WITTENSTEIN alpha

TP+

Operating Manual

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Revision: 08

Revision history

Revision	Date	Comment	Chapter
1	24.02.05	New version	All
2	14.10.05	Technical Data updated	All
3	25.04.06	TP+ High Torque introduced	All
4	16.08.06	bipartite plug receptacles	All
5	13.08.07	Product sizes 300 - 500, ANSI, Layout 07	All
6	02.11.07	Technical Data updated	9
7	25.03.08	TP+ High Torque: Product sizes 300 - 500	3.6, 5.2, 7.4, 9.1.1, 9.1.2, 9.2, 9.3
8	10.07.08	Layout WITTENSTEIN	All

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1 On this manual

This operating manual contains necessary information for the safe operation of the planetary gearhead TP+, referred to as gearhead in the following.

The operator must make sure that this operating manual is read through by all persons assigned to install, operate, or maintain the gearhead, and that they understand it.

Store the operating manual within reach near the gearhead.

1.1 Signal words

The following signal words are used to bring your attention to dangers, prohibitions, and important information:

	DANGER **This signal word points out to an immanent danger that can cause serious injuries and even death.**
	WARNING **This signal word points out to a possible danger that can cause serious injuries and even death.**
	CAUTION **This signal word points out to a possible danger that can cause slight to serious injuries.**
	CAUTION **This signal word (without warning symbol) points out to a possible danger that can cause material damage.**
	INFORMATION **This signal word draws your attention to application tips or especially important information when handling the gearhead.**

1.2 Safety symbols

The following safety symbols are used to bring your attention to dangers, prohibitions, and important information:


General danger


Hot surface


Suspended loads


Danger of pull-in


Environment protection


Information

1.3 Information symbols

The following information symbols are used:

- requires you to carry out an action
  - ➲ indicates the results of an action
- ⓘ provides additional information on handling

2 Safety

This operating manual, especially the safety instructions and the rules and regulations valid for the operating site, must be observed by all persons working with the gearhead.

In addition to the safety specifications mentioned in the operating manual, the general and also the local regulations on the prevention of accidents and on environmental protection should be observed.

2.1 EC – Machinery directive

Within terms of the EC - machinery directive 2006/42/EC, the gearhead is not considered as an autonomous machine, but as a “component to install in machines”.

Operation is prohibited within the area of validity of the EC directive until it has been determined that the machine in which this gearhead is installed corresponds to the regulations within this directive.

2.2 Dangers

The gearhead has been constructed according to current technological standards and accepted safety regulations. To avoid danger to the operator or damage to the machine, the gearhead may be put to use only for its intended usage (see chapter 2.4 "Intended use") and in a technically flawless and safe state.

2.3 Personnel

Only persons who have read and understood this operating manual may carry out work on the gearhead.

2.4 Intended use

The gearhead is suitable for all industrial applications that do not come under article 2 of the EC directive 2002/95/EC (usage restriction of certain dangerous materials in electrical and electronic equipment).

The gearhead is specified for installment on motors that:

- correspond to the design B5 (for any divergences, please consult our Customer Service Department [Technical Customer Service]).
- show a radial and axial runout tolerance of at least “N” according to DIN 42955 and
- have a smooth shaft.

2.5 Guarantee and Liability

Guarantee and liability claims are excluded for personal injury and material damage if the claims derive from one or more of the following causes:

- improper use
- improper assembly/disassembly or improper operation
- operation of the gearhead when safety devices and equipment are defective
- operation of a heavily soiled gearhead
- non-observance of information on transport and storage
- modifications or reconstructions that have been carried out without the written authorisation of **WITTENSTEIN alpha GmbH**
- improper or neglected maintenance and repair

2.6 General safety instructions

⚠ WARNING

Objects flung out by rotating components can cause serious injuries.

- Remove objects and tools from the gearhead before putting it into operation.

⚠ WARNING

Rotating components on the gearhead can pull in parts of the body and cause serious injuries and even death.

- Keep a sufficient distance to rotating machinery while the gearhead is running.

⚠ CAUTION

Hot gearhead housing can cause serious burns.

- Touch the gearhead housing only when wearing protective gloves or after the gearhead has been idle for some time.

INFORMATION

Solvents can pollute soil and water.

- Use and dispose of cleaning solvents appropriately.

3 Description of the gearhead

3.1 General Information

The gearhead is a one- or multistage, low-backlash planetary gearhead, which is manufactured as standard in the “M” version (motor installation) and the “MA” version (motor installation, TP+– High Torque®). The output shaft bearing is designed to receive high tilting moments and axial forces.

Motor centring is performed:

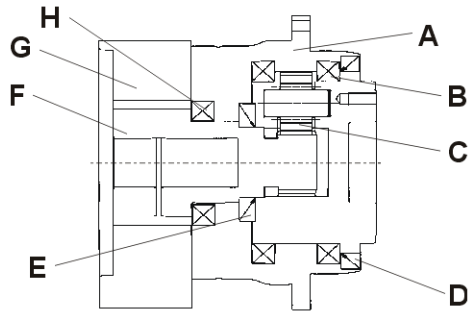
- up to gearhead size TP+ 025 and a motor shaft diameter of 28 mm of through the clamping hub and coupling
- from gearhead size TP+ 050 and a motor shaft diameter of > 28 mm through the centring collar of the motor

Avoid a radial distortion of the motor.

Adaptation to various motors is done through an adaptor plate and a spacer sleeve.

The gearhead can be optionally constructed with a coupling to compensate for thermal linear expansion.

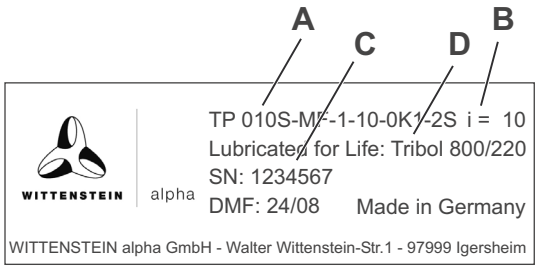
3.2 Overview of the gearhead components

		Gearhead components
	A	Gearhead housing
	B	Output bearing
	C	Planetary gear stage
	D	Radial shaft sealing ring
	E	Radial shaft sealing ring
	F	Clamping hub and coupling
	G	Adaptor plate
	H	Drive bearing arrangement

Tbl-1: Overview of the gearhead components

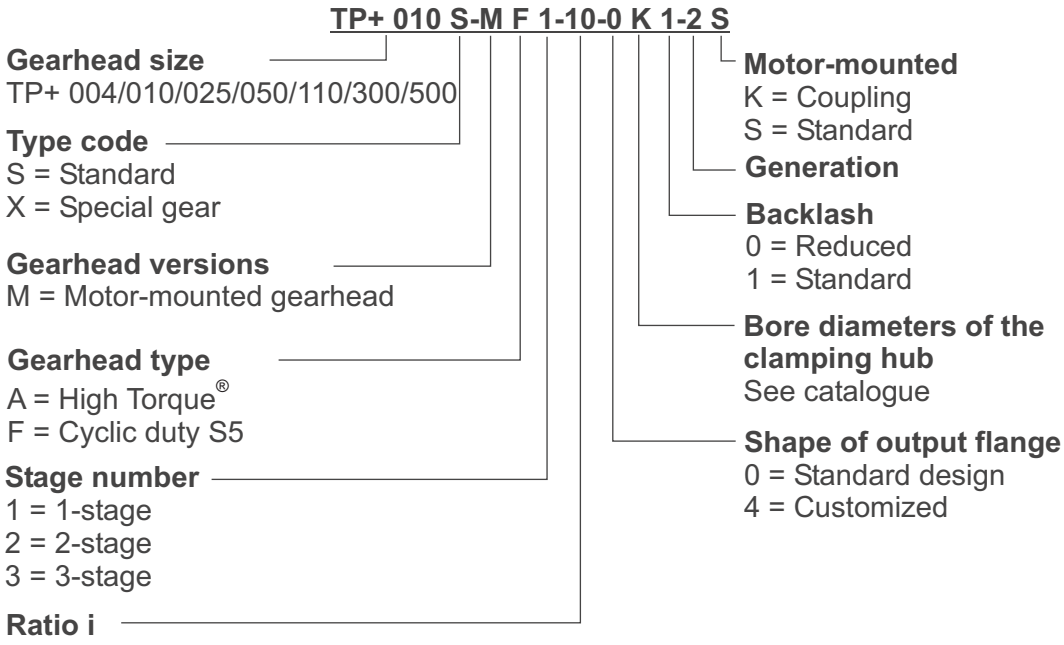
3.3 Type plate

The type plate is attached to the gearhead housing.

		Designation
	A	Ordering key (see chapter 3.4 "Ordering code")
	B	Ratio
	C	Series number
	D	Lubricant

Tbl-2: Type plate (sample values)

3.4 Ordering code



3.5 Performance statistics

Please refer to our catalogue or our Internet page at http://www.wittenstein-alpha.de for the maximum permitted speeds and torques.

INFORMATION

Please consult our service department if your gearhead is older than a year. You will then receive the valid performance data.

3.6 Weight

The table "Tbl-3" specifies the gearhead dimensions with medium-sized adaptor plate. If another adaptor plate is mounted, the actual dimensions can deviate by up to 10%.

Gear reducer size TP+		004	010	025	050	110	300	500
Design	Stages							
M	1	1.4	3.7	6.3	14	30.1	57	79
	2	1.5	3.5	6.6	14.1	33.9	58	74
MA	1	-	-	-	-	-	55	80
	2	-	3.2	5.6	12.5	33.1	64	80
	3	-	3.6	6.1	13.4	35.4	67	89

Tbl-3: Weight [kg]

4 Transport and storage

4.1 Scope of delivery

- Check the completeness of the delivery against the delivery note.

ⓘ Missing parts or damage must be notified immediately in writing to the carrier the insurance, or **WITTENSTEIN alpha GmbH**.

4.2 Packaging

The gearhead is delivered packed in foil and cardboard boxes.

- Dispose of the packaging materials at the recycling sites intended for this purpose. Observe the locally valid regulations for disposals.

4.3 Transport

CAUTION

Hard knocks, for instance because of falling or hard dropping, can damage the gearhead.

- Use only hoisting equipment and transportation devices with sufficient capacity.
- The permitted lifting weight of a hoist may not be exceeded.
- Lower the gearhead slowly.

⚠ WARNING

Suspended loads may fall and cause serious injuries and even death.

- Do not stand under suspended loads.

For specifications on the weights see Chapter 3.6 "Weight".

4.4 Storage

Store the gearhead in horizontal position and dry surroundings at a temperature of 0 °C to +30 °C in the original packaging. Store the gearhead for a maximum of 2 years.

For storage logistics we recommend the “first in – first out” principle.

5 Assembly

CAUTION

Loose or overloaded screw connections can damage the gearhead.

- Use a calibrated torque wrench to tighten and check all screw connections for which a tightening torque has been specified.

CAUTION

Intensive distortions when assembling the motor (e.g. for motors with shaft shoulder, extensive chamfer radius or longer shafts than permitted for the gearhead) can damage the gearhead and the motor.

- Check the interfering edges by measuring, or by a measurement check based on our catalogue specifications and the information of the motor manufacturer.
- Contact our Customer Service Department.

5.1 Preparation

CAUTION

Pressurised air can damage the gearhead.

- Do not use pressurised air to clean the gearhead.

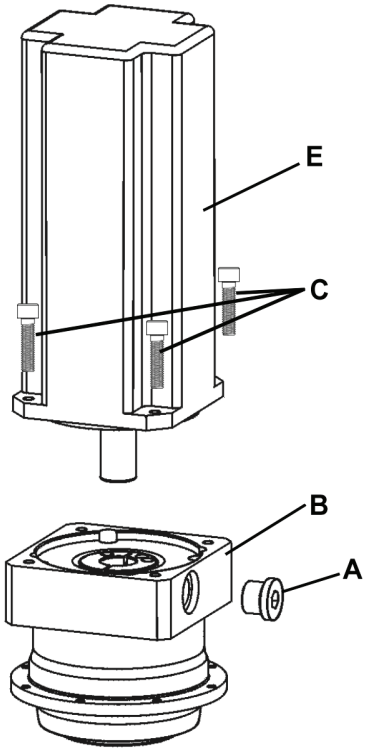
CAUTION

Directly sprayed cleaning agents can alter the frictional values of the clamping hub.

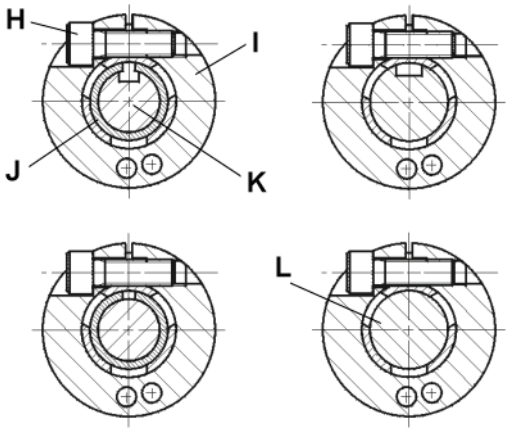
- Only spray cleaning agents onto a cloth, with which you can then clean the clamping hub.

- Clean/de-grease the following gearhead components with a clean and lint-free cloth and grease-dissolving, non-aggressive detergent:
  - all fitting surfaces to neighbouring components
  - centring
  - the motor shaft
  - only the inside diameter of the clamping hub
  - the spacer sleeve (if provided) inside and out
- Check the fitting surfaces in addition for damage and foreign bodies.

5.2 Mounting the motor onto the gearhead



- If the motor shaft has a feather key, remove the feather key.
  - ⓘ If recommended by the motor manufacturer, apply a half wedge.
- Turn the clamping hub (I) until the clamping bolt (H) can be reached by the mounting bore.
- Loosen the clamping bolt (H) of the clamping hub (I) by one revolution.
- Push the motor shaft into the clamping hub of the gearhead.
  - ⓘ The motor shaft should slip in easily. If this is not the case, the clamping bolt must be loosened more.
  - ⓘ A slotted spacer sleeve has to be installed extra for certain motor shaft diameters and applications.
  - ⓘ The slot of the spacer sleeve (if provided) and clamping hub have to be flush with the groove (if provided) of the motor shaft, see table "Tbl-4".
  - ⓘ No gap is premitted between motor (E) and the adaptor plate (B).

		Designation
	H	Clamping bolt
	I	Clamping ring (part of the clamping hub)
	J	Spacer sleeve
	K	Grooved shaft
	L	Smooth shaft

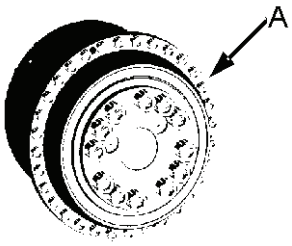
Tbl-4: Arrangement of motor shaft, plug receptacle and spacer sleeve

- Smear screw-bonding agent (for example Loctite 243) onto the four bolts (C).
- Fasten the motor (E) onto the adaptor plate (B) with the four screws.
- Tighten the clamping bolt (H) of the clamping hub (I).
  - ⓘ For bolt sizes and specified torques refer to chapter 9.1 "Specifications on mounting onto a motor", tables "Tbl-8" and "Tbl-9".
- Screw in plug (A) of the adaptor plate (B).
  - ⓘ For screw sizes and specified torques refer to table "Tbl-5".

Width across flats [mm]	5	8	10	12	14
Tightening torque [Nm]	10	35	50	70	140

Tbl-5: Torques for the plugs

5.3 Mounting the gearhead onto a machine



- Smear screw-bonding agent (for example Loctite 243) onto the fastening bolts.
- Fasten the gearhead on the machine with the fastening bolts through the through-holes (A).
  - ⓘ Mount the gearhead in such a way that the type plate remains legible.
  - ⓘ Do not use washers (e.g. plain washers, tooth lock washers).
  - ⓘ For bolt sizes and specified torques refer to chapter 9.3 "Specifications on mounting onto a machine", table "Tbl-11".

5.4 Mounted components on the gear output side

CAUTION

Distortions during mounting operations can damage the gearhead.

- Mount gearwheels and toothed belt pulleys onto the output flange without forcing.
- Do not on any account attempt an assembly by force or hammering!
- Only use suitable tools and equipment for assembly.

ⓘ For bolt sizes and specified torques refer to chapter 9.2 "Specifications on mounting on the gear output side", table "Tbl-10".

6 Startup and operation

⚠ WARNING

Objects flung out by rotating components can cause serious injuries.

- Remove objects and tools from the gearhead before putting it into operation.

⚠ WARNING

Rotating components on the gearhead can pull in parts of the body and cause serious injuries and even death.

- Keep a sufficient distance to rotating machinery while the gearhead is running.

⚠ CAUTION

Hot gearhead housing can cause serious burns.

- Touch the gearhead housing only when wearing protective gloves or after the gearhead has been at standstill for some time.

Operational conditions and requirements for the surroundings:

- Because of the factory-filled lubricant, the ambient temperature may not lie under 0 °C, or over +40 °C. Operating temperature may not exceed +90 °C.

  ⓘ For other conditions of use, please consult our Customer Service Department.
- Only use the gearhead up to its maximum limit values, see chapter 3.5 "Performance statistics".
- Only use the gearhead in a clean, dust-free and dry environment.

7 Maintenance and disposal

⚠ CAUTION

Hot gearhead housing can cause serious burns.

- Touch the gearhead housing only when wearing protective gloves or after the gearhead has been idle for some time.

⚠ WARNING

Rotating components on the gearhead can pull in parts of the body and cause serious injuries and even death.

- Disconnect the machine from the mains before starting maintenance work.
- Secure the motor against restarting during maintenance work.

7.1 Maintenance work

7.1.1 Visual inspection

- Check the entire gearhead for exterior damage.
- The radial shaft seals are subject to wear. Therefore also check the gearhead for leakage during each visual inspection.
  - ⓘ You can find more general information on radial shaft seals on our partner's Internet site at http://www.simrit.de.
  - ⓘ Check the mounting position, so that no foreign medium (e.g. oil) has collected on the output flange.

7.1.2 Checking the tightening torques

- Check the tightening torque of the fastening bolts on the gearhead housing and at the output flange.
  - ⓘ For bolt sizes and specified torques refer to Chapter 9.3 "Specifications on mounting onto a machine", table "Tbl-11" and Chapter 9.2 "Specifications on mounting on the gear output side", table "Tbl-10".
- Check the tightening torque of the clamping bolt on the motor mounting.
  - ⓘ You can find the prescribed tightening torques in Chapter 9.1 "Specifications on mounting onto a motor", tables "Tbl-8" and "Tbl-9".

7.2 Startup after maintenance work

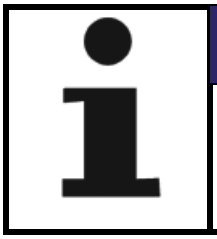
- Clean the outside of the gearhead.
- Assemble all safety devices.
- Do a trial run before releasing the gearhead again for operation.

7.3 Maintenance schedule

Maintenance work	At start-up	After 500 operating hours or 3 months	Every 3 months	Yearly
Visual inspection	X	X	X	
Checking the tightening torques	X	X		X

Tbl-6: Maintenance schedule

7.4 Notes on the lubricant used



INFORMATION

All gearheads are permanently lubricated by the manufacturer with synthetic gear oil (polyglycols) of viscosity class ISO VG 220 or with a high-performance lubricant (see type plate). All bearings are permanently lubricated by the company.

You can receive further information on the lubricants directly from the manufacturer:

Castrol Industrie GmbH, Mönchengladbach

Tel.: + 49 (0) 21 61 / 9 09 - 30

www.castrol.com

7.5 Supplementary information

Consult our Customer Service Department for supplementary information on exchanging the adaptor plate, on disassembly and on disposal of the gearhead.

- Dispose of the gearhead at the recycling sites intended for this purpose.
  ⓘ Observe the locally valid regulations for disposal.

8 Malfunctions

CAUTION

Changed operational behaviour can be an indication of existing damage to the gearhead, or cause damage to the gearhead.

- Do not put the gearhead back into operation until the cause of the malfunction has been rectified.

Fault	Possible cause	Solution
Increased operating temperature	The gearhead is not suited for the task.	Check the technical specifications.
	Motor is heating the gearhead.	Check the wiring of the motor.
		Ensure adequate cooling.
		Change the motor.
	Ambient temperature too high.	Ensure adequate cooling.
Increased noise during operation	Distortion in motor mounting.	Please consult our Customer Service Department.
	Damaged bearings.	
	Damaged gear teeth.	
Loss of lubricant	Lubricant quantity too high.	Wipe off discharged lubricant and continue to watch the gearhead. Lubricant discharge must stop after a short time.
	Seals not tight.	Please consult our Customer Service Department.

Tbl-7: Malfunctions

9 Appendix

9.1 Specifications on mounting onto a motor

9.1.1 Specifications for the “M” version

Gear reducer size TP+		Clamping hub interior Ø “x” [mm]	Clamping screw DIN 912–12.9	Width across flats [mm]	Tightening torque [Nm]	max. axial force [N]	
						Clamping hub	Coupling
004	1–stage	x≤11	M4	3	4.1	100	10
		11< x ≤14	M5	4	9.5		
		14< x ≤19	M6	5	16		
	2–stage	x≤11	M4	3	4.1	80	—
		11< x ≤14	M5	4	9.5		
010	1–stage	x≤14	M5	4	9.5	120	20
		14< x ≤19	M6	5	16		
		19< x ≤24	M8	6	39		
	2–stage	x≤11	M4	3	4.1	100	10
		11< x ≤14	M5	4	9.5		
		14< x ≤19	M6	5	16		
025	1–stage	x≤19	M6	5	16	150	30
		19< x ≤24	M8	6	39		
		24< x ≤28	M6	5	16		
		28< x ≤38	M10	8	79		
	2–stage	x≤14	M5	4	9.5	120	20
		14< x ≤19	M6	5	16		
		19< x ≤24	M8	6	39		
050	1–stage	x≤24	M8	6	39	200	50
		24< x ≤38	M10	8	79		
		38< x ≤48	M12	10	135		
	2–stage	x≤19	M6	5	16	150	30
		19< x ≤24	M8	6	39		
		24< x ≤38	M10	8	79		
110	1–stage	x≤38	M10	8	79	250	200
		38< x ≤48	M12	10	135		
	2–stage	x≤24	M8	6	39	200	50
		24< x ≤38	M10	8	79		
		38< x ≤48	M12	10	135		
300	1–stage	x≤55	M12	10	135	300	—
	2–stage	x≤48	M12	10	135	250	—
500	1–stage	x≤60	M16	14	330	300	—
	2–stage	x≤48	M12	10	135	250	—

Tbl-8: Specifications on mounting onto a motor, version “M”

9.1.2 Specifications for the “MA” version

Gear reducer size TP+		Clamping hub interior Ø “x” [mm]	Clamping screw DIN 912–12.9	Width across flats [mm]	Tightening torque [Nm]	max. axial force [N]	
						Clamping hub	Coupling
010	2–stage	x≤14 14< x ≤19	M5 M6	4 5	9.5 16	120	20
	3–stage	x≤14	M5	4	9.5	120	20
025	2–stage	x≤19 19< x ≤24	M6 M8	5 6	16 39	150	30
	3–stage	x≤19	M6	5	16	150	30
050	2–stage	x≤24 24< x ≤38	M8 M10	6 8	39 79	200	50
	3–stage	x≤24	M8	6	39	200	50
110	2–stage	x≤38 38< x ≤48	M10 M12	8 10	79 135	250	200
	3–stage	x≤38	M10	8	79	250	200
300	1–stage	x≤55	M12	10	135	300	—
	2–stage	x≤48	M12	10	135	250	—
	3–stage	x≤38	M10	8	79	250	—
500	1–stage	x≤60	M16	14	330	300	—
	2–stage	x≤48	M12	10	135	250	—
	3–stage	x≤38 38< x ≤48	M10 M12	8 10	79 135	250	—

Tbl-9: Specifications on mounting onto a motor, version “MA”

9.2 Specifications on mounting on the gear output side

Thread in output flange				
Size / version TP+	**Bore Ø [mm]**	**Quantity x thread x depth [ ] x [mm] x [mm]**	**Property class**	**Tightening torque [Nm]**
004 M	31.5	8 x M5 x 7	10.9	7.69
010 M	50	8 x M6 x 10	10.9	13.2
025 M	63	12 x M6 x 12	10.9	13.2
050 M	80	12 x M8 x 15	10.9	31.9
110 M	125	12 x M10 x 20	10.9	62.7
300 M	140	12 x M16 x 31	10.9	265
500 M	160	12 x M20 x 31	10.9	516
010 MA	50	12 x M6 x 10	10.9	13.2
025 MA	63	12 x M8 x 12	10.9	31.9
050 MA	80	12 x M10 x 15	10.9	62.7
110 MA	125	12 x M12 x 19	10.9	108
300 MA	145	12 x M20 x 31	10.9	516
500 MA	166	12 x M24 x 37	10.9	890
MA = HighTorque®				

Tbl-10: Specifications on mounting on the gear output side

9.3 Specifications on mounting onto a machine

Through-holes in gearhead housing				
Size / version TP+	**Bore Ø [mm]**	**Quantity x diameter [ ] x [mm]**	**For Screw size/ property class**	**Tightening torque [Nm]**
004 M	79	8 x 4.5	M4 / 12.9	4.55
010 M	109	8 x 5.5	M5 / 12.9	9.0
025 M	135	8 x 5.5	M5 / 12.9	9.0
050 M	168	12 x 6.6	M6 / 12.9	15.4
110 M	233	12 x 9.0	M8 / 12.9	37.3
300 M	280	16 x 13.5	M12 / 12.9	126
500 M	310	16 x 13.5	M12 / 12.9	126
010 MA	109	16 x 5.5	M5 / 12.9	9.0
025 MA	135	16 x 5.5	M5 / 12.9	9.0
050 MA	168	24 x 6.6	M6 / 12.9	15.4
110 MA	233	24 x 9.0	M8 / 12.9	37.3
300 MA	280	32 x 13.5	M12 / 12.9	126
500 MA	285	32 x 13.5	M12 / 12.9	126

Tbl-11: Specifications on mounting onto a machine; MA = HighTorque®

9.4 Tightening torques for common thread sizes in general mechanics

The specified tightening torques for headless screws and nuts are calculated values and are based on the following conditions:

- Calculation acc. VDI 2230 (Issue February 2003)
- Friction value for thread and contact surfaces $\mu = 0.10$
- Exploitation of the yield stress 90 %

	Tightening torque [Nm] for threads												
Property class Bolt / nut	**M3**	**M4**	**M5**	**M6**	**M8**	**M10**	**M12**	**M14**	**M16**	**M18**	**M20**	**M22**	**M24**
8.8 / 8	1.15	2.64	5.24	8.99	21.7	42.7	73.5	118	180	258	363	493	625
10.9 / 10	1.68	3.88	7.69	13.2	31.9	62.7	108	173	265	368	516	702	890
12.9 / 12	1.97	4.55	9.00	15.4	37.3	73.4	126	203	310	431	604	821	1042

Tbl-12: Tightening torques for headless screws and nuts

WITTENSTEIN alpha GmbH
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