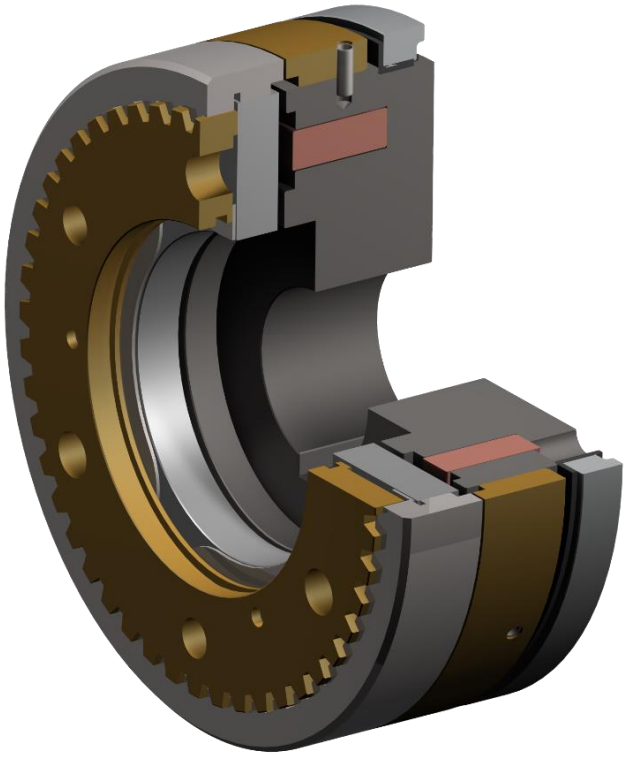
Mönninghoff

# eleOriginal

# Operating and Assembly Instructions

## Electromagnetic tooth clutch
## Type 550.xx



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**As of: 06/2021**

**Read these operating instructions before starting any kind of work!**

# Contents

# 1. General aspects

## 1.1. Information on these instructions

These instructions enable safe and efficient handling of the type 550.xx electromagnetic tooth clutch, armature assembly 4 and 6 and armature assembly 5 and 7, hereinafter referred to as the clutch.

These instructions are a part of the clutch and must be kept in the immediate vicinity of the clutch and be accessible to staff at all times. Staff must read and understand these instructions carefully before beginning any work. Compliance with all safety instructions stated in these instructions constitute the basic requirement for safe working practices.

In addition, local accident prevention regulations and general safety rules apply to application area of the combination.

## 1.2. Explanation of symbols

Warnings

All warnings in these operating instructions are also indicated by a warning symbol.

The following warning symbols are used throughout these operating instructions:

| Symbol | Meaning |
|---|---|
|  | Danger to persons with heart pacemakers |
|  | General warning. |
|  | Danger from electric current! |
|  | Danger of crushing |
|  | Warning of magnetic field |
|  | Danger of environmental pollution |
|  | General instructions and useful suggestions on handling. |

Safety precautions

The safety instructions are indicated in these instructions by symbols. The safety instructions are introduced by signal words that are intended to indicate the extent of the danger.

The warning symbol also refers to the type of hazard.

The following warnings are used throughout these instructions:

**⚠DANGER**

**Danger to life**

Consequences of failure to observe …

Instructions for avoiding

A warning of this category indicates an impending dangerous situation.

If the dangerous situation is not avoided, it may lead to severe injury or even death.

Follow the instructions in this warning to avoid possible danger of severe injury or even death.

**⚠WARNING**

**Risk of injury!**

Consequences of failure to observe …

Instructions for avoiding

A warning of this category indicates a potentially dangerous situation.

If the dangerous situation is not avoided, it may lead to serious injury or even death.

Follow the instructions in this warning to avoid the danger of serious injury to persons or even death.

**⚠CAUTION**

**Injury to persons by …**

Consequences of failure to observe …

Instructions for avoiding

A warning of this category indicates a potentially dangerous situation.

If the dangerous situation is not avoided, it may lead to minor or moderate injuries.

Follow the instructions in this warning to avoid the danger of serious injury to persons.

**ATTENTION**

**Damage to property by ...**

Consequences of failure to observe ...

Instructions for avoiding

A warning of this category indicates potential danger to property.

If the situation is not avoided, it may lead to damage to property.

Follow the instructions in this warning to avoid damage to property.

Tips and recommendations

**NOTE**

Descriptive text...

A descriptive text contains additional information that is important for further processing or for simplifying the procedure step explained.

Special safety instructions

In order to draw attention to special dangers, specific symbols were used in the safety instructions:

**⚠DANGER**

**Danger from electric current!**

Consequences of failure to observe ...

Instructions for avoiding

**⚠DANGER**

**Danger to persons with heart pacemakers!**

Consequences of failure to observe ...

Instructions for avoiding

## 1.3. Limitation of liability

All specifications and instructions contained in these instructions were compiled according to current standards and regulations and reflect the current state of technology as well as our longstanding knowledge and experience.

The manufacturer assumes no liability for damages resulting from:

- Failure to observe the operating instructions
- Use other for the intended purpose
- Deployment of insufficiently qualified staff
- Unauthorised modifications
- Technical modifications
- Use of non-approved spare parts
- faulty connection

The responsibilities agreed upon in the delivery contract, the general terms and conditions, the delivery conditions as set forth by the manufacturer and the applicable statutory regulations all apply.

We reserve the right to make technical modifications resulting from improvements and further development.

## 1.4. Copyright Protection

This documentation is protected by copyright.

The contents and instructions are for internal use only and may not be transferred to a third party, reproduced in any form or manner, either in whole or in part, utilised or communicated without the written permission of the manufacturer.

Infringement obligates damage compensation. Further claims shall remain reserved.

## 1.5. Spare parts

**⚠WARNING**

**Danger of injury due to wrong or faulty spare parts!**

Incorrect or defective spare parts may lead to damage, malfunction or total failure as well as impair safety.

► Only use original spare parts from the manufacturer.

| | NOTE |
|---|---|
| i | The use of spare parts other than original Mönninghoff spare parts or use of spare parts not purchased directly from Maschinenfabrik Mönninghoff GmbH & Co. KG invalidates all commitments of Maschinenfabrik Mönninghoff GmbH & Co. KG such as guarantee, service contracts etc. without prior notice.<br>► Obtain spare parts from authorised dealers or directly from the manufacturer. See page 9 for the address. |

## 1.6. Warranty terms

The guarantee conditions are included in the general terms and conditions of the manufacturer.

## 1.7. Customer service

Technical information is available from our customer service department.

**Maschinenfabrik Mönninghoff GmbH & Co. KG**

Burgstraße 35 Postfach 101749

D – 44867 Bochum D – 44717 Bochum

Telephone: +49 (0) 2327 3033-0

Email: service@moenninghoff.de

Internet: www.moenninghoff.de

Moreover, our employees are always interested in new information and experiences, which result from the use of our products or can lead to the improvement of our products.

## 1.8. Declaration of Incorporation

# Declaration of Incorporation

**according to EC Machine Directive 2006/42/EC,**

**Annex II B**

| | |
|---|---|
| Name of the manufacturer: | **Maschinenfabrik Mönninghoff GmbH & Co. KG** |
| Address of the manufacturer: | **Maschinenfabrik Mönninghoff GmbH & Co. KG**<br>**Burgstraße 35**<br>**D – 44867 Bochum** |
| We hereby declare that the product | |
| Model: | **Electromagnetic tooth clutch** |
| Type: | 550.xx |

is to be installed into a system/machine. Startup is not permitted until it is determined that the system/machine in which this electromagnetic tooth clutch is installed, complies with the requirements of the EC directives.

The following harmonised standards are applicable:

| | |
|---|---|
| **IEC 204-1** | Electrical equipment of machines – General requirements |
| **DIN EN 60204-1** | Safety of machines - electrical equipment of machines - part 1: general requirements |
| **DIN EN ISO 12100-1** | Safety of machines - basic terms, general principles of design - part 1: basic terminology, methodology |
| **DIN EN ISO 12100-2** | Safety of machines - basic terms, general principles of design - part 2: technical principles |

The technical documentation is available in its entirety.
The corresponding operating instructions for the machine/machine part are available.

☐ in their original version and
☐ in the national language of the user

Bochum, the
05.04.2022

Signature.....

Managing director: Dipl.-Kfm. Bodo Finger

# 2. Safety

## 2.1. General aspects

This section provides an overview on all safety aspects for optimum protection of staff during assembly and startup as well as safe and trouble-free operation.

Danger from electric current!

| | |
|---|---|
|  | **⚠DANGER**<br>**Danger from electric current!**<br>Contact with electrically live parts can lead to fatal injuries.<br>► Do not touch electrically live parts.<br>► When working on/with the clutch, switch off the power and secure against switching on again<br>► Pay attention to the safety instructions. |

Danger from failure to observe the safety instructions!

| | |
|---|---|
|  | **⚠DANGER**<br>**Danger from failure to observe the safety instructions!**<br>Failure to observe the safety and handling instructions listed in these instructions can lead to considerable danger.<br>► Always pay attention to all warnings and instructions listed. |

Danger from magnetic fields

| | |
|---|---|
|  | **⚠DANGER**<br>**Danger to life of persons with heart pacemakers!**<br>The magnetic field of the electromagnetic tooth clutch can impair the function of heart pacemakers if the minimum distance for the pacemaker is not observed.<br>► Persons with heart pacemakers may not work with the electromagnetic tooth clutch.<br>► Observe the regulations of BGV B11. |

## 2.2. Staff requirements

### 2.2.1. Qualifications

| | ⚠WARNING |
|---|---|
|  | **Danger of injury due to insufficient qualification!**<br>Improper use can result in considerable damage to persons or property.<br>► Only allow work to be done by **qualified** staff. |

The following qualifications are stated in the operating instructions for various different fields of activities.

- **Instructed person**
  was given instruction by the operator on his/her assigned tasks and possible dangers resulting from improper conduct.
- **Specialist staff**
  is able to carry out assigned work tasks, as well as to recognise and prevent possible dangers based on his/her technical training, knowledge and experience, including knowledge of applicable regulations.

  **Qualified electrician**
  is able to carry out assigned work tasks on electrical systems as well as recognise and prevent possible dangers based on his/her technical training, knowledge and experience, including knowledge of applicable standards and regulations.
  The qualified electrician was trained for the specific work site to which he/she is deployed, and is familiar with the relevant standards and regulations. Only permit members of staff if it can be expected that they will do their assigned tasks reliably. Those staff members whose responsiveness is affected by substances such as drugs, alcohol or medication shall not be permitted.

| | NOTE |
|---|---|
|  | Observe age and occupational-specific regulations at the location of the electromagnetic-applied tooth clutch when selecting staff. |

### 2.2.2. Unauthorized persons

| | ⚠WARNING |
|---|---|
|  | **Danger from unauthorised persons!**<br>Unauthorised persons who do not fulfil the requirements described here, are not familiar with the dangers in the work area.<br>► Do not permit unauthorised persons to be in the vicinity of the workspace.<br>► In case of doubt, approach the persons and instruct them to leave the work area.<br>► Do not continue with work while the unauthorised person is in the vicinity of the workspace. |

## 2.3. Intended use

The clutch was conceived and constructed for exclusive use in frictional connection of shafts and drive flanges.

The clutch may only be used according to the technical data and operating conditions defined by the manufacturer and DIN VDE 0580.

- No potentially explosive or aggressive atmosphere
- Ambient temperature -30°C to +60°C

| | ⚠WARNING |
|---|---|
|  | **Danger from use for other than the intended purpose!**<br>Any use other than for the intended purpose of the combination can lead to dangerous situations.<br>► Only use the clutch for its intended purpose.<br>► All information contained in these operating instructions must be strictly complied with. |

The operator is liable for all damage caused from use for other than the intended purpose.

## 2.4. Technical modifications

| | NOTE |
|---|---|
| i | In order not to endanger the operational safety of the clutch, unauthorised modifications and alterations **are prohibited**! |

## 2.5. Personal protective equipment

To minimise health risks during work, it is necessary to wear personal protective equipment.

- The protective equipment corresponding to the work being done must be worn at all times.
- Pay attention to all notices on personal protective equipment within the workspace.

The following must be worn for all work:

Only wear

| | |
|---|---|
|  | Close-fitting protective clothing with a low tear strength and no protruding parts. They are principally designed to protect against being caught by moving machine parts.<br>Do not wear rings, bracelets or other jewellery. |
|  | Goggles to protect the eyes from flying parts and liquids |

## 2.6. Particular dangers

The following section specifies residual hazards identified during risk assessment.

Pay attention to the safety instructions and warning notes specified in following sections of these operating instructions in order to reduce the risk of damage to health and avoid dangerous situations.

Danger from electric current!

**⚠DANGER**

**Danger from electric current!**

Contact with electrically live parts can lead to fatal injuries.

- ► Do not touch electrically live parts.
- ► When working on/with the clutch, switch off the power and secure against switching on again
- ► Pay attention to the safety instructions.

Danger from magnetic fields

**⚠DANGER**

**Danger to life of persons with heart pacemakers!**

The magnetic field of the electromagnetic tooth clutch can impair the function of heart pacemakers if the minimum distance for the pacemaker is not observed.

- ► Persons with heart pacemakers may not work with the electromagnetic tooth clutch.
- ► Observe the regulations of BGV B11.

Moving components

**⚠CAUTION!**

**Risk of injury from moving parts!**

Moving components can cause injuries.

- ► Do not reach into moving parts with your hands or tamper with these parts during operation.
- ► Do not open the covers during operation.
- ► Wear close-fitting protective clothing in the danger zone.

## 2.7. Safety appliances

The clutch is intended for use within a system. It has no self-contained control system and no automatic emergency stop function.

Before putting the clutch into operation, install the EMERGENCY STOP device for the clutch and integrate this into the safety chain of the system control.

The emergency stop device must be connected in such a way that interruption or re-activation of the power supply following such an interruption does not represent a dangerous situation for persons or property.

The EMERGENCY STOP devices must be accessible at all times.

The operator must install safety devices that will shut down the machine/system as soon as a person enters the danger area of the device.

## 2.8. Signs

The following symbols and signs are located in the work area. These apply to the area immediately surrounding where they are attached.

**⚠WARNING**

**Risk of injury due to illegible symbols!**

Over time, stickers and signs can become illegible due to dirt or other causes.

- ► All safety, warning and operating instructions must remain legible.
- ► Damaged signs or decals must be replaced immediately.

**⚠DANGER**

**Danger to life of persons with heart pacemakers!**

- ► Persons with heart pacemakers may not work in the designated area.

**Electric voltage**

- ► Only qualified electricians may work in the designated work area.
- ► Unauthorised persons may not enter the designated area or open the designated cabinets.

**Strong magnetic fields**

- ► Strong magnetic fields occur in the designated work area.

# 3. Technical data

| Size* | 12 | 13 | 15 | 21 | 23 | 25 | 31 | 32 |
|---|---|---|---|---|---|---|---|---|
| Nominal torque (Nm) | 20 | 40 | 100 | 200 | 350 | 600 | 1200 | 2200 |
| Coil voltage U (V) ± 10% | 24* | 24* | 24* | 24* | 24* | 24* | 24* | 24* |
| Installation dimension X ±0.1 | 0.8 | 0.5 | 0.5 | 0.8 | 0.8 | 0.8 | 0.8 | 1.0 |
| Idle speed air gap 1 ± 0.1 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 |
| Bore diameter d10(mm) for clamp pins | - | 4.5 | 4.5 | 5.5 | 7.8 | 9.5 | 9.5 | 11.5 |
| Run-out (F) | 0.05 | 0.06 | 0.06 | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 |

*The coil voltage is 24 V DC by default. On request, the coil can be designed for the following voltages: 12, 48, 96, 110, 196, 230 V DC

**NOTE**

For additional technical data, refer to the sectional drawing in section 4 "Setup and method of function" as well as the assembly drawing and the catalogue.

The assembly drawing can be requested from the manufacturer.

## 3.1. Connection dimensions, connection fixings

Refer to the assembly drawing for connection dimensions and information on connection fixings.

**NOTE**

The assembly drawing can be requested from the manufacturer.

# 4. Setup and method of function

## 4.1. Body

### 4.1.1. Individual parts view

1: slip ring
2: Stator housing
3: Switching ring
4: Coil
5: Armature assembly (variable design)
S: Face

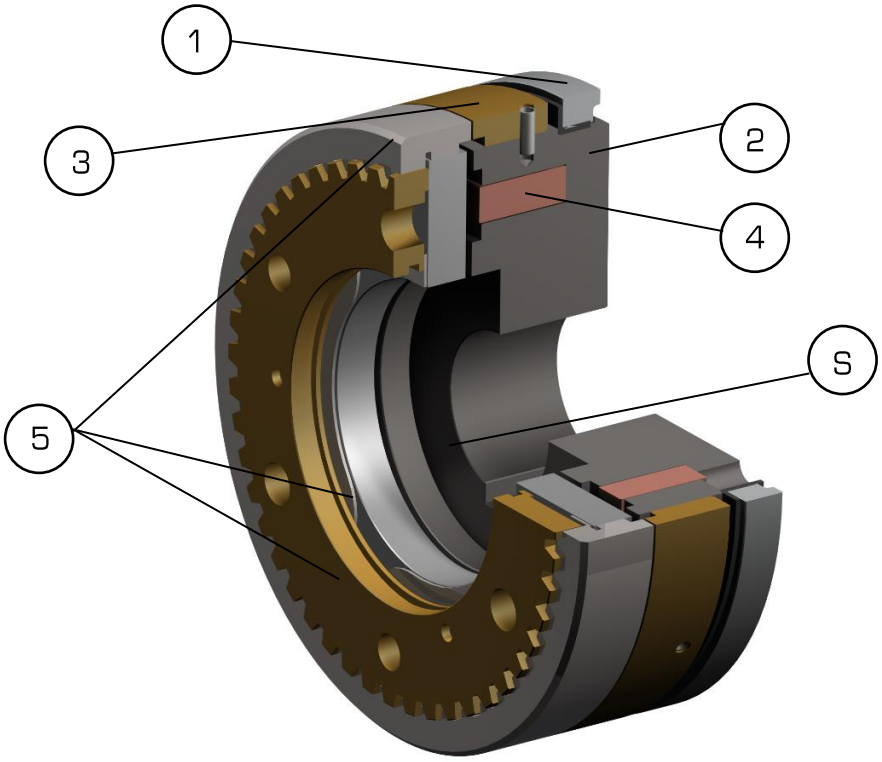
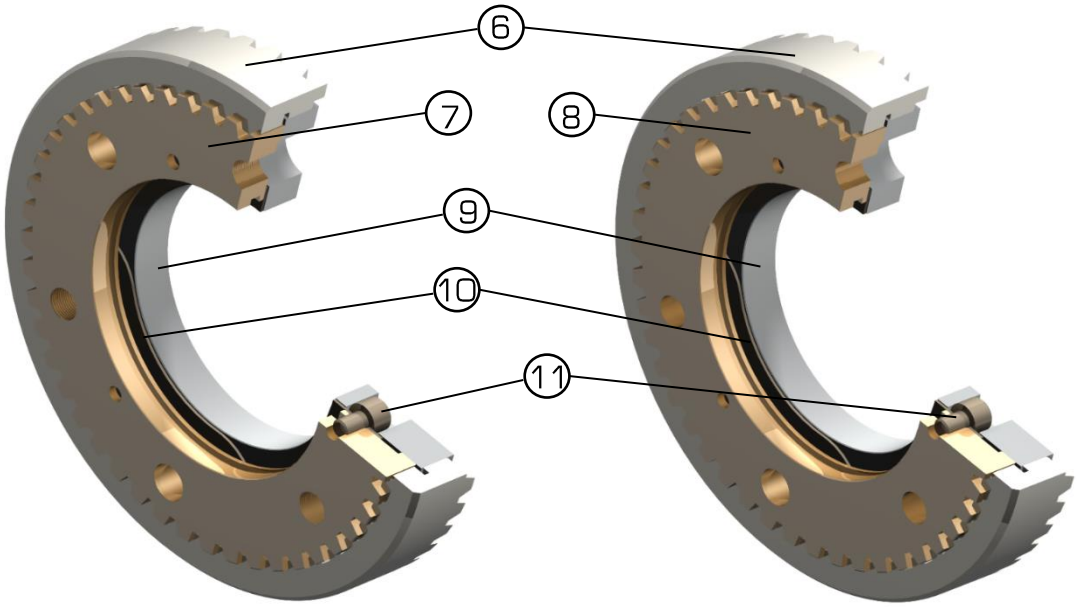



Figure 1: sectional drawing and individual parts

Depiction of the different armature ring designs




6: Sprocket
7: Centring part design 4
8: Centring part design 5
9: Armature ring
10: Diaphragm
11: Diaphragm fixing screw
12: Schnorr ring

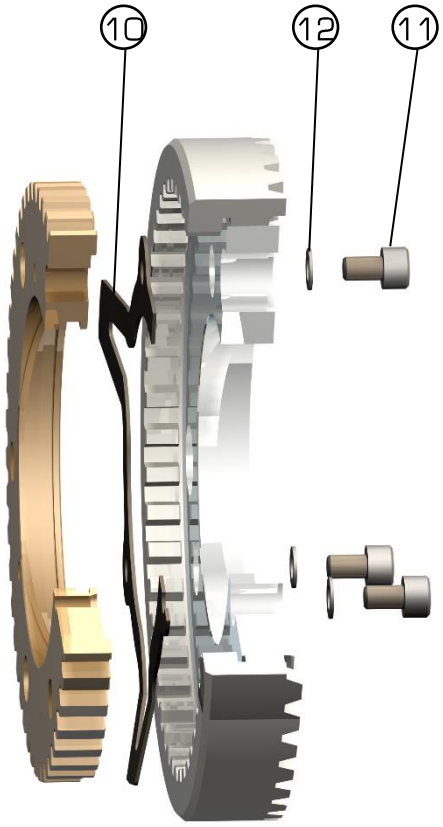



Figure 2: armature ring designs

## 4.2. Description

### 4.2.1. Features

Mönninghoff electromagnetic tooth clutches are electromagnetically-operated spur-cut clutches with slip ring and mounted coil. They are distinguished by the following characteristics:

- High non-slip torque transmission.
- Small dimensions.
- Various gearing options.
- Possibility of synchronous switching.

## 4.3. Functional method

The electromagnetic tooth clutch is operated electromagnetically. The tooth gear can be designed for various different applications.

By applying DC voltage U to the coil (4), a magnetic force is generated between the magnet housing (2) and the armature ring (9). This pulls the armature against the force of the diaphragm (10) in the direction of the stator The tooth gear engages at relative movement.

If DC voltage is no longer applied, the magnetic field collapses and the restoring force of the diaphragm allows the tooth gear to disengage. The torque transmission is then interrupted and the armature is held in the idle position by the membrane.

# 5. Transport, packaging and storage

## 5.1. Safety instructions for transport

Improper transport

| | WARNING |
|---|---|
|  | **Damage due to improper transport!**<br>Improper transport can cause considerable damage.<br>► When unloading the packaged items after delivery, as well as during in-house transport, proceed with care and pay attention to the symbols and instructions on the packaging.<br>► Protect the clutch against heavy knocks as well as all types of force during transport.<br>► Avoid strong ambient temperature fluctuations to prevent formation of condensation.<br>► Remove the packaging immediately prior to installation. |

| | WARNING |
|---|---|
|  | **Damage to property by magnetic fields!**<br>Electromagnetic tooth clutches have a strong magnetic field that is for example, capable of destroying magnetically stored data.<br>► Do not place electromagnetic tooth clutches near to EC cards, video cassettes or other magnetic data storage devices or magnetically sensitive objects. |

## 5.2. Transport inspection

Upon receipt, check consignment immediately for completeness and transport damage.

| | NOTE |
|---|---|
| i | Failure to observe the following instructions will invalidate claims to the insurer for damage. |

In the event of obvious visible transport damage, proceed as follows:

- Even if damage is only suspected, sign receipt of delivery (e.g. on the shipping document) with corresponding information under reservation.
- Determine and adhere to deadlines for submission of claims.
- Report the insurance claim immediately to the insurer and provide him with complete documentation for the damage as soon as possible (however, at the latest before possible exclusion and/or limitation periods for compensation claims against third parties expire) to enable acceleration of the claim processing procedure.

| | NOTE |
|---|---|
| i | Register any claim as soon as a defect is detected. Claims for damage can only be accepted within the valid reclamation period. |

## 5.3. Packaging

On the packaging

The individual packages are packed according to the expected transport conditions. Environmentally compatible materials were used exclusively for packaging.

The size of the transport packaging depends on the quantity delivered.

Packaging should protect the components from transport damage, corrosion and other damage up until installation. For this reason, do not destroy the packaging and remove it only just prior to installation.

Handling packing material

The packaging protects the clutch against damage during transit. The packing materials were selected according to environmental and waste disposal aspects and can therefore be recycled.

Recycling the packaging material for further use saves raw materials and reduces waste. When no longer required, dispose of the packing materials according to local environmental regulations.

## 5.4. Removing from the packaging

Carefully remove the individual parts of the clutch from the packaging.

## 5.5. Storing the packaged items

Anticorrosion oil was applied to clutch parts not protected against corrosion, which must be stored in the original packaging.

Check the corrosion protection when the duration of storage exceeds six months. If the corrosion protection was removed during control of goods received, renew conservation (e.g., with Tectyl 472 from Valvoline).

Packages must be stored under the following conditions:

- Do not store outdoors.
- Store at a dry and dust-free location.
- Do not expose to aggressive media.
- Protect against solar radiation.
- Avoid mechanical shocks and damage.
- Storage temperature: +5 to +45 °C.
- Relative humidity: max. 60 %.
- When storing for longer than 3 months, check the general condition of all parts and the packaging regularly.

| | NOTE |
|---|---|
| i | It is possible that instructions for storage are on the packaging that go beyond the stated requirements. Follow these instructions accordingly. |

# 6. Installation

## 6.1. Safety

Staff

Installation and initial startup may only be carried out by specially trained specialist staff.

Danger from electric current!

| | |
|---|---|
|  | **⚠DANGER**<br>**Danger from electric current!**<br>Contact with electrically live parts can lead to fatal injuries.<br>► Do not touch electrically live parts.<br>► When working on/with the clutch, switch off the power and secure against switching on again<br>► Pay attention to the safety instructions. |

Danger from magnetic fields

| | |
|---|---|
|  | **⚠DANGER**<br>**Danger to the life of persons with active health aids (heart pacemakers)!**<br>The magnetic field of the electromagnetic tooth clutch can impair the function of active health aids such as heart pacemakers if the minimum distance for respective device is not observed.<br>► Persons with active health devices may not work with the electromagnetic tooth clutch<br>► Observe the regulations of BGV B11. |

Personal protective equipment

Wear the following protective equipment during all work on installation and initial startup:

| | |
|---|---|
|  | Close-fitting protective clothing with a low tear strength and no protruding parts. They are principally designed to protect against being caught by moving machine parts.<br>Do not wear rings, bracelets or other jewellery. |
|  | Goggles to protect the eyes from flying parts and liquids |

Improper installation and initial startup

| | |
|---|---|
|  | **⚠CAUTION!**<br>**Risk of injury due to improper installation and initial startup!**<br>Improper installation and initial startup can lead to personal injury or material damage.<br>► Before beginning work, make sure that sufficient installation workspace is available.<br>► Be careful when handling exposed, sharp-edged components.<br>► Pay attention to tidiness and cleanliness at the workplace! Parts and tools lying around or on top of each other can be sources of accidents.<br>► Parts must be properly installed. Adhere to the specified screw torques. |

## 6.2. Preparation

Before installing, check the following points:

- The clutch should not show any deformation, scratches and other damage indicating that it was dropped.
- A sufficient electric supply must be assured (see section "Technical Data").

## 6.3. Setup

Mounting the stator

| | NOTE |
|---|---|
| | The electromagnetic tooth clutch is delivered in a pre-assembled condition. It is not necessary to assemble the individual components. |

Check the parts for completeness, dimensional stability and damage. Clean the shaft ends and flange holes thoroughly.

| | NOTE |
|---|---|
| | The shaft fitting should be h7 to j6.<br>The bore fitting of the centring body for the shaft is H7 by default. The bore in the stator is tolerated with K6. |

| | WARNING |
|---|---|
| | **Damage from improper, forced assembly!**<br>Improper, forceful assembly can cause considerable damage to property.<br>► Never forcefully strike or press the stator!<br>► Only apply assembly force to the front face of the stator! |

- Push the stator onto the drive shaft of the machine.
- Only apply assembly force to the faces of the stator housing marked with **"S"** in order not to damage the stator housing and the switching ring.
- Centre the stator via the internal diameter **"A"** on the customer connecting part and screw together.

| | NOTE |
|---|---|
| | Centre the magnet housing very carefully to ensure proper use! |

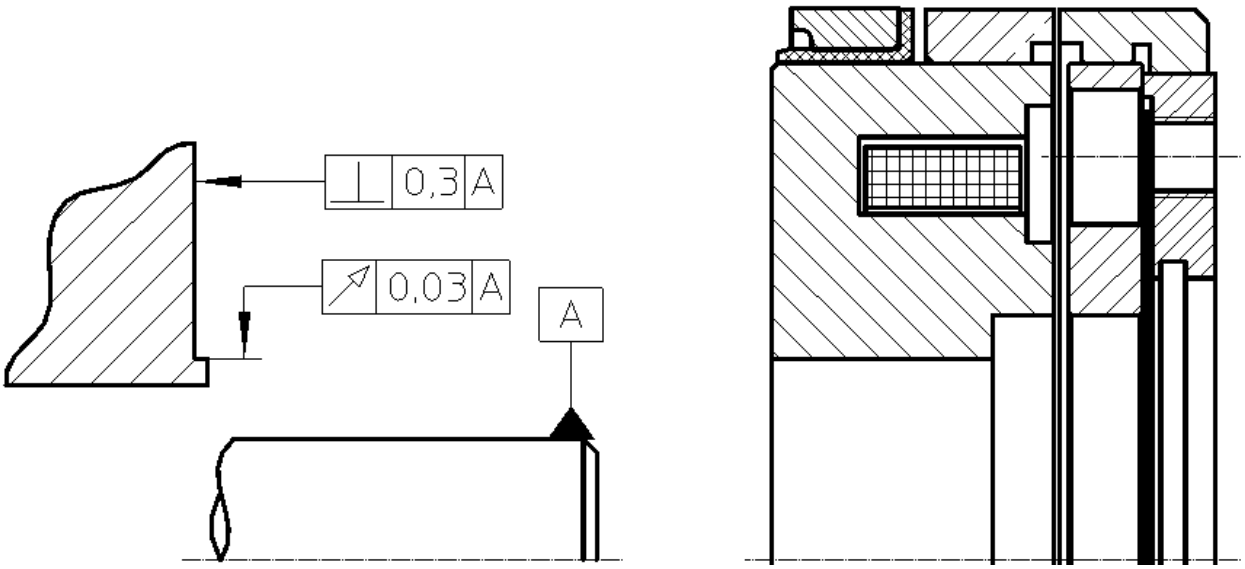



Figure 3: Position tolerances stator

- Connection of the stator to the power supply by means of brushes onto the isolated slip ring may only take place after the clutch has been completely assembled.

| | |
|---|---|
| | **WARNING** |
| | **Damage from improper, forced disassembly!**<br>Improper, forced disassembly can lead to deformation of the stator or the switching ring and therefore to destruction of the clutch.<br>► Never apply force to the switching ring. |

Assembling the armature for design 4 and 6

The only difference between armatures 4 and 6 is the switching ring installed in design 6. The centring parts for design 4 and 6 are to be fixed to a customer's connecting part with threaded holes. Assembly for both armature designs is identical.

- Dismantle the centring part (7). For this purpose, remove the three diaphragm fixing screws (11).
- The centring part for producing the pinholes can be taken from the armature.
- Bore the fixing pin holes to the required size.
- Subsequently clean the centring part thoroughly. Make sure that no drilling swarf remains in the tooth guide of the centring part.
- Grease the tooth guide with Molykote after cleaning and before reinstalling into the armature.

- Centre, screw and pin the centring part with its internal diameter to the component of the customer.

| | NOTE |
|---|---|
| i | Make sure that the fixing pin and the ends of the threads do not protrude out of the front face **"H"** of the centring part (see fig. 4). |

- Subsequently screw the centring part and armature.
- Push the assembled component for the stator onto the shaft.
- Put the stator and armature together so that the run-out deviations between the stator and armature are not greater than stated (see section 3, "Technical Data").
- Mount the centring part with the connecting machine part onto the shaft and secure axially. Subsequently set the idle speed gap of the clutch.

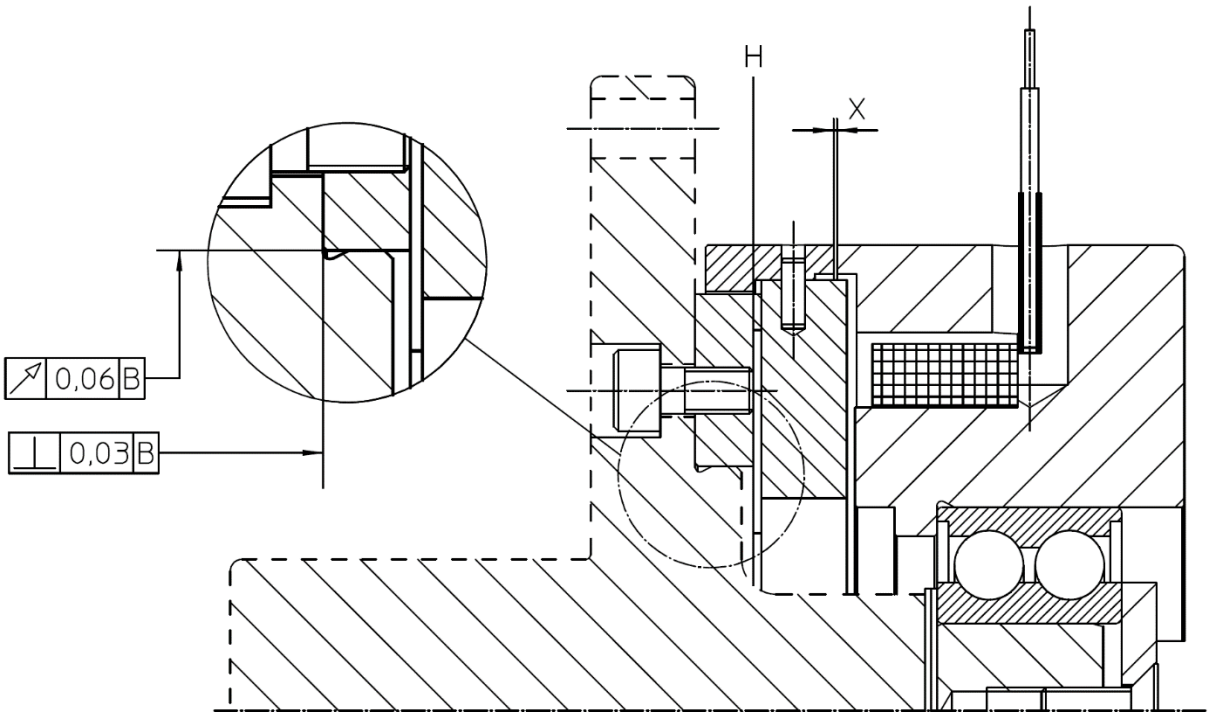



Figure 4: face "H" of the centring part

Assembling the armature for design 5 and 7

The only difference between armatures 5 and 7 is the switching ring installed in design 7. The centring parts for design 5 and 7 are to be fixed to a customer's connecting part with threaded holes. Assembly for both armature designs is identical.

- Dismantle the centring part (8). For this purpose, remove the three diaphragm fixing screws (11).
- The centring part for producing the pinholes can be taken from the armature.
- Bore the fixing pin holes to the required size.
- Subsequently clean the centring part thoroughly. Make sure that no drilling swarf remains in the tooth guide of the centring part.
- Grease the tooth guide with Molykote after cleaning and before reinstalling into the armature.
- Centre, screw and pin the centring part with its internal diameter to the component of the customer.

| | NOTE |
|---|---|
| i | Make sure that the fixing pin and the ends of the threads do not protrude out of the front face **"H"** of the centring part (see fig. 4). |

- Subsequently screw the centring part and armature.
- Push the assembled component onto the shaft.
- Put the stator and armature together so that the run-out deviations between the stator and armature are not greater than stated (see section 3, "Technical Data").
- Mount the centring part with the connecting machine part onto the shaft and secure axially.
- Subsequently set the idle speed gap of the clutch.

Setting the idle speed air gap

The idle speed air gap, meaning the gap between the tips of the gear face in a switched-off condition of the clutch, must be correctly set. If it is too big, the clutch will not engage properly. If on the other hand, if it is set too small, proper disengaging of the tooth gear is not possible.

Refer to the technical data for the idle speed gap width dimension (see section 3).

| | NOTE |
|---|---|
| i | After setting the idle speed air gap, **do not shift the clutch assemblies axially!** |

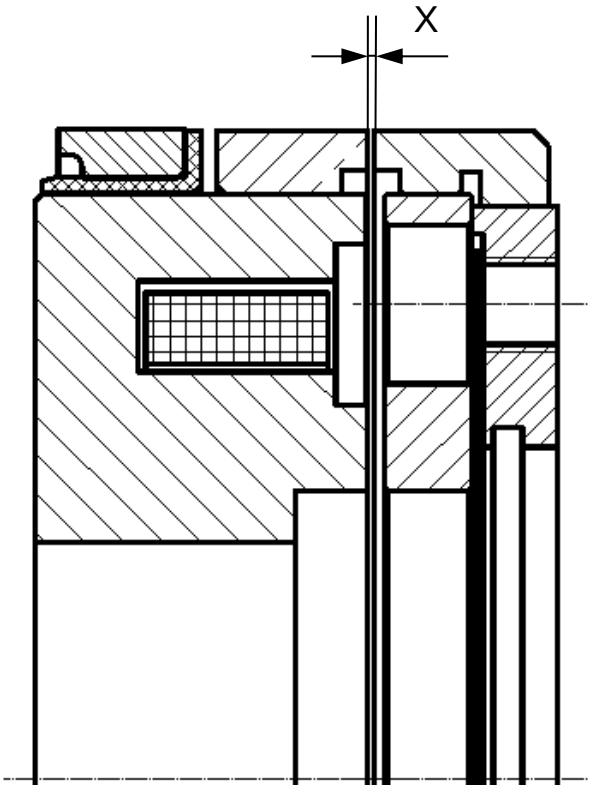



Figure 5: idle speed air gap dimension "X"

Electrical connection

**⚠ DANGER**

**Danger from electric current!**

In the case of electromagnetically-operated device, it is possible that dangerously high electrical voltages are induced during the switch-off procedure.

- ► To prevent high induction voltage peaks, install voltage-dependent resisters (varistors) parallel to the coil or provide a protective circuit.
- ► Do not touch electrically live parts.
- ► Observe the current safety regulations at the place of use for the installation of electrical systems.

**⚠ DANGER**

**Danger to life of persons with heart pacemakers!**

The magnetic field of the electromagnetic tooth clutch can impair the function of heart pacemakers if the minimum distance for the pacemaker is not observed.

- ► Persons with heart pacemakers may not work with the electromagnetic tooth clutch.
- ► Observe the regulations of BGV B11.

**NOTE**

Only operate electromagnetic tooth clutches with **DC current**.

The design of a coil corresponds to the coil voltages specified in the technical data (see section 3).

Polarity is freely selectable.

The coil is designed for a holding voltage of 24 V DC at a switching time of 100% ED.

Switch the current only in the DC current circuit to prevent switch-on and switch-off delays when switching the clutch.

# 7. Startup

Danger from electric current!

**⚠DANGER**

**Danger to life from electric current!**

Contact with live components can be fatal. Switched-on electrical components can cause uncontrolled movement and lead to serious injuries.

- ► Before beginning any work, switch off the power and secure against switching on again.

Danger from magnetic fields

**⚠DANGER**

**Danger to the life of persons with active health aids (heart pacemakers)!**

The magnetic field of the electromagnetic tooth clutch can impair the function of active health aids such as heart pacemakers if the minimum distance for respective device is not observed.

- ► Persons with active health devices may not work with the electromagnetic tooth clutch
- ► Observe the regulations of BGV B11.

Danger from rotating components

**⚠CAUTION!**

**Damage to persons from moving components!**

Rotating parts can cause injury.

- ► Never reach into the area of the rotating clutch and shafts!
- ► Protect the clutch against unintentional access during operation!

- Check for correct assembly of all components before startup of the clutch.
- Check tooth gear for proper engaging and disengaging while at idle.
- Check the function of all safety devices that are to be used with the clutch.
- Switch on the clutch when the system is at idle.
- Start up the system.
- The clutch must be engaged or engage during startup.

| | NOTE |
|---|---|
| | Overratcheting the clutch is **not permitted!** |

- Observe the clutch.
- The clutch can be put into continuous operation after checking for proper function.

| | WARNING |
|---|---|
|  | **Danger of damage to the clutch when switching at too high differential speeds.**<br>Switching the clutch at too high differential speeds causes wear or destruction of the tooth gear.<br>► Switch on clutches with fixed-point switching only at standstill or at very low differential speeds |

| | NOTE |
|---|---|
| | It is not possible to specify the maximum possible switching speed. |

# 8. Operating

## 8.1. General aspects

The clutch is operated fully automatically after startup. Manual intervention is only required for cleaning and fault rectification.

## 8.2. Recommendations for operation

Pay attention to all relevant safety and accident prevention regulations for the place of operation during operation.

The operating staff must be familiar with the details of operating the clutch before startup.

Danger from electric current!

| | |
|---|---|
|  | **⚠DANGER**<br>**Danger to life from electric current!**<br>Contact with live components can be fatal. Switched-on electrical components can cause uncontrolled movement and lead to serious injuries.<br>► Before beginning any work, switch off the power and secure against switching on again. |

Danger from magnetic fields

| | |
|---|---|
|  | **⚠DANGER**<br>**Danger to the life of persons with active health aids (heart pacemakers)!**<br>The magnetic field of the electromagnetic tooth clutch can impair the function of active health aids such as heart pacemakers if the minimum distance for respective device is not observed.<br>► Persons with active health devices may not work with the electromagnetic tooth clutch<br>► Observe the regulations of BGV B11. |

Danger from rotating components

|  | **⚠CAUTION!** |
|---|---|
| | **Damage to persons from rotating components!**<br>Rotating parts can cause injury.<br>► Never reach into the area of the rotating clutch! |

|  | **NOTE** |
|---|---|
| | Only operate the clutch according to the protective requirements in DIN VDE 0580. |

- Cover the clutch to protect it against dirt and magnetic dust.
- Observe the required radio interference suppression measures.
- Introduce adequate measures according to DIN VDE 0848 part 4 to rule out danger to persons and property by direct or indirect electromagnetic fields.

In an unassembled condition, the clutch has IP00 degree of protection according to DIN VDE 0470. The choice of location for setup and use must allow for these circumstances.
If applicable, introduce protective measures to increase the degree of protection should the ambient conditions make this necessary.

|  | **NOTE** |
|---|---|
| | If safety-relevant changes occur during operation of the clutch, stop the system immediately and repair or replace the clutch.<br>If in doubt, contact the manufacturer. |

In the case of electromagnetic tooth clutches that are designed for "oil running" (clutch is not immersed; only splash oil), use only synthetic oil or mineral oil without zinc additives or mixtures containing zinc (e.g., zinc dialkyl dithiophosphates / service life additives).

Only use oils with a viscosity up to 25 x $10^{-6}$ $m^2/s$ at 50°C (3°E/50°C).

# 9. Faults

Possible causes of faults and their elimination are described in the following section.

If a fault cannot be eliminated after following the instructions provided, the manufacturer should be contacted, see service addresses on page 9.

## 9.1. Safety

Danger from electric current!

| | |
|---|---|
|  | **⚠DANGER**<br>**Danger to life from electric current!**<br>Contact with live components can be fatal. Switched-on electrical components can cause uncontrolled movement and lead to serious injuries.<br>► Switch off the electric power prior to starting work and secure it against being switched back on. |

Danger from magnetic fields

| | |
|---|---|
|  | **⚠DANGER**<br>**Danger to the life of persons with active health aids (heart pacemakers)!**<br>The magnetic field of the electromagnetic tooth clutch can impair the function of active health aids such as heart pacemakers if the minimum distance for respective device is not observed.<br>► Persons with active health devices may not work with the electromagnetic tooth clutch<br>► Observe the regulations of BGV B11. |

Staff

- Faults may only be eliminated by specially trained, qualified staff.
- Work on electrical systems may only be carried out by specialist qualified electricians.

Danger from rotating components

| | |
|---|---|
|  | **⚠CAUTION!**<br>**Damage to persons from rotating components!**<br>Rotating parts can cause injury.<br>► Never reach into the area of the rotating clutch! |

Personal protective equipment

Wear the following protective equipment during work with the clutch:

| | |
|---|---|
|  | Close-fitting protective clothing with a low tear strength and no protruding parts. They are principally designed to protect against being caught by moving machine parts.<br>Do not wear rings, bracelets or other jewellery. |
|  | Goggles to protect the eyes from flying parts and liquids |

Improperly performed work on elimination of faults

**⚠WARNING**

**Risk of injury from improperly performed work on elimination of faults!**

Improperly performed work can cause severe damage to persons and property.

- ▶ Before beginning work, make sure that sufficient installation workspace is available.
- ▶ The following applies to the system, in which the clutch is to be operated: never disable the safety devices in the system.
- ▶ Pay attention to tidiness and cleanliness at the workplace! Loosely stacked or scattered parts and tools are sources of accident.
- ▶ If components are removed, pay attention to correct assembly; replace all fixing elements and adhere to all screw torques.
- ▶ In the event of malfunctions or irregularities, stop the system and clutch and inform the person responsible. If faults cannot be rectified, contact the service department of the Maschinenfabrik Mönninghoff GmbH & Co. KG.
- ▶ In the event of errors, switch off all electrical connections before determining the fault.

## 9.2. Malfunctions

The following table provides an overview of possible faults and their causes. If there any uncertainties or questions, consult the manufacturer.

| Error | Possible cause | Remedy |
|---|---|---|
| Clutch does not switch on | Electrical supply interrupted<br>Voltage supply defective | Check voltage supply and supply lines |
| | Coil has short circuit or ground fault | Measure the resistance of the coil. Compare the measured resistance with the nominal resistance (see technical data for value). If the resistance is too low, replace the clutch and return for repair |
| | Wiring is wrong or defective | Check wiring<br>check cable for continuity |
| | Idle speed air gap set too big | Check and correct idle speed air gap |
| Clutch does not switch off | Idle speed air gap set to small, tooth gear cannot disengage | Check idle speed air gap and reset |
| | Diaphragm is damaged or permanently deformed | Dismantle the clutch and return for repair |
| | Armature assembly not properly installed | Install armature assembly properly |
| Clutch switches off with delay | Tooth guide of the centring part heavily contaminated or damaged | Dismantle the clutch, check tooth guide, clean and grease with Rocol MTS 2000<br>If damaged, return the clutch for repair |

| Error | Possible cause | Remedy |
|---|---|---|
| Clutch engages, however gears slip afterwards | Overloading | Stop the system immediately and eliminate the cause of overloading |
| | Tooth gear worn or destroyed | Dismantle clutch and replace |
| | Magnetic field not strong enough<br>Coil probably defective | Check coil and if defective, replace clutch |
| | Idle speed air gap too big | Set idle speed air gap |
| Clutch does not engage or only after considerable delay | Differential speed too high<br>Fixed-point tooth cannot engage fast enough | Lower speed, preferably switch the clutch at standstill |

# 10. Maintenance

The clutch does not require regular maintenance work.

Work on the clutch is only necessary when rectifying a fault. When rectifying a fault, pay attention to the safety instructions in section 9 "Malfunctions".

## 10.1. Checking for wear

**⚠CAUTION!**

**Damage to persons from rotating components!**

Rotating parts can cause injury.

- ► Only check for wear when the clutch is at a standstill!
- ► Never reach into the area of the rotating clutch!

**NOTE**

The electromagnetic tooth clutch is maintenance-free. Nevertheless, the tooth gear must be checked regularly for wear.

The intervals for checking wear depend on the conditions at the place of operation. Increased load on the electromagnetic tooth clutches due to increased switching frequency or frequent overload conditions necessitates shorter intervals.

The intervals for checking are determined by information obtained during operation.

**NOTE**

Store reserve clutches to keep system downtime as short as possible in the event of a disturbance.

# 11. Disassembling

When the end of the service life is reached, the clutch must be dismantled and disposed of according to environment regulations.

## 11.1. Safety

Staff

- Dismantling may only be performed by qualified staff.

Electrical system

**⚠DANGER**

**Danger to life from electric current!**

Contact with live components can be fatal.

► Switch off the electric power prior to starting work and secure it against being switched back on.

## 11.2. Disassembling

Electrical system

Before disassembling:

- Switch off the system, in which the clutch is installed and secure against being switched on again.
- Physically disconnect the entire power supply.

Finally, clean components and parts properly and disassemble in compliance with applicable local work and environmental protection regulations.

## 11.3. Disposal

If no agreement was made on product return and disposal, please submit dismantled components for recycling:

- Scrap all metals.
- Submit plastic elements for recycling.
- Sort and dispose of other components according to material characteristics.

**WARNING**

**Environmental damage resulting from incorrect disposal!**

► Electrical scrap, electronic components, lubricants and other accessories are subject to special waste handling and must be disposed of by authorised specialist companies only!

► The local authorities or special waste disposal companies can provide information on proper disposal according to environmental regulations.

# 12. Applicable standards, guidelines and regulations

| Standard | Designation |
|---|---|
| DIN 740 - 1 | Drive technology; flexible shaft couplings.;<br>Requirements; technical delivery conditions |
| DIN 740 - 2 | Drive technology; flexible shaft couplings;<br>Terms and calculation bases |
| DIN VDE 0470 | Protection class by housing<br>(IP code) |
| DIN VDE 0580 | Electromagnetic devices |
| DIN 31000 | General principles for safety-conscious design of technical products |
| DIN 867 | Reference profile for involute gears |
| DIN ISO 281 | Dynamic load ratings and nominal life cycle calculation procedure for rolling bearings |
| DIN ISO 1940 | Requirements on the balancing quality of rigid rotors |
| VDI 2230 sheet 1 | Systematic calculation of heavily loaded screw connections;<br>Cylindrical screw-in connections |