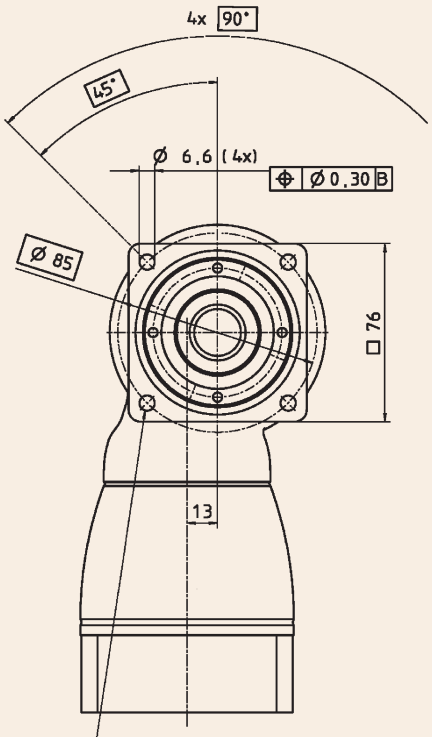


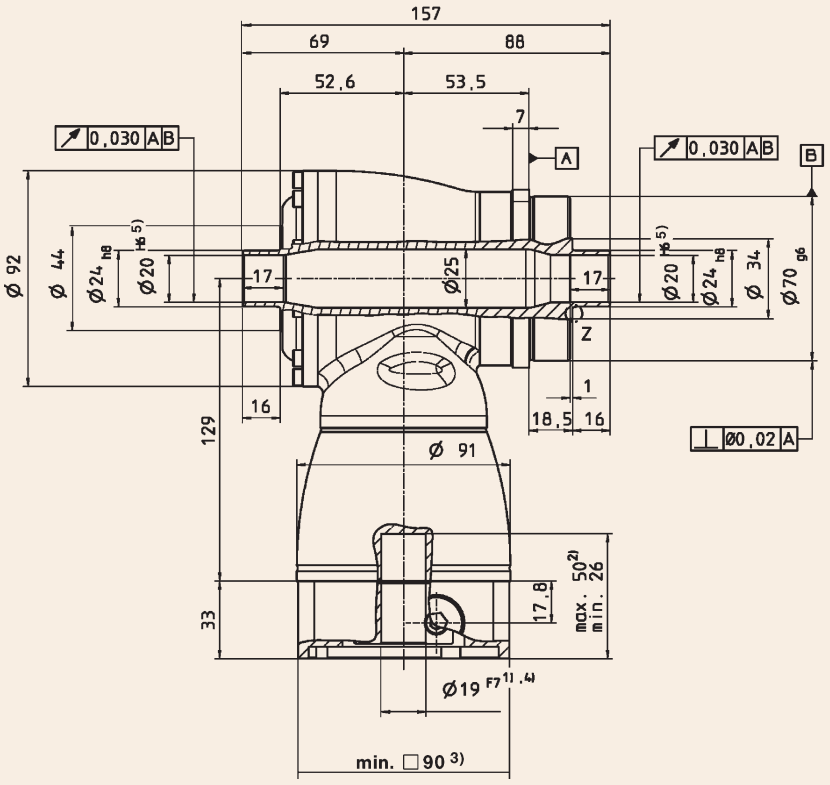
Please contact alpha for information about S1 operating conditions (continuous duty).

Conversion table

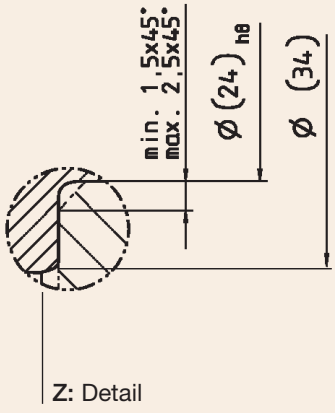
1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 $kgcm^2$	= 8.85 x 10^{-4} in.lb.s^2
1 N	= 0.225 lb_f
1 kg	= 2.21 lb_m

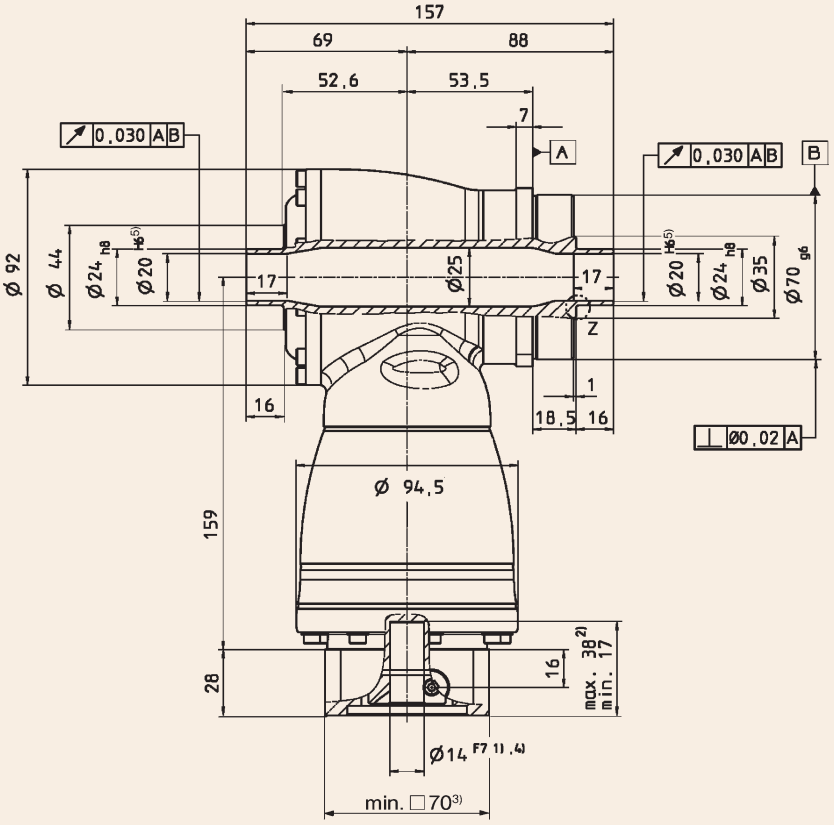
1-stage





2-stage





Non-toleranced dimensions ±1 mm

1) Check motor shaft fit.

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

3) Dimensions depend on motor.

4) Smaller motor shaft diameter possible with bushing with minimum wall thickness of 1 mm (see page 20).

5) Tolerance h6 for shaft to be mounted.

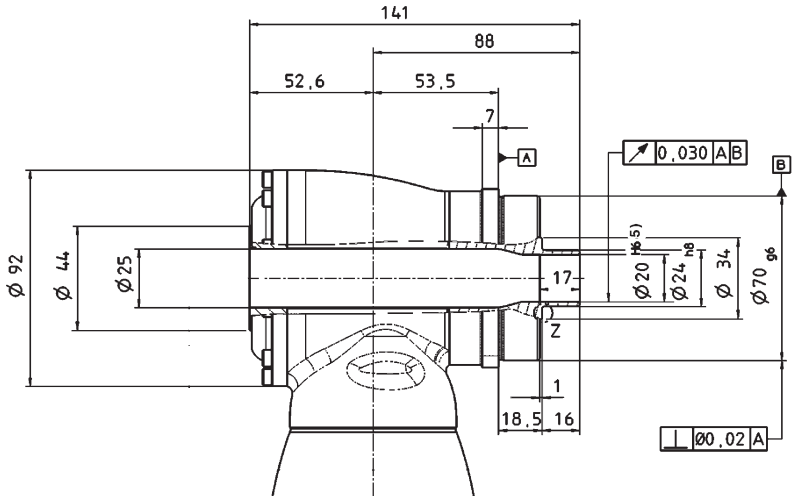
⚠ Motor mounting in accordance with operating manual.

Technical Specifications **HG+ 075**

			1-stage					2-stage								
Ratio	**i**		**3**	**4**	**5**	**7**	**10**	**16**	**20**	**25**	**28**	**35**	**40**	**50**	**70**	**100**
Maximum acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	70	70	70	60	50	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	45	40
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	95	95	95	75	65	95	95	95	95	95	95	95	75	65
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min^{-1}	2500	2500	2500	2500	2500	3500	3500	3500	3500	3500	3500	3800	4500	4500
Max. continuous speed (At 20 °C ambient temperature)**	$n_{1N.cym}$	min^{-1}	3000	3500	3500	4000	4000	For higher mean speeds, contact alpha								
No-load running torque (n_1=3000 rpm) (At 20 °C gearhead temperature)	T_{012}	Nm	2.0	1.7	1.5	2.0	1.8	0.3	-	-	-	-	-	-	-	-
Maximum input speed	n_{1Max}	min^{-1}	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Torsional backlash	j_t	arcmin	≤ 4													
Torsional rigidity	C_{t21}	Nm/arcmin	5.3	5.9	6.7	6.6	6.5	-								
Max. axial force ***	F_{2AMax}	N	3200													
Max. radial force ***	F_{2RMax}	N	3800													
Max. tilting moment	M_{2KMax}	Nm	437													
Efficiency at full load	η	%	96					94								
Service life (For calculation, see alpha Technical Basics catalog)	L_h	h	> 20 000													
Weight (incl. adaptor)	m	kg	4.8					5.1								
Noise level (n_1=3000 rpm) ****	L_{PA}	dB(A)	≤ 66													
Max. permissible housing temperature		°C	+90													
Ambient temperature		°C	0 up to +40													
Lubrication			Synthetic gear oil													
Paint			Blue RAL 5002													
Direction of rotation			Input and output sides in opposite directions													
Type of protection			IP 65													
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$	1.46	1.19	1.06	0.95	0.90	0.27	0.23	0.23	0.20	0.20	0.18	0.18	0.18	0.18

* Higher mean speeds are possible at reduced nominal torque.
** The speed must be reduced at higher ambient temperature.
*** Acting at the centre of the output shaft
**** Measured with gear ratio i = 5.

Optional Version: one-sided hollow-shaft

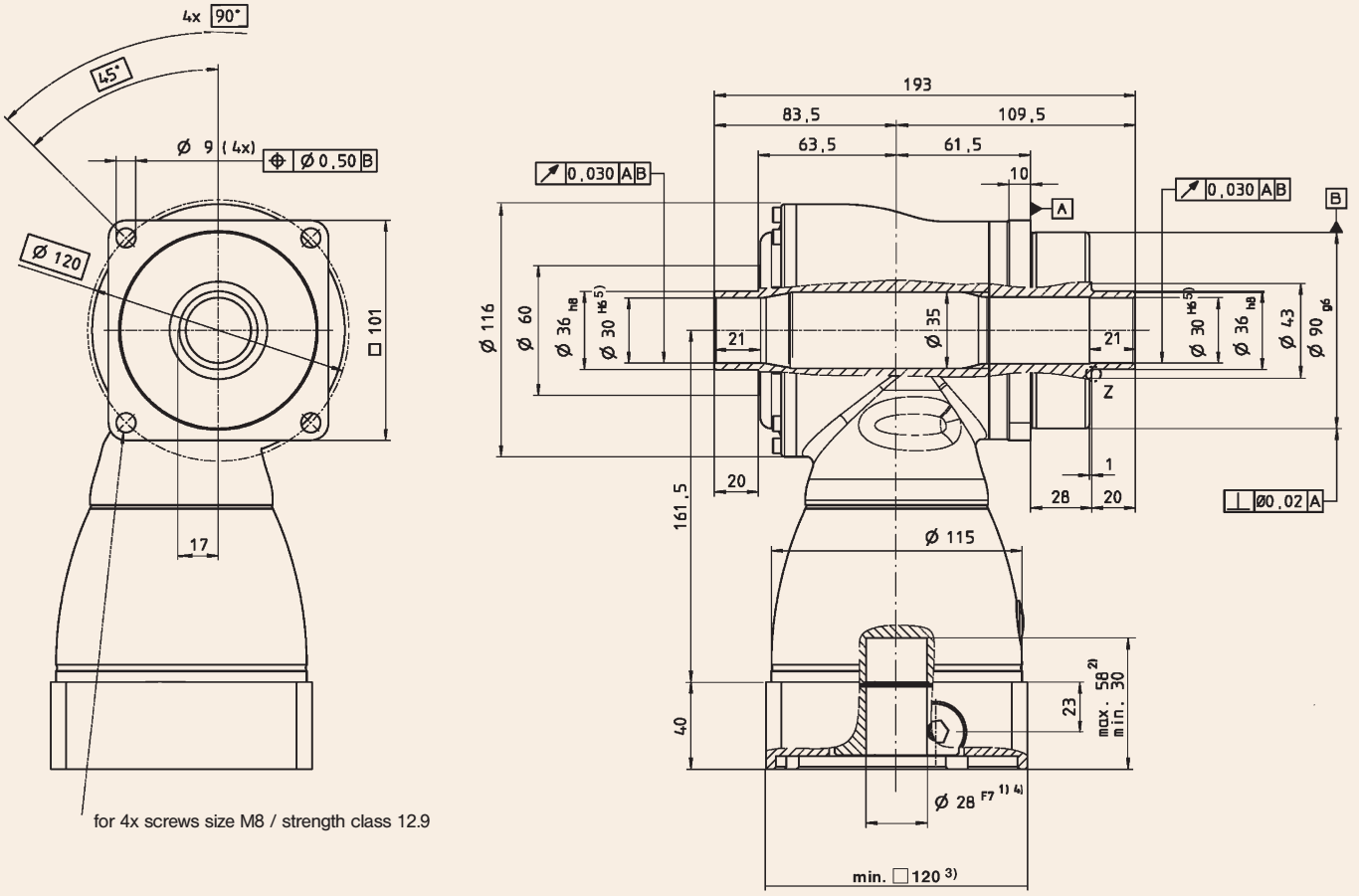


Please contact alpha for information about S1 operating conditions (continuous duty).

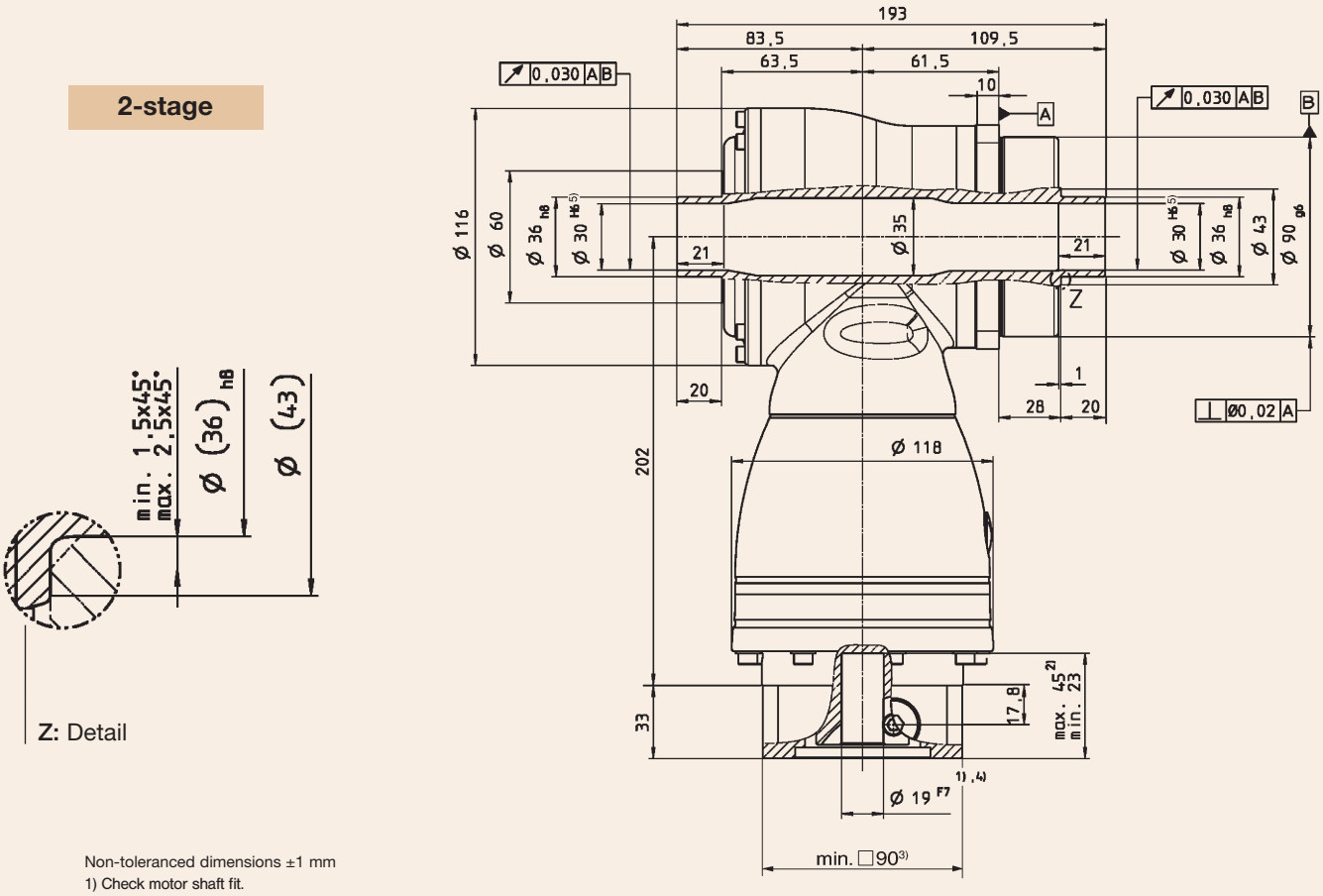
Conversion table

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

1-stage



2-stage



Non-toleranced dimensions ±1 mm

1) Check motor shaft fit.

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

3) Dimensions depend on motor.

4) Smaller motor shaft diameter possible with bushing with minimum wall thickness of 1 mm (see page 20).

5) Tolerance h6 for shaft to be mounted.

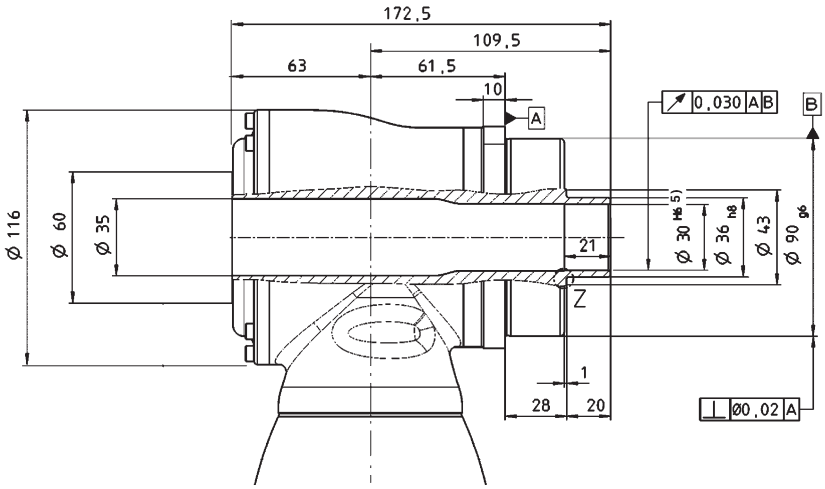
⚠ Motor mounting in accordance with operating manual.

Technical Specifications **HG+ 100**

			1-stage					2-stage								
Ratio	**i**		**3**	**4**	**5**	**7**	**10**	**16**	**20**	**25**	**28**	**35**	**40**	**50**	**70**	**100**
Maximum acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	170	170	170	145	125	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	90	80
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	220	220	220	190	165	220	220	220	220	220	220	220	190	165
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min^{-1}	2200	2200	2200	2200	2200	3100	3100	3100	3100	3100	3100	3500	4200	4200
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N.cym}$	min^{-1}	3000	3400	3400	3800	3800	For higher mean speeds, contact alpha								
No-load running torque (n_1=3000 rpm) (At 20 °C gearhead temperature)	T_{012}	Nm	3.1	2.7	2.0	3.0	2.5	0.7	-	-	-	-	-	-	-	-
Maximum input speed	n_{1Max}	min^{-1}	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500
Torsional backlash	j_t	arcmin	≤ 4													
Torsional rigidity	C_{t21}	Nm/arcmin	10.7	12.3	14	14.2	14.5	-								
Max. axial force ***	F_{2AMax}	N	5400													
Max. radial force ***	F_{2RMax}	N	6000													
Max. tilting moment	M_{2KMax}	Nm	833													
Efficiency at full load	η	%	96					94								
Service life (For calculation, see alpha Technical Basics catalog)	L_h	h	> 20 000													
Weight (incl. adaptor)	m	kg	9.3					9.4								
Noise level (n_1=3000 rpm) ****	L_{PA}	dB(A)	≤ 66													
Max. permissible housing temperature		°C	+90													
Ambient temperature		°C	0 up to +40													
Lubrication			Synthetic gear oil													
Paint			Blue RAL 5002													
Direction of rotation			Input and output sides in opposite directions													
Type of protection			IP 65													
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$	4.64	3.80	3.34	2.98	2.79	0.98	0.86	0.84	0.75	0.74	0.69	0.69	0.68	0.68

* Higher mean speeds are possible at reduced nominal torque.
** The speed must be reduced at higher ambient temperature.
*** Acting at the centre of the output shaft
**** Measured with gear ratio i = 5.

Optional Version: one-sided hollow-shaft

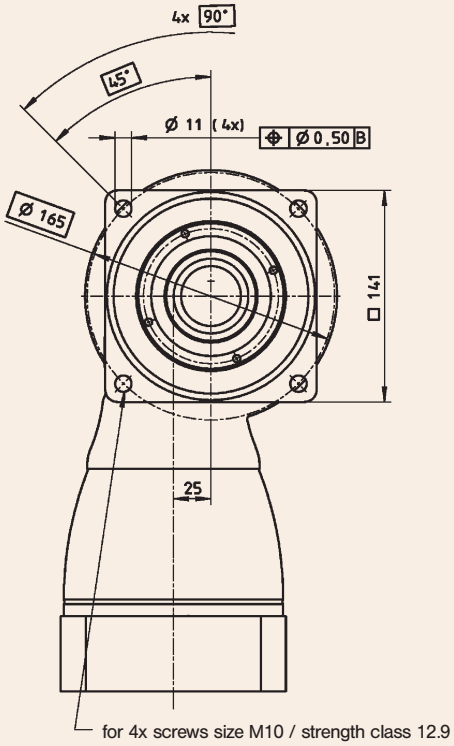


Please contact alpha for information about S1 operating conditions (continuous duty).

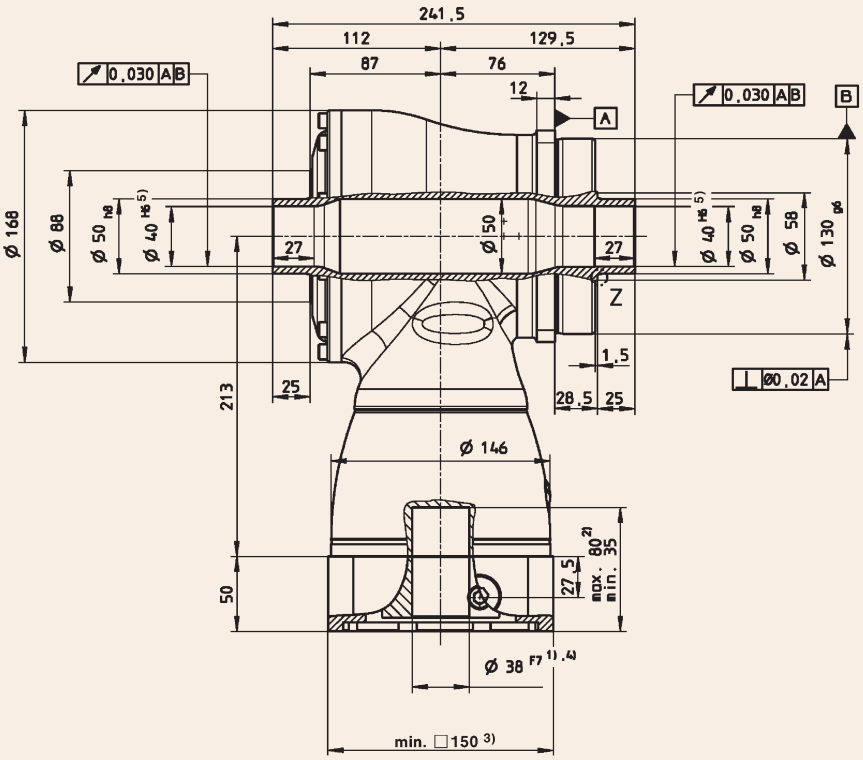
Conversion table

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

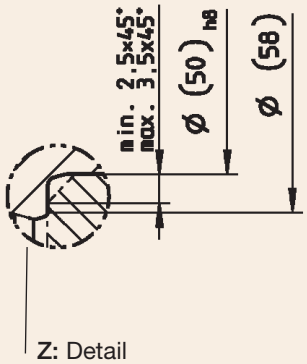
1-stage



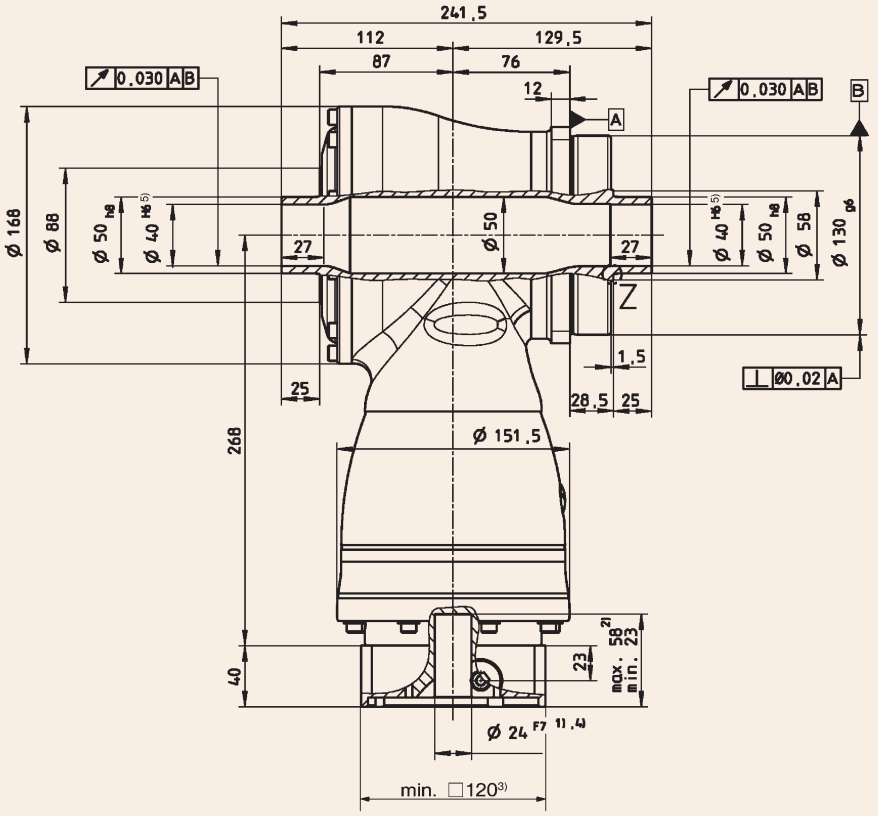
for 4x screws size M10 / strength class 12.9



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, please contact alpha.

3) Dimensions depend on motor.

4) Smaller motor shaft diameter possible with bushing with minimum wall thickness of 1 mm (see page 20).

5) Tolerance h6 for shaft to be mounted.

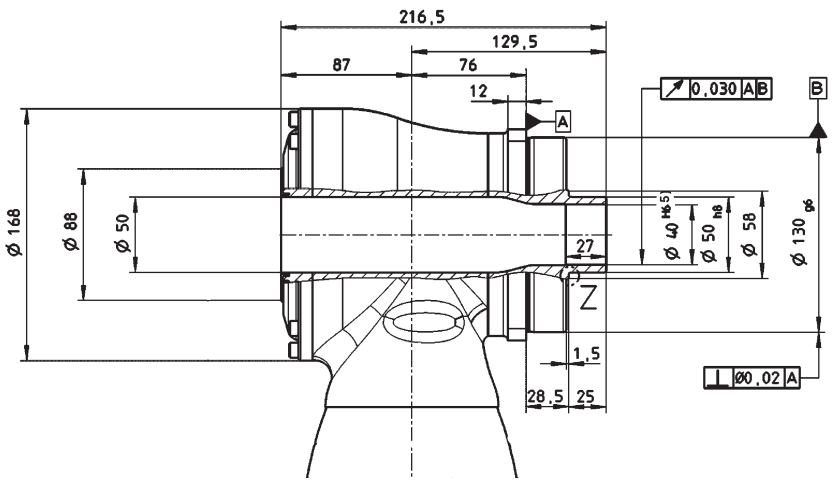
⚠ Motor mounting in accordance with operating manual.

Technical Specifications **HG+ 140**

			1-stage					2-stage								
Ratio	**i**		**3**	**4**	**5**	**7**	**10**	**16**	**20**	**25**	**28**	**35**	**40**	**50**	**70**	**100**
Maximum acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	300	300	300	250	210	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	175	160
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	390	390	390	330	275	390	390	390	390	390	390	390	330	275
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min^{-1}	2000	2000	2000	2000	2000	2900	2900	2900	2900	2900	2900	3200	3200	3900
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N.cym}$	min^{-1}	2500	2800	2800	3000	3000	For higher mean speeds, contact alpha								
No-load running torque (n_1=3000 rpm) (At 20 °C gearhead temperature)	T_{012}	Nm	7.0	6.0	4.5	6.3	5.5	1.5	-	-	-	-	-	-	-	-
Maximum input speed	n_{1Max}	min^{-1}	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500
Torsional backlash	j_t	arcmin	≤ 4													
Torsional rigidity	C_{t21}	Nm/arcmin	32.4	36.1	40.7	39	38	-								
Max. axial force ***	F_{2AMax}	N	9400													
Max. radial force ***	F_{2RMax}	N	9000													
Max. tilting moment	M_{2KMax}	Nm	1692													
Efficiency at full load	η	%	96					94								
Service life (For calculation, see alpha Technical Basics catalog)	L_h	h	> 20 000													
Weight (incl. adaptor)	m	kg	23.0					24.0								
Noise level (n_1=3000 rpm) ****	L_{PA}	dB(A)	≤ 68													
Max. permissible housing temperature		°C	+90													
Ambient temperature		°C	0 up to +40													
Lubrication			Synthetic gear oil													
Paint			Blue RAL 5002													
Direction of rotation			Input and output sides in opposite directions													
Type of protection			IP 65													
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$	25.0	19.1	16.3	14.1	12.8	3.85	3.28	3.17	2.78	2.73	2.48	2.46	2.43	2.42

* Higher mean speeds are possible at reduced nominal torque.
** The speed must be reduced at higher ambient temperature.
*** Acting at the centre of the output shaft
**** Measured with gear ratio i = 5.

Optional Version: one-sided hollow-shaft

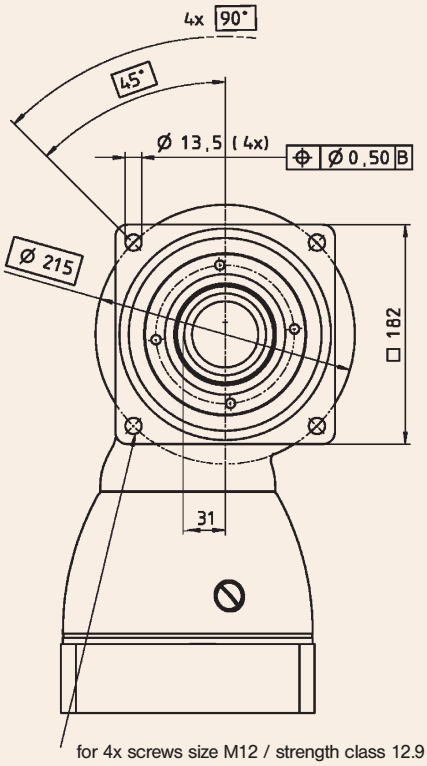


Please contact alpha for information about S1 operating conditions (continuous duty).

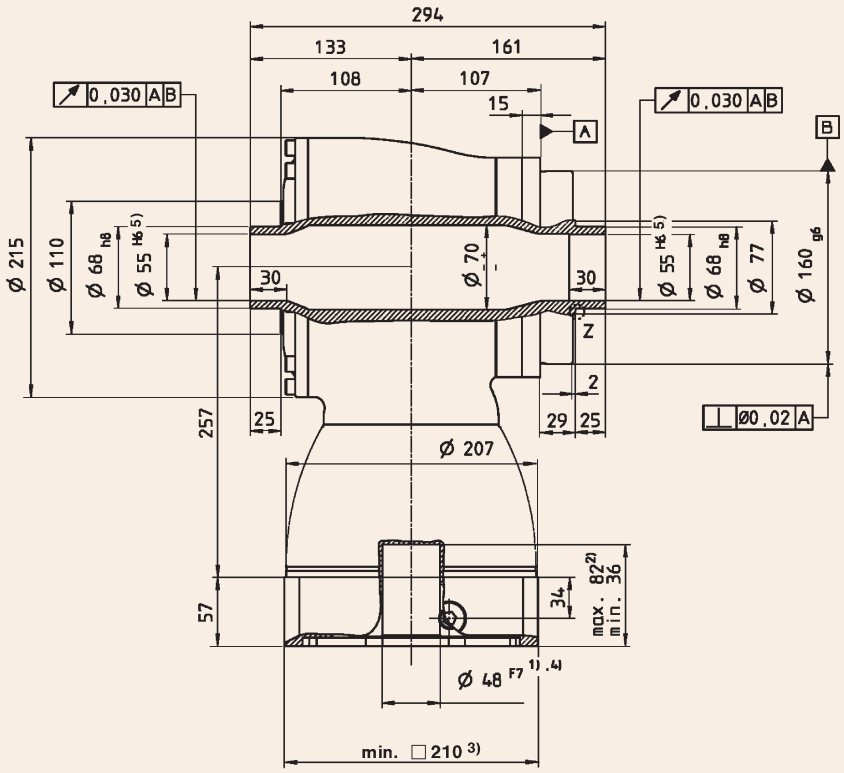
Conversion table

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

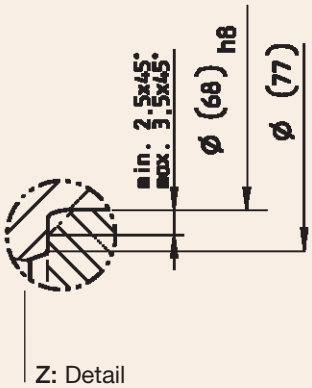
1-stage



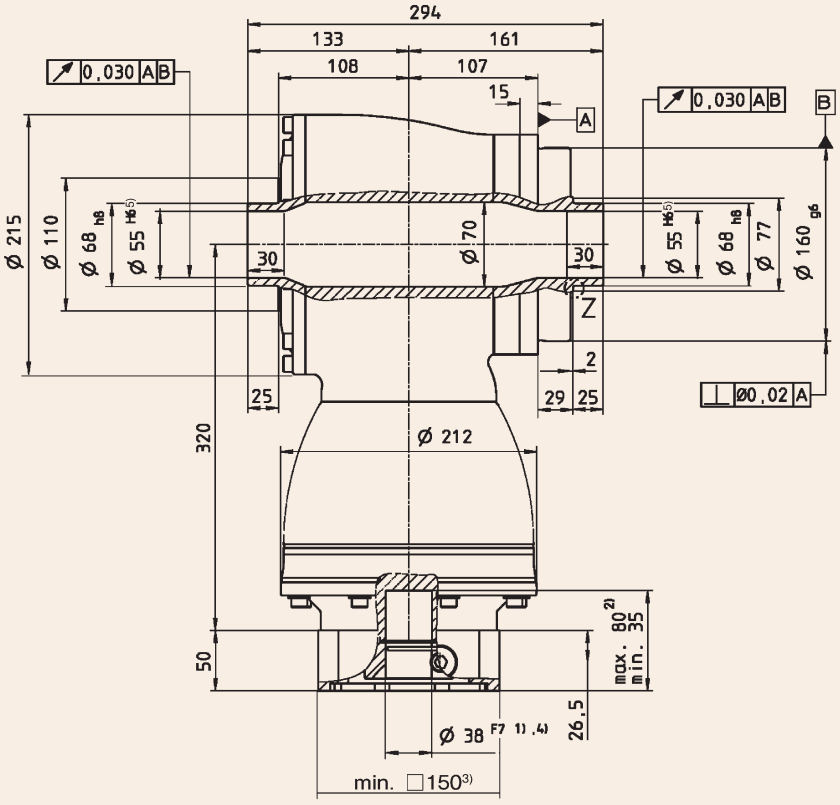
for 4x screws size M12 / strength class 12.9



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, please contact alpha.

3) Dimensions depend on motor.

4) Smaller motor shaft diameter possible with bushing with minimum wall thickness of 1 mm (see page 20).

5) Tolerance h6 for shaft to be mounted.

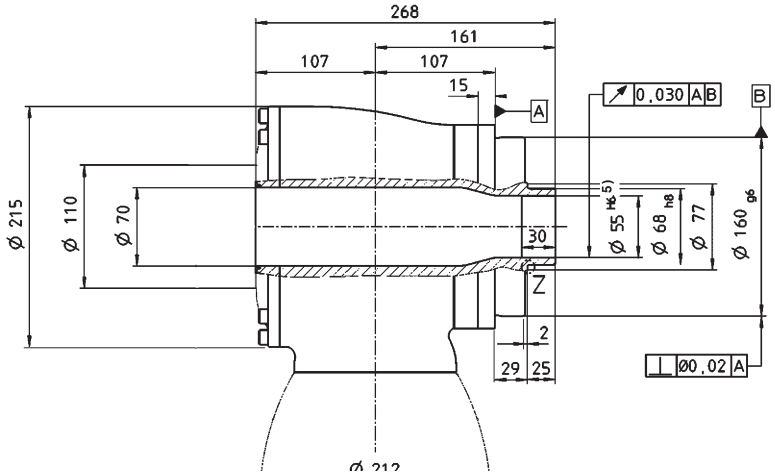
⚠ Motor mounting in accordance with operating manual.

Technical Specifications **HG+ 180**

			1-stage					2-stage								
Ratio	**i**		**3**	**4**	**5**	**7**	**10**	**16**	**20**	**25**	**28**	**35**	**40**	**50**	**70**	**100**
Maximum acceleration torque (max. 1000 cycles per hour)	T_{2B}	Nm	640	640	640	550	470	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	380	360
Emergency stop torque (Permissible 1000 times during the lifespan of the gearhead)	T_{2Not}	Nm	830	830	830	720	600	830	830	830	830	830	830	830	720	600
Nominal input speed at T_{2N} * (At 20 °C ambient temperature) **	n_{1N}	min^{-1}	1600	1600	1600	1600	1600	2700	2700	2700	2700	2700	2700	2900	3200	3400
Max. continuous speed (At 20 °C ambient temperature) **	$n_{1N.cym}$	min^{-1}	2000	2200	2200	2500	2500	For higher mean speeds, contact alpha								
No-load running torque (n_1=3000 rpm) (At 20 °C gearhead temperature)	T_{012}	Nm	-	-	-	-	9.5	-	-	-	-	-	-	-	-	-
Maximum input speed	n_{1Max}	min^{-1}	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Torsional backlash	j_t	arcmin	≤ 4													
Torsional rigidity	C_{t21}	Nm/arcmin	71.5	80.3	90.7	89.4	88.1	-								
Max. axial force ***	F_{2AMax}	N	13500													
Max. radial force ***	F_{2RMax}	N	14000													
Max. tilting moment	M_{2KMax}	Nm	3213													
Efficiency at full load	η	%	96					94								
Service life (For calculation, see alpha Technical Basics catalog)	L_h	h	> 20 000													
Weight (incl. adaptor)	m	kg	46.0					47.0								
Noise level (n_1=3000 rpm) ****	L_{PA}	dB(A)	≤ 68													
Max. permissible housing temperature		°C	+90													
Ambient temperature		°C	0 up to +40													
Lubrication			Synthetic gear oil													
Paint			Blue RAL 5002													
Direction of rotation			Input and output sides in opposite directions													
Type of protection			IP 65													
Mass moment of inertia (referring to the drive)	J_1	$kgcm^2$	73.3	51.6	42.1	34.0	29.7	13.9	12.3	12.0	10.9	10.7	10.1	10.0	9.9	9.9

* Higher mean speeds are possible at reduced nominal torque.
** The speed must be reduced at higher ambient temperature.
*** Acting at the centre of the output shaft
**** Measured with gear ratio i = 5.

Optional Version: one-sided hollow-shaft



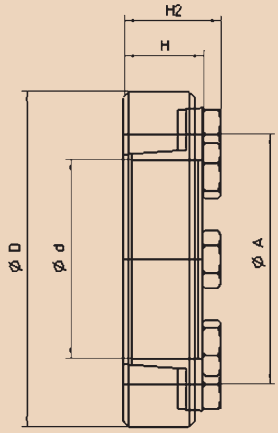
Please contact alpha for information about S1 operating conditions (continuous duty).

Conversion table

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

HG+ – Mounting the Machine Shaft

The load shaft is mounted on the gearhead via a shrink disk. The shrink disk is not supplied with the **HG+** gearhead and must be ordered separately as an accessory (see table).



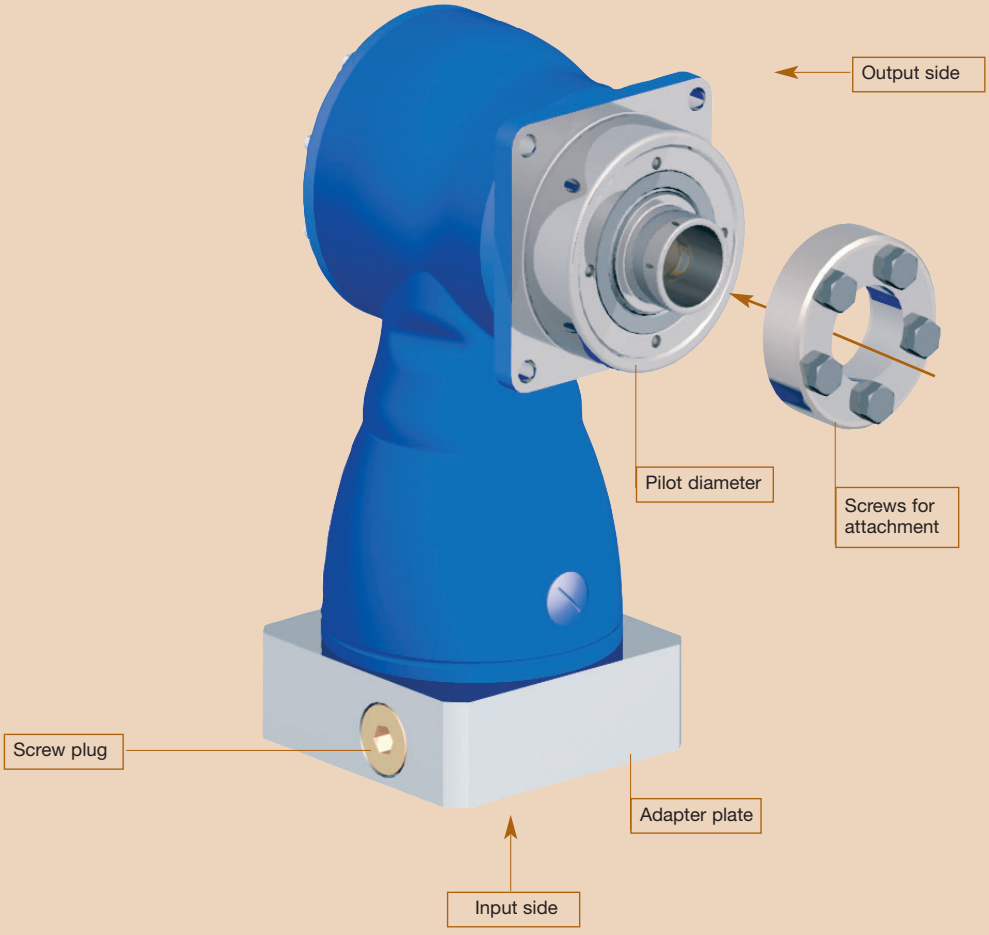
Shrink Disk Dimensions

Size	Disk	d	D	A	H*	H2*	J
HG+ 060	HSD18-22	18	44	30	15	19	0.393
HG+ 075	HSD24-22	24	50	36	18	22	0.753
HG+ 100	HSD36-22	36	72	52	22	27.3	3.94
HG+ 140	HSD50-22	50	90	68	26	31.3	11.1
HG+ 180	HSD68-22	68	115	86	29	35.4	31.1

* unmounted dimensions

One shrink disk per gearhead is sufficient for operation. Two shrink discs can also be fitted, for instance in applications with different machine shafts.

Please refer to the **HG+** operating manual to ensure that the shrink disk is mounted correctly. The manual is supplied with the gearhead or can be downloaded from the alpha homepage.



Symbols and Index

Symbol	Unit	Designation
c	Nm	rigidity
cym.	rpm	nominal without load
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	mean
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 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** catalog (can be downloaded from www.alphagetriebe.com) or use alpha's **cymex® 3.0** servo/gearhead sizing software to design your drive train.

Cyclic Operation S5

Number of cycles
under ≤ 1000/hour

Duty cycle < 60 %
and < 20 minutes

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 18) 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.

Ordering Code

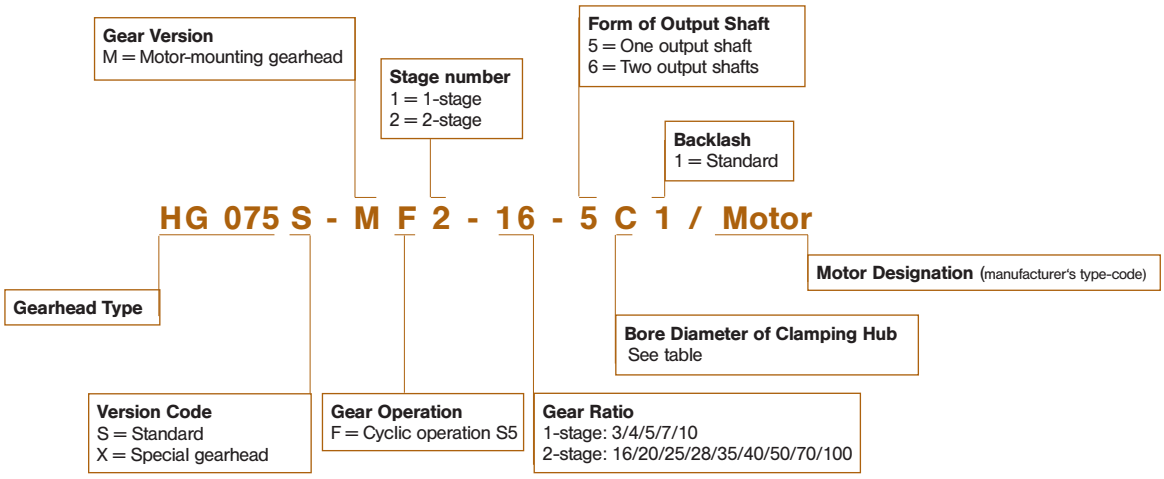


Table of clamping hub diameters

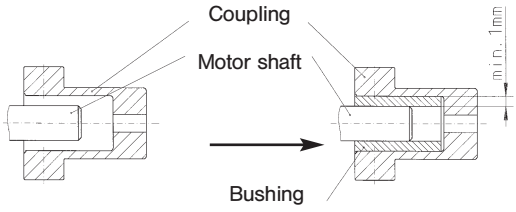
Gear stages	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2
Motor shaft diameter (mm)*	**060**	**075**	**100**	**140**	**180**
11	- / B	- / -	- / -	- / -	- / -
14	C / +	- / C	- / -	- / -	- / -
19	+ / +	E / +	- / E	- / -	- / -
24	+ / +	+ / +	- / +	- / G	- / -
28	+ / +	+ / +	H / +	- / +	- / -
38	+ / +	+ / +	+ / +	K / +	- / K
48	+ / +	+ / +	+ / +	+ / +	M / +

- Select next larger character
+ 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.



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application – gearhead – motor

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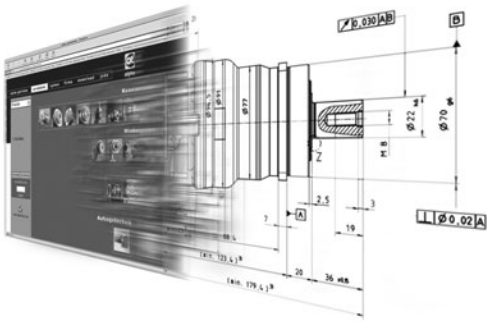

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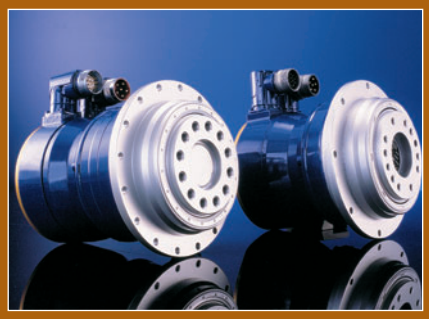

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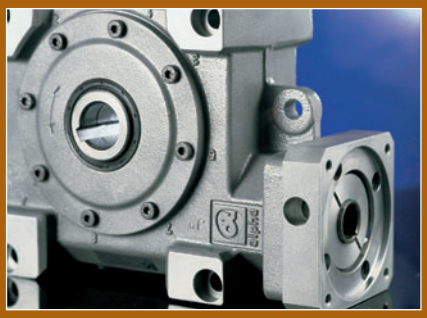

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Torsional backlash ≤ 3 arcmin.
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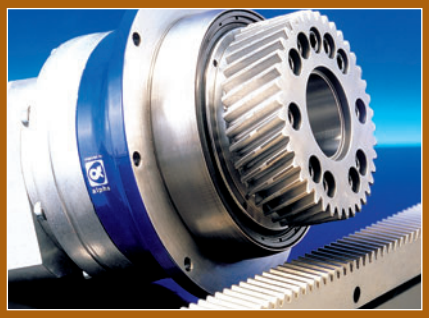
Direct mounting to servo motor.



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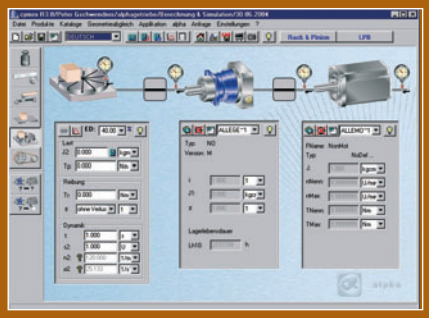

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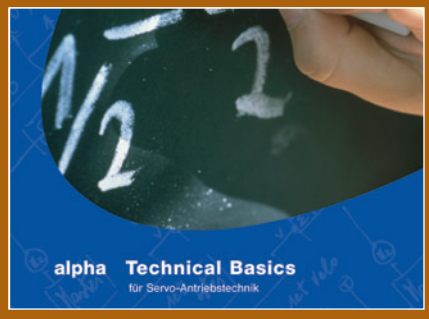

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