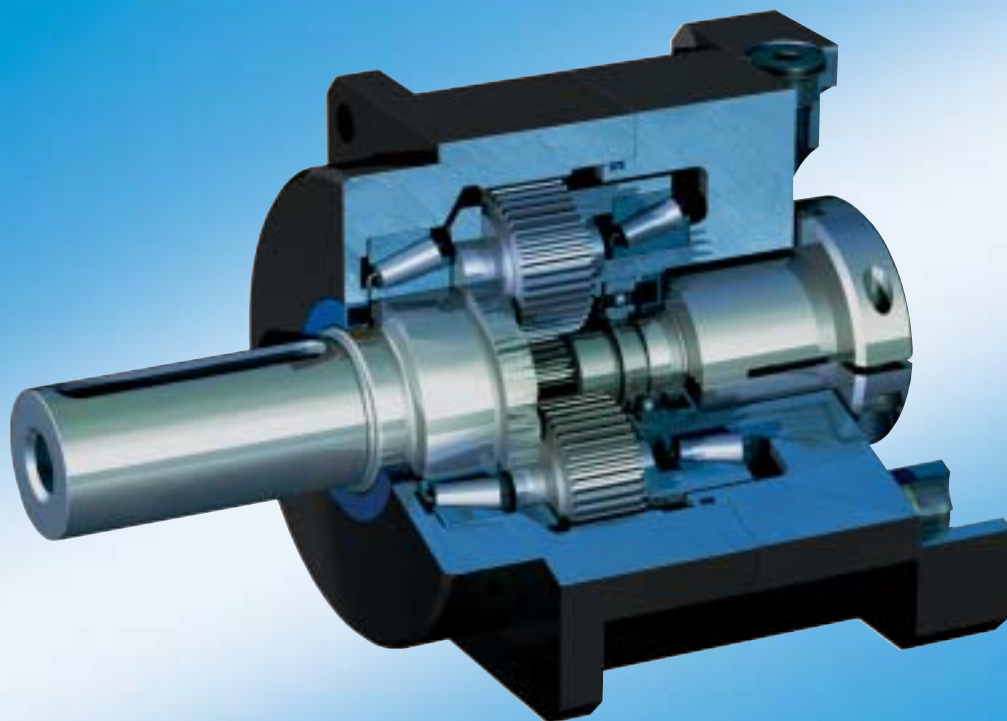


Rexroth GTP Planetary Gearboxes

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Edition 02

Project Planning Manual



Title Planetary Gear Box GTP
for mounting on AC motors

Type of Documentation **Project Planning Manual**

Document Typecode DOK-GEAR**-GTP*****-PR02-EN-P

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Purpose of the Documentation The purpose of this documentation is ...

- to help you select your GTP planetary gearbox,
- to explain technical data,
- to explain about the mechanical integration of the gearbox into the machine, and
- to give details about order information.

Record of Revisions

Description	Release Date	Notes
209-0069-4386-00	09/95	First issue
DOK-GEAR**-GTP*****-PRJ1-DE-P	03/97	Inclusion of MAC, MDD, MHD motors. Amendments of technical data and dimensional notations.
DOK-GEAR**-GTP*****-PR02-DE-P	08/01	Reworked version

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Validity The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract. All rights are reserved with respect to the content of this documentation and the availability of the product.

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**Amendments to the prior version
DOK-GEAR**-GTP*****-PRJ1-EN-P**

Where?	What?
Chapter 2	New: Important Instructions on Use
Chapter 3	New: Safety Notes for Drives and Controls
Chapt. 4.1	New: Constant Velocity without Currentless Time (S1)
Chapt. 5.1	New: Operating conditions Operation Mode S5 (Intermittent Operation)
Chapter 5.3	Reworked and supplemented version of the Chapter: "Possible Combinations of GTP Planetary Gear Boxes and AC Motors"
Chapter 6.1	Reworked and supplemented version of the Chapter: "Technical Data" (Data depending on transmission, General data)
Chapt. 6.4	Reworked version: Dimensional Notations, Single-stage (Mounting of New Motors)
Chapt. 6.5	Reworked version: Dimensional Notations, Two-stage (Mounting of New Motors)
Chapt. 6.6	Reworked and supplemented version of the Chapter: "Type code GTP070"
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Chapt. 7.5	Reworked version: Dimensional Notations, Two-stage (Mounting of New Motors)
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Chapter 10.3	Reworked version: Dimensional Notations, Single-stage (Mounting of New Motors) Dimensional Notations, Two-Stage – no longer applicable!
Chapter 10.4	Reworked version: "Type code GTP200"
Chapt. 12	Commissioning, Operation, and Maintenance
Chapter 13	New: Service & Support
Chapt. 14	Annex "List of Standards"

Note: The completeness of this list is not guaranteed. The author reserves the right not to mention minor changes in this list.

Notizen - Notes

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1 Introduction of the Product



Fig. 1-1: Mounting example: GTP planetary gear box to MKD motors

Scope of application In combination with the Rexroth Indramat drive control systems, the planetary gear boxes for mounting on AC motors offer automation systems for numerous branches of industry at an interesting price. They are especially suitable for the application in rack-and-pinion or toothed wheel drives in high-speed and high-acceleration handling systems (e.g.: chargers, robots).

Gradings

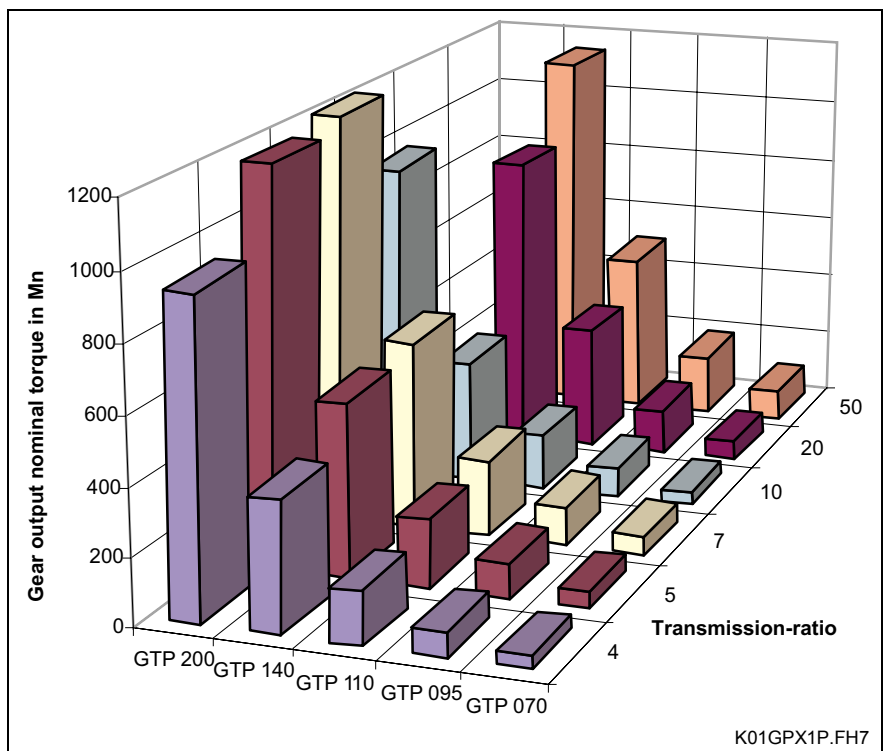


Fig. 1-2: Grading of nominal torques of GTP planetary gear boxes for mounting on AC motors

- Function principles** The GTP planetary gear boxes provide for co-axial drive and output. The driven shaft of the AC motor is connected to the sun wheel of the planetary gear box via a coupling element. This sun wheel drives three planetary wheels running on a ring gear. The planetary wheels are situated in a pinion cage that functions as output. By spreading the meshing over three planetary wheels, a well-balanced power splitting is realised. Thus, a compact design is achieved.
- High operation reliability**
- Maintenance-free operation because of lubrication for working life
 - Application in unfavourable ambient conditions possible because of completely closed design in protection class IP65
- High performance data** Toothed wheel work with little play and low circumferential backlash because of ground gear pairs
- High torsional strength because of division of load to three planetary wheels
 - High efficiency because of planetary wheel principle
 - Low noise because of noise-optimised gear pairs
 - High dynamics because of small inertia masses
 - Low weight because of compact design
- Easy mounting on the machine**
- High radial load capability of the bearings allows for direct mounting of pinion and pulleys as suitable.
 - Mounting in all installation positions is admissible because all bearings and gearings are lubricated.
 - Flange-mounting admissible in all installation positions because of construction type B05 (EN 60034-7:1996-06) with drill holes in the flange
 - The drive elements can be mounted in two ways:
 - friction-locked shaft-hub-connection by means of plain driven shaft (standard version)
 - positive shaft-hub-connection by means of driven shaft with featherkey way

2 Important Instructions on Use

2.1 Intended Use

Introduction

In their development and manufacture, Rexroth Indramat products reflect the latest state of technology. Prior to delivery, the products are checked for operational reliability.

The products may only be used as intended. Should the products not be used as intended, situations may arise resulting in material damage and personal injury.

Note: Rexroth Indramat, as the product manufacturers, will not give any warranty nor assume any liability or pay damages for damage caused by the products having not been used as intended. The user is solely responsible for any risks arising if the products are not used as intended.

Before you start to use the products manufactured by Rexroth Indramat, the following requirements must be fulfilled to ensure that the products are used as intended:

- Anyone handling our products in any way must read and understand the appropriate safety instructions and the sections on their intended use.
- If they are hardware products, the products concerned must be left in their original state, i.e. no structural alterations may be made. Software products may not be decompiled. Software source codes may not be changed.
- Damaged or defective products may not be installed or put into operation.
- It must be ensured that the products are installed as specified in the directions mentioned in the documentation.

Fields of Use and Application

Typical fields of application for planetary gears of the GTP product line are:

- Handling and installation systems,
- packaging and food processing machines,
- printing and paper processing machines, and machine tools.

To control and supervise the motor-and-gear unit, it may be necessary to connect additional sensors and actuators.

Note: The planetary gears may only be used with the accessories and add-on pieces listed in this documentation. Components other than those expressly mentioned may neither be attached nor connected. This is also applicable to lines and cables.

The system may only be operated in those configurations and combinations of the components which are expressly specified as well as with the software and firmware mentioned and specified in the appropriate functional descriptions.

Prior to commissioning, each drive control device must be programmed to have the motor perform the functions for the specific application.

The planetary gears may only be operated under the mounting and installation conditions specified in this documentation, in the position of use specified, and under the environmental conditions specified (temperature, degree of protection, humidity, EMC, and the like).

2.2 Non-Intended Use

Any use of the planetary gears outside of the fields of application listed above or under operating conditions and technical data other than those specified in the documentation is considered to be “non-intended”.

Planetary gears must not be used if

- they are subject to operating conditions which do not comply with the environmental conditions prescribed. For instance, it is not permitted to operate them under water, under extremely varying temperatures or at extreme maximum temperatures.
- In general, they may not be used unless the intended applications have been expressly authorised by Rexroth Indramat. Please be sure to observe the statements made in the general safety instructions!

3 Safety Instructions for Electric Drives and Controls

3.1 Introduction

Read these instructions before the initial startup of the equipment in order to eliminate the risk of bodily harm or material damage. Follow these safety instructions at all times.

Do not attempt to install or start up this equipment without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation of the equipment prior to working with the equipment at any time. If you do not have the user documentation for your equipment, contact your local Rexroth Indramat representative to send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

If the equipment is resold, rented or transferred or passed on to others, then these safety instructions must be delivered with the equipment.



Improper use of this equipment, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, may result in material damage, bodily harm, electric shock or even death!

3.2 Explanations

The safety instructions describe the following degrees of hazard seriousness in compliance with ANSI Z535. The degree of hazard seriousness informs about the consequences resulting from non-compliance with the safety instructions.




Warning symbol with signal word	Degree of hazard seriousness according to ANSI
 DANGER	Death or severe bodily harm will occur.
 WARNING	Death or severe bodily harm may occur.
 CAUTION	Bodily harm or material damage may occur.

Fig. 3-1: Hazard classification (according to ANSI Z535)

3.3 Hazards by Improper Use



DANGER

**High voltage and high discharge current!
Danger to life or severe bodily harm by electric shock !**



DANGER

Dangerous movements! Danger to life, severe bodily harm or material damage by unintentional motor movements!



WARNING

High electrical voltage due to wrong connections! Danger to life or bodily harm by electric shock!



WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!



CAUTION

Surface of machine housing could be extremely hot! Danger of injury! Danger of burns!



CAUTION

Risk of injury due to improper handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock or incorrect handling of pressurized systems!



CAUTION

Risk of injury due to incorrect handling of batteries!

3.4 General Information

- Rexroth Indramat GmbH is not liable for damages resulting from failure to observe the warnings provided in this documentation.
- Read the operating, maintenance and safety instructions in your language before starting up the machine. If you find that you can not completely understand the documentation for your product, please ask your supplier to clarify.
- Proper and correct transport, storage, assembly and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Only persons who are trained and qualified for the use operation of the equipment may work on this equipment or within its proximity. The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the equipment as well as an understanding of all warnings and precautionary measures noted in these instructions.
Furthermore, they must be trained, instructed and qualified to switch electrical circuits and equipment on and off in accordance with technical safety regulations, to ground them and to mark them according to the requirements of safe work practices. They must have adequate safety equipment and be trained in first aid.
- Only use spare parts and accessories approved by the manufacturer.
- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The equipment is designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Use only safety features and applications that are clearly and explicitly approved in the Project Planning Manual.
For example, the following areas of use are not permitted: construction cranes, elevators used for people or freight, devices and vehicles to transport people, medical applications, refinery plants, transport of hazardous goods, nuclear applications, applications sensitive to high frequency, mining, food processing, control of protection equipment (also in a machine).
- The information given in this documentation with regard to the use of the delivered components contains only examples of applications and suggestions.
The machine and installation manufacturer must
 - make sure that the delivered components are suited for his individual application and check the information given in this documentation with regard to the use of the components,
 - make sure that his application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Startup of the delivered components is only permitted once it is sure that the machine or installation in which they are installed complies with the national regulations, safety specifications and standards of the application.
- Operation is only permitted if the national EMC regulations for the application are met.
The instructions for installation in accordance with EMC requirements

can be found in the documentation "EMC in Drive and Control Systems."

The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.

- Technical data, connections and operational conditions are specified in the product documentation and must be followed at all times.

3.5 Protection Against Contact with Electrical Parts

Note: This section refers to equipment and drive components with voltages above 50 Volts.

Touching live parts with voltages of 50 Volts and more with bare hands or conductive tools or touching ungrounded housings can be dangerous and cause electric shock. In order to operate electrical equipment, certain parts must unavoidably have dangerous voltages applied to them.



DANGER

High electrical voltage! Danger to life, severe bodily harm by electric shock!

- ⇒ Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain or repair this equipment.
 - ⇒ Follow general construction and safety regulations when working on high voltage installations.
 - ⇒ Before switching on power the ground wire must be permanently connected to all electrical units according to the connection diagram.
 - ⇒ Do not operate electrical equipment at any time, even for brief measurements or tests, if the ground wire is not permanently connected to the points of the components provided for this purpose.
 - ⇒ Before working with electrical parts with voltage higher than 50 V, the equipment must be disconnected from the mains voltage or power supply. Make sure the equipment cannot be switched on again unintended.
 - ⇒ The following should be observed with electrical drive and filter components:
 - Wait five (5) minutes after switching off power to allow capacitors to discharge before beginning to work. Measure the voltage on the capacitors before beginning to work to make sure that the equipment is safe to touch.
 - ⇒ Never touch the electrical connection points of a component while power is turned on.
 - ⇒ Install the covers and guards provided with the equipment properly before switching the equipment on. Prevent contact with live parts at any time.
 - ⇒ A residual-current-operated protective device (RCD) must not be used on electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.
 - ⇒ Electrical Components with exposed live parts and uncovered high voltage terminals must be installed in a protective housing, for example in a control cabinet.
-

To be observed with electrical drive and filter components:



DANGER

**High electrical voltage on the housing!
High leakage current! Danger to life, danger of
injury by electric shock!**

- ⇒ Connect the electrical equipment, the housings of all electrical units and motors permanently with the safety conductor at the ground points before power is switched on. Look at the connection diagram. This is even necessary for brief tests.
 - ⇒ Connect the safety conductor of the electrical equipment always permanently and firmly to the supply mains. Leakage current exceeds 3.5 mA in normal operation.
 - ⇒ Use a copper conductor with at least 10 mm² cross section over its entire course for this safety conductor connection!
 - ⇒ Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. Otherwise, high voltages can occur on the housing that lead to electric shock.
-

3.6 Protection Against Electric Shock by Protective Low Voltage (PELV)

All connections and terminals with voltages between 0 and 50 Volts on Rexroth Indramat products are protective low voltages designed in accordance with international standards on electrical safety.



WARNING

High electrical voltage due to wrong connections! Danger to life, bodily harm by electric shock !

- ⇒ Only connect equipment, electrical components and cables of the protective low voltage type (PELV = Protective Extra Low Voltage) to all terminals and clamps with voltages of 0 to 50 Volts.
- ⇒ Only electrical circuits may be connected which are safely isolated against high voltage circuits. Safe isolation is achieved, for example, with an isolating transformer, an opto-electronic coupler or when battery-operated.

3.7 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of the connected motors. Some common examples are:

- improper or wrong wiring of cable connections
- incorrect operation of the equipment components
- wrong input of parameters before operation
- malfunction of sensors, encoders and monitoring device
- defective components
- software or firmware errors

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring in the drive components will normally be sufficient to avoid faulty operation in the connected drives. Regarding personal safety, especially the danger of bodily injury and material damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.



Dangerous movements! Danger to life, risk of injury, severe bodily harm or material damage!

- ⇒ Ensure personal safety by means of qualified and tested higher-level monitoring device or measures integrated in the installation. Unintended machine motion is possible if monitoring device are disabled, bypassed or not activated.
- ⇒ Pay attention to unintended machine motion or other malfunction in any mode of operation.
- ⇒ Keep free and clear of the machine's range of motion and moving parts. Possible measures to prevent people from accidentally entering the machine's range of movement:
 - use safety fences
 - use safety guards
 - use protective coverings
 - install light curtains or light barriers
- ⇒ Fences and coverings must be strong enough to resist maximum possible momentum, especially if break off parts can fly into the environment.
- ⇒ Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Don't operate the machine if the emergency stop is not working.
- ⇒ Isolate the drive power connection by means of an emergency stop circuit or use a starting lockout to prevent unintentional start.
- ⇒ Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone. Safe standstill can be achieved by switching off the power supply contactor or by safe mechanical locking of moving parts.
- ⇒ Secure vertical axes against falling or dropping after switching off the motor power by, for example:
 - mechanically securing the vertical axes
 - adding an external braking/ arrester/ clamping mechanism
 - ensuring sufficient equilibration of the vertical axes

The standard equipment motor brake or an external brake controlled directly by the drive controller are not sufficient to guarantee personal safety!

- ⇒ Disconnect electrical power to the equipment using a master switch and secure the switch against reconnection for:
 - maintenance and repair work
 - cleaning of equipment
 - long periods of discontinued equipment use
- ⇒ Prevent the operation of high-frequency, remote control and radio equipment near electronics circuits and supply leads. If the use of such equipment cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial startup. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.

3.8 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated near current-carrying conductors and permanent magnets in motors represent a serious health hazard to persons with heart pacemakers, metal implants and hearing aids.



WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

- ⇒ Persons with heart pacemakers, hearing aids and metal implants are not permitted to enter following areas:
 - Areas in which electrical equipment and parts are mounted, being operated or started up.
 - Areas in which parts of motors with permanent magnets are being stored, operated, repaired or mounted.
- ⇒ If it is necessary for a person with a heart pacemaker to enter such an area, then a doctor must be consulted prior to doing so. Heart pacemakers that are already implanted or will be implanted in the future, have a considerable variation in their electrical noise immunity. Therefore there are no rules with general validity.
- ⇒ Persons with hearing aids, metal implants or metal pieces must consult a doctor before they enter the areas described above. Otherwise, health hazards will occur.

3.9 Protection Against Contact with Hot Parts



CAUTION

**Housing surfaces could be extremely hot!
Danger of injury! Danger of burns!**

- ⇒ Do not touch housing surfaces near sources of heat! Danger of burns!
- ⇒ After switching the equipment off, wait at least ten (10) minutes to allow it to cool down before touching it.
- ⇒ Do not touch hot parts of the equipment, such as housings with integrated heat sinks and resistors. Danger of burns!

3.10 Protection During Handling and Mounting

Under certain conditions, incorrect handling and mounting of parts and components may cause injuries.



CAUTION

Risk of injury by incorrect handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock!

- ⇒ Observe general installation and safety instructions with regard to handling and mounting.
- ⇒ Use appropriate mounting and transport equipment.
- ⇒ Take precautions to avoid pinching and crushing.
- ⇒ Use only appropriate tools. If specified by the product documentation, special tools must be used.
- ⇒ Use lifting devices and tools correctly and safely.
- ⇒ For safe protection wear appropriate protective clothing, e.g. safety glasses, safety shoes and safety gloves.
- ⇒ Never stand under suspended loads.
- ⇒ Clean up liquids from the floor immediately to prevent slipping.

3.11 Battery Safety

Batteries contain reactive chemicals in a solid housing. Inappropriate handling may result in injuries or material damage.



Risk of injury by incorrect handling!

- ⇒ Do not attempt to reactivate discharged batteries by heating or other methods (danger of explosion and cauterization).
- ⇒ Never charge non chargeable batteries (danger of leakage and explosion).
- ⇒ Never throw batteries into a fire.
- ⇒ Do not dismantle batteries.
- ⇒ Do not damage electrical components installed in the equipment.

Note: Be aware of environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air and sea transport in the sense of the legal requirements (danger of explosion). Dispose batteries separately from other waste. Observe the legal requirements in the country of installation.

3.12 Protection Against Pressurized Systems

Certain motors and drive controllers, corresponding to the information in the respective Project Planning Manual, must be provided with pressurized media, such as compressed air, hydraulic oil, cooling fluid and cooling lubricant supplied by external systems. Incorrect handling of the supply and connections of pressurized systems can lead to injuries or accidents. In these cases, improper handling of external supply systems, supply lines or connections can cause injuries or material damage.



Danger of injury by incorrect handling of pressurized systems !

- ⇒ Do not attempt to disassemble, to open or to cut a pressurized system (danger of explosion).
- ⇒ Observe the operation instructions of the respective manufacturer.
- ⇒ Before disassembling pressurized systems, release pressure and drain off the fluid or gas.
- ⇒ Use suitable protective clothing (for example safety glasses, safety shoes and safety gloves)
- ⇒ Remove any fluid that has leaked out onto the floor immediately.

Note: Environmental protection and disposal! The media used in the operation of the pressurized system equipment may not be environmentally compatible. Media that are damaging the environment must be disposed separately from normal waste. Observe the legal requirements in the country of installation.

4 Dimensioning and Selection

4.1 Dimensioning

The applications for GTP planetary gear boxes can be subdivided into the following characteristic velocity-and-time graphs:

- Triangular velocity curve with currentless time
- Operation at constant velocity and currentless time
- Operation with trapezoid velocity curve and currentless time
- Operation at constant velocity without currentless time (S1)

The velocity-and-time graphs essentially define the dimensioning criteria.

Triangular operation with currentless time

This type of operation is characteristic for all highly dynamic feed motions commonly to be found with roll feed mechanisms for sheet metal, paper, plastic, or packaging industry.

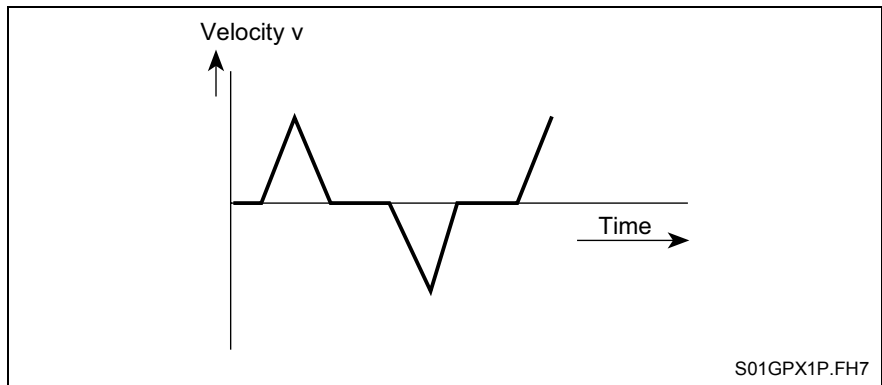


Fig. 4-1: Velocity-and-time graph for triangular operation

For this type of operation, dimensioning is mainly defined by the required maximum moment M_{max} and the effective torque M_{eff} .

Constant velocity with currentless time

This type of operation is characteristic for all feed motions commonly to be found with bobbin carriages, roller drives, and dosing devices in machines for the sheet metal, paper, plastic, or packaging industry.

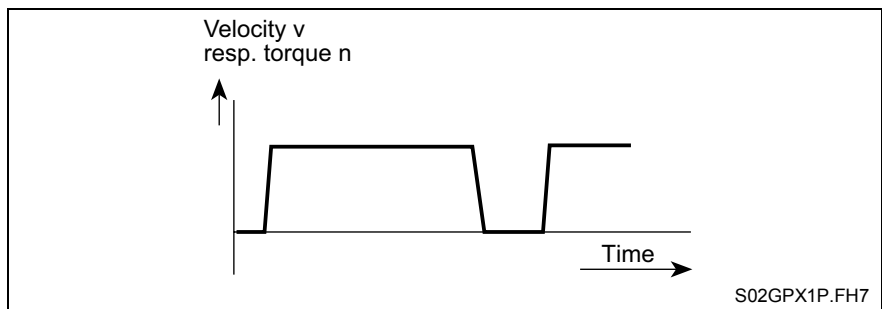


Fig. 4-2: Velocity-and-time graph for operation at constant velocity

For this type of operation, dimensioning is defined mainly by the required permanent torque M_{dN} and the mean velocity V_{mean} or mean speed n_{mean} .

Trapezoid operation with currentless time

This type of operation is characteristic for most feed motions. They are to be found especially frequently with chargers and handling systems in almost all branches of industry.

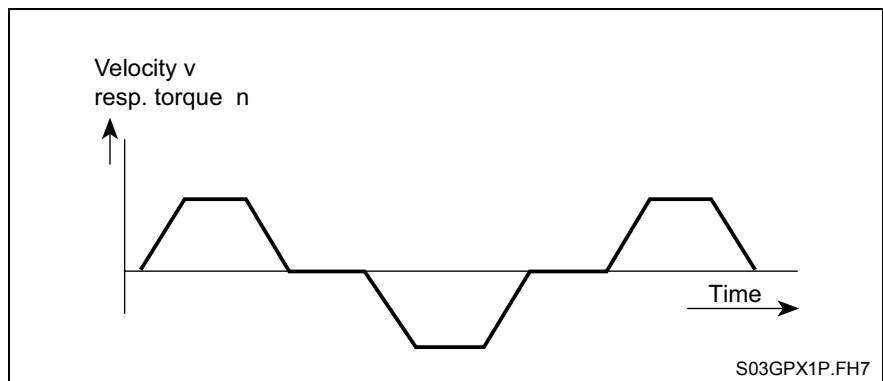


Fig. 4-3: Velocity-and-time graph for trapezoidal operation

With this type of operation, dimensioning is primarily defined by the required maximum torque M_{\max} in the acceleration phases, the effective torque m_{eff} over the total cycle time, and the mean velocity v_{mean} resp. the mean speed n_{mean} .

Constant velocity without currentless time (S1)

This type of operation is characteristic for printing press drives.

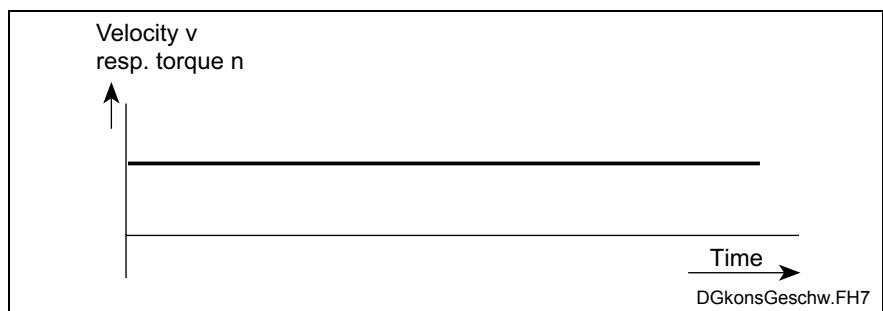


Fig. 4-4: Velocity-and-time graph for constant velocity

Dimensioning is defined by the required permanent torque M_{dN} and velocity v resp. speed n .

4.2 Selection

Drive-defining values The suitable combination of motor and drive, operated by means of a drive control device, is selected by determining the relevant drive-defining values.

- Friction torque
- Weight torque
- Handling torque
- Acceleration torque
- Effective torque
- Required speed
- Operating time

Dimensioning criteria The motor-gear-combination must meet the following conditions:

- It must be able to achieve the required speed
- The permanent torque of the motor-gear-combination must be larger than the effective load moment
- The short-time operation torque must be larger than the total of friction, weight, and handling torque
- The maximum torque must be larger than the total of friction, weight, and acceleration torque
- The required run-up time must be within the limits of the relevant drive selection lists
- The operating time of the GTP planetary drives must be < 60% for the given Technical Data in S5 operation.

Note: Please note that

- the maximum motor torque is smaller or equal the maximum gear input torque;
 - the maximum motor speed is smaller than the maximum admissible gear input speed.
-

5 Notes on Application

5.1 Operating conditions

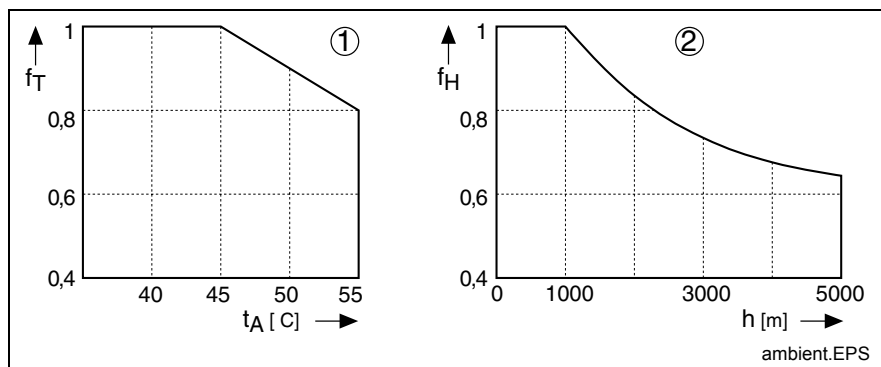
Maximum ambient temperature,
maximum mounting height

The performance listed in the selection data is achieved under the following conditions:

Ambient temperature 0...+45°C

Installation at a height of: 0...1000 m amsl

With deviating conditions, the performance will be reduced according to the diagrams in Fig. 5-1. Where deviating ambient temperatures and installation at a greater height occur simultaneously, the performance data must be multiplied by both factors.



- 1: Possible utilisation grade at an ambient temperature of more than 45°C
2: Possible utilisation grade with installation at a height of above 1000 m

Fig. 5-1: Possible utilisation grade at higher ambient temperature and greater installation height

Type of protection

According to DIN EN 60529-1:2000-09, the housing protects the AC motor with the connected planetary gear GTP from:

- contact with live or moving parts
- ingress of solid bodies and water

The protection type is defined by the abbreviation IP (International Protection) and two identification numbers. For the planetary gear GTP mounted to the AC motors, IP65 applies to:

- the housings of motor and gears bolted to each other;
- the driven shaft of the gears;
- the power and feedback connection of the motor, if mounted by qualified staff.

The first identification number describes the degree of protection from shock and from ingress of bodies. Identification number 6 stands for

- protection from ingress of dust (dust-proof)
- total shock protection.

The second identification number identifies the degree of protection from water. Identification number 5 stands for

- protection from a water jet from a nozzle directed against the equipment (housing) from all directions (jet-water).

Coat of varnish of the housing The coat of varnish is a primary coat; an additional layer of varnish of up to 40 µm can be added.

The primary coat is

- resistant to weather, post colouring, and chalk
- and resistant to diluted acids and lyes

After frequent steam jet cleaning, however, the primary coat may chip off.

**S5 mode
(intermittent operation)**

According to EN 60034-1, planetary gear box of the GTP series are suitable for S5 mode (intermittent operation with breaking). Here, the running time must not exceed 60%.

$$ED = \frac{T_A + T_B + T_{Br}}{T_s} \cdot 100\% \leq 60\%$$

Furthermore, the cycle number must not exceed the limit of 1000 cycles per hour. Here, a cycle is defined as the travel process consisting of an acceleration and a breaking process.

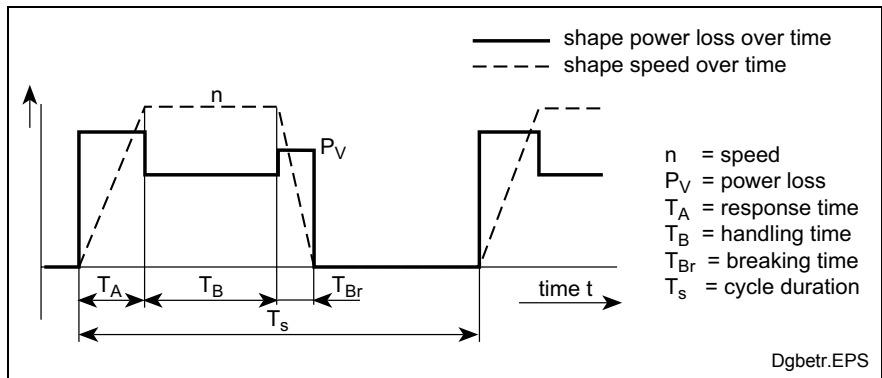


Fig. 5-2: S5 mode (intermittent operation with electronic breaking)

Reduction with higher cycle limits

If cycle limits of more than 1000 cycles per hour are required, the following reduction of the technical data in respect of torque and performance will occur:

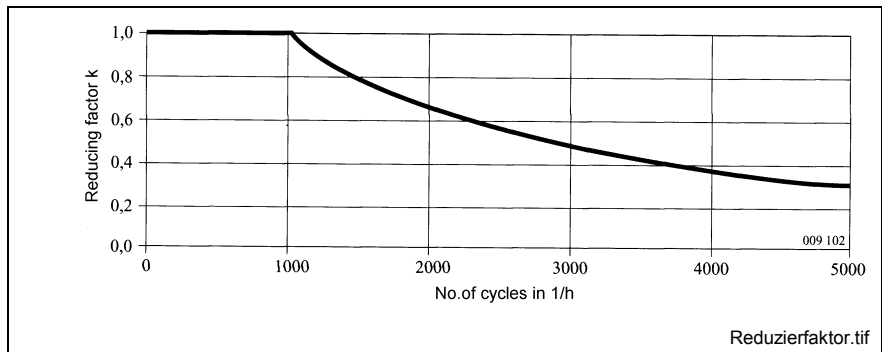


Fig. 5-3: Reduction factor with higher cycle limits

S1 mode (continuous operation)

According to EN 60034-1, planetary gear box GTP are suitable for S1 mode.

5.2 Mechanical properties

Type of construction, mounting position The Indramat planetary gear box GTP in construction type B05 are suitable for flange mounting. According to EN 60034-7:1996-06), the mounting positions listed in Fig. 5-4: Admissible mounting positions can be used.

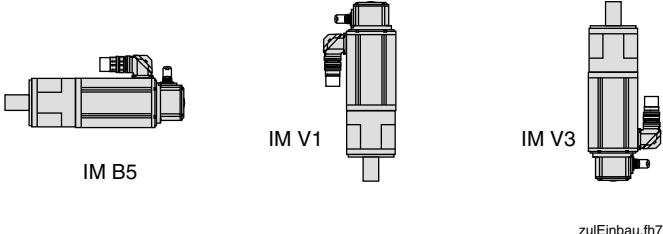
Gears – Construction type	Admissible mounting positions according to EN 60034-7:1996-06	!!! Important note on mounting!!!
B05		<p>Vertical mounting position IM V3 With mounting of IM V3 (vertical, driven shaft to the top), the presence of liquids at the driven shaft must be avoided; otherwise, ingress of liquids cannot be excluded over a long period of time.</p>

Fig. 5-5: Admissible mounting positions

Driven shaft The driven shaft of the planetary gear box is available in the following versions:

- **Plain driven shaft (standard)**

For plain friction-locked shaft-and-hub connections.

This technology results in greater running smoothness and a close connection between shaft and hub.

Note: We recommend the application of driven shafts with friction-locked shaft-and-hub connections.

- or -

- **driven shaft with featherway key according to 6885-1:1968-08**

For keyed shaft-and-hub connections.

Connections of this type are suitable for the reception of direction-constant torques with low requirements. It necessitates additional axial securing of the hub. For this purpose, a threaded centre hole is provided at the gears output shaft (see dimension drawing).

Shaft load For a shaft load check, the axial and the radial shaft load must be checked individually:

For the **radial shaft load** depending on

- the force action point and the
- mean speed,

please see the charts in the chapter "Technical Data". As the nominal working life of the bearing, 300.000 operating hours have been assumed (bearing calculations according to DIN ISO 281:1993-01).

For the axial shaft load, please see the data in the chapter "Technical Data".

Mounting of drive elements The groove nut for the initial tension of the gear output bearing **must not** be used as stopper for the drive elements. Any axial powers must be introduced into the gears directly via the driven shaft.

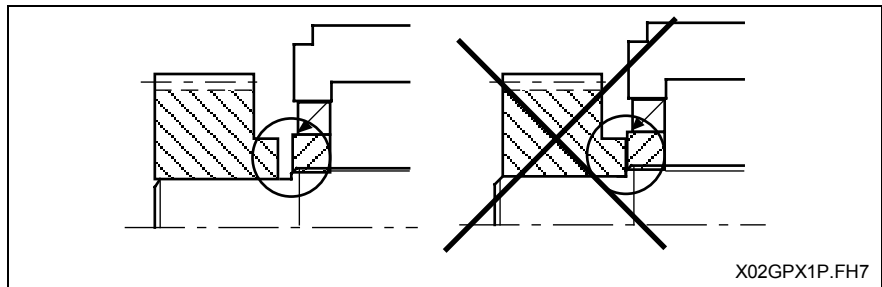


Fig. 5-6: Mounting of drive elements

5.3 Possible combinations of GTP planetary gear box and AC motor

The following table shows the possible combinations of GTP planetary gear box and AC motors.

Planetary gears	Motor type								
	MAC	MKD	MHD	MDD	MKE	MHP	2AD	ADP	ADF
GTP070	MAC025 MAC041	MKD041	MHD041		MKE045	MHP041			
GTP095	MAC071 MAC090	MKD041 MKD071 MKD090	MHD041 MHD071 MHD090	MDD071 MDD090	MKE045 MKE096	MHP041 MHP071 MHP090			
GTP110	MAC071 MAC090 MAC093	MKD071 MKD090	MHD071 MHD090 MHD093 MHD095	MDD071 MDD090 MDD093	MKE096	MHP071 MHP090 MHP093			
GTP140	MAC090 MAC093 MAC112 MAC115	MKD090 MKD112	MHD090 MHD093 MHD095 MHD112 MHD115	MDD090 MDD093 MDD112 MDD115	MKE096 MKE116	MHP090 MHP093 MHP112 MHP115	2AD100 2AD101 2AD104	ADP104	
GTP200	MAC112 MAC115	MKD112	MHD112 MHD115 MHD131	MDD112 MDD115	MKE116	MHP112 MHP115	2AD100 2AD101 2AD104 2AD132 2AD134	ADP104 ADP134	ADF132 ADF134

Fig. 5-7: Potential gears-and-motor combinations with GTP planetary gear box

Note: To allow for mounting of the GTP planetary gear box to the AC motors, the AC motors must be equipped with a plain driven shaft.

6 GTP070

6.1 Technical data for intermittent and continuous operation

Data depending on transformation ratio

	Description	Symbol	Unit	GTP070					
				single-stage				two-stage	
				4	5	7	10	20	50
	Transmission ratio	i	-						
S5 intermittent operation	max. input speed	$n_{in, max}$	min^{-1}	5000	6300	8000	10000	6300	10000
	min. input torque ²⁾	$M_{in, max}$	Nm	18	18	14	7.0	7.0	3.8
	max. output speed	$n_{out, max}$	Min^{-1}	1250	1260	1143	1000	315	200
	min. output torque ²⁾	$M_{out, max}$	Nm	72	90	100	70	140	190
	nominal output torque	$M_{out, nenn}$	Nm	36	45	50	35	70	95
S1 Contin. operation	Nominal input speed S1	$n_{in, nenn S1}$	min^{-1}	3000	4000	5000	6000	3000	4000
	Nominal output torque S1	$M_{out, nenn}$	Nm	24	30	35	24	50	60
	Inertia torque ³⁾	J	kg cm^2	0.35	0.32	0.3	0.29	0.37	0.31
	Torque strength ⁴⁾	D	Nm/rad	8250	8500	8750	9000	20000	21500

²⁾ With a maximum of 1000 cycles/h
³⁾ Mass moment of inertia of the gearbox including the coupling elements to the motor, in respect of the gearbox input side
⁴⁾ Torque strength of the gearbox in respect of the gearbox output side, with blocked gearbox input side

Fig. 6-1: Data GTP070 depending on transmission ratio

General data

Description	Symbol	Unit	GTP070	
			single-stage	two-stage
Efficiency	η	%	95	92
Torsional play 1)	$\Delta\varphi$	arcmin	≤ 6	≤ 10
Working life	L_{10h}	h	>15.000	
Lubrication	-		Lubricating agent on working life	
Admissible ambient temperature	T_{Um}	$^{\circ}\text{C}$	0 ... 45	
Admissible gear housing temperature	T_G	$^{\circ}\text{C}$	90	
Noise level	L_p	dB (A)	< 65 ²⁾	
Type of protection	-		IP65	
Weight	m	kg	2	6
Mounting for motor size			025/041/045	

1) in respect of the gearbox output side at 2 % nominal output torque of the gear and blocked gearbox input side
2) with gearbox input speed 3000 min^{-1}

Fig. 6-2: General data GTP070

6.2 Admissible shaft load, single-stage

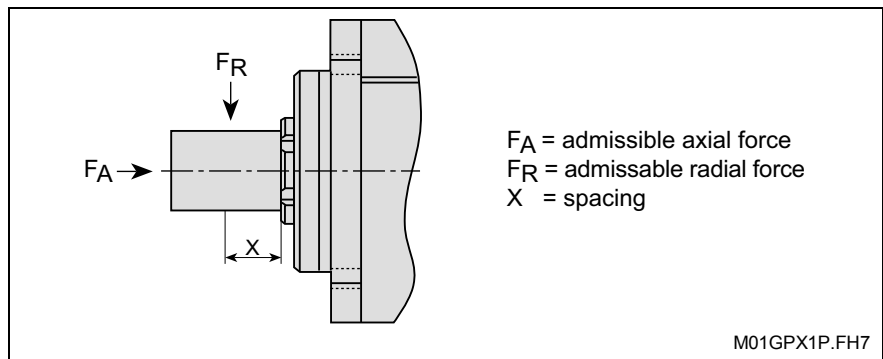


Fig. 6-3: Load action points at the gearbox driven shaft

Admissible radial force F_{radial}

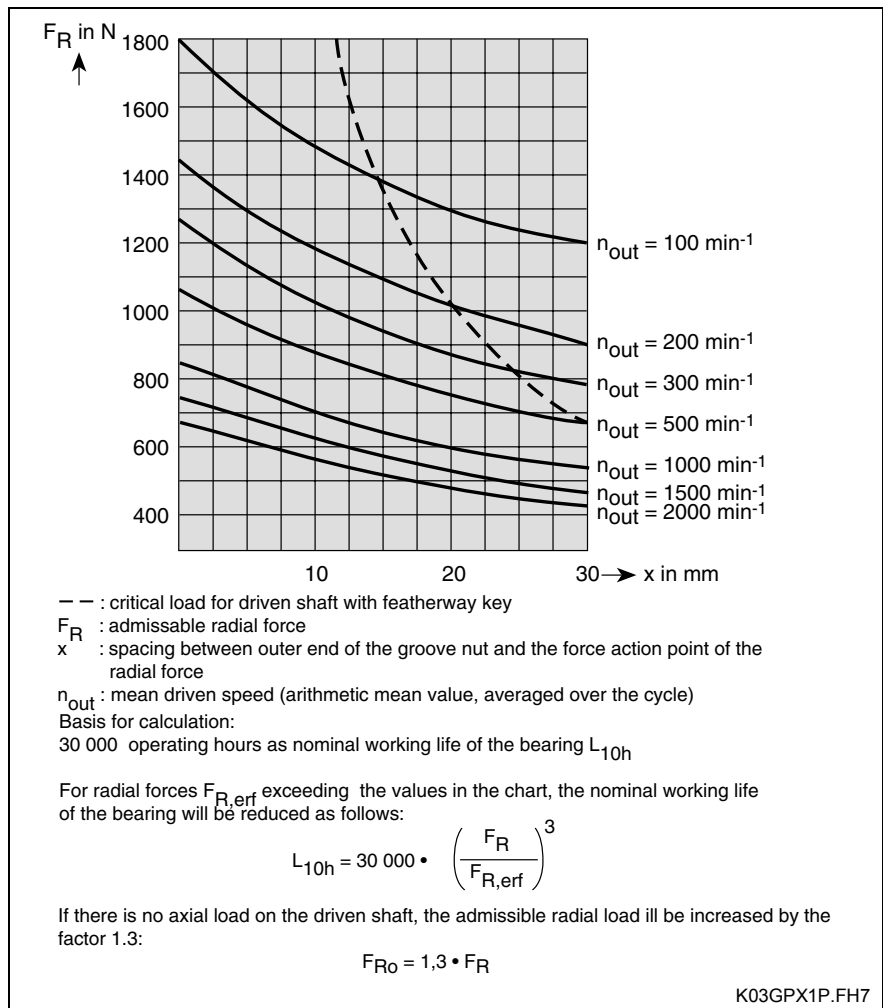


Fig. 6-4: Admissible shaft load GTP070, single-stage

Admissible axial force F_{axial}

$$F_A = 0.5 \cdot F_R$$

F_A : admissible axial force
 F_R : admissible radial force

Fig. 6-5: Admissible axial force

6.3 Admissible shaft load, two-stage

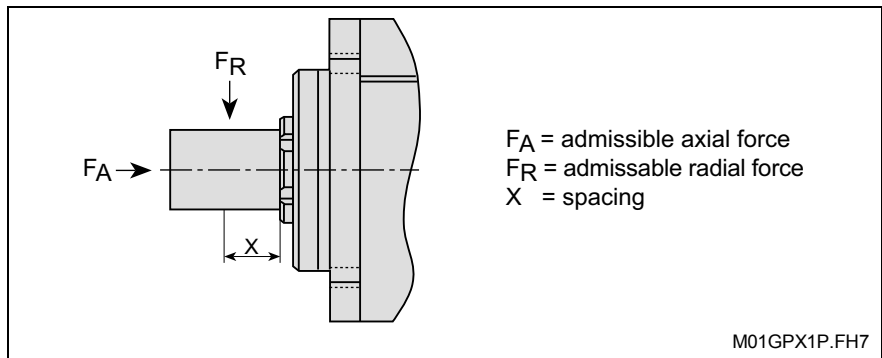


Fig. 6-6: Load action points at the gearbox driven shaft

Admissible radial force F_{radial}

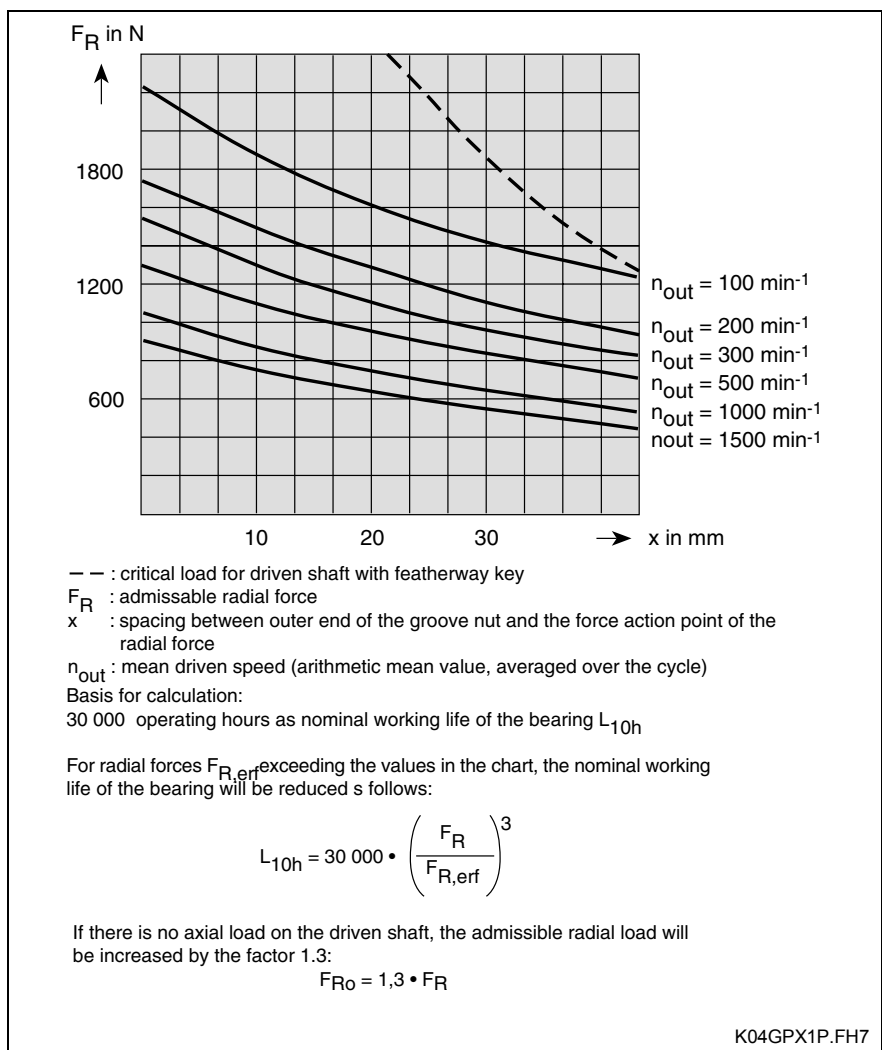


Fig. 6-7: Admissible shaft load GTP070, two-stage

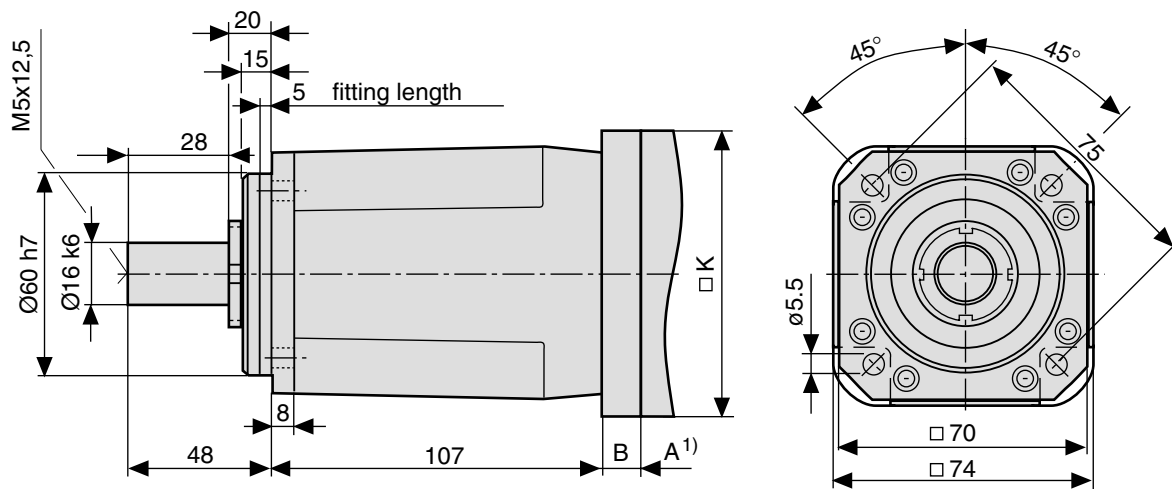
Admissible axial force F_{axial}

$$F_A = 0.5 \cdot F_R$$

F_A : admissible axial force
 F_R : admissible radial force

Fig. 6-8: Admissible axial force F_{axial}

6.4 Dimensional notations, single-stage



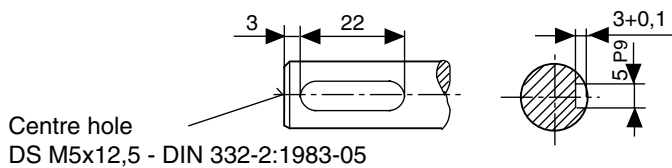
- 1) For dimension A, see respective motor documentation
- Position accuracy in respect of smooth running and concentricity to the shaft according to the tolerance zone N, DIN 42955:1981-12

Dimensions chart

Dimension / Motor type	B	□K
MKD025	0	70
MKD041, MHD041 MHP041	12	82
MKE045	12	82

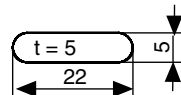
Driven shaft

- plain shaft (preferred type), centred according to DIN 332-1:1986-04, form A
 - with featherway key according to DIN 6885-1:1968-08
(Attention! Balanced with half featherway!)
- Centre hole DS M5x12,5 - DIN 332-2:1983-05



Centre hole
DS M5x12,5 - DIN 332-2:1983-05

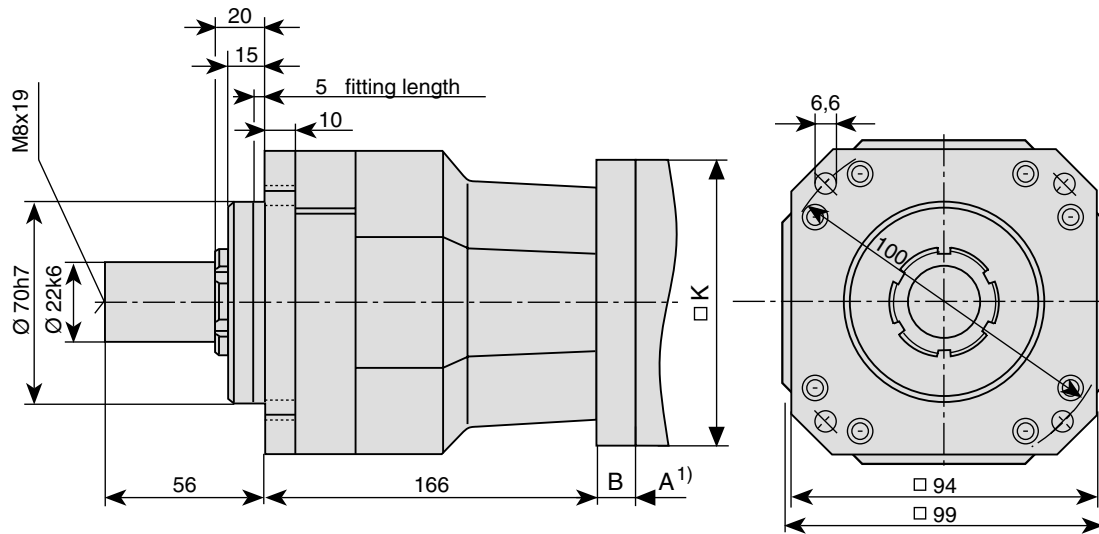
The appurtenant featherway key: DIN 6885-1:1968-08; A5 x 5 x 22
is not included in the delivery scope of the gearbox.



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Fig. 6-9: Dimensional notations GTP070, single-stage

6.5 Dimensional notations, two-stage



1) For dimension A, see respective motor documentation

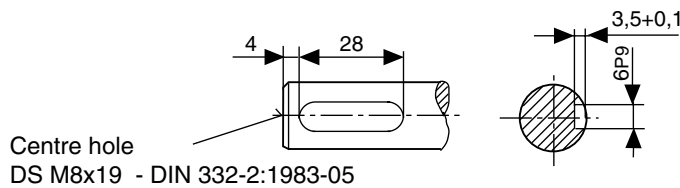
- Position accuracy in respect of smooth running and concentricity to tolerance zone N, DIN 42955:1981-12

Maßtabelle

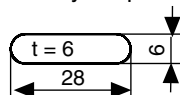
Dimension Motor type	B	□K
MKD025	0	70
MKD041, MHD041, MHP041	12	82
MKE045	12	82

Driven shaft

- plain shaft (preferred type), centred according to DIN 332-1:1986-04, form A
- with featherway key according to DIN 6885-1:1968-08
(Attention! Balanced with half featherway!)
Centre hole DS M8x19 - DIN 332-2:1983-05



The appurtenant featherway key: DIN 6885-1:1968-08; A6 x 6 x 28, is not included in the delivery scope of the gearbox.



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Fig. 6-10: Dimensional notation GTP070, two-stage

7 GTP095

7.1 Technical data for intermittent and continuous operation

Data depending on transformation ratio

	Description	Symbol	Unit	GTP095					
				single-stage				two-stage	
				4	5	7	10	20	50
	Transmission ratio	i	-						
S5 intermittent operation	max. input speed	$n_{in, max}$	min^{-1}	5000	6300	8000	10000	6300	10000
	min. input torque ²⁾	$M_{in, max}$	Nm	35	38	28.6	15	15	7.6
	max. output speed	$n_{out, max}$	min^{-1}	1250	1260	1143	1000	315	200
	min. output torque ²⁾	$M_{out, max}$	Nm	140	190	200	150	300	380
	nominal output torque	$M_{out, nenn}$	Nm	70	95	100	75	150	190
S1 Contin. operation	Nominal input speed S1	$n_{in, nenn S1}$	min^{-1}	3000	4000	5000	6000	3000	4000
	Nominal output torque S1	$M_{out, nenn}$	Nm	50	60	70	50	100	130
	Inertia torque ³⁾	J	kg cm^2	0.79	0.69	0.60	0.54	0.82	0.63
	Torque strength ⁴⁾	D	Nm/rad	22000	23000	23500	24000	61500	70000

²⁾ With a maximum of 1000 cycles/h
³⁾ Mass moment of inertia of the gearbox including the coupling elements to the motor, in respect of the gearbox input side
⁴⁾ Torque strength of the gearbox in respect of the gearbox output side, with blocked gearbox input side

Fig. 7-1: Data GTP095 depending on transmission ratio

General data

Description	Symbol	Unit	GTP095	
			single-stage	two-stage
Efficiency	η	%	95	92
Torsional play 1)	$\Delta\varphi$	arcmin	≤ 6	≤ 10
Working life	L_{10h}	h	>15.000	
Lubrication	-		Lubricating agent on working life	
Admissible ambient temperature	T_{Um}	$^{\circ}\text{C}$	0...45	
Admissible gear housing temperature	T_G	$^{\circ}\text{C}$	90	
Noise level	L_p	dB (A)	< 65	
Type of protection	-		IP65	
Weight	m	kg	4	10
Mounting for motor size			041/045/071/090/096	

1) in respect of the gearbox output side at 2 % nominal output torque of the gear and blocked gearbox input side
2) with gearbox input speed 3000 min^{-1}

Fig. 7-2: General data GTP095

7.2 Admissible shaft load, single-stage

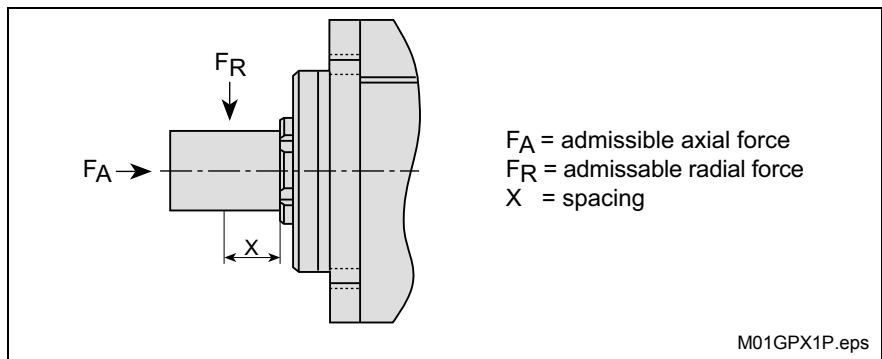


Abb. 7-3: Load action points at the gearbox driven shaft

Admissible radial force F_{radial}

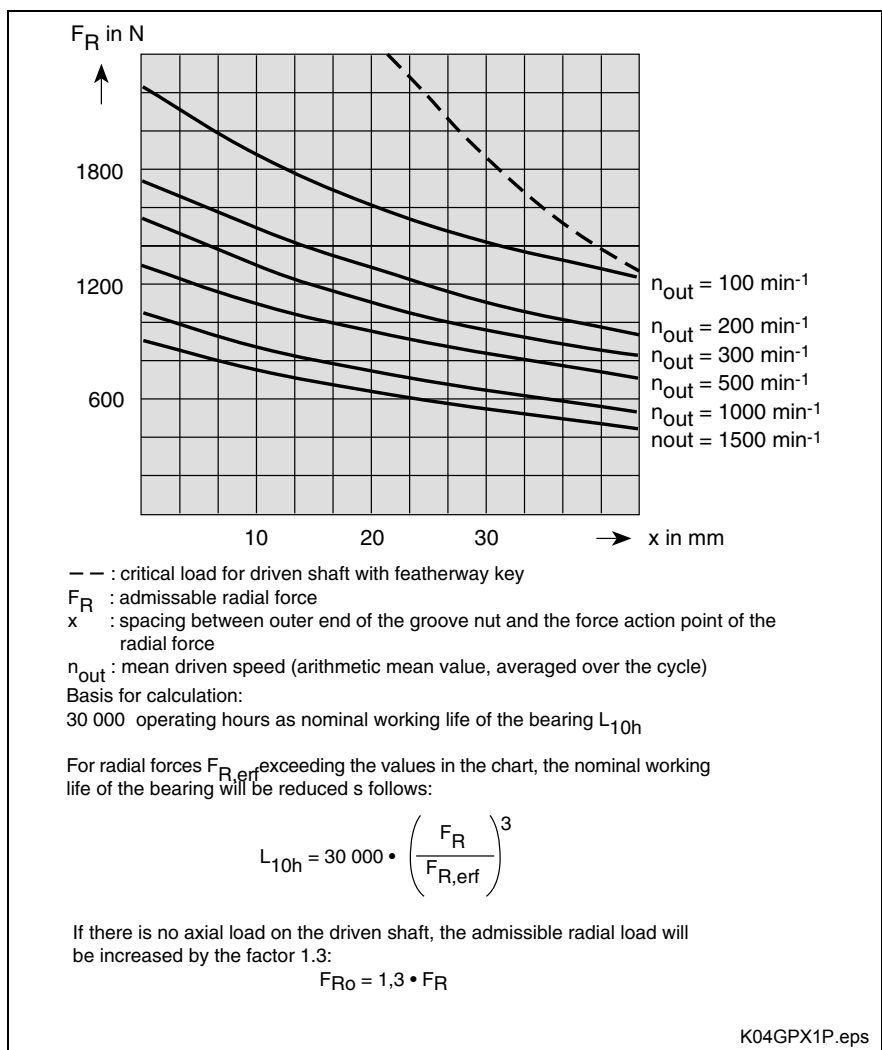


Abb. 7-4: Admissible shaft load GTP095 single-stage

Admissible axial force F_{axial}

$$F_A = 0.5 \cdot F_R$$

F_A : admissible axial force
 F_R : admissible radial force

Fig. 7-5: Admissible axial force F_{axial}

7.3 Admissible shaft load, two-stage

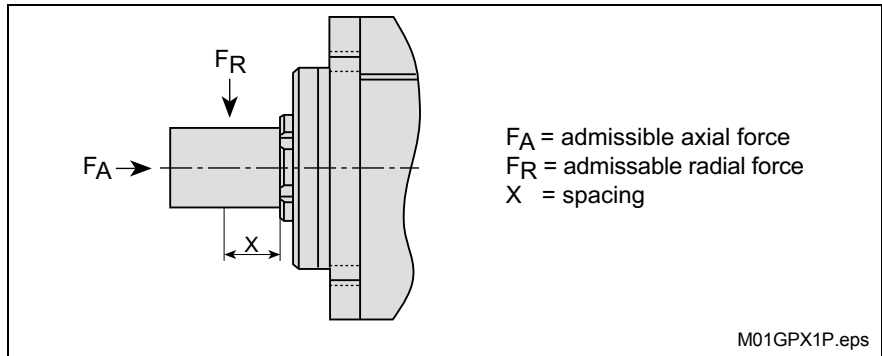


Abb. 7-6: Load action points at the gearbox driven shaft

Admissible radial force F_{radial}

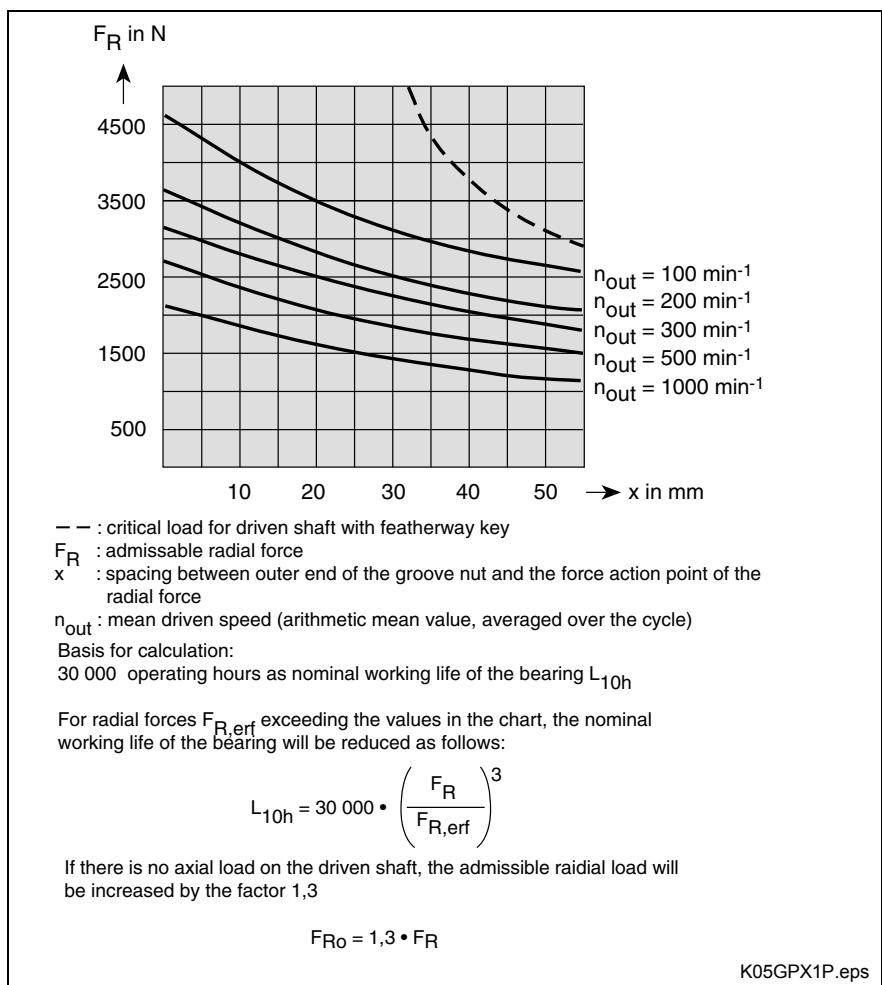


Abb. 7-7: Admissible shaft load GTP095, two-stage

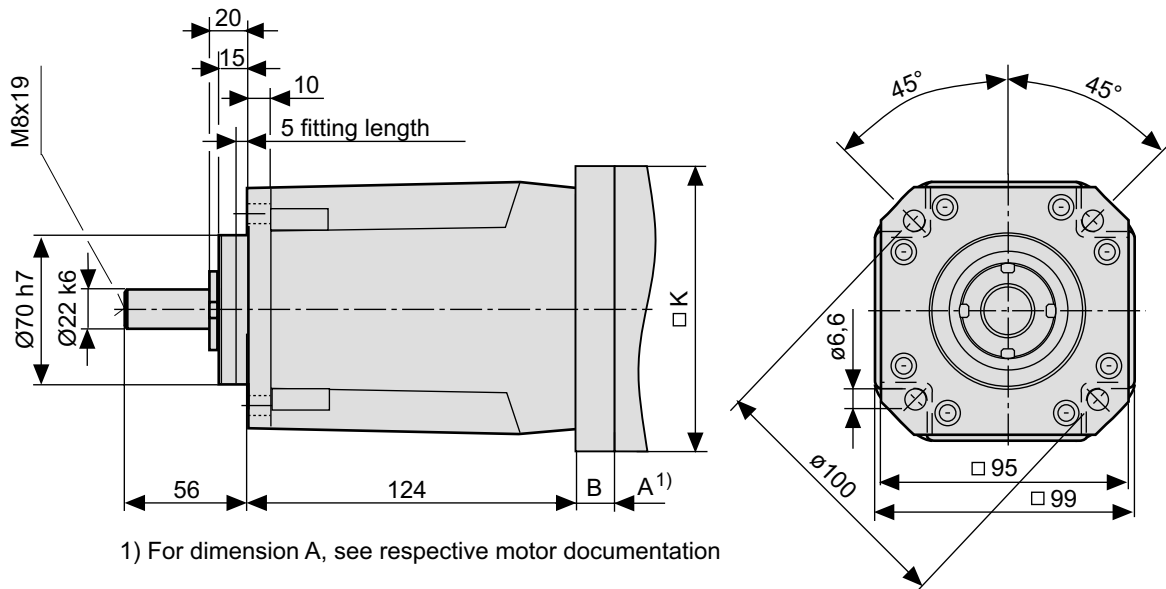
Admissible axial force F_{axial}

$$F_A = 0.5 \cdot F_R$$

F_A : admissible axial force
 F_R : admissible radial force

Fig. 7-8: Admissible axial force F_{axial}

7.4 Dimensional notations, single-stage



1) For dimension A, see respective motor documentation

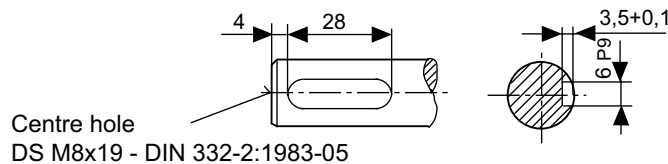
• Position accuracy in respect of smooth running and concentricity to the shaft according to tolerance zone N, DIN 42955:1981-12

Dimensions chart

Motor type	Dimension	B	□ K
MKE045		0	93
MKD041, MHD041, MHP041		0	93
MKD071, MHD071, MHP071 MDD071, MAC071		16	115
MKD090, MDD090, MAC090 MHD090, MHP090		16	140
MKE096		16	140

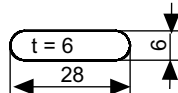
Driven shaft

- plain shaft (preferred type), centred according to DIN 332-1:1986-04, form A
- with featherway key according to DIN 6885-1:1968-08
(Attention! Balanced with half featherway!)
Centre hole DS M8x19 - DIN 332-2:1983-05



Centre hole
DS M8x19 - DIN 332-2:1983-05

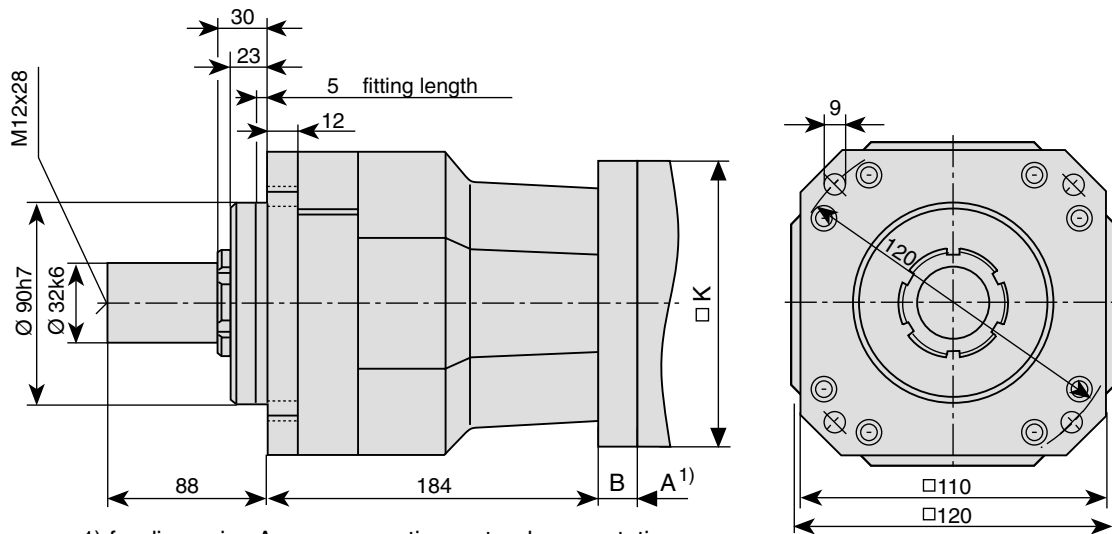
The appurtenant featherway key: DIN 6885-1:1986-08; A 6 x 6 x 28, is not included in the delivery scope of the gearbox.



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Fig. 7-9: Dimensional notations GTP095, single-stage

7.5 Dimensional notations, two-stage



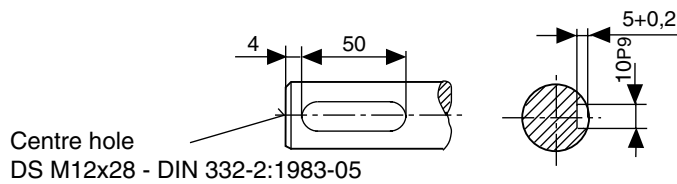
- 1) for dimension A , see respective motor documentation
- Position accuracy in respect of smooth running and concentricity to the shaft according to tolerance zone N , DIN 42955:1981-12

Maßtabelle

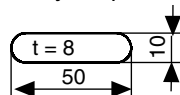
Motor type	Dimension	B	□K
MKE045		0	93
MKD041, MHD041, MHP041		0	93
MKD071, MHD071, MHP071		16	115
MDD071, MAC071		16	115
MKD090, MDD090, MAC090		16	140
MHP090, MHD090		16	140
MKE096		16	140

Driving shaft

- plain shaft (preferred type), centred according DIN 332-1:1986-04, form A
- with featherway key according to DIN 6885-1:1968-08
(Attention! Balanced with half featherway!)
Centre hole DS M12x28- DIN 332-2:1983-05



The appurtenant featherway key: DIN 6885-1:1968-08; A10 x 8 x 50, is not included in the delivery scope of the gearbox.



M05gpx1p.FH7

Fig. 7-10: Dimensional notation GTP095, two-stage

7.6 Type code GTP095

Abbrev.	Column	→	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0							
Example:			G	T	P	0	9	5	-	M	O	1	-	0	0	7	A	0	5																																								

1. Product group
- 1.1 GTP..... = GTP

2. Size
- 2.1 095..... = 095

3. Mounting style
- 3.1 Gear flange with long centering pilot = MO

4. Quantity of gear stages
- 4.1 single stage..... = 1
- 4.2 two stage..... = 2

5. Transmission ratio
- 5.1 single stage: 4 5 7 10 e.g., 7..... = 007
- 5.2 two stage: 20 50 e.g., 20..... = 020

6. Driven shaft
- 6.1 with key..... = A
- 6.2 plain..... = B

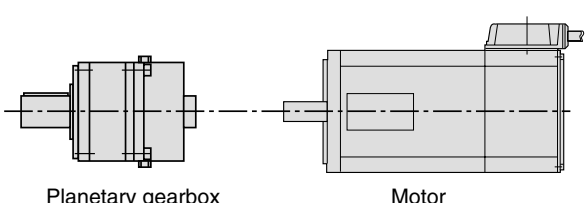
7. Designation of mounted motor

	Motor size				
Product group	041	045	071	090	096
7.1 MAC	-	-	05	06 ①	-
7.2 MDD	-	-	05	06 ① ②	-
7.3 MHD	03	-	05	06	-
7.4 MHP	03	-	05	06	-
7.5 MKD	03	-	05	06	-
7.6 MKE	-	14	-	-	06

Note:

- ① only available for centering diameter 110 mm
- ② not available for motors with liquid coolants

Illustration example: Planetary gearbox



Planetary gearbox

Motor

GTP095-EN.FH7

Fig. 7-11: Type code GTP095

8 GTP110

8.1 Technical data for intermittent and continuous operation

Data depending on transformation ratio

	Description	Symbol	Unit	GTP110					
				single-stage				two-stage	
				4	5	7	10	20	50
	Transmission ratio	i	-						
S5 intermittent operation	max. input speed	$n_{in, max}$	min^{-1}	4000	5000	6300	8000	5000	6300
	min. input torque ²⁾	$M_{in, max}$	Nm	75	76	57	29	37	19
	max. output speed	$n_{out, max}$	min^{-1}	1000	1000	900	800	250	126
	min. output torque ²⁾	$M_{out, max}$	Nm	300	380	400	290	740	950
	nominal output torque	$M_{out, nenn}$	Nm	150	190	200	145	370	475
S1 Contin. operation	Nominal input speed S1	$n_{in, nenn S1}$	min^{-1}	2500	3000	4000	5000	2500	3000
	Nominal output torque S1	$M_{out, nenn}$	Nm	100	130	140	100	250	320
	Inertia torque ³⁾	J	kg cm^2	2.14	1.83	1.58	1.45	2.40	1.75
	Torque strength ⁴⁾	D	Nm/rad	65000	68000	71000	73000	120000	135000

²⁾ With a maximum of 1000 cycles/h
³⁾ Mass moment of inertia of the gearbox including the coupling elements to the motor, in respect of the gearbox input side
⁴⁾ Torque strength of the gearbox in respect of the gearbox output side, with blocked gearbox input side

Fig. 8-1: Data depending on transmission ratio GTP110

General data

Description	Symbol	Unit	GTP110	
			single-stage	two-stage
Efficiency	η	%	95	92
Torsional play 1)	$\Delta\varphi$	arcmin	≤ 6	≤ 10
Working life	L_{10h}	h	>15.000	
Lubrication	-		Lubricating agent on working life	
Admissible ambient temperature	T_{Um}	$^{\circ}\text{C}$	0...45	
Admissible gear housing temperature	T_G	$^{\circ}\text{C}$	90	
Noise level	L_p	dB (A)	< 65	
Type of protection	-		IP65	
Weight	m	kg	6	19
Mounting for motor size			071/090/093/095/096	

1) in respect of the gearbox output side at 2 % nominal output torque of the gear and blocked gearbox input side
2) with gearbox input speed 3000 min^{-1}

Fig. 8-2: General data GTP110

8.2 Admissible shaft load, single-stage

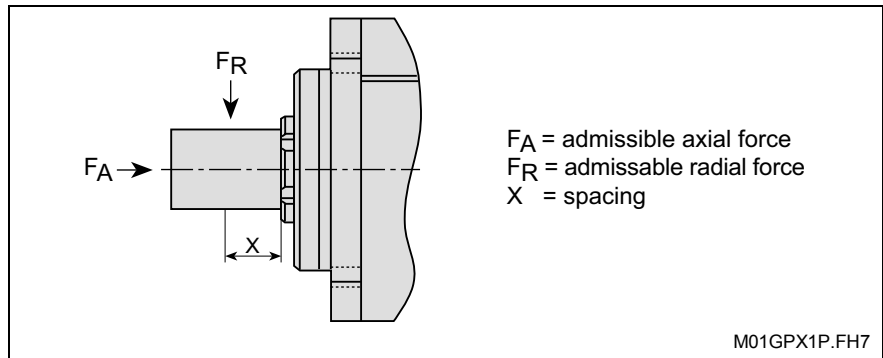


Fig. 8-3: Load action points at the gearbox driven shaft

Admissible radial force F_{radial}

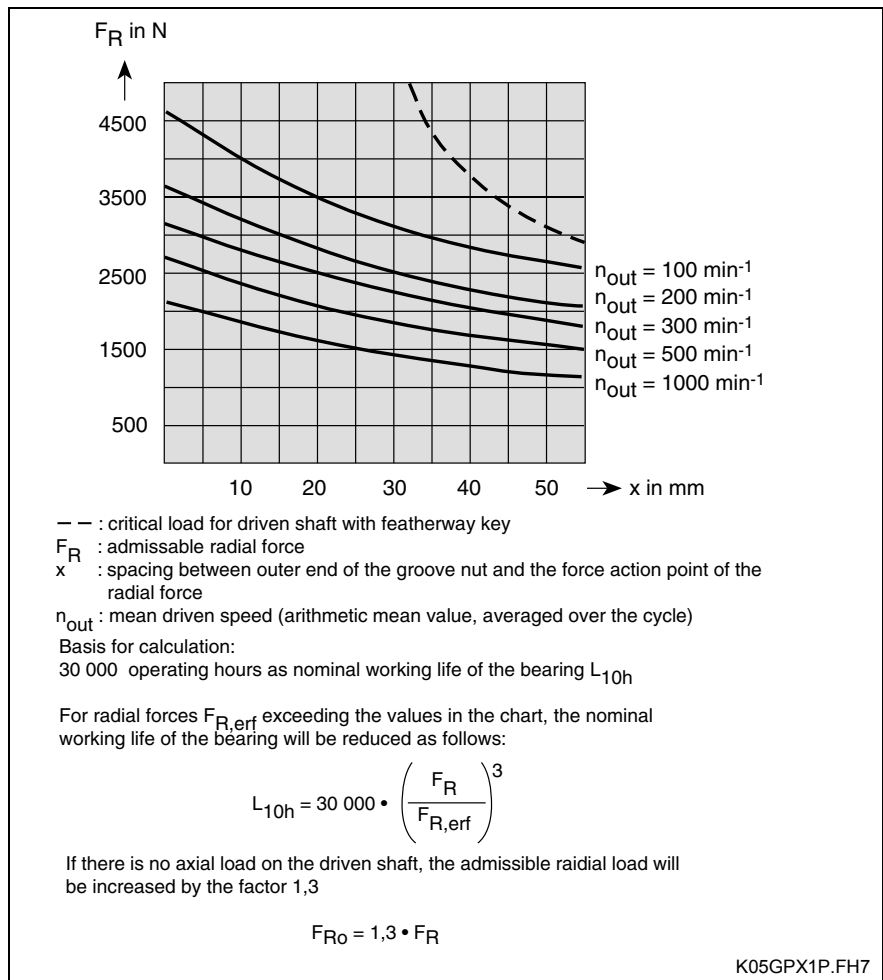


Fig. 8-4: Admissible shaft load GTP110, single-stage

Admissible axial force F_{axial}

$$F_A = 0.5 \cdot F_R$$

F_A : Admissible axial force
 F_R : Admissible radial force

Fig. 8-5: Admissible axial force F_{axial}

8.3 Admissible shaft load, two-stage

Admissible radial force F_{radial}

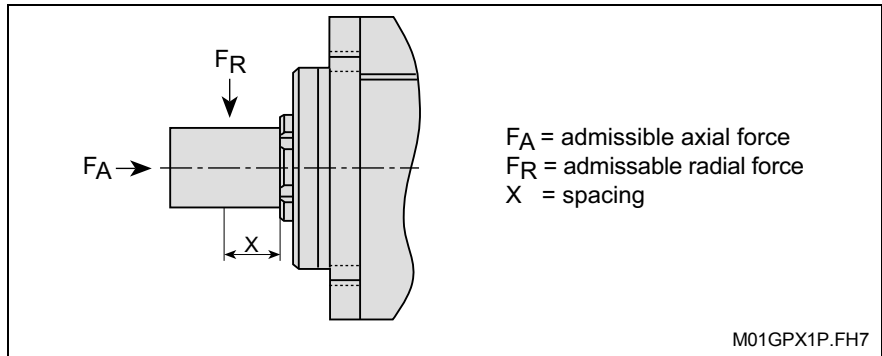


Fig. 8-6: Load action points at the gearbox driven shaft

Admissible axial force F_{axial}

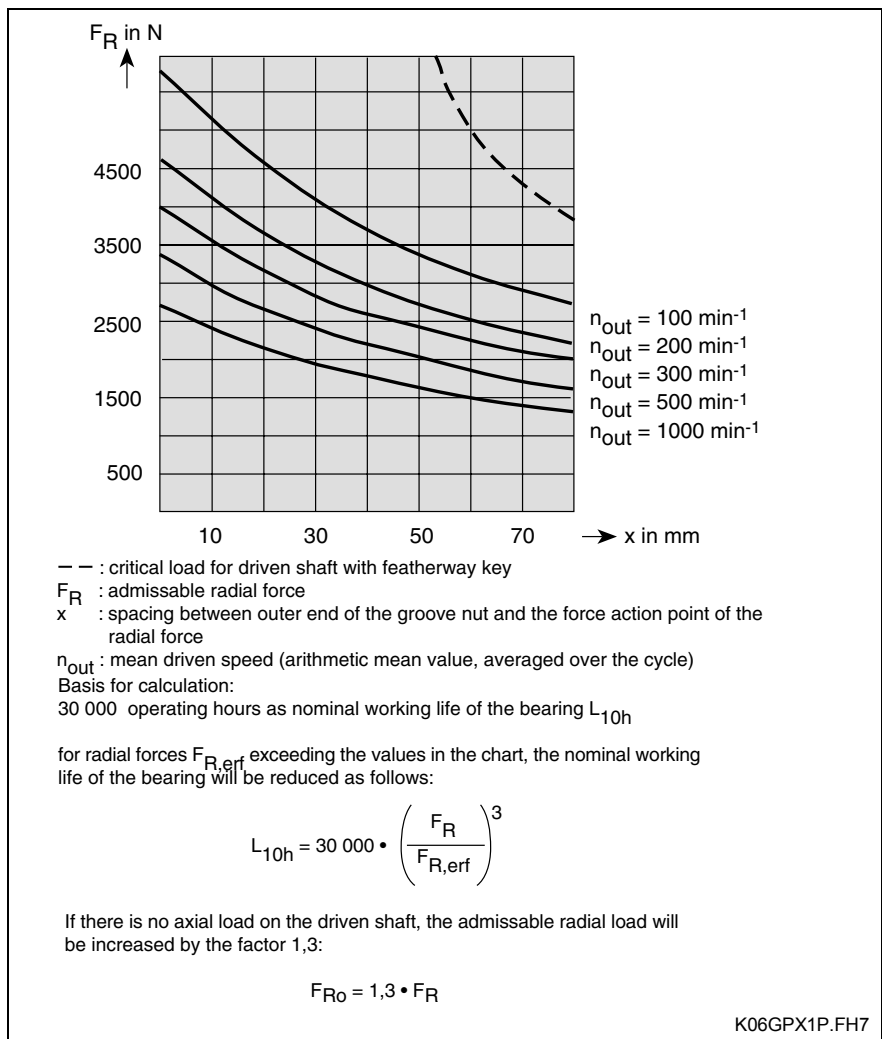


Fig. 8-7: Admissible shaft load GTP110, two-stage

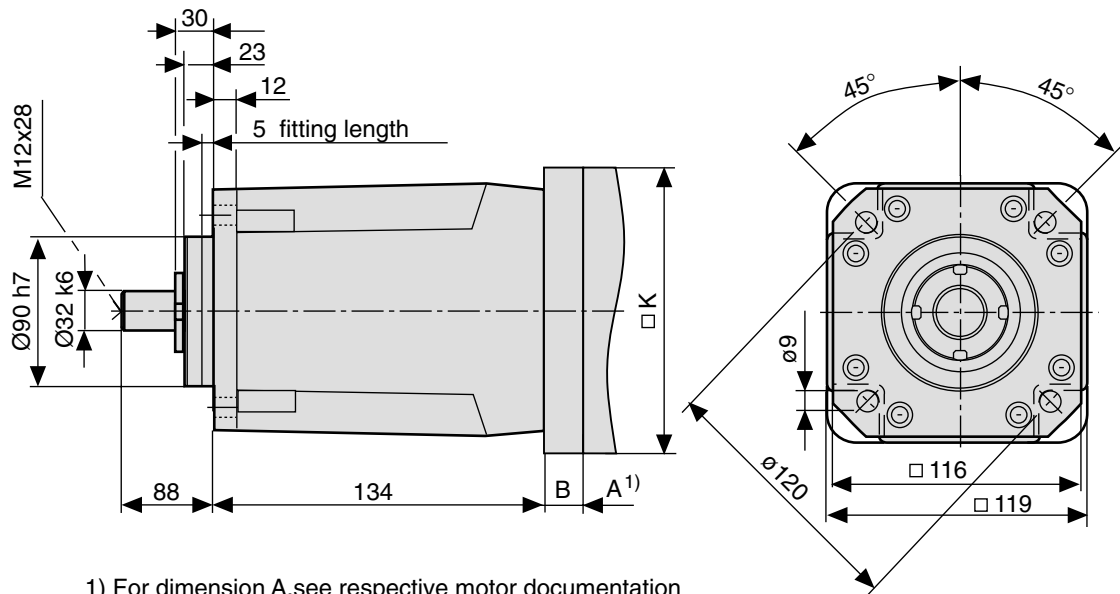
Admissible axial force

$$F_A = 0.5 \cdot F_R$$

F_A : Admissible axial force
 F_R : Admissible radial force

Fig. 8-8: Admissible axial force

8.4 Dimensional notations, single-stage



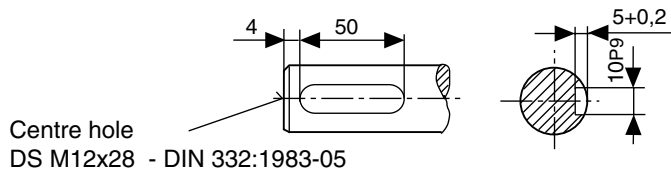
- 1) For dimension A, see respective motor documentation
- Position accuracy in respect of smooth running and concentricity to the shaft according to tolerance zone N, DIN 42955:1981-12

Dimensions chart

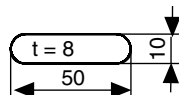
Motor type	Dimension	B	□ K
MKD071, MHD071, MDD071, MAC071, MHP071		0	116
MKD090, MDD090, MAC090, MHD090, MHP090		16	140
MDD093, MAC093		16	140
MHD093, MHD095		16	150
MKE096		16	140

Driven shaft

- plain shaft (preferred type), centred according to DIN 332-1:1986-04, form A
- with featherway key according to DIN 6885-1:1968-08 (Attention! Balanced with half featherway!)
Centre hole DS M12x28 - DIN 332-2:1983-05



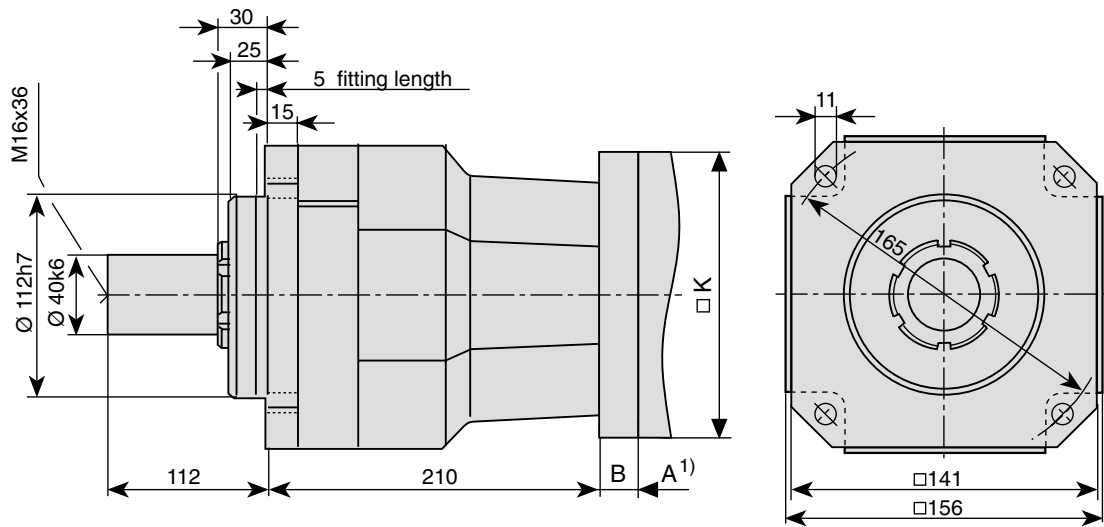
The appurtenant featherway key: DIN 6885-1:1986-08;
A 10 x 8 x 50, is not included in the delivery scope of the gearbox.



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Fig. 8-9: Dimensional notations GTP110, single-stage

8.5 Dimensional notations, two-stage



1) For dimension A, see respective motor documentation

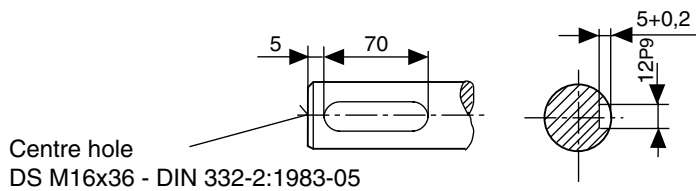
Position accuracy in respect of smooth running and concentricity to the shaft according to tolerance zone N, DIN 42955:1981-12

Dimensions chart

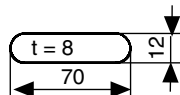
Motor type	Dimension	B	□K
MKD071, MHD071, MDD071, MAC071, MHP071		0	116
MKD090, MDD090, MAC090, MHD090, MHP090		16	140
MDD093, MAC093		16	140
MHD093, MHD095		16	150
MKE096		16	140

Driven shaft

- plain shaft (preferred type), centred according to DIN 332-1:1986-04, form A
- with featherway key according to DIN 6885-1:1968-08
(Attention! Balanced with half featherway!)
Centre hole DS M12x28 - DIN 332-2:1983-05



The appurtenant featherway key: DIN 6885-1:1986-08
A12 x 8 x 70, is not included in the delivery scope of the gearbox.



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Fig. 8-10: Dimensional notations GTP110, two-stage

9 GTP140

9.1 Technical data for intermittent and continuous operation

Data depending on transformation ratio

	Description	Symbol	Unit	GTP140					
				single-stage				two-stage	
				4	5	7	10	20	50
	Transmission ratio	i	-						
S5 intermittent operation	max. input speed	$n_{in, max}$	min^{-1}	3200	4000	5000	6300	4000	5000
	min. input torque ²⁾	$M_{in, max}$	Nm	185	190	142	70	90	46
	max. output speed	$n_{out, max}$	min^{-1}	800	800	714	630	200	100
	min. output torque ²⁾	$M_{out, max}$	Nm	740	950	1000	700	1800	2300
	nominal output torque	$M_{out, nenn}$	Nm	370	475	500	350	900	1150
S1 Contin. operation	Nominal input speed S1	$n_{in, nenn S1}$	min^{-1}	2000	2500	3000	4000	2000	2500
	Nominal output torque S1	$M_{out, nenn}$	Nm	250	320	350	250	600	750
	Inertia torque ³⁾	J	kg cm^2	8.77	7.67	6.74	6.25	10.0	7.3
	Torque strength ⁴⁾	D	Nm/rad	115000	120000	124000	127000	290000	315000

²⁾ With a maximum of 1000 cycles/h
³⁾ Mass moment of inertia of the gearbox including the coupling elements to the motor, in respect of the gearbox input side
⁴⁾ Torque strength of the gearbox in respect of the gearbox output side, with blocked gearbox input side

Fig. 9-1: Data depending on transmission ratio GTP140

General data

Description	Symbol	Unit	GTP140	
			single-stage	two-stage
Efficiency	η	%	95	92
Torsional play 1)	$\Delta\varphi$	arcmin	≤ 6	≤ 10
Working life	L_{10h}	h	>15.000	
Lubrication	-		Lubricating agent over working life	
Admissible ambient temperature	T_{Um}	$^{\circ}\text{C}$	0...45	
Zul. Admissible gearbox housing temperature	T_G	$^{\circ}\text{C}$	90	
Noise level	L_p	dB (A)	< 65	
Type of protection	-		IP65	
Weight	m	kg	13	34
Mounting for motor size			090/093/095/096/100/101/104/112/115/116	

1) in respect of the gearbox output side at 2 % nominal output torque of the gear and blocked gearbox input side
2) with gearbox input speed 3000 min^{-1}

Fig. 9-2: General data GTP140

9.2 Admissible shaft load, single-stage

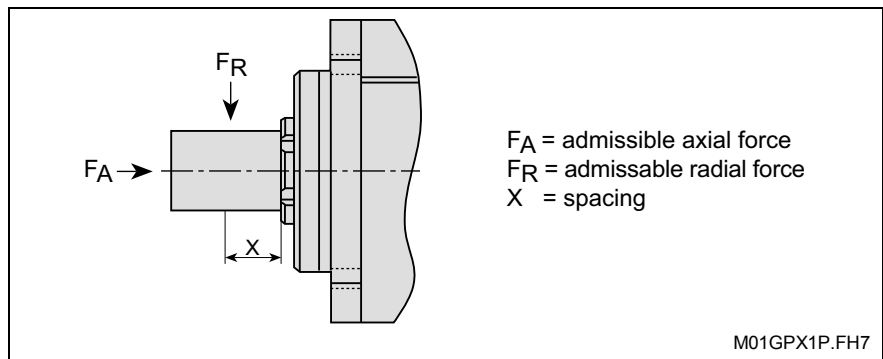


Fig. 9-3: Load action points at the gearbox driven shaft

Admissible radial force F_{radial}

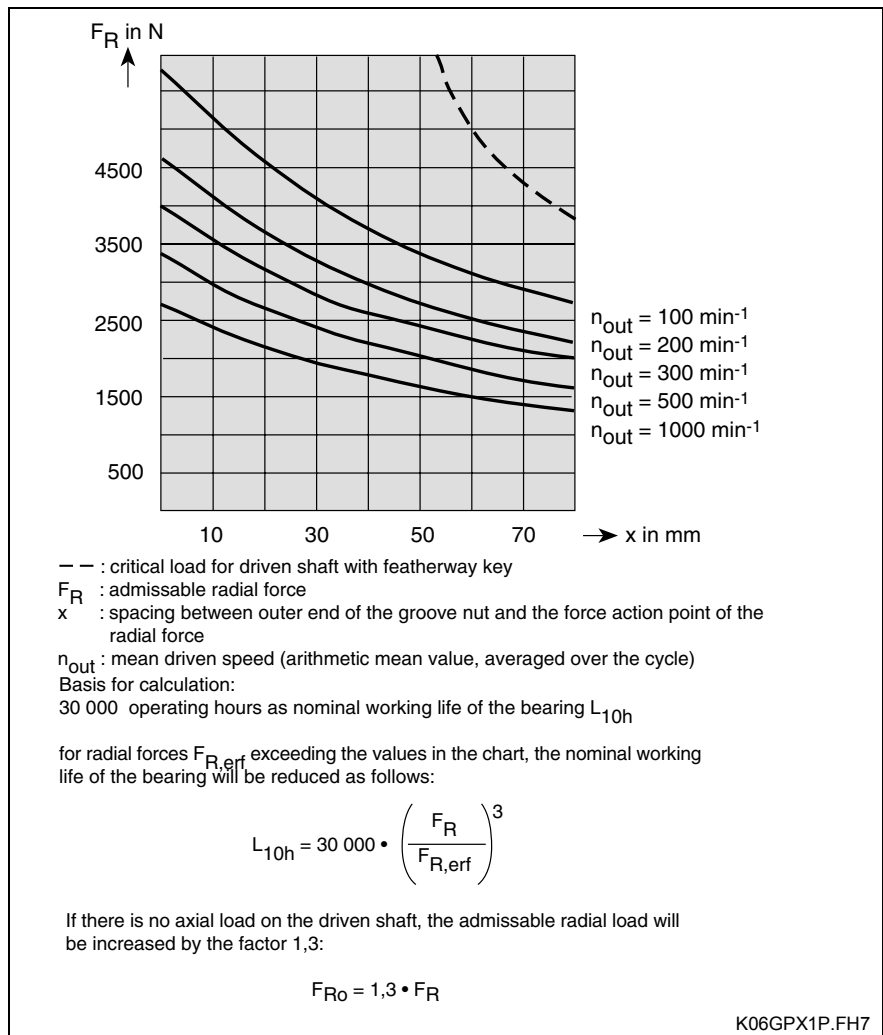


Fig. 9-4: Admissible shaft load GTP140, single-stage

Admissible axial force F_{axial}

$$F_A = 0.5 \cdot F_R$$

F_A : Admissible axial force
 F_R : Admissible radial force

Fig. 9-5: Admissible axial force F_{axial}

9.3 Admissible shaft load, two-stage

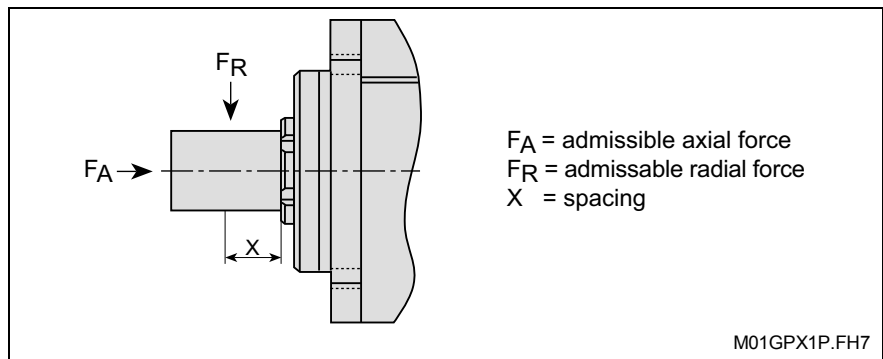


Fig. 9-6: Load action points at the gearbox driven shaft

Admissible radial force F_{radial}

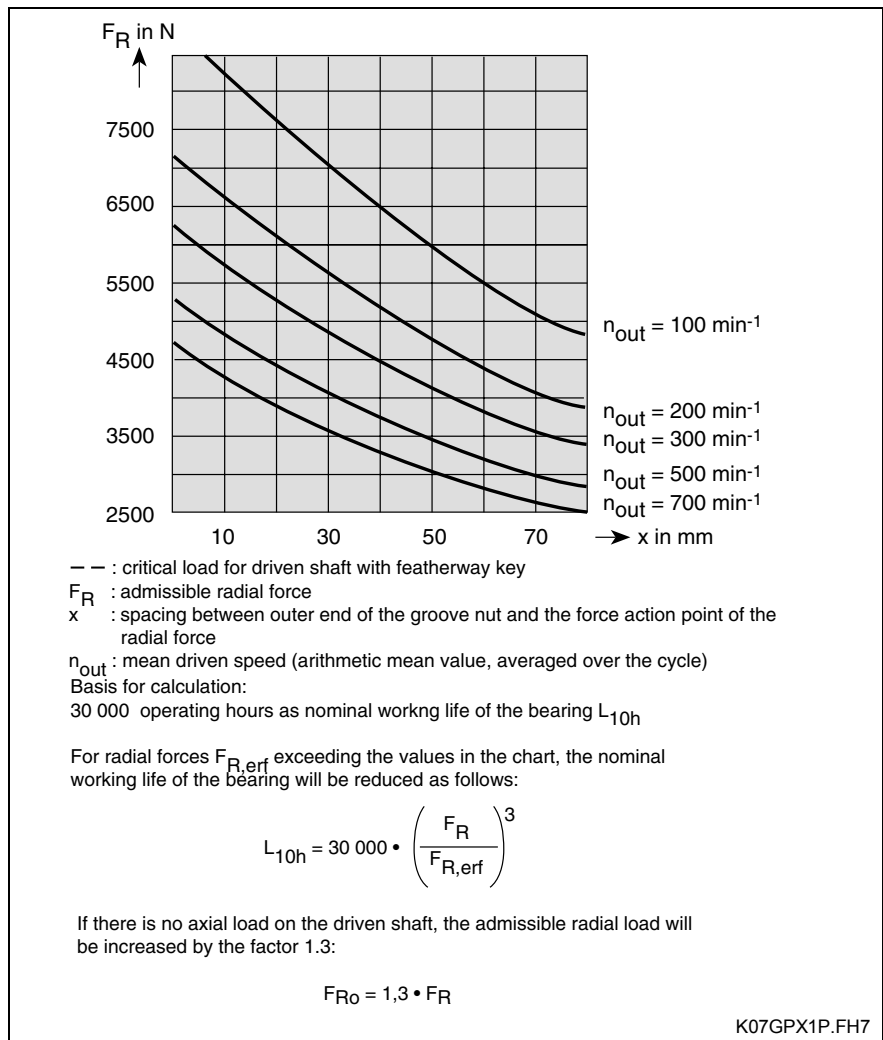


Fig. 9-7: Admissible shaft load GTP140, two-stage

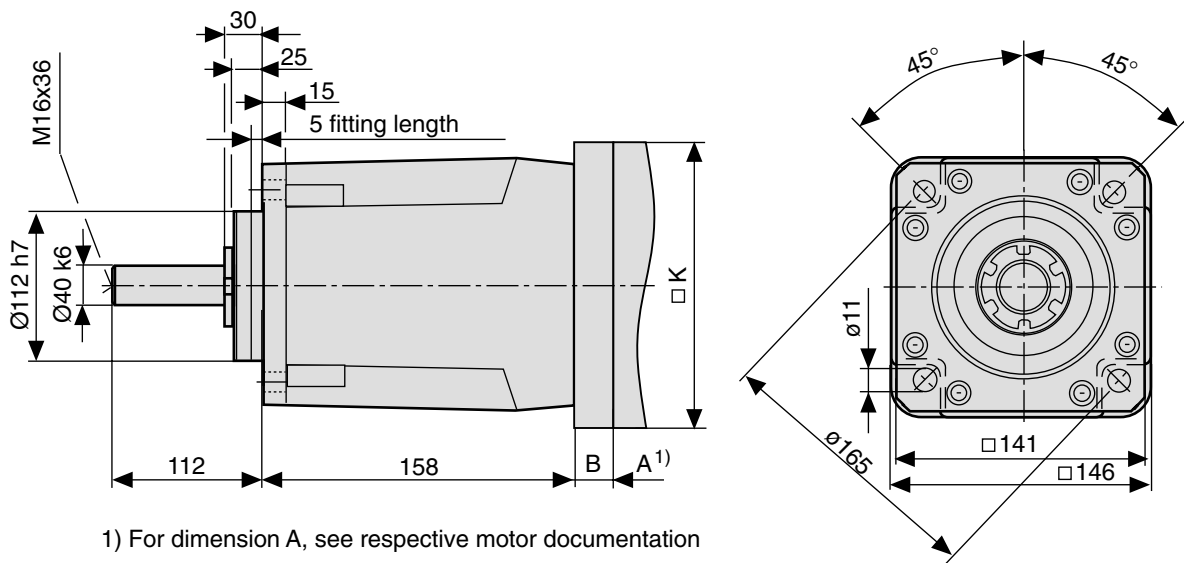
Admissible axial force F_{axial}

$$F_A = 0.5 \cdot F_R$$

F_A : Admissible axial force
 F_R : Admissible radial force

Fig. 9-8: Formula

9.4 Dimensional notations, single-stage



1) For dimension A, see respective motor documentation

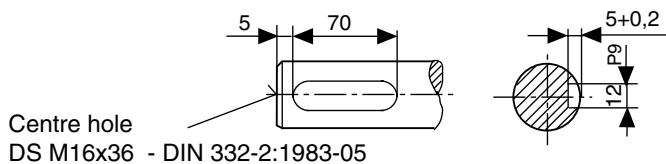
- Position accuracy in respect of smooth running and concentricity to the shaft according to tolerance zone N, DIN 42955:1981-12

Dimensions chart

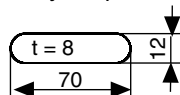
Motor type	Dimension	B	□K
MKD090, MDD090, MAC090, MHD090, MHP090, MKE096		0	141
MDD093, MAC093, MHD093, MHD095		0	141
MHD112, MKD112, MDD112, MAC112, MHP112, MDD115, MAC115, MKE116		20	192
2AD100, 2AD101, 2AD104, ADP104		20	192
MHD115, MHP115		34	192

Driven shaft

- plain shaft (preferred type), centred according to DIN 332-1:1986-04, form A
 - with featherway key according to DIN 6885-1:1968-08 (Attention! (Balanced with half featherway!))
- Centre hole DS M16x36 - DIN 332-2:1983-05



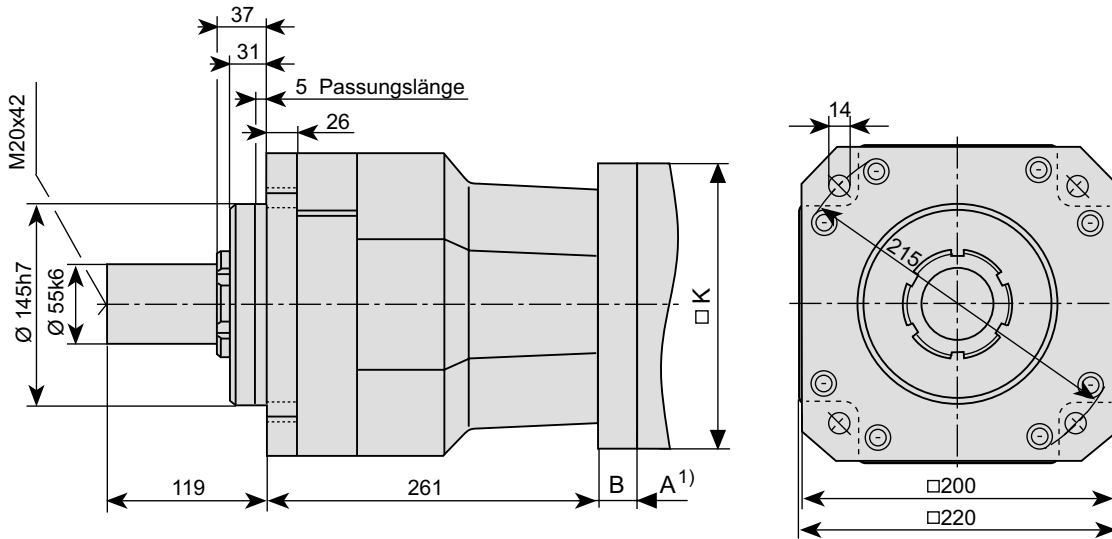
The appurtenant featherway key: DIN 6885-1:1986-08; A 12 x 8 x 70, is not included in the delivery scope of the gearbox.



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Fig. 9-9: Dimensional notations GTP140, single-stage

9.5 Dimensional notations, two-stage



1) Maß A siehe zugehörige Motordokumentation

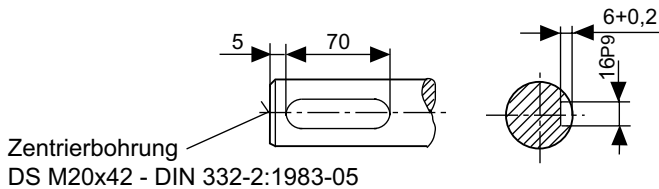
- Lagegenauigkeit bzgl. Rundlauf, Planlauf und Koaxialität zur Welle nach Toleranzklasse N, DIN 42955:1981-12

Maßtabelle

Motortyp	Maß	B	□ K
MKD090, MDD090, MAC090, MHD090, MKE096		0	141
MDD093, MAC093, MHD093, MHD095		0	141
MHD112, MKD112, MDD112, MAC112, MDD115, MAC115, MKE116, ADP104, 2AD100, 2AD101, 2AD104		20	192
MHD115		34	192

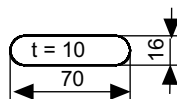
Abtriebswelle

- glatte Welle (Vorzugstype), Zentrierung nach DIN 332-1:1986-04, Form A
- mit Paßfedernut nach DIN 6885-1:1968-08 (Achtung! mit halber Paßfeder gewuchtet)
- Zentrierbohrung DS M20x42 - DIN 332-2:1983-05



Zentrierbohrung DS M20x42 - DIN 332-2:1983-05

zugehörige Paßfeder: DIN 6885-1:1968-08; A16 x 10 x 70, gehört nicht zum Lieferumfang des Getriebes



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Fig. 9-10: Dimensional notations GTP140, two-stage

9.6 Type code GTP140

Abbrev.	Column																																																			
		1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	
Example:		G	T	P	1	4	0	-	M	O	1	-	0	0	7	A	0	6																																		

1. Product group
 - 1.1 GTP = GTP

2. Size
 - 2.1 140 = 140

3. Mounting style
 - 3.1 Gear flange with long centering pilot = MO

4. Quantity of gear stages
 - 4.1 single stage = 1
 - 4.2 two stage = 2

5. Transmission ratio
 - 5.1 single stage: 4 5 7 10 e.g., 7 = 007
 - 5.2 two stage: 20 50 e.g., 20 = 020

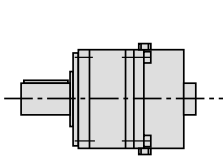
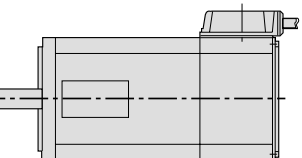
6. Driven shaft
 - 6.1 with key = A
 - 6.2 plain = B

7. Designation of mounted motor

Motor size \ Product gruppe	090	093	095	096	100	101	104	112	115	116
7.1 2AD	-	-	-	-	09	09	09	-	-	-
7.2 ADP	-	-	-	-	-	-	09	-	-	-
7.3 MAC	06 ①	06 ①	-	-	-	-	-	09 ②	09 ②	-
7.4 MDD	06 ① ③	06 ① ③	-	-	-	-	-	09 ② ③	09 ② ③	-
7.5 MHD	06	16	16	-	-	-	-	09	19	-
7.6 MHP	06	16	-	-	-	-	-	09	19	-
7.7 MKD	06	-	-	-	-	-	-	09	-	-
7.8 MKE	-	-	-	06	-	-	-	-	-	09

Note:
 ① only available for centering diameter 110 mm
 ② only available for centering diameter 130 mm
 ③ not available for motors with liquid coolants

Illustration example: Planetary gearbox

Planetary gearbox

Motor

GTP140-EN.FH7

Fig. 9-11: Type code GTP140

10 GTP200

10.1 Technical data for intermittent and continuous operation

Data depending on transformation ratio

	Description	Symbol	Unit	GTP200			
				single-stage			
				4	5	7	10
	Transmission ratio	i	-				
S5 intermittent operation	max. input speed	$n_{in, max}$	min^{-1}	2500	3200	4000	5000
	min. input torque ²⁾	$M_{in, max}$	Nm	450	460	340	180
	max. output speed	$n_{out, max}$	min^{-1}	625	640	570	500
	min. output torque ²⁾	$M_{out, max}$	Nm	1800	2300	2400	1800
	nominal output torque	$M_{out, nenn}$	Nm	900	1150	1200	900
S1 Contin. operation	Nominal input speed S1	$n_{in, nenn S1}$	min^{-1}	1500	2000	2500	3000
	Nominal output torque S1	$M_{out, nenn}$	Nm	600	750	800	600
	Inertia torque ³⁾	J	kg cm^2	37.2	31.2	26.6	24.1
	Torque strength ⁴⁾	D	Nm/rad	300000	308000	316000	320000

²⁾ With a maximum of 1000 cycles/h
³⁾ Mass moment of inertia of the gearbox including the coupling elements to the motor, in respect of the gearbox input side
⁴⁾ Torque strength of the gearbox in respect of the gearbox output side, with blocked gearbox input side

Fig. 10-1: Data GTP200 depending on transmission ratio

General data

Description	Symbol	Unit	GTP200
			single-stage
Efficiency	η	%	95
Torsional play 1)	$\Delta\varphi$	arcmin	≤ 6
Working life	L_{10h}	h	>15.000
Lubrication	-		Lubricating agent over working life
Admissible ambient temperature	T_{Um}	$^{\circ}\text{C}$	0...45
Admissible gear housing temperature	T_G	$^{\circ}\text{C}$	90
Noise level	L_p	dB (A)	< 65
Type of protection	-		IP65
Weight	m	kg	28
Mounting for motor size			100/101/104/112/115/116/131/132/134

1) in respect of the gearbox output side at 2 % nominal output torque of the gear and blocked gearbox input side
2) with gearbox input speed 3000 min^{-1}

Fig. 10-2: General data GTP200

10.2 Admissible shaft load, single-stage

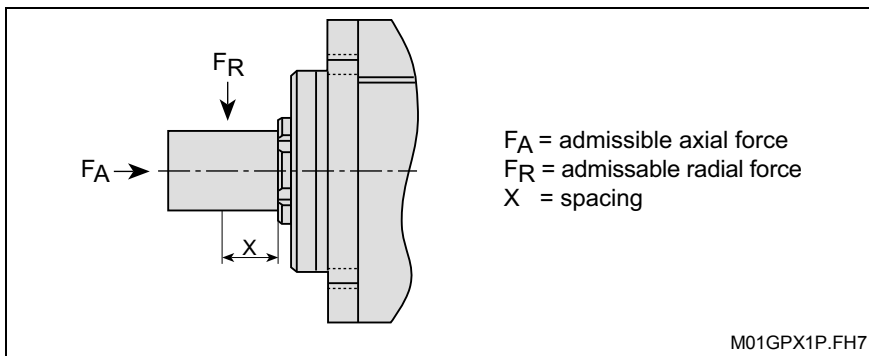


Fig. 10-3: Load action points at the gearbox driven shaft

Admissible radial force F_{radial}

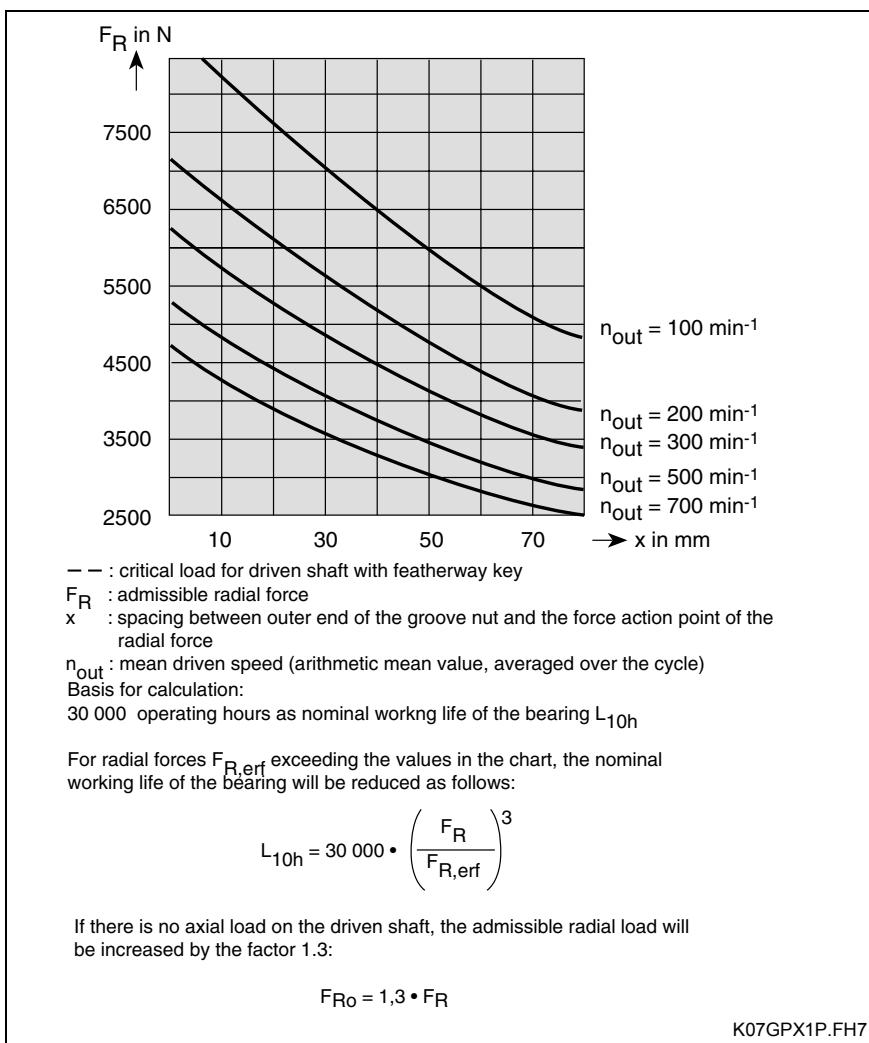


Fig. 10-4: Admissible shaft load GTP200, single-stage

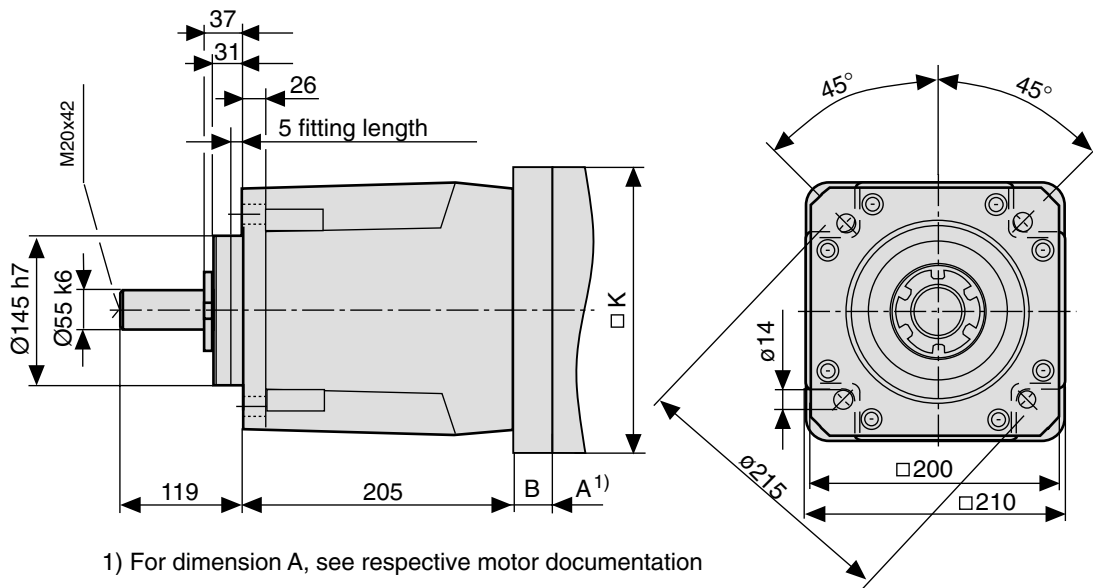
Admissible axial force F_{axial}

$$F_A = 0.5 \cdot F_R$$

F_A : Admissible axial force
 F_R : Admissible radial force

Fig. 10-5: Formula

10.3 Dimensional notations, single-stage



1) For dimension A, see respective motor documentation

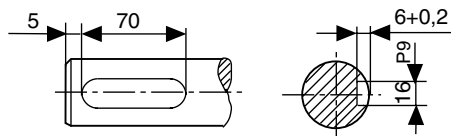
- Position accuracy in respect of smooth running and concentricity to the shaft according to tolerance zone N, DIN 42955:1981-12

Dimensions chart

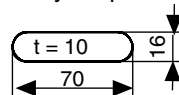
Motor type	Dimension	B	□ K
MHD112, MKD112, MDD112 MAC112		0	190
MDD115, MAC115, MHP115, MKE116		0	190
2AD100, 2AD101, 2AD104 ADP104,		0	190
2AD132, 2AD134		28	260
MHD131		40	260

Driven shaft

- plain shaft (preferred type), centred according to DIN 332-1:1986-04, form A
- with featherway key according to DIN 6885-1:1968-08
(Attention! (Balanced with half featherway!))
Centre hole DS M20x42 - DIN 332-2:1983-05



The appurtenant featherway key: DIN 6885-1:1968-08; A 16 x 10 x 70, is not included in the delivery scope of the gearbox.



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Fig. 10-6: Dimensional notations GTP200, single-stage

10.4 Type code GTP200

Abbrev. Column	→	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0							
Example:		G	T	P	2	0	0	-	M	O	1	-	0	0	7	A	0	9																														

1. Product group
 - 1.1 GTP..... = GTP

2. Size
 - 2.1 200..... = 200

3. Mounting style
 - 3.1 Gear flange with long centering pilot = MO

4. Quantity of gear stages
 - 4.1 single stage..... = 1

5. Transmission ratio
 - 5.1 single stage: 4 5 7 10 e.g., 7..... = 007

6. Driven shaft
 - 6.1 with key..... = A
 - 6.2 plain..... = B

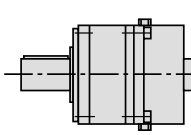
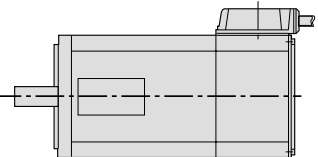
7. Designation of mounted motor

	Motor size	100	101	104	112	115	116	131	132	134
7.1	2AD	09	09	09	-	-	-	-	11	11
7.2	ADF	-	-	-	-	-	-	-	11	11
7.3	ADP	-	-	09	-	-	-	-	-	11
7.4	MAC	-	-	-	09 ^①	09 ^①	-	-	-	-
7.5	MDD	-	-	-	09 ^{①②}	09 ^{①②}	-	-	-	-
7.6	MHD	-	-	-	09	19	-	15	-	-
7.7	MHP	-	-	-	09	19	-	-	-	-
7.8	MKD	-	-	-	09	-	-	-	-	-
7.9	MKE	-	-	-	-	-	09	-	-	-

Note:

- ① only available for centering diameter 130 mm
- ② not available for motors with liquid coolants

Illustration example: Planetary gearbox

Planetary gearbox
Motor

GTP200-EN.FH7

Fig. 10-7: Type code GTP200

11 Order Information

The planetary gear box must be listed as a sub-order position of the AC motor. Generally, a complete unit is supplied at all times, consisting of the GTP planetary gear box and the AC motor.

On ordering the motor, please take into consideration that the motor shaft must be a **plain shaft**.

Example for ordering:

- 1 1 piece AC motor
 Type MKD090B-047-GG0

- 1.1. 1 piece planetary gear box
 Type: GTP140-MO1-005B06
 Attached to Pos. 1

12 Operation of GTP Planetary Gear Boxes

12.1 Commissioning

The following commissioning instructions are applicable for GTP planetary gear boxes as part of a drive system consisting of motor, open and closed loop controls.

Preparation

1. Have the documentations of all used products available.
2. Register all measures taken in a commissioning log.
3. Check the products for defects.
4. Check all mechanical and electrical connections.
5. Activate the safety devices and supervision systems of the unit.



CAUTION

Maloperation of activation of motor and moving units can cause defects! Unidentified operation statuses and product data!

- ⇒ Do not commission your system in case of unidentified or faulty connections, operation statuses or product data!
- ⇒ Do not commission your system if safety devices and supervision systems for the unit are defect or not activated.
- ⇒ Damaged products must not be commissioned.
- ⇒ Contact Rexroth Indramat for missing information or help with commissioning!

Execution

When all conditions are met, proceed as follows:

1. Commission the motors, automatic control equipment and prime power according to the respective instructions. Observe the applicable product documentations.
2. Prior to setpoint signal enabling, check whether the set ration of motor maximum speed and setpoint input corresponds to the machine specifications.
3. At low speed, check whether the direction of rotation of the gears and the setpoint polarity correspond to the machine specifications.
4. At low speed, check whether the positioning commands of the control systems are executed correctly.
5. List all measures taken in the commissioning log .

When all steps have been correctly taken, the commissioning of the gear box is completed.



Commissioning of automatic control equipment, motor and controls can require additional steps. Checking functions and performance of the system is not included in the commissioning of the gearbox but is done in connection with the overall machine commissioning. Please note the machine manufacturer's information and instructions.

12.2 Shutdown

In case of malfunction or for maintenance or shutdown of the motor-and-gears unit, proceed as follows:

1. Observe the instructions in the machine documentation.
2. Shut down the drive according to the instructions via the control commands at the machine side.
3. Switch off the power and control voltage of the control unit.
4. Switch off the motor protecting switch for the motor fan.
5. Switch off the main switch of the machine.
6. Protect the machine from unintentional shifting and from operation by unauthorised persons.
7. Wait until the end of the discharge time and then cut all electrical connections.
8. Prior to disassembly and before you cut the mechanical connections, protect the motor-and-gears unit and the supply lines from falling or from shifting.
9. List all measures taken in the commissioning log or the machine maintenance schedule.

12.3 Dismounting



DANGER

Maloperation of activation of motor and moving units can cause fatal injuries!

- ⇒ Do not perform work on running or unprotected systems.
- ⇒ Before starting to disassemble the machine, protect it from unintentional shifting and from operation by unauthorised persons.
- ⇒ Prior to disassembly and before you cut the mechanical connections, protect the motor-and-gears unit and the supply lines from falling or from shifting.

1. Observe the instructions in the machine documentation.
2. Observe the safety instructions and perform all steps according to the above instruction "12.2 Shutdown".
3. Dismount the gears-and-motor unit from the machine and position the unit correctly.
4. List all measures taken in the commissioning log or the machine maintenance schedule.

12.4 Maintenance

In the framework of the specified operating conditions and working life, the planetary gear boxes of the GTP type series function wear- and maintenance-free. Any operation under unfavourable conditions, however, may lead to restrictions of availability.

- ⇒ Observe the information given by the machine manufacturer in the machine maintenance schedule.
- ⇒ Record all maintenance measures in the machine maintenance schedule.

Measures



DANGER

Danger of injury by moving elements! Danger of injury by hot surfaces!

- ⇒ Do not perform maintenance measures on running machines.
- ⇒ These tasks may only be performed by qualified personnel.
- ⇒ During maintenance, protect the system from re-start and unauthorised use.
- ⇒ Do not work on hot surfaces.
- ⇒ Protect the open supply lines and connections from ingress of dirt particles.

Based on the machine manufacturer's maintenance schedule, Rexroth Indramat recommends the following maintenance measures:

Measure	Interval
Check mechanical and electrical connections.	According to the machine maintenance schedule, as a minimum after each 1000 operating hours.
Check gears- and-motor unit for smooth running, vibrations, and bearing sounds.	According to the machine maintenance schedule, as a minimum after each 1000 operating hours.
Remove dust, shavings, and other dirt from the gears-and-motor housing, cooling fins, and connections.	According to the degree of soiling, at the latest after 6 months. Monthly in case of heavy soiling.

Fig. 12-1: Maintenance schedule for the gears-and-motor unit

12.5 Trouble shooting



DANGER

Danger of injury by moving elements! Danger of injury by hot surfaces!

- ⇒ Do not perform maintenance measures on running machines.
- ⇒ Prior to trouble shooting, switch off the control and the machine and wait for the end of the discharge time of the electrical systems.
- ⇒ During maintenance, protect the system from re-start and unauthorised use.
- ⇒ Do not work on hot surfaces.

Excessive temperature at the gearbox housing

State	The temperature of the gearbox housing increases to unusually high levels.
Potential causes	<ol style="list-style-type: none"> 1. The original machining cycle has been changed. 2. The original drive parameters have been changed.
Countermeasures	<ol style="list-style-type: none"> 1. Check the dimensioning of the drive for the changed demands. Do not continue operation in case of overload. Risk of damage! 2. Restore the original parameterisation. With changed demands, check dimensioning of the drive.

Gears-and-motor unit creates vibrations

State	Vibrations can be heard or felt at the gears-and-motor unit.
Potential causes	<ol style="list-style-type: none"> 3. The driven machine elements have been insufficiently or not at all balanced, or are insufficiently linked. 4. Geared motor bearings are worn or defective. Working life of bearings or lubrication has expired. 5. Mounting of gears and motor has come loose. 6. The drive system is unstable from a control engineering point of view.
Countermeasures	<ol style="list-style-type: none"> 7. Check balancing of driven machine elements. Check featherkey and featherkey way. In case of damages, contact Rexroth Indramat Service. 8. Check gearbox for damages. In case of malfunction, contact Rexroth Indramat Service. 9. Mount motor correctly and check for damages. In case of malfunction, contact Rexroth Indramat Service. 10. Check parameterisation of the drive system (motor and sensor data). Observe the information in the documentation for the control device.

The set position is not reached

State	The positioning command of the control is not performed exactly or not at all. No malfunction indication at the control equipment.
Potential causes	<ol style="list-style-type: none">11. The connection of motor shaft and machine element has come loose.12. The connection of motor shaft and gearbox has come loose.13. Defect gearing.
Countermeasures	<ol style="list-style-type: none">14. Check mechanical connection. Do not continue to use damaged parts.15. Check mechanical connection. Do not continue to use damaged parts.16. Gearbox must be replaced. In case of malfunction, contact Bosch Rexroth Indramat Service.

13 Service & Support

13.1 Helpdesk

Unser Kundendienst-Helpdesk im Hauptwerk Lohr am Main steht Ihnen mit Rat und Tat zur Seite. Sie erreichen uns

- Telefonisch: **+49 (0) 9352 40 50 60**
über Service-Call Entry Center Mo-Fr 07:00-18:00
- per Fax: **+49 (0) 9352 40 49 41**
- per e-Mail: **service@indramat.de**

Our service helpdesk at our headquarters in Lohr am Main, Germany can assist you in all kinds of inquiries. Contact us

- by phone: **+49 (0) 9352 40 50 60**
via Service-Call Entry Center Mo-Fr 07:00 am -6:00 pm
- by fax: **+49 (0) 9352 40 49 41**
- by e-mail: **service@indramat.de**

13.2 Service-Hotline

Außerhalb der Helpdesk-Zeiten ist der Service direkt ansprechbar unter

oder **+49 (0) 171 333 88 26**
+49 (0) 172 660 04 06

After helpdesk hours, contact our service department directly at

or **+49 (0) 171 333 88 26**
+49 (0) 172 660 04 06

13.3 Internet

Weitere Hinweise zu Service, Reparatur und Training finden Sie im Internet unter

www.indramat.de

Außerhalb Deutschlands nehmen Sie bitte zuerst Kontakt mit Ihrem lokalen Ansprechpartner auf. Die Adressen sind im Anhang aufgeführt.

Additional notes about service, repairs and training are available on the Internet at

www.indramat.de

Please contact the sales & service offices in your area first. Refer to the addresses on the following pages.

13.4 Vor der Kontaktaufnahme... - Before contacting us...

Wir können Ihnen schnell und effizient helfen wenn Sie folgende Informationen bereithalten:

1. detaillierte Beschreibung der Störung und der Umstände.
2. Angaben auf dem Typenschild der betreffenden Produkte, insbesondere Typenschlüssel und Seriennummern.
3. Tel./Faxnummern und e-Mail-Adresse, unter denen Sie für Rückfragen zu erreichen sind.

For quick and efficient help, please have the following information ready:

1. Detailed description of the failure and circumstances.
2. Information on the type plate of the affected products, especially type codes and serial numbers.
3. Your phone/fax numbers and e-mail address, so we can contact you in case of questions.

13.5 Kundenbetreuungsstellen - Sales & Service Facilities

Verkaufsniederlassungen
 Niederlassungen mit Kundendienst

sales agencies
 offices providing service

Deutschland – Germany

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Notizen - Notes

14 Appendix

14.1 List of Standards

Standard	Version	Title	Conformity
DIN EN 60034-7; VDE 0530 Part 7	1996-06	Rotating electrical machines – Part 7: Description for structural shapes and list (IM code) (IEC 60034-7:1992); German version EN 60034-7:1993	EN 60034-7(1993-01); IEC 60034-7(1992-12)
89/392/EEC replaced by 98/37/EC	1998-06-22	Directive 98/37/EC of the European Parliament and the Council of June 22, 1998 for adaptation of the member countries' legal and administrative regulations for machines	
89/336/EEC	1989-05-03	Directive of the Council of May 3, 1989 for adaptation of the member countries' regulations on electromagnetic compatibility	
DIN EN 50178; VDE 0160	1998-04	Equipment of power installations with electronic equipment; German version EN 50178:1997	EN 50178(1997-10)
DIN VDE 0100-410; VDE 100 Part 410 IEC 60364-4-41	1997-01	Setting up power installations with rated voltages of up to 1000 V – Part 4: Protective measures; Chapter 41: Protection against electric shock (IEC 60364-4-41:1992, as amended); German version HD 384.4.41 S2:1996	HD 384.4.41 s2 (1996-04); IEC 6036-4-41 (1992-10)
DIN EN 60529; VDE 0470 Part 1	2000-09	Protection classes via housings (IP code) (IEC 60529:1989 + A1:1999); German version EN 60529:1991 + A1:2000	EN 60529(1991-10); EN 60529/A1(2000-02); IEC 60529(1989-11); IEC 60529
DIN ISO 281	1993-01	Rolling bearing; dynamic load rating and rated service life; identical with ISO 281:1990	ISO 281(1990-12)
DIN 42955	1981-12	True running of the shaft ends, concentricity and even run of the mounting flanges of electrical rotating machines; tolerances, test	IEC 60072(1971)
DIN 332-1	1986-04	Centre holes 60°; form R, A, B and C	ISO 866(1975-02); ISO 2540(1973-04); ISO 2541(1972-12)
DIN 6885-1	1968-08	Driver connection without pick-up; feather keys, grooves, high shape	
DIN 332-2	1983-05	Centre holes 60° with thread for shaft ends of electrical machines	

Fig. 14-1: List of standards

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Use *See* intended use *and see* non-intended use

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