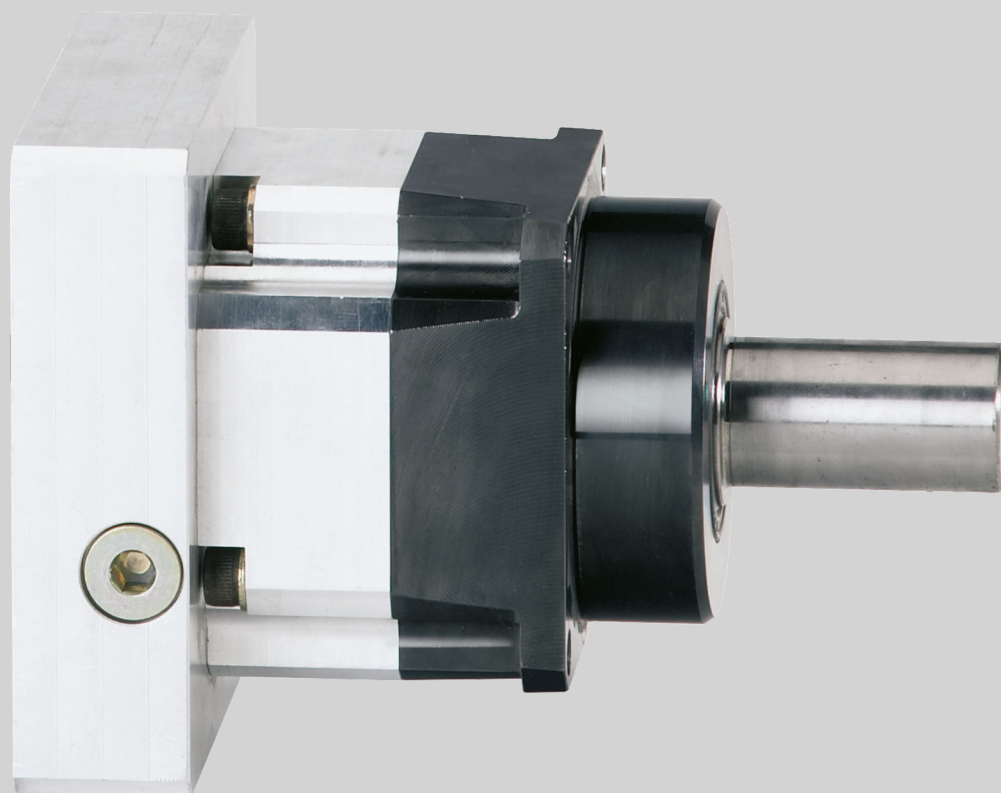


# GTM

## Planetary Gearboxes

**Project Planning Manual**  
**R911297321**

Edition 03



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# Table of Contents

	Page
<b>1 Introduction to the product.....</b>	<b>1</b>
1.1 GTM Planetary gearboxes.....	1
1.2 About this documentation.....	2
1.2.1 Editions of this documentation.....	2
1.2.2 General.....	2
1.2.3 Further documentation.....	3
1.2.4 Standards .....	3
1.2.5 Additional components.....	3
1.2.6 Your feedback.....	3
<b>2 Important instructions on use .....</b>	<b>5</b>
2.1 Appropriate use.....	5
2.1.1 Introduction.....	5
2.1.2 Areas of use and application.....	5
2.2 Inappropriate use.....	6
<b>3 Safety instructions for electric drives and controls.....</b>	<b>7</b>
3.1 Definitions of terms.....	7
3.2 General information.....	8
3.2.1 Using the Safety instructions and passing them on to others.....	8
3.2.2 Requirements for safe use.....	8
3.2.3 Hazards by improper use.....	9
3.3 Instructions with regard to specific dangers.....	10
3.3.1 Protection against contact with electrical parts and housings.....	10
3.3.2 Protective extra-low voltage as protection against electric shock .....	11
3.3.3 Protection against dangerous movements.....	12
3.3.4 Protection against electromagnetic and magnetic fields during operation and mounting.....	13
3.3.5 Protection against contact with hot parts.....	14
3.3.6 Protection during handling and mounting.....	14
3.3.7 Battery safety.....	14
3.3.8 Protection against pressurized systems.....	15
3.4 Explanation of signal words and the Safety alert symbol.....	16
<b>4 Dimensioning and selection.....</b>	<b>17</b>
4.1 Dimensioning.....	17
4.2 Selection.....	18
<b>5 Application notes.....</b>	<b>21</b>
5.1 Operating conditions.....	21
5.1.1 General.....	21
5.1.2 Operating mode S5 (Intermitted operation).....	22
5.1.3 Operating mode S1 (Continuous operation).....	22
5.2 Operating gearboxes or motor/gearbox combinations in hazardous areas (ATEX).....	23

## Table of Contents

	Page
5.3	Mechanical features..... 23
5.4	Combination possibilities of GTM planetary gearboxes with motors..... 24
<b>6</b>	<b>Technical data ..... 27</b>
6.1	Technical data for intermittent and continuous operation..... 27
6.1.1	Ratio-dependend data..... 27
6.1.2	General data..... 29
6.2	Limiting temperature curves to determine higher S1-speed..... 30
6.3	Technical data for increased lifetime..... 33
6.4	Permitted shaft load..... 33
6.4.1	General..... 33
6.4.2	GTM060..... 34
6.4.3	GTM075..... 35
6.4.4	GTM100..... 35
6.4.5	GTM140..... 36
6.4.6	GTM180..... 36
6.4.7	GTM240..... 37
<b>7</b>	<b>Specifications ..... 39</b>
7.1	GTM060..... 39
7.2	GTM075..... 40
7.3	GTM100..... 42
7.4	GTM140..... 44
7.5	GTM180..... 46
7.6	GTM240..... 48
<b>8</b>	<b>Type codes ..... 49</b>
8.1	Type code GTM060..... 49
8.2	Type code GTM075..... 50
8.3	Type code GTM100..... 51
8.4	Type code GTM140..... 52
8.5	Type code GTM180..... 53
8.6	Type code GTM240..... 54
<b>9</b>	<b>Handling, transport and storage ..... 55</b>
9.1	Handling ..... 55
9.1.1	Identifying the goods..... 55
9.1.2	Type plates..... 55
9.2	Transport and storage..... 56
<b>10</b>	<b>Assembly ..... 59</b>
10.1	Skilled personnel..... 59
10.2	Motor mounting..... 59

	Page
10.2.1 General.....	59
10.2.2 Motor connection.....	60
10.2.3 Mounting procedure.....	60
10.3 Gearbox mounting.....	64
<b>11 Commissioning, operation and maintenance.....</b>	<b>65</b>
11.1 Commissioning.....	65
11.1.1 General.....	65
11.1.2 Preparation.....	65
11.1.3 Procedure.....	65
11.2 Deactivation.....	66
11.3 Disassembly.....	66
11.4 Maintenance.....	66
11.4.1 General.....	66
11.4.2 Measures.....	67
11.5 Troubleshooting.....	67
11.5.1 General information.....	67
11.5.2 Excess temperature of gearbox housing.....	67
11.5.3 Gearbox-motor unit generates vibrations.....	68
11.5.4 Specified position is not reached.....	68
<b>12 Environmental protection and disposal .....</b>	<b>69</b>
12.1 Environmental protection.....	69
12.2 Disposal.....	69
<b>13 Service and support.....</b>	<b>71</b>
<b>Index.....</b>	<b>73</b>



# 1 Introduction to the product

## 1.1 GTM Planetary gearboxes

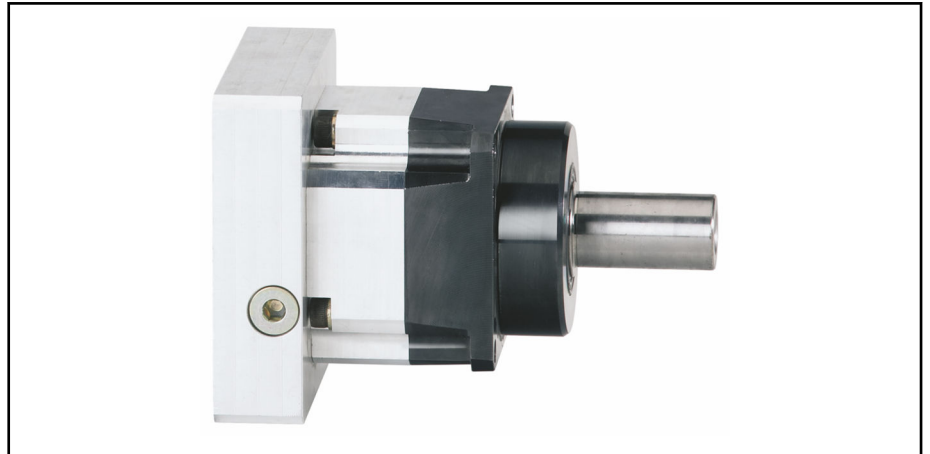


Fig. 1-1: GTM Planetary gearboxes

**Fields of application** Planetary gearboxes for assembly on electric motors in combination with the drive and control system of Rexroth, provide a low-cost automation system for various sectors of industry. They are well-suited for use with gear racks or toothed belts in handling systems with high speed and accelerations (e.g.: loader and robots).

The low backlash gearing with ground gear pairs enables precise positioning tasks to be carried out. Furthermore, the gearboxes in S1 operation are suitable for use in the printing press sector.

**Mode of functioning** The GTM series of planetary gearboxes offers a coaxial input and output. The output shaft of the motor is connected to the sun gear with a non-positive compression clamp coupling. This sun gear drives the planetary gears, which revolve within the ring gear. The planetary gears are fixed in the planet carrier, which acts as the output. By the dividing the load among the planetary gear, a balanced force splitting occurs. This allows for a very compact gearbox with a high power density.

- High operational reliability**
- Maintenance-free operation through lifetime lubrication
  - Use under adverse environmental conditions is possible thanks to the completely enclosed IP65 design.
  - Safe and lasting sealing by tough shaft sealing rings.
  - Hermetically sealed housing
  - Non-positive from backlash-free torque transmission via the compression coupling
- High performance data**
- High accuracy through use of ground, gears and low backlash.
  - High torsional rigidity by optimized planetary gears supported on both sides with stabile needle bearings.
  - High efficiency, low temperature and minimum power loss made possible by using the smallest possible seal diameters.
  - Low running noise by optimized gear profiles.
  - High emergency stop torque made possible by internal transferred power.
  - Highly dynamic because of inertia

**Easy to mount to machine**

- Low weight through compact type of construction
- The high radial-load capability and tilt resistance makes it possible to directly mount a pinion or pulley.
- The design of the output shaft with a solid shaft shoulder makes axial tightening of output elements simple.
- The gearbox can be mounted in any position. Due to the defined bearing position and pump current a sufficient lubricant supply is always ensured.
- Flange mounting is permitted in all installation positions because of the B05 design (EN 60034-7:1996-06) with drillings within the flange.
- The output elements can be mounted in two different ways:
  - Non-positive compression fitting on the plain shaft (standard), or
  - Connection by means of an output shaft with keyway

## 1.2 About this documentation

### 1.2.1 Editions of this documentation

Edition	State	Remark
03	2019-04	Revision / supplement (new type codes)
02	2006-02	Revision
01	2003-07	First edition

Tab. 1-1: Record of revisions

### 1.2.2 General

This document contains safety regulations, technical data, and operating instructions for gearboxes. The individual chapters can be subdivided into the following focal points:

Chapter	Title	Content
1	Product presentation	General information
2	Important instructions for use	<b>Safety</b>
3	Safety instructions	
4	Dimensioning and selection	<b>Product description</b> (for planners and designers)
5	Application notes	
6	Technical data	
7	Specifications	
8	Type code	<b>Practise</b> (for operating and maintenance personnel)
9	Handling, transport and storage	
10	Assembly	
11	Commissioning, operation and maintenance	



Chapter	Title	Content
12	Service & support	General information
13	Index	

Tab. 1-2: Document structure

### 1.2.3 Further documentation

To project planning manual the drive-systems it is possible that you need additional documentation referring the used devices. Rexroth provides the entire product documentation in the Bosch Rexroth media directory in PDF format.

<http://www.boschrexroth.com/various/utilities/mediadirectory/index.jsp>

### 1.2.4 Standards

This documentation refers to German, European and international technical standards. Documents and sheets on standards underlie copyright protection and may not be passed on to third parties by Bosch Rexroth. If required, please contact the authorized sales outlets. In Germany, contact:

**BEUTH Verlag GmbH**

**Burggrafenstraße 6**

**10787 Berlin, Germany**

Phone +49-(0)30-26 01-22 60, Fax +49-(0)30-26 01-12 60

Internet: <http://www.din.de/beuth>

Email: [postmaster@beuth.de](mailto:postmaster@beuth.de)

### 1.2.5 Additional components

Documentation for external systems which are connected to Bosch Rexroth components are not included in the scope of delivery and must be ordered directly from the corresponding manufacturers.

### 1.2.6 Your feedback

Your experiences are an essential part of the improvement process of product and documentation.

Please send your feedback to:

**Bosch Rexroth AG**

**Dept. DC-AE/EPI5 (fs/mb)**

**Buergermeister-Dr.-Nebel-Straße 2**

**97816 Lohr am Main, Germany**

E-Mail: [dokusupport@boschrexroth.de](mailto:dokusupport@boschrexroth.de)



## 2 Important instructions on use

### 2.1 Appropriate use

#### 2.1.1 Introduction

Bosch Rexroth products are designed and manufactured using the latest state-of-the-art-technology. Before they are delivered, they are inspected to ensure that they operate safely.

The products must only be used as intended. If they are inappropriately used, situations may arise resulting in injuries to property and persons.



Bosch Rexroth, as the manufacturer, does not provide any warranty, assume any liability, or pay any damages for damage caused by products not being used as intended. Any risks resulting from the products not being used as intended are the sole responsibility of the user.

Any changes on the gearbox exclude all liability on the part of Bosch-Rexroth for any damages

---

Before using the Bosch Rexroth products, the following condition precedent must be fulfilled so as to ensure that they are used as intended:

- Personnel that in any way, shape or form uses our products must first read and understand the relevant safety instructions and be familiar with their appropriate use.
- If the products are hardware, they must be kept in their original state, i.e., no constructional modifications may be made. Software products may not be decompiled; their source codes may not be modified.
- Damaged or improperly working products may not be installed or put into operation.
- It must be ensured that the products are installed according to the regulations specified in the documentation.

#### 2.1.2 Areas of use and application

Typical application ranges of the GTM planetary gearboxes are:

- Handling and mounting systems,
- Packaging and food-processing machines,
- Printing and paper-processing machines and
- Machine tools

Controlling and monitoring of the motor/-gearbox combination may require connection of additional sensors and actuators.



The gearboxes may only be used with the accessories specified in the documentation. Components that are not explicitly mentioned may neither be attached nor connected. The same is applicable for cables and lines.

---



Operation is only allowed in the explicitly mentioned configurations and combinations of the component and with the software and firmware specified in the corresponding functional description.

---

Any drive controller must be programmed before startup, in order to ensure that the motor executes the functions specific to the particular application.

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

## 2.2 Inappropriate use

Any use of the planetary gearboxes outside of the fields of application mentioned above or under operating conditions and technical data other than those specified in this documentation is considered to be "inappropriate use".

Planetary gearboxes may not be used if . . .

- they are subject to operating conditions which do not comply with the ambient conditions described above; For example, they may not be operated under water, under extreme temperature fluctuations or extreme maximum temperatures;
- the intended application is not explicitly released by Bosch Rexroth. Please be absolutely sure to comply with the instructions given in the general safety instructions!

## 3 Safety instructions for electric drives and controls

### 3.1 Definitions of terms

<b>Application documentation</b>	Application documentation comprises the entire documentation used to inform the user of the product about the use and safety-relevant features for configuring, integrating, installing, mounting, commissioning, operating, maintaining, repairing and decommissioning the product. The following terms are also used for this kind of documentation: Operating Instructions, Commissioning Manual, Instruction Manual, Project Planning Manual, Application Description, etc.
<b>Component</b>	A component is a combination of elements with a specified function, which are part of a piece of equipment, device or system. Components of the electric drive and control system are, for example, supply units, drive controllers, mains choke, mains filter, motors, cables, etc.
<b>Control system</b>	A control system comprises several interconnected control components placed on the market as a single functional unit.
<b>Device</b>	A device is a finished product with a defined function, intended for users and placed on the market as an individual piece of merchandise.
<b>Electrical equipment</b>	Electrical equipment encompasses all devices used to generate, convert, transmit, distribute or apply electrical energy, such as electric motors, transformers, switching devices, cables, lines, power-consuming devices, circuit board assemblies, plug-in units, control cabinets, etc.
<b>Electric drive system</b>	An electric drive system comprises all components from mains supply to motor shaft; this includes, for example, electric motor(s), motor encoder(s), supply units and drive controllers, as well as auxiliary and additional components, such as mains filter, mains choke and the corresponding lines and cables.
<b>Installation</b>	An installation consists of several devices or systems interconnected for a defined purpose and on a defined site which, however, are not intended to be placed on the market as a single functional unit.
<b>Machine</b>	A machine is the entirety of interconnected parts or units at least one of which is movable. Thus, a machine consists of the appropriate machine drive elements, as well as control and power circuits, which have been assembled for a specific application. A machine is, for example, intended for processing, treatment, movement or packaging of a material. The term "machine" also covers a combination of machines which are arranged and controlled in such a way that they function as a unified whole.
<b>Manufacturer</b>	The manufacturer is an individual or legal entity bearing responsibility for the design and manufacture of a product which is placed on the market in the individual's or legal entity's name. The manufacturer can use finished products, finished parts or finished elements, or contract out work to subcontractors. However, the manufacturer must always have overall control and possess the required authority to take responsibility for the product.
<b>Product</b>	Examples of a product: Device, component, part, system, software, firmware, among other things.
<b>Project Planning Manual</b>	A Project Planning Manual is part of the application documentation used to support the sizing and planning of systems, machines or installations.
<b>Qualified persons</b>	In terms of this application documentation, qualified persons are those persons who are familiar with the installation, mounting, commissioning and operation of the components of the electric drive and control system, as well as with the hazards this implies, and who possess the qualifications their work

requires. To comply with these qualifications, it is necessary, among other things,

- to be trained, instructed or authorized to switch electric circuits and devices safely on and off, to ground them and to mark them.
- to be trained or instructed to maintain and use adequate safety equipment.
- to attend a course of instruction in first aid.

#### Qualified personnel for handling functionally safe products

Individuals configuring, commissioning and operating functionally safe products must have the knowledge specified under "[Qualified persons](#)". Additionally, these individuals must be familiar with technical safety concepts as well as prevailing standards and regulations in the field of functional safety.

#### User

A user is a person installing, commissioning or using a product which has been placed on the market.

## 3.2 General information

### 3.2.1 Using the Safety instructions and passing them on to others

Do not attempt to install and operate the components of the electric drive and control system without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with these components. If you do not have the user documentation for the components, contact your responsible Bosch Rexroth sales partner. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the components.

If the component is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the component in the official language of the user's country.

**Improper use of these components, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, could result in property damage, injury, electric shock or even death.**

### 3.2.2 Requirements for safe use

Read the following instructions before initial commissioning of the components of the electric drive and control system in order to eliminate the risk of injury and/or property damage. You must follow these safety instructions.

- Bosch Rexroth is not liable for damages resulting from failure to observe the safety instructions.
- Read the operating, maintenance and safety instructions in your language before commissioning. If you find that you cannot completely understand the application documentation in the available language, please ask your supplier to clarify.
- Proper and correct transport, storage, mounting and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of the component.
- Only qualified persons may work with components of the electric drive and control system or within its proximity.
- Only use accessories and spare parts approved by Bosch Rexroth.
- Follow the safety regulations and requirements of the country in which the components of the electric drive and control system are operated.

- Only use the components of the electric drive and control system in the manner that is defined as appropriate. See chapter "Appropriate Use".
- The ambient and operating conditions given in the available application documentation must be observed.
- Applications for functional safety are only allowed if clearly and explicitly specified in the application documentation "Integrated Safety Technology". If this is not the case, they are excluded. Functional safety is a safety concept in which measures of risk reduction for personal safety depend on electrical, electronic or programmable control systems.
- The information given in the application documentation with regard to the use of the delivered components contains only examples of applications and suggestions.

The machine and installation manufacturers must

- make sure that the delivered components are suited for their individual application and check the information given in this application documentation with regard to the use of the components,
- make sure that their individual application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Commissioning of the delivered components is only allowed once it is sure that the machine or installation in which the components are installed complies with the national regulations, safety specifications and standards of the application.
- Operation is only allowed if the national EMC regulations for the application are met.
- The instructions for installation in accordance with EMC requirements can be found in the section on EMC in the respective application documentation.

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

- The technical data, connection and installation conditions of the components are specified in the respective application documentations and must be followed at all times.

*National regulations which the user has to comply with*

- European countries: In accordance with European EN standards
- United States of America (USA):
  - National Electrical Code (NEC)
  - National Electrical Manufacturers Association (NEMA), as well as local engineering regulations
  - Regulations of the National Fire Protection Association (NFPA)
- Canada: Canadian Standards Association (CSA)
- Other countries:
  - International Organization for Standardization (ISO)
  - International Electrotechnical Commission (IEC)

### 3.2.3 Hazards by improper use

- High electrical voltage and high working current! Danger to life or serious injury by electric shock!

- High electrical voltage by incorrect connection! Danger to life or injury by electric shock!
- Dangerous movements! Danger to life, serious injury or property damage by unintended motor movements!
- Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electric drive systems!
- Risk of burns by hot housing surfaces!
- Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!
- Risk of injury by improper handling of batteries!
- Risk of injury by improper handling of pressurized lines!

## 3.3 Instructions with regard to specific dangers

### 3.3.1 Protection against contact with electrical parts and housings



This section concerns components of the electric drive and control system with voltages of **more than 50 volts**.

Contact with parts conducting voltages above 50 volts can cause personal danger and electric shock. When operating components of the electric drive and control system, it is unavoidable that some parts of these components conduct dangerous voltage.

#### **High electrical voltage! Danger to life, risk of injury by electric shock or serious injury!**

- Only qualified persons are allowed to operate, maintain and/or repair the components of the electric drive and control system.
- Follow the general installation and safety regulations when working on power installations.
- Before switching on, the equipment grounding conductor must have been permanently connected to all electric components in accordance with the connection diagram.
- Even for brief measurements or tests, operation is only allowed if the equipment grounding conductor has been permanently connected to the points of the components provided for this purpose.
- Before accessing electrical parts with voltage potentials higher than 50 V, you must disconnect electric components from the mains or from the power supply unit. Secure the electric component from reconnection.
- With electric components, observe the following aspects:  
Always wait **30 minutes** after switching off power to allow live capacitors to discharge before accessing an electric component. Measure the electrical voltage of live parts before beginning to work to make sure that the equipment is safe to touch.
- Install the covers and guards provided for this purpose before switching on.
- Never touch any electrical connection points of the components while power is turned on.



- Do not remove or plug in connectors when the component has been powered.
- Under specific conditions, electric drive systems can be operated at mains protected by residual-current-operated circuit-breakers sensitive to universal current (RCDs/RCMs).
- Secure built-in devices from penetrating foreign objects and water, as well as from direct contact, by providing an external housing, for example a control cabinet.

**High housing voltage and high leakage current! Danger to life, risk of injury by electric shock!**

- Before switching on and before commissioning, ground or connect the components of the electric drive and control system to the equipment grounding conductor at the grounding points.
- Connect the equipment grounding conductor of the components of the electric drive and control system permanently to the main power supply at all times. The leakage current is greater than 3.5 mA.
- Establish an equipment grounding connection with a minimum cross section according to the table below. With an outer conductor cross section smaller than 10 mm<sup>2</sup> (8 AWG), the alternative connection of two equipment grounding conductors is allowed, each having the same cross section as the outer conductors.

Cross section outer conductor	Minimum cross section equipment grounding conductor Leakage current $\geq 3.5$ mA	
	1 equipment grounding conductor	2 equipment grounding conductors
1.5 mm <sup>2</sup> (16 AWG)	10 mm <sup>2</sup> (8 AWG)	2 × 1.5 mm <sup>2</sup> (16 AWG)
2.5 mm <sup>2</sup> (14 AWG)		2 × 2.5 mm <sup>2</sup> (14 AWG)
4 mm <sup>2</sup> (12 AWG)		2 × 4 mm <sup>2</sup> (12 AWG)
6 mm <sup>2</sup> (10 AWG)		2 × 6 mm <sup>2</sup> (10 AWG)
10 mm <sup>2</sup> (8 AWG)		-
16 mm <sup>2</sup> (6 AWG)	16 mm <sup>2</sup> (6 AWG)	-
25 mm <sup>2</sup> (4 AWG)		-
35 mm <sup>2</sup> (2 AWG)		-
50 mm <sup>2</sup> (1/0 AWG)	25 mm <sup>2</sup> (4 AWG)	-
70 mm <sup>2</sup> (2/0 AWG)	35 mm <sup>2</sup> (2 AWG)	-
...	...	...

Tab. 3-1: Minimum cross section of the equipment grounding connection

### 3.3.2 Protective extra-low voltage as protection against electric shock

Protective extra-low voltage is used to allow connecting devices with basic insulation to extra-low voltage circuits.

On components of an electric drive and control system provided by Bosch Rexroth, all connections and terminals with voltages up to 50 volts are PELV

("Protective Extra-Low Voltage") systems. It is allowed to connect devices equipped with basic insulation (such as programming devices, PCs, notebooks, display units) to these connections.

**Danger to life, risk of injury by electric shock! High electrical voltage by incorrect connection!**

If extra-low voltage circuits of devices containing voltages and circuits of more than 50 volts (e.g., the mains connection) are connected to Bosch Rexroth products, the connected extra-low voltage circuits must comply with the requirements for PELV ("Protective Extra-Low Voltage").

### 3.3.3 Protection against dangerous movements

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

- Improper or wrong wiring or cable connection
- Operator errors
- Wrong input of parameters before commissioning
- Malfunction of sensors and encoders
- Defective components
- Software or firmware errors

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

The monitoring functions in the components of the electric drive and control system will normally be sufficient to avoid malfunction in the connected drives. Regarding personal safety, especially the danger of injury and/or property 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, serious injury or property damage!**

A **risk assessment** must be prepared for the installation or machine, with its specific conditions, in which the components of the electric drive and control system are installed.

As a result of the risk assessment, the user must provide for monitoring functions and higher-level measures on the installation side for personal safety. The safety regulations applicable to the installation or machine must be taken into consideration. Unintended machine movements or other malfunctions are possible if safety devices are disabled, bypassed or not activated.

**To avoid accidents, injury and/or property damage:**

- Keep free and clear of the machine's range of motion and moving machine parts. Prevent personnel from accidentally entering the machine's range of motion by using, for example:
  - Safety fences
  - Safety guards
  - Protective coverings
  - Light barriers

- Make sure the safety fences and protective coverings are strong enough to resist maximum possible kinetic energy.
- Mount emergency stopping switches in the immediate reach of the operator. Before commissioning, verify that the emergency stopping equipment works. Do not operate the machine if the emergency stopping switch is not working.
- Prevent unintended start-up. Isolate the drive power connection by means of OFF switches/OFF buttons or use a safe starting lockout.
- Make sure that the drives are brought to safe standstill before accessing or entering the danger zone.
- Additionally 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 or
  - ensuring sufficient counterbalancing of the vertical axes.
- The standard equipment **motor holding brake** or an external holding brake controlled by the drive controller is **not sufficient to guarantee personal safety!**
- Disconnect electrical power to the components of the electric drive and control system using the master switch and secure them from reconnection ("lock out") 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 components of the electric drive and control system and their supply leads. If the use of these devices cannot be avoided, check the machine or installation, at initial commissioning of the electric drive and control system, for possible malfunctions when operating such high-frequency, remote control and radio equipment in its possible positions of normal use. It might possibly be necessary to perform a special electromagnetic compatibility (EMC) test.

### 3.3.4 Protection against electromagnetic and magnetic fields during operation and mounting

#### Electromagnetic and magnetic fields!

**Health hazard for persons with active implantable medical devices (AIMD) such as pacemakers or passive metallic implants.**

- Hazards for the above-mentioned groups of persons by electromagnetic and magnetic fields in the immediate vicinity of drive controllers and the associated current-carrying conductors.
- Entering these areas can pose an increased risk to the above-mentioned groups of persons. They should seek advice from their physician.
- If overcome by possible effects on above-mentioned persons during operation of drive controllers and accessories, remove the exposed persons from the vicinity of conductors and devices.

### 3.3.5 Protection against contact with hot parts

**Hot surfaces of components of the electric drive and control system. Risk of burns!**

- Do not touch hot surfaces of, for example, braking resistors, heat sinks, supply units and drive controllers, motors, windings and laminated cores!
- According to the operating conditions, temperatures of the surfaces can be **higher than 60 °C (140 °F)** during or after operation.
- Before touching motors after having switched them off, let them cool down for a sufficient period of time. Cooling down can require **up to 140 minutes!** The time required for cooling down is approximately five times the thermal time constant specified in the technical data.
- After switching chokes, supply units and drive controllers off, wait **15 minutes** to allow them to cool down before touching them.
- Wear safety gloves or do not work at hot surfaces.
- For certain applications, and in accordance with the respective safety regulations, the manufacturer of the machine or installation must take measures to avoid injuries caused by burns in the final application. These measures can be, for example: Warnings at the machine or installation, guards (shieldings or barriers) or safety instructions in the application documentation.

### 3.3.6 Protection during handling and mounting

**Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!**

- Observe the relevant statutory regulations of accident prevention.
- Use suitable equipment for mounting and transport.
- Avoid jamming and crushing by appropriate measures.
- Always use suitable tools. Use special tools if specified.
- Use lifting equipment and tools in the correct manner.
- Use suitable protective equipment (hard hat, safety goggles, safety shoes, safety gloves, for example).
- Do not stand under hanging loads.
- Immediately clean up any spilled liquids from the floor due to the risk of falling!

### 3.3.7 Battery safety

Batteries consist of active chemicals in a solid housing. Therefore, improper handling can cause injury or property damage.

**Risk of injury by improper handling!**

- Do not attempt to reactivate low batteries by heating or other methods (risk of explosion and cauterization).
- Do not attempt to recharge the batteries as this may cause leakage or explosion.
- Do not throw batteries into open flames.
- Do not dismantle batteries.

- When replacing the battery/batteries, do not damage the electrical parts installed in the devices.
- Only use the battery types specified for the product.



Environmental protection and disposal! The batteries contained in the product are considered dangerous goods during land, air, and sea transport (risk of explosion) in the sense of the legal regulations. Dispose of used batteries separately from other waste. Observe the national regulations of your country.

---

### 3.3.8 Protection against pressurized systems

According to the information given in the Project Planning Manuals, motors and components cooled with liquids and compressed air can be partially supplied with externally fed, pressurized media, such as compressed air, hydraulics oil, cooling liquids and cooling lubricants. Improper handling of the connected supply systems, supply lines or connections can cause injuries or property damage.

#### **Risk of injury by improper handling of pressurized lines!**

- Do not attempt to disconnect, open or cut pressurized lines (risk of explosion).
- Observe the respective manufacturer's operating instructions.
- Before dismounting lines, relieve pressure and empty medium.
- Use suitable protective equipment (safety goggles, safety shoes, safety gloves, for example).
- Immediately clean up any spilled liquids from the floor due to the risk of falling!



Environmental protection and disposal! The agents (e.g., fluids) used to operate the product might not be environmentally friendly. Dispose of agents harmful to the environment separately from other waste. Observe the national regulations of your country.

---

## 3.4 Explanation of signal words and the Safety alert symbol

The Safety Instructions in the available application documentation contain specific signal words (DANGER, WARNING, CAUTION or NOTICE) and, where required, a safety alert symbol (in accordance with ANSI Z535.6-2011).

The signal word is meant to draw the reader's attention to the safety instruction and identifies the hazard severity.

The safety alert symbol (a triangle with an exclamation point), which precedes the signal words DANGER, WARNING and CAUTION, is used to alert the reader to personal injury hazards.

---

### **DANGER**

In case of non-compliance with this safety instruction, death or serious injury **will** occur.

---

### **WARNING**

In case of non-compliance with this safety instruction, death or serious injury **could** occur.

---

### **CAUTION**

In case of non-compliance with this safety instruction, minor or moderate injury could occur.

---

### **NOTICE**

In case of non-compliance with this safety instruction, property damage could occur.

---

## 4 Dimensioning and selection

### 4.1 Dimensioning

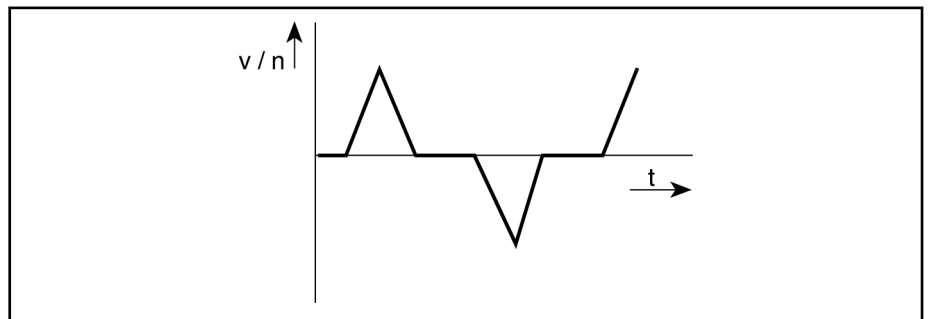
Applications for GTM planetary gearboxes are characterized by the following curves.

- Triangular speed curve with pause interval
- Operation with constant speed and pause interval
- Operation with trapezoidal speed curve and pause interval
- Continuous operation without pause interval (S1)

The speed-time curves define the dimension criteria.

#### Triangular operation with pause interval

This operating mode is characteristic for all highly-dynamic feeds. These are often found in roll-feed mechanisms in the sheet-metal, paper, plastic and packaging industries.



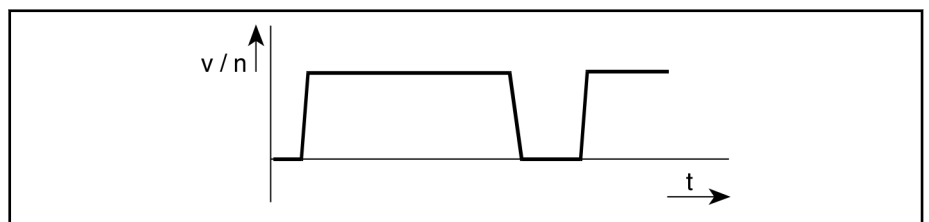
$v/n$  Feed rate / speed  
 $t$  Time

Fig. 4-1: Speed-time curve for triangle operation

The dimensioning of this operating mode is mainly made according to the necessary maximum torque  $M_{\max}$  and the effective torque  $M_{\text{eff}}$ .

#### Continuous operation with pause interval

This operation is characteristic for all highly-dynamic feeds. These are often found in winding machines, drive rolls and in portioning devices in the sheet-metal, paper, plastic and packaging industry.



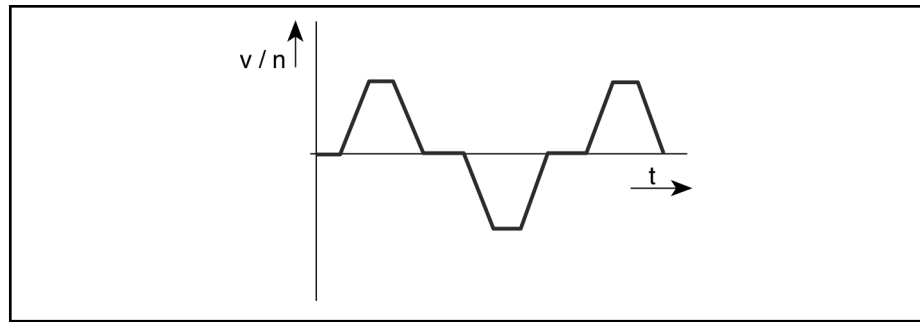
$v/n$  Feed rate / speed  
 $t$  Time

Fig. 4-2: Speed-time diagram for operation with constant speed

The dimensioning of this operation is mainly made according to the necessary continuous torque  $M_{dN}$  and the average velocity  $V_{\text{average}}$  resp. mean speed  $n_{\text{average}}$ .

#### Triangular operation with pause interval

This mode of operation is characteristic for the most highly-dynamic feeds. They can be found in loaders and handling systems in nearly all industry sectors.



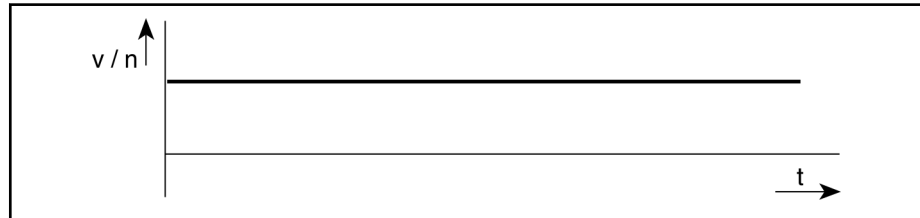
$v/n$  Feed rate / speed  
 $t$  Time

Fig. 4-3: Speed-time-graph for triangle operation

The dimensioning of this operational mode is mainly made according to the necessary maximum torque  $M_{\max}$  in the acceleration phase, the effective torque  $M_{\text{eff}}$  over the total cycle-time and the average velocity  $v_{\text{average}}$  or the mean speed  $n_{\text{average}}$ .

#### Continuous operation without pause interval (S1)

This mode of operation is characteristic for drives in printing machines.



$v/n$  Feed rate / speed  
 $t$  Time

Fig. 4-4: Speed-time graph for constant speed

The dimensioning is made according to the necessary continuous torque  $M_{\text{dN}}$  and the velocity  $v$  or the speed  $n$ .

## 4.2 Selection

### Drive-determined sizes

The selection of the suitable motor/-gearbox combination, operating with a drive control device, is to be taking in the following into consideration:

- Frictional torque
- Starting torque
- Processing torque
- Accelerating torque
- Effective torque
- Necessary speed
- Duty cycle

### Dimensioning criteria

The motor-gearbox combination must fulfill the following conditions:

- The necessary speed must be reached.
- The continuous torque rating of the motor-gearbox combination has to be higher than the effective load torque.
- The intermittent torque has to be higher than the sum of the frictional, starting and processing torque.
- The maximum torque has to be higher than the sum of frictional, weight and processing torque.



- The required acceleration time has to be within the limit of the relevant drive selection lists.
- The ON time of the GTM planetary gearboxes has to be smaller than 60% of the specified technical data in S4 and S5-operation.
- The cycles of the operation modes S4 and S5 should not exceed 1,000 cycles per hour. If higher cycle rates than 1,000 cycles per hour are necessary, the GTM gearbox must be derated accordingly (see 5-3)



Ensure that

- the maximum motor torque is smaller than the maximum gearbox input torque.
- the maximum motor speed is smaller than the maximum permissible gearbox-input speed.

#### Dimensioning motor-gearbox combinations

Due to the self-heating of the gearboxes depending on the speed, the cooling effect in the flange mounting area is limited. A speed-dependent reduction of the specified performance data is necessary, to do not overload motors when using gearboxes.



The standard value of reduction of the **S1 60K characteristic curve** in gearbox mounting is **20 - 30 %**. In case of thermally critical applications (e.g. flange temperatures > 80 °C), Bosch Rexroth recommends to check the temperature load at the gearbox and the motor.

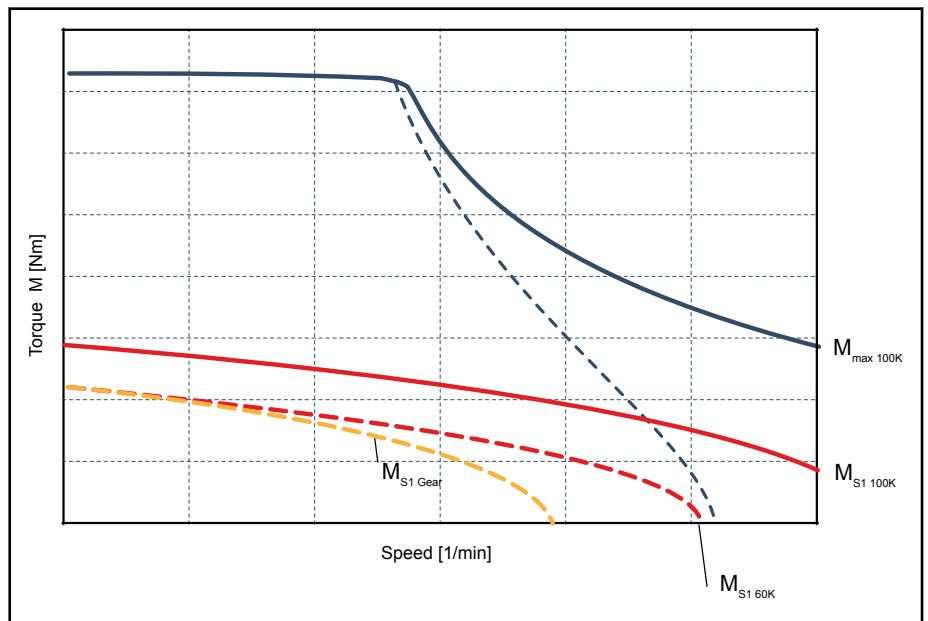


Fig. 4-5: S1 characteristic curve in gearbox

Calculate the characteristic curves for your application by using the sizing tool IndraSize: [www.boschrexroth.com/.../IndraSize](http://www.boschrexroth.com/.../IndraSize)

By using the IndraSize software, drive controllers, motors and mechanic gearboxes can be easily sized. The engineering tool covers the entire range of Rexroth drives and motors.



## 5 Application notes

### 5.1 Operating conditions

#### 5.1.1 General

##### Ambient temperature and installation altitude

The specified technical data of gearboxes (see chapter ) are based on

- Ambient temperature + 20 °C
- Installation altitude 0 ... 1000 m above sea level



In the case of different conditions (higher ambient temperature and/or higher installation altitude), the performance data are limited and a derating according to the selected motor-gearbox combinations must be observed. Please also observe the guidelines in this documentation.

##### Degree of protection

---

The protection class of the motor (IP54 to IP65) and gearboxes (IP65) is designed in accordance with DIN EN 60529 (VDE 0470-1):2014-09. Please note, however, that the degree of protection of a motor/gearbox combination depends on the motor version selected, e.g. motor with or without shaft seal. For a motor/gearbox combination, the lowest protection class of a component in this overall system therefore always applies. Observe the motor-specific notes on the degree of protection in the respective motor project planning.

### 5.1.2 Operating mode S5 (Intermittent operation)

Planetary gearboxes of series GTM are suitable for the operating mode S5 (intermittent operation with braking) according to EN 60034-1:2015-02. The operation time should herewith not surpass 60%.

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

Fig. 5-1: Operation time for intermittent operation

A procedure during intermittent duty, which consists of an acceleration and a braking, is defined as a cycle.

The specified data of the gearboxes in the chapter "Technical data" are valid up to 1,000 cycles per hour.

Are more than 1,000 cycles per hour during operation of the gearbox necessary, the technical data have to be reduced by a factor (see 5-3).

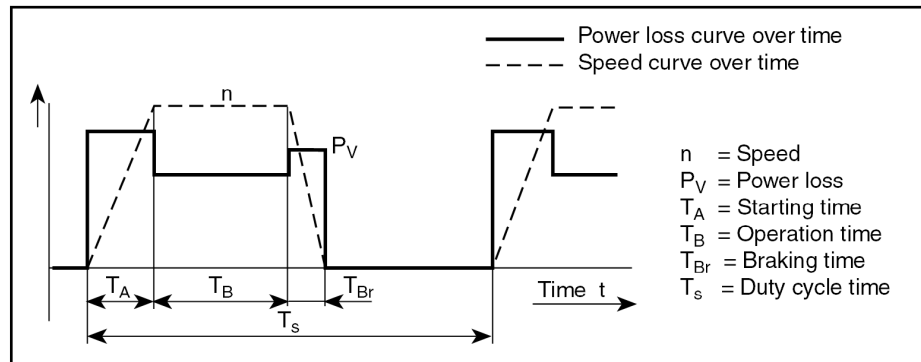


Fig. 5-2: Operating mode S5 (intermittent duty with electrical braking)

#### Reduction at higher cycles

Are higher cycles than 1,000 cycles per hour needed, the following reduced technical data, regarding torque and power are valid.

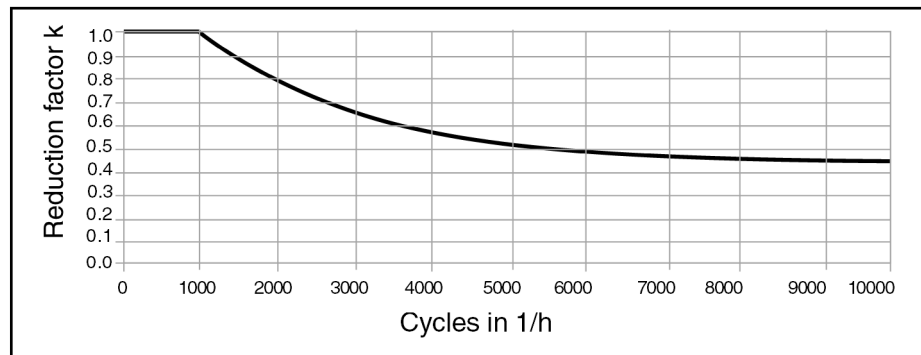


Fig. 5-3: Reduction factor at higher cycles

### 5.1.3 Operating mode S1 (Continuous operation)

Planetary gearboxes GTM are suited for the operating mode S1 according to EN 60034-1:2015-02.

## 5.2 Operating gearboxes or motor/gearbox combinations in hazardous areas (ATEX)



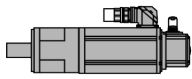
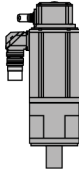
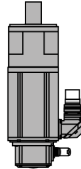
Bosch Rexroth has no ATEX standard gearboxes in its product range.

Selecting ATEX gearboxes and the attachment of such gearboxes to Rexroth motors is in the sole responsibility of the machine manufacturer. The user is also responsible for compliance with applicable regulations for use in potentially explosive atmospheres.

## 5.3 Mechanical features

Type of construction, installation position

Rexroth planetary gearboxes GTM are manufactured in the type of construction B05 for flange mounting. The installation positions can be done as described in the following table according to EN 60034-7:2001-12 .

Gearbox - Type of construction	Allowed installation positions	Important installation note for vertical mounting positions IM V3
B05	  	When installing IM V3 (vertically, output shaft upwards) dam of liquid on the drive shaft has to be avoided, as liquid can penetrate into the gearbox over a longer period of time.

Tab. 5-1: Allowed installation positions

Output shaft

The output shaft of the planetary gearboxes is available in the following variants:

- **Smooth output shaft (standard)**

For a plain non-positive shaft-hub connection.

Therewith, a higher smooth running and a free of clearance connection between shaft and hub.



We recommend to use output shafts with non-positive shaft-hub connections.

or

- **Output shaft with keyway acc. to DIN 6885-1:1968-08**

For a form-fitting shaft-hub connection.

This connection mode is suitable for absorption of direction-constant speed at low demand. It makes an additional axial safety of the hub necessary. Therefore, the frontal of the gearbox output shaft is provided with a centering hole with a thread (see dimension sheet).

Shaft load

**To check the shaft load, the axial and radial shaft load have to be checked separately:**

The **radial shaft load** radial shaft load with subject to

- the point of application of force and
- mean speed

refer to the diagram in [Chapter Permitted shaft load](#). For the rated bearing lifetime were 30,000 operation hours taken as basis (bearing calculation according to DIN ISO 281:1993-01).

The **axial shaft load** is also described in [Chapter Permitted shaft load](#)

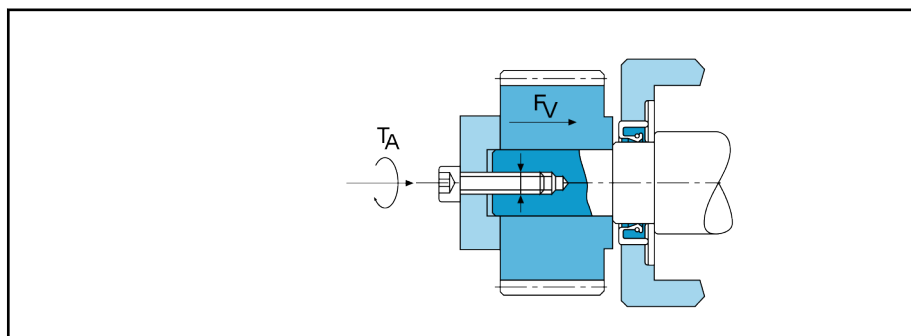
#### Assembly of output elements

The output shaft of the GTM-gearboxes is fitted with a massive shaft shoulder, which is well-suited for the support of axial forces, especially at key connections.

The according tightening torque ( $T_A$ ), resp. preliminary-tension forces ( $F_V$ ), for mounting the output unit have to be taken from the following table.

Size (one-stage & two-stage)						
	GTM060	GTM075	GTM100	GTM140	GTM180	GTM240
Thread	M5	M8	M12	M16	M20	M20
$T_A$ [Nm]	5.5	23	79	195	390	390
$F_V$ [kN]	6.5	17	40	75	120	120

Tab. 5-2: Tightening torque and preload at mounting the drive units



$T_A$  Tightening torque  
 $F_V$  Preload

Fig. 5-4: Output shaft

## 5.4 Combination possibilities of GTM planetary gearboxes with motors

The following table shows the combination possibilities of GTM planetary gearboxes with motors.



For more information about ATEX directive and combining a GTM planetary gearbox with an explosion-proof motor acc. to ATEX standard, please contact your responsible sales office [Chapter Operating gearboxes or motor/gearbox combinations in hazardous areas \(ATEX\)](#).

Gearboxes	Motor type				
	MS2N	MSK	KSM	MAD	MAF
GTM060	MS2N03-B	MSK030	KSM041		
	MS2N03-D	MSK040			
GTM075	MS2N04-x	MSK043	KSM041 KSM061		
	MS2N03-D	MSK040			
GTM100	MS2N05-x	MSK043C	KSM041 KSM061 KSM071 KSM076	- / -	- / -
	MS2N06-x	MSK050			
GTM140	MS2N07-x	MSK060	KSM061 KSM071 KSM076	MAD100	
	MS2N04-x	MSK061			
GTM180	MS2N05-x	MSK070	KSM071	MAD100 MAD130	MAF100 MAF130
	MS2N06-x	MSK071			
GTM240	MS2N07-x	MSK075	- / -	MAD130 MAD160	MAF130
	MS2N10-x	MSK100			
		MSK101			
		MSK103			
		MSK131			
		MSK133			

Tab. 5-3: Motor/gearbox combinations with GTM planetary gearboxes



To mount the GTM planetary gearboxes on the motors, the motors must have a smooth drive shaft.





## 6 Technical data

### 6.1 Technical data for intermittent and continuous operation

#### 6.1.1 Ratio-dependend data

Designation	Symbol		Transmission ratio	GTM					
				060	075	100	140	180	240
Max. input speed [min <sup>-1</sup> ]	n <sub>in, max</sub>	one-stage	i = 3	x	x	4000	3200	2500	2000
			i = 4	5000	5000	4000	3200	2500	2000
			i = 5	6300	6300	5000	4000	3200	2500
			i = 7	8000	8000	6300	5000	4000	3000
			i = 10	10000	10000	8000	6300	5000	3500
		two-stage	i = 20	6300	6300	5000	4000	3200	x
			i = 50	10000	10000	8000	6300	5000	x
Max. input torque [Nm <sup>1</sup> ]	M <sub>in, max</sub>	one-stage	i = 3	x	x	73.3	186.7	480	1000
			i = 4	12.5	42.5	85	210	510	1250
			i = 5	10	40	80	200	480	1200
			i = 7	7.1	24.3	48.6	120	291.4	714.3
			i = 10	4	11	22	56	144	300
		two-stage	i = 20	2.5	8.5	17	42	102	x
			i = 50	1	4	8	20	48	x
Max. output speed [min <sup>-1</sup> ]	n <sub>out, max</sub>	one-stage	i = 3	x	x	1333	1067	833	667
			i = 4	1250	1250	1000	800	625	500
			i = 5	1260	1260	1000	800	640	500
			i = 7	1143	1143	900	714	571	429
			i = 10	1000	1000	800	630	500	350
		two-stage	i = 20	315	315	250	200	160	x
			i = 50	200	200	160	126	100	x
Max. output torque [Nm] <sup>1)</sup>	M <sub>out, max</sub>	one-stage	i = 3	x	x	220	560	1440	3000
			i = 4	50	170	340	840	2040	5000
			i = 5	50	200	400	1000	2400	6000
			i = 7	50	170	340	840	2040	5000
			i = 10	40	110	220	560	1440	3000
		two-stage	i = 20	50	170	340	840	2040	x
			i = 50	50	200	400	1000	2400	x
For more technical data - see next page									
1) at max. 1.000 cycles/h									

## Technical data

Designation	Symbol		Transmission ratio	GTM					
				060	075	100	140	180	240
Rated input speed [min <sup>-1</sup> ]	$n_{in, nenn}$	one-stage	i = 3	x	x	2300	1800	1,300	800
			i = 4	3000	3000	2500	2000	1500	1000
			i = 5	4000	4000	3000	2500	2000	1200
			i = 7	5000	5000	4000	3000	2500	1500
			i = 10	6000	6000	5000	4000	3000	2000
		two-stage	i = 20	4000	4000	3000	2500	2000	x
			i = 50	6000	6000	5000	4000	3000	x
Nominal initial torque [Nm]	$M_{in, nenn}$	one-stage	i = 3	x	x	40	93.3	240	600
			i = 4	6.25	21.3	42.5	105	255	625
			i = 5	5	20	40	100	240	600
			i = 7	3.6	12.1	24.3	60	145.7	357.1
			i = 10	2	6	12	28	72	180
		two-stage	i = 20	1.25	4.25	8.5	21	51	x
			i = 50	0.5	2	4	10	24	x
Nominal output torque [Nm]	$M_{out, nenn}$	one-stage	i = 3	x	x	120	280	720	1800
			i = 4	25	85	170	420	1020	2500
			i = 5	25	100	200	500	1200	3000
			i = 7	25	85	170	420	1020	2500
			i = 10	20	60	120	280	720	1800
		two-stage	i = 20	25	85	170	420	1020	x
			i = 50	25	100	200	500	1200	x
Mass moment of inertia [kg cm <sup>2</sup> ] <sup>2)</sup>	J	one-stage	i = 3	x	x	2.8	8.2	36	128
			i = 4	0.16	0.55	2	6.75	24.5	97.6
			i = 5	0.16	0.47	1.64	5.54	18.8	76.4
			i = 7	0.15	0.41	1.36	4.59	14.5	59.9
			i = 10	0.14	0.38	1.22	4.1	12.3	51.1
		two-stage	i = 20	0.12	0.47	1.56	5.29	6.95	x
			i = 50	0.1	0.47	1.44	4.96	5.45	x

<sup>2)</sup> Moment of inertia of the gearbox referred to the input of the gearbox

Tab. 6-1: Ratio-dependent data

## 6.1.2 General data

Designation	Symbol	Unit		GTM					
				060	075	100	140	180	240
Backlash <sup>3)</sup>	$\Delta\phi$	arcmin	one-stage	≤ 6 (≤ 3)	≤ 6 (≤ 3)	≤ 4 (≤ 2)	≤ 4 (≤ 2)	≤ 4 (≤ 2)	≤ 4 (≤ 2)
			two-stage	≤ 8 (≤ 6)	≤ 8 (≤ 6)	≤ 6 (≤ 4)	≤ 6 (≤ 4)	≤ 6 (≤ 4)	x
Torsional strength <sup>4)</sup>	D	Nm/arcmin	one-stage	3.5	8.2	24	48	148	340
			two-stage						x
Efficiency	$\eta$	%	one-stage	≥ 97					
			two-stage	≥ 94					
Lifetime	$L_h$	h	one-stage	> 20.000					
			two-stage						
Lubrication			one-stage	Filled for life, closed system					
			two-stage						
Admissible gearbox housing temperature	$T_G$	°C	one-stage	-10 ... +90					
			two-stage						
Noise level <sup>5)</sup>	$L_p$	dB (A)	one-stage	≤ 63	≤ 68	≤ 68	≤ 72	≤ 72	≤ 72
			two-stage						x
Degree of protection			one-stage	IP 65					
			two-stage						
Weight	m	kg	one-stage	1.6	2.9	5.7	11.5	27	62
			two-stage	2.2	3.8	7.5	15	35	x

<sup>3)</sup> with regard to the gearbox output at 3% nominal output torque of the gearbox and locked gearbox input side  
<sup>4)</sup> torsional rigidity of the gearbox with regard to the gearbox output side at locked gearbox input side  
<sup>5)</sup> at 3.000 [1/min]

Tab. 6-2: General data

## 6.2 Limiting temperature curves to determine higher S1-speed

Special applications (e.g. printing sector) require higher S1-speed than given in the technical data. The GTM gearboxes fulfill these requirements at an accordingly reduced output torque individually for every gearbox size and ratio. The following limiting temperature curves are the basis. They are on trial determined thermal limiting characteristic curves which illustrate the possible operating points (S1-input speed/S1-output torque) at maximum thermal load of the gearbox (temperature increase 70K at 20°C environmental temperature) and unhindered air circulation.

### ⚠ CAUTION

Overload of the gearbox due to exceeding the permitted gearbox housing temperature of 90°C.

⇒ During operation of motor/gearbox combinations in the selected operating point, please make sure that the permitted gearbox housing temperature of 90°C is not exceeded to avoid a gearbox overload.

⇒ Depending from the gearbox or motor type, more or less heat is induced from the motor into the gearbox. For thermal inappropriate mounting it is recommended to check the permitted gearbox housing temperature after reaching the thermal steady-state.

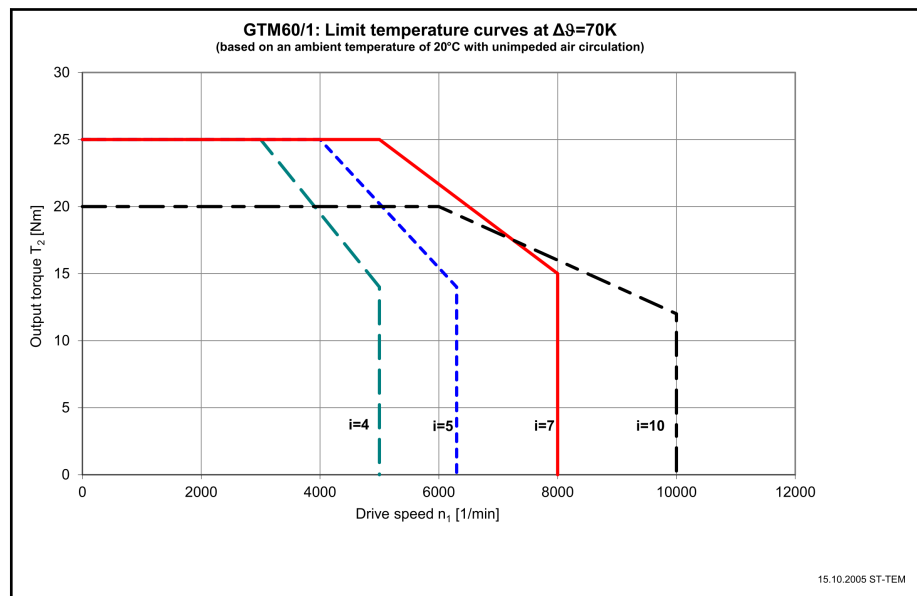


Fig. 6-1: GTM060/1 Limiting temperature curve

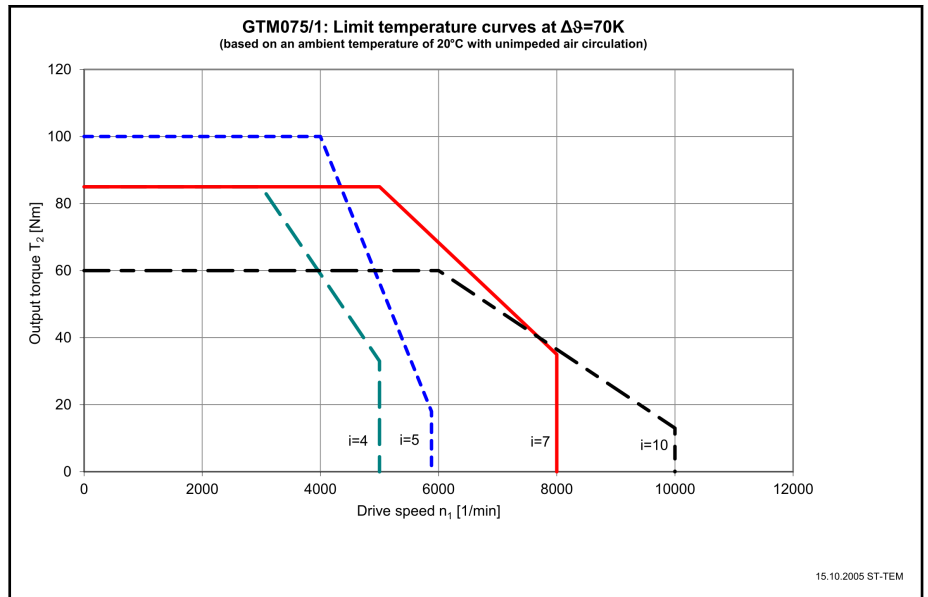


Fig. 6-2: GTM075/1 Limiting temperature curve

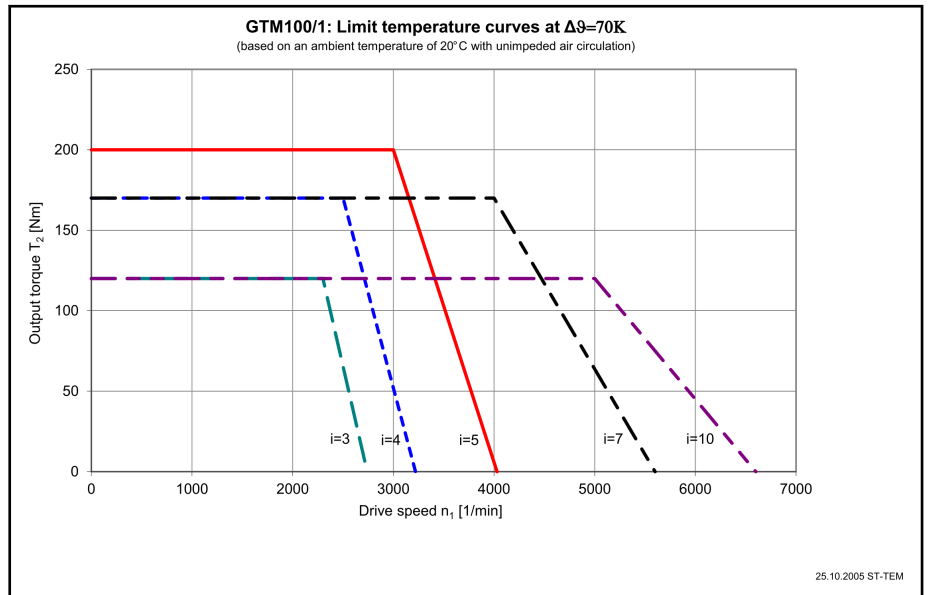


Fig. 6-3: GTM100/1 Limiting temperature curve

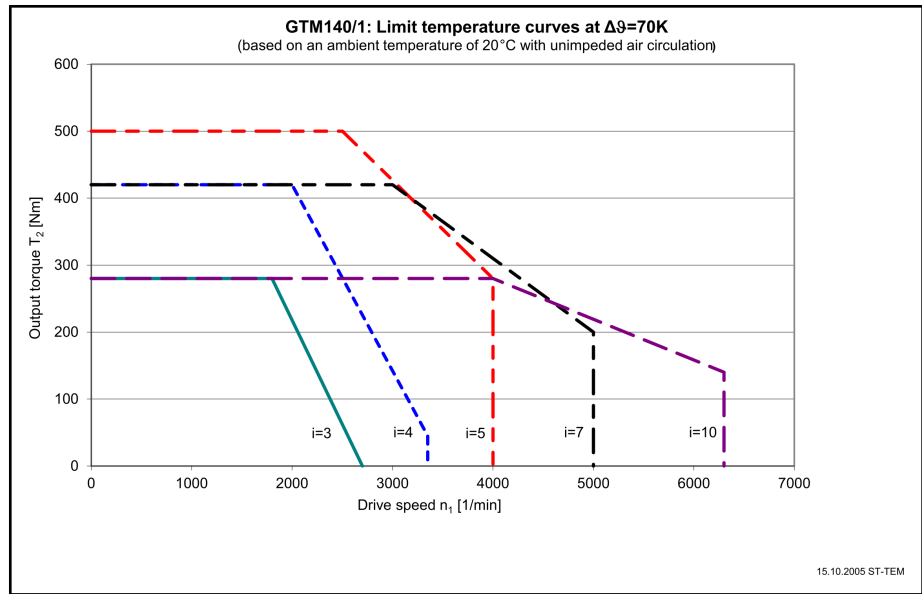


Fig. 6-4: GTM140/1 Limiting temperature curve

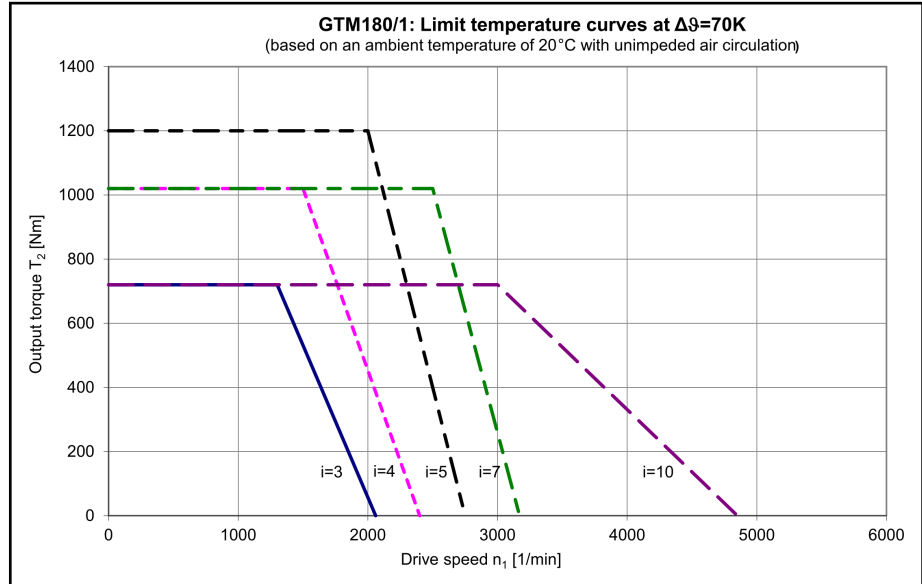


Fig. 6-5: GTM180/1 Limiting temperature curve

### 6.3 Technical data for increased lifetime

The technical data specified in [chapter 6.1](#) are based on a calculated gearbox lifetime of  $L_h = 20,000$  hours.

For applications in which a service life longer than 20000 h is required from the GTM gearboxes, the technical data regarding torque and speed must be reduced by means of the following diagram:

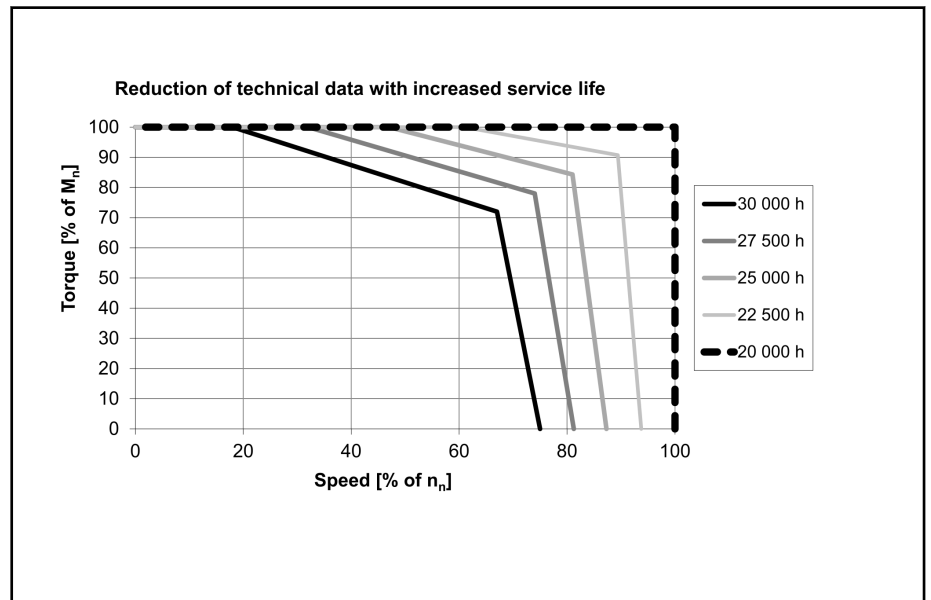
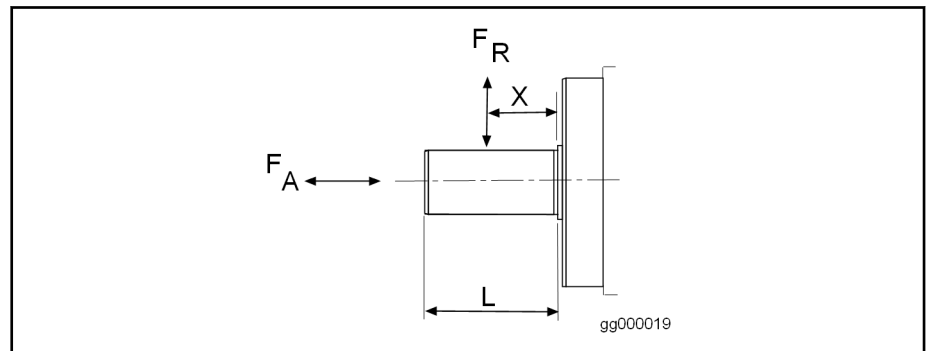


Fig. 6-6: Reduction of the technical data for increased lifetime

### 6.4 Permitted shaft load

#### 6.4.1 General



- $F_A$  Permittable axial force
- $F_R$  Permittable radial force
- $X$  Distance between shaft shoulder on the output shaft and point of application of the radial force
- $n_{2m}$  Middle output speed (over the cycle averaged arithmetic average value)

Fig. 6-7: Permittable shaft load GTM

$$n_{2m} = \frac{n_{2a} \cdot t_a + n_{2b} \cdot t_b + \dots + n_{2n} \cdot t_n}{t_a + t_b + \dots + t_n}$$

**Basis of design:** 30,000 operation hours as nominal bearing lifetime  $L_{10h}$

For radial forces  $F_{Rref}$ , which lie over the value of the diagram, decreases the nominal bearing lifetime as follows:

$$L_{10k} = 30000 \cdot \left( \frac{F_R}{F_{Rref}} \right)^3$$

$F_R$                    permissible radial force  
 $F_{Rref}$                 necessary radial force  
 Fig. 6-8:             Bearing service life  $L_{10h}$

**Permitted axial force**  $F_A < 0.4 \cdot F_R$ ;  $F_A$ : permitted axial force;  $F_R$ : permitted radial force  
 Do occur higher axial forces, the bearing lifetime for this use has to be calculated individually.

### 6.4.2 GTM060

Permitted radial force  $F_R$ :

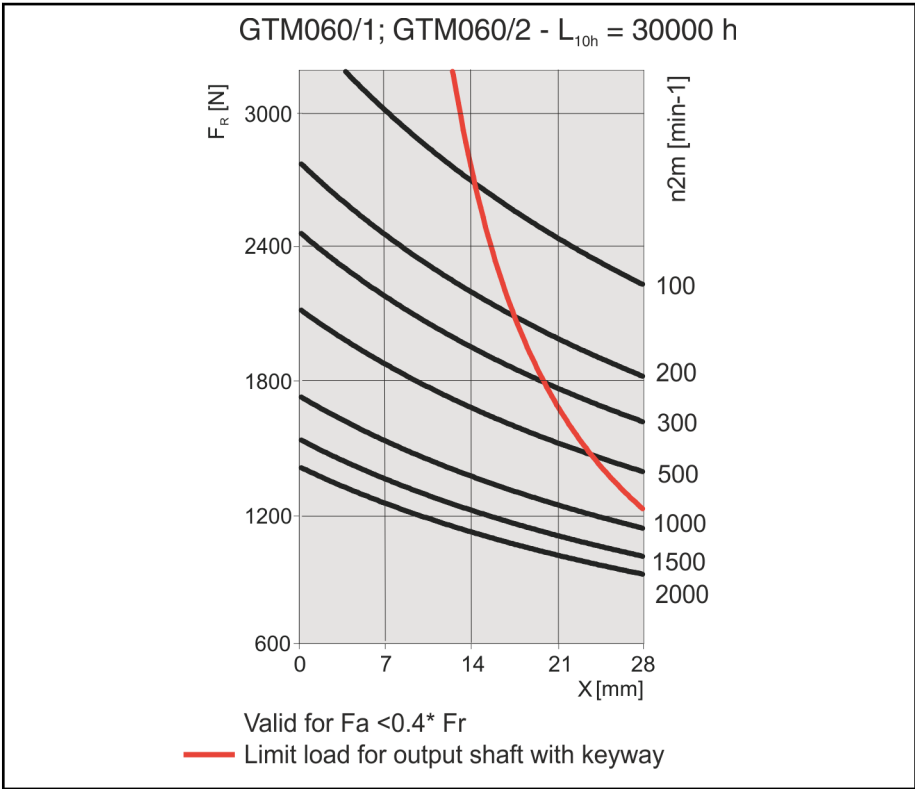


Fig. 6-9: Permitted radial force  $F_R$  GTM060



### 6.4.3 GTM075

Permitted radial force  $F_R$ :

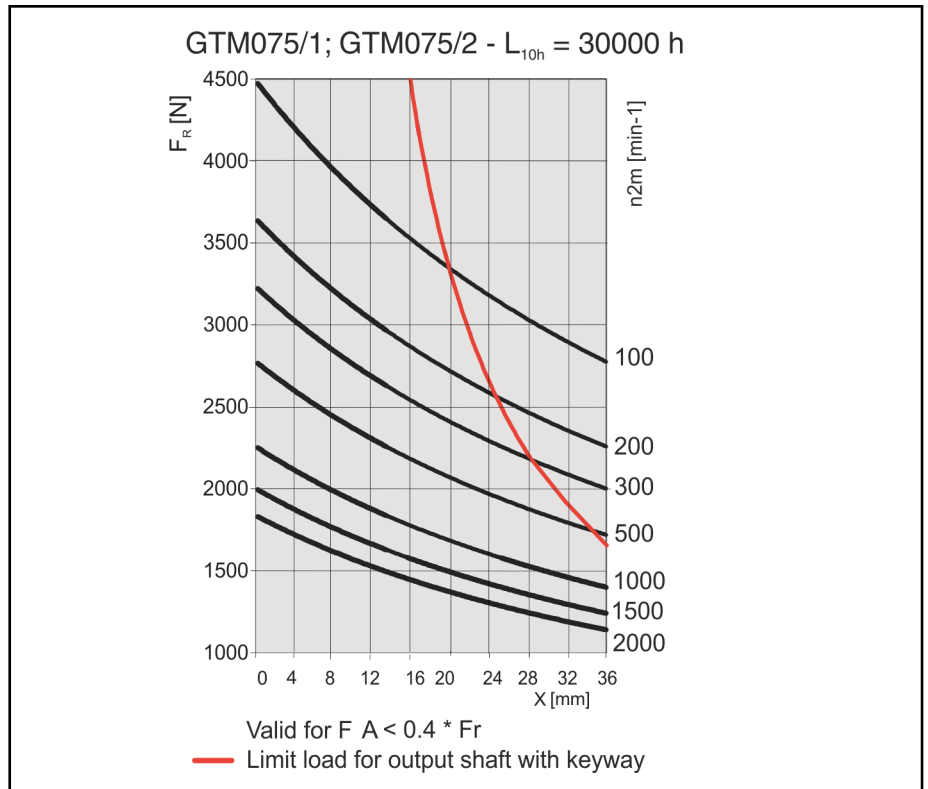


Fig. 6-10: Permitted radial force  $F_R$  GTM075

### 6.4.4 GTM100

Permitted radial force  $F_R$ :

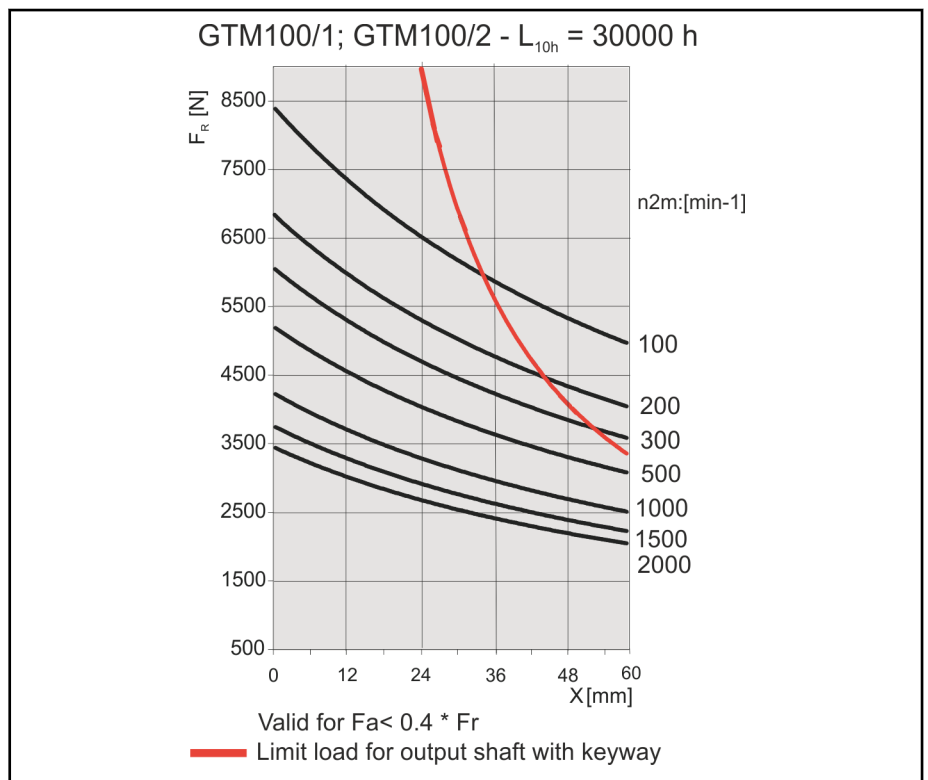


Fig. 6-11: Permitted radial force  $F_R$  GTM100

### 6.4.5 GTM140

Permitted radial force  $F_R$ :

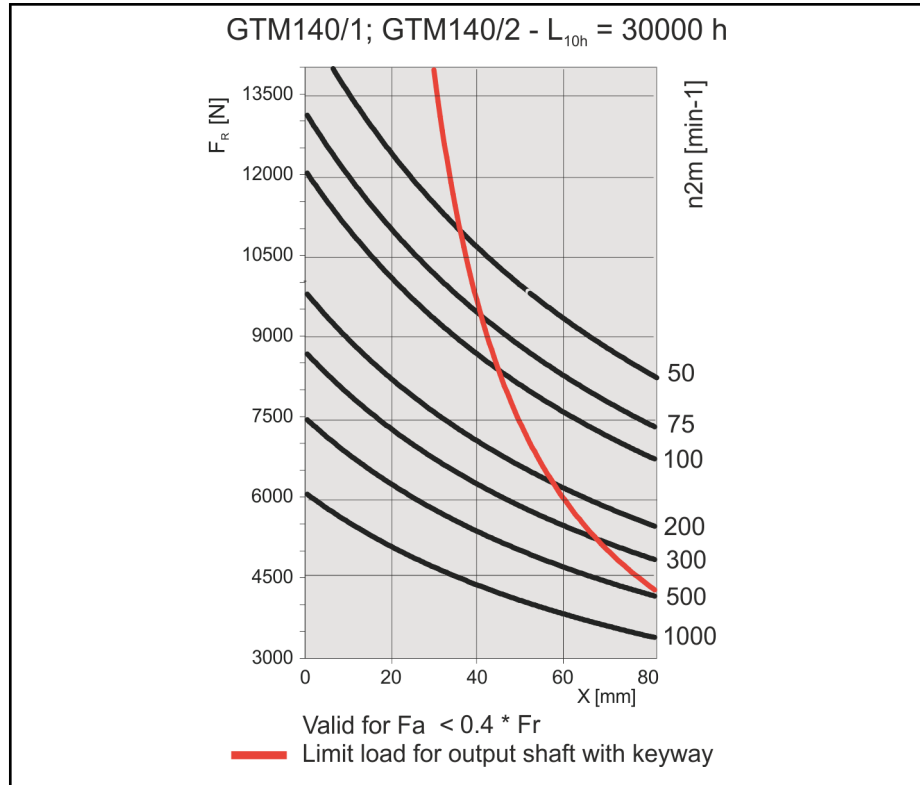


Fig. 6-12: Permitted radial force  $F_R$  GTM140

### 6.4.6 GTM180

Permitted radial force  $F_R$ :

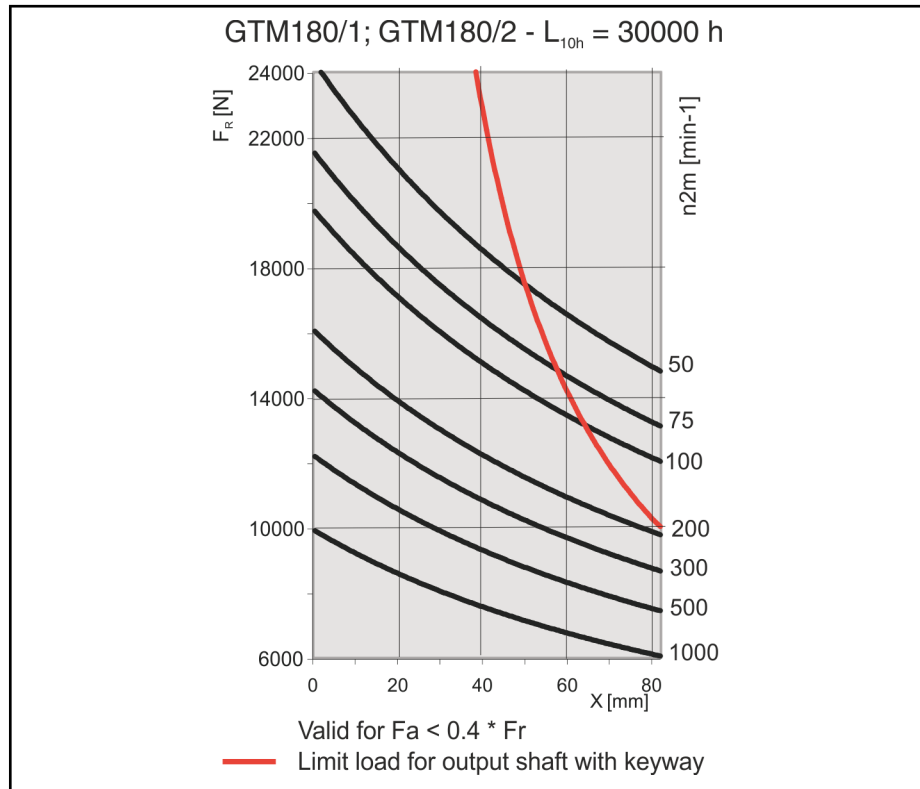


Fig. 6-13: Permitted radial force  $F_R$  GTM180

## 6.4.7 GTM240

Permitted radial force  $F_R$ :

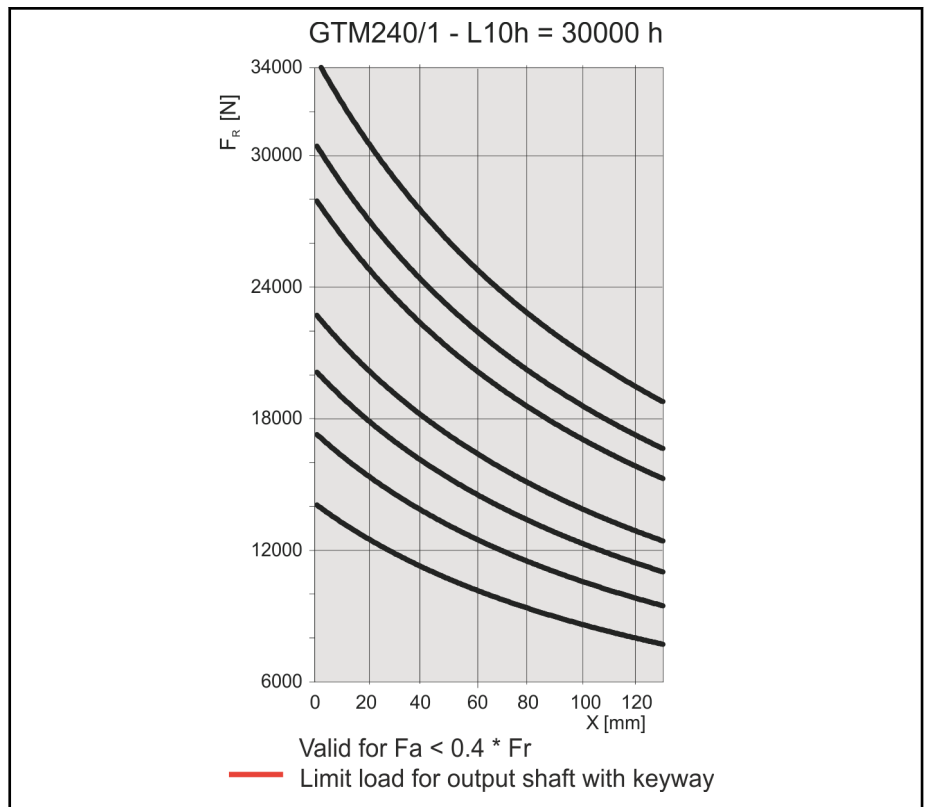


Fig. 6-14: Permitted radial force  $F_R$  GTM240



# 7 Specifications

## 7.1 GTM060

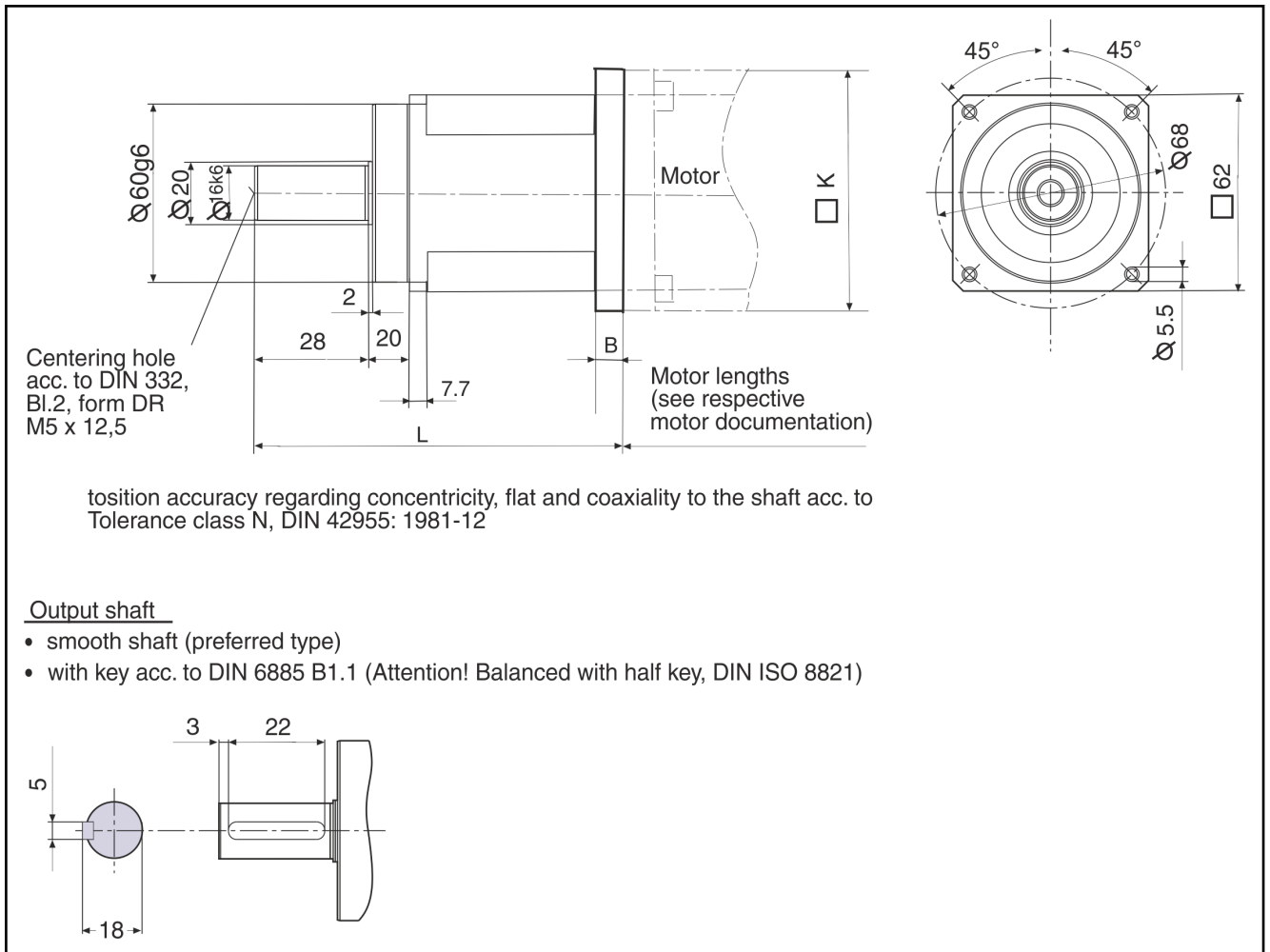


Fig. 7-1: Dimensional details GTM060, single and two-stage

Flanged motor type	One-stage		Two-stage		□ K <sup>1)</sup>
	L	B	L	B	
	[mm]	[mm]	[mm]	[mm]	[mm]
MS2N03-B	130	19	153	19	62
MS2N03-D					62
MS2N04-x					82
MSK030					62
MSK040					82
MSK043					82
KSM041					82

<sup>1)</sup> biggest flange size

Tab. 7-1: Dimensional details GTM060, single and two-stage

## 7.2 GTM075

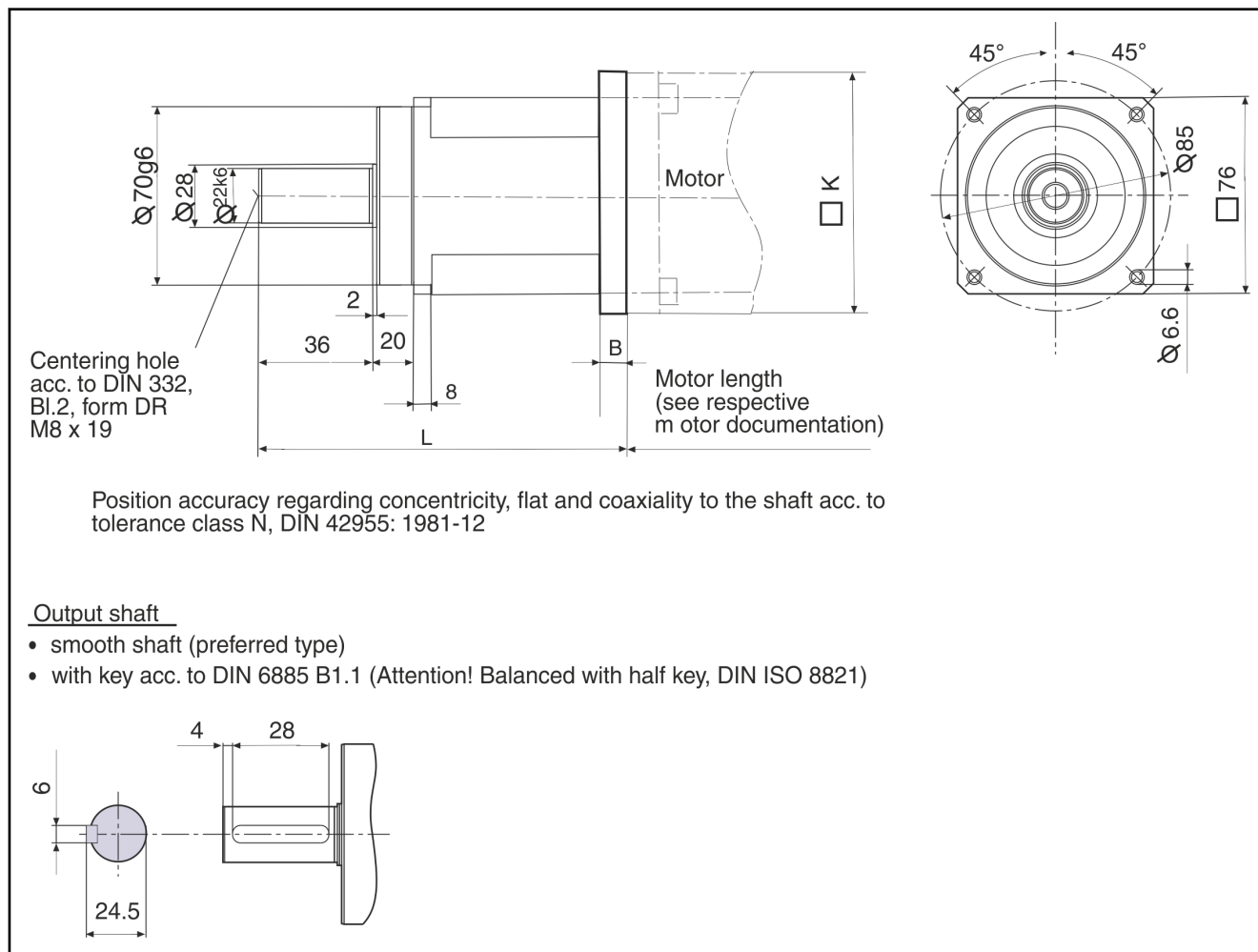


Fig. 7-2: Dimensional details GTM075, single and two-stage

Flanged motor type	One-stage		Two-stage		□ K <sup>1)</sup> [mm]
	L	B	L	B	
	[mm]	[mm]	[mm]	[mm]	
MS2N03-D	155.7	26	183	26	80
MS2N04-x					82
MS2N05-x					110
MS2N06-x	166.7	37	194	37	116
MSK040	155.7	26	183	26	82
MSK043C					82
MSK050					110
MSK060	166.7	37	194	37	116

Flanged motor type	One-stage		Two-stage		□ K <sup>1)</sup>
	L	B	L	B	
	[mm]	[mm]	[mm]	[mm]	[mm]
MSK061	155.7	26	183	26	116
KSM041					82
KSM061					115
1) biggest flange size					

Tab. 7-2: Dimensional details GTM075, single and two-stage

### 7.3 GTM100

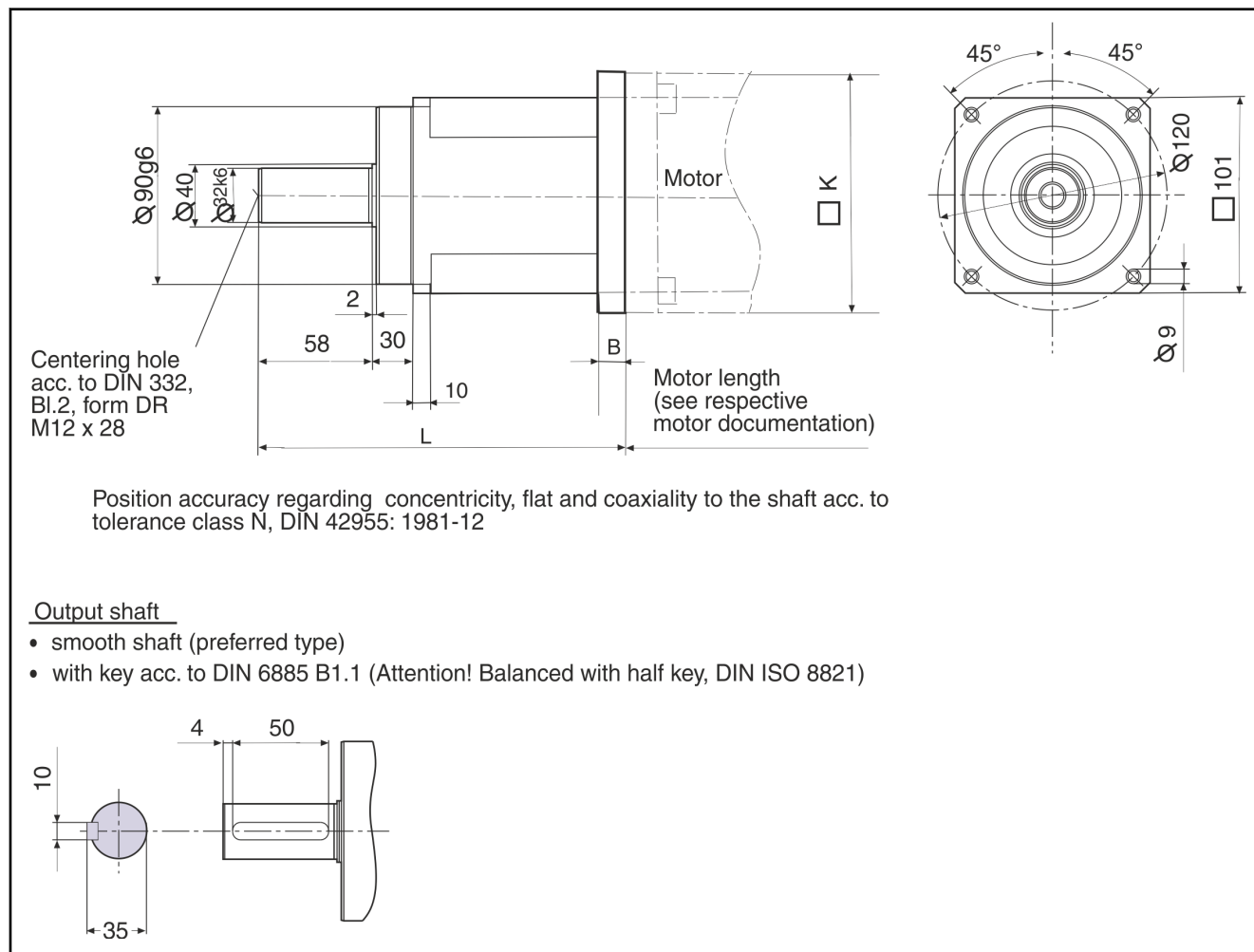


Fig. 7-3: Dimensional details GTM100, single and two-stage

Flanged motor type	One-stage		Two-stage		□ K <sup>1)</sup> [mm]
	L	B	L	B	
	[mm]	[mm]	[mm]	[mm]	
MS2N04-x	194.1	28.5	236	28.5	110
MS2N05-x					106
MS2N06-x					116
MS2N07-x	204.1	38.5	246	38.5	140
MSK040	194.1	28.5	236	28.5	110
MSK043					110
MSK050					106
MSK060					116
MSK061					116



Flanged motor type	One-stage		Two-stage		□ K <sup>1)</sup>
	L	B	L	B	
	[mm]	[mm]	[mm]	[mm]	[mm]
MSK070	204.1	38.5	246	38.5	140
MSK071					140
MSK075					140
MSK076	194.1	28.5	236	28.5	140
KSM041					110
KSM061					115
KSM071	204.1	38.5	246	38.5	140
KSM076	194.1	28.5	236	28.5	140

1) biggest flange size

*Tab. 7-3: Dimensional details GTM100, single and two-stage*

# 7.4 GTM140

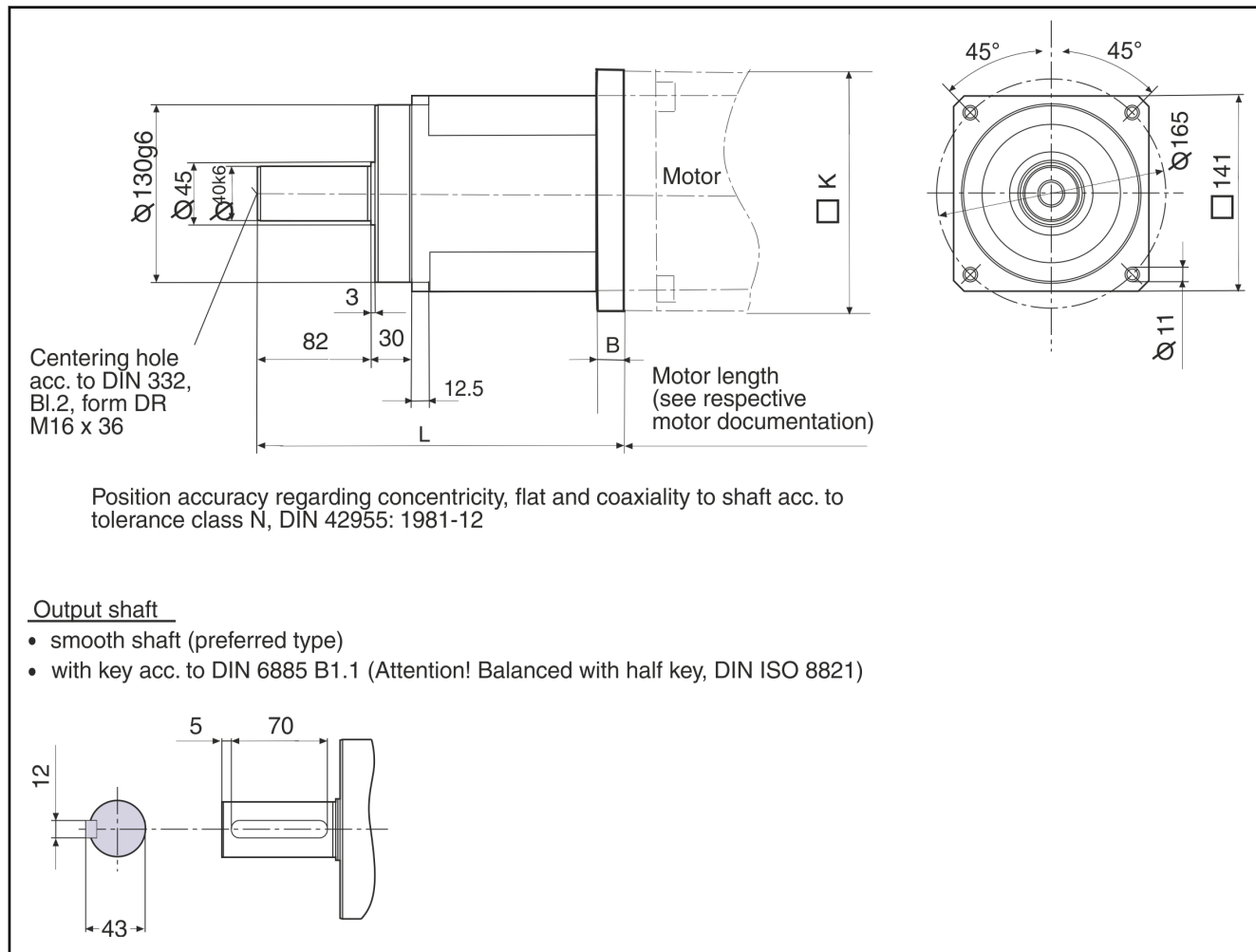


Fig. 7-4: Dimensional details GTM140, single and two-stage

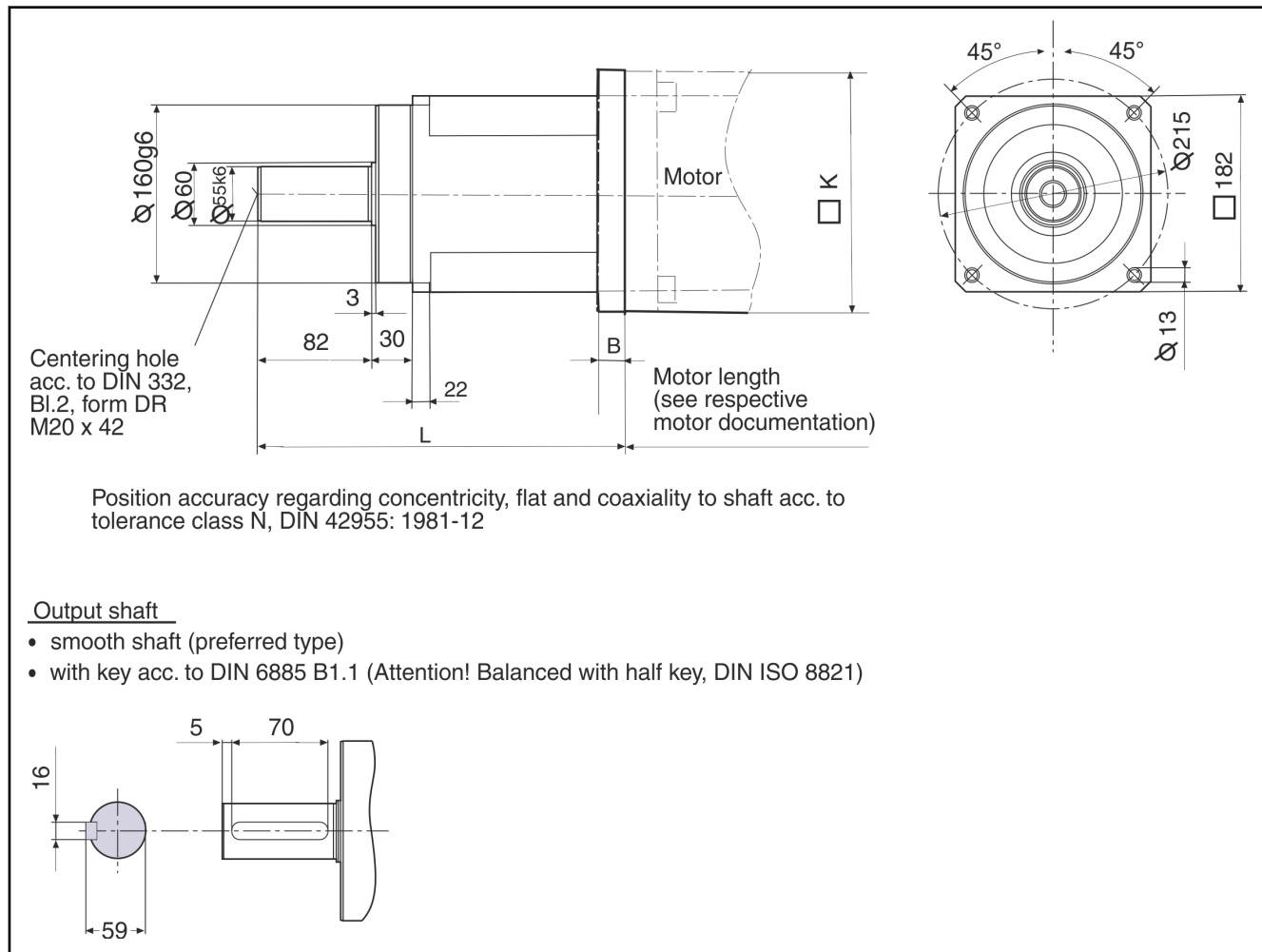
Flanged motor type	One-stage		Two-stage		□ K <sup>1)</sup> [mm]
	L	B	L	B	
	[mm]	[mm]	[mm]	[mm]	
MS2N05-x	245.6	29	296	29	141
MS2N06-x					
MS2N07-x					
MS2N10-x	265.6	49	316	49	196

Flanged motor type	One-stage		Two-stage		□ K <sup>1)</sup>
	L	B	L	B	
	[mm]	[mm]	[mm]	[mm]	[mm]
MSK050	245.6	29	296	29	141
MSK061					
MSK060					
MSK070					
MSK071					
MSK075					
MSK076					
MSK100					
MSK101	265.6	49	316	49	192
MSK103					
KSM061	245.6	29	296	29	141
KSM071					
KSM076					
MAD100					
1) biggest flange size					

Tab. 7-4: Dimensional details GTM140, single and two-stage

## Specifications

## 7.5 GTM180



Flanged motor type	One-stage		Two-stage		□ K <sup>1)</sup> [mm]
	L	B	L	B	
	[mm]	[mm]	[mm]	[mm]	
MS2N07-x	290	32.5	335.2	29	182
MS2N10-x		33	355.2	49	196
MSK070	290	32.5	335.2	29	182
MSK071					
MSK075					
MSK100					192
MSK101	290	33	355.2	49	192
MSK103					
MSK131	318	60.5	-	-	260

Flanged motor type	One-stage		Two-stage		□ K <sup>1)</sup>
	L	B	L	B	
	[mm]	[mm]	[mm]	[mm]	[mm]
KSM071	290	32.5	335.2	29	182
MAD100					192
MAD130	318	60.5	-	-	260
MAF100	290	32.5	355.2	29	192
MAF130	318	60.5	-	-	260
1) biggest flange size					

Tab. 7-5: Dimensional details GTM180, single and two-stage

## 7.6 GTM240

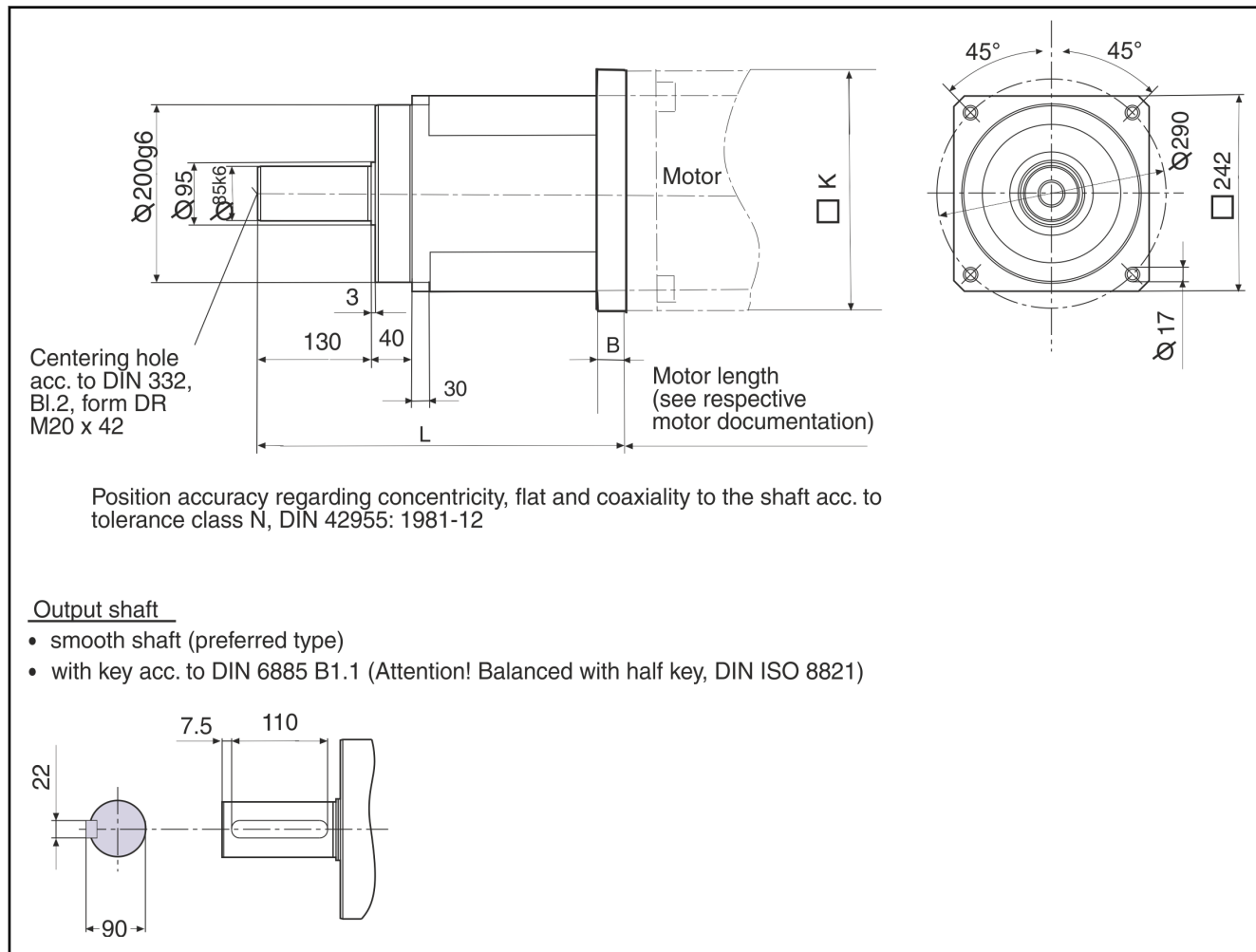


Fig. 7-6: Dimensional details GTM240 single-stage

Flanged motor type	One-stage		Two-stage		□ K <sup>1)</sup> [mm]
	L	B	L	B	
	[mm]	[mm]	[mm]	[mm]	
MSK131	398.2	43.5	-	-	260
MSK133					
MAD130					
MAD160					310
MAF130					260

1) biggest flange size

Tab. 7-6: Dimensional details GTM240, single-stage

# 8 Type codes

## 8.1 Type code GTM060

Type short description	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	2	1	2	3	4	5	6	7	8	9	3	1	2	3	4	5	6	7	8	9	4		
Example:	G	T	M	0	6	0	-	N	N	1	-	0	0	4	A	-	N	N	0	3																					
<b>01 Product</b>	GTM.....= GTM																																								
<b>02 Size</b>	060..... = 060																																								
<b>03 Mounting and operating mode</b>	Arbitrary ..... = NN																																								
<b>04 Stages</b>	One-stage..... = 1																																								
	Two-stage..... = 2																																								
<b>05 Transmission ratio</b>	One-stage: 4 5 7 10 e.g. 4:1 ..... = 004																																								
	Two-stage: 20 50 e.g. 20:1 ..... = 020																																								
<b>06 Output shaft and reduced backlash</b>	With key..... = A																																								
	Plain..... = B																																								
	With key, reduced backlash ..... = C																																								
	Plain, reduced backlash ..... = D																																								
<b>07 Designation of mounted motor</b>																																									

		Gearbox
Motor		GTM060
MS2N	03-B	NN02
	03-D	NN50
	04-x	NN03
MSK	030	NN02
	040	NN03
	043	NN03
KSM	041	NN03
One-Stage		4-5-7-10
Two-Stage		20-50

Fig. 8-1: Type code DCCS-40020-060\_TCO\_N\_DE\_2017-08-01\_fs

## 8.2 Type code GTM075

<b>Type short description</b>	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	M	0	7	5	-	N	N	1	-	0	0	4	A	-	N	N	0	3																												

01	<b>Product</b>	GTM.....= GTM
02	<b>Size</b>	075..... = 075
03	<b>Mounting and operating mode</b>	Arbitrary ..... = NN
04	<b>Stages</b>	One-stage.....= 1 Two-stage.....= 2
05	<b>Transmission ratio</b>	One-stage: 4 5 7 10    e.g. 4:1 .....= 004 Two-stage: 20 50      e.g. 20:1 .....= 020
06	<b>Output shaft and reduced backlash</b>	With key..... = A Plain..... = B With key, reduced backlash ..... = C Plain, reduced backlash ..... = D
07	<b>Designation of mounted motor</b>	

Motor		Gearbox
		GTM075
MS2N	03-D	NN50
	04-x	NN03
	05-x	NN20
	06-x	NN21
MSK	040	NN03
	043C	NN03
	050	NN20
	060	NN21
KSM	061	NN05
	041	NN03
One-stage		4-5-7-10
Two-stage		20-50

Fig. 8-2: Type code DCCS-40020-075\_TCO\_N\_DE\_2017-08-01\_fs



### 8.3 Type code GTM100

Type short description	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	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0										
Example:	G	T	M	1	0	0	-	N	N	1	-	0	0	4	A	-	N	N	0	3																																																												
<b>01 Product</b> GTM..... = GTM																																																																																
<b>02 Size</b> 100..... = 100																																																																																
<b>03 Mounting and operating mode</b> Arbitrary ..... = NN																																																																																
<b>04 Stages</b> One-stage..... = 1 Two-stage..... = 2																																																																																
<b>05 Transmission ratio</b> One-stage: 3 4 5 7 10 e.g. 4:1 ..... = 004 Two-stage: 20 50 e.g. 20:1 ..... = 020																																																																																
<b>06 Output shaft and reduced backlash</b> With key..... = A Plain..... = B With key, reduced backlash ..... = C Plain, reduced backlash ..... = D																																																																																
<b>07 Designation of mounted motor</b>																																																																																
	Motor										Gearbox																																																																					
											GTM100																																																																					
MS2N	04-x										NN03																																																																					
	05-x										NN20																																																																					
	06-x										NN21																																																																					
	07-x										NN16																																																																					
MSK	040										NN03																																																																					
	043										NN03																																																																					
	050										NN20																																																																					
	060										NN21																																																																					
	061										NN05																																																																					
	070										NN16																																																																					
	071										NN16																																																																					
	075										NN16																																																																					
KSM	076										NN06																																																																					
	041										NN03																																																																					
	061										NN05																																																																					
	071										NN16																																																																					
										076										NN06																																																												
	One-Stage										3-4-5-7-10																																																																					
	Two-Stage										20-50																																																																					

Fig. 8-3: Type code DCCS-40020-100\_TCO\_N\_DE\_2017-08-01

### 8.4 Type code GTM140

Type short description	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	M	1	4	0	-	N	N	1	-	0	0	4	A	-	N	N	0	3																				

<b>01 Product</b>	GTM..... = GTM
<b>02 Size</b>	140..... = 140
<b>03 Mounting and operating mode</b>	Arbitrary ..... = NN
<b>04 Stages</b>	One-stage..... = 1 Two-stage..... = 2
<b>05 Transmission ratio</b>	One-stage: 3 4 5 7 10 e.g. 4:1 ..... = 004 Two-stage: 20 50 e.g. 20:1 ..... = 020
<b>06 Output shaft and reduced backlash</b>	With key..... = A Plain..... = B With key, reduced backlash ..... = C Plain, reduced backlash ..... = D
<b>07 Designation of mounted motor</b>	

Motor	Gearbox
	GTM140
MS2N	05-x NN20
	06-x NN21
	07-x NN16
	10-x NN19
MSK	050 NN20
	060 NN21
	061 NN05
	070 NN16
	071 NN16
	075 NN16
	076 NN06
	100 NN09
	101 NN19
	103 NN19
	MAD
KSM	061 NN05
	071 NN16
	076 NN06
One-Stage	3-4-5-7-10
Two-Stage	20-50

Fig. 8-4: Type code DCCS-40020-140\_TCO\_N\_DE\_2017-08-01

## 8.5 Type code GTM180

Type short description	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	M	1	8	0	-	N	N	1	-	0	0	4	A	-	N	N	0	3																					
<b>01 Product</b>																																									
GTM..... = GTM																																									
<b>02 Size</b>																																									
180..... = 180																																									
<b>03 Mounting and operating mode</b>																																									
Arbitrary ..... = NN																																									
<b>04 Stages</b>																																									
One-stage.....= 1 Two-stage.....= 2																																									
<b>05 Transmission ratio</b>																																									
One-stage: 3 4 5 7 10 e.g. 4:1.....= 004 Two-stage: 20 50 e.g. 20:1.....= 020																																									
<b>06 Output shaft and reduced backlash</b>																																									
With key ..... = A Plain..... = B With key, reduced backlash..... = C Plain, reduced backlash ..... = D																																									
<b>07 Designation of mounted motor</b>																																									

Motor		Gearbox
Motor		GTM180
MS2N	07-x	NN16
	10-x	NN19 <sup>1)</sup>
MSK	070	NN16
	071	NN16
	075	NN16
	100	NN09
	101	NN19
	103	NN19
MAD	131	NN15 (1)
	100	NN09
	130	NN11 (1)
	100	NN08
MAF	100	NN08
	130	NN11 (1)
KSM	071	NN16

1) Ready-mounted ex works, only deliverable with single-stage gearbox

Fig. 8-5:

Type code DCCS-40020-180\_NOR\_N\_DE\_2016-07-07

### 8.6 Type code GTM240

<b>Type short description</b>	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	3	1	2	3	4	5	6	7	8	9	0	4		
Example:	G	T	M	2	4	0	-	N	N	1	-	0	0	4	A	-	N	N	0	3																								

01 **Product**  
GTM..... = GTM

02 **Size**  
180..... = 180

03 **Mounting and operating mode**  
Arbitrary ..... = NN

04 **Stages**  
One-stage..... = 1

05 **Transmission ratio**  
One-stage: 3 4 5 7 10 e.g. 4:1..... = 004

06 **Output shaft and reduced backlash**  
 With key ..... = A  
 Plain ..... = B  
 With key, reduced backlash ..... = C  
 Plain, reduced backlash ..... = D

07 **Designation of mounted motor**

Motor		Gearbox
Motor		GTM240
MSK	131	NN15 (1)
	133	NN15 (1)
MAD	130	NN11 (1)
	160	NN12 (1)
MAF	130	NN11 (1)

1) Ready-mounted ex works, only deliverable with single-stage gearbox

Fig. 8-6: Type code DCCS-40020-240\_NOR\_N\_DE\_2016-07-07

## 9 Handling, transport and storage

### 9.1 Handling

#### 9.1.1 Identifying the goods

**Delivery** A single copy of the delivery note is enclosed to each delivery. The delivery note lists all components with their descriptions and their designations. If the contents are distributed among several parcels (transport containers), this is noted on the delivery note or it can be seen from the freight bill.

**Bar code label** The packaging of each gearbox or motor/-gearbox combination package has a bar code label providing the following data:

- Description of the gearbox or motor/-gearbox combination
- Customer
- Number of delivery note
- Consignment

The bar code label is provided for identification of the contents during processing of the order.

#### 9.1.2 Type plates

**Gearbox** The gearbox is delivered with a name plate. The name plate is attached to the gearbox-housing.

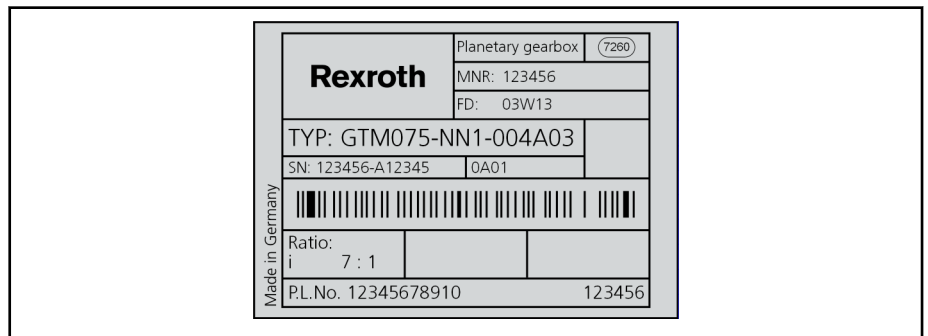


Fig. 9-1: GTM name plate (example)

#### Delivery of a motor-gearbox combination

The motor is delivered with its own separate type plate. This is attached to the motor housing. In addition, a second type plate is attached using two-side tape onto the original motor name plate. The second type plate can be attached where visible on the machine, if the original type plate of the motor is concealed by parts of the machine.

The type plate is provided for

- Identification of the motor
- Procurement of spare parts in case of malfunction
- Service information.



The description of the motor is also stored in the feedback data memory.

## 9.2 Transport and storage

### CAUTION

**Damage or injuries and loss of the warranty due to improper handling!**

- ⇒ Avoid putting the products under mechanical load. Do not throw, tilt or drop the products.
- ⇒ Use only suitable lifting gear.
- ⇒ Never lift the motor out of the optional fan housing.
- ⇒ Use suitable protective equipment and protective clothing during transport, and wear safety shoes.
- ⇒ Protect the products from dampness and corrosion.

**Gearboxes** Also observe the notes regarding storage and transport on the packages

The gearboxes are typically supplied in recyclable cardboard boxes with carton for shaped elements.

It is recommended to store the gearboxes in their original packaging in a horizontal position until they are ready for use. The permissible temperature range for short-term storage or transport is  $-20^{\circ}\text{C}$  up to  $+80^{\circ}\text{C}$ .

For long-term storage, it is recommended to store the gearboxes in a dry environment with temperatures from  $0^{\circ}\text{C}$  to  $+30^{\circ}\text{C}$ . The gearboxes can be stored over a period of maximum 2 years under these conditions.

Avoid direct insolation, UV light and ozone because it leads to deterioration of the sealants.

We recommend using a FIFO system - "First-in, first-out".



Remove all the anticorrosive on the gearboxes before mounting them.

The gearboxes are filled-for-life with lubrication and are ready for use. The input and output are treated with anticorrosive coating.

### **NOTICE**

**Do not proceed cleaning via air pressure!**

The danger consists that overpressure within the gearbox can occur which negatively influences the function and lifetime of the gearbox.

**Motor-gearbox-combination** The following conditions must be kept during transport and handling:

- Use the appropriate means for transport. Take the weight of the components into consideration (weights are specified in the appropriate "Technical Data" chapters of the various motors and gearboxes and/or on the type label of the motor).
- Transport the motor-gearbox combination only in the horizontal position.
- To lift the motor-gearbox combinations use a crane and lifting sling belts
- Avoid damage to the motor flange and drive shaft.
- Avoid impacts on the gearbox drive shaft.
- Remove the protective cover on the gearbox output shaft just before mounting.

**NOTICE****Motor or gearbox damage and guarantee loss due to incorrect storage!**

The following conditions must be kept during storage:

- Allowed transport temperature range:  $-20^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$  (only valid for short-term storage or transport. For a long-term storage please keep a temperature range of  $0^{\circ}\text{C}$  to  $+30^{\circ}\text{C}$ .)
- Store motors in dry places which are free from dust and vibrations.
- Store motors horizontally.
- Do not remove the plastic protective sleeve on the output shaft. It protects the shaft from moisture, rust and mechanical damage.





## 10 Assembly

### 10.1 Skilled personnel

Any work on the system, on the drives, or on the planetary gearboxes or in their vicinity may only be carried out by properly skilled personnel. The owner of the system must ensure that all persons carrying out

- installation works
- maintenance work or
- operating work

on the system are sufficiently familiar with the contents, all warnings and precautions according to this documentation. Qualified specialist personnel are trained, instructed or authorized to switch circuits and devices on and off as well as to ground and to mark them according to the regulations of safety engineering. Qualified technical personnel must possess appropriate safety equipment and have been trained in first aid.

### 10.2 Motor mounting

#### 10.2.1 General

Adapter plates make it possible to mount the GTM-series gearboxes onto every Bosch Rexroth servo motor which is mentioned in the type code. The connection between the motor output shaft and gearbox input shaft is established via a compression coupling.



When combining Bosch Rexroth motors with GTM gearboxes, use motors with **smooth shaft** only.

---

Before mounting the servo motors to the gearboxes, all parts have to be checked closely for damage. All parts should slide easily and without any force into one another. Damage on the motor drive shaft or to the compression coupling of the gearbox can prevent this and must be avoided.

Damage to or contamination on the motor front flange face or on the gearbox flange face can lead to angular offset of the motor drive shaft and the gearbox. This can lead to stress on the connection and will have a negative influence on the lifetime of the motor and/or the gearbox.

## 10.2.2 Motor connection

The gearboxes are provided with the proper adapter parts necessary for the stipulated motor type according to the type code in the order. Adapter parts makes it possible for the GTM gearboxes to be mounted on every Bosch Rexroth servo motor listed in the type code.



Every warranty claim expires, if adapter parts are removed or altered.

The motor is centered via the pilot diameter of the motor and the pilot diameter of the gearbox.

The connection between motor drive shaft and gearbox input shaft is established via a compression coupling. The compression couplings are matched to the corresponding motor shaft diameters when necessary by using a slotted bushings. Slotted distance bushings are used with small motor shaft diameters in order to compensate for the difference in diameter compared to the gear box clamping hub. The slotted bushings are factory-installed so that the slots in the bushings line up with the slots in the compression coupling (see Fig. 10-1). This must be confirmed before mounting and any necessary changes must be made before the motor and gearbox are assembly.

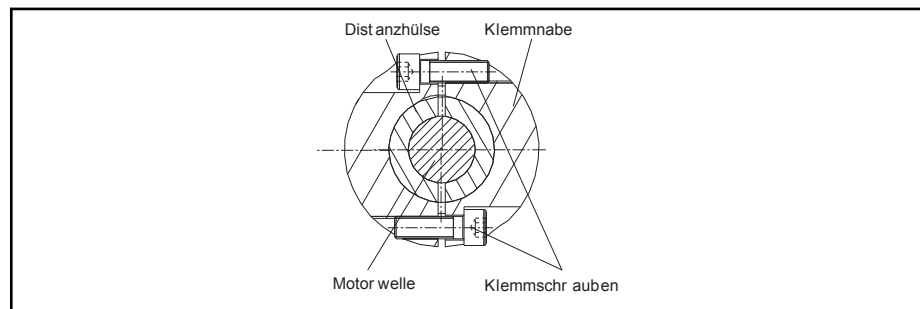


Fig. 10-1: Compression coupling shown with bushing



When combining Bosch Rexroth motors with GTM gearboxes, use motors with **smooth shaft** only.

## 10.2.3 Mounting procedure

If the gearbox and motor have been checked on their quality, the following assembly procedure is recommended.

### 1. Clean and check the parts.

Check for damage to the motor drive shaft, compression coupling bore and any bushing, as well as the faces of motor and gearbox flanges and clean them thoroughly. Do not clean the parts with compressed air. Avoid using aggressive detergents, which could damage the seals.

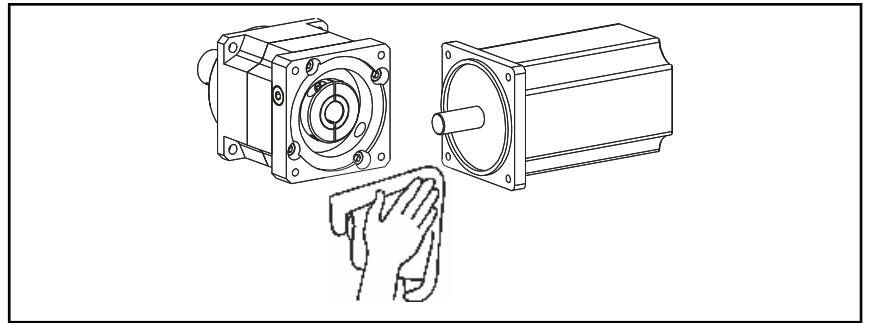


Fig. 10-2: Cleaning of the parts before mounting

## 2. Remove cap screws.

Remove the cap screws from the gearbox adapter plate. The removal will allow access to the two screws in the compression coupling. Turn the compression coupling so that the heads of the clamping screws line up with the tapped holes, which have now been opened in the gearbox's adapter plate.

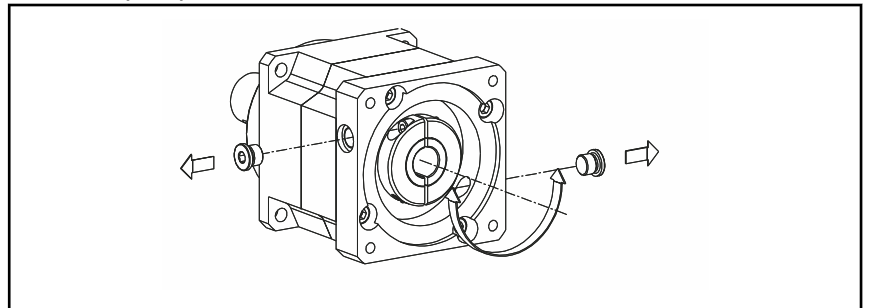


Fig. 10-3: Remove the cover screws

## 3. Connect the motor to the gearbox

Insert the motor shaft into the gearbox coupling until the gearbox's connecting flange and the motor face are fully in contact. It should be possible to accomplish this without excessive force. The gearbox is equipped with an integrated thermal length compensation to compensate for the thermal expansion of the motor shaft. This compensates the linear extension of the motor drive shaft at temperature rise. When joining the parts together, the axial force exerted onto the compression coupling must not exceed the value specified in the table below. If the force is exceeded, the compensation for heat expansion of the motor shaft cannot be ensured. This can lead to damage of the motor and/or the gearbox.

Gearboxes	Clamping screws EN ISO 4762	Key width of [mm]	Tightening torque [Nm]	Clamping hub [N]
GTM060	M5-8.8	SW 4	5.5	60
GTM075	M5-12.9	SW 4	9.5	85
GTM100	M6-12.9	SW 5	16	115
GTM140	M8-12.9	SW 6	40	130
GTM180	M10-12.9	SW 8	79	170
GTM240	M16-12.9	SW 14	330	220

Tab. 10-1: Axial force

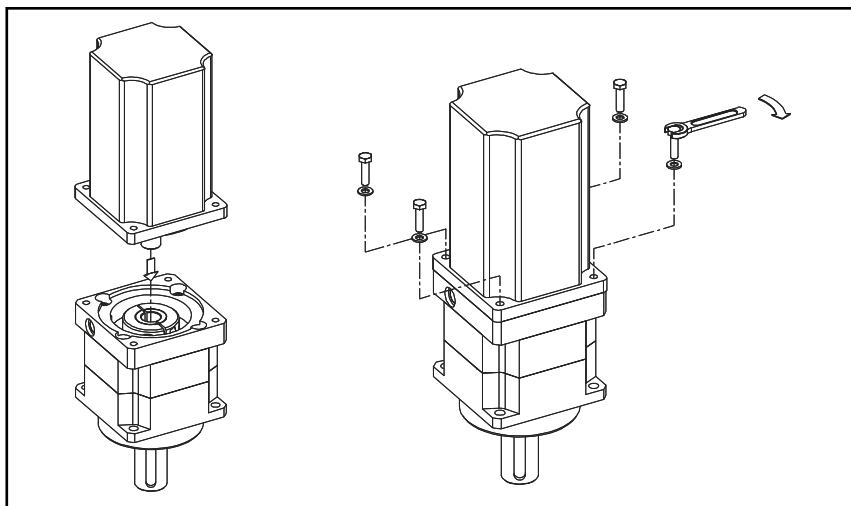


Fig. 10-4: Insert the motor shaft into the gearbox

**⚠ CAUTION**

**Property damage due to self-weight**

To negate the weight of the motor and/or the gearbox itself, we recommend to perform this mounting in the vertical axis.

**4. Connect the motor to the gearbox**

To assure a proper connection of the gearbox, tighten all fastening bolts with the correct tightening torque using the crossover pattern (see Fig. 10-4).

**5. Tighten the clamping screws step-by-step.**

6. To avoid unnecessary binding of the compression couplings tightening the clamping bolts step-by-step as shown below up to the proper torque. Tightening torque

Gearboxes	Step 1	Step 2	Step 3
	(see Fig. 10-5) Step 1 + 2	(see Fig. 10-5) Step 3 + 4	(see Fig. 10-5) Step 5 + 6
<b>GTM060</b>	Tighten bolts by hand	2.5 Nm	5.5 Nm
<b>GTM075</b>		5 Nm	9.5 Nm
<b>GTM100</b>		8 Nm	16 Nm
<b>GTM140</b>		20 Nm	40 Nm
<b>GTM180</b>		40 Nm	79 Nm
<b>GTM240</b>		165 Nm	330 Nm

Tab. 10-2: Tightening torque:

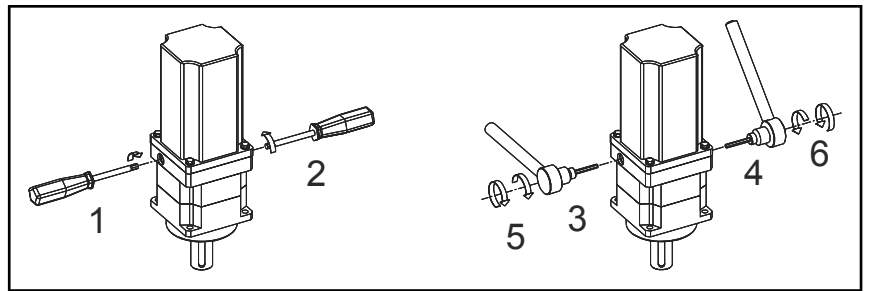


Fig. 10-5: Proper tightening of the clamping bolts.

### 7. Reinsert the cap screws.

In order to guarantee a tight drive system corresponding to the degree of protection, the screw plugs with sealing ring removed in step 2 "**Remove sealing screws**" must be replaced and tightened with the prescribed torque:

Screw plug DIN908	Tightening torque [Nm]
M12x1.5	20
M16x1.5	30

Tab. 10-3: Tightening torques of locking screw

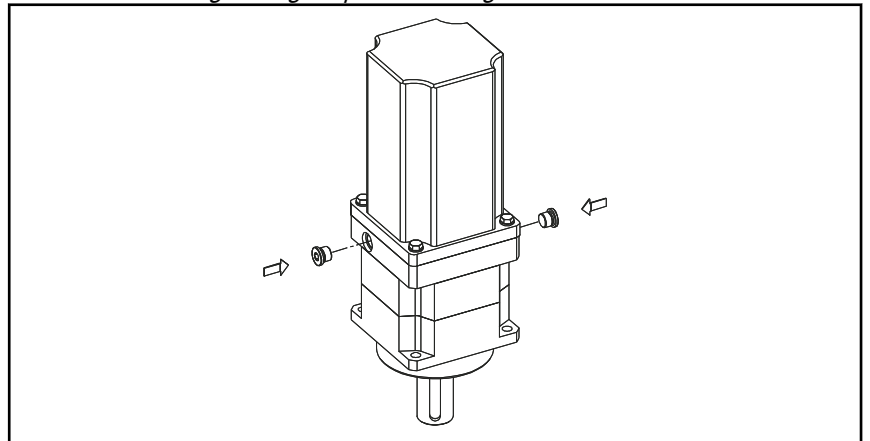


Fig. 10-6: Closing the mounting opening

## 10.3 Gearbox mounting

Remove the protective cap from the GTM gearbox shaft and thoroughly clean the pilot diameter, the contact surface and the output shaft.

Mounting of the gearbox to the machine (or robot, etc.) is to be made via the output pilot diameter of the gearbox and four through holes on the gearbox housing.

We recommend using ISO 12.9-grade bolts with the proper tightening torques. We also recommend securing the bolts with Loctide.

Gearboxes	Centering diameter [mm]	Screw size	Tightening torque [Nm]
GTM060	60	M5-12.9	9.5
GTM075	70	M6-12.9	16
GTM100	90	M8-12.9	40
GTM140	130	M10-12.9	79
GTM180	160	M12-12.9	135
GTM240	200	M16-12.9	330

Tab. 10-4: Flange-mounting data for installing the gearbox on the machine.

Assure a non-distorted mount when installing the gearbox. Attachments part, like gears or tooth lock washers have to be mounted on the output shaft non-violent. In no case, they should be mounted by beating. Use only appropriate tools or appliances.

Thereby, the specified stated mounting forces in Tab. 10-5 are allowed. A constant damage of the output bearing can occur at higher mounting forces.

Gearboxes	Maximum static axial force [Nm]
GTM060	9000
GTM075	11000
GTM100	19000
GTM140	32000
GTM180	50000
GTM240	90000

Tab. 10-5: Maximum static axial force on the output shaft

### CAUTION

**Material damage due to overtemperature on the drive system!**

Make sure that during operation exists unhindered circulation of air, to avoid a heat accumulation and therewith an over-temperature within the drive-system (gearbox + motor).

# 11 Commissioning, operation and maintenance

## 11.1 Commissioning

### 11.1.1 General

The following commission notes refer to the GTM planetary gearboxes as part of a drive-system with motor, drive and control unit.

### 11.1.2 Preparation

1. Make sure you have the documentations of all used products ready.
2. Log all measures taken in the commissioning log.
3. Check the products for damage.
4. Check all mechanical and electrical connections.
5. Enable the safety devices and monitoring systems of the machine.

#### CAUTION

**Property damage caused by errors when controlling motors and moving parts! Unclear operating states and product data!**

⇒ Do not commission the motors if connections, operating states or product data are unclear or faulty.

⇒ Do not carry out commissioning if the safety and monitoring equipment of the system is damaged or not in operation.

⇒ Damaged products must not be put into operation.

⇒ Contact Bosch Rexroth for additional information or support during commissioning

### 11.1.3 Procedure

**Once all requirements are met, proceed as follows:**

1. Commission the motors, controllers and power supplies according to the corresponding descriptions. Note the respective product documentation.
2. Before releasing the setpoint, check whether the set relationship of the maximum motor speed and the preset setpoint corresponds to the specifications for the machine.
3. At a low turning speed, check whether the rotation direction of the gearbox and the polarity setpoint correspond to the specifications for the machine.
4. At a low turning speed, check whether the positioning commands of the control systems are executed correctly.
5. Record all measures taken in the commissioning log.

**When all steps have been executed correctly, commissioning of the gearbox is complete.**



Commissioning of motors and controllers may require additional steps. The inspection of the functioning and performance of the systems is not part of the commissioning of the gearbox; instead, it is carried out within the framework of the commissioning of the machine as a whole. Comply with the information and instructions of the machine manufacturer.

## 11.2 Deactivation

In the case of malfunctions, maintenance measures or to deactivate the gearbox-motor unit, proceed as follows:

1. Comply with the instructions in the machine documentation.
2. Use the machine-side control commands to bring the drive to a controlled standstill.
3. Switch off the power and control voltage of the controller.
4. Switch off the motor protection switch for the motor fan.
5. Switch off the main switch of the machine.
6. Secure the machine against accidental movements and against unauthorized operation.
7. Wait until the discharging time of the electrical systems has elapsed and then disconnect all electrical connections.
8. Before dismantling, secure the gearbox-motor unit and supply cables against falling or movements before disconnecting the mechanical connections.
9. Document all executed measures in the commissioning report or in the machine maintenance plan.

## 11.3 Disassembly

### DANGER

**Fatal injury due to errors in trigger motors and moving elements!**

⇒ Work on machines is only allowed if they are secured and while they are not running.

⇒ Before starting disassembly, secure the machine against unforeseeable movements and against unauthorized operation.

⇒ Before dismantling, secure the gearbox-motor unit and supply cables against falling or movements before disconnecting the mechanical connections.

1. Comply with the instructions in the machine documentation.
2. Comply with the safety instructions and carry out all steps as described above in [Chapter 11.2 Deactivation](#)
3. Remove the gearbox-motor unit from the machine and store the unit properly.
4. Document all executed measures in the commissioning report or in the machine maintenance plan.

## 11.4 Maintenance

### 11.4.1 General

Planetary gearboxes of GTM series operate without deterioration within the given operating conditions. Operation under unfavorable conditions can, however, lead to restrictions in availability.

- Observe the information of the machine manufacturer in the machine maintenance plan.
- Record all maintenance measures in the machine maintenance plan.



## 11.4.2 Measures

### **⚠ DANGER**

**Risk of injury due to moving elements! Risk of injury due to hot surfaces!**

- ⇒ Do not carry out any maintenance measures while the machine is running.
- ⇒ This work may only be carried out by skilled personnel.
- ⇒ While carrying out maintenance, secure the machine against start-up and unauthorized operation.
- ⇒ Do not work at hot surfaces.

Protect open supply lines and connections against ingress of dirt.

Bosch Rexroth recommends the following maintenance measures, based on the maintenance plan of the machine manufacturer:

Measure	Interval
Check the mechanical and electrical connections.	According to the specifications in the machine maintenance plan, but at least every 1.000 operating hours.
Check the gearbox-motor unit for smooth running, vibrations and bearing noises.	According to the specifications in the machine maintenance plan, but at least every 1.000 operating hours.
Remove dust, chips and other dirt from the gearbox-motor housing, cooling fins and the connections.	Depending on the degree of soiling, but after 6 month operation at the latest. Do it monthly at strong pollution.

Tab. 11-1: Gearbox-motor unit maintenance plan

## 11.5 Troubleshooting

### 11.5.1 General information

### **⚠ DANGER**

**Risk of injury due to moving elements! Risk of injury due to hot surfaces!**

- ⇒ Do not carry out any maintenance work while the machine is running
- ⇒ Switch off the controller and the machine and wait until the discharging time of the electrical systems has elapsed before starting troubleshooting
- ⇒ Secure the machine against start-up and unauthorized operation during maintenance work
- ⇒ Do not work on hot surfaces

Protect open supply lines and connections against ingress of dirt.

### 11.5.2 Excess temperature of gearbox housing

<b>State</b>	The housing temperature of the gearbox climbs to unusually high values.
<b>Possible causes</b>	<ol style="list-style-type: none"> <li>1. The original machining cycle has been changed.</li> <li>2. Original drive parameters have been changed.</li> </ol>

- Countermeasures**
1. Check the sizing of the drive for changed requirements. Do not operate any longer at overload. Risk of damage!
  2. Restore the original parameters. Check the sizing of the drive if requirements have been changed.

### 11.5.3 Gearbox-motor unit generates vibrations

- State** Audible or tactile vibrations occur on the gearbox-motor unit.
- Possible causes**
1. Driven machine elements are insufficient, not balanced or insufficiently coupled.
  2. Gearbox or motor bearings are worn or defective. Available bearing lifetime or grease lifetime has elapsed.
  3. Gearbox-motor fixing are loosened.
  4. Drive system is instable from a control point of view.
- Countermeasures**
1. Check balance of driven machine elements. Check key and keyway. In the case of malfunction contact Rexroth Service.
  2. Check the gearbox for damage. In the case of malfunction, contact Rexroth Service.
  3. Fasten motor properly and check for damage. In the case of malfunction, contact Rexroth Service.
  4. Check the parameterization of the drive system (motor and encoder data). Comply with the instructions in the controller documentations.

### 11.5.4 Specified position is not reached


- State** The positioning command of the control unit is executed either not precisely or not at all. No malfunction displayed by the controller or the control unit.
- Possible causes**
1. Motor drive shaft machine element connection loose.
  2. Motor shaft - gearbox connection loose.
  3. Gearing defective.
- Countermeasures**
1. Check the mechanical connection. Do not continue to use damaged parts.
  2. Check the mechanical connection. Do not continue to use damaged parts.
  3. Change of gearbox necessary. Contact Bosch Rexroth Service in case of a failure.

## 12 Environmental protection and disposal

### 12.1 Environmental protection

<b>Production processes</b>	The products are manufactured in energy- and resource-optimized production processes which allow re-using and recycling the resulting waste. We regularly try to replace pollutant-loaded raw materials and supplies by more environment-friendly alternatives.														
<b>No release of hazardous substances</b>	Our products do not contain any hazardous substances which may be released in case of appropriate use. Normally, our products will not have any negative influences on the environment.														
<b>Significant components</b>	Significant components of our products are: <table> <tr> <td><b>Electronic devices</b></td> <td><b>Motors</b></td> </tr> <tr> <td>• Steel</td> <td>• Steel / Stainless steel</td> </tr> <tr> <td>• Aluminum</td> <td>• Aluminum</td> </tr> <tr> <td>• Copper</td> <td>• Copper</td> </tr> <tr> <td>• Plastics</td> <td>• Brass</td> </tr> <tr> <td>• Electronic components</td> <td>• Magnetic materials</td> </tr> <tr> <td></td> <td>• Elektronic components</td> </tr> </table>	<b>Electronic devices</b>	<b>Motors</b>	• Steel	• Steel / Stainless steel	• Aluminum	• Aluminum	• Copper	• Copper	• Plastics	• Brass	• Electronic components	• Magnetic materials		• Elektronic components
<b>Electronic devices</b>	<b>Motors</b>														
• Steel	• Steel / Stainless steel														
• Aluminum	• Aluminum														
• Copper	• Copper														
• Plastics	• Brass														
• Electronic components	• Magnetic materials														
	• Elektronic components														

### 12.2 Disposal

<b>Return of products</b>	<p>Our products can be returned to us for disposal free of charge. However, this requires that the products be free from oil, grease or other dirt.</p> <p>Furthermore, the products returned for disposal may not contain any undue foreign material or foreign components.</p> <p>Deliver the products "free domicile" to the following address:</p> <p style="text-align: center;">Bosch Rexroth AG Electric Drives and Controls Buergermeister-Dr.-Nebel-Straße 2 97816 Lohr am Main, Germany</p>
<b>Packaging</b>	<p>Packaging materials consist of cardboard, wood and polystyrene They can be recycled anywhere without any problem.</p> <p>For ecological reasons, please refrain from returning the empty packages to us.</p>
<b>Batteries and accumulators</b>	<p>Batteries and accumulators can be labeled with this symbol.</p> <p> The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin.</p> <p>End users in the EU are legally bound to return used batteries and accumulators. Outside the validity of the EU Directive 2006/66/EC, the particularly applicable regulations must be followed.</p> <p>Batteries and accumulators can contain hazardous substances which can harm the environment or people's health when improperly stored or disposed of.</p> <p>After use, the batteries or accumulators contained in Rexroth products must be properly disposed of according to the country-specific collection systems.</p>

**Recycling** Most of the products can be recycled due to their high content of metal. In order to recycle the metal in the best possible way, the products must be disassembled into individual assemblies.

Metals contained in electric and electronic assemblies can also be recycled by means of special separation processes.

Plastic parts of the products may contain flame retardants. These plastic parts are labeled according to EN ISO 1043. They have to be recycled separately or disposed of according to the applicable legal provisions.

## 13 Service and support

Our worldwide service network provides an optimized and efficient support. Our experts offer you advice and assistance should you have any queries. You can contact us **24/7**.

**Service Germany** Our technology-oriented Competence Center in Lohr, Germany, is responsible for all your service-related queries for electric drive and controls.

Contact the **Service Hotline** and **Service Helpdesk** under:

Phone: **+49 9352 40 5060**  
Fax: **+49 9352 18 4941**  
E-mail: [service.svc@boschrexroth.de](mailto:service.svc@boschrexroth.de)  
Internet: <http://www.boschrexroth.com>

Additional information on service, repair (e.g. delivery addresses) and training can be found on our internet sites.

**Service worldwide** Outside Germany, please contact your local service office first. For hotline numbers, refer to the sales office addresses on the internet.

**Preparing information** To be able to help you more quickly and efficiently, please have the following information ready:

- Detailed description of malfunction and circumstances
- Type plate specifications of the affected products, in particular type codes and serial numbers
- Your contact data (phone and fax number as well as your e-mail address)



# Index

## A

Accumulators.....	69
Ambient temperature.....	21
Application notes.....	21
Assembly.....	59
Assembly of output elements.....	24

## B

Backlash.....	29
Batteries.....	69
Bearing lifetime.....	24

## C

Combination possibilities of GTM planetary gearboxes with motors.....	24
Commissioning.....	65
Commissioning log.....	65
Contained substances see "Significant components".....	69
Continuous operation.....	22
Continuous operation with pause interval.....	17
Continuous operation without pause interval (S1).....	18

## D

Deactivation.....	66
Degree of protection.....	21, 29
Derating.....	21
Dimensioning.....	17
Disassembly.....	66
Disposal.....	69
Drive system.....	7

## E

Efficiency.....	29
Electric drive system.....	7
Environmental protection.....	69
Explosion protection ATEX.....	23
Hazardous areas.....	23

## F

Fields of application.....	1
----------------------------	---

## G

Gearbox housing temperature.....	29
Gearbox mounting.....	64
Gearboxes Characteristic curves motor-gearbox.....	19
Dimensioning.....	19
Selection.....	19
General data.....	29

## H

Handling.....	55
Hazardous substances.....	69
Helpdesk.....	71
Hotline.....	71
Housing temperature.....	67

## I

Identifying the goods.....	55
Input torque.....	27
Installation altitude.....	21
Installation positions .....	23
Instructions on use Appropriate use.....	5
Consequences, exclusion of liability.....	5
Inappropriate use.....	6
Liability.....	5
Intermitted operation.....	22

## L

Lifetime.....	29
Limiting temperature curves to determine higher S1-speed.....	30
Lubrication.....	29

## M

Maintenance.....	66
Mass moment of inertia.....	28
Mechanical features.....	23
Mode of functioning.....	1
Motor connection.....	60
Motor mounting.....	59
Mounting procedure.....	60

## N

Noise level.....	29
Nominal initial torque.....	28
Nominal output torque.....	28

## O

Operating conditions.....	21
Operating mode.....	22
Operational reliability.....	1
Original packaging.....	56
Output shaft.....	23
Output speed.....	27
Output torque.....	27

## P

Packaging.....	69
PELV.....	11
Performance data.....	1
Permitted axial force.....	34

## Index

Permitted radial force	
GTM060.....	34
GTM075.....	35
GTM100.....	35
GTM140.....	36
GTM180.....	36
GTM240.....	37
Permitted shaft load.....	33
Production processes.....	69
Protective extra-low voltage.....	11

**R**

Rated input speed.....	28
Ratio-dependent data.....	27
Recycling.....	70
Reduction at higher cycles.....	22
Return of products.....	69

**S**

Safety instructions for electric drives and controls.....	7
Selection.....	18
Dimensioning criteria.....	18
Drive-determined sizes.....	18
Service hotline.....	71
Shaft load.....	23
Significant components.....	69
Skilled personnel.....	59
Specifications	
GTM060.....	39
GTM075.....	40
GTM100.....	42
GTM140.....	44
GTM180.....	46
GTM240.....	48
Speed.....	27
Standards.....	3
Storage.....	56
Support.....	71

**T**

Technical data.....	27
Torsional strength.....	29
Transport.....	56
Triangular operation with pause interval.....	17
Troubleshooting.....	67
Type codes.....	49
GTM060.....	49
GTM075.....	50
GTM100.....	51
GTM140.....	52
GTM180.....	53
GTM240.....	54
Type plates.....	55

**W**

Weight.....	29
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# Notes

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