

# \* Operating Manual

Traktionssysteme Austria GmbH  
Brown-Boveri-Str. 1  
A-2351 Wiener Neudorf  
☎ +43 (0) 2236 8118-0  
✉ office@tsa.at

## Traction Motor TME 49-30-4

www.tsa.at

# TME 49-30-4

## IMPRINT

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**Created:** **Ms. C. Linert**  
*Engineering Support*

**Approved:** **Mr. C. Weber**  
*Head of Engineering Support*

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## 1 ABOUT THIS OPERATING MANUAL

### 1.1 Manufacturer

TRAKTIONSSYSTEME AUSTRIA GmbH

Place of business: Wiener Neudorf

**Manufacturer`s address:**

TRAKTIONSSYSTEME AUSTRIA GmbH / Service

Brown-Boveri-Straße 1

A-2351 Wiener Neudorf

Tel.: +43 (0) 2236 8118-111

Fax: +43 (0) 2236 8118-237

E-Mail: [office@tsa.at](mailto:office@tsa.at)

Internet: [www.tsa.at](http://www.tsa.at)

### 1.2 To the user

#### 1.2.1 Operating manual

This operating manual contains all the essential information that is required for the secure and smooth operation of the traction drive. It provides important information that enables you to perform maintenance and repair work correctly.

Work carefully through the operating manual before you commence maintenance and repair work.

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## 1.2.2 Warning and safety instructions formats

Hazards and notes in this Operating Manual are classified and illustrated as follows:



Describes an immediately threatening danger.

If the danger is not avoided, death or very serious injuries (mutilation) may result.



Describes a potentially dangerous situation.

If the dangerous situation is not avoided, death or very serious injury (mutilation) may result.



Describes a potentially dangerous situation.

Not avoiding this dangerous situation may result in slight or minor injuries



Indicates a potentially harmful situation.

Not avoiding this harmful situation may lead to damage to the product or objects in its surroundings.



Notes provide useful tips and supplementary information on the equipment.

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## 1.3 Intellectual property

All developments, patents, design drawings, etc. as well as this operating manual that are connected with our traction motor are our intellectual property. This documents or parts thereof should neither be duplicated nor made available to third parties without a written approval from **TRAKTIONSSYSTEME AUSTRIA GmbH**. Violation infringes copyright and is liable to compensation.



**Exception:** The use and reproduction of all data and documents from these operating instructions (for project planning purposes or for the operator) is permitted without restriction!

## 1.4 Condition for changes

Specifications, graphs and drawings can differ from the actual design as a result of our efforts to carry out continuous upgrades in our traction motor.

We mention here that we reserve the right to make technical changes. Of course, we will send you necessary documents for your information and to complement your operating manual if amendments and changes were carried out on the traction motor or its accessories after compiling this operating manual.

## 1.5 Warranty and guarantee claims

In order not to lose the warranty and guarantee claims in any relevant case, please contact:

**TRAKTIONSSYSTEME AUSTRIA GmbH / Service**

Brown-Boveri-Straße 1

A-2351 Wiener Neudorf

Tel.: +43 (0) 2236 8118-111

E-Mail: [service@tsa.at](mailto:service@tsa.at)



We will decline every right to warranty payments if changes or repairs are carried out on the traction motor by a third party without our consent during the warranty and guarantee period.

In the event of any faults, shut down the traction motor immediately and contact the manufacturer (see the address above).

For repair works within the warranty period, you need previous approval from the manufacturer.

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## 1.6 Spare parts

Those parts that are possibly needed are mentioned in the spare parts list in this manual (see [section 12.2.2](#)). There is no explicit reference to the fitting material. There is a difference between parts that are subject to normal wear, therefore, regarded as "essential" spare parts and those that could be faulty, therefore, just "recommended" as spare parts only.

## 1.7 General information for disassembling and assembling of the traction motor

In the following descriptions used numbers set in brackets i.e. (12) refer to item No. in the figures and the corresponding item/position No. in the parts list(s) in [section 12.1](#).



Installation and deinstallation of the drive are not included in this operating manual.

## 1.8 Abbreviations

|     |                |
|-----|----------------|
| DE  | Drive End      |
| NDE | None Drive End |



## 2 SAFETY INSTRUCTIONS

### 2.1 Intended use



#### **WARNING!**

Improper use may result in danger to the life of the operating personnel or other persons or cause injuries or extensive damage to property.

- ▶ The manufacturer is not liable for damage resulting from improper use. The risk is carried by the user alone.
- ▶ Ensure that the traction motor is only operated within the intended use and within the technical data.

This traction motor is exclusively designed for fitting and operation in railway vehicles.

No warranty and liability are assumed if it is used beyond the specified intended use and without observing the necessary requirements and safety measures.

The traction motor is designed in accordance with the state of the art and recognized safety-related regulations. When in use, however, there can be a threat to life and physical condition of the user or third party; and/or damages to the motor and other material assets can occur.

Therefore, use the traction motor only in technically good order and condition, and according to the law, safety-conscious and risk conscious in compliance with the operating manual! Faults that can affect safety should be rectified immediately.

Intended use also includes adhering to the operating manual and compliance with the inspection and maintenance intervals.

Any other or further use of the traction motor is not as intended.

## 2.2 Basic safety instructions

- In addition to the operating manual, pay attention and follow the generally accepted, legal and other related rules for accident prevention and environmental protection!
- Such responsibilities can also be related to, e.g., hazardous materials handling, putting something at somebody's disposal/wearing personal protective equipment.
- Before starting work, the authorized personnel in charge of operations on the traction motor must have read the operating manual and, in particular, the section "Safety Instructions". It is too late when carrying out the assignment. This applies in particular to personnel who are only rarely assigned a task on the machine, such as changeovers or maintenance.
- At least, one should occasionally inspect the safety-conscious and risk conscious operations of the personnel in compliance with the operating manual!
- The personnel should not have loose long hair, loose clothes, or jewellery, including rings. There is risk of injury e.g. by getting caught or drawn in.
- Personal protective equipment should be used if necessary or required by regulations!
- All safety and hazard instructions on the traction motor should be observed!
- All safety and hazard instructions at/on the traction motor should be complete and kept in good legible state!
- In the event of safety-relevant modifications or operating performance, shut down the tractor motor immediately and report the fault to the relevant office / person!
- No modifications, additions and reconstructions that could affect safety should be carried out on the traction motor without the approval of the manufacturer! The same is true for the installation and setting of safety installations.
- Spare parts must meet the specified technical requirements of the manufacturer. This is always warranted with genuine spare parts.
- Adhere to the specified or stated deadlines for periodic review/inspections in the operating manual!
- Appropriate places for work should be provided for carrying out maintenance measures!
- Pay attention to fire detecting and firefighting possibilities!

## 2.3 Selection of personnel and qualification – basic duties

- Handling and operation, cleaning, maintenance and repair of the traction motor and its components must only be carried out by authorized personnel in accordance with details in these operating instructions. Pay attention to the legally permissible age!
- Make sure that operations on the traction motor are only carried out by authorized (trained or instructed) and assigned personnel for that purpose.
- Clearly state the responsibilities of the personnel for the operation, setting up, maintenance and repair!
- State the responsibility of the machine operator and permit him to reject instructions from a third party that are contrary to safety regulations!
- Personnel who are undergoing training, instruction and Induction or personnel who are generally in vocational training must only work on the traction motor under the constant supervision of an experienced person!
- Working on electrical equipment must only be carried out by a qualified electrician or by instructed persons under the leadership and supervision of a qualified electrician in accordance with the electro-technical regulation.
- No warranty payments or liabilities of any kind whatsoever are assumed by **TRAKTIONSSYSTEME AUSTRIA GmbH** for all types of damage that arises as a result of disregarding the operating instructions, warnings and safety instructions mentioned in the operating manual or that arises from inappropriate operation.

## 2.4 Cleaning and maintenance

- In the interest of our customers, we want to point out that you can boost the performance of the traction motor via systematic planning of the maintenance and cleaning work. One can minimize faults and damage by carrying out regular cleaning and maintenance. In this way, you reduce the time and effort in repairs and energy and the consequent costs.
- Observe the setting, maintenance and inspection activities specified in the operating manual as well as deadlines including the specifications for changing components / component fittings!
- These activities must only be carried out by qualified personnel!
- For all operations that relate to handling, maintenance, inspection and repair, pay attention to the activation and deactivation operations in accordance with the operating instructions and details for maintenance work!
- Secure a spacious maintenance area if necessary!
- Carry out maintenance and repair work only when the traction motor is switched off and secured on a level and stable surface!
- If the traction motor is completely switched off during maintenance and repair work, it must be secured against inadvertent restarting.
- During installation work above head height, designated or other climbing aids and working platforms that are in conformity with security norms should be used.
- Machine parts should not be used as climbing aids!
- Keep all handle holds, steps, railings, stair heads, platforms, and ladders free from dirt, snow and ice!
- At the beginning of maintenance/repair work, clean the traction motor, particularly, the connections and screwed fittings of oil, fuel or maintenance bushing plates! Do not use any abrasive cleansing material! Use fibre-free cleaning rags!
- During maintenance and repair work, always tighten screw connections that have come loose!
- Screws that are tightened with a tightening torque should be marked.
- If dismantling of the safety installations is required during setting up, maintenance and repair, new installation and inspection of the safety installations should be carried out immediately after completing the maintenance and repair work.
- Make sure that there is safe and environmentally friendly disposal of consumables and auxiliary materials as well as replacement parts!

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## 2.5 Reference notes on types of risk

### 2.5.1 Electrical power

- In the case of any intervention, the power supply to the traction motor should be disconnected.
- In case of faults in the electrical system, the traction motor should be shut down immediately.
- The electrical equipment should be inspected regularly. Defects such as loose connections or burnt cables must be rectified immediately.
- Check all hoses, cables and connections regularly for leaks and externally noticeable damage. Damage should be rectified immediately.

### 2.5.2 Hazards of rotating parts

- Serious or fatal injuries possible due to parts not secured against rotation (couplings, shafts, fans, rotors).
- Follow the local accident prevention regulations and general safety regulations applicable to the area of use of the traction motor.

### 2.5.3 Gas, dust, vapour, smoke

- Observe the applicable regulations for the site of operation.
- Welding, burning and grinding operations on the traction motor should only be carried out if this is expressly approved. There can be fire and explosion hazard.
- Before welding, burning and grinding, the traction motor and its surroundings should be cleaned of dust and combustible materials and you must make sure there is enough ventilation (explosion hazard).

### 2.5.4 Oils, grease and other chemical substances

- When dealing with oils, grease and other chemical substances, pay attention to the safety instructions applicable to the bushing plate.
- Watch out when dealing with hot consumables and auxiliary materials (burn or scalding hazard).
- Pay special attention to specifications concerning personal protective equipment, specifications on toxicology and the reference notes on waste disposal in the safety data sheets as well as country-specific regulations.

## 2.5.5 Transport and recommissioning

- Only load and convey in accordance with the operating instructions.
- Only use suitable means of conveyance and hoisting devices with adequate load carrying capacity.
- Individual components and bigger components should be carefully fastened and secured to the hoisting devices during replacement. Only use suitable and technically perfect hoisting devices as well as load-carrying equipment with adequate load carrying capacity.
- Only experienced people should be entrusted with fastening of loads and instructing the crane operators. The banks man must remain within the range of vision of the operator, or they must be able to speak to each other.
- Do not stand or work under suspended loads.
- During recommissioning, proceed only in accordance with the operating manual.

## 2.5.6 Liability

- **TRAKTIONSSYSTEME AUSTRIA GmbH** assumes no warranty payments or liabilities of any kind whatsoever for all types of damage that arises as a result of disregarding the operating instructions, warnings and safety instructions mentioned in the operating manual, or from inappropriate operation.
- Manipulations or modification to the traction motor in order to change or manipulate its intended use or its performance led to liability exclusion.
- We will decline every right to warranty payment if changes or repairs are carried out on our traction motors by a third party without our consent during the guarantee period.
- Repair work within the warranty period needs the prior approval of the motor manufacturer.

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## 2.6 Safety regulations

### 2.6.1 Specialists

Specialists are persons who:

- Have the training and experience,
- Who know the applicable standards, regulations, requirements and accident prevention regulations respectively,
- Are instructed about the mode of operation and operating conditions of the electric machines,
- Can spot and avoid dangers.

### 2.6.2 Qualified and authorised personal



**WARNING!**

#### RISK OF DAMAGE AND INJURY!

Handling the machines and materials improperly can result in severe injury, death, and/or major material damage. Therefore, please observe the notes in this section when performing all work.

- ▶ All assembly, dismantling, maintenance work and repairs may only be carried out by appropriately qualified personnel and authorized bodies.
- ▶ Take note of DIN VDE 0105 and IEC364 in this respect.
- ▶ Traction motors may only be transported, positioned, connected, commissioned, serviced, and operated by skilled personnel who are fully conversant with the applicable safety regulations and installation provisions. All work must be checked by authorized skilled personnel.
- ▶ The skilled personnel must be authorized to perform the necessary activities by the plant's safety officer.
- ▶ The prescribed maintenance intervals and the repair and replacement instructions must be strictly observed.



## DANGER!

### HIGH VOLTAGE – DANGER TO LIFE!

The deployment of unqualified staff and ignorance of sources of danger can lead to injuries and death.

- ▶ Ensure that only personnel with qualifications corresponding to the purpose of the task are used.



## NOTE

### RISK OF DAMAGE!

The deployment of unqualified staff and the incorrect use of equipment can lead to damage to the gearbox and the operator's property.

- ▶ Only use qualified personnel for all activities.

## 2.6.3 Disconnect power from traction motor



## DANGER!

### ATTENTION HIGH VOLTAGE – DANGER TO LIFE!

Before opening active parts of the traction motor, make sure that the traction motor is switched off according to instructions. This applies especially during removal from and mounting into the vehicle, and after carrying out inspections on the motor.

Here, the "safety rules" are (e.g. in accordance with DIN VDE 0105):

- ▶ Disconnecting
- ▶ Securing against re-starting
- ▶ Ensuring that the unit is de-energized
- ▶ Earthing and short-circuiting (for voltages above 1000 V)
- ▶ Disabling or covering of adjacent parts



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## 2.6.4 Shorts circuits



### HIGH VOLTAGE – DANGER TO LIFE!

Short circuiting as a result of uninsulated areas puts the motor out of operation, on the one hand, and carries the risk of subsequent injury or death, on the other.

- ▶ Ensure that any damage detected is remedied immediately.

## 2.6.5 Operating manual



This operating manual is to be stored in such a way that it is freely accessible to operational personnel during operation, maintenance, and repair without any restrictions.

## 2.6.6 Safety instructions



### RISK OF DAMAGE OR INJURY!

Failure to observe the warnings and safety instructions in this operating manual can lead to damage and/or injury.

- ▶ Traction motors may only be transported, positioned, connected, commissioned, serviced, and operated by skilled personnel who are fully conversant with the applicable safety regulations and installation provisions.
- ▶ Ensure that all work is checked by authorized skilled personnel.

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## 2.6.7 Protective devices and personal protective equipment



### RISK OF INJURY or DANGER TO LIFE!

Faulty or missing protective equipment or damaged protective equipment can lead to injury or death.

- ▶ Never operate traction motors without protective equipment (air grilles on the air inlets of the DE side bearing plate) or with the terminal box open.
- ▶ Insulated tools insulated protective clothing, protective devices, safety belts, devices, and other auxiliary material must be maintained in perfect condition.
- ▶ The user must check insulated protective clothing for obvious damage before each use.
- ▶ Damage to insulated protective clothing may only be repaired by appropriately qualified workshops.
- ▶ However, gloves may not be repaired and must be replaced with NEW ones instead.
- ▶ Insulated gloves and shoes/boots must also be tested at certain intervals with respect to their electrical protection capability.
- ▶ Wristwatches, rings, and bracelets may not be worn at work.

## 2.6.8 Firefighting



- Switch traction motor off immediately.
- Secure against restarting.
- Notify the fire department and indicate that there is an electrical fire.
- Fight fire with appropriate extinguishing agents (e.g. powder or foam extinguisher).

# TME 49-30-4

## 2.6.9 First aid measures



### HIGH VOLTAGE – DANGER TO LIFE!

The following measures must be carried out immediately in the event of electrical accidents:

- ▶ Interrupt the current by switching off the machine, pulling the plug, and/or removing the fuse.
- ▶ If these measures are not immediately possible, the accident victim(s) must be separated from the live components using non-conducting objects or must be dragged away by their clothes.
- ▶ Persons providing assistance must ensure that they are insulated, for instance by standing on a dry wooden board, on dry clothing, or on a thick pile of newspapers. Persons providing assistance must not touch anything else.

Emergency number: .....

Emergency services control centre: .....

Tel.: .....

*(Please enter your country-specific emergency numbers yourself!)*

Administer first aid until the doctor arrives:

- ▶ Immediately place the victim in a resting position.
- ▶ Check breathing and pulse.
- ▶ Perform artificial respiration if there is no breathing.
- ▶ Perform CPR (cardiopulmonary resuscitation) if there is no pulse.
- ▶ Place the victim on their side if they are unconscious but breathing.
- ▶ Cover burns with a sterile dressing.

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# TME 49-30-4

## 3 PRODUCT DESCRIPTION

### 3.1 Technical data

|                          |  |       |              |
|--------------------------|--|-------|--------------|
| Designation              | Asynchronous three-phase traction motor  |       |              |
| Type designation         | TME 49-30-4  |       |              |
| Outline drawing          | TSA024288  |       |              |
| Machine assembled        | TSA024539R0001   |       |              |
| Motor mass               | $m_{\text{Motor}}$   | 900   | kg $\pm 3\%$ |
| Nominal power (S1)       | $P_{\text{nom}}$   | 210   | kW           |
| Nominal speed            | $n_{\text{nom}}$   | 3574  | rpm          |
| Nominal voltage          | $U_{\text{nom}}$   | 1184  | V            |
| Nominal current          | $I_{\text{nom}}$   | 120   | A            |
| Nominal frequency        | $f_{\text{nom}}$   | 120,2 | Hz           |
| Maximum speed            | $n_{\text{max}}$   | 4992  | rpm          |
| Maximum voltage          | $U_{\text{max}}$   | 1430  | V            |
| Cooling type             | Air, self-ventilated   |       |              |
| Air inlet temperature    | $T_{\text{max.}}$  | 50    | °C           |
| Max. ambient temperature | $T$  | 50    | °C           |
| Protection system        | IP 20  |       |              |
| Thermal class            | 220  |       |              |
| Insulation system        | TSADUR®  |       |              |
| Fire protection          | According to EN 45545 HL3  |       |              |
| Design / Model           | <ul style="list-style-type: none"> <li>• two-bearing three-phase asynchronous motor</li> <li>• Air inlet on NDE without filters</li> <li>• speed sensor</li> <li>• resistance thermometer Pt100</li> </ul> |       |              |

The operation of this traction motor may only take place within the scope of this data.

In the case of different applications, a written declaration of consent must always be obtained from the manufacturer of traction motor!

## 3.2 Monitoring

### Temperature sensor – resistance thermometer Pt100<sup>1</sup>

- Warning - °C
- Power reduction - °C
- Shut down - °C

---

<sup>1</sup> Follows after type test.

# TME 49-30-4

## 3.3 Description

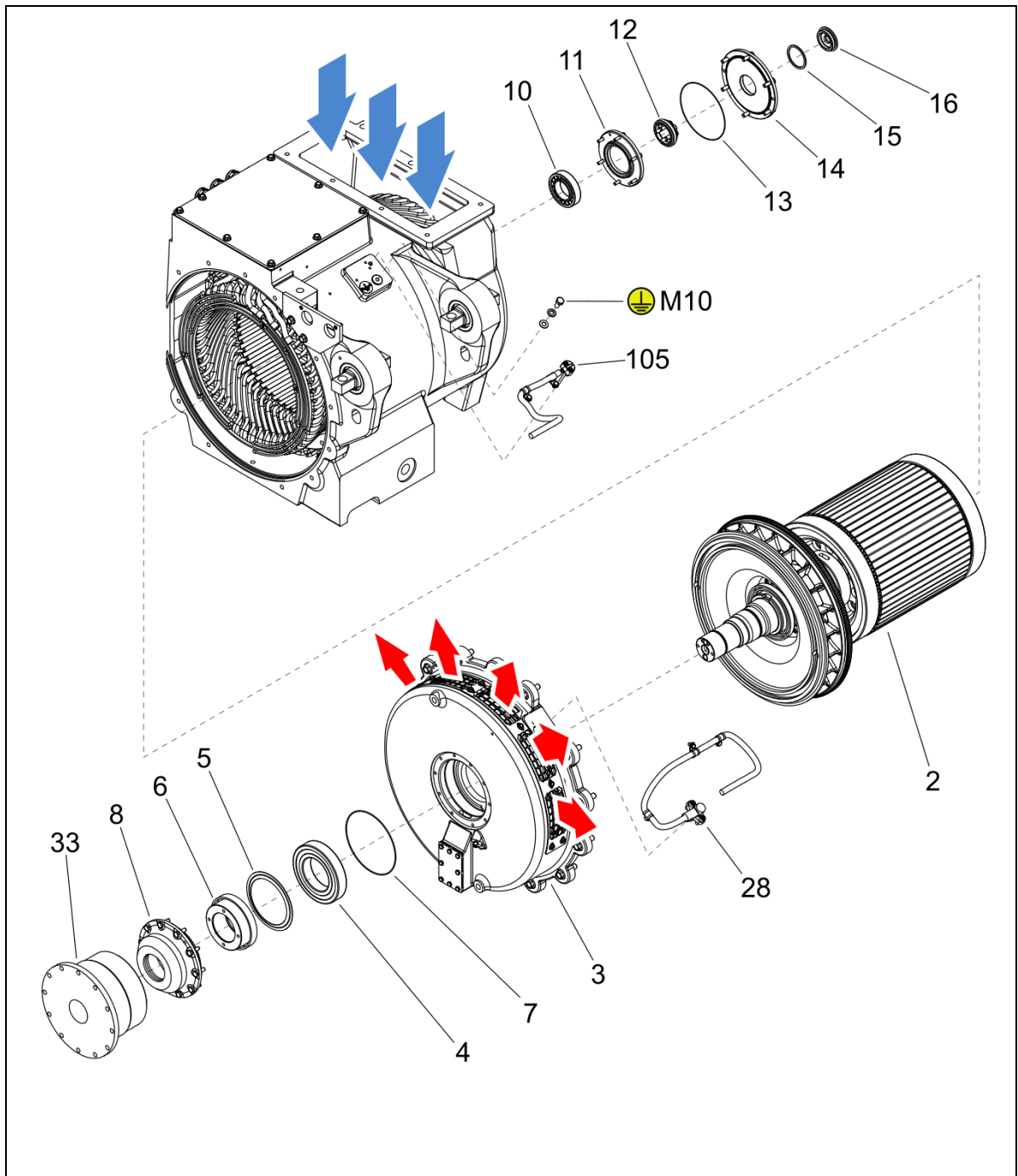


Figure 1: Main assemblies

### 3.3.1 Stator

The stator (1) has a casted and machined housing. The stator winding consists of shaped coils which are wound from insulated rectangular profile - copper wire, banded with additional coiling insulation where slots are inserted, which are equipped with a slot lining. The connections of the stator coils take place on the drive side (DE). The stator winding is insulated in accordance with TSA standard (TSADUR®) and conforms to thermal class 220.

# TME 49-30-4

## 3.3.2 Rotor

The lamination stack of the rotor (2) is made up of layered dynamo sheet. The entire lamination stack is suspended on the shaft and clamped together on both sides by rotor clamping rings. The motor torque is transmitted to the shaft via a frictional connection. On the non-drive side, the lamination stack is secured further with a shrink ring, shrunk onto the shaft. Short circuit bars and short circuit rings are brazed on both sides. Shrink collars made up of high-strength, non-magnetic material absorbs the loading from the centrifugal force load on the short circuit rings.

The motor shaft is designed as a solid shaft. The rotor is cooled via the axial holes. The coupling interface on the drive side is realized with a conical fitting connection.

## 3.3.3 Motor connections

The electric motor connection is located in the terminal box on the junction plate at the top of the stator. To introduce the connection cables three threaded holes are provided in the cable bushing plate for the cable glands.

## 3.3.4 Motor monitoring

For monitoring the motor rotation speed, a tooth wheel is mounted to the ventilator (206) and the speed sensor (28) is fitted in the bearing shield DE (3).

For monitoring the stator temperature, a resistance thermometer Pt100 (105) is fixed on the top of the stator housing.

## 3.3.5 Rotor bearing

The motor shaft is equipped with a deep groove ball bearing 6217 (4) at the drive end (DE) and with a cylindrical roller bearing NU 210 (10) at the non-drive end (NDE).

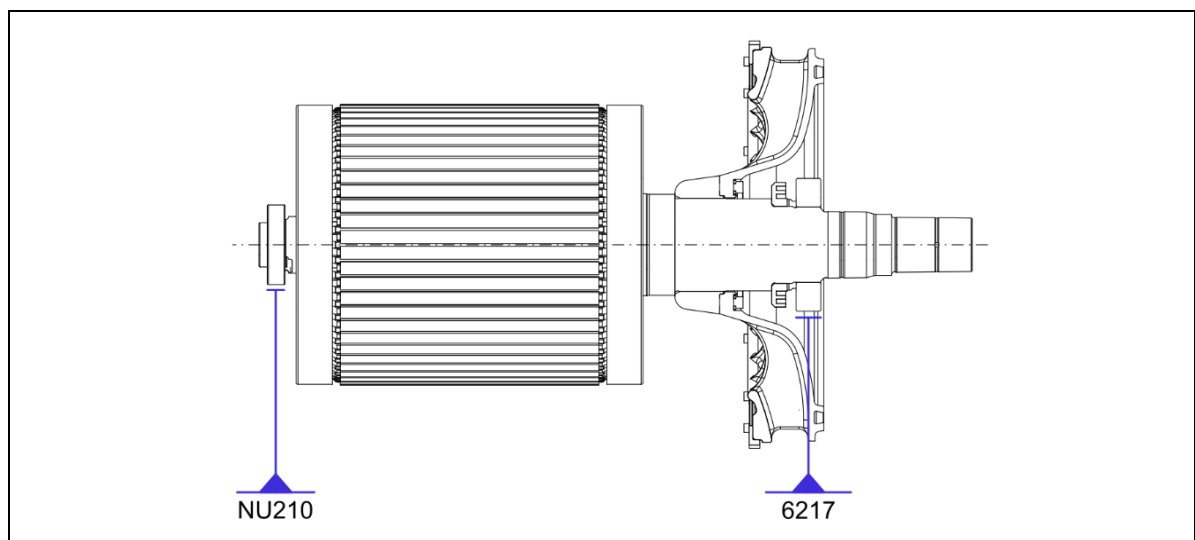


Figure 2: Rotor bearing



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## 3.3.6 Cooling system

Airflow is generated by a ventilator directly attached to the motor shaft. The cooling air enters the interior of the machine through the opening in the housing on the non-drive side (NDE), is drawn over winding overhang and through stator and rotor holes, passes the ventilator (206) and leaves the machine in radial direction through air grids on the drive side (DE).



### NOTE

#### RISK OF DAMAGE!

The inflowing cooling air temperature must always be  $\leq 50$  °C.

- ▶ The air inlet openings and air outlet openings must be kept free of contamination so that the fresh cooling air can enter the traction motor on the one hand, and the heated discharge air can leave the traction motor unobstructed on the other hand.
- ▶ The released air should not be sucked in again immediately.

## 3.3.7 Painting

The traction motor is provided with standard paintwork according to specification TSA000075 – V56 (see [section 14.1](#))

- Traction motor: RAL 9005 (jet black)
- Transport lock: RAL 3001 (signal red)

## 3.3.8 Scope of delivery

The scope of delivery consists of:

- Traction motor ready for shipment - TSA024591R0001

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## 3.4 Identification

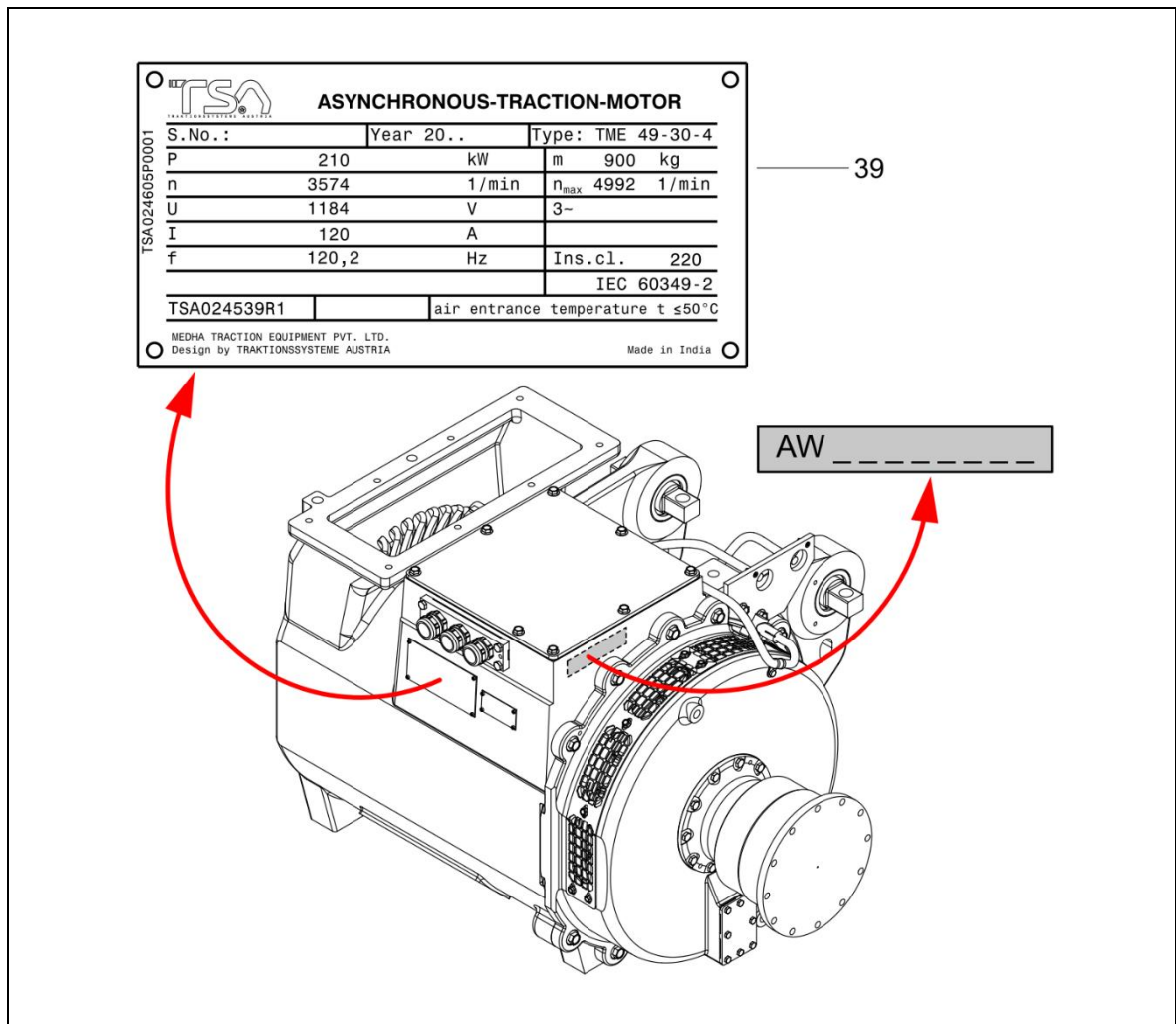


Figure 3: Rating plate and serial number

The rating plate (39) is located on the side of the stator housing. The serial number of the traction motor is stamped on the side of the terminal box and is an eight-digit number (AW \_\_\_\_\_).

The type designation identifies essential design features of the traction motor.

**T** **M** **E**      **4** **9** - **3** **0** -      **4**

- TME**      Traktions-Motor-Eigenbelüftet = traction motor self-ventilated
- 49**      Code number for the magnetic outer diameter (= 490 mm)
- 30**      Code number for the iron length (= 300 mm)
- 4**      Number of poles (4-pole)

# TME 49-30-4

## 4 PACKAGING, TRANSPORT AND STORAGE

### 4.1 Packaging

During the delivery, the traction motor is packed on a pallet and wrapped in plastic.

Check the traction motor and its components for transport damage.

The packaging must be disposed of according to the waste control statute on-site.

### 4.2 Transport



#### NOTE

#### RISK OF DAMAGE!

- ▶ Transport without transport lock is not permitted, as damage to the roller bearings may occur.
- ▶ The roller bearings are protected against bearing damage by a transport lock. This must be removed before commissioning.
- ▶ The transport lock must be refitted for all further transports (see [section 4.2.1](#)).
- ▶ When traction motor is removed from the bogie the air inlet on the stator housing and the openings in the cable glands must be closed. Otherwise, this could lead to motor damage.

If the traction motor is placed on a pallet, the traction motor can be shipped and transported using hand lift trucks and forklift trucks.

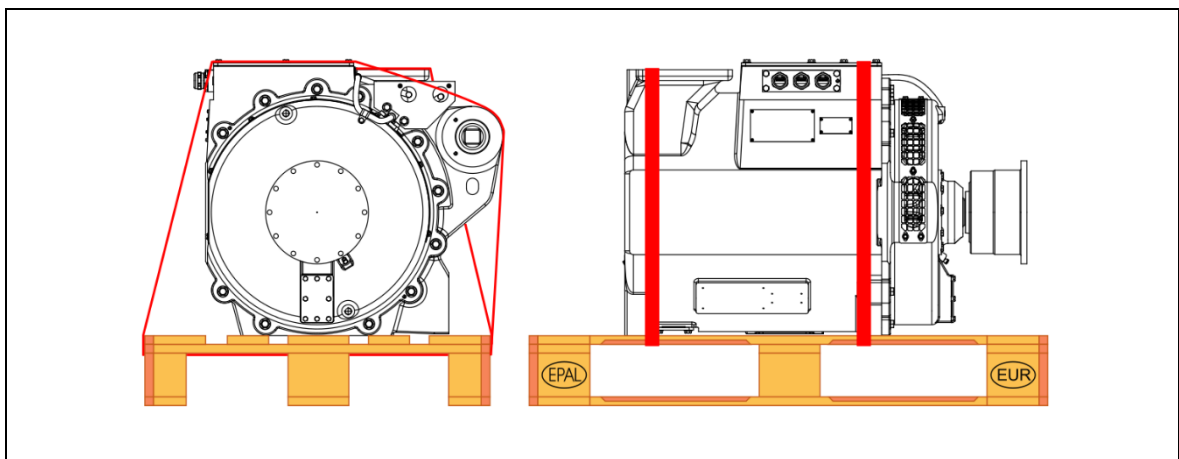


Figure 4: Traction motor on pallet



Load swivels M20 or eye bolts M20 can be used to lift the traction motor (are not part of the scope of delivery).

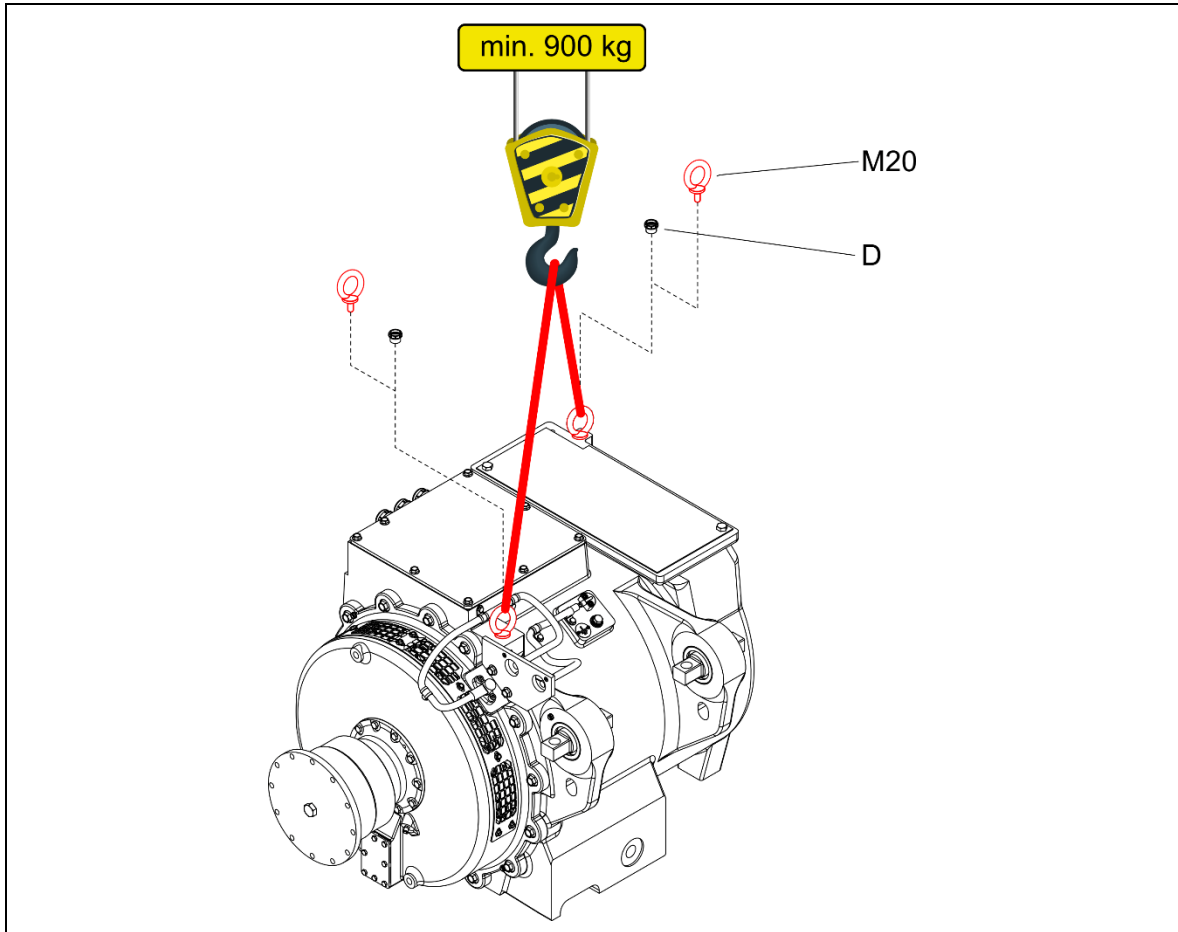


Figure 5: Crane transport



**WARNING!**

### RISK OF DAMAGE OR INJURY!

Avoid jerky motions, impacts, or vibrations on the motor/drive when loading!

The traction motor can also be transported by crane.

- 1 Remove the two screw plugs (D) and install two eye bolts M20.
- 2 Attach suitable slings and lift the motor off the pallet.



Use adequate hoisting devices for the corresponding weights.  
**Mass of Traction motor = approx. 900 kg**

### 4.2.1 Transport lock

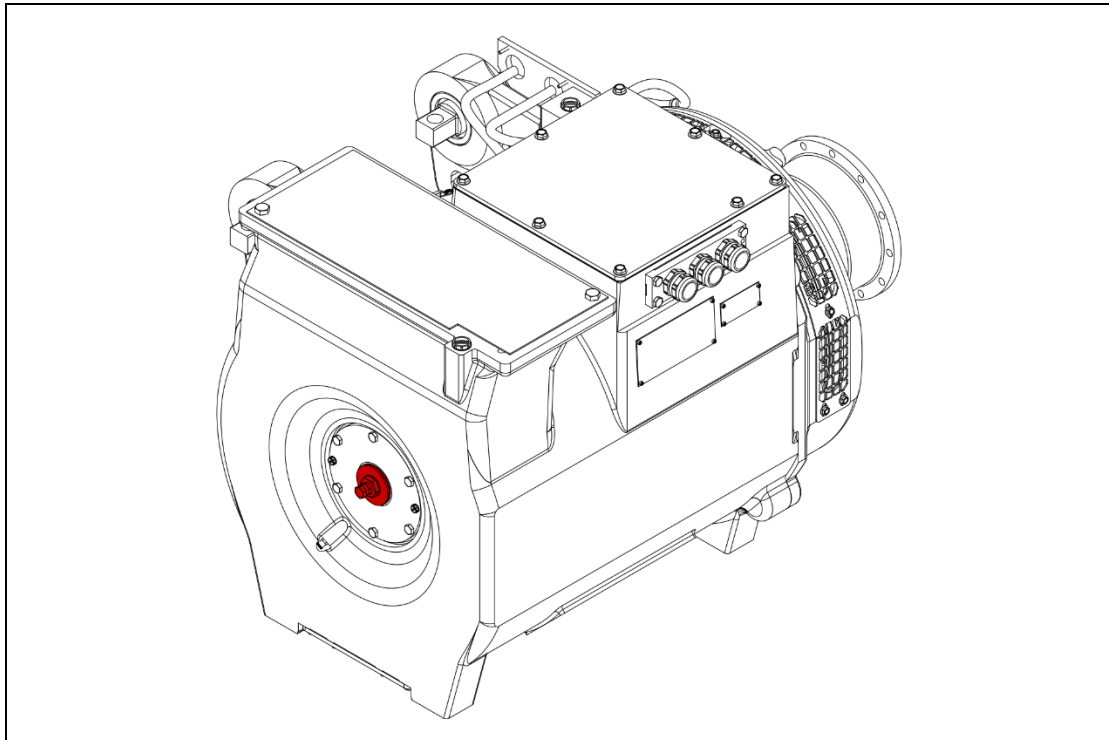


Figure 6: Transport lock



#### NOTE

#### RISK OF DAMAGE!

Jerky movements without transport lock can lead to bearing damage.

- ▶ Use lifting gear with fine control and avoid jerky movements.
- ▶ Carry out the further assembly activities with increased caution.



The transport lock is painted in RAL 3001 (signal red).

Keep all parts of the transport lock for later use.



#### NOTE

#### RISK OF DAMAGE!

If the traction motor is removed from the bogie (for maintenance or repair work), the air inlet opening on the bearing shield DE must be closed with the cover plate (B) and the two hexagon head screws (C).

If small parts get into the traction motor via the air inlet during assembly or maintenance work, they must be removed before commissioning. Otherwise, the traction motor may fail.

**NOTE****RISK OF DAMAGE!**

Transport of the traction drive (Traction motor connected to gearbox):

If the motor is connected to the gearbox, the transport lock must be mounted on NDE (M, N, O and P) always during transport.

This applies to:

- ▶ Transport outside the bogie
- ▶ Transport if already mounted in the bogie (bogie transport)
- ▶ Transport of the whole vehicle, without rotation of the rotor ( $n = 0$  rpm)



If the function of the transport lock NDE is no longer required, the function of the transport lock can be neutralised:

- Keep transport lock NDE installed without any changes; the plastic insert (P) wears out (if operated over 1000 m or over 5 km/h).

**Summary:**

Remove the transport lock on NDE if,

- Traction motor is coupled with gearbox,
- Traction motor (or drive) is lifted by crane to be mounted / dismantled in bogie,
- Traction motor (or drive) is transported in the workshop,
- Traction motor (or drive) is moved in the workshop for repair or maintenance work.

The following points must be observed when the transport lock has been dismantled:

- no jerky movements,
- no impacts (e.g. due to "hard" placing on a workbench, impacts during transport by forklift truck, etc.),
- no permanent vibrations,
- transport only on level roadways (at walking speed)

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## 4.2.2 Dismantling the transport lock

Preliminary work: -  
 Tools: -  
 Consumables: Assembly paste MOLYKOTE P40  
 Required manpower: 1 Mechanic

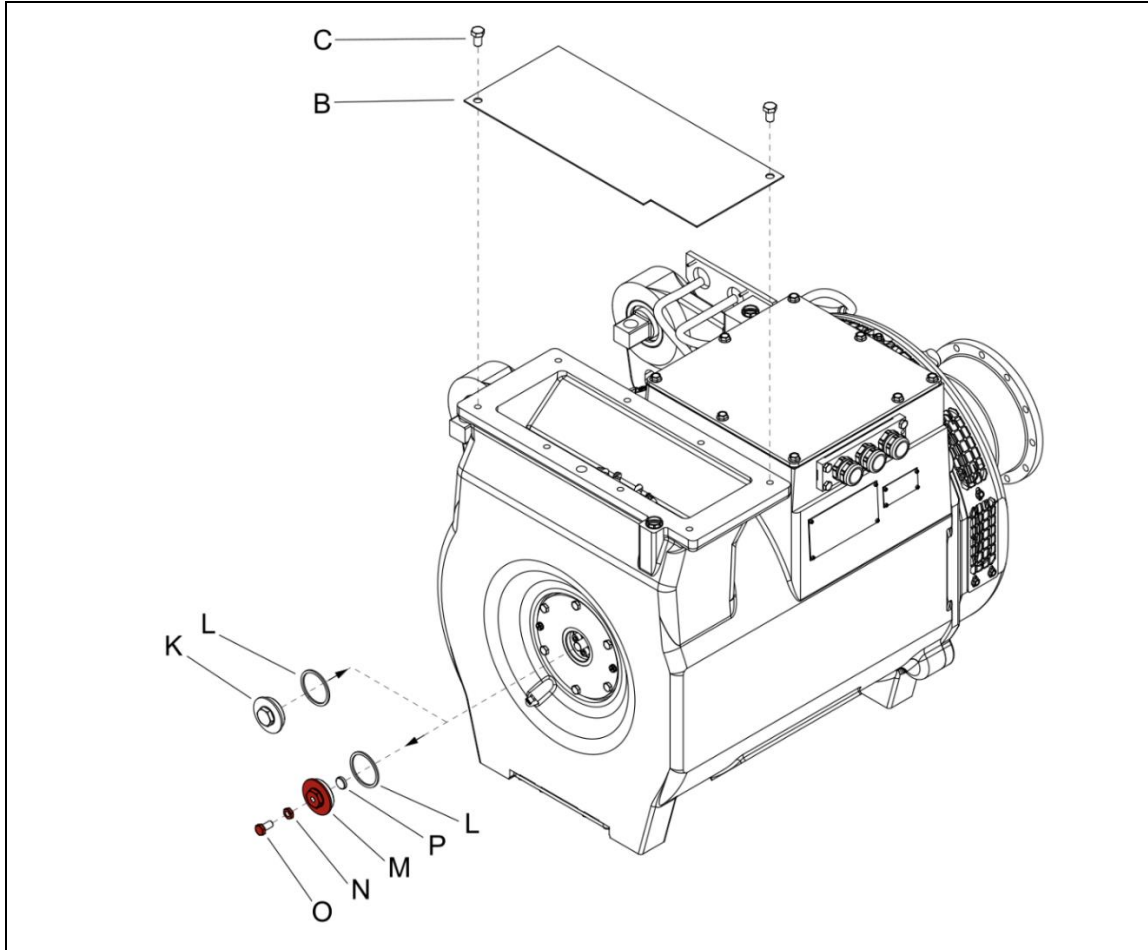


Figure 7: Dismantling the transport lock

- 1 Loosen the hexagon head screw (O) and the hexagon nut (N)
- 2 Loosen the locking screw (M) and remove it with the plastic insert (P).



Store the transport lock (M, N, O and P) for later use.

- 3 Loosen the two hexagon head screws (C) and remove the cover plate (B).
- 4 Apply some assembly paste to the thread of the plug screw (K).
- 5 Mount a new sealing ring (L) und screw in the plug screw (K).
- 6 Tighten the plug screw (K) with a **tightening torque of 70 Nm**.

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## 4.2.3 Mounting the transport lock

|                    |                             |
|--------------------|-----------------------------|
| Preliminary work:  | -                           |
| Tools:             | -                           |
| Consumables:       | Assembly paste MOLYKOTE P40 |
| Required manpower: | 1 Mechanic                  |

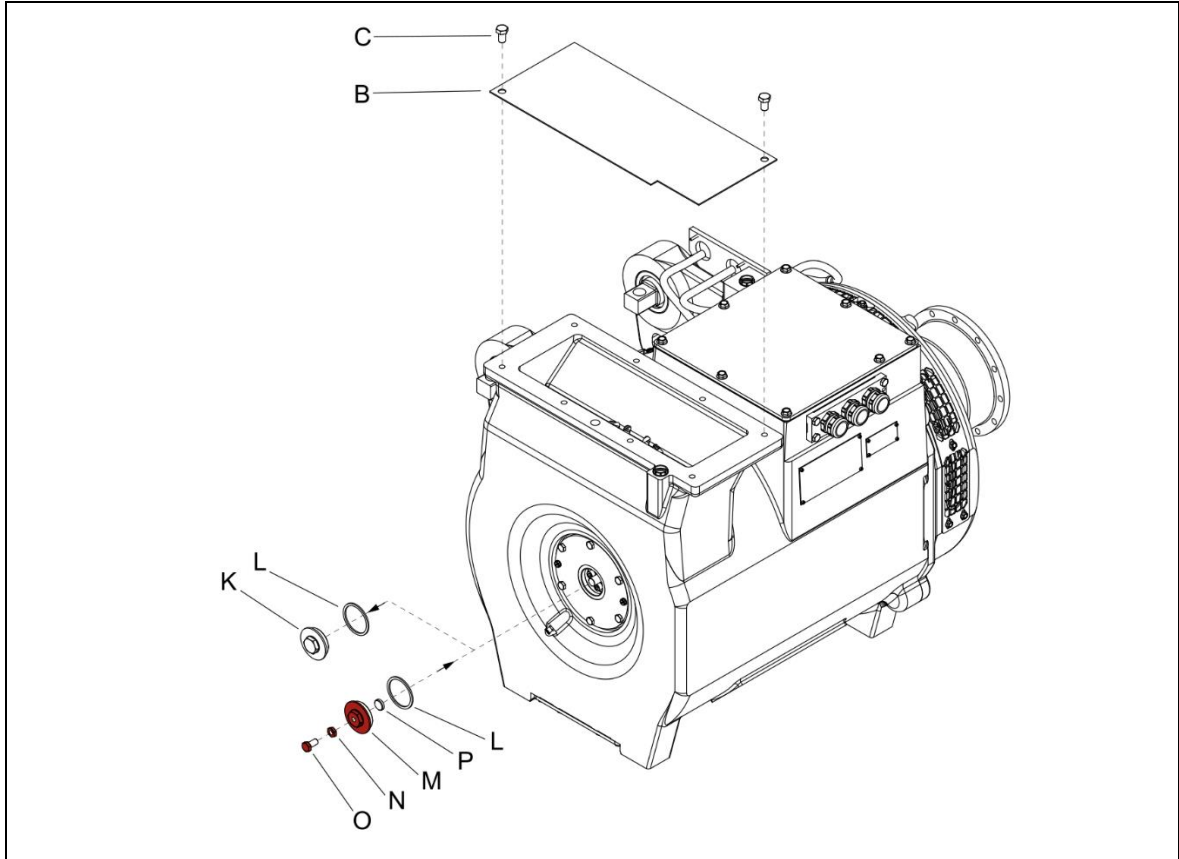


Figure 8: Mounting the transport lock

- 1 Loosen the plug screw (K) and remove it with the sealing ring (L).
- 2 Position the cover plate (B) on the stator and fix it with the two hexagon head screws (C).
- 3 Apply some assembly paste to the thread of the locking screw (M).
- 4 Position the plastic insert (P) in the locking screw (M) and mount both parts on the traction motor.
- 5 Tighten the locking screw (M) with a **tightening torque of 70 Nm**.
- 6 Mount the hexagon nut (N) and the hexagon head screw (O).
- 7 Secure the hexagon head screw (O) against the hexagon nut (N) with a **tightening torque of 10 Nm**.



Store the plug screw (K) for later use.



## 4.3 Storage



### NOTE

#### RISK OF DAMAGE!

When traction motor is removed from the bogie the air inlet on the stator housing and the openings in the cable glands must be closed. Otherwise, this could lead to motor damage

### 4.3.1 Storage conditions

All blank surfaces are treated with an appropriate agent at the time of delivery from the factory and are protected against corrosion.

If the traction motor has to be stored temporarily because it cannot be assembled and put into operation immediately after arrival at the destination, the following must be observed when choosing the location:

The traction motors and equipment belong in enclosed storage rooms that

- are well ventilated, dry and vibration-free,
- provide protection against dampness, cold, heat, dust and grit,
- are protected against vermin, such as rodents, termites etc.



### NOTE

#### RISK OF DAMAGE!

Stacking the traction motors on top of each other is not permitted!

### 4.3.2 Long-term storage (longer than 3 months)

For long-term storage without operational service, the traction motors must be protected, in addition to the storage conditions (see [section 4.3.1](#)), against damage by special preservation measures. All bare surfaces must be protected against corrosion by coating with an appropriate agent.

Traction motors must be protected from sunlight, other UV effects (e.g. welding) and weather. The temperature must not exceed 45 °C.

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## 4.3.3 Inspection during storage

The traction motor/drive should undergo a test **biannually**.

Check for obvious (external) damages such as mechanical deformation, scratches, abrasions, patches of rust, etc.

The most important points are:

- Damage to the wire insulation of the electric cables.
- Damage to the terminal box (squashed, cracked).
- Damage to the fixing points for the gearbox and chassis suspension.
- Examine the polished surfaces for corrosion.

If possible, operate the traction motor during this period.

If commissioning is not possible, the rotor must be set in rotation manually to avoid a standstill mark on the roller bearings.

## 4.3.4 Storage of roller bearings



### NOTE

#### RISK OF DAMAGE!

The bearings should remain in their original packaging until they are installed to protect them from contamination.

Unmounted roller bearings can be damaged due to vibrations and shocks if no protective measures are taken.

Roller bearings may only be stored in rooms suitable for this purpose.

The room temperature must be kept constant at  $20 \pm 5$  °C and the formation of condensation must be prevented.

Roller bearings should be stored at a relative humidity below 55 %.

No chemicals may be stored in the same room.

The bearings are pre-lubricated by the manufacturer and **should not** be washed and/or additionally greased.

The storage from delivery to mounting the bearing unit should not be more than one year. This limitation is caused by the grease inside the bearing.

The sealing function will be fulfilled through an axial labyrinth with a sheet metal cover, which is integrated into the bearing.

An additional sealing on the shaft is recommended.

If bearings are reused, they must also be preserved and packed in the same way as a new bearing.

## 5 TRACTION MOTOR MOUNTING / DEMOUNTING

### 5.1 General notes

This operating manual only provides general information on the assembly and commissioning of the traction motor. For the assembly and disassembly of the plug base, the gearbox and the associated couplings, the manufacturer's instructions must be observed.

For the installation and removal of the traction motor in the bogie, the instructions of the person responsible for the component apply.

If the traction motor has been out of service for a longer period, the instructions according to [chapter 6](#) must be considered.

Mounting:

- Visual inspection of the traction motor for damage, especially for paint damage. Paint damage must be repaired in accordance with painting instructions TSA000075 and TSA900099 (see [section 14.1](#)).
- Damaged mounting parts and fastening elements must be repaired or replaced.
- Check all connection surfaces for damage and cleanliness before mounting the traction motor.
- Remove the transport lock (see [section 4.2.2](#)).
- Check the shaft end to ensure that it is undamaged and clean.
- Check that the rotor can be turned easily by hand.
- Check the terminal box for damage.



#### NOTE

#### RISK OF DAMAGE!

When traction motor is removed from the bogie the air inlet on the stator housing and the openings in the cable glands must be closed. Otherwise, this could lead to motor damage

## 5.2 Mounting



For installation of the traction motor in the vehicle, see [vehicle documentation](#).

The fastening and connecting elements are not included in the scope of delivery.

## 5.3 Demounting



For the removal of the traction motor from the vehicle, see the [vehicle documentation](#).

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## 5.4 Electrical lines

|                    |   |
|--------------------|---|
| Preliminary work:  | Disconnect the traction motor from the power supply!                        |
| Tools:             | Torque Wrench   |
| Consumables:       | Thread locker LOCTITE 243   |
| Required manpower: | 1 Electrician   |
| Intervals:         | During initial commissioning and each time the traction motor is installed. |



### DANGER!

#### DANGER TO LIFE DUE TO HIGH VOLTAGE!

If the power supply is not switched off, there is a danger to life from electric shock when handling the connection cables.

- ▶ All work on the electrical connections of the traction motor may only be carried out by qualified personnel and an authorised body.
- ▶ Observe DIN VDE 0105 and IEC 60364 for this.
- ▶ Make sure that the voltage supply is interrupted.



### WARNING!

#### RISK OF DAMAGE AND INJURY!

Danger of damage and subsequently danger of life due to incorrect connection of the connecting cables.

- ▶ The connection of the cables must be carried out carefully so that the contact force required for a safe electrical connection is permanently maintained.
- ▶ To avoid tensile stresses, connection cables must be attached in a strain-relieved manner.
- ▶ Make sure that there are no foreign objects, dirt or moisture in the terminal box.
- ▶ To ensure the degree of protection, use the original seals when closing the terminal box.
- ▶ Seal any cable entry openings that are not required so that they are dustproof and waterproof.

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## 5.4.1 Connecting the electrical lines - commissioning

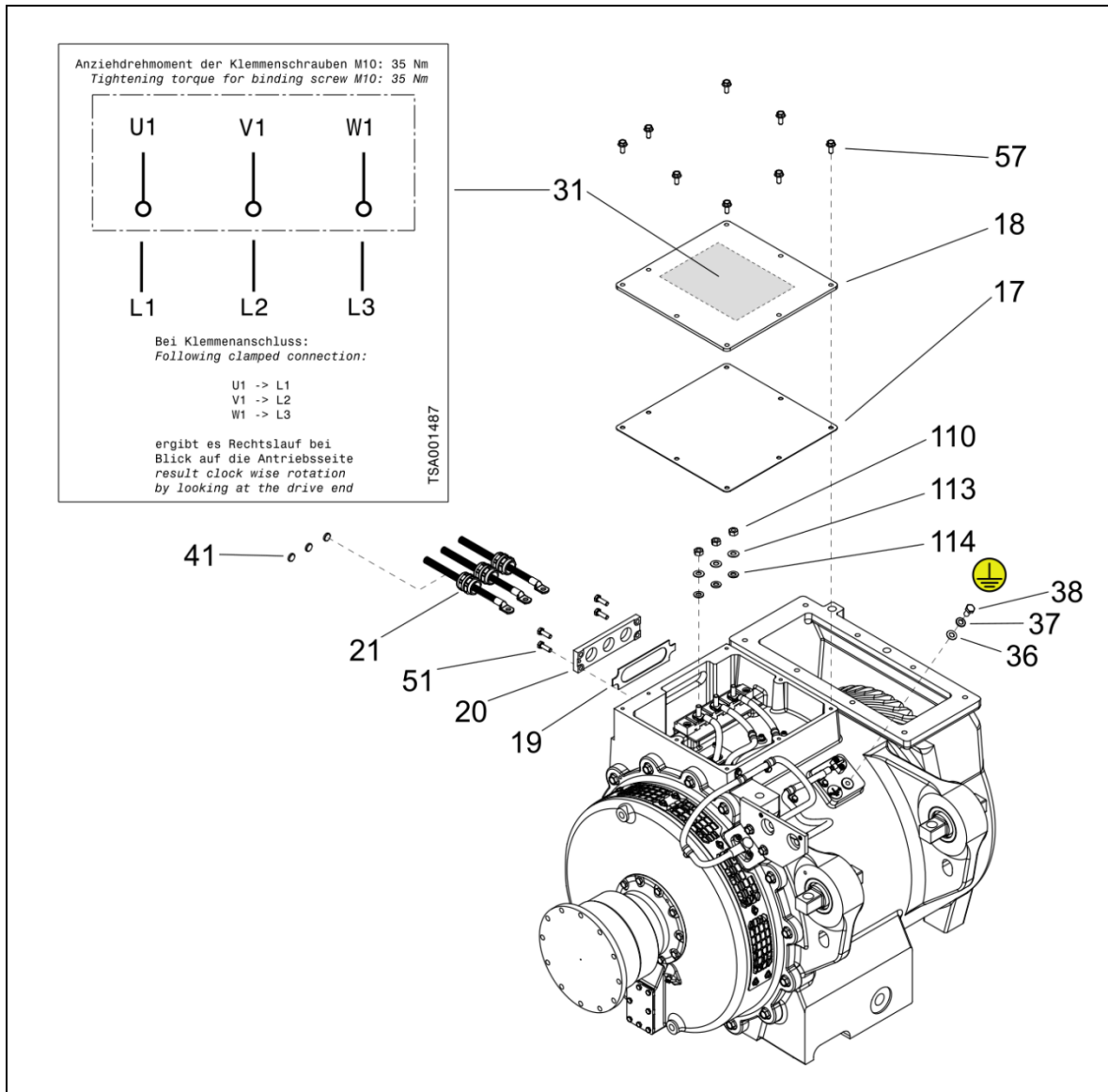


Figure 9: Connecting the electrical lines

**connect:**

- 1 Loosen the hexagon head screw (38) and remove it with the washer (36) and spring washer (37).
- 2 Earthing pin M10 must be free of paint and impurities.
- 3 Connect the earthing cable to the earthing pin.
- 4 Mount the spring washer (37), the washer (36) and the hexagon head screw (38) again and tighten them.

**Connect L1 – L2 – L3:**

Replacing the sealings is not necessary during initial commissioning.

- 1 Loosen the eight hexagon head cap ribbed flange screws (57) and take off the terminal box cover (18) and the terminal box cover sealing (17).
- 2 Remove the three blind disks (41), if installed.
- 3 Loosen the four hexagon head screws (51) and remove the bushing plate (20) and the bushing plate sealing (19).
- 4 Check for damage on the bushing plate sealing (19) and replace it if it shows damage.
- 5 Apply thread locker to the threads of the four hexagon head screws (51).
- 6 Mount the bushing plate (20) and the bushing plate sealing (19) with the hexagon head screws (51).
- 7 Tighten the four hexagon head screws (51) with a ***tightening torque of 20 Nm***.
- 8 Loosen the three hexagon nuts (110) and remove the three spring washers (113) and the three washers (114).
- 9 Connect the connection lines L1 – L2 – L3 to the corresponding terminals U – V – W through the opening according to the junction scheme (31).
- 10 Mount the three hexagon nuts (110) with the three spring washers (113) and the three washers (114).
- 11 Counter the hexagon nuts (110) with a ***tightening torque of 35 Nm***.
- 12 Replace the terminal box cover sealing (17) if it is showing signs of damage.
- 13 Assemble the terminal box cover (18) and the terminal box sealing (17) using the eight hexagon head cap ribbed flange screws (57).
- 14 Tighten the eight hexagon head cap ribbed flange screws (57) with a ***tightening torque of 35 Nm***.

**Connect Pt100:**

- 1 Connect the plug for temperature monitoring (Pt100).

## 5.4.2 Disconnecting the electrical lines

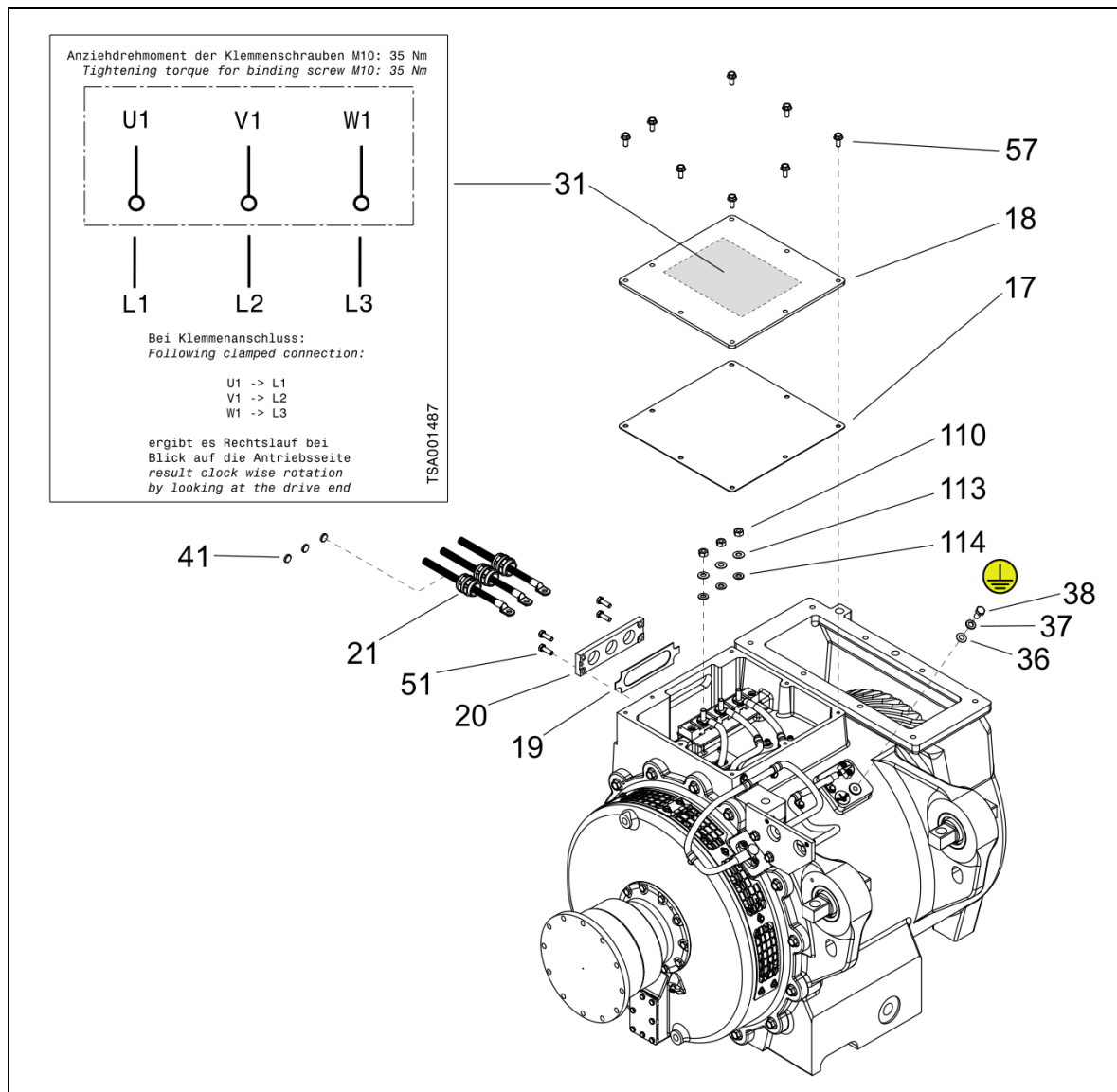


Figure 10: Disconnecting electrical lines

### Disconnect L1 – L2 – L3:

- 1 Loosen the eight hexagon head cap ribbed flange screws (57) and take off the terminal box cover (18) and the terminal box cover sealing (17).
- 2 Loosen the three hexagon nuts (110) and remove the three spring washers (113) and the three washers (114).
- 3 Disconnect the connection lines L1 – L2 – L3 from the corresponding terminals U – V – W and pull them through the openings.
- 4 Close the openings with the three blind disks (41).
- 5 Mount the three hexagon nuts (110) with the three spring washers (113) and the three washers (114) and tighten them.
- 6 Replace the terminal box cover sealing (17) if it is showing signs of damage.



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- 7 Assemble the terminal box cover (18) and the terminal box sealing (17) using the eight hexagon head cap ribbed flange screws (57).
- 8 Tighten the eight hexagon head cap ribbed flange screws (57) with a *tightening torque of 35 Nm*.



## disconnect:

- 1 Loosen the hexagon head screw (38) and remove it with the washer (36) and spring washer (37).
- 2 Disconnect the earthing cable to the earthing pin.
- 3 Mount the spring washer (37), the washer (36) and the hexagon head screw (38) and tighten it.

## Disconnect Pt100:

- 1 Disconnect the plug for temperature monitoring (Pt100).

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## 6 COMMISSIONING

### 6.1 Checklist for initial commissioning / commissioning

The traction motor must be checked from the electrical side.

- The connection of the earthing is assembled and tightened with the specified tightening torque (see [section 5.4](#)).
- The electrical connections are assembled and tightened according to the junction scheme (see [section 5.4](#)).
- All connecting elements, such as plugs etc., are properly connected.
- There is no damage to the electrical lines.

The traction motor has to be checked from the mechanical side.

- All transport locks have been removed (see [section 4.2](#)).
- All tightened screws are marked according to [section 8.1.1](#).
- Traction motor does not show any visible damage (see [section 8.4](#)).
- Visual inspection of the mechanical connections (see [section 8.4.5](#)).
- Cooling system (supply and discharge) shows no damage and is free of contamination (see [section 8.4.1](#)).
- All screws are tightened with specified tightening torque (see [section 12.5](#)).

Final inspection:

- All covers that were dismantled for electrical and mechanical testing are fitted.
- Test run completed (see [section 6.2](#)).

## 6.2 Commissioning after extended storage



### NOTE

#### RISK OF DAMAGE!

Possible winding damage due to long storage and standstill time.

- ▶ Check the insulation condition of the stator winding.
- ▶ Follow [section 8.7.2](#).



### NOTE

#### RISK OF DAMAGE!

Note that due to ageing, the lubricants in the bearing units lose their service properties after a period of approx. five to six years.

- ▶ Before commissioning, replace the bearing units of the traction motor that have been kept (stored) for more than four years to prevent possible bearing damage.

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## 6.3 Test run

After assembling the traction motor and after each reassembling on maintenance or repair work, a test run has to be carried out.

The traction motor should be operated at 1200 min<sup>-1</sup> on the rotor shaft for at least 15 minutes in a suitable set-up.

A faulty test run will show the following:

- noticeable noises
- strong vibrations
- increased temperatures that are not within the value range (see [section 3.2](#))




---

New bearing units may experience a temperature rise during start-up. Nevertheless, the temperature goes down immediately when the grease has dispersed in the bearing.

---

In the event of a faulty test run, observe [chapter 11](#) and contact the manufacturer's service department.




---

Manufacturer:  
**TRAKTIONSSYSTEME AUSTRIA GmbH / Service**  
 Brown-Boveri-Straße 1  
 A-2351 Wiener Neudorf  
 Tel.: +43 (0) 2236 8118-111  
 E-Mail: [service@sa.at](mailto:service@sa.at)

---

## 7 OPERATION

### 7.1 Operating conditions



#### NOTE

#### RISK OF DAMAGE!

Operating the traction motor outside the specified data may cause damage.

- ▶ Only operate the traction motor within the scope of the machine data, (see [section 3.1](#)).
- ▶ In case of different use, obtain written consent from the machine manufacturer.

### 7.2 Deviations from normal operation

Any deviation from normal operation (higher power consumption, oscillations, unwanted noises or others, activation of the monitoring devices etc.) show that the operation is affected.

Promptly inform the competent maintenance personnel to prevent faults which could directly or indirectly cause severe damages to people or property on your part.

During faults or extreme working conditions which can pose an electrical or mechanical overload of the motor, the corresponding maintenance works, and inspections should be initiated immediately to prevent subsequent damages.

### 7.3 Monitoring during operation

By appropriately designed control and speed monitoring, it must be ensured that the limit values specified in the technical data and on the rating plate are not surpassed.

### 7.4 Operation break

When taking the traction motor out of service for a longer period, the instructions according to [section 4.3](#) must be followed.

In case of recommissioning, [chapter 6](#) must be followed.

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## 8 MAINTENANCE

### 8.1 Maintenance work



#### WARNING!

#### RISK OF INJURY AND DAMAGE!

Risk of damage and injury due to improperly performed maintenance and repair work.

- ▶ Work must be carried out only when the motor is shut down.
- ▶ For carrying out the maintenance work, specialists of the operating company with qualification such as electricians and or locksmiths should be consulted.
- ▶ Re-commissioning of the traction motor which was shut down because of fault must only be carried out by authorized people. Restarting is possible without risk only after the cause of the stoppage was determined and rectified.
- ▶ It is advantageous to request for our assembly fitters in all cases where any types of problem develop in the plant.



#### NOTE

#### RISK OF DAMAGE!

Possible damage to the traction motor, due to loose or improperly tightened screw connections.

- ▶ Never use an impact wrench, otherwise the screws could break off or be damaged.
- ▶ Only use a torque wrench if tightening torques are specified for screws in the text of this operating manual or in the drawings.
- ▶ Mark the tightened screws (see [section 8.1.1](#)).



#### NOTE

#### RISK OF DAMAGE!

All seals (17, 19, 22 and 24) and O-ring (7, 9, 13 and 15) have to be replaced after dismantling.

## 8.1.1 Marking of tightened screws:

For all assembly work where screws are assembled, the following steps must be carried out to ensure a consistent and proper execution of the assembly process.

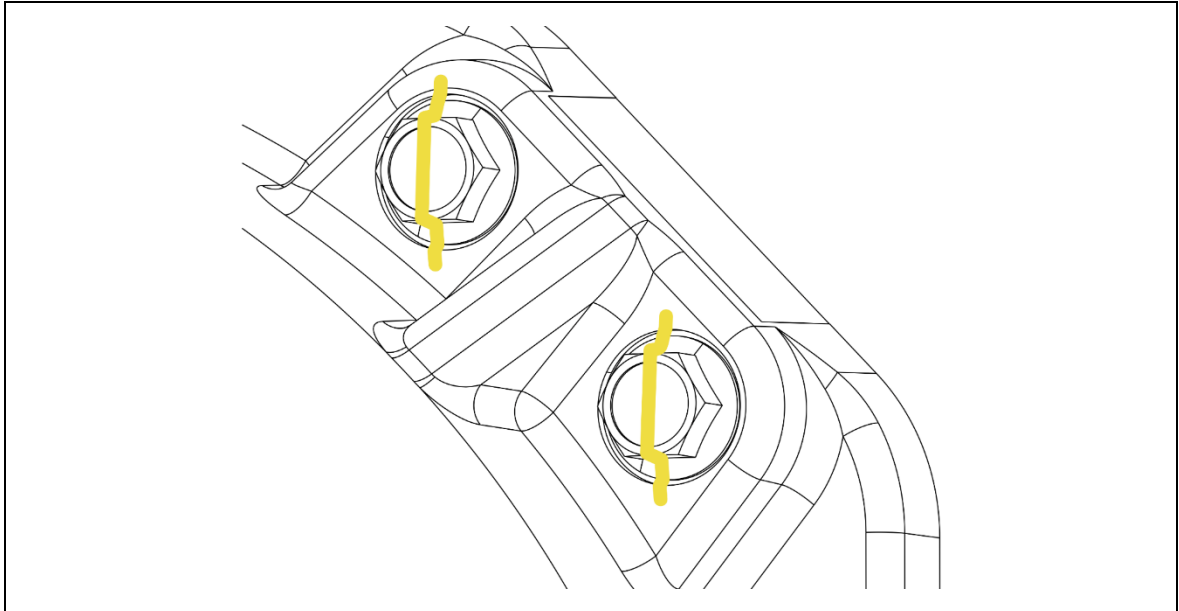


Figure 11: Marking of tightened screws

- 1 Clean all threaded holes with cleaner (e.g. LOCTITE SF 7063), blow out with compressed air and check for damage before assembling the screws.
- 2 If specified, apply thread locker or assembly paste to the threads of the screws.
- 3 Tighten the screws to the specified tightening torque and mark them with a paint stroke in a contrasting colour (e.g. RAL1004 - golden yellow).

## 8.2 Maintenance intervals

Careful and regular maintenance is necessary to detect and correct possible faults in good time before these can develop into enormous damages.

The maintenance work to be carried out is listed below in the order of occurrence.

The definite maintenance intervals should be set in accordance with the records of the test operating time.



### NOTE

#### RISK OF DAMAGE!

In the event of malfunctions or exceptional operating conditions that represent an electrical or mechanical overload on the unit, the appropriate maintenance work and checks must be carried out immediately.



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## 8.3 Maintenance schedule

### 8.3.1 Preventive maintenance

| Intervals                      | Maintenance task  | Description see section |
|--------------------------------|---|-------------------------|
| Every 15 days or 25,000 km *)  | Visual inspection and cleaning of the air inlet and outlet openings | 8.4.1                   |
|                                | Cleaning the bearing cover drain hole                               | 8.4.3                   |
| Every 3 months or 75,000 km *) | Checking for external damage  | 8.4.4                   |
|                                | Checking the mechanical connecting elements                         | 8.4.5                   |
|                                | Checking connection lines   | 8.4.6                   |
| Every year or 300,000 km *)    | Relubricating roller bearings                                       | 8.4.7                   |

\*) *Maintenance work on the installed traction motor*

## 8.3.2 General inspection

| Intervals                            | Maintenance task                                     | Description<br>see section |
|--------------------------------------|--|----------------------------|
| Every 8 years or 3,000,000 km<br>**) | Main inspection                                      | 8.5.1                      |
|                                      | Disassembling the traction motor gear coupling half  | 8.5.3                      |
|                                      | Removing the rotor                                   | 8.5.5                      |
|                                      | Disassembling the bearing shield DE                  | 8.5.6                      |
|                                      | Disassembling the bearing                            | 8.5.7                      |
|                                      | Cleaning and checking the bearing shield DE          | 8.5.8                      |
|                                      | Cleaning of cooling holes in stator and rotor        | 8.5.9                      |
|                                      | Cleaning the stator windings and checking for damage | 8.5.10                     |
|                                      | Cleaning   | 8.6                        |
|                                      | Measuring insulation and winding resistance          | 8.7.2                      |
|                                      | Checking and fine balancing of the rotor             | 8.7.4                      |
|                                      | Assembling the bearing on NDE side                   | 8.7.5                      |
|                                      | Assembling the rotor                                 | 8.7.6                      |
|                                      | Assembling the cover NDE                             | 8.7.7                      |
|                                      | Assembling the traction motor gear coupling half     | 8.7.8                      |
| Finishing operations and checks      | 8.7.9  |                            |

\*) *Maintenance work on the installed traction motor*

\*\*\*) *Maintenance work on the disassembled traction motor*

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## 8.4 Maintenance tasks on the installed traction motor

### 8.4.1 Visual inspection and cleaning of the air inlet and outlet openings

|                    |   |
|--------------------|---|
| Preliminary work:  | -   |
| Tools:             | - Cleaning cloth<br>- Round brush<br>- Vacuum cleaner |
| Consumables:       | -   |
| Required manpower: | 1 Mechanic  |
| Intervals:         | Every 15 days or 25,000 km                            |

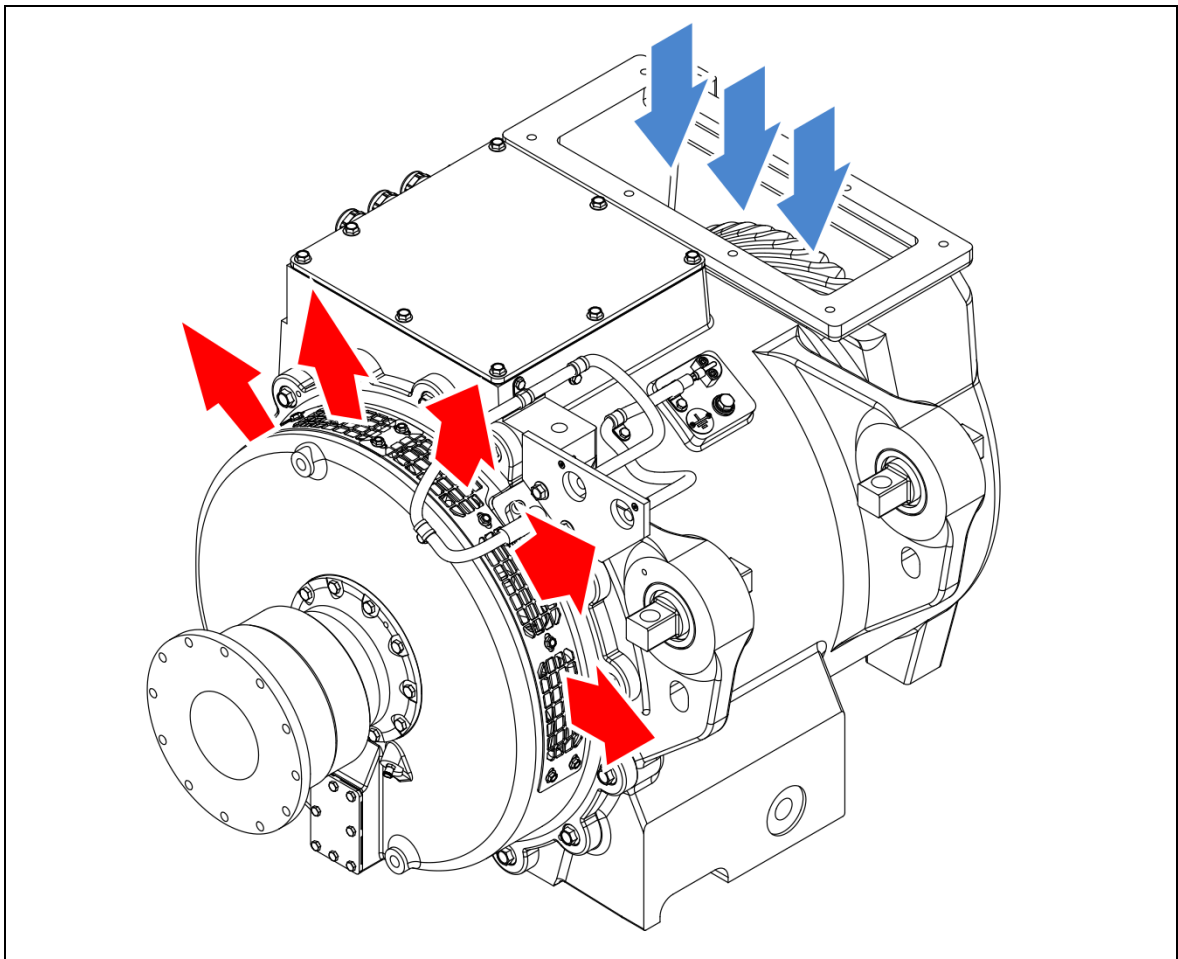


Figure 12: Visual inspection and cleaning outlet openings

- 1 Check air inlet - see [vehicle documentation](#).
- 2 Clean the air outlet openings on the bearing shield DE from the outside (e.g. with a cloth, brush or vacuum cleaner). Replace them if necessary.

**NOTE****RISK OF DAMAGE!**

Cleaning with compressed air or high-pressure cleaning equipment is NOT permitted, as otherwise impurities will enter the traction drive. Increased contamination will affect operation and could even lead to failure. Only use a cloth or a vacuum cleaner for cleaning. For more information on cleaning, see also [section 8.6](#).

**NOTE****RISK OF DAMAGE!**

If the openings at the air outlet are covered with dirt, the cleaning interval must be shortened.

# TME 49-30-4

## 8.4.2 Removing protection grids

|                    |  |
|--------------------|--|
| Preliminary work:  | -  |
| Tools:             | Torque wrench<br>Cleaning cloth<br>Round brush<br>Vacuum cleaner |
| Consumables:       | Thread locker LOCTITE 243  |
| Required manpower: | 1 Mechanic   |
| Intervals:         | When necessary   |

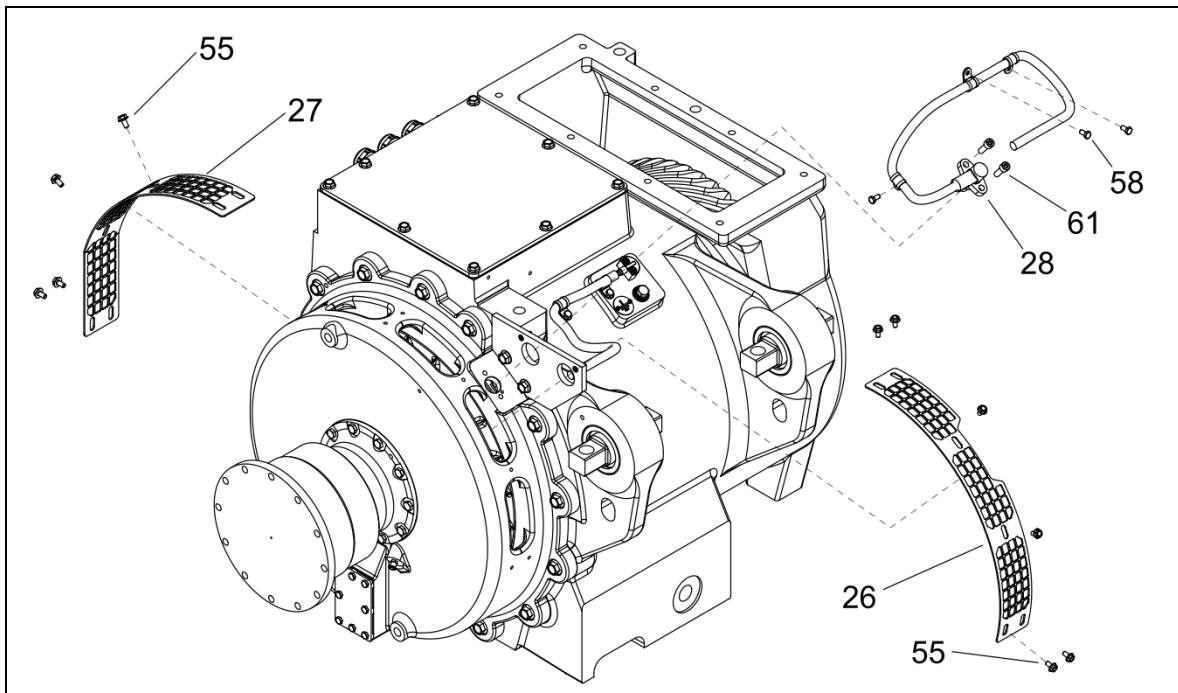



Figure 13: Removing protection grids

 For more information on removing the speed sensor (28) see [section 8.4.9](#).

- 1 Remove the speed sensor - if necessary.
- 2 Clean the protection grids (26, 27) from the outside, using clean cloth, round brush or a vacuum cleaner.
- 3 Loosen and remove the hexagon ribbed flange bolts (55) of corresponding protection grid (26, 27).
- 4 Lift up the corresponding protection grids (26, 27).
- 5 If possible, clean the protection grids (26, 27) (or replace with a new one, if the protection grid is damaged, or cannot be cleaned).
- 6 Clean the opening on the bearing shield.

- 7 Apply some thread locker to the threads of the hexagon ribbed flange bolts (55).
- 8 Attach the corresponding protection grids (26, 27).
- 9 Fasten the protection grids (26, 27) with corresponding number of hexagon ribbed flange bolts (55).
- 10 Tighten with a *tightening torque of 15 Nm*.
- 11 If necessary, attach the speed sensor.



## NOTE

### RISK OF DAMAGE!

Cleaning with compressed air or high-pressure cleaning equipment is NOT permitted, as otherwise impurities will enter the traction drive. Increased contamination will affect operation and could even lead to failure. Only use a cloth or a vacuum cleaner for cleaning. For more information on cleaning, see also [section 8.6](#).

# TME 49-30-4

## 8.4.3 Cleaning the bearing cover drain hole

|                    |                            |
|--------------------|----------------------------|
| Preliminary work:  | -                          |
| Tools:             | Round brush                |
| Consumables:       | -                          |
| Required manpower: | 1 Mechanic                 |
| Intervals:         | Every 15 days or 25,000 km |

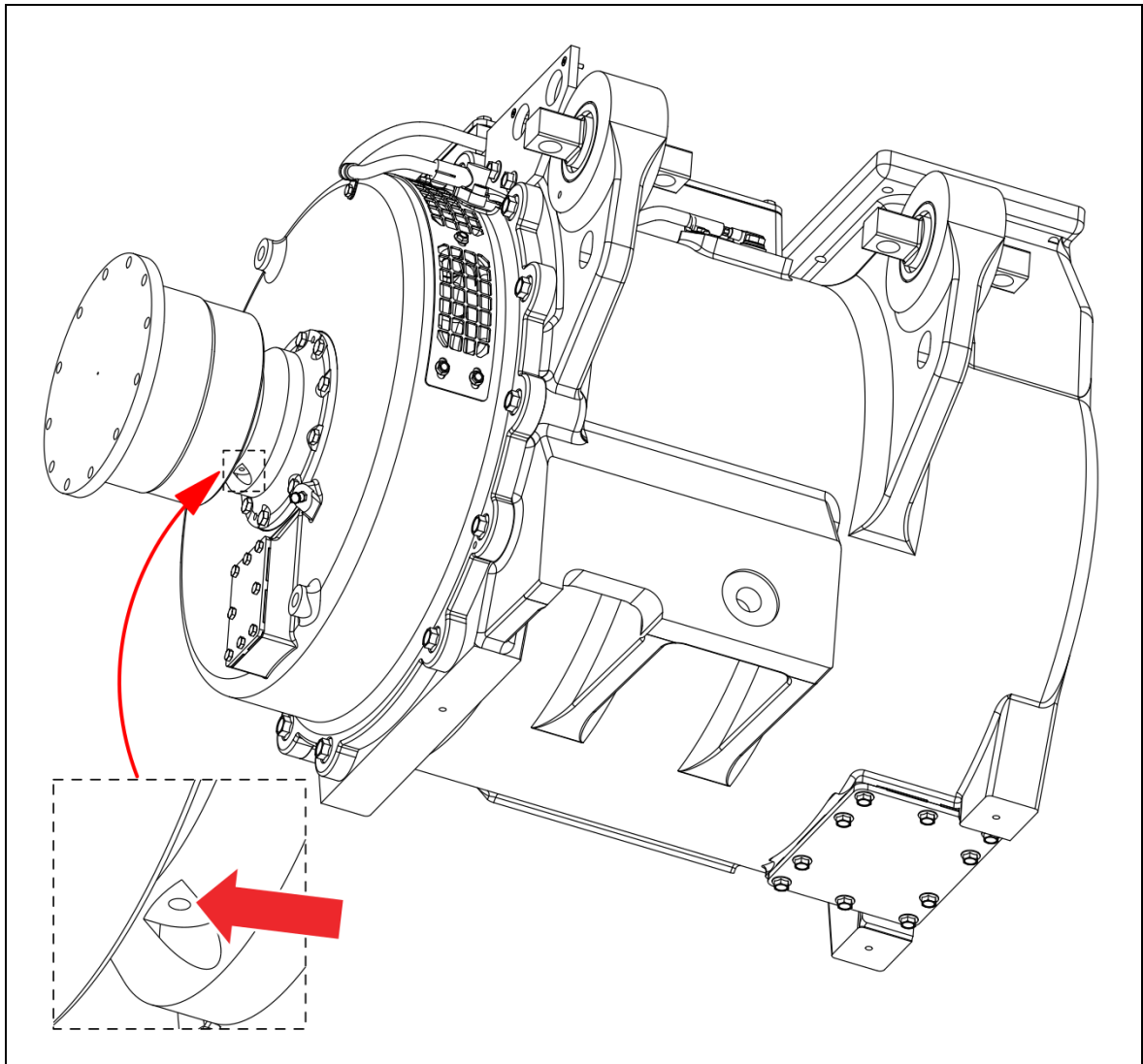


Figure 14: Cleaning the bearing cover drain hole



### NOTE

#### RISK OF DAMAGE!

If the hole is heavily covered in dirt, the cleaning interval must be shortened.

- 1 Using the round brush, clean the dirt from the drain hole in bearing cover.

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## 8.4.4 Checking for external damage

|                    |                            |
|--------------------|----------------------------|
| Preliminary work:  | -                          |
| Tools:             | -                          |
| Consumables:       | -                          |
| Required manpower: | 1 Mechanic                 |
| Intervals:         | Every 3 months or 75,000km |

Check traction motor for external damage due to mechanical causes (e.g. stone impact; visual inspection, if possible).

Dismantle damaged attachments and suspension elements, repair damage or replace attachments.

If necessary, the corrosion protection must be renewed at damaged points.

## 8.4.5 Checking the mechanical connecting elements

|                    |                            |
|--------------------|----------------------------|
| Preliminary work:  | -                          |
| Tools:             | -                          |
| Consumables:       | -                          |
| Required manpower: | 1 Mechanic                 |
| Intervals:         | Every 3 months or 75,000km |

External screws must be checked for tightness by visual inspection of the marked screws (see [section 8.1.1](#)). Check the screw connections of the electrical connection of the traction motor to ensure safe contact.



### NOTE

#### RISK OF DAMAGE!

Screw connections secured with **thread locker** must **not be retightened** as the required safety is no longer fulfilled.

- ▶ Ensure that the screw is removed, the thread recut (to clean it of excess adhesive residue) and a new screw is glued in and tightened with appropriate tightening torque
- ▶ Mark the tightened screws (see [section 8.1.1](#)).



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## 8.4.6 Checking connection lines

|                    |                            |
|--------------------|----------------------------|
| Preliminary work:  | -                          |
| Tools:             | Flashlight                 |
| Consumables:       | -                          |
| Required manpower: | 1 Electrician              |
| Intervals:         | Every 3 months or 75,000km |



**DANGER!**

### DANGER TO LIFE DUE TO HIGH VOLTAGE!

Danger to life when touching connection lines that are still active or damaged. Short circuits due to bare spots put the traction motor out of operation on the one hand, on the other hand there is the danger of resulting damage (injuries, death).

- ▶ The electrical connection lines must be inspected for external damage and bare spots in accordance with the separate maintenance instructions of the person responsible for the components.

In the process of checking the motor connection lines, the terminal box cover sealing (17) and the sealing for bushing plate (19) must also be checked for damage (e.g. cracks, porous spots). If necessary, replace them!

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## 8.4.7 Relubricating roller bearings

|                    |   |
|--------------------|---|
| Preliminary work:  | -   |
| Tools:             | Lever grease gun                                    |
| Consumables:       | Roller bearing grease <b>SHELL GADUS S3 V220C 2</b> |
| Required manpower: | 1 Mechanic  |
| Intervals:         | Every year or 300,000 km                            |



The required quantity of roller bearing grease can be found on the regreasing plate (40) which is placed on the stator, below the terminal box. It contains additional information about the type of roller bearing grease and required interval.

To ensure correct amount of roller bearing grease is applied, press out one stroke from the lever grease gun on the sheet of paper and weight it. With the g/stroke determined in this way, the required number of strokes can now be determined.

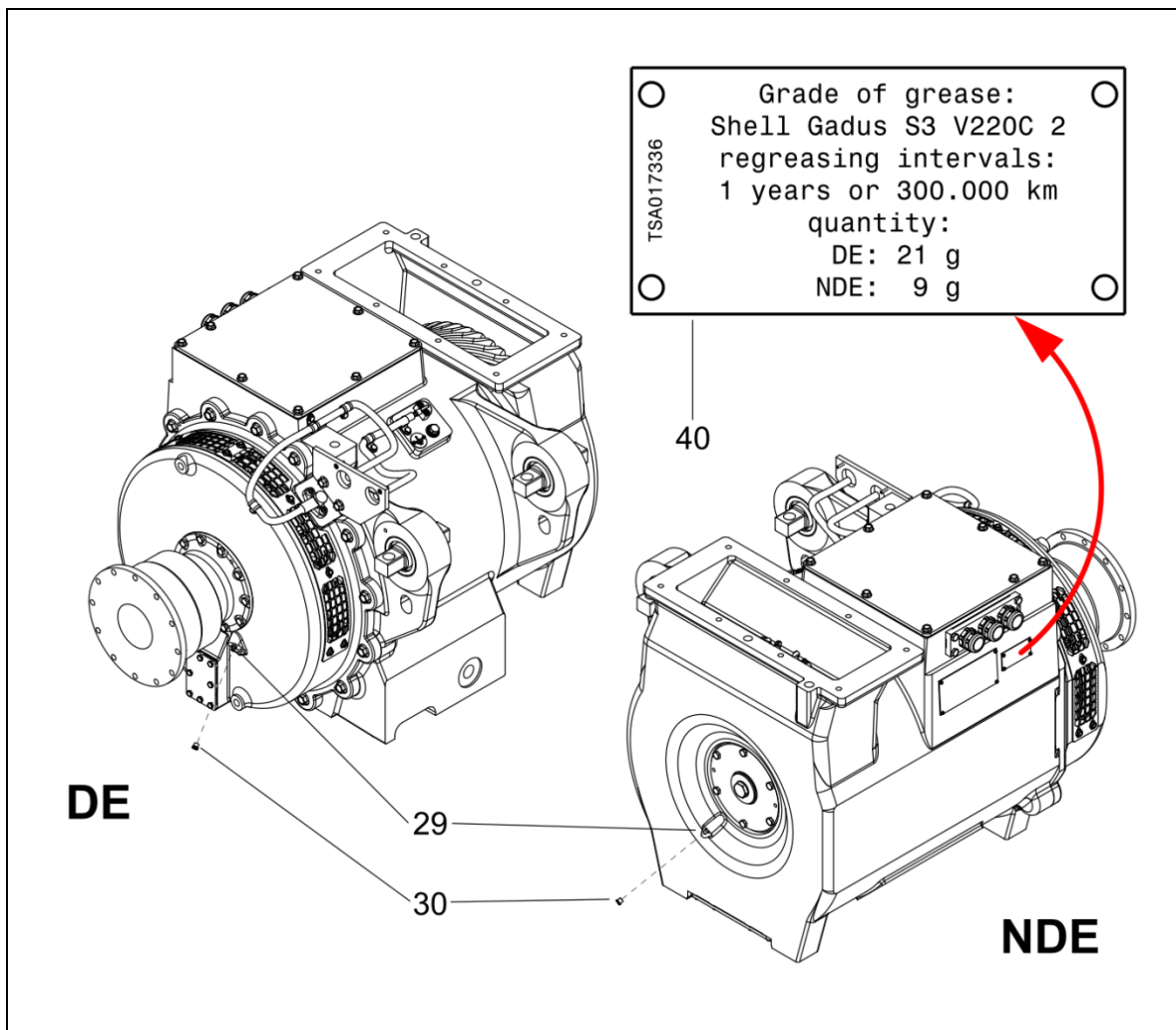


Figure 15: Relubrication of roller bearings

# TME 49-30-4

- 1 Remove the regreasing nipple caps (30).
- 2 Clean the lubricating nipples (29).
- 3 Lubricate the roller bearings according to the instructions found on the regreasing plate (40).
- 4 Clean the regreasing nipple caps (30) and attach them.



If a regreasing nipple cap (30) has been lost during operation or maintenance work, it must be replaced with a new one.



## CAUTION!

### POLLUTION!

Grease can be hazardous to the environment.

- ▶ Clean off excess grease. Collect and dispose of contaminated clothes according to country-specific regulations.

# TME 49-30-4

## 8.4.8 Replacing resistance thermometer (Pt100)

|                    |   |
|--------------------|---|
| Preliminary work:  | -   |
| Tools:             | Torque wrench   |
| Consumables:       | Thread locker LOCTITE 243<br>Silicone LOCTITE SI 5990 |
| Required manpower: | 1 Mechanic  |
| Intervals:         | If defective  |

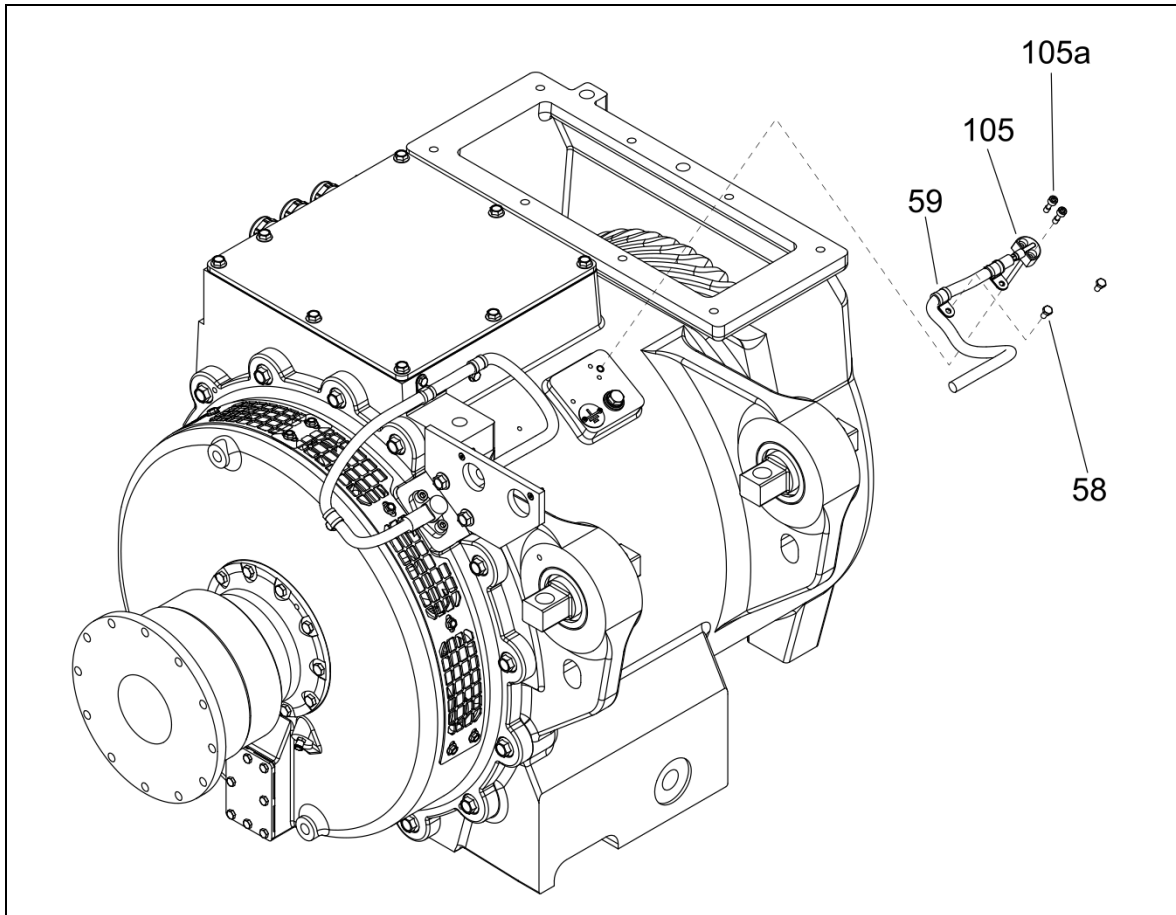


Figure 16: Replacing resistance thermometer (Pt100)

### Decommission:

- 1 Disconnect the unit plug (see [vehicle documentation](#)).
- 2 Loosen and remove two hexagon head cap screws (58) from the pipe-clamps (59).
- 3 Loosen and remove two screws (105a) from the resistance thermometer (105).
- 4 Remove the resistance thermometer (105).
- 5 Remove the pipe-clamps (59) from the resistance thermometer (105) cable, if necessary.

## Commission:

- 1 Before assembly, clean the hole for the resistance thermometer (105) in the stator plate.
- 2 Attach the pipe-clamps (59) to the resistance thermometer (105) cable.
- 3 Seal the resistance thermometer (105) with silicone and fit it to the stator plate with the two screws (105a).
- 4 Tighten the two screws (105a) with a ***tightening torque of 11 Nm***.
- 5 Apply some thread locker to the threads of hexagon head cap screws (58).
- 6 Fasten the pipe-clamps (59) of resistance thermometer (105) with two hexagon head cap screws (58).
  - 1 Tighten with a ***tightening torque of 10 Nm***.
  - 2 Connect the lines of the resistance thermometer to the unit plug (see [vehicle documentation](#)).

# TME 49-30-4

## 8.4.9 Replacing speed sensor

|                    |                              |
|--------------------|------------------------------|
| Preliminary work:  | -                            |
| Tools:             | Torque wrench<br>Depth gauge |
| Consumables:       | Thread locker LOCTITE 243    |
| Required manpower: | 1 Mechanic                   |
| Intervals:         | If defective                 |

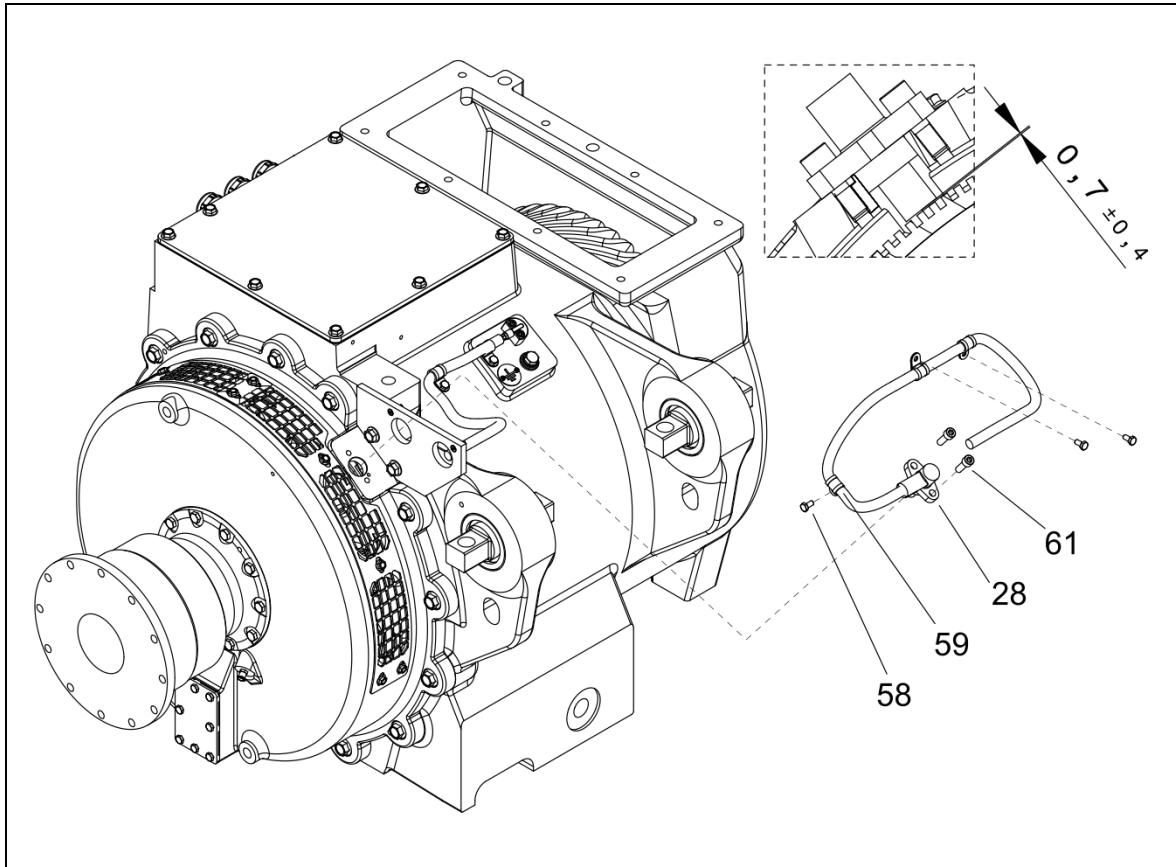


Figure 17: Replacing the speed sensor

### Decommission:

- 1 Disconnect the unit plug (see [vehicle documentation](#))
- 2 Loosen and remove three hexagon head cap screws (58) from the pipe-clamps (59).
- 3 Remove two hexagon socket screws (61) from the speed sensor (28).
- 4 Remove the speed sensor (28).
- 5 Remove the pipe-clamps (59) from the cable of speed sensor (28).

### Commission:

- 1 Before assembly, clean the bore for speed sensor in the bearing shield.
- 2 Attach the pipe clamps (59) to cable of the speed sensor (28).

- 3 Apply some thread locker to the threads of two hexagon socket screws (61).
- 4 Attach the speed sensor and fasten it with two hexagon socket screws (61).
- 5 Tighten with a ***tightening torque of 25 Nm***.
- 6 Apply some thread locker to hexagon head cap screws (58).
- 7 Fasten the pipe-clamps (59) with hexagon head cap screws (58), securing the cable. Tighten with a ***tightening torque of 10 Nm***.
- 8 Connect the speed sensor to the connector (see [vehicle documentation](#)).



## NOTE

Measure the distance from the bearing shield DE to the toothed wheel with the depth gauge. Thereafter, measure the speed sensor. The difference of these two values must fall within the nominal value mentioned in Figure 17.

# TME 49-30-4

## 8.5 Maintenance tasks on the removed traction motor

### 8.5.1 Main inspection

A main inspection is scheduled every 8 years or 3,000,000 km.

During this main inspection, the traction motor is removed from the vehicle (see vehicle documentation), dismantled, and checked for damage.



The disassembly of the traction drive from the vehicle is not part of this operating manual.

- For transporting the traction motor, observe [section 4.2](#).
- Only use lifting gear and sling equipment with the appropriate lifting capacity.



**DANGER!**

### DANGER TO LIFE DUE TO HIGH VOLTAGE!

Danger to life when working on the electrical connections.

- ▶ When working on the electrical connections of the traction motor, the instructions in the [section 2.6.3](#) must be observed.



The rotor assembly is moved out of the stator housing vertically, in the direction of NDE.

### 8.5.2 Preliminary works

Before starting maintenance work, disconnect the electrical connections (see [section 5.4](#) and [5.4.2](#)), remove the traction motor and clean it completely. We recommend cleaning with dry ice (see [section 8.6.4.3](#)), as this results in the least amount of after-treatment on the components.



# TME 49-30-4

## 8.5.3 Disassembling the traction motor gear coupling half

|                    |   |
|--------------------|---|
| Preliminary work:  | Demounted traction motor (see <a href="#">section 5.3</a> ) |
| Tools:             | Hydraulic pump for disassembly                              |
| Consumables:       | -   |
| Required manpower: | 1 Mechanic / 1 Assistant                                    |
| Intervals:         | Every 8 years or 3,000,000 km                               |

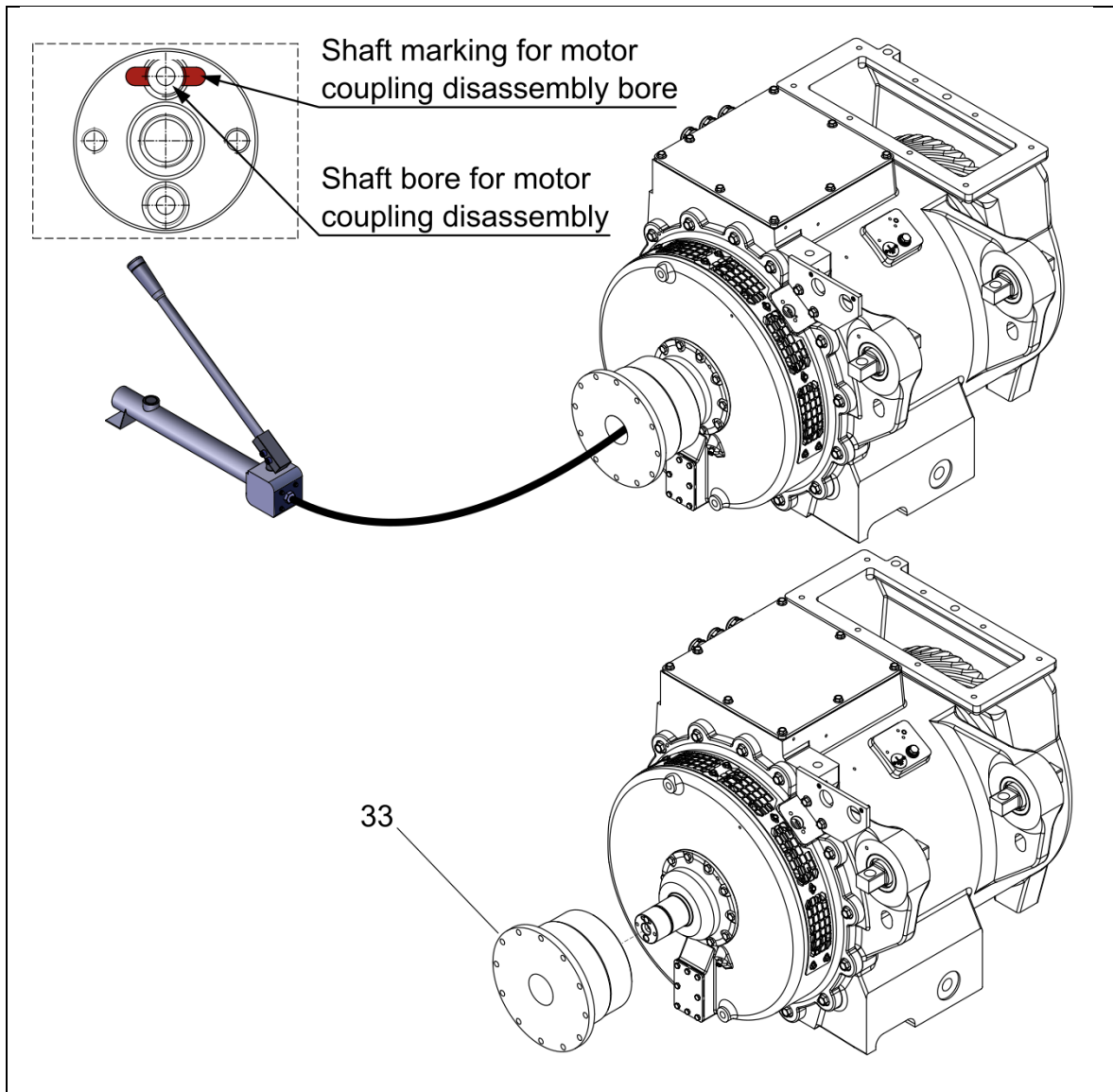


Figure 18: Disassembling the gear coupling half

- 1 Disconnect the resistance thermometer and the speed sensor (see [sections 8.4.8](#) and [8.4.9](#))
- 2 Attach the hydraulic pump to the designated bore for disassembling of the gear coupling half (33) – see [Figure 18](#).
- 3 Slide off the gear coupling half (33) when the oil leaks between the mating surfaces of gear coupling half (33) and rotor's shaft.

- 4 If necessary, remove the hydraulic pump (after the oil leaks between the mating surfaces), and attach the two-arm puller to remove the gear coupling half (33).



**CAUTION!**

## **POLLUTION!**

Used oil can be hazardous to the environment.

- ▶ Clean off excess oil. Collect and dispose of contaminated clothes according to country-specific regulations.

### 8.5.4 Preliminary work on NDE side

|                    |   |
|--------------------|---|
| Preliminary work:  | Demounted traction motor (see <a href="#">section 5.3</a> ) |
| Tools:             | Ejecting screws (M8)  |
| Consumables:       | -   |
| Required manpower: | 1 Mechanic  |
| Intervals:         | Every 8 years or 3,000,000 km                               |

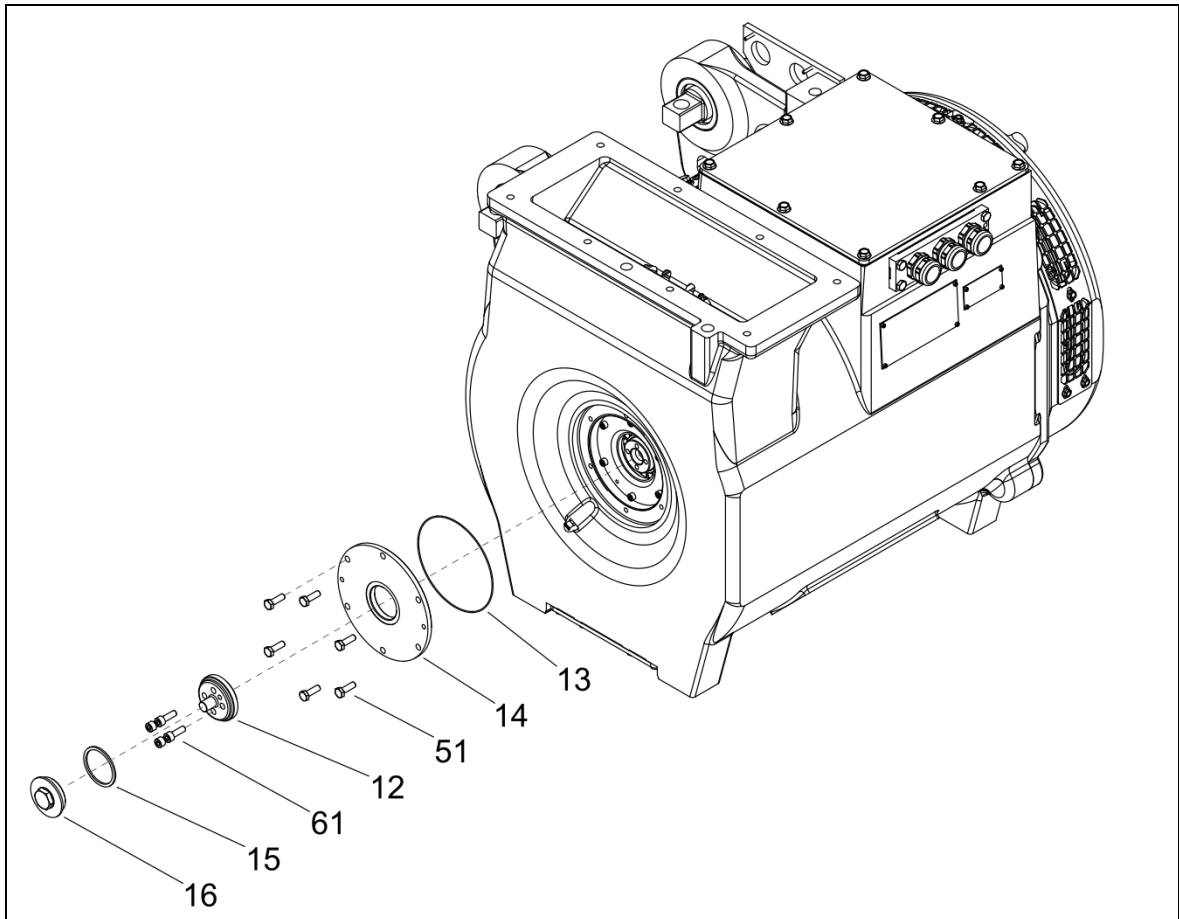


Figure 19: Preliminary work on NDE side

- 1 Remove the reworked locking screw (16) and the sealing ring (15).
- 2 Loosen and remove four hexagon socket screws (61).
- 3 Remove the end plate (12). If necessary, use ejecting screw (M8).
- 4 Loosen and remove six hexagon head screws (51).
- 5 Remove the cover NDE (14). If necessary, use ejecting screws (M8).
- 6 Remove the O-ring (13).

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## 8.5.5 Removing the rotor

|                    |  |
|--------------------|--|
| Preliminary work:  | Demounted traction motor (see <a href="#">section 5.3</a> )  |
| Tools:             | Hoisting device (> 301kg, > 900kg)<br>Lifting eye bolts (M16)<br>Ejecting screws (M8)<br>Hydraulic device for labyrinth ring disassembly (T3)<br>Two-arm puller<br>Wooden beams (T2) |
| Consumables:       | -  |
| Required manpower: | 1 Mechanic / 1 Assistant   |
| Intervals:         | Every 8 years or 3,000,000 km  |

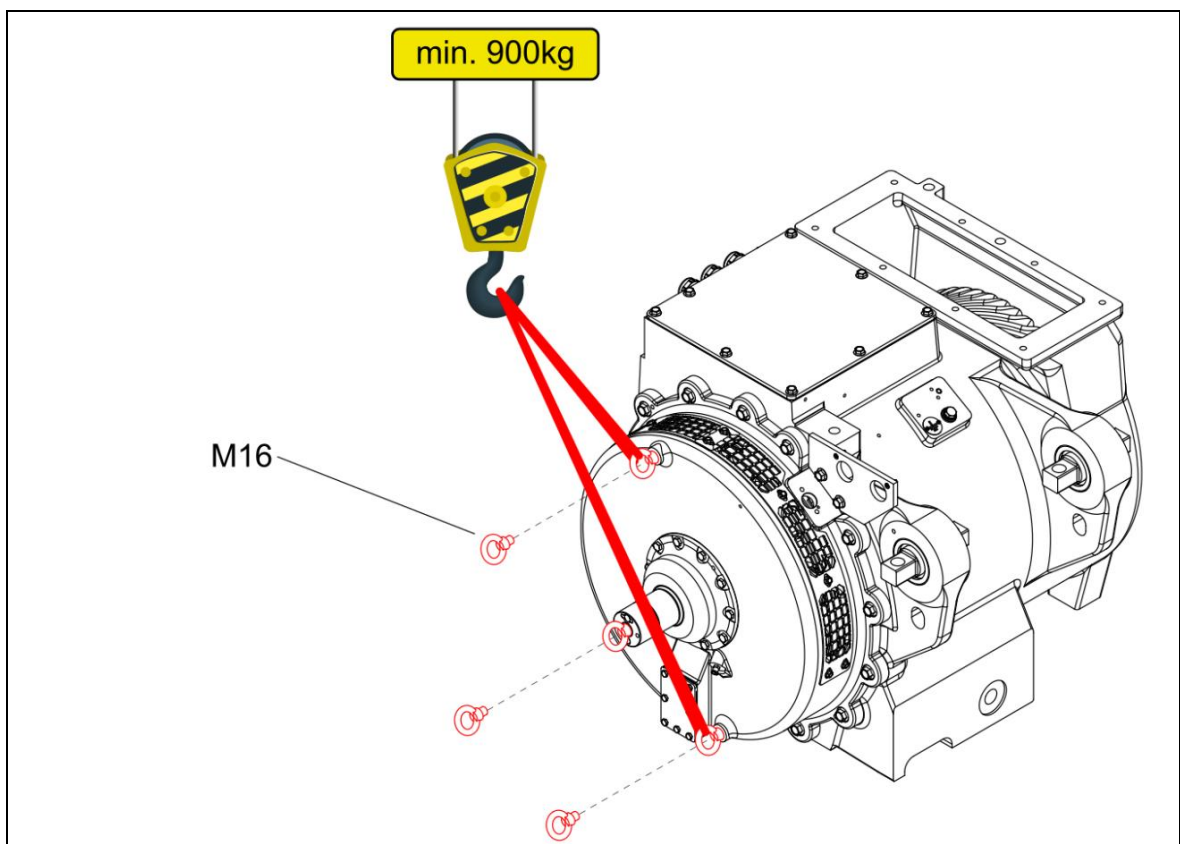


Figure 20: Turning the traction motor



### CAUTION!

#### RISK OF INJURY FROM HEAVY LOAD!

Mass of the traction motor assembled is approx. 900kg.

Mass of the bearing shield DE with rotor assembled is approx. 301kg.

The use of hoisting devices with precision control, as well as the use of an assistant is strongly recommended. This is due to the tight assembly clearances, and the need to pull out the rotor without colliding with other parts.

# TME 49-30-4

- 1 Attach the two eye bolts (M16) to the bearing shield DE and one eye bolt (M16) rotor's shaft.
- 2 Attach the hoisting straps to two eye bolts (16) in the bearing shield DE, and turn the traction motor by 90°.
- 3 Place the traction motor on a suitable surface and secure it.
- 4 Remove the hoisting straps from the eye bolts (M16).
- 5 Remove the two eye bolts (M16) from bearing shield DE.

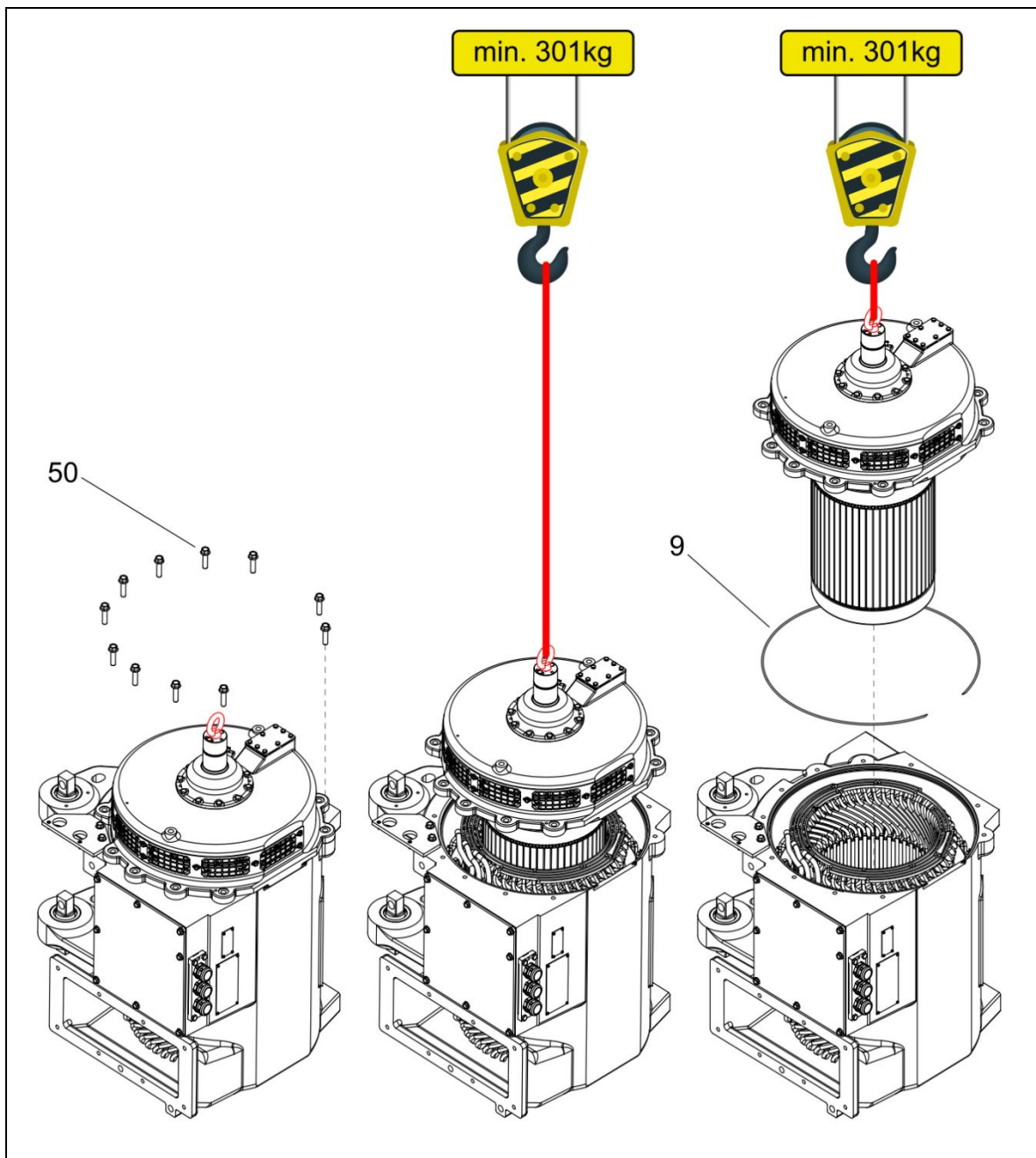


Figure 21: Rotor disassembly

# TME 49-30-4

- 6 Remove eleven hexagon head screws (50) from the bearing shield DE.
- 7 Remove the bearing shield DE with the rotor assembled. If necessary, use two ejecting screws (M8) to separate the mating surfaces.
- 8 Remove the O-ring (9).
- 9 Place the separated rotor and bearing shield assembly on secure surface (on wooden beams (T2) e.g.)



## NOTE

The bearing (10) inner race remains on the rotor's shaft.

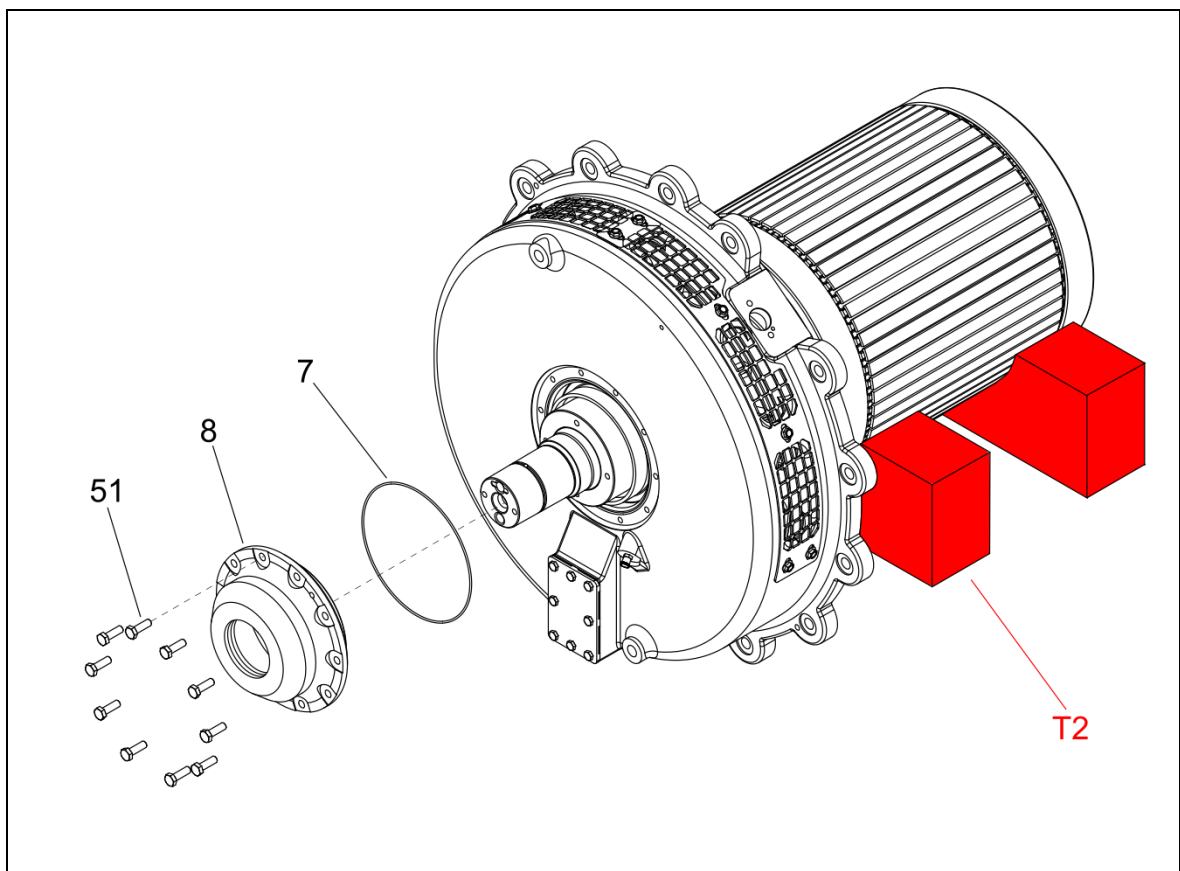


Figure 22: Removing bearing cover DE

- 10 Loosen and remove ten hexagon head screws (51).
- 11 Remove the bearing cover DE (8).
- 12 Remove the O-ring (7).

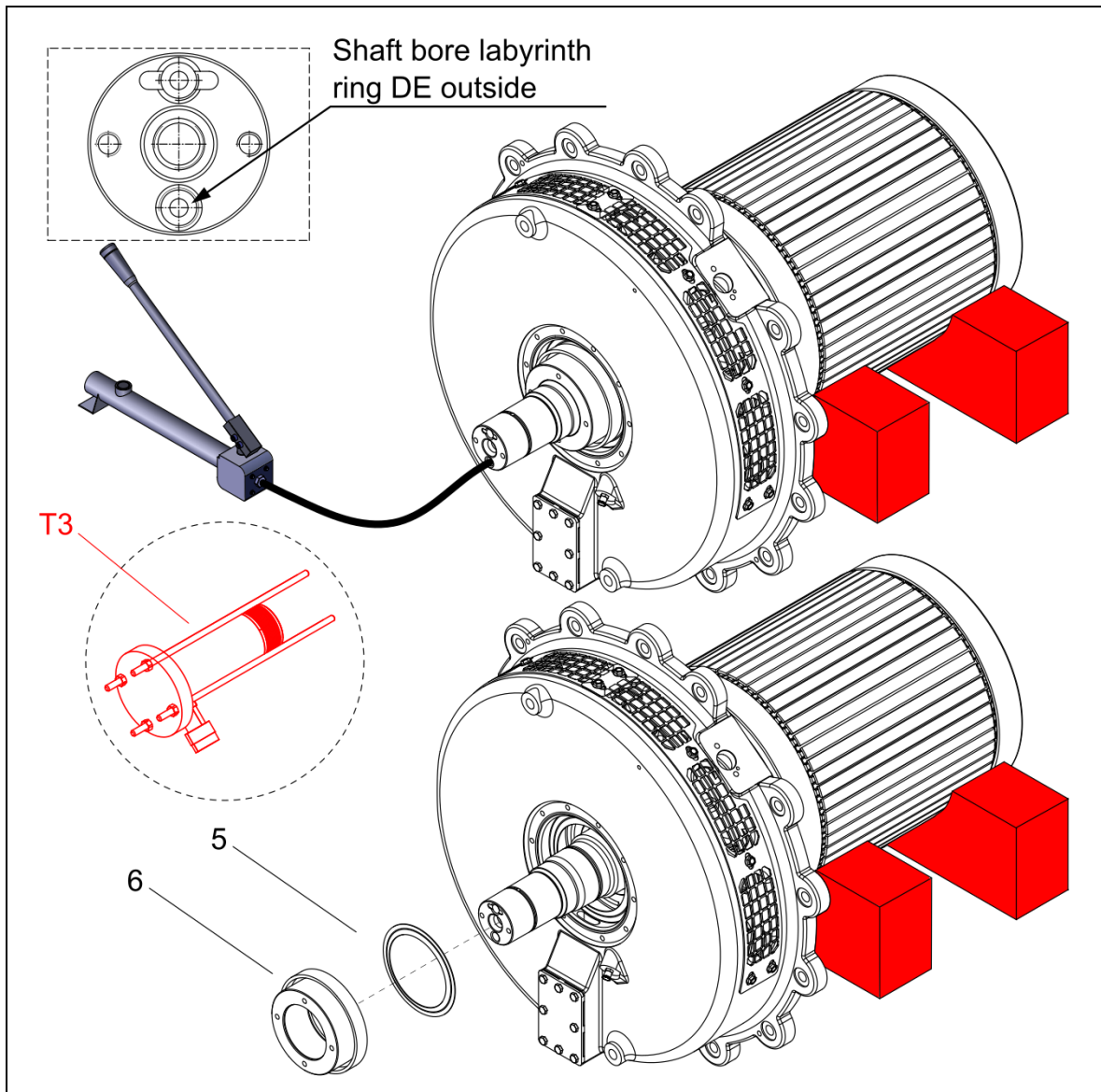


Figure 23: Removing outer labyrinth ring DE

- 13 Attach the hydraulic pump to the bore according to the Figure 23.
- 14 Apply pressure until oil leaks between the mating surfaces of the rotor's shaft and labyrinth ring DE (6).
- 15 Slide off the labyrinth ring DE (6) from the rotor's shaft. If necessary, use hydraulic cylinder assembly (T3) to remove the labyrinth ring DE (6).
- 16 Remove the grease retaining ring (5).

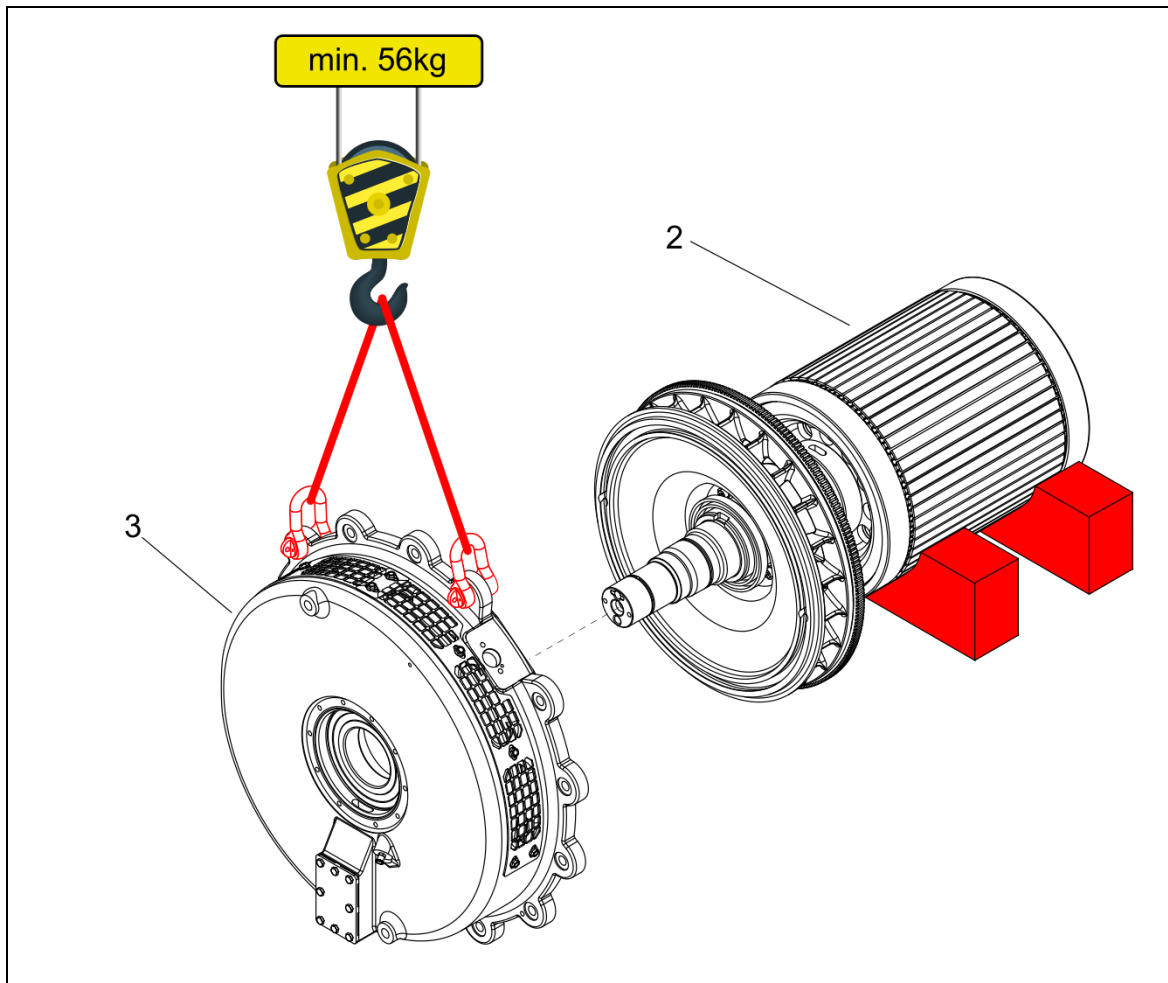


Figure 24: Removing the bearing shield DE



### CAUTION!

#### RISK OF INJURY FROM HEAVY LOAD!

Use adequate hoisting devices to remove the bearing shield.

Mass of the bearing shield DE is approx. 56kg.

17 Hook the hoisting device to the bearing shield DE (3).

18 Remove the bearing shield DE (3) from the rotor.



### NOTE

The deep groove ball bearing (4) remains in the bearing shield DE (3) when separating it from the rotor. The cylinder roller bearing (10) inner race remains on the rotor's shaft.



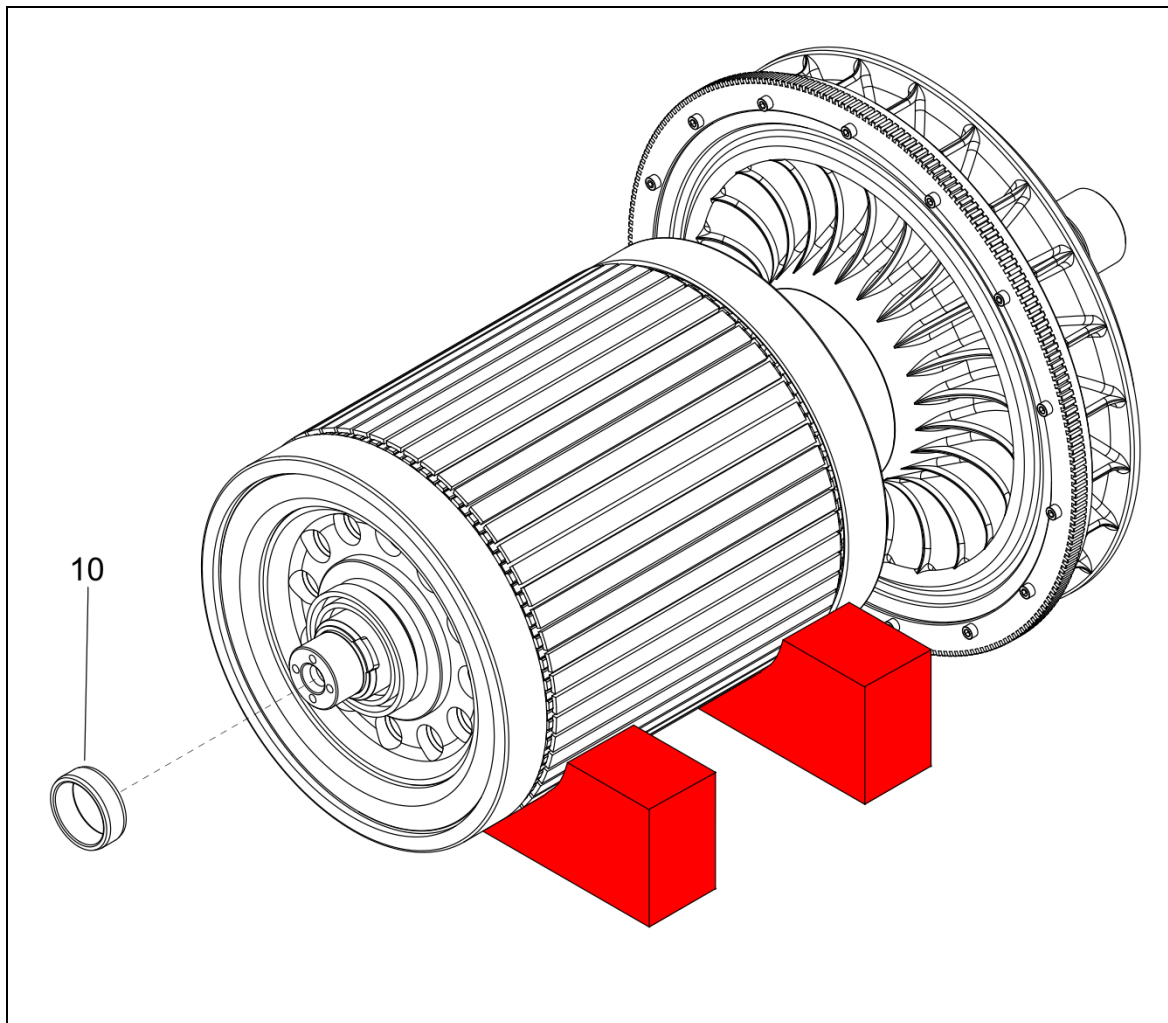


Figure 25: Removing the cylinder roller bearing inner ring  
19 Using two-arm puller, remove the cylinder roller bearing (10) inner ring.

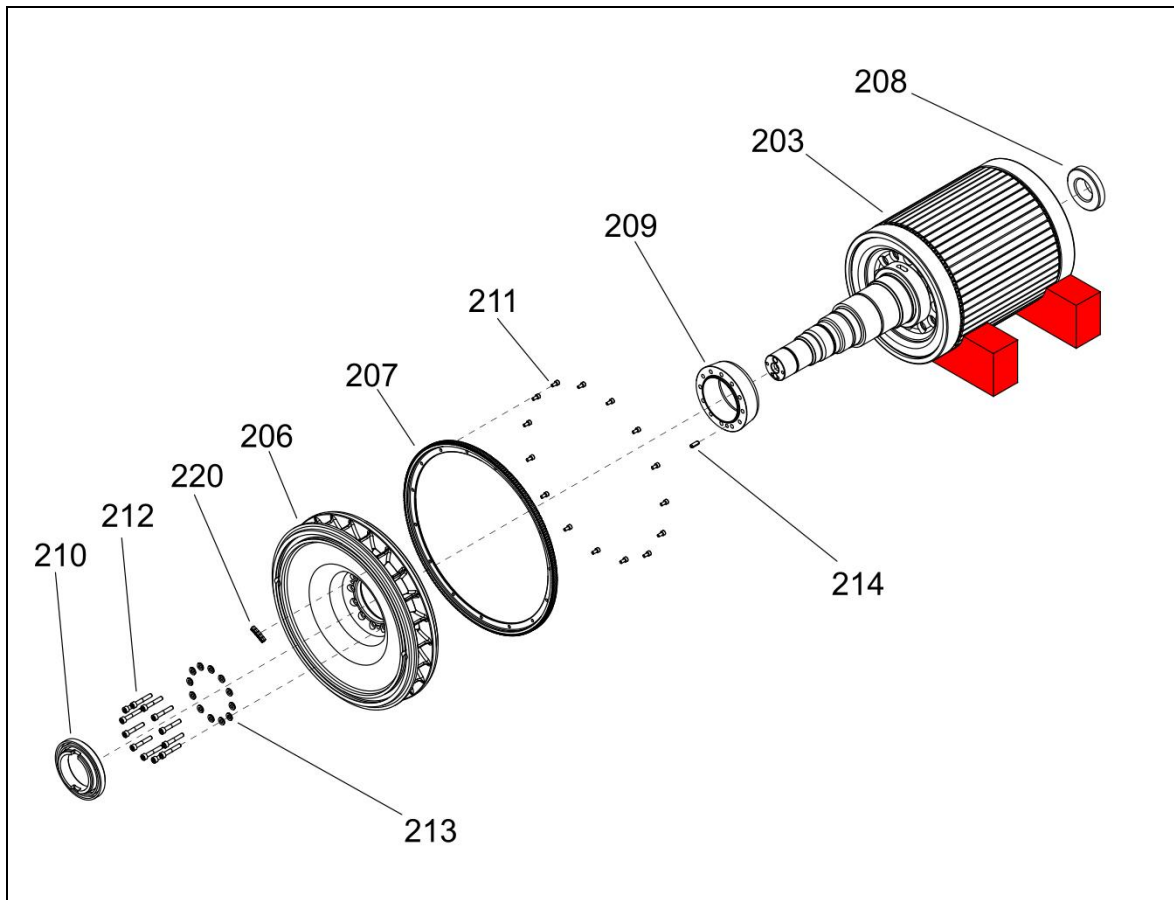


Figure 26: Disassembling the rotor



Disassemble the labyrinth ring NDE (208), labyrinth ring DE (210), ventilator (206), toothed wheel (207) and ventilator hub (209) from the rotor only when necessary – due to damages or detected imbalances in operation.

Any disassembly of these parts requires balancing of the assembly.

For more information, see [section 8.7.4](#).

- 20 Using two-arm puller, remove the labyrinth ring NDE (208).
- 21 Using two-arm puller, remove the labyrinth ring DE (210).
- 22 Remove the twelve hexagon socket screws (212) and Nord-Lock (213) washers.
- 23 Remove the ventilator (206) and place it on the stable and secure surface.
- 24 Remove the fifteen hexagon socket head cap screws (211).
- 25 Remove the toothed wheel (207) from the ventilator (206).
- 26 Using two-arm puller, remove the ventilator hub (209).
- 27 Remove the slotted spring pin (214) from the ventilator hub (209).

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## 8.5.6 Disassembling the bearing shield DE

|                    |   |
|--------------------|---|
| Preliminary work:  | Demounted traction motor (see <a href="#">section 5.3</a> ) |
| Tools:             | -   |
| Consumables:       | -   |
| Required manpower: | 1 Mechanic / 1 Assistant                                    |
| Intervals:         | Every 8 years or 3,000,000 km                               |

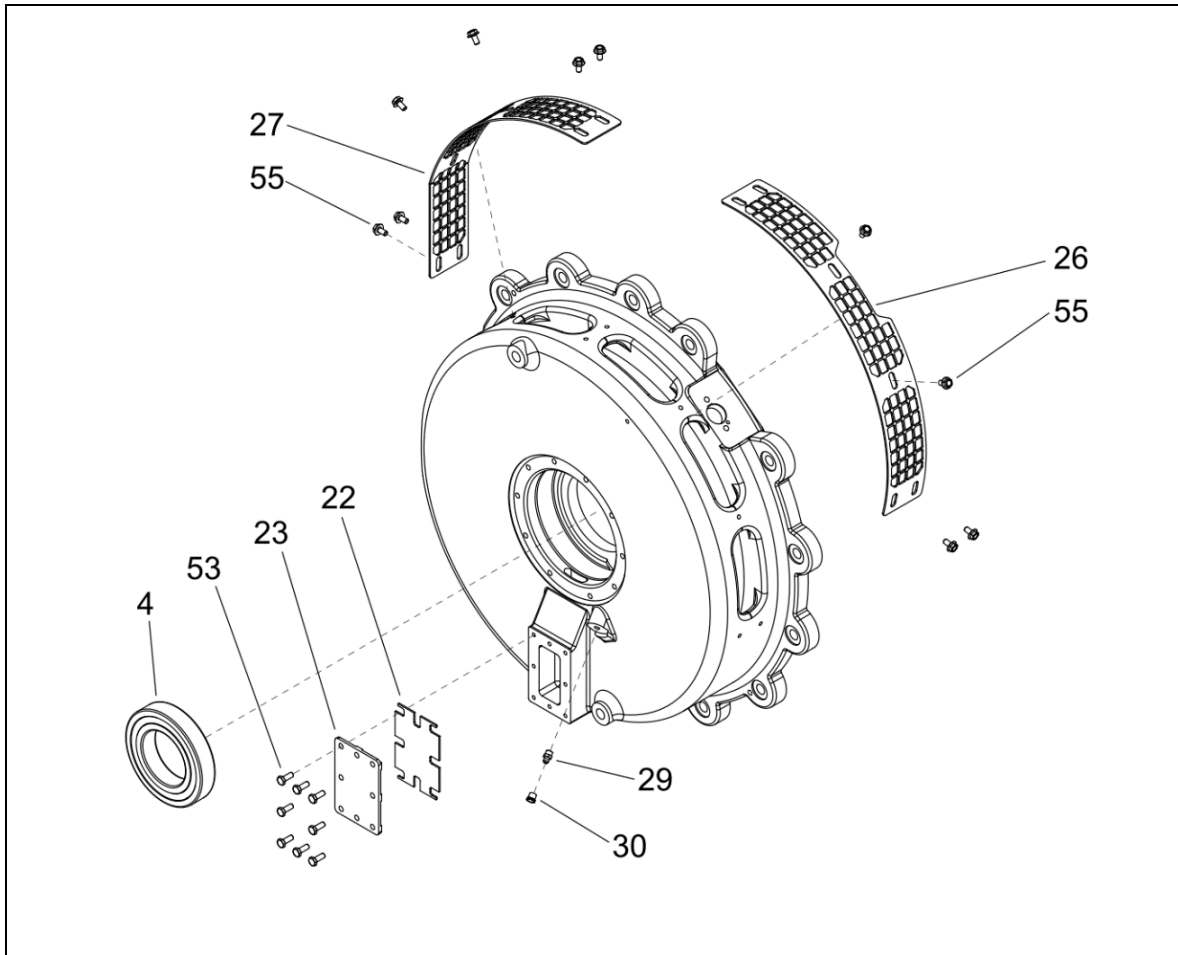


Figure 27: Disassembling the bearing shield DE

- 1 Place the bearing shield DE on a stable surface and secure it.
- 2 Loosen and remove eight hexagon head screws (53).
- 3 Remove the used grease cover (23) and used grease cover sealing (22).
- 4 Clean the used grease from the channels.
- 5 Press out the deep groove ball bearing (4) from the bearing shield DE.
- 6 Remove the regreasing nipple cap (30) and the lubricating nipple (29).
- 7 Loosen and remove hexagon ribbed flange bolts (55).
- 8 Remove the protective grids (26, 27).

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## 8.5.7 Disassembling the bearing from stator

|                    |   |
|--------------------|---|
| Preliminary work:  | Demounted traction motor (see <a href="#">section 5.3</a> ) |
| Tools:             | Ejecting screws (M8)  |
| Consumables:       | -   |
| Required manpower: | 1 Mechanic / 1 Assistant                                    |
| Intervals:         | Every 8 years or 3,000,000 km                               |

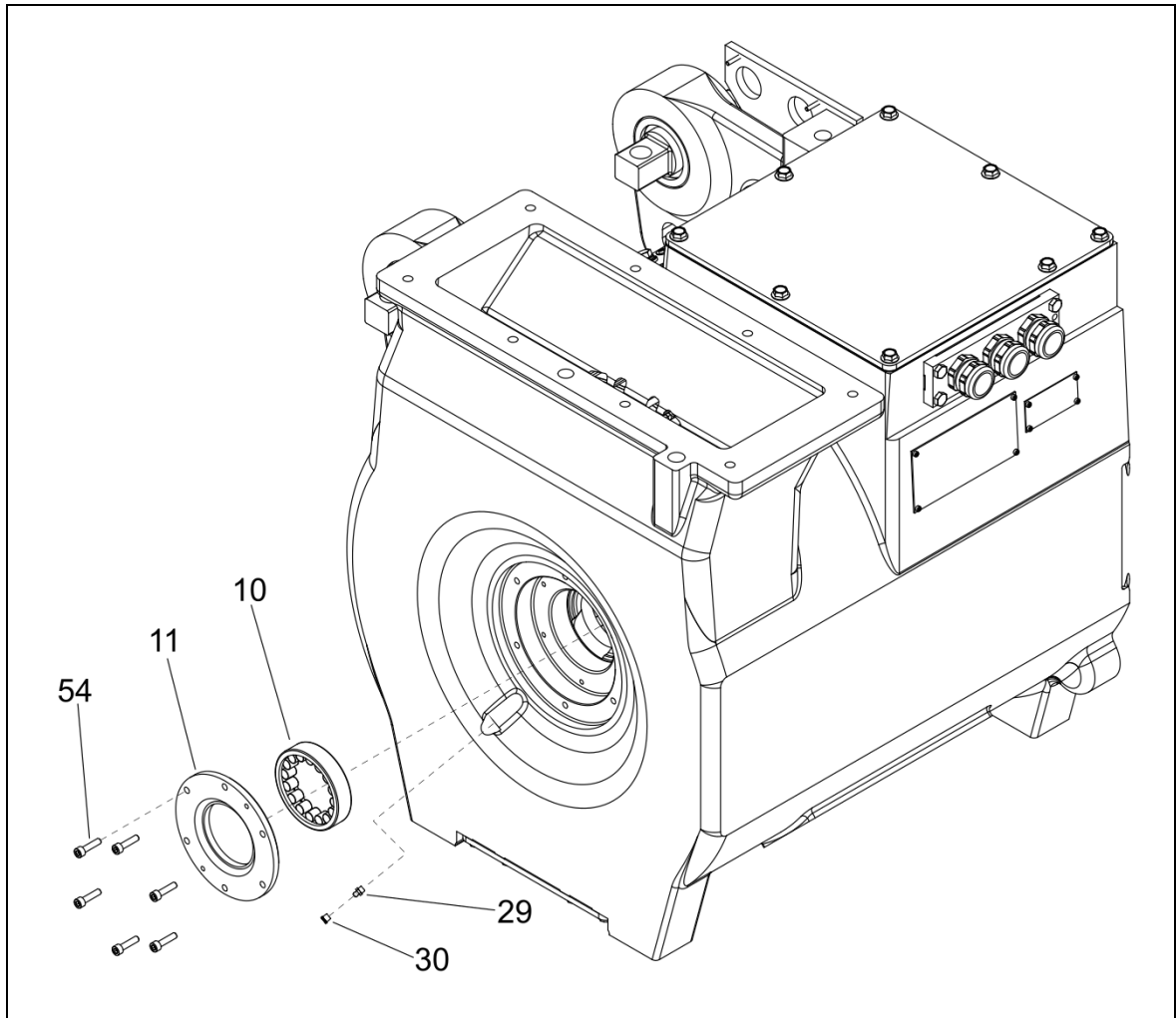


Figure 28: Disassembling the bearing from stator

- 1 Remove the six hexagon ribbed flange bolts (54).
- 2 Remove the bearing cover NDE (11). If necessary, use ejecting screws (M8) to remove it.
- 3 Remove the regreasing nipple cap (30) and the lubricating nipple (29).
- 4 Clean the old grease from the lubricating channel.

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## 8.5.8 Cleaning and checking the bearing shield DE

|                    |   |
|--------------------|---|
| Preliminary work:  | Removing the rotor (see <a href="#">section 8.5.5</a> ) |
| Tools:             | -   |
| Consumables:       | -   |
| Required manpower: | 1 Mechanic / 1 Assistant                                |
| Intervals:         | Every 8 years or 3,000,000 km                           |

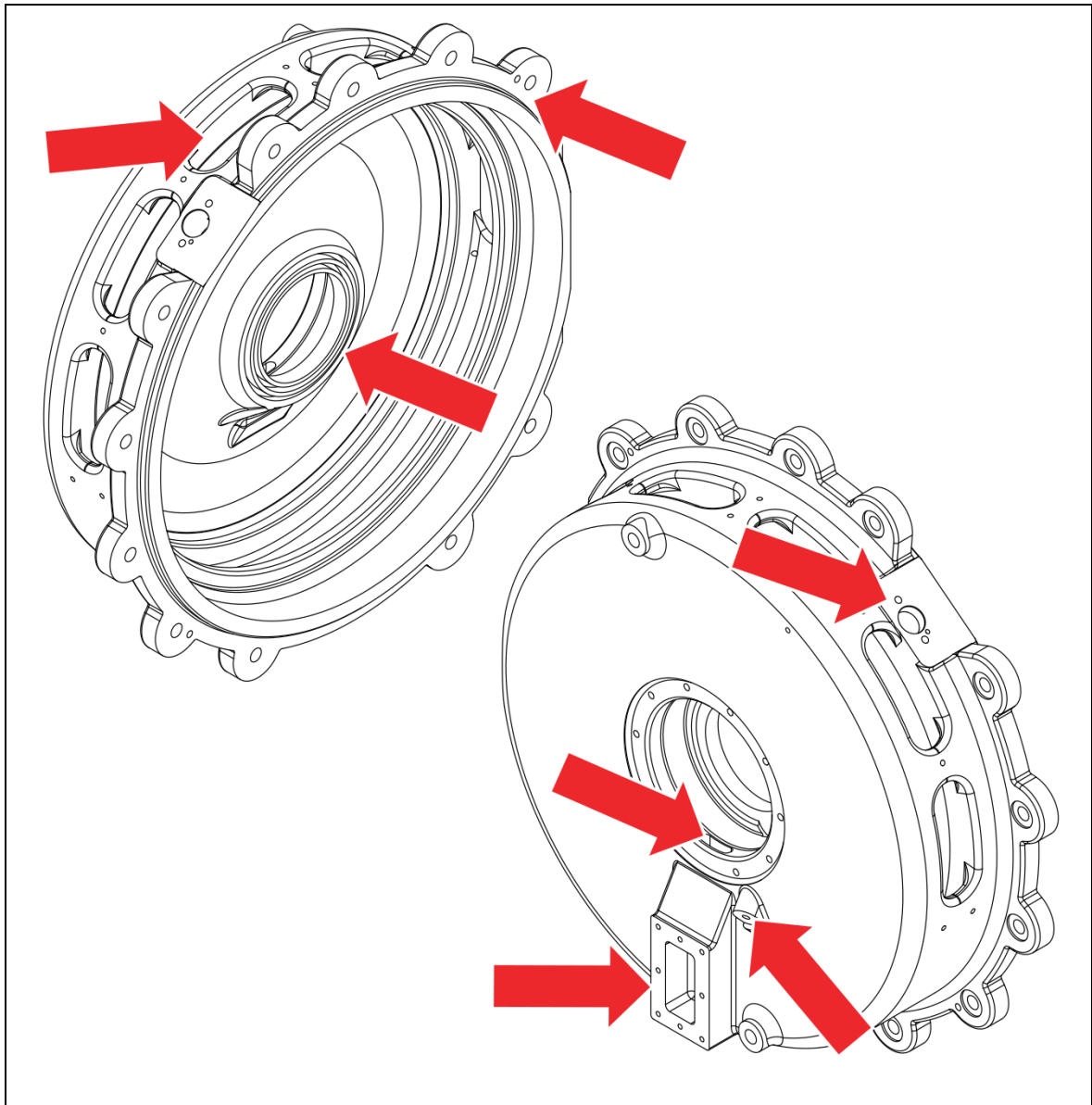


Figure 29: Cleaning the bearing shield DE

- 1 Check that the mating surfaces with the stator are clean.
- 2 Check that the grease is completely removed from used grease channel and lubricating channel.
- 3 Clean the speed sensor hole and the protective grids holes.
- 4 Clean the labyrinth ring surfaces.

# TME 49-30-4

## 8.5.9 Cleaning of cooling holes in stator and rotor

|                    |   |
|--------------------|---|
| Preliminary work:  | Removing the rotor (see <a href="#">section 8.5.5</a> ) |
| Tools:             | Vacuum cleaner<br>Round brush                           |
| Consumables:       | -   |
| Required manpower: | 1 Mechanic / 1 Assistant                                |
| Intervals:         | Every 8 years or 3,000,000 km                           |

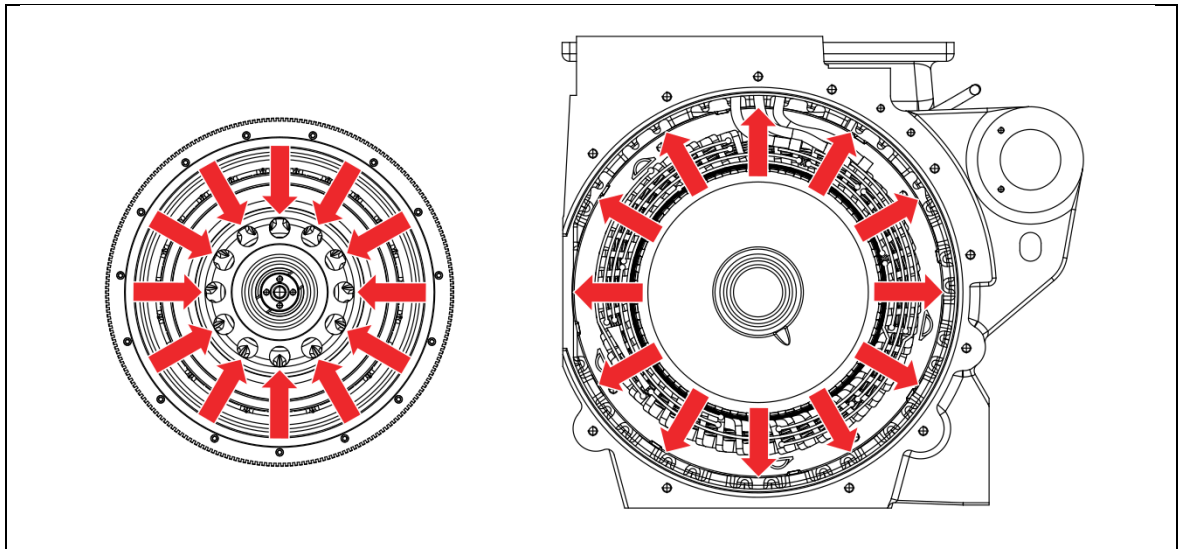


Figure 30: Cleaning of cooling holes in stator and rotor

- 1 Check the cooling holes in the rotor and stator for free passage.
- 2 Clean dirty cooling holes using a suitable round brush and vacuum cleaner.

# TME 49-30-4

## 8.5.10 Cleaning the stator windings and checking for damage

|                    |  |
|--------------------|--|
| Preliminary work:  | Disassembling the bearing from stator (see <a href="#">section 8.5.7</a> ) |
| Tools:             | Flashlight   |
| Consumables:       | -  |
| Required manpower: | 1 Mechanic / 1 Assistant   |
| Intervals:         | Every 8 years or 3,000,000 km  |

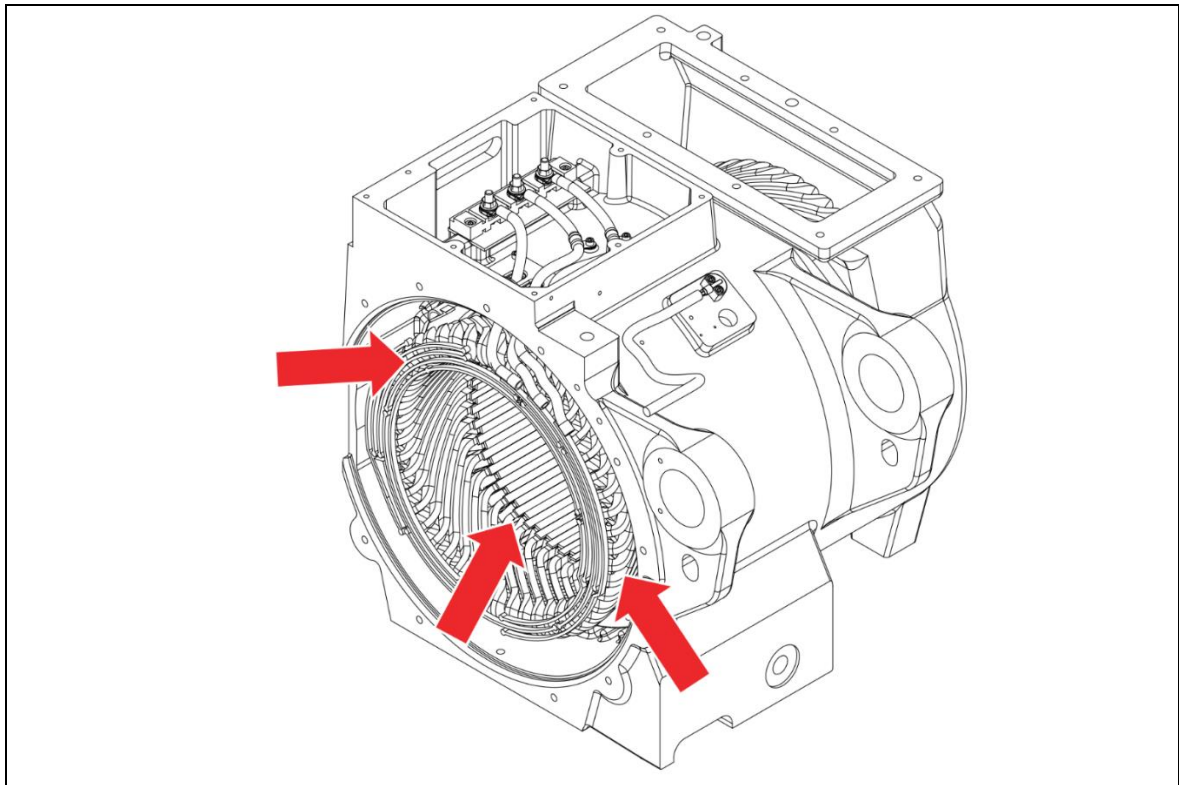


Figure 31: Cleaning and checking stator windings

- 1 After the cleaning process (see [section 8.6](#)), check the coating paint of the coils (impregnation) for cracks and flaws.
- 2 If a defect is found, send the stator to the manufacturer for inspection or contact the manufacturer's service department!



**Manufacturer:**

**TRAKTIONSSYSTEME AUSTRIA GmbH / Service**

Brown-Boveri-Straße 1

A-2351 Wiener Neudorf

Tel.: +43 (0) 2236 8118-111

E-Mail: [service@tsa.at](mailto:service@tsa.at)

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# TME 49-30-4

## 8.6 Cleaning

### 8.6.1 Introduction

In general, dry cleaning only must be carried out in normal maintenance. Frequent washing or cleaning with solvents compromises the insulation considerably more than normal dry dirt would.

Cleaning with solvents, e.g. mineral spirit is prescribed in particular in the case of oily contamination. If the traction drives are fully cleaned with solvents, subsequent waterproofing or repainting is necessary.



### WARNING!

#### HARMFUL TO HEALTH!

Halogenated hydrocarbons are **NOT** suitable as cleaning agents in the workplace as they pose a health hazard.

### 8.6.2 Dry cleaning

Use for traction motors that are affected by normal levels of dirt, with either no oil deposits or light localised oil deposits. Wet traction motors must be dried before cleaning in an oven for **12 hours** at **100 °C**.

Possible methods:

- Dry compressed air (with oil separator) and vacuum cleaner.
- Plastic brushes.
- Cleaning rags that must be changed frequently, etc.



### CAUTION!

#### RISK OF DAMAGE!!

Using mechanical tools may cause damage to the winding.

- ▶ Do not use mechanical tools (such as spatulas or scrapers).

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## 8.6.3 Wet cleaning



One of the following cleaning methods must be chosen for wet cleaning (follow order):

- Dry ice
- Washing by hand
- Wet cleaning only with soft water spray at a pressure of **0.5 bar**, minimum duration (a few minutes in total) and a water temperature between **+10 °C** and **+40 °C**.

Any cleaning method not expressly permitted must be checked with **TRAKTIONSSYSTEME AUSTRIA GmbH** first.

### Possible methods:

- Blast with compressed air (oil-free).
- Pre-wash with water or with water and detergent, soak and remove heavy dirt.
- Main wash with water and detergent.
- Rinse with water or water with anti-corrosive additives.



**CAUTION!**

### **RISK OF DAMAGE!**

The use of high-pressure cleaning equipment is not permitted as this can damage the insulation.



**CAUTION!**

### **RISK OF DAMAGE!**

It is **not permitted** to wash the traction motor in an industrial washing machine or immerse it completely in a water bath.

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## 8.6.4 Cleaning agents

In principle, use halogen-free solvents only (see [section 8.6.4.1](#)). The aromatic content of the solvent must not exceed 30 % when cleaning silicone/rubber coatings.

Solvents containing halogens can cause stress corrosion cracking of CrNi steels (e.g. shafts) and are therefore not permitted.



### WARNING!

#### HARMFUL TO HEALTH CLEANING AGENTS!

Application by qualified specialists only!

- ▶ Solvents may contain halogens and may be toxic.
- ▶ Furthermore, for safety reasons, highly volatile solvents are not permitted for cleaning the traction motor. For example: acetone, nitro thinners and highly volatile petrol's.
- ▶ Work with solvents should only be carried out in well-ventilated rooms. Special protective measures may be necessary. In special cases, cleaning in special closed-circuit systems is appropriate.
- ▶ The safety regulations of the respective countries must be observed.



### CAUTION!

#### POLLUTION OF THE ENVIRONMENT!

Spent cleaning fluids must not be allowed to enter the canalisation, otherwise damage to the environment may occur!

- ▶ The safety regulations of the respective countries must be observed.
- ▶ Dispose of the used cleaning liquids according to the respective waste regulations.

Use as a supplement to dry cleaning in case of oily soiling and for repair objects, if the washing procedure cannot be applied. Re-impregnation and/or re-varnishing of the windings after cleaning is necessary.

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Cleaning procedure:

- Pre-clean mechanically (see [section 8.6.2](#)).



## RISK OF DAMAGE!

It is **not permitted** to wash the traction motor in an industrial washing machine or immerse it completely in a water bath.

- Apply the cleaning agent with a brush, spray, etc. - Application time five to max. 10 minutes.
- Wiping with a cloth or rinsing with the cleaning agent max. 5 minutes.
- Oven drying

### 8.6.4.1 Permissible cleaning agents and solvent (involves cleaning with dry ice)

Mineral spirits: halogen-free, non-volatile, combustible

|  |                                     |
|--|-------------------------------------|
| Density:                                   | 0.76 – 0.8 g/cm <sup>3</sup>        |
| Boiling range:                             | 140 – 200 °C                        |
| Abel-Pensky flash point:                   | > 21 °C                             |
| Aromatic content:                          | 20 ±5 vol. %                        |
| Hazard class in accordance with DIN 51755: | A II                                |
| Poison category (CH):                      | 4 – 5 depending on aromatic content |
| Xylol:                                     | CHR (chemically pure)               |

Mineral spirits: halogen-free, medium volatility, combustible

|  |                               |
|--|-------------------------------|
| Density:                                   | 0.86 – 0.87 g/cm <sup>3</sup> |
| Boiling range:                             | 138 – 143 °C                  |
| Abel-Pensky flash point:                   | 20 – 25 °C                    |
| Hazard class in accordance with DIN 51755: | A I                           |
| Poison category (CH):                      | 4                             |

## 8.6.4.2 Not permissible cleaning agents and solvent



### CAUTION!

#### RISK OF DAMAGE!

Cleaning agents and solvents like **trichloroethane**, **trichloroethylene**, **perchloroethylene** and **fluorinated solvents** are not recommended.

If in doubt, contact our technicians for advice.

## 8.6.4.3 Cleaning with dry ice

Dry ice pellets or dry ice snowflakes are accelerated up to an **approximate speed of 150 m/s** with the aid of a dry ice blasting machine and strike the object to be cleaned. They trigger an isolated thermal shock when they strike the object. This temperature shock causes the coating or dirt that is to be removed to contract and come loose from the base material. The coating is removed by the resulting kinetic energy.

Dry ice leaves behind no moisture residue since it immediately changes to a gaseous state upon impact. Only the stripped coating remains; no blasting media needs to be removed. The surface quality of the base material is preserved as the pellets only have a hardness of **approximately 2 Mohs** and therefore do not cause any abrasion!



### CAUTION!

#### RISK OF DAMAGE!

- ▶ Crush pellets to snow.
- ▶ Limit the pressure setting to 6 bar.
- ▶ Blast the winding at a minimum distance of **15 to 30 cm**.

Measure the insulating resistance and, if necessary, dry the stator winding.

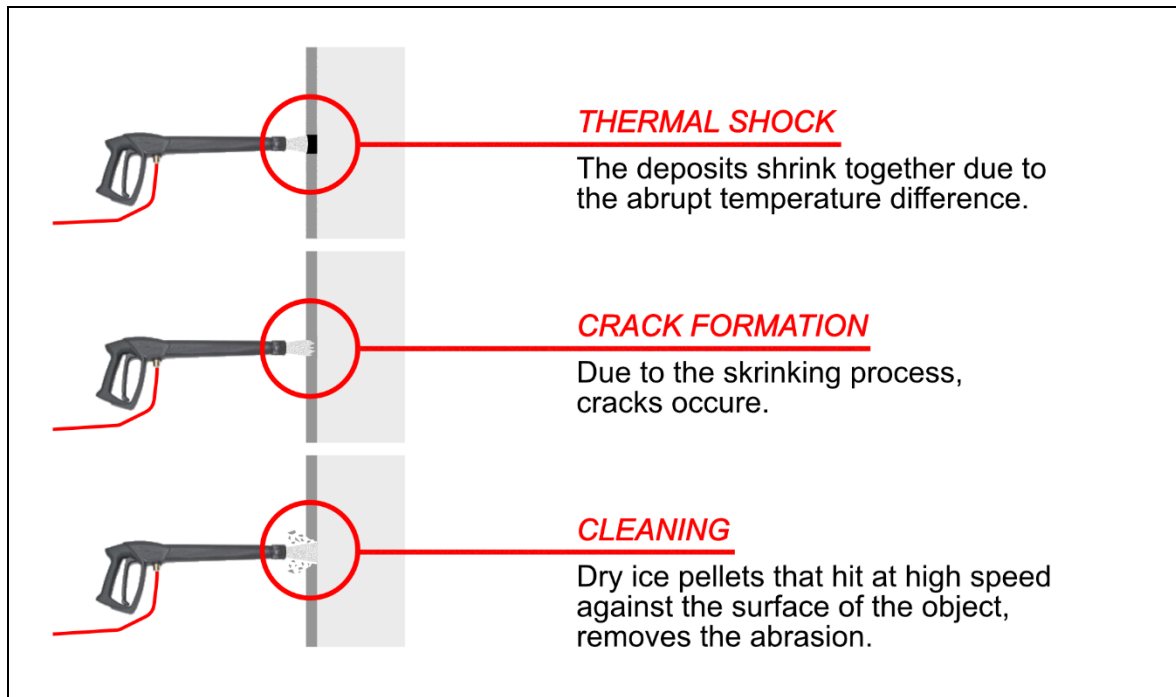


Figure 32: Dry ice cleaning

## 8.7 Assembling the traction motor

This section describes the procedure for assembling the traction motor as well as notes on important points to be observed during assembly.

If the motor was only partially disassembled, as is the case with various inspection, maintenance, or repair work, only the necessary steps in this section need to be carried out.



### NOTE

Transport and assembly of the motor may only be carried out in a horizontal position!

The maximum axial displacement of the rotor is limited to 6 mm.

The displacements necessary for assembly may only be carried out slowly and without impacts.

Protect the stator winding from damage! If the insulation or winding has been damaged in the course of the work, it must be repaired by the manufacturer.

### 8.7.1 Preparation

- Before reassembly, carefully clean all fitting and bearing seating surfaces, as well as dismantled parts.
- Remove residues of sealants and thread lockers.
- For assembly, the specified tightening torques, application of sealants and thread lockers must be observed.
- Apply thread locker to the threaded holes (wetting at least 90%) in the case of blind threaded holes, and to the screw thread in the case of threaded through holes.
- Heating of the components to be shrunk on can be done either in the oven or with inductive devices. Induction heating is recommended as this ensures uniform heating and prevents excessive heating.
- Place the outer ring of the cylindrical roller bearing in the freezer the day before assembly.
- If necessary, the corrosion protection must be renewed at damaged points in accordance with the production specification.

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## 8.7.2 Measuring insulation and winding resistance

|                    |   |
|--------------------|---|
| Preliminary work:  | Disconnecting the electrical lines (see <a href="#">section 5.4.2</a> ) |
| Tools:             | Milli Ohmmeter<br>Mega Ohmmeter   |
| Consumables:       | -   |
| Required manpower: | 1 Electrician   |
| Intervals:         | Every 8 years or 3,000,000 km   |



After a long storage period, a long downtime or after cleaning, the insulation value of the winding must be checked.

It should be at least 100 MΩ when cold.

Experience has shown that the insulation value is lower after commissioning; it is therefore advisable to take another measurement at operating temperature. If the insulation value is below 100 MΩ after heating at 60 °C to 80 °C, the winding must be dried (see [section 8.6.2](#)).



**DANGER!**

### HIGH VOLTAGE - DANGER TO LIFE!

Danger to life from contact with terminals that are still active.

- ▶ For measuring, disconnect the traction motor from all line connections. (Disconnect the connection lines).



## 8.7.2.1 Measuring insulation resistance

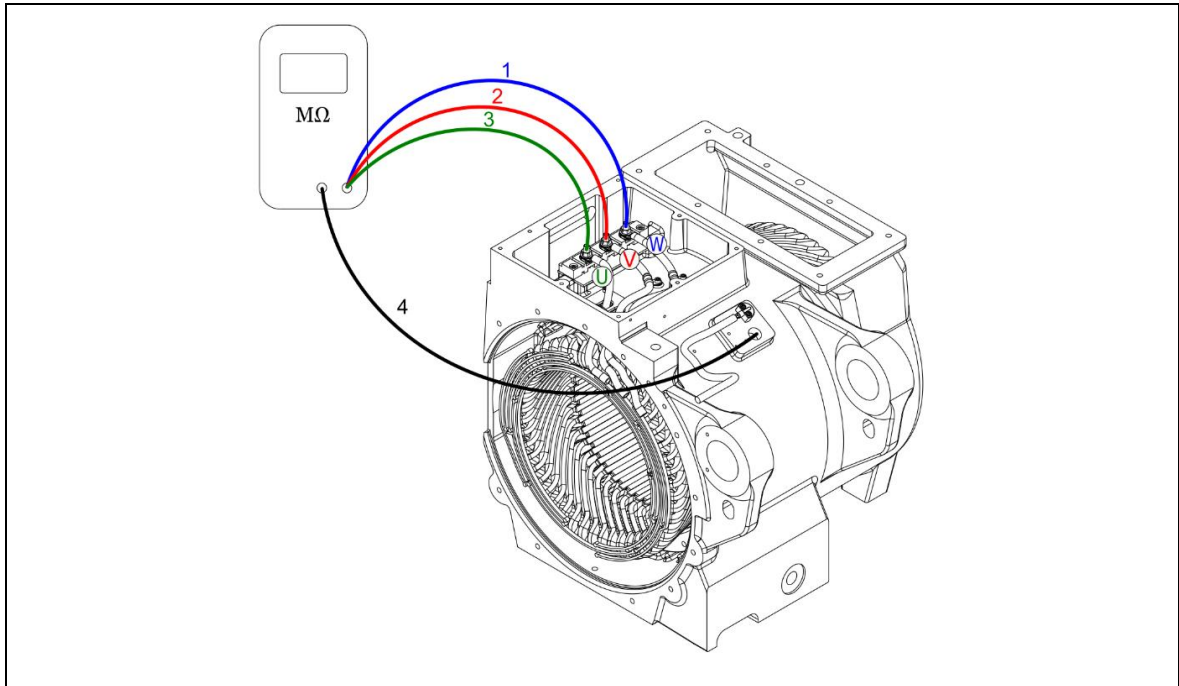


Figure 33: Measuring insulation resistance



**DANGER!**

**HIGH VOLTAGE – DANGER TO LIFE!**

- ▶ For measuring, disconnect the traction motor from all line connections.

- 1 Connect the measurement device.  
One connection takes place to the winding, the second connection is clamped against the earth (or on a polished area of the motor – e.g., ground connection on the stator).
- 2 The measurement device is adjusted to the measurement voltage of 1,000 V DC.
- 3 After switching on the measurement device, the correct metered value is reached after a minute.
- 4 Take readings of the metering value (min. 100 MΩ in a cold condition).
- 5 Switch off the measurement device (or activate the automatic shut-off after a minute).

The measurements are carried out as described above between:

- W1 (1) — and earth (4) —
- V1 (2) — and earth (4) —
- U1 (3) — and earth (4) —

## 8.7.2.2 Measuring winding resistance

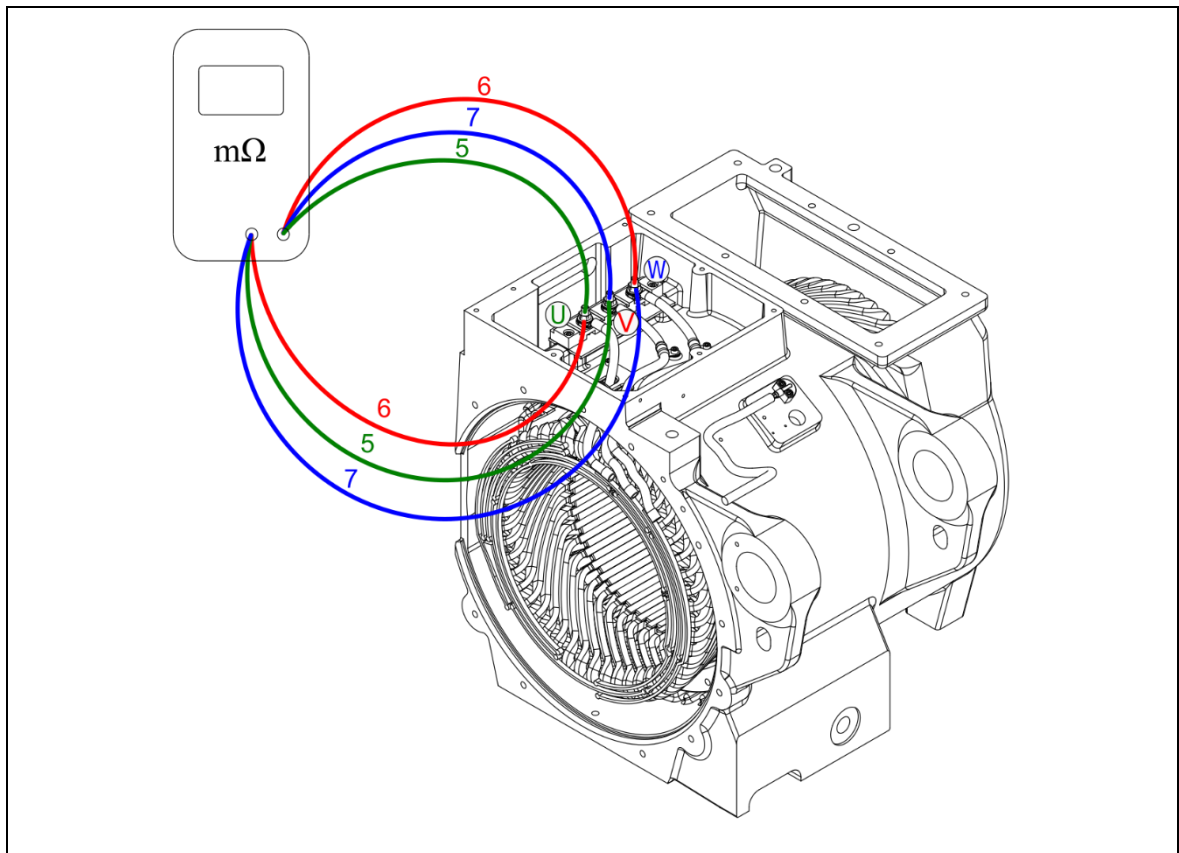


Figure 34: Measuring winding resistance



### NOTE

#### RISK OF DAMAGE!

After repairs are carried out on the winding, the winding resistance must be checked.

The measurements for the winding resistance are carried out between:

- U (5) — and V (5) —
- U (6) — and W (6) —
- V (7) — and W (7) —

- 1 Read the measured value. At 20 °C this should be in the range of 102,79 mΩ – 113,61 mΩ.
- 2 Switch off the instrument (or activate the automatic switch-off after one minute).
- 3 After completing the measurements, disconnect the respective measuring cable from the connection terminals.
- 4 Reconnect the connecting cable.

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## 8.7.3 Drying of damp windings

|                    |  |
|--------------------|--|
| Preliminary work:  | Cleaning the stator windings and checking for damage (see <a href="#">section 8.5.10</a> ) |
| Tools:             | Induction heater with demagnetization and temperature measuring probe<br>Oven              |
| Consumables:       | -  |
| Required manpower: | 1 Mechanic   |
| Intervals:         | If necessary   |

Drying is carried out with the traction motor open by:

- **Current drying**

The heating current must be set to approx. 50 % of the rated current. Ensure that all phases are loaded evenly for 12 hours and that the stator winding temperature does not rise above 100 °C.

- **Oven drying**

The stator must dry at approx. 100 °C for about 12 hours.

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## 8.7.4 Checking and fine balancing of the rotor

|                    |   |
|--------------------|---|
| Preliminary work:  | Removing the rotor (see <a href="#">section 8.5.5</a> )   |
| Tools:             | Torque wrench<br>Balancing machine<br>Inductive heater with demagnetization and temperature measuring probe |
| Consumables:       | Thread locker LOCTITE 243   |
| Required manpower: | 1 Mechanic  |
| Intervals:         | Every 8 years or 3,000,000 km   |

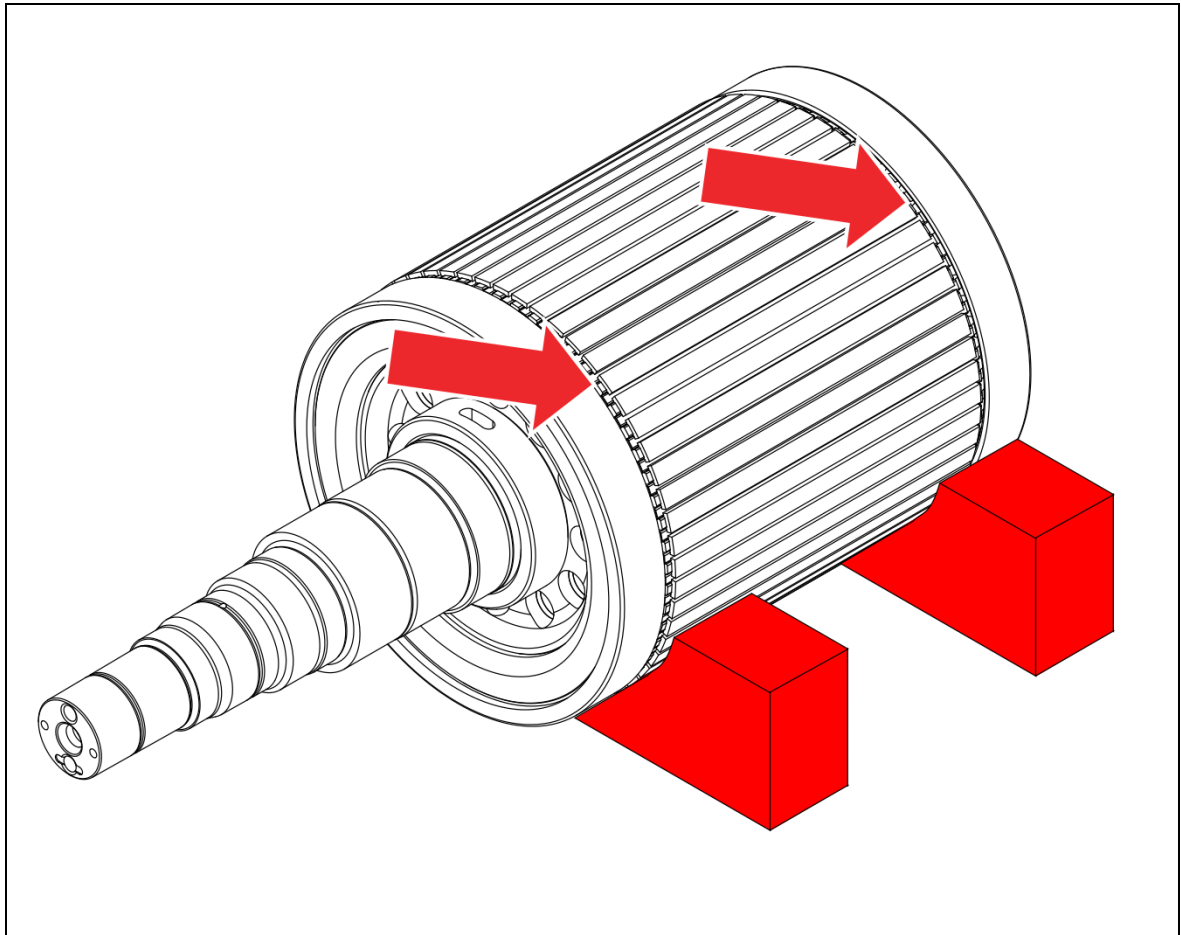


Figure 35: Checking the rotor



The following steps must be carried out only when imbalances have been detected during operation.



**CAUTION!**

Fitting surfaces must be dry and free of grease. Clean fitting surfaces with fat-dissolving detergent.

- 1 Visually check for cracks at all brazed joints between shorting bars and shorting ring on both sides.
- 2 If there is evidence of cracks in the impregnation and lacquer, ensure that there are no cracks in the solder connections by removing the coating.
- 3 After checking, the removed impregnation and the lacquer coating shall be restored.



Please contact the manufacturer for further information.

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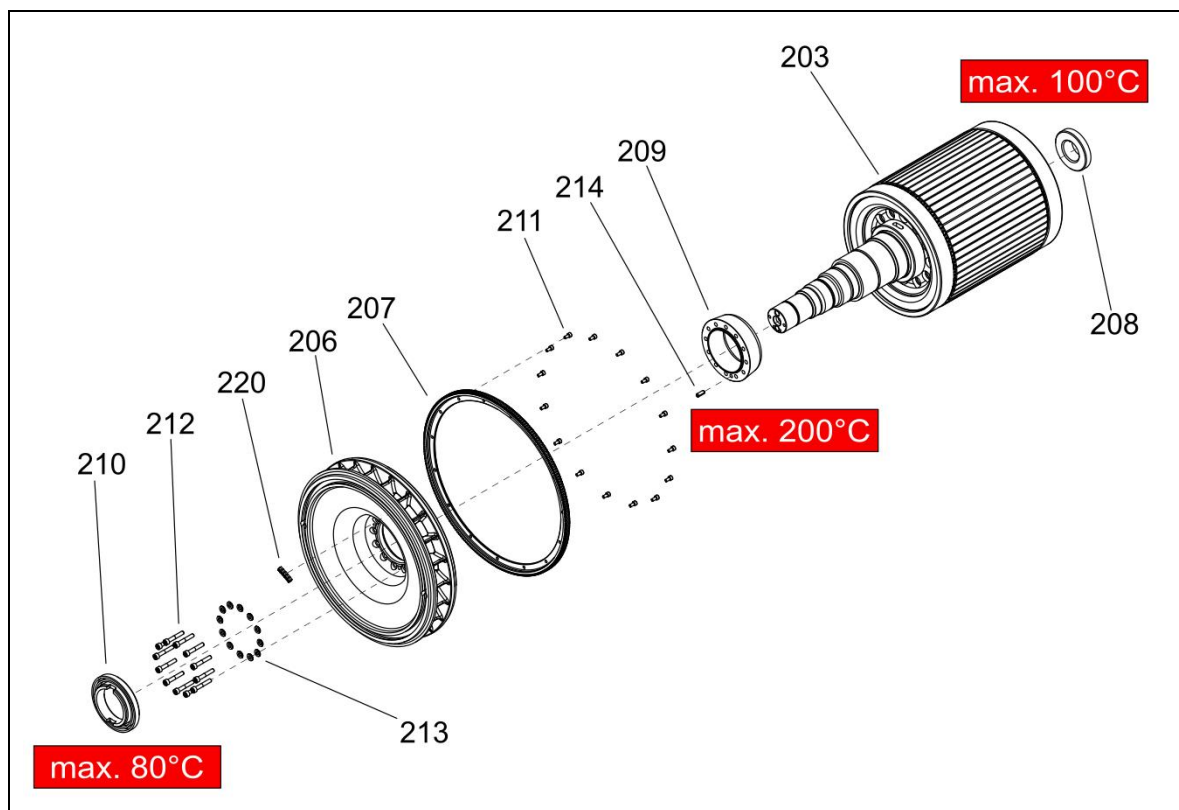


Figure 36: Assembling the rotor

- 1 Heat the labyrinth ring NDE (208) inductively to max. 100°C and place it on the rotor's (203) shaft.
- 2 Let it cool to room temperature.
- 3 Heat the ventilator hub (209) inductively to max. 200°C, and place it on the rotor's (203) shaft.
- 4 Let it cool to room temperature.
- 5 Insert the slotted pin (214) in the designated place on the ventilator hub (209).
- 6 Apply some thread locker to the threads of fifteen hexagon socket head cap screws (211).
- 7 Place the toothed wheel (207) on the ventilator (206).

# TME 49-30-4

- 8 Fasten it using fifteen hexagon socket head cap screws (211).
- 9 Tighten with a **tightening torque of 10 Nm**.
- 10 Apply some thread locker to the threads of twelve hexagon socket screws (212).
- 11 Attach the ventilator (206) and toothed wheel (207) assembled to the ventilator hub (209). Fasten using twelve hexagon socket screws (212) and Nord-Lock washers (213).
- 12 Tighten with a **tightening torque of 25 Nm**.
- 13 Heat the labyrinth ring DE (210) inductively to 80°C and place it on the rotor's (203) shaft.
- 14 Let it cool to room temperature.

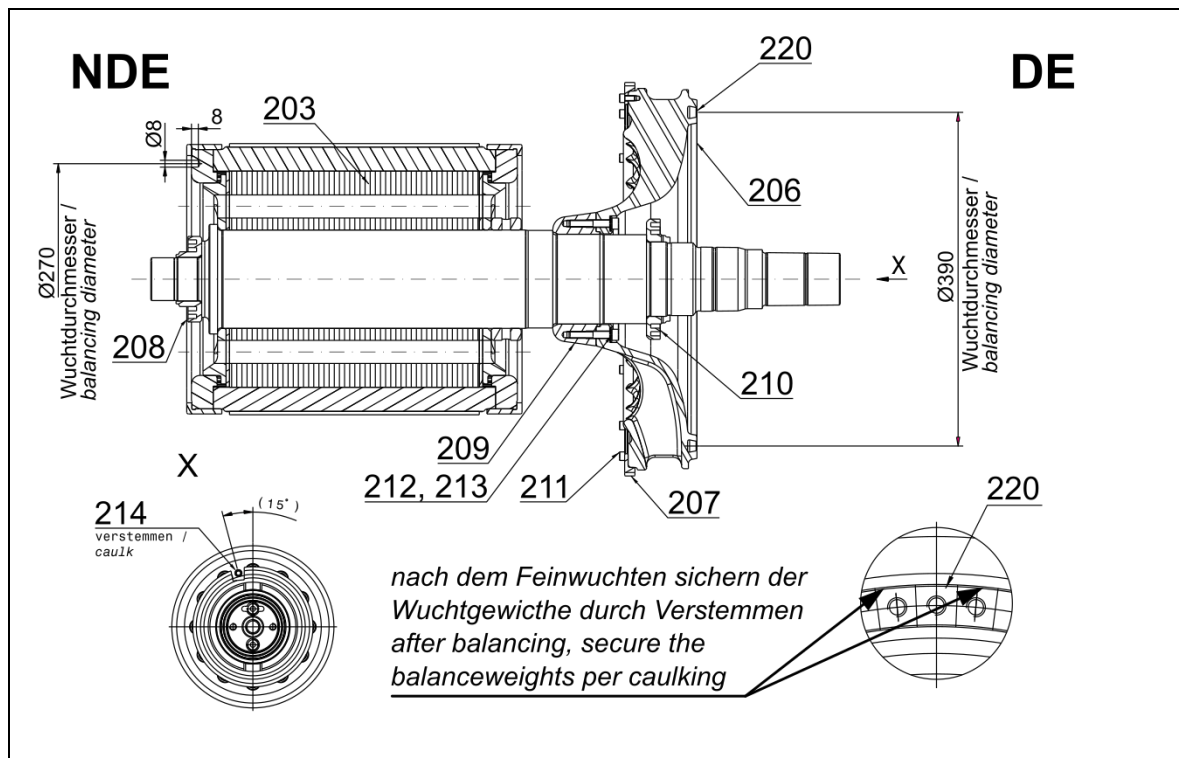


Figure 37: Fine balancing the rotor



## NOTE

The fine balancing of the rotor is done with ventilator hub (209), ventilator (206), toothed wheel (207) and labyrinth rings (208, 210) fitted.

If components are replaced, the fine balancing has to be repeated.

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## Rotor fine balancing

- Rotor mass:..... 237,5 kg
- Max. operating speed ..... 4992 rpm
- Balancing quality..... G = 1mm/s
- Balancing planes..... 2
  - Allowed residual unbalance **DE**..... 1,16 g
  - Allowed residual unbalance **NDE** ..... 1,68 g




---

Correcting the imbalance is done by adding or removing balancing weights (220) on the ventilator (206), and by drilling holes with max.  $\varnothing 8 \times 8\text{mm} = 3,5 \text{ gr}$  at the ring.

---

# TME 49-30-4

## 8.7.5 Assembling the bearing on NDE side

|                    |   |
|--------------------|---|
| Preliminary work:  | Checking and fine balancing of the rotor (see <a href="#">section 8.7.4</a> ) |
| Tools:             | Hoisting device   |
| Consumables:       | Thread locker LOCTITE 243<br>Lubricating grease SHELL GADUS S3 V220C 2        |
| Required manpower: | 1 Mechanic / 1 Assistant  |
| Intervals:         | Every 8 years or 3,000,000 km   |

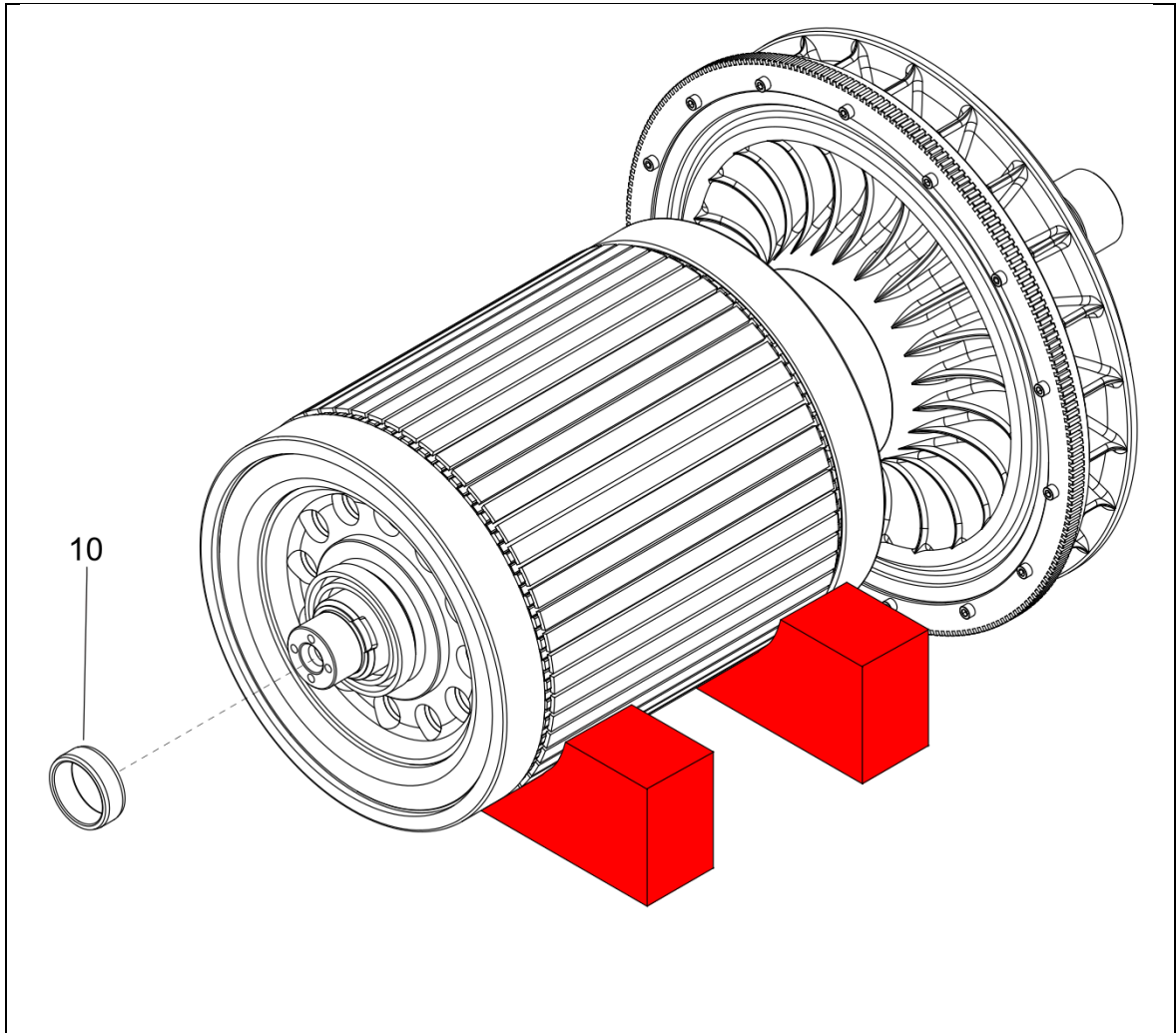


Figure 38: Assembling the bearing inner ring

- 1 Press the cylinder roller bearing (10) inner ring to the rotor's shaft.



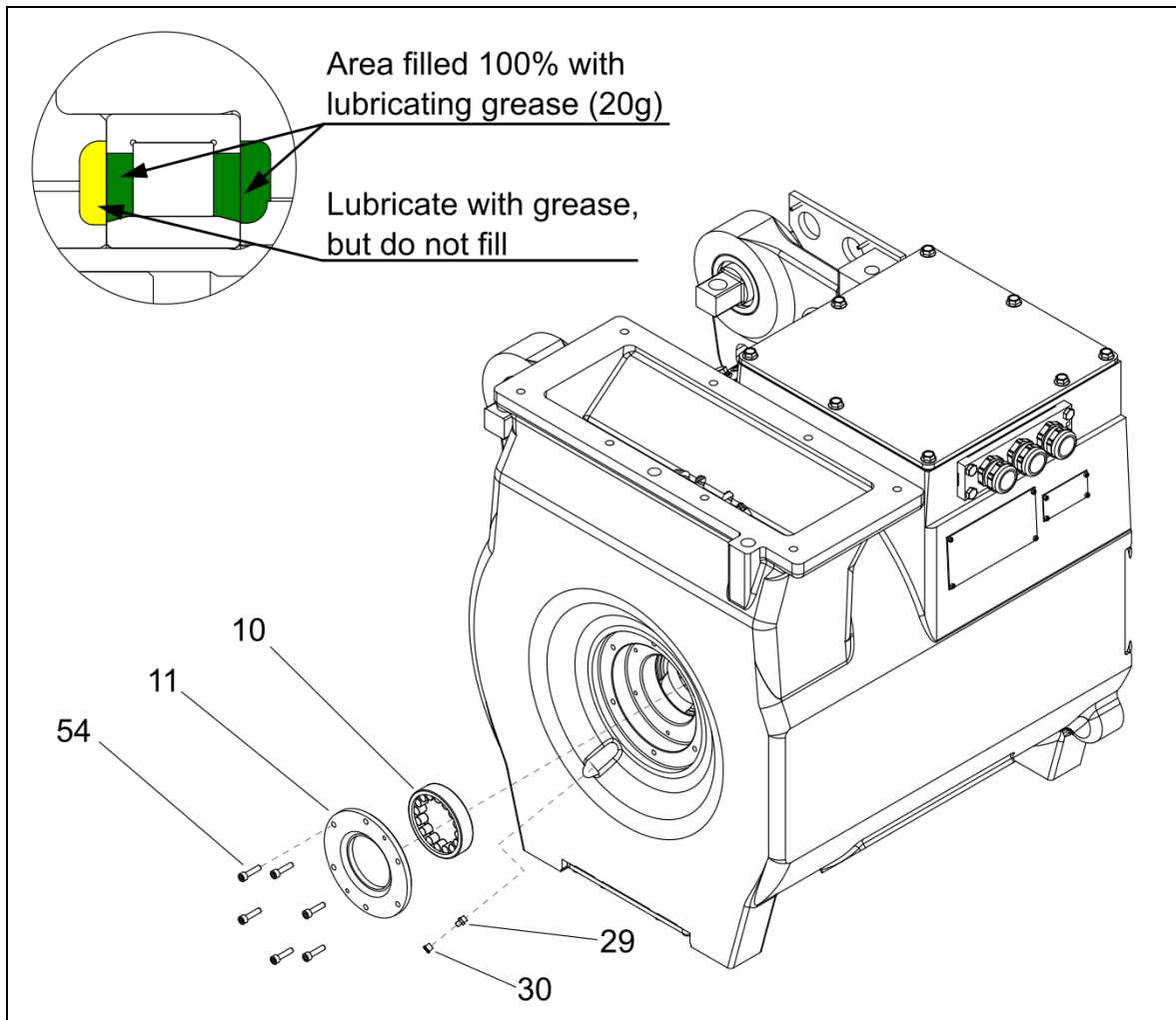


Figure 39: Assembling the NDE side of traction motor

- 2 Press the cylindrical roller bearing (10) outer ring with rolling elements to the stator.
- 3 Attach the lubricating nipple (29).
- 4 Fill the lubricating channel completely with lubricating grease.
- 5 Attach the regreasing nipple cap (30).
- 6 Lubricate the bearing according the Figure 39.
- 7 Lubricate and attach the bearing cover NDE (11).
- 8 Apply some thread locker to threads of six hexagon socket screws (54).
- 9 Fasten the bearing cover NDE (11) with hexagon socket screws (54).
- 10 Tighten with a ***tightening torque of 10 Nm***.
- 11 Flip the stator and secure it, so it lies on the NDE side, to prepare it for vertical assembly.

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## 8.7.6 Assembling the rotor

|                    |   |
|--------------------|---|
| Preliminary work:  | Checking and fine balancing of the rotor (see <a href="#">section 8.7.4</a> )                     |
| Tools:             | Torque wrench<br>Hoisting device (>56kg, >301kg, >900kg)  |
| Consumables:       | Thread locker LOCTITE 243<br>Sealant LOCTITE SI 5910<br>Lubricating grease SHELL GADUS S3 V220C 2 |
| Required manpower: | 1 Mechanic / 1 Assistant  |
| Intervals:         | Every 8 years or 3,000,000 km   |

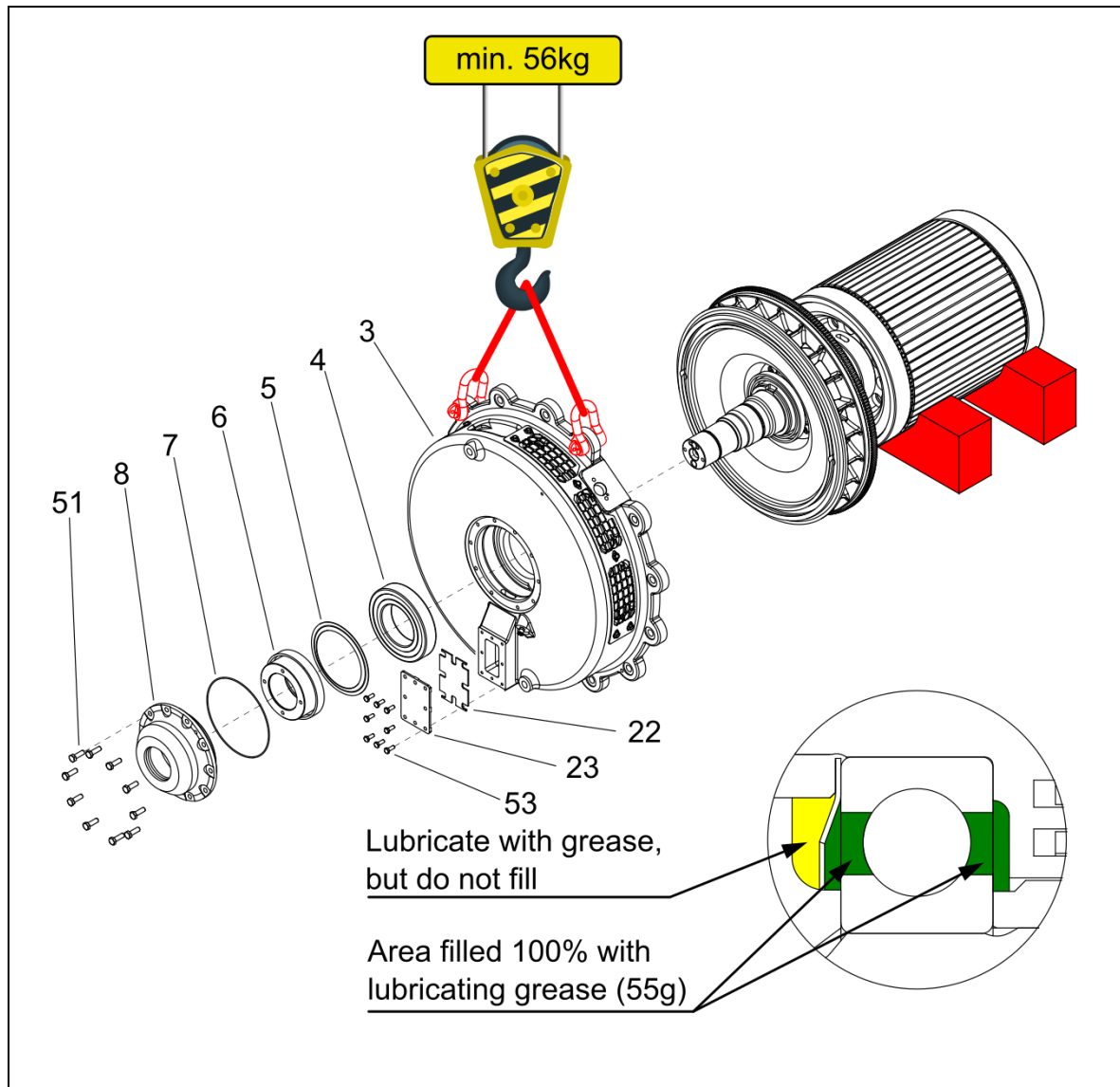


Figure 40: Assembling the bearing shield DE

- 1 Attach the bearing shield DE (3) to the rotor's shaft and secure it in place.
- 2 Lubricate the assembly according to the detail in [Figure 40](#).

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- 3 Press the deep groove ball bearing (4) to the bearing shield (3) and rotor's shaft.
- 4 Lubricate the bearing according the Figure 40.
- 5 Lubricate the grease retaining ring (5) lightly and attach it.
- 6 Lubricate the assembly according the Figure 40.
- 7 Press the labyrinth ring DE (6) to the rotor's shaft.
- 8 Attach the O-ring (7).
- 9 Apply some thread locker to the threads of ten hexagon head screws (51).
- 10 Attach the bearing cover DE (8) and fasten with ten hexagon head screws (51).
- 11 Tighten with a ***tightening torque of 20 Nm***.
- 12 Attach the lifting eye bolt (M16) on the rotor's shaft DE side, to prepare it for lifting and vertical mounting.

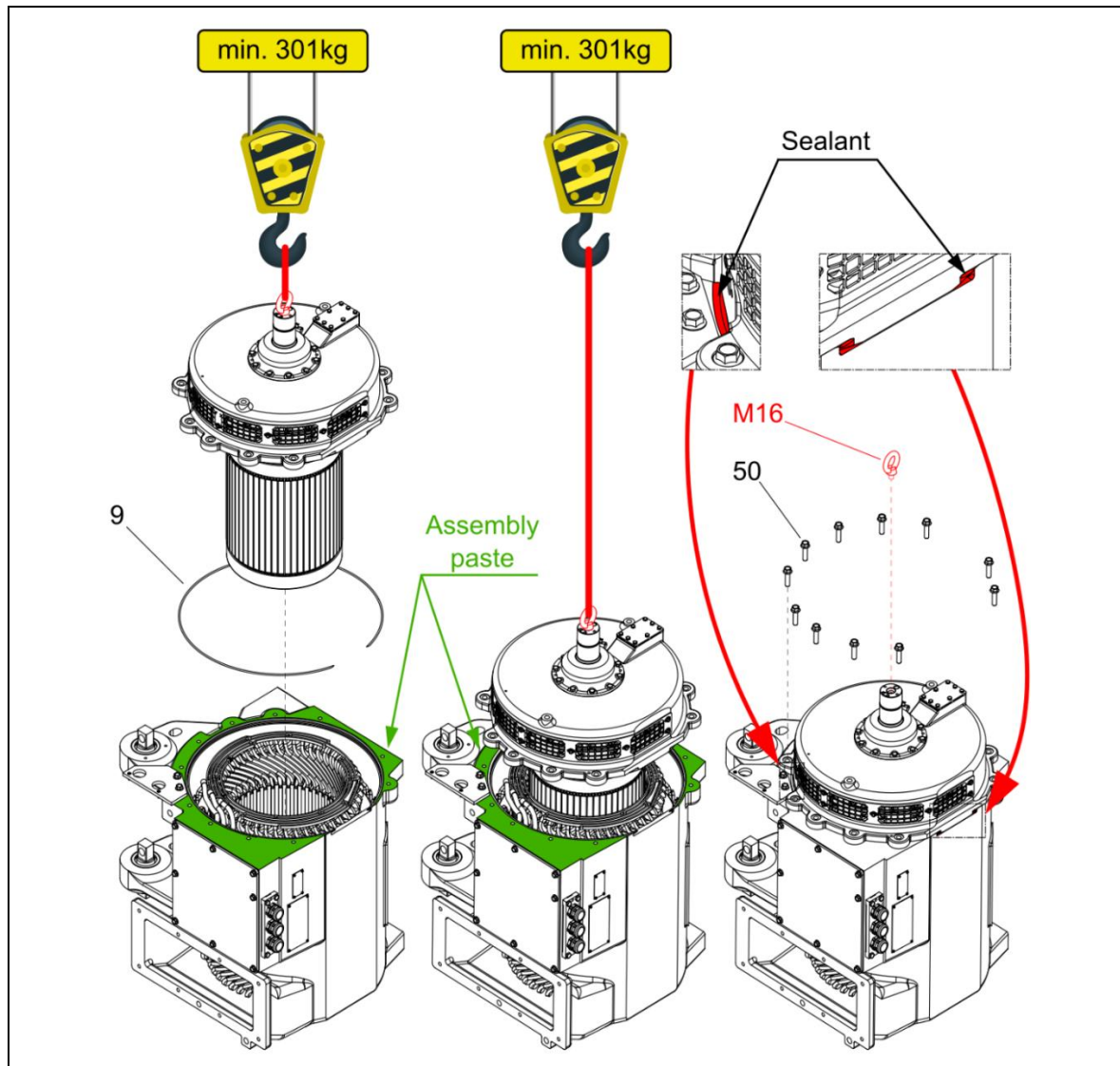


Figure 41: Assembling the rotor

- 13 Apply some assembly paste to the contacting surfaces of rotor and stator.
- 14 Place the O-ring (9).
- 15 Lower the rotor in the stator carefully.
- 16 Apply some thread locker to threads of eleven hexagon head bolts (51).
- 17 Fasten the bearing shield DE using eleven hexagon head bolts (51).
- 18 Tighten with a ***tightening torque of 115 Nm***.
- 19 Remove the lifting eye bolt (M16).
- 20 Cut off the excess O-ring under the terminal box, and under the speed sensor and resistance thermometer plugs.
- 21 Seal the cut O-rings with sealant.
- 22 Flip the assembly to horizontal position.

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## 8.7.7 Assembling the cover NDE

|                    |   |
|--------------------|---|
| Preliminary work:  | Assembling the rotor (see <a href="#">section 8.7.6</a> ) |
| Tools:             | Torque wrench   |
| Consumables:       | Lubricating grease SHELL GADUS S3 V220C 2                 |
| Required manpower: | 1 Mechanic / 1 Assistant                                  |
| Intervals:         | Every 8 years or 3,000,000 km                             |

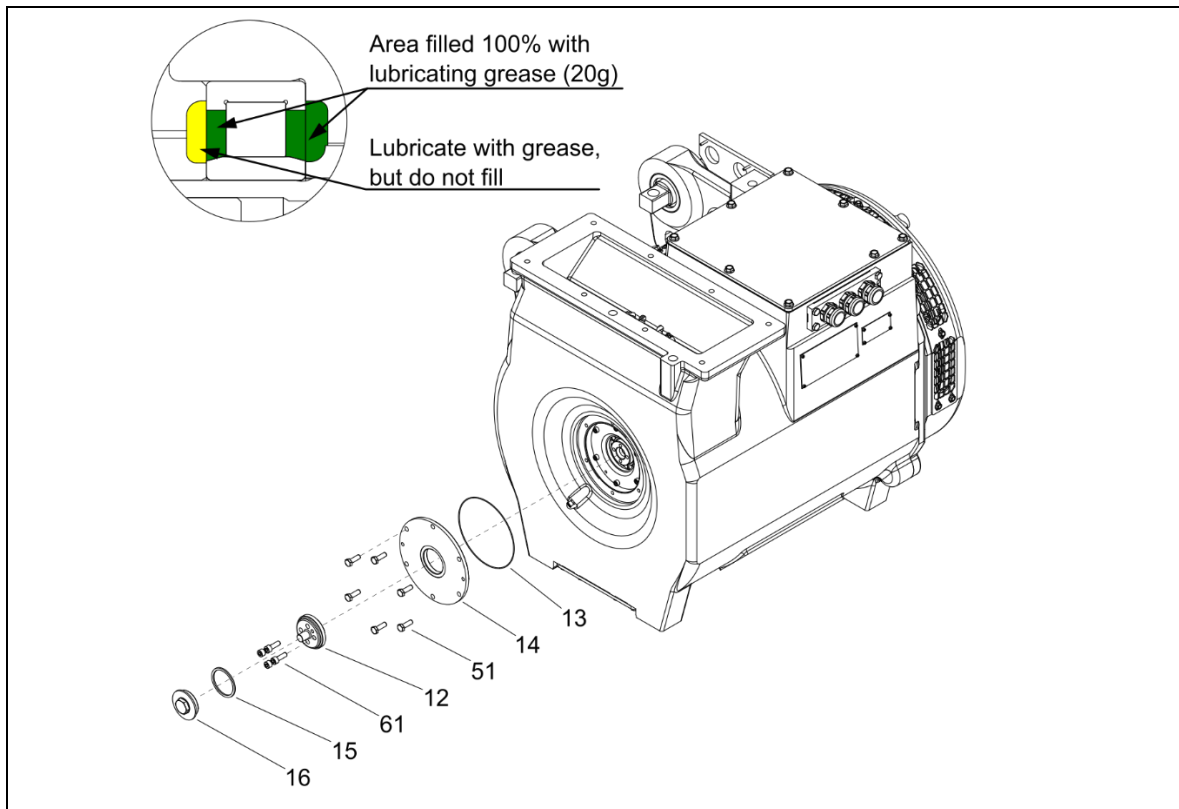


Figure 42: Assembling the cover NDE

- 1 Attach the O-ring (13).
- 2 Apply some thread locker to threads of hexagon head screws (51).
- 3 Attach the bearing cover NDE (14).
- 4 Fasten the cover NDE (14) with six hexagon head screws (51).
- 5 Tighten with a **tightening torque of 20 Nm**.
- 6 Apply some thread locker to threads of four hexagon socket screws (61).
- 7 Lubricate the end plate (12) according the Figure 42.
- 8 Attach the end plate (12) and fasten with four hexagon socket screws (61).
- 9 Tighten with a **tightening torque of 25 Nm**.
- 10 Place the sealing ring (15) and fasten it with reworked locking screw (16).
- 11 Tighten with a **tightening torque of 70 Nm**.

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## 8.7.8 Assembling the traction motor gear coupling half

|                    |   |
|--------------------|---|
| Preliminary work:  | Assembling the rotor (see <a href="#">section 8.7.6</a> )                       |
| Tools:             | Hydraulic pumps for assembly<br>Device for mounting the gear coupling half (T4) |
| Consumables:       | -   |
| Required manpower: | 1 Mechanic / 1 Assistant  |
| Intervals:         | Every 8 years or 3,000,000 km   |

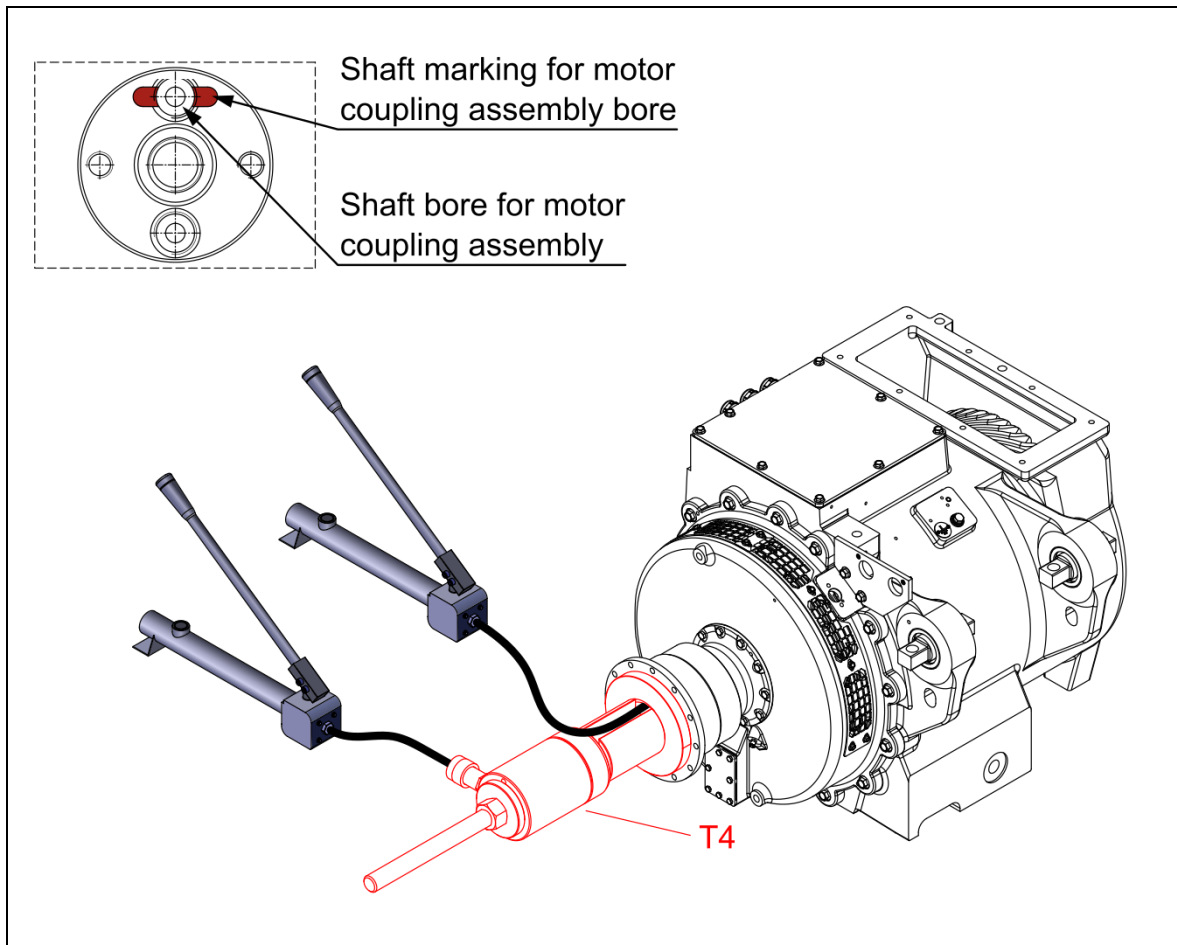


Figure 43: Assembling the traction motor gear coupling half

- 1 Mount the traction motor gear coupling half to the rotor's shaft, as described in the motor coupling documentation (see [section 14.2](#)).
- 2 Pay attention to designations on the rotor's shaft for mounting the gear coupling half – see [Figure 43](#).

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## 8.7.9 Finishing operations and checks

- Preliminary work: Assembling the traction motor gear coupling half (see [section 8.7.8](#))
- Tools: -
- Consumables: -
- Required manpower: 1 Mechanic
- Intervals: Every 8 years or 3,000,000 km

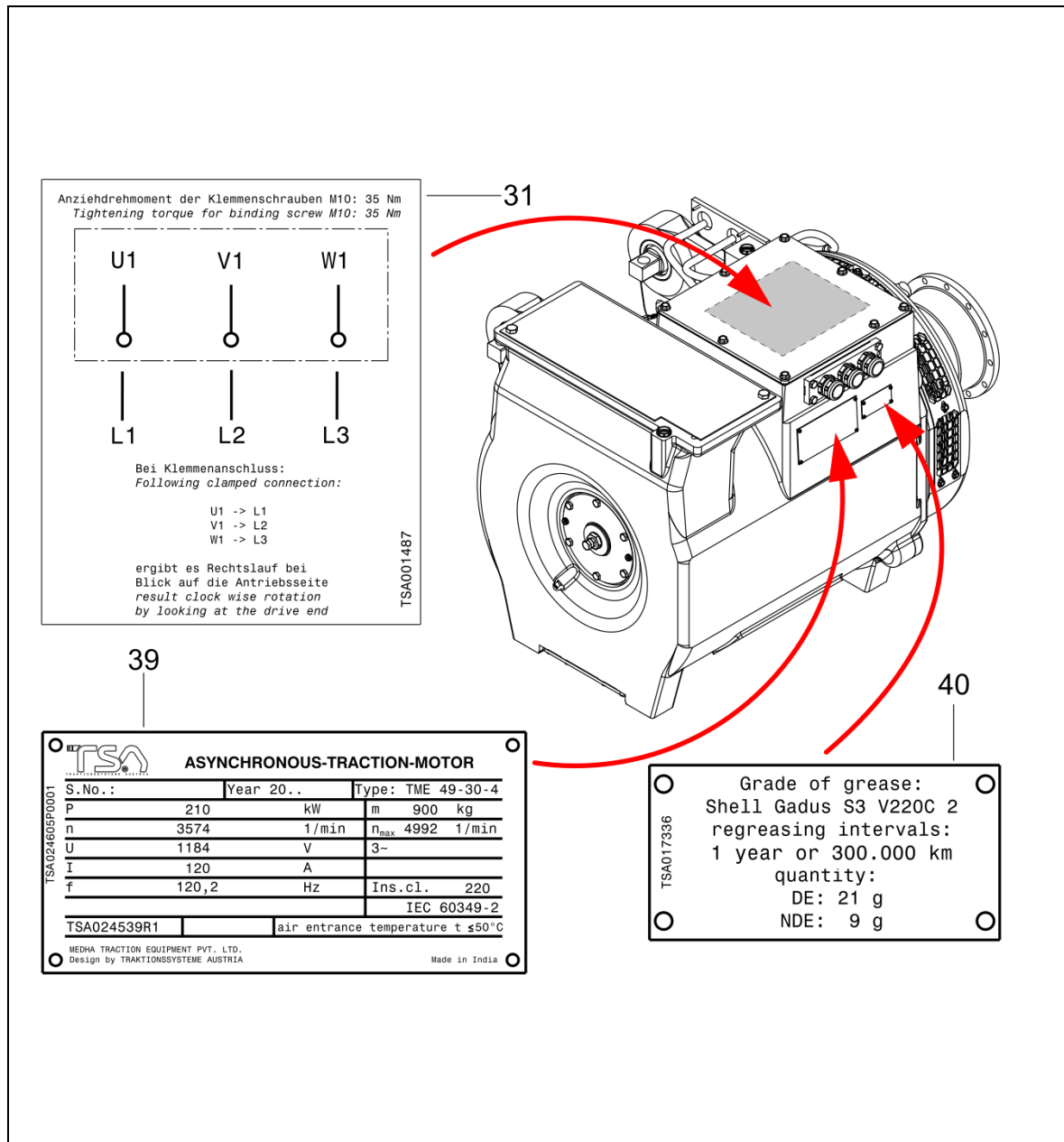


Figure 44: Finishing operations and checks

# TME 49-30-4

- 1 After completion of the maintenance works, the corrosion protection on the traction motor must be checked and, if necessary, repaired (see [section 14.1](#)).
- 2 Earthing connections must be free of paint and impurities.
- 3 Check that the earthing label is present on the traction motor and still legible. Replace if necessary.
- 4 Check whether...
  - ... The rating plate (39), the junction scheme (31) and the lubricating plate (40) on the traction motor are present and still legible. If necessary, replace them.
  - ... Resistance thermometer (105) is mounted – see [section 8.4.8](#).
  - ... Speed sensor (28) is mounted – see [section 8.4.9](#).
- 5 If the traction motor is not reassembled immediately, fit the transport lock - see [section 4.2.1](#).
- 6 In addition, the information for packaging, transport and storage in [chapter 4](#) must be observed.



## 9 DECOMMISSIONING

- Dismantle the traction motor from the bogie (see [vehicle documentation](#)).
- Install the transportation locks and close the air inlet with e.g. a cover (see [section 4.2.3](#)).
- Execute an external cleaning (e.g. with a cloth, brush or a vacuum cleaner).
- Check electrical lines for damages.
- Close openings to the terminal box especially when cable glands are removed.
- Repaint and apply corrosion protection in accordance with regulation TSA000075 (see [section 14.1](#)).
- Transport and store the traction motor according to [section 4](#).



### NOTE

#### RISK OF DAMAGE!

When traction motor is removed from the bogie the air inlet on the stator housing and the openings in the cable glands must be closed. Otherwise, this could lead to motor damage

## 10 RECYCLING AND DISPOSAL

### 10.1 Introduction

The following instructions are only recommendations for environmentally friendly disposal of the traction motor. It falls within the operator's responsibility to observe the national regulations. A few customer-specific elements are, possibly, not included in this manual.

### 10.2 Recycling packaging material

The packaging materials must be disposed of after the traction motor has arrived at the premises of the vehicle manufacturer and the operator respectively.




---

In some countries, seaworthy packaging made of waterproof wood must be recycled in accordance with the regional regulations.

---

- The plastic material which encloses the traction motor can be recycled.
- Anti-corrosive agents which cover the surface of the traction motor can be cleaned with the recommended solvents. Dirty clothes should be disposed of in accordance with the regional regulations.

### 10.3 Dismantling the traction motor

The demounting is carried out in accordance with this manual.

### 10.4 Separation of individual materials

The rotor and stator are the main components that also contain electrical insulation.

The stator and rotor contain a not inconsiderable amount of copper, which can be separated out in a suitable heat treatment process.

The bearing shields are made of spheroidal cast iron, the terminal box cover and the lead-through to the terminal box are made of aluminium and can be disposed of with the old iron (scrap).

### 10.5 Hazardous materials

Paint, lacquer, cleaning agents and solvents as well as lubricants are harmful to the environment and should be collected and disposed of in accordance with the regional regulations. Pay attention to the material safety data sheets.

## 11 TROUBLESHOOTING

| Abnormality  | Possible causes  | Measures  |
|--|--|---|
| Engine vibrates, unusual engine noises   | Engine suspension (rubber elements) defective            | Carry out a visual inspection of the motor suspension. If necessary, replace the rubber elements.   |
|  | Loose screws   | A screw check is necessary. It must be checked if the screws have been tightened with the correct torque.<br><br>Replace broken or broken screws. |
|  | Imbalance of Rotor                                       | The rotor must be dismantled and the balancing must be checked.<br><br>If necessary, the rotor must be rebalanced.                                |
|  | Damage of bearing  | Replace bearing   |
|  | Damage of coupling                                       | Replace coupling  |
|  | Ventilator damaged or blocked                            | Check ventilator  |
| Temperature in the stator is too high.<br><br>(warning limit has been reached) | Cooling airline (supply or discharge) damaged or blocked | Check cooling airline (supply or discharge).  |
|  | Ventilator damaged or blocked                            | Check ventilator  |
|  | Protective grid on the air outlet dirty or clogged       | Clean the protective grid on the air outlet   |
|  | Cooling air inlet temperature too high                   | Observe the allowed inlet temperature.  |
|  | Motor overload   | Observe technical data  |

| Abnormality         | Possible causes  | Measures  |
|---------------------|--|---|
| Smoke development   | Bearing damage, damaged winding, temperature in stator is too high | Check the engine according to the general inspection.               |
| Reduced drive power | Defective supply cable   | Visual inspection of the supply cables. If necessary, replace them. |
|                     | Defective connection of the supply cable                           | Visual inspection of the terminal box.                              |
|                     | Defect in the power supply of the inverter                         | Check the functions of the inverter.                                |
|                     | Defective coupling   | Visual inspection of the coupling.                                  |

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# TME 49-30-4

## 12 ANNEXE

### 12.1 Parts list

#### 12.1.1 Machine ready for transport

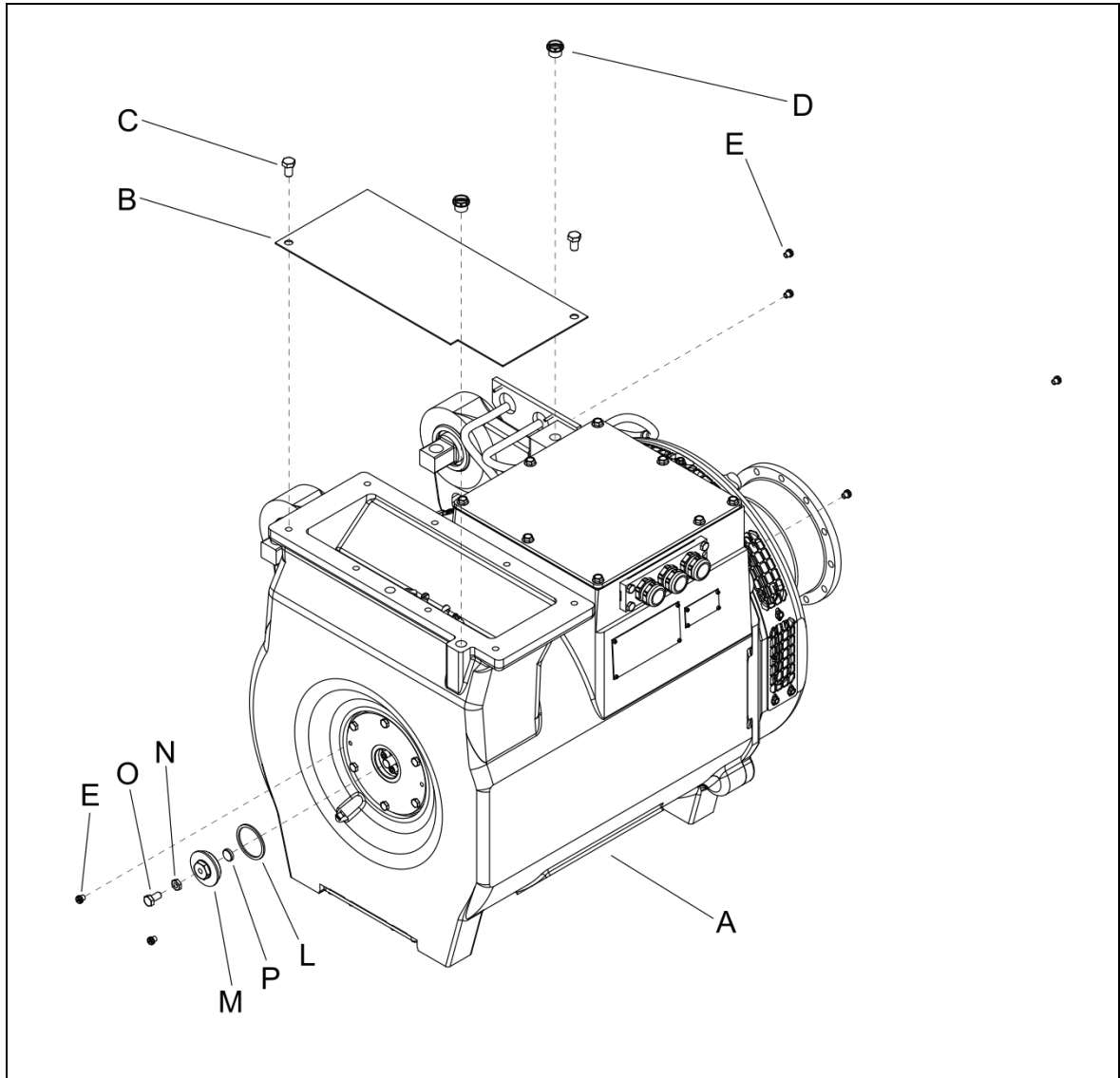


Figure 45: Parts list - Traction motor ready for transport

| Pos. | Designation                             | Part number           | Quantity |
|------|---|-----------------------|----------|
| -    | <i>Machine ready for shipment</i>       | <i>TSA024591R0001</i> | <i>1</i> |
| A    | Machine assembled                       | TSA024539R0001        | 1        |
| B    | Cover plate                             | TSA015405P0037        | 1        |
| C    | Hexagon head screw DIN933<br>M12x20     | TSA700006P0001        | 2        |
| D    | Screw plug GPN700 M20 PHT yellow        | TSA700008P0003        | 2        |
| E    | Screw plug GPN700 M8 PHT yellow         | TSA700008P0006        | 8        |
| L    | Sealing ring DIN7603 A 52x60x2,5-<br>Cu | TSA700105P0016        | 1        |
| M    | Locking screw M52x1,5                   | TSA017496P0001        | 1        |
| N    | Hexagon nut DIN439-B M10                | TSA700051P0001        | 1        |
| O    | Hexagon head screw DIN933<br>M10x20     | TSA700000P0036        | 1        |
| P    | Plastic insert                          | TSA017500P0001        | 1        |

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## 12.1.2 Machine assembled

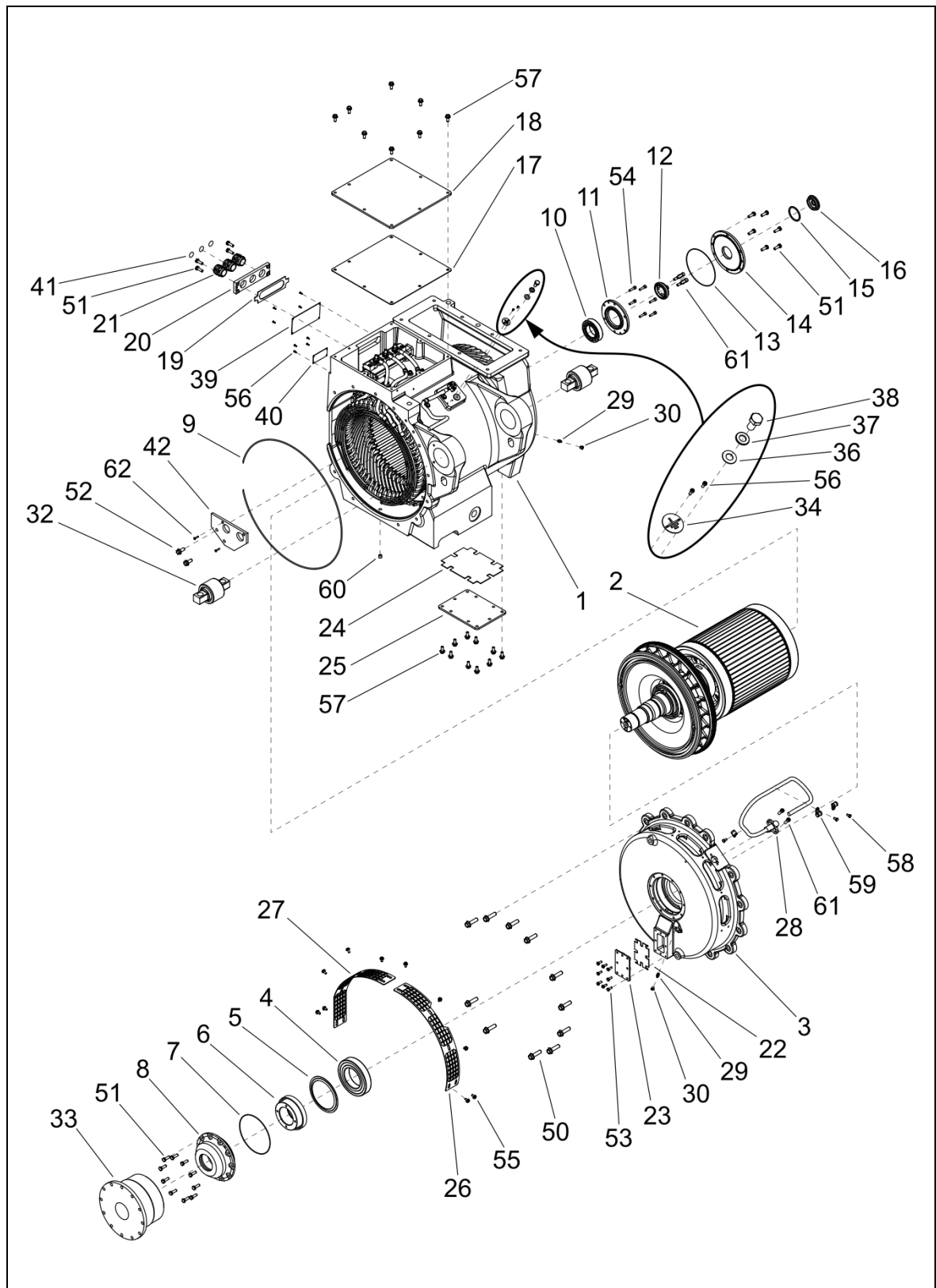


Figure 46: Parts list - machine assembled



| Pos. | Designation  | Part number           | Quantity |
|------|--|-----------------------|----------|
| -    | <i>Machine assembled</i>                           | <i>TSA024539R0001</i> | <i>1</i> |
| 1    | Stator complete                                    | TSA024765R0001        | 1        |
| 2    | Rotor ready for mounting                           | TSA024794R0004        | 1        |
| 3    | Bearing shield DE                                  | TSA024633P0002        | 1        |
| 4    | Deep groove ball bearing 6217                      | TSA700027P0022        | 1        |
| 5    | Grease retaining disk for groove ball bearing 6217 | TSA014508P0001        | 1        |
| 6    | Labyrinth DE outside                               | TSA017334P0001        | 1        |
| 7    | O-ring 160x2 NBR 70                                | TSA700013P0100        | 1        |
| 8    | Bearing cover DE                                   | TSA017335P0001        | 1        |
| 9    | O-ring 530x4 NBR 70                                | TSA700013P0102        | 1        |
| 10   | Cylinder roller bearing NU210                      | TSA008927P0002        | 1        |
| 11   | Bearing cover NDE outside                          | TSA013384P0001        | 1        |
| 12   | End plate  | TSA013908P0001        | 1        |
| 13   | O-ring 145x1,5 NBR 70                              | TSA700013P0144        | 1        |
| 14   | Cover NDE  | TSA012882P0002        | 1        |
| 15   | Sealing ring DIN7603 A 52x60x2,5-Cu                | TSA700105P0016        | 1        |
| 16   | Locking screw DIN7604 M52x1,5                      | TSA009525P0001        | 1        |
| 17   | Terminal box cover sealing                         | TSA024847P0001        | 1        |
| 18   | Terminal box cover                                 | TSA024846P0001        | 1        |
| 19   | Sealing for bushing plate                          | TSA010946P0001        | 1        |
| 20   | Cable bushing plate                                | TSA019045P0001        | 1        |
| 21   | Cable gland M32x1,5                                | TSA700110P0022        | 3        |
| 22   | Used grease cover sealing                          | TSA017339P0001        | 1        |
| 23   | Used grease cover                                  | TSA017338P0001        | 1        |
| 24   | Grease cover sealing                               | TSA024851P0001        | 1        |
| 25   | Cover  | TSA024850P0001        | 1        |
| 26   | Protection grid                                    | TSA024818P0001        | 1        |
| 27   | Protection grid                                    | TSA024852P0001        | 1        |
| 28   | Speed sensor                                       | TSA013431P0001        | 1        |

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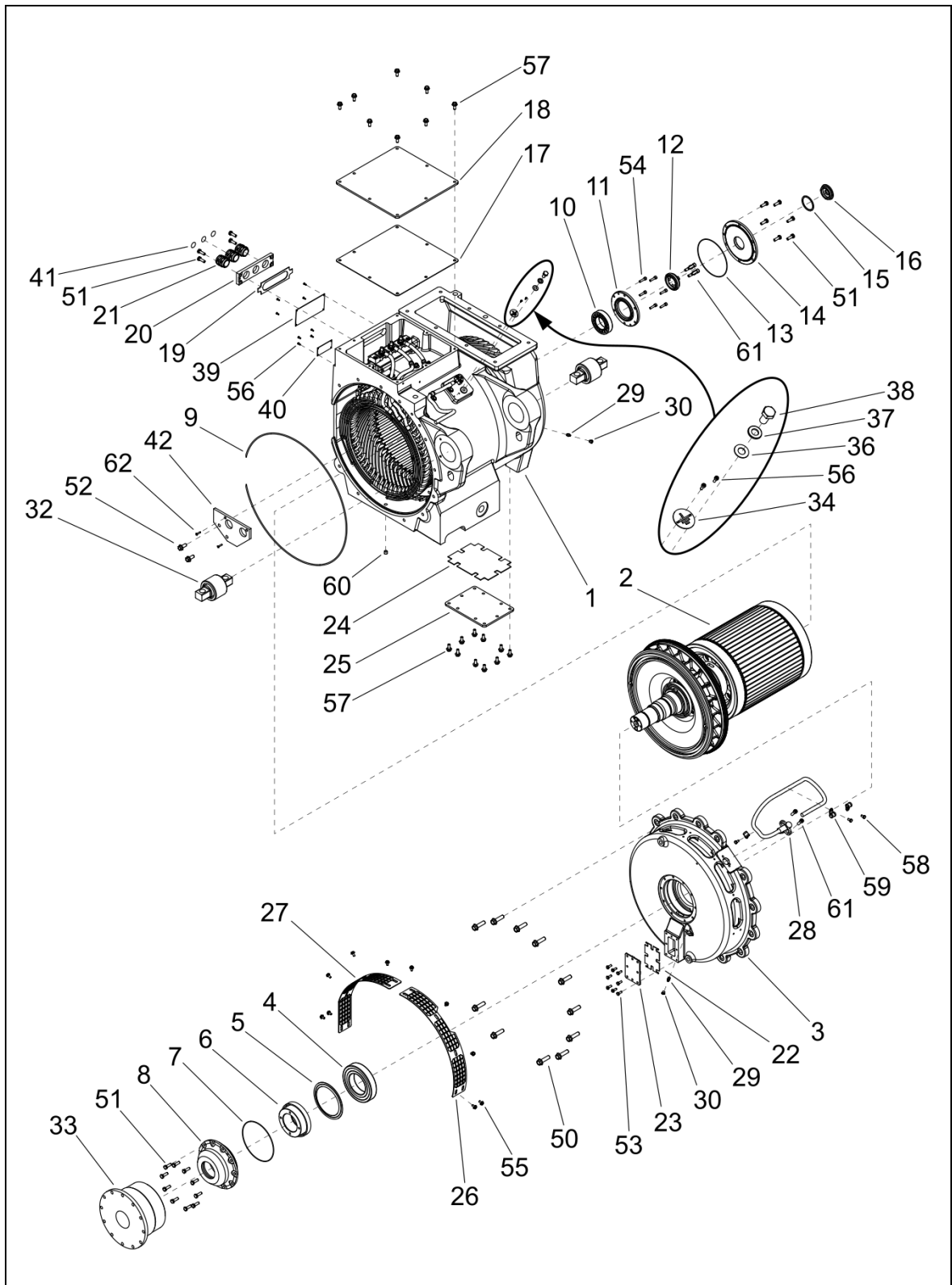


Figure 47: Parts list - machine assembled

| Pos. | Designation   | Part number           | Quantity |
|------|---|-----------------------|----------|
| -    | <i>Machine assembled</i>                            | <i>TSA024539R0001</i> | <i>1</i> |
| 29   | Lubricating nipple DIN71412-A M8x1                  | TSA700010P0003        | 2        |
| 30   | Regreasing nipple cap GPN985, form B, PHT yellow    | TSA700085P0001        | 2        |
| 32   | Motor suspension top                                | TSA017721P0001        | 2        |
| 33   | Gear coupling half motor                            | TSA024594R0002        | 1        |
| 34   | Ground label DIN40011 MS 31,5mm                     | /TSA44P30             | 1        |
| 36   | Washer DIN125 10,4                                  | TSA700002P0007        | 1        |
| 37   | Wave spring washer DIN137 B10                       | TSA700007P0002        | 1        |
| 38   | Hexagon head screw DIN933 M10x20                    | TSA70006P0002         | 1        |
| 39   | Rating plate  | TSA024605P0001        | 1        |
| 40   | Regreasing plate DE/NDE                             | TSA017336P0001        | 1        |
| 41   | Blind disk for cable gland M32x1,5                  | TSA700110P0008        | 3        |
| 42   | Plate   | TSA024849P0001        | 1        |
| 50   | Hexagon head bolt M12x45                            | TSA700005P0051        | 11       |
| 51   | Hexagon head screw ISO4017 M8x25                    | TSA700000P0071        | 20       |
| 52   | Hexagon head bolt M10x25                            | TSA700005P0019        | 2        |
| 53   | Hexagon head screw ISO4017 M6x16                    | TSA700000P0091        | 8        |
| 54   | Hexagon socket screw ISO4762 M6x25                  | TSA700004P0047        | 6        |
| 55   | Hexagon ribbed flange bolt M6x12                    | TSA700005P0021        | 10       |
| 56   | Hexagon socket screw M3x8                           | TSA700023P0001        | 10       |
| 57   | Hexagon head cap ribbed flange bolt M8x20           | TSA700005P0004        | 18       |
| 58   | Hexagon head cap screw ISO4017 M6x12                | TSA700000P0007        | 5        |
| 59   | Pipe-clamp DIN3016 RSGU 1.13/15                     | TSA700070P0007        | 5        |
| 61   | Hexagon socket screw DIN EN ISO 4762 M8x25          | TSA700004P0009        | 6        |
| 62   | Countersunk screw with hexagon socket DIN7991 M4x20 | TSA700033P0030        | 2        |

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## 12.1.3 Stator complete

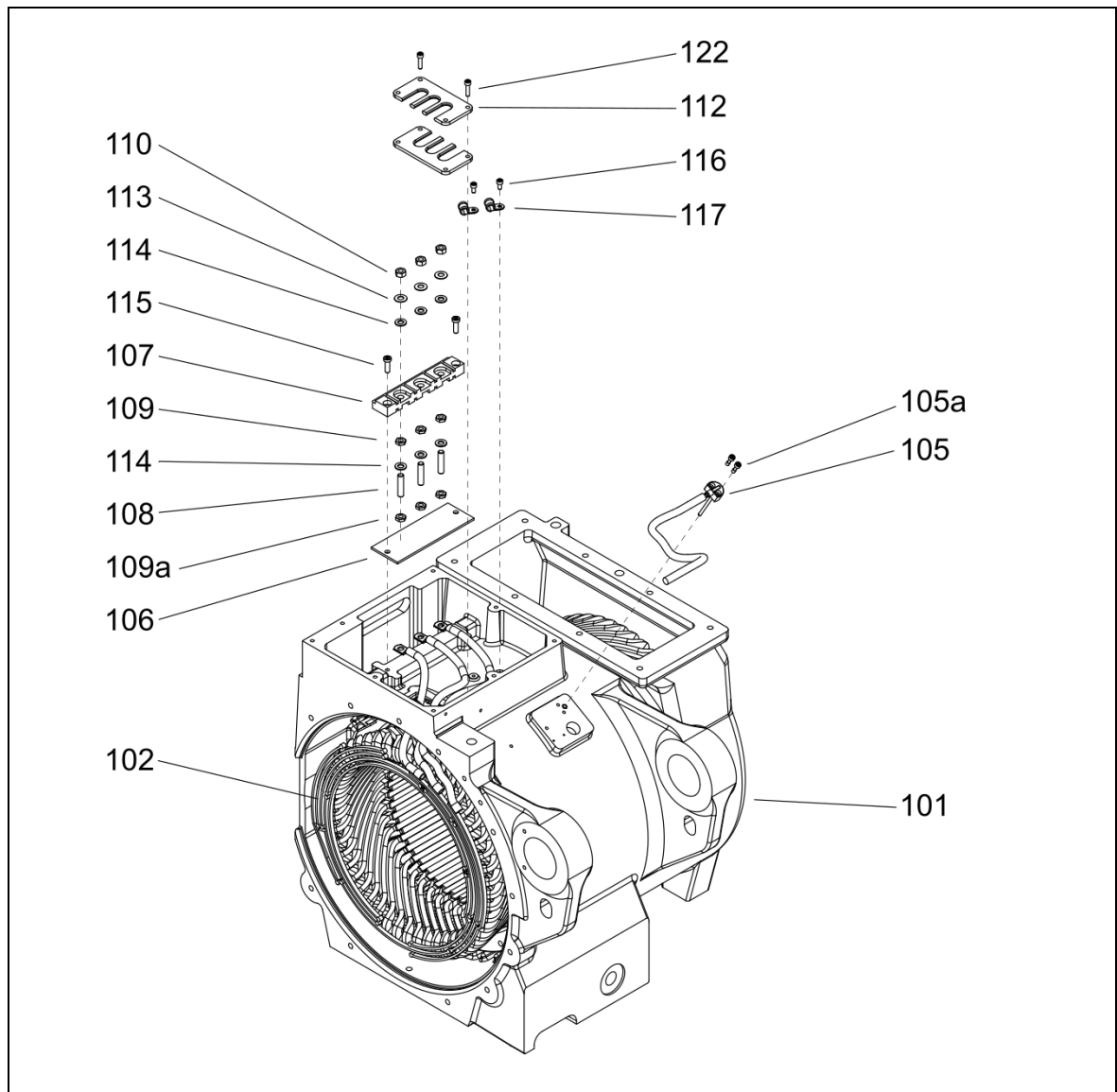


Figure 48: Parts list - Stator complete

| Pos.     | Designation  | Part number                  | Quantity |
|----------|--|------------------------------|----------|
| <b>1</b> | <b><i>Stator complete</i></b>                          | <b><i>TSA024765R0001</i></b> | <b>1</b> |
| 101      | Housing machined                                       | TSA024632P0002               | 1        |
| 102      | Stator with winding                                    | TSA024540R0001               | 1        |
| 105      | Resistance thermometer                                 | TSA024848P0001               | 1        |
| 106      | Spacer   | TSA011422P0001               | 1        |
| 107      | Junction plate   | TSA011421P0001               | 1        |
| 108      | Threaded pin DIN913 M10x45                             | TSA700063P0010               | 3        |
| 109      | Hexagon nut DIN439-B M10                               | TSA700051P0001               | 6        |
| 110      | Hexagon nut DIN934 M10                                 | TSA700074P0024               | 3        |
| 112      | Cover for junctions                                    | TSA024815P0001               | 2        |
| 113      | Spring washer Schnorr HS10                             | TSA700041P0007               | 3        |
| 114      | Washer DIN125 10,5                                     | TSA700002P0002               | 6        |
| 115      | Hexagon socket screw DIN7984<br>M8x25                  | TSA700025P0013               | 2        |
| 116      | Hexagon socket head cap screw DIN<br>EN ISO 4762 M6x12 | TSA700004P0041               | 2        |
| 117      | Pipe-clamp DIN3016 RSGU 1.13/15                        | TSA700070P0007               | 2        |
| 122      | Hexagon socket screw ISO 4762<br>M6x25                 | TSA700004P0047               | 2        |

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## 12.1.4 Rotor ready for assembly

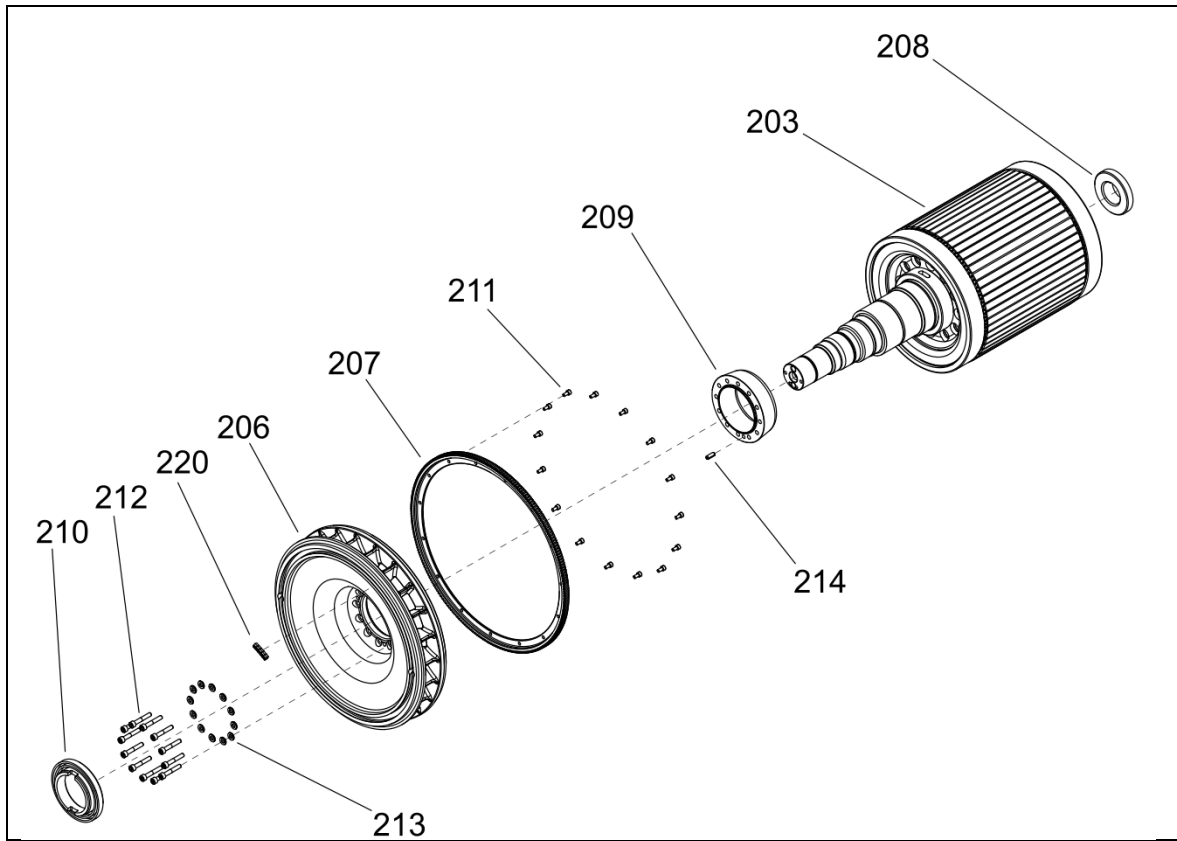


Figure 49: Parts list - Rotor ready for assembly

| Pos.     | Designation   | Part number                  | Quantity        |
|----------|---|------------------------------|-----------------|
| <b>2</b> | <b><i>Rotor ready for mounting</i></b>              | <b><i>TSA024794R0004</i></b> | <b><i>1</i></b> |
| 203      | Rotor impregnation and colouring                    | TSA024794R0002               | 1               |
| 206      | Ventilator  | TSA017328P0002               | 1               |
| 207      | Tooth wheel   | TSA017356P0001               | 1               |
| 208      | Labyrinth ring NDE inside                           | TSA011036P0001               | 1               |
| 209      | Ventilator hub                                      | TSA017327P0001               | 1               |
| 210      | Labyrinth ring DE inside                            | TSA012883P0001               | 1               |
| 211      | Hexagon socket head cap screw DIN EN ISO 4762 M6x12 | TSA700004P0041               | 15              |
| 212      | Hexagon socket screw ISO 4762 M8x50                 | TSA700004P0088               | 12              |
| 213      | Nord-Lock washer NL 8xp                             | TSA700064P0002               | 12              |
| 214      | Slotted spring pin DIN1481 8x22                     | TSA700011P0010               | 1               |

# TME 49-30-4

## 12.2 Spare parts

### 12.2.1 Order process

The following minimum data are necessary in order to ensure an accurate spare part handling.

- **Motor data**

Type:..... TME 49-30-4

Machine assembled:..... TSA024539R0001

Serial-No.:..... AW \_\_\_\_\_ (8-digit)

- **Spare part data: (using the example of a cylinder roller bearing):**

Stock no.: ..... TSA008927P0002

Designation:..... Cylindrical roller bearing NU210

Quantity ..... 1

- **Ordering address**

**TRAKTIONSSYSTEME AUSTRIA GmbH / Service**

Brown-Boveri-Straße 1

A-2351 Wiener Neudorf

Tel.: +43 (0) 2236 8118-111

E-Mail: [service@tsa.at](mailto:service@tsa.at)

Internet: [www.tsa.at](http://www.tsa.at)

# TME 49-30-4

## 12.2.2 Spare parts list

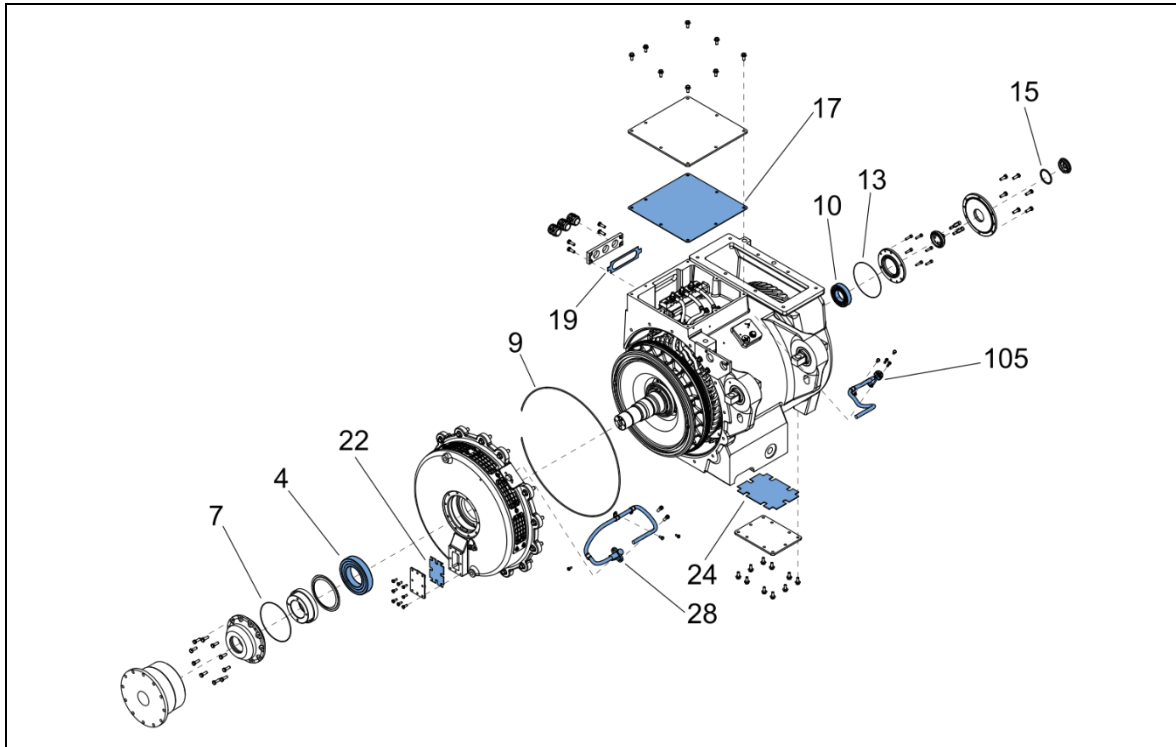


Figure 50: Spare parts

Manufacturer's recommended spare parts list for the traction motor **TMF 49-30-4**

✱ Spare parts stock required    ○ Spare parts stock recommended

| Item No. | ✱/○ | Designation                             | Part number    | Quantity |
|----------|-----|---|----------------|----------|
| 4        | ✱   | Deep groove ball bearing 6217           | TSA700027P0022 | 1        |
| 10       | ✱   | Cylinder roller bearing NU120           | TSA008927P0002 | 1        |
| 15       | ✱   | Sealing ring DIN7603-A<br>52x60x2,5- Cu | TSA700105P0016 | 1        |
| 7        | ○   | O-ring 160x2 NBR 70                     | TSA700013P0100 | 1        |
| 9        | ○   | O-ring 530x4 NBR 70                     | TSA700013P0102 | 1        |
| 13       | ○   | O-ring 145x1,5 NBR 70                   | TSA700013P0144 | 1        |
| 17       | ○   | Terminal box cover sealing              | TSA024847P0001 | 1        |
| 19       | ○   | Sealing for bushing plate               | TSA010946P0001 | 1        |
| 22       | ○   | Used grease cover sealing               | TSA017339P0001 | 1        |
| 24       | ○   | Grease cover sealing                    | TSA024851P0001 | 1        |
| 28       | ○   | Speed sensor                            | TSA013431P0001 | 1        |
| 105      | ○   | Resistance thermometer                  | TSA024848P0001 | 1        |



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## 12.3 Production equipment and consumables

### 12.3.1 Lubricating grease, locking agents and sealants

| Designation           | Specification          | Quantity |
|-----------------------|------------------------|----------|
| Roller bearing grease | SHELL GADUS S3 V220C 2 | AR       |
| Corrosion protection  | ---                    | AR       |
| Assembly paste        | MOLYKOTE P40           | AR       |
| Silicone              | LOCTITE SI 5990        | AR       |
|                       | LOCTITE SI 5910        | AR       |
| Thread locker         | LOCTITE 243            | AR       |

AR ... as required

### 12.3.2 Surface treatment

| Designation                        | Specification   |
|------------------------------------|---|
| Topcoat                            | The following colours are used:<br>Motor: RAL 9005 (jet black)<br>Transport lock: RAL 3001 (signal red) |
| Painting specification             | <b>TSA000075 - V56</b><br>(see <a href="#">section 14.1</a> )   |
| Maintenance and repair of coatings | <b>TSA900099</b> (see <a href="#">section 14.1</a> )  |

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## 12.4 Devices, tools, measuring and auxiliary equipment

| Pos. | Designation  | Part number                              | Quantity |
|------|--|--|----------|
| ---  | Lifting gears with a sufficient lifting capacity                         | min. 60 kg<br>min. 310 kg<br>min. 900 kg | 3        |
| T2   | Wood beams for rotor support   | -  | 2        |
| T3   | Hydraulic device for labyrinth ring disassembly                          | -  | 1        |
| T4   | Device for mounting the gear coupling half                               | -  | 1        |
| ---  | Hydraulic pump   | -  | 2        |
| ---  | Torque wrench  | 5 – 115Nm                                | 1        |
| ---  | Induction heater with demagnetisation and temperature measuring probe    | -  | 1        |
| ---  | Oven   | -  | -        |
| ---  | Resistance measuring devices:<br>- Milli – ohmmeter<br>- Mega - ohmmeter | -  | 1        |
| ---  | Two-arm puller   | -  | 1        |
| ---  | Lever grease gun   | -  | 1        |
| ---  | Compressed air   | dry and de-oiled                         | 1        |
| ---  | Lifting eye bolts  | M16                                      | 3        |
| ---  | Ejecting screws  | M8                                       | 2        |
| ---  | Flashlight   | -  | 1        |
| ---  | Vacuum cleaner   | -  | 1        |
| ---  | Balancing machine  | -  | 1        |
| ---  | Calliper / depth gauge   | -  | 1        |
| ---  | Round brush  | -  | -        |
| ---  | Cleaning cloth   | -  | -        |

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## 12.5 Tightening torques

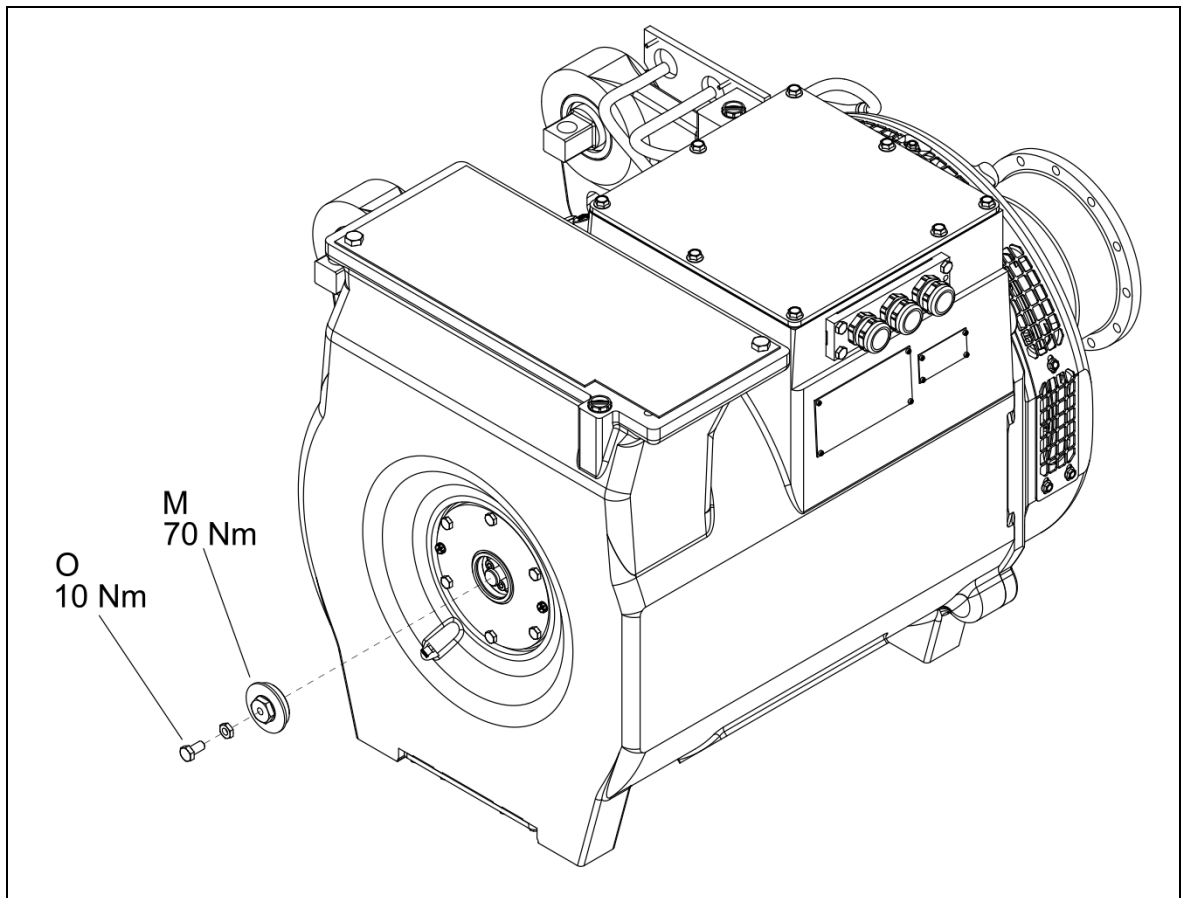


Figure 51: Tightening torques for machine ready for transport

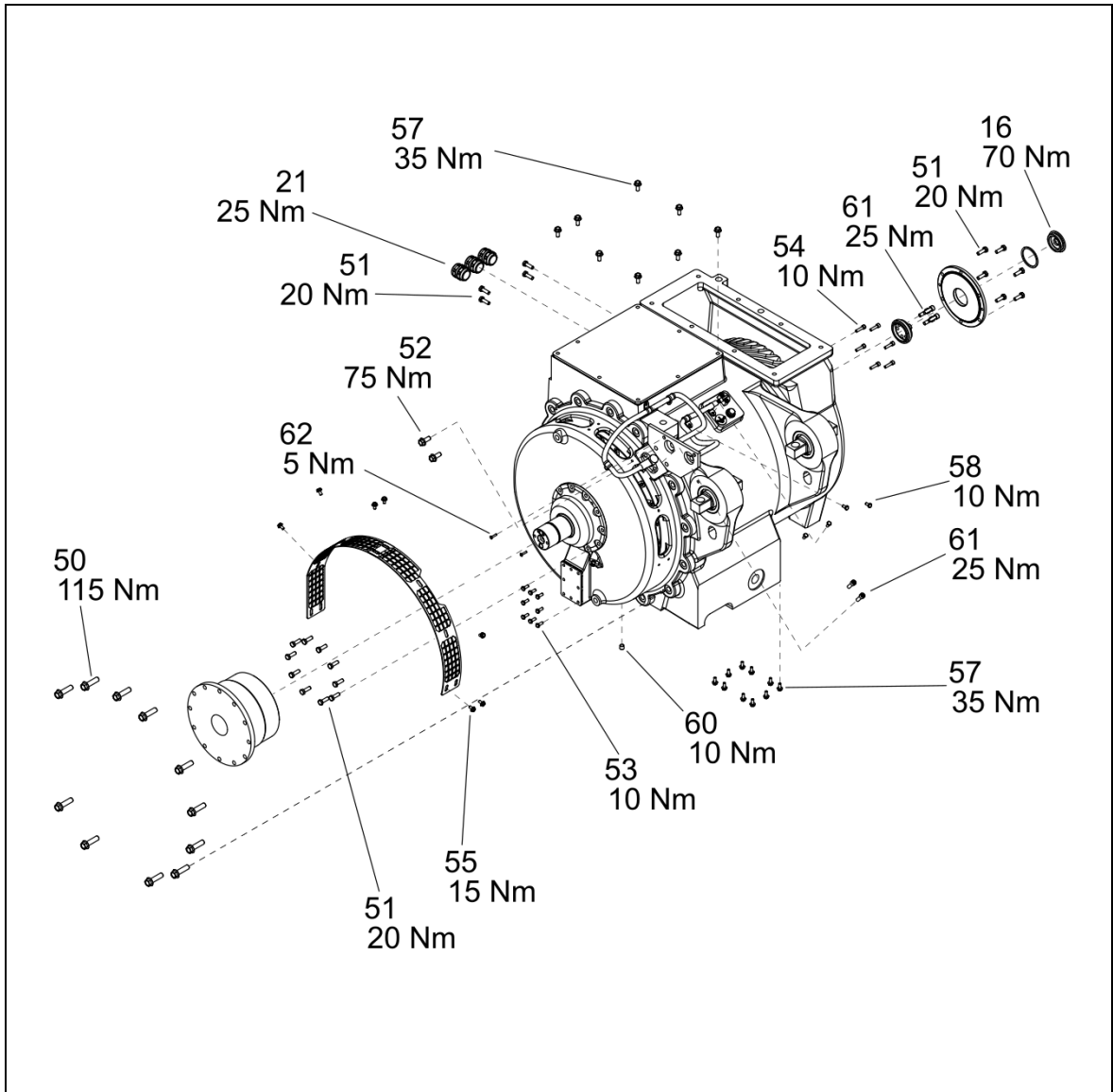


Figure 52: Tightening torques for machine assembled

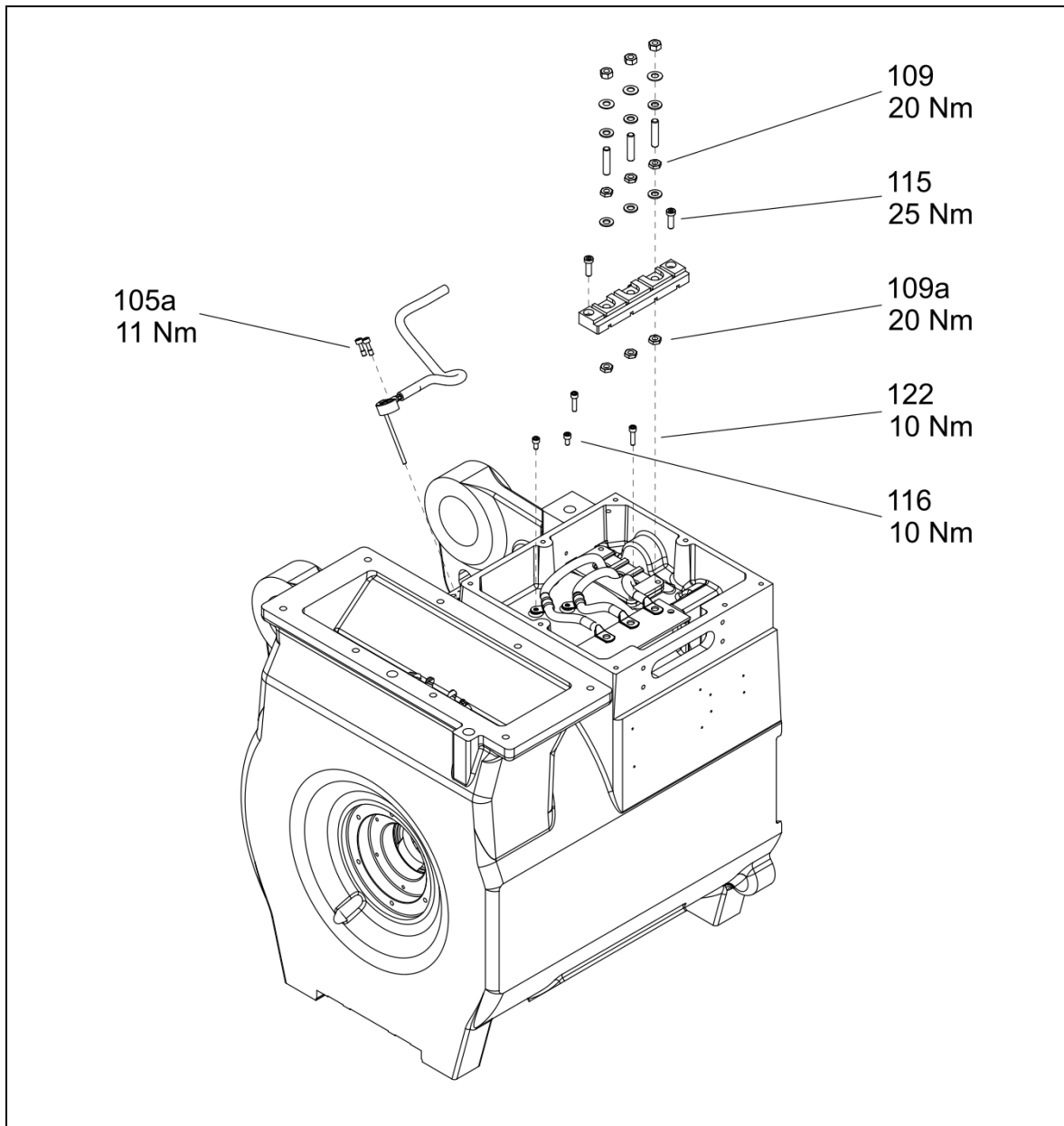


Figure 53: Tightening torques for stator complete

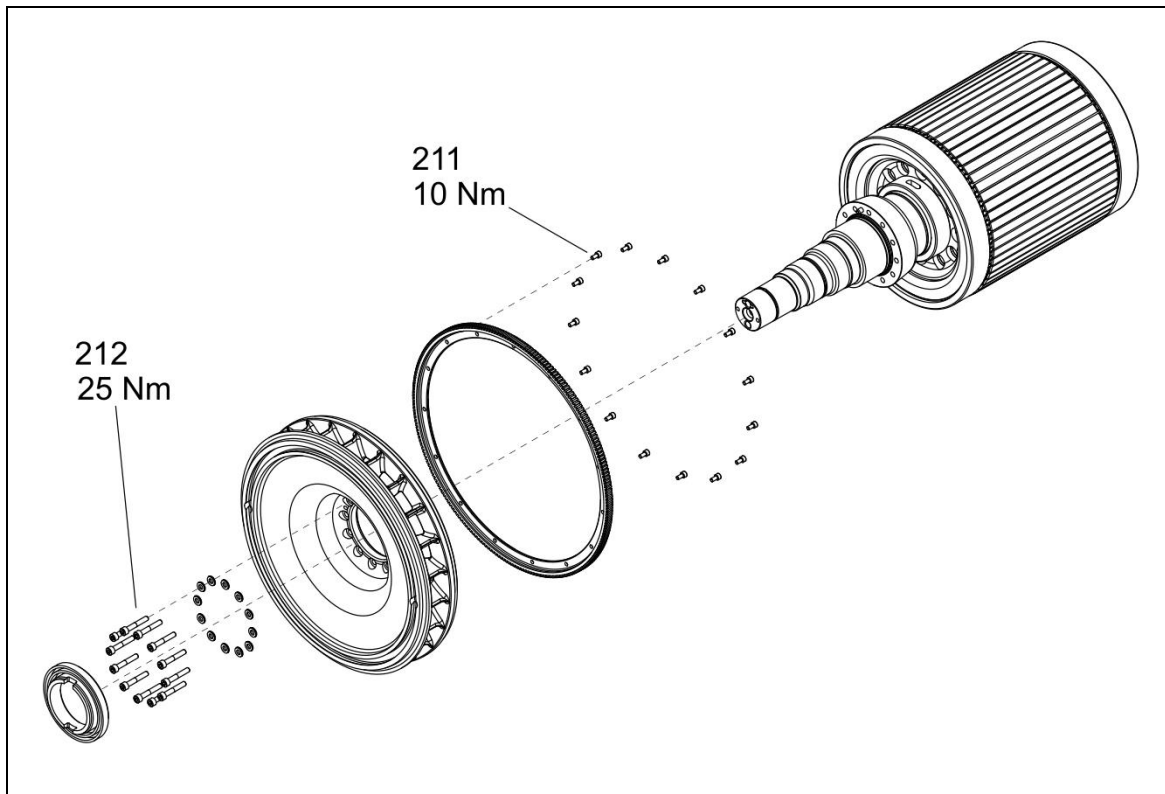


Figure 54: Tightening torques for rotor

# TME 49-30-4

## 12.6 Records and forms

### 12.6.1 Record log of type testing

Type testing according to test plan: TSA024537



---

Type test plan and type test protocol are supplied separately (are not part of this operating manual).

---

### 12.6.2 Product monitoring

We are bound by law to continue to observe the product beyond its delivery.

Particularly on:

- Recurring faults
- Inappropriate, unsafe operation
- Accidents that occurred
- Other abnormal operating behaviours

These details are of great interest to us and serve as guiding principles for adjustments that should be made.



---

We ask you to inform us of any malfunctions, damage, accidents, etc. This will enable us to improve our products if necessary and to further increase their operational safety and reliability.

---



## 13 SUBJECT INDEX

|  |     |                                     |        |
|--|-----|-------------------------------------|--------|
| <b>A</b>   |     | <b>M</b>                            |        |
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## 14 FURTHER DOCUMENTS

For further technical information see the following documents.

### 14.1 Corrosion protection

Coating regulation for corrosion protection via  
paint coating and lacquer coating..... [TSA000075](#)

Coating Restoration and Repair..... [TSA900099](#)

### 14.2 Coupling

Assembly and operating instructions..... [ZK 242-R6E-BD](#)

### 14.3 Safety data sheets




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The safety data sheets are subject to local regulations. These must be handled by the user and kept up to date.

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