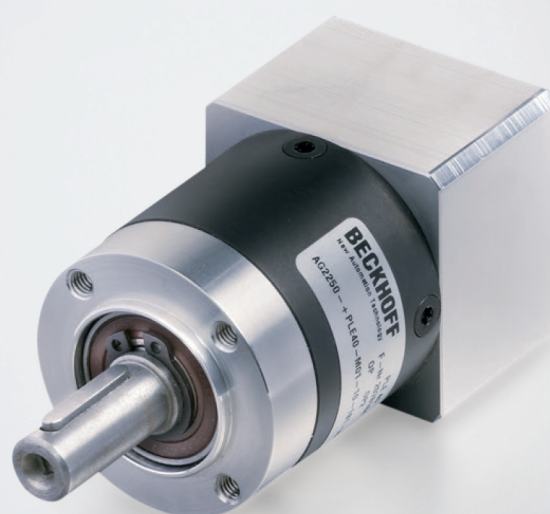
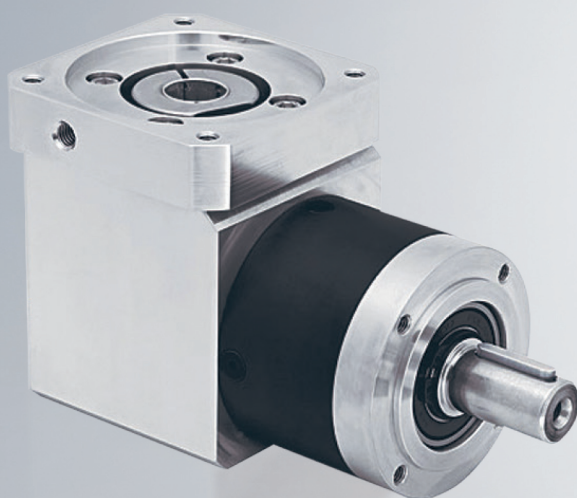


Operating instructions | EN

AG2250

Planetary gear unit



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The EtherCAT technology is protected by patent rights through the following registrations and patents with corresponding applications and registrations in various other countries:

- EP1590927
- EP1789857
- EP1456722
- EP2137893
- DE102015105702



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All components in this product as described in the operating instructions are delivered in a specific configuration of hardware and software, depending on the application regulations. 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.

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- Improper use
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- Use of unauthorized spare parts

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Version numbers



Provision of revision levels

On request, you can obtain a list of revision levels for changes in the operating instructions.

- Send your request to motion-documentation@beckhoff.com.

Origin of the document

These operating instructions were originally written in German. All other languages are derived from the German original.

Product features

Only the product properties specified in the current operating instructions are valid. Further information given on the product pages of the Beckhoff homepage, in emails or in other publications is not authoritative.

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.

Staff qualification

These operating instructions are intended for trained control and automation specialists with 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 operating instructions published at the respective time of each installation and commissioning is to be used. 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

Qualified electricians

Qualified electricians have comprehensive technical knowledge gained from a course of study, an apprenticeship or technical training. They have an understanding of control technology and automation. They are familiar with relevant standards and directives. Qualified 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

Safety and instruction

Read the contents that refer to the activities you have to perform with the product. Always read the chapter For your safety in the operating instructions. Observe the warnings in the chapters so that you can handle and work with the product as intended and safely.

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 observe will result in serious or fatal injuries.

WARNING

Failure to observe may result in serious or fatal injuries.

CAUTION

Failure to observe may result in minor or moderate injuries.



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

- Malfunctions of the product
- Damage to the product
- Damage to the environment



Information

This sign indicates information, tips and notes for dealing with the product or the software.



Examples

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



QR-Codes

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

You can read the QR code, for example, with the camera of your smartphone or tablet. If your camera doesn't support this function you can download a free QR code reader app for your smartphone. Use the Appstore for Apple operating systems or the Google Play Store for Android operating systems.

If you cannot read the QR code on paper, make sure that the lighting is adequate and reduce the distance between the reading device and the paper. In the case of documentation on a monitor screen, use the zoom function to enlarge the QR code and reduce the distance.


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

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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

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

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.


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Downloadfinder

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

 www.beckhoff.com/documentations

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.

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.

Before operation

Keep the immediate environment clean

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

Shut down and secure the machine or plant

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

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

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.

After operation

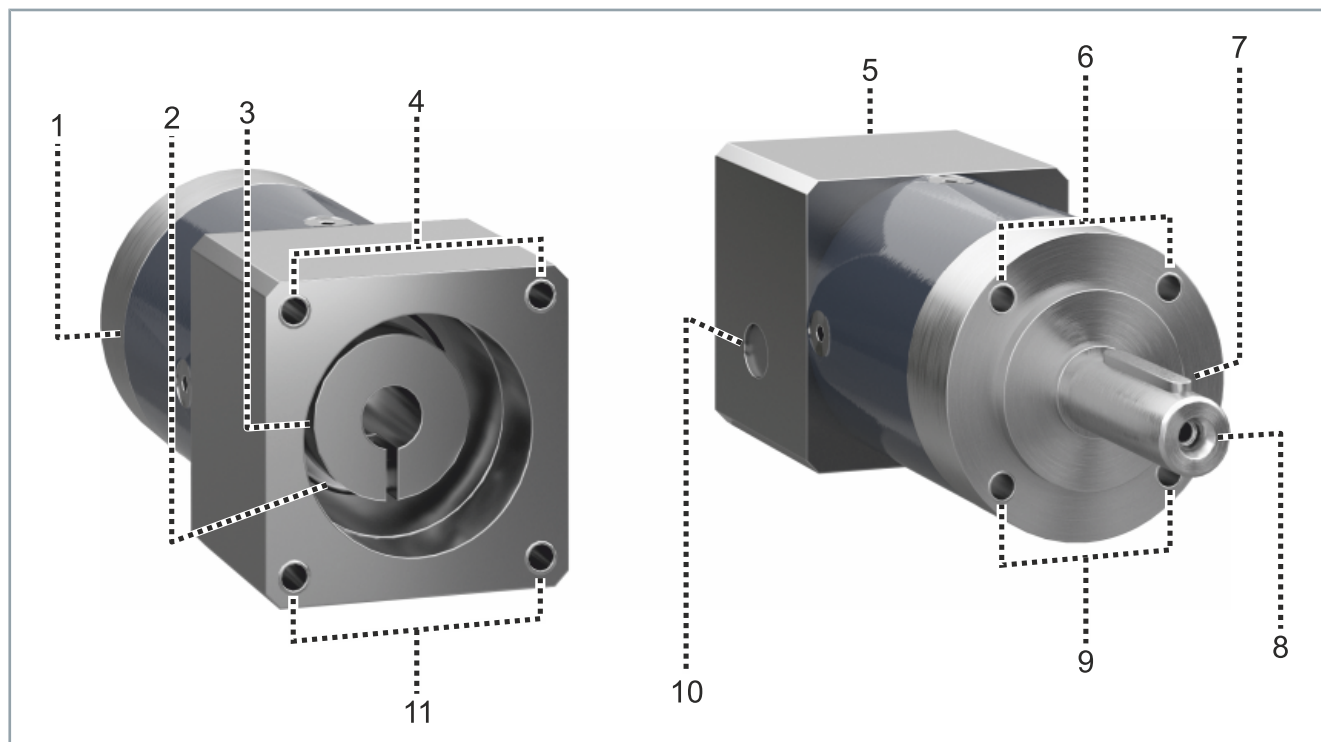
De-energize and switch off components before working on them

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

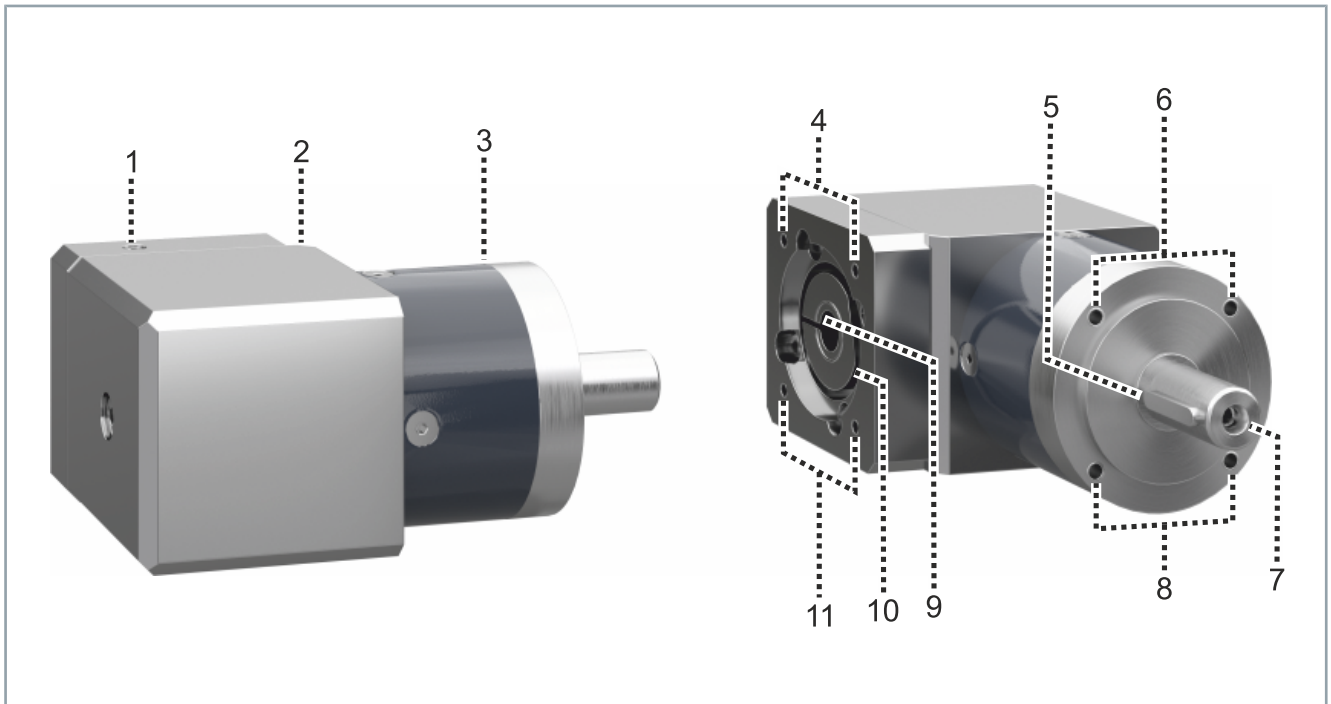
In case of improper use, the solvents or lubricants used can lead to skin irritations. Avoid direct skin contact.

Standard gear unit



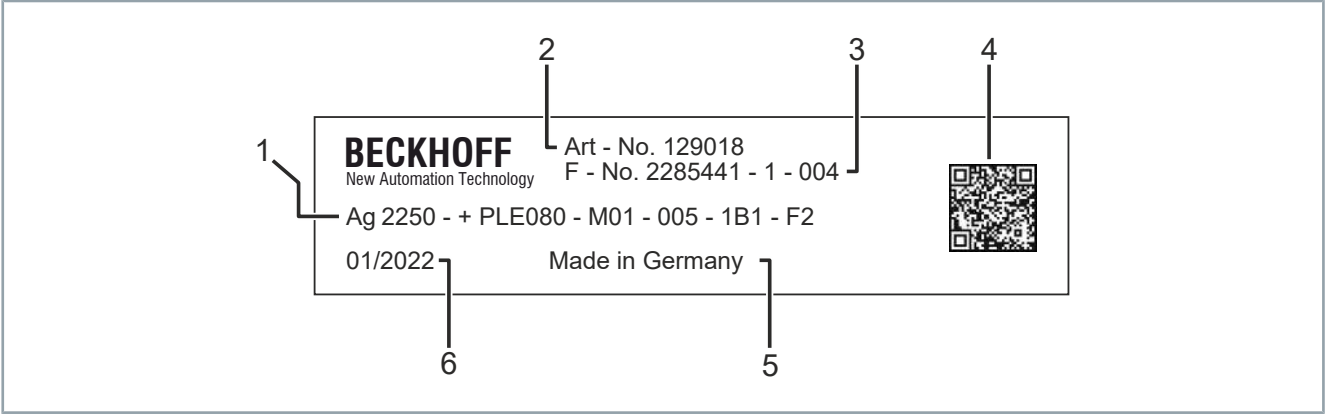
Number	Explanation
1	Gear housing
2	Clamping bolt
3	Clamping hub
4	Holes for the motor attachment
5	Adapter plate
6	Holes for the output side
7	Feather key [+]
8	Output shaft with center bore
9	Holes for the output side
10	Plug; mounting hole
11	Holes for the motor attachment

Right-angle gear unit



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

Name plate



Number	Explanation
1	Gear unit type
2	Order number
3	Serial number
4	Data Matrix Code with Beckhoff BTN
5	Country of manufacture
6	Date of manufacture

Type key

AG2250 -+ [W]PLE040 – M01 – 3 - 1C1 – F3	Explanation
AG2250	Gear unit series AG2250 = planetary gear unit PLE
[W]PLE	Gear type PLE = standard W = right-angle gear unit
040	Size 040 060 080 120 160
M	Gear unit variant M = Motor-mounted gear unit
0	Gear unit version F = Standard
1	No. of stages 1 = single stage 2 = two-stage 3 = three-stage
3	Ratio See documentation
1	Type of output 0 = smooth shaft 1 = feather key DIN 6885 form A
C	Clamping hub identifying letter Not freely selectable Selected according to the motor to be mounted
1	Torsional backlash 1 = Standard
F3	Beckhoff flange size F1 F2 F3 F4

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.

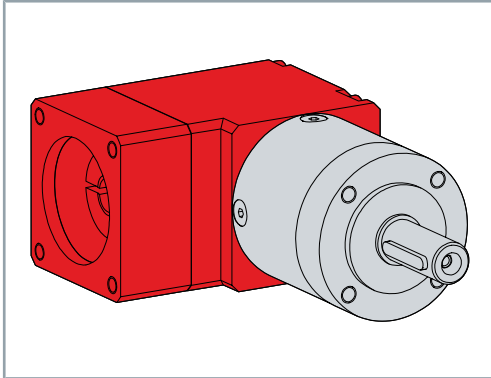
Maintenance-free ball bearings

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

Ordering options

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

Right-angle gear unit

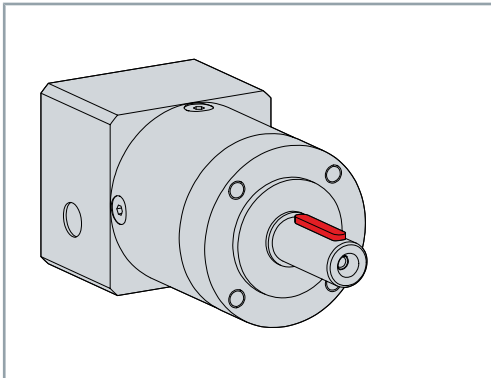


The gear units from the AG2250 series are available as a standard version "PLE" and as an angle version "WPLE".

In the case of right-angle gear units, the input shaft and output shaft are arranged in different directions to each other. The right-angle gear unit version, for example, is perfectly suited for dynamic multi-axis systems and limited installation space.

This ordering option as a right-angle gear unit is available for all gear units from the series up to size 120.

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.

Intended use

The planetary gear units and right-angle gear units from the AG2250 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

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 and right-angle gear units from the AG2250 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

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

Definitions

When attaching a gear unit, the performance may be reduced by up to 20 %. The flange of a motor serves to dissipate heat. If a gear unit is attached, heat is generated due to operation. The power derating therefore has thermal reasons.

Technical terms

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

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

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

Equivalent application torque T_{2_eq} [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 Q_g [dB/A]

The running noises are influenced, for example, by:

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

Maximum radial force F_{2RMax} [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_{2N} [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_{2Stop} [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.

Data for operation and environment



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	-25 °C to +90 °C, extended temperature range
Ambient temperature for transport and storage	-25 °C to +60 °C, maximum fluctuation 20 K/hour:
Permissible humidity in operation	15 % to 95 % relative humidity, no condensation
Permissible humidity during transport and storage	15 % to 95 % relative humidity, no condensation
Specifications for intended use	
Protection class	IP 54
Lubrication	Grease; maintenance-free
Direction of rotation	Drive side and output side in the same direction

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.

PLE040

Mechanical data	1-stage					
Ratio i	3	4	5	7	8	10
Efficiency under full load η [%]	98 to 95					
Mass moment of inertia J_1 [kgcm ²]	0.014 to 0.027					
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	58					
Weight m_G [kg]	0.35					
Service life L10h tL [h]	30000					
Torques and speeds						
Nominal output torque T_{2N} [Nm]	11	15	14	8.5	6	5
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the out- put shaft</i>	17.5	24	22	13.5	10	8
EMERGENCY STOP torque T_{2Stop} [Nm]	22.5	30	36	26	27	
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temper- ature	0.05					
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	5000					
Maximum input speed n_{1Limit} [min ⁻¹]	18000					
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	3					
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	< 15					
Maximum torsional rigidity C_{t21} [Nm/arcmin]	0.7 to 1.0					
Radial force for 20000 h $F_{r20000h}$ [N]	200					
Axial force for 20000 h $F_{a20000h}$ [N]	200					
Radial force for 30000 h $F_{r30000h}$ [N]	160					
Axial force for 30000 h $F_{a30000h}$ [N]	160					
Maximum axial force F_{aStat} [N] <i>In relation to the shaft center at the output</i>	200					
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	240					
Breakdown torque for 20000 h M_{K20000} [Nm]	5					
Breakdown torque for 30000 h M_{K30000} [Nm]	4					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing disks					

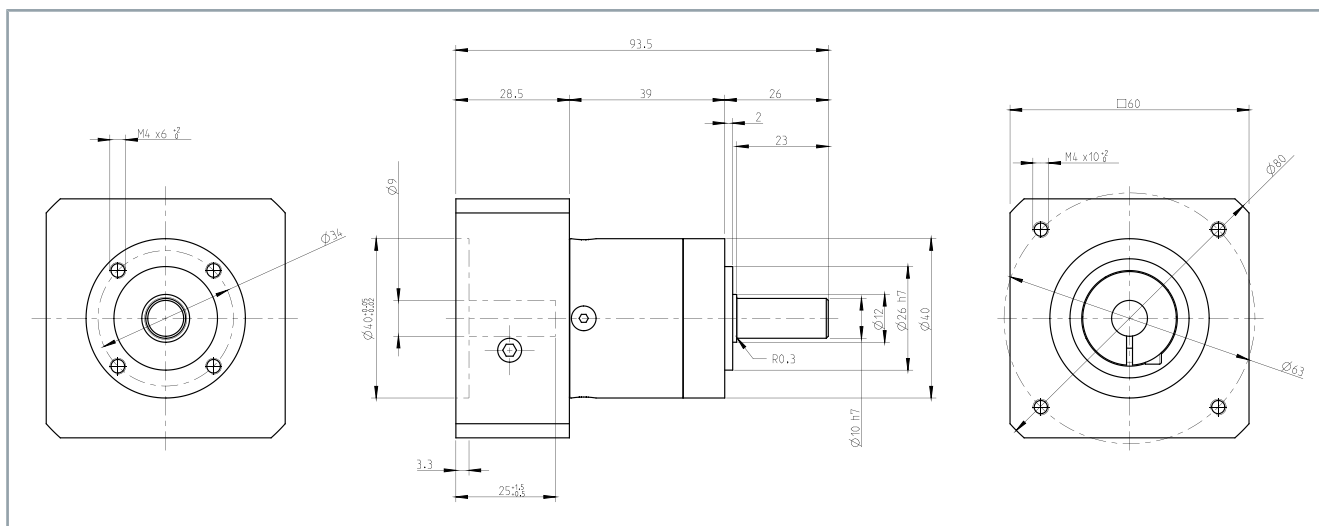
Mechanical data	2-stage									
Ratio i	9	12	15	16	20	25	32	40	64	
Efficiency under full load η [%]	97 to 86									
Mass moment of inertia J_1 [kgcm ²]	0.015 to 0.026									
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	58									
Weight m_G [kg]	0.45									
Service life L10h tL [h]	30000									
Torques and speeds										
Nominal output torque T_{2N} [Nm]	16.5	20	18	20	20	18	20	18	7.5	
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	26	32	29	32	32	29	32	29	12	
EMERGENCY STOP torque T_{2Stop} [Nm]	33	40	36	40	40	36	40	36	27	
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temperature	0.05									
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	5000									
Maximum input speed n_{1Limit} [min ⁻¹]	18000									
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	3									
Torsion and forces										
Maximum torsional backlash j_t [arcmin]	< 19									
Maximum torsional rigidity C_{t21} [Nm/arcmin]	0.8 to 1.0									
Radial force for 20000 h $F_{r20000h}$ [N]	200									
Axial force for 20000 h $F_{a20000h}$ [N]	200									
Radial force for 30000 h $F_{r30000h}$ [N]	160									
Axial force for 30000 h $F_{a30000h}$ [N]	160									
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	200									
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	240									
Breakdown torque for 20000 h M_{K20000} [Nm]	5									
Breakdown torque for 30000 h M_{K30000} [Nm]	4									
Housing										
Properties	Heat-treated steel									
Color	Anthracite gray; RAL 7016									
Seal	Sealed bearing disks									

Mechanical data	3-stage								
Ratio i	60	80	100	120	160	200	256	320	512
Efficiency under full load η [%]	92 to 48								
Mass moment of inertia J_1 [kgcm ²]	0.015 to 0.025								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	58								
Weight m_G [kg]	0.55								
Service life L10h tL [h]	30000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	20	20	20	18	20	18	20	18	7.5
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	32	32	32	29	32	29	32	29	12
EMERGENCY STOP torque T_{2Stop} [Nm]	40	40	40	36	40	36	40	36	27
Idling torque At $n_1 = 3000 \text{ rpm}$ and 20°C gearbox temperature	0.05								
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	5000								
Maximum input speed n_{1Limit} [min ⁻¹]	18000								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	3								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 22								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	0.8 to 1.0								
Radial force for 20000 h $F_{r20000h}$ [N]	200								
Axial force for 20000 h $F_{a20000h}$ [N]	200								
Radial force for 30000 h $F_{r30000h}$ [N]	160								
Axial force for 30000 h $F_{a30000h}$ [N]	160								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	200								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	240								
Breakdown torque for 20000 h M_{K20000} [Nm]	5								
Breakdown torque for 30000 h M_{K30000} [Nm]	4								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

Dimensional drawing

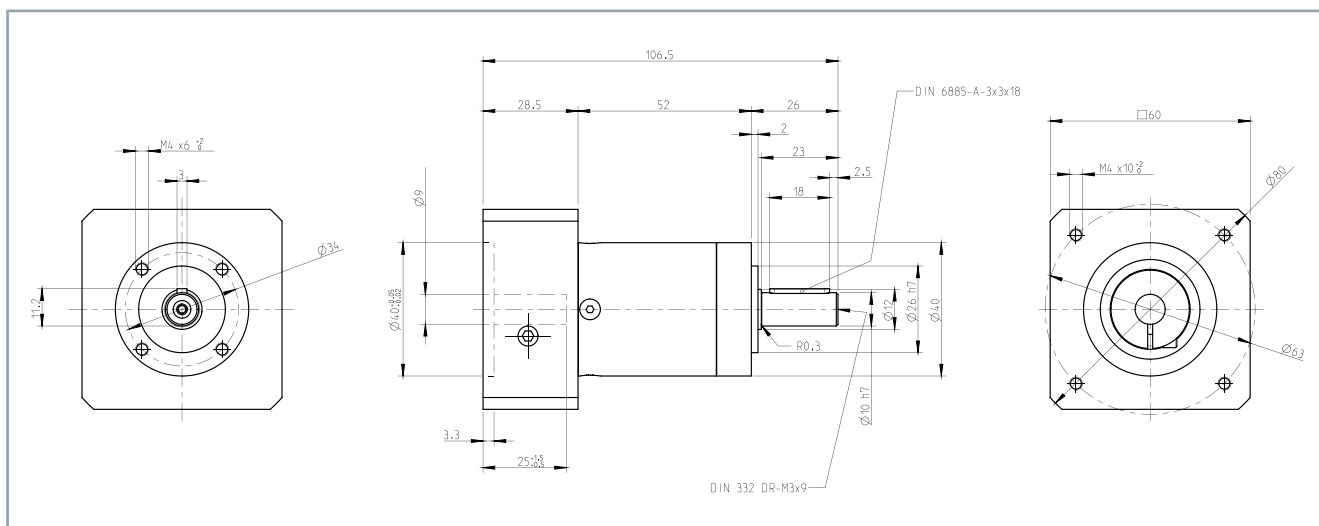
1-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M3x9
- Feather key according to DIN 6885-A 3x3x18
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



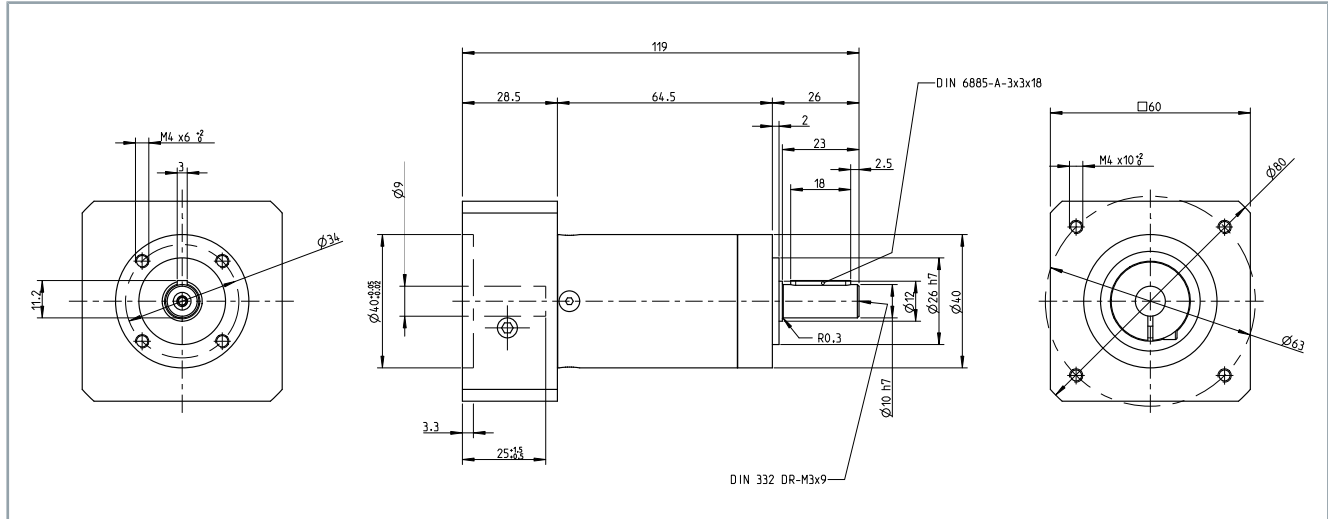
2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M3x9
- Feather key according to DIN 6885-A 3x3x18
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



3-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M3x9
- Feather key according to DIN 6885-A 3x3x18
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



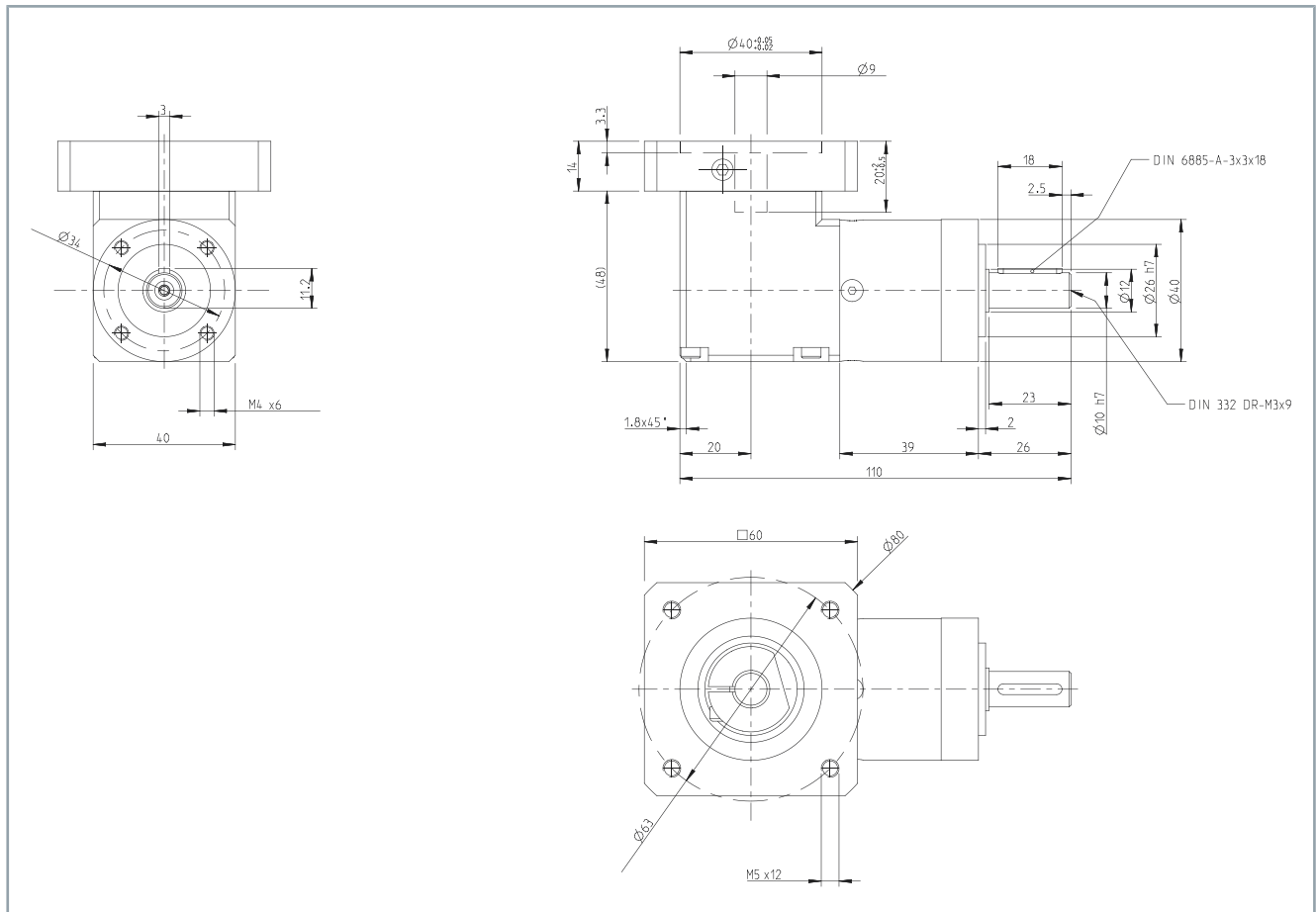
WPLE040

Mechanical data	1-stage					
Ratio i	3	4	5	7	8	10
Efficiency under full load η [%]	94 to 90					
Mass moment of inertia J_1 [kgcm ²]	0.032 to 0.049					
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	68					
Weight m_G [kg]	0.5					
Service life L10h tL [h]	20000					
Service life at $T_{2N} \times 0.88$	30000					
Torques and speeds						
Nominal output torque T_{2N} [Nm]	4.5	6	7.5	8.5	6	5
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the out- put shaft</i>	7	10	12	13.5	10	8
EMERGENCY STOP torque T_{2Stop} [Nm]	22.5	28	35	26	27	25
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temper- ature	0.05					
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	5000					
Maximum input speed n_{1Limit} [min ⁻¹]	18000					
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	2					
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	< 21					
Maximum torsional rigidity C_{t21} [Nm/arcmin]	0.5 to 0.8					
Radial force for 20000 h $F_{r20000h}$ [N]	200					
Axial force for 20000 h $F_{a20000h}$ [N]	200					
Radial force for 30000 h $F_{r30000h}$ [N]	160					
Axial force for 30000 h $F_{a30000h}$ [N]	160					
Maximum axial force F_{aStat} [N] <i>In relation to the shaft center at the output</i>	200					
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	240					
Breakdown torque for 20000 h M_{K20000} [Nm]	5					
Breakdown torque for 30000 h M_{K30000} [Nm]	4					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing disks					

Mechanical data	2-stage								
Ratio i	9	12	15	16	20	25	32	40	64
Efficiency under full load η [%]	94 to 75								
Mass moment of inertia J_1 [kgcm ²]	0.032 to 0.048								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	68								
Weight m_G [kg]	0.6								
Service life L10h tL [h]	20000								
Service life at $T_{2N} \times 0.88$	30000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	16.5	20	18	20	20	18	20	18	7.5
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	26	32	29	32	32	29	32	29	12
EMERGENCY STOP torque T_{2Stop} [Nm]	33	40	36	40	40	36	40	36	27
Idling torque At $n_1 = 3000 \text{ rpm}$ and 20°C gearbox temperature	0.05								
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	5000								
Maximum input speed n_{1Limit} [min ⁻¹]	18000								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	2								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 25								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	0.7 to 1								
Radial force for 20000 h $F_{r20000h}$ [N]	200								
Axial force for 20000 h $F_{a20000h}$ [N]	200								
Radial force for 30000 h $F_{r30000h}$ [N]	160								
Axial force for 30000 h $F_{a30000h}$ [N]	160								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	200								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	240								
Breakdown torque for 20000 h M_{K20000} [Nm]	5								
Breakdown torque for 30000 h M_{K30000} [Nm]	4								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

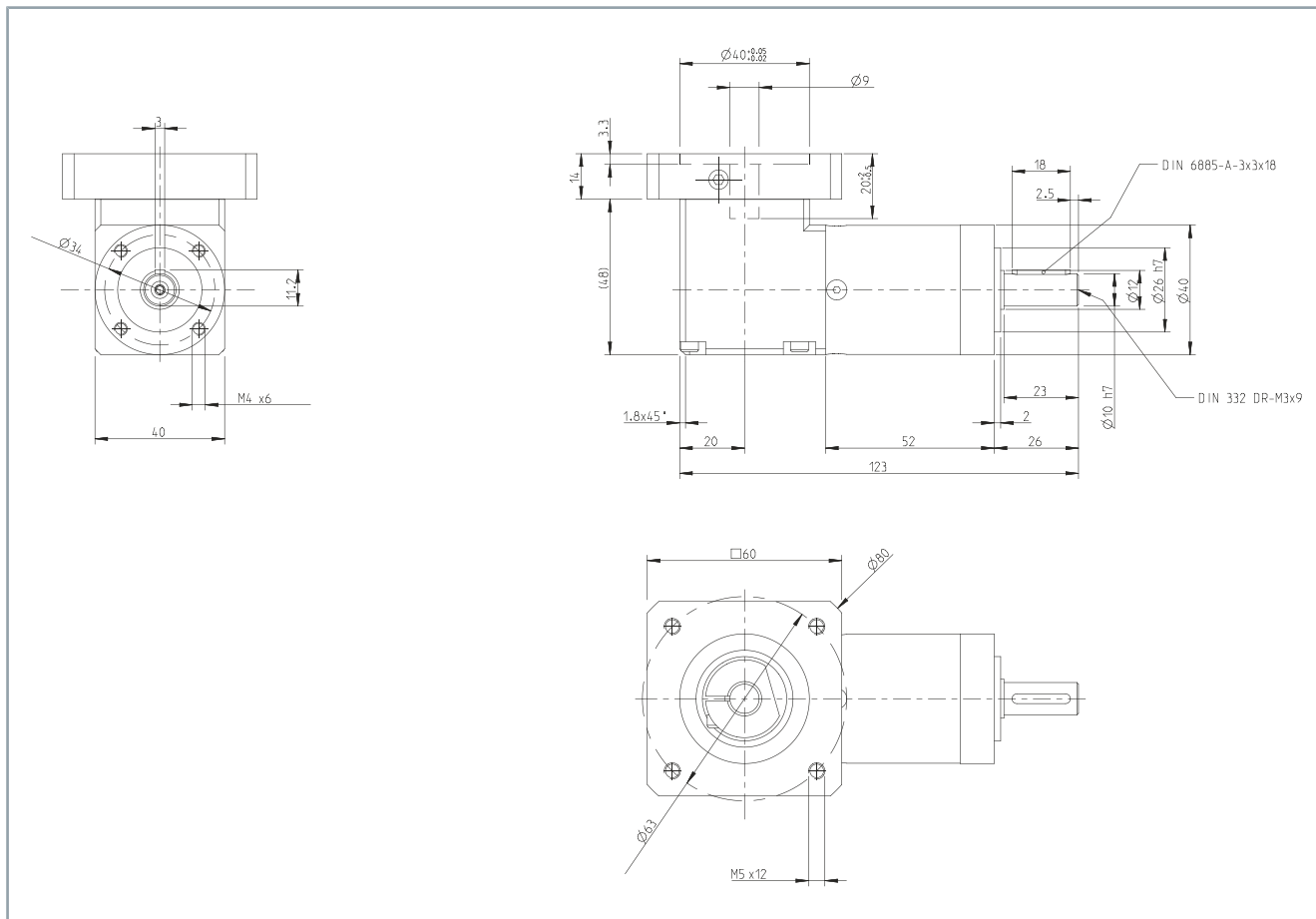
Mechanical data	3-stage								
Ratio i	60	80	100	120	160	200	256	320	512
Efficiency under full load η [%]	86 to 31								
Mass moment of inertia J_1 [kgcm ²]	0.032 to 0.047								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	68								
Weight m_G [kg]	0.7								
Service life L10h tL [h]	20000								
Service life at $T_{2N} \times 0.88$	30000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	20	20	20	18	20	18	20	18	7.5
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	32	32	32	29	32	29	32	29	12
EMERGENCY STOP torque T_{2Stop} [Nm]	40	40	40	36	40	36	40	36	27
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temperature	0.05								
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	5000								
Maximum input speed n_{1Limit} [min ⁻¹]	18000								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	2								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 28								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	0.8 to 1.0								
Radial force for 20000 h $F_{r20000h}$ [N]	200								
Axial force for 20000 h $F_{a20000h}$ [N]	200								
Radial force for 30000 h $F_{r30000h}$ [N]	160								
Axial force for 30000 h $F_{a30000h}$ [N]	160								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	200								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	240								
Breakdown torque for 20000 h M_{K20000} [Nm]	5								
Breakdown torque for 30000 h M_{K30000} [Nm]	4								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M3x9
- Feather key according to DIN 6885-A 3x3x18
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



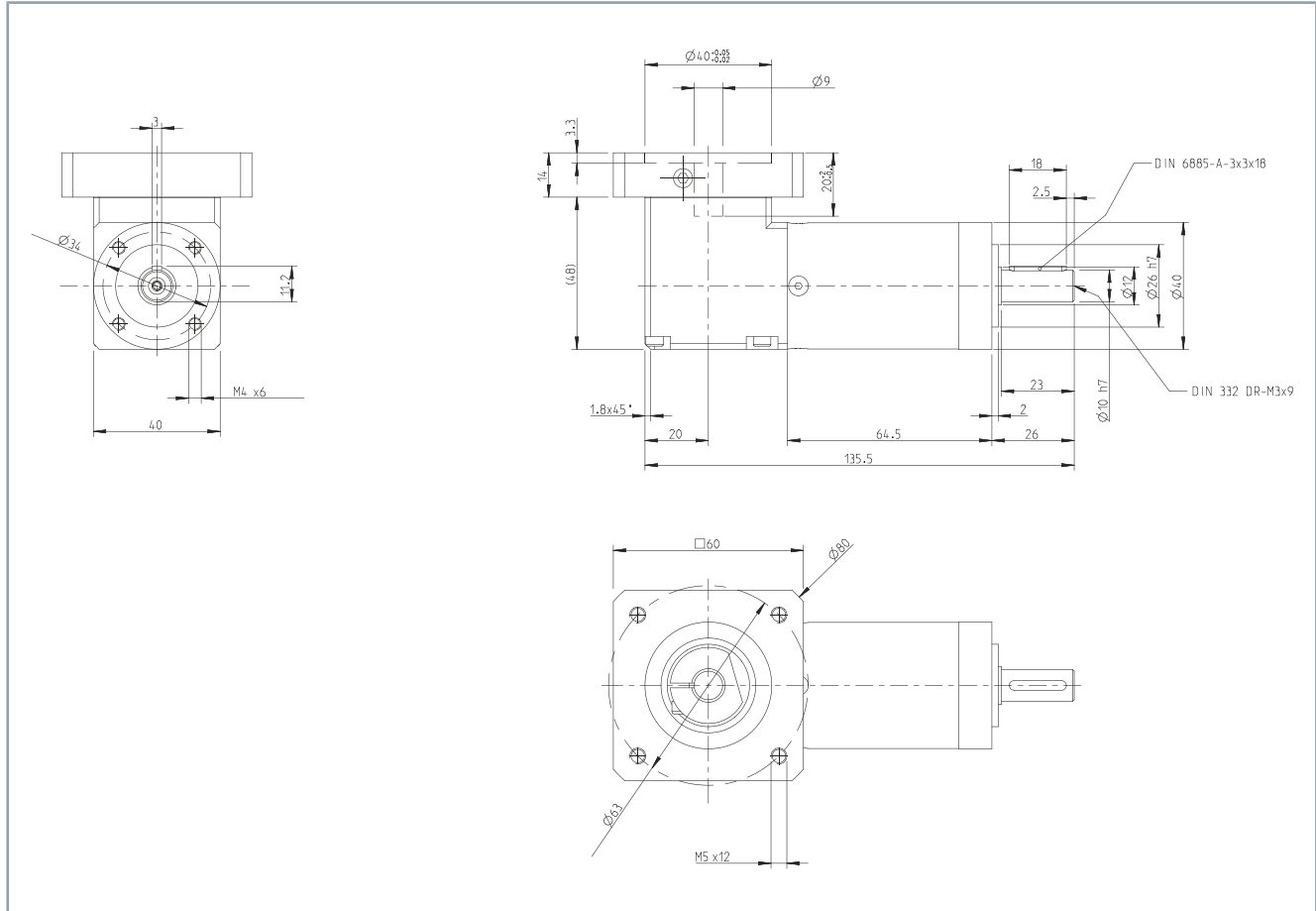
2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M3x9
- Feather key according to DIN 6885-A 3x3x18
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



3-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M3x9
- Feather key according to DIN 6885-A 3x3x18
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



PLE060

Mechanical data	1-stage					
Ratio i	3	4	5	7	8	10
Efficiency under full load η [%]	98 to 96					
Mass moment of inertia J_1 [kgcm ²]	0.065 to 0.128					
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	58					
Weight m_G [kg]	0.9					
Service life L10h tL [h]	30000					
Torques and speeds						
Nominal output torque T_{2N} [Nm]	28	38	40	25	18	15
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the out- put shaft</i>	45	61	64	40	29	24
EMERGENCY STOP torque T_{2Stop} [Nm]	66	88	80	80	80	80
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temper- ature	0.15	0.1				
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	4500					
Maximum input speed n_{1Limit} [min ⁻¹]	13000					
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	8					
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	< 10					
Maximum torsional rigidity C_{t21} [Nm/arcmin]	2.1 to 2.8					
Radial force for 20000 h $F_{r20000h}$ [N]	400					
Axial force for 20000 h $F_{a20000h}$ [N]	500					
Radial force for 30000 h $F_{r30000h}$ [N]	340					
Axial force for 30000 h $F_{a30000h}$ [N]	450					
Maximum axial force F_{aStat} [N] <i>In relation to the shaft center at the output</i>	700					
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	800					
Breakdown torque for 20000 h M_{K20000} [Nm]	14					
Breakdown torque for 30000 h M_{K30000} [Nm]	12					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing disks					

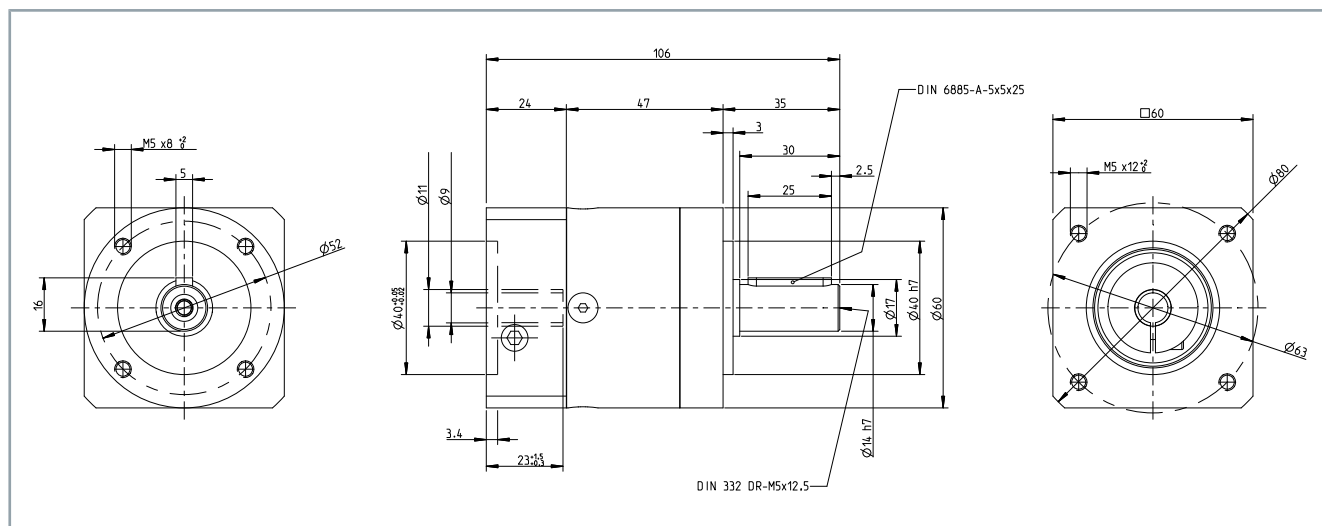
Mechanical data	2-stage								
Ratio i	9	12	15	16	20	25	32	40	64
Efficiency under full load η [%]	97 to 87								
Mass moment of inertia J_1 [kgcm ²]	0.066 to 0.121								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	58								
Weight m_G [kg]	1.1								
Service life L10h tL [h]	30000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	44	44	44	44	44	40	44	40	18
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	70	70	70	70	70	64	70	64	29
EMERGENCY STOP torque T_{2Stop} [Nm]	88	88	88	88	88	80	88	80	80
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temperature	0.1								
Mean thermal input speed n_{1N} [min ⁻¹] <i>at T_{2N} & S1</i>	4500								
Maximum input speed n_{1Limit} [min ⁻¹]	13000								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	8								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 12								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	2.3 to 2.8								
Radial force for 20000 h $F_{r20000h}$ [N]	400								
Axial force for 20000 h $F_{a20000h}$ [N]	500								
Radial force for 30000 h $F_{r30000h}$ [N]	340								
Axial force for 30000 h $F_{a30000h}$ [N]	450								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	700								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	800								
Breakdown torque for 20000 h M_{K20000} [Nm]	14								
Breakdown torque for 30000 h M_{K30000} [Nm]	12								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

Mechanical data	3-stage								
Ratio i	60	80	100	120	160	200	256	320	512
Efficiency under full load η [%]	92 to 51								
Mass moment of inertia J_1 [kgcm ²]	0.066 to 0.076								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	58								
Weight m_G [kg]	1.3								
Service life L10h tL [h]	30000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	44	44	44	44	44	40	44	40	18
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	70	70	70	70	70	64	70	64	29
EMERGENCY STOP torque T_{2Stop} [Nm]	88	88	88	88	88	80	88	80	80
Idling torque At $n_1 = 3000 \text{ rpm}$ and 20°C gearbox temperature	0.1								
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	4500								
Maximum input speed n_{1Limit} [min ⁻¹]	13000								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	8								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 15								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	2.3 to 2.8								
Radial force for 20000 h $F_{r20000h}$ [N]	400								
Axial force for 20000 h $F_{a20000h}$ [N]	500								
Radial force for 30000 h $F_{r30000h}$ [N]	340								
Axial force for 30000 h $F_{a30000h}$ [N]	450								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	700								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	800								
Breakdown torque for 20000 h M_{K20000} [Nm]	14								
Breakdown torque for 30000 h M_{K30000} [Nm]	12								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

Dimensional drawing

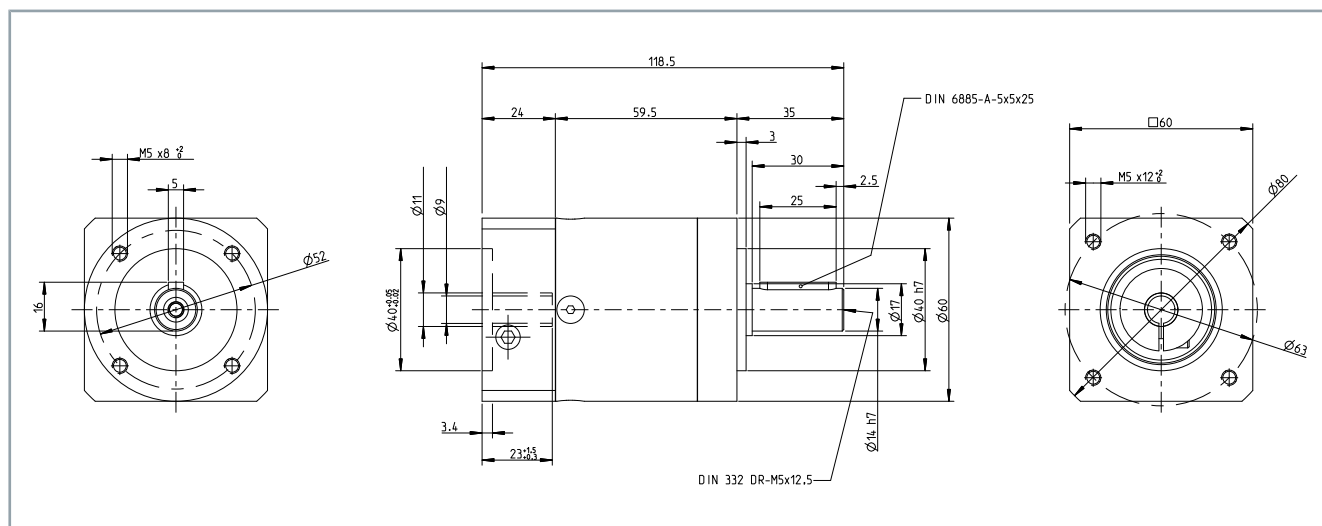
1-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M5x12.5
- Feather key according to DIN 6885-A 5x5x25
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



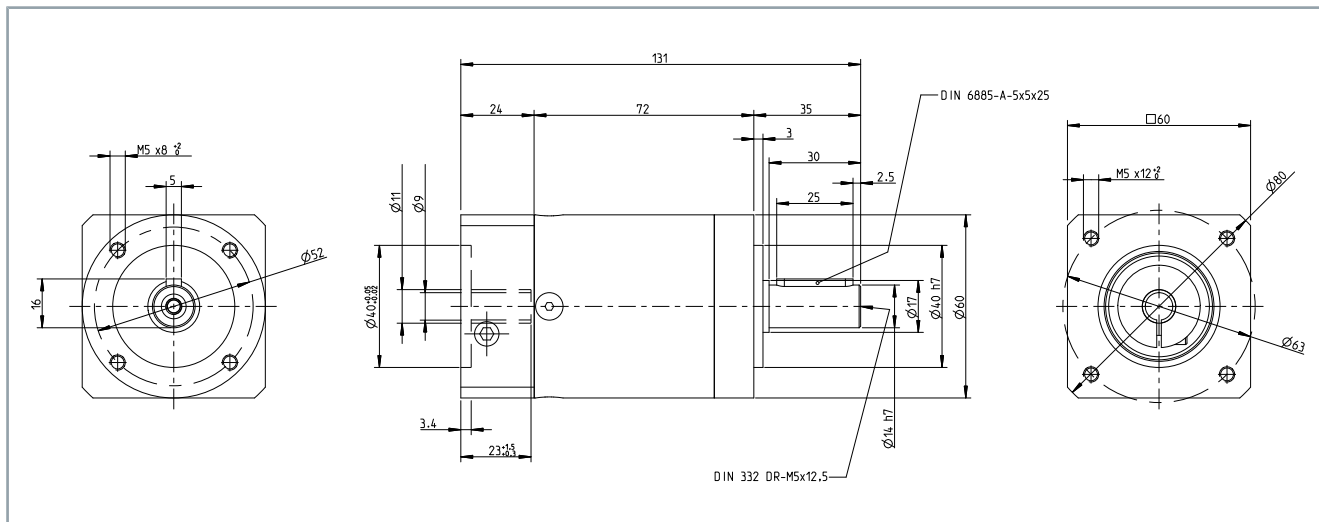
2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M5x12.5
- Feather key according to DIN 6885-A 5x5x25
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



3-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M5x12.5
- Feather key according to DIN 6885-A 5x5x25
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



WPLE060

ndoraMechanical data		1-stage					
Ratio i		3	4	5	7	8	10
Efficiency under full load η [%]		95 to 92					
Mass moment of inertia J_1 [kgcm ²]		0.221 to 0.357					
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>		70					
Weight m_G [kg]		1.7					
Service life L10h tL [h]		30000					
Service life at $T_{2N} \times 0.88$		20000					
Torques and speeds							
Nominal output torque T_{2N} [Nm]		14	19	24	25	18	15
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the out- put shaft</i>		22	30	38	40	29	24
EMERGENCY STOP torque T_{2Stop} [Nm]		66	86	80	80	80	70
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temper- ature		0.2	0.2	0.15	0.15	0.15	0.15
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>		4500					
Maximum input speed n_{1Limit} [min ⁻¹]		13000					
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>		5					
Torsion and forces							
Maximum torsional backlash j_t [arcmin]		< 16					
Maximum torsional rigidity C_{t21} [Nm/arcmin]		1.5 to 2.3					
Radial force for 20000 h $F_{r20000h}$ [N]		400					
Axial force for 20000 h $F_{a20000h}$ [N]		500					
Radial force for 30000 h $F_{r30000h}$ [N]		340					
Axial force for 30000 h $F_{a30000h}$ [N]		450					
Maximum axial force F_{aStat} [N] <i>In relation to the shaft center at the output</i>		700					
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>		800					
Breakdown torque for 20000 h M_{K20000} [Nm]		14					
Breakdown torque for 30000 h M_{K30000} [Nm]		12					
Housing							
Properties		Heat-treated steel					
Color		Anthracite gray; RAL 7016					
Seal		Sealed bearing disks					

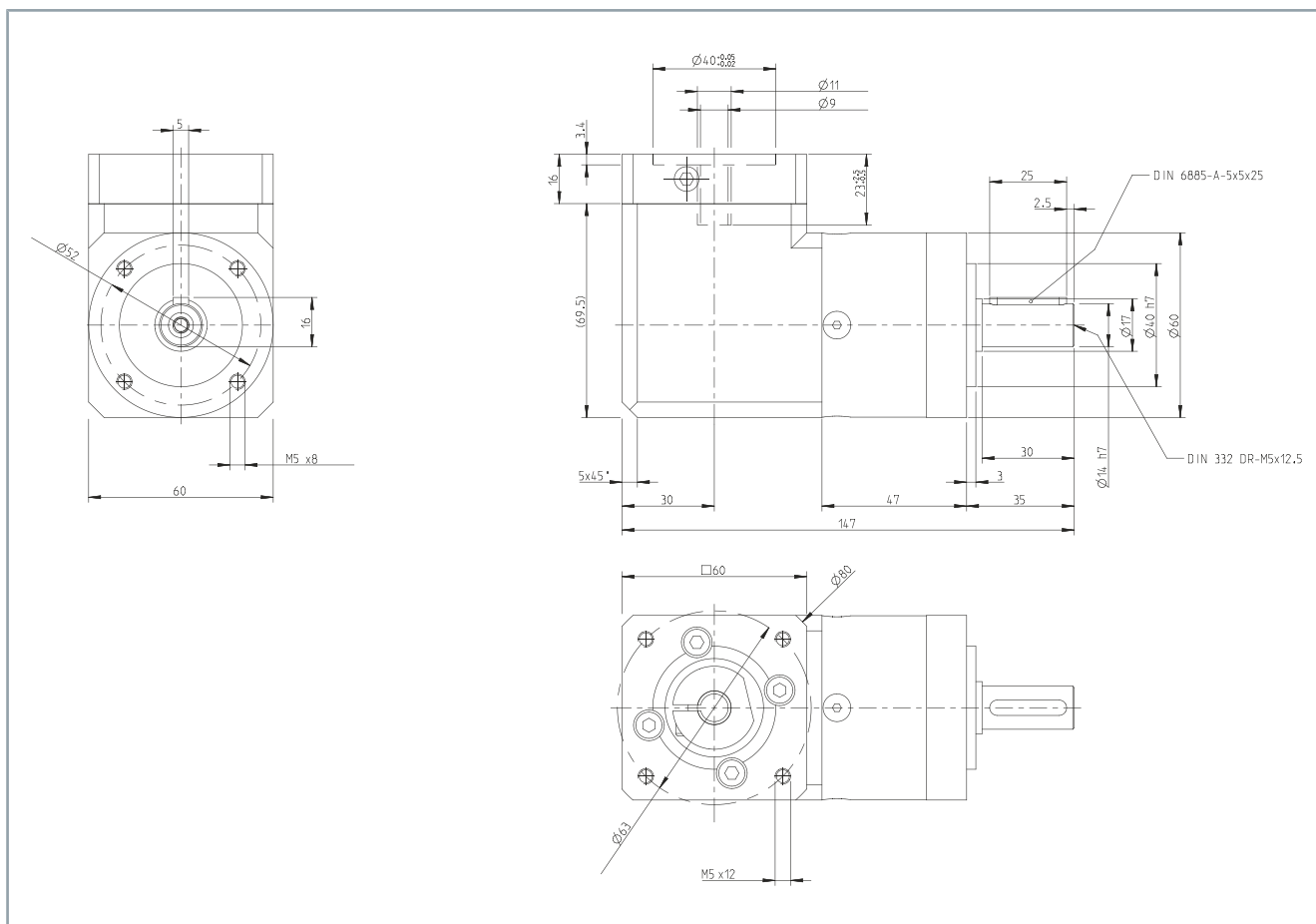
Mechanical data	2-stage									
Ratio i	9	12	15	16	20	25	32	40	64	
Efficiency under full load η [%]	94 to 77									
Mass moment of inertia J_1 [kgcm ²]	0.222 to 0.350									
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	70									
Weight m_G [kg]	1.9									
Service life L10h tL [h]	30000									
Service life at $T_{2N} \times 0.88$	20000									
Torques and speeds										
Nominal output torque T_{2N} [Nm]	44	44	44	44	44	40	44	40	18	
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	70	70	70	70	70	64	70	64	29	
EMERGENCY STOP torque T_{2Stop} [Nm]	88	88	88	88	88	80	88	80	80	
Idling torque At $n_1 = 3000 \text{ rpm}$ and 20°C gearbox temperature	0.2	0.2	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	4500									
Maximum input speed n_{1Limit} [min ⁻¹]	13000									
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	5									
Torsion and forces										
Maximum torsional backlash j_t [arcmin]	< 18									
Maximum torsional rigidity C_{t21} [Nm/arcmin]	2.2 to 2.7									
Radial force for 20000 h $F_{r20000h}$ [N]	400									
Axial force for 20000 h $F_{a20000h}$ [N]	500									
Radial force for 30000 h $F_{r30000h}$ [N]	340									
Axial force for 30000 h $F_{a30000h}$ [N]	450									
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	700									
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	800									
Breakdown torque for 20000 h M_{K20000} [Nm]	14									
Breakdown torque for 30000 h M_{K30000} [Nm]	12									
Housing										
Properties	Heat-treated steel									
Color	Anthracite gray; RAL 7016									
Seal	Sealed bearing disks									

Mechanical data	3-stage								
Ratio i	60	80	100	120	160	200	256	320	512
Efficiency under full load η [%]	86 to 33								
Mass moment of inertia J_1 [kgcm ²]	0.222 to 0.232								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	70								
Weight m_G [kg]	2.1								
Service life L10h tL [h]	30000								
Service life at $T_{2N} \times 0.88$	20000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	44	44	44	44	44	40	44	40	18
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	70	70	70	70	70	64	70	64	29
EMERGENCY STOP torque T_{2Stop} [Nm]	88	88	88	88	88	80	88	80	80
Idling torque At $n_1 = 3000 \text{ rpm}$ and 20°C gearbox temperature	0.15								
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	4500								
Maximum input speed n_{1Limit} [min ⁻¹]	13000								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	5								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 21								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	2.2 to 2.7								
Radial force for 20000 h $F_{r20000h}$ [N]	400								
Axial force for 20000 h $F_{a20000h}$ [N]	500								
Radial force for 30000 h $F_{r30000h}$ [N]	340								
Axial force for 30000 h $F_{a30000h}$ [N]	450								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	700								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	800								
Breakdown torque for 20000 h M_{K20000} [Nm]	14								
Breakdown torque for 30000 h M_{K30000} [Nm]	12								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

Dimensional drawing

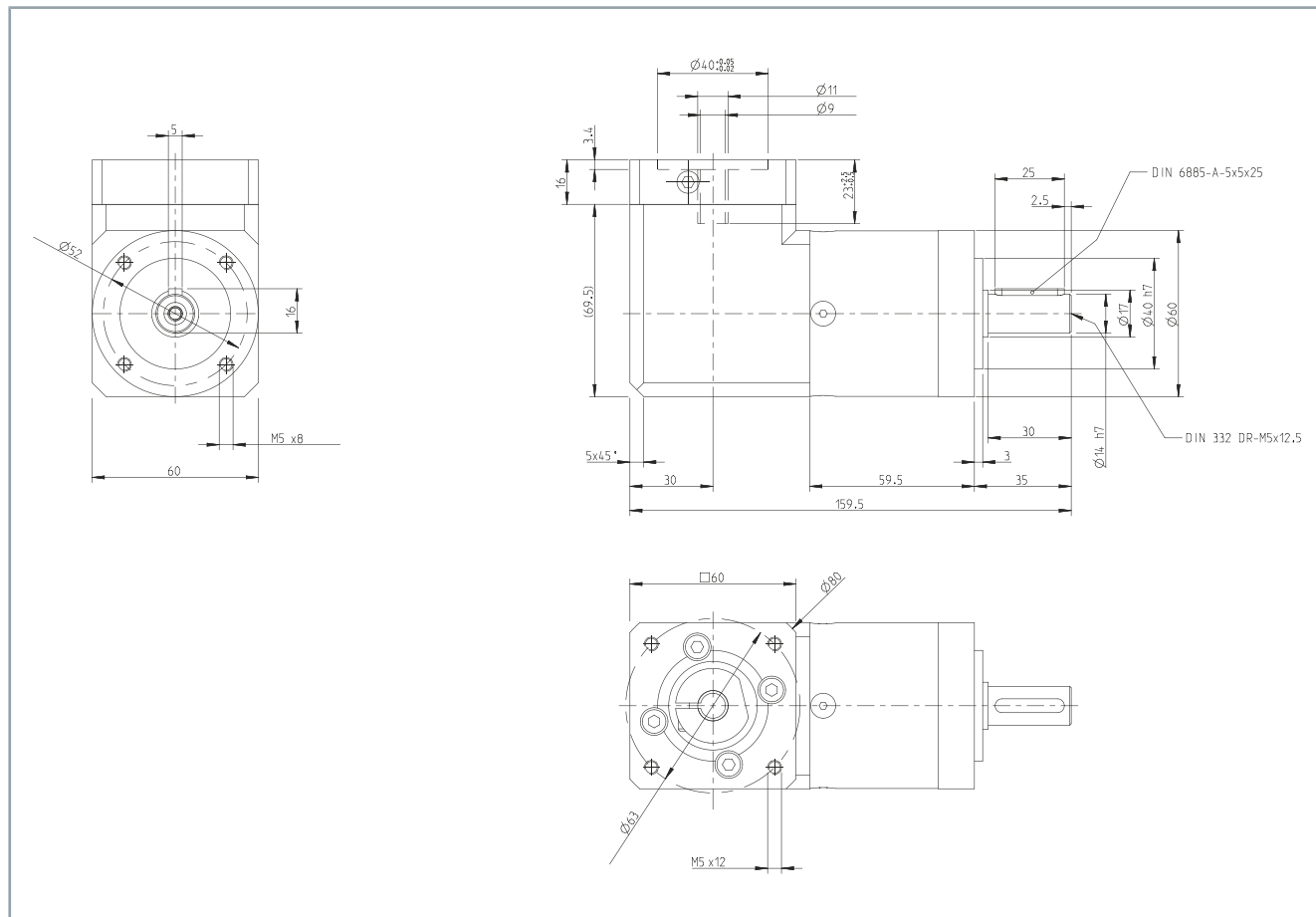
1-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M5x12.5
- Feather key according to DIN 6885-A 5x5x25
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



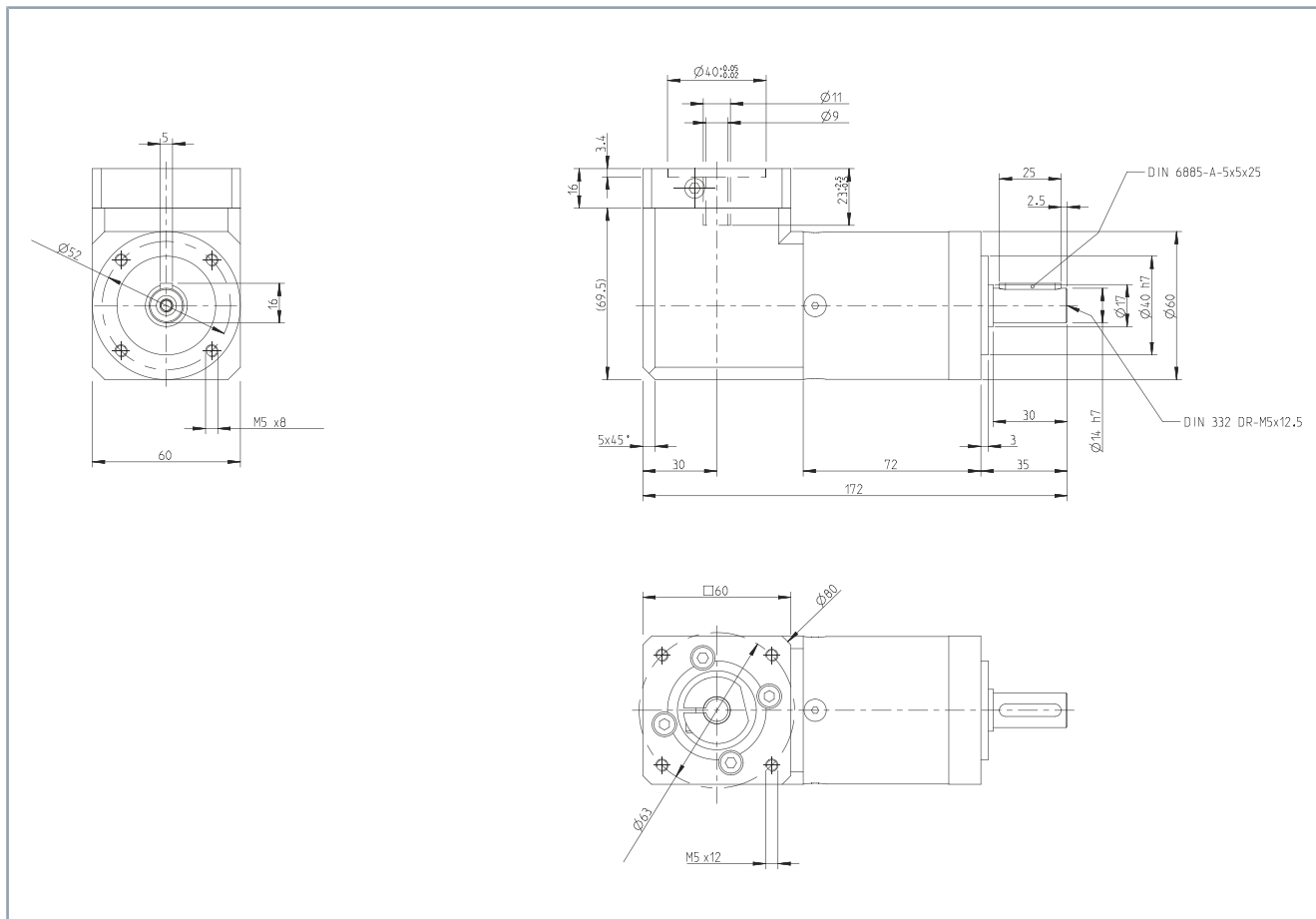
2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M5x12.5
- Feather key according to DIN 6885-A 5x5x25
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



3-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M5x12.5
- Feather key according to DIN 6885-A 5x5x25
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



PLE080

Mechanical data	1-stage					
Ratio i	3	4	5	7	8	10
Efficiency under full load η [%]	98 to 96					
Mass moment of inertia J_1 [kgcm ²]	0.359 to 0.654					
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	60					
Weight m_G [kg]	2.1					
Service life L10h tL [h]	30000					
Torques and speeds						
Nominal output torque T_{2N} [Nm]	85	115	110	65	50	38
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the out- put shaft</i>	136	184	176	104	80	61
EMERGENCY STOP torque T_{2Stop} [Nm]	180	240	220	178	190	200
Idling torque At $n_1 = 3000 \text{ rpm}$ and 20°C gearbox temper- ature	0,35		0.25	0.20		
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	4000	3900	4000	4000	4000	4000
Maximum input speed n_{1Limit} [min ⁻¹]	7000					
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	16					
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	< 7					
Maximum torsional rigidity C_{t21} [Nm/arcmin]	7.2 to 10					
Radial force for 20000 h $F_{r20000h}$ [N]	750					
Axial force for 20000 h $F_{a20000h}$ [N]	1000					
Radial force for 30000 h $F_{r30000h}$ [N]	650					
Axial force for 30000 h $F_{a30000h}$ [N]	900					
Maximum axial force F_{aStat} [N] <i>In relation to the shaft center at the output</i>	1250					
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	1600					
Breakdown torque for 20000 h M_{K20000} [Nm]	31					
Breakdown torque for 30000 h M_{K30000} [Nm]	27					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing disks					

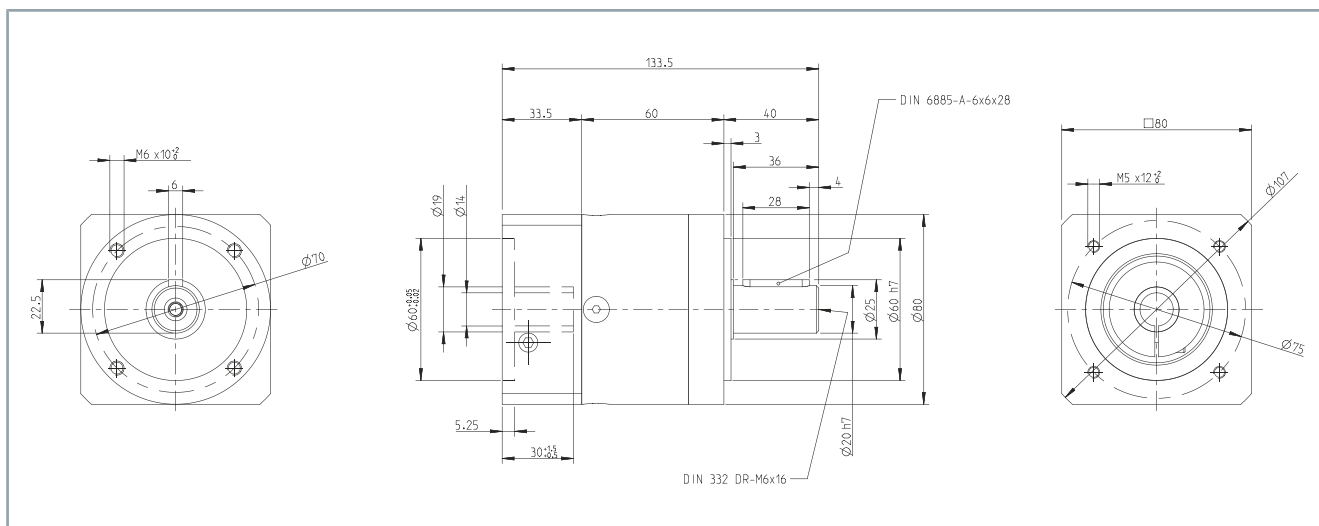
Mechanical data	2-stage									
Ratio i	9	12	15	16	20	25	32	40	64	
Efficiency under full load η [%]	97 to 89									
Mass moment of inertia J_1 [kgcm ²]	0.356 to 0.613									
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	60									
Weight m_G [kg]	2.6									
Service life L10h tL [h]	30000									
Torques and speeds										
Nominal output torque T_{2N} [Nm]	130	120	110	120	120	110	120	110	50	
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	208	192	176	192	192	176	192	176	80	
EMERGENCY STOP torque T_{2Stop} [Nm]	260	240	220	240	240	220	240	220	190	
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temperature	0.25				0.2			0.15		
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	4000									
Maximum input speed n_{1Limit} [min ⁻¹]	7000									
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	16									
Torsion and forces										
Maximum torsional backlash j_t [arcmin]	< 9									
Maximum torsional rigidity C_{t21} [Nm/arcmin]	7.9 to 10.4									
Radial force for 20000 h $F_{r20000h}$ [N]	750									
Axial force for 20000 h $F_{a20000h}$ [N]	1000									
Radial force for 30000 h $F_{r30000h}$ [N]	650									
Axial force for 30000 h $F_{a30000h}$ [N]	900									
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	1250									
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	1600									
Breakdown torque for 20000 h M_{K20000} [Nm]	31									
Breakdown torque for 30000 h M_{K30000} [Nm]	27									
Housing										
Properties	Heat-treated steel									
Color	Anthracite gray; RAL 7016									
Seal	Sealed bearing disks									

Mechanical data	3-stage								
Ratio i	60	80	100	120	160	200	256	320	512
Efficiency under full load η [%]	92 to 57								
Mass moment of inertia J_1 [kgcm ²]	0.365 to 0.590								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	60								
Weight m_G [kg]	3.1								
Service life L10h tL [h]	30000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	110	120	120	110	120	110	120	110	50
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	176	192	192	176	192	176	192	176	80
EMERGENCY STOP torque T_{2Stop} [Nm]	220	240	240	220	240	220	240	220	190
Idling torque At $n_1 = 3000 \text{ rpm}$ and 20°C gearbox temperature	0.2				0.15				
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	4000								
Maximum input speed n_{1Limit} [min ⁻¹]	7000								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	16								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 11								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	7.9 to 10.5								
Radial force for 20000 h $F_{r20000h}$ [N]	750								
Axial force for 20000 h $F_{a20000h}$ [N]	1000								
Radial force for 30000 h $F_{r30000h}$ [N]	650								
Axial force for 30000 h $F_{a30000h}$ [N]	900								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	1250								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	1600								
Breakdown torque for 20000 h M_{K20000} [Nm]	31								
Breakdown torque for 30000 h M_{K30000} [Nm]	27								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

Dimensional drawing

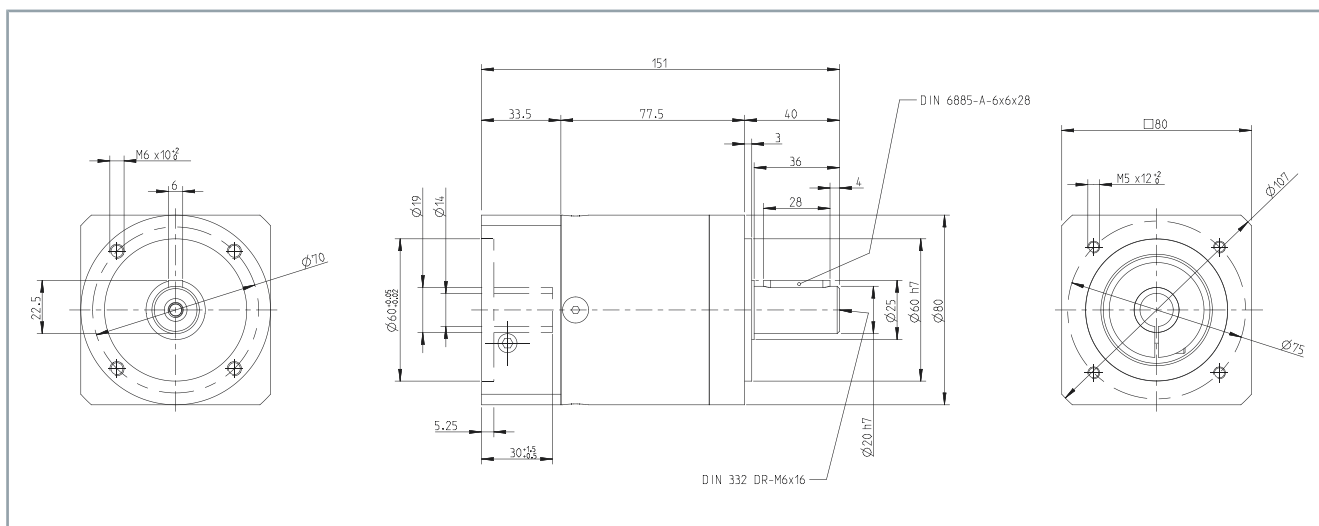
1-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M6x16
- Feather key according to DIN 6885-A 6x6x28
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



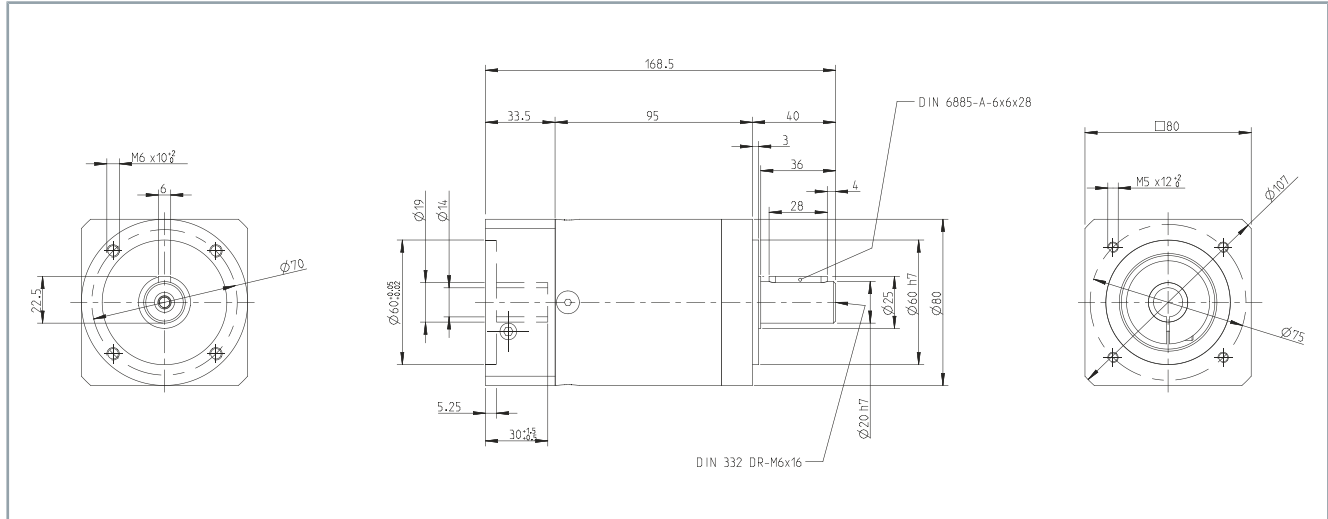
2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M6x16
- Feather key according to DIN 6885-A 6x6x28
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



3-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M6x16
- Feather key according to DIN 6885-A 6x6x28
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



WPLE080

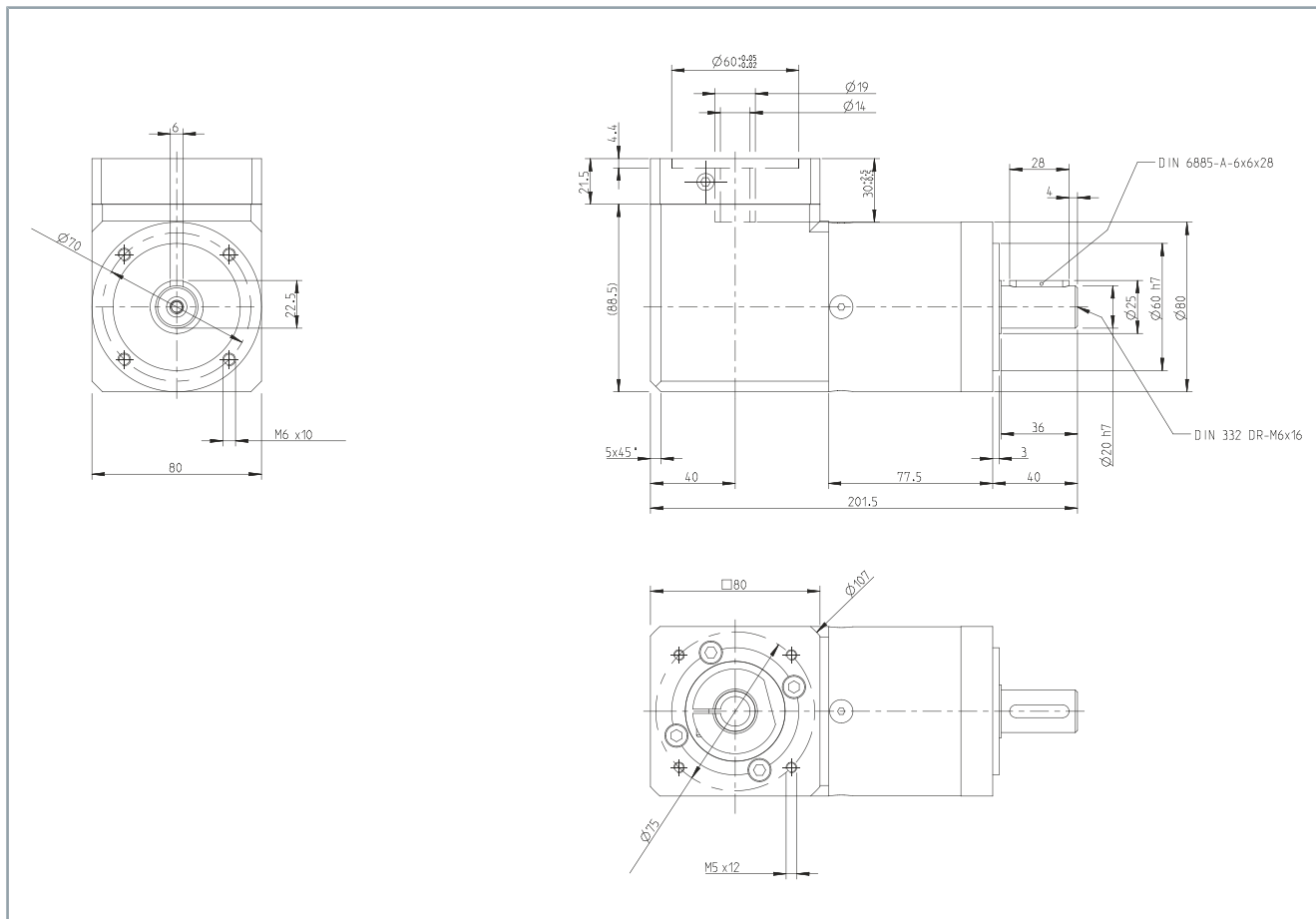
Mechanical data	1-stage					
Ratio i	3	4	5	7	8	10
Efficiency under full load η [%]	95 to 93					
Mass moment of inertia J_1 [kgcm ²]	0.910 to 1.273					
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	73					
Weight m_G [kg]	4.4					
Service life L10h tL [h]	20000					
Service life at $T_{2N} \times 0.88$	30000					
Torques and speeds						
Nominal output torque T_{2N} [Nm]	40	53	67	65	50	38
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the out- put shaft</i>	64	85	107	104	80	61
EMERGENCY STOP torque T_{2Stop} [Nm]	180	240	220	178	190	170
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temper- ature	0.6	0.45	0.35	0.3	0.25	0.25
Mean thermal input speed n_{1N} [min^{-1}] <i>At T_{2N} & S1</i>	3500	3550	3600	4000	4000	4000
Maximum input speed n_{1Limit} [min^{-1}]	7000					
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	10.5					
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	< 13					
Maximum torsional rigidity C_{t21} [Nm/arcmin]	4.9 to 7.9					
Radial force for 20000 h $F_{r20000h}$ [N]	750					
Axial force for 20000 h $F_{a20000h}$ [N]	1000					
Radial force for 30000 h $F_{r30000h}$ [N]	650					
Axial force for 30000 h $F_{a30000h}$ [N]	900					
Maximum axial force F_{aStat} [N] <i>In relation to the shaft center at the output</i>	1250					
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	1600					
Breakdown torque for 20000 h M_{K20000} [Nm]	31					
Breakdown torque for 30000 h M_{K30000} [Nm]	27					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing disks					

Mechanical data	2-stage								
Ratio i	9	12	15	16	20	25	32	40	64
Efficiency under full load η [%]	94 to 80								
Mass moment of inertia J_1 [kgcm ²]	0.916 to 1.232								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	73								
Weight m_G [kg]	5								
Service life L10h tL [h]	20000								
Service life at $T_{2N} \times 0.88$	30000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	130	120	110	120	120	110	120	110	50
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	208	192	176	192	192	176	192	176	80
EMERGENCY STOP torque T_{2Stop} [Nm]	260	240	220	240	240	220	240	220	190
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temperature	0.6	0.55	0.35	0.45	0.35	0.35	0.25	0.25	0.25
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	3250	3850	4000	4000	4000	4000	4000	4000	4000
Maximum input speed n_{1Limit} [min ⁻¹]	7000								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	10.5								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 15								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	6.9 to 9.6								
Radial force for 20000 h $F_{r20000h}$ [N]	750								
Axial force for 20000 h $F_{a20000h}$ [N]	1000								
Radial force for 30000 h $F_{r30000h}$ [N]	650								
Axial force for 30000 h $F_{a30000h}$ [N]	900								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	1250								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	1600								
Breakdown torque for 20000 h M_{K20000} [Nm]	31								
Breakdown torque for 30000 h M_{K30000} [Nm]	27								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

Mechanical data	3-stage								
Ratio i	60	80	100	120	160	200	256	320	512
Efficiency under full load η [%]	87 to 38								
Mass moment of inertia J_1 [kgcm ²]	0.916 to 1.209								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	73								
Weight m_G [kg]	5.5								
Service life L10h tL [h]	20000								
Service life at $T_{2N} \times 0.88$	30000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	110	120	120	110	120	110	120	110	50
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	176	192	192	176	192	176	192	176	80
EMERGENCY STOP torque T_{2Stop} [Nm]	220	240	240	220	240	220	240	220	190
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temperature	0.35	0.35	0.35	0.35	0.25	0.25	0.25	0.25	0.25
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	4000								
Maximum input speed n_{1Limit} [min ⁻¹]	7000								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	10.5								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 17								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	7.4 to 9.9								
Radial force for 20000 h $F_{r20000h}$ [N]	750								
Axial force for 20000 h $F_{a20000h}$ [N]	1000								
Radial force for 30000 h $F_{r30000h}$ [N]	650								
Axial force for 30000 h $F_{a30000h}$ [N]	900								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	1250								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	1600								
Breakdown torque for 20000 h M_{K20000} [Nm]	31								
Breakdown torque for 30000 h M_{K30000} [Nm]	27								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

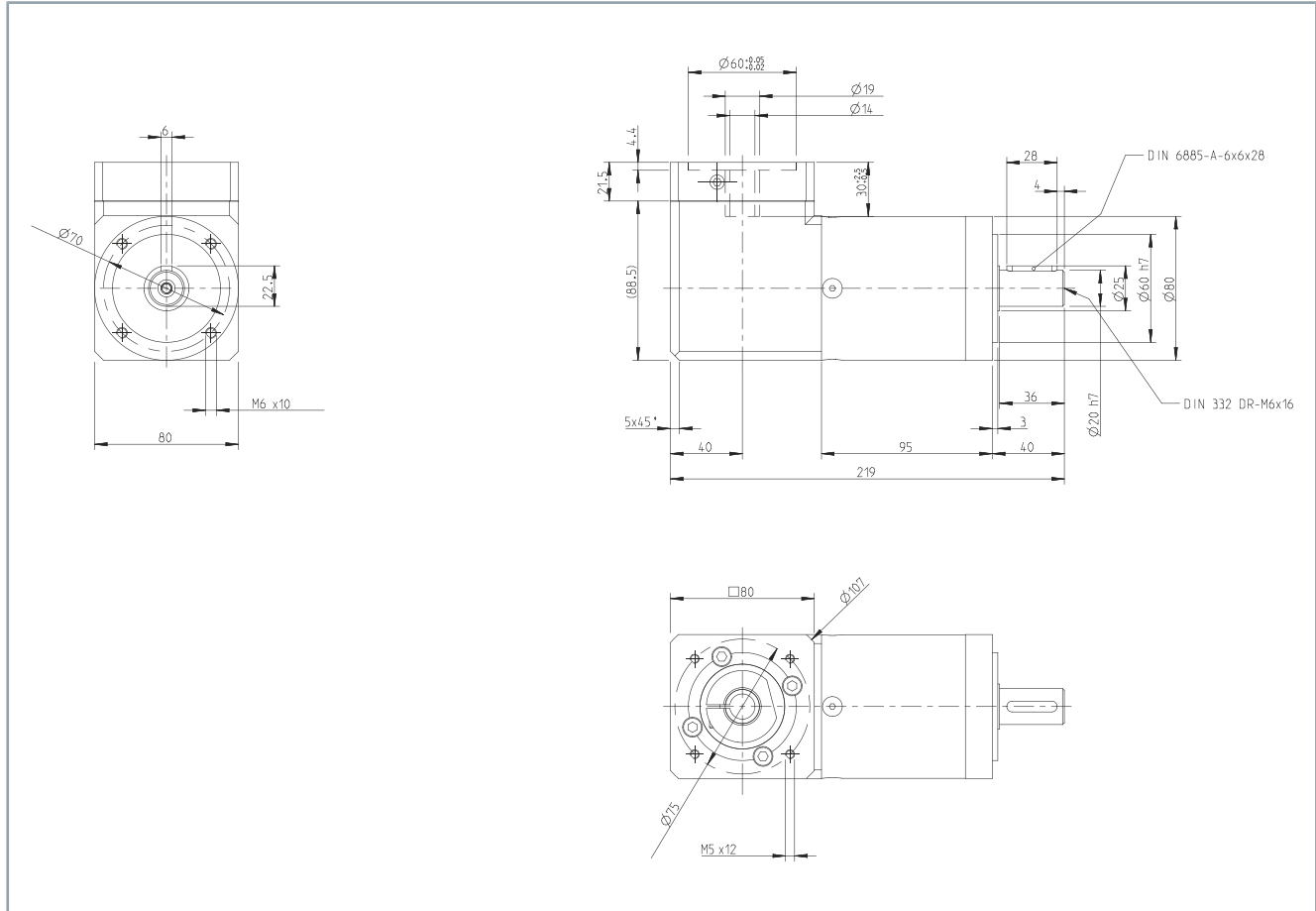
2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M6x16
- Feather key according to DIN 6885-A 6x6x28
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



3-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M6x16
- Feather key according to DIN 6885-A 6x6x28
- For gear units for AM802x, AM812x, AM302x:
M4 thread in adapter plate



PLE120

Mechanical data	1-stage					
Ratio i	3	4	5	7	8	10
Efficiency under full load η [%]	98 to 97					
Mass moment of inertia J_1 [kgcm ²]	1.378 to 2.361					
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	65					
Weight m_G [kg]	6					
Service life L10h tL [h]	30000					
Torques and speeds						
Nominal output torque T_{2N} [Nm]	115	155	195	135	120	95
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the out- put shaft</i>	184	248	312	216	192	152
EMERGENCY STOP torque T_{2Stop} [Nm]	390	520	500	340	380	480
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temper- ature	1.05	1	0.75	0.55	0.55	0.5
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	3400	3500	3500	3500	3500	3500
Maximum input speed n_{1Limit} [min ⁻¹]	6500					
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	40					
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	< 7					
Maximum torsional rigidity C_{t21} [Nm/arcmin]	15.5 to 21					
Radial force for 20000 h $F_{r20000h}$ [N]	1750					
Axial force for 20000 h $F_{a20000h}$ [N]	2500					
Radial force for 30000 h $F_{r30000h}$ [N]	1500					
Axial force for 30000 h $F_{a30000h}$ [N]	2100					
Maximum axial force F_{aStat} [N] <i>In relation to the shaft center at the output</i>	2000					
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	3800					
Breakdown torque for 20000 h M_{K20000} [Nm]	101					
Breakdown torque for 30000 h M_{K30000} [Nm]	86					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing disks					

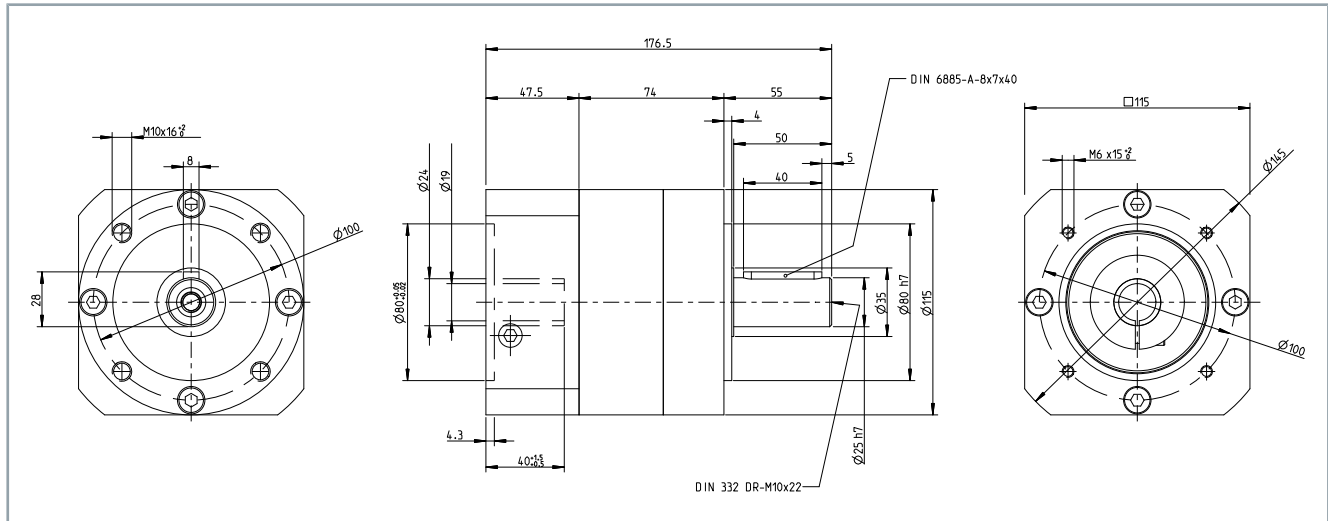
Mechanical data	2-stage								
Ratio i	9	12	15	16	20	25	32	40	64
Efficiency under full load η [%]	97 to 89								
Mass moment of inertia J_1 [kgcm ²]	1.414 to 2.288								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	65								
Weight m_G [kg]	8								
Service life L10h tL [h]	30000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	210	260	230	260	260	230	260	230	120
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	336	416	368	416	416	368	416	368	192
EMERGENCY STOP torque T_{2Stop} [Nm]	500	520	500	520	520	500	520	500	380
Idling torque At $n_1 = 3000 \text{ rpm}$ and 20°C gearbox temperature	0.8	0.8	0.75	0.8	0.65	0.6	0.45	0.45	0.45
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	3500								
Maximum input speed n_{1Limit} [min ⁻¹]	6500								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	40								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 9								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	17.5 to 22								
Radial force for 20000 h $F_{r20000h}$ [N]	1750								
Axial force for 20000 h $F_{a20000h}$ [N]	2500								
Radial force for 30000 h $F_{r30000h}$ [N]	1500								
Axial force for 30000 h $F_{a30000h}$ [N]	2100								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	2000								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	3800								
Breakdown torque for 20000 h M_{K20000} [Nm]	101								
Breakdown torque for 30000 h M_{K30000} [Nm]	86								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

Mechanical data	3-stage									
Ratio i	60	80	100	120	160	200	256	320	512	
Efficiency under full load η [%]	92 to 58									
Mass moment of inertia J_1 [kgcm ²]	0.365 to 0.590									
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	65									
Weight m_G [kg]	10									
Service life L10h tL [h]	30000									
Torques and speeds										
Nominal output torque T_{2N} [Nm]	260	260	260	230	260	230	260	230	120	
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	416	416	416	368	416	368	416	368	192	
EMERGENCY STOP torque T_{2Stop} [Nm]	520	520	520	500	520	500	520	500	380	
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temperature	0.75	0.6	0.6	0.7	0.45	0.45	0.45	0.45	0.45	
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	3500									
Maximum input speed n_{1Limit} [min ⁻¹]	6500									
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	40									
Torsion and forces										
Maximum torsional backlash j_t [arcmin]	< 11									
Maximum torsional rigidity C_{t21} [Nm/arcmin]	17.5 to 22									
Radial force for 20000 h $F_{r20000h}$ [N]	1750									
Axial force for 20000 h $F_{a20000h}$ [N]	2500									
Radial force for 30000 h $F_{r30000h}$ [N]	1500									
Axial force for 30000 h $F_{a30000h}$ [N]	2100									
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	2000									
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	3800									
Breakdown torque for 20000 h M_{K20000} [Nm]	101									
Breakdown torque for 30000 h M_{K30000} [Nm]	86									
Housing										
Properties	Heat-treated steel									
Color	Anthracite gray; RAL 7016									
Seal	Sealed bearing disks									

Dimensional drawing

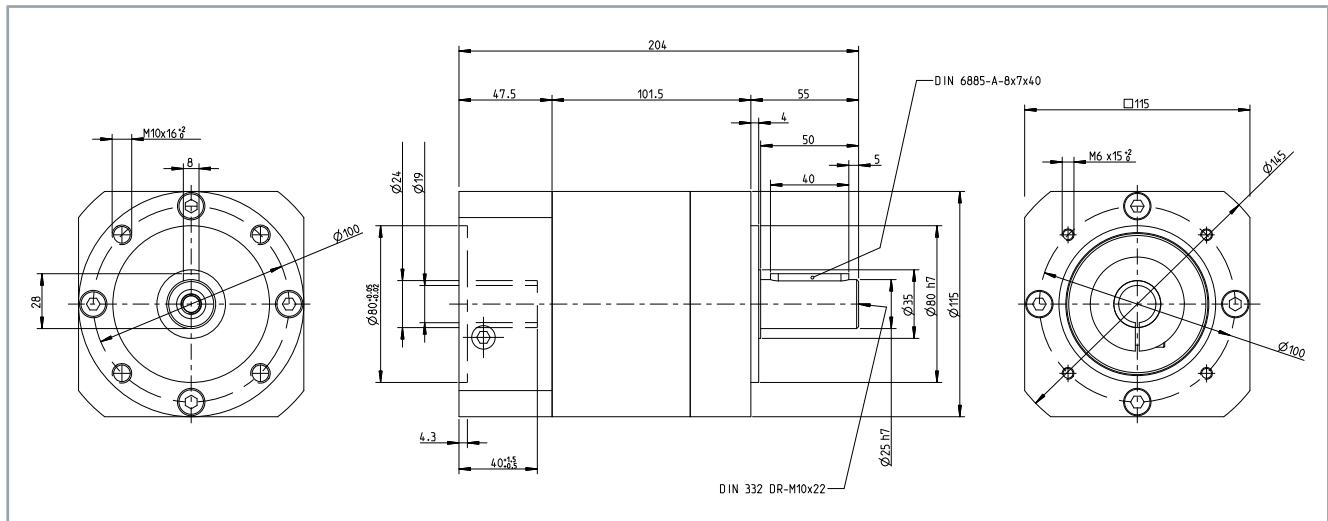
1-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M10x22
- Feather key according to DIN 6885-A 8x7x40



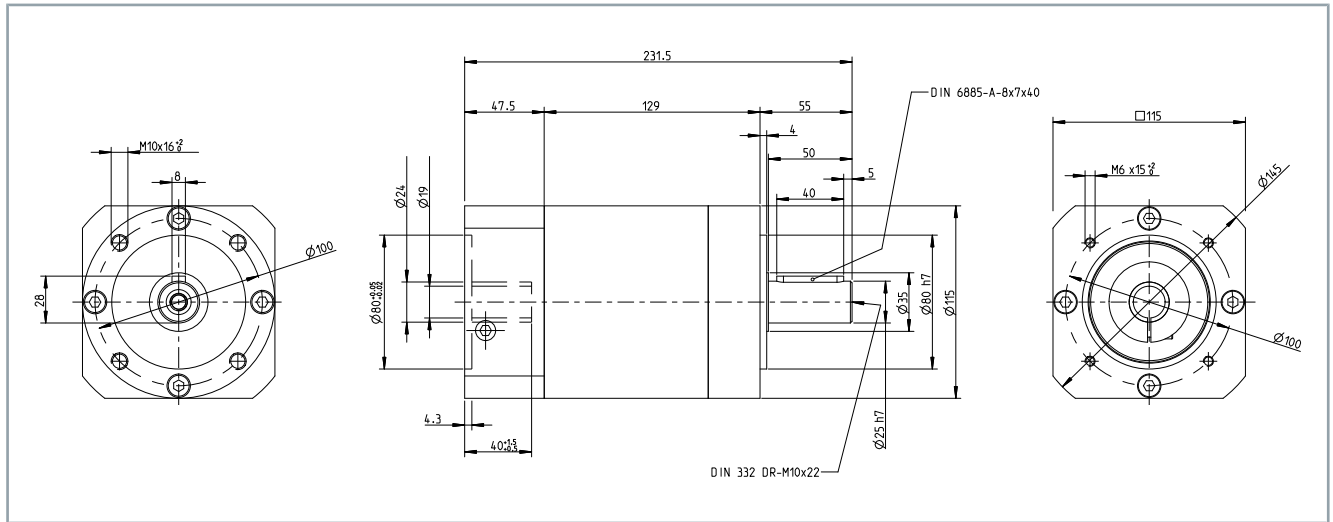
2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M10x22
- Feather key according to DIN 6885-A 8x7x40



3-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M10x22
- Feather key according to DIN 6885-A 8x7x40



WPLE120

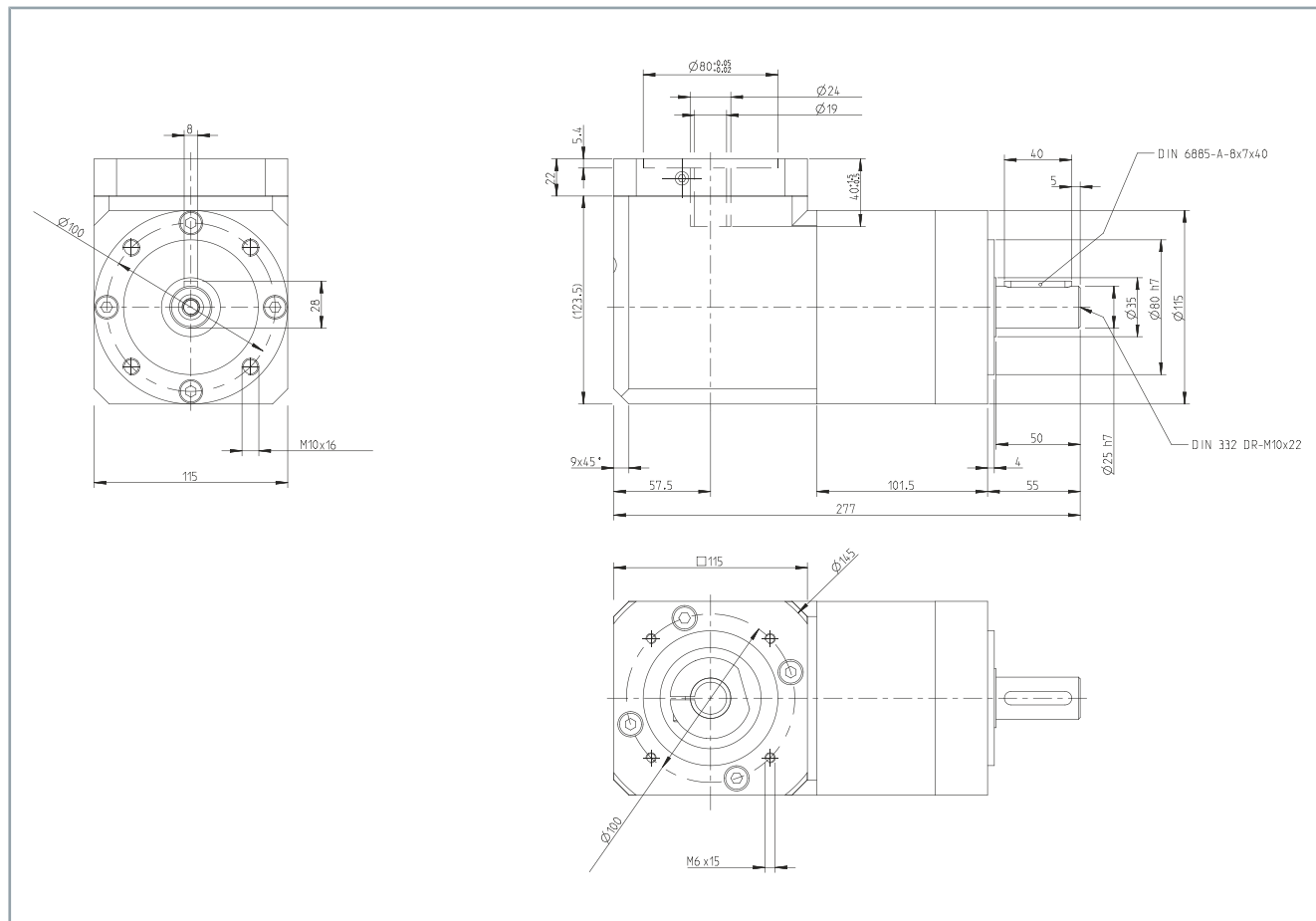
Mechanical data	1-stage					
Ratio i	3	4	5	7	8	10
Efficiency under full load η [%]	95 to 94					
Mass moment of inertia J_1 [kgcm ²]	1.820 to 2.846					
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	75					
Weight m_G [kg]	12					
Service life L10h tL [h]	20000					
Service life at $T_{2N} \times 0.88$	30000					
Torques and speeds						
Nominal output torque T_{2N} [Nm]	80	105	130	135	120	95
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the out- put shaft</i>	128	168	208	216	192	152
EMERGENCY STOP torque T_{2Stop} [Nm]	360	474	500	340	380	430
Idling torque At $n_1 = 3000 \text{ rpm}$ and 20°C gearbox temper- ature	1.35	1.1	0.95	0.85	0.85	0.8
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	2850	2950	3050	3500	3500	3500
Maximum input speed n_{1Limit} [min ⁻¹]	6500					
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	26					
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	< 11					
Maximum torsional rigidity C_{t21} [Nm/arcmin]	9.9 to 17.5					
Radial force for 20000 h $F_{r20000h}$ [N]	1750					
Axial force for 20000 h $F_{a20000h}$ [N]	2500					
Radial force for 30000 h $F_{r30000h}$ [N]	1500					
Axial force for 30000 h $F_{a30000h}$ [N]	2100					
Maximum axial force F_{aStat} [N] <i>In relation to the shaft center at the output</i>	2000					
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	3800					
Breakdown torque for 20000 h M_{K20000} [Nm]	101					
Breakdown torque for 30000 h M_{K30000} [Nm]	86					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing disks					

Mechanical data	2-stage									
Ratio i	9	12	15	16	20	25	32	40	64	
Efficiency under full load η [%]	94 to 84									
Mass moment of inertia J ₁ [kgcm ²]	1.855 to 2.773									
Running noise Q _g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of n₁ = 3000 min⁻¹ without load; i = 5</i>	75									
Weight m _G [kg]	14									
Service life L10h tL [h]	20000									
Service life at T _{2N} x 0.88	30000									
Torques and speeds										
Nominal output torque T _{2N} [Nm]	210	260	230	260	260	230	260	230	120	
Maximum output torque T _{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	336	416	368	416	416	368	416	368	192	
EMERGENCY STOP torque T _{2Stop} [Nm]	500	520	500	520	520	500	520	500	380	
Idling torque At n1 = 3000 rpm and 20 °C gearbox temperature	1.45	1.4	1	1.1	1	0.95	0.85	0.85	0.85	
Mean thermal input speed n _{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	2950	3050	3500	3450	3500	3500	3500	3500	3500	
Maximum input speed n _{1Limit} [min ⁻¹]	6500									
Maximum bending moment M _b [Nm] <i>In relation to the gear unit drive flange</i>	26									
Torsion and forces										
Maximum torsional backlash j _t [arcmin]	< 13									
Maximum torsional rigidity C _{t21} [Nm/arcmin]	16.4 to 20.5									
Radial force for 20000 h F _{r20000h} [N]	1750									
Axial force for 20000 h F _{a20000h} [N]	2500									
Radial force for 30000 h F _{r30000h} [N]	1500									
Axial force for 30000 h F _{a30000h} [N]	2100									
Maximum axial force F _{2AMax} [N] <i>In relation to the shaft center at the output</i>	2000									
Maximum radial force F _{2RMax} [N] <i>In relation to the shaft center at the output</i>	3800									
Breakdown torque for 20000 h M _{K20000} [Nm]	101									
Breakdown torque for 30000 h M _{K30000} [Nm]	86									
Housing										
Properties	Heat-treated steel									
Color	Anthracite gray; RAL 7016									
Seal	Sealed bearing disks									

Mechanical data	3-stage								
Ratio i	60	80	100	120	160	200	256	320	512
Efficiency under full load η [%]	88 to 46								
Mass moment of inertia J_1 [kgcm ²]	1.854 to 2.681								
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	75								
Weight m_G [kg]	16								
Service life L10h tL [h]	20000								
Service life at $T_{2N} \times 0.88$	30000								
Torques and speeds									
Nominal output torque T_{2N} [Nm]	260	260	260	230	260	230	260	230	120
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	416	416	416	368	416	368	416	368	192
EMERGENCY STOP torque T_{2Stop} [Nm]	520	520	520	500	520	500	520	500	380
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temperature	1.05	1	1	0.85	0.85	0.85	0.85	0.85	0.85
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	3500								
Maximum input speed n_{1Limit} [min ⁻¹]	6500								
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	26								
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	< 15								
Maximum torsional rigidity C_{t21} [Nm/arcmin]	16.4 to 21								
Radial force for 20000 h $F_{r20000h}$ [N]	1750								
Axial force for 20000 h $F_{a20000h}$ [N]	2500								
Radial force for 30000 h $F_{r30000h}$ [N]	1500								
Axial force for 30000 h $F_{a30000h}$ [N]	2100								
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	2000								
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	3800								
Breakdown torque for 20000 h M_{K20000} [Nm]	101								
Breakdown torque for 30000 h M_{K30000} [Nm]	86								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing disks								

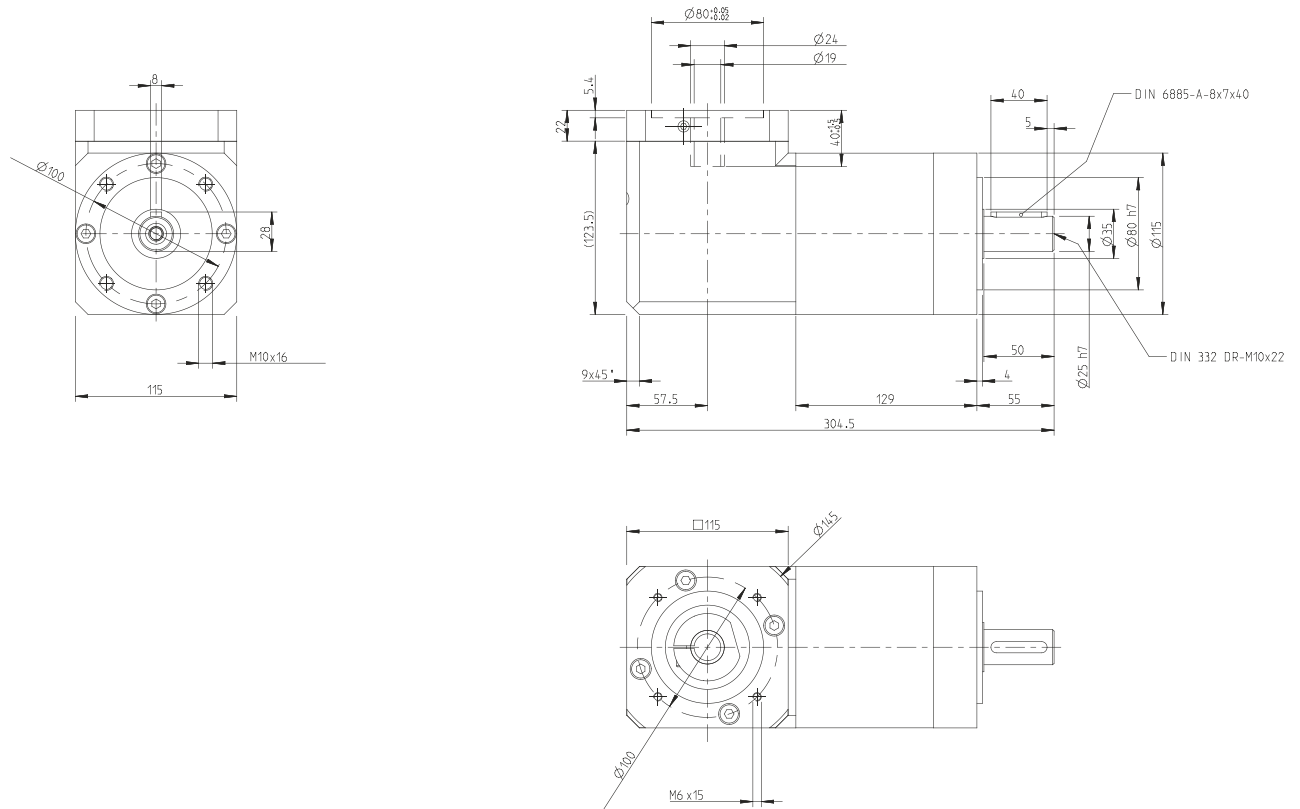
2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M10x22
- Feather key according to DIN 6885-A 8x7x40



3-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M10x22
- Feather key according to DIN 6885-A 8x7x40



PLE160

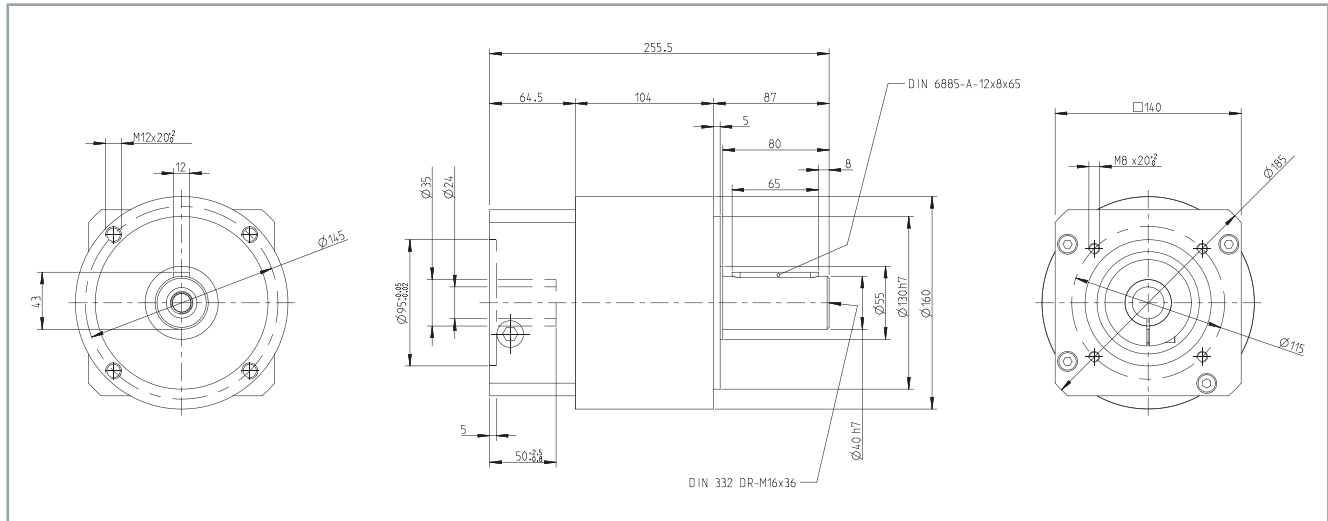
Mechanical data	1-stage			
Ratio i	3	4	5	8
Efficiency under full load η [%]	98 to 97			
Mass moment of inertia J_1 [kgcm ²]	3.726 to 11.999			
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	70			
Weight m_G [kg]	18			
Service life L10h tL [h]	30000			
Torques and speeds				
Nominal output torque T_{2N} [Nm]	400	450	450	450
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the out- put shaft</i>	640	720	720	720
EMERGENCY STOP torque T_{2Stop} [Nm]	800	900	900	900
Idling torque At $n_1 = 3000 \text{ rpm}$ and 20°C gearbox temper- ature	2.85	2.5	1.8	1.1
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	1350	1450	1700	2200
Maximum input speed n_{1Limit} [min ⁻¹]	6500			
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	140			
Torsion and forces				
Maximum torsional backlash j_t [arcmin]	< 6			
Maximum torsional rigidity C_{t21} [Nm/arcmin]	57.5 to 69			
Radial force for 20000 h $F_{r20000h}$ [N]	5000			
Axial force for 20000 h $F_{a20000h}$ [N]	7000			
Radial force for 30000 h $F_{r30000h}$ [N]	4200			
Axial force for 30000 h $F_{a30000h}$ [N]	6000			
Maximum axial force F_{aStat} [N] <i>In relation to the shaft center at the output</i>	5000			
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	11000			
Breakdown torque for 20000 h M_{K20000} [Nm]	474			
Breakdown torque for 30000 h M_{K30000} [Nm]	398			
Housing				
Properties	Heat-treated steel			
Color	Anthracite gray; RAL 7016			
Seal	Sealed bearing disks			

Mechanical data	2-stage							
Ratio i	12	15	16	20	25	32	40	64
Efficiency under full load η [%]	96 to 90							
Mass moment of inertia J_1 [kgcm ²]	3.502 to 10.087							
Running noise Q_g [dB/A] <i>Sound pressure level at a distance of 1 m: Measured at an input speed of $n_1 = 3000 \text{ min}^{-1}$ without load; $i = 5$</i>	70							
Weight m_G [kg]	22							
Torques and speeds								
Nominal output torque T_{2N} [Nm]	800	700	800	800	700	800	700	450
Maximum output torque T_{2B} [Nm] <i>Permissible for 30000 revolutions of the output shaft</i>	1280	1120	1280	1280	1120	1280	1120	720
EMERGENCY STOP torque T_{2Stop} [Nm]	1600	1400	1600	1600	1400	1600	1400	900
Idling torque At $n_1 = 3000 \text{ rpm}$ and $20 \text{ }^\circ\text{C}$ gearbox temperature	1.75	1.6	1.8	1.3	1.25	0.85	0.85	0.8
Mean thermal input speed n_{1N} [min ⁻¹] <i>At T_{2N} & S1</i>	1600	1900	1800	2100	2400	2700	3000	3000
Maximum input speed n_{1Limit} [min ⁻¹]	6500							
Maximum bending moment M_b [Nm] <i>In relation to the gear unit drive flange</i>	140							
Torsion and forces								
Maximum torsional backlash j_t [arcmin]	< 10							
Maximum torsional rigidity C_{t21} [Nm/arcmin]	61 to 75							
Radial force for 20000 h $F_{r20000h}$ [N]	5000							
Axial force for 20000 h $F_{a20000h}$ [N]	7000							
Radial force for 30000 h $F_{r30000h}$ [N]	4200							
Axial force for 30000 h $F_{a30000h}$ [N]	6000							
Maximum axial force F_{2AMax} [N] <i>In relation to the shaft center at the output</i>	5000							
Maximum radial force F_{2RMax} [N] <i>In relation to the shaft center at the output</i>	11000							
Breakdown torque for 20000 h M_{K20000} [Nm]	474							
Breakdown torque for 30000 h M_{K30000} [Nm]	398							
Housing								
Properties	Heat-treated steel							
Color	Anthracite gray; RAL 7016							
Seal	Sealed bearing disks							

Dimensional drawing

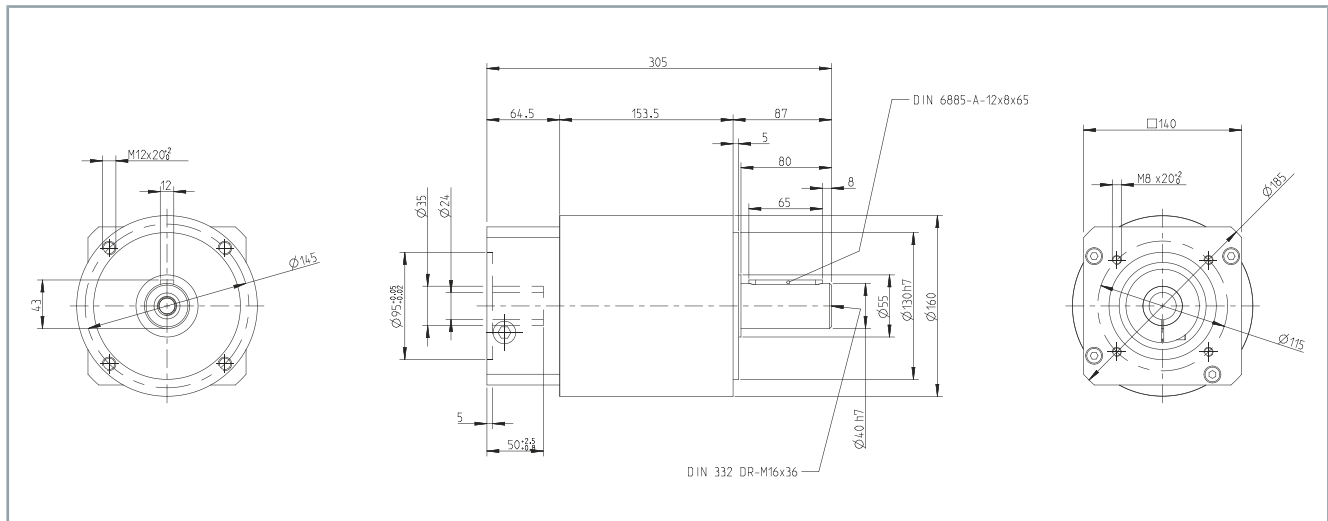
1-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M16x36
- Feather key according to DIN 6885-A 12x8x65



2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Center bore according to DIN 332-DR M16x36
- Feather key according to DIN 6885-A 12x8x65





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.

Check the shipment for the following contents:




- Gear units from the AG2250 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 AG2250 series.

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.



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.

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 +60 °C, maximum fluctuation 20 K/hour
- Humidity: relative humidity 15% to 95%, no condensation
- Use of suitable means of transport
- Transport and storage only in a horizontal position
- Use of the vendor's original packaging

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.



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.

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

Long-term storage



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.

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.

Prevent the formation of condensation

Ensure a constant ambient temperature in the range from -25°C to +60°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. Adhere to the conditions specified in the chapter: "Transport and storage", [Page 74].

Installation position



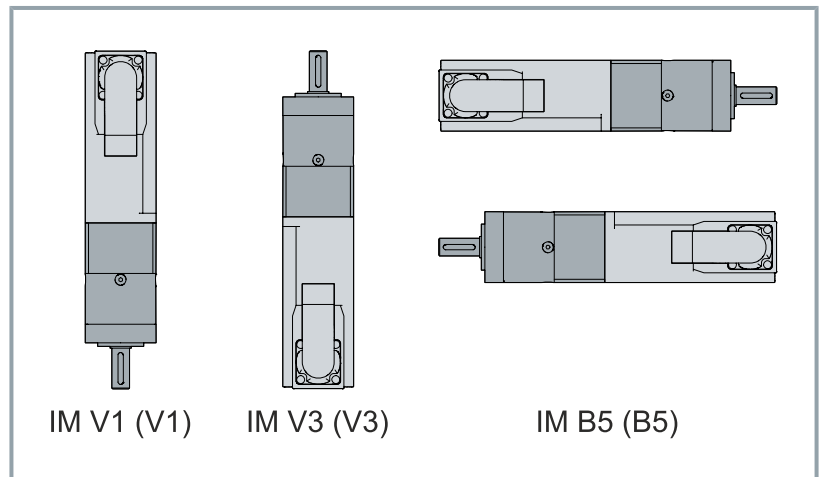
Observe the maintenance intervals and mounting positions

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 units is the motor attachment "M". You can use the gear units in any other installation position.





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.

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.

General tightening torques

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:

Screw size	Quality of the screws		
	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

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

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

Motor on gear unit



If a motor is included in the scope of delivery:
Motors included in the scope of delivery are pre-mounted.
For optimum performance, we recommend installation on Beckhoff AM8xxx synchronous servomotors.

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

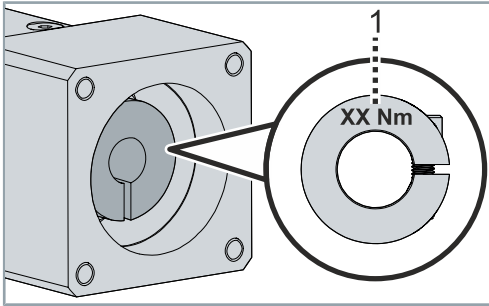
Clamping hub

The following table provides a description of the clamping hub:

Infographic	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

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

Mounting

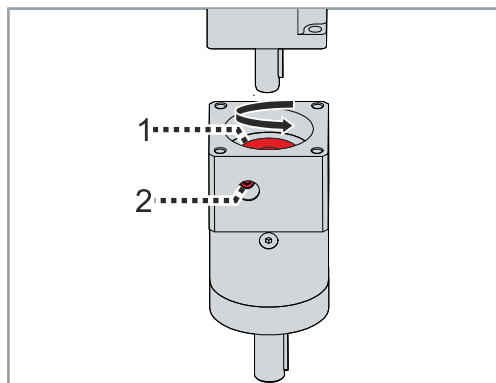
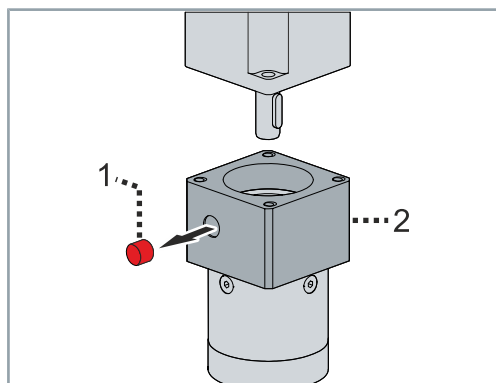
► Carefully degrease the following components with a cloth:

- 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

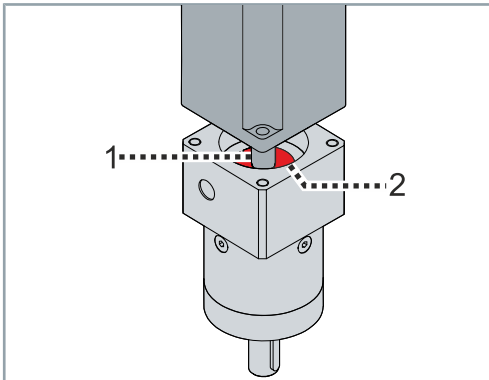
► Loosen the screw [2] by one turn



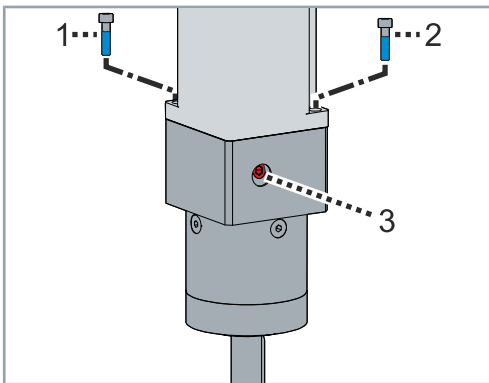
Do not exceed the permissible axial forces

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 small motor size with two fastening points in the flange, for which you require two screws. Use four screws for fastening other motor sizes with four fastening points in the flange.

- Apply threadlocker to bolts [1] and [2]
- Insert bolts [1] and [2] and tighten evenly.
- Tighten bolt [3]. Refer to the chapter "Clamping hub", [Page 80].
- Insert the plug in the adapter plate again

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.

Output side



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.

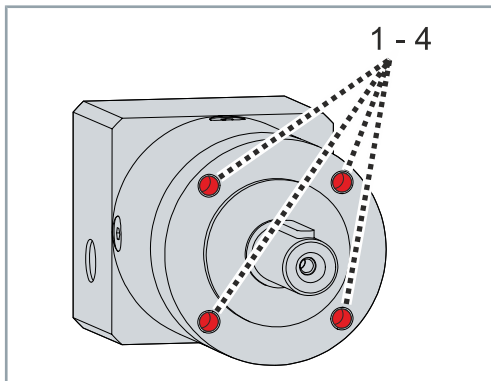
- ▶ Seal any gap over a wide area when attaching to the output side
- ▶ Make sure that the surfaces of the attached parts have a low roughness
- ▶ Use only screw head seals and o-rings for sealing

Permissible axial forces

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

Gear unit	040	060	080	120	160
$F_{a \text{ Stat}}$ [N]	240	800	1600	3800	11000
$F_{r \text{ Stat}}$ [N]	200	700	1250	2000	5000

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 screws 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 screw plug 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 screws = strength class 12.9			
Gear unit	Pitch circle diameter [mm]	Thread	Tightening torque [Nm]
040	34	M4 x 6	4.55
060	52	M5 x 8	9
080	70	M6 x 10	15.40
120	100	M10 x 16	73.50
160	145	M12 x 20	126



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 rated 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

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

Output torque of the gear unit with a transmission ratio i of 10:
 $1 \text{ Nm} \times 10 = 10 \text{ Nm}$

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:
 $5 \text{ Nm} \times 10 = 50 \text{ Nm}$

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"

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

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

⚠ 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.



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.

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.

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

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

Lubrication



Notes on lubrication

Beckhoff gear units from the AG2250 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 gearboxes are lubricated for life at the factory with a special grease for highly loaded gearboxes:

- Klübersynth GE 14-112

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.

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

Disassembly may only be carried out by qualified and trained technical personnel. Read the 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.

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

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.

Returning to the vendor

In accordance with the WEEE-2012/19/EU directives, you can return used devices and accessories for professional disposal. The transport costs are borne by the sender.

Send the used devices with the note "For disposal" to:

Beckhoff Automation GmbH & Co. KG
"Service" Building
Stahlstrasse 31
D-33415 Verl

In addition, you have the option to contact a local certified specialist company for the disposal of used electrical and electronic appliances. Dispose of the old components in accordance with the regulations applicable in your country.

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

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

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.

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More Information:
www.beckhoff.com/ag2250

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