BECKHOFF New Automation Technology

Operating instructions | EN

AG2300

Highend planetary gear unit

2023-09-29 | Version 2.6.1

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- EP1456722
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- 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.

The following is excluded from the liability:

- Failure to observe these operating instructions
- Improper use
- Use of untrained personnel
- 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.de

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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+49 5246 963-157
service@beckhoff.com
www.beckhoff.com/en-en/support/our-service-offerings/

Headquarters Germany

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

+49 5246 963-0
info@beckhoff.com
www.beckhoff.com/en-en/

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Our download finder contains all the files we offer for download: from our application reports to our technical documentation and configuration files.

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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.

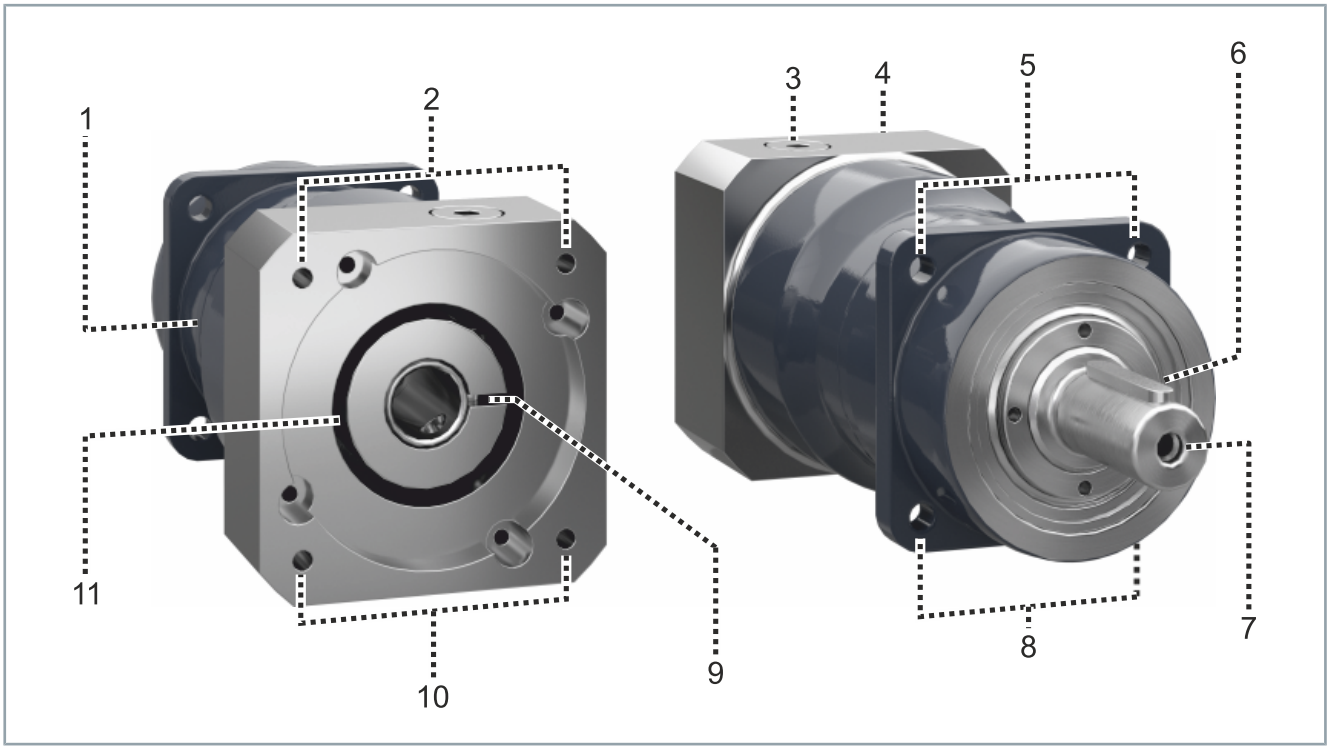
After operation

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".

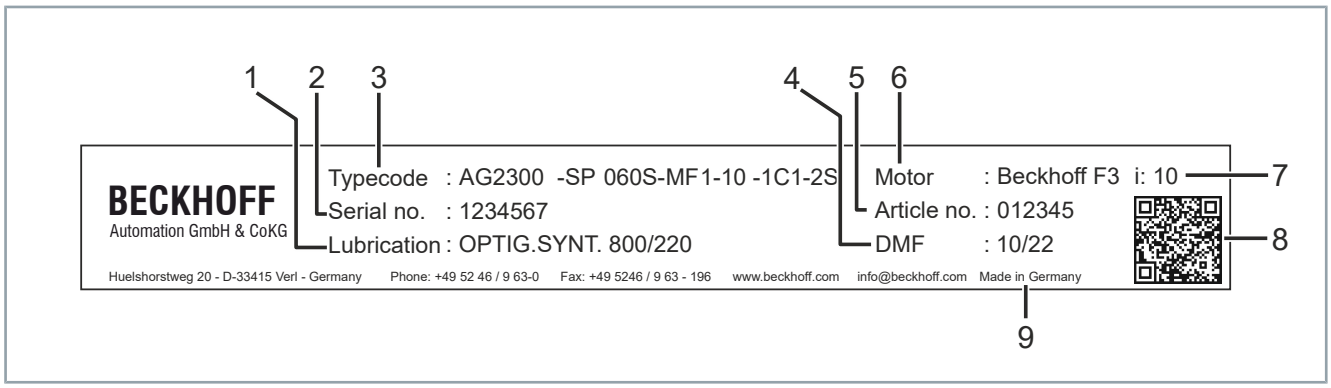
No direct skin contact with solvents or lubricants

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



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

Name plate



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

Type key

AG2300-+SP075S-MF1-3-1C1-F3	Explanation
AG2300	Gear unit series AG2300 = planetary gear unit SP
SP	Gear type SP = standard
075	Size 060 075 100 140 180 210 240
S	Lubrication S = Standard
M	Gear unit variant M = Motor-mounted gear unit
F	Gear unit version F = Standard C = high-speed
1	No. of stages 1 = single stage 2 = two-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 0 = Reduced
F3	Beckhoff flange size F2 F3 F4 F5 F6 F7

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.

High speeds in continuous operation
The order option "High-Speed" is intended for applications with high speeds in continuous operation.

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.

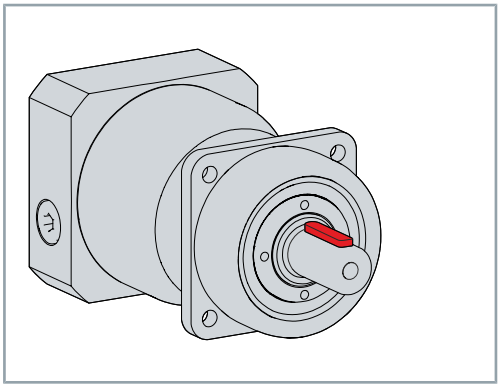
Ordering options

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

High-speed version

In addition to the standard "MF" version, the AG2300 planetary gear unit is available as a high-speed version. This version is specially designed for applications with high speeds in continuous operation compared to the standard version and has the type key "MC".

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 from the AG2300 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 minimum concentricity tolerance or axial run-out tolerance is N according to DIN 42955
- The motor has a smooth shaft end

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 from the AG2300 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	-15 °C to +40 °C, extended temperature range
Ambient temperature for transport and storage	0 °C to +40 °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 65
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_{1max} 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.

SP060 MF

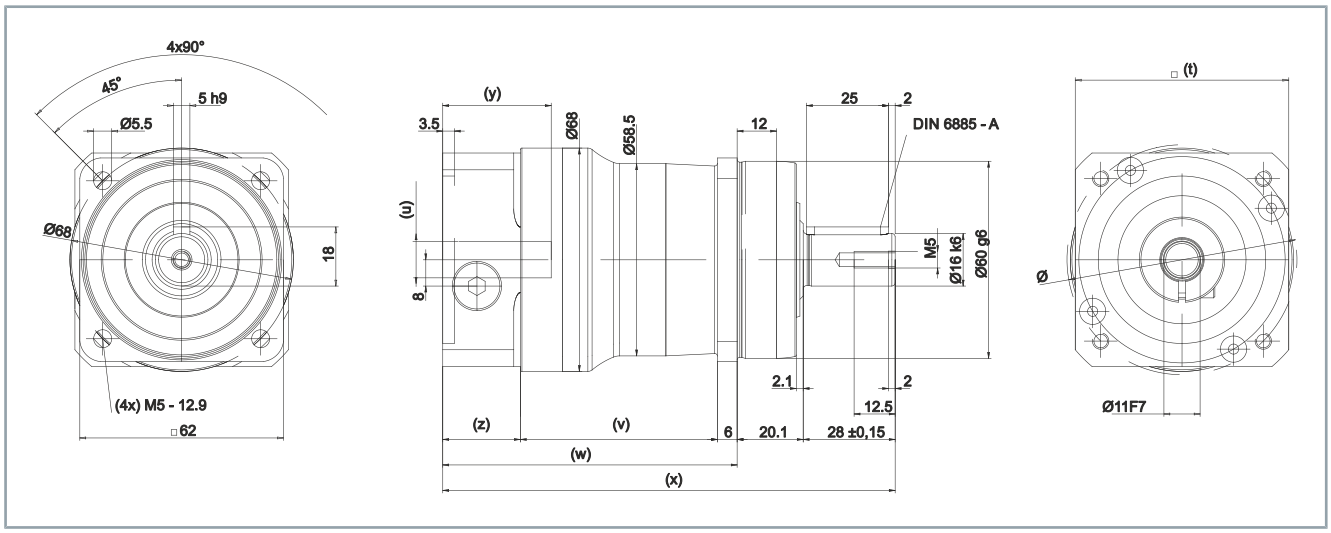
Mechanical data	1-stage					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	97					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 58					
Service life L_h [h]	> 20000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	1.9					
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
B = 11 mm	0.21	0.15	0.12	0.10		0.09
C = 14 mm	0.28	0.22	0.20	0.18	0.16	
E = 19 mm	0.61	0.55	0.52	0.50	0.49	
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	21	27		26		27
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	36	50			38	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	96	109			100	
Nominal input speed n_{1N} [min^{-1}]	3300			4000		
Maximum input speed n_{1Max} [min^{-1}]	7500					
Idle torque T_{012} [Nm] *Based on the drive*	0.68	0.52	0.48	0.34	0.32	
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 4 / Reduced ≤ 2					
Maximum torsional rigidity C_{t21} [arcmin]	3.5					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	2400					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	2800					
Maximum breakdown torque M_{2Max} [Nm]	152					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	**2-stage**										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	94										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 57										
Service life L_h [h]	> 20000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	2										
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
B = 11 mm	0.077	0.069		0.061			0.057		0.056		
C = 14 mm	0.17	0.16					0.15				
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	38	40			38	40			31	40	31
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	50								38	50	38
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	109										100
Nominal input speed n_{1N} [min^{-1}]	4400							4800		5500	
Maximum input speed n_{1Max} [min^{-1}]	8500										
Idle torque T_{012} [Nm] *Based on the drive*	0.28	0.25	0.23	0.22	0.24	0.20		0.19		0.17	0.18
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 6 / Reduced ≤ 4										
Maximum torsional rigidity C_{t21} [arcmin]	3.5										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	2400										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	2800										
Maximum breakdown torque M_{2Max} [Nm]	152										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

Dimensional drawing

1-stage

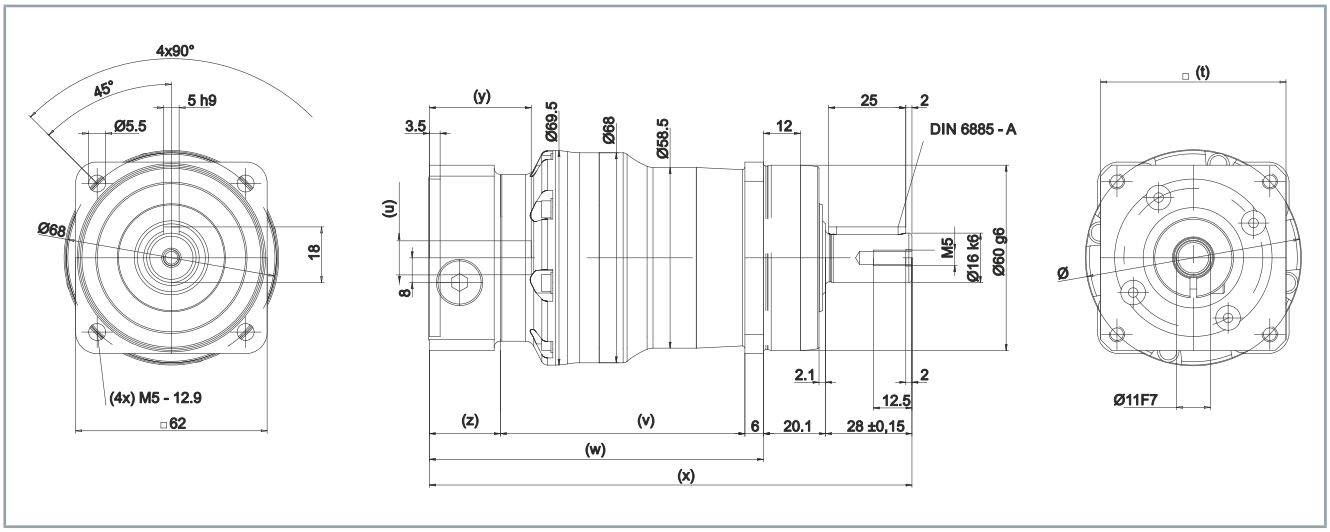
- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M5x12
- Feather key 5h9x25 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]		
	B; up to 11	C; up to 14	E; up to 19
t [motor-dependent]	min. 70		min. 90
u [check motor shaft]	11	14	19
v	60		67
w [motor-dependent]	min. 89.6	min. 94	min. 67
x [motor-dependent]	min. 137.6	min. 142	min. 154
y [minimum and maximum permissible shaft length]	max. 33 min. 14	max. 38 min. 17	max. 45 min. 23
z [motor-dependent]	min. 23.6	min. 28	min. 33

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M5x12
- Feather key 5h9x25 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]	
	B; up to 11	C; up to 14
t [motor-dependent]	min. 60	min. 70
u [check motor shaft]	11	14
v	79	82
w [motor-dependent]	min. 108	min. 116
x [motor-dependent]	min. 156	min. 164
y [minimum and maximum permissible shaft length]	max. 32 min. 14	max. 38 min. 17
z [motor-dependent]	min. 23	min. 18

SP075 MF

Mechanical data	1-stage					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	97					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 59					
Service life L_h [h]	> 20000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	3.9					
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
C = 14 mm	0.86	0.61	0.51	0.42	0.38	
E = 19 mm	1.03	0.78	0.68	0.59	0.54	
G = 24 mm	2.40	2.15	2.05	1.96	1.91	
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	63	81			80	81
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	102	132			114	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	139	185	250			
Nominal input speed n_{1N} [min^{-1}]	2900			3100		
Maximum input speed n_{1Max} [min^{-1}]	7500					
Idle torque T_{012} [Nm] *Based on the drive*	1.50	1.40	0.96	0.72	0.55	0.52
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 4 / Reduced ≤ 2					
Maximum torsional rigidity C_{t21} [arcmin]	10					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	3350					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	4200					
Maximum breakdown torque M_{2Max} [Nm]	236					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	**2-stage**										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	94										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 55										
Service life L_h [h]	> 20000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	3.6										
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
B = 11 mm	0.16	0.13		0.10			0.09				
C = 14 mm	0.23	0.20		0.18			0.16				
E = 19 mm	0.55	0.53	0.52	0.50			0.49				
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	101		106	101		106	101	106	84	90	84
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	126		132	126		132	126	132	105	113	105
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	250										
Nominal input speed n_{1N} [min^{-1}]	3500							3800		4500	
Maximum input speed n_{1Max} [min^{-1}]	8500										
Idle torque T_{012} [Nm] *Based on the drive*	0.50	0.41	0.35	0.32	0.44	0.28	0.26	0.23		0.21	0.23
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 6 / Reduced ≤ 4										
Maximum torsional rigidity C_{t21} [arcmin]	10										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	3350										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	4200										
Maximum breakdown torque M_{2Max} [Nm]	236										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

SP075 MC

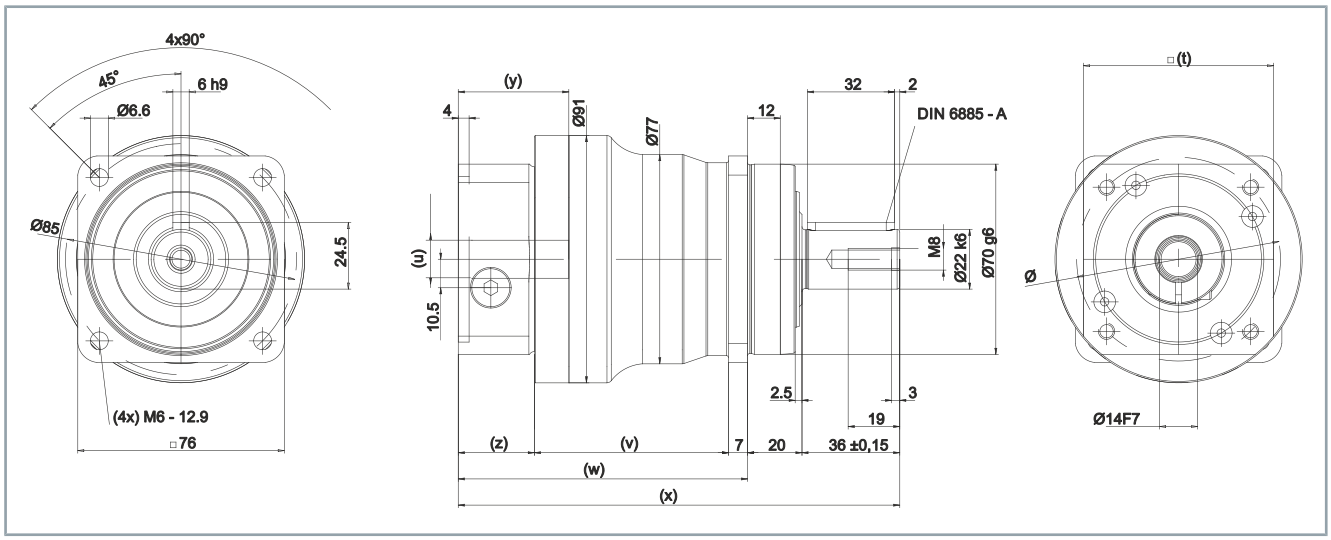
Mechanical data	1-stage					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	98.5					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 59					
Service life L_h [h]	> 30000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	3.9					
Mass moment of inertia J1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
E = 19 mm	1.03	0.78	0.68	0.59	0.54	
G = 24 mm	2.40	2.15	2.05	1.96	1.91	
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	41	51		52	50	53
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	68	90			70	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	139	185	250		213	
Nominal input speed n_{1N} [min^{-1}]	4500					
Maximum input speed n_{1Max} [min^{-1}]	6000					
Idle torque T_{012} [Nm] *Based on the drive*	1.10	0.88	0.72	0.49	0.42	0.40
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 6 / Reduced ≤ 4					
Maximum torsional rigidity C_{t21} [arcmin]	10					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	3350					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	4200					
Maximum breakdown torque M_{2Max} [Nm]	236					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	**2-stage**										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	96.5										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 55										
Service life L_h [h]	> 30000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	3.6										
Mass moment of inertia J1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
C = 14 mm	0.23	0.20		0.18			0.16				
E = 19 mm	0.55	0.53	0.52	0.50			0.49				
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	62		72	65	72		65	72	56	72	56
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	90								70	90	70
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	250								213	250	213
Nominal input speed n_{1N} [min^{-1}]	4500										
Maximum input speed n_{1Max} [min^{-1}]	6000										
Idle torque T_{012} [Nm] *Based on the drive*	0.50	0.41	0.35	0.32	0.44	0.28	0.26	0.23		0.21	0.23
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 8 / Reduced ≤ 6										
Maximum torsional rigidity C_{t21} [arcmin]	10										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	3350										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	4200										
Maximum breakdown torque M_{2Max} [Nm]	236										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

Dimensional drawing

1-stage

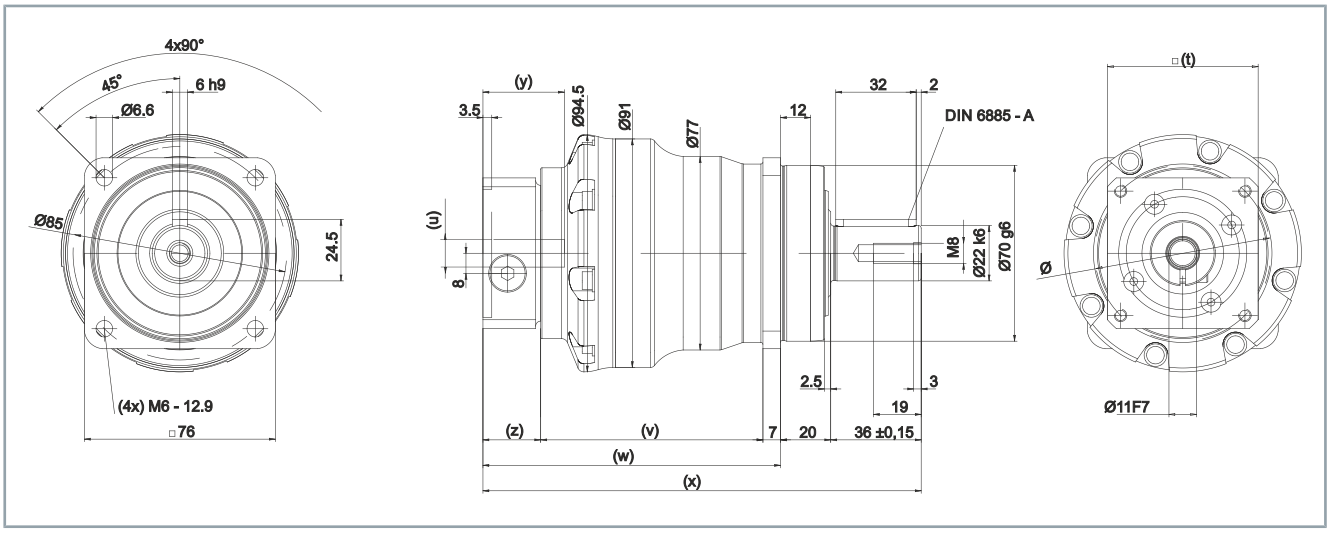
- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M8x19
- Feather key 6h9x32 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]		
	C; up to 14	E; up to 19	G; up to 24
t [motor-dependent]	min. 90		min. 120
u [check motor shaft]	14	19	24
v	71.5		82.56
w [motor-dependent]	min. 107.8	min. 111.5	min. 129.5
x [motor-dependent]	min. 163.8	min. 167.5	min. 185.5
y [minimum and maximum permissible shaft length]	max. 42 min. 18	max. 45 min. 18	max. 58 min. 23
z [motor-dependent]	min. 29.3	min. 33	min. 40

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M8x19
- Feather key 6h9x32 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]		
	B; up to 11	C; up to 14	E; up to 19
t [motor-dependent]	min. 70		min. 90
u [check motor shaft]	11	14	19
v	88.4		96
w [motor-dependent]	min. 119	min. 123.4	min. 136
x [motor-dependent]	min. 175	min. 179.4	min. 192
y [minimum and maximum permissible shaft length]	max. 33 min. 14	max. 38 min. 17	max. 45 min. 23
z [motor-dependent]	min. 23.6	min. 28	min. 33

SP100 MF

Mechanical data	1-stage					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	97					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 58					
Service life L_h [h]	> 20000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	7.7					
Mass moment of inertia J1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
E = 19	3.29	2.35	1.92	1.60	1.38	
G = 24	3.99	3.04	2.61	2.29	2.07	
H = 28	3.59	2.65	2.22	1.90	1.68	
K = 38	11.1	10.1	9.68	9.36	9.14	
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	131	171	169	166		174
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	282	378			282	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	500	625				
Nominal input speed n_{1N} [min^{-1}]	2500			2800		
Maximum input speed n_{1Max} [min^{-1}]	5500					
Idle torque T_{012} [Nm] *Based on the drive*	3.10	2.40	2.10	1.30	1	
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 3 / Reduced ≤ 1					
Maximum torsional rigidity C_{t21} [arcmin]	31					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	5650					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	6600					
Maximum breakdown torque M_{2Max} [Nm]	487					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	2-stage										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	94										

Mechanical data	1-stage								
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 56								
Service life L_h [h]	> 20000								
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	7.9								
Mass moment of inertia J1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*									
C = 14 mm	0.64	0.54	0.52	0.43		0.38		0.54	0.37
E = 19 mm	0.81	0.70	0.68	0.60	0.43	0.59	0.55	0.54	0.38	0.54
G = 24 mm	2.18	2.07	2.05	1.97		1.96	1.92	1.91		
H = 28 mm	1.98	1.90	1.88	1.81		1.80	1.76	1.75		
Torques and speeds									
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	243	259	257	277	243	277		207	277	207
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	347							259	347	259
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	625									
Nominal input speed n_{1N} [min^{-1}]	3100						3500		4200	
Maximum input speed n_{1Max} [min^{-1}]	6500									
Idle torque T_{012} [Nm] *Based on the drive*	1	0.93	0.85	0.77	0.86	0.54	0.46		0.39	0.37
Torsion and forces									
Maximum torsional backlash j_t [arcmin]	Standard ≤ 5 / Reduced ≤ 3								
Maximum torsional rigidity C_{t21} [arcmin]	31								
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	5650								
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	6600								
Maximum breakdown torque M_{2Max} [Nm]	487								
Temperature [°C]									
Maximum housing temperature	+ 90								
Ambient temperature	-15 to +40								
Housing									
Properties	Heat-treated steel								
Color	Anthracite gray; RAL 7016								
Seal	Sealed bearing discs								

SP100 MC

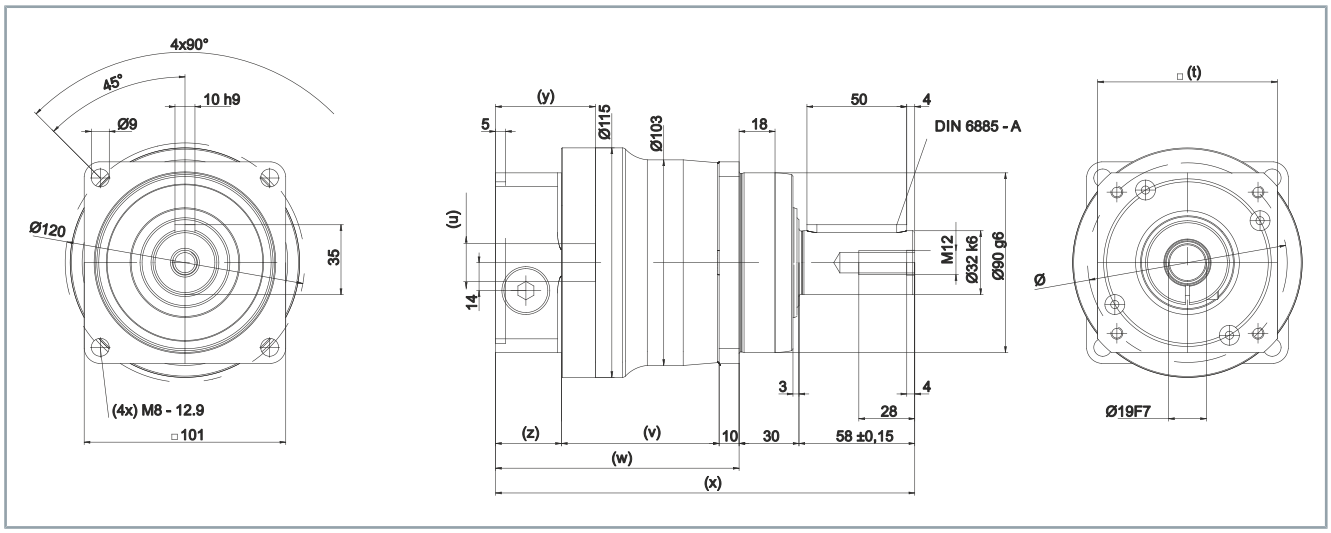
Mechanical data	1-stage					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	98.5					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 58					
Service life L_h [h]	> 30000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	7.7					
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
G = 24 mm	3.99	3.04	2.61	2.29	2.07	
K = 38 mm	11.1	10.1	9.68	9.36	9.14	
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	76	95	91	93		97
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	180	240			180	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	454	625			599	
Nominal input speed n_{1N} [min^{-1}]	3500	4000	4500			
Maximum input speed n_{1Max} [min^{-1}]	6000					
Idle torque T_{012} [Nm] *Based on the drive*	2	1.80	1.40	0.84	0.78	0.64
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 4 / Reduced ≤ 2					
Maximum torsional rigidity C_{t21} [arcmin]	31					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	5650					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	6600					
Maximum breakdown torque M_{2Max} [Nm]	487					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	2-stage										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	96.5										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 56										
Service life L_h [h]	> 30000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	7.9										
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
E = 19 mm	0.81	0.70	0.68	0.60	0.43	0.59	0.55	0.54	0.38	0.54	
G = 24 mm	2.18	2.07	2.05	1.97	1.97	1.96	1.92	1.91			
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	138	148	149	164	141	164	183	182	144	189	144
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	240								180	240	180
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	625								599	625	599
Nominal input speed n_{1N} [min^{-1}]	4500										
Maximum input speed n_{1Max} [min^{-1}]	6000										
Idle torque T_{012} [Nm] *Based on the drive*	0.52	0.53	0.48	0.43	0.38	0.28	0.40	0.25		0.20	0.19
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 6 / Reduced ≤ 4										
Maximum torsional rigidity C_{t21} [arcmin]	31										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	5650										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	6600										
Maximum breakdown torque M_{2Max} [Nm]	487										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

Dimensional drawing

1-stage

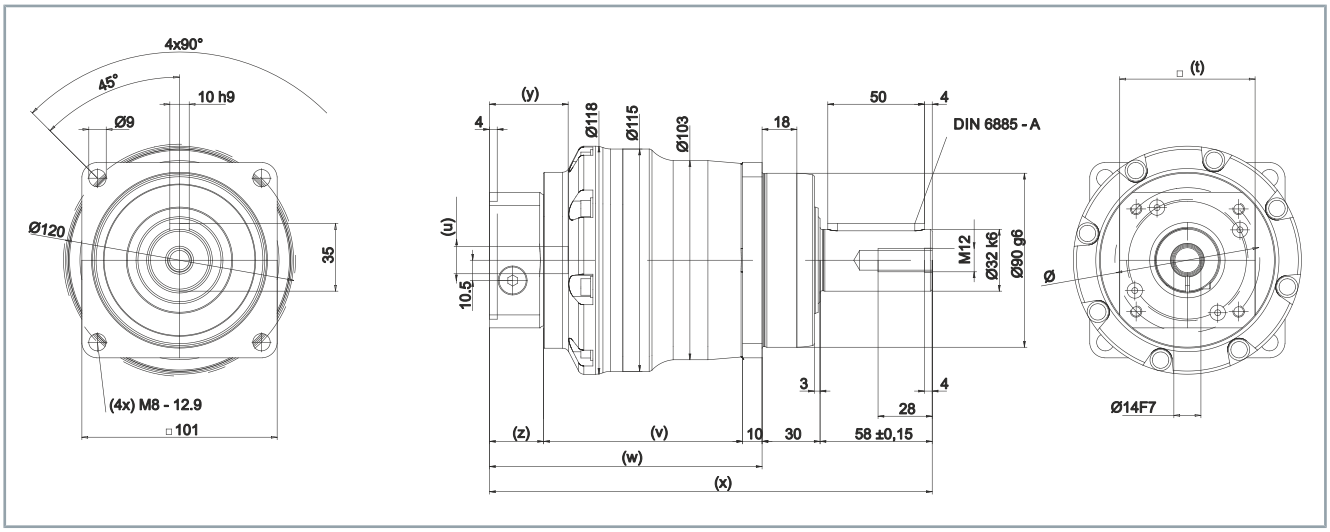
- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M12x28
- Feather key 10h9x50 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]		
	E; up to 19	H; up to 28	K; up to 38
t [motor-dependent]	min. 120		min. 150
u [check motor shaft]	19	28	38
v	79		96
w [motor-dependent]	min. 122	min. 129	min. 156
x [motor-dependent]	min. 210	min. 217	min. 244
y [minimum and maximum permissible shaft length]	max. 50 min. 23	max. 58 min. 23	max. 80 min. 35
z [motor-dependent]	min. 33	min. 40	min. 50

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M12x28
- Feather key 10h9x50 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]		
	C; up to 14	E; up to 19	H; up to 28
t [motor-dependent]	min. 90		min. 120
u [check motor shaft]	14	19	28
v	103		114
w [motor-dependent]	min. 142	min. 146	min. 164
x [motor-dependent]	min. 230	min. 234	min. 252
y [minimum and maximum permissible shaft length]	max. 42 min. 18	max. 45 min. 23	max. 58 min. 23
z [motor-dependent]	min. 29.3	min. 33	min. 40

SP140 MF

Mechanical data	1-stage					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	97					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 59					
Service life L_h [h]	> 20000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	17.2					
Mass moment of inertia J1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
G = 24 mm	10.70	7.82	6.79	5.84	5.28	
I = 32 mm	13.80	11	9.95	9	8.44	
K = 38 mm	14.90	12.10	11	10.1	9.51	
M = 48 mm	29.50	26.70	26.60	24.70	24.20	
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	202	335	333	319	312	327
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	468	792			636	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	1250	1350			1250	
Nominal input speed n_{1N} [min^{-1}]	2100			2600		
Maximum input speed n_{1Max} [min^{-1}]	5000					
Idle torque T_{012} [Nm] *Based on the drive*	6.70	5.40	4.40	2.80	2.50	2.20
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 3 / Reduced ≤ 1					
Maximum torsional rigidity C_{t21} [arcmin]	53					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	9870					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	9900					
Maximum breakdown torque M_{2Max} [Nm]	952					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	2-stage										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	94										

Mechanical data	1-stage										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 59										
Service life L_h [h]	> 20000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	17										
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
E = 19 mm	2.50	2.01	1.97	1.65		1.63	1.40	1.39		1.38	
G = 24 mm	3.19	2.71	2.67	2.34		2.32	2.10	2.08	2.08	2.08	2.07
K = 38 mm	10.30	9.77	9.73	9.41		9.39	9.16	9.15		9.14	
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	461	493	489	545	464	536	581	536	466	581	466
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	726		670	726		670	726	670	583	726	583
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	1350										1250
Nominal input speed n_{1N} [min^{-1}]	2900							3200			3900
Maximum input speed n_{1Max} [min^{-1}]	6000										
Idle torque T_{012} [Nm] *Based on the drive*	2.40	2.10	2	1.80	1.60	1.20		1.10		0.88	0.80
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 5 / Reduced ≤ 3										
Maximum torsional rigidity C_{t21} [arcmin]	53										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	9870										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	9900										
Maximum breakdown torque M_{2Max} [Nm]	952										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

SP140 MC

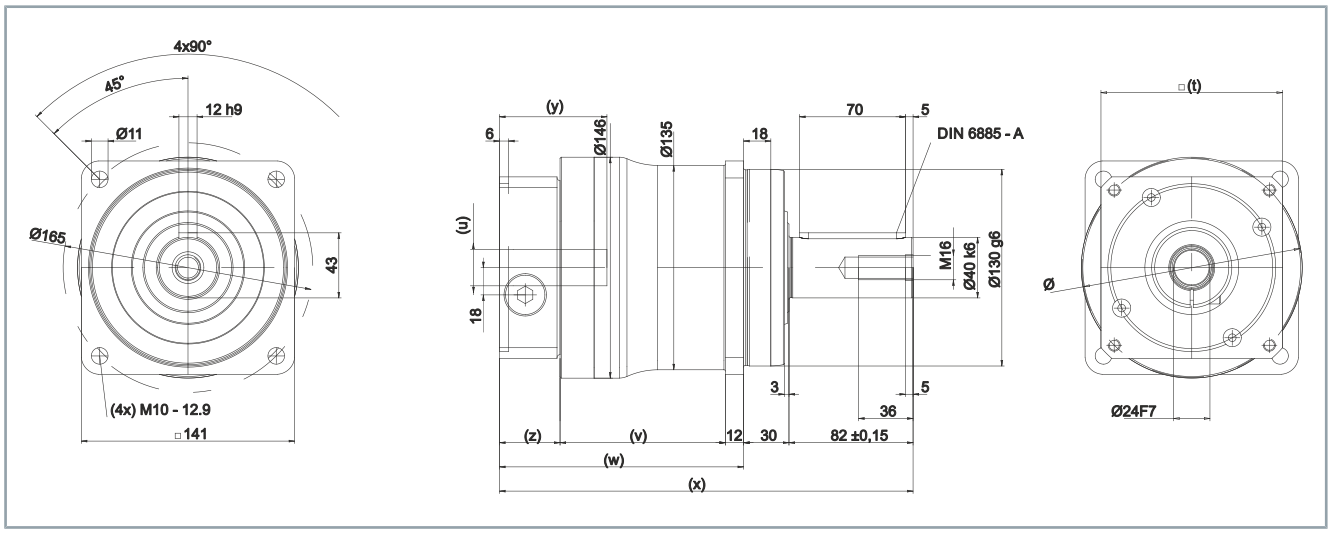
Mechanical data	**1-stage**					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	98.5					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 59					
Service life L_h [h]	> 30000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	17.2					
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
K = 38 mm	14.90	12.10	11	10.10		9.51
M = 48 mm	29.50	26.70	25.60	24.70		24.20
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	127	195	182	187	186	195
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	310	480			380	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	1250	1350			1250	
Nominal input speed n_{1N} [min^{-1}]	3000	3500	4500			
Maximum input speed n_{1Max} [min^{-1}]	6000					
Idle torque T_{012} [Nm] *Based on the drive*	4.10	3.50	2.80	2.20	1.80	1.70
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 4 / Reduced ≤ 2					
Maximum torsional rigidity C_{t21} [arcmin]	53					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	9870					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	9900					
Maximum breakdown torque M_{2Max} [Nm]	952					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	2-stage										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	96.5										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 59										
Service life L_h [h]	> 30000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	17										
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
G = 24 mm	3.19	2.71	2.67	2.34	1.65	2.32	2.10	2.08			2.07
K = 38 mm	10.30	9.77	9.73	9.41	2.34	9.39	9.16	9.15	1.39	9.14	
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	277	297	298	328	287	329	364	367	304		
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	480								380	480	380
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	1350								1250	1350	1250
Nominal input speed n_{1N} [min^{-1}]	4500										
Maximum input speed n_{1Max} [min^{-1}]	6000										
Idle torque T_{012} [Nm] *Based on the drive*	1.10	1	0.96	0.80	0.72	0.60	0.55	0.45		0.40	
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 6 / Reduced ≤ 4										
Maximum torsional rigidity C_{t21} [arcmin]	53										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	9870										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	9900										
Maximum breakdown torque M_{2Max} [Nm]	952										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

Dimensional drawing

1-stage

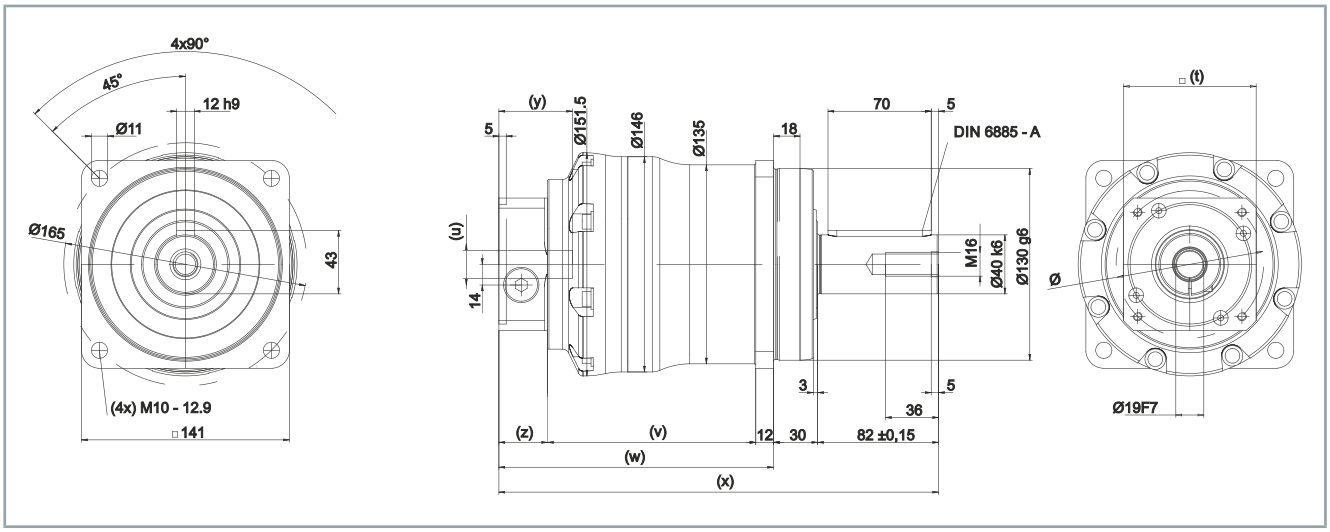
- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M16x36
- Feather key 12h9x70 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]		
	G; up to 24	K; up to 38	M; up to 48
t [motor-dependent]	min. 150	min. 210	
u [check motor shaft]	24	32	48
v	109.3		124
w [motor-dependent]	min. 162.3	min. 171.3	min. 193
x [motor-dependent]	min. 274.3	min. 283.3	min. 305
y [minimum and maximum permissible shaft length]	max. 72 min. 28	max. 80 min. 35	max. 82 min. 36
z [motor-dependent]	min. 41	min. 50	min. 57

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M16x36
- Feather key 12h9x70 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]		
	E; up to 19	G; up to 24	K; up to 38
t [motor-dependent]	min. 120		min. 150
u [check motor shaft]	19	24	38
v	141.3		158
w [motor-dependent]	min. 186.3	min. 193.3	min. 220
x [motor-dependent]	min. 298.3	min. 305.3	min. 332
y [minimum and maximum permissible shaft length]	max. 50 min. 23	max. 58 min. 23	max. 80 min. 35
z [motor-dependent]	min. 33	min. 40	min. 50

SP180 MF

Mechanical data	1-stage					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	97					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 62					
Service life L_h [h]	> 20000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	34					
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
K = 38 mm	50.80	33.90	27.90	22.20		19.20
M = 48 mm	58.20	41.20	35.30	29.60		26.50
N = 55 mm	65.70	49.70	44	38.50		35.40
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	513	927	919	825		864
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	1164	1452			1164	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	2750					
Nominal input speed n_{1N} [min^{-1}]	1500			2300		
Maximum input speed n_{1Max} [min^{-1}]	4500					
Idle torque T_{012} [Nm] *Based on the drive*	15	12	8	5.60		3.80
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 3 / Reduced ≤ 1					
Maximum torsional rigidity C_{t21} [arcmin]	175					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	15570					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	15400					
Maximum breakdown torque M_{2Max} [Nm]	1600					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	**2-stage**										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	94										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 58										
Service life L_h [h]	> 20000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	36.40										
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
G = 24 mm	9.27	7.72	7.48	6.32		6.20	5.51	5.45		5.39	5.36
I = 32 mm	12.40	10.90	10.60	9.48		9.36	8.67	9.68	8.55		8.52
K = 38 mm	13.50	12	11.70	10.60		10.40	9.74	9.68		9.63	9.60
M = 48 mm	28.10	26.60	26.30	25.20		25.10	24.40	24.30			
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	1162								931	1085	931
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	1452								1164	1356	1164
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	2750										
Nominal input speed n_{1N} [min^{-1}]	2700							2900		3200	3400
Maximum input speed n_{1Max} [min^{-1}]	5000										
Idle torque T_{012} [Nm] *Based on the drive*	4.70	3.90	3.60	3.30		2.80	2.20	1.90		1.80	
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 5 / Reduced ≤ 3										
Maximum torsional rigidity C_{t21} [arcmin]	175										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	15570										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	15400										
Maximum breakdown torque M_{2Max} [Nm]	1600										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

SP180 MC

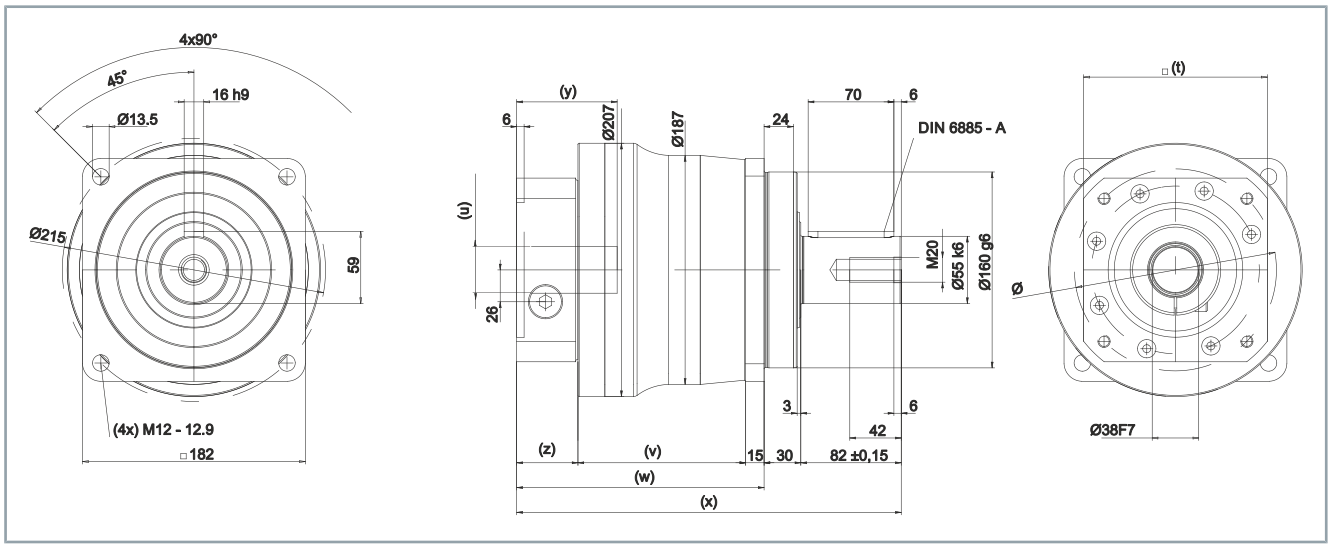
Mechanical data	**1-stage**					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	98.5					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 62					
Service life L_h [h]	> 30000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	34					
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
M = 48 mm	58.50	41.60	35.60	30		26.90
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	289	492	379	469	465	488
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	700	880			700	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	2640	2750			2640	
Nominal input speed n_{1N} [min^{-1}]	3000	3500	4500			
Maximum input speed n_{1Max} [min^{-1}]	4500	6000				
Idle torque T_{012} [Nm] *Based on the drive*	8.80	7.40	6	4.40		3.20
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 4 / Reduced ≤ 2					
Maximum torsional rigidity C_{t21} [arcmin]	175					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	14150					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	15400					
Maximum breakdown torque M_{2Max} [Nm]	1600					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	**2-stage**										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	94										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 58										
Service life L_h [h]	> 30000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	36										
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
K = 38 mm	13.50	12	11.70	10.60		10.40	9.74	9.68	5.45	9.63	9.60
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	696	704							560	704	560
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	880								700	880	700
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	2750								2640	2750	2640
Nominal input speed n_{1N} [min^{-1}]	4500										
Maximum input speed n_{1Max} [min^{-1}]	6000										
Idle torque T_{012} [Nm] *Based on the drive*	2.20	2.30	1.80	1.70		1.40	1.20			0.95	1
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 6 / Reduced ≤ 4										
Maximum torsional rigidity C_{t21} [arcmin]	175										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	14150										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	15400										
Maximum breakdown torque M_{2Max} [Nm]	1600										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

Dimensional drawing

1-stage

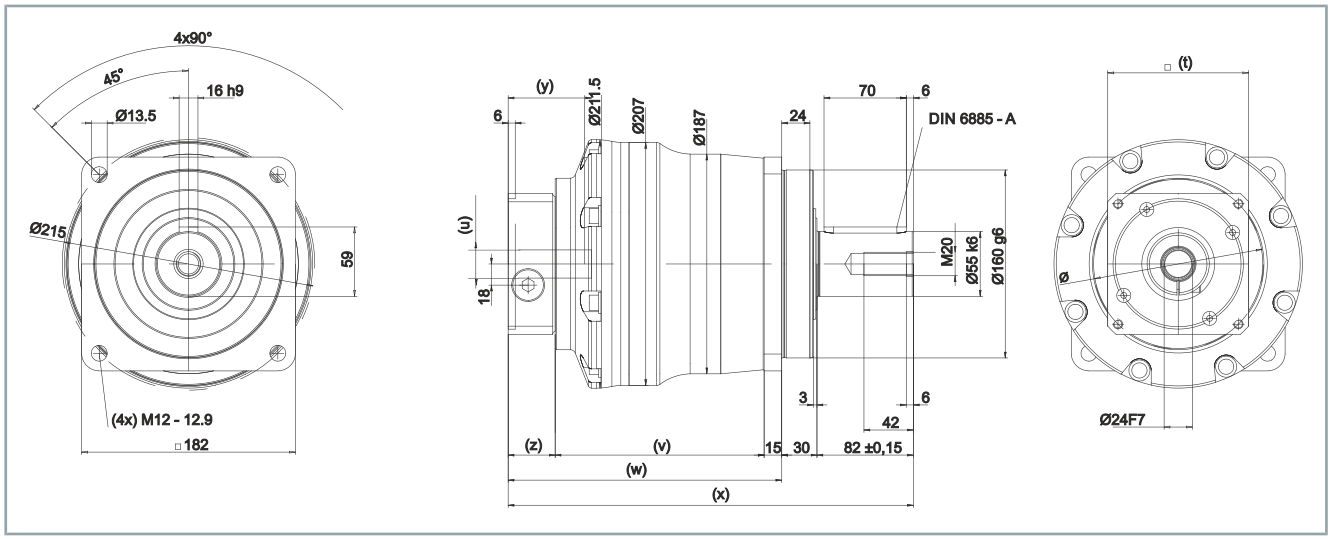
- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M20x42
- Feather key 16h9x70 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]		
	K; up to 38	M; up to 48	N; up to 55
t [motor-dependent]	min. 210		
u [check motor shaft]	38	48	55
v	137		
w [motor-dependent]	min. 198	min. 209	
x [motor-dependent]	min. 310	min. 321	
y [minimum and maximum permissible shaft length]	max. 78 min. 35	max. 82 min. 36	max. 82 min. 40
z [motor-dependent]	min. 46	min. 57	

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M20x42
- Feather key 16h9x70 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]		
	G; up to 24	K; up to 38	M; up to 48
t [motor-dependent]	min. 150		min. 210
u [check motor shaft]	24	32	48
v	178		192.4
w [motor-dependent]	min. 234	min. 243	min. 264
x [motor-dependent]	min. 346	min. 355	min. 376
y [minimum and maximum permissible shaft length]	max. 72 min. 28	max. 80 min. 35	max. 82 min. 36
z [motor-dependent]	min. 41	min. 50	min. 57

SP210 MF

Mechanical data	1-stage					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	97					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 64					
Service life L_h [h]	> 20000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	56					
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
N = 55 mm	139	94.30	76.90	61.50	61.50	53.10
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	1536	1895	1767	1731	1631	1708
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	1920	3000		2880	2280	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	5900					
Nominal input speed n_{1N} [min^{-1}]	1200		1500	1700	2000	
Maximum input speed n_{1Max} [min^{-1}]	3000					
Idle torque T_{012} [Nm] *Based on the drive*	26	19	15	8.80	8.80	6.40
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 3 / Reduced ≤ 1					
Maximum torsional rigidity C_{t21} [arcmin]	400					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	30000					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	21000					
Maximum breakdown torque M_{2Max} [Nm]	3100					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	**2-stage**										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	94										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 57										
Service life L_h [h]	> 20000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	53										
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
M = 48 mm	34.50	31.50	30.80	30		29.70	28.50	28.30		28.10	28
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	1274	1266	1567	1294	2200	1599	1358	1679	1634	1965	1634
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	2880	3000		2880			2840	2880	2043	2457	2043
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	5900										
Nominal input speed n_{1N} [min^{-1}]	2500									3000	
Maximum input speed n_{1Max} [min^{-1}]	4500										
Idle torque T_{012} [Nm] *Based on the drive*	5.60	5.20	4.80	4.50		3.60	3.40	3	3	2.60	2.40
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 5 / Reduced ≤ 3										
Maximum torsional rigidity C_{t21} [arcmin]	400										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	30000										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	21000										
Maximum breakdown torque M_{2Max} [Nm]	3100										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

SP210 MC

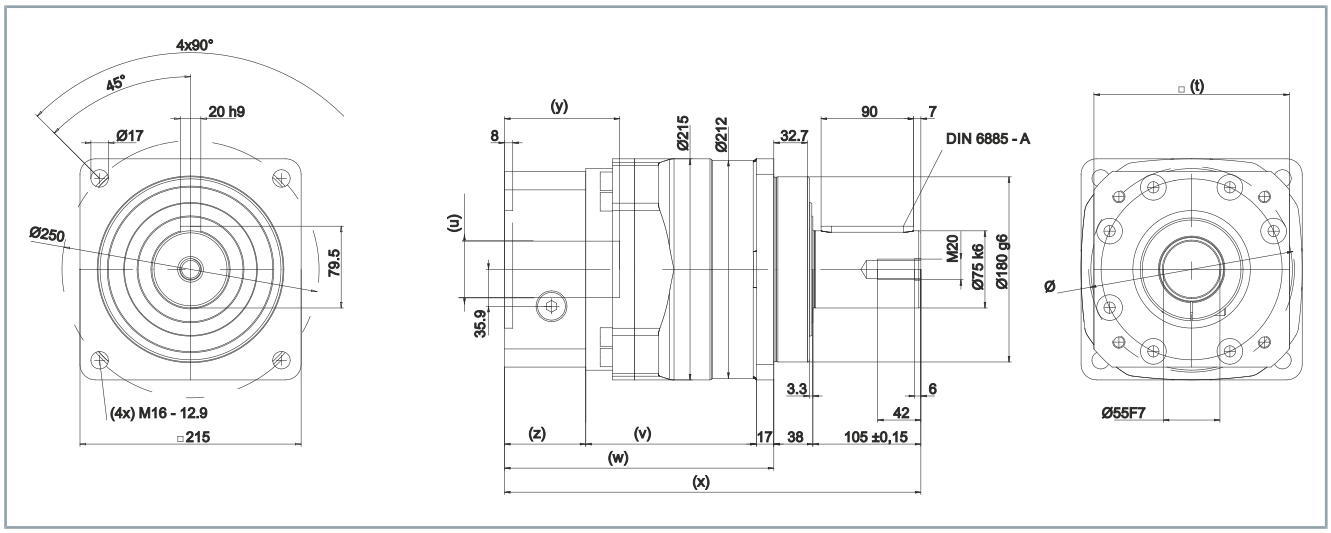
Mechanical data	1-stage					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	97					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 64					
Service life L_h [h]	> 20000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	56					
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
N = 55 mm	139	94.30	76.90	61.50	61.50	53.10
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	960	1260	1141	1169	960	
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	1200	2000		1700	1200	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	5900					
Nominal input speed n_{1N} [min^{-1}]	2250	2500	3500			
Maximum input speed n_{1Max} [min^{-1}]	3400	6000				
Idle torque T_{012} [Nm] *Based on the drive*	12	11	8.40	5.60		3.60
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 4 / Reduced ≤ 2					
Maximum torsional rigidity C_{t21} [arcmin]	400					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	30000					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	21000					
Maximum breakdown torque M_{2Max} [Nm]	3100					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	**2-stage**										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	96.5										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 57										
Service life L_h [h]	>30000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	53										
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
M = 48 mm	34.50	31.50	30.80	30		29.70	28.50	28.30		28.10	28
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	898	728	910	744	1344	929	787	984	960	1360	960
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	1680	1800	2000	1680		1920	1040	1300	1200	1700	1200
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	5900										
Nominal input speed n_{1N} [min^{-1}]	3500	4500									
Maximum input speed n_{1Max} [min^{-1}]	6000										
Idle torque T_{012} [Nm] *Based on the drive*	3.40	3.10	2.90	2.60		2		1.80		1.60	
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 5 / Reduced ≤ 4										
Maximum torsional rigidity C_{t21} [arcmin]	400										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	30000										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	21000										
Maximum breakdown torque M_{2Max} [Nm]	3100										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

Dimensional drawing

1-stage

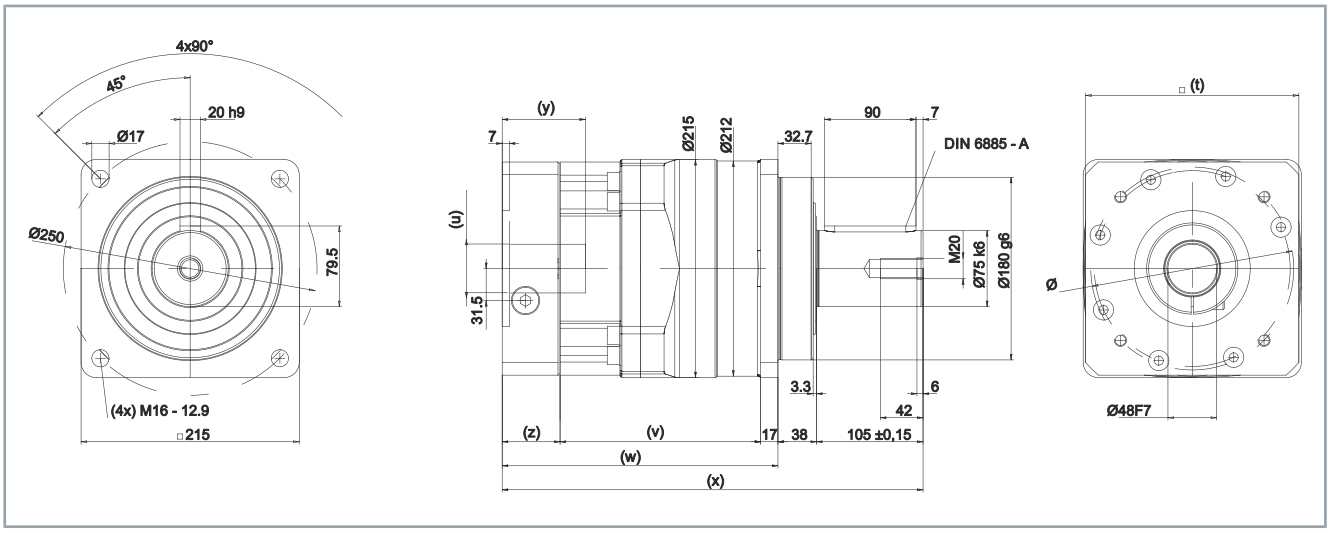
- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M20x42
- Feather key 20h9x90 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]
	N; up to 55
t [motor-dependent]	min. 190
u [check motor shaft]	55
v	166
w [motor-dependent]	min. 242
x [motor-dependent]	min. 385
y [minimum and maximum permissible shaft length]	max. 95 min. 45
z [motor-dependent]	min. 59

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M20x42
- Feather key 20h9x90 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]
	M; up to 48
t [motor-dependent]	min. 210
u [check motor shaft]	48
v	198
w [motor-dependent]	min. 272
x [motor-dependent]	min. 415
y [minimum and maximum permissible shaft length]	max. 82 min. 45
z [motor-dependent]	min. 57

SP240 MF

Mechanical data	1-stage					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	97					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 66					
Service life L_h [h]	> 20000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	77					
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
O = 60 mm	260	198	163	138	138	125
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	2333	3038	2872	2737	2611	2735
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	3300	5400		5160	4000	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	6850	8500			6850	
Nominal input speed n_{1N} [min^{-1}]	1000		1200	1500	1700	
Maximum input speed n_{1Max} [min^{-1}]	3000					
Idle torque T_{012} [Nm] *Based on the drive*	32	24	19	12	12	8
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 3 / Reduced ≤ 1					
Maximum torsional rigidity C_{t21} [arcmin]	550					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	33000					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	30000					
Maximum breakdown torque M_{2Max} [Nm]	5000					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	**2-stage**										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	94										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 58										
Service life L_h [h]	> 20000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	76										
Mass moment of inertia J_1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
M = 48 mm	39.20	34.60	33.20	30.50	30.50	29.70	28.20	27.90	27.60	27.60	27.50
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	2658	2596	3198	2667	3754	3283	2803	3457	2914	3784	2914
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	5400						4400	5160	3642	4730	3642
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	8500								6850	8500	6850
Nominal input speed n_{1N} [min^{-1}]	2300	2500								2800	
Maximum input speed n_{1Max} [min^{-1}]	4500										
Idle torque T_{012} [Nm] *Based on the drive*	8.40	7.10	6.50	5.90	5.90	4.50	4.10	3.50	3.50	3	3
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 5 / Reduced ≤ 3										
Maximum torsional rigidity C_{t21} [arcmin]	550										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	33000										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	30000										
Maximum breakdown torque M_{2Max} [Nm]	5000										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

SP240 MC

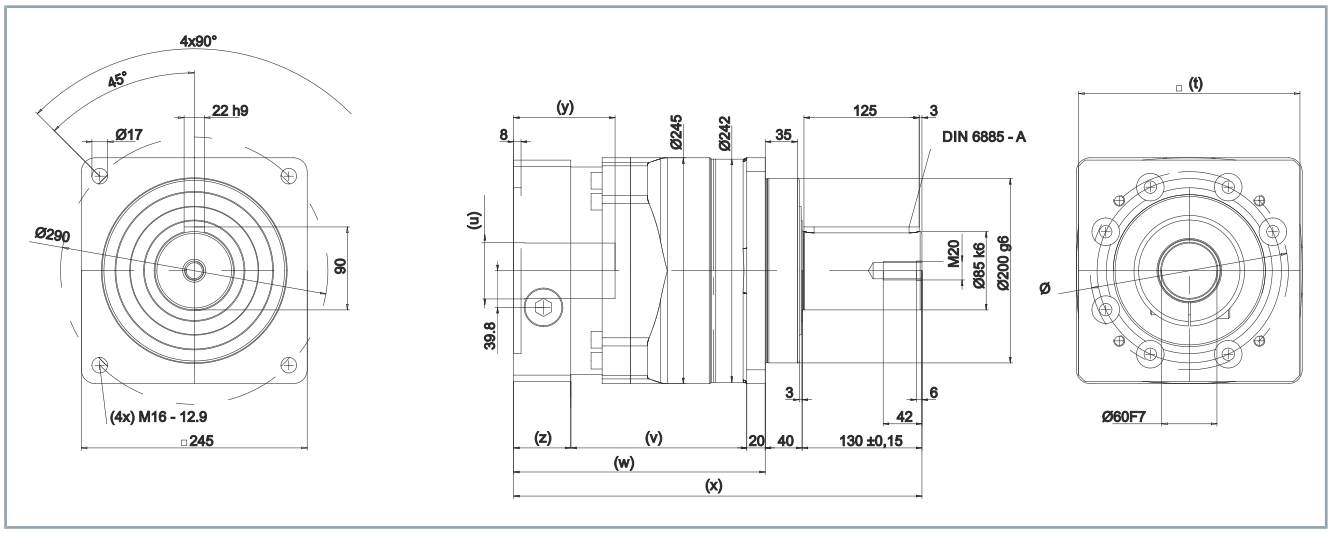
Mechanical data	**1-stage**					
Ratio	3	4	5	7	8	10
Efficiency under full load η [%]	98.5					
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 66					
Service life L_h [h]	> 30000					
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	83					
Mass moment of inertia J1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*						
O = 60 mm	260	198	163	138		125
Torques and speeds						
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	1400	2029	1861	1910	1440	1440
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	1750	3500	3600	2700	1800	
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	6850	8500			6850	
Nominal input speed n_{1N} [min^{-1}]	1750	2250	3000			
Maximum input speed n_{1Max} [min^{-1}]	3400	4000	5000			
Idle torque T_{012} [Nm] *Based on the drive*	18	16	12	8.60	8.60	5.80
Torsion and forces						
Maximum torsional backlash j_t [arcmin]	Standard ≤ 4 / Reduced ≤ 2					
Maximum torsional rigidity C_{t21} [arcmin]	550					
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	33000					
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	30000					
Maximum breakdown torque M_{2Max} [Nm]	5000					
Temperature [°C]						
Maximum housing temperature	+ 90					
Ambient temperature	-15 to +40					
Housing						
Properties	Heat-treated steel					
Color	Anthracite gray; RAL 7016					
Seal	Sealed bearing discs					

Mechanical data	**2-stage**										
Ratio	16	20	25	28	32	35	40	50	64	70	100
Efficiency under full load η [%]	96.5										
Running noise L_{PA} [dB] *at n1 = 3000 rpm without load*	≤ 58										
Service life L_h [h]	> 30000										
Weight [kg] *Depending on the clamping hub diameter and selected adapter plate*	76										
Mass moment of inertia J1 [kgcm²] *Based on the drive* *Letters = specification of the clamping hub diameter*											
M = 48 mm	34.50	31.50	30.80	30		29.70	28.50	28.30	28.30	28.10	28
Torques and speeds											
Rated torque at the output T_{2N} [Nm] *at n_{1N}*	1950	1803	2266	1867	2320	2694	1344	1680	1440	2160	1440
Maximum acceleration torque T_{2B} [Nm] *Maximum 1000 cycles per hour*	3500		3600	2900		3600	1680	2100	1800	2700	1800
EMERGENCY STOP torque T_{2Emer} [Nm] *Possible 1000 times during the service life of the gear unit*	8500								6850	8500	6850
Nominal input speed n_{1N} [min^{-1}]	3500	4500									
Maximum input speed n_{1Max} [min^{-1}]	6000										
Idle torque T_{012} [Nm] *Based on the drive*	4.80	4.40	4	3.60	3.60	2.80	2.40	2		1.60	1.40
Torsion and forces											
Maximum torsional backlash j_t [arcmin]	Standard ≤ 5 / Reduced ≤ 4										
Maximum torsional rigidity C_{t21} [arcmin]	400										
Maximum axial force F_{2AMax} [N] *In relation to the shaft center at the output*	33000										
Maximum lateral force F_{2QMax} [N] *In relation to the shaft center at the output*	30000										
Maximum breakdown torque M_{2Max} [Nm]	5000										
Temperature [°C]											
Maximum housing temperature	+ 90										
Ambient temperature	-15 to +40										
Housing											
Properties	Heat-treated steel										
Color	Anthracite gray; RAL 7016										
Seal	Sealed bearing discs										

Dimensional drawing

1-stage

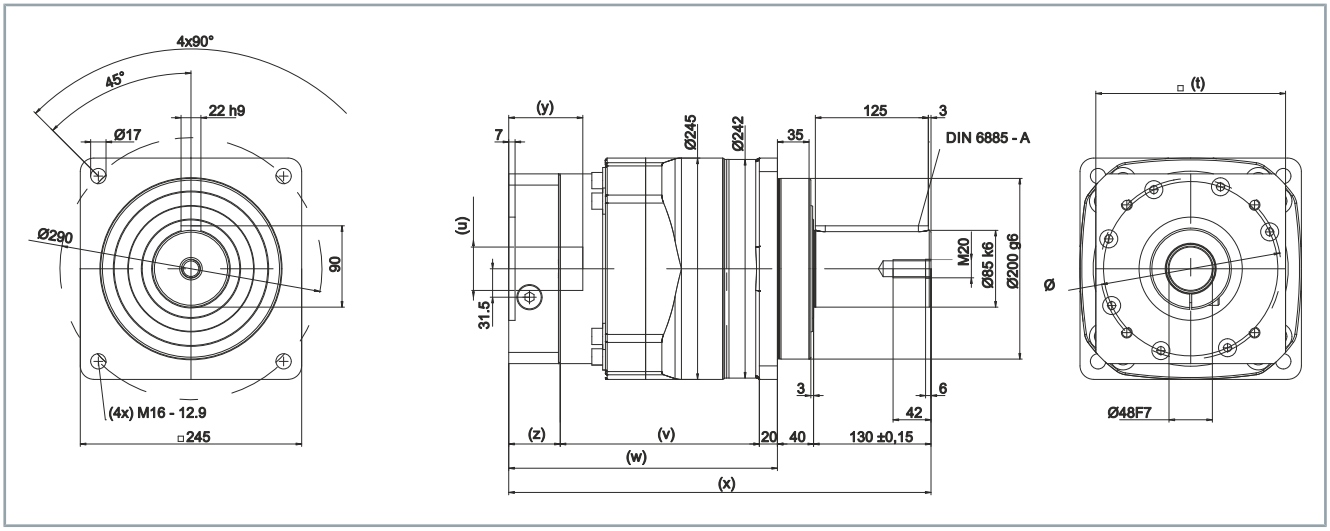
- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M20x42
- Feather key 22h9x125 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]
	O; up to 60
t [motor-dependent]	min. 240
u [check motor shaft]	60
v	191
w [motor-dependent]	min. 273
x [motor-dependent]	min. 443
y [minimum and maximum permissible shaft length]	max. 110 min. 55
z [motor-dependent]	min. 62

2-stage

- All figures in millimeters
- Dimensions without tolerance ± 1 mm
- Clamping hub diameter depending on the motor size
- Center bore according to DIN 332-DR M20x42
- Feather key 22h9x125 according to DIN 6885-A



Variables	Clamping hub internal diameter [mm]
	M; up to 48
t [motor-dependent]	min. 210
u [check motor shaft]	48
v	220
w [motor-dependent]	min. 297
x [motor-dependent]	min. 467
y [minimum and maximum permissible shaft length]	max. 82 min. 45
z [motor-dependent]	min. 57

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 AG2300 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 AG2300 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: 0 °C to +40 °C, maximum fluctuation 20 K/hour
- Air humidity: 15 % to 95 % relative humidity, no condensation
- Use of suitable means of transport
- Transport and storage only in a horizontal position
- Use of the vendor's original packaging

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:

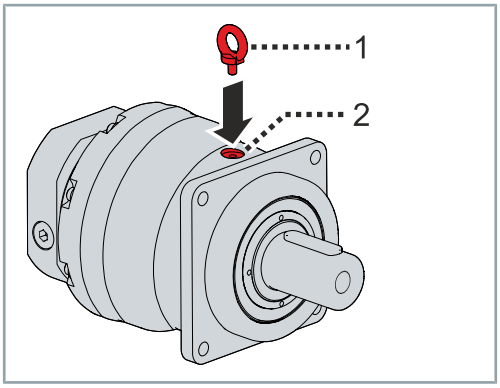
- Without aids, by hand in compliance with the legal requirements for the lifting of loads
- Using suitable transport slings on the gear unit with averaged center of gravity, with sufficiently dimensioned hoists
- using suitable transport slings on the gear unit and on the motor with averaged center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

Eyebolt

From size 180 upwards, the unit features one or more mounting holes for eyebolts.

The following table provides information about the diameter of the mounting hole and the corresponding eyebolt size:

Gear unit size	Mounting hole
180	M8
210	M10
240	M12



► Screw the appropriate eyebolt [1] into the mounting hole [2]

► Move the gear unit to the desired location using adequately dimensioned lifting gear

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.

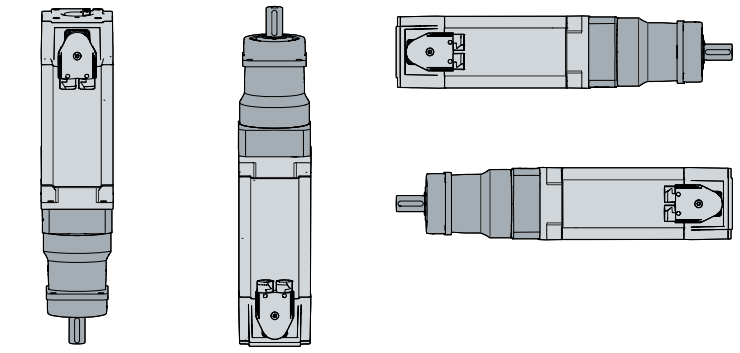
Prevent the formation of condensation
Ensure a constant ambient temperature in the range from 0°C to +40°C at the storage location. Avoid high humidity.
Failure to comply may result in the formation of condensation. Condensation can cause damage in later operation or rust formation on the gear unit.

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

Mounting 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.



IM V1 (V1) IM V3 (V3) IM B5 (B5)

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 μ = 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

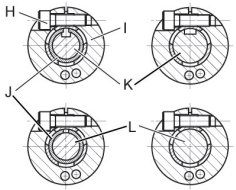
If a motor is included in the scope of delivery:
Motors included in the scope of delivery are pre-mounted.
For optimum performance, we recommend installation on Beckhoff AM8xxx synchronous servomotors.

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

- Design B5
- Minimum concentricity tolerance and axial run-out tolerance N according to DIN 42955
- Smooth shaft
- Motor attachment if possible in a vertical position

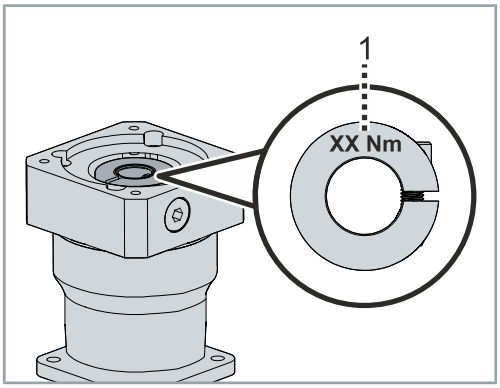
Clamping hub

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:

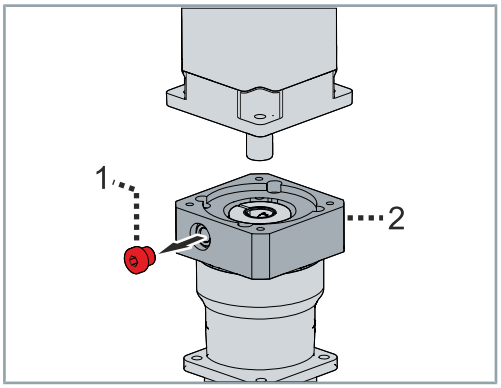
Clamping hub diameter [mm]	Identifying letter	Width across flats [mm]	Tightening torque [Nm]
8	Z	2.5	2
9	A	2.5	2
11	B	3	4.1
14	C	4	9.5
16	D	5	14
19	E	5	14
24	G	6	35
28	H	5	14
32	I	8	79
38	K	8	79
48	M	10	135
55	N	10	135
60	O	14	330

Mounting

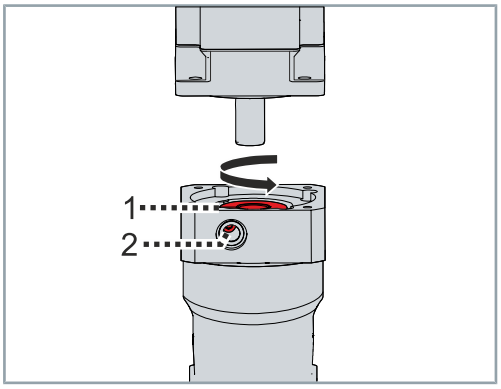
► Carefully degrease the following components with a cloth:
- Contact surfaces with adjacent components
- Centering and motor shaft
- Internal diameter of the clamping hub
- Spacer sleeve inside and outside

In case of motor with feather key [+]

► Remove feather key [+] and insert half wedge



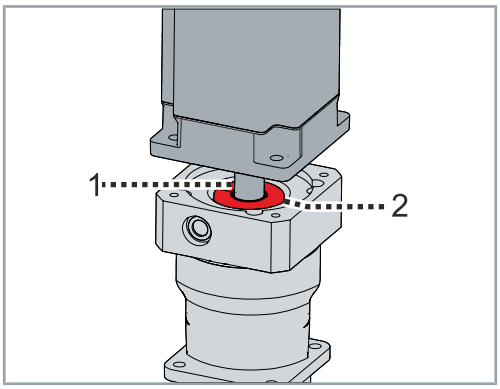
► Remove the screw plug [1] from the adapter plate [2]



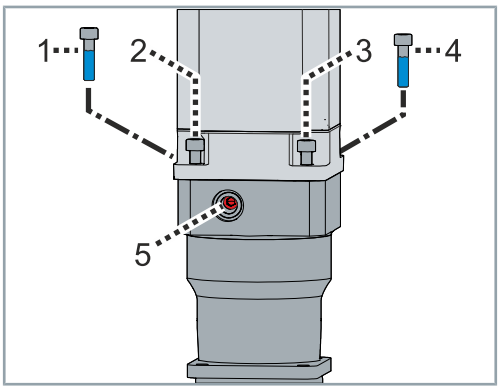
► Turn the clamping hub [1] until the screw [2] can be seen above the mounting hole

► Loosen the screw [2] by one turn

Do not exceed the permissible axial forces
If the motor shaft cannot be inserted easily, the screw on the clamping hub must be loosened a little more.
With certain motor shaft diameters, a slotted spacer sleeve must be installed in addition. If there is a groove on the motor shaft, it must be aligned with the slot in the spacer sleeve.



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



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

- ► Coat screws [1], [2], [3] and [4] with threadlocker
- ► Insert bolts [1], [2], [3] and [4] and tighten evenly
- ► Tighten bolt [5]. Refer to the chapter "Clamping hub", [Page 72].
- ► Insert the screw plug back into the adapter plate

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.

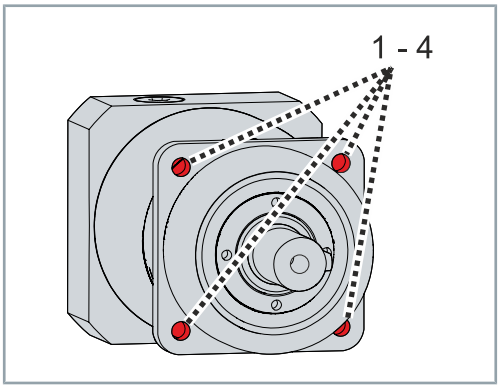
- ► Seal any gap over a wide area when attaching to the output side
- ► Make sure that the surfaces of the attached parts have a low roughness
- ► Use only screw head seals and o-rings for sealing

Permissible axial forces

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

Gear unit	060	075	100	140	180	210	240
$F_{a\ max}$ [N]	9250	10750	19500	31250	49750	83250	97750

Mounting



- ► 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

Tightening torques

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]**
060	68	M5	9
075	85	M6	15.4
100	120	M8	37.5
140	165	M10	73.5
180	215	M12	126
210	250	M16	310
240	290	M16	310

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 Nm x 10 = **10 Nm**

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

Calculation based on the peak motor current:
Standstill torque M_{pmax} of the motor: 5 Nm

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

Output torque of the gear unit with a transmission ratio i of 10:
5 Nm x 10 = **50 Nm**

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

Relevant parameters

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

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	$C_6H_5NH_2HCl$
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 AG2300 series are lubricated for life. The lubricant used does not have to be renewed.
If you wish to change the lubricant, contact Beckhoff Service.

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

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

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

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. For more information please refer to Chapter: Documentation notes.
When disposing of electronic waste, make sure that you dispose of it in accordance with the regulations applicable in your country.
Read and follow the instructions for proper disposal.

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/ag2300

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