

Operating instructions | EN

AG3210

Economy planetary gear unit



Table of contents

1 Documentation notes	5
1.1 Disclaimer	5
1.1.1 Trademarks	5
1.1.2 Limitation of liability	5
1.1.3 Copyright	6
1.1.4 Third-party brands	6
1.2 Version numbers	7
1.3 Scope of the documentation	7
1.4 Staff qualification	8
1.5 Safety and instruction	9
1.5.1 Notes on information security	9
1.6 Explanation of symbols	9
1.7 Beckhoff Services	11
1.7.1 Support services	11
1.7.2 Training offerings	11
1.7.3 Service offerings	11
1.7.4 Headquarters Germany	12
1.7.5 Downloadfinder	12
2 For your safety	13
2.1 General safety instructions	13
2.1.1 Before operation	13
2.1.2 During operation	14
2.1.3 After operation	14
3 Product overview	15
3.1 Name plate	16
3.2 Type key	17
3.3 Product characteristics	18
3.4 Ordering options	19
3.4.1 Feather key	19
3.5 Intended use	20
3.5.1 Improper use	20
4 Technical data	21
4.1 Definitions	21
4.1.1 Technical terms	21
4.2 Data for operation and environment	23
4.2.1 Gear unit design	23
4.3 NP005	24
4.3.1 Dimension drawing NP005	26
4.4 NP015	28
4.4.1 Dimension drawing NP015	30
4.5 NP025	32
4.5.1 Dimension drawing NP025	34
4.6 NP035	36
4.6.1 Dimension drawing NP035	38

4.7	NP045	40
4.7.1	Dimension drawing NP045	41
5	Scope of supply	43
5.1	Packaging	43
6	Transport and storage	44
6.1	Conditions	44
6.2	Transport	44
6.2.1	Gear unit	45
6.3	Long-term storage	46
7	Technical description	47
7.1	Mounting position	47
8	Mechanical installation	48
8.1	General tightening torques	48
8.1.1	Steel	48
8.1.2	Stainless steel in aluminum	49
8.1.3	Stainless steel in steel	49
8.2	Motor on gear unit	50
8.2.1	Clamping hub	50
8.2.2	Mounting	52
8.3	Gear unit to machine	54
8.3.1	Output side	54
8.3.2	Mounting	55
9	Commissioning	56
9.1	Before operation	57
9.2	During operation	57
10	Maintenance and cleaning	58
10.1	Cleaning agents	58
10.1.1	Not applicable	58
10.2	Intervals	59
10.2.1	Lubrication	59
11	Fault correction	60
12	Decommissioning	61
12.1	Disassembly	61
12.2	Disposal	62
13	Guidelines and Standards	63
13.1	EU conformity	63
13.2	RoHS	64
	Index	65

1 Documentation notes

1.1 Disclaimer

Beckhoff products are subject to continuous further development. We reserve the right to revise the documentation at any time and without notice. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams, and descriptions in this documentation.

1.1.1 Trademarks

Beckhoff®, ATRO®, TwinCAT®, TwinCAT/BSD®, TC/BSD®, EtherCAT®, EtherCAT G®, EtherCAT G10®, EtherCAT P®, Safety over EtherCAT®, TwinSAFE®, XFC®, XTS® and XPlanar® are registered and licensed trademarks of Beckhoff Automation GmbH.

The use by third parties of other brand names or trademarks contained in this documentation may lead to an infringement of the rights of the respective trademark owner.



EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH.

1.1.2 Limitation of liability

All components of this product described in the original operating instructions are delivered in a hardware and software configuration, depending on the application requirements. Modifications and changes to the hardware or software configuration that go beyond the documented options are prohibited and nullify the liability of Beckhoff Automation GmbH & Co. KG.

The following is excluded from the liability:

- Failure to comply with this documentation
- Improper use
- Use of untrained personnel
- Use of unauthorized spare parts

1.1.3 Copyright

© Beckhoff Automation GmbH & Co. KG, Germany

The copying, distribution and utilization of this document as well as the communication of its contents to others without express authorization is prohibited. Offenders will be held liable for the payment of damages.

We reserve all rights in the event of registration of patents, utility models and designs.

1.1.4 Third-party brands

Third-party trademarks and wordmarks are used in this documentation. The trademark endorsements can be found at: <https://www.beckhoff.com/trademarks>

1.2 Version numbers

On request we can send you a list of revision levels for changes to the documentation. Please send your request to:

✉ motion-documentation@beckhoff.com

Origin of the document

This documentation was originally written in German. All other languages are derived from the German original.

Product features

The valid product features are always those specified in the current documentation. Further information given on the product pages of the Beckhoff homepage, in emails or in other publications is not authoritative.

1.3 Scope of the documentation

Apart from these operating instructions, the following documents are part of the overall documentation:

Documentation	Definition
Short information about the gear unit	Accompanying document with general notes on handling the gear units. Included with each product.

1.4 Staff qualification

This documentation is aimed at trained specialists working in control technology and automation who have knowledge of the applicable and required standards and directives.

Specialists must have knowledge of drive technology and electrical equipment as well as knowledge of safe working on electrical systems and machines. This includes knowledge of proper setup and preparation of the workplace as well as securing the working environment for other persons.

The documentation published at the time must be used for each installation and commissioning. The products must be used in compliance with all safety requirements, including all applicable laws, regulations, provisions and standards.

Instructed person

Instructed persons have a clearly defined task area and have been informed about the work to be carried out. Instructed persons are familiar with:

- the necessary protective measures and protective devices
- the intended use and risks that can arise from use other than for the intended purpose

Trained person

Trained persons meet the requirements for instructed persons. Trained persons have additionally received training from the machine builder or vendor:

- machine-specific or
- plant-specific

Trained specialists

Trained specialists have received specific technical training and have specific technical knowledge and experience. Trained specialists can:

- apply relevant standards and directives
- assess tasks that they have been assigned
- recognize possible hazards
- prepare and set up workplaces

Electricians

Electricians have extensive technical knowledge from their studies, apprenticeships, or specialist training. They have an understanding of control technology and automation. They are familiar with relevant standards and directives. Electricians can:

- independently recognize, avoid and eliminate sources of danger
- implement specifications from the accident prevention regulations
- assess the work environment
- independently optimize and carry out their work

1.5 Safety and instruction

Read the contents that are related to the activities you will perform with the product. Always read the For your safety chapter in the documentation. Observe the warning notes in the chapters so that you can handle the product and work with it properly and safely.

1.5.1 Notes on information security

The products of Beckhoff Automation GmbH & Co. KG (Beckhoff), insofar as they can be accessed online, are equipped with security functions that support the secure operation of plants, systems, machines and networks. Despite the security functions, the creation, implementation and constant updating of a holistic security concept for the operation are necessary to protect the respective plant, system, machine and networks against cyber threats. The products sold by Beckhoff are only part of the overall security concept. The customer is responsible for preventing unauthorized access by third parties to its equipment, systems, machines and networks. The latter should be connected to the corporate network or the Internet only if appropriate protective measures have been set up.

In addition, the recommendations from Beckhoff regarding appropriate protective measures should be observed. Further information regarding information security and industrial security can be found in our <https://www.beckhoff.com/secguide>.

Beckhoff products and solutions undergo continuous further development. This also applies to security functions. In light of this continuous further development, Beckhoff expressly recommends that the products are kept up to date at all times and that updates are installed for the products once they have been made available. Using outdated or unsupported product versions can increase the risk of cyber threats.

To stay informed about information security for Beckhoff products, subscribe to the RSS feed at <https://www.beckhoff.com/secinfo>.

1.6 Explanation of symbols

Various symbols are used for a clear arrangement:

- The triangle indicates instructions that you should execute.
- The bullet point indicates an enumeration.
- [...] The square brackets indicate cross-references to other text passages in the document.
- [1] The number in the square brackets refers to the position in the adjacent figure.
- [+] The plus sign in square brackets indicates ordering options and accessories.

In order to make it easier for you to find text passages, pictograms and signal words are used in warning notices:

DANGER

Failure to comply will result in serious or fatal injuries.

WARNING

Failure to comply may result in serious or fatal injuries.

CAUTION

Failure to comply may result in minor or moderate injuries.

NOTICE

Notes are used for important information on the product. The possible consequences of failure to observe these include:

- product malfunctions
- damage to the product
- damage to the environment



Information

This symbol indicates information, tips, and notes for handling the product or the software.



Examples

This symbol shows examples of how to use the product or software.



Required tool

This symbol indicates a tool that is required for the following steps.



Required accessories [+]

This symbol shows the accessories required for the following steps. The accessories are not included in the scope of delivery and can be ordered from Beckhoff.



Assembly material required

This symbol shows the assembly material required for the following steps. The assembly material is not included in the scope of delivery and must be purchased separately.



Permitted cleaning agents

This symbol indicates the permitted cleaning agents that the components may be cleaned with. The permitted cleaning agents are not included in the scope of delivery and must be purchased separately.




QR codes

This symbol shows a QR code that you can scan to watch videos or animations. Internet access is required in order to use it.

1.7 Beckhoff Services

Beckhoff and its international partner companies offer comprehensive support and service.

 www.beckhoff.com/en-en/support/global-availability/

1.7.1 Support services

The Beckhoff Support offers technical advice on the use of individual Beckhoff products and system planning. The support engineers offer you competent assistance, for comprehension questions as well as for commissioning.

 +49 5246 963-157

 support@beckhoff.com

 www.beckhoff.com/en-en/support/our-support-services/

1.7.2 Training offerings

Training in Germany takes place at the Beckhoff branches or, after consultation, at the customer's premises. Beckhoff offers both face-to-face and online training courses.


 +49 5246 963-5000

 training@beckhoff.com

 www.beckhoff.com/en-en/support/training-offerings/

1.7.3 Service offerings

The Beckhoff service experts support you worldwide in all areas of after-sales service.

 +49 5246 963-460

 service@beckhoff.com

 www.beckhoff.com/en-en/support/our-service-offerings/

1.7.4 Headquarters Germany

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20
33415 Verl, Germany

☎ +49 5246 963-0

✉ info@beckhoff.com

🌐 www.beckhoff.com/en-en/

A detailed overview of the Beckhoff locations worldwide can be found at:

🌐 www.beckhoff.com/en-en/company/global-presence/

1.7.5 Downloadfinder

In the Download finder you will find configuration files, technical documentation and application reports to download.

🌐 www.beckhoff.com/documentations

2 For your safety

Read this chapter containing general safety information. The chapters in these operating instructions also contain warning notices. Always observe the safety instructions for your own safety, the safety of other persons and the safety of the product.

When working with control and automation products, many dangers can result from careless or incorrect use. Work particularly thoroughly, not under time pressure and responsibly towards other people.

2.1 General safety instructions

This chapter provides you with instructions on safety when handling the gear units. They cannot run independently. The gear units are therefore regarded as incomplete machines. They must be installed in a machine or plant by the machine manufacturer. The documentation created by the machine manufacturer must be read.

2.1.1 Before operation

Protective equipment

Do not remove or bypass any protective devices. Check all protective devices before operation. Make sure that all emergency switches are present at all times and can be reached by you and other people. People could be seriously or fatally injured by unprotected machine parts.

Shut down and secure the machine or plant

Shut down the machine or plant. Secure the machine or plant against being inadvertently started up.

Keep the immediate environment clean

Keep your workplace and the surrounding area clean. Ensure safe working.

Observe tightening torques

Mount and repeatedly check connections and components, complying with the prescribed tightening torques.

Use the original packaging only

Use the original packaging for dispatch, transportation, storage and packing.

Secure feather key against loss

Secure the existing feather key against loss, for example:

- during transportation or
- during operation without mounted parts

2.1.2 During operation

Do not touch hot surfaces

Check the cooling of the surfaces with a thermometer. Do not touch the components during and immediately after operation. Allow the components to cool sufficiently after switching off.

Avoid overheating

Operate the components according to the technical specifications. Refer here to the chapter: "Technical data". Provide for sufficient cooling. Switch the components off immediately if the temperature is too high.

Do not touch any moving or rotating components

Do not touch any moving or rotating components. Fasten all parts or components on the machine or plant.

2.1.3 After operation

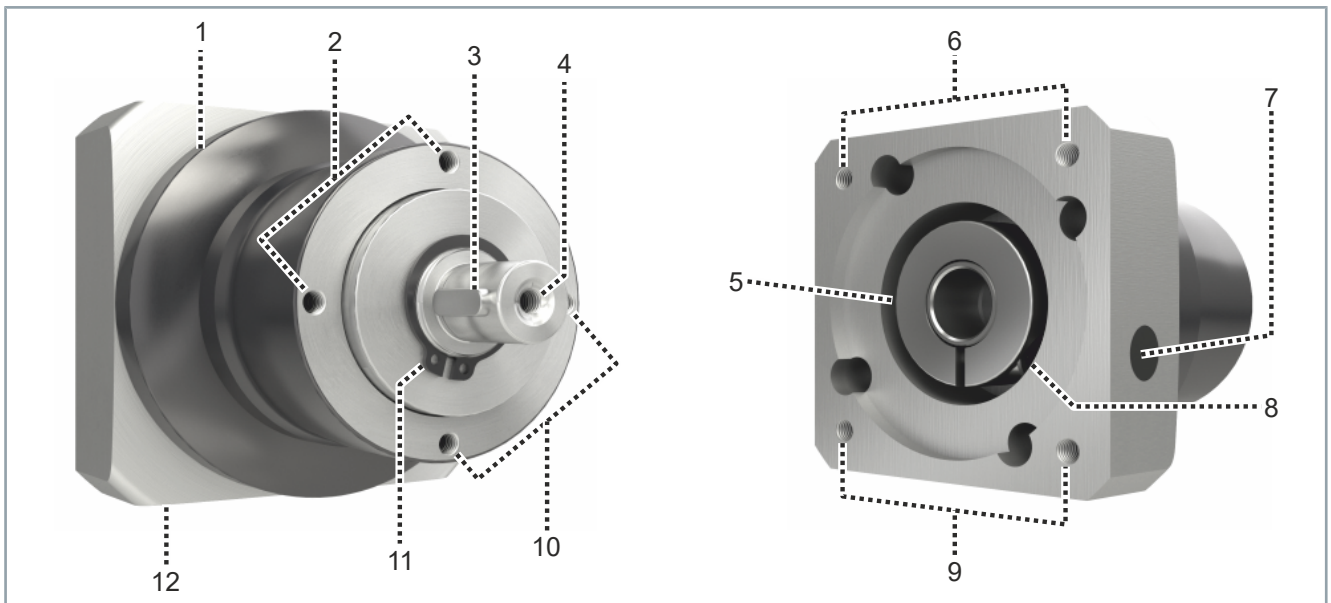
De-energize and switch off components before working on them

Check the functionality of all safety-relevant devices. Secure the working environment. Secure the machine or plant against being inadvertently started up. Observe the chapter: "Decommissioning".

No direct skin contact with solvents or lubricants

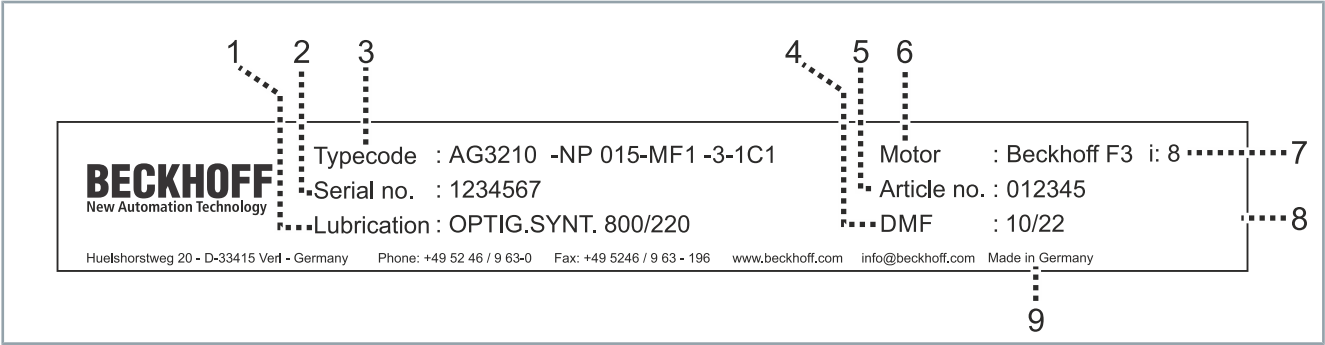
In case of improper use, the solvents or lubricants used can lead to skin irritations. Avoid direct skin contact.

3 Product overview



Number	Explanation
1	Gear housing
2	Holes for the output side
3	Feather key [+]
4	Output shaft
5	Clamping hub
6	Holes for the motor attachment
7	Plug; mounting hole
8	Clamping bolt
9	Holes for the motor attachment
10	Holes for the output side
11	Circlip
12	Adapter plate

3.1 Name plate



Number	Explanation
1	Lubrication
2	Serial number
3	Gear unit type
4	Date of manufacture
5	Order number
6	Beckhoff flange size
7	Ratio
8	DataMatrix code with Beckhoff BTN
9	Country of manufacture

3.2 Type key

AG3210 – NP005S – MF1 – 3 – 1C1 – F3		Explanation
AG3210		<i>Gear unit series</i> • AG3210 = NP economy planetary gear unit
NP005		<i>Gear type</i> • NP 005 • NP 015 • NP 025 • NP 035 • NP 045
S		<i>Execution</i> • S = Standard
M		<i>Gear unit variant</i> • M = Motor-mounted gear unit
F		<i>Gear unit version</i> • F = Standard • A = HIGH TORQUE
1		<i>No. of stages</i> • 1 = single-stage • 2 = two-stage
3		<i>Ratio</i> • See documentation
1		<i>Type of output</i> • 0 = smooth shaft • 1 = feather key DIN 6885 shape A
C		<i>Clamping hub identifying letter</i> • Not freely selectable Is selected on the basis of the motor to be mounted
1		<i>Torsional backlash</i> • 1 = Standard
F3		<i>Beckhoff flange size</i> • F1 • F2 • F3 • F4 • F5 • F6 • F7

3.3 Product characteristics

Wide range of possible applications

The planetary gear unit can be used in any installation position. This gives you the opportunity to install the planetary gear units in a variety of ways in your machine or system. The gear units are delivered in the "M" variant for motor attachment.

Adaptation to different motor types

The planetary gear unit can be adapted to different motor types with the adapter flange and a spacer sleeve.

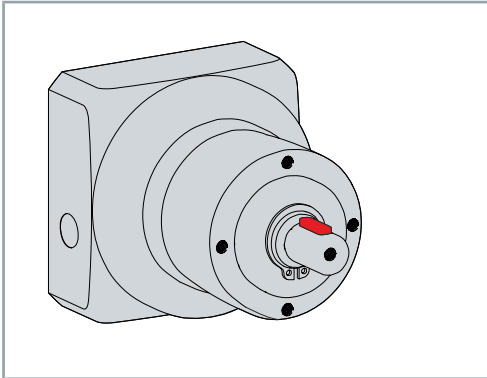
Maintenance-free ball bearings

The ball bearings are lifetime-lubricated and maintenance-free.

3.4 Ordering options

Order options are defined by the type key and must be ordered separately. The listed components cannot be retrofitted.

3.4.1 Feather key



A feather key transmits torque to an output element.

The gear units are available with feather key groove and inserted feather key according to DIN 6885.

3.5 Intended use

The planetary gear units from the AG3210 series may be operated only in the intended ambient and environmental conditions defined in this documentation.

The components are installed in plants or machines. Stand-alone operation of the components is not permitted.

The gear unit is intended for attachment to motors under the following conditions:

- The design of the motors is B5
- The concentricity tolerance or axial run-out tolerance conforms to EN 50347
- The cylindrical shaft end has the tolerance class h6 to k6



Observe the approvals for gear units with the Ex-marking

Gear units marked with the Ex-marking comply with EU Directive 2014/34/EN; ATEX and are approved for use in potentially explosive atmospheres. The performance data are limited and can be found in the chapter: "Technical data" of this translation of the original instructions.

Read the entire drive system documentation:

- This translation of the original instructions
- Original operating instructions for the motors
- Machine manufacturer's complete documentation for the machine

3.5.1 Improper use

Any type of use that exceeds the permissible values from the technical data is regarded as inappropriate and is thus prohibited.

The planetary gear units from the AG3210 series are not suitable for use in the following areas:

- Potentially explosive atmospheres without a suitable housing
- Areas with aggressive environments, for example aggressive gases or chemicals
- Areas with ionizing radiation and nuclear plants
- Aerospace industry
- Food processing, pharmacy and cosmetics
- Product areas that are not protected from abrasion
- Installation situations in which external media such as oil are present at the output shaft

4 Technical data

Below you will find definitions of terms, environmental conditions, operating details and technical data for the planetary gear units.

4.1 Definitions

When attaching a gear unit, the performance may be reduced by up to 20 %. The flange of the motor used for heat dissipation is fitted with a gear unit that generates heat during operation. The power derating therefore has thermal reasons.

4.1.1 Technical terms

This chapter provides information on various technical terms and their meaning.

Equivalent force on the output F_{2eq} [N]

The equivalent force on the output describes the force that is relevant for dimensioning the gear unit.

Equivalent application torque T_{2eq} [Nm]

The equivalent application torque describes the torque that is relevant for the dimensioning of the gear unit.

Dimensioning factor f_a

The dimensioning factor describes the influence of the daily operating time and the operating factor on the application torque.

Operating mode factor K_m

The operating mode factor describes the influence of duty cycle, number of cycles and dynamics on the application torque.

Mass moment of inertia; based on the drive J_1 [kgcm²]

The mass moment of inertia is a measure for the tendency of a body to maintain its motion state (whether at rest or in motion).

Running noise L_{pA} [dB/A]

The running noises are influenced, for example, by:

- transmission ratio and speed
- lubricants and gearing or
- Installation position

Maximum radial force F_{2R} [N]

The radial force is the force component that acts at right angles to the output shaft and parallel to the output flange. It acts perpendicular to the axial force and can have an axial distance x_2 to the shaft shoulder or the shaft flange. This distance acts as lever arm. The lateral force generates a bending moment.

Maximum torque at the output T_{2a} [Nm]

Represents the maximum torque that can be transmitted by the gear unit. This value may be lower, depending on application-specific boundary conditions.

EMERGENCY STOP torque T_{2Emerg} [Nm]

The EMERGENCY STOP torque is the maximum permissible torque at the gear unit output. It may be reached 1000 times at the most during the service life of the gear unit and must never be exceeded.

4.2 Data for operation and environment

NOTICE

Operate the gear units only under the specified environmental conditions

Operate the gear units only in accordance with the specifications for operation and the environment listed in this chapter. This way you can ensure a long service life and operation as intended.

If you do not adhere to the permissible specifications for the operation and the environment, this can lead, for example, to icing of the seal and damage to the gear unit.

Beckhoff products are designed for operation under certain environmental conditions, which vary according to the product. The following specifications must be observed for operation and environment in order to achieve the optimum service life of the products.

Environmental requirements	
Climate category	2K3 according to EN 60721
Ambient temperature during operation	-15 °C to +40 °C, extended temperature range
Ambient temperature for transport and storage	Maximum fluctuation 20 K/hour: -25 °C to +70 °C
Permissible humidity in operation	5 % to 95 % relative humidity, no condensation
Permissible humidity during transport and storage	5 % to 95 % relative humidity, no condensation
Specifications for intended use	
Protection class	IP 64
Lubrication	Oil; maintenance-free
Direction of rotation	Drive side and output side in the same direction

4.2.1 Gear unit design

The two speeds that are relevant for the gear unit design are the maximum permitted nominal speed and the permitted nominal input speed.

The maximum permitted nominal speed $n_{1\max}$ may not be exceeded. Cycle operation is dimensioned based on this value.

The permitted nominal input speed n_{1N} must not be exceeded during continuous operation.

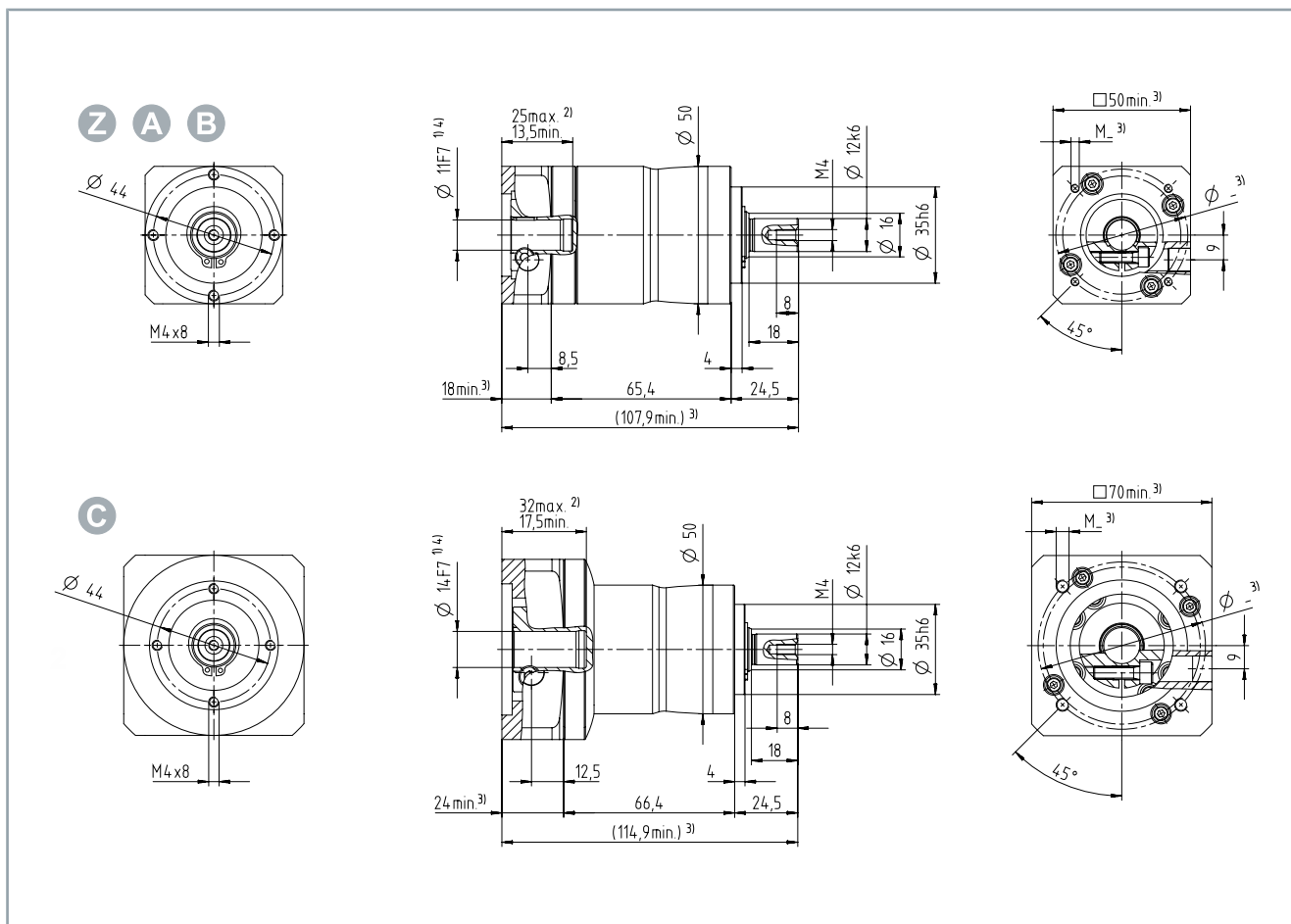
4.3 NP005

Mechanical data	1-stage				
• Ratio i	4	5	7	8	10
• Efficiency under full load η [%]	97				
• Mass moment of inertia J_1 [kgcm ²] • <i>Based on the drive</i>	0.02 to 0.14				
• Running noise L_{PA} [dB/A] • <i>i = 10/n₁ = 3000 rpm without load</i>	≤ 58				
• Weight with adapter plate m [kg] • <i>Depending on the clamping hub diameter and selected adapter plate</i>	0.70 to 1.20				
Torques and speeds					
• Rated torque at the output T_{2N} [Nm]	5.10	6.50		6	
• Acceleration torque T_{2B} [Nm] • <i>Maximum 1000 cycles/hour</i>	11	14		13	
• Maximum torque T_{2a} [Nm]	18	22		21	
• EMERGENCY STOP torque T_{2Emer} [Nm] • <i>1000 x during gear unit service life, at $T_{2a} > T_{2E-mer}$ maximum T_{2Emer} permitted</i>	26				
• Mean drive speed n_{1N} [rpm] • <i>T_{1N} & 20 °C ambient temperature</i>	3800		4300		
• Maximum drive speed n_{1Max} [rpm]	10000				
• No-load running torque T_{012} [Nm]	0.10	0.009	0.008		
Torsion and forces					
• Maximum torsional backlash j_t [arcmin]	Standard ≤ 10				
• Maximum torsional rigidity C_{t21} [Nm/arcmin]	1.20			0.85	
• Maximum axial force F_{2AMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150$ rpm</i>	700				
• Maximum radial force F_{2RMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150$ rpm</i>	800				
Temperature [°C]					
• Maximum housing temperature	+ 90				
• Ambient temperature	-15 to + 40				
Clamping hub diameter [mm]					
• Standard	8 Z; 9 A; 11 B				
• Large	14 C				
Housing					
• Properties	Heat-treated steel				
• Color	Anthracite gray; RAL 7016				

Mechanical data	2-stage									
• Ratio i	16	20	25	28	35	40	50	64	70	100
• Efficiency under full load η [%]	95									
• Mass moment of inertia J_1 [kgcm ²] • <i>Based on the drive</i>	0.02 to 0.13									
• Running noise L_{PA} [dB/A] • $i = 10/n_1 = 3000 \text{ rpm without load}$	≤ 58									
• Weight with adapter plate m [kg] • <i>Depending on the clamping hub diameter and selected adapter plate</i>	0.90 to 1.60									
Torques and speeds										
• Rated torque at the output T_{2N} [Nm]	5.10	6.50	5.10	6.50	5.10	6.50	6	6.50	6	
• Acceleration torque T_{2B} [Nm] • <i>Maximum 1000 cycles/hour</i>	11	14	11	14	11	14	13	14	13	
• Maximum torque T_{2a} [Nm]	18	22	18	22	18	22	21	22	21	
• EMERGENCY STOP torque T_{2Emer} [Nm] • <i>1000 x during gear unit service life, at $T_{2a} > T_{2E-mer}$ maximum T_{2Emer} permitted</i>	26									
• Mean drive speed n_{1N} [rpm] • T_{1N} & 20 °C ambient temperature	4000		4300							
• Maximum drive speed n_{1Max} [rpm]	10000									
• No-load running torque T_{012} [Nm]	0.11	0.10	0.009		0.008					
Torsion and forces										
• Maximum torsional backlash j_t [arcmin]	Standard ≤ 13									
• Maximum torsional rigidity C_{t21} [Nm/arcmin]	1.20						0.85	1.20	0.85	
• Maximum axial force F_{2AMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150 \text{ rpm}$</i>	700									
• Maximum radial force F_{2RMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150 \text{ rpm}$</i>	800									
Temperature [°C]										
• Maximum housing temperature	+ 90									
• Ambient temperature	-15 to + 40									
Clamping hub diameter [mm]										
• Standard	8 Z; 9 A; 11 B									
• Large	14 C									
Housing										
• Properties	Heat-treated steel									
• Color	Anthracite gray; RAL 7016									

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M4x8
- Feather key according to DIN 6885-A 4x4x14



Position	Explanation
Z, A, B	Clamping hub diameter up to 11 mm
C	Clamping hub diameter up to 14 mm
1)	Check motor shaft adaptation
2)	Smallest or largest permissible motor shaft length. Longer motor shafts are possible; please contact us.
3)	Dimensions are dependent on the motor
4)	Smaller motor shaft diameters are adaptable using a spacer sleeve with a minimum wall thickness of 1 mm

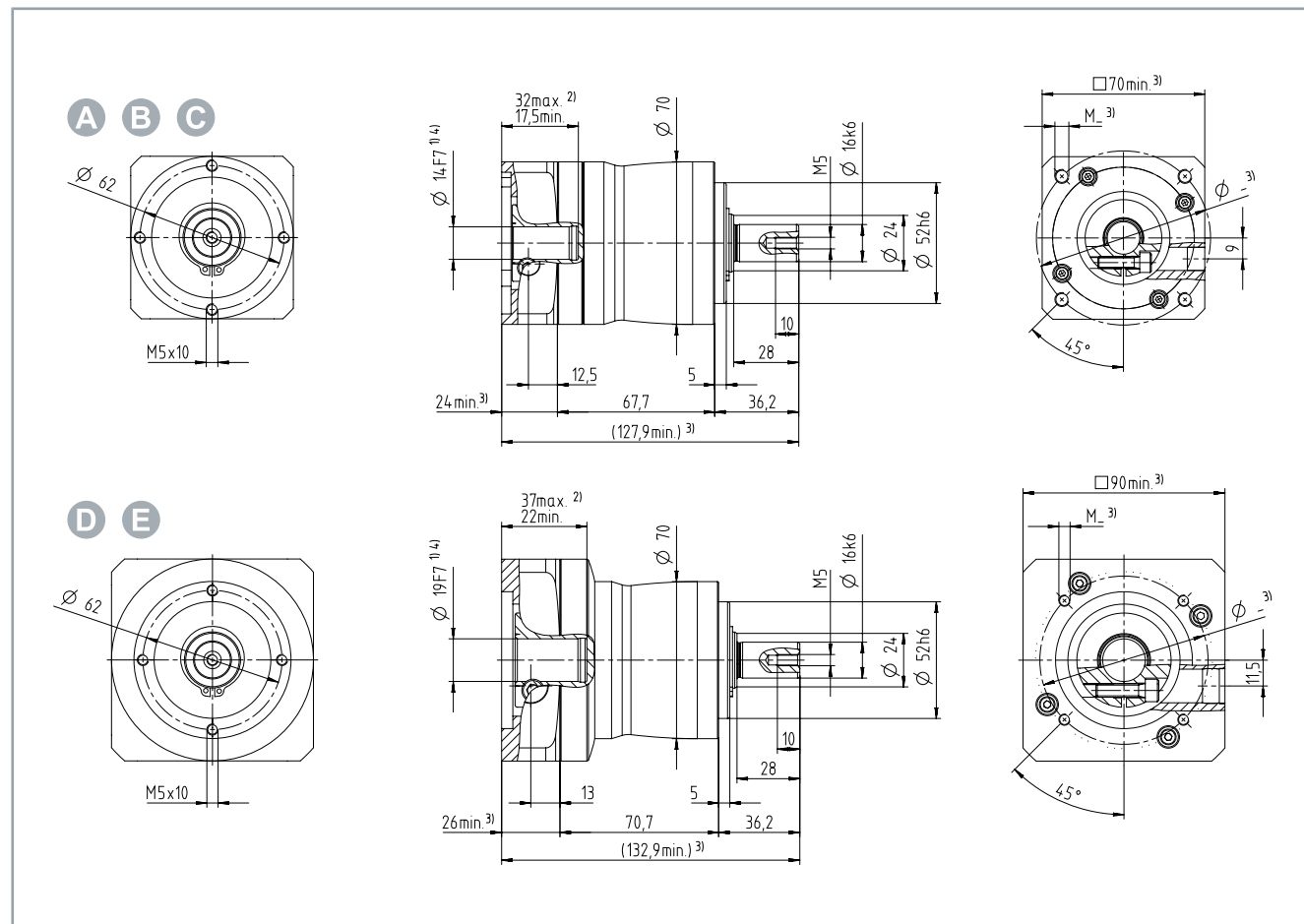
4.4 NP015

Mechanical data	1-stage					
• Ratio i	3	4	5	7	8	10
• Efficiency under full load η [%]	97					
• Mass moment of inertia J_1 [kgcm ²] • <i>Based on the drive</i>	0.13 to 0.53					
• Running noise L_{PA} [dB/A] • <i>i = 10/n₁ = 3000 rpm without load</i>	≤ 59					
• Weight with adapter plate m [kg] • <i>Depending on the clamping hub diameter and selected adapter plate</i>	1.90 to 3					
Torques and speeds						
• Rated torque at the output T_{2N} [Nm]	17	18	21		19	
• Acceleration torque T_{2B} [Nm] • <i>Maximum 1000 cycles/hour</i>	32	35	40		35	
• Maximum torque T_{2a} [Nm]	51	56	64		56	
• Rated torque at the output T_{2N} [Nm] • <i>HIGH TORQUE</i>	29	22	-	-	-	-
• Maximum torque T_{2a} [Nm] • <i>HIGH TORQUE</i>	88	67	-	-	-	-
• EMERGENCY STOP torque T_{2Emer} [Nm] • <i>1000 x during gear unit service life, at $T_{2a} > T_{2E-mer}$ maximum T_{2Emer} permitted</i>	75					
• Mean drive speed n_{1N} [rpm] • <i>T_{1N} & 20 °C ambient temperature</i>	3300			4000		
• Maximum drive speed n_{1Max} [rpm]	8000					
• No-load running torque T_{012} [Nm]	0.24	0.20	0.17	0.14	0.13	0.12
Torsion and forces						
• Maximum torsional backlash j_t [arcmin]	Standard ≤ 8					
• Maximum torsional rigidity C_{t21} [Nm/arcmin]	3.30				2.80	
• Maximum axial force F_{2AMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150$ rpm</i>	1550					
• Maximum radial force F_{2RMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150$ rpm</i>	1700					
Temperature [°C]						
• Maximum housing temperature	+ 90					
• Ambient temperature	-15 to + 40					
Clamping hub diameter [mm]						
• Standard	9 A; 11 B; 14 C					
• Large	16 D; 19 E					
Housing						
• Properties	Heat-treated steel					
• Color	Anthracite gray; RAL 7016					

Mechanical data	2-stage													
• Ratio i	12	15	16	20	25	28	30	32	35	40	50	64	70	100
• Efficiency under full load η [%]	95													
• Mass moment of inertia J_1 [kgcm ²] • <i>Based on the drive</i>	0.02 to 0.14													
• Running noise L_{PA} [dB/A] • $i = 10/n_1 = 3000 \text{ rpm without load}$	≤ 58													
• Weight with adapter plate m [kg] • <i>Depending on the clamping hub diameter and selected adapter plate</i>	1.90 to 2.90													
Torques and speeds														
• Rated torque at the output T_{2N} [Nm]	18				21	18		19	21	18	21	19	21	19
• Acceleration torque T_{2B} [Nm] • <i>Maximum 1000 cycles/hour</i>	32		35		40	35	32	35	40	35	40	35	40	35
• Maximum torque T_{2a} [Nm]	51		56		64	56	51	56	64	56	64	56	64	56
• Rated torque at the output T_{2N} [Nm] • <i>HIGH TORQUE</i>	22				-	22		-	-	22	-	-	-	-
• Maximum torque T_{2a} [Nm] • <i>HIGH TORQUE</i>	62		67		-	67	62	-	-	67	-	-	-	-
• EMERGENCY STOP torque T_{2Emer} [Nm] • <i>1000 x during gear unit service life, at $T_{2a} > T_{2Emer}$ maximum T_{2Emer} permitted</i>	75													
• Mean drive speed n_{1N} [rpm] • T_{1N} & 20 °C ambient temperature	3800						4300							
• Maximum drive speed n_{1Max} [rpm]	10000													
• No-load running torque T_{012} [Nm]	0.13	0.11	0.12	0.11	0.10	0.09				0.08				
Torsion and forces														
• Maximum torsional backlash j_t [arcmin]	Standard ≤ 10													
• Maximum torsional rigidity C_{t21} [Nm/arcmin]	3.30						4	3.30				2.80	3.30	2.80
• Maximum axial force F_{2AMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150 \text{ rpm}$</i>	1550													
• Maximum radial force F_{2RMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150 \text{ rpm}$</i>	1700													
Temperature [°C]														
• Maximum housing temperature	+ 90													
• Ambient temperature	-15 to + 40													
Clamping hub diameter [mm]														
• Standard	8 Z; 9 A; 11 B													
• Large	14 C													
Housing														
• Properties	Heat-treated steel													
• Color	Anthracite gray; RAL 7016													

1-stage

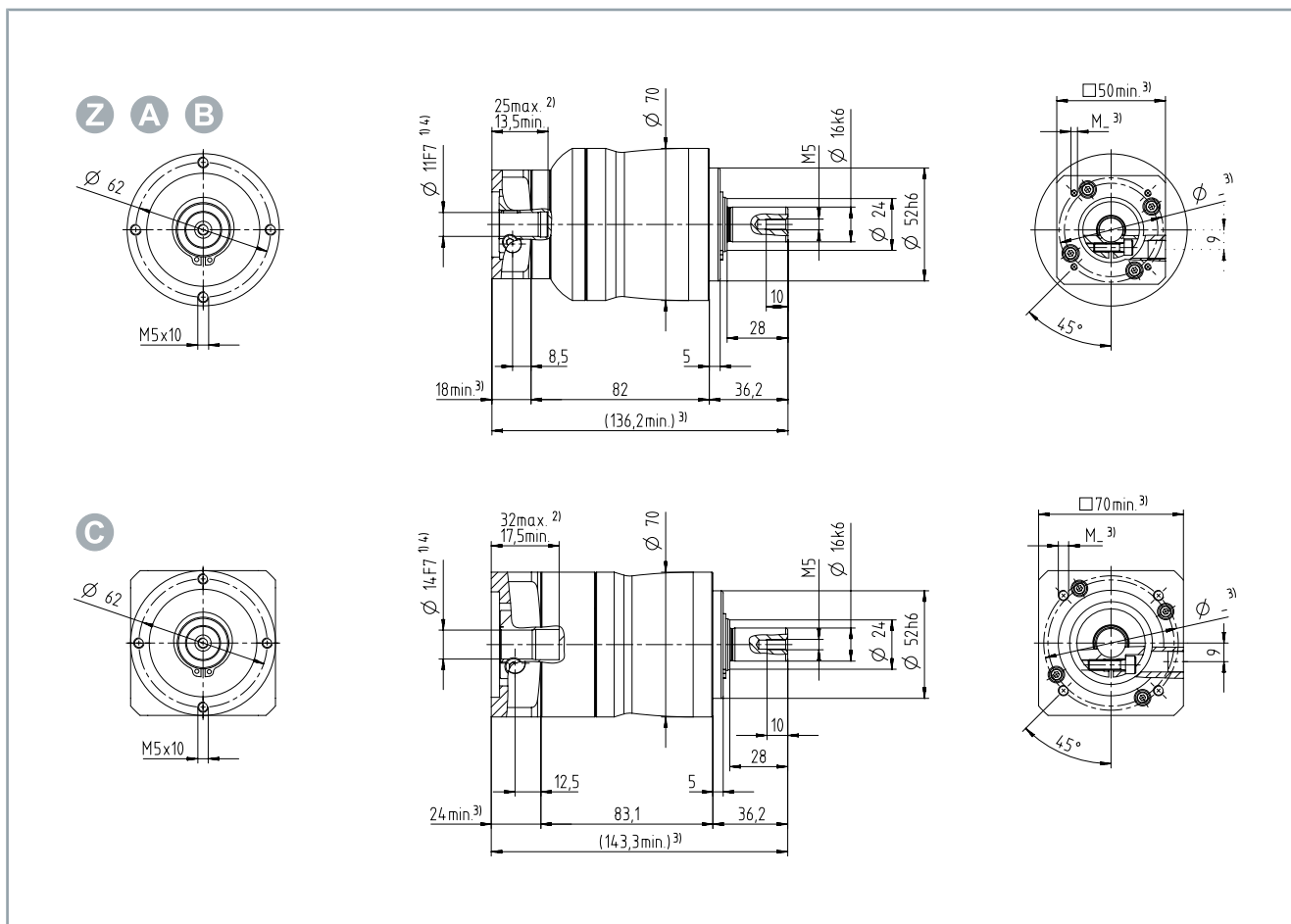
- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M5x10
- Feather key according to DIN 6885-A 5x5x25



Position	Explanation
A, B, C	Clamping hub diameter up to 14 mm
D, E	Clamping hub diameter up to 19 mm
1)	Check motor shaft adaptation
2)	Smallest or largest permissible motor shaft length. Longer motor shafts are possible; please contact us.
3)	Dimensions are dependent on the motor
4)	Smaller motor shaft diameters are adaptable using a spacer sleeve with a minimum wall thickness of 1 mm

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M5x10
- Feather key according to DIN 6885-A 5x5x25



Position	Explanation
Z, A, B	Clamping hub diameter up to 11 mm
C	Clamping hub diameter up to 14 mm
1)	Check motor shaft adaptation
2)	Smallest or largest permissible motor shaft length. Longer motor shafts are possible; please contact us.
3)	Dimensions are dependent on the motor
4)	Smaller motor shaft diameters are adaptable using a spacer sleeve with a minimum wall thickness of 1 mm

4.5 NP025

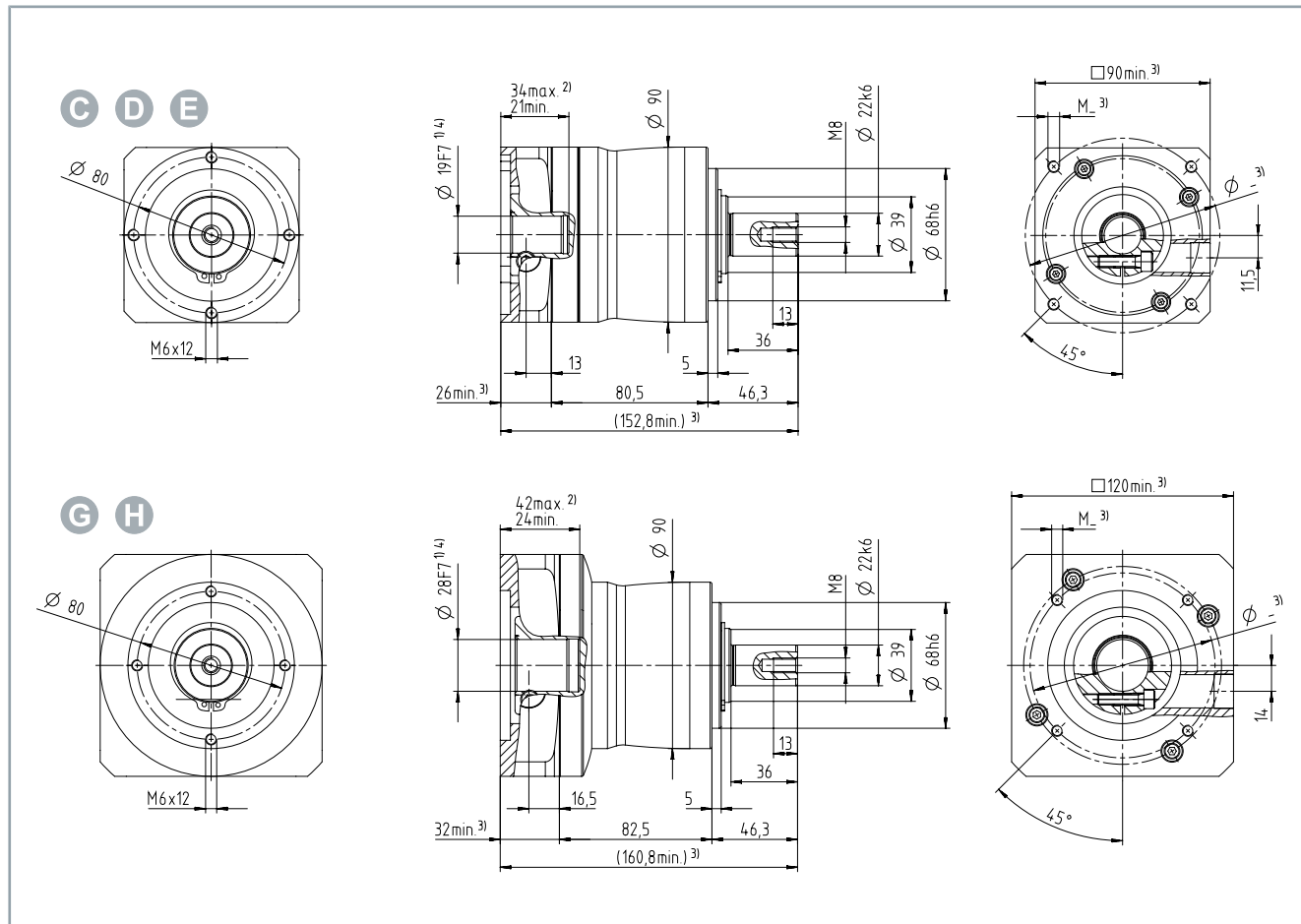
Mechanical data	1-stage					
• Ratio i	3	4	5	7	8	10
• Efficiency under full load η [%]	97					
• Mass moment of inertia J_1 [kgcm ²] • <i>Based on the drive</i>	0.30 to 1.80					
• Running noise L_{PA} [dB/A] • <i>i = 10/n₁ = 3000 rpm without load</i>	≤ 61					
• Weight with adapter plate m [kg] • <i>Depending on the clamping hub diameter and selected adapter plate</i>	3.80 to 6.40					
Torques and speeds						
• Rated torque at the output T_{2N} [Nm]	48	48	50	45		
• Acceleration torque T_{2B} [Nm] • <i>Maximum 1000 cycles/hour</i>	80	95	100	90		
• Maximum torque T_{2a} [Nm]	128	152	160	144		
• Rated torque at the output T_{2N} [Nm] • <i>HIGH TORQUE</i>	63	58	-			
• Maximum torque T_{2a} [Nm] • <i>HIGH TORQUE</i>	200	184	-			
• EMERGENCY STOP torque T_{2Emer} [Nm] • <i>1000 x during gear unit service life, at $T_{2a} > T_{2Emer}$ maximum T_{2Emer} permitted</i>	190					
• Mean drive speed n_{1N} [rpm] • <i>T_{1N} & 20 °C ambient temperature</i>	3100			3600		
• Maximum drive speed n_{1Max} [rpm]	7000					
• No-load running torque T_{012} [Nm]	0.38	0.31	0.26	0.21	0.19	0.17
Torsion and forces						
• Maximum torsional backlash j_t [arcmin]	Standard ≤ 8					
• Maximum torsional rigidity C_{t21} [Nm/arcmin]	9.50				8.50	
• Maximum axial force F_{2AMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150$ rpm</i>	1900					
• Maximum radial force F_{2RMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150$ rpm</i>	2800					
Temperature [°C]						
• Maximum housing temperature	+ 90					
• Ambient temperature	-15 to + 40					
Clamping hub diameter [mm]						
• Standard	14 C; 16 D; 19 E					
• Large	24 G; 28 H					
Housing						
• Properties	Heat-treated steel					
• Color	Anthracite gray; RAL 7016					

Mechanical data	2-stage														
• Ratio i	9	12	15	16	20	25	28	30	32	35	40	50	64	70	100
• Efficiency under full load η [%]	95														
• Mass moment of inertia J_1 [kgcm ²]	0.20 to 0.56														
• Based on the drive															
• Running noise L_{PA} [dB/A]	≤ 59														
• $i = 10/n_1 = 3000 \text{ rpm without load}$															
• Weight with adapter plate m [kg]	4.10 to 5.90														
• Depending on the clamping hub diameter and selected adapter plate															
Torques and speeds															
• Rated torque at the output T_{2N} [Nm]	40		48		50	48	40	48	50	48	50	45	50	45	
• Acceleration torque T_{2B} [Nm]	80		95		100	95	80	95	100	95	100	90	100	90	
• Maximum 1000 cycles/hour															
• Maximum torque T_{2a} [Nm]	128		152		160	152	128	152	160	152	160	144	160	144	
• Rated torque at the output T_{2N} [Nm]	63	60	58		-	58	53	-	-	58	-	-	-	-	
• HIGH TORQUE															
• Maximum torque T_{2a} [Nm]	200	192	184		-	184	168	-	-	184	-	-	-	-	
• HIGH TORQUE															
• EMERGENCY STOP torque T_{2Emer} [Nm]	190														
• 1000 x during gear unit service life, at $T_{2a} > T_{2Emer}$ maximum T_{2Emer} permitted															
• Mean drive speed n_{1N} [rpm]	3300							4000							
• T_{1N} & 20 °C ambient temperature															
• Maximum drive speed n_{1Max} [rpm]	8000														
• No-load running torque T_{012} [Nm]	0.22	0.18	0.16		0.15	0.14	0.12				0.11	0.10		0.090	
Torsion and forces															
• Maximum torsional backlash j_t [arcmin]	Standard ≤ 10														
• Maximum torsional rigidity C_{t21} [Nm/arcmin]	9.50												8.50	9.50	8.50
• Maximum axial force F_{2AMax} [N]	1900														
• In relation to the shaft center at the output, $n_2 = 150 \text{ rpm}$															
• Maximum radial force F_{2RMax} [N]	2800														
• In relation to the shaft center at the output, $n_2 = 150 \text{ rpm}$															
Temperature [°C]															
• Maximum housing temperature	+ 90														
• Ambient temperature	-15 to + 40														
Clamping hub diameter [mm]															
• Standard	9 A; 11 B; 14 C														
• Large	16 D; 19 E														
Housing															
• Properties	Heat-treated steel														
• Color	Anthracite gray; RAL 7016														

4.5.1 Dimension drawing NP025

1-stage

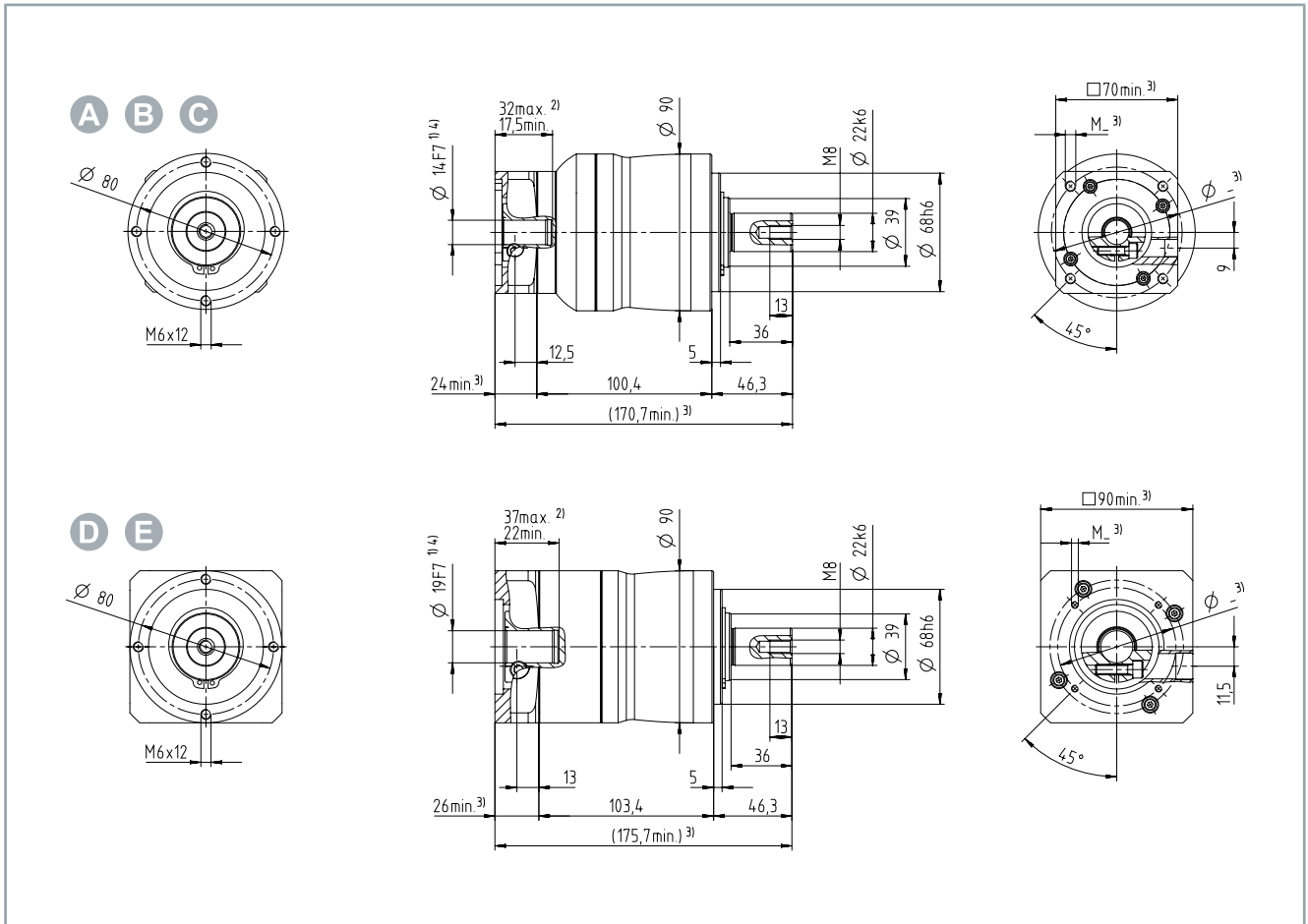
- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M8x13
- Feather key according to DIN 6885-A 6x6x32



Position	Explanation
C, D, E	Clamping hub diameter up to 19 mm
G, H	Clamping hub diameter up to 28 mm
1)	Check motor shaft adaptation
2)	Smallest or largest permissible motor shaft length. Longer motor shafts are possible; please contact us.
3)	Dimensions are dependent on the motor
4)	Smaller motor shaft diameters are adaptable using a spacer sleeve with a minimum wall thickness of 1 mm

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M8x13
- Feather key according to DIN 6885-A 6x6x32



Position	Explanation
A, B, C	Clamping hub diameter up to 14 mm
D, E	Clamping hub diameter up to 19 mm
1)	Check motor shaft adaptation
2)	Smallest or largest permissible motor shaft length. Longer motor shafts are possible; please contact us.
3)	Dimensions are dependent on the motor
4)	Smaller motor shaft diameters are adaptable using a spacer sleeve with a minimum wall thickness of 1 mm

4.6 NP035

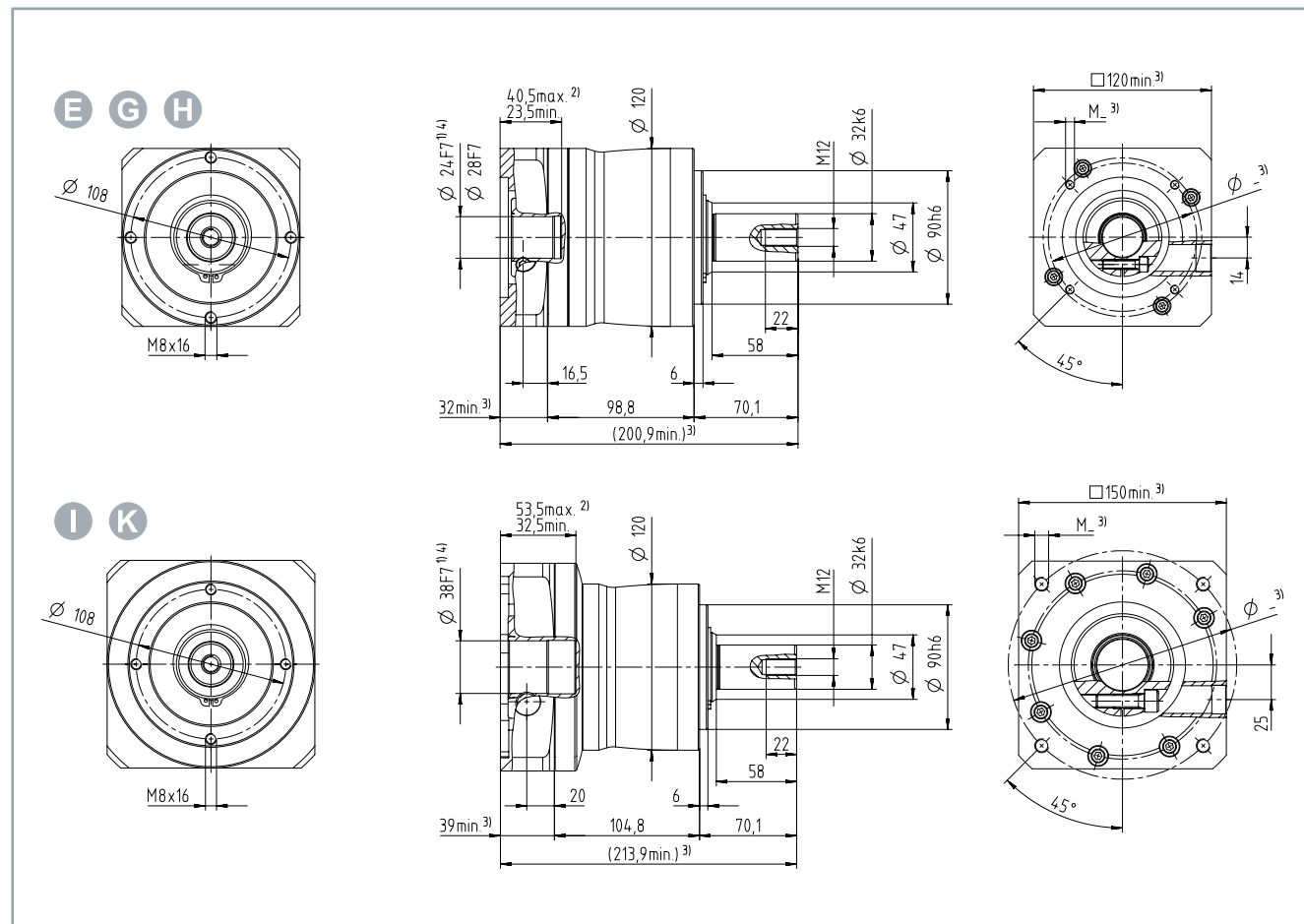
Mechanical data	1-stage					
• Ratio i	3	4	5	7	8	10
• Efficiency under full load η [%]	97					
• Mass moment of inertia J_1 [kgcm ²] • <i>Based on the drive</i>	0.90 to 8.30					
• Running noise L_{PA} [dB/A] • <i>i = 10/n₁ = 3000 rpm without load</i>	≤ 65					
• Weight with adapter plate m [kg] • <i>Depending on the clamping hub diameter and selected adapter plate</i>	9.40 to 15.60					
Torques and speeds						
• Rated torque at the output T_{2N} [Nm]	102	130	125	110		
• Acceleration torque T_{2B} [Nm] • <i>Maximum 1000 cycles/hour</i>	200	255	250	220		
• Maximum torque T_{2a} [Nm]	320	408	400	352		
• Rated torque at the output T_{2N} [Nm] • <i>HIGH TORQUE</i>	155 -					
• Maximum torque T_{2a} [Nm] • <i>HIGH TORQUE</i>	488 -					
• EMERGENCY STOP torque T_{2Emer} [Nm] • <i>1000 x during gear unit service life, at $T_{2a} > T_{2E-mer}$ maximum T_{2Emer} permitted</i>	480					
• Mean drive speed n_{1N} [rpm] • <i>T_{1N} and 20 °C ambient temperature</i>	2300			2800		
• Maximum drive speed n_{1Max} [rpm]	6000					
• No-load running torque T_{012} [Nm]	1	0.85	0.76	0.66	0.63	0.58
Torsion and forces						
• Maximum torsional backlash j_t [arcmin]	Standard ≤ 8					
• Maximum torsional rigidity C_{t21} [Nm/arcmin]	22	25			22	
• Maximum axial force F_{2AMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150$ rpm</i>	4000					
• Maximum radial force F_{2RMax} [N] • <i>In relation to the shaft center at the output, $n_2 = 150$ rpm</i>	5000					
Temperature [°C]						
• Maximum housing temperature	+ 90					
• Ambient temperature	-15 to + 40					
Clamping hub diameter [mm]						
• Standard	19 E; 24 G; 28 H					
• Large	32 I; 38 K					
Housing						
• Properties	Heat-treated steel					
• Color	Anthracite gray; RAL 7016					

Mechanical data	2-stage															
• Ratio i	9	12	15	16	20	25	28	30	32	35	40	50	64	70	100	
• Efficiency under full load η [%]	95															
• Mass moment of inertia J_1 [kgcm ²] • Based on the drive	0.24 to 1.90															
• Running noise L_{PA} [dB/A] • $i = 10/n_1 = 3000 \text{ rpm without load}$	≤ 61															
• Weight with adapter plate m [kg] • Depending on the clamping hub diameter and selected adapter plate	9.80 to 14.30															
Torques and speeds																
• Rated torque at the output T_{2N} [Nm]	102		130		12	13	10	13	12	13	12	11	12	11		
• Acceleration torque T_{2B} [Nm] • Maximum 1000 cycles/hour	200		255		25	25	20	25	25	25	25	22	25	22		
• Maximum torque T_{2a} [Nm]	320		408		40	40	32	40	40	40	40	35	40	35		
• Rated torque at the output T_{2N} [Nm] • HIGH TORQUE	155	150	155		-	15	13	-	-	15	-	-	-	-		
• Maximum torque T_{2a} [Nm] • HIGH TORQUE	488	480	488		-	48	43	-	-	48	-	-	-	-		
• EMERGENCY STOP torque T_{2Emer} [Nm] • 1000 x during gear unit service life, at $T_{2a} > T_{2Emer}$ maximum T_{2Emer} permitted	480															
• Mean drive speed n_{1N} [rpm] • T_{1N} & 20 °C ambient temperature	3100						3600									
• Maximum drive speed n_{1Max} [rpm]	7000															
• No-load running torque T_{012} [Nm]	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.20	0.1	0.17	0.1	0.1			
	5	6	0	2	7	5	2	9		8		6	5			
Torsion and forces																
• Maximum torsional backlash j_t [arcmin]	Standard ≤ 10															
• Maximum torsional rigidity C_{t21} [Nm/arcmin]	22		25		22		25		22		25		22		25	
• Maximum axial force F_{2AMax} [N] • In relation to the shaft center at the output, $n_2 = 150 \text{ rpm}$	4000															
• Maximum radial force F_{2RMax} [N] • In relation to the shaft center at the output, $n_2 = 150 \text{ rpm}$	5000															
Temperature [°C]																
• Maximum housing temperature	+ 90															
• Ambient temperature	-15 to + 40															
Clamping hub diameter [mm]																
• Standard	14 C; 16 D; 19 E															
• Large	24 G; 28 H															
Housing																
• Properties	Heat-treated steel															
• Color	Anthracite gray; RAL 7016															

4.6.1 Dimension drawing NP035

1-stage

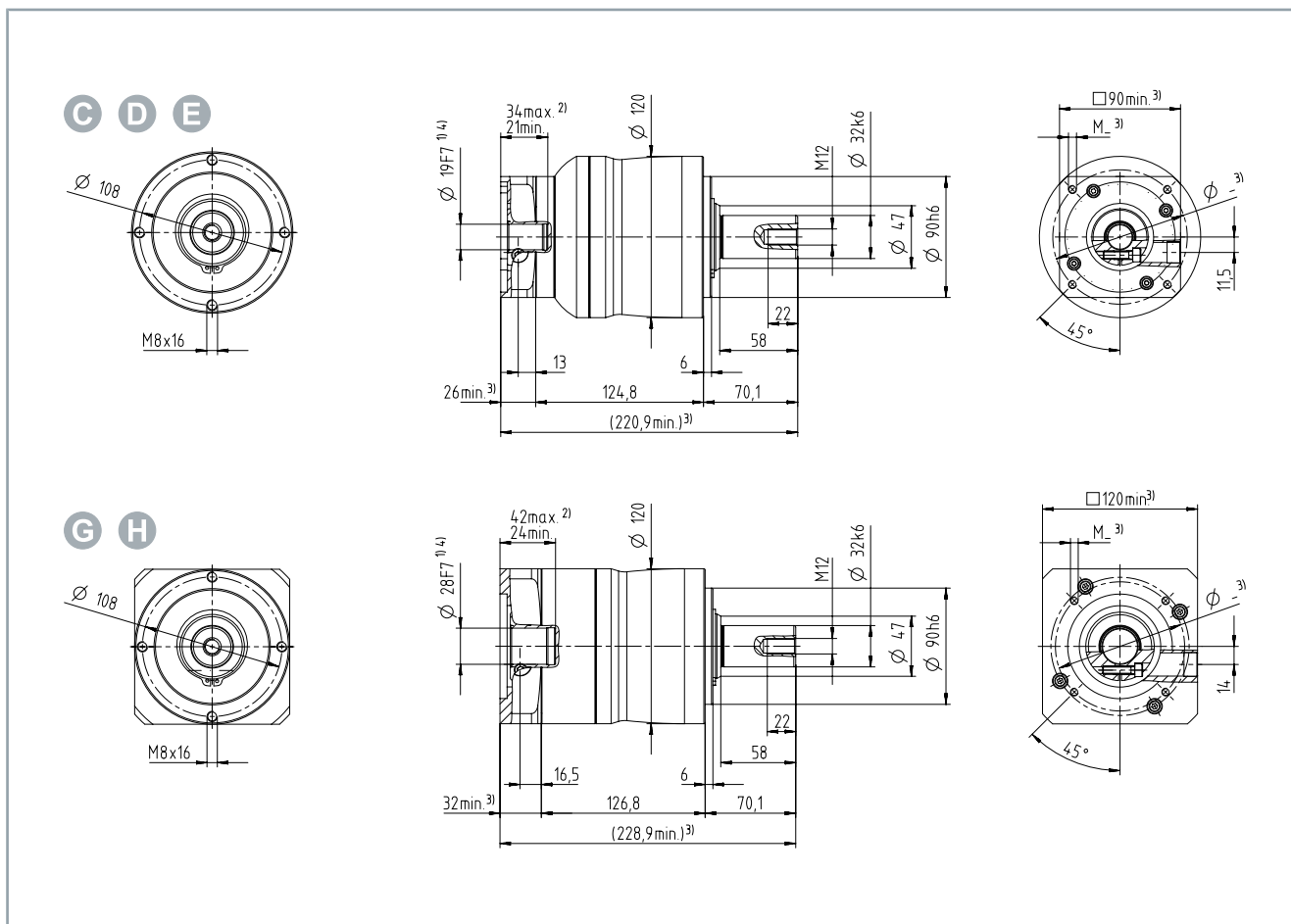
- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M12x22
- Feather key according to DIN 6885-A 10x10x50



Position	Explanation
E, G, H	Clamping hub diameter up to 28 mm
I, K	Clamping hub diameter up to 38 mm
1)	Check motor shaft adaptation
2)	Smallest or largest permissible motor shaft length. Longer motor shafts are possible; please contact us.
3)	Dimensions are dependent on the motor
4)	Smaller motor shaft diameters are adaptable using a spacer sleeve with a minimum wall thickness of 1 mm

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M12x22
- Feather key according to DIN 6885-A 10x10x50



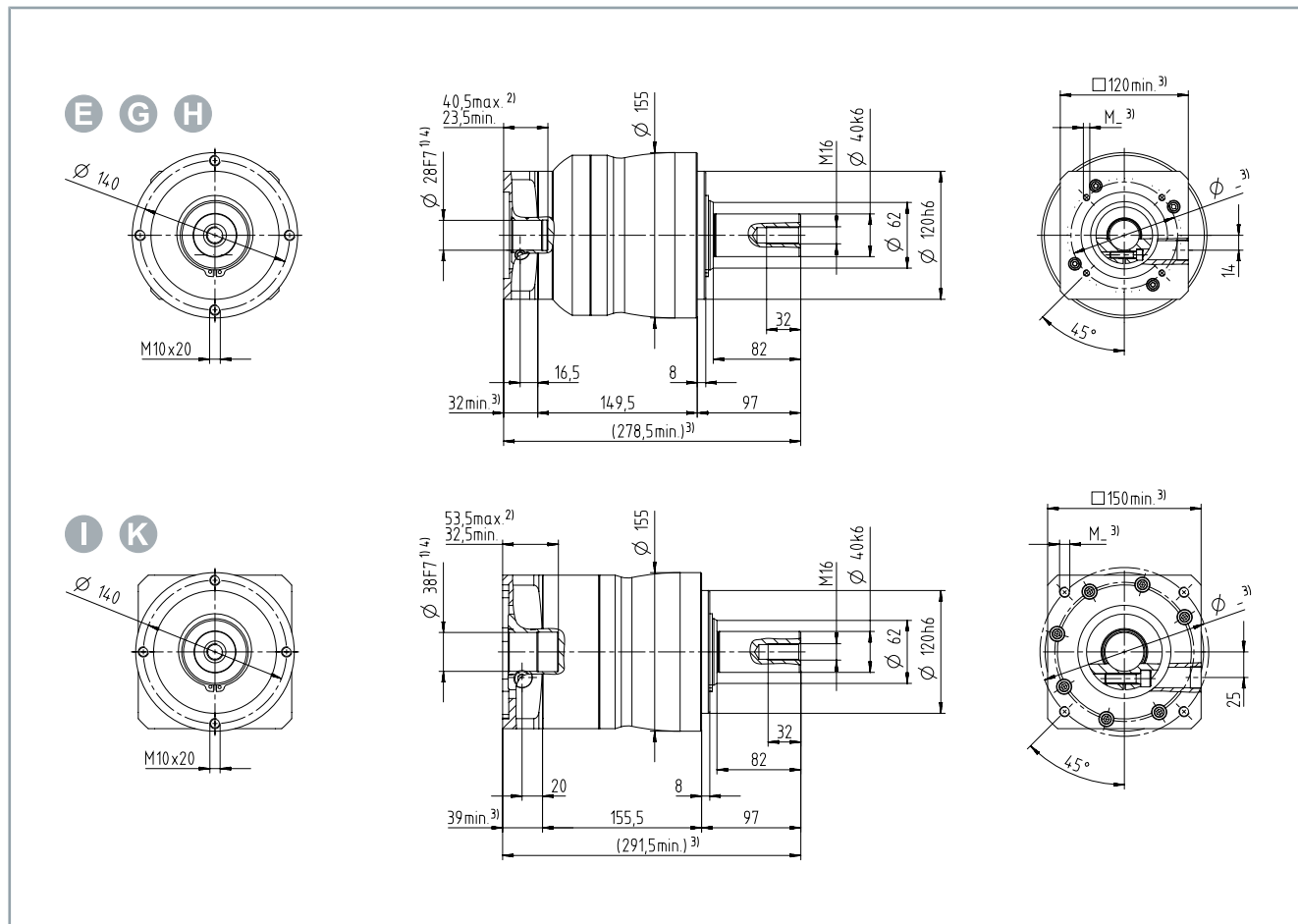
Position	Explanation
C, D, E	Clamping hub diameter up to 29 mm
G, H	Clamping hub diameter up to 28 mm
1)	Check motor shaft adaptation
2)	Smallest or largest permissible motor shaft length. Longer motor shafts are possible; please contact us.
3)	Dimensions are dependent on the motor
4)	Smaller motor shaft diameters are adaptable using a spacer sleeve with a minimum wall thickness of 1 mm

4.7 NP045

Mechanical data	1-stage			2-stage				
• Ratio i	5	8	10	25	32	50	64	100
• Efficiency under full load η [%]	97			95				
• Mass moment of inertia J ₁ [kgcm²]	7.20 to 8.80			0.80 to 7.60				
• <i>Based on the drive</i>								
• Running noise L _{PA} [dB/A]	≤ 68			≤ 65				
• <i>i = 10/n₁ = 3000 rpm without load</i>								
• Weight with adapter plate m [kg]	19 to 25			20 to 28				
• <i>Depending on the clamping hub diameter and selected adapter plate</i>								
Torques and speeds								
• Rated torque at the output T _{2N} [Nm]	350	200		350	200	350	200	
• Acceleration torque T _{2B} [Nm]	500	400		500	400	500	400	
• <i>Maximum 1000 cycles/hour</i>								
• Maximum torque T _{2a} [Nm]	800	640		700	640	700	640	
• EMERGENCY STOP torque T _{2Emer} [Nm]	4000			6000				
• <i>1000 x during gear unit service life, at T_{2a} > T_{2E-mer} maximum T_{2Emer} permitted</i>								
• Mean drive speed n _{1N} [rpm]	2000	2200	2300	2600	2500	3000	2900	3000
• <i>T_{1N} & 20 °C ambient temperature</i>								
• Maximum drive speed n _{1Max} [rpm]	4000			6000				
• No-load running torque T ₀₁₂ [Nm]	2.40	2	1.90	0.80	0.68	0.60	0.55	
Torsion and forces								
• Maximum torsional backlash j _t [arcmin]	Standard ≤ 8			Standard ≤ 10				
• Maximum torsional rigidity C _{t21} [Nm/arcmin]	55	44		55			44	
• Maximum axial force F _{2AMax} [N]	6000							
• <i>In relation to the shaft center at the output, n₂ = 150 rpm</i>								
• Maximum radial force F _{2RMax} [N]	8000							
• <i>In relation to the shaft center at the output, n₂ = 150 rpm</i>								
Temperature [°C]								
• Maximum permissible housing temperature	+ 90							
• Ambient temperature	-15 to + 40							
Clamping hub diameter [mm]								
• Standard	38 K			19 E; 24 G; 28 H				
• Large	-			32 I; 38 K				
Housing								
• Properties	Heat-treated steel							
• Color	Anthracite gray; RAL 7016							

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M16x32
- Feather key according to DIN 6885-A 12x12x70



Position	Explanation
E, G, H	Clamping hub diameter up to 28 mm
I, K	Clamping hub diameter up to 38 mm
1)	Check motor shaft adaptation
2)	Smallest or largest permissible motor shaft length. Longer motor shafts are possible; please contact us.
3)	Dimensions are dependent on the motor
4)	Smaller motor shaft diameters are adaptable using a spacer sleeve with a minimum wall thickness of 1 mm

5 Scope of supply



Check the scope of supply for missing or damaged parts

Check your delivery for completeness. If any parts are missing or became damaged during transport, contact the carrier, vendor or our service department immediately.

Please check that the delivery includes the following items:

- Gear units from the AG3210 series with packaging
- Short information

Screws for fastening the gear unit to the motor or the machine are not included in the scope of delivery .

No motor is included in the standard delivery of a planetary gear unit from the AG3210 series.

5.1 Packaging

Instructions for handling are printed on the packaging:

Symbol	Explanation
	This is the correct position for the packaging.
	The packaging must be protected from moisture.
	The contents are fragile.

6 Transport and storage

NOTICE

Avoid damaging the gear unit

Observe the conditions and the following chapters on transport and storage.

Disregarding the conditions can lead to damage to the gear unit and invalidation of the guarantee.

6.1 Conditions

Make sure that the gear units are not damaged during transport and storage.

Observe the specifications in the following chapters and comply with the following conditions:

- Climate category: 2K3 according to EN 60721
- Temperature: -25 °C to +70 °C, maximum fluctuation 20 K/hour
- Air humidity: 5 % to 95 % relative humidity, no condensation
- Use of suitable means of transport
- Transport and storage only in a horizontal position
- Use of the vendor's original packaging

6.2 Transport

⚠ WARNING

Do not move under suspended loads

Use suitable means of transport and secure the gear unit against falling down.

If the gear unit falls down it can cause a fatal accident.

NOTICE

Use means of transport with a sufficient lifting capacity

Use means of transport or hoists with a sufficient lifting capacity to transport the gear unit. Ensure secure fastening. Avoid impacts against the gear unit.

Means of transport with an insufficient lifting capacity can tear and thus damage the gear unit or motor/gear unit combination due to falling down or impacts.



Legal regulations for the lifting of loads

When transporting individual gear units or motor/gear unit combinations without a hoist, adhere to the legal requirements for the lifting of loads by employees.

6.2.1 Gear unit

The following options are available to you for the transportation of the gear unit:

- Without aids, by hand in compliance with the legal requirements for the lifting of loads
- Using suitable transport slings on the gear unit with averaged center of gravity, with sufficiently dimensioned hoists
- using suitable transport slings on the gear unit and on the motor with averaged center of gravity, with sufficiently dimensioned hoists

6.3 Long-term storage

NOTICE

Observe the storage conditions

Store the gear unit in a dry, clean interior room protected against UV radiation. Temperature changes with formation of condensation, shocks or vibrations are to be avoided.

Failure to comply with the specified storage conditions may result in changes in the processed materials and surfaces on and in the gear unit.

NOTICE

Observe storage times

Ensure suitable storage conditions if the gear units are not installed directly.

For storage times of more than one year, up to two years:

- Provide shafts and bare surfaces with corrosion protection
- Store the gear units in a horizontal position

Failure to comply with the specified storage conditions and storage times may result in changes in the processed materials and surfaces on and in the gear unit.

NOTICE

Prevent the formation of condensation

Ensure a constant ambient temperature in the range from -25°C to +70°C at the storage location. Avoid high humidity.

Failure to comply may result in the formation of condensation. Condensation can cause damage in later operation or rust formation on the gear unit.

You have the possibility to store the gear unit in a horizontal position and a dry environment over a short or long period. For storage we always recommend the original packaging. Observe the conditions specified in chapter: Transport and storage.

7 Technical description

7.1 Mounting position

NOTICE

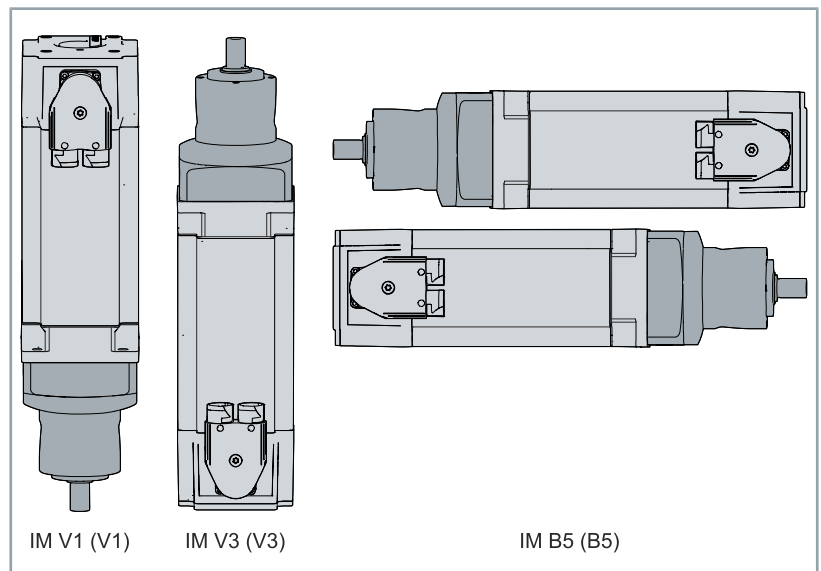
Observe the maintenance intervals and mounting positions

Carry out maintenance at regular intervals.

In the horizontal mounting position IM V3, liquid which has been left on the flange for a longer period can penetrate the motor through capillary action. In mounting position IM V1 liquid can escape.

If you do not observe the maintenance intervals, the motor may overheat depending on the mounting position. Ingress and leakage of liquids may damage the motor.

The standard installation position of the gear unit is the motor attachment M. Alternatively, it can be used in any other installation position.



8 Mechanical installation

NOTICE

Do not use compressed air and do not spray inside the gear unit

Use a cloth for cleaning. Spray only the cloth with cleaning agent and carefully clean the clamping hub.

Compressed air can damage the seals of the gear unit and cleaning agent directly sprayed inside can affect the coefficient of friction of the clamping hub.

NOTICE

Leaks on gear units with grease lubrication

Seal the surfaces of the adapter plates, the drive housing and the motor with a surface sealing adhesive.

Leaks may occur on the drive with gear units with grease lubrication. This so-called sweating can negatively affect the lifecycle of the gear unit.

8.1 General tightening torques

8.1.1 Steel

The specified tightening torques for nuts and bolts are mathematical values based on the following requirements:

- Calculation according to VDI 2230 (February 2003 edition)
- Friction coefficient for threads and contact surfaces $\mu = 0.10$
- Elastic limit utilization 90%
- Torque tools type II classes A and D according to ISO 6789

The setting values are rounded to conventional scalings or adjustment possibilities:

Bolt size	Quality of the bolts		
	8.8	10.9	12.9
	Tightening torque in Nm		
M3	1.15	1.68	1.97
M4	2.64	3.88	4.55
M5	5.2	7.6	9
M6	9	13.2	15.4
M8	21.5	32	37.5
M10	42.5	62.5	73.5
M12	73.5	108	126
M14	118	173	202
M16	180	264	310
M18	258	368	430
M20	362	520	605
M22	495	700	820
M24	625	890	1040

8.1.2 Stainless steel in aluminum

The specified tightening torques for stainless steel bolts in aluminum apply in conjunction with the matching Beckhoff servomotors.

The setting values are rounded to conventional scalings or adjustment possibilities:

Quality of the bolts = strength class A2-70		
Servomotor	Screw size	Tightening torque in Nm
AM801x	M4	2.1
AM802x		
AM803x	M5	4.3
AM853x		
AM804x	M6	7.3
AM854x		
AM805x	M8	17.8
AM855x		
AM806x	M10	35
AM856x		
AM807x	M12	62
AM857x		
AM808x	M14	115

8.1.3 Stainless steel in steel

The specified tightening torques for stainless steel bolts in steel apply in conjunction with the matching Beckhoff servomotors.

The setting values are rounded to conventional scalings or adjustment possibilities:

Quality of the bolts = strength class A2-70		
Servomotor	Screw size	Tightening torque in Nm
AM801x	M4	2.3
AM802x		
AM803x	M5	4.6
AM853x		
AM804x	M6	7.7
AM854x		
AM805x	M8	18.7
AM855x		
AM806x	M10	37
AM856x		
AM807x	M12	65
AM857x		
AM808x	M14	120

8.2 Motor on gear unit



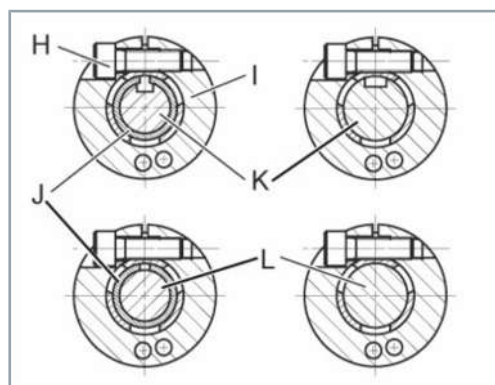
Motors included in the scope of delivery are pre-mounted. No further installation is required.

For optimal performance data, we recommend attachment to Beckhoff synchronous servomotors from the AM8xxx series.

Requirements for the attachment of a motor to the gear unit:

- Design B5
- Concentricity and axial run-out tolerance according to EN 50347
- Smooth shaft
- Motor attachment if possible in a vertical position

8.2.1 Clamping hub

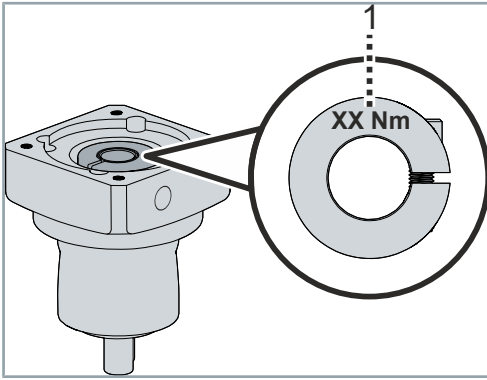


The following table provides a description of the clamping hub:

Position	Name
H	Clamping bolt
I	Clamping ring
J	Spacer sleeve
K	Grooved motor shaft
L	Smooth motor shaft

- Clamping screw according to ISO 4762

8.2.1.1 Tightening torques



The value for the tightening torque [1] of the clamping screw is punched into the clamping hub from above.

Information on the screw sizes and tightening torques can be found in the table below:

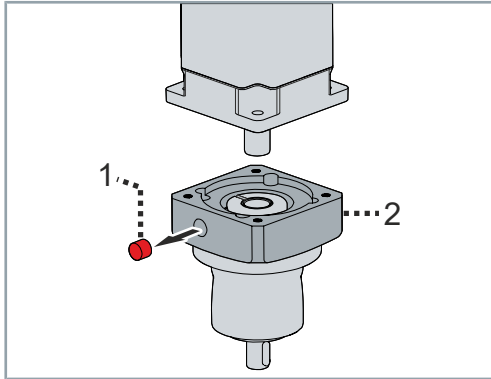
Quality of clamping hub bolt = strength class 12.9				
Clamping hub diameter [mm]	Clamping screw H	Width across flats [mm]	Tightening torque [Nm]	Maximum axial force [N]
8	M3	2.5	2	70
9	M3	2.5	2	70
11	M4	3	4.1	70
14	M5	4	9.5	70
16	M6	5	14	150
19	M6	5	14	150
24	M8	6	35	220
28	M6	5	14	220
32	M10	8	79	300
38	M10	8	79	300

8.2.2 Mounting

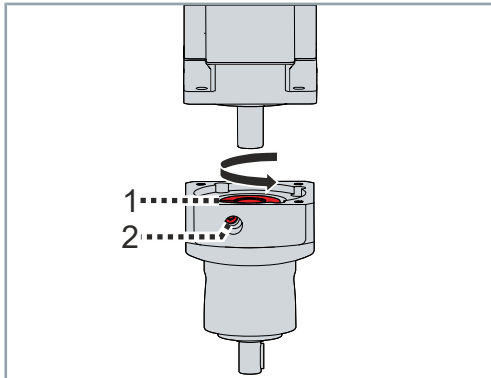
- ▶ Carefully degrease the following components with a cloth:
 - Contact surfaces with adjacent components
 - Centering and motor shaft
 - Internal diameter of the clamping hub
 - Spacer sleeve inside and outside

In case of motor with feather key [+]

- ▶ Remove feather key [+] and insert half wedge



- ▶ Remove the plug [1] from the adapter plate [2]



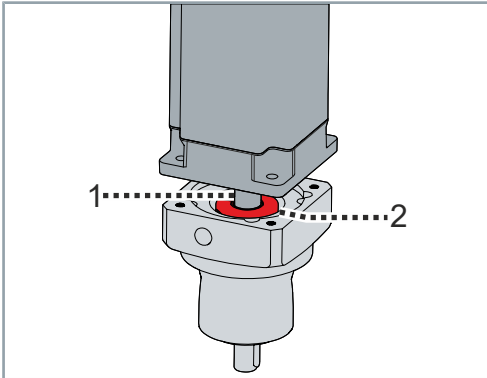
- ▶ Turn the clamping hub [1] until the screw [2] can be seen above the mounting hole
- ▶ Loosen the screw [2] by one turn



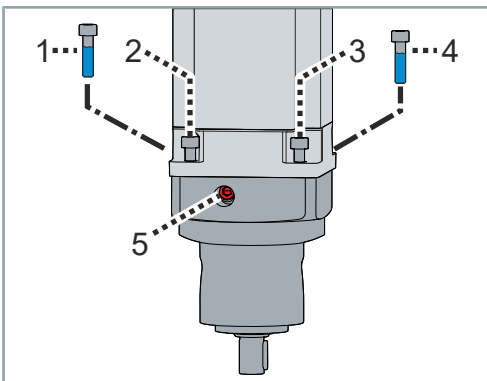
Do not exceed the permissible axial forces

If the motor shaft cannot be inserted easily, the screw on the clamping hub must be loosened a little more.

With certain motor shaft diameters, a slotted spacer sleeve must be installed in addition. If there is a groove on the motor shaft, it must be aligned with the slot in the spacer sleeve.



- Insert the motor shaft [1] into the clamping hub [2]
- Make sure that no gap is created between the motor and the adapter plate



This example shows a motor size with four fixing points in the flange.

- Coat screws [1], [2], [3] and [4] with threadlocker
- Insert bolts [1], [2], [3] and [4] and tighten evenly
- Tighten bolt [5]. Refer to the chapter "Clamping hub", [Page 50].
- Insert the plug in the adapter plate again

8.3 Gear unit to machine



No washers necessary

Beckhoff recommends not using washers if the material of the screw contact surface has an adequate interface pressure.

8.3.1 Output side

NOTICE

Avoid damage due to stresses

Use suitable tools for the assembly. Mount gear wheels and toothed belt pulleys without force on the output shaft and avoid mounting by driving or hammering on.

The gear unit can be damaged if stress occurs during mounting.

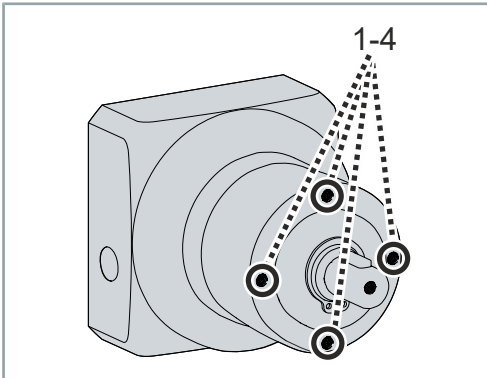
- ▶ Seal any gap over a wide area when attaching to the output side
- ▶ Make sure that the surfaces of the attached parts have a low roughness
- ▶ Use only screw head seals and o-rings for sealing

8.3.1.1 Permissible axial forces

The following table shows the maximum permissible static axial forces. The permitted forces refer to the center of the shaft:

Gear unit	005	015	025	035	045
Fa max [N]	1800	4300	5100	11300	18500

8.3.2 Mounting



Tightening torques

- ▶ Carefully degrease the following components with a cloth:
 - Contact surfaces with adjacent components
 - Output shaft and centering

There are four threaded holes [1] to [4] in the gear unit housing for the bolted connection with your machine

- ▶ Coat suitable screws with threadlocker
- ▶ Fasten the gear unit to the machine by screwing the correct bolts into the threaded holes [1] to [4]
- ▶ Make sure that the surface of the machine has a low roughness
- ▶ Attach the gear unit such that the plug screw faces downward and the name plate is readable

In the following you will find supplementary information regarding the attachment of the gear unit to a machine:

Quality of the bolts = strength class 12.9			
Gear unit	Pitch circle diameter	Thread	Tightening torque
005	44 mm	M4	4.55 Nm
015	62 mm	M5	9.0 Nm
025	80 mm	M6	15.4 Nm
035	108 mm	M8	37.5 Nm
045	140 mm	M10	73.5 Nm

9 Commissioning

NOTICE

Avoid overloading

Motors and gear units often have different operating areas. With higher transmission ratios the gear unit may be overloaded due to multiplication of the motor torque. In this case, the nominal motor torque and/or the peak motor torque must be limited.

Failure to limit this can result in overloading and damage to the gear unit.



Observe the operating instructions for the motors

For commissioning, read the original operating instructions for the motors used and follow the steps according to the chapter: "Commissioning".

Commissioning example

The procedure for commissioning is described as an example. A different method may be appropriate or necessary, depending on the application of the components.



Example:

Limitation of rated motor current and peak motor current.

Calculation based on the rated motor current:

Standstill torque M_0 of the motor: 1 Nm

Nominal torque T_{2N} of the gear unit: 8 Nm

Output torque of the gear unit with a transmission ratio i of 10:

1 Nm x 10 = **10 Nm**

Result: The rated motor current must be limited to 80%.

Calculation based on the peak motor current:

Standstill torque M_{pmax} of the motor: 5 Nm

Maximum acceleration torque T_{2B} of the gearbox: 20 Nm

Output torque of the gear unit with a transmission ratio i of 10:

5 Nm x 10 = **50 Nm**

Result: The peak motor current must be limited to 40%.

Relevant parameters

Servo drive	Rated current	Peak current
AX5000	P-0-0093 "Configured channel current"	P-0-0092 "Configured channel peak current"
AX8000	"Configured channel rated current"	"Configured channel peak current"
Servo terminal	0x7010:0B "Torque limitation"	0x2003:11 "Max current"

9.1 Before operation

Checklist that helps to check important points before starting the operation:

- Inspect the gear unit for damage
- Check mounting and alignment
- Tighten screw connections correctly
- Installing mechanical, thermal and electrical protective devices

9.2 During operation

Checklist that helps to check important points during operation:

- Check function and adjustment of attachments
- Observe information for environment and operation
- Check protective measures against moving and live parts
- Pay attention to unusual noise developments
- Always check gear unit surfaces and lines for dirt, leakages, moisture or dust
- Check temperature development
- Check for lubricant leakage
- Observe recommended maintenance intervals
- Check function of safety devices

10 Maintenance and cleaning

⚠ WARNING

Shut down and secure the machine or plant

Make sure that the machine or plant is shut down and secured against accidental start-up.

Failure to observe may result in components moving in the machine or plant. Rotating or moving components can lead to serious injuries.

NOTICE

Do not immerse or hose down the gear unit

Wipe the gear unit only with cleaning agent and a cloth.

Due to impermissible solutions, cleaning by immersion can lead to damage to the surface and the gear unit as well as to leak-tightness problems.

Contamination, dust or chips can have a negative effect on the function of the components. In the worst case, contamination can lead to failure. Therefore, clean and service the components at regular intervals.

10.1 Cleaning agents

Clean the components carefully with a damp cloth or a brush.

Use grease-dissolving and non-aggressive cleaning agents such as isopropanol for cleaning. You will also receive information about non-approved cleaning agents.

10.1.1 Not applicable

Cleaning agents	Chemical formula
Aniline hydrochloride	$\text{C}_6\text{H}_5\text{NH}_2\text{HCl}$
Bromine	Br_2
Sodium hypochlorite; bleaching solution	NaClO
Mercury (II) chloride	HgCl_2
Hydrochloric acid	HCl

10.2 Intervals

Under nominal conditions, the motor components have different operating hours. We have provided you with a list of maintenance work and intervals for the associated components below:

Component	Interval	Maintenance
Gear unit	During commissioning Thereafter: Every three months	Check gear unit for external damage and leaks Check drive shaft and output shaft for foreign media such as oil and dirt Check gear unit for corrosion
Clamping screw Motor attachment	During commissioning Thereafter: Every three months	Check tightening torques
Fastening screw Gear unit housing	During commissioning Thereafter: Every three months	Check tightening torques

10.2.1 Lubrication

NOTICE

Notes on lubrication

Beckhoff gear units from the AG3210 series are lubricated for life. The lubricant used does not have to be renewed.

If you wish to change the lubricant, contact Beckhoff Service.

All gear units are lubricated for life in the factory with a synthetic polyglycol gear oil or with a high-performance grease.

Refer to the name plate for detailed information on lubrication. All bearings are lubricated for life at the factory.

Further information on the lubricants can be obtained directly from the manufacturer.

11 Fault correction

The following table describes a selection of faults. Depending on the application, other causes may be responsible for the malfunction.

Error	Possible cause	Remedy
Increased operating temperature	Gear unit unsuitable for the application	Check the technical data
	Heating up by the motor	Check the motor wiring
		Ensure sufficient cooling
		Replace the motor
	Ambient temperature too high	Ensure sufficient cooling
Increased operating noises	Distorted motor mounting	Contact Beckhoff Service
	Damage to the bearings	
	Damage to the toothing	
	Toothed belt tension too high	Check and correct toothed belt tension
Lubricant loss	Lubricant quantity too high	Wipe off lubricant, refill and monitor the gear unit
	Gear unit leaking	Contact Beckhoff Service
Loose screws	Tightening torque too low	Retighten the screws

12 Decommissioning

Disassembly may only be carried out by qualified and trained technical personnel. For more information please refer to Chapter: Documentation notes.

When disposing of electronic waste, make sure that you dispose of it in accordance with the regulations applicable in your country. Read and follow the instructions for proper disposal.

12.1 Disassembly

WARNING

Risk of injury from leaking oil

Prevent oil from leaking. Soak up any leaked oil with approved binding agents. Mark the danger spot.

Leaking oil can cause slips and falls, resulting in serious or fatal injury.



Impermissible removal of gear unit components

Only Beckhoff Automation GmbH & Co. KG is permitted to dismantle the gear unit.

Contact Beckhoff Service for further information.

Removal of the gear unit from the machine

- Remove necessary lines and connections
- Allow the gear unit to cool down
- Loosen and remove the gear unit screws
- Transport the gear unit to the workplace or put it into storage

12.2 Disposal

Depending on your application and the products used, ensure the professional disposal of the respective components:

Cast iron and metal

Dispose of cast and metal parts as scrap metal for recycling.

Cardboard, wood and foam polystyrene

Dispose of packaging materials made of cardboard, wood or foam polystyrene in accordance with the regulations.

Plastics and hard plastics

You can recycle parts made of plastic and hard plastic via the recycling depot or re-use them depending on the component designations and markings.

Oils and lubricants

Dispose of oils and lubricants in separate containers. Hand over the containers at the used oil collection station.

Batteries and rechargeable batteries

Batteries and rechargeable batteries may also be marked with the crossed-out trash can symbol. You must separate these components from the waste and are legally obliged to return used batteries and rechargeable batteries within the EU. Observe the relevant provisions outside the area of validity of the EU Directive 2006/66/EC.



Electronic components

Products marked with a crossed-out waste bin must not be disposed of with general waste. Electronic components and device are considered as waste electrical and electronic equipment for disposal. Observe the national regulations for the disposal of old electrical and electronic equipment.

13 Guidelines and Standards

Test procedures and certifications vary by product. Beckhoff products are certified and tested according to the following directives and standards.

13.1 EU conformity

**Provision**

Beckhoff Automation GmbH & Co KG will be pleased to provide you with EU declarations of conformity and manufacturer's declarations for all products on request.

Send your request to: info@beckhoff.com

13.2 RoHS

All homogeneous materials used in the gear unit fall below the prescribed limit values of Directive 2011/65/EU Annex II. The following table contains an overview of the proportional quantities of harmful substances:

Material	Percentage
Lead	0.1%
Mercury	0.1%
Cadmium	0.01%
Hexavalent chromium	0.1%
Polybrominated biphenyls; PBB	0.1%
Polybrominated diphenyl ethers; PBDE	0.1%

Installation of the gear unit as a machine component therefore does not affect the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Index

A

Anzugsdrehmomente	
Edelstahlschrauben in Aluminium	49
Edelstahlschrauben in Stahl	49
Getriebemontage	49
Klemmnabe	51

B

Bestelloptionen	19
Bestimmungsgemäße Verwendung	20
Betriebsbedingungen	23

C

Cleaning	58
----------	----

D

Declaration of conformity	63
Dimensional drawings	21
Disposal	62

G

Gear unit	
Dismantling	61
Disposal	62
Mounting	54
Getriebe	
In Betrieb nehmen	56
Lagern	44

I

Installation position	47
Instruction	9

L

Lagerung	44
Leistungsreduzierung (Derating)	21
Lieferumfang	43
Lubrication	59

M

Maintenance	58
Merkmale	18
Motor	
Montieren	50

O

Ordering options	
Feather key	19
Output elements	
Mounting	54

P

Pictograms	9
------------	---

R

Reinigung	
Reinigungsmittel	58
RoHS	
Proportional quantities of harmful substances	64

S

Safety	13
De-energized and voltage-free condition	14
Hot surfaces	14
Keep the environment clean	13
Moving or rotating components	14
Overheating	14
Protective equipment	13
Secure feather key	13
Shut down and secure the machine or plant	13
Solvents and lubricants	14
Tightening torques	13
Use original packaging	13
Security	13
General safety instructions	13
Sicherheit	
Bestimmungsgemäße Verwendung	20
Signal words	9
Störungen	60
Support	11
Symbols	9

T

Target group	8
Technical data	21
Tightening torques	
Mounting the gear unit	48
Transport	44
Typenschild	16

U

Umgebungsbedingungen	23
----------------------	----

W

Wartung	
Intervallen	59

Trademark statements

Beckhoff®, TwinCAT®, TwinCAT/BSD®, TC/BSD®, EtherCAT®, EtherCAT G®, EtherCAT G10®, EtherCAT P®, Safety over EtherCAT®, TwinSAFE®, XFC®, XTS® and XPlanar® are registered trademarks of and licensed by Beckhoff Automation GmbH.

More Information:
www.beckhoff.com/ag3210

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20
33415 Verl
Germany
Phone: +49 5246 9630
info@beckhoff.com
www.beckhoff.com

