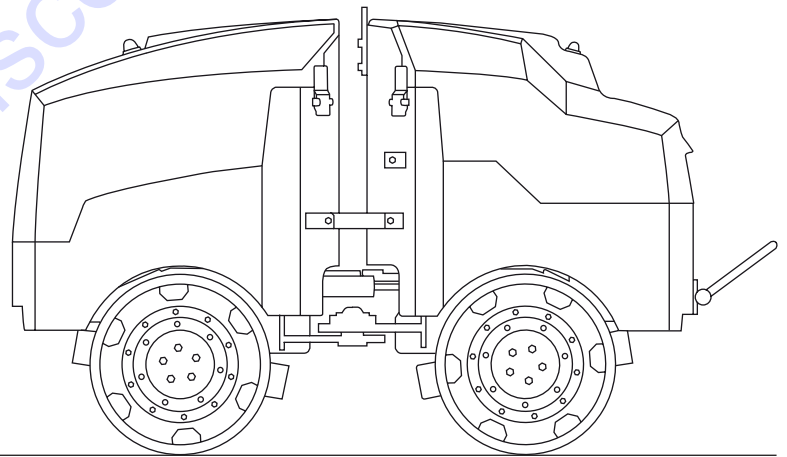


ARR 1575

TRENCH ROLLER
YANMAR 3TNV80F-SPAMM
U.S. EPA Tier 4f



WORKSHOP MANUAL

EDITION 01/2021 EN
Product Identification Number 3001980

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Preface

Information, specifications, and recommended instructions for the assembly and disassembly of individual machine components or parts contained in this publication represent basic and final information at the time of the printing of this publication. Print errors, technical modifications and modifications of illustrations are reserved. All dimensions and weights are approximate, and therefore not binding.

Ammann Czech Republic a.s. reserves the right to perform modifications at any time with no obligation to inform the machine user. If you identify any differences between the machine operated by you and the information contained in this publication, contact Discount-equipment.

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AMMANN

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1 Introduction

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1 Introduction

The workshop manual is divided into separate chapters and contains technical and maintenance data, instructions for adjustment and instructions for the use of special tools, jigs and aids.

The main purpose of this manual is to provide basic information for disassembly, assembly and service repairs of the main subassemblies of the machine.

Labelling of machine subassemblies in this manual corresponds to the spare parts catalogue.

In order to ensure smooth operation of the AMMANN compaction equipment, use only original spare parts supplied by AMMANN for repairs.

Before disassembly, it is recommended to always mark the removed parts for their reassembly and blank off all holes of individual parts of the hydraulic system in order to prevent contamination of the hydraulic circuits.

When mounting individual parts on the machine, tighten individual screws or nuts according to the table of tightening torques (see the appendix), unless specified otherwise in the text.

During work, always follow the safety instructions and measures given in Chapter 2.

The manufacturer constantly improves its products on the basis of operational experience and the latest findings. Due to development, the manufacturer reserves the right to change the images, descriptions, procedures and designs presented in this manual.

SAFETY NOTICES AND SIGNS:



The notice warns of a serious risk of personal injury or other personal hazards.



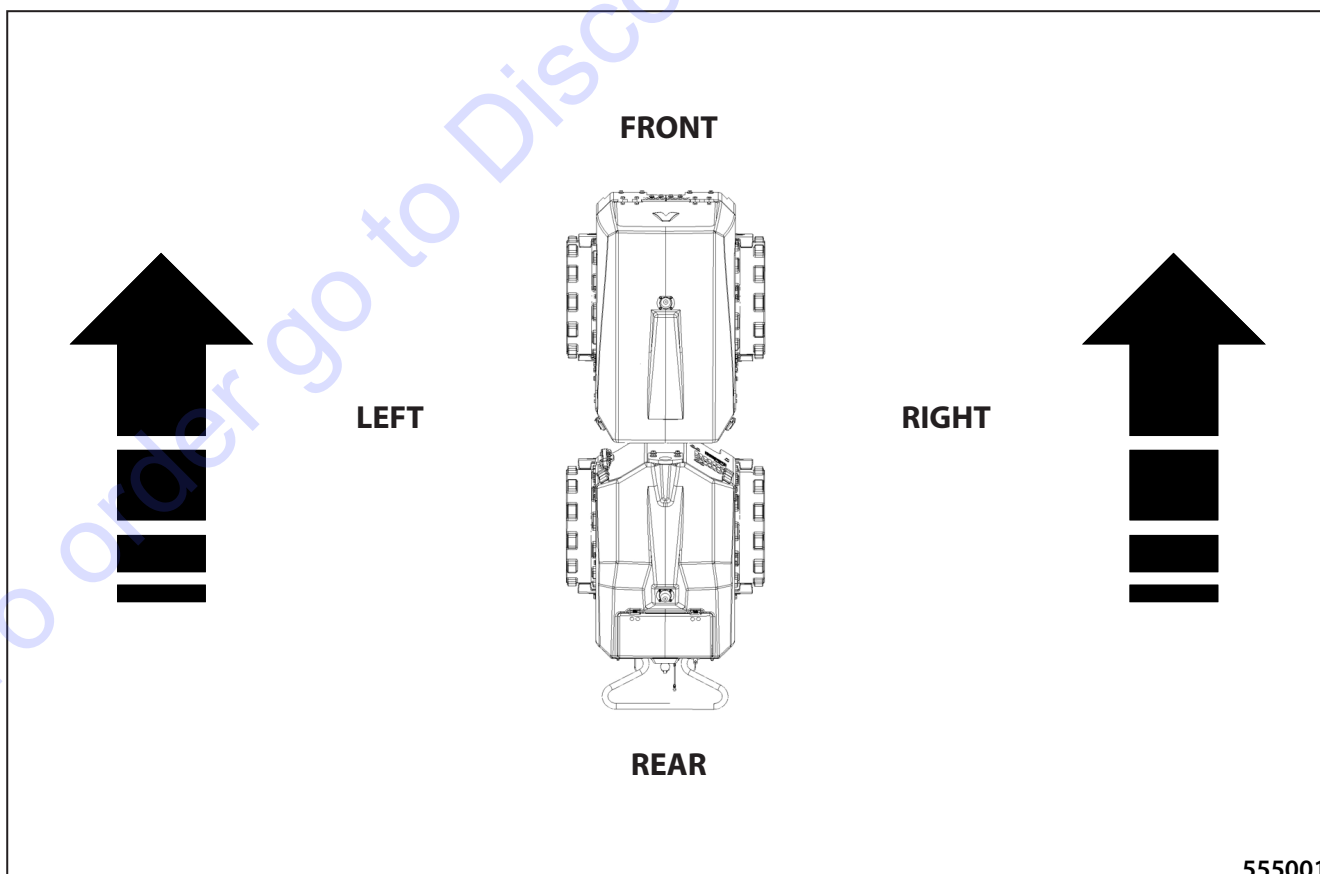
The notice warns of possible damage to the machine or its parts.



The notice warns of the necessity of environmental protection.

! CAUTION!

As used in this operating manual, the terms **right**, **left**, **front** and **rear** indicate sides of the machine moving forward.



555001

2 Safety measures and instructions

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2 Safety measures and instructions

2.1 Safety rules

These safety rules must be followed by all persons involved in machine repairs!

- Repairs of this machine may be carried out only by qualified, professionally trained and experienced workers.
- Always use our workshop manual when performing repairs. Individual chapters contain special instructions regarding assembly work.
- Before putting the machine into operation, familiarize yourself with the machine controls according to the Operating Manual and make sure you have well understood all the equipment of your machine.
- Do not use the machine if you do not fully understand all operating and control elements and if you do not know exactly how the machine works.
- Familiarize yourself with the area where you work.
- Do not carry out any alterations or modifications to the machine, as this may affect the safety of the machine.
- Original parts and accessories have been designed specifically for this machine.
- Installation and use of spare parts that are not supplied or authorized by the machine manufacturer may have a negative impact on the operational characteristics and safe operation of the machine.
- It is forbidden to remove components of individual parts during the warranty period. If you fail to comply with this prohibition, the warranty of the damaged component will not be recognized.

Safety measures for machine repairs and inspection

- Wear work clothes and footwear.
- Use gloves when handling oil, fuel and coolant.
- When handling the battery, protect your eyes with goggles or a shield.
- Place the machine on a level and firm surface before performing repairs. Secure the machine against rolling.
- Secure the machine and drum frame against relative rotation with a lock pin and rod.
- Before starting work, remove the key from the ignition, disconnect the batteries and allow hot parts to cool.
- Attach a "machine out of order" sign to the steering wheel and leave it there for the duration of the work.
- Properly wash the entire machine. In the case of steam cleaning, avoid aiming the steam flow directly at electrical components and insulating material or cover them beforehand.
- When removing, installing and repairing individual groups, maintain absolute cleanliness of all parts. Protect removed parts against dirt.
- Clean the surface of removed parts and create a corresponding dust-free work environment with the necessary storage area.
- Handle cleaning agents with caution. Do not use petrol or other flammable substances for cleaning!
- Dry the cleaned parts and immediately coat them with anti-corrosion oil – never install corroded parts!
- Tools, lifting equipment, securing elements, supports and other auxiliary equipment must be in a good, working condition.
- Lifting equipment and slings (ropes, chains) must have adequate load capacity and be intact.
- Ensure sufficient air supply when starting the machine indoors.
- Before putting the machine into operation, make sure there are no persons on the machine or in its dangerous proximity. Use the audible warning signal when putting the machine into operation, always before starting the engine and after each break, before the machine starts moving. Persons located on the machine and in its dangerous proximity must leave the machine and the area after the audible warning signal.
- Do not adjust the machine in operation.
- When performing necessary work on a running engine (adjustment), avoid contact with hot and rotating parts of the machine. Work performed when the engine is running (adjustment) must be carried out in the presence of another person who has immediate access to emergency shut-down and who is continuously in contact with the person performing the adjustment, so that the engine can be immediately switched off if necessary.
- Only use prescribed kinds of engine, transmission and hydraulic oil and coolant.

Safety measures for work on hydraulic circuits

- Before disassembly, make sure the hydraulic circuits are depressurized. Hydraulic oil leaking under pressure may damage your skin and cause serious injury.
- Before disassembly, mark the parts, hoses and pipes.
- Do not put hydraulic pumps and motors into operation without oil.
- Work with hot oil may result in scalding.
- Do not heat the oil to temperatures above 160 °C – the oil or its vapours may ignite.
- When removing hydraulic components, always blank off the hose ends and outlets of the components.
- Use lint-free cloth when wiping and cleaning hydraulic parts.
- When assembling parts, use hydraulic oil as a slip agent – not lubricating grease.
- Before installation, carefully clean the fittings and flush and blow compressed air through hoses and pipes.
- Only use new seals.
- Fill new aggregates with hydraulic oil before installation.
- After a hydraulic aggregate replacement, flush the hydraulic circuit and clean the hydraulic tank.
- Replace the oil filter cartridge.
- Fill the hydraulic circuit with clean oil of prescribed viscosity, only when the engine is off!
- Wipe any overflowed oil.
- Check the connections for any leaks before the system pressurizes.
- Check all connections after finishing all work.
- Do not adjust safety valves.
- After finishing work, reinstall all protective elements.

Check after putting into operation

- Oil level in the hydraulic tank.
- Check the charge pressure of replaced hydraulic pumps and the pressure of safety valves.
- Perform the measurement at 40 °C (104 °F).

Safety measures for work on the fuel system

Petrol and diesel mixtures (winter fuel) are as flammable as petrol.

- Do not refuel in enclosed spaces.
- Wipe any overflowed fuel.
- Do not smoke and do not use an open flame while working on the fuel system! There is a risk of fire!

2 Safety measures and instructions

Safety measures for work on the electrical system

- Disconnect the battery when repairing the charging circuit to prevent accidental short circuits.
- Before removal, disconnect the cable from the negative pole (–) and then from the positive pole (+).
- Do not disconnect the batteries when the engine is running.
- Connect the negative battery pole to the ground and the positive pole to the “B+” alternator output. The opposite connection would destroy the whole semiconductor equipment.
- When starting using an auxiliary external power supply, do not disconnect this power supply until the machine battery is connected. Pay attention to the starting voltage of the auxiliary external power supply (for 24 V).
- Do not put the alternator into idle operation, i.e. with a disconnected wire from the “B+” terminal and connected “D+” terminal.
- Do not check the presence of voltage in the wire by sparking against the machine frame.
- Do not perform any activities generating sparks.
- Use protective rubber gloves and eye protection when handling batteries.
- Protect your skin and clothes against being splashed by the electrolyte or lead particles.
- In case of eye contact with the electrolyte, immediately flush the affected eye thoroughly with running water for several minutes. Then, seek medical treatment as soon as possible.
- If the electrolyte comes in contact with skin or clothing, remove the clothes, immediately wash the affected areas with soapy water or a solution of baking soda and water and seek medical treatment.
- In case of ingestion of electrolyte, drink the maximum possible amount of milk, magnesium oxide dissolved in water or at least water and immediately seek medical treatment.
- Never fill the cells with distilled water, unless it is followed by work with the machine or recharging outside the machine. It would otherwise cause excessive battery self-discharge.
- Never fill up the acid (H_2SO_4)!
- Do not turn over the batteries to avoid electrolyte flowing out of the degassing vents.
- In case of acid (electrolyte) spillage, wash the affected area with water and neutralize with lime.
- The battery charging process releases hydrogen, which forms an explosive, easily combustible mixture with air. Do not smoke or use open flame or lights in the vicinity.

Welding work on the machine

- Before performing welding work on the machine using an electric arc, disconnect all elements containing semiconductors from the electrical system, including the machine electronics:
 - ground the power supply as well as the repaired machine,
 - protect the power supply against moisture,
 - place the ground terminal in close proximity to the weld joint,
 - When performing welding work on suspended parts or machine, it is necessary to prevent current from reaching the lifting equipment by insulating the point of current transition or using non-conductive slings (hemp rope).

Sealing

- Use new seals for all installation.
- Seal kits are obtained as spare parts.

Tightening torques

- In order to apply the correct tightening torque, use a torque spanner.
- Fastening screws and nuts of used quality shall be tightened according to the respective tables.
- The screw quality is indicated on the screw head.
- Different tightening torques are specified in the respective chapters.
- Threaded joints of hydraulic circuits shall be tightened according to the tables.
- The presented tightening torques apply to non-lubricated threads.
- Only use new self-locking nuts.

2.2 Environmental and hygiene principles

When repairing the machines, observe general principles of health and environmental protection as well as laws and regulations related to this issue and being in force within the territory where the machine is used.

Hygiene principles

- Petroleum products, fillings of cooling systems, battery fluids and paints, including thinners, are harmful substances that can cause severe injuries when in contact with body organs.
- It is therefore necessary to strictly follow safety and hygiene instructions of products and use personal protective equipment when handling these substances.
- Workers coming into contact with the above products when repairing the machine are obliged to follow general principles of their own health protection and comply with safety and hygiene manuals of the manufacturers of the products.

In particular we draw your attention to the following:

- protect your eyes and skin while working with the batteries
- protect your skin while handling petroleum products, coating compounds and coolants
- Wash your hands properly after finishing the work and before eating, treat your hands with a suitable reparation cream.
- when handling the cooling system, follow the instructions given in the manuals supplied with the machine
- Always store petroleum products, cooling system fluids, battery fluids and coating compounds including thinners and also cleaners and preservative agents in their original and properly labelled containers. These materials are not allowed to be stored in unlabelled bottles or in any other containers considering the possible risk of confusion. Possible confusion with foodstuffs or beverages is very dangerous.
- If by accident the skin, eyes or mucous membrane is stained or if you breathe in the vapours of such products, apply first aid measures immediately. In case of accidental ingestion of these products, immediately seek medical help.

Environmental measures

- Discarded operating fluids of individual systems of the machine and also some of its parts become hazardous wastes with dangerous properties for the environment.

This category of waste products includes in particular:

- organic and synthetic lubricating materials, oils and fuels;
- coolants;
- battery fluids and batteries;
- cleaning and preservative agents;
- all removed filters and filter cartridges;
- all used and discarded hydraulic or fuel hoses, rubber-metal elements and other parts of the machine contaminated by the above mentioned products.
- It is necessary to treat the above mentioned materials and parts after their discard in accordance with relevant national regulations valid for protection of individual parts of the environment and in compliance with regulations of health protection.
- When disassembling hydraulic, fuel and cooling systems and their units. Escape of fluids into the ground has to be prevented by using suitable vessels placed underneath and by plugging of the holes.
- In case of leakage, the affected area must be immediately dried with the use of sawdust, Vapex, etc.
- The affected soil must be removed to prevent further leakage. The contaminated soil and absorbent should then be handed over for further safe disposal.

2 Safety measures and instructions

2.3 Fire prevention

- The oil change point must be where it cannot interfere in explosion or fire hazard areas.
- It must be identified by "No smoking" and "No open flame" plates and signs.
- The handling area must be dimensioned so that it can capture a volume of the flammable liquid equal to the capacity of the biggest transport container.
- It must be equipped with portable fire extinguishers.
- For handling the oil and diesel fuel, use metal barrels, jerry cans, sheet-metal cans and similar vessels.
- The transport containers must be properly closed during storage.
- Vessels must be with only one outlet, stored always with the outlet up and secured against the outflow and drains.
- Vessels must be marked with non-removable writings showing the contents and flammability classes.

Special tools, jigs – see relevant chapters of the manual

2.4 Claim conditions and disclaimer of liability

1. Warranty rules

- Regular inspections and correct operation of the equipment
- Products have been registered at the service portal
- The equipment is operated by a trained operator
- Following parts are excluded from warranty: part subject to wear and tear, including, without limitation, rubber washers/wheels, belts, scrapers, wipers, filters, grease, fluids, conveyor parts, chains, foundation boards, compacting rods, auger elements, bearings, fuel and consumables.
- Batteries are provided with a warranty for 12 months / 1,000 hours. After this period, batteries are included in parts subject to wear and tear and are excluded from the warranty.
- Hydraulic hoses can be purchased from local dealers and charged as an expense to Ammann.

2. Procedure for raising a claim

- In case of raising a warranty claim, the owner/user shall immediately submit the manufacturer a completed warranty claim and images of the fault. The owner/user shall also send a proof of regular maintenance before sending the warranty claim or together with it at the latest.
- Ammann recommends that you send a proof of regular maintenance regularly.
- The document can be sent in various ways (e.g. via the service portal, service application). The document shall contain a machine serial number and a serial number of the original maintenance kit of Ammann. This information can be provided either typed, or scanned according to the selected manner of handover.

3. Breach

- If a dealer breaches obligations stated in points 1) and 2), any warranty claims will be rejected.

3 MACHINE DESCRIPTION

To order go to Discount-Equipment.com

3 Machine description

3.1 Machine description

The ARR 1575 trench roller is a roller specially designed for compacting trenches. The drums enable compacting even in very narrow trenches right up to the trench wall.

Specification of the expected use of the machine

This modern trench roller can be used on wet, clay soils in the construction of sewers, utility lines, roads, building refills, etc. On hazardous jobsites, the operator can control the machine from a safe distance without being exposed to danger.

Only use the ARR 1575 roller for driving on and compacting of non-cohesive (loose) materials.

The machines are designed for operation in arid, temperate and cold climates according to EN 60721-2-1:2014 with a limited temperature range from -15 °C (5 °F) to +45 °C (113 °F) and a maximum absolute humidity of 25 g.m⁻³.

The machine that complies with the health and safety requirements is provided with a nameplate with CE marking.

1. Name – always mentioned only in the English version
2. Type
3. Product identification number
4. Rated power
5. Operating weight
6. Maximum weight
7. Shipping weight
8. Version
9. Engine emissions
10. Front axle load
11. Rear axle load
12. Year of manufacture
13. Model year

AMMANN 4145		
DESIGNATION		
TYPE	VERSION	
PRODUCT IDENTIFICATION NUMBER		
NOMINAL POWER	kW	ENGINE EMISSIONS
OPERATING MASS	kg	FRONT AXLE LOAD
MAXIMUM MASS	kg	REAR AXLE LOAD
SHIPPING MASS	kg	YEAR OF CONSTRUCTION
		MODEL YEAR
MADE IN CZECH REPUBLIC		

Nameplate position

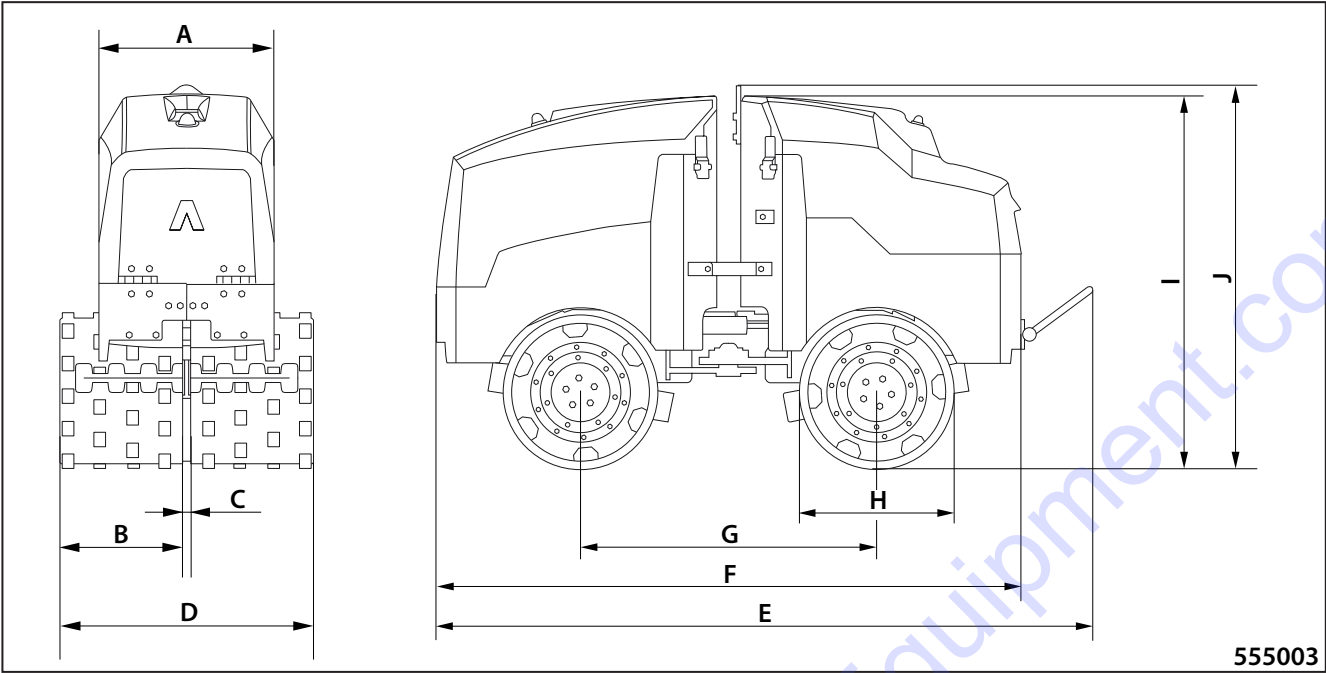


Engine nameplate position



3 Machine description

3.2 Dimensional drawing of the machine



mm (in)		A	B	C	D	E	F	G	H	I	J
ARR 1575 T4 final	640	601	302	36	640	2227	1980	1000	525	1282	1317
		(23.7)	(11.9)	(1.4)	(25.2)	(87.7)	(78.0)	(39.4)	(20.7)	(50.5)	(51.9)
	850	601	407	36	850	2227	1980	1000	525	1282	1317
		(23.7)	(16.0)	(1.4)	(33.5)	(87.7)	(78.0)	(39.4)	(20.7)	(50.5)	(51.9)

3.3 Technical data

		ARR 1575	
		U.S. EPA Tier 4f	
		640	850
Dimensions			
Drum width	(mm)	640	850
Weight			
Operating weight EN 500-1+A1 (CECE)	kg (lb)	1340 (2950)	1440 (3170)
Operating load EN 500-1+A1 (CECE) on the front axis	kg (lb)	730 (1610)	780 (1720)
Operating load EN 500-1+A1 (CECE) on the rear axis	kg (lb)	610 (1340)	660 (1460)
Weight of the half volume of operating fluids	kg (lb)	10 (20)	10 (20)
Operating weight ISO 6016	kg (lb)	1350 (2980)	1450 (3200)
Maximum weight with accessories	kg (lb)	1450 (3200)	1450 (3200)
Riding qualities			
Maximum transport speed	km/h (mph)	2.8 (1.7)	2.8 (1.7)
Working speed		1.4 (0.9)	1.4 (0.9)
Climbing ability without vibration	%	30	30
Climbing ability with vibration	%	25	25
Lateral static stability	%	80	80
Lateral stability when driving without vibration	%	25	25
Lateral stability when driving with vibration	%	15	15
Turning radius, inner (edge)	mm (in)	1540 (60.6)	1440 (56.7)
Turning radius, outer (contour)	mm (in)	2190 (86.2)	2290 (90.2)
Drive type	-	Hydrostatic	
Number of driving axles	-	2	
Oscillation angle	°	±7	
Steering angle	°	±30	
Steering			
Steering type	-	Joint	
Steering control	-	Hydraulic	
Linear hydraulic motors	-	2	
Engine			
Manufacturer	-	YANMAR	
Type	-	3TNV80F-SPAMM	
Power according to ISO 3046-1	kW (HP)	14.6 (20)	
Number of cylinders	-	3	
Cylinder capacity	cm³ (cu in)	1266 (77)	
Nominal speed	min⁻¹ (RPM)	2400	
Maximum torque	Nm (ft lb)/rpm	68.4/1800	
Fuel consumption in common operation	l/h (gal US/h)	3.2 (0.8)	
The engine complies with emission regulations	-	U.S. EPA Tier 4 Final	
Engine cooling system	-	Liquid	
Brakes			
Operating	-	Hydrostatic	
Parking	-	Mechanical multi-disc	

3 Machine description

		ARR 1575	
		U.S. EPA Tier 4f	
		640	850
Vibration			
Frequency I	Hz (vpm)	40 (2400)	
Amplitude I	mm (in)	0.6 (0.024)	
Amplitude II	mm (in)	1.1 (0.043)	
Operating fluids			
Fuel	l (gal US)	28 (7.4)	
Engine (oil filling)	l (gal US)	3.4 (0.9)	
Cooling system	l (gal US)	1.2 (0.3)	
Hydraulic system	l (gal US)	16 (4.2)	
Electrical installation			
Voltage	V	12	
Battery capacity	Ah	77	
Noise and vibration emissions			
Measured sound power level A, L _{pA} at the operator's position *	dB	70	
Uncertainty K _{pA} *	dB	1	
Guaranteed sound power level A, L _{WA} **	dB	101	
Optional equipment			
Safety bar			
Drum extension set			
Scrapers			
Set of filters, 500 h			
Tarp cover			
* measured according to EN 500-4			
** measured according to DIRECTIVE 2000/14/EC			

4 Specification of operating fluids

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4 Specification of operating fluids

4.1 Engine oil



The engine oil is specified according to the performance and viscosity classification.

Performance classification according to

API (AMERICAN PETROLEUM INSTITUTE)

ACEA (ASSOCIATION DES CONSTRUCTEURS EUROPÉENS D'AUTOMOBILE)

Viscosity classification

To determine the SAE (Society of Automotive Engineers) viscosity class, the ambient temperature and type of operation where the machine is used are decisive.

Use of permissible oils according to API: CF

Use of permissible oils according to ACEA: E-3, E-4 and E-5

Year-round SAE 15W-40 (e.g. Valvoline, Premium Blue).

Note

Exceeding the lower temperature limit does not result in damage to the engine; it can only cause some starting difficulties.

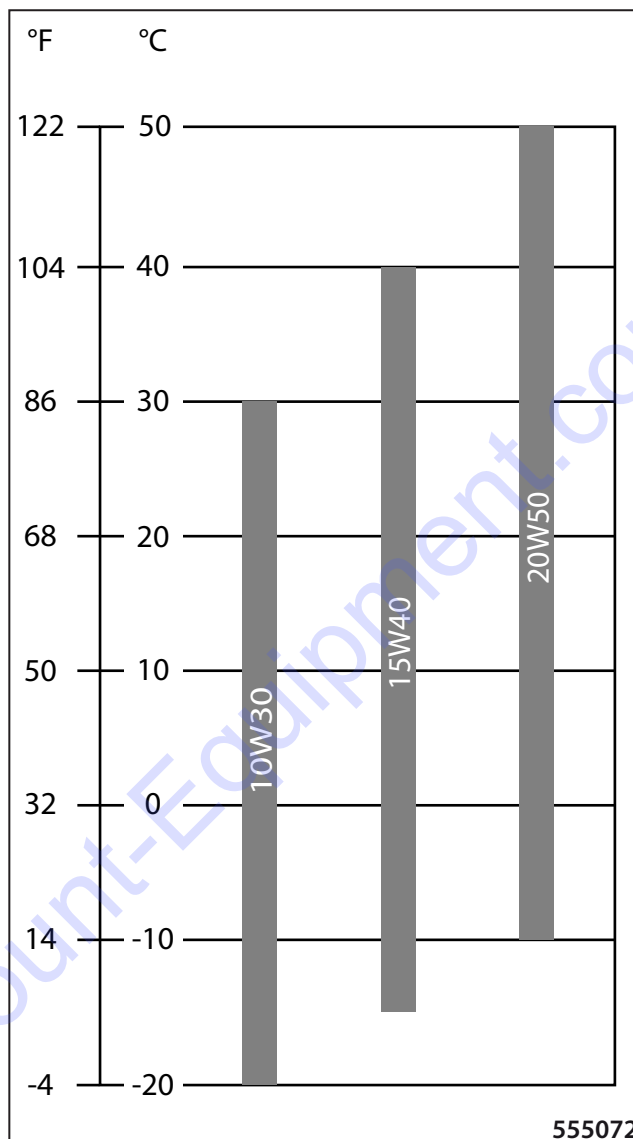
It is recommended that universal multi-range oils are used to avoid the necessity of oil changes due to changes of ambient temperature.

It is possible to use synthetic engine oils if the performance and viscosity classification of the oils corresponds to the recommended mineral oils. The oil change periods must be observed in the same intervals like when mineral oils are used.

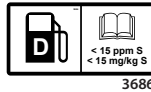
For easier starting at the temperatures below 0 °C (32 °F), the engine manufacturer recommends the SAE 10W-30 oil.



Considering the reduced lubricating capabilities of the oil, the upper temperature limit must not be exceeded for a long period.



4.2 Fuel



Diesel oil is used as fuel for the engine:

- CEN EN 590 (2009)
- ASTM D 975-94: 1-D, 2-D
- ISO 8217 DMX

Note

The engine manufacturer recommends fuels with a sulphur content not exceeding 0.0015 percent by weight.

Water and sediment in fuel should not exceed 200 mg/kg. Ash in fuel should not exceed 0.01 percent by weight.



At ambient temperatures below 0 °C (32 °F), use winter diesel fuel.

Mixing diesel with special additives is forbidden.

Use of biofuel (diesel fuel)

The use of the fuel mixture under the trade name of biodiesel is in principle approved by the engine manufacturer for the engine of this machine if it conforms to the specifications according to EN 14214 or ASTM D6751. A fuel mixture with 5% portion of biodiesel at most is acceptable.

Before using biodiesel in the machine, make sure that it is supplied by a reputable supplier who supplies fuels corresponding to the above mentioned standards.

Always ask the supplier of biodiesel for information concerning the condition under which it can be used.



The engine guarantee will be rejected when biodiesel is used which does not correspond to the above mentioned standards and when the fuel system or engine is damaged due to the use of the improper biodiesel!

When biodiesel is used, the power can be reduced by up to 12% depending on the used mixture of biodiesel. Therefore, never adjust the engine or the injection pump to increase the power. Never mix the fuel mixture by yourself on the work site.

Biodiesel has a higher cloud point at low ambient temperatures and therefore wax crystals form in the fuel, which results in clogging of the fuel filter.

When biodiesel is used, it is necessary to shorten replacement intervals of the fuel filter.

When you start using biodiesel, corrosion and impurities made on internal walls of the fuel tank will get separated. Impurities are carried away by the fuel to the filter where they are caught and the filter must be replaced.

Biodiesel has a higher ability to absorb atmospheric moisture and therefore the atmospheric moisture condenses on internal walls of the tank, which results in higher content of water in the fuel, which must be more frequently drained from the separator of the fuel filter. This problem occurs more often in cold weather.

When biodiesel is used all the year round, it is necessary to clean the fuel system with a clean diesel fuel for at least 30 minutes during operation of the engine before the machine is shut down for longer than 3 months. Further, it is necessary to drain off and clean the fuel tank, and either fill with diesel fuel or minimise the occurrence of moisture and limit the microbiological growth inside the tank. Consult these measures with Discount-equipment.

4 Specification of operating fluids

4.3 Coolant



The coolant specification must meet requirements of:

ASTM D6210

ASTM D4985

JIS K-2234

SAE J814C, J1941, J1034 or J2036



To fill the cooling circuit, use the coolant in the mixing ratio of 50%/50% with high-quality water (thermal protection up to -37 °C).

Change the coolant every 2,000 hours, after 2 years at the latest.

Note:

The machines are filled with a cooling solution with the Bantleon Avia Antifreeze NG coolant, specification SAE J 1034 at the manufacturer's during the production.

It is a coolant containing silicates based on monoethylene glycol. It does not contain phosphates, nitrates, amines and borates.

There is an Avia NG label placed where the coolant is to be filled into the machine.



Refill the cooling circuit with the same or a completely miscible coolant of the required specification.

If the use of a different, immiscible coolant is necessary, the cooling circuit must be completely drained and cleaned with clean water repeatedly, at least 3 times. However, it is not allowed to use a coolant of a different specification than stated by the engine manufacturer.

The coolant protects the cooling system from freezing, corrosion, cavitation, overheating etc.

It is forbidden to operate the machine without coolant even for a short time.

It is forbidden to use a coolant of a different than prescribed specification and base. The engine and the cooling system can get damaged, which will void the warranty.

Always check the ratio of antifreeze cooling agent in the coolant with a refractometer before the winter season starts.

Water quality

Do not use hard water with a higher content of calcium and magnesium, which results in calculus formation, and with a higher content of chlorides and sulphates, which causes corrosion.

The maximum content of compounds of calcium and magnesium is 170 milligrams – hardness of water.

The maximum content of compounds of chlorine is 40 milligrams.

The maximum content of compounds of sulphur is 100 milligrams.

Safety instructions:

1. **Protect your hands with protective gloves.**
2. **In case of ingestion, immediately seek medical treatment.**
3. **In case of contact with skin or clothing, immediately wash the affected area with clean water.**
4. **Do not mix different types of coolants. The mixture can cause a chemical reaction with formation of harmful substances.**

4.4 Hydraulic oil



For the hydraulic system of the machine, it is necessary to use only high-quality hydraulic oil grades according to ISO VG 46 HVLP (corresponding to DIN 51524 part 3 HVLP).

Fill the machines normally with the ISO VG 46 hydraulic oil with a kinematic viscosity of 46 mm²/s at 40 °C (104 °F). This oil is the most suitable to be used in the widest range of ambient temperatures.

Synthetic hydraulic oil

The hydraulic system can be filled with synthetic oil, which if leaks occur will be degraded completely by micro-organisms present in water and soil. Hydraulic oil on the basis of HE ester, HEES category according to ISO 15380, can only be used.



Please consult always with oil manufacturer or dealer any switching from mineral oil to synthetic one or mixing the oils of various brands!

4.5 Lubricating grease



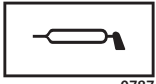
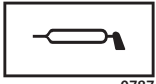
For lubrication of the machine, use lubricants according to:

ISO 2137

DIN 51 502

4 Specification of operating fluids

4.6 Fillings

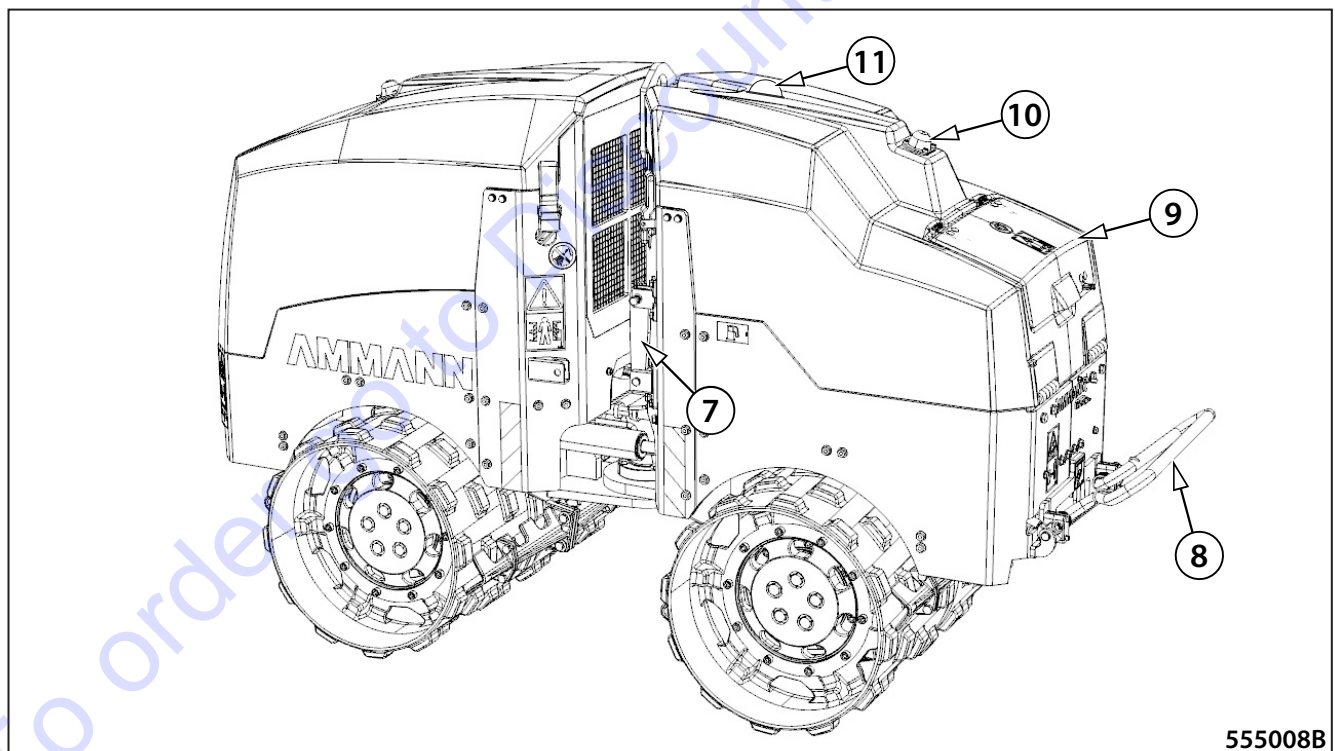
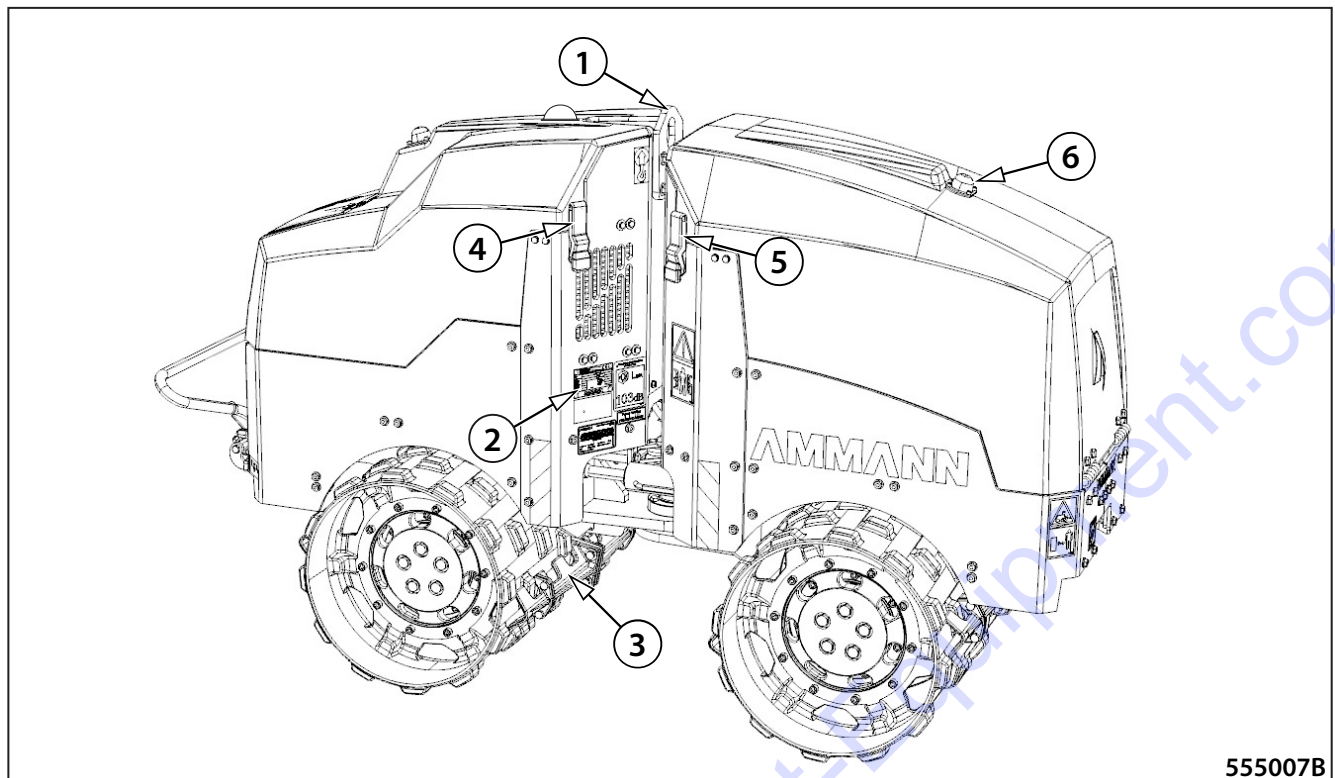
Part	Fluid type	Fluid quantity l (gal US)	Brand
Engine	Engine oil according to Chapter 4.2.1	3.4 (0.9)	 2412
Fuel tank	Diesel according to Chapter 4.2.2	28 (7.4)	 2151
Hydrostatic system	Hydraulic oil according to Chapter 4.2.4	16 (4.23)	 2158
Engine cooling system	Year-round anti-freeze according to Chapter 4.2.3	1.2 (0.3)	 2152
Articulated bearings – steering joint and steering cylinders	Plastic grease according to Chapter 4.2.5	as required	 0787
Vibrator bearings	Plastic grease according to Chapter 4.2.5	year-round filling	 0787

5 Frame

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5 Frame

5.1 Description of basic elements

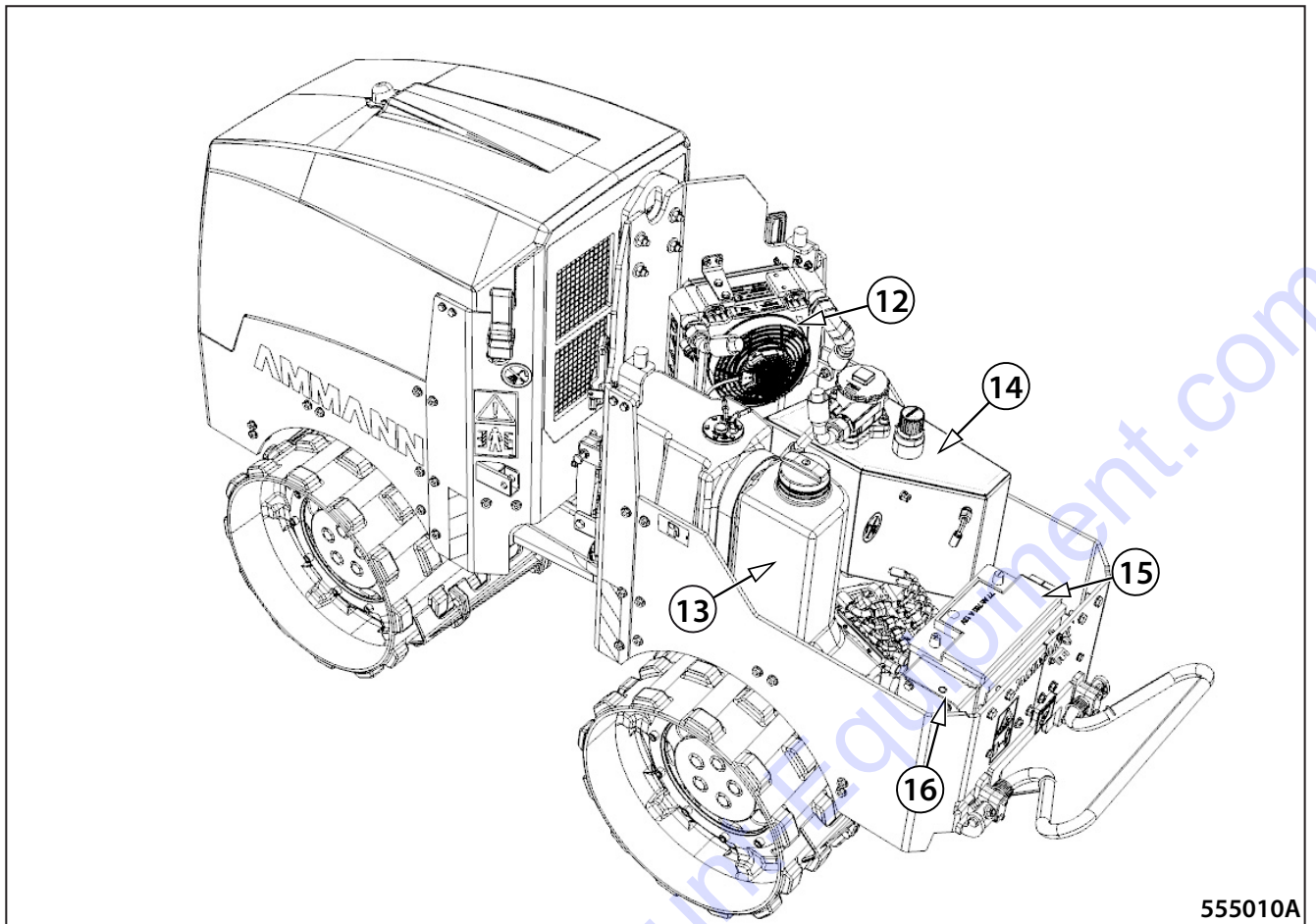


Right side view

- 1 - One-point lifting lug
- 2 - Name plate
- 3 - Drum scraper
- 4 - Rear bonnet lock
- 5 - Front bonnet lock
- 6 - Front infrared sensor

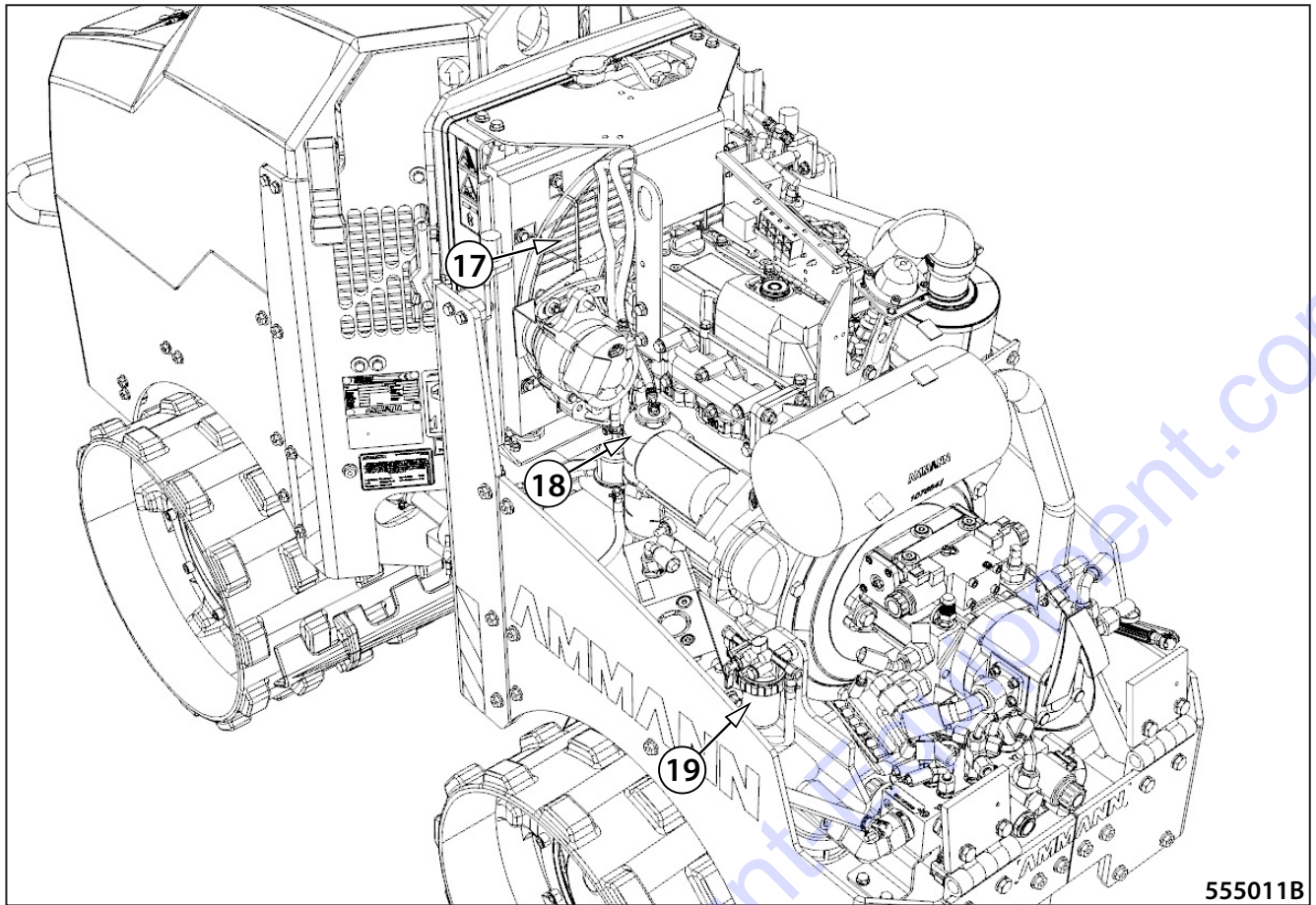
Left side view

- 7 - Articulation joint lock
- 8 - Safety bar (optional)
- 9 - Control panel cover
- 10 - Rear infrared sensor
- 11 - Light indication

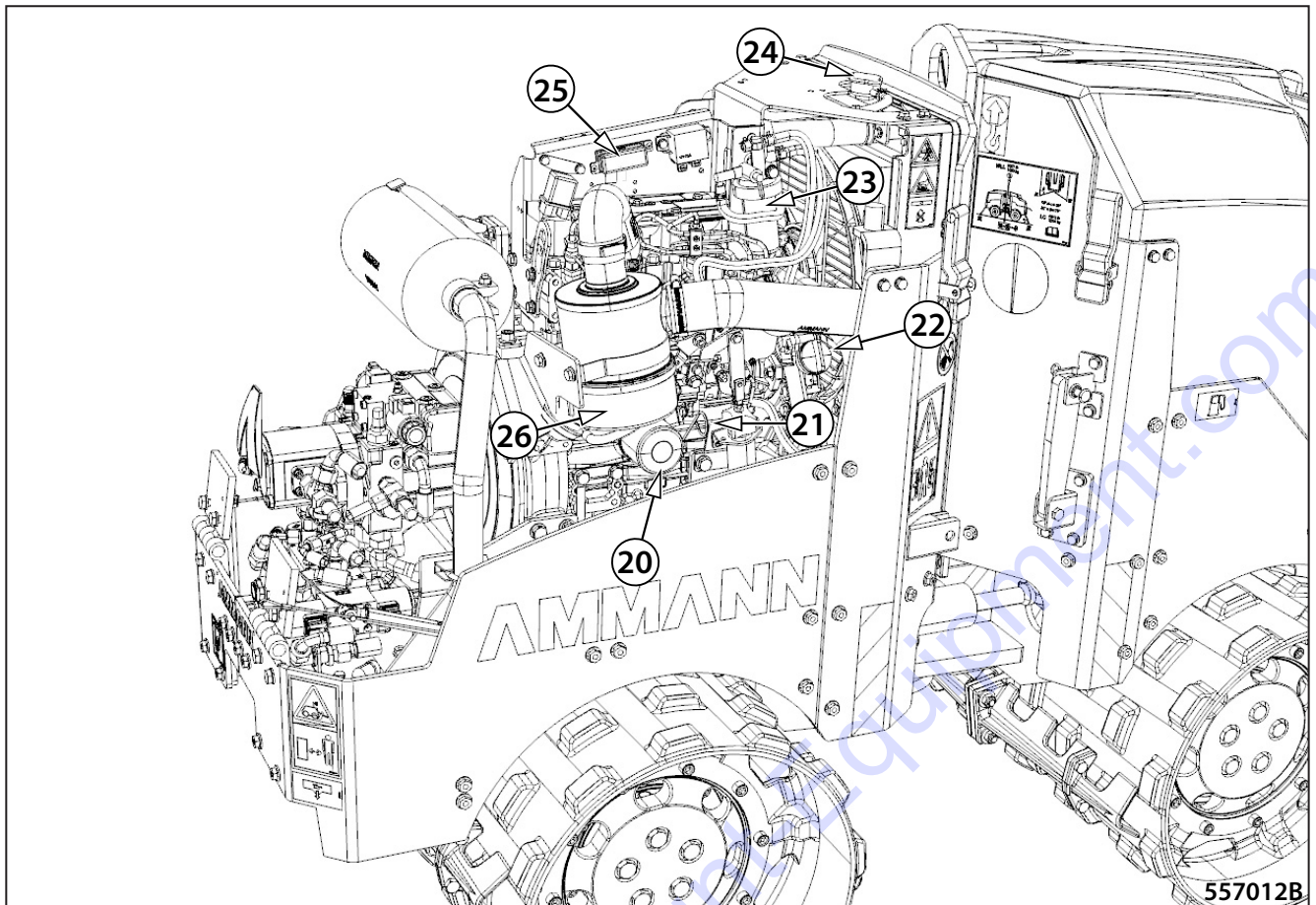


555010A

- 12 - Oil cooler
- 13 - Fuel tank
- 14 - Hydraulic oil tank
- 15 - Battery
- 16 - Control unit



- 17 - Engine cooler
- 18 - Coolant level expansion tank
- 19 - Water separator



- 20 - Oil filter
- 21 - Oil dipstick
- 22 - Oil filler cap
- 23 - Fuel filter
- 24 - Coolant filler cap
- 25 - Engine fuses
- 26 - Air filter

5 Frame

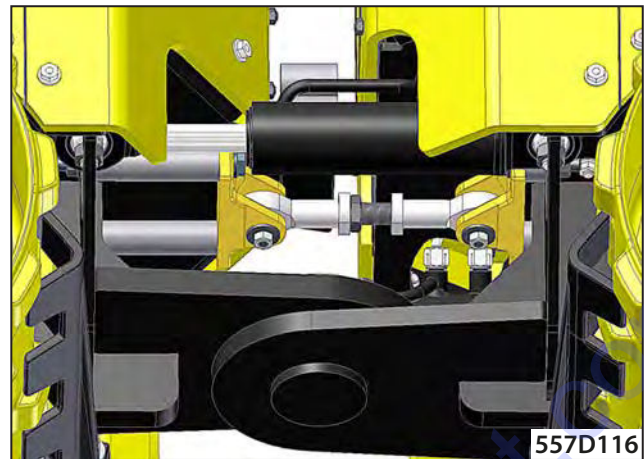
5.4 Mechanical parts

5.4.1 Swinging support, replacement of the joint head

Check the swinging support once a year for potential occurrence of inadequate clearance.

Hang the roller on a crane (central suspension).

The clearance can be checked when lifting and lowering the roller (visual check).



5.4.2 Replacement of swinging joint bearing

Check the swinging joint once a year for potential occurrence of inadequate clearance. If axial clearance exceeds 4 mm, the joint must be replaced (Chapter 5.4.10).

Hang the roller on a crane (central suspension).

The clearance can be checked when lifting and lowering the roller.



5.4.3 Steering piston, bearing lubrication

To lubricate the piston, completely turn the roller.

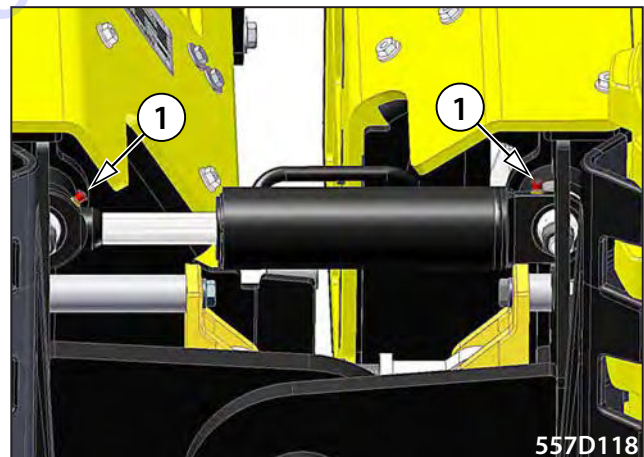
Move the roller from right to left briefly. This will unload the bearing.

Clean the grease nipple head (1) before lubrication.

Put a grease gun on the nipple.

Inject a sufficient quantity of grease so that it flows out of the bearing.

Re-attach the protective cover.



Material damage in case of excessive wear!

Lubricate the bearing after every roller cleaning/spraying.

5.4.5 Gas strut

Gas struts are maintenance-free! No maintenance, such as oil application or grease lubrication, is required. They are always equipped for relevant requirements and operate faultlessly for many years.

Gas strut replacement



Before you begin replacing the gas struts, secure the engine bonnet against spontaneous fall.

There is a risk of injury!

Removal

Use a screwdriver to pull out the clamps and release the struts.



Pull out the gas strut away from the ball stud.



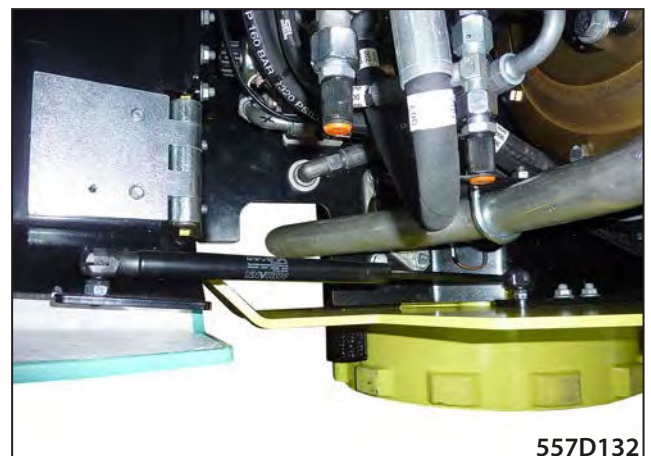
Installation

Push new gas struts on the ball stud.

The clamp then needs to be safely seated.



When reinstalling the gas strut, fasten the extracted part at the bottom.





Do not install gas struts if they are damaged due to mechanical handling.

Welds on the gas struts as well as dirt or paint on the piston rod may lead to equipment failure.

Avoid changes and manipulations, shocks, tensile loads, heating, repainting and removal of prints.

Do not install any defective or improperly processed products.



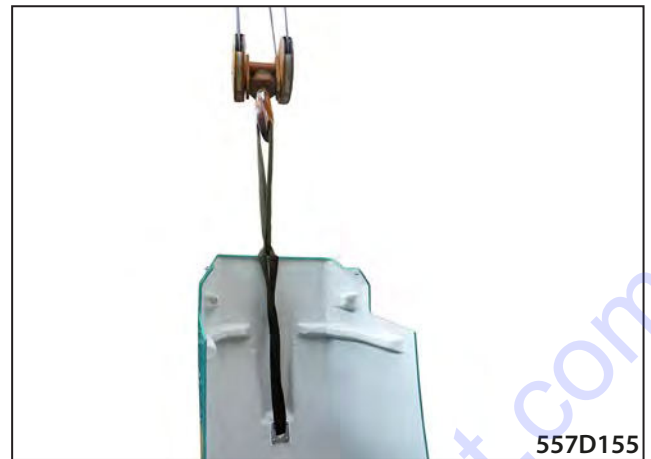
If you do not need the gas struts any more, dispose of them in an environmentally-friendly manner.

5.4.6 Front bonnet replacement

Removal

Remove the sensor (Chapter 5.4.6.2).

Hang the bonnet.



557D155



557D156

Use a screwdriver to lift the clamp.

Pull the gas cylinder away from the ball joints to the right and left.



557D157

5 Frame

Release the wire rope from the bonnet on the left.
Lift the engine bonnet using a crane.



Remove the bottom screws of the butt hinge on the left.



Remove the bottom screws of the butt hinge on the right.



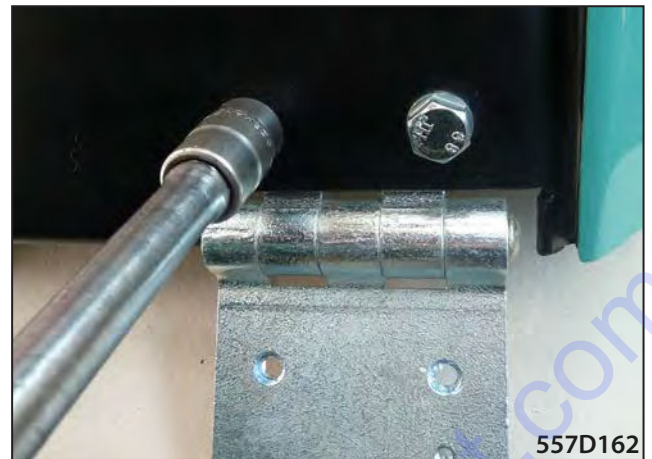
Lift the bonnet using a crane and put it aside.



5.4.6.1 Replacement of bonnet hinges

Remove the bonnet (Chapter 5.4.6).

Remove the hinge screws.



Replace the bonnet hinge.



Apply blue adhesive on the screws.



Mount the hinges using screws. The tightening torque is 50 Nm.



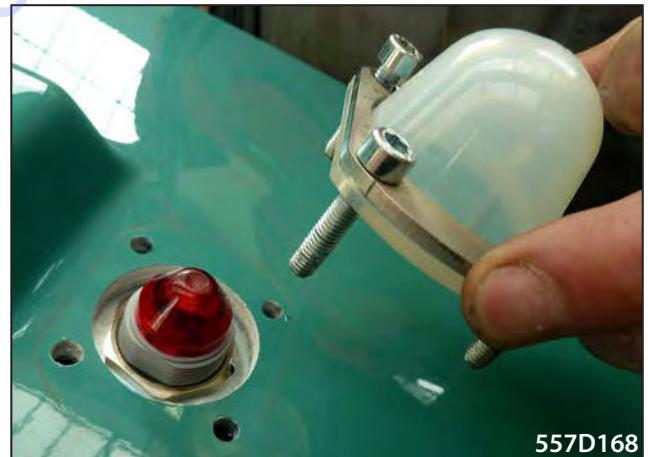
5.4.6.2 Sensor replacement

Removal

Remove the screws of the sensor cover.



Remove the sensor cover.



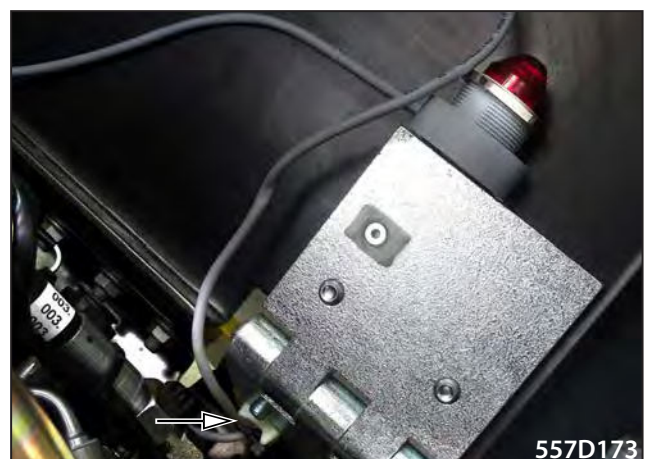
Remove the sensor.



Release the sensor cables from the holders.



Remove the cable ties.



5 Frame

Unplug the X5 connector (infrared sensor at the front).



Remove the sensor and wiring.



Installation

Put the sensor into the hole in the bonnet.



Install the sensor using the special tool.

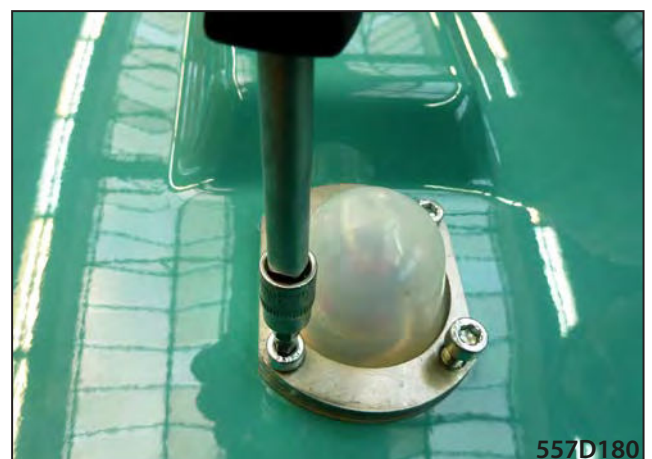
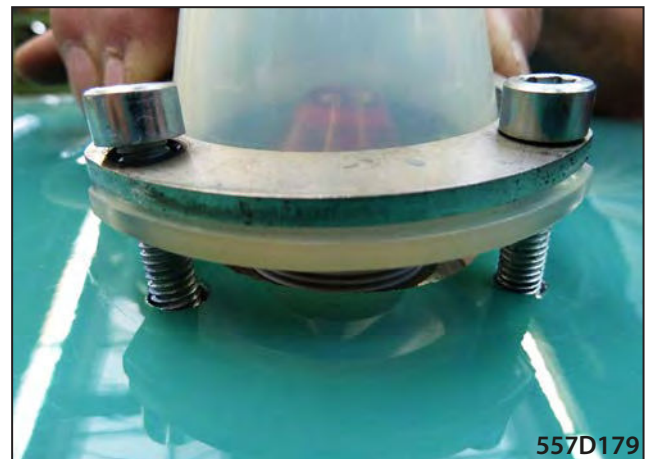


Apply blue adhesive on the sensor cover screws.



Install the sensor cover.

The tightening torque of the cover is 10 Nm.

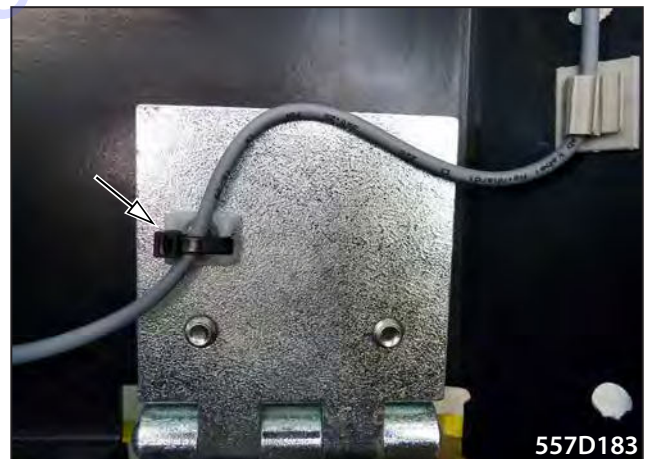


5 Frame

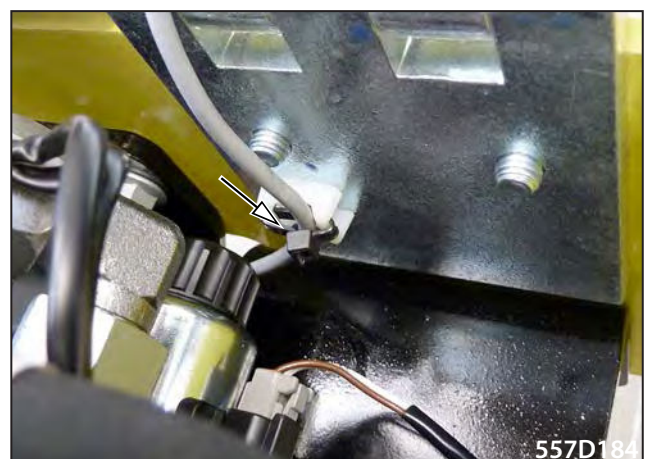
Fasten the sensor harness using the holders.



Fasten the cables with a cable tie on the holder at the top of the bonnet hinge.



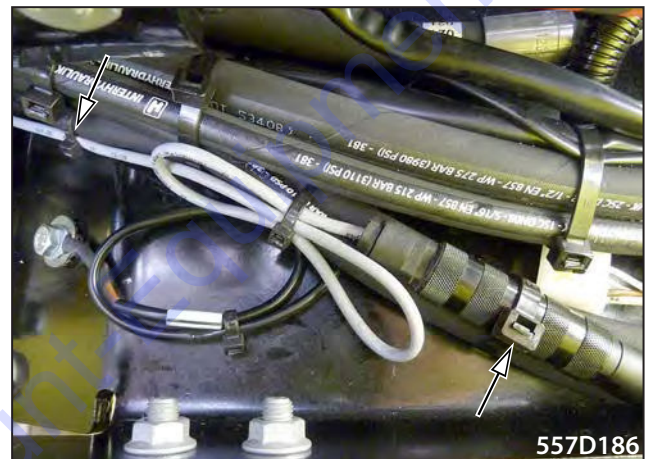
Fasten the cables with a cable tie on the holder at the bottom of the bonnet hinge.



Fasten the cables with a cable tie on the 010 hydraulic hose.



Plug the X5 connector (infrared sensor at the front).
Attach the cable ties.



5.4.6.3 Replacement of the rubber-metal elements of the front bonnet stop

Remove the fastening nut of the rubber-metal element.



5 Frame

Remove the rubber-metal element from the holder.



Apply blue adhesive on the rubber-metal element screw.



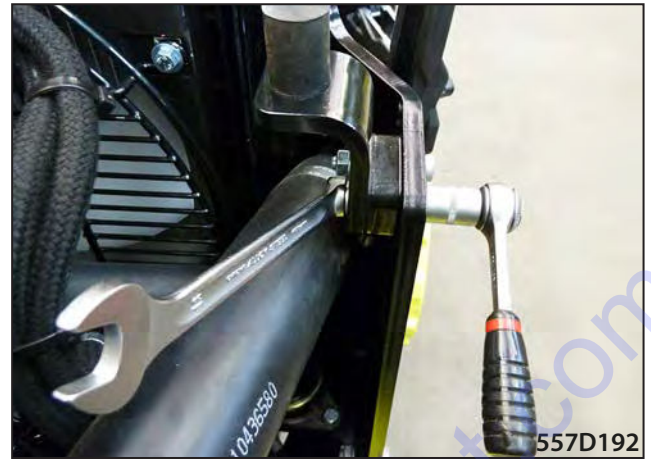
Mount the rubber-metal element into the holder.



5.4.6.4 Adjustment of the rubber-metal elements of the front bonnet stop

After installing the bonnet or replacing a bonnet stop rubber-metal element, adjust the distance between the bonnet and the machine frame.

Loosen the rubber-metal element holder screws.



Move the holder to adjust the distance between the bonnet and the machine frame.

Make sure the distance is even.



Loosen the bottom screws of the bonnet hinges.



Move the bonnet to adjust the distance between the bonnet and the machine frame.

The bonnet and the chassis should be aligned.

Tighten the screws. The tightening torque is 50 Nm.



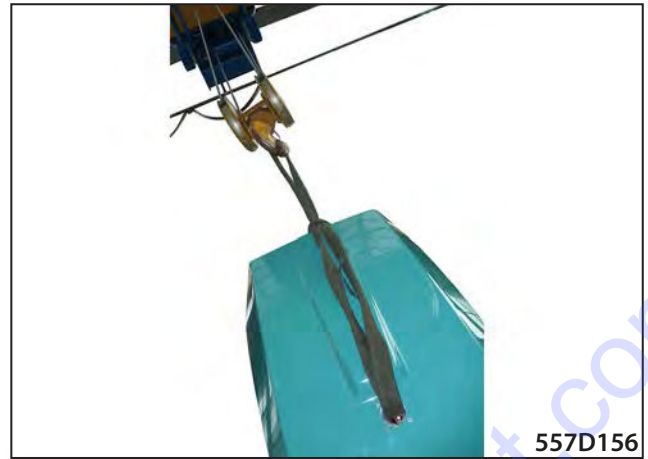
5 Frame

5.4.7 Rear bonnet replacement

Removal

Remove the sensor (Chapter 5.4.7.2).

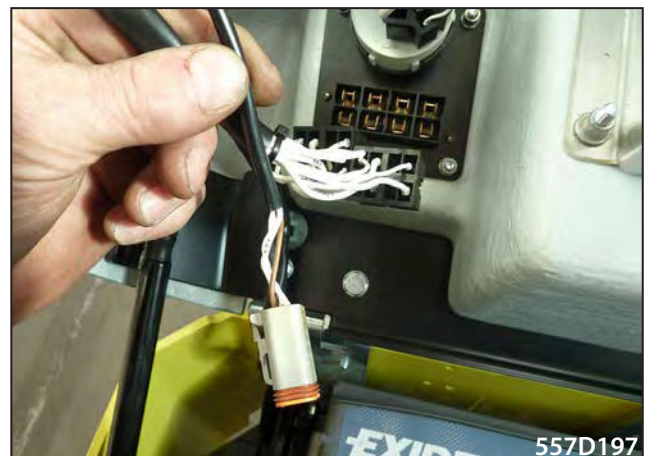
Hang the bonnet.



Remove the fastening straps of the N2 connector.



Disconnect the connectors from the fuse box.



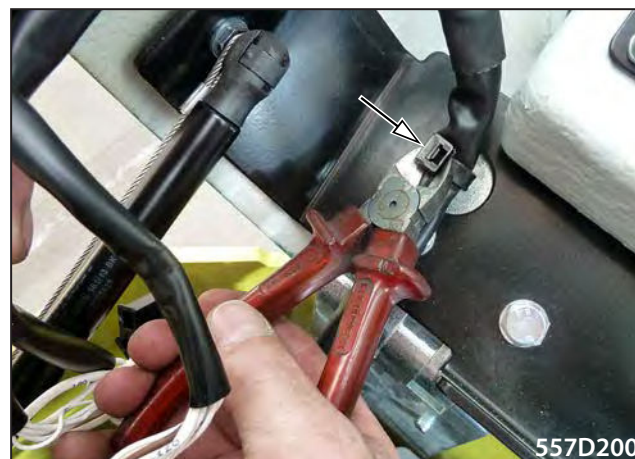
Disconnect the connectors of the ignition box.



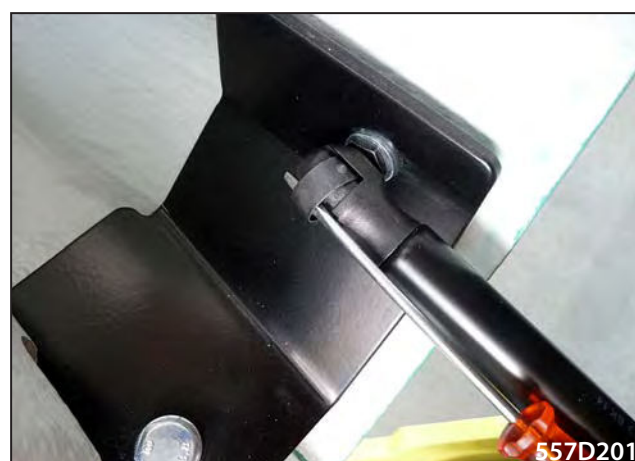
Disconnect the N2 connector.



Remove the bonnet cable ties.



Use a screwdriver to lift the clamp.
Pull away the gas cylinder from the ball joint.



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5 Frame

Release the wire rope from the bonnet.
Lift the engine bonnet using a crane.



Remove the bottom screws of the butt hinges on the left.



Remove the bottom screws of the butt hinge on the right.



Remove the cable ties on the bonnet hinge.



Lift the bonnet using a crane and put it aside.



5 Frame

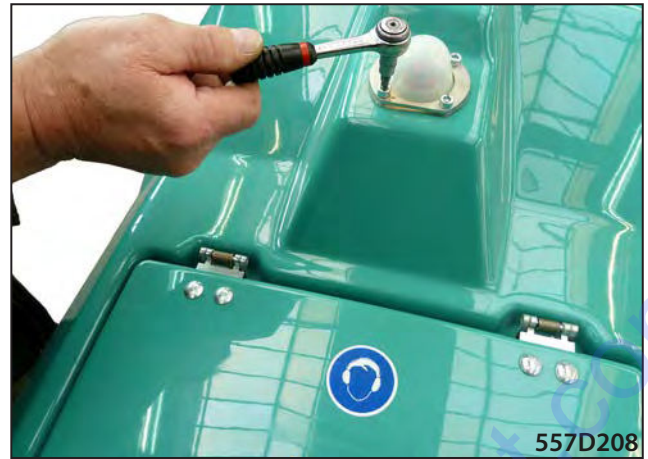
5.4.7.1 Replacement of bonnet hinges

Replacement of bonnet hinges (Chapter 5.4.6.1).

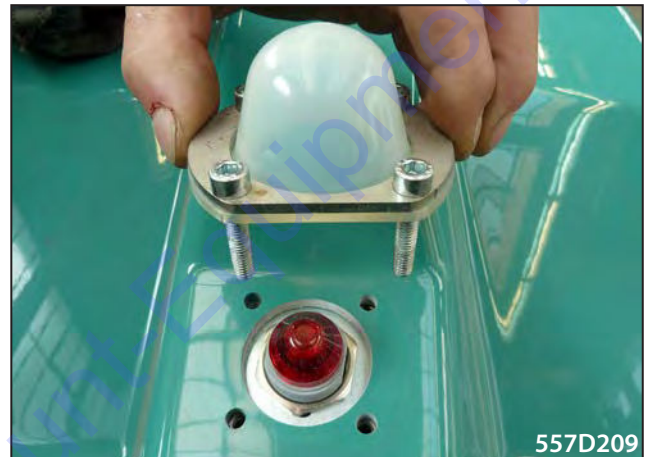
5.4.7.2 Sensor replacement

Removal

Remove the screws of the sensor cover.



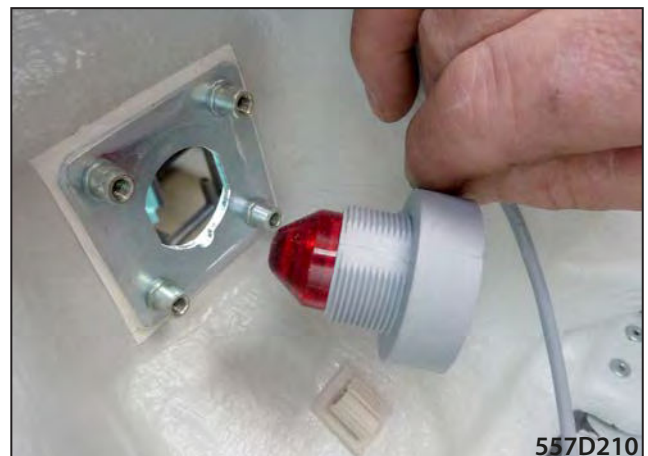
Remove the sensor cover.



Remove the sensor using the special tool.



Remove the sensor.



Disconnect the sensor connector.



557D211

Installation

Put the sensor into the hole in the bonnet.



557D176



557D177

Install the sensor using the special tool.



557D169

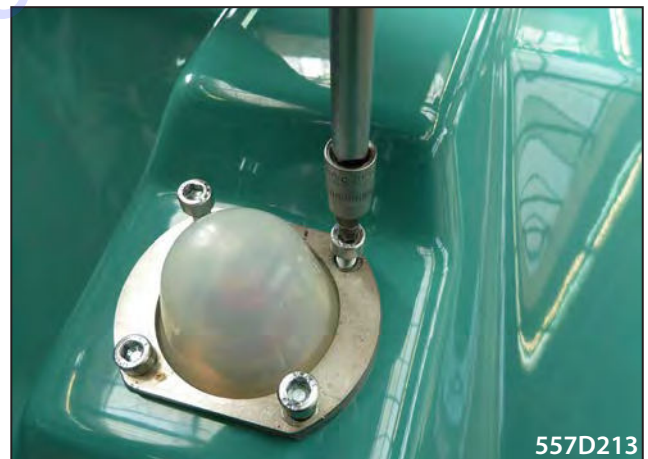
5 Frame

Apply blue adhesive on the sensor cover screws.

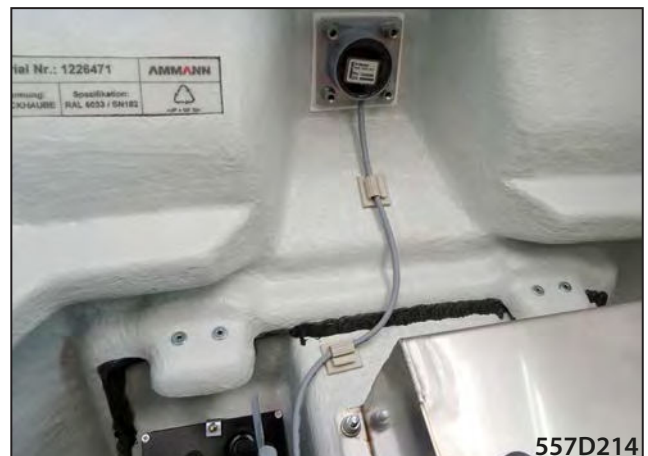


Install the sensor cover.

The tightening torque of the cover is 10 Nm.



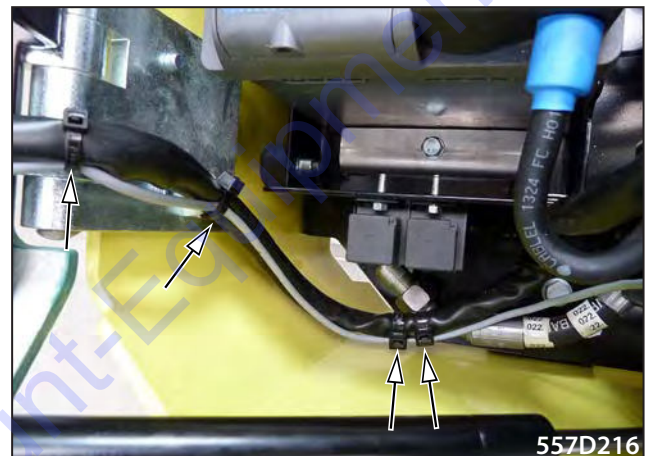
Fasten the sensor harness using the holders.



Connect the connector of the ignition box.
Connect the N2 connector.
Fasten the connector with a cable tie.



Fasten the cables using the fastening straps.



Place the sensor cables and fasten with a cable tie.



5.4.7.3 Replacement of the rubber-metal elements of the rear bonnet stop

Replacement of the rubber-metal elements of the front bonnet stop (Chapter 5.4.6.3).

5.4.7.4 Adjustment of the rubber-metal elements of the rear bonnet stop

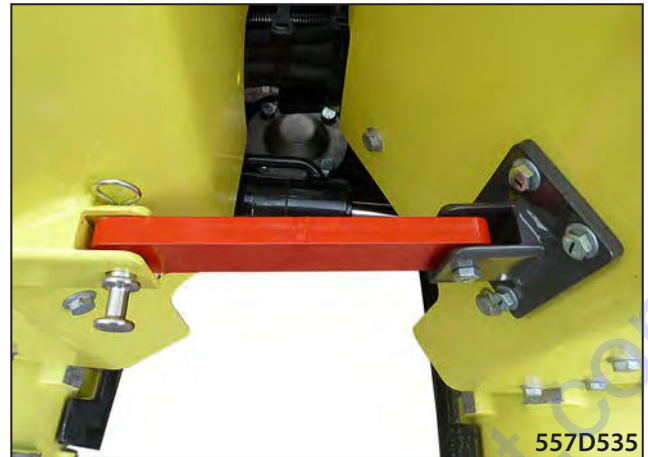
Adjustment of the rubber-metal elements of the front bonnet stop (Chapter 5.4.6.4).

5 Frame

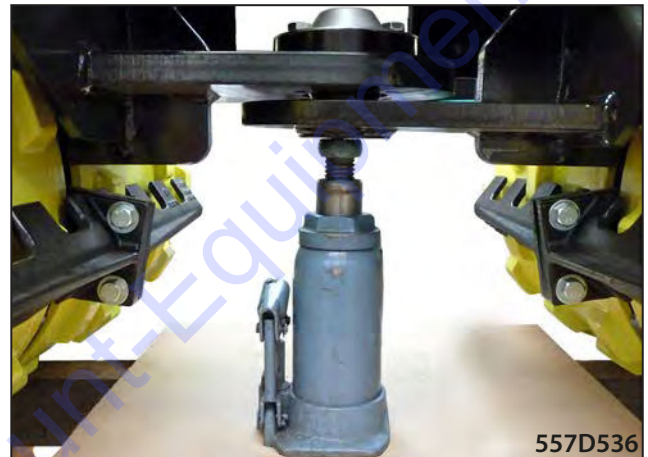
5.4.8 Swinging support

Removal

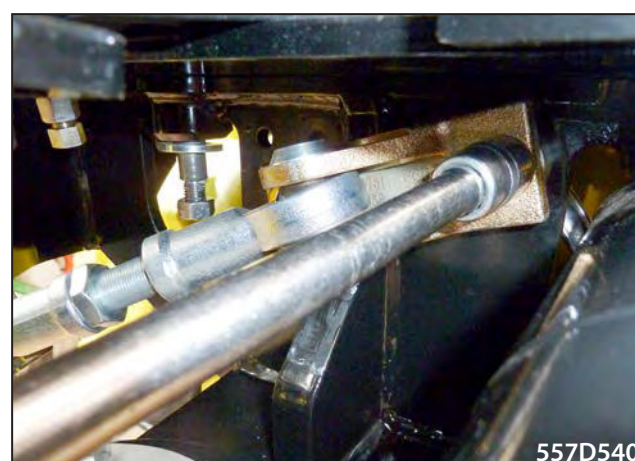
Mount a lock against cranking.



Place the hydraulic jack to the centre of the swinging joint.
Slightly unload the roller.



Remove the screws of the swinging support.

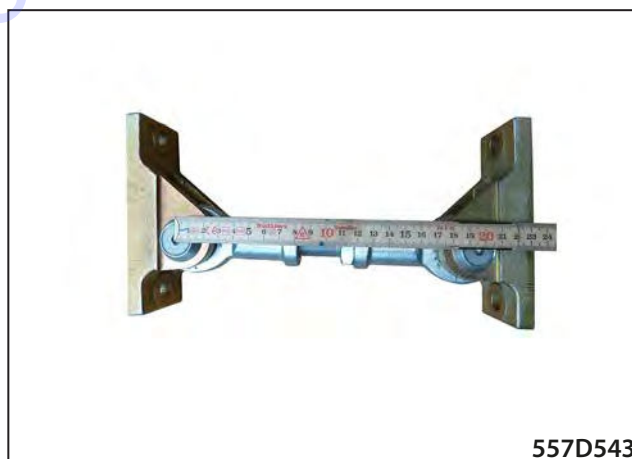


5 Frame

Remove the swinging support.



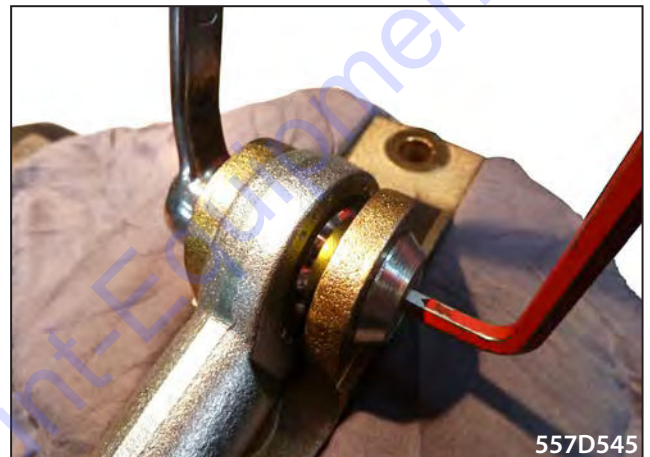
Before disassembling the swinging support, measure the distance between the joint centres. Use the measured value during reassembly.



Replacement of the joint head

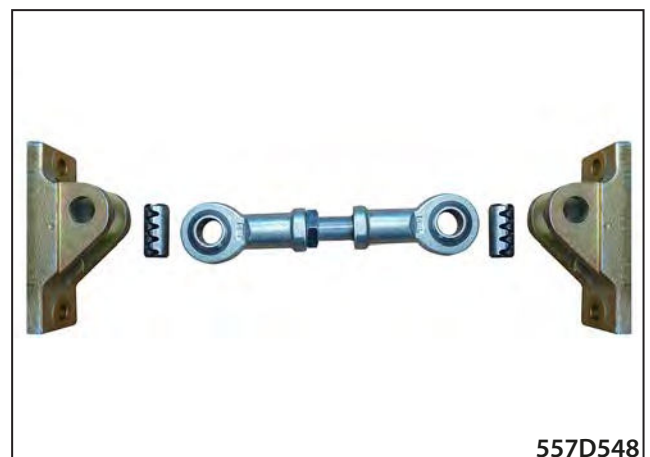
Removal

Remove the retaining screw.



Place the swinging support under a press.

Push out the heavy clamping pin with the mandrel.



5 Frame

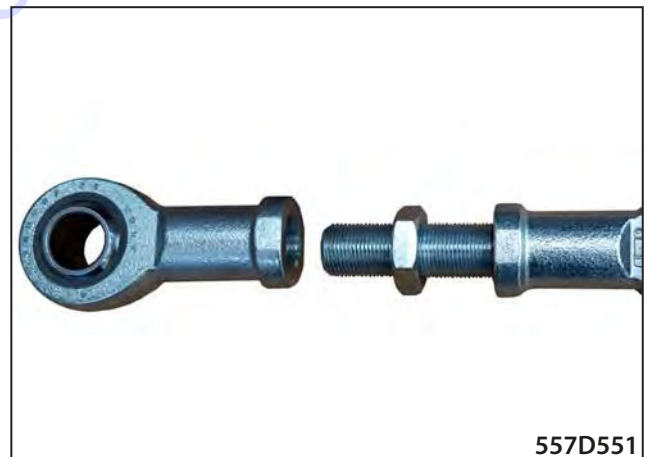
Clamp the swinging support in a vice.

Heat the lock nut and joint head to approximately 200 °C (392 °F).



Loosen the lock nut.

Rotate the joint head using a spanner.



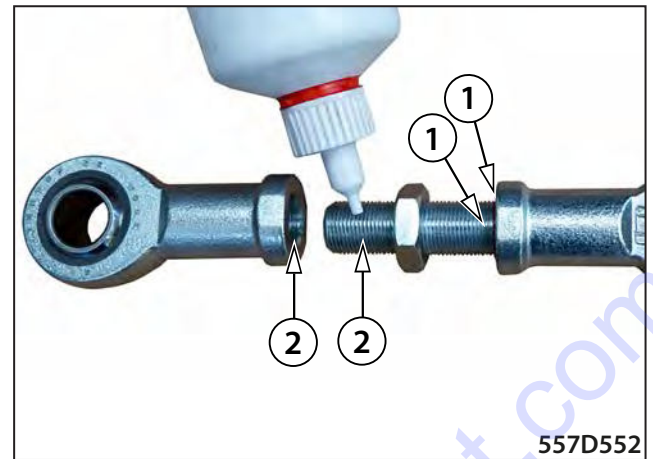
Installation

Apply red adhesive on the new rear joint head and swinging support (1).

Apply blue adhesive on the new front joint head and swinging support (2).

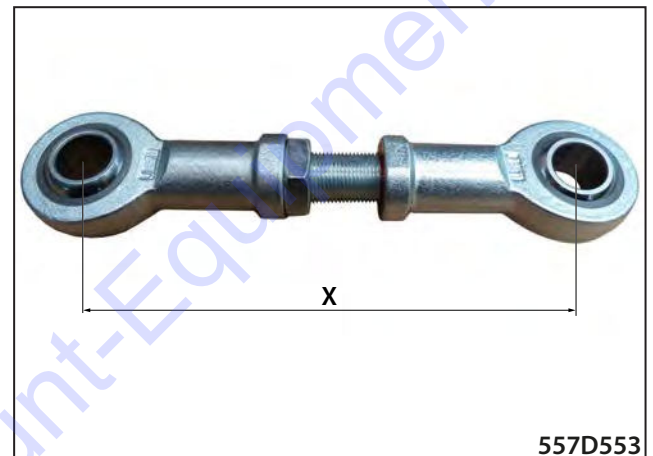
Mount the rear joint head on the swinging support all the way to the stop.

Set the front joint head to the required distance.

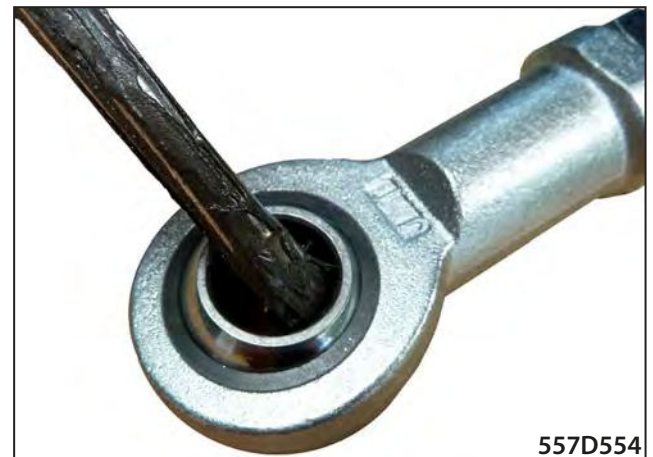


Set the swinging support to the measured length.

Secure the nut.



Lubricate the boreholes in the joint head at the back and front.



Lubricate the clamping pins.

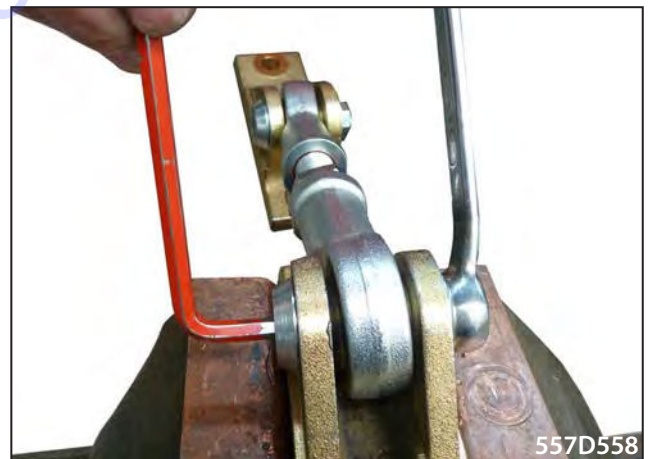


5 Frame

Insert the clamping pin so that the gap is on the push-out side.
Push the clamping pins inside.



Apply red adhesive on the screw.



Installation

Mount the joint head fixing screws.

The tightening torque is 85 Nm.

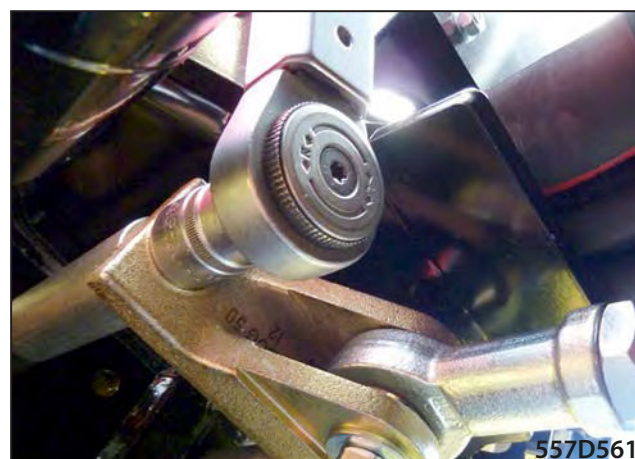
Apply blue adhesive on the screws.



557D559



557D560



557D561



557D562

5 Frame

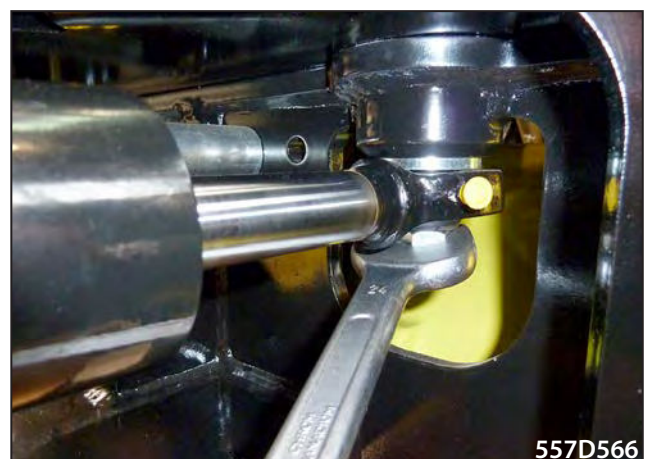
5.4.9 Replacement of the steering piston

Removal

Remove hydraulic hoses 017 and 018 from the hydraulic cylinder.



Remove the steering piston nuts.



Remove the steering piston.



Close the screw unions on the steering piston.



Close the screw unions on hoses 017 and 018.



5 Frame

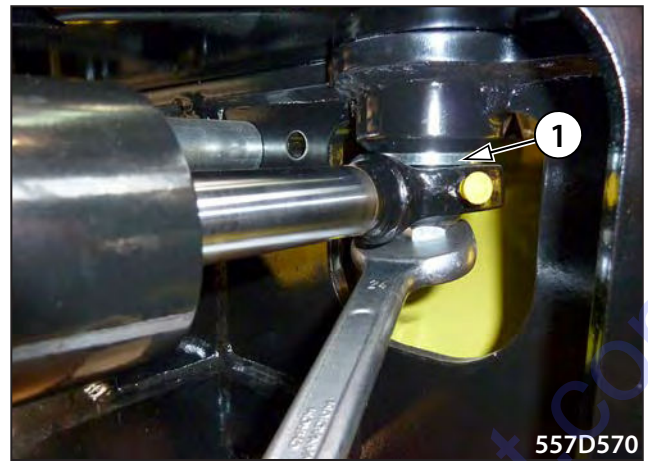
Installation

Clean the fastening pins (remove corrosion if necessary).

Mount the sealing washer (1).

Lubricate the fastening pins.

Apply blue adhesive on the threaded pins.

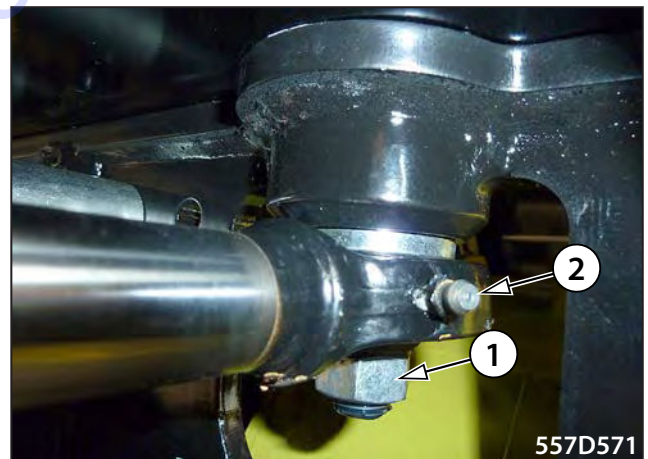


Install the new steering piston.



Tighten the nut firmly (100 Nm).

Lubricate the grease nipple (2) at the front and back.



Mount hydraulic hoses 017 and 018.

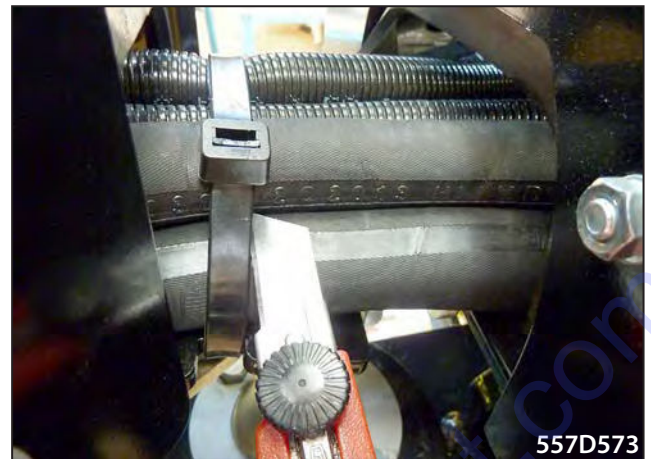


5.4.10 Swinging joint

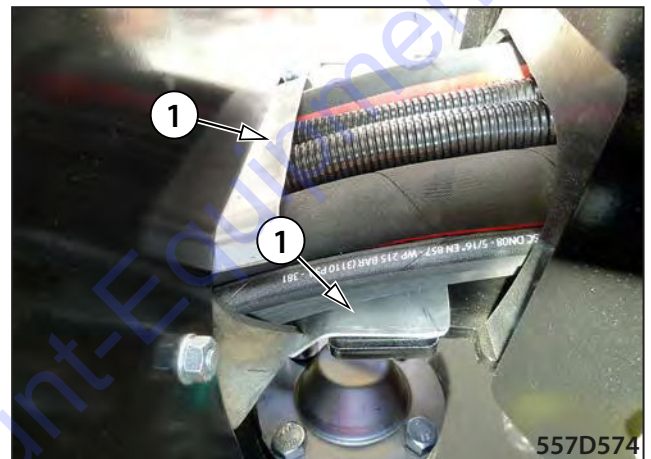
Remove the swinging support (Chapter 5.4.8).

Remove the steering piston (Chapter 5.4.9).

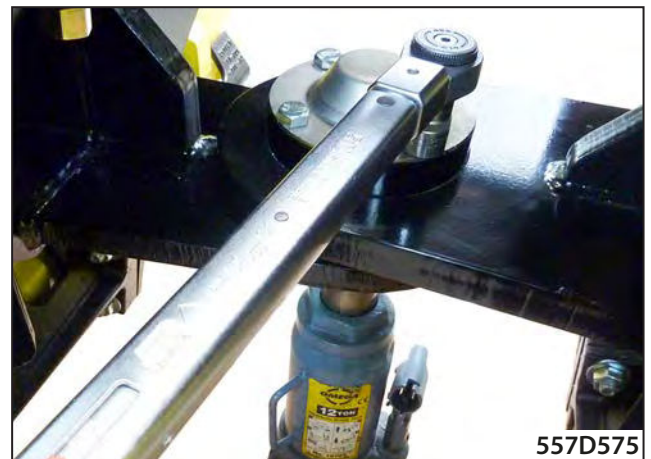
Cut the hose bundle ties.



Place a protective plate (e.g. aluminium) at the bottom and top between the chassis and the hose bundle.



Remove the screws of the swinging joint.

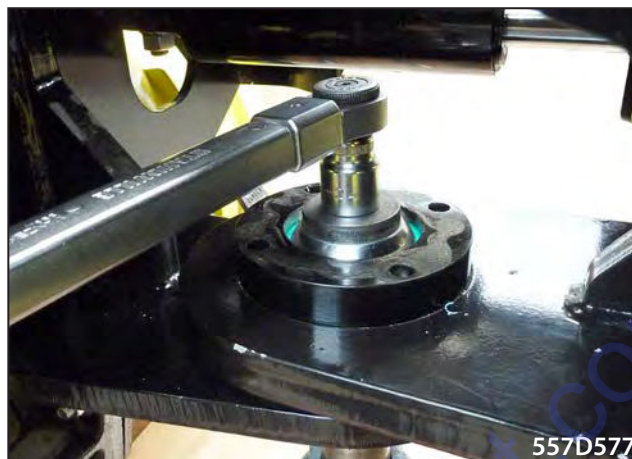


Remove the cap.



5 Frame

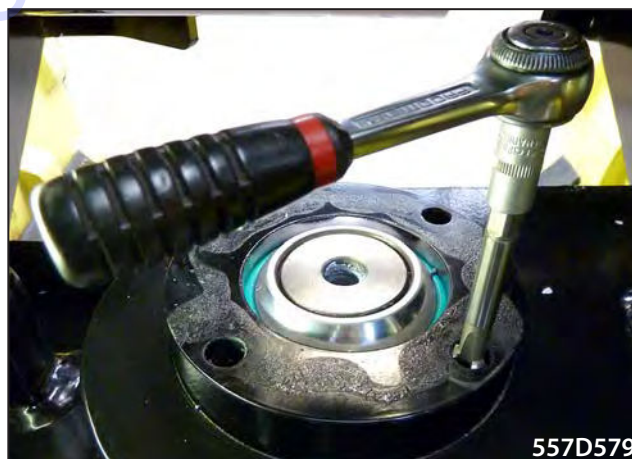
Remove the bearing lock screw.



Remove the bearing lock (1).



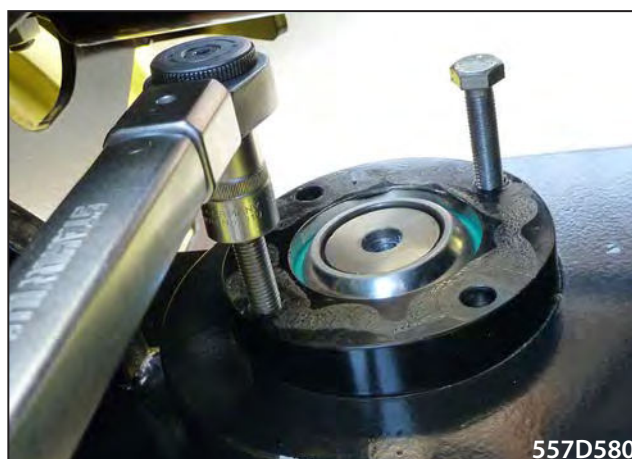
Cut the thread in the support chassis.



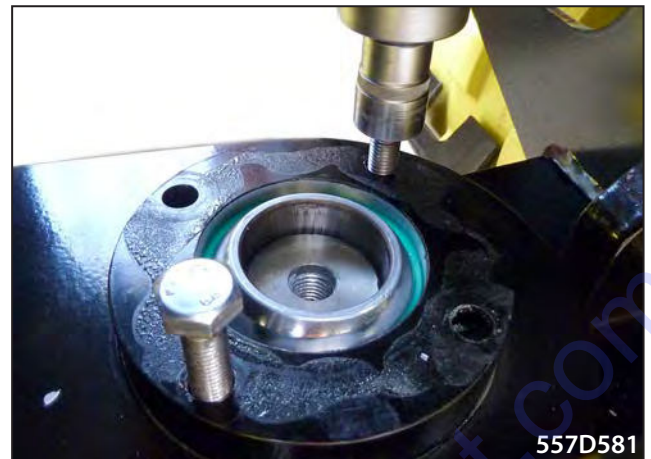
Mount the screws.



In the event of corroded bearing seat, use 4 screws.

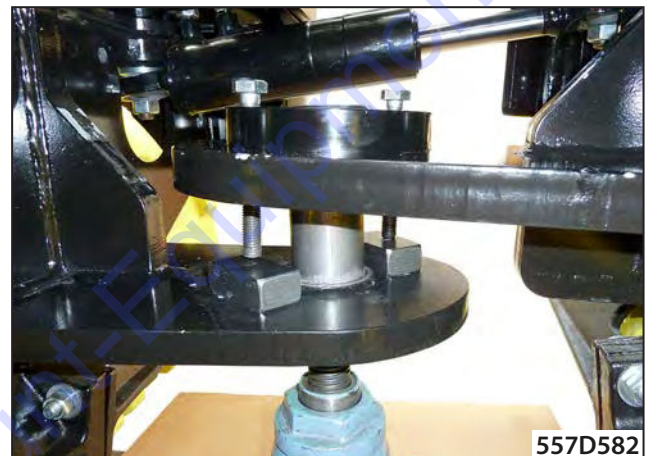


Screw in the screws until the swivel bearing from the bearing pin.



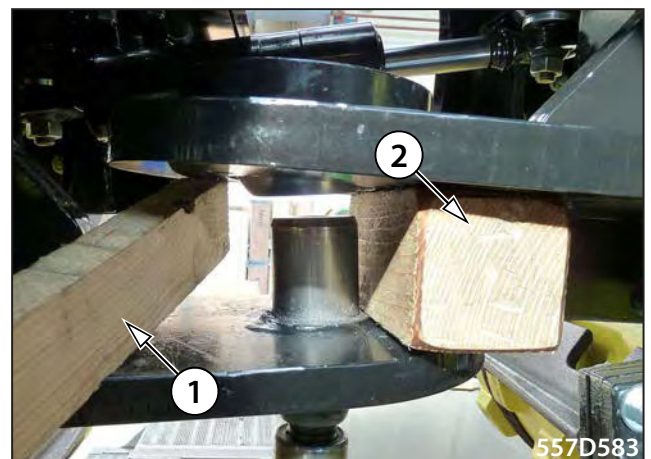
Because there is not enough space for longer screws than M12x100, spacers (approx. 20 mm) must be placed under the screws.

Remove the screws as soon as the bearing is pushed out of the bearing pin.



Use squared wood (1) to separate the chassis at the front and back.

Use another squared wood (2) to support the chassis at the back.



Special tool for the removal of the articulated bearing.



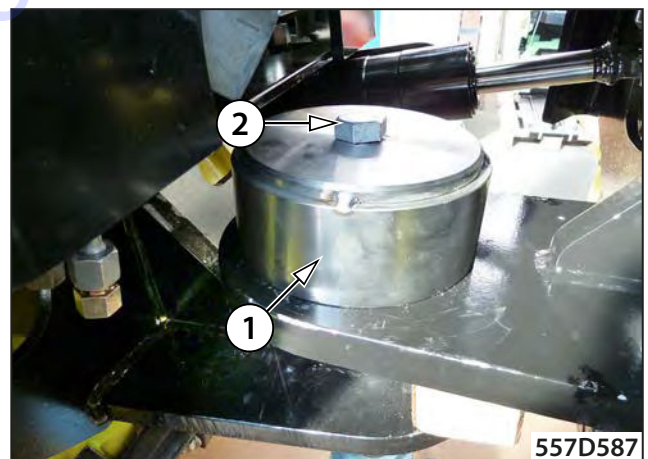
5 Frame

Move the pulling disc under the articulated bearing using the special tool.



Use the special tool to mount the upper part (1) on the support chassis.

Use the special tool to mount the M20 hex screw (2).



Pull the bearing out of the support.

Tighten the screw until the bearing is loose.



Remove the bearing out of the support.



Removed binding ring with a bearing.



Place the binding ring under a press.



5 Frame

Push out the bearing.



Clean the binding ring.



Lubricate the bearing seat.



Lubricate the new bearing.



Push the bearing into the binding ring.



Clean the support chassis.



Lubricate the bearing seat.



5 Frame

Apply sealant on the sealing surface.



Pull the bearing flange to the support using the screws.



Lubricate the bearing pins.



Centre the chassis towards the bearing pins.



Mount the washer and the screw with the nut into the bearing pin.



Use the nut to pull the bearings over the bearing pin.
Remove the screw.



5 Frame

Mount the lock washer on the screw.

Apply blue adhesive on the screw.



Secure the swivel bearing with a screw and a washer. The tightening torque is 210 Nm.

Remove the mounting screws (1).



Apply sealant on the surface of the binding ring.



Place the cap.



Apply blue adhesive on the screws.



5 Frame

Secure the cap. The tightening torque is 85 Nm.



Remove the protective plates.

Arrange the hose bundle and fasten it using cable ties.



5.5 Fuel tank

5.5.1 Fuel level check

Open the engine bonnet.

Check the level in the plastic tank.



Do not smoke while working!

5.5.2 Fuel replenishment

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

Every day before starting to work

The tank capacity is 28 litres of diesel.

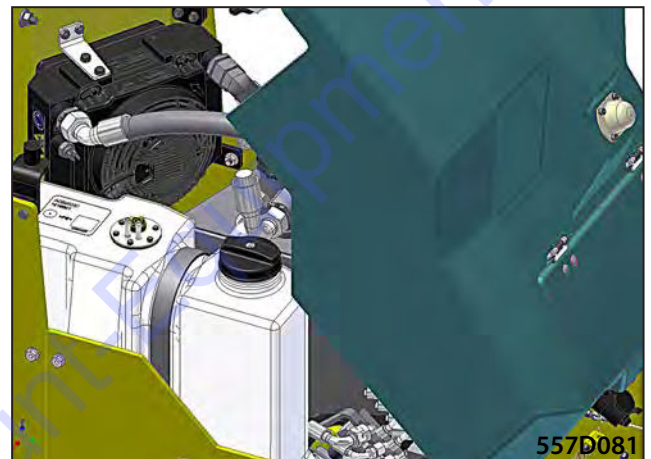


Do not smoke while working!

Check the fuel tank and the fuel circuit for leaks.



Catch the drained fuel.



5 Frame

5.5.3 Fuel draining



Operating fluids pose a risk to the environment!

Prevent fluids from leaking into sewage systems, soil or the environment.

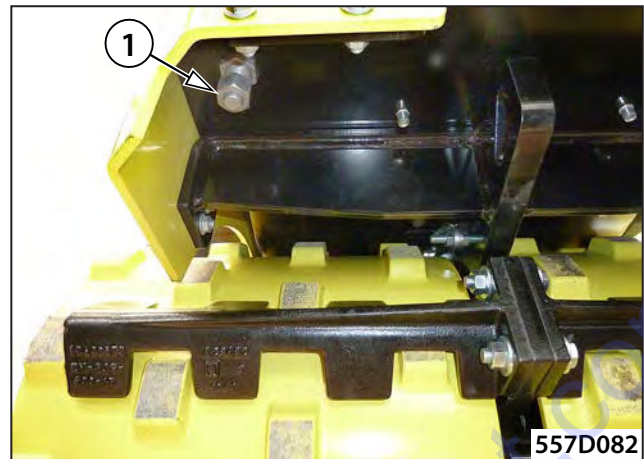
Loosen the screw plug (1) under the roller.

Place a vessel under the drain neck.

Let the diesel flow out.

Put on the screw plug (1).

Diesel drain, chassis at the back, left



5.5.4 Fuel tank cleaning

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

Loosen the screw plug (1) under the roller.

Place a vessel under the drain neck.

Let approximately 1/2 litre of the fluid flow out.

Water which has accumulated on the bottom of the tank flows out as the first.

Put on the screw plug (1).

5.6 Hydraulic tank

5.6.1 Checking the hydraulic oil level

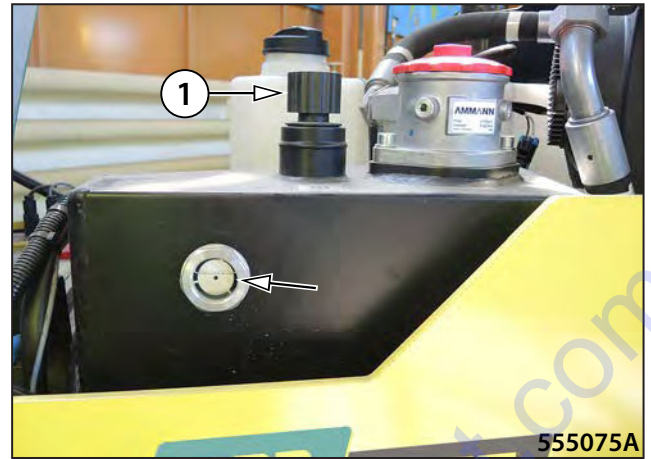
Check the hydraulic oil level always when the engine is cold but running.

Put the machine on a flat terrain.

Let the engine run at idle.

Check the oil level in the inspection hole.

The ideal hydraulic oil level is when the gauge is half-full.



5.6.2 Hydraulic oil replenishment

Take off the ventilation filter (1) from the filler neck.

Refill the required quantity of hydraulic oil.

Screw in the ventilation filter (1) back in place.



Always lubricate the O-ring before screwing it in place.

Check the oil when it is cooled down. Fill up the same oil type, see Chapter 4.4.

5 Frame

5.6.3 Hydraulic oil draining



**Drain hydraulic oil only at operating temperature.
Residues in the tank are drained with the oil.**

Put a vessel (with a volume of at least 30 litres) under the hydraulic oil drain plug.

Take out the ventilation filter (1).

Remove the plug (2) from the hydraulic tank.

Let the oil flow out into the vessel.

Put on the screw plug (2). Tighten the screw connection with your hand.

Tighten the screw connections in the hydraulic tank with hand.



When draining the hydraulic oil, replace the hydraulic oil filter and the ventilation filter as well. See Chapter 5.6.4.



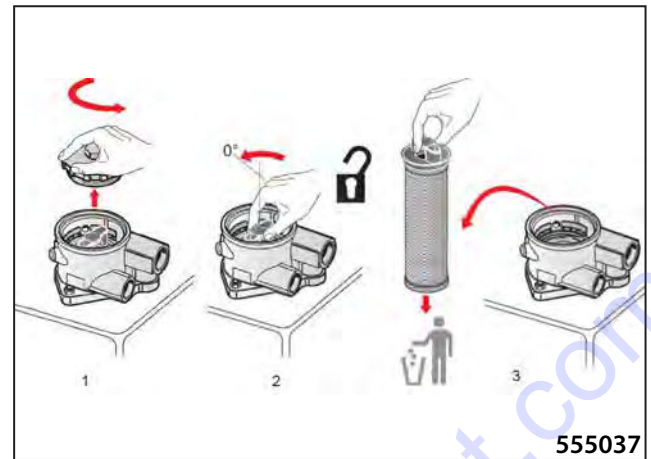
5.6.4 Hydraulic oil filter replacement

Take off the filter cap.

Unlock the filter cartridge.

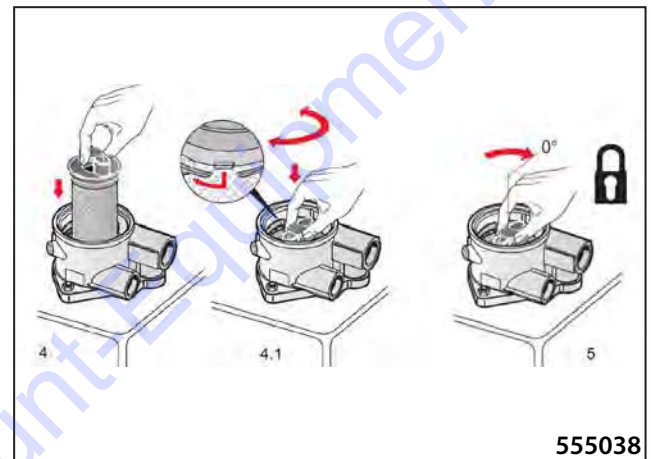
Pull out the filter cartridge from the filter housing.

Dispose of the filter cartridge environmentally.



Insert the new filter cartridge in the correct place. Keep the position of the safety cam.

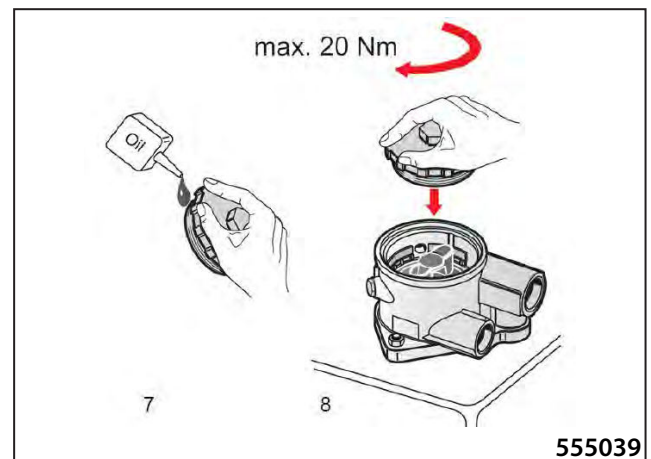
Turn the filter cartridge clockwise up to the stop.



Oil the sealing ring on the filter cap slightly.

Put the filter cap in place.

Tighten the cap with the torque spanner (tightening torque 20 Nm).



5 Frame

5.6.6 Ventilation filter replacement

Remove the ventilation filter and replace it with a new one.



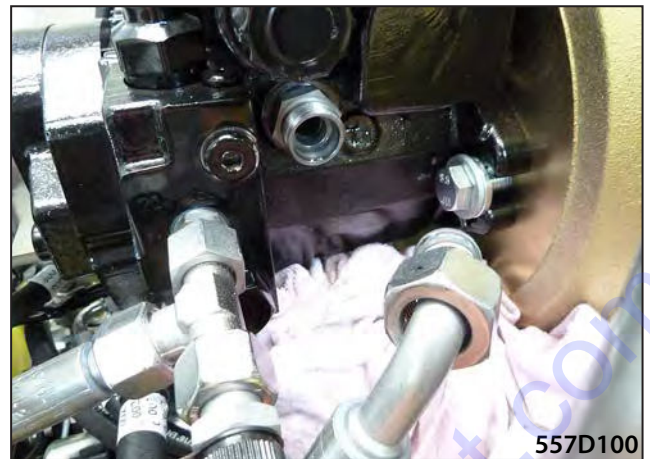
5.6.7 Hydraulic tank filling

Fill the hydraulic oil tank (approximately 16 l).

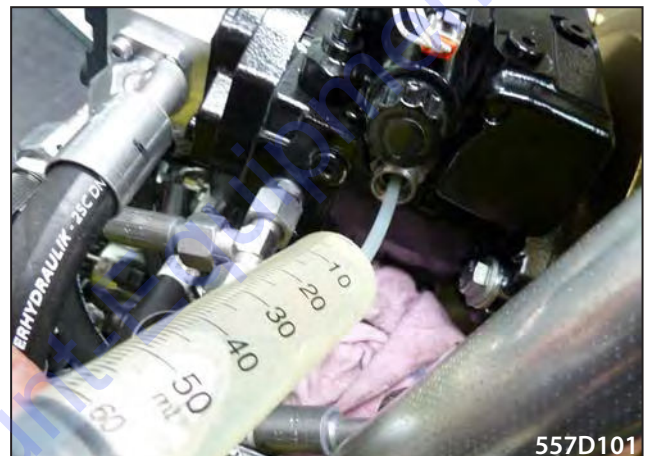


5.6.8 Filling the travel pump, increasing the supply pressure

Remove the 006 (S) hydraulic hose.



Fill the travel pump housing with hydraulic oil.



Fill hydraulic oil (0.3–0.4 l) so that it flows out of the screw union (S).



Mount the 006 (S) hydraulic hose.



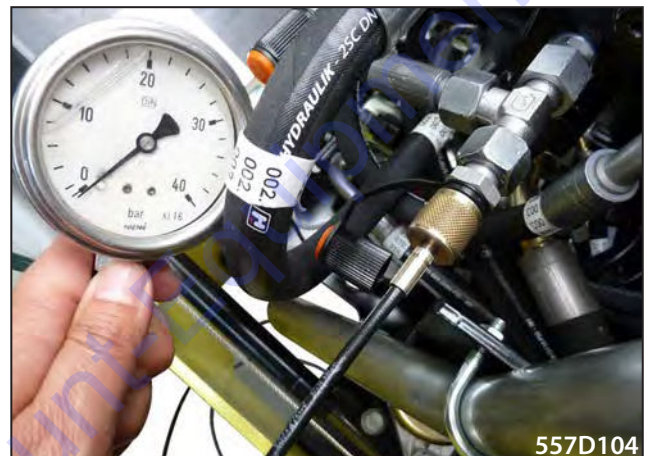
5 Frame

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



Connect a pressure gauge (40 bar) to the supply pressure measuring point.

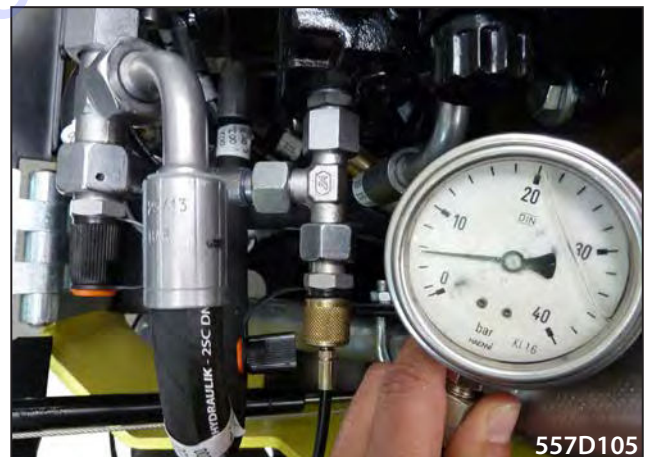
Rotate the engine with the engine starter.



Rotate the engine until the pressure reaches 3–5 bar.



Do not overheat the starter! After no more than 30 seconds, let the starter cool down.

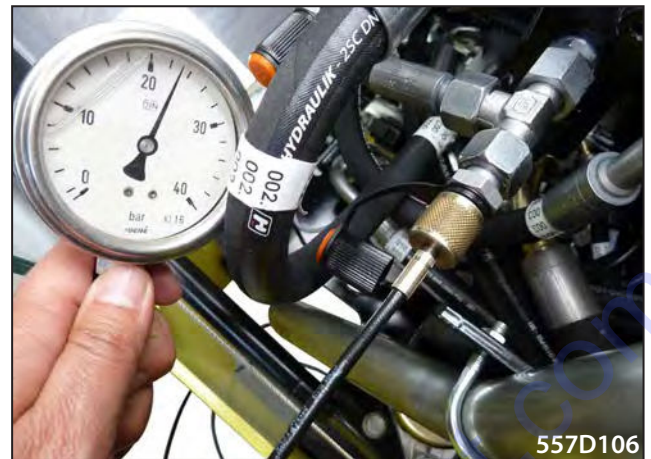


Insert the F21 (40A) fuse in the engine compartment.



Start the diesel engine.

Check the pressure increase. Maximum pressure = 23 bar.



If hydraulic components have been replaced or repaired, perform a function and leak check.

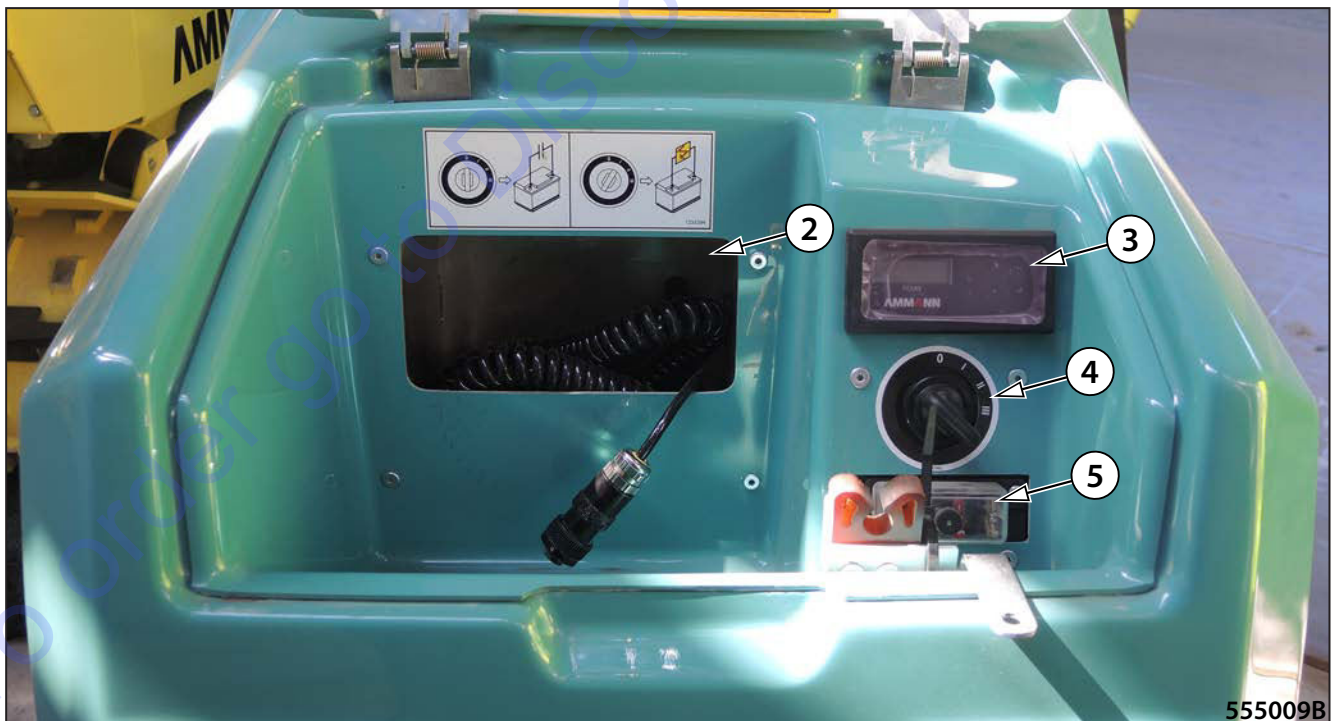
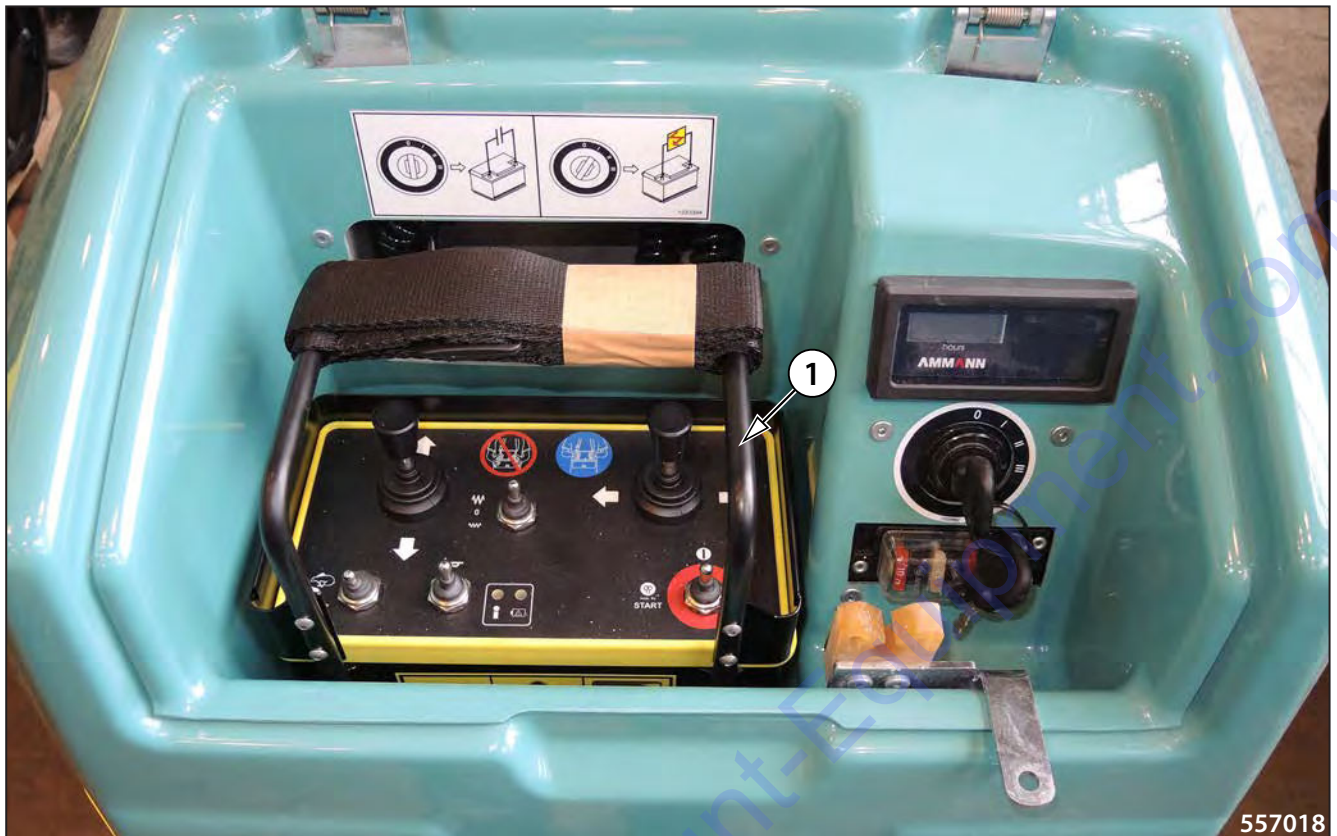


6 Cab and platform

To order go to Discount-Equipment.com

To order go to Discount-Equipment.com

6.1 Control and indication elements



1. Infrared remote control
2. Spiral cable compartment
3. Display unit
4. Ignition box
5. Fuses

6 Cab and platform

6.1.1 Display unit

6.1.1.1 Indicator lamps

Operating hours counter (1)



Charging indicator lamp (2)

The indication lamp goes on after the key in the ignition box is switched into the position "I" and goes out after the engine starts. If the indicator lamp turns on during operation or does not turn off after starting, immediately perform the following check.

- Turn off the engine.
- Check the V-belt of the engine for damage and loosening.

If the battery charging indicator lamp is still on after this check, contact Discount-equipment.



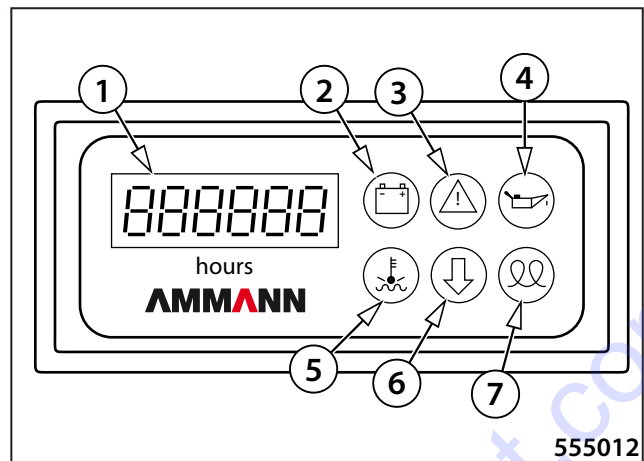
Error indicator lamp (3)

The error indicator lamp turns on when the control unit detects an error.

The inclination sensor is activated. The machine is positioned at an angle exceeding 45°. Place the machine upright.

The wiring is faulty. Check for a short circuit or cable break.

If the error indicator lamp is still on after this check, contact Discount-equipment.





Engine oil pressure indicator lamp (4)

The indication lamp goes on after the key in the ignition box is switched into the position "I" and goes out after the engine starts.

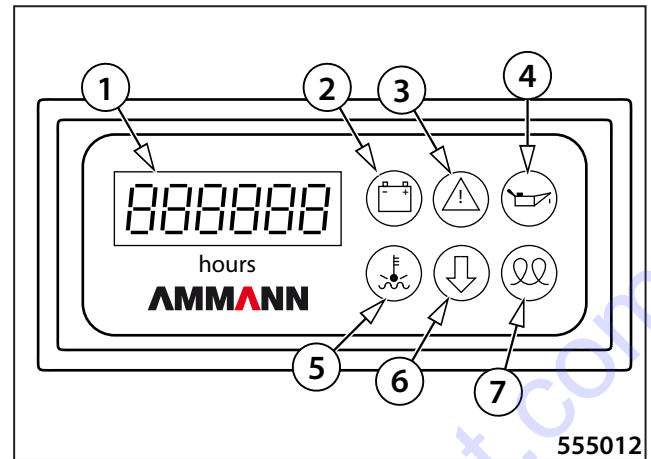


If the engine oil pressure indicator lamp turn on during operation or does not turn off after starting, immediately stop the machine and the engine.

- Check the engine for oil leaks and correct oil level.
- If the oil level in the engine is correct, contact Discount-equipment.

Note:

The machine is equipped with an automatic shutdown system. If the oil pressure drops below the limit value, the oil pressure indicator lamp turns on. It lights up for 4 seconds and then the machine turns off.



Coolant temperature indicator lamp (5)



There is a risk of engine overheating. Immediately stop the operation!

If the coolant temperature indicator lamp turns on during machine operation, immediately turn off the engine and refill the coolant.

- Check the cooling system for leaks and the level of coolant in the cooler / expansion vessel.
- No error found: Contact Discount-equipment.

Note:

The machine is equipped with an automatic shutdown system. If the coolant temperature exceeds the limit value, the temperature indicator lamp turns on. It lights up for 4 seconds and then the machine turns off.

6 Cab and platform



Safety bar indicator lamp (6)

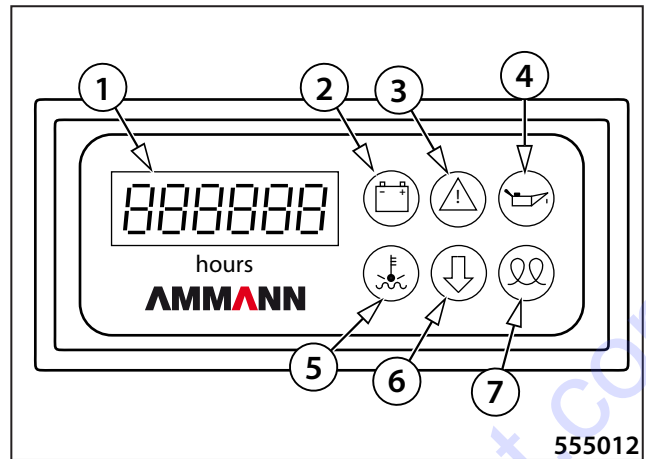
The safety bar indicator lamp is continuously on the whole time the safety bar is connected (optional equipment).

The safety bar indicator lamp also lights up during the activation of the near and remote halt.



Preheating indicator lamp (7)

The preheating time is approximately 6 seconds. The preheating indicator lamp turns off after the engine starts.



6.1.2 Error indication via LEDs on the display unit

Error indication (inclination switch)

Indication	Reason	Corrective action
Error lights up	The inclination switch activated. The roller is inclined by more than approx. 45° or overturned.	Set the machine upright.



If the roller overturns, the ignition deactivates for safety reasons.

The machine control is equipped with an inclination sensor. This sensor activates when the inclination angle exceeds 45°. The engine then

automatically turns off. After the sensor activates, the machine cannot be started.

If the machine is overturned, engine oil cannot reach the combustion chamber. Starting the engine after the machine is set upright again may cause engine damage.

Set the machine upright. Do not start the engine.

Contact Discount-equipment.

Error and Safety Bar indication

Indication	Reason	Corrective action
Error lights up	The switching transistor signals a status error. This means, for example, that a short circuit or broken cable has been detected.	Check that the cable is not short-circuited or broken.
The Error and Safety Bar indicator lamps are on simultaneously	The control unit of the machine waits until the "Oil Pressure" and "Alternator" inputs are in the basic position.	Check the Oil Pressure and Alternator outputs.



Pay attention to the indicator lamp priority: First the inclination switch, then "waiting" and finally the status error transistor.

Safety Bar indication

Indication	Reason	Corrective action
The Safety Bar indicator lamp is on	The safety bar switch activated.	Put the safety bar to the initial position.
The Safety Bar indicator lamp is flashing	Near halt detected.	Move at least 2.5 m away from the roller.
The Safety Bar indicator lamp is illuminated brightly	Near field detected.	If the roller is controlled using a cable, the user must be located in the so-called near field (at a distance of 2.5 to 4 m).



CAUTION!

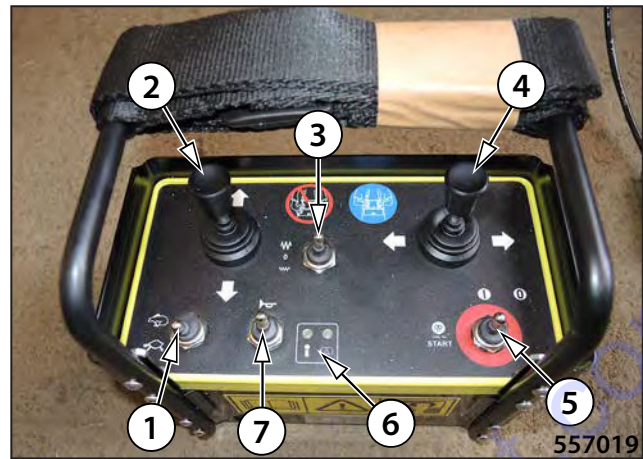
Pay attention to the indicator lamp priority: First the safety bar switch, then near halt and finally near field.

6 Cab and platform

6.1.3 Infrared light emitter

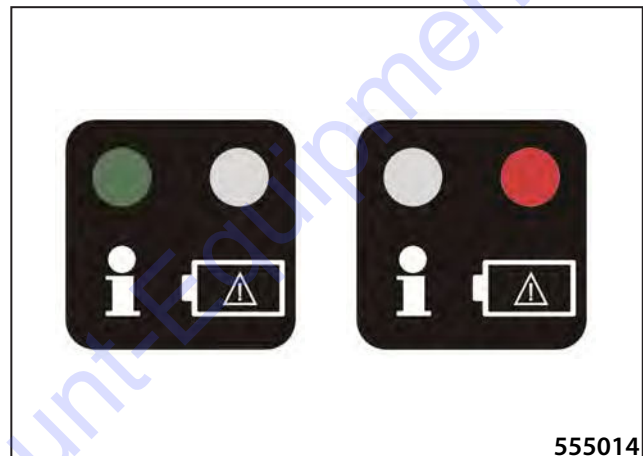
6.1.3.1 Layout

- 1 Working speed (tortoise) / transport speed (hare)
- 2 Forward / reverse
- 3 High / low amplitude vibration
- 4 Steering angle left / right
- 5 Start / Stop
- 6 LED indicators
- 7 Warning horn switch



6.1.3.2 Indication of faults by LEDs on the infrared light emitter

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



Standard indicator lamp (green)

Indicator lamp	Reason
The green LED is flashing slowly	The machine is controlled by the infrared remote control and cable
The green LED is flashing rapidly	The machine is controlled by the infrared remote control

Battery charge status indicator (red).

The red LED indicator flashes faster or slower depending on the battery charge status.

The more the battery is discharged, the slower the red LED indicator flashes.

When the battery is discharged, the red LED indicator lights continuously.

Controlling via the infrared remote control

Indicator lamp	Reason	Solution
The red LED is flashing.	The battery is running low.	Connect the charging cable for at least an hour.
The red LED is on.	The battery is discharged, the control does not work.	Connect the charging cable for at least an hour.

Controlling via the infrared remote control and cable

Indicator lamp	Reason	Solution
The red LED is flashing rapidly.	The battery is charging.	
The red LED is on.	The battery is fully charged.	



When the battery is discharged, the machine can still be controlled using a cable.

The battery warning and error are then indicated also during control (if the controller is activated).

When and as long as the infrared light emitter is connected via a cable to the machine's control unit and the ignition is in the "I" position, the red LED must be flashing or illuminated.

Automatic pairing function

- If you wish to control the machine via the infrared remote control, you must first perform a mutual assignment of addresses. This is only necessary when registering a new infrared remote control to the machine.
- Connect the cable to the emitter.
- Turn the ignition key to the "I" position.
- After about 3 seconds, you can disconnect the cable.
- The cable is not required for operation with the infrared remote control.

Indicator lamp	Reason
The green and red LEDs are both flashing rapidly.	The infrared remote control is paired with the control unit of the machine.

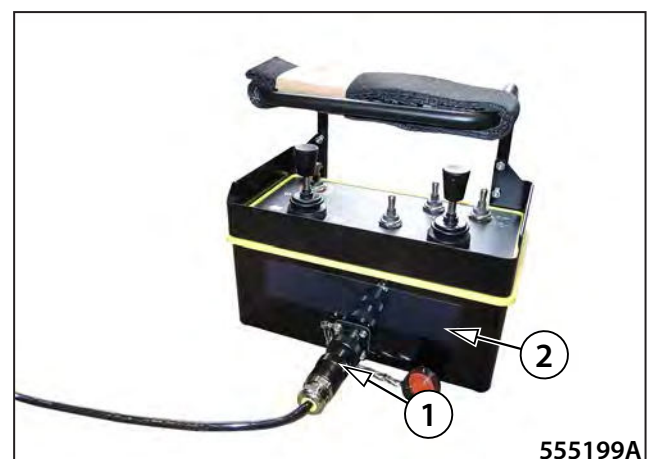
Note:

This process normally takes a maximum of 3 seconds. If the flashing is longer or even persistent, a pairing problem occurred:

- cable break in one of the signal connections,
- short circuit in one of the signal connections,

6.1.3.3 Cable connection

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



6 Cab and platform

6.1.3.4 Handling

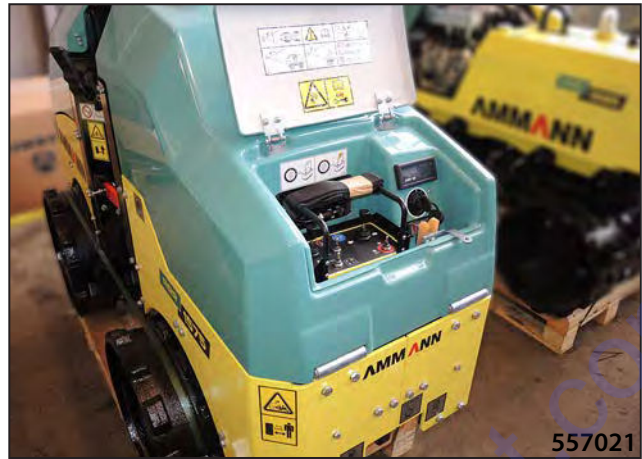
The infrared remote control is located under the dashboard cover.

It contains the following transmission elements:

- solar cells,
- infrared diodes for data transmission and measurement of safe distance.

Clean the transmission elements before starting.

Keep the solar cells clean during operation.



Risk of injury due to obstructed bottom part of the cover!

Before and during the operation with the infrared remote control, make sure the entire bottom part of the cover remains completely exposed throughout the whole operation.

The operator must not cover the bottom part of the cover, not even partially.

Proper carrying and use of the infrared remote control

Ensure correct positioning.

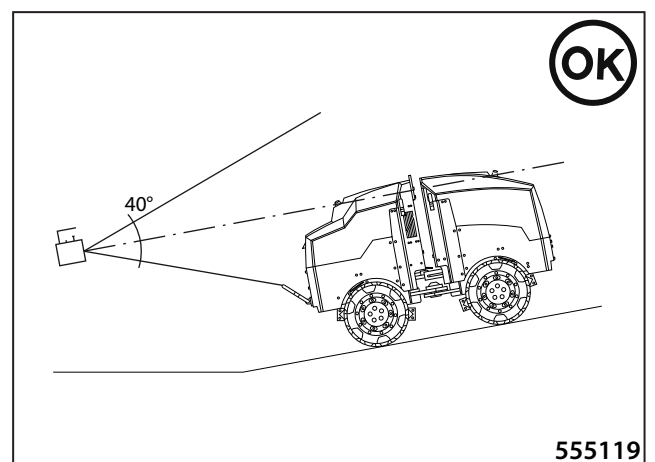
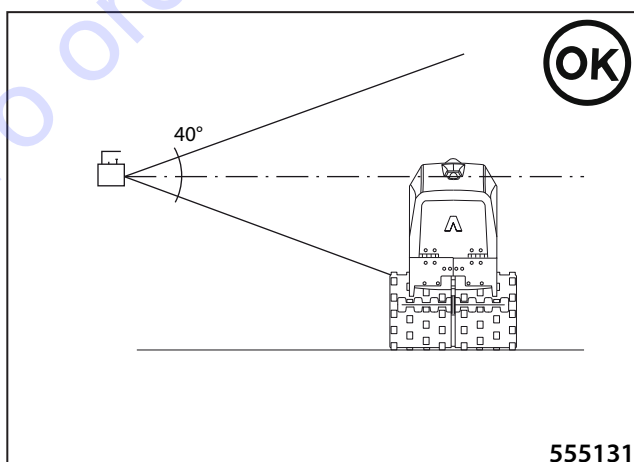
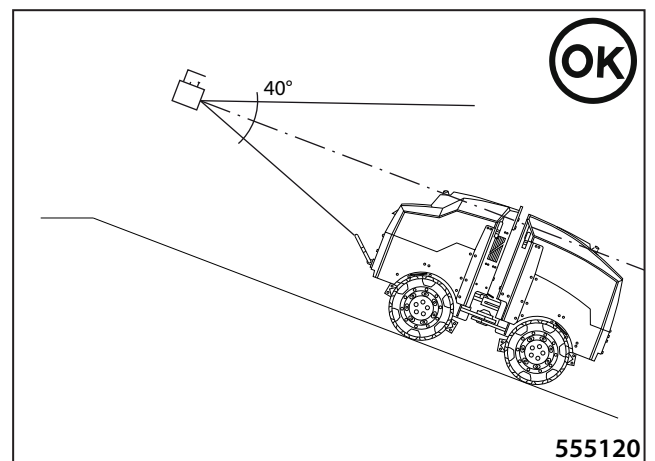
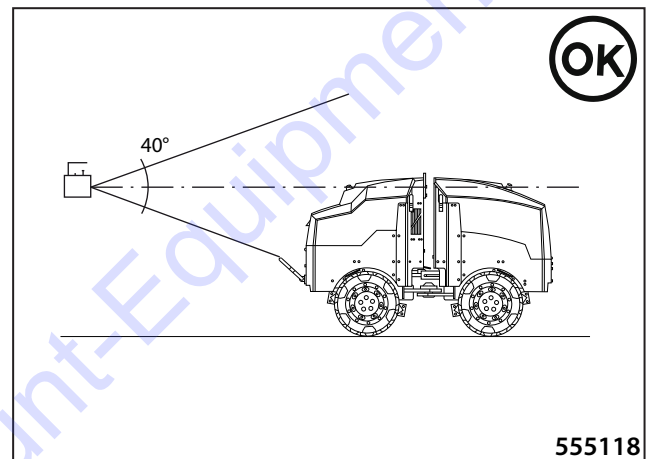
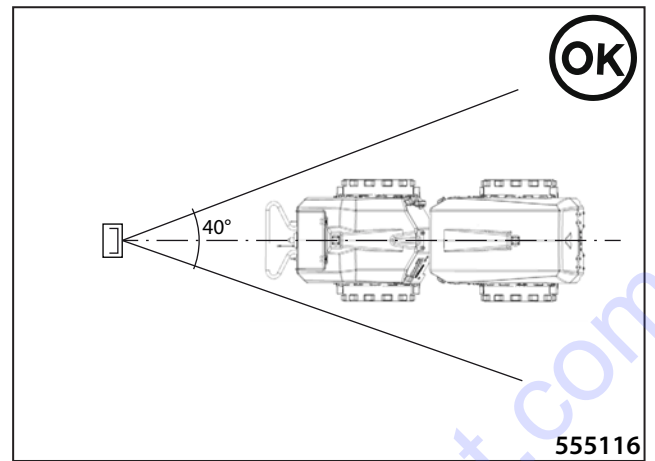
- Proper function requires direct visual contact between the manual infrared remote control and the infrared sensor on the machine.



The infrared sensor must always be in the area of effect of the infrared remote control.

The operating angle of the infrared remote control is 40°.

Proper use of the infrared remote control



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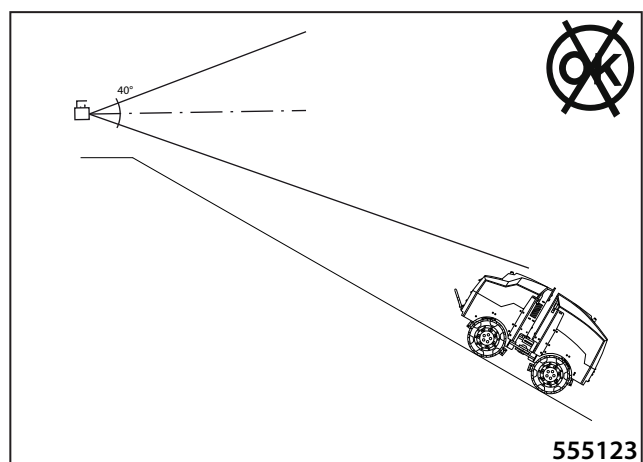
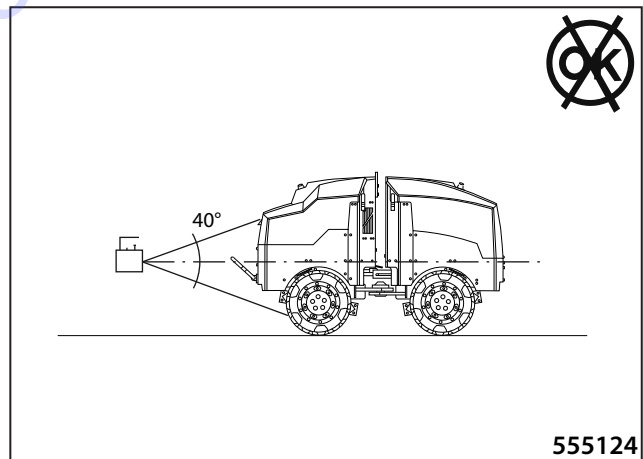
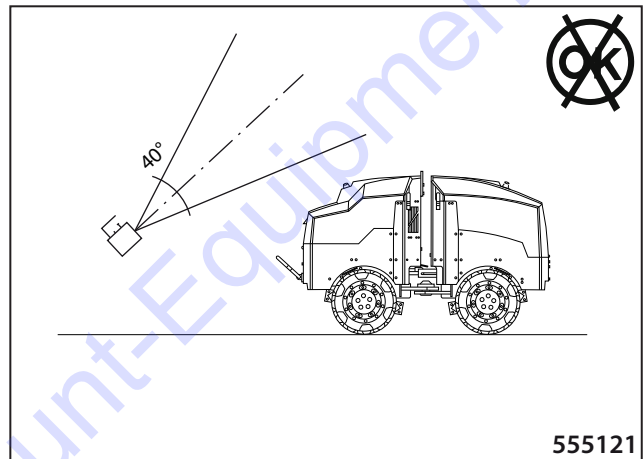
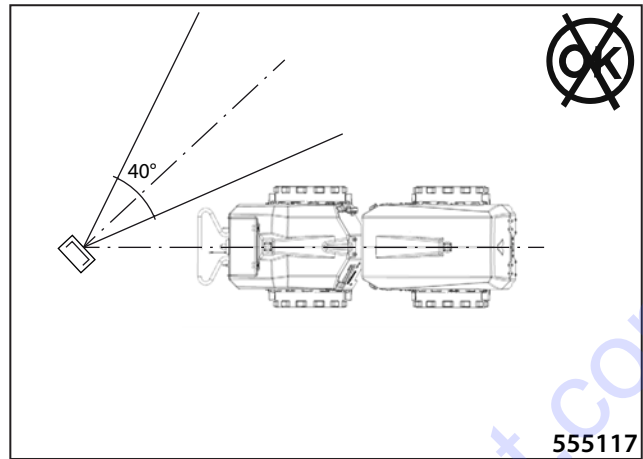
6 Cab and platform

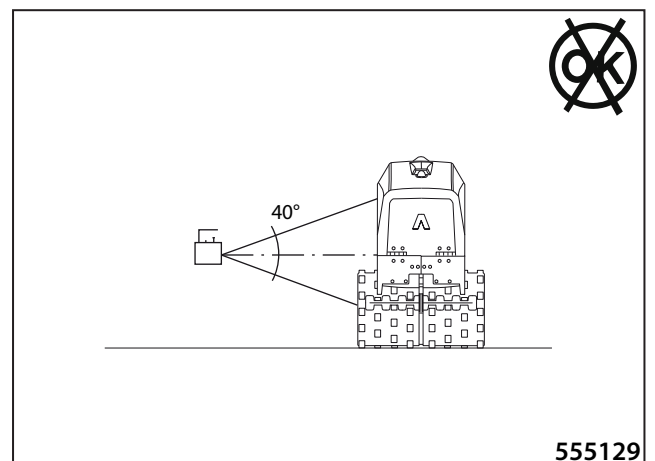
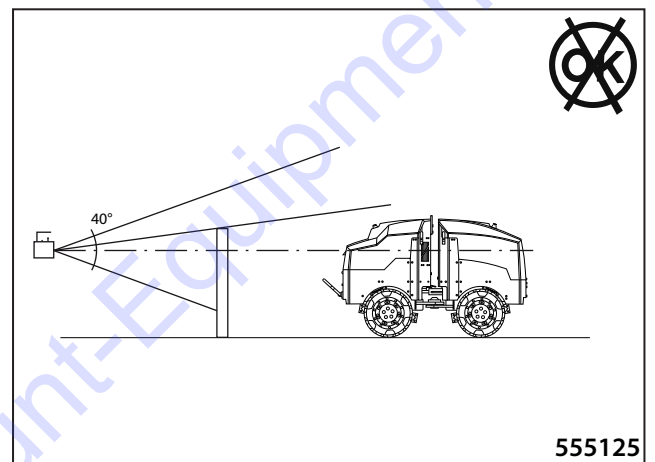
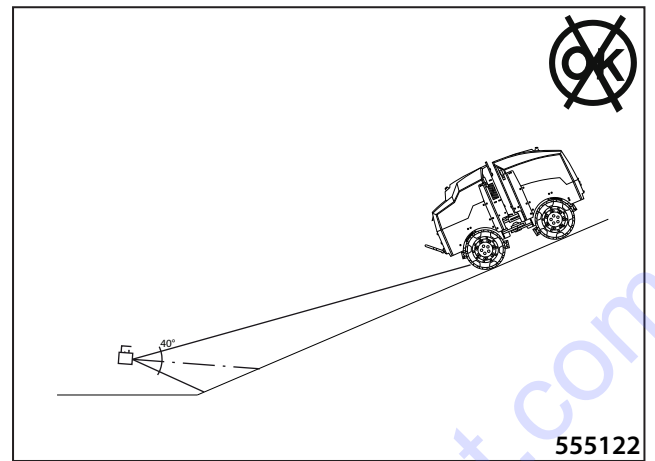
Improper use of the infrared remote control



During the operation of the machine, it is forbidden to use the infrared remote control without direct visual contact between the infrared remote control and the infrared sensor on the machine.

The operating angle of the infrared remote control is 40°.



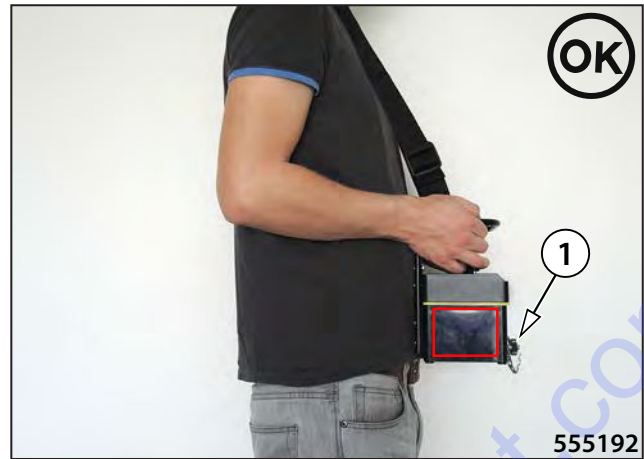


6 Cab and platform

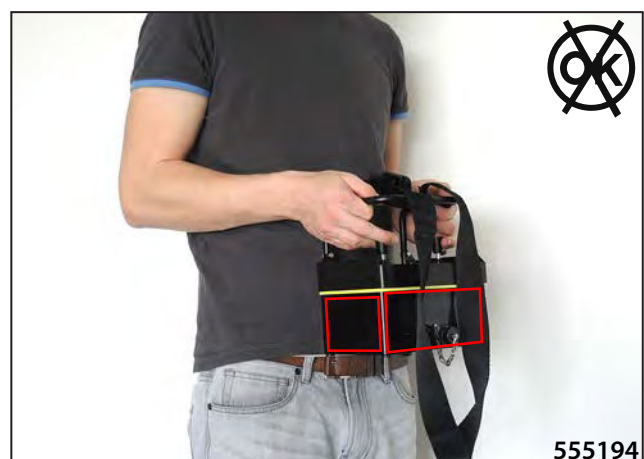


During operation, aim the infrared remote control in the direction of the machine only. The cable connector (1) must face forward.

- The infrared remote control can lean on the operator's body.



The side and front diodes of the infrared remote control must not be covered (e.g. by fingers, hand, foreign objects or dirt).





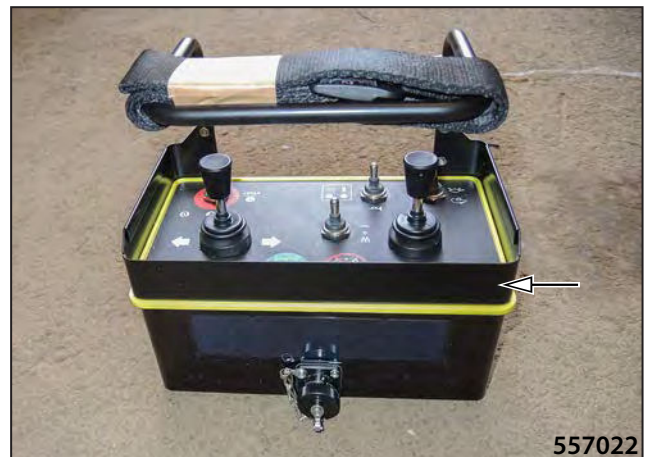
Do not aim the transmitter at reflective objects (large surfaces, light objects, other machinery, etc.).

Do not use the infrared remote control in the protected 2 m zone or if there is insufficient visual contact between the machine and the operator or the infrared remote control, unless stated otherwise.

For optimum comfort, adjust the strap to the correct length.



The infrared remote control is provided with a protective cover. This cover reduces risk of inadvertent covering of the side and front diodes with hands or fingers of the operator. Do not remove the cover from the infrared remote control.



6.3.3 Relays and fuses in the engine compartment

Dashboard fuses

The fuses are located under the cover in the dashboard.

F11 - 10 A.....Control unit, power supply

F12 - 25 A.....Control unit, outputs

F13 - 10 A.....Display unit, safety bar

F14 - 25 A.....Hydraulic oil cooler

Fuses in the engine compartment

The fuses are located above the engine.

F21 - 40 A.....Pull solenoid

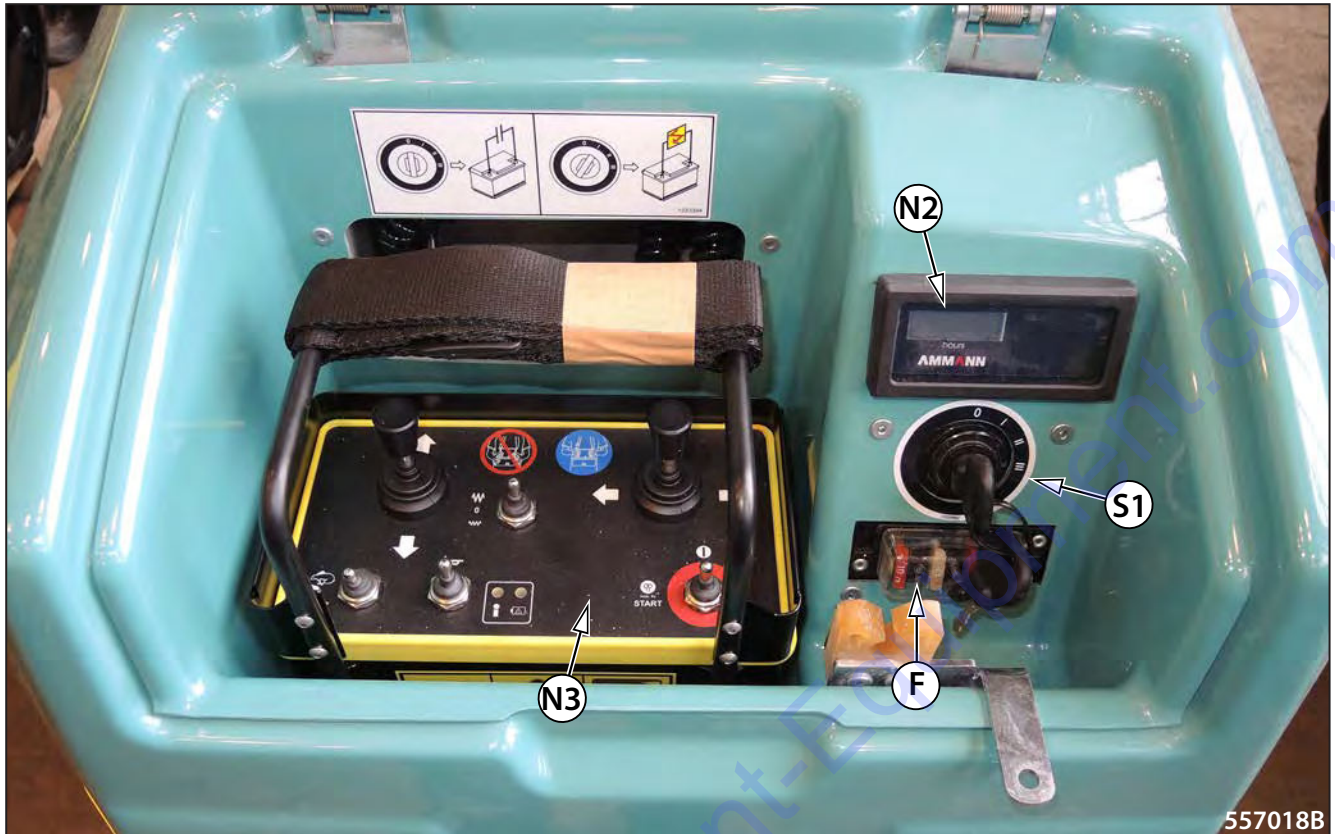
F22 - 10 A.....Fuel pump, alternator

F23 - 40 A.....Working speed

F24 - 40 A.....Ignition coil

F25 - 40 A.....Altitude sensor

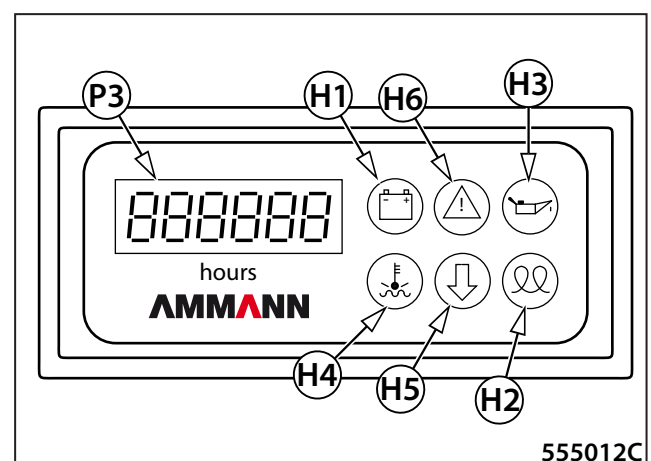
6.3.4 Dashboard



	Functions
N2	Display unit
N3	Infrared light emitter
S1	Ignition box

N2 display unit

	Functions
H1	Charging indicator lamp
H2	Preheating indicator lamp
H3	Oil pressure indicator lamp
H4	Water temperature indicator lamp
H5	Safety bar indicator lamp
H6	Error indicator lamp
P3	Operating hours counter



6 Cab and platform

6.3.4.1 Other components

6.3.4.2 N1 connector / cable harness



Make sure there is no water or dirt on the N1 connector.



List of harness wires / N1 connector

No.	Cross-section	Colour	from	Pin	to	Pin	Note
101	2.5	white	N1	1	F11	1	Control 12 V
102	2.5	white	N1	2	F12	2	Control 12 V
103	2.5	brown	N1	3	Casing - back		Casing - control
104	2.5	brown	N1	4	Casing - back		Casing - control
105	0.75	white	N1	5	K1	86	Ignition relay
106	0.75	white	N1	6	S1 19	9	Preheating relay
107	0.75	white	N1	7	S1 50	7	Ignition relay
108	1	white	N1	8	S25	1	Holding coil
109	0.75	white	N1	9	K5	86	Accelerator relay
110	1	white	N1	10	Y3	1	Forward
111	1	white	N1	11	Y4	1	Reverse
112	1	white	N1	12	Y3	2	Return line
113	1	white	N1	13	Y5	1	Steering to the left
114	1	white	N1	14	Y6	1	Steering to the right
115	1	white	N1	15	Y7	1	high amplitude
116	1	white	N1	16	Y8	1	low 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	Safety 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	+V12
125	1	brown	N1	26	X1	4	Casing
126	0.5	white	N1	27	N2	5	Engine oil pressure
127	0.75	white	N1	28	S24	1	Safety bar
128	0.5	white	N1	29	N2	6	Water temperature
129	1	white	N2	1	F13	3	+12 V
130	0.5	white	N2	3	S1 19	8	Preheating indicator lamp
131	0.5	white	N2	5	S21		Oil pressure indicator 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	Casing - back		Ignition relay
138	4	white	K2	30	M1	30	Battery 12 V
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	Input coil
142	0.75	white	K2	85	G1 D+	1	Ignition lock
143	0.75	white	K3 red		F21	1	Timer
144	0.75	brown	K3 black		Casing - engine		Timer
145	0.75	white	K3 red/black		K4	86	Timer
146	0.75	white	K3 yellow		K4	85	Timer

6 Cab and platform

No.	Cross-section	Colour	from	Pin	to	Pin	Note
147	1.5	white	K4	30	F21	1	Input relay
148	1.5	white	K4	87	Y1 white		Input coil
149	0.75	brown	K5	85	Casing - engine		Accelerator relay
150	1.5	white	K5	30	F23	3	Accelerator magnet
151	1.5	white	K5	87	Y2	+	Accelerator magnet
152	0.75	white	K6	86	S1 19	9	Preheating relay
153	0.75	brown	K6	85	Casing - engine		Preheating relay
154	4	white	K6	30	F24	4	Preheating
155	4	white	K6	87	R1		Preheating
156	0.75	white	K7	86	S25	2	Cooler relay
157	0.75	brown	K7	85	Casing - back		Cooler 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	Safety bar
161	0.75	white	S24	4	F13	3	Safety bar
162	4	white	G1 30		M1	30	Charging current
163	0.75	white	G1 15	2	F22	2	Exciter voltage
164	0.75	white	M2		F22	2	Diesel fuel pump
165	1	brown	M2		Casing - engine		Diesel fuel pump
166	1.5	brown	Y1 black		Casing - engine		Holding coil
167	1	white	Y3	2	Y4	2	Return line
169	1	brown	Y5	2	Casing - engine		Steering to the left
170	1	brown	Y6	2	Casing - engine		Steering to the right
171	1	brown	Y7	2	Casing - engine		high amplitude
172	1	brown	Y8	2	Casing - engine		low amplitude
173	1	brown	Y9	2	Casing - engine		Brake valve
174	1.5	brown	Y2		Casing - engine		Accelerator magnet
175	1	brown	N2	8	Casing - back		Display unit
176	2.5	brown	M3	2	Casing - back		Oil cooler
177	1.5	white	F13	C	F14	D	Display unit
178	2.5	white	F12	B	S1 15	6	Control 12 V
179	1	white	F12	B	F11	A	Control 12 V
180	4	white	M1	30	S1 30	1	+12 V
181	4	white	M1	30	F24	D	Preheating
182	1.5	white	M1	30	F23	C	Accelerator magnet
183	4	brown	Casing - engine		Casing - back		Connection
184	4	brown	Casing - engine		Casing - front		Connection
185	1	white	S25	1	Y1 red		Holding coil
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	Casing - engine		2. Holding coil Y11

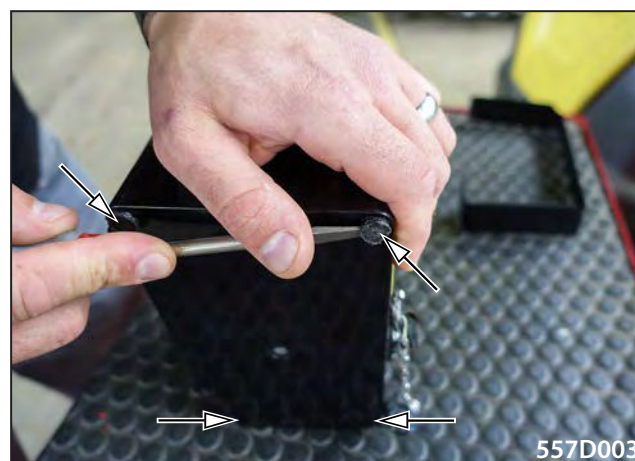
6.4.1 Replacement of the remote control battery

Removal

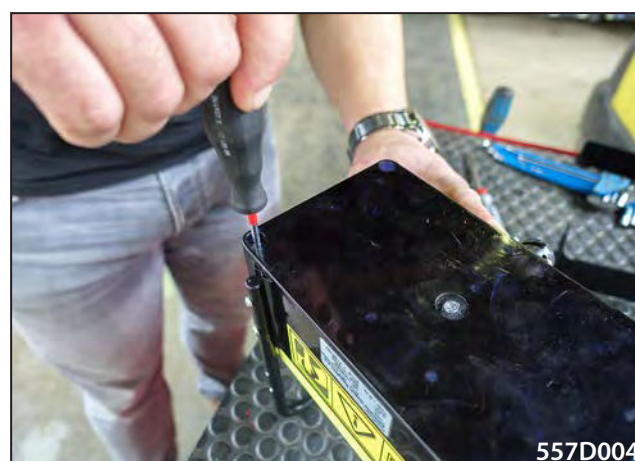
Remove the protective cover.



Remove the rubber gaskets.



Remove the screws.

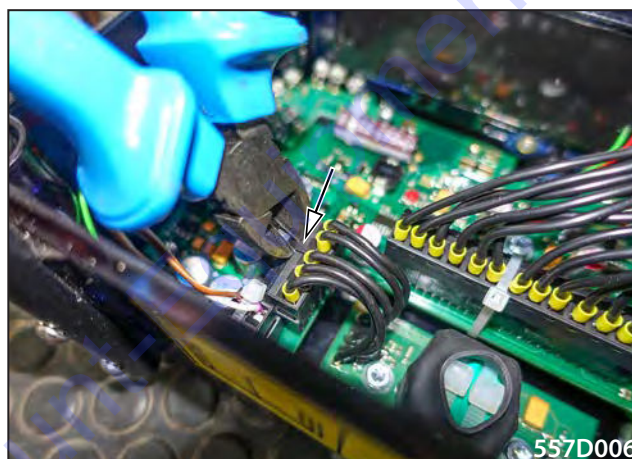


6 Cab and platform

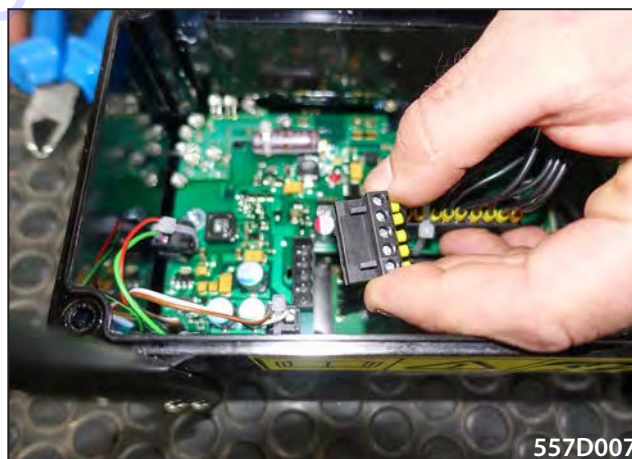
Open the top of the remote control.



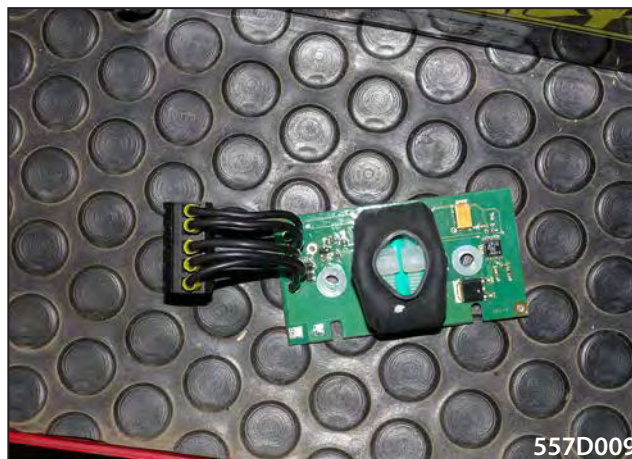
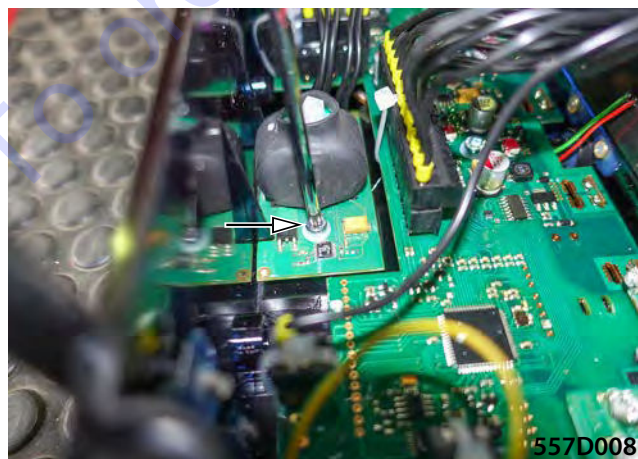
Remove the connector fastening strip.



Disconnect the connector.

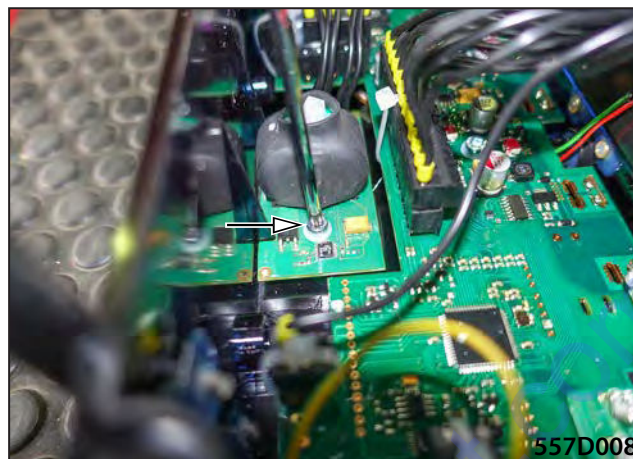


Remove the battery.

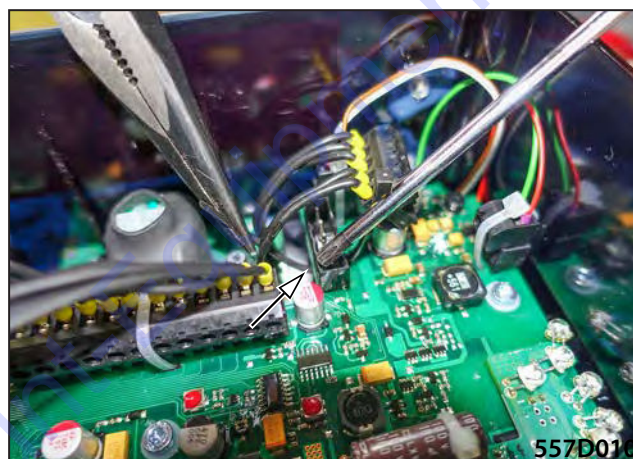


Installation

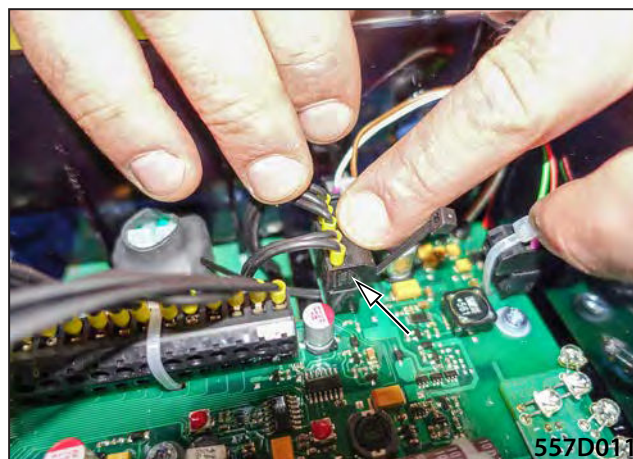
Insert the battery.



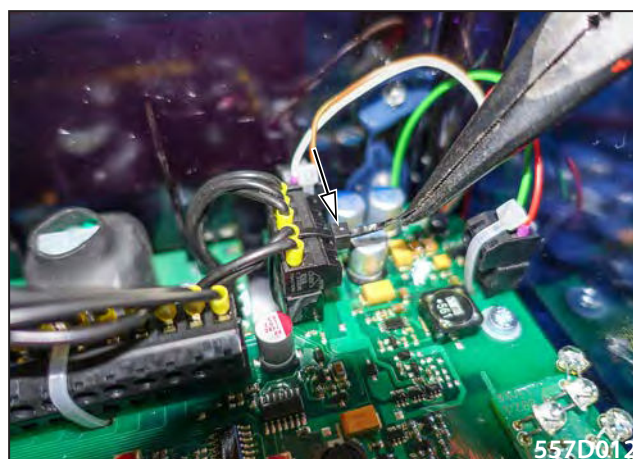
Pull the fastening strip through the hole under the connector.



Connect the connector.



Fasten the connector with the fastening strip.

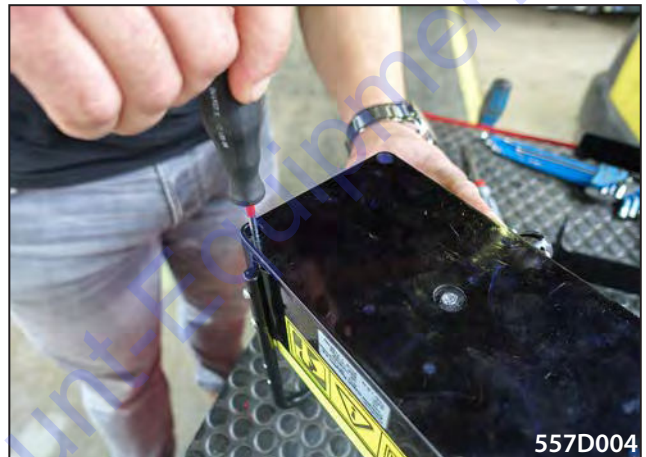


6 Cab and platform

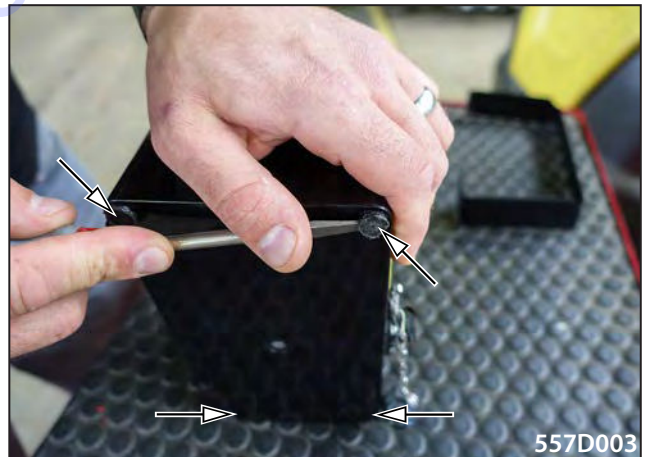
Shorten the fastening strip.



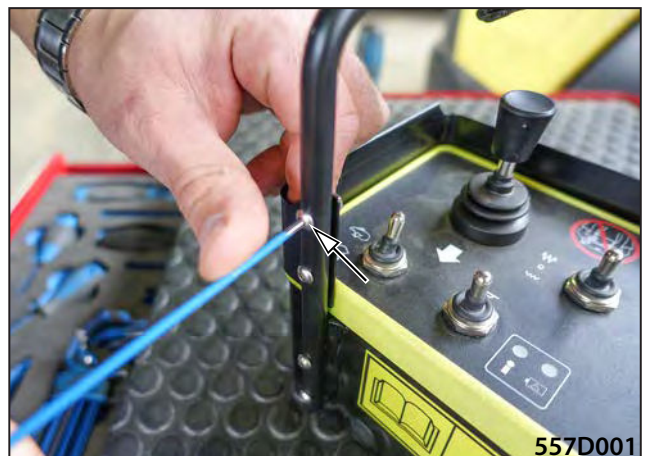
Install the top of the remote control using the screws.



Install the rubber gaskets.



Install the protective cover.



6.4.2 Replacement of the display unit

Disconnect the N2 connector.



Remove the two fasteners of the display unit.



You can now extract the display unit.



Install the new unit in the reversed order.

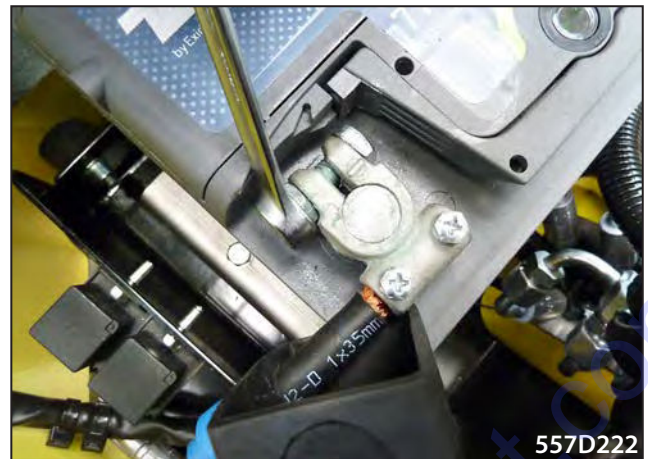


6 Cab and platform

6.4.3 Replacement of the control unit

Removal

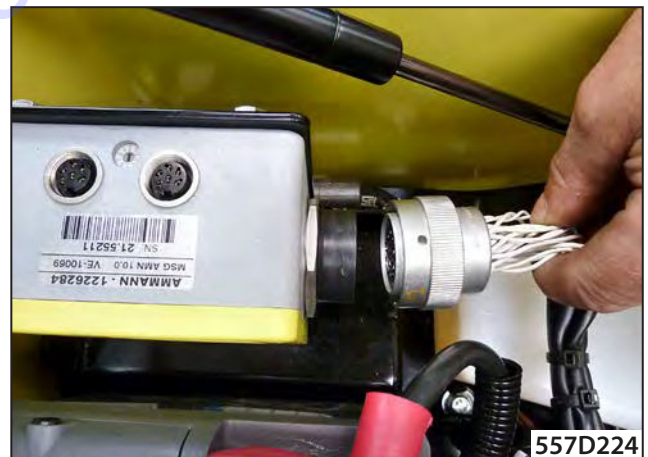
Remove the battery clamp (-).



Disconnect the connectors of the control unit.



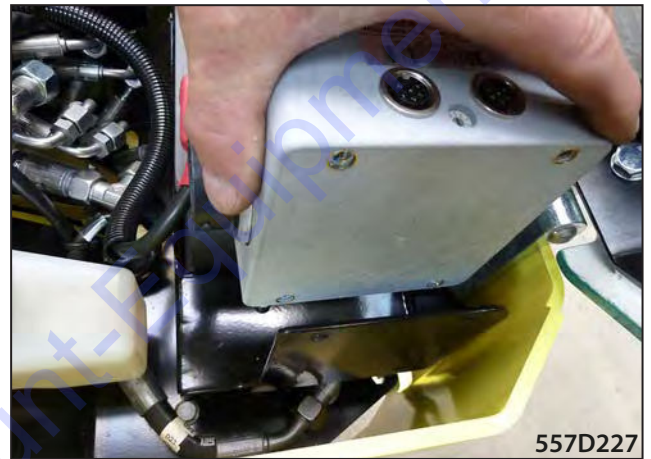
Disconnect the N1 connector.



Use a screwdriver to lift the clamp
Pull away the gas cylinder from the ball joint.



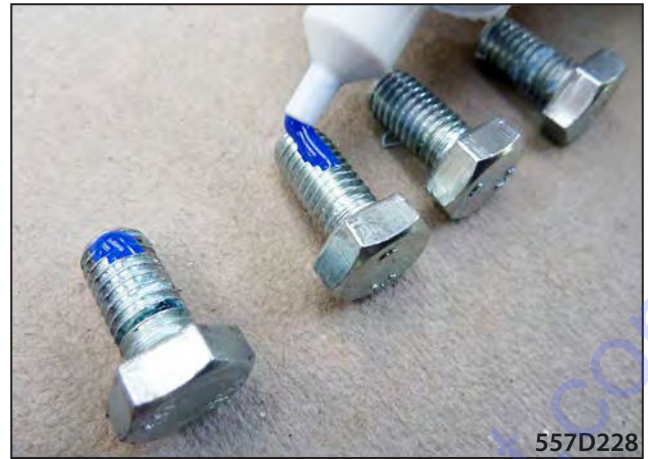
Remove the control unit fastening screws and remove the unit.



6 Cab and platform

6.4.3.2 Installation

Apply blue adhesive on the screws.

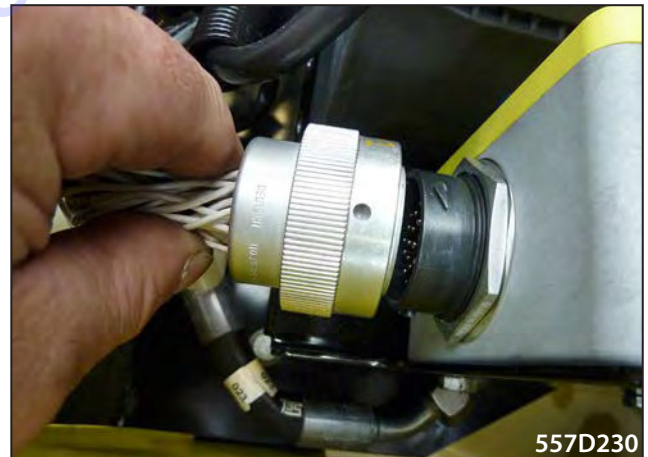


Install the control unit using the screws.



Connect the N1 connector.

Connect the battery terminal (-).



7 Front drum

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7 Front drum

7.2 Hydraulic parts

7.2.1 Travel drive/vibration hose

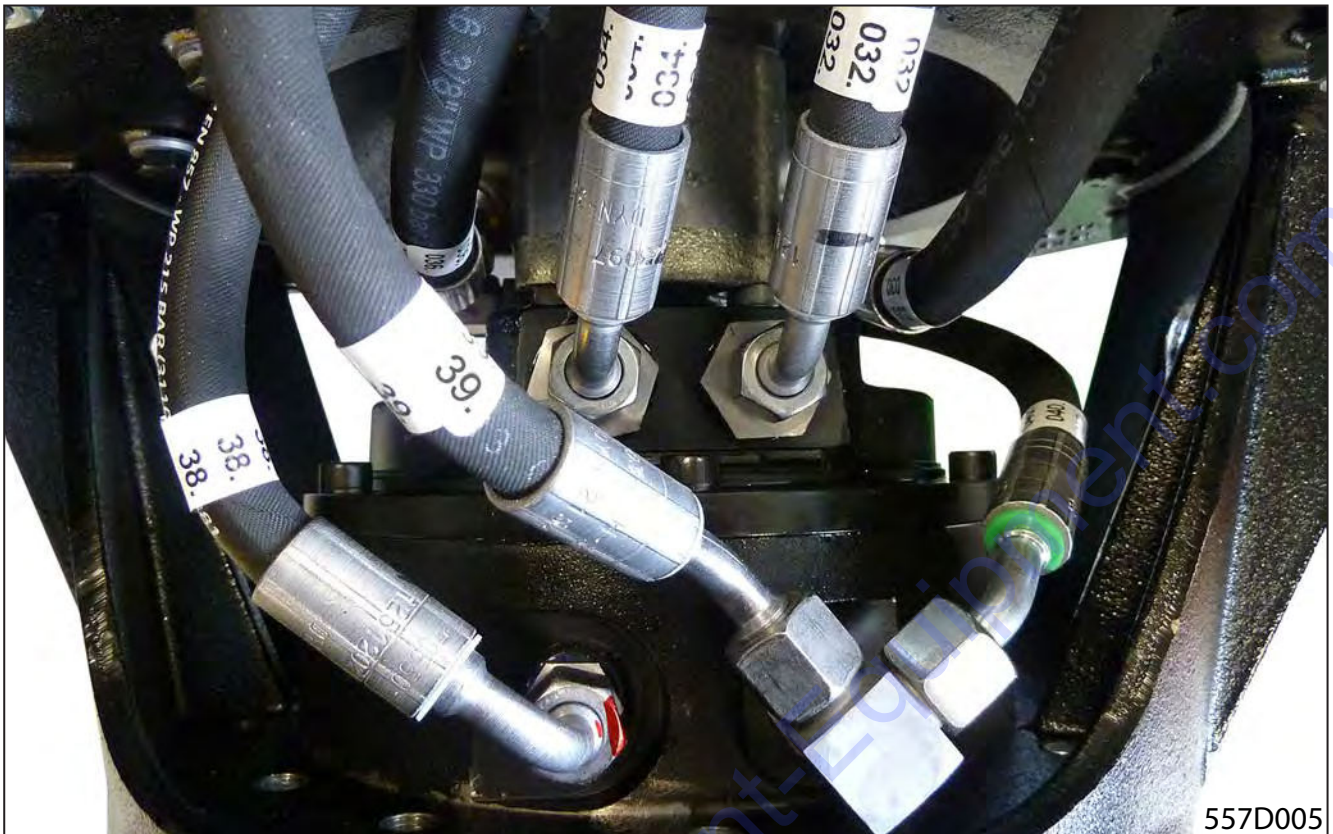
Drum, front left



Drum hose, front left

No.	from	to
31	Travel circuit B forward	Hydraulic block, left
33	Travel motor brake	Valve block BR
35	Travel circuit A reverse	Travel pump A – T neck
37	Leaked oil – travel motor, front left – L neck	Valve block T3
38	Brake, front left	Travel motor brake, front right
39	Leaked oil – travel motor, front left – L neck	Leaked oil – travel motor, front right – L neck

Drum, front right



Drum hose, front right

No.	from	to
30	Vibration motor front	Valve block A1
32	Travel circuit B forward	Hydraulic block right
34	Travel circuit A reverse	Travel pump A – T neck
36	Vibration motor, front, connection rear	Vibration interface – angled divider neck
38	Travel motor brake, front right	Travel motor brake, left – L neck
39	Leaked oil – travel motor, front right – L neck	Leaked oil – travel motor, front left – L neck
40	Leaked oil – travel motor, front right – L neck	Leaked oil vibration motor front

7 Front drum

Drum, rear left



Drum hose, rear left

No.	from	to
50	Vibration motor rear, connection rear	Interface, rear, angled neck
52	Travel circuit B forward	Interface, rear
54	Travel circuit A reverse	Interface, rear
56	Vibration motor rear, connection front	Interface, rear, angled neck
58	Travel motor brake, rear left	Travel motor brake, rear right – L neck
59	Leaked oil – travel motor, rear left – L neck	Leaked oil – travel motor, rear right – L neck
60	Leaked oil – travel motor, rear left	Leaked oil – vibration motor, rear

Drum, rear right



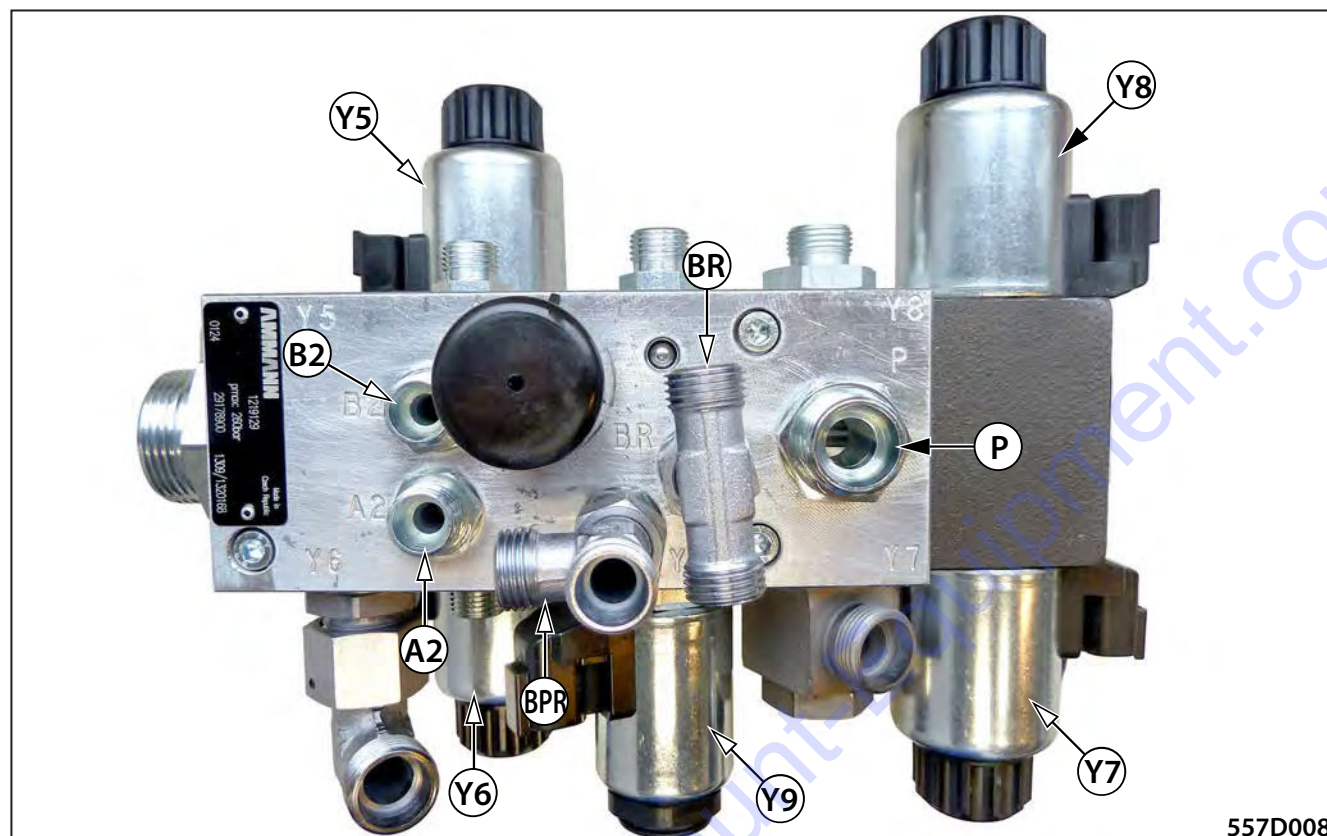
Drum hose, rear right

No.	from	to
51	Travel circuit A reverse	Interface, rear
53	Travel motor brake rear right	Interface, rear
55	Travel circuit B forward	Interface, rear
57	Leaked oil – return flow	Hydraulic oil tank – return flow
58	Travel motor brake, rear right – L neck	Travel motor brake, rear left
59	Leaked oil – travel motor, rear right – L neck	Leaked oil – travel motor, rear left – L neck

7 Front drum

7.2.2 Valve block connections

Valve block – top view



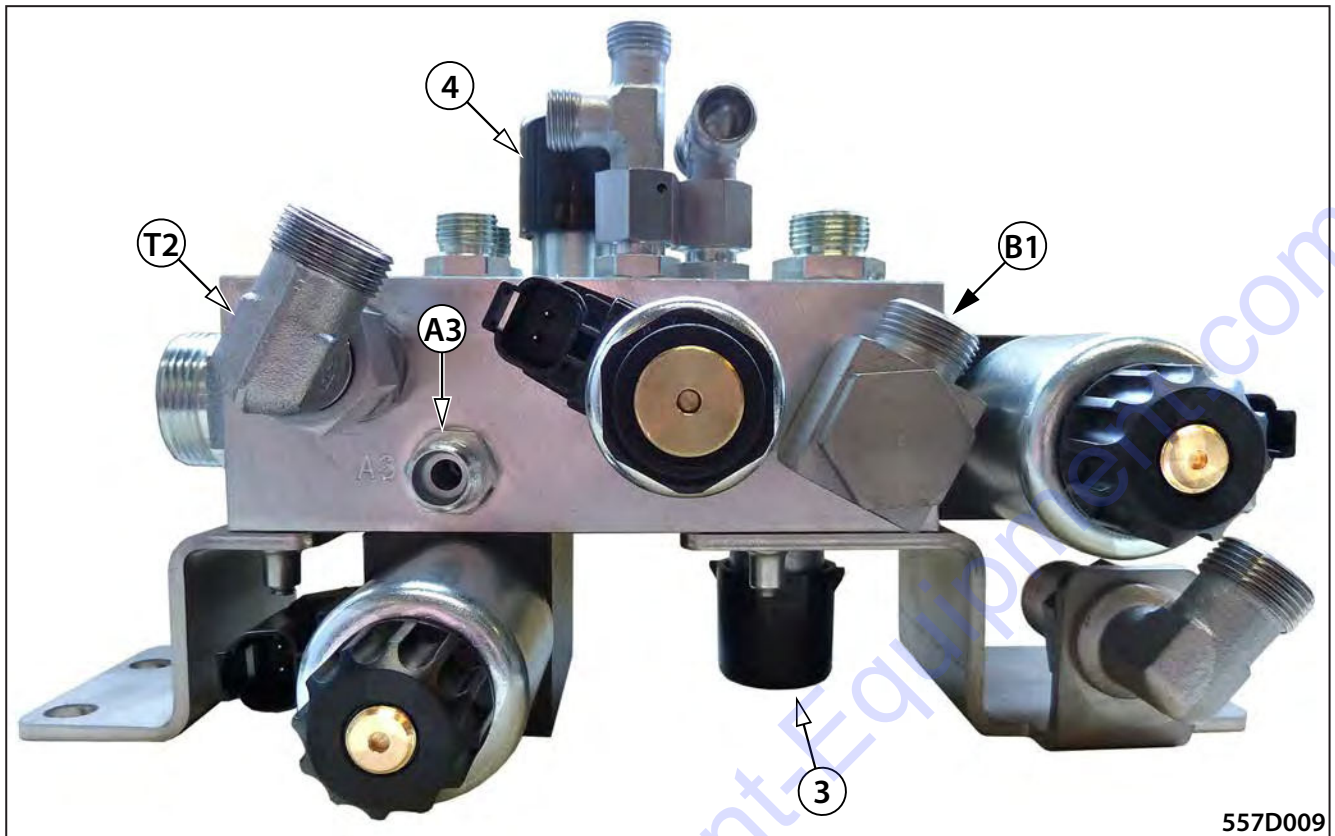
Valve block – solenoid valves

No.	Designation
Y5	Steering to the left
Y6	Steering to the right
Y7	High amplitude
Y8	Low amplitude
Y9	Brake

Valve block – connections

No.	Designation
BR	Brake
PBR	Travel pump G supply pressure
P	Vibration control pump pressure
A2	Steering to the right / right steering piston
B2	Steering to the left / right steering piston

Valve block – front view



557D009

Valve block – connections at the front

No.	Designation
T2	Tank line to travel pump T1
A3	Steering to the left / left steering piston
B1	Vibration motor rear left / high amplitude, angled divider screw connection

Valve block – pressure drain valve

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

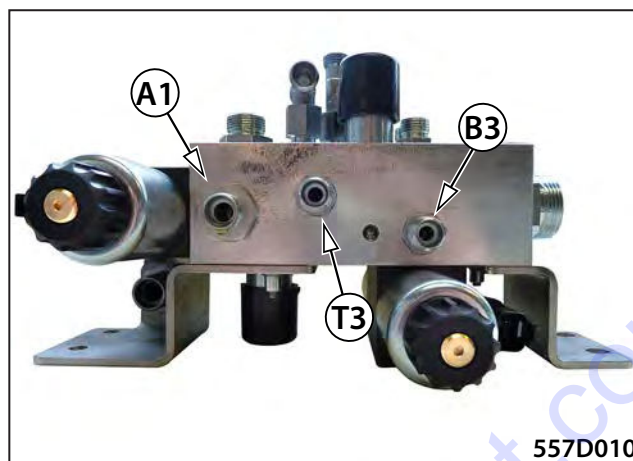
* Values measured at an engine speed of at least 2380 rpm / max. 2430 rpm

7 Front drum

Valve block – rear view

Valve block – hydraulic hose connections, rear

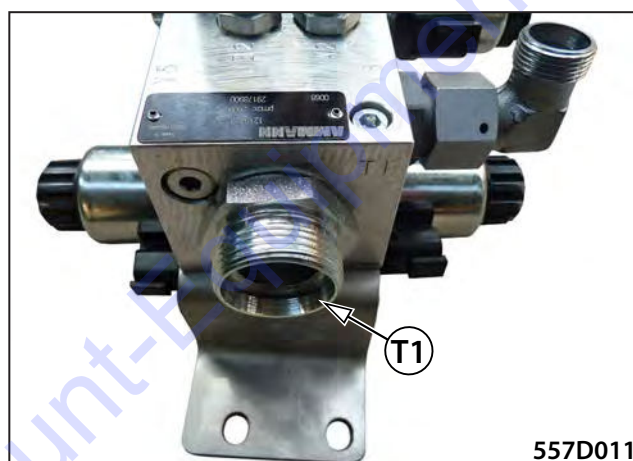
No.	Designation
A1	Vibration motor front right – low amplitude
T3	Leaked oil / travel motor, front left and right
B3	Steering to the left / left steering piston



Valve block – right view

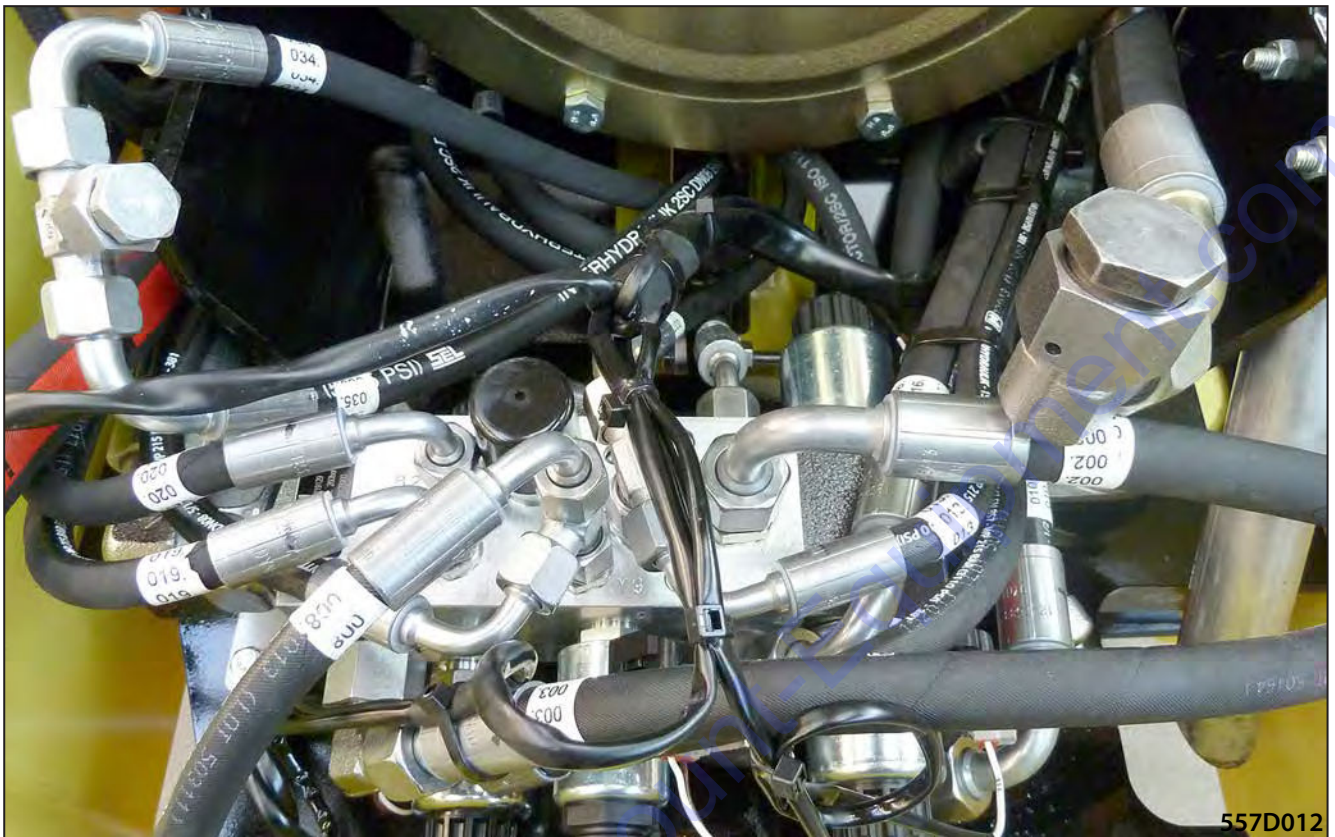
Valve block – return line

No.	Designation
T1	Return flow through the oil cooler, return flow filter in the hydraulic oil tank



7.2.3 Valve block hose

Valve block – top view



Valve block – solenoid valves

No.	from	to
2	Valve block P	Vibration – steering pump pressure – L neck
3	Valve block T2 – angled neck	Travel pump T1
4	Valve block T1 – angled neck	Hydraulic oil cooler – angled neck
7	Valve block PBR – L neck	Quantity divider T
8	Valve block PBR – L neck	Travel pump G – L neck
13	Valve block BR – T neck	Interface, rear
16	Valve block B1	Interface, rear – angled neck
17	Valve block B3	Left steering piston – cylinder
18	Valve block A3	Left steering piston – piston rod
19	Valve block A2	Right steering piston – cylinder
20	Valve block B2	Right steering piston – piston rod
30	Valve block A1	Vibration motor at the front, connection at the front
33	Valve block BR – T neck	Travel motor brake, front left – L neck
37	Valve block T3	Leaked oil – travel motor, front left – L neck

7 Front drum

Valve block – divider neck



Valve block – solenoid valves

No.	from	to
10	Divider neck near the valve block holder	Interface, rear – angled neck
36	Divider neck near the valve block holder	Vibration motor, front, connection rear

Interface, rear



7.4 Mechanical parts

7.4.1 Removal of the drum extension

Remove the drum scrapers.

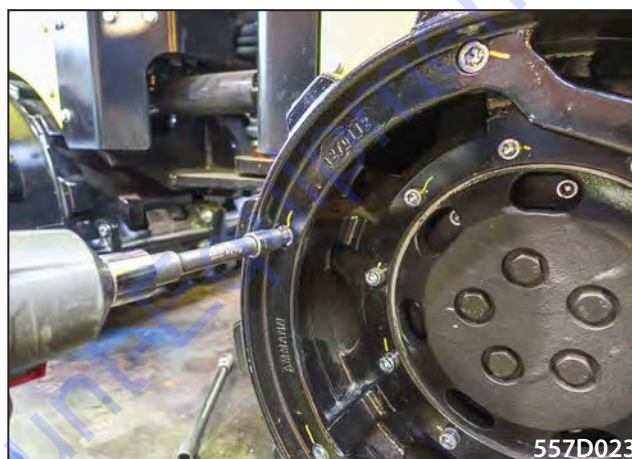


7 Front drum

Support the frame using a jack.



Remove the drum extension screws.



7.4.2 Drum removal

Support the machine using a jack.

Hang the drum on a crane and lift it slightly.



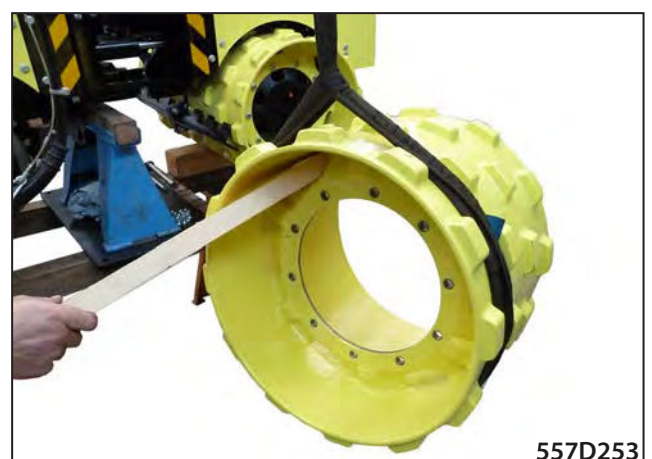
Remove the drum fastening screws.



Move the drum using a suitable tool under the chassis outwards.
Keep the drum balanced using an aid (e.g. squared wood)



Store the drum safely for reuse.



7 Front drum

7.4.3 Replacement of vibration unit rubber elements

If any rubber element has cracks deeper than 10 mm, it must be replaced.

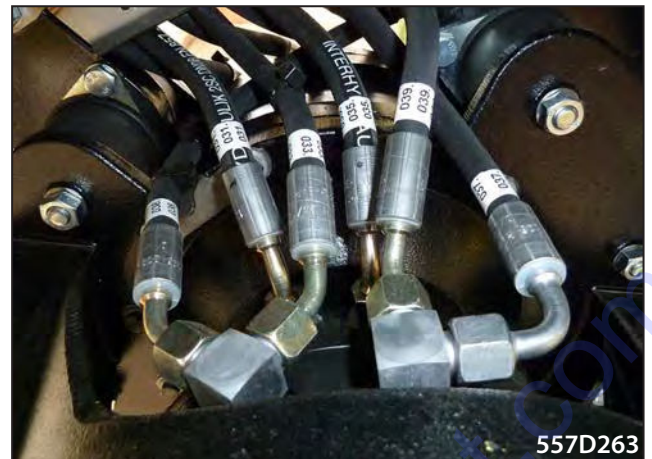
Removal

Remove the drum (Chapter 7.4.2).

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Clean the hoses and surroundings.

Before hanging the hoses, place an oil drip container under the travel motor.



557D263



557D264

Remove all hoses at the travel motor.

Close the screw union.



557D265

Install the aid on the travel hydraulic motor flange.

Hang the aid on a crane.



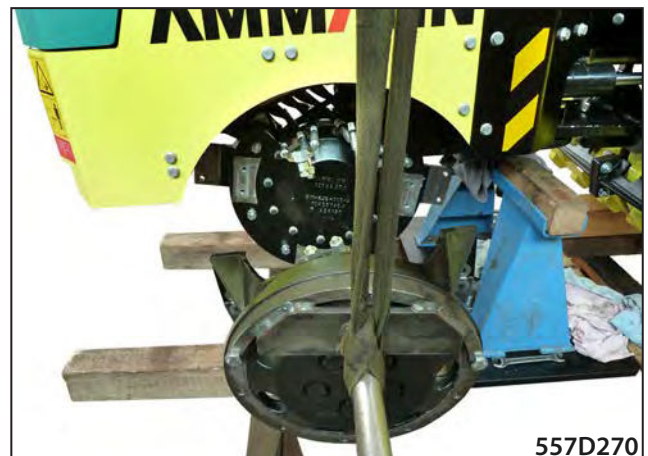
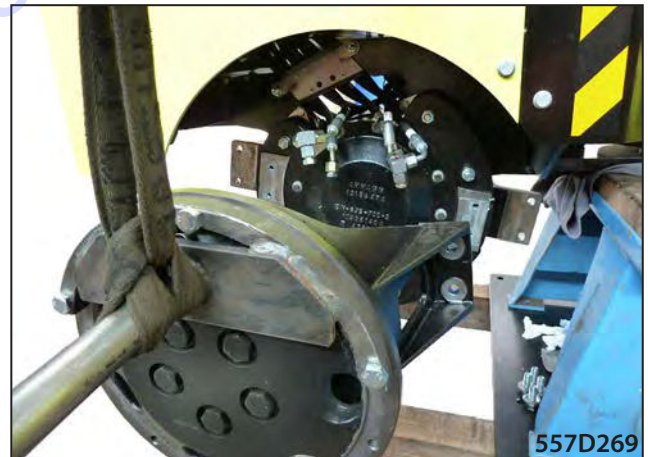
557D266

7 Front drum

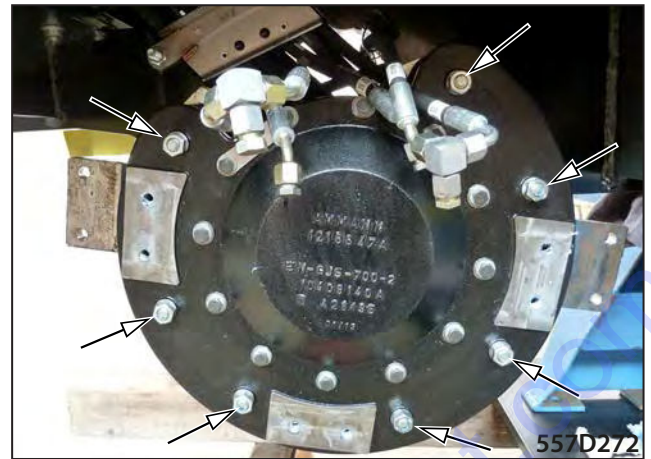
Remove the screws of the travel hydraulic motor attachment.



Remove the travel hydraulic motor and put it aside.

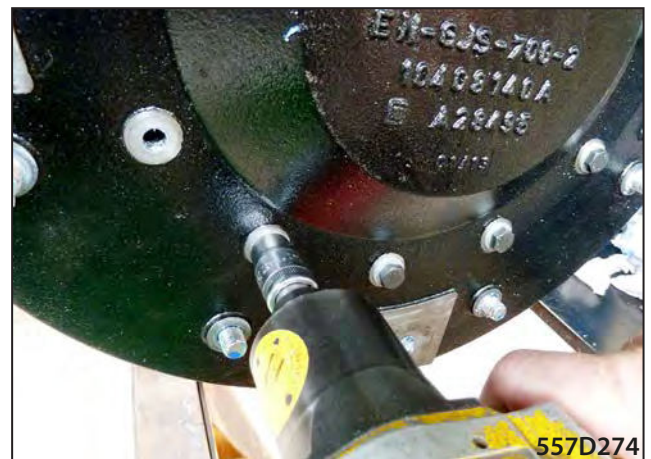


Remove the nuts on the gearbox cover.



Put an oil drip container under the gearbox.

Remove the screws on the gearbox cover.



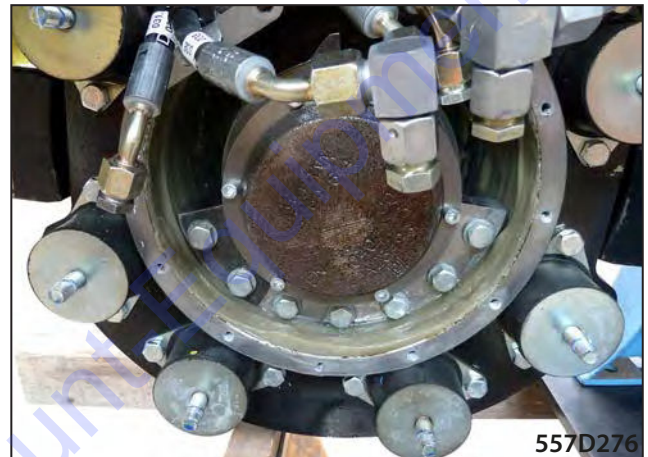
7 Front drum

Put the gearbox cover aside.

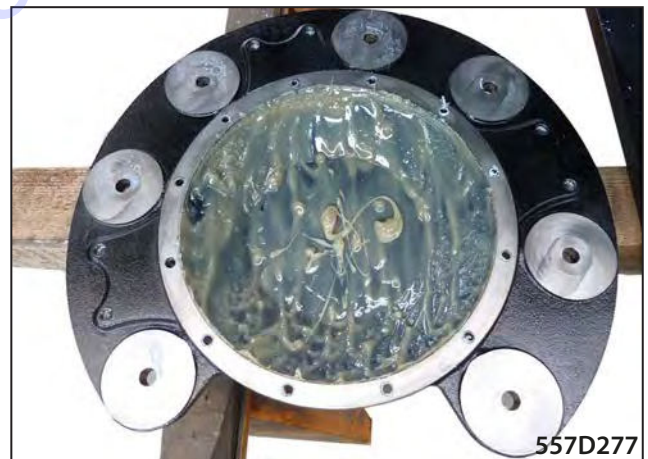


Grease comes out of the gearbox.

The same amount of grease then must be refilled during reassembly.

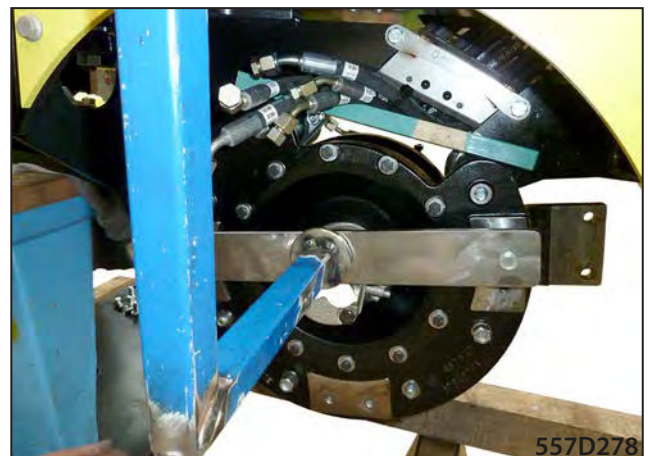


Store the gearbox cover safely for reuse.



Install the aid on the gearbox cover.

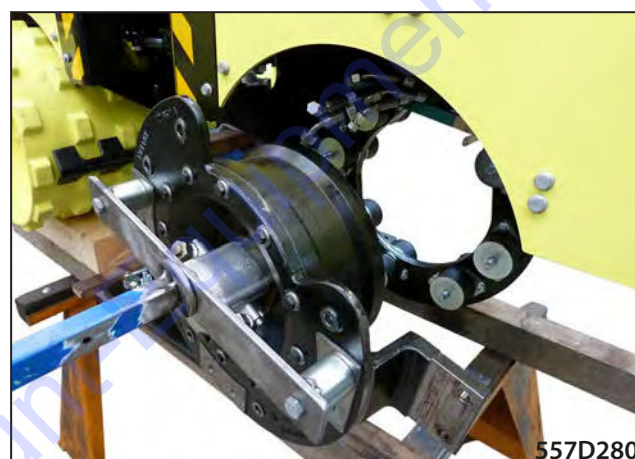
Hang the aid on a crane.



Remove the nuts on the gearbox cover.



Remove the gearbox and put it aside.



7 Front drum

7.4.3 Disassembly of the vibration unit

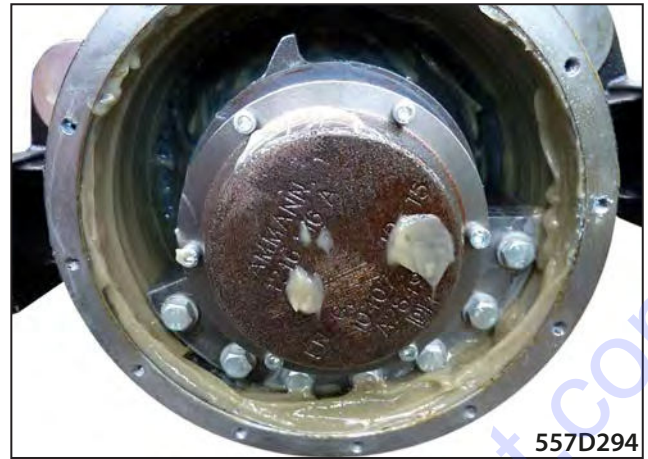
View of the vibration housing after opening.



The grease in the housing is consumed after a certain number of operating hours and must be refilled.

The following steps were performed on a new vibration unit. The grease is therefore unconsumed and light in all pictures.

Clean the vibration housing, remove the consumed grease.



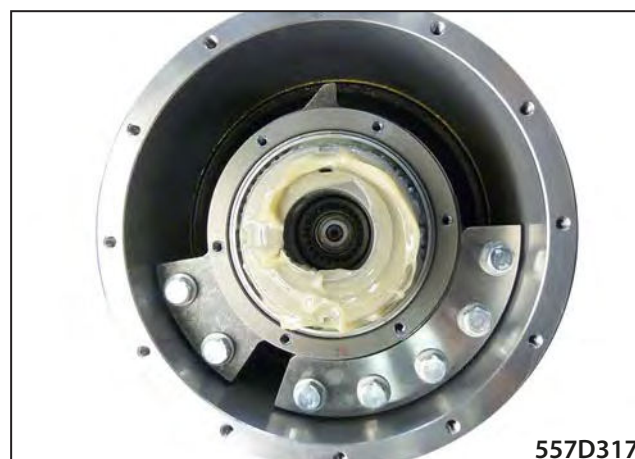
Remove the screws on the bearing cap.



Remove and clean the bearing cap.

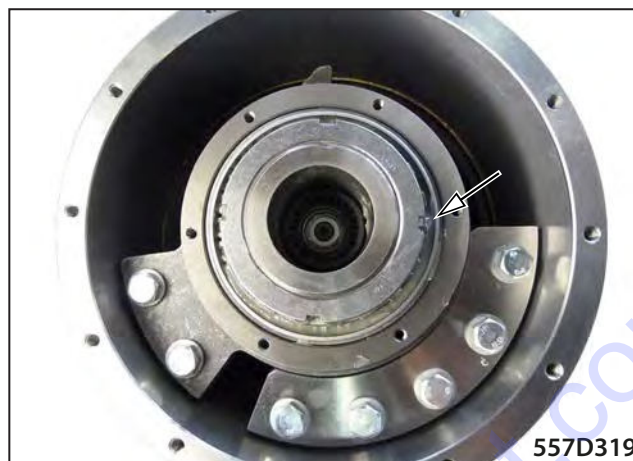


Remove the grease on the hub.



7 Front drum

Loosen the grooved nut lock.
Use a small chisel or screwdriver.

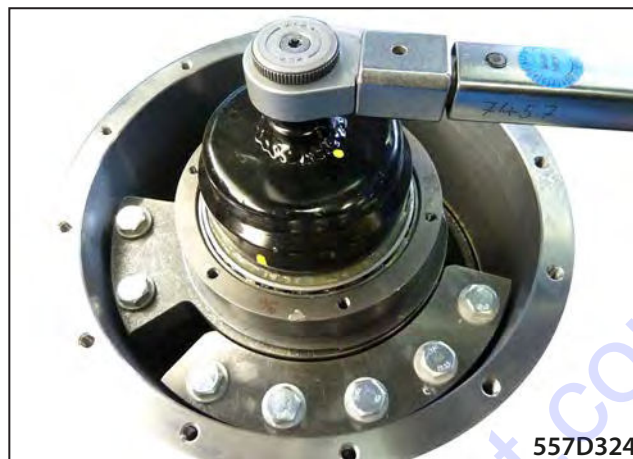


Mount the special "spanner for grooved nuts" tool.



7 Front drum

Loosen the grooved nut lock.



Remove the grooved nut.



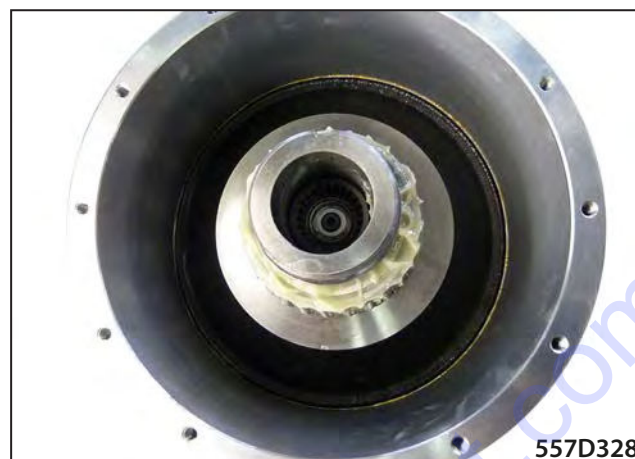
Remove the grooved nut lock.



Lift the vibration unit from the shaft.



Remove the grease on the hub.



Remove the spacer rings.

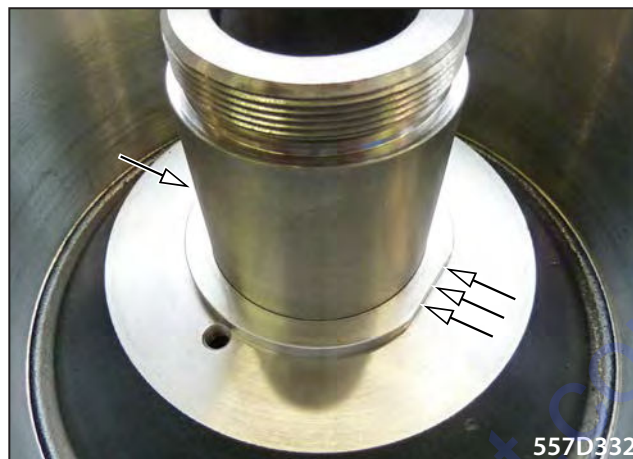


Pull the bearings from the hub using the pulling tool.

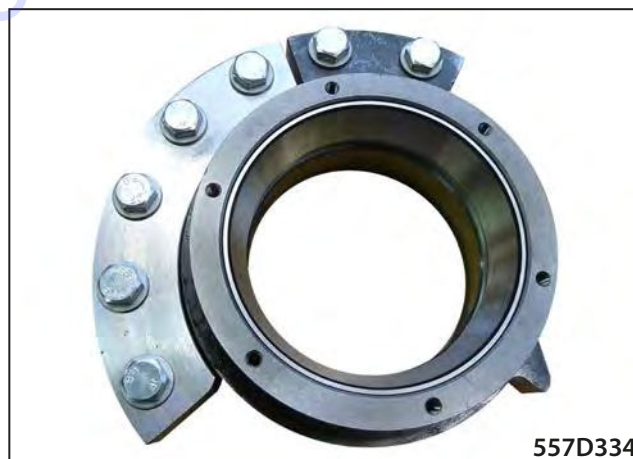


7 Front drum

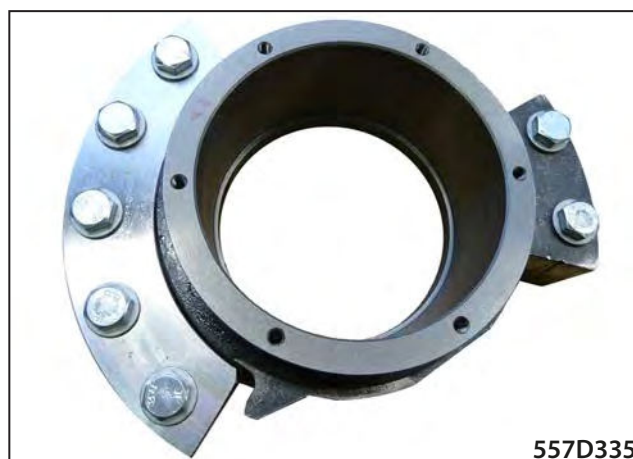
Mount the pulling tool here (arrow).



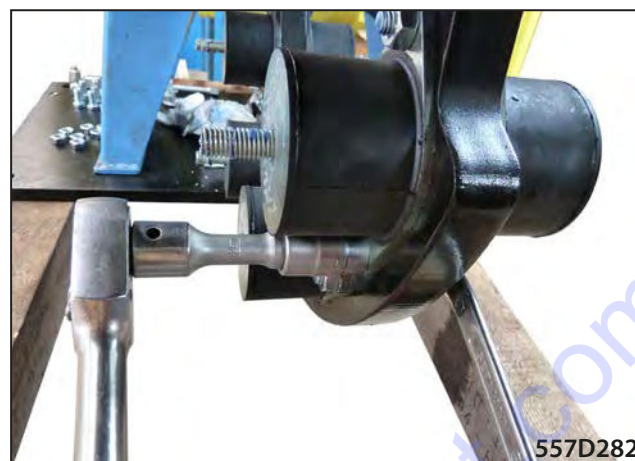
Remove the outer bearing rings and the spacer ring.



Clean the bearing housing.



Remove the rubber-metal elements.



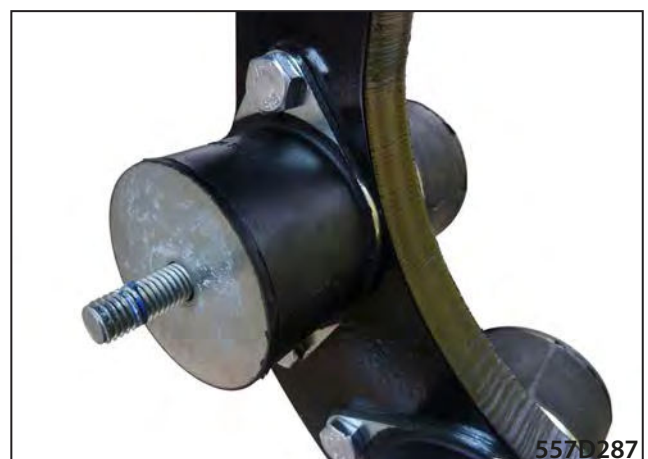
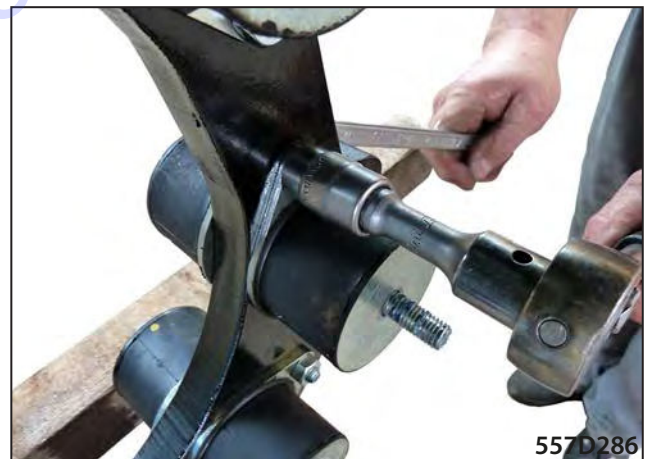
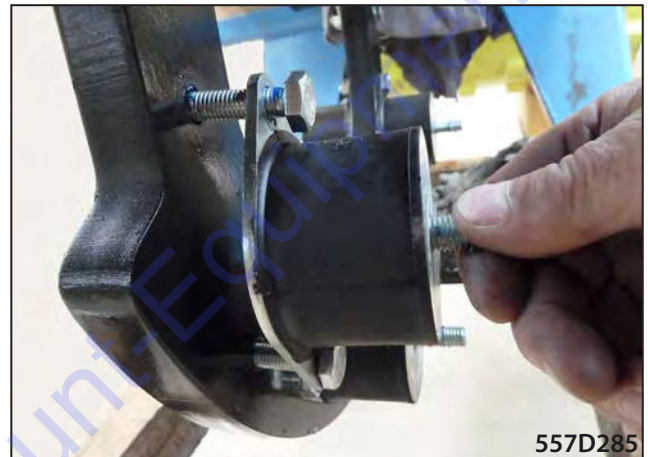
7 Front drum

7.4.4 Installation of the drum rubber-metal elements

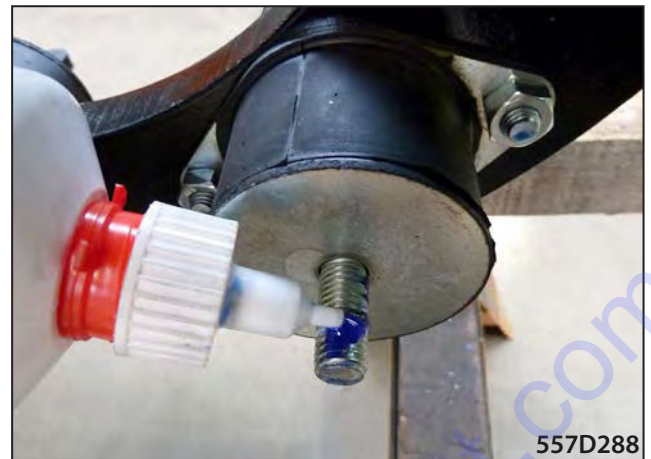
Apply blue adhesive on the screws.



Install new rubber-metal elements on the centre beam. The tightening torque is 50 Nm.

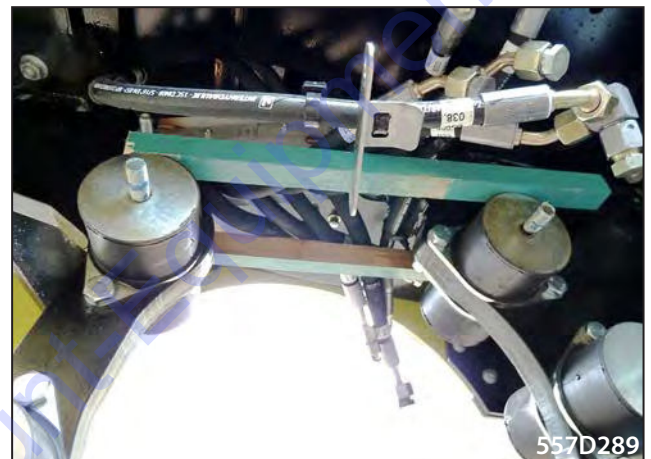


Apply blue adhesive on the rubber-metal element threads from the vibration motor side.



557D288

Support the hoses with squared wood on the vibration motor side so that they can be released.

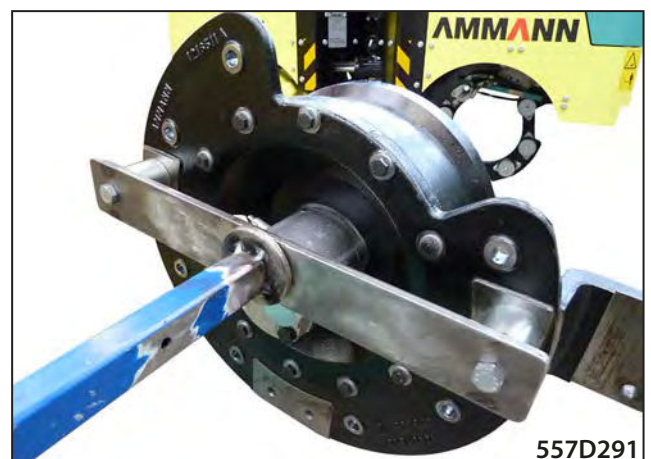


557D289

Attach the gearbox to a crane using the aid.



557D290

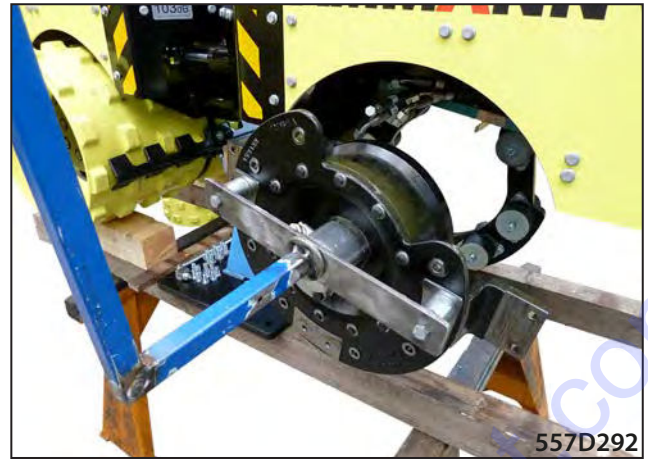


557D291

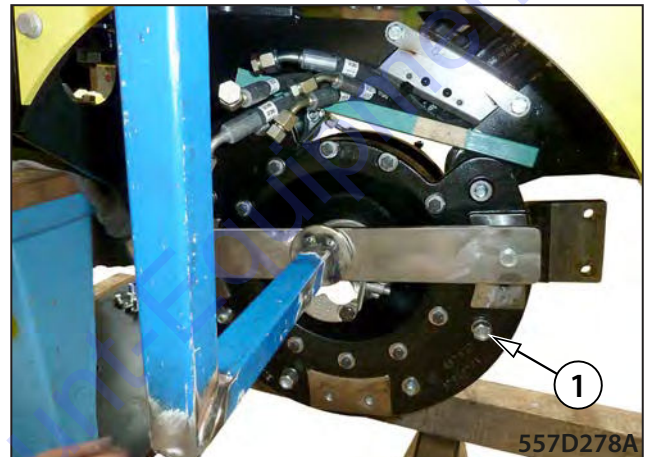
7 Front drum

Align the gearbox.

Place the gearbox on the rubber-metal elements.



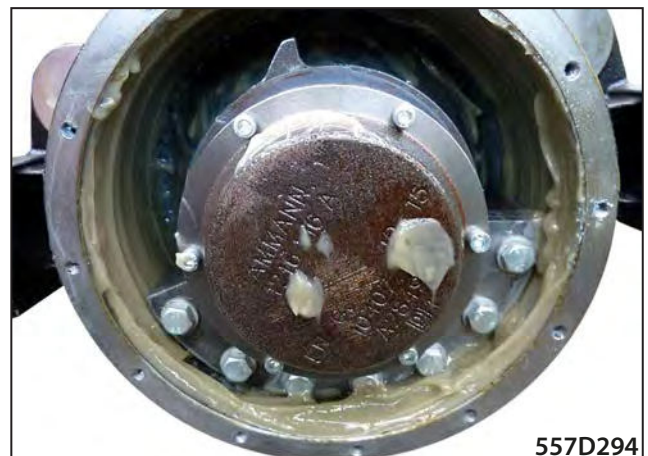
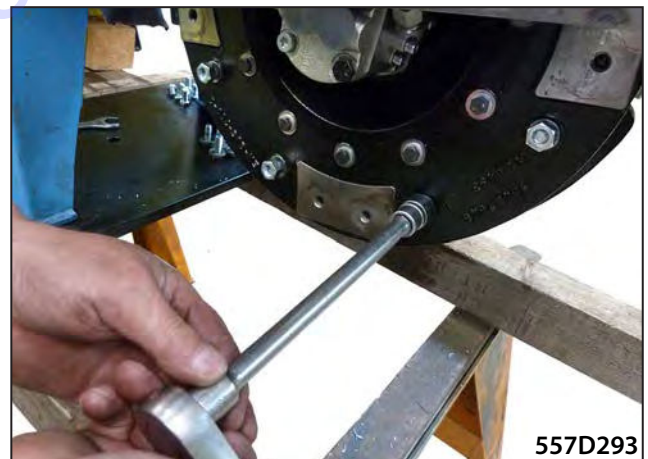
Tighten the nuts (1) to a torque of 50 Nm.



This concludes the gearbox installation from the vibration motor side. If bearing replacement or new lubrication is required, refer to Chapter "Replacement of vibration unit bearings" (Chapter 7.4.3).

Without bearing replacement or new lubrication, you cannot proceed further here.

Clean the sealing surface of the gearbox.



Cut all threads (M8).



Blow-clean the threaded bores.



Thoroughly remove all glue residues and dirty grease.
Replace the removed or blow-cleaned grease with the same amount of new grease.
Grease: Foodgrease SPM00



Apply sealant to the sealing surface.



7 Front drum

Spread the sealant with a brush.



Apply a drop of blue adhesive in all threaded bores.



Clean / blow-clean the boreholes in the gearbox cover.



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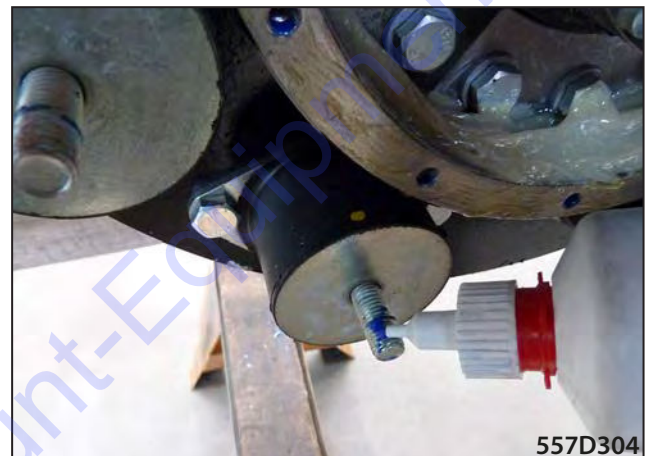
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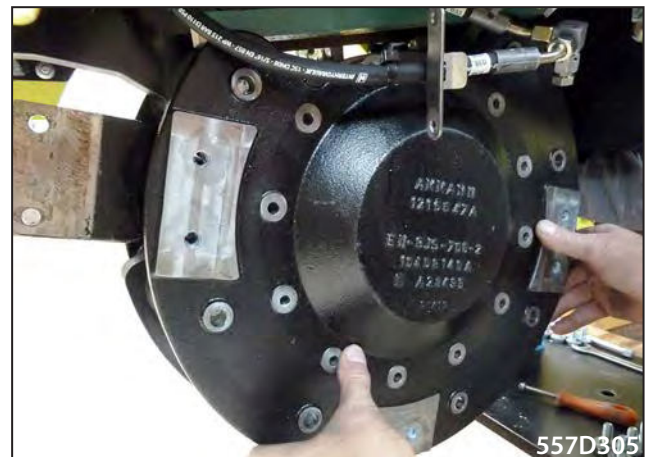
Clean the sealing surface of the gearbox cover.



Apply blue adhesive on the threads of the rubber elements.



Mount the gearbox cover.



Fasten the gearbox cover using the nuts. The tightening torque is 50 Nm.

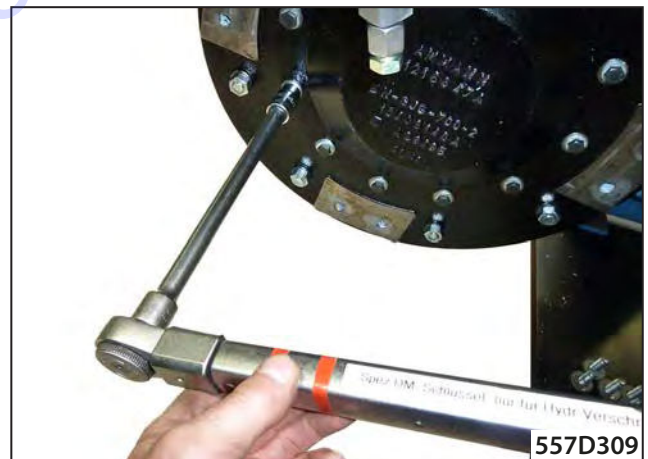
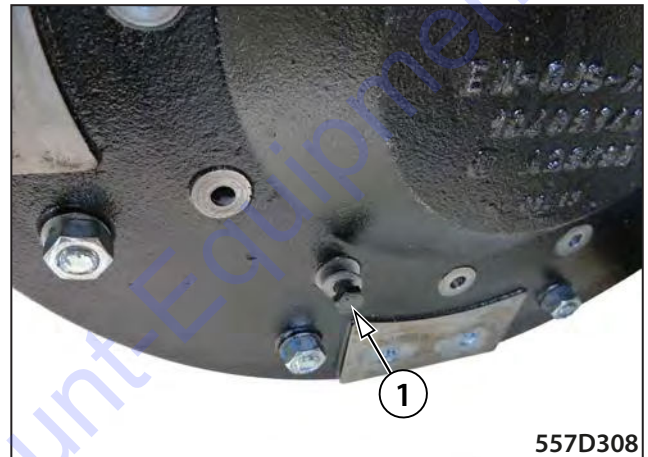


7 Front drum

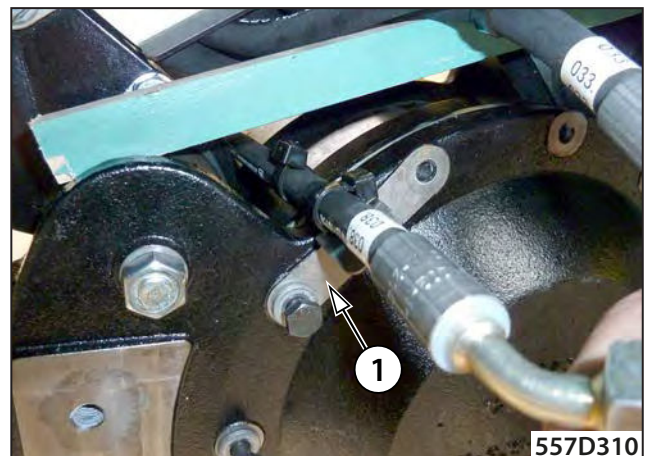
Apply blue adhesive on the screws.



Tighten the screws (1) to a torque of 36 Nm.



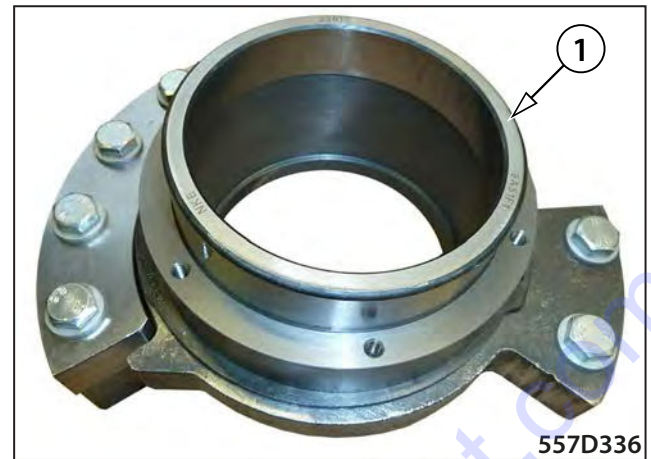
Install the hose guide holder (1) using the same screws.



7.4.4 Installation of the vibration unit

Install a new wide outer bearing ring (1) into the bearing housing.

Observe the installation position.



Push the wide outer bearing ring into the housing.



Insert the spacer ring (1) into the bearing housing.



7 Front drum

Install a narrow outer bearing ring (1) into the bearing housing.
Observe the installation position.



Push the narrow outer bearing ring into the housing.



Heat the rear cone bearing to 110 °C.



Slide the rear cone bearing onto the hub.



Apply a small amount of grease on the bearing.



Mount the spacer rings.



7 Front drum

Lubricate the bearing ring from the outside.



Insert the vibration unit into the vibration housing.



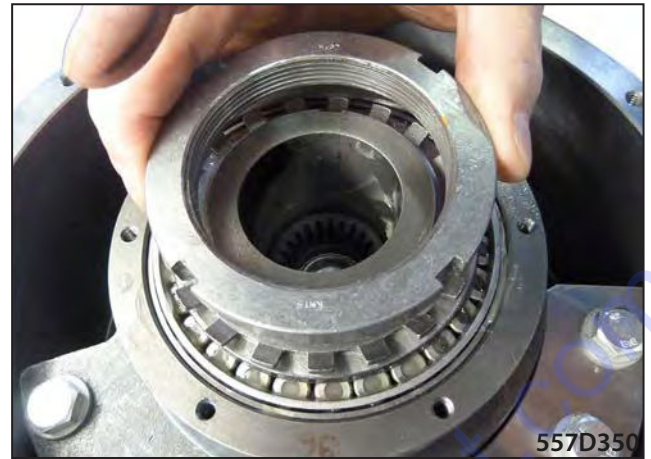
Mount the bearing from the outside.



Mount the lock ring.



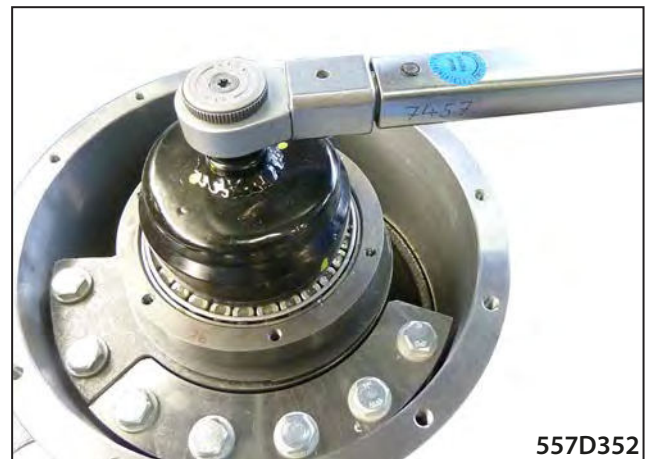
Mount the grooved nut.



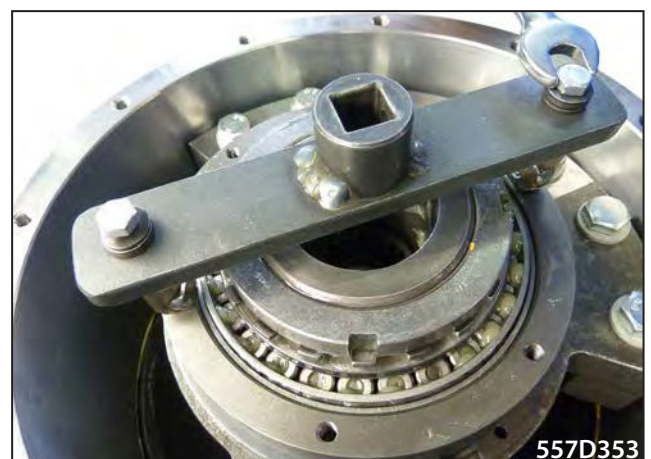
Mount the special "spanner for grooved nuts" tool.



Tighten firmly (200 Nm).

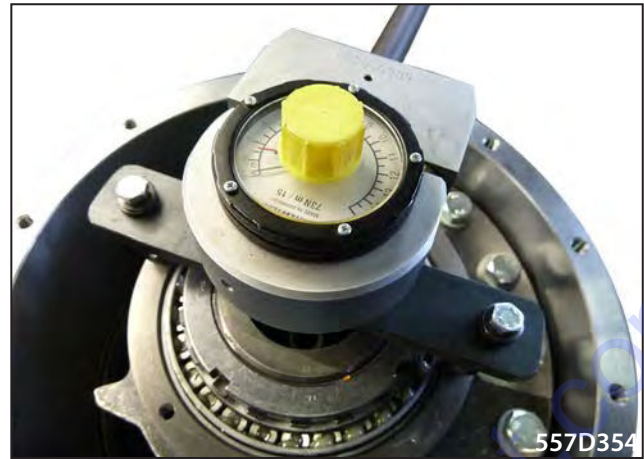


Install the bridge for the torque meter.



7 Front drum

Mount the torque meter.



Turn the vibrator with the torque meter 20 times clockwise.
This eliminates any stress.



The housing must not stand on a support and must be freely rotatable.



Set the tightening torque to 1–3 Nm.

If the value does not match, perform correction using spacers until it does.

$$1/10 = 4 \text{ Nm}$$

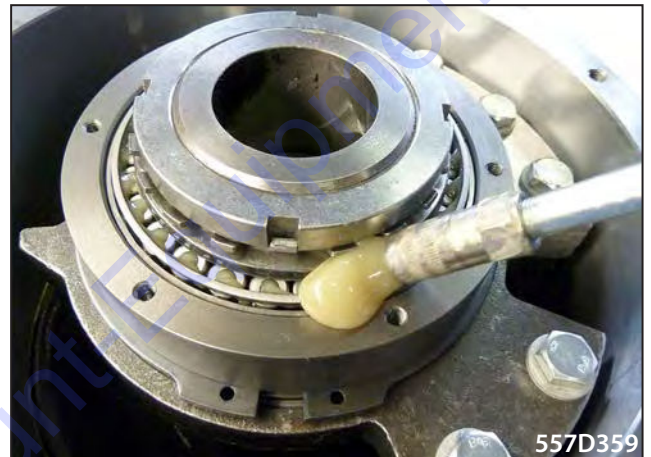


Bend the securing plate with a suitable tool into the suitable nut groove.





Grease the bearings.



Total amount of grease in the bearing housing:
100 g of liquid grease BLASER FOODGREASE SPM00



7 Front drum

Put a small amount of blue adhesive in the threaded bores.



Apply blue adhesive on the screws.



Mount the bearing cap on the vibrator housing.



Tighten the screws to a torque of 10 Nm.



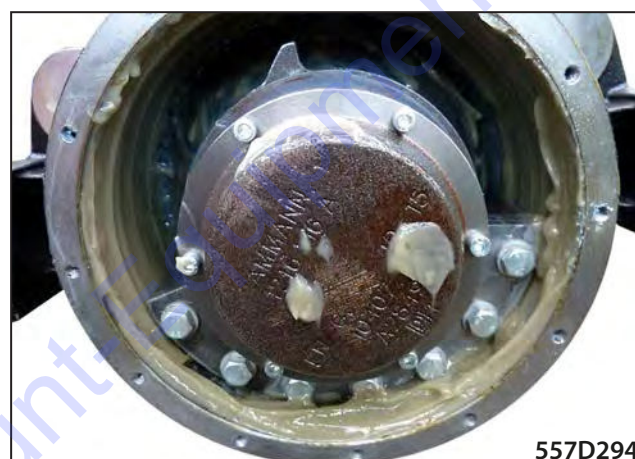
Weight of the vibration unit must move freely.



Apply 300 g of grease in the vibration housing.



Clean the sealing surface of the gearbox.



Cut all threads (M8).



Blow-clean the threaded bores.



7 Front drum

Thoroughly remove all glue residues and dirty grease.

Replace the removed or blow-cleaned grease with the same amount of new grease.

Grease: Foodgrease SPM00



Apply sealant to the sealing surface.



Spread the sealant with a brush.



Apply a drop of blue adhesive in all threaded bores.



Clean / blow-clean the boreholes in the gearbox cover.



Clean the sealing surface of the gearbox cover.

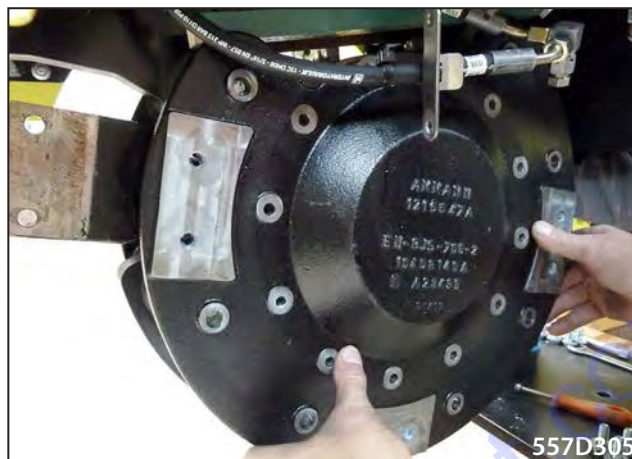


Apply blue adhesive on the threads of the rubber elements.



7 Front drum

Mount the gearbox cover.



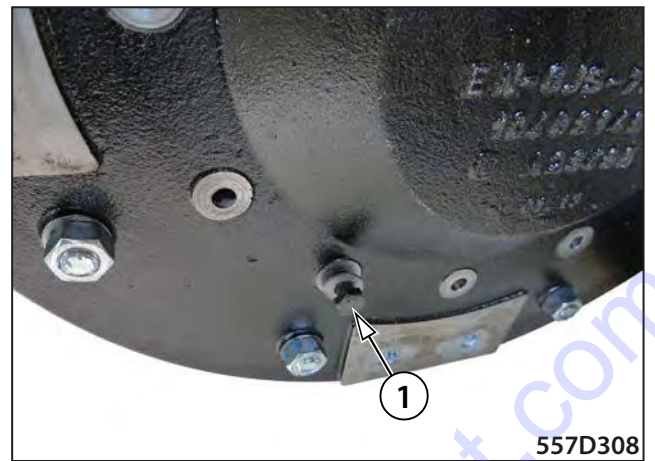
Tighten the nuts to a torque of 50 Nm.



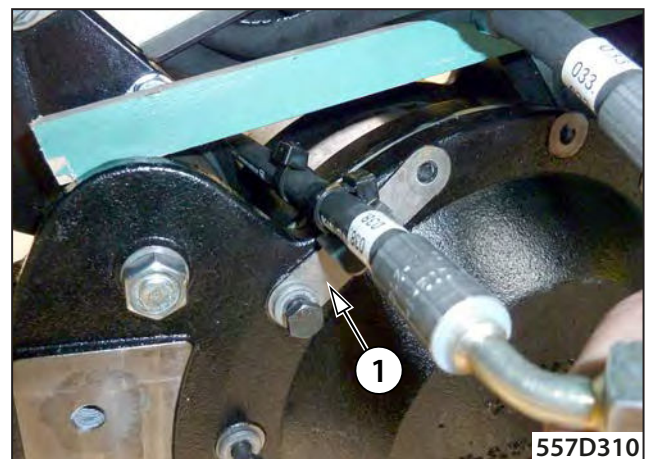
Apply blue adhesive on the screws.



Tighten the screws (1) to a torque of 36 Nm.



Install the hose guide holder (1) using the same screws.



7 Front drum

7.4.5 Replacement of the travel hydraulic motor

Removal

Remove the drum, travel hydraulic motor (Chapter 7.4.2).

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On the removed travel motor, remove all screw unions.



Remove the screws on the travel hydraulic motor flange.

The screws are inaccessible:

In rare cases (7x) where bolts are not accessible, the travel hydraulic motor flange must be completely removed. You then have to remove (5x) hexagon bolts. Lift the flange from the travel motor.



Screw two eye screws in the travel motor flange.



7 Front drum

Attach slings to a crane and the eye screws.

Before lifting the travel motor from the motor support, mark the motor location with a pencil.



If the travel motor is stuck in the motor support due to corrosion, push the traction motor out of the motor support.

- (3x) Clean the threads.
- (3x) Cut the threads.
- (3x) Mount M12x60 hex screws.
- Push the travel motor out of the motor support.



Lift the travel motor from the motor support.



Clean the seating surface and threads.



Lubricate the bearing seat with NeverSeez.



Put a small amount of blue adhesive in the threaded bores.



Place the new travel motor in the motor support.
Pay attention to the motor position (previously marked).



Apply blue adhesive on the screws.



7 Front drum

Mount the screws. The tightening torque is 85 Nm.



Apply blue adhesive on the screw unions from the old travel motor.



Mount the screw unions on the travel motor, firmly tighten.

Material

Hydraulic motor K 04/340.0 cm³/rev. (1)

- (2x) Straight neck with thread GES10L M22x1.5 (2) (125 Nm)
- (1x) Straight neck with thread GES10L M16x1.5 (3) (55 Nm)
- (1x) Straight neck with thread GES10L M14x1.5 (4) (45 Nm)



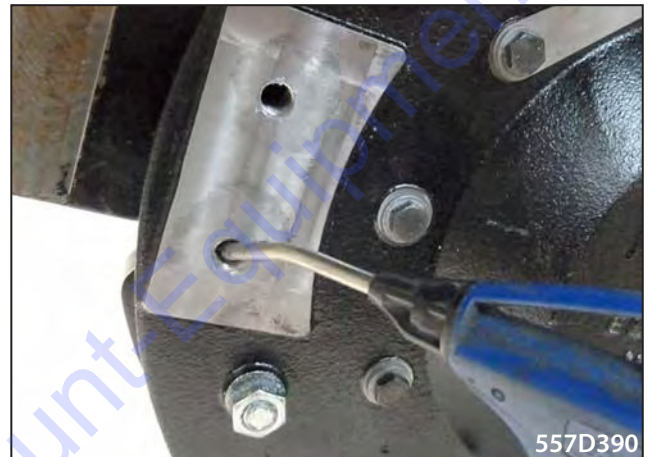
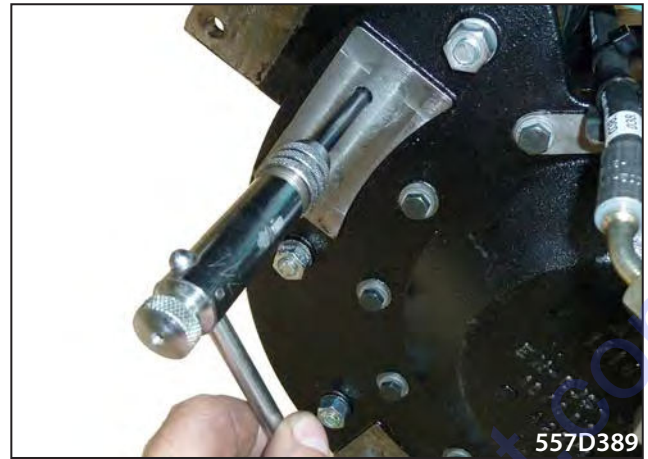
Cover the screw unions with caps.



7 Front drum

Installation

Clean the seating surface of the motor support and threads.



Put a small amount of blue adhesive in the threaded bore.



Mount the aid on the travel hydraulic motor flange.



Screw one threaded pin to the right and left of the vibration housing flange as a mounting aid for the travel hydraulic motor.



Hang the travel hydraulic motor on a crane and install it in the machine.



7 Front drum

Apply blue adhesive on the screws.



Mount the travel hydraulic motor using the screws. The tightening torque is 85 Nm.



Remove the aid.



Mount all hoses.



Clean the hose fittings and the surroundings using cleaning agents (e.g. brake cleaner).

Apply NeverSeez on the flange (arrow).

Before installing the drum, let the machine run on blocks. Perform a leak check.



Move the drum under the chassis using an aid.

Keep the drum balanced using an aid (e.g. squared wood).



Mount the drum using the screws. The tightening torque is 85 Nm.



7 Front drum

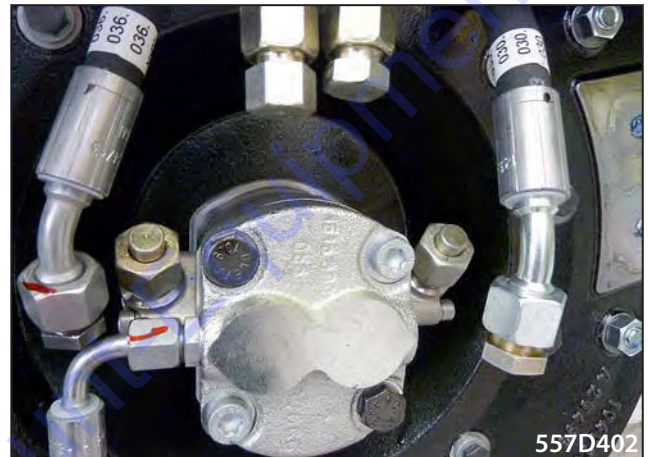
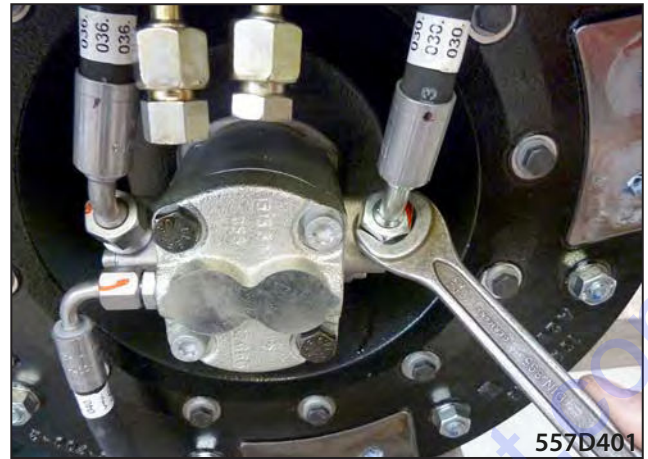
7.4.6 Replacement of the vibration hydraulic motor

Removal

Remove the drum, travel hydraulic motor (Chapter 7.4.2).

Remove all hoses at the travel motor.

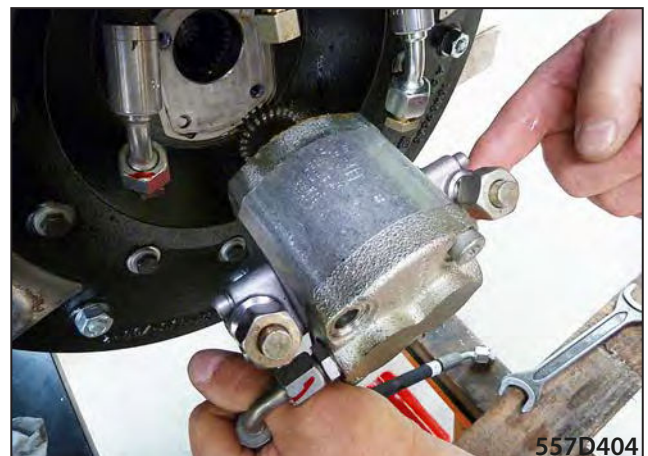
Close the screw union.



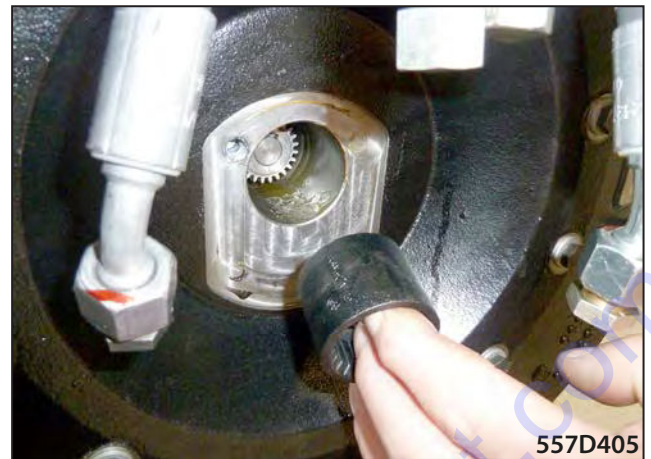
Remove the screws of the vibration hydraulic motor.



Remove the vibration hydraulic motor.



Remove the clutch.



In the case of a defective vibration hydraulic motor, remove the screw union and pinion.



Remove the pinion nut.



Remove the pinion using a pulling tool.





Remove the screws.
Remove the angled flanges on both sides.



Remove the 040 hydraulic hose.

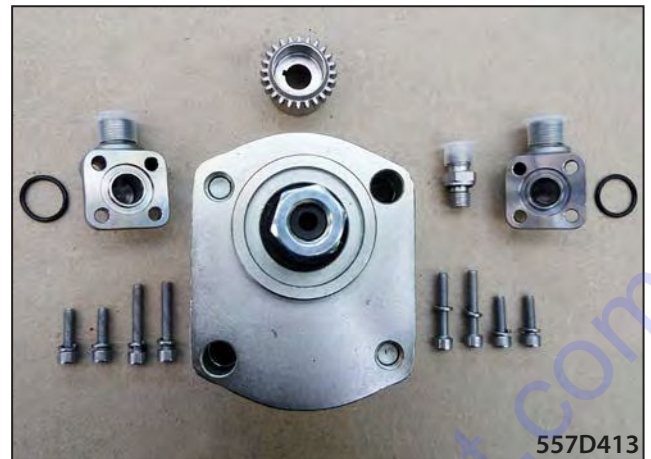


Remove the threaded neck.



Installation

Overview of all parts used for the new vibration motor. If the screw unions and other parts are undamaged, they may be re-used in the new vibration motor.



Always replace the sealing rings.



Apply blue adhesive on the screws.



Mount the angled flanges using the screws with a torque of 10 Nm.



7 Front drum

Mount the pinion.



Apply blue adhesive on the thread.



Insert a spring washer.



Mount the pinion nut.



Tighten the pinion nut firmly to a torque of 50 Nm.



Apply blue adhesive on the straight neck.



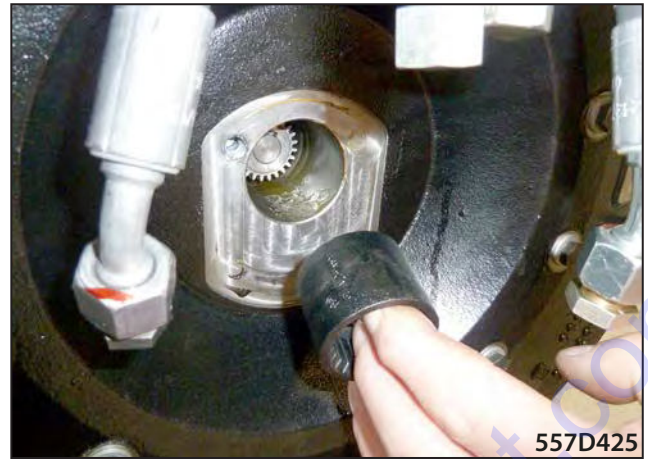
Mount the straight neck and tighten firmly to torque of 40 Nm.



7 Front drum

Mount the clutch.

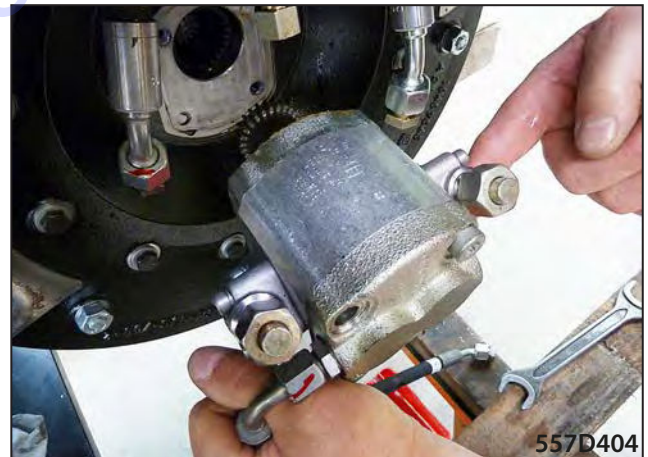
If the old clutch is undamaged, you can reuse it. Otherwise, insert a new clutch.



Apply sealant on the sealing surface.



Insert the vibration hydraulic motor.



Apply blue adhesive on the screws.



Tighten the screws firmly (56 Nm).



Mount the hydraulic hoses.



7 Front drum

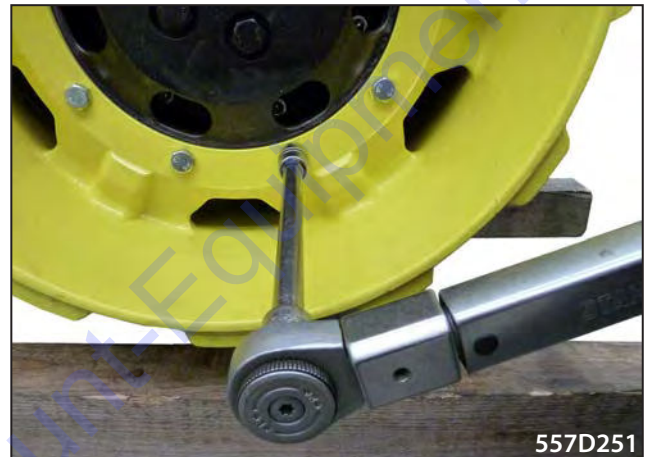
7.4.7 Drum installation

Move the drum under the chassis using an aid.

Keep the drum balanced using an aid (e.g. squared wood).

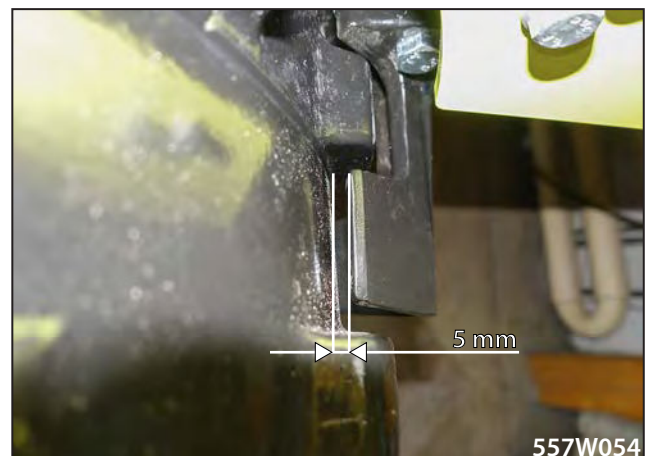


Tighten the screws firmly (85 Nm).



7.4.8 Scraper

Before driving, adjust the scraper so that there is a gap of about 5 mm between the scraper and the drum.



8 Rear drum

To order go to Discount-Equipment.com

8 Rear drum

8.2 Hydraulic parts

Hydraulic parts (Chapter 7.2).

To order go to Discount-Equipment.com

8.3 ACEecon

Removal

Remove the rear drum scrapers.

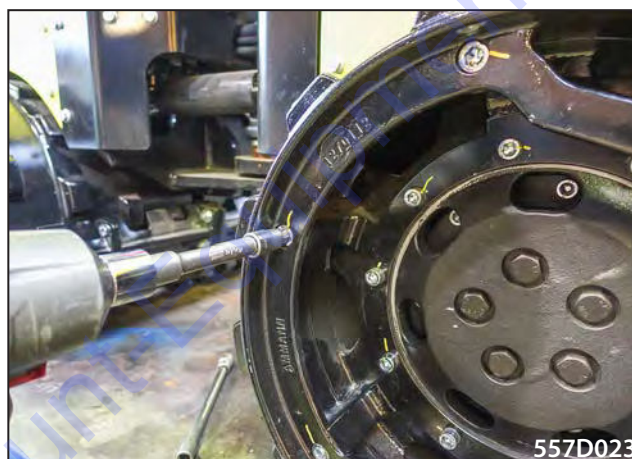


8 Rear drum

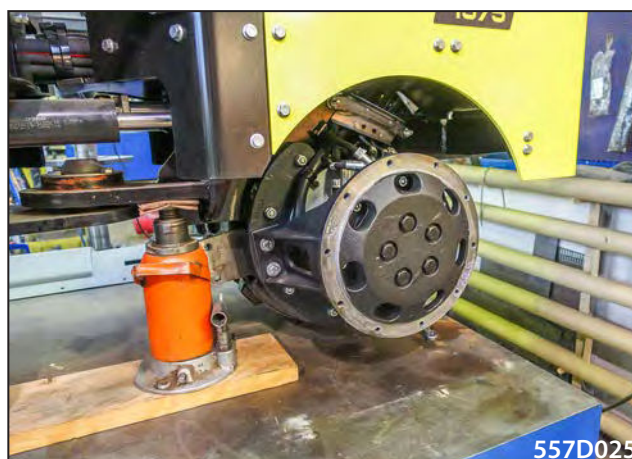
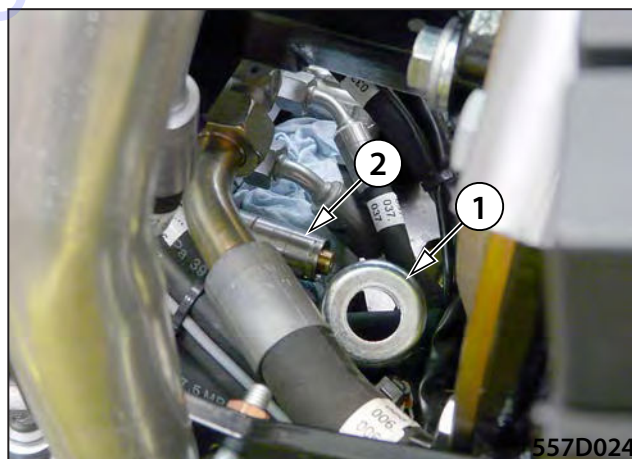
Support the left rear part of the frame with a jack.



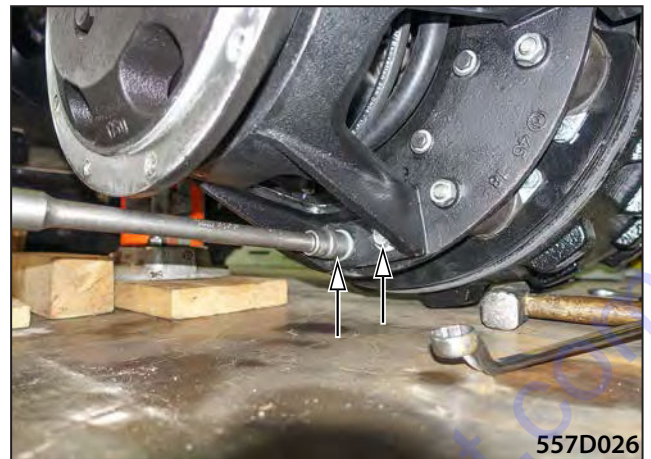
Remove the extension of the left rear drum.



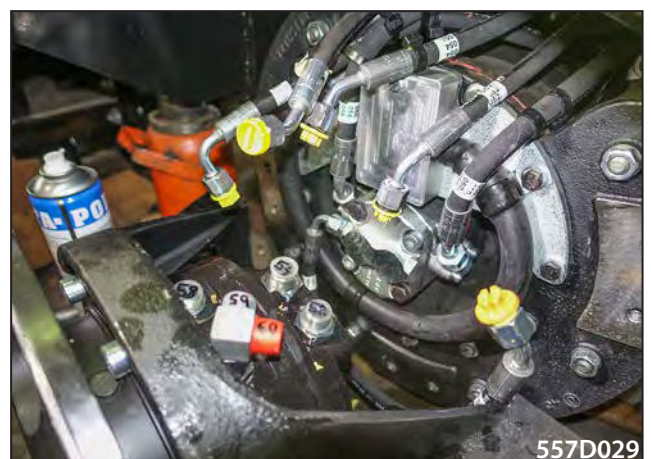
Remove the left rear drum.



Remove the hydraulic motor from the machine frame.

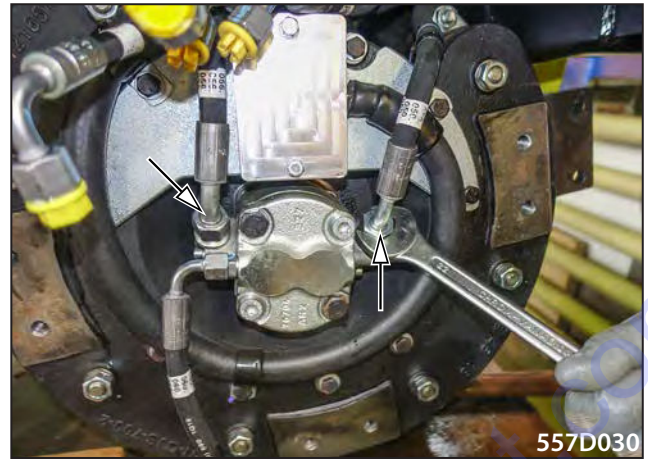


Remove the hoses from hydraulic motor. Mark the outlets and blind them with plugs.

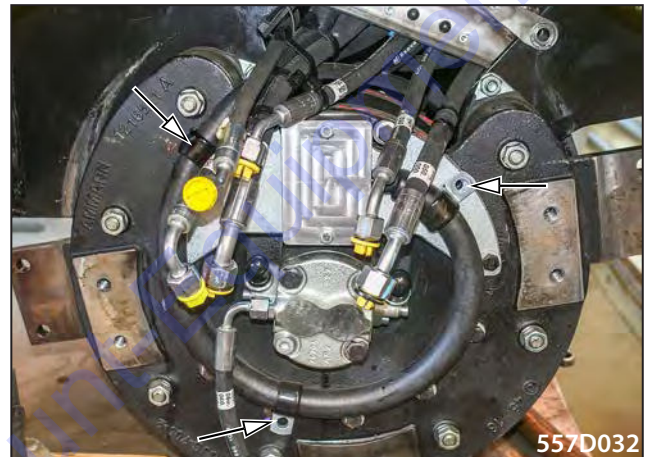


8 Rear drum

Remove the hoses from the vibration hydraulic motor.



Remove the sensor wiring clips.



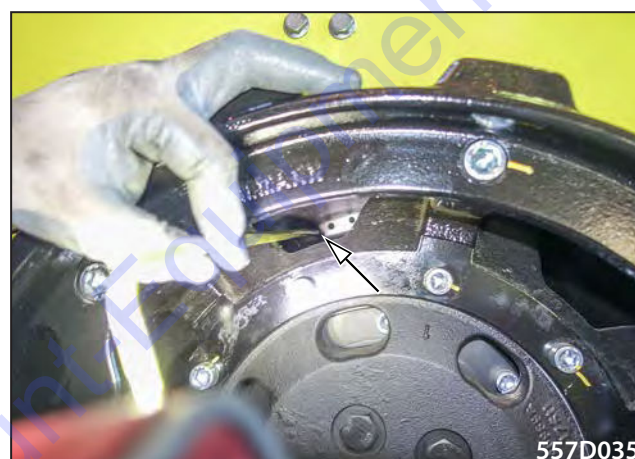
Remove the hose holder.



Remove the M7 screws using the jig.



557D034



557D035



557D036

8 Rear drum

Remove the holder of the ACEecon sensor.



Remove the document compartment.



Remove the wiring ties.



557D038



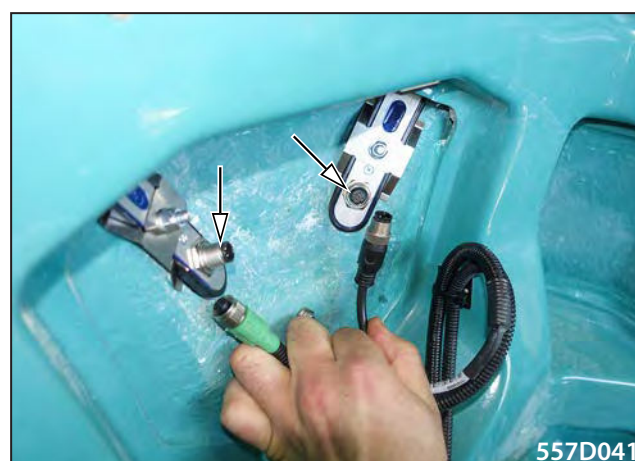
557D039

Disconnect the X50 connector.



557D040

Disconnect the display panel connectors.



557D041

8 Rear drum

Installation

Mount the hose holder using the screws.

Secure the screws with the Loxeal 83-54 adhesive.



Mount the hoses of the vibration hydraulic motor.



Mount the travel hydraulic motor.

Secure the screw joints with the Loxeal 83-54 adhesive.



Attach the hydraulic hoses of the travel hydraulic motor.



Install the drum. Secure the screws with the Loxeal 83-54 adhesive.



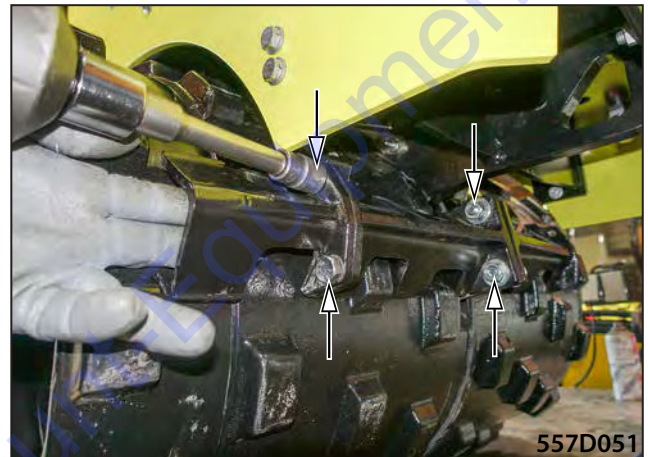
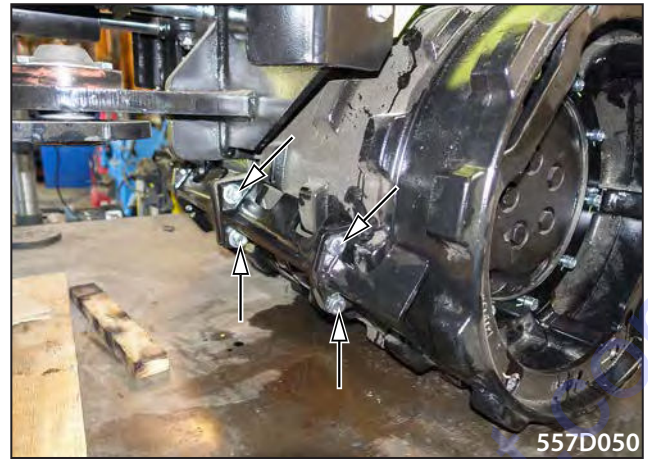
Install the drum extension. Secure the screws with the Loxeal 83-54 adhesive.



8 Rear drum

Install the scrapers.

Set the scrapers so that there is a gap of about 5 mm between the scraper and the drum.



8.4 Mechanical parts

See Chapter 7.4.

9 Front axle (not included in the machine equipment)

To order go to Discount-Equipment.com

10 Rear axle (not included in the machine equipment)

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11 Travel

To order go to Discount-Equipment.com

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11.2 Hydraulic parts

11.2.1 Replacement of the travel pump

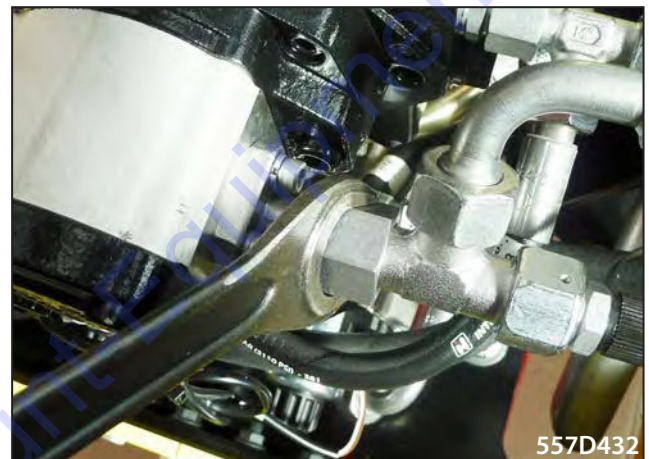
Drain the hydraulic oil (Chapter 5.6.3).

Removal

Place an oil drip container under the chassis at the front or the travel pump.



Remove the pressure line, vibration pump screw union.



Close the screw union.





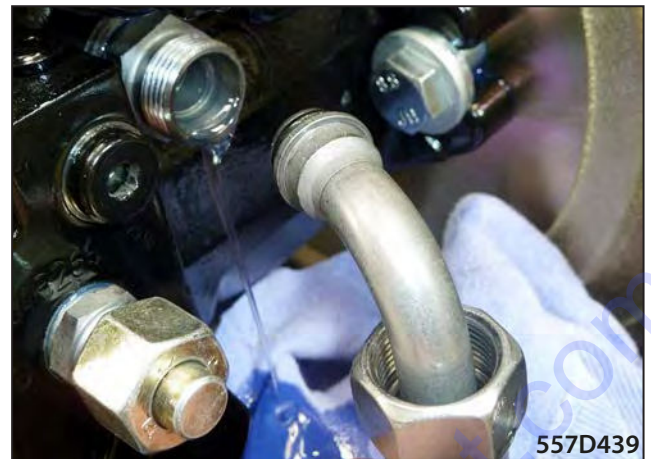
Remove the supply pressure, travel pump screw union.



Close the screw union.



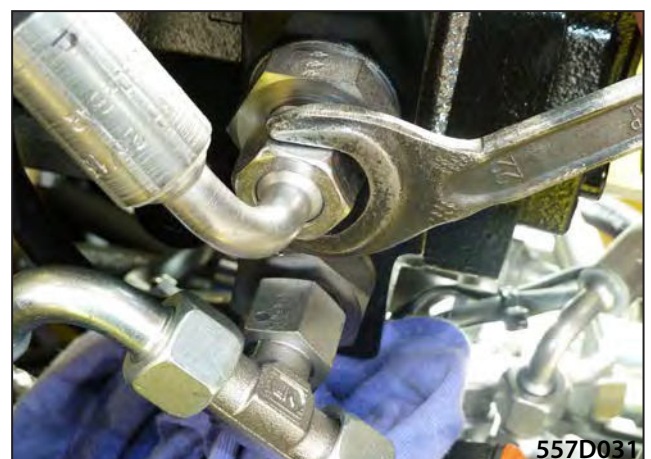
Remove the supply, travel pump hydraulic hose.



Close the screw union.

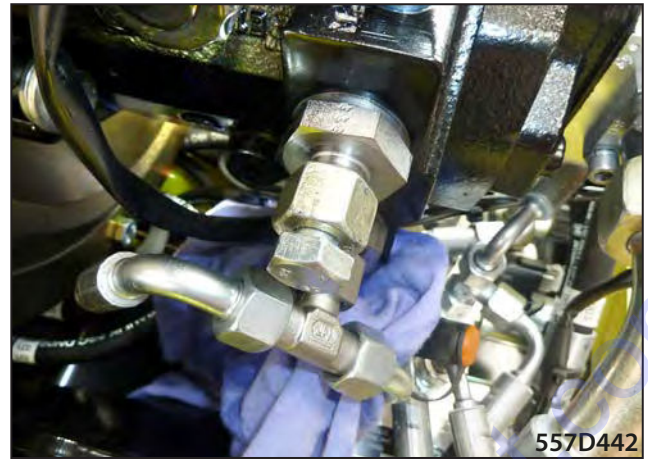


Remove the hydraulic hose of the forward travel (B), travel pump circuit.



11 Travel

Close the screw union.



Remove the T screw union of the reverse travel (A), travel pump circuit.



Close the screw union.



Remove the suction line, vibration pump screw union.



Close the screw union.

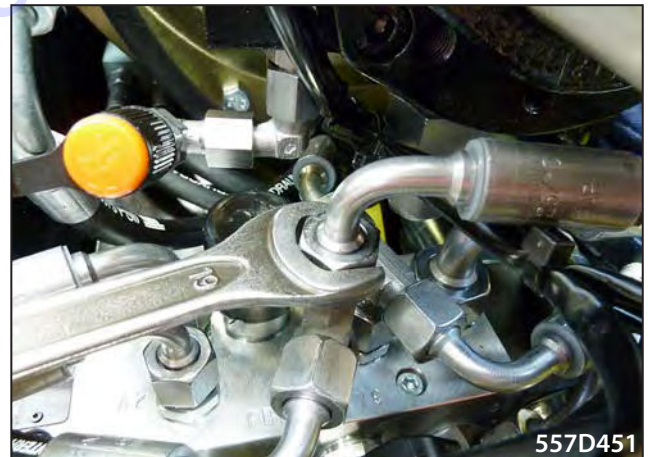


11 Travel

Remove the angled screw union of the suction line, travel pump.
The hydraulic oil will stop flowing.



Remove the hydraulic hose of the supply pressure, PBR valve block.
Close the screw union.



Remove the cable ties on both sides on the servo block.





Remove connectors Y3 and Y4.



Remove the screws on the travel pump.

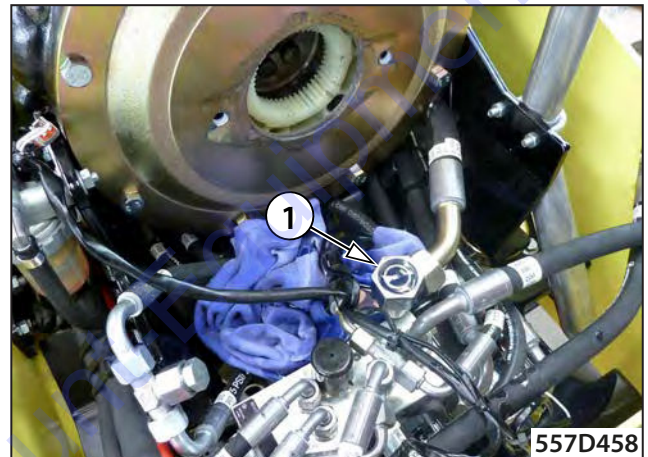


11 Travel

Lift the travel pump from the motor.



Now close the loose angled screw union of the suction line (1).

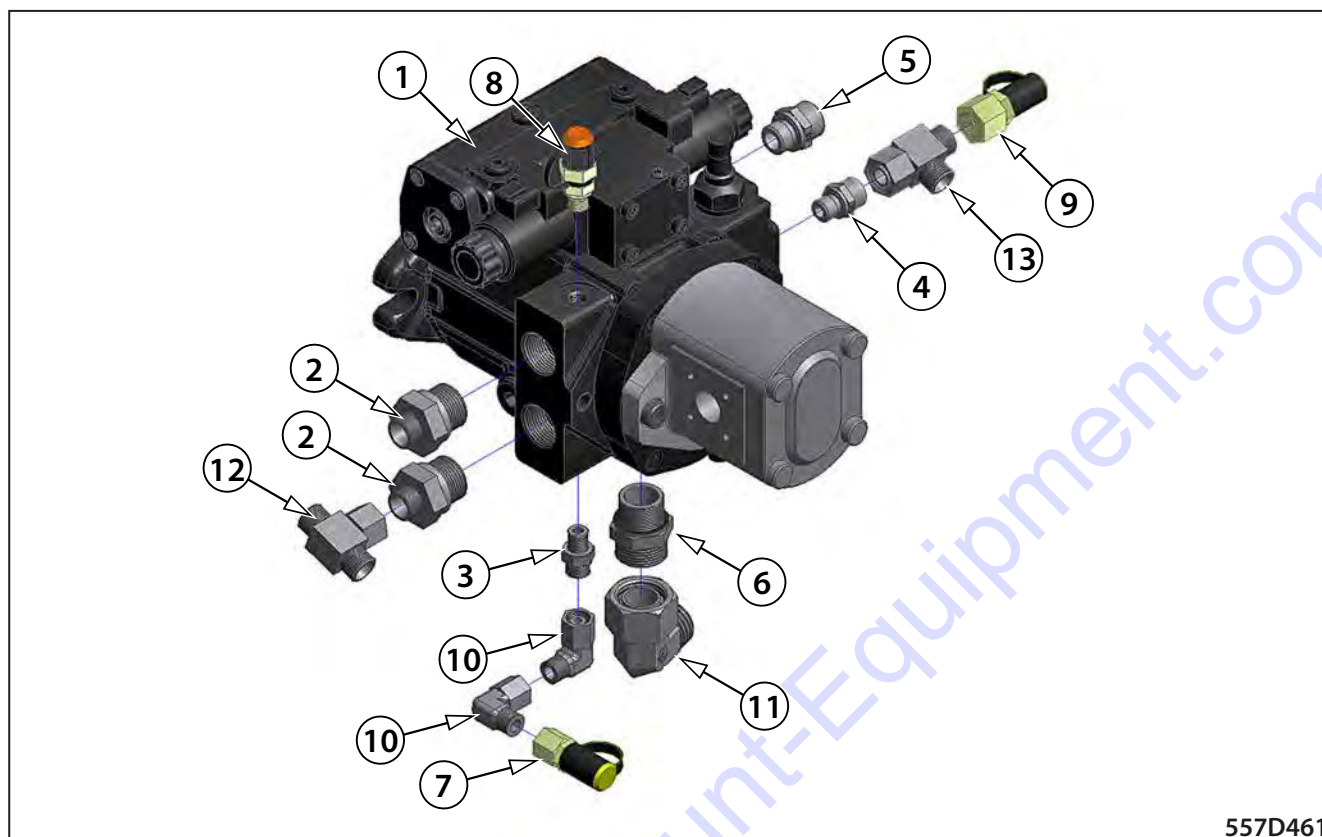


Pull the pinion off the shaft.



Preparation of a new vibration travel pump

If the old screw unions are undamaged, you can reuse them. Otherwise, use new screw unions.

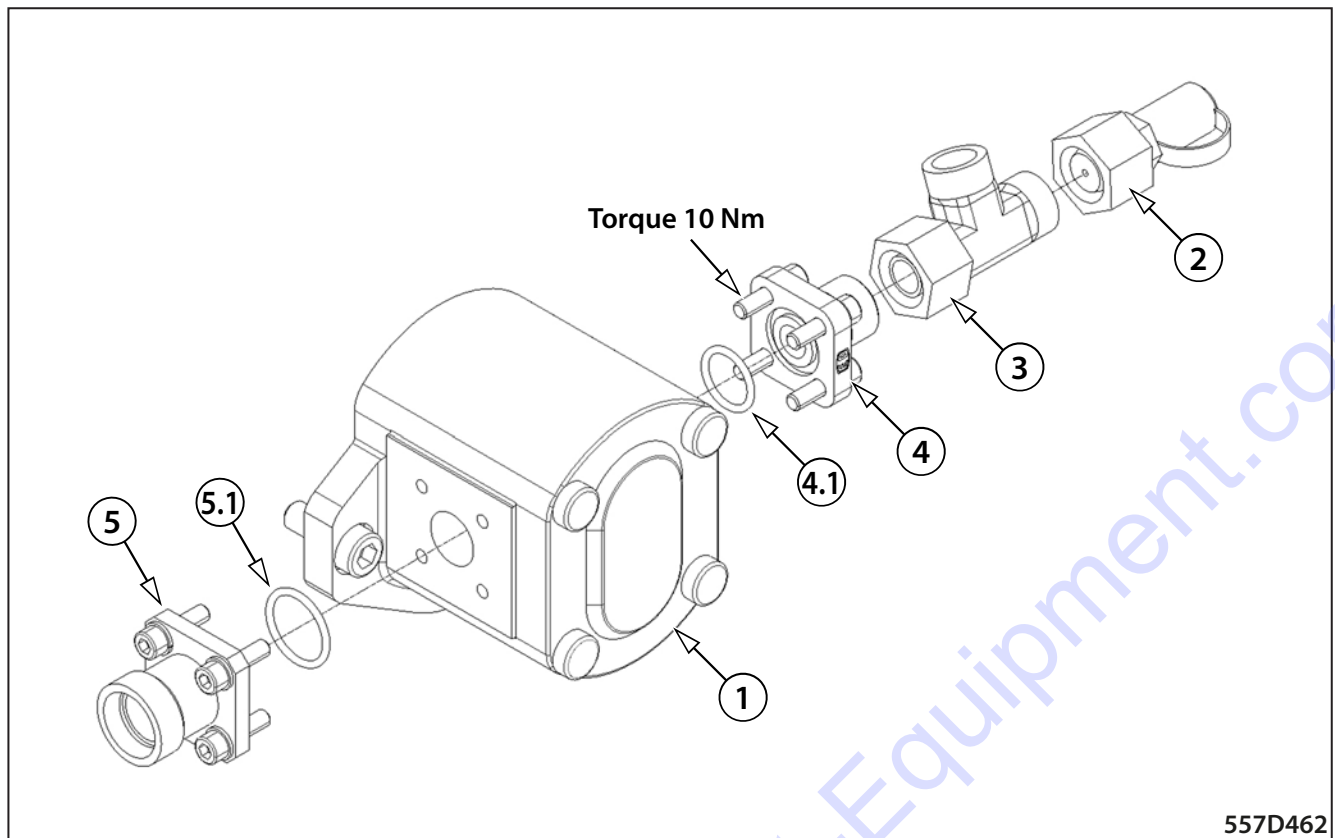


557D461

Travel pump screw unions

		SW	Nm
1	Hydraulic pump		
2*	Straight neck with thread GES12L/M27x2-WD	32	180
3*	Straight neck with screw union GES 8LM-WD	17	25
4*	Straight neck with screw union 12L/M 14x1.5-WD	19	45
5*	Straight neck with screw union GES15LM-WD	27	70
6*	Straight neck with screw union GES22LM-WD	32	125
7	Screw connection MINIMESS-1620 DKO 8L	17	
8*	Screw connection MINIMESS-1620 M12x1.5	17	
9	Screw connection MINIMESS-1620 DKOL 12L	22	
10	Adjustable angled neck EWSD 8L	17	
11	Adjustable angled neck EWSD 22L	36	
12	Adjustable T-neck ETSD12L	22	
13	Adjustable L-neck ELSD12L	22	

* Apply blue adhesive on all straight threaded necks and Minimesse M12x1.5.



Vibration control pump

- 1 Gear pump 11 ccm/rev. 9 teeth 82.55 mm
- 2 Screwed connection MINIMESS-1620 DKOL 15L
- 3 Adjustable L-neck ELSD15L o.M+D K
- 4 Straight neck with flange GFS 15L-35
- 4.1 Sealing ring
- 5 Straight neck with flange GFS 22L-40
- 5.1 Sealing ring

Apply NeverSeez on the shaft.



Apply blue adhesive on the screw.



Set the pinion

Insert a feeler gauge (1.5 mm) between the pinion and the pump housing.



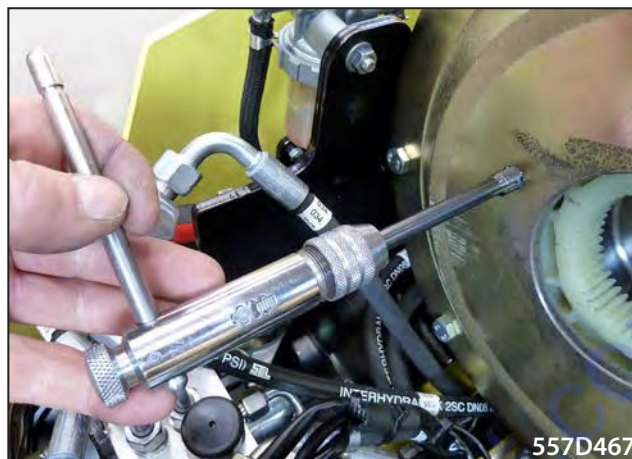
Tighten the screw to a torque of 85 Nm.



11 Travel

Installation

Clean the M12 thread on the pump flange.



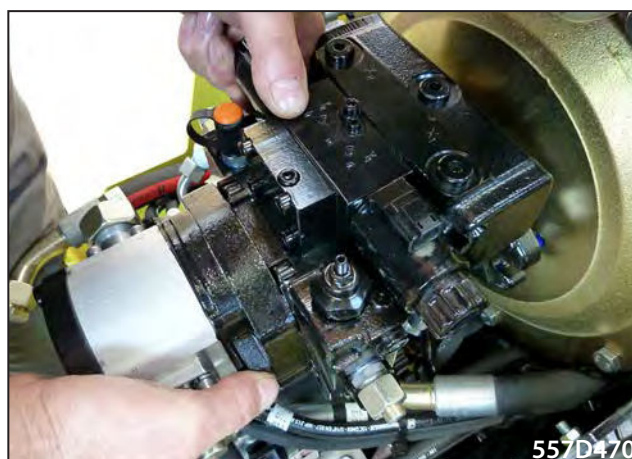
Remove the suction hose stopper cap.



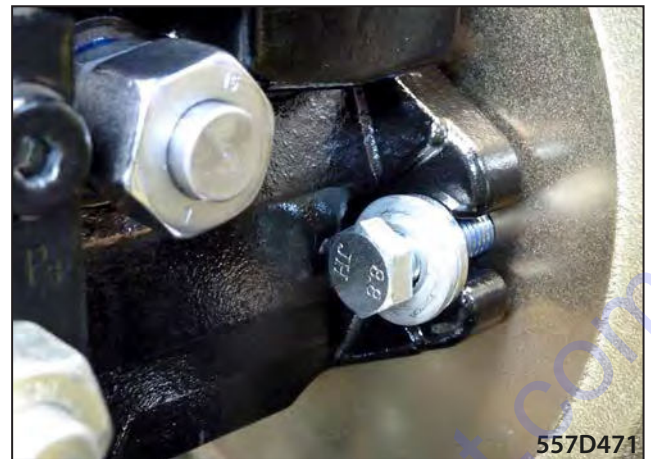
Apply blue adhesive on the screws.



Move the travel pump on the pump flange.



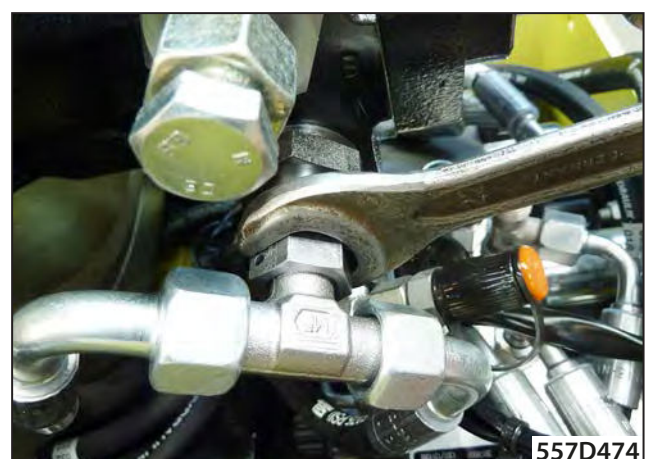
Tighten the screws to a torque of 85 Nm.



Mount the suction line screw union.



Mount the T screw union of the reverse travel (A), travel pump circuit.



11 Travel

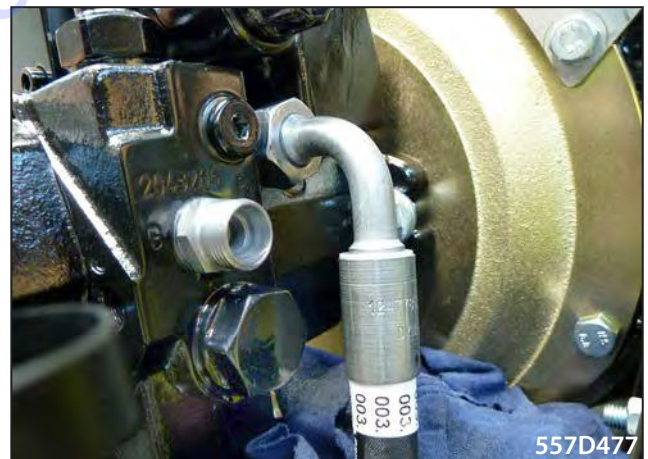
Mount the hydraulic hose of the forward travel (B), travel pump circuit.



Mount the pressure line, vibration pump screw union.



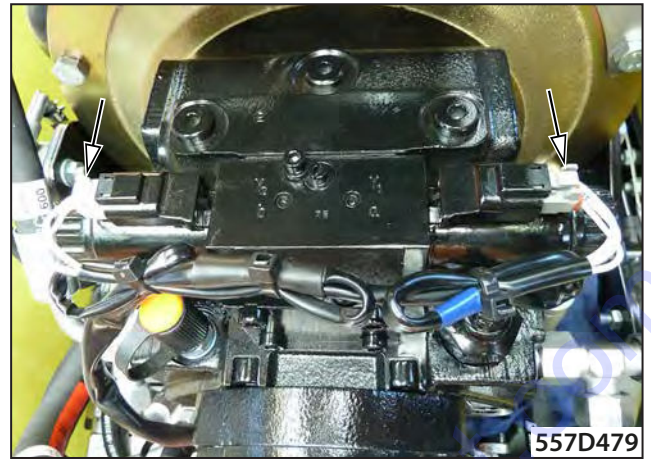
Mount the supply, travel pump hydraulic hose.



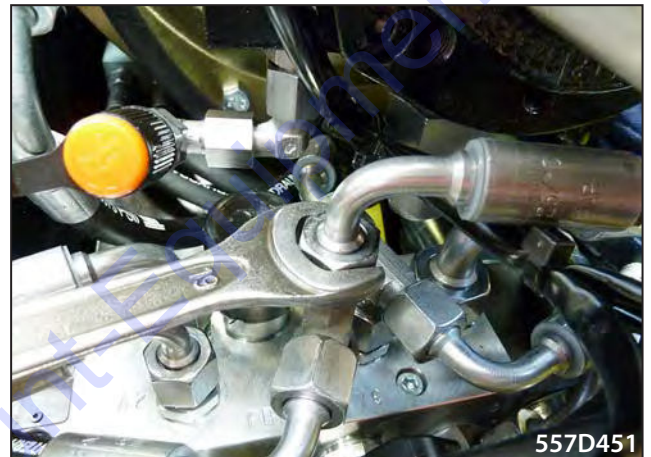
Mount the supply pressure, travel pump screw union.



Connect connectors Y3 and Y4.



Mount the hydraulic hose of the supply pressure, PBR valve block.

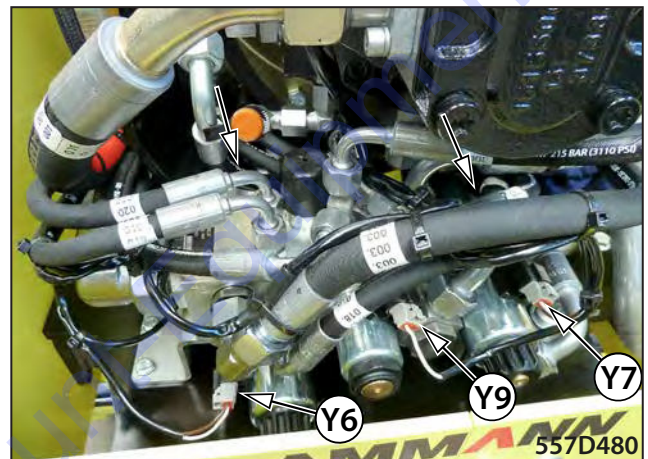


11.2.2 Replacement of the valve block

Before removing the valve block, drain the hydraulic oil, see "Hydraulic oil draining" (5.6.3).

Removal

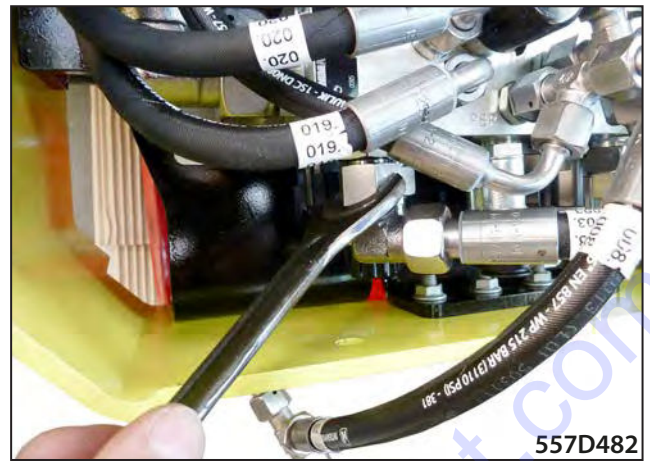
Disconnect connectors Y5 to Y9.



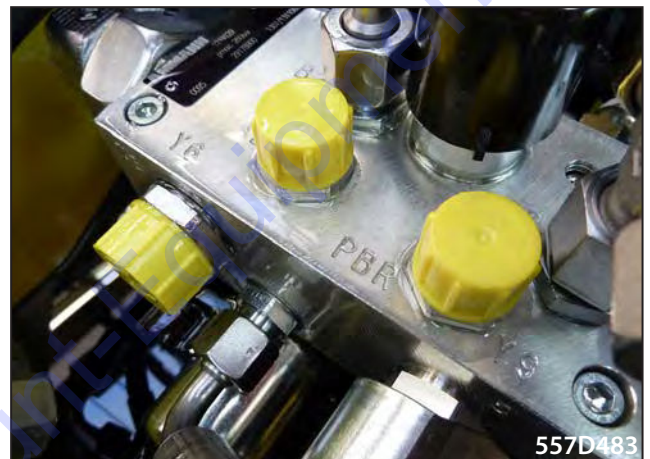
Cut all cable ties on the harness / valve block.
Loosen the cable harness.



Remove hydraulic hoses A2, B2, PBR, T2.



Close the screw union.



Remove the BR hydraulic hose.



Close the screw union.



11 Travel

Remove the 018 (A3) hydraulic hose.

Close the screw union.



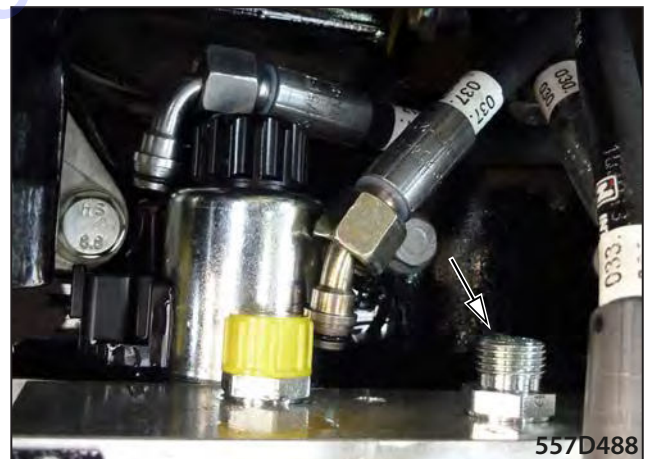
Remove the 004 (T1) hydraulic hose.

Close the screw union.



Remove the 037 (T3) hydraulic hose.

Close the screw union.



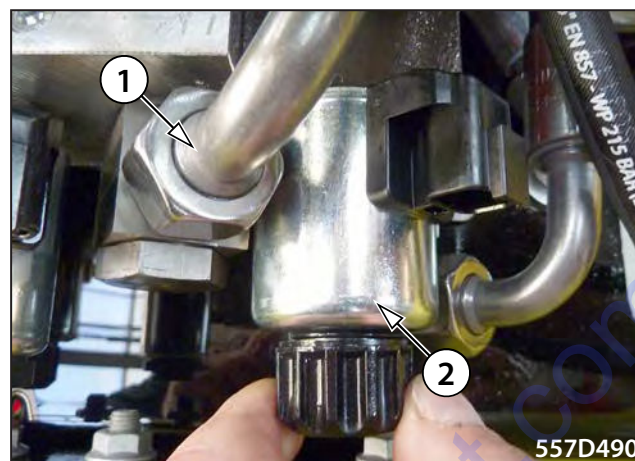
Remove the 030 (A1) hydraulic hose.

Close the screw union.

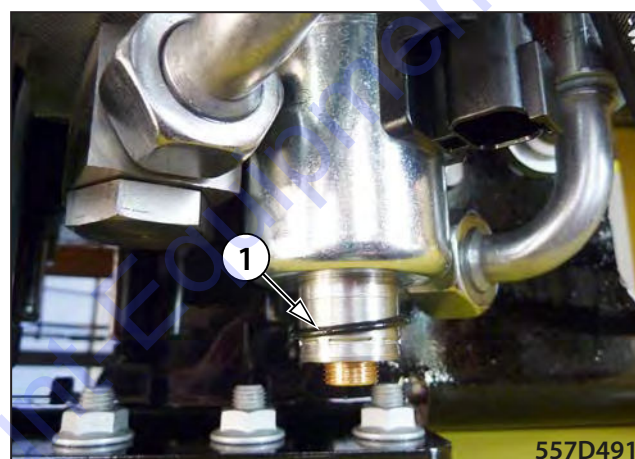


To maintain access to the screw union of the B1 hose (1), first move the magnetic coil (2) back.

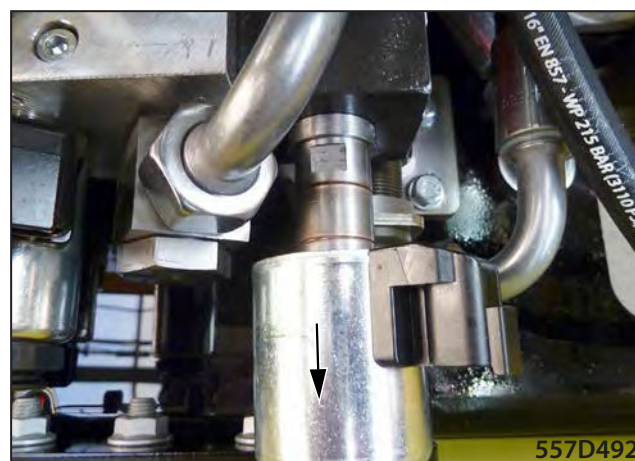
Remove the knurled nut on the Y7 magnetic valve.



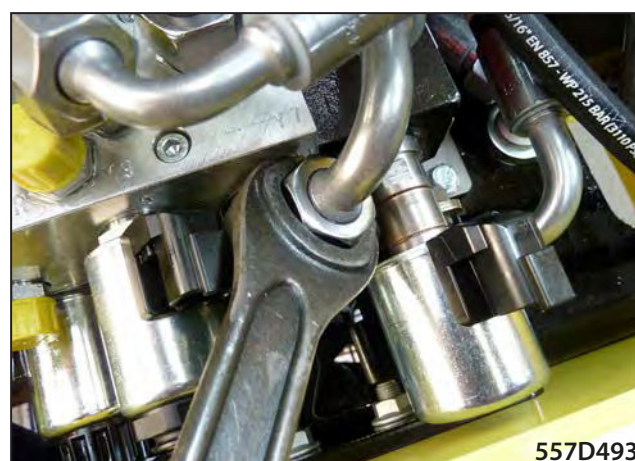
Remove the sealing ring (1).



Move the magnetic coil back.

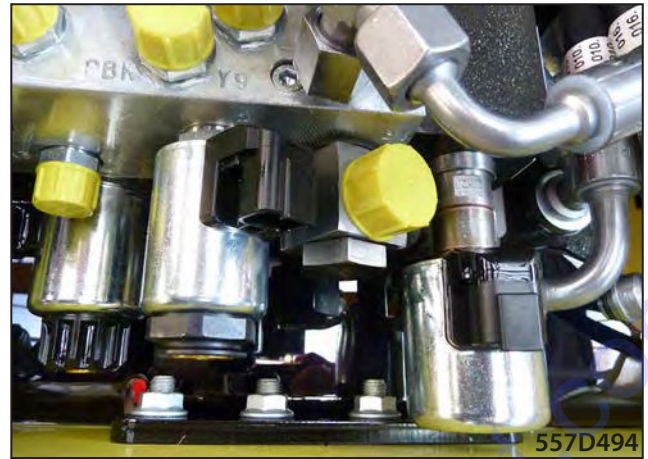


Remove the 016 (B1) hydraulic hose.



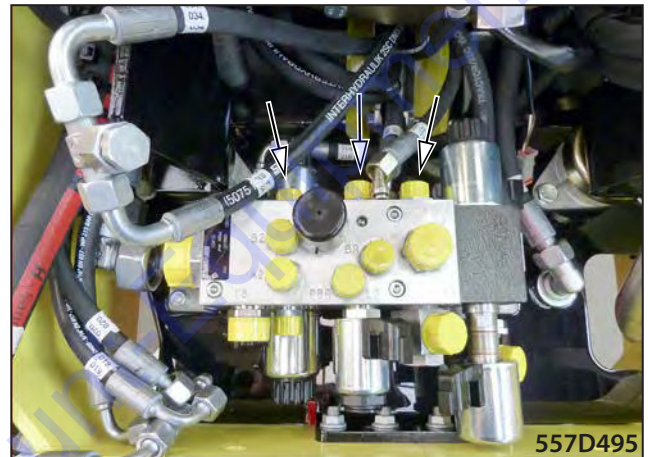
11 Travel

Close the screw union.



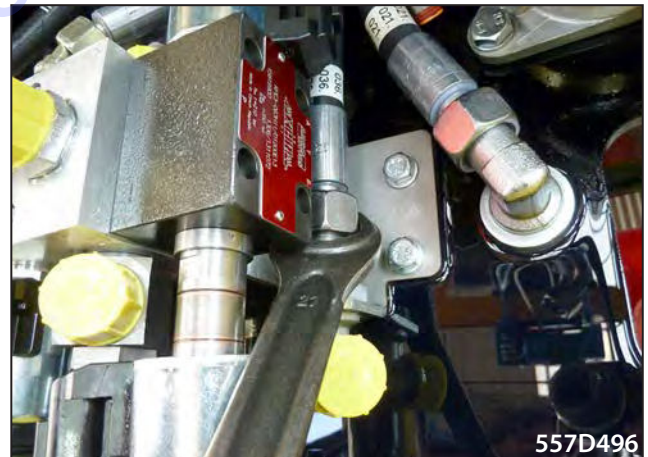
Remove hydraulic hoses A1, B3, T3.

Close the screw union.

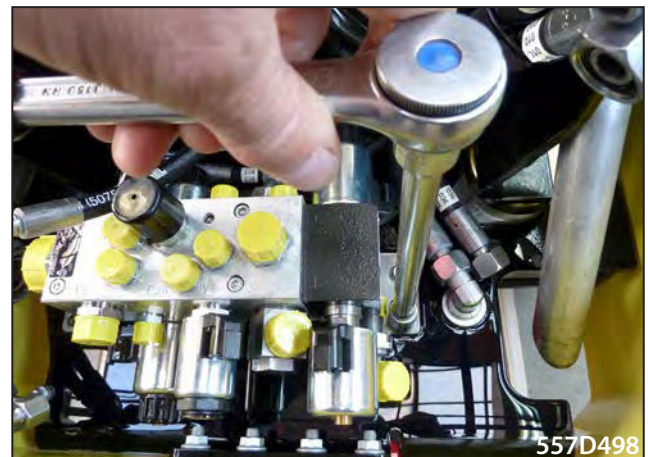
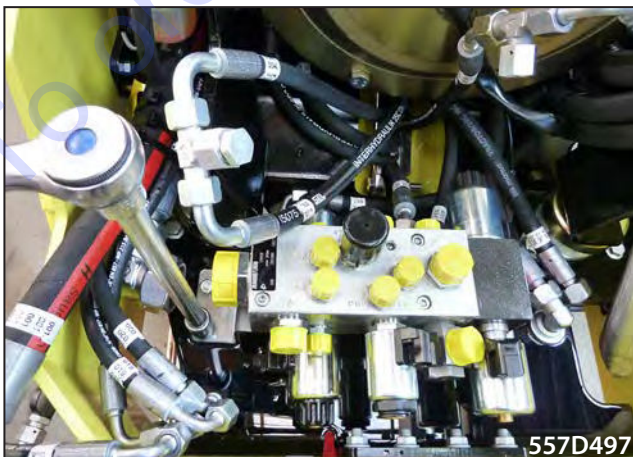


Remove hydraulic hoses 010 and 036 (screw union of the angled divider).

Close the screw union.



Remove the screws.

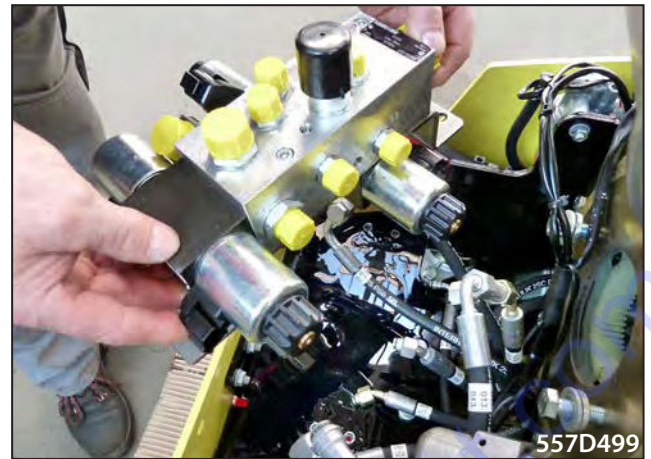


Lift the valve block from the chassis.

CAUTION:

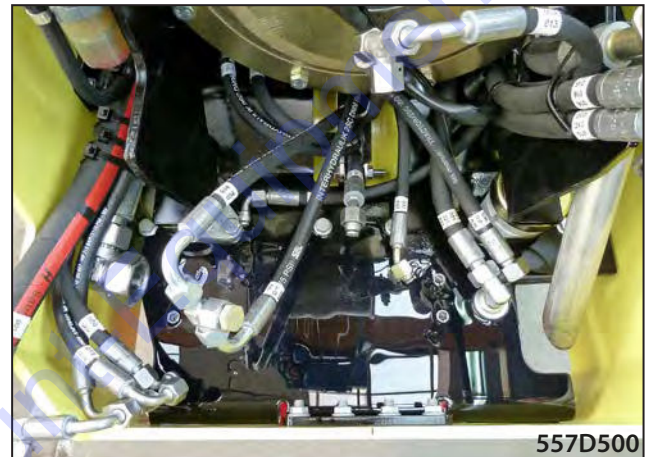
In this example, the travel pump has already been removed. It is not necessary to remove the travel pump to remove the valve block.

You can remove the side plates on the right and left on the chassis.



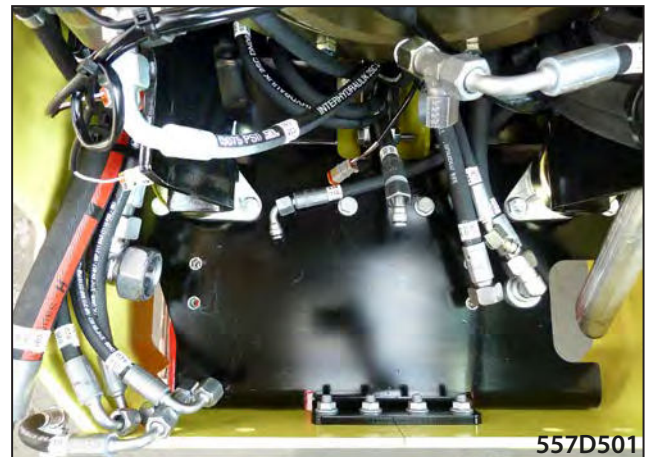
557D499

View of the motor compartment, removed valve block.



557D500

Before installing a new or tested valve block, clean the bottom plate of hydraulic oil and dirt.



557D501

Check

Magnetic valve – brake

We recommend checking all magnetic coils and valves on the removed valve block.

Remove the nut on the magnetic valve.



Remove the magnetic coil.

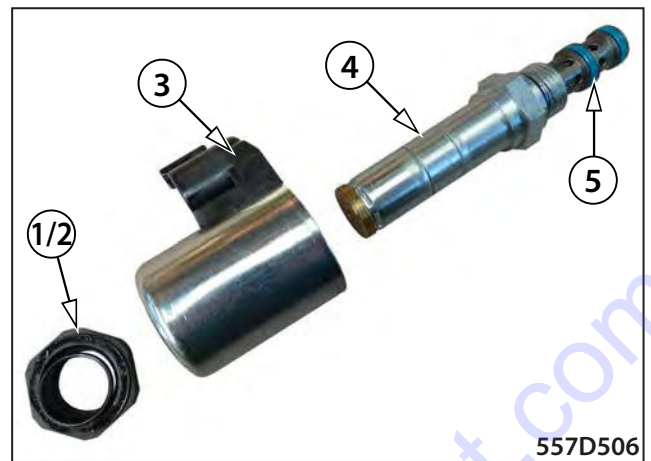


Remove the valve.



Removed magnetic valve:

- 1 Nut
- 2 Sealing ring
- 3 Magnetic coil
- 4 Magnetic valve
- 5 Sealing ring



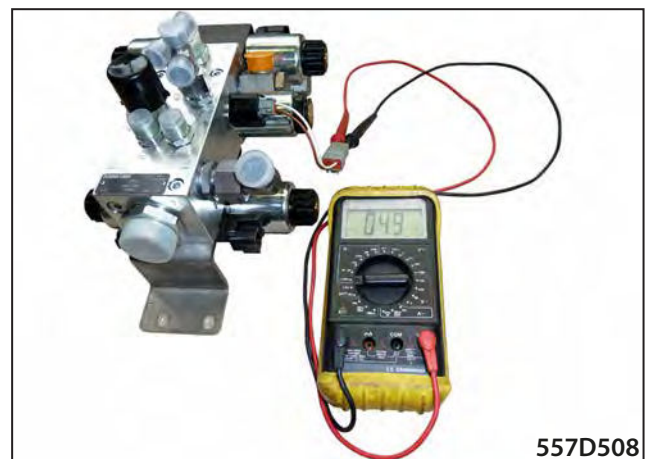
Supply the magnetic valve with 12 V.

The valve (arrow) must switch visibly and audibly

Check the sealing rings (1) for damage.



Brake magnetic coil resistance (4.9 Ohm).



11 Travel

Magnetic valve – high, low amplitude and steering

Remove the nut on the magnetic valve.

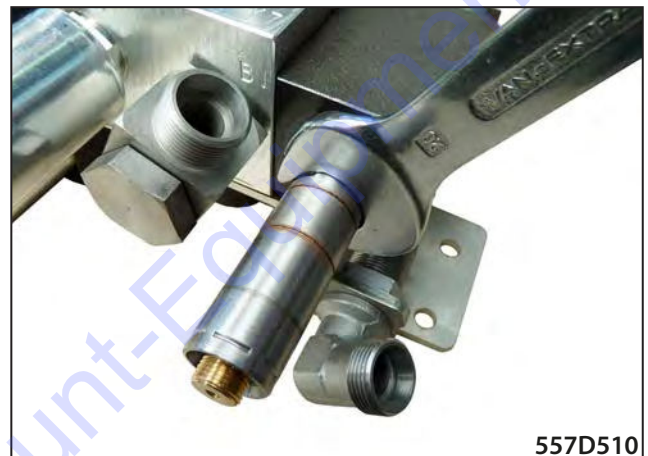
Remove the magnetic coil.



557D509

Remove the valve.

Put the valve in the magnetic coil.



557D510

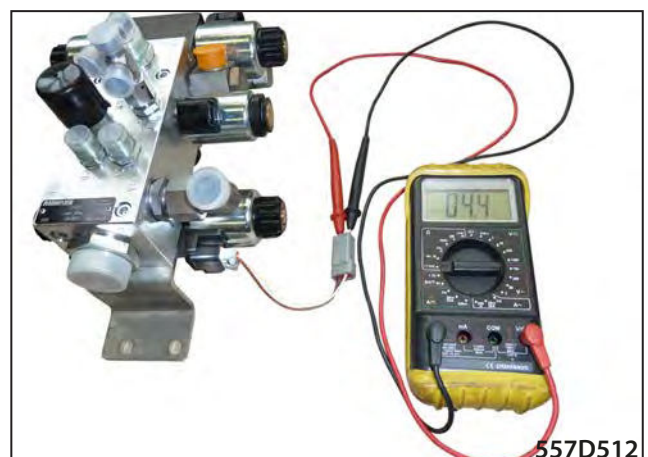
Supply the magnetic valve with 12 V.

The piston must switch visibly and audibly



557D511

Resistance of the high / low amplitude and steering magnetic valve (4.4 Ohm).



557D512

Max. pressure – brake, max. pressure – vibration

You can set the brake drain valve if necessary.



You can set the vibration drain valve if necessary.



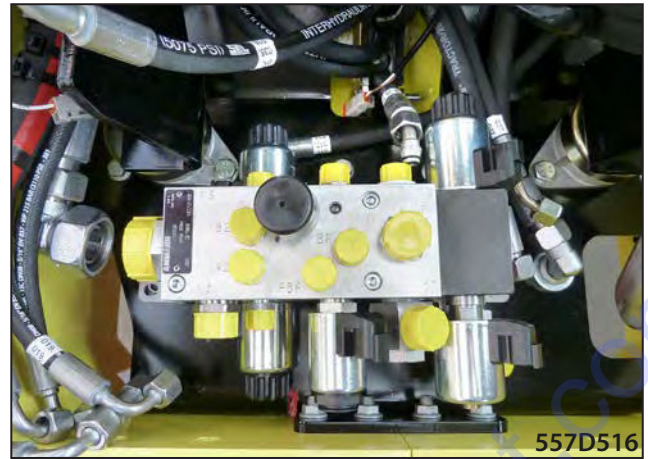
Magnetic valves can be activated manually.



11 Travel

Installation

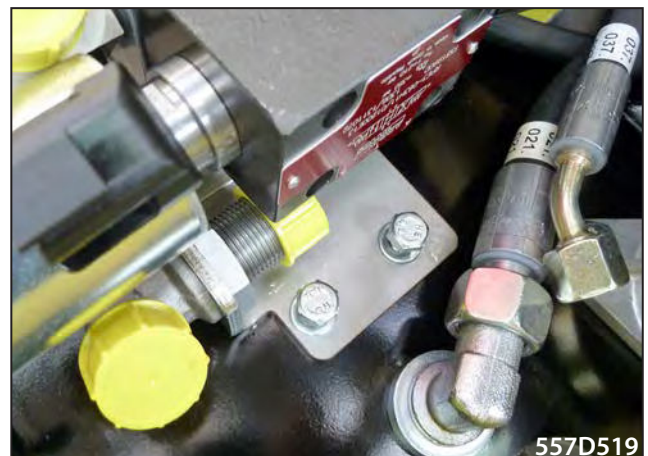
Place a new or checked valve block on the bottom plate.



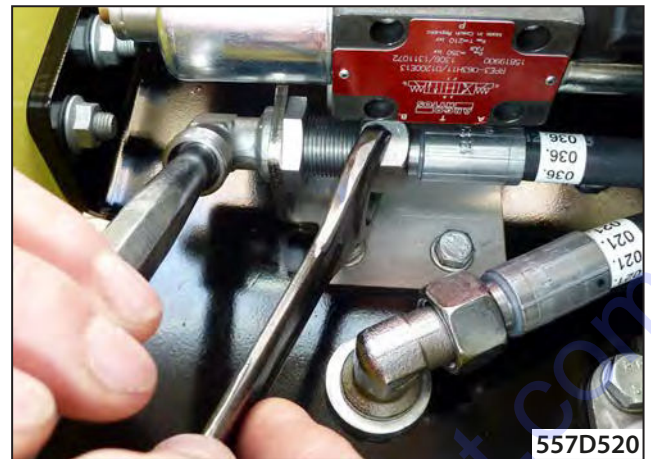
Apply blue adhesive on the screws.



Tighten the valve block screws (25 Nm).



Mount the 036 hydraulic hose on the screw union of the angled divider.



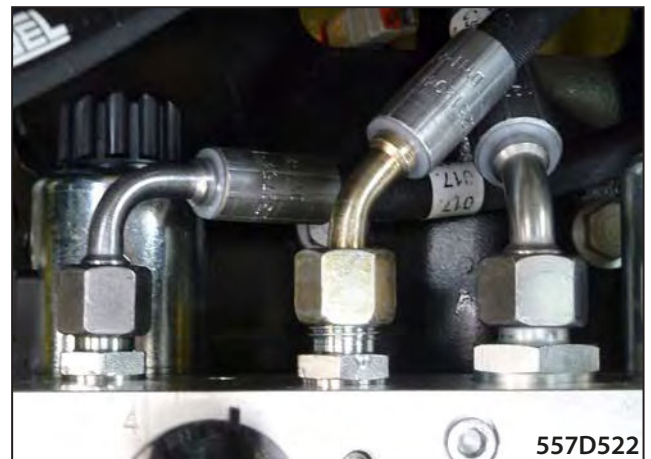
557D520

Mount the 010 hydraulic hose on the screw union of the angled divider.



557D521

Mount hydraulic hoses A1, B3, T3.



557D522

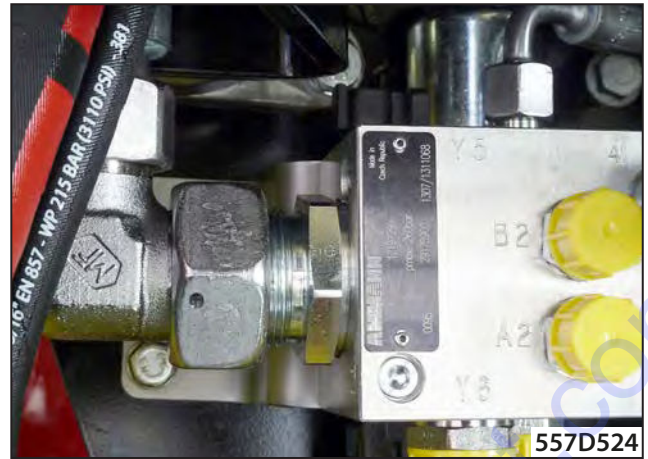
Connect the connectors in the back (Y5, Y8).



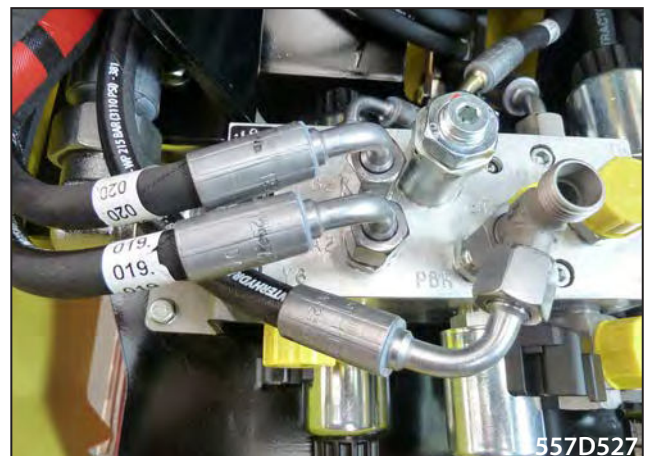
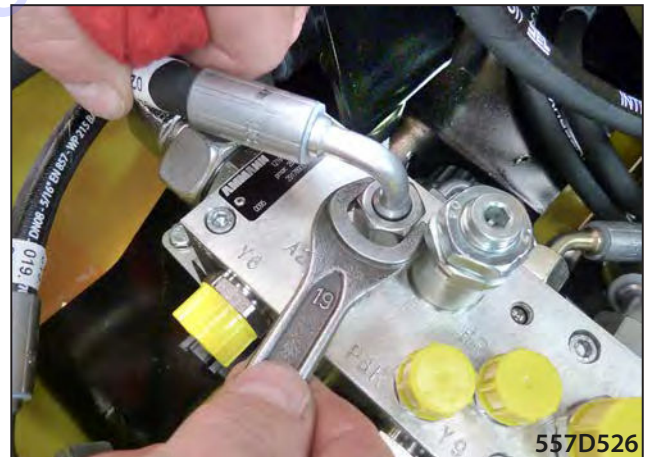
557D523

11 Travel

Mount the 004 (T1) hydraulic hose.



Mount hydraulic hoses A2, B2, PBR.



Mount the hydraulic hose of the T-screw union (BR).



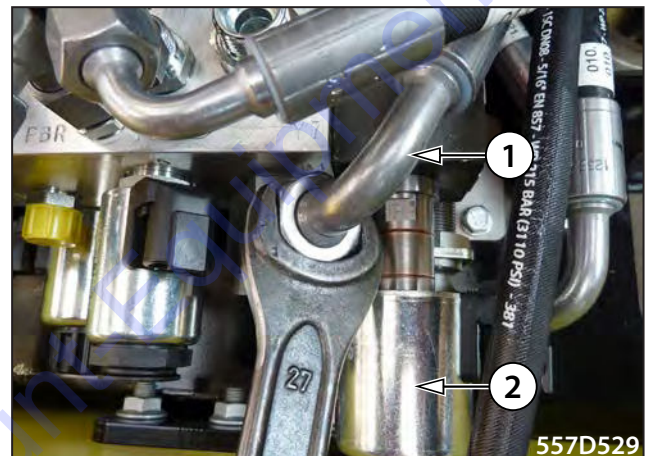
To maintain access to the screw union of the B1 hose (1), first move the magnetic coil (2) back.

Remove the knurled nut.

Remove the sealing ring.

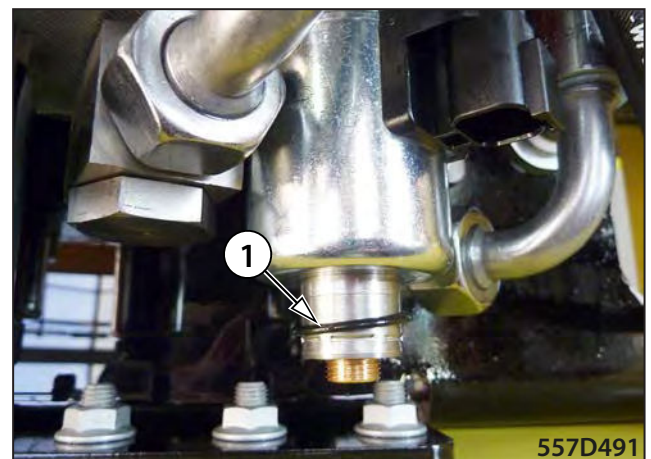
Move the magnetic coil (2) back.

Mount the B1 hydraulic hose (1).



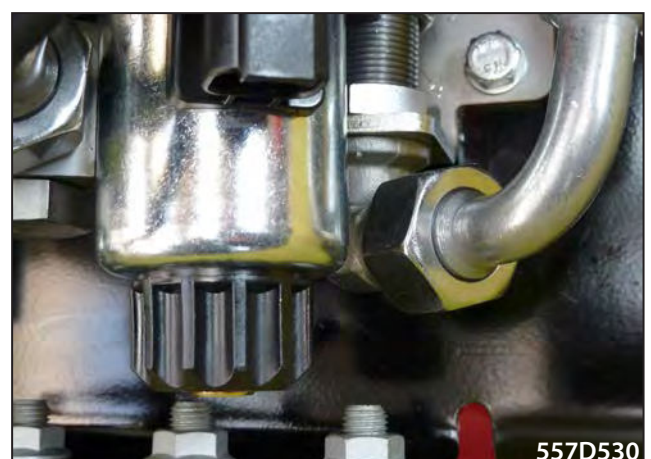
Move the magnetic hose back to the initial position.

Mount the sealing ring (1).



Mount the knurled nut.

Firmly tighten the magnetic coil.



11 Travel

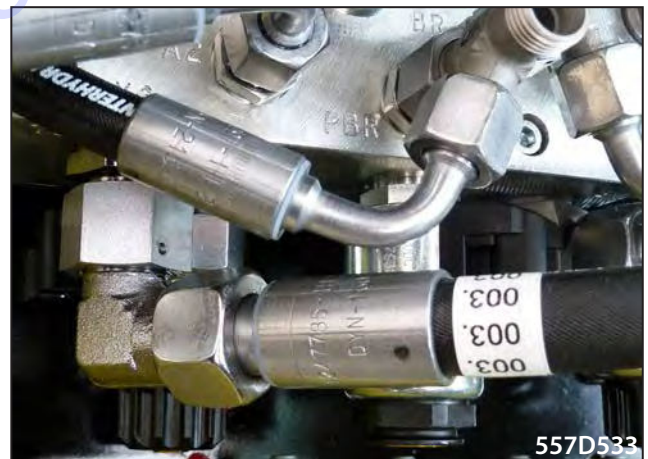
Mount the 018 (A3) hydraulic hose.



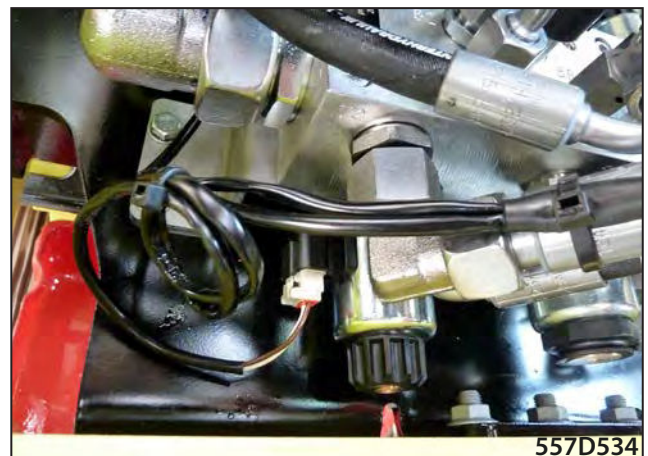
Mount the 002 (P) hydraulic hose.



Mount the 003 (T2) hydraulic hose.



Connect all front connectors (Y6, Y9, Y7).



Place the cable harness cleanly.

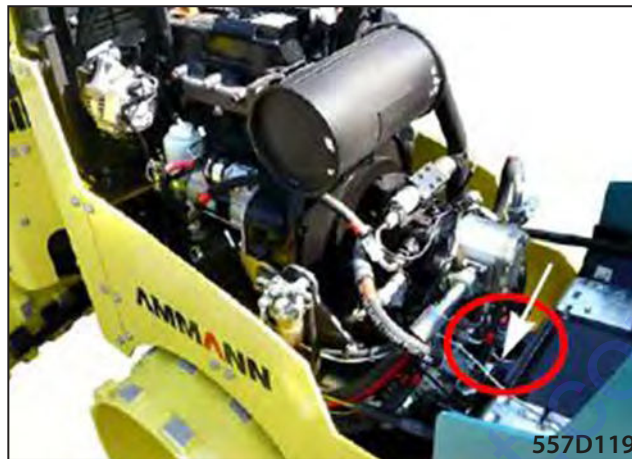
Fasten the cable harness with a cable tie.



11 Travel

11.2.3 Brake test

The brake function must be regularly checked.



Set the machine to the working position.

Disconnect the Y9 connector from the magnet located under the front bonnet.

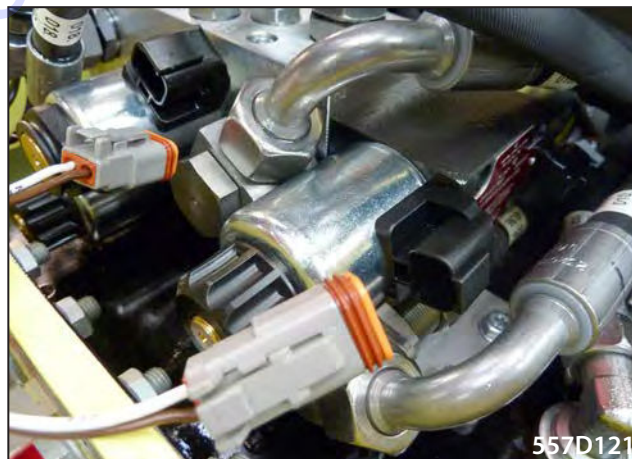
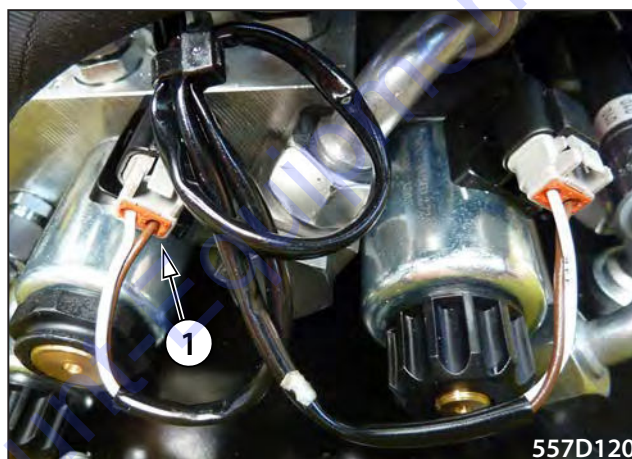
Drive forward and reverse using the infrared controller.

Check for drum spinning.

If the brake is defective, the corresponding drum will spin.



If the brake is defective, the roller is not safe to operate. Contact an authorized dealer and have the drum repaired by a specialist.



11.2.4 Replacement of the travel hydraulic motor

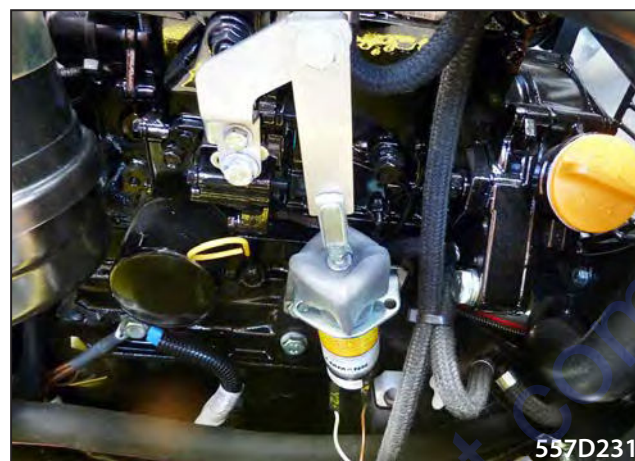
Replacement of the travel hydraulic motor (Chapter 7.4.2).

11.4 Mechanical parts

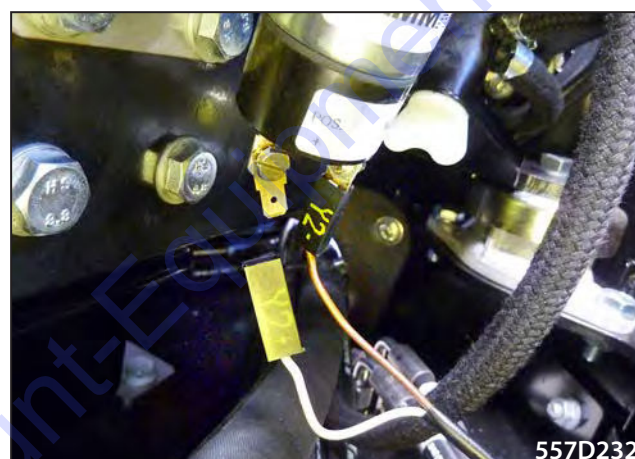
11.4.1 Replacement and adjustment of the speed magnet

Removal

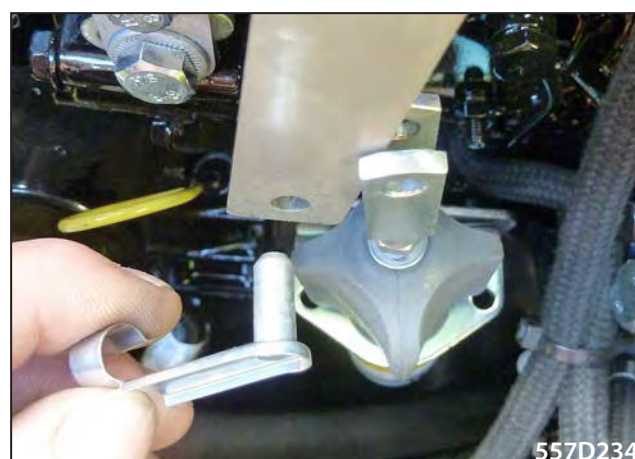
Speed magnet (1).



Pull down cables Y2+ and Y2-.



Remove the safety pin from the plug head.



11 Travel

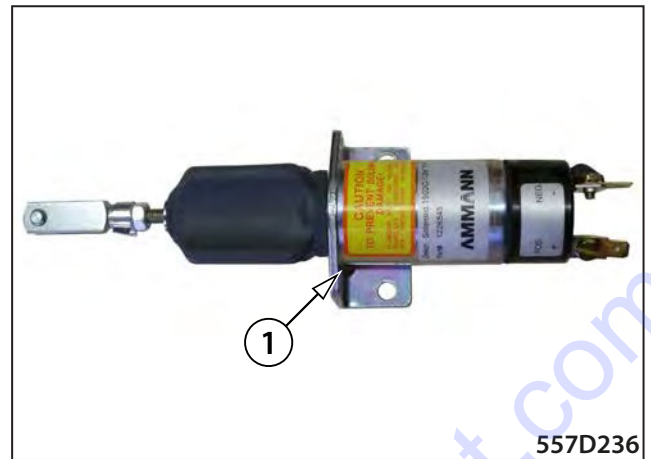
Remove the two screws.

Remove the speed magnet.



Installation

Preassembled speed magnet (1).



Apply blue adhesive on the screws.



Place and firmly fasten the speed magnet.



Lubricate the safety pin of the plug head.

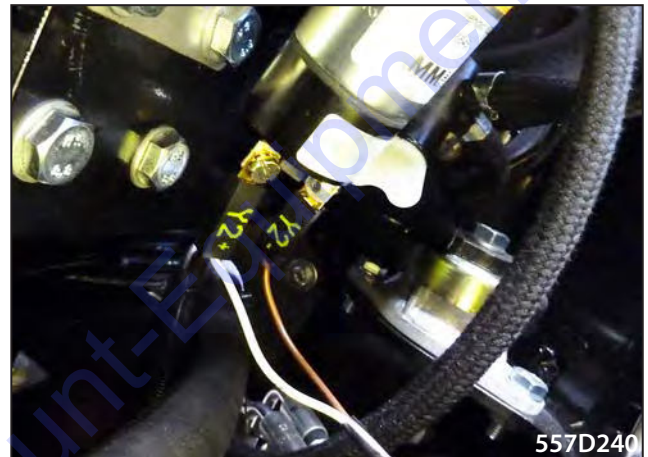


11 Travel

Mount the safety pin on the plug head.



Connect cables Y2+ and Y2-.

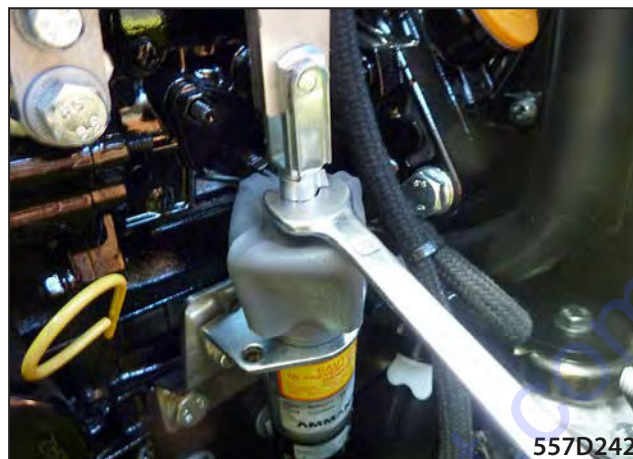


Do not interchange the - and + cables.

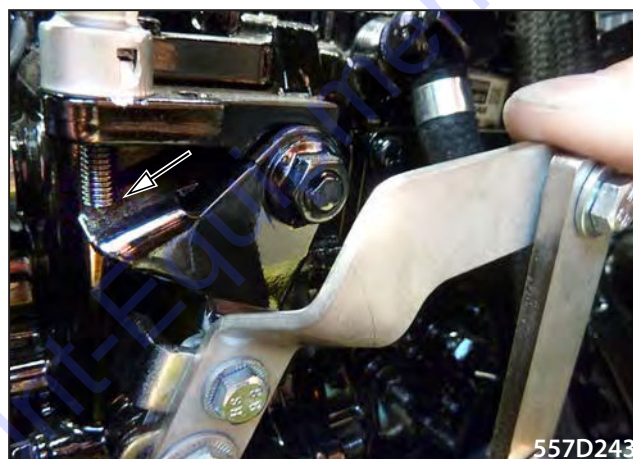


Adjustment

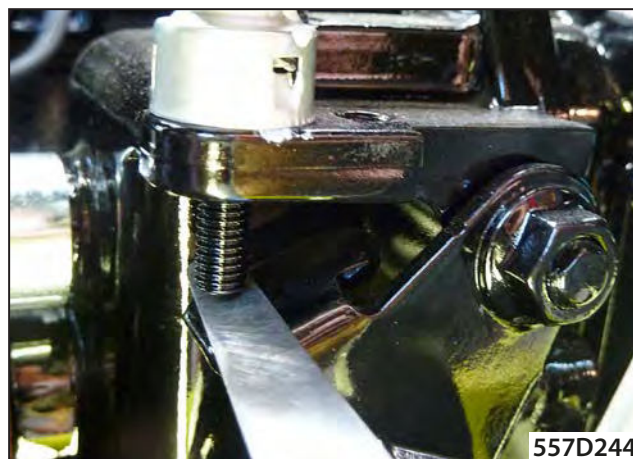
Loosen the lock nut on the plug head.



Push the piston rod completely down with your hand.
The stop (arrow) must not touch the adjustment screw.



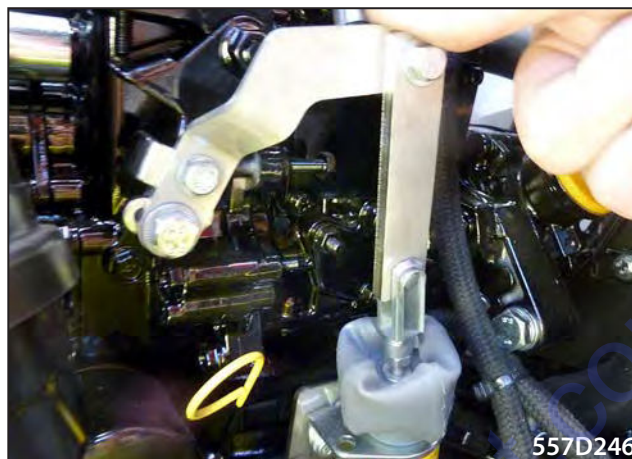
Use a feeler gauge (1.5 mm) to determine the distance between the adjustment screw and the stop.



11 Travel

Push the speed magnet completely to the stop!

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

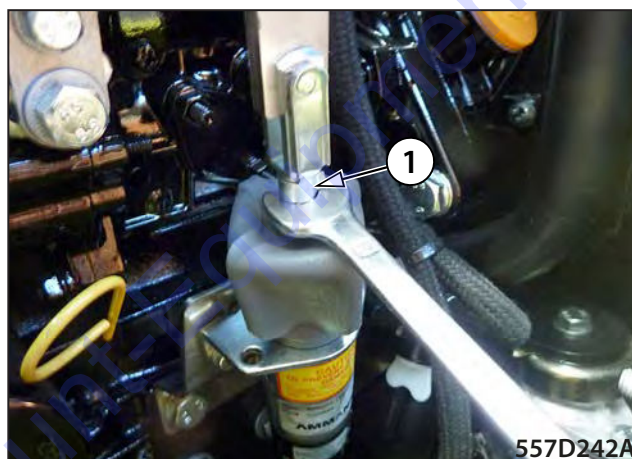


Start the engine.

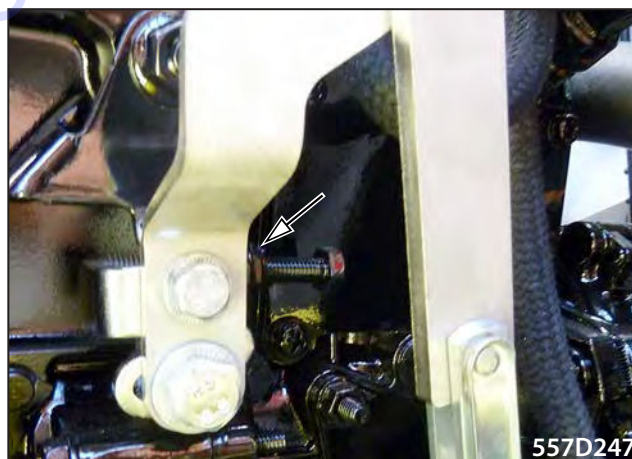
Push the speed magnet completely to the stop!

Measure the engine speed using the engine speed counter.

If the specified speed (at least 2390–2440 rpm) is not reached, it must be adjusted on the plug head (1).



When the engine is idling, move the adjustment lever to the adjustment screw.



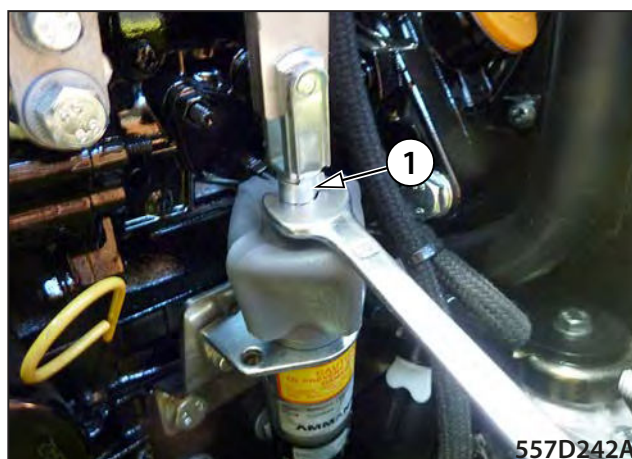
After the adjustment, firmly tighten the lock nut on the plug head.

Secure the nut with Loxeal 83-54.

Movement test: Move the speed magnet up and down with your hand.



When pushing the rod mechanism, it must move back to its original position by itself and without tension.



11.3.2 Checking the engine speed and frequency



Adjust the speed at the machine operating temperature.

Place the machine on two large or four small old tyres or adequately soft ground.

Start the engine.

Select vibration.

The machine sets the maximum speed = 2390–2440 rpm.

Use a revolution counter to measure the frequency. The required value is 41 Hz.

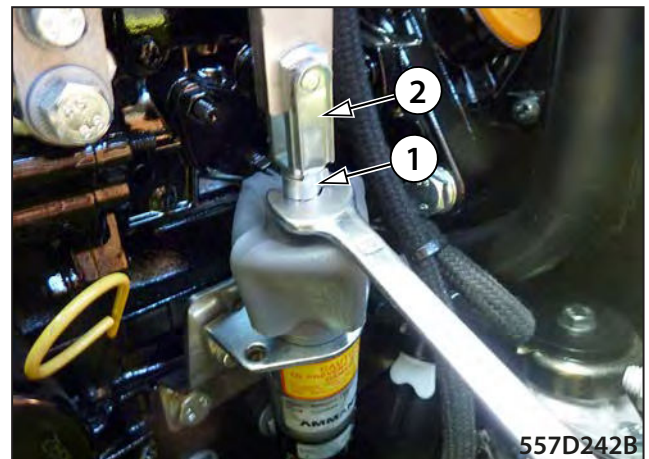


If the speed is not reached, check the engine speed.

If necessary, set the speed on the plug head (1).

Secure the nuts.

Make sure the lock (2) is engaged on the plug head.



Engine speed

	rpm	
	after 5 min.	after 60 min.
Engine speed 100%	2415 ± 25	2405 ± 25
Vibration speed, front low	2250 ± 150	2250 ± 150
Vibration speed, rear low	2250 ± 150	2250 ± 150
Vibration speed, front high	2250 ± 150	2250 ± 150
Vibration speed, rear high	2250 ± 150	2250 ± 150

12 Vibration

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13 Steering

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13 Steering

13.2 Hydraulic parts

13.2.1 Replacement of the steering piston

Replacement of the steering piston (Chapter 5.4.9).

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14 Cooling

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14 Cooling

14.2 Hydraulic parts

14.2.1 Cleaning of the hydraulic oil cooler

Check that the cooler fins are not dirty or clogged.

Clean the fins with water or blow-clean them with compressed air.



Never clean the cooler with high pressure (e.g. with strong water jets).

When the cooler is contaminated by petroleum products, use a cleaning agent and proceed according to the manufacturer's instructions! Find out the cause of contamination!

Do not smoke while working!

Check the hydraulic circuit for leakage.



Follow environmental standards and regulations when cleaning the machine!

Clean the machine in a workplace equipped with a catching system of cleaning agents to avoid contamination of the soil and water resources!

Do not use forbidden cleaning agents!



14.4 Mechanical parts

14.4.1 Coolant and checking the coolant level

A mixture of water and an anti-freeze liquid to -25 °C has been filled in the factory. The liquid shall be replaced with a suitable cooler mixture at temperatures below -25 °C.

14.4.1.1 Checking the coolant level

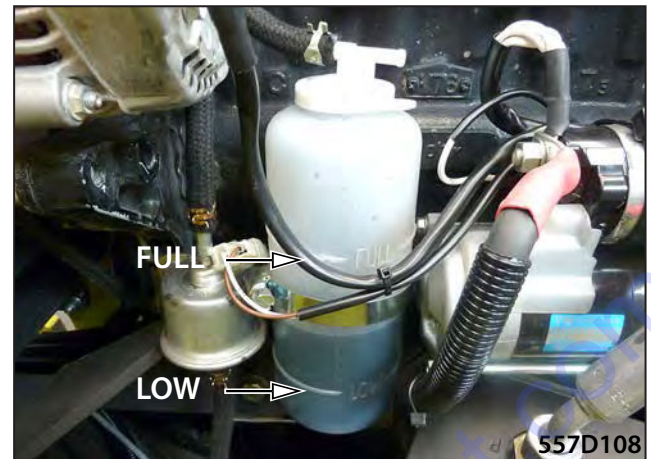
Check the coolant level daily.

Check it at a horizontal position of the roller and with cold engine.

You can see the coolant level on the indicator situated on the expansion vessel.

The coolant level must be between the upper mark (FULL) and the lower mark (LOW).

Refill the coolant as required.



14.4.1.2 Coolant replenishment



Risk of scalding from hot coolant!

Do not open the cooler tank until the coolant and the engine cool down.

Unscrew the coolant tank cap.

Fill up the cooler with a coolant with an anti-freeze liquid.



14.4.1.3 Cooler cleaning

Check that the cooler fins are not dirty or clogged.

Clean the fins with water or blow-clean them with compressed air.



Never clean the cooler with high pressure (e.g. with strong water jets).



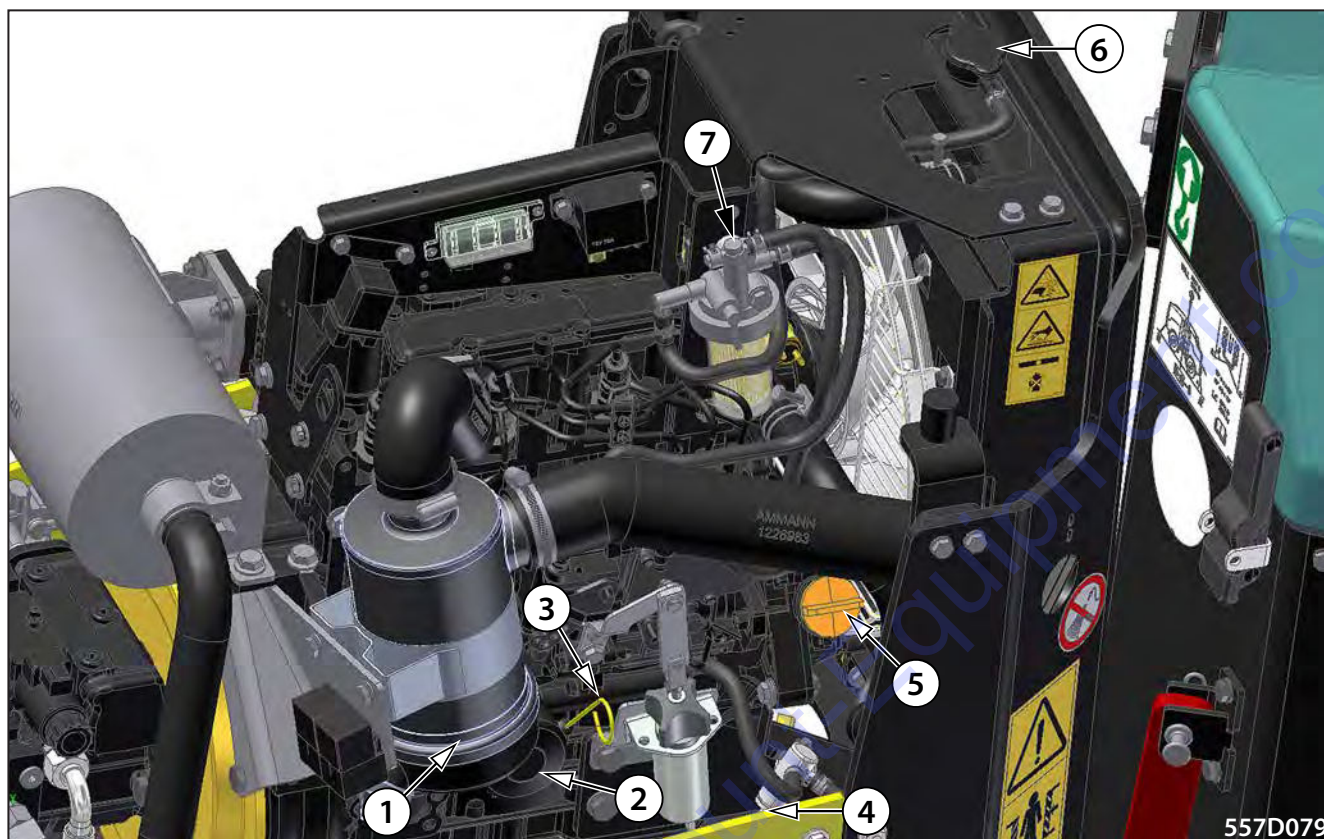
15 Engine

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15 Engine

15.1 Engine compartment, overview

15.1.1 Engine, left side



- | | | | |
|---|---------------------|---|----------------------------|
| 1 | Inlet air filter | 5 | Engine oil, filler neck |
| 2 | Engine oil filter | 6 | Cooling water, filler neck |
| 3 | Oil dipstick | 7 | Fuel filter |
| 4 | Cooling water drain | | |

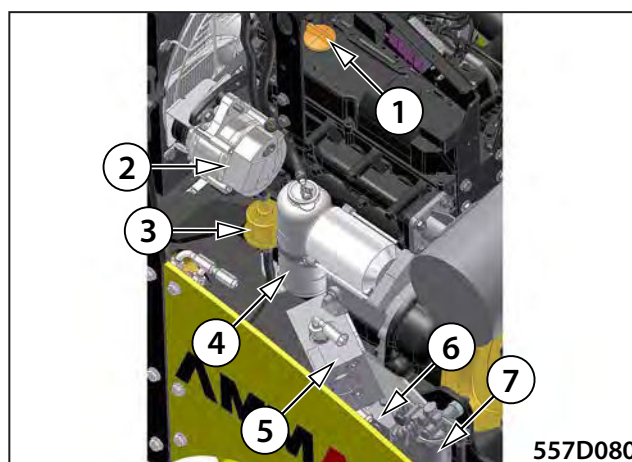
15.1.2 Engine, right side

- 1 Engine oil, filler neck
- 2 Alternator
- 3 Fuel pump
- 4 Cooling water level indicator
- 5 Quantity divider
- 6 Hydraulic block
- 7 Water separator



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

Always switch off the diesel engine before any inspection operations. The parking brake is active when the engine is switched off.



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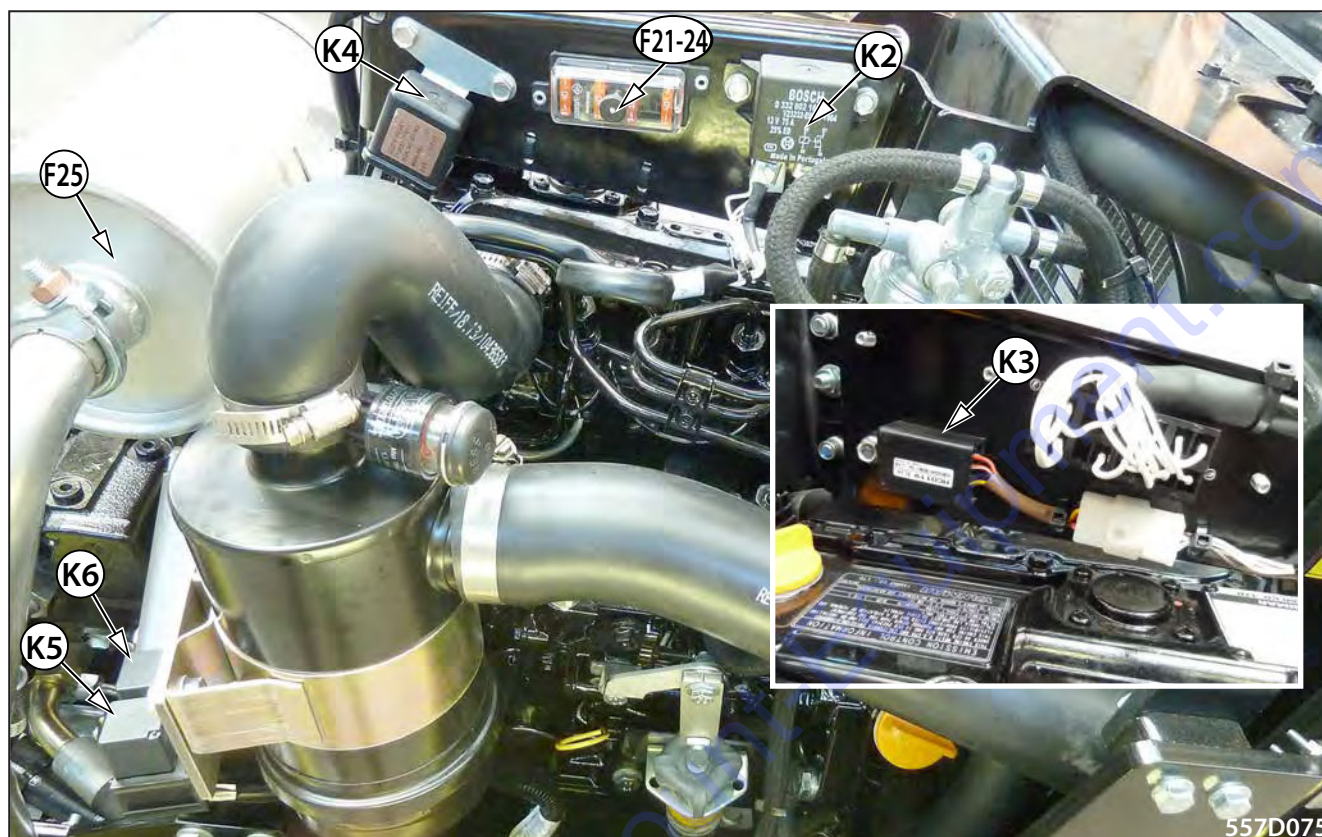
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15.3 Electrical installation

15.3.1 Engine compartment



Engine compartment relays / fuses

Functions of the engine compartment relays

	Functions
K2	Ignition relay, ignition lock
K3	Timer 1 s, input coil
K4	Relay, input coil, tripping magnet
K5	Speed magnet
K6	Preheating relay

Engine compartment fuses

Fuse no.	Value	Protected electric circuit	Socket
F21	40 A	Input coil, tripping magnet	A-1
F22	10 A	Diesel fuel pump, alternator 15+	B-2
F23	40 A	Speed magnet	C-3
F24	40 A	Preheating plug	D-4
F25	40 A	2. Single coil (Tier 4) (optional equipment)	

CAUTION!

K3 is located on the back of the plate.

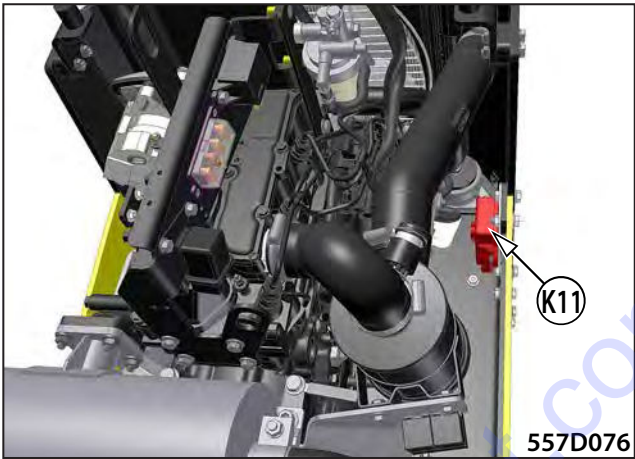
15 **Engine**

Height sensor Tier 4

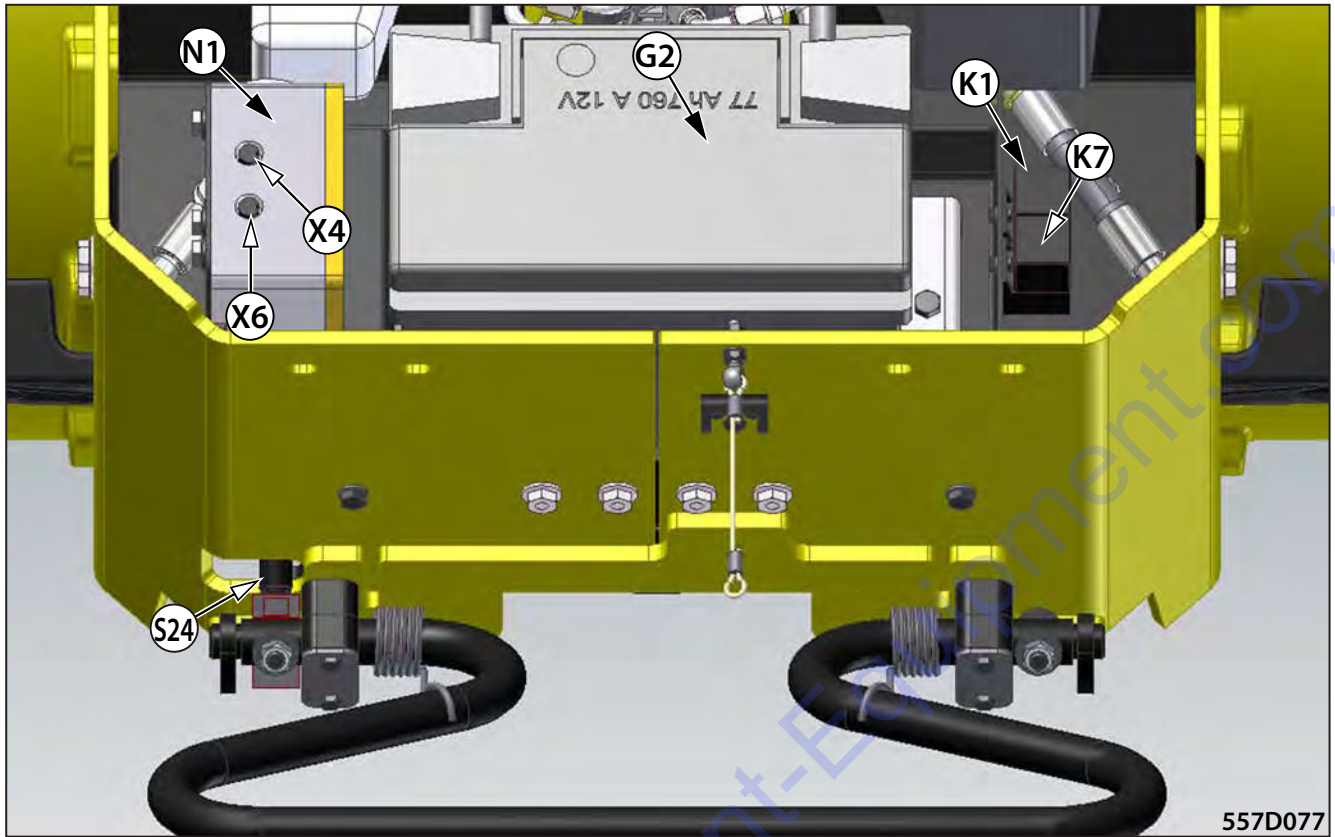
Relay Tier 4

Relay functions Tier 4

	Functions
K11	Height sensor Tier 4



15.3.2 Chassis at the rear



Relay, chassis at the rear

Relay functions, chassis at the rear

	Functions
G2	Battery
K1	Relay, ignition
K7	Relay, hydraulic oil cooler
N1	Machine control unit
S24	Switch, sensor, safety bar (optional equipment)
X4	Infrared sensor at the front P1
X6	Infrared sensor at the rear P2



Machines without a safety bar do not have the S24 proximity switch. The bridge retracts instead of the switch.

Infrared sensor connectors X4 and X6 are interchangeable. This has no effect on the machine.

15 Engine

15.3.3 Battery



Danger of cable burn or short circuit.

Follow the order in which the clamps are disconnected and connected.

- Ignition on = battery voltage The voltage during the ignition process should not drop below 10 V. Otherwise, the battery must be recharged.
- Machine running = alternator charging voltage. The voltage should be between 13 and 14.5 V.

15.3.3.1 Battery replacement

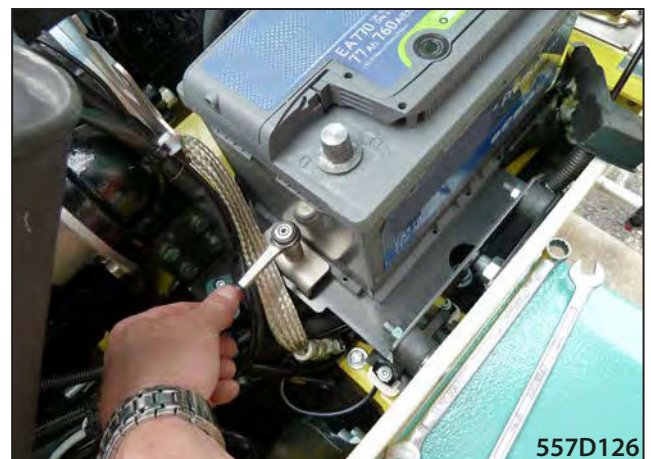
Loosen the (-) clamp and remove it.



Loosen the (+) clamp and remove it.



Loosen the holding angle piece and remove it.



Lift the battery from the machine area.

Insert a new battery.

Connect the battery.

Start with the (+) clamp.



Battery poles and clamps must be clean. If they show a coat of sulphate (whitish or greenish), they must be cleaned.



15 Engine

15.3.4 Batteries

The batteries are filled with an acid at a density of 1.28 g/ml by the manufacturer and charged sufficiently for immediate use. When the starting power is insufficient, recharging is required.

Charging

- The battery must be recharged if the open-circuit voltage is below 12.5 V due to a longer storage time. The open-circuit voltage shall be checked after 2–4 quarters from the production date. If the open-circuit voltage is below 12.5 V, the battery must be recharged before a longer storage time to a level from 12.7 to 12.8 V. The open-circuit voltage shall be measured with a digital multimeter. The measurement should be made at about 20 °C.
- Ensure good ventilation of working areas.
- Use suitable DC chargers only.
- Connect the plus pole of the battery with the plus output of the charger; connect the minus pole in a similar way.
- Turn on the charger after the battery is connected and turn it off after it is recharged.
- Recommended charging current: 1/10 battery capacity in Amperes (Ah).
- If the acid temperature exceeds 55 °C, interrupt the charging.
- The battery is fully charged when the charging voltage does not increase further in the course of two hours.
- When the charging is completed, always measure the open-circuit voltage (do it no sooner than 1 hour after the charging).

Removal

- While disassembling, first disconnect the cable of the negative (–) pole and then of the positive (+) pole. Never disconnect the battery when the engine is running.

Installation

- Remove the protective cover of the plus pole only in the machine while connecting the pole terminals and put it on the pole of the removed battery to prevent short-circuits.
- Clean the poles and clamps and apply a thin layer of grease on the poles.
- First, attach the plus poles and make sure the clamps are firmly attached.
- Leave at least one degassing vent free.

15.3.5 Alternator replacement

The alternator is a part of the engine. In the event of a fault, contact Discount-equipment.

15.3.6 Starter replacement

The starter is a part of the engine. In the event of a fault, contact Discount-equipment.

15.4 Mechanical parts

15.4.1 Fuel filter element

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

Close the cock (3).

Switch to OFF.

Remove the filter cap (2)

Remove the old filter element (1).

Insert the new filter element (1).

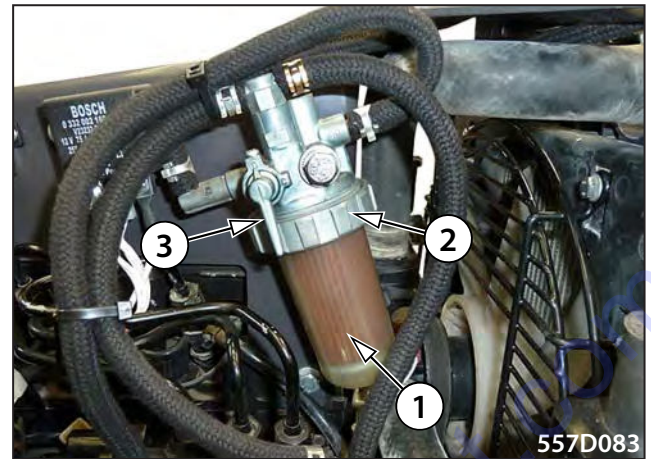
Screw on the filter cap (2).

Open the cock (3).

Switch to ON.

Turn the ignition on.

The fuel pump will automatically bleed the system.



15.4.2 Water separator filter element

Empty the filter housing

If there is water in the filter housing, immediately empty it.

Close the cock (3).

Switch to OFF.

Unscrew and empty the filter housing.

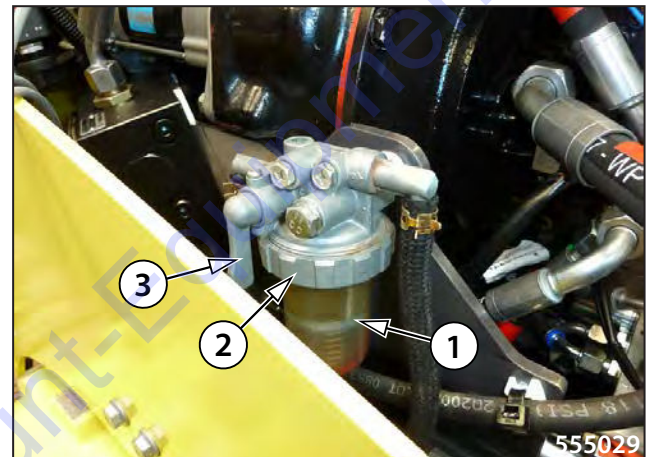
Screw on the filter housing.

Open the cock (3).

Switch to ON.

Turn the ignition on.

The fuel pump will automatically bleed the system.



Filter element, cleaning

Clean the water separator filter element (1) according to the service plan.

Close the cock (3).

Switch to OFF.

Remove the filter cap (2)

Clean the filter element (1).

Screw on the filter cap (2).

Open the cock (3).

Switch to ON.

Turn the ignition on.

The fuel pump will automatically bleed the system.

15 Engine

15.4.3 Checking the engine oil level

Oil dipstick

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

Check it at a horizontal position of the roller and with cold engine.

The engine oil level can be seen on the oil dipstick. The oil level must be between the upper mark (x) and the lower mark (y).

Refill the engine oil as required.



15.4.4 Engine oil replenishment

Replenish the engine oil through one of the two filler necks.

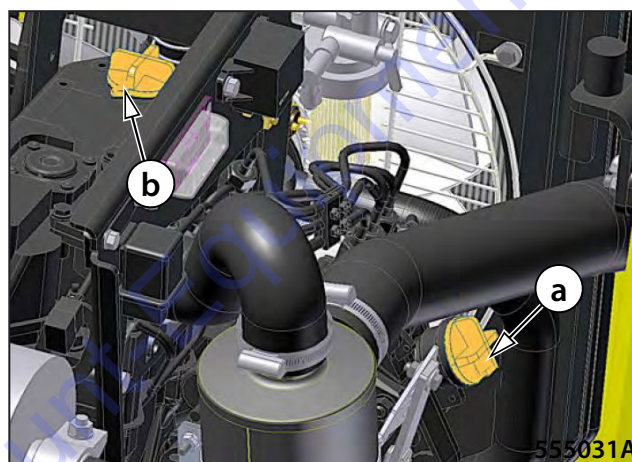
Filler neck on the left side of the engine.

Filler neck on the engine.

Filler neck on the left and filler neck on the top.



To assure permanent operational safety of the engine, no additives may be added to the engine oil.



15.4.5 Engine oil draining

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



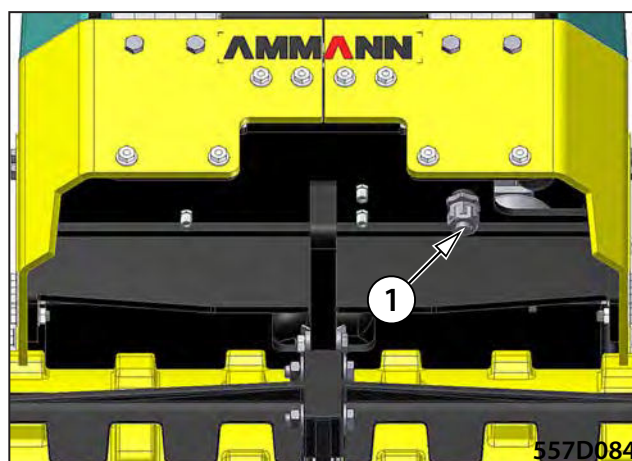
Operating fluids pose a risk to the environment!

Prevent fluids from leaking into sewage systems, soil or the environment.

Place a vessel under the drain.

Remove the drain plug.

The oil flows out immediately.



15.4.6 Engine oil filter replacement

Release the filter (1) manually or using the filter key.

The oil starts to automatically flow out. First place a rag under it.

Replace the oil filter.

Install in accordance with instructions (see filter packaging or filter housing).

Screw the filter back in place.

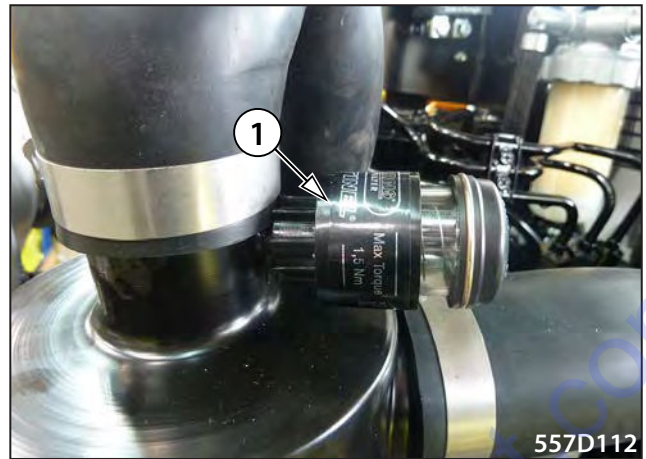


15 Engine

15.4.7 Inlet air filter

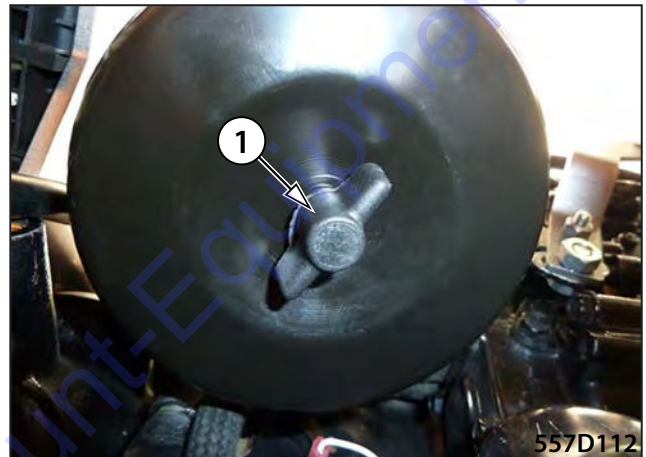
Dirt indicator

- If the red ring appears on the contamination indicator (1) during operation of the machine, you must replace the cartridge.

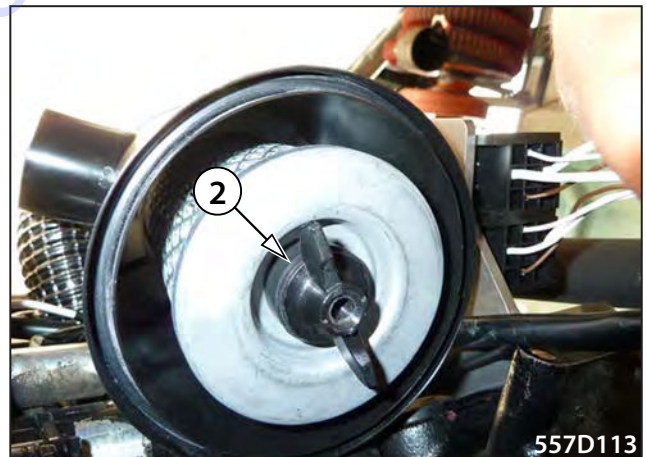


Air filter cartridge

- The air filter is located on the left side of the engine.
- Remove the wing nuts (1) with the cap.



- Remove the wing nuts (2) from the air filter cartridge.



- Remove the air filter cartridge (3).



Check the air filter cartridge for:

- Damage: replace the cartridge.
- Dirt: clean the cartridge.



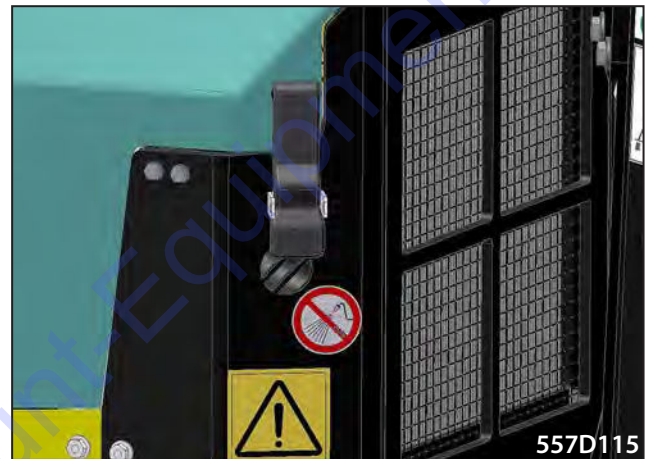
If the machine is used on heavily dusty grounds, the air filter must be checked daily for dirt.

When cleaning / replacing the cartridge, make sure that no dirt enters the suction hose.

Suction port

Check the suction port for:

- Dirt: clean the suction port.



15.5 Replacement and adjustment of the speed magnet

Replacement and adjustment of the speed magnet (Chapter 11.4.1).

15 Engine

15.6 Checking the engine speed and frequency

Checking the engine speed and frequency (Chapter 11.3.2).

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16 Optional equipment

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16 Optional equipment

16.1 List of optional equipment

Safety bar

Drum extension set

Scrapers

Set of filters, 500 h

Tarp cover

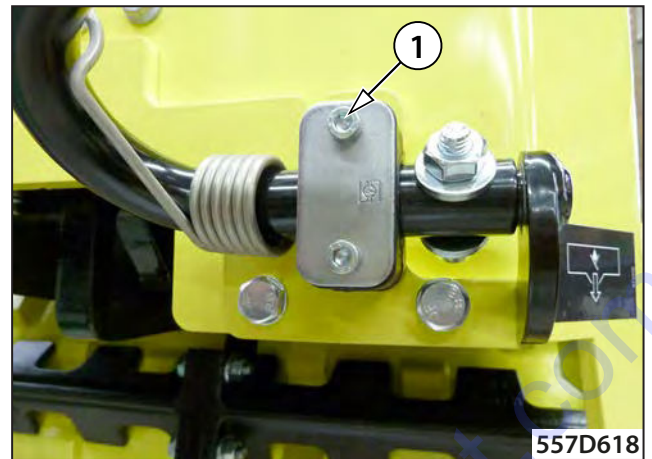
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16.2 Safety bar

16.2.1 Safety bar replacement

Remove the screws (1) on the clip body.

Remove the safety bar from the chassis.



Right side, remove the screw on the safety bar.



Remove the stop on the right.

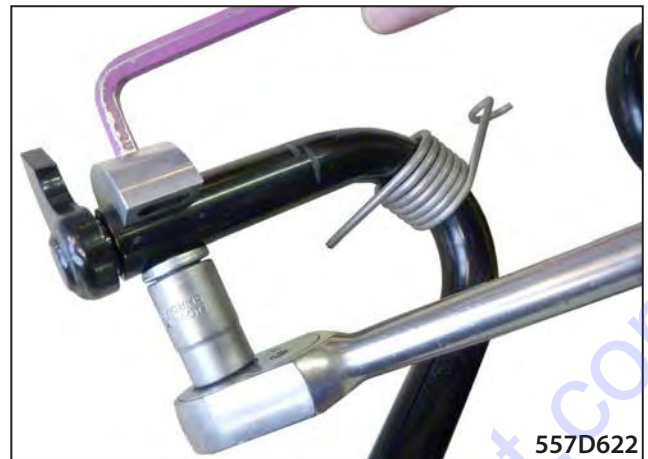


Remove the spring.



16 Optional equipment

Left side, remove the screw on the safety bar.



Remove the stop on the left.



Remove the magnet.



Remove the spring.



Check if the removed parts can be reused.



557D626

Apply blue adhesive on the clip body.



557D627

Attach the clip body on the chassis using the screws.



557D628

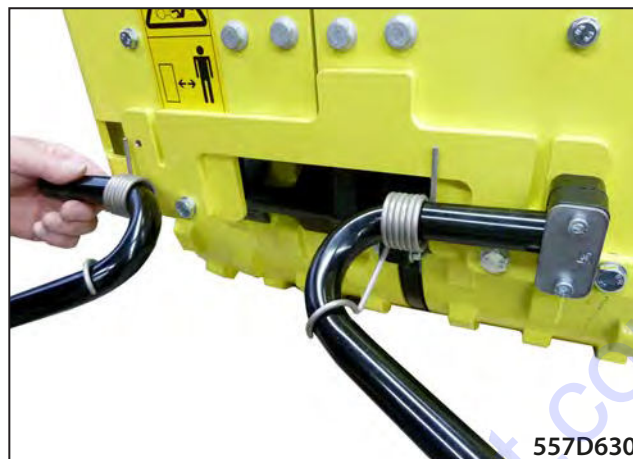
Move the spring on the right and left to the safety bar.



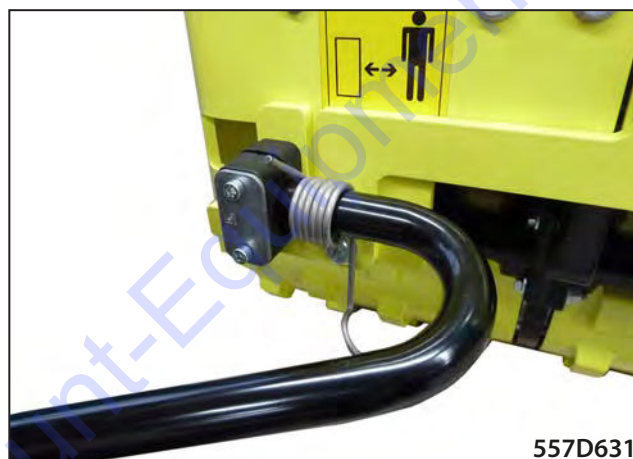
557D629

16 Optional equipment

Move the safety bar in the clip body to the right.



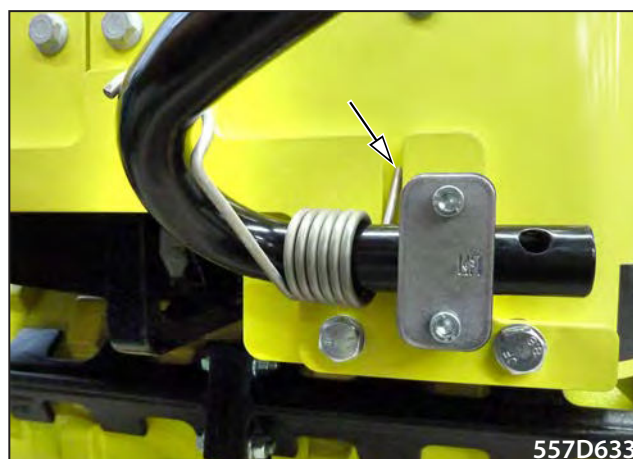
Mount the clip body on the left.



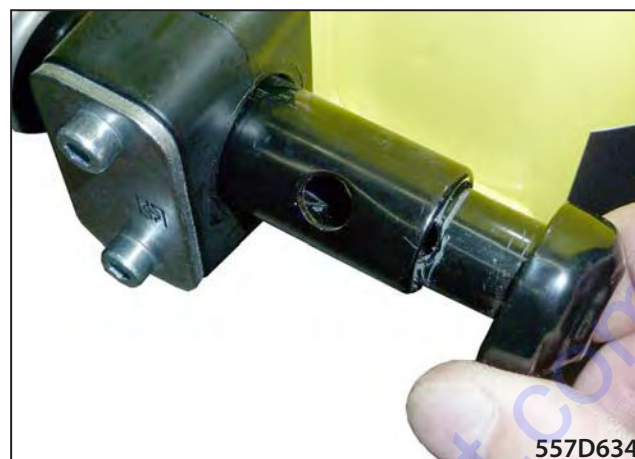
Tighten the screws firmly.



Place the springs in the dedicated slots, on the right and left.



Place the stop on the right.



557D634

Insert the screw and apply blue adhesive on it.



557D635

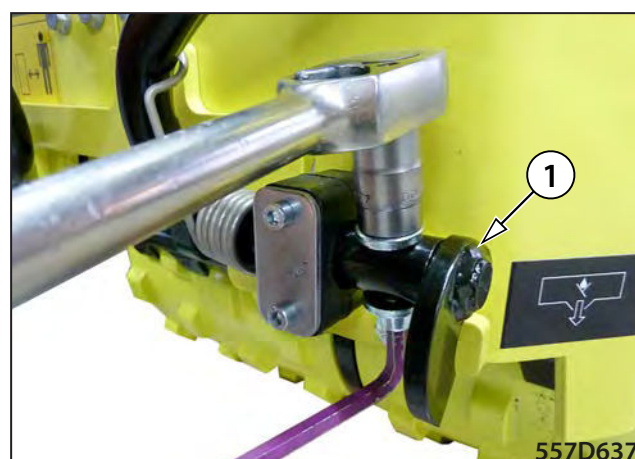
Mount the washer and nut.



557D636

Tighten the screw firmly.

Tighten the screw firmly until the stop (1) lies in the tube without a gap.



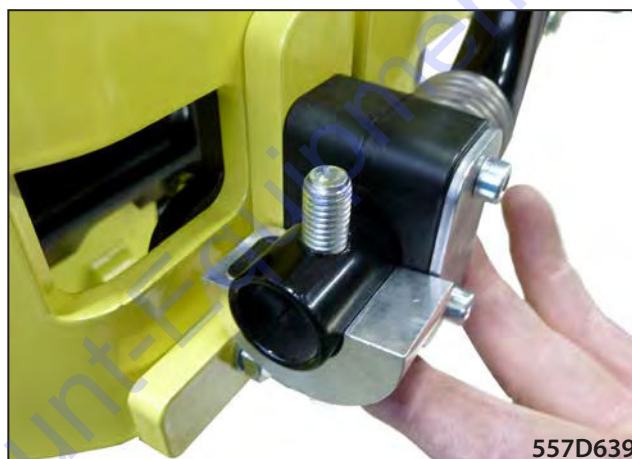
557D637

16 Optional equipment

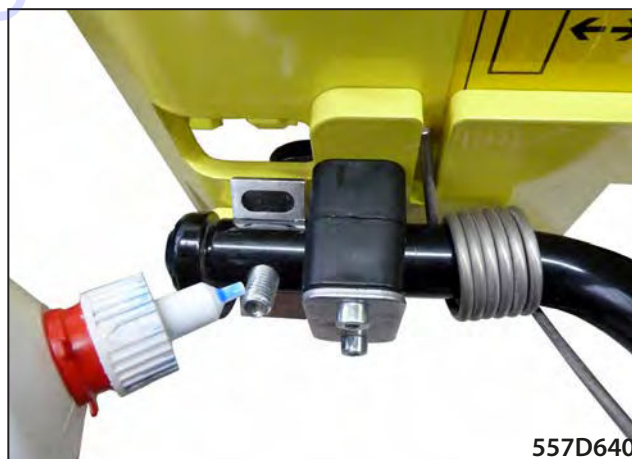
Mount the magnet on the left on the tube.

Observe the installation position (see the figure).

Insert the screw from below.

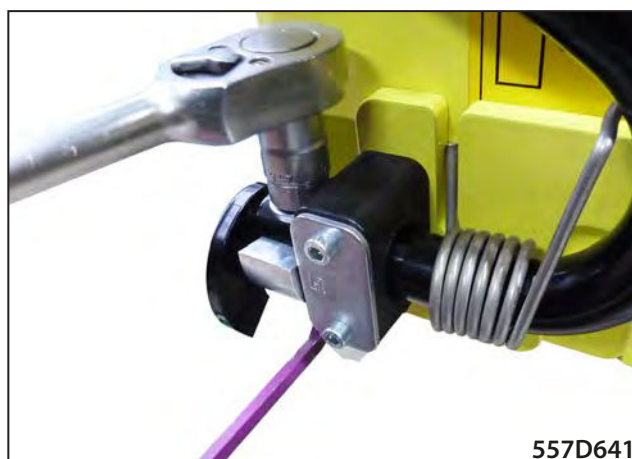


Apply blue adhesive on the screw.



Tighten the screw firmly.

Tighten the screw firmly until the stop (1) lies in the tube without a gap.



New safety bar, completely installed.



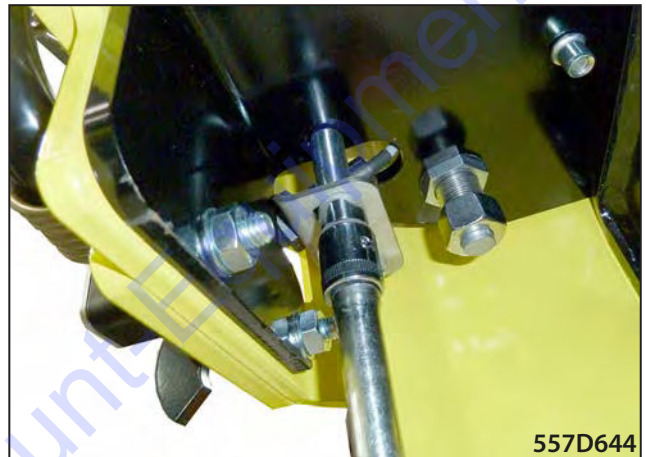
16 Optional equipment

16.2.2 Sensor replacement and adjustment

Disconnect the sensor cable connectors.



Remove the sensor holder under the chassis.



Remove the old (defective) sensor from the holder.



Apply blue adhesive on the new sensor.



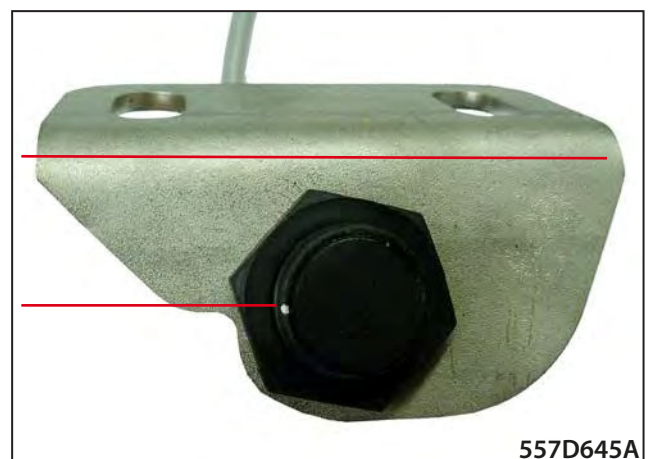
Check the installation distance (approx. 25 mm).



Observe the installation position (see the white mark on the sensor head).



Mark parallel to the holder bend.



16 Optional equipment

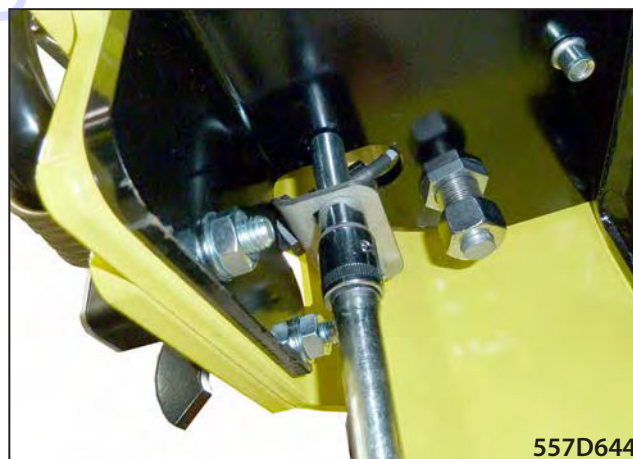
Apply blue adhesive on the screws.



Put the sensor cable through the hole in the chassis.
Mount the sensor holder.

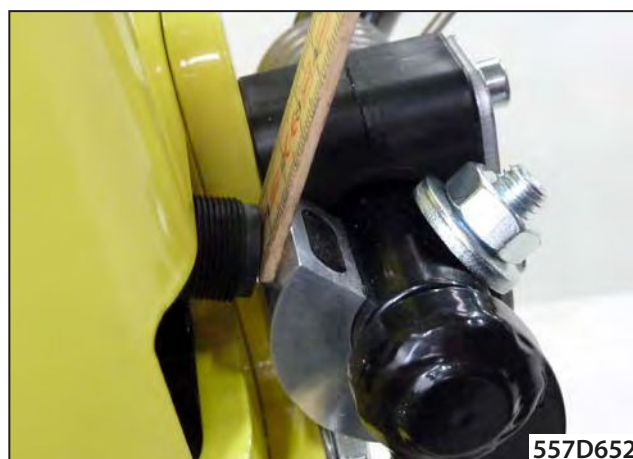


Tighten the screws slightly.

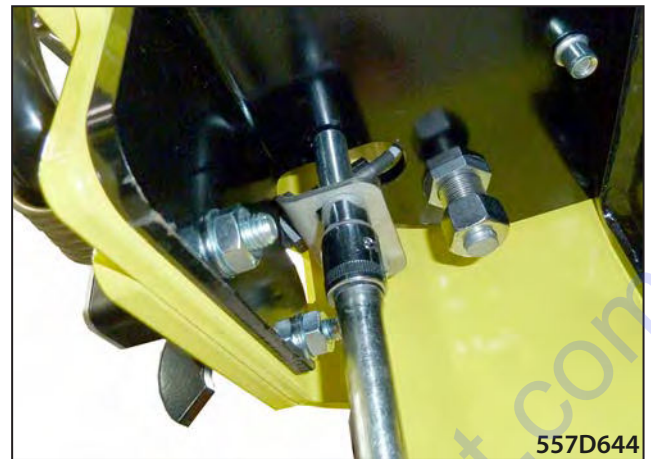


Set the distance (approx. 3 mm) between the sensor head and the magnet.

Move the sensor holder appropriately.



Tighten the screws to a torque of 25 Nm.



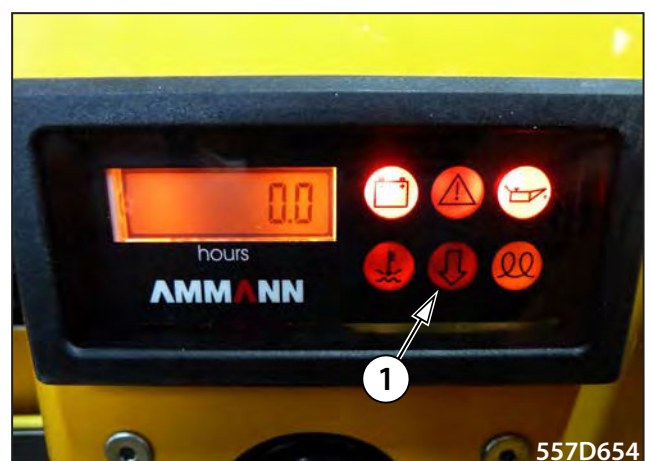
Connect the sensor cable.
Fasten the connector with a cable tie.



Function check, safety bar at the top: The "Safety Bar" indicator lamp (1) must be on.



Function check, safety bar at the bottom: The "Safety Bar" indicator lamp (1) must be off.



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17 General procedures

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17 General procedures

17.2 Electrical installation

17.2.2 Preparation for welding work



Welding work on a roller with an installed battery may damage the machine control device!

Completely remove the battery before welding work on the roller.

Place grounding cables of the welding equipment as near to the point of welding as possible. The grounding point must be free of paint.



Danger of injury!

Incorrectly welded castings may result in material cracks.

Welding of castings is prohibited!

17.2.3 Starting the battery by means of another battery (jumping)

Attach the red cable to the (+) clamps of both batteries.

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

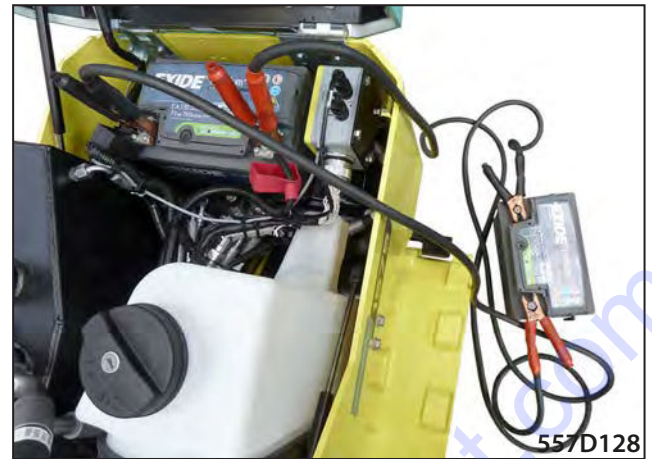
Press the starter. Let the engine run.

Wait until the engine evenly rotates at idle speed and disconnect the cables from the clamps.

Start with the (+) clamp.



Battery poles and clamps must be clean. If they show a coat of sulphate (whitish or greenish), they must be loosened and cleaned.



17.2.4 Charging the battery with a charger

Disconnect the battery from the clamps.

Connect the charger.

Observe the operating manual of the charger manufacturer.

When reconnecting the battery, start with the (+) clamp.



Battery poles and clamps must be clean. If they show a coat of sulphate (whitish or greenish), they must be loosened and cleaned.

17.2.5 Long-term storage

In case of prolonged downtime of more than two weeks, remove the battery cable from the negative battery pole.

17.2.6 Battery replacement

Battery replacement (Chap. 15.3.2.1).

18 Troubleshooting

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18 Troubleshooting

18.1 Error diagnostics

This chapter states possible causes of faults and their troubleshooting according to fault symptoms. Although it is not expressly mentioned, respect that cabling may always be a possible cause of an electric failure.



According to our experience, faults are mostly caused by the cable harness or connection of connectors.

It is a good idea to first check the machine for worn cables and loose or defective connectors.

Because it is a remotely controlled machine, faults can have countless causes. We recommend reading this chapter briefly to get an insight. In any case, also pay attention to the LEDs on the manual control and signals on the display unit.



The machine does not switch off automatically if the hydraulic oil temperature is too high!

If you suspect that the machine has become too hot, check the following:

F14 fuse

S25 oil temperature switch

K7 relay

M3 cooler

The S25 oil temperature switch must turn on the fan when the oil temperature exceeds 50 °C.

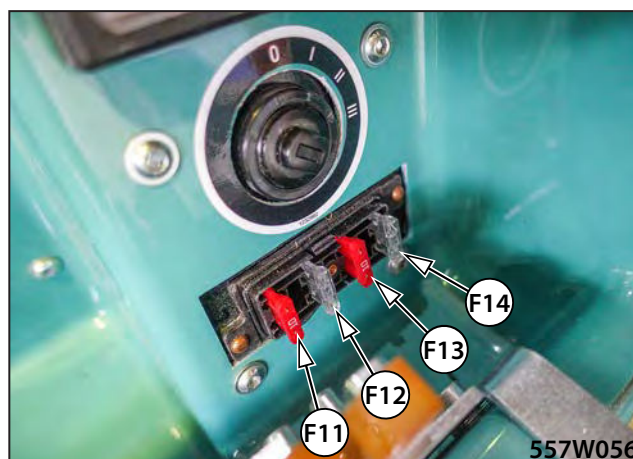
18.1.1 Description of basic components

F11 – Fuse - control unit, power supply

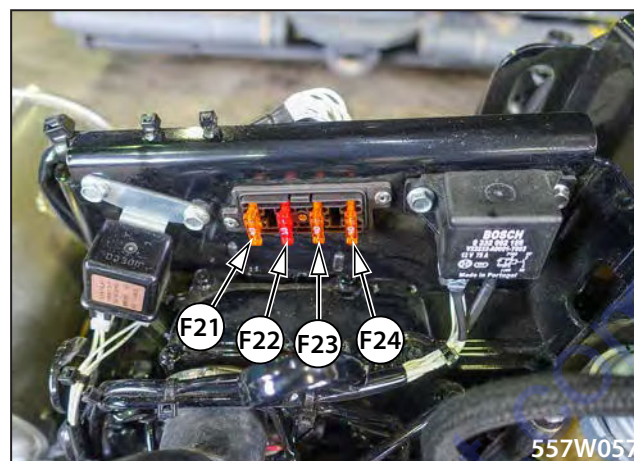
F12 – Fuse - control unit, outputs

F13 – Fuse – display unit, safety bar

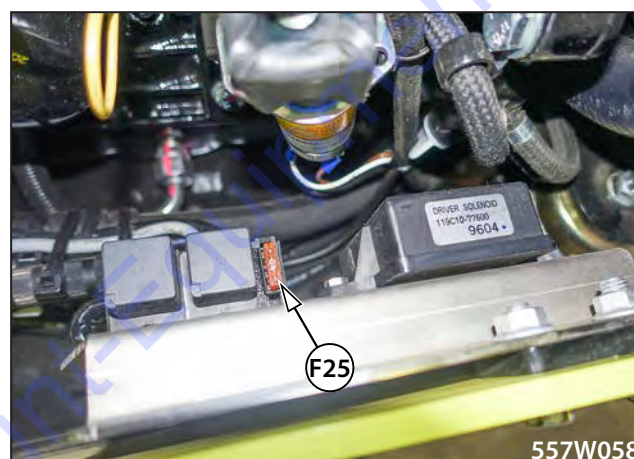
F14 – Fuse – Hydraulic oil cooler



- F21 – Fuse – Pull solenoid
- F22 – Fuse – Fuel pump, alternator
- F23 – Fuse – Working speed
- F24 – Fuse – Ignition coil



- F25 - Fuse – altitude sensor

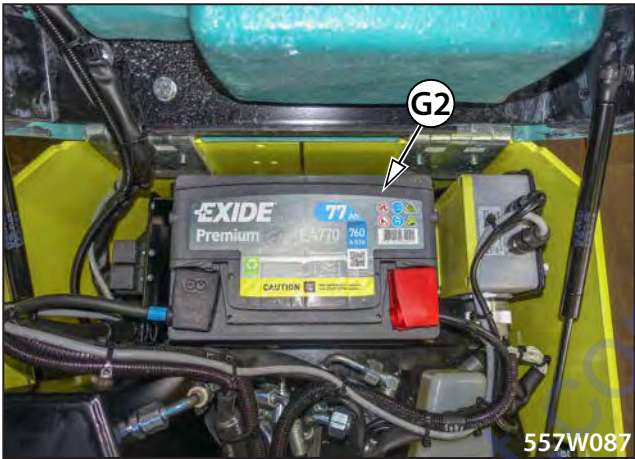


- G1 – Alternator

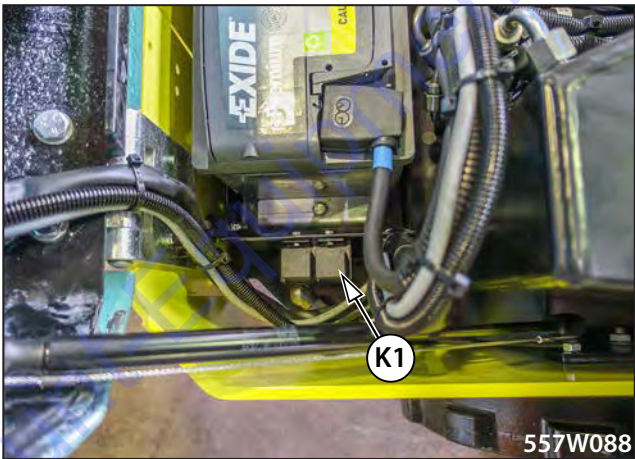


18 Troubleshooting

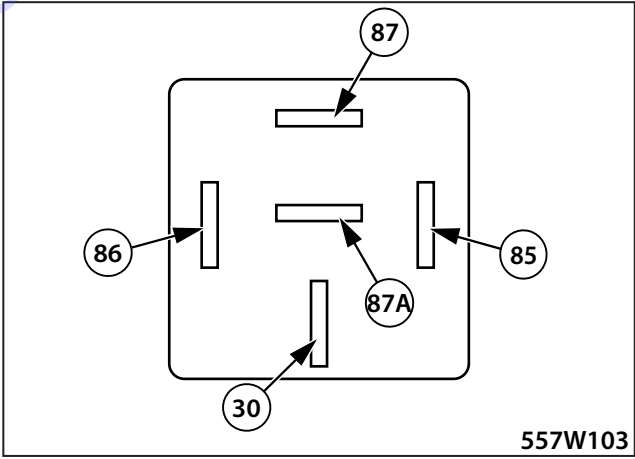
G2 – Battery



K1 – Ignition relay



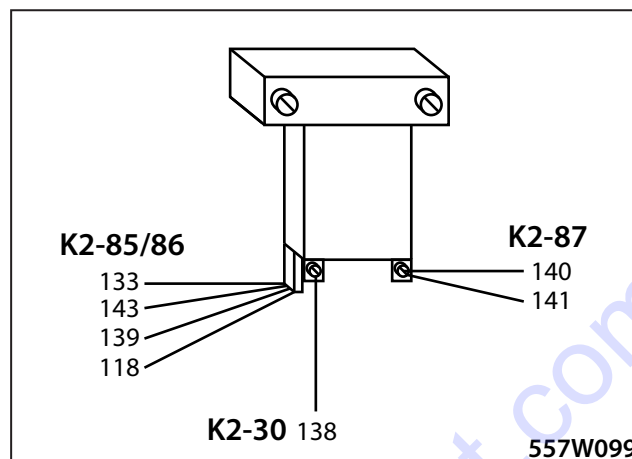
K1 relay – Pin layout



K2 – Relay – start lock



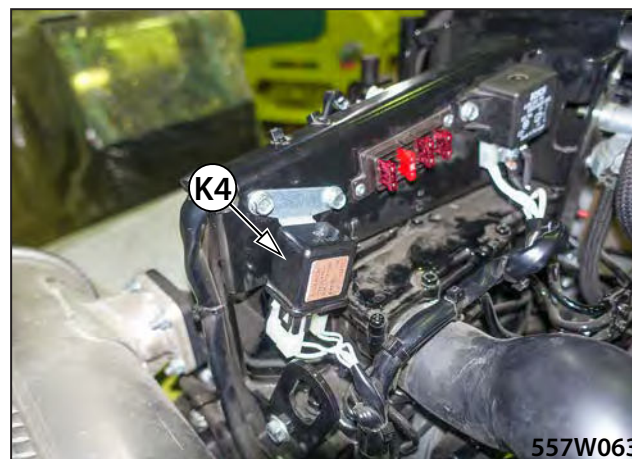
K2 relay – Conductor layout



K3 – Time relay

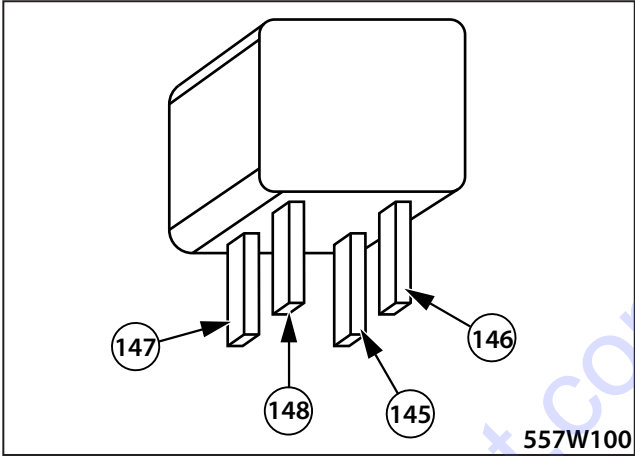


K4 – Relay – Pull solenoid

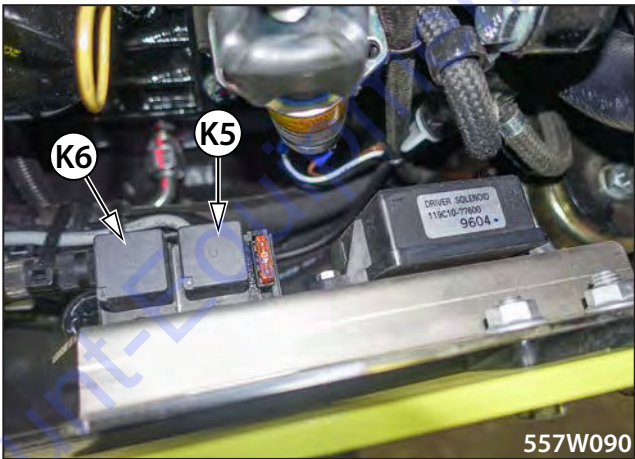


18 Troubleshooting

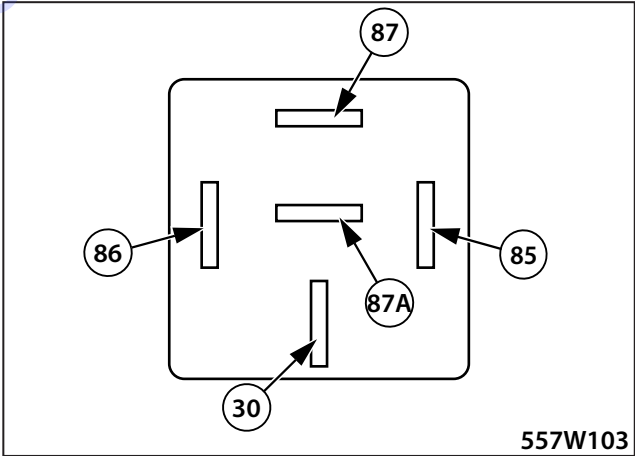
K4 relay – Pin layout



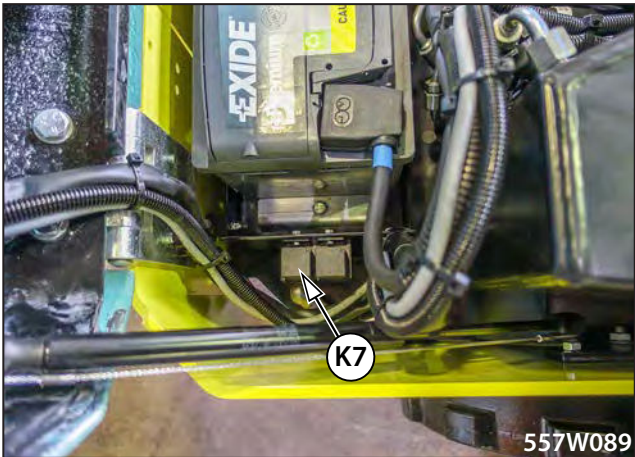
K5 – Working speed relay
K6 – Glow plug relay



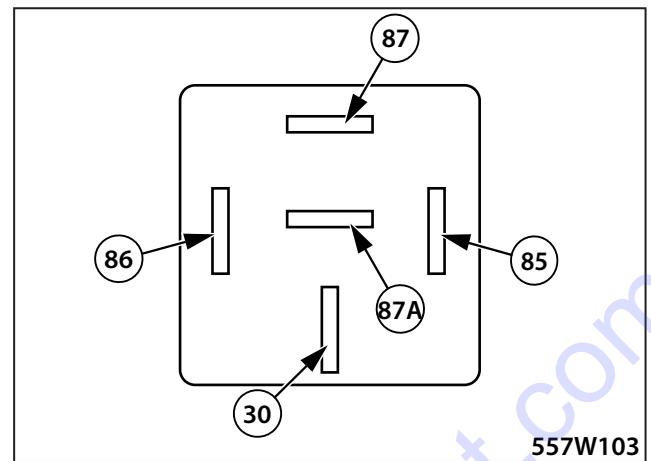
K5, K6 relays – Pin layout



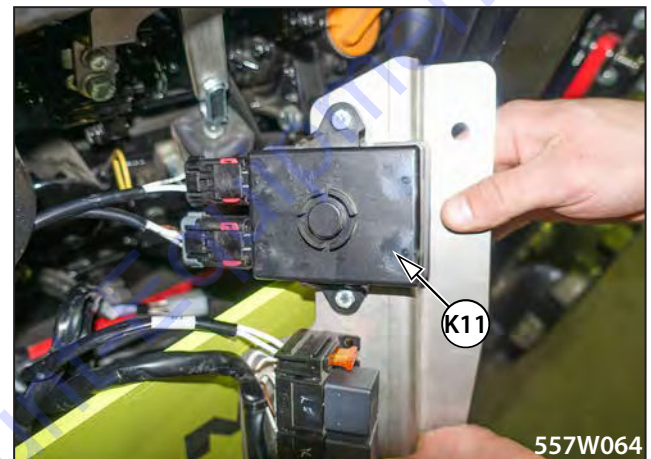
K7 – Hydraulic oil cooler relay



K7 relay – Pin layout



K11 – Solenoid driver relay – Atmospheric pressure sensor

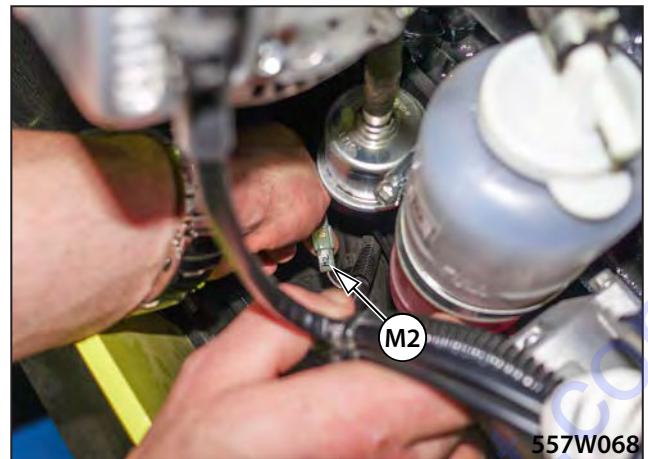


M1b – Starter

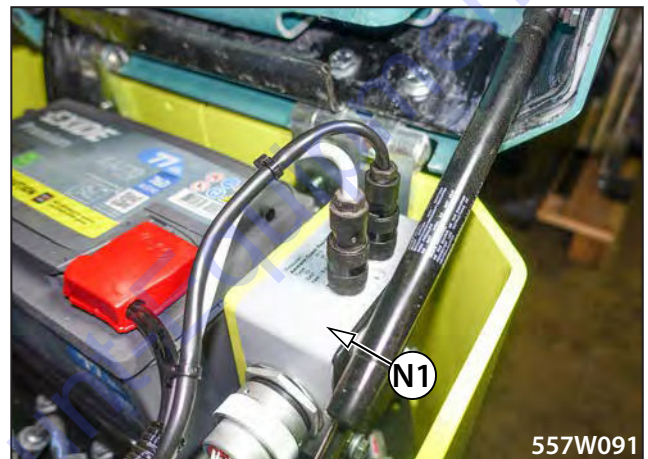


18 Troubleshooting

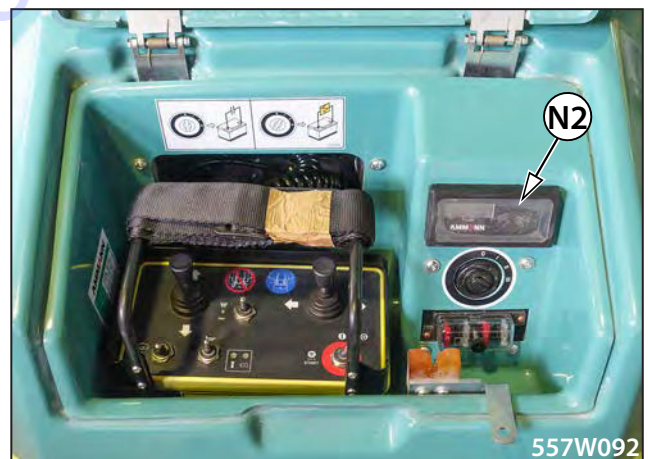
M2 – Fuel pump



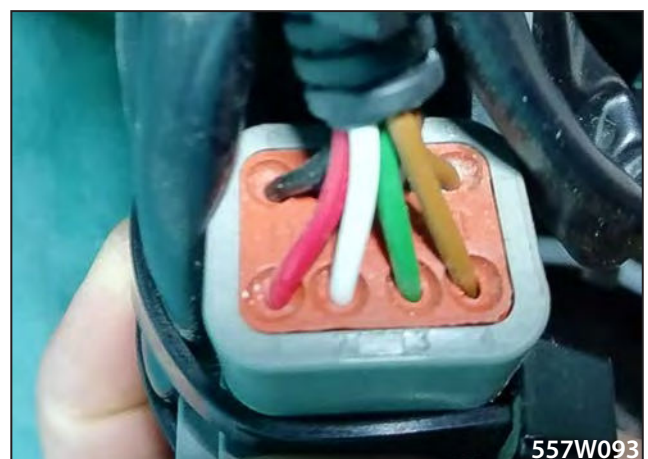
N1 – Control unit



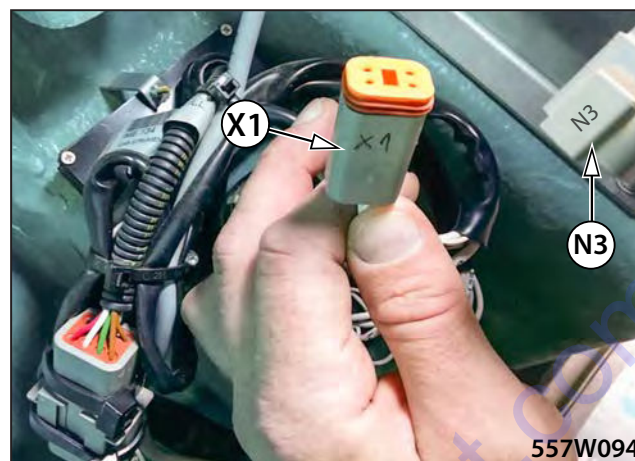
N2 – Display unit



Layout of connector conductors

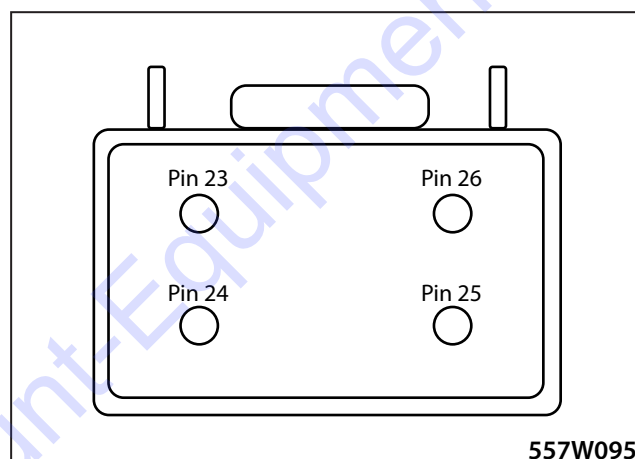


N3 – Infra-red remote control



557W094

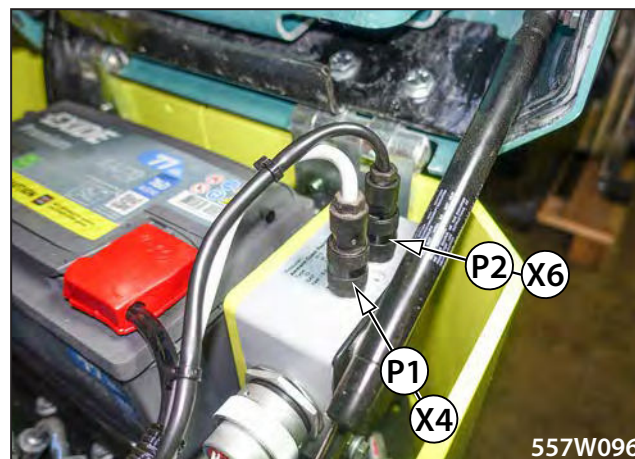
Layout of connector X1 pins



557W095

P1 / X4 – Front infra-red sensor

P2 / X6 – Rear infra-red sensor

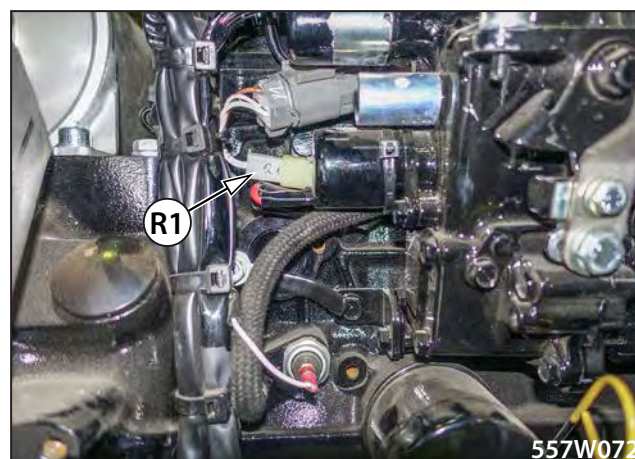


557W096

R1 – Ignition coil



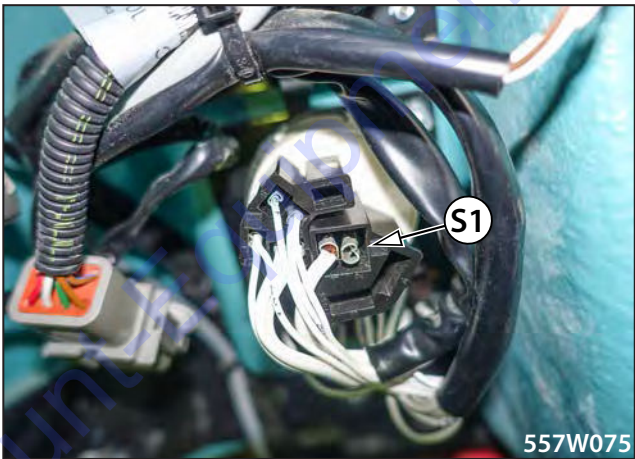
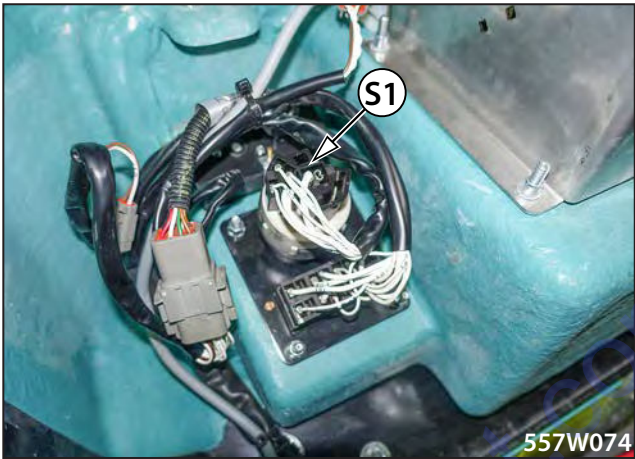
557W071



557W072

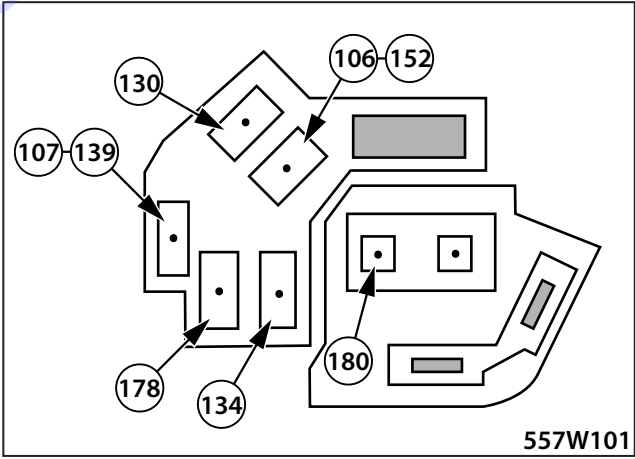
18 Troubleshooting

S1– Ignition box

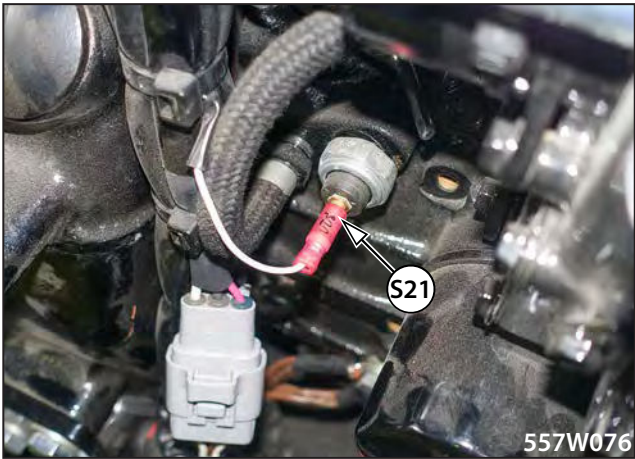


Layout of S1 ignition box conductors

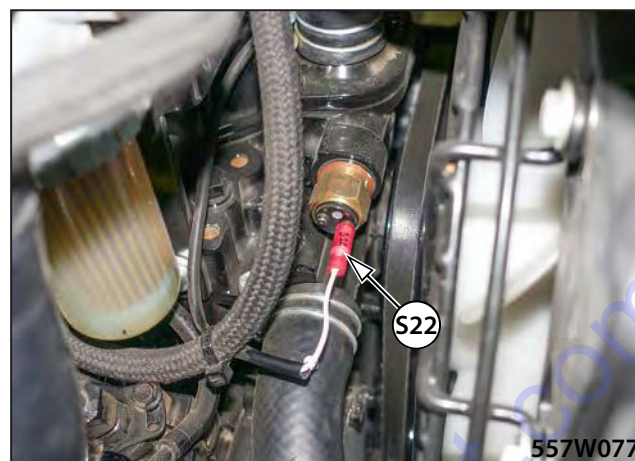
Pin	Conductor
19	152
	106
	130
15	178
	134
30	180
50	107
	139



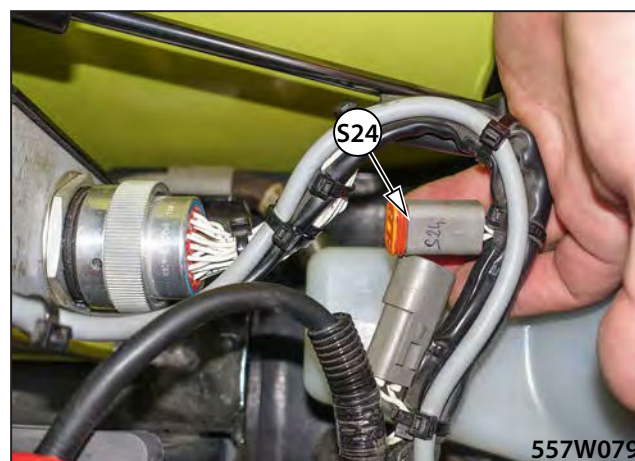
S21 – Engine oil pressure sensor



S22 – Coolant temperature sensor



S24 – Safety bar sensor

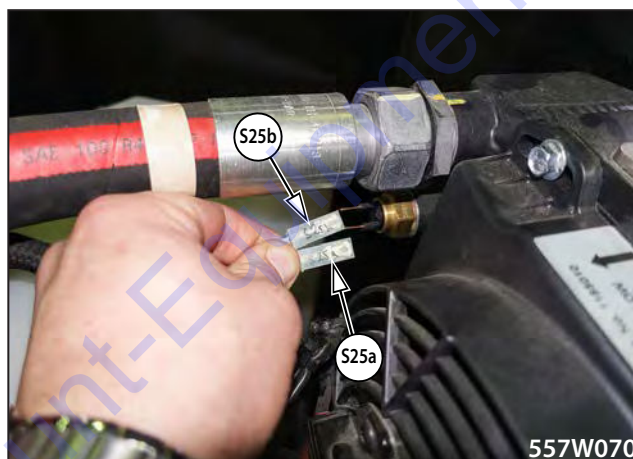
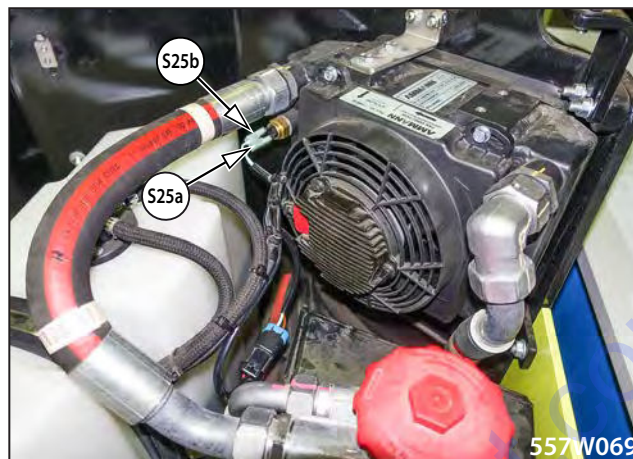


S25 – Hydraulic oil temperature sensor

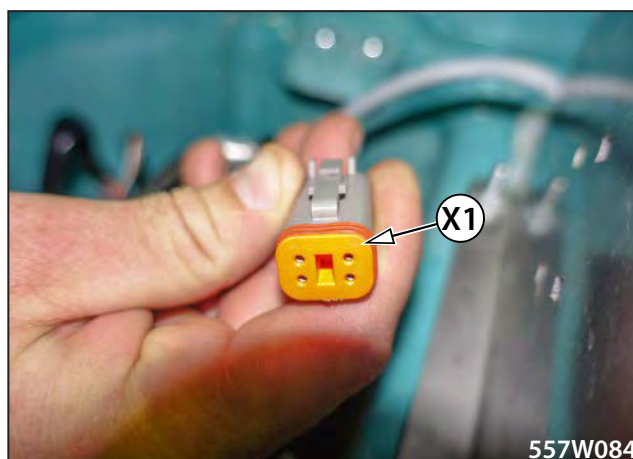
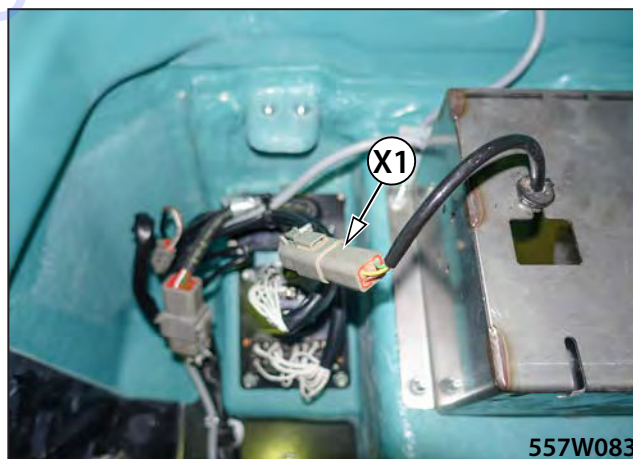


18 Troubleshooting

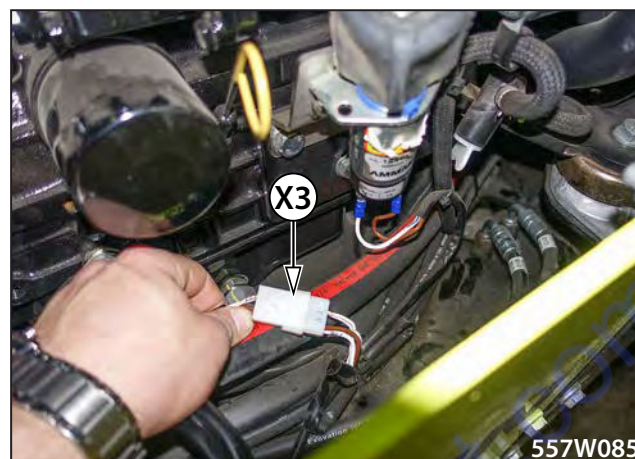
S25a; S25b – Hydraulic oil cooler



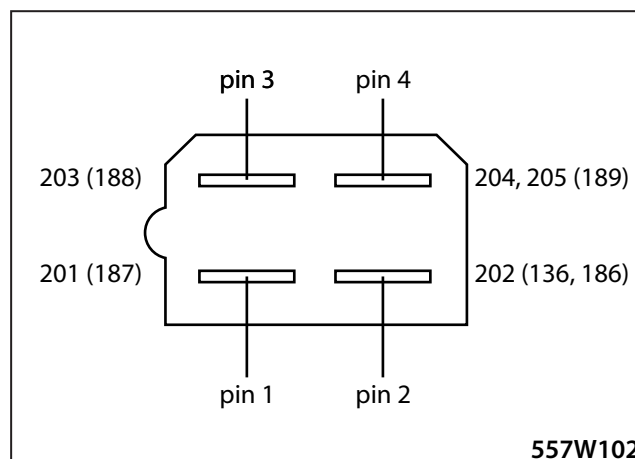
X1



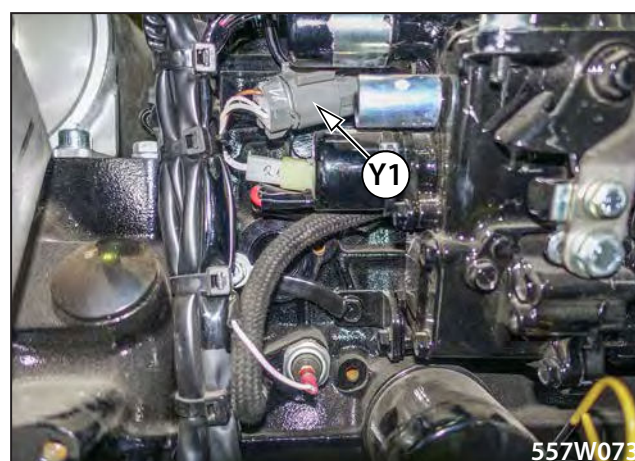
X3



Layout of X3 connector pins and conductors

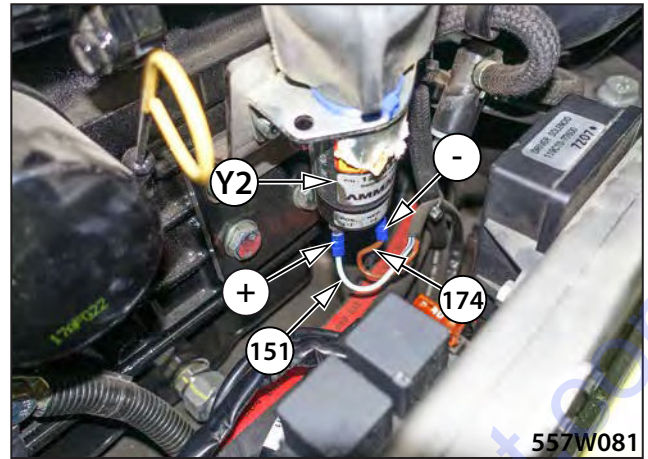


Y1 – Magnet, pull / holding solenoid



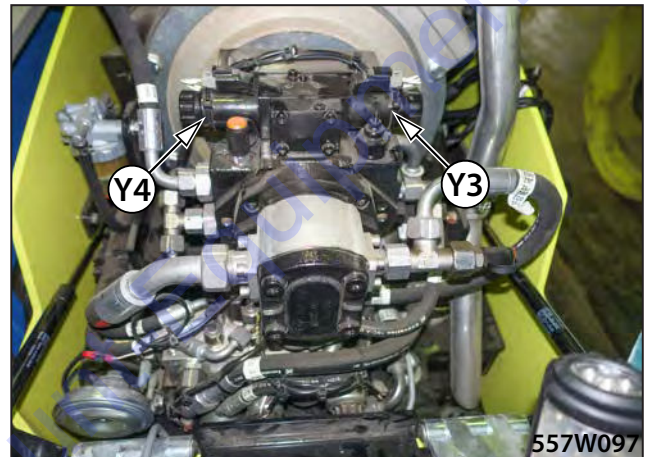
18 Troubleshooting

Y2 – Magnet, working speed



Y3 - Forward travel valve

Y4 - Reverse travel valve



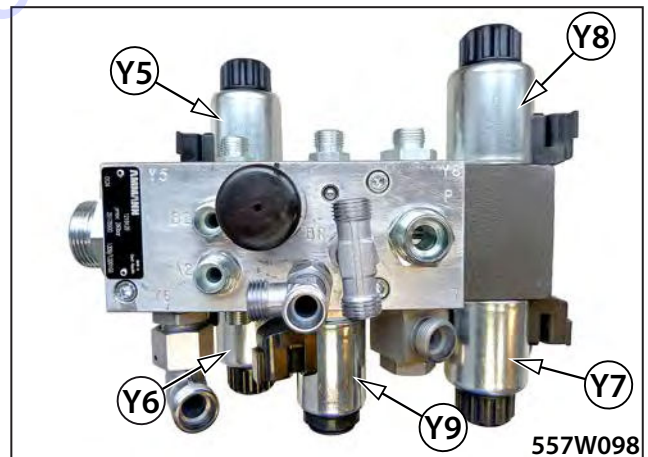
Y5 – Valve, turning, left

Y6 – Valve, turning, right

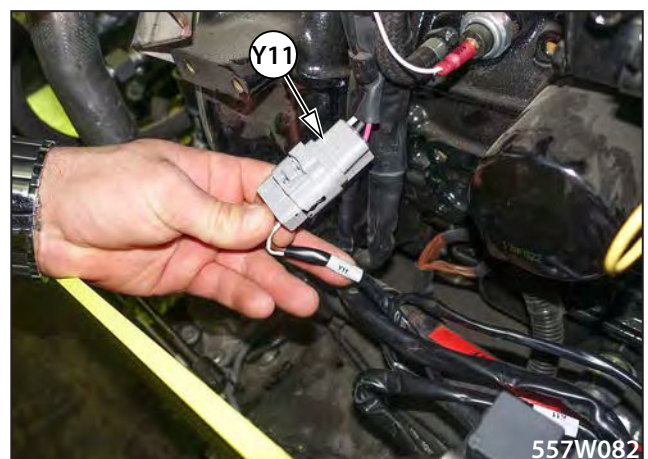
Y7 – Valve, vibration – high amplitude

Y8 – Valve, vibration – low amplitude

Y9 – Parking brake valve



Y11 – Magnet, second solenoid



18.1.2 The engine does not start

The following description applies to starting using the ignition lock: If the machine cannot be started using only the manual control, refer to the next chapter.

Defect description, the engine does not start

Defect description	Probable cause	Check
The engine does not start	G2 battery	Is the battery voltage OK? Battery terminals? Battery cable on the terminals?
The starter does not rotate	S1 ignition	Can the engine be started by ignition? -> Control does not work.
	F11 fuse	Is F11 OK?
	N1 control unit	Is the connector connected?
	K1 relay	The relay must close when the ignition turns on.
	F22 fuse	Is F22 OK?
	G1 alternator	Is the connector connected? With the ignition turned on, the connection must be D+=0V. Is the connector correctly connected? Relay checked?
	K2 ignition relay	With the ignition in the Start position, the connection must be 50 + 12 V.
	M1 engine starter	
The engine does not start	M2 diesel fuel pump	Is there enough diesel in the tank? Is the diesel fuel pump working?
The starter rotates But the engine does not start	F21 fuse	Is the F21 fuse OK?
	S21 engine oil pressure switch	If the motor is stopped, the switch must be closed. Is F12 OK?
	F12 fuse	When the starter rotates, there must be +12 V on Y1 (red).
	N1 control unit	Is the connector connected?
	K3 timer	Is the connector connected? Relay checked?
	K4 relay	For the 50 starting position, the input coil (white) must be +12 V for 1 s.
	Y1 input/holding coil	Was the safety bar checked?
The engine starts but runs only for approx. 4 s	S22 water temperature switch	At normal operating temperature, the switch must be open. Grounding? Is the connector firmly connected? Corrosion-free?
	S21 engine oil pressure switch	When starting, the switch must be closed. When the engine is running, it must be open. Is the connector firmly connected? Corrosion-free?
Preheating does not work	R1 preheating plug	In cold weather, please also check the preheating system. In the preheating ignition position, the H2 indicator lamp must be on and there must be +12 V on the glow plug.
	F24 fuse	Is F24 OK?
	K6 relay	Is the connector connected? Relay checked?
Yanmar engine (Yanmar TNVDI, service manual)	Diesel	Diesel in the tank? Passable diesel inlet? Air in the injection system? Passable filter? Air in the system? "Smoke signals" on the exhaust pipe? Compression, injection system, valve clearance? Is the fuel pump working? Is F22 OK?

18 Troubleshooting

Defect description	Probable cause	Check
The hydraulic oil cooler is not rotating	Hydraulic oil temperature sensor	Bypass the switch, start the engine
	F14 fuse	Is F14 OK?
	K7 relay	Is the K7 relay switching?
	Defective engine	Connect the engine to the power supply directly.

18.1.3 Start of the conductor and infrared radiation test

Normal test

Open the cab cover.

Open the cover without covering the sensor.

Turn the ignition on.

Keep a distance of three metres from the roller.

Always keep an eye on the safety bar indicator lamp.

If the safety bar indicator lamp is flashing, increase the distance from the roller.

Hold down the switch button on the infrared sensor.

The preheating indicator lamp must be on.

If the preheating indicator lamp is off, reduce the distance from the roller.

When the preheating indicator lamp turns on, the roller starts after 6 seconds.

Quick start

Open the cab cover.

Open the cover without covering the sensor.

Turn the ignition on.

Keep a distance of three metres from the roller.

Always keep an eye on the safety bar indicator lamp.

If the safety bar indicator lamp is flashing, increase the distance from the roller.

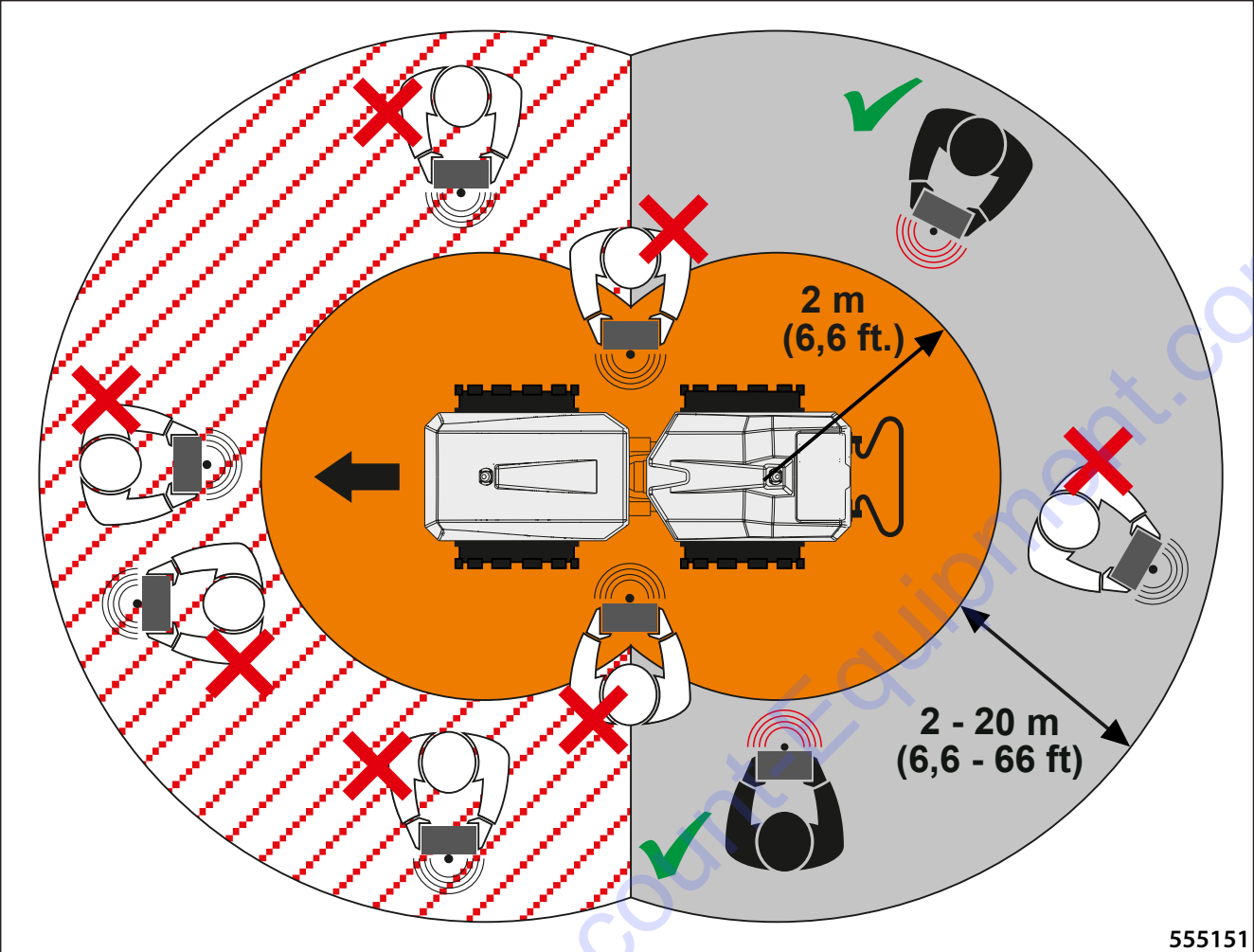
Hold down the switch button on the infrared sensor.

The preheating indicator lamp must be on.

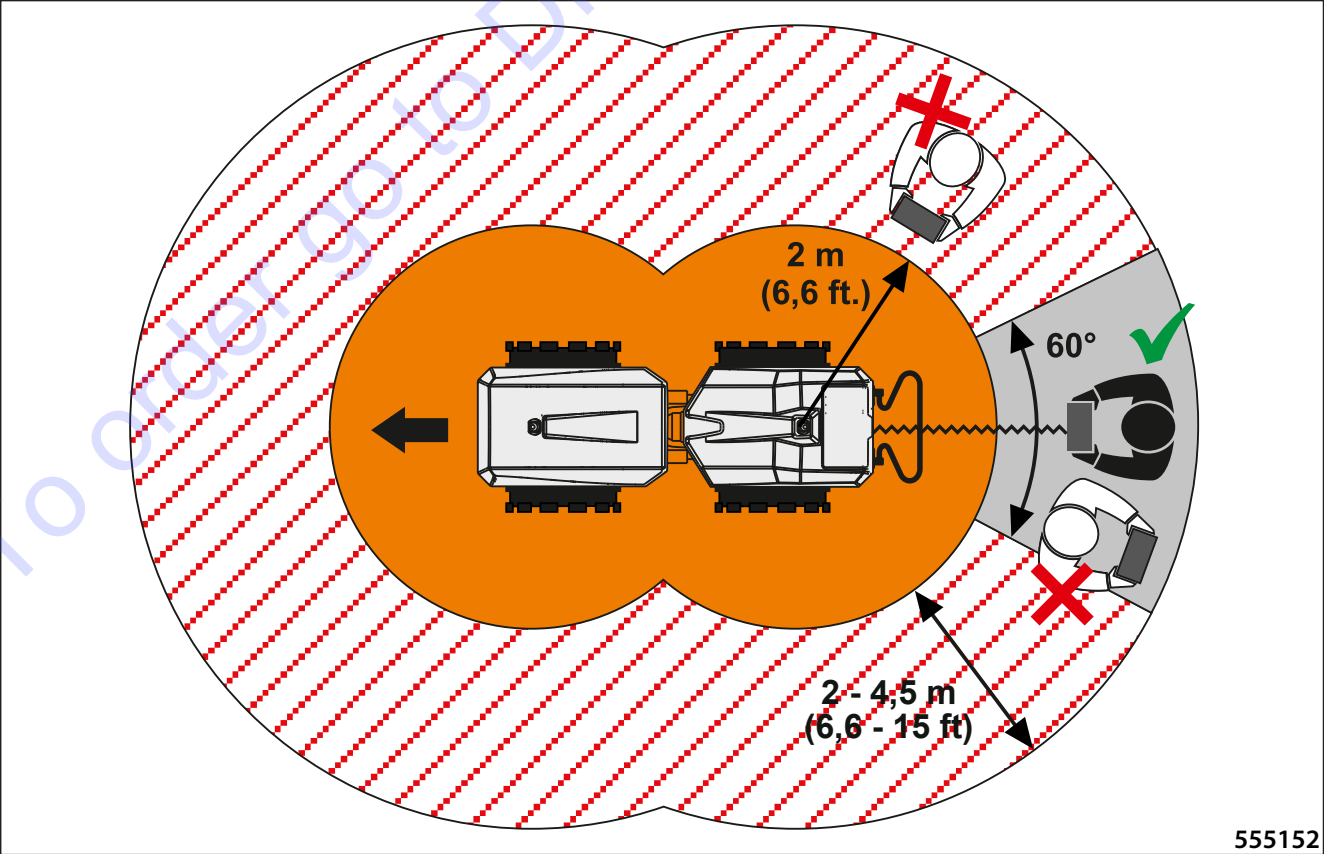
If the preheating indicator lamp is off, reduce the distance from the roller.

When the preheating indicator lamp turns on, immediately let go of the switch. Start the engine.

Protected zone and safe zone when using the infrared remote control



Protected, safe and operating zone during the operation of the infrared remote control and cable



18.1.4 Near and remote machine halt

The near and remote machine halt function is an electronic safety feature designed to prevent the loss of visual contact between the operator and the machine and excessive proximity of the operator to the machine.

A machine equipped with infrared remote control contains infrared sensors determining the safe distance of the operator from the working machine. This creates a protected zone and a safe zone.

The protected zone is within 2 m from the infrared sensors.

The safe zone is an area marked in grey located at a distance of 2 ÷ 20 m when using the infrared remote control; see Fig. 555151.

When using the infrared remote control, the operator is allowed to move only within the safety zone.

The safe zone is an area marked in grey located at a distance of 2 ÷ 4.5 m when using the infrared remote control and cable; see Fig. 555152.

When using the infrared remote control and cable, the operator is allowed to move only within the safety zone.

Conditions for the near and remote machine halt function

	Infrared remote control and cable	Infrared remote control
Near halt	approx. 2 m	approx. 2 m
Remote halt	approx. 4.5 m	approx. 20 m

If the operator leaves the safe zone, the machine halts. The engine keeps running, but all other functions are disabled. In order to reactivate the machine, the operator must be located in the safe zone according to specific conditions, with the cable connected (2–4.5 m) and when controlling via the infrared remote control (2–20 m).



The infrared sensors do not react to people approaching the machine, only to the infrared remote control.

During the operation of the machine, do not enter the protected zone of two metres.

The border of the protected 2 m zone might be deformed by the deflection of rays of the infrared remote control or insufficient direct visual contact.

Do not use the infrared remote control in the protected 2 m zone or when there is insufficient visual contact between the machine and the operator or the infrared remote control, unless stated otherwise.

Operate the machine exclusively from the area in grey, i.e. from the safe zone. Outside the safe zone, the control switches of control elements do not correspond to directions of machine movements.

18 Troubleshooting

18.1.5 Control does not work

To localize and remove the fault, proceed step by step as described below.

18.1.6.1 External influences

- Reflective surfaces (mirrors, reflective stripes...) in the vicinity may interfere with the remote control distance detection.
- Under certain circumstances, special light sources (fluorescent lamps, light beacons...) may interfere with infrared communication.
- The control may be adversely affected by strong electromagnetic radiation (e.g. near high-current equipment).

If the faults occur only in certain locations or situations, check the area for the above interference and try to avoid it.

18.1.6.2 Machine cabling

- Are fuses F11 and F12 OK?
- Are the connectors on the N1 control unit dirty or wet?
- Is the N1 control unit properly fastened?
- Are both infrared sensors P1 and P2 clean and undamaged?
- Is the cabling from N1 to P1 and P2 undamaged? Do not forget that there is the X5 interconnecting connector near the sensor at the front of the engine compartment.
- Are the N3 manual control cable and the corresponding connectors undamaged and clean? Do not forget the X1 connector on the inside of the bonnet.

18.1.6.3 Operation

- Has the manual control already been connected to the machine? -> Connect the cable to the manual control.
- Is the distance between the manual control and the machine OK? (2.5–4 m when using a cable or 2.5–20 m when using remote control)
- Is the N3 manual control battery discharged? -> Temporarily work with cable control.



Keep in mind that open anti-vandal protection may shield the infrared signal. This also applies to cable operation.

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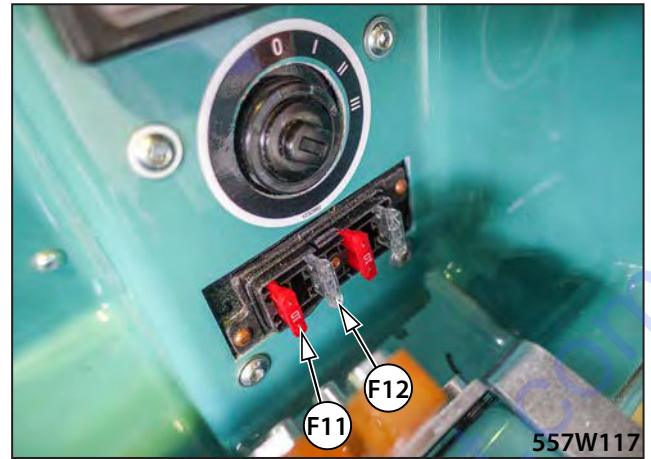
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Fault: **Steering does not work, the engine cannot be started even with the ignition box**

Probable cause: Fuses F11, F12

Check: Check fuses F11, F12.



Fault: **Steering does not work, the engine cannot be started even with the ignition box**

Probable cause: N1 control unit

Check: Check the signal of the D+ alternator and the S21 engine oil pressure switch.

If the K1 relay does not switch, the problem is probably in the control unit.

Check for proper battery voltage, battery terminals, and cables.



Fault: **The machine can only be started via the ignition box, otherwise nothing works**

Probable cause: Infra-red N3 remote control

Check: If no LEDs are flashing on the N3 remote control, there is probably a fault in with the remote control.

Check the remote control cable.



Fault: **The machine can only be started via ignition, otherwise nothing works**

Probable cause: Infra-red sensors P1, P2

Check: If no LEDs are flashing on the N3 remote control, there is probably a fault in with the remote control.

Check the remote control cable.



18 Troubleshooting

Fault: The machine only works when used with a cable

Probable cause: Infra-red N3 remote control

Check: If the red LED on the N3 remote control that is not connected via a cable is lit each time one of the functions is performed. Or no LEDs are lit, the remote control battery is probably defective.



Fault: The engine suddenly turns off during operation

Probable cause: N1 control unit

Check: Check the display unit for a tilt sensor activation.

Fault: The engine suddenly turns off during operation

Probable cause: S22 coolant temperature switch

Check: At normal operating temperature, the switch must not be activated.

Fault: **The engine suddenly turns off during operation**

Probable cause: S21 engine oil pressure switch

Check: When the engine is running, the switch must not be activated.

Fault: **The engine suddenly turns off during operation**

Probable cause: G1 alternator

Check: When the engine is running, the connection must be D+=12 V.

Fault: **The machine is not moving**

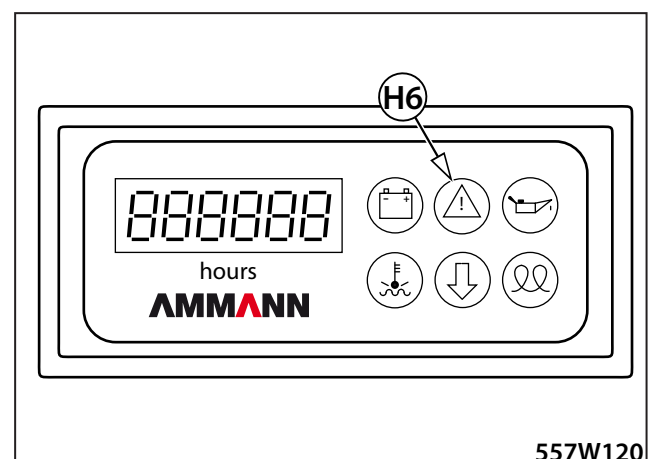
Probable cause: Infra-red N3 remote control

Check: Check that the green LED is flashing when you press the switch.

Fault: **The machine is not moving**

Probable cause: N1 control unit

Check: Check that the fault indicator lamp (H6) on the display unit is lit.



18 Troubleshooting

Fault: **The machine is not moving**

Probable cause: Y3 travel pump

Check: Check that the connectors are connected.
 Check that the valves and the magnetic coil are OK.
 Check the supply pressure.
 Check the servo block.

Fault: **The machine is not moving**

Probable cause: Parking brake valve Y9

Check: Check that the connector is connected.

Fault: **The machine is not moving (moves against the brake)**

Probable cause: Parking brake valve Y9

Check: Check that the connector is connected.
 Check that the brake is released when you activate the solenoid valve.
 Check the supply pressure.

Fault: **The machine is not moving (moves against the brake)**

Probable cause: N1 control unit

Check: Check that the parking brake valve Y9 is activated.

Fault: The machine moves only forward

Probable cause: Safety bar S24 sensor

Check: Check the correct position of the magnet on the safety bar.

Fault: The machine moves only forward

Probable cause: Travel pump Y3, Y4

Check: Check that the connectors are connected.



Fault: The machine moves too slowly

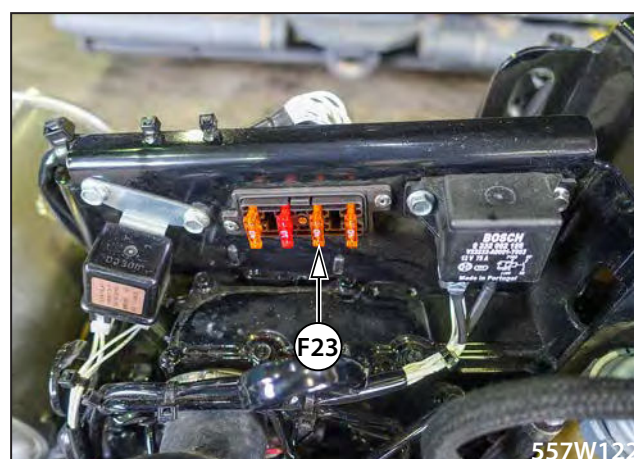
Probable cause: Infra-red N3 remote control

Check: Check that the green LED is flashing when you engage the transport gear.

Fault: The machine moves too slowly

Probable cause: F23 fuse

Check: Check F23 fuse.

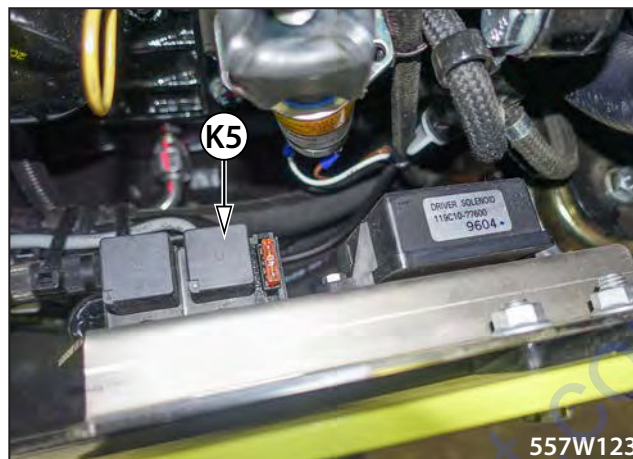


18 Troubleshooting

Fault: The machine moves too slowly

Probable cause: K5 relay

Check: Check the relay is functioning.



Fault: The machine moves too slowly

Probable cause: N1 control unit

Check: The magnet must pull when the function is performed.

Fault: The machine moves too slowly

Probable cause: Y2 magnet

Check: Check the engine speed, quantity separator, travel hydraulic motors and travel pump.

Fault: The machine does not vibrate

Probable cause: Infra-red N3 remote control

Check: Check that the green LED is flashing when vibration is activated.



Fault: **The machine does not vibrate**

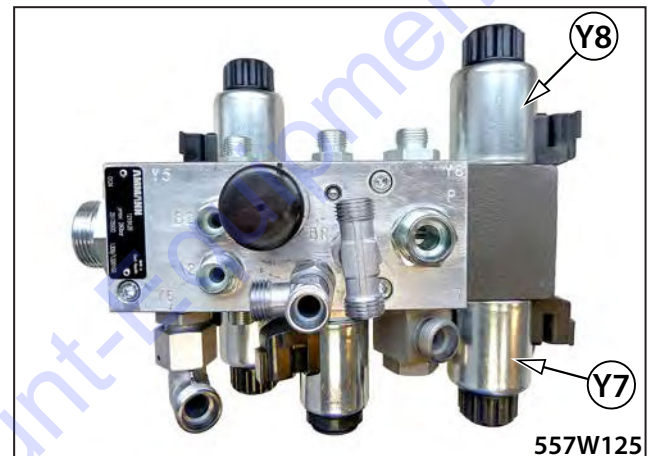
Probable cause: Magnets Y7, Y8

Check: Check that the connectors are connected.
 Check that the valves and the coil are OK.
 Check the vibration pressure.
 Remove the coupling on the vibration hydraulic motor.

Fault: **The machine does not vibrate**

Probable cause: N1 control unit

Check: Check the function of magnets Y7, Y8.



Fault: **Control does not work.**

Probable cause: Infra-red N3 remote control

Check: Check that the green LED is flashing when steering.



Fault: **Control does not work.**

Probable cause: Magnets Y5, Y6

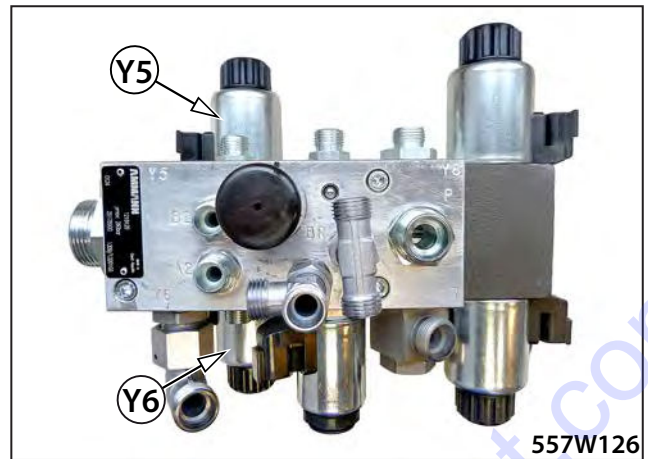
Check: Check that the connectors are connected.
 Check that the valves and the coil are OK.

18 Troubleshooting

Fault: Control does not work.

Probable cause: N1 control unit

Check: Check that magnets Y5 and Y6 are activated.



Fault: Control does not work.

Probable cause: N1 control unit

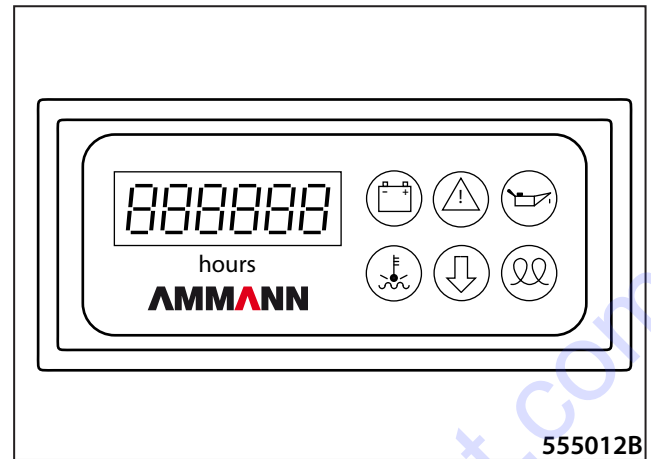
Check: Check the steering pressure.
Check the linear hydraulic steering motor.
Check for mechanical damage.

18.1.7 Display unit



When starting ignition, the display unit shows an indicator lamp for several seconds. All indicator lamps are on and every digit of the operating hours counter is displayed as 8.

On this occasion, check that the display unit functions properly. Otherwise, it must be replaced.



18 Troubleshooting

Defect description, the machine is not moving

Defect description	Probable cause	Check
The display unit is not working.	F13 fuse	Is F13 OK?
After turning on ignition, neither the indicator lamps nor the display are illuminated.	N2 display unit K1 relay	After turning on ignition, there must be +12 V on pin 1 and ground on pin 8. The relay must close when the ignition turns on.
The P3 operating hours counter is not working and the H1 charging indicator lamp does not go off during when the engine is running. 	G1 alternator N2 display unit	Is the connector connected? After turning on ignition, there must be 0 V (ground) on pin 7. When the engine is running, however, there must be +12 V. If the battery is charging anyway (voltage approx. 14 V), the problem is likely in N2.
When ignition is on, the H1 charging indicator lamp is not illuminated. 	G1 alternator Cable, connectors, N2 display unit	Connect the 133 cable to the ground. The indicator lamp must be on.
The H6 warning indicator lamp is on. 	N1 control unit F22 fuse G1 alternator S21 engine oil pressure switch	- The inclination sensor measured a value exceeding 45° (the diesel engine turns off). - If the H5 safety bar indicator lamp flashes at the same time: The engine may start after the S21 oil pressure switch is closed (H3 is illuminated) and when D+ at G1 is 0 V (H1 is illuminated). - The control detected an error. If the machine is not inclined and the N1 control unit was installed properly, there is a problem with the control switching outputs -> control does not work.
The H3 oil pressure indicator lamp is on when the engine is running. 	S21 engine oil pressure switch	Is the connector connected? Grounding? Engine oil level OK? Engine oil pressure OK? When the engine is stopped, the connection must have a ground contact. When the engine is running, the switch must be open. The diesel engine suddenly turns off after 4 s.
The H3 oil pressure indicator lamp is off when ignition is on. 	S21 engine oil pressure switch Cable, connectors, N2 display unit	Disconnect the connector from the switch and connect it to ground. The indicator lamp must be on. Is the connector firmly connected? Corrosion-free?
The H4 water temperature warning indicator lamp is on. The engine is running. 	S22 cooling water temperature switch	Is the connector connected? Grounding? At normal operating temperature, the switch must be open. The diesel engine suddenly turns off after 4 s.
When ignition is on, the H4 water temperature indicator lamp is not illuminated. Indicator lamp test. 	S22 cooling water temperature switch Cable, connectors, N2 display unit	Defective? Is the connector firmly connected? Corrosion-free? Disconnect the connector from the cooling water temperature switch and connect it to ground. The indicator lamp must be on. At normal operating temperature, the switch must be open. The diesel engine suddenly turns off after 4 s.

Defect description	Probable cause	Check
The H5 safety bar warning indicator lamp is on even if the safety bar is not activated or installed. 	S24 contactless switch N1 control unit	The indicator lamp is continuously on: If the machine is equipped with a safety bar, check that the magnet is positioned correctly on the bar. If the safety bar is not activated, the switch must be closed. Otherwise, check the jumping in the S24 place. The indicator lamp is flashing rapidly: The infrared light emitter is less than 3 m away from the machine. The indicator is flashing slowly: The infrared light emitter is 3 to 4 m away from the machine. No defect! The prerequisite for operation with a cable is remote control.
The H2 preheating indicator lamp is never on.  The indicator lamp is continuously on	S1 ignition N1 control unit K6 relay	The indicator lamp must be on even if the S1 ignition is in the "preheating" position. The indicator lamp must be on when you hold the Start switch on the manual control. F24 OK? Ignition OK? Relay OK?

18 Troubleshooting

18.1.8 Manual control

Infrared light emitter



When ignition is turned on, indicator lamp test is displayed briefly. Both LEDs are flashing.
On this occasion, check that the LEDs function properly. Otherwise, the unit must be replaced.

Defect description, manual control

Defect description	Probable cause	Check
The indicator lamps are never on. 	N3 infrared light emitter	The battery might be discharged or defective. Connect the control to the cable. If the battery is defective, replace the control.
The red indicator lamp is flashing (the cable is not connected). The red indicator lamp is flashing (the cable is connected). The red indicator lamp is continuously on. The red indicator lamp is on even if the control is activated. 	N3 infrared light emitter	No defect! Charge the battery. No defect! The battery is charging. No defect! The battery is fully charged. The battery is charged, no data is transmitted to the machine.
The green indicator lamp is always flashing when the control is activated. 	N3 infrared light emitter	No defect! Data is transmitted to the machine.
Both indicator lamps flash synchronously. 	N3 infrared light emitter	No defect! The infrared light emitter connects to the machine control unit. This happens always when: - another manual control connects to the machine via a cable for the first time. - ignition turns on. If indicator lamps are flashing, the engine cannot be started.

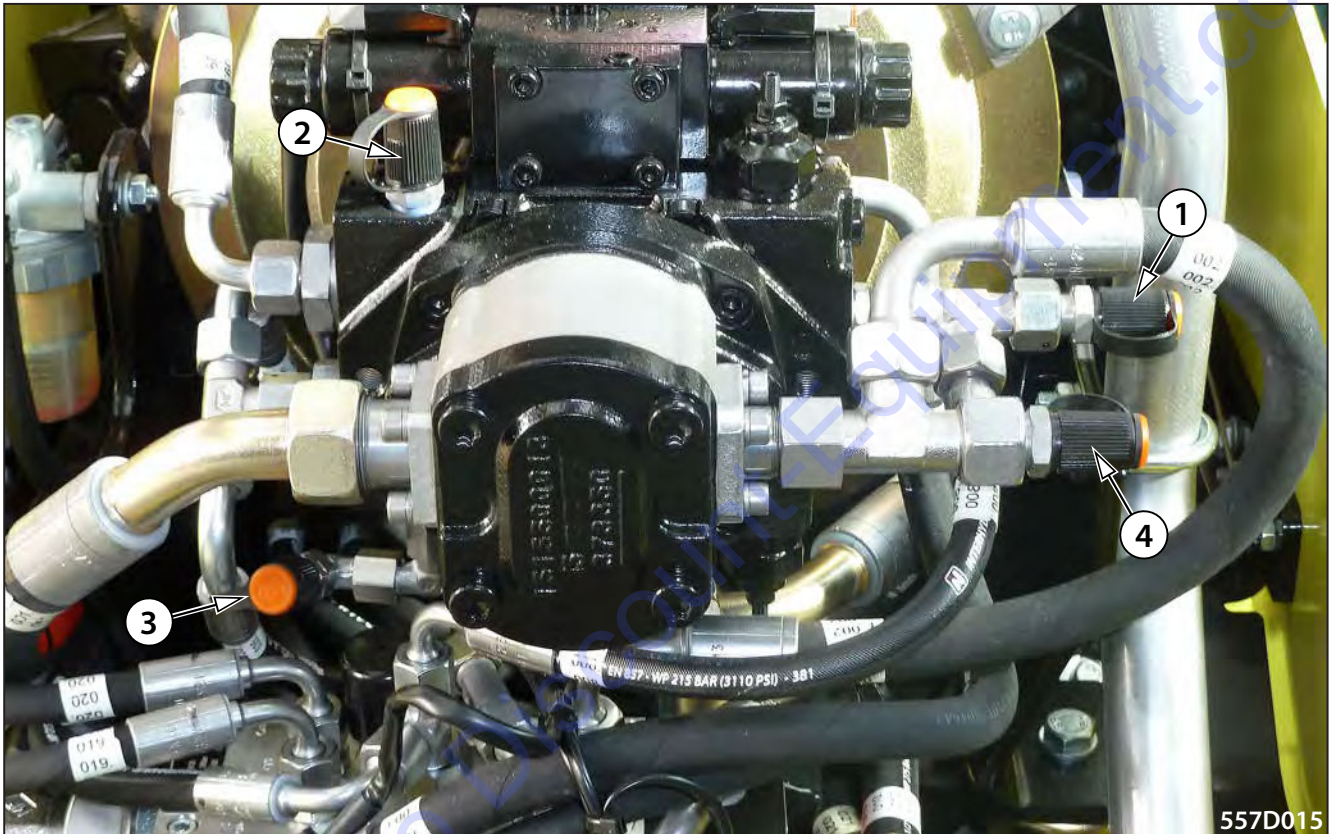
18.2 Pressure check

18.2.1 Pressure check and adjustment

All mentioned values are applicable at a hydraulic oil temperature of approximately 60 °C and the maximum speed of the diesel engine.

Drain the pressure-relief valves for a maximum period of 5 s. Use the following pressure gauges:

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



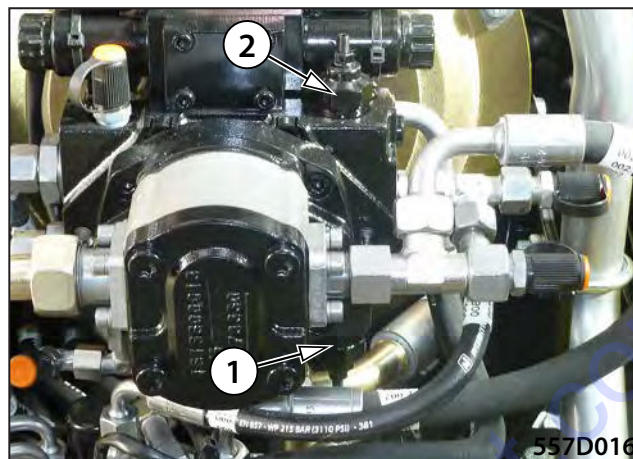
Travel pump, vibration/steering pump

- 1 M1 supply pressure
21 ± 2 bar can only be set by means of washers.
- 2 MB forward travel pressure
330 ± 15 bar should be measured when drums are locked.
- 3 MA reverse travel pressure
330 ± 15 bar should be measured when drums are locked.
- 4 M2 vibration activation indicator lamp
220 ± 10 bar.
M2 steering pressure
67 ± 8 bar.

18 Troubleshooting

Adjust the reverse travel pressure.

Adjust the forward travel pressure.



Supply pressure valve
(adjustable using spacers).



Oil may overheat and seals may get damaged.

For the test procedures below, strictly observe the following:

Let the engine run only briefly, for up to 5 s.

After performing the test procedures, reconnect all hydraulic hoses.

Start a test run.

Check the tightness of all connections.

18.2.2 Checking the steering pressure

Turn the machine to the limit position.

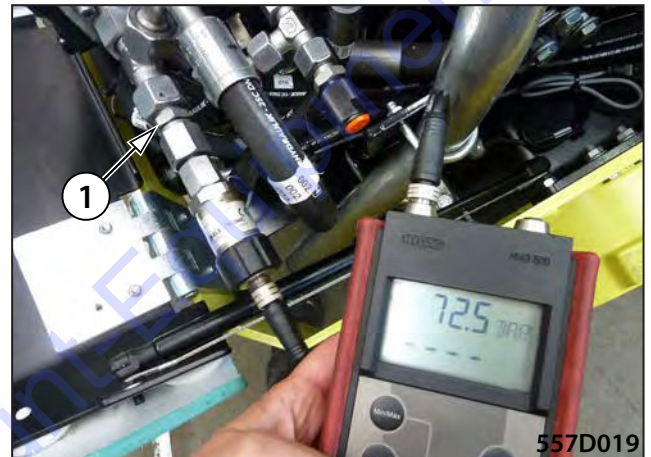
Hold the lever pressed throughout the entire further procedure.



Measurement point (1) Vibration/steering pressure.

If a steering pressure of 67 ± 7 bar is not reached:

- remove the right steering piston line and pressure-close it.
- remove the left steering piston line and pressure-close it.
- remove the valve block, see "Replacement of the valve block" (Chapter 11.2.2).
- check the steering pressure relief valve.



18 Troubleshooting

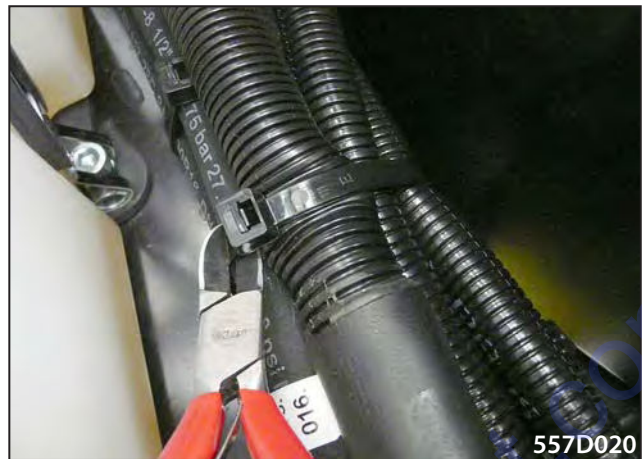
18.2.4 Checking the maximum vibration pressure

This procedure must be performed when the vibration setting pressure is lower than 200 bar.

Open the rear bonnet.

Ensure access to the angled screw connection.

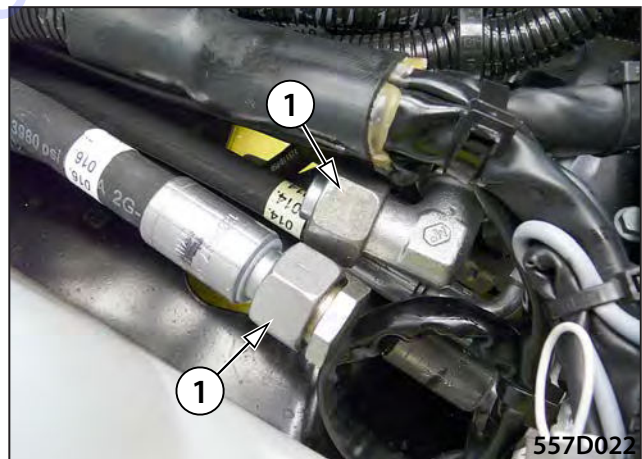
Cut the cable ties on the hose bundle.



Remove the hydraulic hose (016) from the angled screw connection.



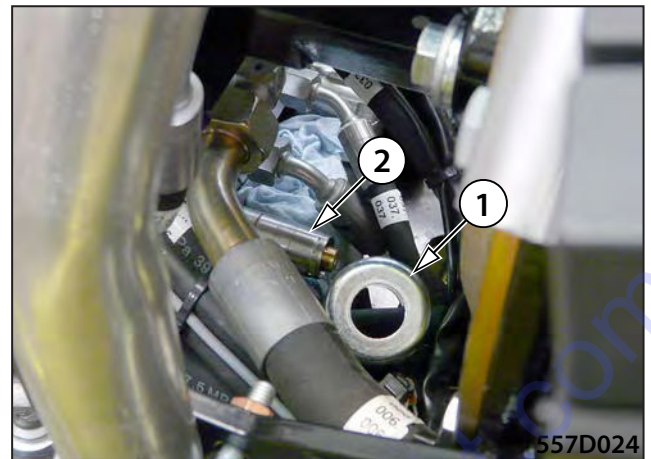
Pressure-close the screw connections (1).



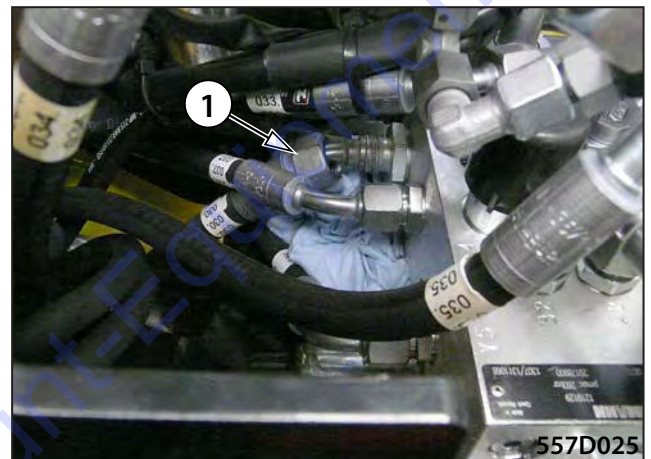
Remove the knurled nut and sealing ring at the Y8 magnetic valve (1).



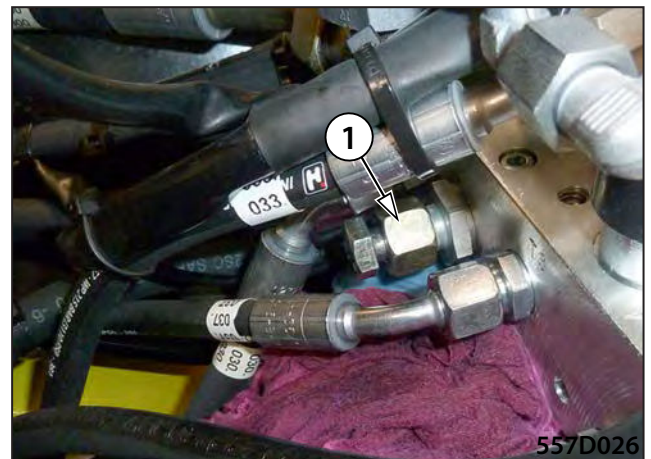
Remove the magnetic coil (1) from the magnetic valve (2).



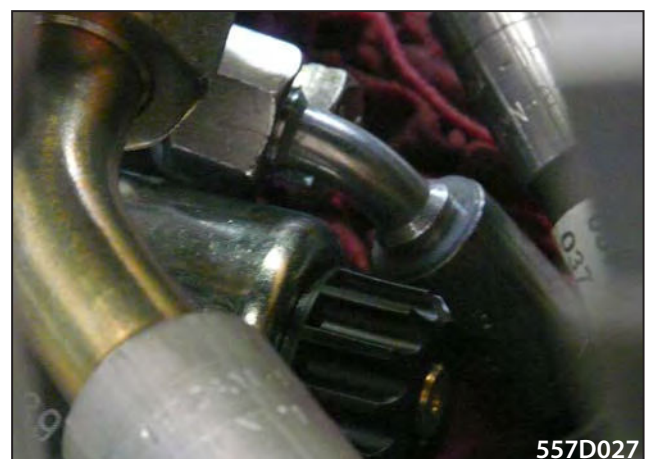
Remove the hydraulic hose (030).



Pressure-close the screw connection.



Reinstall the magnetic coil.



18 Troubleshooting

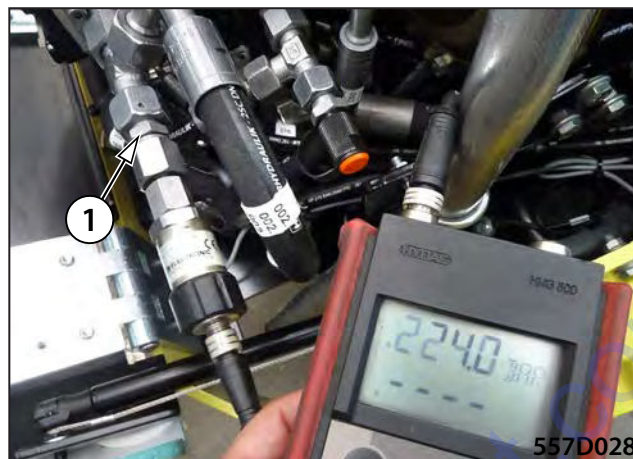
Connect a pressure gauge (at least 250 bar) to the vibration pressure measuring point (1).

Start the engine.

Full speed

Turn on vibration.

Let it run for no more than 5 seconds.



If a vibration pressure of 220 ± 10 bar is not reached:

- remove the valve block, see "Replacement of the valve block" (Chapter 11.2.2).
- check the vibration pressure relief valve.

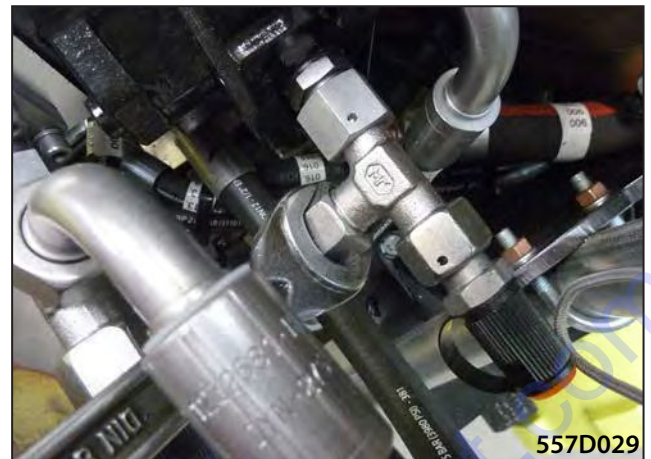
After the tests, perform the following:

- Mount the hydraulic hoses
- Refill oil
- Clean the machine
- Start the machine
- Check the tightness and function

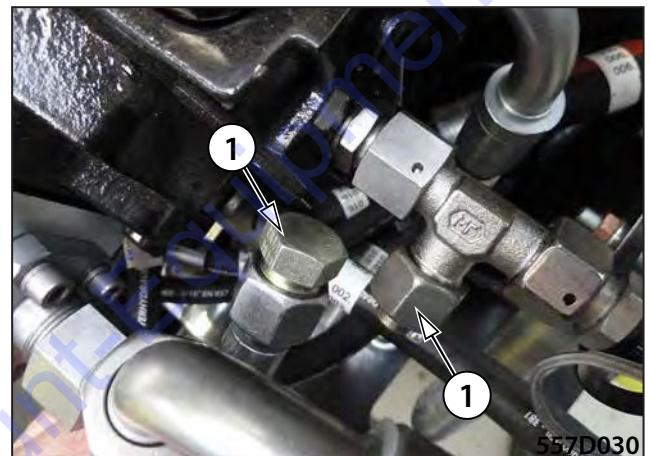
18.2.5 Checking the travel pump

18.2.5.1 Checking the maximum supply pressure

Remove the 008 hydraulic hose for the supply pressure measuring point.

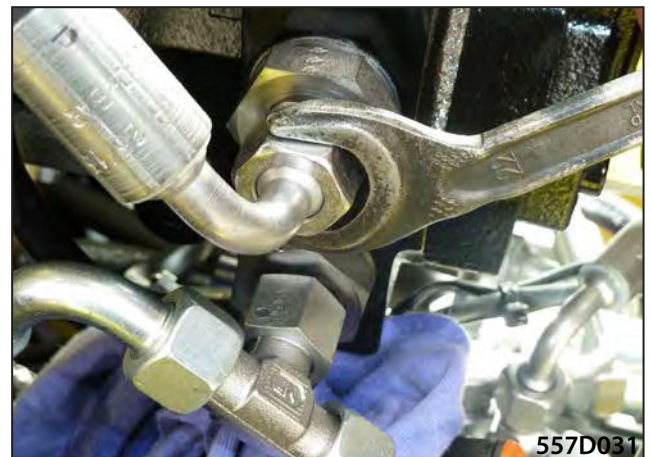


Pressure-close the screw connections (1).



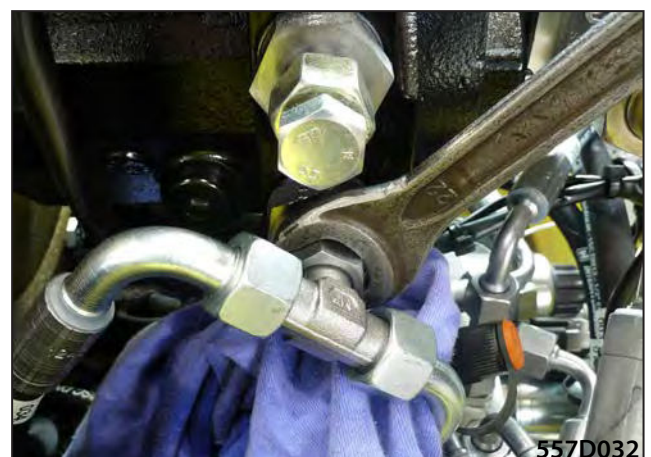
Remove the hydraulic hose of the B travel circuit (forward) for the travel pump.

Pressure-close the screw connections.



Remove the screw connection of the A travel T-circuit (reverse) for the travel pump.

Pressure-close the screw connections.

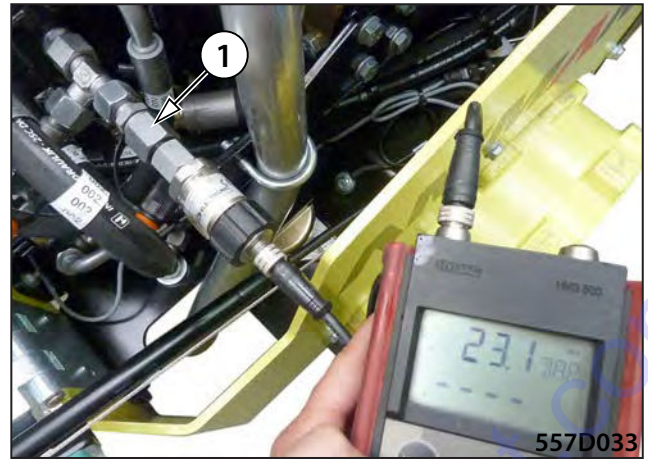


18 Troubleshooting

Connect a pressure gauge (at least 40 bar) to the supply pressure measuring point (1).

Start the engine.

- Full speed
- Let it run for no more than 5 seconds.



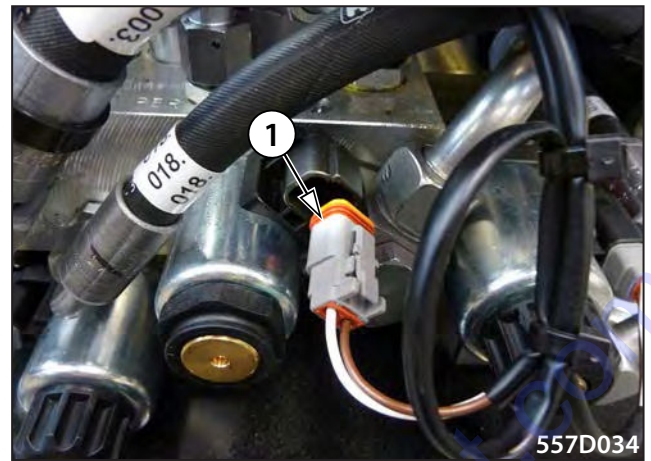
If a supply pressure of 21 ± 2 bar is not reached:

- check the supply pressure valve.

If it is still not reached, replace the travel pump. See "Replacement of the travel pump" (Chapter 11.2.1).

18.2.5.2 Checking the travel pressures (reverse/forward)

Pull out the Y9 connector (1) on the valve block.



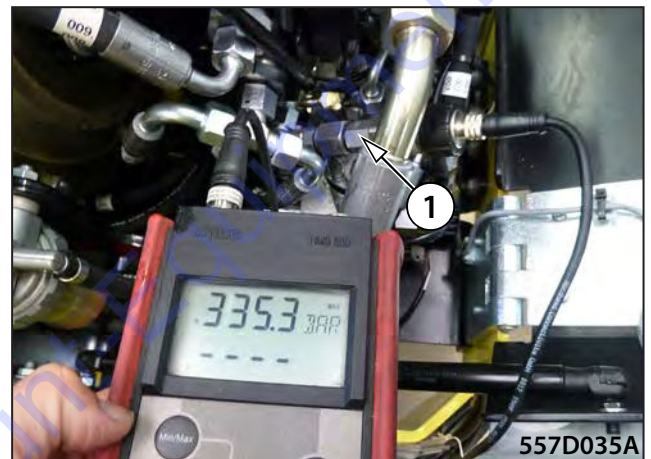
Connect a pressure gauge (at least 400 bar) to the travel pressure measuring point (1).

Start the engine.

Full speed

Reverse while braking.

Let it run for no more than 5 seconds.



Connect a pressure gauge (at least 400 bar) to the MB travel pressure measuring point (1).

Start the engine.

Full speed

Drive forward while braking.

Let it run for no more than 5 seconds.



If a travel pressure of 330 ± 15 bar is not reached:

- check the travel hydraulic motors (Chapter 18.2.6).
- check the maximum pressure of the travel pump.

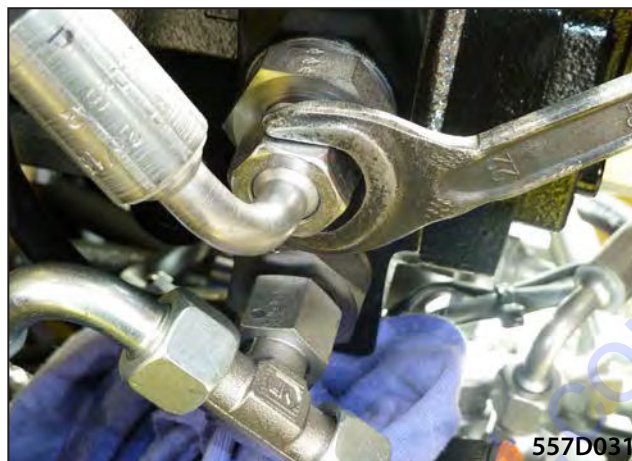
If it is still not reached, replace the travel pump. See "Replacement of the travel pump" (Chapter 11.2.1).

18 Troubleshooting

18.2.5.3 Checking the maximum pressure of the travel pump (reverse/forward)

Remove the hydraulic hose of the B travel circuit (forward) for the travel pump.

Pressure-close the screw connections.



Remove the screw connection of the A travel T-circuit (reverse) for the travel pump.

Pressure-close the screw connections.



Connect a pressure gauge (at least 400 bar) to the MA travel pressure measuring point.

Start the engine.

Full speed

Reverse at full speed while locked.

Let it run for no more than 5 seconds.



Connect a pressure gauge (at least 400 bar) to the MB travel pressure measuring point (1).

Start the engine.

Full speed

Drive forward at full speed while locked.

Let it run for no more than 5 seconds.



If the travel pump maximum pressure of 330 ± 15 bar is not reached:

- replace the travel pump, see "Replacement of the travel pump" (Chapter 11.2.1).

18.2.6 Checking the travel hydraulic motors

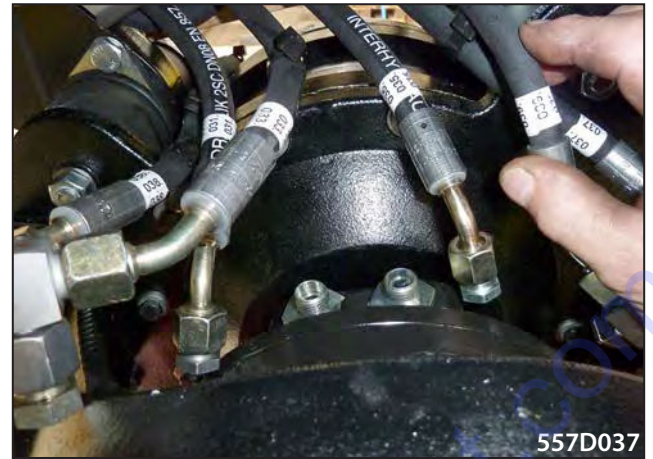
The following operation is required, when:

- The travel pump test is positive.
- The pressure is not reached with the connected travel motors.

Successively check individual travel motors.

Remove the hydraulic hoses of the travel circuit A and B on the travel motor.

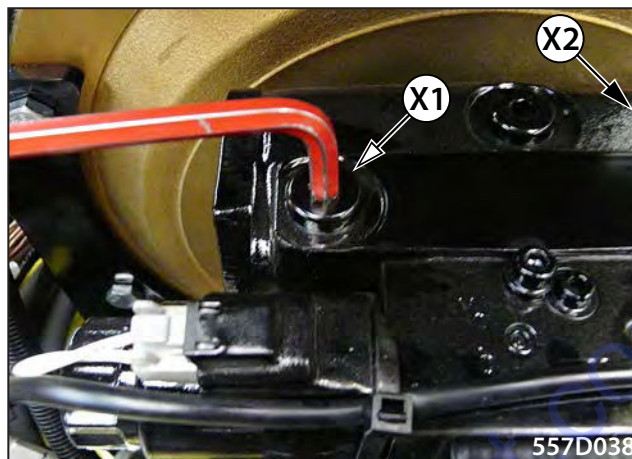
Pressure-close the screw connections.



18 Troubleshooting

18.2.7 Adjustment of the travel pump zero position

Remove both plugs X1 and X2.



Remove the aperture.



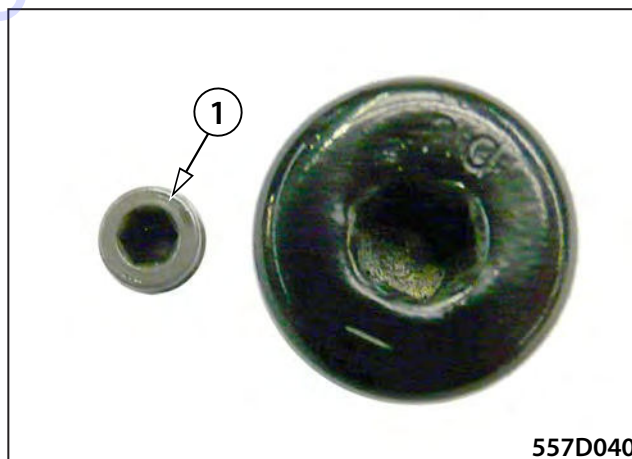
Check the aperture (1) for clogging.

Blow-clean it with compressed air.

Mount plugs X1 and X2 (40 Nm).



Tighten the aperture properly when mounting it back!



Place the machine safely on blocks!

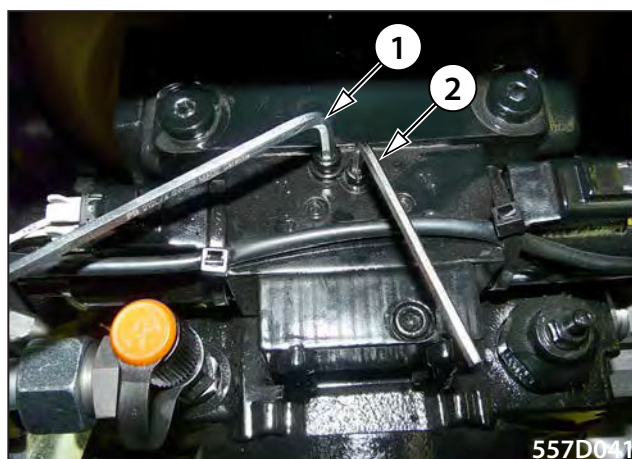
Let the machine run.

Loosen the lock screw (1).

Adjust the zero position (2).

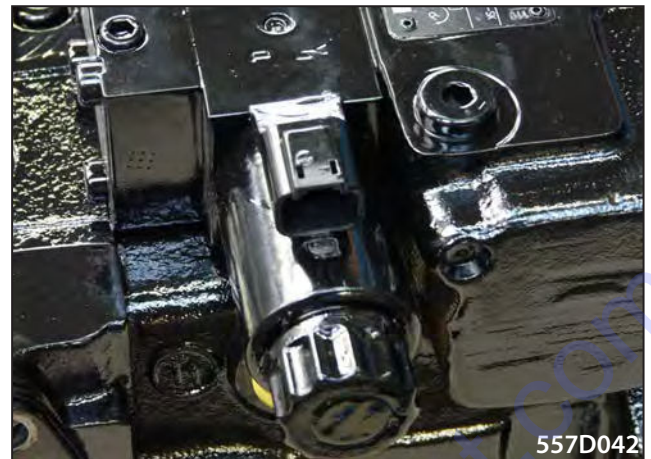
Carefully turn the spanner until the drum stops.

Tighten the lock screw firmly.



18.2.7.1 Checking the travel pump magnetic coil / travel pump servo block

The travel pump magnetic coil cannot be controlled mechanically.



Loosen the knurled nut.

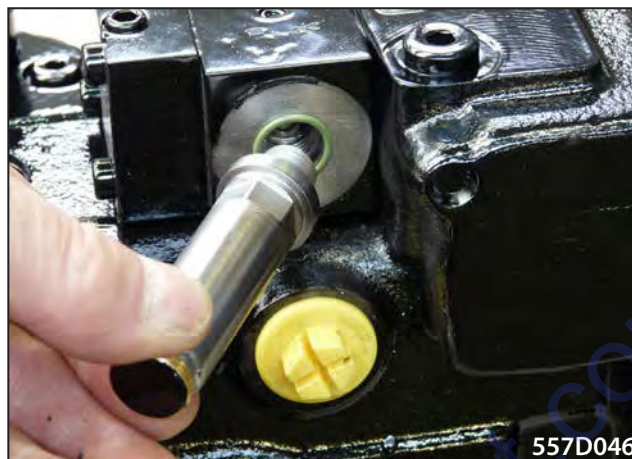


Remove the magnetic coil.



Screw out the magnetic valve.





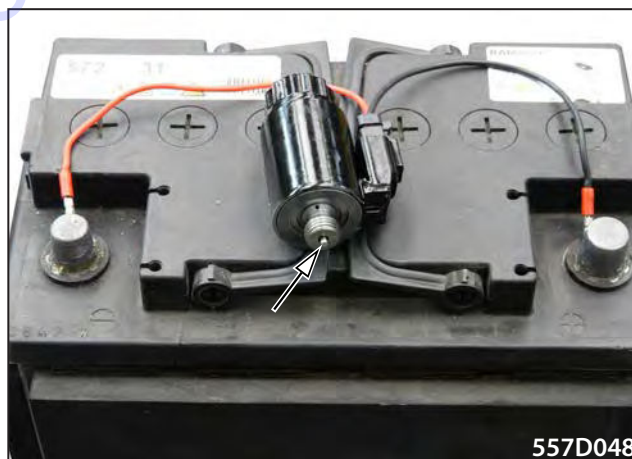
557D046

Measure the resistance of the Y3/Y4 magnetic coil.
The resistance value is approximately 6 Ohm.



557D047

Connect 12 V to the magnetic valve.
The valve (arrow) must visibly switch.



557D048

Change the position of the magnetic coil connector

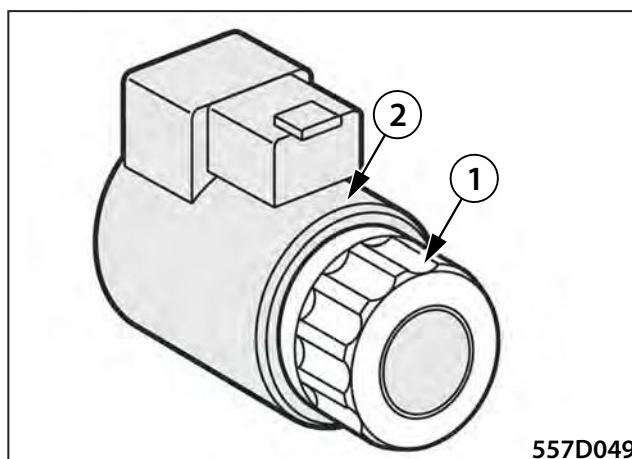
The position of the connector can be changed by turning the magnet body as needed.

Release the lock nut (1) of the magnet.

Turn the lock nut (1) by one turn to the left.

Turn the body of the magnet (2) to the required position.

Tighten the lock nut again. Tightening torque of the lock nut:
5+1 Nm.



557D049

18.2.8 Travel pump servo block check

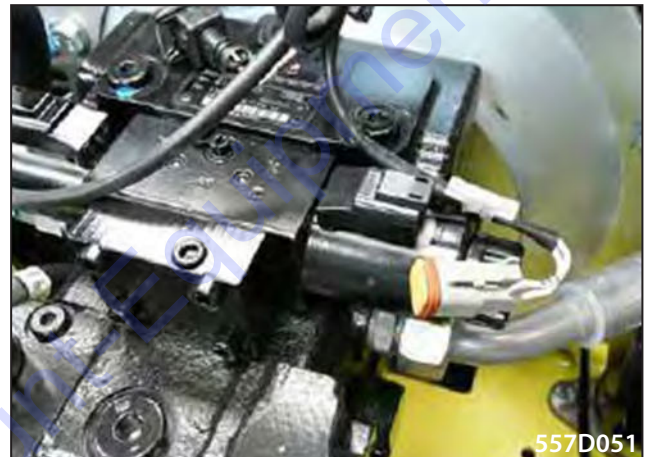
The procedure shall be performed when:

- The electric part of the machine has been checked and the machine is still not running.
- The machine only moves in one direction.
- The machine only moves slowly with the lever switched to the limit position.
- The machine moves unequally.

A view of the travel pump.



Pull out the connector from magnetic coils Y3 (on the left) and Y4 (on the right).



Remove plugs X1 and X2.



A view of the travel pump without a plug.



If the oil does not flow under the unscrewed plug back to the pump housing, apertures are clogged or the piston is out of the centre and jammed.

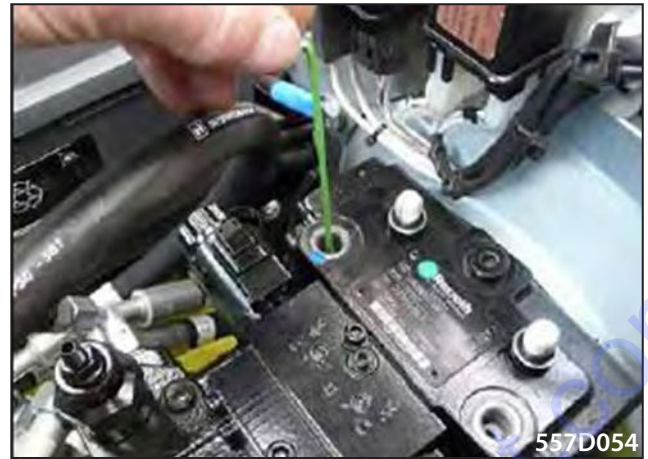


18 Troubleshooting

Loosen the apertures and screw them out.



The apertures must not be loose! Loose apertures cause problem when driving.



Loose apertures can be easily removed using a small magnet. Improve as needed.



A view of the dismantled aperture holder (1) with apertures.



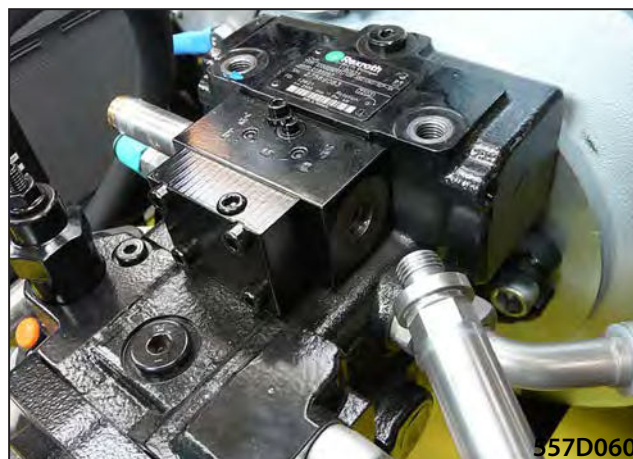
Loosen the knurled nut.



Remove the magnetic coils.



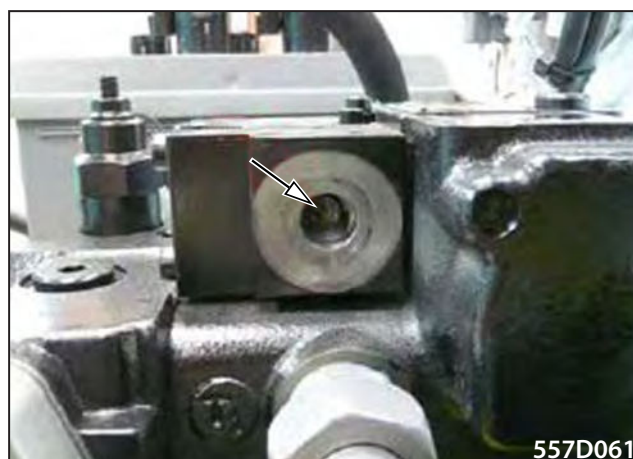
Screw out the magnetic valve.



View of the control piston.



The control piston is a spring type and shall always spontaneously return to the zero position.



18 Troubleshooting

Checking the control piston movement e.g. by means of a screwdriver.

Press the piston to the stop from the left to the right three to four times.



The movement must not be stiff in any case!

It must move smoothly and return easily to the zero position under the force of the spring, from both sides.



If the control piston does not move smoothly after several movements, or it does not spontaneously return to the zero position, it is mechanically damaged.

The servo block must be repaired in a professional workshop.

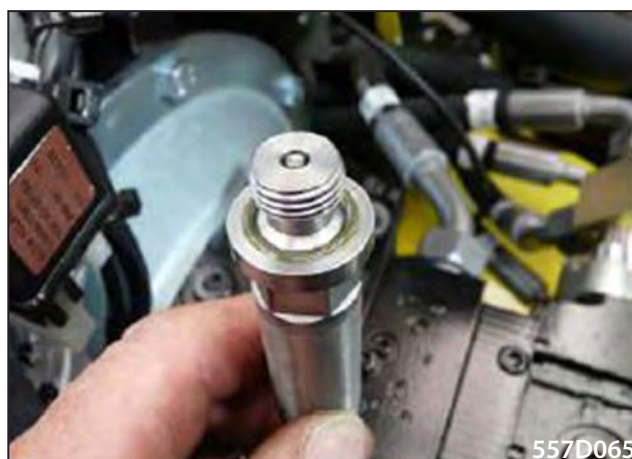


A view of the pump before assembly.



Check the magnetic valve seals for damage.

Lubricate them slightly with oil.



Mount the magnetic valve.



557D066

Install a cleaned aperture with the holder and tighten firmly.



557D067

Check the plug seal.

Lubricate the seal slightly with oil.



557D068

Install both plugs and tighten firmly.



557D069

18 Troubleshooting

Reinstall both magnetic coils.



Install the round seal ring and tighten firmly with a knurled nut.

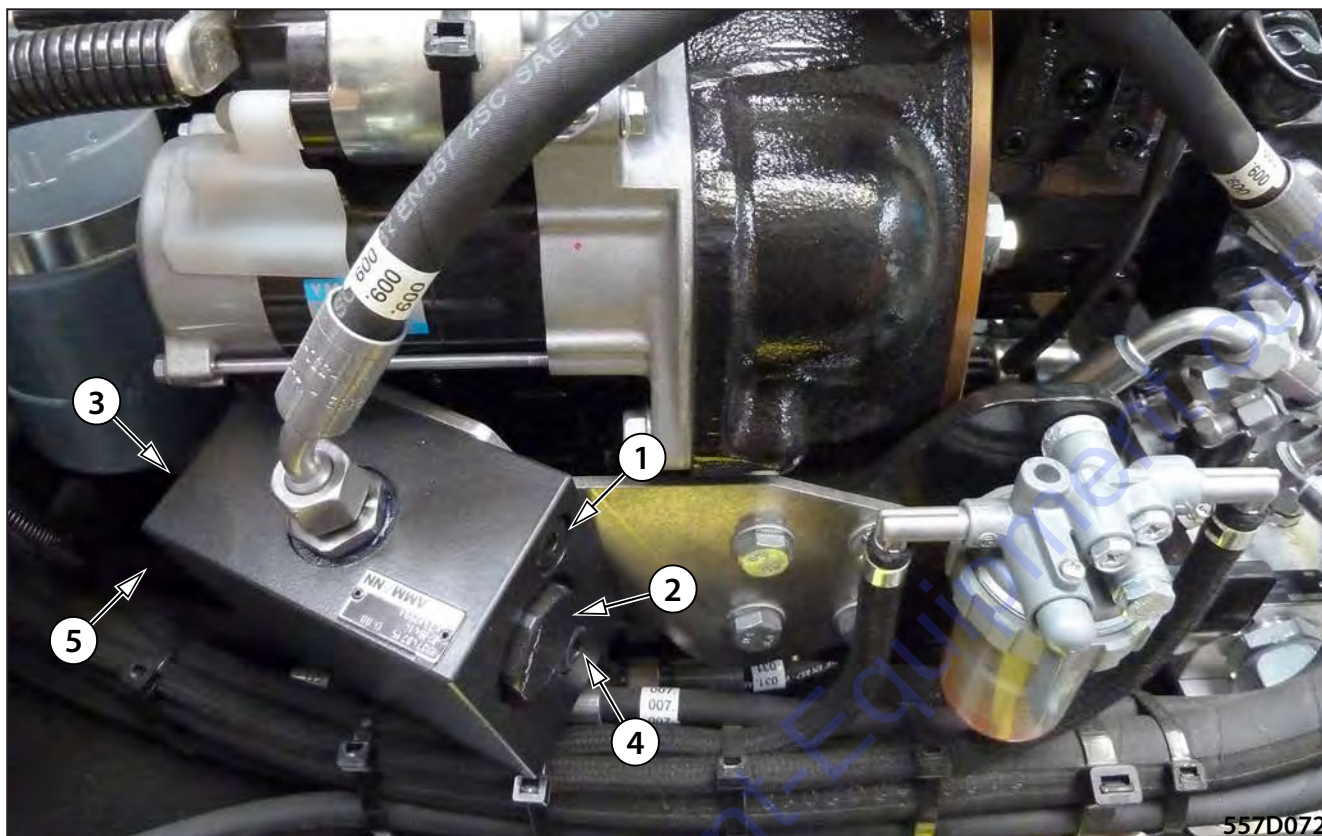


Connect the cable.

Fasten it using a cable tie.

Check the function and sealing.

18.2.9 Checking the quantity divider



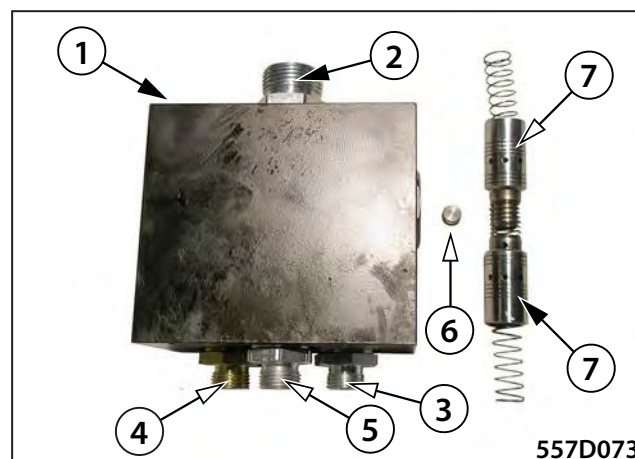
Quantity divider

1. Aperture access
2. Front piston access
3. Rear piston access
4. Front non-return valve access
5. Rear non-return valve access

1. Quantity divider – housing
2. P connection of the B pump
3. Rear interface quantity divider B
4. Rear interface quantity divider A
5. T connection of the G pump
6. Aperture
7. Two spring pistons



In case of a fault (jerky movement) check the aperture for contamination. If required, short circuit the quantity divider = remove the whole piston assembly.



18 Troubleshooting

18.2.10 Speeds and pressures

			after 5 min.	after 60 min.
Diesel engine speed		rpm	2415 ±25	2405 ±25
Vibration speed	front low	rpm	2250 ± 150	2250 ± 150
	rear low	rpm	2250 ± 150	2250 ± 150
	front high	rpm	2250 ± 150	2250 ± 150
	rear high	rpm	2250 ± 150	2250 ± 150
Supply pressure		bar	21 ±2	21 ±2
Travel working pressures	forward	bar	100 ±20	100 ±20
	reverse	bar	100 ±20	100 ±20
Vibration drive pressures *	low amplitude	bar	105 ±55	65 ±15
	high amplitude	bar	110 ±50	80 ±20
Maximum travel pressure	Forward locking	bar	-	330 ±15
	Reverse locking	bar	-	330 ±15
Maximum pressure	Steering	bar	-	67 ±7
	Vibration	bar	-	220 ±10

* During the first start, only low amplitude vibration can be used for the first 2 minutes.

18.3 Roller overturning



Place the machine on belts as quickly as possible.
Turn off the ignition (0 position).



Never try to immediately start the engine!
Prevent oil shock!
It can result in serious engine damage!



Operating fluids pose a risk to the environment!
Prevent fluids from leaking into sewage systems, soil or the environment.
Immediately collect any leaked liquids, oil, diesel fuel, anti-freeze agent, battery sulphur!

18 Troubleshooting

18.3.1 Checking damage

Open both bonnets.

Disconnect the grounding cable (-).

Disconnect the battery.

Check the machine for visible defects, especially for leaked liquids.

If necessary, drain defective tanks.



18.3.2 Preventing oil shock



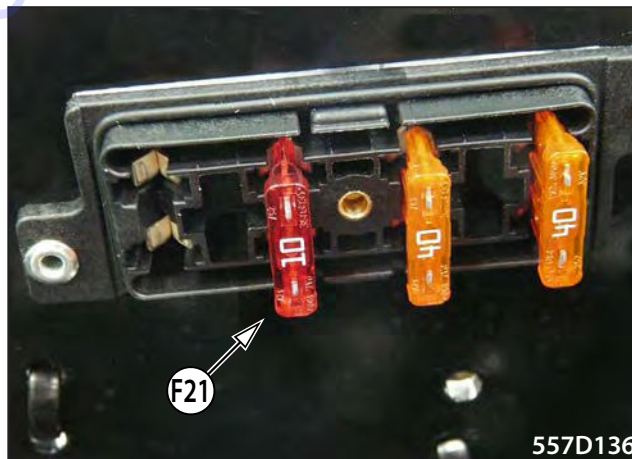
Before removing parts, thoroughly clean the area of valve caps, cylinder heads and electrical sheet.

If no visible damages can be detected or if they were already removed, perform the following:

Removal of parts

Remove the F21 fuse in the engine compartment.

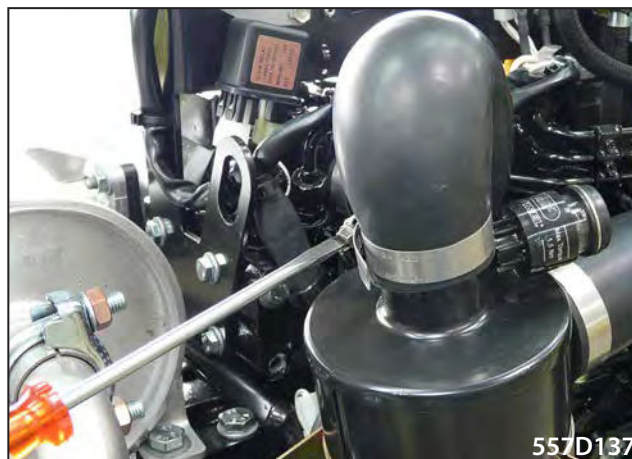
Engine compartment fuses



Remove the air filter element (Chapter 15.4.7).

If it is oily, replace it.

Clean the air filter housing.



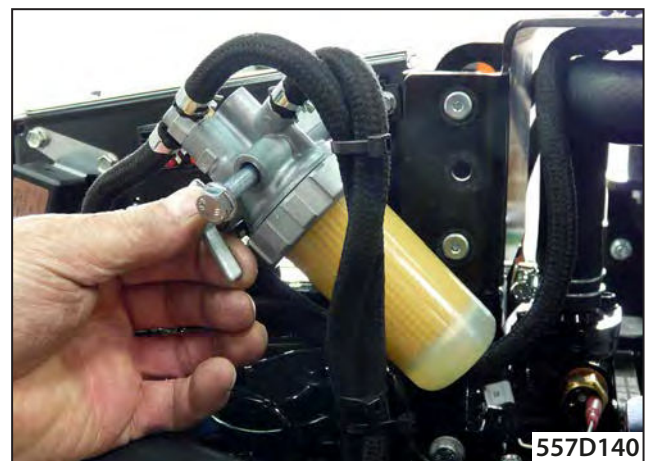
Remove the air filter hose at the top.

Remove the air filter hose at the top.

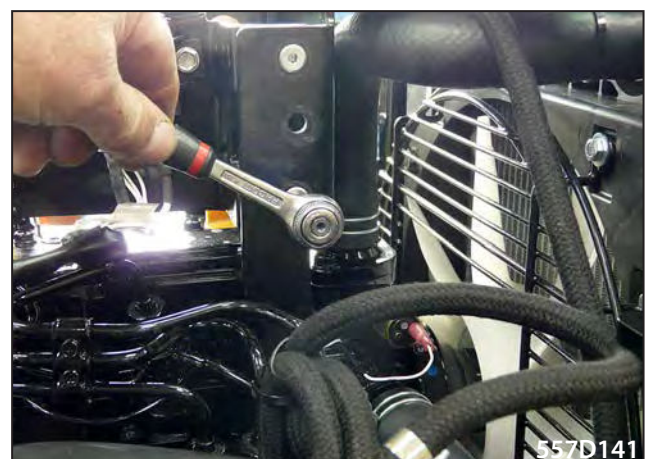


Remove the fuel filter.

Remove the fuel filter.

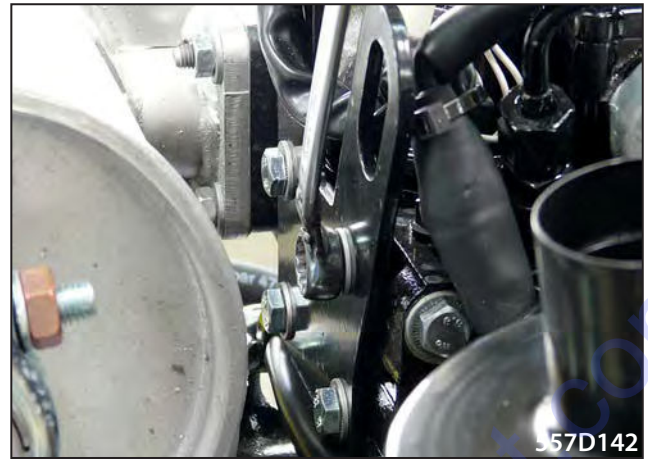


Remove the electrical sheet and tilt it back.



18 Troubleshooting

Screws at the back.



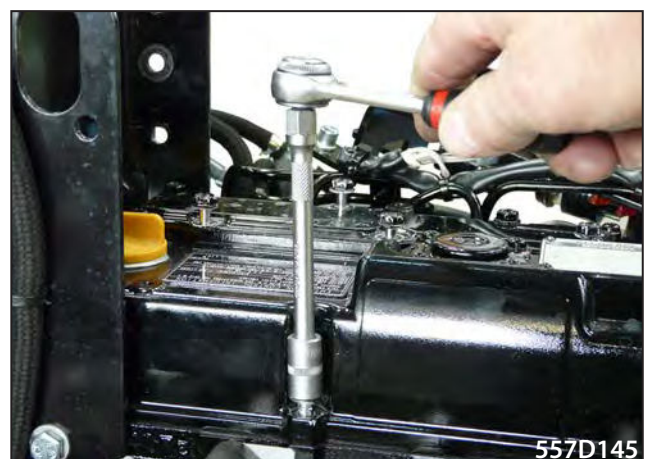
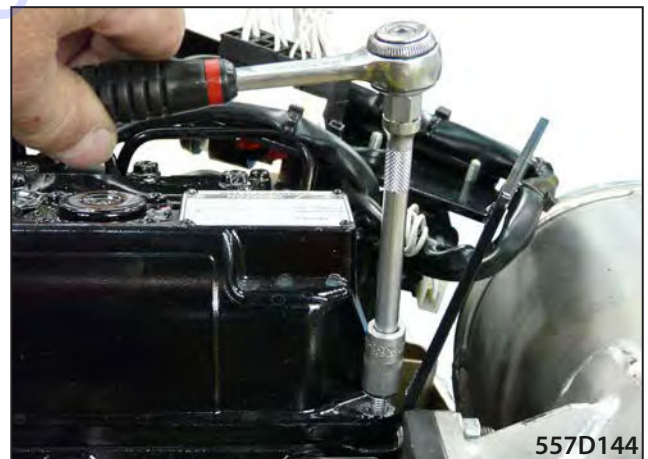
Screws at the front.

Remove the electrical sheet at the back / front.



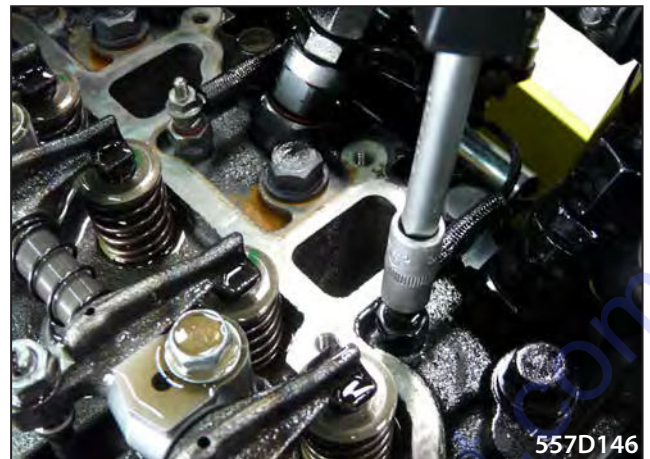
Remove the valve cap.

Remove the valve cap.



Remove the three cables and the contact connection on the glow plugs.

Remove the cables and the contact connection.



Remove ALL three glow plugs.

Tools: Long bit and torque spanner.

Remove the tool / glow plugs.

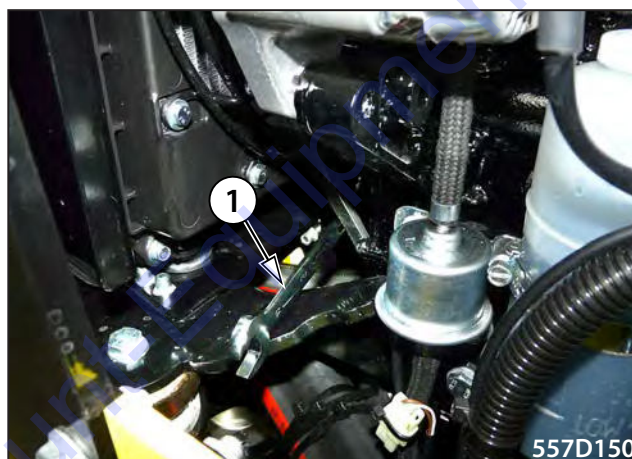


18 Troubleshooting

Rotate the engine with a spanner

Make sure that any accumulated oil is pushed out by the piston.

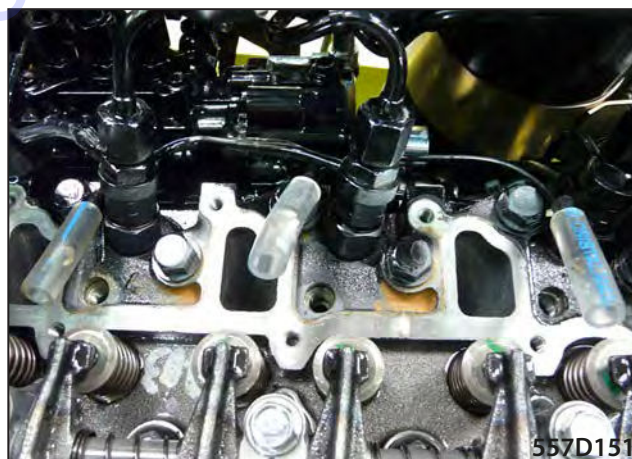
Rotate the engine on the central screw crankshaft clockwise twice using a box-end ratchet spanner (1).



Danger of cable burn or short circuit.

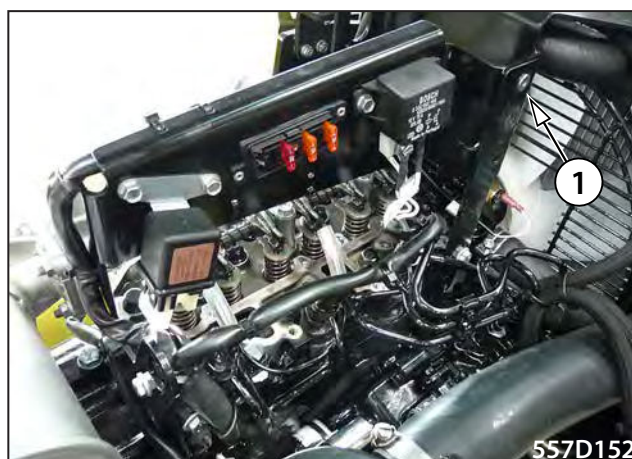
Insulate the glow plug cables e.g. with a piece of hose.

Insulate the connecting cables.



Reattach the electrical sheet with two screws (1).

Reconnect the battery (-).





**Risk of burns from splashing oil! Eye damage, burns.
Wear safety goggles.**

Rotate the engine with the starter

Rotate the engine with the starter (1–2 min.).

After several turns, the accumulated oil in the combustion area should be pushed through the glow plug holes.

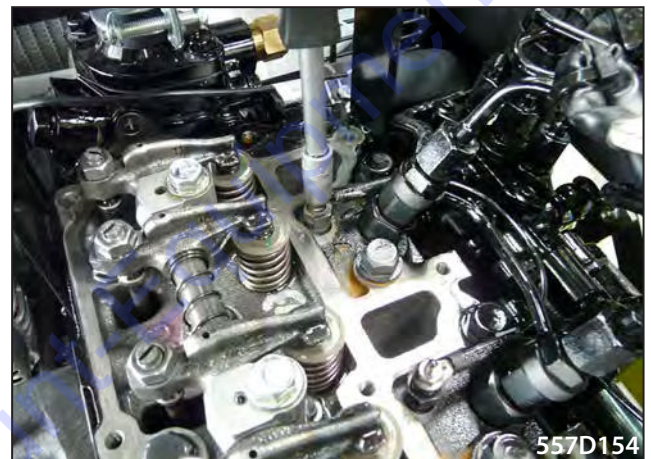
Repeat the process after approx. 5 min. Make sure there is no oil in the combustion area!

Reinstall the glow plugs, tightening torque 18 Nm.

Reconnect the glow plugs to the contact connection and cables (tightening torque 1.5 Nm).

Mount the valve cap.

Mount the electrical sheet.



Rotate the engine with the ignition key

Rotate the ignition key clockwise to the III position.

The engine must rotate.

If it does not, never attempt to start the engine!

There may still be oil in the combustion area. Repeat the procedure as described above. Otherwise, immediately contact Discount-equipment

If the engine rotates:

Check the levels of all fluids.

Refill the liquid if needed.

Reinstall the F21 fuse.

18.3.3 Starting the engine

1. Attempt to start

Rotate the ignition key clockwise to the III position.

The starting attempt was successful, the engine is running: See below under "The engine is running".

The starting attempt was unsuccessful, the engine is not running: There may be air in the diesel system. See "Checking the pump" below.

Checking the pump

Rotate the ignition key clockwise to the I position.

Check if the electric fuel pump is working.

Let the pump run for approximately 1 minute. The system will automatically vent any air.

2. Attempt to start

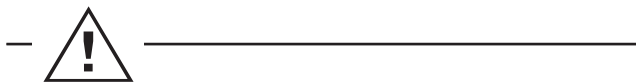
Rotate the ignition key clockwise to the III position.

Let the engine run idle!

Do not activate any function.

The engine is running

The engine will emit smoke until the oil accumulated in the exhaust system burns out (this can take up to 1 h).



Risk of fire!

The exhaust pipe might shoot flames / glowing material.

Immediately visually check any leaking liquids.

If everything is OK:

Bring the engine to full speed.

Check the function.

Engine smoking must noticeably decrease and disappear completely. Otherwise, the engine may have a mechanical defect.

Stop the engine.

Check the levels of fluids.

Refill if necessary.

Check fluid losses.

Start the engine.

19 Appendices

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19.1 Hydraulic system

19.1.1 Adjustment of the travel pump zero position

Adjustment of the travel pump zero position (Chapter 18.2.7).

19.1.1.1 Checking the travel pump magnetic coil / travel pump servo block

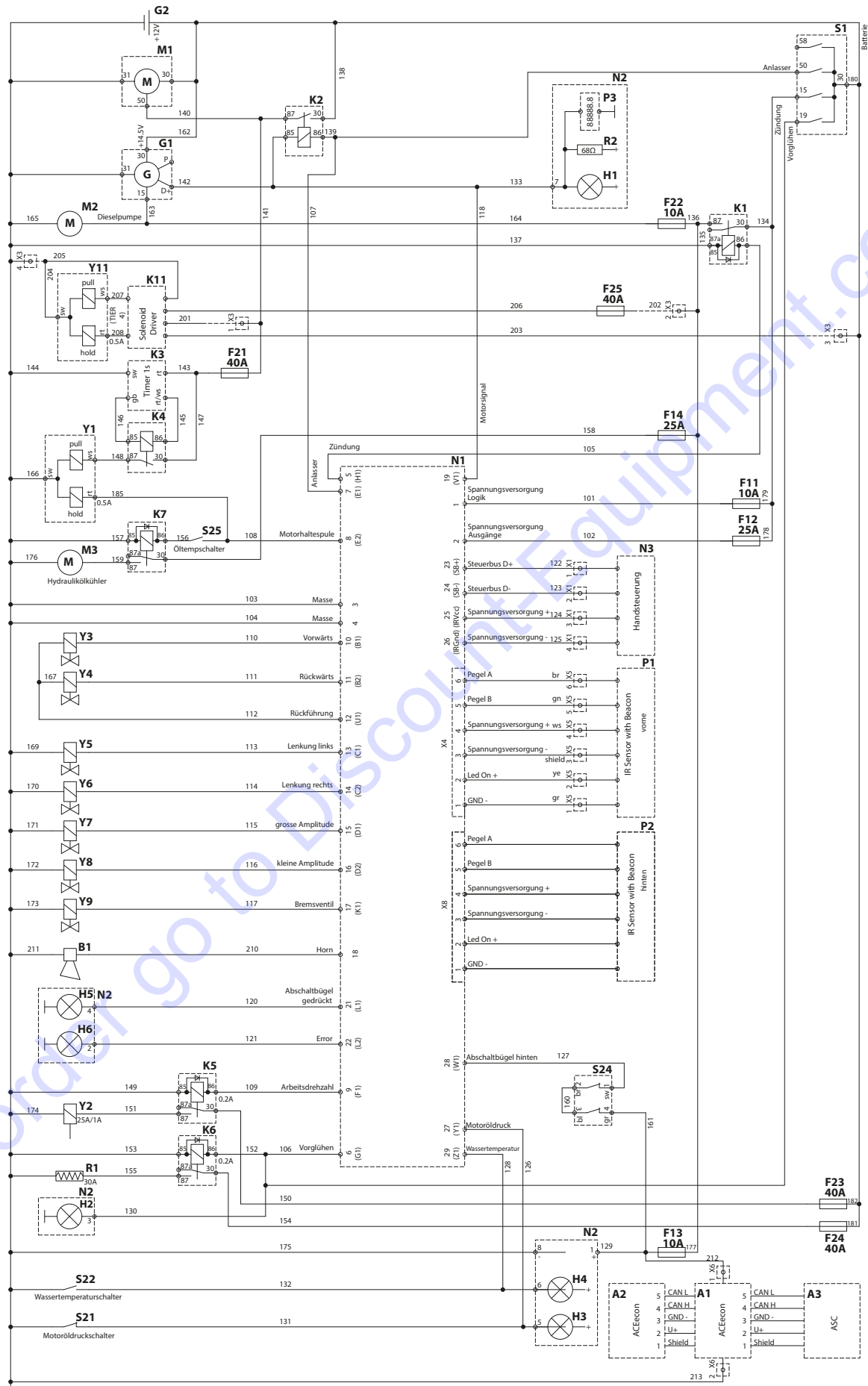
Checking the travel pump magnetic coil / travel pump servo block (Chapter 18.2.7.1).

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19.2 Wiring diagram

Legend:

A1	ACEecon display
A2	ACEecon display
A3	ACEecon sensor
F11	Fuse, control unit, power supply
F12	Fuse, control unit, outputs
F13	Fuse, display unit, safety bar
F14	Fuse, hydraulic oil cooler
F21	Fuse, pull solenoid
F22	Fuse, fuel pump, alternator
F23	Fuse, working speed
F24	Fuse, ignition coil
F25	Fuse, second solenoid
G1	Alternator
G2	Battery
K1	Relay, ignition
K2	Relay, start lock
K3	Time relay
K4	Relay, pull solenoid
K5	Relay, working speed
K6	Relay, ignition coil
K7	Relay, hydraulic oil cooler
K11	Relay, solenoid exciter
M1	Starter
M2	Fuel pump
M3	Hydraulic oil cooler
N1	Machine control unit
N2	Display unit
N3	Infrared remote control
P1	Front infrared sensor
P2	Rear infrared sensor
R1	Ignition coil
S1	Switch, ignition switch
S21	Sensor, engine oil pressure
S22	Sensor, coolant temperature
S24	Sensor, safety bar
S25	Sensor, hydraulic oil temperature
Y1	Magnet, pull / holding solenoid
Y2	Magnet, working speed
Y3	Magnet, pump with a drive, forward
Y4	Magnet, pump with a drive, reverse
Y5	Valve, steering, left
Y6	Valve, steering, right
Y7	Valve, vibration with high amplitude
Y8	Valve, vibration with low amplitude
Y9	Valve, parking brake
Y11	Magnet, second solenoid



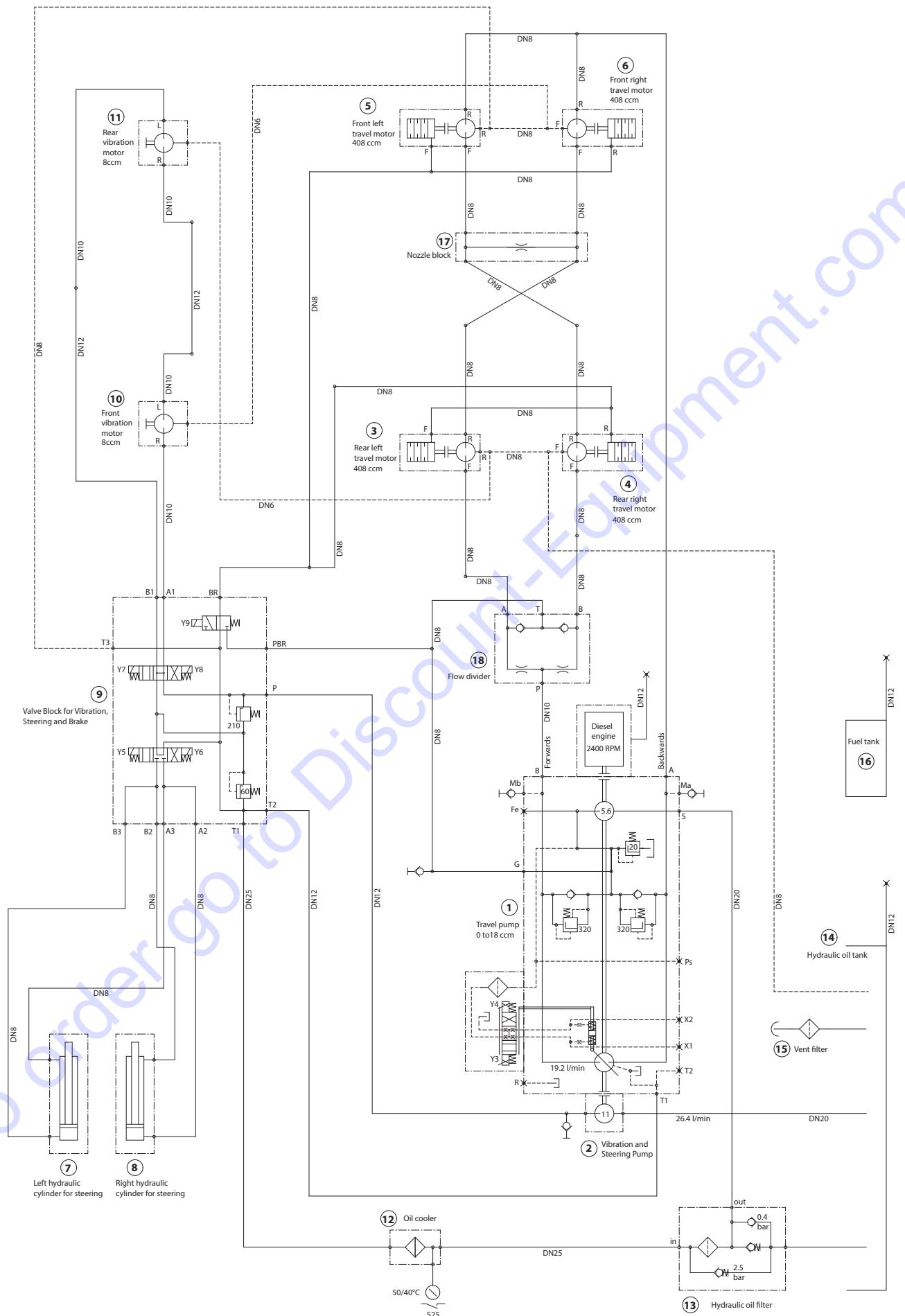
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19.4 Hydraulic system diagram

Legend:

- 1 Travel pump
- 2 Steering and vibration pump
- 3 Travel hydraulic motor, rear left
- 4 Travel hydraulic motor, rear right
- 5 Travel hydraulic motor, front left
- 6 Travel hydraulic motor, front right
- 7 Left steering hydraulic cylinder
- 8 Right steering hydraulic cylinder
- 9 Valve block of vibration, steering and brake
- 10 Vibration hydraulic motor, front
- 11 Vibration hydraulic motor, rear
- 12 Oil cooler
- 13 Hydraulic oil filter
- 14 Hydraulic oil tank
- 15 Ventilation filter
- 16 Diesel fuel tank
- 17 Nozzle block
- 18 Flow divider

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19 Appendices

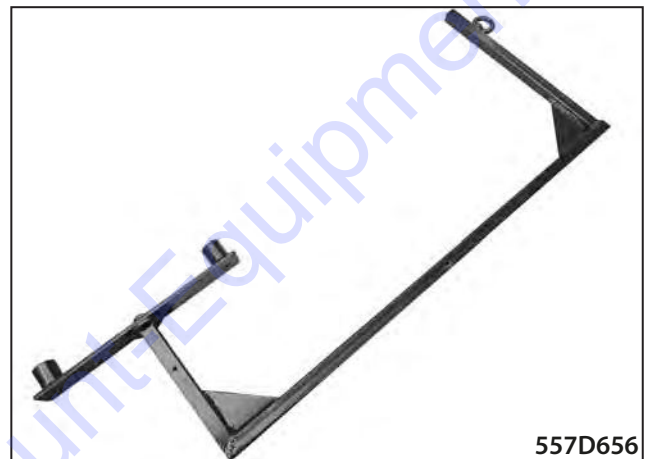
19.6 Workshop jigs

19.6.1 Special tools

Assembly tool for the travel motor



Assembly tool for the vibration unit



Removing tool for swinging joint bearings



Insertion screw of the swinging joint bearing



Assembly tool for swinging joint bearings
1175656



Pressure screws of the swinging joint bearing



Spacer for pressure screws (4x)



Assembly pin, heavy clamping pin, swinging support



19 Appendices

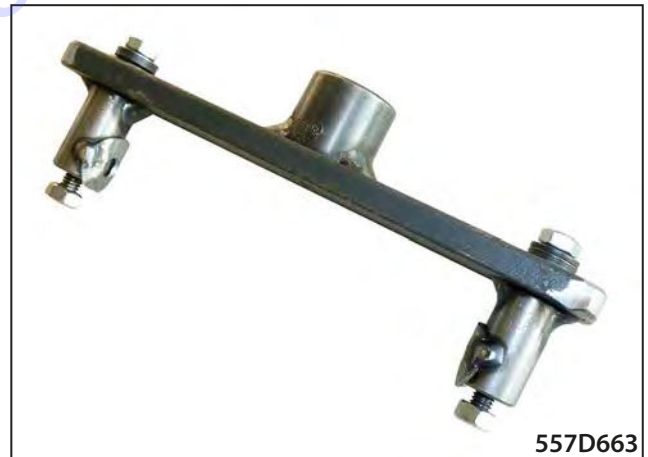
Special bit for the installation of an infrared sensor.



Spanner for grooved nuts for the vibration gearbox



Bridge for the vibration gearbox torque meter



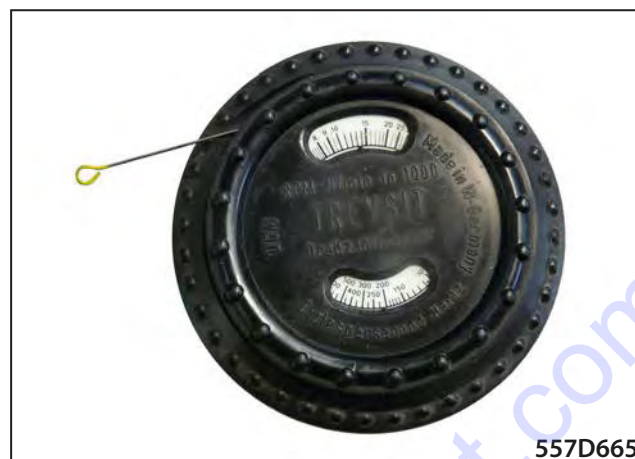
Torque meter



19.6.2 Special tool for measuring the speed and frequency

Revolution counter

2-90000030



557D665

19.6.3 Special tool for magnetic coil check

Solenoid tester

1-10300477



557D666

19 Appendices

19.7 Checking the tightness of screw connections

- Check regularly the screw connections for loosening.
- Use torque spanners for tightening.

	Tightening torque					Tightening torque			
	For screws 8.8 (8G)		For screws 10.9 (10K)			For screws 8.8 (8G)		For screws 10.9 (10K)	
Thread	Nm	lb ft	Nm	lb ft	Thread	Nm	lb ft	Nm	lb ft
M6	10	7.4	14	10.3	M18×1.5	220	162.2	312	230.1
M8	24	25.0	34	25.0	M20	390	287.6	550	405.6
M8×1	19	14.0	27	19.9	M20×1.5	312	230.1	440	324.5
M10	48	35.4	67	49.4	M22	530	390.9	745	549.4
M10×1.25	38	28.0	54	39.8	M22×1.5	425	313.4	590	435.1
M12	83	61.2	117	86.2	M24	675	497.8	950	700.6
M12×1.25	66	48.7	94	69.3	M24×2	540	398.2	760	560.5
M14	132	97.3	185	136.4	M27	995	733.8	1400	1032.5
M14×1.5	106	78.2	148	109.1	M27×2	795	586.3	1120	826.0
M16	200	147.5	285	210.2	M30	1350	995.7	1900	1401.3
M16×1.5	160	118.0	228	168.1	M30×2	1080	796.5	1520	1121.0
M18	275	202.8	390	287.6					

Values given in the table are tightening torques for dry threads (friction coefficient = 0.14). The values are not applicable to lubricated threads.

Tightening torques of compression nuts with an O ring – hoses

			Tightening torques of compression nuts with an O ring – hoses					
			Nm			lb ft		
Spanner size	Thread	Pipe	Nominal	Min	Max	Nominal	Min	Max
14	12×1.5	6	20	15	25	15	11	18
17	14×1.5	8	38	30	45	28	22	33
19	16×1.5	8	45	38	52	33	28	38
		10						
22	18×1.5	10	51	43	58	38	32	43
		12						
24	20×1.5	12	58	50	65	43	37	48
27	22×1.5	14	74	60	88	55	44	65
		15						
30	24×1.5	16	74	60	88	55	44	65
32	26×1.5	18	105	85	125	77	63	92
36	30×2	20	135	115	155	100	85	114
		22						
41	36×2	25	166	140	192	122	103	142
46		28						
50	42×2	30	240	210	270	177	155	199
50	45×2	35	290	255	325	214	188	240
	52×2	38	330	280	380	243	207	280
		42						

Tightening torques for necks with sealing edge or flat sealing

G-M	Tightening torques of necks	
	Nm	lb ft
G 1/8	25	18
G 1/4	40	30
G 3/8	95	70
G 1/2	130	96
G 3/4	250	184
G 1	400	295
G 1 1/4	600	443
G 1 1/2	800	590
10 x 1	25	18
12 x 1.5	30	22
14 x 1.5	50	37
16 x 1.5	60	44
18 x 1.5	60	44
20 x 1.5	140	103
22 x 1.5	140	103
26 x 1.5	220	162
27 x 1.5	250	184
33 x 1.5	400	295
42 x 1.5	600	443
48 x 1.5	800	590

Tightening torques for plugs with flat sealing

G-M	Tightening torques of plugs	
	Nm	lb ft
G 1/8	15	11
G 1/4	33	24
G 3/8	70	52
G 1/2	90	66
G 3/4	150	111
G 1	220	162
G 1 1/4	600	443
G 1 1/2	800	590
10 x 1	13	10
12 x 1.5	30	22
14 x 1.5	40	30
16 x 1.5	60	44
18 x 1.5	70	52
20 x 1.5	90	66
22 x 1.5	100	74
26 x 1.5	120	89
27 x 1.5	150	111
33 x 1.5	250	184
42 x 1.5	400	295
48 x 1.5	500	369

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