

Rotary ring indexer
TSR
Assembly instructions

V 1.2
2024-06-27

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1 About these instructions

1.1 Purpose

The purpose of these assembly Instructions is to provide users with all the information necessary for proper and safe installation of the TSR rotary ring indexer in a complete machine.

1.2 Contact information

TAKTOMAT GmbH

Rudolf-Diesel-Straße 14
86554 Pöttmes

Tel.: +49 (0) 8253-9965-0
Fax: +49 (0) 8253-9965-50
E-mail: info@taktomat.de
Internet: <http://www.taktomat.de/>

1.3 Product designation

Product designation: Rotary ring indexer

Product type: TSR

The following information relating to the machine can be found on the type plate:

- Type
- Code
- Serial number



Fig. 1: Example type plate

1.4 Symbols

The following symbols are used in these instructions:

Instructions and directions

Requirements for performing an instruction are indicated by a check mark.

The action steps to be executed are numbered.

The results of individual action steps are indicated by a black arrow. The overall result of an instruction is marked by a white arrow in a black circle.

Example

- ✓ Requirement
- 1. Instruction (step 1)
- 2. Instruction (step 2)
 - ⇒ Result or response of system to step 2
- 3. Instruction (step 3)
- ➡ Overall result of the instruction

Enumerations

Enumerations in no strict order are indicated as follows:

- Property A
 - Detail 1
 - Detail 2
- Property B
 - Detail 1
 - Detail 2

2 Safety

2.1 Safety instructions

General safety instructions

- Read the instructions in full
- Adhere to the information and instructions in this manual
- Keep unauthorised persons away from the working area
- Work on the electrical systems must only be carried out by qualified electricians
- Keep the manual safe in a place where it is accessible by all employees
- Adhere to the documentation for the externally supplied parts
- Wear the stipulated personal protective equipment

2.2 Warnings

2.2.1 Structure of the warnings

All the warnings in these instructions have the following structure:

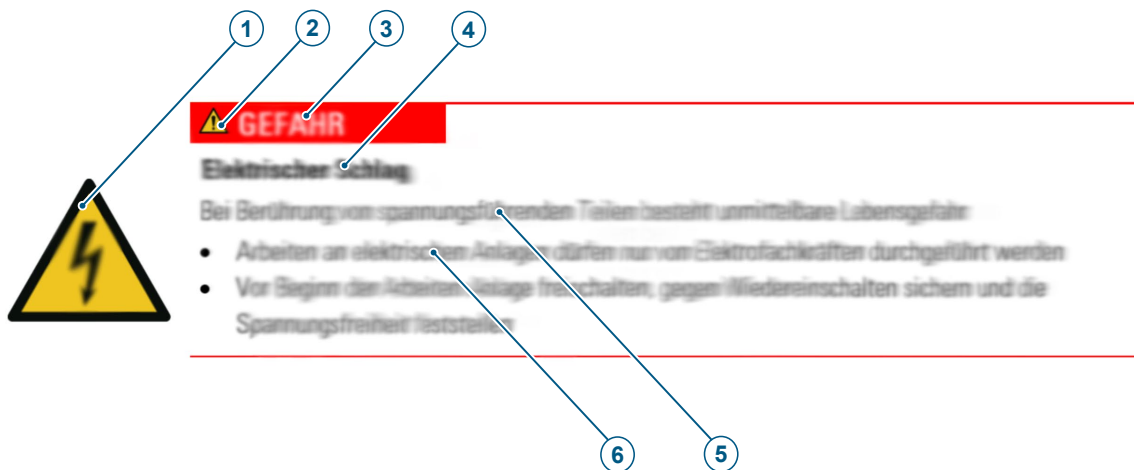


Fig. 2: Structure of the warnings

| | | | |
|---|---|---|---------------------------------|
| 1 | Hazard-specific symbol | 2 | Hazard symbol |
| 3 | Signal word | 4 | Type and source of danger |
| 5 | Possible consequences of non-observance | 6 | Procedure for hazard prevention |

2.2.2 Meanings of the signal words and symbols

The following signal words are used in this document:

| Signal word | Meaning |
|-------------|--|
| DANGER | Indicates a hazardous situation which will result in death or serious injury. |
| WARNING | Indicates a potentially hazardous situation which may result in death or serious injury. |
| CAUTION | Indicates a potentially hazardous situation which may result in minor or moderate injury. |
| NOTICE | Indicates a potentially hazardous situation which may result in property and environmental damage. |

The following symbols for dangers, warnings, mandatory requirements and prohibitions are used in this document:

| | |
|---|-----------------------------|
|  | General warning sign |
|  | Warning: Electrical voltage |
|  | Warning: Suspended load |
|  | Wear head protection |
|  | Wear eye protection |
|  | Wear foot protection |
|  | Wear hand protection |

2.3 Requirements for personnel

The different tasks described in these instructions require the personnel who are employed to carry out these tasks, to have different qualifications.

Qualified personnel

Qualified personnel are persons who are able to carry out the work assigned to them due to their technical training, knowledge and experience. They are familiar with the relevant standards and regulations and are able to recognize potential hazards on their own.

Operator

Operators are persons who, as a result of their technical training and experience, have sufficient knowledge on handling this incomplete machine and are sufficiently familiar with the valid state occupational health and safety regulations, accident prevention regulations, directives and general rules of technology to be able to assess whether this incomplete machine is in safe operational condition.

Servicing, repair and maintenance of the incomplete machine

Servicing, repair and maintenance work on the incomplete machine must only be carried out by the manufacturer's service technicians or by qualified personnel authorised by TAKTOMAT. Always secure the workstation carefully when this work is being carried out.

2.4 Personal protective equipment

Personal protective equipment is used to protect personnel from impairments to safety and health during work. Personnel must wear the personal protective equipment when performing all of the activities described in these instructions. The required personal protective equipment is indicated in the different chapters of these instructions.

2.5 Requirements for incorporation into a complete machine

The TSR rotary ring indexer is an incomplete machine. Operation of the TSR rotary ring indexer is only permitted in a complete, CE-compliant machine or plant.

The manufacturer of the complete machinery or system is responsible for integrating the TSR rotary ring indexer into the plant in such a way that completely safe operation is guaranteed.

- During operation, it is prohibited to remain in the immediate vicinity of the TSR rotary ring indexer. Remaining in the vicinity of the TSR rotary ring indexer is only permitted within the scope of inspection tasks, maintenance or servicing work which is carried out by specially trained personnel.
- Maintenance work must be carried out in accordance with the maintenance schedule and the operating instructions.
- All tasks on or at the TSR rotary ring indexer must only be carried out by trained, qualified personnel.

3 Product description

3.1 Intended use

The incomplete machine is designated for installation in a surrounding structure in which the incomplete machine is integrated into an overall plant.

The incomplete machine is controlled by the overall plant.

The functions of the safety devices are also connected to the incomplete machine by the controller. The incomplete machine must only be operated within a CE-compliant plant.

Attachments/components are fastened to the designated bores on the TSR rotary ring indexer. The TSR rotary ring indexer has a fixed or flexible division (see data sheet for exact design).

The TSR rotary ring indexer is integrated into a machine with comprehensive safety, or is equipped with safety equipment. The safety equipment, i.e. assembly/installation, is implemented by the integrator. The same goes for the electrical connection to the controller.

Any types of use which differ from the intended use, are considered improper use. These include:

- Use outside of the permitted operating limits
- Operation without suitable monitoring/supervision
- Operation with insufficient maintenance
- Use of non-original parts as spare parts
- Use of food products
- Use of aggressive materials (e.g. acids)
- Transporting with fastening equipment and fastening points other than those recommended.

The manufacturer is not liable for any resultant damage. Intended use also includes adhering to all the specifications in these instructions.

3.2 Technical data

NOTE**Material damage due to different ambient temperatures**

Ambient conditions different to those specified can lead to material damage.

- Do not put the incomplete machine into operation in different ambient conditions.
 - Adhere to the operating and storage conditions.
 - Any ambient conditions which differ from those specified must be checked. Before use of the incomplete machine, contact TAKTOMAT.
-

Product description

3.2.1 Operating conditions

| | |
|------------------------|-----------------------------------|
| Area of application | indoors |
| Temperature range [°C] | +10 to +40 |
| Relative humidity [%] | 40 to 70 |
| Media | do not expose to aggressive media |

3.2.2 Storage conditions

| | |
|---------------------------|--|
| Area of application | indoors |
| Temperature range [°C] | -22 to +50 |
| Relative humidity [%] | 40 to 70 |
| Lighting [Lux] | min. 300 |
| Media | do not expose to aggressive media |
| Storage period > 6 months | Coat the machine with corrosion protection |

3.2.3 Dimensions

The dimensions of the different versions are given on the TAKTOMAT website: <https://www.taktomat.de/>.

3.3 Product overview

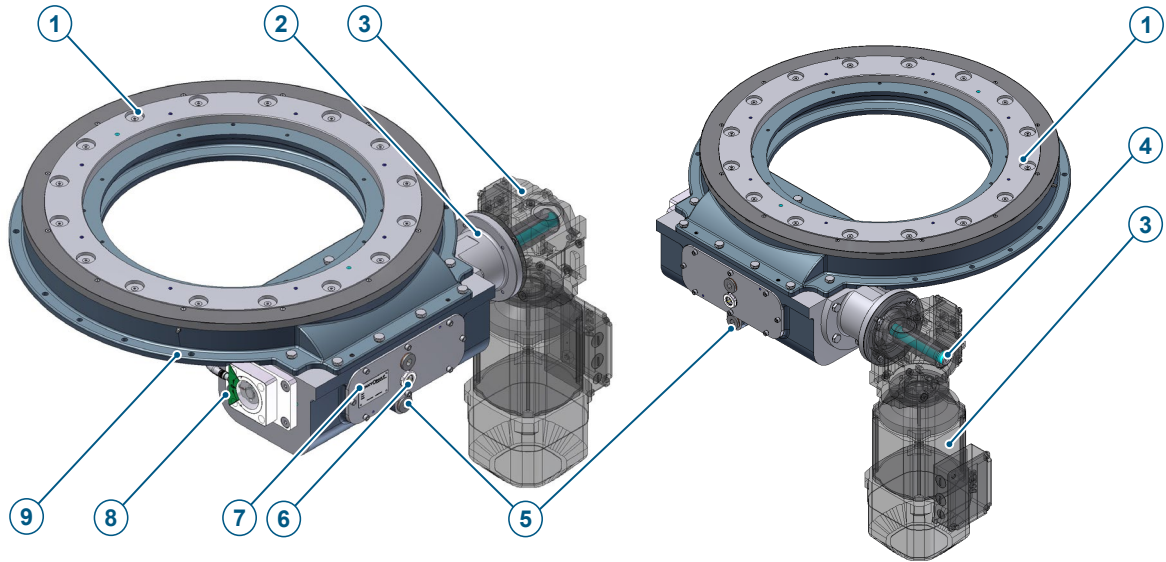


Fig. 1 Construction of the TSR rotary ring indexer

| | | | |
|---|------------------------|---|---------------------------|
| 1 | Output flange (output) | 2 | Transmission bell housing |
| 3 | Drive | 4 | Input shaft (drive) |
| 5 | Oil drain plug | 6 | Oil sight glass |
| 7 | Type plate | 8 | Position indicator |
| 9 | Housing | | |

Function

The drive (3) drives the output flange (1) via the input shaft (4) via the cylinder cam. The output level is offset by 90° to the input level. A uniform radial movement on the input side is converted into a uniform reduced output movement. The attachments are fastened to the output flange (1). The position indicator (8) indicates the respective position of the cylinder cam. The type plate (7) is attached to the housing (9). The oil level of the lubricating oil is checked through the oil sight glass (6).

An additional locking mechanism for the output flange (1) is not required. It can lead to excessive mechanical determination and thus destruction of the TSR rotary ring indexer in the long term. The flux onto the input shaft is generated by a three-phase A.C. motor with a break via a worm gear or by a chain wheel or belt wheel. It is connected to the cylinder cam fixedly, without further internal gear stages, and cranks the output flange via cam followers.

The output flange (1) is bearing mounted rigidly and without clearance in an insulator groove assembly (in steel rings not directly in cast iron).

4 Transport

Qualified personnel

Required personal protective equipment



⚠ WARNING



Tipping or falling loads

Suspended loads can tip or fall down. This can cause serious or fatal injuries to persons.

- Do not step under suspended loads
- Keep unauthorized persons out of the danger zone
- Observe the weight and centre of gravity
- Only use suitable, approved and undamaged load handling attachments

NOTICE



Damage to components

Improper transport can cause material damage

- Carry out transport carefully and note the symbols on the packaging
- Align the lifting eyes in the direction of the load
- Follow the operating instructions for the lifting gear

Check the delivery immediately on receipt for completeness and transport damage.

In the event of externally visible transport damage, observe the following:

- Do not accept the delivery or accept it only with reservations
- Note the extent of the damage on the transport documents or on the transport delivery note
- Report material damage to the manufacturer immediately

4.1 Packaging

The TSR rotary ring indexer is packaged in plastic sheeting and fastened to a pallet for transportation. Remove the packaging carefully and dispose of it in an environmentally friendly manner.

4.2 Transport with slings

4.2.1 Lifting equipment

Transport the TSR rotary ring indexer with the lifting equipment as follows:

Attach the lifting equipment to the threaded bores as shown below, and make sure it is functioning properly.

The angle between the perpendicular and the chain sling or sling strap must be between 0 and 45°.

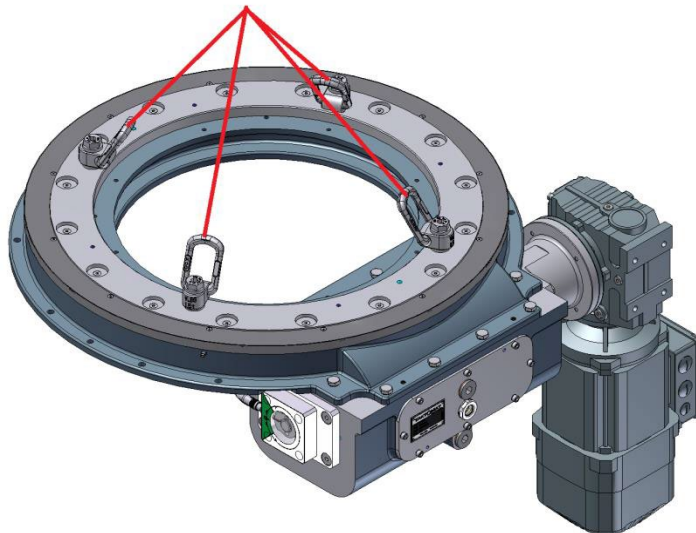


Fig. 3: Lifting instructions and fastening points

Recommended lifting equipment

| Screw size | Quantity | Lifting equipment |
|------------|----------|-------------------|
| M6 | 4 | VRS-F |
| M6 | 4 | VRS-F |
| M8 | 4 | VLBG 0.3 t |
| M8 | 4 | VLBG 0.3 t |
| M8 | 4 | VLBG 0.3 t |
| M10 | 4 | VLBG 0.63 t |
| M10 | 4 | VRS-F |
| M12 | 4 | VRS-F |
| M16 | 4 | VLBG 1.5 t |
| M24 | 4 | VLBG 4 t |

5 Assembly

Qualified personnel

Required personal protective equipment



DANGER

Electric shock

Touching live parts poses an immediate danger to life



- Work on the electrical systems must only be carried out by qualified electricians
- In case of damage to the insulation, switch off the power supply immediately and have repairs carried out
- Before starting work, disconnect the plant, secure it to prevent it from being switched back on, and make sure that it free from voltage

NOTE

Damage to components

Improper attachment of the drive can cause material damage



- When attaching the standard drive (SEW drive), adhere to the operating instructions
- The oil level check and drain plugs and the vent valves must be freely accessible

5.1 Drive attachment

Attach the drive to the TSR rotary ring indexer as follows:

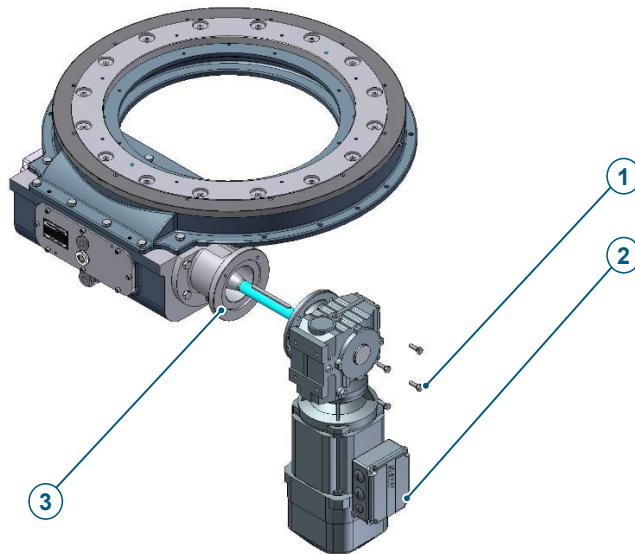


Fig. 4: Attachment sequence for drive

| | | | |
|---|------------------------------|---|-------|
| 1 | Hexagon screw; safety washer | 2 | Drive |
| 3 | Drive flange | | |

1. Install the fastening accessories in the threaded bores (see dimension sheet), as shown in the figure.
2. Tighten with torque.
3. Check that the tightening torque is correct.

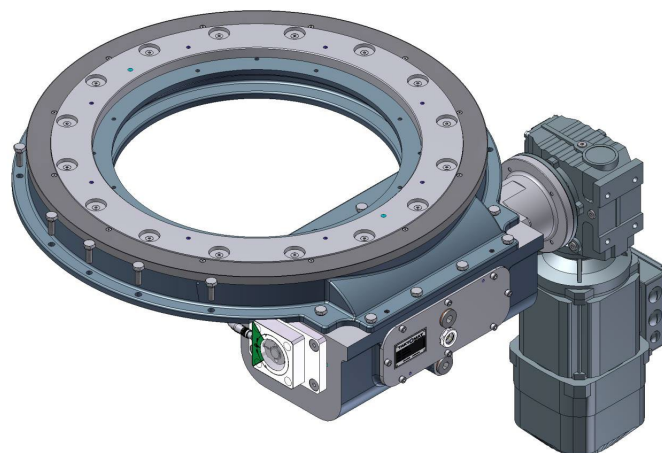


Fig. 5: Attachment side of the TSR rotary ring indexer

5.1.1 Installation

Install the TSR rotary ring indexer as follows:

- ✓ The mounting surface must be level.
 1. Clean the mounting surface and apply film of oil.
 2. Place the TSR rotary ring indexer on the mounting surface.
 3. Fasten the TSR rotary ring indexer with screws and alignment pins in accordance with the requirements
 4. Compare the supply voltage with the data on the nameplate.
 5. Connect the drive unit.
 6. Earth the housing of the TSR rotary ring indexer with an adequate cross section.

Output flange attachments

Pay attention to the following in relation to attachments on the output flange:

- Mass moved (as per TAKTOMAT project planning)
- Minimum time until positioning (as per TAKTOMAT project planning)
- Maximum overhang (tilting moment) (as per TAKTOMAT project planning)
- Maximum tightening torque for fastening bores, see torque table.

| Screw/nut size | Unit | Tightening torque $\pm 10\%$ Strength class 8.8 |
|----------------|------|---|
| M4 | [Nm] | 3.3 |
| M5 | [Nm] | 6.5 |
| M6 | [Nm] | 11 |
| M8 | [Nm] | 25 |
| M10 | [Nm] | 48 |
| M12 | [Nm] | 86 |
| M16 | [Nm] | 210 |
| M20 | [Nm] | 410 |
| M24 | [Nm] | 710 |

6 Operation

6.1 Operating modes

Normal operation

In normal operation, the output flange moves in one direction from one position to the next. The rotational direction of the output flange corresponds to the rotational direction of the drive. The rotational direction of a three-phase a.c. motor can be reversed easily by swapping two phases of the supply voltage.

Intermittent operation

The drive shaft stops in the dwell phase of the drum curve. The step time is fixed. The dwell time is variable. This mode is used in machines with significantly longer machining times than rotating times and is the most frequent mode.

Continuous operation

The rotary indexer runs continuously without the motor stopping. Step and dwell times are fixed and are run through uniformly. The drive motor has only one direction of rotation.

This mode is frequently used in fast-running machines with short machining times. The partly completed machinery is synchronised mechanically with the rest of the machine via the free drive shaft. The ration between the dwell and step time can be adjusted within certain limits by TAKTOMAT when producing the curve.

Reversing operation (reciprocating operation)

In this mode the output flange oscillates (shuttles) continuously, back and forth between two positions. The drive of the partly completed machinery is reversed in the respective dwell phase.

Inching mode

In inching mode, the output flange move in small steps between two dwell positions.

The cylinder is unable to accelerate and decelerate the accumulated load gently. As a result, high accelerations occur, which impact the mechanics. Inching may only be carried out with a suitable universal controller. A suitable controller is, for example, the TIC controller (TAKTOMAT Indexing Controller).

Emergency stop

The emergency stop stops the movement of the output flange immediately. The resultant load that is built up impacts the mechanics. The emergency stop should therefore only be used in emergency situations.

7 Maintenance

7.1 Maintenance schedule

| Interval | Activity | Personnel |
|-------------|---|---------------------|
| Daily | General visual inspection and check for noises | Operator |
| Monthly | Check the TSR rotary ring indexer for oil leaks | Operator |
| Monthly | Check the oil level | Operator |
| Half-yearly | <ul style="list-style-type: none"> • Check for damage (visual inspection) • Remove dust deposits (especially from the ventilation grille of the drive unit) • Check electric cables for damage | Qualified personnel |
| Annually | Check the TSR rotary ring indexer for clearance in the latch positions | Qualified personnel |

7.2 Lubricating

Careful lubrication is necessary to ensure operating reliability and a long service life of the incomplete machine. All lubricating points must be supplied with the specified oils and greases.

Clean soiled lubricating points carefully with petroleum or an appropriate means and then lubricate with new lubricant. After lubricating, the surplus lubricant must be removed and disposed of properly.

NOTE



Component damage due to unsuitable lubricants

Mixing greases with different bases leads to gumming and decomposition of the greases and cancels the lubricating effect.

- Use lithium-saponified grease only for relubricating

Lubricating oils

Only use lubricating oils to DIN 51 517 (ISO VG 460).

Recommended gear oils

| Manufacturer | Designation |
|---------------|-------------------------|
| Mobil | Mobilgear 600 XP 460 |
| BP | Energol GR-XP 460 |
| SHELL | Omala 460 |
| LIQUI MOLY | meguin CLP 460 gear oil |
| Zeller+Gmelin | Divinol ICL ISO 460 |
| Klüber | Klüberoil GEM 1 N |

Lubricating greases

Only use lubricating greases to DIN 51 825-KP 2K.

Recommended grease

| Manufacturer | Designation | Specification |
|--------------|--------------------|---------------|
| Mobil | Mobilux EP2 | KP2 K-30 |
| BP | Energrease LS-EP 2 | KP2 K-20 |
| Aral | Aralub HLP 2 | KP2 N-30 |
| Fuchs-DEA | Renolit MP | KP2 K-40 |
| Klüber | Centoplex 2 | KP2 K-20 |
| SHELL | Alvania G2 | KP2 N-20 |

7.2.1 Checking the oil level

Operator

Required personal protective equipment



NOTICE

Damage to components



Improper refilling of the lubricant can cause material damage.

- Before checking the oil level, the rotary indexer must stand still for at least 30 minutes
- Check the oil level only when the indexer is at a standstill
- Do not overfill oil. Fill the oil only up to the level of the oil sight glass.

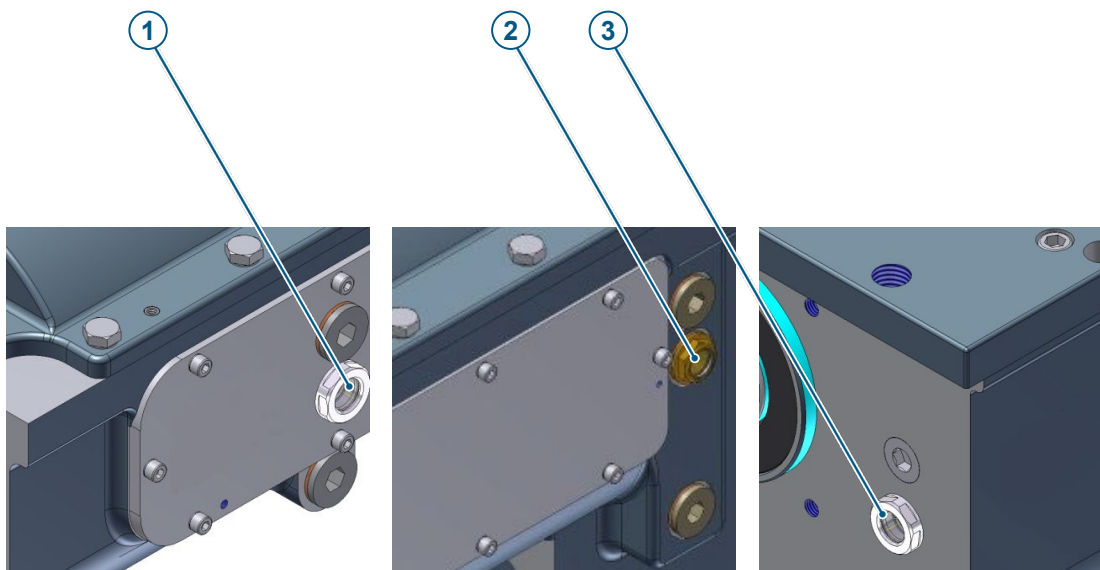


Fig. 6: Checking the oil level

| | | | |
|---|---------------------------------|---|-------------------------|
| 1 | Oil sight glass TSR950, TSR1890 | 2 | Oil sight glass TSR1350 |
| 3 | Oil sight glass TSR1750 | | |

The TSR rotary ring indexer has an oil sight glass, and must be checked to make sure the oil level is correct in accordance with the maintenance schedule. The correct oil level has been reached when the oil is in the middle of the oil sight glass (1). Top up oil if necessary.

7.2.2 Oil fill quantities

| Gear type | Filling quantity [l] [dm ³] |
|-----------|---|
| TSR600 | 2.0 |
| TSR1000 | 9.5 |
| TSR1400 | 17.0 |

8 Troubleshooting

DANGER

Electric shock



Touching live parts poses an immediate danger to life

- Work on the electrical systems must only be carried out by qualified electricians
- In case of damage to the insulation, switch off the power supply immediately and have repairs carried out
- Before starting work, disconnect the plant, secure it to prevent it from being switched back on, and make sure that it free from voltage

WARNING



Risk of injury as a result of improper fault clearance

Improper fault clearance can lead to severe personal injury or material damage.

- Before starting work, make sure there is sufficient installation space
- Make sure the installation site is clean and tidy

| Fault | Possible cause | Remedy |
|--|--|--|
| Motor not running | <ul style="list-style-type: none"> • No supply voltage • Motor contactor faulty • Motor protection switch tripped • Brake not open | <ul style="list-style-type: none"> • Check the voltage • Replace the motor contactor • Let the motor cool down and engage the switch • Brake connected incorrectly or worn |
| The motor is running but the rotary ring indexer does not turn and the output flange has <u>no</u> clearance | <ul style="list-style-type: none"> • External gear faulty | <ul style="list-style-type: none"> • Contact TAKTOMAT GmbH • Remove the external blockage |
| The motor is running but the rotary ring indexer does turn and the output flange has clearance | <ul style="list-style-type: none"> • Cam follower broken off as a result of a major overload | <ul style="list-style-type: none"> • Contact TAKTOMAT GmbH |
| The motor runs with loud humming noises | <ul style="list-style-type: none"> • The motor only runs on 2 phases | <ul style="list-style-type: none"> • Check fuses or motor contactor • Measure current in all 3 phases (voltage measurement is not enough) |
| Rotary ring indexer does not position to station 1 - n | <ul style="list-style-type: none"> • Check the initial position (station 1) • Encoder faulty | <ul style="list-style-type: none"> • Check the encoder • Replace the encoder in case of fault • Contact TAKTOMAT GmbH |

Sensor transmits no signal

- Sensor not actuated
- Cable faulty
- Sensor faulty
- No supply voltage
- Switching distance is not correct
- Remove blockage
- Check cable and replace if necessary
- Replace sensor
- Check the voltage
- Push the sensor into the clamp mounting as far as it will go

The rotary encoder does not deliver any position data

- Rotary encoder not connected to input shaft because the coupling is not tightened/coupling slips
- Cable faulty
- Rotary encoder faulty
- Re-tighten the fastening screws on the coupling.
- Replace the cable
- Replace the rotary encoder

9 Disposal

Required personal protective equipment



DANGER

Electric shock



Touching live parts poses an immediate danger to life

- Work on the electrical systems must only be carried out by qualified electricians
- In case of damage to the insulation, switch off the power supply immediately and have repairs carried out
- Before starting work, disconnect the plant, secure it to prevent it from being switched back on, and make sure that it free from voltage

NOTICE



Environmental damage

Improper disposal may result in environmental damage

- Dispose of components and operating materials in accordance with local regulations
- Observe the safety data sheets of the operating materials

Materials used

The components are mainly made of the following materials:

- Copper (complete drive units, electrical cables)
- Steel and grey cast iron (housings, attachments, shafts, bearings)
- Plastic (toothed belt, insulation, bearing)

Preparation for disposal

1. Disconnect the system from all power supplies and secure it against being switched on again.
2. Wait 15 minutes until all live components are completely discharged.
3. Disassemble and dispose of assemblies and components in accordance with local environmental regulations.

10 Spare and wear parts

NOTICE

**The use of unsuitable spare parts may result in material damage**

Spare parts must comply with the technical requirements specified by the manufacturer

- Only use original spare parts
 - Check spare parts for faults or defects prior to installation
-

Spare and wear parts are always order-specific. A corresponding spare and wear parts list is available from TAKTOMAT on request. When ordering spare parts, always state the serial number. The serial number is located on the nameplate.

11 Annexes

11.1 Content of the declaration of incorporation

(The original declaration of incorporation is included in the documentation)

| | |
|---|--|
| <p>Translation of the original declaration of incorporation (in German) for partly completed machinery (Machinery Directive 2006/42/EC, Annex II 1 B)</p> <p>Manufacturer: TAKTOMAT GmbH Rudolf-Diesel-Straße 14 D-86554 Pöttmes</p> <p>Description and identification of the partly completed machinery: Your order No.: - Our order No.: - Product: Rotary ring indexer Type: TSR Serial number: - Commercial name: Rotary ring indexer TSR</p> <p>The manufacturer declares that the following essential requirements of the Machinery Directive 2006/42/EC have been applied and met: 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.5.3, 1.5.4, 1.6.1, 1.6.4, 1.7.1, 1.7.4</p> <p>Reference of the applied harmonised standards according to Article 7 Section 2: EN ISO 12100:2010 Safety of machinery — General principles for design — Risk assessment and risk reduction</p> <p>Furthermore, it is declared that the relevant technical documentation for this partly completed machinery has been compiled according to Annex VII Part B. The manufacturer undertakes to transmit in electronic form relevant information on the partly completed machinery within a reasonable time in response to a reasoned request by the national authorities.</p> <p>The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared to be in conformity with the provisions of the Machinery Directive.</p> <p>Responsible for the documentation: TAKTOMAT GmbH Address: Rudolf-Diesel-Straße 14, D-86554 Pöttmes</p> |  <p>TAKTOMAT passion for automation</p> |
|---|--|