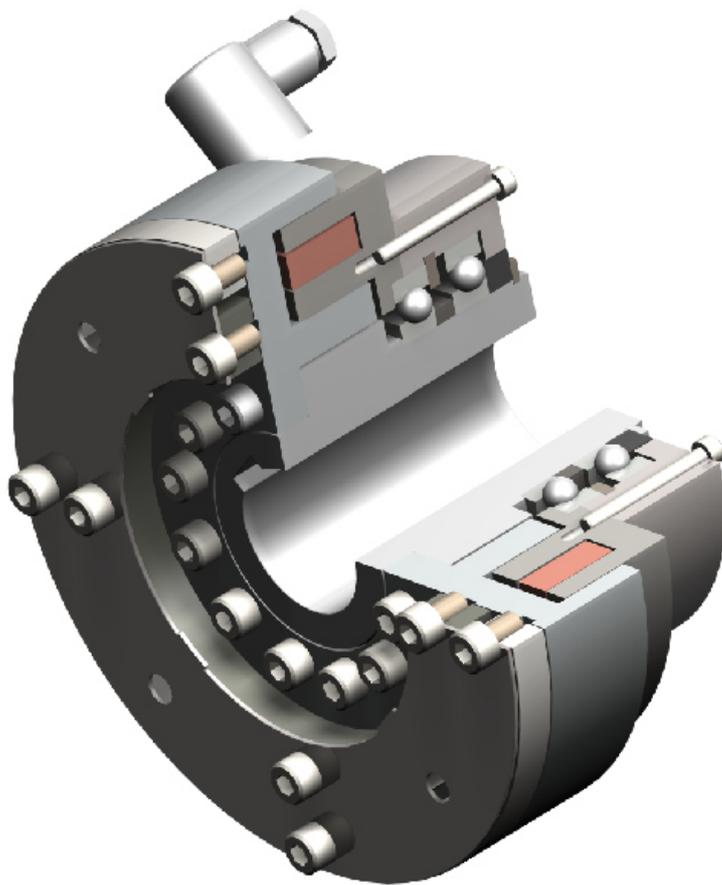


Operating and Assembly Instructions

**Pole-face friction clutch
Type 450.xx**



**Doc-ID: T24.0098
as of: 12/2018**

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

Content

1. General	4
1.1. Information about these instructions	4
1.2. Explanation of symbols	4
1.3. Limitation of liability	7
1.4. Copyright	7
1.5. Spare parts	7
1.6. Guarantee conditions	8
1.7. Customer service	8
1.8. Declaration of Incorporation	9
2. Safety	10
2.1. General	10
2.2. Staff requirements	10
2.2.1. Qualifications	10
2.2.2. Unauthorized persons	11
2.3. Intended use	12
2.4. Technical modifications	12
2.5. Personal protective equipment	13
2.6. Specific dangers	13
2.7. Safety devices	15
2.8. Signs	15
3. Technical data	16
3.1. Connection dimensions, connection fixings	16
4. Setup and method of function	17
4.1. Setup	17
4.2. Description	18
4.2.1. Features	18
4.3. Functional method	18
5. Transport, packaging and storage	19
5.1. Safety instructions for transport	19
5.2. Transport inspection	19
5.3. Packaging	20
5.4. Unpacking	20
5.5. Storing the packaged items	21
6. Installation	22
6.1. Safety	22
6.2. Preparation	23

6.3. Setup	24
7. Startup	27
7.1. Safety precautions	27
7.2. Putting the clutch into operation	28
7.3. Running in the pole surfaces	28
8. Operating	29
8.1. General	29
8.2. Recommendations for operation	29
9. Faults	31
9.1. Safety	31
9.2. Malfunctions	34
10. Maintenance	35
10.1. Checking for wear	35
10.2. Cleaning	37
10.2.1. General	37
10.2.2. Preparing for cleaning work	37
10.2.3. Cleaning	37
11. Dismantling	38
11.1. Safety	38
11.2. Dismantling	38
11.3. Disposal	38
12. Applicable standards, guidelines and regulations	39

1. General

1.1. Information about these instructions

These instructions enable safe and efficient handling of the type 450 pole-face friction clutch, hereinafter referred to as clutch.

These instructions are part of the clutch system and must be kept in the immediate vicinity of the location, where the clutch is used 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 the range of application of the combination.

1.2. Explanation of symbols

Warnings

All warnings in these operating instructions will be indicated by a warning symbol.

The following warning symbols are used throughout these operating instructions:

Symbol	Meaning
	General warning
	Danger of 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 indicates the type of danger.

The following warnings are used throughout these instructions:

	⚠ DANGER
	<p>Danger to life</p> <p>Consequences upon non-observance of the instructions...</p> <p>▶ In order to avoid...</p>

A warning of this category indicates an impending 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 possible danger of serious injury or even death.

	⚠ WARNING
	<p>Risk of injury!</p> <p>Consequences upon non-observance of the instructions...</p> <p>▶ In order to avoid...</p>

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
	<p>Injury to persons due to..!</p> <p>Consequences upon non-observance of the instructions...</p> <p>▶ In order to avoid...</p>

A warning of this category indicates a potentially dangerous situation.

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

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

	ATTENTION
	<p>Damage to property due to...</p> <p>Consequences upon non-observance of the instructions...</p> <p>▶ In order to avoid...</p>

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

i	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
	<p>Danger due to electric current!</p> <p>Consequences upon non-observance of the instructions...</p> <p>▶ In order to avoid...</p>

	⚠ DANGER
	<p>Danger to persons with heart pacemakers!</p> <p>Consequences upon non-observance of the instructions...</p> <p>▶ In order to avoid...</p>

1.3. Limitation of liability

All specifications and notes in these instructions were compiled according to all standards and regulations considering the current state of technology and many years of knowledge and experience.

The manufacturer assumes no liability for damages resulting from:

- Upon non-observance of the instructions
- Use for the non-intended purpose
- Deployment of insufficiently qualified staff
- Unauthorized modifications
- Technical modifications
- Use of non-approved spare parts

The commitment as agreed in the delivery contract, the general terms and conditions, the delivery conditions specified by the manufacturer as well as the applicable statutory regulations apply.

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

1.4. Copyright

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, utilized or communicated without the written permission of the manufacturer.

Infringement obligates damage compensation. We reserve the right to impose further claims.

1.5. Spare parts

	▲WARNING
	<p>Danger of injury due to wrong or faulty spare parts!</p> <p>Incorrect or defective replacement parts can lead to injury, damage, malfunction or total breakdown.</p> <p>► Use original spare parts from the manufacturer only.</p>

NOTE	
i	<p>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 or its dealers such as guarantee, service contracts etc. without prior notice.</p> <p>► Obtain spare parts from authorized dealers or directly from the manufacturer. See page 8 for the address.</p>

1.6. Guarantee conditions

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

Bessemerstraße 100 Postfach 101749
D – 44793 Bochum D – 44717 Bochum
Tel.: +49 (0) 234 3335-0
E-Mail: 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**
Bessemerstrasse 100
D - 44793 Bochum

We hereby declare that the product

Model: Pole-face friction clutch
 Type 450.xx

Project no.:

is intended for installing into a system/machine. Startup is not permitted until it is determined that the system/machine in which this pole-face friction clutch is installed, complies with the requirements of the EC directives.

The following harmonized standards were applied:

- 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

Full technical documentation is available.

The corresponding operating instructions for the machine/machine part are available.

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

Bochum,
21.09.2018

Signature..... 
 Managing director: Dipl.-Kfm. Bodo Finger

2. Safety

2.1. General

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 failure to observe the safety instructions!

	⚠ DANGER
	<p>Danger due to failure to observe the safety instructions!</p> <p>Failure to observe the safety and instructions listed in these assembly instructions can lead to considerable danger.</p> <p>▶ Always pay attention to all warnings and instructions listed.</p>

2.2. Staff requirements

2.2.1. Qualifications

	⚠ WARNING
	<p>Danger of injury due to insufficient qualification.</p> <p>Improper use can result in considerable damage to persons or property.</p> <p>▶ All activities shall only be performed by qualified staff.</p>

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 recognize 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 recognize and prevent possible dangers based on his/her technical training, knowledge and experience, including knowledge of applicable standards and regulations.

The qualified electrician has been 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 carry out their assigned tasks reliably. Those staff members whose responsiveness is affected by substances such as drugs, alcohol or medication shall not be permitted.

i	NOTE
	Observe all age and occupational regulations at the location of the electromagnetic tooth clutch when selecting staff!

2.2.2. Unauthorized persons

	⚠ WARNING
	<p>Danger due to unauthorized persons!</p> <p>Unauthorized persons who do not fulfil the requirements described here, are not familiar with the dangers in the work area.</p> <ul style="list-style-type: none"> ▶ Do not permit unauthorized persons to be in the vicinity of the work area. ▶ In case of doubt, approach the persons and instruct them to leave the work area. ▶ Do not continue with work while the unauthorized person is in the vicinity of the work area.

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	
	<p>Danger due to use for other than the intended purpose!</p> <p>Any use other than for the intended purpose of the combination can lead to dangerous situations.</p> <ul style="list-style-type: none"> ▶ Only use the clutch for its intended purpose. ▶ 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	
	<p>In order not to endanger the operational safety of the clutch, unauthorized modifications and alterations are prohibited!</p>

2.5. Personal protective equipment

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

- The protective equipment corresponding to the work, which is carried out, must be worn at all times.
- Pay attention to all advices on personal protective equipment within the work area.

Only wear

The following must be worn for all work:

	<p>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.</p> <p>Do not wear rings, bracelets or other jewelry.</p>
	<p>Goggles to protect the eyes from flying parts and liquids</p>
	<p>Protective footwear with steel caps and oil-resistant soles</p>

2.6. Specific 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 due to electric current!

	<p>⚠ DANGER</p>
	<p>Danger due to electric current!</p> <p>Contact with electrically live parts can lead to fatal injuries.</p> <ul style="list-style-type: none"> ▶ 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 due to magnetic fields

	⚠ DANGER
	<p>Danger to life of persons with heart pacemakers!</p> <p>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.</p> <ul style="list-style-type: none"> ▶ Persons with heart pacemakers may not work with the electromagnetic tooth clutch. ▶ Observe the regulations of BGV B11.

Danger of burns

	⚠ WARNING
	<p>Danger of burns due to hot surfaces!</p> <p>Parts of the clutch become very hot during operation. Observe the following safety instructions to avoid injuries from burning:</p> <ul style="list-style-type: none"> ▶ Always wear protective clothing when working. ▶ Allow the clutch to cool down before maintenance/cleaning.

Moving components

	⚠ CAUTION
	<p>Risk of injury due to moving parts!</p> <p>Moving components can cause injuries.</p> <ul style="list-style-type: none"> ▶ 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 devices

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 working area. These apply to the area immediately surrounding where they are mounted.

	▲WARNING
	<p>Risk of injury due to illegible symbols!</p> <p>Due to dirt or other causes, stickers and signs can become illegible.</p> <ul style="list-style-type: none"> ▶ All safety, warning and operating instructions must remain legible. ▶ Damaged signs or stickers must be replaced immediately.

	▲DANGER
	<p>Danger to the life of persons with active health aids!</p> <ul style="list-style-type: none"> ▶ Persons with active health aids such as heart pacemakers may not work in the designated area.

	<p>Electric voltage</p> <ul style="list-style-type: none"> ▶ Only qualified electricians may work in the designated work area. ▶ Unauthorized persons may not enter the designated area or open the designated cabinets.
	<p>Strong magnetic fields</p> <ul style="list-style-type: none"> ▶ Strong magnetic fields occur in the designated work area.

3. Technical data

Size	23	25	31	32	33	35	38
Nominal torque (Nm)	250	500	1300	2000	2800	5000	8000
Coil voltage U (V) +5%/ 10%	24*	24*	24*	24*	24*	24*	24*
Coil resistance R (Ω) (at 20 °C)	13.7	5.9	4.23	3.38	2.81	2.13	1.6
Coil capacity P (W) (at 20 °C)	42.1	97	136	171	205	270.5	360
Air gap (mm) ^{+0.2}	0.4	0.4	0.4	0.4	0.5	0.5	0.6

*The coil voltage is 24 V DC by default. Other voltages on request

NOTE	
i	<p>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.</p> <p>The assembly drawing can be requested from the manufacturer.</p>

3.1. Connection dimensions, connection fixings

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

NOTE	
i	<p>The assembly drawing can be requested from the manufacturer.</p>

4. Setup and method offunction

4.1. Setup

Armature assembly

- 1 Allen head screws
- 2 Diaphragm
- 3 Inner armature ring
- 4 Outer armature ring

Stator group

- 5 Solenoid
- 6 Stator housing
- 7 Angled plug connector
DIN43650-A

Rotor

- 8 Rotor
- 9 Allen screw
- 10 Hub
- 11 Bearing ring and grease
chamber lid
- 12 Spacer ring
- 13 Air gap

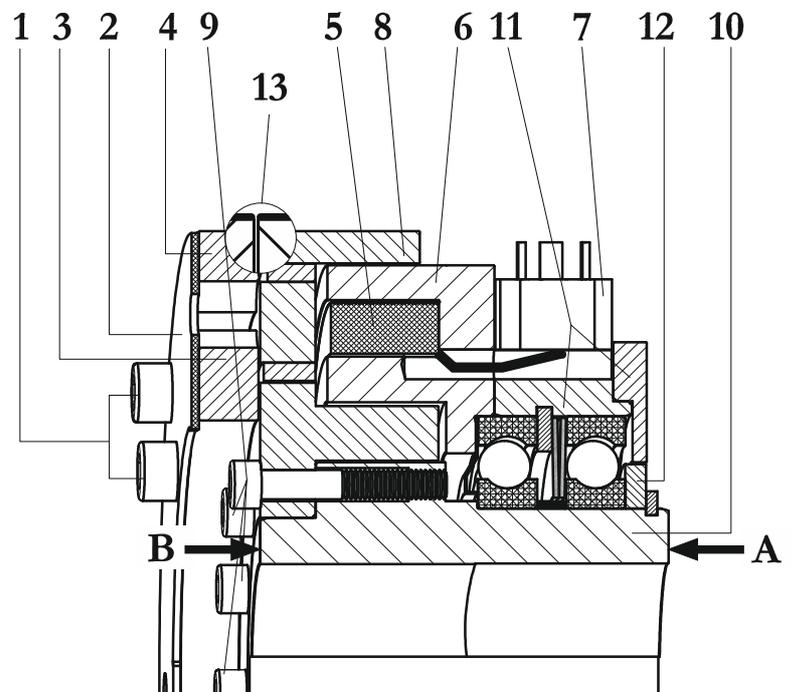


Figure 1: sectional drawing and individual parts

4.2. Description

4.2.1. Features

Mönninghoff pole-face friction clutches are electromagnetically-activated friction clutches that are particularly suitable for torque transmission with initial differential speed between the drive elements. They are distinguished by the following characteristics:

- High backlash-free torque transmission.
- Fast separation of the coupling halves without residual torque during shut-down.
- High switching rates are possible.

NOTE	
i	<p>According to the EMC directive, electromagnetic clutches and brakes from Maschinenfabrik Mönninghoff GmbH & Co. KG cannot be operated independently. They can therefore be considered as non-critical operating equipment with respect to their electromagnetic compatibility.</p> <p>Assessment according to EMC is only possible after integration of the electromagnet clutch/brake into an overall system.</p>

4.3. Functional method

The pole-face friction clutch is operated electromagnetically.

By applying DC voltage U to the coil (5), a magnetic force is generated between the rotor (8) and the armature ring (3) and (4). This drags the armature assembly against the force of the diaphragm (2) frictionally in the direction of the rotor. The rotor and hub (10) are screwed. The hub transmits the output drive to the rotor.

If DC voltage is no longer applied, the magnetic field collapses and the restoring force of the diaphragm disengages the armature assembly and the rotor without residual torque. The air gap between the friction surfaces of the armature ring and the rotor is reestablished. The armature ring remains in this position until the coil voltage U is reapplied and the magnetic field re-established.

5. Transport, packaging and storage

5.1. Safety instructions for transport

Improper transport

	ATTENTION
	<p>Damage due to improper transport!</p> <p>Improper transport can cause considerable damage.</p> <ul style="list-style-type: none"> ▶ 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. ▶ Protect the clutch against heavy knocks as well as all types of force during transport. ▶ Avoid strong ambient temperature fluctuations to prevent formation of condensation. ▶ Remove the packaging immediately prior to installation.

	ATTENTION
	<p>Damage to property due to magnetic fields!</p> <p>Electromagnetic clutches have a strong magnetic field that is for example, capable of destroying magnetically stored data.</p> <ul style="list-style-type: none"> ▶ Do not place electromagnetic 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
	<p>Failure to observe the following instructions will invalidate claims to the insurer for damage.</p>

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 of 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.

i	NOTE
	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

Regarding the packaging

The individual packages are packed according to the expected transport conditions. Environmentally compatible materials have been used exclusively for packing.

Packaging should protect the individual 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 device 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 packaging materials according to local environmental regulations.

5.4. Unpacking

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 received goods, conservation should be renewed (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 pc.
- When storing for longer than 3 months, check the general condition of all parts and the packaging regularly.

	NOTE
	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 due to electric current!

	⚠ DANGER
	<p>Danger to life due to electric current!</p> <p>Contact with electrically live parts can lead to fatal injuries.</p> <ul style="list-style-type: none"> ▶ 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 due to magnetic fields

	⚠ DANGER
	<p>Danger to the life of persons with active health aids (heart pacemakers)!</p> <p>The magnetic field of the electromagnetic tooth clutch can impair the function of active health devices such as heart pacemakers if the minimum distance for respective device is not observed.</p> <ul style="list-style-type: none"> ▶ Persons with active health devices may not work with the electromagnetic tooth clutch. ▶ Observe the regulations of BGV B11.

Personal protective equipment

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

	<p>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.</p> <p>Do not wear rings, bracelets or other jewellery.</p>
	<p>Goggles to protect the eyes from flying parts and liquids</p>
	<p>Protective footwear with steel caps and oil-resistant soles.</p>

Improper installation and initial startup

	<p>⚠CAUTION</p>
	<p>Risk of injury due to improper installation and initial startup!</p> <p>Improper installation and initial startup can lead to personal injury or material damage.</p> <ul style="list-style-type: none"> ▶ Before beginning work, make sure that sufficient installation workspace is available. ▶ Be careful when handling exposed, sharp-edged components. ▶ 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. ▶ 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").

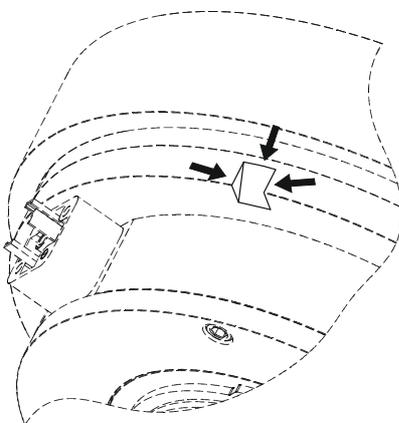
6.3. Setup

i	NOTE
	The clutch is delivered in an installable 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.

i	NOTE
	The shaft fitting should be h7 to j6. The rotor borehole for the shaft is H7 by default.

	ATTENTION
	<p>Damage due to improper, forced assembly!</p> <p>Improper, forceful assembly can cause considerable damage to property.</p> <ul style="list-style-type: none"> ▶ Never forcefully strike or push the clutch onto the shaft! ▶ Only apply assembly force to the front face of the rotor! ▶ No power may be directed into the stator!



Push the stator and the rotor onto the drive shaft of the machine.

- Only apply assembly force to the faces of the rotor marked with "A" or "B" in order not to damage the rotor and the switching ring.
- Secure the clutch against axial shifting.
- Secure the stator housing against twisting by inserting anti-twist protection into the groove (inclined or longitudinal groove) supplied.

Figure 3: example of a groove for twist protection

i	NOTE
	<p>The standard groove for protecting the stator housing against twisting is not suitable for strongly loaded or strongly vibrating clutches.</p> <p>In individual cases, provide a customised solution for the existing installation conditions after consulting the manufacturer.</p>

i	NOTE
	<p>The twist protection is not supplied and must be adjusted to the relevant installation conditions.</p>

- Connection of the stator to the power supply by means of plug-in connector may only take place after the clutch has been completely assembled.
- Screw the armature assembly to the connecting part on the output side.

	ATTENTION
	<p>Damage due to improper assembly!</p> <p>Improper assembly can damage the clutch.</p> <ul style="list-style-type: none"> ▶ Pay attention to tension-free installation of the armature assembly and proper centring of the diaphragm on the customer connecting part. ▶ Screw locking on the diaphragm is not permitted.

i	NOTE
	<p>The fixing screws for the armature assembly are not part of the scope of supply.</p> <p>Screw joint calculations must be made.</p> <p>Diaphragm material: steel with a tensile strength of 1500 N/mm².</p> <p>Recommendation: cylinder-head screws according to ISO 4762</p>

- Align the clutch halves to each other with their input and output assemblies corresponding to tolerance class "N" according to DIN 42955.
- Check the width of the air gap several points of the circumference with the help of a feeler gauge. Refer to the technical data for the air gap width dimension (see section 3).

Electrical connection

	⚠ DANGER
	<p>Danger due to electric current</p> <p>In the case of electromagnetically-operated device, it is possible that dangerously high electrical voltages are induced during the switch-off procedure.</p> <ul style="list-style-type: none"> ▶ To prevent high induction voltage peaks, install voltage-dependent resistors (varistors) parallel to the coil or provide a protective circuit. ▶ Do not touch electrically live parts. ▶ Pay attention to the current safety regulations for the installation of electrical systems at the place of use.

	⚠ DANGER
	<p>Danger to the life of persons with heart pacemakers</p> <p>The magnetic field of the pole-face friction clutch can impair the function of heart pacemakers if the minimum distance for the pacemaker is not observed.</p> <ul style="list-style-type: none"> ▶ Persons with heart pacemakers may not work with the clutch. ▶ Observe the regulations of BGV B11.

	NOTE
	<p>Only operate the pole-face friction clutch with direct current.</p>

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

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

7.1. Safety precautions

Danger due to electric current!

	⚠ DANGER
	<p>Danger due to electric current!</p> <p>Contact with live components can be fatal. Switched-on electrical components can cause uncontrolled movement and lead to serious injuries.</p> <ul style="list-style-type: none"> ▶ Before beginning any work, switch off the power and secure against switching on again.

Danger due to magnetic fields

	⚠ DANGER
	<p>Danger to the life of persons with active health aids (heart pacemakers)!</p> <p>The magnetic field of the pole-face friction clutch can impair the function of active health aids such as heart pacemakers if the minimum distance for respective device is not observed.</p> <ul style="list-style-type: none"> ▶ Persons with active health aids may not work with the clutch. ▶ Observe the regulations of BGV B11.

Danger due to rotating components

	⚠ CAUTION
	<p>Damage to persons due to moving components!</p> <p>Rotating components can cause injury.</p> <ul style="list-style-type: none"> ▶ Never reach into the area of the rotating clutch and shafts! ▶ Protect the clutch against unintentional access during operation!

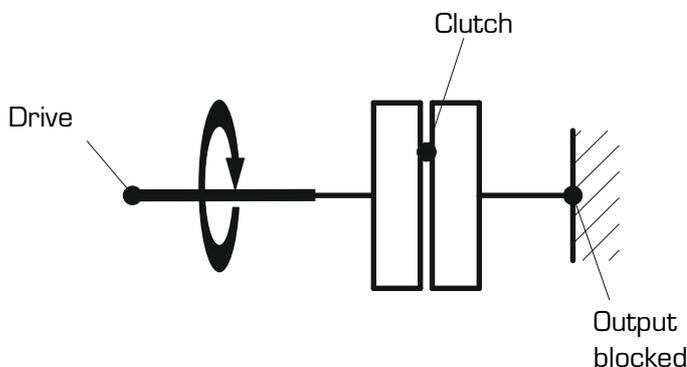
7.2. Putting the clutch into operation

- Check for correct assembly of all components before startup of the clutch.
- Check the function of all safety devices that are to be used with the clutch.
- Allow the pole surfaces to run in, see section 7.3.
- The clutch can be put into continuous operation after checking for proper function.

7.3. Running in the pole surfaces

After assembling the clutch for the first time or replacing the armature or rotor assemblies, the pole surfaces must be run in.

Running in is necessary in order for the clutch to be able to transmit the nominal torque.



Select the run-in speed so that the mean friction speed is 1 m/s

Switch on the drive side several times against the blocked output side.

The coil voltage should be at 75% of the nominal voltage and the switch-on duration $t_{\text{Rutsch}} < 1$ s.

	ATTENTION
	<p>Possible damage to the friction surfaces!</p> <p>Standstill during slipping can lead to local welding.</p> <p>► Make sure that the friction surfaces do not come to standstill during slipping.</p>

After switching approx. 30-40 times, the clutch is run in.

If the run-in procedure can only be performed at higher speeds due to technical reasons, switching must be performed at a lower voltage and with shorter switch-on times.

8. Operating

8.1. General

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 due to electric current!

	⚠ DANGER
	<p>Danger due to electric current!</p> <p>Contact with live components can be fatal. Switched-on electrical components can cause uncontrolled movement and lead to serious injuries.</p> <ul style="list-style-type: none"> ▶ Before beginning any work, switch off the power and secure against switching on again.

Danger due to magnetic fields

	⚠ DANGER
	<p>Danger to the life of persons with active health aids (heart pacemakers)!</p> <p>The magnetic field of the clutch can impair the function of active health aids such as heart pacemakers if the minimum distance for respective device is not observed.</p> <ul style="list-style-type: none"> ▶ Persons with active health aids may not work with the clutch. ▶ Observe the regulations of BGV B11.

Danger due to rotating components

	⚠CAUTION
	<p>Damage to persons due to rotating components!</p> <p>Rotating components can cause injury.</p> <p>▶ Never reach into the area of the rotating clutch!</p>

i	NOTE
	<p>Only operate the clutch according to the protective requirements in DIN VDE 0580.</p>

i	NOTE
	<p>According to the EMC directive 2004/108/EC, electromagnetic clutches and brakes do not produce any emissions. Applying current to clutches with a phase demodulator or similar controllers can cause interference levels that are above the permitted limits.</p> <p>For this reason, pay attention to the EMC directive.</p>

- 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
- Introduce suitable measures against fire, burns and overheating according to DIN VDE 0100 part 420.

In an unassembled condition, the clutch has IPOO 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.

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

In the case of pole-face friction 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 $25 \times 10^{-6} \text{ m}^2/\text{s}$ 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 8.

9.1. Safety

Danger due to electric current!

	⚠ DANGER
	<p>Danger due to electric current!</p> <p>Contact with live components can be fatal. Switched-on electrical components can cause uncontrolled movement and lead to serious injuries.</p> <ul style="list-style-type: none"> ▶ Before beginning any work, switch off the power and secure against switching on again.

Danger due to magnetic fields

	⚠ DANGER
	<p>Danger to the life of persons with active health aids (heart pacemakers)!</p> <p>The magnetic field of the clutch can impair the function of active health aids such as heart pacemakers if the minimum distance for respective device is not observed.</p> <ul style="list-style-type: none"> ▶ Persons with active health aids may not work with the clutch. ▶ 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 of burns

	⚠WARNING
	<p>Danger of burns due to hot surfaces!</p> <p>Parts of the clutch become very hot during operation. Observe the following safety instructions to avoid injuries from burning:</p> <ul style="list-style-type: none"> ▶ Always wear protective clothing when working. ▶ Allow the clutch to cool down before maintenance/cleaning.

Danger due to rotating components

	⚠CAUTION!
	<p>Damage to persons due to rotating components!</p> <p>Rotating components can cause injury.</p> <ul style="list-style-type: none"> ▶ Never reach into the area of the rotating clutch!

Personal protective equipment

Wear the following protective equipment during work with the clutch:

	<p>Close-fitting protective clothing with a low tear strength and no protruding parts. These clothes are principally designed to protect against being caught by moving machine parts.</p> <p>Do not wear rings, bracelets or other jewellery.</p>
	<p>Goggles to protect the eyes from flying parts and liquids.</p>
	<p>Protective footwear with steel caps and oil-resistant soles.</p>

Improperly performed work on elimination of faults

⚠WARNING	
	<p>Risk of injury due to improperly performed work on elimination of faults!</p> <p>Improperly performed work can cause severe damage to persons and property.</p> <ul style="list-style-type: none">▶ Before beginning work, make sure that sufficient installation workspace is available.▶ The following applies to the system in which the clutch will 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 any uncertainties or questions, consult the manufacturer.

Error	Possible cause	Remedy
Clutch does not switch on	Electrical supply interrupted. 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 magnetic part and return for repair.
		Check the coil for ground fault. In the case of a ground fault, replace the magnetic part and return for repair.
	Wiring is wrong or defective.	Check wiring. Check cable for continuity.
	Air gap is set too large.	Reset the air gap and realign the clutch if required.
Clutch does not switch off	Air gap is set too small.	Reset the air gap and realign the clutch if required.
	Diaphragm is damaged or permanently deformed.	Dismantle the armature and magnetic assemblies and replace.
	Armature assembly not properly installed.	Install armature assembly properly.
	Clutch was not properly fixed onto the shaft ends or the axial play of the attached parts is too large.	Check the fixings. Check fixed bearings and reduce axial play.

Error	Possible cause	Remedy
Clutch does not transmit the nominal torque.	Friction surfaces are lightly contaminated by oil or grease.	Restart the clutch, the friction surfaces clean themselves automatically.
	Friction surfaces are strongly contaminated by oil or grease.	Dismantle the clutch and clean the friction surfaces.
	The run-in process was not performed.	Run in the clutch.
	The friction surfaces were overloaded during the run-in process.	Dismantle the clutch and adjust the friction surfaces on a flat surface with sandpaper. Subsequently repeat the run-in process.

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
	<p>Damage to persons due to rotating components!</p> <p>Rotating parts can cause injury.</p> <ul style="list-style-type: none"> ▶ Only check for wear when the machine is at a standstill! ▶ Never reach into the area of the rotating clutch!

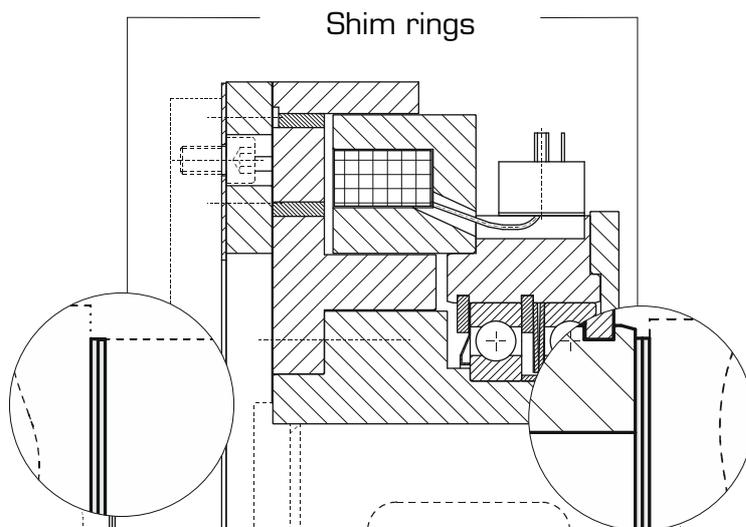
	⚠WARNING
	<p>Danger of burns due to hot surfaces!</p> <p>Parts of the clutch become very hot during operation. Observe the following safety instructions to avoid injuries from burning:</p> <ul style="list-style-type: none"> ▶ Always wear protective clothing when working. ▶ Allow the clutch to cool down before maintenance/cleaning.

The intervals for checking wear depend on the conditions at the place of operation. Increased load on the pole-face friction clutch due to increased switching frequency or frequent overload conditions necessitates shorter intervals.

Adjust the intervals for checking from information obtained during operation.

Keep grease and oil contamination away from the friction surfaces.

If the pole-face friction clutch no longer transmits the required torque due to wear on the friction surfaces, it can be adjusted once by the customer by inserting shim rings onto the original air gap dimension if the deviation from the original dimension is < 0.3 mm (wear reserve).



Because the opposing pole surfaces have worked into each other, the rotor and armature assemblies must be aligned exactly to each other. In the case of a deviation of > 0.3 mm, both the rotor and the armature assembly must be replaced.

i	NOTE
	<p>Store reserve clutches to keep system downtime as short as possible in the event of a disturbance.</p>

10.2. Cleaning

10.2.1. General

	⚠ CAUTION
	Risk of injury! Handling cleaning agents can cause injuries. ▶ Wear personal protective equipment when cleaning.

- Check to make sure cleaning agents can be used without harming persons or the machine. Follow the manufacturer's instructions!

10.2.2. Preparing for cleaning work

- Switch off the system/machine, in which the clutch is installed and secure against being switched on again.
- Secure the cleaning area.

10.2.3. Cleaning

- If required, clean the friction surfaces.

11. Dismantling

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
	<p>Danger due to electric current!</p> <p>Contact with live components can be fatal.</p> <p>▶ Before beginning any work, switch off the power and secure against switching on again.</p>

11.2. Dismantling

Electrical system

Before dismantling:

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

Subsequently clean modules and components properly and dismantle in accordance with local occupational safety and environmental protection regulations.

11.3. Disposal

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

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

ATTENTION
<div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Environmental damage resulting due to incorrect disposal!</p> <ul style="list-style-type: none"> ▶ Electrical scrap, electronic components, lubricants and other accessories are subject to special waste handling and must be disposed of by authorized specialist companies only! ▶ The local authorities or special waste disposal companies can provide information on proper disposal according to environmental regulations. </div> </div>

12. Applicable standards, guidelines and regulations

Standard	Designation
DIN 740 - 1	Drive technology; flexible shaft couplings; Requirements; technical delivery conditions
DIN 740 - 2	Drive technology; flexible shaft couplings; Terms and calculation bases
DIN VDE 0470	Protection class by housing (IP code)
DIN VDE 0580	Electromagnetic devices
DIN 31000	General principles for safety-conscious design of technical products
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; Cylindrical screw-in connections