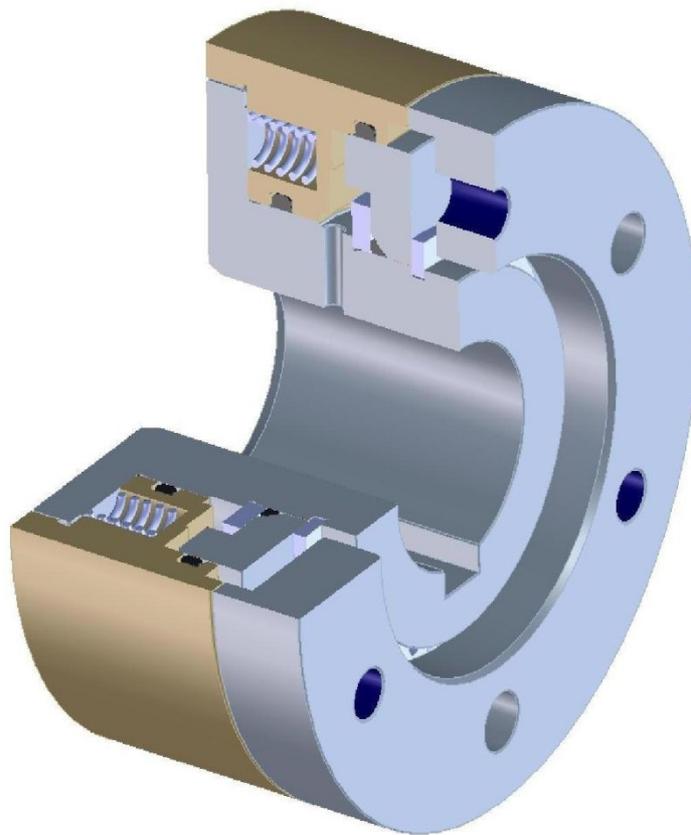


Mönninghoff

Operating and Assembly Instructions

Spring-applied tooth clutch, pneumatically released

Type 577.xx



Doc-ID: T24.0134_e

as off: 01/2012

Read these operating instructions before beginning any kind of work!

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Maschinenfabrik Mönninghoff GmbH & Co. KG

Bessemerstrasse 100

Postfach 101749

D – 44793 Bochum

D – 44717 Bochum

Telephone: +49 (0) 234 3335-186

Fax: +49 (0) 234 3335-215

Email: service@moeninghoff.de

Internet: www.moeninghoff.de

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1 General

1.1 Information on these instructions

These instructions enable safe and efficient handling of the spring-applied tooth clutch, type 543.xx, hereinafter referred to as 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.

In addition to these instructions, the instructions for the installed components in the appendix also apply.

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1.2 Explanation of symbols

Warnings

All warnings in these operating instructions are also marked with a warning symbol.

The following warning symbols are used throughout these operating instructions:

Symbol	Meaning
	General warning
	Danger of crushing!
	Danger from systems under pressure
	Danger of environmental pollution
	General instructions and useful suggestions on handling

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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 Consequences of failure to observe... ► Instructions for avoiding</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 Consequences of failure to observe... ► Instructions for avoiding</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 possible danger of serious injury or even death.

	⚠ CAUTION!
	<p>Injury to persons by... Consequences of failure to observe... ► Instructions for avoiding</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 possible danger of serious personal injuries.

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	ATTENTION
	<p>Damage to property by... Consequences of failure to observe... ► Instructions for avoiding</p>

This warning level indicates potential damage 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
	<p>Descriptive text...</p>

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

1.3 Limitation of liability

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

The manufacturer assumes no liability for damages resulting from:

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

The responsibilities 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 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. We reserve the right to impose further claims.

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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> <ul style="list-style-type: none"> ▶ Use original spare parts from the manufacturer only.

	NOTE
	<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 such as guarantee, service contracts etc. without prior notice.</p> <ul style="list-style-type: none"> ▶ Obtain spare parts from authorised dealers or directly from the manufacturer. See page 2 for the address.

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

Telephone: +49 (0) 234 3335-186

Fax: +49 (0) 234 3335-215

Email: service@moeninghoff.de

Internet: www.moeninghoff.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.

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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: Spring-applied tooth clutch

Type 577.xx

Project no.:

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

The following harmonised standards were applied:

DIN EN ISO 12100 Safety of machinery - General principles for design - Risk assessment and risk reduction

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

Bochum, 24.06.2013

Signature.....

Managing director: Dipl.-Staatswissenschaftler Kai Neubauer

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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!
	<p>Danger from 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> <ul style="list-style-type: none"> ▶ Always pay attention to all warnings and instructions specified here.

2.2 Staff requirements

2.2.1 Qualifications

	⚠ WARNING
	<p>Risk of injury due to insufficient qualification!</p> <p>Improper use can result in considerable damage to persons or property.</p> <ul style="list-style-type: none"> ▶ All activities shall only be performed 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 recognise and prevent possible dangers based on his/her technical training, knowledge and experience, including knowledge of applicable regulations.

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■ Pneumatics specialist

is able to carry out assigned work tasks on pneumatic systems as well as recognise and prevent possible dangers based on his/her technical training, knowledge and experience, including knowledge of the applicable standards and regulations.

The pneumatics specialist is trained for the location in which she/he is working and is familiar with the relevant standards and regulations.

Only those staff members are permitted who can be expected to reliably perform their task. Those staff members whose responsiveness is affected by substances such as drugs, alcohol or medication shall not be permitted.

i	NOTE
	Observe age and occupational-specific regulations at the location of the clutch when selecting staff.

2.2.2 Unauthorised persons

	⚠ WARNING
	<p>Danger from unauthorised persons!</p> <p>Unauthorised 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 unauthorised 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. ▶ Interrupt all work as long as the unauthorised person is in the work area.

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2.3 Intended use

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

The tooth clutch may only be used according to the technical data and operating conditions defined by the manufacturer, see section 3.

	▲WARNING
	<p>Danger from use for other than the intended purpose!</p> <p>Any use other than for the intended purpose of the clutch can lead to dangerous situations.</p> <ul style="list-style-type: none"> ▶ Only use the tooth 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.

2.3.1 Foreseeable misuse

The tooth clutch may not be used in potentially explosive or aggressive atmospheres.

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2.4 Technical modifications

i	<i>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 carried out must be worn at all times.
- Pay attention to all notices on personal protective equipment within the work area.

Only wear

The following must be worn for all work:

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

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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.

Moving components

	⚠ CAUTION!
	<p>Risk of injury from moving parts! Rotating and/or linearly moving parts can cause injury.</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.

Pressure

	⚠ CAUTION!
	<p>Risk of injury from moving parts under pressure! Severe injuries are possible from components under high pressure.</p> <ul style="list-style-type: none"> ▶ Disconnect the pressure before starting any work on the spring-applied tooth clutch system.

2.7 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! 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.

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3 Technical data

<i>NOTE</i>	
i	Refer to the order-related clutch drawings for all technical data.

3.1 Connection dimensions, connection fixings

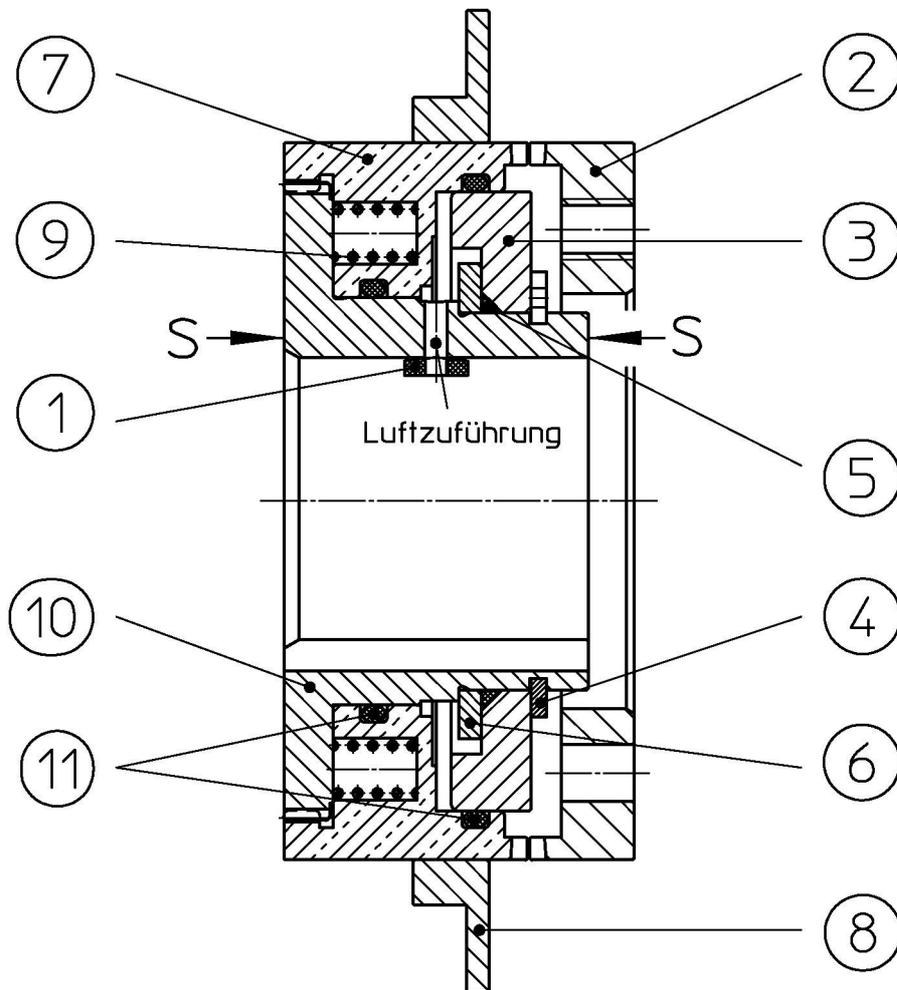
Refer to the assembly drawing for connection dimensions and information on connection fixings.

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

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4 Setup and method of function

4.1 Setup



- | | |
|-------------------|------------------------------------|
| 1 Sealing ring | 7 Switching ring |
| 2 Annular gear | 8 Switching disk (only design 1.6) |
| 3 Pressure disk | 9 Pressure spring |
| 4 Retaining ring | 10 Hub |
| 5 O-ring | 11 Piston seal |
| 6 Supporting ring | |

Setup Figure 1: sectional drawing and individual parts

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4.2 Description

4.2.1 Features

Mönninghoff spring-applied tooth clutches are pneumatic releasing, serrated clutches. Pressure springs serve as central elements. The spring-applied tooth clutches distinguish themselves by the following features:

- High non-slip torque transmission.
- Small dimensions.
- Various gearing options.

4.3 Functional method

The pressure rings (9) displace the 1 switching ring (7) axially in the direction of the annular gear (2) until the gear facing is completely in the mesh.

To open the face gear, compressed air is fed into the piston interior through the machine shaft as well as through the air supply hole of the hub (10) and the switching ring (7) pressed against the collar of the hub (10).

The seal between the machine shaft and the hub takes place by means of the sealing ring (1) supplied.

The torque of the hub (10) is transmitted via the guiding profile of the switching ring (7).

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5 Transport, packaging and storage

5.1 Safety instructions for transport

Improper transport

ATTENTION	
	<p>Damage due to improper transport! 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.

5.2 Transport inspection

The delivery should be checked immediately for completeness and for transport damage.

NOTE	
	<p>Failure to observe the following instructions will invalidate claims to the insurer for damage.</p>

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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.

NOTE	
i	Register any claim as soon as a defect is detected. Claims for damages can be made only within the applicable reporting periods.

5.3 Packaging

On 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 packaging 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.

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5.4 Removing from the packaging

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

5.5 Storing the packaged items

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).

Store packaged items under the following conditions:

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

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

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6 Installation

6.1 Safety

Personnel

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

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. These clothes are principally designed to protect against being caught by moving machine parts. 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 style="text-align: center;">⚠ 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, ensure that sufficient workspace is available for assembly. ▶ Be careful when handling exposed, sharp-edged components. ▶ Pay attention to tidiness and cleanliness at the workplace! Components and tools lying around or on top of each other can be sources of accidents. ▶ Assembly components must be properly installed. Adhere to the specified screw torques.
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6.2 Preparation

Before installing, check the following points:

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

6.3 Setup

i	NOTE
	The spring-applied tooth 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 bore fitting of the hub for the shaft is H7 by default.

	ATTENTION
	Damage from improper, forced assembly! Improper, forceful assembly can cause considerable damage to property. ▶ Never forcefully strike or press the hub! ▶ Only apply assembly force to the front face of the hub!

- Slide the complete spring-applied tooth clutch without annular gear onto the shaft of the machine.
- Only allow the assembly force to be applied to the front faces of the hub marked with an "S" in order not to damage the clutch.
- Secure the clutch against axial shifting.

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- Screw the annular gear to the customer's connecting part.
- If the annular ring is to be pinned to the customer's connecting part, drill the pin holes in the annular ring and the customer's connecting part to measure.
- Check concentricity and axial run-out. The permissible tolerances on the machine side for the hub and annular ring may not be exceeded.

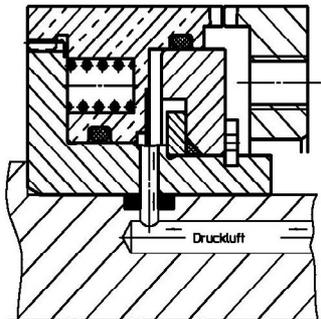


Figure 2: compressed air connection

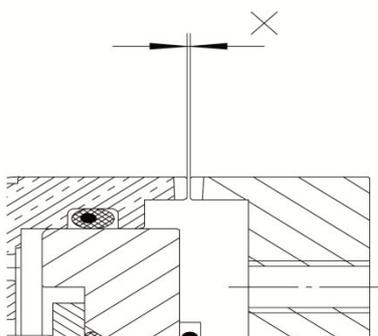


Figure 3: air gap

ATTENTION	
	<p>Damage from improper, forced assembly! Improper, forceful assembly can cause considerable damage to property.</p> <ul style="list-style-type: none"> ▶ The annular ring with the connecting part on the machine side must be supported in the machine shaft and secured against axial displacement. Direct connection of separate shafts is not permissible.

- Align the spring-applied tooth clutch and annular ring with each other so that the specified air gap (X) between the tooth heads is not exceeded when the compressed air supply is switched on (gear facing not in the mesh) .

NOTE	
	<p>Refer to the contract-related order drawing for the permissible dimension of the air gap.</p>

- Switch the spring-applied tooth clutch several times to set the air gap exactly.

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7 Startup

Danger from rotating components

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

- Check for correct assembly of all components before startup of the tooth clutch.
- Perform a trial run to test the function of the tooth clutch.

	NOTE
	<p>The tooth clutch may only be switched when it is at a standstill.</p>

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

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8 Operation

8.1 General aspects

The tooth 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.

Danger from rotating components

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

In the case of "wet run" tooth clutches, only use oils with a viscosity up to $25 \times 10^{-6} \text{ m}^2/\text{s}$ at 50 °C ($3^\circ\text{E}/50 \text{ °C}$).

	NOTE
	<p>Only half of the tooth clutch may be immersed into oil.</p>

To protect against inadvertent contact and heavy contamination, the tooth clutch must be covered with a hood. Switching off the tooth clutch depends on the rotating speed and load (for gearing without self-inhibition).

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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 2.

9.1 Safety

Personnel

- Faults may only be eliminated by specially trained, qualified staff.

Danger from rotating components

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

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>

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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, ensure that sufficient workspace is available for assembly.
- ▶ The following applies to the system, in which clutch is to be operated: never disable the safety devices in the system.
- ▶ Pay attention to tidiness and cleanliness at the workplace! Components and tools lying around or on top of each other can be sources of accidents.
- ▶ If components are removed, pay attention to correct assembly; replace all fixing elements and adhere to all screw tightening torques.
- ▶ In the event of malfunctions or irregularities, stop the system and inform the person responsible. If faults cannot be rectified, contact the service department of the Maschinenfabrik Mönninghoff GmbH & Co. KG.

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9.2 Malfunctions

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

Error	Possible cause	Remedy
Tooth clutch does not switch on	Air gap is set too large.	Reset the air gap and realign the tooth clutch if required.
Tooth clutch does not switch off	Air gap is set too small.	Reset the air gap and realign the tooth clutch if required.
	Air pressure too low.	Check compressed air supply.
	Tooth 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.

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10 Maintenance

The tooth clutch does not require regular maintenance work. Work on the tooth clutch is only necessary when rectifying a fault. Pay attention to the safety instruction in the section "Faults" when rectifying faults.

10.1 Checking for wear

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

	NOTE
	<p>The clutch is maintenance-free. Nevertheless, the tooth clutch must be checked regularly for wear.</p>

The intervals for wear checking depend on the conditions at the place of operation. An increased load on the tooth clutch by increased switching frequency results in shorter intervals. The intervals for checking are determined by information obtained during operation.

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

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11 Dismantling

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

11.1 Safety

Personnel

- Dismantling may only be performed by qualified staff.

11.2 Dismantling

Power supply

Before dismantling:

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

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

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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	
	<p>Environmental damage due to improper 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 authorised specialist companies only!▶ The local authorities or special waste disposal companies can provide information on proper disposal according to environmental regulations.

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12 Applicable standards, guidelines and regulations

Standard	Designation
DIN 31000	General principles for safety-conscious design of technical products
DIN 867	Reference profile for involute gears
DIN 2089 Part 1	Calculation of pressure springs
VDI 2230 sheet 1	Systematic calculation of heavily loaded screw connections; Cylindrical screw-in connections

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