# SERVICE MANUAL

MULTIQUIP ®


# RX1575
# TRENCH ROLLER

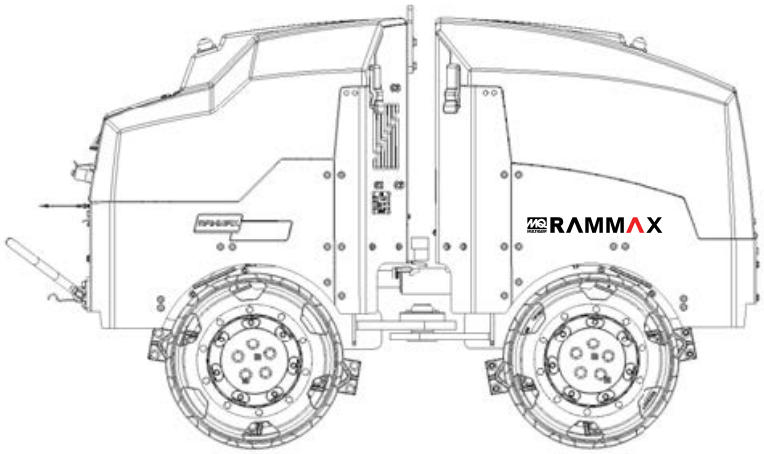
SCHEMATICS ○ TEST PROCEDURES ○ TROUBLESHOOTING

Updated 5/7/15

Manual No. RX1575SM

# Rammax 1575

(Yanmar 3TNV76 Diesel Engine)



# Preface

This manual was created for field and in the shop service.

Along with maintenance and repair instructions, this Service Manual also contains a description of the machine.

This Service Manual does not, however, replace the roller operating manual.

Because the content of the deliverable depends on the order, the features of your roller may differ in some descriptions and pictures.


The Rammax 1575 trench roller is a roller specially designed for trench compacting.

# Table of contents

# SERVICE & SUPPORT CENTER

**Operation and Parts manuals as well as other service related material can be viewed and downloaded on the MULTIQUIP Service & Support Center website - use the link below**

**http://service.multiquip.com**

**You can also access the Service & Support Center website using the QR code below on your mobil device**

MULTIQUIP

Service & Support Center

Setting the standard in Construction, Power and Lighting Solutions

# 1

# General

## 1.1 About this Service manual

This manual is part of the customer documentation for the Rammax 1575 trench roller. It is customer documentation of the Ammann Schweiz AG and its representatives in other countries.

### *1.1.1 Target audience*

This Service manual is intended for service technicians in the field and at repair shops who have been authorized to service and repair MQ vibratory rollers by the relevant operating company.

### *1.1.2 Purpose*

The purpose of this Service manual is to ensure that the roller will be used optimally and safely during the following processes.

- Maintenance
- Repair

### *1.1.3 Scope of this Service manual*

This Service manual covers the following rollers:
Rammax 1575

Some of the figures and descriptions in this Service manual may not exactly match your roller.

### *1.1.4 Completeness of the Service Manual*

Never remove sections from this manual. Missing pages - specifically the Safety section - must be replaced immediately if lost.

### *1.1.5 Technical changes*

In the interest of technical developments, Multiquip reserves the right to make changes to this document at any time without separate notice.

### 1.1.6 *Copyrights*



### 1.1.7 *Spare parts*

When performing scheduled and unscheduled repairs, you may need to replace components of the roller.

Only use spare parts which meet the requirements specified by the Amman Schweiz AG. These requirement are fulfilled if only original Ammann spare parts are used.

For the ordering spare parts, download parts manual at http://service.multiquip.com

## 1.2 Structure of the Service Manual

The following explanations are designed to familiarize you with the roller and to provide support for handling and maintenance.

It is essential that you read chapter *3 Safety information*, page 23 carefully before commissioning and carrying out maintenance work.

Observing the "safety instructions" in particular increases the reliability of the roller in operation and its service life. This reduces repair costs and down time.

### 1.2.1 *Orientation on the roller*

When describing the components of the roller, we inform you of their position on the roller. We adhere to the orientation below when doing so.

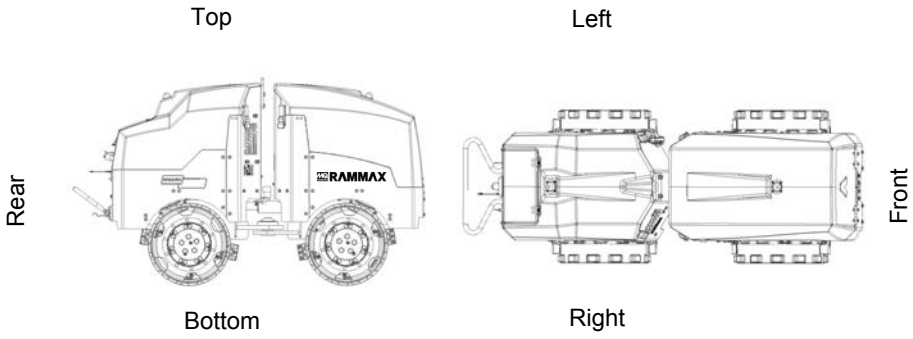


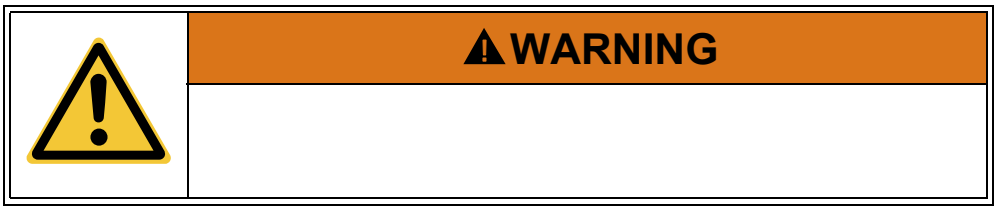

*Fig. 1-1 Rammax 1575 orientation*

We view the roller from the position of the driver standing behind the roller looking in the direction of travel.

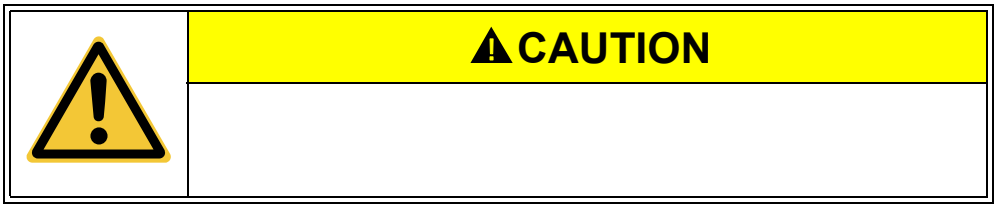
### *1.2.2 Warnings*

Please observe the meaning of the following warnings:


- **DANGER** represents an **immediate hazard** leading to **severe bodily injury** or **death**.




- **WARNING** represents a **possibly hazardous situation** which could lead to **severe bodily injury** or to **death**.




- **CAUTION** represents a **possibly hazardous situation** which could lead to **slight bodily injury**.
- Caution also represents a hazard of **environmental pollution** causing local or global environmental damage.

**NOTE** **The battery poles and terminals must be clean. If they are coated with a (whitish or greenish) sulfur crust they must be cleaned.**

**NOTE** **Risk of cable fire or short circuit**

- **NOTE** represents first of all: damage which could be caused to the roller or parts of it.
- **NOTE** represents secondly: Application tips and other particularly useful information.
- **NOTE** is **not** a signal word for a hazardous or damaging situation.

# 2

# Product description

## 2.1 Identification of the roller

### *2.1.1 Machine type Rammax 1575*

This Service Manual is valid for the following machines of the Rammax 1575 series.


*Tab. 2-1 Roller drum width Rammax 1575*

| Model | Roller drum width | Weight |
|---|---|---|
| Rammax 1575 | | |
| with 24" drums | 24 in (640mm) | 3,087 lbs (1400kg) |
| with drum rings | 33in (850mm) | 3,197 lbs (1450kg) |
| Rammax 157533 | 33in (850mm) | 3,197 lbs (1450kg) |

## 2.2 Product data

### *2.2.1 Dimensions Rammax 1575*

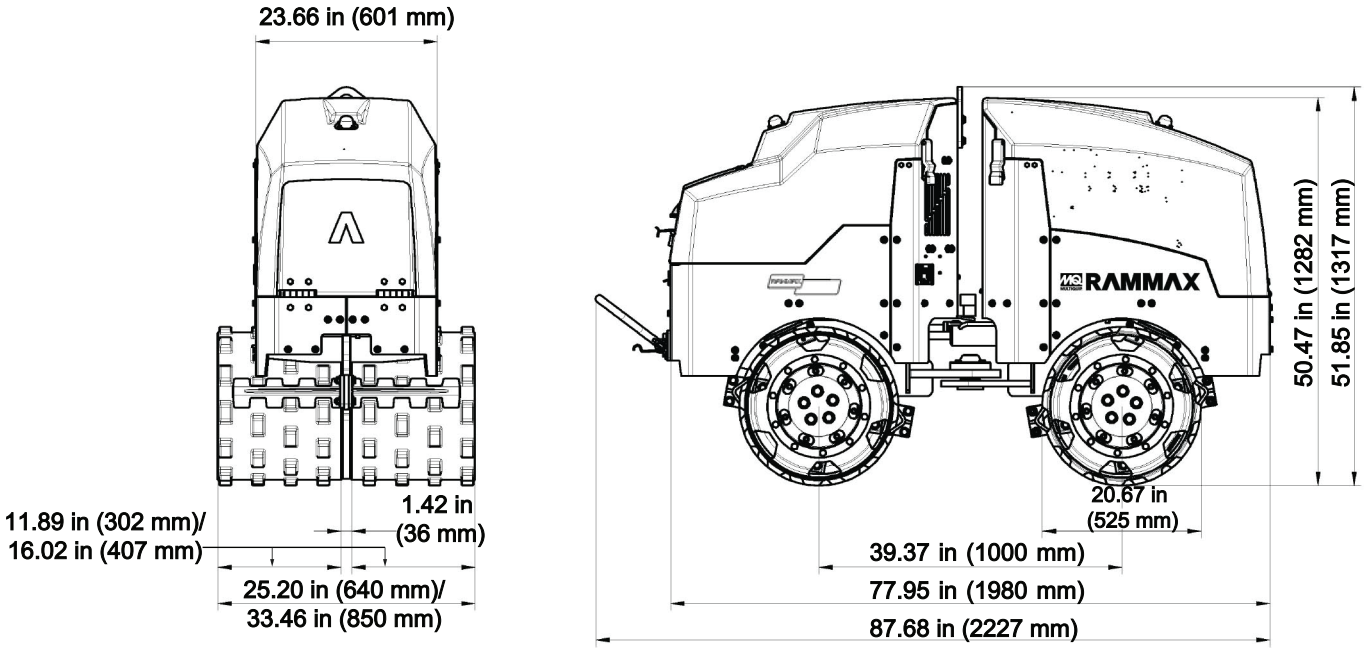



*Fig. 2-1 Dimensions Rammax 1575*

### *2.2.2 Specifications*

*Tab. 2-2 Rammax 1575 performance data*

| | Rammax 1575 | |
|---|---|---|
| **Roller drum width (mm)** | **24 (640)** | **33(850)** |
| Service weight according to CECE (kg) | 3,087 (1400) | 3,197 (1450) |
| Static linear load (kg / cm) | 10.1 (11.6) | 7.7 (8.9) |
| Outside / inside turning radius (mm) | 36.25/61 (2191/1541) | 90/57 (2286/1436) |
| Large/ small amplitude (mm) | .024 (0.6)/0.43 (1.1) | |
| Gradient in % with/without vibration | 40/50 | |
| Drive | YANMAR 3TNV76/EPA 4 | |
| Performance according to ISO 3046 | 15.0kW/20.4HP | |
| Operating speed | 2400 1/min | |
| Travel speed, working gear | 82 (25) m/min | |
| Transport gear travel speed | 148 (45) m/min | |
| Steering angle / pivoting | +/-30°/+/-7° | |
| Vibration frequency | 2,460 (41) Hz | |

*Tab. 2-3 Rammax 1575 filling capacities*

| Container | Contents |
|---|---|
| Hydraulic oil tank | 4.2 (16l) |
| Diesel tank | 7.4 (28) |

# 2.3 Roller designation

## *2.3.1 Identification plate*

An identification plate is affixed to the roller for identification. The identification plate is attached to the rear part of the chassis below the steering column.

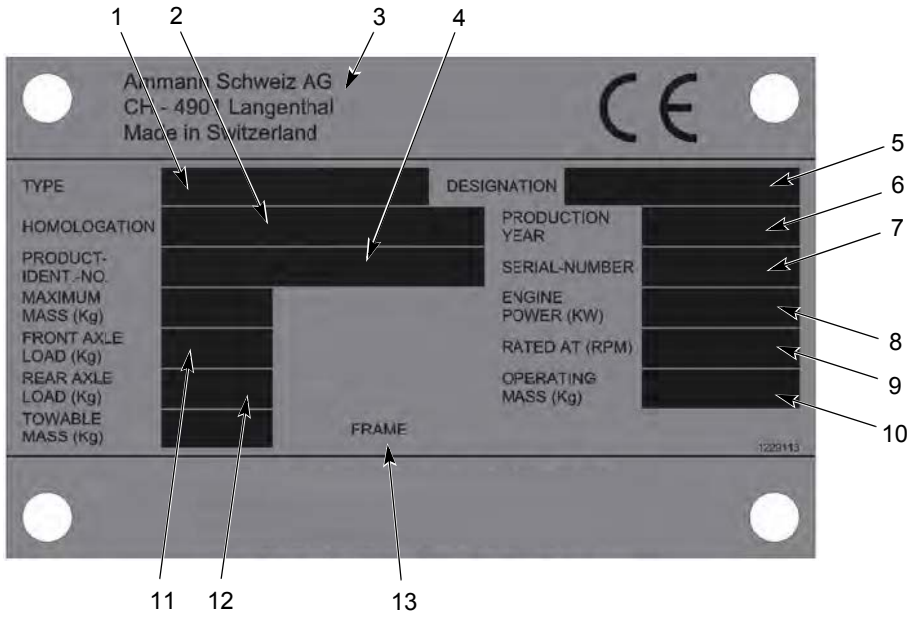



*Fig. 2-2 Data on the identification plate*

1 Roller designation
2 Homologation number
3 Name and address of the manufacturer
4 Vehicle Identification Number (VIN)
5 Roller model
6 Year of manufacture
7 Serial number
8 Fuel engine output at
9 Speed of fuel motor (rpm)
10 CECE total weight
11 Axle load, front
12 Axle load, rear
13 Number stamped in chassis

**NOTE** **When ordering spare parts you must indicate the serial number (S/N) of the roller.**

## 2.3.2 Location of machine rating plate


*Fig. 2-3 201309200003*

**1** The rating plate is located on the front right of the rear chassis.

## 2.3.3 Location of machine chassis number

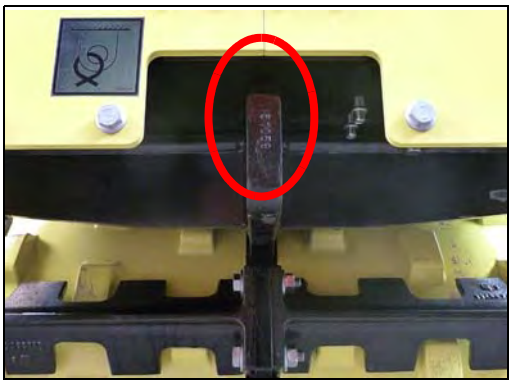


*Fig. 2-4 201309200004*

**1** The front chassis number is located under the steering/Vibro pump.

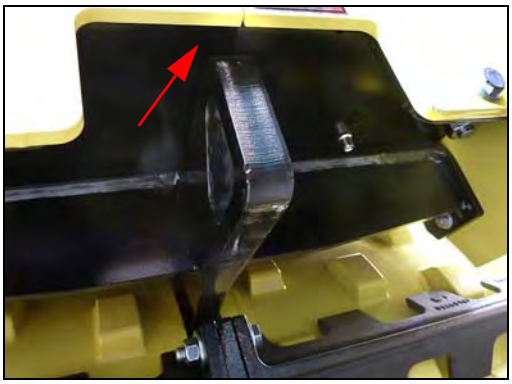


*Fig. 2-5 201309200005*

**1** The rear chassis number is located hidden on the rear-most part of the center beam.

### *2.3.4 Location of Yanmar engine rating plate*


*Fig. 2-6 201309200002*

**1** The Yanmar engine's rating plate is located on the valve cover.

### *2.3.5 Location of engine number*


*Fig. 2-7 201212140000*

**1** The engine number is located on the starter side (on the machine's right-hand side) of the engine block.

## 2.4 Disclaimer

Multiquip accepts no liability for the continued reliable functioning of the roller if it is not used appropriately.

Unauthorized conversions and changes to the roller are prohibited for safety reasons and void any and every Multiquip guarantee as well as, possibly, the CE directive.

Replaced spare or wear parts must meet the technical requirements specified by Multiquip. These requirements are fulfilled if only original Multiquip spare parts are used.

The instructions given in the various sections must be adhered to. The safety instructions must be observed at all times. Failure to adhere to working instructions, their correct order, safety instructions or safety labeling requirements causes liability claims to become void.

### *2.4.1 Warranty*

Opening or attempting to repair defective parts will void their warranty.

# 3

# Safety information

## 3.1 General working safety

- The roller may only be used for driving on and compacting loose top layers (gravel, earth). Other uses are prohibited.
- Rollers may only be operated with all safety devices operating. Manipulation or disregard of safety devices and regulations invalidates the CE conformity.
- Before starting every shift, check the effectiveness of the operation and safety devices and that the protection devices are in place.
- Check the steering and brakes when you start work. If defects are apparent, roller operation is not permitted.
- If you identify any defects on the safety system or defects that impair safe operation of the equipment, inform your supervisor immediately. The roller may no longer be operated.
- If you identify any defects which endanger safe operation, cease operation immediately.
- Only perform work on and clean the roller if it is stationary and secured from rolling away.
- Switch off the engine when filling the fuel tank. Do not fill up fuel in enclosed spaces. No open flames.
- Do not vibrate on slopes or inclines where there is a hazard of slipping or overturning.
- Do not drive on slopes that are steeper than the maximum climbing capacity of the equipment. Always drive the roller carefully perpendicular to the slope dip.
- Do not vibrate inside buildings and on unstable ground.
- The driving and working field of view must not be obstructed in any way.
- Switch off the engine before leaving the roller. Secure the roller against unauthorized start-up and rolling away.
- Take suitable visible measures to secure parked rollers that pose an obstruction.
- Never work under the influence of drugs, alcohol or medicines that impair consciousness.
- Only operate the roller in good general light conditions and good workspace illumination.
- The workplace of the operator is located at a safe distance of at least 2m.

## 3.2 Roller operation

**⚠DANGER**

**Rollover hazard when driving the roller!**

- Only start the roller using the handheld transmitter.
- Personnel may not stand in front of or behind the roller while it is in operation.
- Persons necessary for operations at the sides of the equipment must remain at a safe distance of at least 2 m.

### *3.2.1 Shear points*

- When closing the hood ensure that no objects are situated between the hood and the chassis.
- Take care that nothing is jammed in the joint plates when rotating the roller drums.
- Do not put hands between the roller drum and support during operation.

## ⚠ DANGER

**Danger to life through tipping or slipping of the roller! The edges of filled areas may give way!**

- Only travel directly up or down slopes.
- Do not drive across slopes.
- Keep your distance to embankments and edges!
- Do not drive at an angle into or out of the trench.
- Park the roller on slopes only in such a way that it cannot overturn.
- Use the roller on slopes only in such a way that it cannot overturn.
- The roller drums have very poor adhesion on snow and ice. Driving or working on a slope in snow or ice is prohibited.
- Damp and loose surfaces reduce the traction of the machine on upward and downward grades considerably. Adapt the speed of the machine to the terrain when driving on grades.
- The nature of the ground and weather conditions can negatively affect the climbing ability of the machine. Never drive on slopes that are steeper than the maximum climbing ability of the machine.

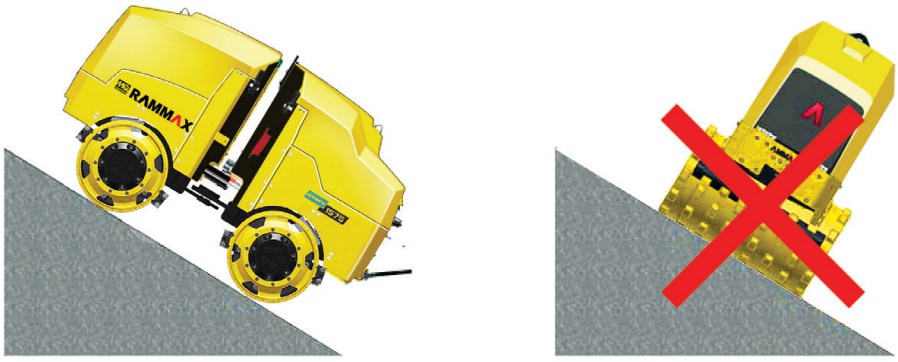
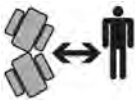



*Fig. 3-1 Tipping hazard*

Construction site conditions can have a negative effect on stability and the tipping angle.



## ⚠ DANGER

**Crushing hazard in the area of the articulated joint**

- During operation, there is always a crushing hazard in the area of the articulated joint. Therefore, it is not permitted for persons to be in this area during operation. In general, a safety distance of at least 2 meters to the machine must be maintained during operation.

## ⚠ DANGER

**Crushing of toes through careless handling of the roller!**

- Wear safety shoes when working with the roller in order to help avoid crushed toes.

**⚠DANGER**

**Danger of accident through improper operation of the roller!**

- Read the operating instructions before operating the roller.
- Adhere to the safety regulations at all costs.
- In case of lack of clarity, contact your authorized dealer.

## 3.3 Noise levels

**⚠WARNING**

**Hearing damage due to continuous noise level!**

**Depending on the use of equipment it is possible that the permissible noise level of 85 dB (A) will be exceeded.**

- Wear ear protectors in accordance with national accident prevention regulations when working at higher noise levels.

The following noise level measurements were carried out by an accredited testing and monitoring body in accordance with machine directive 2000/14/EEC of the European parliament and council.

Inspecting and monitoring organization: TÜV Österreich (Austrian technical inspectorate)
Testing body no. 0408

*Tab. 3-1 Sound power level*

| Model | Value |
|---|---|
| Measured sound power level | 100dB (A) |

**NOTE** **The obligation to wear ear protection is standardized nationally. In Switzerland and Germany, this is as of a measured level of 85 dB (A) (sound pressure).**

## 3.4 Safety markings on the machine

- Observe and adhere to the rules.
- Keep the safety stickers and signs complete and legible.
- Replace any damaged or illegible stickers and signs immediately.
- You can order new stickers from Multiquip.

From the moment the signs are no longer recognizable and understandable at first glance, the machine must be shut down until new signs are installed.

### 3.4.1 Warning stickers

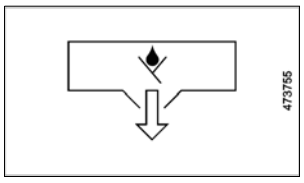
*Tab. 3-2 Warning stickers on board*

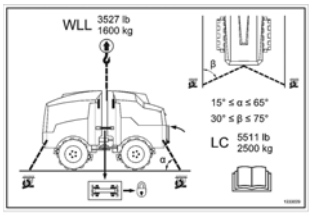
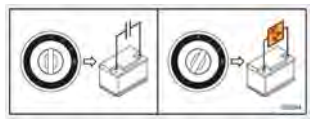
| Warning stickers | Meaning |
|---|---|
|  | **Location on roller:**<br>Air intake opening/Inside of cowling<br>**Danger:**<br>Damage to electrical controls!<br>**Explanation:**<br>Never spray a water jet into electrical or electronic components. Never spray into the engine combustion air intake. |
|  | **Location on roller:** Outer cowling cover.<br>**Danger:** Danger of injury due to incompetent operation:<br>**Explanation:** Read the operating instructions before operating the roller. Adhere to the safety regulations at all costs. Contact your authorized dealer if anything is unclear. |
|  | **Location on roller:** Between the front and rear parts of the roller.<br>**Danger:** Crushing hazard!<br>**Explanation:** Only stand in this area when necessary and only with extreme caution! |
|  | **Location on roller:** In the middle of the front and back.<br>**Danger:** Rollover hazard<br>**Explanation:** Only stand in this area when necessary and only with extreme caution! |

| Warning stickers | Meaning |
|---|---|
|  | **Location on roller:** Radiator, both sides.<br>**Danger:** Warnings for cooling water radiator<br>**Explanation:** Do not put hands in the radiator fan when the machine is running. |
|  | **Location on roller:** Inner cowling cover.<br>**Danger:** If the roller has overturned, do not start the machine.<br>**Explanation:** Avoid oil shock. |
|  | **Location on roller:** Outer cowling cover.<br>**Requirement:** Wear ear protectors!<br>**Explanation:** Wear ear protectors in accordance with national accident prevention regulations when working at higher noise levels. |

### 3.4.2 *Notice stickers*

*Tab. 3-3 Notice stickers on board*

| Notice stickers | Meaning |
|---|---|
|  | **Location on roller:** Chassis rear<br>**Designation:** Guaranteed sound power level.<br>**Explanation:** Indicates the overall noise level produced by the roller. |
|  | **Location on roller:** On the hydraulic oil tank<br>**Designation:** Hydraulic oil<br>**Explanation:** Please only use hydraulic oil indicated |
|  | **Location on roller:** Chassis rear.<br>**Designation:** Hydraulic oil drain.<br>**Explanation:** Drain hole for the hydraulic oil |
|  | **Location on roller:** Chassis, front right.<br>**Designation:** Motor oil drain.<br>**Explanation:** Drain hole for the motor oil |
|  | **Location on roller:** Chassis rear.<br>**Designation:** Fuel.<br>**Explanation:** Filler neck for diesel fuel. |
|  | **Location on roller:** On the middle of the front and rear chassis.<br>**Designation:** Tie-down point.<br>**Explanation:** Points on the roller at which lashing means for securing the roller on the transport vehicle can be attached. |

| Notice stickers | Meaning |
|---|---|
|  | **Location on roller:** Roll bar, rear.<br>**Designation:** Suspension hooks.<br>**Explanation:** Points on the roller at which hoisting tackle for lifting the roller can be attached. |
|  | **Location on roller:** Rear chassis, front upper left.<br>**Designation:** Lifting and tie-down points.<br>**Explanation:** Illustrates how the machine is to be loaded and transported. |
|  | **Location on roller:** Rear chassis, front upper left.<br>**Designation:** Spare parts information<br>**Explanation:** Information about the filters of the machine. |
|  | **Location on roller:** Inner cowling cover.<br>**Designation:** Close the cover.<br>**Explanation:** Attention: When driving using remote control and when parking the machine, the cover must be closed. |
|  | **Location on roller:** Inner cowling cover.<br>**Designation:** Ignition<br>**Explanation:** Attention: Current is present when the ignition is on. |

## 3.5 Radiation compliance

This machine complies with the emission requirements for radio interference due to radiation, European Norm EN 13309, for construction machinery.

# 4

# Structure and function

## 4.1 Component overview Rammax 1575

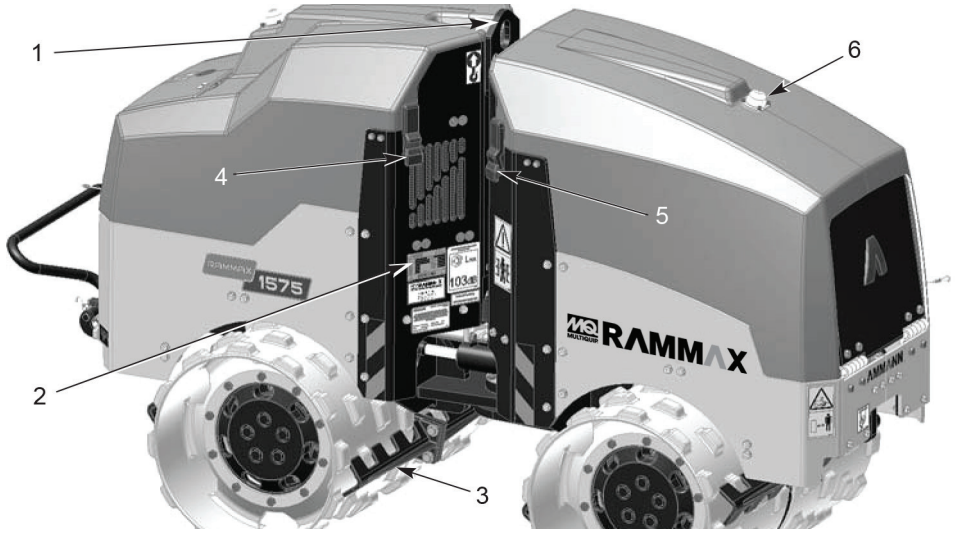



*Fig. 4-1 View from the right*

1 1-point lifting eye
2 Identification plate
3 Roller drum scraper
4 Rear hood latch (cowling)
5 Front hood latch (engine hood)
6 Front infrared sensor

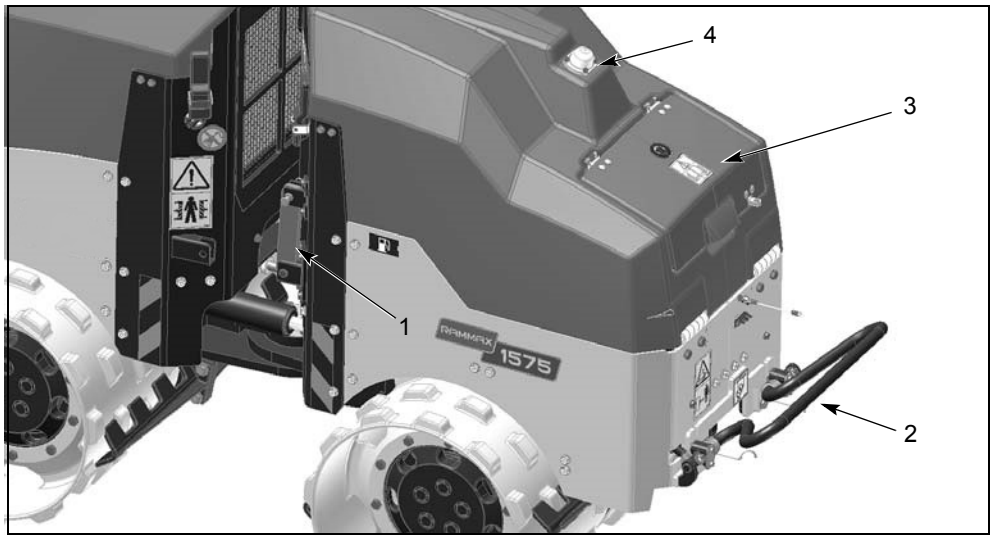



*Fig. 4-2 View from left*

1 Articulated joint protection
2 Shutdown bar (optional)
3 Cockpit cover
4 Rear infrared sensor

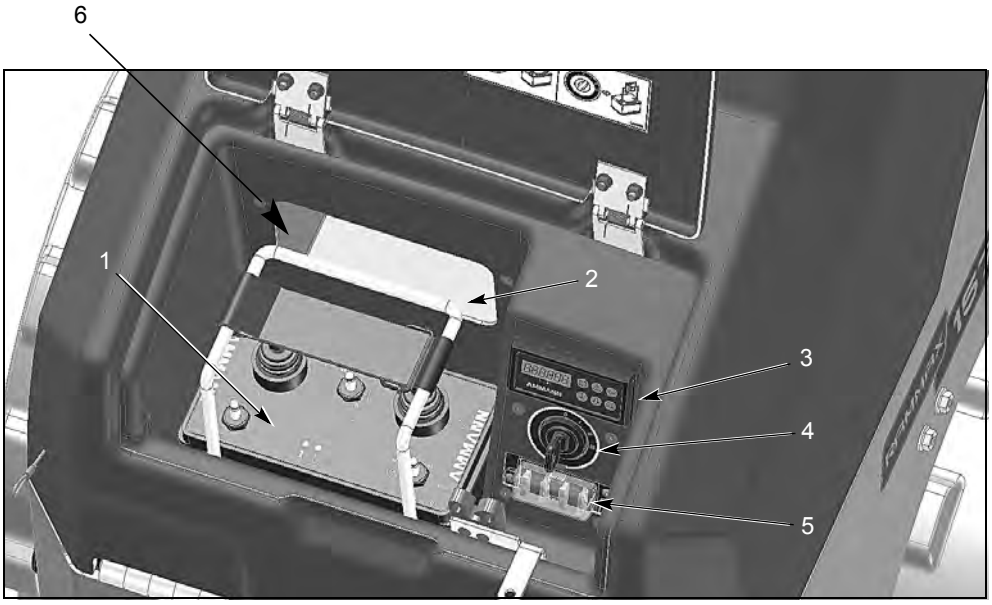



*Fig. 4-3 Cockpit overview*

1 Infrared transmitter
2 Storage area for spiral cable
3 Display unit
4 Ignition switch
5 Fuses
6 Connector for spiral cable to infrared sensor (back area)

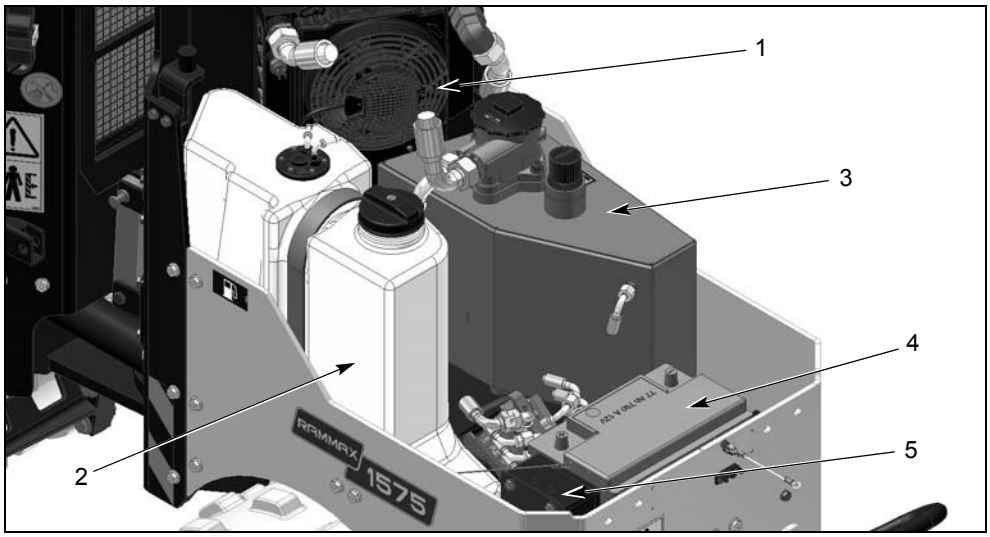



*Fig. 4-4 Overview of interior of rear chassis*

1 Oil cooler
2 Fuel tank
3 Hydraulic tank
4 Battery
5 Controller (machine controller)

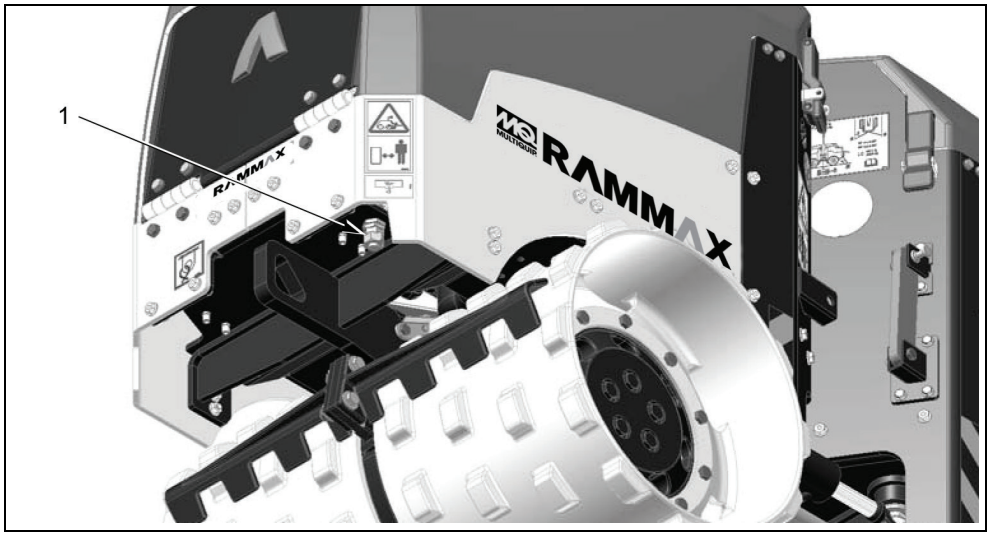



*Fig. 4-5 Front bottom view*

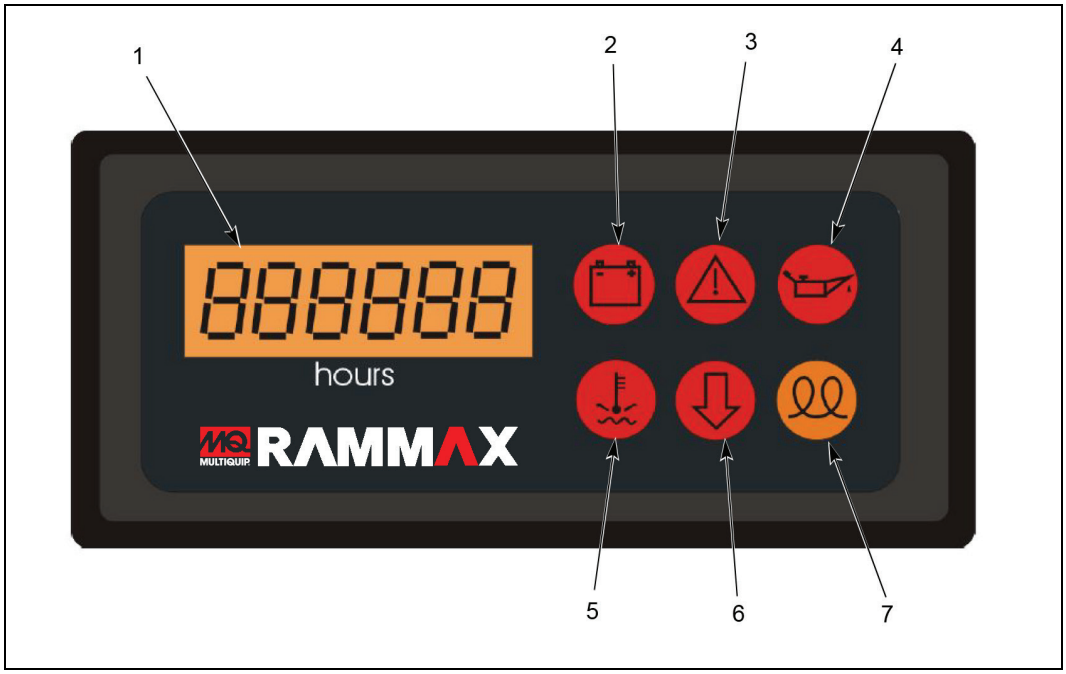
1 Engine oil drain plug

# 5

# Operating and display elements

## 5.1 Display unit

### *5.1.1 Control lamps*




1 Display/operating hours counter
2 Control lamp for battery charge level (charge control)
3 Error control lamp
4 Control lamp for engine oil pressure
5 Control lamp for cooling water temperature
6 Control lamp for shutdown bar
7 Control lamp for pre-heating

### *5.1.2 Control lamp functions*

*Error*

The **Error control lamp** lights as soon as the controller recognizes an error.

**1** Check whether the desired function is working. (This also applies when the tilt sensor is triggered.)

If the Error control lamp is still lit after carrying out these checks, call a specialist to help solve the problem.

### *Battery*

If the **battery charge level control lamp** lights up during operation or does not go off after starting, carry out the following check immediately.

**1** Stop the engine.

**2** Check the engine for defective or loose V-belt.

If the battery charging lamp is still lit after carrying out these checks, call a specialist.

### *Engine oil pressure*

If the **engine oil pressure control lamp** lights up during operation or does not go off after starting, stop the roller and turn off the engine immediately!

**1** Check the engine for oil loss and correct oil level.

**1.1** The oil level in the engine is correct: Call a specialist to remedy the problem.

**NOTE** **The machine is equipped with an automatic shutdown system. If the oil pressure falls below the limit value, the oil pressure warning lamp lights up. After the warning lamp has been lit for 4 seconds, the machine is shut down.**

### *Coolant temperature*

**⚠WARNING**

**Danger of scalding! The cooling circuit is pressurized.**

**NOTE** **Danger of engine overheating. Stop immediately!**

If the **coolant temperature control lamp** lights up during operation of the machine, switch off the engine **immediately** and top up coolant!

**1** Allow the engine to cool down.

**2** Remove the radiator cap.

**3** In order to avoid scalding, first unscrew the radiator cap one turn and allow the pressure to drop.

**4** As soon as the pressure has dropped, remove the cap and top up the liquid.

**5** Check the cooling system for leaks and the radiator/expansion vessel for correct coolant level.

**5.1** You are unable to find an error: Call a specialist to remedy the problem.

**NOTE** **The machine is equipped with an automatic shutdown system. If the cooling water temperature exceeds the limit value, the temperature warning lamp lights up. After the warning lamp has been lit for 4 seconds, the machine is shut down.**

### *Pre-heating*

The pre-heating time amounts to about 6 sec. When the motor is started, the **Pre-heating control lamp** goes off.

### *Shutdown bar*

The **shutdown bar indicator lamp** remains lit as long as the shutdown bar is actuated.

**1** Check whether the shutdown bar has been released.

**2** Release the shutdown bar.

## *5.1.3 LED error display on the display unit*

*Tab. 5-1 Error display (tilt switch)*

| Display | Cause | Remedy |
|---|---|---|
| Error lights up | The tilt switch has been triggered. The roller is at an angle of more than about 45° or has tipped over. | Set the machine upright. |

**NOTE** **For safety reasons, as soon as the roller tips over, the ignition is also shut off.**

**The machine controller is equipped with an inclination sensor. It triggers as of an angle of 45°. In this case, the engine shuts itself off automatically. The machine cannot be started as long as the inclination sensor remains triggered.**

**If the machine has tipped over, it is possible for engine oil to enter the combustion area. If the machine is started after it has been righted, engine damage is possible.**

- **Set the machine upright. Do not start the engine under any circumstances.**
- **Inform the service Service.**

### *Error display*

*Tab. 5-2 Error and shutdown bar display*

| Display | Cause | Remedy |
|---|---|---|
| Error lights up | A switching transistor signals a status error. This means that, for example, a short circuit or a cable break has been detected. | Check the cable for a short circuit or cable break. |
| Error and shutdown bar light up in unison | The machine controller is waiting for both the inputs “Oil pressure” and “Alternator” to be at the rest position. | Check the oil pressure and Alternator outputs. |

**NOTE** **Bear in mind the priority of the displays: First is the tilt switch, then “Wait” and last, the status error transistor.**

### *Shutdown bar display*

*Tab. 5-3 Shutdown bar display*

| Display | Cause | Remedy |
|---|---|---|
| Shutdown bar lights up | Switch on shutdown bar has triggered. | Move the shutdown bar to its original position. |
| Shutdown bar is blinking | Close proximity shutdown has been detected. | Move more than 2.5 m away from the roller. |
| Shutdown bar is flashing | Close proximity has been detected. | If the roller is controlled by means of the cable, the user must be present in the close proximity area (between 2.5 and 4m) |

**NOTE** **Bear in mind the priority of the displays: First the bar switch, then the close proximity shutdown and last, the close proximity area.**

## 5.2 Infrared transmitter

### *5.2.1 Design*


*Fig. 5-1 Infrared transmitter*

1 Work gear/transport gear
2 Forward travel/backward travel
3 Large/small amplitude vibration
4 Steering angle left/right
5 Start/Stop
6 LED (error and charging display from IR transmitter)
7 Cable

### *5.2.2 LED error display on the IR transmitter*

There are two LEDs on the cover: a green one and a red one.

Fig. 5-2 LED error display, green/red

### *Standard*

*Tab. 5-4 Standard display*

| Display | Cause |
|---|---|
| The green LED is blinking slowly. | The roller is being controlled via the cable. |
| The green LED is flashing. | The roller is being controlled via infrared. |

### *Battery charge monitoring*

The red LED blinks either faster or slower depending on the battery charge level. The lower the charge state, the longer the on-phase of the LED.

*Tab. 5-5 Battery charge monitoring display while performing a function*

| Display | Cause | Remedy |
|---|---|---|
| The red LED flashes briefly | The battery is slowly becoming drained | Connect the charging cable for at least 1h. |
| The red LED always lights when a control is operated. | When the battery is drained, it is no longer sent. | Connect the charging cable for at least 1h. |
| The red LED flashes. | The battery is being charged. | |
| The red LED is lit. | The battery is fully charged. | |

**NOTE**

**It is still possible to control via the cable once the battery is empty.**

**Battery warnings and errors are only displayed during active control (i.e., when a control element is actuated).**

**As soon as and as long as the infrared transmitter is attached to the machine controller via the cable and the ignition is turned to I, the red LED must flash or be lighted.**

### *Automatic pairing*

*Tab. 5-6 Automatic pairing display*

| Display | Cause |
|---|---|
| The green and red LEDs are blinking in unison quickly. | The infrared transmitter is coupled with the machine controller. |

**NOTE**

**This procedure normally only takes a maximum of about 3 seconds. If this blinking lasts longer or should even become permanent, there is a problem with pairing:**

- **A cable break in one of the signal lines**
- **A short circuit in one of the signal lines**

**As long as this blinking pattern remains, no control signals will be sent to the machine controller. Engine does not start.**

**Automatic pairing occurs at the moment the cable is unplugged, or, if the cable is plugged in, when the ignition is switched on.**

*Special cases*

- When the infrared transmitter is switched on, both LEDs are switched on briefly. This feature helps to determine that the LEDs are still functioning.
- As soon as the cable is unplugged from the handheld transmitter or from the roller, the red LED lights up for about 1 second.

### *5.2.3 Cable connection*


*Fig. 5-3 Spiral cable connector*

1 Spiral cable connector/protective cover fastener
2 Solar cells/Transmission elements

### *5.2.4 Handling*

*Sticker*

The infrared transmitter is located in the black lower part of the housing. It contains the following transmission elements:

- The solar cells
- The infrared diodes for data transmission and measuring the safety distance.

- Before startup, clean the transmission elements.
- Before startup, be sure that the solar cells in the lower part of the housing are not covered over.

- Keep the solar cells clean during operation.

**⚠CAUTION**

**Accident hazard due to covered over lower part of the housing!**

- Before and during operation with the infrared transmitter, make sure that the entire lower part of the housing remains completely uncovered for the entire time of operation.
- In particular, the operator's hand must not cover the lower part of the housing even partially.

### *Wear the infrared transmitter correctly*

**1** Pay attention to correct positioning.

**1.1** The cable connector must face forwards or be oriented according to the sticker on the transmitter. The infrared transmitter may rest on the stomach of the operator.

**1.2** Adjust the strap for the correct length to ensure optimal wearing comfort.

**2** Pay attention to correct operation.

**2.1** Only hold the housing by the upper part; see the warning information.

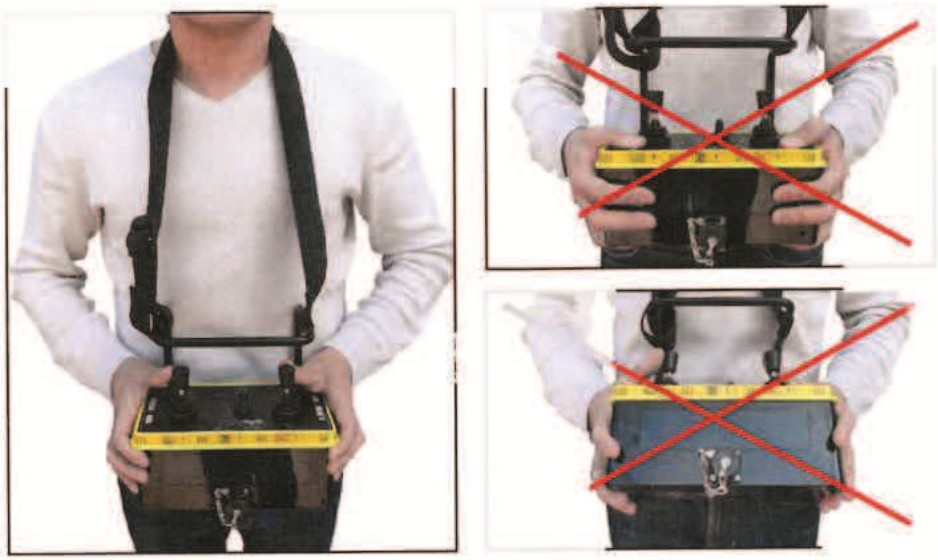
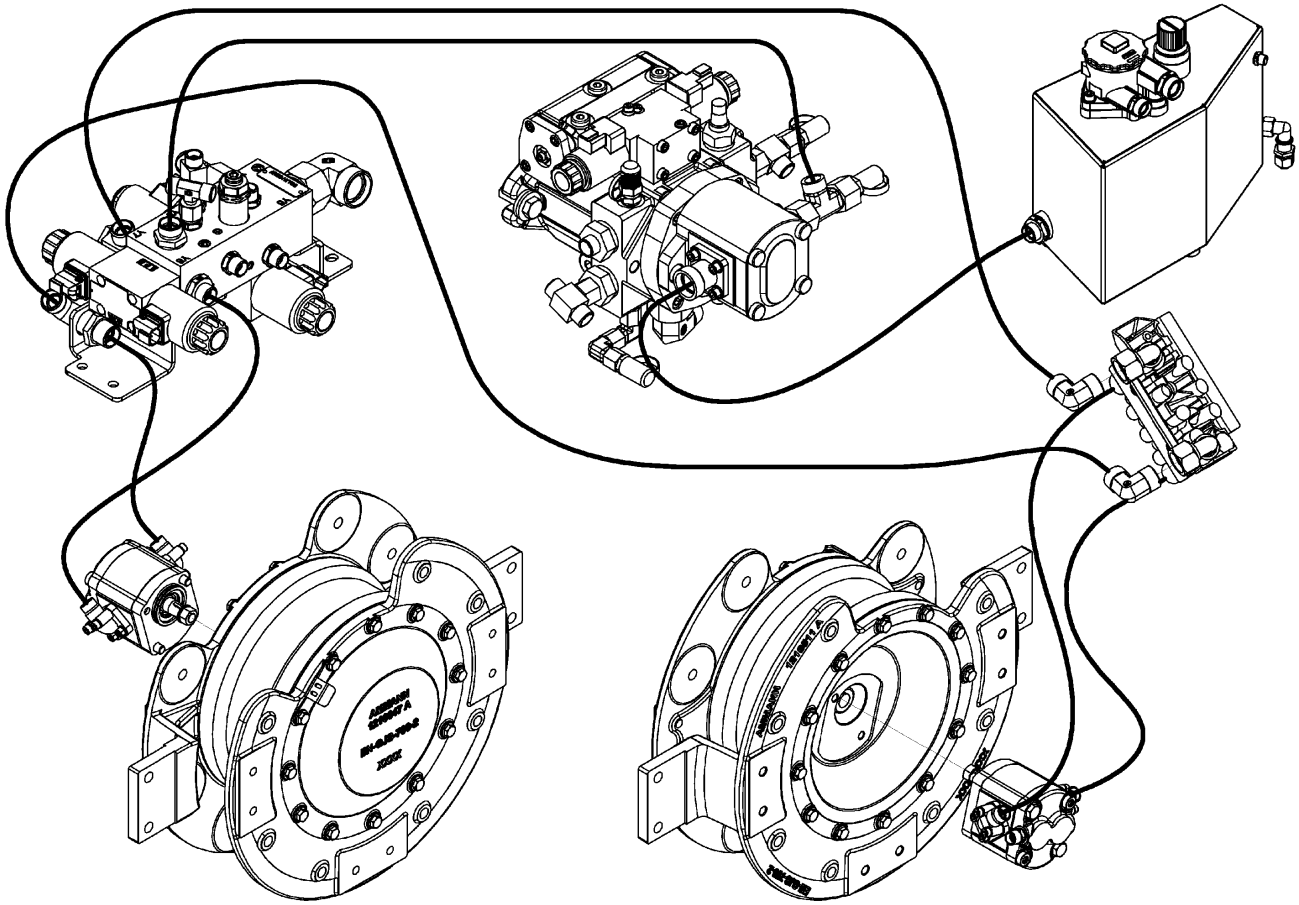


*Fig. 5-4 Wear the infrared transmitter correctly*

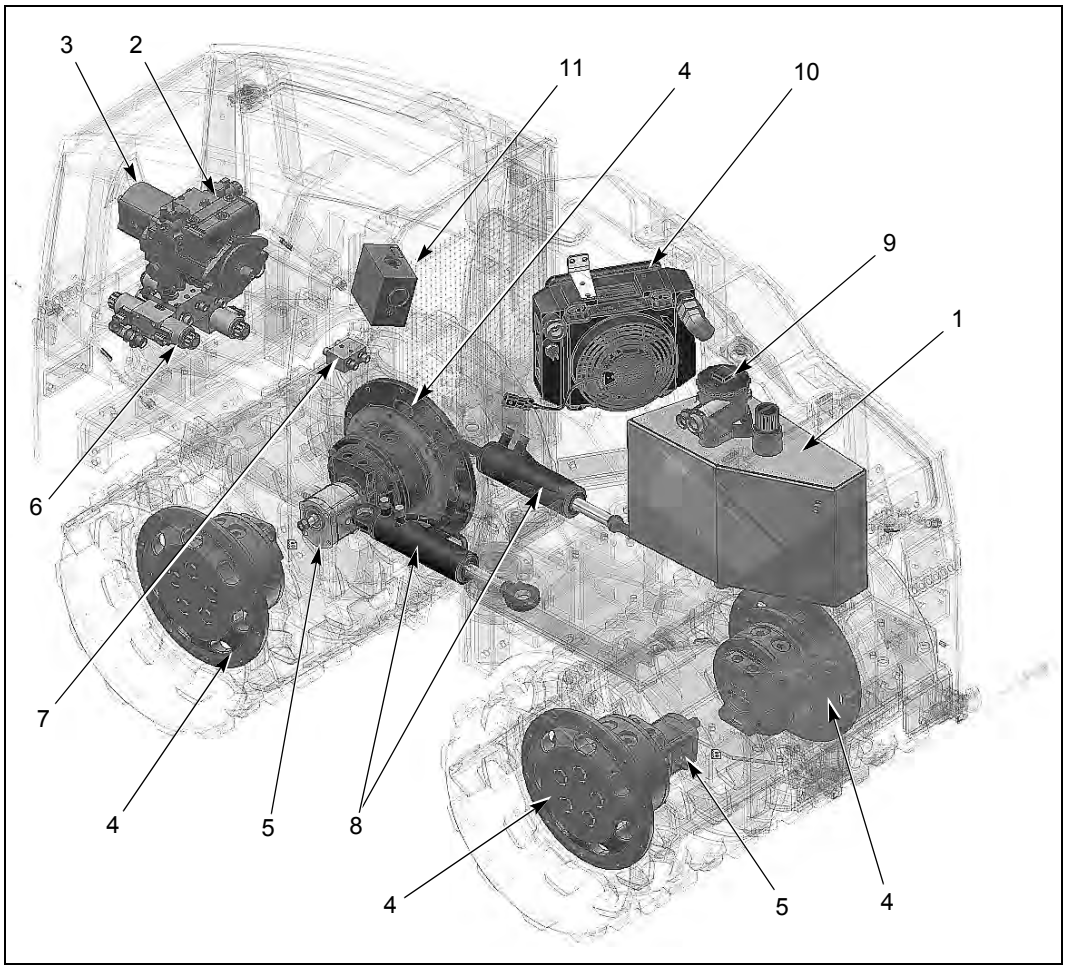
**NOTE** **Be certain that the desired confirmation can be carried out safely.**

# 6

# Hydraulic System



## 6.1 Overview of the hydraulic system




1 Hydraulic oil tank
2 Drive pump
3 Vibro-steering pump
4 Drive motor
5 Vibromotor
6 Valve block
7 Hydraulic manifold
8 Steering cylinder
9 Hydraulic oil filter
10 Oil cooler
11 Flow divider

### *6.1.1 Hydraulic hose service life and storage*

**NOTE** **The hydraulic hoses should not be used for more than six years (this includes any storage periods). In addition, the hoses should not be stored for more than two years (as per DIN 20066).**

## 6.2 Overview of hydraulic hoses

### *6.2.1 Hoses for travel/vibro drive*

*Front left roller drum*


*Fig. 6-1 201310020003*

*Tab. 6-1 Hoses for front left roller drum*

| No. | of | position |
|---|---|---|
| 31 | Drive circuit B, forwards | Hydraulic manifold, left |
| 33 | Drive motor brake | Valve block BR |
| 35 | Drive circuit A, reverse | Drive pump A, T-fitting |
| 37 | Front left drive motor leakage oil, L-fitting | Valve block T3 |
| 38 | Front left brake | Front right drive motor brake |
| 39 | Front left drive motor leakage oil, L-fitting | Front right drive motor leakage oil, L-fitting |

## *Front right roller drum*

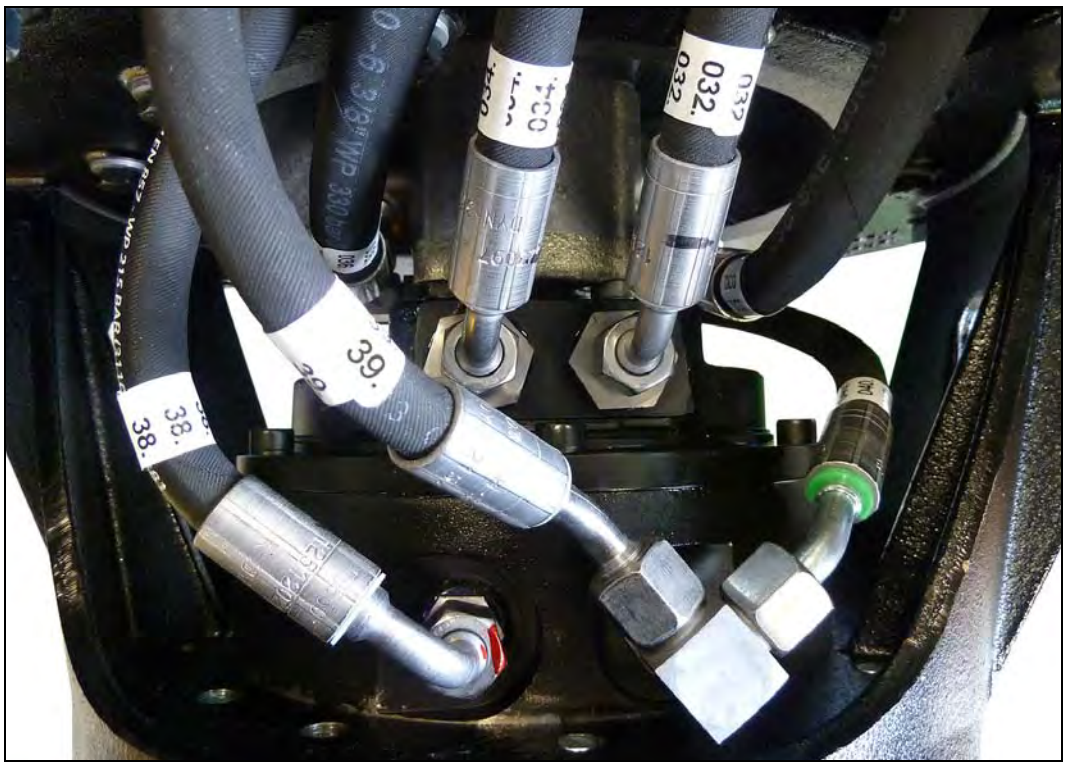



*Fig. 6-2 201310020004*

*Tab. 6-2 Hoses for front right roller drum*

| No. | of | position |
|---|---|---|
| 30 | Vibro motor, front | Valve block A1 |
| 32 | Drive circuit B, forwards | Hydraulic manifold, right |
| 34 | Drive circuit A, reverse | Drive pump A, T-fitting |
| 36 | Front vibromotor, connection at rear | Junction, vibration elbow bulkhead fitting |
| 38 | Front right drive motor brake | Left drive motor brake, L-fitting |
| 39 | Front right drive motor leakage oil, L-fitting | Front left drive motor leakage oil, L-fitting |
| 40 | Front right drive motor leakage oil, L-fitting | Leakage oil, front vibromotor |

## *Rear left roller drum*

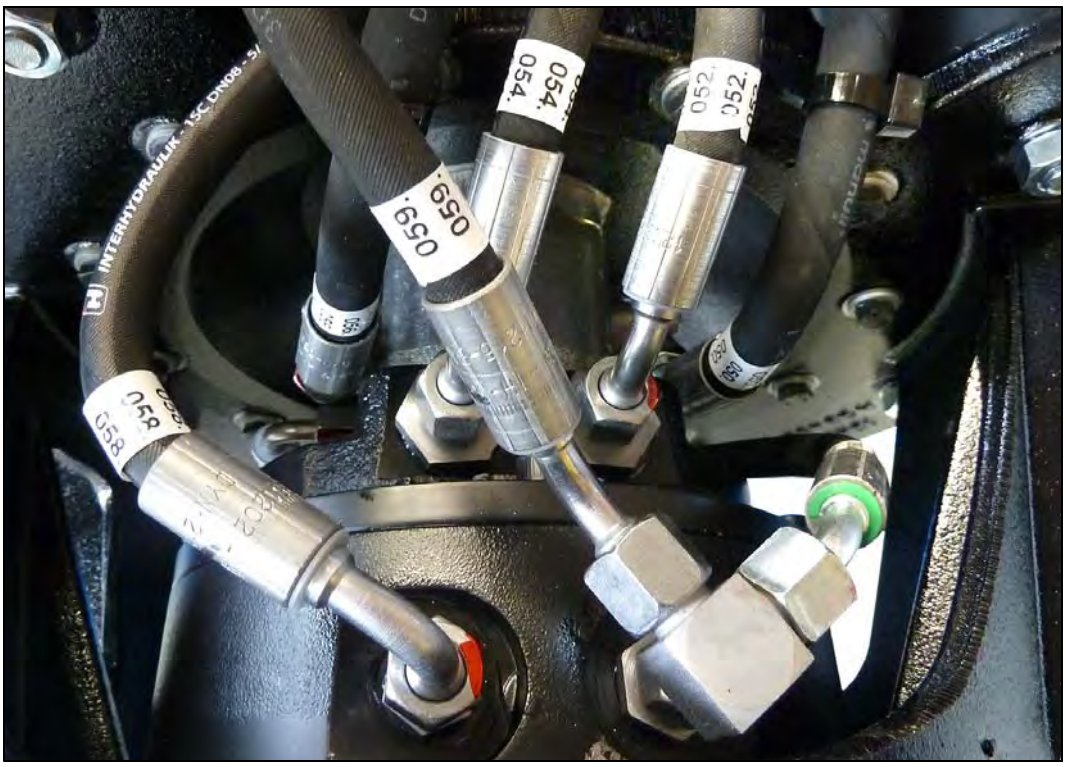



*Fig. 6-3 201310020002*

*Tab. 6-3 Hoses for rear left roller drum*

| No. | of | position |
|---|---|---|
| 50 | Rear vibromotor, connection at rear | Junction rear elbow fitting |
| 52 | Drive circuit B, forwards | Junction at rear |
| 54 | Drive circuit A, reverse | Junction at rear |
| 56 | Rear vibromotor, connection at front | Junction rear elbow fitting |
| 58 | Rear left drive motor brake | Rear right drive motor brake L-fitting |
| 59 | Rear left drive motor leakage oil L-fitting | Rear right drive motor leakage oil L-fitting |
| 60 | Rear left drive motor leakage oil | Rear vibromotor leakage oil |

## *Rear right roller drum*

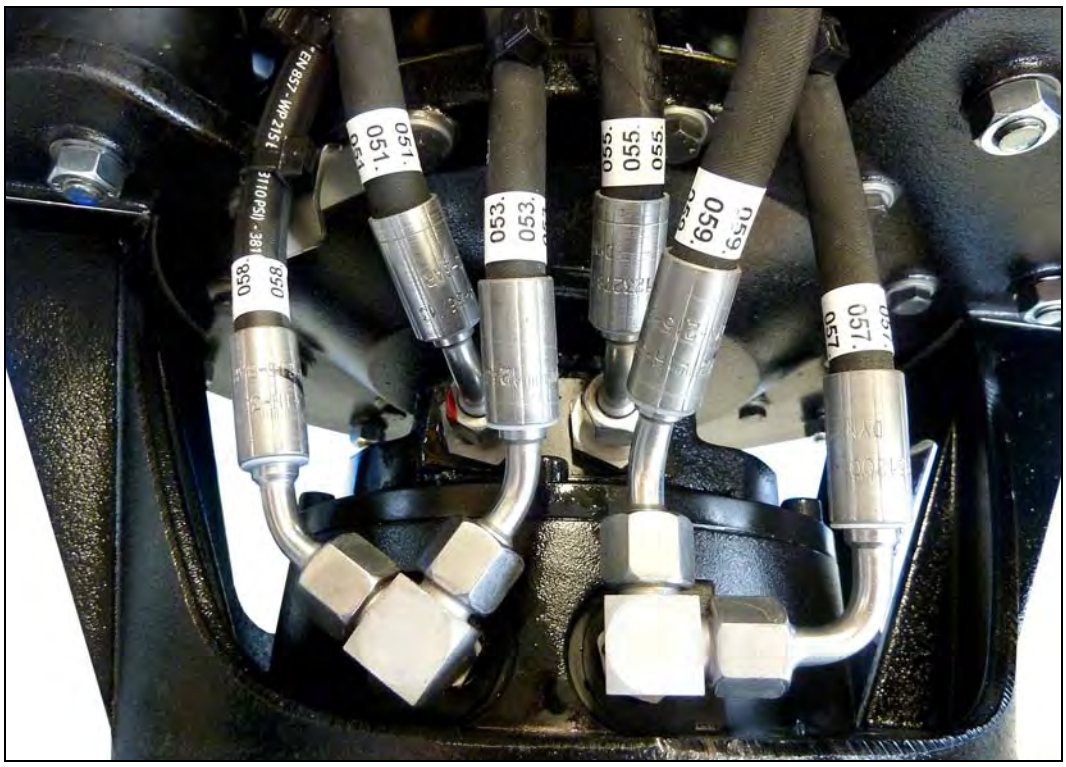



*Fig. 6-4 201310020001*

*Tab. 6-4 Hoses for rear right roller drum*

| No. | of | position |
|---|---|---|
| 51 | Drive circuit A, reverse | Junction at rear |
| 53 | Rear right drive motor brake | Junction at rear |
| 55 | Drive circuit B, forwards | Junction at rear |
| 57 | Leakage-oil return | Hydraulic oil tank return |
| 58 | Rear right drive motor brake L-fitting | Rear left drive motor brake |
| 59 | Rear right drive motor leakage oil L-fitting | Rear left drive motor leakage oil L-fitting |

### 6.2.2 *Valve block connections*

General information: The valve block is factory set.

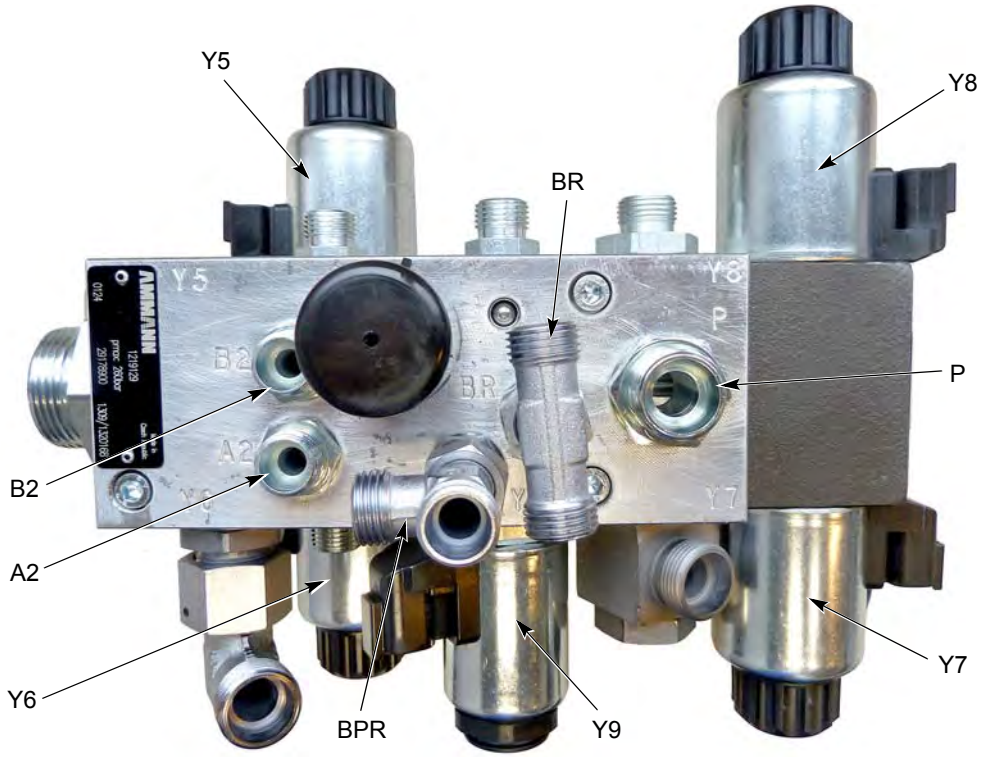



*Fig. 6-5 201309210103 / valve block top view*

*Tab. 6-5 Valve block solenoid valves*

| No. | Designation |
|---|---|
| Y5 | Steering left |
| Y6 | Steering right |
| Y7 | Big amplitude |
| Y8 | Small amplitude |
| Y9 | Brake |

*Tab. 6-6 Valve block connections*

| No. | Designation |
|---|---|
| BR | Brake |
| PBR | Charge pressure from drive pump G |
| P | Pressure from vibro/steering pump |
| A2 | Steering right / right steering cylinder |
| B2 | Steering left / right steering cylinder |

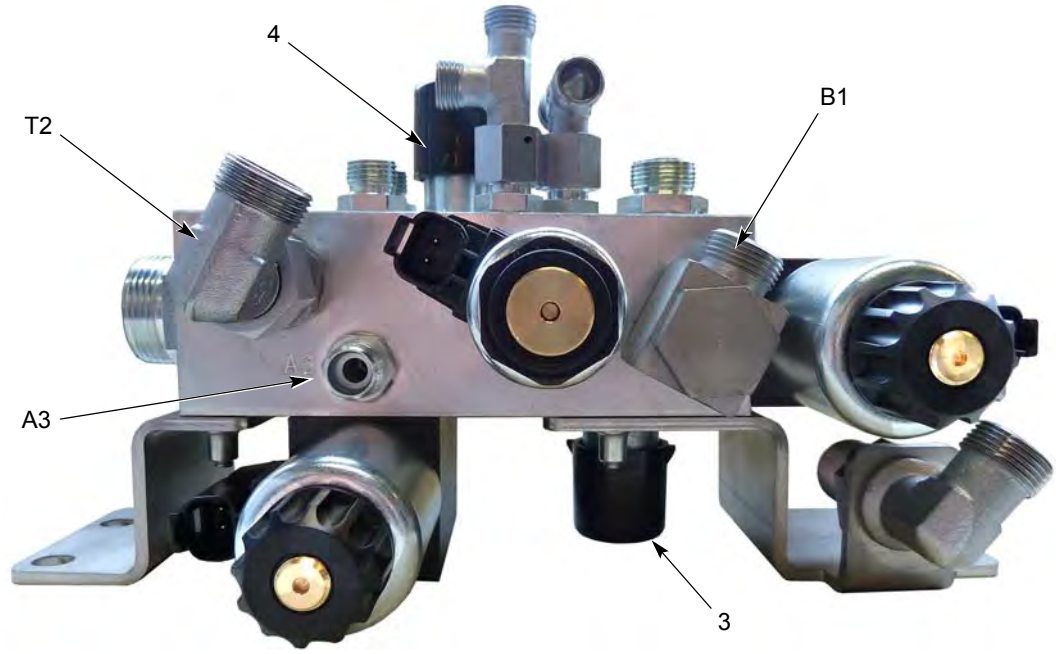



*Fig. 6-6 201309210104 / valve block front view*

*Tab. 6-7 Valve block front connections*

| No. | Designation |
|---|---|
| T2 | Tank supply line to drive pump T1 |
| A3 | Steering left / left steering cylinder |
| B1 | Rear left vibromotor / large amplitude elbow bulkhead screw connection |

*Tab. 6-8 Valve block pressure relief valve*

| No. | Designation |
|---|---|
| 3 | Vibration pressure relief valve (min. 210 bar / max. 230 bar)* |
| 4 | Steering pressure relief valve (min. 60 bar / max. 75 bar)* |

*** Values measured with engine speed of min. 2380 rpm / max. 2430 rpm**

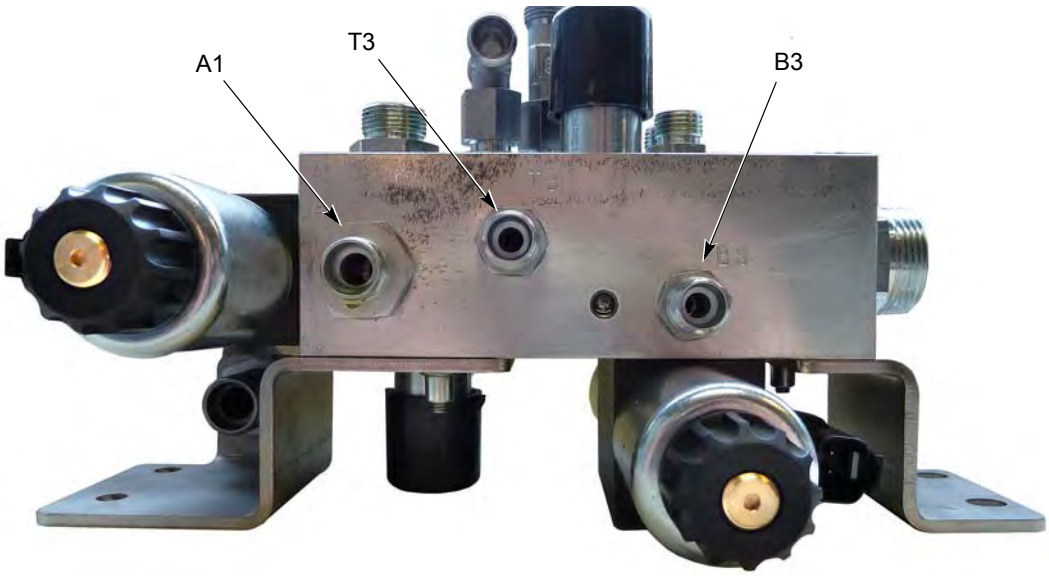



*Fig. 6-7 201309210105 / valve block rear view*

*Tab. 6-9 Valve block connections for hydraulic hoses, rear*

| No. | Designation |
|---|---|
| A1 | Front right vibromotor, small amplitude |
| T3 | Front left and right drive motor leakage oil |
| B3 | Steering left / left steering cylinder |

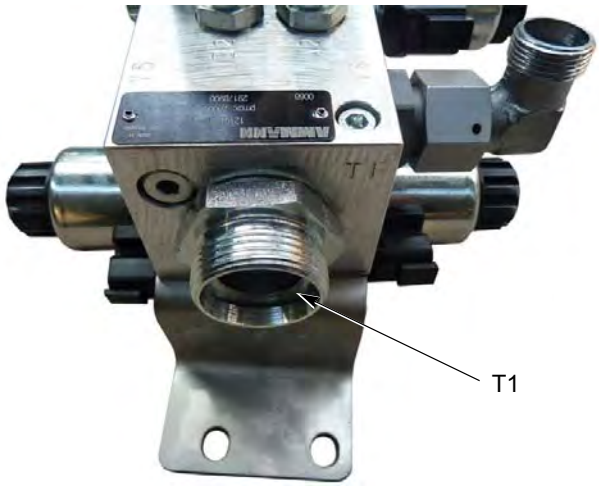



*Fig. 6-8 201309210106 / valve block right side view*

*Tab. 6-10 Valve block return*

| No. | Designation |
|---|---|
| T1 | Return via oil cooler, return flow filter to hydraulic oil tank |

### 6.2.3 Valve block hoses

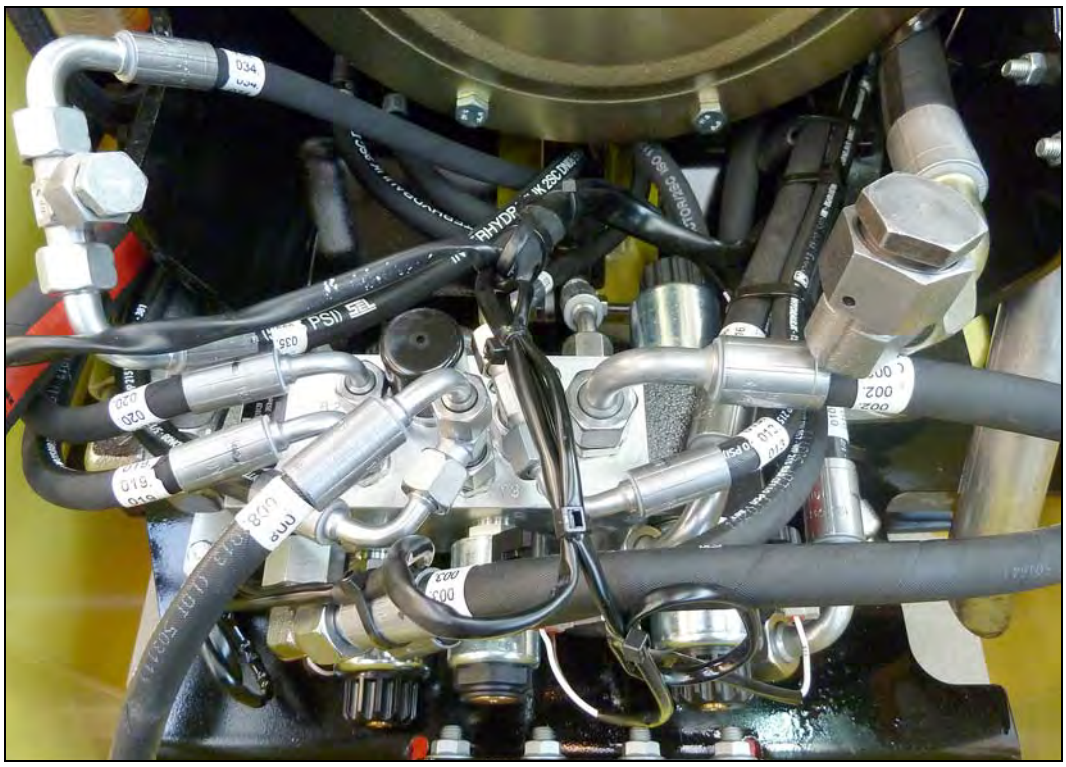


*Fig. 6-9 201309220068 / valve block top view*

*Tab. 6-11 Valve block solenoid valves*

| No. | of | position |
|---|---|---|
| 2 | Valve block P | Vibro/steering pump pressure L-fitting |
| 3 | Valve block T2, elbow fitting | Drive pump T1 |
| 4 | Valve block T1, elbow fitting | Hydraulic oil cooler in, elbow fitting |
| 7 | PBR valve block L-fitting | Flow divider T |
| 8 | PBR valve block L-fitting | Drive pump G, L-fitting |
| 13 | Valve block BR, T-fitting | Junction at rear |
| 16 | Valve block B1 | Junction rear elbow fitting |
| 17 | Valve block B3 | Left steering cylinder piston |
| 18 | Valve block A3 | Left steering cylinder rod |
| 19 | Valve block A2 | Right steering cylinder piston |
| 20 | Valve block B2 | Right steering cylinder rod |
| 30 | Valve block A1 | Front vibromotor, connection at front |
| 33 | Valve block BR, T-fitting | Front left drive motor brake, L-fitting |
| 37 | Valve block T3 | Front left drive motor leakage oil, L-fitting |

*Fig. 6-10 201310180001 / valve block bulkhead fitting*

*Tab. 6-12 Valve block solenoid valves*

| No. | of | position |
|---|---|---|
| 10 | Bulkhead fitting at valve block bracket | Junction rear elbow fitting |
| 36 | Bulkhead fitting at valve block bracket | Front vibromotor, connection at rear |

## *Junction at rear*

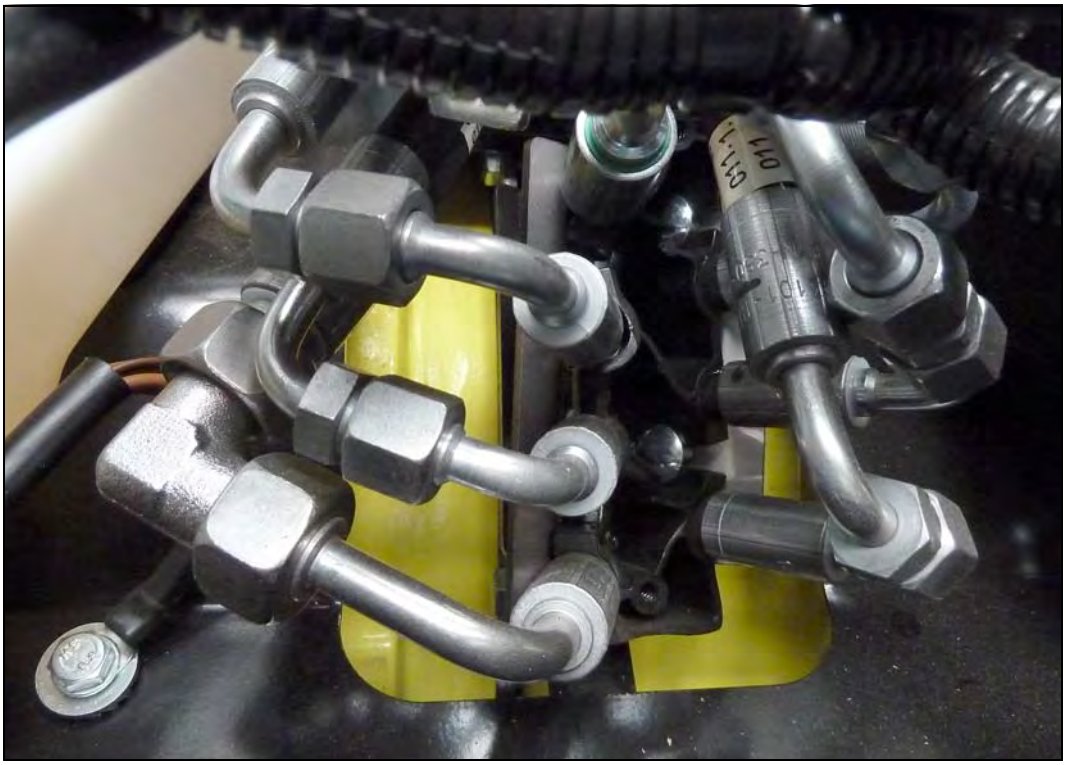


*Fig. 6-11 201311040001 / junction at rear*

## 6.3 Checking and adjusting pressures

All values apply at a hydraulic oil temperature of approx. 60 °C and max. diesel engine speed.

Bleed pressure relief for a maximum of 5 sec.

Use the following pressure gauge:

- For high pressure = min. 400 bar
- For charge pressure = min. 40 bar

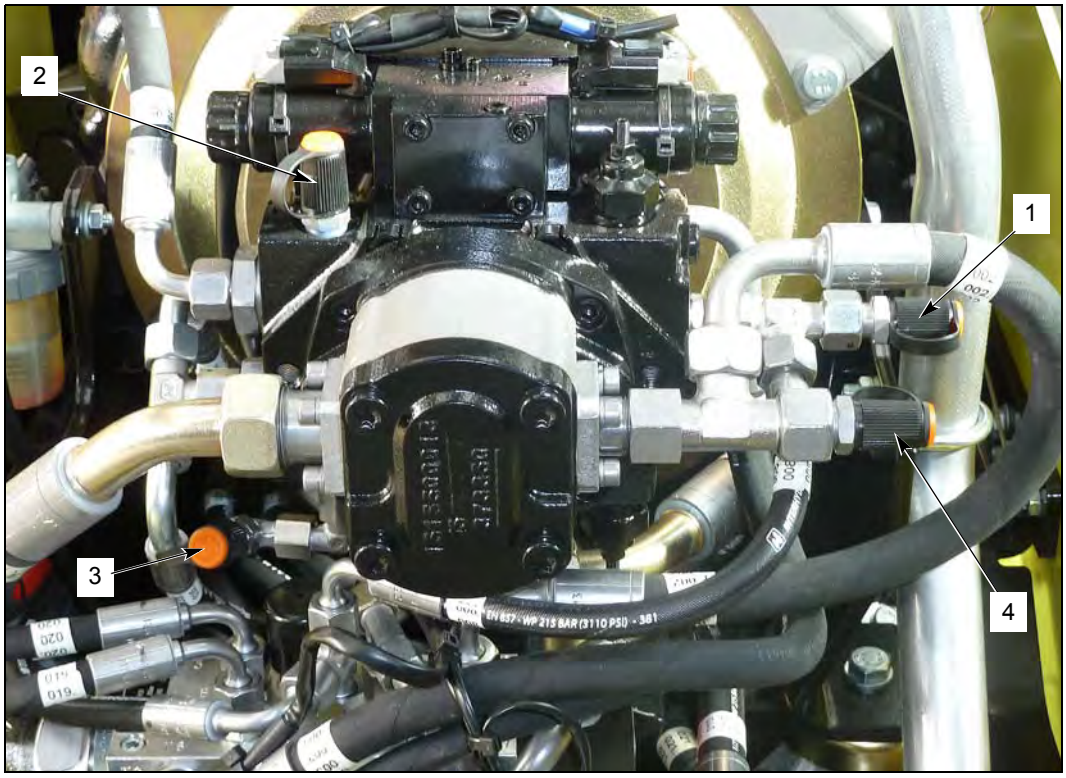



*Fig. 6-12 201309210060 / drive pump, vibro/steering pump*

**1** M1 charge pressure
21 ± 2 bar; can only be adjusted using washers.

**2** MB forward drive pressure
330 ± 15 bar; measure with the roller drums blocked.

**3** MA backward drive pressure of
330 ± 15 bar; measure with the roller drums blocked.

**4** M2 vibration switch-on pressure
220 ± 10 bar

M2 steering pressure
67 ± 8 bar.

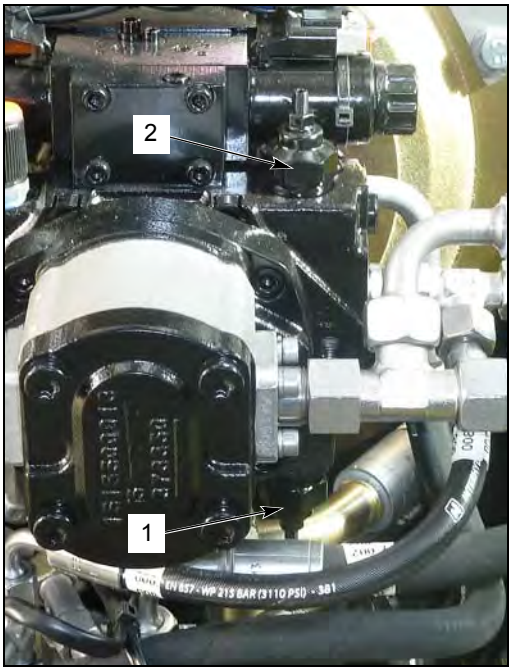



*Fig. 6-13 201309210060*

**1** Set drive pressure forward

**2** Setting drive pressure forward.

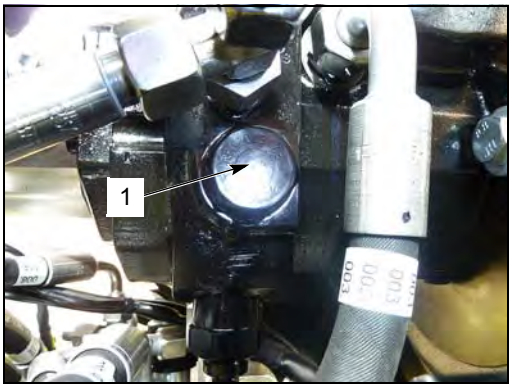



*Fig. 6-14 201309210057*

**1** Charge pressure valve (adjustable with spacer disks)

**⚠CAUTION**

**Oil can overheat and seals can be damaged.**

During the test procedures listed below, be certain that:

- The engine only runs at full speed for max. 5 s.

**1** After the test procedures, reconnect all hydraulic hoses.

**2** Start test run.

**3** Check to be sure connections do not leak.

### 6.3.1 Checking the steering pressure

*Fig. 6-15 10460297 / 1575 steering end position*

**1** Use the control unit to steer the machine fully to the right or left end stop.

**1.1** Keep the lever actuated throughout the entire following procedure.

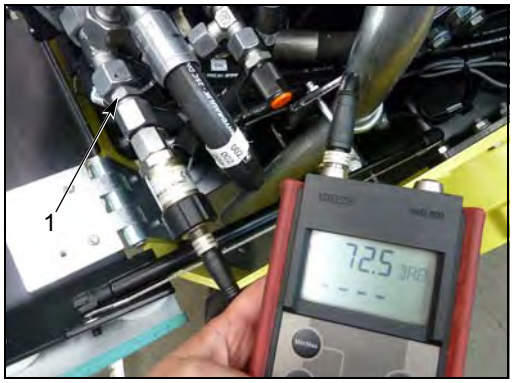



*Fig. 6-16 201310020006*

**1** Measuring point **(1)** vibro/steering pressure.

If a steering pressure of 67 ± 7 bar is not achieved, then:

- The right steering cylinder line must be removed and sealed pressure-tight.
- The left steering cylinder line must be removed and sealed pressure-tight.
- The valve block must be removed. Siehe “Replacing the valve block” see page 250.
- The steering pressure relief valve must checked.

### 6.3.2 Checking the maximum vibration pressure

This procedure must be carried out if the vibration switch-on pressure falls below 200 bar.

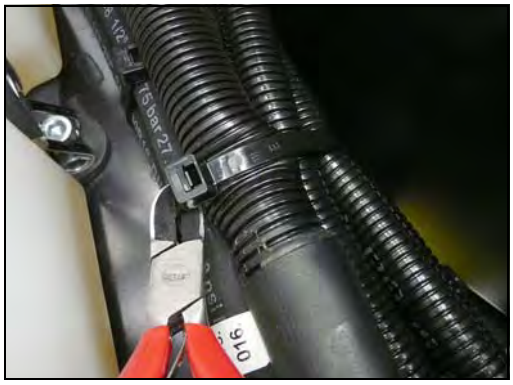


*Fig. 6-17 21311190001*

**1** Open the rear hood.

**2** Gain access to the elbow screw connection.

**2.1** Cut through all the cable ties on the hose bundle.

*Fig. 6-18 21311190002*

**1** Disconnect the hydraulic hose (016) from the elbow screw connection (AF size 27/AF size 22).

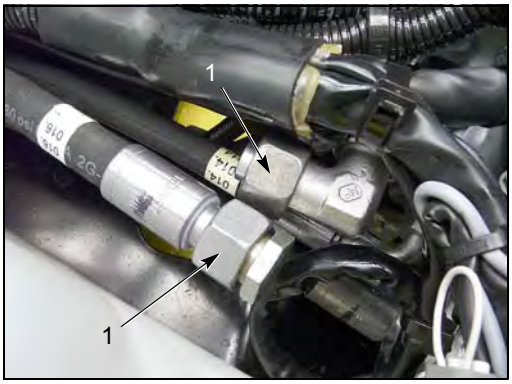



*Fig. 6-19 21311190003*

**1** Seal the screw connections **(1)** pressure-tight.


*Fig. 6-20 21311190004*

**1** Remove the knurled nut and O-ring on solenoid valve Y8 **(1)** .

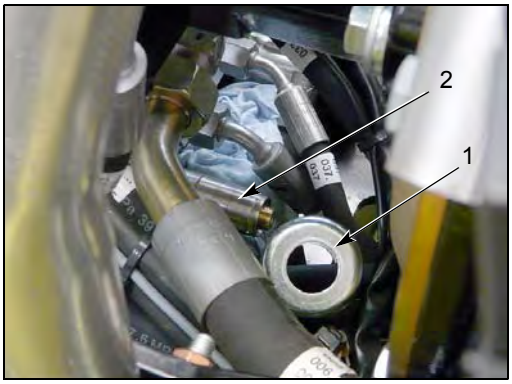



*Fig. 6-21 21311190006*

**1** Remove the magnetic coil **(1)** from the solenoid valve **(2)**.


*Fig. 6-22 21311190008*

**1** Remove the hydraulic hose (030).


*Fig. 6-23 21311190014*

**1** Seal the screw connection (AF size 22) pressure-tight.

*Fig. 6-24 21311190009*

**1** Re-mount the magnetic coil.


*Fig. 6-25 201310020007*

**1** Connect a pressure gauge (min. 250 bar) to the vibration pressure measuring point **(1)**.

**2** Start the engine.

**2.1** Full speed

**3** Switch on vibration

**3.1** Let it run for a maximum of 5 sec.

If the vibration pressure of 220 ± 10 bar is not achieved, then:

- The valve block must be removed. Siehe “Replacing the valve block” see page 250.
- The vibration pressure relief valve must checked.

After the test, the following tasks must be carried out:

- Connect the hydraulic hoses
- Top up oil
- Clean the machine
- Start the machine
- Check for leakage and proper function

### 6.3.3 Checking the maximum charge pressure

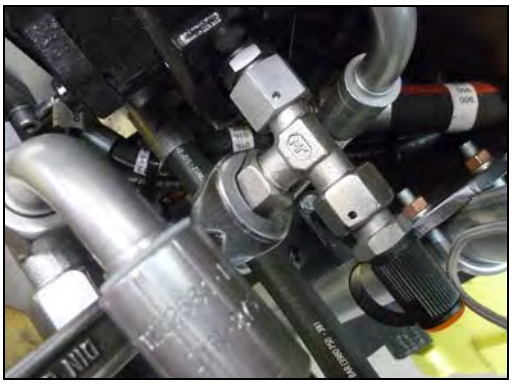


*Fig. 6-26 201311210010*

**1** Remove hydraulic hose 008 at the charge pressure measuring point.


*Fig. 6-27 201311210011*

**1** Seal the screw connections **(1)** pressure-tight.

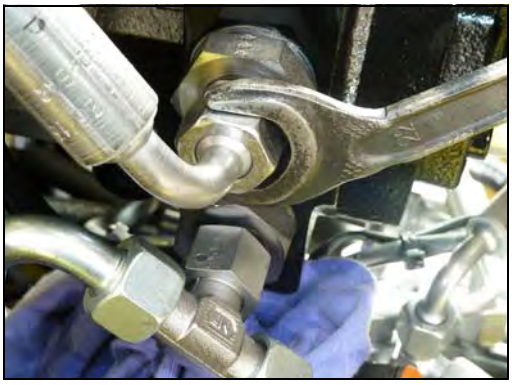


*Fig. 6-28 201309210080*

**1** Remove the hydraulic hose for drive circuit B (forwards) from the drive pump.

**2** Seal the screw connections pressure-tight.

*Fig. 6-29 201309210084*

**1** Remove the drive circuit A (reverse) T-screw connection from the drive pump.

**2** Seal the screw connections pressure-tight.


*Fig. 6-30 201310020010*

**1** Connect the pressure gauge (min. 40 bar) to the charge pressure measuring point **(1)**.

**2** Start the engine.

**2.1** Full speed

**2.2** Let it run for a maximum of 5 sec.

If a charge pressure of 21 ± 2 bar is not achieved, then:

- The charge pressure valve must be checked. See page 57.

If the pressure still cannot be achieved, the drive pump must be replaced. Siehe “Replacing the drive pump” see page 237.

### *6.3.4 Checking the drive pressures (reverse / forwards)*

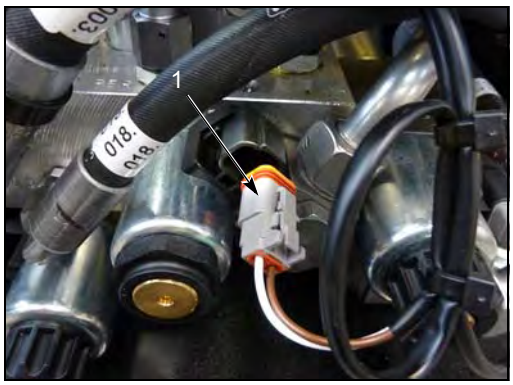



*Fig. 6-31 201310020005*

**1** Disconnect connector Y9 **(1)** from the valve block.


*Fig. 6-32 201310020009*

1 Connect a pressure gauge (min. 400 bar) to the drive pressure measuring point MA **(1)**.

2 Start the engine.

**2.1** Full speed

3 Drive in **reverse** against the brake.

**3.1** Let it run for a maximum of 5 sec.


*Fig. 6-33 201211270001*

1 Connect a pressure gauge (min. 400 bar) to the drive pressure measuring point MB **(1)**.

2 Start the engine.

**2.1** Full speed

3 Drive **forwards** against the brake.

**3.1** Let it run for a maximum of 5 sec.

If one of the drive pressures of 330 ± 15 bar is not achieved, then:

- The drive motors must be checked. page 63.
- The drive pump maximum pressure must be checked. page 64.

If the pressure still cannot be achieved, the drive pump must be replaced. Siehe “Replacing the drive pump” see page 237.

### *6.3.5 Checking the drive motors*

The following operation is necessary if:

- The drive pump test is positive.
- The pressure is not achieved with the drive motor which is connected.

Check the drive motors individually one after the other.

*Fig. 6-34 201310010053*

1 Remove the hydraulic hoses for drive circuits A and B from the drive motor.

2 Seal the screw connections pressure-tight.

3 Perform test procedure as described under *6.3.4*.

### 6.3.6 Checking the maximum drive pump pressure (reverse / forwards)

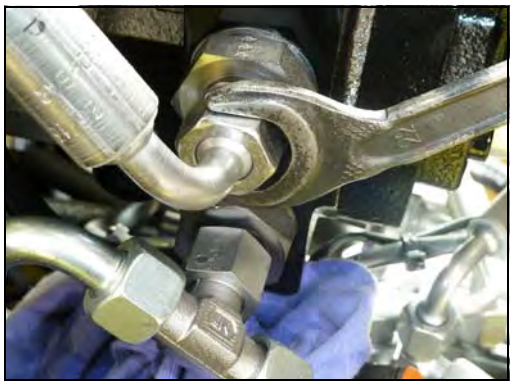


*Fig. 6-35 201309210080*

**1** Remove the hydraulic hose for drive circuit B (forwards) from the drive pump.

**2** Seal the screw connections pressure-tight.

*Fig. 6-36 201309210084*

**1** Remove the drive circuit A (reverse) T-screw connection from the drive pump.

**2** Seal the screw connections pressure-tight.


*Fig. 6-37 201310020009*

**1** Connect a pressure gauge (min. 400 bar) to the drive pressure measuring point MA.

**2** Start the engine.

**2.1** Full speed

**3** Drive at full in **reverse** against a block.

**3.1** Let it run for a maximum of 5 sec.


*Fig. 6-38 201211270001*

**1** Connect a pressure gauge (min. 400 bar) to the drive pressure measuring point MB **(1)**.

**2** Start the engine.

**2.1** Full speed

**3** Drive at full **forwards** against a block.

**3.1** Let it run for a maximum of 5 sec.

If the maximum drive pump pressure of 330 ± 15 bar is not achieved, then:

- The drive pump must be replaced. Siehe “Replacing the drive pump” see page 237.

## 6.4 Setting the drive pump to the neutral position

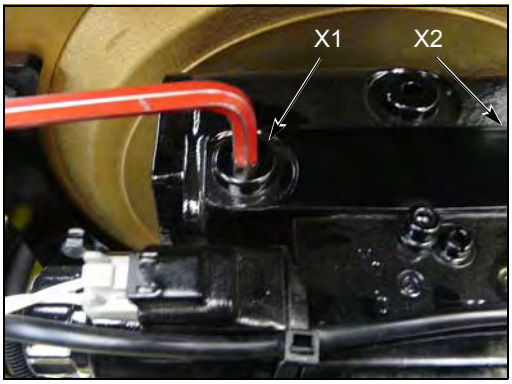



*Fig. 6-39 201211260060*

**1** Remove the **X1** and **X2** plugs (size 6).

*Fig. 6-40 201211260061*

**1** Use an Allen key (size 3) to remove the cap.

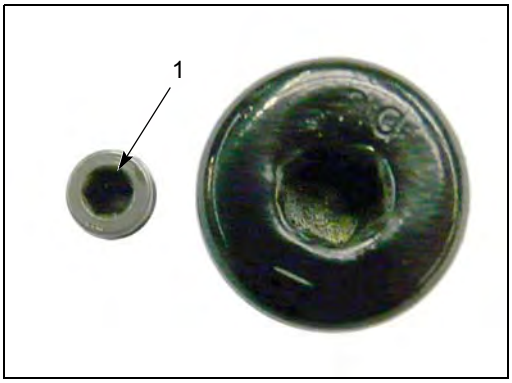



*Fig. 6-41 201211260062*

**1** Check the cap **(1)** for any dirt accretions or other blockages.

**1.1** Use compressed air to clean them out.

**2** Install plugs X1 and X2 (40 Nm).

**NOTE**
**The cap must be tightened securely when reassembled!**

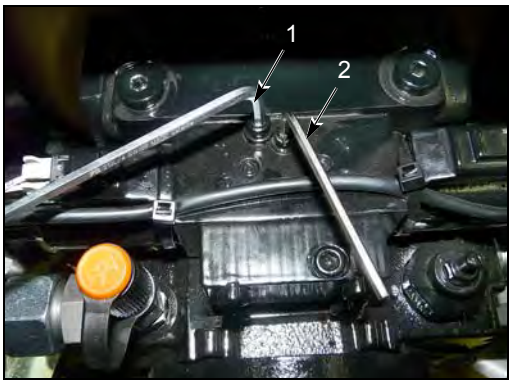



*Fig. 6-42 201211270063*

**1** Safely jack up the machine.

**2** Let the machine run.

**3** Unscrew the lock screw (size 4) **(1)**.

**4** Set the neutral position **(2)**.

**4.1** Carefully turn the key (size 3) until the roller drum stops.

**5** Tighten the lock screw.

### 6.4.1 Checking the drive pump's solenoid

Fig. 6-43 201301170001

The drive pump's solenoid cannot be actuated mechanically.

Fig. 6-44 201301170002

**1** Unscrew the knurled nut.

Fig. 6-45 201301170003

**1** Pull out the solenoid.

Fig. 6-46 201301170004

**1** Unscrew the solenoid valve (size 17).

Fig. 6-47 201301170005

*Fig. 6-48 201301170006*

**1** Measure the solenoid's Y3 / Y4 resistance.

**1.1** Approx. resistance of 6 ohms.

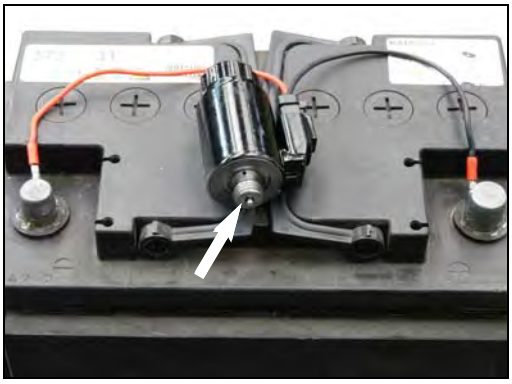


*Fig. 6-49 201301170007*

**1** Apply a voltage of 12 V to the solenoid valve.

**2** The valve (arrow) must be visibly actuated.

### *Changing the solenoid's connector position*

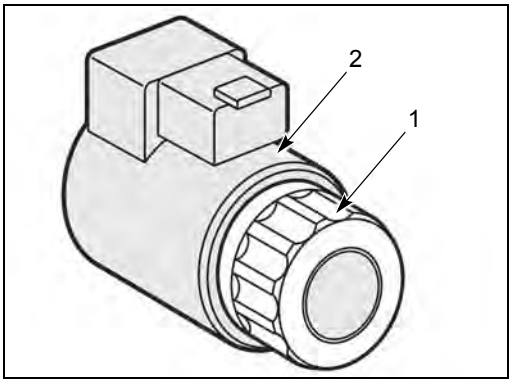



*Fig. 6-50 201301170007*

If necessary, you can change the connector's position by turning the solenoid body.

**1** Loosen the solenoid's securing nut **(1)**.

**1.1** Turn the securing nut **(1)** one full counterclockwise rotation.

**2** Turn the solenoid body **(2)** to the position you want.

**3** Tighten the securing nut. Securing nut tightening torque: 5+1 Nm.

## 6.5 Checking the drive pump servo-block

This operation must be carried out if:

- The machine has been checked over electrically but still does not drive.
- The machine only move in one direction.
- The machine only moves slowly even when the operating lever is at full speed.
- The machine moves erratically.

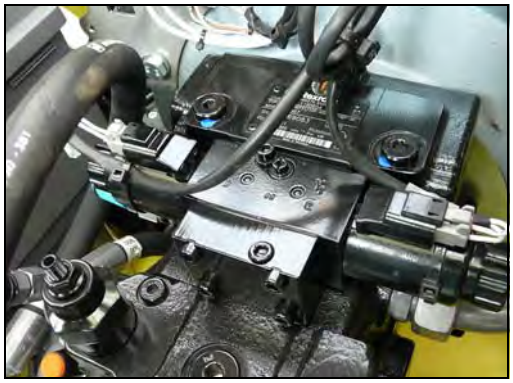


*Fig. 6-51 201308290001*

View of drive pump.

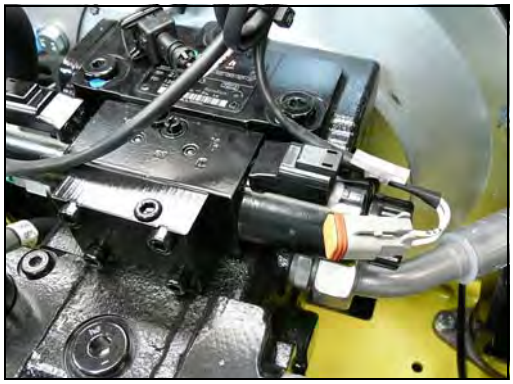


*Fig. 6-52 201308290002*

**1** Pull the connectors off of the magnetic coils Y3 (left) and Y4 (right).


*Fig. 6-53 201308290003*

**1** Remove closure plugs X1 and X2 (AF size 6).


*Fig. 6-54 201308290004*

View of the drive pump without the closure plugs.

**NOTE**
**If the oil at the site of the unscrewed plug does not flow back into the pump housing, then the apertures are clogged or the piston is not at the center and is jammed.**

*Fig. 6-55 201308290005*

**1** Loosen and unscrew the apertures (size 3).

**NOTE**
**The apertures must not be loose! Loose apertures lead to problems with driving.**

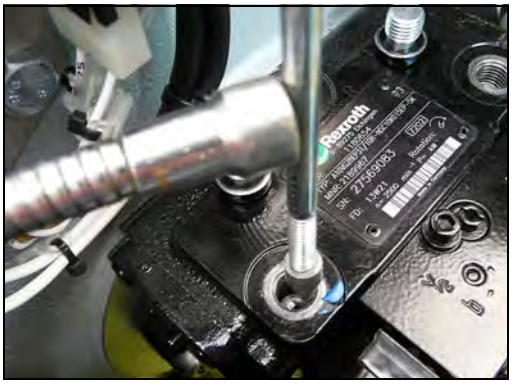


*Fig. 6-56 201308290006*

**1** The loosened apertures can best be lifted out with a small magnet. Improvise if needed.


*Fig. 6-57 201308290007*

View of the dismantled aperture holder **(1)** with the apertures.

*Fig. 6-58 201308290008*

**1** Unscrew the knurled nut.

*Fig. 6-59 201308290009*

**1** Pull off the magnetic coils.

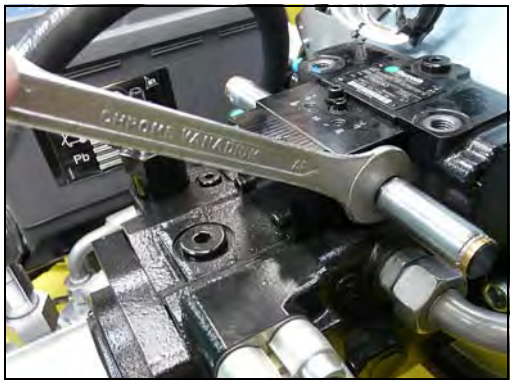


*Fig. 6-60 201308290010*

**1** Unscrew the solenoid valve (size 17).

*Fig. 6-61 201308290011*

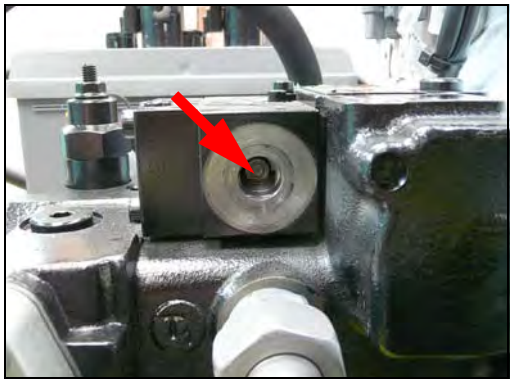


*Fig. 6-62 201308290012*

View of the control spools.

**NOTE**
**The control spool is spring-loaded and must always slide back to the 0 position by itself.**

*Fig. 6-63 201308290013*


*Fig. 6-64 201308290014*

1 Checking the movement of the control spool, for example using a screwdriver.

2 Push the control spool from the left and right all the way to the stop three or four times.

**NOTE**

- **It must not jam under any circumstances!**
- **It must slide smoothly without catching and return smoothly to the 0 position by means of the spring force. This must be the case on both sides.**

**NOTE** **If the control spool does not move without catching after several tries or it does not return to the 0 position by itself, then it is mechanically damaged.**
**The servo-block must be repaired in a qualified repair shop.**

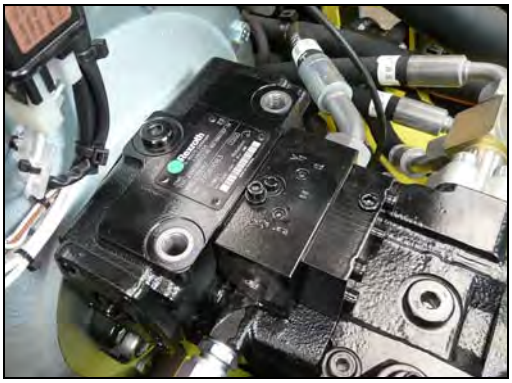


*Fig. 6-65 201308290015*

View of the pump before assembly.

*Fig. 6-66 201308290016*

**1** Check the seals of the solenoid valve for damage.

**2** Oil lightly.

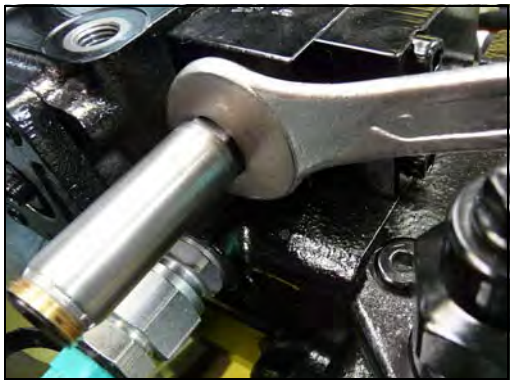


*Fig. 6-67 201308290017*

**1** Install the solenoid valve (AF size 17).

*Fig. 6-68 201308290018*

**1** Put the cleaned aperture with the aperture holder in place and tighten.

*Fig. 6-69 201308290020*

**1** Check the seal of the closure plug.

**2** Lubricate the seal lightly with oil.


*Fig. 6-70 201308290019*

**1** Put both plugs in place and tighten.

*Fig. 6-71 201308290021*

**1** Re-mount the two magnetic coils.

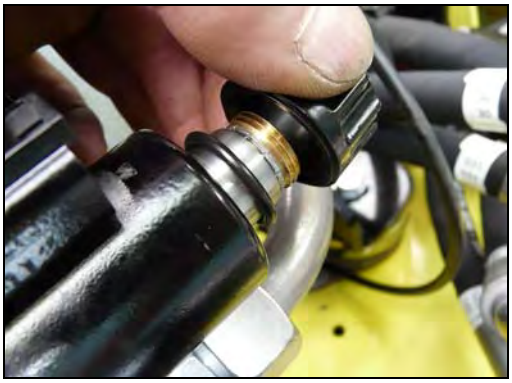


*Fig. 6-72 201308290022*

**1** Put the O-ring in place and tighten the knurled nut.

**1** Connect the cable.

**2** Secure them with cable ties.

**3** Perform a functional check and look for leakage.

## 6.6 Checking the flow divider

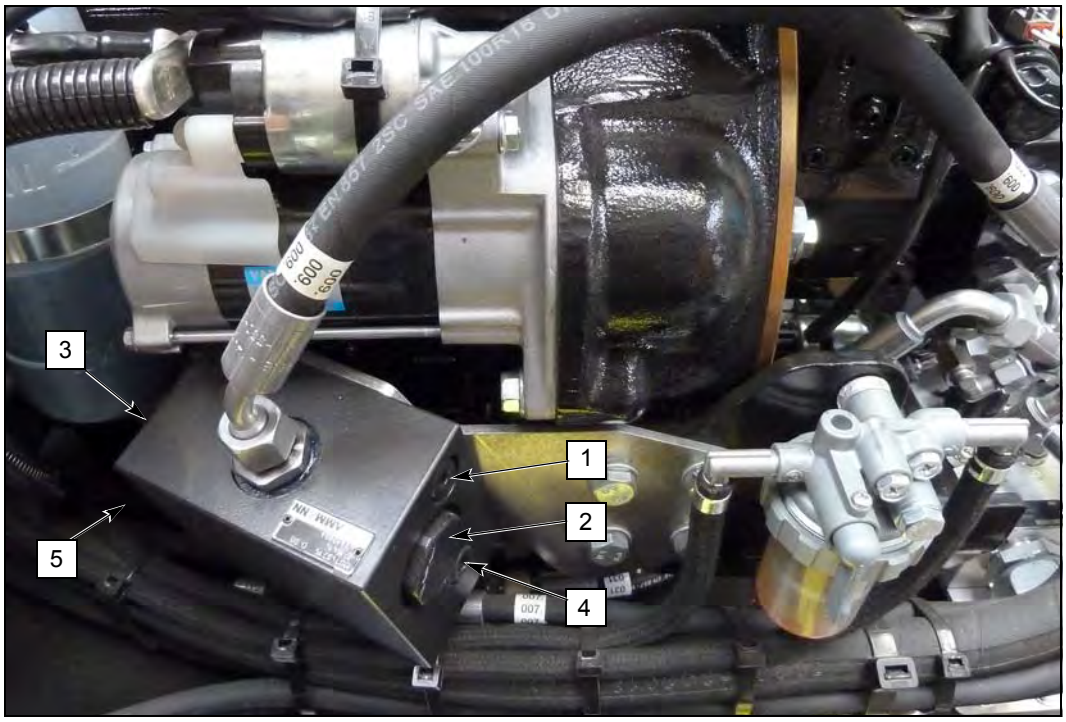



*Fig. 6-73 201311050001 / flow divider*

1 Access to aperture
2 Access to front piston
3 Access to rear piston
4 Access to front check valve
5 Access to rear check valve

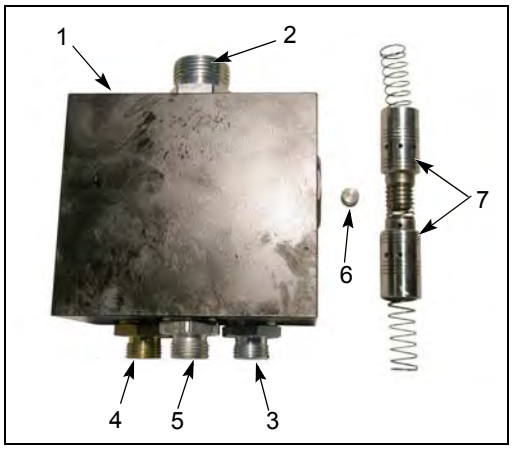



*Fig. 6-74 200907220001*

**1** Flow divider housing
**2** Connector P of pump B
**3** Flow divider B to junction at rear
**4** Flow divider A to junction at rear
**5** Connector T of pump G
**6** Aperture
**7** Two spring-loaded pistons

*Fig. 6-75 201211130107*

**NOTE** **In case of faults, jerky driving, check aperture for soiling. If necessary, short-circuit the flow divider = remove the entire piston package.**

## 6.7 Speeds and pressures

*Tab. 6-13 Speeds and pressures*

| | | | After 5 min. | After 60 min. |
|---|---|---|---|---|
| Diesel engine speed | | rpm | 2415 ±25 | 2405 ±25 |
| Vibration speed | Front, small | rpm | 2250 ±150 | 2250 ±150 |
| | Rear, small | rpm | 2250 ±150 | 2250 ±150 |
| | Front, large | rpm | 2250 ±150 | 2250 ±150 |
| | Rear, large | rpm | 2250 ±150 | 2250 ±150 |
| Charge pressure | | PSI (bar) | 306 (21) ±2 | 306 (21) ±2 |
| Working pressures for driving | Forwards | PSI (bar) | 1450 (100) ±20 | 1450 (100) ±20 |
| | Reverse | PSI (bar) | 1450 (100) ±20 | 1450 (100) ±20 |
| Vibro drive pressures * | Small amplitude | PSI (bar) | 1522 (105) ±55 | 942 (65)±15 |
| | big amplitude | PSI (bar) | 1595 (110) ±50 | 1160 (80) ±20 |
| Maximum drive pressure | Blocked, forwards | PSI (bar) | - | 4786 (330) ±15 |
| | Blocked, in reverse | PSI (bar) | - | 4786 (330) ±15 |
| Maximum pressure | Steering | PSI (bar) | - | 972 (67) ±7 |
| | Vibration | PSI (bar) | - | 3191 (220) ±10 |

* When first started, it is only possible to use the small amplitude vibration function for the first 2minutes.

## 6.8 Hydraulics diagram

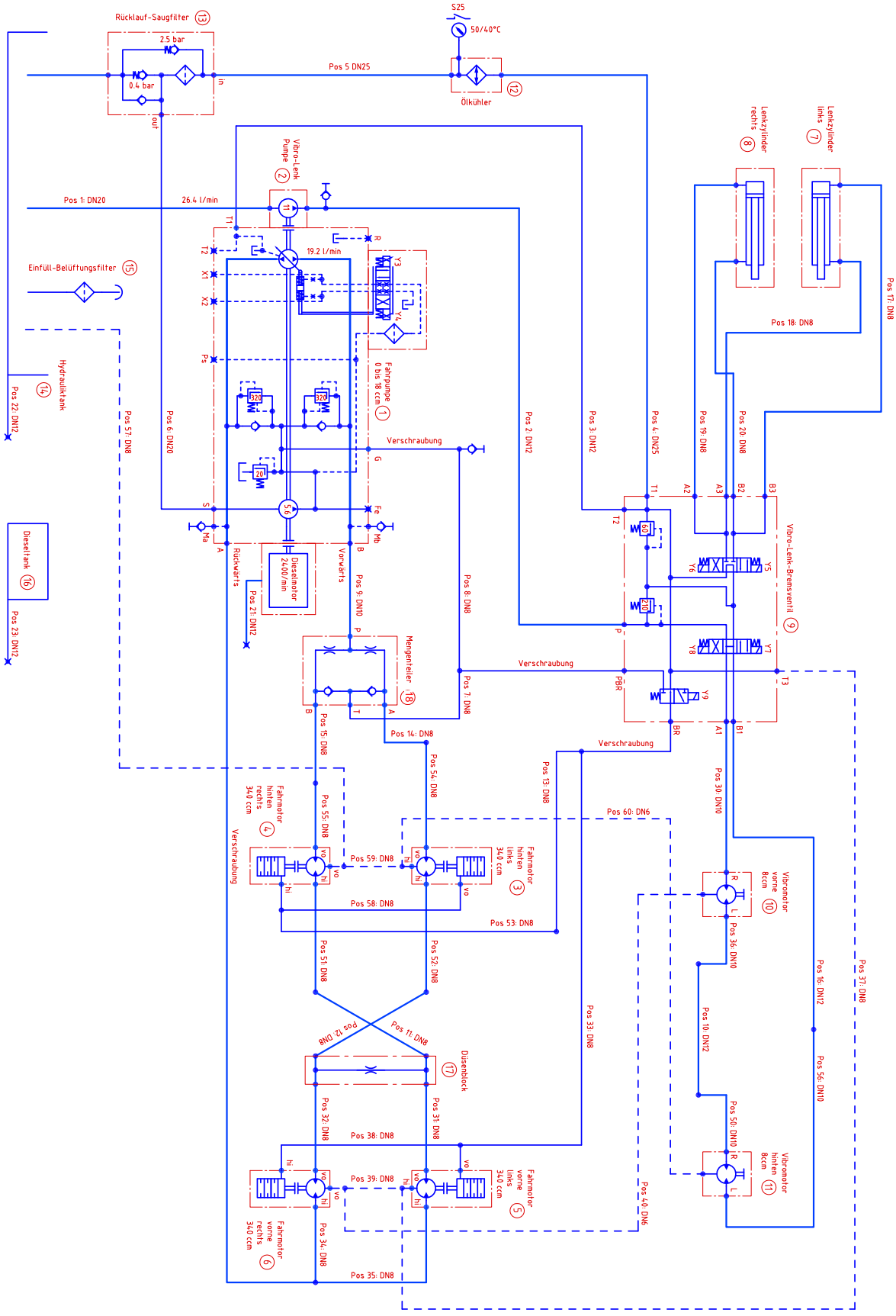



*Fig. 6-76 Hydraulics diagram no. 10442344*

### 6.8.1 Hydraulics Diagram Legend

*Tab. 6-14 Hydraulics Diagram Legend*

| Element | Description |
|---|---|
| 1 | Drive pump |
| 2 | Vibro-steering pump |
| 3 | Drive motor, rear left |
| 4 | Drive motor, rear right |
| 5 | Front left drive motor |
| 6 | Front right drive motor |
| 7 | Left steering cylinder |
| 8 | Right steering cylinder |
| 9 | Valve block |
| 10 | Vibro motor, front |
| 11 | Vibro motor, rear |
| 12 | Oil cooler |
| 13 | Hydraulic oil filter |
| 14 | Hydraulic oil tank |
| 15 | Ventilation filter |
| 16 | Diesel tank |
| 17 | Hydraulic manifold |
| 18 | Flow divider |

# 7

# Electrical system

## 7.1 Engine electrical system / Fuses

**⚠ DANGER**

**There is danger to life if the roller does not stop in hazardous situations!**

- Fuses and safety switches must never be shorted.

**⚠ CAUTION**

**Risk of injury through short circuit and cable fire when handling electrical parts!**

- Always disconnect the power supply when working on the electrical system.

**NOTE** **Before replacing the fuse, you must identify and remove the cause of the fault.**


Always replace a defective fuse **(1)** with a functioning fuse **(2)** of the same amperage (according to the label or color of the fuse).

### *7.1.1 Engine compartment*

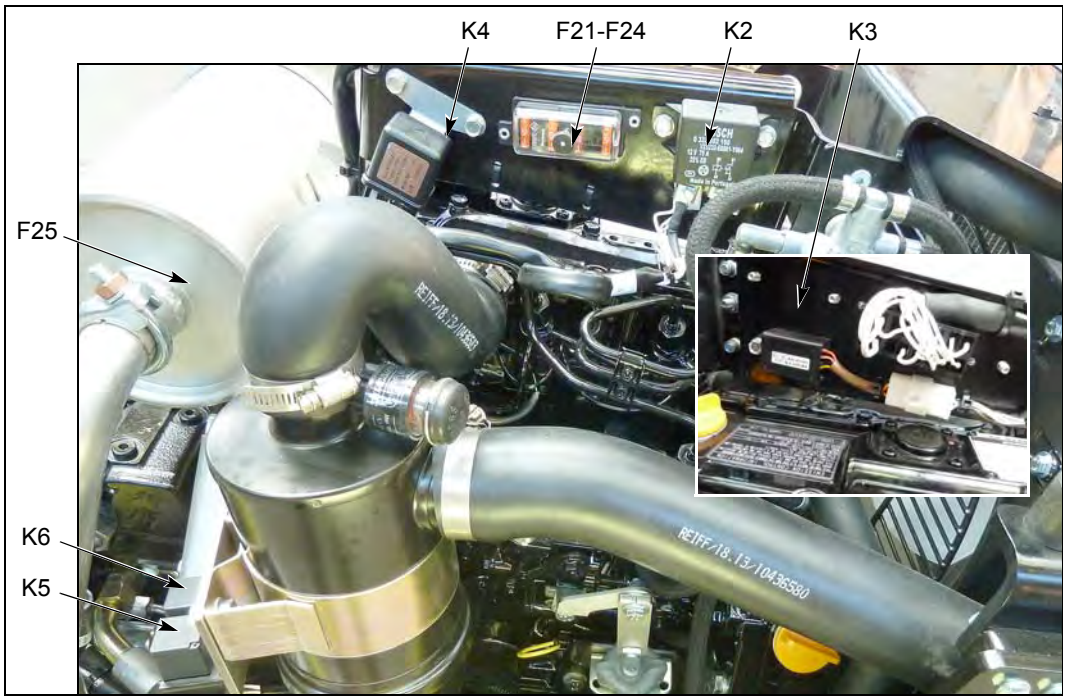



*Fig. 7-1 Relay / Engine compartment fuses*

*Tab. 7-1 Engine compartment relay functions*

| | Function |
|---|---|
| K2 | Starter relay start inhibit |
| K3 | Timer 1s pull-in solenoid |
| K4 | Relay for pull-in solenoid of stop solenoid |
| K5 | Magnetic rotational speed sensor |
| K6 | Relay for pre-heating |

**NOTE** **K3 is located on the back of the metal sheet.**

*Tab. 7-2 Engine compartment fuses*

| Fuse No. | Power | Fuse-protected circuit | Socket |
|---|---|---|---|
| F21 | 40 A | Pull-in solenoid of stop solenoid | A-1 |
| F22 | 10 A | Diesel pump, alternator 15+ | B-2 |
| F23 | 40 A | Magnetic rotational speed sensor | C-3 |
| F24 | 40 A | Pre-heating glow plug | D-4 |
| F25 | 40 A | 2. Single coil (tier 4) (option) | |

## *Height sensor, tier 4*

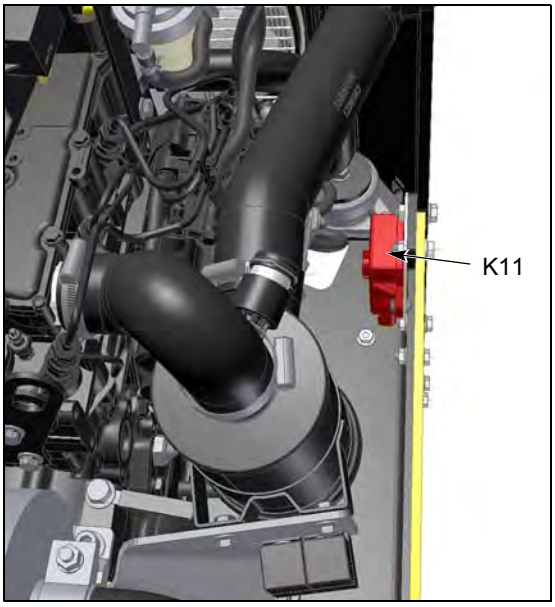



*Fig. 7-2 Relay, tier 4*

*Tab. 7-3 Tier 4 relay functions*

| | Function |
|---|---|
| K11 | Height sensor, tier 4 |

### 7.1.2 Chassis rear

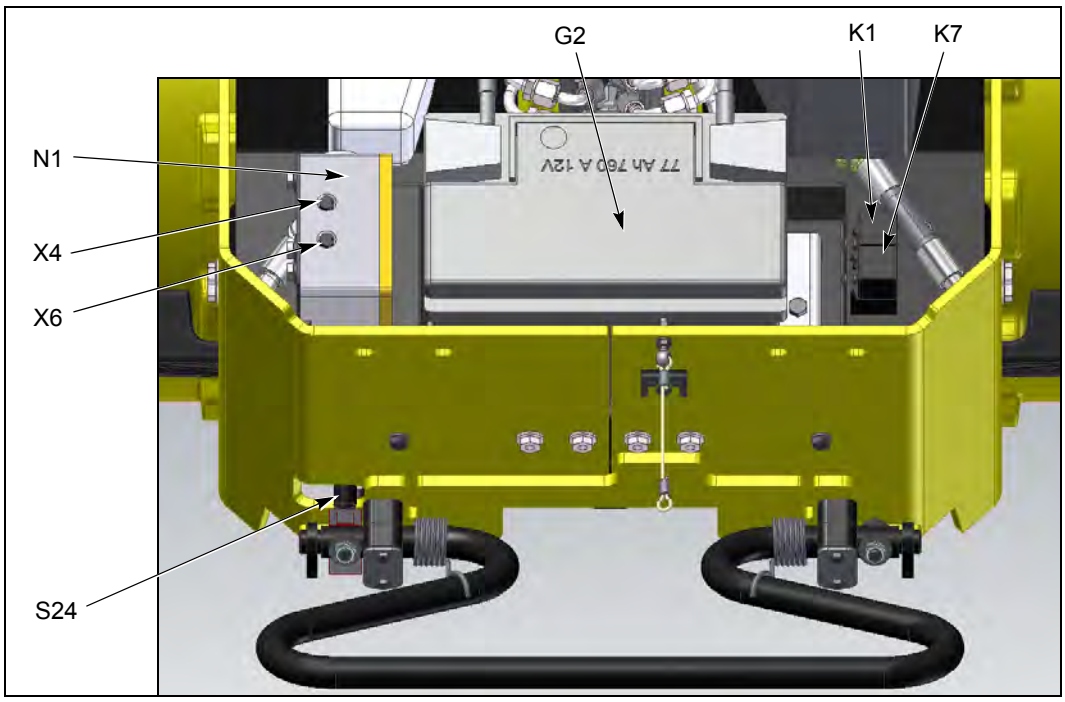



*Fig. 7-3 Rear chassis relay*

*Tab. 7-4 Rear chassis relay functions*

| | Function |
|---|---|
| G2 | Battery |
| K1 | Relay, ignition |
| K7 | Relay, hydraulic oil cooler |
| N1 | Machine controller |
| S24 | Switch, shutdown bar sensor (option) |
| X4 | Front infrared sensor P1 |
| X6 | Rear infrared sensor P2 |

**NOTE** **Machines without a shutdown bar will not have an S24 proximity switch. A jumper is inserted instead of the switch.**

**NOTE** **Infrared sensor connectors X4 and X6 can be interchanged. This will not affect the machine in any way.**

### 7.1.3 Cockpit

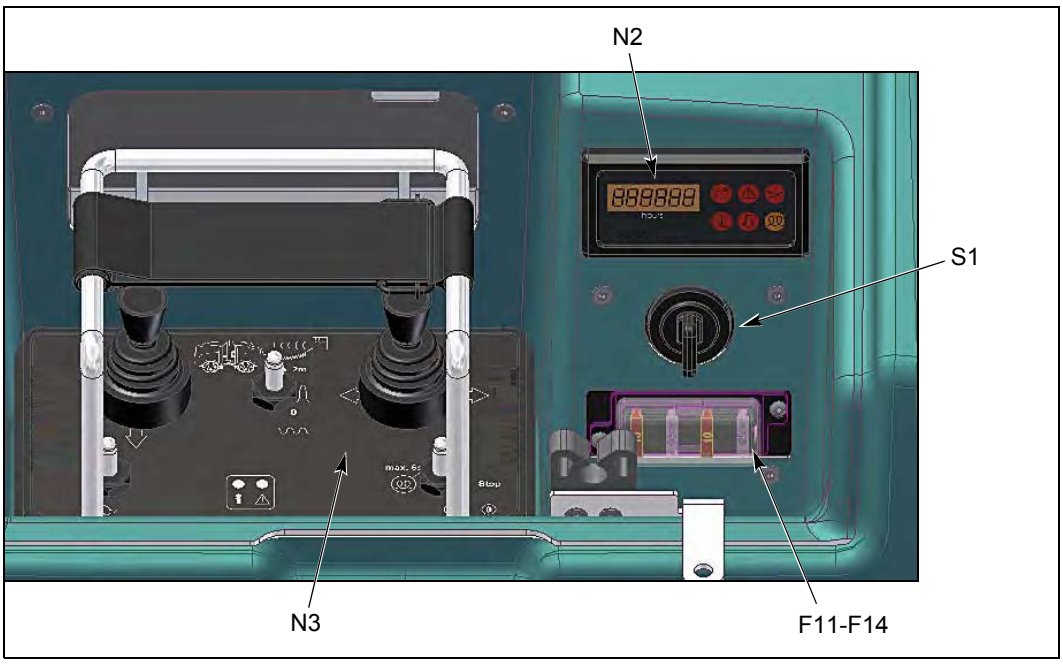



*Fig. 7-4 Relay / cockpit fuses*

*Tab. 7-5 Cockpit relay functions*

| | Function |
|---|---|
| N2 | Display unit |
| N3 | Infrared transmitter |
| S1 | Ignition switch |

## *Fuses*

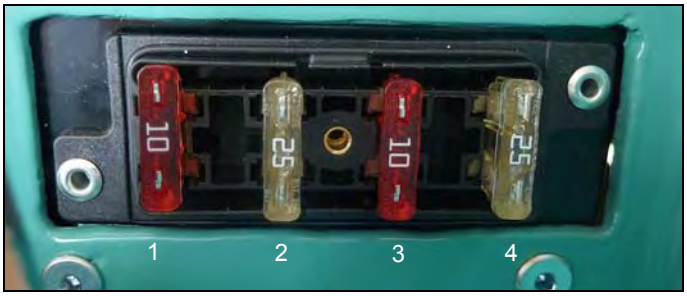



*Fig. 7-5 Cockpit fuses*

*Tab. 7-6 Cockpit fuses*

| Fuse No. | Power | Fuse-protected circuit | Socket |
|---|---|---|---|
| F11 | 10 A | Machine controller supply | A-1 |
| F12 | 25 A | Machine controller outputs | B-2 |
| F13 | 10 A | Display unit, shutdown bar | C-3 |
| F14 | 25 A | Hydraulic oil cooler | D-4 |

## *Display unit N2*

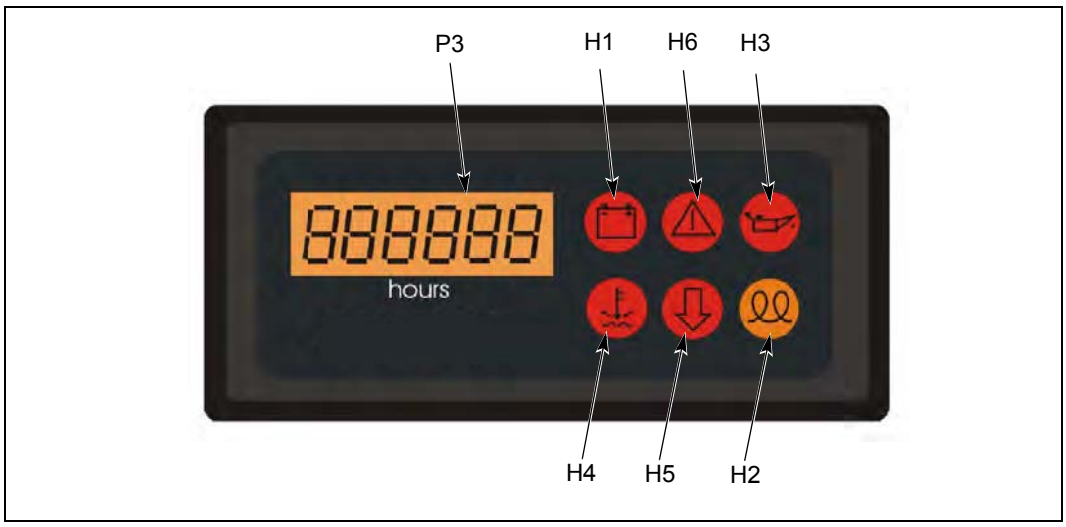



*Fig. 7-6 Display unit N2*

*Tab. 7-7 N2 display unit functions*

| | **Function** |
|---|---|
| H1 | Battery charge indicator |
| H2 | Pre-heating control lamp |
| H3 | Oil pressure warning indicator |
| H4 | Water temperature warning indicator |
| H5 | Shutdown bar warning lamp |
| H6 | Error warning lamp |
| P3 | Operating hours counter |

## 7.2 Other components

### *7.2.1 Connector N1 / wiring harness*

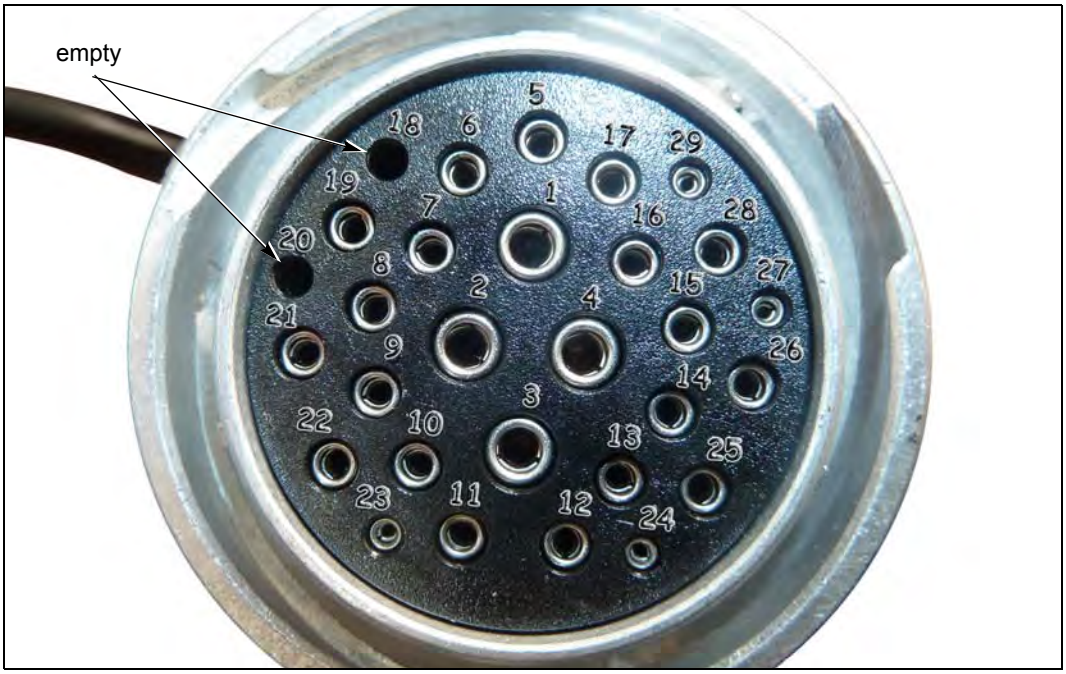



*Fig. 7-7 Connector N1*

**NOTE** **Make sure that the connector N1 is free of water and dirt.**

*Tab. 7-8 List of wiring harness wires / connector N1*

| No. | Cross-section | Color | Of | Pin | To | Pin | Comment |
|---|---|---|---|---|---|---|---|
| 101 | 2.5 | white | N1 | 1 | F11 | 1 | 12V controller |
| 102 | 2.5 | white | N1 | 2 | F12 | 2 | 12V controller |
| 103 | 2.5 | brown | N1 | 3 | Ground at rear | | Controller ground |
| 104 | 2.5 | brown | N1 | 4 | Ground at rear | | Controller ground |
| 105 | 0.75 | white | N1 | 5 | K1 | 86 | Ignition relay |
| 106 | 0.75 | white | N1 | 6 | S1 19 | 9 | Pre-heater relay |
| 107 | 0.75 | white | N1 | 7 | S1 50 | 7 | Starter relay |
| 108 | 1 | white | N1 | 8 | S25 | 1 | Holding solenoid |
| 109 | 0.75 | white | N1 | 9 | K5 | 86 | Gas relay |
| 110 | 1 | white | N1 | 10 | Y3 | 1 | Forwards |
| 111 | 1 | white | N1 | 11 | Y4 | 1 | Reverse |
| 112 | 1 | white | N1 | 12 | Y3 | 2 | Return |
| 113 | 1 | white | N1 | 13 | Y5 | 1 | Steering left |
| 114 | 1 | white | N1 | 14 | Y6 | 1 | Steering right |

| No. | Cross-section | Color | Of | Pin | To | Pin | Comment |
|---|---|---|---|---|---|---|---|
| 115 | 1 | white | N1 | 15 | Y7 | 1 | big amplitude |
| 116 | 1 | white | N1 | 16 | Y8 | 1 | small amplitude |
| 117 | 1 | white | N1 | 17 | Y9 | 1 | Brake valve |
| 118 | 0.75 | white | N1 | 19 | K2 85 | | Engine signal |
| 120 | 0.75 | white | N1 | 21 | N2 | 4 | Shutdown bar |
| 121 | 0.75 | white | N1 | 22 | N2 | 2 | Error |
| 122 | 0.5 | white | N1 | 23 | X1 | 1 | Control bus D+ |
| 123 | 0.5 | white | N1 | 24 | X1 | 2 | Control bus D- |
| 124 | 1 | white | N1 | 25 | X1 | 3 | +12V |
| 125 | 1 | brown | N1 | 26 | X1 | 4 | Earth |
| 126 | 0.5 | white | N1 | 27 | N2 | 5 | Engine oil pressure |
| 127 | 0.75 | white | N1 | 28 | S24 | 1 | Shutdown bar |
| 128 | 0.5 | white | N1 | 29 | N2 | 6 | Water temperature |
| 129 | 1 | white | N2 | 1 | F13 | 3 | +12V |
| 130 | 0.5 | white | N2 | 3 | S1 19 | 8 | Preheating lamp |
| 131 | 0.5 | white | N2 | 5 | S21 | | Oil pressure lamp |
| 132 | 0.5 | white | N2 | 6 | S22 | 1 | Water temperature |
| 133 | 0.5 | white | N2 | 7 | K2 85 | | Engine signal |
| 134 | 2.5 | white | K1 | 30 | S1 15 | 5 | Ignition |
| 135 | 2.5 | white | K1 | 87 | F14 | D | Ignition |
| 136 | 2.5 | white | K1 | 87 | X3 | 2 | Ignition |
| 137 | 0.75 | brown | K1 | 85 | Ground at rear | | Ignition relay |
| 138 | 4 | white | K2 | 30 | M1 | 30 | Battery 12V |
| 139 | 0.75 | white | K2 86 | | S1 50 | 7 | Starter |
| 140 | 2.5 | white | K2 | 87 | M1 | 50 | Starter |
| 141 | 1.5 | white | K2 | 87 | F21 | A | Pull-in solenoid |
| 142 | 0.75 | white | K2 85 | | G1 D+ | 1 | Starting interlock |
| 143 | 0.75 | white | K3 red | | F21 | 1 | Timer |
| 144 | 0.75 | brown | K3 black | | Engine ground | | Timer |
| 145 | 0.75 | white | K3 red/black | | K4 | 86 | Timer |
| 146 | 0.75 | white | K3 yellow | | K4 | 85 | Timer |
| 147 | 1.5 | white | K4 | 30 | F21 | 1 | Pull-in relay |
| 148 | 1.5 | white | K4 | 87 | Y1 white | | Pull-in solenoid |
| 149 | 0.75 | brown | K5 | 85 | Engine ground | | Gas relay |
| 150 | 1.5 | white | K5 | 30 | F23 | 3 | Gas magnet |
| 151 | 1.5 | white | K5 | 87 | Y2 | + | Gas magnet |
| 152 | 0.75 | white | K6 | 86 | S1 19 | 9 | Pre-heater relay |

| No. | Cross-section | Color | Of | Pin | To | Pin | Comment |
|---|---|---|---|---|---|---|---|
| 153 | 0.75 | brown | K6 | 85 | Engine ground | | Pre-heater relay |
| 154 | 4 | white | K6 | 30 | F24 | 4 | Pre-heating |
| 155 | 4 | white | K6 | 87 | R1 | | Pre-heating |
| 156 | 0.75 | white | K7 | 86 | S25 | 2 | Radiator relay |
| 157 | 0.75 | brown | K7 | 85 | Ground at rear | | Radiator relay |
| 158 | 2.5 | white | K7 | 30 | F14 | 4 | Oil cooler |
| 159 | 2.5 | white | K7 | 87 | M3 | 1 | Oil cooler |
| 160 | 0.75 | white | S24 | 2 | S24 | 3 | Shutdown bar |
| 161 | 0.75 | white | S24 | 4 | F13 | 3 | Shutdown bar |
| 162 | 4 | white | G1 30 | | M1 | 30 | Charging current |
| 163 | 0.75 | white | G1 15 | 2 | F22 | 2 | Exciting voltage |
| 164 | 0.75 | white | M2 | | F22 | 2 | Diesel pump |
| 165 | 1 | brown | M2 | | Engine ground | | Diesel pump |
| 166 | 1.5 | brown | Y1 black | | Engine ground | | Holding solenoid |
| 167 | 1 | white | Y3 | 2 | Y4 | 2 | Return |
| 169 | 1 | brown | Y5 | 2 | Engine ground | | Steering left |
| 170 | 1 | brown | Y6 | 2 | Engine ground | | Steering right |
| 171 | 1 | brown | Y7 | 2 | Engine ground | | big amplitude |
| 172 | 1 | brown | Y8 | 2 | Engine ground | | small amplitude |
| 173 | 1 | brown | Y9 | 2 | Engine ground | | Brake valve |
| 174 | 1.5 | brown | Y2 | | Engine ground | | Gas magnet |
| 175 | 1 | brown | N2 | 8 | Ground at rear | | Display unit |
| 176 | 2.5 | brown | M3 | 2 | Ground at rear | | Oil cooler |
| 177 | 1.5 | white | F13 | C | F14 | D | Display unit |
| 178 | 2.5 | white | F12 | B | S1 15 | 6 | 12V controller |
| 179 | 1 | white | F12 | B | F11 | A | 12V controller |
| 180 | 4 | white | M1 | 30 | S1 30 | 1 | +12V |
| 181 | 4 | white | M1 | 30 | F24 | D | Pre-heating |
| 182 | 1.5 | white | M1 | 30 | F23 | C | Gas magnet |
| 183 | 4 | brown | Engine ground | | Ground at rear | | Connection |
| 184 | 4 | brown | Engine ground | | Ground at front | | Connection |
| 185 | 1 | white | S25 | 1 | Y1 red | | Holding solenoid |
| 186 | 1 | white | X3 | 2 | F22 | B | Ignition |
| 187 | 1 | white | F21 | A | X3 | 1 | Starter |
| 188 | 1.5 | white | M1 | 30 | X3 | 3 | Battery + |
| 189 | 2.5 | brown | X3 | 4 | Engine ground | | 2. Holding solenoid Y11 |

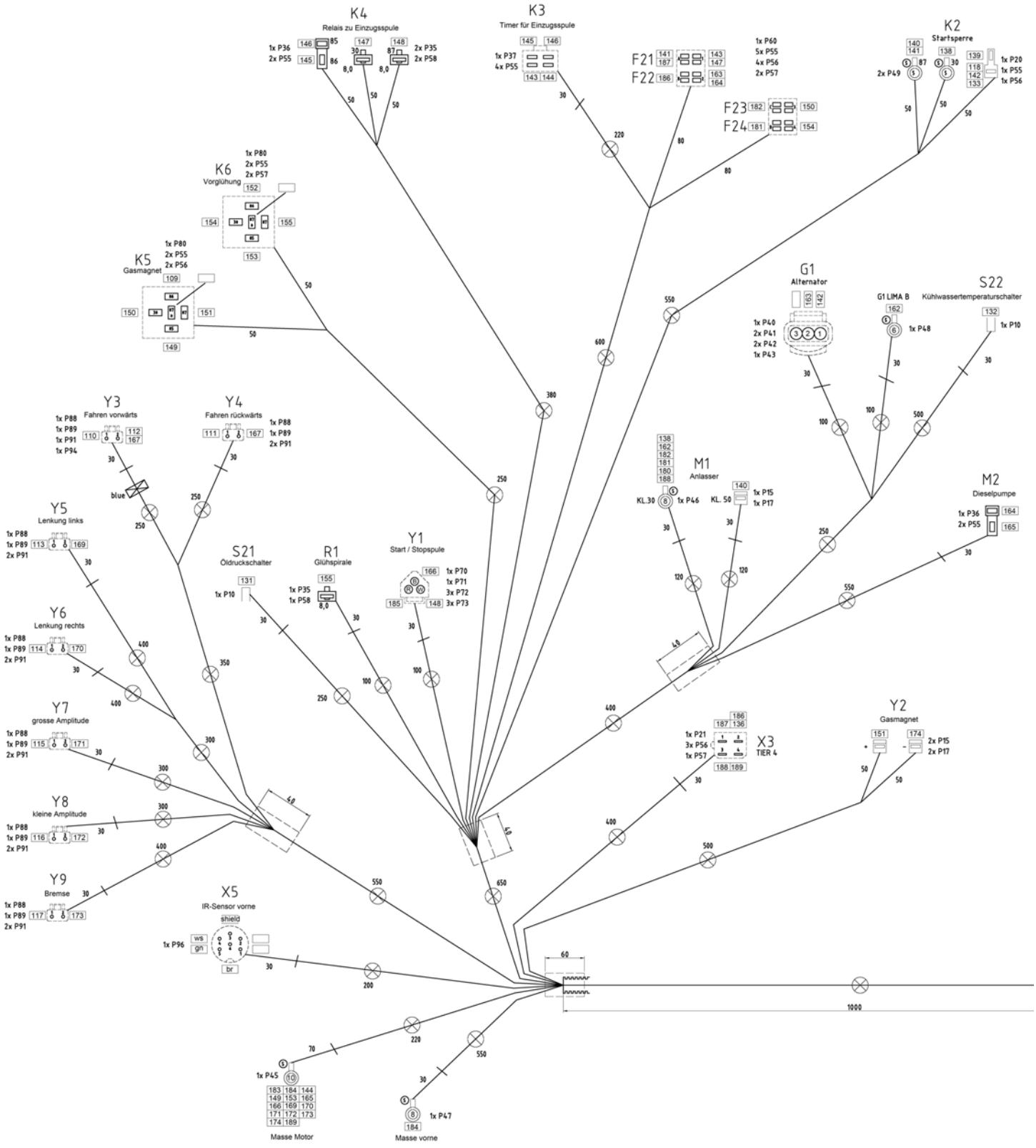



*Fig. 7-8 Front chassis wiring harness*

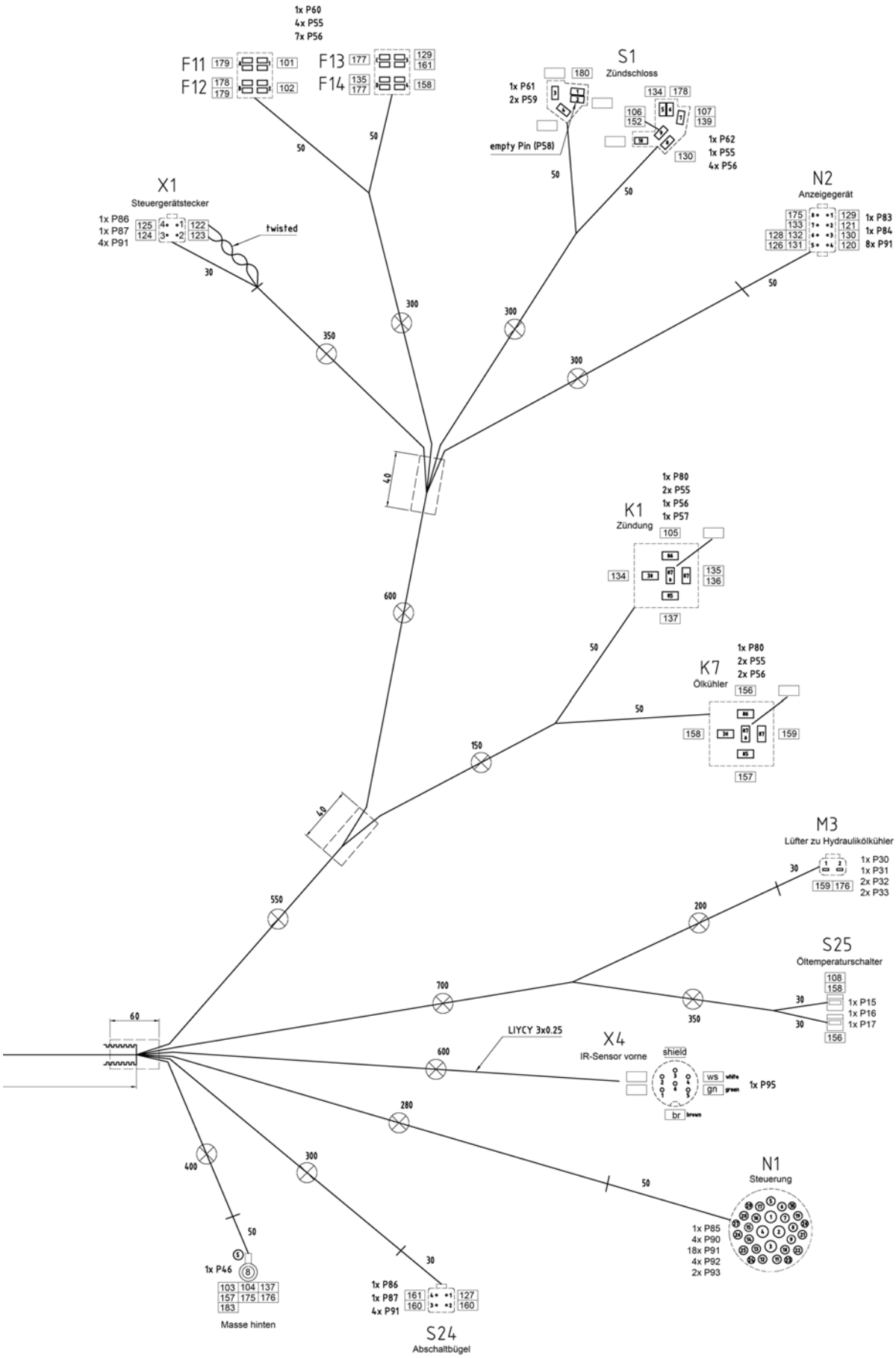



*Fig. 7-9 Rear chassis wiring harness*

## 7.2.2 Tier 4 / Wiring harness

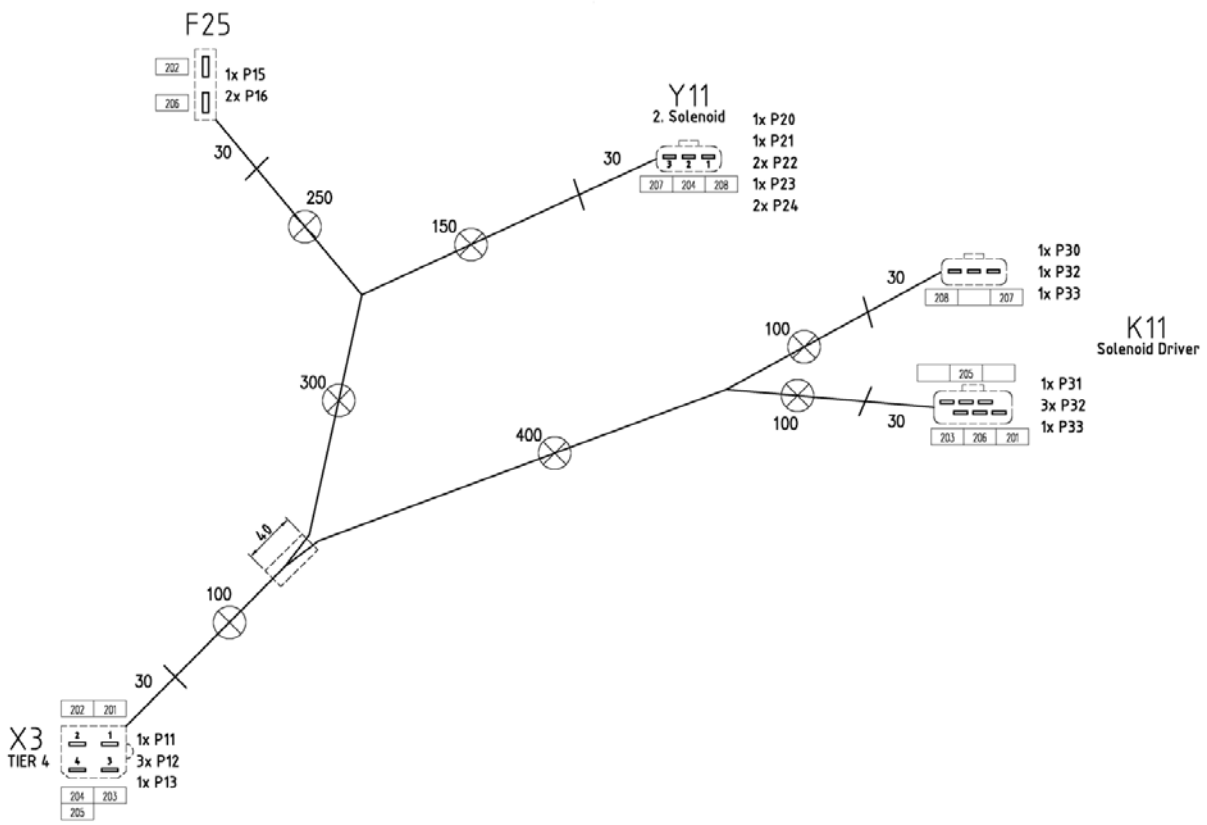


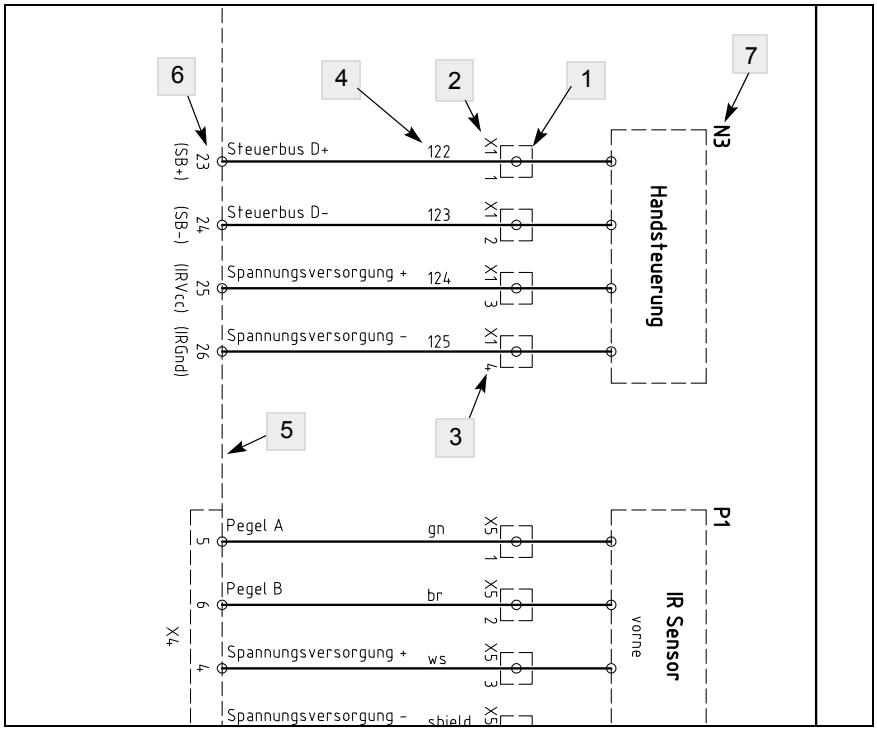

*Fig. 7-10 Tier 4 wiring harness*

*Tab. 7-9 List of wiring harness wires / tier 4*

| No. | Cross-section | Color | Of | Pin | To | Pin | Comment |
|---|---|---|---|---|---|---|---|
| 201 | 1 | white | X3 | 1 | K11 | | Starter |
| 202 | 2.5 | white | X3 | 2 | F25 | 1 | Ignition |
| 203 | 1 | white | X3 | 3 | K11 | | Battery |
| 204 | 2.5 | brown | Y11 | 2 | X3 | 4 | Earth |
| 205 | 1 | brown | K11 | | X3 | 4 | Earth |
| 206 | 2.5 | white | F25 | 2 | K11 | | Ignition |
| 207 | 2.5 | white | K11 | | Y11 | 3 | Pull-in solenoid |
| 208 | 1 | white | K11 | | Y11 | 1 | Holding solenoid |

# 7.3 Wiring diagram

## *7.3.1 Explanations*




1 Connection

2 Connector name

3 Contact number

4 Cable number
All white cables are serially numbered, the brown cables are not numbered and are always a connection to earth.

5 Component separation
(In some cases also optional cable connections)

6 Contact number on device connector

7 Element name
(cf. wiring diagram key page 93)

## 7.4 Wiring diagram

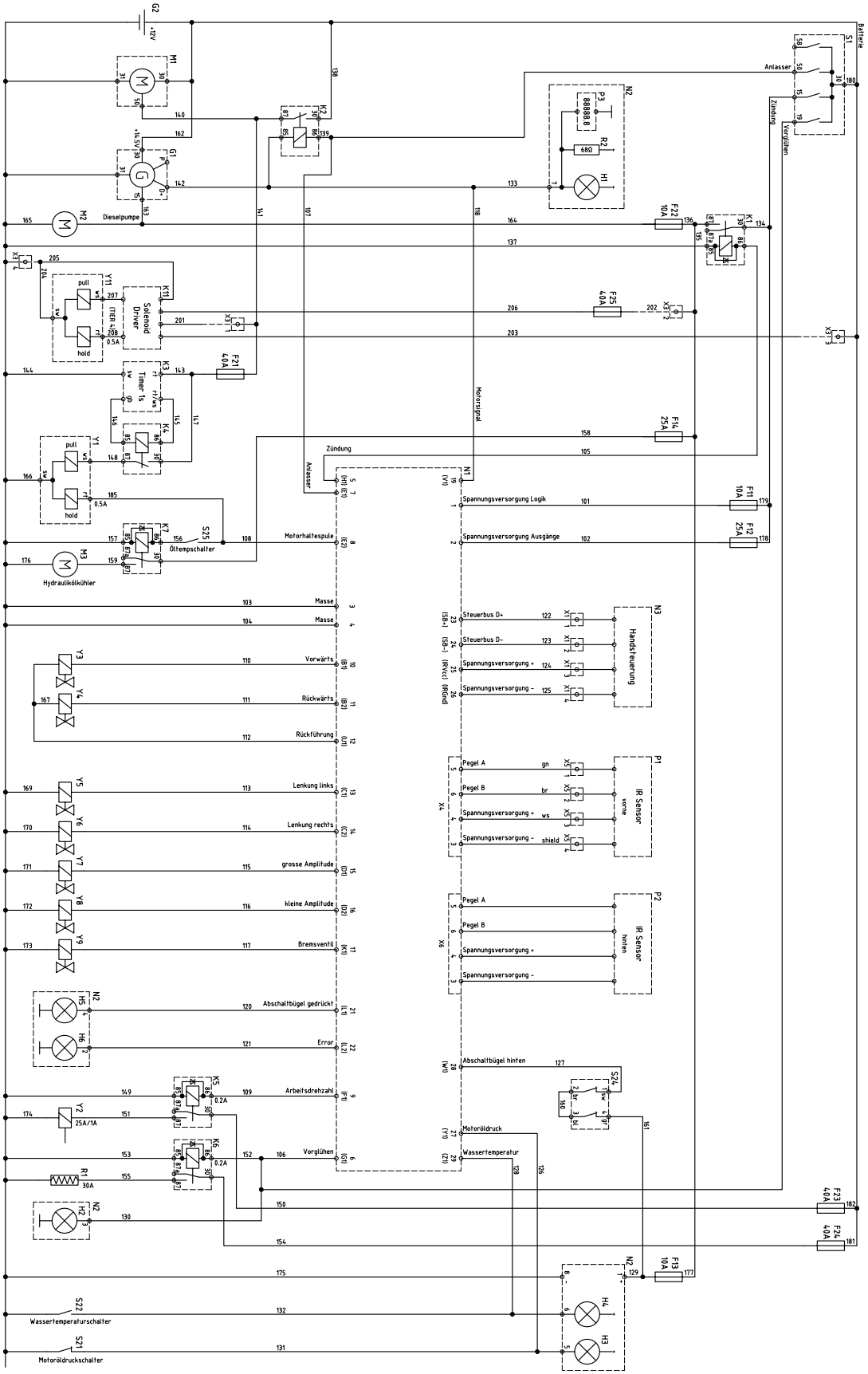



*Fig. 7-11 Wiring diagram no. 10378070*

### 7.4.1 Wiring diagram key

| Element | Description |
|---|---|
| F11 | Fuse, controller, supply |
| F12 | Fuse, controller, outputs |
| F13 | Fuse, display unit, shutdown bar |
| F14 | Fuse, hydraulic oil cooler |
| F21 | Fuse, pull-in solenoid |
| F22 | Fuse, diesel pump, alternator |
| F23 | Fuse, operating speed |
| F24 | Fuse, preheating glow plug |
| F25 | Fuse, “2nd solenoid” |
| G1 | Alternator |
| G2 | Battery |
| K1 | Relay, ignition |
| K2 | Relay, starting interlock |
| K3 | Timer relay |
| K4 | Relay, pull-in solenoid |
| K5 | Relay, operating speed |
| K6 | Relay, preheating glow plug |
| K7 | Relay, hydraulic oil cooler |
| K11 | Relay, “solenoid driver” (tier 4) |
| M1 | Starter motor |
| M2 | Diesel pump |
| M3 | Hydraulic oil cooler |
| N1 | Machine controller |
| N2 | Display unit |
| N3 | Infrared transmitter |
| P1 | Front infrared sensor |
| P2 | Rear infrared sensor |
| R1 | Preheating glow plug |
| S1 | Switch, ignition switch |
| S21 | Sensor, engine oil pressure |
| S22 | Sensor, coolant temperature |
| S24 | Sensor, shutdown bar |
| S25 | Sensor, hydraulic oil temperature |
| Y1 | Magnet, pull-in / holding solenoid |

| Element | Description |
|---|---|
| Y2 | Magnet, operating speed |
| Y3 | Magnet, drive pump, forwards |
| Y4 | Magnet, drive pump, backwards |
| Y5 | Valve, steering, left |
| Y6 | Valve, steering, right |
| Y7 | Valve, large amplitude vibration |
| Y8 | Valve, small amplitude vibration |
| Y9 | Valve, locking brake |
| Y11 | Magnet, “2nd holding solenoid” (tier 4) |

# 8

# Troubleshooting

## 8.1 Introduction

This section describes possible causes and action sorted according to error symptoms. Note that the machine wiring, although not mentioned explicitly, is always a possible cause of electrical problems.

**NOTE** **In our experience, in most cases errors are caused by the wiring harness or connectors.**

Therefore, it is a good idea to check the machine for frayed cables and defective or loose connectors first.

Since the machine is remote-controlled, faults can be due to a variety of causes. The best thing to do is to read through this chapter quickly at first in order to get a general overview. Also make sure to pay attention to the LEDs on the handheld controller and the lamps on the display unit.

**NOTE** **The machine will not shut down automatically when the hydraulic oil temperature is too high!**

**If you think the machine may be getting too hot, check:**

- **Fuse F14**
- **Oil temperature switch S25**
- **Relay K7**
- **Radiator M3**

**Oil temperature switch S25 should turn on the fan if the oil temperature is 50°C or higher.**

## 8.2 Engine doesn’t start

The following description applies when starting the machine with the ignition switch. If the machine cannot be turned on with the handheld controller only, please refer to the next section.

*Tab. 8-1 Fault description, engine won’t start*

| Fault description | Possible cause | Checks |
|---|---|---|
| Engine doesn’t start | Battery **G2** | Is the battery voltage OK? Battery terminal clamps? Battery cables in terminal clamps? |
| Starter does **not** turn | Ignition switch **S1** | Can the engine be started with the ignition switch? -> Controller not working. |
| | Fuse **F11** | Is **F11** OK? |
| | Controller **N1** | Is the connector connected? |
| | Relay **K1** | The relay must be switched as soon as the ignition is switched on. |
| | Fuse **F22** | Is **F22** OK? |
| | Alternator **G1** | Is the connector connected?<br>Connection D+ must have a voltage of 0 V when the ignition is on. |
| | Starter relay **K2** | Is the connector connected correctly? Relay checked? |
| | Starter motor **M1** | With the ignition in the Start position, connector 50 must have +12 V. |
| Engine doesn’t start<br><br>Starter turns<br>But engine doesn’t start | Diesel pump **M2** | Is there enough diesel in the tank?<br>Does the diesel pump work? |
| | Fuse **F21** | Is fuse **F21** OK? |
| | Engine oil pressure switch **S21** | The switch must be closed when the engine is stopped. |
| | Fuses **F12**, **F12** | Is **F12** OK? |
| | Controller **N1** | As soon as the starter turns, holding solenoid **Y1** (red) must have a voltage of +12 V. |
| | Timer **K3** | Is the connector connected? |
| | Relay **K4** | Is the connector connected? Relay checked? |
| | Pull-in/holding solenoid **Y1** | In ignition Start position 50, pull-in solenoid (white) must have +12 V for 1s.<br>Has the shutdown bar been checked? |
| The engine starts, but only runs for about 4 s | Water temperature switch **S22** | The switch must be open when the operating temperature is normal. Short-circuit to ground?<br>Solid connector connection? No corrosion? |
| | Engine oil pressure switch **S21** | The switch must be closed when starting and open when the engine is running.<br>Solid connector connection? No corrosion? |

| Fault description | Possible cause | Checks |
|---|---|---|
| Pre-heating doesn't work | Glow plug **R1**<br><br>Fuse **F24**<br><br>Relay **K6** | In cold weather, please check the pre-heating system too.<br>In ignition Pre-heating position, control lamp H2 must light up and heater plug must have +12 V.<br><br>Is **F24** OK?<br><br>Is the connector connected? Relay checked? |
| Yanmar engine (Yanmar TNVDI, service manual) | Diesel | Diesel in tank?<br>Diesel flow line free?<br>Air in injection system?<br>Filter free?<br>Air in system?<br>"Smoke signals" from exhaust tailpipe?<br>Compression, injection system, valve play?<br>Is the fuel pump working? F22 OK? |
| Hydr. oil cooler does not turn | Hydr. oil temperature sensor<br><br>Fuse F14<br><br>Relay K7<br><br>Motor defective | Bridge the switch, start the engine.<br><br>Is F14 OK?<br><br>Does relay K7 switch?<br><br>Apply current directly to motor. |

### *8.2.1 Start test for cable and infrared modes*

#### *Normal start*

**1** Open the cockpit cover.

**1.1** Open the cover without covering the sensor.

**2** Turn the ignition on.

**3** Position yourself three meters from the roller.

**4** Keep an eye on the shutdown bar indicator lamp.

**4.1** If the shutdown bar indicator lamp blinks, increase your distance from roller.

**5** Hold down the Start switch on the infrared transmitter.

**5.1** The pre-heating indicator lamp must be lit.

**5.1a** If the pre-heating indicator lamp is not lit, decrease your distance from the roller.

**5.1b** Once the pre-heating indicator lamp lights, the roller will start in 6 s.

#### *Quick start*

**1** Open the cockpit cover.

**1.1** Open the cover without covering the sensor.

**2** Turn the ignition on.

**3** Position yourself three meters from the roller.

**4** Keep an eye on the shutdown bar indicator lamp.

**4.1** If the shutdown bar indicator lamp blinks, increase your distance from roller.

**5** Hold down the Start switch on the infrared transmitter.

**5.1** The pre-heating indicator lamp must be lit.

**5.1a** If the pre-heating indicator lamp is not lit, decrease your distance from the roller.

**5.1b** Once the pre-heating indicator lamp lights, release the switch immediately.

The engine starts.+

## *8.2.2 Position of the operator*

Distance to roller:

< 2m Operation is not possible.
> 4.5 m Cable is too short, operation is not possible (do not overstretch the cable).

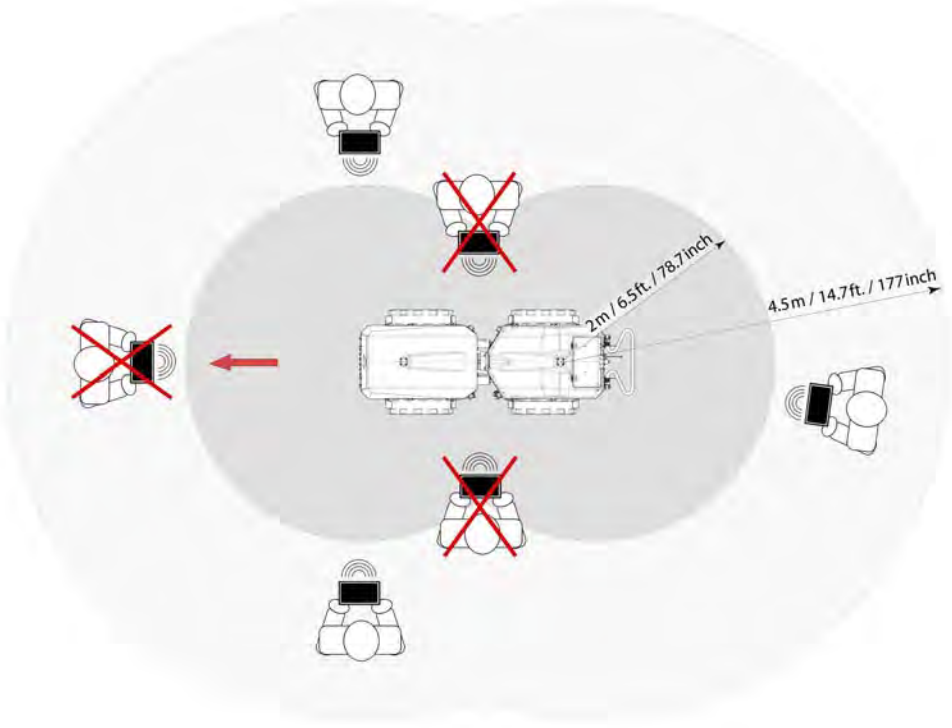



*Fig. 8-1 Position of the operator/Distance to roller*

| Overview of functions | |
|---|---|
| **Operation with the cable** | **Operation with the infrared sensor** |
| automatic pairing | |
| Steering functions | |
| Vibration functions | |
| max. range = 3.5 - 4.5 m | max. range = 20 m |
| Close proximity shutdown 2-2.5 m | |

## 8.3 The controller is not working

Follow the instructions below step by step in order to pinpoint faults and fix them.

### *8.3.1 External factors*

- Reflective surfaces (mirrors, reflective strips, etc.) in the machine's close vicinity can interfere with the remote controller's distance calculating function.
- Special sources of light (fluorescent tubes, flash lamps, etc.) may interfere with infrared communications under certain circumstances.
- Strong electromagnetic radiation (e.g., in the proximity of power plants) may affect the controller.

If faults occur only at specific locations or in specific situations, check the machine's surroundings to see if any of the above factors are present and try to avoid them.

### *8.3.2 Machine wiring*

- Are fuses **F11** and **F12** OK?
- Are the connectors on controller **N1** free of soiling and water?
- Is controller **N1** properly mounted?
- Are both the **P1** and **P2** infrared sensors clean and free of damage?
- Is the wiring from **N1** to **P1** and **P2** free of damage? Keep in mind that there is an **X5** adapter (going towards the front sensor) in the engine compartment.
- Is the cable to handheld controller **N3**, together with the corresponding connectors, free of damage and of soiling? Do not forget connector **X1** on the hood's inside.

### *8.3.3 Operation*

- Is the handheld controller already paired with the machine? -> Briefly connect the handheld controller to the cable for this purpose.
- Is the distance between the handheld controller and the machine OK? (2.5 m - 4 m in cable mode or 2.5 m - 20 m in remote control mode)
- Is the battery for handheld controller **N3** empty? -> Use the cable mode temporarily fir control.

**NOTE** **Please note that the vandalism protection cover may shield the infrared signal when open. This applies to cable operation as well.**

*Tab. 8-2 Troubleshooting, controller is not working*

| Fault description | Possible cause | Checks |
|---|---|---|
| The controller is not working at all and the engine cannot be started with the ignition switch either | Fuses **F11**, **F12**<br><br>Controller **N1** | Are **F11** and **F12** OK?<br><br>Check the machine as instructed in the previous description.<br>Pay special attention to alternator signal D+ and to engine oil pressure switch **S21**.<br>If relay **K1** is not being switched, the problem probably has to do with controller N1.<br><br>Is the battery voltage OK? Battery terminal clamps? Battery cables in terminal clamps? |
| The machine can only be started with the ignition switch and is not working otherwise | Infrared transmitter **N3**<br><br>Infrared sensors **P1**, **P2** | Check the machine as instructed in the previous description.<br>If none of the LEDs on handheld controller **N3** flash even during cable operation, the unit may have to be replaced.<br><br>Check the wiring. |
| The machine only works in cable operation mode | Infrared transmitter **N3** | Check the machine as instructed in the previous description.<br>If the red LED on handheld controller **N3** always flashes when a function is carried out during wireless operation, or if none of the LEDs light up during wireless operation, the battery is probably faulty. |
| The diesel engine turns off all of a sudden during operation. | Controller **N1**<br><br>Water temperature switch **S22**<br><br>Engine oil pressure switch **S21**<br><br>Alternator **G1** | Also check the display unit. The tilt sensor may have been incorrectly triggered.<br><br>The switch must be open when the operating temperature is normal.<br><br>The switch must be open when the engine is running.<br><br>Connection D+ must have a voltage of 12 V when the engine is running. |
| Machine does not drive (nothing happens) | Handheld controller **N3**<br><br>Controller **N1**<br><br>Drive pump **Y3**<br><br>Brake valve **Y9** | Does the green LED flash when the switch is actuated?<br><br>Does error warning lamp **H6** on the display unit light up?<br><br>Are the connectors connected? Are the magnetic coils and valves OK? Charge pressure OK? Servoblock OK?<br><br>Is the connector connected? |

| Fault description | Possible cause | Checks |
|---|---|---|
| Machine does not drive (it attempts to move against the brakes) | Brake valve **Y9**<br><br>Controller **N1** | Is the connector connected?<br>Actuate the solenoid valve manually; is the brake released? Charge pressure OK?<br><br>Is **Y9** being actuated? |
| The machine moves forward only | Proximity switch **S24** | If the machine features a shutdown bar, check to make sure that the magnet on the shutdown bar is positioned correctly. The switch must be closed when the shutdown bar is not being actuated.<br><br>Otherwise, check the jumper that is plugged in instead of **S24**. |
| | Drive pump **Y3**, **Y4** | Are the connectors connected? |
| Machine drives too slowly | Handheld controller **N3** | Does the green LED flash when the machine is put in transport gear? |
| | Fuse **F23** | Is **F23** OK? |
| | Relay **K5** | The relay must be switched as soon as a function is carried out. |
| | Controller **N1** | Is **K5** being actuated? |
| | Magnet **Y2** | The magnet must pull as soon as a function is carried out.<br><br>Engine speed? Flow divider OK?<br>Drive motors OK? Drive pump OK? |
| Machine does not vibrate | Handheld controller **N3** | Does the green LED flash when vibration is switched on? |
| | Magnets **Y7, Y8** | Are the connectors connected? Has the magnetic coil been actuated manually? Are the magnetic coils and valves OK? Vibration pressure OK? Coupling on vibromotor OK? Vibro unit OK? |
| | Controller **N1** | Are **Y7** and **Y8** being actuated? |
| The steering system is not working | Handheld controller **N3**<br><br>Magnets **Y5, Y6**<br><br>Controller **N1** | Does the green LED flash when the steering is actuated?<br><br>Are the connectors connected? Are the magnetic coils and valves OK? Has the magnetic coil been actuated manually?<br><br>Are **Y5** and **Y6** being actuated?<br><br>Steering pressure OK? Mechanical faults? Steering cylinder OK? |

## 8.4 Display unit


*Fig. 8-2 Display unit*

**NOTE** **When the ignition is turned on, a lamp test will run on the display unit for a couple of seconds. During this test, all the lamps will light up and every digit in the operating hours counter will be shown as an 8.**

**Use this test to check whether the display unit is working correctly. If it is not, it will have to be replaced.**

*Tab. 8-3 Fault description, machine won't move*

| Fault description | Possible cause | Checks |
|---|---|---|
| Display unit is dead.<br><br>No lamps and displays when ignition is switched on. | Fuse **F13**<br><br>Display unit **N2**<br><br>Relay **K1** | Is **F13** OK?<br><br>When the ignition is on, pin 1 must have a voltage of +12 V and pin 8 must have the chassis ground voltage level.<br><br>The relay must be switched as soon as the ignition is switched on. |
| Operating hours counter **P3** is not working and battery charging lamp **H1** does not turn off when the engine is running  | Alternator **G1**<br><br>Display unit **N2** | Is the connector connected?<br><br>When the ignition is on, pin 7 must have a voltage of 0 V = chassis ground. When the engine is running, on the other hand, it must have +12 V.<br><br>If the battery charges anyway (voltage approx. 14 V), the problem is probably with **N2**. |
| Control lamp **H1** does not light when the ignition is switched on.  | Alternator **G1**<br><br>Cable, connector, display unit **N2** | Hold cable 133 against ground. The lamp must be lit. |
| Error warning indicator **H6** lights up.  | Controller **N1**<br><br>Fuse **F22**<br>Alternator **G1**<br>Engine oil pressure switch **S21** | • The tilt sensor measured a tilt angle greater than 45° (the diesel engine is turned off when this happens).<br>• If shutdown bar **H5** is flashing at the same time: It will not be possible to start the engine until oil pressure switch **S21** is closed (**H3** is lit up) and D+ for G1 has a voltage of 0 V (H1 is lit up).<br>• The controller detected a fault.<br><br>If the machine is not inclined and controller **N1** is properly mounted, there is a fault in the controller's switching outputs -> The controller does not work |

| Fault description | Possible cause | Checks |
|---|---|---|
| Oil pressure warning lamp **H3** lights up while the engine is running.  | Engine oil pressure switch **S21** | Is the connector connected? Short-circuit to ground? Engine oil level OK? Engine oil pressure OK?<br><br>When the engine is stopped, the connection must have contact to chassis earth. The switch must be open when the engine is running.<br><br>The diesel engine turns off after 4 s. |
| Oil pressure warning lamp **H3** does not light when the ignition is switched on.  | Engine oil pressure switch **S21**<br><br>Cable, connector, display unit **N2** | Pull the connector off of the switch and ground it. The lamp must be lit.<br>Solid connector connection? No corrosion? |
| Water temperature warning indicator **H4** lights up. Engine running.  | Cooling water temperature switch **S22** | Is the connector connected? Short-circuit to ground?<br><br>The switch must be open when the operating temperature is normal.<br><br>The diesel engine turns off after 4 s. |
| Water temperature warning lamp **H4** does not light when the ignition is switched on. Lamp test.  | Coolant temperature switch **S22**<br><br>Cable, connector, display unit **N2** | Defective? Solid connector connection? No corrosion?<br>Pull the connector off of the coolant temperature switch and ground it. The lamp must be lit.<br><br>The switch must be open when the operating temperature is normal.<br><br>The diesel engine turns off after 4 s. |
| Shutdown bar warning lamp **H5** lights up even though the shutdown bar is not being actuated / a shutdown bar is not installed  | Proximity switch **S24**<br><br>Controller **N1** | The lamp lights up with a solid light:<br>If the machine features a shutdown bar, check to make sure that the magnet on the shutdown bar is positioned correctly. The switch must be closed when the shutdown bar is not being actuated.<br>Otherwise, check the jumper that is plugged in instead of **S24**.<br><br>The lamp flashes:<br>The infrared transmitter is located less than 3 m from the machine.<br><br>The lamp flashes like a camera flash:<br>The infrared transmitter is located between 3 m and 4 m from the machine.<br>Not a fault! Prerequisite for cable operation of the remote control. |
| Pre-heating control lamp **H2** never lights up.  <br><br>Control lamp is lit continuously | Ignition switch **S1**<br><br>Controller **N1**<br><br>Relay **K6** | The lamp must light up when ignition switch **S1** is in the pre-heating position.<br><br>The lamp must light up when the switch is held at the Start position on the handheld controller.<br>F24 OK? Ignition switch OK?<br><br>Relay OK? |

## 8.5 Handheld controller


*Fig. 8-3 Infrared transmitter*

**NOTE**

**When the ignition is turned on, a lamp test will run on the display unit briefly. Both LEDs blink while this is done.**

**Use this test to check whether the LEDs are working correctly. If they are not, the device will have to be replaced.**

*Tab. 8-4 Fault description, handheld controller*

| Fault description | Possible cause | Checks |
|---|---|---|
| The lamps never light up.  | Infrared transmitter N3 | The battery may be empty or faulty. Connect the cable to the controller. If the battery is faulty, the controller will have to be replaced. |
| The red lamp flashes (cable not connected).<br><br>The red lamp flashes (cable connected).<br><br>The red lamp lights up with a solid light.<br><br>The red lamp lights up when a control is operated.  | Infrared transmitter N3 | Not a fault! The battery needs to be charged.<br><br>Not a fault! The battery is being charged.<br><br>Not a fault! The battery is fully charged.<br><br>The battery is empty; no data is being sent to the machine. |

| Fault description | Possible cause | Checks |
|---|---|---|
| The green lamp always flashes when a control is operated.<br>  | Infrared transmitter **N3** | Not a fault! Data is being sent to the machine. |
| Both lamps flash synchronously.<br>  | Infrared transmitter **N3** | Not a fault! The infrared transmitter is coupled with the machine controller.<br>This always occurs when:<br>• A different handheld controller is connected to the machine for the first time using a cable.<br>• The ignition is switched on.<br>When the lamps are blinking, it is not possible to start the engine. |

# 9

# Maintenance

## 9.1 General safety information

Maintenance and repairs **must be performed exclusively** by **trained and qualified personnel**!

- Only perform maintenance and repair work on the roller if it is static and secured from rolling away.
- Secure the roller with the joint protection.
- Before carrying out any work on hydraulic hoses, make sure to relieve the pressure in the system.
- Disconnect the battery before commencing work on the roller's electrical systems.
  - Cover the battery with isolating material or remove it completely. This does not apply to work requiring an electric current.
  - In the event of injuries caused by acid, rinse immediately with clean water and consult a doctor.
- Replace all protection devices properly after performing maintenance and repair work.

**⚠DANGER**

**Danger to life through an unsafe work area!**

- Always use an accident-proof support when working on a raised roller.
- Never work below a roller which is only supported by a crane or other electrical / hydraulic lifting device.
- Only stand under a raised roller if it has been mechanically secured.
- Only use stable loading ramps suitable for the weight of the roller for loading.
- On transport vehicles, correctly secure the roller against rolling, slipping and overturning.

**⚠DANGER**

**Gas poisoning through letting engine run in enclosed spaces!**

- Do not leave the engine running in closed areas.
- If use of the roller in a confined space cannot be avoided, the exhaust fumes must be extracted directly from the exhaust pipe.

**⚠DANGER**

**Danger of scalding from hot water / steam!**

- Never remove the expansion cap or radiator cap while the engine is running or hot!
- First loosen the cap to the first stop to release the pressure. Only then remove the cap.

**⚠ DANGER**

**Danger of severe injury through loose clothing being caught and drawn in!**

- Only open the engine hood when the engine is switched off.
- If trouble shooting makes working on moving parts (engine or roller) unavoidable, **never** wear: necklaces, bracelets, rings, scarves, ties or other loose items of clothing.
  If any of these get caught in moving parts there is a danger of serious injury!

**⚠ WARNING**

**Danger of burns from hot roller parts!**

- Only work on a cool engine.
- Keep enough distance to the exhaust.

**⚠ CAUTION**

**Environmental hazard through operating materials!**

- Do not allow any liquids to enter drains, the soil or the environment.

**NOTE** **Damage to electrical controls through contact with water!**

- **Never spray a water jet into electrical or electronic components.**
- **Never spray into the engine combustion air intake.**

**NOTE** **Damage to hydraulic controls through use of wrong oil!**
**Hydraulic tubes decompose.**

- **It is forbidden to change used rollers for use with biodegradable hydraulic oils!**
- **If hydraulic hoses on a roller running on synthetic ester HE need replacing, only those declared by the supplier as being compatible with synthetic esters may be used.**

### 9.1.1 *Battery safety instructions*

**⚠DANGER**

**Risk of serious injury through leaking battery acid!**

**The sulfuric acid in the battery is poisonous and so strong it can burn holes in clothes and dissolve skin. If it gets into eyes it can lead to blindness.**

- Protect the battery from fire, flames and sparks.
- Protect the battery from mechanical damage.

**⚠DANGER**

**Risk of explosion when charging battery!**

- Never check the battery charge level with a metal object. Use a voltmeter or the battery's charge indicator.
- When disconnecting the battery always disconnect the negative terminal first **(-)**.
- Connect the positive terminal **(+)** first when reconnecting.

**NOTE** **Doing welding work on the roller when the battery in installed can damage the electrical controls!**

**Always remove the battery completely before performing welding work on the roller.**

**NOTE** **Always replace the battery with a service-free battery. If you are using a battery that requires maintenance, always observe the safety instructions in the battery manual.**

## 9.2 General information about maintenance

- When carrying out maintenance work always observe the applicable safety regulations in the *3 Safety information*, page 23 section.
- Maintenance work and inspections must be performed according to the following maintenance tables in order to guarantee reliable roller operation.
- Remove all dirt before taking off any covers, plugs, measuring rods, etc. to inspect or top up engine oil, hydraulic oil, diesel or other liquids.
- Any parts that do not pass the following inspections must be replaced immediately.
- The protective devices must be correctly refitted after every service.

# 9.3 Maintenance

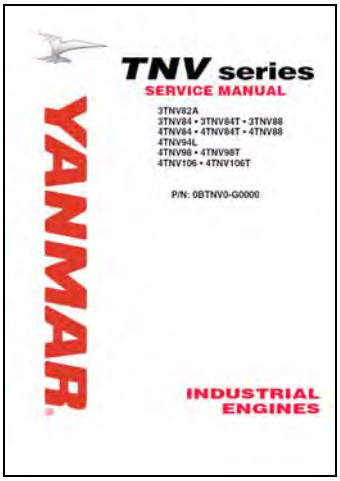
## *9.3.1 Maintenance plan*

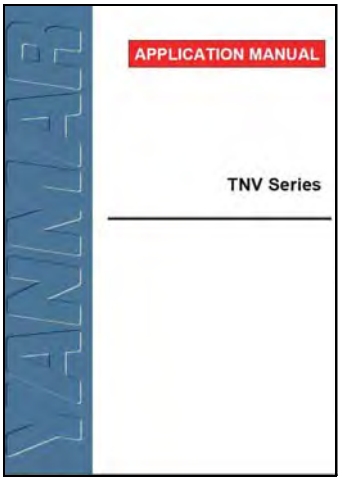
| Maintenance intervals in operating hours [h] and in calendar periods [daily, weekly, monthly, quarterly, semi annually, annually]<br>1) the first time, 2) the second time | | | | | | | | Check, inspect, test, correct, set up<br>Clean, drain<br>Lubricate, treat<br>Exchange, replace<br>Object, condition | Chapter / D = information from dealer |
|---|---|---|---|---|---|---|---|---|---|
| 10<br>1 day | 50<br>1 week | 100<br>1 month | 250<br>3 months | 500<br>6 months | 1000<br>1 year | as needed | | | |
| • | • | | | | | | | Coolant/Expansion tank | *9.11* |
| • | | • | | | | | • | Fuel system leakage | - |
| • | | | • | | | | • | Hydraulic oil cooler | - |
| • | | | | | | • | • | Engine oil level | ***9.8*** |
| • | | | | | | • | • | Air-intake filter | ***9.12.2*** |
| • | | | | | | • | • | Fuel level | *9.7* |
| • | | | | | | • | • | Hydraulic oil level | *9.9* |
| • | | | | | | | • | Roller drum scraper | *9.12.1* |
| | **(•) 1** | | **(•) 2** | • | | | | Engine oil/engine oil filter | *9.8.4* |
| | • | | | | • | • | • | Brake test | *9.14* |
| | | • | | | | • | | Steering cylinder bearing | *9.13* |
| | | | • | | | • | • | Hydraulic system leaks | - |
| | | | | **(•) 1** | • | • | • | Hydraulic oil tank ventilation filter | *9.9.6* |
| | | | | **(•) 1** | • | | • | Hydraulic oil/hydraulic oil filter | *9.9.5* |

| 10<br>1 day | 50<br>1 week | 100<br>1 month | 250<br>3 months | 500<br>6 months | 1000<br>1 year | as nee-<br>ded | | | | | **Object, condition** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | • | | | | | | • | Fuel filter element | *9.7.5* |
| | | | | • | | • | • | | | | Water separator filter element | *9.7.6* |
| | | | | • | | • | | | | • | Air filter cartridge | *9.12.2* |
| | | | | • | | | • | | | | Check 1-point lifting eye for cracks and deformation | *12.1.4* |
| | | | | | • | • | | | | | Cleaning the fuel tank | *9.7.4* |
| | | | | | • | • | • | | | • | Roller drum rubber elements | *10.13* |
| | | | | | • | | • | | | | Gas strut for hood, front and rear | *10.3* |
| | | | | | | • | | | | • | Fuel hoses | - |
| | | | | | | • | | | | • | Hydraulic hoses | *6.1.1* |
| | | | | | | • | | | | • | Battery | *10.2* |
| | | | | | | • | | • | • | | Cooling water radiator | *9.11* |
| | | | | | | • | | | | • | Relays and fuses | *7.1* |
| | | | | | | • | | | | | Preparation for welding work | *10.1* |
| | | | | | | • | | • | • | • | Replacing bearing, vibro unit | *10.14* |
| | | | | | | • | | | • | • | Hood hinges, front and rear | *10.5.2* |
| | • | | | | | • | | | | | Close proximity and distant shutdown | *8.2.1* |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

**NOTE** **Please also observe the Yanmar engine operating manual and the detailed instructions given there.**

### 9.3.2 *Yanmar engine service*




If you have any questions or doubts regarding how to service and/or repair the Yanmar engine, please consult the Yanmar service manual and the application manual to obtain the required information.

These manuals can be obtained through the directly from Yanmar.

## 9.4 Maintenance check sheet

Roller, serial no._____

| Date | Operating hours | Comments / Activity | Signature |
|---|---|---|---|
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## 9.5 Opening the hood, front and rear

**⚠ DANGER**

**Danger of severe injury through loose clothing being caught and drawn in!**

- Only open the engine hood when the engine is switched off.
- If trouble shooting makes working on moving parts (engine or roller) unavoidable, **never** wear: Necklaces, bracelets, rings, scarves, ties or other loose items of clothing.
  If any of these get caught in moving parts there is a danger of serious injury!

**⚠ WARNING**

**Danger of burns from hot roller parts!**

- Only work on a cool engine.
- Keep enough distance to the exhaust.

There is one locking device each on the front and back as well as the left and right of the roller.

**1** Open both catches, on the right and the left.

**2** Open the hood.

**2.1** Lift the hood with slight pressure toward the center of the roller.

**2.2*** If the hood is defective, replace it immediately.

*Fig. 9-1 Locking device*

**NOTE** **Two gas struts reduce the force required to open the hood and give it its final position. If you need more force to open the hood, replace the gas absorbers.**
**Siehe “Gas strut” see page 148.**

## 9.6 Engine compartment overview

### *9.6.1 Left side of the engine*

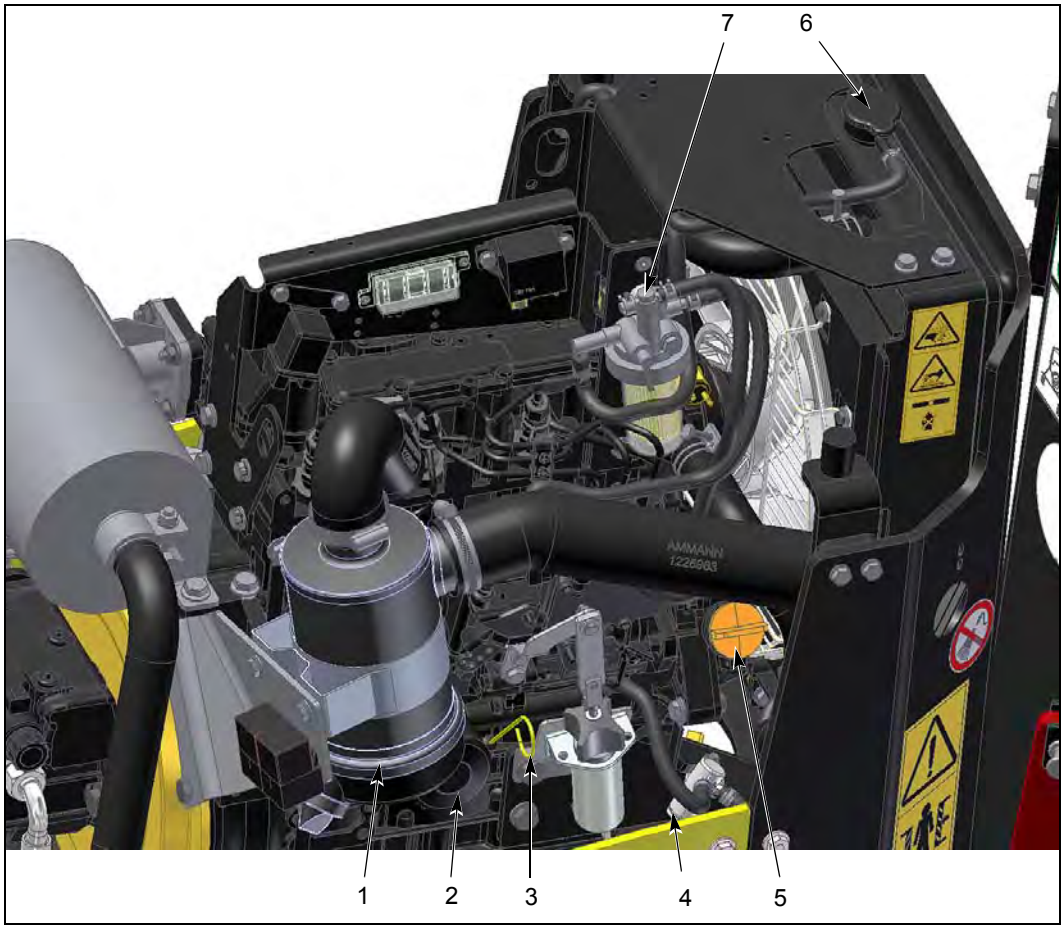



*Fig. 9-2 Left side of the engine*

1 Air-intake filter
2 Engine oil filter
3 Oil dipstick
4 Coolant drain
5 Engine oil filler neck
6 Coolant filler neck
7 Fuel filter

### 9.6.2 *Right side of the engine*

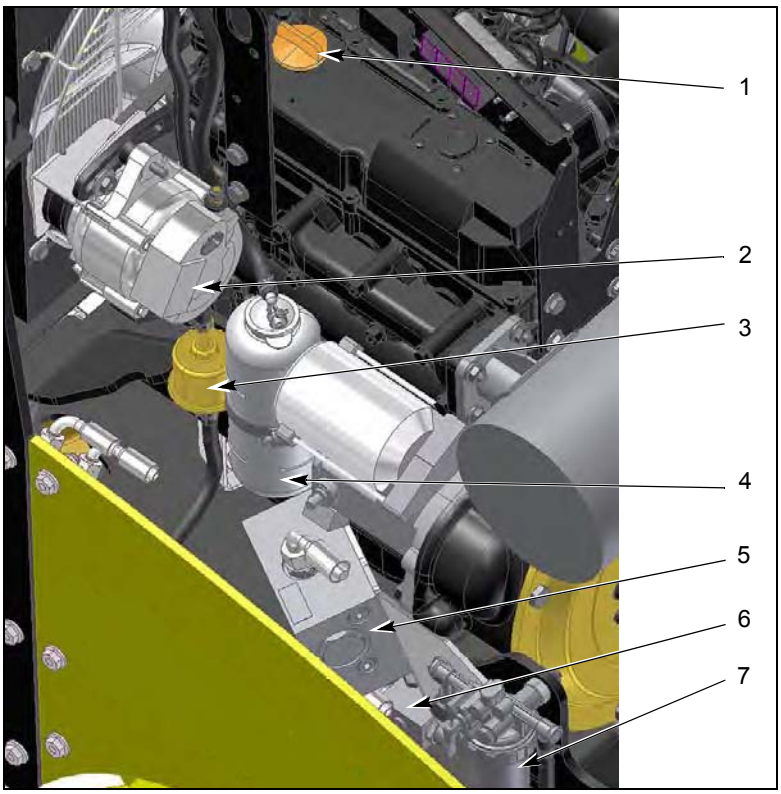



*Fig. 9-3 Right side of the engine*

1 Engine oil filler neck
2 Alternator
3 Fuel pump
4 Coolant level display
5 Flow divider
6 Hydraulic manifold
7 Water separator

**⚠WARNING**

**Risk of burning and injury when handling parts in the engine compartment!**

- Switch the diesel engine off when performing any inspection work. The locking brake is active when the diesel engine is switched off.

## 9.7 Fuel (diesel)

### *9.7.1 Checking fuel level*

**1** Open the hood.

**2** Check the level in the plastic tank.

### *9.7.2 Refueling*

**1** Fill the fuel tank with diesel fuel up to the lower edge of the filler neck.

**1a** Every day before beginning work

The tank holds 28 liters of diesel fuel.

*Fig. 9-4 Diesel fuel filler neck*

#### *Diesel specifications*

*Tab. 9-1 Excerpt from the Yanmar engine manual about diesel specifications*

| Diesel specifications | Application |
|---|---|
| No. 2-D, No.1-D, ASTM D975-94 | USA |
| EN 590:96 | Europe |
| ISO 8217 DMX | International |
| BS 2869-A1 or A2 | Great Britain |
| JIS K2204 grade no. 2 | Japan |
| KSM-2610 | Korea |
| GB252 | China |

**NOTE** **Poor quality diesel can:**

- **Reduce the performance of the engine**
- **Damage the engine**

**NOTE** **For more detailed information, please see the Yanmar engine manual.**

### 9.7.3 *Draining fuel*

**⚠CAUTION**

**Environmental hazard through operating materials!**

- Do not allow any liquids to enter drains, the soil or the environment.

**1** Unscrew the cover screw **(1)** under the roller (AF size 27 wrench).

**2** Place a container under the drain tap.

**3** Drain off the diesel.

**4** Install the screw plug **(1)**.

**4.1** Tighten the screw connection hand tight.


*Fig. 9-5 Diesel drain, rear left on chassis*

### 9.7.4 *Cleaning the fuel tank*

Over time, condensation water gathers in the fuel tank. It must be drained once a year.

**1** Unscrew the cover screw **(1)** under the roller (AF size 27 wrench).

**2** Place a container under the drain tap.

**3** Allow about **1/2 liter** of fluid to drain.

First, the water which has collected on the bottom of the tank will run out.

**4** Install the screw plug **(1)**.

**4.1** Tighten the screw connection hand tight.

### 9.7.5 *Fuel filter element*

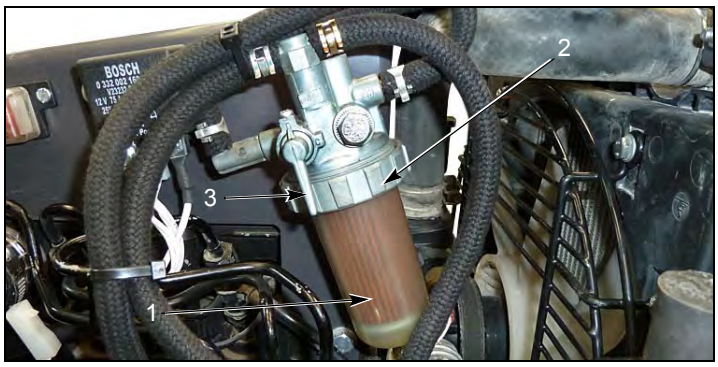



*Fig. 9-6 Fuel filter*

Replace fuel filter element **(1)** according to the maintenance plan.

**1** Close stop cock **(3)**.

**1.1** Move to OFF.

**2** Unscrew the filter housing **(2)**.

**3** Remove the old filter element **(1)**.

**4** Insert new filter element **(1)**.

**5** Screw the filter housing **(2)** on.

**6** Open stop cock **(3)**.

**6.1** Move to ON.

**7** Switch on the ignition.

**7.1** The fuel pump bleeds the system automatically.

### 9.7.6 *Water separator filter element*

#### *Drain filter housing*

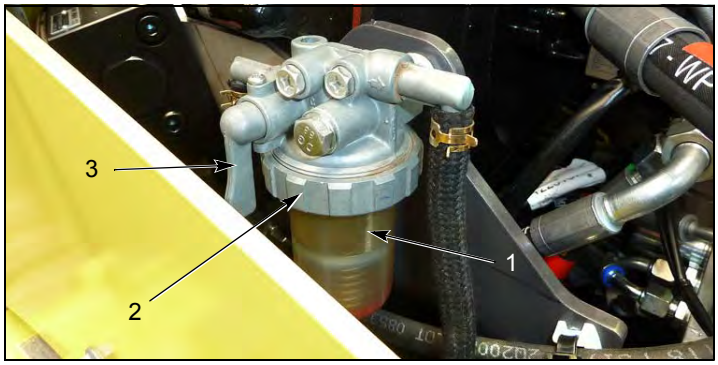



*Fig. 9-7 Water separator*

If there is water in the filter housing, the housing must be drained at once.

**1** Close stop cock **(3)**.

**1.1** Move to OFF.

**2** Unscrew filter housing and empty.

**3** Screw the filter housing on.

**4** Open stop cock **(3)**.

**4.1** Move to ON.

**5** Switch on the ignition.

**5.1** The fuel pump bleeds the system automatically.

### *Clean filter element*

Clean water separator element **(1)** according to the maintenance plan.

**1** Close stop cock **(3)**.

**1.1** Move to OFF.

**2** Unscrew the filter housing **(2)**.

**3** Clean filter element **(1)**.

**4** Screw the filter housing **(2)** on.

**5** Open stop cock **(3)**.

**5.1** Move to ON.

**6** Switch on the ignition.

**6.1** The fuel pump bleeds the system automatically.

## 9.8 Engine oil


*Engine oil*

### *Checking the engine oil level*

### *Oil dipstick*

**1** Check engine oil level daily using the dipstick. The dipstick **(1)** is located on the left of the engine.

**1.1** Check oil level while the roller is standing on a level surface and the engine is cold.

**1.2** You can see the engine oil level on the dipstick.
The oil level must be between the top **(x)** and bottom **(y)** marks.

**2** Top up engine oil as required.

*Fig. 9-8 Location of dipstick*

## *9.8.2 Topping up the engine oil*

**1** Top up the engine oil at one of the two oil filler necks.

**1a** Filler neck on the left-hand side of the engine.

**1b** Filler neck on the engine.

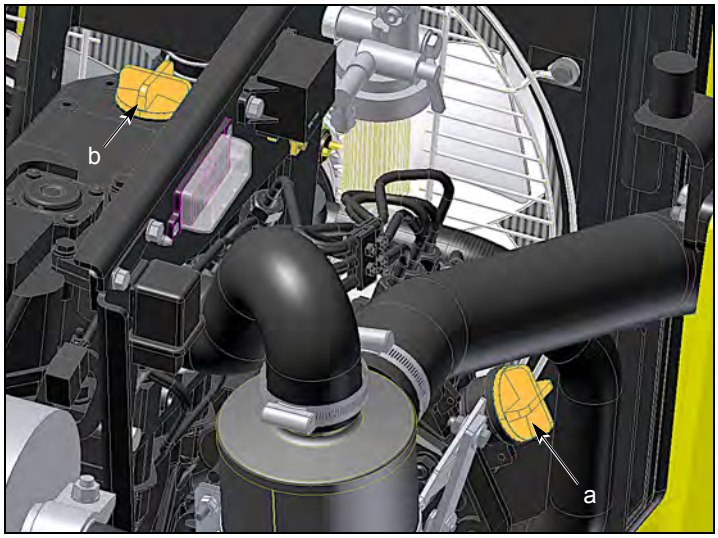



*Fig. 9-9 Filler neck to the left and filler neck on top.*

**NOTE** **In order to guarantee operating safety of the engine for the long term, you must not put any additives in the engine oil.**

## *9.8.3 Draining engine oil*

The engine oil drain **(1)** is located under the chassis at the front left.

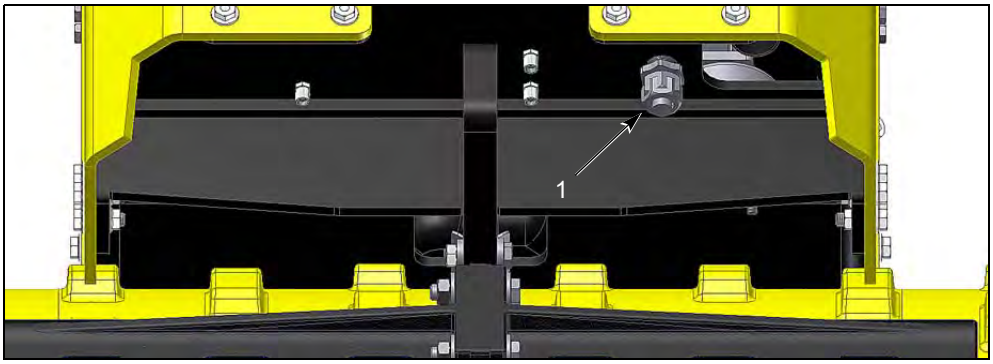



Fig. 9-10 Roller turned fully / Engine oil drain

**⚠CAUTION**

**Environmental hazard through operating materials!**

- Do not allow any liquids to enter drains, the soil or the environment.

**1** Place a container under the drain.

**2** Open the union by turning it anti-clockwise (27 mm wrench).

The oil starts to flow out immediately.

### *9.8.4 Replacing the engine oil filter*


*Fig. 9-11 Engine oil filter*

**1** Loosen the filter **(1)** by hand or using a filter wrench.

**1.1** The oil starts to flow out immediately. It's best to place a rag under it beforehand.

**2** Replace oil filter **(2)**.

**2.1** Install in accordance with regulations (see filter packaging or filter housing).

**3** Screw the complete filter back in place.

# 9.9 Hydraulic oil

## *9.9.1 Checking the hydraulic oil level*

*Inspection window*

Always check the hydraulic oil level when the system is cold.

**1** Place the roller on level ground.

**2** Check the oil level in the inspection window.

The hydraulic oil level is ideal when the display itself is half full.

## *9.9.2 Topping up hydraulic oil*

**1** Remove the breather filter **(1)** from the filler neck.

**2** Pour in hydraulic oil.

**3** Screw the breather filter **(1)** back in place.

**3.1** **Important:** Always grease the O-ring before screwing it in place.


*Fig. 9-12 Hydraulic oil filler neck*

**NOTE** **Observe the table of lubricants in chapter *9.15*.**

## *9.9.3 Draining the hydraulic oil*

**NOTE** **Only drain the hydraulic oil at operating temperature.**

- **The oil flows better.**
- **Residues in the tank will be flushed out with the oil.**

**1** Place a container (with at least a 30 liter capacity) under the hydraulic oil drain.

**2** Remove the breather filter.

3 Unscrew the cover screw **(1)** under the roller (AF size 27 wrench).

4 Allow the oil to drain into the container.

5 Install the screw plug **(1)**.

**5.1** Tighten the screw connection hand tight.

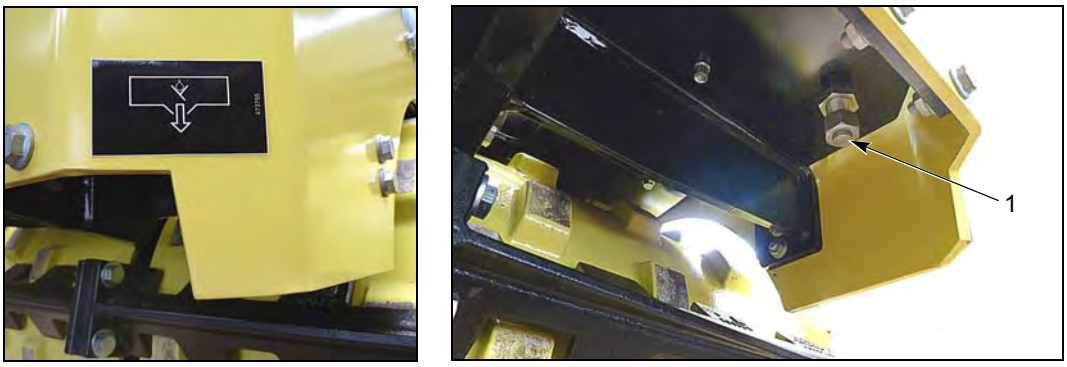



*Fig. 9-13 Hydraulic oil drain*

**NOTE** **When you drain the hydraulic oil, please also replace the hydraulic oil filter and breather filter. See Replacing the hydraulic oil filter *9.9.5*, page 126**

**NOTE** **Tighten the screw connections in the hydraulic tank hand tight.**

## *9.9.4 Cleaning the hydraulic oil cooler*

1 Check the cooling ribs of the hydraulic oil cooler for dirt and clogging.

2 Clean the ribs with water or blow them out with compressed air.

**NOTE** **Never clean the cooler with high pressure (e.g. powerful water jet).**

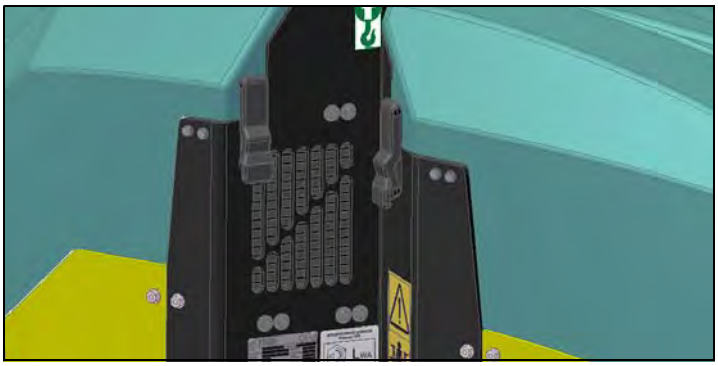


*Fig. 9-14 Hydraulic oil cooler grill*

### 9.9.5 *Replacing the hydraulic oil filter*

**1** Remove the filter lid.

**2** Unlock the filter element.

**3** Lift the filter element out of the filter housing.

**3.1** Dispose of the filter element in an ecologically appropriate manner.

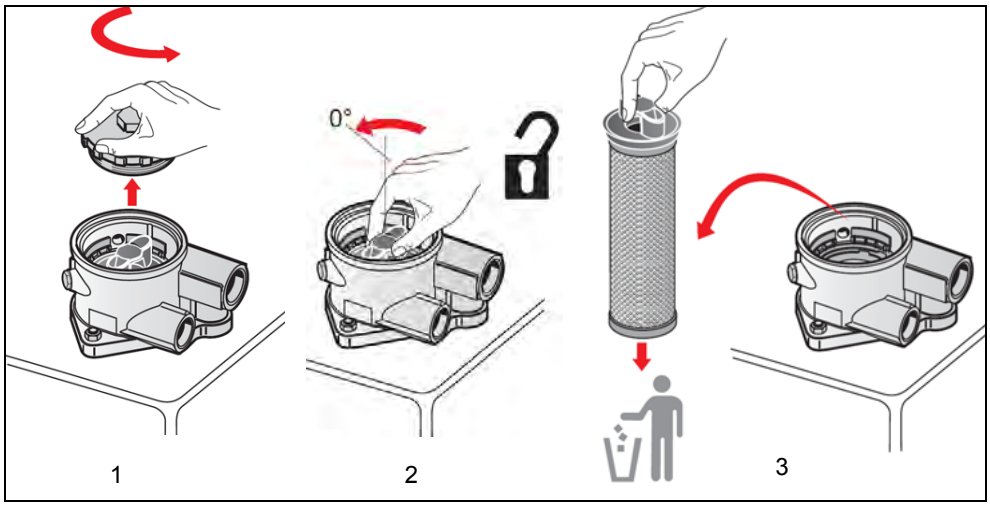



*Fig. 9-15 Replacing the hydraulic oil filter, steps 1 to 3*

**4** Place the new filter element in the proper position.

**4.1** Observe the position of the locking cam.

**5** Turn the filter element fully clockwise to the stop.

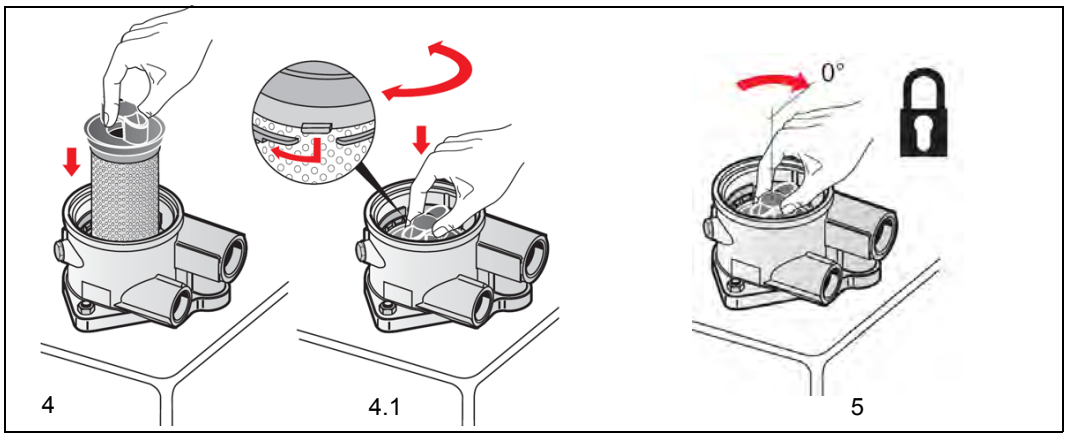



*Fig. 9-16 Replacing the hydraulic oil filter, steps 4 to 6*

**6** Lightly oil the sealing ring on the filter lid.

**7** Put the filter lid in place.

**7.1** Tighten the lid with a torque wrench (max. torque, 20 Nm).

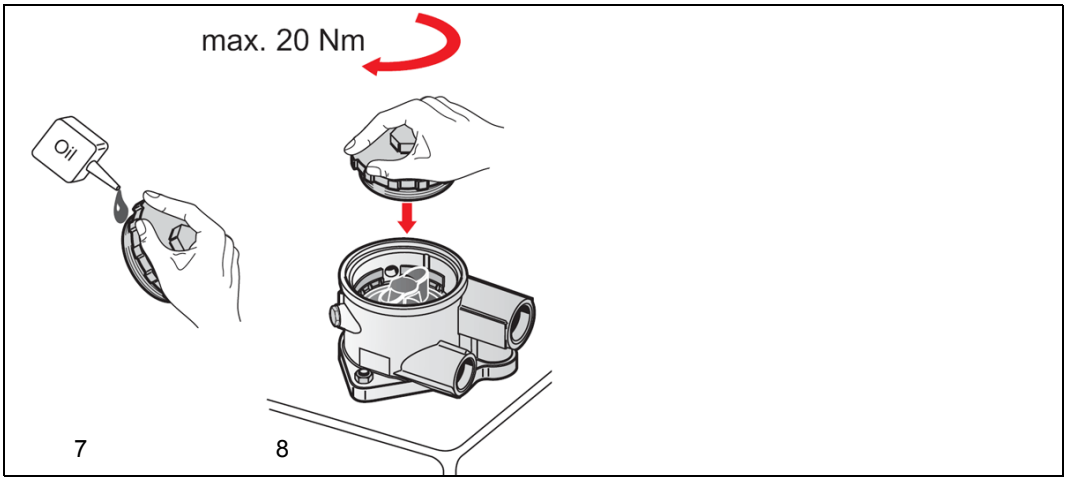



*Fig. 9-17 Replacing the hydraulic oil filter, steps 7 to 8*

### 9.9.6 *Replacing the ventilation filter*

*Fig. 9-18 Ventilation filter*

**1** Ventilation filter according to the maintenance plan.

## 9.10 Hydraulic oil replacement

### 9.10.1 *Filling the hydraulic tank*

*Fig. 9-19 201310010071*

**1** Fill the hydraulic oil tank (approx. 16 l).

*Fig. 9-20 201310010072*

### *9.10.2 Filling the drive pump, building charge pressure*

*Fig. 9-21 201310010074*

**1** Remove hydraulic hose 006 (S).

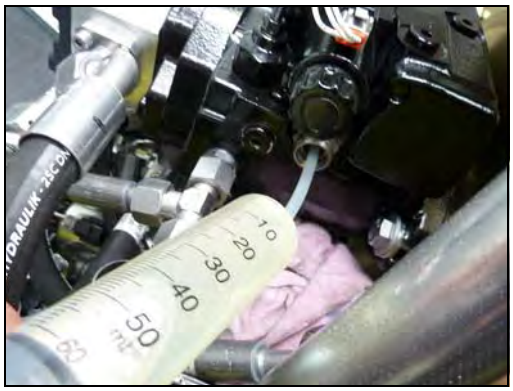



*Fig. 9-22 201310010075*

**1** Fill the drive pump housing with hydraulic oil.

*Fig. 9-23 201310010078*

**1** Pour in hydraulic oil (0.3 - 0.4 l) until the oil runs out of the screw connection (S).

*Fig. 9-24 201310010079*

**1** Install hydraulic hose 006 (S).

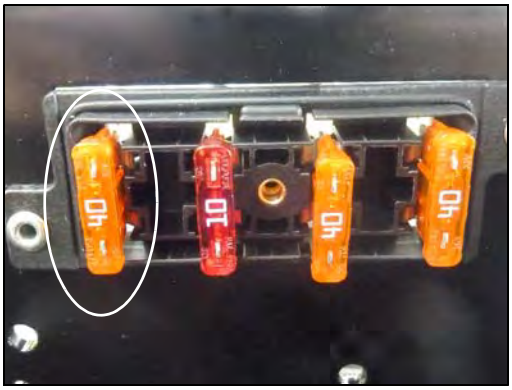


*Fig. 9-25 201310010080*

**1** Remove fuse F21 (40 A) located in the engine compartment.

*Fig. 9-26 201310010082*

**1** Connect the pressure gauge (40 bar) to the charge pressure measuring point.

**2** Turn the engine over using the starter.

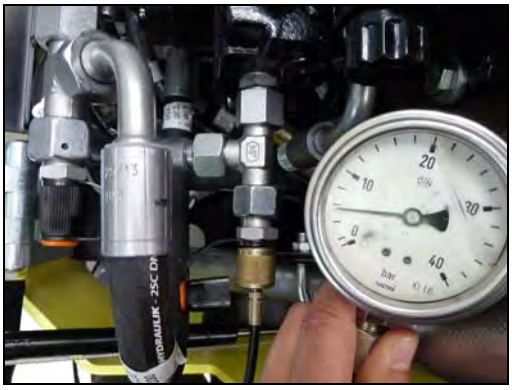


*Fig. 9-27 201310010084*

**1** Turn the engine over until 3-5 bar of pressure has been built up.

**NOTE:**
**Do not overheat the starter! After 30 seconds at the latest, allow the starter to cool down.**

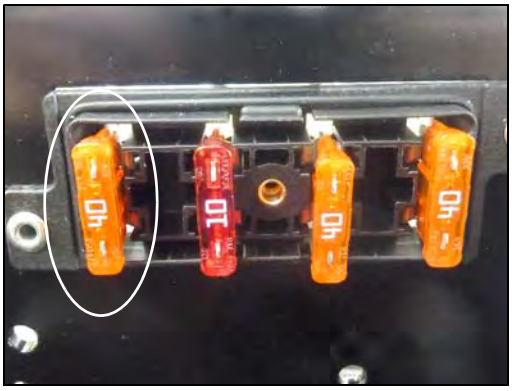


*Fig. 9-28 201310010080*

**1** Install fuse F21 (40 A) located in the engine compartment.


*Fig. 9-29 201310010086*

**1** Start the diesel engine.

**2** Check the buildup of pressure.
Maximum pressure = 23 bar.


*Fig. 9-30 201310010087*

**1** If hydraulic components have been replaced or repaired, perform a check for proper function and for leaks.

## 9.11 Coolant

A coolant antifreeze mixture for up to -25° is provided upon delivery from the factory. For temperatures colder than -25°, the fluid must be replaced by a suitable coolant antifreeze mixture.

### *9.11.1 Checking coolant level*

**1** Check coolant level every day.

**1.1** Check oil level while the roller is standing on a level surface and the engine is cold.

**1.2** You can read off the level of coolant on the expansion tank display.
The water level must be between the top (FULL) and bottom (LOW) marks.

**2** Top up coolant as required.

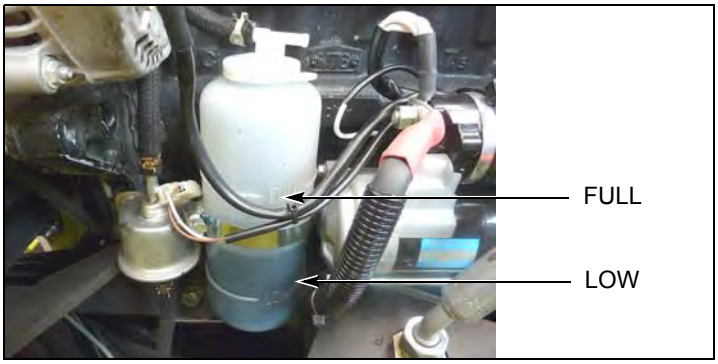



*Fig. 9-31 Expansion tank*

## 9.11.2 Topping up coolant

**⚠CAUTION**

**Danger of scalding from hot water / steam!**

- Only open the radiator once the engine and the coolant have cooled down.

**1** Unscrew the lid of the radiator.

**2** Add coolant with antifreeze until the radiator is full.

*Fig. 9-32 Coolant filler neck*

## 9.11.3 Cleaning the radiator

**1** Check the cooling ribs of the water tank for dirt and clogging.

**2** Clean the ribs with water or blow them out with compressed air.

**NOTE** **Never clean the cooler with high pressure (e.g. powerful water jet).**

*Fig. 9-33 Radiator grill*

## 9.12 Functional check

### *9.12.1 Scrapers*

**1** Before driving, adjust the roller drum scraper so that there is a clearance of about 5mm between the roller drum and the scraper.

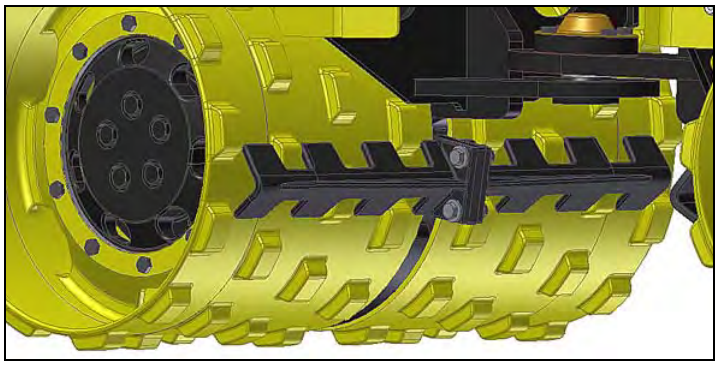


*Fig. 9-34 Roller drum scraper*

### *9.12.2 Air-intake filter*

#### *Soiling indicator*

**1** If a red ring appears on the soiling display **(1)** during operation of the roller, you must:

**2a** clean the air filter cartridge,

**2b** or replace it.

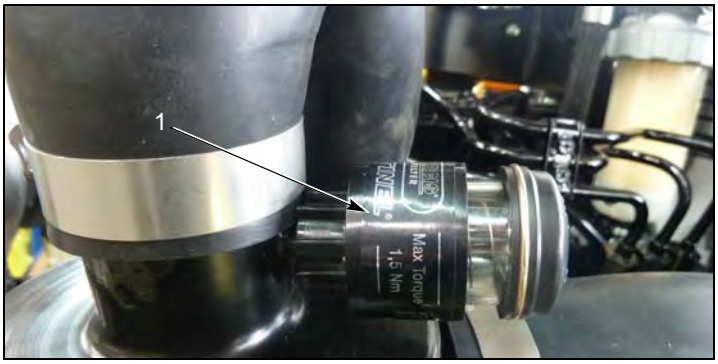



*Fig. 9-35 Soiling indicator*

## *Air filter cartridge*

The air filter is located on the left side of the engine.

**1** Remove the wing nut **(1)** with the cover.

**2** Remove the wing nut **(2)** from the air filter cartridge.

**3** Remove the air filter cartridge **(3)**.

**4** Check the air filter cartridge for:

**5a** **Damage**: replace the cartridge.

**6a** **Soiling**: clean the cartridge.

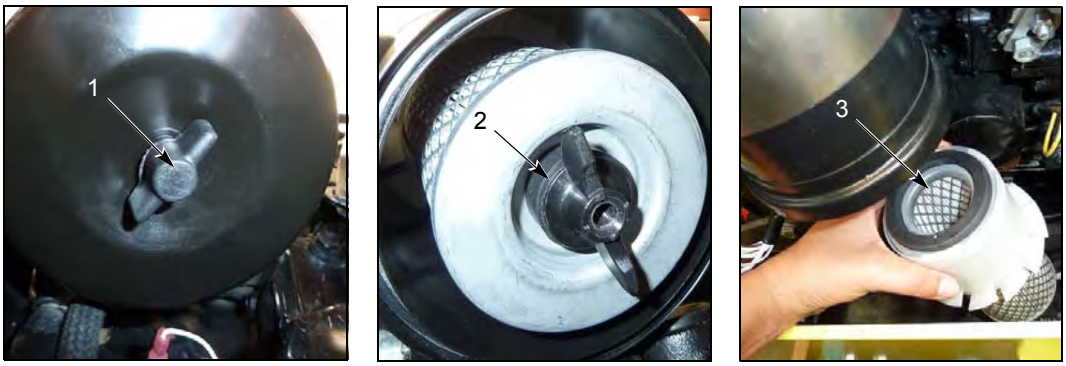



*Fig. 9-36 Air filter cartridge*

**NOTE** **If the machine is used on very dusty surfaces, the air filter must be checked for clogging daily.**

- **When cleaning/replacing the cartridge, take care that no dirt enters the intake hose.**

## *Intake opening*

**1** Check the intake opening for:

**1a** **Soiling**: clean the intake opening.

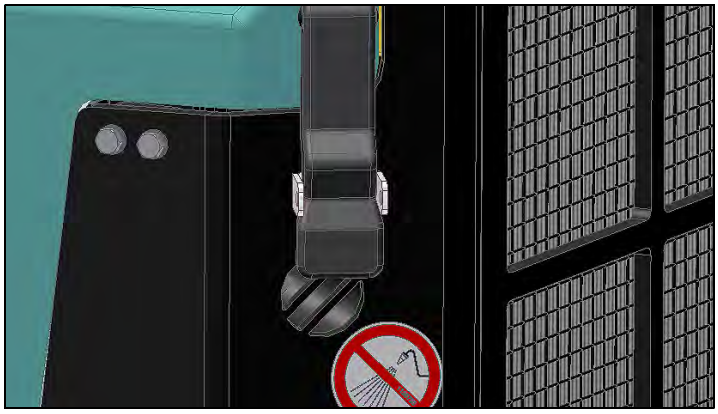


*Fig. 9-37 Intake opening*

### 9.12.3 Replacing the pendulum support joint head

Check the pendulum support once a year for excessive play.

**1** Attach the roller to a crane (central lifting point).

The play can be checked by alternately applying and releasing upward pressure to the roller (visual inspection).

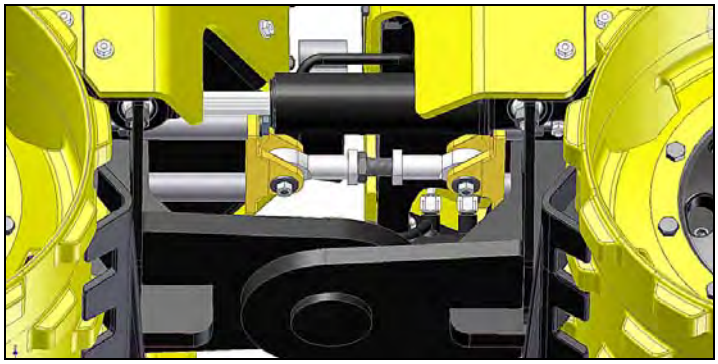


*Fig. 9-38 Pendulum support*

### 9.12.4 Replacing the pendulum joint bearing

Check the pendulum joint once a year for excessive play.
If the axial play is greater than 4 mm, the joint bearing must be replaced. See page 272.

**1** Attach the roller to a crane (central lifting point).

Lift and lower the roller to check the play.

*Fig. 9-39 Pendulum joint*

## 9.13 Lubricating steering cylinder, bearing

**1** Rotate the roller's steering fully to the stop in order to grease the cylinder.

**2** Steer the roller briefly to the right and the left. This causes the bearing to be unloaded.

**3** Clean the grease nipple **(1)** before greasing.

**4** Connect the grease gun to the grease nipple.

**5** Press grease into the bearing until it visibly begins to ooze out.

**6** Put the protective cover back on.

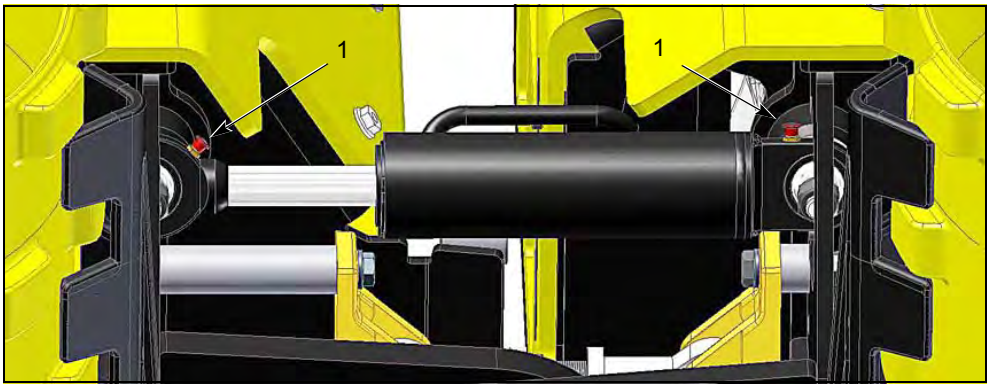



*Fig. 9-40 Location of grease nipples on steering cylinder*

**NOTE** **Damager to property due to increased wear!**

- **Regrease the bearing after every cleaning/steam cleaning of the roller.**

## 9.14 Brake test

The function of the brakes must be checked periodically.

### 9.14.1 Cable/connector Y9

The cable/connector Y9, which must be disconnected for the brake test, is located at the front under the hood.

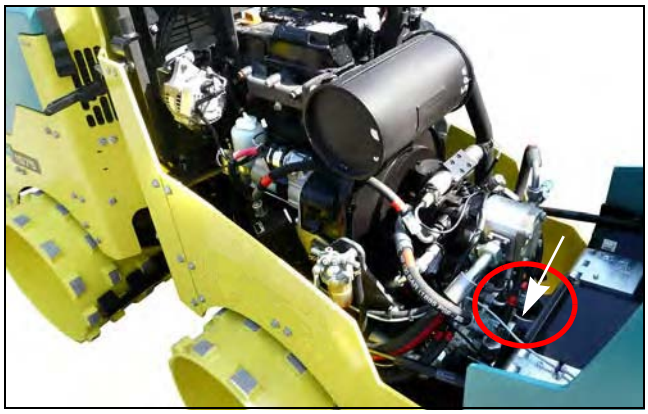


*Fig. 9-41 Cable/connector Y9 under the hood*

### 9.14.2 Brake test

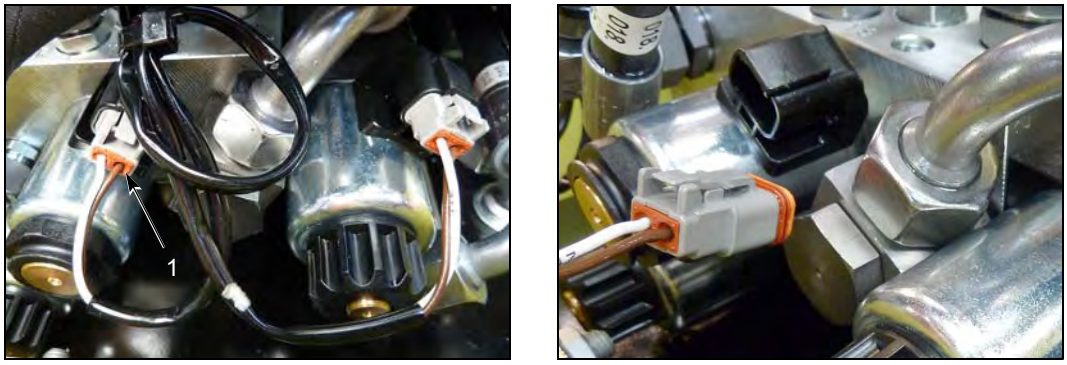



*Fig. 9-42 201309220064 cable/201309220064 connector Y9 under the hood*

**1** Put the machine into the work gear.

**2** Disconnect connector Y9 **(1)** from the connector housing at the magnet.

**3** Perform the forwards and backwards driving functions using the infrared sensor.

**4** Check all four roller drums for rotation (slipping).

If a brake is defective, the corresponding roller drum will rotate.

**NOTE** **If a brake is defective, the roller is no longer safe for operation. Contact your authorized dealer and have the roller repaired professionally.**

## 9.15 Lubricant table

*Tab. 9-2 Lubricant table*

| Brand | Hydraulic oil | Synthetic hydraulic oil based on HE esters | Grease |
|---|---|---|---|
| **Standard** | **ISO VG 46 HVLP DIN 51524 T3** | **ISO 15380 HEES** | **ISO 2137 DIN 51502** |
| **Application** | **Drive and vibration hydraulics** | **Drive and vibration hydraulics** | |
| AGIP | Amica 46 | | |
| BLASER | Blasol 148 | | Foodgrease SPM00 (Rammax vibro bearing) |
| BP | Bartran HV 46 | | |
| CASTROL | Hyspin AWH 46 | | |
| ESSO | Univis HP 46 | | |
| MOBIL | Mobil DTE15 | | |
| Motorex | Corex HV 46 | | MOLY 218 (steering cylinder) |
| PANOLIN | HLP Universal 46 | HLP Synth 46 | |
| SHELL | Tellus T 46 | | |
| TOTAL | Equivis ZS 46 | | |

**NOTE** **Using the wrong oil can cause damage to the hydraulic controls! Hydraulic tubes decompose.**

- **It is forbidden to change used rollers for use with biodegradable hydraulic oils!**
- **If hydraulic hoses on a roller running on synthetic ester HE need replacing, only those declared by the supplier as being compatible with synthetic esters may be used.**

## 9.16 Consumables

*Tab. 9-3 Consumables*

| Designation | Brand | Quantity | Art.no. |
|---|---|---|---|
| Engine oil | Motorex Focus CF SAE 10W/40 | 1l | 1242375 |
| Grease | Motorex Moly 218 | 400g | 1111368 |
| Grease | Blaser Foodgrease SPM00 | 0.38 kg | 1094392 |
| Blue adhesive | Ergo 4052 | 50 ml | 1-907977 |
| Red adhesive | Ergo 4100 | 50 ml | 1-907978 |
| Paint spray | RAL 1016 Sulfur yellow | 400 ml | 1-922700 |
| Paint spray | RAL 6033 Mint turquoise | 400 ml | 1-922701 |
| Sealant | Ergo 4207 | 250 g | 1-923054 |

**NOTE** **The screws can loosen due to the vibration of the roller!**

- **Unless otherwise specified, secure all screws with the blue adhesive.**

## 9.17 Tightening torques

The values below apply:

- Unless otherwise specified in the operating manual or in the Service manual
- To female steel threads

### *Hex screws/bolts and hexagon-socket-head cap screws*

*Tab. 9-4 Tightening torque: Hex screws/bolts (including tapping hex screws) and hexagon-socket-head cap screws*

| AF SIZE hex | AF SIZE Hex socket | Screw diameter | Steel quality | Tightening torque in Nm |
|---|---|---|---|---|
| 7 | 3 | M4 | 8.8 | 3 |
| 8 | 4 | M5 | 8.8 | 6 |
| 10 | 5 | M6 | 8.8 | 10 |
| 13 | 6 | M8 | 8.8 | 25 |
| 13 | 6 | M8 | 10.9 | 36 |
| 15 | | M10x1.25 | 10.9 | 90 |
| 17 | 8 | M10 | 8.8 | 48 |

| AF SIZE hex | AF SIZE Hex socket | Screw diameter | Steel quality | Tightening torque in Nm |
|---|---|---|---|---|
| 19 | 10 | M12 | 8.8 | 84 |
| 19 | 10 | M12 | 10.9 | 123 |
| 24 | - | M16 | 8.8 | 206 |

## *Extremely low-profile cylinder screws and filister-head screws*

*Tab. 9-5 Tightening torque: Extremely low-profile cylinder screws and filister-head screws*

| Allen key size | Screw diameter | Steel quality | Tightening torque in Nm |
|---|---|---|---|
| 3 | M6 | 10.9 | 6 |
| 4 | M8 | 10.9 | 13 |

## *Flanged oval-head screws*

*Tab. 9-6 Tightening torque: Flanged oval-head screws*

| Allen key size | Screw diameter | Steel quality | Tightening torque in Nm |
|---|---|---|---|
| 3 | M5 | 10.9 | 5 |

## *Countersunk head screws*

*Tab. 9-7 Tightening torque: Countersunk head screws*

| Allen key size | Screw diameter | Steel quality | Tightening torque in Nm |
|---|---|---|---|
| 5 | M8 | 10.9 | 16 |

## *Threaded adapters / Metric threads*

*Tab. 9-8 Tightening torques for threaded adapters / metric threads*

| Thread size | Cutting ring | Soft seat ring | Nominal joint size | |
|---|---|---|---|---|
| M10x1.0 | 18 Nm | 18 Nm | 6 | L |
| M12x1.5 | 25 Nm | 25 Nm | 8 | L |
| M14x1.5 | 45 Nm | 45 Nm | 10 | L |
| M16x1.5 | 55 Nm | 55 Nm | 12 | L |
| M18x1.5 | 70 Nm | 70 Nm | 15 | L |
| M22x1.5 | 125 Nm | 125 Nm | 18 | L |
| M26x1.5 | 180 Nm | 180 Nm | 22 | L |

| Thread size | Cutting ring | Soft seat ring | Nominal joint size | |
|---|---|---|---|---|
| M33x2.0 | 310 Nm | 310 Nm | 28 | L |
| | | | | |
| M12x1.5 | 35 Nm | 40 Nm | 6 | S |
| M14x1.5 | 55 Nm | 40 Nm | 8 | S |
| M16x1.5 | 70 Nm | 70 Nm | 10 | S |
| M18x1.5 | 110 Nm | 90 Nm | 12 | S |
| M20x1.5 | 150 Nm | 125 Nm | 14 | S |
| M22x1.5 | 170 Nm | 135 Nm | 16 | S |
| M27x1.5 | 270 Nm | 180 Nm | 20 | S |

## *Threaded adapters / Inch threads*

*Tab. 9-9 Tightening torques for threaded adapters / inch threads*

| Thread size | Cutting ring | Soft seat ring | Nominal joint size | |
|---|---|---|---|---|
| 1/8“ | 18 Nm | 18 Nm | 6 | L |
| 1/4“ | 25 Nm | 25 Nm | 8 | L |
| 1/4“ | 45 Nm | 45 Nm | 10 | L |
| 3/8“ | 55 Nm | 55 Nm | 12 | L |
| 1/2“ | 70 Nm | 70 Nm | 15 | L |
| 1/2“ | 125 Nm | 125 Nm | 18 | L |
| 3/8“ | 180 Nm | 180 Nm | 22 | L |
| 1" | 310 Nm | 310 Nm | 28 | L |
| | | | | |
| 1/4“ | 35 Nm | 40 Nm | 6 | S |
| 1/4“ | 55 Nm | 40 Nm | 8 | S |
| 3/8“ | 70 Nm | 70 Nm | 10 | S |
| 3/8“ | 110 Nm | 90 Nm | 12 | S |
| 1/2“ | 150 Nm | 125 Nm | 14 | S |
| 1/2“ | 170 Nm | 135 Nm | 16 | S |
| 3/4“ | 270 Nm | 180 Nm | 20 | S |

**NOTE** **To tighten hydraulic hoses and fittings:**

- **Screw the union nut by hand all the way to the stop, then tighten ¼ of a turn with the wrench (90°)**

### 9.17.1 *Cementing hydraulic threaded joints*

Blue adhesive must be used when installing all hydraulic threaded joints in the engine assembly and in the roller drum assemblies.

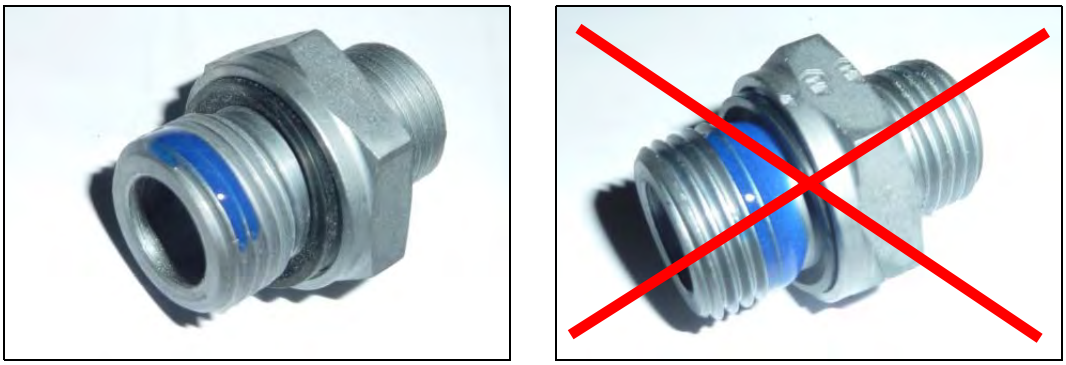


*Fig. 9-43 Hydraulic threaded joint cemented correctly / incorrectly*

**NOTE** **The person that applies the adhesive on the threaded joint is responsible for ensuring that the threaded joint is tightened.**

**NOTE** **Do not retighten cemented threaded joints!**

## 9.18 Conversion table for bar à psi

*Tab. 9-10 Conversion table for bar à psi*

| bar | psi | KPa | Atm |
|---|---|---|---|
| 1 | 15 | 100 | 0.99 |
| 2 | 29 | 200 | 1.97 |
| 3 | 44 | 300 | 2.96 |
| 4 | 58 | 400 | 3.95 |
| 5 | 73 | 500 | 4.93 |
| 6 | 87 | 600 | 5.92 |
| 7 | 102 | 700 | 6.91 |
| 8 | 116 | 800 | 7.90 |
| 9 | 131 | 900 | 8.88 |
| 10 | 145 | 1000 | 9.87 |
| 15 | 218 | 1500 | 14.80 |
| 20 | 290 | 2000 | 19.74 |
| 25 | 363 | 2500 | 24.67 |
| 30 | 435 | 3000 | 29.61 |
| 35 | 508 | 3500 | 34.54 |
| 40 | 580 | 4000 | 39.48 |
| 45 | 653 | 4500 | 44.41 |
| 50 | 725 | 5000 | 49.35 |
| 100 | 1450 | 10000 | 98.69 |
| 150 | 2175 | 15000 | 148.04 |
| 200 | 2901 | 19999 | 197.39 |
| 250 | 3626 | 24999 | 246.74 |
| 300 | 4351 | 29999 | 296.08 |
| 350 | 5076 | 34999 | 345.43 |
| 400 | 5801 | 39999 | 394.78 |
| 450 | 6526 | 44999 | 444.13 |

*Conversion factors:*

- 1 psi = 0.06895 bar
- 1 bar = 14.50326 psi
- 1 psi = 6.8948 KPa

## 9.19 Cleaning the roller

After completion of work, clean the roller:

- of major soiling;
- and the lower scrapers of deposits.

Regularly clean completely; at least once a week. When working on cohesive soils, or with cement and lime stabilizers, complete cleaning must be performed daily.

**⚠DANGER**

**Danger to life through runaway roller. Persons standing in the vicinity can be rolled over!**

- Before cleaning the roller, be absolutely certain to secure it against unintentional rolling away.

**NOTE** **While cleaning, observe the following:**

- **Do not use aggressive or flammable cleansing agents (e.g. gasoline or inflammable substances).**
- **Only work with the engine turned off.**
- **Do not directly subject electrical components or isolating materials to a steam jet when using a steam cleaner. Always cover these materials.**
- **When washing the roller, ensure that no water is sprayed into the air-intake filter.**
- **Before cleaning the roller with pressure cleaners using water, steam, etc., cover all openings into which the cleaning agent may penetrate. Remove these dummy flanges after cleaning the roller.**

# 10

# Repair

## 10.1 Preparation for welding work

**NOTE** **Doing welding work on the roller when the battery is installed can damage the machine controller!**

**Always remove the battery completely before performing welding work on the roller.**

Attach the welder's ground cable as close to the welding point as possible. The grounding point must be free of paint.

**⚠WARNING**

**Accident hazard!**

Poorly welded cast parts can result in material failure.

**DO NOT weld cast parts!**

## 10.2 Battery

**NOTE** **Risk of cable fire or short circuit.**

- **Keep to the proper sequence when removing or installing the terminal connections.**

- Ignition on = battery voltage. The battery voltage should not fall below 10 volts while starting, otherwise the battery must be charged.
- Machine running = alternator charging voltage. The voltage should lie in a range of from 13 to 14.5 volts.

### *10.2.1 Replacing the battery*

**1** Loosen the **(-)** terminal and disconnect it (size13).

**2** Loosen the **(+)** terminal and disconnect it (size13).

**3** Loosen and remove the mounting bracket.

*Fig. 10-1 Loosening the terminals*

4 Lift the battery out of the engine compartment.

5 Set the new battery in place.

6 Connect the battery.

6.1 Begin with the **(+)** terminal.

*Fig. 10-2 Replacing the battery*

**NOTE** **The battery poles and terminals must be clean. If they are coated with a (whitish or greenish) sulfur crust they must be cleaned.**



## *10.2.2 Starting with another battery (jumpering)*

1 Connect the red cable to the **(+)** terminals of both batteries.

2 Connect one end of the green or black cable to the **(-)** terminals of both batteries.

3 Actuate the starter. Allow the engine to run.

4 Wait until the engine is idling smoothly and then disconnect the cables.

4.1 Begin with the **(-)** terminal.

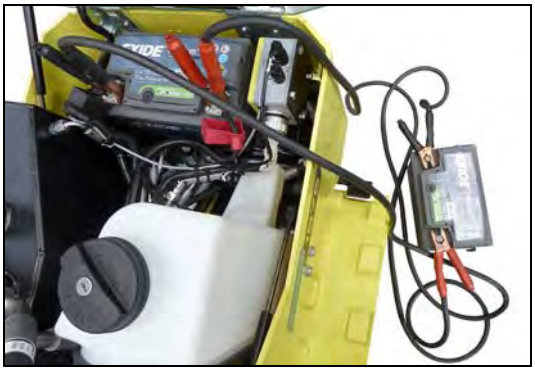


*Fig. 10-3 Starting with an external battery*

**NOTE** **The battery poles and terminals must be clean. If they are coated with a (whitish or greenish) sulfur crust they must be removed and cleaned.**

### *10.2.3 Charging the battery using a battery charger*

**1** Disconnect the battery.

**2** Connect the battery charger.

**2.1** Observe the battery charger manufacturer's manual.

**3** Start with the **(+)** terminal when reconnecting the battery.

**NOTE** **The battery poles and terminals must be clean. If they are coated with a (whitish or greenish) sulfur crust they must be removed and cleaned.**

### *10.2.4 Long-term storage*

Remove the negative battery cable from the battery if a standstill period of more than two weeks is expected.

## 10.3 Gas strut

Gas struts are maintenance-free! They require no maintenance such as lubrication. They are designed for the respective requirements and work trouble-free for many years.

### *10.3.1 Replacing gas struts*

**⚠WARNING**

**Risk of accident through hood falling down!**

- Secure the hood before you replace the gas struts.
  - Support the hood with a rod.

*removal*

**1** Use a screwdriver to lift the clips.

**2** Pull the gas strut away from the ball joint.

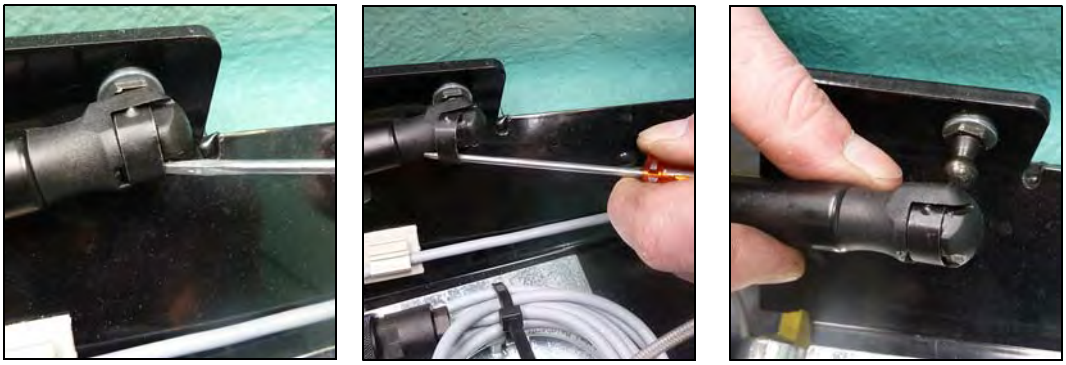


*Fig. 10-4 Using a screwdriver, lift the clips and loosen the springs*

## *installing*

**1** The new gas struts can easily be installed by pressing them onto the ball joint.

**1.1** The clamp must be seated securely afterward.

**NOTE** **When reinstalling the gas strut, secure the extended part at the bottom:**

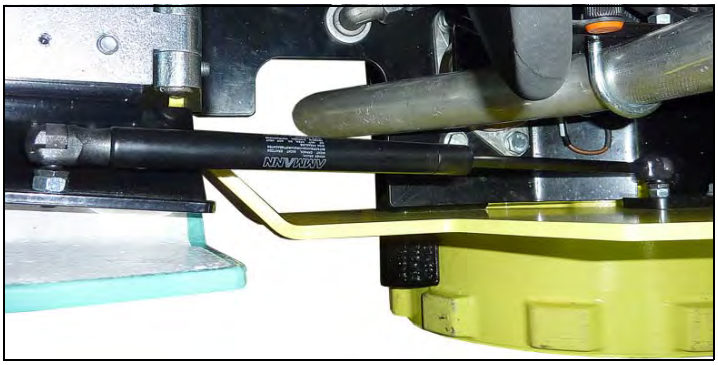


*Fig. 10-5 Gas strut*

**NOTE** **Gas struts should not be installed if they have been damaged through mechanical manipulation.**

- **Welding on gas struts as well as dirt or paint on the piston rods can lead to failure of the units.**
- **Avoid modifications, manipulation, impacts, tensile loading, heating, painting over or removal of imprints.**
- **Do not install defective or improperly handled products.**

**NOTE** **If gas struts are no longer needed, they must be disposed of in an environmentally appropriate manner. For this purpose, they will be drilled out to allow the compressed nitrogen to escape and to drain the oil they contain. See also** *Removal and depressurization of the gas strut*, **page 306**

## 10.4 Overturning/Tipping of the Rammax 1575

*Fig. 10-6 Rammax 1575 overturned*

**1** Place the machine back onto the roller drums as quickly as possible.

**2** Turn the ignition off (position 0).

**NOTE** **Do not under any circumstances attempt to restart the engine right away!**

- **Avoid oil shock!**
- **Severe engine damage can result!**

**⚠ CAUTION**

**Environmental hazard through operating materials!**

- Do not allow any liquids to enter drains, the soil or the environment.
- Immediately bind any fluids which have leaked out, such as oil, diesel, antifreeze, battery acid!

*Fig. 10-7 Rammax 1575*

### *10.4.1 Inspect for damage*

**1** Open both hoods.

**2** Disconnect the ground cable (-).

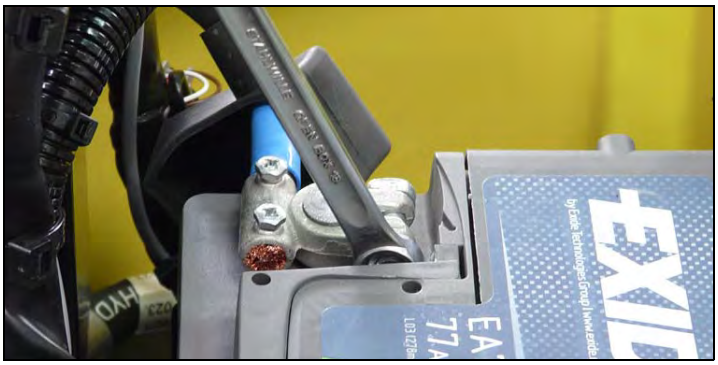


*Fig. 10-8 Disconnect the battery*

**3** Inspect the machine for visible damage.

**3.1** Especially for fluids which have leaked out.

**4** Empty any containers (tanks) which may be defective.

### *10.4.2 Prevent an oil shock*

**NOTE** **Before you begin the dismantling and disassembly of parts, you must thoroughly clean the area around the valve cover, cylinder head and electrical steel.**

If no visible damage is found or it has already been repaired, perform the following procedure:

#### *Removal of parts*

**1** Remove fuse F21 in the engine compartment.

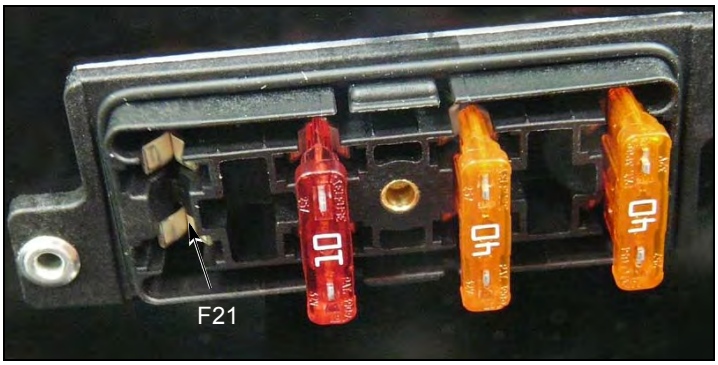



*Fig. 10-9 Engine compartment fuses*

**2** Remove the air filter element. See page 84.

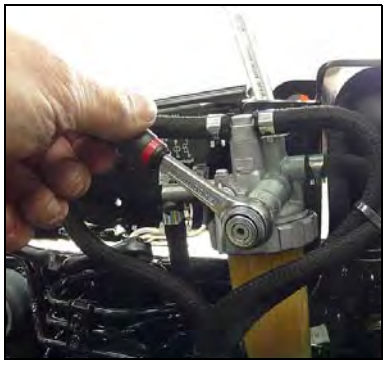
**2.1** If it is oily, replace it.

**3** Clean the air filter housing.

**4** Disassemble the air filter hose at the top.

*Fig. 10-10 Remove the air filter hose at the top*

**5** Disassemble the fuel filter (AF size 13).



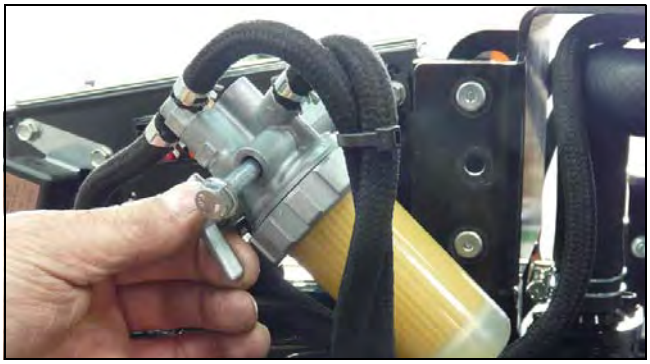


*Fig. 10-11 Disassembling fuel filter*

**6** Disassemble the electrical steel and fold it toward the back.

**6.1** Screws at back (2 Allen screws, AF size 4).

**6.2** Screws at front (4 hex screws, AF size 13).

*Fig. 10-12 Disassembling electrical steel at back/front*

**7** Disassemble the valve cover (9 hex screws, AF size 10).

*Fig. 10-13 Disassembling the valve cover*

**8** Remove the three cables and contact connectors on the glow plugs (AF size 8).

*Fig. 10-14 Remove cables and contact connectors*

**9** Remove ALL three glow plugs (AF size 12).

**9.1** Tools: Long socket (AF size 12) and torque wrench.

*Fig. 10-15 Tools/Spark plug removal*

*Turn the engine over (rotate crankshaft) with a wrench*

Ensure that the oil which may have collected is displaced by the piston.

**1** Turn the engine over twice clockwise by means of the central bolt (AF size 17) on the crankshaft using a box-end ratchet wrench **(1)**.

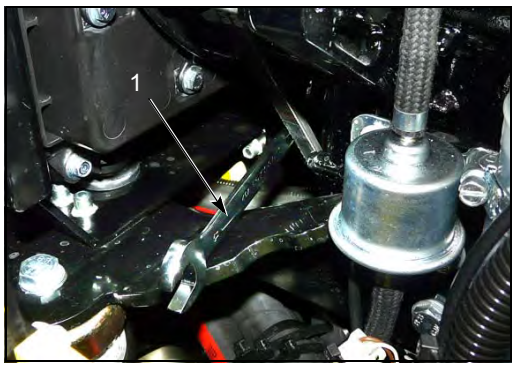



*Fig. 10-16 Box-end ratchet wrench/Rotate crankshaft*

**NOTE** **Risk of cable fire or short circuit.**

**Insulate the connection cables for the glow plugs, e.g. using a piece of hose.**

*Fig. 10-17 Insulate the connection cable*

**2** Refasten the electrical steel using two screws **(1)**.

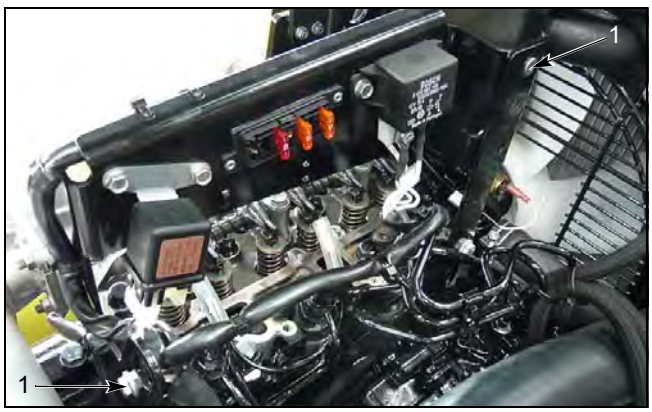



*Fig. 10-18 Fasten electrical steel*

**3** Reconnect the battery ground cable (-).

**⚠WARNING**

**Danger of burns due to ejected oil!**

**Eye injury, burns**

- Wear safety goggles

*Turn the engine over using the starter*

**1** Turn the engine over using the starter for 1-2 minutes.

After a few revolutions, the oil which has gathered in the combustion chambers should have been pressed out through the openings for the glow plugs.

Repeat the procedure after about 5 minutes. It is essential to be sure that no more oil is present in the combustion chambers!

**2** Reinstall the glow plugs (AF size 12, torque, 18Nm).

*Fig. 10-19 Glow plugs*

**3** Reconnect the contact connectors and cables to the glow plugs (AF size8, torque, 1.5 Nm).

*Fig. 10-20 Connection cable*

**4** Install the valve cover.

**5** Install the electrical steel.

### *Turn the engine over with the ignition key*

**1** Turn the ignition key clockwise to position III.

**1.1** The engine must turn over.

If this is not the case, do not under any circumstances attempt to start the engine!

It is possible that there could still be oil in the combustion chambers. Repeat the procedure described above, or otherwise contact your authorized dealer right away!

If the engine turns over:

**1** Check all fluid levels.

**1.1** If needed, top up the fluids.

**2** Put fuse F 21 back in place.

## *10.4.3 Start the engine*

### *1. Attempt to start*

**1** Turn the ignition key clockwise to position III.

**1.1a** Attempt to start is successful, engine is running: See “Engine is running” further down.

**1.1b** Attempt to start is unsuccessful, engine is not running: There could be air in the diesel system. See “Check the pump” in the following.

### *Check the pump*

**1** Turn the ignition key clockwise to position I.

**1.1** Check whether the electrical fuel pump is working.

Allow the pump to operate for about 1 minute. The system will be bled automatically.

### *2. Attempt to start*

**1** Turn the ignition key clockwise to position III.

**2** Allow the engine to turn over in neutral!

**2.1** Do not activate any functions.

### *Engine running*

The engine will smoke until the oil that has gathered in the exhaust system has been burned away (can take up to 1h).

**▲WARNING**

**Danger of fire!**

**It is possible for flames/glowing embers to be shot out of the exhaust pipe.**

**1** Immediately perform a visual inspection for any leaking fluids.

If everything is in order:

**1** Bring the engine up to maximum speed.

**1.1** Check the functions.

The smoke from the engine must be decreasing noticeably and then stop completely. Otherwise, there may be a mechanical defect in the engine.

**1** Switch off the engine.

**2** Check all fluid levels.

**2.1** Top up as needed.

**3** Inspect for fluid losses.

**4** Start the engine.

## 10.5 Front engine hood

### *10.5.1 Removal*

The sensor must be removed before the hood can be taken off. Siehe “Replacing the sensor” auf page 161.

*Fig. 10-21 201309210017*

**1** Attach the hood to an anchor sling.

*Fig. 10-22 201309210018*

*Fig. 10-23 201309210019*

**1** Use a screwdriver to lift the clips.

**2** Pull the gas struts off of the ball joint on the left and right.

*Fig. 10-24 201309210021*

**1** Disconnect the wire cable on the left from the hood.

**2** Use a crane to lift the hood up.

*Fig. 10-25 201309210022*

**1** Remove the lower screws from the hinge on the left (AF size 17).

*Fig. 10-26 201309210023*

**1** Remove the lower screws from the hinge on the right (AF size 17).

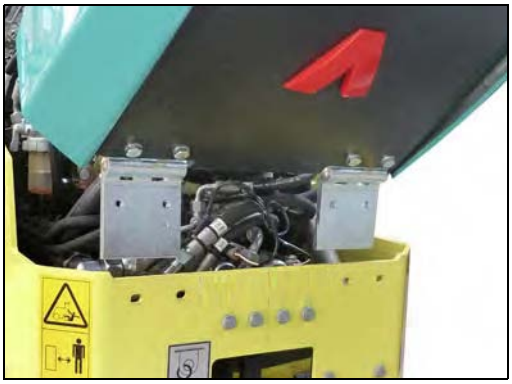


*Fig. 10-27 201309210024*

**1** You can now use the crane to completely remove the hood from the chassis.

### *10.5.2 Replacing the hinges*

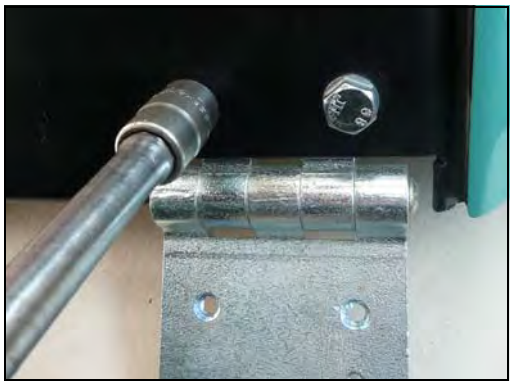


*Fig. 10-28 201309210028*

**1** Remove the hood as shown above.

**2** Remove the **two** M10x20 hex screws.

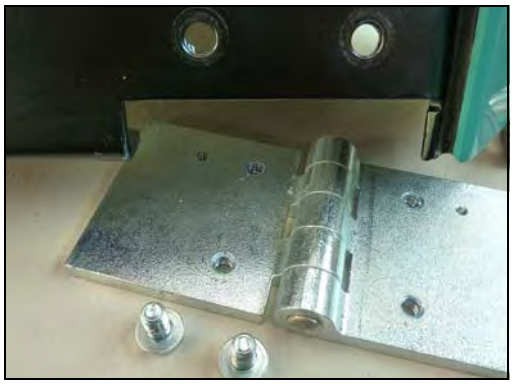


*Fig. 10-29 201309210029*

**1** Replace the hinge.

*Fig. 10-30 201309210031*

**1** Apply blue adhesive to the M10x20 (AF size 17) hex screws.

*Fig. 10-31 201309210033*

**1** Retighten the screws with a torque of 50 Nm.

### 10.5.3 Replacing the sensor

#### *Removing the sensor*

*Fig. 10-32 201309210003*

**1** Remove the **four** M6x30 (AF size 5) Allen screws.

*Fig. 10-33 201309210002*

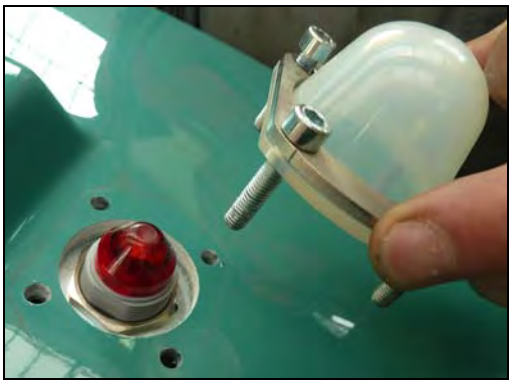


*Fig. 10-34 201309210004*

**1** Remove the protective cover of the sensor.


*Fig. 10-35 201309260007*

**1** Unscrew the sensor using the special tool (AF size 36).

*Fig. 10-36 201309210006*

**1** Remove the sensor from the inside.

Fig. 10-37 201309210007

**1** Remove the sensor cable from the cable mountings.

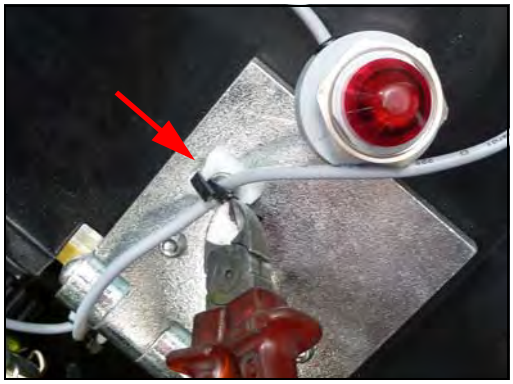


Fig. 10-38 201309210008

**1** Remove cable ties.

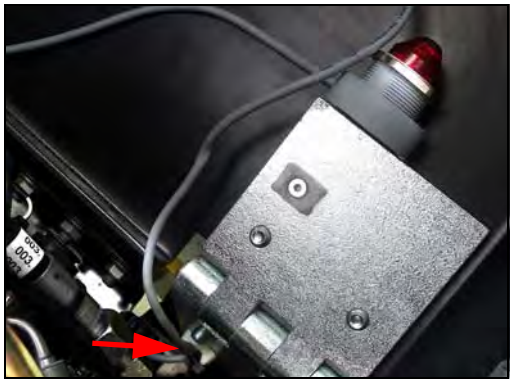


Fig. 10-39 201309210009

**1** Remove cable ties.

Fig. 10-40 201309210010

**1** Disconnect connector X5 (front IR sensor).

*Fig. 10-41 201309210011*

**1** Disassembled sensor. Now it can be replaced.

## *Installing the sensor*

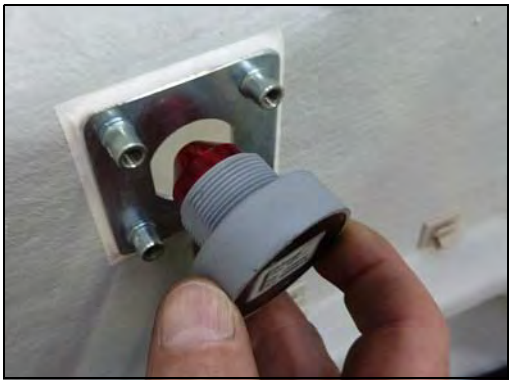


*Fig. 10-42 201309260005*

**1** Insert the new sensor.

*Fig. 10-43 201309260006*


*Fig. 10-44 201309260007*

**1** Screw the sensor in place from the outside using the special tool (AF size 36).

*Fig. 10-45 201309260009*

**1** Apply blue adhesive to the screws of the protective cover of the sensor.

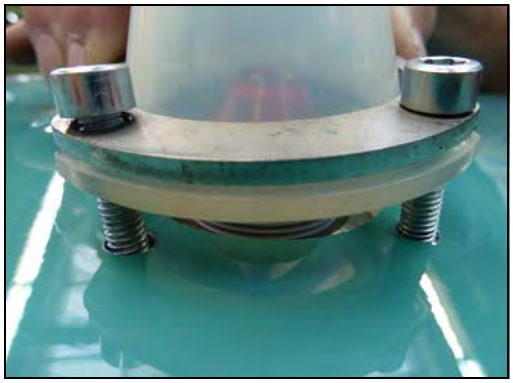


Fig. 10-46 201309260010

**1** Position the protective cover for the sensor on the hood.

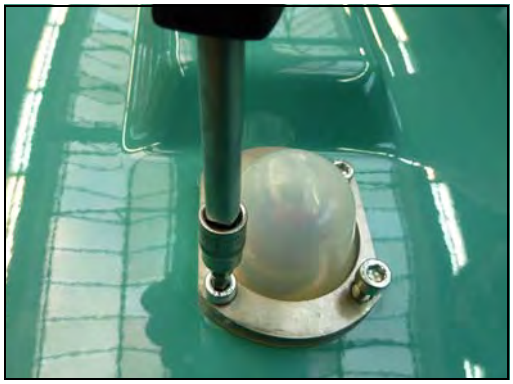


Fig. 10-47 201309260011

**1** Securely tighten the M6x30 (AF size 5) Allen screws to a torque of 10 Nm.

Fig. 10-48 201309260013

**1** Secure the cables in the cable mountings under the hood.

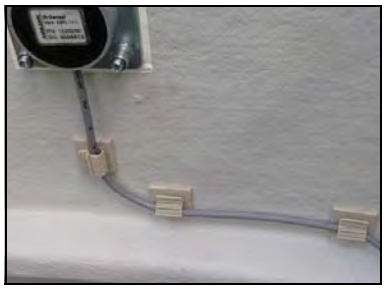


Fig. 10-49 201309260012

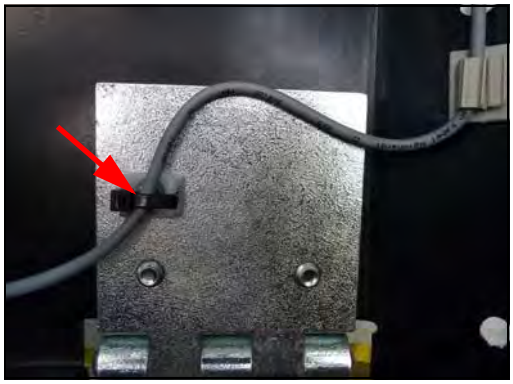


Fig. 10-50 201309260014

**1** Secure the cable to the bracket on the upper part of the hinge with a cable tie.

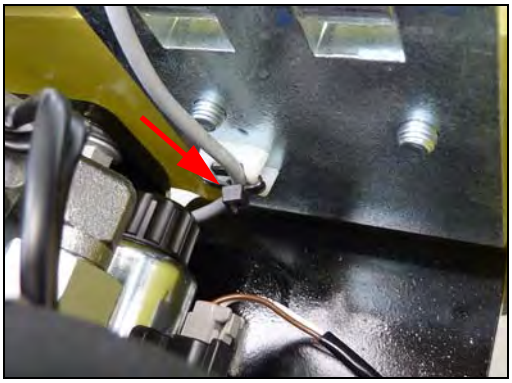


*Fig. 10-51 201309260016*

1 Secure the cable to the bracket on the lower part of the hinge with a cable tie.

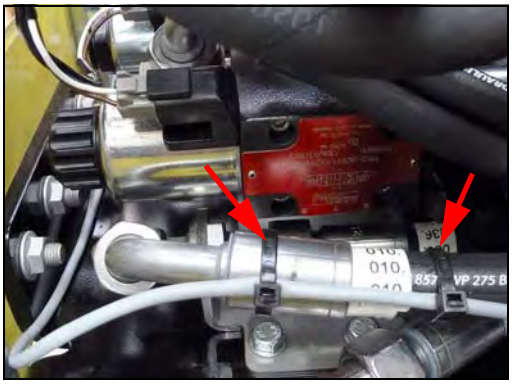


*Fig. 10-52 201309260017*

1 Secure the cable to hydraulic hose 010 with a cable tie.

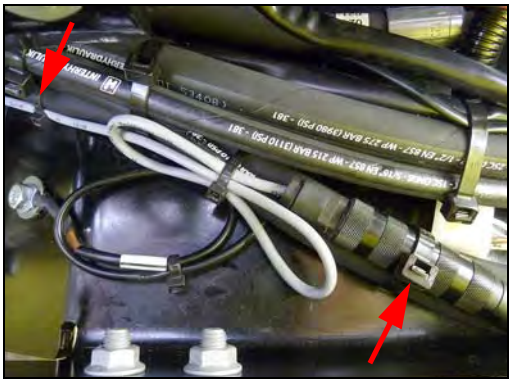


*Fig. 10-53 201309260018*

1 Screw connector X5 (front IR sensor) back together.

2 Secure cable with cable tie.

### *10.5.4 Replacing the rubber hood buffers*

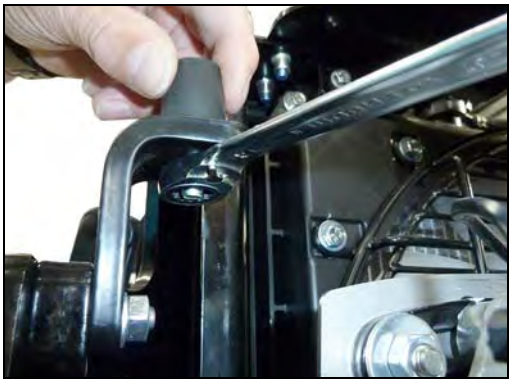


*Fig. 10-54 201311050004*

1 Remove the M8 hex nut from the rubber buffer (AF size 13).

*Fig. 10-55 201311050005*

**1** Remove the rubber buffer from the mounting.

*Fig. 10-56 201311050006*

**1** Apply blue adhesive to the threads of the new rubber buffer.

*Fig. 10-57 201311050007*

**1** Install the new rubber buffer into the mounting.

*Fig. 10-58 201311050009*

**1** Screw the rubber buffer firmly in place with the M8 hex nut and washer.

### 10.5.5 Adjusting the rubber hood buffers

If the hood makes contact with the chassis, the distance between the two can be adjusted.

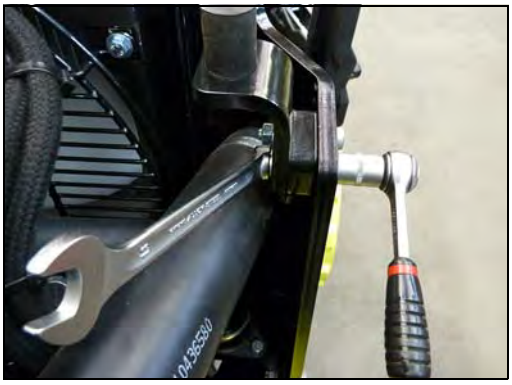


*Fig. 10-59 201309260003*

**1** Slightly loosen the two M8 screws on the rubber buffer mounting.

*Fig. 10-60 201309260001*

**1** The distance between the hood and the chassis can now be adjusted by shifting the mounting.

**1.1** Be sure the spacing is uniform.

*Fig. 10-61 201309260004*

**1** Slightly loosen the four M10 lower hinge screws.

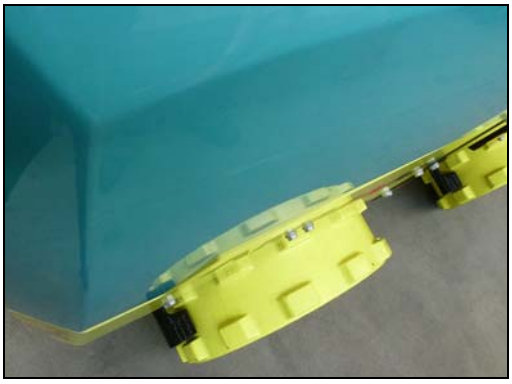


*Fig. 10-62 201309260002*

**1** The hood can now be aligned with the chassis by shifting it accordingly.

**1.1** The hood and chassis should be flush.

**2** When finished, tighten all screws (50 Nm).

## 10.6 Rear engine hood

### *10.6.1 Removal*

The sensor must be removed before the hood can be taken off. Siehe “Replacing the sensor” see page 161.

*Fig. 10-63 201309210038*

**1** Attach the hood to an anchor sling.

*Fig. 10-64 201309210037*

*Fig. 10-65 201309210040*

**1** Cut through and remove the two cable ties at connector N2.

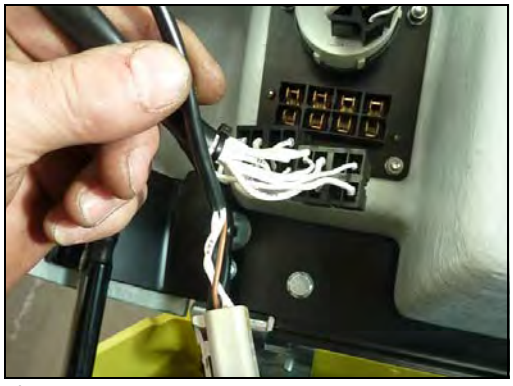


*Fig. 10-66 201309210041*

**1** Pull the two connectors off of the fuse box.


*Fig. 10-67 201309210042*

1 Pull the connector off of the ignition switch.


*Fig. 10-68 201309210043*

1 Disconnect connector N2.

*Fig. 10-69 201309210044*

1 Remove cable ties on hood.

*Fig. 10-70 201309210045*

1 Use a screwdriver to lift the clips.

2 Pull the gas strut away from the ball joint.

Fig. 10-71 201309210046

**1** Disconnect the wire cable from the hood.

**2** Use a crane to lift the hood up.

Fig. 10-72 201309210047

**1** Remove the lower screws from the hinges on the left (AF size 17).

Fig. 10-73 201309210049

**1** Remove the lower screws from the hinges on the right (AF size 17).

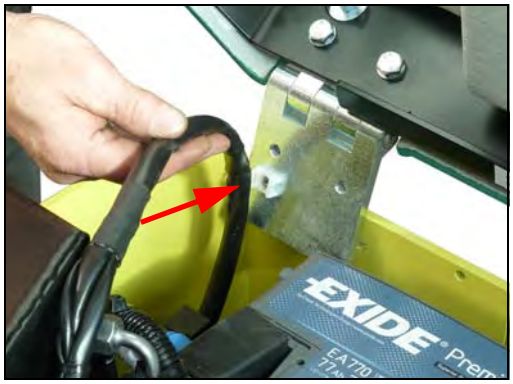



Fig. 10-74 201309210050

**1** Remove the cable tie on the hinge.

*Fig. 10-75 201309210051*

**1** You can now use the crane to completely remove the hood from the chassis.


*Fig. 10-76 201309210052*

## 10.6.2 Replacing the hinge

For “Replacing the hinge” of the rear engine hood, see the section “Replacing the hinges” of the front engine hood, page 160

## 10.6.3 Replacing the sensor

### *Replacing the sensor*

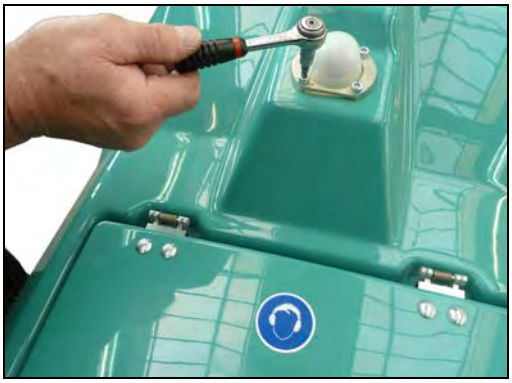


*Fig. 10-77 201309210012*

**1** Remove the **four** M6x30 (AF size 5) Allen screws.

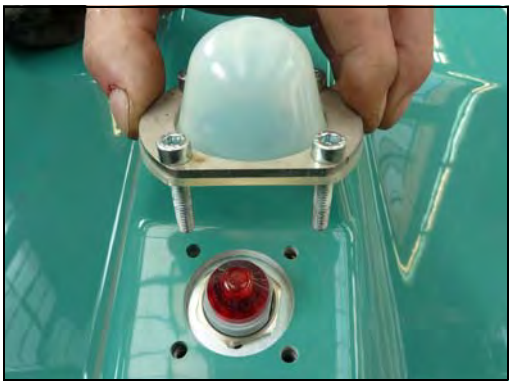


*Fig. 10-78 201309210013*

**1** Remove the protective cover of the sensor.


*Fig. 10-79 201309260007*

**1** Unscrew the sensor using the special tool (AF size 36).

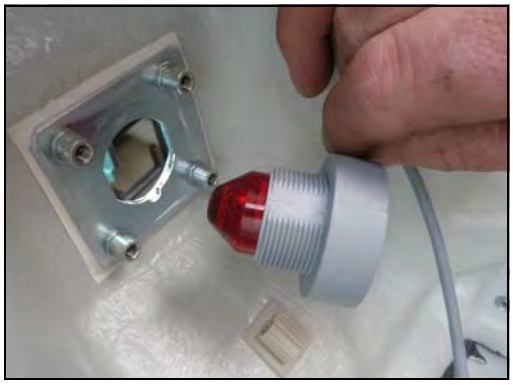


*Fig. 10-80 201309210015*

**1** Remove the sensor from the inside.

*Fig. 10-81 201309210016*

**1** Unscrew the rear sensor connector.

## *Installing the sensor*

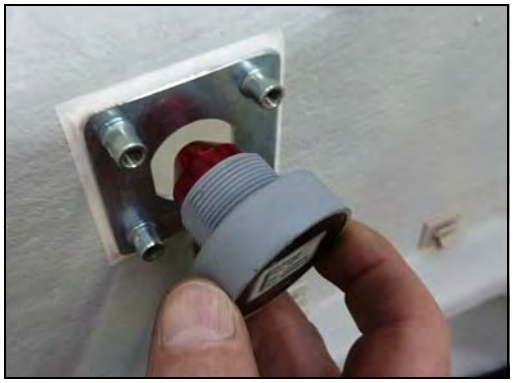


*Fig. 10-82 201309260005*

**1** Insert the new sensor.

*Fig. 10-83 201309260006*


*Fig. 10-84 201309260007*

**1** Screw the sensor in place from the outside using the special tool (AF size 36).

*Fig. 10-85 201309260009*

**1** Apply blue adhesive to the screws of the protective cover of the sensor.

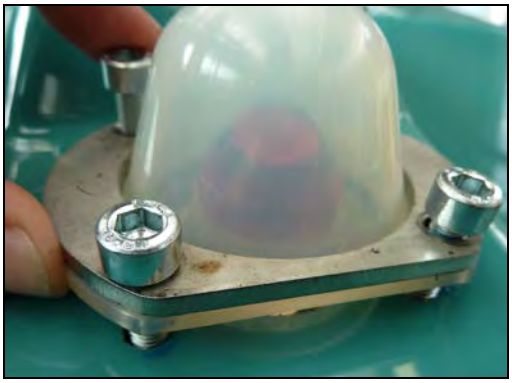


*Fig. 10-86 201309260040*

**1** Position the protective cover for the sensor on the hood.

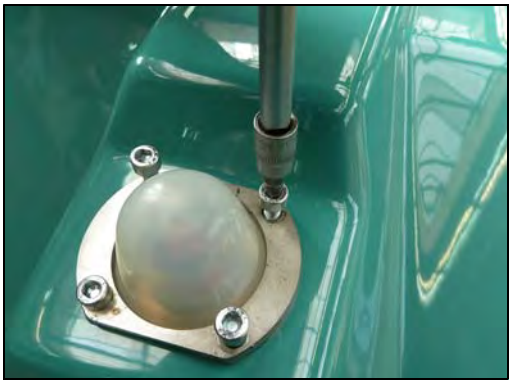


*Fig. 10-87 201309260041*

**1** Securely tighten the M6x30 (AF size 5) Allen screws to a torque of 10 Nm.


*Fig. 10-88 201309260030*

**1** Secure the cables in the cable mountings under the hood.

*Fig. 10-89 201309260031*

**1** Plug in the ignition switch connector.

**2** Plug in connector N2.

**3** Secure the connector with a cable tie.

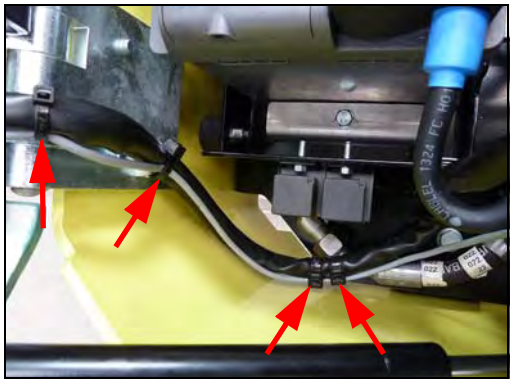


*Fig. 10-90 201309260032*

**1** Secure the cable along the wiring harness with cable ties.


*Fig. 10-91 201309260039*

**1** Route the sensor cable and secure it with cable ties.

## *10.6.4 Replacing the rubber hood buffers*

For “Replacing the rubber hood buffers” of the rear engine hood, see the section “Replacing the rubber hood buffers” of the front engine hood, page 165.

### *10.6.5 Adjusting the rubber hood buffers*

For “Adjusting the rubber hood buffers” of the rear engine hood, see the section “Adjusting the rubber hood buffers” of the front engine hood, page 167.

## 10.7 Replacing the display unit

### *10.7.1 Removal*


*Fig. 10-92 201309260033*

**1** Disconnect connector N2.

*Fig. 10-93 201309260035*

**1** Remove the two fasteners of the display unit (AF size 5.5).

*Fig. 10-94 201309260036*

**1** The display unit can now be removed from the inside toward the outside.

*Fig. 10-95 201309260038*

**1** Install the new unit in the opposite order.

## 10.8 Replacing the controller (machine controller)

### *10.8.1 Removal*


*Fig. 10-96 201309260019*

**1** Disconnect the (-) pole of the battery.


*Fig. 10-97 201309260020*

**1** Unscrew both sensor connectors.

*Fig. 10-98 201309260022*

**1** Disconnect connector N1.

*Fig. 10-99 201309260024*

**1** Use a screwdriver to lift the clips.

**2** Pull the gas strut away from the ball joint.

*Fig. 10-100 201309260025*

**1** Remove the four fastening screws (AF size 13).

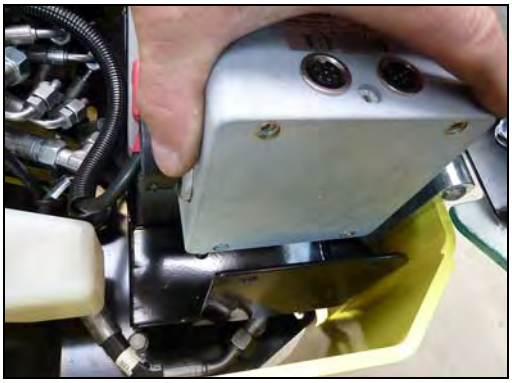


*Fig. 10-101 201309260026*

**1** Remove the controller.

### 10.8.2 Installation

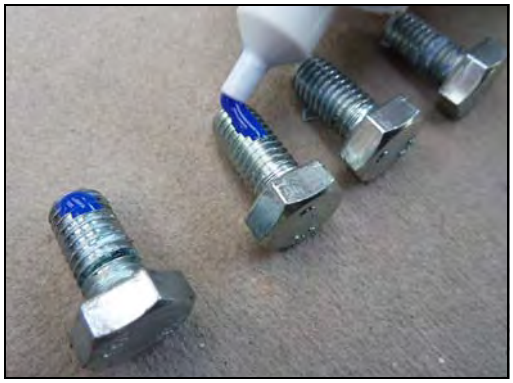


*Fig. 10-102 201309260027*

**1** Apply blue adhesive to the M8x20 hex screws.

*Fig. 10-103 201309260028*

**1** Screw the new controller firmly in place using M8x30 (AF size 13) hex screws.

*Fig. 10-104 201309260029*

**1** Connect connector N1.

**2** Reconnect the (-) pole of the battery.

## 10.9 Replacing and adjusting the magnetic rotational speed sensor

### *10.9.1 Removal*

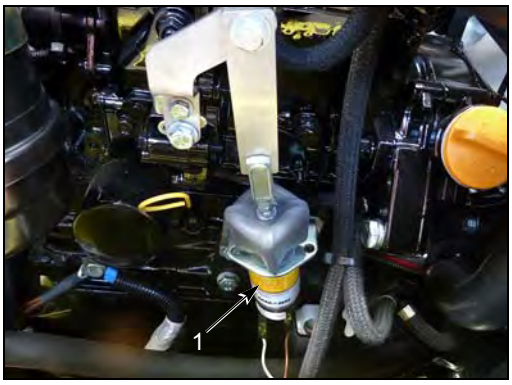



*Fig. 10-105 201309220001*

Magnetic rotational speed sensor **(1)**

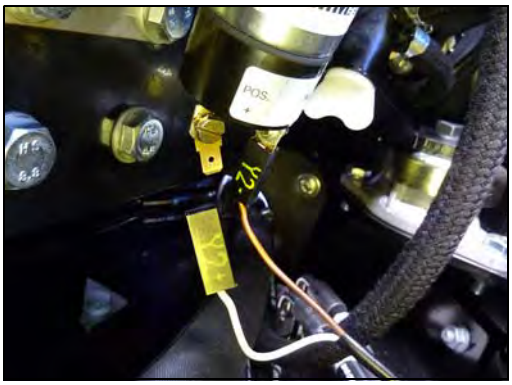



*Fig. 10-106 201309220002*

**1** Pull off the two leads Y2+ and Y2-.

*Fig. 10-107 201309220003*

**1** Remove safety bolt from the clevis head.

*Fig. 10-108 201309220004*

Fig. 10-109 201309220007

**1** Remove the two Allen screws (AF size 5).

**2** Remove the magnetic rotational speed sensor.

## *10.9.2 Installation*


Fig. 10-110 201311060001

Premounted magnetic rotational speed sensor **(1)**

Fig. 10-111 201309220006

**1** Apply blue adhesive to the two Allen screws.

Fig. 10-112 201309220007

**1** Position the magnetic rotational speed sensor and screw firmly in place.

*Fig. 10-113 201309220008*

**1** Grease the safety bolt of the clevis head.

*Fig. 10-114 201309220009*

**1** Put the safety bolt onto the clevis head.

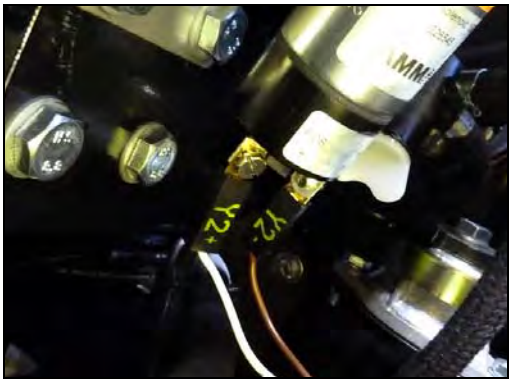


*Fig. 10-115 201309220025*

**1** Connect the two leads Y2+ and Y2-.

**1.1** Do not reverse - and + cables.


*Fig. 10-116 201309220005*

## *10.9.3 Adjusting*

*Fig. 10-117 201309220011*

**1** Loosen counter nut on clevis head (AF size 10).

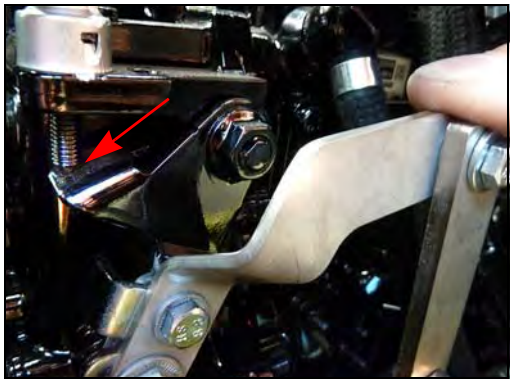


*Fig. 10-118 201309220013*

**1** Push the piston rod all the way down by hand.

**1.1** The stop (arrow) must not be allowed to touch the adjustment screw.

*Fig. 10-119 201309220021*

**1** Use a feeler gauge (1.5 mm) to set the spacing between the adjustment screw and the stop.

*Fig. 10-120 201309220015*

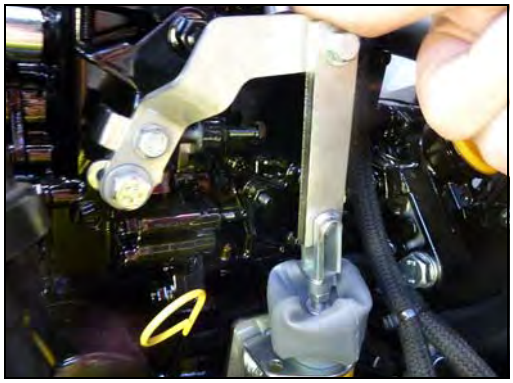


*Fig. 10-121 201309220016*

**1** Push the magnetic rotational speed sensor **all the way through** to the stop!

There must be a gap of 1.5 mm between the stop and the adjustment screw.

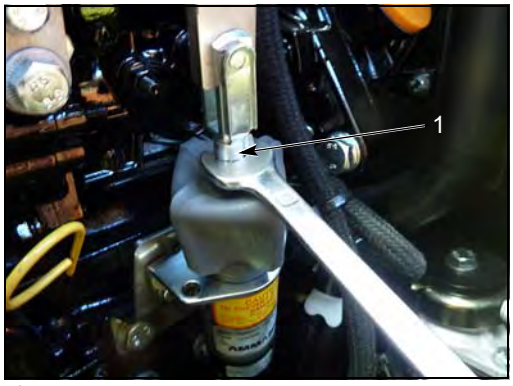



*Fig. 10-122 201309220011*

**1** Start the engine.

**2** Push the magnetic rotational speed sensor **all the way through** to the stop!

**3** Measure the engine speed using the tachometer.

If the specified speed (min. 2390 - 2440 rpm) is not reached, the clevis head (AF size 10) **(1)** must be adjusted.

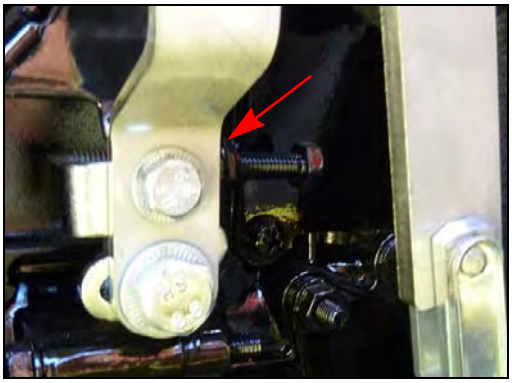


*Fig. 10-123 201309220018*

The governor lever must rest against the adjustment screw when the diesel engine is at the idle position.

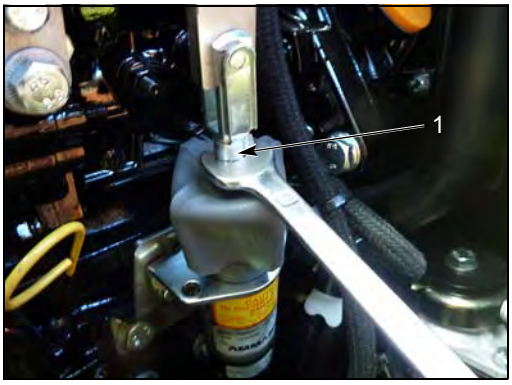



*Fig. 10-124 201309220011*

**1** After the adjustment is completed, tighten the counter nut on the clevis head (AF size 10).

**2** Motion test: Move the magnetic rotational speed sensor up and down by hand.

**IMPORTANT: When the linkage is pressed down, it must return to its starting position strain-free on its own.**

## 10.10 Testing the engine speed and frequency

**NOTE** **Adjust the speed when the roller is at operating temperature**

*Fig. 10-125 201311150005*

**1** Put the machine on two large or four small old tires or on a suitably soft base.

*Fig. 10-126 201311190100*

**1** Start the engine.

**2** Select vibration.

**3** The machine goes to full speed:
100% = 2390 - 2440 rpm

**4** Use a tachometer to measure the frequency.

100% = Desired value: 41 Hz.

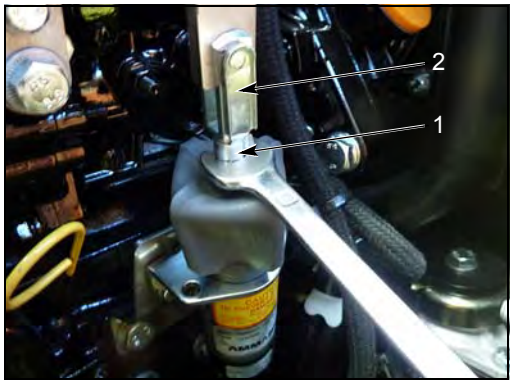



*Fig. 10-127 201309220011*

**1** If the rotational speed is not reached, check the engine speed.

**2** If necessary, adjust the speed at the clevis head (AF size 10) **(1)**.

**3** Counter the nuts.

**4** Be certain that the safety bolt **(2)** on the clevis head is engaged.

*Tab. 10-1 Diesel engine speeds*

| | RPM | |
|---|---|---|
| | After 5 min. | After 60 min. |
| Engine rpms, 100% | 2415 ±25 | 2405 ±25 |
| Vibration speed, front, small | 2250 ±150 | 2250 ±150 |
| Vibration speed, rear, small | 2250 ±150 | 2250 ±150 |
| Vibration speed, front, large | 2250 ±150 | 2250 ±150 |
| Vibration speed, rear, large | 2250 ±150 | 2250 ±150 |

## 10.11 Roller drum removal

*Fig. 10-128 201309270028*

**1** Safely jack up the machine.

**2** Attach an anchor sling to the roller drum.

**3** Use a crane to slightly lift the roller drum.

*Fig. 10-129 201309300003*

**1** Remove the roller drum screws (AF size 19).

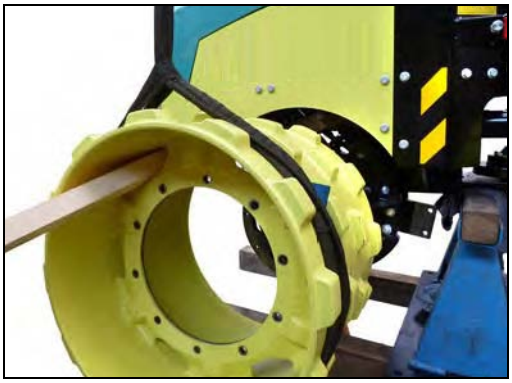


*Fig. 10-130 201309300001*

**1** Pull the roller drum out from under the chassis using a suitable aid.

**1.1** Keep the roller drum balanced using a suitable aid (e.g. piece of square timber).

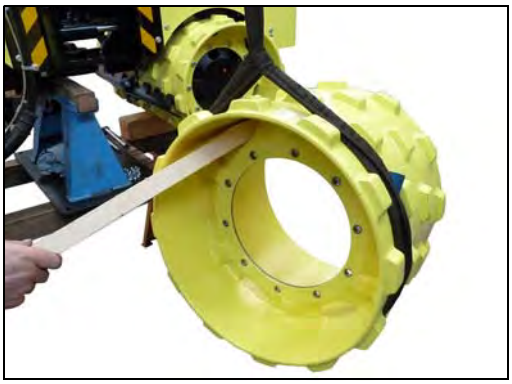


*Fig. 10-131 201309270031*

**1** Set the roller drum down securely until needed again.

## 10.12 Installing the roller drum extender

*Fig. 10-132 201310010088*

**1** Place the roller on a firm, stable surface.

**2** Use a crane or hydraulic jack to slightly lift the roller.

**3** For roller drum removal, see page 184.

*Fig. 10-133 201312180002*

**1** Screw in the **two** installation pins.

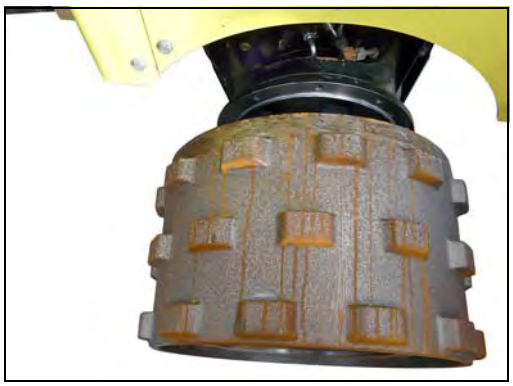


*Fig. 10-134 201312180003*

**1** Position the new roller drum.

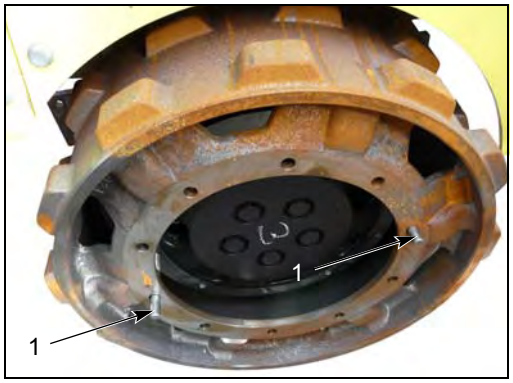



*Fig. 10-135 201312180004*

**1** Push the roller drum over the two installation pins **(1)**.

*Fig. 10-136 201312180005*

**1** Screw in **four** hex screws M12 x 25 (AF size 19) (87 Nm).

**NOTE**
**Pay attention to the position of the screws, see photo at left.**

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*Fig. 10-137 201312180006*

**1** Screw in the **two** installation pins.


*Fig. 10-138 201312180007*

**1** Push the roller drum extender over the two installation pins **(1)**.

*Fig. 10-139 201312180008*

**1** Screw in **six** M12 x 90 hex screws (AF size 19) (87 Nm).

## 10.13 Rubber elements of vibro unit

If a rubber element has cracks that are deeper than 10 mm, it must be replaced.

### 10.13.1 Removal

*Fig. 10-140 201309270028*

**1** Safely jack up the machine.

**2** Attach an anchor sling to the roller drum.

**3** Use a crane to slightly lift the roller drum.

*Fig. 10-141 201309270029*

**1** Remove the roller drum screws (AF size 19).

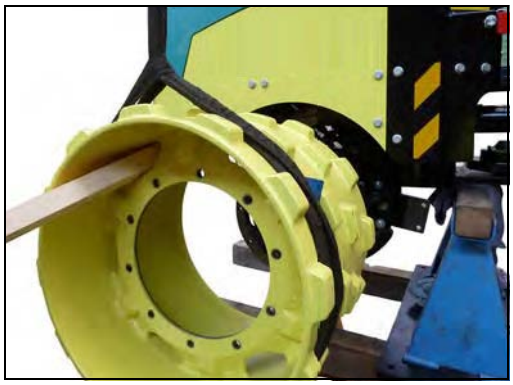


*Fig. 10-142 201309270030*

**1** Pull the roller drum out from under the chassis using a suitable aid.

**1.1** Keep the roller drum balanced using a suitable aid (e.g. piece of square timber).

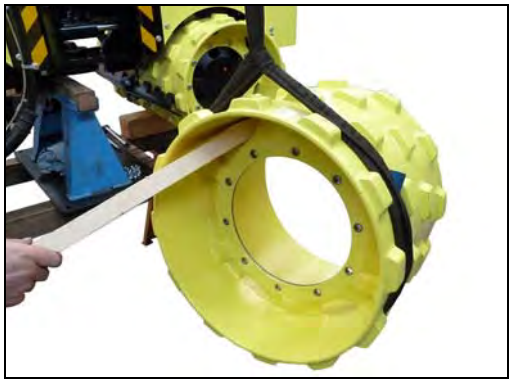


*Fig. 10-143 201309270031*

**1** Set the roller drum down securely until needed again.

*Fig. 10-144 201309270032*

1 Clean hoses and the immediate surroundings.

2 Place an oil catch basin beneath the drive motor before disconnecting the hoses.

*Fig. 10-145 201309270034*

1 Remove all hoses from the drive motor.

2 Plug the fittings.

*Fig. 10-146 201309220015*

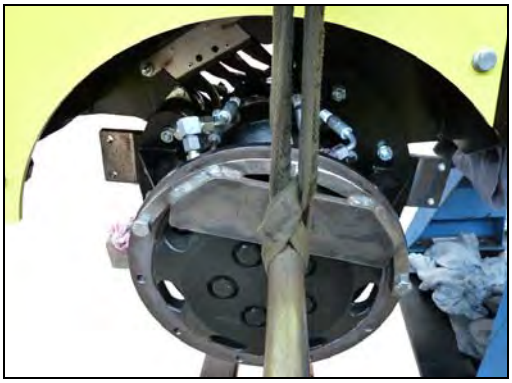


*Fig. 10-147 201309270036*

1 Mount auxiliary tool on drive motor flange using three M12 screws (AF size 19).

2 Attach an anchor sling to the auxiliary tool and a crane.

3 Use the crane to slightly lift the auxiliary tool.

*Fig. 10-148 201309270037*

4 Remove **six** M12 hex screws (AF size 19) from the drive motor support.

*Fig. 10-149 201309260068*

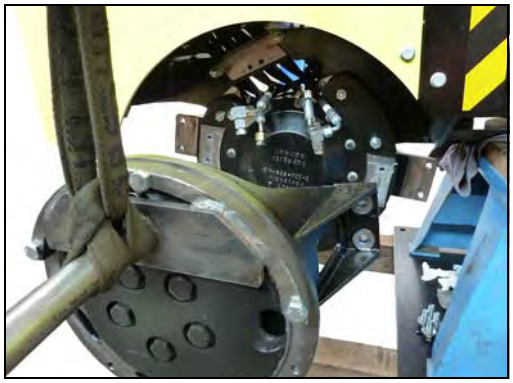


Fig. 10-150 201309270038

1 Pull the drive motor complete with the auxiliary tool away from the gear box.

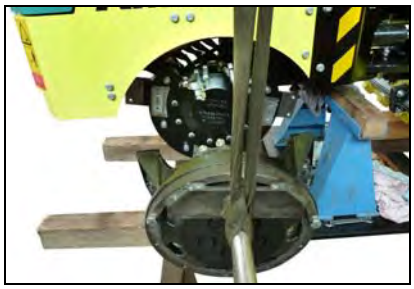


Fig. 10-151 201309270039

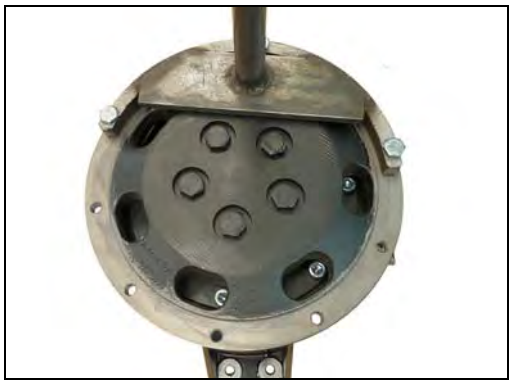


Fig. 10-152 201309270040

1 Set the drive motor down securely until needed again.

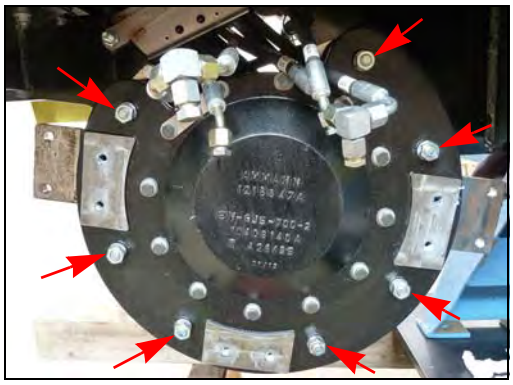


Fig. 10-153 201309270041

1 Remove **seven** M10 hex screws (AF size 17) from the gear box cover.

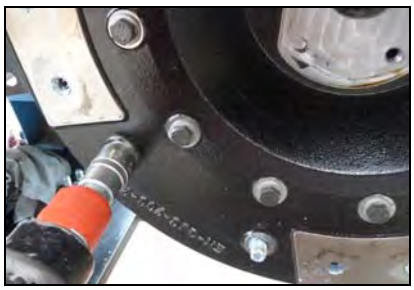


Fig. 10-154 201309270041

Fig. 10-155 201309270043

1 Remove **twelve** M8 hex screws (AF size 13) from the gear box cover.

2 Relocate the oil catch basin beneath the gear box before removing the gear box cover.

*Fig. 10-156 201309270044*

**1** Carefully remove the gear box cover by hand.

*Fig. 10-157 201309270045*

Grease will escape from the unbalanced drive gear box.

During reassembly later, the same amount of grease must be added once again.

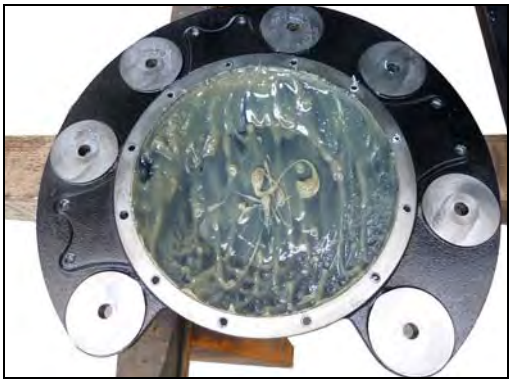


*Fig. 10-158 201309270046*

**1** Set the gear box cover down securely until needed again.

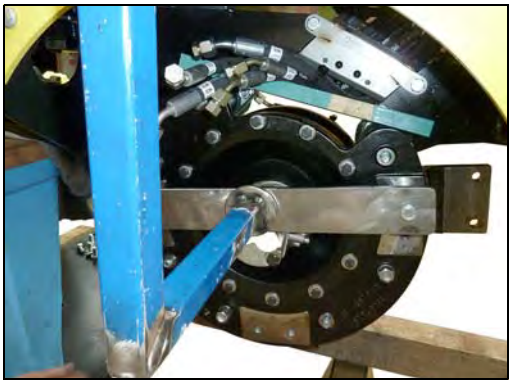


*Fig. 10-159 201310010017*

**1** Support the hoses with square timber to keep them free.

**2** Screw the auxiliary tool securely onto the vibromotor side of the gear box cover (AF size 19).

**3** Attach an anchor sling to the auxiliary tool and a crane.

**4** Use the crane to slightly lift the auxiliary tool.

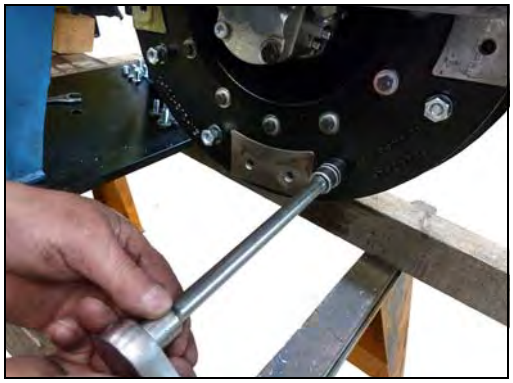


*Fig. 10-160 201310010018*

**1** Remove **seven** M10 hex screws (AF size 17) from the gear box cover.

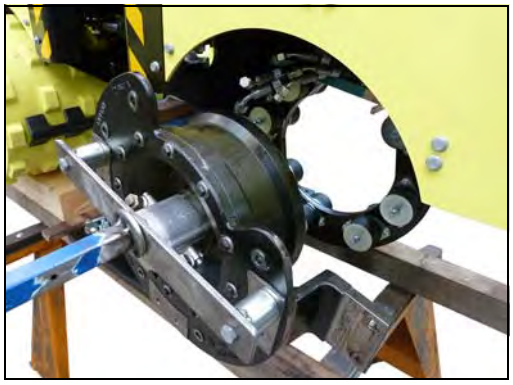


*Fig. 10-161 201310010015*

**1** Pull the gear box complete with the auxiliary tool away from the center beam.

*Fig. 10-162 201309270050*

**1** Set the entire gear box down securely until needed again.

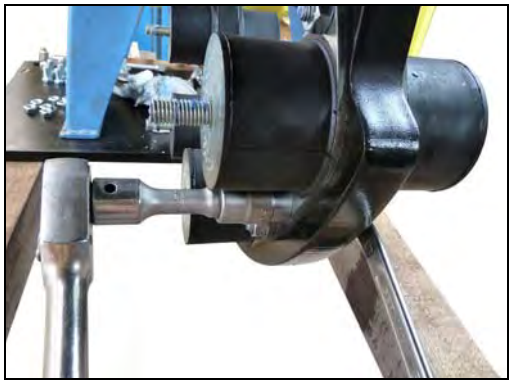


*Fig. 10-163 201309270056*

**1** Remove **fourteen** M10 hex screws (AF size 17) from the center beam / rubber elements.

*Fig. 10-164 201309270058*

**1** Remove the rubber elements.

### *10.13.2 Installation of the rubber elements*

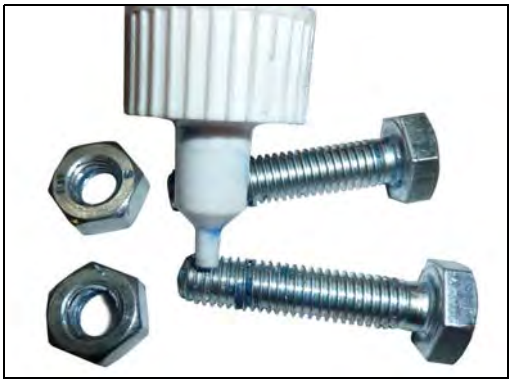


*Fig. 10-165 201310010001*

**1** Apply blue adhesive to the **fourteen** M10 hex screws.

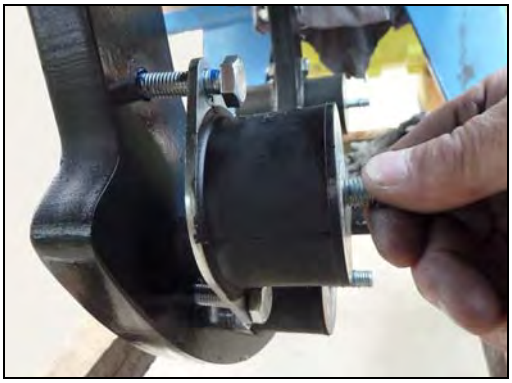


*Fig. 10-166 201310010002*

**1** Place the new rubber elements onto the center beam.

*Fig. 10-167 201309270057*

**1** Securely tighten the **fourteen** M10 hex screws (AF size 17) on the center beam / rubber elements to a torque of 50 Nm.

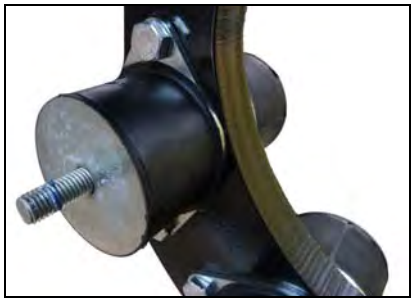


*Fig. 10-168 201310010004*

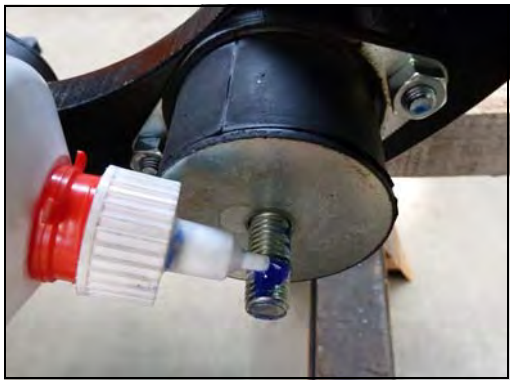


*Fig. 10-169 201310010007*

**1** Apply blue adhesive to the rubber elements' threads on the vibromotor side.

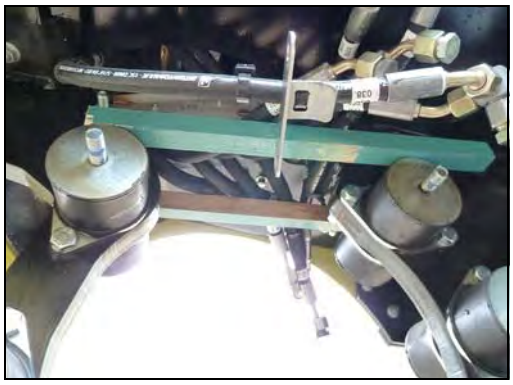


*Fig. 10-170 201309270053*

**1** Support the hoses on the vibromotor side as well with square timber to keep them free.

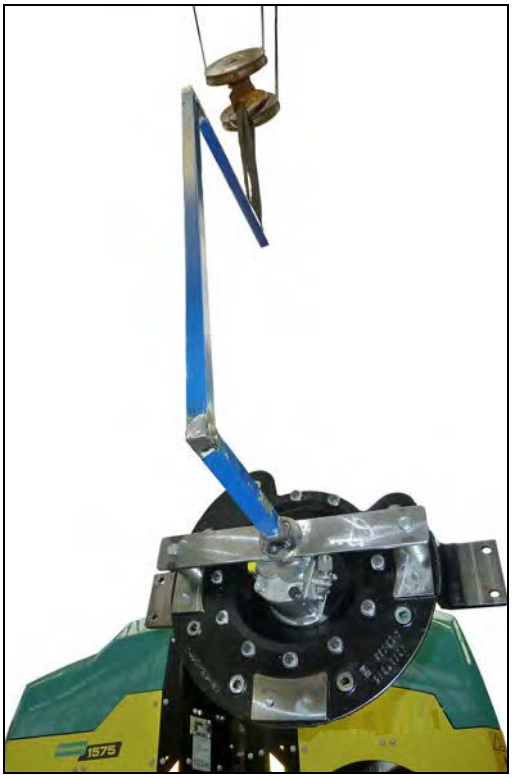


Fig. 10-171 201310010011

**1** Attach the gear box to the crane by means of the auxiliary tool.

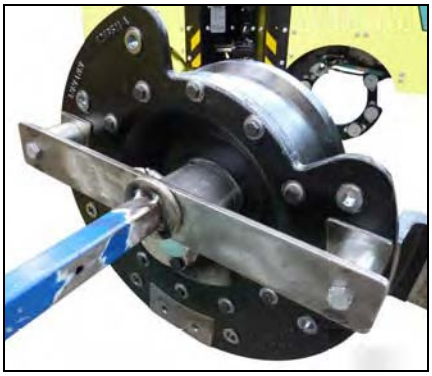


Fig. 10-172 201310010009

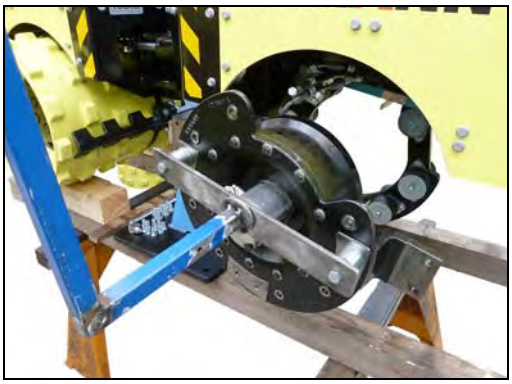


Fig. 10-173 201310010016

**1** Align the gear box.

**2** Place the gear box onto the rubber elements.

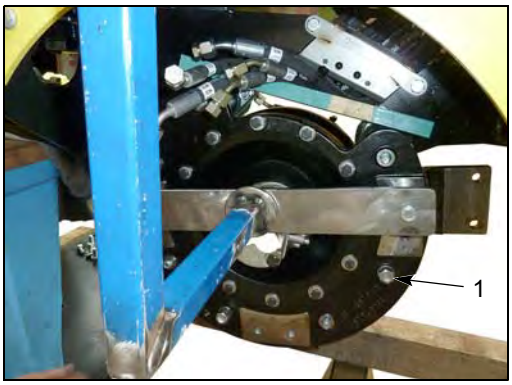



Fig. 10-174 201310010017

**1** Tighten the **seven** hex nuts **(1)** (AF size 17) to a torque of 50 Nm.

Fig. 10-175 201310010018

This completes the installation of the gear box on the vibromotor side. If a bearing replacement or regreasing is necessary, please see chapter “Replacing bearing, vibro unit” see page 200.

Without a bearing replacement or regreasing, you may proceed here.

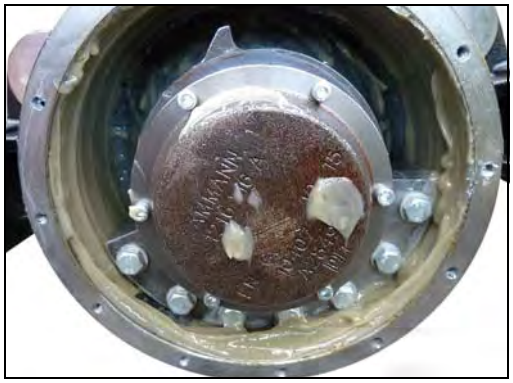


*Fig. 10-176 201310010008*

**1** Clean the sealing surface of the gear box housing.

*Fig. 10-177 201310010012*

**1** Retap all threads (M8).

*Fig. 10-178 201310010014*

**1** Blow out the thread bores.

*Fig. 10-179 201310010020*

**1** Thoroughly remove all soiling in the form of adhesive residues and contaminated grease.

**2** Replace grease that has been removed or has run out with the same amount of new grease.

Grease: Castrol Longtime PD2 - or compatible (extreme pressure grease for long term lubrication)

*Fig. 10-180 201310010021*

**1** Apply sealant to the sealing surface.

*Fig. 10-181 201310010023*

**1** Spread the sealant with a brush.

*Fig. 10-182 201310010024*

**1** Place one drop of blue thread adhesive in each threaded bore.

*Fig. 10-183 201310010026*

**1** Clean / blow out the holes in the gear box cover.

*Fig. 10-184 201310010028*

Fig. 10-185 201310010027

**1** Clean the sealing surface of the gear box cover.

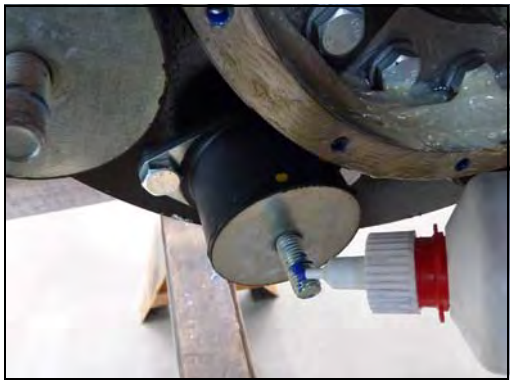


Fig. 10-186 201310010025

**1** Apply blue adhesive to the threads of the rubber elements.

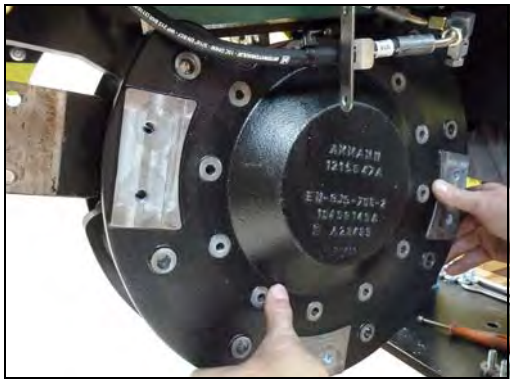


Fig. 10-187 201310010029

**1** Put the gear box cover in place.

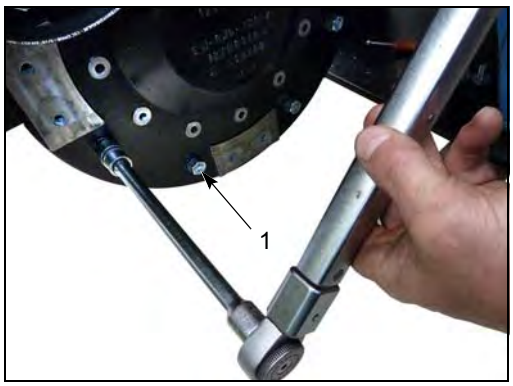



Fig. 10-188 201310010031

**1** Tighten the **seven** M10 hex nuts **(1)** (AF size 17) to a torque of 50 Nm.

*Fig. 10-189 201310010034*

**1** Apply blue adhesive to the **twelve** M8x35/22 hex screws.

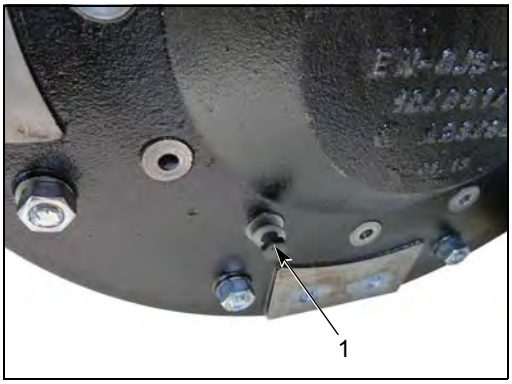



*Fig. 10-190 201310010035*

**1** Tighten the hex screws **(1)** (AF size 13) to a torque of 36 Nm.

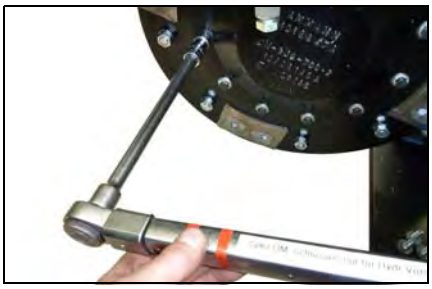


*Fig. 10-191 201310010038*

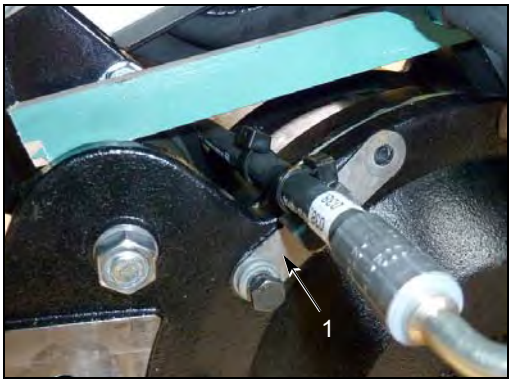



*Fig. 10-192 201310010036*

**1** Install the hose guide bracket **(1)** using the same screws.

## 10.14 Replacing bearing, vibro unit

### *10.14.1 Gaining access to the vibro unit*

*Fig. 10-193 201309270028*

**1** Safely jack up the machine.

**2** Attach an anchor sling to the roller drum.

**3** Use a crane to slightly lift the roller drum.

*Fig. 10-194 201309270029*

**1** Remove the roller drum screws (AF size 19).

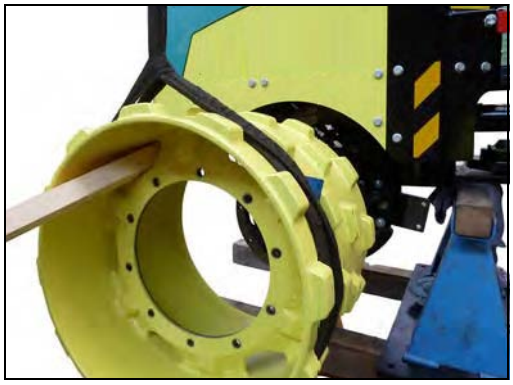


*Fig. 10-195 201309270030*

**1** Pull the roller drum out from under the chassis using a suitable aid.

**1.1** Keep the roller drum balanced using a suitable aid (e.g. piece of square timber).

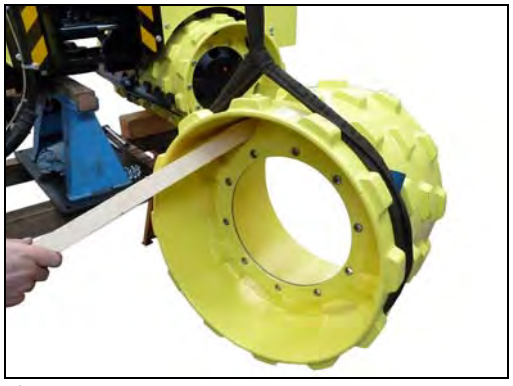


*Fig. 10-196 201309270031*

**1** Set the roller drum down securely until needed again.

*Fig. 10-197 201309270032*

1 Place an oil catch basin beneath the drive motor before disconnecting the hoses.

*Fig. 10-198 201309270034*

1 Remove all hoses from the drive motor.

2 Plug the fittings.

*Fig. 10-199 201309220015*

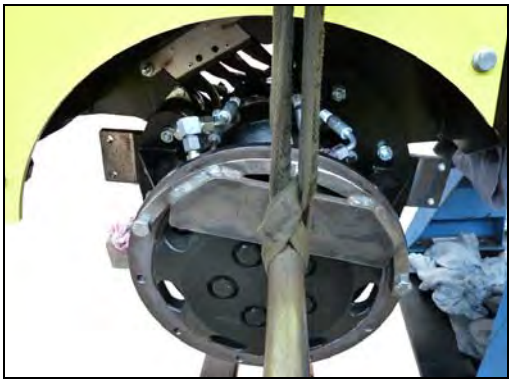


*Fig. 10-200 201309270036*

1 Mount auxiliary tool on drive motor flange using three M12 screws (AF size 19).

2 Attach an anchor sling to the auxiliary tool and a crane.

3 Use the crane to slightly lift the auxiliary tool.

*Fig. 10-201 201309270037*

1 Remove **six** M12 hex screws (AF size 19) from the drive motor support.

*Fig. 10-202 201309260068*

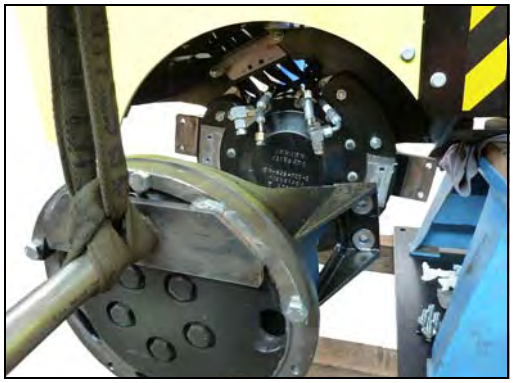


*Fig. 10-203 201309270038*

**1** Pull the drive motor complete with the auxiliary tool away from the gear box.

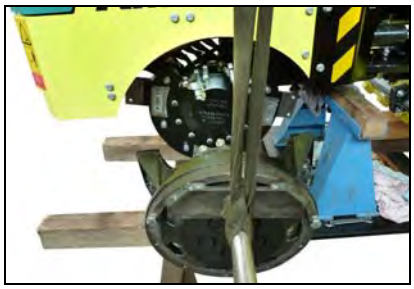


*Fig. 10-204 201309270039*

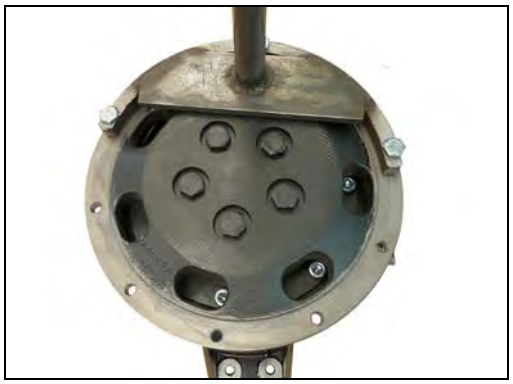


*Fig. 10-205 201309270040*

**1** Set the drive motor down securely until needed again.

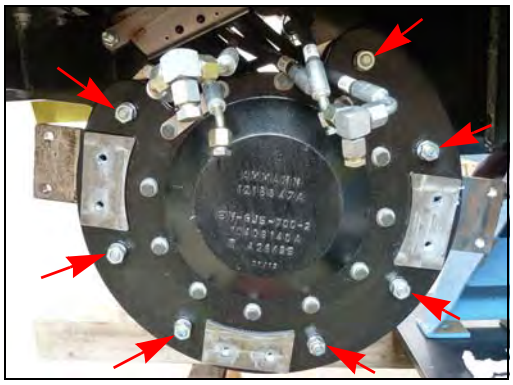


*Fig. 10-206 201309270041*

**1** Remove **seven** M10 hex screws (AF size 17) from the gear box cover.

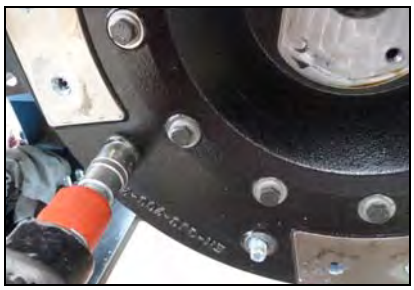


*Fig. 10-207 201309270041*

*Fig. 10-208 201309270043*

**1** Remove **twelve** M8 hex screws (AF size 13) from the gear box cover.

**2** Relocate the oil catch basin beneath the gear box before removing the gear box cover.

*Fig. 10-209 201309270044*

**1** Carefully remove the gear box cover by hand.

*Fig. 10-210 201309270045*

Grease will escape from the unbalanced drive gear box.

During reassembly later, the same amount of grease must be added once again.

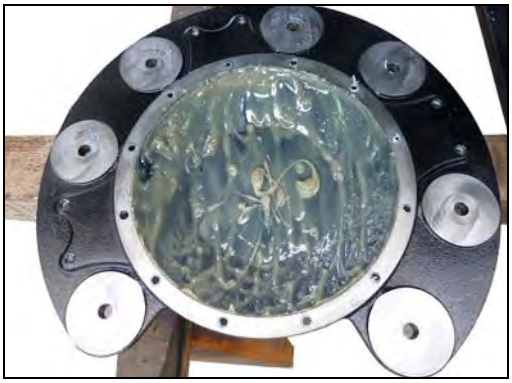


*Fig. 10-211 201309270046*

**1** Set the gear box cover down securely until needed again.

## *10.14.2 Dismantling the vibro unit*

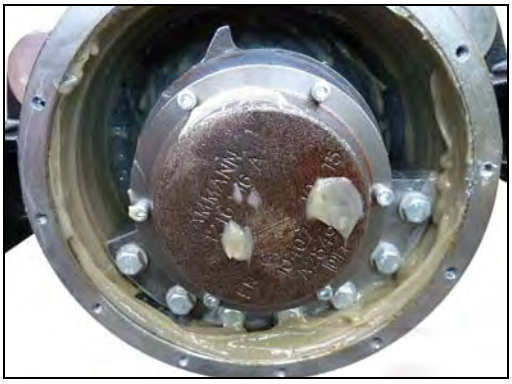


*Fig. 10-212 201310010008*

View of the vibro housing after opening.

**NOTE:**
**The grease in the housing is spent after a certain number of operating hours and must be replaced.**

The following steps were performed on a new vibro unit. This is why the grease in all the photos is unspent and light in color.


*Fig. 10-213 201311130001*

**1** Clean the vibro housing and remove spent grease.

*Fig. 10-214 201311130002*

**1** Remove the M6 Allen screws (AF size 5) from the bearing cover.

*Fig. 10-215 201311130003*

**1** Remove the bearing cover and clean it.

*Fig. 10-216 201311130004*

*Fig. 10-217 201311130005*

**1** Remove grease from the boss.

*Fig. 10-218 201311130004*

*Fig. 10-219 201311130007*

**1** Loosening the grooved nut lock ring.

**1.1** Use a small chisel or screwdriver.

*Fig. 10-220 201311130008*

*Fig. 10-221 201311130009*

*Fig. 10-222 201311130010*

**1** Put the special “grooved nut wrench” in place.

*Fig. 10-223 201311130011*

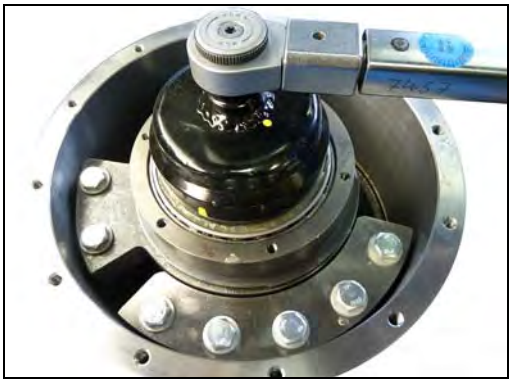


*Fig. 10-224 201311130013*

**1** Loosen the grooved nut.

*Fig. 10-225 201311130014*

**1** Remove the grooved nut.

*Fig. 10-226 201311130015*

**1** Remove the grooved nut lock ring.

*Fig. 10-227 201311130016*

**1** Lift the unbalance unit off of the shaft.

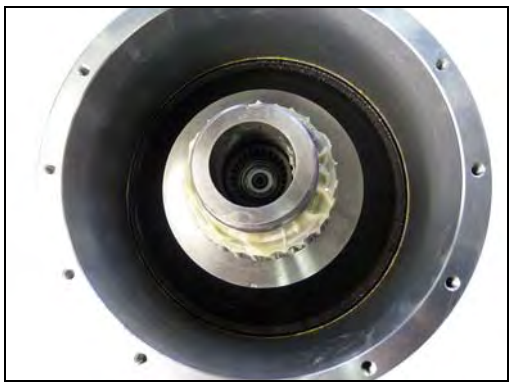


*Fig. 10-228 201311130017*

**1** Remove grease from the boss.

*Fig. 10-229 201311130018*

**1** Removing the spacer rings.

*Fig. 10-230 201311130019*

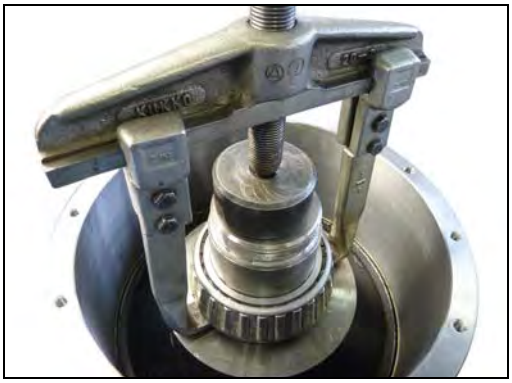


*Fig. 10-231 201311130020*

**1** Pull the bearing off of the boss with a bearing puller.

**1.1** Apply the bearing puller here (arrows).

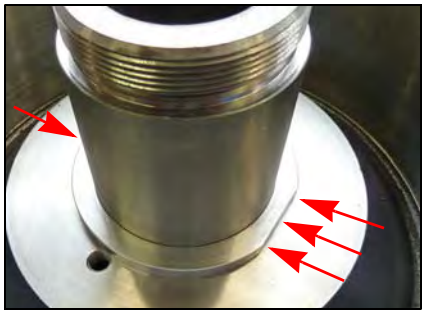


*Fig. 10-232 201311130021*

*Fig. 10-233 201311140002*

**1** Remove the bearing outer rings and the spacer ring.

*Fig. 10-234 201311140010*

*Fig. 10-235 201311140001*

**1** Clean the bearing housing.

### *10.14.3 Assembling the vibro unit*

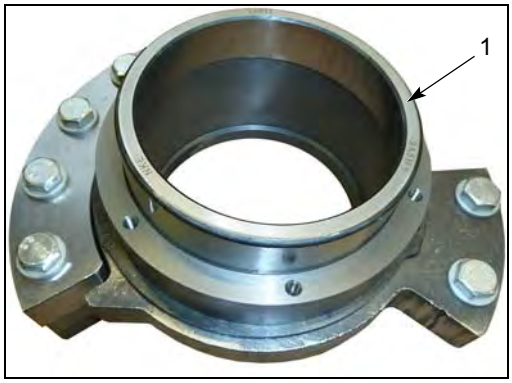



*Fig. 10-236 201311140003*

**1** Place the new, wide bearing outer ring **(1)** into the bearing housing.

**1.1** Observe the mounting orientation.

*Fig. 10-237 201311140004*

**1** Press the wide bearing outer ring into the housing.


*Fig. 10-238 201311140005*

**1** Place the spacer ring **(1)** into the bearing housing.

*Fig. 10-239 201311140006*


*Fig. 10-240 201311140007*

**1** Place the narrow bearing outer ring **(1)** into the bearing housing.

**1.1** Observe the mounting orientation.

*Fig. 10-241 201311140008*

**1** Press the narrow bearing outer ring into the housing.

*Fig. 10-242 201311140006*

## *10.14.4 Assembling the vibro unit*

*Fig. 10-243 201311130022*

**1** Heat the rear taper roller bearing to 110°C.

*Fig. 10-244 201208250003*

**1** Push the rear taper roller bearing onto the boss.

*Fig. 10-245 201311130022*

**1** Lightly grease the bearing.

*Fig. 10-246 201311130023*

**1** Install the spacer rings.

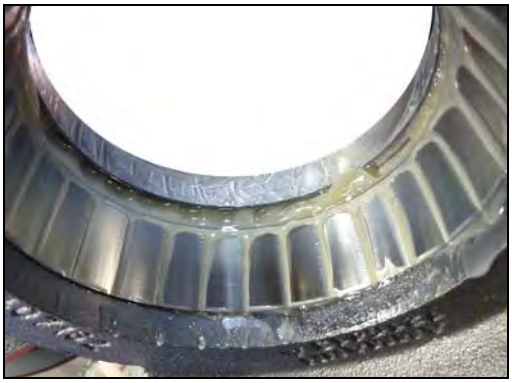


*Fig. 10-247 201311130024*

**1** Grease the outside of the bearing rings.

*Fig. 10-248 201311130025*

**1** Place the unbalance unit into the vibro housing.

*Fig. 10-249 201311130026*

**1** Install the outer bearing.

*Fig. 10-250 201311130027*

**1** Install the lock ring.

*Fig. 10-251 201311130028*

**1** Install the grooved nut.

*Fig. 10-252 201311130029*

**1** Put the special “grooved nut wrench” in place.

*Fig. 10-253 201311130031*

**1** Tighten to a torque of 200 Nm.

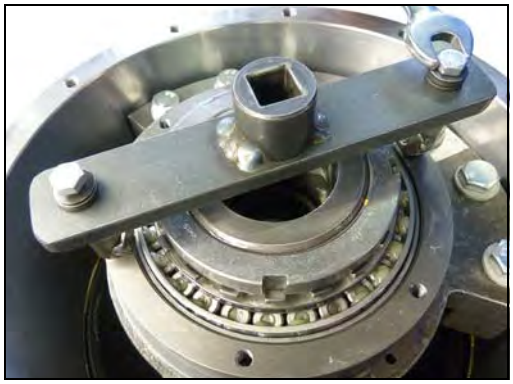


*Fig. 10-254 201311130033*

**1** Screw on the bracket for the torque measurement instrument.

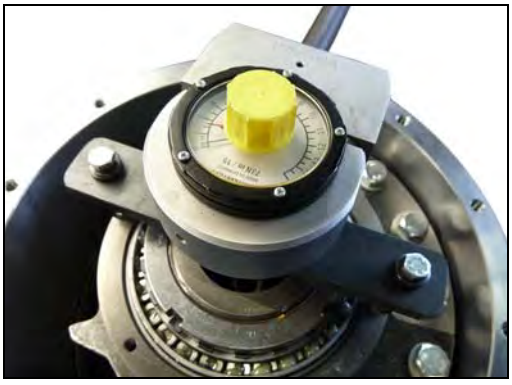


*Fig. 10-255 201311130032*

**1** Attach the torque measurement instrument.

*Fig. 10-256 201311130035*

**1** Rotate the unbalance with the torque measurement instrument clockwise 20 times.

This will eliminate any tension points.

**NOTE:**
**Under no circumstances may the housing hit against the support; it must rotate freely.**

*Fig. 10-257 201311130036*

**1** Set the torque to a value of 1-3 Nm.

If the value is not correct, a correction must be made using the spacers until the target value is achieved.

1/10 = 4Nm

*Fig. 10-258 201311130037*

**1** Bend the tooth of the lock ring into the matching groove of the nut using a suitable tool.

*Fig. 10-259 201311130038*

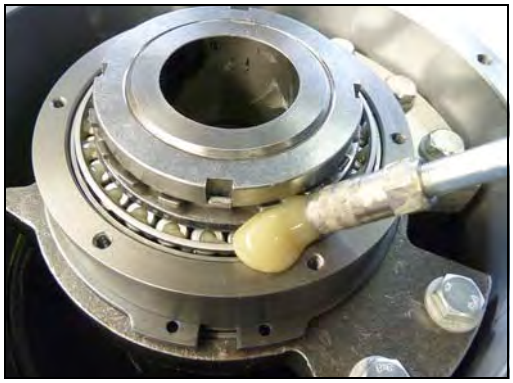


*Fig. 10-260 201311130039*

*Fig. 10-262 201311130041*

*Fig. 10-263 201311130042*

*Fig. 10-264 201311130043*

**1** Regrease the bearing.

*Fig. 10-261 201311130040*

Total amount of grease in the bearing housing: 100 g of Castrol Longtime PD2 - or compatible
(extreme pressure grease for long term lubrication)

**1** Put a little blue adhesive into the threaded holes.

**1** Apply blue adhesive to the M6x20 Allen screws.

*Fig. 10-265 201311130044*

**1** Place the bearing cover onto the unbalance housing.

*Fig. 10-266 201311130048*

**1** Securely tighten the M6x20 (AF size 5) Allen screws to a torque of 10 Nm.

**NOTE**
**The unbalance weight must be able to move with complete freedom.**

*Fig. 10-267 201311130049*

**1** Fill the vibro housing with 300 g of grease.

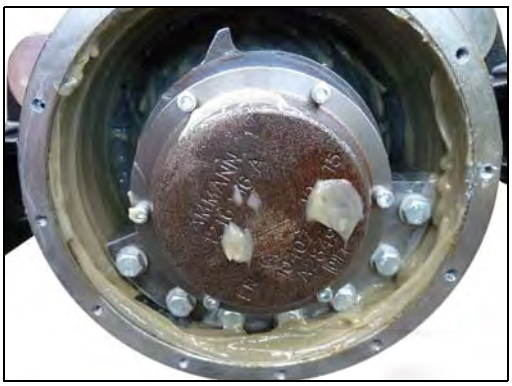


*Fig. 10-268 201310010008*

**1** Clean the sealing surface of the gear box housing.

*Fig. 10-269 201310010012*

**1** Retap all threads (M8).

*Fig. 10-270 201310010014*

**1** Blow out the thread bores.

*Fig. 10-271 201310010020*

**1** Thoroughly remove all soiling in the form of adhesive residues and contaminated grease.

**2** Replace grease that has been removed or has run out with the same amount of new grease.

Grease: Castrol Longtime PD2 - or compatible (extreme pressure grease for long term lubrication)

*Fig. 10-272 201310010021*

**1** Apply sealant to the sealing surface.

*Fig. 10-273 201310010023*

**1** Spread the sealant with a brush.

*Fig. 10-274 201310010024*

**1** Place one drop of blue thread adhesive in each threaded bore.

*Fig. 10-275 201310010026*

**1** Clean / blow out the holes in the gear box cover.

*Fig. 10-276 201310010028*

*Fig. 10-277 201310010027*

**1** Clean the sealing surface of the gear box cover.

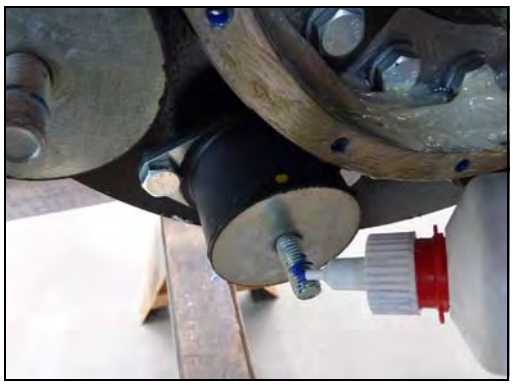


*Fig. 10-278 201310010025*

**1** Apply blue adhesive to the threads of the rubber elements.

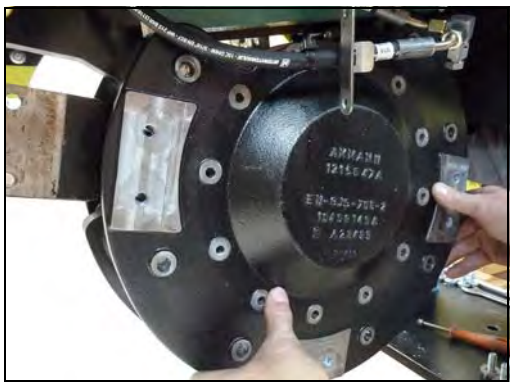


*Fig. 10-279 201310010029*

**1** Put the gear box cover in place.

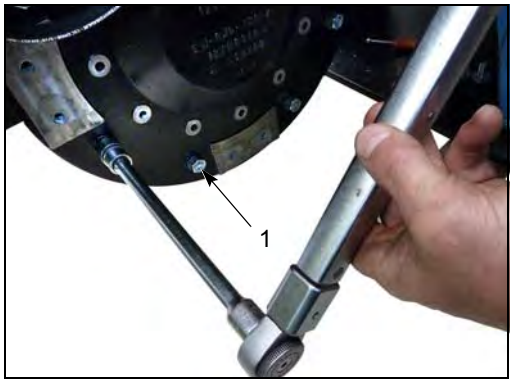



*Fig. 10-280 201310010031*

**1** Tighten the **seven** M10 hex nuts **(1)** (AF size 17) to a torque of 50 Nm.

*Fig. 10-281 201310010034*

**1** Apply blue adhesive to the **twelve** M8x35/22 hex screws.

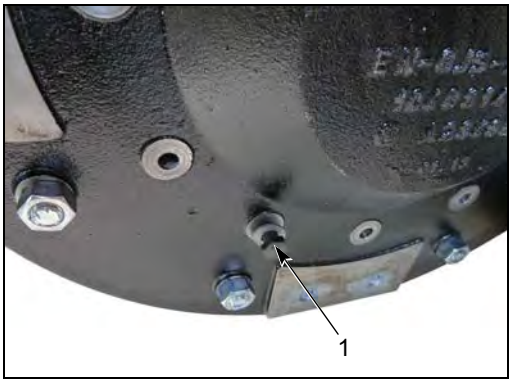



*Fig. 10-282 201310010035*

1 Tighten the hex screws **(1)** (AF size 13) to a torque of 36 Nm.

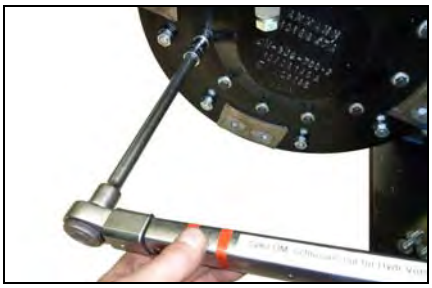


*Fig. 10-283 201310010038*

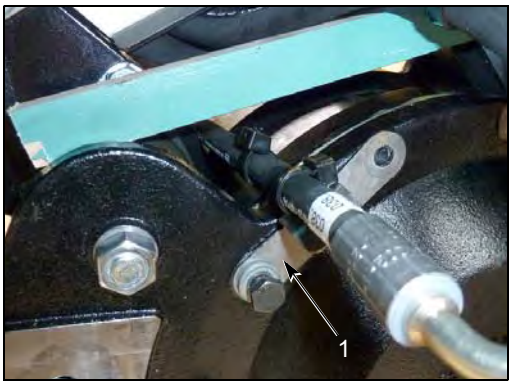



*Fig. 10-284 201310010036*

1 Install the hose guide bracket **(1)** using the same screws.

## 10.15 Replacing the drive motor

### *10.15.1 Removal*

*Fig. 10-285 201309260053*

1 Safely jack up the machine.

2 Remove the hex screws (AF size 19) on the roller drum scraper.

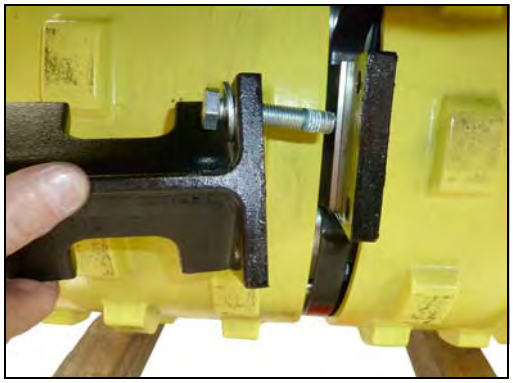


*Fig. 10-286 201309260054*

**1** Remove the scraper

*Fig. 10-287 201309260056*

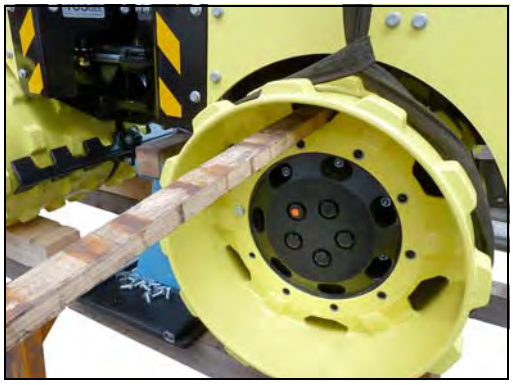


*Fig. 10-288 201309260058*

**1** Attach an anchor sling to the roller drum.

**2** Use a crane to slightly lift the roller drum.

*Fig. 10-289 201309260059*

**1** Remove the roller drum screws (AF size 19).

*Fig. 10-290 201309260060*

**1** Pull the roller drum out from under the chassis using a suitable aid.

**1.1** Keep the roller drum balanced using a suitable aid (e.g. piece of square timber).

*Fig. 10-291 201309270032*

1 Place an oil catch basin beneath the drive motor before disconnecting the hoses.

*Fig. 10-292 201309270034*

1 Remove all hoses from the drive motor.

2 Plug the fittings.

*Fig. 10-293 201309220015*

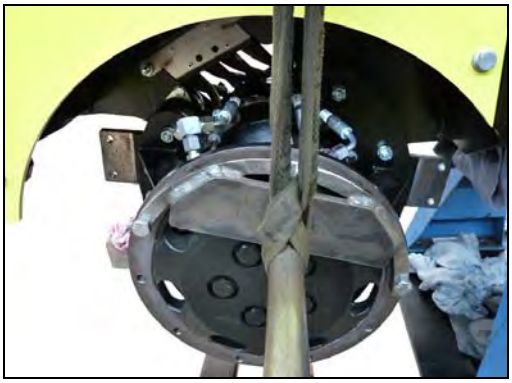


*Fig. 10-294 201309270036*

1 Mount auxiliary tool on drive motor flange using three M12 screws (AF size 19).

2 Attach an anchor sling to the auxiliary tool and a crane.

3 Use the crane to slightly lift the auxiliary tool.

*Fig. 10-295 201309270037*

1 Remove **six** M12 hex screws (AF size 19) from the drive motor support.

*Fig. 10-296 201309260068*

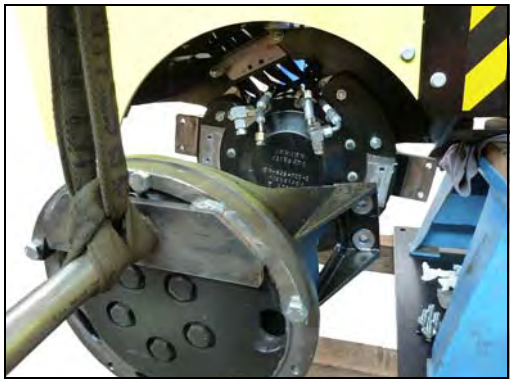


Fig. 10-297 201309270038

**1** Pull the drive motor complete with the auxiliary tool away from the gear box.

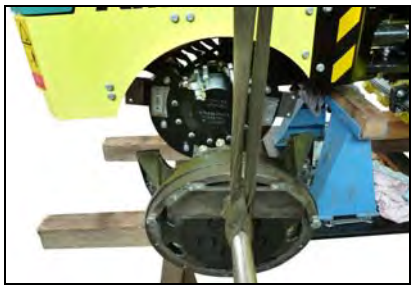


Fig. 10-298 201309270039

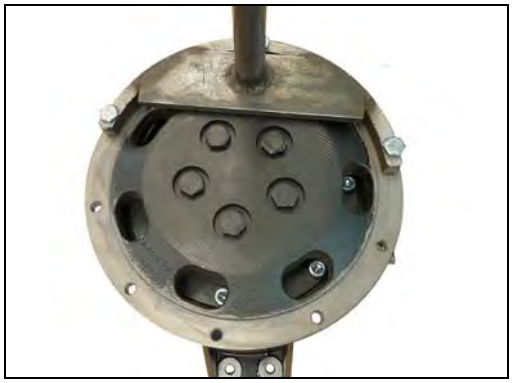


Fig. 10-299 201309270040

**1** Set the drive motor down securely until needed again.

## *10.15.2 replace*

Fig. 10-300 201309260073

**1** Completely remove all of the screw connections from the demounted drive motor.

Fig. 10-301 201309260076

Fig. 10-302 201309260078

**1** Remove the **seven** M12x25 Allen screws (AF size 10) from the drive motor flange.

Screws inaccessible:
In infrequent cases, the **seven** M12x25 Allen screws are not accessible, which means that the drive motor flange must be completely removed. In this case, the **five** hex screws (AF size 24) must be removed. Lift the flange from the drive motor.

*Fig. 10-303 201309260079*

**1** Screw two eye bolts into the drive motor flange.

*Fig. 10-304 201309260080*

**1** Attach the tackle to the crane and the eye bolts.

**2** The orientation of the drive motor must be marked with a marker before the drive motor is lifted out of the motor support.

*Fig. 10-305 201312180001*

If the drive motor is rusted in place in the motor support, the drive motor must be pressed out of the motor support:

**1** Clean **three** threads.

**2** Retap **three** threads.

**3** Install **three** M12x60 hex screws.

**4** Press the drive motor out of the motor support.

*Fig. 10-306 201309260083*

**1** Lift the drive motor out of the motor support.

*Fig. 10-307 201309260085*

**1** Clean the bearing surface and the threads.

*Fig. 10-308 201309260086*

**1** Apply Anti-Seize to the seat of the bearing on the drive motor support.

*Fig. 10-309 201309260087*

**1** Put a little blue adhesive into the threaded bores.

*Fig. 10-310 201309260083*

**1** Place the new drive motor into the motor support.

**1.1** Bear in mind the orientation of the motor (marked previously).

*Fig. 10-311 201309260089*

**1** Apply blue adhesive to the **six** M12 Allen screws.

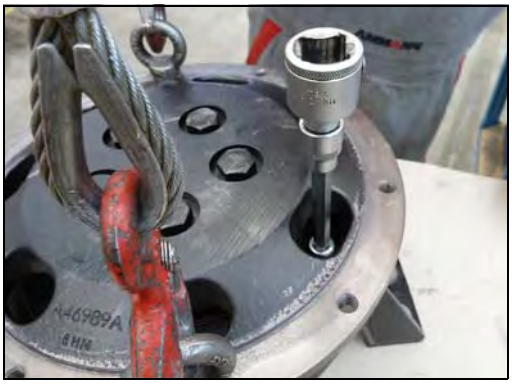


*Fig. 10-312 201309260091*

**1** Install the Allen screws.

*Fig. 10-313 201309260092*

**1** Tighten the Allen screws (SW10) to a torque of 85 Nm.

*Fig. 10-314 201309260093*

**1** Apply blue adhesive to the screw connections from the old drive motor.

*Fig. 10-315 201309260094*


*Fig. 10-316 201309260096*

**1** Mount the screw connections on the drive motor and tighten to the proper torque.

- Material
  - Hydraulic motor MK 04/340.0 cm3/rev. **(1)**
  - **(2x)** straight screw-in fittings GES10L M22x1.5 **(2)** (125 Nm)
  - **(1x)** straight screw-in fitting GES10L M16x1.5 **(3)** (55 Nm)
  - **(1x)** straight screw-in fitting GES10L M14x1.5 **(4)** (45 Nm)

**1** Cover the screw connections with protective caps.

## *10.15.3 Installation*

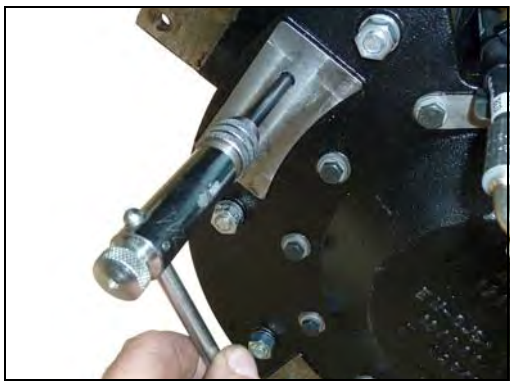


*Fig. 10-317 201310010039*


*Fig. 10-319 201310010042*

**1** Clean the contact surface of the motor support and the threads.


*Fig. 10-318 201310010040*

**1** Put a little blue adhesive into the threaded hole.

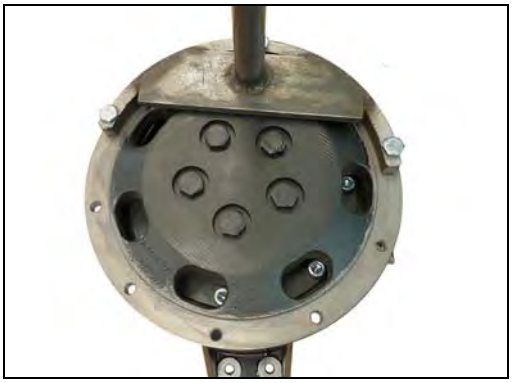


Fig. 10-320 201309270040

1 Mount the auxiliary tool on drive motor flange using three M12 hex screws (AF size 19).

Fig. 10-321 201310010061

1 Screw in one threaded bolt to the right and left of the vibro gearbox flange as an aid for assembly of the drive motor.

Fig. 10-322 201310010043

1 Lift the premounted drive motor using the auxiliary tool and crane...

Fig. 10-323 201310010045

1 ... and install it.

Fig. 10-324 201310010063

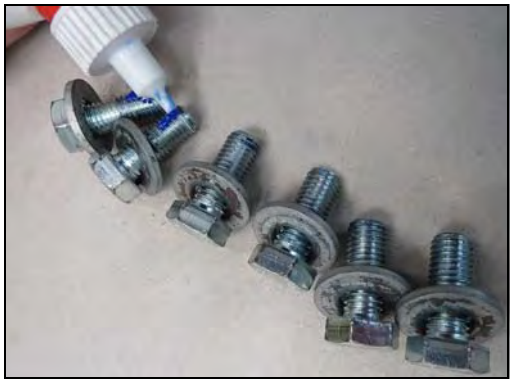


*Fig. 10-325 201310010064*

**1** Apply blue adhesive to the **six** M12 hex screws.

*Fig. 10-326 201310010047*

**1** Install the hex screws.

*Fig. 10-327 201310010065*

**1** Tighten hex screws (AF size 19) to a torque of 85 Nm.

**2** Remove the auxiliary tool.

*Fig. 10-328 201310010056*

**1** Mount all of the hoses.

*Fig. 10-329 201310010057*

**1** Clean the hose fittings and surroundings with cleaner (such as brake cleaner).

**2** Apply Anti-Seize to the shoulder (arrow).

**3** Allow the machine to run while still jacked up before the roller drums are once again installed. Perform an inspection for leakage.

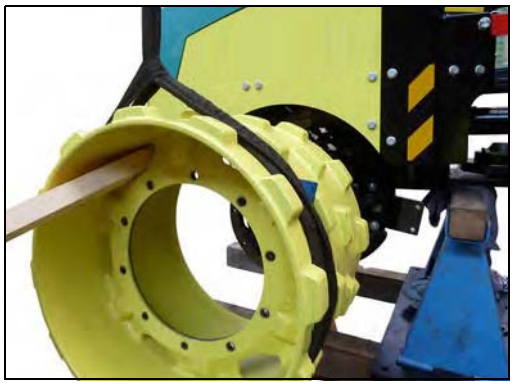


*Fig. 10-330 201309270030*

**1** Push the roller drum under the chassis using a suitable aid.

**1.1** Keep the roller drum balanced using a suitable aid (e.g. piece of square timber).

*Fig. 10-331 201309270029*

**1** Tighten the **ten** M12 hex screws (AF size 19) to a torque of 85 Nm.

## 10.16 Replacing vibromotor

### *10.16.1 Removal*

The vibromotors are installed at the front right and rear left. To gain access to the vibromotors, the drive motors must first be removed. Siehe “Replacing the drive motor” see page 219.

*Fig. 10-332 201309270001*

**1** Remove all hoses from the drive motor.

**2** Plug the fittings.

*Fig. 10-333 201309270002*

*Fig. 10-334 201309270003*

**1** Install **two** hex screws on the vibromotor.

*Fig. 10-335 201309270004*

**1** Pull out the vibromotor.

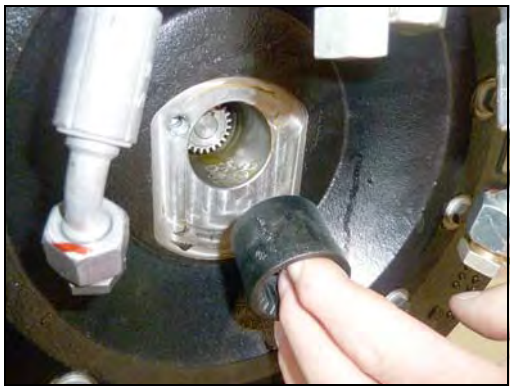


*Fig. 10-336 201309270005*

**1** Remove the coupling.

*Fig. 10-337 201309270008*

**1** The screw connections and the sprocket must be removed from the defective vibromotor.

*Fig. 10-338 201309270007*

**1** Remove the sprocket nut (AF size 19).

*Fig. 10-339 201309270009*

**2** Remove the sprocket with puller device.

*Fig. 10-340 201309270010*

*Fig. 10-341 201309270012*

**1** Remove the Allen screws (AF size 5).

**2** Remove the elbow flanges on both sides.

*Fig. 10-342 201309270013*

**1** Remove hydraulic hose 040.

*Fig. 10-343 201309270014*

**1** Remove the screw-in fittings (AF size 17).

## *10.16.2 Installation*

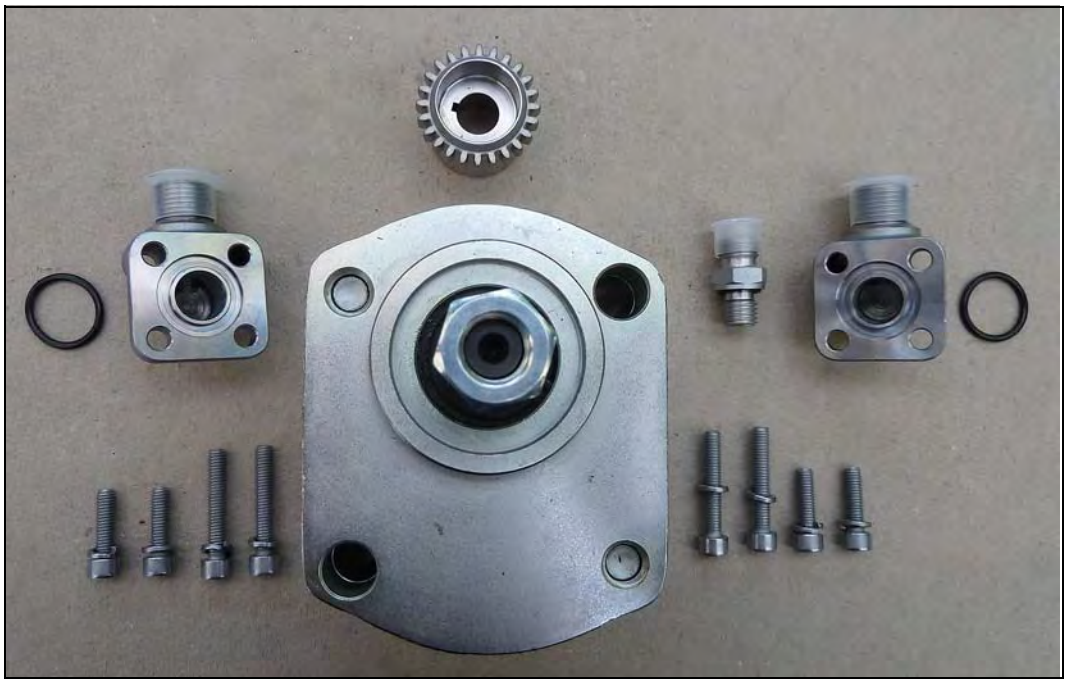


*Fig. 10-344 201309270006*

Overview of all parts that are used for the new vibromotor. If the screw connections and other parts are not damaged, they can be reused for the new vibromotor.

*Fig. 10-345 201309270015*

**1** O-rings must always be replaced.

*Fig. 10-346 201309270016*

**1** Apply blue adhesive to the Allen screws.

*Fig. 10-347 201309270017*

**1** Install the elbow flanges using the M6 screws (AF 5) and tighten to a torque of 10 Nm.

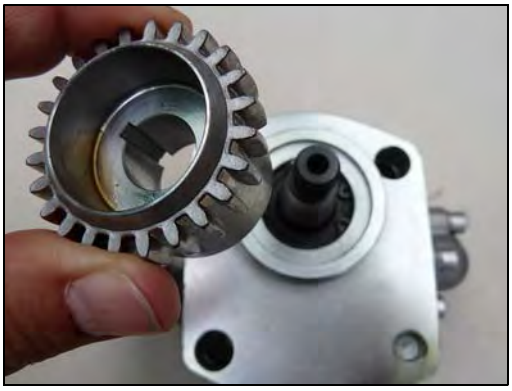


*Fig. 10-348 201309270018*

**1** Put the sprocket in place.

*Fig. 10-349 201309270019*

**1** Apply blue adhesive to the threads.

*Fig. 10-350 201309270020*

**1** Install the spring washer.

*Fig. 10-351 201309270021*

**1** Install the sprocket nut.

*Fig. 10-352 201309270022*

**1** Tighten the sprocket nut (AF size 19) to a torque of 50 Nm.

*Fig. 10-353 201309270023*

**1** Apply blue adhesive to the straight screw-in fitting GES10L/M12x1.5WD.

*Fig. 10-354 201309270024*

**2** Install the straight screw-in fittings and tighten them to a torque of 40 Nm.

*Fig. 10-355 201309270025*

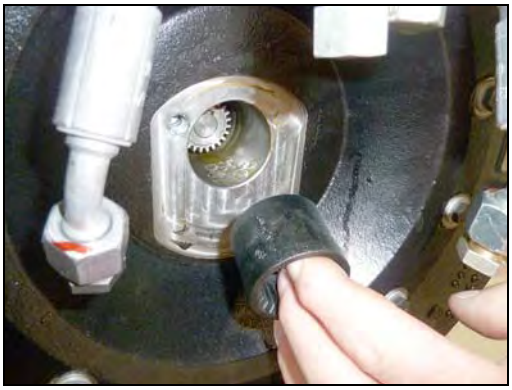


*Fig. 10-356 201309270005*

**1** Install the coupling.

**1.1** If the old coupling is not defective, it can be reused. Otherwise install a new coupling.

*Fig. 10-357 201208250034*

**1** Apply sealant to the sealing surface.

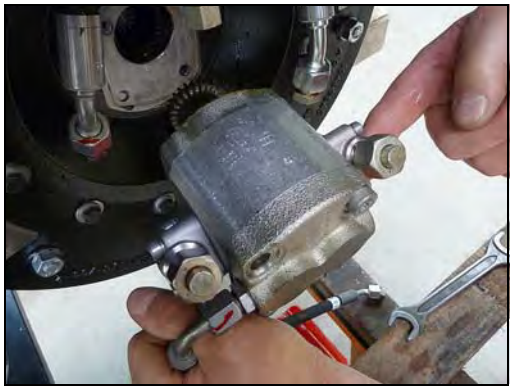


*Fig. 10-358 201309270004*

**1** Insert the Vibromotor.

*Fig. 10-359 201208250037*

**1** Apply blue adhesive to the **two** M10x95 hex screws.

*Fig. 10-360 201309270003*

**1** Tighten the M10x95 hex screws (AF size 17) to a torque of 56 Nm.

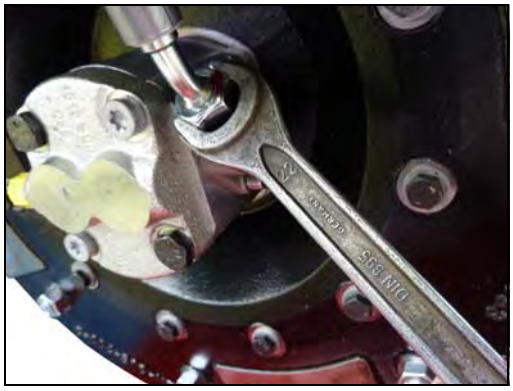


*Fig. 10-361 201310010059*

**1** Mount the hydraulic hoses.

*Fig. 10-362 201310010060*

*Fig. 10-363 201310010061*

**1** Completely assembled vibromotor.

## 10.17 Roller drum installation

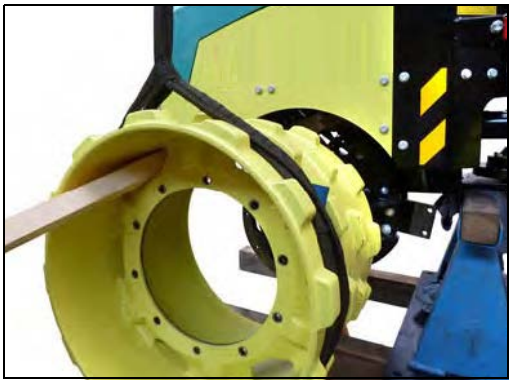


*Fig. 10-364 201309300001*

**1** Push the roller drum under the chassis using a suitable aid.

**1.1** Keep the roller drum balanced using a suitable aid (e.g. piece of square timber).

*Fig. 10-365 201309300003*

**1** Tighten the **twelve** M12 hex screws (AF size 19) to a torque of 85 Nm.

## 10.18 Replacing the drive pump

The hydraulic oil must be drained before the drive pump can be demounted.
Siehe “Draining the hydraulic oil” see page 124.

### 10.18.1 Removal

Fig. 10-366 201309210065

**1** Place an oil catch basin beneath the chassis toward the front at the drive pump.

Fig. 10-367 201309210066

**1** Remove the pressure line screw connection for the vibro pump.

Fig. 10-368 201309210067

Fig. 10-369 201309210069

**1** Plug the fittings.

Fig. 10-370 201309210070

Fig. 10-371 201309210071

**1** Remove the charge pressure screw connection for the drive pump.

*Fig. 10-372 201309210072*

**1** Plug the fittings.

*Fig. 10-373 201309210074*

*Fig. 10-374 201309210077*

**1** Remove the supply hydraulic hose for the drive pump.

*Fig. 10-375 201309210078*

**1** Plug the fittings.

*Fig. 10-376 201309210079*

*Fig. 10-377 201309210080*

**1** Remove the hydraulic hose for the forwards drive circuit (B) drive pump.

*Fig. 10-378 201309210082*

**1** Plug the fittings.

*Fig. 10-379 201309210083*

*Fig. 10-380 201309210084*

**1** Remove the T-screw connection for the reverse drive circuit (A) drive pump.

*Fig. 10-381 201309210085*

*Fig. 10-382 201309210086*

**1** Plug the fittings.

*Fig. 10-383 201309210087*

**1** Remove the intake line screw connection for the vibro pump.

*Fig. 10-384 201309210088*

**1** Plug the fittings.

*Fig. 10-385 201309210089*

*Fig. 10-386 201309210090*

**1** Remove the intake line elbow screw connection for the drive pump.

**1.1** Hydraulic oil will run out.

*Fig. 10-387 201309210093*

*Fig. 10-388 201309220063*

**1** Remove the charge pressure hydraulic hose for the PBR valve block.

**2** Plug the fittings.

*Fig. 10-389 201309210094*

**1** Remove the cable ties on both sides of the servo-block.

*Fig. 10-390 201309210095*

*Fig. 10-391 201309210096*

**1** Remove connectors Y3 and Y4.

*Fig. 10-392 201309210098*

*Fig. 10-393 201309210099*

**1** Remove the M12 hex screws (AF size 19) on the drive pump.

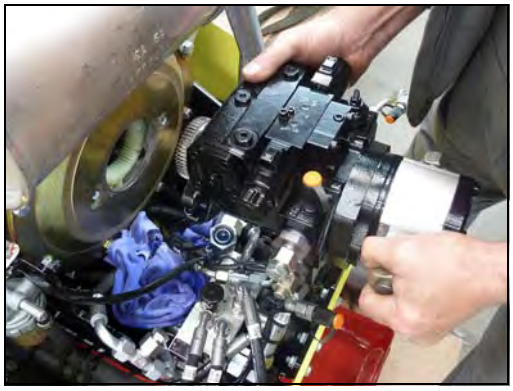


*Fig. 10-394 201309210100*

**1** Lift the drive pump away from the motor.


*Fig. 10-395 201309210101*

**1** Plug the elbow screw connection for the intake line **(1)** which is now exposed.

*Fig. 10-396 201309210102*

*Fig. 10-397 201309220034*

**1** Remove the M10 Allen screw (AF size 8).

**2** Pull the gear wheel off the shaft.

### 10.18.2 *Preparing the new drive vibro pump*

If the old screw connections are not defective, they can be reused. Otherwise new screw connections must be used.

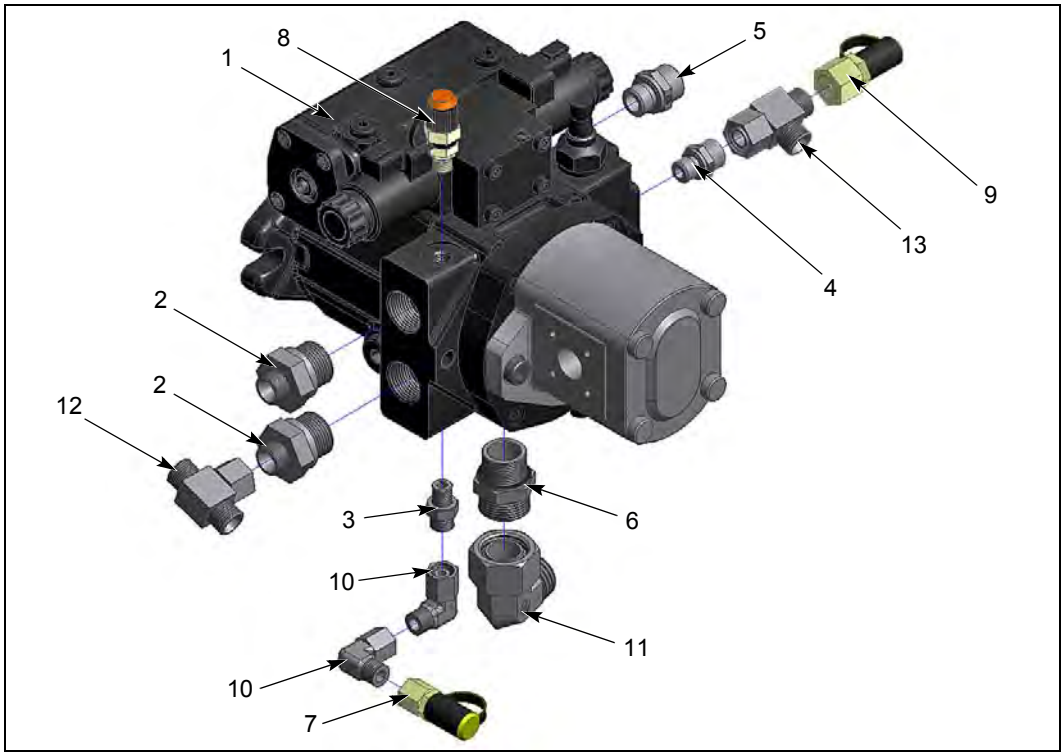



*Fig. 10-398 Drive pump screw connections*

| | | AF SIZE | Nm |
|---|---|---|---|
| 1 | Hydraulic pump | | |
| 2* | Straight screw-in fitting GES12L/M27x2-WD | 32 | 180 |
| 3* | Straight screw-in fitting GES 8LM-WD | 17 | 25 |
| 4* | Straight screw-in fitting 12L/M 14x1.5-WD | 19 | 45 |
| 5* | Straight screw-in fitting GES15LM-WD | 27 | 70 |
| 6* | Straight screw-in fitting GES22LM-WD | 32 | 125 |
| 7 | Screw coupling MINIMESS-1620 DKO 8L | 17 | |
| 8* | Screw coupling MINIMESS-1620 M12x1.5 | 17 | |
| 9 | Screw coupling MINIMESS-1620 DKOL 12L | 22 | |
| 10 | Elbow fitting, adjustable, EWSD 8L | 17 | |
| 11 | Elbow fitting, adjustable, ESWD 22L | 36 | |
| 12 | T-fitting, adjustable ETSD12L | 22 | |
| 13 | L-fitting, ELSD12L | 22 | |

*Apply blue adhesive to all straight screw-in fittings and Minimess M12x1.5.

Siehe “Cementing hydraulic threaded joints” see page 141.

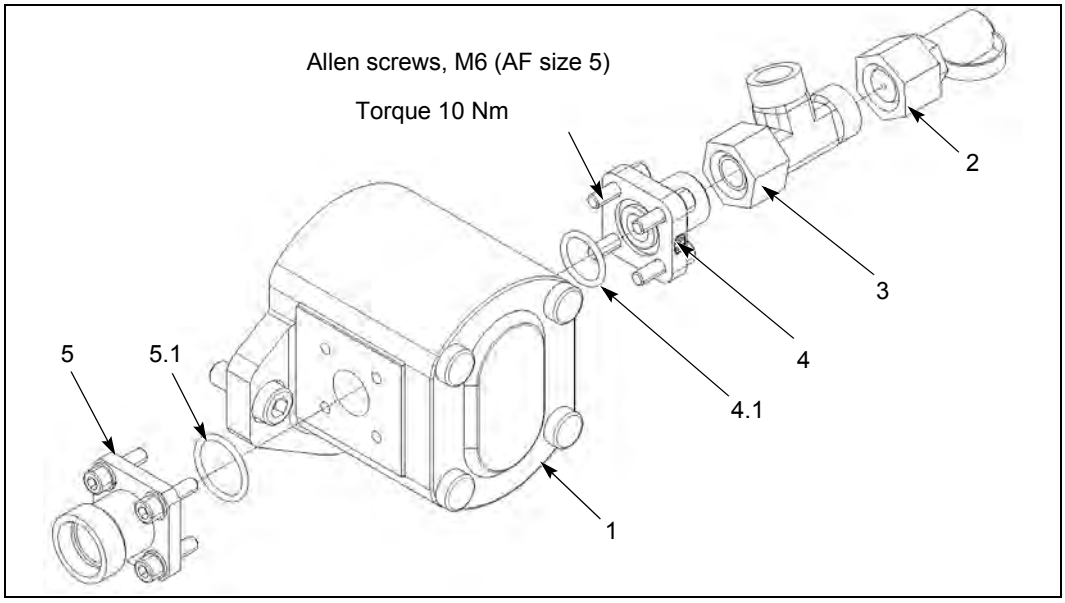



*Fig. 10-399 Vibro-steering pump*

1 Gear pump, 11 ccm/rev. 9 teeth 82.55mm
2 Screw coupling MINIMESS-1620 DKO 15L
3 L-fitting, ELSD15L w/o M+D K
4 Straight flange fitting GFS 15L-35
4.1 O-ring
5 Straight flange fitting GFS 22L-40
5.1 O-ring

*Fig. 10-400 201309220035*

**1** Apply Anti-Seize to the shaft.

*Fig. 10-401 201309220036*

**1** Apply blue adhesive to the M10 Allen screw.

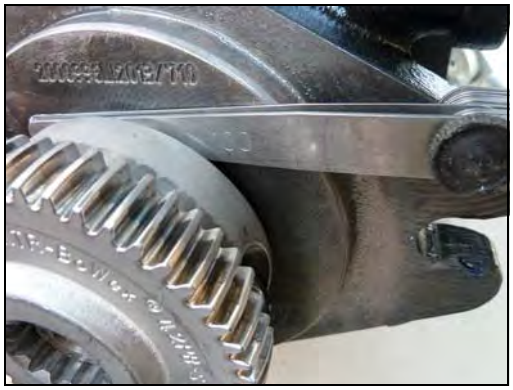


*Fig. 10-402 201309220037*

**1** Adjust the gearwheel

**1.1** Place a feeler gauge (1.5 mm) between the gearwheel and the pump housing.

*Fig. 10-403 201309220038*

**1** Firmly secure the gearwheel with the M10 Allen screw (AF size 8) tightening it to a torque of 85 Nm.

## *10.18.3 Installation*

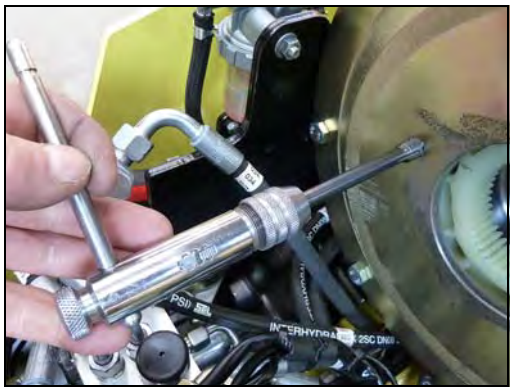


*Fig. 10-404 201309220039*

**1** Clean the M12 thread on the pump flange.

*Fig. 10-405 201309220040*

**1** Remove the cap from the intake hose.

*Fig. 10-406 201309220042*

**1** Apply blue adhesive to the **two** M12x35 hex screws.

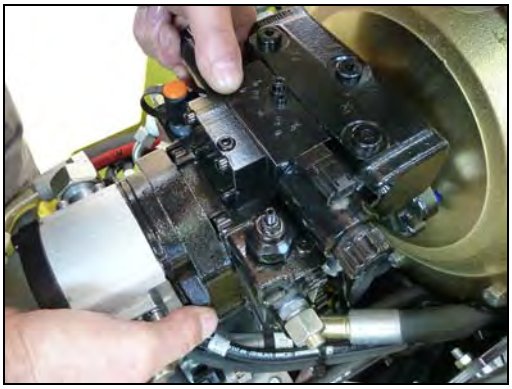


*Fig. 10-407 201309220043*

**1** Push the drive pump onto the pump flange.

*Fig. 10-408 201309220044*

**1** Tighten the **two** M12x35 hex screws (AF size 19) to a torque of 85 Nm.

*Fig. 10-409 201309220045*

*Fig. 10-410 201309220051*

**1** Install the screw connection for the intake line.

Fig. 10-411 201309220053

**1** Install the T-screw connection for the reverse drive circuit (A) drive pump.

Fig. 10-412 201309220054

**1** Install the hydraulic hose for the forwards drive circuit (B) drive pump.

Fig. 10-413 201309220055

**1** Install the pressure line screw connection for the vibro pump.

Fig. 10-414 201309220059

**1** Install the supply hydraulic hose for the drive pump.

*Fig. 10-415 201309220061*

**1** Install the charge pressure screw connection for the drive pump.

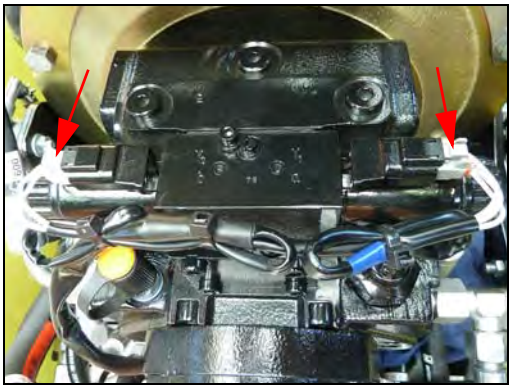


*Fig. 10-416 201309220062*

**1** Connect connectors Y3 and Y4.

*Fig. 10-417 201309220063*

**1** Install the charge pressure hydraulic hose for the PBR valve block.

## 10.19 Replacing the valve block

The hydraulic oil must be drained before the valve block can be demounted.
Siehe “Draining the hydraulic oil” see page 124.

### *10.19.1 Removal*

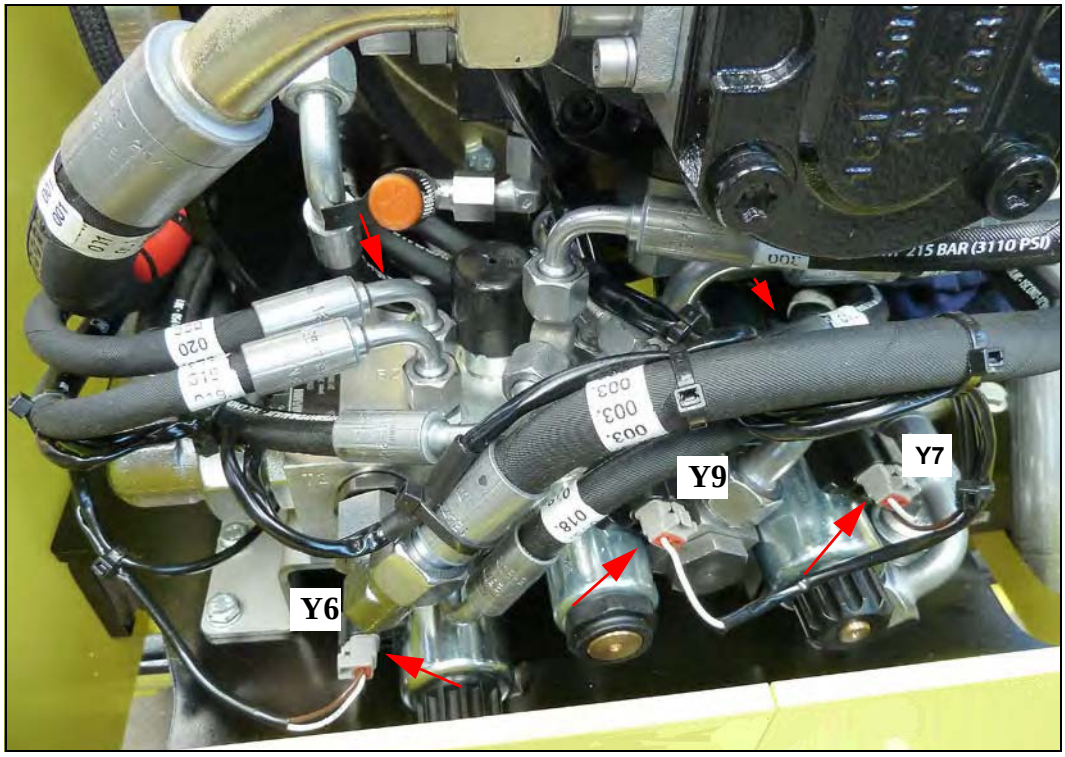



*Fig. 10-418 201309220066*

**1** Disconnect connectors Y5 through Y9.

*Fig. 10-419 201309220067*

**1** Cut through all the cable ties on the wiring harness / valve block.

**2** Pull back the wiring harness.

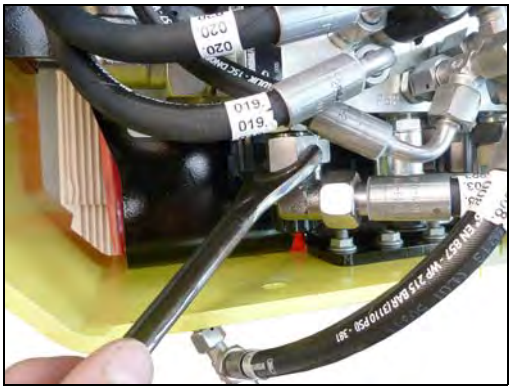



*Fig. 10-420 201309220072*

**1** Remove hydraulic hoses (A2, B2, PBR, T2).


*Fig. 10-421 201309220073*

**1** Plug the fittings.

*Fig. 10-422 201309220074*

**1** Remove the hydraulic hose (BR).

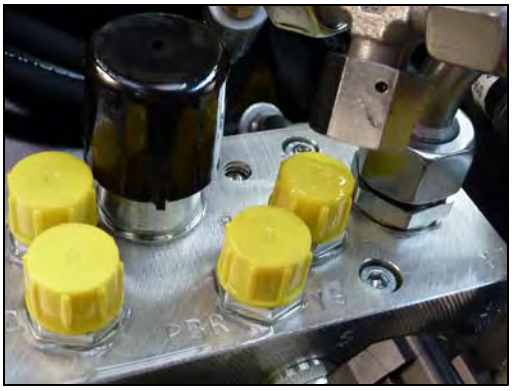


*Fig. 10-423 201309220075*

**1** Plug the fitting.

Fig. 10-424 201309220076

1 Remove hydraulic hose 018 (A3).

2 Plug the fitting.

Fig. 10-425 201309220077

1 Remove hydraulic hose 004 (T1).

2 Plug the fitting.

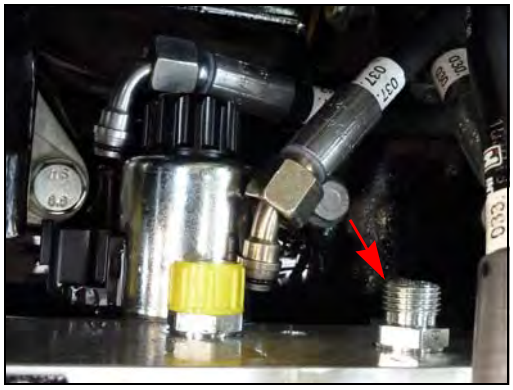


Fig. 10-426 201309220078

1 Remove hydraulic hose 037 (T3).

2 Plug the fitting.

Fig. 10-427 201309220079

1 Remove hydraulic hose 030 (A1).

2 Plug the fitting.

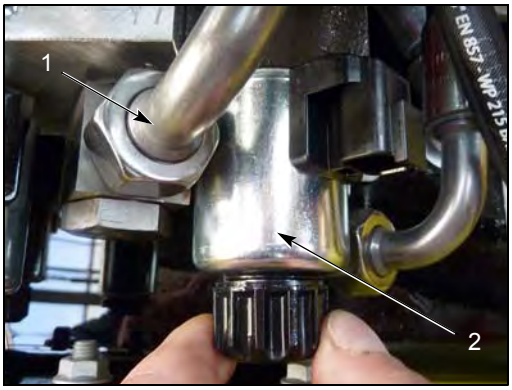


*Fig. 10-428 201309220080*

To gain access to hose screw connection B1 **(1)**, the magnetic coil **(2)** must first be pushed back.

**1** Remove the knurled nut on solenoid valve Y7.

*Fig. 10-429 201309220081*

**1** Remove round sealing ring **(1)**.

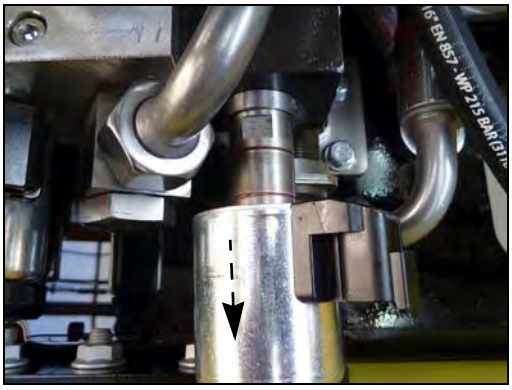


*Fig. 10-430 201309220082*

**1** Push back the magnetic coil.


*Fig. 10-431 201309220083*

**1** Remove hydraulic hose 016 (B1).

*Fig. 10-432 201309220085*

**1** Plug the fitting.

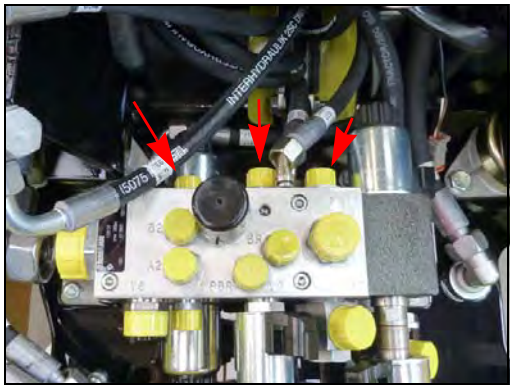


*Fig. 10-433 201309220086*

**1** Remove hydraulic hoses (A1, B3, T3).

**2** Plug the fittings.

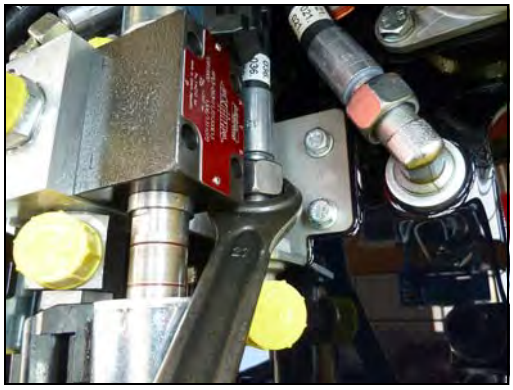


*Fig. 10-434 201309220087*

**1** Remove hydraulic hoses 010 and 036 (elbow bulkhead screw connection).

**2** Plug the fittings.

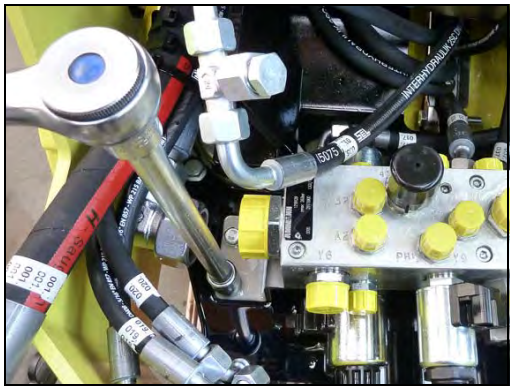


*Fig. 10-435 201309220089*

**1** Remove the **four** M8 hex screws (AF size 13).

*Fig. 10-436 201309220090*

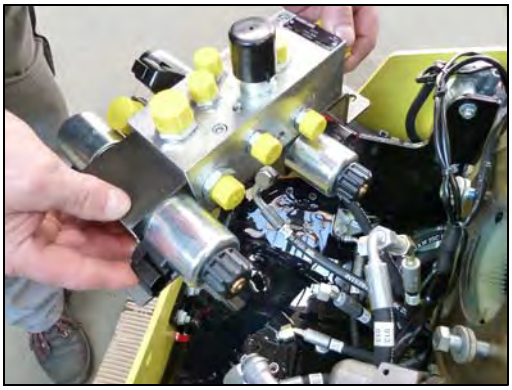


*Fig. 10-437 201309220093*

**1** Lift the valve block out of the chassis.

**NOTE:**
**In our example, the drive pump was already demounted. To demount the valve block, it is not necessary to remove the drive pump.**
**The side panels to the right and left on the chassis can be removed.**

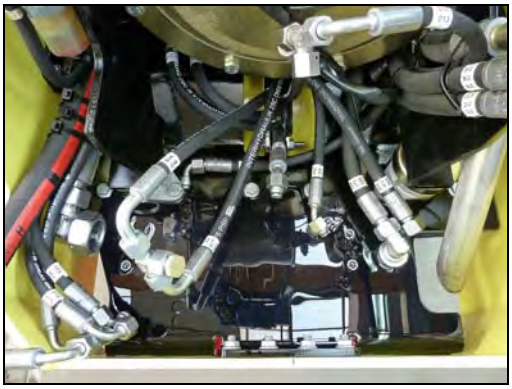


*Fig. 10-438 201309220094*

View of the engine compartment with valve block demounted.

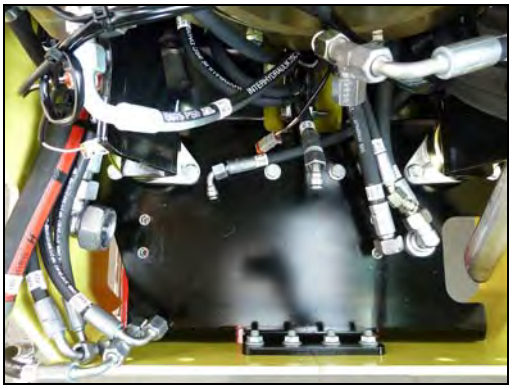


*Fig. 10-439 201309220095*

**1** Before the new or tested valve block can be installed, the floor panel must be cleaned to remove hydraulic oil and dirt.

### 10.19.2 Check

*Brake solenoid valve*

*Fig. 10-440 201309210113*

It is recommended that all magnetic coils and valves be checked on the demounted valve block.

**1** Remove the nut on the solenoid valve.

*Fig. 10-441 201309210116*

**1** Remove the solenoid.

*Fig. 10-442 201309210114*

*Fig. 10-443 201309210115*

**1** Remove valve (AF size 22).

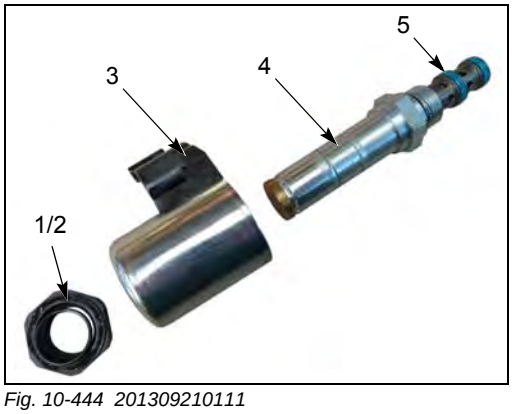



*Fig. 10-444 201309210111*

Disassembled solenoid valve:

- Nut **(1)**
- Gasket **(2)**
- Solenoid **(3)**
- Solenoid valve **(4)**
- Gasket **(5)**

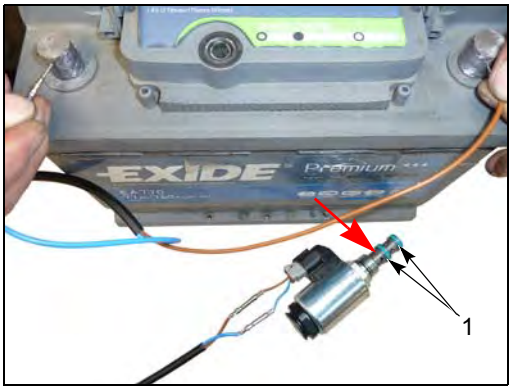



*Fig. 10-445 201309210112*

**1** Apply a voltage of 12 V to the solenoid valve.

**2** The valve (arrow) must be visibly and audibly actuated.

**3** Check the ring seals **(1)**for damage.

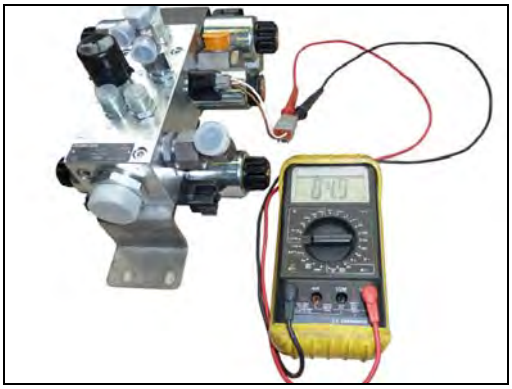


*Fig. 10-446 201311150002*

**1** Resistance of the solenoid (4.9 Ohm).

## *Solenoid valve for large / small amplitude vibration and steering.*

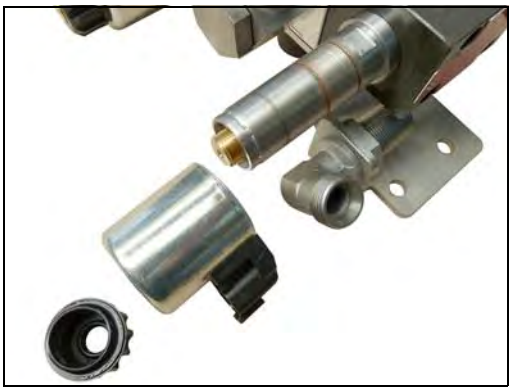


*Fig. 10-447 201309210118*

**1** Remove the nut on the solenoid valve.

**2** Remove the solenoid.

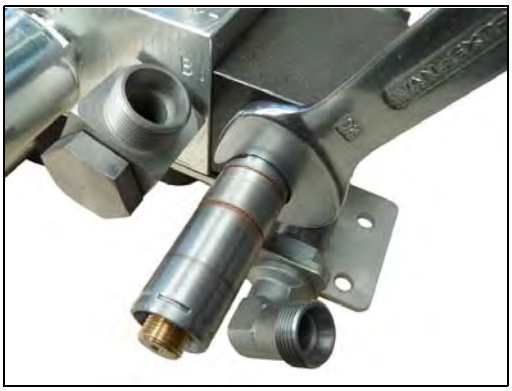


*Fig. 10-448 201309210119*

**1** Remove valve (AF size 26).

**2** Place valve in magnetic coil.


*Fig. 10-449 201309210120*

**1** Apply a voltage of 12 V to the solenoid valve.

**2** The valve must be visibly and audibly actuated.

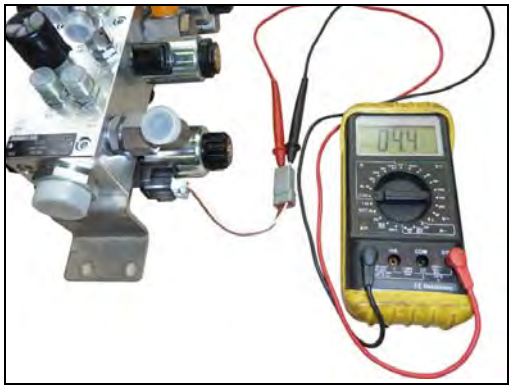



*Fig. 10-450 201311150001*

**1** Resistance of the magnetic coil for large / small amplitude vibration and steering
(4.4 Ohm).

## *max. brake pressure, max. vibration pressure*

*Fig. 10-451 201309210121*

**1** The brake pressure relief valve (AF size 22 / AF size 6) can be adjusted if necessary.

*Fig. 10-452 201309210122*

**1** The vibration pressure relief valve (AF size 22 / AF size 6) can be adjusted if necessary.

*Fig. 10-453 201309210117*

**1** The solenoid valves can be actuated manually.

### *10.19.3 Installation*

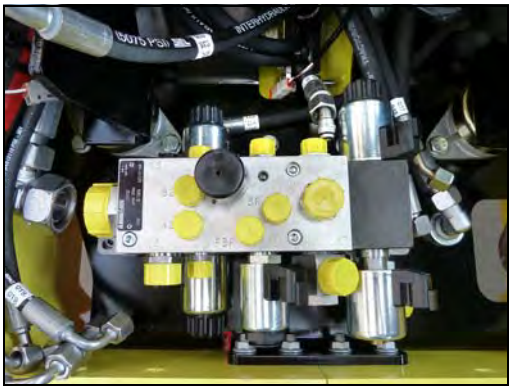


*Fig. 10-454 201309220096*

**1** Place the new or tested valve block on the floor panel.

*Fig. 10-455 201309220097*

**1** Apply blue adhesive to the M8 hex screws.

*Fig. 10-456 201309220100*

**1** Tighten the M8 hex screws (AF size 13) to a torque of 25 Nm.

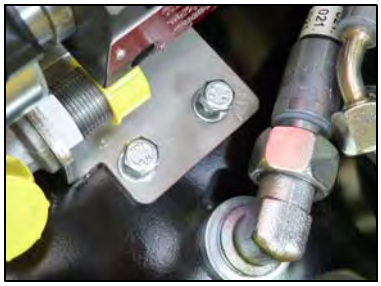


*Fig. 10-457 201309220098*

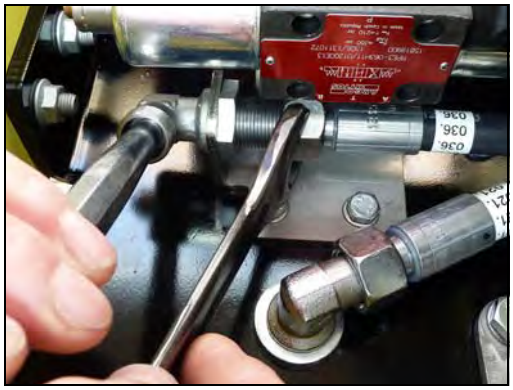



*Fig. 10-458 201309220101*

**1** Install hydraulic hose 036 on the elbow bulkhead screw connection.

*Fig. 10-459 201309220115*

**1** Install hydraulic hose 010 on the elbow bulkhead screw connection.

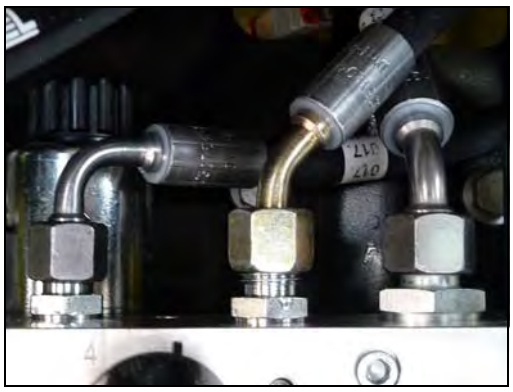



*Fig. 10-460 201309220104*

**1** Install hydraulic hoses (A1, B3, T3).

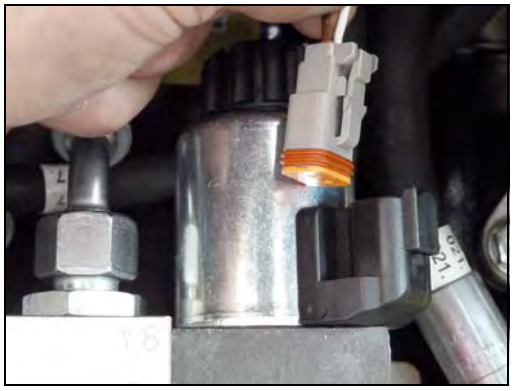



*Fig. 10-461 201309220105*

**1** Connect the plugs in back (Y5, Y8).

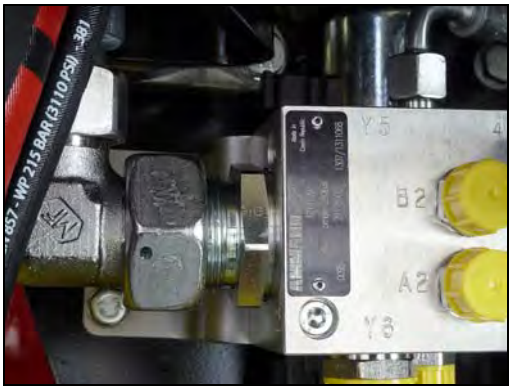



*Fig. 10-462 201309220106*

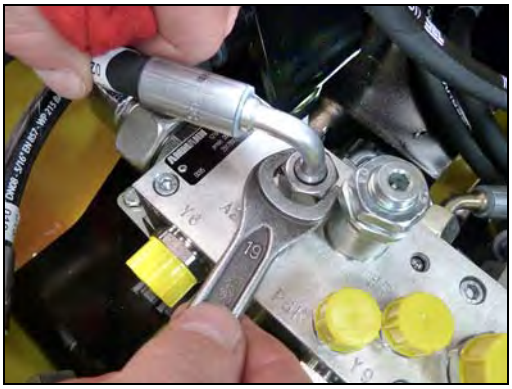


*Fig. 10-464 201309220108*

*Fig. 10-466 201309220113*


*Fig. 10-467 201309220111*

**1** Install hydraulic hose 004 (T1).

*Fig. 10-463 201309220107*

**1** Install hydraulic hoses (A2, B2, PBR).

*Fig. 10-465 201309220110*

**1** Install hydraulic hose onto T-screw connection (BR).

To gain access to hose screw connection B1 **(1)**, the magnetic coil **(2)** must first be pushed back.

**1** Remove the knurled nut.

**2** Remove the O-ring.

**3** Push back the magnetic coil **(2)**.

**4** Install hydraulic hose B1 **(1)**.


*Fig. 10-468 201309220081*

**1** Push the magnetic coil back to the original position.

**2** Install the O-ring **(1)**.

*Fig. 10-469 201309220116*

**1** Install the knurled nut.

**2** Tighten the magnetic coil.

*Fig. 10-470 201309220120*

**1** Install hydraulic hose 018 (A3).

*Fig. 10-471 201309220121*

**1** Install hydraulic hose 002 (P).


*Fig. 10-472 201309220122*

**1** Install hydraulic hose 003 (T2).

*Fig. 10-473 201309220125*

**1** Connect all the connectors at the front (Y6, Y9, Y7).


*Fig. 10-474 201309220067*

**1** Route the wiring harness with care.

**2** Secure the wiring harness with cable ties.

## 10.20 Readying the machine for operation

After replacing components (drive pump, valve block, drive motor) for which all of the oil had to be drained, the machine must be refilled and the charge pressure must be built up once again. Siehe “Hydraulic oil replacement” see page 127.

## 10.21 Pendulum support

### *10.21.1 Removal*

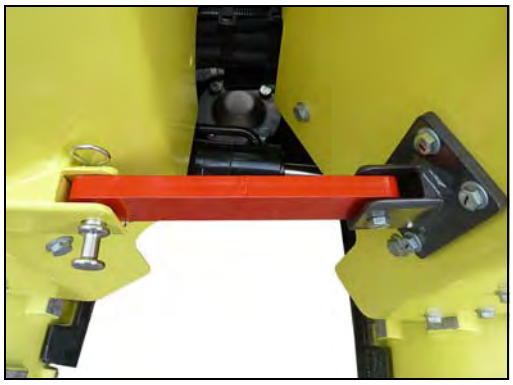


*Fig. 10-475 Joint protection*

**1** Install joint protection.

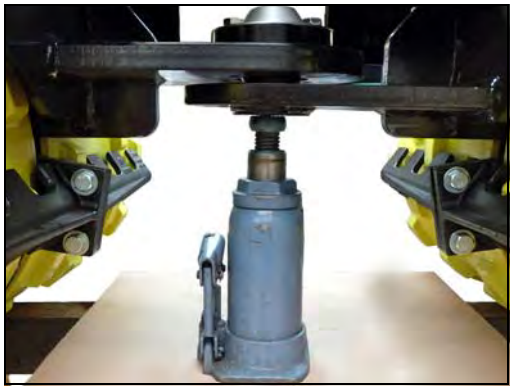


*Fig. 10-476 201309240011*

**1** Place the hydraulic jack at the center of the pendulum joint.

**2** Slightly relieve the pressure on the roller.

*Fig. 10-477 201309240014*

**1** Remove the **two** M12 hex screws (AF size 19) for **front** support.

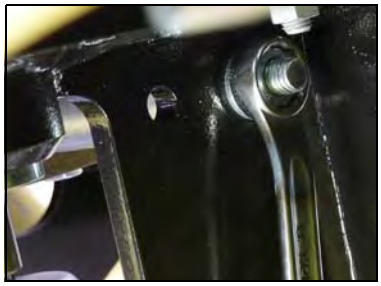


*Fig. 10-478 201309240012*

*Fig. 10-479 201309240015*

**1** Remove the **two** M12 hex screws (AF size 19) for **rear** support.

*Fig. 10-480 201309240016*

Fig. 10-481 201309240019

**2** Remove the pendulum support.

Fig. 10-482 201309240020

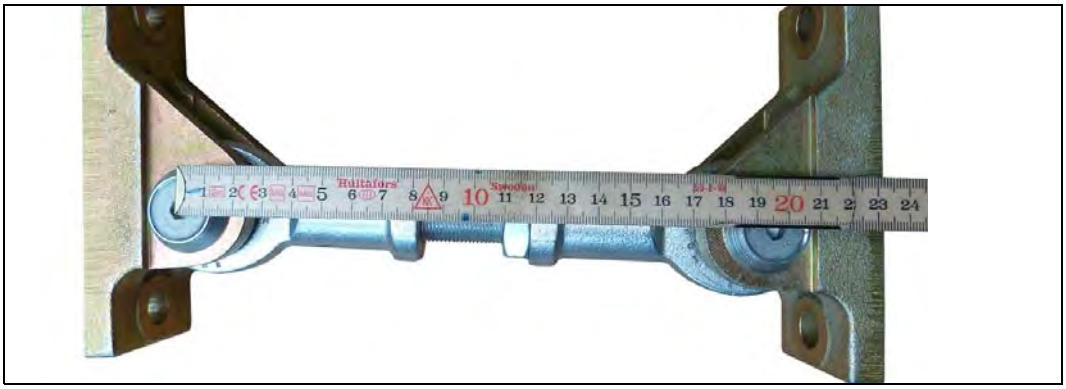


Fig. 10-483 201309240032

**1** The on-center dimension from one joint to the other must be recorded before disassembling the pendulum support. This dimension is required for the reassembly.

## *10.21.2 Replacing the joint head*

### *Removing the old joint head*

Fig. 10-484 201309240023

**1** Remove M10 securing bolt (AF size 6, AF size 17).

**2** Procedure is the same for rear and front

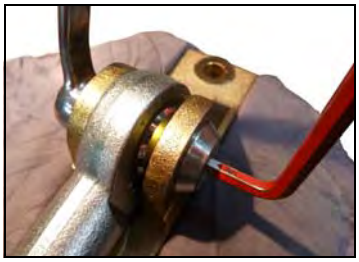


Fig. 10-485 201309240021

Fig. 10-486 201309240027

1 Place the pendulum support under the press.

2 Use the drift pin to press out the heavy-duty dowel pin.

3 Procedure is the same for rear and front.

Fig. 10-487 201309240028

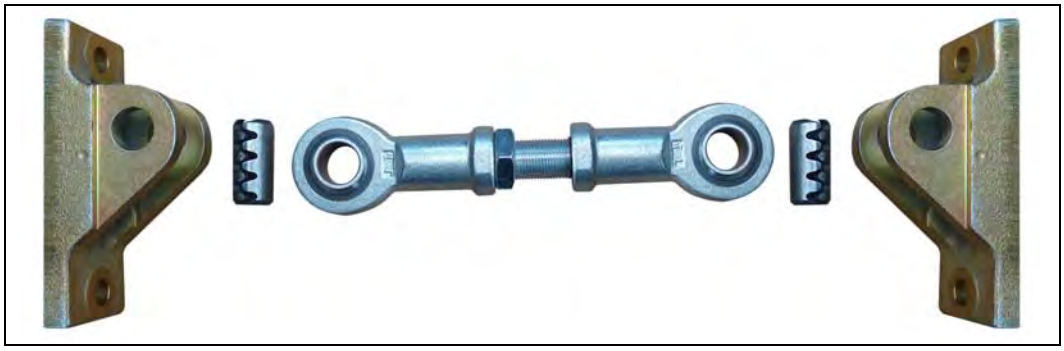


Fig. 10-488 201309240029

Fig. 10-489 201309240030

1 Clamp the pendulum support in a vise.

2 Heat up the locknut and joint head to approx. 200°C (392°F).

Fig. 10-490 201309240031

1 Loosen the locknut.

2 Use a wrench to unscrew the joint head (AF size 46) from the rod.

3 Procedure is the same for rear and front

Fig. 10-491 201309240034

*Installing a new joint head*

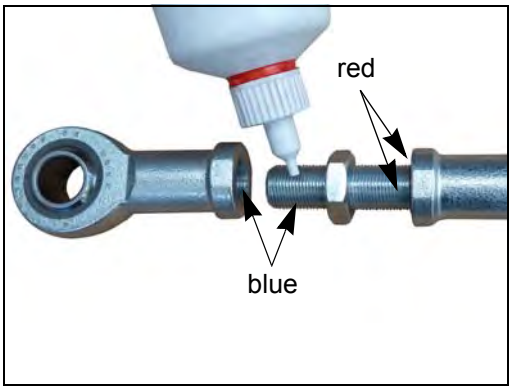



*Fig. 10-492 201309240034-2*

**1** Apply **red** adhesive to the **rear** inner thread of the new joint head and the outer thread of the pendulum support.

**2** Apply **blue** adhesive to the **front** inner thread of the new joint head and to the outer thread of the pendulum support.

**3** Screw the **rear** joint head onto the pendulum support all the way to the stop.

**4** Set the **front** joint head to the dimension.

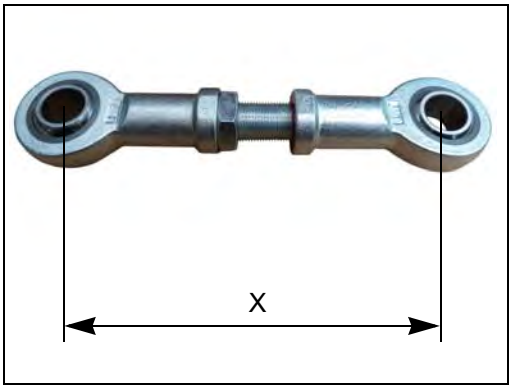



*Fig. 10-493 201309240037*

**1** Adjust the pendulum support until it has the length you measured previously.

**2** Counter the nuts.

*Fig. 10-494 201309240039*

**1** Grease the bores of the rear and front joint heads.

*Fig. 10-495 201309240040*

**1** Grease the dowel pins.

*Fig. 10-496 201309240038*

**1** Insert the dowel pin in such a way that the gap is on the pressure side.

**2** Press in the dowel pins.

*Fig. 10-497 201309240042*

**1** Secure the M10x60 countersunk Allen screw with red adhesive.

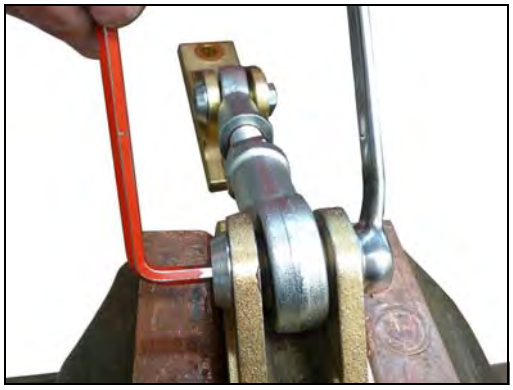


*Fig. 10-498 201309240043*

**1** Install the M10x60 Allen bolt (AF size 6 / AF size 17) with an M10 nut and washer.

### *10.21.3 Installation*

*Fig. 10-499 201309250001*

**1** **Apply blue adhesive to the two** M12x160 hex screws at the **rear**.

**2** Apply blue adhesive to the **two** M12x65/30 hex screws at the **front**.

*Fig. 10-500 201309250002*

1 Install **two** M12x160 hex screws (AF size 17) and washers **at the rear** and torque to 85 Nm.

*Fig. 10-501 201309250003*

*Fig. 10-502 201309250004*

1 Install **two** M12x65/30 hex screws (AF size 17) and washers **at the front** and torque to 85 Nm.

## 10.22 Replacing the steering cylinder

The removal of the left steering cylinder will be described in the following. The removal of the right steering cylinder is exactly the same.

### *10.22.1 Removing the old steering cylinder*

*Fig. 10-503 201309240001*

1 Remove hydraulic hoses 017 and 018 from the hydraulic cylinder.


*Fig. 10-504 201309250004*

*Fig. 10-505 201309240005*

**1** Remove the M16 (AF size 24) securing nut from the **front** steering cylinder.

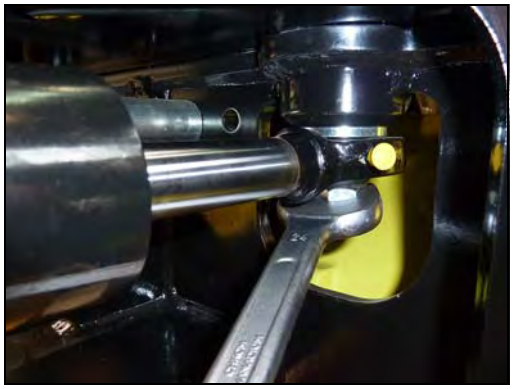


*Fig. 10-506 201309240006*

**1** Remove the M16 (AF size 24) securing nut from the **rear** steering cylinder.

*Fig. 10-507 201309240007*

**1** Remove the steering cylinder.

*Fig. 10-508 201309240008*

**1** Plug the screw connections on the steering cylinder.

*Fig. 10-509 201309240010*

**1** Plug the screw connections on hoses 017 and 018.

## *10.22.2 Install a new steering cylinder*

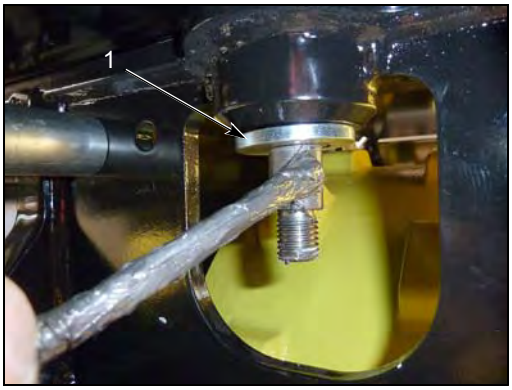



*Fig. 10-510 201309250006*

**1** Clean the securing bolt (remove rust as needed).

**2** Install the spacer **(1)**.

**3** Grease the securing bolt.

**4** Apply blue adhesive to threaded bolt.

*Fig. 10-511 201309240007*

**1** Install a new steering cylinder.

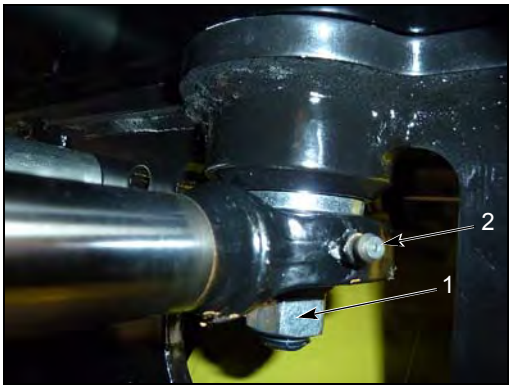



*Fig. 10-512 201309250009*

**1** Tighten the M16 nut (AF size 24) **(1)** to a torque of 100 Nm.

**2** Grease the front and rear grease nipples **(2)**.

Fig. 10-513 201309250014

**1** Install hydraulic hoses 017 and 018.

## 10.23 Pendulum joint

Before the pendulum joint can be demounted, the following components must be removed:

- The pendulum support (“Pendulum support” see page 264)
- The steering cylinder (“Replacing the steering cylinder” see page 269)

Fig. 10-514 201309250016

**1** Cut through the cable tie on the hose bundle.

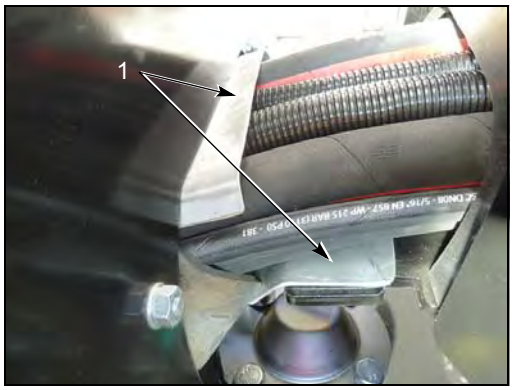



Fig. 10-515 201309240057

**1** Place a protective sheet (e.g. aluminum) beneath and above the hose bundle between it and the chassis.

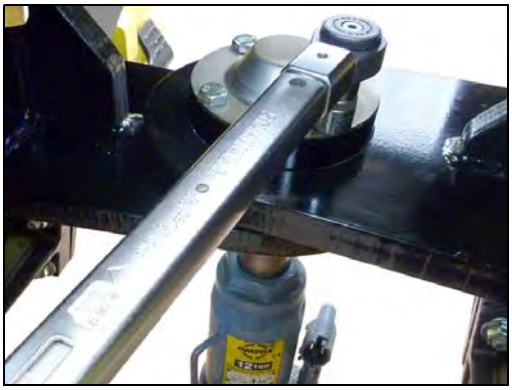


*Fig. 10-516 201309240046*

**1** Remove the M12 hex screws (AF size 19) from the pendulum joint.

*Fig. 10-517 201309240049*

**1** Remove the cover.

*Fig. 10-518 201309240050*

**1** Remove the M16 hex screw (AF size 24) from the bearing lock.

**2** Remove the bearing lock **(1)**.

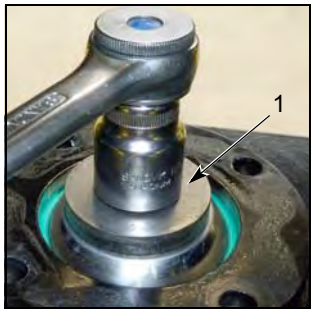



*Fig. 10-519 201309240051*

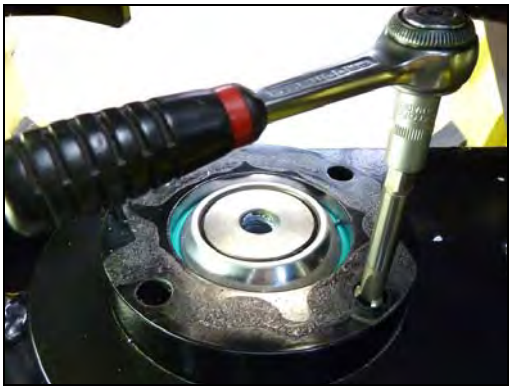


*Fig. 10-520 201309240052*

**1** Retap the thread in the chassis support.

*Fig. 10-521 201309240053*

**1** Screw in **two** M12x100 hex screws (AF size 19).

**NOTE:**
**If the bearing seat is rusted, use 4 screws.**

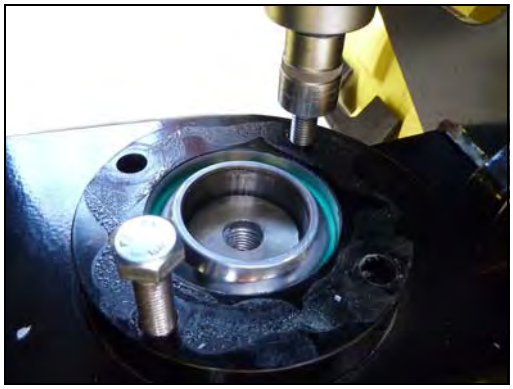


*Fig. 10-522 201309240054*

**1** Screw the screws in until the pendulum bearing is separated from the bearing bolt.

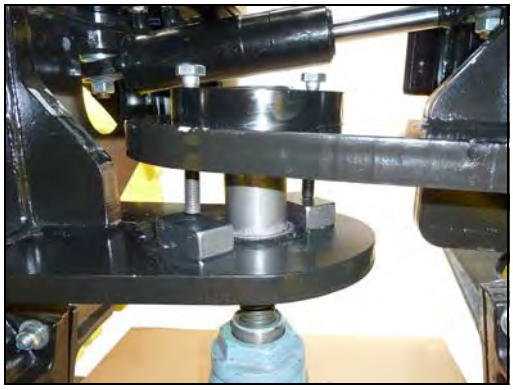


*Fig. 10-523 2201309240055*

**1** Space limitations mean that no screws longer than M12x100 can be used. Therefore, spacer blocks (approx. 20 mm) must be placed under the screws.

**2** When the bearing has been pressed free of the bearing bolt, remove the screws.

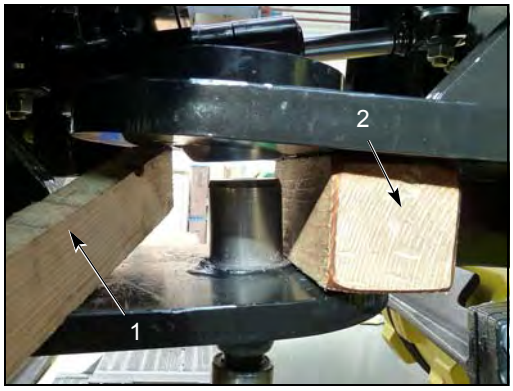



*Fig. 10-524 201309240058*

**1** Use a piece of square timber **(1)** to force the chassis apart at the front and rear.

**2** Support the chassis at the rear using another piece of square timber **(2)**.


*Fig. 10-525 201311210022*

Special tool for removing the joint bearing.

*Fig. 10-526 201309240061*

**1** Place the thrust washer of the special tool under the joint bearing.

*Fig. 10-527 201309240062*

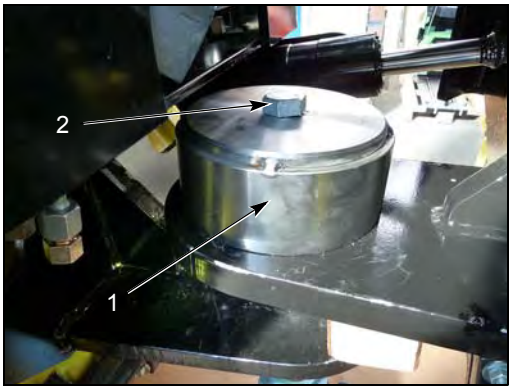



*Fig. 10-528 201309240063*

**1** Position the upper part **(1)** of the special tool on the chassis support.

**2** Put the M20 hex screw **(2)** of the special tool in place.

*Fig. 10-529 201309240064*

**1** Press the bearing out of the support.

**1.1** Turn the screw until the bearing is free.

*Fig. 10-530 201309240065*

**1** Lift the bearing out of the support.

*Fig. 10-531 201309240068*

*Fig. 10-532 201309240066*

Dismantled clamp ring with bearing.

*Fig. 10-533 201309240069*

**1** Place the clamp ring under the press.

*Fig. 10-534 201309240070*

**1** Press the bearing out.


*Fig. 10-535 201309240071*

**1** Clean the clamp ring.

*Fig. 10-536 201309240072*

**2** Grease the bearing seat.

*Fig. 10-537 201309240074*

**1** Position the new bearing.

*Fig. 10-538 201309240075*

**1** Press the bearing into the clamp ring.

Fig. 10-539 201309240076

**2** Clean the chassis support.


Fig. 10-540 201309240077


Fig. 10-541 201309240078

**1** Grease the bearing seat.


Fig. 10-542 201309240079

**2** Apply sealant to the sealing surface.


Fig. 10-543 201309240081


Fig. 10-544 201309240083

**1** Draw the bearing flange into the support with M12x60 hex screws and spring washers.

*Fig. 10-545 201309240086*

**1** Grease the bearing bolt.

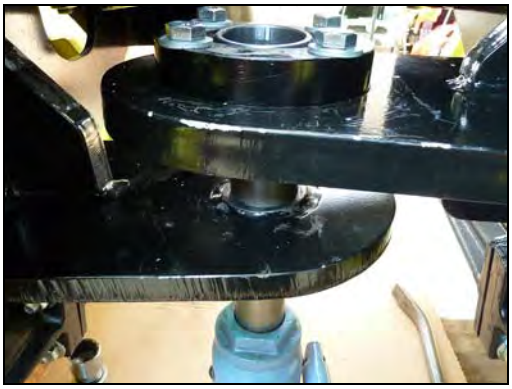


*Fig. 10-546 201309240087*

**1** Center the chassis relative to the bearing bolt.

*Fig. 10-547 201309240088*

*Fig. 10-548 201309240089*

**1** Position the washer.

**2** Screw the M16x100 hex screw with the nut into the bearing bolt.

*Fig. 10-549 201309240090*

**1** Using the M16 (AF size 24) hex nut, pull the bearing over the bearing bolt.

**2** Remove the hex screw.

*Fig. 10-550 201309240091*

**1** Install retaining washer onto the screw.

**2** Apply blue adhesive to the M16x30 hex screw.


*Fig. 10-551 201309240092*

**1** Secure the pendulum bearing with the M16 hex screw (AF size 24) and washer (210 Nm).

**2** Remove the four mounting screws **(1)**.

*Fig. 10-552 201309240093*

*Fig. 10-553 201309240095*

**3** Apply sealant to the surface of the clamp ring.

*Fig. 10-554 201309240096*

*Fig. 10-555 201309240097*

**1** Put cover in place.

*Fig. 10-556 201309240098*

**1** Apply blue adhesive to the **four** M12x40 hex screws.

*Fig. 10-557 201309240099*

**1** Install the M12x40 hex screw (AF size 19) and torque to 85 Nm.

*Fig. 10-558 201309250015*

**1** Remove the protective metal sheets.

**2** Arrange the hose bundle and secure with cable tie.

## 10.24 Shutdown bar

### *10.24.1 Replacing the shutdown bar*

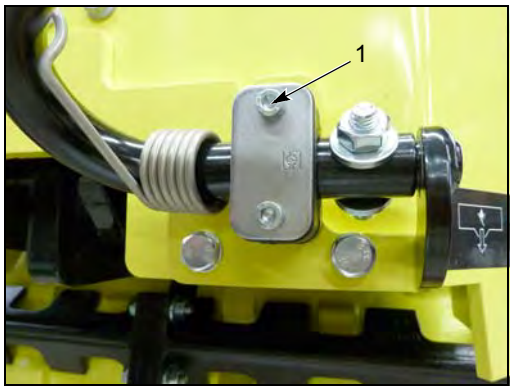



*Fig. 10-559 201311170052*

**1** Remove the Allen screws (AF size 5) **(1)** on the clamp body.

**2** Remove the shutdown bar from the chassis.

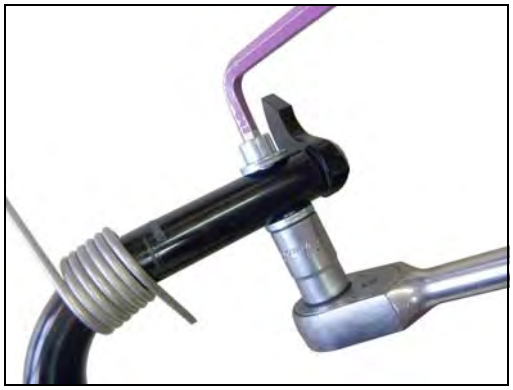


*Fig. 10-560 201311200001*

**1** Remove the hex screw (AF size 8 / AF size 17) from the right side of the shutdown bar.

*Fig. 10-561 201311200002*

**1** Remove the stop on the right.

*Fig. 10-562 201311200003*

**1** Remove the spring.

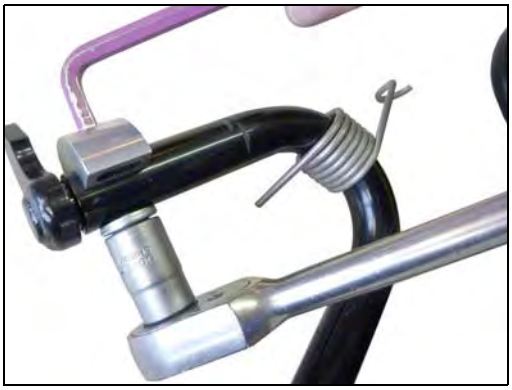


*Fig. 10-563 201311200004*

**1** Remove the hex screw (AF size 8 / AF size 17) from the left side of the shutdown bar.

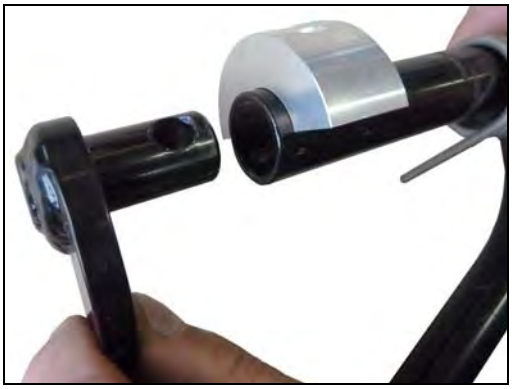


*Fig. 10-564 201311200006*

**1** Remove the stop on the left.

*Fig. 10-565 201311200007*

**1** Remove the magnet.

*Fig. 10-566 201311200008*

**1** Remove the spring.

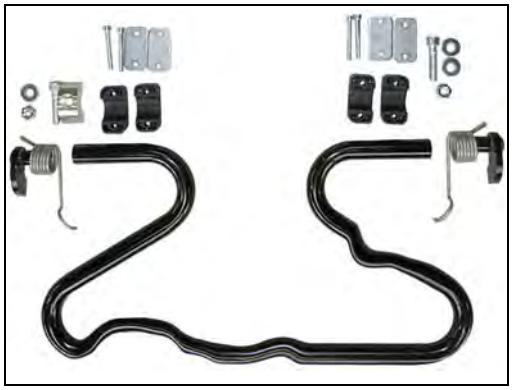


*Fig. 10-567 201311170001*

**1** Inspect the removed parts for suitability for reuse.

*Fig. 10-568 201311170032*

**1** Apply blue adhesive to the Allen screws on the clamp body.

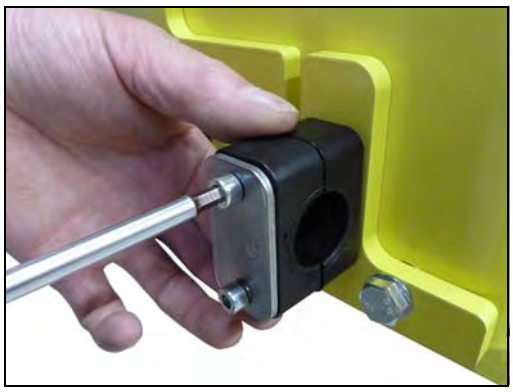


*Fig. 10-569 201311170033*

**1** Secure the clamp body to the chassis using the M6 hex screws (AF size 5).

*Fig. 10-570 201311170034*

**1** Push the right and left springs onto the shutdown bar.

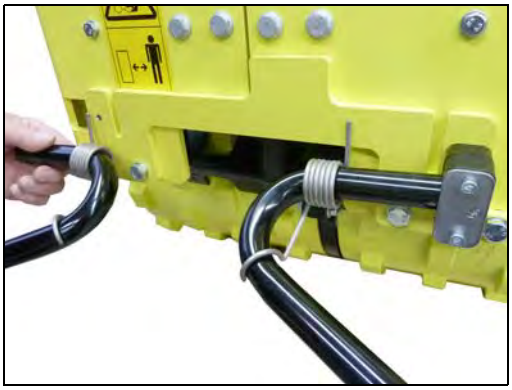


*Fig. 10-571 201311170035*

**1** Push the shutdown bar into the right clamp body.

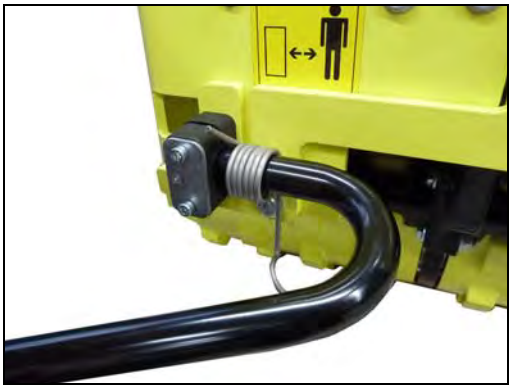


*Fig. 10-572 201311170036*

**1** Install left clamp body.

*Fig. 10-573 201311170037*

**1** Tighten the Allen screws (AF size 5).

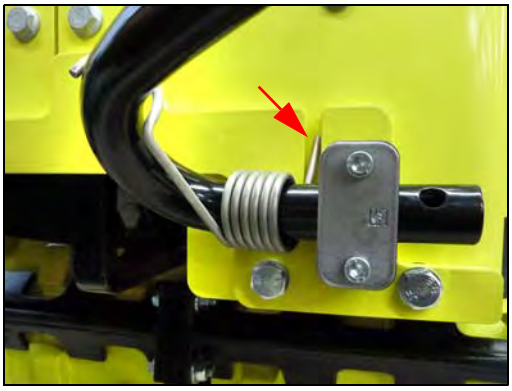


*Fig. 10-574 201311170040*

**1** Insert the springs into the recesses provided for them on the left and right.

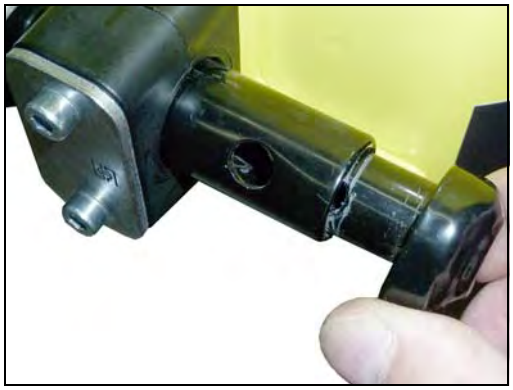


*Fig. 10-575 201311170041*

**1** Insert the stop on the right.

*Fig. 10-576 201311170045*

**1** Install the M10 Allen screw (AF size 8).

**2** Apply blue adhesive to the Allen screw.

*Fig. 10-577 201311170048*

**1** Put the washer in place.

**2** Put the M10 hex nut in place.

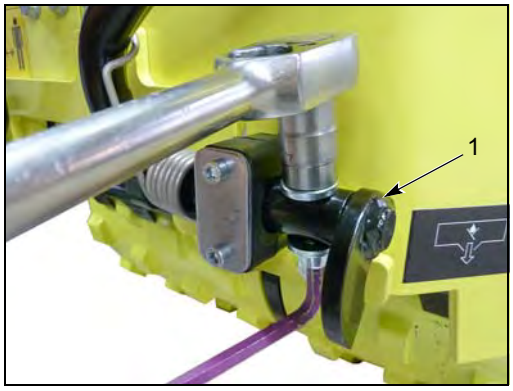



*Fig. 10-578 201311170051*

**1** Tighten the M10 Allen screw (AF size 8).

**1.1** Tighten the screw until the stop **(1)** rests in the tube without play.

*Fig. 10-579 201311170053*

**1** Place the magnet on the tube on the left side.

**1.1** Observe the mounting orientation (see photo).

**2** Insert the hex screw from below.

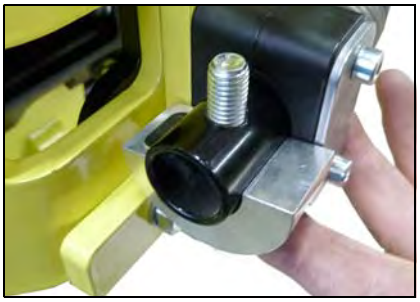


*Fig. 10-580 20131117055*

*Fig. 10-581 201311170057*

**1** Apply blue adhesive to the Allen screw.

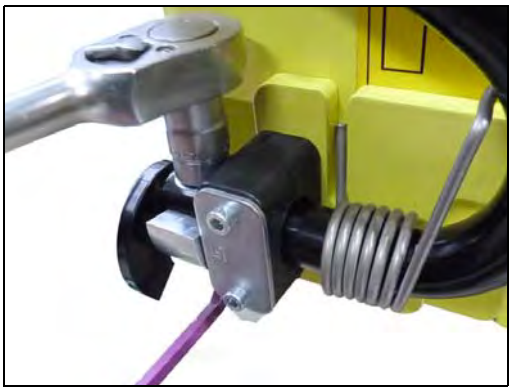


*Fig. 10-582 201311170058*

**1** Tighten the M10 Allen screw (AF size 8).

**1.1** Tighten the screw until the stop **(1)** rests in the tube without play.

Fig. 10-583 201311170104

The new shutdown bar is fully installed.

## *10.24.2 Sensor replacement and adjustment*

Fig. 10-584 201311170112

**1** Disconnect the sensor cable connector.

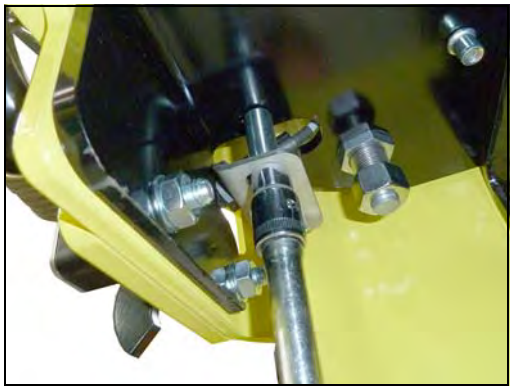


Fig. 10-585 201311170086

**2** Remove the sensor mounting bracket (AF size 13) under the chassis.

Fig. 10-586 201311170080

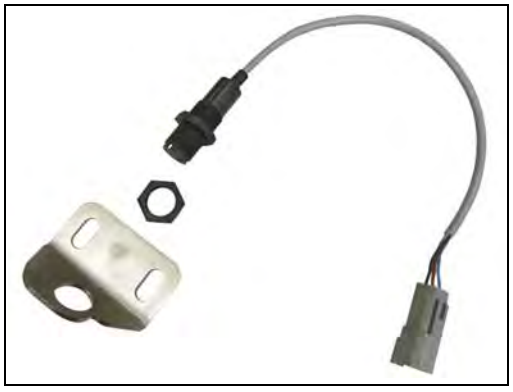


Fig. 10-587 201311170079

**1** Remove the old (defective) sensor from the bracket.

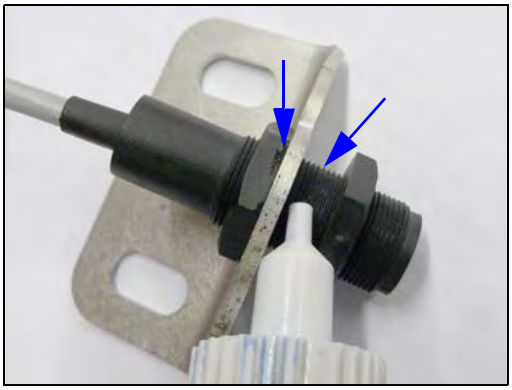


*Fig. 10-588 201311170090*

**1** Apply blue adhesive to the new sensor.

*Fig. 10-589 201311170094*

**1** Check the mounted dimension (approx. 25 mm).

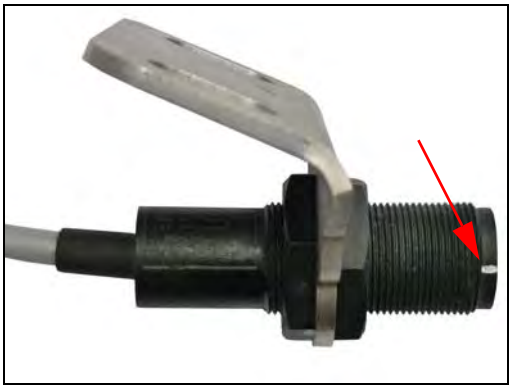


*Fig. 10-590 201311170093*

**2** Observe the mounting orientation (see the white mark on the sensor head).

**2.1** Marking parallel to bracket bend.

*Fig. 10-591 201311170080*

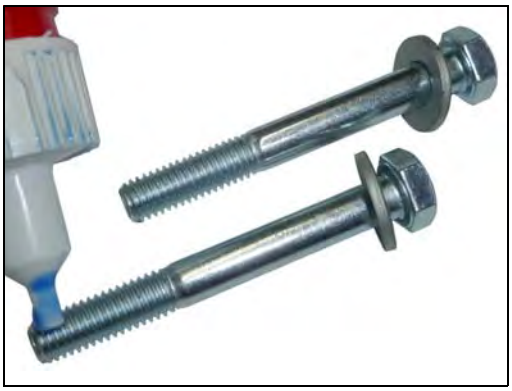


*Fig. 10-592 201311170082*

**1** Apply blue adhesive to the M8x65/22 hex screws.

*Fig. 10-593 201311170083*

**1** Feed the sensor cable through the opening in the chassis.

**2** Install the sensor mounting bracket.

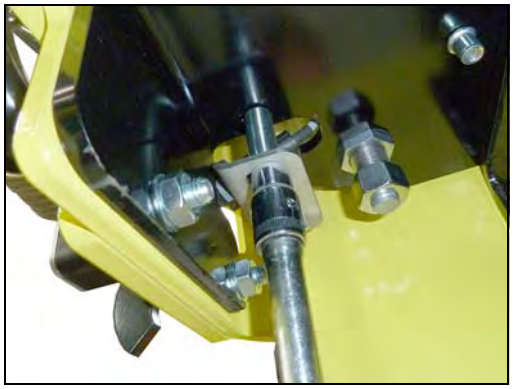


*Fig. 10-594 201311170086*

**1** Lightly tighten the M8x 65/22 hex screws (AF size 13).

*Fig. 10-595 201311170097*

**1** Set the gap (approx. 3 mm) between the sensor head and the magnet.

**1.1** Adjust the sensor mounting bracket accordingly for this.

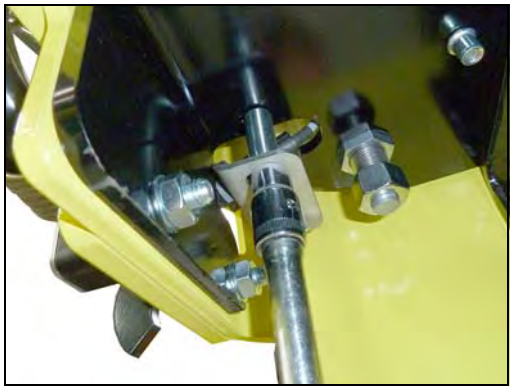


*Fig. 10-596 201311170086*

**1** Tighten the M8x 65/22 hex screws (AF size 13) to a torque of 25 Nm.

*Fig. 10-597 201311170112*

**1** Connect the sensor cable.

**2** Secure connector with cable ties.


*Fig. 10-598 201311210002*

Perform functional check of shutdown bar, up: “Shutdown bar” indicator lamp **(1)** must light.


*Fig. 10-599 201311210001*

Perform functional check of shutdown bar, down: “Shutdown bar” indicator lamp **(1)** must not light.

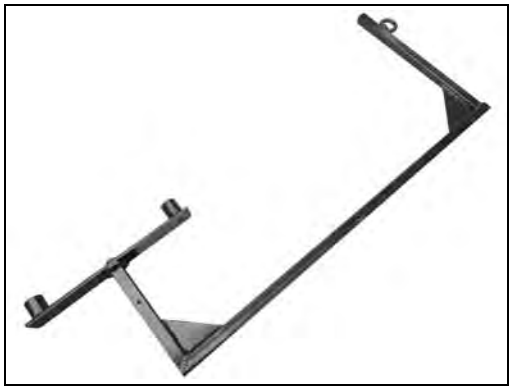
## 10.25 Tools

Inquire with your local MQ Field Service Manager for Special Tool needs

### *10.25.1 Special tools*

*Fig. 10-600 201311210020*

Assembly tool for drive motor



Assembly tool for vibro unit

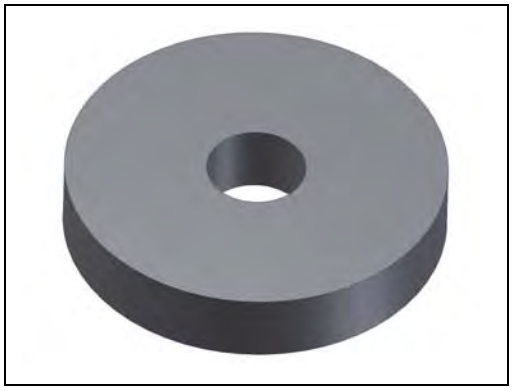
*Fig. 10-601 201311210021*

Puller for pendulum joint bearing

*Fig. 10-602 201311210022*

Bolt for pressing in the pendulum joint bearing

*Fig. 10-603 201311210024*



Assembly tool for pendulum joint bearing

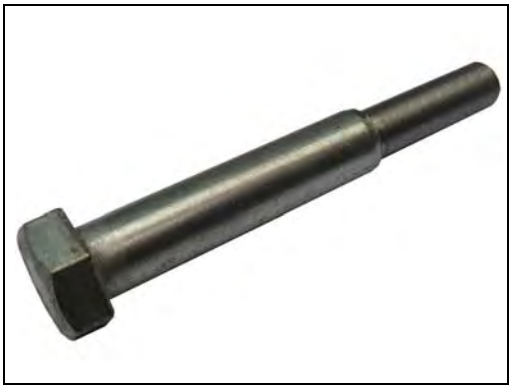
*Fig. 10-604 201301150031*

Pressure screws for pendulum joint bearing

*Fig. 10-605 201311210025*

Spacer block for pressure screws (4x)

*Fig. 10-606 201311210027*



Assembly drift pin for pendulum support
heavy-duty dowel pin

*Fig. 10-607 201311210026*

Special socket for assembly of the infrared sensor.

*Fig. 10-608 201311210023*

Fig. 10-609 201311130011

Grooved nut wrench for vibro gearbox

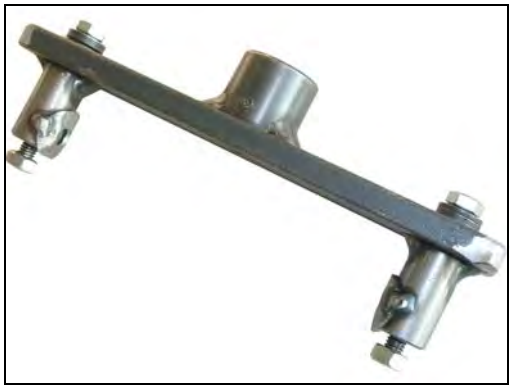


Fig. 10-610 201312110001

Bracket for torque measurement instrument for vibro gearbox

Fig. 10-611 201312110002

Torque measurement instrument

## 10.25.2 Special tool for measuring speed and frequency

Fig. 10-612 201212130022

### 10.25.3 Special tool for checking solenoids

*Fig. 10-613 200608300003*

## 10.26 Plugs and stoppers

### 10.26.1 Vibromotor

*Tab. 10-2 Plugs and stoppers for 1 vibromotor*

| Material | Size | Quantity | Material number |
|---|---|---|---|
| Pipe plug | 15L | 2 | 1-901441 |
| End plug | 15L | 2 | 1-901276 |
| Cap nut | 15L | 2 | 1-901003 |

### 10.26.2 Vibromotor valve block maximum pressure

*Tab. 10-3 Vibromotor valve block maximum pressure plugs*

| Material | Size | Quantity | Material number |
|---|---|---|---|
| Pipe plug | 15L | 1 | 1-901441 |
| End plug | 15L | 1 | 1-901276 |
| Cap nut | 15L | 1 | 1-901003 |
| Pipe plug | 12L | 2 | 1-901440 |
| End plug | 12L | 2 | 1-901275 |
| Cap nut | 12L | 2 | 1-901325 |

### 10.26.3 Drive motor

*Tab. 10-4 Plugs and stoppers for 1 drive motor*

| Material | Size | Quantity | Material number |
|---|---|---|---|
| Pipe plug | 10 L | 2 | 1-901439 |
| End plug | 10 L | 2 | 1-901274 |
| Cap nut | 10 L | 2 | 1-901397 |

### 10.26.4 Drive pump drive pressure test

*Tab. 10-5 Plugs and stoppers for drive pump drive pressure test*

| Material | Size | Quantity | Material number |
|---|---|---|---|
| Pipe plug | 12L | 2 | 1-901440 |
| End plug | 12L | 2 | 1-901275 |
| Cap nut | 12L | 2 | 1-901325 |

### 10.26.5 Drive pump charge pressure

*Tab. 10-6 Plugs and stoppers for drive pump charge pressure*

| Material | Size | Quantity | Material number |
|---|---|---|---|
| Pipe plug | 12L | 1 | 1-901440 |
| End plug | 12L | 1 | 1-901275 |
| Cap nut | 12L | 1 | 1-901325 |

### 10.26.6 Steering valve block maximum pressure

*Tab. 10-7 Plugs and stoppers for B2, A2*

| Material | Size | Quantity | Material number |
|---|---|---|---|
| Pipe plug | 10 L | 2 | 1-901439 |
| End plug | 10 L | 2 | 1-901274 |
| Cap nut | 10 L | 2 | 1-901397 |

# 11

# Storage

## 11.1 Storage

### *11.1.1 Short-term storage*

- Move the Start/Stop lever on the infrared transmitter to the neutral position.
- Secure the roller from unauthorized start-up and unintentional rolling away.
- Remove the ignition key.

### *11.1.2 Long-term storage*

*Tab. 11-1 Long-term storage*

| Component | precautions | Chapter |
|---|---|---|
| Diesel engine | Observe the information in the "Long-term storage" section in the diesel engine manual. | |
| Fuel (diesel) | Drain. | *9.7.3* |
| Battery | Uninstall the battery and clean the outside.<br>Charge the battery once a month during standstill time. | *10.1* |
| Air filter unit, exhaust pipe | Cover the air filter unit or its intake opening and the exhaust pipe with adhesive tape. This prevents moisture from getting into the engine. | |
| Steering cylinder | Lubricate the bearings of the steering knuckle and the front bearing of the steering cylinder with grease.<br><br>Lubricate the piston rod of the steering cylinder with grease guard. | *9.12* |
| Infrared transmitter | Always move the “Start/Stop” switch to the Stop position. | |

# 12

# Transport

# 12.1 Transport

## *12.1.1 Shipping weights and dimensions*

*Tab. 12-1 Shipping weight and dimensions*

| | Rammax 1575 | |
|---|---|---|
| **Roller drum width - inch (mm)** | **24 (640)** | **33 (850)** |
| Shipping weight - lbs (kg) | 3086 (1400) | 3196 (1450) |
| Dimensions: L x W x H - without shutdown bar inch | 79x25x52 | 79x33x52 |
| Dimensions: L x W x H - without shutdown bar (cm) | 200x64x132 | 200x85x132 |
| Dimensions: L x W x H - with shutdown bar inch | 81x25x52 | 81x33x52 |
| Dimensions: L x W x H - with shutdown bar (cm) | 205x64x132 | 205x85x132 |

**⚠ DANGER**

**Risk of crushing through presence in the pivoting area (danger zone)!**

- The articulated joint lock (joint protection) must be fitted before lifting the roller for transport.
- Be certain that no persons are present in the area of the joint protection.

## *12.1.2 Transportation overseas*

The machine is ready for transportation overseas when the “Environmentally Damaging” **(1)** and “Hazardous Goods, Class 3“ **(2)** labels have been applied to the machine.

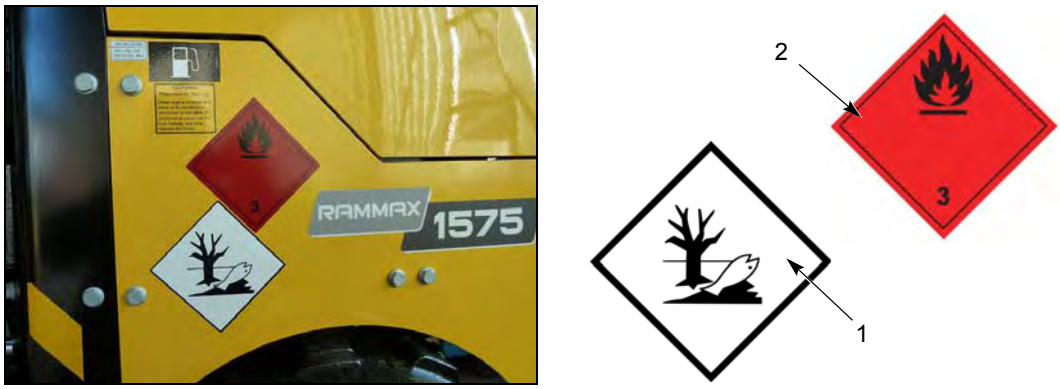



*Fig. 12-1 Labels for overseas transportation*

### 12.1.3 Joint protection

*Blocking the joint protection*

1 Release the lower part of the joint protection **(1)**.

**1.1** First, remove the compression spring **(2)** and then the lock bolt **(3)**.

2 Carefully turn the roller steering until you can insert the joint protection into the loop on the opposite side.

3 Now steer to the left all the way to the stop.

**NOTE** **In order to operate the steering, you must start the roller and maintain a distance of at least 2 meters.**

**⚠ DANGER**

**Risk of crushing through presence in the pivoting area (danger zone)!**

- As soon as the roller is aligned, shut if off again.

4 Secure the joint protection with the lock bolt **(3)**.

5 Secure the lock bolt with the compression spring **(2)**.

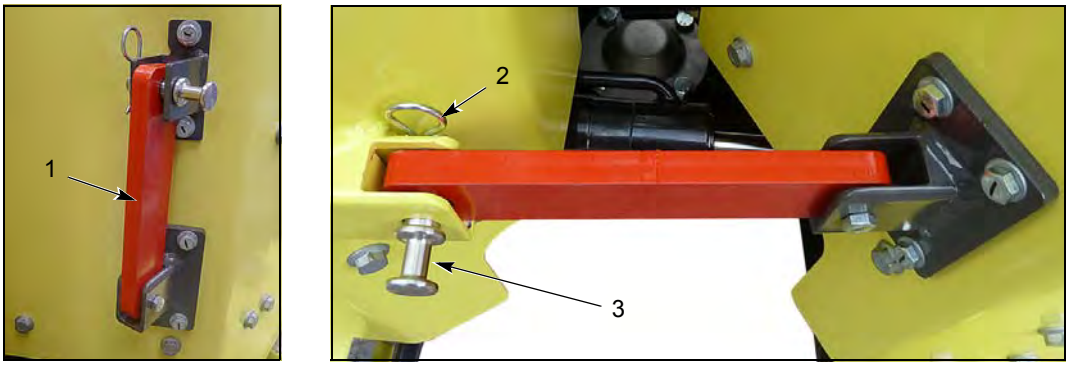



*Fig. 12-2 Joint protection open / joint protection locked in place*

### 12.1.4 *Lifting at the 1-point lifting eye*

**⚠ DANGER**

**Crushing hazard!**

- Always lift the roller vertically.
- Do not stand under suspended loads!
- Use only anti-slip, stable ramps when loading!
- Secure the roller on transport vehicles to prevent it from rolling away, slipping to the side or tipping over!

**⚠ DANGER**

**Accident hazard due to falling load**

- Before lifting, check to be sure all screws on the 1-point lifting eye are damage free and securely tightened.

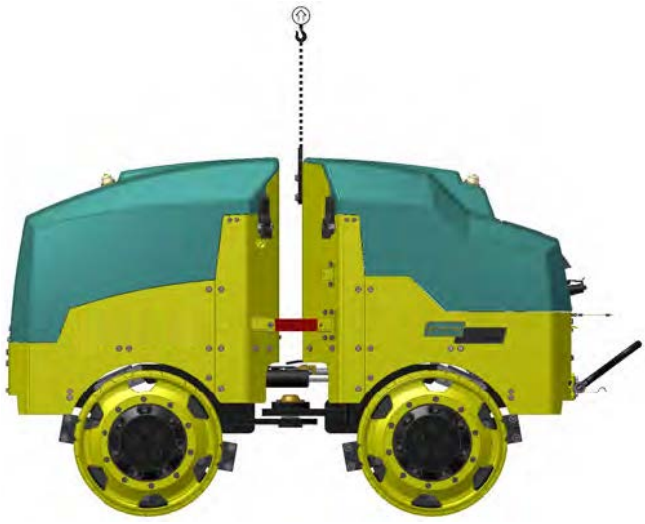
**NOTE** **The lifting devices (steel cables, etc.) must be dimensioned in accordance with relevant regulations.**

**1** Bring the joint protection into place.

**2** Lift the roller vertically with suitable hoisting tackle.

**2.1** Use suitable lifting equipment.

The 1-point lifting eye is designed for a WLL of **1.6 tons** (Working Load Limit).



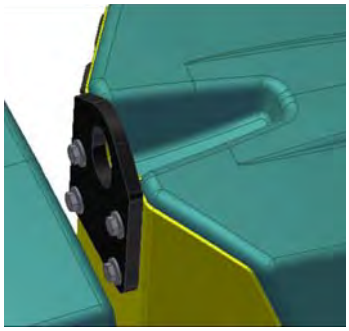


*Fig. 12-3 1-point lifting eye*

### *Securing the roller on the transporter*

**1** Bring the joint protection into place.

**2** Attach the lashing straps to the lashing rings on the roller and on the truck

**2.1** Lashing method: Direct lashing / diagonal lashing as shown in photo

**2.2** Use a lashing strap with a permissible tensile force of LC = 2,500 daN

The lashing rings on the roller are designed for a permissible tensile force of 2,500 daN.

Permissible angle ranges for diagonal lashing:

- 15° ≤ α ≤ 65°
- 30° ≤ β ≤ 75°

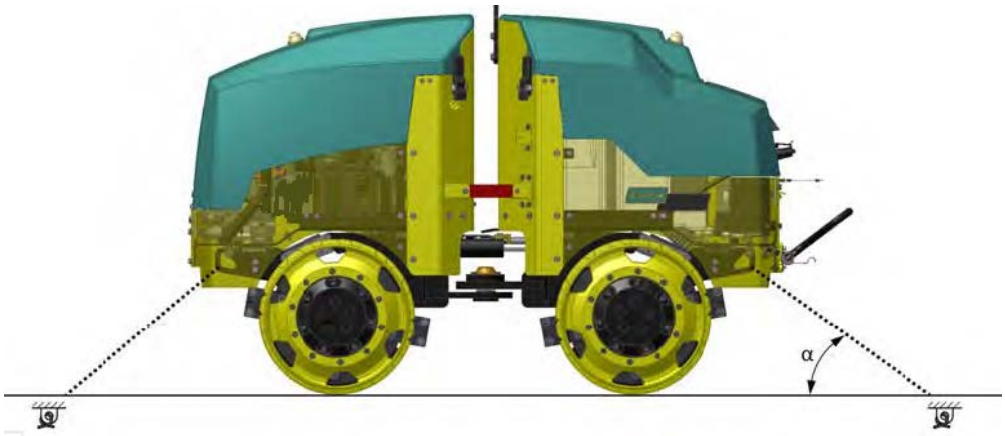



*Fig. 12-4 Lashing the roller / side view*

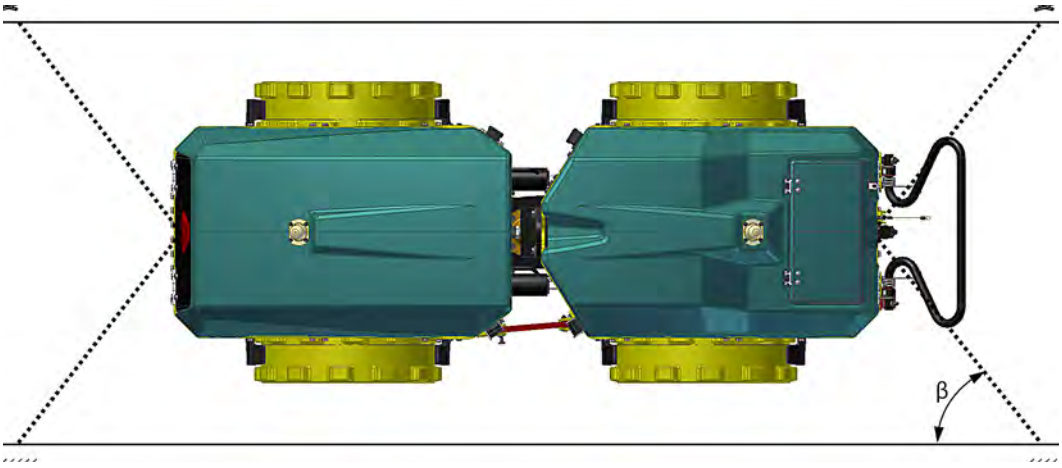



*Fig. 12-5 Lashing the roller / top view*

**⚠CAUTION**

**Risk of accident through blocked steering!**

- Open the joint protection before starting the roller.

## *12.1.6 Center of gravity*

The center of gravity relevant to transport is located 460mm from the floor and approx. in the center of the roller, depending on the fill level of the diesel or water tanks.

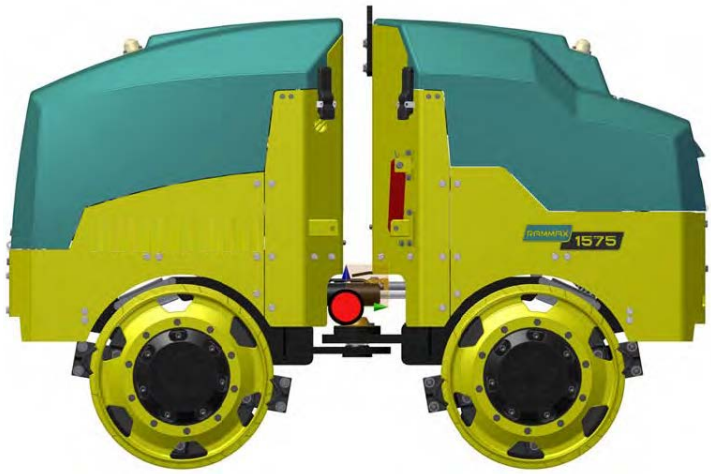



*Fig. 12-6 Roller's center of gravity*

# 13

# Disposal

## 13.1 Introduction

**⚠CAUTION**

**Environmental hazard through operating materials!**

- Do not allow any liquids to enter drains, the soil or the environment.

The roller must be disposed of properly; ask your authorized dealer.

## 13.2 Removal and depressurization of the gas strut

**⚠WARNING**

**Eye injury!**

**Because of the high internal pressure, chips and oil can spatter from the site of sawing or drilling.**

- Wear eye and face protection.
- Cover the site of the saw cut.

**▲CAUTION**

**Environmental hazard through operating materials!**

**Gas struts are filled with oil.**

- Do not allow any liquids to enter drains, the soil or the environment.

In case of disposal, pressurized gas struts must be depressurized according to the following regulations:

**1** Fasten the pressurized tube between two prismatic jaws without deforming it and in such a way that the dimension X is at least 25 mm (see below).

**2** To depressurize:

**2a** Slowly cut the pressurized tube open at the points indicated using a **handsaw** or,

**2b** Drill a hole in the tube using a **drill** with about a 3 mm diameter.

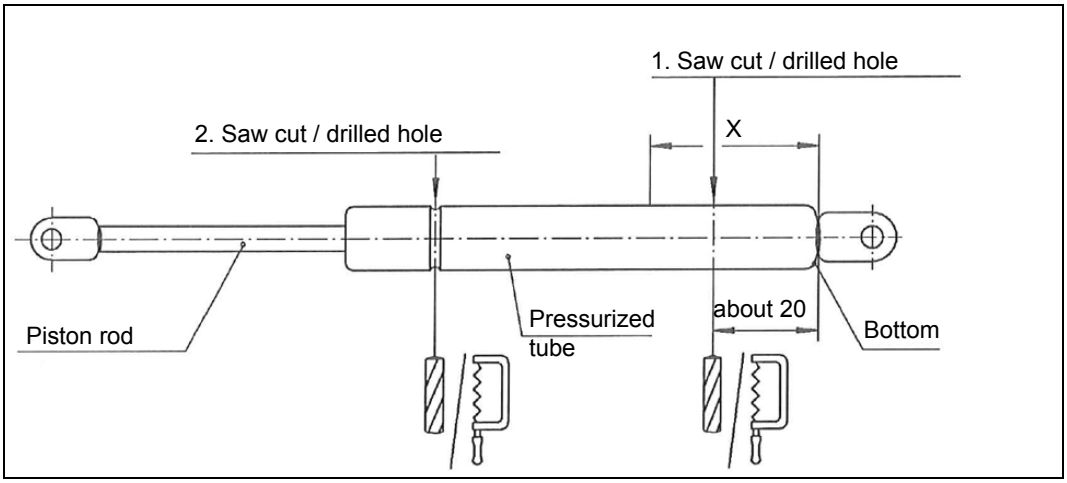



*Fig. 13-1 Removal and depressurization of the gas strut*

1. saw cut / hole position: Cut or drill into the pressurized tube about 20 mm from the bottom.
2. saw cut / hole position: Cut or drill into the pressurized tube in the bead.

**NOTE** **If disposal according to these regulations is not possible, ask your authorized dealer.**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