

BOMAG

FAYAT GROUP

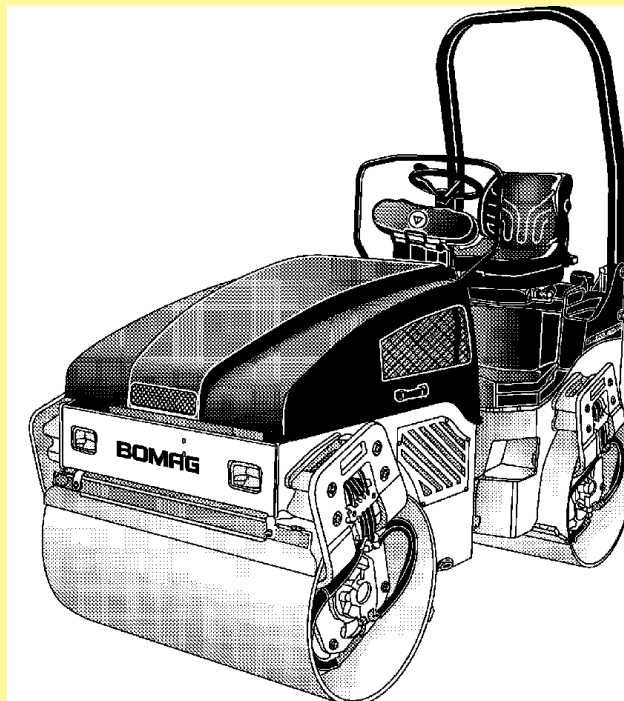
Service - Manual

BW 100 AD-4 / BW 100 AC-4

BW 120 AD-4 / BW 125 AD-4

BW 120 AC-4 / BW 125 AC-4

S/N 101 880 16 > / S/N 101 880 17>
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Tandem Vibratory Roller

Combination Roller

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1 General

1.1 Introduction

This manual addresses the professionally qualified personnel or the after sales service of BOMAG, and should be of help and assistance in correct and efficient repair and maintenance work.

This manual describes the disassembly, dismantling, assembly, installation and repair of components and assemblies. The repair of components and assemblies is only described as this makes sense under due consideration of working means and spare parts supply.

Documentation

For the BOMAG machines described in this manual the following documentation is additionally available:

- 1 **Operating and maintenance instructions**
- 2 **Spare parts catalogue**
- 3 **Wiring diagram***
- 4 **Hydraulic diagram***
- 5 **Service Information**

Use only genuine BOMAG spare parts.

Spare parts needed for repairs can be taken from the spare parts catalogue for the machine.

These repair instructions are not subject of an updating service; for this reason we would like to draw your attention to our additional "Technical Service Bulletins".

In case of a new release all necessary changes will be included.

In the course of technical development we reserve the right for technical modifications without prior notification.

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Danger

These safety regulations must be read and applied by every person involved in the repair /maintenance of this machine. The applicable accident prevention instructions and the safety regulations in the operating and maintenance instructions must be additionally observed.

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Important notes

These safety regulations must be read and applied by every person involved in the repair /maintenance of this machine. The applicable accident prevention instructions and the safety regulations in the operating and maintenance instructions must be additionally observed.

Repair work shall only be performed by appropriately trained personnel or by the after sales service of BOMAG.

Workshop equipment and facilities as well as the use and waste disposal of fuels and lubricants, cleaning agents and solvent as well as gases and chemicals are subject to legal regulations, which are intended to provide a minimum on safety. It is obviously your own responsibility to know and adhere to these regulations.

This manual contains headers like "Note", "Attention", "Danger" and "Environment", which must be strictly complied with in order to inform about and avoid dangers to persons, property and the environment.

Note

Paragraphs marked like this contain technical information for the optimal economical use of the machine.

Caution

Paragraphs marked like this highlight possible dangers for machines or parts of the machine.

Danger

Paragraphs marked like this highlight possible dangers for persons.

Environment

Paragraphs marked like this point out practices for safe and environmental disposal of fuels and lubricants as well as replacement parts.

Observe the regulations for the protection of the environment.

General

- For repair and maintenance work move the machine on a firm base and shut it down.
- Always secure the machine against unintended rolling.
- Secure the engine reliably against unintentional starting.
- Mark a defective machine and a machine under repair by attaching a clearly visible warning label to the dashboard.

- Block the articulated joint with the articulation lock.
- Use protective clothes like hard hat, safety boots and gloves.
- Keep unauthorized persons away from the machine during repair work.
- Tools, lifting gear, lifting tackle, supports and other auxiliary equipment must be fully functional and in safe condition.
- Use only safe and approved lifting gear of sufficient load bearing capacity to remove and install parts or components from and to the machine.
- Do not use easily inflammable or harmful substances, such as gasoline or paint thinners for cleaning.
- Do not smoke or use open fire and avoid sparks when cleaning or repairing a tank.
- When performing welding work strictly comply with the respective welding instructions.

Transport work with cranes and lifting tackle

Note

Cranes must only be operated by instructed persons who had been trained in handling cranes.

- Follow the operating instructions of the manufacturer when working with cranes.
- Follow the operating instructions of the operator when working with cranes.
- Always comply with the applicable accident prevention instructions when working with cranes and lifting tackle.

Precautions and codes of conduct for welding work

Welding work must only be carried out by properly trained personnel.

Danger

Electric shock!

Sparks, fire hazard, burning of skin!

Infrared or ultraviolet radiation (arc), flashing of eyes!

Health hazard caused by welding work on highly alloyed work pieces, metal coatings, paint coatings, plastic coatings, oil containing dirt deposits, grease or solvent residues, etc.!

- Check welding equipment and cables for damage before use (also the validity of inspection stickers).
- Ensure good conductivity between ground cable and workpiece, avoid joints and bearings.

- Start the extraction fan before starting work and guide with the progressing work as required.
- Always isolate the burner when laying it down (remove possible electrode residues).
- Protect cables from being damaged, use cables with insulated couplings.
- Ensure sufficient fire protection, keep a fire extinguisher at hand.
- Welding work in areas where there is a risk of fire or explosion, must only be carried out with welding permission.
- Remove any combustible materials from the welding area or cover such items appropriately.
- Name a fire watch during and after welding work.
- Place welding rod holders and inert gas welding guns only on properly insulated bases.
- Place the inert gas bottles in a safe place and secure them against falling over.
- Use a protective screen or hand shield with welding filter, wear welding gloves and clothes.
- Switch the welding unit off before connecting welding cables.
- Check electrode holders and electric cables at regular intervals.

Behaviour in case of faults

- In case of faults on the welding unit switch of the welding unit immediately and have it repaired by expert personnel.
- In case of failure of the extraction system switch the system off and have it repaired by expert personnel.

Maintenance; waste disposal

- Replace damaged insulating jaws and welding rod holders immediately.
- Replace the welding wire reels only in de-energized state.

What to do in case of accidents; First Aid

- Keep calm.
- Call first air helpers.
- Report the accident.
- In case of an electric accident: Interrupt the power supply and remove the injured person from the electric circuit. If breathing and heart have stopped apply reactivation measures and call for an emergency doctor.

Old oils

Prolonged and repetitive contact with mineral oils will remove the natural greases from the skin and causes dryness, irritation and dermatitis. Moreover, used en-

gine oils contain potentially hazardous contaminants, which could cause skin cancer. Appropriate skin protection agents and washing facilities must therefore be provided.

- Wear protective clothes and safety gloves, if possible.
- If there is a risk of eye contact you should protect your eyes appropriately, e.g. chemistry goggles or full face visor; a facility suitable for rinsing the eyes should also be available.
- Avoid longer and repetitive contacts with oils. In case of open incisions and injuries seek medical advice immediately.
- Apply protective cream before starting work, so that oil can be easier removed from the skin.
- Wash affected skin areas with water and soap (skin cleansers and nail brushes will help). Lanolin containing agents will replace natural skin oils that were lost.
- Do not use gasoline, kerosene, diesel, thinner or solvents to wash the skin.
- Do not put oil soaked cloths into your pockets.
- Avoid clothes getting soiled by oil.
- Overalls must be washed at regular intervals. Dispose of non-washable clothes environmentally.
- If possible degrease components before handling.

Environment

It is strictly prohibited to drain off oil into the soil, the sewer system or into natural waters. Old oil must be disposed of according to applicable environmental regulations. If in doubt you should consult your local authorities.

Hydraulics

- Always relieve the pressure in the hydraulic system before disconnecting any lines. Hydraulic oil escaping under pressure can penetrate the skin and cause severe injury.
- Always make sure that all screw fittings have been tightened properly and that hoses and pipes are in mint condition before pressurizing the system again.
- Hydraulic oil leaking out of a small opening can hardly be noticed, therefore please use a piece of cardboard or wood when checking for leaks. When injured by hydraulic oil escaping under pressure consult a physician immediately, as otherwise this may cause severe infections.
- Do not step in front of or behind the drums, wheels or crawler tracks when performing adjustment work in the hydraulic system while the engine is running. Block drums, wheels or crawler tracks with wedges.

Reattach all guards and safety installations after all work has been completed.

Environment

It is strictly prohibited to drain off oil into the soil, the sewer system or into natural waters. Oil oil must be disposed of according to applicable environmental regulations. If in doubt you should consult your local authorities.

Fuels

Danger

Repair work shall only performed by appropriately trained personnel or by the after sales service of BOMAG.

Follow the valid accident prevention instructions when handling fuels.

The following notes refer to general safety precautions for danger free handling of fuel.

Fuel vapours not only are easily inflammable, but also highly explosive inside closed rooms and toxic; dilution with air creates an easily inflammable mixture. The vapours are heavier than air and therefore sink down to the ground. Inside a workshop they may easily become distributed by draft. Even the smallest portion of spilled fuel is therefore potentially dangerous.

- Fire extinguishers charged with FOAM, CO² GAS or POWDER must be available wherever fuel is stored, filled in, drained off, or where work on fuel systems is performed.
- The vehicle battery must always be disconnected, BEFORE work in the fuel system is started. Do not disconnect the battery while working on the fuel system. Sparks could cause explosion of the fuel fumes.
- Wherever fuel is stored, filled, drained off or where work on fuel systems is carried out, all potential ignition sources must be extinguished or removed. Search lights must be fire proof and well protected against possible contact with running out fuel.

Hot fuels

Please apply the following measures before draining of fuel to prepare for repair work:

- Allow the fuel to cool down, to prevent any contact with a hot fluid.
- Vent the system, by removing the filler cap in a well ventilated area. Screw the filler cap back on, until the tank is finally emptied.

Synthetic rubber

Many O-rings, hoses, etc. are made of synthetic material, a so-called fluorocarbon elastomer. Under normal operating conditions this material is safe and does not impose any danger to health.

However, if this material becomes damaged by fire or extreme heat, it may decompose and form highly caustic hydrofluoric acid, which can cause severe burns in contact with skin.

- If the material is in such a state it must only be touched with special protective gloves. The protective gloves must be disposed of according to applicable environmental regulations immediately after use.
- If the material has contacted the skin despite these measures, take off the soiled clothes and seek medical advice immediately. In the meantime cool and wash the affected area of skin over a sufficient time with cold water or lime water.

Poisonous substances

Some of the fluids and substances used are toxic and must under no circumstances be consumed.

Skin contact, especially with open wounds, must be avoided.

These fluids and substances are, amongst others, anti-freeze agents, hydraulic oils, fuels, washing additives, refrigerants, lubricants and various bonding agents.

Engine

Danger

Do not work on the fuel system while the engine is running. (Danger to life!)

Once the engine has stopped wait approx. 1 minutes for the system to depressurize. The systems are under high pressure. (Danger to life!)

Keep out of the danger zone during the initial test rung. Danger caused by high pressure in case of leaks. (Danger to life!)

When performing work on the fuel system make sure that the engine cannot be started unintentionally during repair work. (Danger to life!)

- Maintenance and cleaning work on the engine must only be performed with the engine stopped and cooled down. Make sure that the electric system is switched off and sufficiently secured against being switched on again (e.g. pull off ignition key, attach a warning label).
- Observe the accident prevention regulations for electric systems (e.g. -VDE-0100/-0101/-0104/-

0105 Electric precautions against dangerous contact voltages).

- Cover all electric components properly before wet cleaning.

Battery

- Always wear goggles and protective clothing to service or clean batteries! Battery acid can cause severe injury by cauterization when coming in contact with skin.
- Work only well ventilated rooms (formation of oxygen-hydrogen gas).
- Do not lean over the battery while it is under load, being charged or tested (danger of explosion).
- Keep ignition sources away from the battery. Burning cigarettes, flames or sparks can cause explosion of the battery
- Use battery chargers etc. only in strict compliance with the operating instructions.
- After an accident with acid flush the skin with a sufficient amount of water and seek medical advice.
- Do not allow children access to batteries.
- When mixing battery fluid always pour acid into water, never vice-versa.

Special safety regulations

- Use only genuine BOMAG spare parts for repair and maintenance work. Genuine spare parts and original accessories were specially developed, tested and approved for the machine.
- The installation and use of non-genuine spare parts or non-genuine accessories may therefore have an adverse effect on the specific characteristics of the machine and thereby impair the active and/or passive driving safety. The manufacturer explicitly excludes any liability for damage caused by the use of non-original parts or accessories.
- Unauthorized changes to the machine are prohibited for safety reasons.
- Do not perform any cleaning work while the engine is running.
- If tests on the articulated joint need to be performed with the engine running, do not stand in the articulation area of the machine (danger of crushing!).
- If tests must be performed with the engine running do not touch rotating parts of the engine (danger of injury!).
- Always ensure an adequate supply of fresh air when starting in closed rooms. Exhaust gases are highly dangerous!
- Refuel only with the engine shut down. Ensure strict cleanliness and do not spill any fuel.

- Always ensure an adequate supply of fresh air when refuelling in closed rooms.
- Dispose of used filters in accordance with applicable environmental regulations.
- When performing repair and maintenance work collect oils and fuels in suitable containers and dispose of in compliance with applicable environmental regulations.
- Do not heat up oils higher than 160 °C because they may ignite.
- Wipe off spilled or overflowed oil using suitable cleaning means and dispose of in accordance with applicable environmental regulations.
- Dispose of old batteries according to applicable environmental regulations.
- There is a danger of scalding when draining off engine or hydraulic oil at operating temperature! Allow engine and hydraulic system to cool down to a sufficient level.
- Do not exceed the max. permissible tire pressure.

General

- Before removing or disassembling parts, assemblies, components or hoses mark these parts for easier assembly.
- Before assembling and installing parts, assemblies or components oil or grease all movable parts or surfaces as required and in compliance with the compatibility of materials.

Electrics

General

Due to the fast technical development electric and electronic vehicle systems become more intelligent and more comprehensive day by day, and can hardly be dispensed with in hydraulic and mechanical vehicle systems.

Diagnostics according to plan

Well structured trouble shooting procedures can save time and money.

Random tests have revealed that purely electronic components or control units only very rarely are the actual cause of failures:

- In approx. 10 % of the examined cases the problems were caused by control units.
- In approx. 15 % sensors and actuators were the cause of the problems.


By far the highest proportion of all faults could be traced back to wiring and connections (plugs, etc.).

General:

- Before changing any expensive components, such as control units, you should run a systematic trouble shooting session to eliminate any other possible fault sources. Knowledge in basic electrics is required for this purpose. If a fault was diagnosed without having pulled the plug of the control unit or inspected the wiring, this should be done before changing any parts.
- Check for good cable and ground contacts, therefore keep all mechanical transition points between electric conductors (terminals, plugs) free of oxide and dirt, as far as this is possible.
- Always use the machine related wiring diagram for testing. If one or more faults were detected, these should be corrected immediately.
- Do not disconnect or connect battery or generator while the engine is running.
- Do not operate the main battery switch under load.
- Do not use jump leads after the battery has been removed.
- Sensors and electric actuators on control units must never be connected individually or between external power sources for the purpose of testing, but only in connection with the control unit in question.
- It is not permitted to pull plugs off while the voltage supply is switched on (terminal 15 "ON")! Switch the voltage supply "OFF" first and pull out the plug.
- Even with an existing polarity reversal protection incorrect polarity must be strictly avoided. Incorrect polarity can cause damage to control units!

- Plug-in connectors on control units are only dust and water tight if the mating connector is plugged on! Control units must be protected against spray water, until the mating connector is finally plugged on!
- Unauthorized opening of control electronics (Micro-controller MC), modifications or repairs in the wiring can cause severe malfunctions.
- Do not use any radio equipment or mobile phones in the vehicle cab without a proper aerial or in the vicinity of the control electronics!

Electrics and welding

 **Caution**

Before starting welding work you should disconnect the negative battery pole or interrupt the electric circuit with the main battery switch, disconnect the generator and pull the plugs off all control units in order to protect the electrical system of the machine.

- Disconnect the minus pole of the battery or interrupt the electric circuit with the main battery switch.
- Isolate the generator and all control units from the electric circuit.
- Always fasten the earth clamp of the welding unit in the immediate vicinity of the welding location.
- When choosing the location for the earth clamp make sure that the welding current will not pass through joints or bearings.

Battery

Rules for the handling of batteries

When removing a battery always disconnect the minus pole before the plus pole. When installing the battery connect the minus pole after the plus pole to avoid short circuits.

Fasten the terminal clamps with a little force as possible.

Always keep battery poles and terminal clamps clean to avoid high transition resistances when starting and the related development of heat.

Make sure the battery is properly fastened in the vehicle.

Generator

Before removing the generator you must disconnect the ground cable from the minus pole of the battery while the ignition is switched off. Do not disconnect the generator while the engine is running, because this may cause extremely high voltage peaks in the vehicle wiring system ("Load Dump"), which could possibly damage control units, radios or other electronic equipment.

When disassembling the battery cable, the B+-nut underneath on the generator side may also be loosened. This nut must in this case be retightened.

When connecting e.g. the battery cable to the terminal of the generator you must make sure that the polarity is correct (generator B+ to the + pole of the battery). Mixing up the polarities by mistake causes short circuit and damage to the rectifier elements - the generator will be out of function.

The generator can only be operated with the battery connected. Under special conditions emergency operation without battery is permitted, the lifetime of the generator is in such cases especially limited.

Plus and minus cables must be disconnected during rapid charging of the battery or electric welding on the vehicle.

When cleaning the generator with a steam or water jet make sure not to direct the steam or water jet directly on or into the generator openings or ball bearings. After cleaning the generator should be operated for about 1 - 2 minutes to remove any deposits of water from the generator.

Starter motor

So-called jump starting (using an additional external battery) without the battery connected is dangerous. When disconnecting the cables from the poles high inductivities (arcs, voltage peaks) may occur and destroy the electrical installation.

For purposes like e.g. purging the fuel systems, starters may be operated for maximum 1 minute without interruption. Then you should wait for at least 30 minutes (cooling down) until trying again. During the 1 minute starting period this process should not be interrupted.

Starter motors must not be cleaned with high pressure steam cleaning equipment.

The contacts on starter terminals 30, 45, 50 must be protected against unintended shorting (jump protection).

When replacing the starter the ring gear on the engine flywheel must be checked for damage and its number of teeth - if necessary replace the ring gear.

Always disconnect the battery before starting assembly work in the starter area of the engine or on the starter itself.

Hydraulic system

Caution

Repair work on hydraulic elements shall only be performed by appropriately trained personnel or by the after sales service of BOMAG.

Please note

Note

Cleanliness is of utmost importance. Dirt and other contaminations must strictly be kept out of the system.

- Connections and screw fittings, filler neck covers and their immediate surrounding areas must be cleaned before removal.
- Before loosening hoses, pipe lines etc. relieve all pressure from the system.
- During repair work keep all openings closed with clean plastic plugs and caps.
- Never run pumps, motors and engines without oil or hydraulic oil.
- When cleaning hydraulic components take care not to damage any fine machine surfaces.
- Chemical and rubber soluble cleansing agents may only be used to clean metal parts. Do not let such substances come in contact with rubber parts.
- Rinse of cleaned parts thoroughly, dry them with compressed air and apply anti-corrosion oil immediately. Do not install parts that show traces of corrosion.
- Avoid the formation of rust on fine machined caused by hand sweat.
- Use new O-rings or seal rings for reassembly.
- Use only hydraulic oil as sliding agent when reassembling. Do not use any grease!
- Use only the specified pressure gauges. Risk of damaging the pressure gauges under too high pressure.
- Check the hydraulic oil level before and after the work.
- Fill in only clean oil as specified in the maintenance instructions.
- Check the hydraulic system for leaks, if necessary find and rectify the cause.
- Before taking new hydraulic components into operation fill these with hydraulic oil as specified in the operating and maintenance instructions.
- After changing a hydraulic component thoroughly flush, refill and bleed the complete hydraulic system.

- Perform measurements at operating temperature of the hydraulic oil (approx. 40 °C).
- After changing a component perform a high and charge pressure test, if necessary check the speed of the exciter shaft.
- The operating pressure of the exciter shaft to a great extent depends on the base under the vibrating drum. On hard ground place the drums on a suitable base and check the drum pressure. Do not activate the vibration on a hard, concreted base, danger of bearing damage.
- After the completion of all tests perform a test run and then check all connections and fittings for leaks with the engine still stopped and the hydraulic system depressurized.

Before commissioning

- Fill the housings of hydraulic pumps and motors with hydraulic oil. Use only hydraulic oils according to the specification in the maintenance instructions.
- After changing a component flush the hydraulic system as described in the flushing instructions.

Taking into operation

- Bleed the hydraulic circuits.
- Start up the hydraulic system without load.
- Check the hydraulic oil level in the tank, if necessary top up with hydraulic oil as specified in the operating and maintenance instructions or drain oil off into a suitable container.

After taking into operation

- Check fittings and flanges for leaks.
- After each repair check all adjustment data, system pressures, rotational speeds and nominal values in the hydraulic system, adjust if necessary.
- Do not adjust pressure relief valves and control valves to values above their specified values.

Fuel hoses

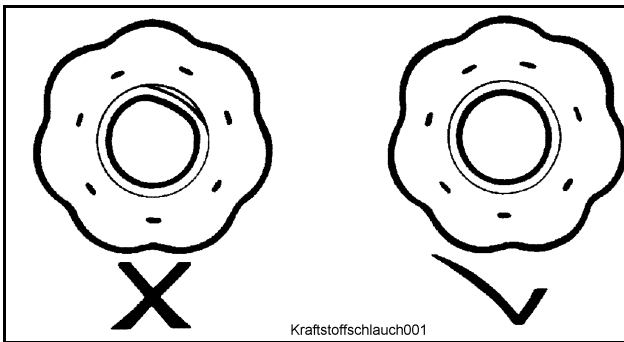


Fig. 1

⚠ Caution

All fuel hoses have two layers of material, a reinforced rubber coating outside and an internal Viton hose. If a fuel hose has come loose one must make absolutely sure that the internal Viton layer has not been separated from the reinforced outer layer. In case of a separation the hose needs to be replaced.

Gaskets and mating surfaces

Leaking sealing faces can mostly be traced back to incorrect assembly of seals and gaskets.

- Before assembling a new seal or gasket make sure that the sealing surface is free of pitting, flutes, corrosion or other damage.
- Inappropriately stored or handled seals (e.g. hanging from hooks or nails) must under no circumstances be used.
- Assemble seals and gaskets only with sealing compound, grease or oil, if this is specifically specified in the repair instructions.
- If necessary remove any old sealing compound before assembling. For this purpose do not use any tools that could damage the sealing surfaces.
- Sealing compound must be applied thin and evenly on the corresponding surfaces; take care that the compound does not enter into oil galleries or blind threaded bores.
- Examine the contact faces for scratches and burrs, remove these with a fine file or an oilstone; take care that no grinding dust and dirt enters into tapped bores or enclosed components.
- Blow out lines, ducts and gaps with compressed air, replace any O-rings and seals that have been dislodged by the compressed air.

Assembly of radial seals

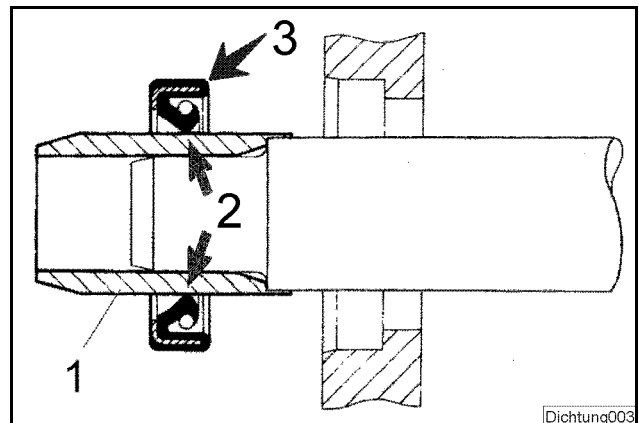


Fig. 2

- Lubricate the sealing lips (2) (Fig. 2) with clean grease; in case of double seals fill the space between the sealing lips with a generous amount of grease.
- Slide the seal over the shaft, with the lip facing towards the fluid to be sealed.

i Note

If possible, use an assembly sleeve (1 (Fig. 2)), to protect the lip from being damaged by sharp edges, threads or splines. If no assembly sleeve is avail-

able, you should use a plastic tube or adhesive tape to prevent the sealing lip from being damaged.

- Lubricate the outer rim (arrow 3 (Fig. 2)) of the seal and press it flat on the housing seat.

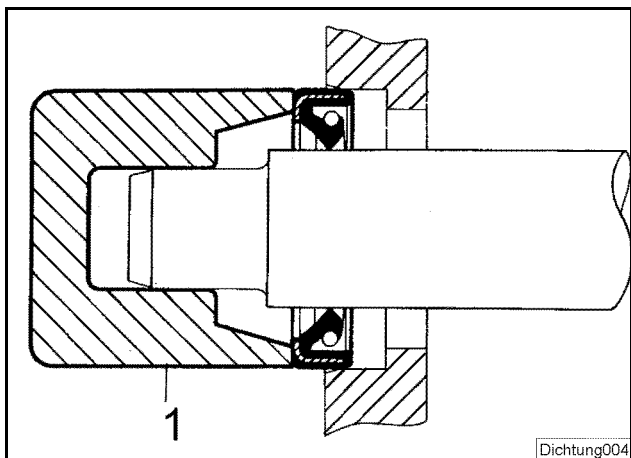


Fig. 3

- Press or knock the seal into the housing, until it is flush with the housing surface.

i Note

If possible, use a "bell" (1 (Fig. 3)), to make sure **that the seal will not skew**. In some cases it may be advisable to assemble the seal into the housing first, before sliding it over the shaft. Under no circumstances should the full weight of the shaft rest on the seal.

If you have no proper service tools at hand, use a suitable drift punch with a diameter which is about 0,4 mm smaller than the outer diameter of the seal. Use **VERY LIGHT** blows with the hammer if no press is available.

Feather keys and keyways

⚠ Caution

Feather keys may only be reused if they are free of damage.

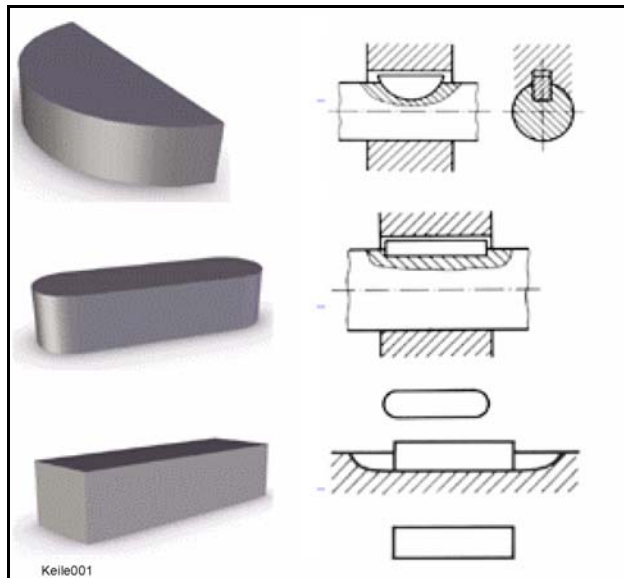


Fig. 4

- Clean and thoroughly examine the feather key.
- Deburr and thoroughly clean the edges of the keyway with a fine file before reassembling.

Ball and roller bearings

⚠ Caution

Ball and roller bearings may only be reused if they are free of damage and do not show any signs of wear.



Fig. 5

- If a ball or roller bearing of a bearing pair shows defects, both ball or roller bearings need to be replaced.
- Remove any lubricant residues from the ball or roller bearing to be examined by washing it with gasoline or any other appropriate degreasing agent. Ensure strict cleanliness.
- Check balls or rollers, running surfaces, outer faces of outer races and inner faces of inner races for visible damage. Replace the ball or roller bearing if necessary.
- Check the ball or roller bearing for clearance and resistance between the inner and outer races, replace if necessary.
- Lubricate the ball or roller bearing with the recommended type of grease before assembly or reassembly.
- On greased bearings (e.g. wheel bearings) fill the space between ball or roller bearing and outer seal with the recommended type of grease before assembling the seal.

- Check shaft and bearing housing for discolouration or other signs of movement between ball or roller bearing and seats.
- Make sure that shaft and housing are free of burrs before assembling the ball or roller bearing.
- Always mark the individual parts of separable ball or roller bearings (e.g. taper roller bearings) to enable correct reassembling. Never assemble the rollers to an outer race that has already been used, replace the complete ball or roller bearing instead.

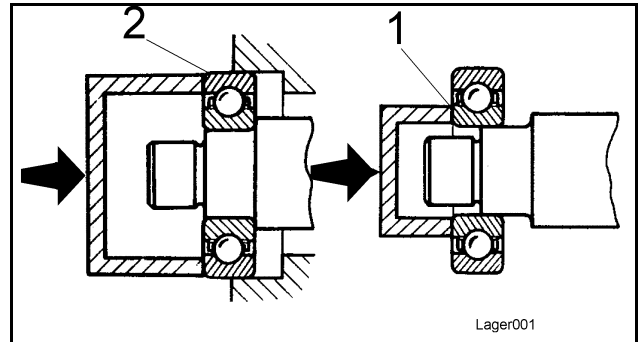


Fig. 6

⚠ Caution

When assembling the ball or roller bearing to the shaft load must only be applied to the inner race 1 (Fig. 6).

When fitting the bearing into the housing load must only be applied to the outer race (2).

Screws and nuts

Tightening torque

⚠ Caution

Tighten nuts or screws with the tightening torques specified in the following tables of tightening torques. Tightening torques deviating from the ones in the table are specially mentioned in the repair instructions.

Damaged screws must under no circumstances be used any longer. Recutting threads with thread cutters or taps adversely affects the strength and leak tightness of the screw joint. Damaged or corroded thread pitches can cause incorrect torque value readings.

Self-locking nuts must generally be replaced after disassembly.

The use of screws with too high strength can cause damage!

- Nut of a higher strength can generally be used instead of nuts of a lower strength classification.
- When checking or retightening screw joints to the specified tightening torque you should first relieve by a quarter turn and then tighten to the correct torque.
- Before tightening you should lightly oil the thread, in order to ensure low friction movement. **The same applies for self-locking nuts.**
- Make sure that no oil or grease will enter into blind tapped bores. The hydraulic power generated when turning in the screw could cause breakage of the affected part.

Strength classes, metric screws

The strength classes (from 3.6 to 12.9) are specified for all strength classes from a nominal diameter of 5mm. The corresponding identification can be found where allowed for by the shape of the screw.

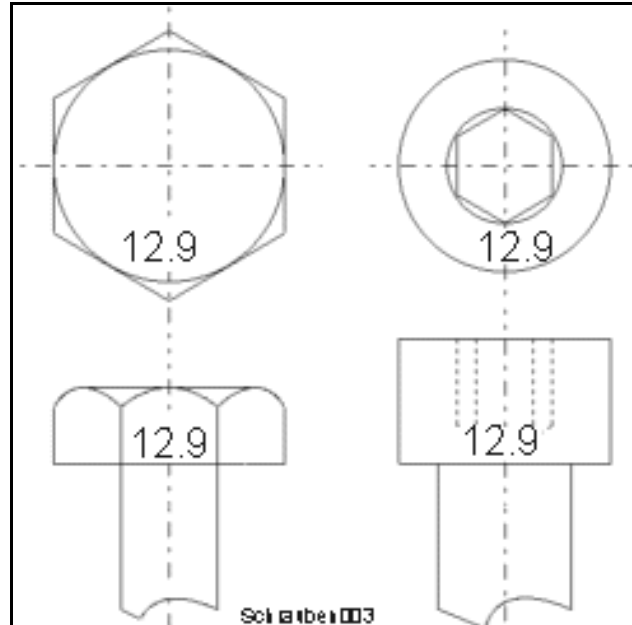


Fig. 7 Identification of screws

Example: A screw is identified with 12.9.

The first number corresponds with 1/100 of the nominal tensile strength (minimum tensile strength) in N/mm².

- The nominal tensile strength is $12 \times 100 \text{ N/mm}^2 = 1200 \text{ N/mm}^2$.

The second number specifies 10-times the ratio between lower yield point and nominal tensile strength (yield point ratio).

i Note

When exceeding the lower yield point, the material will return to its original shape when being relieved (plastic deformation).

When exceeding the upper yield point the material will not restore its original shape after being relieved.

- The lower tensile strength is $9/10 \times 1200 \text{ N/mm}^2 = 1080 \text{ N/mm}^2$.

i Note

However, these values are by no means identical with the tightening torques, which are to be set on a torque wrench. The corresponding calculation requires a higher effort and, in the end, depends on the materials to be bolted together.

Strength classes of metric nuts

Nuts are differentiated by three load groups. Each load group has a special designation system for the strength class assigned, so that the load group can be clearly identified.

Nuts for screw joints with full load capability (4, 5, 6, 8, 10, 12)

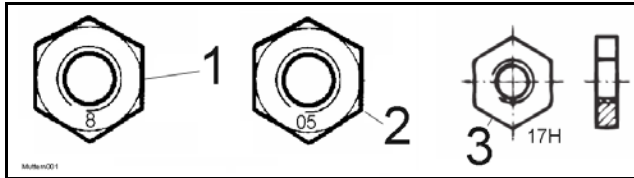


Fig. 8 Identification of nuts

In a connection with a screw, these nuts 1 (Fig. 8) must be able to bear the full pre-load at the yield point.

Nut height above 0.8 d (d = nominal dimension).

Strength class of nut	Strength class of associated screw
4	3.6, 4.6, 4.8
5	3.6, 4.6, 4.8 5.6, 5.8
6	6.8
8	8.8
9	9.8
10	10.8
12	12.8

Nuts for screw joints with limited load factor (04, 05)

The preceding "0" indicates that, due to their low height, nuts 2 (Fig. 8) in this group are only able to withstand the force of a screw to a limited extent.

Nut height below 0,8 d (d = nominal dimension).

Nuts for screw joints without specified load factor (11H, 14H, 17H, 22H)

This standard contains strength classes (hardness classes) for nuts 3 (Fig. 8), for which no load values can be specified, e.g. because of their shape and dimensions, but which can only be classified by their hardness.

Nut height below 0,5 d (d = nominal dimension).

Identification in clock system

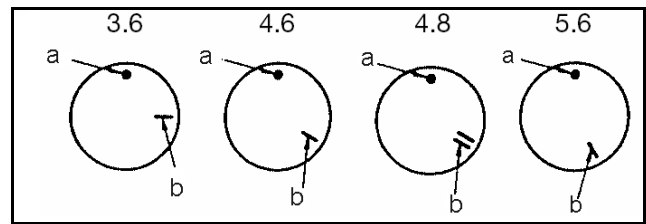


Fig. 9 Identification of nuts in clock system

For small nuts (Fig. 9) the clock system can be used for identification.

- The 12 o'clock position is identified by a dot or the manufacturer's symbol.
- The strength class is identified by a dash (b).

Identification of UNF-threads

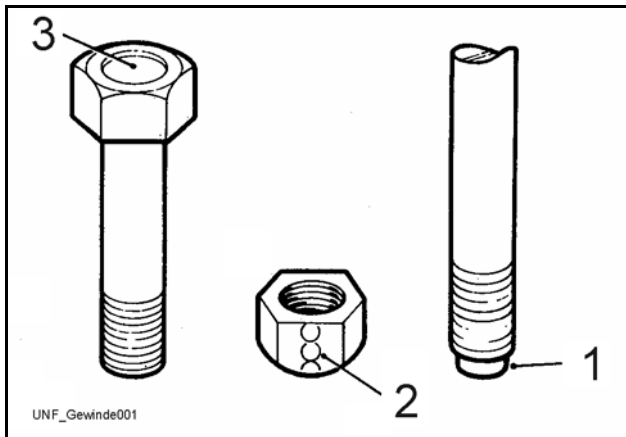


Fig. 10

Screws

The screw head is marked with a stamped in, round cavity 3 (Fig. 10).

Nuts

An uninterrupted series of stamped in circles parallel to the axis of the nut on a hexagon area (2).

Studs and brake rods

At the outmost end a short end of the component is reduced to its core diameter (1).

Cotter pins

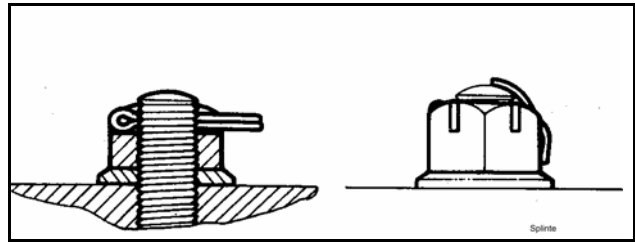


Fig. 11

In places where cotter pins are used, these must be reassembled. Cotter pins must generally be renewed after disassembly.

Cotter pins must be assembled as shown in the illustration, unless specified differently.

The values specified in the table apply for screws:

- black oiled
- with surface protection A4C
- with surface protection DACROMET

i Note

DACROMET is a surface protection that mainly consists of zinc and aluminium in a chromium oxide matrix. DACROMETIZATION provides excellent corrosion protection for metal surfaces by applying a mineral coating with metallic-silver appearance.

Tightening torques for screws with metric unified thread¹

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
M4	3	5	5
M5	6	9	10
M6	10	15	18
M8	25	35	45
M10	50	75	83
M12	88	123	147
M14	137	196	235
M16	211	300	358
M18	290	412	490
M20	412	578	696
M22	560	785	942
M24	711	1000	1200
M27	1050	1480	1774
M30	1420	2010	2400

¹ Coefficient of friction μ tot. = 0,14

Tightening torques for screws with metric unified fine thread¹

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
M8 x 1	26	37	48
M10 x 1.25	52	76	88
M12 x 1,25	98	137	126
M12 x 1.5	93	127	152
M14 x 1.5	152	216	255
M16 x 1.5	225	318	383
M18 x 1.5	324	466	554
M20 x 1.5	461	628	775
M22 x 1.5	618	863	1058
M24 x 2	780	1098	1294
M27 x2	1147	1578	1920
M30 x 2	1568	2254	2695

¹ Coefficient of friction μ tot. = 0,14

Tightening torques for screws treated with anti-seizure paste OKS 240¹ (copper paste)

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
M16	169	240	287
M16 x 1.5	180	255	307
M18	232	330	392
M18 x 1.5	260	373	444
M20	330	463	557
M20 x 1.5	369	502	620
M22	448	628	754
M22 x 1.5	495	691	847
M24	569	800	960
M24 x 2	624	879	1036
M27	840	1184	1520
M27 X 2	918	1263	1536
M30	1136	1608	1920
M30 x 2	1255	1804	2156
3/4" - 10 UNC	276	388	464
3/4" - 16 UNC	308	432	520

¹ Anti-seizure paste (copper paste) is used for the assembly of screw connections, which are exposed to high temperatures and corrosive effects. Prevents seizure and corrosion.

Tightening torques for wheel nuts (fine thread)^{1 2}

Thread diameter	Tightening torques Nm
	10.9
M12x1.5	100
M14x1.5	150
M18x1.5	300 - 350
M20x1.5	400 - 500
M22x1.5	500 - 600

¹ Coefficient of friction μ tot. = 0,14

² These values result in a 90% utilization of the yield point

The values specified in the table apply for screws:

- black oiled
- with surface protection A4C
- with surface protection DACROMET

i Note

The difference between Withworth and UNF/UNC threads is the fact that UNF and UNC threads have 60° flanks, as the metric ISO-thread, whereas Withworth has a flank of only 55°.

DACROMET is a surface protection that mainly consists of zinc and aluminium in a chromium oxide matrix. DACROMETIZATION provides excellent corrosion protection for metal surfaces by applying a mineral coating with metallic-silver appearance.

Tightening torques for screws with UNC thread, ¹ UNC Unified Coarse Thread Series, American Unified Coarse Thread

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
1/4" - 20	11	15	19
5/16" - 18	23	32	39
3/8" - 16	39	55	66
7/16" - 14	62	87	105
1/2" - 13	96	135	160
9/16" - 12	140	200	235
5/8" - 11	195	275	330
3/4" - 10	345	485	580
7/8" - 9	560	770	940
1" - 8	850	1200	1450
1 1/8" - 7	1200	1700	2000
1 1/4" - 7	1700	2400	2900
1 3/8" - 6	2200	3100	3700
1 1/2" - 6	3000	4200	5100

¹ Coefficient of friction μ tot. = 0,14

Tightening torques for screws with UNF thread, ¹ UNF Unified National Fine Thread Series, American Unified Fine Thread

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
1/4" - 28	13	18	22
5/16" - 24	25	35	42
3/8" - 24	45	63	76
7/16" - 20	70	100	120
1/2" - 20	110	155	185
9/16" - 18	155	220	260
5/8" - 18	220	310	370
3/4" - 16	385	540	650
7/8" - 14	620	870	1050

Tightening torques for screws with UNF thread, ¹ UNF Unified National Fine Thread Series, American Unified Fine Thread

Screw dimension	Tightening torques Nm		
	8.8	10.9	12.9
1" - 12	930	1300	1600
1 1/8" - 12	1350	1900	2300
1 1/4" - 12	1900	2700	3200
1 3/8" - 12	2600	3700	4400
1 1/2" - 12	3300	4600	5600

¹ Coefficient of friction $\mu_{tot.} = 0,14$

2 Technical data

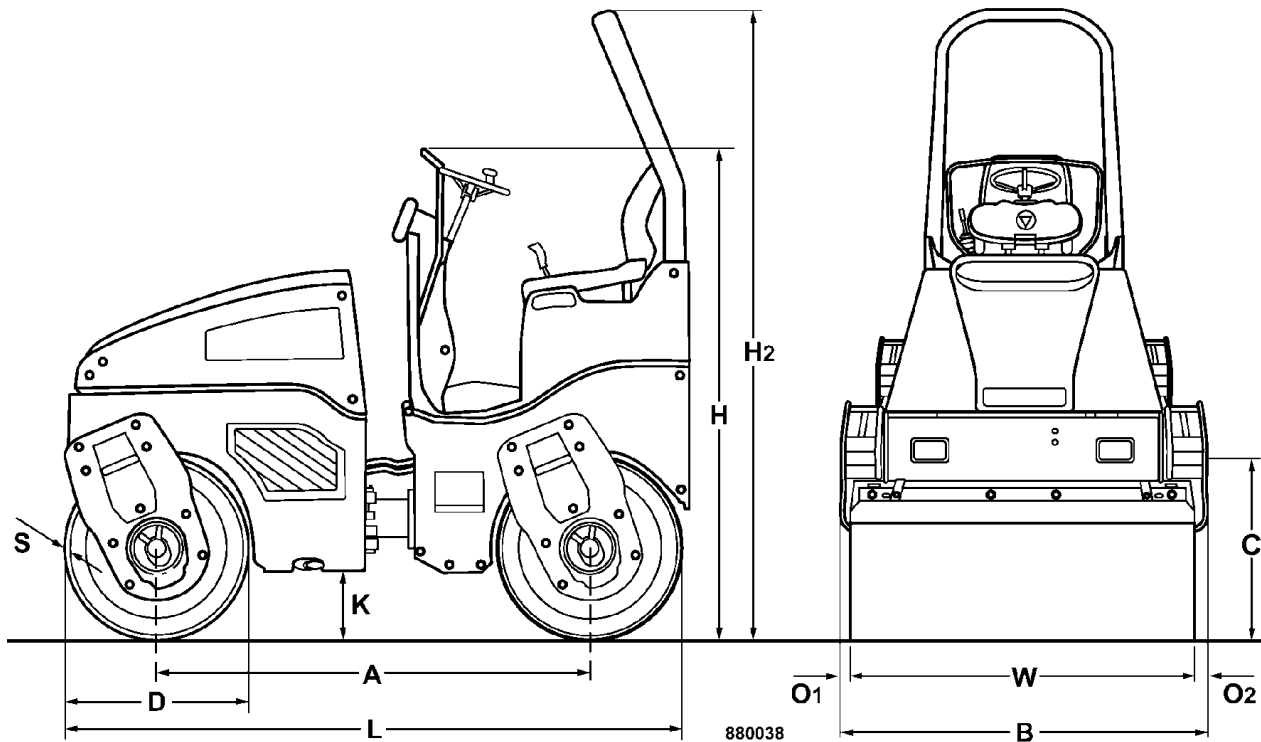


Fig. 12

Dimensions in mm	A	B	C	D	H	H2	K	L	O	S	W
BW 100 AD-4	1728	1076	475	700	1800	2475	255	2475	38	13	1000
BW 120 AD-4	1728	1276	474	700	1800	2475	255	2475	38	13	1200
BW 125 AD-4	1728	1276	474	700	1800	2475	255	2475	38	23	1200

1	BW 100 AD-4	BW 120 AD-4	BW 125 AD-4
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Weights

Operating weight with ROPS (CECE)	kg	2400	2600	3150
Operating weight with ROPS (CECE) and empty chip spreader ²	kg	2520	2730	3150
Mean axle load (CECE)	kg	1200	1300	1575
Mean static linear load (CECE)	kg/cm	12.0	10.8	13.1

Dimensions

Inner track radius	mm	2720	2620	2620
Length with chip spreader**	mm	3250	3250	-
Width with chip spreader**	mm	1180	1276	-

Travel characteristics

Working speed with vibration	km/h	0 – 6.5	0 – 6.5	0 – 6.5
Travel speed	km/h	0 – 12	0 – 12	0 – 12
Max. gradability without/with vibration (soil dependent)	%	40/30	40/30	40/30

Drive

Engine manufacturer	Kubota	Kubota	Kubota
Type	D 1703-M-EU32	D 1703-M-EU32	D 1703-M-EU32

1		BW 100 AD-4	BW 120 AD-4	BW 125 AD-4
Cooling		Water	Water	Water
Number of cylinders		3	3	3
Rated power ISO 9249	kW	24.7	24.7	24.7
Rated power SAE J 1349	hp	33.1	33.1	33.1
Rotary speed (nominal speed)	rpm	2600	2600	2600
Fixed engine speed 1	rpm	2400	2400	2400
Fixed engine speed 2	rpm	2600	2600	2600
Electrical equipment	V	12	12	12
Brake				
Service brake		hydrost.	hydrost.	hydrost.
Parking brake		hydro-mech.	hydro-mech.	hydro-mech.
Steering				
Type of steering		Oscill.-articul.	Oscill.-articul.	Oscill.-articul.
Steering operation		hydrost.	hydrost.	hydrost.
Steering/oscillation angle	+/- °	30/7	30/7	30/7
Exciter system				
Vibrating drum		front + rear	front + rear	front + rear
Drive system		hydrost.	hydrost.	hydrost.
Frequency 1/2	Hz	70/55	70/55	60/50
Amplitude	mm	0.49	0.51	0.40
Centrifugal force 1/2	kN	37/23	45/28	41/29
Water sprinkler system				
Type		Gravity feed	Gravity feed	Gravity feed
Filling capacities				
Fuel (diesel)	l	approx. 40	approx. 40	approx. 40
Water tank capacity	l	approx. 220	approx. 220	approx. 220
Hydraulic oil	l	approx. 28	approx. 32	approx. 32
Engine oil	l	approx. 6,5	approx. 6,5	approx. 6,5

1 The right for technical modifications remains reserved

2 Optional equipment

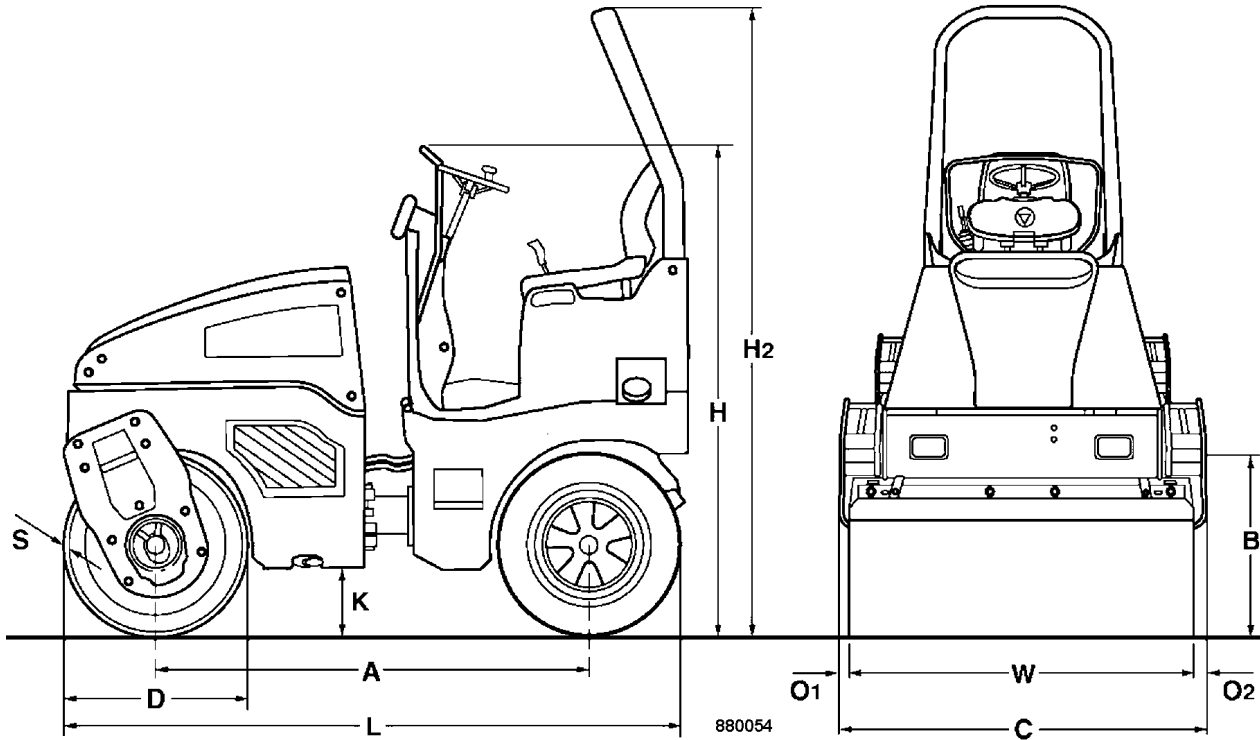


Fig. 13

Dimensions in mm	A	B	C	D	H	H2	K	L	O	S	W
BW 100 AC-4	1728	1076	475	700	1800	2475	255	2475	38	13	1000
BW 120 AC-4	1728	1276	474	700	1800	2475	255	2475	38	13	1200
BW 125 AC-4	1728	1276	474	700	1800	2475	255	2475	38	23	1200

1

BW 100 AC-4 BW 120 AC-4 BW 125 AC-4

Weights

Operating weight with ROPS (CECE)	kg	2270	2450	2950
Axle load, drum (CECE)	kg	1170	1290	1600
Axle load, wheels (CECE)	kg	1100	1160	1350
Static linear load (CECE)	kg/cm	11.7	10.8	13.5
Wheel load (CECE)	kg	275	290	338

Dimensions

Inner track radius	mm	2720	2620	2620
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Travel characteristics

Working speed with vibration	km/h	0 – 6	0 – 6	0 – 6
Travel speed	km/h	0 – 10	0 – 10	0 – 10
Max. gradability without/with vibration (soil dependent)	%	40/30	40/30	40/30

Drive

Engine manufacturer	Kubota	Kubota	Kubota
Type	D 1703-M-EU32	D 1703-M-EU32	D 1703-M-EU32
Cooling	Water	Water	Water
Number of cylinders	3	3	3

1		BW 100 AC-4	BW 120 AC-4	BW 125 AC-4
Rated power ISO 9249	kW	24.7	24.7	24.7
Rated power SAE J 1349	hp	33.1	33.1	33.1
Rotary speed (nominal speed)	rpm	2600	2600	2600
Fixed engine speed 1	rpm	2400	2400	2400
Fixed engine speed 2	rpm	2600	2600	2600
Electrical equipment	V	12	12	12
Tires				
Number of tires		4	4	4
Tire size		205/60-15	205/60-15	205/60-15
Brake				
Service brake		hydrost.	hydrost.	hydrost.
Parking brake		hydro-mech.	hydro-mech.	hydro-mech.
Steering				
Type of steering		Oscill.-articul.	Oscill.-articul.	Oscill.-articul.
Steering operation		hydrost.	hydrost.	hydrost.
Steering/oscillation angle	degree	30/7	30/7	30/7
Exciter system				
Vibrating drum		front	front	front
Drive system		hydrost.	hydrost.	hydrost.
Frequency 1/2	Hz	70/55	70/55	60/50
Amplitude	mm	0.49	0.52	0.40
Centrifugal force 1/2	kN	37/23	45/28	42/29
Water sprinkler system				
Type		Pressure	Pressure	Pressure
Interval control		Standard	Standard	Standard
Filling capacities				
Fuel (diesel)	l	approx. 40	approx. 40	approx. 40
Water tank capacity	l	approx. 220	approx. 220	approx. 220
Emulsion	l	approx. 20	approx. 20	approx. 20
Hydraulic oil	l	approx. 28	approx. 28	approx. 28
Engine oil	l	approx. 6,5	approx. 6,5	approx. 6,5

1 Subject to technical alterations.

Additional engine data

Combustion principle		4-stroke diesel
Low idle speed	rpm	1200 - 1300
High idle speed	rpm	2700 ± 25
Specific fuel consumption	g/kWh	235
Valve clearance intake	mm	0,2
Valve clearance exhaust	mm	0,2
Injection valves opening pressure	bar	140 + 10

Travel pump

Manufacturer		Bosch-Rexroth
Type		A10VG28
System		Axial piston/swash plate
Max. displacement	cm ³ /rev.	28
Max. flow capacity	l/min	72,8
High pressure limitation	bar	380 ± 5
Charge pressure, high idle	bar	24 ± 1

Drum drive motor

Manufacturer		Poclair
Type		MK 04
System		Radial piston
Displacement	cm ³ /rev.	408
Perm. leak oil rate	l/min	1,5

Wheel motor

Manufacturer		Poclair
Type		MSE 02
System		Radial piston
Displacement	cm ³ /rev.	408
Perm. leak oil rate	l/min	1,5

Vibration pump

Type		HYZ/11
System		Gear pump
Max. displacement	cm ³ /rev.	11
Start up pressure	bar	210 ± 20
Operating pressure (soil dependent)	bar	100 ± 60

Vibration motor

Type		HYZ/8
System		Gear motor
Displacement	cm ³ /rev.	8

Check steering/

Type		HYZ/8
System		Gear pump
Displacement	cm ³ /rev.	8
Max. steering pressure	bar	190 ± 20

Steering valve

Manufacturer		Danfoss
Type		OSPC 80 ON
System		Rotary spool valve

The following noise and vibration data acc. to

- EC Machine Regulation edition 2006/42/EC
- the noise regulation 2000/14/EG, noise protection guideline 2003/10/EC
- Vibration Protection Regulation 2002/44/EC

were determined during conditions typical for this type of equipment and by application of harmonized standards.

During operation these values may vary because of the existing operating conditions.

Noise value

Sound pressure level on the place of the operator:

$L_{pA} = 84 \text{ dB(A)}$, determined acc. to ISO 11204 and EN 500

Guaranteed sound power level:

$L_{WA} = 106 \text{ dB(A)}$, determined acc. to ISO 3744 and EN 500

Danger

Wear your personal noise protection means (ear defenders) before starting operation.

Vibration value

Vibration of the entire body (driver's seat)

The weighted effective acceleration value determined according to ISO 7096 is $\leq 0.5 \text{ m/s}^2$.

Hand-arm vibration values

The weighted effective acceleration value determined according to ISO 5349 is $\leq 2.5 \text{ m/s}^2$.

3 Maintenance

3.1 General notes on maintenance

When performing maintenance work always comply with the appropriate safety regulations.

Thorough maintenance of the machine guarantees far longer safe functioning of the machine and prolongs the lifetime of important components. The effort needed for this work is only little compared with the problems that may arise when not observing this rule.

The terms right/left correspond with travel direction forward.

- Always clean machine and engine thoroughly before starting maintenance work.
- For maintenance work stand the machine on level ground.
- Always remove the main battery switch for all maintenance work.
- Perform maintenance work only with the motor switched off.
- Relieve hydraulic pressures before working on hydraulic lines.
- Before working on electric parts of the machine disconnect the battery and cover it with insulation material.
- When working in the area of the articulated joint attach the articulation lock (transport lock).

Environment

During maintenance work catch all oils and fuels and do not let them seep into the ground or into the sewage system. Dispose of oils and fuels environmentally.

Keep used filters in a separate waste container and dispose of environmentally.

Catch biodegradable oils separately.

Notes on the fuel system

The lifetime of the diesel engine depends to a great extent on the cleanliness of the fuel.

- Keep fuel free of contaminants and water, since this will damage the injection elements of the engine.
- Drums with inside zinc lining are not suitable to store fuel.
- When choosing the storage place for fuel make sure that spilled fuel will not harm the environment.
- Do not let the hose stir up the slurry at the bottom of the drum.
- The fuel drum must rest for a longer period of time before drawing off fuel.
- The rest in the drum is not suitable for the engine and should only be used for cleaning purposes.

Notes on the performance of the engine

On diesel engines both combustion air and fuel injection quantities are thoroughly adapted to each other and determine power, temperature level and exhaust gas quality of the engine.

If your engine has to work permanently in "thin air" (at higher altitudes) and under full load, you should consult the customer service of BOMAG or the customer service of the engine manufacturer.

Notes on the cooling system

Prepare and check coolant with highest care, since otherwise the engine may be damaged by corrosion, cavitation and freezing.

The coolant is prepared by mixing a cooling system protection agent (ethylene glycol) into the coolant.

Mixing with cooling system protection agent is necessary in all climatic zones. It prevents corrosion, lowers the freezing point and raises the boiling point of the coolant.

Notes on the hydraulic system

During maintenance work on the hydraulic system cleanliness is of major importance. Make sure that no dirt or other contaminating substances can enter into the system. Small particles can produce flutes in valves, cause pumps to seize, clog nozzles and pilot bores, thereby making expensive repairs inevitable.

- If, during the daily inspection of the oil level the hydraulic oil level is found to have dropped, check all lines, hoses and components for leaks.
- Seal leaks immediately. If necessary inform the responsible customer service.
- Always use the filling and filtering unit (BOMAG part-no. 007 610 01) to fill the hydraulic system. This unit is fitted with a fine filter to clean the hydraulic oil, thereby prolonging the lifetime of the filter.
- Clean fittings, filler covers and the area around such parts before disassembly to avoid entering of dirt.
- Do not leave the tank opening unnecessarily open, but cover it so that nothing can fall in.

3.2 Fuels and lubricants

Engine oil

Quality

Lubrication oils are classified according to their performance and quality class. Oils according to other comparable specifications may be used.

If low sulphur fuel (< 0.05%) is used, you must only use engine oils of API¹-classification CF, CF-4, CG-4, CH-4 and CI-4.

For operation of an engine with high sulphur fuels it is recommended to use an engine oil of classification CF or higher with a total base number of at least 10.



Caution

Engine oils of classification CJ-4 must not be used!

Oil viscosity

Since lubrication oil changes its viscosity with the temperature, the ambient temperature at the operating location of the engine is of utmost importance when choosing the viscosity class (SAE-class) .

Optimal operating conditions can be achieved by using the following oil viscosity chart as a reference.

Ambient temperature	Viscosity
over 25 °C!	SAE 30 SAE10W-30 SAE 15W40
0°C to 25°C	SAE 20 SAE10W-30 SAE 15W40
below 0 °C	SAE 10 SAE10W-30 SAE 15W40

Oil change intervals

The longest permissible time a lubrication oil should remain in an engine is 1 year. If the following oil change intervals are not reached over a period of 1 year, the oil change should be performed at least once per year, irrespective of the operating hours reached.

API: CF, CF-4, CG-4, CH-4 and CI-4= 500 operating hours

Fuels

Quality

Cetan index number: The recommended minimum index number for the Cetan value is 45. A Cetan index number higher than 50 should preferably be used, especially at ambient temperatures below -20 °C and when working at altitudes of 1500 m and more.

Diesel fuel specifications: With respect to the percentage (ppm) of sulphur the fuel used in the engine must comply with all relevant exhaust emission regulations in the are of use of the engine.

It is highly recommended to use a fuel with a sulphur content of less than 0,10 % (1000 ppm).

When using a diesel fuel with a high sulphur content of 0.50 % (5000 ppm) to 1.0 % (10.000 ppm), the engine oil change intervals must behaved.



Caution

Do not use any fuels with a sulphur content of more than 1,0 % (10000 ppm).

It is recommended to use diesel fuel that complies with the specifications EN590 or ASTM D975.

Diesel fuel with the designation no. 2-D is a distillate fuel with low volatility, which is especially suitable for industrial engines and heavy-duty commercial vehicles (SAE J313 JUN87).

Since KUBOTA diesel engines with a rated power of less than 56 kW (75 HP) comply with the exhaust emission standard of EPA²-stage 4, the use of low or ultra-low sulphur fuel is mandatory for these engines, if the engines are operated within the validity area of the EPA standard. As an alternative to no. 2-D you may also use diesel fuel no. 2-D S500 or S15; with ambient temperatures below -10 °C the diesel fuel no. 1-D S500 or S15 should be used fir no. 1-D.

The fuel level should always be topped up in due time so that the fuel tank is never run dry, as otherwise filter and injection lines need to be bled.

Winter fuel



Danger

Fire hazard!

Diesel fuels must never be mixed with gasoline.

For winter operation use only winter diesel fuel, to avoid clogging because of paraffin separation. At very low temperatures disturbing paraffin separation can also be expected when using winter diesel fuel.

Coolant

Always use a mixture of anti-freeze agent and clean, dehardened water with a mixing ratio of 1:1.

1 American Petroleum Institute

2 United States Environmental Protection Agency


Under particularly extreme temperature conditions you should consult the service representation of the engine manufacturer with respect to the anti-freeze agent to be used.

There are various types of anti-freeze agents available. For this engine you should use ethylene glycol.

Before filling in the coolant mixed with anti-freeze agent the radiator must be flushed with clean water. This procedure should be repeated two to three times to clean the inside of radiator and engine block.

Mixing the anti-freeze agent: Prepare a mixture of 50 % anti-freeze agent and 50 % low mineral, clean water. Stirr well before filling it into the radiator. The method for mixing water and anti-freeze agent depends on the brand of the anti-freeze agent. In this respect see standard SAE J1034 and also the standard SAE J814c.

Add anti-freeze agent: If the coolant level drops because of evaporation, only clean water is to be used for topping up. In case of leakages you must always fill in anti-freeze agents of the same brand and the same mixing ratio.

 **Caution**

Do not mix different coolants and additives of any other kind.

Do not use any radiator cleaning agent after the anti-freeze agent has been mixed in. The anti-freeze agent also contains a corrosion protection agent. If this mixes with cleaning agent it may cause the development of sludge, which could damage the cooling system.

Anti-freeze concentration

50% = -37 °C

 **Environment**

Coolant must be disposed of environmentally.

Mineral oil based hydraulic oil

The hydraulic system is operated with hydraulic oil HV 46 (ISO) with a kinematic viscosity of 46 mm²/s at 40 °C. For topping up or for oil changes use only high-quality hydraulic oil, type HVLP according to DIN 51524, part 3, or hydraulic oils type HV according to ISO 6743/3. The viscosity index (VI) should be at least 150 (observe information of manufacturer).

Bio-degradable hydraulic oil

The hydraulic system can also be operated with a synthetic ester based biodegradable hydraulic oil.

The biologically quickly degradable hydraulic oil Panolin HLP Synth.46 meets all demands of a mineral oil based hydraulic oil according to DIN 51524.

In hydraulic systems filled with Panolin HLP Synth.46 always use the same oil to top up.

When changing from mineral oil based hydraulic oil to an ester based biologically degradable oil, you should consult the lubrication oil service of the oil manufacturer for details.

 **Caution**

Check the filter more frequently after this change.

Perform regular oil analyses for content of water and mineral oil.

Replace the hydraulic oil filter element every 500 operating hours.

3.3 Table of fuels and lubricants

Assembly	Fuel or lubricant		Quantity
	Summer	Winter	Attention Observe the level marks
Engine - Engine oil	Engine oil API: CF, CF-4, CG-4, CH-4 or CI-4 SAE 10W/30 (-15 °C to +30 °C) SAE 15W/40 (-15 °C to + 40 °C)		approx. 6.5 litres
- Fuel	SAE 30 (+5 °C to +30 °C) Diesel	SAE 10 (-30 °C to -5 °C) Winter diesel fuel (down to -12°C)	approx. 40 litres
- Coolant	Mixture of water and anti-freeze agent		approx. 4 litres
Hydraulic system	Hydraulic oil (ISO), HV46, kinem.viscosity 46 mm ² /s at 40 °C or biodegradable ester based hydraulic oil		approx. 28 litres
Sprinkler system	Water	Anti-freeze mixture water ¹	approx. 220 litres
- Rubber tire sprinkler system	Emulsion		approx.20 l

1 Mix water and anti-freeze agent by following the instructions of the manufacturer.

3.4 Running-in instructions

The following maintenance work must be performed when running in new machines or overhauled engines:

 **Caution**

Up to approx. 250 operating hours check the engine oil level twice every day.

Depending on the load the engine is subjected to, the oil consumption will drop to the normal level after approx. 100 to 250 operating hours.

Maintenance after 50 operating hours

- Change engine oil and filter
- Check the engine for leaks
- Retighten the fastening screws on air filter, exhaust and other attachments.
- Check screw connections on the machine, retighten as necessary.

3.5 Maintenance table

No.	Maintenance work	Comment	every 10 operating hours, daily	every 50 operating hours	every 250 oper. hours	every 500 oper. hours	every 1000 oper. hours	every 2000 oper. hours	every 3000 oper. hours	as required
5.6	Check the engine oil level	Dipstick mark	X							
5.7	Check the fuel level	Instrument cluster	X							
5.8	Check the hydraulic oil level	Dipstick mark	X							
5.9	Check the hydraulic oil filter element	Contamination indicator	X							
5.10	Check the coolant level		X							
5.11	Check the water separator		X							
5.12	Check the water level	Water level gauge	X							
5.13	Check the emulsion level	only AC-machines	X							
5.14	Check the chip spreader and clean the spreading beam		X							
5.15	Check fuel lines and clamps			X						
5.16	Service the chip spreader			X						
5.17	Check, clean, replace the combustion air filter	replace min. 1x per year			X					
5.18	Check the air intake lines				X					
5.19	Clean radiator and hydraulic oil cooler				X					
5.20	Check, tension, replace the V-belt				X					
5.21	Check radiator hoses and hose clamps				X					
5.22	Check, adjust the scrapers				X					
5.23	Change engine oil and oil filter ¹	at least 1x per year see foot note				X				
5.24	Battery service	pole grease				X				
5.25	Drain the fuel tank sludge					X				
5.26	Change the fuel pre-filter					X				
5.27	Change the fuel filter, bleeding the fuel system					X				

No.	Maintenance work	Comment	every 10 operating hours, daily	every 50 operating hours	every 250 oper. hours	every 500 oper. hours	every 1000 oper. hours	every 2000 oper. hours	every 3000 oper. hours	as required
5.28	Check, adjust the valve clearance	Intake and exhaust valve: 0,20 mm on cold engine					X			
5.29	Check the engine mounts						X			
5.30	Change the hydraulic oil ²	at least every 2 years						X		
5.31	Change the hydraulic oil filter**	at least every 2 years						X		
5.32	Change the coolant	at least every 2 years						X		
5.33	Change the fuel lines	at least every 2 years						X		
5.34	Check the injection valves							X		
5.35	Check the fuel injection pump								X	
5.36	Check the tire pressure	only AC-machines								X
5.37	Clean the water sprinkler system									X
5.38	Drain the water sprinkler system, maintenance in case of frost									X
5.39	Fill the provision tank for the windscreen washer system									X
5.40	Tightening torques									X
5.41	Engine conservation									X

1 oil change after 50 and 500 operating hours, then every 500 operating hours

2 Also after repairs in the hydraulic system.

4 Electrics

4.1 Understanding wiring diagrams

Electric circuit diagrams

Electric circuit diagrams are graphic presentations of control logical conditions in the electric system. They do not contain any information on the type of wiring, their purpose is solely the clarification of control logics.

The wiring diagram is indispensable for effective and systematic trouble shooting in the vehicle wiring system. This plan provides the following information:

- Number and type of individual elements in the examined electric circuit, such as plug connectors, fuses, switches, consumers, relays, etc.
- The sequence in which current flows through the individual elements in the electric circuit.
- Connections between the examined electric circuit and other circuits in the vehicle wiring system.
- Pin assignment of plug-and-socket connections.

Structure of a wiring diagram

- Cover sheet, see section "Cover sheet"
- Table of contents, see section "Table of contents"
- Structuring symbol overview, see section "Structuring symbol overview"

i Note

The structuring symbol overview is NOT present in circuit diagrams, which are sorted by systems and local identification!

- Sheets with illustration of function, see section "Sheets with illustration of function"
- List of fuels and lubricants, see "List of fuels and lubricants"
- Terminal strip overview, see section "Terminal strip overview"
- Plug overview, see section "Plug overview"
- Pin overview, see section "Pin overview"

Cover sheet

The cover sheet, see example (Fig. 14), contains general information.

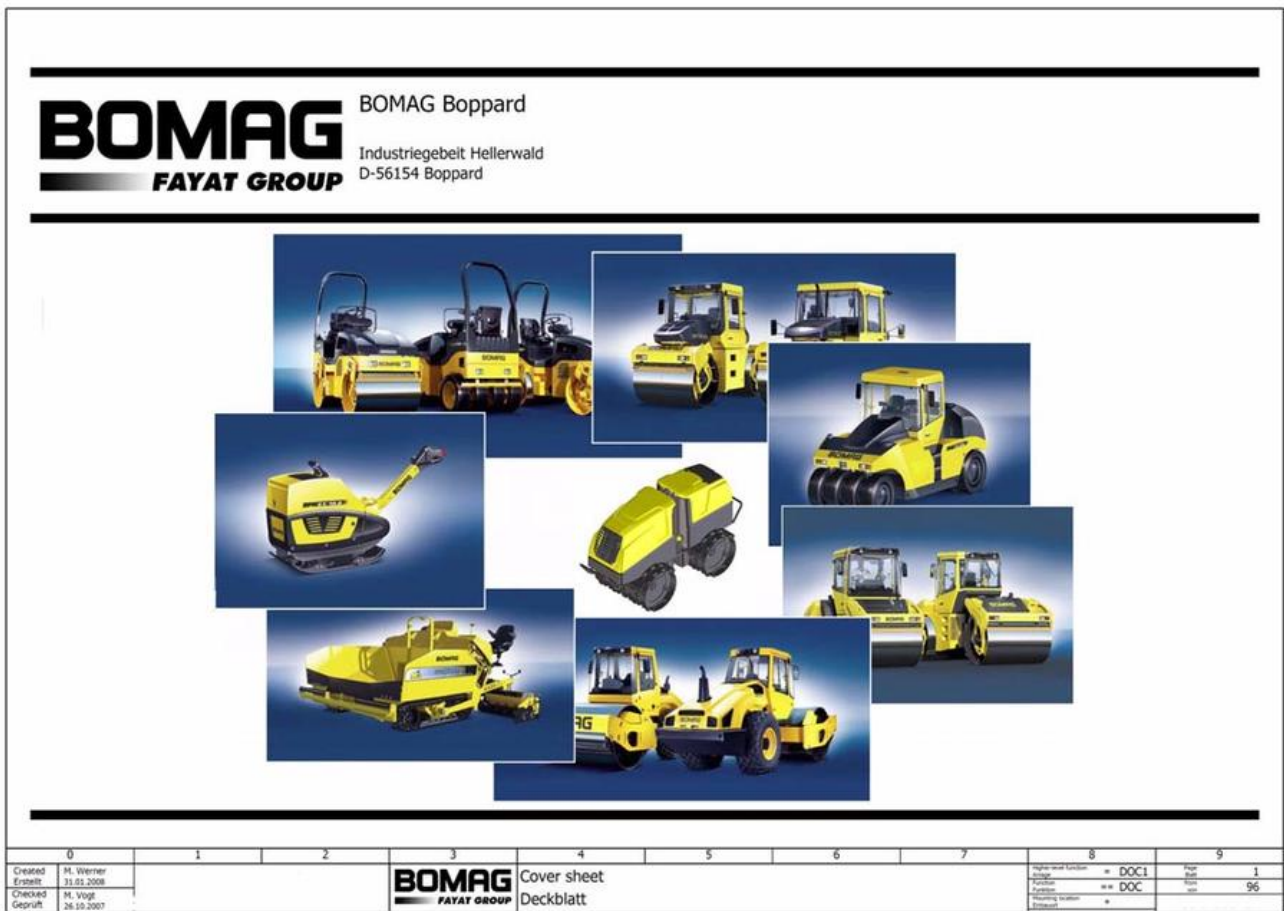


Fig. 14 Example: Cover sheet

Table of contents

The table of contents, see example (Fig. 15), lists the individual functions and identifies the corresponding sheets in the wiring diagram.

Table of contents		Inhaltsverzeichnis	
Page Blatt	Higher-level function Anlage	Function Funktion	Description Beschreibung
1	=DOC1	==DOC	Cover sheet Deckblatt
2	=DOC1	==DOC	Table of contents Inhaltsverzeichnis
3	=DOC1	==DOC	Structure identifier overview Strukturkennzeichenübersicht
4	=MPH	==SUPL	generating supply voltage Erzeugung Versorgung Spannung
5	=MPH	==SUPL	bushing battery box Durchführung Batterie Kasten
6	=MPH	==SUPL	Overview E-Box Übersicht Schaltkasten
7	=MPH	==SUPL	Terminal strip overview Klemmleistenübersicht
8	=MPH	==SUPL	Illustration X1 Darstellung X1
9	=MPH	==SUPL	Illustration X2 Darstellung X2
10	=MPH	==SUPL	Illustration X2 Darstellung X2
11	=MPH	==SUPL	Illustration X3 Darstellung X3
12	=MPH	==SUPL	fuses machine Sicherungen Maschine
13	=MPH	==SUPL	supply controllers Versorgung Steuerungen
14	=MPH	==SUPL	bushings front frame Durchführungen vorne Rahmen
15	=MPH	==SUPL	bushings rear frame and cabin Durchführungen hinten Rahmen und Kabine
16	=MPH	==SUPL	Ignition switch Startschalter
17	=MPH	==SUPL	supply controller module water BLM1 Versorgung Steuerung Modul Wasser BLM1
18	=MPH	==ENGI	DEUTZ engine EMR 3 machine-part DEUTZ Motor EMR 3 Fahrzeugseite
19	=MPH	==ENGI	DEUTZ engine EMR 3 motor-part DEUTZ Motor EMR 3 Motorseite
20	=MPH	==COM	communication CAN1 / CAN2 Kommunikation CAN1 / CAN2
21	=MPH	==COM	communication CAN3 / serial Kommunikation CAN3 / seriell
22	=MPH	==DRIV	security devices Sicherheit Einrichtungen
23	=MPH	==DRIV	actuation drive functions Betätigung Fahren Funktionen
24	=MPH	==DRIV	sensors and valves drive Sensoren und Ventile Fahren
25	=MPH	==STER	articulated steering Schemelgelenk lenken
26	=MPH	==STER	rear axle steering hinten Achse lenken
27	=MPH	==MILL	actuation milling functions Betätigung Fräsen Funktionen
28	=MPH	==MILL	sensors and valves Milling Sensoren und Ventile Fräsen
29	=MPH	==MILL	Sensors and valves / Rotor Hood Sensorik und Ventile / Rotor Haube
30	=MPH	==DATA	signals data collector engine and hydraulic Signale Daten Sammler Motor und hydraulisch
31	=MPH	==DATA	signals gear-box monitoring Signale Getriebe Überwachung
32	=MPH	==COMF	adjustment cabin Einstellung Kabine
33	=MPH	==COMF	fuses cabin Sicherungen Kabine
34	=MPH	==COMF	bushings to cabin Durchführungen bis Kabine
35	=MPH	==COMF	mounting parts cabin Einbau Teile Kabine
36	=MPH	==COMF	Air conditioner and Heating Luft Klimaanlage und Heizung
37	=MPH	==COMF	Rear View Camera, Printer and Mirror adjustment Hinten Ansicht Kamera, Drucker und Spiegel Einstellung
38	=MPH	==COMF	Windscreen Wipers and Washers Scheibenwischer und Wascher
39	=MPH	==ILUM	Working lights Arbeitsbeleuchtung


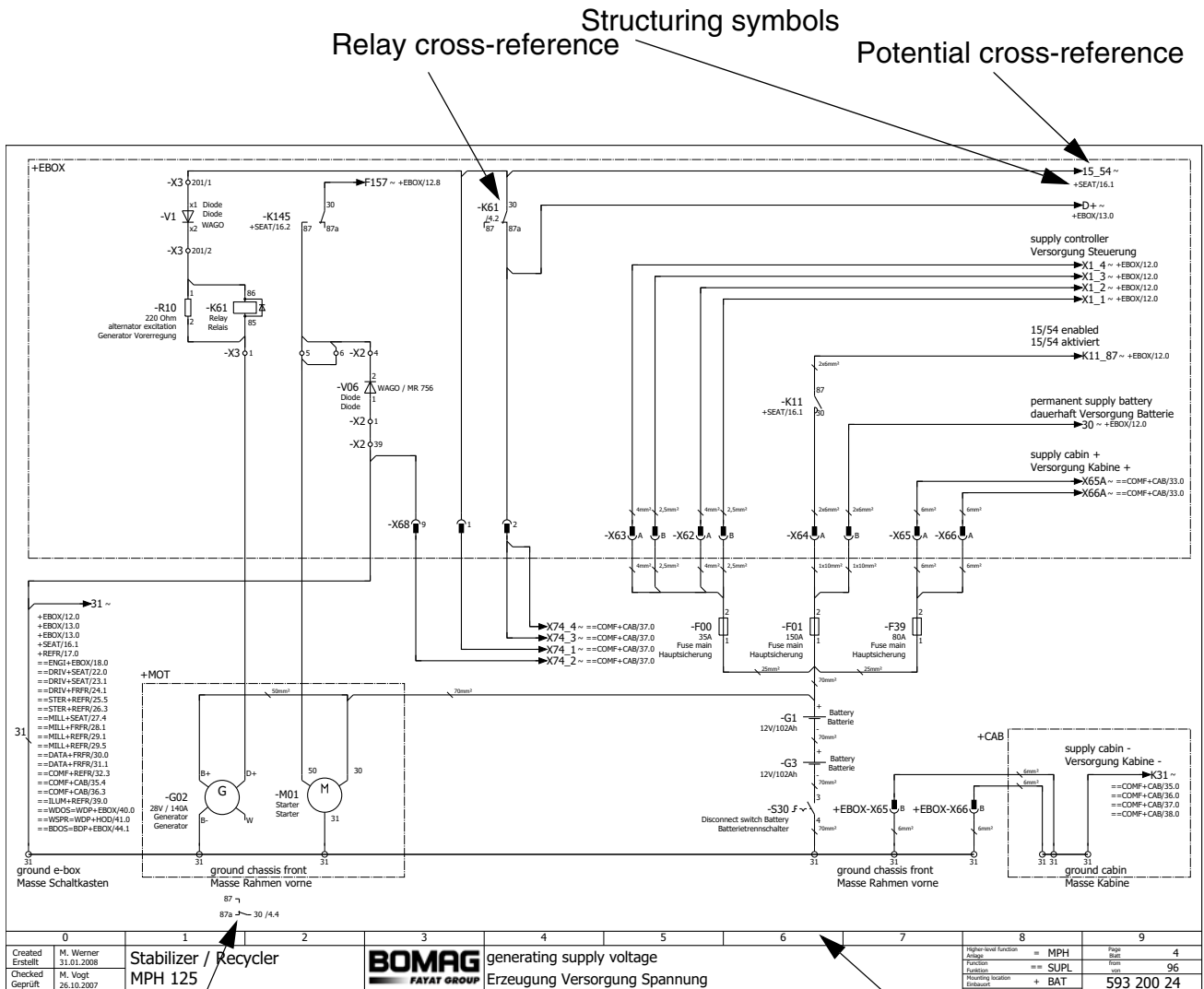
Created Erstellt	M. Werner 31.01.2008	Stabilizer / Recycler	 Table of contents Inhaltsverzeichnis	Higher level function Anlage	== DOC1	Page Seite	2
Checked Geprüft	M. Vogt 26.10.2007	MPH 125		Function Funktion	== DOC	from von	96
				Mounting location Einbaustelle	+		593 200 24

Fig. 15 Example: Table of contents

Sheets with representations of functions

- The main reading direction is sheet by sheet, from top to bottom and from right to left.
- All sheets are successively numbered.
- BOMAG used the resolved type of representation. In this case parts and components with different functions, which belong to the same components (e.g. relay coil and relay contact), can be represented on different sheets. Cross-references, which refer to the sheet and current path, serve as linkage between these partial components (Fig. 16).



Mimic diagram of relay

Current paths

Fig. 16 Example: Sheet with functions

Current paths (Fig. 16)

- Current paths are successively numbered from 0 to 9.

Potential cross references (Fig. 16)

- Potential cross references serve the purpose of tracking signals, which are transmitted from one representation of a function to another. Potential cross-references may additionally have structuring symbols assigned to them.

Example: Potential → 15_54 ~+SEAT/16.1 (on sheet 4, current path 8) continues to the right on sheet 16, current path 1. +SEAT is the structuring symbol.

Relay cross references (Fig. 16)

- Relay cross references serve the tracking of signals, which need to be tracked for components with outgoing contacts. A mimic diagram with information about the contact types of a relay and their positions in the wiring diagram is additionally attached to the bottom of each contactor coil.

Example: The relay cross-reference (-K61/4.2) (on sheet 4, current path 4) indicates that the relay coil on sheet 4 is found in current path 2.

List of component

The list of components, see example (Fig. 17), is the first evaluation list that follows the representation of function. This list contains all components used in the wiring diagram, except terminal strips and plugs.

Device tag list Betriebsmittelliste							
Device tag BMK	Page Blatt	Path Pfad	Mounting location Einbaubort	Higher-level function Anlage	Function text	Funktionstext	characteristics Techn.-Kenngrößen
A12	35	3	+CAB	=MPH	Radio	Radio	
A48	18	0	+EBOX	=MPH	Engine-controller EMR3 (EDC7)	Motorsteuergerät EMR3 (EDC7)	
A66	25	4	+EBOX	=MPH	drive controller	Fahren Steuerung	Pin overview -->
A72	36	0	+CAB	=MPH	Controller air conditioning Heating Unit	Regler Luft Aufbereitung Heizung Einheit	
A79	40	0	+EBOX	=WDP	readings converter	Meßwertumformer	
A80	30	4	+EBOX	=MPH	data collector	Daten Sammler	Pin overview -->
A81	16	5	+SEAT	=MPH	LC-display	LCD-Anzeige	Pin overview -->
A83	46	1	+EBOX	=WDP	dosage controller	Dosierung Steuerung	Pin overview -->
A95	47	1	+BAT	=BDP	Value Transformer	Meßwertumformer	
A98	49	1	+REFR	=BDP	valve module BLM 2	Ventil Modul BLM 2	Pin overview -->
A99	17	2	+REFR	=MPH	controller module water BLM1	Steuerung Modul Wasser BLM1	Pin overview -->
A104	49	1	+REFR	=BDP	valve module BLM 3	Ventil Modul BLM 3	Pin overview -->
A107	37	2	+CAB	=MPH	splitter Box	Verteiler Box	
B03	30	4	+FRFR	=MPH	Vacuum switch	Unterdruckschalter	
B04	30	7	+FRFR	=MPH	pressure switch charge pressure 1	Druckschalter Speisedruck 1	
B05	31	5	+FRFR	=MPH	Pressure differential switch Gear-Box oil	Differenzdruckschalter Getriebeöl	
B11	35	4	+CAB	=MPH	Warning horn	Signalhorn	
B19	30	2	+FRFR	=MPH	Magnetic sensor contamination	magnetischer Schmutzsensord	
B21	30	8	+FRFR	=MPH	Differential pressure switch 1	Differenzdruckschalter 1	
B22	30	9	+FRFR	=MPH	Differential pressure switch 2	Differenzdruckschalter 2	
B23	30	6	+FRFR	=MPH	Level switch hydraulic oil	Füllstandschalter Hydrauliköl	
B25	30	3	+FRFR	=MPH	Differential pressure switch return flow Filter	Differenzdruckschalter Rücklauffilter	
B28	35	5	+CAB	=MPH	Warning horn	Signalhorn	
B29	36	5	+CAB	=MPH	Temperature switch Heating	Temperatur Schalter Heizung	
B33	40	8	+FRFR	=WDP	water lack sensor	Wasser Mangel Sensor	
B42	30	9	+FRFR	=MPH	Differential pressure switch 3	Differenzdruckschalter 3	
B46	26	7	+REFR	=MPH	Sensor 2 steering Axle	Sensor 2 lenken Achse	
B47	26	6	+REFR	=MPH	Sensor 1 steering Axle	Sensor 1 lenken Achse	
B48	28	8	+REFR	=MPH	Sensor Cross-Slope 2	Sensor Querneigung 2	
B49	28	7	+REFR	=MPH	Sensor Cross-Slope 1	Sensor Querneigung 1	
B51	35	3	+CAB	=MPH	Loudspeaker	Lautsprecher	
B52	30	2	+FRFR	=MPH	Proximity switch Lubrication piston	Initiator Schmierkolben	
B52	35	2	+CAB	=MPH	Loudspeaker	Lautsprecher	
B55	30	5	+FRFR	=MPH	Sensor Coolant water level	Sensor Kühlmittel Wasser Füllstand	
B65	25	4	+REFR	=MPH	Sensor steering Buckling-link	Sensor lenken Knickgelenk	
B88	19	8	+MOT	=MPH	EMR engine oil pressure	EMR Motor Öl Druck	
B103	36	4	+CAB	=MPH	Temperature switch conditioner	Temperatur Schalter Klimaanlage	


Created Erstellt	M. Werner 31.01.2008	0	1	2	3	4	5	6	7	8	9	
Checked Geprüft	M. Vogt 26.10.2007	Stabilizer / Recycler MPH 125				Component-Listing Bauteilliste				High-level function Anlage Function Funktion Mounting location Einbaubort	DOC2 DOC +	Page Seite from von 55 96 200 24

Fig. 17 Example: List of components

An electric component is a part, assembly or device in an electrical installation.

- Components are marked with a combination of letters and numbers. The identification with letters follows the standard DIN - EN 61346 T1-T2. A component identification (BMK), e.g.: "S04" always identifies the same component. In this context the term "component" is always considered a function specific assignment and does not represent a parts or article number. This ensures that the component with the designation "S04" always refers to the "Brake Switch", irrespective of whether the abbreviation is used in a wiring diagram for a single drum roller, a tandem roller, a finisher or a milling machine.
- The component identifications are alphabetically sorted in the list of components. Each component has the corresponding cross-references assigned, identifying where it can be found in the wiring diagram, which installation location it is assigned to and to which part of the system it belongs to. Moreover, the functions (function text) and the technical characteristics are also described.

i Note

Component identifications are used in both the electrical and the hydraulic documentation and are identical.

Overview of terminal strips

The overview of terminal strips, see example (Fig. 18), contains all terminal strips used in the circuit diagram. Each terminal strip starts on a new page and can be localized via the cross-reference in the wiring diagram.

X1				Fuses, WAGO Relays Sicherungen, WAGO Schütze		
Mounting location Einbauort				=MPH+EBOX		
Device tag BMK	Page Blatt	Path Pfad	Device tag BMK	Page Blatt	Path Pfad	
X1:1A	12	1	X1:25A	12	3	
X1:1E	12	1	X1:25E	12	3	
X1:2A	12	1	X1:26A	12	4	
X1:2E	12	1	X1:26E	12	4	
X1:3A	12	2	X1:27A	12	4	
X1:3E	12	2	X1:27E	12	4	
X1:4A	12	2	X1:28A	12	5	
X1:4E	12	2	X1:28E	12	5	
X1:5A	12	3	X1:29A	12	5	
X1:5E	12	3	X1:29E	12	5	
X1:6A	12	4	X1:30A	12	6	
X1:6E	12	4	X1:30E	12	6	
X1:7A	12	4	X1:31A	12	6	
X1:7E	12	4	X1:31E	12	6	
X1:8A	12	5	X1:32A	12	7	
X1:8E	12	5	X1:32E	12	7	
X1:9A	12	5	X1:33A	12	8	
X1:9E	12	5	X1:33E	12	8	
X1:10A	12	6	X1:34A	12	8	
X1:10E	12	6	X1:34E	12	8	
X1:11A	12	6				
X1:11E	12	6				
X1:12A	12	7				
X1:12E	12	7				
X1:13A	12	8				
X1:13E	12	8				
X1:14A	12	8				
X1:14E	12	8				
X1:21A	12	1				
X1:21E	12	1				
X1:22A	12	1				
X1:22E	12	1				
X1:23A	12	2				
X1:23E	12	2				
X1:24A	12	2				
X1:24E	12	2				


Created Erstellt	M. Werner 31.01.2008	Stabilizer / Recycler MPH 125		Terminal strip overview X1 Klemmleistenübersicht X1	Higher level function Höhere Funktion	= DOC2 = DOC	Page Blatt	66 96
Checked Geprüft	M. Vogt 26.10.2007				Mounting location Einbauort	+	593 200 24	

Fig. 18 Example: Terminal strip overview X1

Overview of plugs

The overview of plugs, see example (Fig. 19), contains all plugs used in the circuit diagram.

The following information is listed for each plug:

- Contact numbering
- Structuring symbols
- Function text
- Use in wiring diagram.

Plug overview Steckerübersicht			
Designation Bezeichnung	Mounting location Einbaort	Function text Funktionstext	
X0	=MPH+EBOX	connector Drive controller Stecker Antrieb Steuerung	
Contact Kontakt	Page Blatt	Path Pfad	Type Typ
1	25	4	AMP JPT 68-polig
2	22	6	
3	22	4	
4	21	1	
5	21	2	
8	13	8	
9	25	5	
11	32	4	
12	24	6	
14	22	2	
15	22	3	
16	27	6	
17	23	4	
20	28	4	
21	26	3	
22	26	4	
23	25	3	
24	32	3	
25	22	5	
26	20	1	
27	20	0	
28	13	7	
31	24	2	
33	20	1	
34	24	4	
35	24	8	
36	31	4	
37	31	5	
39	27	7	
42	28	3	
43	25	6	
44	25	7	
45	32	5	
46	24	6	
47	24	7	
48	24	8	
49	24	4	
50	23	3	
53	20	0	
54	13	6	
55	13	1	
56	13	1	
57	13	2	

Designation Bezeichnung	Mounting location Einbaort	Function text Funktionstext	
X0	=MPH+EBOX	connector Drive controller Stecker Antrieb Steuerung	
Contact Kontakt	Page Blatt	Path Pfad	Type Typ
58	13	3	
59	13	4	
60	13	5	
61	24	3	
62	24	2	
63	28	2	
64	24	5	
65	13	2	
66	13	3	
67	13	4	
68	13	5	

Designation Bezeichnung	Mounting location Einbaort	Function text Funktionstext	
X00	=BDP+PUM	Connector Temperature Sensor Verbindungssymbol Temperatur Sensor	
Contact Kontakt	Page Blatt	Path Pfad	Type Typ
1	53	4	Deutsch DT 2-polig
2	53	4	

Designation Bezeichnung	Mounting location Einbaort	Function text Funktionstext	
XS1	=MPH+REFR	Socket rear frame Bordsteckdose hinten Rahmen	
Contact Kontakt	Page Blatt	Path Pfad	Type Typ
+/-	12	4	Merit

Designation Bezeichnung	Mounting location Einbaort	Function text Funktionstext	
XS2	=MPH+EBOX	Socket e-box Bordsteckdose Schaltkasten	
Contact Kontakt	Page Blatt	Path Pfad	Type Typ
+/-	12	4	Merit

Designation Bezeichnung	Mounting location Einbaort	Function text Funktionstext	
XD2.1	=MPH+MOT	connector engine controller - vehicle Stecker Motor Steuerung - Fahrzeug	
Contact Kontakt	Page Blatt	Path Pfad	Type Typ
2	18	1	
3	18	1	
5	18	2	
6	18	2	
8	18	1	
9	18	2	
10	18	3	
11	18	3	
14	18	6	
15	18	6	
40	18	5	
52	18	4	
53	18	4	
89	18	5	

0	1	2	3	4	5	6	7	8	9		
Created Erstellt	M. Werner 31.01.2008	Stabilizer / Recycler	BOMAG	Plug overview				Higher-level function Anlage	= DOC2	Page Blatt	71
Checked Geprüft	M. Vogt 26.10.2007	MPH 125	FAYAT GROUP	Steckerübersicht				Revision Änderung	= DOC	Page Blatt	96
								Mounting location Einbaort	+	Page Blatt	593 200 24

Fig. 19 Example: Plug overview X0

Overview of pins

The overview of pins, see example (Fig. 20), informs about the type of inputs and outputs of the electronic controls (E-BOX) used in the machine, as well as their signals and potentials.

A66			drive controller Fahren Steuerung	
Pin Kontakt	Page Blatt	Path Pfad	Description Beschreibung	Signal
X0:1	25	4	AGND	OV (Ref. for PIN 23)
X0:2	22	6	DOUT	Relais Horn
X0:3	22	4	DOUT	Buzzer Malfunction
X0:4	21	1	seriell 1	RxD/1
X0:5	21	2	seriell 1	TxD/1
X0:8	13	8	DIN	Signal D+
X0:9	25	5	AIN	Signal Steering Sensor
X0:11	32	4	DOUT	Lower Cabin
X0:12	24	6	FIN	Rpm Signal wheel front right
X0:14	22	2	DIN	Signal Sensor Arm rest left
X0:15	22	3	DIN	Signal Sensor Arm rest right
X0:16	27	6	DIN	Signal Milling-Tool exchange
X0:17	23	4	DIN	Signal Joystick BTS Brake
X0:20	28	4	PWM	Rotor Pump 2
X0:21	26	3	DOUT	Valve Steering Axle left
X0:22	26	4	DOUT	Valve Steering Axle right
X0:23	25	3	+8,5V	+8,5V Out
X0:24	32	3	DOUT	Lift Cabin
X0:25	22	5	DOUT	Relais engine shut-off
X0:26	20	1	CAN	CAN 1L
X0:27	20	0	CAN	CAN 1H
X0:28	13	7	Potential 15	Main Power Supply
X0:31	24	2	AIN	Signal Pressure travel Pump
X0:33	20	1	CAN	CAN 2L
X0:34	24	4	FIN	Rpm Signal wheel front left
X0:35	24	8	FIN	Rpm Signal Axle
X0:36	31	4	DIN	Signal Pressure Gear-box
X0:37	31	5	DIN	Diff.-Pressure Filter Gear-box
X0:39	27	7	DIN	Signal turn Rotor
X0:42	28	3	PWM	Rotor Pump 1
X0:43	25	6	PWM	Valve Buckling-link left
X0:44	25	7	PWM	Valve Buckling-link right
X0:45	32	5	DOUT	Locking Cabin Position
X0:46	24	6	PWM	Valve Wheel front left
X0:47	24	7	PWM	Valve Wheel front right
X0:48	24	8	PWM	Valve Axle
X0:49	24	4	PWM	Travel Pump forward

0	1	2	3	4	5	6	7	8	9		
Created Erstellt	M. Werner 31.01.2008	Stabilizer / Recycler	BOMAG FAYAT GROUP	Pin overview A66				Higher level function Anlage	== DOC2	Page Blatt	84
Checked Geprüft	M. Vogt 26.10.2007	MPH 125		Pin Übersicht A66					Function Funktion	== DOC	Page Blatt
								Steering location Einbaust.	+		593 200 24

Fig. 20 Example: Overview of pins, control A66

4.2 Designation of components in the wiring diagram

The designation of components in the wiring diagram groups several electrical parts of the machine in one group. The components can be identified by the following table.

Component designation	Meaning
A	Interval switch, indicator relay, modules, electronic component
B	Pressure, pressure differential, temperature switches and sensors, transducers
C	Capacitor
E	Headlights, heater, air conditioning condenser
F	Fuses
G	Battery, generator
H	Control lights, warning buzzer, warning light
K	Relays
M	Starter, pumps, motors
P	Operating hour meter, general gauges
R	Transducers, resistors
S	Switches, momentary contact switches
V	Diode
X	Terminal
Y	Solenoid valves

4.3 Terminal designations in wiring diagram

- For easier connection work almost every connection on a consumer or switch used in a motor vehicle has a terminal designation. In Germany the designation of the individual connection terminals is determined by the standard DIN 72552. The following table shows some examples from this DIN standard.

Terminal designation	Meaning
15	Switch plus (after battery) : Output of ignition switch
15a	Output from dropping resistor to ignition coil and starter
17	Preheating starter switch, preheating
19	Preheating starter switch, starting
30	Battery plus direct
30a	Battery changeover relay 12V / 24V, input from battery 2 plus
31	Battery minus direct or ground
31a	Battery changeover relay 12V / 24V return line to battery 2 minus
31b	Return line to battery minus or ground via switch or relay (switched minus)
31c	Battery changeover relay 12V / 24V return line to battery 1 minus
49	Input flasher relay
49a	Output flasher relay
49b	Flasher relay output 2nd flasher circuit
49c	Flasher relay output 3rd flasher circuit
50	Starter, starter control
50a	Battery changeover relay, output for starter control
53	Wiper motor input (+)
53a	Wiper motor (+) end limit shut down
53b	Wiper shunt winding
56	Head light
56a	Head light, travel light and travel light control
56b	Head lights, dimmed head light
56d	Head lights, flash light
57	Parking light for motor cycles (abroad also for cars and trucks)
57a	Parking light
57L	Parking light left
57R	Parking light right
58	Side lights, tail light, number plate light, dashboard light
58b	Tail light changeover for single axle trailers
58c	Trailer plug for single core wired and trailer fused tail light
58d	Adjustable dashboard light, tail light and side light
58L	Side light, left
58R	Side light, right
61	Generator control
75	Radio, cigarette lighter
76	Loudspeaker
87	Relay contact on breaker and two-way contact, input

Terminal designation	Meaning
87a	Relay contact on breaker and two-way contact, output 1 (breaker side)
87b	Relay contact on breaker and two-way contact, output 2
87c	Relay contact on breaker and two-way contact, output 3
87z	Relay contact on breaker and two-way contact, input 1
87y	Relay contact on breaker and two-way contact, input 2
87x	Relay contact on breaker and two-way contact, input 3
88	Relay contact for maker
88a	Relay contact on maker and two-way contact, (maker side) output 1
88b	Relay contact on maker and two-way contact, (maker side) output 2
88c	Relay contact on maker and two-way contact, (maker side) output 3
88z	Relay contact on maker, input 1
88y	Relay contact on maker, input 2
88x	Relay contact on maker, input 3
B+	Battery positive
B-	Battery minus
D+	Dynamo Plus
D-	Dynamo Minus
DF	Dynamo field (generator excitation current)
DF1	Dynamo field 1 (generator excitation current)
DF2	Dynamo field 2 (generator excitation current)

4.4 Circuit symbols in the circuit diagram

Circuit symbols

Circuit symbols are standardized representations for electrical appliances. They serve the purpose of a simplified representation of complete systems, from which, however, the function can be clearly identified. This standardization is in compliance with the globally valid regulations of the IEC (International Electrical Commission). The standardization serves the purpose of global understanding and fault free connection of appliances, especially in automobile repairs. Since the wiring diagram is intended to show only the most essential aspects, the circuit symbol only shows as much of the function, as is needed for easy recognition and for the avoidance of mistakes.

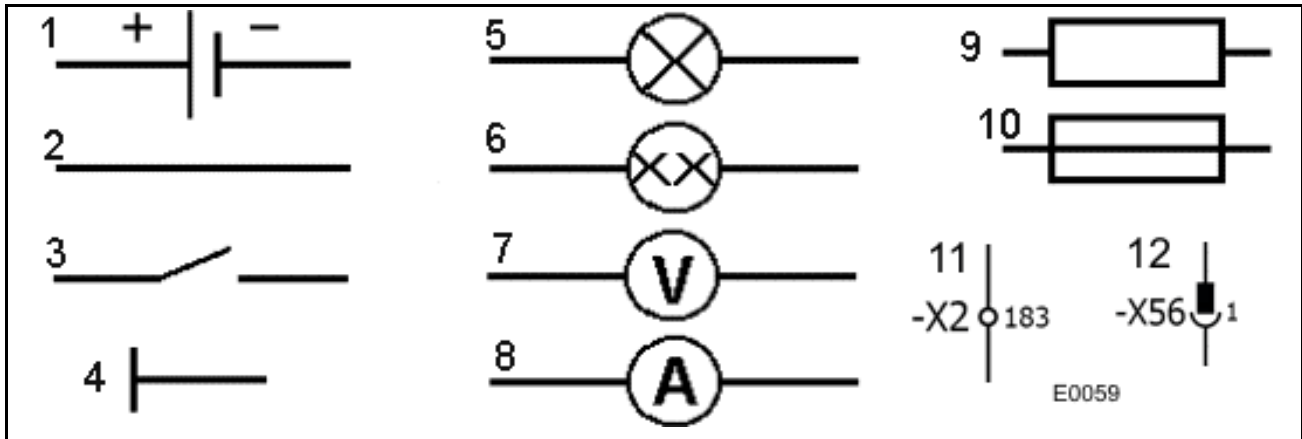


Fig. 21 Example: Circuit symbol

- 1 Current source
- 2 Conductor
- 3 Switch
- 4 Ground
- 5 Filament lamp
- 6 Filament lamp with two luminous elements
- 7 Voltmeter
- 8 Amperemeter
- 9 Resistance
- 10 Fuse
- 11 Terminal strip
- 12 Plug

Different symbols are used to simplify the differentiation of terminal strips 11 (Fig. 21) and plugs (12) in a wiring diagram.

i Note

Plugs are mainly used to connect two wiring looms or to connect a wiring loom with a component with cable connection and mating plug.

Representation of electric devices

Electronic devices and components are increasingly used in the construction equipment industry. Controls with software, control elements (e.g. joysticks and man/machine interface (e.g. screens, LC Displays) are frequently used to represent and control machine functions. The internal construction of such components is in most cases protected or just too complex to be illustrated in the wiring diagram within the context of the actual machine function. There are two different ways to simplify the representation of such devices in the diagram.

Black-Box representation(Fig. 22)

The Black-Box representation shows the device as a Box with the connections required for the machine function. Connections which are not needed do not need to be represented.

The Black-Box representation is mainly used when no differentiated information (e.g. signals on pins) is available.

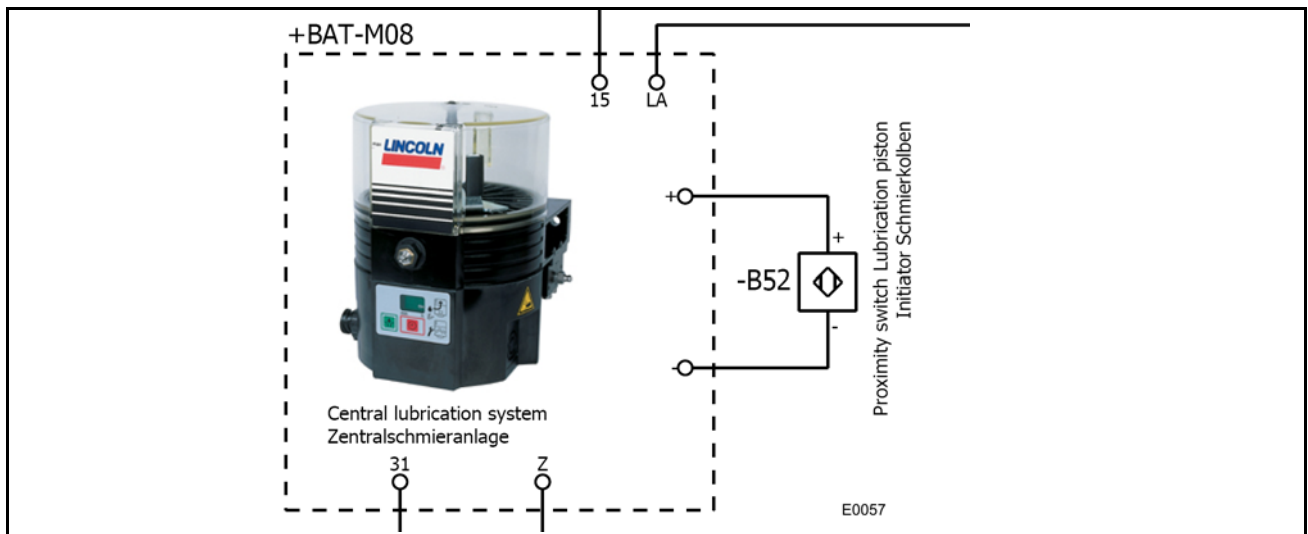


Fig. 22 Example: Central lubrication system

Identification of externally supplied documentation (Fig. 23)

In industrial technology of today it is quite common to integrate externally supplied electric sub-systems into the projecting of machines. These systems may be composed of various components and wirings. For easier differentiation of BOMAG designation and manufacturer identification the latter appears under the BOMAG designation with a text frame and a reduced character height.

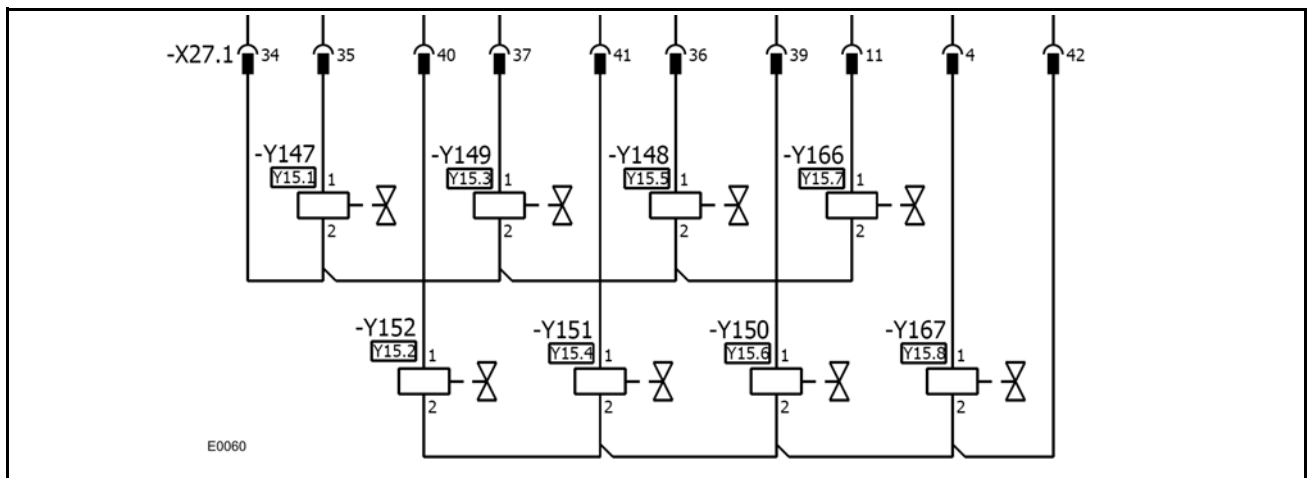


Fig. 23 Example: Identification of externally supplied documentation

PLC representation(Fig. 24)

The PLC-Box representation of connecting pins uses a table with associated connecting plugs, which are used in connection with the machine functions. The table symbols can be arranged in a line, if necessary. Connections

which are not needed do not need to be represented. The PLC-Box representation enables the representation of further reaching functional descriptions to the individual component connections.

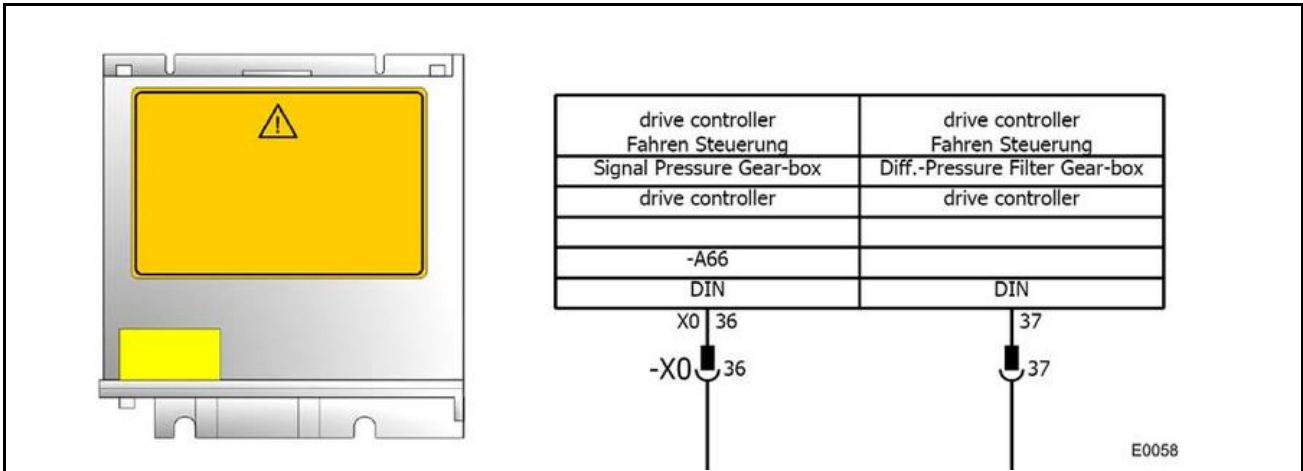


Fig. 24 PLC representation

The PLC-Box representation is mainly used for controls with BOMAG software, or for electronic devices which were specified accordingly, and where information on the assignment of signals is available.

Identification of similar, adjacent switching symbols

In wiring diagrams you will frequently find the situation that symbols of the same type appear in a line or are arranged just next to each other. In such cases it is common practice to reduce the identification on the subsequent symbol to the criteria, which are different to the previous symbol to the left.

Example: -X0 36 and -X0 37 (Fig. 24)

In the example illustrated here the component identification "-X0" for the left plug symbol is also valid for the right plug symbol.

4.5 Identification of switch blocks in the wiring diagram

Switches of modular design

- For normally open contacts the contact symbols "3/4" are used.
- For normally closed contacts the contact symbols "1/2" are used.

In combination with the contact block numbering described above each individual connection is clearly defined.

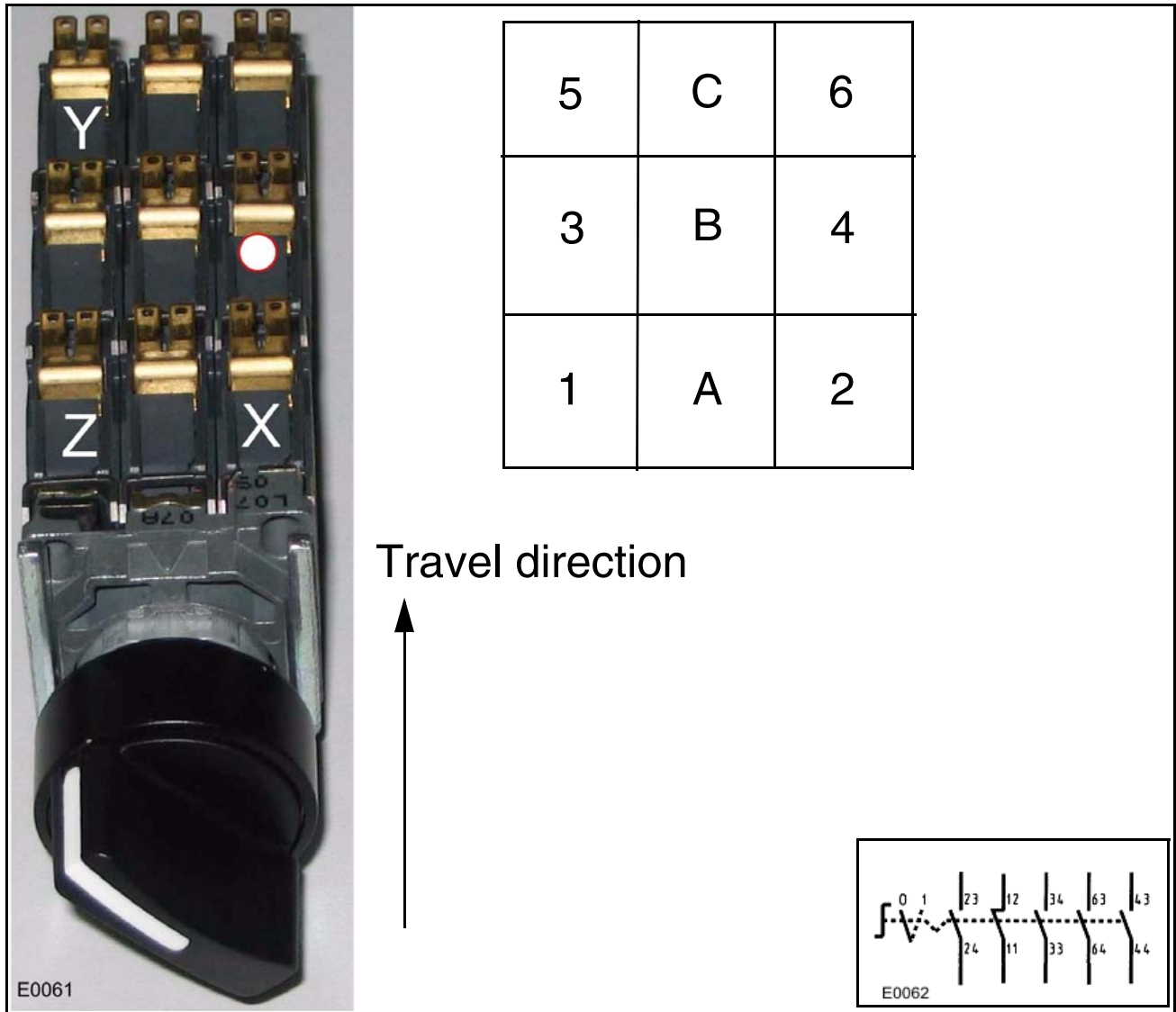


Fig. 25

Example:

The contact block marked with the "circle" is referred to as "43"/ "44" if it is a normally open contact and "41" / "42" if it is a normally closed contact.

The contact block marked with "X" is referred to as "23"/ "24" if it is a normally open contact and "21" / "22" if it is a normally closed contact.

The contact block marked with "Z" is referred to as "13"/ "14" if it is a normally open contact and "11" / "12" if it is a normally closed contact.

The contact block marked with "Y" is referred to as "53"/ "54" if it is a normally open contact and "51" / "52" if it is a normally closed contact.

4.6 Battery ground and analog ground

GND, battery ground

The term "ground" (abbreviated GND) describes a conductive body which is normally defined with the potential of "Zero" Volt and represents the reference potential for operating voltages.

The positive pole of the supply voltage (symbol +) and all other electric voltages and electrical signals in an electrical circuitry refer to the ground potential.

On motor vehicles and also on motorbikes and bicycles the ground potential is represented by the chassis or the frame. As a conductive part, which covers the entire vehicle, it also serves a return conductor for the vehicle wiring system - the consumers only need to be wired up.

Terminal designation for GND = terminale 31

AGND, analog ground

Apart from the "normal" battery ground there is also the analog ground, which is solely reserved for sensors.

4.7 Current and voltage

General

If one wants to describe electric current, this can most simply be accomplished by means of a comparison:

One simply compares electric current with water.

Voltage

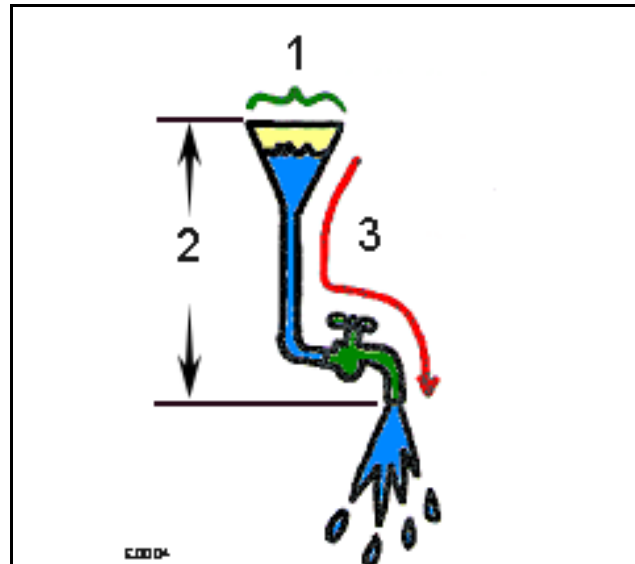


Fig. 1

- 1 (Fig. 1) Charge
- 2 Voltage
- 3 Current

The equalization attempt between different electric charges is referred to as electric voltage.

Voltage sources have two poles of different charge. On the one side we have the plus pole with a lack of electrons, on the opposite side the minus pole with a surplus of electrons. This electric "pressure" is known as electric voltage.

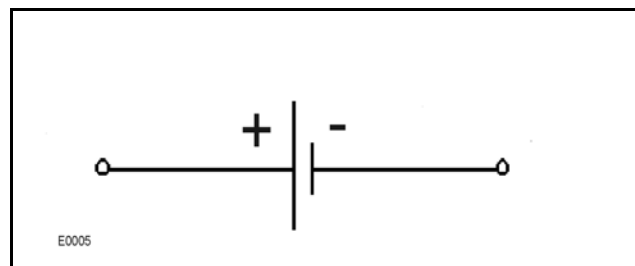


Fig. 2

If there is a connection between these two poles a discharge will take place, resulting in the flow of an electric current.

Plus pole= lack of electrons

Minus pole = excess of electrons

The following statements concerning electric voltage can be made

- electric voltage is the pressure or force applied to free electrons.
- the electric voltage is the cause of electric current
- electric voltage is a result of the equalization attempt of electric charges.

Voltage is measured with a Voltmeter.

Unit, Volt

The electric voltage (U) is measured in Volt (V).

Current

Electric current generally describes the directed movement of charge carriers.

- The charge carriers may either be electrons or ions.
- Electric current can only flow if there is a sufficient amount of free moving charge carriers.
- The higher the number of electrons flowing through a conductor per second, the higher the amperage.

Current is measured with an ammeter.

Unit, Ampere

The electric amperage (I) is measured in Ampere (A).

The technical flow direction is specified from PLUS to MINUS.

i Note

Current actually flows from minus to plus, because the current flow is made up of negatively charged electrons.

But since this was only discovered after the poles of a current source had already been designated, the assumption that current flows from plus to minus was maintained for historic reasons.

Circuit

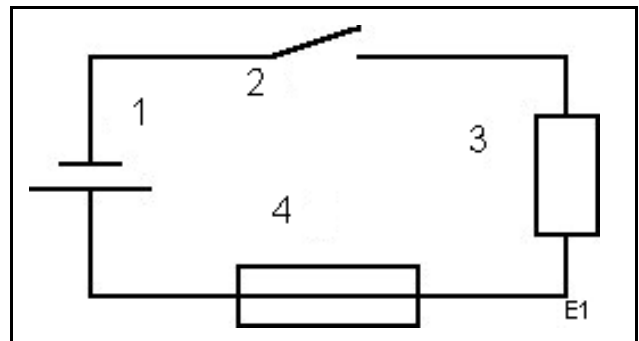


Fig. 3 Circuit

A simple circuit consists of a current source 1 (Fig. 3), a consumer (3) and the connecting wiring.

When the circuit is closed, current can flow.

The circuit can be interrupted or closed with a switch (2).

The system is protected by a fuse (4).

Types of current

Direct current (D.C.)

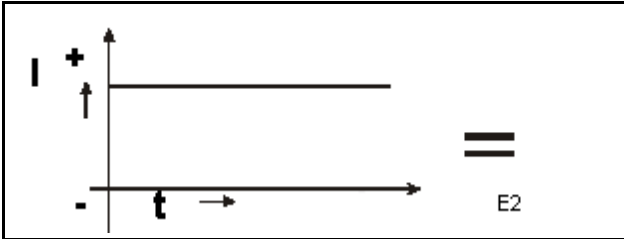


Fig. 1 Direct current (D.C.)

Direct current flows with steady voltage and amperage from the plus to the minus pole.

Pure D.C.-voltages are only delivered by accumulators or batteries.

The voltage in the vehicle wiring system is no pure D.C.-voltage. Even without the generator running, but the consumers switched on, the voltage is not constant, but drops gradually according to the battery charge condition.

The internal resistance of the battery also causes permanent changes in the vehicle voltage, as soon as consumers are switched on or off.

Alternating current (A.C.)

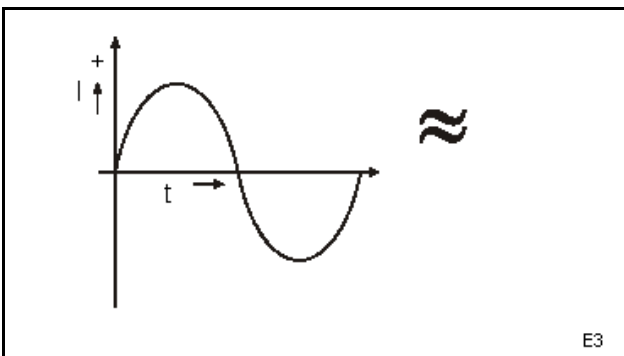


Fig. 2 Alternating current (A.C.)

Alternating current not only changes its direction, but also its amperage.

4.8 Resistance

Resistance and voltage drop

While current flows through a conductor the current flow is more or less inhibited by the conductor, this inhibition is referred to as Resistance.

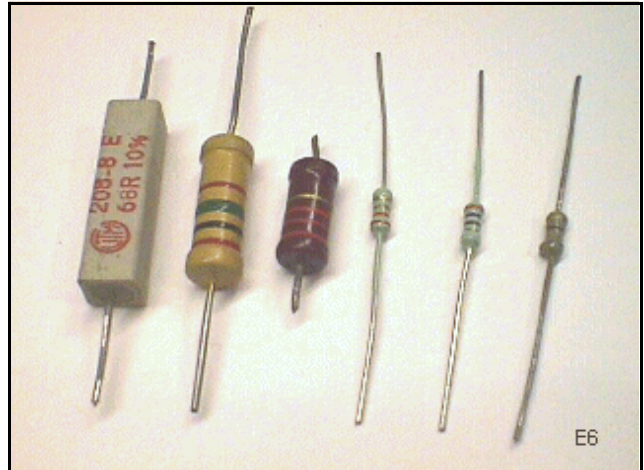


Fig. 1 Various size resistors

Each conductor has its specific resistance, which is characteristic for the corresponding material. A good conductor has a low resistance, a poor conductor has a high resistance.

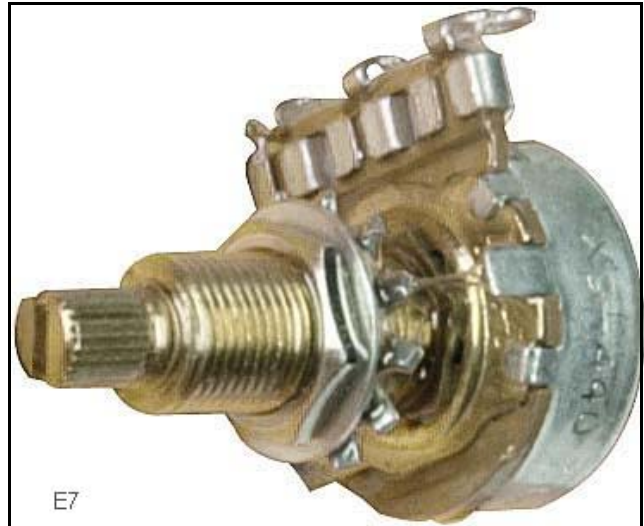


Fig. 2 Potentiometer, infinitely adjustable resistor

The resistance can only be measured with a Multimeter.

Symbol, R

Unit, Ohm Ω

The electric resistance (R) is measured in Ohm Ω

Rule of thumb:

- The thicker the cable cross-section, the lower the voltage loss.
- The shorter the cable, the better the current.

- The cleaner the contacts, the better the current.
- The quality of the ground cable is of the same importance as the supply line.

Unnecessary resistances

Unnecessary resistances are frequently caused by mechanical connections, even clean ones, but mainly soiled and oxidizes terminals, too thin cables, material with poor conductivity or bent open cable lugs.

Bad



Fig. 1 Screw-type terminals

Copper wires are squashed and thus become faulty.

Better



Fig. 2 Spring clamps

Connecting clamps for flexible conductors

BOMAG No. 057 565 72

Ampacity up to 20 Amp.

Cable cross-section 0.08 to 2.5 qmm



Fig. 3

In many cases it is better to replace the contact. Soiled or oxidized contacts should be cleaned with Ballistol (Fig. 4) and subsequently wetted with copper paste.

Copper paste is a heat resistant grease, which has been mixed with copper powder. The paste protects electric contacts against oxidation. Copper paste keeps water away.



Fig. 4 Balistol oil

Sometimes the flanks of flat plugs bend open. If these are closed again with the help of pliers the flanks will be excessively strained at the bend and will definitely break sooner or later. It is better to place a small nail under the bottom of the cable lug before bending.

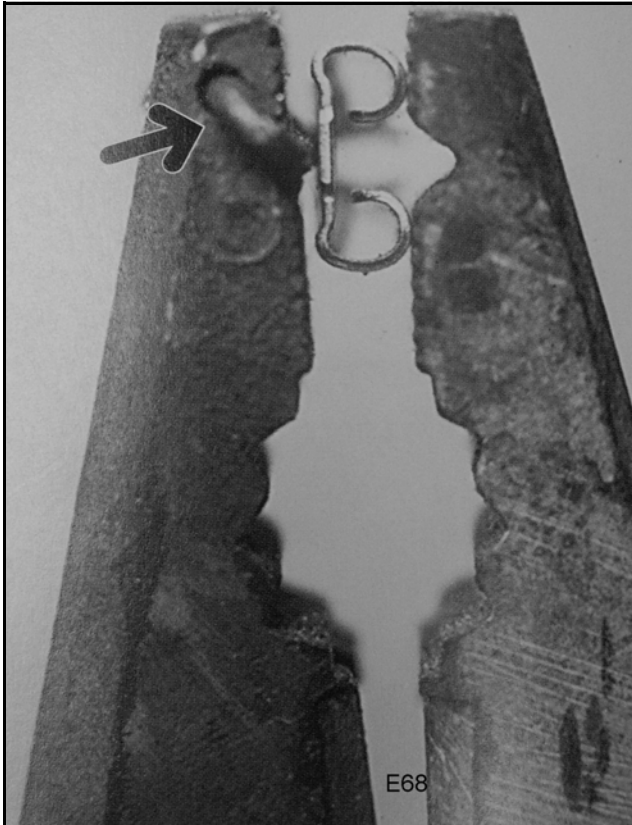


Fig. 5

Hint for practice:

A tool you cannot buy. The pliers were converted, the nail is permanently present.

4.9 Series / parallel connection

Series connection

In a series circuit the resistors (consumers) are lined up one after the other and the same current (I) passes through each of the consumers. However, series connection of consumers is not suitable in practice, as each resistance causes a voltage drop. In the vehicle wiring system all consumers are designed for the same vehicle voltage (e.g. 12 Volt).

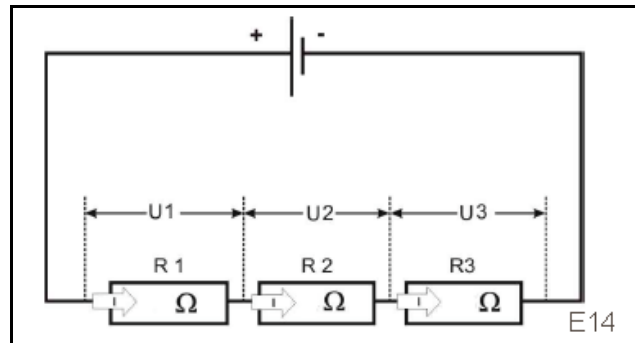


Fig. 1 Series connection

Current

In series connection the current is identical at every point.

$$I_{\text{total}} = I_1 = I_2 = I_3$$

Voltage

The sum of all partial voltages is identical with the total voltage.

$$U_{\text{total}} = U_1 + U_2 + U_3$$

Resistance

The sum of all partial resistances is identical with the total resistance.

$$R_{\text{total}} = R_1 + R_2 + R_3$$

Series connection of batteries

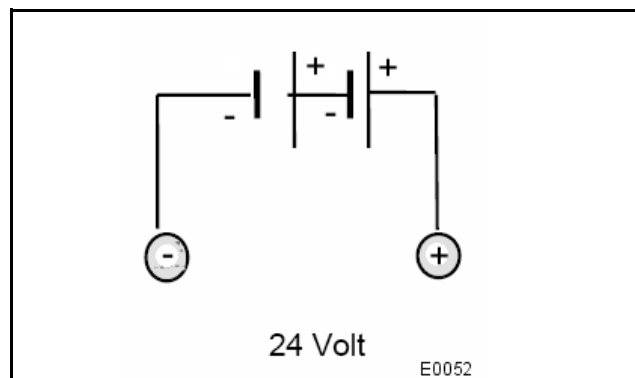


Fig. 2

In order to achieve a vehicle voltage of 24 V two batteries of the same type and capacity must be connected in series mode.

- In series connection the plus pole of the first battery must be connected with the minus pole of the second battery.
- The sum of all individual voltages is applied to the free poles.
- The total capacity (Ah) is identical with the capacity of the individual battery.

Parallel connection

In parallel connection all resistances (consumers) are connected between feed and return line.

- All resistances (consumers) are supplied with the same voltage.
- Each of the resistances (consumers) draws as much current as required.

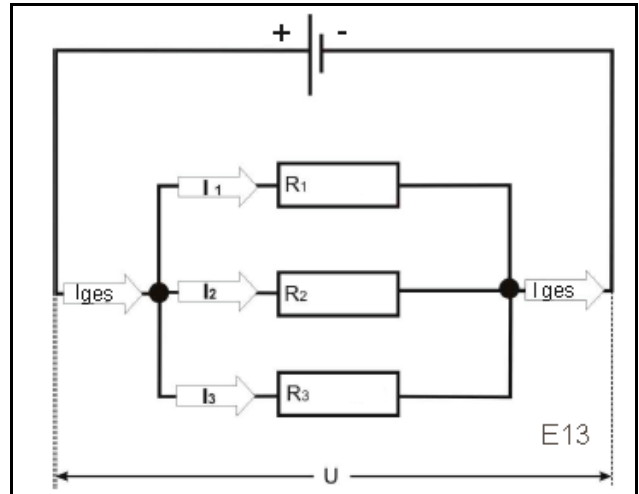


Fig. 3 Parallel connection

Current

The total current is the sum of all currents.

$$I_{total} = I_1 + I_2 + I_3$$

Voltage

The voltage values are identical at every resistance (consumer).

$$U_{total} = U_1 = U_2 = U_3$$

Resistance

The total resistance is less than the lowest individual resistance.

Parallel connection of batteries

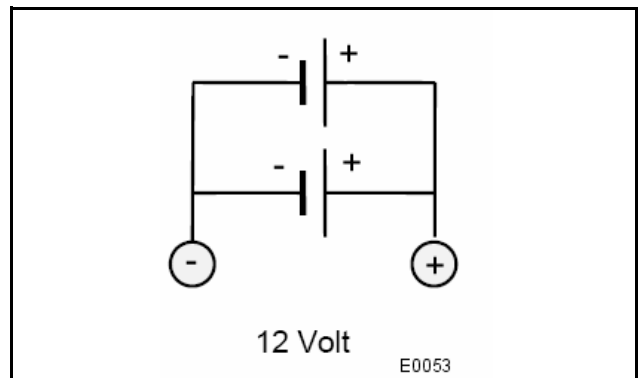


Fig. 4

By connecting 2 batteries of same type and capacity in parallel mode the capacity can be doubled, because the individual capacities add up to the total capacity.

- In parallel connection the plus pole of the first battery is connected with the plus pole of the second battery and the minus pole of the first battery with the minus pole of the second battery.
- Plus and minus poles have the voltage of the single battery applied.
- The total capacity (Ah) is identical with the sum of all battery capacities.

The disadvantage of a parallel connection becomes apparent, by equalizing currents flowing between parallel batteries, if the batteries have different states of charging.

4.10 Ohm's law

In a closed electric circuit voltage, current and resistance must always be considered in close relation. This relation is represented by Ohm's Law.

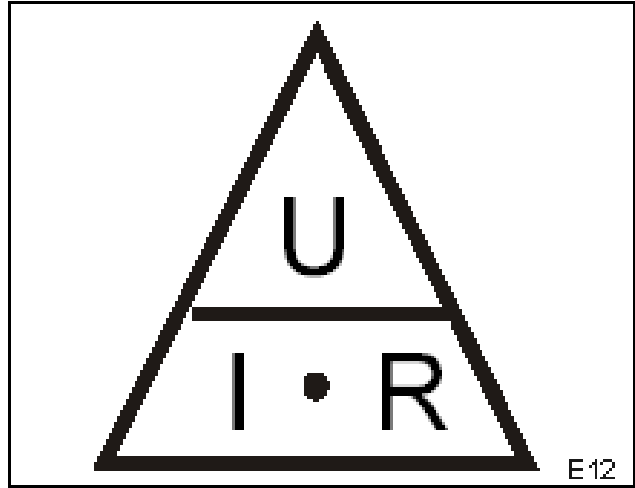


Fig. 1

According to this law a voltage of 1V is required to let 1A (ampere) flow through a conductor with a resistance of 1 (Ohm Ω).

Advice

By means of this triangle the formula can be easily rearranged, the value you are looking for must just be blanked off with a finger.

Voltage $U = I$ multiplied with R

Resistance $R = U$ divided by I

Amperage $I = U$ divided by R

U = Voltage in Volt

I = Current in Ampere

R = Resistance in OHM Ω

4.11 Electrical energy

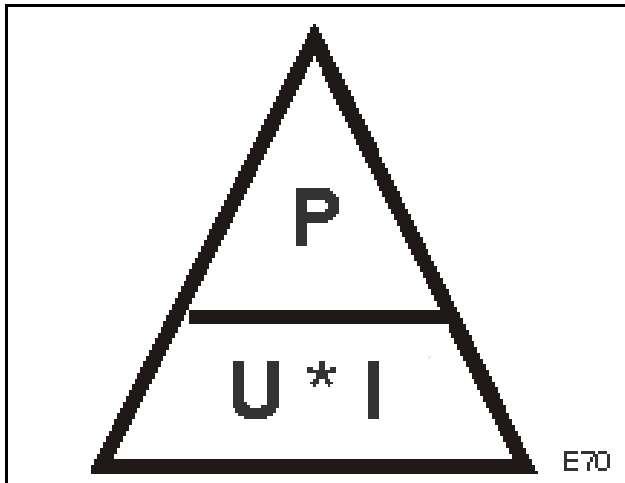


Fig. 1

In a closed electric circuit current and voltage generate energy.

If a current of 1 Ampere flows at a voltage of 1 Volt, energy of 1 Watt is produced.

Advice

By means of this triangle the formula can be easily rearranged, the value you are looking for must just be blanked off with a finger.

Energy $P = I$ multiplied with U

Amperage $I = P$ divided by U

Voltage $U = P$ divided by I

U = Voltage in Volt

I = Current in Ampere

P = Power in Watt

4.12 Formula diagram

Description:

- Select the desired value from the inner circle.
- Determine the formula variables in the quarter circle
- Calculate

Example:

$P = 150$ Watt

$U = 24$ Volt

Sought for = Current in Ampere

$I = P : U = 150 \text{ W} : 24 \text{ Volt} = 6.25$ Ampere

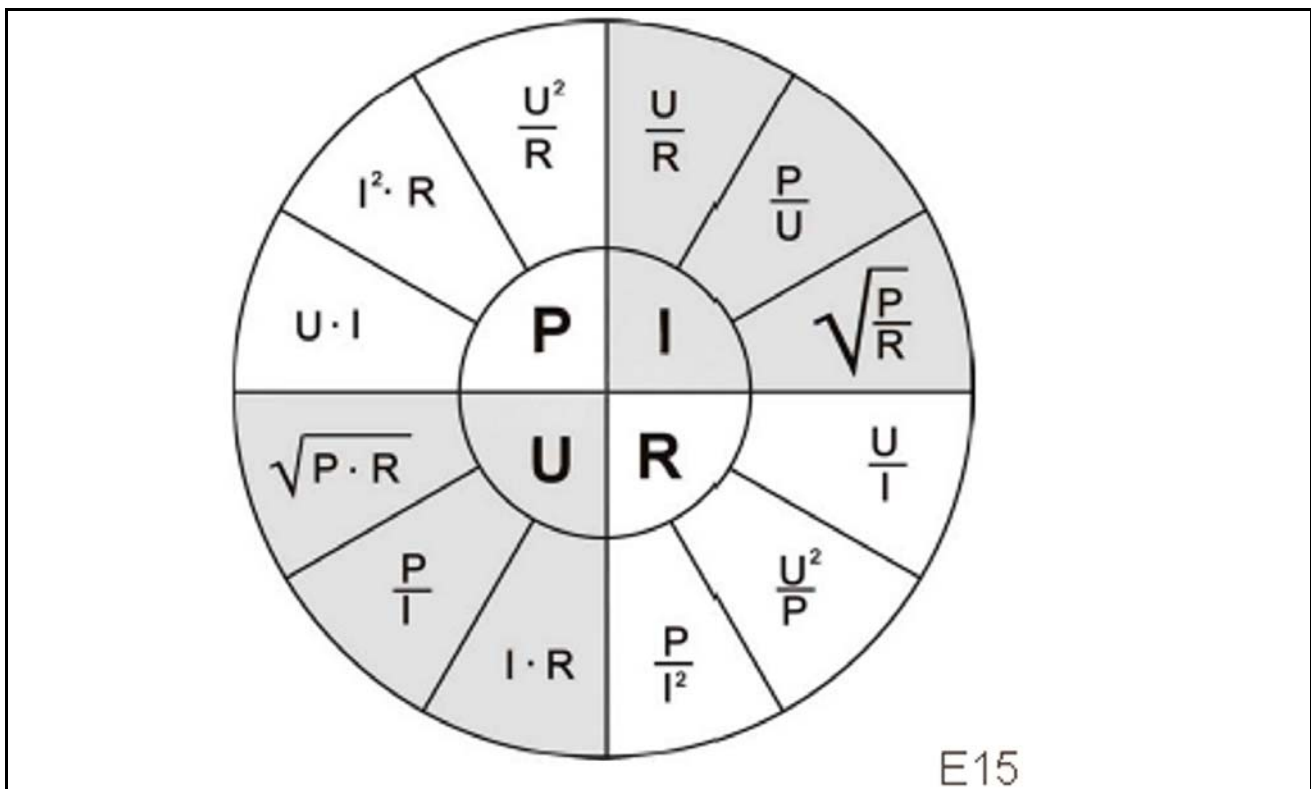


Fig. 1 Formula diagram

Resistance, R Ohm Ω

Voltage, U Volt

Current, I Ampere

Power, P Watt

4.13 Metrology

Test lamps

Test lamp



Fig. 1 Test lamp

⚠ Caution

This type of tester must not be used for testing on electronic components. The high power consumption of the test lamp may destroy electronic components in the control units.

Diode test lamp

This instrument is used for simple voltage measurements. The test lamp consists of two test points. The negative measuring cable is connected to ground and the positive measuring cable to the corresponding measuring location.



Fig. 2 Diode test lamp

If voltage is present, the corresponding light emitting diode will light up.

Multimeter

This tester is a multimeter and can be used to measure e.g. current, voltage and resistance. Depending on the design it may also be suitable for transistor and frequency.

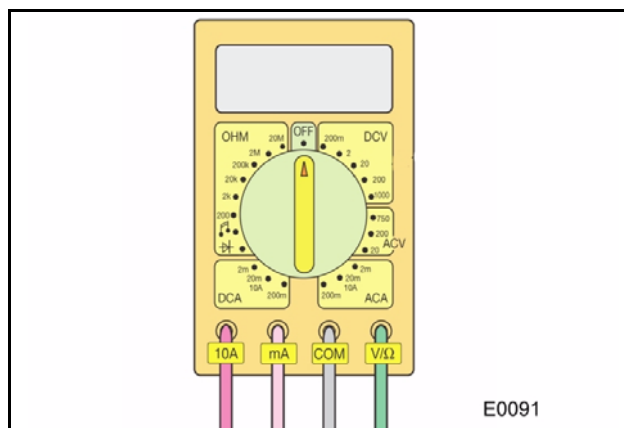


Fig. 1 Multimeter

In order to avoid damage:

- the range selector switch must be correctly set for the corresponding measurement.
- the test cable must be plugged into the correct socket.
- the voltage type (AC/DC) must be set.
- In case of direct voltage the correct polarity must be assured.
- the measuring range should be chosen higher at the beginning of the test.
- In order to avoid any influence on the circuitry to be measured, the internal resistance of the voltage tester should be as high as possible.

Resistance and continuity measurement with multimeter

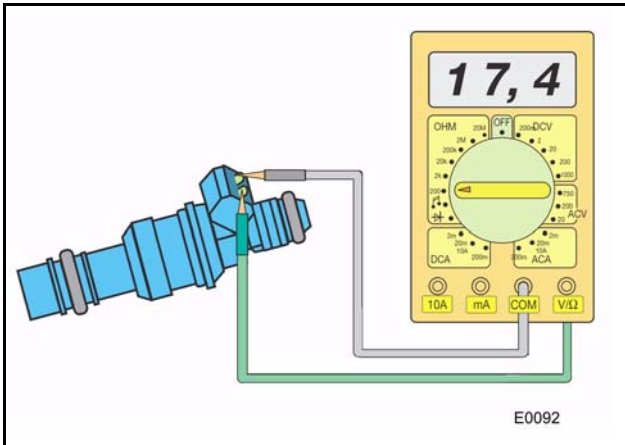


Fig. 2

The continuity tester of the multimeter can be used to measure whether there is a connection between 2 measuring points.

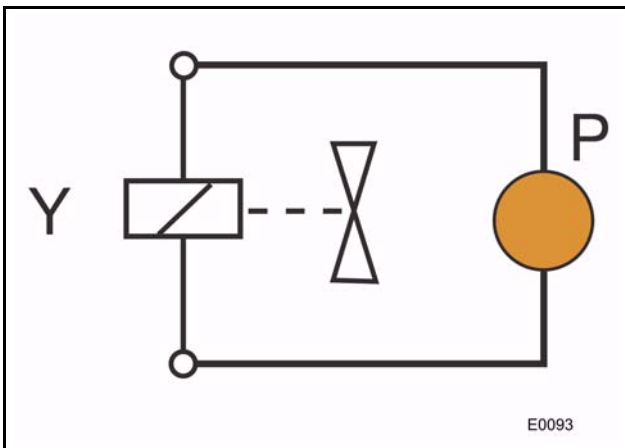


Fig. 3

The following information should be observed when measuring resistance and continuity:

- The component to be measured must not be connected to the power supply during the measurement.
- At least one side of the component to be measured must be disconnected from the circuitry, as otherwise the measuring result may be influenced by parallel components.
- Polarity is of no significance.

Voltage and voltage drop measurement with multimeter

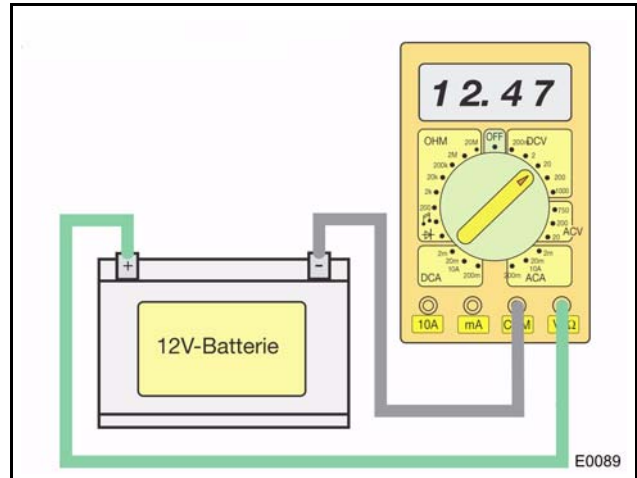


Fig. 4 Measuring voltage

- Measurement at the voltage source measures the currently available Voltage.
- The meter is always connected parallel to consumer, component or power source.

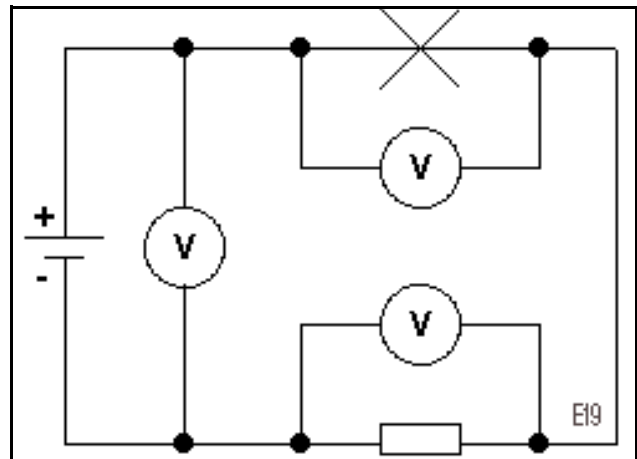


Fig. 5 Voltage measurement

- A measurement at the consumer measures the voltage drop at this component.

Current measurement with the multimeter

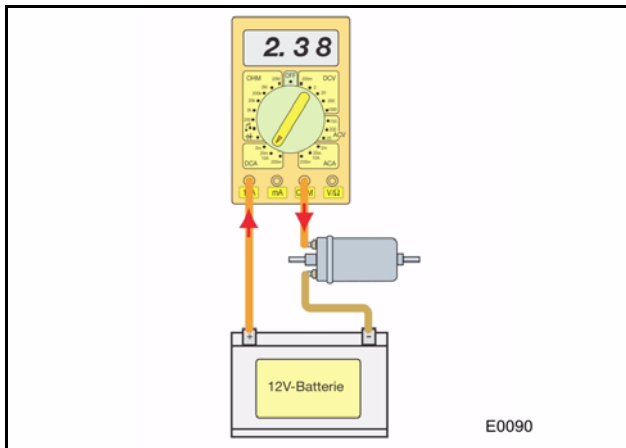


Fig. 6 Measuring current

- The meter is connected in series with the consumer.
- During the measurement the current must be able to flow through the meter, i.e. the electric circuit must be opened.

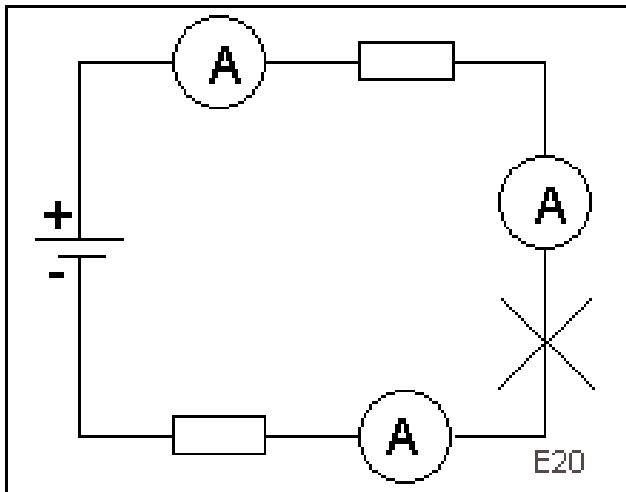


Fig. 7 Current measurement

Advice

If the electric circuit is difficult to access and the internal resistance of the consumer is known, the voltage may also be measured at the consumer.

The current value can then be calculated with the help of Ohm's law.

Clip-on measuring instrument

The clip-on measuring instrument can be used to measure current, voltage and resistance.



Fig. 1 Clip-on measuring instrument

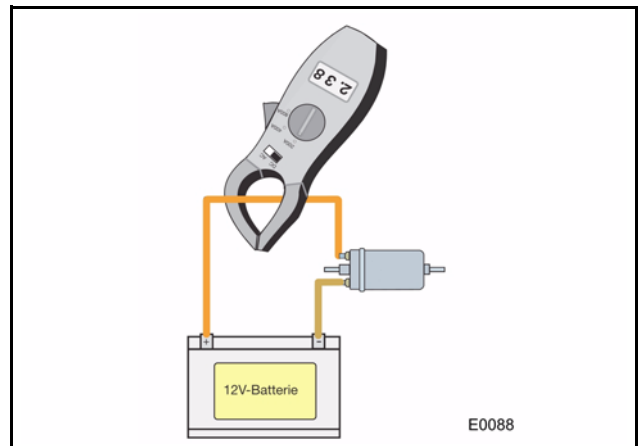


Fig. 2

- For measuring current the individual conductor must be fully enclosed by the measuring tongs, the actual measurement takes place without contact.

Magnet tester



Fig. 1 Magnet tester

The magnet tester is used to test solenoid valves and magnetic coils.

The test lamp responds to the magnetic fields of A.C.-voltage, D.C.-voltage and permanent magnets.

- The component to be tested does not need to be removed.
- The magnetic coil can also be tested under a protective cap.

Power measurement

The electric power of a module within a circuit can be indirectly determined (calculated) by separate measuring of current and voltage.

However, there are also pure power meters with 4 connections available. The power meter has a electrodynamic measuring mechanism. The current circuit must be opened for measuring. Take care when performing power measurements: Voltage or current path may already be overloaded during the measurement, even though the end stop in the meter has not yet been reached.

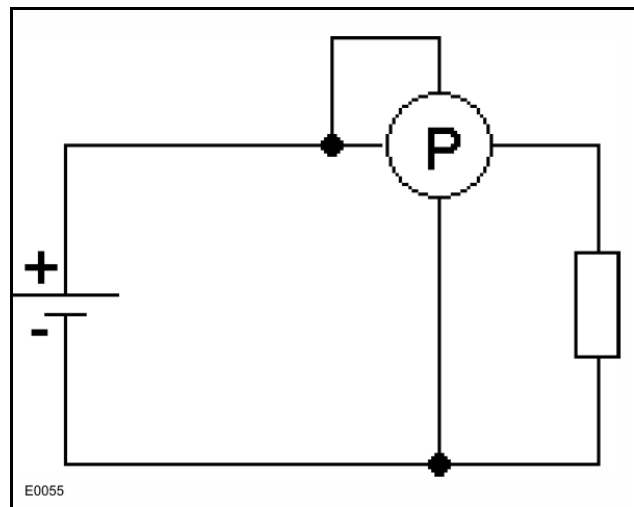


Fig. 2

4.14 Diodes, relays, fuses

Diodes

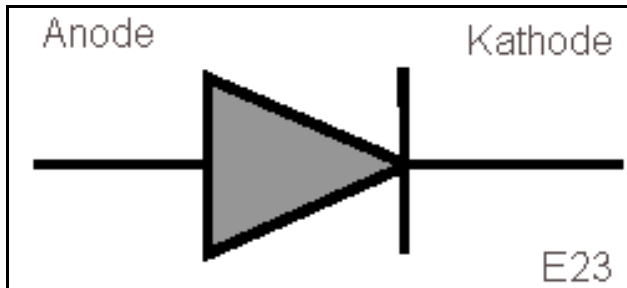


Fig. 1

A diode consists of two different semi-conductors, which are connected by a separating layer. The max. conducting state current must not be exceeded.

Plus-voltage on diode:

- At 0.6 – 0.7 Volt (silicium diode) the diode becomes conductive.

Negative voltage on diode:

- The diode does not allow current to pass through.



Fig. 2 Marking of the cathode

Diodes are used:

- For rectifying A.C. voltage.
- For absorbing voltage peaks (free-wheeling diode).
- For construction of logical circuits.

Diode logics and free-wheeling diode

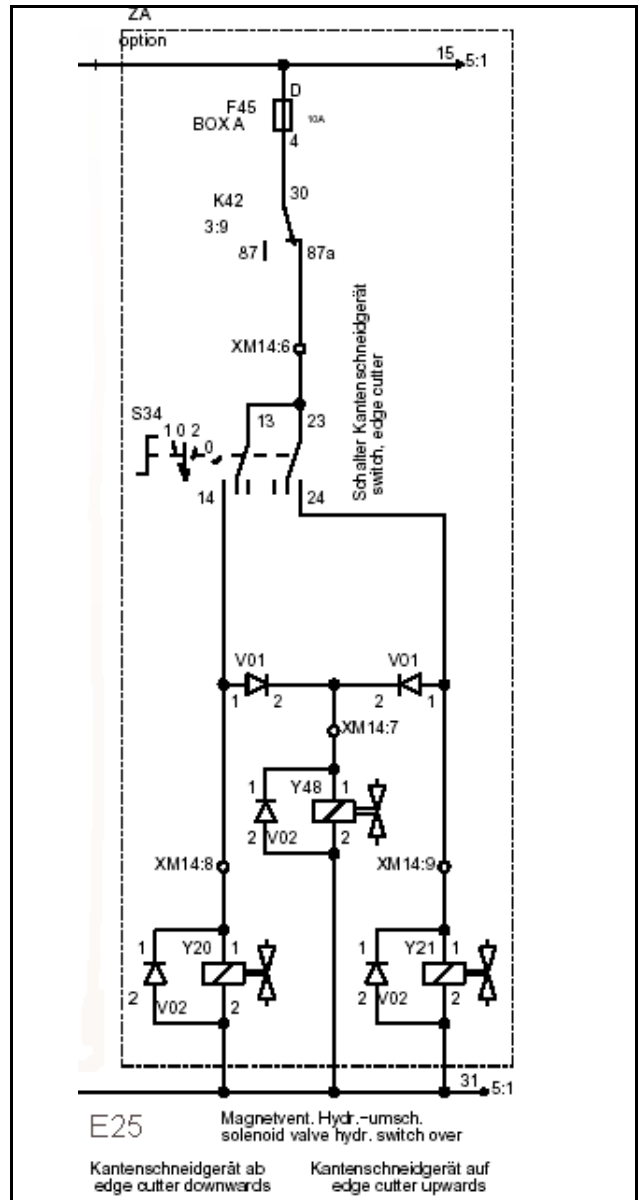
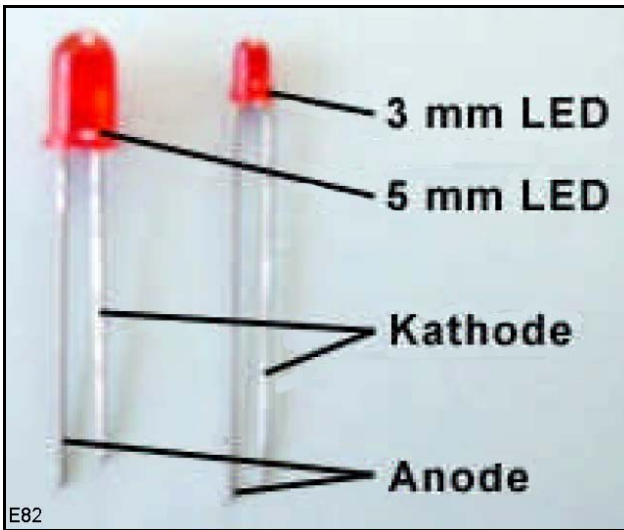


Fig. 3 Diode circuitry

- The solenoid valve Y48 (Fig. 3) is supplied with electric current when switch S34 is switched to position "1" or "2".
- Solenoid valve Y20 is supplied, if the switch is in position "1".
- Solenoid valve Y21 is supplied, if the switch is in position "2".

The three diodes V02 serve as free-wheeling diodes with the function of eliminating voltage peaks.

Light emitting diodes



E82

Fig. 4 LED

The light emitting diode, also referred to as LED, is a semi-conductor diode, which generates (emits) light during operation in forward direction. A semi-conductor crystal thereby emits a light signal, which is converged or scattered by the lenticular shape of the head. Light emitting diodes are available in various colours, sizes and shapes. They are for this reason used as signal lamps. This component is constructed of different semi-conductor crystals, depending on its colour. It works like any other semi-conductor diode.

Relays

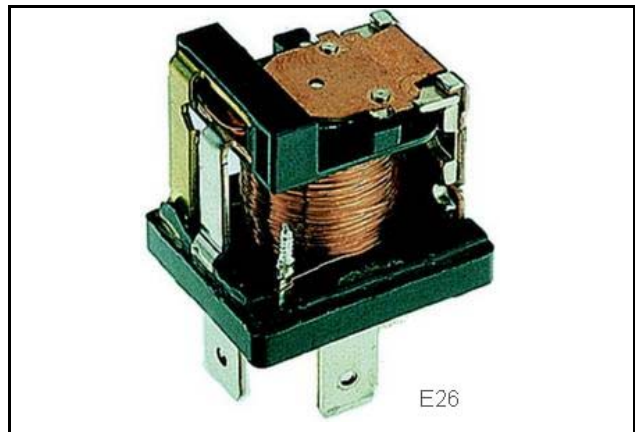


Fig. 1 Relays

Relays are commonly used to realize switching processes.

A free-wheeling diode prevents induction voltage from flowing back from the coil into the vehicle wiring system, which would cause interference with electronic components (control units).

With the possibility of using breaker - maker contacts the effect of an information can be reversed.

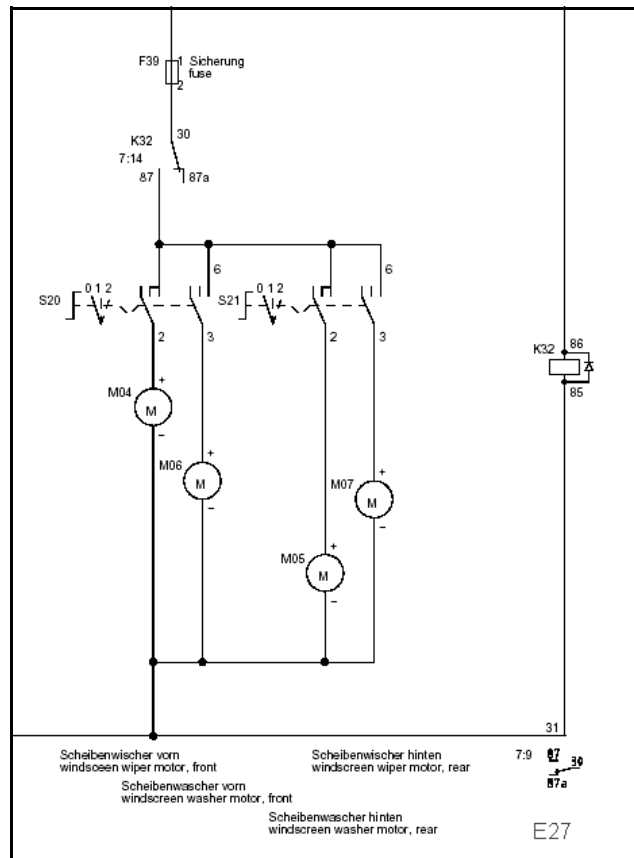


Fig. 2 Relay circuitry

The windscreen wiper and washer motors can only be operated via switches S20 and S21, when relay K32 is supplied with electric current (Fig. 2).

86 = Positive supply for coil

85 = Ground supply for coil
30 = Supply voltage
87 = Normally open contact
87a = Normally closed contact

Fuses



Fig. 1

Fuses are used to protect lines and equipment against overloads and short circuit. If the fuse is overloaded the fusible wire heats up with increasing current, until it finally melts.

Caution

Fuses must not be repaired or bridged.

The melting time at 23 °C is:

- approx. 1 hour with 1.5 times the rated current
- approx. 1 minute with 2.5 times the rated current.

A 5 Amp fuse loaded with 1.5 times the rated current (7.5 Amp) will finally melt after approx. 1.5 hours.

Yellow = 5 A

Brown = 7.5 A

White = 8 A

Red = 16 A

Blue = 25 A

4.15 Telemecanique switch

Disassembly

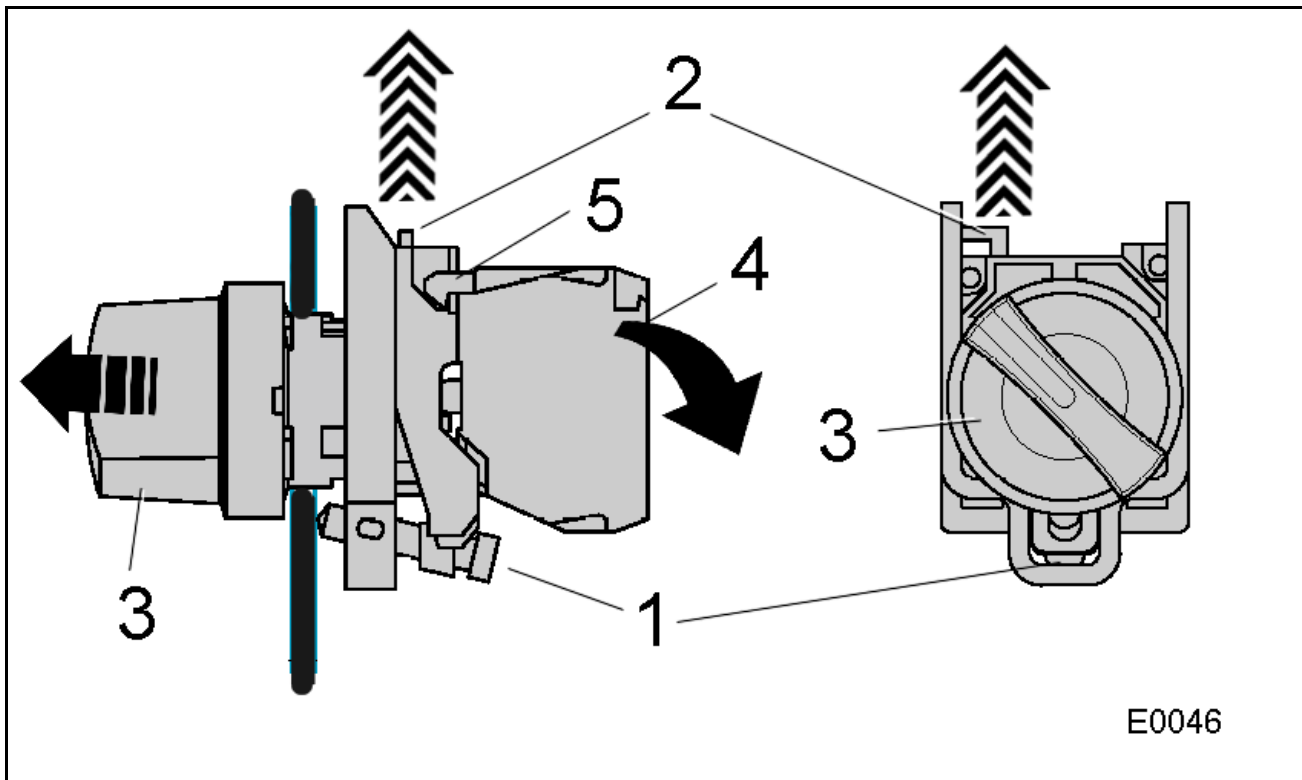


Fig. 1 Disassembly

- Lift up the interlock (5).

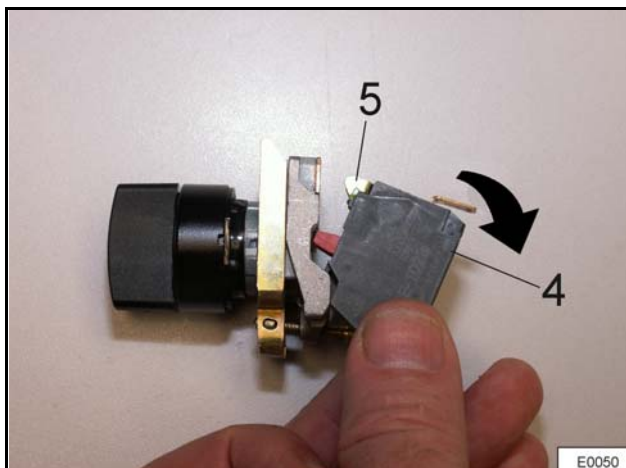


Fig. 2 Folding down the switch block

- Fold down the switch block (4).
- Loosen screw (1).

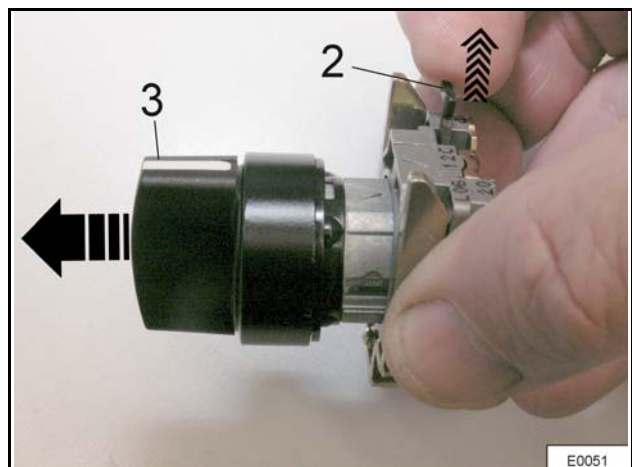


Fig. 3 Pulling out the front element

- Lift up the interlock (2) and pull out the front element (3).

Assembly

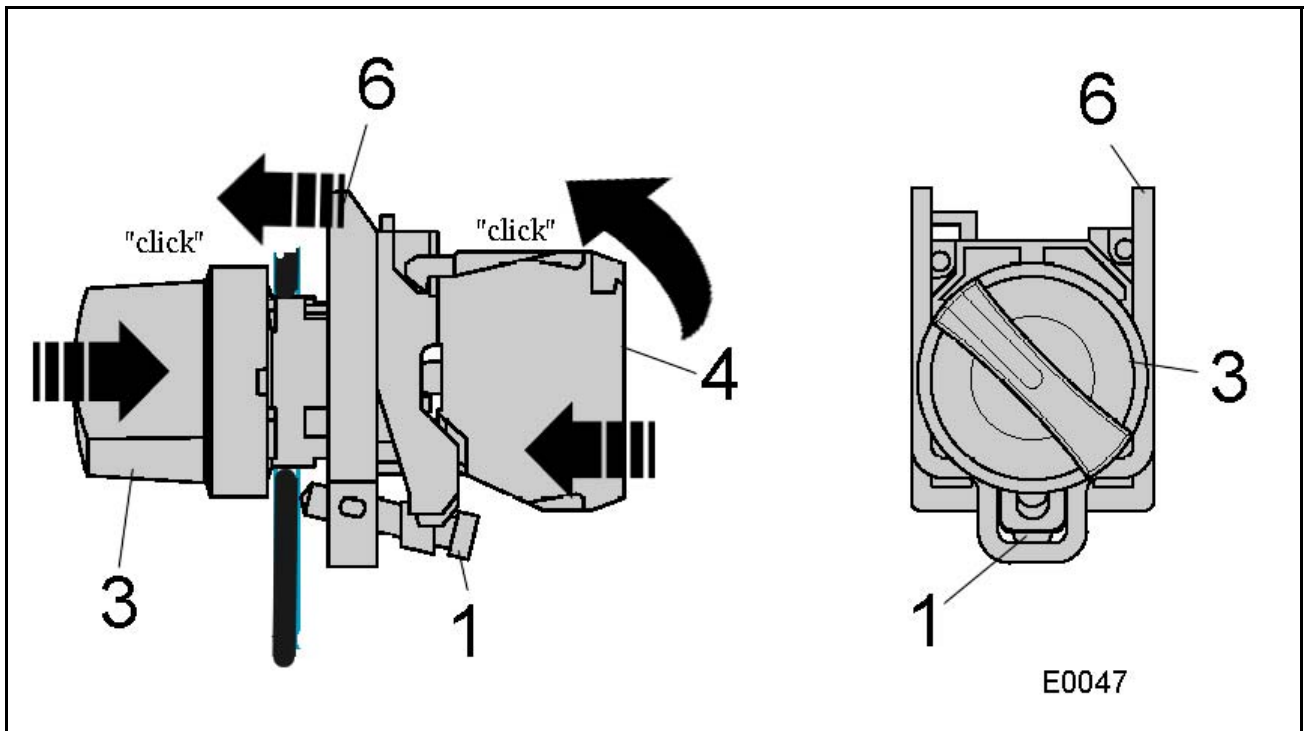


Fig. 4 Assembly

- Insert the front element (3) into the bore in the control panel.

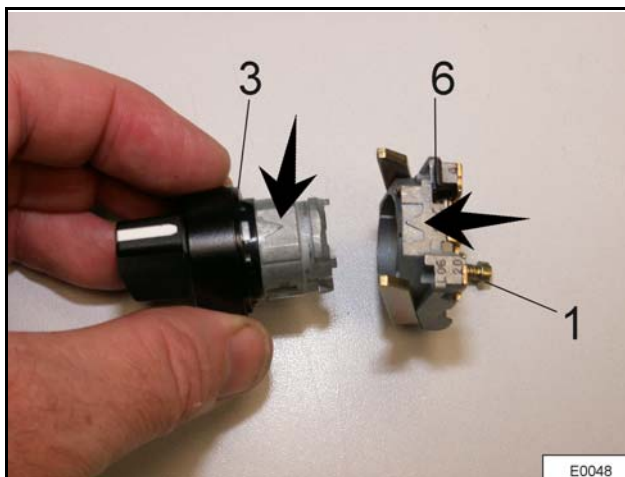


Fig. 5 Observe the marks.

- Clip the fastening adapter (6) onto the front element (3).

i Note

Watch the marks on front element (Fig. 5) and fastening flange.

- Tighten the screw (1) with a tightening torque of 0.6 Nm.

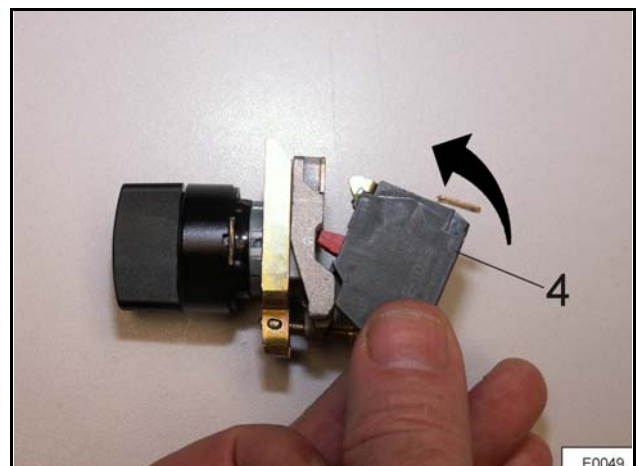


Fig. 6 Assemble the switch block

- Clip on the switch block (4).

i Note

Hook in the switch block at the bottom first (Fig. 6).

4.16 Inductive proximity switches

General

In all automated sequences the use of sensors as a source of information for the electronic control is indispensable. The sensors deliver the necessary signals about positions, end positions, filling levels or serve as pulse transducers for counting tasks or speed detection. In industrial applications inductive and capacitive proximity switches are today indispensable. Compared with mechanical switches, they offer almost ideal prerequisites: non-contact, wear free operation, high switching frequencies and switching accuracies, as well as high protection against vibration, dust and moisture. Inductive sensors detect all metals without contact, capacitive sensors detect almost all solid and liquid media, such as metal, glass, wood, plastic, water, oil, etc.

Working principle

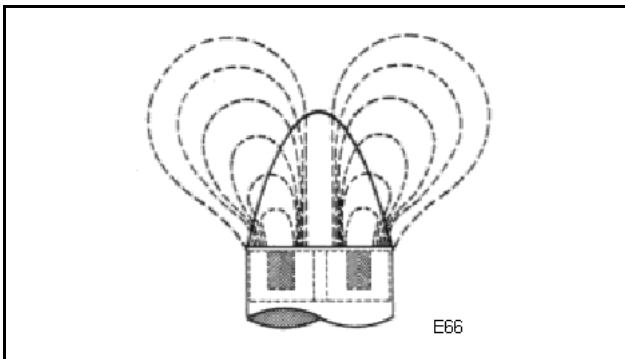


Fig. 7

The working principle is based on the principle of the dampened LC-oscillator. The coil of the oscillation circuit forms a high-frequency magnetic stray field.

This stray field leaks out from the active area of the proximity switch. If metal or non-ferrous metal enters the response range energy is absorbed. The oscillator is thus dampened and the resulting change in current consumption is evaluated.

PNP circuitry

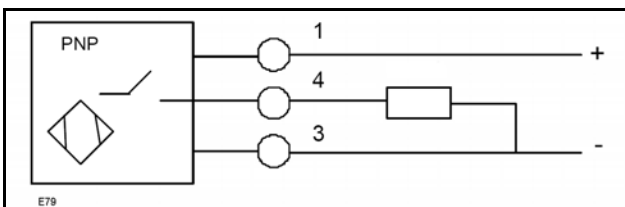


Fig. 8 PNP circuitry

On sensors with PNP-circuitry the output stage contains a PNP-transistor, which switches the load against the positive operating voltage. The load is connected between the output and the negative operating voltage. The switch is designed with a normally open contact, i.e. the contact closes when the initiator comes in "contact" with metal.

NPN circuitry

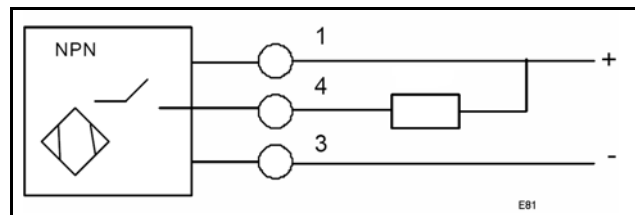


Fig. 9 NPN circuitry

On sensors with NPN-circuitry the output stage contains a NPN-transistor, which switches the load against the negative operating voltage. The load is connected between the output and the positive operating voltage.

Breaking and making contacts

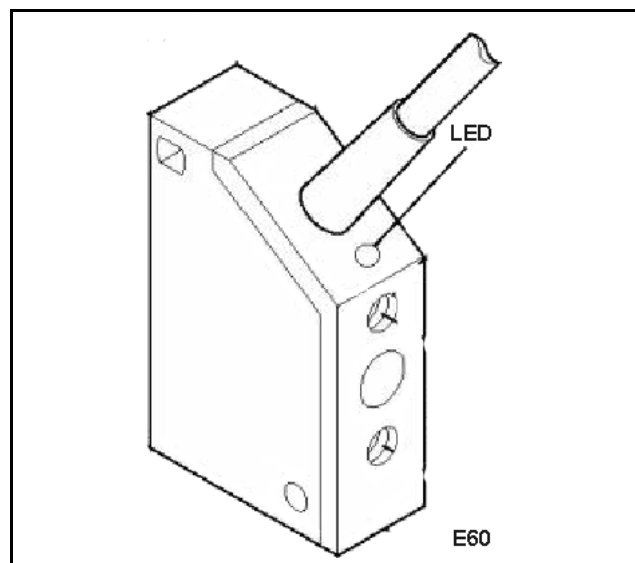


Fig. 10

Proximity switches are used as breaking or making contacts. Depending on the design the switching distances are 2 or 4 mm. The maximum amperage is 300 mA.

The LED (Fig. 10) lights up, when the initiator has detected metal in its stray field.

4.17 Angle sensors

Sensor with current output

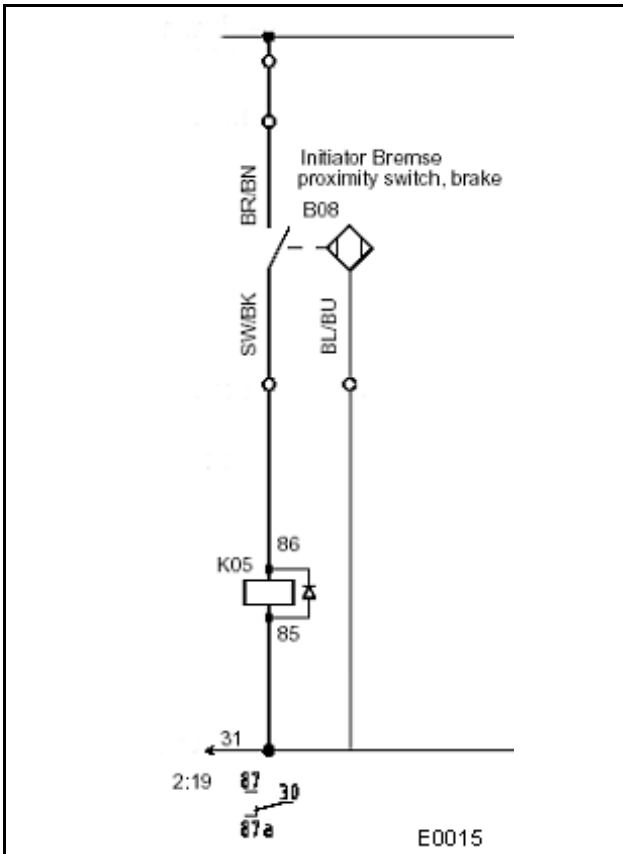


Fig. 11 Circuit diagram, making contact

The circuit diagram (Fig. 11) shows a proximity switch with normally open contact.

Brown = voltage supply

Blue = ground supply

Black = switching output

The initiator switches the relay (K05)



Fig. 1 Angle sensor

The the function of the angle sensor (Fig. 1) is based on the so-called "Hall-Effect". Named after the American physicist E.H. Hall.

The advantage of the Hall sensor lies in the fact that, in contrast to the potentiometer, there is no dragging contact and thus no wear by abrasion.

The Hall sensor generates an electric voltage, the Hall voltage. The necessary electric and magnetic processes take place in a very confined space inside the Hall-IC. Since a vast variety of electronic elements work together in highly complicated circuitries inside the Hall-IC, the Hall sensor needs an external power supply, which is not possible through the vehicle mains supply or the associated control unit.

The Hall effect is based on the phenomenon that electrons are deflected to one side when they pass through a magnetic field that acts from the outside. In this case an excess of electrons is created on the side used by the electrons, because the negative electrical potential of the flowing electrons predominates. On the opposite side the electrically positive potential of the stationary atomic cores is predominant, after the associated electrons were forced to the opposite side. A semi-conductor is used as current conductor.

Situation without external magnetic field

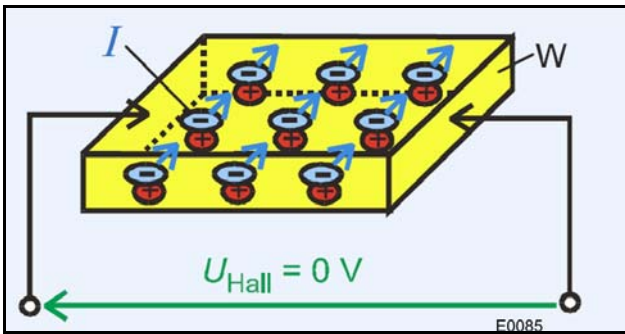


Fig. 2

I = Current in semi-conductor of Hall-IC

W = Semi-conductor as current conductor in Hall-IC

Current passes through the semi-conductor W in the Hall-IC. Since there is no other magnetic force, the electrons pass evenly through the semi-conductor. There is no measurable Hall voltage ($U_{Hall} = 0 V$).

Situation with external magnetic field

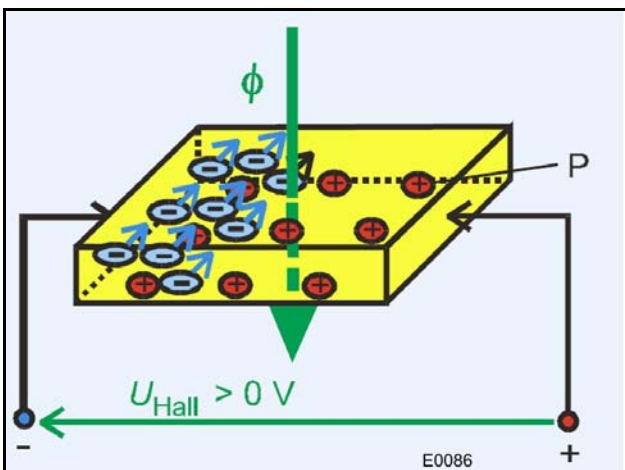


Fig. 3

Current passes through the semi-conductor W in the Hall-IC. Since there is the effect of an external magnetic field, the electrons are deflected to the left. There is an excess of electrons on the left, and a lack of electrons on the right. Hall voltage ($U_{Hall} > 0 V$) can be measured on the side surfaces.

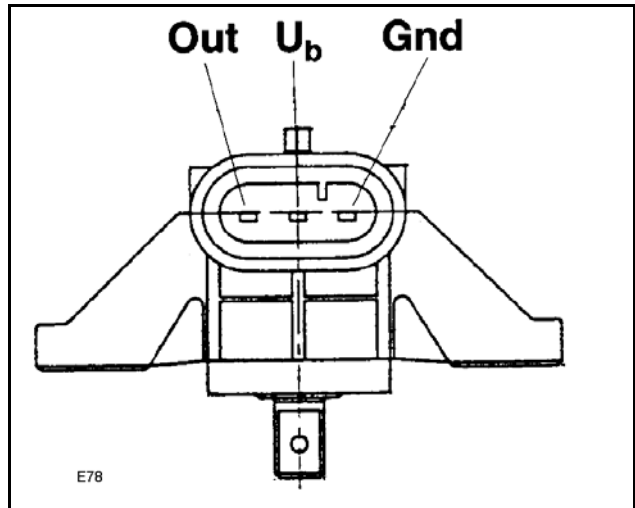


Fig. 4 Connection diagram

The angle sensor has 3 electric connections (Fig. 4).

Ub, supply voltage (+ 8.5 Volt)

Gnd, ground

Out, output current 4-20 mA.

- at $-35^\circ = 4 \text{ mA}$ output current
- at $0^\circ = 12 \text{ mA}$ output current
- at $+35^\circ = 20 \text{ mA}$ output current.

4.18 Plug connectors

Duties and requirements

Electric plug connectors must provide a reliable connection between different system components and thus ensure the safe function of the systems under any operating condition. Their design ensures that they will withstand the applied loads throughout the lifetime of the machine.

Examples for these loads are:

- Vibration acceleration
- Temperature fluctuations, high and low temperatures
- Dampness
- Micro movements of the contact with resulting friction corrosion.

These loads may increase the transition resistances of the contacts, up to total interruption. Even the insulation resistances may drop and thus cause short circuits in neighbouring lines. Electric plug connectors must therefore have the following properties:

- Low transition resistances of the conductive parts.
- High insulation strength between conductive parts with different voltage potentials.
- Excellent leak tightness against water and moisture.

Magnetic coil plug with LED and suppressor diode

The plug is equipped with a polarized function display and a suppressor diode as protection against over-voltages.

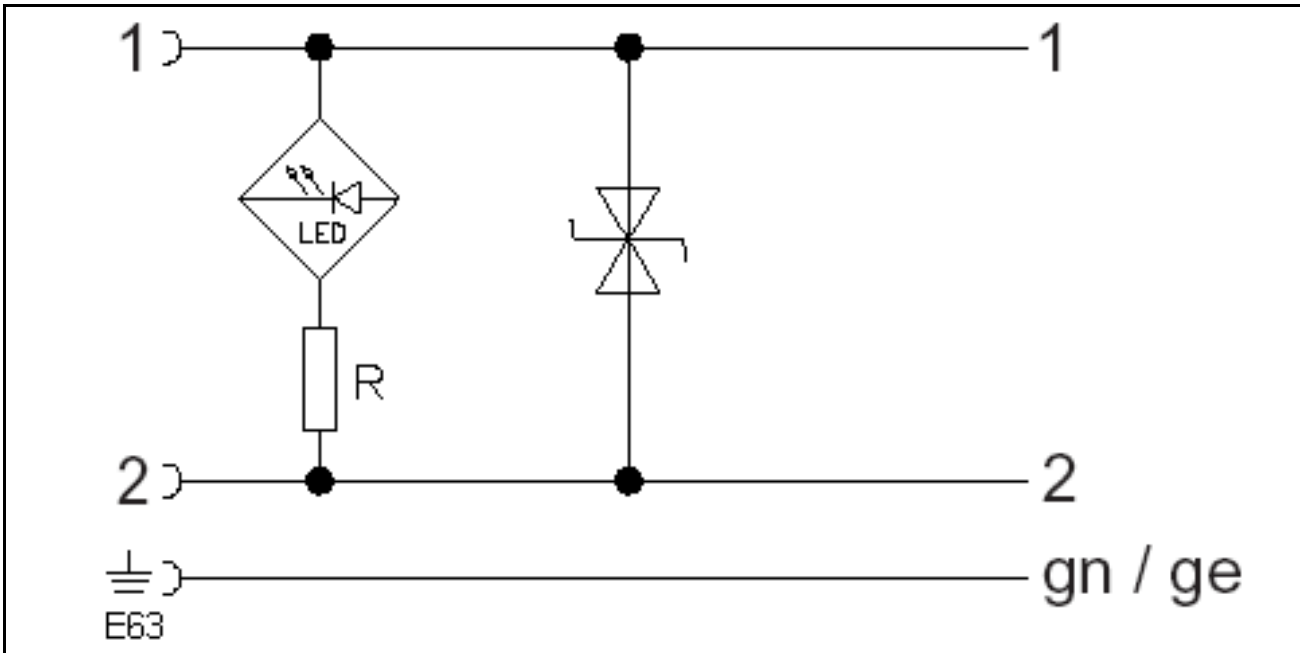


Fig. 5

The plug is polarized, it does not matter whether Pin 1 or Pin 2 is supplied with current, Pin 3 is not used. The LED lights if voltage is applied to the solenoid valve.

Magnetic coil plug without LED and without suppressor diode

The plug has no LED and no suppressor diode as protection against overvoltages.

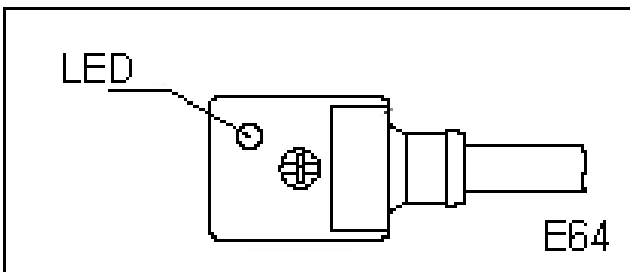


Fig. 6

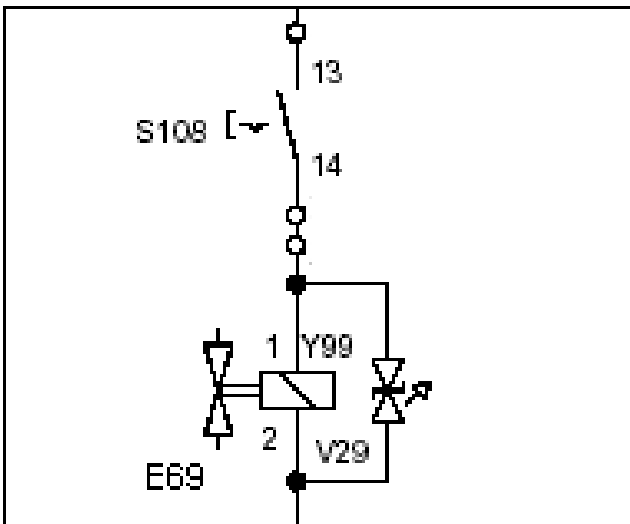


Fig. 7 Switching symbol in circuit diagram

Assembly of magnetic coil plugs

These instructions are intended to explain the correct installation of the magnetic coil plug. The objective of the instructions is the correct installation of the plug and to avoid malfunctions in the field caused by moisture and any related corrosion damage.



Fig. 8 Solenoid valve plug with pointed cable



Fig. 9

- Connect the plug with the coil connection and press it firmly onto the connecting housing.



Fig. 10

- Fasten the screw with a suitable screwdriver.



Fig. 11

- Press the plug firmly on again.



Fig. 12

- Retighten the screw.



Fig. 13

⚠ Caution

There should be no gap between plug and solenoid coil!



Fig. 14 Correctly installed plug without gap

4.20 Deutsch plug, series DT and DTM

General

Plug connectors DT and DTM have a wedge to hold the pins and sockets in their position. This wedge can be removed and replaced, without having to cut any leads.

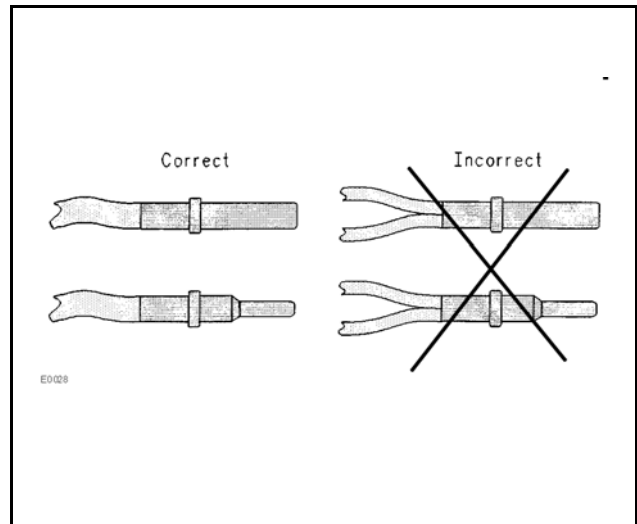


Fig. 15 Crimp connections

⚠ Caution

Do not crimp more than one lead per pin or per socket.

Sockets and pins must not be soldered to leads, they may only be crimped (see special tools for electrics).

When connecting sockets and plugs these must engage with a noticeable click when both halves interlock.

The plug connection should not be separable (without loosening the interlock).

Pulling test

This pulling test ensures that the lead is perfectly crimped and the contact has correctly engaged in the housing.

- Perform a pull test on each lead, each of the terminals and connections must withstand a pulling force of 45 N without any difficulties.

DT Series



Fig. 1 DT plug connection

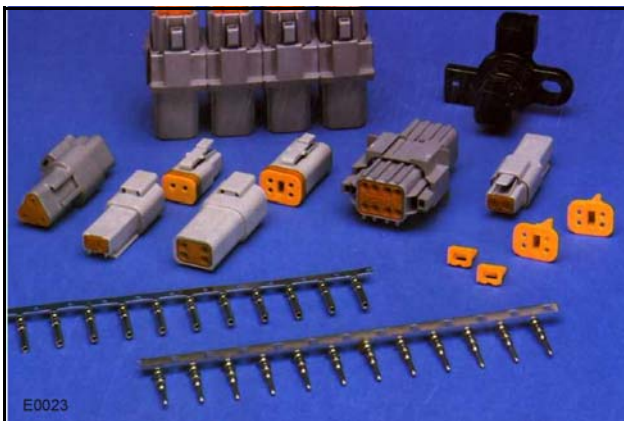


Fig. 2 DT Series

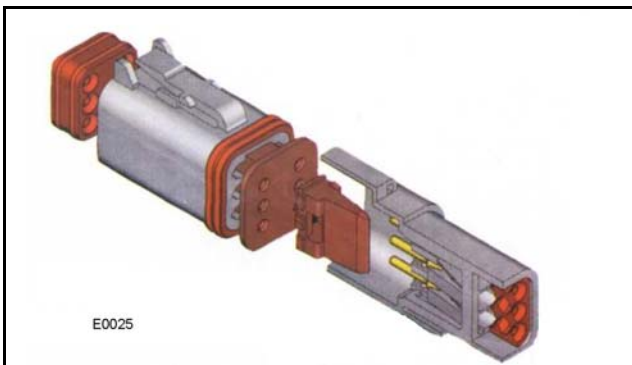


Fig. 3 Sectional drawing

Installing DT contacts

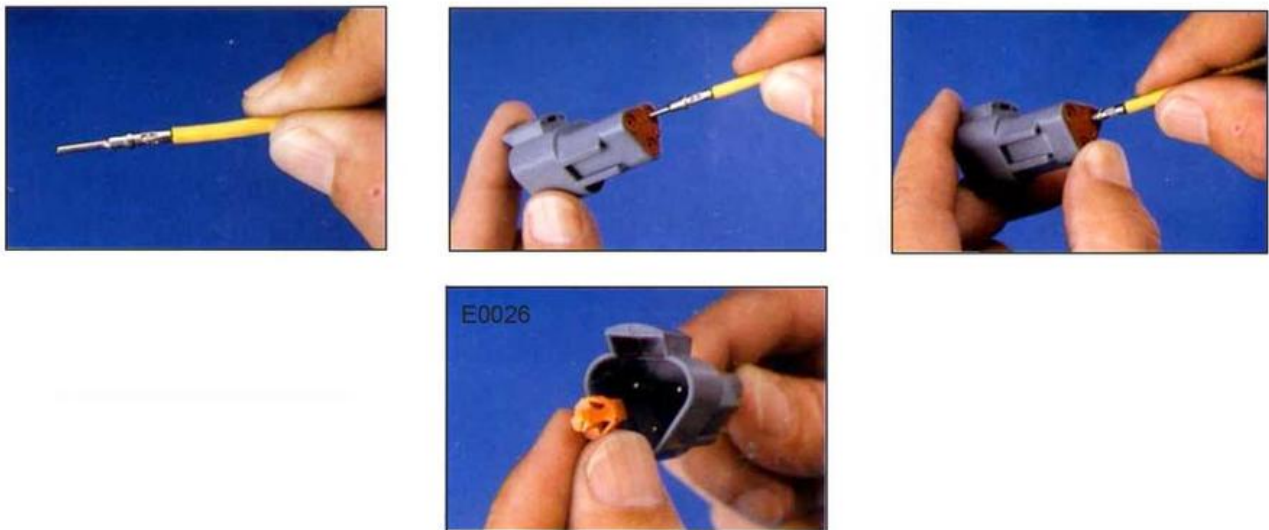


Fig. 4

- Insert the contacts through the rubber grommet until they click into place.
- Insert the orange wedge in direction of arrow.

⚠ Caution

Perform a pull test on each lead, each of the terminals and connections must withstand a pulling force of 45 N without any difficulties.

i Note

Use the same method when assembling the socket.

Disassembling DT contacts



Fig. 5

- Pull the orange wedge out with long nose pliers.
- Slightly pull the lead and unlock the interlocking hook with a screw driver.
- Pull the contact out of the socket.

i Note

Use the same method when assembling the socket.

In this case the interlock disassembly tool (see special tools for electricians) serves as an aid to remove the wedges.

DTM Series

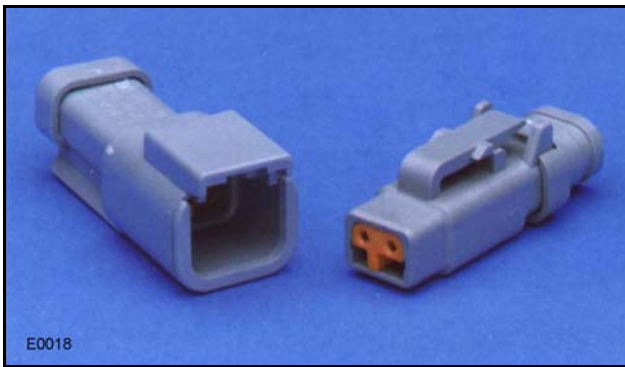


Fig. 1 DTM plug connection

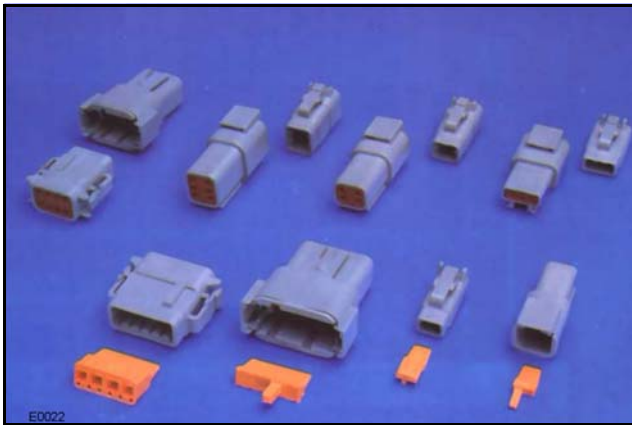


Fig. 2 DTM Series

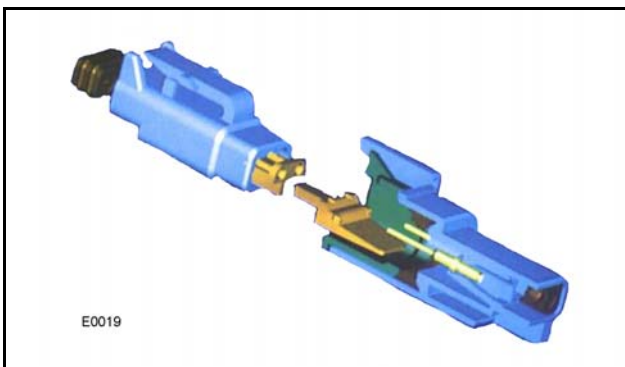


Fig. 3 Sectional drawing

Installing DTM contacts

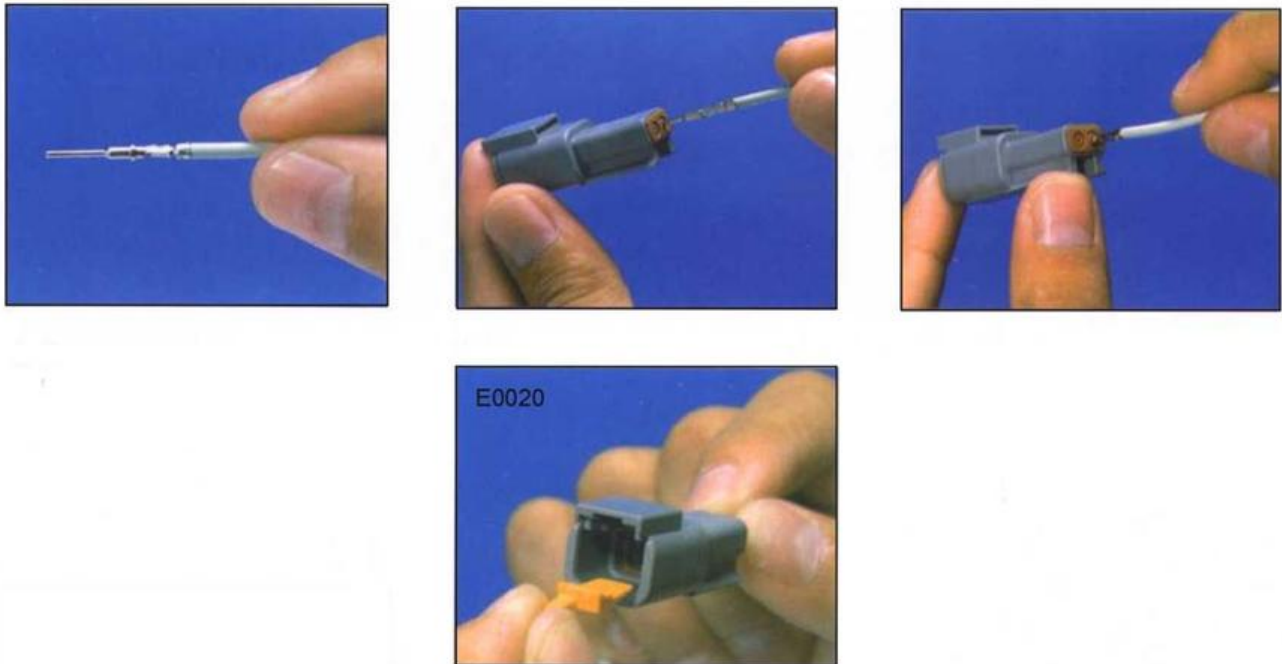


Fig. 4

- Insert the contacts through the rubber grommet until they click into place.
- Insert the orange wedge, until it clicks into place.

⚠ Caution

Perform a pull test on each lead, each of the terminals and connections must withstand a pulling force of 45 N without any difficulties.

i Note

Use the same method when assembling the socket.

Disassembling DTM contacts



Fig. 5

- Pull the orange wedge (interlock) out with long nose pliers.
- Slightly pull the lead and unlock the interlocking hook with a screw driver.
- Pull the contact out of the socket.

i Note

Use the same method when assembling the socket.

In this case the interlock disassembly tool (see special tools for electricians) serves as an aid to remove the wedges.

4.21 Plugs and terminals in spring clamping technology

General

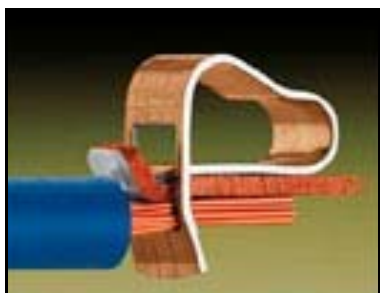


Fig. 1

Caution

The spring clamp technology is not suitable for extra fine conductors. Extra fine conductors can be easily pulled out of the spring clamp!

Spring clamp technology (Fig. 1) for quick, vibration resistant and maintenance-free connection of all conventional copper conductors (single, multiple or fine stranded) with or without wire and ferrule.

Connecting terminal for quick repairs

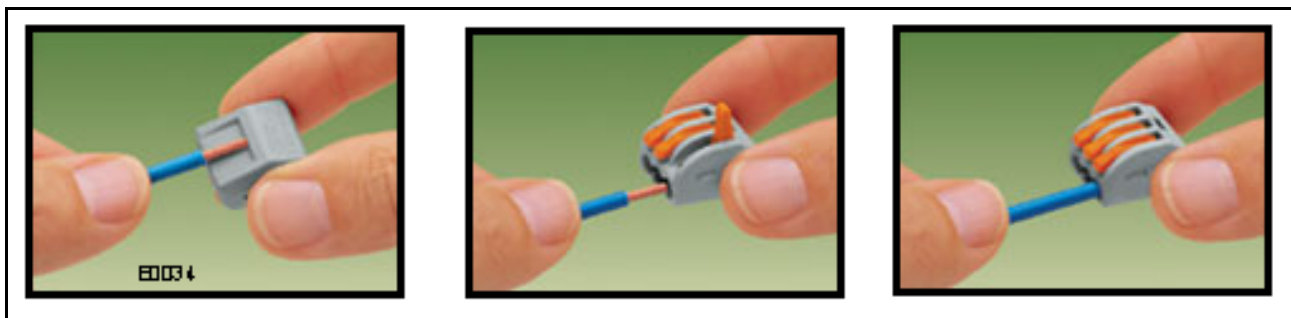


Fig. 2 That's how it works

BOMAG part-no.: 057 565 72

The connecting clamp clamps up to 3 or 5 stripped fine conductors of 0.08 mm² to 4 mm², single or multiple strand up to 2.5 mm². And this even without tools (Fig. 2).

That's how it works

- Strip 9-10 mm of the lead.
- Open the actuating lever and insert the strand.
- Return the actuating lever to initial position.

Caution

Perform a pull test on each lead, each of the terminals must withstand a pulling force of 45 N without any difficulties.

Series clamp

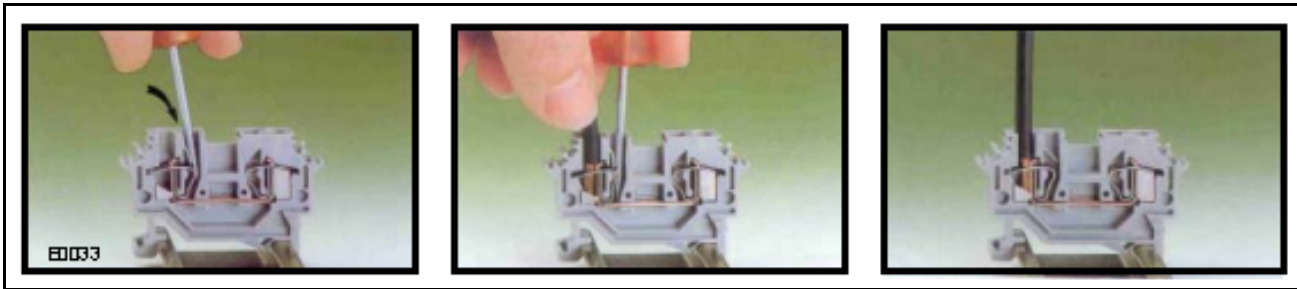


Fig. 3 That's how it works

That's how it works

- Insert a screw driver into the actuating opening until it bottoms.
- Strip 9-10 mm of the lead and insert it into the clamp.
- Pull out the screw driver.

⚠ Caution

Perform a pull test on each lead, each of the terminals must withstand a pulling force of 45 N without any difficulties.

Measuring signals

On these terminal blocks the bridge slot is most suitable for tapping off and measuring signals. Here you may directly insert a 4 mm test adapter (see special tools for electricians) for connecting a measuring lead. This test adapter is standard in the central electricians of heavy equipment machines.

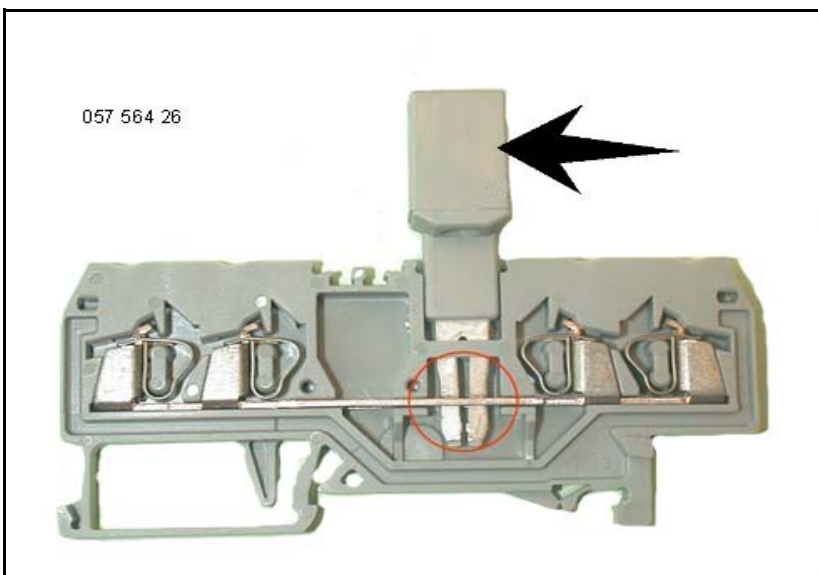


Fig. 4 Test adapter

X-COM System

The X-COM-SYSTEM, a synthesis of plug connector and series clamp, has grown up to a construction kit for universal system wiring, ever since it was introduced in 1997. All the familiar series clamping functions have thus become pluggable.

X-COM plug clamp

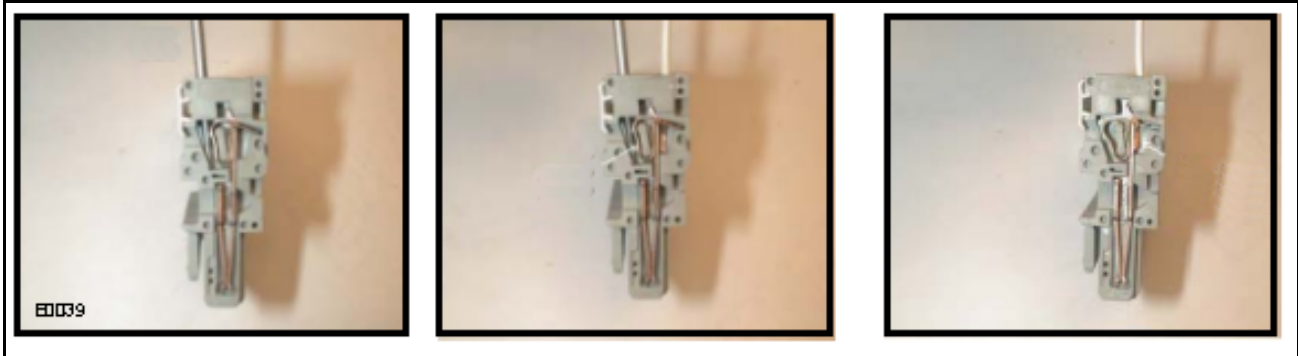


Fig. 5 That's how it works

That's how it works

- Insert a screw driver into the actuating opening until it bottoms.
- Strip 9-10 mm of the lead and insert it into the plug.
- Pull out the screw driver.

⚠ Caution

Perform a pull test on each lead, each of the terminals must withstand a pulling force of 45 N without any difficulties.

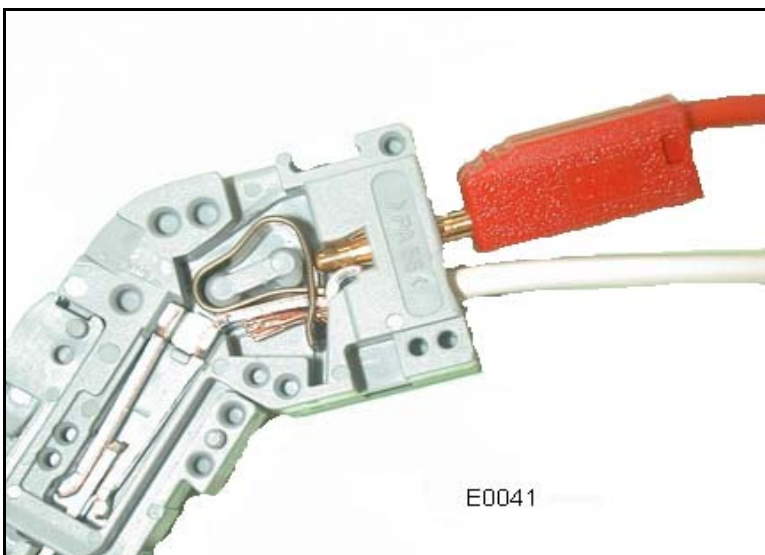


Fig. 6 X-COM plug with measuring cable

- The most reliable measurements on the plug can be made when using the measuring and connecting cable with 2mm plug (see special tools for electricians).

Measuring signals

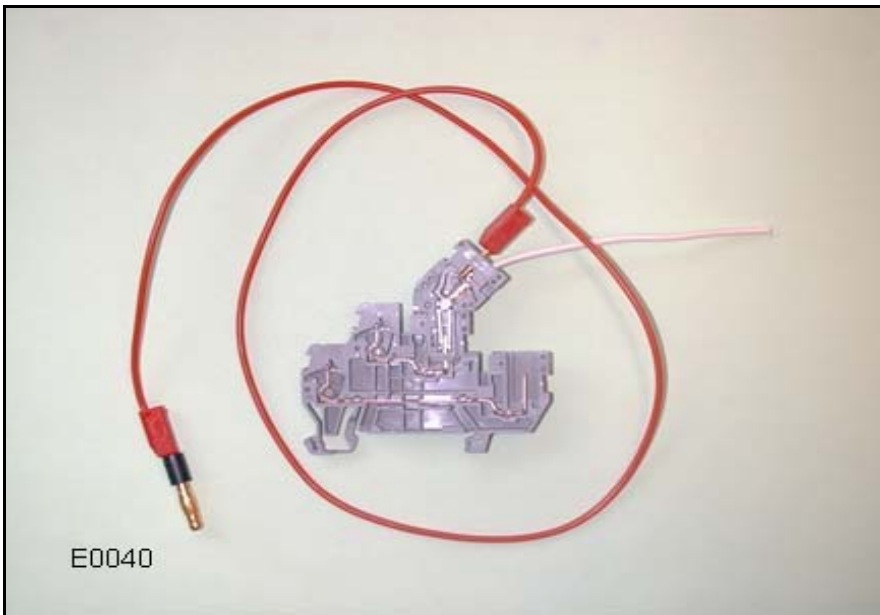


Fig. 7 X-COM plug plugged onto the series clamp

4.22 Batteries

Battery – accumulator

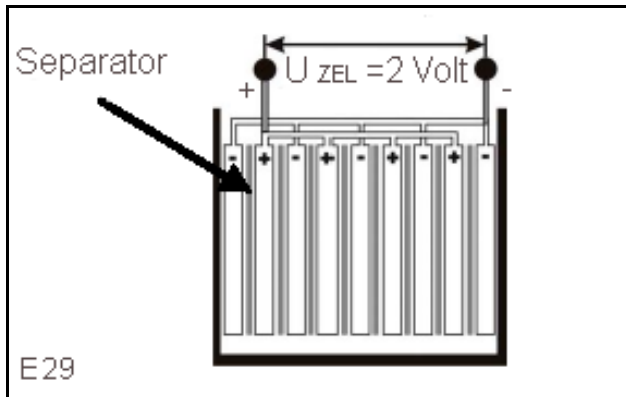


Fig. 1

In vehicles batteries are used to start the engine. The ability to start the engine depends on the charge condition of the batteries.

Lead collectors or accumulators are secondary elements, i.e. they can be recharged after discharging electric current.

The basic element of a lead accumulator is the cell. It contains the plate blocks consisting of positive and negative plates. These plates are separated from each other by separators.

All positive plates are arranged parallel to the plus pole, the negative plates parallel to the minus pole of the cells.

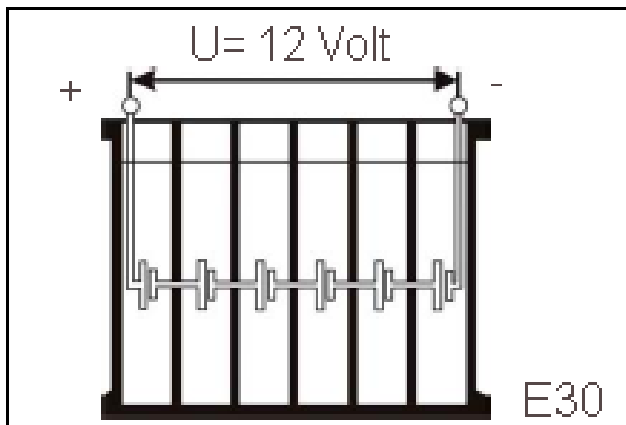


Fig. 2

All cells are filled with a conductive fluid, the electrolyte. For a 12 Volt battery 6 cells are connected in series.

Capacity

is a synonym for the amount of current taken up and discharged by a battery over a specified period of time.

Battery maintenance

i Note

Maintenance free batteries are gaining more and more significance, this freedom from maintenance, however, is only limited to the fact that no water needs to be added.

If the battery is not charged and discharged over a longer period of time, the battery will slowly discharge by itself.

The accumulator may only be discharged down to a final discharging voltage of 10.5 Volt, as otherwise there is a risk of sulphation, i.e. the generated lead sulphate forms increasingly coarser crystals, which will finally not react at all or only very sluggishly during a subsequent charging process.

In the worst case the accumulator can only be disposed of after such an exhaustive discharge.

The following therefore applies for longer downtimes:

- Remove the battery and store it in a cool, dry and frost protected room.
- Check the open circuit voltage on the battery at regular intervals (at least once every month).
- Recharge immediately if the open circuit voltage has dropped to 12.25 Volt (no rapid charging).

i Note

The open circuit voltage of batteries occurs approx. 10 h after the last charging or approx. 1 h after the last discharge.

Battery test in general

- Is the battery leaking? Can traces of impact, shock or compression be found in the leaking area?
- Check for e.g. incorrect fastening, foreign bodies on the battery mounting surface and similar.

Batteries with screw plugs

Checking the electrolyte level

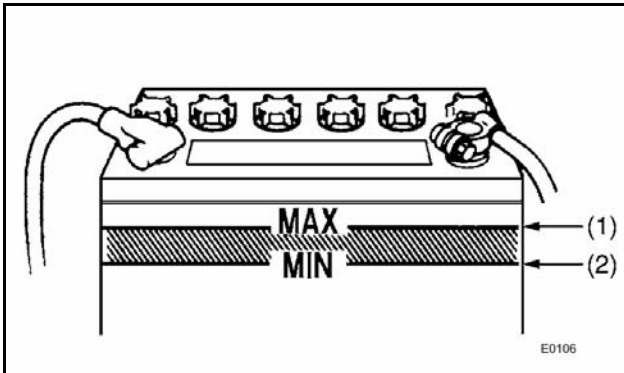


Fig. 3

- 1 Upper filling level mark
 - 2 Lower filling level mark
- If the electrolyte level only reaches up to the lower filling level mark (2), fill distilled water into the corresponding cells.

Checking the electrolyte density

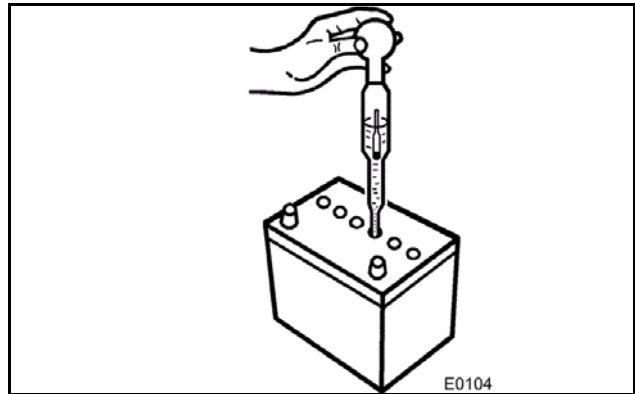


Fig. 4

The cells are filled with diluted sulphuric acid as electrolyte (approx. 25 Vol% sulphuric acid in distilled water), also referred to as accumulator acid, which has a density of 1.285 kg/dm^3 at a temperature of $+27^\circ \text{ Celsius}$. This means that one litre of electrolyte has a weight of 1.285 kg. As the cell is being discharged lead sulphate (PbSO_4) will form on both electrodes and the electrolyte will increasingly change to water. Since water has a lower specific weight than diluted sulphuric acid, the density of the electrolyte will also drop during the discharge and with a fully discharged cell and a temperature of 27°C it will only be 1.18 kg/dm^3 .

With a lead cell the acid density is therefore a measure for the charge condition. This characteristic is used to determine the charge condition of a lead battery. The so-called electrolyte tester (densimeter) is used for this purpose.

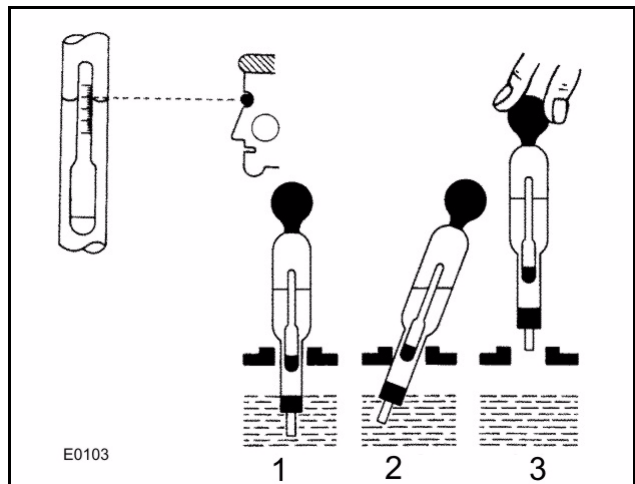


Fig. 5 Checking the electrolyte density:

- 1) correct
- 2) poor
- 3) poor

i Note

(Hold the pipe of the electrolyte tester vertically, without taking it out of the electrolyte.)

Do not draw too much electrolyte into the pipe.

Make sure that the float is not obstructed in its movement and hold the electrolyte tester at eye level.

The electrolyte tester must be read at the highest electrolyte level.

- If the electrolyte temperature deviates from the electrolyte tester calibration temperature, the indicated value for the specific electrolyte weight must be corrected acc. to the formula (**reference**) below.

Reference

The specific weight varies slightly with temperature. To be exact, the specific weight drops by 0.0007 per 1 °C temperature increase (by 0.0004 per 1 °F) and increases by 0,0007 per 1 °C temperature reduction (by 0,0004 per 1 °F) . If e.g. a temperature of 20 °C (68 °F) is used as reference, the indicated value of the specific weight must be corrected acc. to the following formula.

- Specific weight at 20 °C = measuring value + 0,0007 × (electrolyte temperature: 20 °C)
- Specific weight at 68 °F = measuring value + 0,0004 × (electrolyte temperature: 68 °F)

Acid density at 27 °C in kg/dm³

- 1.25 -1.28, open-circuit voltage approx. 12.7 Volt. Battery is charged.
- 1.20 -1.24, open circuit voltage approx. 12.4 to 12.5 Volt, is 50% discharged. Charging is necessary.
- 1.19 and less, open circuit voltage less than 12.3 Volt. Battery is insufficiently charged. The battery needs to be recharged immediately.
- If there is a deviation of the specific weight of more than 0.05 between any of the cells, the battery needs to be replaced.
- If the current consumption during charging is not 1/20 of the nominal capacity (example 100 Ah battery: 100Ah x 1/20 = 5 A) or full recharging of the battery results in a final electrolyte density of only 1.24 kg/dm³ or less, the battery shows normal wear by aging. The battery was insufficient charging or exhaustive discharge.

4.23 Starting with jump wires

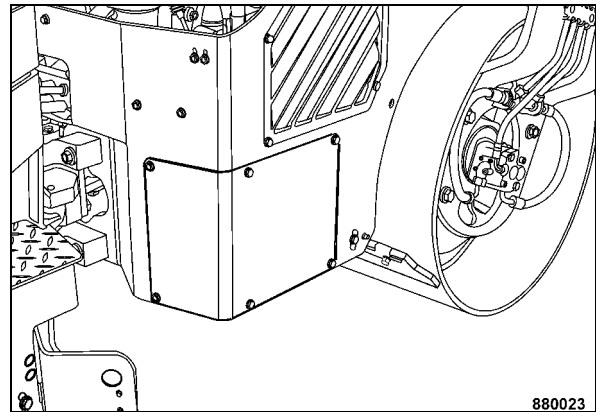


Fig. 6

- Remove the cover from the battery compartment (Fig. 6).

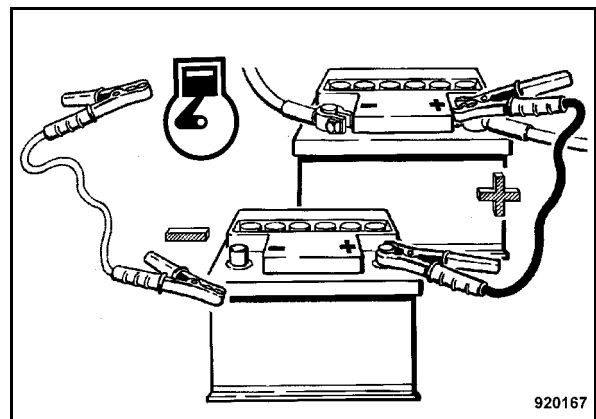


Fig. 7

⚠ Caution

A wrong connection will cause severe damage in the electric system.

- Only use a 12 Volt battery to bridge the machine.
- When jump starting with an external battery connect both plus poles first.
- Then connect the ground cable first to the minus pole of the current supplying battery and then to engine or chassis ground, as far away from the battery as possible (Fig. 7).
- Start as described under 'Starting the engine'.
- Once the engine is running switch on a powerful consumer (working light, etc.).

⚠ Caution

If no powerful consumer is switched on voltage peaks may occur when separating the connecting cables between the batteries, which could damage electrical components.

- After starting disconnect the negative poles (ground cable) first and the positive poles after.
- Switch off the consumer.
- Close the battery compartment with the cover.

4.24 Main fuse

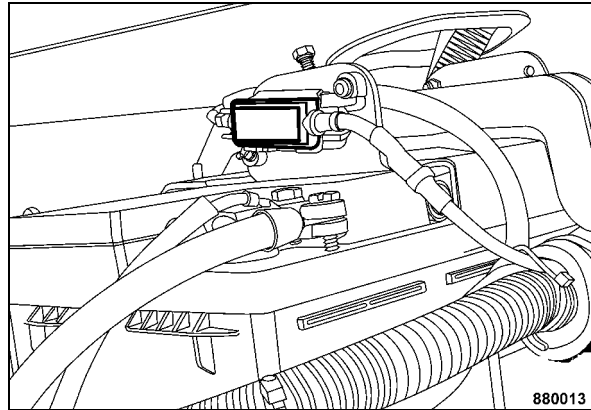


Fig. 8

Main fuse for battery

80A = F 00

4.25 Generator

General

The generator should be of light weight, have a high rate of efficiency and supply all consumers in the vehicle with electric current at a steady voltage already at idling speed.

Terminal designations

- B61, L = charge control
- B+, B = battery plus, also with the designation "30"
- B- = battery minus, also with the designation "31"
- D+ = dynamo plus corresponds with terminal "61" and "L"
- D- = dynamo minus (this designation is only found on D.C. generators or A.C. generators with regulator removed)
- DF = dynamo field (this designation is only found on D.C. generators or A.C. generators with regulator removed). Note: The designation DF is also found on older alternators with externally arranged regulator on the connection of the exciting coil to the regulator or on the regulator itself
- DF1 = dynamo field 1
- DF2 = dynamo field 2
- IG = "15" ignition switch

Three-phase generator

The AC-generator first of all produces AC-voltage / AC-current.

Why does AC-current need to be rectified?

There are a few components for which can either be operated with alternating current or direct current, because they work independently from the current flow direction.

This includes :

- Incandescent lamps
- Fluorescent lamps
- Glow lamps
- Electric heating elements.

There are also a few components that could be operated either with alternating current, direct current or three-phase current, if the components were designed accordingly.

This includes :

- Electric motors
- Relays.

Finally, a variety of important components solely require direct current. These will under no circumstances work with alternating or three-phase current.

This includes :

- Accumulators
- Control units
- All electronics
- Communication equipment.

Design and function

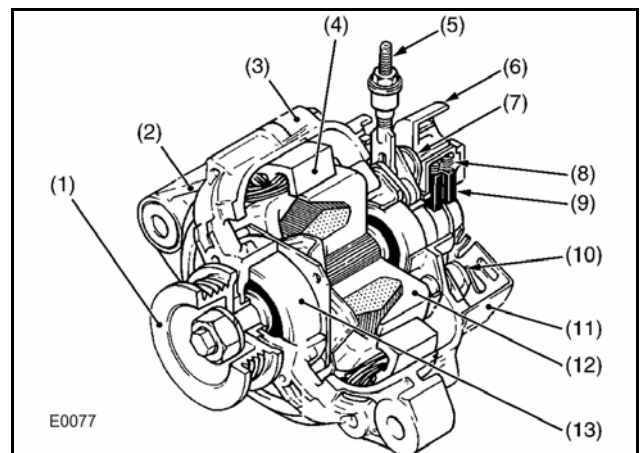


Fig. 9

- 1 V-belt pulley
- 2 Holding plate
- 3 Bearing cover
- 4 Stator
- 5 Terminal
- 6 Plug connector
- 7 Regulator

- 8 Spring
- 9 Brush
- 10 Rectifier
- 11 Cover
- 12 Rotor
- 13 Bearing



Fig. 10 Rotor with claw poles

In the generator the armature windings are located inside the stationary stator (Fig. 11), whereas the exciter winding is arranged on the internally revolving rotor (Fig. 10).



Fig. 11 Stator with 3 windings

The three stator windings (Fig. 11) are electrically offset to each other by 120° . The excitation of the magnetic field requires direct current, which is fed to the rotor via two carbon brushes and slip rings.

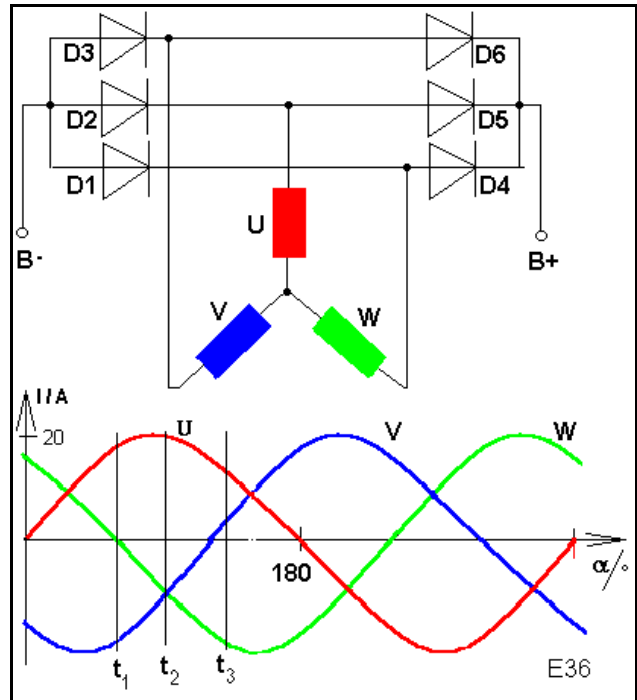


Fig. 12 3-phase current

The wiring diagram (Fig. 12) shows the 3 windings in Y-connection and the 6 associated rectifier diodes (D1 to D6).

The diodes D1, D2, D3 are also referred to as minus diodes, because they have B- as common connection (minus plate). The other diodes are the plus diodes.

The rectifier diodes have the effect that the negative half-wave is suppressed and only the positive section of the wave is allowed to pass, resulting in a pulsating D.C. voltage.

Charge control light

The charge control light has two duties:

- Indication of the correct generator function
- External excitation of the generator during the starting phase

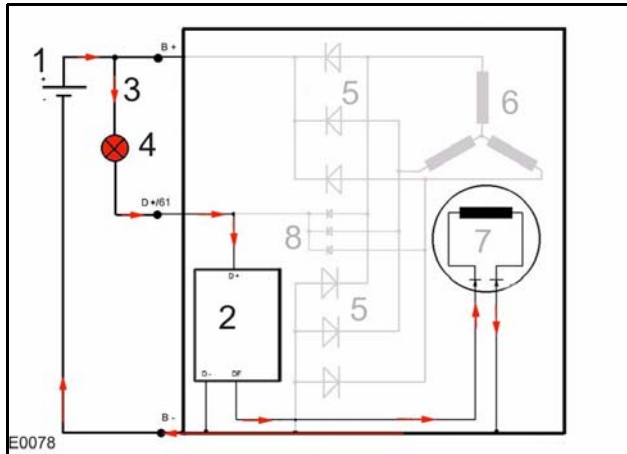


Fig. 13 plus controlled charging regulator

(Fig. 13) shows the current flow with the ignition switched on, engine stopped.

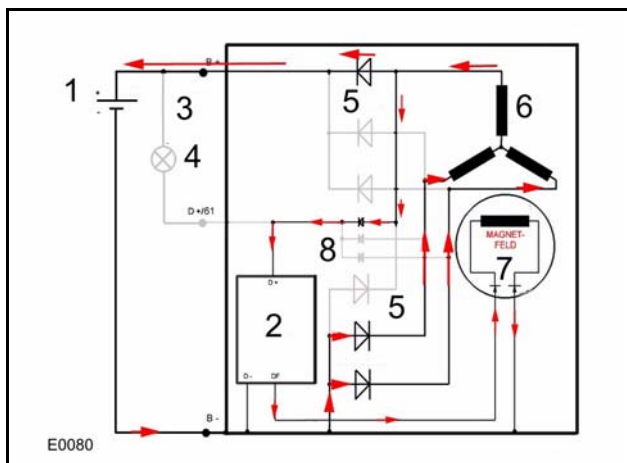


Fig. 14 plus controlled charging regulator

(Fig. 14) shows the current flow with the ignition switched on, engine running.

- 1 Battery
- 2 Charge controller
- 3 Ignition switch
- 4 Charge control light
- 5 Rectifier
- 6 Rotor
- 7 Sliprings / carbon brush
- 8 Auxiliary rectifier

Normally the charge control light lights with the engine stopped and the ignition switched on and goes out at low engine speed, but at the latest after a single, short-term increase in engine speed from idle speed, because there is no longer a voltage difference on the lamp.

Any other behaviour would indicate a defect on the generator (rectifier, carbon brushes, regulator) or a defect on the lamp, presumed the on-board battery is not discharged.

A far more important function of the lamp is the transition and provision of field current. At standstill there is no magnetic field in the de-energized generator. Since this is necessary for the generation of electric current, the rotor must be supplied with current, so that a weak field can build up.

The current flows from the ignition switch via the charge control light through the generator winding against ground (terminal 31) and is limited to approx. 300 mA by the light bulb (4 W) (without the lamp the current flow would be 2 to 5 A). While the rotor is rotating current is induced into the stator winding, whereby a small part (2–5 A, depending on speed) flows through the charge regulator into the field winding of the rotor and the major part flows to the output terminals (B+), where it can be tapped as useful current. If the charge control light is defective or no battery is available or the battery is discharged, external excitation is no longer possible at standstill and no voltage will be generated, even when the generator is running.

With used, older generators a weak permanent magnetic field may have developed over the lifetime, which does even exist when no voltage is applied. This type of machines can even start without charge control light and produce current during operation. However, this is an unintended effect and you should not presume that a generator without charge control light or external excitation can be started up.

Charge controller

The charge controller has the following functions

- To regulate the voltage generated by the generator
- To protect against overloads caused by too high output current
- Protection against reverse current

If the output voltage or the output current of the generator exceeds the determined maximum values, the field current and thus the electric power is reduced.

Electronic charge regulator

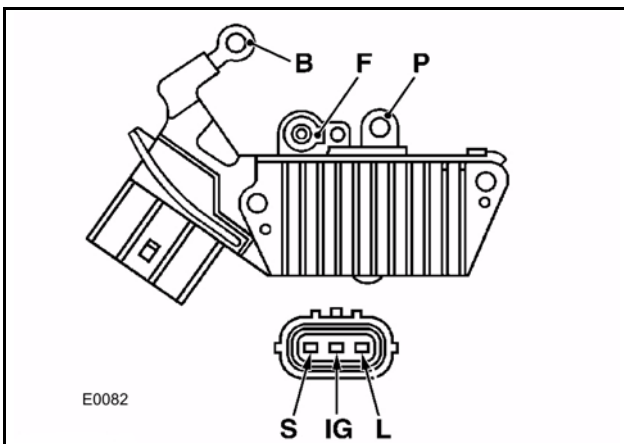


Fig. 15 Regulator, Kubota engine

In AC-generators the electrically generated exciter field of the generator rotor is influenced by an attached electronic charge regulator. Together with the holder for the carbon brushes this regulator forms a unit, which transfers the field current to the sliprings of the rotor.

The regulator compares the rectified actual current of the generator with the a stable reference voltage in the regulator and matches the strength of the exciter field (field current) by increasing or reducing the current flow (PWM, switching controller) in such a way, that the actual voltage of the generator remains constant, irrespective of load and speed. The generator voltage is thereby regulated, the generator current, however, is not measured, but limited by the construction dependent internal resistance of the stator coils or thermal monitoring.

Checking the generator

⚠ Caution

Before removing the generator you must disconnect the ground cable from the minus pole of the battery while the ignition is switched off. Do not disconnect the generator while the engine is running, because this may cause extremely high voltage peaks in the vehicle wiring system ("Load Dump"), which could possibly damage control units, radios or other electronic equipment.

When disassembling the battery cable, the B+-nut underneath on the generator side may also be loosened. This nut must in this case be retightened.

When connecting e.g. the battery cable to the terminal of the generator you must make sure that the polarity is correct (generator B+ to the + pole of the battery). Mixing up the polarities by mistake causes short circuit and damage to the rectifier elements - the generator will be out of function.

The generator can only be operated with the battery connected. Under special conditions emergency operation without battery is permitted, the lifetime of the generator is in such cases especially limited.

Plus and minus cables must be disconnected during rapid charging of the battery or electric welding on the vehicle.

When cleaning the generator with a steam or water jet make sure not to direct the steam or water jet directly on or into the generator openings or ball bearings. After cleaning the generator should be operated for about 1 - 2 minutes to remove any deposits of water from the generator.

First one must check whether the generator is actually defective.

- This can be easily found out by checking whether the charge control light in the dashboard lights up. If the light does not go out, even at higher speeds, there must be a defect on the generator, the regulator, the wiring or the V-belt.
- When the engine is at rest, the charge control light must light up. If not, the lamp may probably be defective. Defects on generator or wiring are obviously also possible.

The following points allow to contain faults in the voltage supply within certain limits.

- Cable connections on the generator OK?
- V-belt OK?
- Generator ground (engine ground) OK?
- Pre-excitation from vehicle electronics OK?

Only if all criteria mentioned above are OK, the fault must be in the generator itself. In this case it must be

replaced or the following trouble shooting procedure must be performed.

Measuring the charge current

- All plug-and-socket connectors must be free of corrosion and intermittent contact.
 - The generator ground connection must be OK.
 - During the measurement switch on as many consumers as possible.
- 1 Attach the clip-on ammeter around the B+ line.
 - 2 Gradually increase the engine speed.
 - 3 The generator current must be at least as high as the total current of all consumers.

Checking the regulator voltage with the generator tester

The battery and generator tester comes with an 8-line LC display with background illumination and is able to print out test results via an (optional) thermal printer.



Fig. 16

The generator test assesses the regulator voltage and the ripple factor of the generator voltage.

- All plug-and-socket connectors must be free of corrosion and intermittent contact.
- The generator ground connection must be OK.
- The battery should be in good condition – the idle speed voltage of the battery should be at least 12.6 Volt.
- If possible switch off all consumers.
- Perform the measurement at raised engine speed.

Checking the regulator voltage with the multimeter

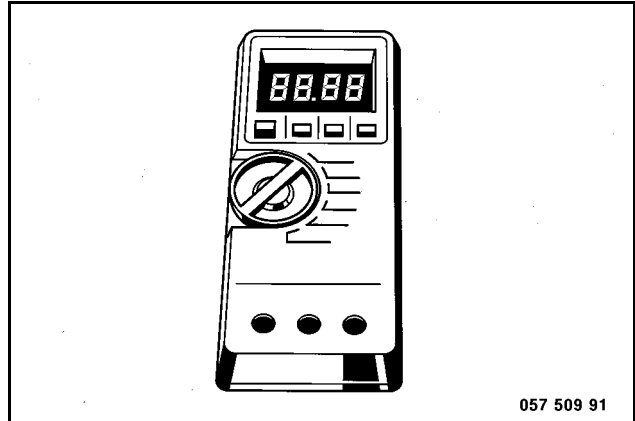


Fig. 17

- All plug-and-socket connectors must be free of corrosion and intermittent contact.
- The generator ground connection must be OK.
- The battery should be in good condition – the idle speed voltage of the battery should be at least 12.6 Volt.
- If possible switch off all consumers.
- Perform the measurement at raised engine speed.
- The voltage (B+) should adjust itself at 13 to 14 Volt.

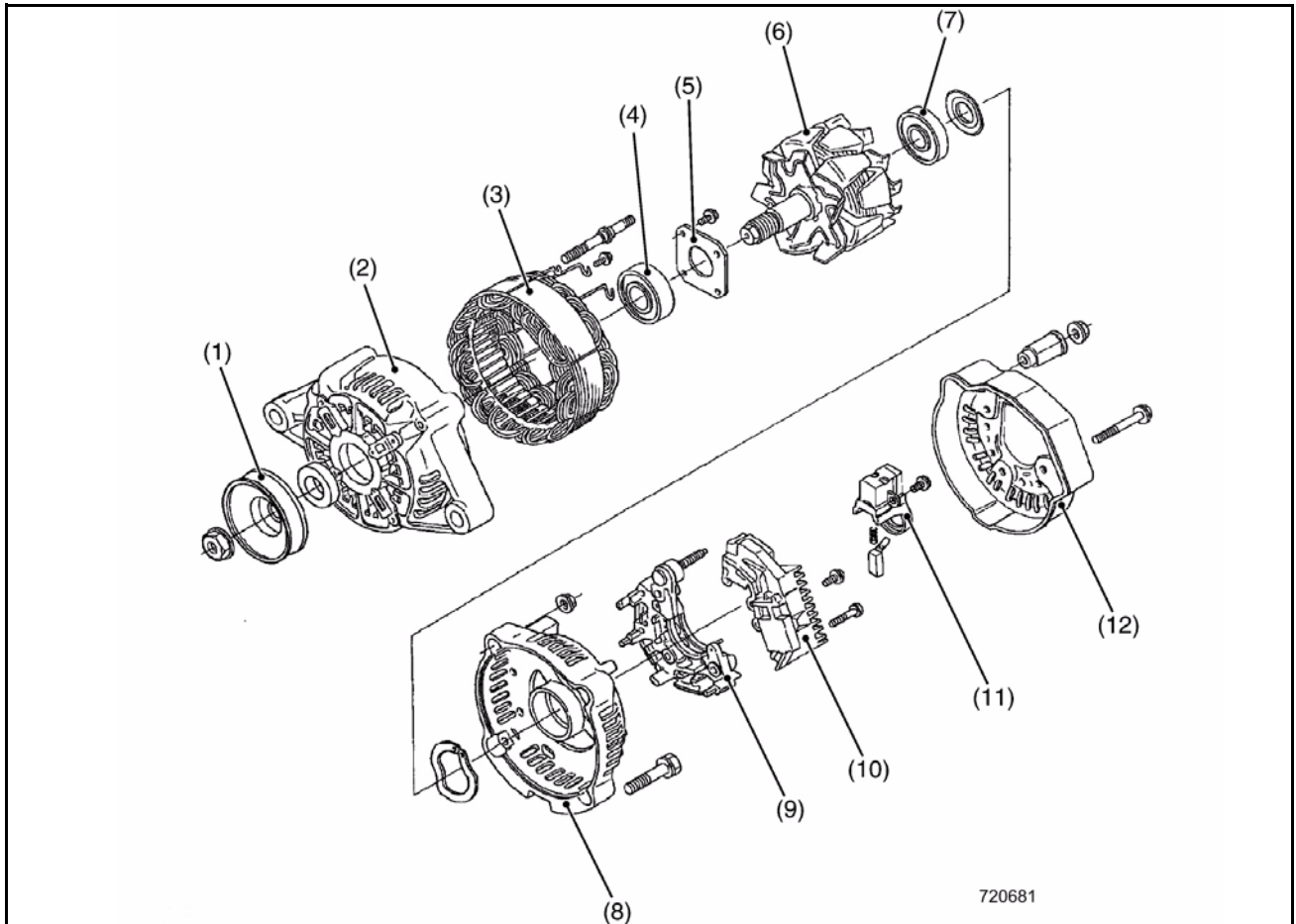


Fig. 1

- 1 V-belt pulley
- 2 Drive bearing plate
- 3 Stator
- 4 Bearing
- 5 Holding plate
- 6 Rotor
- 7 Bearing
- 8 Rear bearing plate
- 9 Rectifier
- 10 IC-regulator
- 11 Brush holder
- 12 Rear covering

Dismantling

- Remove the V-belt pulley (1).
- Remove the rear covering (12).
- Disassemble the brush holder (11).
- Disassemble the IC-regulator (10).
- Unscrew the four stator cable fastening screws.
- Take off the rectifier (9).
- Take off the rear bearing plate (8).
- Press the rotor (6) out of the drive bearing plate (2).

- Disassemble the holding plate (5).
- Use a press and a suitable device to press the bearing (4) out of the drive bearing plate (2).
- To protect the rotor against damage clamp it lightly in vice and extract the bearing (7) with a puller.

Assembly

i Note

V-belt pulley tightening torque 58.4 to 78.9 Nm.

Bearing

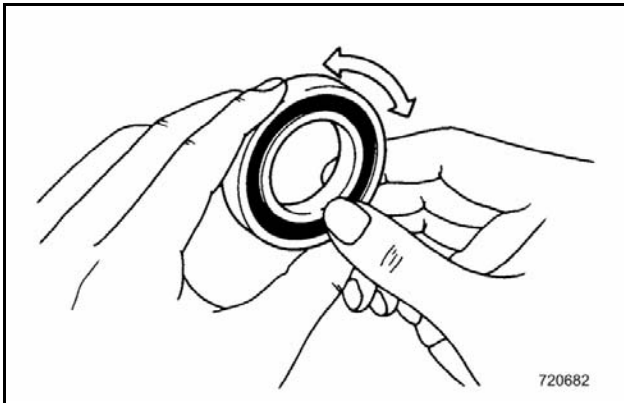


Fig. 2

- Check whether the bearing rotates without obstruction.
- Replace the bearing if it does not rotate properly.

Stator

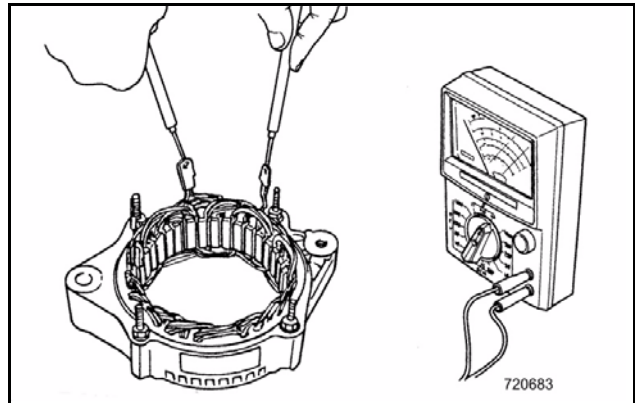


Fig. 3

- Use the resistance range of the continuity tester to measure the resistance between the individual lines of the stator winding.
- If the measuring value does not comply with the factory specification, replace the stator.
- Use the resistance range of the continuity tester to check the continuity between the individual stator windings and the core.
- Replace the stator if no infinite value is indicated.

i Note

Factory specification for resistance: Less than 1Ω

Rotor

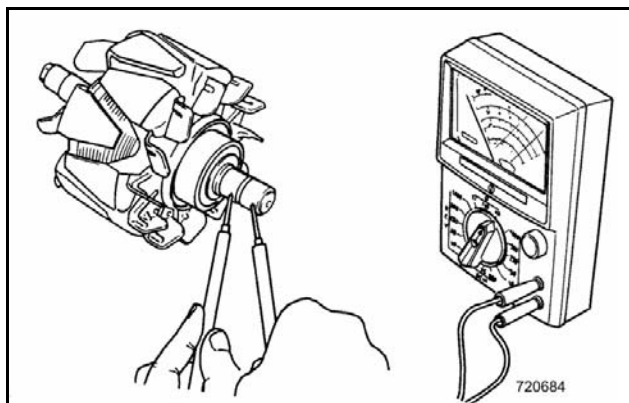


Fig. 4

- Measure the resistance between the sliprings.
- If the resistance does not comply with the factory specification, replace the rotor.
- Use the resistance range of the continuity tester to check the continuity between slipring and core.
- Replace the rotor if no infinite value is indicated.

i Note

Factory specification for resistance: 2.9Ω

Slipring

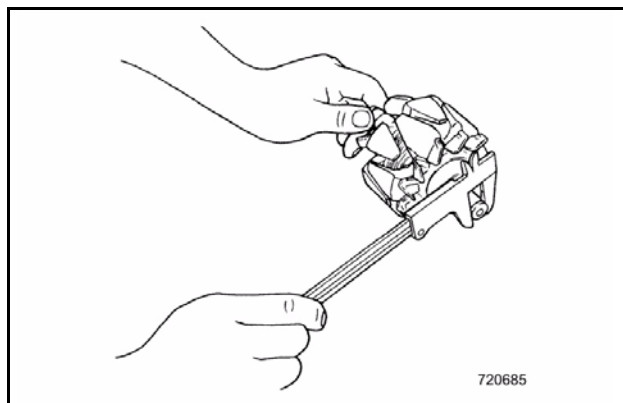


Fig. 5

- Check the slipring for score marks.
- If score marks are found rework the slipring with emery cloth or on a lathe.
- Measure the outer diameter of the slipring with a vernier caliper.
- Replace if the measuring value is below the permissible limit.

i Note

Outer slipring diameter: 14.4 mm.

Permissible limit: 14.0 mm.

Wear on carbon brushes

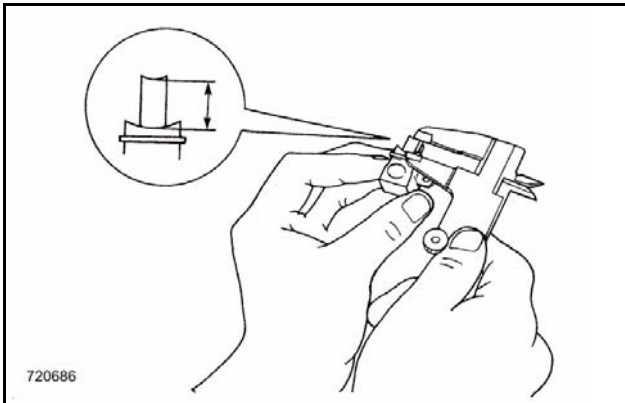


Fig. 6

- Measure the brush length with a vernier caliper.
- Replace if the measuring value is below the permissible limit.
- Make sure that the brush is light moving.
- A defective carbon brush must be replaced.

i Note

Brush: 10.0 mm.

Permissible limit: 8.4 mm.

Rectifier

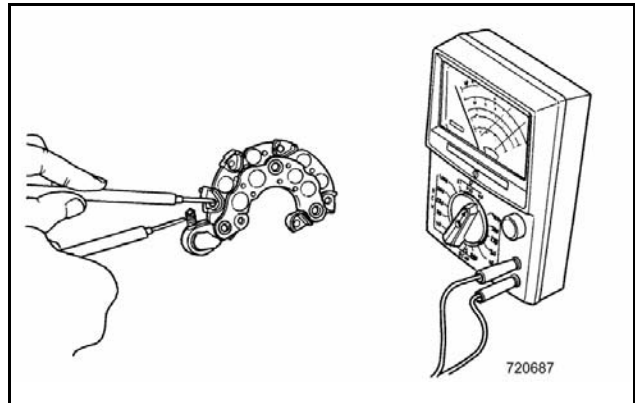


Fig. 7

- Use the resistance range of the continuity tester to check the continuity between the individual rectifier diodes.
- The rectifier is in good working order when the rectifier diode conducts to one direction and block in the other direction.

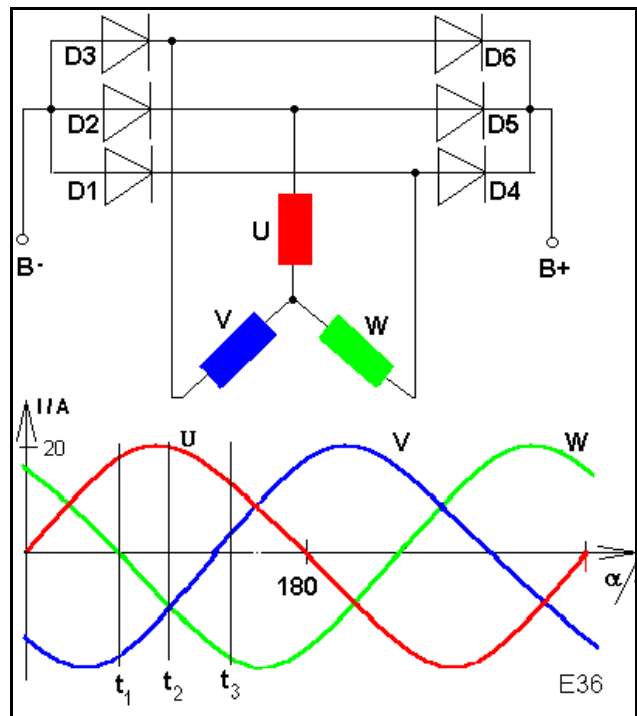


Fig. 8

Regulator

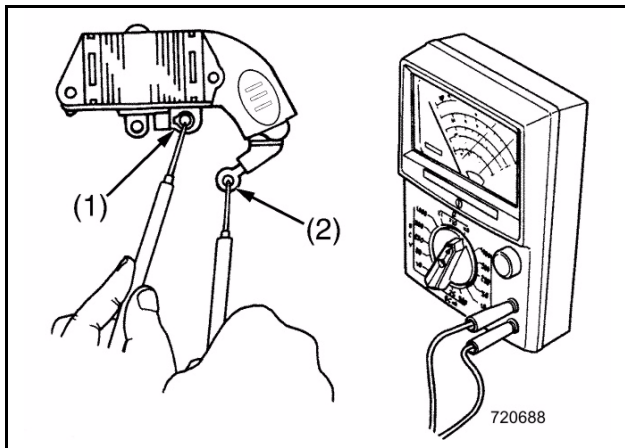


Fig. 9

- Use the resistance range of the continuity tester to check the continuity between terminal B (2) and terminal F (1) on the IC-regulator.
- The IC-regulator is in good working order when it conducts current to one direction, but not in the other direction.

4.27 Electric starter

General

Combustion engines need to be started by means of a special device, because they are not able to start by themselves. Considerable resistances caused by compression and friction must thereby be overcome.

The starter converts the electric energy stored in the battery into mechanical energy. The starter can only generate its power when a battery with appropriate capacity is available.

Duties of the starter:

- to accelerate the combustion engine to start speed with lowest possible current consumption.
- establish the gear connection between starter and combustion engine.
- to maintain this connection.
- to switch on the starter current.

After starting the engine:

- to return the starter pinion to initial position.
- to switch off the starter current.

Starter with spur gear reducer

The starter is a heat and vibration proof geared motor with a small, fast running electric motor, the armature of which drives the pinion with a reduction ratio of approx. 1:3 to increase the torque.

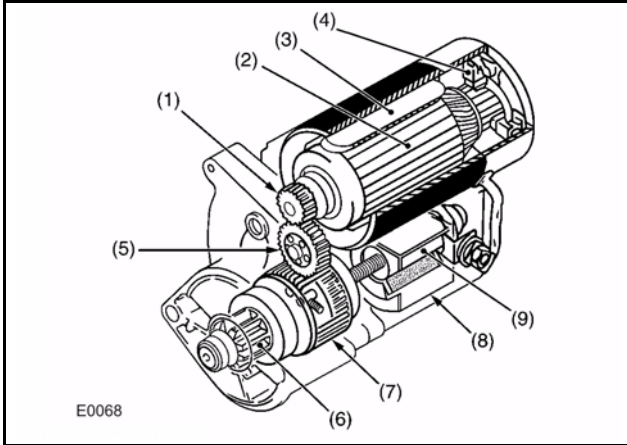


Fig. 10 with spur gear reducer

- 1 Drive gear
- 2 Armature
- 3 Exciting winding
- 4 Brush
- 5 Intermediate gear
- 6 Pinion
- 7 Freewheeling clutch
- 8 Magnetic switch
- 9 Armature

Working principle of the starter

Starter switch in position "START"

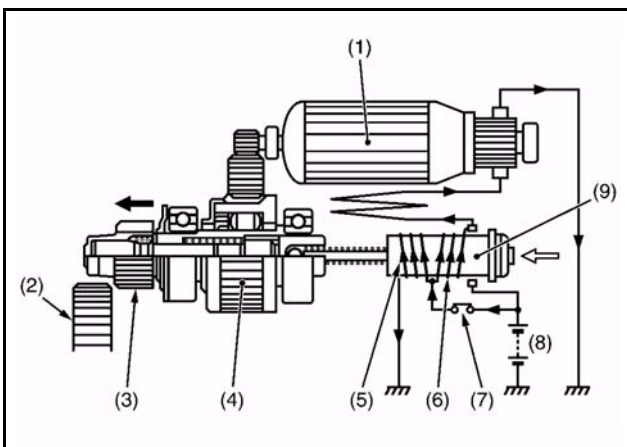


Fig. 11

With the starter switch (7) in "START" position current flows from the battery (8) through the holding winding (5) and the pick-up winding (6). The armature (9) is magnetically picked up and presses the pinion (3) outwards.

- 1 Armature

- 2 Ring gear
- 3 Pinion
- 4 Freewheeling clutch
- 5 Holding winding
- 6 Pick-up winding
- 7 Ignition switch
- 8 Battery
- 9 Armature

Pinion meshes with the ring gear

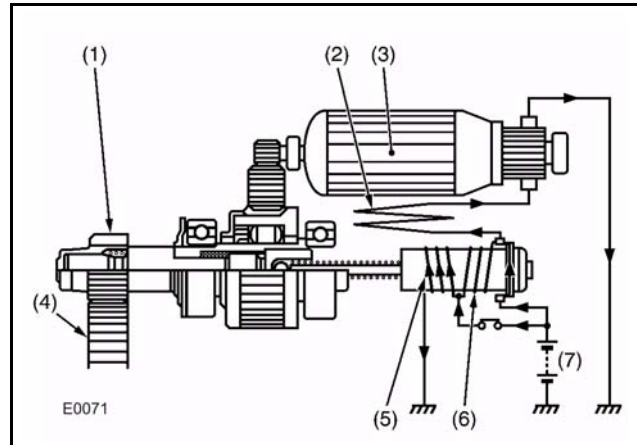


Fig. 12

When the pinion (1) meshes with the flywheel mounted ring gear (4) and the magnetic switch is closed, a strong current flows from the battery (7) directly into the exciting winding (2) and the armature winding (3), but not into the pick-up winding (6). This causes the armature (3) to rotate with high speed and drives the pinion (1), which in turn drives the ring gear (4) with a speed of 200 to 300 rpm.

- 1 Pinion
- 2 Exciting winding
- 3 Armature
- 4 Ring gear
- 5 Holding winding
- 6 Pick-up winding
- 7 Battery

Engine running

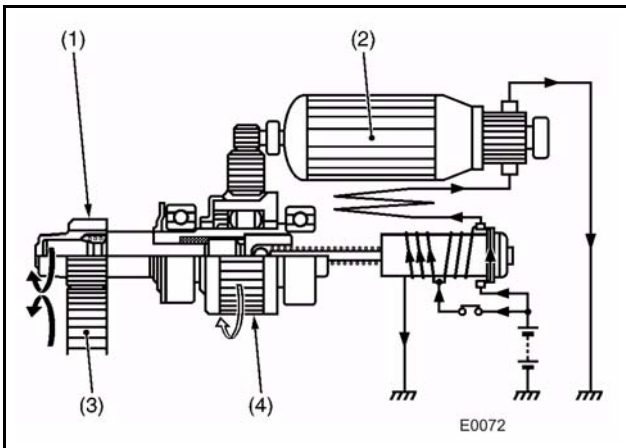


Fig. 13

Once the engine is running and drives the pinion (1) via the ring gear (3), the freewheeling clutch (4) will open and prevent the armature (2) from being driven by the engine.

- 1 Pinion
- 2 Armature
- 3 Ring gear
- 4 Freewheeling clutch

- 4 Holding winding
- 5 Pick-up winding
- 6 Ignition switch
- 7 Battery
- 8 Armature

Releasing the starter switch

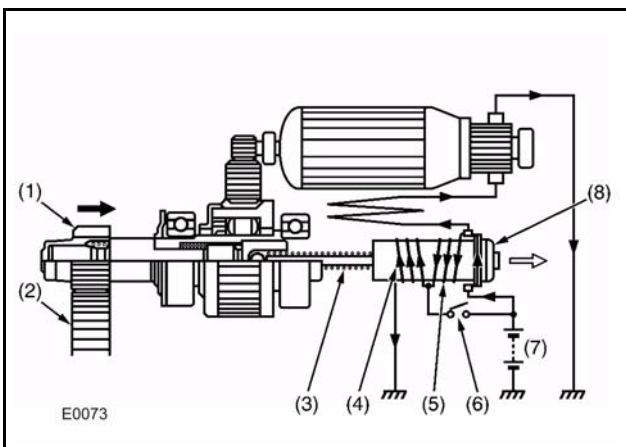


Fig. 14

When releasing the starter switch (6) it will return from position "START" to "ON" and interrupt the starter current circuit. Current will now flow from the battery (7) through the contact plate in the pick-up winding (5) and the holding winding (4).

Since both coils generate opposed magnetic fields, the magnetic field will collapse and the resetting spring (3) takes the armature (8) back to its initial position. This opens the current circuit on the contact plate and the pinion (1) is pulled back from the ring gear (2) and stops.

- 1 Pinion
- 2 Ring gear
- 3 Resetting spring

Magnetic switch

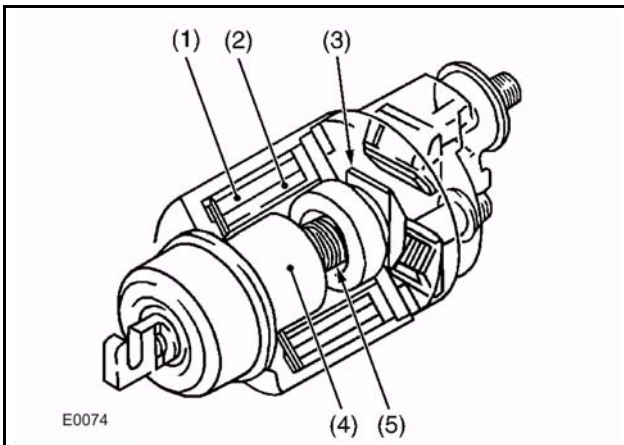


Fig. 1 Direct acting electric motor

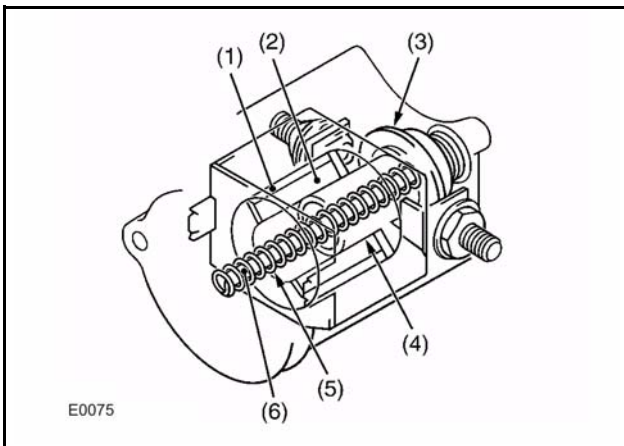


Fig. 2 Geared motor

Armature (4), contact plate (3) and armature guide (6) form a closed unit. When the ignition switch is turned to "START", the armature is picked up and causes the pinion of the clutch to disengage.

This causes the pinion and the ring gear to mesh, while the contact plate establishes a connection between the contacts, which enable the main current to flow into the armature. Once the ignition switch is opened, the resetting spring (5) will pull the armature back to initial position.

- 1 Holding winding
- 2 Pick-up winding
- 3 Contact plate
- 4 Armature
- 5 Resetting spring
- 6 Armature guide

Freewheeling clutch

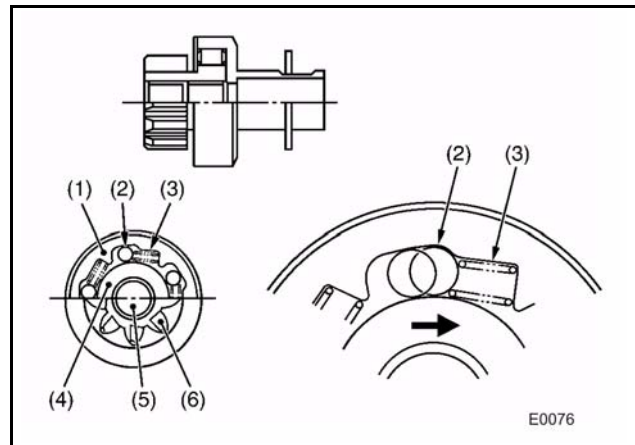


Fig. 1 Freewheeling clutch

The freewheeling clutch is designed in such a way, that the flow of force is automatically interrupted if the pinion (5) of the clutch rotates faster than the free-wheeling ring (1) at higher engine speeds.

This makes sure that the armature will only drive the ring gear, but can never be driven by the engine.

- 1 Freewheeling ring
- 2 Roller
- 3 Roller spring
- 4 Splined shaft
- 5 Pinion
- 6 Pinion

Trouble shooting "Starter"

Caution

So-called jump starting (using an additional external battery) without the battery connected is dangerous. When disconnecting the cables from the poles high inductivities (arcs, voltage peaks) may occur and destroy the electrical installation.

For purposes like e.g. purging the fuel systems, starters may be operated for maximum 1 minute without interruption. Then you should wait for at least 30 minutes (cooling down) until trying again. During the 1 minute starting period this process should not be interrupted.

Starter motors must not be cleaned with high pressure steam cleaning equipment.

The contacts on starter terminals 30, 45, 50 must be protected against unintended shorting (jump protection).

When replacing the starter the ring gear on the engine flywheel must be checked for damage and its number of teeth - if necessary replace the ring gear.

Always disconnect the battery before starting assembly work in the starter area of the engine or on the starter itself.

Note

The most frequent fault is definitely a fully discharged battery.

If the starter rotates too slowly, either the brushes are partly worn off, or parts of the exciter or armature winding is shorted. In some cases oxidized electric contacts or a soiled ground connection causing extremely high voltage losses in the overall starter system are the cause of problems.

If the starter only emits a clicking sound,- either the magnetic switch is defect / soiled (dismantle and clean)- the main contacts on the magnetic switch are worn off / soiled (scrape off carefully with a file and clean)- the starter motor is defective / soiled (remove armature and clean), cover cleaned, moveable parts with grease.

Frequently a jammed return mechanism is the reason for a starter failure.

Occasionally worn contacts are found on the magnetic return switch

Defects on the actual starter motor including pinion and carbon brushes are very rare.

With a trouble shooting chart the faults in the starter system can be narrowed down. The starter system can only work when many conditions are fulfilled at the same time.

- Immobilizer deactivated?

- Ignition switch OK?
- Travel lever in correct position?
- Emergency stop not actuated?
- Battery sufficiently charged?
- Battery poles OK?
- Main battery fuse OK?
- Main battery switch closed?
- Main starter cable (terminal 30) OK?
- Starter control cable (terminal 50) OK, voltage drop?
- Ground cable OK?
- Switching of magnetic switches OK?

The sequence of these tests is generally of no significance. It mainly depends on:

- the experience of the specialist
- the failure probability of the component to be tested and the testing effort for the respective part.

Only if all criteria mentioned above are OK, the fault must be in the starter itself. In this case it can be repaired or replaced.

Testing and measuring the starter

i Note

The highest current flows when the starter is blocked! (Short circuit current in starter). This is the case when the pinion is engaged and the starter has the duty to accelerate the flywheel to starting speed.

Function control with the starter installed

- Initiate the starting process and measure the voltage on the pickup solenoid switch (50a). At least 10.8 Volt should be applied.
- When operating the starter switch the magnetic switch must engage in the flywheel ring gear (noticeable clicking sound) and release the starting current to the starter. On most magnetic switches the voltage can be measured with the multimeter. If this does not happen even though voltage is applied, replace the magnetic switch.

Testing and measuring the starter

Function control with the starter removed

⚠ Caution

Fasten the starter to make sure that it will not come loose during the test.

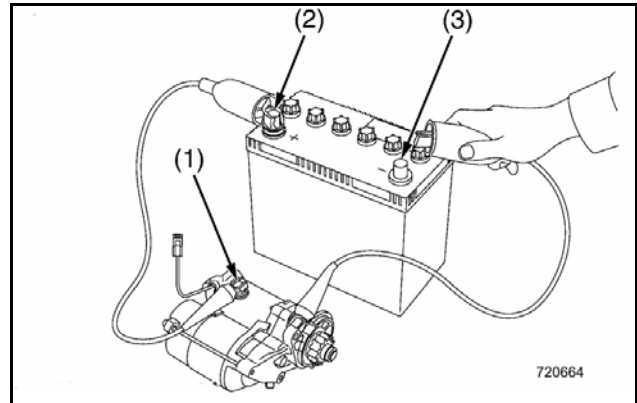


Fig. 2

- Connect a jumper lead between start terminal (1) and battery plus (2).
- Connect a jumper cable instantaneously between starter housing and battery minus (3).

i Note

If the motor does not start, the starter is defective. Repair or replace the starter.

Checking the magnetic switch

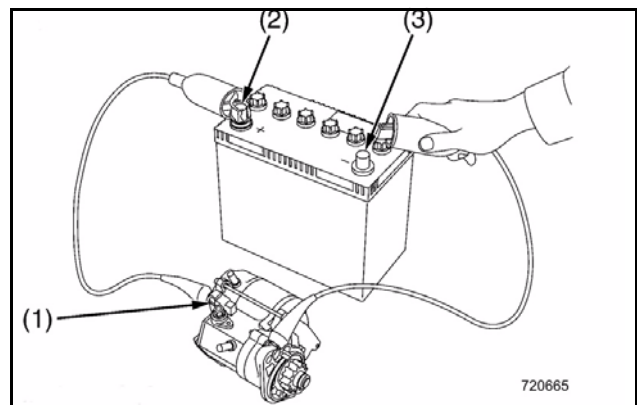


Fig. 3

- Connect a jumper lead between start terminal (1) and battery plus (2).
- Connect a jumper cable instantaneously between starter housing and battery minus (3).

i Note

If the pinion does not disengage, the magnetic switch is defective. Repair or replace the starter.

Continuity test for the magnetic switch

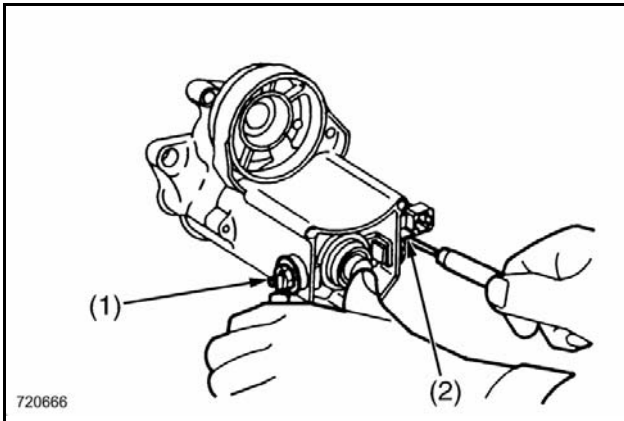


Fig. 4

- Use a continuity tester to check for continuity between terminal (1) and terminal (29) while holding the pin depressed.
- Replace the magnetic switch if no continuity is detected.

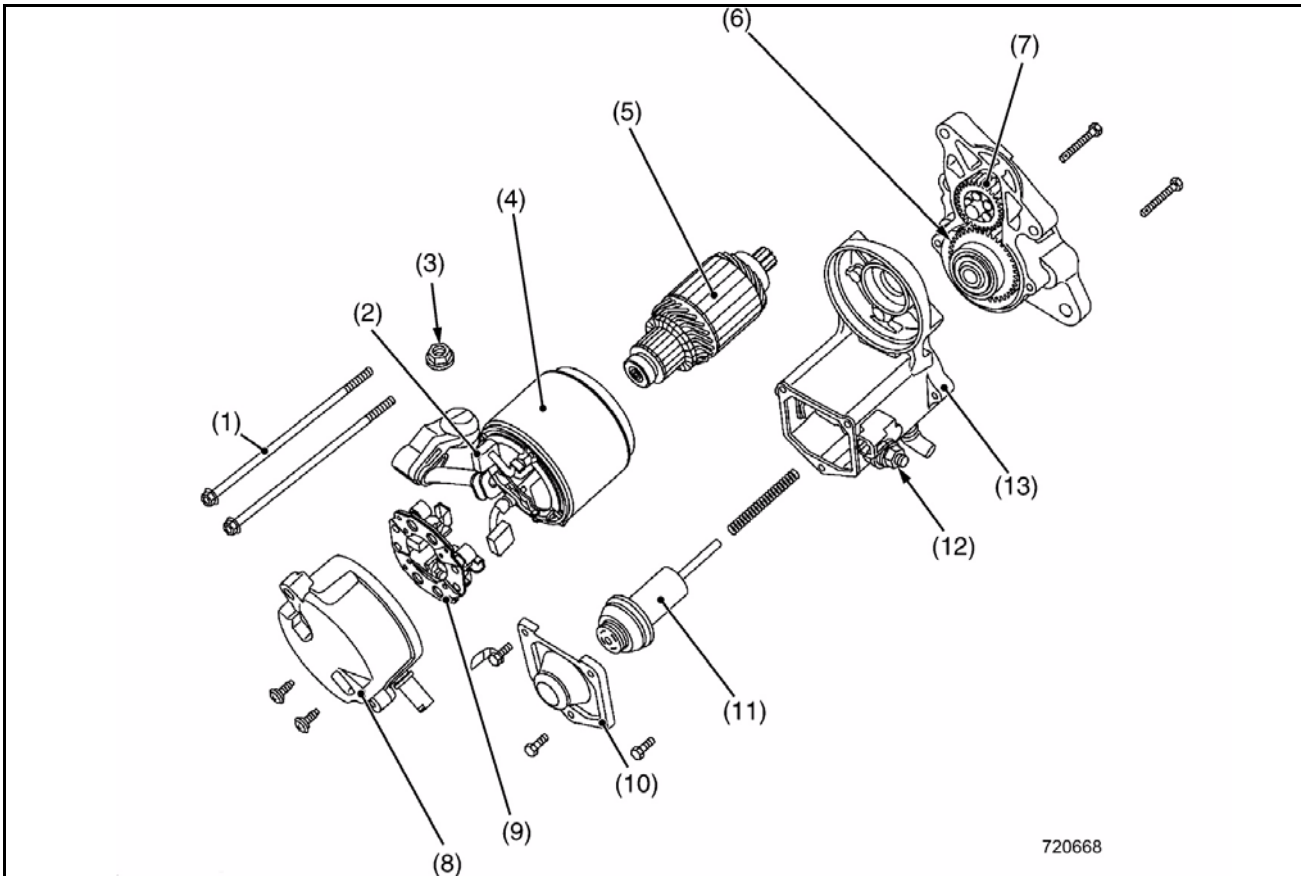


Fig. 1

- 1 Through bolt
- 2 Brush
- 3 Terminal nut C
- 4 Starter frame
- 5 Armature
- 6 Freewheel
- 7 Intermediate gear
- 8 Housing cover
- 9 Brush holder
- 10 Magnetic switch cover
- 11 Piston
- 12 Terminal nut B
- 13 Housing

Dismantling

- Unscrew the terminal nut (3) and take off the connecting cable.
- Disassemble the two through bolts (1).
- Take off the motor.
- Disassemble the housing cover (8).
- Compress the spring and take the carbon brush off the brush holder.
- Disassemble the brush holder (9).
- Separate the armature (5) from the starter frame (4).
- Disassemble the housing (13).
- Disassemble intermediate gear (7) and freewheel (6).
- Remove the magnetic switch cover (9).
- Disassemble the piston (11).

⚠ Caution

Do not damage carbon bushes or collector.

Assembly

- Apply some grease to intermediate gear and freewheel. Tightening torque for terminal nut (12): 5.88 to 11.8 Nm

Freewheel

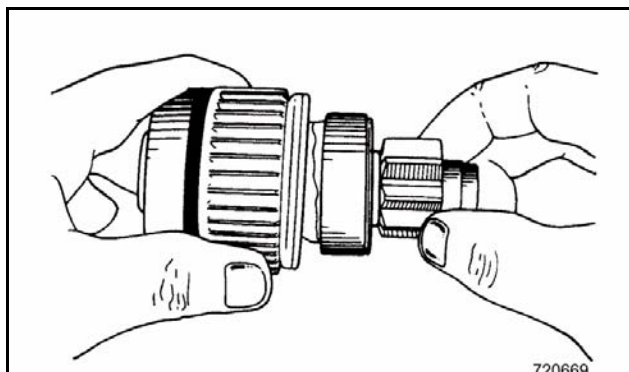


Fig. 2

- Check the pinion, replace the complete freewheel if signs of wear or damage are found.
- Make sure that the pinion rotates freely in the freewheeling direction and does not slip in starting direction.
- If the pinion slips or does not rotate to both directions, replace the freewheel assembly.

i Note

Do not wash the grease in the freewheel out with chemicals or oils.

Collector and mica capacitor

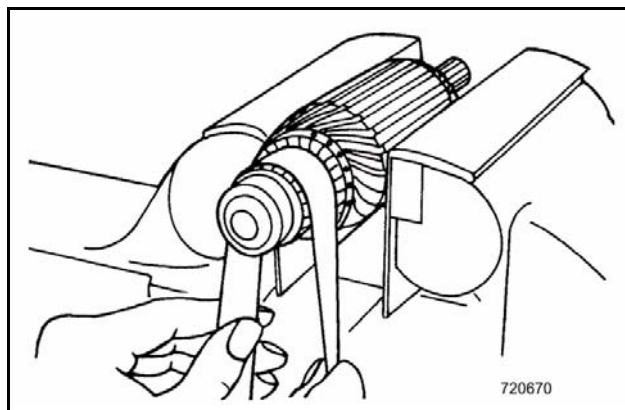


Fig. 3

- Check the contact surface of the collector for wear and rework it with sanding paper if it is slightly worn.

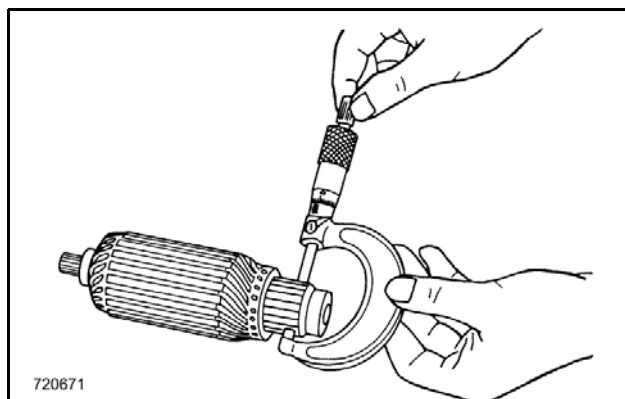


Fig. 4

- Measure the outer diameter of the collector at several points with an outside micrometer.
- If the smallest outside diameter is below the permissible limit, the rotor must be replaced.

i Note

Factory specification, collector outside diameter: 30.0 mm.

Permissible limit: 29.0 mm.

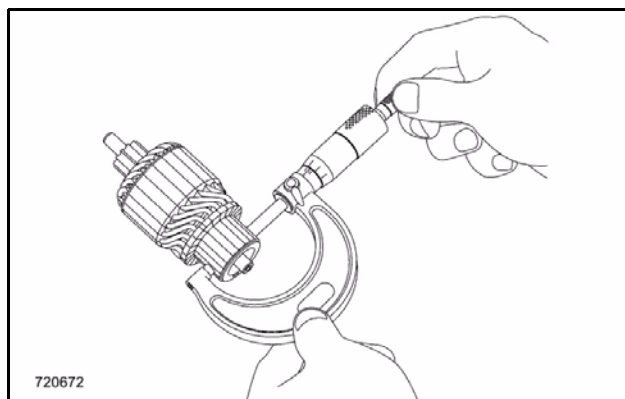


Fig. 5

- If the difference between the outer diameter measuring values exceeds the permissible limit have the

collector reworked to the factory specifications on a lathe.

i Note

Factory specification, difference of outer diameter measurements: Less than 0.02 mm.

Permissible limit: 0.05 mm.

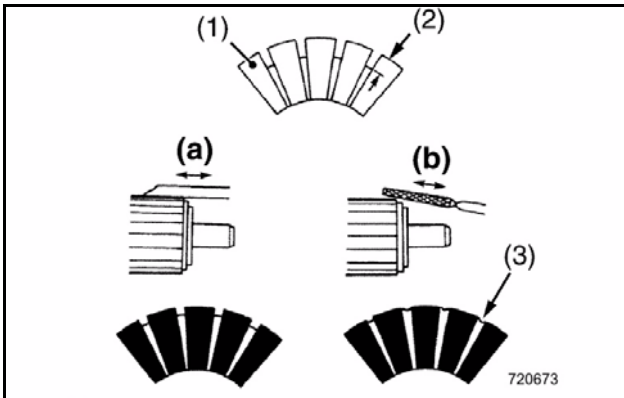


Fig. 6

- 1 Segment
- 2 Counterdraft
- 3 Collector

a) correct

b) not correct

- Measure the counterdraft on the collector.
- If the counterdraft falls short of the lower limit value, correct it with a saw blade and bevel the segment edges.

i Note

Factory specification, collector counterdraft: 0.5 to 0.8 mm

Permissible limit: 0.2 mm.

Wear on carbon brushes

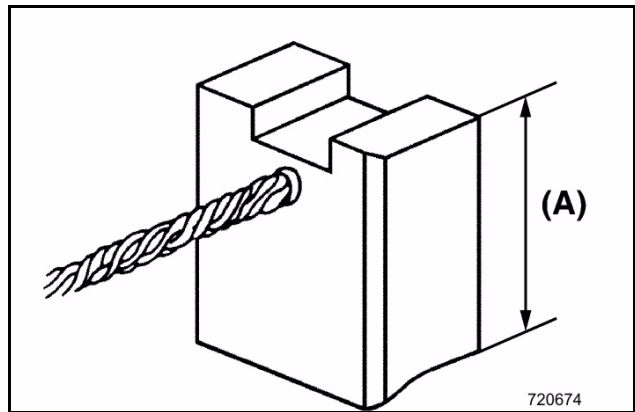


Fig. 7

- If the contact area of the carbon brush is dirty or dusty, clean it with emery cloth.
- Measure the brush length (A) with a vernier caliper.
- If the length is shorter than the permissible limit, the brush holder must be replaced.

i Note

Factory specification, brush length: 16.0 mm.

Permissible limit: 10.5 mm.

Brush holder

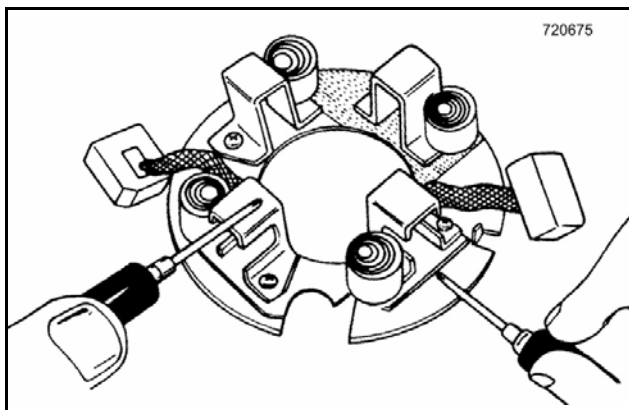


Fig. 8

- Use a continuity tester to check the continuity between brush holder and holder carrier.
- If continuity is found replace the brush holder.

Armature coil

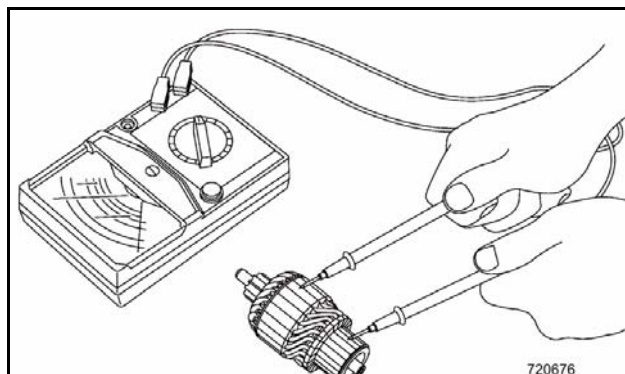


Fig. 9

- Use the resistance range of the continuity tester to check the continuity between collector and armature coil.
- If continuity is found replace the armature.

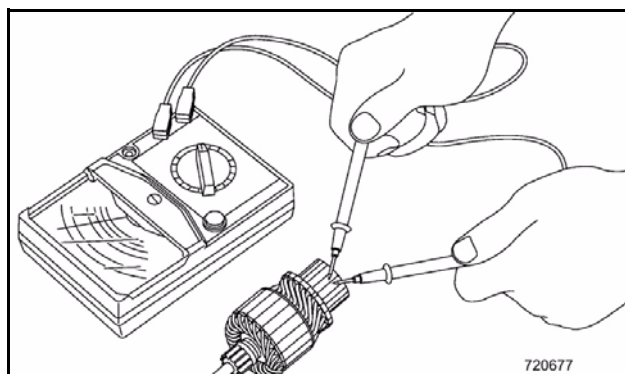


Fig. 10

- Use the resistance range of the continuity tester to check the continuity between the collector segments.
- If no continuity is found replace the armature.

Field coil

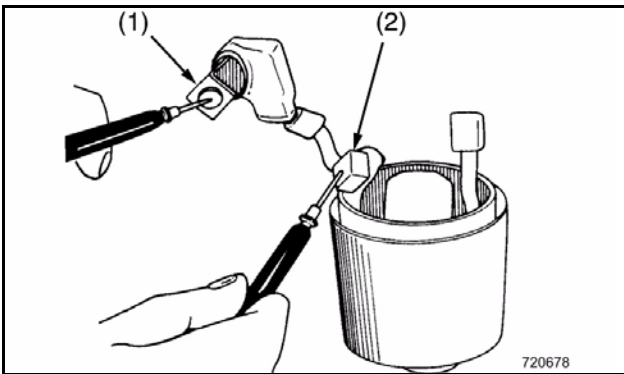


Fig. 11

- 1 Replace the
- 2 Brush
- 3 Stator

- Use the continuity tester to check the continuity between line (1) and brush (2).
- If no continuity is found replace the stator frame.

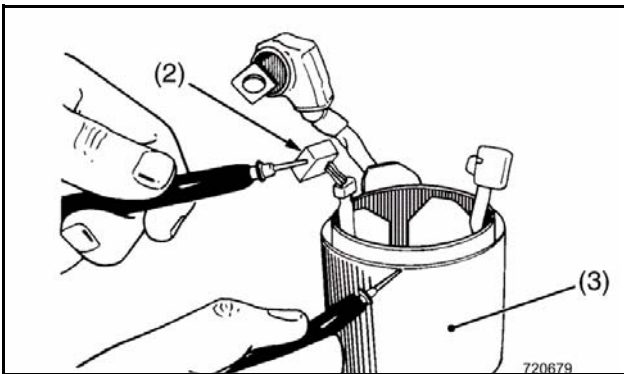


Fig. 12

- Use the continuity tester to check the continuity between brush (2) and stator (3).
- If continuity is found replace the stator frame.

4.29 Glow plugs

During preheating the glow plugs are energized via terminals (17 and 19) on the ignition switch.

When starting the glow plugs are energized via terminals (17, 19 and 50a) on the ignition switch.

Measuring the glow plug voltage (R02)

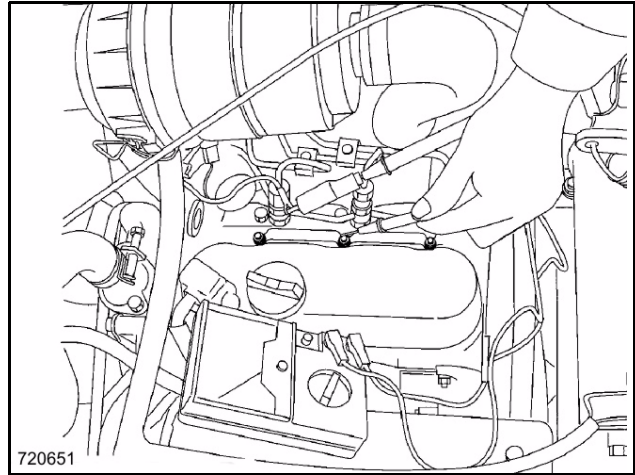


Fig. 13

- Turn the ignition switch to preheating position and check for voltage between the cable terminal and the engine block with a line tester.

Continuity test

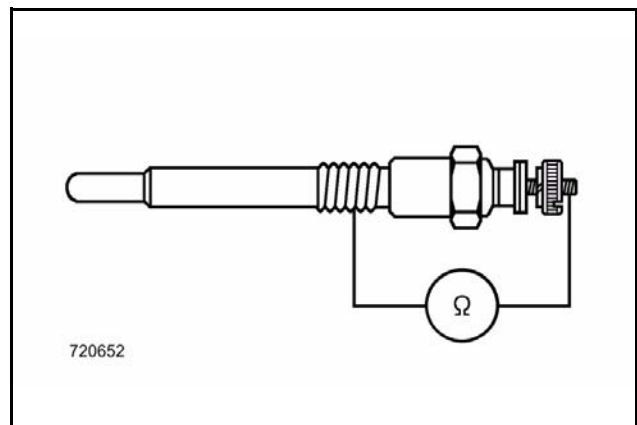


Fig. 14

- Remove the glow plug.
- Use a line tester to check the resistance between glow plug connection and glow plug body.
- If the factory specification is not indicated, the glow plug is defective.

i Note

Factory specification of resistance approx. 0.9 Ω

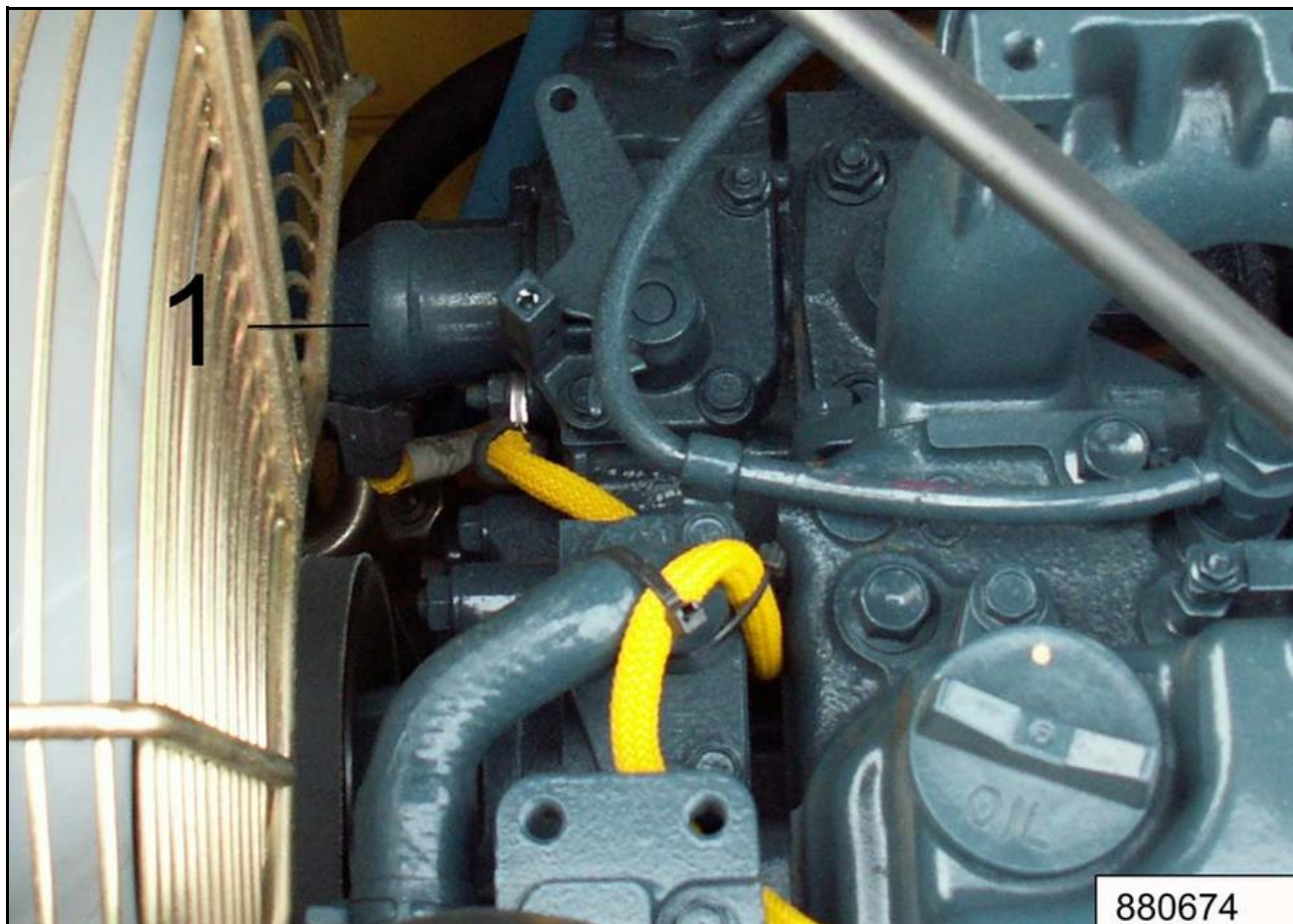


Fig. 1

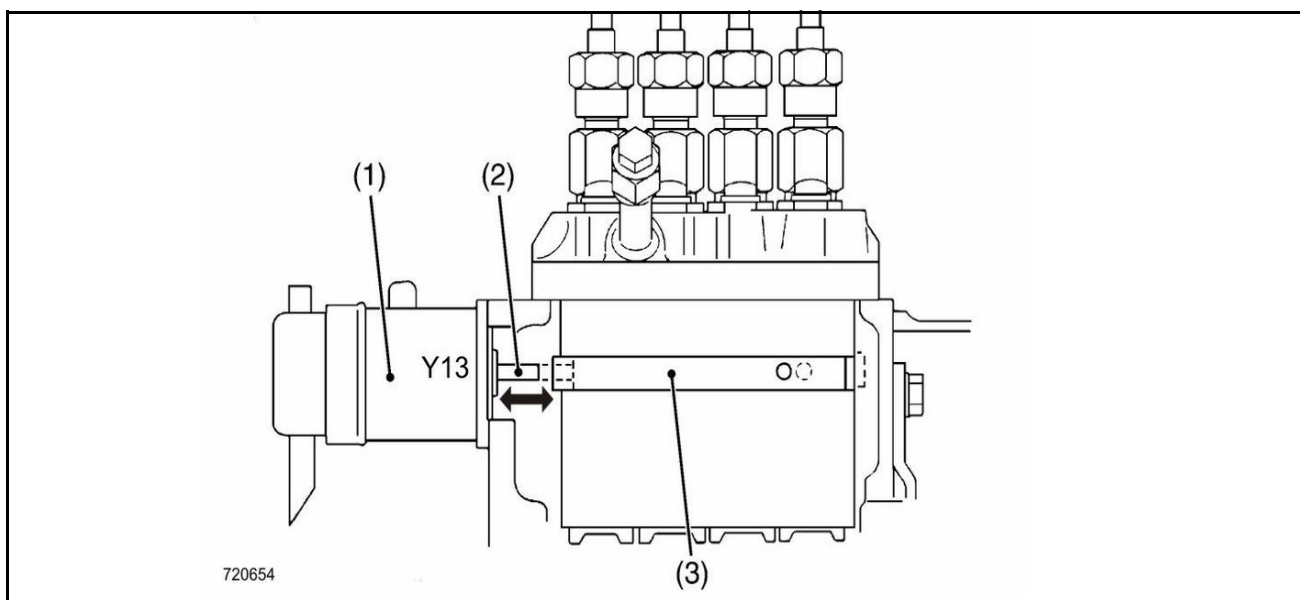


Fig. 2

- 1 Engine shut-down solenoid Y13
- 2 Armature
- 3 Control rod

initial position, while the control rod (3) is blocked in position "No fuel injection".

Battery current forces the armature (2) inside the shut-off solenoid (1) to engage to the left, enabling the control rod to move freely. Once the battery current is switched off, the spring will return the armature (2) to

Testing the function

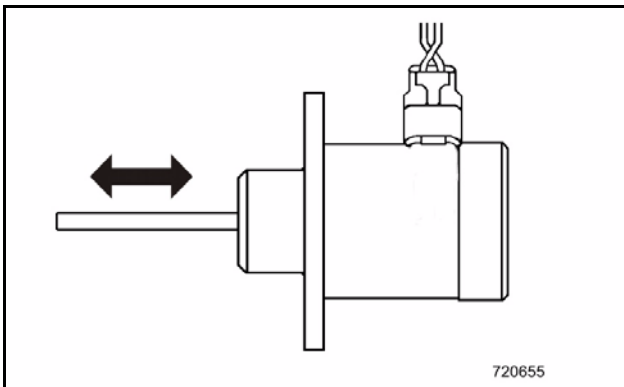


Fig. 3

⚠ Danger**Danger of burning!****The shut-down solenoid heats up during the starting process.**

- Remove the shut-down solenoid, do not detach the plug from the solenoid.
- Connect the solenoid housing to engine ground (ground supply).
- Preheat or start the engine.

i Note

During preheating and starting the pin is retracted and it moves out again when the ignition is switched off.

Testing the shut-off solenoid



Fig. 4

- 1 Plug
- 2 Battery
- 3 Switch for holding winding (H)
- 4 Switch for pick-up winding (P)

⚠ Caution

During inspection do not apply current to the pick-up winding for longer than two seconds.

i Note

P: Terminal for pick-up winding, resistance approx. 0.38Ω

H: Terminal for holding winding, resistance approx. 16Ω

- Remove the shut-down solenoid.
- Connect bridging cables between terminal P on the pick-up winding and switch (4), as well as between switch (4) and battery plus.
- Connect bridging cables between terminal H on the holding winding and switch (3), as well as between switch (3) and battery plus.
- Connect a bridging cable between the shut-down solenoid housing and battery minus (ground supply).
- Switch the switch (4) on and off..

i Note

When switching the switch (4) on the pin is retracted and it will move out again when the switch (4) is switched off.

- Switch on switch (3) first and switch (4) after, the pin is retracted into the solenoid body and remains in this position when switch (4) is switched off.

4.31 Engine oil pressure monitoring

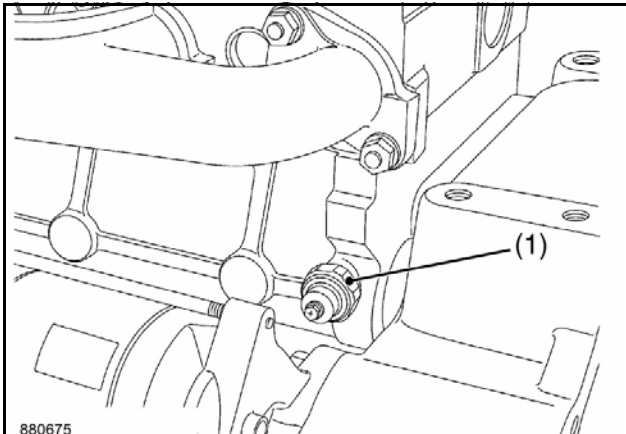


Fig. 1 (1) Oil pressure switch

The control light (c, red) (Fig. 2) flashes when the engine pressure is too low, the engine will be shut down 10 seconds later.

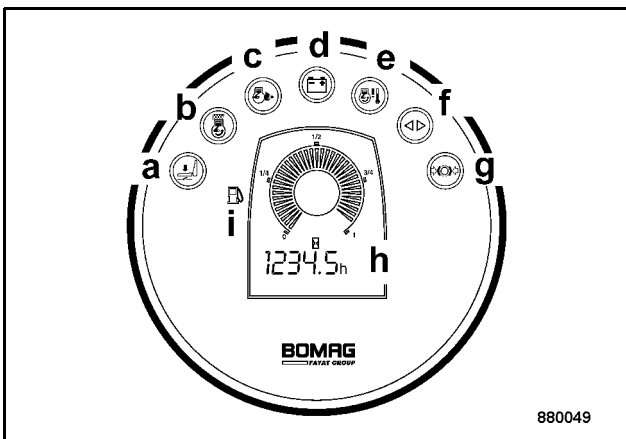


Fig. 2 Instrument cluster

4.32 Coolant temperature monitoring



Fig. 1 Temperature switch

When the coolant temperature is exceeded the warning buzzer will sound, the control lamp (e, red) (Fig. 2) will flash and the engine will be shut down after 2 minutes.

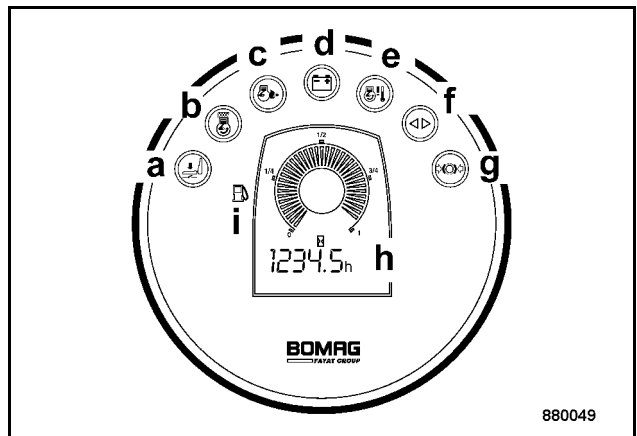


Fig. 2 Instrument cluster

4.33 Modules

In the latest generation of machines BOMAG uses machine programmable modules. A module mainly consists of a programmable microprocessor with additional circuitry for inputs and outputs.

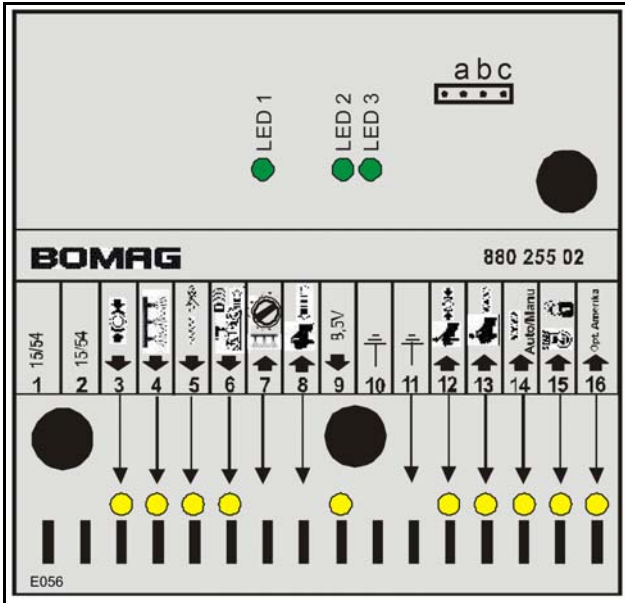


Fig. 1 Module

The modules have control lights on inputs and outputs to monitor the applied signals.

Signals

Analog signals

Process states are continuous (analog) when they can be mapped by means of a real number, e.g. temperature = 65.5 °C. The sensor converts a continuous process status into an analog signal. If the control unit needs the numerical value of the analog signal, an analog-digital conversion is required.

Analog signals are needed to control, display or monitor limit values. Checking the limit values of physical quantities leads to the binary information: limit value reached/not reached.

Binary signals

Process states are bivalent (binary) if they have only 2 possible states of truth, such as e.g. button pressed/not pressed, object present/not present. The two states of truth are mapped by means of defined states of an information carrier, e.g. 'not pressed' equals 0 V, 'pressed' equals 24 V. These states are described with {0,1} or {false, true}

4.34 Switching the vibration on

Push button (S13) switches ground potential to the module (A03 Pin 13). A03 then switches the solenoid valve (Y71) accordingly.

When moving the travel lever fully to forward or reverse vibration is switched off in dependence on the position of angle sensor (B 39) when a speed of 6 km/h is exceeded.

If the speed is fallen short of (< 6 km/h) the vibration switches on again.

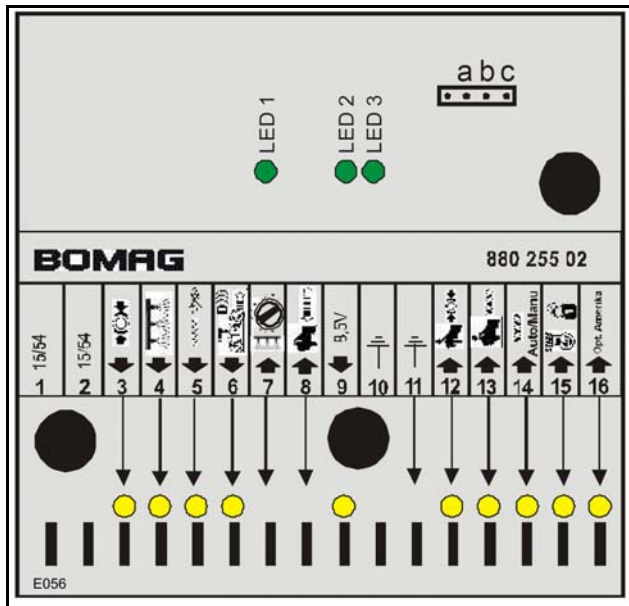


Fig. 1 Module

4.35 Switching the pressure sprinker system on

Interval switch (A01) switches + potential to module (A03 on PIN 1). The module switches relay (K79, terminal 86) via (Pin 4). This requires that the travel lever has been moved out of 0-position. The module now switches relay (K79) in dependence on the set interval. The contact of relay (K79) then activates the water pump.

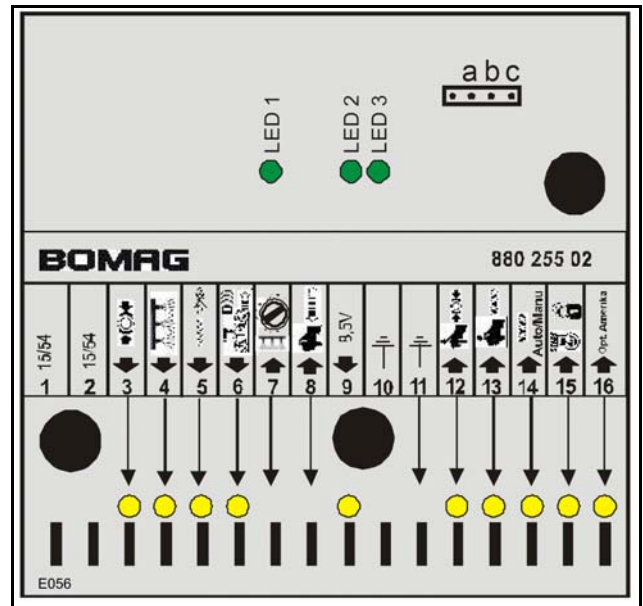


Fig. 1 Module

4.36 Fuses

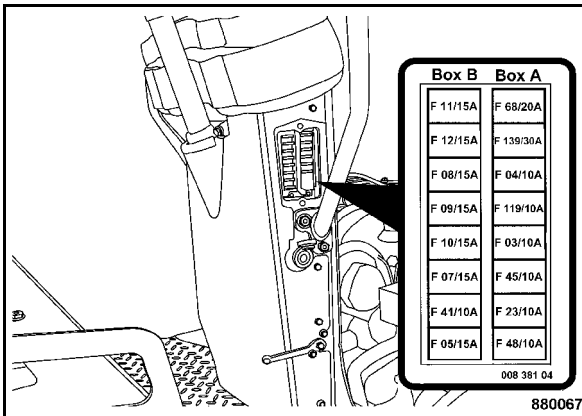


Fig. 2

No. 1 = Fuses**⚠ Danger****Fire hazard!**

Do not use fuses with higher ampere ratings and do not repair fuses with a piece of wire.

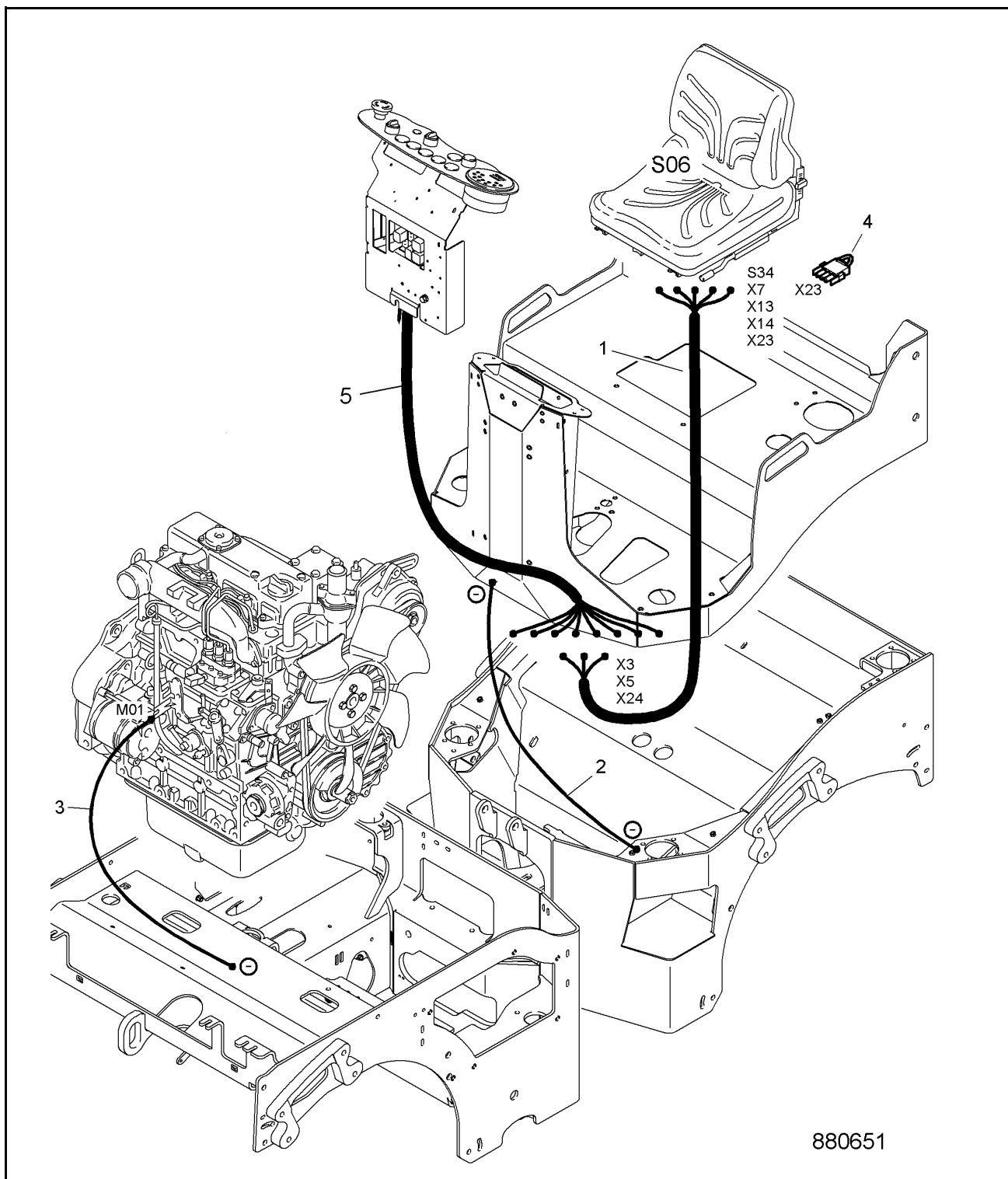
Fuse box A

- (1) 20A = (F68) Potential 30
- (2) 30A = (F139) Engine solenoid
- (3) 10A = (F04) Gauges
- (4) 10A = (F119) engine
- (5) 10A = (F03) vibration
- (6) 10A = (F45) edge cutter
- (7) 10A = (F23) Warning horn
- (8) 10A = (F48) pre-heating system

Fuse box B

- (1) 15A = (F11) head lights, left ¹
- (2) 15A = (F12) head lights, right*
- (3) 15A = (F08) direction indicators* and working head lights
- (4) 15A = (F09) parking and tail light, left*
- (5) 15A = (F10) parking and tail light, right*
- (6) 15A = (F07) hazard light*
- (7) 10A = (F41) Flashing beacon*
- (8) 15A = (F05) Socket*

¹ Optional equipment



880651

Fig. 1

- 1** = Wiring loom, driver's seat
- 2** = Ground cable, rear frame
- 3** = Ground cable, front frame
- 4** = Wiring loom, omission of seat contact
- 5** = Wiring loom, central electrics
- S06** = Seat contact switch
- S34** = Switch for edge cutter

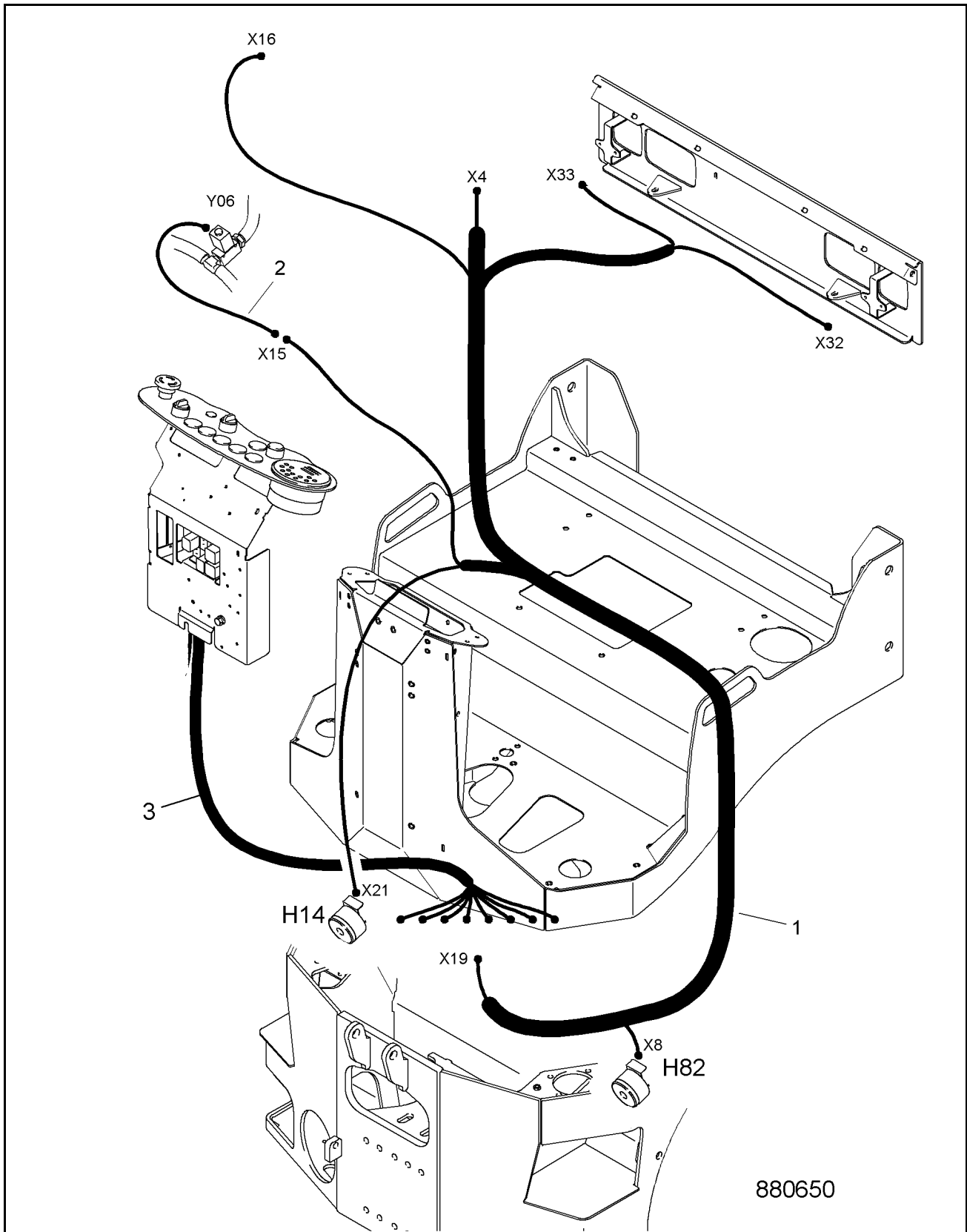


Fig. 2

- 1** = Wiring loom, rear frame
- 2** = Wiring loom, solenoid valve for sprinkling system
- 3** = Wiring loom, central electrics
- H14** = Warning buzzer for reverse travel

- H82** = Warning buzzer for seat contact
- Y06** = Solenoid valve, water sprinkling system

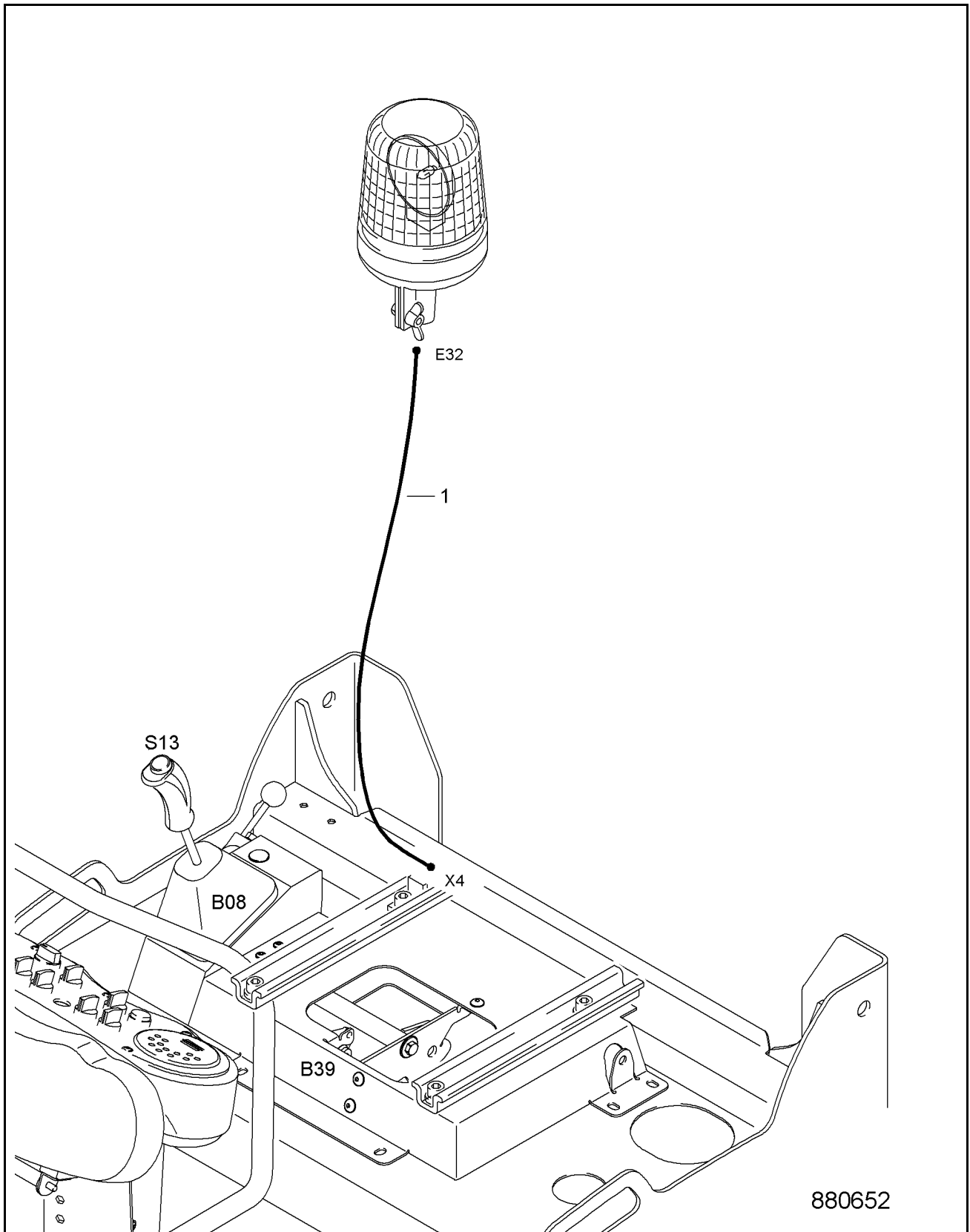


Fig. 3

- 1** = Wiring loom, flashing beacon
- B08** = Proximity switch, travel lever "0"-position
- B39** = Transducer, travel lever
- E32** = Identification light
- S13** = Vibration push button

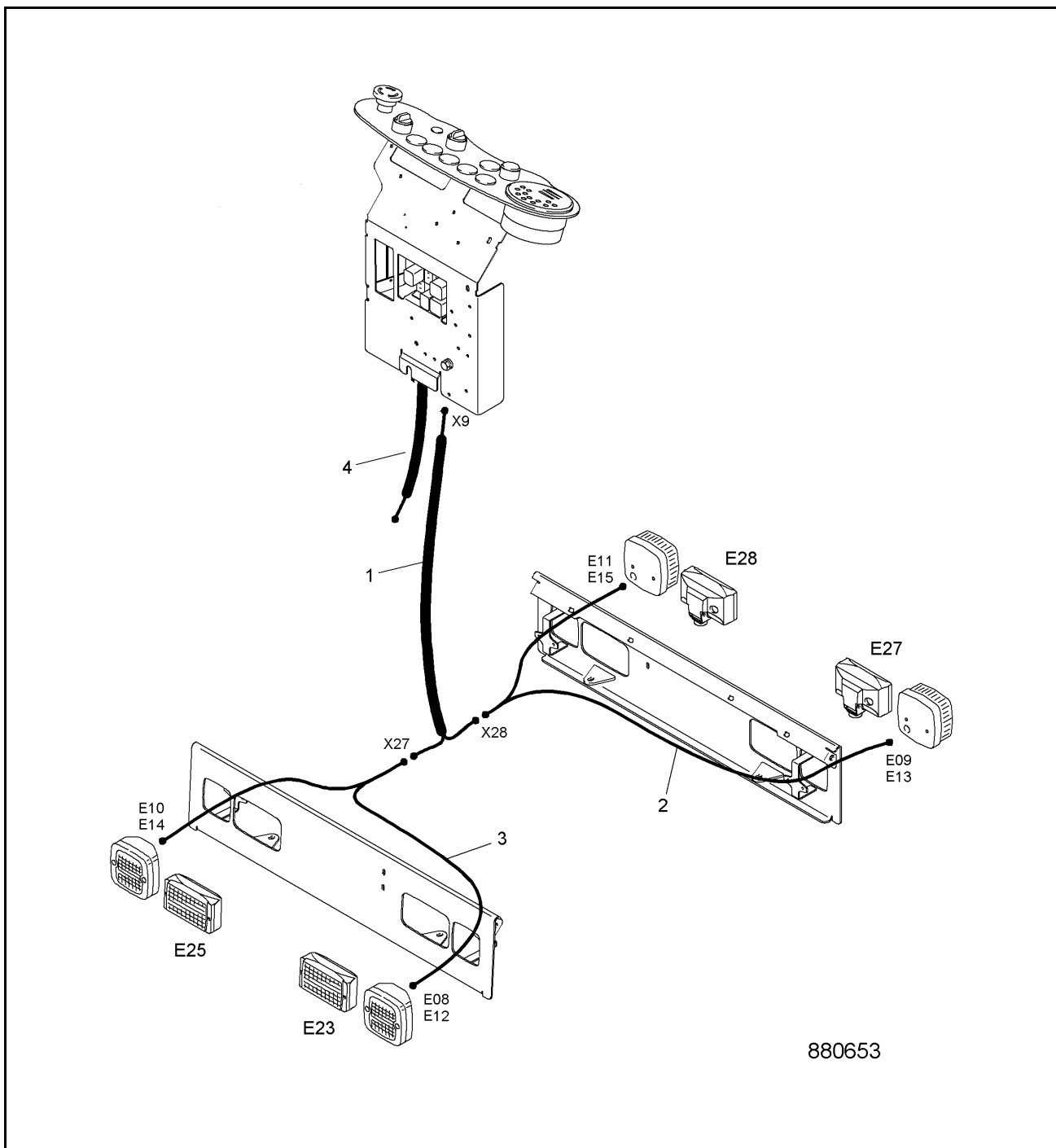


Fig. 4

- | | | | |
|------------|--|------------|--------------------------|
| 1 | = Wiring loom E2-StVZO lighting | E15 | = Tail light, rear right |
| 2 | = Wiring loom E2-StVZO lighting | E23 | = Headlight, front left |
| 3 | = Wiring loom E2-StVZO front | E25 | = Headlight, front right |
| 4 | = Wiring loom E2-StVZO central electrics | E27 | = Headlight, rear left |
| E08 | = Direction indicator front left | E28 | = Headlight, rear right |
| E09 | = Flash light, rear left | | |
| E10 | = Flash light, front right | | |
| E11 | = Flash light, rear right | | |
| E12 | = Parking light, front left | | |
| E13 | = Tail light rear left | | |
| E14 | = Parking light, front right | | |

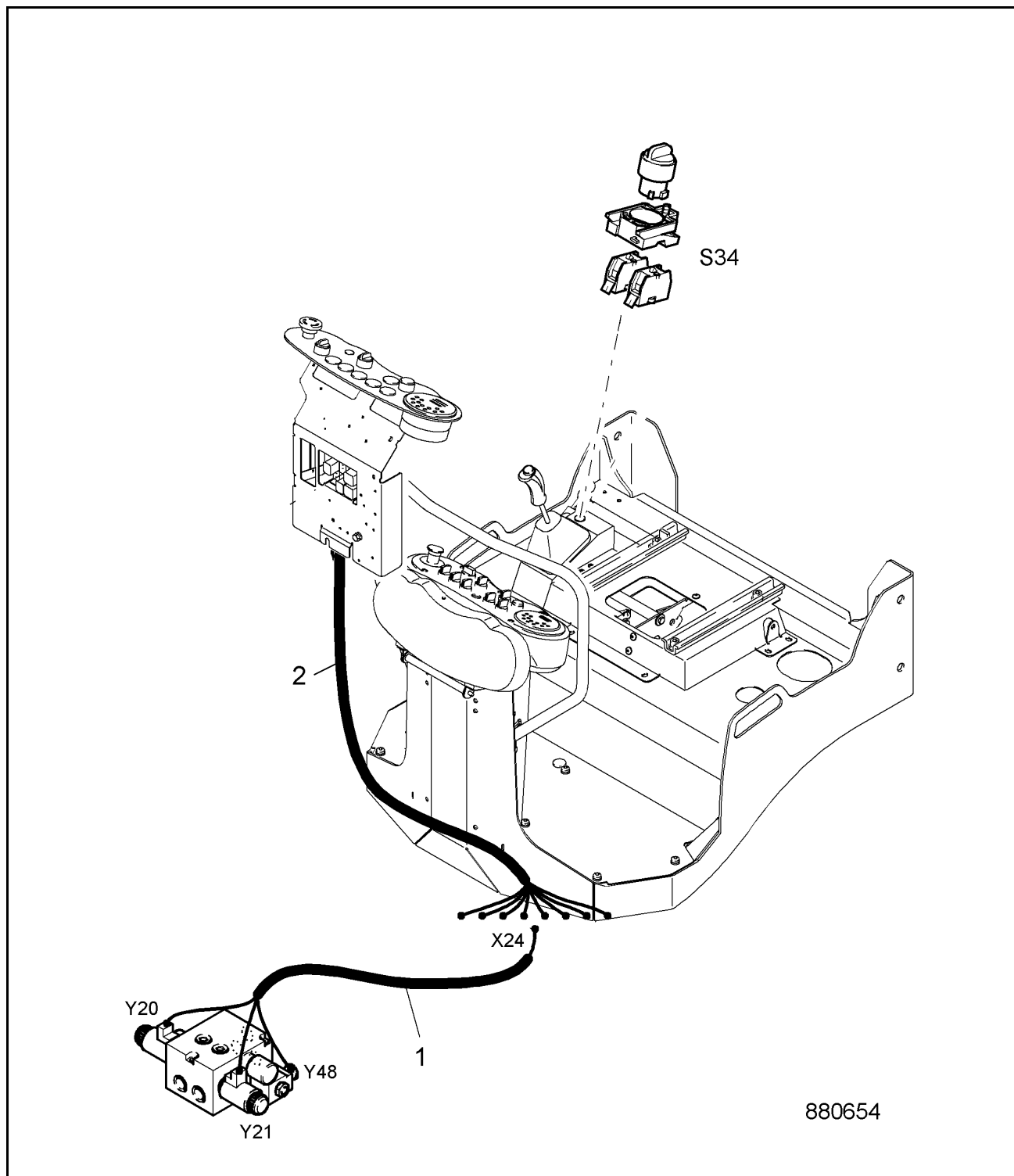


Fig. 5

- 1** = Wiring loom, edge cutter
- 2** = Wiring loom, central electrics
- S34** = Switch for edge cutter
- Y20** = Solenoid valve, edge cutter down
- Y21** = Solenoid valve, edge cutter up
- Y48** = Solenoid valve, edge cutter, hydraulic switch-over

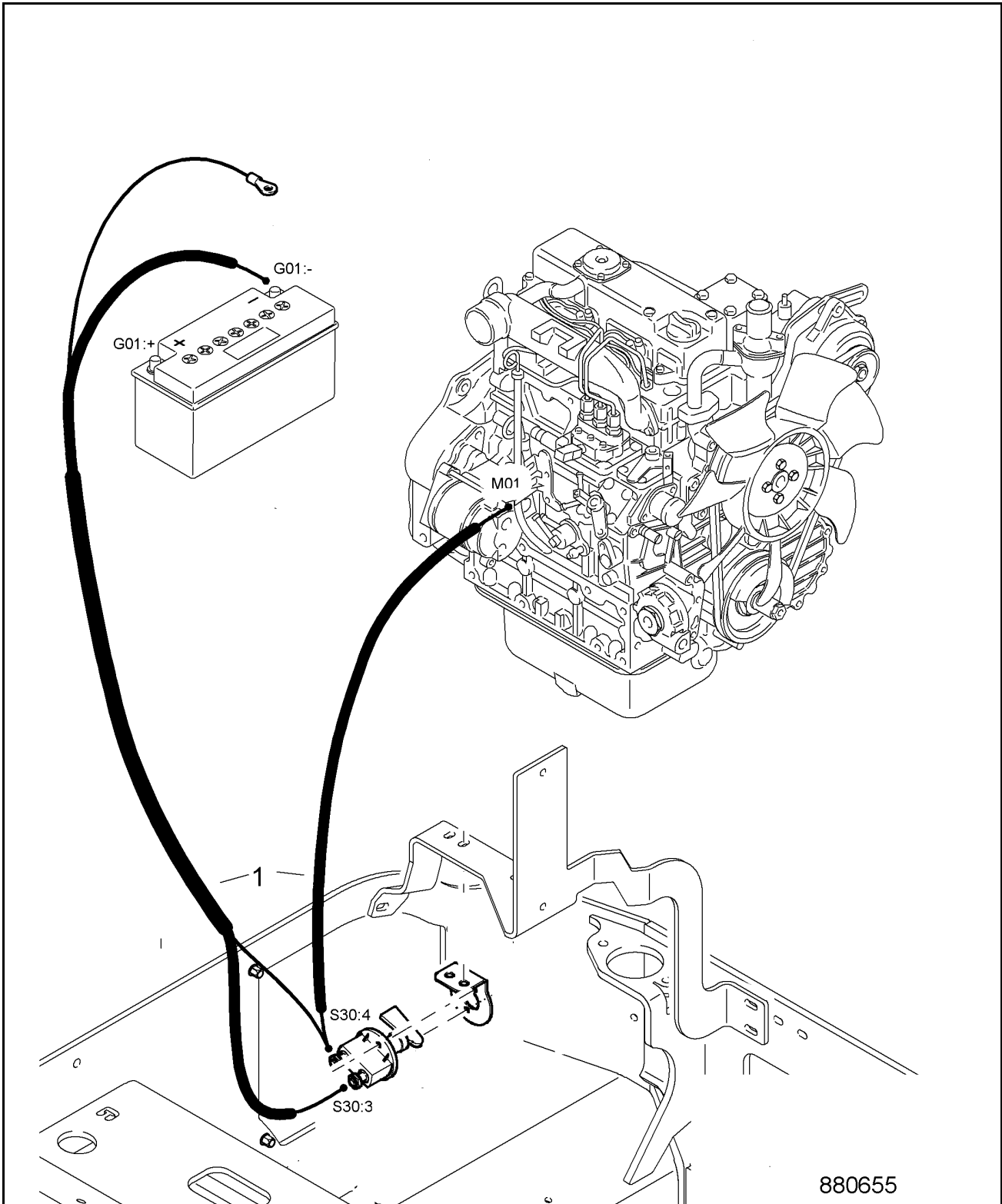
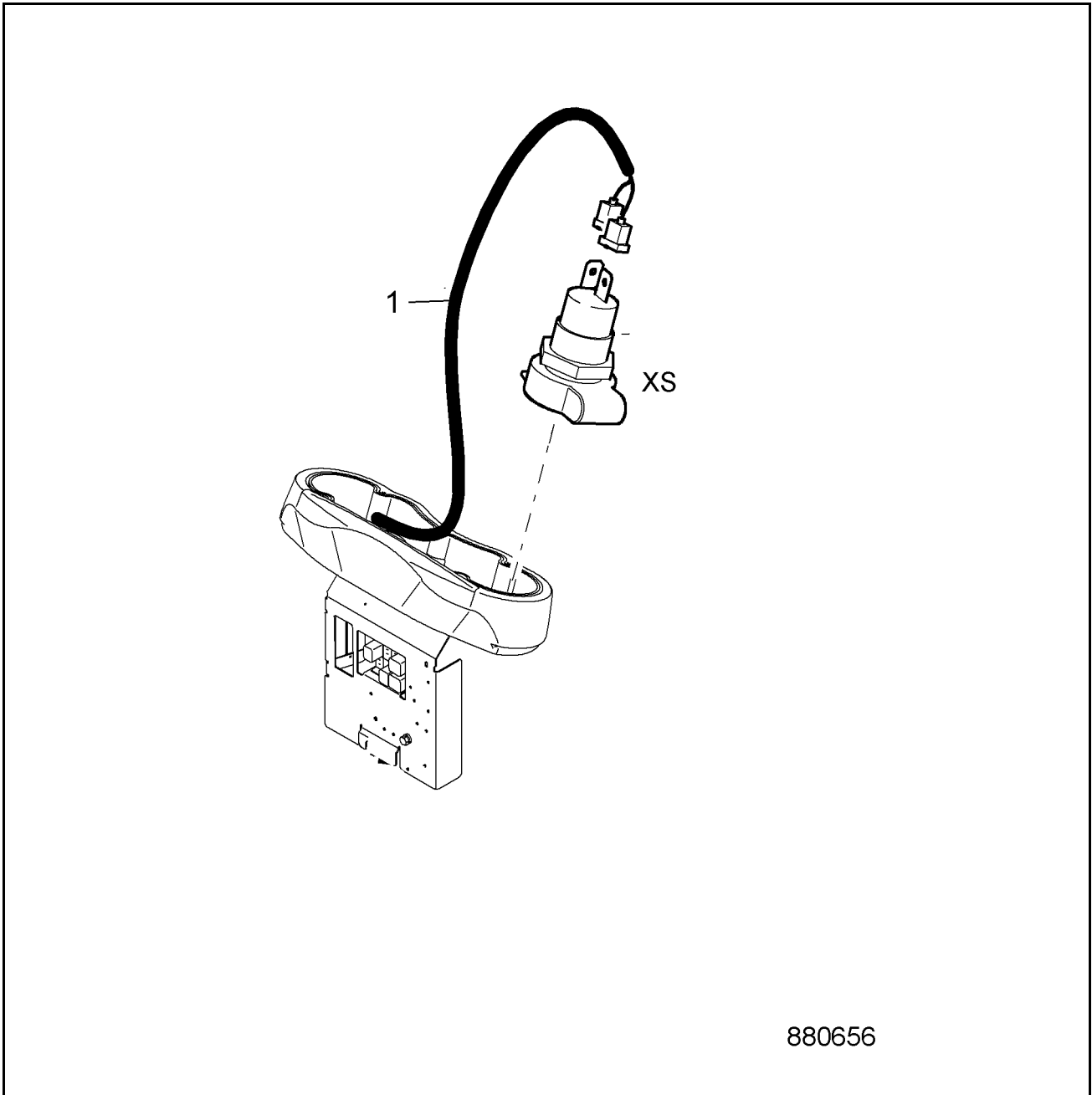


Fig. 6

- 1** = Wiring loom, battery disconnect switch
G01 = Battery
S30 = Battery disconnecting switch
M01 = Starter



880656

Fig. 7

1 = Wiring loom, socket

XS = Socket

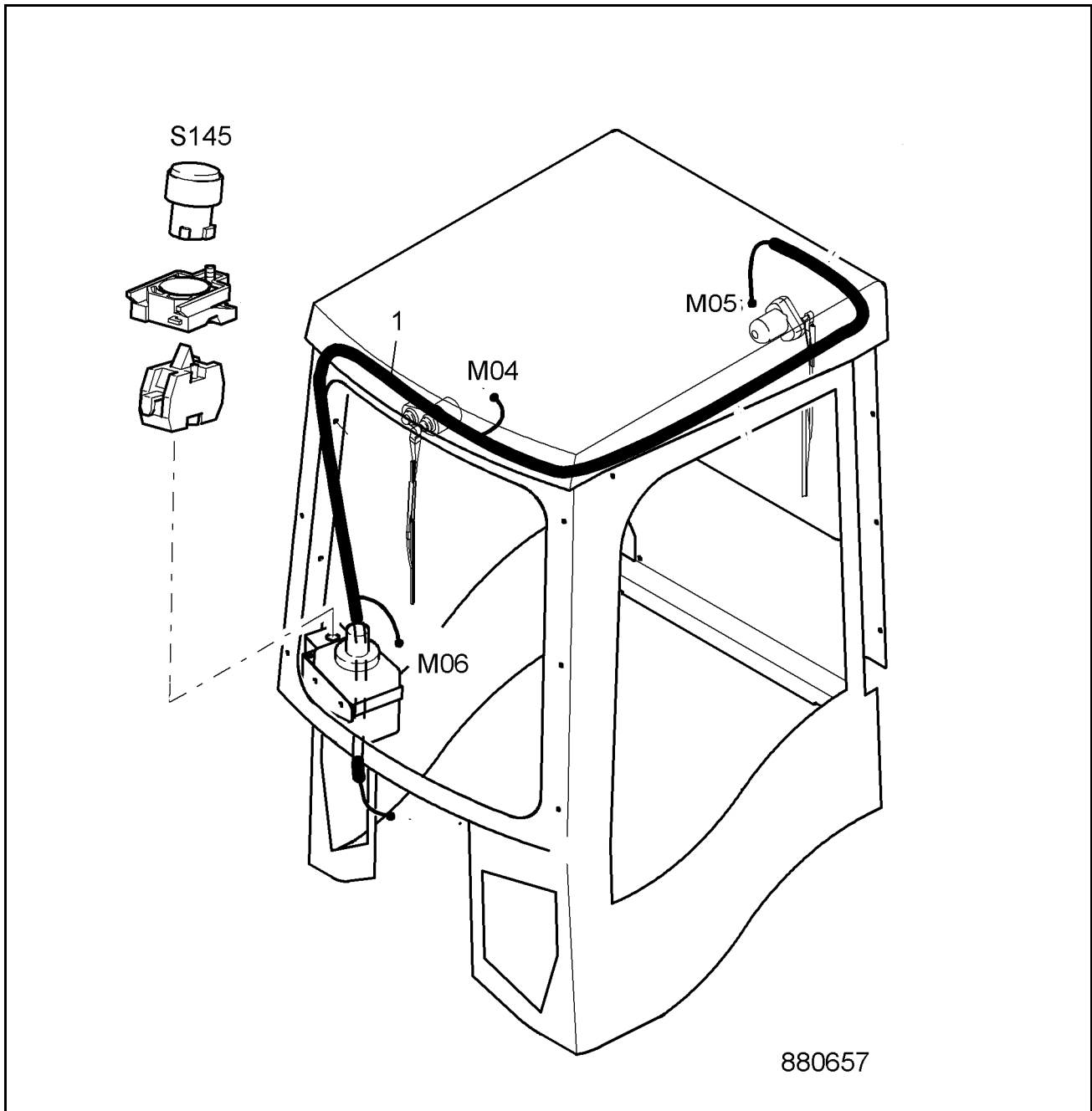


Fig. 8

- 1** = Wiring loom, rain protection cab
- M04** = Windscreen wiper motor, front
- M05** = Windscreen wiper motor, rear
- M06** = Windscreen washer motor
- S145** = Push button, windscreen wiper

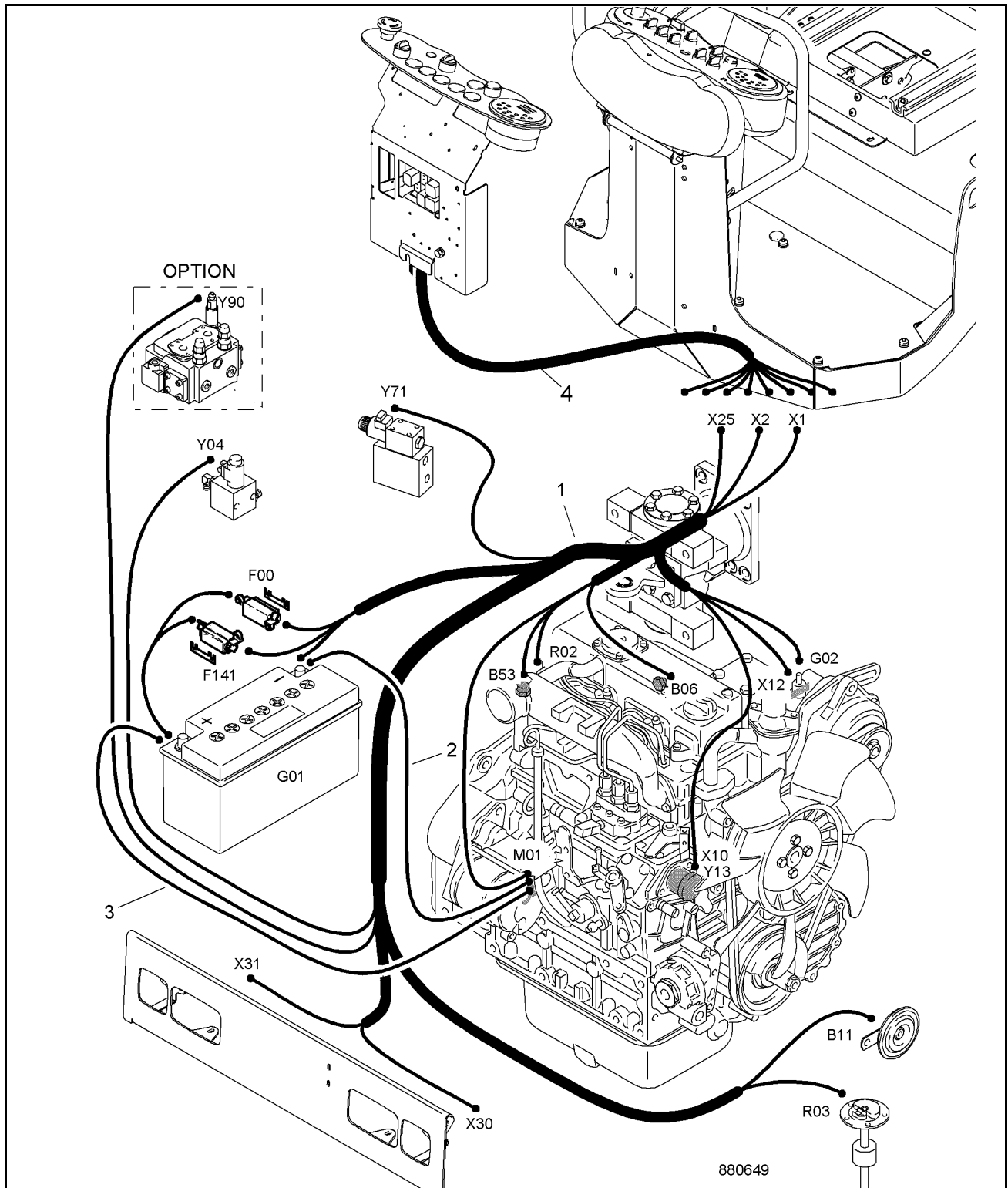


Fig. 9

- | | | | |
|------------|----------------------------------|-------------|--|
| 1 | = Wiring loom, engine | F141 | = Generator fuse (only old version) |
| 2 | = Battery cable (-) | F141 | = (new version) generator fuse no longer available |
| 3 | = Battery cable (+) | G01 | = Battery |
| 4 | = Wiring loom, central electrics | G02 | = Generator |
| B06 | = Engine oil pressure switch | M01 | = Starter |
| B53 | = Coolant temperature sensor | R02 | = Glow plug |
| B11 | = Warning horn | R03 | = Fuel level sensor |
| F00 | = Main fuse for battery | Y04 | = Solenoid valve for brake |

- Y13** = Engine solenoid
- Y71** = Solenoid valve for vibration
- Y90** = Solenoid valve for flow divider (only old version)
- Y90** = (new version) solenoid valve for flow divider no longer available

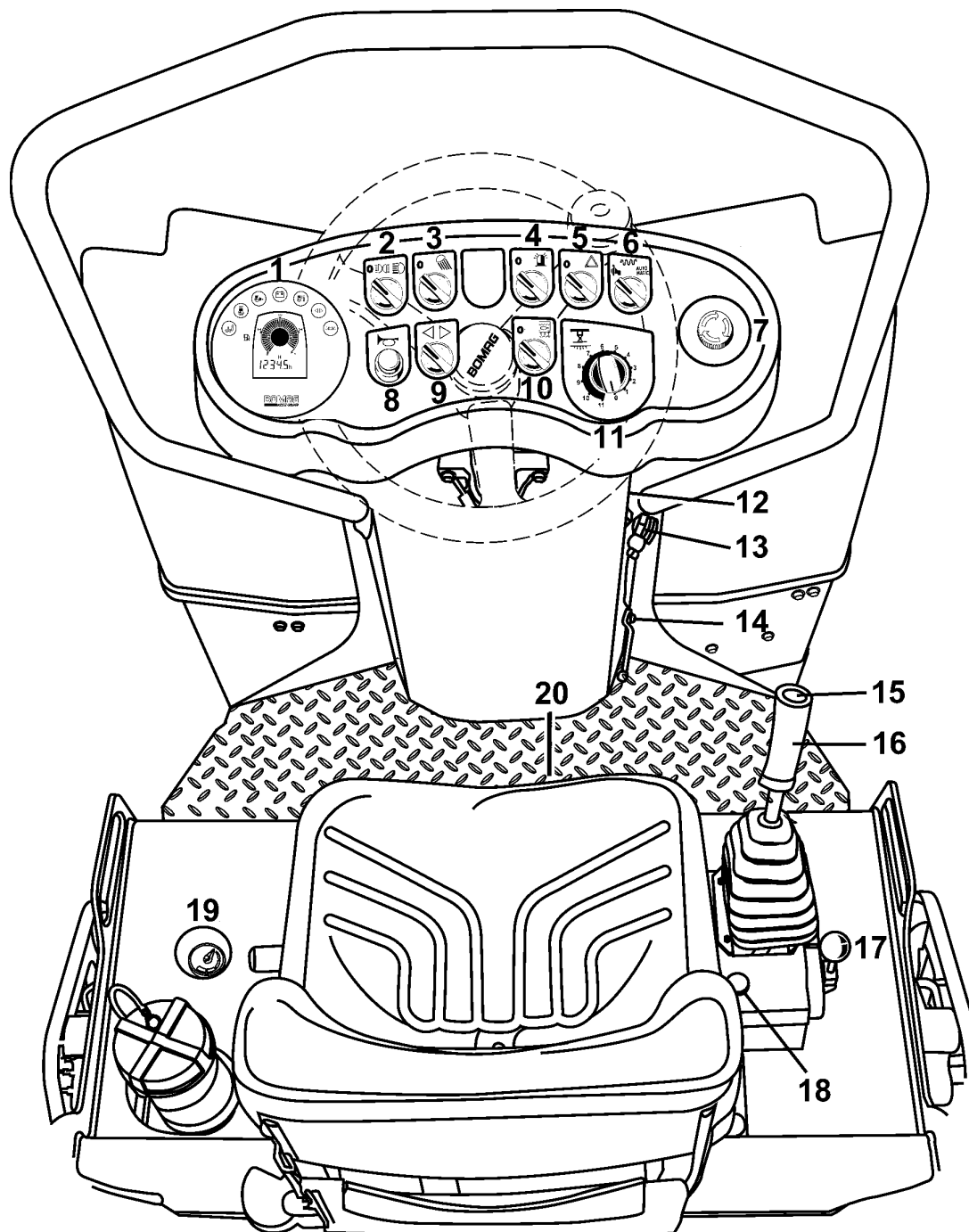


Fig. 10

- | | |
|---|--|
| <ul style="list-style-type: none"> 1 A15, instrument cluster 2 S15, rotary switch for lighting (STVZO) 3 S53, rotary switch for working light 4 S38, rotary switch for flashing beacon 5 S14, rotary switch for hazard light / H06, hazard light control light 6 S08, rotary switch, vibration pre-selection 7 S01, Emergency Stop switch 8 S03, push button, warning horn 9 S37, rotary switch for direction indicators | <ul style="list-style-type: none"> 10 S05, rotary switch for gravity feed sprinkling system 11 A01, interval switch for pressurized sprinkling 12 Box A, Box B, fuse boxes 13 S00, ignition switch 14 Ball valve, vibration (only AD) 15 S13, push button for vibration / B08, proximity switch travel lever in "0"-position 16 Travel lever / braking position 17 Throttle lever 18 S34, rotary switch for edge cutter 19 Water level gauge |
|---|--|

20 S164, foot switch for rubber tire sprinkling system (only AC) / S77, foot switch for flow divider (only old version) / S77, (new version) foot switch for flow divider no longer exists

Instrument cluster (A15) (Fig. 1)

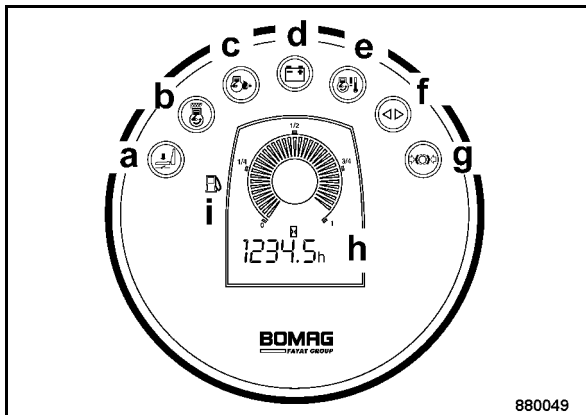


Fig. 1

- a** yellow = H20, control light seat contact switch
- b** yellow = H52, pre-heating control light
- c** red = H09, engine oil pressure control light
- d** yellow = H08, charge control light
- e** red = H49, control light engine overheating
- f** green = H05, indicator control light
- g** red = H01, brake control light
- h** = P00, operating hour meter
- i** = P01, fuel level gauge

i Note

0 OHM = Tank full

52 OHM = Tank 1/2 full

89 OHM = Tank empty

If no level switch is connected or the cable is broken, the fuel level gauge will go out.

Theft protection system (A67) (Fig. 2)

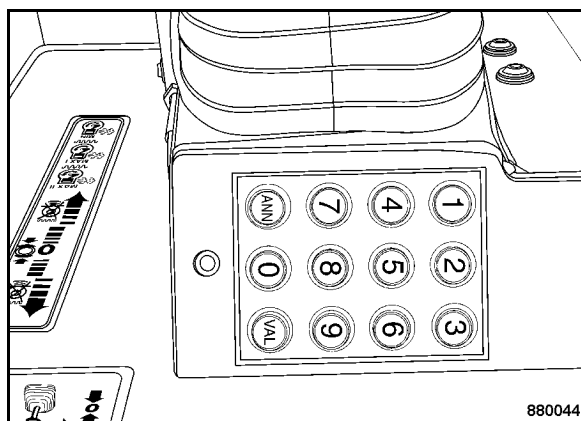


Fig. 2

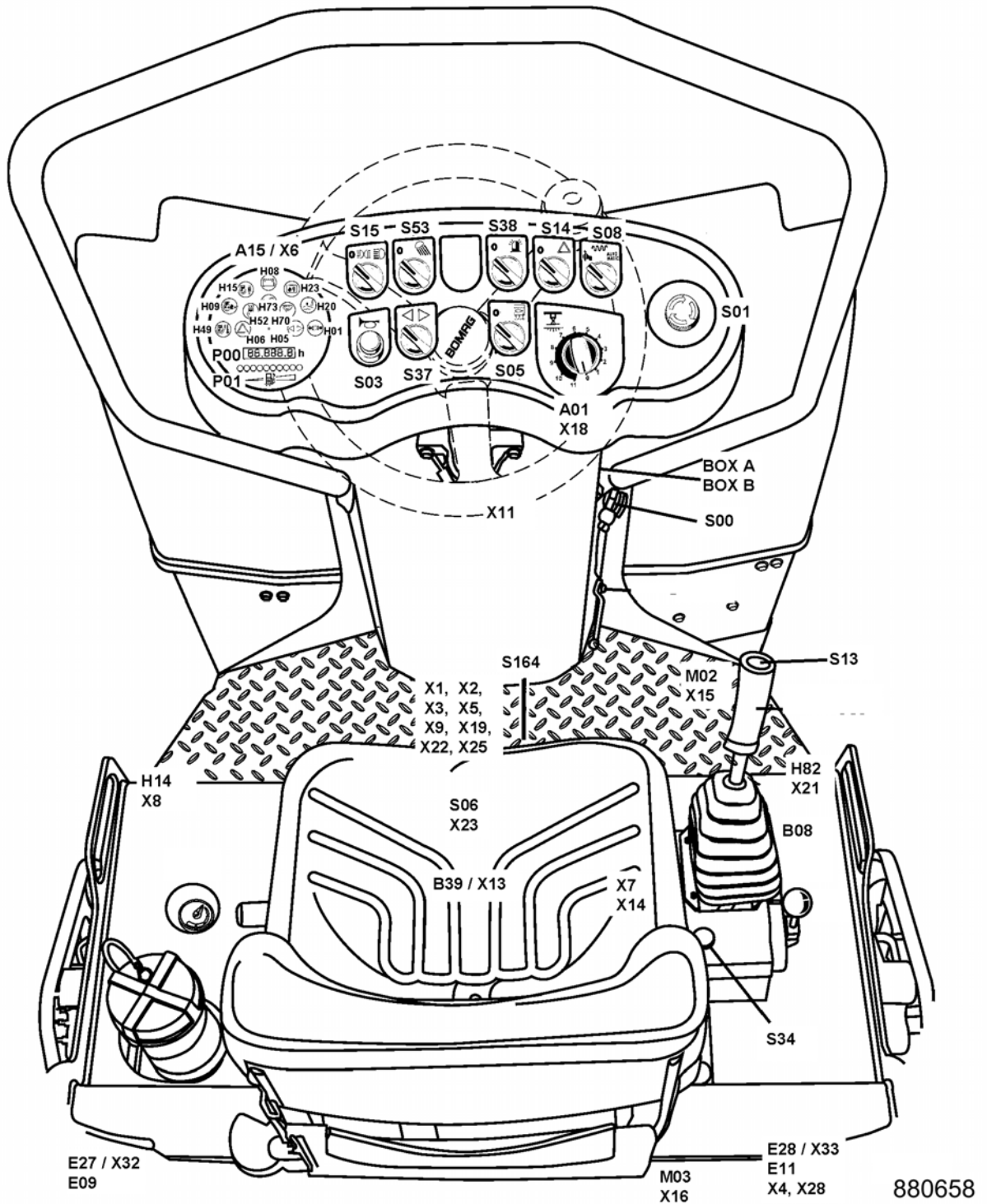


Fig. 3



Fig. 4

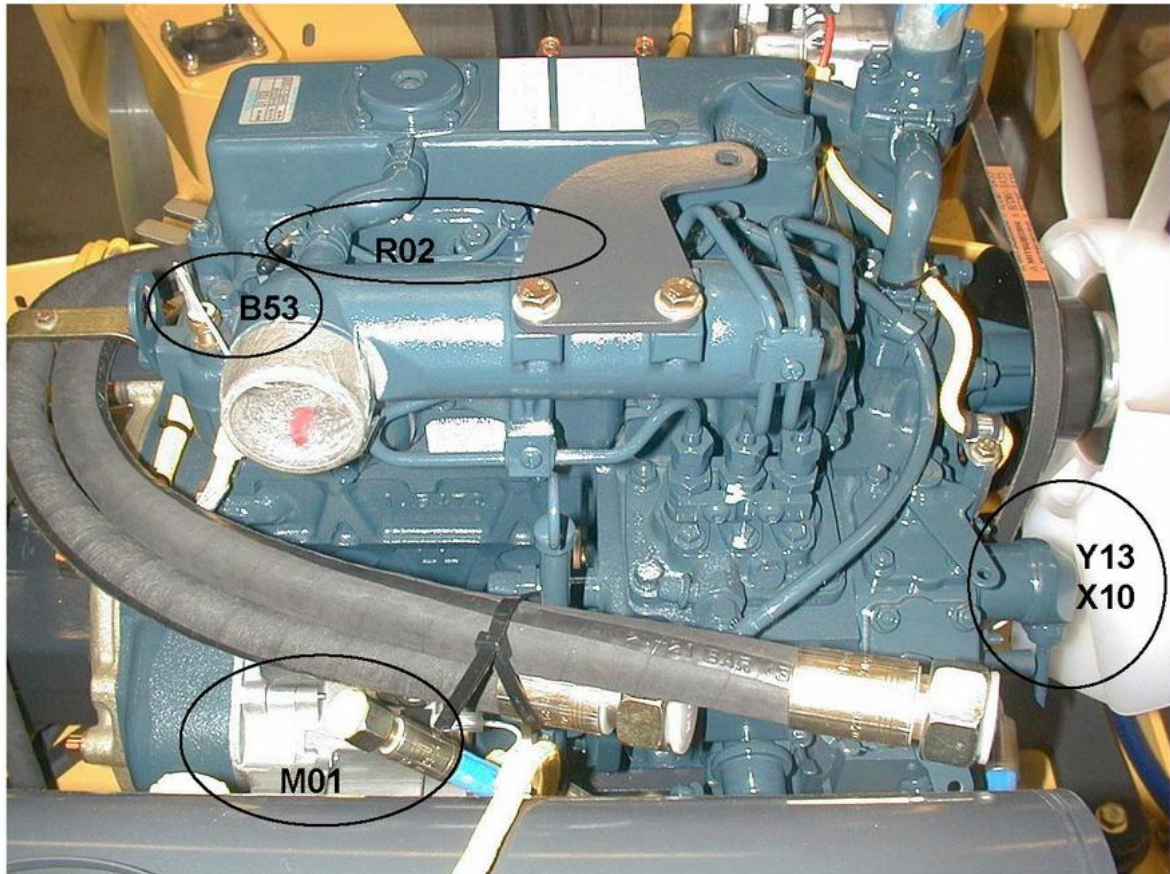
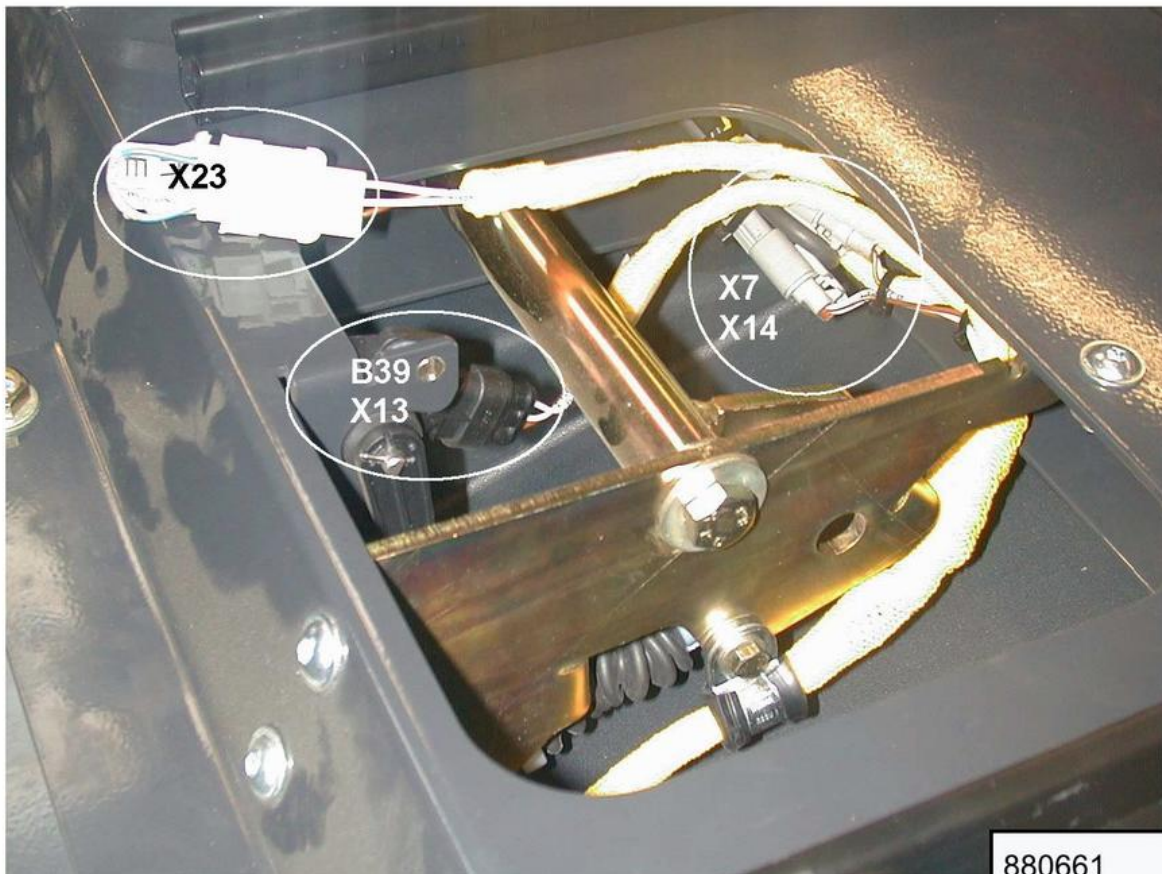
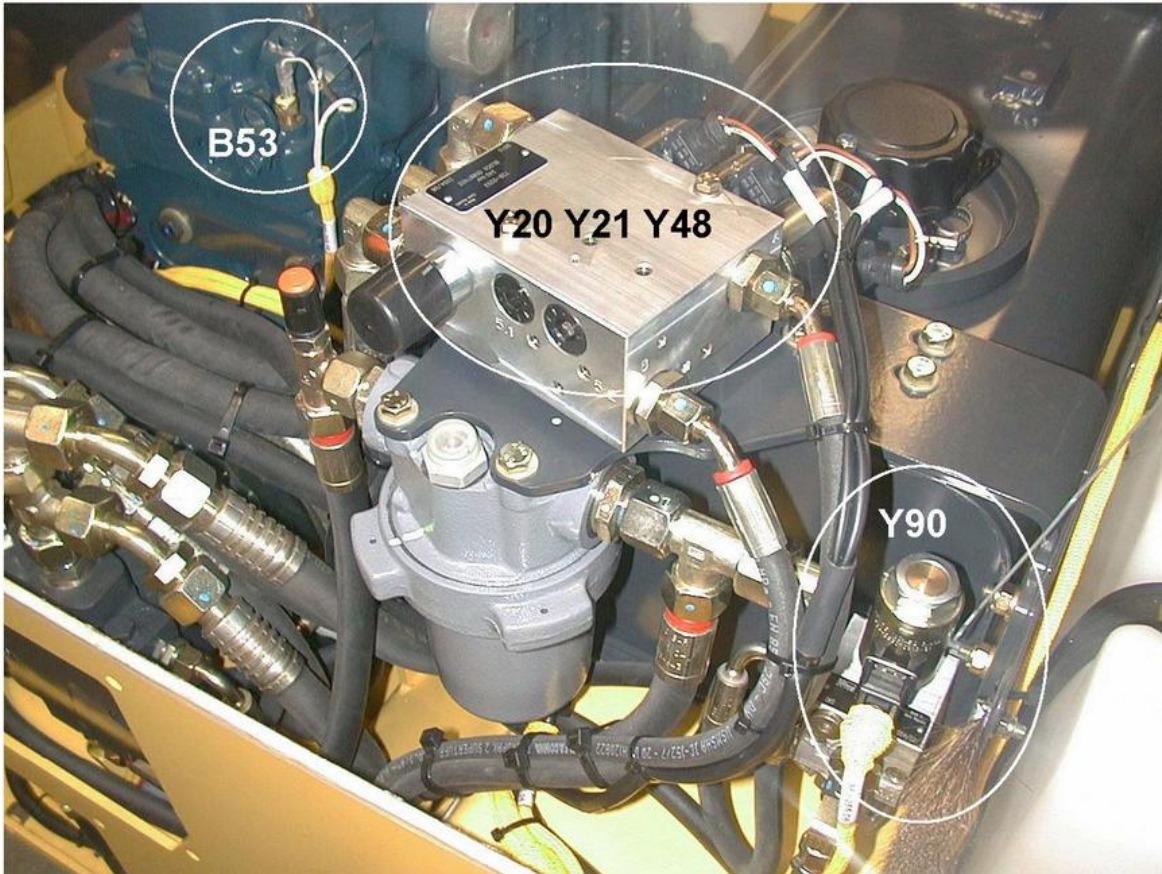


Fig. 5



880661

Fig. 6

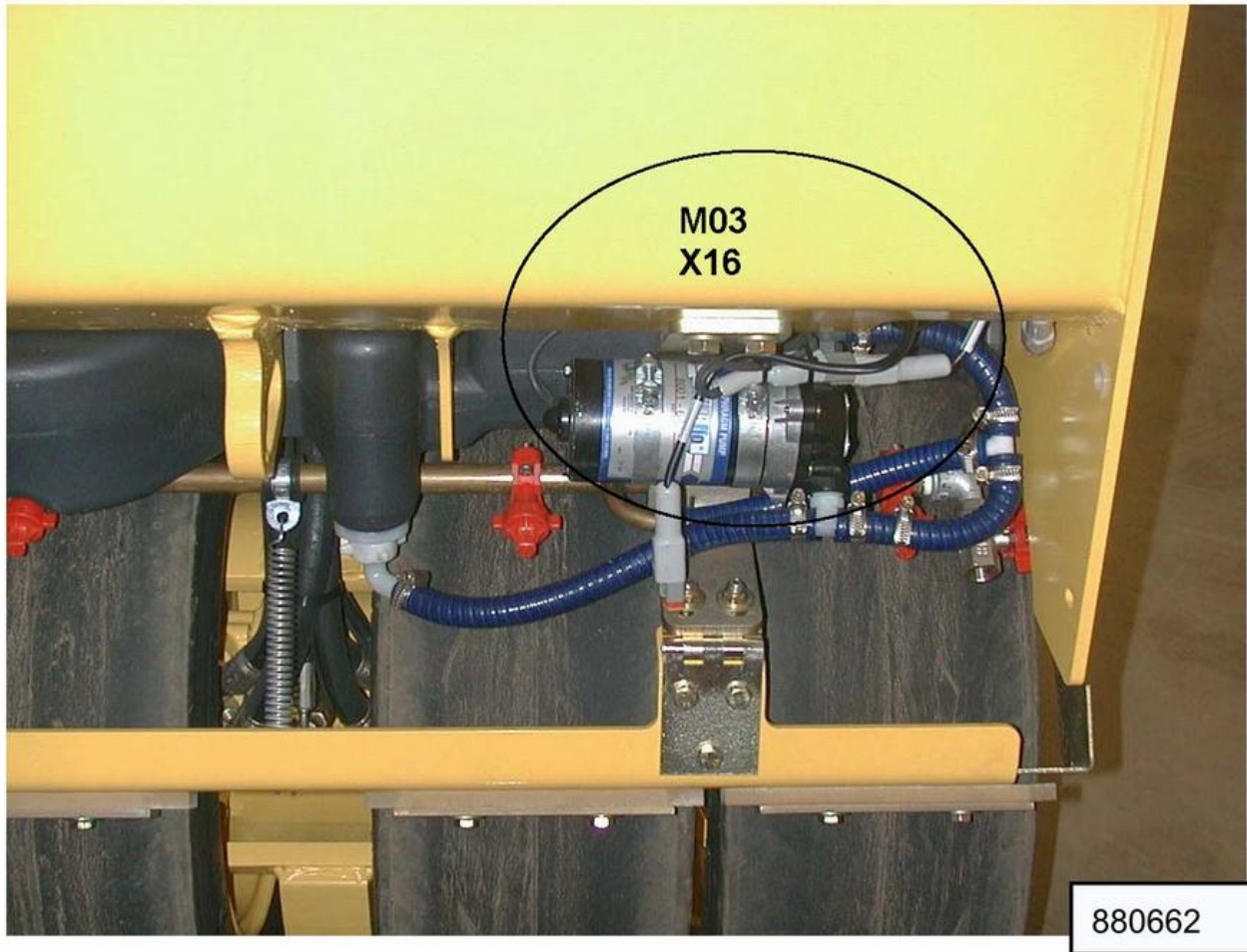


Fig. 7

5 Description of the modules

5.1 Electric modules

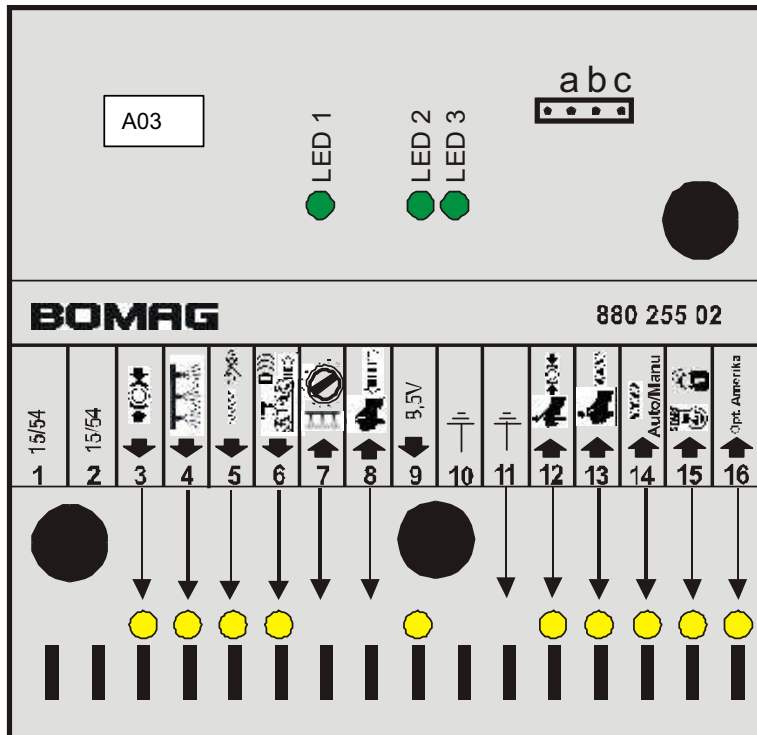
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Service Training

Description of the modules

The machine is equipped with two control/monitoring modules. These modules are fitted with control lamps on the inputs/outputs, which are used to monitor the applied signals.

Module Vibration/travel lever monitoring (part number 880 255 02)



The following applies when measuring the signal level:

PIN	Potential with LED on	Potential with LED off
digit. inputs (HIGH-active)	Operating voltage +12V	Voltage < 1V
digit. input (LOW-active)	Ground	Input open/no ground
digit. output	Operating voltage (UB - 0,7V)	< 1V
Analogue input (PIN 8)	Current on PIN 8 = 3,5mA to 20,5mA (depending on angle sensor)	
Analogue input (PIN 7)	Voltage on PIN 7 against ground = 0,6V to 7,65V (depending on interval switch)	

BOMAG**Service Training****Description of hardware:**

The inputs are designed in such a way, that the following table is valid:

Input	Performance	Remark
Input PIN12	HIGH-active	LED lights when applying positive voltage!
Input PIN13	LOW-active	LED lights when applying ground potential!
Input PIN14	HIGH-active	LED lights when applying positive voltage!
Input PIN15	HIGH-active	LED lights when applying positive voltage!
Input PIN16	HIGH-active	LED lights when applying positive voltage!

Pin assignment digital inputs

Signal Name	Module Pin	Description
Initiator for brake	12	Active-HIGH = Travel lever in braking position LED on LOW = Travel lever not in brake position LED off
Button vibration on	13	Active-LOW = Momentary contact function LED on HIGH = Normal status LED off
Switch position vibration auto / manual	14	Active-HIGH = autom. vibr. nominal on, LED on LOW = manual vibr. nominal on LED off
Start signal	15	Active-HIGH = Vibration may not switch on LED on LOW = Vibration may switch on LED off
Bridge option America	16	Active-HIGH = Vibration shut down at >6km/h LED on LOW = No vibration shut down at >6km/h LED off

Pin assignment analog inputs

Signal Name	Module Pin	Description
8,5 Volt Voltage output	9	Output 8,5 V for voltage supply of angle sensor. Function o.k. → LED on
Analog input 1	8	Input for signal 4-20mA Connection for travel lever angle sensor
Analog input 2	7	Input for signal 0-8,5V 12-stage switch (stage 1 = off)

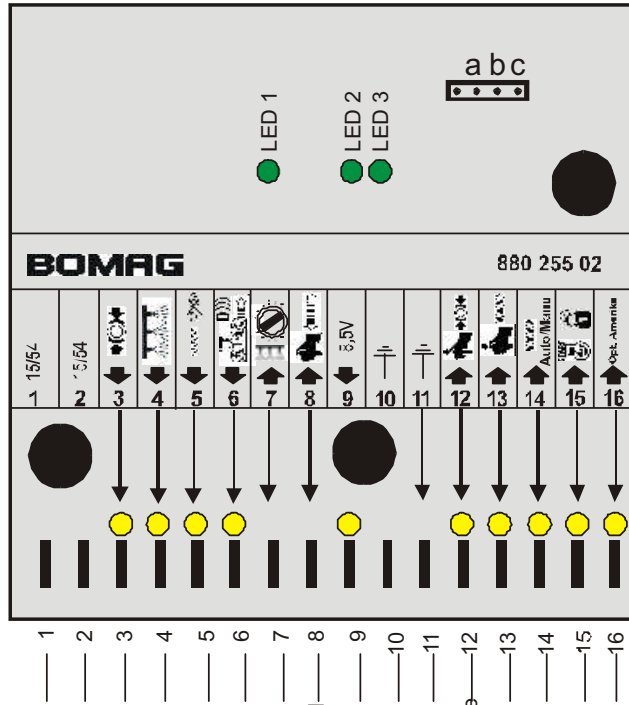
Pin assignment outputs

Signal Name	Module Pin	Description
Brake	3	HIGH = Brake valve picked up LED on LOW = Brake valve not picked up LED off
Water sprinkling system	4	HIGH = Sprinkling on LED on LOW = Sprinkling off LED off
Vibration	5	HIGH = Vibration on, LED on LOW = Vibration off LED off
Backup alarm	6	HIGH = Buzzer on, LED on LOW = Vibration off LED off

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Service Training

Signal level:



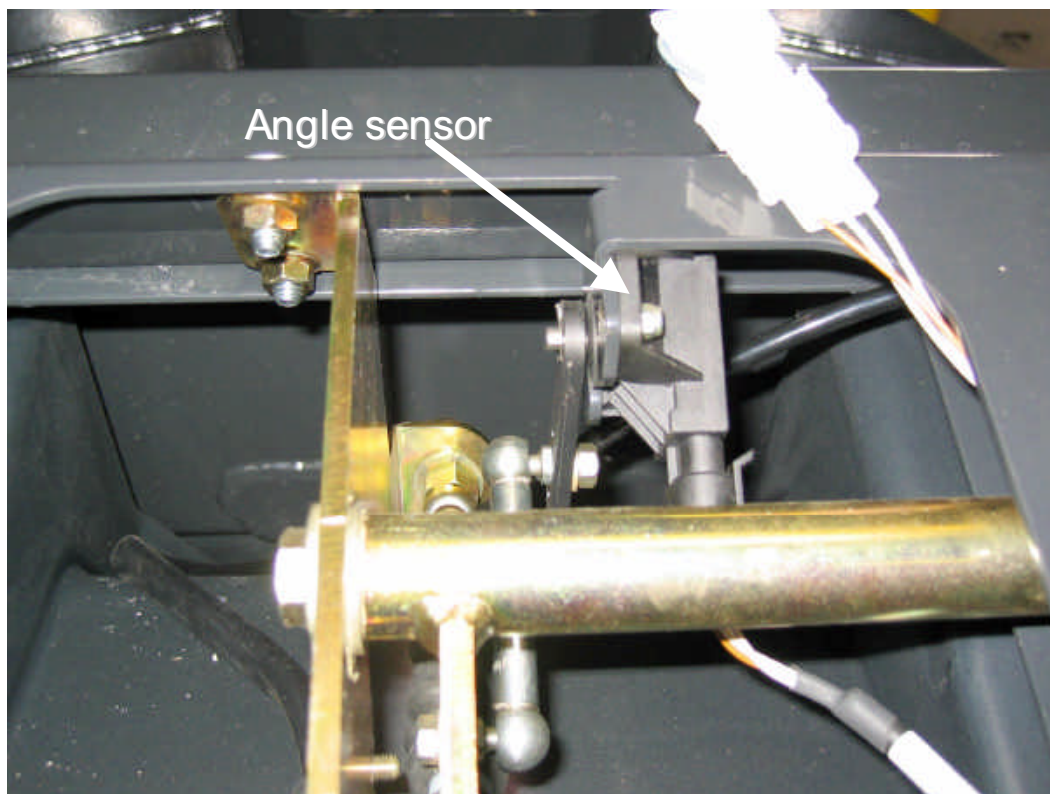
- 1) Power Supply (+UB)
- 2) Power Supply (+UB)
- 3) Brake
- 4) Output Sprinkler system
- 5) Vibration ON
- 6) Backup alarm
- 7) Interval switch Sprinkler system
- 8) Angle Sensor Travel lever
- 9) Output 8.5 Volt
- 10) Ground potential
- 11) Ground potential
- 12) Proximity switch Brake
- 13) Button Vibration
- 14) Switch Vibration Auto/Manual
- 15) Startsignal
- 16) Bridge Option America

BOMAG**Service Training****Description of function****Switching off**

If operating voltage is applied to the module (PIN1/2 U_B , PIN10/11 ground), LED1 will light as a control light. LED 2 flashes as Stay-Alive-Indicator („Live Sign of Module“), but with a flashing frequency which depends on the current on input PIN 8 (analogue input 1).

Angle sensor:

The machine is equipped with an angle sensor under the driver's seat, mounted to the switch guide plate of the travel lever. The angle sensor reports the travel lever position back to the module. The sensor works with an output current of 4-20 mA.

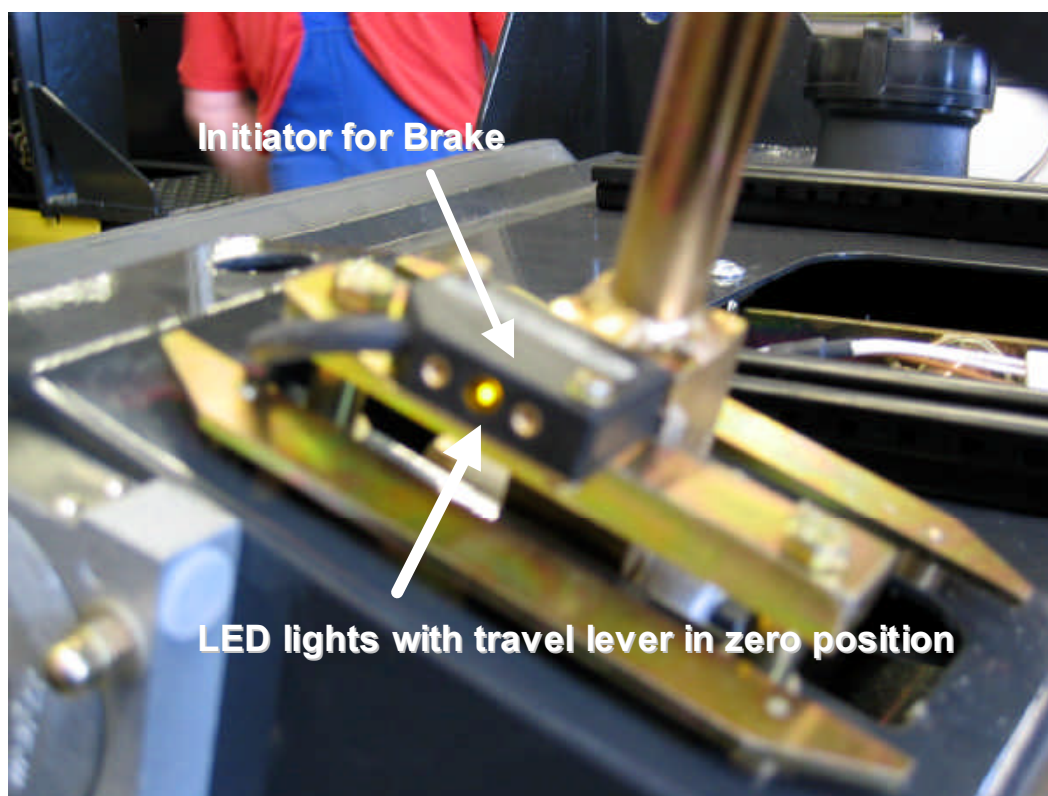


When replacing the sensor, a zero adjustment will be automatically performed as followed.

BOMAG**Service Training****Neutral position of angle sensor**

The zero point of the angle sensor is automatically adjusted via the module. Once the travel lever is in neutral position the brake initiator (on the travel lever) (Pin 12) is actuated. The zero position is thereby recognized. Should the brake initiator be defective or a cable is broken the last value is set as default for the zero point.

If LED2 (on the module) flashes in intervals of one second and LED3 lights permanently, the zero point is reached.



BOMAG**Service Training****Defect on angle sensor**

The current of the functional angle sensor is in the range from 4mA to 20mA. A current flow of <2mA or >22mA on Pin 8 of the module indicates a sensor fault (sensor defective, short circuit, or sensor not connected, etc.). LED2 and LED3 are then used as indicators. LED2 flashes fast (with 80 Hz), LED3 shows permanent light.

Constant voltage monitoring

The flashing frequency of LED 2 indicates whether the output voltage of 8.5 V on Pin 9 is outside the permissible tolerance. If this voltage is not high enough, the angle sensor will not work correctly and the output signal of the sensor is undefined.

For this reason the flashing frequency of LED2 is set to 80 Hz, if the voltage is too low. This always takes place in case of a low voltage level on Pin 9. This may be caused by a too low supply voltage for the module (with $U_B < 9,5V$ the voltage of 8,5V can no longer be maintained on PIN 9) or by a defect of the module.

The complete module works from a minimum voltage of $U_b = 6,5V$. However, the analogue inputs only work from a supply voltage of 9,5 Volt, since the sensor supply voltage of 8,5V can only be generated if this input voltage is available.

The following functions are influenced by the angle sensor:

- Automatic vibration ON/OFF
- Sprinkler system water off after 30 sec. If travel lever is in 0-position
- Backup protection
- Checking of neutral position

BOMAG

Service Training

Vibration control

Manual vibration

If no voltage is applied to PIN 14 (*manual vibration on*), vibration can be switched on via button input (*vibration on*) on PIN 13. Vibration is always switched on or off when a clear ground potential is detected on Pin 13. If vibration is switched on, the LED on Pin 5 lights up.

In case of a bridge (Active-HIGH-Signal) on PIN 16 vibration switched off at a speed higher than 6 km/h and on again at a speed below 6 km/h.

Without a bridge on PIN 16 the vibration is not switched off above 6 km/h.

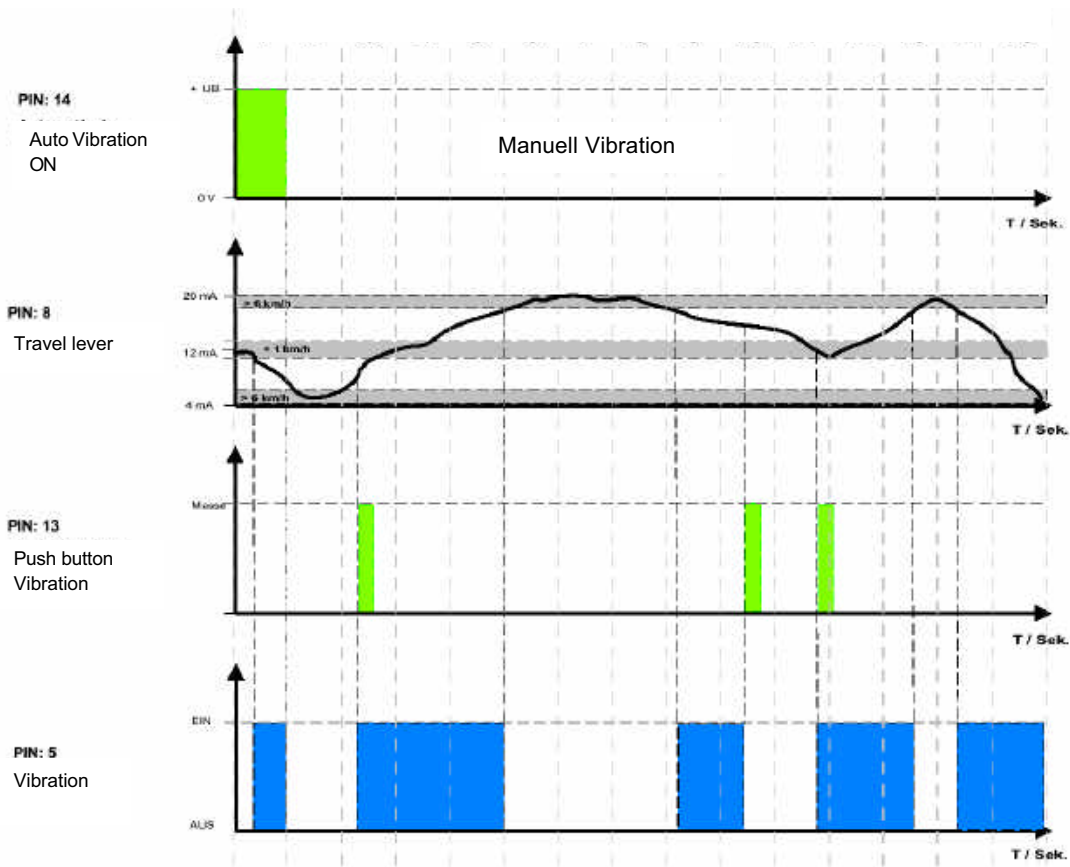


Fig. 1: Manual vibration control with HIGH-Signal on PIN 16

BOMAG**Service Training****Automatic vibration control (optional)**

If a positive voltage is applied to PIN 14 (*automatic vibration on*) the LED on PIN 14 lights up and the vibration (PIN 5) is switched on and off in dependence on the travel lever position.
 With a bridge (Active-HIGH-Signal) on PIN 16 the vibration (output, PIN 5) is switched off with the travel lever in a position <1 km/h and >6 km/h.
 Without the bridge (LOW-Signal) on PIN 16 the vibration (output, PIN 5) is only switched off at a speed < 1 km/h.

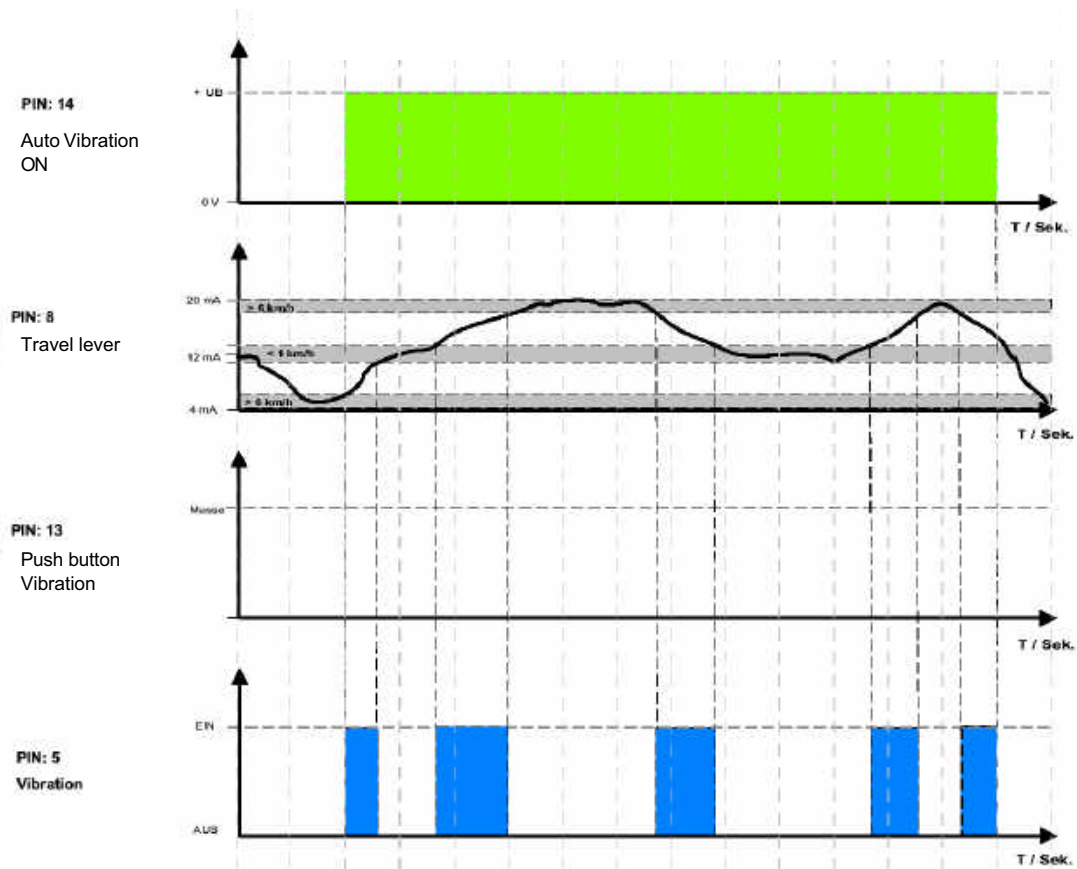


Fig.: Automatic vibration control with Active-HIGH-Signal on PIN 16
 (Active High means + 12 V)

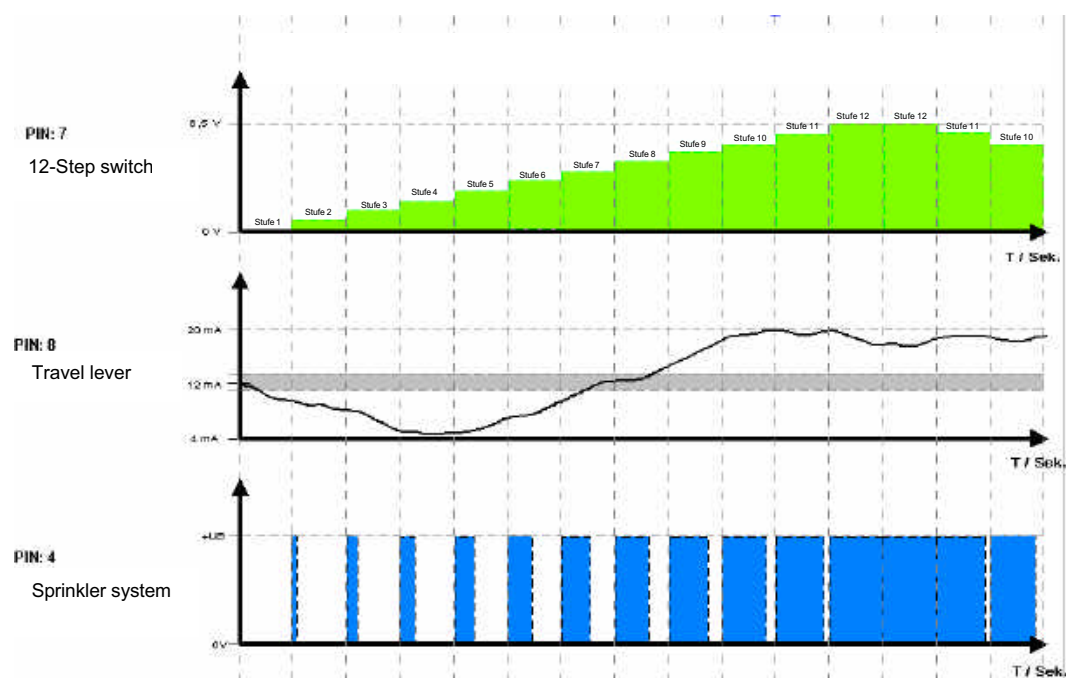
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Service Training

Water sprinkling control

The sprinkler intervals are controlled by connection of a 12-stage switch to PIN 7. This switch switches resistors in 500 Ω-steps from 500 Ω to 6 kΩ.

Sprinkling stages for pressurized sprinkler system



The total cycle (time for activation and deactivation phase) takes 15 seconds. The sprinkling intervals are set according to the following table:

Stage	Activation time	Deactivation time	Cycle time
1	0,0 s	15,0 s	15s
2	1,0 s	14,0 s	15s
3	2,0 s	13,0 s	15s
4	3,0 s	12,0 s	15s
5	4,0 s	11,0 s	15s
6	5,0 s	10,0 s	15s
7	6,0 s	9,0 s	15s
8	7,0 s	8,0 s	15s
9	8,0 s	7,0 s	15s
10	10,0 s	5,0 s	15s
11	12,5 s	2,5 s	15s
12	15,0 s	0,0 s	15s

BOMAG**Service Training**

After stopping the machine (travel lever in neutral, evaluation of analogue signal on PIN 8) sprinkling continues with the set interval for another 30 seconds (pressure sprinkling). After this time sprinkling will only be resumed after moving the travel lever out of neutral. If the switch is in stage 12 (permanent sprinkling), sprinkling will continue after the 30 seconds, without any temporal limitation! Should be used for inspection with the machine stopped to check nozzles, pump etc.

Gravity feed sprinkler system

If no 12-stage switch is connected, but the gravity sprinkler switch (S05 on output PIN 4) instead, the output will permanently switch a High signal. The sprinkling system is triggered via this switch.

With the machine stopped (travel lever in neutral position, evaluation of analogue signal on PIN 8) the HIGH-signal will still be emitted at PIN4 for another 30 seconds, after this it will be set to LOW-signal, until the travel lever is moved out of neutral again.

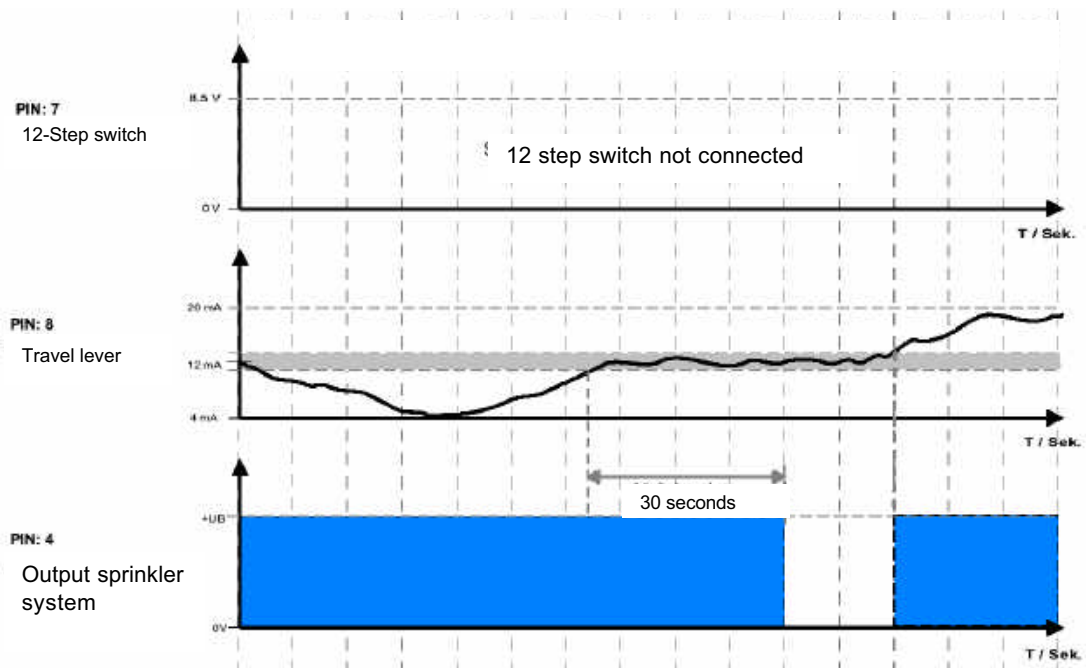


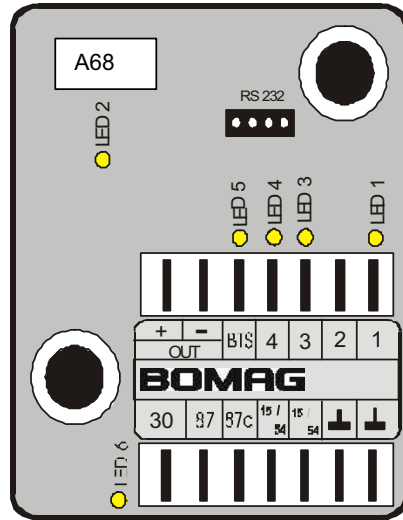
Fig. 2: Gravity feed sprinkler system

With both sprinkling systems the sprinkling cycle time is independent from the displacement of the travel lever, i.e. from the travel speed of the machine. Only the neutral position is of significance for the automatic shut down of the sprinkling system after 30 seconds.

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Service Training

Description of the seat contact module (part-no.: 88003042)



Pin assignment:

PIN	Signal	Description
1	IN (Active LOW)	Seat contact switch
2	IN (Active LOW)	Seat contact switch
3	IN (Active HIGH)	Travel lever sensor 0-position
4	IN (Active HIGH)	Oil pressure
BTS	OUT (BTS)	Engine solenoid pickup winding
OUT -	PWM -	Not used
OUT +	PWM +	Not used
30	Relay – Contact	Ground
87	Relay – Contact	Engine solenoid holding winding
87a	Relay – Contact	Normally closed
15/54	Supply voltage	10-39 V
-	Ground	

BOMAG Service Training

Description of hardware

The inputs are designed in such a way, that the following table is valid:

Input	Performance	Remark
Input PIN1	LOW-active	LED lights when applying ground potential!
Input PIN2	LOW-active	LED lights when applying ground potential!
Input PIN3	HIGH-active	LED lights when applying positive voltage!
Input PIN4	HIGH-active	LED lights when applying positive voltage!

Pin assignment digital inputs

Signal Name	Module Pin	Description
Seat contact switch	1	Active-LOW = Driver seated HIGH = Driver standing LED on LED off
Seat contact switch (is presently not evaluated)	2	Active-LOW = Driver standing HIGH = Driver seated LED on LED off
Sensor Travel lever neutral position	3	Active-HIGH = Brake released LOW = Brake applied LED on LED off
Engine – oil pressure	4	Active-HIGH = Oil pressure present LOW = Oil pressure not present LED on LED off

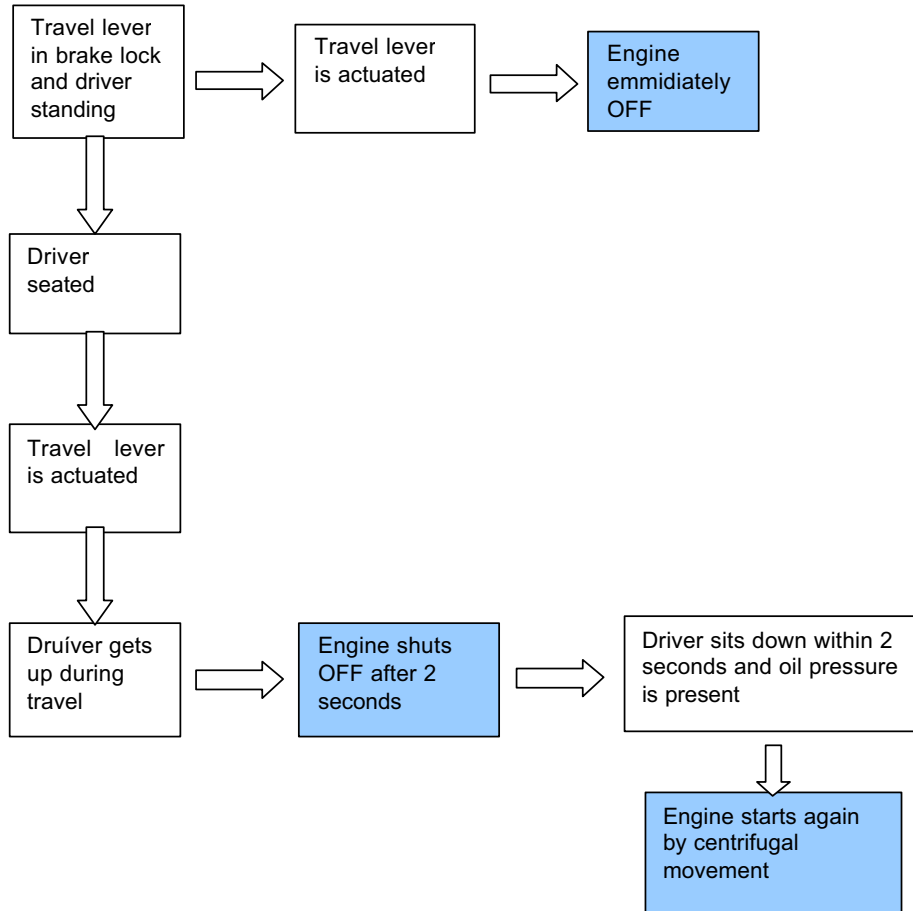
Pin assignment outputs

Signal Name	Module Pin	Description
Relay contact 15 + 87 (normally open)	30 + 87	HIGH = Holding winding of engine solenoid is switched on LED on LOW = Holding winding of engine solenoid is not switched on LED off
BTS	BTS	HIGH = Holding winding of engine solenoid is switched on LED on LOW = Holding winding of engine solenoid is not switched on LED off

BOMAG

Service Training

Description of function



BOMAG**Service Training*****Description of function******Switch ignition on and start the engine***

- Stay-Alive-(Live Signs) LED flashes in one second intervals.
- Engine running

Shut down the engine immediately

- If the driver seat is not occupied (PIN 2 has HIGH-Signal) and the travel lever is actuated (PIN 3 has Active-HIGH-Signal), the module will simulate a oil pressure fault. Relay (PIN 30 + 87) switches immediately for half a second and LED6 lights for half a second.
- The holding winding of the engine solenoid is **not** energized for half a second and the engine is shut down.

Engine shut down with time delay

- The driver's seat is occupied (PIN 2 has Active-LOW-Signal) and the travel lever is in neutral position (PIN 3 has LOW-Signal).
- When leaving the driver's seat (PIN 2 has LOW-Signal) after shifting the travel lever out of neutral (PIN 3 has Active-HIGH-Signal), the warning buzzer is activated.
- After 2 seconds the relay (PIN 30 + 87) is switched on for half a second and LED6 lights for half a second.
- The holding winding of the engine solenoid is **not** energized for half a second and the engine is shut down.

Restarting the engine

- If the engine has shut down as described in point 3.4 it can be restarted within 2 seconds after occupying the driver's seat. This is only possible if the engine is still rotating and oil pressure (PIN 4 has Active-HIGH-Signal) is present.
- This is accomplished by switching on the BTS-output (PIN BTS) for 1 second. LED5 lights for 1 second.
- The pickup winding of the engine solenoid is energized for half a second and the engine is restarted.

6 Service Training

6.1 Service Training

BOMAG

Service Manual



BW 100 AD/AC Series 4 **BW 120 AD/AC Series 4**

P/N 008 099 86

STATUS: 03/2004

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Service Training

Foreword

In 2004 the tandem vibratory rollers of product range BW 100 AD/AC4 and BW 120 AD/AC4 were launched in the market for the first time.

They are a further development of the old BW 100/120AD/AC of generation 3, which already were a great sales success.

The contents of this training shall enable the service engineer to perform adjustments and trouble shooting as well as all necessary repair work in a professional manner. The owner of the machine should recognize that the service engineer is fully familiar with the machine. He should realize that the service engineer applies the correct measures to detect a possible fault on a machine and that all repair measures are performed with skill and knowledge.

Persons participating on this training course should be confident when having to work on this machine.

Documentation

For the BOMAG machines described in this training manual the following documentation is additionally available:

Attention!

The currently valid part numbers for the documents can be taken from the Doclist or the Customer Service page in the BOMAG Intranet or Extranet (BOMAG Secured Area) in accordance with the serial number of the machine.

1. Operating and maintenance instructions
2. Spare parts catalogue
3. Wiring diagram*
4. Hydraulic diagram*
5. Repair instructions
6. Service Information

* The document versions valid at the date of printing are part of this training manual.

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Service Training

General

Machines of product range BW 100/120 AD/AC-4 are tandem vibratory rollers or combination rollers for compaction work in road construction. They are most suitable for the compaction of bituminous materials as well as light compaction tasks in earthwork. Compaction is achieved by the vibration of both drums or the vibration of the drum and the static load of the rubber tires. The power output from the water cooled Kubota diesel engine is transferred to drums or wheels (travel and vibration systems) and to the steering via the hydrostatic drive systems of the machine. This type of power transmission ensures lowest possible efficiency losses.

Both drums of the BW 100/120 AD-4 are fitted with both travel motors as well as vibration motors. The motors for the respective drive systems are always arranged on one side of the machine. Since it is beneficial for many applications (e.g. when laying asphalt layers) to work with one vibrating and one static drum, the machine is equipped with a vibration shut-off valve for the rear drum.

On machines of type BW 100/120 AC-4 the wheel set is driven by two travel motors. This roller combines the high compaction power of a vibration drum with the excellent surface sealing effect of rubber tires in one machine. This machine obviously achieves considerable savings in costs when compared with a pure vibratory or pneumatic tired roller.

The standard equipment of the machine includes a gravity sprinkler system. A pressure sprinkler system is optionally available on request. In connection with the scrapers the water sprinkler system avoids picking up of material by the drums.

On the AC-machines a pressure sprinkler system prevents sticking of dirt and bitumen to the rubber tires. For this purpose the tires are sprayed with emulsion.

Front and rear frames of the machine are joined by an oscillating articulated joint. The amply dimensioned oscillation angle makes sure that the drums always have ground contact over the entire width.

Both travel motors are fitted with integrated brakes working as parking brakes. Depending on the position of the brake solenoid valve these brakes are released by charge pressure when starting the engine and applied when shutting the engine down.

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Service Training

Maintenance

The tandem/combination rollers of series BW 100/120 AD/AC-4 are high performance machines for the extremely difficult use in asphalt compaction and earth work. To be able to meet these demands the machine must always be ready to be loaded up to its limits. Apart from that, all safety installations must always be fully functional when working under the partly very dangerous conditions on a construction site.

Thorough maintenance of the machine is therefore mandatory. This not only guarantees a remarkably higher functional safety, but also prolongs the lifetime of the machine and of important components.

The time required for thorough maintenance is only minor when being compared with the malfunctions and faults that may occur if these instructions are not observed.

The maintenance intervals are given in operating hours. It is quite obvious that with each maintenance interval all the work for shorter preceding intervals must also be performed. During the 2000 hour interval you must also perform the maintenance work for the 500 and 1000 hour intervals.

It should also be clear, that with the 2500 hours interval only the work for the 10 and 500 hour intervals must be performed.

For maintenance work you must only use the fuels and lubricants mentioned in the table of fuels and lubricants (oils, fuels, grease etc.).

BOMAG**Service Training****List of components****BW 100/120 AD/AC-4****Engine**

Manufacturer		Kubota
Type		D 1703 MDI
Cooling		Water
Working cycles		4
Number of cylinders		3
Power DIN 6271 IFN/SAE at 2700 rpm	kW	25,2
Fixed engine speed Stage 1	rpm	2250
Fixed engine speed Stage 2	rpm	2700
Valve clearance I/E	mm	0,20/0,20

Travel pump

Manufacturer		Hydromatik
Type		A10 VG 28
System		Axial piston
Displacement	cm ³ /rev.	28
High pressure limitation	bar	380
Charge pressure	bar	24
Speed	rpm	2700
Max. flow capacity	l/min	73

BW 100/120 AD Series 4
 BW 100/120 AC Series 4

B1

BOMAG**Service Training****BW 100/120 AD/AC-4****Travel motor (drums)**

Manufacturer		Poclain
Type		MK 04
Number		2
System		Radial piston motor
Displacement	cm ³ /rev.	408
Brake		yes

BW 100/120 AC-4**Travel motor (wheels)**

Manufacturer		Poclain
Type		MSE 02
Number		2
System		Radial piston motor
Displacement	cm ³ /rev.	255
Brake		yes

BW 100/120 AD/AC-4**Vibration pump**

Manufacturer		Bosch
Type		HYZ 11
System		Gear
Displacement	cm ³ /rev.	11
Starting pressure	bar	210
Operating pressure	bar	100 +/-60 bar (soil dependent)

BW 100/120 AD Series 4
 BW 100/120 AC Series 4

B2

BOMAG**Service Training****Vibration motor**

Manufacturer		Bosch
Type		HYZ 8
System		Gear
Displacement	cm ³ /rev.	8
Frequency stage 1	Hz	55
Frequency stage 2	Hz	70
Amplitude	mm	0.5

Steering pump

Manufacturer		Bosch
Type		HYZ 8
System		Gear
Displacement	cm ³ /rev.	8
max. steering pressure	bar	140 +/-30 bar

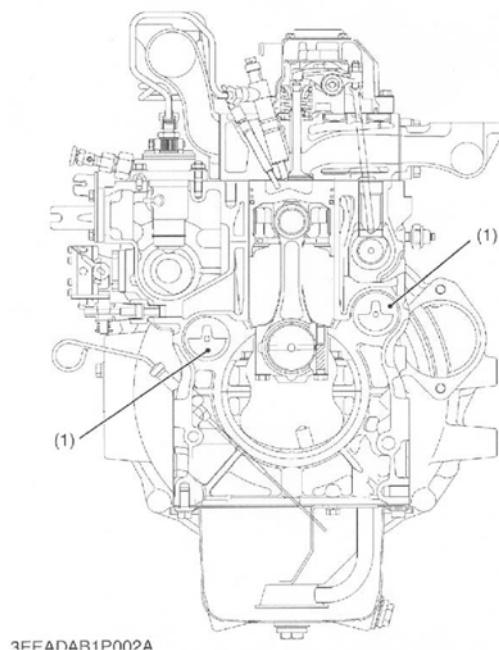
Steering valve

Manufacturer		Danfoss
Type		OSPC 80 ON
System		Rotary valve

BOMAG**Service Training****Kubota diesel engine 1703 MDI**

The tandem vibratory rollers of series BW 100/120 AD/AC-4 are powered by a water cooled 3-cylinder Kubota diesel engine type 1703 MDI.

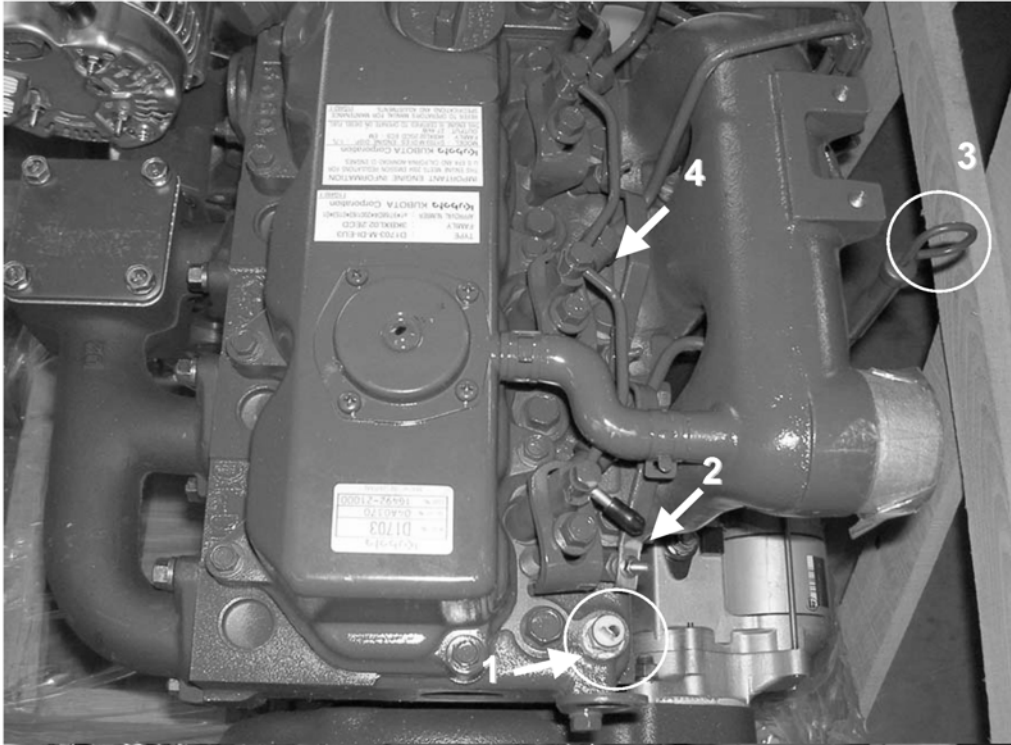
The engine is an upright water-cooled four-stroke diesel engine.



Cross-section of diesel engine

BW 100/120 AD Series 4
BW 100/120 AC Series 4

C 1

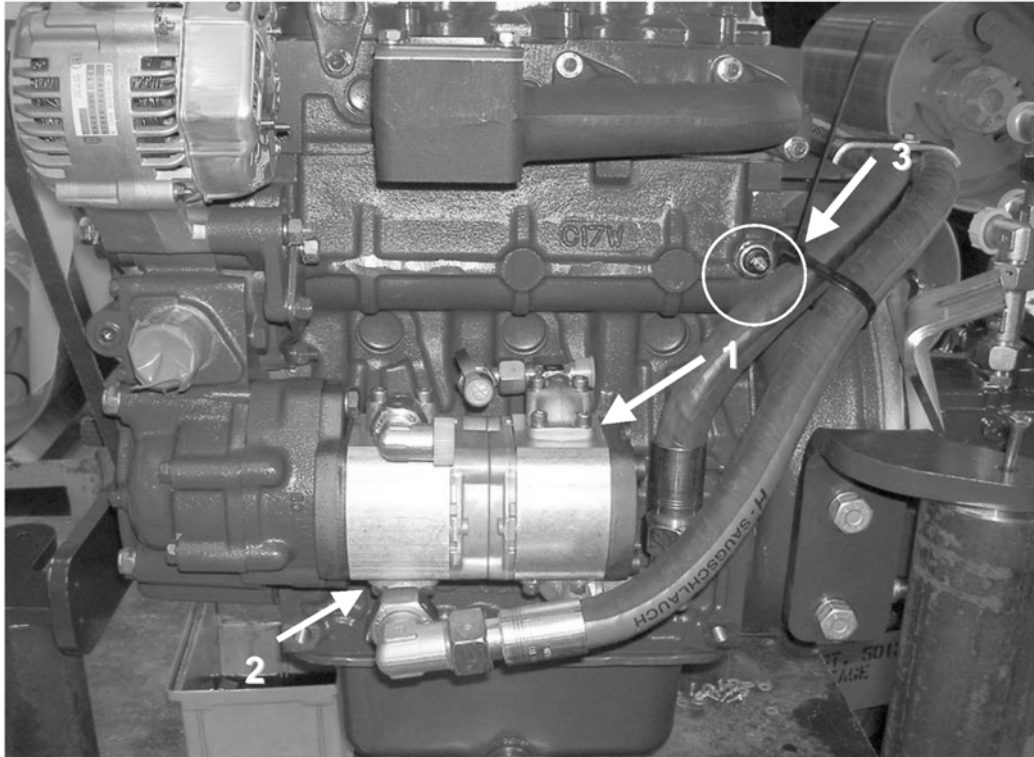
BOMAG**Service Training***View of engine:*

Pos. 1	Engine temperature switch	
Pos. 2	Connection glow plug	
Pos. 3	Oil dipstick	
Pos. 4	Injection nozzles	

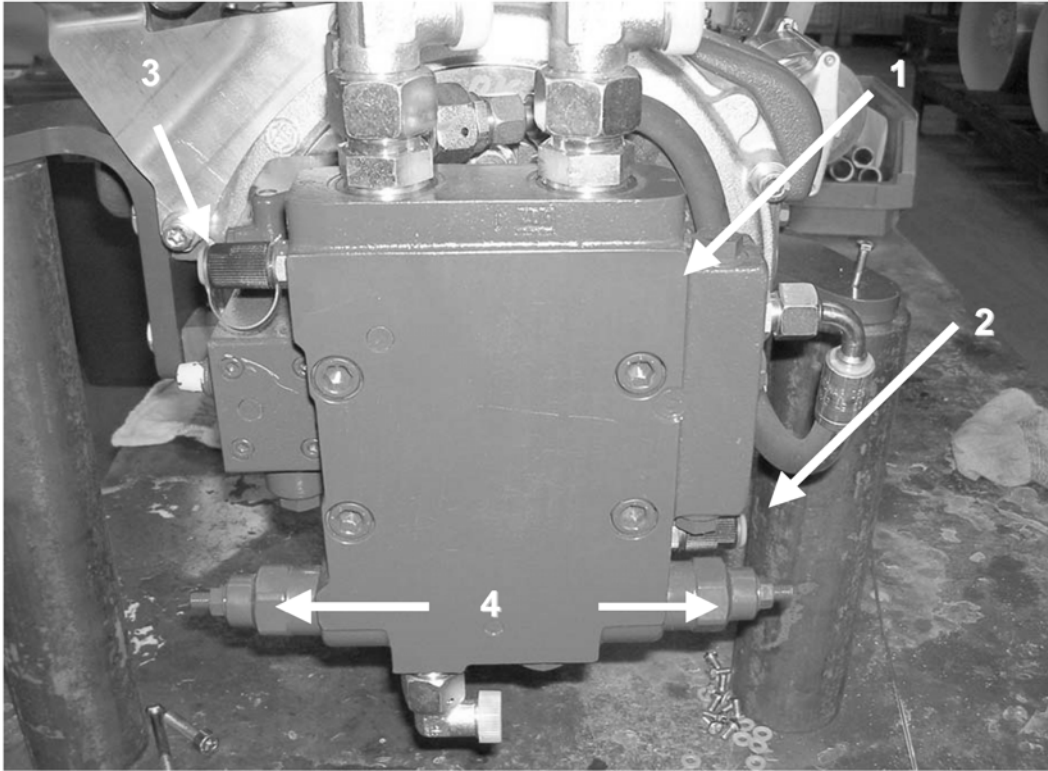
BOMAG

Service Training

Pump installation on diesel engine



Pos. 1	Charge pump	
Pos. 2	Vibration pump	
Pos. 3	Oil pressure switch	0.6 bar

BOMAG**Service Training***View of diesel engine, flywheel side*

Pos. 1	Travel pump	
Pos. 2	Pressure test port A high pressure forward	
Pos. 3	Pressure test port B high pressure reverse	
Pos. 4	High pressure relief valves	380 bar

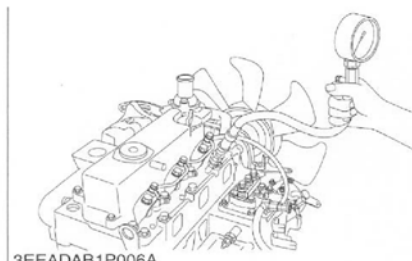
BOMAG**Service Training****Tests and adjustments****Measuring the compression**

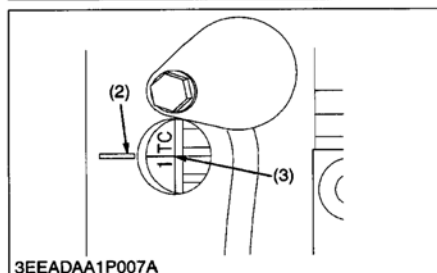
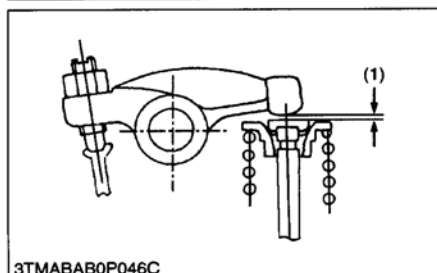
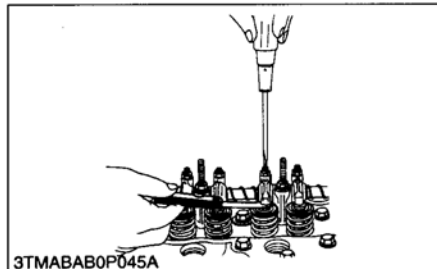
Fig. 5:

Compression pressure:

1. Run the engine warm and shut it down. Disassemble the nozzle holders.
2. Install the diesel engine compression tester to the nozzle holder opening.
3. Make sure that the throttle lever is in top position (no injection) and start the engine with the starter motor.
4. Read the max. pressure. Repeat the measurement at least two times.
5. If the measurement is below the permissible limit value check cylinder, piston, valve and cylinder head.

Adjustment values:

Compression pressure	Factory settings	29.4 -32.4 bar
	Permissible limit value min.	23.5 bar

BOMAG**Service Training****Checking the valve clearance****IMPORTANT:**

The valve clearance must only be checked and adjusted when the engine is cold.

The cylinders are counted from the flywheel end, i.e. cylinder 1 is on the flywheel side.

1. Remove the cylinder head cover.
2. Align the mark „1TC“ on the flywheel and the notched part (1) on the plate so that piston no. 1 is in compression stroke or overlaps top dead centre (TDC).
3. Measure the valve clearance marked "1" with a feeler gauge.
4. Correct the clearance by the setscrew if it is not within the limits of the specified factory data.

Valve clearance (cold)	Factory settings	0,20 mm
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(The values apply for intake and exhaust valves)

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BOMAG**Service Training**

Please note that the TC-mark is only valid for cylinder 1. There is no mark for the other cylinder.

Cylinder 1 is in compression stroke when the TC-mark is visible in the window (2)

Now turn the flywheel further, until the other valves overlap top dead centre and adjust the valve clearance accordingly.

Note:

- The "TC"-mark on the flywheel applies only for cylinder no. 1. The other cylinder has no "TC"-mark.
- When the „TC“-mark is aligned with the punched mark on the rear disc, piston no. 1 is in top dead centre position. Now turn the flywheel by 15° clockwise or anti-clockwise to check whether the pistons are in TDC-position (compression position).
(The piston is in TDC when intake and exhaust valves do not move. When both valves are moving, the piston is in overlapping position.)
- Finally turn the flywheel by 360 ° to ensure that „TC“-mark and punched mark match exactly. All valve clearances must be set to the nominal value.
- Turn the flywheel two to three times in anti-clockwise direction to check the valve clearance.
- After adjusting the valve clearance retighten the locking nut of the setscrew.

BOMAG**Service Training****Troble Shooting**

Fault	Possible cause	Remedy
Engine does not start	<ul style="list-style-type: none"> • No fuel • Air in the fuel system • Water in the fuel system • Fuel line clogged • Fuel filter clogged • Too high viscosity of fuel or engine oil at low temperatures • Fuel with low Ceten-number • Fuel loss caused by loose locking but on injection line • Incorrect adjustment of injection • Fuel camshaft worn • Injection nozzle clogged • Malfunction of fuel lift pump • Crankshaft, camshaft, piston or bearings seized • Loss of compression on a cylinder • Incorrect valve seat alignment, valve spring broken, valve seized • Insufficient valve control • Piston rings worn • Excessive valve clearance • Battery discharged 	Fill in fuel Bleed Replace fuel and clean or replace the fuel system Clean Replace Use specified fuel Use specified fuel Tighten nuts Adjust Replace Clean Repair or replace Repair or replace Replace cylinder head gasket, tighten cylinder head screws, glow plug and nozzle holder Repair or replace Adjust Replace Adjust Charge
Starter does not work	<ul style="list-style-type: none"> • Malfunction of starter • Malfunction of ignition switch • Wiring has come loose 	Repair or replace Repair or replace Connect

BOMAG**Service Training**

Fault	Possible cause	Remedy
Engine does not turn regularly	<ul style="list-style-type: none"> • Fuel filter clogged or soiled • Air filter clogged • Fuel loss caused by loose locking but on injection line • Faulty function of injection pump • Incorrect injection valve opening pressure • Injection nozzle sticking or clogged • Fuel overflow line clogged • Malfunction of regulator 	Replace Clean or replace Tighten nuts Repair or replace Adjust Repair or replace Clean Repair
White or blue exhaust gas	<ul style="list-style-type: none"> • Too high engine oil level • Piston ring worn or sticking • Incorrect injection setting • Insufficient compression • Cylinder head gasket defective 	Correct the oil level Replace Adjust Check compression pressure Repair
Black or dark grey exhaust fumes	<ul style="list-style-type: none"> • Overload • Poor fuel quality • Fuel filter clogged • Air filter clogged 	Reduce the load Use specified fuel Replace Clean or replace
Insufficient power	<ul style="list-style-type: none"> • Incorrect injection setting • Moving engine parts possibly seized • Uneven fuel injection • Insufficient nozzle injection • Loss of compression 	Adjust Repair or replace Repair or replace the injection pump Repair or replace the nozzle Replace cylinder head gasket, tighten cylinder head screws, glow plug and nozzle holder
Excessive lubrication oil consumption	<ul style="list-style-type: none"> • Oil scraper ring worn or sticking • Piston ring groove worn • Valve stem and guide worn • Crankshaft bearing and crank journal bearing worn 	Replace Replace piston Replace Replace
Fuel mixed with lubrication oil	<ul style="list-style-type: none"> • Injection pump plunger worn 	Replace pump elements or pump
Water mixed with lubrication oil	<ul style="list-style-type: none"> • Cylinder head gasket defective • Cracks in crankcase or cylinder head 	Replace Replace
Lubrication oil in coolant	<ul style="list-style-type: none"> • Cylinder head gasket defective 	Replace

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BOMAG**Service Training**

Fault	Possible cause	Remedy
Too low oil pressure	<ul style="list-style-type: none"> • Engine oil level too low • Oil strainer clogged • Oil filter cartridge clogged • Pressure relief valve clogged with dust • Pressure relief valve spring fatigued or broken • Excessive clearance of crankshaft bearing • Excessive clearance of Rocker arm shaft • Oil passage clogged • Different type of oil • Oil pump defective 	Top up Clean Replace Clean Replace Replace Replace Clean Use specified oil quality Repair or replace
Excessive oil pressure	<ul style="list-style-type: none"> • Different type of oil • Pressure relief valve defective 	Use specified oil quality Replace
Engine overheating	<ul style="list-style-type: none"> • Engine oil level too low • Fan drive belt broken or not correctly tightened • Coolant level too low • Radiator and cooling fins clogged by dust • Radiator internally corroded • Coolant line corroded • Radiator cap defective • Water pipe damaged • Thermostat defective • Water pump defective • Overload 	Top up Replace or adjust Top up Clean Clean or replace Clean or replace Replace Replace Replace Replace Reduce the load
Rapid discharging of battery	<ul style="list-style-type: none"> • Battery fluid level too low • Fan drive belt slipping • Wiring has come loose • Regulator defective • Generator defective • Battery defective 	Top up distilled water and recharge Adjust the tension or replace the belt Connect Replace Replace Replace

BOMAG

Service Training

Engine solenoid:

The machine is equipped with a solenoid which works according to the principle „ENERGIZED TO RUN“. This solenoid has the benefit that the engine will be immediately shut down in case of a fault in the electric system. A disadvantage is the quite costly design of the solenoid with two coils.

Nominal currents of windings:

Pickup winding (PW) 51 A

Holding winding (HW) 0.7 A

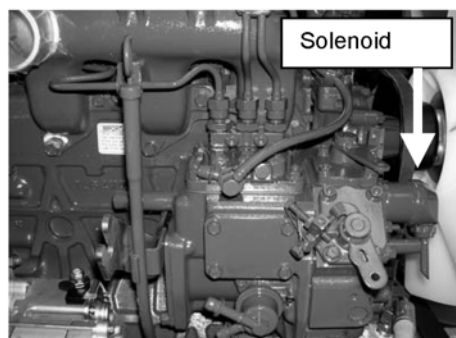


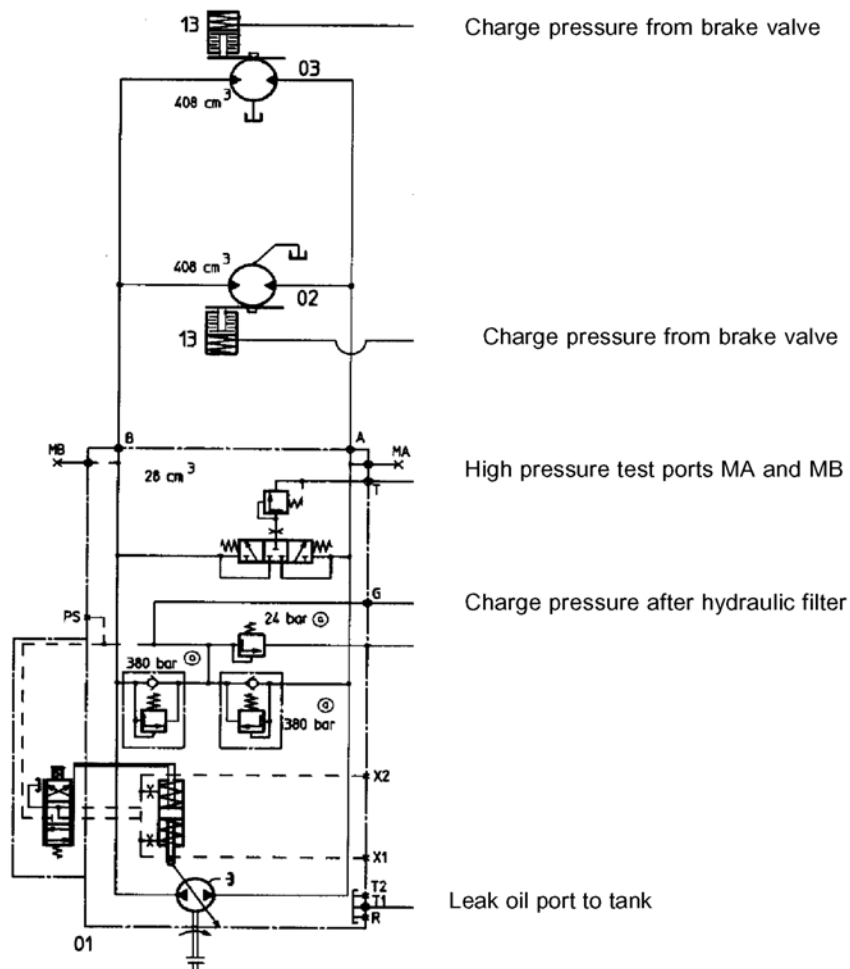
Fig. 14:

Function of the engine solenoid:

The pickup winding (PW) is directly triggered via potential 30. Once the engine has started and oil pressure is available the voltage to the pickup winding is interrupted and voltage is only applied to the holding winding.

BOMAG**Service Training****Travel system:**

On the machines described in this training manual the travel system consists of a closed hydraulic circuit. It mainly consists of the travel pump with the integrated safety elements, two travel motors, the hydraulic oil filter and the hydraulic oil cooler.



The installation of a hydraulic pump with variable displacement into a closed hydraulic circuit is a perfect solution for a hydrostatic travel system, because with this design the travel direction can be reversed without any problems.

The travel pump is flanged to the flywheel side of the diesel engine. It is directly driven by the engine with constant speed.

The tandem gear pump driven by the auxiliary output of the diesel engine consists of a steering/charge pump and a vibration pump. The return flow from the steering valve is fed through the charge oil port into the travel pump.

BOMAG Service Training

Besides its function of supplying the closed circuit with cool and filtered oil as replacement for leakage and flushing losses, the oil from the charge circuit is also used to release the travel motor integrated brakes:

All safety and control elements needed for the operation in a closed hydraulic circuit are integrated in the travel pump. These are:

High pressure relief valves (380 bar) with integrated boost check valves

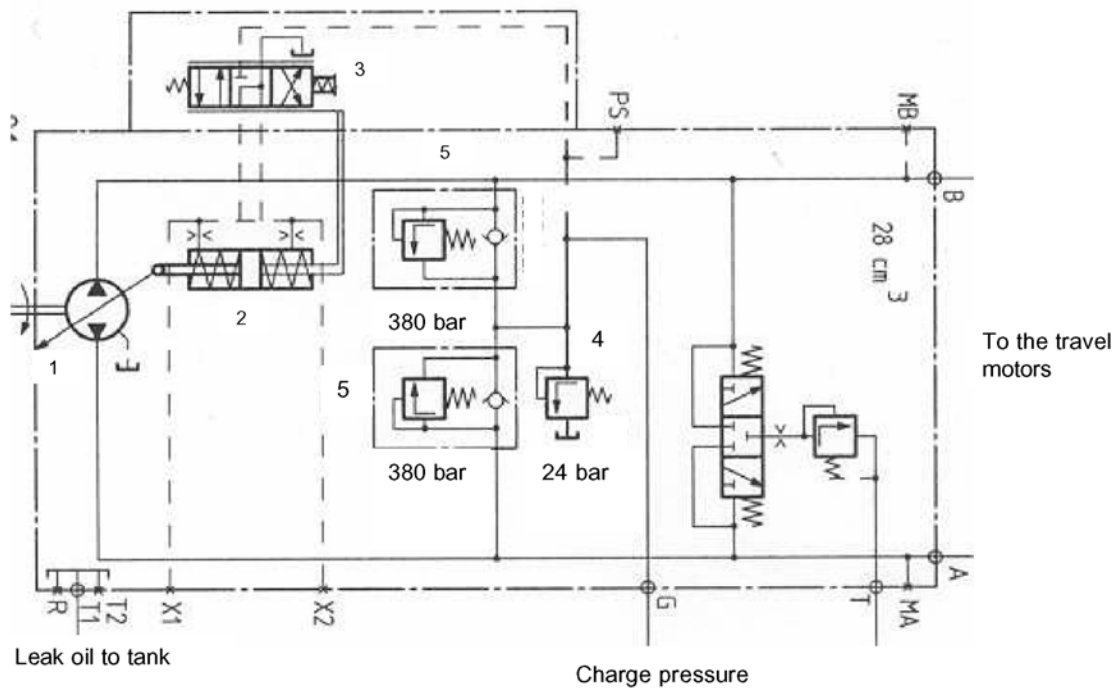
Charge pressure relief valve (24 bar)

Servo control

The travel motors (on AD-machines) are hydraulically connected parallel to each other. On AC-machines all three motors are arranged parallel to each other.

BOMAG**Service Training****Travel pump**

The travel pump is a swash plate operated axial piston pump with variable displacement from Bosch Rexroth-Hydromatik, type A 10 VG 28.



Hydraulic diagram for travel pump

- 1 Pump drive
- 2 Control piston
- 3 4/3-way servo valve
- 4 Charge pressure relief valve
- 5 High pressure relief valves

The pump is fitted with all control and safety elements needed for operation in a closed hydraulic circuit. These are:

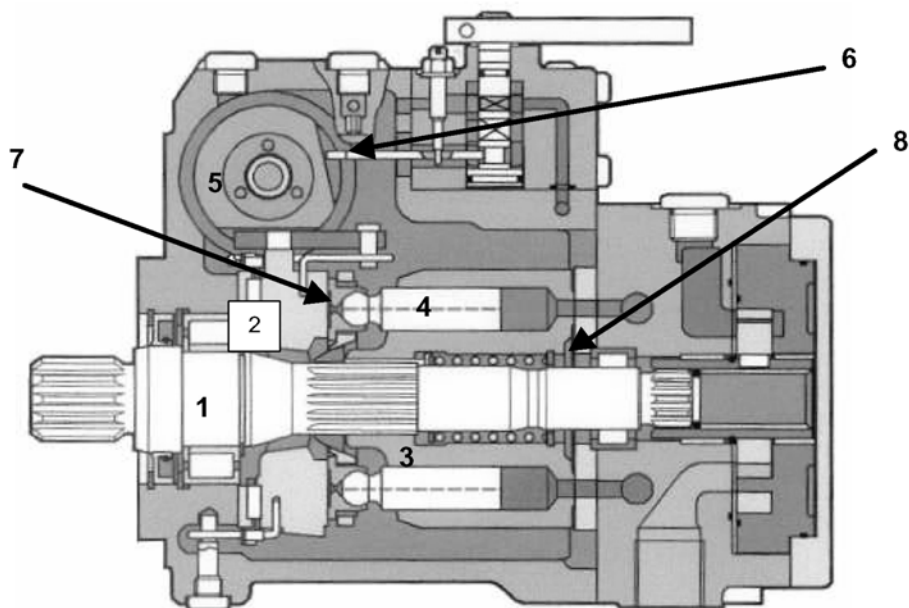
BOMAG**Service Training**

Servo control

High pressure relief valves with integrated boost check valves

Charge pressure relief valve

The travel pump unit is directly driven by the flywheel side of the engine via an elastic coupling. The pump speed is therefore identical with the engine speed.



Travel pump, cross-section

- 1 Drive shaft
- 2 Swashing cradle with swashing lever
- 3 Cylinder block
- 4 Working pistons
- 5 Control piston
- 6 Control unit with feedback lever
- 7 Slipper pad
- 8 Valve plate

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BOMAG**Service Training**

Pilot pressure is used to operate the pump out of neutral position to the desired pumping direction (direction of oil flow).

A manually operated 4/3-way valve directs the pilot oil flow (from the charge circuit) to the corresponding control piston side in the servo control. The 4/3-way valve is controlled by the travel lever and the travel cable.

In neutral position both control chambers are loaded with case pressure. When opening the 4/3-way valve pilot oil (from the charge circuit) is directed to one of the control piston sides and moves the control piston to the corresponding direction.

The swashing lever between the control piston and the swash plate transfers the control piston movement to the swash plate. The needle bearing mounted swash plate swivels to the chosen direction. This causes the axial movement of the pistons inside the cylinder block. The axial movement draws oil into the pump and presses it to the travel motors.

All working pistons are drilled through their entire length. Pressure fluid flows through these bores into the areas between the slipper pads and the surface of the swash plate. This forms a hydraulically balanced field, on which the slipper pads can slide without any metal to metal contact between swash plate and slipper pads. The feedback lever on the control piston detects when the swash plate has reached a position that corresponds with the displacement of the travel lever. This feedback lever controls a pilot oil portioning valve which interrupts the pilot oil flow to the control chambers when the swashing angle corresponds with the position of the travel lever. Swashing angle and displacement of the working pistons (oil flow rate) remain constant, until a new control command requires a different swashing angle.

When changing the swashing angle through the neutral position to the opposite side, the flow direction of the oil and the sense of rotation of the travel motors will change. The spherical valve plate centres cylinder block, which is mounted on the splines of the drive shaft. This avoids the appearance of undesired transverse forces.

The complete drive consisting of

valve plate

cylinder block with working pistons and

swash plate

is held together and preloaded by Belleville springs. This immediately eliminates any appearing wear, increases the efficiency of the pump and prolongs the lifetime considerably.

When controlling the travel pump pressure will build up in the line between pump outlet and motor inlet. This pressure depends on the load acting on the travel motors. This pressure keeps the boost check valve inside the high pressure relief valve for this particular side of the closed hydraulic circuit closed. Cool and filtered oil can now only enter into the closed circuit on the opposite side (low pressure side). The high pressure relief valve limits possibly occurring extreme pressure peaks to the adjusted value. If one of these valves responds, hydraulic oil will flow out of the high pressure side and enter the low pressure side through the corresponding boost check valve.

BOMAG**Service Training****Control**

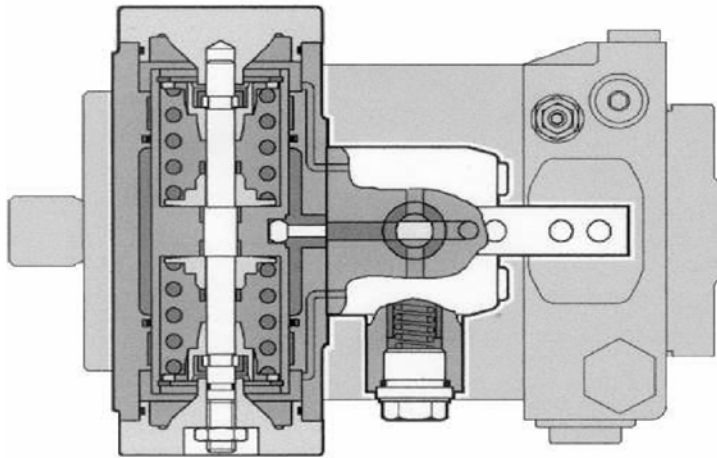
The servo control of the pump is an integral part of the pump housing and consists mainly of:

the manually controlled 4/3-way valve (1)

the control piston (2)

the feedback lever (3)

the swashing lever with the swashing cradle (see Fig. 3).



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BOMAG Service Training

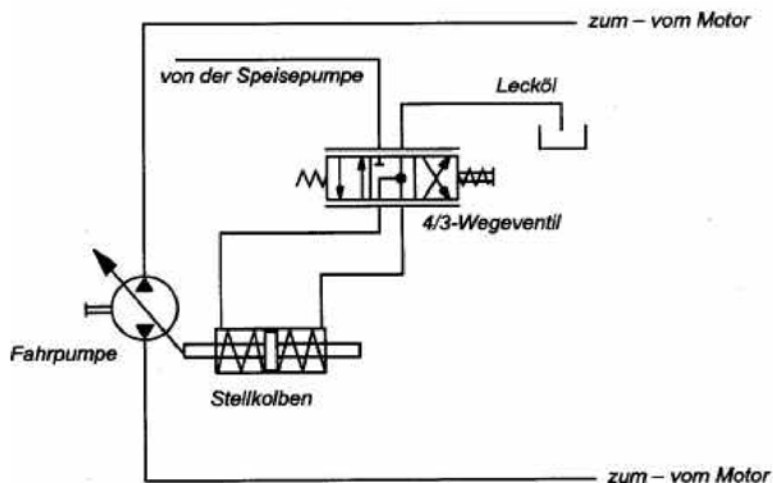
Travel pump control

When actuating the travel lever the 4/3-way valve moves out of neutral position to the desired direction and guides the pilot oil flow through the pilot oil portioning valve to the corresponding control piston side. The control piston moves to the corresponding direction and operates the swash plate via the swashing lever accordingly.

The feedback lever, which is mounted with its ball head in the pump control shaft, follows the control piston and interrupts the pilot oil flow when the control piston has reached a position corresponding with the displacement of the travel lever. The pump can now deliver oil to the travel motors.

The oil from the opposite control chamber flows through the 4/3-way valve as leak oil into the pump housing.

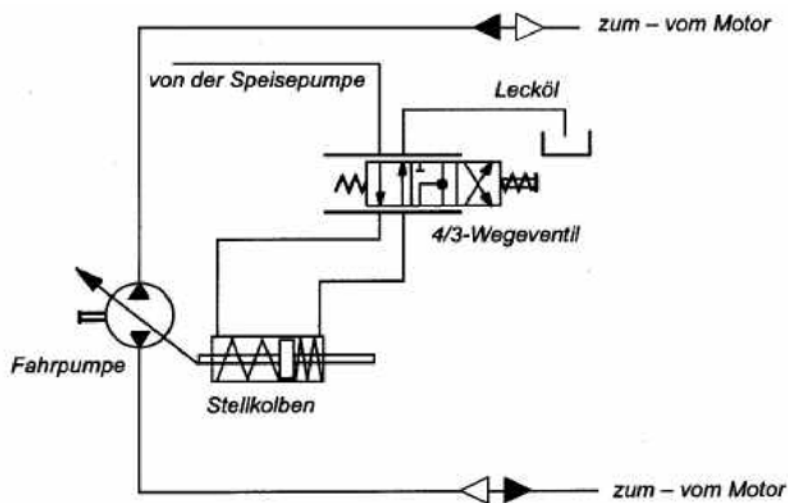
The supply bores to both control chamber sides are fitted with nozzles (swashing time nozzles). These nozzles restrict the pilot oil flow and enable a very sensitive control of the pump.



Control in neutral position

BOMAG Service Training

The feedback lever controls the pilot oil portioning valve so that the swashing angle remains unchanged, until the introduction of a new control command.

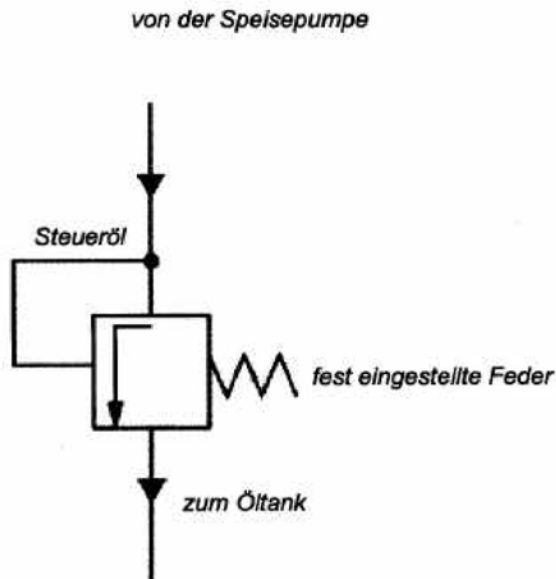


Control actuated

When the 4/3-way valve is in neutral position, the pressure values in both control chambers are identical (case pressure = max. 3 bar).

BOMAG**Service Training****Charge pressure relief valve**

The charge pressure relief valve belongs to the group of safety elements in a closed hydraulic circuit. This valve limits the pressure in the charge circuit to the adjusted value.

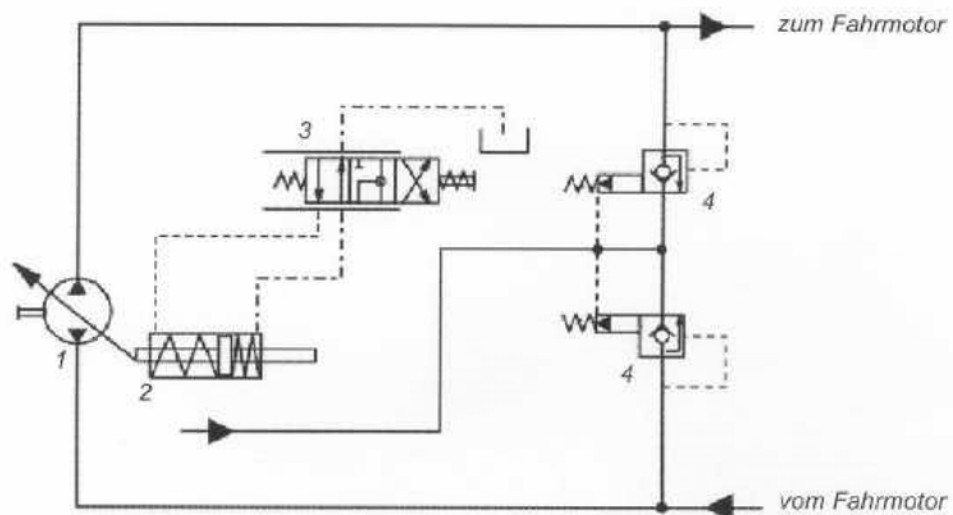
**Charge pressure relief valve**

The charge circuit is needed for the compensation of leak oil and flushing quantities in the closed hydraulic circuit. Charge oil is also required to control the pumps and to release the parking brake.

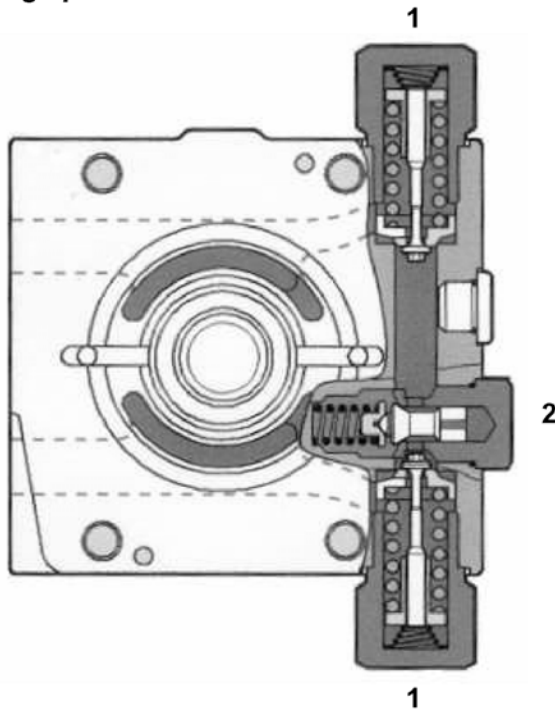
Since feeding of cool and filtered oil is only possible on the low pressure side of the closed circuit, the pressure in the low pressure side is identical with charge pressure. If the travel pump is in neutral position, both boost check valves can open and let in oil from the charge circuit. In this case the pressure in both sides of the closed circuit is identical with charge pressure.

BOMAG**Service Training****High pressure relief valves**

High pressure relief valves are safety elements, which are needed in every hydraulic circuit. These valves limit the pressure in the hydraulic circuit to the value determined by the adjustment spring.

*Hydraulic diagram*

- 1 Travel pump
- 2 Control piston (actuated)
- 3 4/3-way valve (actuated)
- 4 High pressure relief valves, fixed adjustment (380 bar)

BOMAG**Service Training***High pressure relief valves*

- 1 *High pressure relief valves*
- 2 *Charge pressure relief valve*

The high pressure relief valves in both sides of the hydraulic circuit protect the hydraulic system, the diesel engine and all other machine components against overloads.

The boost check valves are integrated in the high pressure relief valves. These valves open to the low pressure side and let cool and filtered oil flow from the charge oil circuit into the closed hydraulic circuit, in order to compensate leaks and flushing quantities.

High pressure relief valve 380 bar

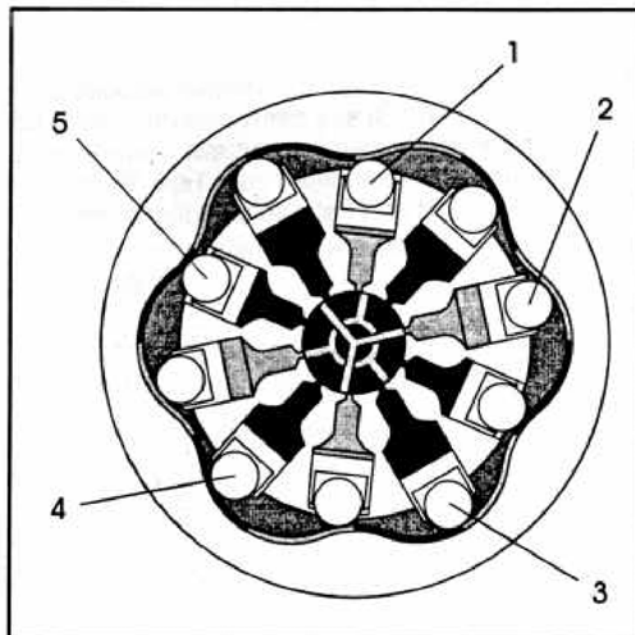
BOMAG**Service Training*****Drum drive motor:*****Poclair travel motor type MK04**

Both drums are driven by Poclair travel motors type MK04. These are radial piston motors. These drive motors consist of the outer housing, the flat distributor, the cylinder block with the working pistons, the output shaft and the brake. The brake is designed as a Hirth-toothing.

The housing consists of

- bearing section (bearings for output shaft)
- torque module (cam race)
- oil distributor and
- Hirth brake

The function of the radial piston motor is described hereunder. The piston positions mentioned in the description are shown in the corresponding illustration.



The movement of a piston along the cam race must be examined during various phases of the rotation.

BOMAG**Service Training****Piston position 1:**

- The oil enters into the oil distributor under pressure, flows through the distributor and presses against the piston. This is the start of a rotation. Due to the pressure on the back of the piston the roller will move along the cam, thereby causing a rotary movement of the cylinder block.

Piston position 2:

- At this point the oil flow to the piston has reached its largest cross section. The piston continues its travel along the cam race towards the valley between two cams. The opening cross section decreases with continuing rotary movement.

Piston position 3:

- Once the piston has reached the deepest point the oil flow to the piston is cut off. The piston is no longer driven. It has reached its dead centre. Another piston must now be driven to move the previous piston out of dead centre position.

Piston position 4:

- By driving other pistons the previous piston is moved out of dead centre position. The oil behind the piston is connected with the low pressure side and the retracting piston presses it back to the pump.

Piston position 5:

- The oil supply back to the pump comes close to an end, the connecting bore between cylinder and low pressure side closes slowly. The piston will now reach its second dead centre position. This point is the start of a new working cycle.

Reversing the oil flow reverses also the rotation of the motor.

BOMAG Service Training

Brake actuation MK04 motor (drum drive motor)

The travel system is equipped with a Hirth-type brake in the travel motors. This brake serves as parking brake to park the machine. (to secure the machine when the engine is running or to park the machine with the engine shut down) and as emergency brake.

The brake control is accomplished via a 3/2 way valve which is located at the front in the engine compartment. If the solenoid valve is supplied with electric current when the engine is started, the valve will switch over and guide charge pressure into the brake housings. This releases the brakes.

If the solenoid valve is de-energized while the engine is running (e.g. when actuating the emergency stop switch), the oil pressure in the brake housings is relieved to the tank and the brakes will close.



BOMAG Service Training

During travel operation the machine is braked by the closed hydraulic circuit. When moving the travel lever to neutral position the supply from the pump is interrupted. The machine will stop.

However, both travel motors are additionally fitted with brakes. These brakes work only as parking brakes. The brakes are automatically relieved by the charge pressure building up when starting the engine. Should the charge pressure drop considerably (failure or shut-down of the engine, damage in the hydraulic system), the brakes close automatically.

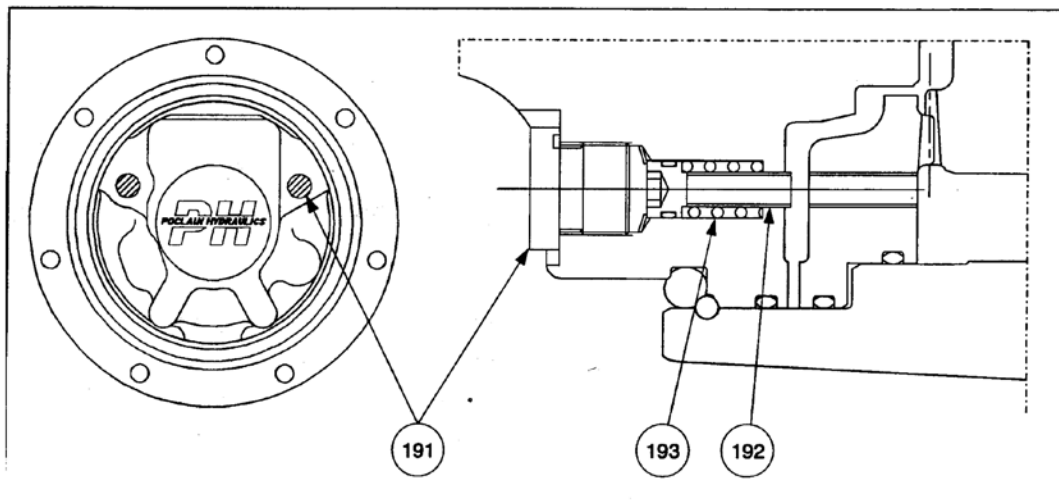
When shifting the travel lever to neutral position the brake closes after a short while. The brake closes also when the seat contact switch is open.

The brakes can be relieved mechanically with screws.

The mechanical releasing of the brakes works as follows

- Unscrew the 2 plugs (191)
- Press the screws (192) against the springs (193)
- Tighten both screws (192) alternately and in steps until they bottom (approx. 2 revolutions) (**max. 35 Nm**)

To close the brake, proceed in reverse order.



BOMAG Service Training

Wheel drive motors on AC-machines

The rubber tires of the BW 100/120 AC-4 are driven by **two** radial piston motors Poclairn MSE 02 which are joined parallel to each other and also parallel to the drum drive motor.

The function of the motor is identical with the previously described Poclairn motor MK04. However, the main difference is the design of the integrated brake. The MSE02 is fitted with a multi-disc brake. This consists of inner and outer discs which run permanently in an oil bath. Since the brake is normally only applied in events of emergency, it is almost wear free. If needed, the brakes can be released with the help of a brake releasing device. For this purpose a ball valve is installed in the engine compartment. By operating this valve oil can be directly guided to the motors (drum as well as wheel drive motors). For this purpose the steering wheel must be slowly turned for approx. two turns in clockwise direction. In this case the steering wheel or Orbitrol has the effect of a pump and delivers oil to the brakes (to the drum as well as the wheel drive motors). The brakes are thereby released.

BOMAG**Service Training****Trouble shooting travel system*****Machine does not drive*****Checking the function of the brake valve**

- > Switch the ignition on
- > Release the parking brake by shifting the travel lever out of neutral position
- > Measure the voltage supply on the solenoid valve

Nominal value: 12 V

If the voltage supply is not correct perform trouble shooting in the electric system.

If the voltage supply is correct

the **current** consumption of the brake valve must be checked next:

- > For this purpose the meter must be connected **in line** with the solenoid of the brake valve
- > Switch the ignition on

Nominal value: max. 2.7 A

If no current consumption can be detected, change the solenoid coil

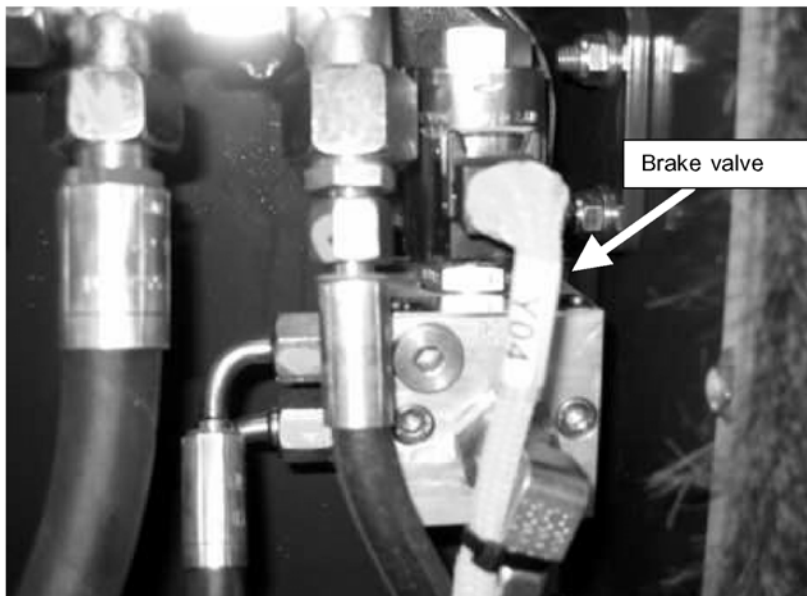


Fig. 1

BOMAG Service Training

If the solenoid coil is o.k., check the solenoid valve.

- > Connect a 60 bar pressure gauge to the pressure test port
- > Start the engine and move the travel lever out of neutral.
- > Read the pressure gauges.

Nominal value: approx. charge pressure 24 bar

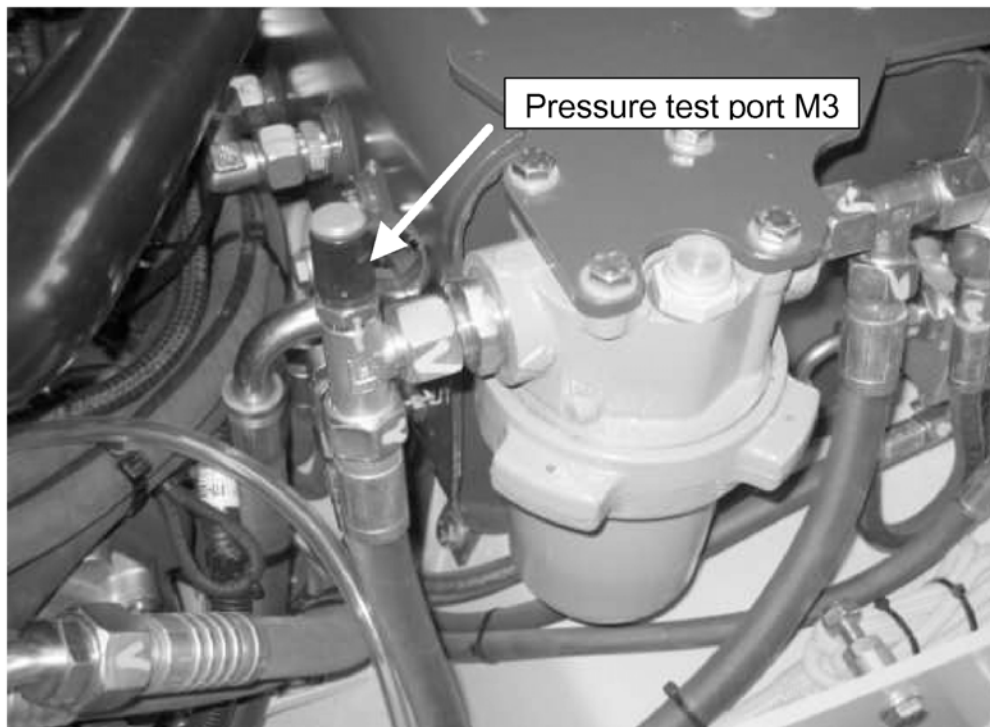


Fig. 2

BOMAG**Service Training**

If the charge pressure value is not reached check the brakes in the motors.

- > Connect a 600 bar pressure gauge to pressure test port (M1).
- > Close the brake (travel lever in neutral)
- > Start the engine
- > Turn the steering against an end stop and read the pressure gauge

Nominal value approx.: 170 bar

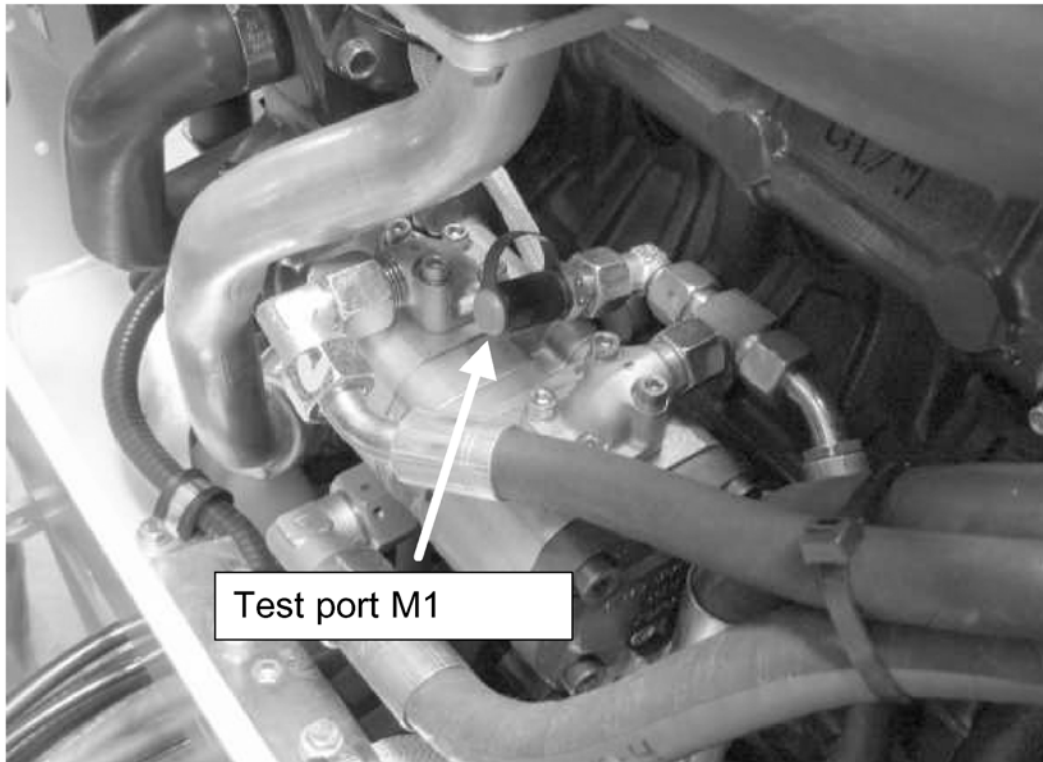


Fig 3:

If the steering pressure value is not reached replace the steering/charge pump.

BOMAG**Service Training**

If the steering pressure is correct check the charge pressure relief valve of the travel pump.

- > Unscrew the plug.
- > Take the valve insert out.
- > Check the valve visually.

Replace the valve immediately if damaged.

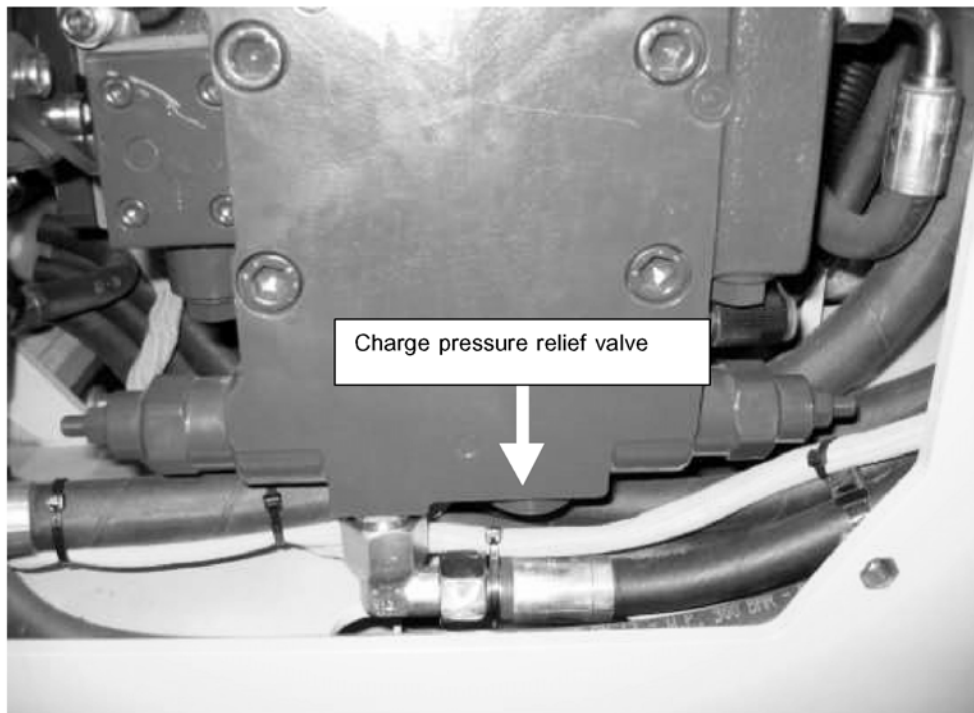


Fig 4:

BOMAG**Service Training**

If the valve is o.k., check the brakes.

- > Disconnect the brake hoses from front and rear travel motor, one after the other, and close them with plugs.
- > Perform a pressure test on the pressure test port (near hydraulic oil filter M 3) after each disconnection of a brake hose

If the charge pressure value is not reached replace the corresponding motor.

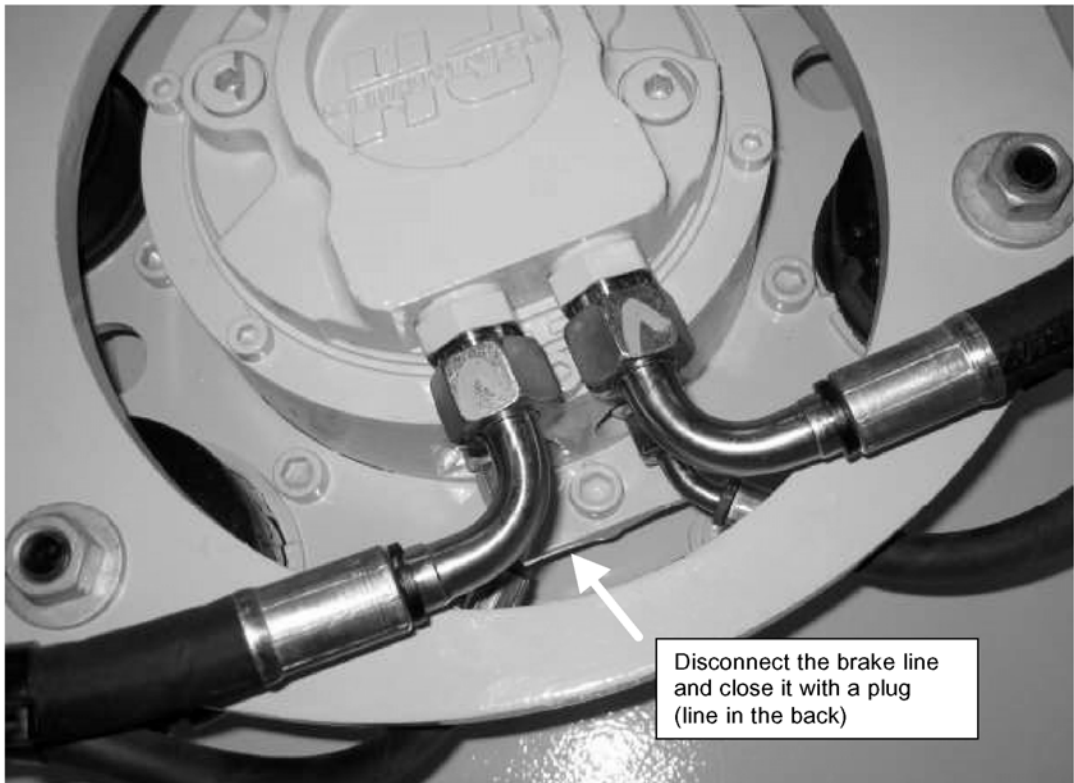


Fig 5:

BOMAG**Service Training**

If the charge pressure is correct check the high pressure of the travel pump.

Attention! The following test must not exceed 5 seconds !

- > Close high pressure ports A and B.
- > Connect 600 bar pressure gauges to the high pressure test ports
- > Run the engine in idle speed and actuate the travel pump quickly to both directions.
- > Read the pressure gauges.

Nominal value: approx. 400 bar

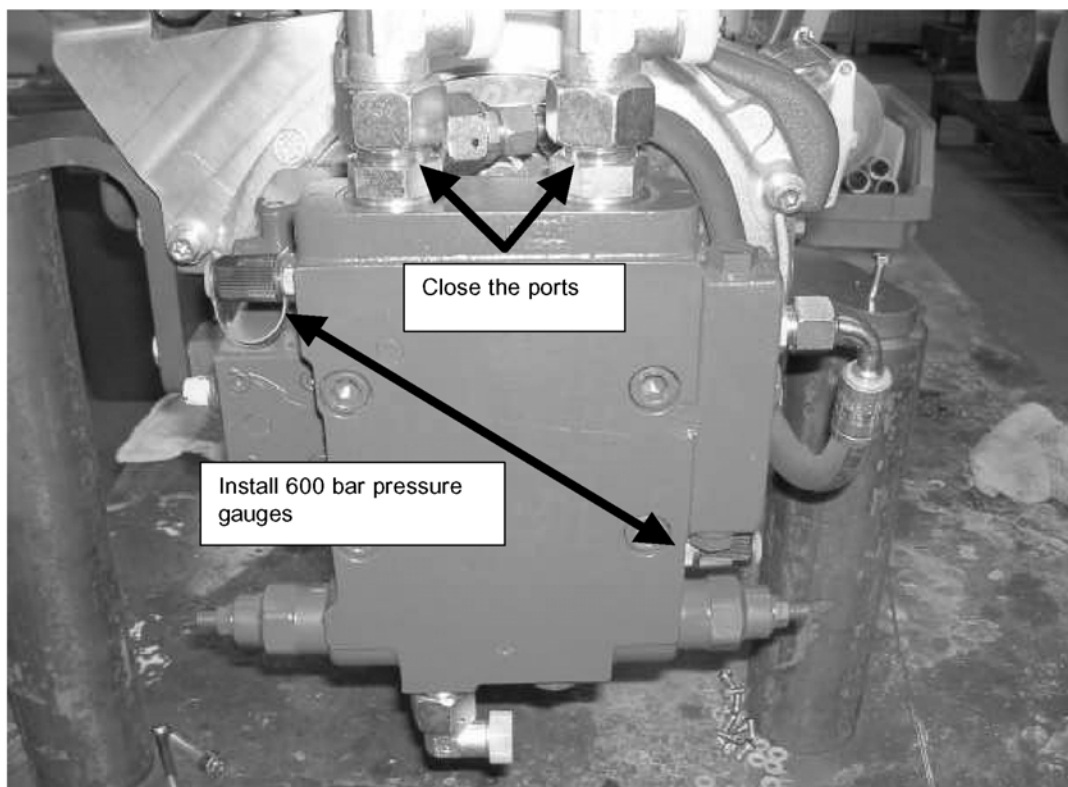


Fig 6:

BOMAG Service Training

If the high pressure value is not reached replace the high pressure relief valves.

If the problem still exists after replacing the high pressure relief valves, replace or repair the travel pump.

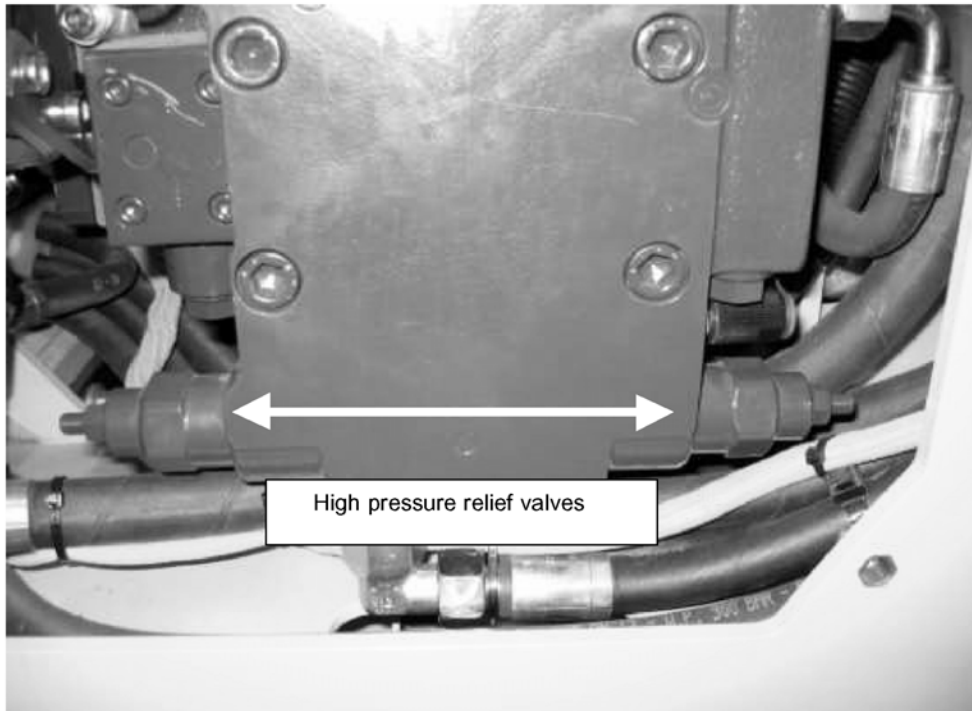


Fig 7:

BOMAG Service Training

If the high pressure value is reached, the travel motors must be checked individually.

- > Reconnect the high pressure hoses from the front travel motor to the travel pump.
- > Repeat the pressure test

If the high pressure value is not reached replace the front travel motor.

If the high pressure value is reached replace the rear travel motor.

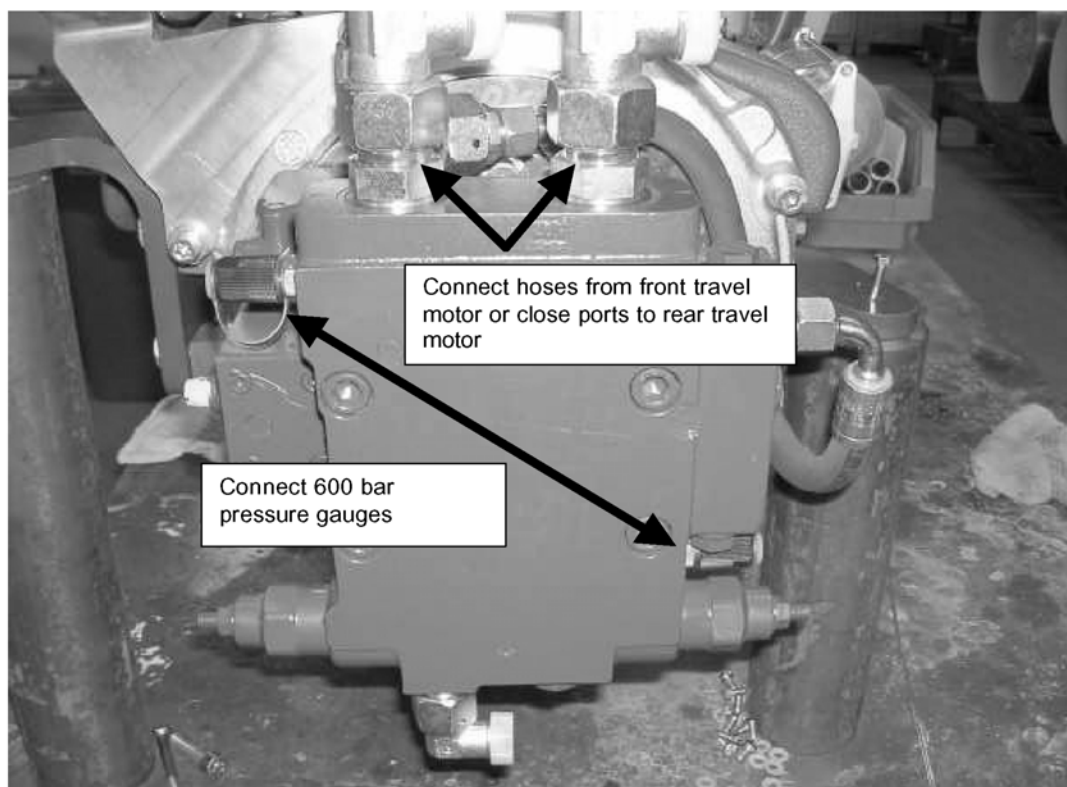


Fig 8:

BOMAG Service Training

If the charge pressure is reached in the test described under Fig. 2, charge pressure must be checked together with high pressure.

- > Connect 600 bar pressure gauges to the pressure test ports MA and MB. (Travel pump)
- > Run the engine with max. speed
- > Block the drum or disconnect the cable from the brake valve.
- > Actuate the travel lever for a moment and read the pressure gauge

Nominal value: **charge pressure approx. 22 to 24 bar**
 high pressure approx. 380 bar

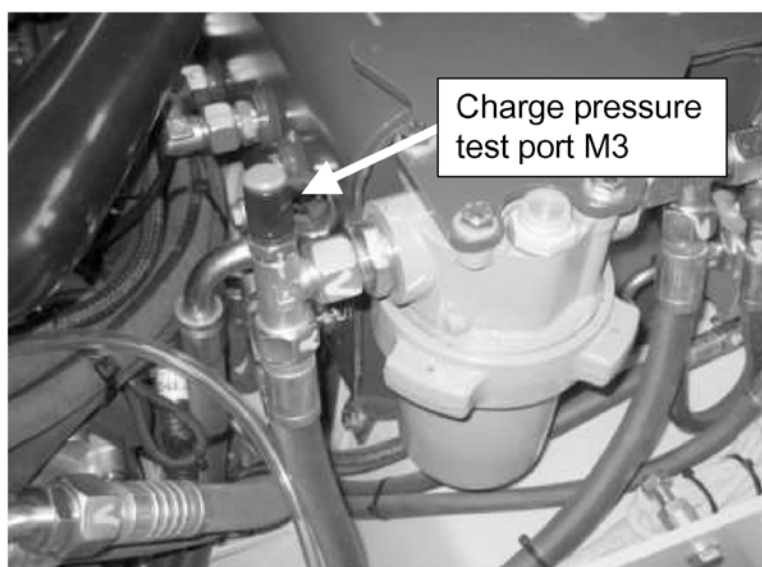
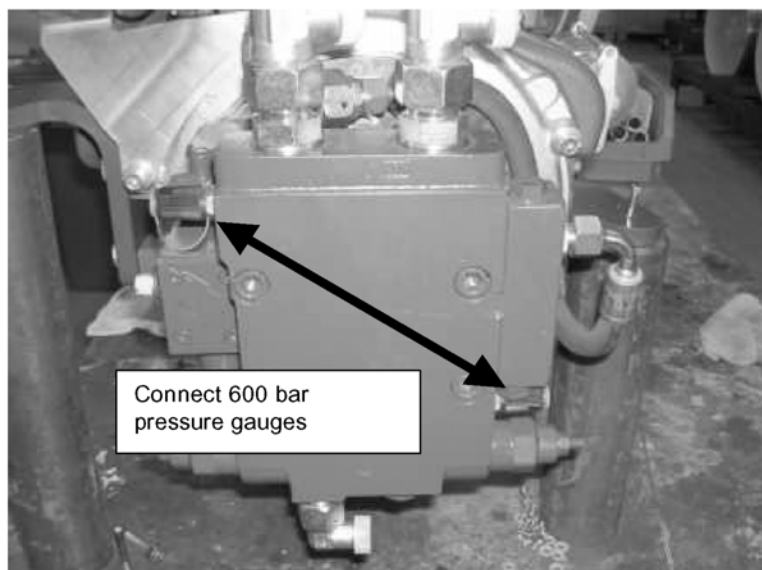


Fig 9:

BOMAG Service Training

If the charge pressure is reached check the control chamber pressure.

- > Connect pressure test ports to the control chambers (X1 and X2).
- > Connect a 60 bar pressure gauge to the pressure test ports
- > Block the drum or disconnect the cable from the brake valve.
- > Actuate the travel pump to full displacement and read the pressure gauge.

Nominal value: approx. 24 bar

If the control chamber pressure value is not reached replace or repair the travel pump.



Fig 10:

BOMAG Service Training

If the control chamber pressure is reached and the high pressure value is correct, release the brakes in both travel motors mechanically

> Check whether the machine is able to drive

If the machine drives replace or repair the travel motor with the defective brake.

Mechanical releasing of brake (AD-machines only) is accomplished as follows:

- Unscrew the 2 plugs (191)
- Press the screws (192) against the springs (193)
- Tighten both screws (192) alternately and in steps until they bottom (approx. 2 revolutions) (**max. 35 Nm**)

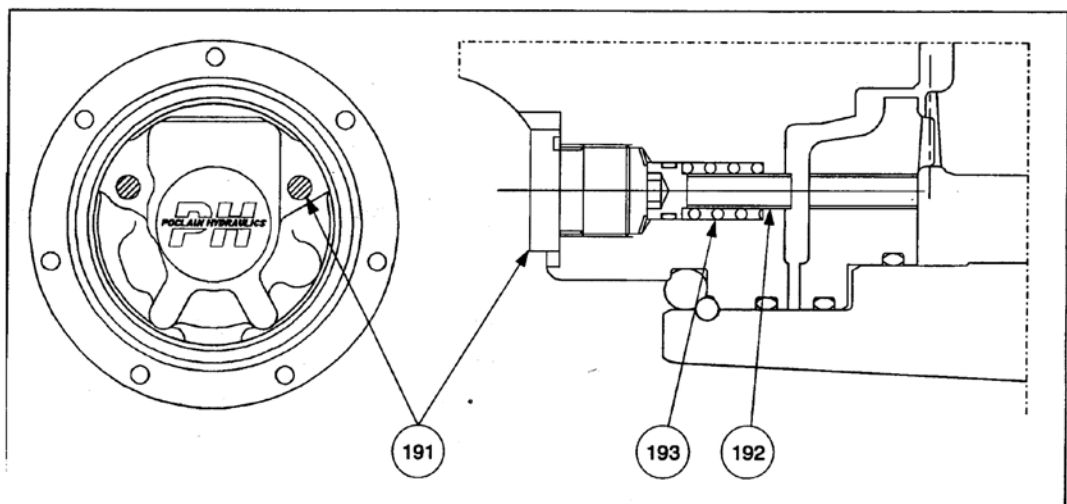


Fig 11:

BOMAG Service Training

Insufficient travel power

With this fault the engine speed must be checked first.

Nominal value: **Stage 1 = 2250 rpm**
 Stage 2 = 2700 rpm

If the nominal speeds are not reached perform trouble shooting on the engine.

If the speed values are correct check the travel control.

- > Detach the control cable
- > Shift the pump control lever forward and reverse and check whether the pump swashes to maximum displacement.
- > Check whether the travel cable is worn.

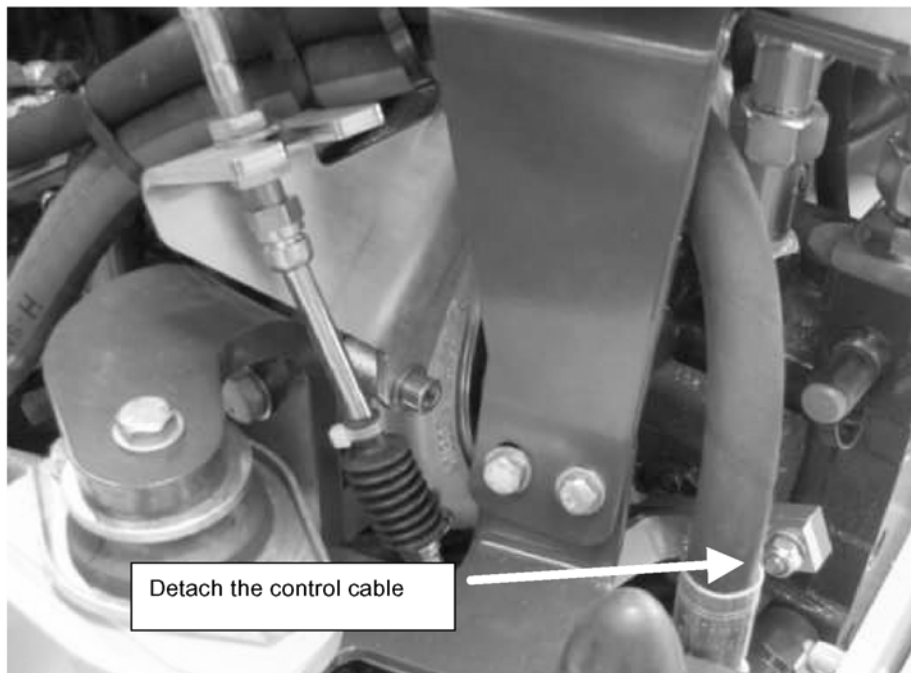


Fig 12:

BOMAG Service Training

If the end stops are not reached adjust the end stops.

Adjust the end stops for the speed on the setscrews

> Check the travel cable for wear.

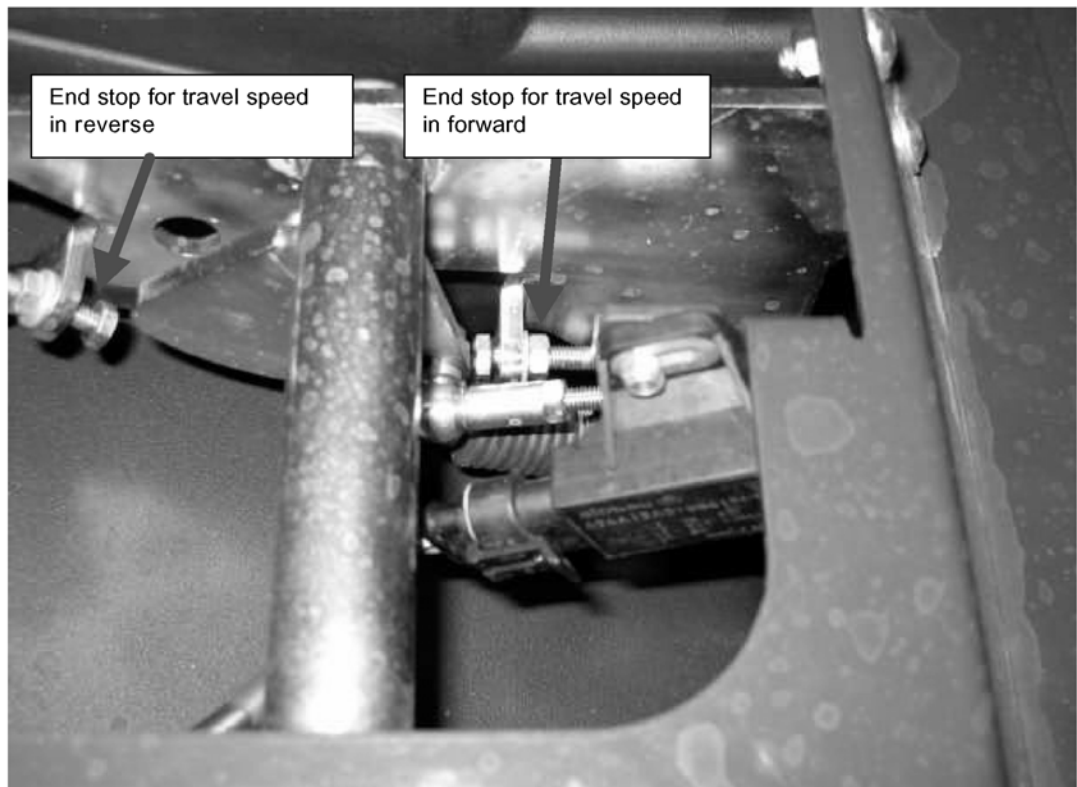


Fig 13:

BOMAG Service Training

The machine moves with the travel lever in "Neutral"

With this fault the neutral position of the pump must be checked first.

- > Shift the travel lever to "Neutral" position
- > Disconnect the travel cable from the pump

Check, whether bores in ball socket and pump control lever are in line.

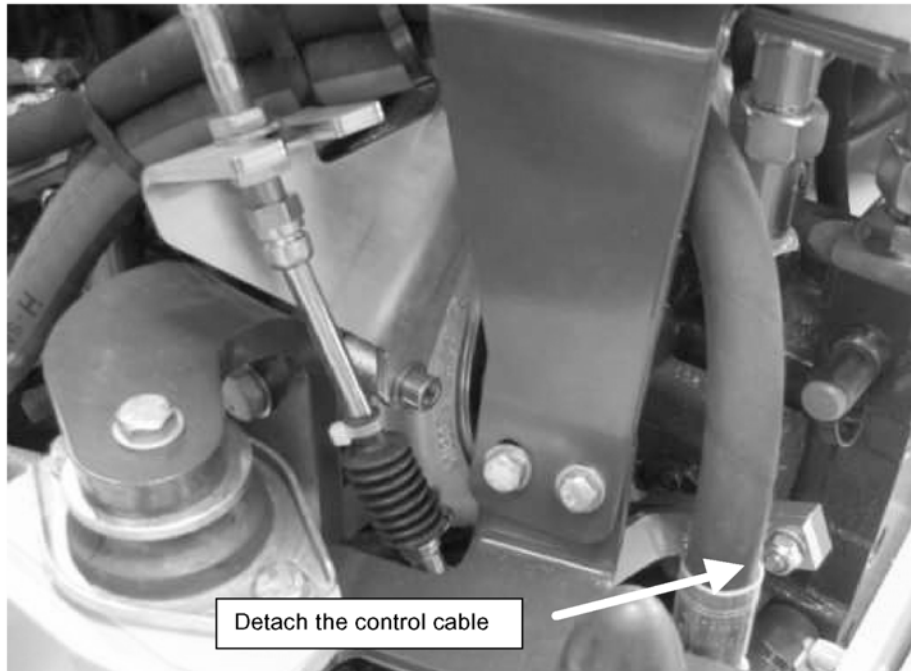


Fig 14:

BOMAG Service Training

If the bores are not in line adjust the travel cable.

- > Slacken the counter nut on the back stop.
- > Adjust the nuts until the travel cable corresponds with the neutral setting of the pump.
- > Tighten the counter nut again



Fig 15:

BOMAG Service Training

If the bores are in line check the mechanical neutral position.

> Join both control chambers of the travel pump (X1 and X2)

Note: *The resulting condition of equilibrium must bring the machine to standstill.*

If the neutral position is reached by this measure replace or repair the servo control on the machine.



Fig 16:

BOMAG**Service Training**

If the neutral position is not reached it is necessary to adjust the mechanical neutral position.

- > Connect 600 bar pressure gauges to MA and MB.
- > Block the drum or disconnect the cable from the brake valve.
- > Run the engine with max. speed.
- > Read the pressure gauges.
- > Adjust the mechanical 0-position until the pressure readings are identical on both sides

If the neutral position is not reached, replace or repair the travel pump.



Fig 17:

BOMAG

Service Training

Vibration

The vibration drive is an open hydraulic circuit and consists mainly of the vibration pump, the control valve and the vibration motors.

Circuit diagram AD-machine

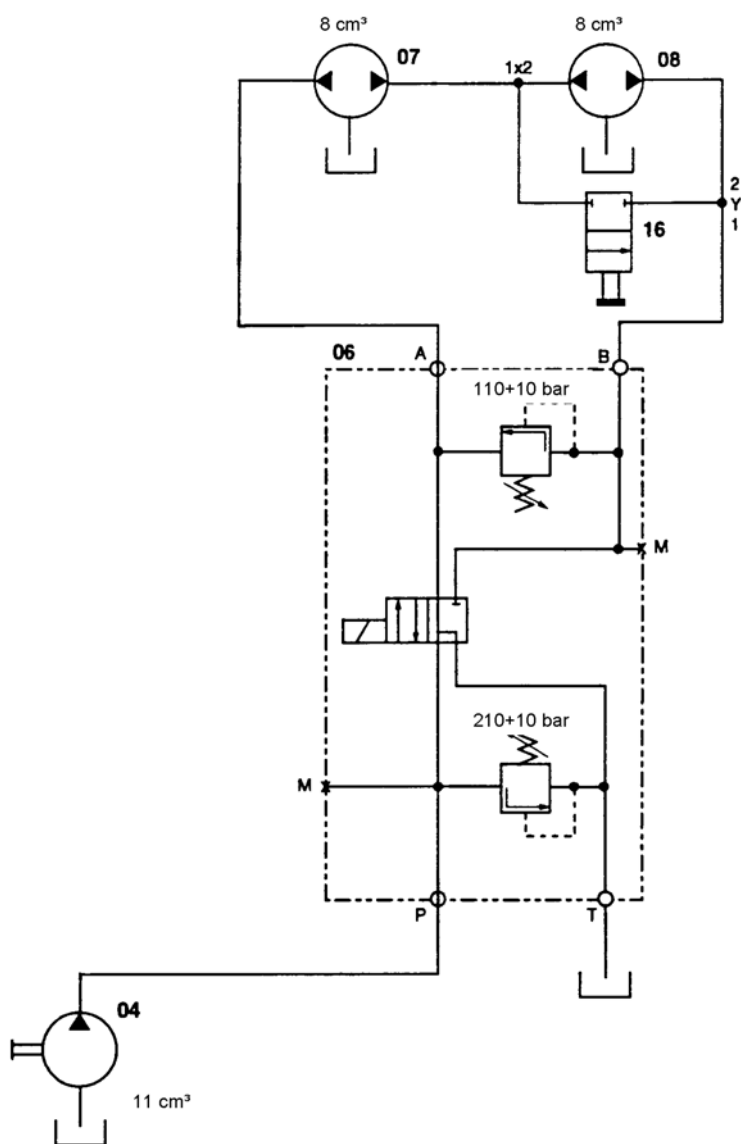


Fig. 20:

BW 100/120 AD Series 4
 BW 100/120 AC Series 4

E 1

BOMAG**Service Training**

The vibration pump is directly driven by the timing gear side of the diesel engine. Vibration pump and steering/charge pump are joined together to a tandem pump unit. The gear pump delivers the hydraulic oil out of the hydraulic oil tank to the vibration control valve.

If the vibration is switched off the hydraulic oil flows directly back to the tank.

When the vibration is switched on, the control valve directs the oil flow to the in line connected vibration motors (BW 100/120 AD-4), or to the vibration motor on the drum (BW 100/120 AC-4).

The vibration motors (gear motors) drive the vibrator shafts in the drums with constant speed via Bowex couplings.

The rotation of the exciter shafts with the attached eccentric masses generates the vibration of the drums, which are suspended in rubber elements. From the second vibration motor the oil flows back through the control valve block to the tank (open circuit).

The standard equipment of the AD-machine includes a shut-off valve for the rear drum vibration. When operating a ball valve the oil flow is directly returned to the tank after the first motor (front drum) via the control valve block

BOMAG**Service Training****Vibration pump**

The vibration pump is a directly driven gear pump.

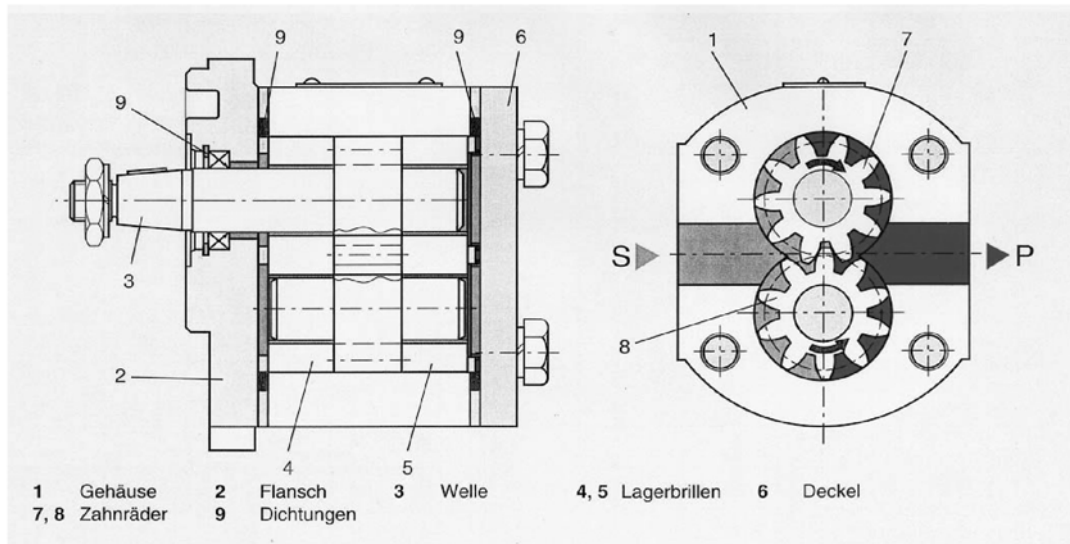


Fig 21:

The drive gear is connected with the auxiliary drive of the diesel engine via a pinion. Drive gear and driven gear are positioned by a bearing plate in such a way, that the gears mesh with minimum clearance when rotating.

The displacement chambers are created between the tooth flanks, the inside wall of the housing and the faces of the bearing plates.

During operation of the pump the hydraulic oil is transported in these chambers from the suction side to the pressure side. This causes a vacuum in the suction line by which the hydraulic oil is drawn out of the tank. These tooth chambers convey the fluid to the pump outlet from where it is pressed to the consumer. To ensure a safe function of the pump the tooth chambers must be so tightly sealed that the hydraulic fluid can be transported from the suction side to the pressure side without any losses.

Outer gear pumps are fitted with gap seals. In dependence on the operating pressure there will be losses from the pressure side to the suction side. An axial pressure field presses the bearing plate on the cover side against the front face of the gears, making sure that only a very little quantity of oil will leak from the pressure side to the suction side when the pressure increases.

The pressure field is always under the actual system pressure.

The vibration pump delivers the hydraulic oil from the tank to the vibration motors and from there back to the tank.

BOMAG**Service Training*****Vibration control valve***

With the vibration control valve the vibration is electrically switched on and off.

The valve consists of the solenoid operated valve piston, the pressure relief valve for the vibration circuit and the brake valve to brake the exciter shafts when switching the vibration off.

When switching the vibration on the direct return flow to the hydraulic oil tank is interrupted and the hydraulic oil is guided to the vibration motors.

The high pressure (starting pressure) in the vibration circuit generated by the resistance of the resting exciter shafts is limited to 210 bar by a pressure relief valve inside the control valve block.

When operating the control valve the valve spool opens also a direct connection between the outlet of the second vibration motor and the oil tank.

When switching the vibration off this direct connection is interrupted. The hydraulic oil, which is now displaced to the control valve by the still rotating vibration motors is applied to 110 bar pressure relief valve (brake valve). This valve brakes the rotation of the exciter shafts within the shortest possible time.

BOMAG**Service Training*****Vibration motor***

On the machines of series BW 100/120 AD-4 and BW 100/120 AC-4 the exciter shafts inside the drums are directly driven by vibration motors.

These vibration motors are gear motors which are directly connected with the exciter shafts via Bowex couplings.

The design of these vibration motors is almost identical with the design of the vibration pump. A more detailed description of the design is therefore not required.

On the BW 100/120 AD-4 the vibration motors are connected in series.

The standard equipment of the machine includes a shut-off valve for the rear drum vibration. When operating a ball valve the oil flow is directly returned via the control valve block to the tank after the first motor.

BOMAG**Service Training*****Trouble shooting vibration*****Vibration frequency too low**

If the specified exciter shaft speed is not reached, the engine speed must be checked first.

Check the engine speed with a vibration reed frequency meter.

Nominal value: 2700 rpm (with throttle control in stage II)

If the nominal speed is not reached perform trouble shooting on the engine.

Various instruments or methods may be used to check the engine speed. (e.g. vibration reed frequency meter, optical speedometer etc.)

BOMAG**Service Training**

If the engine speed is correct, check the pressures in the vibration circuit.

- > Stand both drums on an elastic base (rubber tires).
- > Connect a 600 bar pressure gauge to vibration pressure test port.
- > Run the engine with full speed and switch the vibration on.

Nominal value : Starting pressure approx. 210 bar (for approx. 3 - 6 seconds)
Operating pressure (one vibrating drum): approx. 60 bar
Operating pressure (two vibrating drums): approx.: 100 bar

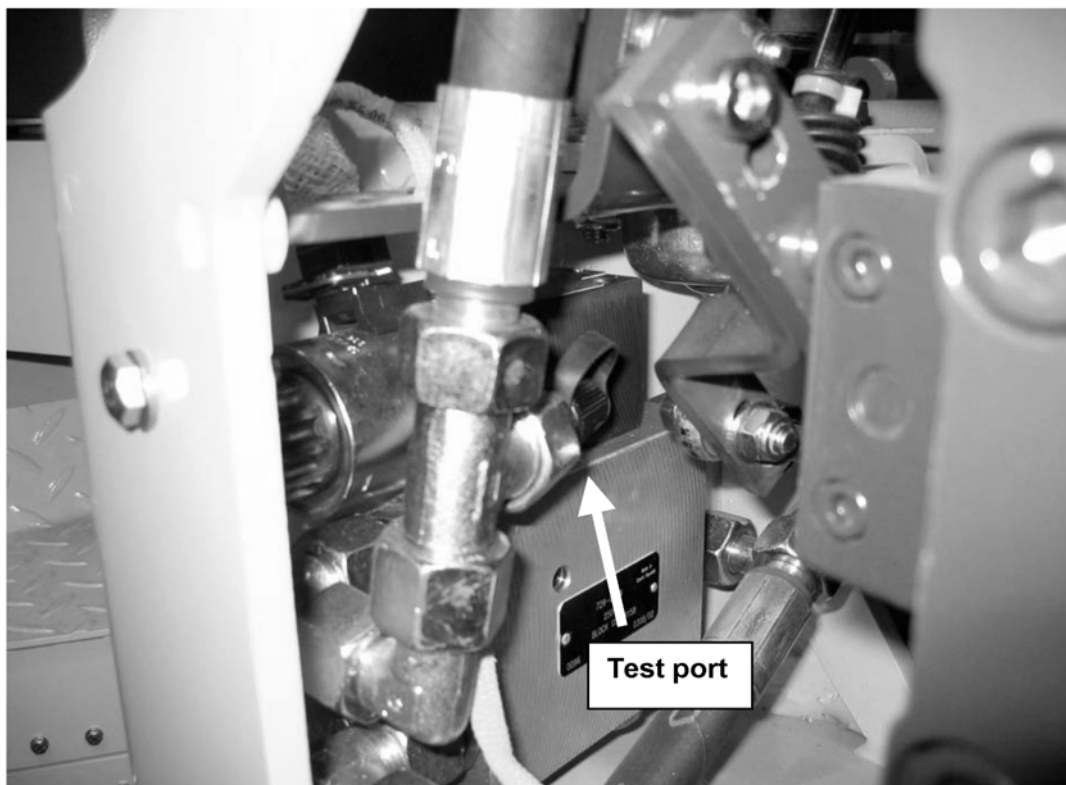


Fig 22:

BOMAG**Service Training**

If the starting pressure is not reached check the control valve block.

- > Disconnect the high pressure hoses from the valve block (A and B).
- > Close ports A and B on the valve block.
- > Switch the vibration on.

Nominal value : approx. 210 bar

BOMAG**Service Training**

If the pressure value is not reached subject the vibration pump to a high pressure check.

- > Install a 200 bar pressure relief valve with a 600 bar pressure gauge between vibration pump and vibration valve.
- > Start the engine and switch on the vibration

Nominal value : approx. 200 bar

If the pressure is reached replace the vibration valve block.

If the pressure value is not reached replace the vibration pump.

BOMAG**Service Training**

If the pressure is reached during the pressure test described in Fig. 5, check the leak oil rate of the vibration motors. For this purpose stand the machine on rubber tires.

- > Disconnect the leak oil line and hold it into a measuring vessel.
- > Switch the vibration on.

Nominal value: max. 1.0 l/min

Replace the motor with too high leak oil rate.

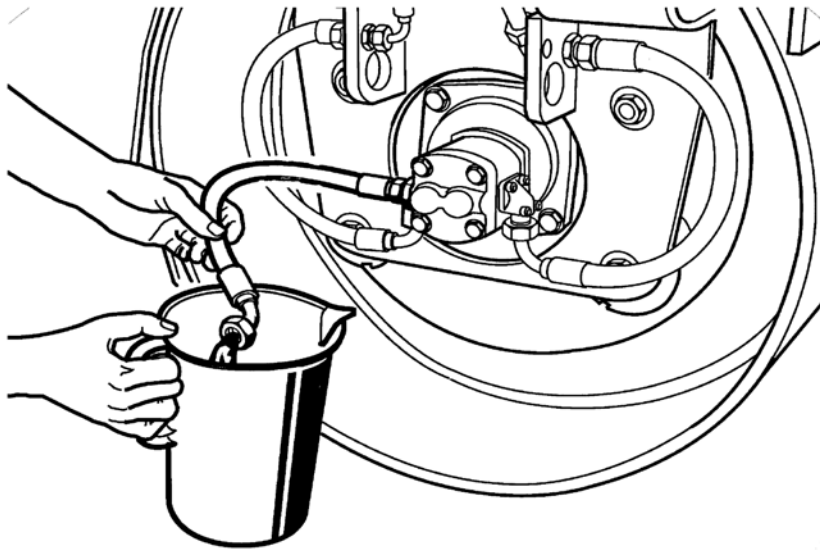


Fig 23:

If the starting pressure is reached, but the operating pressure is too low, you must also check the leak oil rate of the vibration motors.

BOMAG**Service Training**

If the operating pressure is **too high**, the bearings for both vibrator shafts must be checked.

> Check end float and moveability of the exciter shafts (front and rear).

Nominal values: min 0.5 mm
 max. 2.00 mm

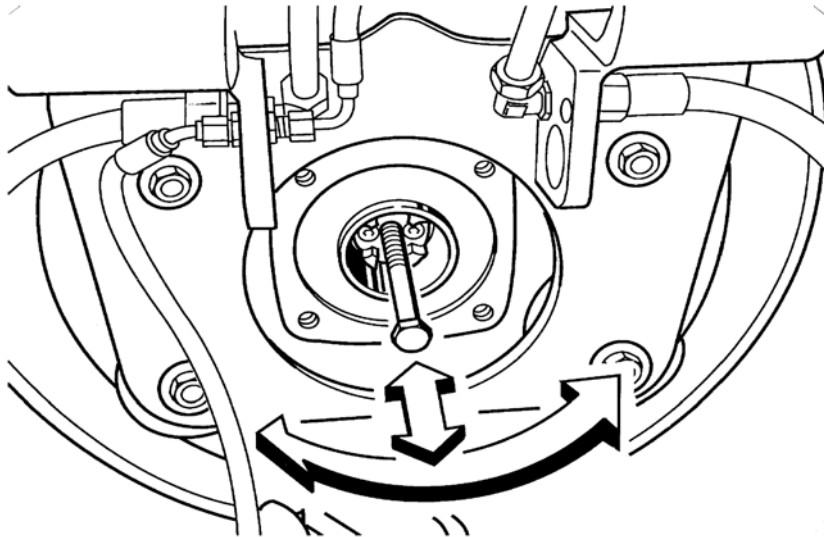


Fig 24:

BOMAG**Service Training*****No vibration***

If the vibration does not work at all you should first check the voltage supply for the vibration control valve.

> Switch the vibration on and check whether voltage is applied to the plug.

Nominal value: 12 Volt

If no voltage is applied, perform trouble shooting in the electric system.

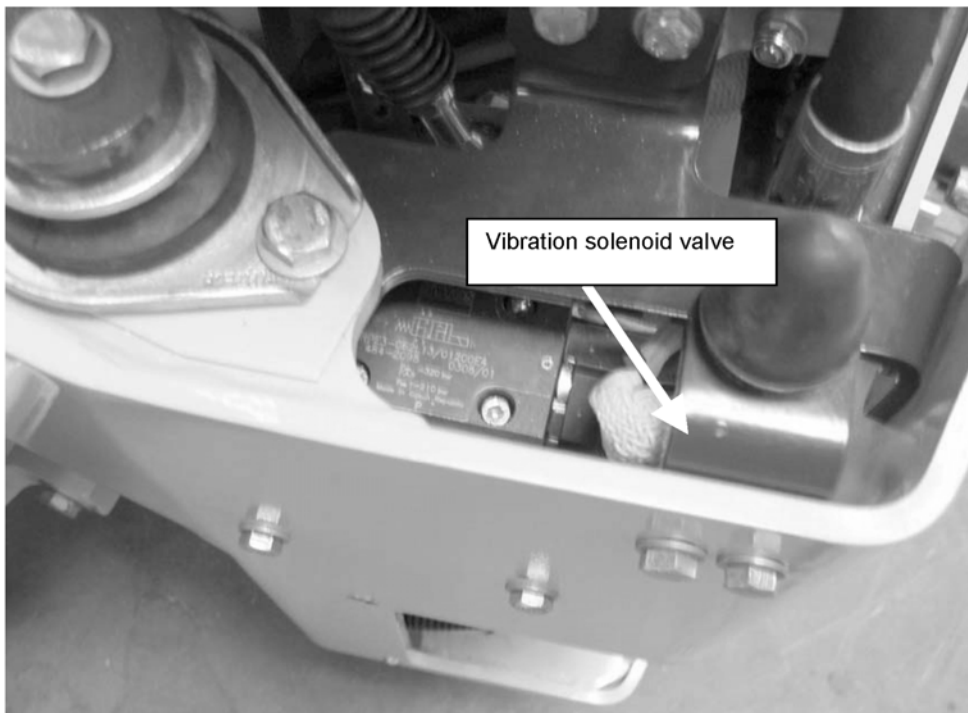


Fig 25:

If voltage is applied check the magnetic coil of the control valve.

> Measure the current consumption with a meter.
(For this purpose the meter must be connected in line with the magnet)

Nominal value : approx. 3.5 A

If the current consumption is not correct replace the magnetic coil.

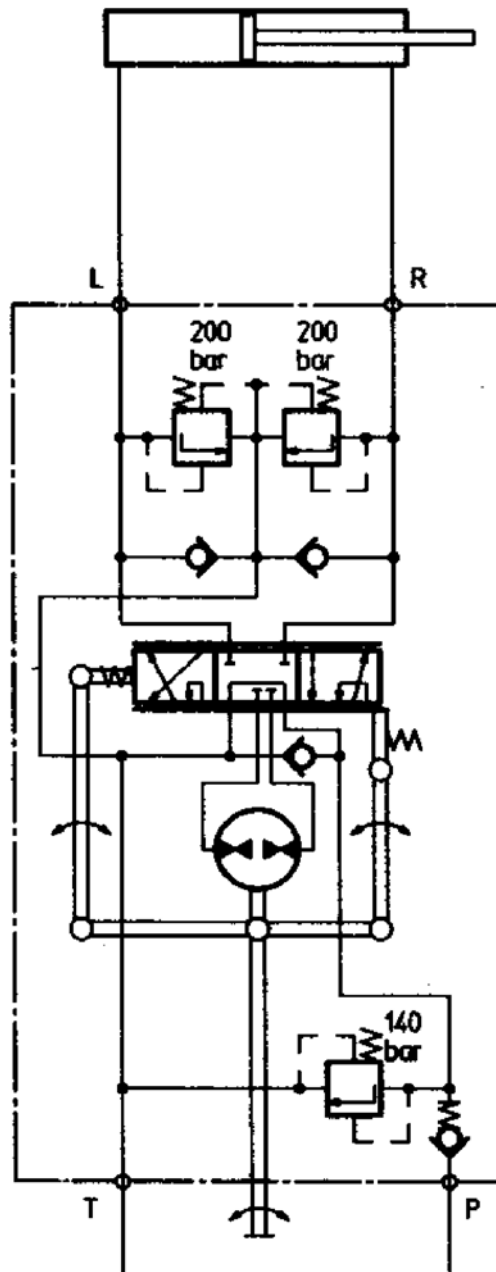
If the current consumption is correct continue trouble shooting with Fig. 22.

BOMAG

Service Training

Steering

The steering system is an open hydraulic circuit and consists mainly of the steering/charge pump, the steering valve, the steering cylinder and the connecting pressure resistant hoses.



BW 100/120 AD Series 4
 BW 100/120 AC Series 4

F 1

BOMAG**Service Training**

The steering pump delivers the hydraulic oil from the tank to the steering valve and the connected steering cylinder. When the steering is not operated the complete oil flow is guided through the fine filter to the charge ports on the travel pump and further via the cooler to the tank.

When turning the steering wheel the distributor valve guides the oil flow to the piston or piston rod side of the steering cylinder.

A measuring pump in the steering unit measures the exact oil quantity corresponding to the turning angle of the steering wheel and delivers this oil to the steering cylinder. The steering cylinder extends or retracts and articulates the machine. The steering unit is fitted with an integrated pressure relief valve. This valve limits the steering pressure to 140 bar. Since the hydraulic oil flowing out of the steering system is used as charge oil for the closed travel circuit, the charge pressure value must be added. When testing the pressure a value of 160 bar would therefore be measured.

BOMAG

Service Training

Steering valve

The steering valve block consists mainly of distributor valve, measuring pump, steering pressure relief valve and the shock valves. When turning the steering wheel the oil flow from the pump is directed through the distributor valve to the measuring pump. The measuring pump, in turn, directs the oil flow through the distributor valve to the corresponding side of the steering cylinder. The machine is fitted with a so-called "Open Centre" steering valve, i.e. in neutral position of the valve the incoming oil flows through the tank return bore directly to the charge ports for the closed travel circuit.

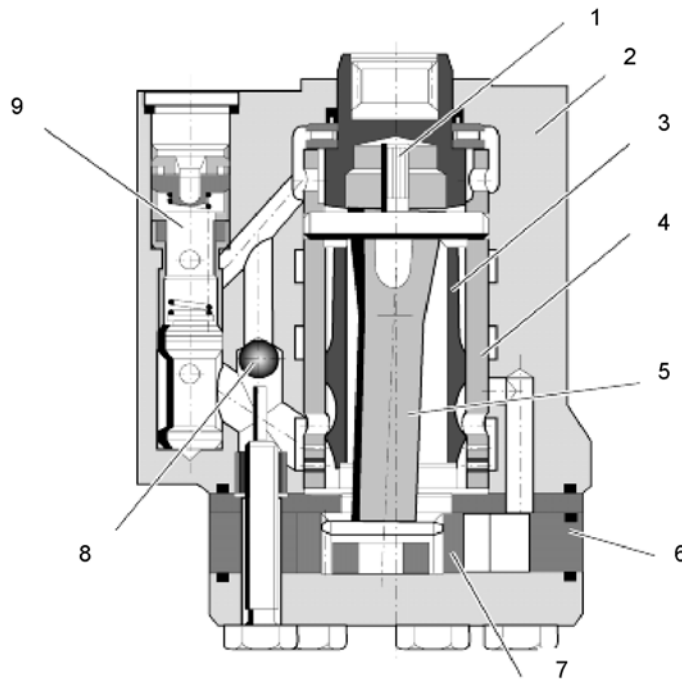


Fig. 3:

- | | | | |
|---|-------------------------|---|-------------|
| 1 | Neutral setting springs | 2 | Housing |
| 3 | Inner spool | 4 | Outer spool |
| 5 | Universal shaft | 6 | Gear ring |
| 7 | Gear | 8 | Check valve |
| 9 | Pressure relief valve | | |

BOMAG**Service Training**

The rating pump determines the exact oil quantity in dependence on the turning angle of the steering wheel. The oil quantity directed to the steering cylinder articulates and steers the machine. The high pressure relief valve in the steering unit limits the pressure in the steering system to 140 bar. Since the oil leaving the steering system is used to charge the closed travel circuit, this charge pressure value must obviously be added when checking the steering pressure. The steering unit is fitted with so-called shock valves in each pressure side to the steering cylinder. These valves are adjusted to an opening pressure of 200 bar. The valves compensate extreme pressure peaks which may occur, e.g. when driving over obstructions, and protect the system against overloads.

Each of these shock valves has its additional anti-cavitation valve. This anti-cavitation valves prevent the appearance of cavitation, which may be caused by the response of the shock valves. A check valve near the inlet port of the steering unit makes sure that no hydraulic oil will flow back to the steering pump if the machine is articulated by sudden external forces. In such a case the steering cylinders would act as pumps and press the oil back to the pump.

BOMAG**Service Training*****Trouble shooting steering*****Steering function faulty****Note:**

The steering pump works also as charge pump.

In case of a fault in the steering system the steering/charge pump must be checked first.

- > Connect a 600 bar pressure gauge to steering pressure test port (M1).
- > Turn the steering against an end stop.
- > Read the pressure gauge.

Nominal value: approx. 170 bar

If the steering pressure is reached check the moveability of articulated joint and steering cylinder.

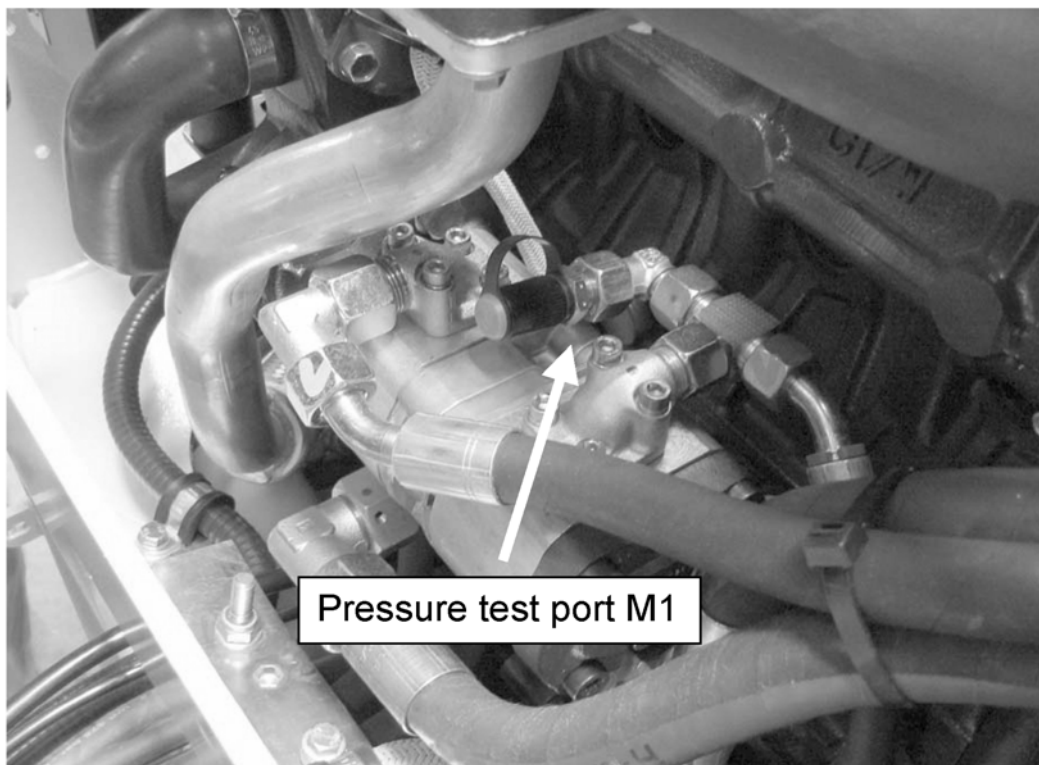


Fig. 26:

BOMAG**Service Training**

If the nominal value is not reached check the steering cylinder.

- > Disconnect the hydraulic hoses from ports L and R on the **steering orbitrol** and close the orbitrol with plugs. Due to the installation position the test is conducted on the orbitrol valve and not directly on the steering cylinder.

- > Run the engine and turn the steering wheel.

Nominal value: approx. 160 to 190 bar

If the nominal value is reached replace the steering cylinder.

If the nominal value is not reached check the steering/charge pump.

- > Close the pump outlet with a 200 bar pressure relief valve.
- > Repeat the pressure test.

Nominal value: approx. 200 bar

If the nominal value is not reached replace the steering/charge pump.

If the nominal value is reached replace the steering valve (Orbitrol).

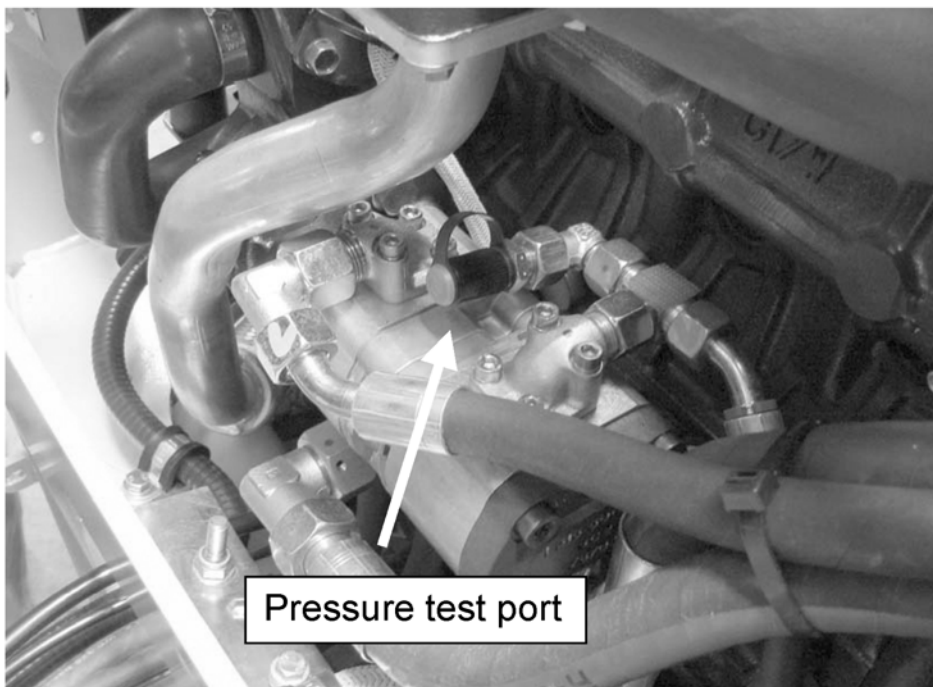


Fig. 6:

BW 100/120 AD Series 4
BW 100/120 AC Series 4

F 6

7 Flushing and bleeding



Fig. 1

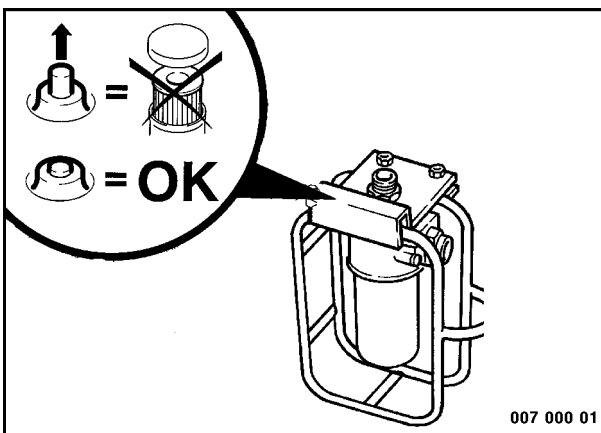


Fig. 2

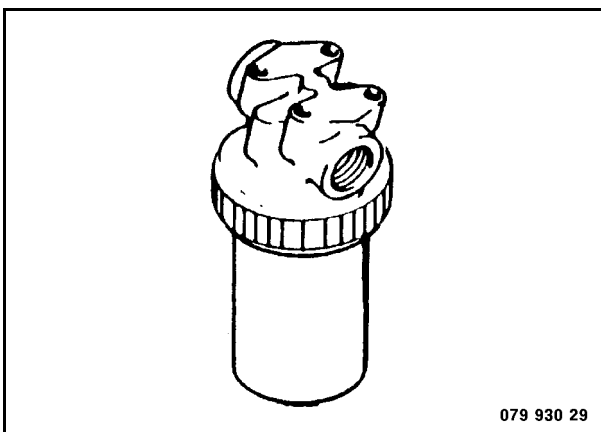


Fig. 3

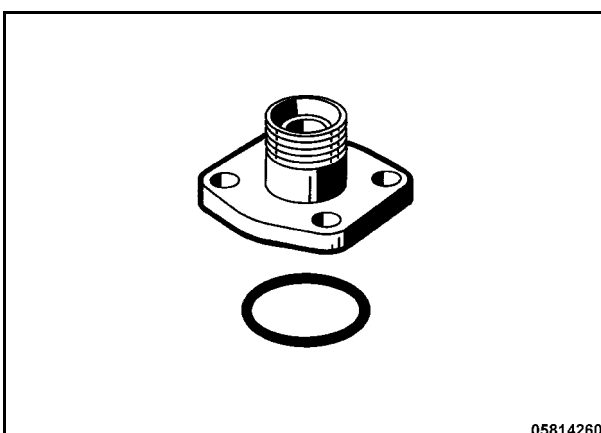


Fig. 4

7.1 Special tools for flushing

1. Filling and filtering unit

BOMAG part-no.: 058 240 22

2. Flushing filter (S connection)

BOMAG part-no.: 007 000 01

3. Filter element 1 μ

BOMAG part-no.: 079 930 52

4. Flushing hose 20S - 25S (2 pieces)

BOMAG part-no.: 055 509 19

5. Screw socket R1" - 25S (2 pieces)

BOMAG part-no.: 055 400 52

6. Flushing filter (L connection)

BOMAG part-no.: 079 390 29

7. Filter element

BOMAG part-no.: 079 390 14

8. Flushing hose 15L (2 pieces)

BOMAG part-no.: 055 510 09

9. Screw socket R3/4" -- 15L (2 pieces)

BOMAG part-no.: 055 400 89

10. SAE-flange 1" - 20S

BOMAG part-no.: 058 142 60

11. O-ring

BOMAG part-no. 062 203 30

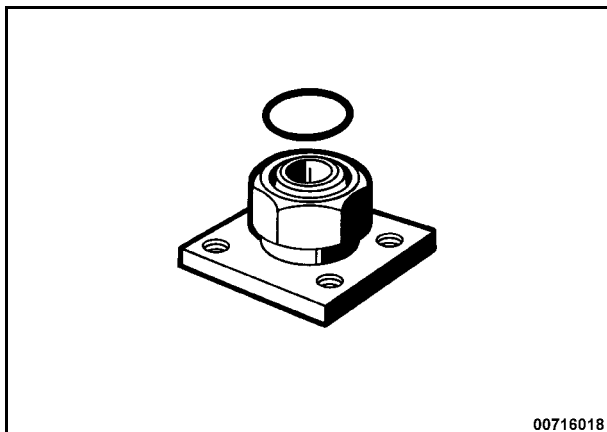


Fig. 5

00716018

- 12. Flanged plate 1" - 25S
BOMAG part-no.: 007 160 18
- 13. O-ring
BOMAG part-no. 062 202 22

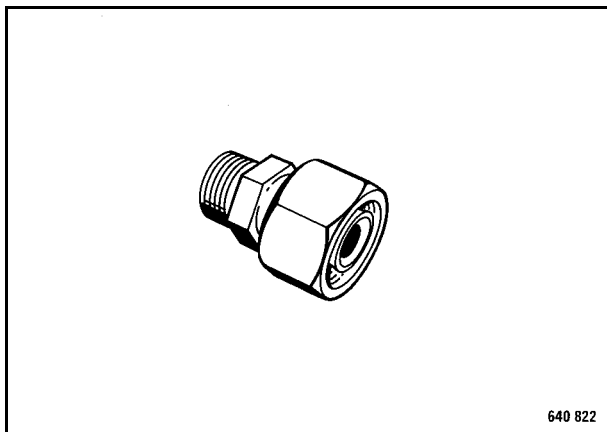


Fig. 6

640 822

- 14. Reducing fitting 18L - 15L
BOMAG part-no.: 055 422 92

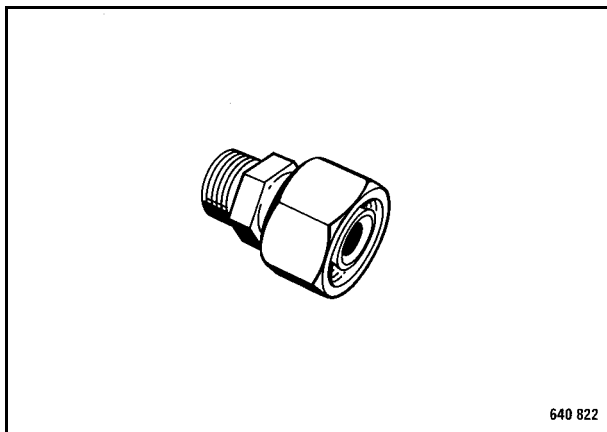


Fig. 7

640 822

- 15. Reducing fitting 25S - 20S
BOMAG part-no.: 055 422 98

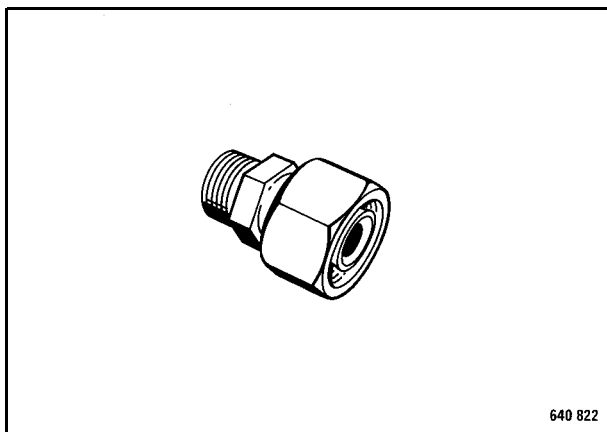


Fig. 8

640 822

- 16. Reducing fitting 20S - 16S
BOMAG part-no.: 055 423 26

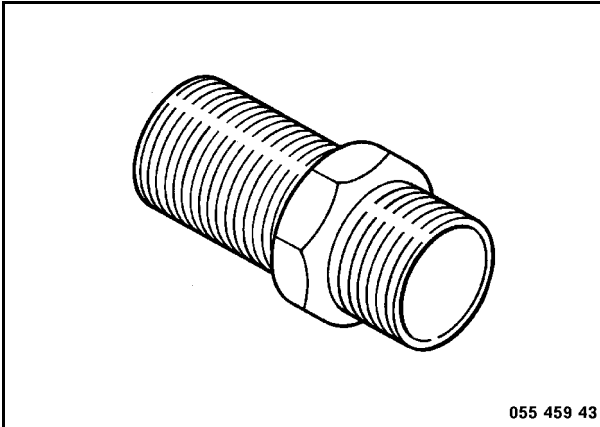


Fig. 9

17. Connecting socket 15L

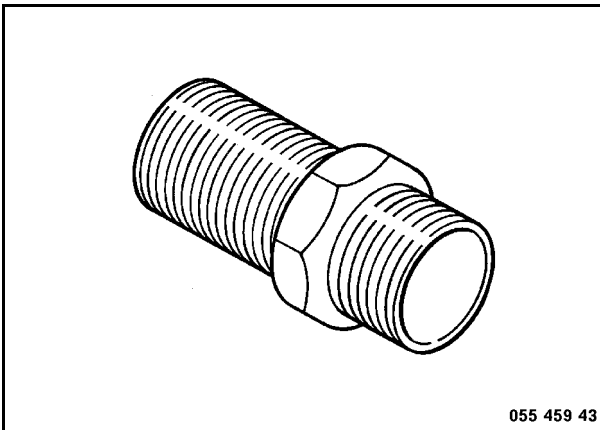
BOMAG part-no.: 055 426 55

Fig. 10

18. Connecting socket 18L

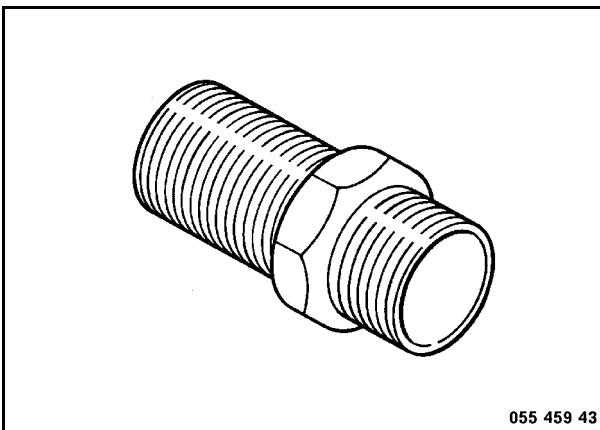
BOMAG part-no.: 055 426 06

Fig. 11

19. Connecting socket 16S

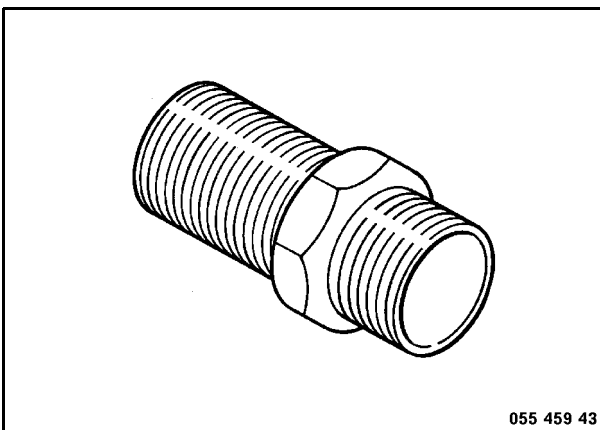
BOMAG part-no.: 055 459 43

Fig. 12

20. Connecting fitting 20S

BOMAG part-no.: 055 459 44

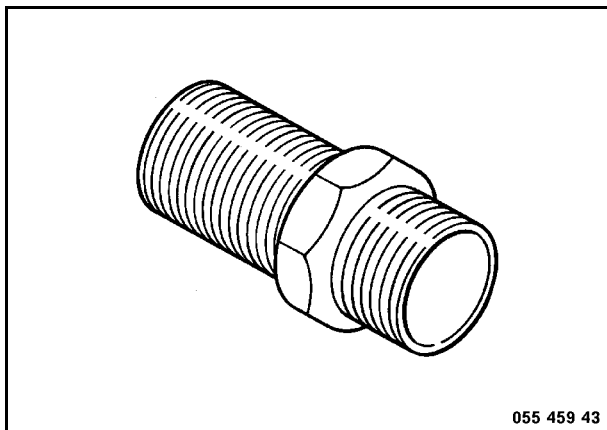


Fig. 13

- 21. Connecting fitting 25S
BOMAG part-no.: 055 459 45

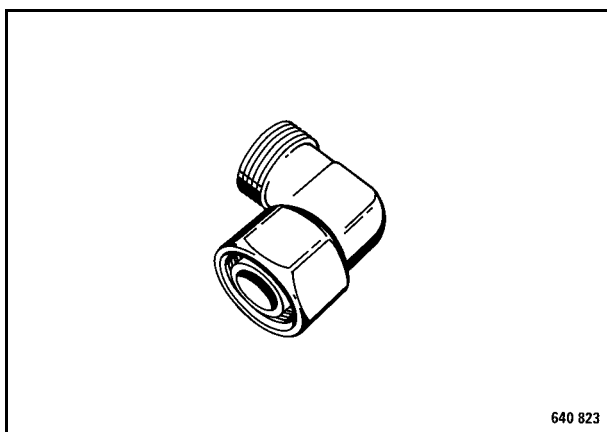


Fig. 14

- 22. Angular fitting 18L
BOMAG part-no.: 055 421 26

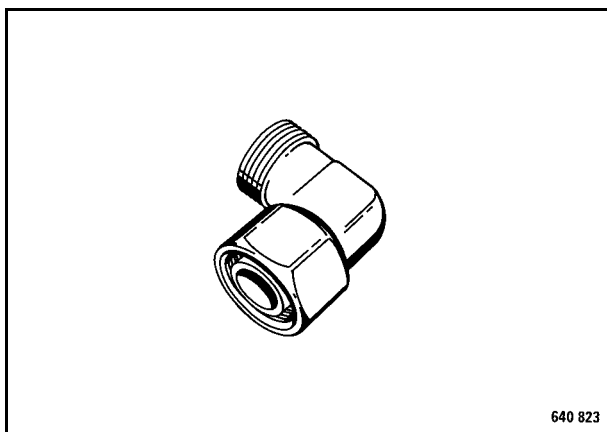


Fig. 15

- 23. Elbow fitting 16L
BOMAG part-no.: 055 421 36

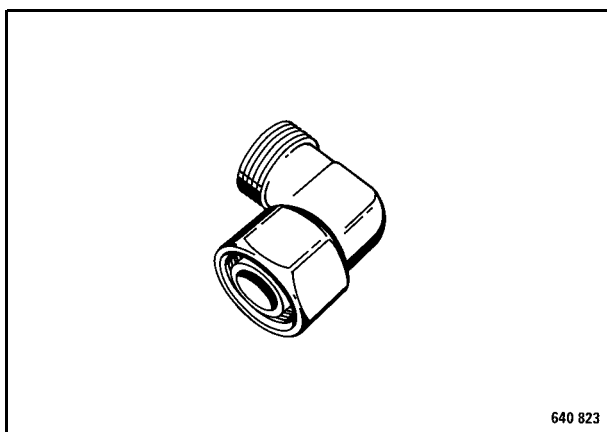


Fig. 16

- 24. Elbow 20S
BOMAG part-no.: 055 421 37

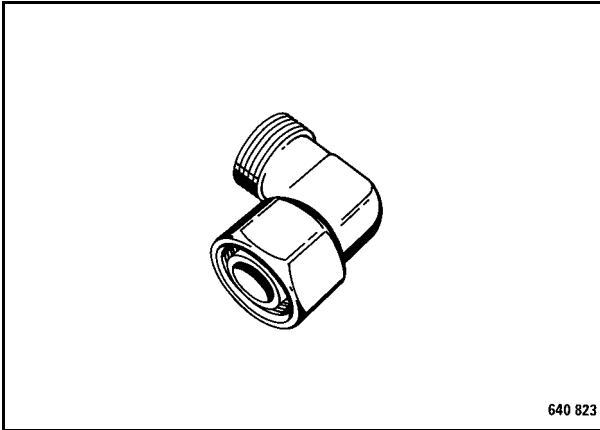


Fig. 17

25. Elbow 25S

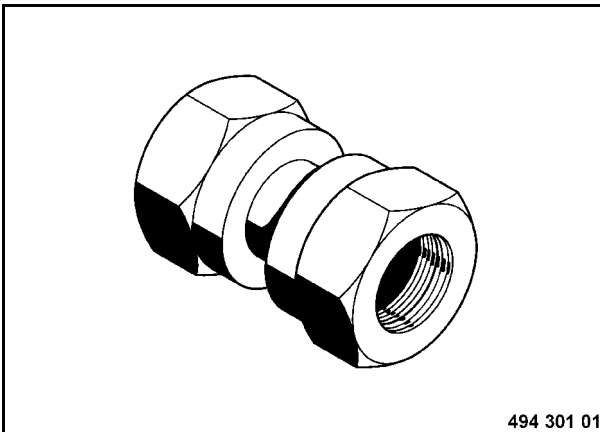
BOMAG part-no.: 055 421 38

Fig. 18

26. Pipe connection 16S - 16S

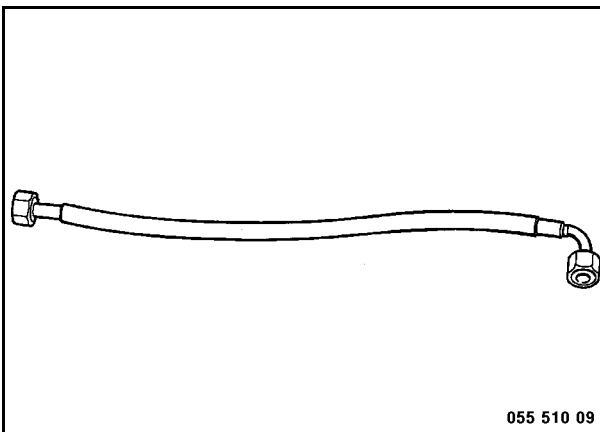
BOMAG part-no.: 493 301 01

Fig. 19

27. Connecting hose 15L

BOMAG part-no.: 055 510 09

7.2 Flushing - general

Solid particles in the circuit will very quickly cause damage to machine components.

Changing a component



Caution
Always flush the complete oil circuit after you have replaced a component.

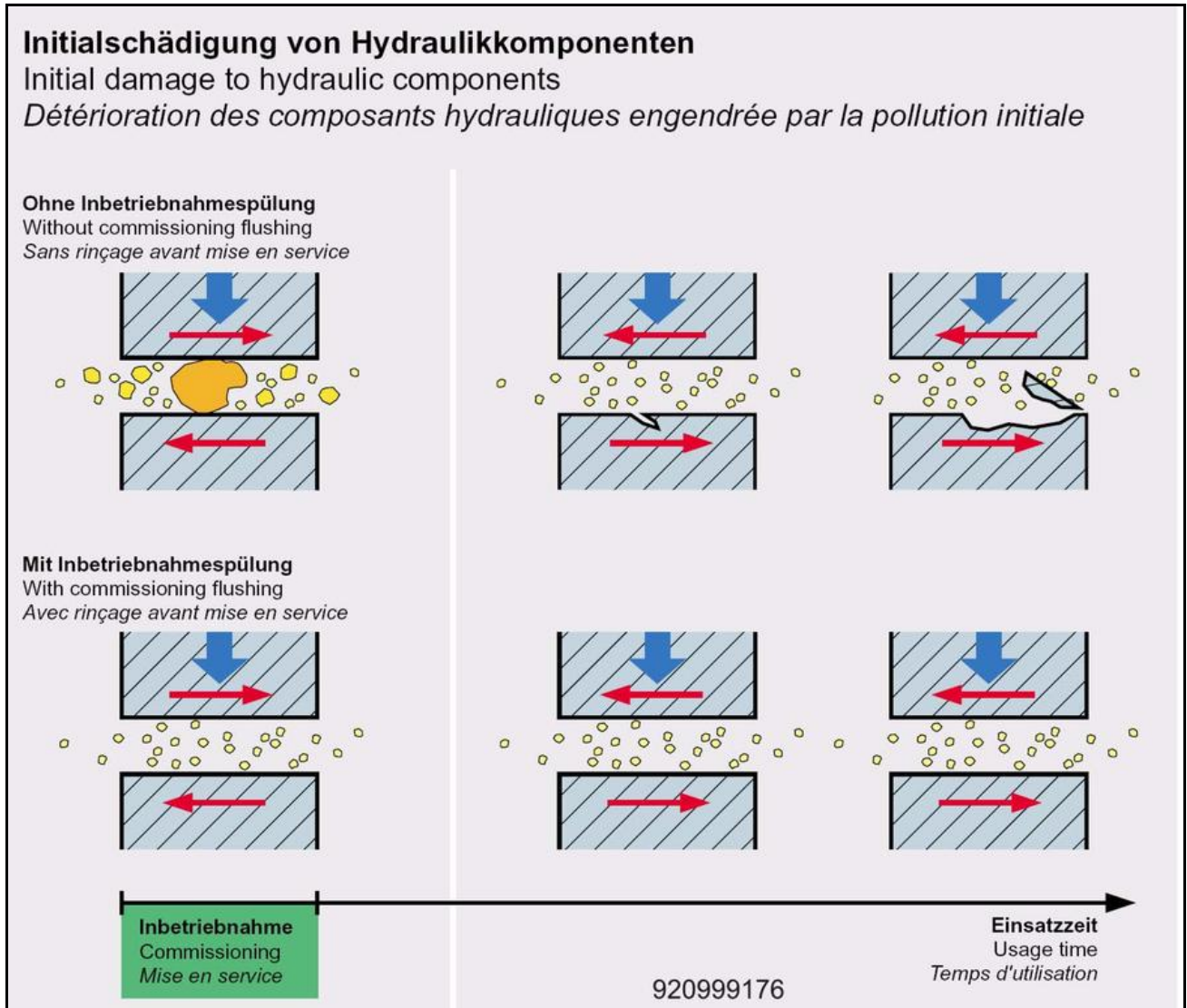


Fig. 1

Chips (abrasion) in the oil

Effect of contamination

Coarse particles (> 15 µm)

Sudden failure of components.

Fine particle contamination (5 – 15 µm)

Wear of components, internal leaks, inaccurate controlling behaviour, blockage of valves.

Extra fine particle contamination (< 2 – 5 µm)

Silting of oil, accelerated aging of oil, corrosion.

Water in oil

Increased wear, accelerated aging of oil.

- Open and clean all components in the oil circuit, replace if necessary.
- Clean all high pressure hoses in the oil circuit, replace if necessary.
- If abrasion is found in the travel circuit you should also flush the vibration circuit.
- If abrasion is found in the vibration circuit you should also flush the travel circuit.

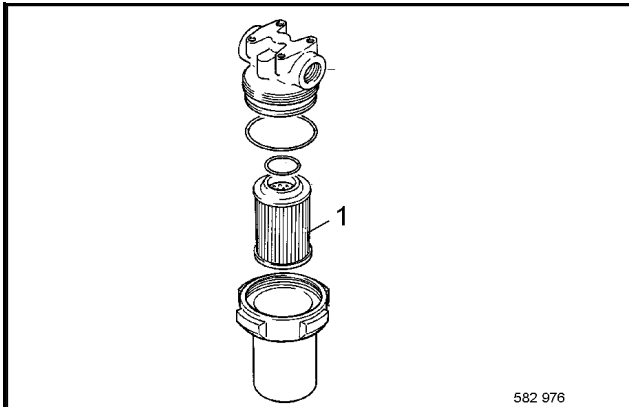
Before flushing**Change the filter element**

Fig. 1

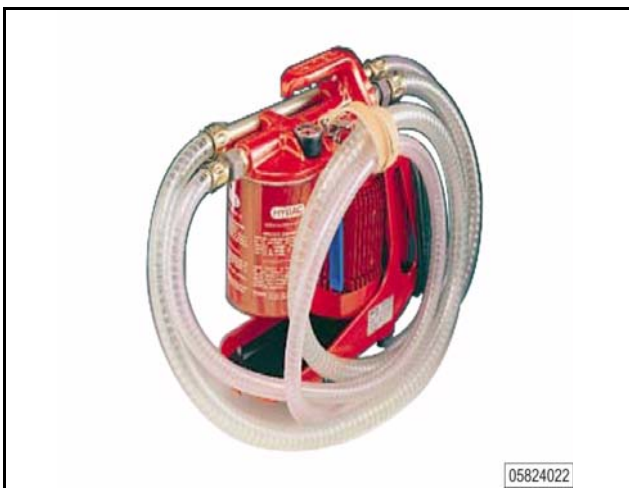
Clean the hydraulic tank

Fig. 2

⚠ Caution

Change the oil in case of excessive contamination, oil discoloration or if the oil change interval is almost due.

- Filter the tank content with the filling and filtering unit and pump it into an oil container.
- Mark all hoses and disconnect them from the hydraulic oil tank.
- Clean the oil tank thoroughly from inside, if necessary remove the tank cover.
- Reconnect all hoses.
- Fill the hydraulic oil tank again with the filling and filtering unit.

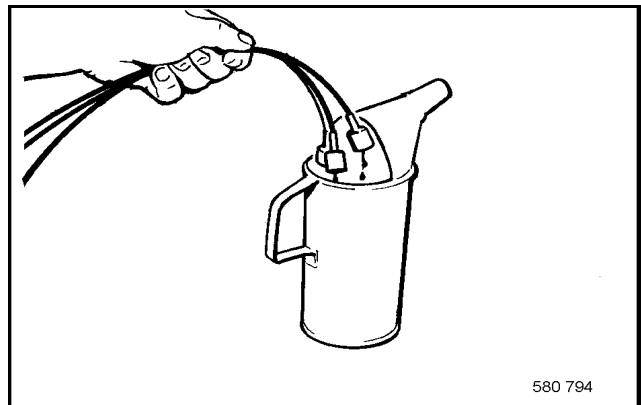
Bleeding

Fig. 3

- Always bleed closed hydraulic circuits if lines had been removed or connected.

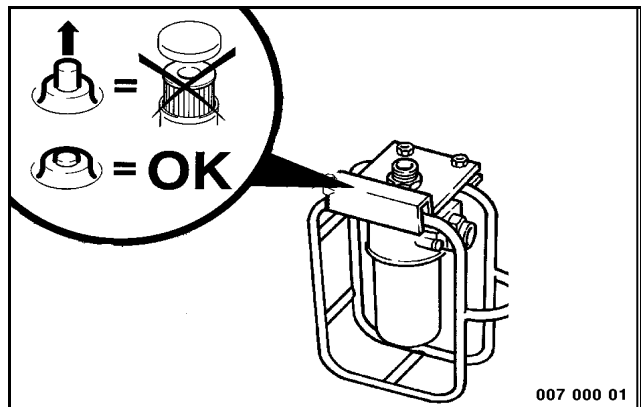
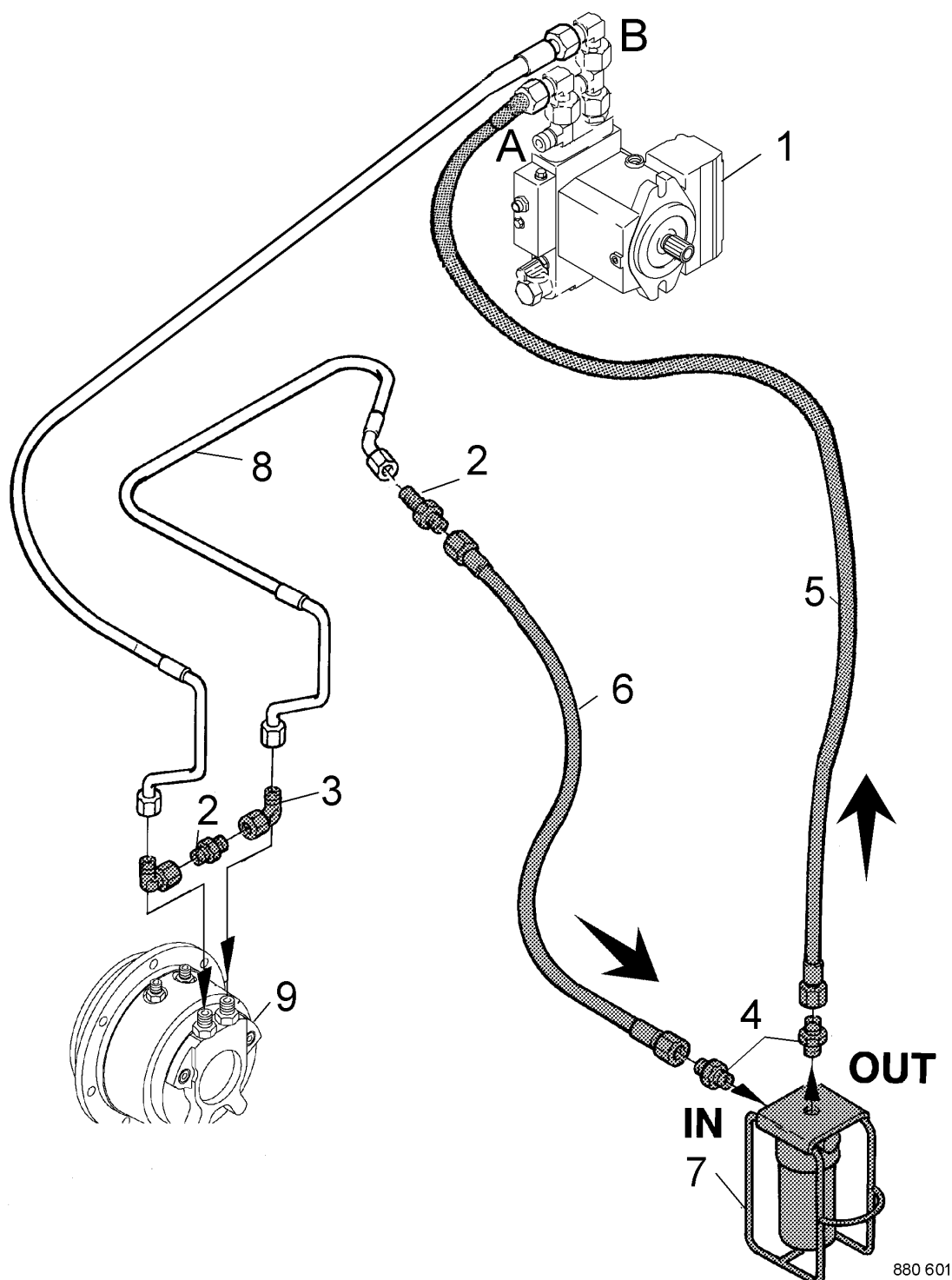
Servicing the flushing filter kit

Fig. 4

- Replace the filter element of the flushing filter when the red control pin of the contamination indicator is pressed out during the filtering process.
- Clean hoses and connections and store the flushing kit in a clean and protected environment.



- | | | | |
|---|--------------------------------|---|--|
| 1 | Travel pump | 6 | Flushing hose 25S - 20S (tool) |
| 2 | Bulkhead fitting (tool) | 7 | Flushing filter with filter element 1 μ (tool) |
| 3 | Elbow union (tool) | 8 | Hose connection, travel pump A - drum drive motor, front |
| 4 | Screw socket 1" - 25S (tool) | 9 | Front drum drive motor |
| 5 | Flushing hose 25S - 20S (tool) | | |

7.4 Flushing the front drum drive

 Environment

Environmental damage

Catch running out hydraulic oil and dispose of environmentally.


Replacing the hydraulic oil filter element

Cleaning the hydraulic oil tank

 Note

Observe the chapter "Flushing - General"

Installing the flushing filter

 Caution

Before the installation of the filters check hoses and connections for cleanliness.

The flushing filter must be installed in the low pressure side in the return flow to the pump, so that only cleaned oil will enter the travel pump.

With the connection shown in the illustration the travel pump must therefore be actuated to forward direction.

1. Disconnect the high pressure hose (8) from the travel pump (port A) and connect it with the flushing hose (6) flushing filter inlet "IN" (see chapter "Flushing schematic for front drum drive").
2. Connect the flushing hose (5) flushing filter outlet "OUT" to the high pressure port A on the travel pump.

Disconnecting the front drum drive motor

3. Take the drum drive motor out of the hydraulic circuit by joining the hoses together.

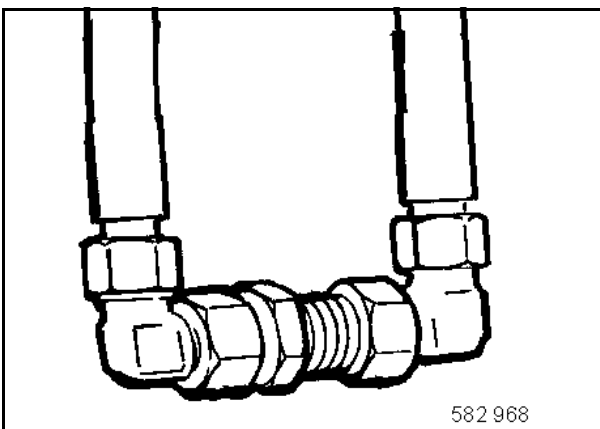


Fig. 1

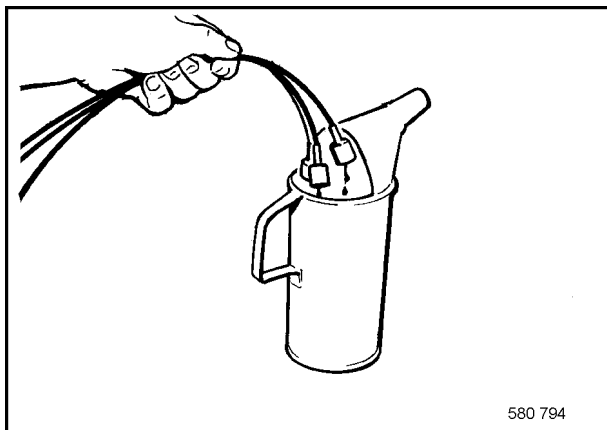


Fig. 2

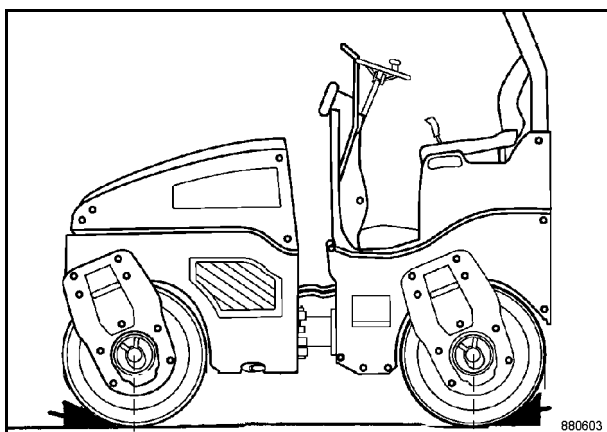


Fig. 3

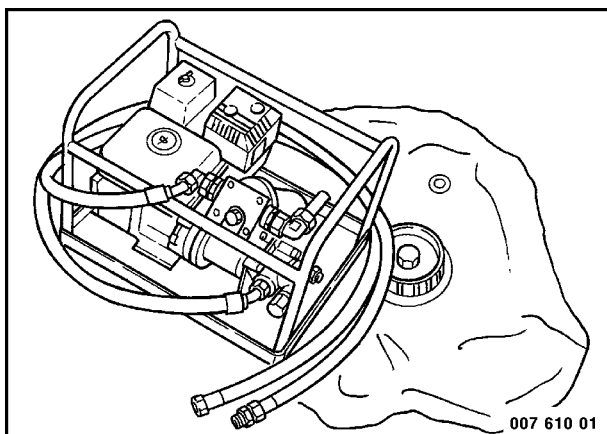


Fig. 4

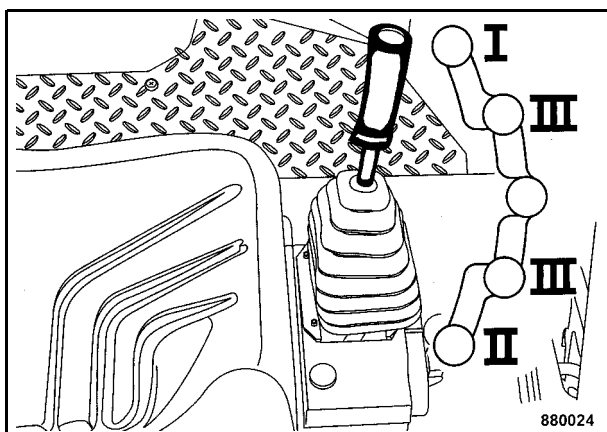


Fig. 5

Bleeding the travel circuit

i Note

Bleeding the travel circuit, see chapter "Bleeding the travel circuit".

Flushing the front hoses

- Block the drums with suitable chocks.

i Note

On AC-machines block drum and rubber wheels.

i Note

Keep circulating the complete tank content with the filling and filtering unit throughout the entire flushing process.

⚠ Caution

Move the travel lever only to travel direction forward, as otherwise the flushing filter will be subjected to oil flow from the wrong direction.

- Start the engine and shift the travel lever to travel direction forward.
- Perform the flushing process at various engine speeds for approx. 10 minutes.
- Shut down the engine.
- Reconnect the high pressure hoses to the drum drive motor.

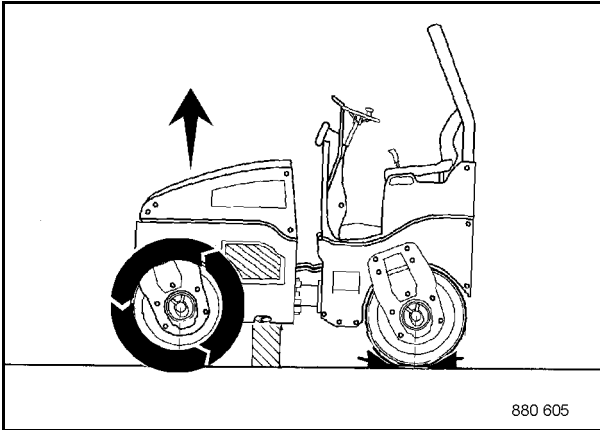


Fig. 6

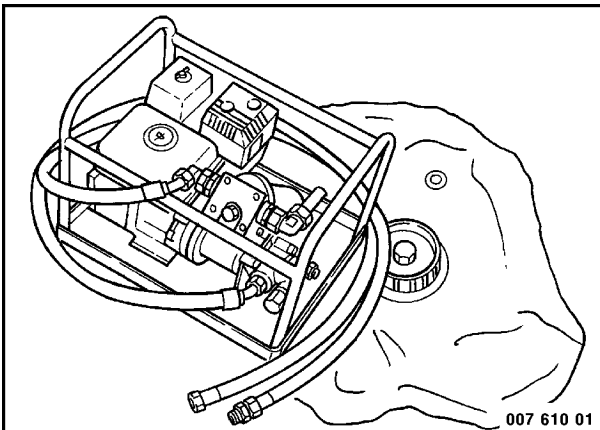


Fig. 7

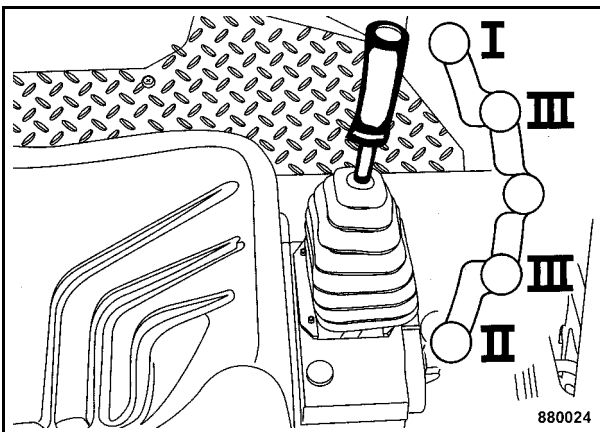


Fig. 8

Flushing the front drum drive motor

⚠ Danger

Danger of accident!

The drum must rotate freely.

9. Jack up the front of the machine, so that the drum can rotate freely.
10. Secure the rear drum with chocks .

i Note

On AC machines block the rubber wheels.

i Note

Keep circulating the complete tank content with the filling and filtering unit throughout the entire flushing process.

⚠ Caution

Move the travel lever only to travel direction forward, as otherwise the flushing filter will be subjected to oil flow from the wrong direction.

11. Start the engine, run it with maximum speed and shift the travel lever to travel direction forward.
12. Run the flushing procedure for approx. 10 minutes. During this process keep changing the pump flow by shifting the travel lever several times between full and halve reverse travel.
13. Shut down the engine.
14. Remove the flushing filter and reconnect the high pressure lines.

Bleeding the travel circuit

i Note

Bleeding the travel circuit, see chapter "Bleeding the travel circuit".

Keep circulating the tank content.

15. After completing the bleeding process circulate the tank content with the filling and filtering unit for another 15 minutes.

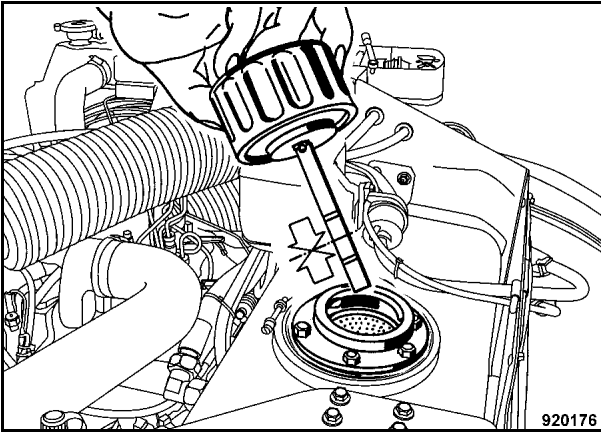
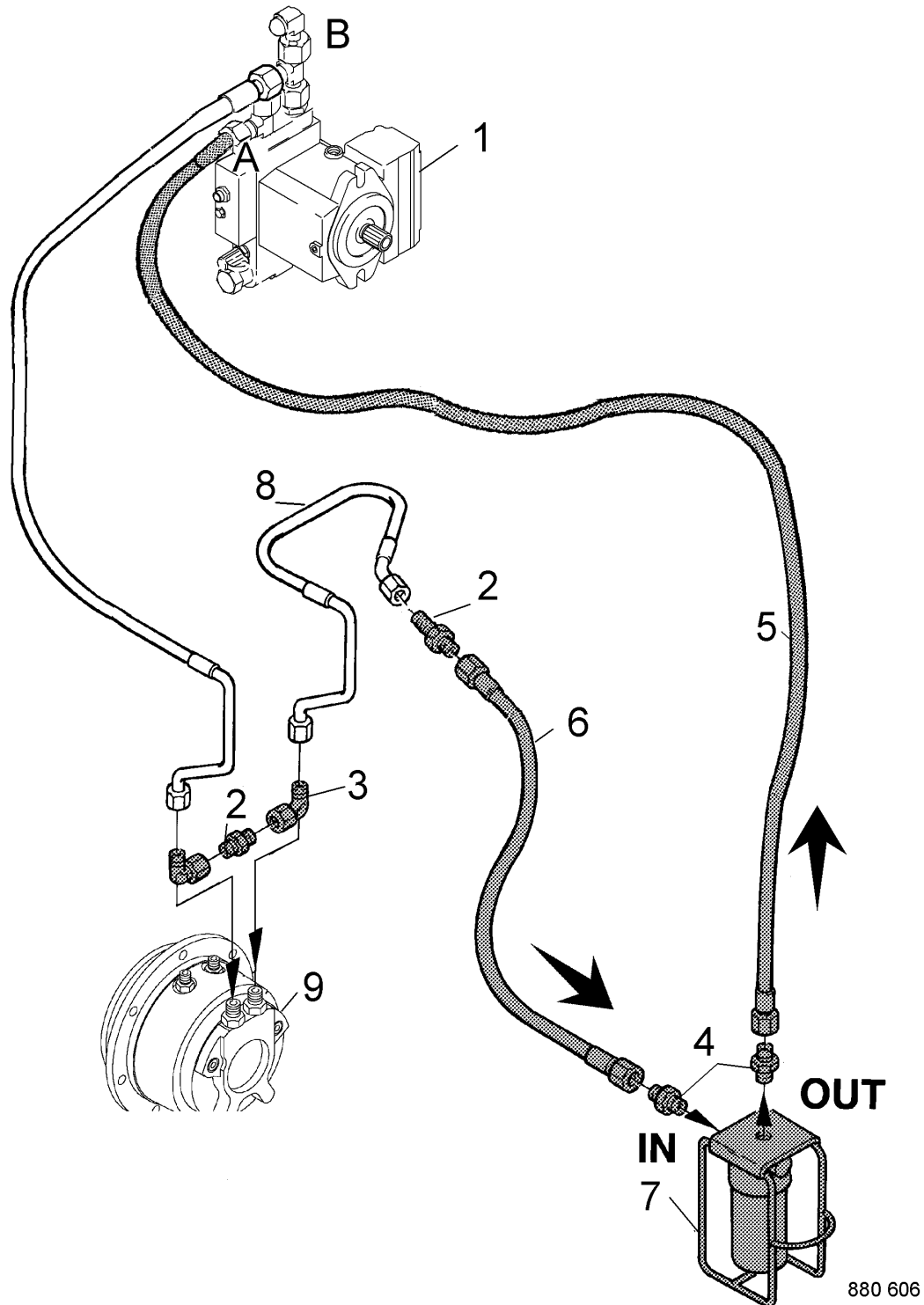


Fig. 9

Function test

16. Check the hydraulic oil level in the tank, fill up if necessary.
17. Check all connections for leaks with the engine running (visual inspection).
18. Perform a test drive, load the travel system in forward and reverse, e.g. by driving uphill or starting on a gradient.
19. Check all ports and connections for leak tightness (visual inspection).



- | | | | |
|---|--------------------------------|---|---|
| 1 | Travel pump | 6 | Flushing hose 25S - 20S (tool) |
| 2 | Bulkhead fitting (tool) | 7 | Flushing filter with filter element 1 μ (tool) |
| 3 | Elbow union (tool) | 8 | Hose connection, travel pump A - drum drive motor, rear |
| 4 | Screw socket 1" - 25S (tool) | 9 | Rear drum drive motor |
| 5 | Flushing hose 25S - 20S (tool) | | |

7.6 Flushing the rear drum drive

Environment

Environmental damage

Catch running out hydraulic oil and dispose of environmentally.

Replacing the hydraulic oil filter element

Cleaning the hydraulic oil tank

Note

Observe the chapter "Flushing - General"

Installing the flushing filter

Caution

Before the installation of the filters check hoses and connections for cleanliness.

The flushing filter must be installed in the low pressure side in the return flow to the pump, so that only cleaned oil will enter the travel pump.

With the connection shown in the illustration the travel pump must therefore be actuated to forward direction.

1. Disconnect the high pressure hose (8) from the travel pump (port A) and connect it with the flushing hose (6) flushing filter inlet "IN" (see chapter "Flushing schematic for rear drum drive").
2. Connect the flushing hose (5) flushing filter outlet "OUT" to the high pressure port A on the travel pump.

Disconnecting the rear drum drive motor

3. Take the drum drive motor out of the hydraulic circuit by joining the hoses together.

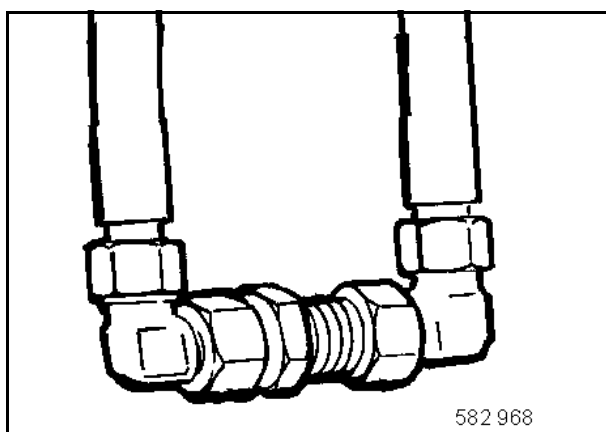


Fig. 1

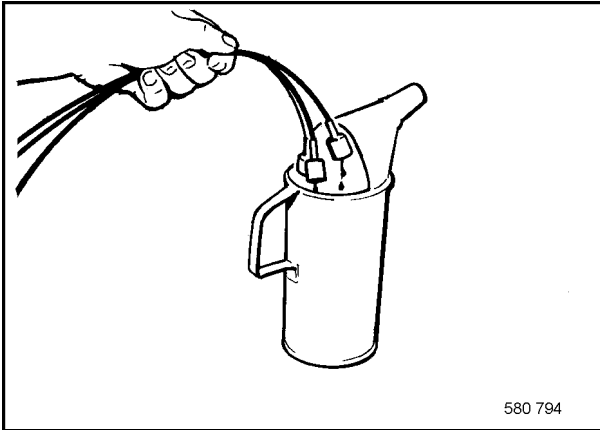


Fig. 2

580 794

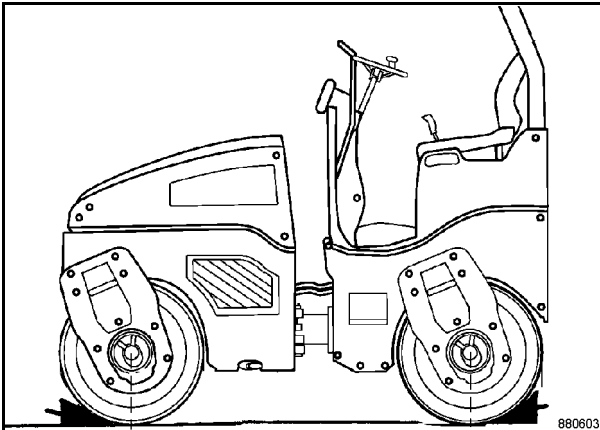


Fig. 3

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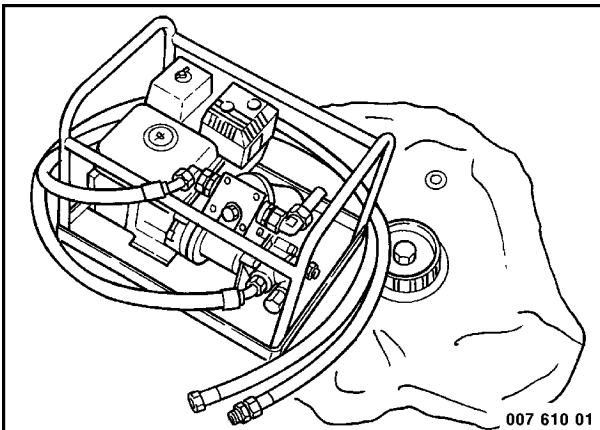


Fig. 4

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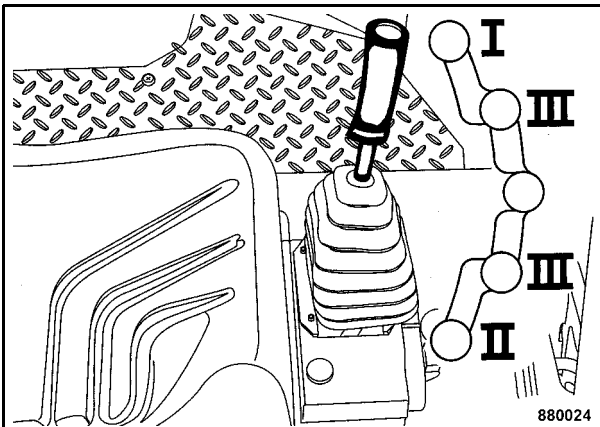


Fig. 5

880024

Bleeding the travel circuit

i Note

Bleeding the travel circuit, see chapter "Bleeding the travel circuit".

Flushing the rear hoses

4. Block the drums with suitable chocks.

i Note

Keep circulating the complete tank content with the filling and filtering unit throughout the entire flushing process.

⚠ Caution

Move the travel lever only to travel direction forward, as otherwise the flushing filter will be subjected to oil flow from the wrong direction.

5. Start the engine and shift the travel lever to travel direction forward.
6. Perform the flushing process at various engine speeds for approx. 10 minutes.
7. Shut down the engine.
8. Reconnect the high pressure hoses to the drum drive motor.

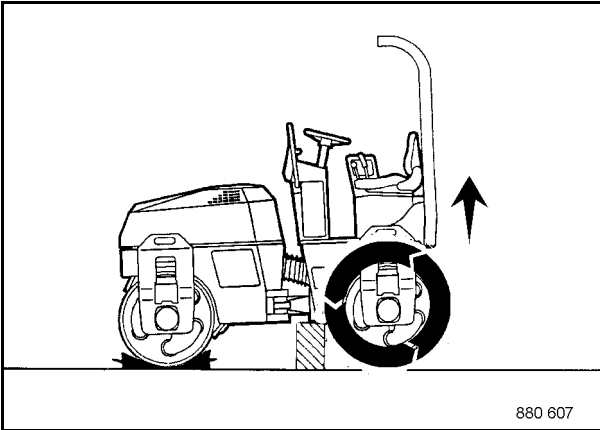


Fig. 6

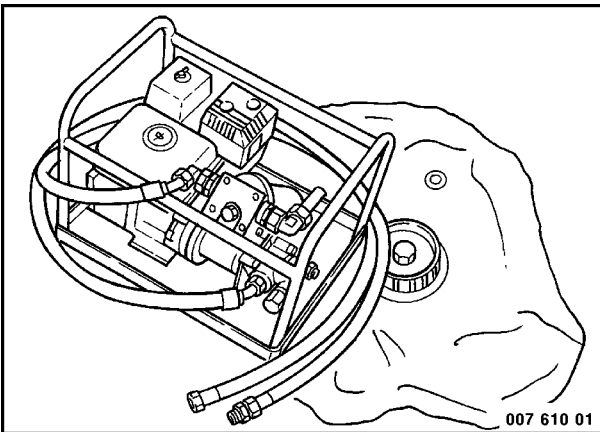


Fig. 7

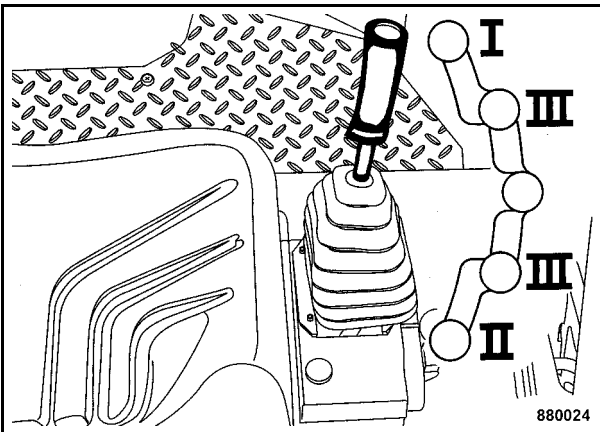


Fig. 8

Flushing the rear drum drive motor

⚠ Danger

Danger of accident!

The drum must rotate freely.

9. Jack up the rear of the machine, so that the drum can rotate freely.
10. Secure the front drum with chocks .

i Note

Keep circulating the complete tank content with the filling and filtering unit throughout the entire flushing process.

⚠ Caution

Move the travel lever only to travel direction forward, as otherwise the flushing filter will be subjected to oil flow from the wrong direction.

11. Start the engine, run it with maximum speed and shift the travel lever to travel direction forward.
12. Run the flushing procedure for approx. 10 minutes. During this process keep changing the pump flow by shifting the travel lever several times between full and halve reverse travel.
13. Shut down the engine.
14. Remove the flushing filter and reconnect the high pressure lines.

Bleeding the travel circuit

i Note

Bleeding the travel circuit, see chapter "Bleeding the travel circuit".

Keep circulating the tank content.

15. After completing the bleeding process circulate the tank content with the filling and filtering unit for another 15 minutes.

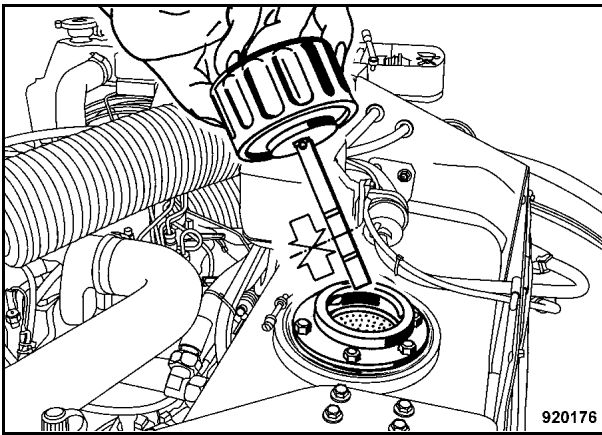
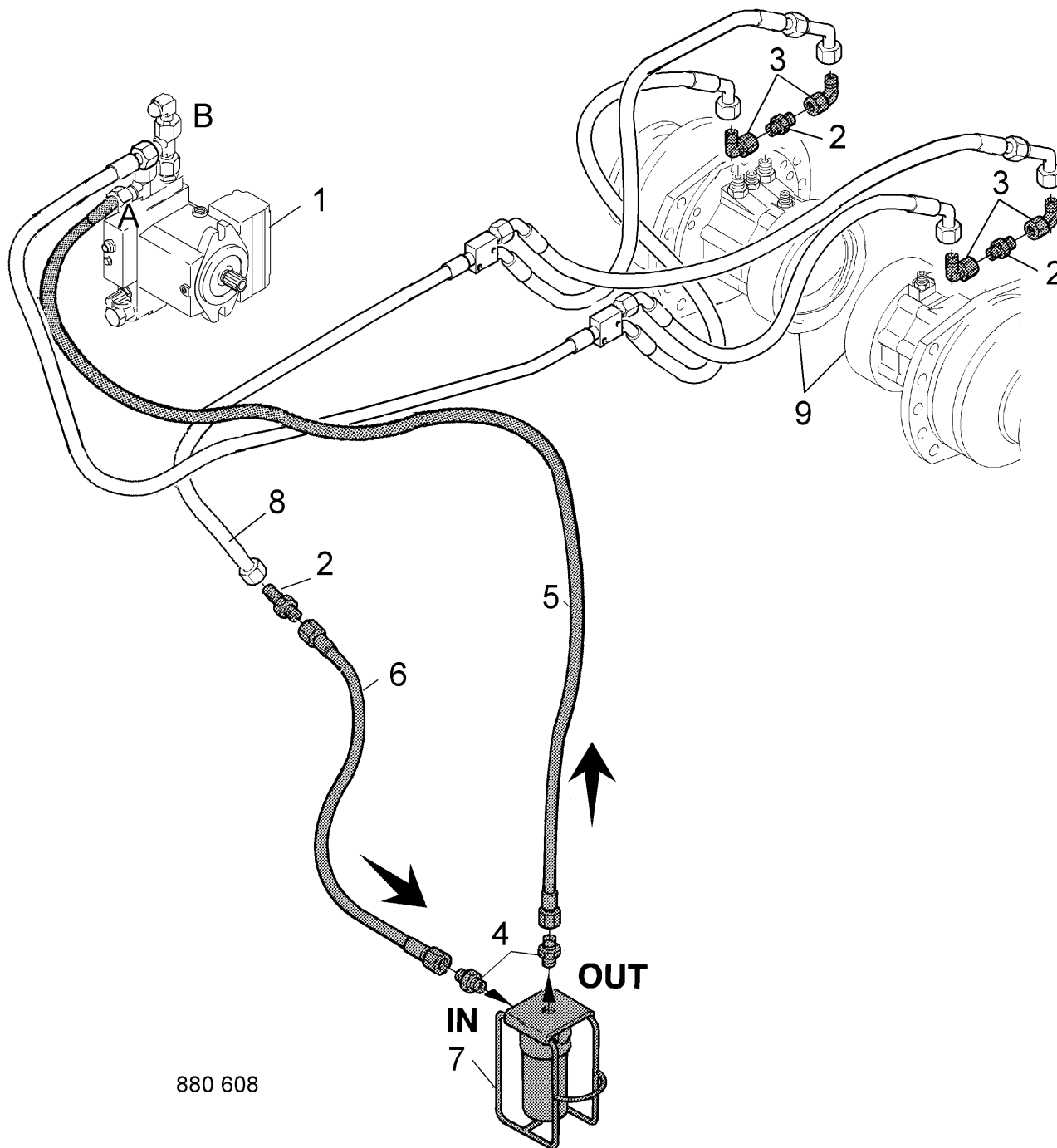


Fig. 9

Function test

16. Check the hydraulic oil level in the tank, fill up if necessary.
17. Check all connections for leaks with the engine running (visual inspection).
18. Perform a test drive, load the travel system in forward and reverse, e.g. by driving uphill or starting on a gradient.
19. Check all ports and connections for leak tightness (visual inspection).



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- | | | | |
|---|--------------------------------|---|--|
| 1 | Travel pump | 6 | Flushing hose 25S - 20S (tool) |
| 2 | Bulkhead fitting (tool) | 7 | Flushing filter with filter element 1µ (tool) |
| 3 | Elbow union (tool) | 8 | Hose connection, travel pump A - rear wheel drive motors |
| 4 | Screw socket 1" - 25S (tool) | 9 | Rear wheel drive motors |
| 5 | Flushing hose 25S - 20S (tool) | | |

7.8 Flushing the rear wheel drive

 Environment

Environmental damage

Catch running out hydraulic oil and dispose of environmentally.


Replacing the hydraulic oil filter element

Cleaning the hydraulic oil tank

 Note

Observe the chapter "Flushing - General"

Installing the flushing filter

 Caution

Before the installation of the filters check hoses and connections for cleanliness.


The flushing filter must be installed in the low pressure side in the return flow to the pump, so that only cleaned oil will enter the travel pump.

With the connection shown in the illustration the travel pump must therefore be actuated to forward direction.

1. Disconnect the high pressure hose (8) from the travel pump (port A) and connect it with the flushing hose (6) flushing filter inlet "IN" (see chapter "Flushing schematic for wheel drive motors").
2. Connect the flushing hose (5) flushing filter outlet "OUT" to the high pressure port A on the travel pump.

Disconnecting the wheel motors

3. Take the wheel drive motors (9) out of the hydraulic circuit and join the hoses together.

 Note

If necessary remove the rubber wheels.

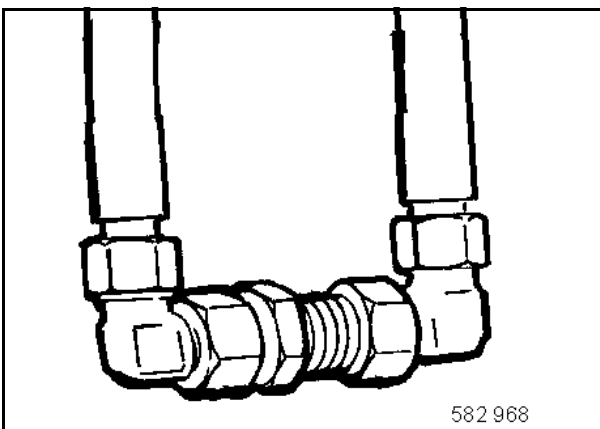


Fig. 1

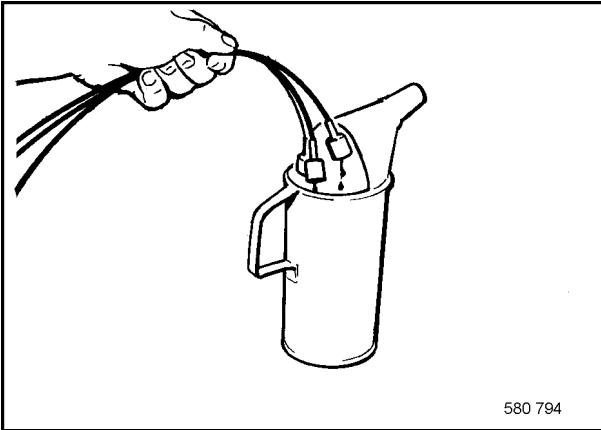


Fig. 2

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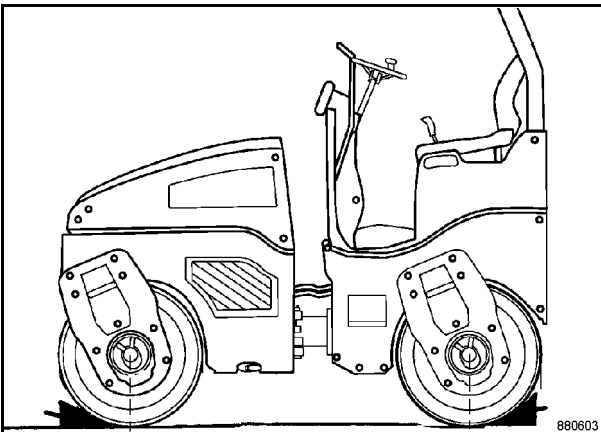


Fig. 3

880603

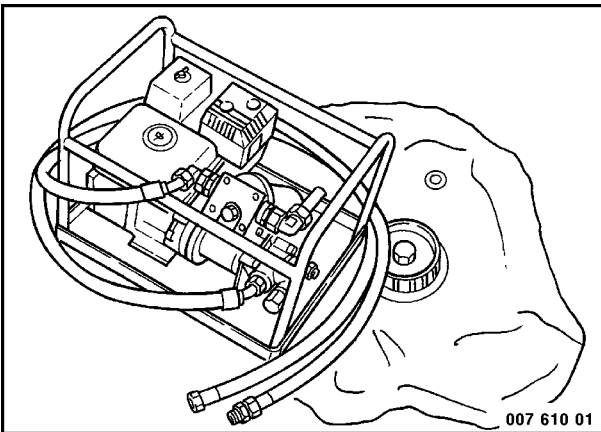


Fig. 4

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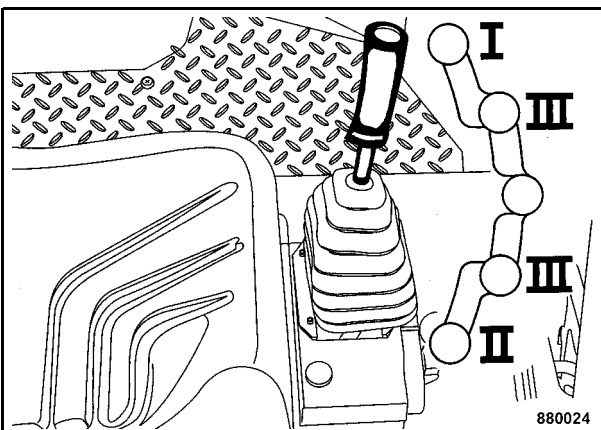


Fig. 5

880024

Bleeding the travel circuit

i Note

Bleeding the travel circuit, see chapter "Bleeding the travel circuit".

Flushing the rear hoses

4. Block drum and wheels with suitable chocks .

i Note

Keep circulating the complete tank content with the filling and filtering unit throughout the entire flushing process.

⚠ Caution

Move the travel lever only to travel direction forward, as otherwise the flushing filter will be subjected to oil flow from the wrong direction.

5. Start the engine and shift the travel lever to travel direction forward.
6. Perform the flushing process at various engine speeds for approx. 10 minutes.
7. Shut down the engine.
8. Reconnect the high pressure hoses to the wheel drive motors.

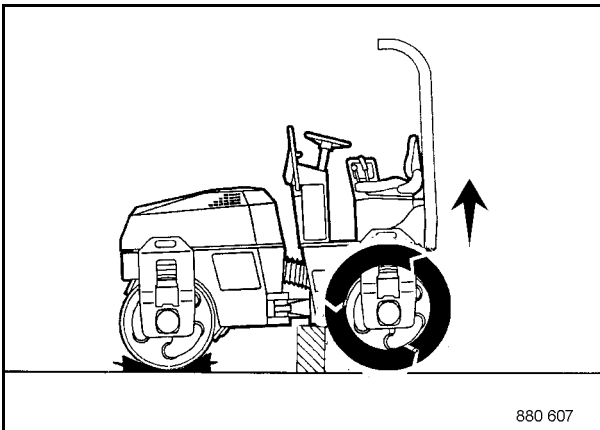


Fig. 6

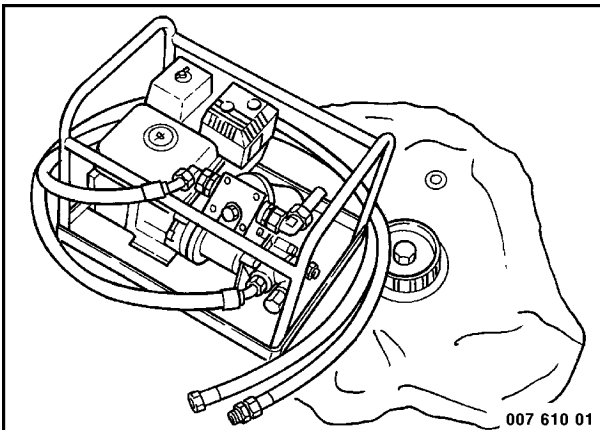


Fig. 7

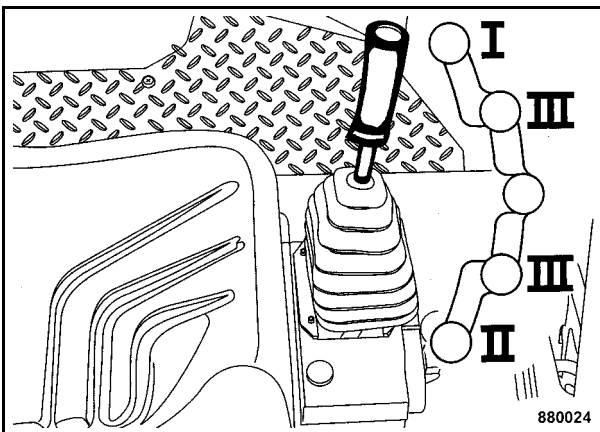


Fig. 8

Flushing the rear wheel motors

⚠ Danger

Danger of accident!

The drum must rotate freely.

9. Jack up the rear of the machine, so that the rubber wheels can rotate freely.

i Note

If necessary remove the rubber wheels.

10. Secure the front drum with chocks .

i Note

Keep circulating the complete tank content with the filling and filtering unit throughout the entire flushing process.

⚠ Caution

Move the travel lever only to travel direction forward, as otherwise the flushing filter will be subjected to oil flow from the wrong direction.

11. Start the engine, run it with maximum speed and shift the travel lever to travel direction forward.
12. Run the flushing procedure for approx. 10 minutes. During this process keep changing the pump flow by shifting the travel lever several times between full and halve reverse travel.
13. Shut down the engine.
14. Remove the flushing filter and reconnect the high pressure lines.

Bleeding the travel circuit

i Note

Bleeding the travel circuit, see chapter "Bleeding the travel circuit".

Keep circulating the tank content.

15. After completing the bleeding process circulate the tank content with the filling and filtering unit for another 15 minutes.

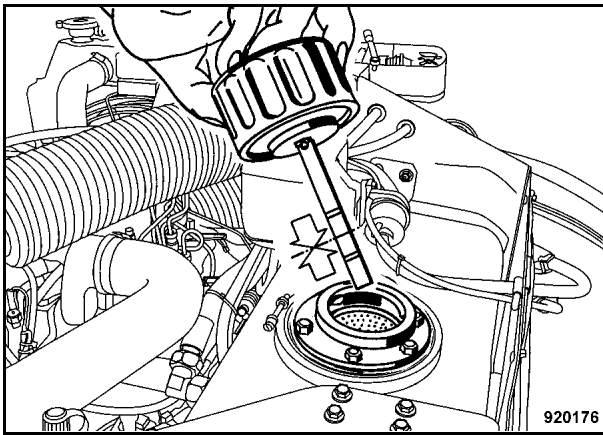
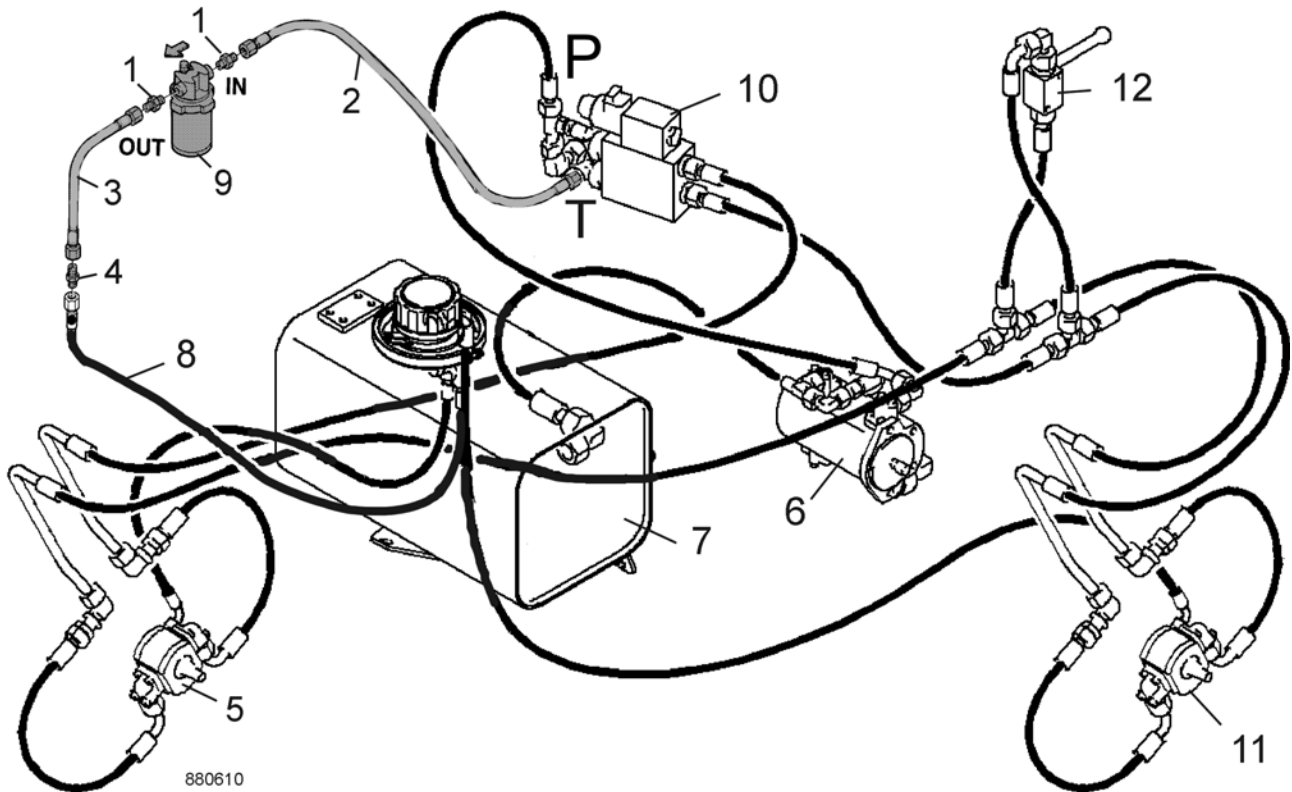


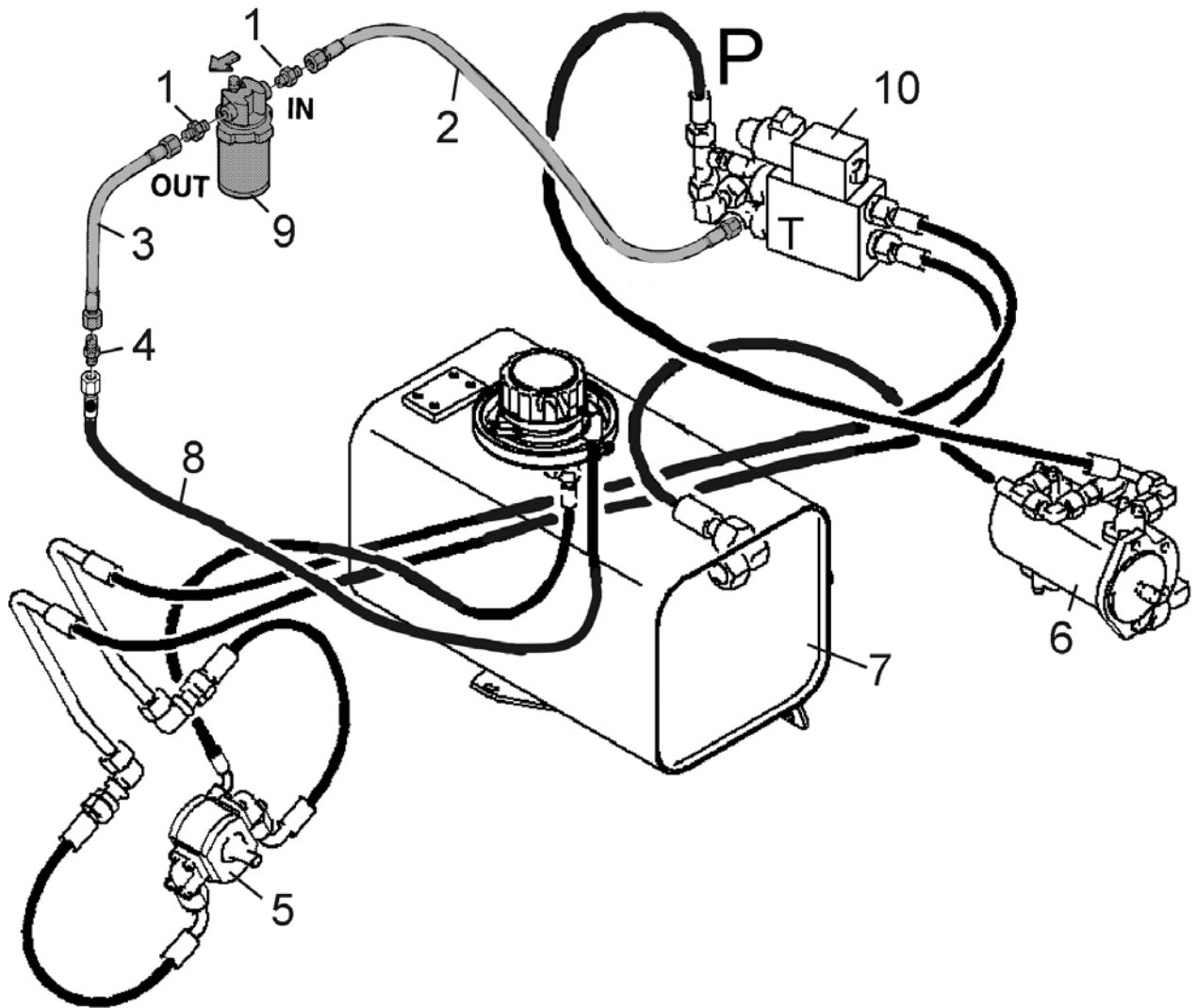
Fig. 9

Function test

16. Check the hydraulic oil level in the tank, fill up if necessary.
17. Check all connections for leaks with the engine running (visual inspection).
18. Perform a test drive, load the travel system in forward and reverse, e.g. by driving uphill or starting on a gradient.
19. Check all ports and connections for leak tightness (visual inspection).



- | | | | |
|---|----------------------------------|----|---|
| 1 | Screw fitting R3/4" - 15L (tool) | 7 | Hydraulic oil tank |
| 2 | Flushing hose 15L (tool) | 8 | Hydraulic hose, vibration valve (T) to tank |
| 3 | Flushing hose 15L (tool) | 9 | Flushing filter with filter element (tool) |
| 4 | Connecting union 15L (tool) | 10 | Vibration valve |
| 5 | Front vibration motor | 11 | Rear vibration motor |
| 6 | Vibration pump | 12 | Ball valve |



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- | | | | |
|---|----------------------------------|----|---|
| 1 | Screw fitting R3/4" - 15L (tool) | 6 | Vibration pump |
| 2 | Flushing hose 15L (tool) | 7 | Hydraulic oil tank |
| 3 | Flushing hose 15L (tool) | 8 | Hydraulic hose, vibration valve (T) to tank |
| 4 | Connecting union 15L (tool) | 9 | Flushing filter with filter element (tool) |
| 5 | Vibration motor | 10 | Vibration valve |

7.11 Flushing the vibration circuit

Environment

Environmental damage

Catch running out hydraulic oil and dispose of environmentally.

Replacing the hydraulic oil filter element

Cleaning the hydraulic oil tank

i Note

Observe the chapter "Flushing - General"

Installing the flushing filter

Caution

Before the installation of the filters check hoses and connections for cleanliness.

The flushing filter must be installed in the low pressure side in the return flow to the pump, so that only cleaned oil will enter the hydraulic oil tank.

1. Disconnect the hydraulic hose (8) from the vibration valve (port T) and connect it with the flushing hose (3) flushing filter inlet "OUT" (see chapter "Flushing schematic for vibration circuit").
2. Connect flushing hose (2) flushing filter inlet "IN" with the vibration valve (port T).

Flushing the vibration motors

3. Unscrew the fastening screws for the vibration motors and pull both motors (5 and 11) out of the coupling.

i Note

AC-machines are fitted with a front vibration motor only.

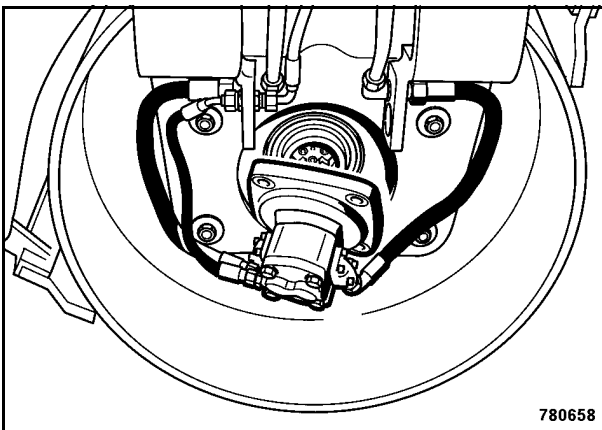


Fig. 1

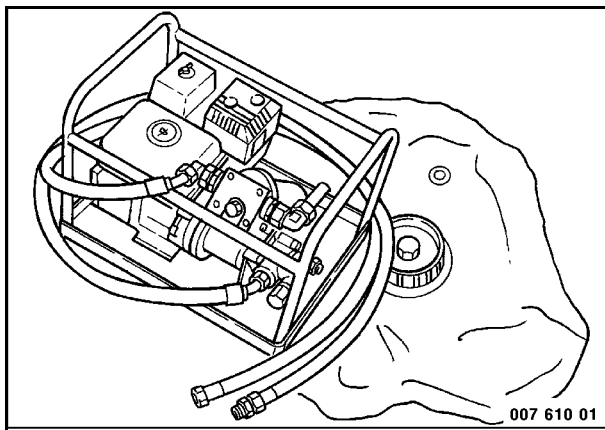


Fig. 2

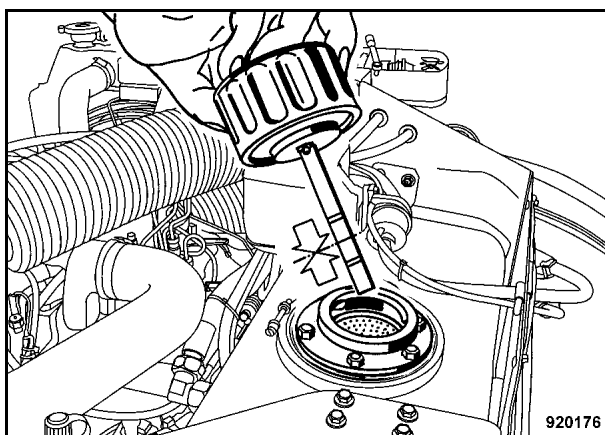


Fig. 3

i Note

Keep circulating the complete tank content with the filling and filtering unit throughout the entire flushing process.

4. Start the engine and run it with maximum speed.
5. Flush the circuit for approx. 10 minutes, thereby switch the vibration on and off at intervals of approx. 30 seconds.
6. Shut down the engine.
7. Remove the flushing filter and reinstall the vibration motors.

Function test

8. Check the hydraulic oil level in the tank, fill up if necessary.
9. Test drive.
10. Check all ports and connections for leak tightness (visual inspection).

7.12 Bleeding the travel circuit

 **Environment**

Catch hydraulic oil and dispose of environmentally.

1. Secure the drums with chocks .

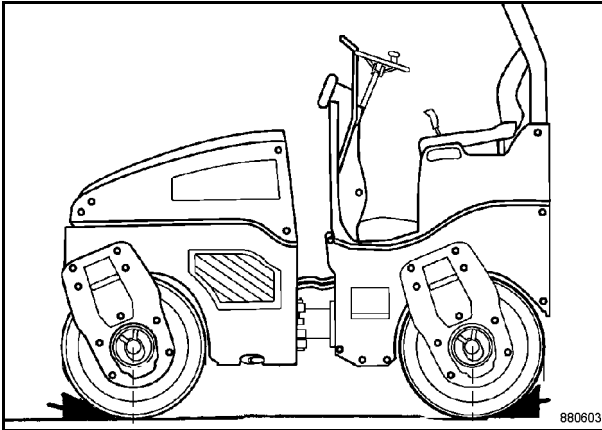


Fig. 1

2. Actuate the emergency stop switch.

 **Danger**

The engine should not start.

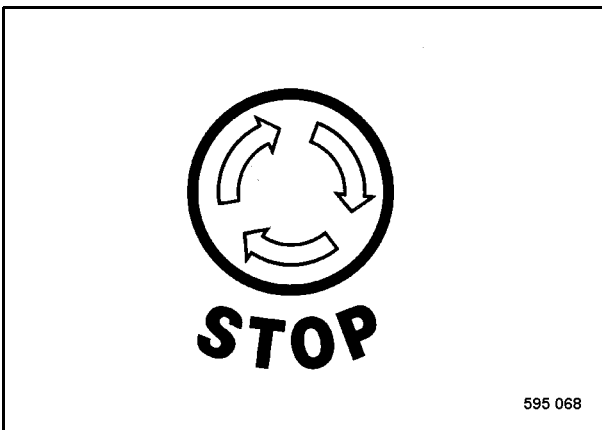


Fig. 2

3. Install a pressure test hose to the charge pressure test port.
4. Install a pressure test hose each to the high pressure test ports.
5. Hold the open ends of the pressure test hoses (Fig. 3) into a container.
6. Operate the starter motor for approx. 30 seconds. Wait one minute and repeat this procedure, until oil starts to run out from the pressure test hoses.
7. Remove the pressure test hoses.

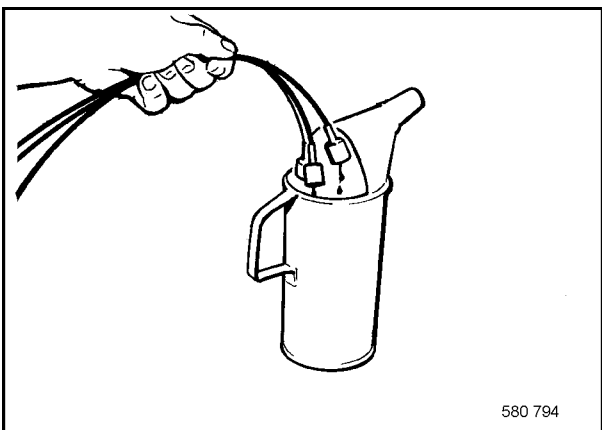


Fig. 3

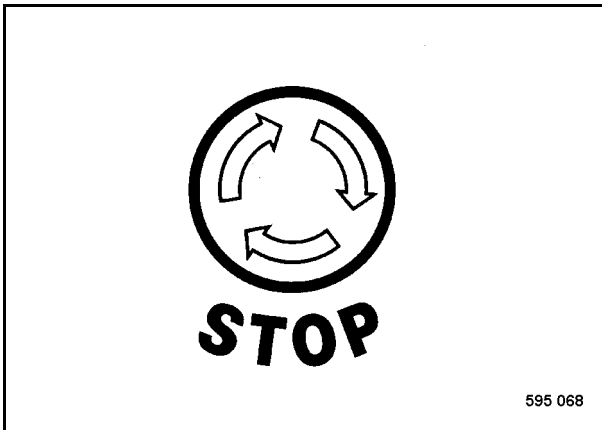


Fig. 4



Fig. 5

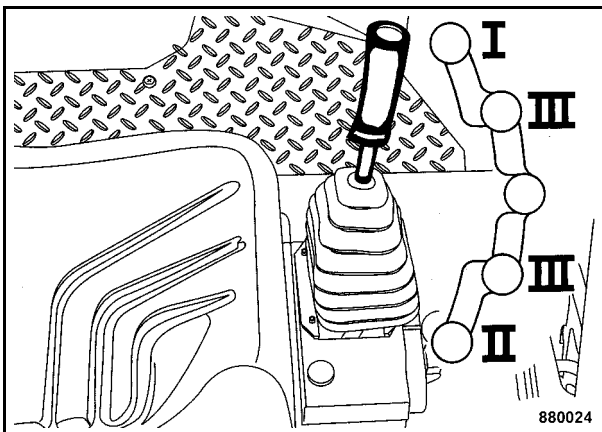


Fig. 6

8. Unlock the emergency stop switch

9. Connect a 60 bar pressure gauge to the charge pressure test port (Fig. 5) and run the engine max. 15 seconds at idle speed.
10. Pause for approx. 30 seconds and keep repeating this procedure, until the gauge shows a constant charge pressure reading.

⚠ Caution

With the flushing filter installed shift the travel lever only to travel direction forward, as otherwise the flushing filter will be subjected to oil flow from the wrong direction.

⚠ Danger

Run the engine with idle speed.

11. Start the engine.
12. Shift the travel lever (Fig. 6) approx. 1/3 to forward direction.
13. After approx. 1 to 2 minutes shut down the engine for a minute.

i Note

This waiting time is necessary to allow air bubbles to escape through the leak oil return line.

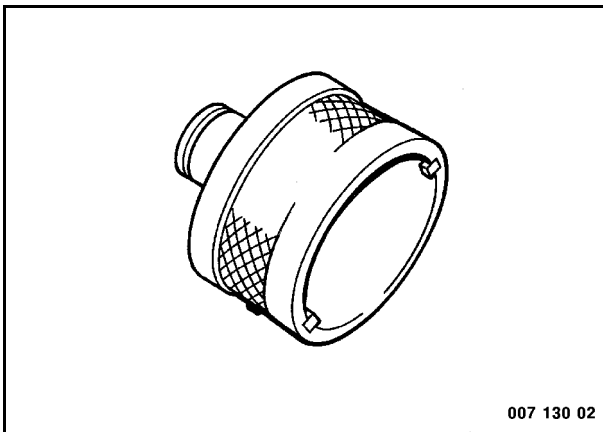
14. After a waiting time of approx. 1 minute keep repeating this procedure, until the indicated charge pressure drops directly to zero when shutting down the engine.

8 Drum

8.1 Special tools

1. Bell to change the rubber buffers

BOMAG part-no.: 007 130 02

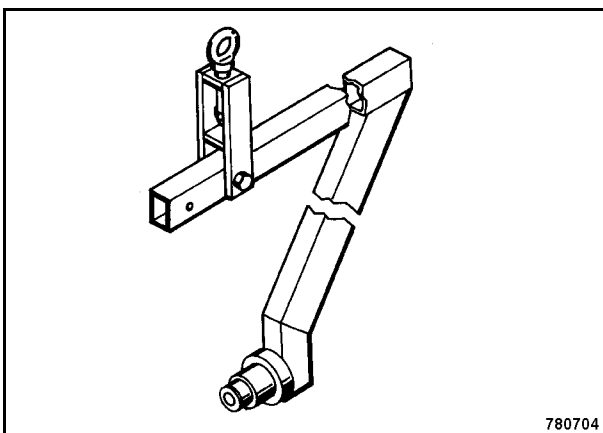


007 130 02

Fig. 1

2. Lifting device for exciter unit

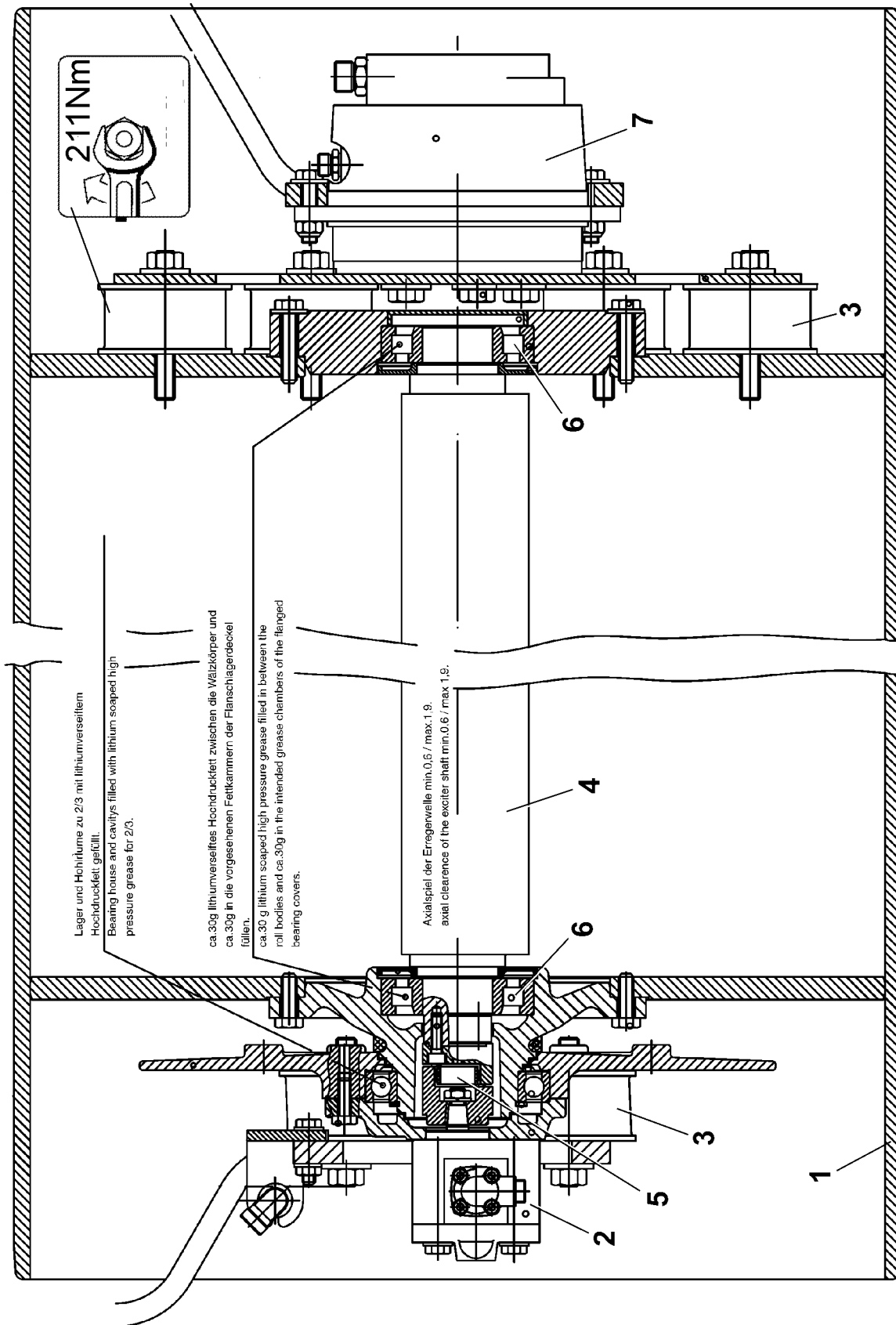
BOMAG part-no.: 007 100 55



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Fig. 2

8.2 Repair overview for drum



782 627

Fig. 1

- | | |
|-------------------|----------------------|
| 1 Drum | 5 Coupling |
| 2 Vibration motor | 6 Vibration bearings |
| 3 Rubber buffer | 7 Drum drive motor |
| 4 Vibrator shaft | |

8.3 Removing and installing the drum

Removing the drum

i Note

The procedures for the removal of front and rear drums are identical. The following instructions describe the removal of the front drum, however, the work steps apply also for the removal of the rear drum.

1. Jack the the machine up (Fig. 1) and support it safely, so that the rubber buffers on the drive disc are unloaded.

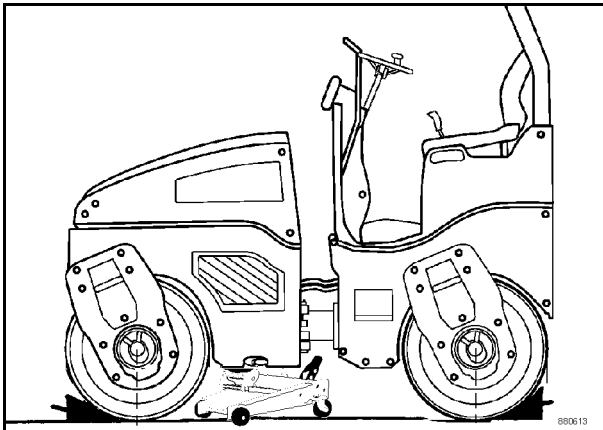


Fig. 1

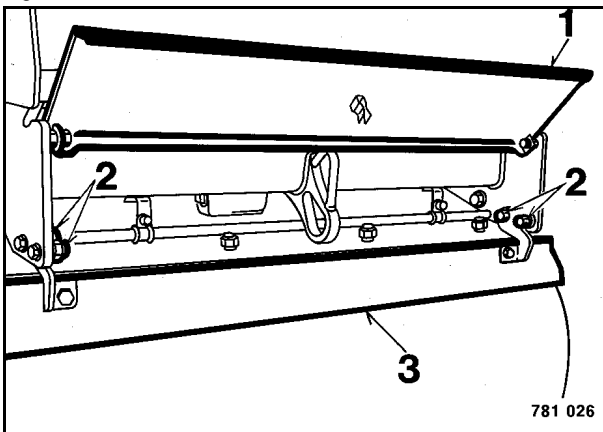


Fig. 2

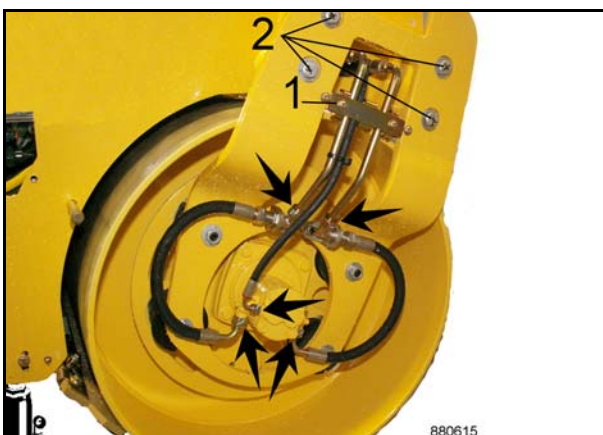


Fig. 3

⚠ Danger

Danger of accident!

Block front and rear drums with wedges against rolling!

Do not work in the articulation area of the roller while the engine is running.

⚠ Caution

Do not start the engine during repair work!

2. Open flap 1 (Fig. 2).
3. Unscrew the hexagon screws (2) to remove the scrapers (3).

Vibration motor side

4. Disassemble the bracket 1 (Fig. 3).
5. Mark the hydraulic hoses and disconnect them from the vibration motor ports.

♻ Environment

Catch running out hydraulic oil and dispose of environmentally.

6. Close the connections with plugs.
7. Unscrew screws (2).



Fig. 4

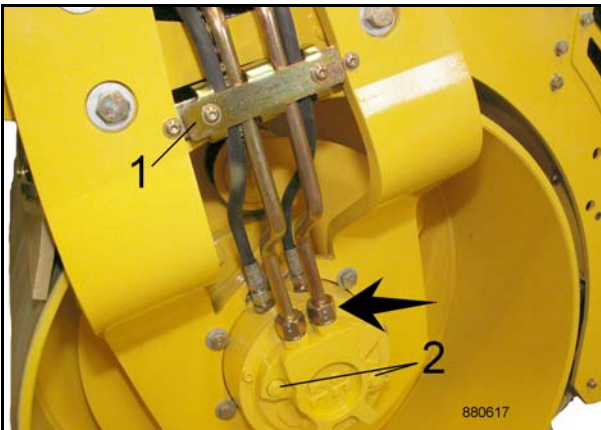


Fig. 5

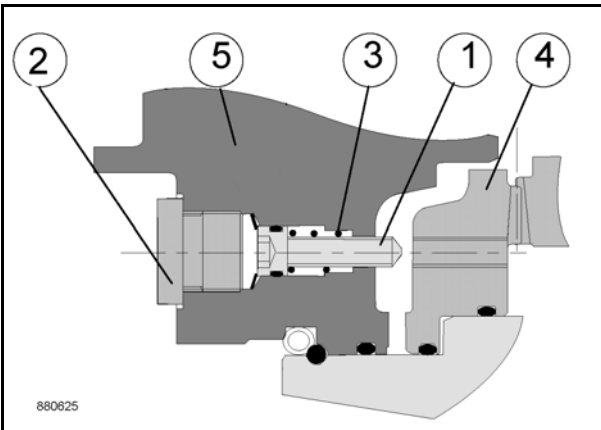


Fig. 6

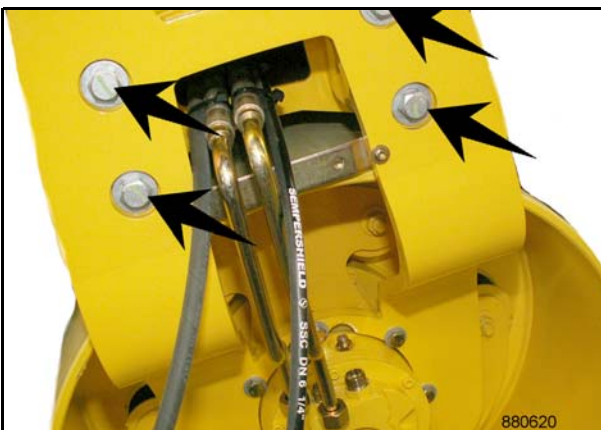


Fig. 7

8. Unscrew the nuts and remove the support leg (Fig. 4).

Travel motor side

9. Disassemble the bracket 1 (Fig. 5).
10. Mark and disassemble hydraulic hoses and pipes from the drum drive motor.

Environment

Catch running out hydraulic oil and dispose of environmentally.

11. Close the connections with plugs.

Releasing the mechanical brake

12. Remove both plugs (2).
13. Compress springs (3) and insert the screws 1 (Fig. 6) into the threaded bore of the brake piston (4), until the screw head touches the valve cover (5).

i Note

Tighten both screws (1) alternately and in steps (approx. 2 revolutions).

14. Unscrew the fastening screws (Fig. 7) and roll the drum with travel motor and support leg forward out from the machine.

i Note

If necessary raise the machine further at the front, so that the drum can be rolled out.

Installing the drum

15. Examine all rubber buffers (Fig. 8) and (Fig. 9) for wear, replace if necessary.

i Note

Tighten the rubber buffers with 210 Nm.

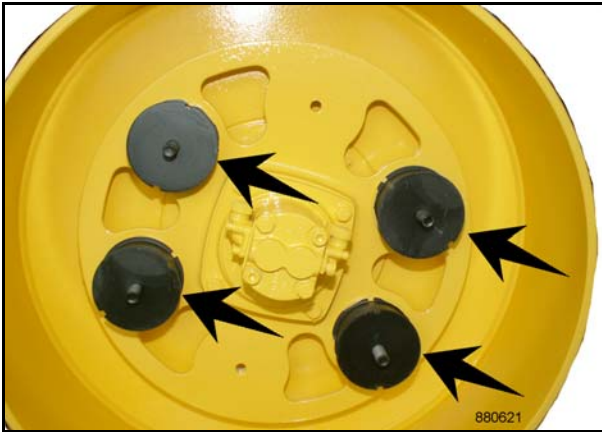


Fig. 8



Fig. 9

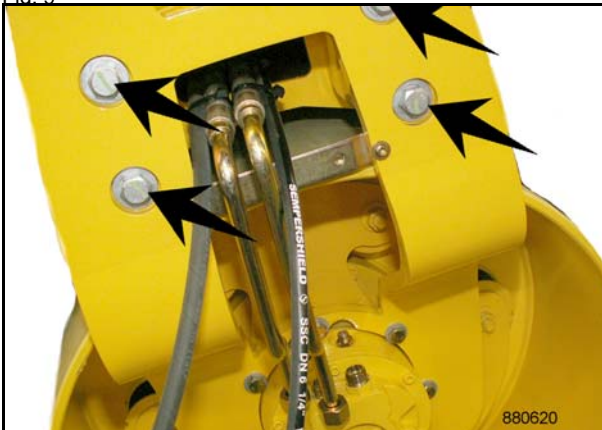


Fig. 10

16. Place the drum with travel motor and support leg (Fig. 10) parallel into the frame, turn in and tighten the fastening screws.

Reapplying the mechanical brake

17. Completely release both screws 1 (Fig. 11) to close the brake.

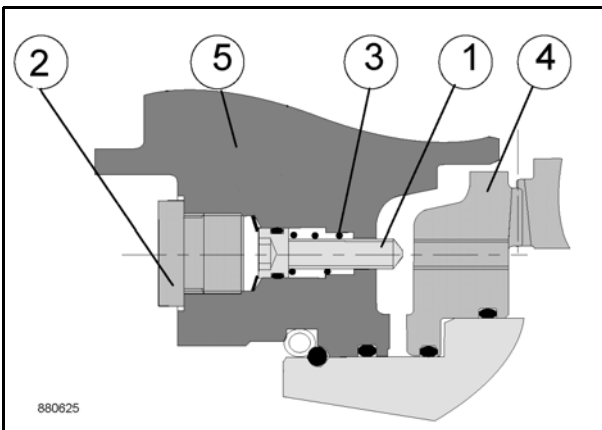


Fig. 11

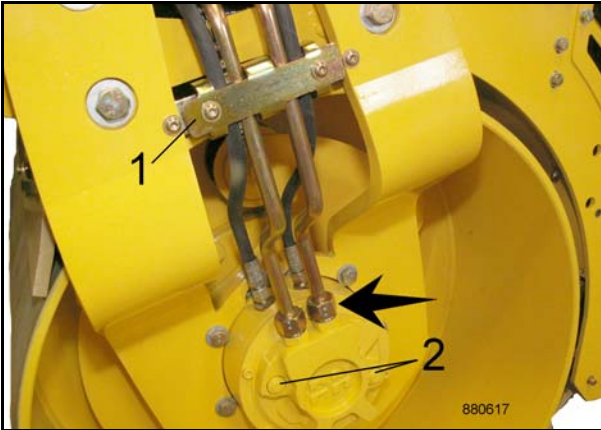


Fig. 12



Fig. 13

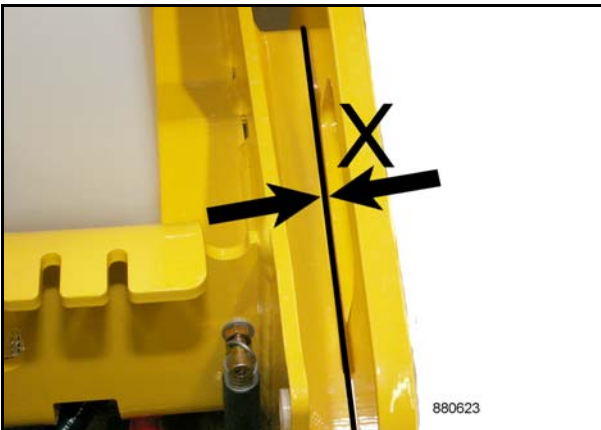


Fig. 14

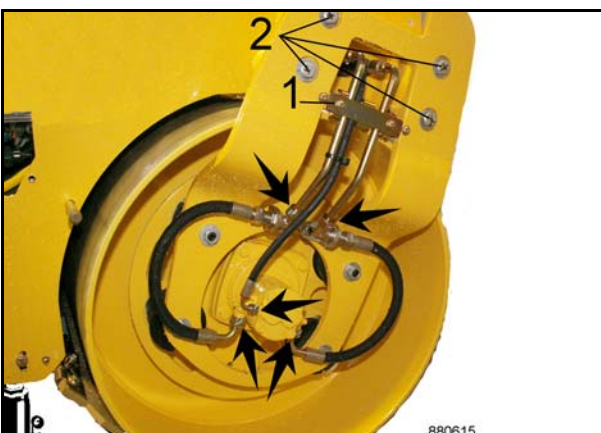


Fig. 15

18. Screw the plug 2 (Fig. 12) back in and tighten it with 60 Nm.
19. Connect hydraulic hoses and pipes.
20. Install the bracket (1).

21. Assemble the support leg (Fig. 13) and tighten the nuts. .

Adjusting the preload of the rubber buffers

⚠ Caution

Fasten the support legs under preload to the frame.

The preload of the rubber buffers is achieved by the gap "X" (Fig. 14) between support leg and frame when tightening.

Nominal value: Distance "X" = 2mm

i Note

If necessary attach compensation shims on either side.

22. Fasten the support leg to the frame with the screws 2 (Fig. 3).
23. Connect the hydraulic hoses.
24. Install the bracket (1).

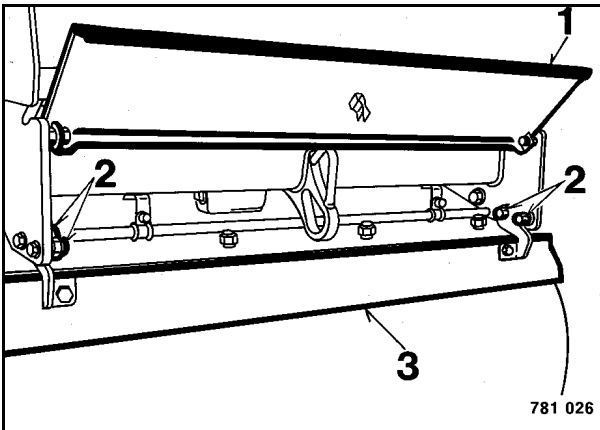


Fig. 16

25. Assemble the scrapers 3 (Fig. 2) with screws (2).
26. Close the flap (1).

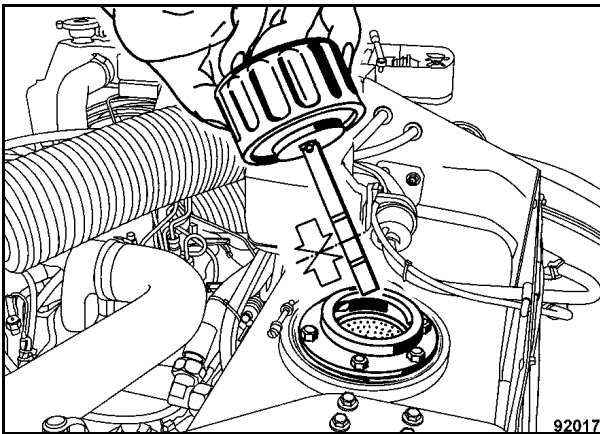


Fig. 17

27. Check the hydraulic oil level (Fig. 17), top up if necessary.

⚠ Caution

Bleed the travel circuit before starting operation.

28. Perform a test drive, check function of travel system, vibration and water sprinkling system.
29. Check all connections and fittings for leak tightness.

8.4 Dismantling the drum

Removing the drum drive motor

⚠ Danger

Secure the drum against unintended rolling.

1. Attach the lifting tackle to the support leg (Fig. 1).
2. Remove the support leg from the travel motor.

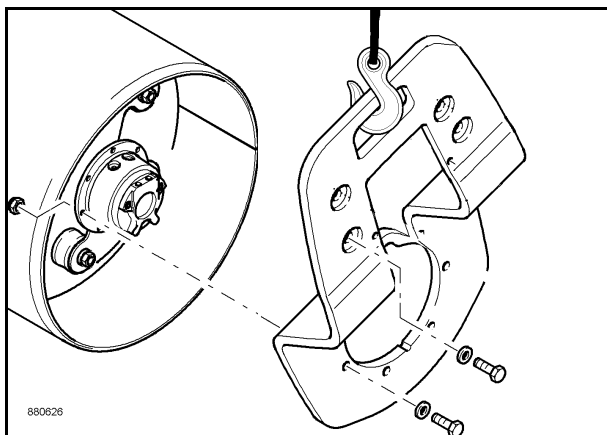


Fig. 1



Fig. 2

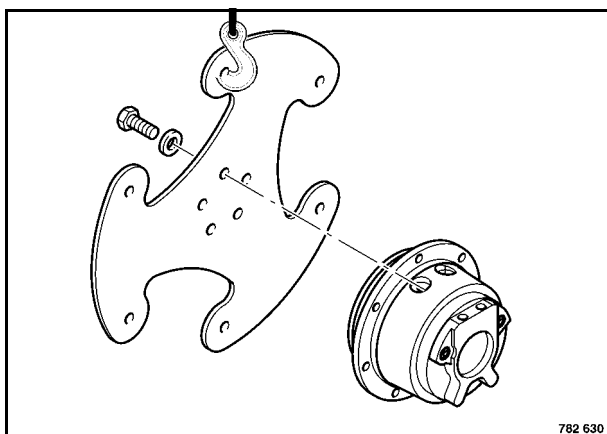


Fig. 3

3. Attach the lifting tackle to the travel motor with drive disc (Fig. 2).
4. Unscrew the fastening nuts and separate the drive disc with travel motor from the drum.
5. Unscrew the screws (Fig. 3) and lift the drive disc off the drum motor.

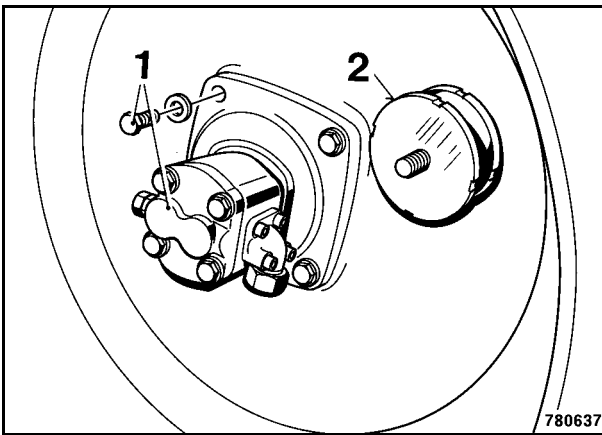


Fig. 4

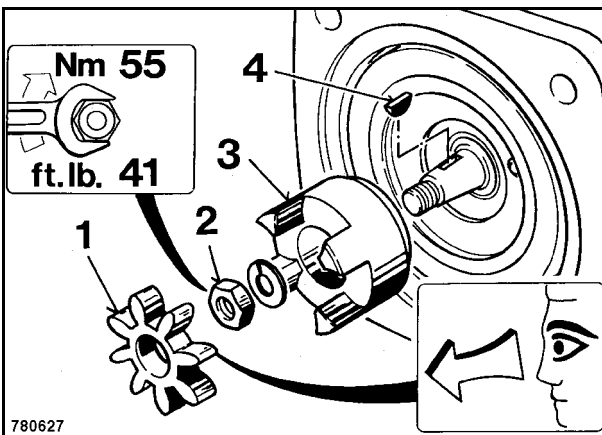


Fig. 5

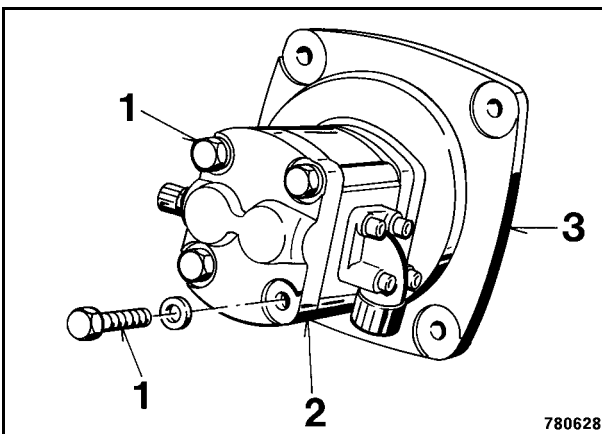


Fig. 6

Remove the vibration motor

6. Remove the vibration motor 1 (Fig. 4).
7. Check the rubber buffers (2) for wear, if necessary unscrew from the bearing cover by using an appropriate special tool.
8. Remove the elastic coupling 1 (Fig. 5).
9. Unscrew nut (2) and pull the coupling hub (3) off with a puller.
10. Remove fitting key (4).
11. Unscrew both fastening screws 1 (Fig. 6) and separate the vibration motor (2) from the flange (3).

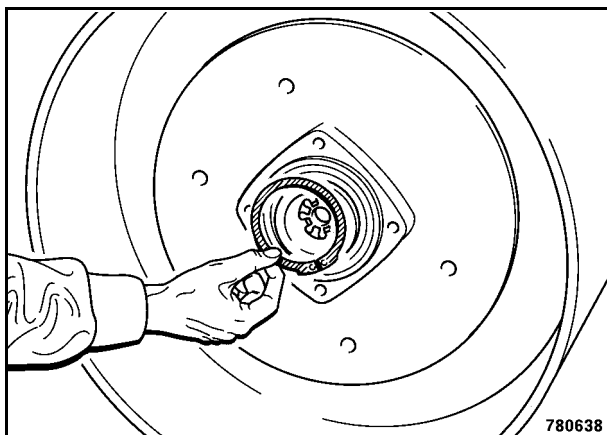


Fig. 7

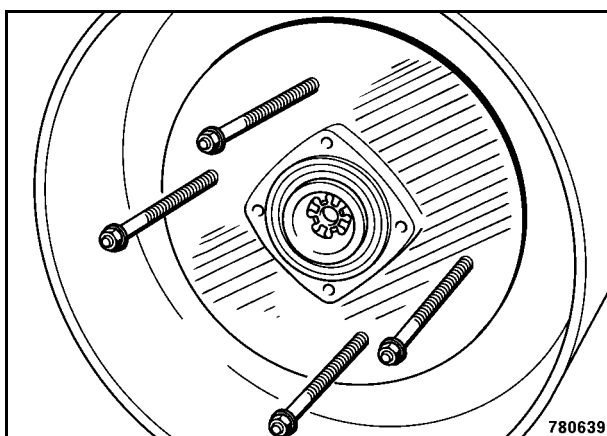


Fig. 8

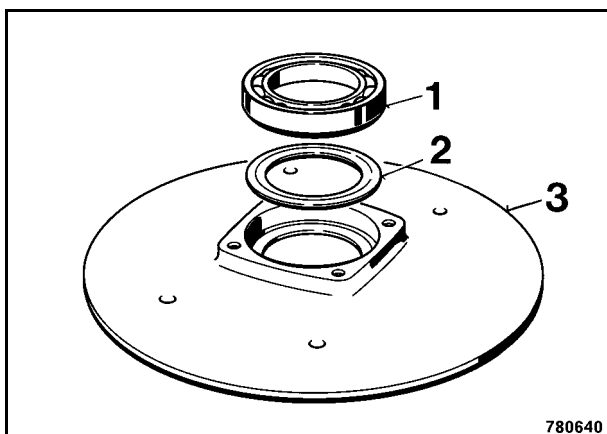


Fig. 9

Remove the bearing plate

12. Unclip the circlip (Fig. 7) from the bearing housing.
13. Force the bearing plate (Fig. 8) off with forcing screws.
14. Knock the grooved ball bearing 1 (Fig. 9) out of the bearing plate (3).
15. Remove the Nilos ring (2).

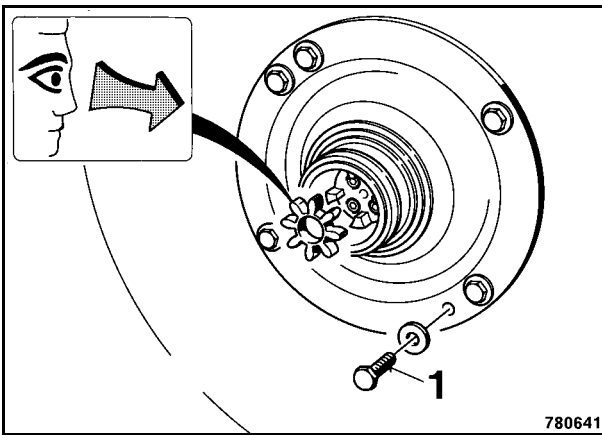


Fig. 10

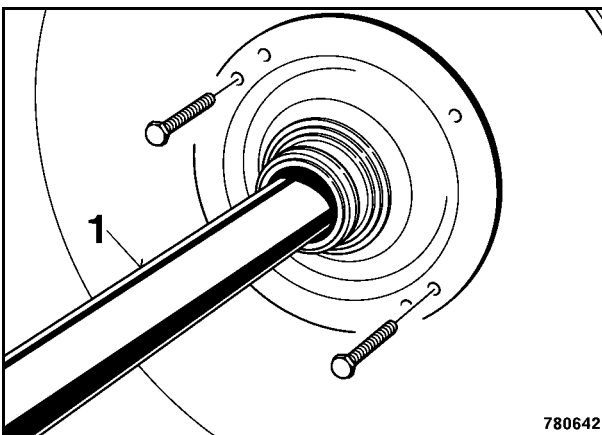


Fig. 11

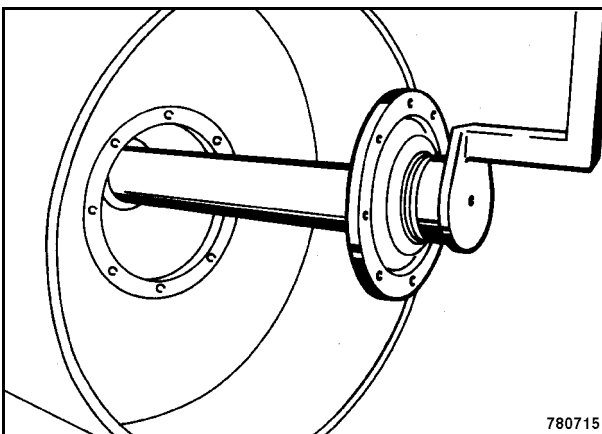


Fig. 12

Disassembling the exciter shaft

16. Unscrew the fastening screws 1 (Fig. 10) for the bearing housing.
17. Remove the elastic coupling, check for wear, replace if necessary.
18. Pick up the lifting device 1 (Fig. 11) with a crane and slide it over the exciter shaft.
19. Force the bearing housing out of the drum using forcing screws.
20. Pull the exciter shaft (Fig. 12) out of the drum with a special tool.

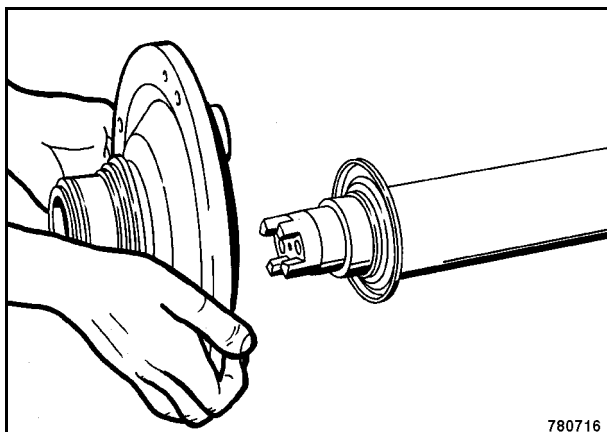


Fig. 13

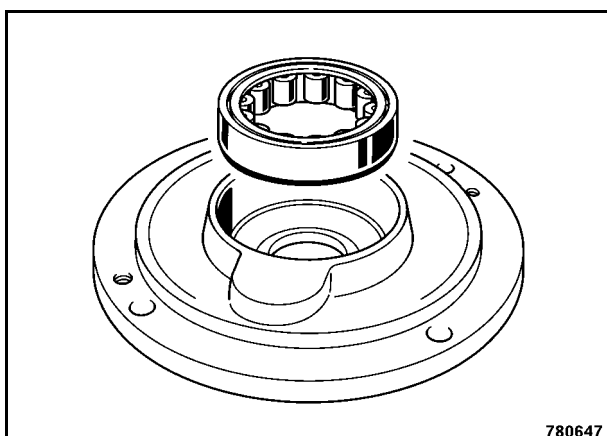


Fig. 14

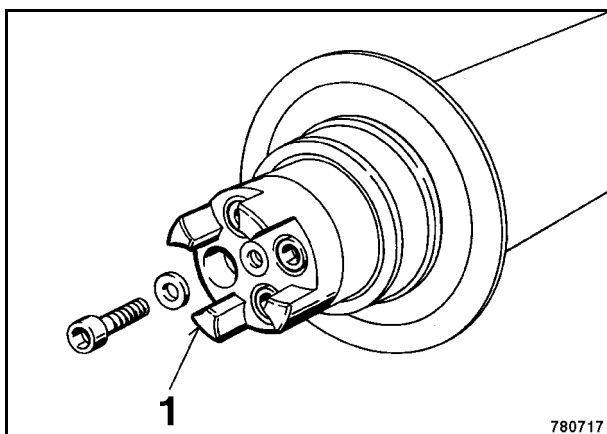


Fig. 15

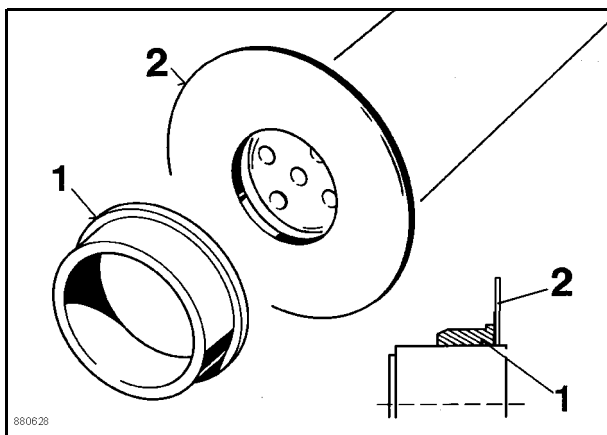


Fig. 16

Dismantling the exciter shaft

21. Take the bearing housing (Fig. 13) off the exciter shaft.

22. Knock the cylinder roller bearing (Fig. 14) out of the bearing housing.

23. Pull coupling hub 1 (Fig. 15) off the exciter shaft.

24. Pull inner bearing race 1 (Fig. 16) off both sides of the exciter shaft.

i Note

If the inner bearing race sits very tight, heat the ring up with a torch.

25. Remove the sealing ring (2).

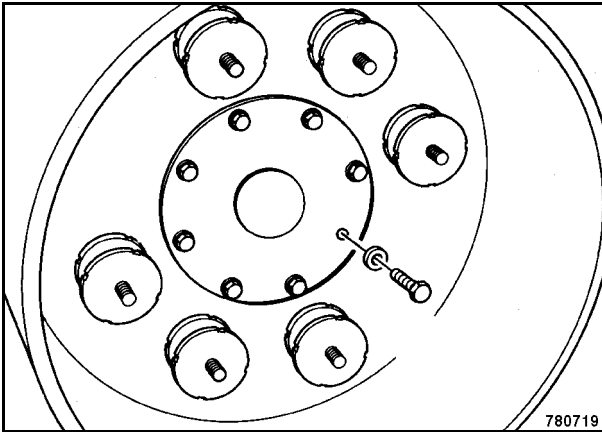


Fig. 17

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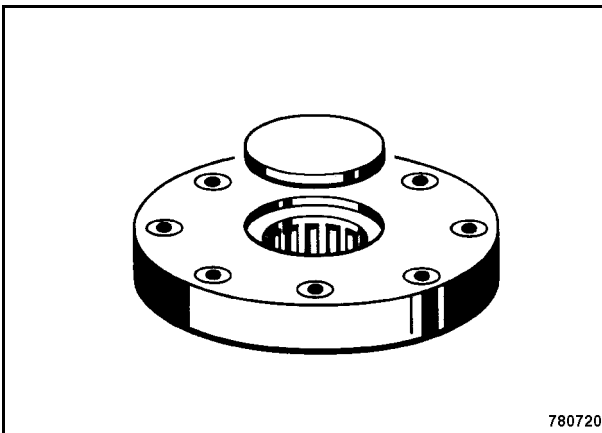


Fig. 18

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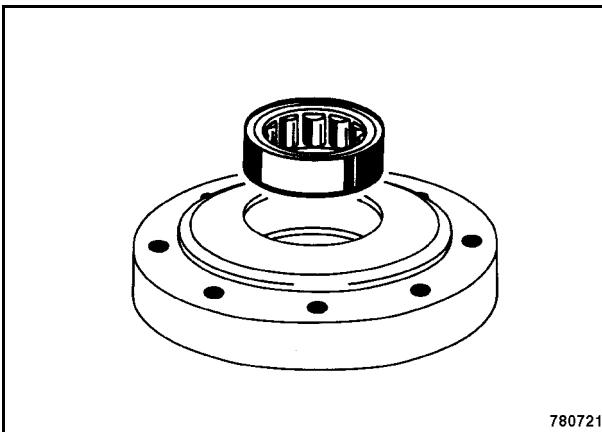


Fig. 19

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Disassembling the bearing cover

26. Unscrew the fastening screws (Fig. 17) from the drum.
27. Knock the bearing cover out from the vibration drive side.

28. Remove the cover (Fig. 18).

29. Knock the cylinder roller bearing (Fig. 19) out of the bearing housing.

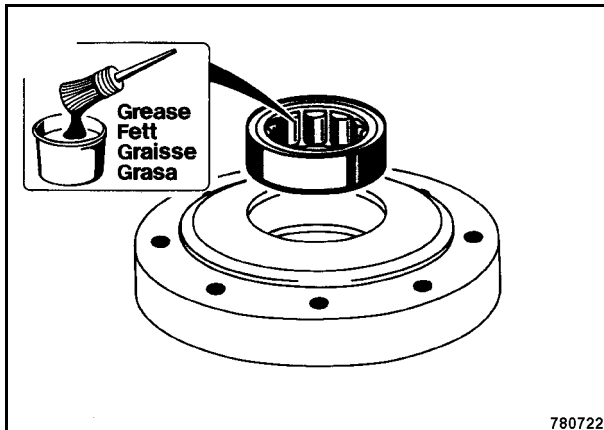


Fig. 1

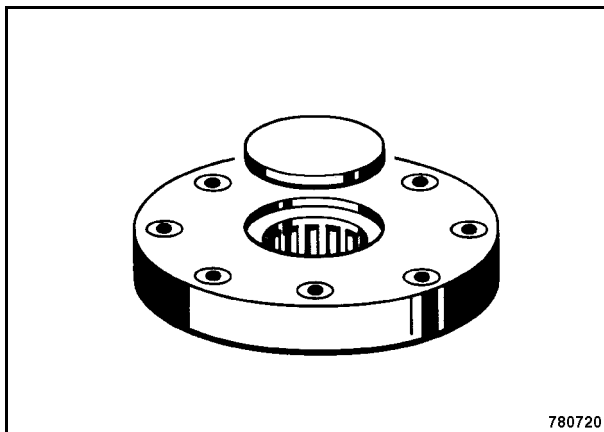


Fig. 2

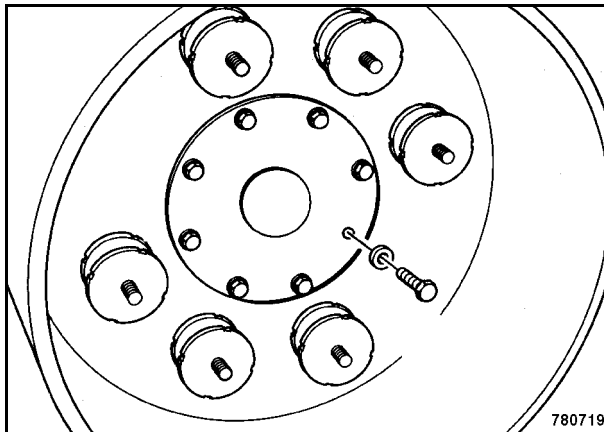


Fig. 3

8.5 Assembling the drum

Installing the bearing cover

1. Press the new bearing (Fig. 1) down to full contact.
2. Fill approx. 30g of lithium saponified high pressure grease into the gap between the roller drums and another 30 g into the grease chamber of the bearing cover.
3. Attach the cap (Fig. 2).
4. Assemble the bearing cover (Fig. 3).

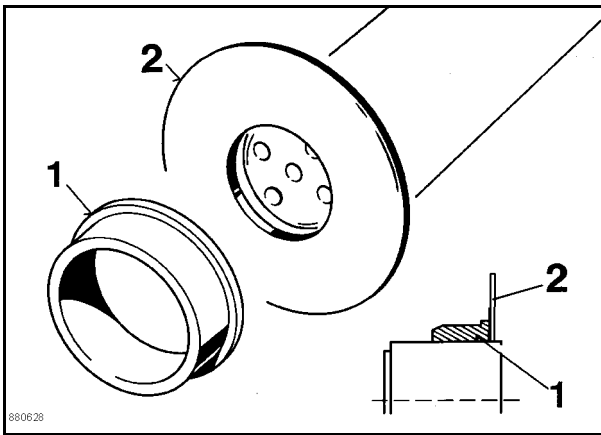


Fig. 4

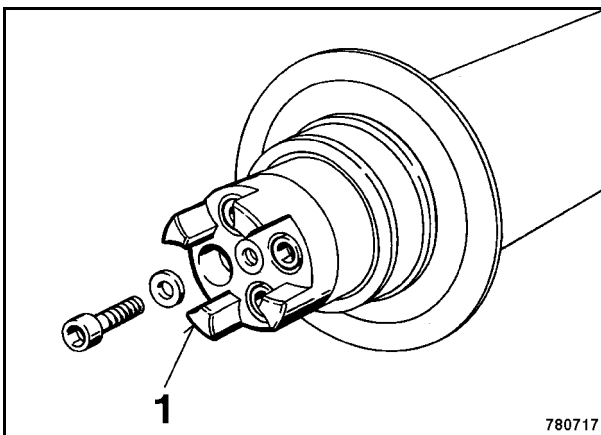


Fig. 5

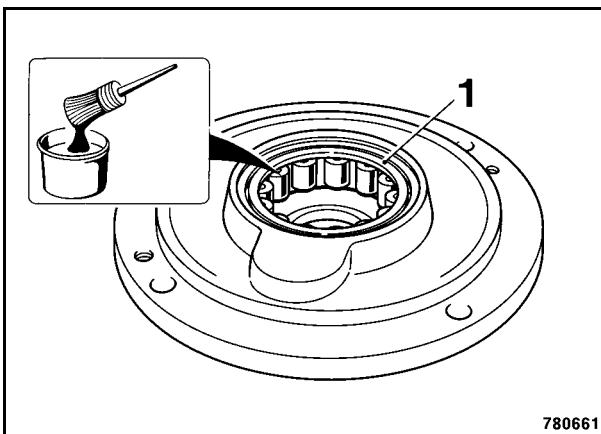


Fig. 6

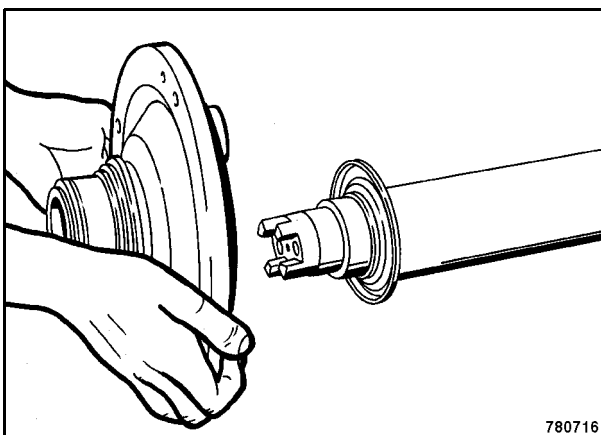


Fig. 7

Assembling the exciter shaft

5. Push on the sealing ring 2 (Fig. 4).

⚠ Danger

Wear protective gloves.

6. Heat inner bearing races (1) up to approx. 80 °C and slide them on the exciter shaft from both ends.

7. Install coupling hub 1 (Fig. 5).

8. Knock the new bearing 1 (Fig. 6) into the bearing housing until it bottoms.
9. Fill approx. 30g of lithium saponified high pressure grease into the gap between the roller drums and another 30 g into the grease chamber of the bearing housing.

10. Slide the bearing housing over the exciter shaft (Fig. 7).

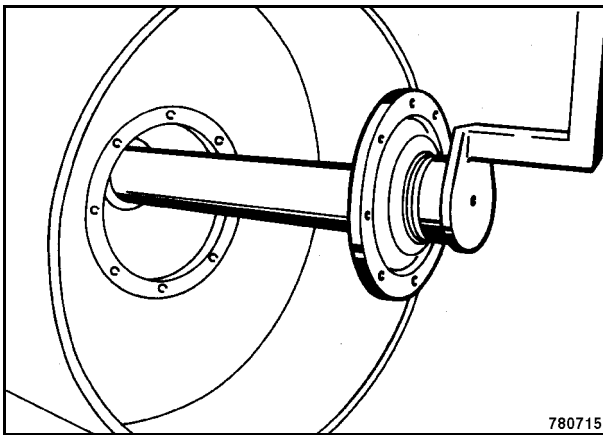


Fig. 8

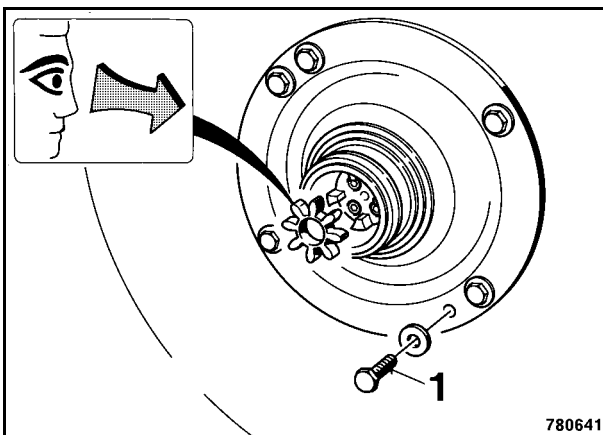


Fig. 9

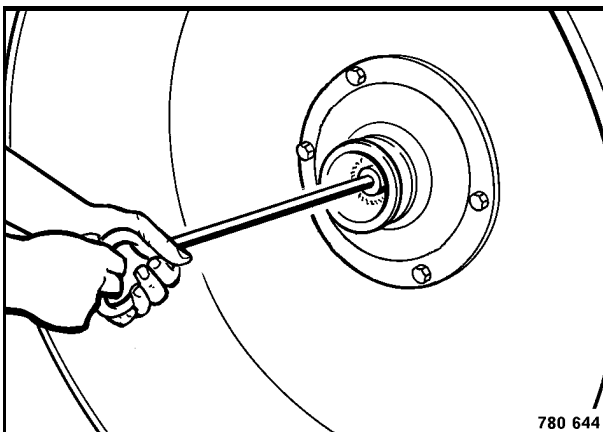


Fig. 10

Installing the exciter shaft

11. Slide the special tool (Fig. 8) over the exciter shaft and insert it carefully into the opposite bearing.

12. Fasten the bearing housing with screws 1 (Fig. 9).

13. Insert the elastic coupling into the coupling hub.

Measuring the end float

14. Screw the eye bolt (Fig. 10) into the exciter shaft bore to measure the end float.

15. Push the exciter shaft into the bearing housing against the end stop.

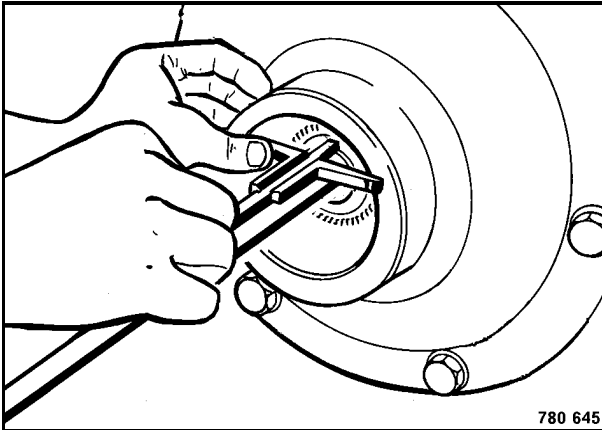


Fig. 11

16. Measure the distance between coupling and front face of bearing housing (Fig. 11).

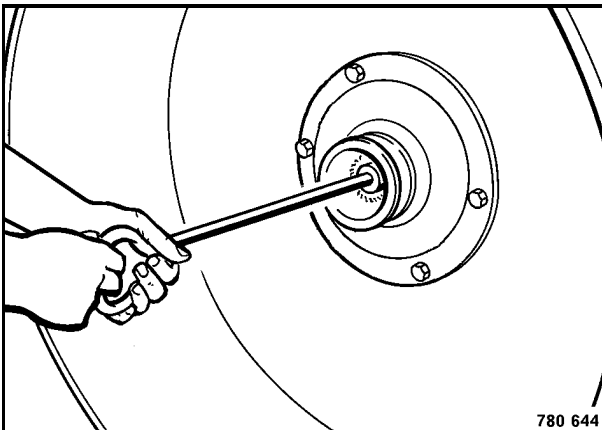


Fig. 12

17. Pull the exciter shaft out of the flange against the stop (Fig. 12).

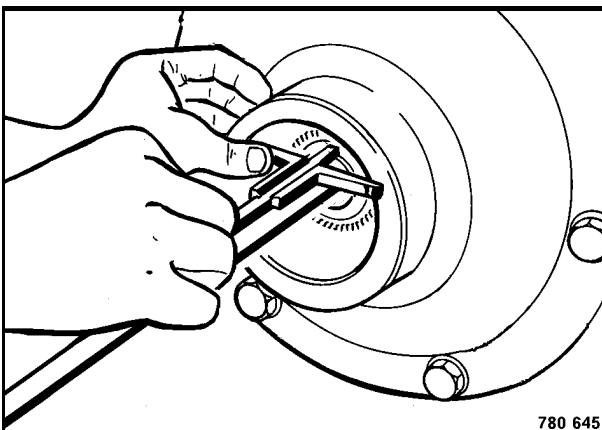


Fig. 13

18. Measure the distance between coupling and front face of bearing housing again (Fig. 13).

i Note

Subtract the second measurement from the first measurement to calculate the end float.

Nominal value:

min. 0,6 mm

max. 1,9 mm

Assembling the bearing plate

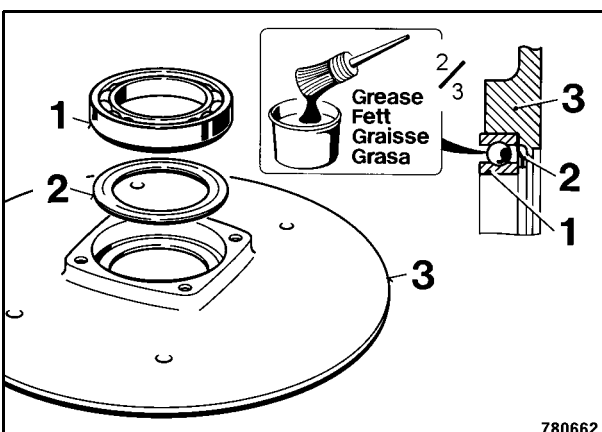


Fig. 14

19. Install Nilos ring 2 (Fig. 14).
20. Press the new bearing (1) into the bearing plate (3) until it bottoms and fill it to 2/3 with lithium saponified high pressure grease.

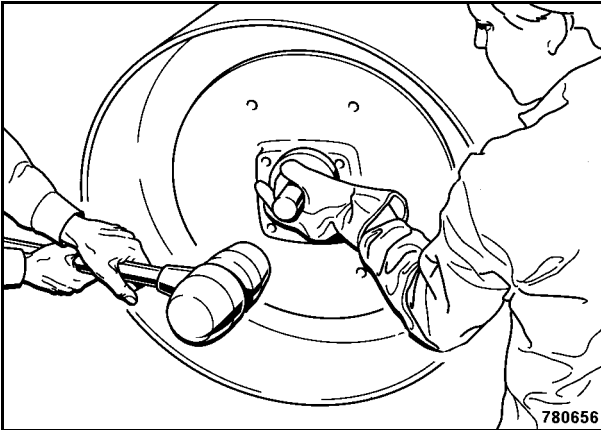


Fig. 15

21. Knock the bearing plate into the bearing housing using a drift punch (Fig. 15).

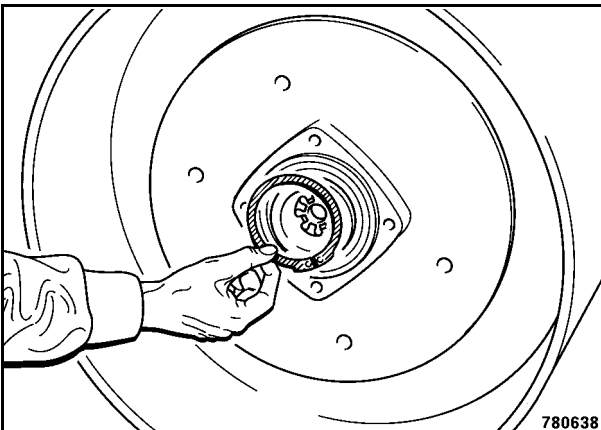


Fig. 16

22. Snap the circlip into the groove in the bearing housing (Fig. 16).

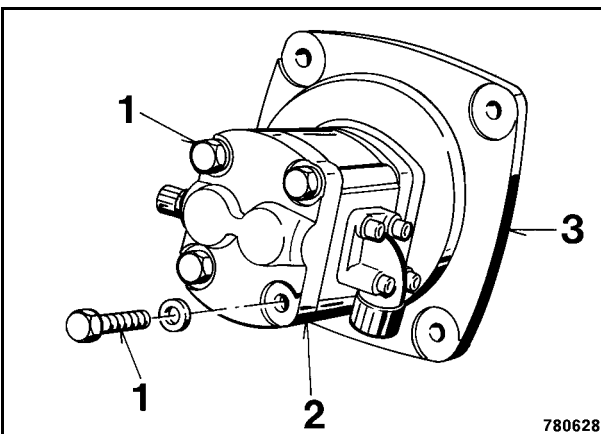


Fig. 17

23. Fasten the vibration motor 2 (Fig. 17) to the flange (3) with fastening screws (1).

Installing the vibration motor

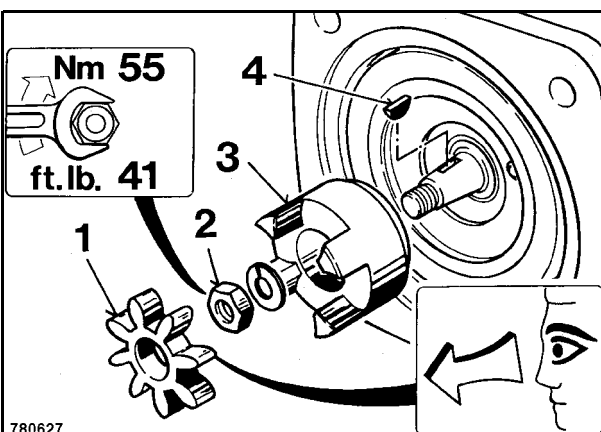


Fig. 18

24. Insert the fitting key 4 (Fig. 18).
25. Slide on coupling hub (3) and tighten nut (2) with 55 Nm.
26. Assemble the elastic coupling (1).

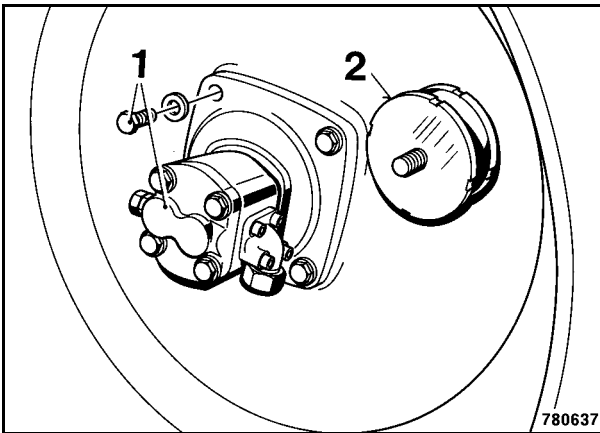


Fig. 19

27. Install the vibration motor 1 (Fig. 19).
28. If necessary fasten new rubber buffers (2) with 210 Nm.

Installing the drum drive motor

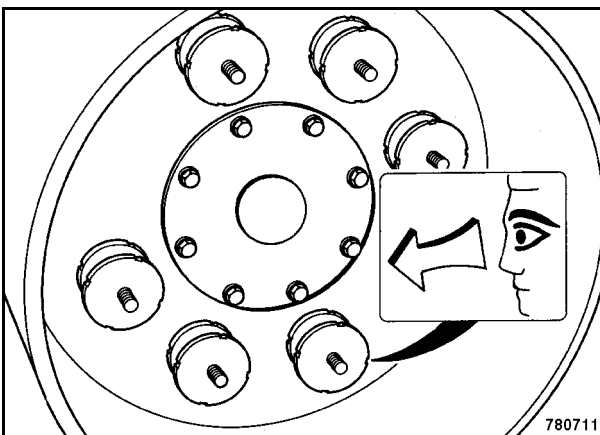


Fig. 20

29. If necessary fasten new rubber buffers with 210 Nm (Fig. 20).

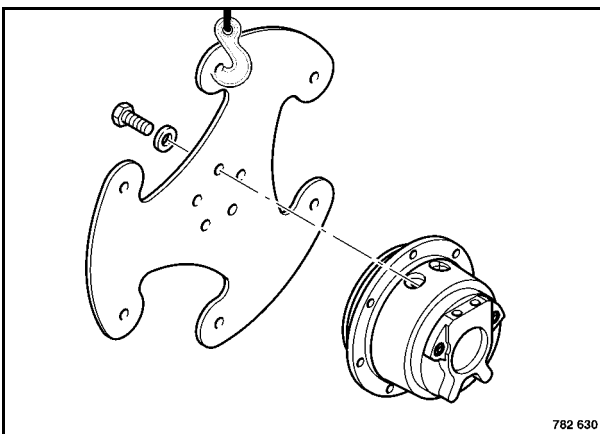


Fig. 21

30. Use screws (Fig. 21) and washers to connect the drum drive motor to the drive disc.

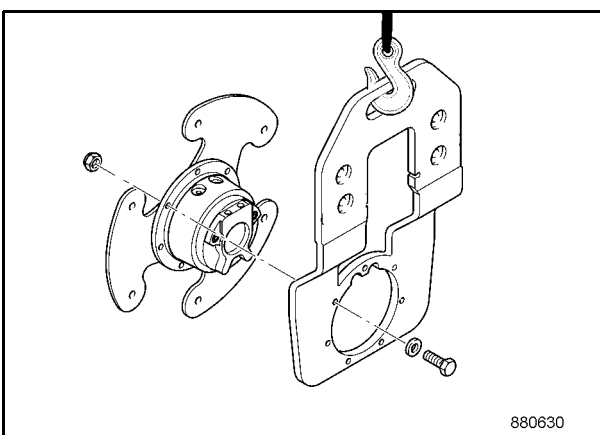


Fig. 22

31. Assemble the support leg (Fig. 22) with the drum drive motor.
32. Attach the lifting tackle to the completely assembled unit.

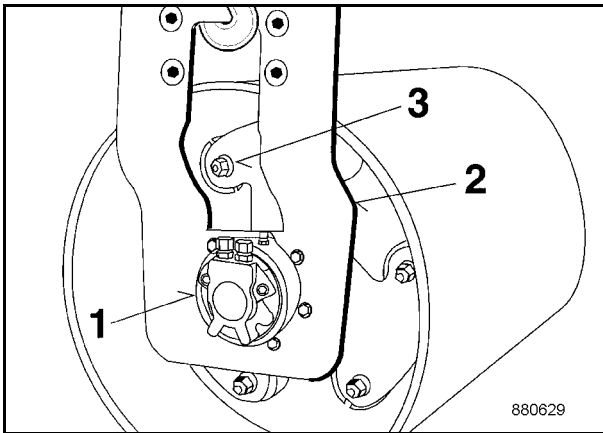


Fig. 23

- 33. Assemble the drum drive motor with drive disc and support leg 2 (Fig. 23) to the drum.
- 34. Attach the drive disc to the rubber buffers and tighten the nuts (3) with 210 Nm.

9 Oscillating articulated joint

9.1 Special tools

1. Extraction ring for taper roller bearing

BOMAG part-no.: 007 100 60

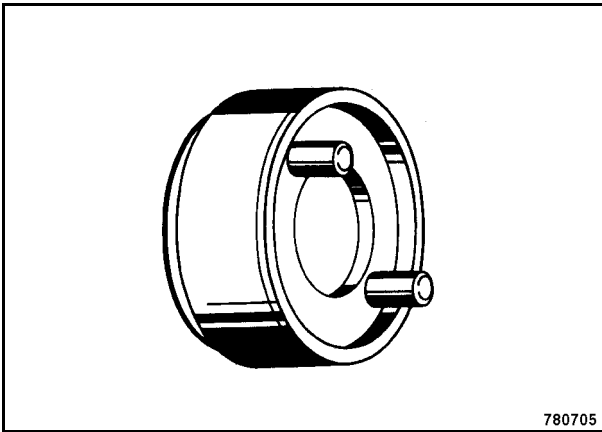
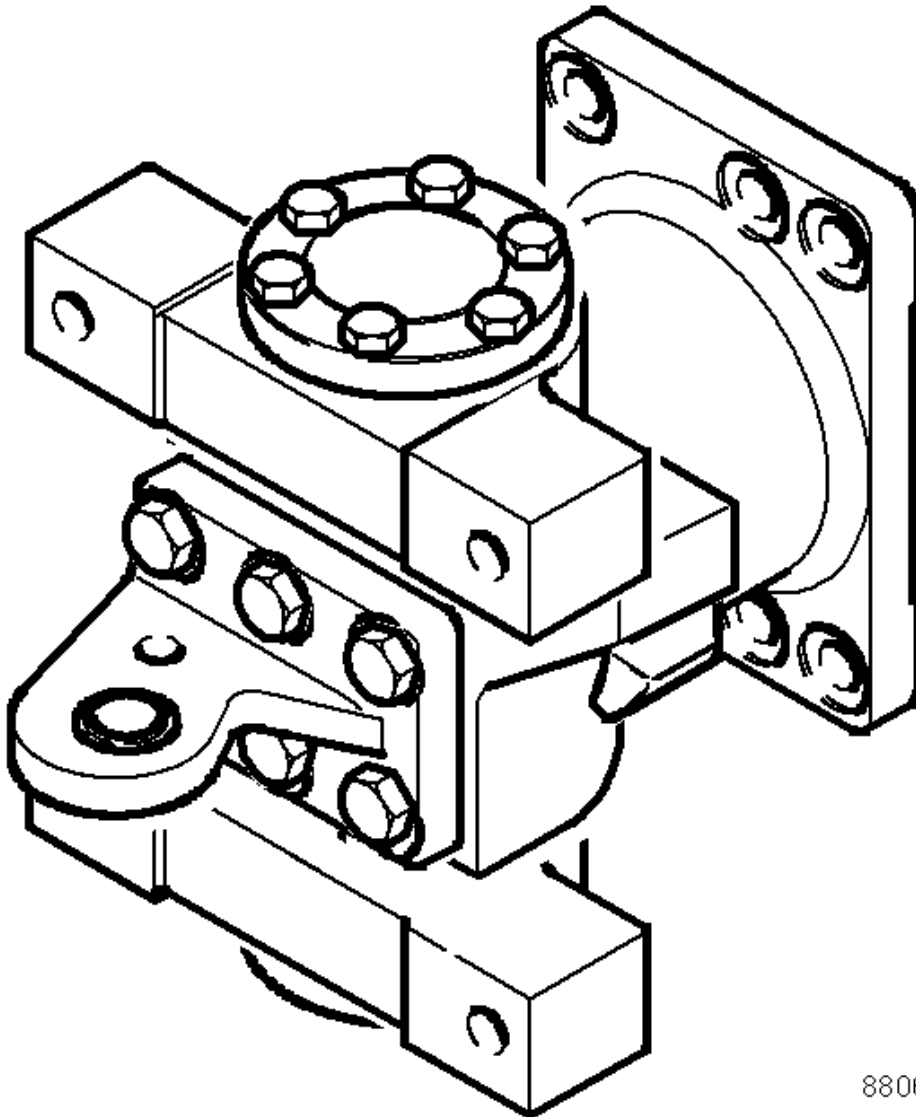
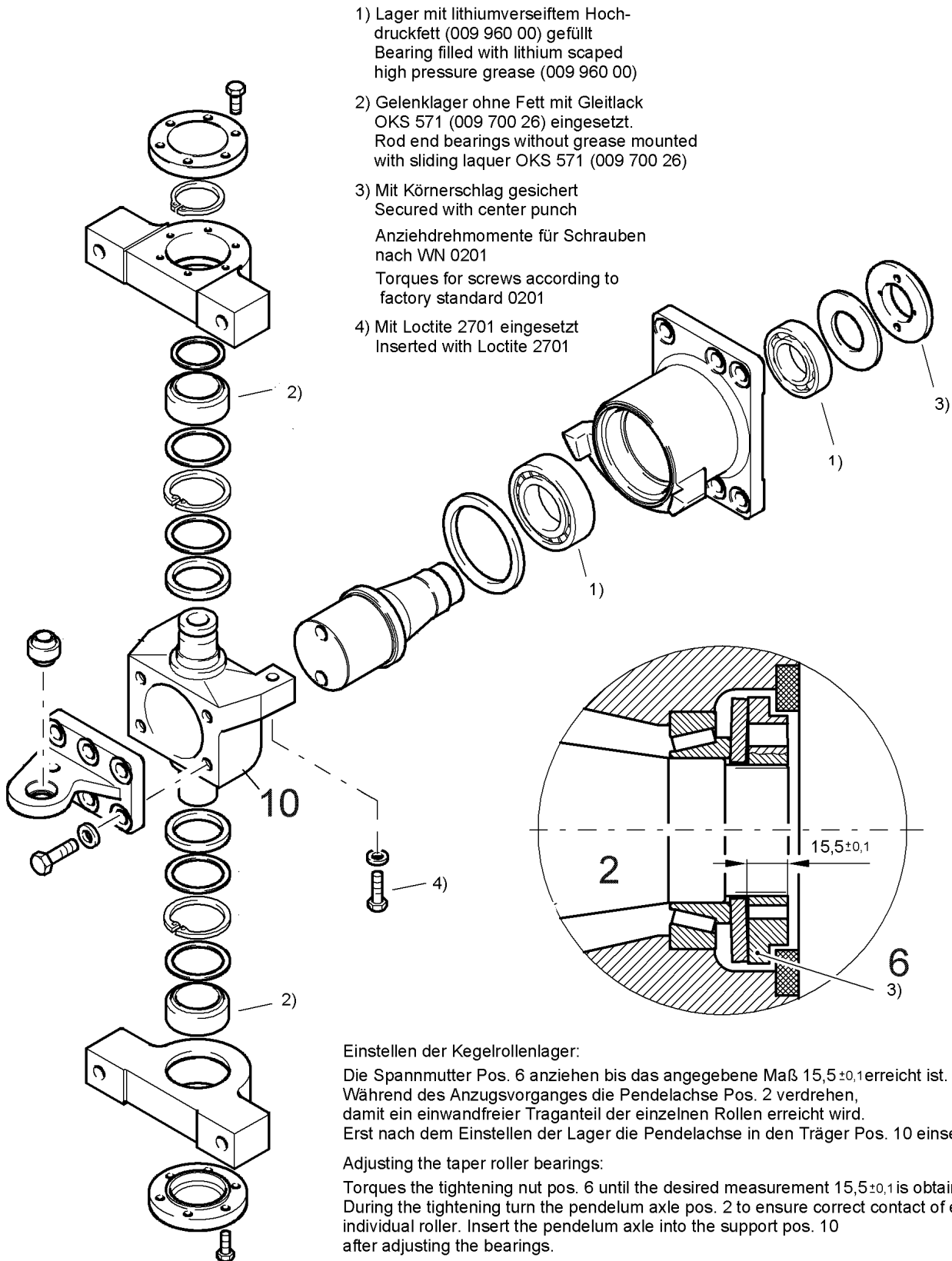


Fig. 1

9.2 Repair overview Oscillating articulated joint



880648



Einstellen der Kegelrollenlager:

Die Spannmutter Pos. 6 anziehen bis das angegebene Maß $15,5 \pm 0,1$ erreicht ist. Während des Anzugsvorganges die Pendelachse Pos. 2 verdrehen, damit ein einwandfreier Traganteil der einzelnen Rollen erreicht wird. Erst nach dem Einstellen der Lager die Pendelachse in den Träger Pos. 10 einsetzen.

Adjusting the taper roller bearings:

Torques the tightening nut pos. 6 until the desired measurement $15,5 \pm 0,1$ is obtained. During the tightening turn the pendulum axle pos. 2 to ensure correct contact of each individual roller. Insert the pendulum axle into the support pos. 10 after adjusting the bearings.

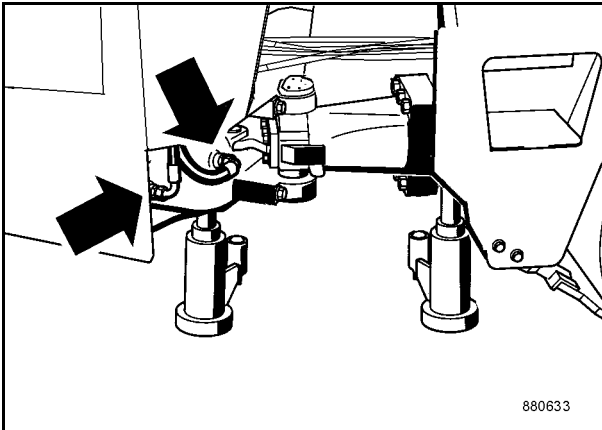


Fig. 1

9.3 Removing and installing the oscillating articulated joint

1. Support the front and rear frames of the machine safely with jacks (Fig. 1).

⚠ Danger

Danger of accident!

Block front and rear drums with wedges against rolling!

Do not work in the articulation area of the roller while the engine is running.

⚠ Caution

Do not start the engine during repair work!

2. Disconnect the hydraulic hoses from the steering cylinder ports. Close the connections with plugs.

♻ Environment

Catch running out hydraulic oil and dispose of environmentally.

3. Remove the split pin from the steering cylinder bearing bolt 1 (Fig. 2) and knock out the bolt.
4. Take off supporting discs (2).
5. Attach lifting tackle to the articulated joint.
6. Unscrew fastening screws (3), washers and nuts (5) from the front bearing blocks.
7. Unscrew the fastening screws (4) from the bearing housing and remove the articulated joint with the steering cylinder.

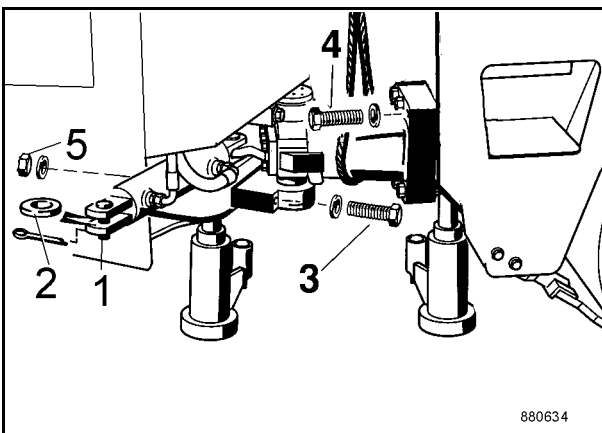


Fig. 2

8. Remove the split pin from the steering cylinder bearing bolt 1 (Fig. 3) and knock out the bolt.
9. Take off supporting discs (2).

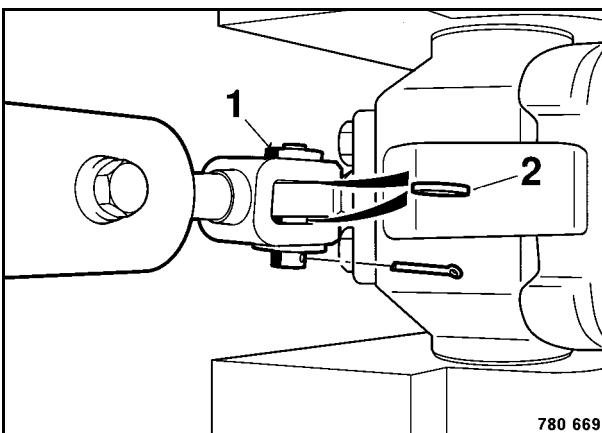


Fig. 3

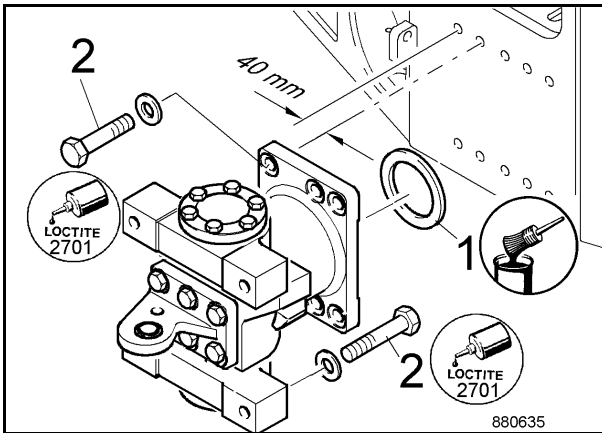


Fig. 4

Notes on assembly:

Stick the new seal 1 (Fig. 4) with some grease to the bearing housing.

Take care of the crabwalk position (40mm offset).

Install the screws (2) with Loctite 2701 .

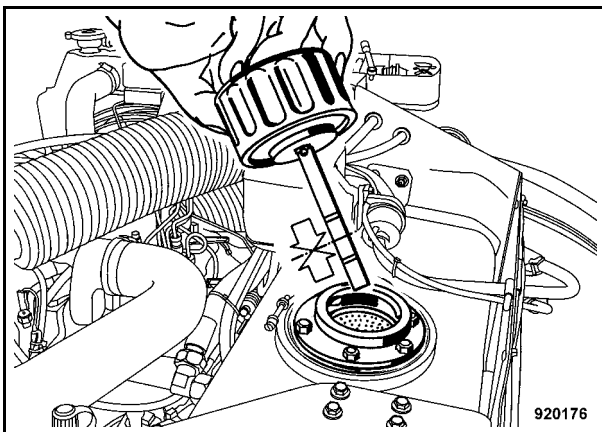


Fig. 5

After installing the steering cylinder check the hydraulic oil level, top up if necessary (Fig. 5).

To bleed the steering cylinder run the engine with idle speed and operate the steering several times to left and right.

Check all connections and fittings for leak tightness.

9.4 Dismantling the oscillating articulated joint

1. Disassemble both bearing covers 1 (Fig. 1).

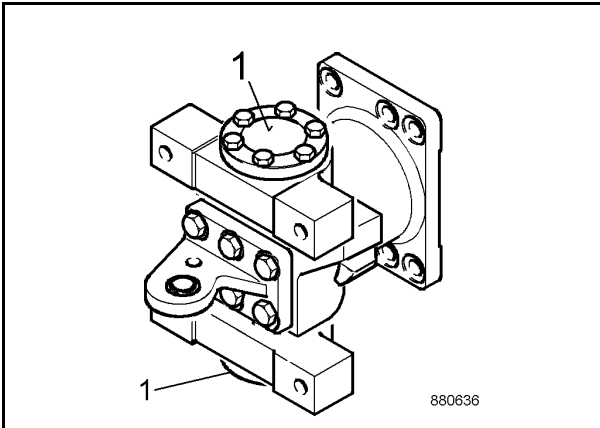


Fig. 1

2. Remove circlip 1 (Fig. 2) and backing discs (2).

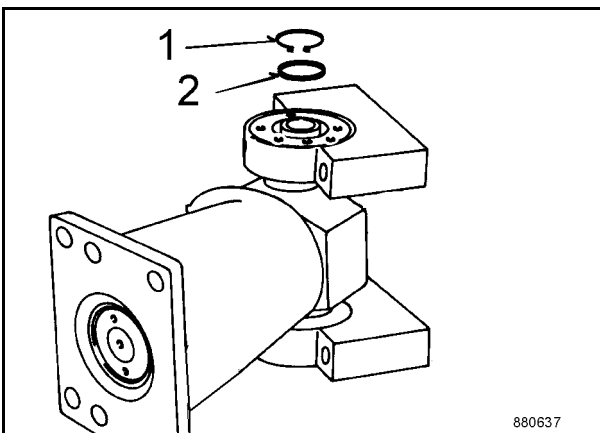


Fig. 2

i Note

Only the upper side is fitted with a circlip.

3. Pull both bearing blocks 1 (Fig. 3) off with a puller (2).
4. Pull sealing rings (3) and supporting discs off bearing block or shaft journal.

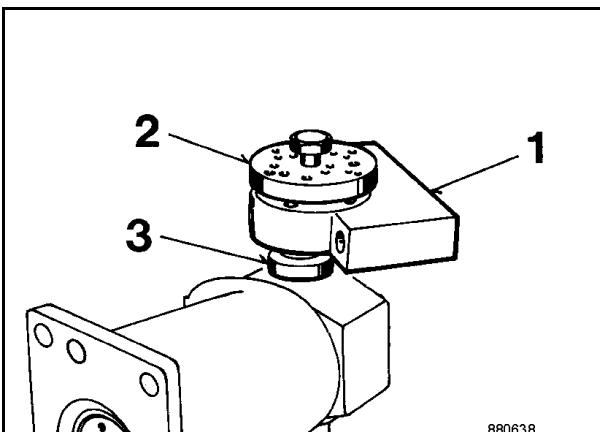


Fig. 3

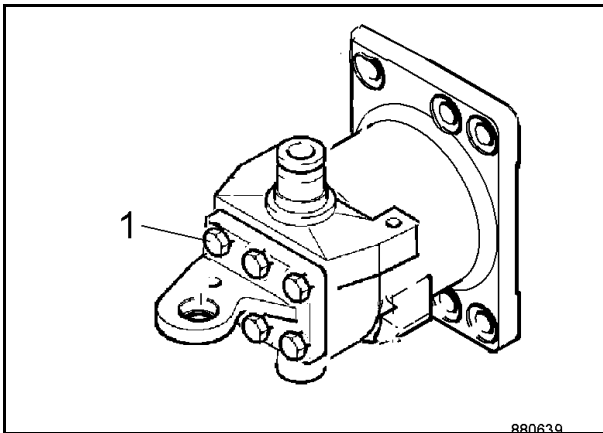


Fig. 4

5. Unscrew fastening screws 1 (Fig. 4) and remove the cylinder eye.

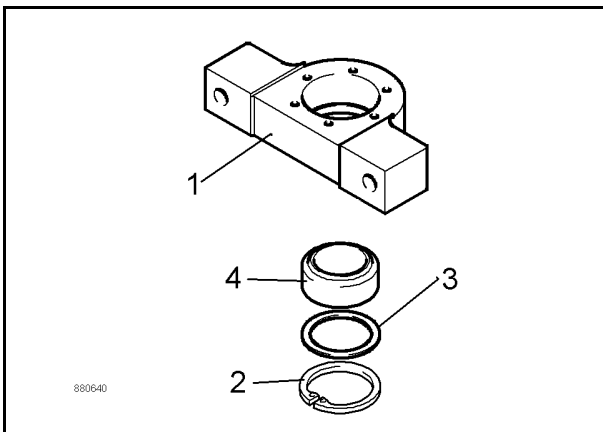


Fig. 5

6. Remove circlip 2 (Fig. 5) and backing disc (3).
7. Knock the rocker bearing (4) out of the bearing block (1).

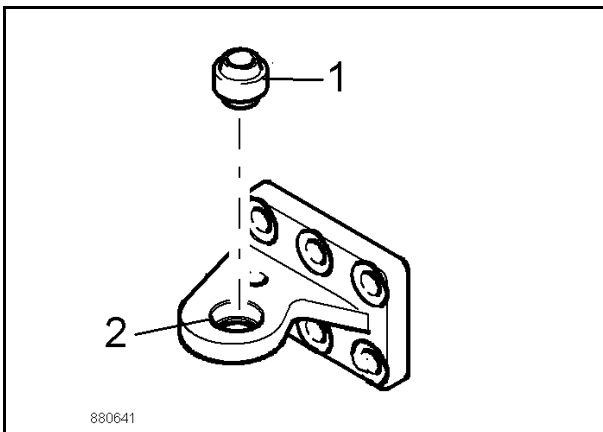


Fig. 6

8. Knock the rocker bearing 1 (Fig. 6) out of the cylinder eye (2).

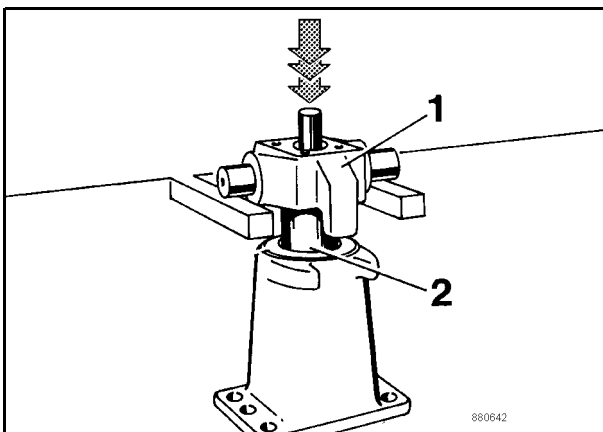


Fig. 7

9. Press the cross member 1 (Fig. 7) off the axle journal (2).

9.4

Dismantling the oscillating articulated joint

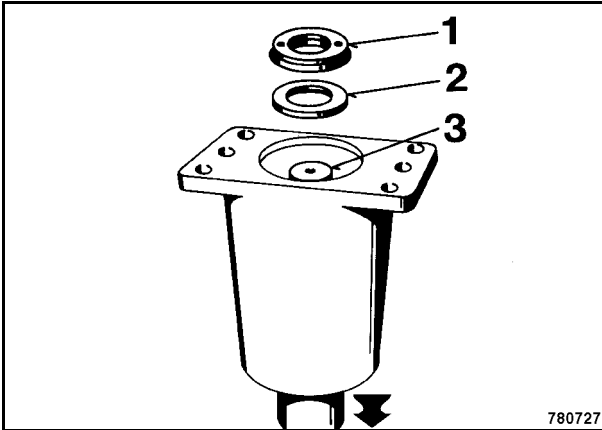


Fig. 8

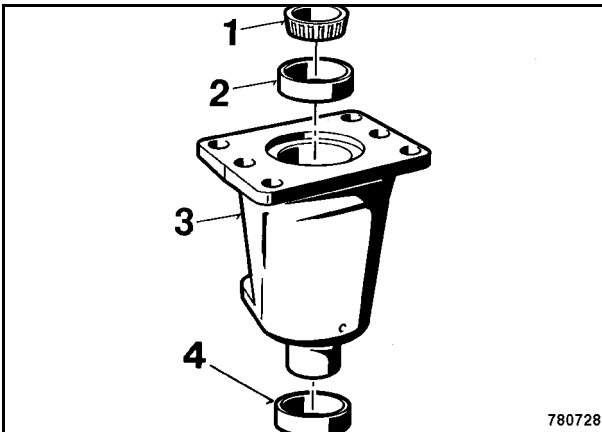


Fig. 9

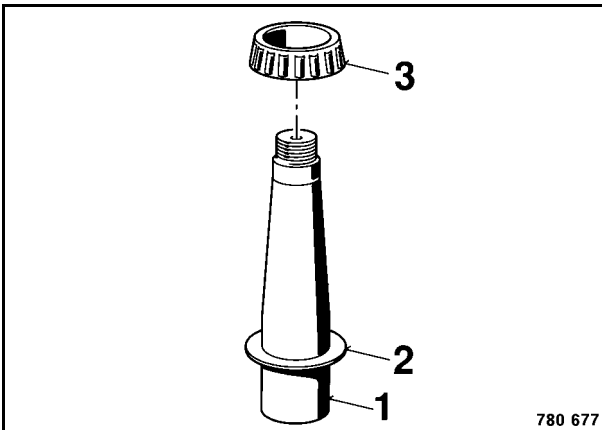
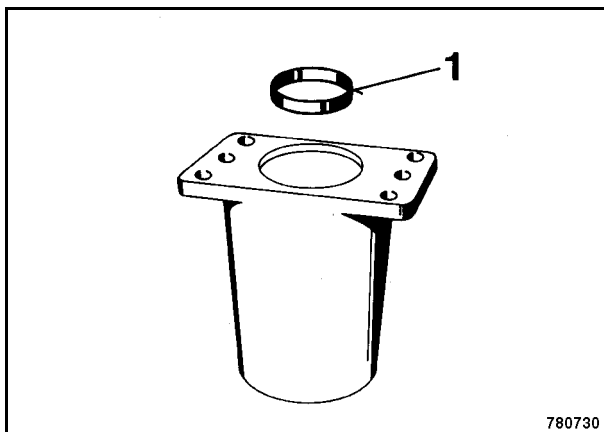
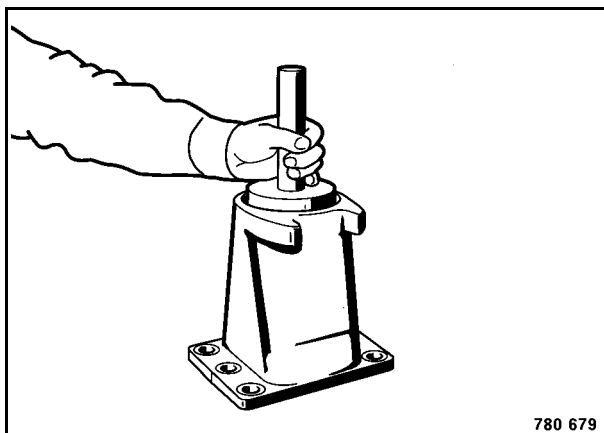
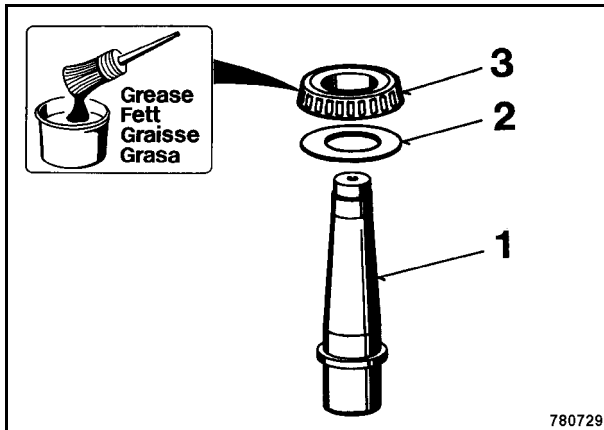


Fig. 10

10. Loosen the clamping nut 1 (Fig. 8) with the tightening ring and remove it from the housing together with the Belleville spring (2).
11. Pull the oscillation axle (3) out of the housing. If the oscillation axle is tight knock it carefully out of the housing with a plastic hammer.
12. Take out taper roller bearing 1 (Fig. 9) and knock the outer bearing races (2 and 4) out of the bearing housing (3).
13. Separate the taper roller bearing 3 (Fig. 10) from the oscillation axle (1) and remove the sealing ring (2).



9.5 Assembling the oscillating articulated joint

1. Slide the sealing ring 2 (Fig. 1) over the oscillation axle (1) and fit the new taper roller bearing (3).
2. Fill the taper roller bearing with lithium saponified high pressure grease.
3. Knock the new outer bearing race into the bearing housing (Fig. 2).
4. Turn the bearing housing upside down.
5. Press in the outer bearing race 1 (Fig. 3).

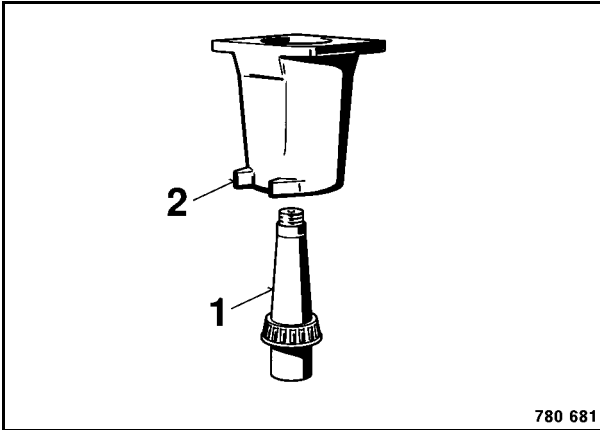


Fig. 4

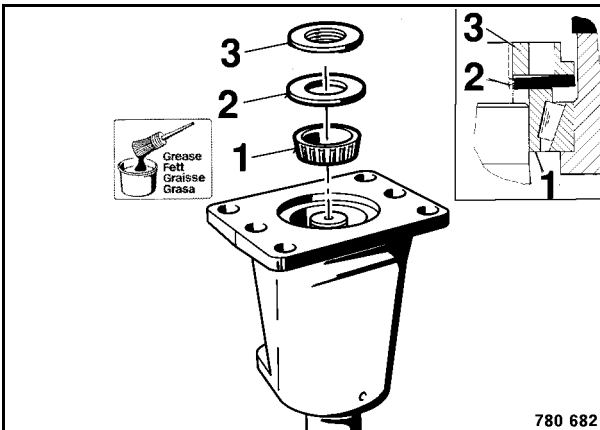


Fig. 5

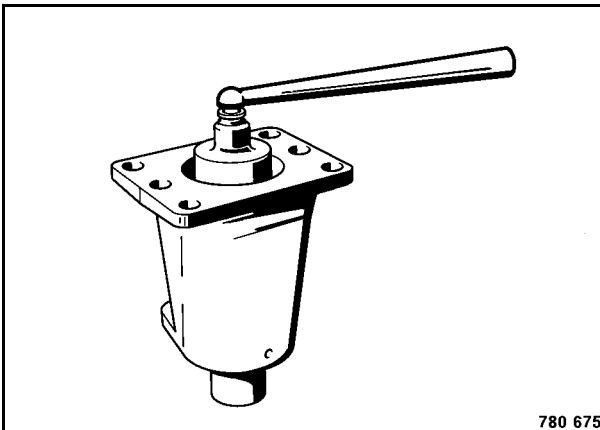


Fig. 6

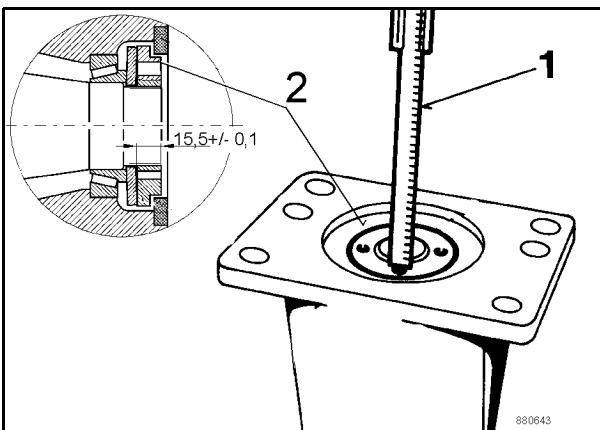


Fig. 7

6. Insert the oscillation axle 1 (Fig. 4) with taper roller bearing into bearing housing (2).

7. Grease the new taper roller bearing 1 (Fig. 5) with lithium saponified high pressure grease and install.

8. Insert the Belleville spring (2) with arched area pointing inward.

9. Install the new tensioning nut (3) with the large outer diameter pointing inward.

⚠ Caution

While tightening keep moving the oscillation axle, in order to achieve a correct contact pattern of the individual rolls. Insert the oscillation axle into the cross member, only after adjusting the bearing.

10. Tighten the tensioning nut with the tightening ring (Fig. 6), thereby

11. measure the depth with a vernier caliper 1 (Fig. 7) through the bore in the tensioning nut (2).

Nominal value:

15.5 +/- 0,1 mm

12. If necessary tighten the tensioning nut until the nominal value is reached.

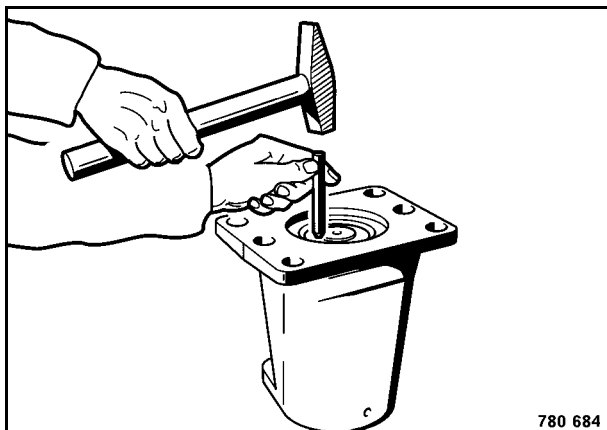


Fig. 8

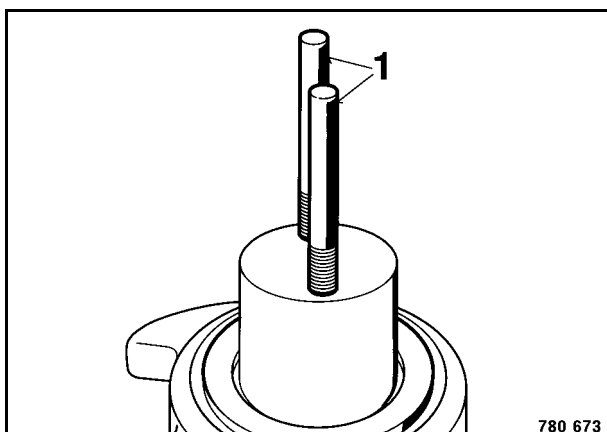


Fig. 9

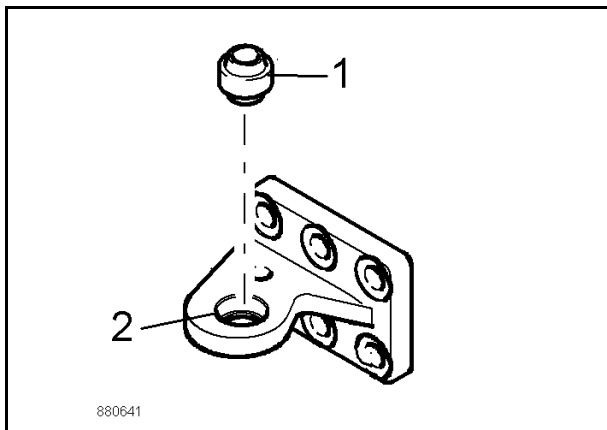


Fig. 10

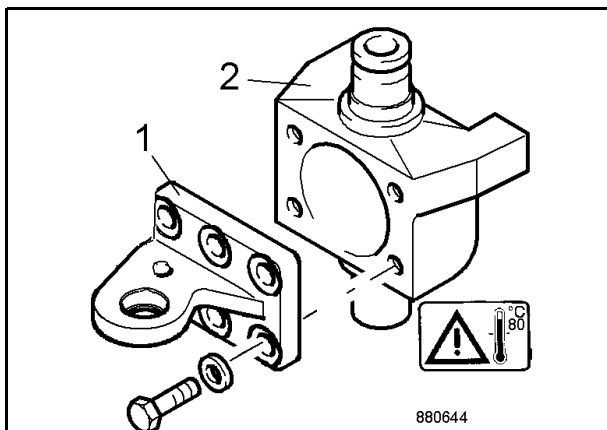


Fig. 11

- Secure the tensioning nut with two prick-punch locks opposite each other (Fig. 8).

- Insert two threaded bars 1 (Fig. 9) M16 x 200 into the oscillating axle.

i Note

The threaded bars are needed to guide the cross member during assembly.

⚠ Caution

The drift punch should only contact the outer race of the rocker bearing, as otherwise the bearing will be destroyed!

- Knock the rocker bearing 1 (Fig. 10) into the cylinder eye (2).

⚠ Danger

Wear protective gloves.

- Heat the cross member 2 (Fig. 11) up to approx. 80 °C.

i Note

Observe the installation position (see illustration)!

- Mount the cylinder eye (1) with the four outer screws to the cross member (2).

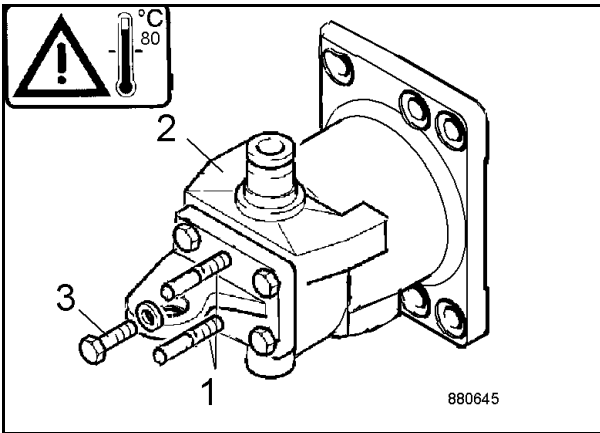


Fig. 12

⚠ Danger

Use protective gloves, heat the cross member up to 80 °C.

18. Attach the cross-member 2 (Fig. 12) to the oscillating axle, unscrew the threaded rods (1) from the oscillating axle and pull the cross-member with screws (3) bis tightly against the oscillating axle. Then allow the cross member to cool down.

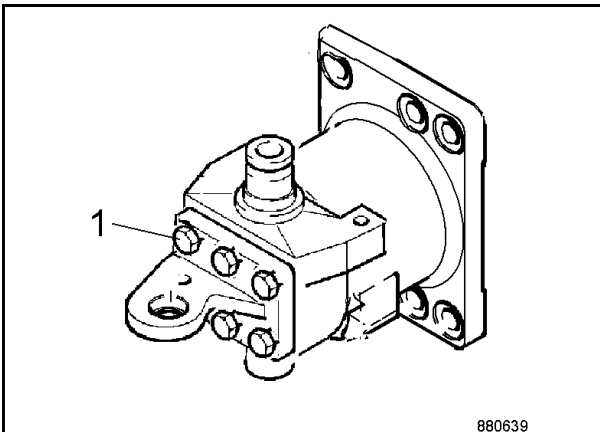


Fig. 13

19. Tighten the fastening screws 1 (Fig. 13).

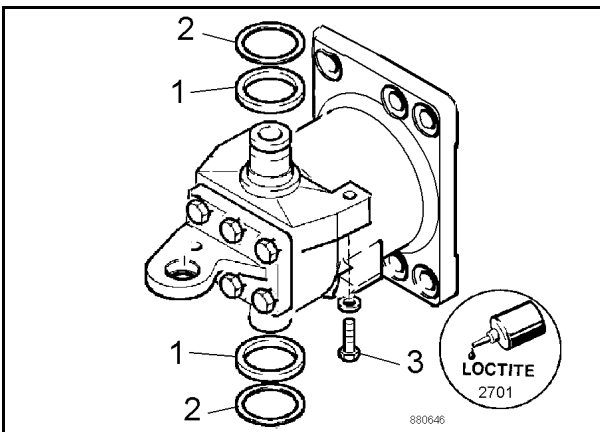


Fig. 14

20. Slide the sealing rings 1 (Fig. 14) and the supporting discs (2) over both bearing journals.
21. Install the stop screws (3) with Loctite 2701 .

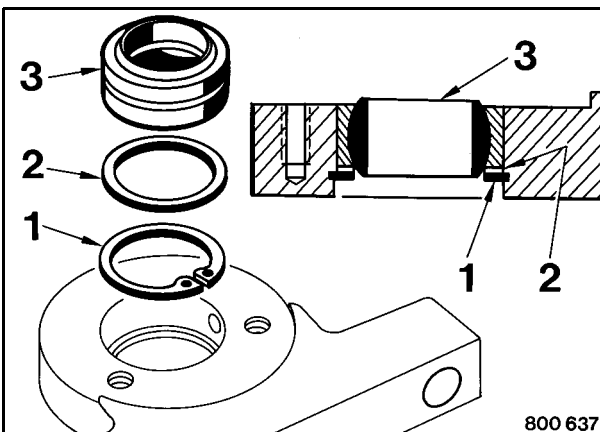


Fig. 15

22. Assemble circlips 1 (Fig. 15) and supporting discs (2) in both bearing blocks.

⚠ Caution

The drift punch should only contact the outer race of the rocker bearing, as otherwise the bearing will be destroyed!

23. Knock the new rocker bearings (3) until they bottom.

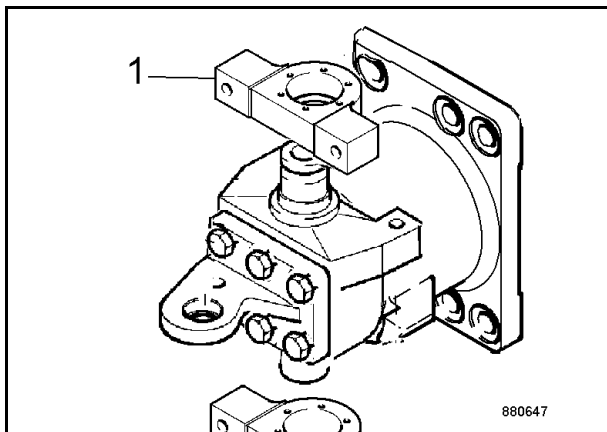


Fig. 16

⚠ Caution

Only knock on the outer race of the rocker bearing!

24. Knock both bearing blocks 1 (Fig. 16) onto the bearing journals.

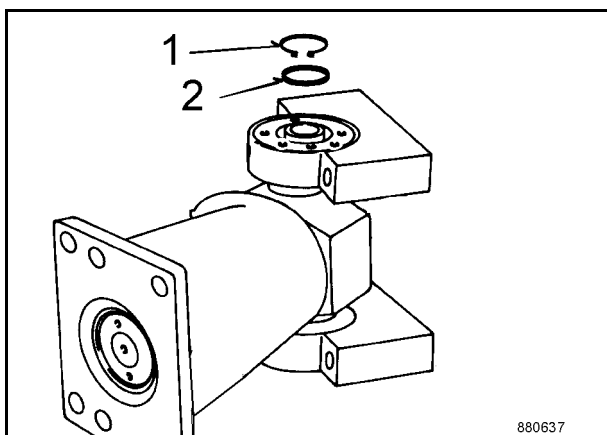


Fig. 17

25. Assemble circlip 1 (Fig. 17) and supporting discs (2).

i Note

Only one side is fitted with a circlip!

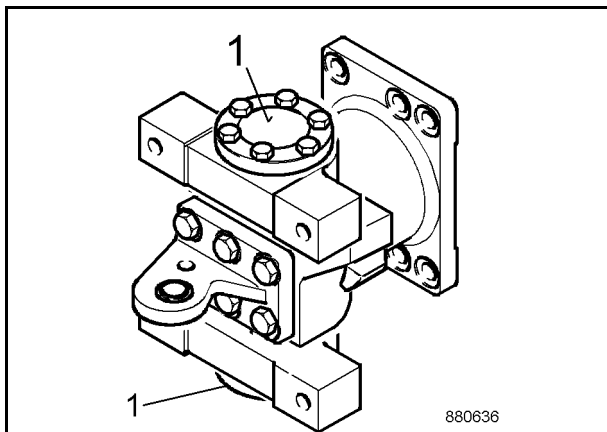


Fig. 18

26. Fasten the bearing covers 1 (Fig. 18) on both sides with screws.

10 Suppliers documentation

10.1 Steering valve



Hydrostatic
Steering Unit Type
OSPB, OSPC and
OSPF

Service Manual

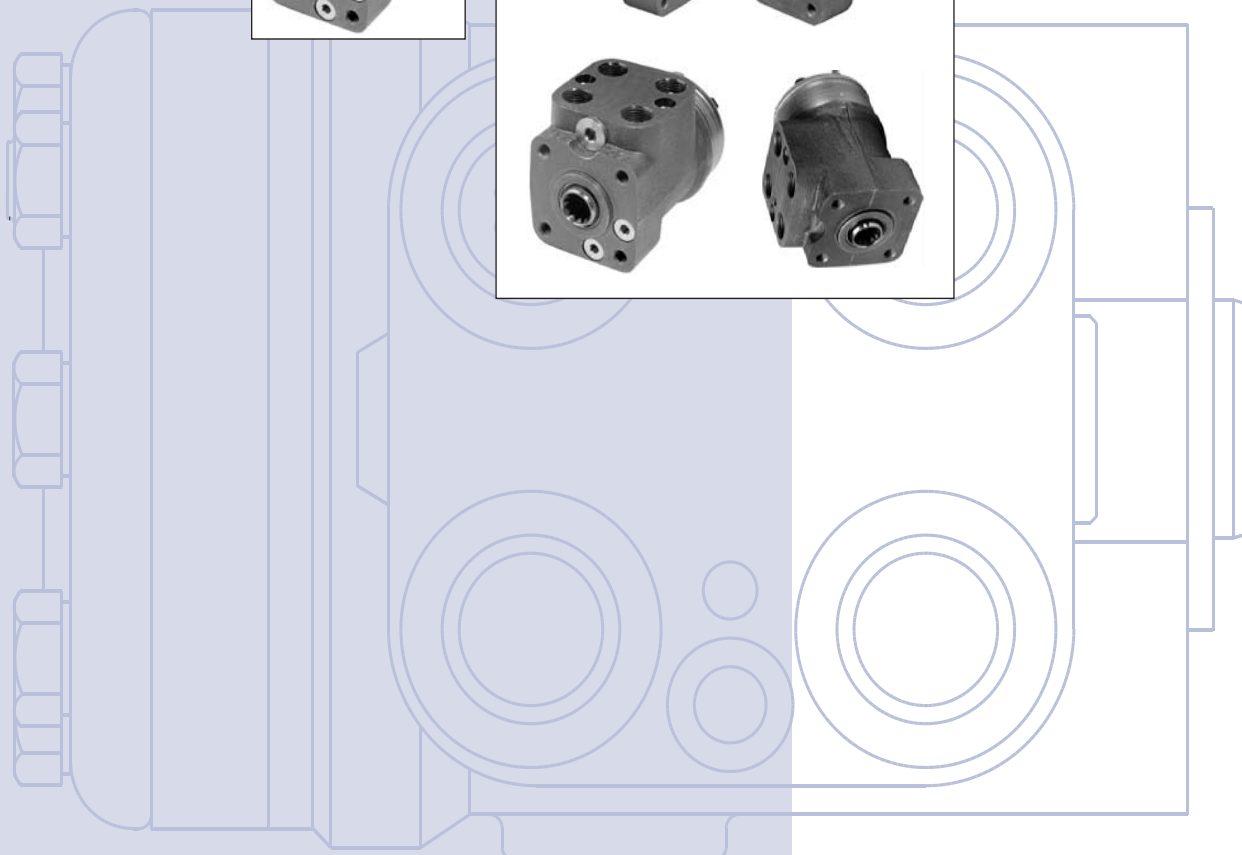
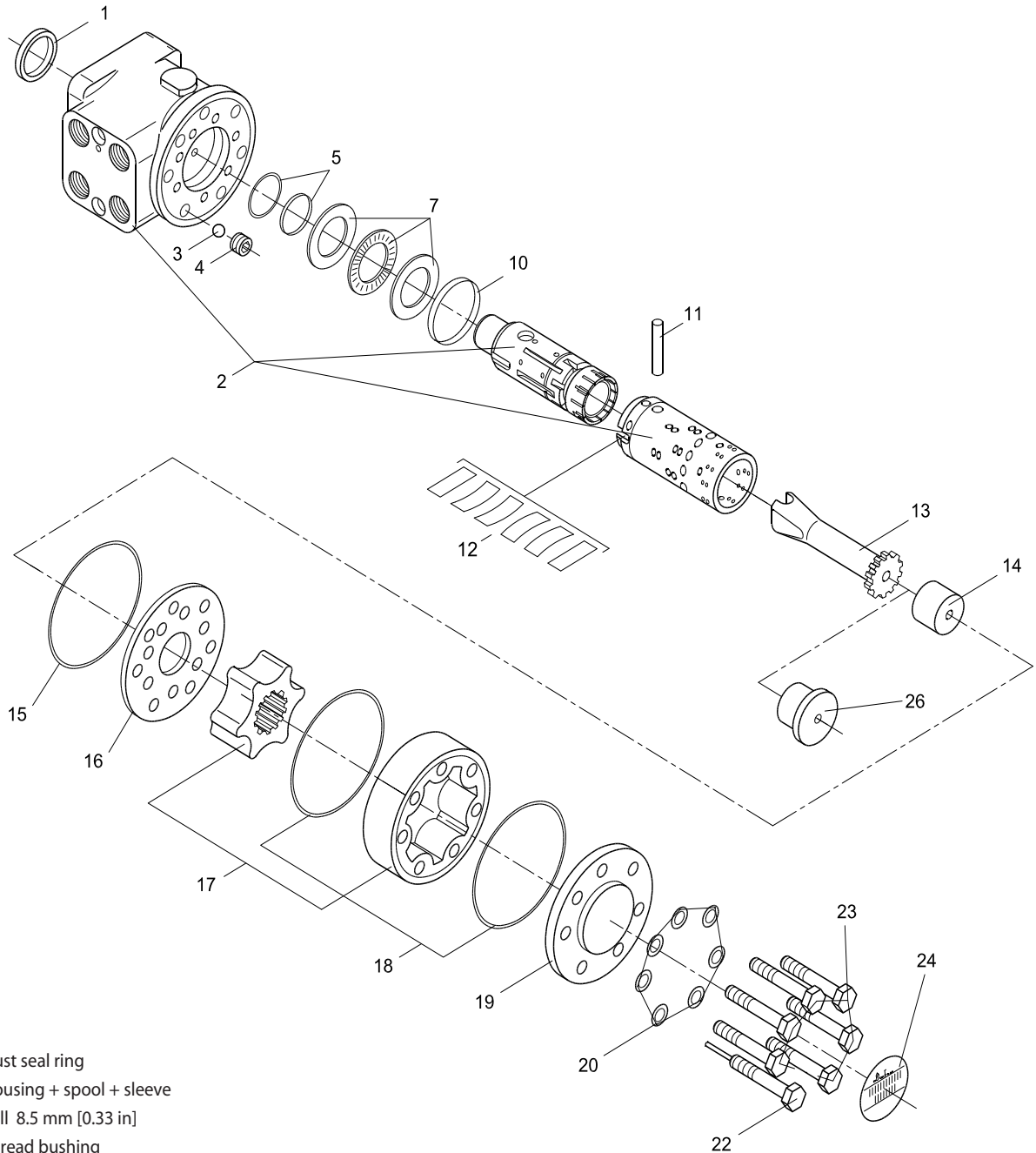


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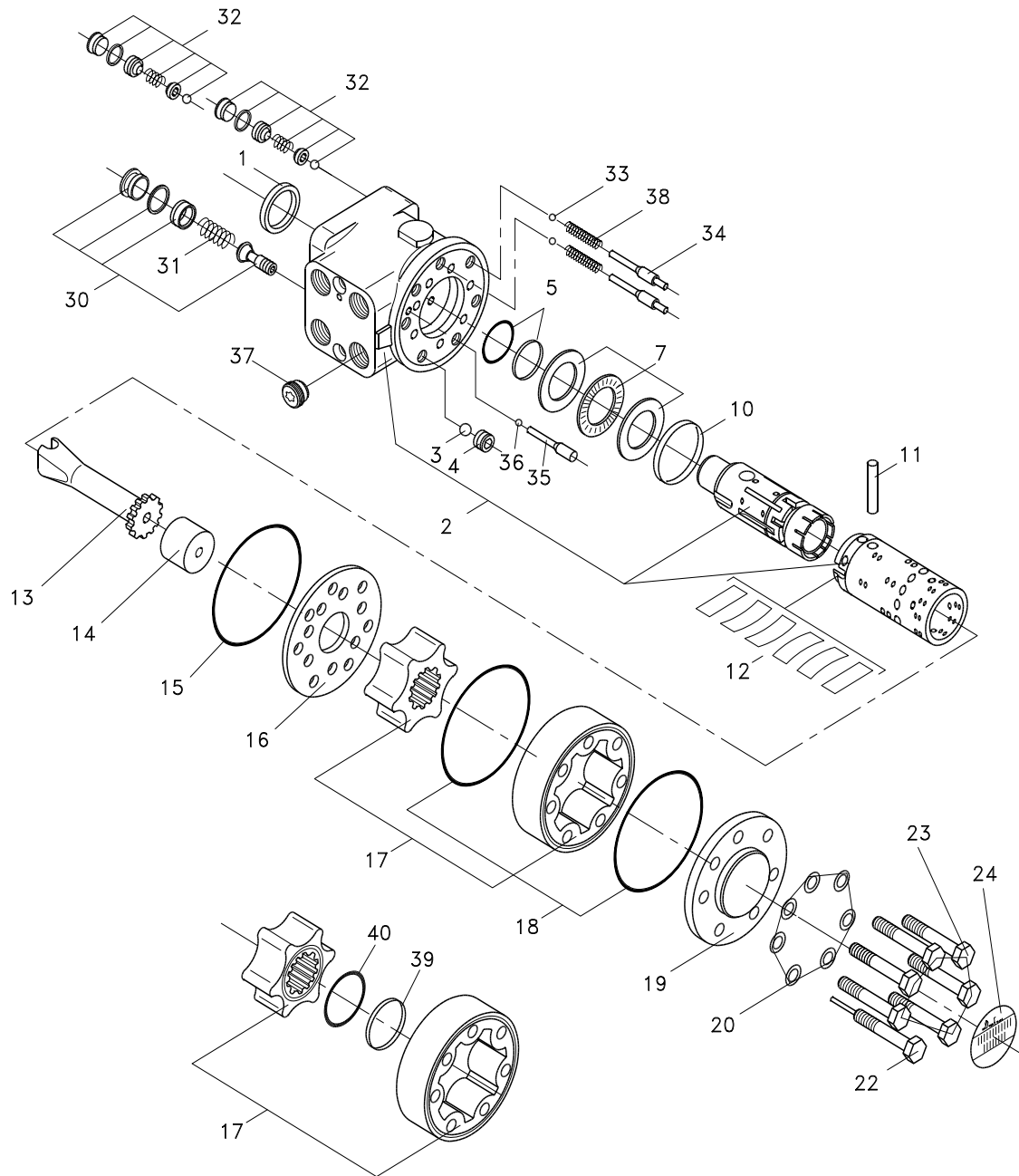
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Front cover illustrations: F300617, F300618, F300619
Drawing: 150-577 fa



- | | |
|--|---|
| 1 Dust seal ring | |
| 2 Housing + spool + sleeve | |
| 3 Ball 8.5 mm [0.33 in] | |
| 4 Thread bushing | |
| 5 O-ring with kin-ring or Roto Glyd | |
| 7 Bearing assembly | 16 Distributor plate |
| 10 Ring for springs | 17 Gearwheel |
| 11 Cross pin 6 • 41 mm [0.24 • 1.61 in] | 18 O-ring 75.92 • 1,78 mm [2.99 • 0.07 in] |
| 12 Neutral position springs | 19 End cover |
| 13 Cardan shaft | 20 Washer 8.2 • 11,9 • 1.0 mm [0.32 • 0.47 • 0.04 in] |
| 14 Spacer | 22 Special screw |
| 15 O-ring 80,5 • 1,5 mm [3.17 • 0.06 in] | 23 Screw |
| | 24 Name label |
| | 26 Spacer |

150-385.10

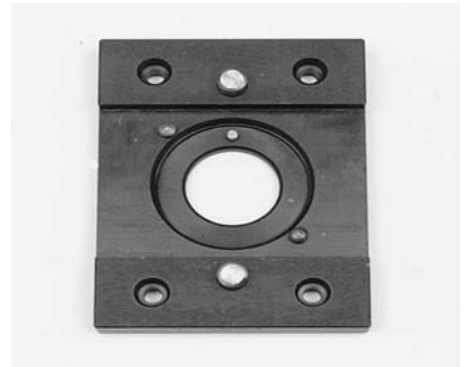


150-454.10

- | | | | | | |
|----|--|----|-------------------|----|------------------------|
| 1 | Dust seal ring | 14 | Spacer | 24 | Name plate |
| 2 | Housing, spool and sleeve.
Check valve and the seats for relief and shock valves are locktited. | 13 | Cardan shaft | 30 | Complete relief valve |
| 3 | Ball 8.5 mm [0.33 in] | 12 | Set of springs | 31 | Spring wire |
| 4 | Thread bushing | 15 | O-ring | 32 | Complete shock valve |
| 5 | O-ring used with kin-ring (item 6) | 16 | Distributor plate | 33 | Ball $\frac{3}{16}$ in |
| 6 | Kin-ring | 17 | Gearwheel set | 38 | Spring |
| 7 | Bearing assembly | 18 | O-ring | 34 | Rolled pin |
| 10 | Ring | 19 | End cover | 36 | Bushing |
| 11 | Cross pin | 20 | Washer | 35 | Ball |
| | | 22 | Special screw | 39 | Kin ring |
| | | 23 | Screw | 40 | O-ring |
| | | | | | |

Tools

Holding tool
Code number: SJ 150-9000-2



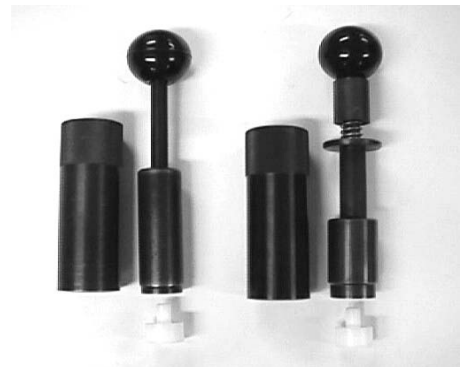
F300937

Guide ring
Code number: SJ 150-9000-16



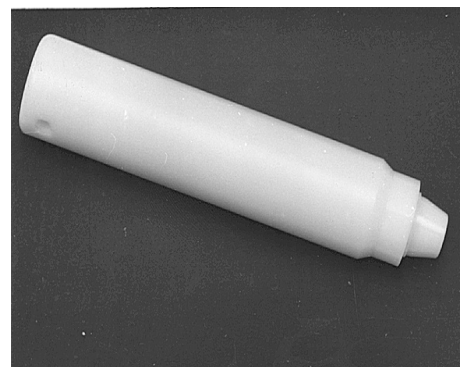
F301015

Assembly tool for O-ring and kin-ring /
Roto Glyd
Code number: SJ 150-9000-11
Code number: SJ 150N4014-1



F300940

Assembly tool for lip seal
Code number: SJ 150-9000-17



F300944

Tools

Assembly tool for cardan shaft.
Code number: SJ 150-9000-3



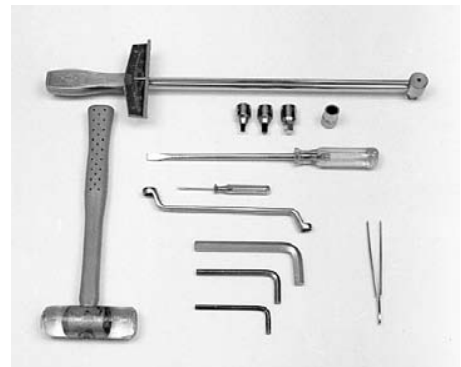
F300945

Assembly tool for dust seal.
Code number: SJ 150-9000-22



F300946

Torque wrench 0 - 70 N·m.
13 mm socket spanner.
6.8 and 12 mm sockets.
12 mm screwdriver.
2 mm [0.08 in] screwdriver.
13 mm ring spanner.
6.8 and 12 mm socket spanners.
Plastic hammer.
Tweezers.



F300939

The tools are not available from Sauer-Danfoss

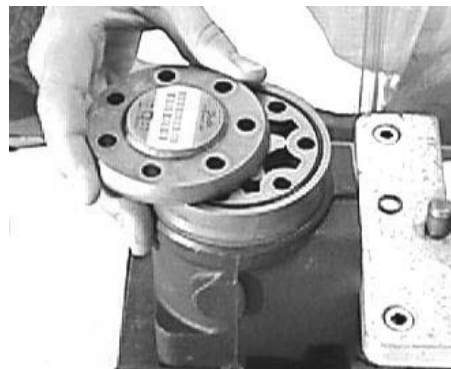
Dismantling

Dismantle steering column from steering unit and place the steering unit in the holding tool.
Screw out the screws in the end cover (6-off plus one special screw).



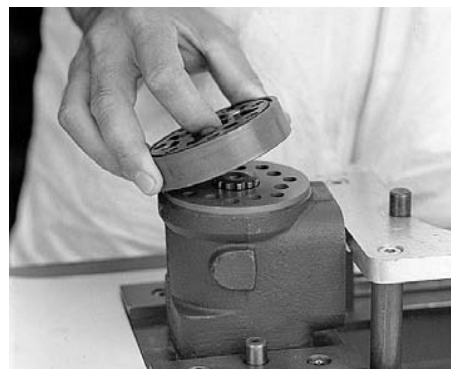
F300947

Remove the end cover, sideways.



F300948

Lift the gearwheel set (with spacer if fitted) off the unit. Take out the two O-rings.



F300949

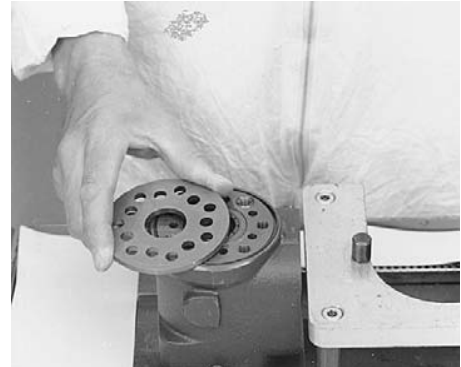
Remove the cardan shaft



F300950

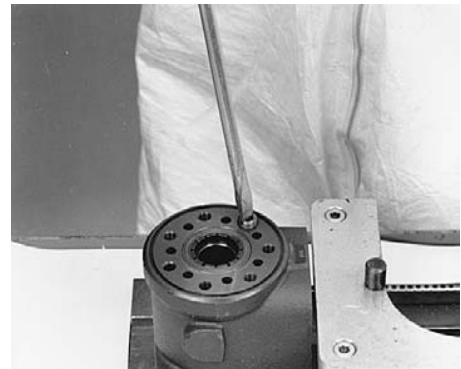
Dismantling

Remove distributor plate.



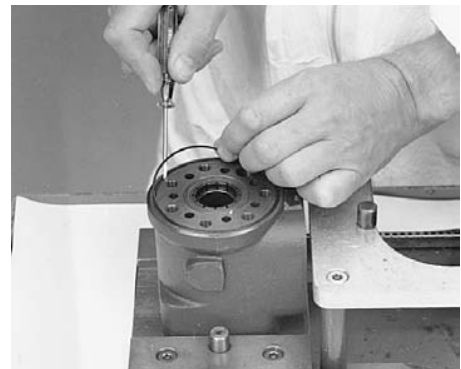
F300951

Screw out the threaded bush over the check valve.



F300953

Remove O-ring

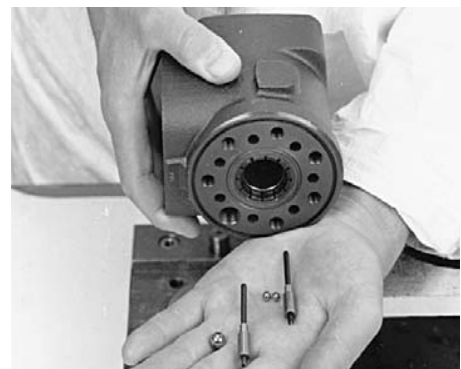


F300952

OSPB, OSPB LS, OSPBX LS:
Shake out the check valve ball (ø8 mm)

OSPC LS, OSPC LSR:
Shake out the check valve ball and
suction valve pins and balls.

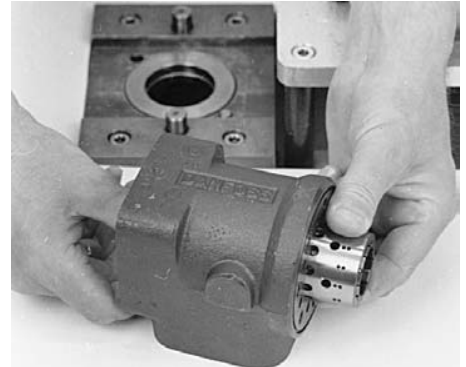
On some pins in the OSPC there are
two springs (see page 4, pos. 38).
Replace this pins prior to the reassembly!



F300954

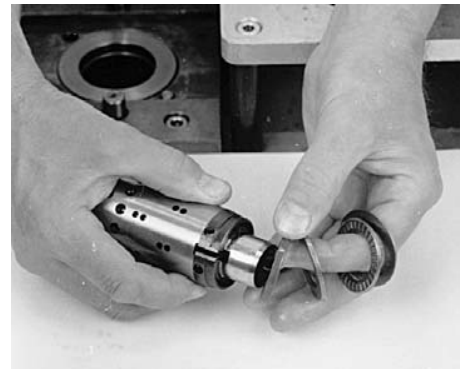
Dismantling

Take care to keep the cross pin in the sleeve and spool horizontal. The pin can be seen through the open end of the spool. Press the spool inwards and the sleeve, ring, bearing races and needle bearing will be pushed out of the housing together.



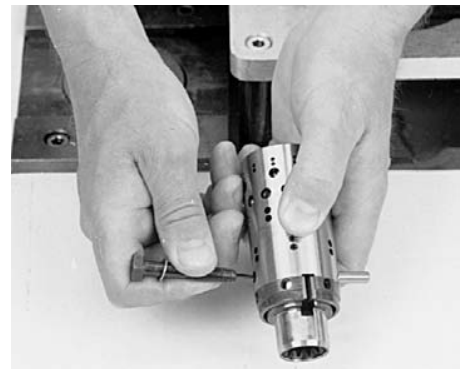
F300955

Take ring, bearing races and needle bearing from sleeve and spool. The outer (thin) bearing race can sometimes "stick" in the housing, therefore check that it has come out.



F300956

Press out the cross pin. Use the special screw from the end cover. Note next point/paragraph!



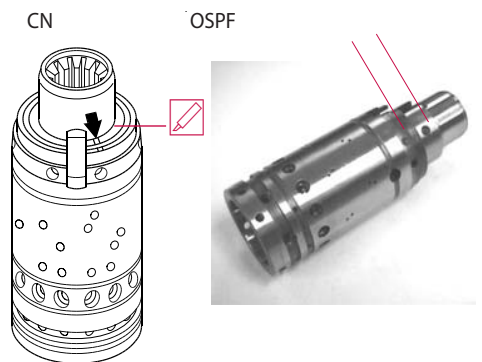
F300957

OSPB CN and OSPC CN

A small mark has been made with a pumice stone on both spool and sleeve close to one of the slots for the neutral position springs (see drawing).

If the mark is not visible, remember to leave a mark of your own on sleeve and spool before the neutral position springs are dismantled.

For OSPF both marks should be placed opposite each other!



F301014

Dismantling

Carefully press the spool out of the sleeve.



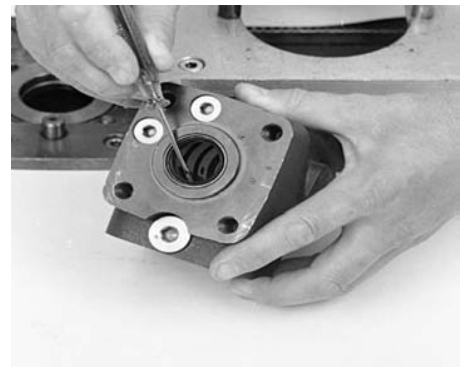
F300958

Press the neutral position springs out of their slots in the spool.




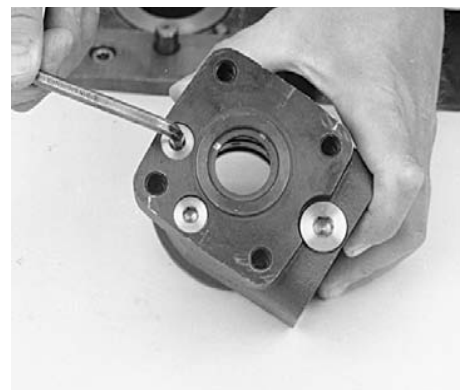
F300959

Remove dust seal and O-ring / Kin-ring / Roto Glyd.



F300960

Remove plugs from shock valves using a 6 mm  hexagon socket spanner




F300961

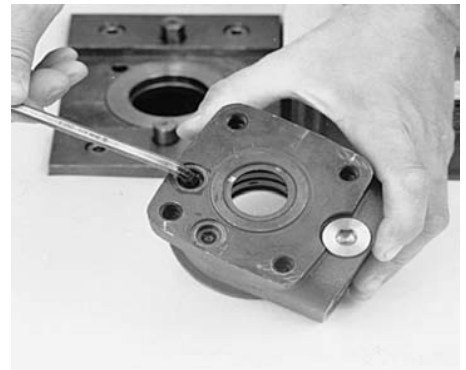
Dismantling

Remove seal washers (2-off).



F300962

Unscrew the setting screws using a 6 mm  hexagon socket spanner.



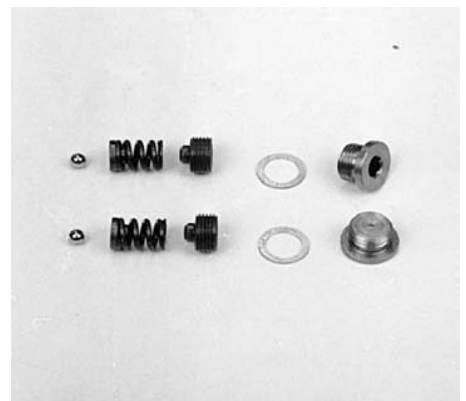
F300963

Shake out the two springs and two valve balls into your hand. The valve seats are bonded into the housing and cannot be removed.



F300964


The shock valves are now dismantled.

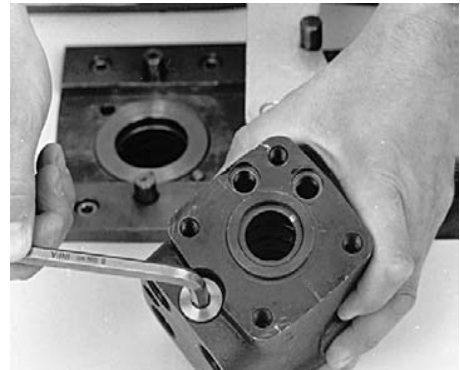


F300965


Dismantling the Pressure Relief Valve for OSPC

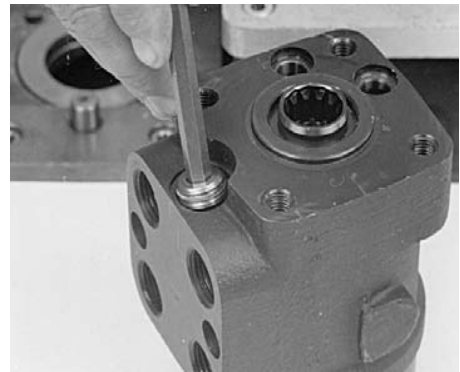
Dismantling

Screw out the plug using and 8 mm  hexagon socket spanner. Remove seal washers.



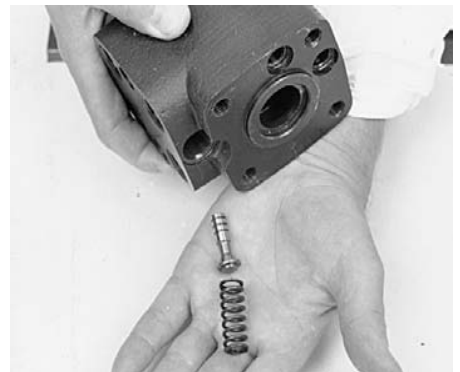
F300966

Unscrew the setting screw using an 8 mm  hexagon socket spanner.



F300968

Shake out spring and piston. The valve seat is bonded into the housing and cannot be removed.



F300942


The pressure relief valve is now dismantled.

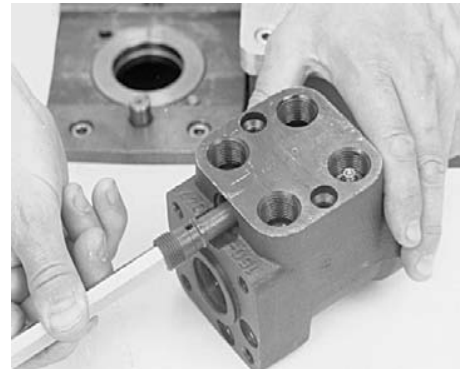


F300967

Dismantling the Pressure Relief Valve (Cartridge)

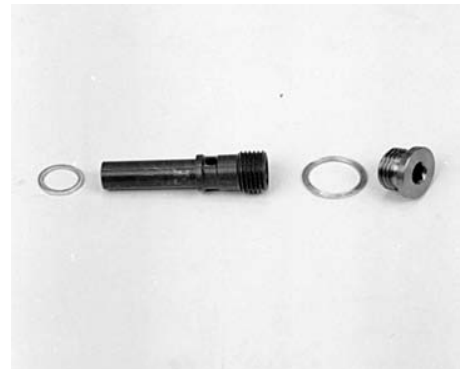
Dismantling the Pressure Relief Valve (Cartridge) for OSPC LS / OSPC LSR

Screw out the pressure relief valve using an 8 mm  hexagon socket spanner. Remove the seal ring. If the valve is defective it must be replaced.



F300969

The pressure relief valve is now dismantled.



F300970

The steering unit OSPB is now completely dismantled.



F300973

The steering unit OSPB LS is now completely dismantled.



F300974

Dismantling the Pressure Relief Valve (Cartridge)

Dismantling the Pressure Relief Valve (Cartridge) for OSPC LS / OSPC LSR

The steering unit OSPC is now completely dismantled.
Replace this pins prior to the reassembly!



F300971

The steering unit OSPC LS is now completely dismantled.
Replace this pins prior to the reassembly!



F300972

Cleaning

Clean all parts carefully in Shellsol K or the like.

Lubrication

Before assembly, lubricate all parts with hydraulic oil.

Inspection and replacement

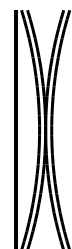
Replace all seals and washers.
Check all parts carefully and make any replacements necessary.

Assembling

Place the two flat neutral position springs in the slot.
Place the curved springs between the flat ones and press them into place.



F300975



150-386.10

A150-386

Line up the spring set.



F300976

Guide the spool into the sleeve. Make sure that spool and sleeve for OSPB LS, OSPBX LS, OSPC LS, OSPC LSR and OSPF are placed correctly in relation to each other (see page 10).



F300977

Assembling

Assemble spool and sleeve.

OSPB LS, OSPBX LS, OSPC LS, OSPC LSR and OSPF

When assembling spool and sleeve only one of two possible ways of positioning the spring slots is correct. There are three slots in the spool and three holes in the sleeve in the end of the spool/sleeve opposite to the end with spring slots. Place the slots and holes opposite each other so that parts of the holes in the sleeve are visible through the slots in the spool.

OSPB CN and OSPC CN

Assemble the spool/sleeve and make sure the marks on spool and sleeve are opposite each other (see drawing page 10).

Press the springs together and push the neutral position springs into place in the sleeve.

Line up the springs and centre them.



F300978



F301016



F300979



F300980

Assembling

Guide the ring down over the sleeve.

The ring should be able to move
- free of springs.



F300981

Fit the cross pin into the spool/sleeve.



F300982

Fit bearing races and needle bearings
as shown on the drawing next page.

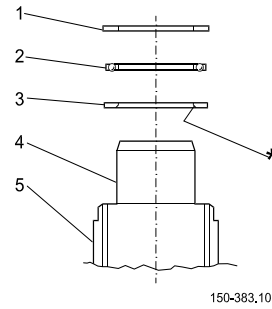


F300983

**Assembling for
 Standard Bearing**

Assembly pattern for standard bearing

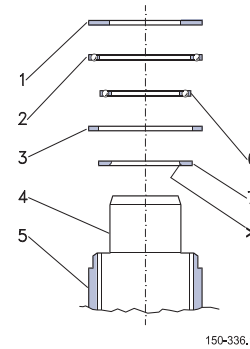
- 1 Outer bearing race
- 2 Needlebearing
- 3 Inner bearing race
- 4 Spool
- 5 Sleeve



A150-383

Assembly pattern for double bearing

- 1 Washer for axial bearing
- 2 Outer needlebearing
- 3 Outer bearing race
- 4 Spool
- 5 Sleeve
- 6 Inner needlebearing
- 7 Inner bearing race



A150-336

The inside chamfer on the inner bearing race must face the inner spool.

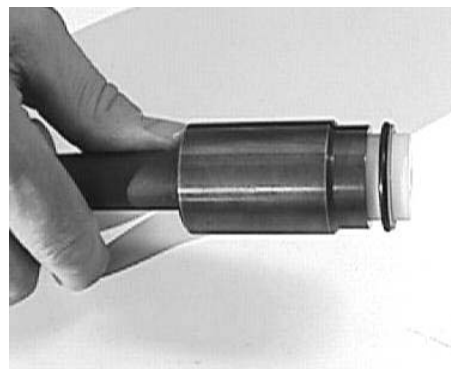
**Installation
Instructions for
O-ring / Kin-ring
Roto glyd**

Turn the steering unit until the bore is horizontal. Guide the outer part of the assembly tool into the bore for the spool/sleeve.



F300984

Grease o-ring and king-ring/roto Glyd with hydraulic oil and place them on the tool.



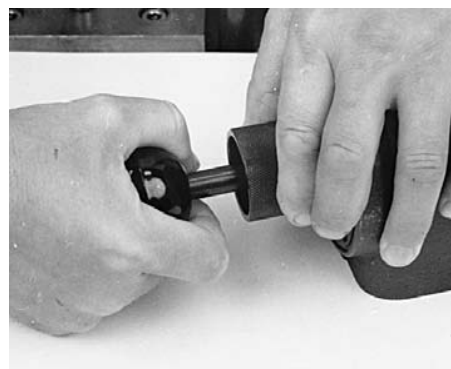
F300985

Hold the outer part of the assembly tool in the bottom of the steering unit housing and guide the inner part of the tool right to the bottom.



F300986

Press and turn the o-ring/kin-ring into position in the housing.

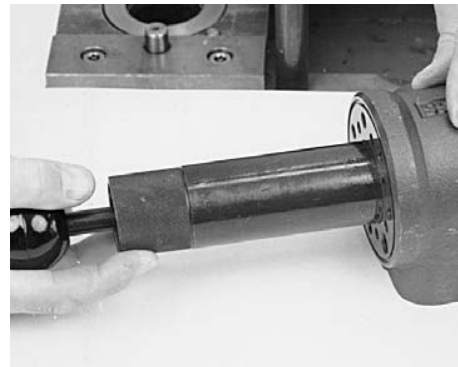


F300987

Installation Instruction for O-ring / Kin-ring / Roto Glyd

**Installation
Instructions for
O-ring / Kin-ring /
Roto Glyd**

Draw the inner and outer parts of the assembly tool out of the steering unit bore, leaving the guide from the inner part in the bore.



F300988

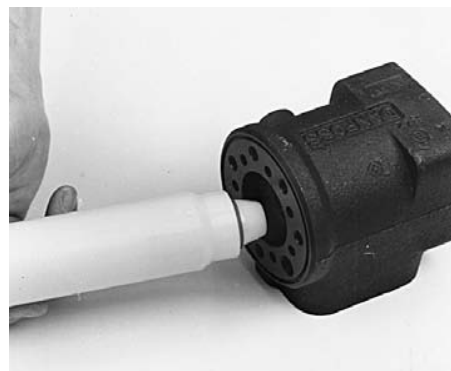
**Installation
Instructions for
Lip Seal**

Lubricate the lip seal with hydraulic oil and place it on the assembly tool.



F300989

Guide the assembly tool right to the bottom.



F300990

Press and turn the lip seal into place in the housing.



F300991

With a light turning movement,
guide the spool and sleeve into the
bore.

Fit the spool set holding the cross pin
horizontal.



F300992

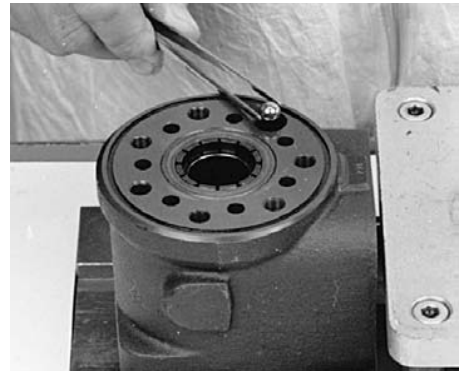
**Installation
Instructions for
Lip Seal**

The spool set will push out the assembly tool guide. The o-ring and kin-ring/roto Glyd are now in position.



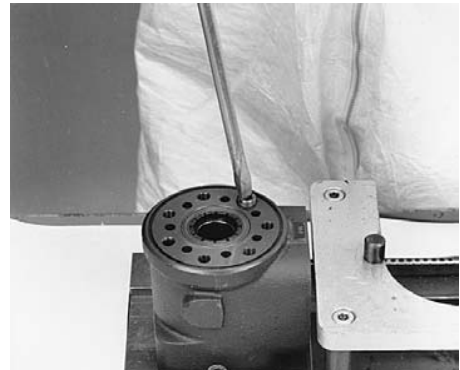
F300993

Turn the steering unit until the bore is vertical again. Put the check valve ball into the hole indicated by the arrow.



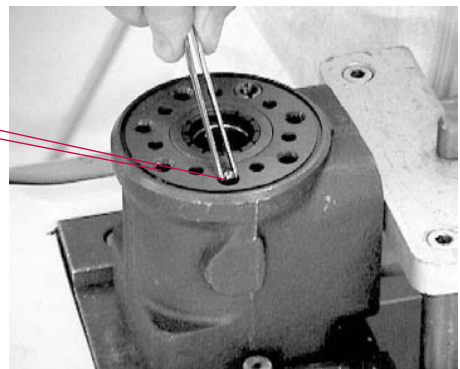
F300994

Screw the threaded bush lightly into the check valve bore. The top of the bush must lie just below the surface of the housing.



F300953

Place a ball in the two holes indicated by the arrows



F300995

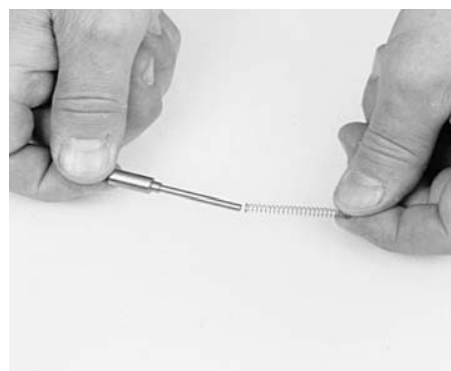
**Installation
Instructions for
Lip Seal**

Place a new pin in the same two holes.



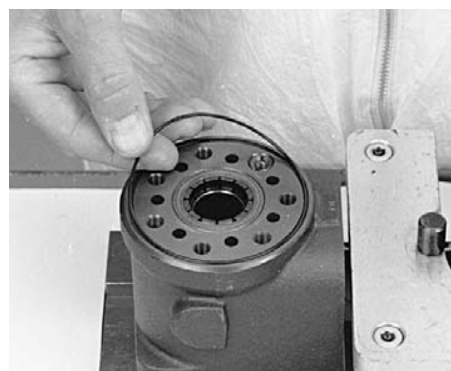
F300996

In some cases a spring has to be fitted (see page 4 pos.38) on the pin before it is placed in the housing.



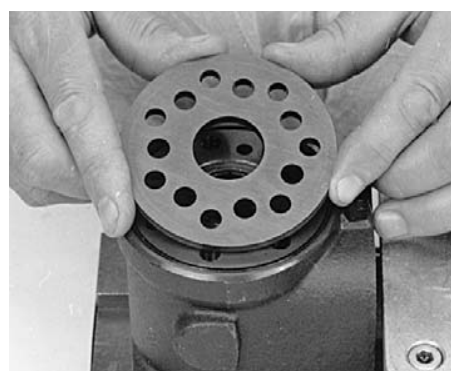
F300997

Grease the o-ring with mineral oil approx. viscosity 500 mm²/s [SUS] at 20°C [68 °F].



F300998

Place the distributor plate so that the channel holes match the holes in the housing.



F300999

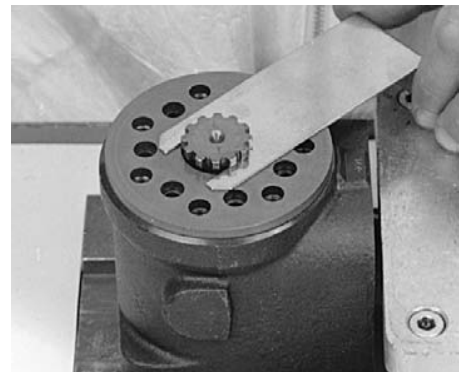
Installation Instructions for Lip Seal

Guide the cardan shaft down into the bore so that the slot is parallel with the connection flange.



F301000

Place the cardan shaft as shown - so that it is held in position by the mounting fork.



F301001

Grease the two o-rings with mineral oil approx. viscosity 500 mm²/s [SUS] at 20°C [°F] and place them in the two grooves in the gear rim. Fit the gearwheel and rim on the cardan shaft.



F300949

⚠ Caution

Fit the gearwheel (rotor) and cardan shaft so that a tooth base in the rotor is positioned in relation to the shaft slot as shown. Turn the gear rim so that the seven trough holes match the holes in the housing.



F301002

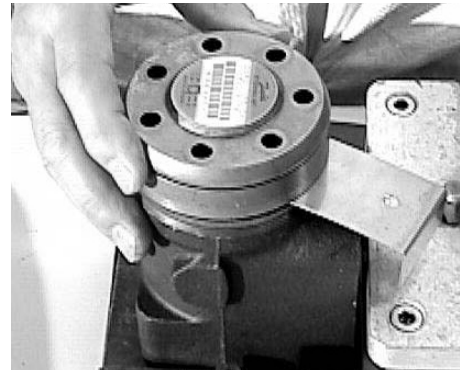
**Installation
Instructions for
Lip Seal**

Fit the spacer, if any.



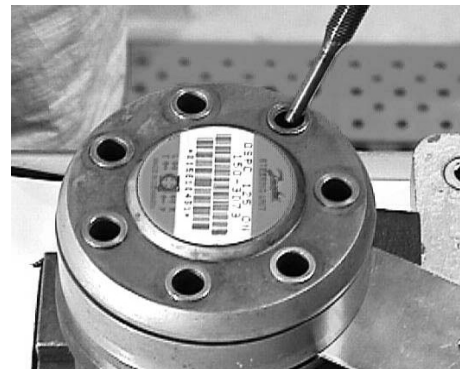
F301003

Place the end cover in position.




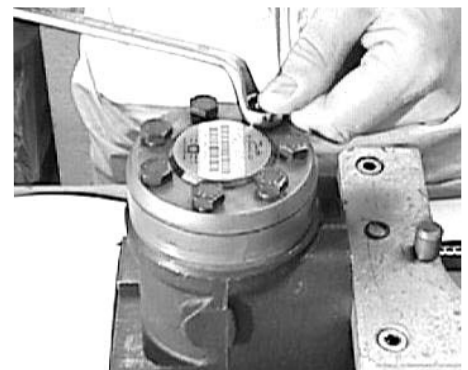
F301004

Fit the special screw with washer and place it in the hole shown.



F301005

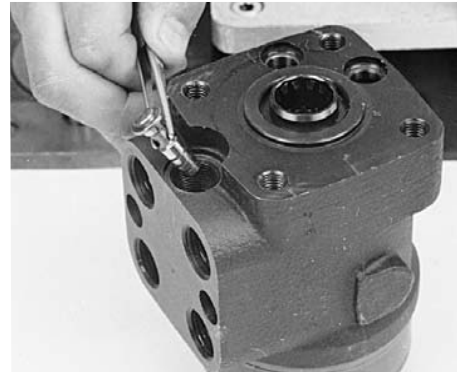
Fit the six screws with washers and insert them.
Cross-tighten all the screws and the rolled pin with a torque of  30 +/- 6 N·m [265.5 +/- 53 lbf·in].
The OSPB, OSPB LS and OSPBX LS can now be function tested.



F300947

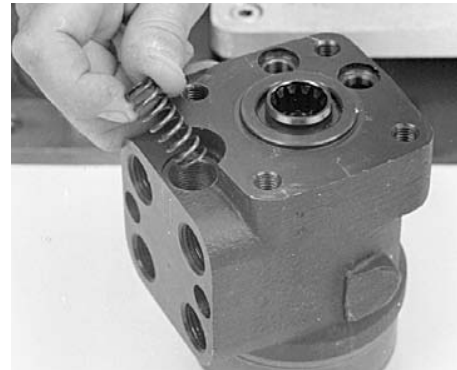
Assembly of the Pressure Relief Valve for OSPC

Fit the piston.



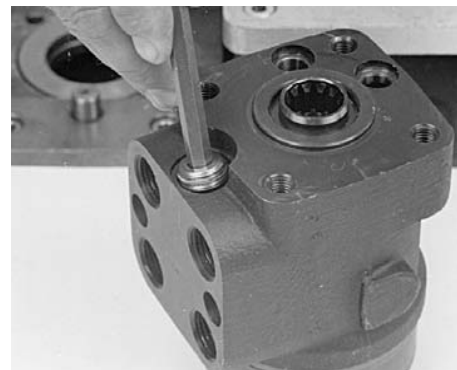
F300938

Fit the spring





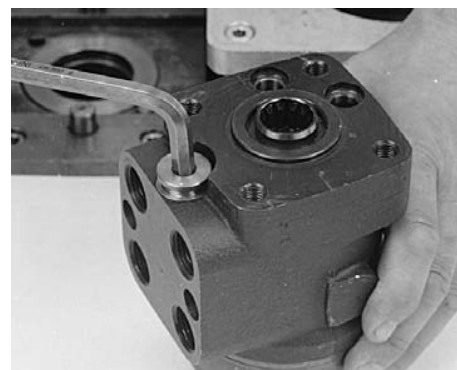
F301013

Screw in the setting screw with an 8 mm hexagon socket spanner. Make the pressure setting on a panel or the vehicle.



F300968

Screw plug with dust seal into the housing using an 8 mm  hexagon socket spanner.
Tightening torque:  50 +/-10 N·m.
[443 +/- 8.85 lbf·in]

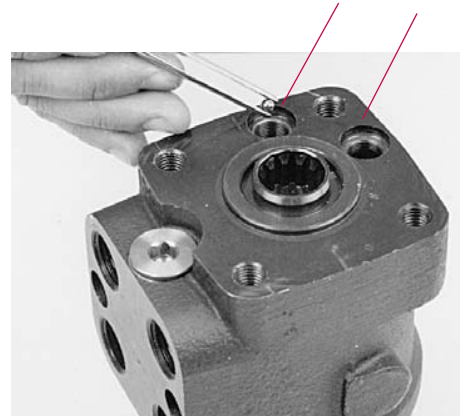


F300941

Assembly of the Shock Valves for OSPC/OSPC LS/OSPC LSR

Assembly of the Shock
Valves for OSPC/OSPC LS/
OSPC LSR

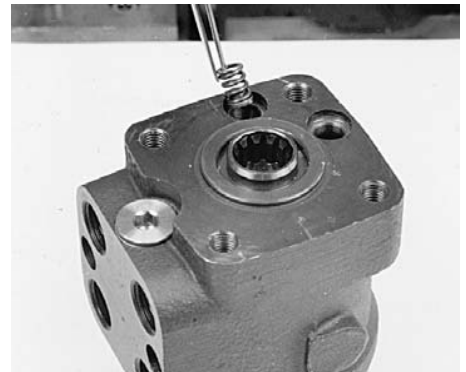
Put a ball in the two holes indicated
by the arrows.




F301006

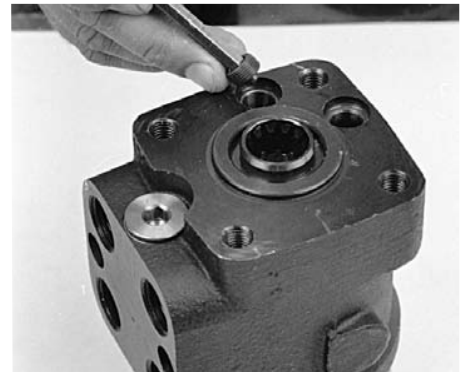
Place springs and valve cones over
the two balls.

The blue spring applies to setting
range 90-180 bar [1305-2610 psi]. The
untreated spring applies to setting
range 170-260 bar [2465-3770 psi]





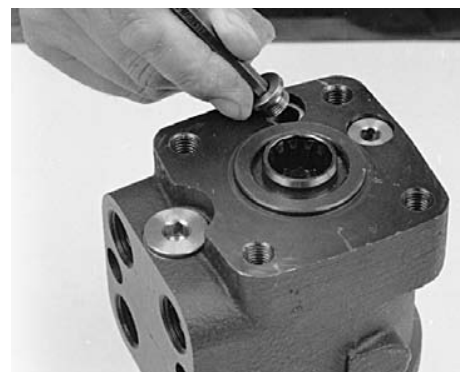
F301007

Screw in the two setting screws using
a 6 mm  hexagon socket spanner.
Make the pressure
setting on a panel or the vehicle.



F301008

Screw plug with seal ring into the
two shock valves and tighten them
with a torque of: 
 $30 + 10 \text{ N}\cdot\text{m}$ [265.5 + 88.5 lbf-in] using
a 6 mm  hexagon socket spanner.
Steering unit type OSPC, OSPC LS or
OSPC LSR is now assembled.

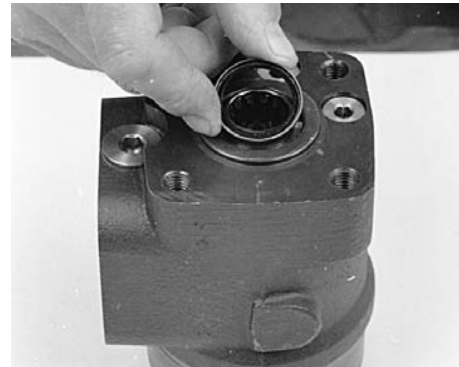


F301009

Assambly of the Shock Valves for OSPC/OSPC LS/OSPC LSR

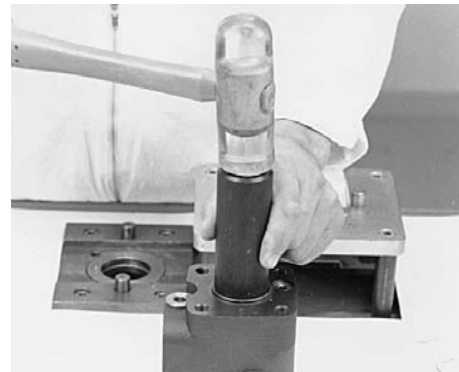
Assambly of the Shock Valves for OSPC/OSPC LS/OSPC LSR

Place the dust seal ring in the housing. With the OSPC, OSPC LS and OSPC LSR the dust seal ring must be placed only after the pressure relief valve and shock valves have been fitted.



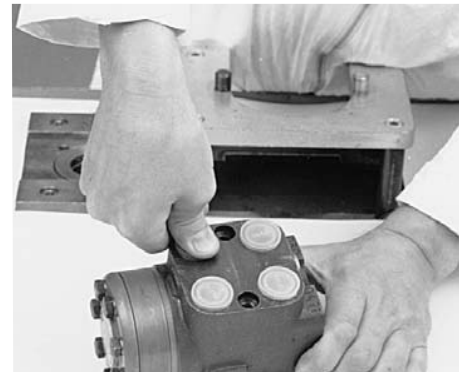
F301010

Fit the dust seal ring in the housing using special tool SJ 150-9000-22 (see page 5) and a plastic hammer.



F301011

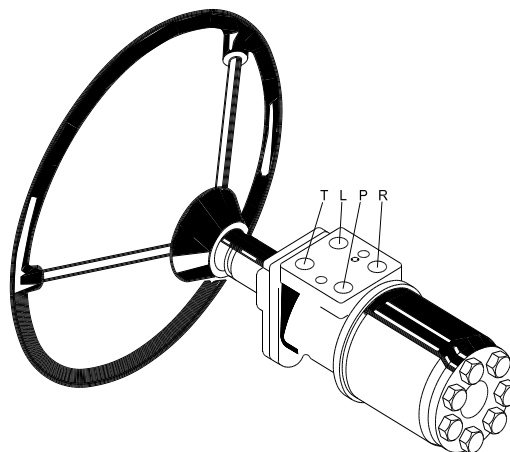
Press the plastic plugs into the connection ports.
Do not use a hammer!



F301012

Max. Tightening Torque and Hydraulic Connections

- T: Tank
- L: Left port
- P: Pump
- R: Right port



150-382.10

Screwed connection	Max. tightening torque N·m [lbf·in]			
	With cutting edge	With cooper washer	With aluminium washer	With O-ring
G 1/4	35 [309]	35 [309]	35 [309]	-
G 3/8	70 [619]	45 [398]	50 [442]	-
G 1/2	100 [885]	55 [486]	80 [708]	-
7/16-20 UNF	-	-	-	20 [177]
3/4-16 UNF	-	-	-	60 [531]
M 12 • 1.5	30 [265]	20 [177]	30 [265]	25 [221]
M18 • 1.5	80 [708]	55 [486]	70 [619]	50 [442]
M22 • 1.5	100 [885]	65 [575]	80 [708]	60 [531]



Hydrostatic Steering unit OSPB, OSPC and OSPF
Service Manual
Notes



Hydrostatic Steering unit OSPB, OSPC and OSPF
Service Manual
Notes



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Hydrostatic Transmissions
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Proportional Valves
Directional Spool Valves
Cartridge Valves
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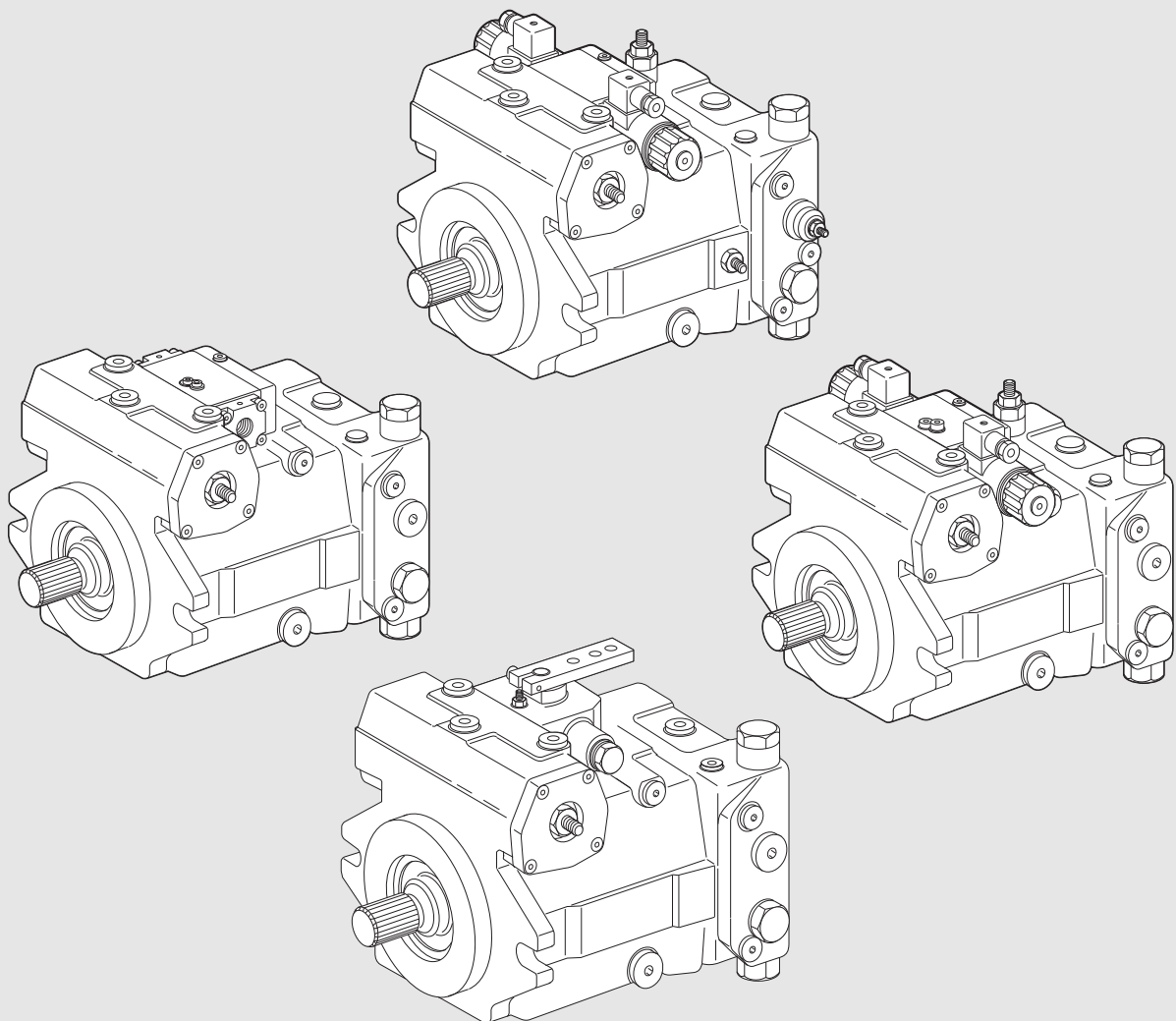
10.2 Travel pump

Verstellpumpe A10VG 28/63
Variable Pump A10VG 28/63
Baureihe/Series 10

RDE 92 750-01-R/03.03
ersetzt/replaces 10.02

R

Reparaturanleitung / Repair Instructions



Hinweis / Inhalt**Notice / Contents****HINWEIS**

Bezeichnungen, Beschreibungen und Darstellungen entsprechen dem Informationsstand zum Zeitpunkt der Drucklegung dieser Unterlage.

Änderungen können den Service am Produkt beeinflussen, Verpflichtungen entstehen uns daraus nicht.

Methoden und Vorrichtungen sind Empfehlungen, für deren Resultat wir keine Haftung übernehmen können.

BRUENINGHAUS HYDROMATIK- Baugruppen, mit Angabe der Fabrik-Nr. bestellt, sind die Basis guter Reparaturen.

Einstell- und Prüfarbeiten sind bei Betriebstemperatur auf dem Teststand vorzunehmen.

Schutz von Personen und Eigentum ist durch Vorkehrungen sicherzustellen.

Sachkenntnis, die Voraussetzung für jede Service-arbeit, vermitteln wir in unseren Schulungskursen.

NOTICE

Specifications, descriptions and illustrative material shown here in were as accurate as known at the time this publication was approved for printing.

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Optional equipment and accessories may add cost to the basic unit, and some options are available only in combination with certain models or other options.

For the available combinations refer to the relevant data sheet for the basic unit and the desired option.

Adjustment and tests have to be carried out on the test bench under operating temperatures.

Protection of personnel and property has to be guaranteed by appropriate measures.

Expert knowledge, the precondition of any service work, can be obtained in our training courses.

INHALT**Seite/
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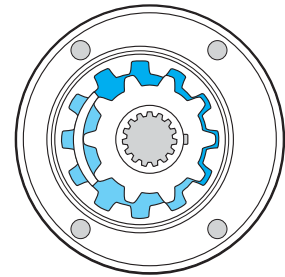
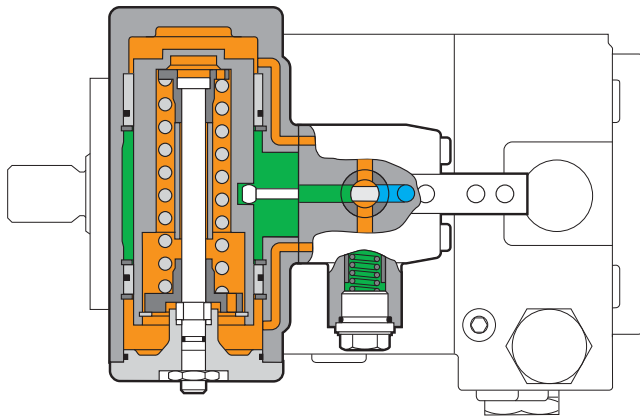
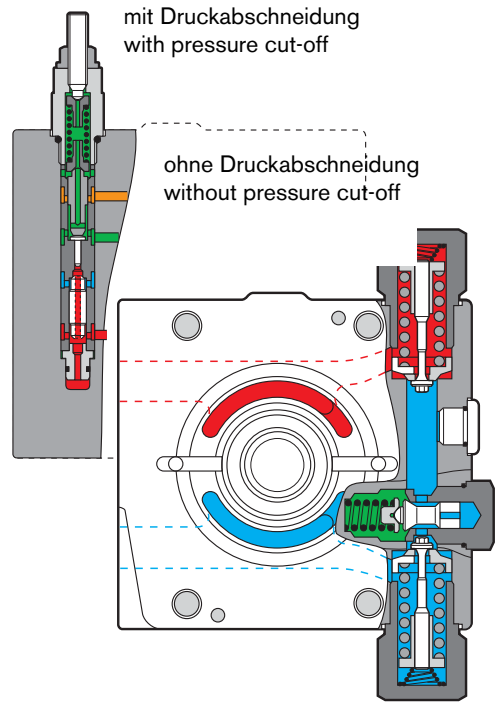
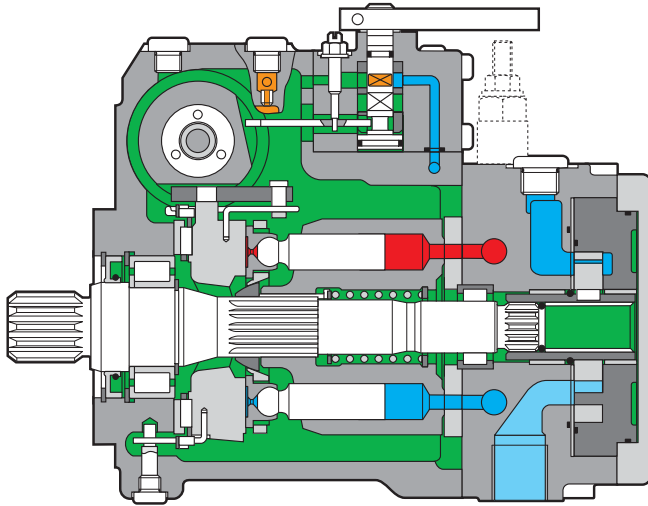
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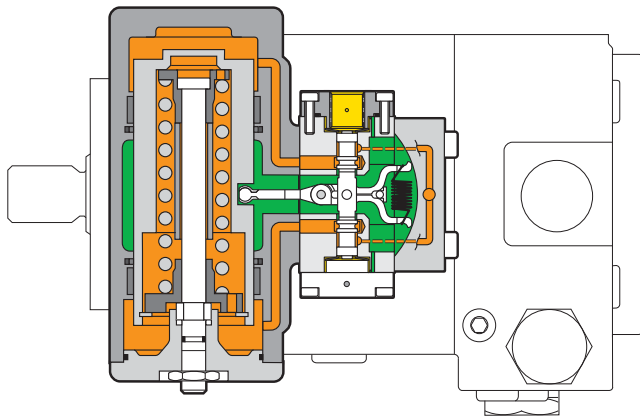
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Schnittbild
Sectional view

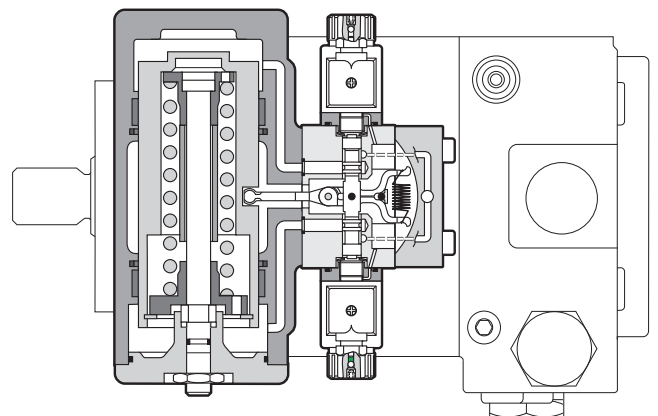
HW



HDD

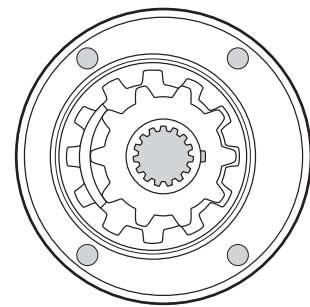
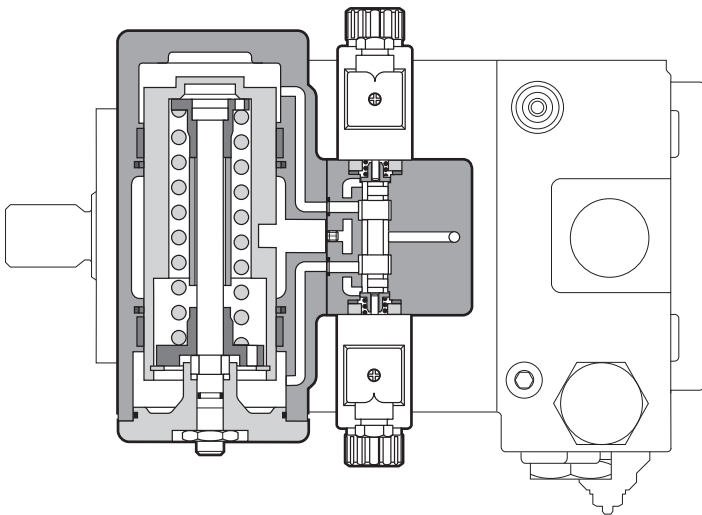
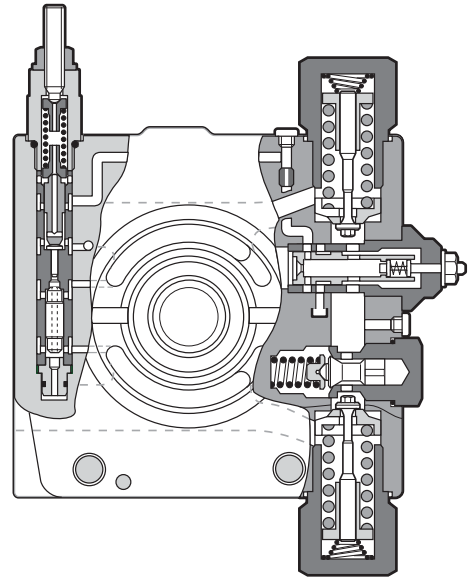
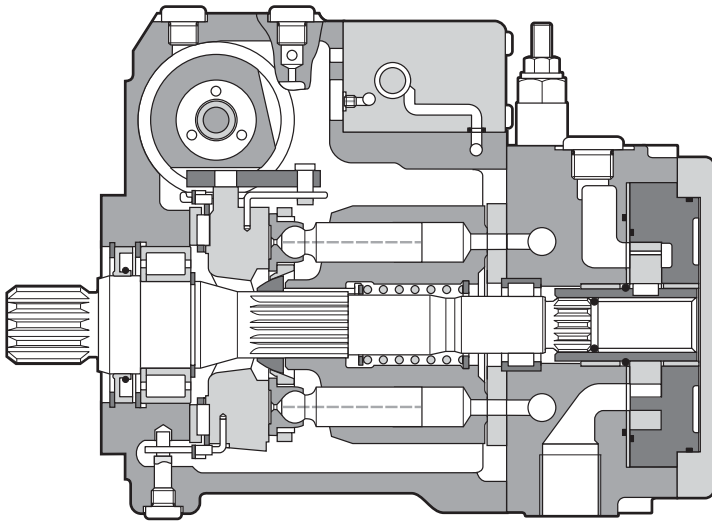


EPD



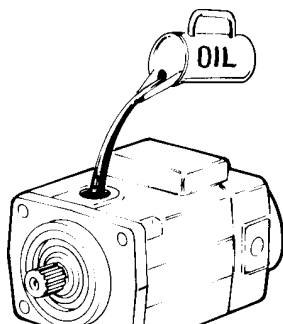
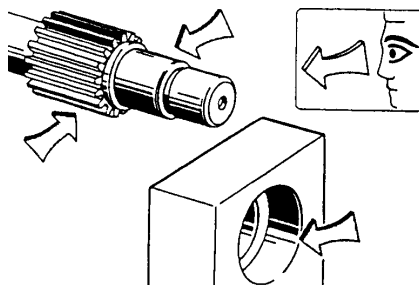
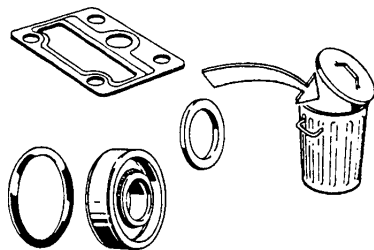
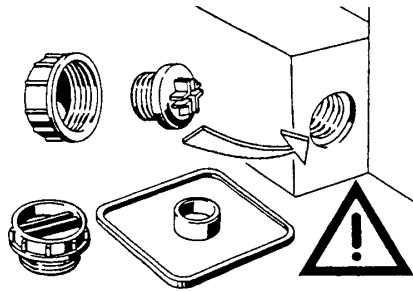
Schnittbild
Sectional view

DA



Allgemeine Reparaturhinweise

General repair instructions



Achtung!

Nachfolgende Hinweise bei allen Reparaturarbeiten an Hydraulikaggregaten beachten!

Attention!

Observe the following notices when carrying out repair work at hydraulic aggregates!

Alle Öffnungen der Hydraulikaggregate verschließen.

Close all ports of the hydraulic aggregates.

Alle Dichtungen erneuern.

Nur ORIGINAL BRUENINGHAUS HYDROMATIK-Ersatzteile verwenden.

Replace all seals.

Use only ORIGINAL BRUENINGHAUS HYDROMATIK spare parts.

Alle Dicht- und Gleitflächen auf Verschleiß prüfen.

Achtung: Nacharbeiten an Dichtflächen z.B. durch Schleifpapier kann die Oberfläche beschädigen.

Check all seal and sliding surfaces for wear.

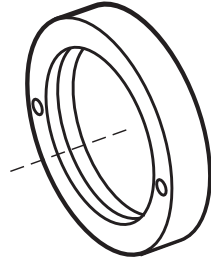
Attention: Rework of sealing area f. ex. with abrasive paper can damage surface.

Hydraulikaggregate vor Inbetriebnahme mit Betriebsmedium befüllen.

Fill the hydraulic units with the operating medium before commissioning.

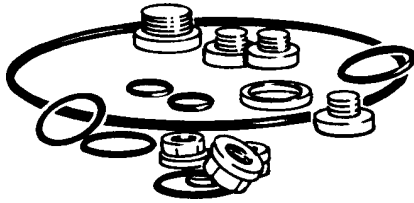
Dichtsätze und Baugruppen

Seal kits and sub-assemblies



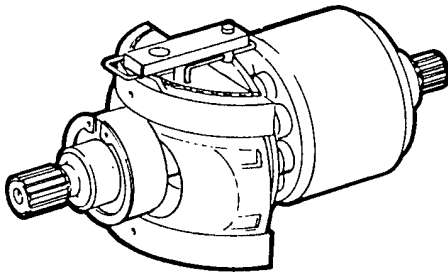
Dichtsatz für Triebwelle.

Seal kit for drive shaft.



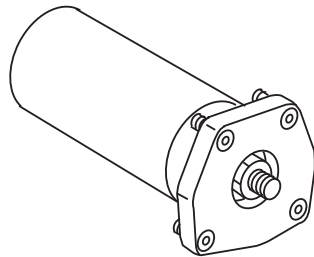
Äußerer Dichtsatz.

Peripheral seal kit.



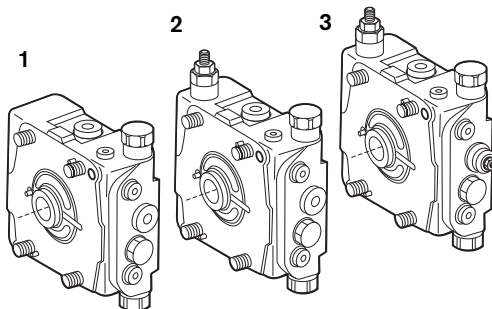
Triebwerk komplett.

Complete rotary group.



Stellkolben

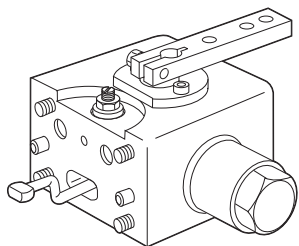
Positioning piston



1. Anschlußplatte Standard,
2. Anschlußplatte mit Druckabschneidung
3. Anschlußplatte DA mit Druckabschneidung

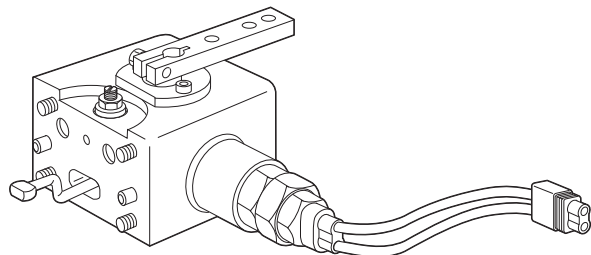
1. Standard connection plate
2. Connection plate with pressure cut-off
3. DA connection

Dichtsätze und Baugruppen
Seal kits and sub-assemblies



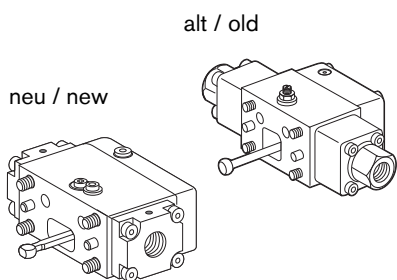
Ansteuergerät **HW**

Control unit **HW**



Ansteuergerät **HW** mit Nulllagenanzeige

Control unit **HW** with zero indicator

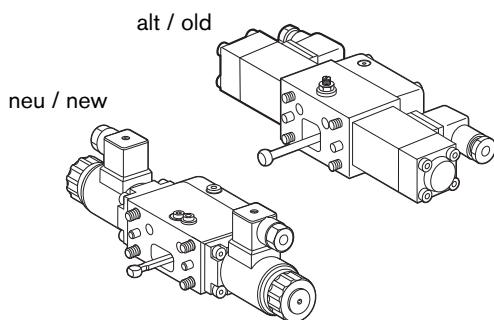


alt / old

neu / new

Ansteuergerät **HD**

Control unit **HD**

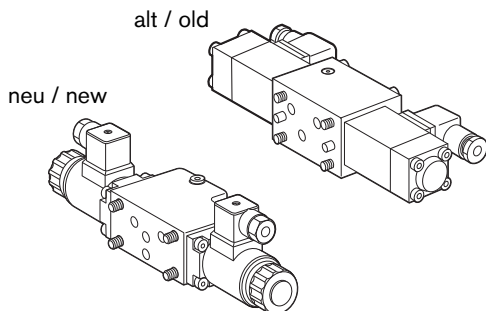


alt / old

neu / new

Ansteuergerät **EP**

Control unit **EP**



alt / old

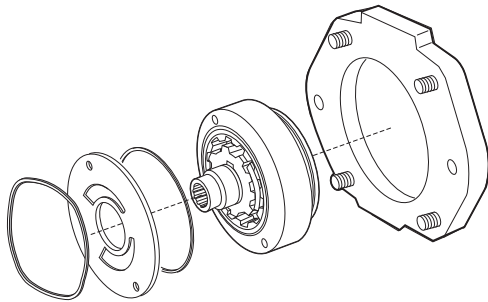
neu / new

4/3 Wegeventil **DA**

Control unit **DA**

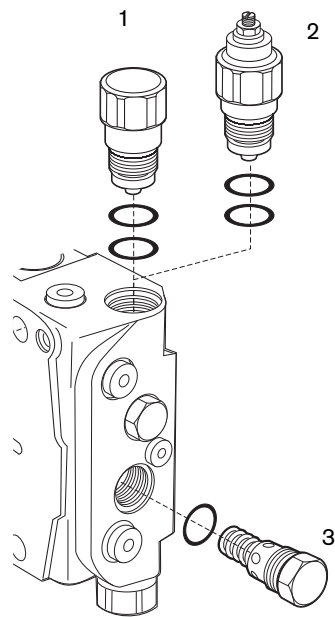
Dichtsätze und Baugruppen

Seal kits and sub-assemblies



Hilfspumpe mit Verschleißplatte

Boost pump with wear plates



1. HD - Ventil

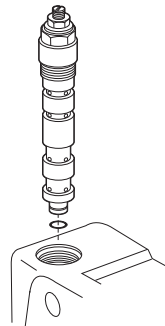
2. HD - Ventil mit Bypass

3. ND - Ventil

1. High pressure valve

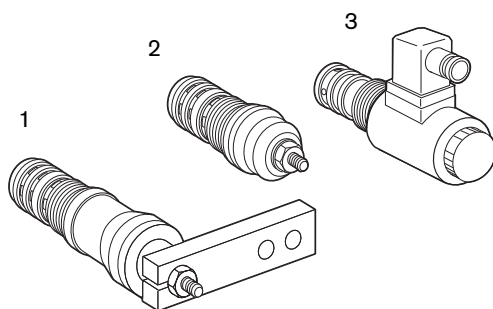
2. High pressure valve with bypass function

3. Low pressure valve



Druckabschneidung

Pressure cut-off



1. DA - Regelventil, verstellbar mit Hebel

2. DA - Regelventil, festeingestellt

3. Zuschaltventil

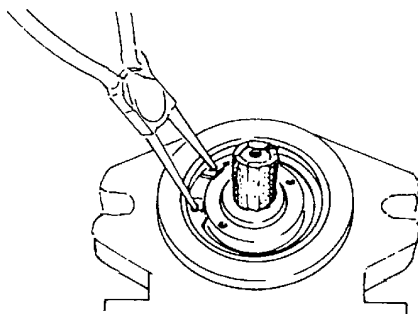
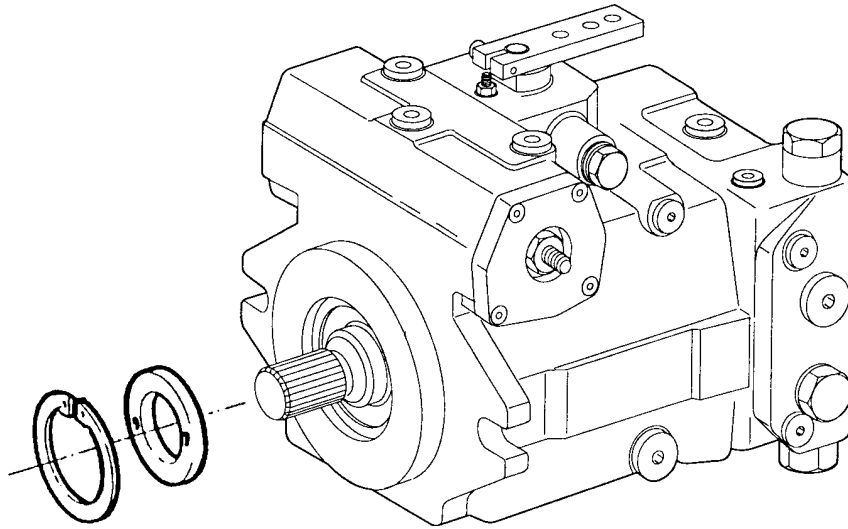
1. DA control valve, adjustable via a lever

2. DA control valve, fixed

3. Switching valve

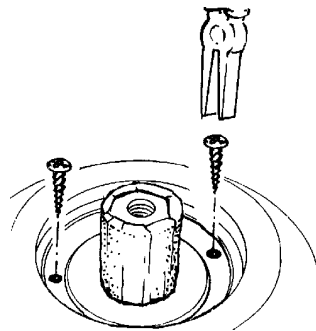
Triebwelle abdichten

Sealing of the drive shaft



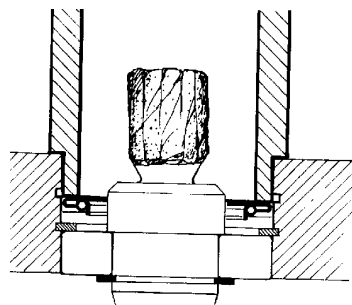
Triebwelle abkleben.
Sicherungsring ausbauen.

Protect the drive shaft (e.g. masking tape).
Remove the retaining ring.



Blechschrabe in die mit Gummi gefüllten Löcher
eindreihen.
Mit Zange WDR herausziehen.

Screw the metal screws into the holes that are
fitted with rubber.
Withdraw the shaft seal using pliers.

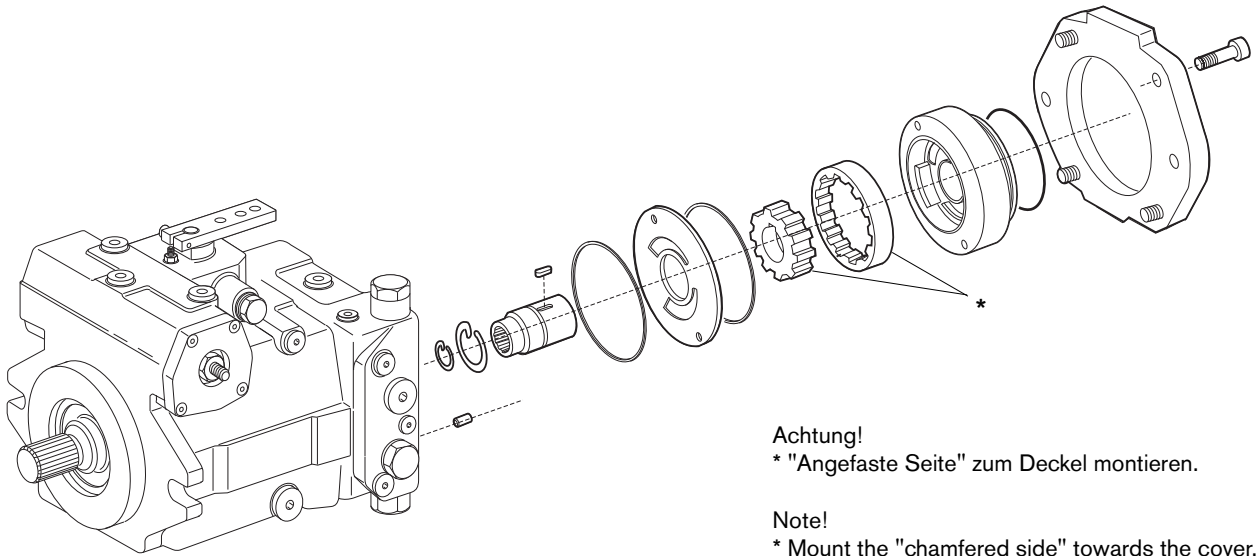


Wellendichtring mit Buchse auf Anschlag
einpressen.
Zwischen Dicht- und Staublippe, Wellendichtring
leicht einfetten.

Press-in shaft seal with bush to stop.
Lightly grease the seal, dust lips and shaft seal ring.

Hilfspumpe abdichten

Sealing of the boost pump

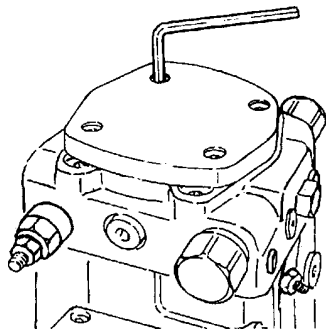


Achtung!

* "Angefaste Seite" zum Deckel montieren.

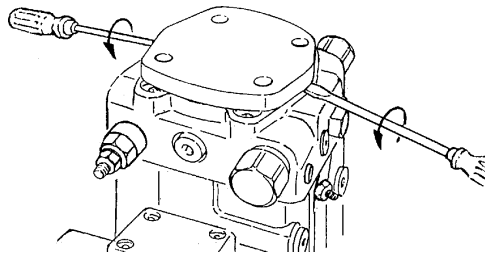
Note!

* Mount the "chamfered side" towards the cover.



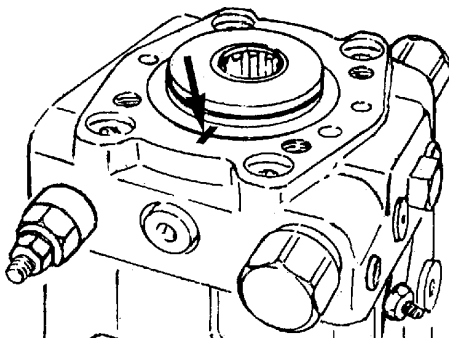
Befestigungsschrauben ausbauen.

Remove fixing screws.



Deckel abdrücken.

Pry-off cover.

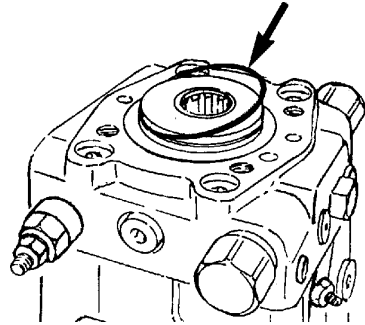


Einbaulage kennzeichnen.

Mark position.

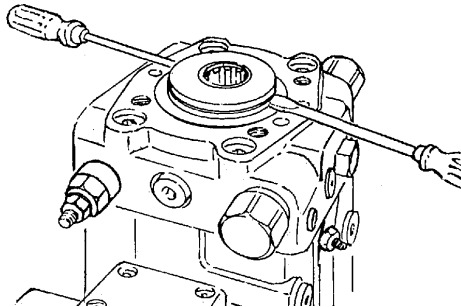
Hilfspumpe abdichten

Sealing of the boost pump



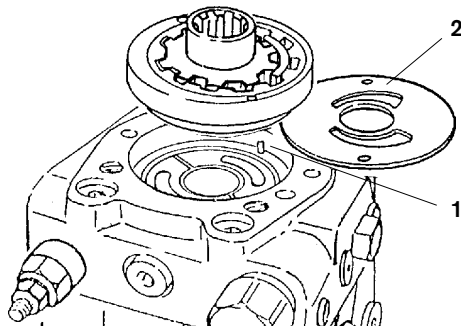
O-Ring ausbauen.

Remove O-ring.



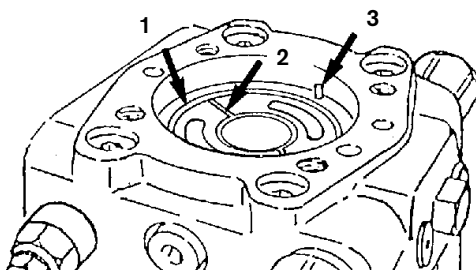
Hilfspumpe abdrücken.

Pry off the boost pump.



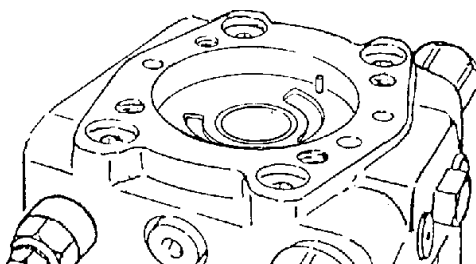
1. Verschleißplatte
2. Fixierstift

1. Wear plate
2. Locating pin



1. Kantsil-Ring
2. Entlastungsnut
3. Fixierstift

1. Kantsil-ring
2. Unloading channel
3. Locating pin

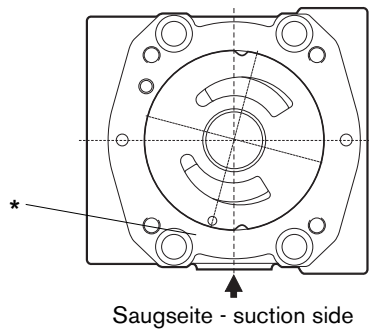


Verschleißplatte einsetzen.
Drehrichtung beachten!

Fit wear plate taking the direction of rotation account.

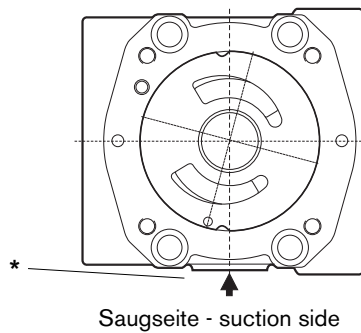
Hilfspumpe abdichten

Sealing of the boost pump



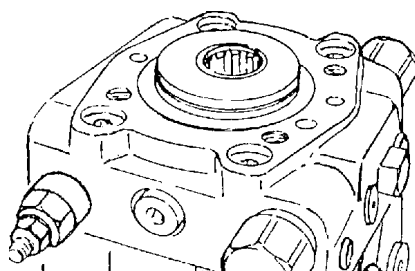
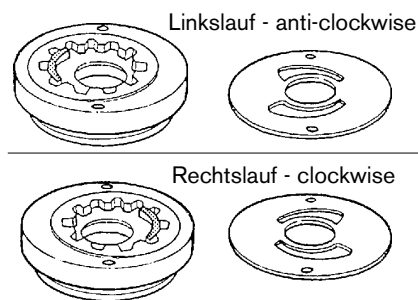
Verschleißplatte einsetzen.
Drehrichtung "Rechts" bei Blick auf die Triebwelle.
Achtung! Fixierstift

Fit wear plate.
Direction of rotation "clockwise" looking on the drive shaft.
Attention! Locating pin



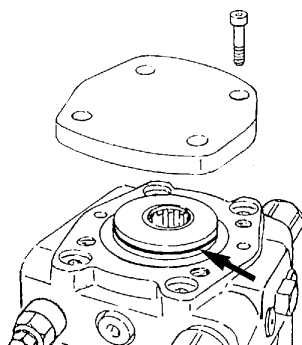
Verschleißplatte einsetzen.
Drehrichtung "Links" bei Blick auf die Triebwelle.
Achtung! Fixierstift

Fit wear plate.
Direction of rotation "anti-clockwise" looking on the drive shaft.
Attention! Locating pin



Hilfspumpe montieren.

Fit boost pump

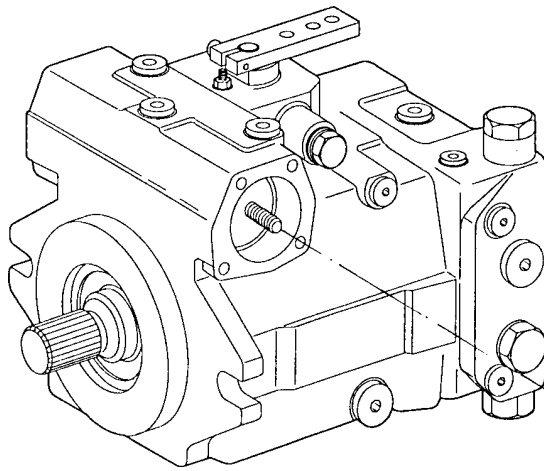


O-Ring und Deckel montieren.

Fit O-ring and cover plate.

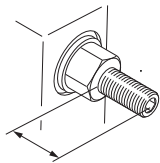
Stellkolbendeckel abdichten

Sealing of the control piston cover

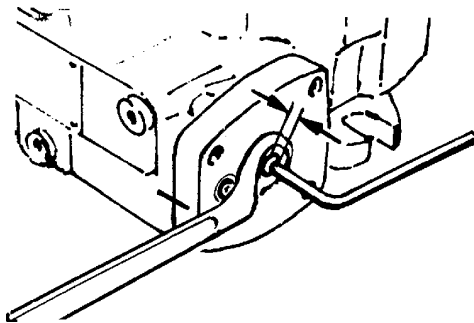


Achtung!
Korrekte mechanische 0-Lageneinstellung überprüfen!

Attention!
Check that the mechanical "0"-position is correct!

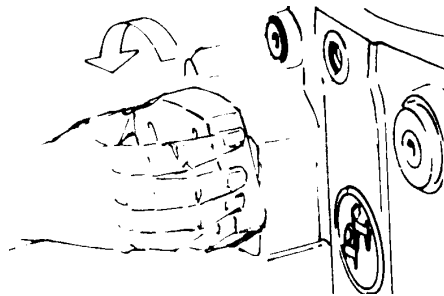


Maß X



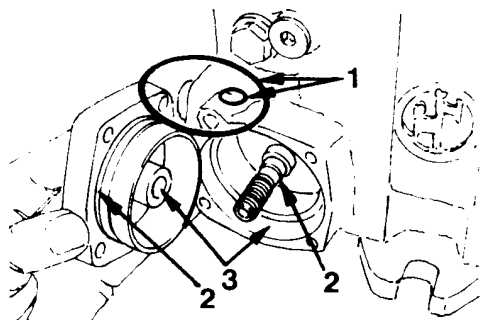
Kontermutter ausbauen, Stellschraube gegenhalten. Deckel kennzeichnen. Maß festhalten, Kontermutter lösen.

Remove lock unit, whilst holding the adjustment screw, mark the cover plate, ascertain the dimension, loosen locknut.



Deckel von Stellschraube "abschrauben".

Remove the cover from the adjustment screw by unscrewing it from the adjustment screw.



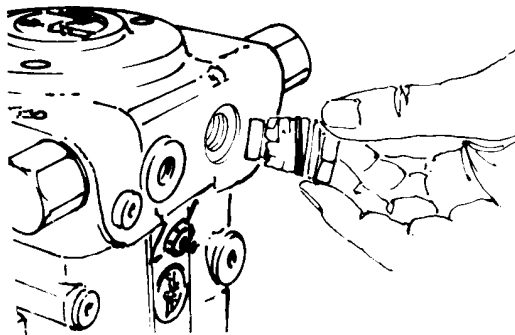
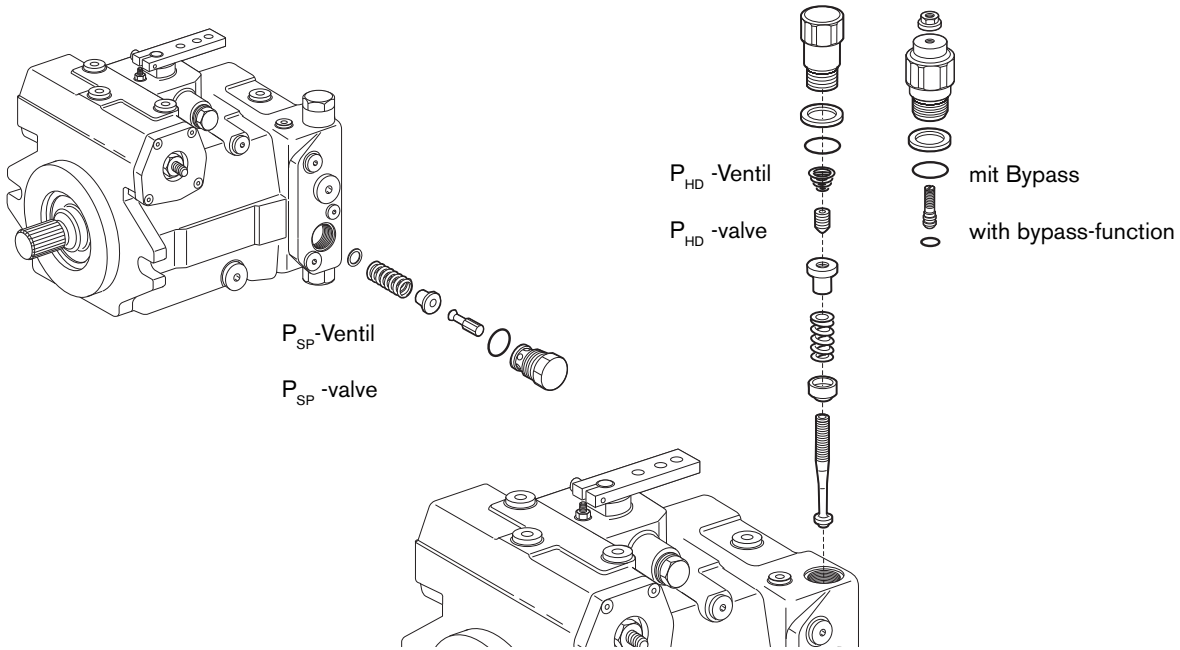
Kontrolle! O-Ring (1), Nut (2), Gehäuse und Deckel (3).

Achtung!
Korrekte mechanische 0-Lageneinstellung muß nach Einbau im Gerät bzw. Prüfstand erfolgen.

Check! O-ring (1), groove (2), housing with cover (3).

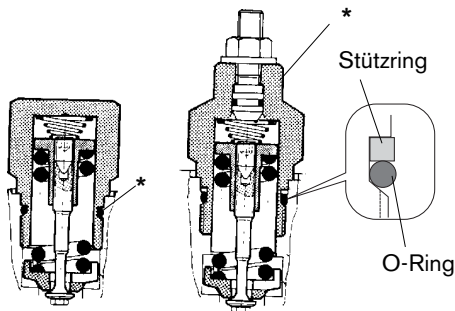
Attention!
The correct mechanical "0" position has to be adjusted after the unit has been built into the machine or on a test rig.

Ventile abdichten
Sealing of the valves



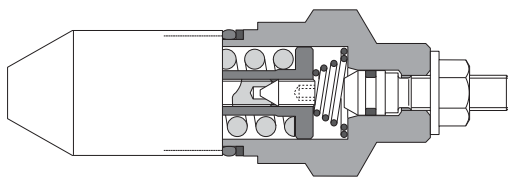
Gewinde vor Montage des neuen O-Ringes abkleben. (Beschädigungsschutz).

Cover threads before fitting new O-rings. (Damage protection).



Ventilkegel mit Druckfeder ausbauen. * mit Bypassfunktion

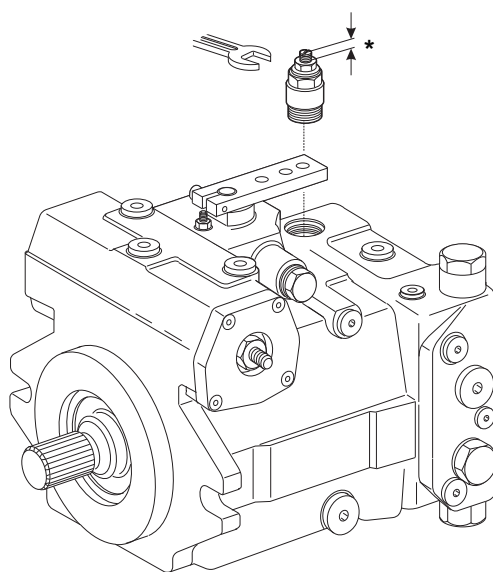
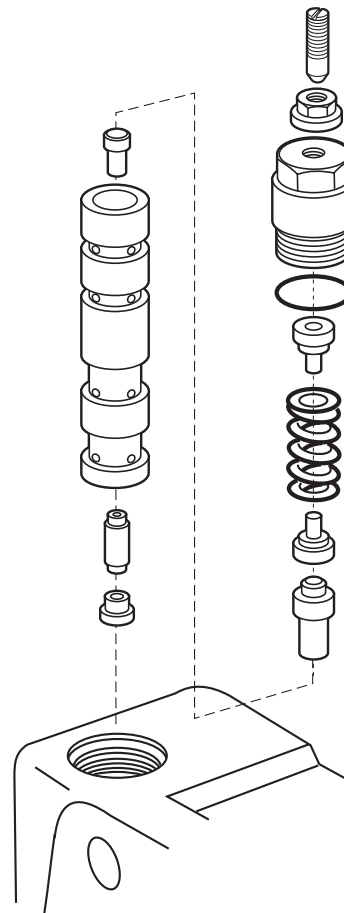
Remove valve poppet with compression spring. * with bypass function



O-Ring und Stützring mit Hilfswerkzeug (Hülse) aufziehen.

Place on O-ring and back-up ring with auxiliary tool (sleeve).

Druckabschneidung abdichten Sealing of the pressure cut-off valve



Wechsel der Dichtmutter.
Einstellmaß festhalten (*).

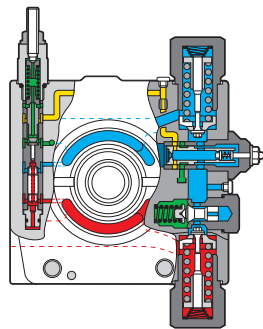
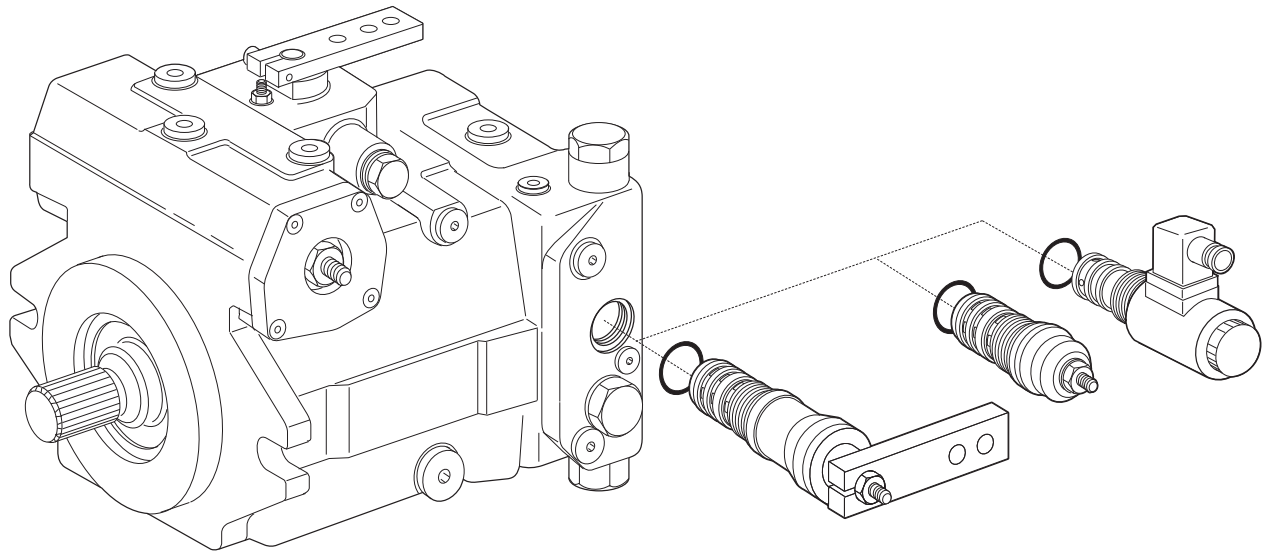
Exchanging the sealing nut.
Ascertainment the adjustment dimension (*).

Achtung!
Nach Einbau "Ventileinstellung" überprüfen.

Attention!
After assembly check "valve setting".

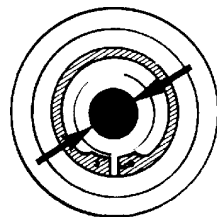
Regelventil abdichten

Sealing of the control valve



Regelventil ausbauen.

Remove control valve.



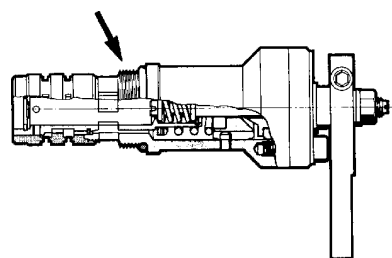
Blendendurchmesser nicht beschädigen.

Kontrolle:

Blendendurchmesser

Do not damage the orifice diameter.

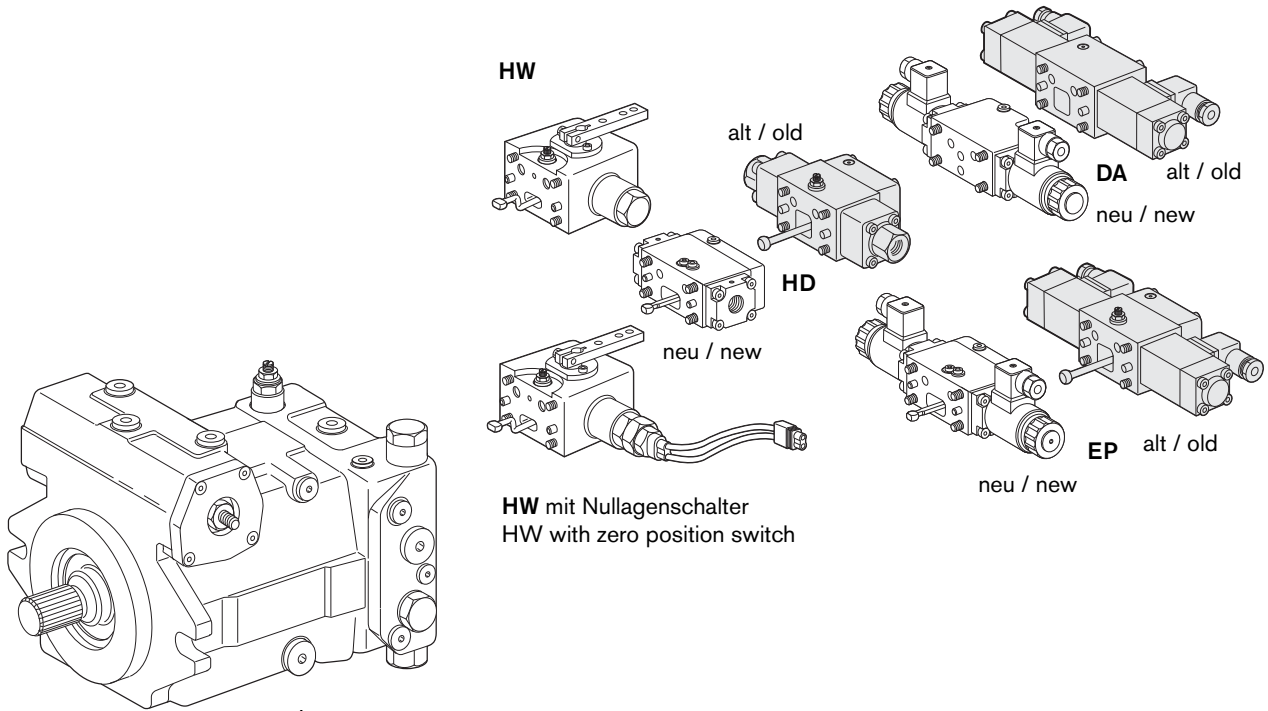
Check: Orifice diameter.



Gewinde vor Montage des neuen O-Ringes abkleben.

Before fitting the new O-ring cover the threads (e.g. tape).

Steuergerät demontieren
Removing of the control unit



HW

alt / old

DA alt / old

neu / new

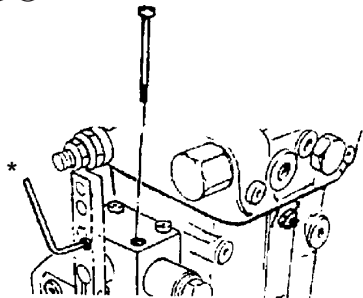
HD

neu / new

EP alt / old

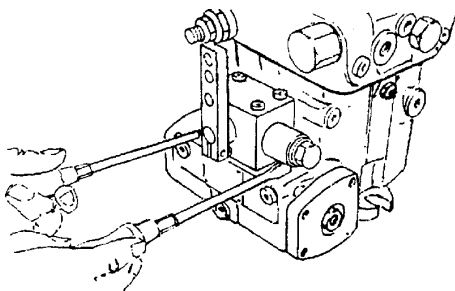
neu / new

HW mit Nullagenschalter
HW with zero position switch



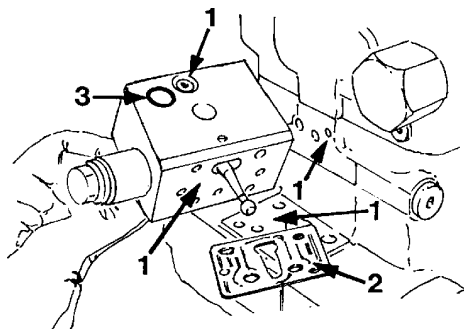
* Befestigungsschrauben demontieren.

* Remove fixing screws.



Ansteuergerät abdrücken.

Pry-off the control unit.



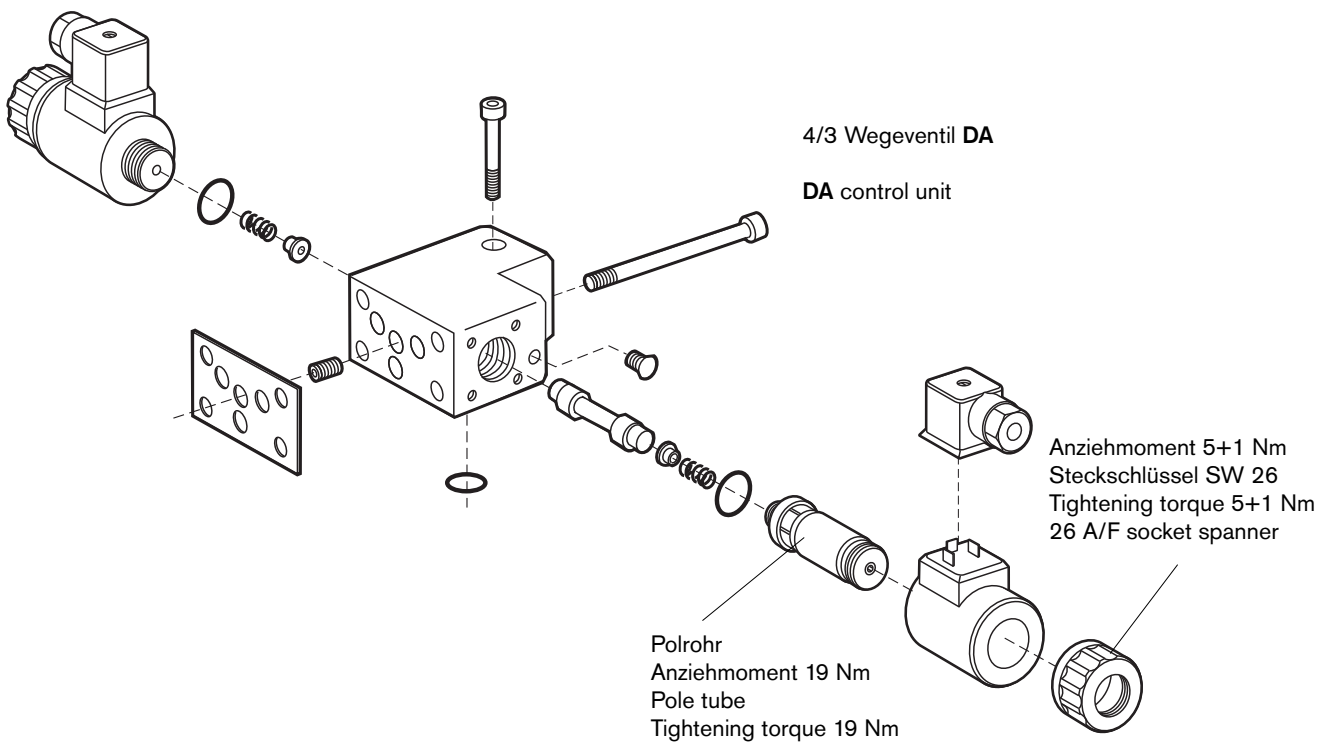
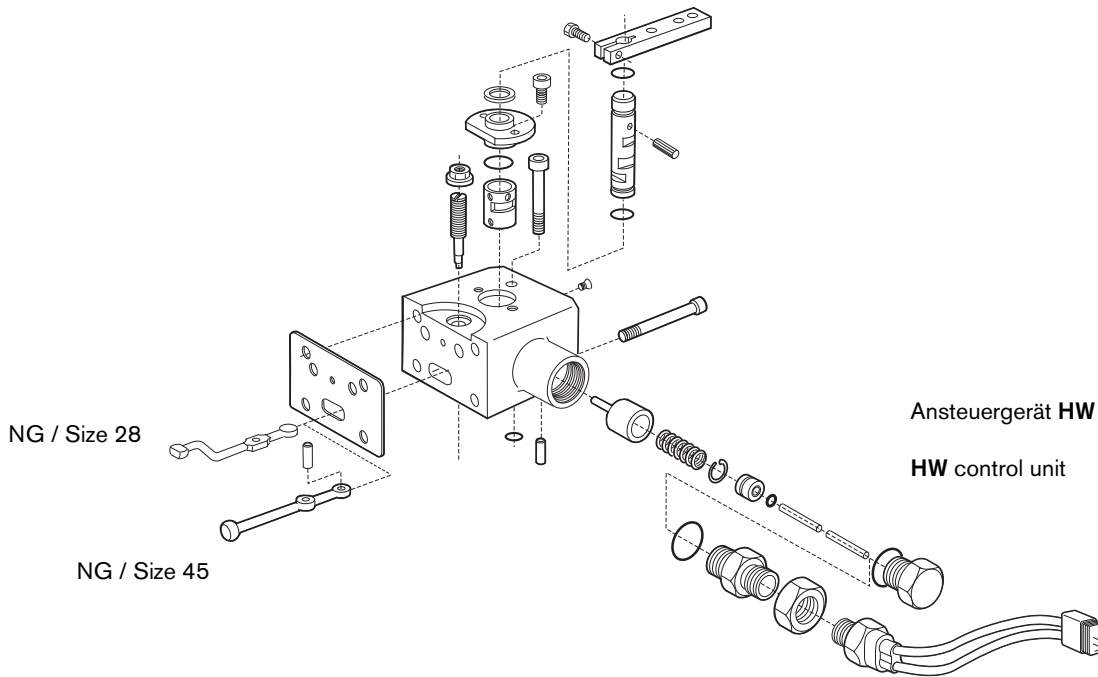
Kontrolle

Dichtfläche (1), Flachdichtung (2), O-Ringe (3).

Check

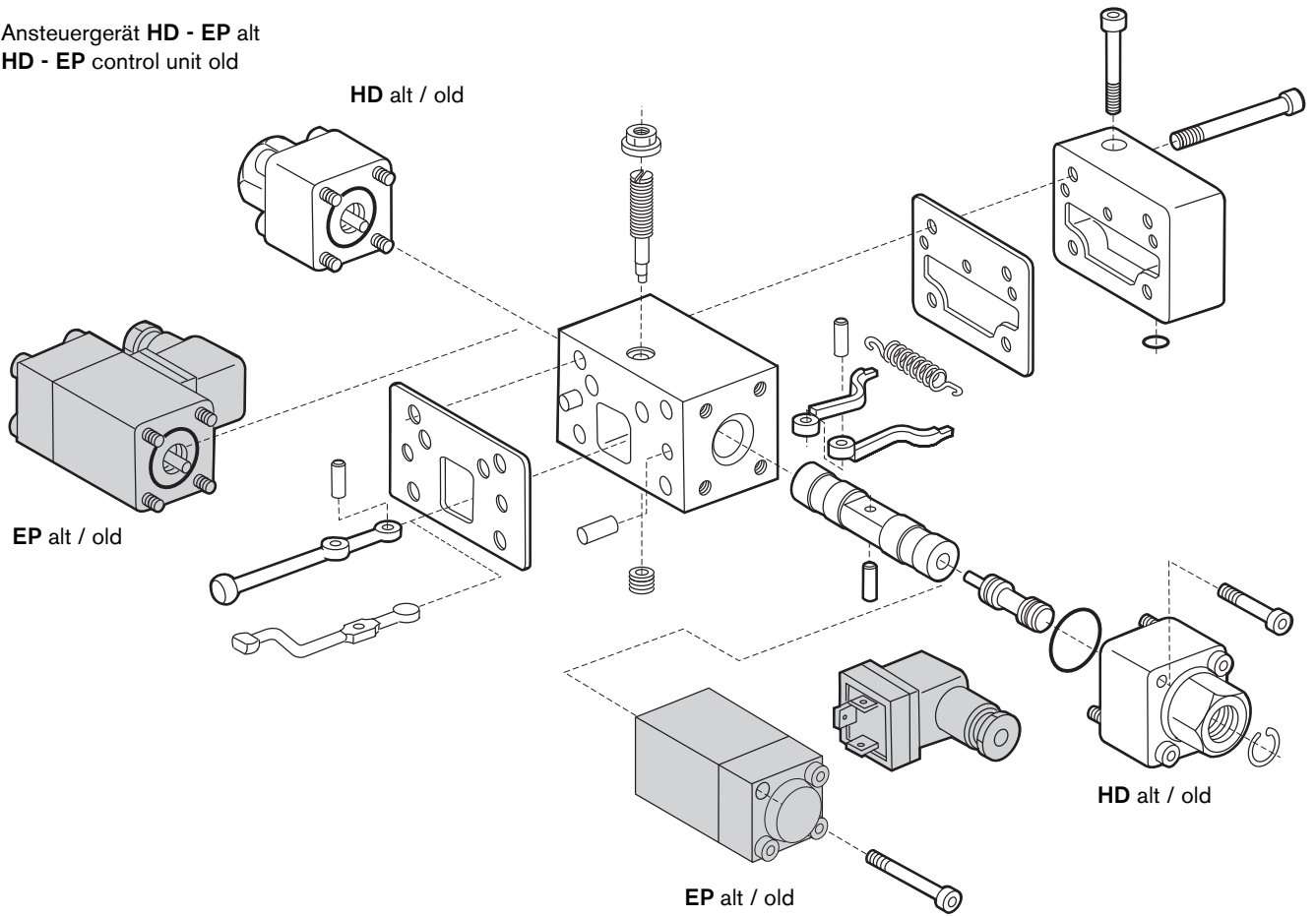
Sealing surface (1), gasket (2), O-rings (3).

Ansteuergeräte
Control units

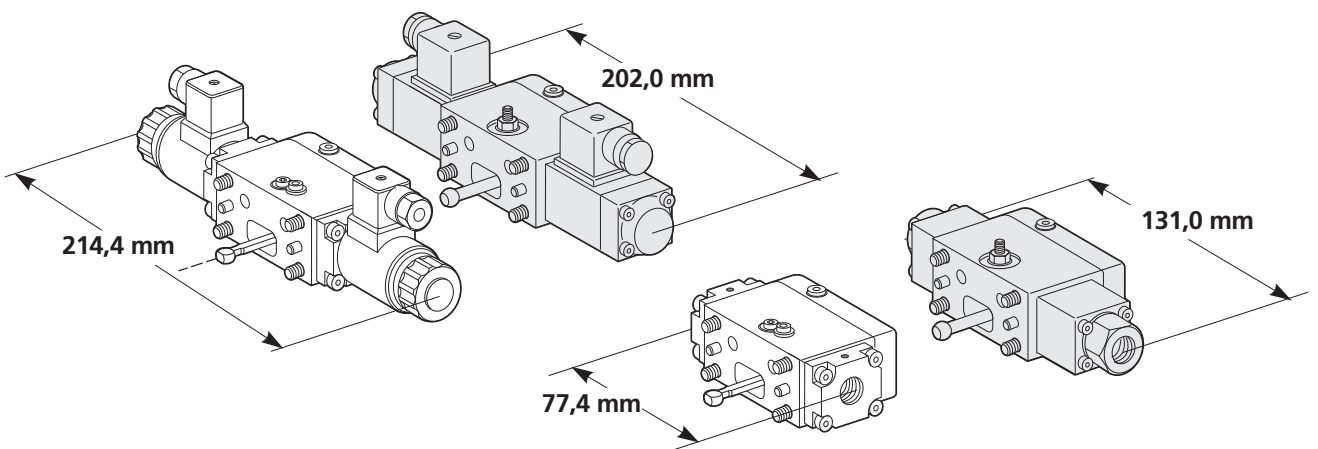


Ansteuergeräte
Control units

Ansteuergerät **HD - EP alt**
HD - EP control unit old

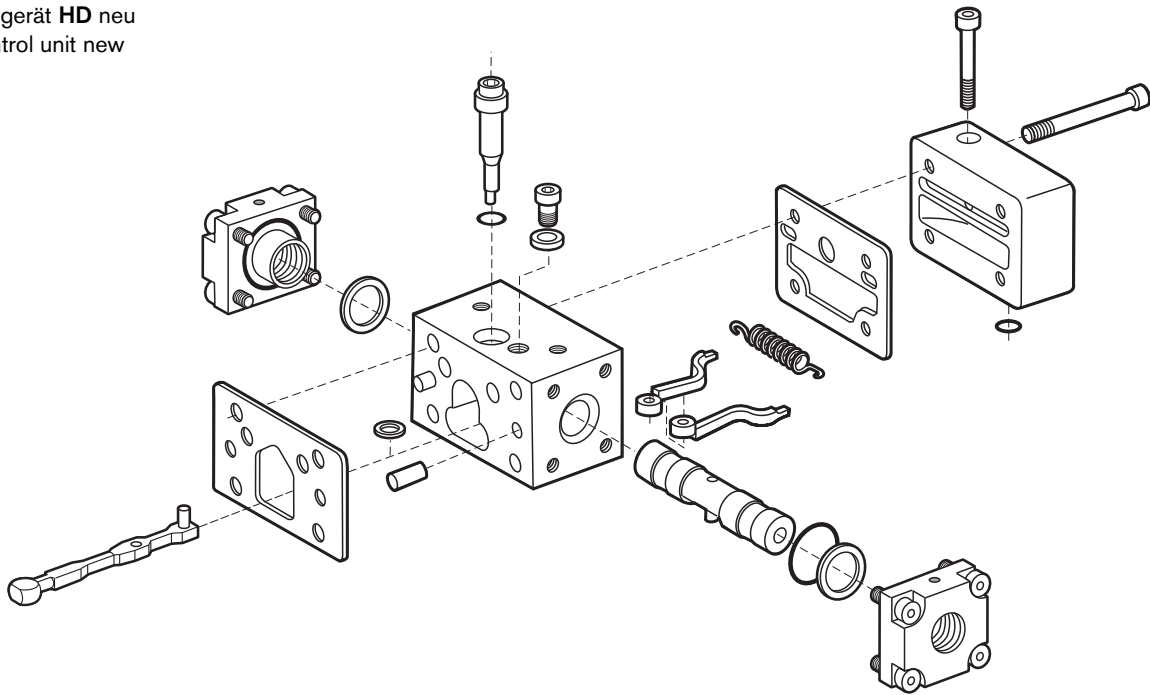


Neues Ansteuergerät **HD - EP**
New **HD - EP control unit old**

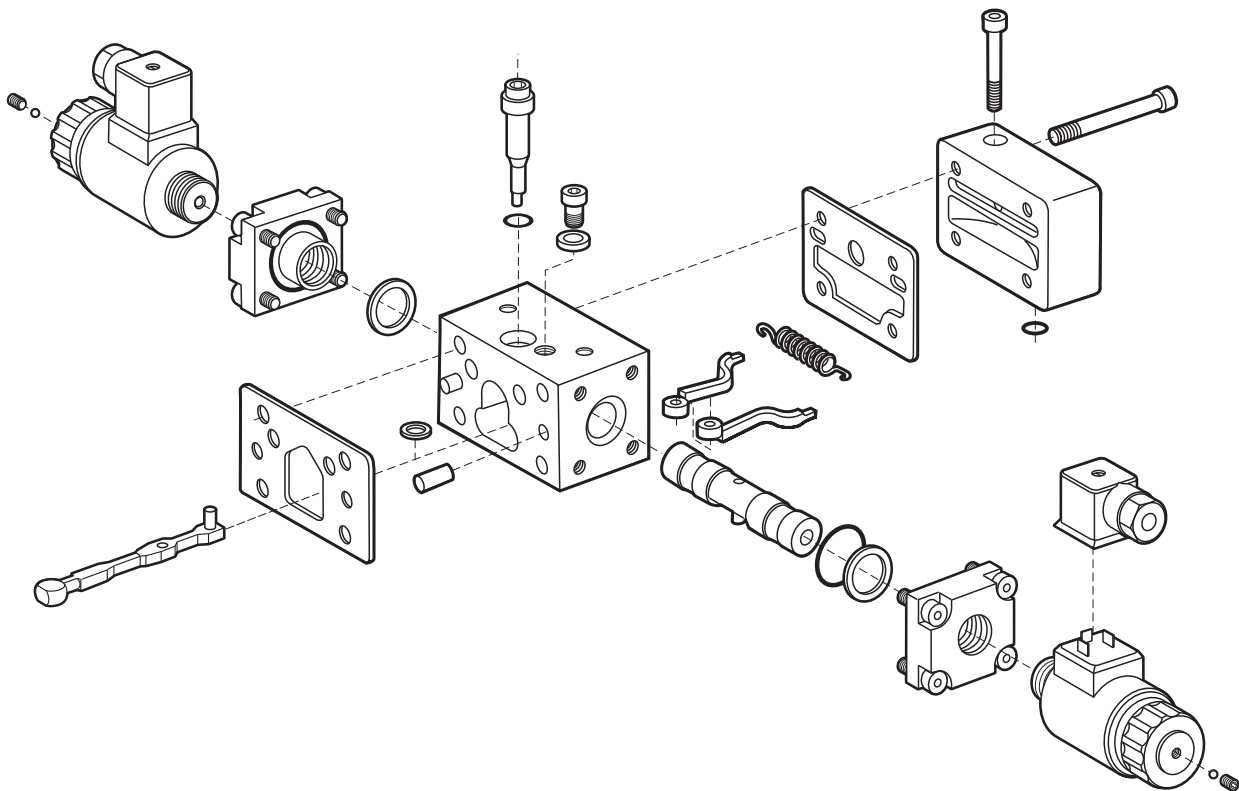


Ansteuergeräte Control units

Ansteuergerät **HD** neu
HD - control unit new

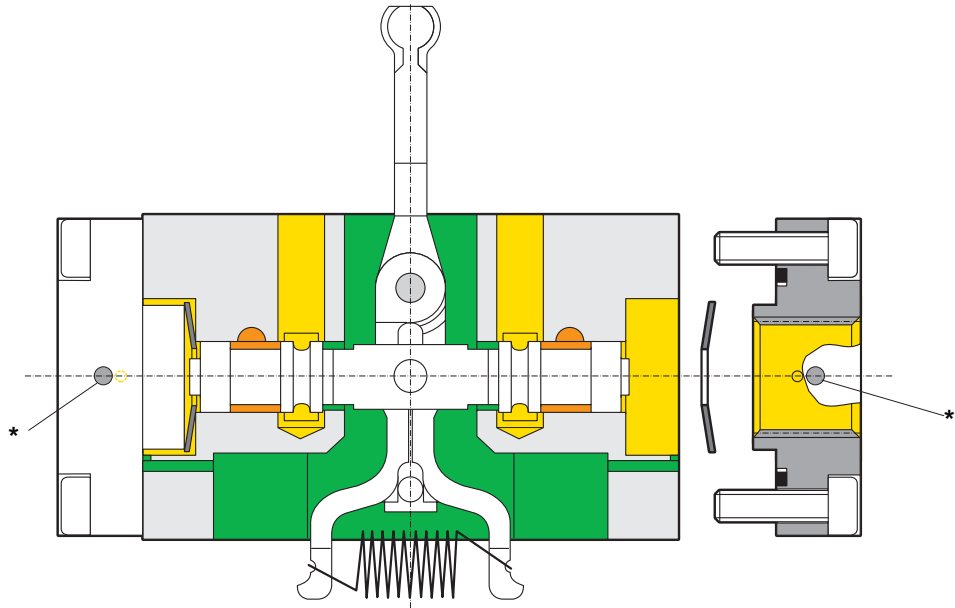
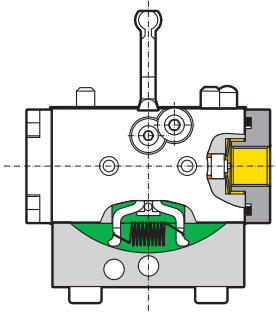
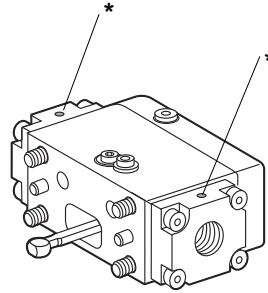


Ansteuergerät **EP** neu
EP - control unit new



Ansteuergeräte
Control units

- * Markierung Montageposition HD
- * Marking the assembly position HD



* Markierung
Montageposition HD


* Assembly position marker HD


Wird von EP- auf HD-Ausführung umgebaut -
Deckelposition beachten siehe Markierung

Is converted from EP into the HD version -
take note of the cover position, see marker

○ Leckölkanal offen wird geschlossen.

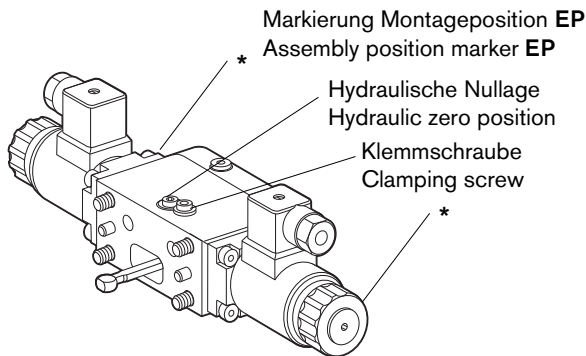
○ The open leakage port is plugged

 Zugfeder tauschen!

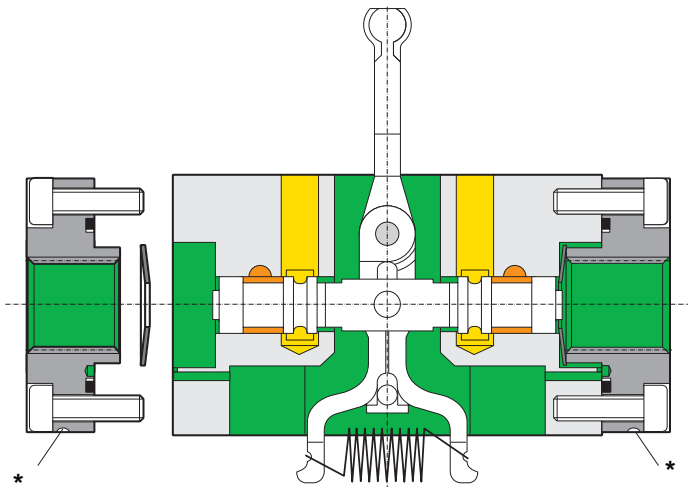
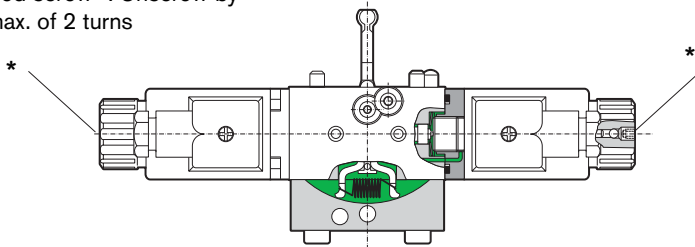
 Exchange the tension spring!

Ansteuergeräte

Control units



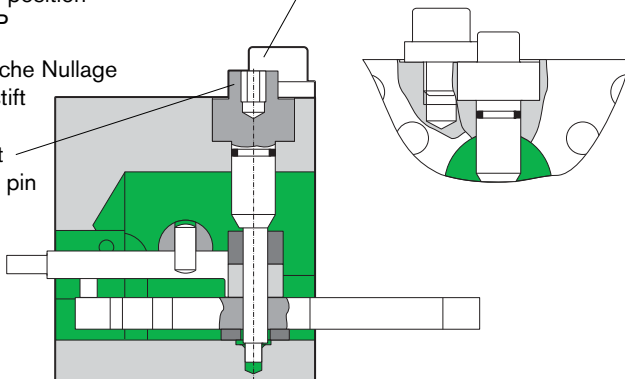
Entlüftungsschraube * max. 2 Umdrehungen herausdrehen.
Bleed screw *. Unscrew by a max. of 2 turns



Markierung Montageposition EP
Assembly position marker EP

Klemmschraube 6,1 Nm
Clamping screw 6,1 Nm

Hydraulische Nullage
Exzenterstift
Hydraulic zero point
Eccentric pin



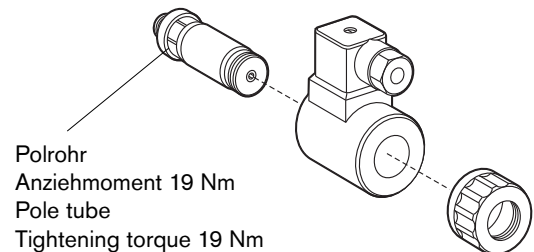
Die neuen Proportionalmagnete müssen bei der Inbetriebnahme entlüftet werden. Wird die Luft nicht aus dem Ankerraum entfernt, kann es zum Schwingen der Ansteuerung kommen.

Zum Entlüften ist am Ende des Magneten, im Messingteil, ein kleiner Gewindestift M4, SW 2 vorhanden. Dieser Gewindestift ist max. 2 Umdrehungen herausdrehen und nach dem Entlüften mit 1 Nm wieder festzuziehen.


Bei der Ausführung mit Nothand mit Federrückzug muß zum Entlüften die Kunststoffmutter mit Gummibalg entfernt und nach dem Entlüften mit 5+1 Nm wieder angeschraubt werden.


The new proportional solenoids must be bled during commissioning. If the air is not removed from the armature chamber oscillations at the control can occur. For bleeding purposes there is, on the end of the solenoid, in the brass component a small set screw M4, 2A/F. This can be unscrewed by a maximum of 2 turns and then after completion of the bleeding tightened to a maximum of 2 Nm.

For the version with hand override and spring return the plastic nut with rubber coating has to be removed for bleeding. After bleeding it has to be replaced and tightened with 5+1 Nm.

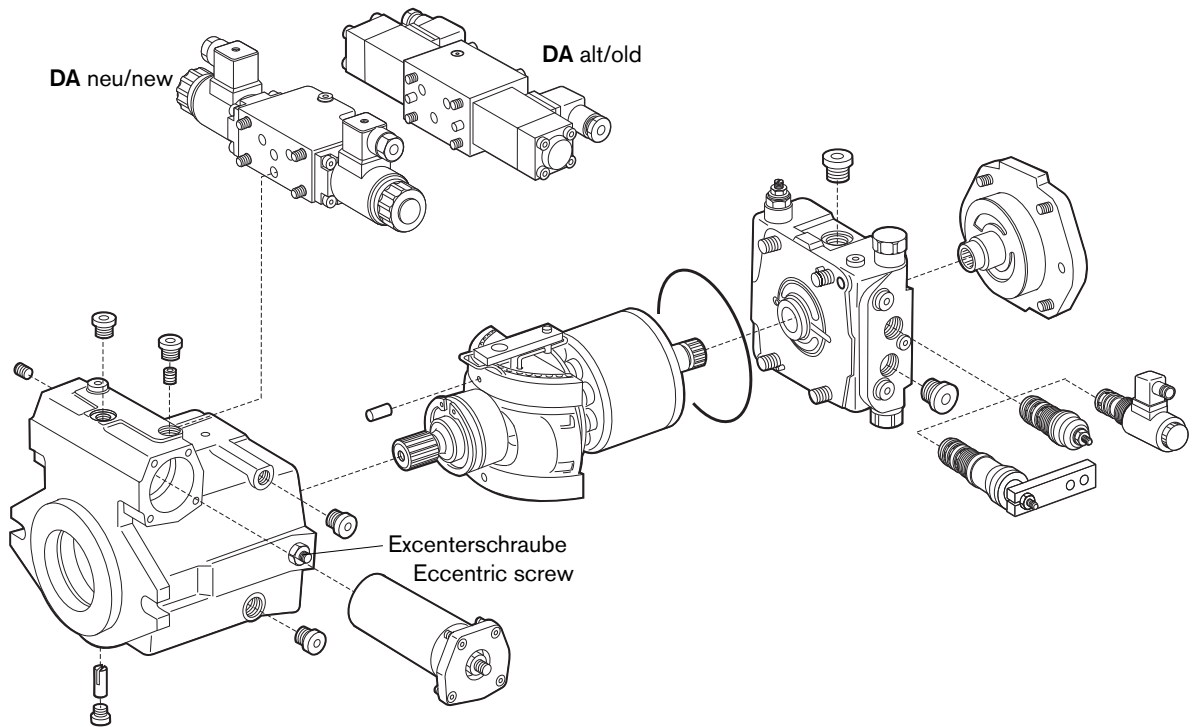
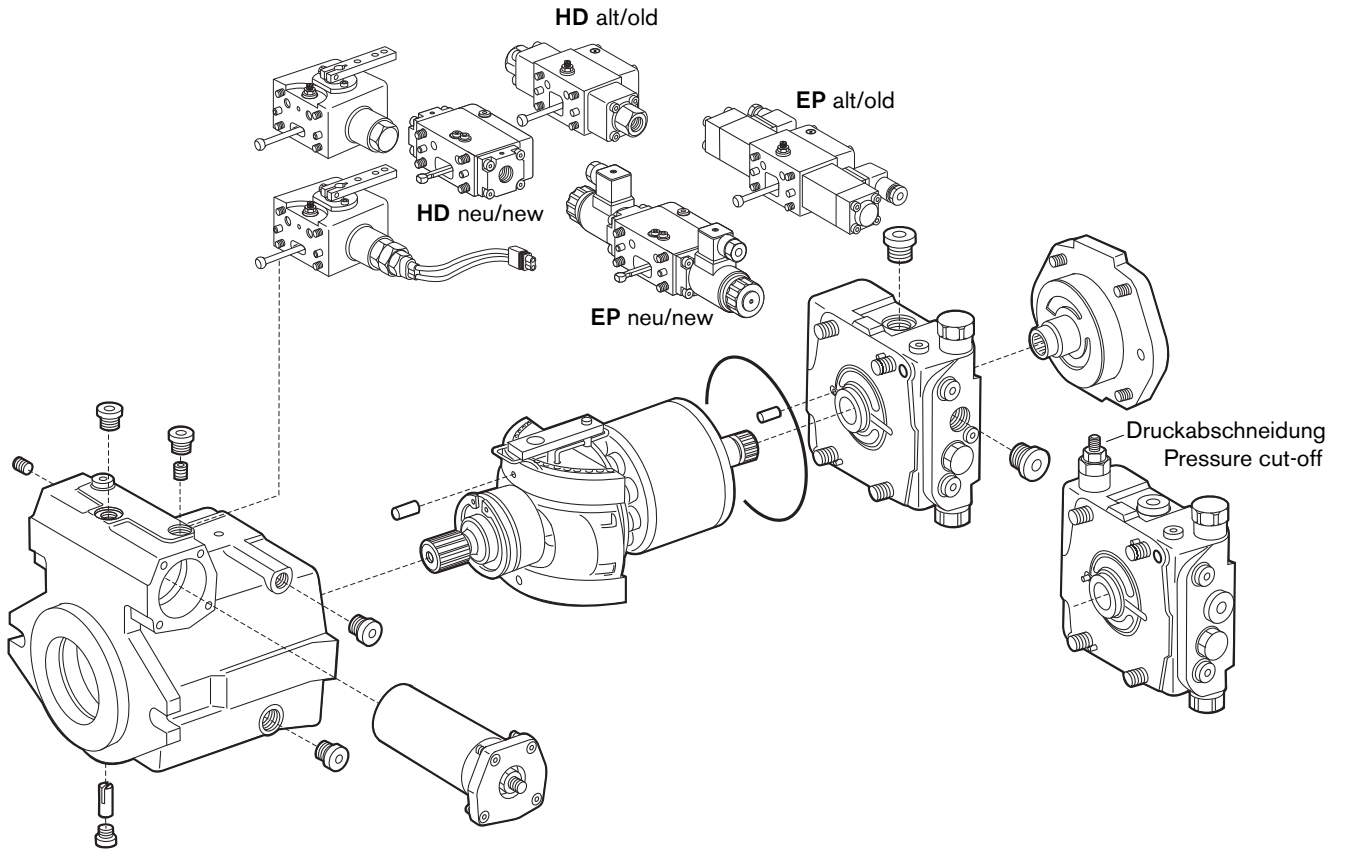


Anziehmoment 5+1 Nm
Steckschlüssel SW 26
Tightening torque 5+1 Nm
26 A/F socket spanner

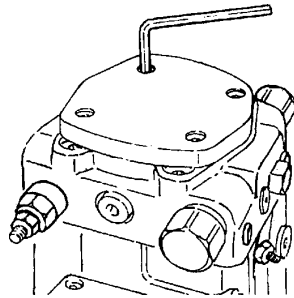
 Beim Lösen der Klemmschraube
Exzenterstift - Hydraulische Nullage festhalten.

 When loosening the clamping screw
Hold the eccentric pin - hydraulic zero point

Pumpe demontieren
Pump disassembly

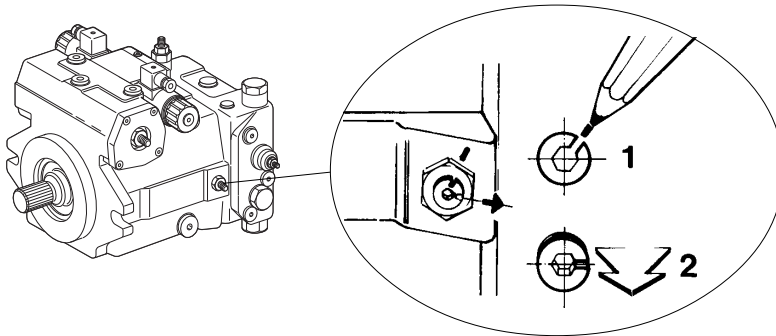


Pumpe demontieren
Pump disassembly



Lage der Hilfspumpe und Anschlußplatte markieren.
Hilfspumpe abbauen.

Mark position of the boost pump and the port plate.
Remove the boost pump.

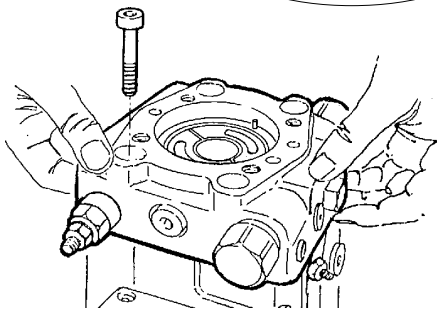


DA-Ausführung:

Lage der Verdrillschraube markieren (1).
Verdrillschraube auf Demontageposition stellen (2).

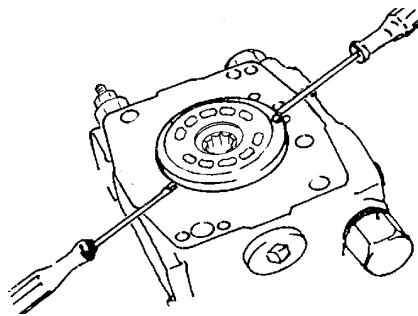
DA-design:

Mark the position of the eccentric screw (1).
Set the eccentric screw to disassembly position (2).



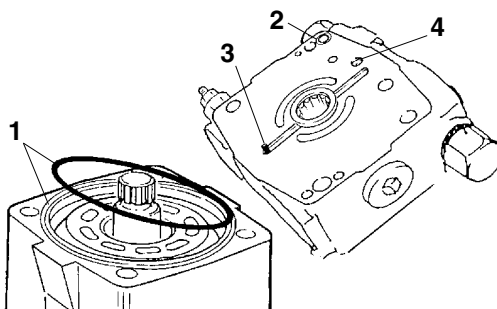
Anschlußplattenbefestigung lösen. Anschlußplatte abheben.

Remove connecting plate fixing screws.
Lift off the connection plate.



Steuerplatte abdrücken.
Lage notieren.

Lift off control plate.
Note position.



Kontrolle!

O-Ring mit Nut (1)

O-Ring mit Nut (2)

Fixierstift - Steuerplatte (3) Bei **DA** - kein Stift

T - Ablauf verschlossen (4)

Check

O-ring and groove (1)

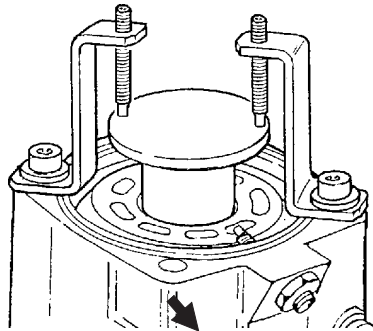
O-Ring and groove (2)

Locating pin - control plate (3) type **DA** has no pin

T drain plugged (4) open for type **DA**

Pumpe demontieren

Pump disassembly

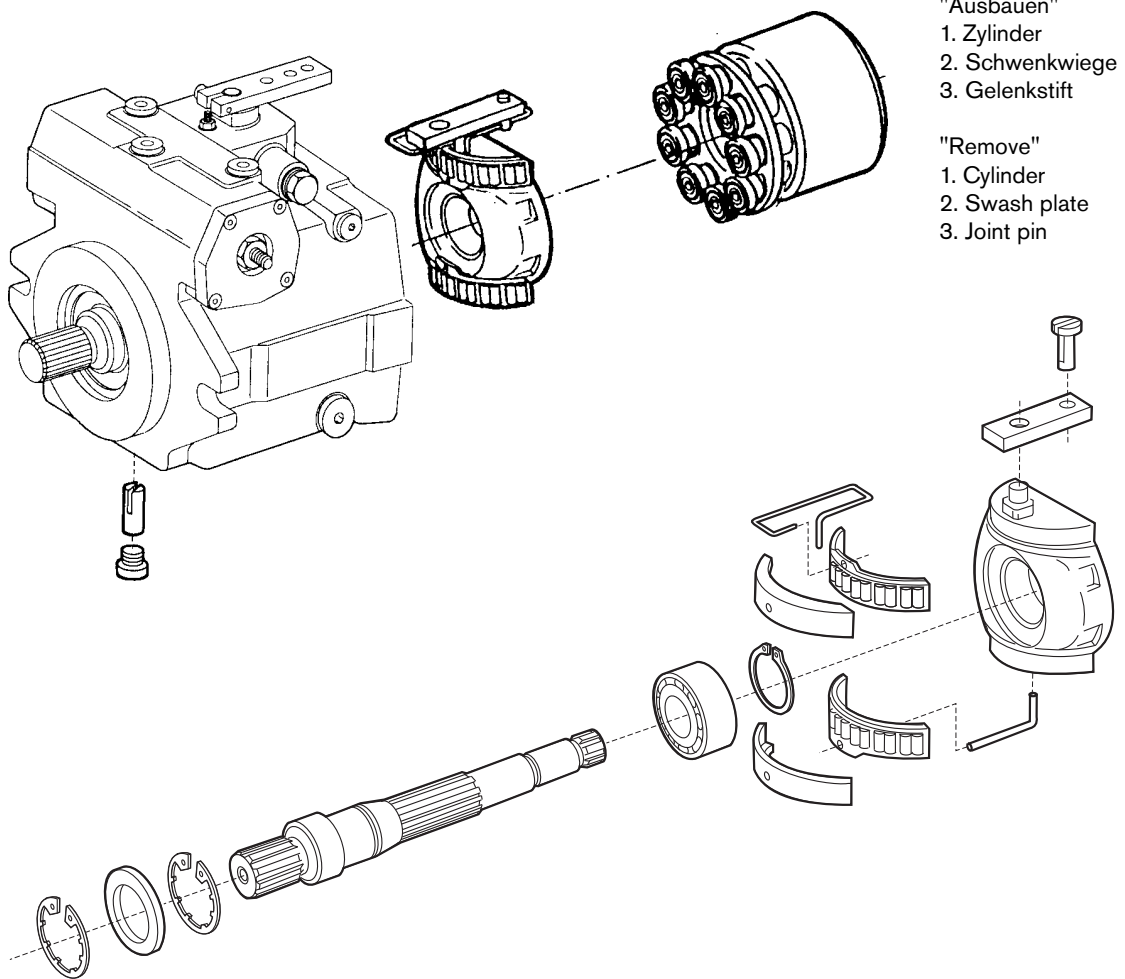


DA-Ausführung

Zylinder nach unten drücken (1).
Verdrillschraube herausdrehen (2).
Triebwerk ausheben (3).

DA- version

Press the cylinder downwards (1).
Remove the eccentric screw (2).
Lift out the rotary group (3).

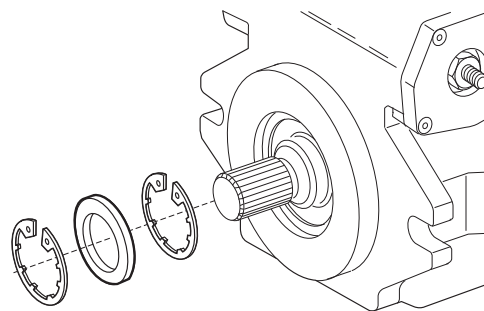


"Ausbauen"

- 1. Zylinder
- 2. Schwenkwiege
- 3. Gelenkstift

"Remove"

- 1. Cylinder
- 2. Swash plate
- 3. Joint pin

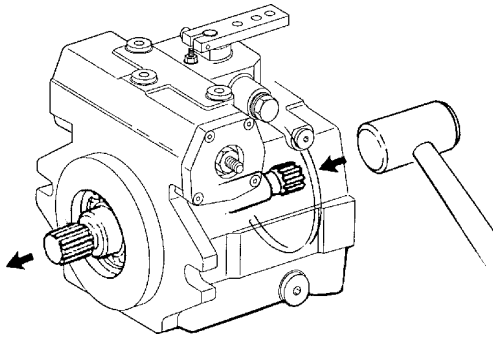


Sicherungsring, WDR ausbauen.

Remove retaining ring, remove drive shaft seal.

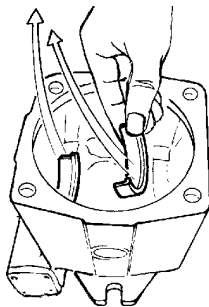
Triebwerk ausbauen

Removal of the rotary group



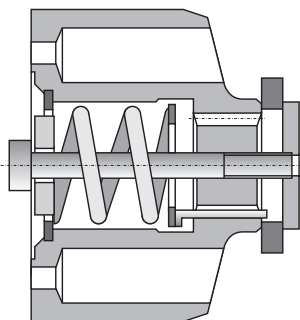
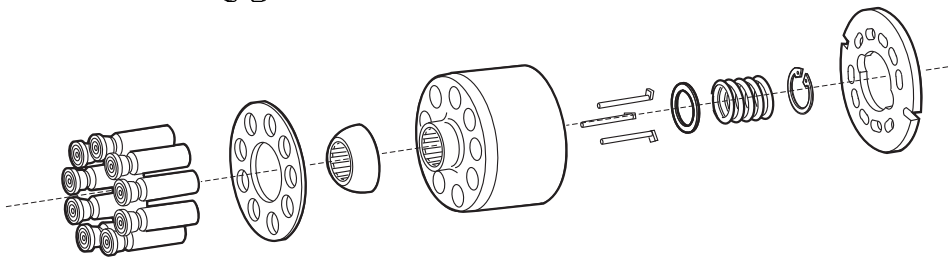
Triebwelle mit leichten Hammerschlägen austreiben.

Remove drive shaft with light hammer strokes.



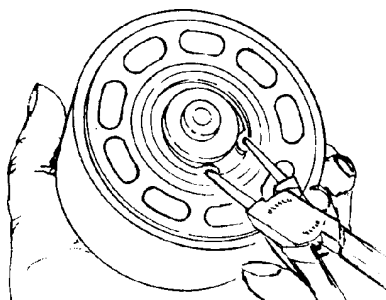
Lagerschalen ausbauen.

Remove bearing shells.



Feder mit Vorrichtung vorspannen.

Pre-tension the spring using a suitable device.

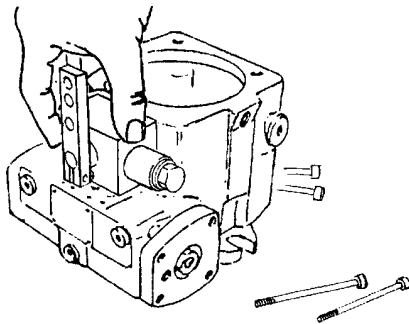


Sicherungsring demontieren.

Feder und Druckstifte ausbauen.

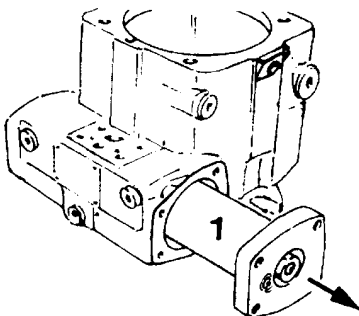
Remove circlip.

Remove spring and pressure pins.

Stellkolben demontieren - Gehäuse mit Buchse**Disassembly of the positioning piston - housing with bush**

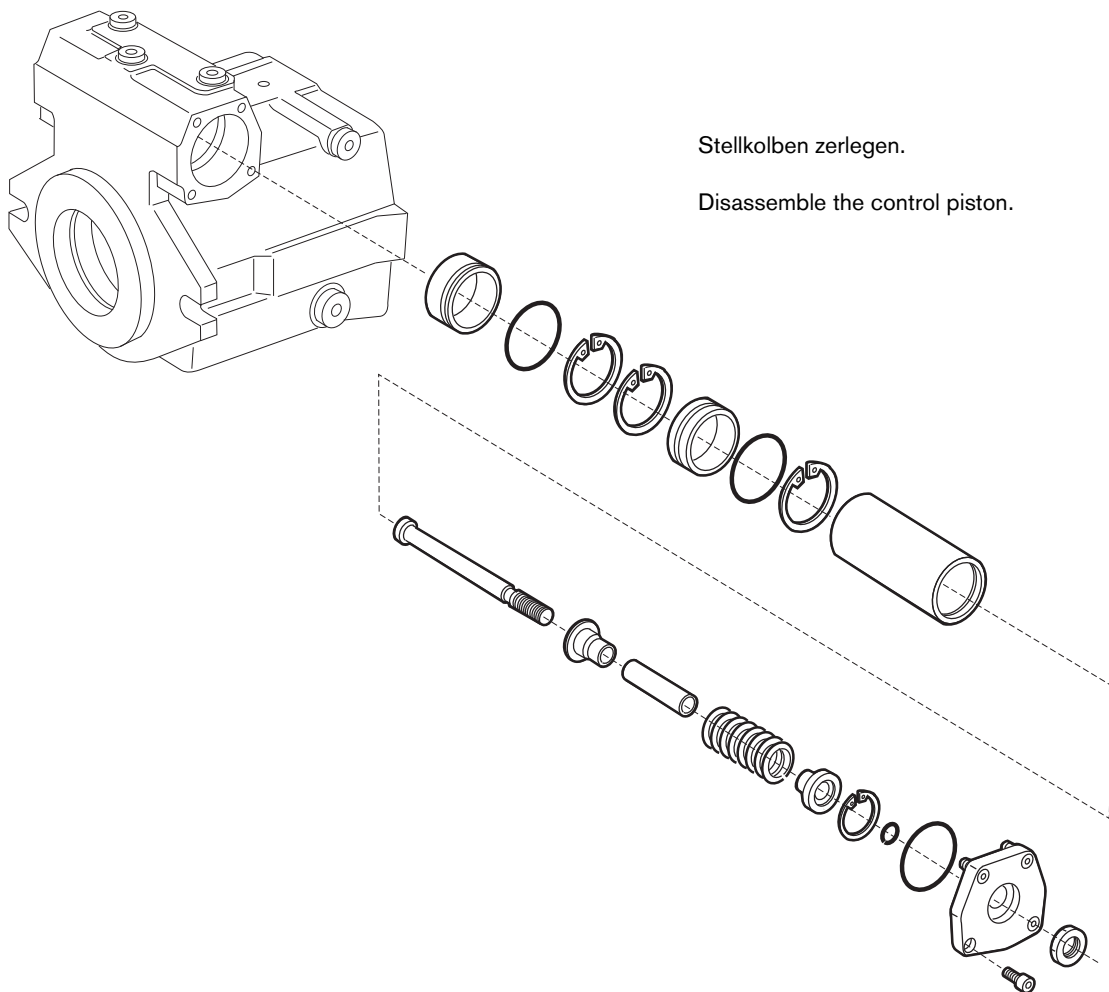
Steuergerät abbauen.

Remove control unit.



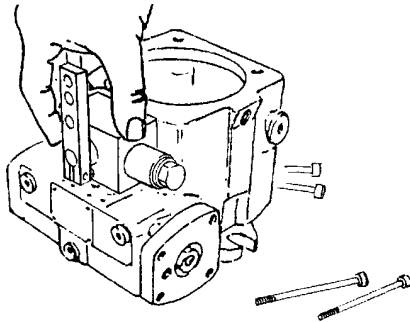
Stellkolben (1) ziehen.

Pull out control piston (1).



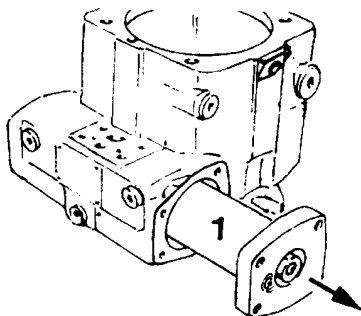
Stellkolben zerlegen.

Disassemble the control piston.

Stellkolben demontieren - Gehäuse mit Turcon-Glyd-Ring**Disassembly of the positioning piston - housing with Turcon-Glyd-ring**

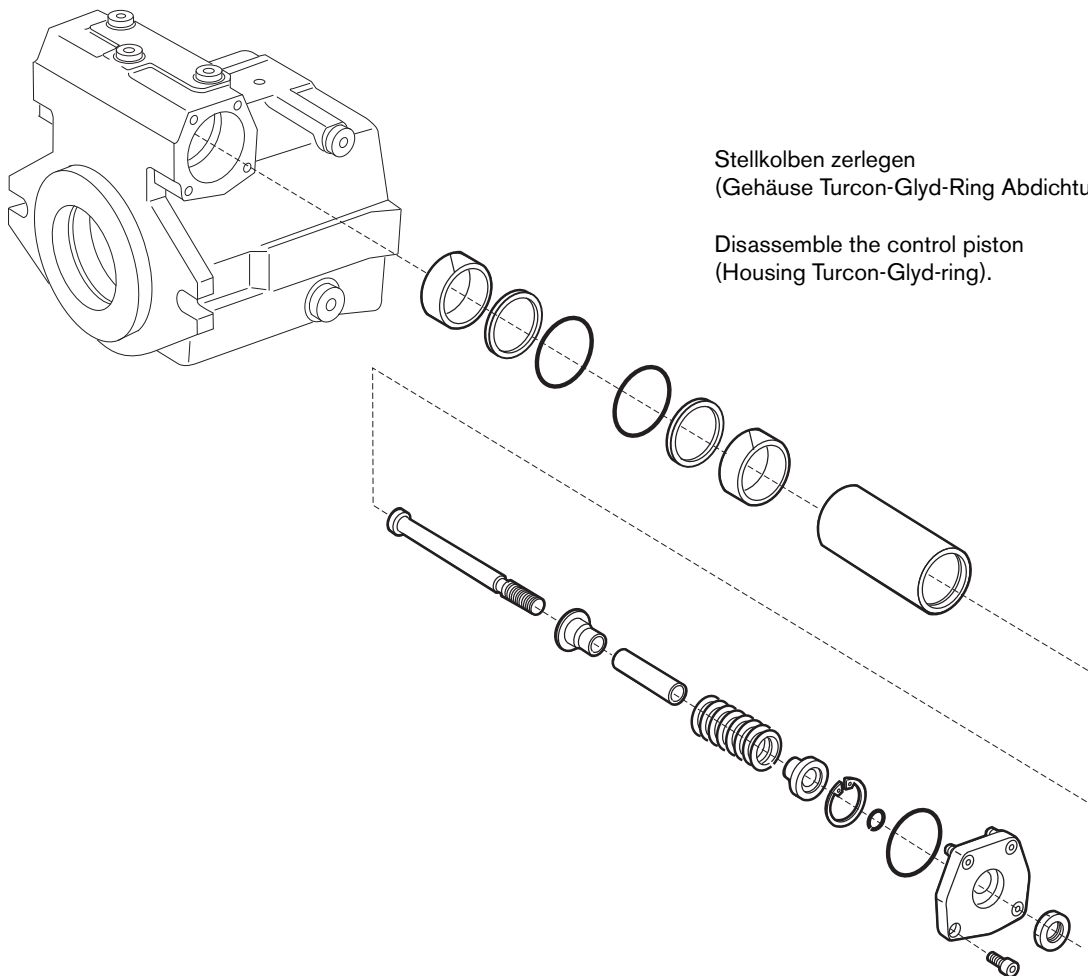
Steuergerät abbauen.

Remove control unit.



Stellkolben (1) ziehen.

Pull out control piston (1).

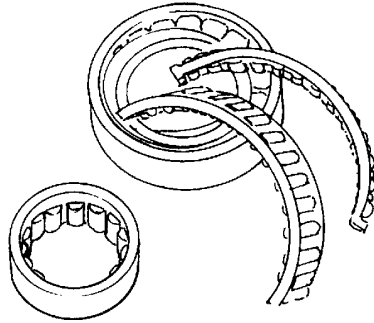


Stellkolben zerlegen
(Gehäuse Turcon-Glyd-Ring Abdichtung).

Disassemble the control piston
(Housing Turcon-Glyd-ring).

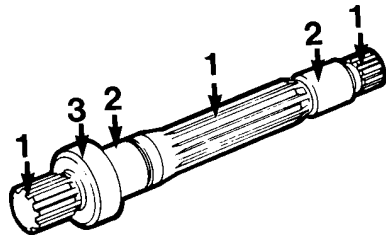
Überprüfungshinweise

Inspection notes



Alle Lager erneuern.

Replace all bearings.

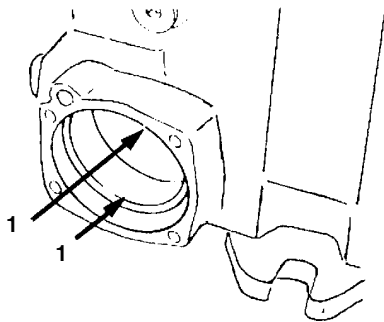


Kontrolle!

1. Verzahnung, ausgeschlagen, Passungsrost.
2. Lauffläche.
3. Einlaufrillen vom Wellendichtring.

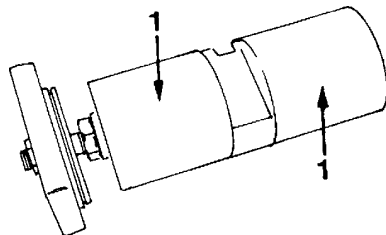
Check!

1. Splines, wear steps, corrosion.
2. Running surfaces.
3. Grooves made by the shaft seal.



Stellkolbenlaufbüchse (1) riefenfrei, nicht ausgelaufen.

Check that the control piston guide bush (1) is free of grooves and is free of wear.



Kontrolle!

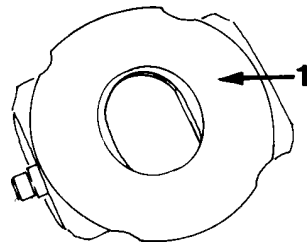
Stellkolben (1) riefenfrei.

Check!

Control piston (1) is not scored.

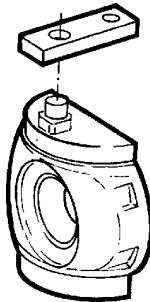
Überprüfungshinweise

Inspection notes



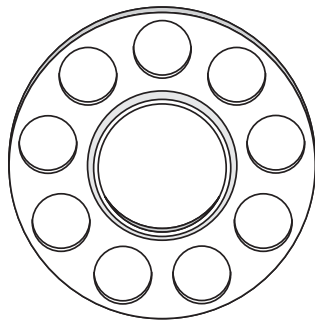
Kontrolle!
Gleitfläche riefenfrei.

Check!
Sliding surface free of grooves.



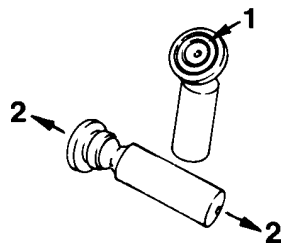
Kontrolle!
Verbindung Gleitstein/Schwenkzapfen spielfrei.

Check!
That the connection of slide ring/swivel pin is free of play.



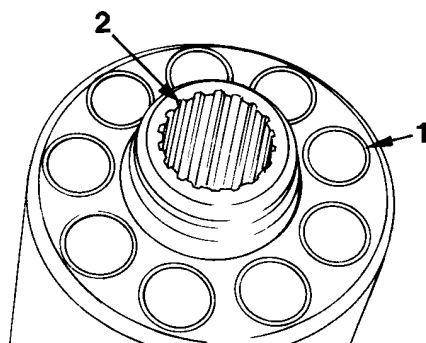
Kontrolle!
Rückzugeinrichtung riefenfrei (1), keine Einlaufspuren (2) im Gleitschuhbereich.

Check!
That the retaining plate is free of grooves (1) and that there is no wear (2) in the slipper pad area.



Kontrolle!
Lauffläche (1) keine Kratzer, keine Metalleinlagerungen, kein Axialspiel (2), (Kolben nur satzweise tauschen).

Check!
Check to see that there are no scratches or metal deposits on the sliding surface (1), and that there is no axial play (2), (pistons must only be replaced as a set).

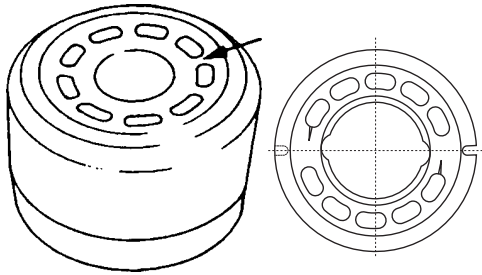


Kontrolle!
Zylinderbohrungen (1), Verzahnungen (2).

Check!
Cylinder bores (1), splines (2).

Überprüfungshinweise

Inspection notes

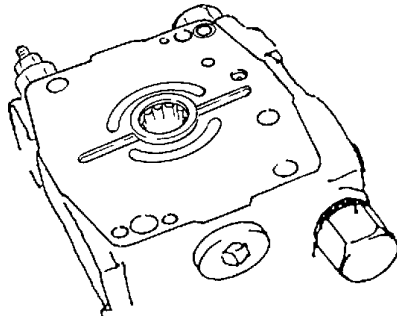


Kontrolle!

Zylindergleitfläche riefenfrei, nicht eingelaufen,
keine Einlagerungen,
Steuerplatte nicht riefig (nur satzweise
austauschen).

Check!

Cylinder sliding surface free of grooves, no wear,
no embedded foreign particles. That there are no
scratches on the control plate. (Only replace them
as a set).

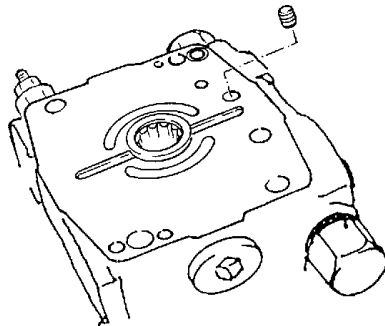


Kontrolle!

Auflagefläche - Steuerplatte ohne Beschädigung.

Check!

Mounting surface - control plate undamaged

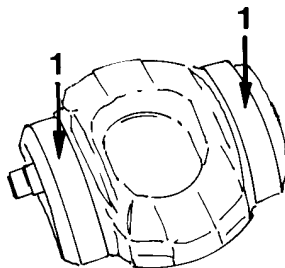


Hinweis:

Bohrung bei DA-Regelung offen. (gültig nur bei
A10VG 45).

Information:

Hole for DA-control is open, without DA control valve
it is plugged.

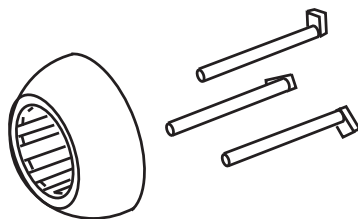


Kontrolle!

Lagerbahnen (1)

Check!

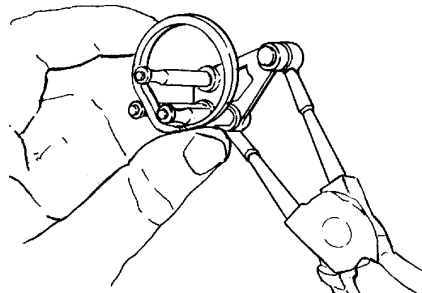
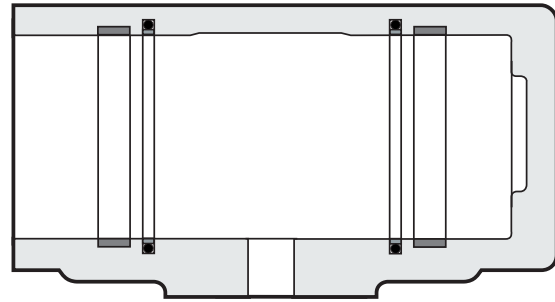
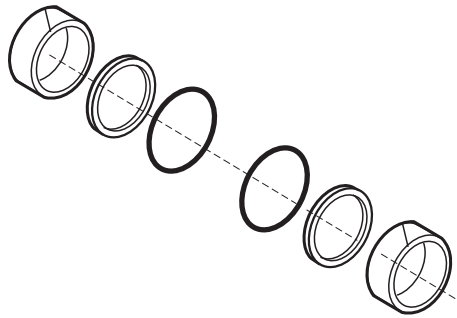
Bearing surfaces (1)



Riefenfrei, keine Einlaufspuren

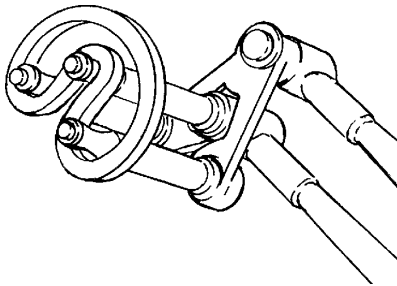
Free of grooves, no wear.

Gehäuse - Turcon-Glyd-Ring montieren Assemble housing - Turcon-Glyd-ring



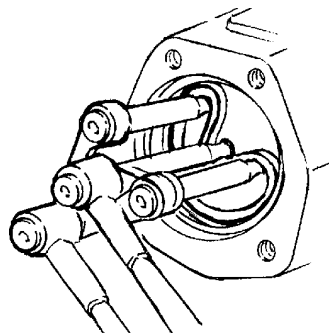
Dichtring in die Montagezange einlegen.

Fit the seal ring into the assembly tool.



Dichtring mit Zangenschenkel nierenförmig zusammendrücken. Die Verformung von Turcon-Dichtungen ist sorgfältig vorzunehmen, damit die Dichtkanten nicht beschädigt werden.

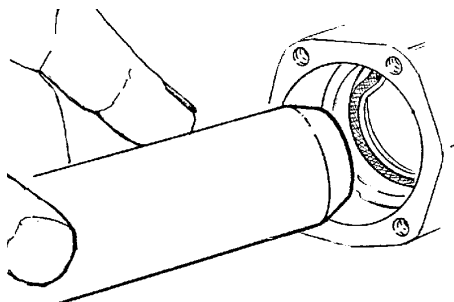
Press the seal ring into the kidney shape using the assembly tool. The deformation of the Turcon seal has to be done with care so as not to damage the sealing edges.



O-Ring in Nut einlegen.

Dichtring ins Gehäuse einführen und in der Aufnahmeplatzieren. Dann Spannung lösen und Montagezange herausziehen. Lage des Dichtringes prüfen - eventuell mit dem Finger egalisieren.

Position the seal ring into the groove.
Position the seal ring into the housing and place it into the groove. Release the tension and withdraw the assembly tool. Check the position of the seal ring if necessary straighten using a finger.

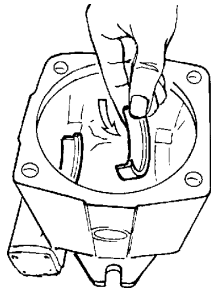


Kalibrieren des Dichtringes mit einem Kalibrierdorn (Stellkolben) - mit langer Schräge 10° bis 15°.

Calibrate the seal ring using a cylindrical plug gauge (positioning piston) at an angle of 10° to 15°.

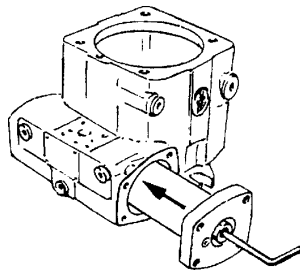
Pumpe montieren

Assembly of the pump



Lagerschalenpaar einsetzen.

Insert bearing shells.



Stellkolben ins Gehäuse einsetzen.

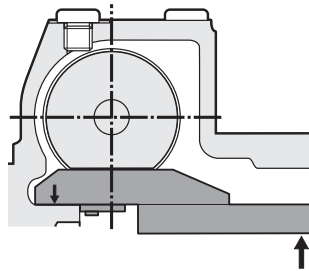
Hinweis:

Stellkolben vor Einbau einölen.

Insert positioning piston into the housing.

Instruction:

Oil positioning piston before assembly.

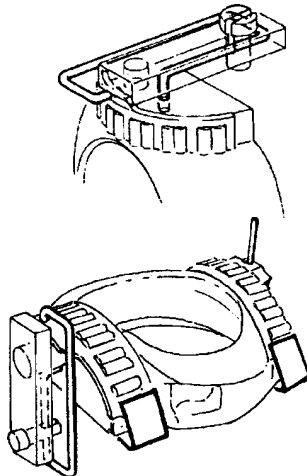


Stellkolben mit Hebel (Id.Nr. 2774491) ausrichten.

* Führung für Gleitstein - Schwenkwiege

Position stroke piston with lever (Id.No. 2774491).

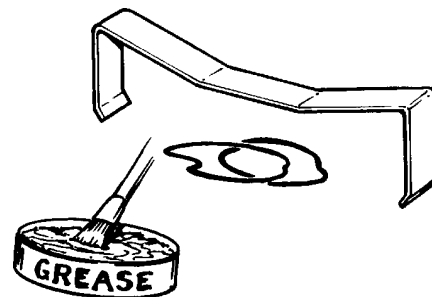
* Sliding stone guidance in the piston.



Lager, Draht, Gleitstein und Gelenkstift montieren.
Montagehilfe: z.B. - Klammer / Gummiringe / Fett

Assemble the bearing, wire, slide ring and joint pin
Assemble aids:

e.g. - clips / rubber rings / grease



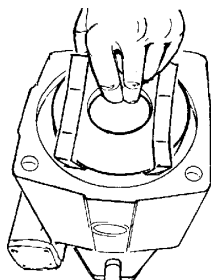
Schwenkwiege komplett ins Gehäuse einsetzen.
Auf korrekten Sitz der Schwenklager im Gehäuse
"achten".

⚠ Montagehilfe ausbauen.

Insert the swash plate into the housing.

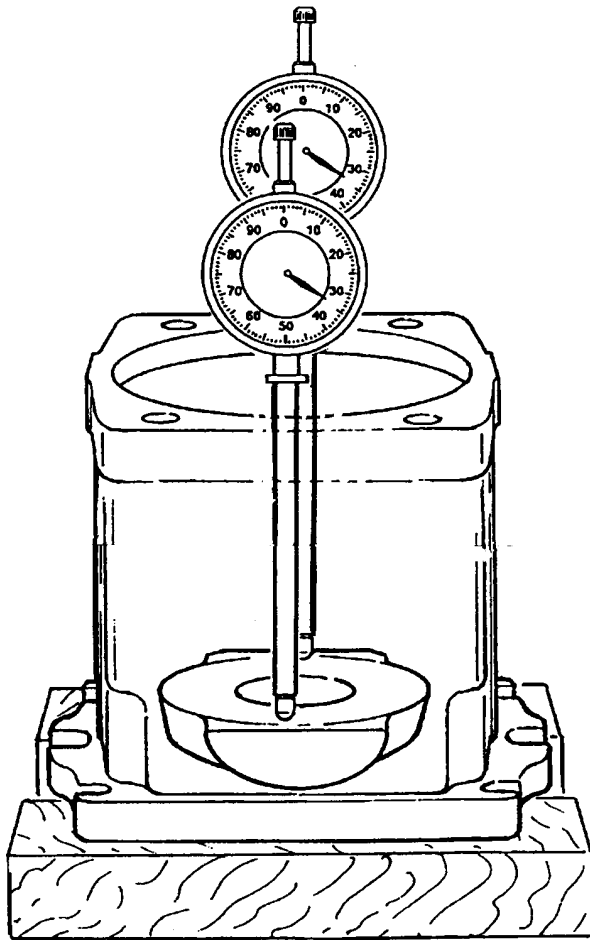
Ensure that the swivel-bearing is correctly located
in the housing.

⚠ Remove assembly aid.



Pumpe montieren

Assembly of the pump



Kontrolle: Sitz der Schwenklager in der Lagerbahn.

Mittig stellen mit Meßvorrichtung (Uhr oder Tiefenmaß)

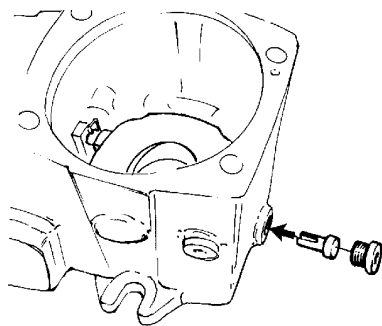
Punkt 1 und 2 kontrollieren - gleiches Maß.



Check: Location of the swivel-bearing in the bearing.

Centralise by using a measuring device (dial gauge or depth measurement).

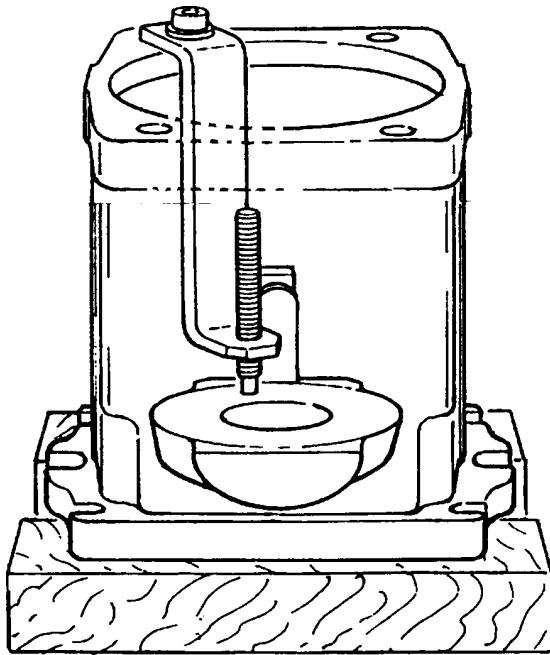
Check points 1 and 2 - they should have the same dimension.





Gelenkstift montieren.

Fit joint pin.

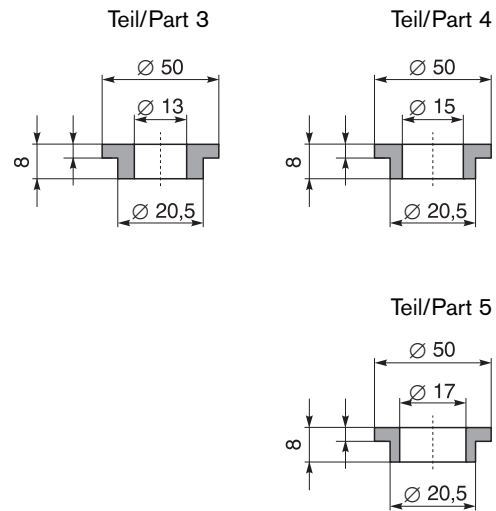
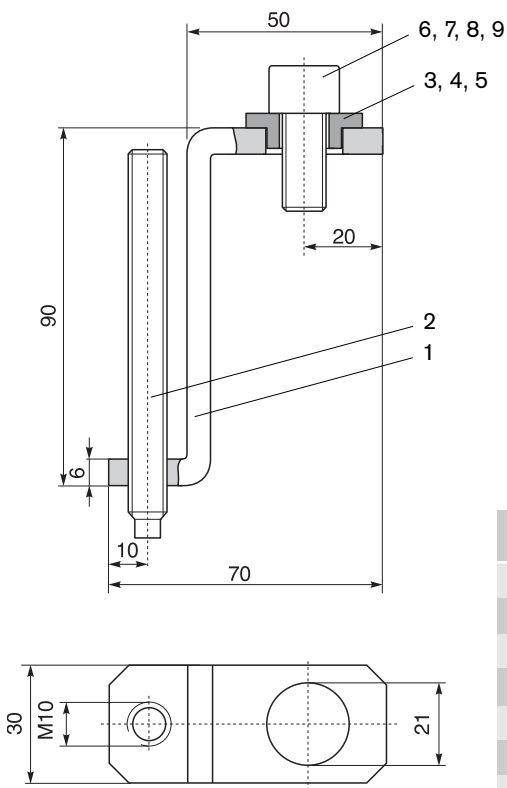
Pumpe montieren
Assembly of the pump



Haltevorrichtung montieren.
Mit Gewindestift Schwenkwiege festhalten.
 Keine Gewaltanwendung.

Fit holding device.
Hold swash plate in position utilising the set screw.
 Do not use force.

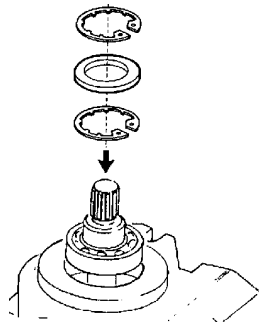
Haltevorrichtung "Schwenkwiege" A4V
Holding device "swivel cradle" A4V



Pos./Item	Benennung/Designation	Stck./Qty.
1	Winkel/Angle	2
2	Gewindestift/Threaded pin	2
3	Scheibe/Shim	2
4	Scheibe/Shim	2
5	Scheibe/Shim	2
6	Zyl. Schraube/Cyl. screw M12 x 25 DIN 912	2
7	Zyl. Schraube/Cyl. screw M14 x 25 DIN 912	2
8	Zyl. Schraube/Cyl. screw M16 x 30 DIN 912	2
9	Zyl. Schraube/Cyl. screw M20 x 35 DIN 912	2

Triebwerk einbauen

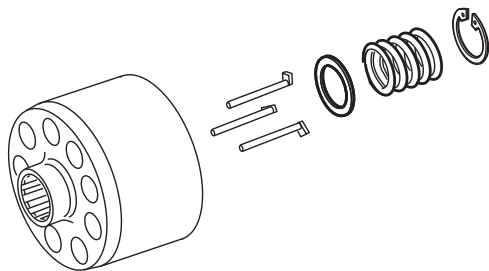
Installation of the rotary group



Neue Montageposition!

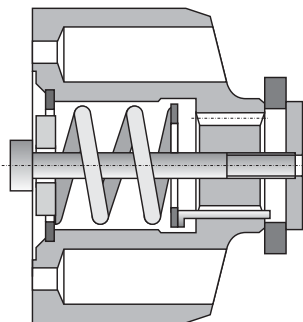
Triebwelle mit Lager und Wellendichtring einbauen.

Assemble drive shaft with bearings and radial seal rings.



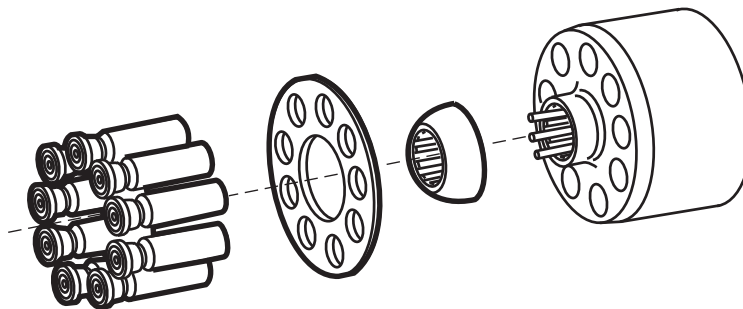
Mit Vorrichtung Druckstifte montieren.

Fit pressure pins using an assembly aid.



Feder mit Vorrichtung vorspannen.

Pre-tension the spring using a suitable device.



Kolben mit Rückzugeinrichtung montieren.

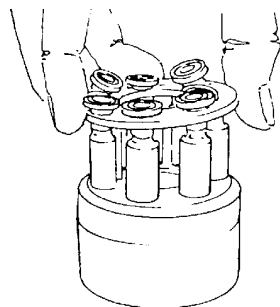
Hinweis:

Kolben, Gleitschuhe einölen.

Assemble piston with retaining plate.

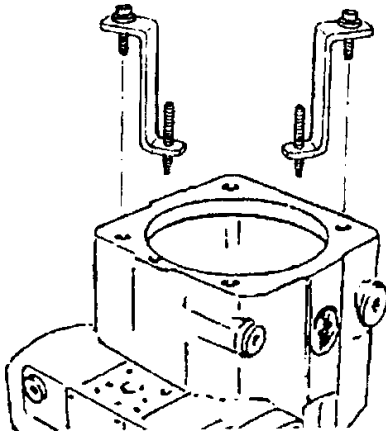
Note:

Oil piston and piston pad.



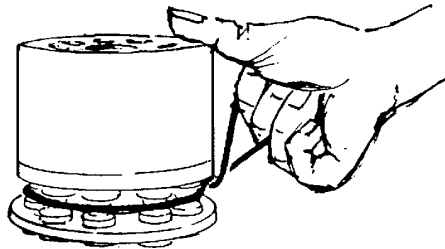
Triebwerk einbauen HW / HD / EP

Installation of the rotary group HW / HD / EP



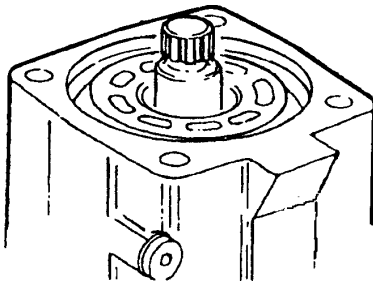
Vorrichtung ausbauen.
Zylinder mit Kolben und Rückzugeinrichtung einbauen.

Remove holding device.
Fit cylinder complete with pistons and retaining device.



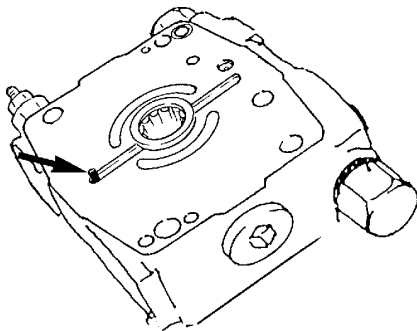
Montagehilfe:
Mit O-Ring Kolben festhalten.

Assembly aid:
Hold the pistons by using an O-ring.



Bei Ausführung mit Verdrillschraube:
Zylinder nach unten drücken - Verdrillschraube auf Maß x einschrauben.
* Kerbe in Montageposition.

For the version with eccentric screw:
Push the cylinder down - screw in the eccentric screw until dimension x is reached.
* groove in assembled position.

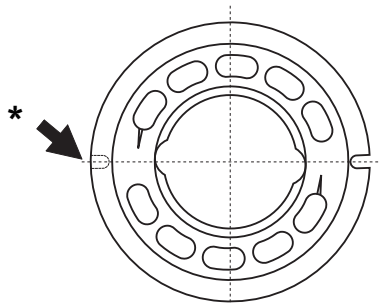


Fixierstift für Steuerplatte einsetzen.
Bei DA - Ausführung mit Verdrillschraube ohne Fixierstift.

Fit locating pin for control plate.
For the DA version with eccentric screw without locating pin.

Triebwerk einbauen HW / HD / EP

Installation of the rotary group HW / HD / EP

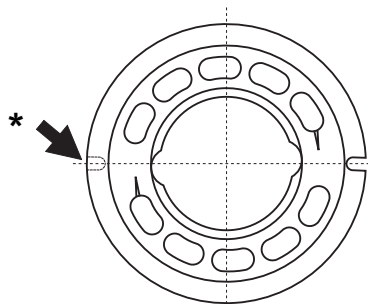


Steuerplatte Rechtslauf

* Fixierstift

Control plate, clockwise rotation

* Locating pin

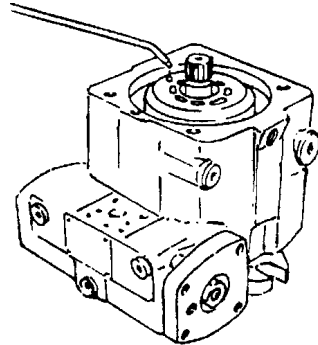


Steuerplatte Linkslauf

* Fixierstift

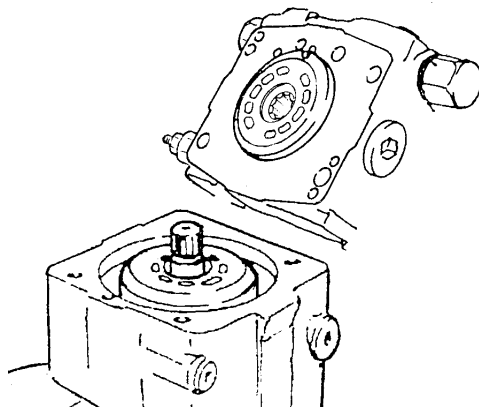
Control plate, anti-clockwise rotation

* Locating pin



Zylinderflächen einölen, neue O-Ringe mit Fett einreiben und einsetzen.

Oil the cylinder surfaces, grease the new O-rings and fit into place.



Lagerichtig aufsetzen.

Hinweis:

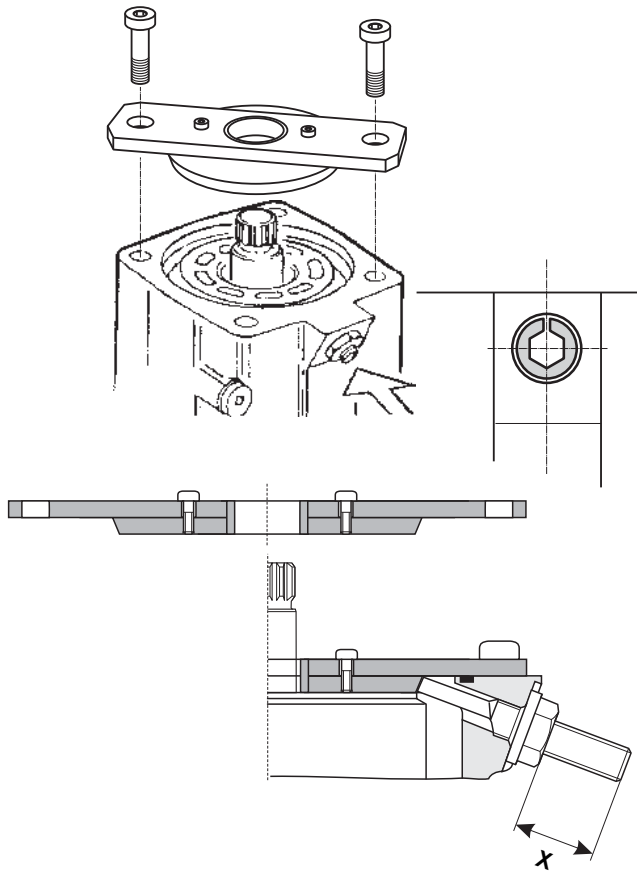
HW, HD, EP Steuerplatte mit Fett auf Anschlußplatte.

Place in correct position.

Note:

HW, HD, EP - Locate the control plate on the connection plate using grease.

Triebwerk einbauen DA Installation of the rotary group DA



Bei Ausführung mit Verdrillschraube:
Zylinder nach unten drücken - Verdrillschraube
auf Maß x einschrauben.
* Kerbe in Montageposition.

For the version with eccentric screw:
Push the cylinder down - screw in the eccentric
screw in the eccentric screw until dimension x is
reached.
* groove in assembled position.

! Maß X mit Vorrichtung neu ermitteln.
Zylinder mit Vorrichtung nach unten drücken.
Verdrillschraube bis Anschlag einschrauben -
Maß X - Kerbe in Montageposition drehen.

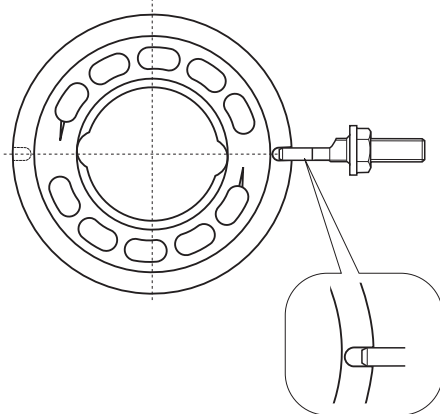
! Re-identify dimension X with device.
Push cylinder down with device.
Screw in eccentric screw till stop - Dimension X -
Turn groove in assembly position.

Ident. Nummer Hilfsvorrichtung/
Ident- No. Auxiliary device

NG / Size 28 = I 2 775 075

NG / Size 45 = I 2 774 882

NG / Size 63 = I 2 775 076

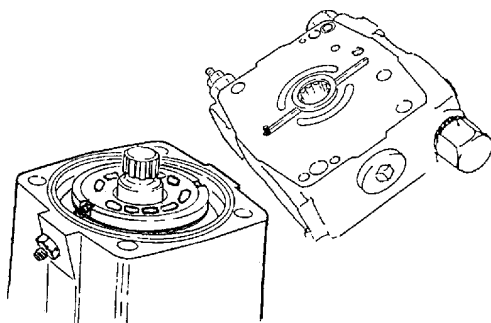


Steuerplatte Rechtslauf mit Verdrillschraube

Control plate, clockwise rotation with eccentric
screw

! Max. Einschraubtiefe beachten.
Einstellhinweis beachten

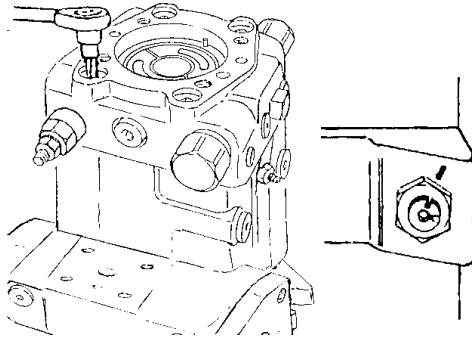
! Max. depth - take into account!



Lagerichtig aufsetzen.
Bei DA Steuerplatte auf Zylinderfläche legen.

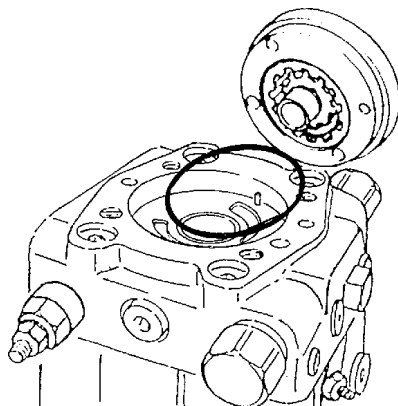
Place in correct position.
For the DA version, place control plate on the
cylinder surface.

Pumpe montieren Assembly of the pump



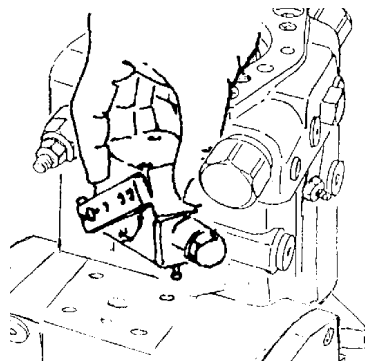
Schrauben über Kreuz anziehen.
Verdrillschraube auf Markierung drehen.

Tighten the screws across corners.
Turn the eccentric screw until the marker is reached.



Hilfspumpe montieren.

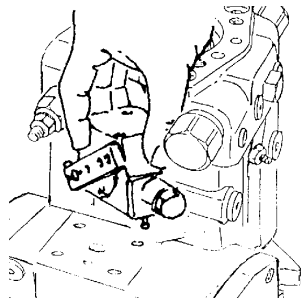
Fit boost pump.



Ansteuergerät mit Dichtung montieren.

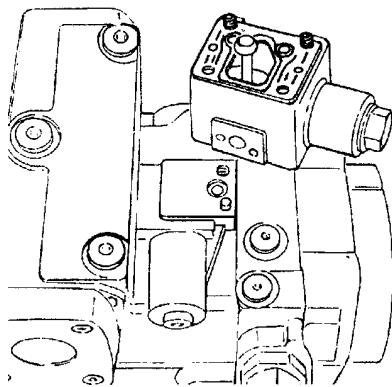
Fit control device with seal.

Pumpe montieren Assembly of the pump



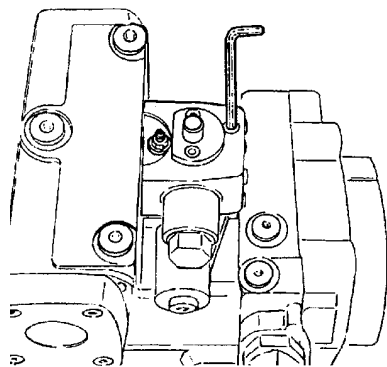
Ansteuergerät mit Dichtung montieren.

Fit control device with seal.



Dichtung mit zwei Befestigungsschrauben zentrieren und Ansteuergerät einbauen. Alle vier Schrauben mit halbem Drehmoment anziehen.

Centre the seal using two fixing screws and fit the control unit. Tighten all four screws to half of specified torque.



Fünfte Schraube einsetzen und mit Drehmoment = 10,4 Nm festziehen. Restliche vier Schrauben nach Drehmoment festziehen.

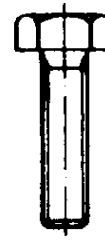
Fit the fifth screw and tighten to a torque of 10,4 Nm. Then tighten the other four screws to their correct torque.

Montageanweisung für Anziehdrehmomente

Assembly guidelines for tightening torques

1. Schafschrauben (nach N 08.001)

Die Werte gelten für Schafschrauben mit metrischem ISO-Gewinde nach DIN 13 Teil 13, sowie Kopfauflegemaßen nach DIN 912 Zylinderschrauben, DIN 931 Sechskantschrauben mit Schaft bzw. DIN 933 Sechskantschrauben mit Gewinde bis Kopf.



1. Bolts (to N 08.001)

The values stated are valid for bolts with metric ISO threads to DIN 13 part 13, as well as head areas to DIN 912 socket head cap screws, DIN 931 hexagon bolt or DIN 933 hexagon bolts with threads up to the head.

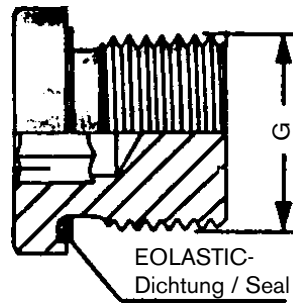
Gewinde / Thread	Festigkeitsklassen / Tensile strength class		
	8.8	10.9	12.9
	Anziehdrehmoment / Tightening torque M_A in Nm		
M3	1,1	1,6	1,9
M4	3,1	4,5	5,3
M5	6,1	8,9	10,4
M6	10,4	15,5	18
M8	25	37	43
M10	51	75	87
M12	87	130	150
M14	140	205	240
M16	215	310	370
M18	300	430	510
M20	430	620	720
M22	580	830	970
M24	740	1060	1240

Montageanweisung für Anziehdrehmomente

Assembly guidelines for tightening torques

2. **Verschlussschrauben** mit Innensechskant und Profildichtring (nach N 02.009).

2. **Plugs** with internal hexagon and profile seal ring (to N 02.009).



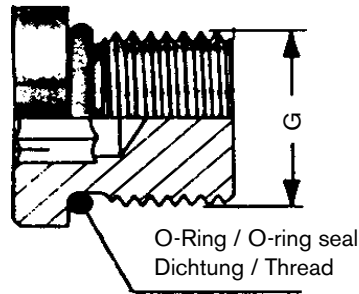
Gewinde / Thread	Anziehdrehmoment / Tightening torque M_A in Nm	Gewinde / Thread	Anziehdrehmoment / Tightening torque M_A in Nm
M8 x 1	5	G 1/8 A	10
M10 x 1	10	G 1/4 A	30
M12 x 1,5	20	G 3/8 A	35
M14 x 1,5	30	G 1/2 A	60
M16 x 1,5	35	G 3/4 A	90
M18 x 1,5	40	G 1 A	140
M20 x 1,5	50	G 1 1/4 A	240
M22 x 1,5	60	G 1 1/2 A	300
M26 x 1,5	70		
M27 x 2	90		
M30 x 1,5	100		
M33 x 2	140		
M42 x 2	240		
M48 x 2	300		

Montageanweisung für Anziehdrehmomente

Assembly guidelines for tightening torques

5. **Verschlussschrauben** mit Innensechskant, O-Ring und UNF-, UN-Gewinde nach SAE J 514 (nach N 02.106)

5. **Plugs** with internal hexagon, O-ring and UNF-, UN- threads to SAE J 514 (nach N 02.106)

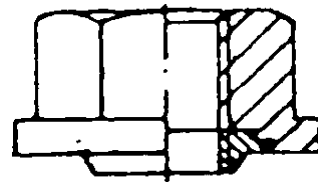


Gewinde / Thread	Anziehdrehmoment / Tightening torque M_A in Nm	Gewinde / Thread	Anziehdrehmoment / Tightening torque M_A in Nm
7/16 - 20 UNF	15	M12 x 1,5	10
1/2 - 20 UNF	20	M14 x 1,5	30
9/16 - 18 UNF	25	M27 x 1,5	35
3/4 - 16 UNF	72		
7/8 - 14 UN	127		
1 1/16 -12 UN	147		
1 3/16 -12 UN	173		
1 5/16 -12 UN	198		
1 5/8 -12 UN	320		
1 7/8 -12 UN	390		

6. **SEAL-LOCK-Dichtmuttern** (nach N 02.100)

6. **SEAL-LOCK - sealing nuts** (to N 02.100)

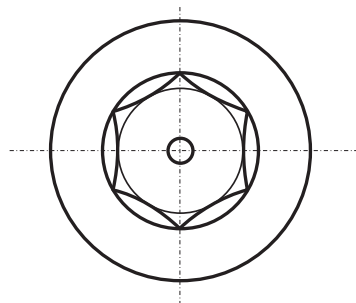
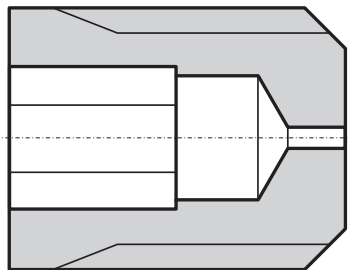
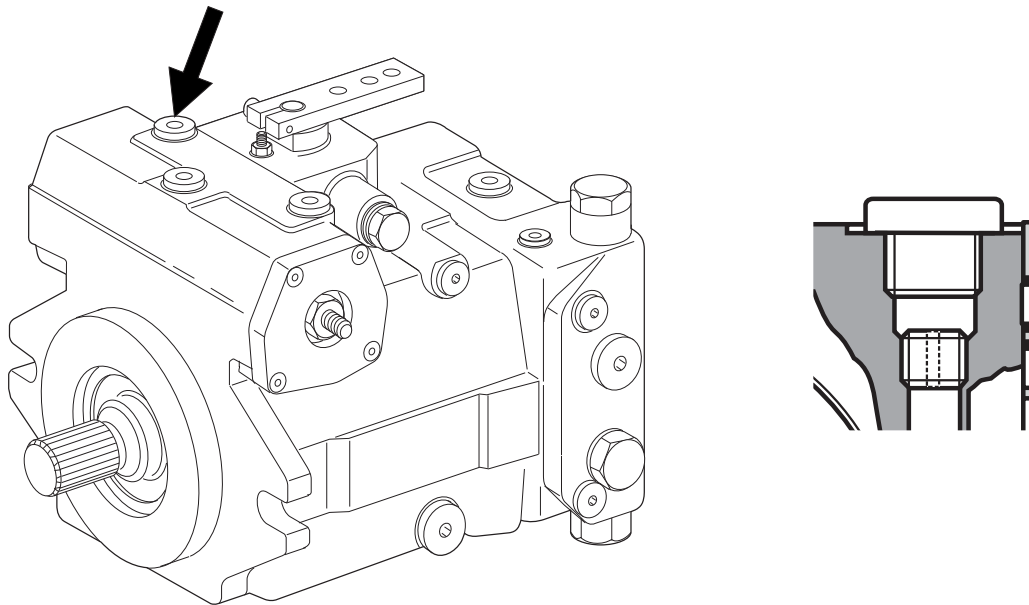
Gewinde / Thread	Anziehdrehmoment M_A in Nm Tightening torque M_A in Nm
M6	10
M6 x 0,5	11
M8	22
M8 x 1	24
M10	40
M10 x 1	44
M12	69
M12 x 1,5	72
M14	110
M14 x 1,5	120
M16	170
M16 x 1,5	180



Montageanweisung für Anziehdrehmomente

Assembly guidelines for tightening torques

A10V - Düsen / orifices



Gewinde / Thread	Anziehdrehmomente Nm / Tightening torques Nm	
	bisher / up to	neu / new
M6	6,5	3
M10	28	12

Sicherheitsbestimmungen

Safety regulations

Allgemein

- Machen Sie sich mit der Ausstattung der Maschine vertraut.
- Fahren Sie die Maschine nur, wenn Sie sich völlig mit den Bedien- und Steuerelementen sowie der Arbeitsweise der Maschine vertraut gemacht haben.
- Benutzen Sie Ihre Schutzausrüstung wie Schutzhelm, Sicherheitsschuhe und Gehörschutz.
- Machen Sie sich mit Ihrem Arbeitsgebiet vertraut.
- Benutzen Sie die Maschine nur für den ihr zugedachten Zweck.

Beachten Sie bitte die Richtlinien der Berufsgenossenschaft und des Maschinenherstellers



General advice

- Make yourself familiar with the equipment of the machine.
- Only operate the machine if you are completely familiar with the operating and control elements as well as the functioning of the machine.
- Use your safety equipment like helmet, safety shoes and hearing protection.
- Make yourself familiar with your working field.
- Only operate the machine for its intended purpose.

Please observe the guidelines of the Professional Association and the machine manufacturer.



Vor dem Start

- Beachten Sie die Bedienungshinweise vor dem Starten.
- Prüfen Sie die Maschine auf auffällige Fehler.
- Fahren Sie die Maschine nicht mit defekten Instrumenten, Kontrolleuchten oder Steuerorganen.
- Alle Schutzvorrichtungen müssen fest auf ihrem Platz sein.
- Nehmen Sie keine losen Gegenstände mit bzw. befestigen Sie diese an der Maschine.
- Halten Sie die Maschine von öligem und zündfähigem Material frei.
- Prüfen Sie vor dem Besteigen der Maschine, ob sich Personen oder Hindernisse neben oder unter der Maschine befinden.
- Vorsicht beim Besteigen der Maschine, benützen Sie Treppen und Griffe.
- Stellen Sie vor dem Start Ihren Sitz ein.

Before starting

- Observe the operating instructions before starting.
- Check the machine for remarkable faults.
- Do not operate the machine with defective instruments, warning lights or control elements.
- All safety devices must be in a secure position.
- Do not carry with you movable objects or secure them to the machine.
- Keep oily and inflammable material away from the machine.
- Before entering the driver's cabin, check if persons or obstacles are beside or beneath the machine.
- Be careful when entering the driver's cabin, use stairs and handles.
- Adjust your seat before starting.

Sicherheitsbestimmungen

Safety regulations

Starten


- Beim Starten müssen alle Bedienhebel in "Neutralstellung" stehen.
- Die Maschine nur vom Fahrersitz aus starten.
- Prüfen Sie die Anzeigeeinstrumente nach dem Start, um sicher zu gehen, daß alles ordnungsgemäß funktioniert.
- Lassen Sie die Maschine nicht unbewacht, während der Motor läuft.
- Beim Start mit Batterieverbindungskabeln verbinden Sie Plus mit Plus und Minus mit Minus. Massekabel (Minus) immer zuletzt anschließen und zuerst abtrennen.

Vorsicht


- Auspuffgase sind lebensgefährlich. Bei Start in geschlossenen Räumen für ausreichende Luftzufuhr sorgen!

Hydraulikanlage

1. Hydraulikanlage steht unter hohem Druck!

 Unter hohem Druck austretende Hochdruck- Flüssigkeiten (Kraftstoff, Hydrauliköl) können die Haut durchdringen und schwere Verletzungen verursachen. Daher sofort einen Arzt aufsuchen, da anderenfalls schwere Infektionen entstehen können!

2. Bei der Suche nach Leckstellen wegen Verletzungsgefahr geeignete Hilfsmittel verwenden!
3. Vor Arbeiten an der Hydraulikanlage diese unbedingt drucklos machen und angebaute Geräte absenken!
4. Bei Arbeiten an der Hydraulikanlage unbedingt Motor abstellen und Traktor gegen Wegrollen sichern (Feststellbremse, Unterlegkeil)!
5. Beim Anschließen von Hydraulikzylindern und -motoren ist auf vorgeschriebenen Anschluß der Hydraulikschläuche zu achten!
6. Bei Vertauschen der Anschlüsse umgekehrte Funktionen (z.B. Heben/Senken) - Unfallgefahr!
7. Hydraulikschlauchleitungen regelmäßig kontrollieren und bei Beschädigung und Alterung austauschen! Die Austauschschlauchleitungen müssen den technischen Anforderungen des Geräteherstellers entsprechen!

 Öle, Kraftstoffe und Filter ordnungsgemäß entsorgen!

Start


- When starting all operating levers must be in "neutral position".
- Only start the machine from the driver's seat.
- Check the indicating instruments after start to assure that all functions are in order.
- Do not leave the machine unobserved when the motor is running.
- When starting with battery connection cables connect plus with plus and minus with minus. Always connect mass cable (minus) at last and cut off at first.

Attention


- Exhaust gas is dangerous. Assure sufficient fresh air when starting in closed rooms!

Hydraulic equipment

1. Hydraulic equipment is standing under high pressure.

 High pressure fluids (fuel, hydraulic oil) which escape under high pressure can penetrate the skin and cause heavy injuries. Therefore immediately consult a doctor as otherwise heavy infections can be caused.

2. When searching leakages use appropriate auxiliary devices because of the danger of accidents.
3. Before working at the hydraulic equipment, lower pressure to zero and lower working arms of the machine.
4. When working at the hydraulic equipment, absolutely stop motor and secure tractor against rolling away (parking brake, shim)!
5. When connecting hydraulic cylinders and motor pay attention to correct connection of hydraulic flexible hoses.
6. In case of exchanging the ports, the functions are vice versa (f. ex. lift-up/lower) - danger of accidents!
7. Check hydraulic flexible hoses regularly and replace them in case of damage or wear! The new hose pipes must comply with the technical requirements of the machine manufacturer!

 Orderly disposal or recycling of oil, fuel and filters!

Einstellhinweise - ND-Ventil (Speisedruck)

Adjustment instructions - Low pressure valve (Boost pressure)

Achtung!
Sicherheitsbestimmungen beachten!

Hinweis:
Nachjustierung nur bei Betriebstemperatur.

Manometer an "G" anschließen.

Achtung!
* Speisedruckeinstellung!
Nenndruck p_H - 20 bar
Höchstdruck p_H - 40 bar
Bei Max.-Drehzahl.

Hinweis:
Einstelldaten nach Werksauftrag.

* bei DA-Ausführung

Attention!
Observe safety regulations!

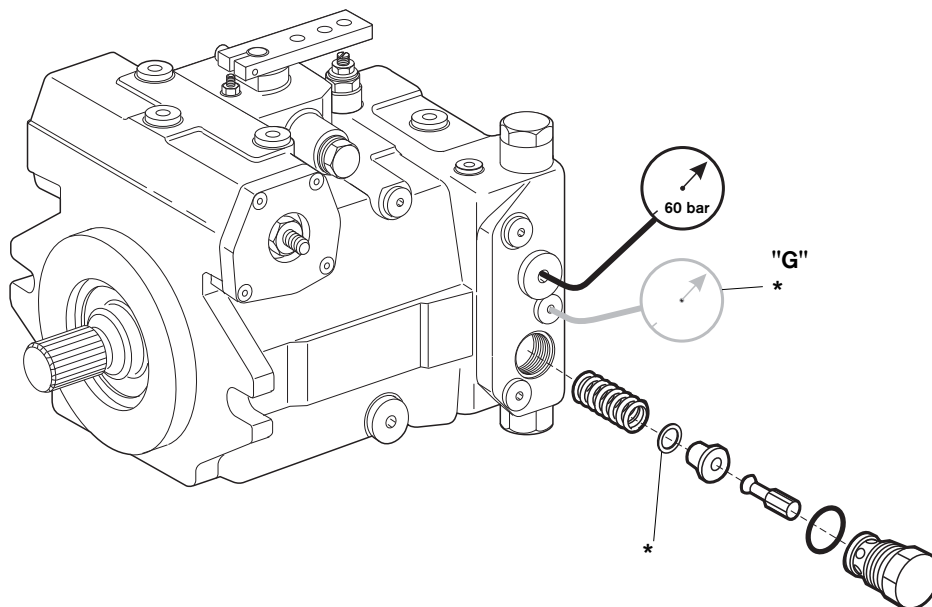
Note:
Readjusting only at operating temperature.

Connect pressure gauge to "G".

Attention!
* Boost pressure setting!
Nominal pressure p_H - 20 bar
Peak pressure p_H - 40 bar
at max. speed.

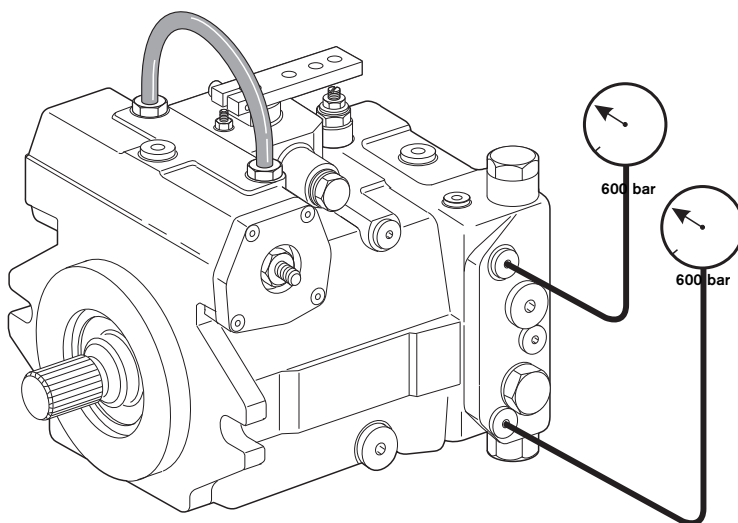
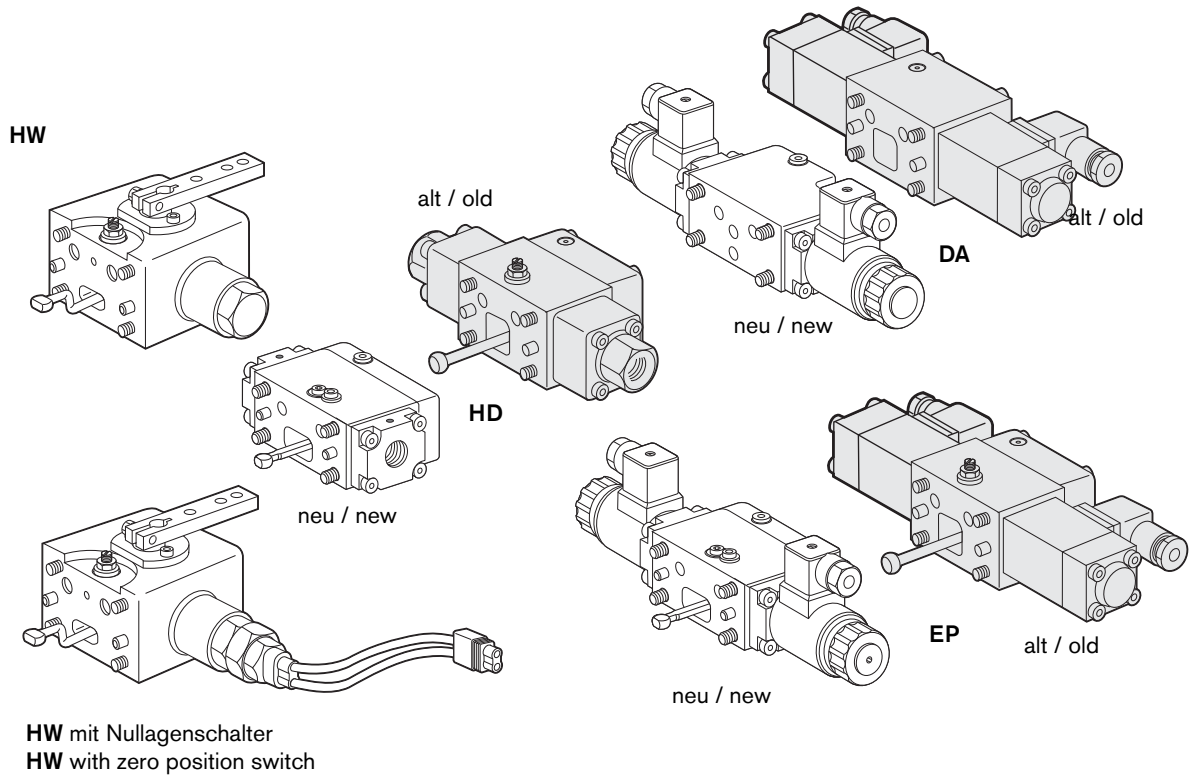
Note:
Setting data is in accordance to the works order.

* with the DA version



Einstellhinweise - Mechanische "Nullage"

Adjustment instructions - Mechanical "zero position"

**Achtung!**

Sicherheitsbestimmungen beachten!

Mit Schlauch NW6 beide Stellkammern verbinden. Vermeidung von Restsignal aus hydraulischer Nullage.

Manometer an M_A und M_B anschließen.

Nullage so einstellen, daß bei blockiertem Antrieb beide Manometer auf gleichem Druckwert stehen.

Hinweis:

Totband der Nullage - vermitteln.

Attention!

Observe safety regulations!

Connect both control chambers with a nominal size 6 hose. Avoidance of residual signals from hydraulic zero position.

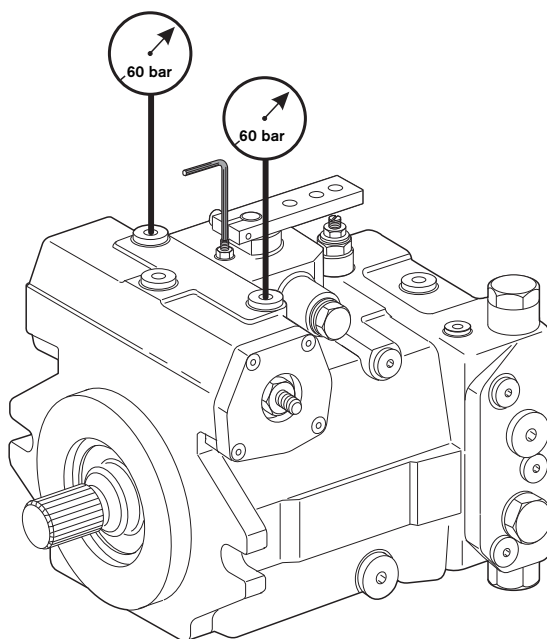
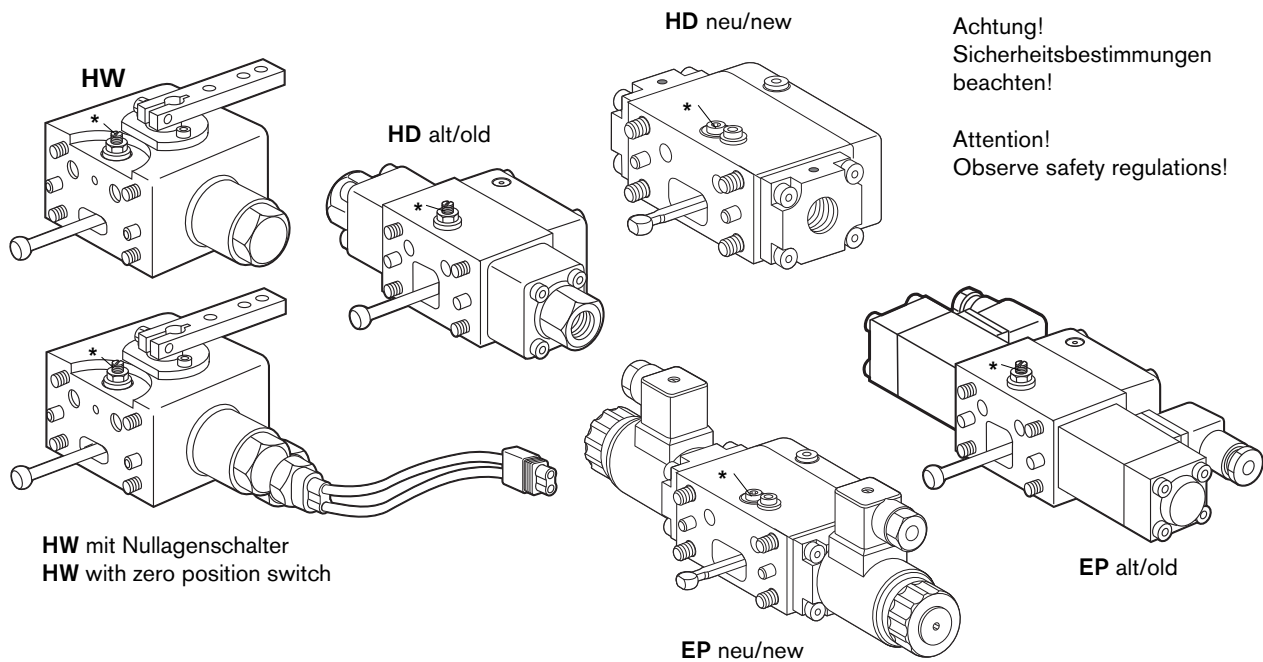
Connect pressure gauges to M_A and M_B . Adjust the zero position so that with at blocked drive both pressure gauges indicate the same pressure value.

Note:

Ascertain the zero position dead band.

Einstellhinweise - Hydraulische "Nullage"

Adjustment instructions - Hydraulic "zero position"



Manometer (60 bar) an X_1 und X_2 anschließen.

*** Nullage so einstellen, daß bei blockiertem Antrieb beide Manometer auf gleichem Druckwert stehen.**

Hinweis:

Excenterjustierung - nicht über $\pm 90^\circ$ verdrehen.

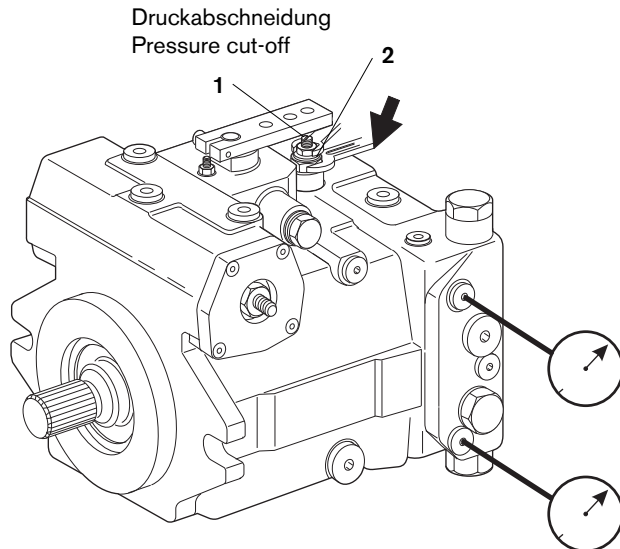
Connect pressure gauges(60 bar) to X_1 and X_2 .
*** Adjust the zero position so that with a block drive both pressure gauges indicate the same pressure value.**

Note:

Eccentric adjusting - Do not turn more than $\pm 90^\circ$.

Einstellhinweise - HD- Ventile (Hochdruck) und Druckabschneidung

Adjustment instructions - HP- valves (High pressure) and pressure cut-off



Druckabschneidung
Pressure cut-off

1

2

Achtung!

Sicherheitsbestimmungen beachten!

HD-Ventil ohne Bypass

1. HD-Ventile sind immer 10% höher eingestellt als die Druckabschneidung.
2. Nachjustierung nur bei Betriebstemperatur
Manometer (600 bar) an M_A und M_B anschließen.



Druckabschneidung:

Zum Blockieren der Druckabschneidung beim Überprüfen der Hochdruckventile die Einstellschraube Pos. 1 mit gelöster Kontermutter Pos. 2 bis zum Anschlag mit **max. 2 Nm im drucklosen Zustand eindrehen!**

HD-Ventile: Mit geringer Pumpenmenge über Ventile fahren. Einstellwert kontrollieren.

(Nur kurzzeitig "Temperatur".)

Einstellwert verändern - siehe Serviceinfo

Druckabschneidung:

Einstellschraube auf Maß (*) zurückdrehen.

Druckwert kontrollieren bzw. nachjustieren.

Achtung! Differenz von 10% HD-Ventile und Druckabschneidung beachten!

Hinweis: Einstelldaten nach Werksauftrag.

Attention!

Observe safety regulations.

HP valve without bypass-function

1. HP valves are always adjusted 10% higher than the pressure cut-off.
2. Readjusting only at operating temperature.



Connect pressure gauge (600 bar) to M_A and M_B .
Pressure cut-off:

To block the pressure cut-off when testing the high pressure valves, the adjustment screw (item 1), with the lock-nut (item 2) loosened, has to be screwed in

with a max. torque of 2 Nm in the depressurised condition until the end stop is reached.

HP valves: Operate the valves with small pump flow over the valves.

Check setting value. (only for a short time "temperature").

Change setting value - see service information.

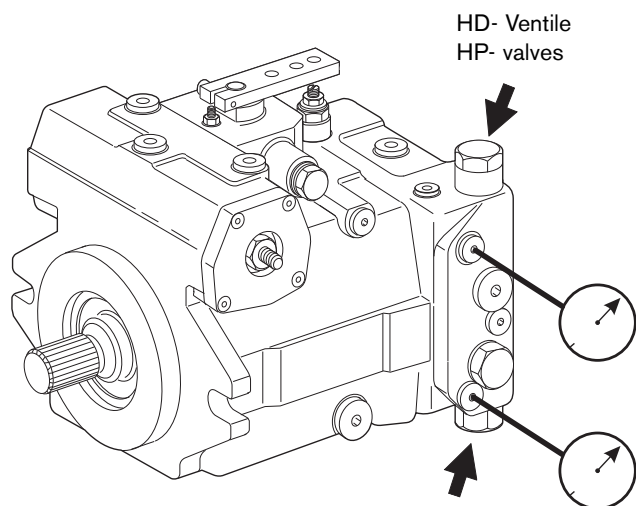
Pressure cut-off:

Turn back setting screw to measurement (*).

Check pressure value and readjust if necessary.

Attention! Observe the 10% pressure difference between the HP valves and the pressure cut-off!

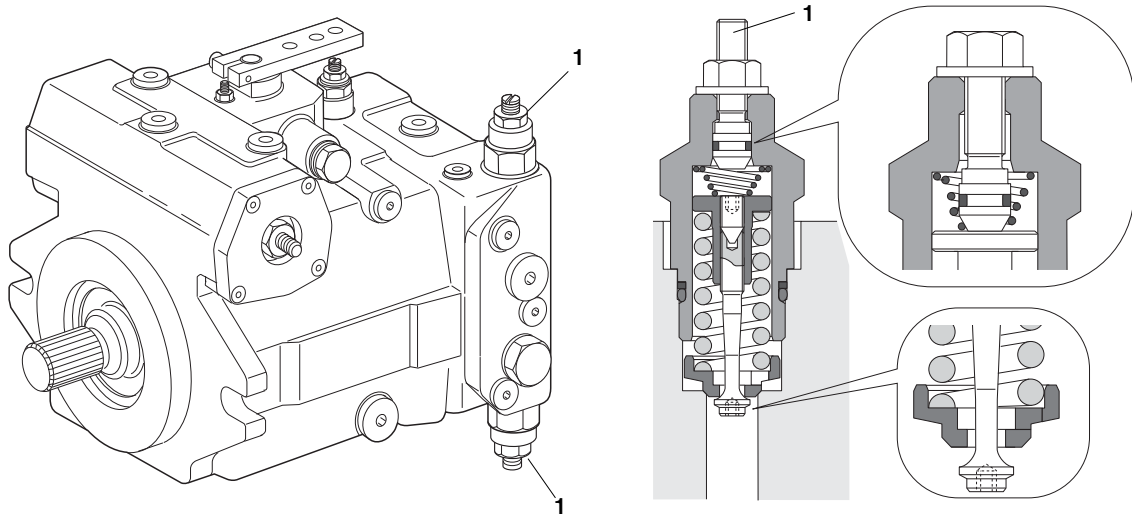
Note: Setting data is in accordance with the works order.



HD- Ventile
HP- valves

Einstellhinweise - Bypassventil HW, HD, EP

Adjustment instructions - Bypass valve HW, HD, EP



Fahrzeuge mit rein-hydrostatischem Fahrtrieb bzw. mit hydrostatischem Fahrtrieb und Schaltgetriebe ohne Leerlaufstellung (Freilauf).

Vehicle with a pure hydrostatic transmission or with a hydrostatic drive with gear box without free wheel position.

Hydrostatischer Antrieb / Bypass-Schaltung

Hydrostatic transmission / Bypass condition

In diesem Fall wird der Fahrtrieb auf freien Umlauf geschaltet. Zu diesem Zweck haben die in der Verstellpumpe integrierten Hochdruckbegrenzungsventile eine sogenannte Bypass-Funktion. D.h. durch Drehen der entsprechenden Schraube (Pos.1) wird der Ventil-Einsatz so entspannt, daß ein freier Öl-Umlauf möglich ist.

In this case the travel drive is switched on to the free wheel position. For this purpose the high pressure valves of the variable displacement pump have a so-called bypass function. By turning the relevant screw (item 1) the valve is so released that free oil circulation is made possible.

! Bypass: Pos.1 einschrauben bis eben mit Mutter. Mutter wieder anziehen.

! Bypass: Screw in item 1 until it is level with the nut.

Schleppgeschwindigkeit

Die maximale Schleppgeschwindigkeit sollte 2 km/h nicht überschreiten.

Towing speed

The max. towing speed of 2 km/h should not be exceeded.

- Höhere zulässige Schleppgeschwindigkeiten sind abhängig von der Hydromotordrehzahl bzw. dem eingelegten Gang.

- Higher permissible speeds are depended on the hydraulic motor speed or the selected gear.

Abschleppdistanz

Die Schleppentfernung sollte 1 km nicht überschreiten.

Towing distance

The towing distance should not exceed 1 km.

- Bei fehlender Einspeisung entleert sich der Hydraulik-Kreislauf. Zu beachten ist die Wärmeentwicklung im Hydromotor-Triebwerk.

- With no boost available the hydraulic circuit drains. The heat generation in the hydraulic motor rotary group has to be taken into account.

Abschleppvorgang beendet

Nach beendetem Abschleppvorgang Pos.1 zurückdrehen. Der ursprüngliche Einstellwert der Hochdruckventile liegt somit wieder vor.

Termination of the towing operation

After termination of the towing operation turn back item 1. The original set pressure value is thereby available.

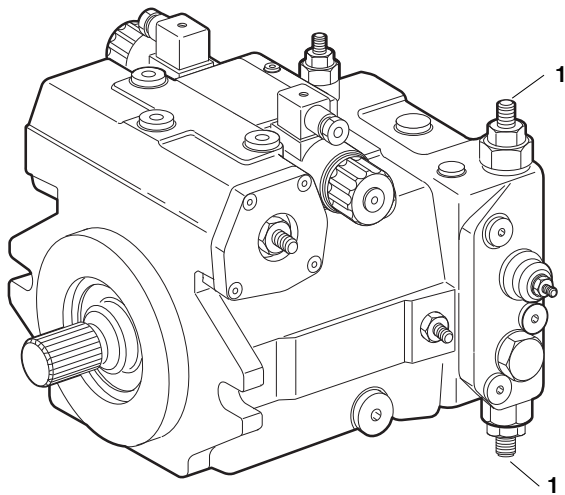
! Ventilfunktion: Pos.1 zurückschrauben bis Anschlag. Mutter anziehen.

! Valve function: Screw back item 1 up to stop. Screw up the nut.

Einstellhinweise - Bypassventil DA

Adjustment instructions - Bypass valve DA

A10VG 28-45
DA-Control



Fahrzeuge mit rein-hydrostatischem Fahrtrieb bzw. mit hydrostatischem Fahrtrieb und Schaltgetriebe ohne Leerlaufstellung (Freilauf).

Hydrostatischer Antrieb / Bypass-Schaltung

In diesem Fall wird der Fahrtrieb auf freien Umlauf geschaltet. Zu diesem Zweck haben die in der Verstellpumpe integrierten Hochdruckbegrenzungsventile eine sogenannte Bypass-Funktion. D.h. durch Drehen der entsprechenden Schraube (Pos.1) wird der Ventil-Einsatz so entspannt, daß ein freier Öl-Umlauf möglich ist.



Bypass: Pos.1 einschrauben bis Schraube am Federteller anliegt.
Maximal 1/2 Umdrehung weiter drehen.

Schleppgeschwindigkeit

Die maximale Schleppgeschwindigkeit sollte 2 km/h nicht überschreiten.

- Höhere zulässige Schleppgeschwindigkeiten sind abhängig von der Hydromotordrehzahl bzw. dem eingelegten Gang.

Abschleppdistanz

Die Schleppentfernung sollte 1 km nicht überschreiten.

- Bei fehlender Einspeisung entleert sich der Hydraulik-Kreislauf.
Zu beachten ist die Wärmeentwicklung im Hydromotor-Triebwerk.

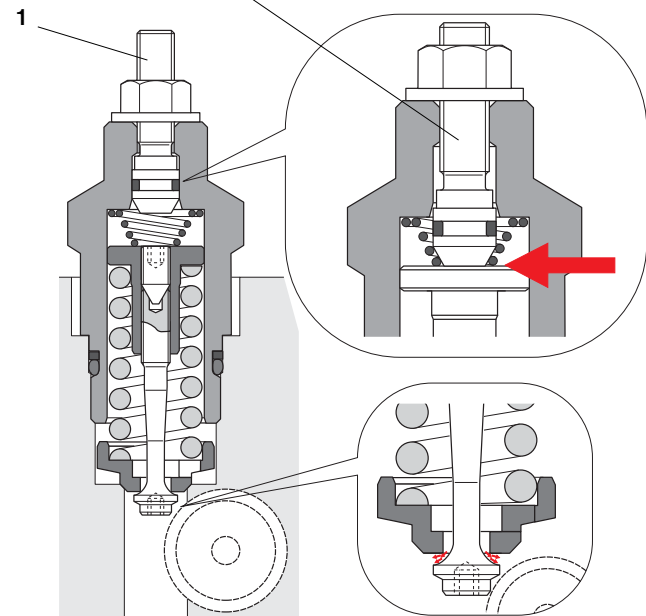
Abschleppvorgang beendet

Nach beendetem Abschleppvorgang Pos.1 zurückdrehen. Der ursprüngliche Einstellwert der Hochdruckventile liegt somit wieder vor.



Ventilfunktion: Pos.1 zurückschrauben bis Anschlag. Mutter anziehen.

Bypass: Pos.1 einschrauben bis Schraube am Federteller anliegt.Schraube maximal 1/2 Umdr. weiterdrehen!
Bypass: Screw in item 1 until contact, max 1/2 turn more.



Vehicle with hydrostatic transmission and gear shift without idling setting position (free wheeling).

Hydrostatic transmission / Bypass-switching

In this case the travel transmission is switched on to free wheeling.For this purpose the variable displacement pump has incorporated high pressure relief valves with bypass function. The screw (item 1) is unscrewed to such an extent, that the valve cartridge is released and free oil circulation is possible.



Bypass: Screw in item1 until contact,
Max. 1/2 turn more.

Towing speed

The max. towing speed of 2 km/h should not be exceeded.

- Higher admissible towing speeds depend on the available hydr. motor speed and engaged gear shift.

Towing distance

The towing distance should not exceed 1 km.

- If there is a lack of oil boosting, the hydraulic circuit will get empty.
Take care of the heat development in the hydr. motor-rotary group.

Towing operation terminated

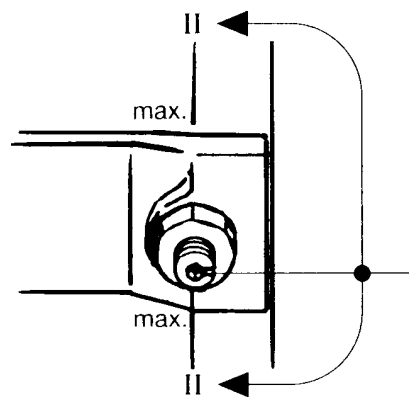
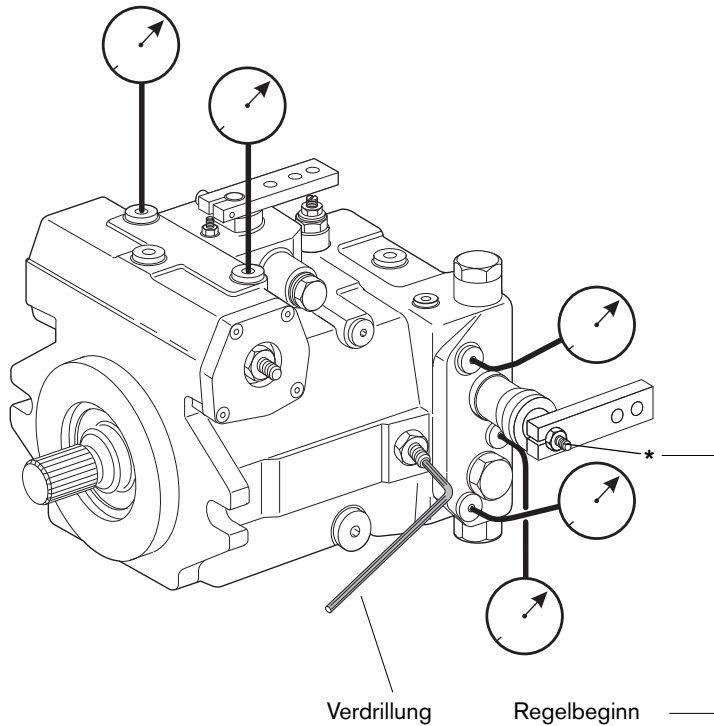
After termination of the towing operation turn item 1 back. The original pressure value setting of the high pressure relief valves will be available again.



Valve function: Screw back item 1 up to stop.
Screw up the nut.

Einstellhinweise - DA- Regelung

Adjustment instructions - DA control



Achtung!

Sicherheitsbestimmungen beachten!

Überprüfung der Einstelldaten
Betriebstemperatur soll während des Überprüfungs Vorgangs weitgehend konstant gehalten werden.

Antriebsmotor starten, Leerlaufdrehzahl

Blockzustand

Fahrtrichtungsschalter "0"

Motordrehzahl langsam steigern bis zur max.

Motordrehzahl, dabei Meßgeräte beobachten.

Speisedruck:

Leerlaufdrehzahl

Psp = ca. 15-20 bar

max. Motordrehzahl

Psp = bar*

Blockzustand

Fahrtrichtungsschalter - vorwärts

(Straßengang und Festgebremst)

Einstelldaten Pumpe A10V/DA überprüfen

* Regelbeginn

HD 40 - 50 bar

Motordrehzahl min.¹ * Psp bar*

HD bar

Nachjustierung - Regelbeginnschraube

Regelende

HD bar*

Motordrehzahl min.¹ * Psp bar*

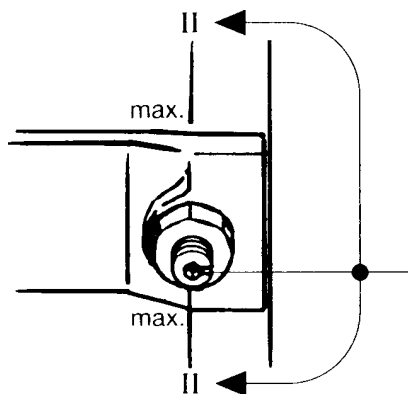
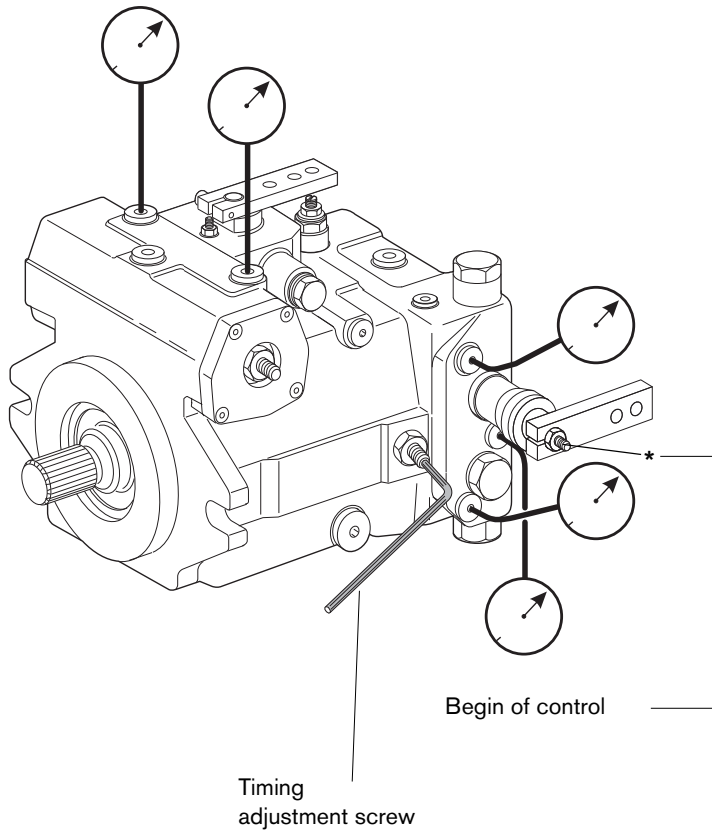
Nachjustierung - Verdrillschraube

Hinweis:

Excenterjustierung - Drehrichtung beachten

Hinweis: * Einstelldaten nach Werksauftrag!

Einstellhinweise - DA- Regelung
Adjustment instructions - DA control



Attention!
 Observe safety regulations!

Check setting data.
 Operating temperature should be generally kept constant during the checking procedure.
 Start prime mover, idle speed.

Block position

Drive direction switch - "0".
 Slowly increase motor speed up to the max. motor speed and observe measuring instruments.

Boost pressure:

Idle speed of prime mover
 Psp = approx. 15 - 20 bar
 max. motor speed
 Psp = bar*

Block position

Drive direction switch - **forwards**
 (Road gear and fully applied brake)

Check setting data pump A4VIDA

*** Start of control:**

HD 40 - 50 bar
 Motor speed rpm* Psp bar*
 HD bar*
 Readjustment of start of control screw

End of control

HD bar
 Motor speed rpm* Psp bar*
 Readjustment of the indexing screw

Note:
 Eccentric adjusting - observe direction of rotation.

Note: * Setting data is in accordance to the order work!

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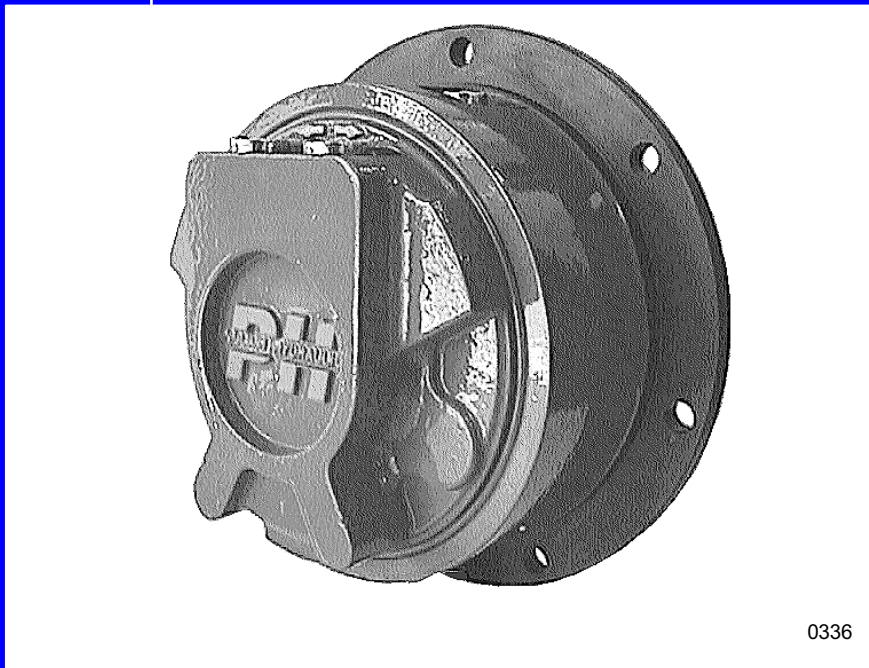
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10.3 Drum drive

Hydraulikmotoren *Hydraulic motors*

MK 04

Reparaturen
Repairs



0336

Reparaturen
Repairs

Beschreibung
Description

Dieses Dokument richtet sich an die Hersteller von Maschinen und Systemen, die Produkte von **POCLAIN-HYDRAULICS** einbauen, deren Artikelnummer auf der Titelseite genannt sind. Es beschreibt die Installationsangaben und den Inbetriebnahmevergong, damit ihre optimale Funktionsweise gewährleistet wird.

Es wird empfohlen, daß sämtliche Arbeiten von Monteuren mit einer angemessene Ausbildung durchgeführt werden. Sie müssen die Informationen in diesem Dokument gelesen und verstanden haben und vom Hersteller der Maschine bevollmächtigt sein. Selbstverständlich müssen die Monteure die Richtlinien zur Sicherheit und zur Unfallverhütung beachten.

Dieses Dokument enthält wichtige Hinweise zur Sicherheit. Sie werden auf folgende Weise gekennzeichnet:



Sicherheitshinweis.

Dieses Dokument enthält weiterhin wesentliche Anweisungen zum Betrieb des Produkts sowie allgemeine Informationen. Sie werden auf folgende Weise gekennzeichnet:



Wesentliche Anweisung.



Allgemeine Information.

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Jegliche Änderung einstellbarer Parameter der PH Produkte kann eine Neuzulassung der Maschinen erforderlich machen.

Mit dem Ziel, den besten Service zu bieten, empfiehlt **POCLAIN HYDRAULICS** seinen Kunden, jede Anwendung von **POCLAIN HYDRAULICS** prüfen und freigeben zu lassen.

Das Öffnen der Produkte führt zum Garantieverlust. Verwenden Sie nur Original-Ersatzteile von **POCLAIN HYDRAULICS**. Die Montage von Teilen anderen Ursprungs könnte den Betrieb des Bauteils und des Systems sowie die Sicherheit beeinträchtigen.

Stets um die Verbesserung seiner Erzeugnisse bemüht, behält sich **POCLAIN HYDRAULICS** das Recht vor, ohne vorherige Ankündigung alle Änderungen vorzunehmen, die als nützlich für die in diesem Dokument beschriebenen Produkte bewertet werden.

Dieses Dokument enthält Abschnitte auf deutsch und kursiv gedruckte Abschnitte, die Übersetzung in englischer Sprache darstellen.

Im Zweifelsfall ist die französische Version ausschlaggebend.

Die Maße sind in metrischen Einheiten angegeben. Die Entsprechungen in anderen Meßsystemen (vor allem angelsächsisch) werden zur Unter- richtung angegeben.

Die Abbildungen haben unverbindlichen Charakter.

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*This document is provided to machine manufacturers integrating **POCLAIN-HYDRAULICS** products. It suggests basic installation specifications and commissioning processes that manufacturers may utilize to assure optimal functioning of the products.*

It is recommended that any operation be performed by engineers trained accordingly. The engineers should read and understand the information given in this document and be authorized by the machine manufacturer.

It is essential that the engineers comply with safety instructions to prevent injury.

This document includes major safety warnings announced in this way:



Safety warning.

Additionally, this document includes instructions essential to product function as well as those providing general information. Both are announced similar to the following examples:



Essential instruction.



General information.

POCLAIN HYDRAULICS designs products which are integrated by its customers in the machines they design.

Subsequently **POCLAIN HYDRAULICS** disclaims liability for consequences of improper integration of its products and of improper set-up of adjustable devices. In the same way, **POCLAIN HYDRAULICS** may not be liable for incomplete or improper operating and maintenance instructions provided to the end user by the machine manufacturer nor for failures resulting from operations performed by any person using these suggested procedures.

A re-certification of the machine may be required for every change in set-up of adjustable devices.

In order to offer the best quality service, **POCLAIN HYDRAULICS** recommends to its customers to have applications approved by **POCLAIN HYDRAULICS.**

Opening of products disrupts the warranty contract.

Use only **POCLAIN HYDRAULICS** genuine spare parts. Using parts from different source could reduce the performance of the components or systems and pose a safety hazard.

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This document contains sections written in German and sections printed in italics composing the English translation of the French version. The French version will be the reference in case of dispute.

All measures are expressed in metric units. Converted values to other systems (notably US and UK) are given for reference only.

The illustrations for information only.

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Sicherheit und Qualität

Vor den Wartungsarbeiten

- Alle notwendigen Sicherheitsvorkehrungen treffen (Menschen und Material) und die geltenden Sicherheitsvorschriften beachten.
- Parkbremse betätigen und Maschine mit Keilen festsetzen.
- Energieerzeugung (Motor) des Hydrauliksystems abstellen und die Stromversorgung ausschalten.
- Gegebenenfalls eine Sicherheitszone einrichten.
- Die Außenflächen der Bauteile reinigen, um Schmutz und Fett restlos zu entfernen.
- Warten, bis das Hydrauliksystem vollständig abgekühlt und druckentlastet ist (die Sammler entlasten).
- Die Hydraulikflüssigkeit, die sich eventuell noch in den Gehäusen der Bauteile befindet, ausleeren. Die gebrauchte Flüssigkeit auffangen und umweltschonend entsorgen.



Das heiße oder unter Druck stehende Öl kann zu schweren Verbrennungen mit Entzündung führen. Bei einem Unfall einen Arzt hinzuziehen.

Während der Wartungsarbeiten

- Bestimmte Bauteile sind sehr schwer. Sie müssen bei der Abnahme vom Rahmen mit einer angemessenen ausgelegten Hebevorrichtung gehalten werden.
- Die Sauberkeit ist wesentlich beim Betrieb der Hydraulikbauteile. Die meisten Teile können mit einem sauberen Lösungsmittel gereinigt werden.
- Während der Handhabung alle empfindlichen Oberflächen gegen Stöße schützen (Zentrierungen, gleitende Teile, Auflagen, Dichtungs- und Lagerauflagen usw.).
- Diese Flächen vor dem Wiederausammenbau reinigen.
- Systematisch die demontierten Dichtungen beim Wiederausammenbau durch neue ersetzen. Wir empfehlen, vor der Montage alle Dichtungen zu fetten.
- Alle gleitenden Flächen durch Aufbringen eines Films sauberer Hydraulikflüssigkeit ölen, der eine korrekte Schmierung beim ersten Neustart gewährleistet.
- Niemals die Hydraulikflüssigkeit, die sich bei hohen Temperaturen entzünden kann, erwärmen. Einige Lösungsmittel sind ebenfalls entzündlich. Während der Arbeiten nicht rauchen.

Nach den Wartungsarbeiten

Die Bauteile wieder einbauen und das Hydrauliksystem gemäß den Anweisungen in den folgenden Dokumenten wieder in Betrieb nehmen:

- INSTALL MK04 D/GB (ref. 800078171T)
- INSTALL CIRCUITS D/GB (ref. 677777853U)



Die Sicherheitsventile nicht überregulieren.

Safety and Quality

Before servicing

- *Be extremely careful to prevent personal injury and to avoid damage to material. Comply with all safety regulations.*
- *Apply the parking brake and prevent the machine from rolling with tire blocks.*
- *Stop the hydraulic system power source (engine) and disconnect the battery.*
- *If necessary, block off the safety area.*
- *Wash dirt and grease from exterior of the components.*
- *Await the complete cooling down and depressurization of the hydraulic system (accumulators must be purged).*
- *Flush the casings of the hydraulic components which may retain hydraulic fluid. Collect the old hydraulic fluid preventing contamination of the environment.*



Hot or pressurized hydraulic fluid may cause serious burns & infections to the human body. Consult a physician in case of accident.

During servicing

- *Some hydraulic components are very heavy. Secure them with a lifting device of adequate capacity when removing from the machine frame.*
- *Cleanliness is essential to functioning of the hydraulic components. Most of the parts may be cleaned with a clean solvent.*
- *During handling, protect all sensitive surfaces from shocks (piloting and interface surfaces, thrust & bearings surfaces, seal races, etc...)*
- *Clean up these surfaces before reassembly.*
- *Always install new O-rings, seals & gaskets discarding the old ones. We recommend lubricating all seals prior to assembly.*
- *Lubricate all surfaces which have relative motion between parts by coating them with a film of clean hydraulic fluid to assure lubrication at first start.*
- *Never heat hydraulic fluid, as it may flame at high temperature. Some solvents are also flammable. Do not smoke during servicing.*

After servicing

Reinstall the components and restart the hydraulic system according to instructions defined in the following documents:

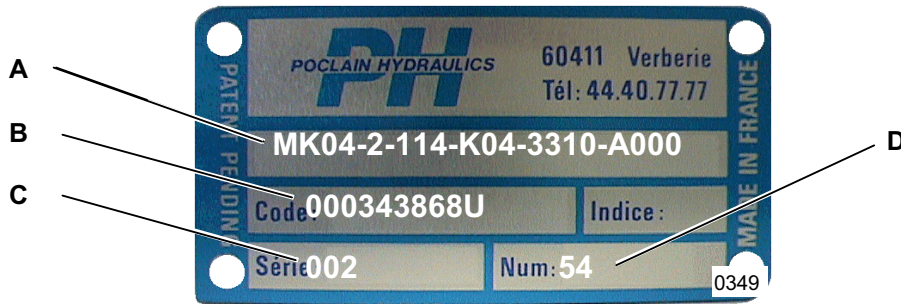
- *INSTAL MK04 F/GB (ref. 800078101S)*
- *INSTAL CIRCUITS F/GB (ref. 677777831V)*



Do not overset relief valves.

Identifizierung des Bauteils

Identification of the component.



A : Handelsbezeichnung:
Ex : MK04-2-114-K04-3310-A000

A: Commercial description:
E.g : MK04-2-114-K04-3310-A000

B : Code : Artikelnummer
Ex : 000343868U

B: Code: Part number.
E.g : 000343868U

C : Série : Herstellungsnummer
Ex : 002

C: Series: Manufacturing batch number.
E.g : 002

D : Num : Chronologische Ordnungsnummer
Ex : 54

D: Num: Chronological serial number.
E.g : 54



Bei jeder Bestellung von Ersatzteilen müssen die Artikelnummer und die Ordnungsnummer angegeben werden.



The part number and the chronological order number must be specified to order spare parts.

Austauschen des Motors

Ausbau

- Druck im Arbeitskreis abbauen.
- Leckageleitung am Tank abschrauben, um ein Leerlaufen zu verhindern.
- Die Rohre oder Schläuche, die am Motor angeschlossen sind, abklemmen.
- Die Befestigungsschrauben demontieren und den Motor ausbauen.
- Das Motorgehäuse entleeren.

Einbau

- Den Zustand der Befestigungsflächen kontrollieren.
- Den Motor einsetzen.
- Die Befestigungsschrauben einsetzen und anziehen.

MOTOREN	Anziehmoment (Nm)	
	cl. 10.9	cl. 12.9
MK04	300	350

Bei den Anziehmomenten handelt es sich um Kennwerte.

- Das Gehäuse gemäß den Anweisungen in folgendem Dokument befüllen:
INSTALL MOTOR MK04 D/GB (ref 800078171T)

Replacing the motor

Removal

- Release the pressure in the supply lines.
- Disconnect the leakage line at the tank end to avoid its siphoning.
- Disconnect and plug the pipes or hoses which are connected to the motor.
- Disconnect the mounting bolts, and remove the motor.
- Drain the casing.

Installation

- Check the condition of the surface on which the motor is mounted.
- Position and mount the motor.
- Fit and tighten the mounting bolts.

MOTORS	Tightening torque N.m [lbf.ft]	
	cl. 10.9	cl. 12.9
MK04	300 [221.2]	350 [258.1]

Torques given for information only.

- Fill the casing according to instructions defined in the following documents:
INSTAL MOTEUR MK04 F/GB (ref 800078101S)

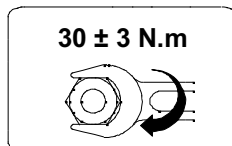
Mechanische Bremslösung.

Bei bestimmten Reparaturfällen oder zum Abschleppen der Maschine muß die integrierte Parkbremse gelöst werden. Führen Sie dazu folgende Arbeiten durch:

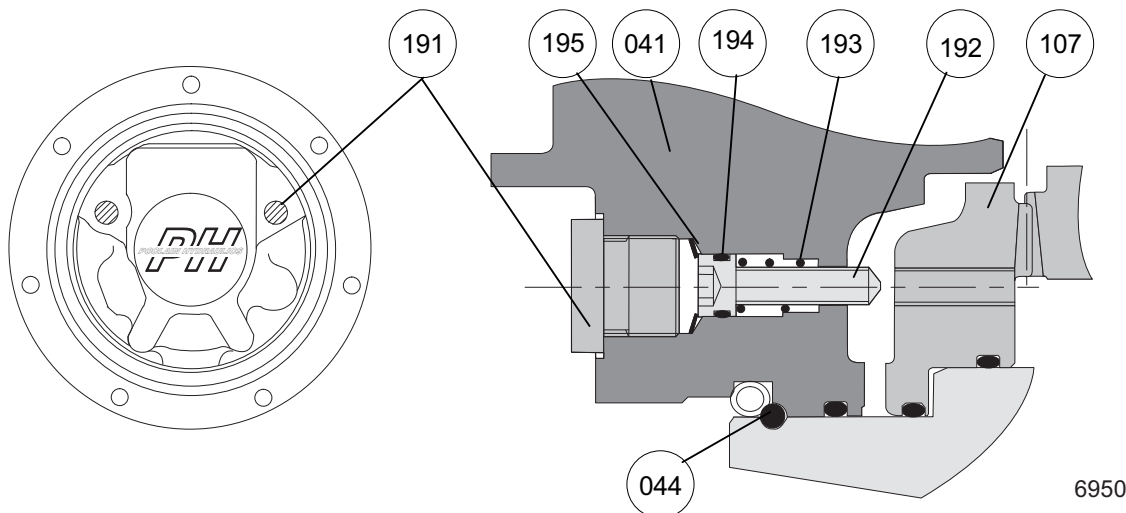
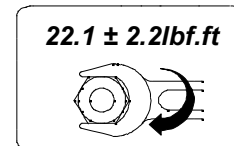
- Die 2 Stopfen (191) demontieren.
- Die Schrauben M8 (192) durch Zusammendrücken der Federn (193) in die Gewindebohrungen des Bremskolbens (107) einschieben, bis der Schraubenkopf (192) an den Verteilerdeckel (041) stößt.
- Beide Schrauben (192) abwechselnd und schrittweise anziehen. (ungefähr 2 Schraubenumdrehungen), um den Bremskolben (107) zu ziehen.



Unbedingt das Anzugsmoment der M8-Schrauben Klasse 10-9 (192) beachten :



It is necessary to respect the tightening torque of the M8 screws class 10-9 (192) :



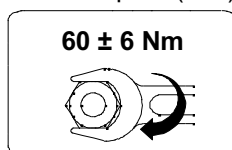
Die Maschine darf nur mit gebremstem Motor gestartet werden. (Mechanische Bremslösung nicht aktiv)



The machine should be started with the motor brakes engaged. (brake release inactive)

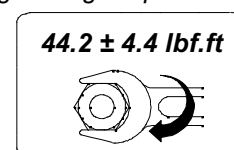
Die beiden Schrauben (192) zum Schließen der Bremse vollständig lösen und die Stopfen (191) wieder einbauen.

- Anziehmoment der Stopfen (191) :



After brake release, loosen completely the 2 screws (192), then reinstall the plugs (191).

- Plug (191) tightening torque :



Austausch des Dichtrings (027) und des Simmerrings (172) am Motor MK04.

Replacement of the sealing ring (027) and lip seal (172) on MK04 motor.

Demontage.

- Den Motor ausbauen.
- Die Schutzabdeckung (171) abbauen.
- Den Dichtring (172) herausnehmen und beseitigen.
- Den Sprengring (028) und dann die Stützscheibe (034) demontieren.
- Den Dichtring (027) herausnehmen und beseitigen.

Wiedereinbau.

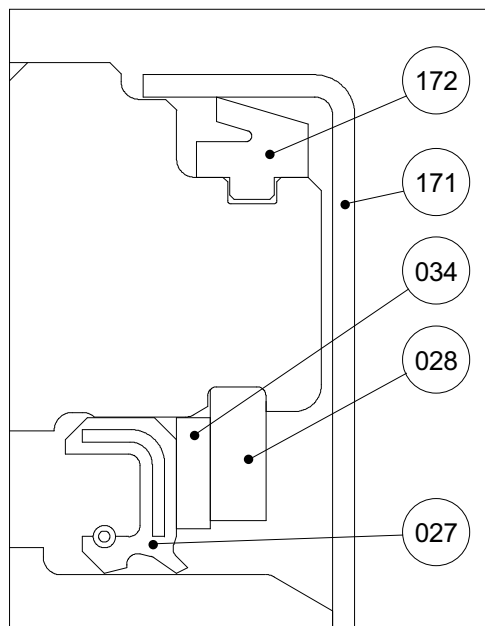
- Den Zustand des Dichtringsitzes und der Schutzabdeckungsaufnahme kontrollieren.
- Die Dichtlippen fetten und dann den Dichtring (027) einsetzen.
- Die Stützscheibe (034) und dann den Sprengring (028) einsetzen.
- Den Dichtring (172) in seine Nut einsetzen.
- Die Innenfläche der Schutzabdeckung (171) fetten (säurefreies Fett: Artikelnr. AUTO-TOP 2000 hergestellt von AGIP, Farbe leuchtgrün).
- Die Schutzabdeckung montieren (171).
- Den Motor wieder einbauen.

Disassembly.

- Remove the motor.
- Remove the protective plate (171).
- Extract and discard the lip seal (172)
- Remove the spring ring (028) then the thrust washer (034).
- Extract and discard the sealing ring (027).

Reassembly.

- Check the condition of mating surface of sealing ring then the condition of the protective plate.
- Grease the lips and install the sealing ring (027).
- Install the thrust washer (034) and the spring ring (028).
- Install the lip seal (172) in its groove.
- Grease the mounting surface of protective plate (171) (anti-oxidizing grease, part number AUTO-TOP 2000 manufactured by AGIP, fluorescent green color).
- Install the protective plate (171).
- Install the motor.



Vor der Montage des Motors auf das Maschinen-Chassis die Versorgungsöffnungen und die Halterungsschrauben mit Stopfen verschließen, um die Schutzabdeckung (171) während der Montage zu halten.



Plug the supply ports and the mounting screws to keep the protection (171) when handling before installing the motor on the machine chassis.

Austauschen des Dichtrings (118) und der Buchse (128) im Motor MK04 mit Hohlwelle.

Replacement of the sealing (118) and bushing (128) on hollow shaft MK04 motor .

Demontage.

- Den Motor ausbauen.
- Den Sicherungsring (109) herausnehmen.
- Das Rohr (110) herabstreifen.
- Den O-Ring (115) herausnehmen und beseitigen.
- Den Anschlagring (116) und dann die Stützscheibe (121) herausnehmen.
- Den Dichtring (118) herausnehmen und beseitigen und dann die Buchse (128) herausnehmen.

Wiedereinbau.

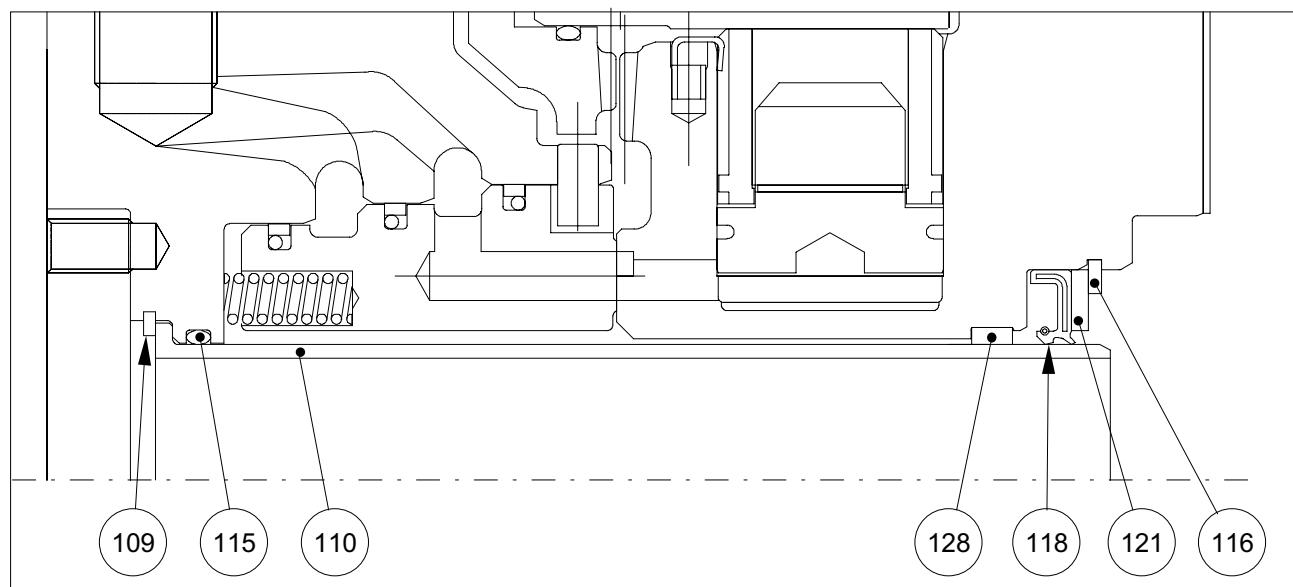
- Den Zustand des Dichtring- und Buchsensitzes kontrollieren.
- Die Buchse (128) einbauen.
- Den Dichtring (118) fetten und dann einbauen.
- Die Stützscheibe (121) und dann die Anschlagsc heibe (116) montieren.
- Den O-Ring (115) fetten und montieren.
- Die Dichtsitze des Rohrs (110) ölen und es dann in seine Aufnahmen schieben.
- Den elastischen Sicherungsring (109) mit der abgerundeten Seite zum Rohr (110) gerichtet einbauen.
- Den Motor wieder einbauen.

Disassembly.

- Remove the motor.
- Remove the snap ring (109).
- Press out the tube (110).
- Extract and discard the O-ring (115).
- Remove the snap ring (116) then the thrust washer (121).
- Extract and discard the sealing ring (118) then the bushing (128).

Reassembly.

- Check the condition of mating surfaces of sealing ring and bushing.
- Install the bushing (128).
- Grease and install the sealing ring (118).
- Install the thrust washer (121) and snap ring (116).
- Grease and install O-ring (115).
- Lubricate lightly the sealing surfaces of the tube (110) and install in its housing.
- Install the spring snap ring (109) the curvature of tongues facing the flange tube (110).
- Install the motor.



Beschreibung

Identifikation der Motorbauteile.

Description.

Identification of the components.

Baugruppe Bezeichnung

003	Dichtungssatz
011	Zylinderblock
012	Kolben
015	Reparatursatz
026	Nocken
027	Dichtring
028	Sprengring
032	Stopfen
033	O-Ring
034	Stützscheibe
036	Rollenkäfig
041	Abdeckung
042	Sicherungsring
044	O-Ring
045	O-Ring
046	Fixierstift
047	Verteiler
048	Verteilerdichtungen
050	Stift
051	Feder
106	O-Ring
107	Kolben
108	Feder
109	Sicherungsring (MK04PC)
110	Rohr (MK04PC)
111	Sinusdichtung
114	Stopfen
115	O-Ring (MK04PC)
116	Sicherungsring
118	Dichtring (MK04PC)
121	Stützscheibe (MK04PC)
128	Buchse (MK04PC)
171	Schutzabdeckung
172	Simmerring
191	Stopfen
192	Schraube
193	Druckfeder
194	O-Ring
195	Kerbring

Item Description

003	Seals kit
011	Cylinder block
012	Piston
015	Guidance
026	Cam
027	Sealing ring
028	Spring ring
032	Plug
033	O ring
034	Thrust washer
041	Cover
036	Bearing cage
042	Ring
044	O ring
045	O ring
046	Locating peg
047	Valving
048	Seals of distribution
050	Locating pin
051	Spring
106	O ring
107	Piston
108	Spring
109	Snap ring (MK04PC)
110	Tube (MK04PC)
111	Sinus seal
114	Plug
115	O-ring (MK04PC)
116	Snap ring
118	Sealing ring (MK04PC)
121	Thrust washer (MK04PC)
128	Bushing (MK04PC)
171	Protective plate
172	Lip seal
191	Plug
192	Screw
193	Compression spring
194	O ring
195	Notched ring

MK04PC: Motor mit Hohlwelle

MK04PC : Hollow shaft motor

Ersatzteile.

Geben Sie bei der Bestellung des Dichtungssatzes (003) die Artikelnummer und die chronologische Ordnungsnummer des Hydraulikmotors an. (siehe Abb. 0137)

Zusammensetzung des Dichtungssatzes (003)
 Motor MK04 : 027 + 172
 Motor MK04 PC : 027 + 115 + 118 + 128 + 172
 Mechanischer Bremslössatz: 193 + 194 + 195

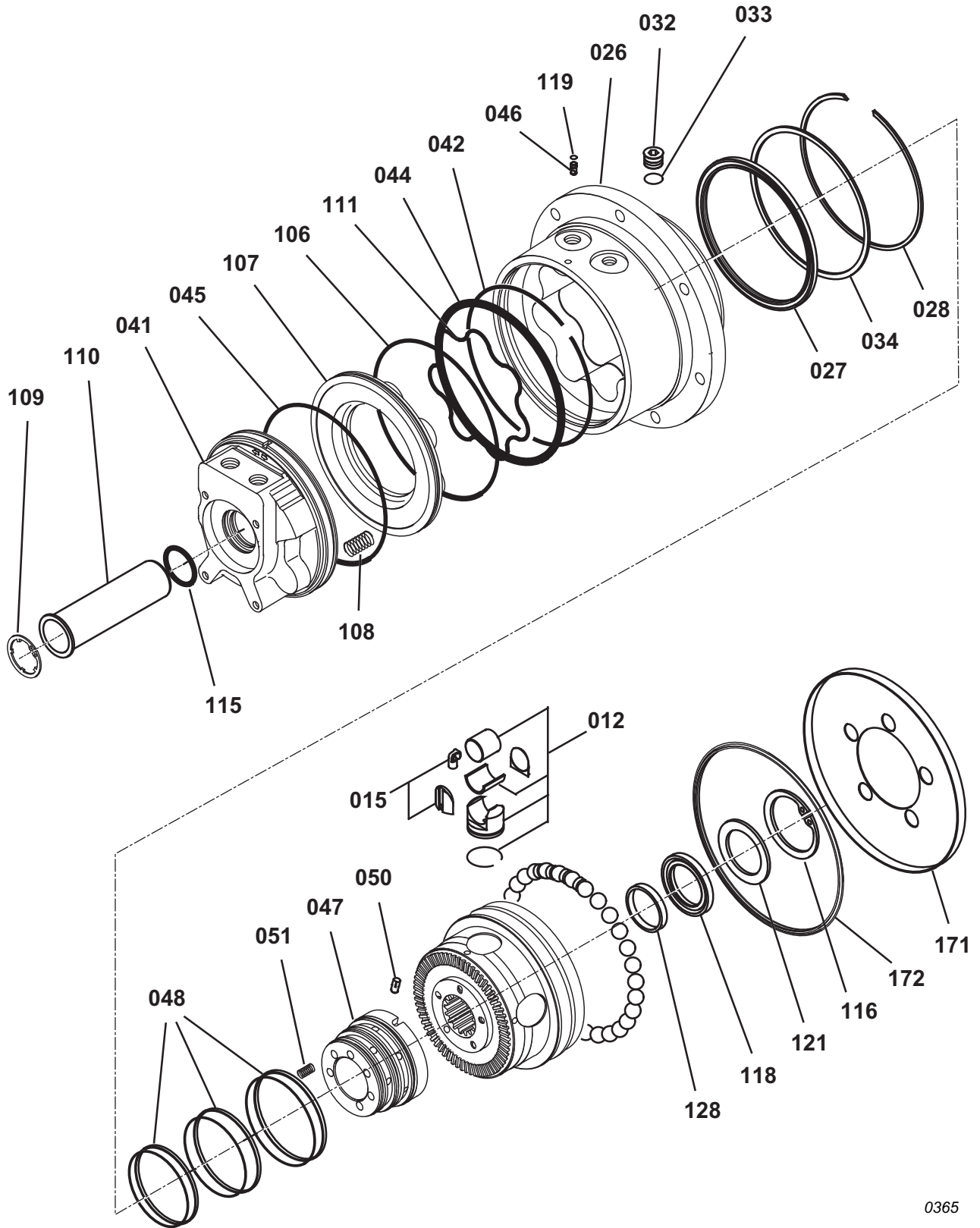
Spare parts

To order the seals kit (003) indicate part number and chronological number of the hydraulic motor (see fig. 0137)

Composition of seals kit (003)
 Motor MK04 : 027 + 172
 Motor MK04 PC : 027 + 115 + 118 + 128 + 172
 Mechanical brake release kit : 193 + 194 + 195

Motor MK04 mit Hohlwelle

Hollow shaft motor MK04



0365

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10.4 Wheel drive

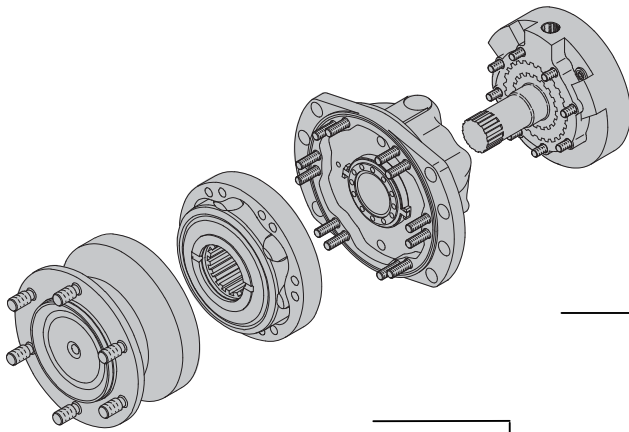
Moteurs hydrauliques

Hydraulic motors

MS

Réparations
Repairs

	02	03	05	08	11	18
MS	■	■	■	■	■	■
MSE	■	■	■	■	■	■



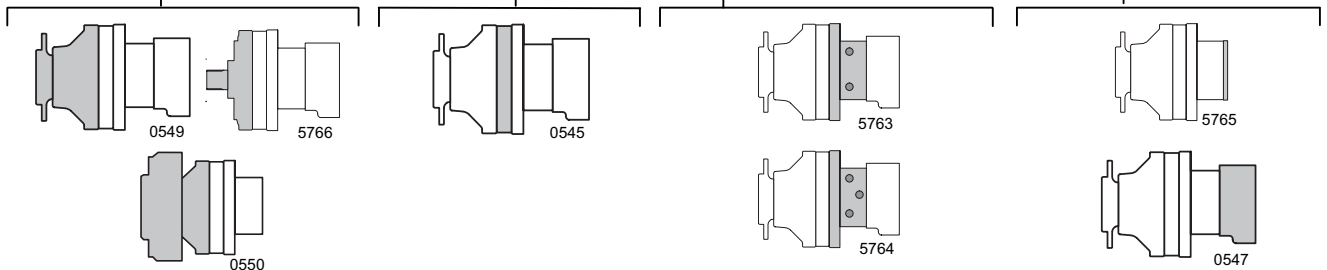
5767

Dépannage
Trouble shooting

Interventions
Maintenance

Réparations
Repairs

Pièces de rechange
Spare parts



Ref : 67777845L
REPAR MS2-18 F/GB
Rev : B - Avr 01

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POCLAIN HYDRAULICS

Ce document s'adresse aux constructeurs des machines qui intègrent les produits **POCLAIN-HYDRAULICS**. Il préconise les processus que les constructeurs peuvent mettre en oeuvre pour réparer ces produits à l'issue de la période de garantie.

Il est recommandé que toutes les opérations soient effectuées par des techniciens ayant bénéficié de la formation adéquate. Les techniciens doivent avoir lu et compris les informations figurant dans ce document et avoir été habilités par le constructeur de la machine. Ces techniciens devront impérativement observer les directives de sécurité et de protection contre les accidents. Ce document inclut des remarques importantes concernant la sécurité. Elles sont mentionnées de la manière suivante:



Remarque de sécurité.

Ce document inclut également des instructions essentielles au fonctionnement du produit ainsi que des informations générales. Elles sont mentionnées de la manière suivante:



Instruction essentielle.



Information générale.

POCLAIN HYDRAULICS est concepteur de produits que ses clients intègrent aux machines qu'ils conçoivent. De ce fait, **POCLAIN HYDRAULICS** ne peut être tenu pour responsable des conséquences liées à la mauvaise intégration de ses produits, ni des conséquences pouvant résulter du mauvais paramétrage de leurs dispositifs réglables. De la même manière, **POCLAIN HYDRAULICS** ne peut être tenu pour responsable d'instructions d'utilisation et de maintenance erronées ou incomplètes qui auraient été communiquées par les constructeurs de machines aux utilisateurs finaux ni d'incidents qu'aurait engendrés quiconque ayant appliqué les processus préconisés dans ce document. Toute modification de paramétrage des dispositifs réglables peut nécessiter une nouvelle homologation des machines.

Dans le but d'offrir le meilleur service, **POCLAIN HYDRAULICS** recommande à ses clients de lui faire approuver chaque application. L'ouverture des produits conduit à la perte de la garantie. N'utilisez que des pièces de rechange d'origine **POCLAIN HYDRAULICS**. Le montage de pièces d'origine différente pourrait nuire au fonctionnement du composant et du système et à la sécurité.

Soucieux d'améliorer ses fabrications, **POCLAIN HYDRAULICS** se réserve le droit d'apporter sans préavis, toutes les modifications qu'il jugerait utile aux produits décrits dans ce document. Ce document contient des sections en langue Française et des sections imprimées en italique constituant leur traduction en langue Anglaise. En cas de contestation, les sections en langue Française feront foi. Les mesures sont exprimées en unités métriques. Les correspondances à d'autres systèmes de mesure (notamment anglosaxons) sont données à titre indicatif.

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AUTO-TOP est une marque déposée de **AGIP SPA**.

*This document is provided to machine manufacturers integrating **POCLAIN-HYDRAULICS** products.. It suggests processes that manufacturers may utilize to repair products after the warranty period.*

It is recommended that all operations be performed by technicians trained accordingly. The technicians should read and understand the information given in this document and be authorized by the machine manufacturer.

It is essential that the technicians comply with safety instructions to prevent injury.

This document includes major safety warnings announced in this way:



Safety warning.

Additionally, this document includes instructions essential to product function as well as those providing general information. Both are announced similar to the following examples:



Essential instruction.



General information.

***POCLAIN HYDRAULICS** designs products that are integrated by its customers in the machines they design. Subsequently **POCLAIN HYDRAULICS** disclaims liability for consequences of improper integration of its products and of improper set-up of adjustable devices. In the same way, **POCLAIN HYDRAULICS** may not be liable for incomplete or improper operating and maintenance instructions provided to the end user by the machine manufacturer nor for failures resulting from operations performed by any person using these suggested procedures.*

A re-certification of the machine may be required for every change in set-up of adjustable devices.

*In order to offer the best quality service, **POCLAIN HYDRAULICS** recommends to its customers to have applications approved by **POCLAIN HYDRAULICS**.*

Opening of products voids the warranty contract.

*Use only **POCLAIN HYDRAULICS** genuine spare parts. Using parts from different sources could reduce the performance of the product and pose a safety hazard..*

*In accordance with its policy of continuous improvement, **POCLAIN HYDRAULICS** reserves the right to modify the specifications of all products described herein without prior notice.*

This document contains sections written in French and sections printed in italics composing the English translation of the French sections. The French sections will be the reference in case of dispute.

All measures are expressed in metric units. Converted values to other systems (notably US and UK) are given for reference only.

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Sécurité et Qualité

Avant toute intervention

- Prendre toutes les dispositions de sécurité nécessaires (hommes et matériel) en se conformer aux réglementations de sécurité en vigueur.
- Engager le frein de parking et immobiliser la machine avec des cales.
- Stopper le générateur d'énergie (moteur) du système hydraulique et déconnecter l'alimentation électrique.
- Le cas échéant, délimiter le périmètre de sécurité.
- Nettoyer l'extérieur des composants pour en retirer toute trace de boue et de graisse.
- Attendre le refroidissement et la dépressurisation complète du système hydraulique (décharger les accumulateurs).



L'huile chaude ou sous pression peut provoquer des brûlures graves avec infection. Consulter un médecin en cas d'accident.

Durant l'intervention

- Certains composants sont très lourds. Les soutenir au moyen d'un dispositif de levage de capacité adéquate pour les déposer du châssis.
- La propreté est essentielle au fonctionnement des composants hydrauliques. La plupart des pièces peuvent être nettoyées au moyen d'un solvant propre.
- Durant les manutentions, protéger toutes les surfaces sensibles contre les chocs (centrages, parties frottantes, appuis, portées des joints et des roulements, etc...).
- Nettoyer ces surfaces avant remontage.
- Toujours remonter des joints neufs en éliminant systématiquement les joints démontés. Nous recommandons de graisser tous les joints avant montage.
- Huiler toutes les surfaces frottantes en y déposant un film de fluide hydraulique propre qui assurera une lubrification correcte lors du premier (re)démarrage.
- Ne jamais chauffer le fluide hydraulique qui peut s'enflammer à haute température. Certains solvants sont également inflammables. Ne pas fumer durant l'intervention.

Après intervention

Réinstaller les composants et remettre le système hydraulique en service selon les instructions figurant dans les documents suivants:

- INSTALLATION MS F/GB (ref. 677777844K)
- INSTALLATION CIRCUITS F/GB (ref. 677777831V)



Ne pas surtarer les soupapes de sécurité.

Safety and Quality

Before servicing

- *Be extremely careful to prevent personal injury and to avoid damage to material. Comply with all safety regulations.*
- *Apply the parking brake and prevent the machine from rolling with tire blocks.*
- *Stop the hydraulic system power source (engine) and disconnect the battery.*
- *If necessary, block off the safety area.*
- *Wash dirt and grease from exterior of the components.*
- *Await the complete cooling down and depressurization of the hydraulic system (accumulators must be purged).*



Hot or pressurized hydraulic fluid may cause serious burns & infections to the human body. Consult a physician in case of accident.

During servicing

- *Some hydraulic components are very heavy. Secure them with a lifting device of adequate capacity when removing from the machine frame.*
- *Cleanliness is essential to functioning of the hydraulic components. Most of the parts may be cleaned with a clean solvent.*
- *During handling, protect all sensitive surfaces from shocks (piloting and interface surfaces, thrust & bearings surfaces, seal races, etc...)*
- *Clean up these surfaces before reassembling.*
- *Always install new O-rings, seals & gaskets discarding the old ones. We recommend lubricating all seals prior to assembly.*
- *Lubricate all surfaces which have relative motion between parts by coating them with a film of clean hydraulic fluid to assure lubrication at first start.*
- *Never heat hydraulic fluid, as it may flame at high temperature. Some solvents are also flammable. Do not smoke during servicing.*

After servicing

Reinstall the components and restart the hydraulic system according to instructions defined in the following documents:

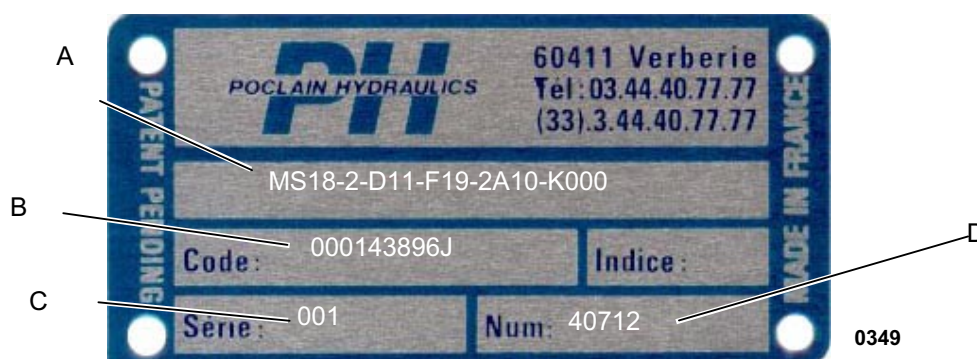
- *INSTALLATION MS F/GB (ref. 677777844K)*
- *INSTALLATION CIRCUITS F/GB (ref. 677777831V)*



Do not overset relief valves.

Identification du composant

Identification of the component



A : Désignation commerciale :
Ex : MSE18-2-D11-F19-2A10-K000

B : Code : Code Article
Ex : 000143896J

C : Série : Numéro de fabrication
Ex : 001

D : Num : Numéro d'ordre chronologique
Ex : 40712

A: Commercial description:
E.g : MSE18-2-D11-F19-2A10-K000

B: Code: Part number.
E.g : 000143896J

C: Series: Manufacturing batch number.
E.g : 001

D: Num: Chronological serial number.
E.g : 40712



Le Code article et le numéro d'ordre doivent être indiqués pour toute commande de pièces de rechange.



The part number and the chronological serial number must be specified to order spare parts.

Dépannage

DETERIORATION → LIMAILLE → DETECTION PAR LES FILTRES → PREVENTIF.....

Pannes	Causes		Remèdes
MOTEUR BRUYANT	À vide	Ronronnement régulier	Palier usagé Procéder au remplacement du palier
		Vibrations	Desserrage des fixations, des tuyauteries Resserrer au couple
	En charge	Claquement	Pression de gavage trop faible Contrôler le tarage et l'état de la soupape de contre-pression.
		Cavitation	Fuites internes trop importantes Remplacer le bloc cylindre et la distribution
LE MOTEUR NE TOURNE PAS		Le moteur n'est pas alimenté	Contrôler l'entraînement de la pompe et son alimentation
		Le circuit ne monte pas en pression	Contrôler l'état de la soupape de sécurité (régulateur)
		Fuites internes trop importantes	Remplacer le bloc cylindre et la distribution
		Le frein reste serré	Contrôler le circuit de pilotage du frein
LE MOTEUR NE TOURNE PAS A SA VITESSE NORMALE EN CHARGE		Le débit de la pompe est insuffisant	Contrôler la vitesse d'entraînement et l'état de la pompe
		Fuites internes trop importantes	Vérifier l'état du bloc cylindre et de la distribution
		La pression de fonctionnement est trop basse	Contrôler le tarage de la soupape de sécurité (régulateur)
LE MOTEUR TOURNE IRREGULIEREMENT		Le débit est irrégulier	Contrôler le débit de la pompe
		Fuites trop importantes	Vérifier l'état du bloc cylindre et de la distribution
FUITES D'HUILE EXTERNES		Pression carter trop élevée	Vérifier le circuit de drainage, et l'état du filtre
		Joints détériorés	Remplacer les joints
		Montage défectueux	Contrôler le serrage des vis d'assemblage, des vis de purge et raccords

Trouble shooting

DAMAGE → IRON PARTICLES → DETECTION BY FILTERS → PREVENTION.....

Troubles		Causes		Remedies
NOISY MOTOR	Without load	Regular rumbling	Worm bearing support	Replace the bearing support
		Vibrations	Mountings and/or hydraulic piping becoming loose	Tighten to torque
	Under load	Clattering	Boost pressure too low	Check the setting and condition of counter-pressure valve
		Cavitation	Excessive internal leaks	Replace the cylinders- block and distribution valve assembly
THE MOTOR DOES NOT REVOLVE			No supply to the motor	Check pump drive and pump inlet
			The circuit does not reach working pressure	Check condition of safety valve (regulator)
			Excessive internal leaks	Replace the cylinders block and distribution valve assembly
			The brake stays engaged	Check the brake pilot circuit
THE MOTOR DOES NOT REVOLVE AT ITS NORMAL SPEED UNDER LOAD			Pump flow is too low	Check drive speed and condition of the pump
			Excessive internal leaks	Check condition of cylinders- block and distribution valve assembly
			Working pressure is too low	Check safety valve setting pressure (regulator)
THE MOTOR REVOLVES IRREGULARLY			Irregular flow	Check the pump flow
			Excessive leaks	Check condition of cylinders- block and distribution valve assembly
EXTERNAL OIL LEAKS			Too high casing pressure	Check the leakage circuit and filter condition
			Seals damaged	Replace seals
			Incorrect assembling	Check tightening of mounting screws, bleed screws and unions

Interventions

Remplacement du moteur

Dépose

- Éliminer la pression dans le circuit d'alimentation.
- Débrancher la tuyauterie de drainage au niveau du réservoir afin d'éviter le siphonnage de celui-ci.
- Débrancher et boucher les tuyauteries ou flexibles raccordés sur le moteur.
- Débrancher le connecteur du capteur tachy
- Démonter les vis de fixation, puis déposer le moteur.
- Vidanger le carter.

Repose

Reprendre les opérations de dépose dans l'ordre inverse.

Veuillez vous reporter aux documentations suivantes:

- INSTALLATION MS F/GB (ref: 677777844K)
- INSTALLATION CIRCUITS F/GB (réf: . 677777831V)

Maintenance

Replacing the motor

Removal

- Release the pressure in the supply circuit.
- Disconnect the drain line at the tank level to avoid its siphoning.
- Disconnect and plug the pipes or hoses connected to the motor.
- Disconnect the speed sensor.
- Disconnect the mounting screws, and remove the motor.
- Drain the casing.

Installation

Execute the removal operations in the reverse order.

Please refer to the following documentation brochures:

- INSTALLATION MS F/GB (ref: 677777844K)
- INSTALLATION CIRCUITS F/GB (réf: . 677777831V)

Défreinage mécanique

(sauf moteur avec palier DYNA+)

Mechanical brake release

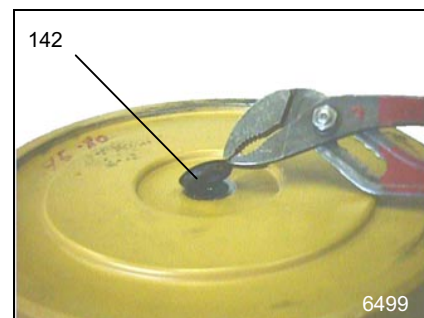
(except motor with DYNA+ bearing support)

Dans certains cas de dépannage, il peut être nécessaire que le moteur soit défreiné.

In certain service situations, it may be necessary to release the motor brake.

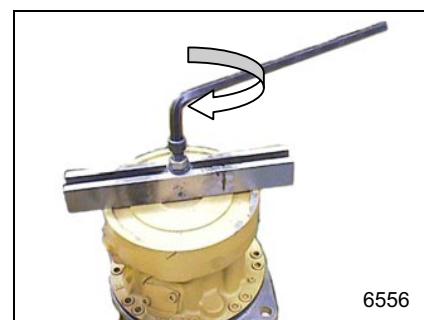
- Extraire et éliminer le bouchon (142) de la coiffe de frein.

- Extract and release the plug (142) from the brake cover.



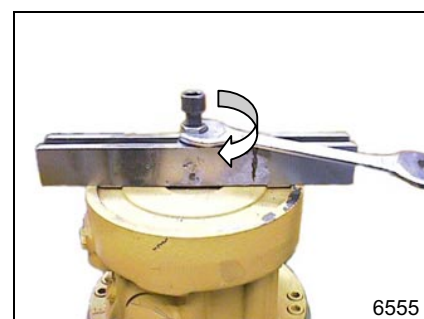
- Serrer la vis dans le piston

- Tighten the screw in the piston



- Puis serrer l'écrou jusqu'à ce que l'arbre du moteur tourne librement.

- And tighten the nut until the motor shaft turns freely.



Freins	Brakes	Effort N	Force [lbf]	Couple équivalent N.m	Equivalent torque [lbf.ft]	Ecrou	Nut
F02-F04		18000	[4.000]	42	[30.9]	M12	
F05-F07		20000	[4.500]	47	[34.6]	M12	
F08		34000	[7.600]	110	[81.1]	M16	
F11		45000	[10.000]	140	[103]	M16	
F12		45000	[10.000]	140	[103]	M16	
F19		45000	[10.000]	140	[103]	M16	



Après le défreinage, monter un bouchon (142) neuf.



After brake release, mount a new plug (142).

Désactivation du freinage mécanique des moteurs à paliers DYNA+.

- Se reporter aux brochures caractéristiques pour obtenir les volumes nécessaires pour défreiner et pour freiner.

Cette opération peut être nécessaire lors du montage du moteur ou dans certains cas pour déplacer une machine lors d'un dépannage.

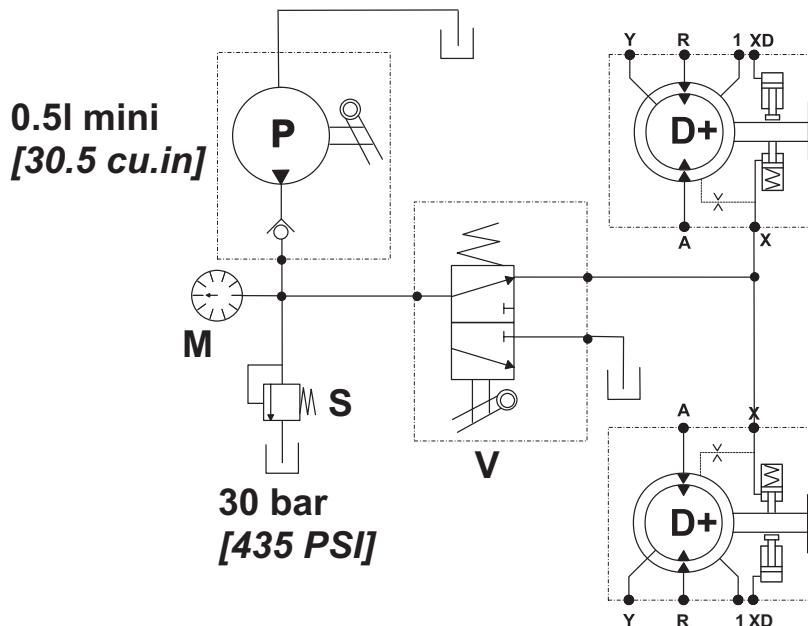
- Dévisser et démonter la soupape d'irrigation des moteurs à palier DYNA+.(D+).
- Monter en lieu et place l'obturateur M18x1.5 équipé. (Code article 003037414M).
- À l'aide d'une tuyauterie flexible, relier les orifices de défreinage (X) des paliers DYNA+ à une pompe manuelle (M) équipée d'un réservoir (0.5 l [30.5 cu.in] minimum), ainsi qu'une soupape de sécurité (S) tarée à 30 bar [435 PSI] maxi, d'une vanne de vidange (V), d'un clapet anti-retour en sortie de pompe et d'un manomètre (M) (0-100 bar [0 – 1450 PSI]).
- Actionner la pompe à main (M) pour désactiver le frein mécanique.
- Pour réactiver le frein mécanique, actionner la vanne de vidange (V), puis procéder aux opérations inverses.
- Après l'intervention, remonter les soupapes d'irrigations.

Mechanical brake deactivation of the motors with DYNA+ bearing support

- See the characteristics brochures to obtain the necessary volumes to release the brake or to brake.

This operation can be necessary to do during the motor's assembly or to move a machine during a breakdown.

- Unscrew and remove the irrigation valve of the motors with DYNA+ bearing support (D+).
- Install the M18x1.5 plug assembly (Part number 003037414M).
- Using a flexible piping, connect the break release ports (X) of DYNA+ bearing supports to a manual pump (M) equipped with a tank (0.5 L [30.5 cu.in] minimum), as well as a safety valve (S) calibrated at 30 bar [435 PSI] maximum, a blow off valve (V), a check valve at the pump output and a manometer (M) (0-100 bar [0 – 100 bar [1450 PSI]]).
- Activate the hand pump to release the mechanical brake.
- To reactivate the mechanical brake, activate the blow off valve (V), then execute the operations in the reverse order.
- After the intervention, reinstall the irrigations valves.



Contrôle de l'efficacité de frein de parking.

Checking the parking brake efficiency.



Pour un engin roulant, effectuer ce test sur un sol horizontal.



For a rolling machine, make the test on a horizontal ground.

Pression de pilotage du frein: mini 12 bar
Maxi 30 bar.

Pilot brake pressure : Minimum 12 bar [174 PSI]
Maximum 30 bar [435 PSI]

- S'assurer que la pression d'alimentation du frein est nulle,
- Effectuer la purge du frein par la vis (112) située au niveau le plus haut,
- Alimenter le moteur jusqu'à la pression de tarage,
- L'arbre du moteur ne doit pas tourner sinon il est nécessaire de procéder au remplacement du frein:

- *Make sure that the brake supply pressure is zero,*
- *Purge the brake using the screw (112) located at the highest level,*
- *Supply the motor up to the setting pressure.*
- *The motor shaft must not turn, otherwise it is necessary to replace the brake :*



Ne pas roder les freins multidisques.



Do not run multidisc brakes in.

Réparations.

Repairs.

Réparation du frein.

(sauf moteur avec palier DYNA+)

Repair of the brake.

(except motor with DYNA+ bearing support)

Démontage

Disassembly



Prévoir la fourniture de la coiffe(141) car elle sera détruite au démontage.



Plan to supply a cover (141) as it will be destroyed during disassembly.

- Déposer le moteur.
- Mettre le moteur en appui sur le support palier.

- Remove the motor.
- Place the motor on the bearing support.



Protéger les goujons en remontant les écrous



Protect the studs by re-installing the nuts

- Démontez et éliminez la coiffe de frein.(141)

- Remove and discard the brake cover.(141)

- Extraire et éliminer le joint torique (143).

- Extract and discard the O-ring (143).

- Comprimer la rondelle élastique (108):
- À l'aide du mandrin et de l'extracteur (voir outillage page 66) (fig 6502)
- À l'aide du mandrin et d'une vis de classe 12.9 (voir outillage page 66)
- À l'aide du mandrin et d'une presse (fig 6503). Respecter la force F (voir tableau page 9)

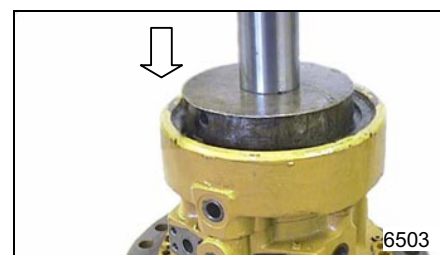
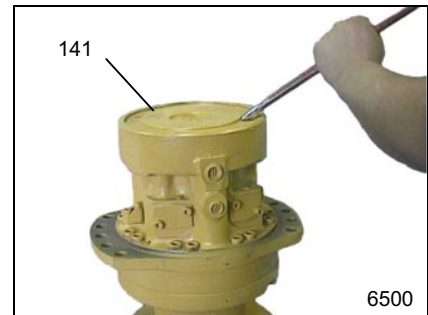
- Compress the spring washer (108).
- Using a mandrel and an extractor (see tools page 66) (fig 6502)
- Using a mandrel and a screw class 12.9 (see tools page 66)
- Using a mandrel and a press (fig 6503). Respect the force F (see table page 9)



Repérer le sens de montage de l'anneau élastique.



Mark the mounting direction of the snap ring.



- Démontez l'anneau d'arrêt (109) à l'aide d'une pince à anneaux d'arrêt intérieur. (voir outillage 66)

- Remove the snap ring (109) using internal snap ring pliers. (see tools 66)

- Extracteur et pince (fig 6504 et 6505)

- Extractor and pliers (fig 6504 and 6505)

- Presse et pince (fig 6506 et 6507)

- Press and pliers (fig 6506 and 6507)



Ne pas mettre le palier en appui sur les goujons lors de la mise sous la presse.



If you use the press do not place the bearing support on the studs.

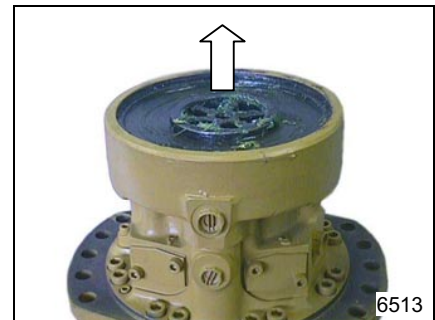
- Extraire la rondelle élastique (108).

- Extract the spring washer (108).



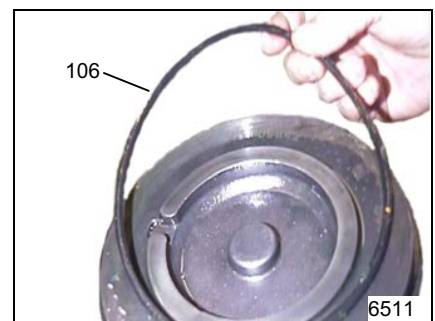
- Extraire le piston de frein (107).

- Extract the brake piston (107)



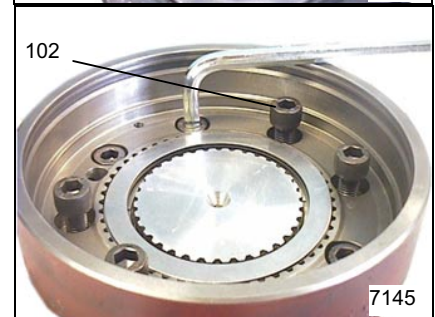
- Éliminer le joint torique (106).

- Discard the O-ring (106).



- Démontez et éliminez les vis (102).

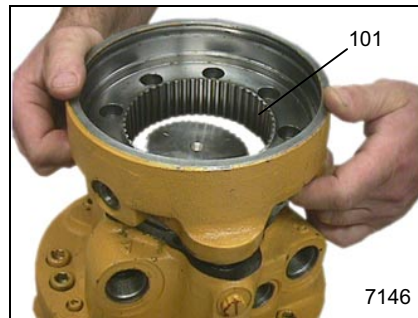
- Remove and discard the screws (102).



POCLAIN HYDRAULICS

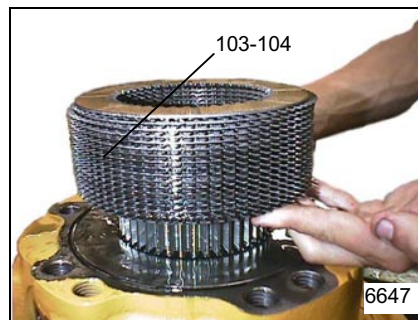
- Démontez le corps de frein (101).

- *Remove the brake housing (101).*



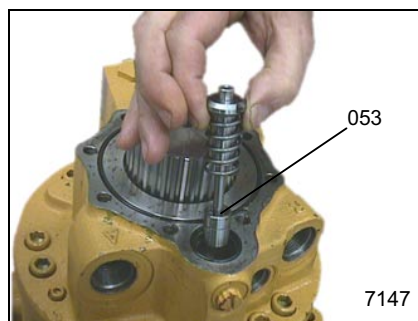
- Extraire le calage (105) et les disques de frein (103-104).

- *Extract the shims (105) and the brake discs (103-104).*



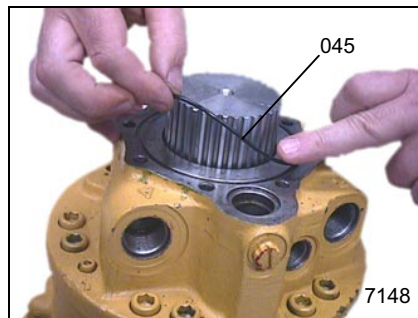
- Si le moteur est à 2 cylindrées, démontez le tiroir de changement de cylindrée (053).

- *If motor with dual displacement (two speed) : remove the two speed shift spool (053).*



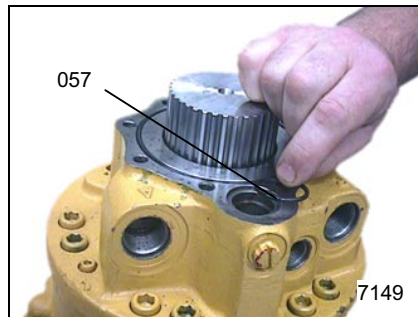
- Éliminer le joint torique (045).

- *Discard the O-ring (045).*



- Si le moteur est à deux cylindrées, éliminer le joint (057).

- *If motor with dual displacement, discard the O-ring (057).*



Remontage.

Avant le remontage, il est impératif de s'assurer de la propreté de toutes les pièces, des portées de joint et des gorges.



Toute trace de rouille, boue, eau doit être supprimée.

Reassembly.

Before reassembling, it is necessary to ensure that all parts, the surface conditions of the piston seal and the grooves are clean.



All traces of rust, mud, water must be removed.

S'assurer également que le corps de frein présente bien des chanfreins dans les trous de passage des vis de fixation sur le corps de frein.

Also make sure that the brake housing has proper chamfers around the mounting screws holes.

Enduire de graisse anti-oxydante (voir outillage page 66), les gorges, le dessus du piston de frein, la rondelle élastique, l'anneau d'arrêt, et la portée du joint de piston dans le corps de frein.

Coat with anti-oxidizing grease (see tools page 66), the grooves, the top of the brake piston, the spring washer, the snap ring and the piston seal contact surface in the brake housing.

Montage du corps de frein :

- De type 1 : collé
- De type 2 : non collé
- De type 3 : à fixation à billes

Brake housing mounting :

- 1st type : glued
- 2nd type : not glued
- 3rd type : balls fixing

Type 1

- Contrôler l'absence de colle sur la face de liaison du **couvercle**. Eliminer toute trace de colle à l'aide d'une spatule.

Type 1

- Check there is no dried glue on the mating face of the **valving cover**. Scrape off all glue residues with a blade.



NE PAS TOILER LA FACE DE LIAISON AFIN DE CONSERVER SA RUGOSITE ORIGINALE.



DO NOT FILE OR EMERY THE MATING SURFACE AS THE ORIGINAL SURFACE FINISH MUST BE MAINTAINED

- Essuyer la face de liaison en faisant des mouvements vers l'extérieur à l'aide d'un chiffon humide ne présentant pas de particules détachables.

- Wipe the mating face with a lint-free moist rag, stroking the valving cover from the inside to the outside.

- **Dégraisser la face de liaison à l'aide d'alcool isopropylique.**

- **Degrease the mating face using isopropyl alcohol.**

- Contrôler l'absence de colle sur la face de liaison du **corps de frein**. Éliminer toute trace de colle à l'aide d'une spatule.

- Check there is no dried glue on the mating face of the **brake housing**. Scrape off all glue residues of the brake housing.



NE PAS TOILER LA FACE DE LIAISON AFIN DE CONSERVER SA RUGOSITE ORIGINALE.



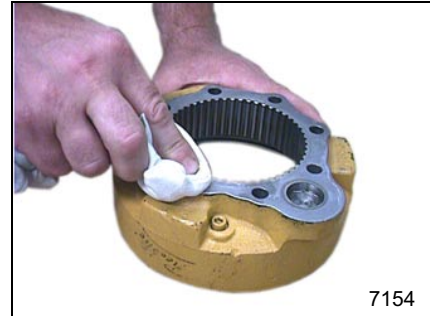
DO NOT FILE OR EMERY THE MATING SURFACE AS THE ORIGINAL SURFACE FINISH MUST BE MAINTAINED.



POCLAIN HYDRAULICS

- Essuyer la face de liaison en faisant des mouvements vers l'extérieur à l'aide d'un chiffon humide ne présentant pas de particules détachables.
- **Dégraissier la face de liaison à l'aide d'alcool isopropylique.**

- *Wipe the mating face with a moist lint-free rag, stroking the brake housing from the inside to the outside .*
- *Degrease the mating face using isopropyl alcohol.*



7154



LE DEGRAISSAGE TERMINE, LES MAINS ET LES DOIGTS DE L'OPERATEUR DE DEVRONT PLUS ETRE EN CONTACT AVEC LES FACES A ASSEMBLER.



AFTER DEGREASING, DO NOT TOUCH THE MATING SURFACES WITH HANDS NOR FINGERS.

- Déposer un film d'**activateur Loctite 7471** (voir tableau page 66) à l'aide d'un pinceau propre sur la surface du couvercle qui doit être en contact avec le corps de frein, et attendre 2 minutes.

- *Using a clean brush apply a film of **Loctite 7471 activator** (see table page 66) on the valving cover surface which should be in contact with the brake housing, and wait 2 minutes.*



7151

NE PAS APPLIQUER D'ACTIVATEUR SUR L'ARBRE.

DO NOT APPLY ANY ACTIVATOR ON THE SHAFT.

- Monter le joint torique neuf (045) et si le moteur est à 2 cylindres, le joint (057) neuf.

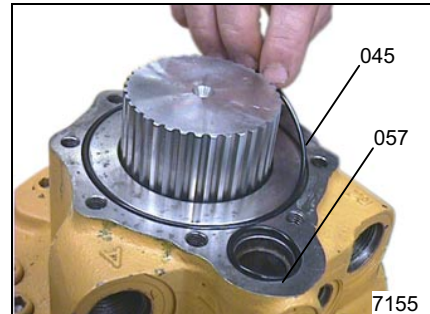
- *Install the new O-ring (045), and if motor with dual displacement, install the new O-ring (057).*



NE PAS TOUCHER LA SURFACE RECOUVERTE D'ACTIVATEUR.



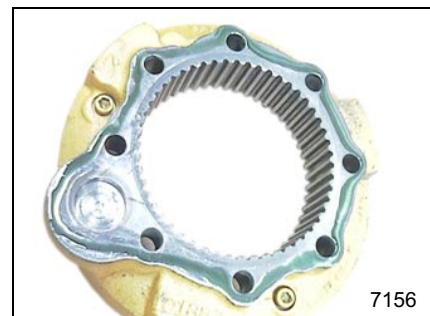
DO NOT TOUCH THE MATING SURFACE AFTER COATING IT WITH THE ACTIVATOR.



7155

- Déposer sur le corps de frein un cordon continu d'adhésif **LOCTITE 638** (voir page 66) suivant la ligne moyenne des centres de trous de passage des vis de fixation (voir dessin).
- Veiller à raccorder les cordons sans discontinuité.

- *Place a continuous bead of **LOCTITE 638** glue (see page 66) on the brake housing following the median line of the mounting screw hole centers (see drawing).*
- *Make sure the bead of glue is continuous (no gaps).*



7156



NE JAMAIS DEPOSER D'ACTIVATEUR SUR LA FACE RECEVANT LE CORDON ADHESIF.



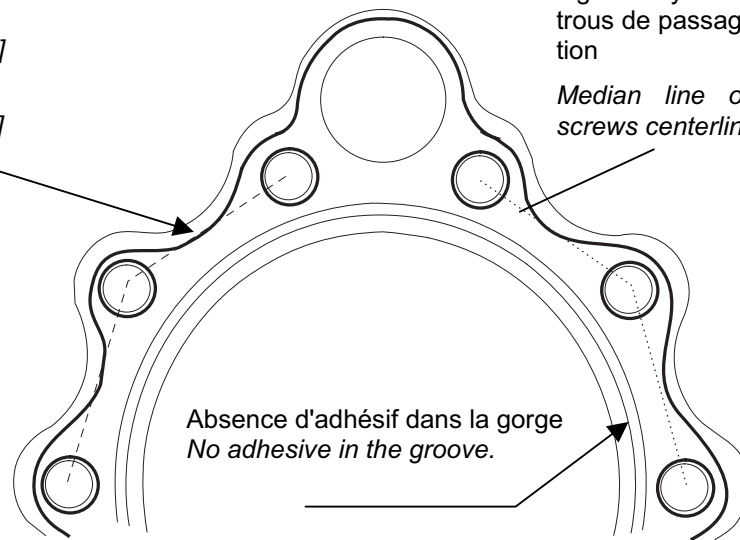
NEVER APPLY THE ACTIVATOR ON THE SAME SURFACE AS THE BEAD OF GLUE.

Largeur du cordon :
5 à 10 mm [0.2 to 0.4 in]

Width of bead :
5 à 10 mm [0.2 to 0.4 in]

Ligne moyenne des centres de
trous de passage des vis de fixation

Median line of the mounting
screws centerline.



Absence d'adhésif dans la gorge
No adhesive in the groove.



LES OPERATIONS SUIVANTES
DOIVENT ETRE EFFECTUEES AU
MAXIMUM 10 MINUTES APRES
LE DEPOT DU CORDON.



THE FOLLOWING STEPS MUST
BE ACHIEVED IN 10 MINUTES
MAXIMUM AFTER THE GLUE AP-
PLICATION.

Type 1 et 2

- Présenter les pièces à assembler en montant quelques vis neuves (classe 12.9)

Type 1 et 2

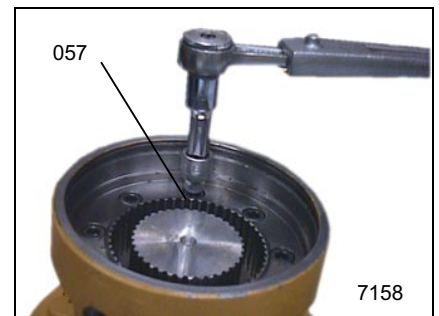
- Position the parts to be assembled by installing some new screws (cl 12.9)



7157

- Monter et serrer toutes les vis neuves (102) au couple préconisé. (voir page 69).

- Install and tighten all new screws (102) to the required torque. (see page 69)



7158

Type 1



LA LIAISON COLLEE DEMEURE FRAGILE DURANT UNE PERIODE DE 6 HEURES APRES COLLAGE.

Durant cette période :

- **NE PAS CHOQUER** les pièces collées,
- **NE PAS UTILISER OU TESTER** le frein ou le moteur.

Type 3

- Monter les 6 billes (123) sur le couvercle (041).

- Monter un joint torique neuf (045) dans le couvercle (041).

Type 1



THE GLUED CONNECTION REMAINS FRAGILE SIX HOURS AFTER BEING GLUED.

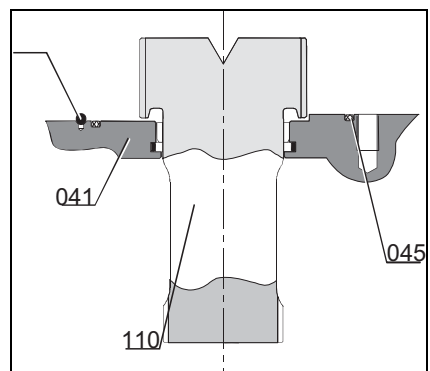
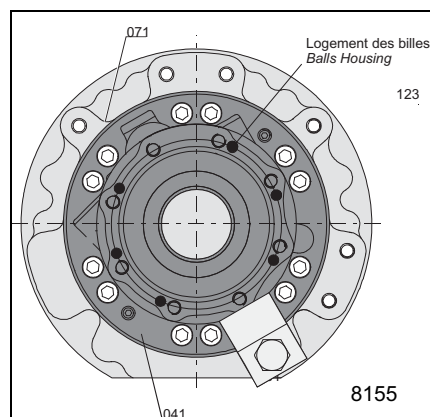
During this time :

- **AVOID ANY SHOCK** to the glued parts,
- **DO NOT USE OR TEST** the brake nor the motor

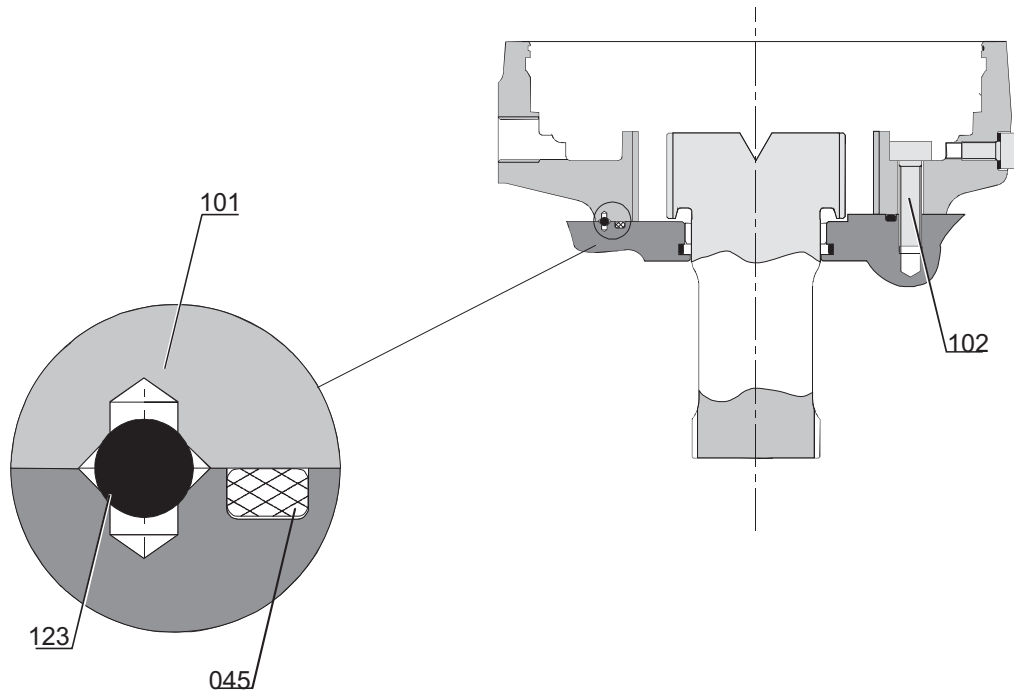
Type 3

- *Install the 6 balls (123) on the cover (041).*

- *Install a new O-Ring (045) in the cover (041).*



- Assembler le corps de frein (101) sur le couvercle (041) en prenant soin de présenter les logements en face des billes (123).
- Monter et serrer toutes les vis (102) au couple préconisé.
- *Install the brake housing (101) on the cover 041). Take care to place the housings in front of the balls (123).*
- *Install and tighten all the screws (102) to the required torque :*



8157

REGLAGE DU FREIN.

ADJUST THE BRAKE.



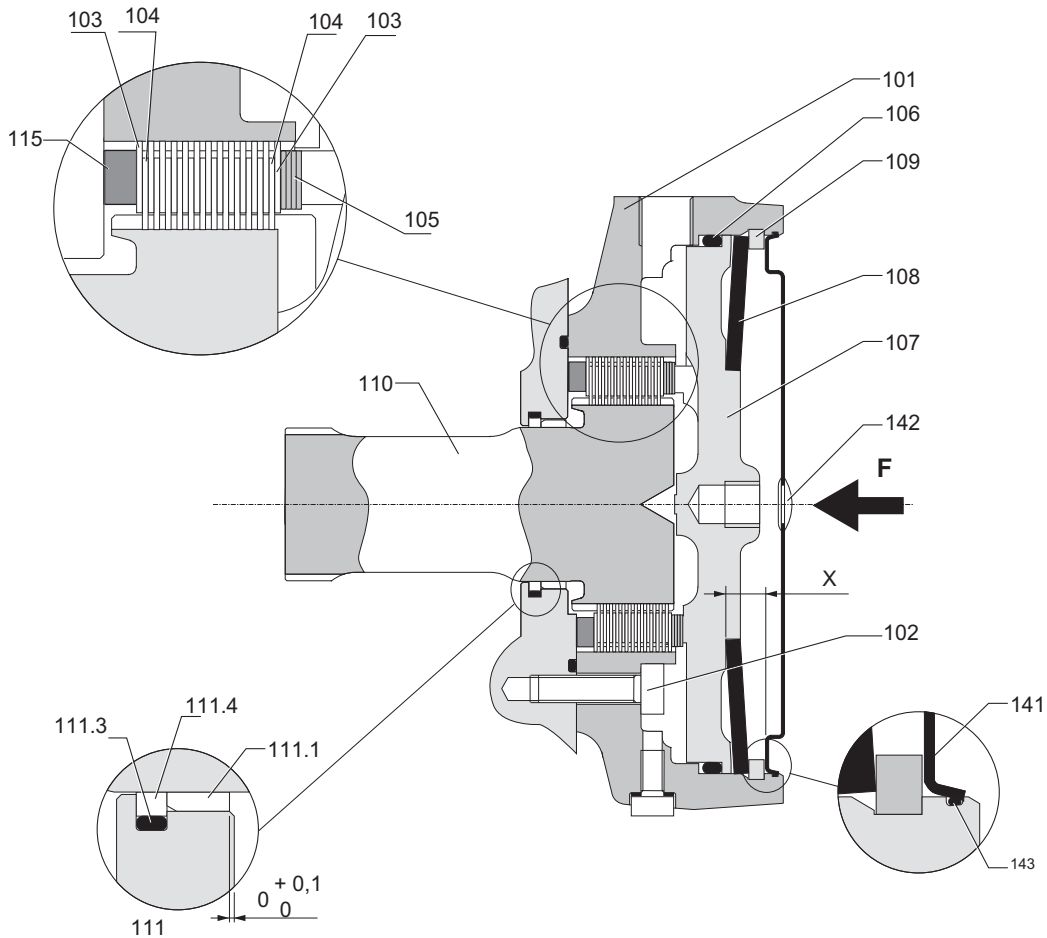
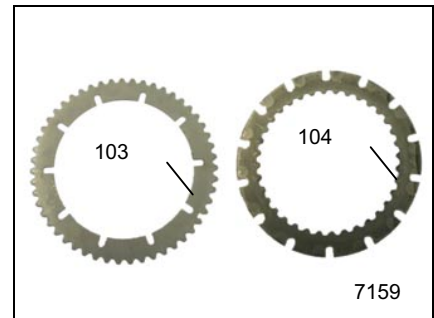
TOUTE TRACE DE ROUILLE, BOUE, EAU, COLLE, DOIT ETRE SUPPRIME.



ALL TRACES OF RUST, MUD, WATER OR GLUE, MUST BE REMOVED.

- Monter le calage de compensation de couple (115) suivant version (voir dessin 6736).
- Huiler les disques neufs (utiliser du fluide hydraulique).
- Commencer par monter un disque extérieur (103), puis un disque intérieur (104), puis alternativement (103) et (104).
- Le dernier disque à monter est un disque extérieur (103).

- *Install the torque reduction shims (115) according to the version (see drawing 6736).*
- *Oil the new discs (use hydraulic fluid).*
- *Start by installing one external brake disc (103), then one internal brake disc (104), then alternately (103) et (104).*
- *The last brake disc must be an external disc (103).*



6736

REP. ITEM	DÉSIGNATION	DESCRIPTION
101	Corps de frein	Brake housing
102	Vis de fixation	Mounting screw
103	Disque de frein extérieur	External brake disc
104	Disque de frein intérieur	Internal brake disc
105	Calage	Shims
106	Joint de piston de frein	Brake piston O-ring
107	Piston de frein	Brake piston
108	Rondelle élastique	Spring washer
109	Anneau d'arrêt	Snap ring
115	Calage de compensation de couple	Torque reduction shim
141	Chapeau de frein	Brake cover
142	Bouchon	Plug
143	Joint torique	O-ring

- Enduire de graisse antioxydante (réf. AUTO-TOP 2000 origine AGIP ou Mobil XHP222) la portée du joint de piston dans le corps de frein (101).

- Monter un joint torique (106) neuf sur le piston (107).

- Coat the piston seal contact surface in the brake housing with anti-oxidizing grease (ref. AGIP AUTO-TOP 2000 or Mobil XHP222).

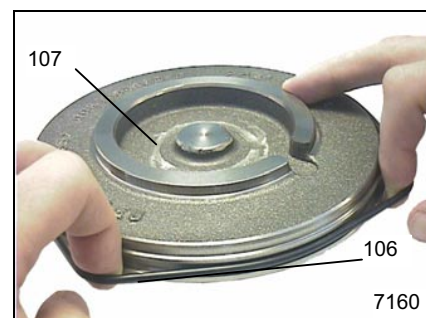
- Install a new O-ring (106) on the piston (107).



Le joint doit être serré sur le piston et non vrillé.



The ring should be tight on the piston and not twisted.



- Monter le piston de frein (107) dans le corps de frein (101).

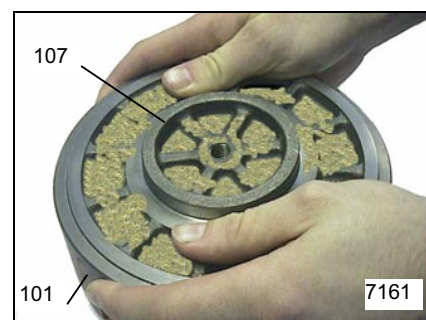
- Install the brake piston (107) in the brake body (101).



Attention au passage du joint sur la gorge de l'anneau d'arrêt.

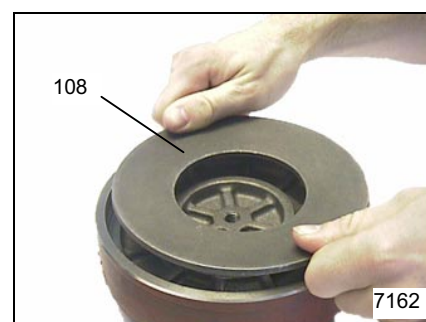


Be careful when passing the seal over the snap ring groove.



- Monter la rondelle élastique (108) sur le piston de frein (107).

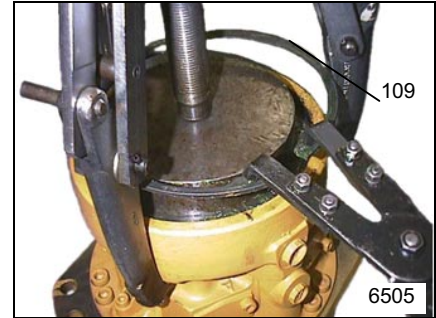
- Install the spring washer (108) on the brake piston (107).



POCLAIN HYDRAULICS

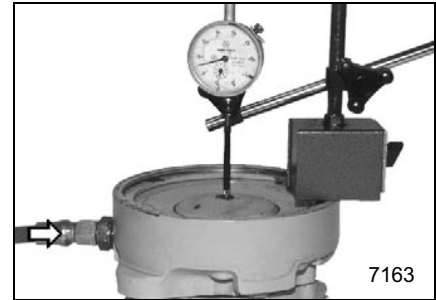
• Appliquer l'effort **F** (voir tableau ci-dessous) à l'aide de la presse ou avec l'extracteur (FACOM U20B) pour monter l'anneau d'arrêt (109).

• *Using a press or an extractor (FACOM U20B) apply the compressive force **F** (see table here below) to install the snap ring (109).*



• Alimenter le frein en pression (voir tableau ci-dessous) et mesurer la course du piston à l'aide d'un comparateur.

• *Supply the pressure to the brake (see table here below) and measure the brake piston stroke using a dial gauge.*



• Calculer alors la valeur pour le calage (105) afin de respecter la course C indiquée dans le tableau ci-dessous.

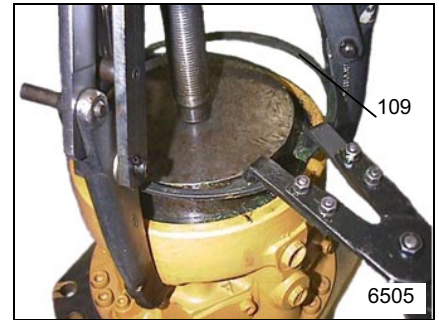
• *Calculate the shimming (105) value in order to respect the stroke C indicated in the table here below.*

FREINS A DISQUES FRITTES BRAKE WITH SINTERED DISCS	TAILLE SIZE	COURSE STROKE		EFFORT F (N) FORCE F [LBF]		NBRE DE DISQUES* NUMBER OF DISCS*		PRESSION DE REGLAGE SETTING PRESSURE		
		mm	in	N	lbf	103	104	bar	PSI	
F02 MSE02	0.65	+0.32 -0.14	0.025	+0.012 -0.005	50000	11200	10	10	17	246
F04 MSE02	0.75	+0.32 -0.14	0.029	+0.012 -0.005			14	14		
F02 MS02	0.65	+0.32 -0.14	0.025	+0.012 -0.005			11	10		
F05	0.55	+0.4 -0.3	0.021	+0.016 -0.012	70000	15700	11	11	14	203
F05	0.55	+0.4 -0.3	0.021	+0.016 -0.012			11	11		
F07	0.8	+0.4 -0.3	0.031	+0.016 -0.012			15	15		
F11	0.65	+0.32 -0.25	0.025	+0.016 -0.012	100000	22500	10	10	17	246
F18	1	+0.35 -0.25	0.039	+0.016 -0.012			17	17		
F03	095	+0.32 -0.14	0.037	+0.012 -0.005	50000	1124	21	19	17	246
F04	0.87	+0.45 -0.25	0.034	+0.018 -0.01	70000	1573	19	18		
F09	0.85	+0.4 -0.3	0.033	+0.016 -0.012	90000	2023	19	18		
F12	0.90	+0.42 -0.3	0.035	+0.017 -0.012	100000	2250	20	19		
F19	1.4	+0.35 -0.25	0.055	+0.014 -0.01			33	32		

*Dans certains cas, on peut réparer un frein équipé d'origine en disques frittés avec des disques nitrurés. Pour connaître l'ordre spécifique du montage des disques, prendre contact avec les services techniques de **POCLAIN HYDRAULICS**.

In certain cases it's possible to repair a brake system equipped with genuine sintered discs with nitrided discs. To know the specific order of brake discs mounting, contact **POCLAIN HYDRAULICS technical departments.*

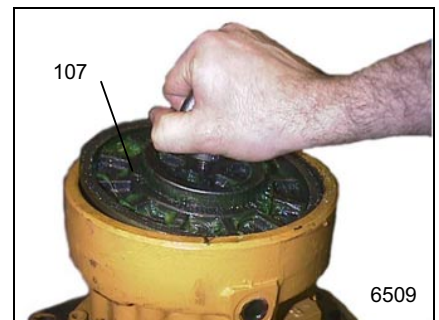
- Appliquer à nouveau l'effort **F** pour dégager l'anneau d'arrêt (109).
- *Reapply the compressive force **F** to remove the snap ring (109).*



- Démontez la rondelle élastique (108).
- *Remove the spring washer (108).*



- Démontez le piston de frein (107).
- *Remove the brake piston (107).*



- Installer le calage nécessaire (105) sur le dernier disque de frein, la cale la plus épaisse côté piston de frein.
- *Install the proper shimming (105) on the last disc, **the thickest shim towards the brake piston.***



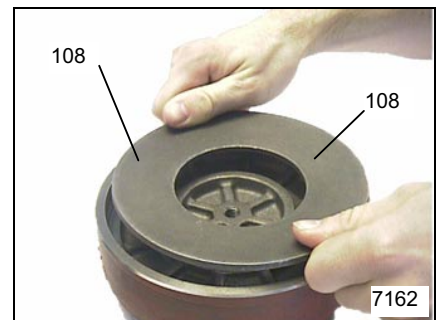
MINIMISER LE NOMBRE DE CALES D'ÉPAISSEUR 0.2 mm



MINIMIZE THE NUMBER OF SHIMS OF THICKNESS 0.2 mm [0.0079 inch]



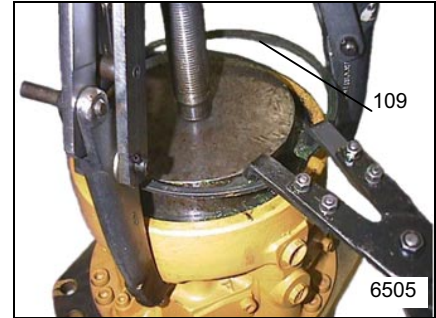
- Remonter le piston de frein (107), la rondelle élastique (108).
- *Reinstall the brake piston (107), the spring washer (108).*



POCLAIN HYDRAULICS

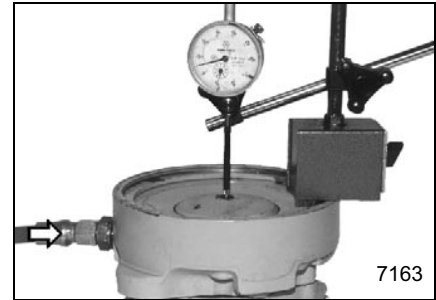
- Appliquer l'effort **F** pour monter l'anneau d'arrêt (109) et relâcher l'effort.

- *Apply the compressive force **F** to install the snap ring (109) and release the compressive force.*



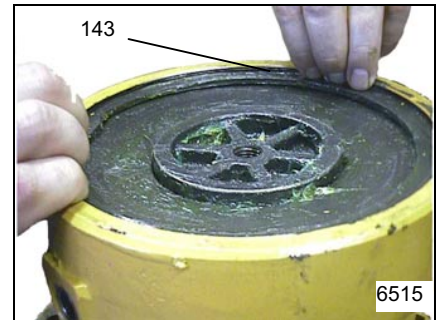
- Alimenter à nouveau le frein en pression pour vérifier la course du piston de frein.

- *Supply the pressure to the brake piston again to check the piston stroke.*



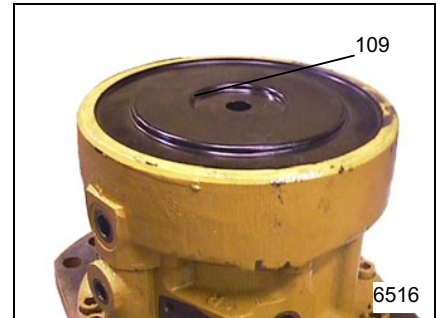
- Monter un joint torique neuf (143) enduit de graisse anti-oxydante (voir outillage page 66) dans sa gorge.

- *Install a new O-ring (143) coated with antioxidizing grease (see tool page 66) in its groove.*



- Placer la coiffe neuve (141) sur le chanfrein d'entrée.

- *Install a new cover (141) on the entry chamfer.*



- L'encliqueter à l'aide du mandrin correspondant (voir outillage page 66).

- *Click it into place using the corresponding mandrel (see tools page 66).*

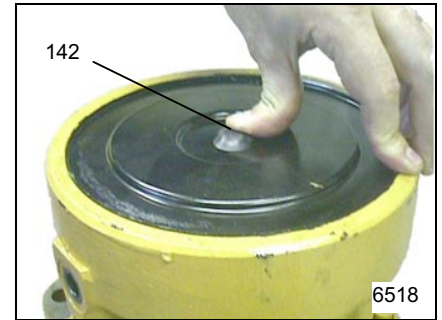


S'ASSURER QUE LE BORD EXTERIEUR DE LA COIFFE EST EN PRISE DANS SA GORGE.



MAKE SURE THAT THE OUTER EDGE OF THE BRAKE COVER IS ENGAGED IN THE GROOVE

- Monter un bouchon neuf (142).
- *Install a new plug (142).*



- Reposer le moteur.
- *Install the motor.*

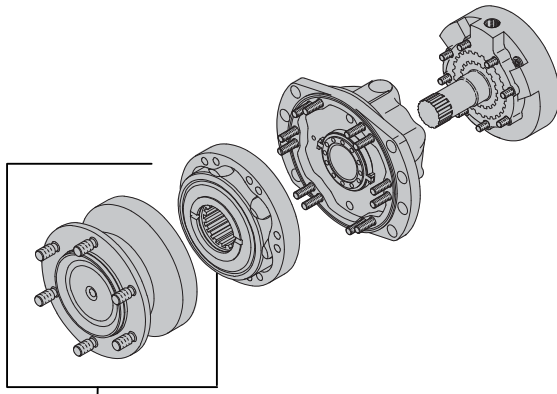


**ATTENDRE SIX HEURES APRES
LE COLLAGE AVANT DE SOLLI-
CITER LE FREIN OU D'UTILISER
LES FONCTIONS DE PUISSANCE
DU MOTEUR.**

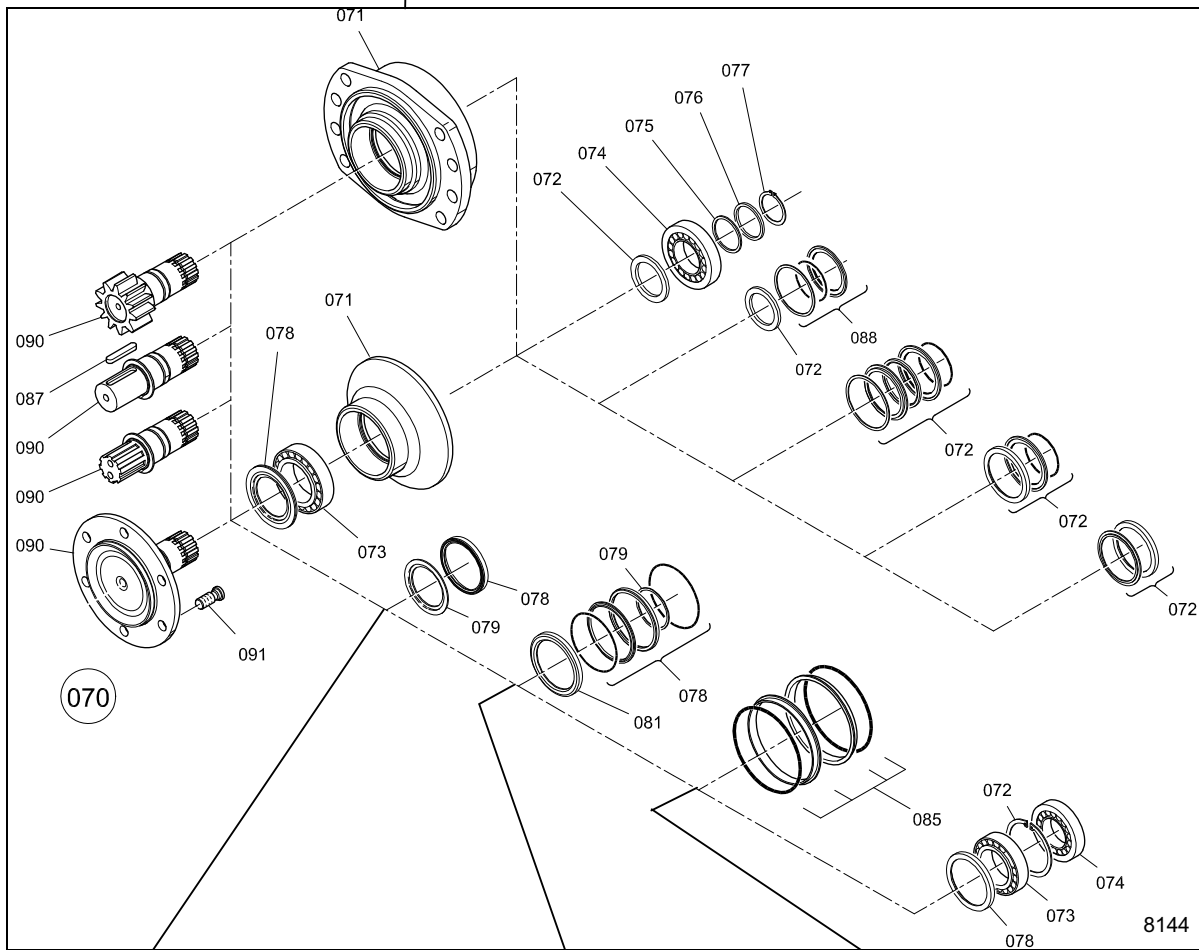


**WAIT SIX HOURS AFTER GLUING
BEFORE USING THE BRAKE OR
ENGAGING THE POWER FUNC-
TIONS OF THE MOTOR**

- Vérifier l'efficacité du frein.
- *Check brake effectiveness.*



5767



Etanchéité TYPE 1 :
Bague d'étanchéité faciale à lèvres

Sealing TYPE 1 :
Facial lip seal

Etanchéité TYPE 2 :
Bague d'étanchéité radiale à lèvres

Sealing TYPE 2 :
Radial lip seal

Etanchéité TYPE 3 :
joint glace

Sealing TYPE 3 :
Mechanical seal

Réparation du palier (070)

(Type 1, 2 et 3, sauf moteur MS02 avec palier "1340".et palier DYNA+)

Démontage

- Déposer le moteur.
- Disposer le moteur en appui sur le frein ou sur la plaque de fermeture (moteur sans frein)

- Repérer la position de la came (026) par rapport au couvercle distributeur (040).

- Démontez les vis (042).

- Démontez le palier (070), en utilisant un palan.

Bearing support (070) repair

(Type 1, 2 et 3, except MS02 motor with 1340 DYNA+ bearing support)

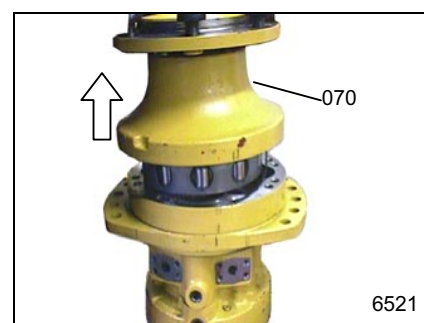
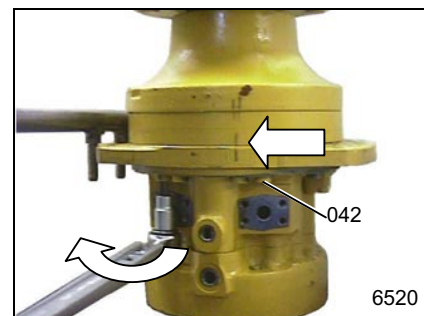
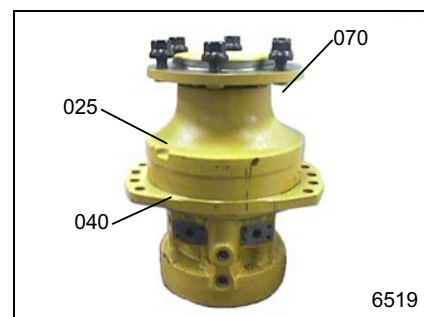
Disassembly

- Remove the motor.
- Place the motor on the brake or on the end cover (motor without brake)

- Mark the position of the cam (026) in relation to the valving cover (040).

- Remove the screws (042).

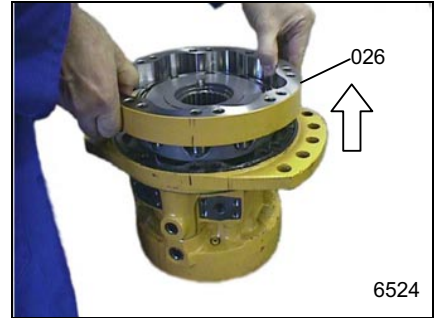
- Remove the bearing support (070), using a lifting tackle.



POCLAIN HYDRAULICS

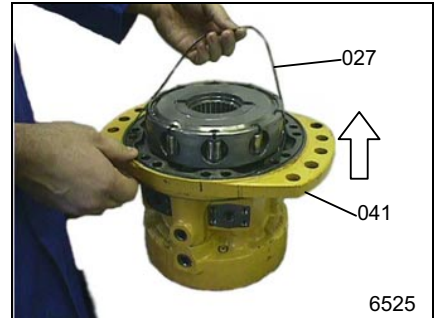
- Déposer la came (026).

- *Remove the cam (026).*



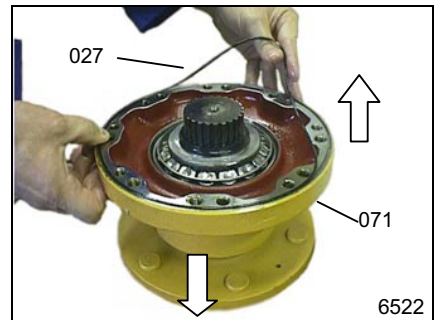
- Eliminer le joint torique (027) du couvercle (041).

- *Discard the O-ring (027) from the valving cover (041).*



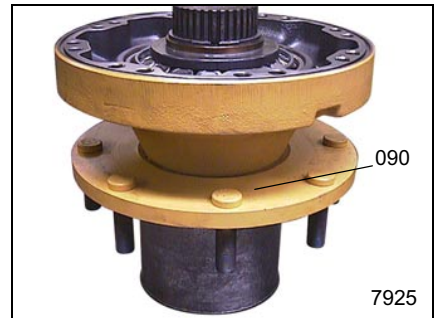
- Eliminer le joint torique (027) du support palier (071).

- *Discard the O-ring (027) from the bearing support (071)*



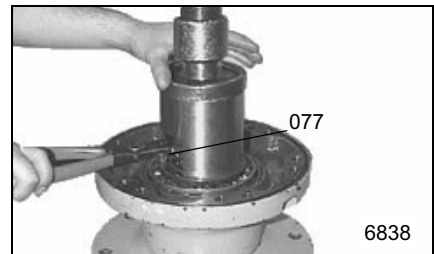
- Installer le palier posé sur l'arbre (090) sous une presse ou sur un support pour éviter tout effort sur les goujons.

- *Position the bearing support placed on the shaft (090) under a press or on a support to avoid any force on the studs.*



- Comprimer les roulements à l'aide d'un mandrin, Effort F (voir tableau page 72), puis démonter l'anneau d'arrêt (077) à l'aide d'une pince à anneaux d'arrêt extérieurs (voir outillage page 66).

- *Compress the roller bearings using a mandrel, force F (see table page 72), then remove the snap ring (077) using external snap ring pliers (see tools page 66).*



- Relâcher l'effort F de la presse, puis enlever le mandrin.
- Démontez la bague d'appui (076) et les cales de réglage (075)

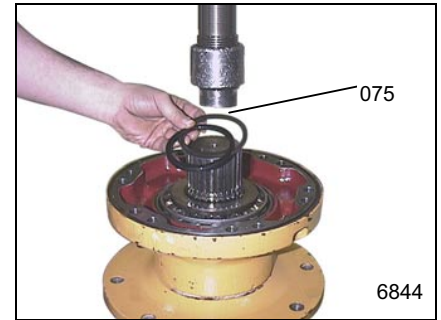
- Release the press force F and remove the mandrel.
- Remove the thrust ring (076) and the shims (075)



REPERER L'ORDRE DE MONTAGE DES CALES (075)



MARK THE MOUNTING ORDER OF THE SHIMS (075)



6844

- Fixer sur le support palier la plaque d'appui correspondante.

- Fix a right contact plate on the bearing support.



6840

- Positionner la plaque d'appui sur des supports sous la presse.

- Position the contact plate on the supports under the press.



DISPOSER SOUS LE PALIER UN MATERIAU SOUPLE (BOIS) POUR AMORTIR LA CHUTE DE L'ARBRE



PLACE UNDER THE BEARING SUPPORT A PLIANT MATERIAL (WOOD) TO ABSORB THE SHAFT DOWNFALL



6841

- Chasser l'arbre (090)

- Press out the shaft (090)



CHAUFFER LEGEREMENT LA BAGUE INTERIEURE DU ROULEMENT SI NECESSAIRE. LE ROULEMENT SERA DETRUIT PENDANT CETTE OPERATION



IF NECESSARY, HEAT SLIGHTLY THE INNER RING OF THE ROLLER BEARING. THE BEARING WILL BE DESTROYED BY THIS OPERATION



6842



PAR MESURE DE SECURITE, SE TENIR ELOIGNE DU MONTAGE PENDANT LA DESCENTE DE L'ARBRE



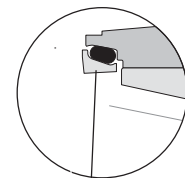
AS A SAFETY MEASURE, STAY APART FROM THE ASSEMBLY DURING THE SHAFT FALLING DOWN

Dans le cas de TYPE 3:

- Extraire la partie (078.2) du joint glace (côté support-palier) à l'aide d'un tournevis plat.

If TYPE 3:

- Using a flat screwdriver remove the part (078.2) of the mechanical seal (on the bearing support side).



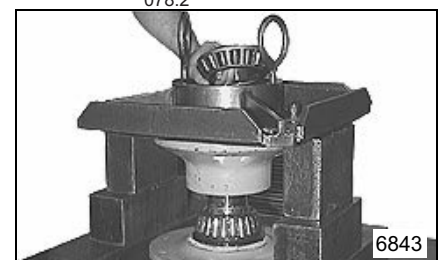
7873

Pour tous types

- Démontez la bague intérieure du roulement (074.1)

For all types:

- Remove the internal bearing cage (074.1)



6843

POCLAIN HYDRAULICS

- Extraire la bague extérieure du roulement (074.2). Utiliser un extracteur à deux branches à prise extérieure (voir outillage page 66) et un burin posé à plat pour obtenir un point d'appui centrale. Finir d'extraire la bague à l'aide d'un jet et d'un marteau.

- *Extract the bearing outer race (074.2) using a two legs extractor (see tools page 66) and a cutting tool lying flat to have a central support point for the extractor. Finish extracting the race using a casing and a hammer.*



Pour tous types sauf TYPE 3 :

- Chasser l'ensemble d'étanchéité (072).

All types except TYPE 3 :

- *Press out the sealing assembly (072).*



ATTENTION DE NE PAS ENDOMMAGER LE LOGEMENT DE LA BAGUE ETANCHE.

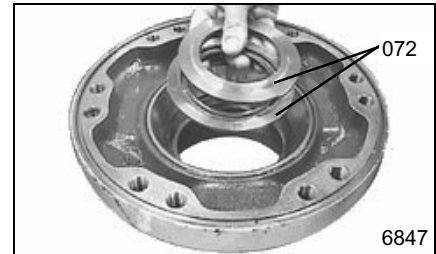


BE CAREFUL NOT TO DAMAGE THE SEAL'S HOUSING



- Eliminer l'ensemble d'étanchéité (072).

- *Discard the sealing assembly (072).*



- Extraire la bague extérieure du roulement (073) (voir outillage page 66). Finir d'extraire la bague à l'aide d'un jet et d'un marteau

- *Extract the bearing outer race (073) (see tools page 66). Finish extracting the race using a casing and a hammer.*

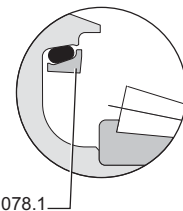


Dans le cas du TYPE 3 :

- Extraire la partie (078.1) du joint glace à l'aide d'un tournevis plat.

If TYPE 3 :

- *Remove the part (078.1) of the mechanical seal using a flat screwdriver.*



Pour tous types :

- Détruire cage à rouleaux du roulement (073) à l'aide d'un burin en la sectionnant en quatre points au-dessus des rouleaux.

For all types :

- *Destroy the bearing cage (073) using a cutting tool by sectioning it in four points above the rollers.*



NE PAS ENDOMMAGER LA PORTÉE DE JOINT SUR L'ARBRE



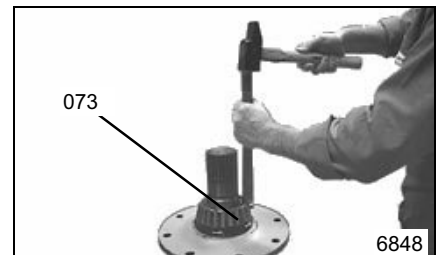
DO NOT DAMAGE THE SEAL CONTACT SURFACE ON THE SHAFT



NE JAMAIS TRONÇONNER DANS L'ATELIER POUR EVITER TOUTE POLLUTION



NEVER TRUNCATE IN THE WORKSHOP TO PREVENT POLLUTION



Ecarter la cage avec un tournevis et éliminer cage et rouleaux.

Pour tous types sauf TYPE 3 :

- Palier équipé de la bague d'étanchéité type 1 (078). Découper celle-ci à l'aide d'un burin. L'extraire avec un tournevis plat.
- Palier équipé de la bague d'étanchéité type 2 (078). Ecraser celle-ci à l'aide d'un burin plat.

Pour tous types :

- Extraire la bague intérieure du roulement (074) (voir outillage).



CHAUFFER LEGEREMENT SI NECESSAIRE : LA BAGUE D'ETANCHEITE (078) SERA DESTRUITE PAR CETTE OPERATION



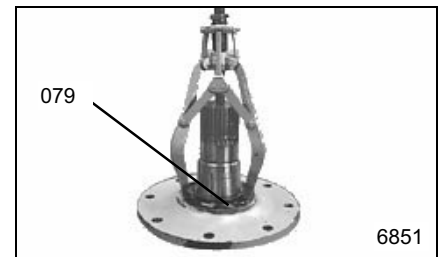
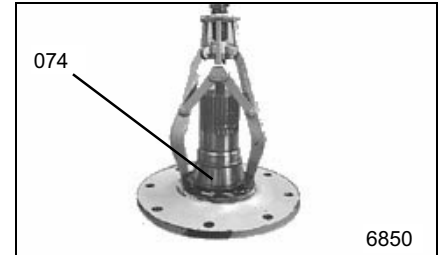
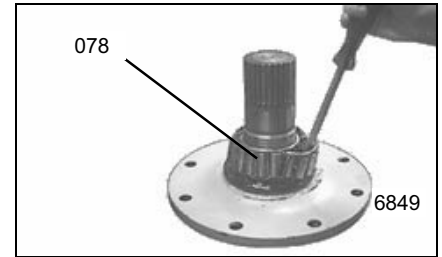
IF NECESSARY HEAT SLIGHTLY. THE LIP SEAL (078) WILL BE DESTROYED BY THIS OPERATION

Pour TYPE 1 :

- Extraire le déflecteur (079) à l'aide d'un tournevis plat.

TYPE 1:

- Extract the deflector (079) with a flat screwdriver.



**Remontage.
(TYPE 1 ou 2)**

- Contrôler la portée de la bague d'étanchéité (072) sur l'arbre (090) l'état des cannelures, la portée de la bague (078) sur le palier (071).
- Monter la bague d'étanchéité (072) dans le support palier à l'aide du mandrin correspondant voir outillage.



ENLEVER LE RESSORT POUR POSITIONNER LA BAGUE ETANCHE (072)

- S'assurer visuellement que la bague soit bien en place au fond de son logement.
- Monter la bague extérieure du roulement (074) dans le corps du support palier en la mettant en butée. (voir outillage page 66).
- Contrôler visuellement la bonne position de la bague dans son logement.

- Retourner le support palier et l'équiper de la bague extérieure du roulement (073) en la mettant en butée (voir outillage page 66).



NE PAS OUBLIER DE REMONTER LE RESSORT DE LA BAGUE D'ETANCHEITE.

- Contrôler visuellement la bonne position de la bague dans son logement.
- Enduire de graisse (LG EP2) la bague extérieure du roulement (073)

**Reassembly
(TYPE 1 or 2)**

- Check the lip seal (072) contact surface on the shaft (090), the splines conditions, the lip seal (078) contact surface on the bearing support (071)
- Install the lip seal (072) in the bearing support using the right mandrel – see tools.



TAKE OFF THE SPRING TO POSITION THE LIP SEAL (072)

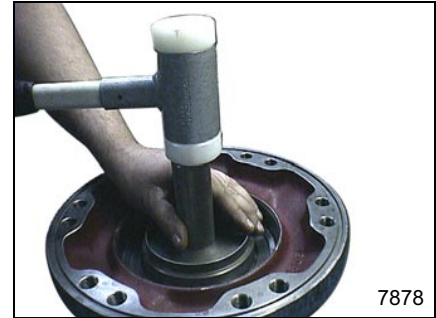
- Check visually that the lip seal is properly placed in the bottom of its groove
- Install the bearing outer race (074) in the bearing support housing up to the stop (see tools page 66)
- Check visually the right position of the race in its groove.

- Return the bearing support and install the bearing outer race (073) up to the stop (see tools page 66)



DO NOT FORGET TO INSTALL THE LIP SEAL SPRING.

- Check visually the right position of the race in its groove.
- Coat with grease (LG EP2) the bearing external race (073).



7878



7836



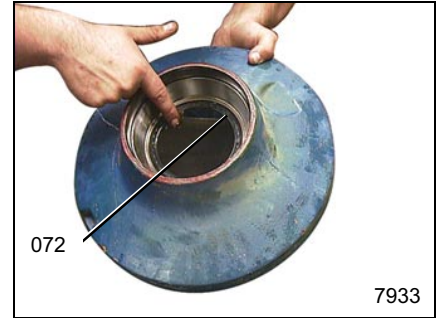
7837



7832

- Enduire de graisse (LG EP2) les lèvres de la bague d'étanchéité (072).

- Coat with grease (LG EP2) the lips of the lip seal (072).



- Enduire de graisse (LG EP2) le roulement (073).

- Coat with grease (LG EP2) the bearing (073).



- Monter le roulement (073) (voir outillage page 65) dans sa bague extérieure.

- Install the bearing (073) (see tools page 65) inside its external race.

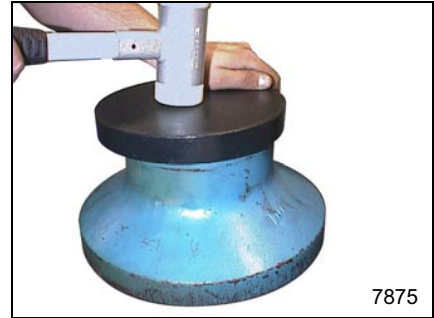


MONTAGE TYPE 1 :

- Monter la bague (078) à l'aide d'une plaque de téflon de diamètre supérieur et d'un maillet jusqu'au contact de la plaque sur le support palier et finir le montage à la main.

TYPE 1 ASSEMBLY:

- *Install the seal (078) using a teflon plate with upper diameter and a mallet up to the contact of the plate with the bearing support, then finish the assembly manually.*



7875

- Enduire de graisse (LG EP2) les lèvres de la bague type 1. (078)

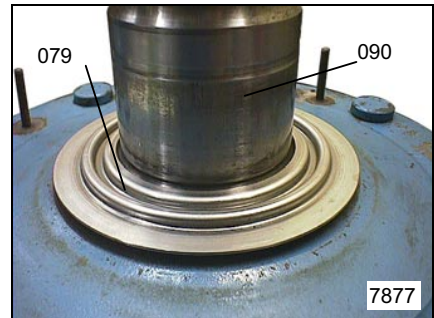
- *Coat with grease (LG EP2) the lips of the type 1 seal.(078)*



7927

- Monter le déflecteur (079) sur l'arbre (090).

- *Install the deflector (079) on the shaft (090)*



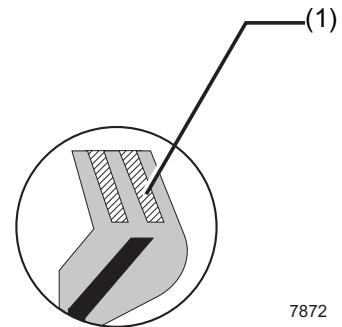
7877

MONTAGE TYPE 1 :

- Enduire de graisse (LG EP2) les lèvres (1) de la bague type 2 (078).

TYPE 1 ASSEMBLY :

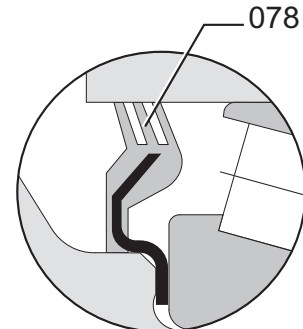
- *Coat with grease (LG EP2) the lips (1) of the type 2 seal (078).*



7872

- Monter manuellement la bague type 2 (078) dans le support palier et mettre en butée sur le roulement (074).

- *Install manually the type 2 seal (078) into the bearing support up to the stop on the bearing (074)*



3159



ATTENTION AU SENS DE MONTAGE DE LA BAGUE TYPE 2.(078)



BE CAREFUL ABOUT THE TYPE 2 SEAL (078) MOUNTING DIRECTION.



LES LEVRES NE DOIVENT PAS SE RETOURNER VERS L'INTERIEUR.



THE LIPS SHOULD NOT TURN INSIDE.

DANS TOUT LES CAS :

- Sous une presse, poser l'arbre sur un support pour éviter tout effort sur les goujons.

ALL CASES :

- *Under press, place the shaft on a support to avoid any force on the studs.*



- Positionner le support palier sur l'arbre

- *Install the bearing support on the shaft*



ATTENTION AU PASSAGE DES CANNELURES SUR LA BAGUE D'ÉTANCHEITE (072).

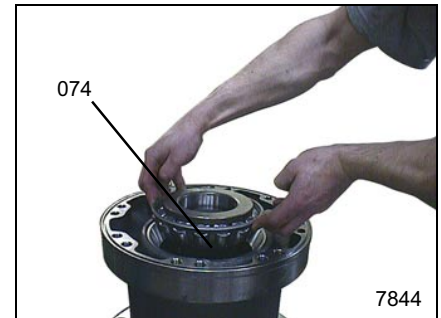


TAKE CARE WHEN PASSING THE SPLINES THROUGH THE LIP SEAL (072).



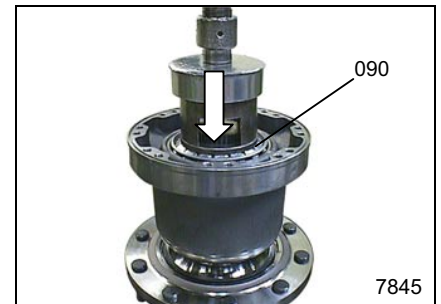
- Positionner le roulement (074) dans sa bague extérieure.

- *Install the bearing (074) in its outer race*



- Appliquer l'effort F (voir tableau page 69) sur le roulement (074) à l'aide du mandrin correspondant (voir outillage page 65).

- *Using the right mandrel (see tools page 65) press with F force (see table page 69) on the bearing (074)*



- Relâcher l'effort F (voir tableau page 69) jusqu'à obtenir 20 000 N [4500 lbf] et s'assurer de la mise en place des roulements par la rotation du palier (5 tours mini à droite et à gauche)

- *Release the F force (see table page 69) up to 20 000 N [4500 lbf] and check the bearings position by turning the bearing support (minimum 5 rev. to the right and left)*

- Appliquer à nouveau l'effort F (voir tableau page 69) sur le roulement (074) à l'aide d'un mandrin.

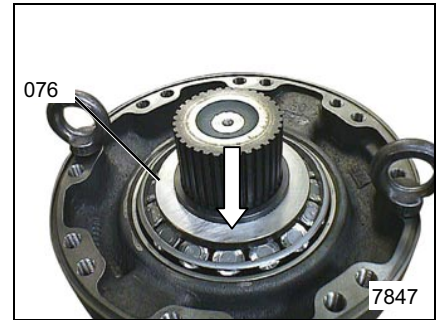
- *Using a mandrel press again with F force (see table page 69) on the bearing (074)*



POCLAIN HYDRAULICS

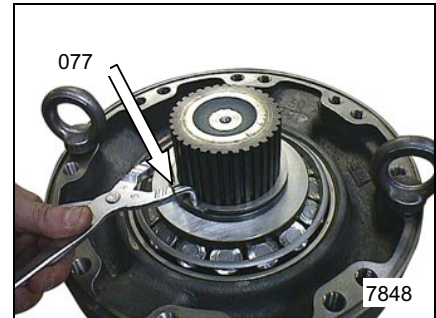
- Relâcher l'effort F, et monter la bague d'appui (076)

- *Release the F force, and install the thrust ring (076)*



- Monter l'anneau d'arrêt (077) en utilisant une pince à anneaux d'arrêt extérieurs

- *Remove the snap ring (077) using external snap ring pliers*

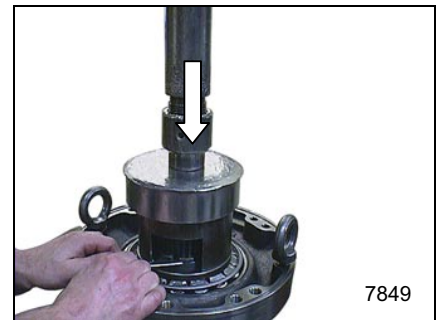


- Appliquer l'effort F (voir tableau page 69) sur le roulement (074), puis mesurer le jeu entre la bague d'appui (076) et l'anneau d'arrêt (077).

- *Apply the F force (see table page 69) on the bearing (074), then measure the clearance between the thrust ring (076) and the snap ring (077).*

- Déterminer le calage (075) afin d'obtenir le couple de rotation (C) correspondant (voir tableau page 69). (valeur approximative du calage = mesure + S)

- *Determine the shimming (075) in order to obtain the rotational torque (C) (see table page 69) (Approximate shimming value = measure + S).*



- Relâcher l'effort F. Démontez l'anneau d'arrêt (077) et la bague (076).

- *Stop the F force. Remove the snap ring (077) and the thrust ring (076).*

- Monter le calage (075)

- *Install the shimming (075)*



LA CALE LA PLUS EPAISSE DOIT ETRE MONTÉE CÔTÉ ROULEMENT



THE THICKEST SHIM SHOULD BE MOUNTED TOWARDS THE BEARING

- Remonter la bague (076).
- Monter l'anneau d'arrêt (077) (l'angle vif opposé à la bague d'appui (076)) en utilisant l'effort F initial (voir tableau page 69)

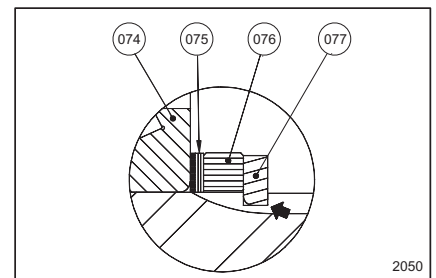
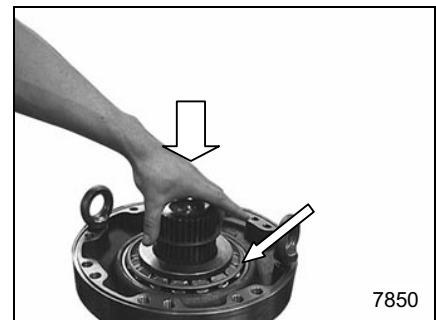
- *Install the thrust ring (076).*
- *Install the snap ring (077) (the sharp corner opposite to the thrust ring (076) using the initial F force (see table page 69).*

S'ASSURER :

- De l'impossibilité de tourner la bague (076) d'appui manuellement.
- Visuellement que le diamètre de l'anneau d'arrêt (077) n'est pas plus grand que celui de la bague d'appui (076).

CHECK :

- *that it is not possible to turn the thrust ring (076) manually*
- *visually that the snap ring (077) diameter is not larger than the thrust ring (076) diameter.*



ETANCHEITE RENFORCEE

REINFORCED SEALING

- Equiper le support de la bague d'étanchéité à l'aide du mandrin correspondant (voir outillage page 66).

- *Install the lip seal on its support using the right mandrel (see tools page 66)*



ENLEVER LE RESSORT POUR POSITIONNER LA BAGUE ETANCHE (072)



TAKE OFF THE SPRING TO POSITION THE LIP SEAL (072)



7880

- Contrôler visuellement la bonne position de la bague d'étanchéité.

- *Check visually the right position of the lip seal.*



7881

- Appliquer un cordon de Loctite 542 (voir outillage page 63) sur le diamètre extérieur du support équipé de la bague d'étanchéité.

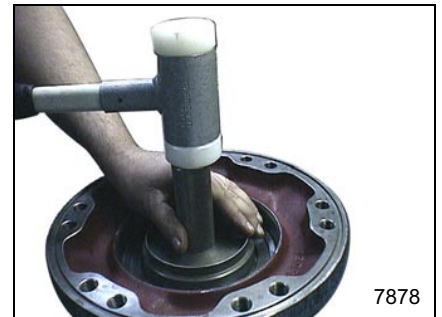
- *Coat with Loctite 542 (see tools page 63) the external diameter of the lip seal support assembly.*



7882

- Monter le support équipé à l'aide du mandrin (voir outillage page 66) dans le support palier.

- *Using a mandrel (see tools page 66) install the lip seal support assembly into the bearing support.*



7878

- Contrôler visuellement la bonne position du support équipé dans le support palier

- *Check visually the right position of the lip seal support assembly in the bearing support*



NE PAS OUBLIER D'ESSUYER L'EXCEDENT DE LOCTITE.



DO NOT FORGET TO CLEAN THE LOCTITE EXCESS



7885

POCLAIN HYDRAULICS

- Remonter le ressort de la bague d'étanchéité.
- *Reinstall the lip seal spring.*



- Appliquer un cordon de loctite 542 (voir outillage page 63) sur le support de contre-joint.
- *Coat with Loctite 542 (see tools page 63) the back-up ring support.*



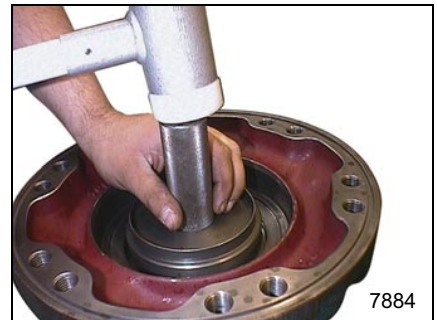
- Monter le support de contre-joint à l'aide du mandrin (voir outillage 66)
- *Using a mandrel (see tools page 66) install the back-up ring support*



ATTENTION AU SENS DE MONTAGE.



BE CAREFUL ABOUT THE MOUNTING DIRECTION.



- Essuyer l'excédent de Loctite.
- *Clean the Loctite excess.*
- Monter le joint torique.
- *Install the O-ring.*



- Monter le contre-joint.
- *Install the back-up ring.*



Remontage (TYPE 3)

- Contrôler les portées de joint et l'état des cannelures.



ARBRE NU SAUF SI DEFLECTEUR AVEC UNE BAGUE TYPE 1

Reassembly (TYPE 3)

- Check the lip seal contact surface and the splines conditions.

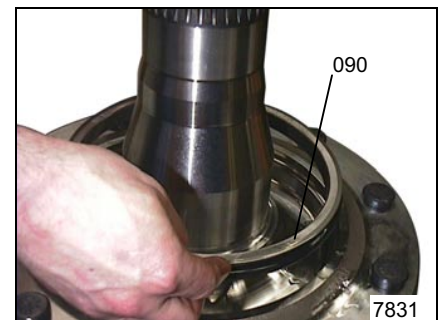


SHAFT PART EXCEPT IF THERE IS A DEFLECTOR WITH TYPE 1 SEAL



- Monter les éléments de la partie (78.1) du joint glace. Ici 1^{er} élément.

- Install the first component of the mechanical seal part (78.1)



- Ici 2^{ème} élément.

- Install the second component



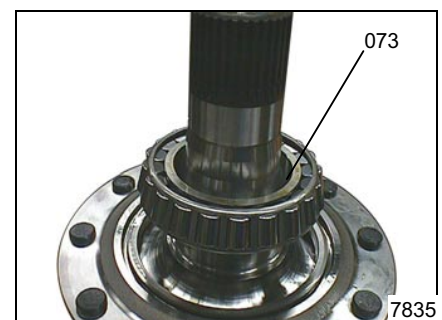
- Vérifier le positionnement du joint (085) visuellement en quatre points.

- Check visually at four points the seal's positioning (085).



- Positionner la bague intérieure du roulement (073) sur l'arbre

- Install the bearing inner race (073) on the shaft



POCLAIN HYDRAULICS

- Monter la bague extérieure du roulement (074) dans le corps du support palier, en la mettant en butée. (voir outillage page 66)

- *Install the bearing outer race (074) into the bearing support housing up to the stop. (see tools page 66)*



- Retourner le support palier et monter la bague extérieure du roulement (073) en la mettant en butée.

- *Turn the bearing support and install the bearing outer race (073) up to stop.*



- Positionner la partie (78.2) du joint glace sur l'outil (voir outillage page 66).

- *Place the mechanical seal part (78.2) on the tool (see tools page 66)*



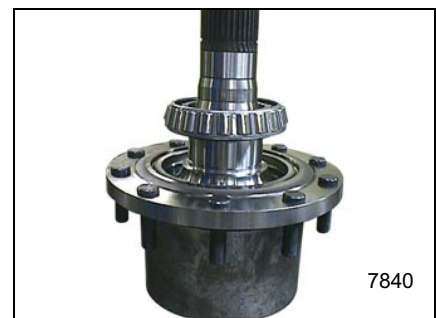
- Monter le joint glace sur le palier.
- Vérifier que le joint soit bien positionné visuellement en quatre points.

- *Install the mechanical seal on the bearing support.*
- *Check visually at four points the seal's positioning.*



- Poser l'arbre sur un support pour éviter tout effort sur les goujons

- *Place the shaft on a support to avoid any force on the studs*

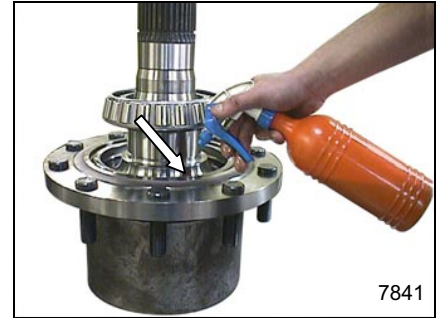


S'ASSURER QU'IL N'Y AIT AUCUNE IMPURETE SUR LES DEUX PARTIES DU JOINT GLACE



MAKE SURE THERE ARE NO IMPURITIES ON THE TWO PARTS OF THE MECHANICAL SEALS

- Huiler une des portées du joint glisse.
- *Lubricate one of the sealing surfaces*



7841

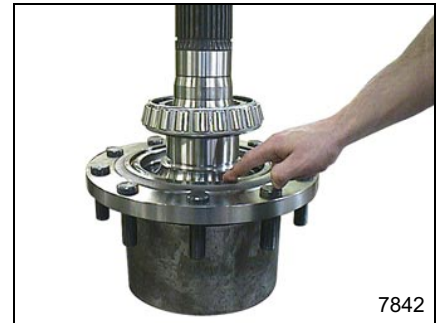
- Appliquer un film huile sur le joint.
- *Apply an oil film on the seal*



**PROCEDER AVEC PRECAUTION,
RISQUE DE COUPURE.**



**BE CAREFUL NOT TO CUT
YOURSELF**



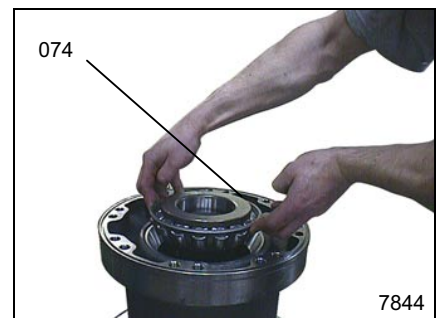
7842

- Positionner le support palier sur l'arbre
- *Position the bearing support on the shaft*



7843

- Positionner le roulement (074).
- *Position the bearing (074)*



7844

- Puis suivre les instructions décrites de la page 35 à la page 36 concernant le calage du palier.
- *Then follow the mounting instructions on pages 35 - 36 about the bearing support shimming.*

POCLAIN HYDRAULICS

Remontage du palier sur le moteur.

Avant le remontage, il est impératif de s'assurer de la propreté de la gorge.



Toute trace de rouille, boue, eau doit être supprimée.



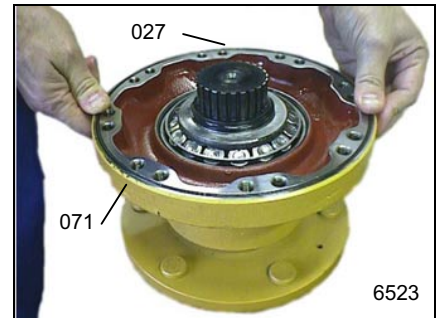
All traces of rust, mud, water must be removed

Reassembling of the bearing support on the motor.

Before reassembling it is necessary to ensure that the groove is clean

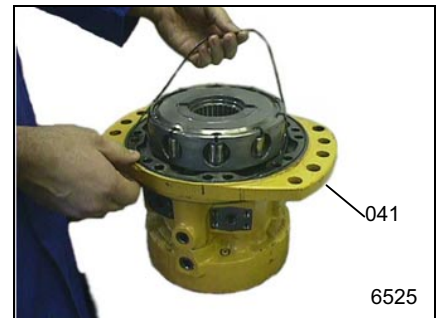
- Monter un joint torique neuf (027) enduit de graisse anti-oxydante (voir outillage page 66) dans la gorge du support palier (071).

- *Install a new O-ring (027) coated with anti-oxidizing grease (see tools page 66) in the groove of the bearing support (071).*



- Monter un joint torique neuf (027) enduit de graisse anti-oxydante (voir outillage page 66) dans la gorge du couvercle (041).

- *Install a new O-ring (027) coated with anti-oxidizing grease (see tools page 66) in the groove of the valving cover (041).*



- Monter la came (026) sur le couvercle, suivant les repères établis au démontage.

- *Install the cam (026) on the valving cover, in line with the marks made during disassembly.*



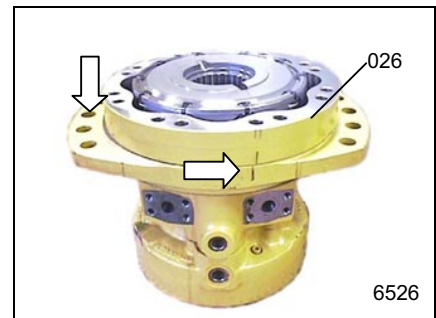
Gros chanfreins orientés côté palier



The big chamfers oriented towards bearing support

- Centrer la came à l'aide de deux vis (042) diamétralement opposées.

- *Center the cam using two screws (042) diametrically opposite.*



- Monter le palier en utilisant un palan.

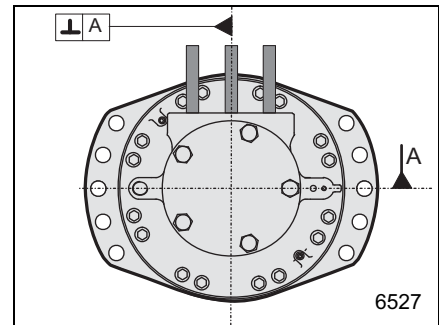
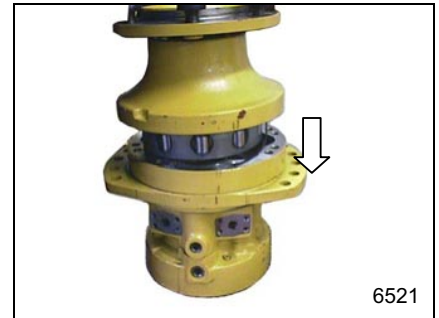
- *Install the bearing support, using a lifting tackle.*



Pour les moteurs paliers les orifices doivent être perpendiculaires à l'axe de fixation du moteur. (Fig 6527)

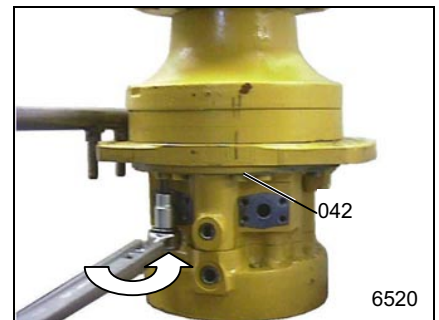


For shaft motors the ports must be perpendicular to the mounting axis of the motor. (Fig 6527)



- Monter et serrer les vis de fixations (042) au couple indiqué. (voir tableau page 71).

- *Install and tighten the mounting screws (042) to the right torque. (see table page 71).*



- Reposer le moteur.

- *Install the motor.*

Remplacement du palier DYNA +

Démontage.

Les étapes suivantes sont impératives si le joint (045) fuit sinon commencer le démontage des vis (042) page 45

- Disposer le moteur en appui sur le palier et desserrer les vis (066).

Replacement of the DYNA + bearing support.

Disassembly.

The following steps are mandatory if there are leaks on the seal (045) level, if not start removing the screws (042) page 45

- Place the motor on the bearing support and unscrew the screws (066).

- Démontez les vis (066) puis la plaque de fermeture (065).

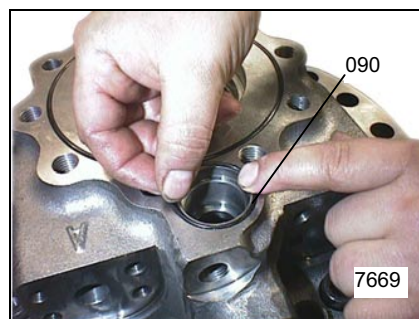
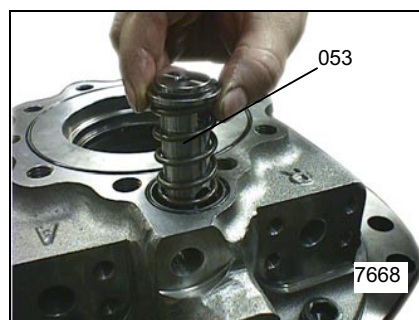
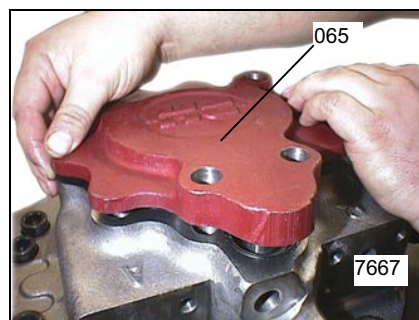
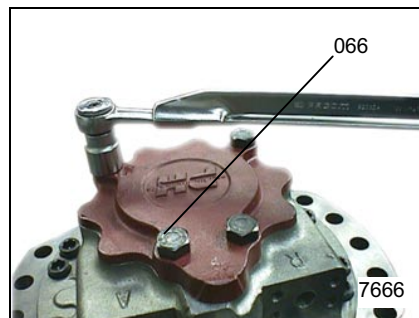
- Remove the screws (066) and the end cover (065).

- Démontez le tiroir (053)

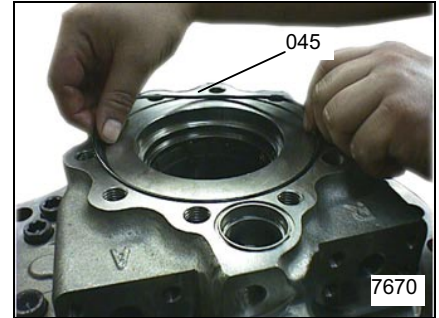
- Remove the valve spool (053).

- Éliminez le joint torique (057).

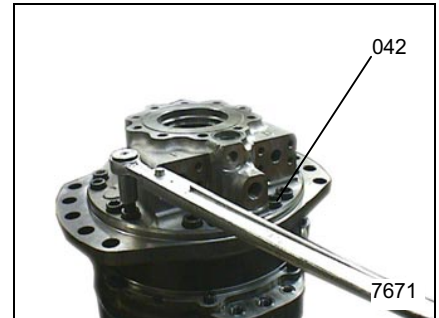
- Discard the O-ring (057).



- Éliminer le joint torique (045).
- Discard the O-ring (045).



- Desserrer les vis (042).
- Unscrew the screws (042).



- Démonter le couvercle (040) équipé de la glace.
- Remove the valving cover (040) equipped with the valving.



Repérer la position de la glace (047) par rapport au couvercle (041).



Mark the location of the valving (047) in relation to the valving cover (041).



- Démonter la came (025).
- Remove the cam (025).



- Démonter le bloc cylindre équipé (010).
- Remove the cylinders block assembly (010).



POCLAIN HYDRAULICS

- Éliminer le joint torique (027).
- Discard the O-ring (027).



Remontage.

- Avant le remontage, il est impératif de s'assurer de la propreté de la gorge.



Toute trace de rouille, boue, eau doit être supprimée.

- Monter un joint torique (027) neuf dans la gorge du support palier (071).



Monter le joint sans l'enduire de graisse.

Les 2 étapes suivantes ne sont pas nécessaires si la plaque de fermeture (065) n'a pas été démontée.

- Monter un joint torique neuf (027) enduit de graisse anti-oxydante (voir outillage page 66) dans la gorge du couvercle (041).

- Monter un joint torique neuf (057) enduit de graisse anti-oxydante (voir outillage page 66) dans la gorge du tiroir (053).

- Monter le bloc cylindre équipé (010).

Reassembly.

Before reassembling it is necessary to ensure that the groove is clean



All traces of rust, mud, water must be removed

- Install a new O-ring (027) in the groove of the bearing support (071).



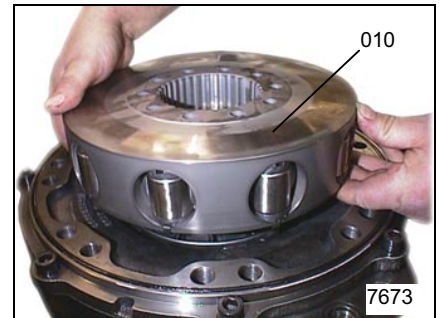
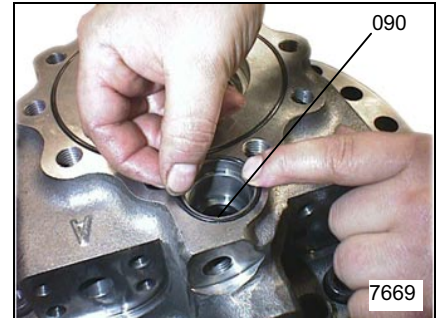
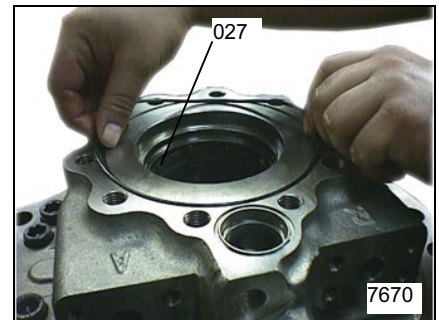
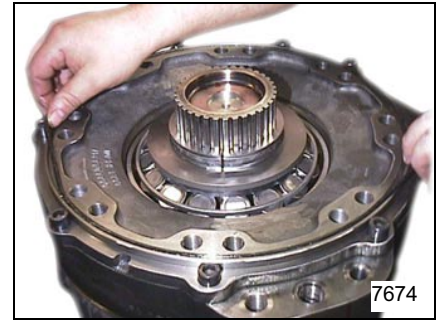
Install the O-ring without greasing it.

The 2 following steps are not necessary if the end cover (065) was not removed.

- Install a new O-ring (027) coated with anti-oxidizing grease (see tools page 66) in the groove of the valving cover (041).

- Install a new O-ring (057) coated with anti-oxidizing grease (see tools page 66) in the groove of the valve spool (053).

- Install the cylinders-block assembly (010).



POCLAIN HYDRAULICS

- Monter la came (025).



**Gros chanfreins orientés
côté palier**

- *Install the cam (025).*



**The big chamfers oriented
towards bearing
support**



- Huiler avec du fluide hydraulique le dessus du bloc-cylindres.

- *Lubricate with hydraulic fluid the top of the cylinder-block.*



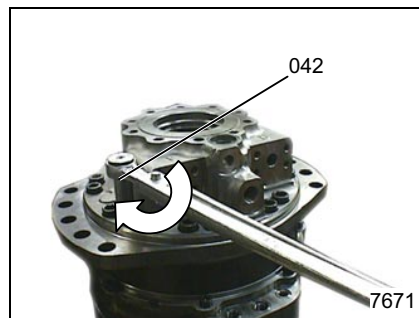
- Monter le couvercle équipé sur l'ensemble. Utiliser les 2 piges de positionnement.

- *Install the valving cover assembly on the unit. Use 2 positioning pins.*



- Monter et serrer au couple les vis (042). Puis retirer les piges de positionnement.

- *Install and tighten the screws (042). Then remove the positioning pins.*

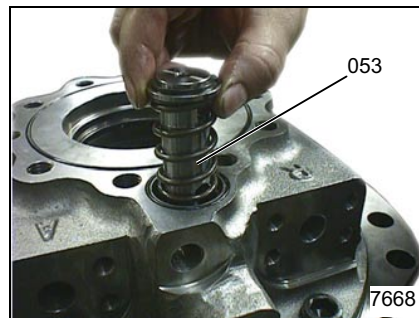


Les 3 étapes suivantes ne sont pas nécessaires si la plaque de fermeture n'a pas été démontée.

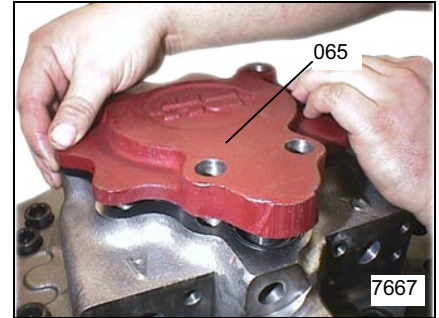
The 3 following steps are not necessary if the end cover was not removed.

- Monter le tiroir (053).

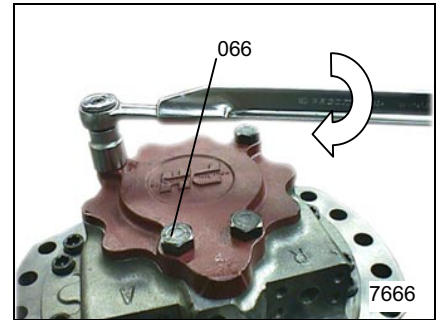
- *Install the valve spool (053).*



- Monter la plaque de fermeture (065).
- *Install the end cover (065).*



- Monter et serrer au couple les vis (066).(voir tableau page 69)
- *Install and tighten the screws (066).(see table page 69)*

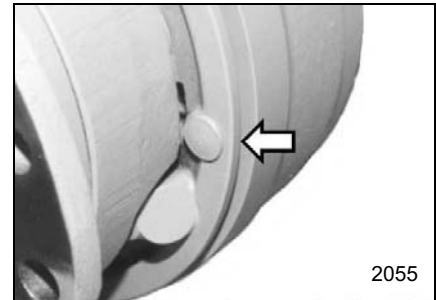


Remplacement des mâchoires de frein

Avant démontage il est possible de contrôler visuellement l'usure des garnitures de frein par les trous de visite.

Replacing the brake shoes.

Before disassembling it is possible to make a visual checking of the brake pads wear via the inspection ports.



Démontage

Disassembly



Le remplacement des mâchoires et des tambours doit être effectué sur chaque moteur d'un même essieu



The same repairs should be made on each motor of the same axle when replacing shoes and brake drums.

- Débloquer les écrous de fixation de la jante.
- Lever l'engin à proximité de la jante à déposer.
- Déposer la jante (pneu).
- Desserrer le frein mécanique.

- Loosen the wheel rim retaining nuts.
- Raise the machine on the side of the wheel rim to be removed.
- Remove the wheel rim (tyre).
- Release the mechanical brake.

- Extraire le tambour (096)

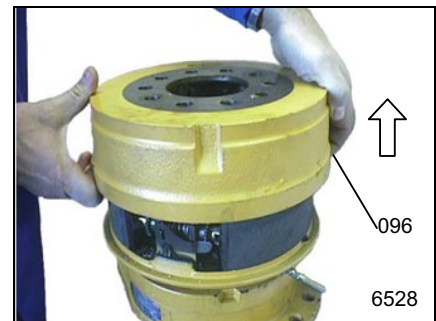
- Extract the drum (096).



Contrôler l'état de la surface de frottement du tambour qui ne doit comporter aucune rayure profonde (0,2 mm maxi) ni d'usure anormale sinon procéder à son remplacement. (Ra 1,6 à 3,2)

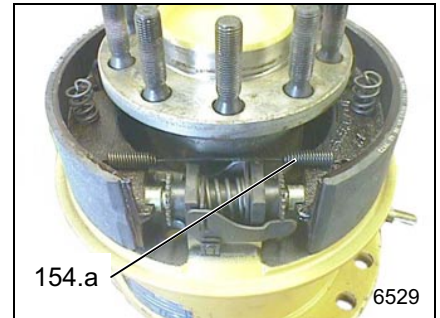


Check the friction surface condition of the drum which should show no deep scratches (deeper than 0,2 mm [0.0078 in]) nor abnormal wear. Otherwise, the brake drum should be replaced. (Ra 1.6 to 3.2)



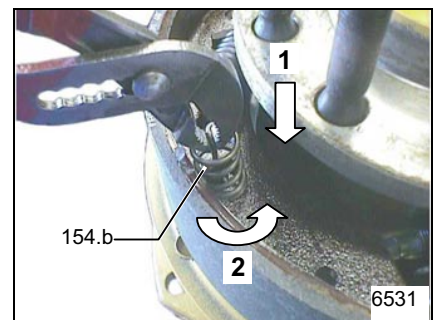
- Démontez le ressort de rappel (154.a).

- Remove the return spring (154.a).



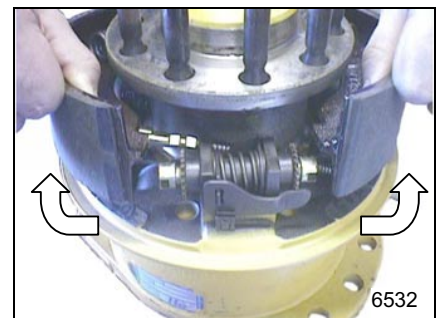
- Démontez les ressorts de maintien (154.b).

- Remove the retention springs (154.b).



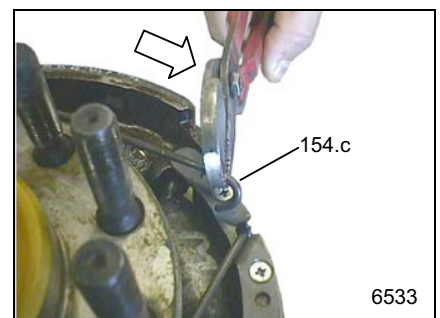
- Libérez les mâchoires du mécanisme de réglage.

- Release the brake shoes from the regulating mechanism.



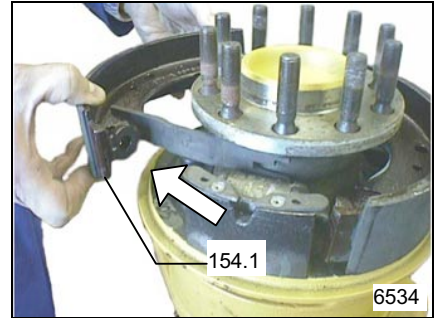
- Démontez les ressorts de rappel (154.c).

- Remove the return springs (154.c).

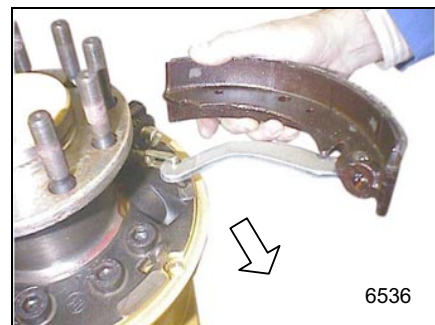
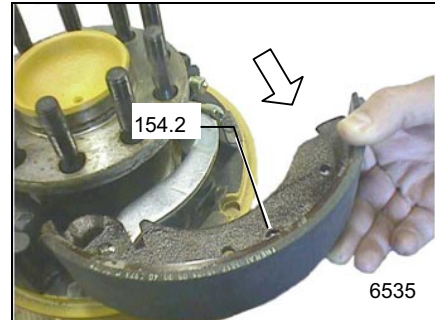


POCLAIN HYDRAULICS

- Déposer la mâchoire (154.1)
- *Remove the brake shoe (154.1)*



- Déposer la mâchoire (154.2) en libérant le levier de freinage mécanique de son câble.
- *Releasing the mechanical brake control lever from its cable, remove the brake shoe (154.2)*



Remontage



Dépoussiérer l'ensemble, s'assurer de l'étanchéité du cylindre de roue.

Contrôler l'état de la surface de frottement du tambour qui ne doit comporter aucune rayure profonde (supérieure à 0.2 mm) ni d'usure anormale sinon procéder à son remplacement.

- Monter la mâchoire (154.2), en accrochant le levier de commande sur le câble de frein (098).

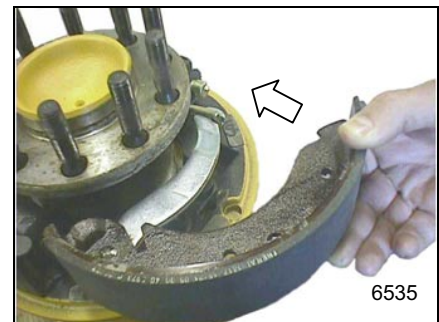
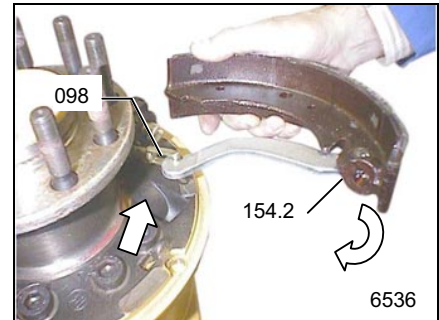
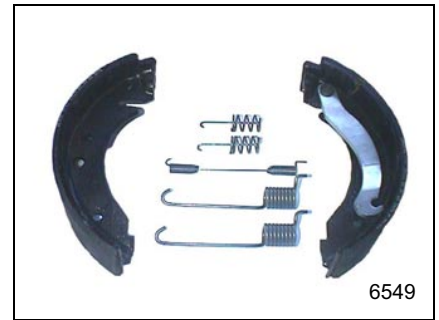
Reassembly



Remove all dust from the whole assembly. Make sure there are no leaks at the wheel cylinder.

Check the friction surface condition of the drum which should show no deep scratches (deeper than 0.2 mm) [0.0078in] nor abnormal wear. Otherwise, the brake drum should be replaced.

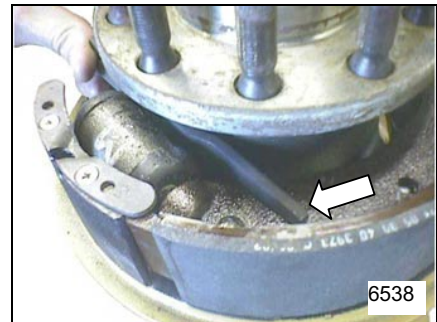
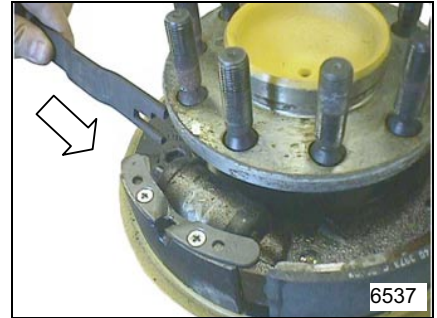
- Attaching the control lever on the brake cable (098), install the brake shoe (154.2)



POCLAIN HYDRAULICS

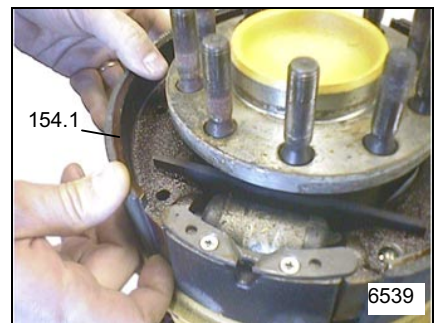
- Monter la plaque de renvoi sur la mâchoire (154.2)

- *Mount the return plate on the brake shoe (154.2)*



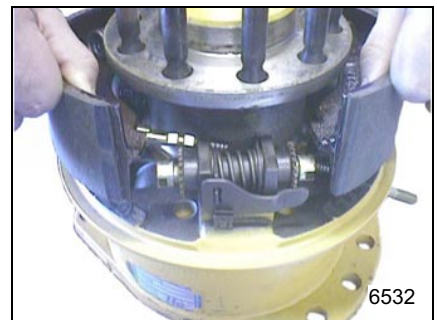
- Monter la mâchoire (154.1)

- *Install the brake shoe (154.1)*



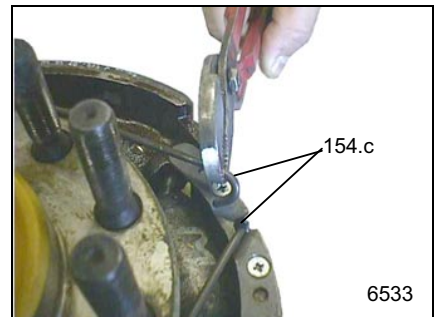
- Positionner les mâchoires sur le mécanisme de réglage.

- *Position the brake shoes on the regulating mechanism.*



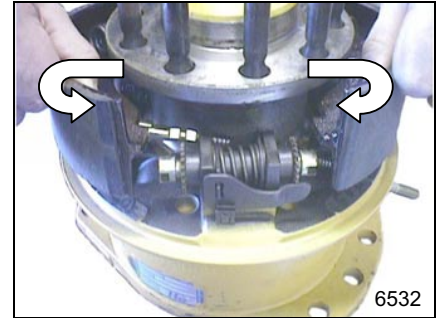
- Monter les ressorts de rappel (154.c)

- *Install the return springs (154.c)*



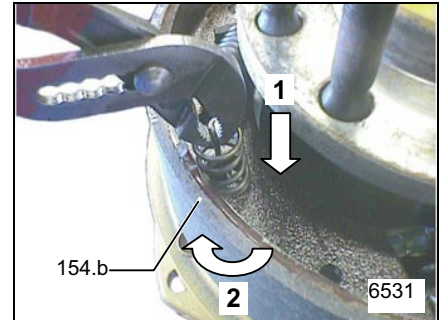
• Mettre en place les mâchoires dans le mécanisme de réglage

• *Install the brake shoes in the regulating mechanism*



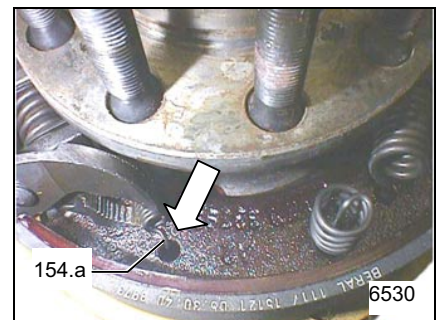
• Monter les ressorts de maintien (154.b)

• *Install the retention springs (154.b)*



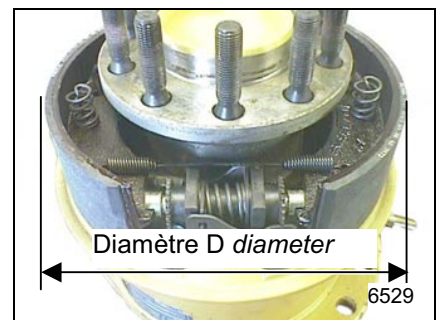
• Monter le ressort de rappel (154.a)

• *Install the return spring (154.a)*



• Mesurer le diamètre D de frottement du tambour puis celui des mâchoires en place

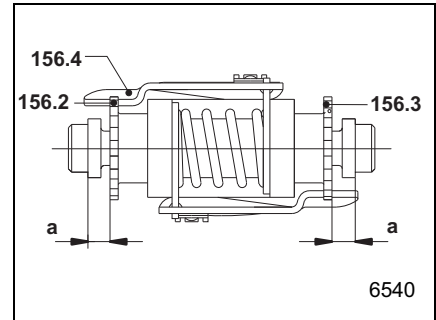
• *Measure the brake drum friction diameter D and that of the brake shoes, which have been installed.*



POCLAIN HYDRAULICS

- Ajuster le diamètre des mâchoires pour obtenir le jeu entre garniture et tambour à l'aide de la roue dentée (156.1) pour les freins équipés d'un dispositif de réglage mécanique ou des deux roues dentées (156.2 et 156.3) pour les freins équipés d'un dispositif de rattrapage de jeu automatique. Dans ce cas, l'action sur les roues dentées doit être symétrique (a). Dégager légèrement le levier (156.4) pour permettre cette opération.

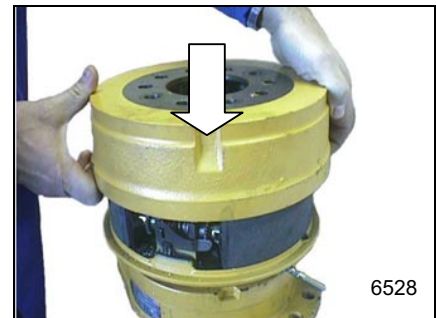
- *Adjust the brake shoes diameter to obtain correct clearance between the brake padding and the drum using the adjusting wheel (156.1) for brakes equipped with mechanical adjustment system or two adjusting wheels (156.2 and 156.3) for brakes equipped with automatic clearance adjustment. In this case, the adjusting wheels should be adjusted symmetrically (a). Release the lever slightly (156.4) to enable this operation to take place.*



Freins <i>Brake</i>	Diamètre tambour (mm) <i>Drum diameter [in]</i>		Jeu total (mm) <i>Total clearance [in]</i>
	nominal	maximum	
250 x 60	250 [9.84]	252 [9.92]	0.55 [0.02]
270 x 60	270 [10.63]	272 [10.70]	0.80 [0.03]
325 x 80	325 [12.79]	327 [12.87]	0.80 [0.03]
350 x 60	350 [13.78]	352 [13.85]	0.80 [0.03]

- Monter le tambour, contrôler sa libre rotation.

- *Install the drum, check that it can turn freely.*



- Purger le cylindre de roue si nécessaire.
- Remonter la jante.

Voir brochure INSTALLATION MS F/GB (ref. 677777844K)

- *Bleed the wheel cylinder, if necessary.*
- *Install the wheel rim.*

• See brochure *INSTALLATION MS F/GB (ref 677777844K)*

Remplacement de la came (026)

Replacement of the cam (026)

Démontage

Disassembly

Effectuer les opérations décrites à la rubrique "démontage" du chapitre "remplacement du palier" page 27

Do operations described in chapter "replacement of the bearing support" section "disassembly" page 27

Remontage

Reassembly

Effectuer les opérations décrites à la rubrique "remontage" du chapitre "remplacement du palier" page 28. Il est nécessaire de respecter la position angulaire de la came dans le cas des moteurs à 2 cylindrées dont le rapport de cylindrée est différent de 2

Do operations described in chapter "replacement of the bearing support" section "reassembly" page 28. The angular position of the cam must be respected on dual displacement motors with a displacement ratio different from 2.

Exemple : Moteur MS18, cylindrées 1747-1049-698

Example : Motor MS18 with displacement 1747-1049-698.

Petite cylindrée : 698 cm³ lettre P

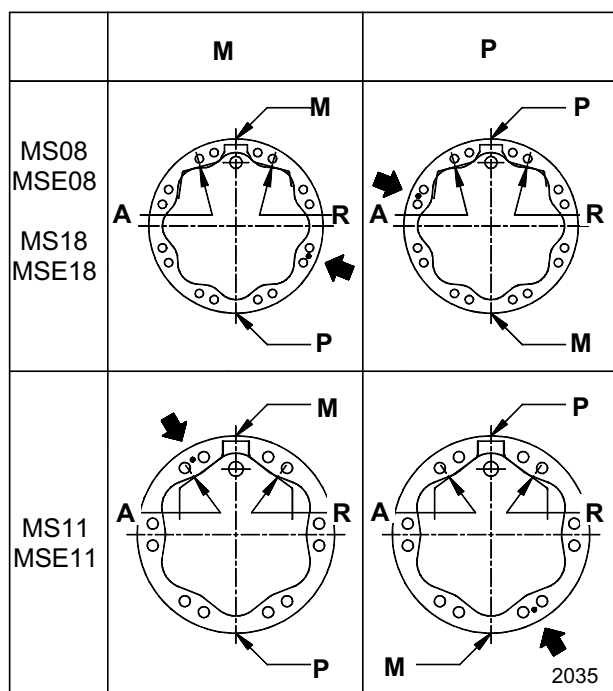
Small displacement : 698 cm³ [42.59 cu.in] letter P

Moyenne cylindrée : 1 049 cm³ lettre M

Medium displacement : 1049 cm³ [64.01 cu.in] letter M.

La lettre P ou M doit être située dans l'axe et vers le tiroir de changement de cylindrée, le trou borgne côté fixation de la came sur le palier.

The letter P or M must be located in the axis and towards the displacement change spool, with the blind hole towards the fixing of the cam on the bearing support.



Remplacement du bloc cylindre équipé (010)

Démontage

Effectuer les opérations décrites à la rubrique "démontage" du chapitre "remplacement du palier" page 27

- Après avoir démonté la came, démonter le bloc cylindre.

Remontage

- Monter un joint torique neuf (027)

- Monter le bloc cylindre équipé (010)

- Effectuer les opérations décrites à la rubrique "remontage" du chapitre "remplacement du palier" page 28.

Replacement of the cylinders block assembly (010)

Disassembly

Do operations described in chapter "replacement of the bearing support" section "disassembly" page 27

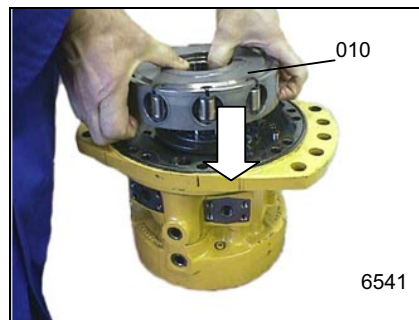
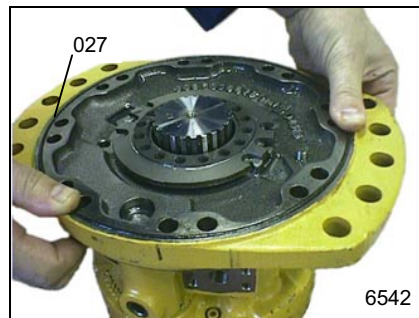
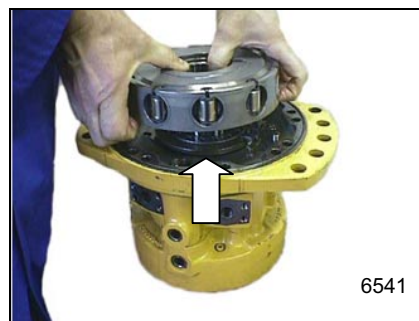
- After removing the cam, remove the cylinders block.

Reassembly

- Install a new O-ring (027)

- Install the cylinders block assembly (010)

- Do operations described in chapter "replacement of the bearing support" section "reassembly" page 28.



Remplacement de la glace (047).

Démontage

- Effectuer les opérations décrites à la rubrique "démontage" du chapitre "remplacement du bloc cylindre équipé (010)" page 58.



Repérer le position de la glace (047) par rapport au couvercle (041) (moteur à deux cylindrées).

- Déposer la glace (047) du couvercle (041) en faisant levier au niveau des doigts d'indexage ou de la collerette.



Protéger la glace de toute poussière.

- Extraire les ressorts (052).
- Extraire et éliminer les joints et contre joints (048) du couvercle (041).

Remontage



Toute trace de rouille, boue, eau doit être supprimée.

- Huiler, puis monter des joints toriques et contre joints neufs (048) en déformant les contres joints au minimum.

- Placer les ressorts (052) dans leur logement préalablement rempli de graisse.
- Huiler les portées de joints de la glace (047).
- Enfoncer la glace (047) dans le couvercle (041).

Replacement of the valving (047).

Disassembly

- Do operations described in chapter "replacement of the cylinders bloc assembly (010)" section "disassembly" page 58.



Mark location to the valving (047) in relation to the valving cover (041) (Dual displacement motor).

- Separate the valving (047) from the cover (041) by levering at the indexing pins or at the flange.



Protect the valving from dusts.

- Remove the springs (052).
- Remove and discard the seals and back-up rings (048) from the cover (041).

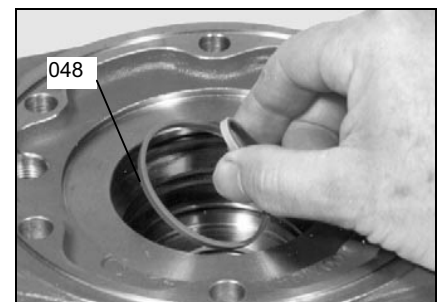
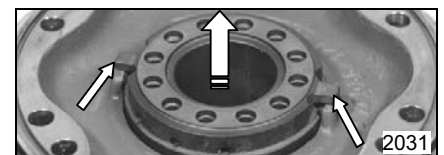
Reassembly



All traces of rust, mud, water must be removed.

- Lubricate and install new seals and back-up rings (048), ensuring the back up rings are twisted as little as possible.

- Place the springs (052) in their housings, previously filled with grease.
- Lubricate the faces of the seals of the valving (047).
- Press the valving (047) into the cover (041).



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Respecter le sens de montage de la glace (047) par rapport au couvercle (041).



Respect the assembly sense of the valving (047) in relation to the cover (041).



Ne pas forcer lors du montage de la glace (047) dans le couvercle (041).



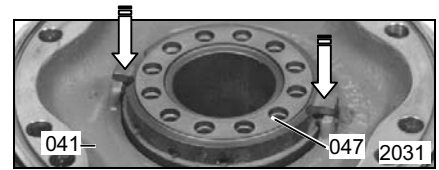
Do not force when installing the valving (047) into the cover (041).

Montage glace version 1C.

Valving assembly type single displacement motor.

- Pas de sens de montage particulier.

- No particular assembly sense.



Montage glace version 2C.

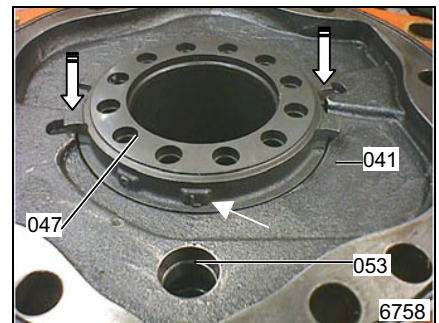
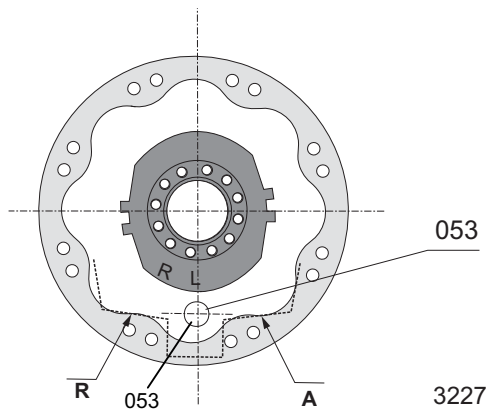
Valving assembly type Dual displacement motor.

- Mettre la lettre choisie indiquant le sens de rotation en face du tiroir de pilotage (053).

- Place the chosen letter indicate the rotation sense in front of the displacement change spool (053).

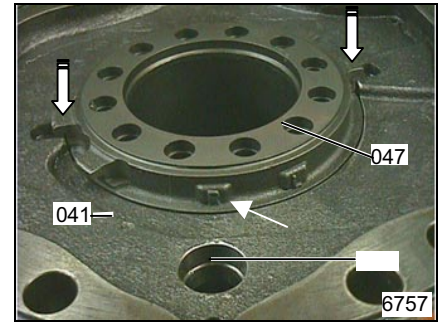
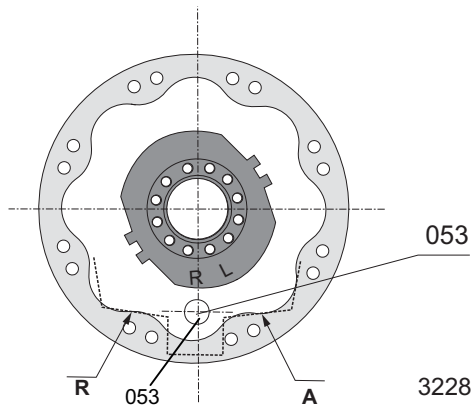
POSITIONNEMENT DE LA GLACE
G/L Gauche

VALVING POSITIONING
G/L Left



D/R Droite

D/R Right



• Si il n'y a pas de lettre, réaliser l'indexage suivant les repères établis au démontage.

• If there is no letter, do the indexing according to the marks made during disassembly.

• Effectuer les opérations décrites à la rubrique "remontage" du chapitre "remplacement du bloc cylindre" page 58.

• Do operations described in chapter "replacement of the cylinders block" section "reassembly" page 58.

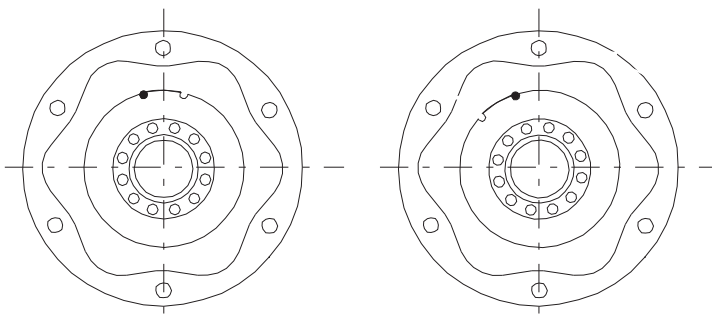
Cas des moteurs SE02 et S05 :

Situation of SE02 and S05 motors :

Moteur SE02 :
SE02 Motor :

G/L Gauche
G/L Left

D/R Droite
D/R Right

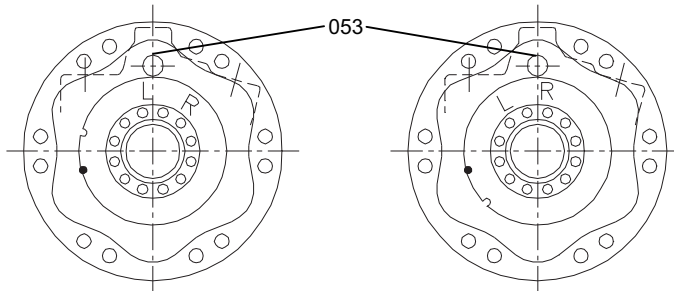


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Moteur S05 :
S05 Motor :

G/L Gauche
G/L Left

D/R Droite
D/R Right



6948

Remplacement du joint (045) de la plaque de fermeture.

Démontage

- Disposer le moteur en appui sur le palier (écrou montés pour protéger les goujons)
- Démontez les vis (066)

Replacement of the end cover O-ring (045)

Disassembly

- Place the motor on the bearing support (fitted with nuts for studs protection)
- Remove the screws (066)

- Démontez la plaque de fermeture

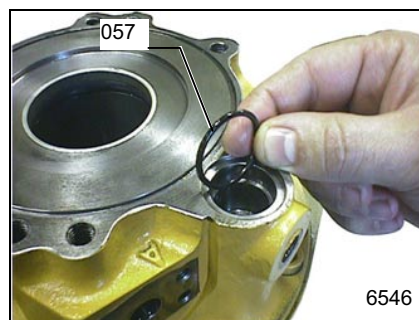
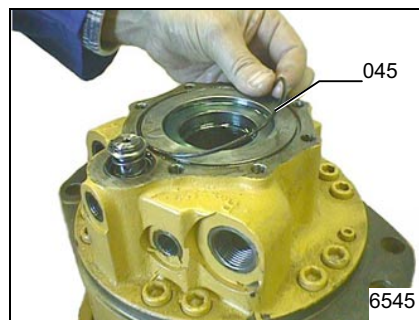
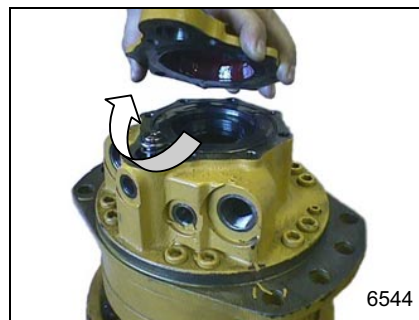
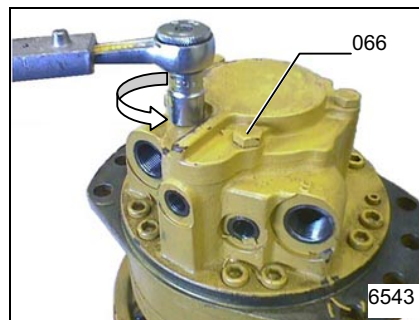
- Remove the end cover

- Éliminer le joint torique (045)

- Discard the O-ring (045)

- Éliminer le joint torique (057) si le moteur est un 2 cylindrées

- Discard the O-ring (057) if the motor has 2-displacement

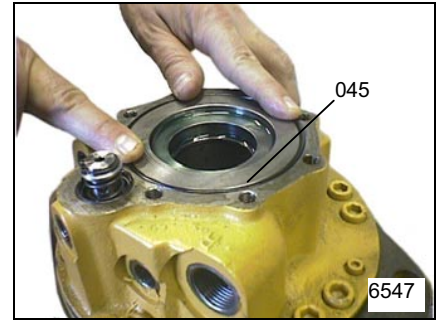


Remontage

Reassembly

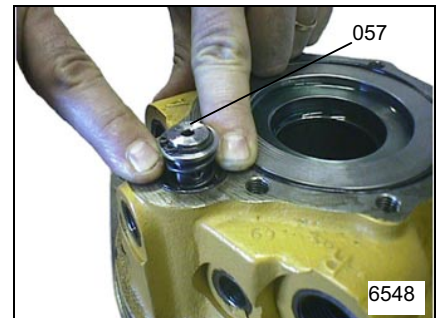
- Monter un joint torique (045) neuf.

- *Install a new O-ring (045).*



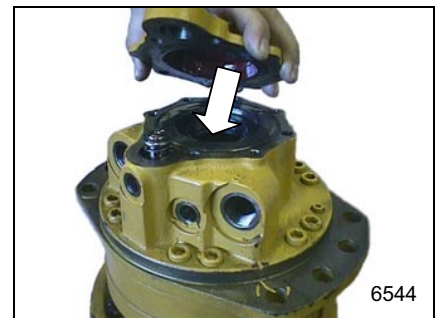
- Monter un joint torique (057) neuf si le moteur est un 2 cylindrées sinon passer à l'étape suivante

- *Install a new O-ring (057) if the motor has 2-displacement. If not go to the next section*



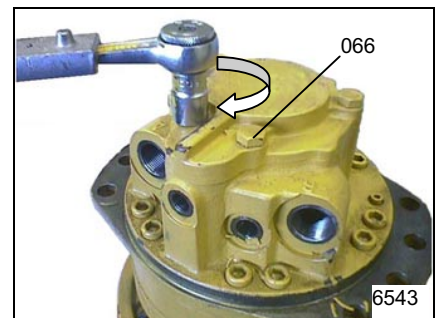
- Monter la plaque de fermeture

- *Install the end cover*



- Monter et serrer les vis (066) au couple correspondant (voir tableau page 71)

- *Install and tighten the screws (066) to the right torque (see table page 71)*



Remplacement du capteur (option)

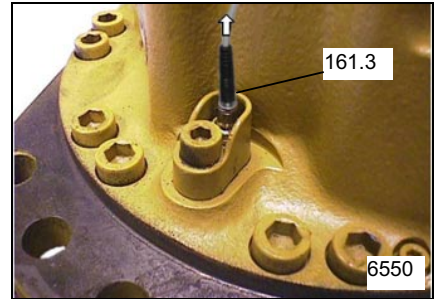
Démontage

- Débrancher le connecteur (161.3)

Replacing the sensor (optional)

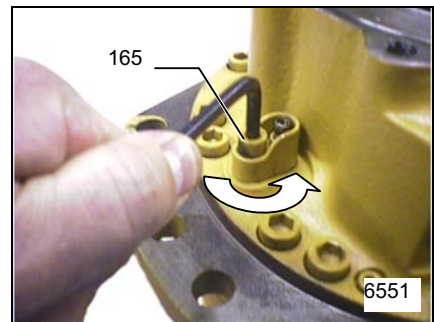
Disassembly

- Disconnect the connector (161.3)



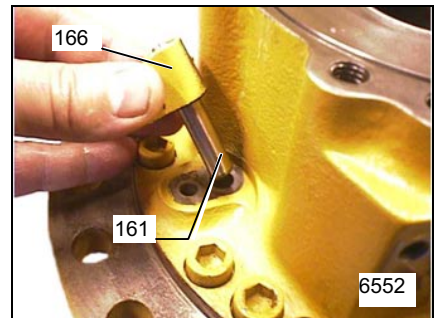
- Desserrer et démonter la vis (165)

- Unscrew and remove the screw (165)



- Extraire le capteur (161) avec le support (166)

- Extract the sensor (161) with its support (166)



Remontage

Reassembly



S'assurer de la propreté de la portée de joint (164) sur le couvercle distributeur (041)



Make sure that the seal mounting surface (164) on the valving cover (041) is clean

- Monter la rondelle frein (163) neuve et le joint (164) neuf sur le capteur (161) équipé de sa pastille de réglage (167)
- Engager le capteur équipé dans le support (166) jusqu'à ce que le joint (164) soit dans son logement

- Install the new brake washer (163) and the new seal (164) on the sensor (161) fitted with its adjusting sticker (167).
- Push the sensor assembly into the support (166) until the seal (164) is in its housing

- Enfoncer le capteur dans le couvercle distributeur (041) jusqu'à venir en contact sur le bloc cylindre (011).

- Push the sensor into the valving cover (041) until it comes in contact with the cylinders block (011).

l'encoche du capteur doit être orientée vers le centre du moteur.

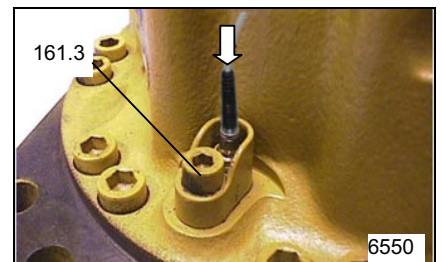
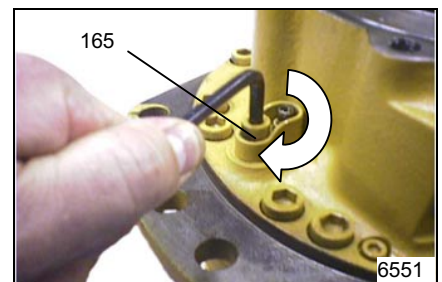
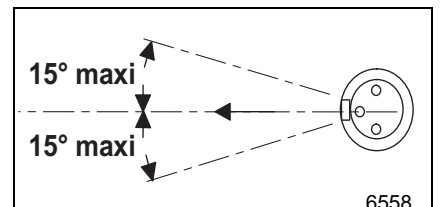
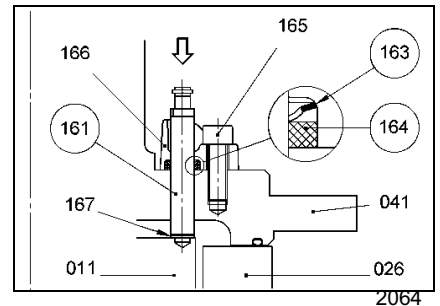
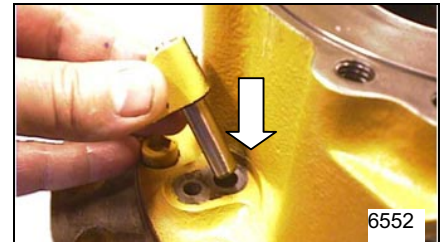
the notch of the sensor should be oriented towards the center of the motor.

- Monter et serrer la vis (165) au couple de serrage correspondant (voir tableau page 38).

- Install and tighten the screw (165) to the right torque (see table page 38).

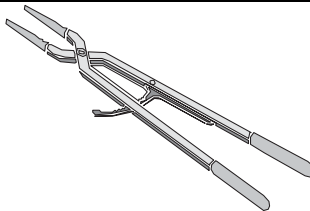
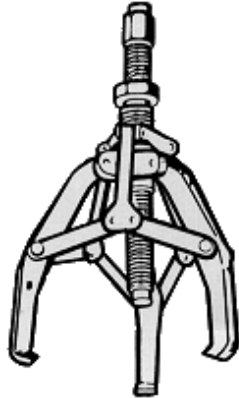
- Rebrancher le connecteur (161.3)

- Reconnect the connector (161.3)



Récapitulatif outillage

Tooling inventory

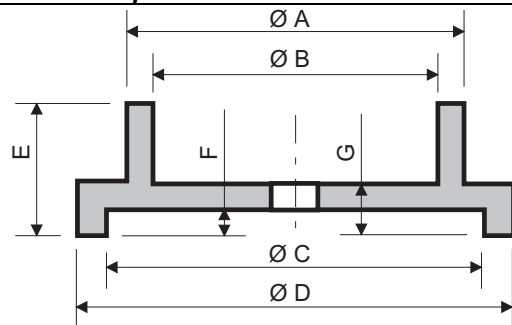
Outillage standard		Standard tools	
• Clé hexagonale pour vis six pans creux		<i>Hollow head wrench</i>	5 6 8 10 12 14
• Clé hexagonale pour tête hexagonale		<i>Hex head wrench</i>	13 17 19 22 24
• Clé dynamométrique	FACOM J 250 A	<i>Torque wrench</i>	6 à 30 N.m [4.4 to 22.1 lbf.ft]
• Clé dynamométrique	FACOM S 250 A	<i>Torque wrench</i>	50 à 240 N.m [35 to 175 lbf.ft]
• Clé dynamométrique	FACOM K 250 A	<i>Torque wrench</i>	160 à 800 N.m [120 à 600 lbf.ft]
• Graisse anti-oxydante	Auto-top 2000 origine AGIP ou Mobil XHP 222	<i>Anti-oxidizing grease</i>	Couleur vert fluo / fluorescent green color
• Alcool isopropylique	du commerce commercial	<i>isopropyl alcohol</i>	
• Pinceau standard	du commerce commercial	<i>Standard brush</i>	
• Activateur	LOCTITE 7471 T	<i>Activator</i>	
• Adhésif anaérobie	LOCTITE 638	<i>Anaerobic adhesive</i>	
• Adhésif	LOCTITE 542	<i>Adhesive</i>	
• Pince à anneau d'arrêt intérieur	FACOM 499.32	<i>Internal snap ring pliers</i>	 0761
• Extracteur	FACOM U 20 B	<i>Extractor</i>	 6553
• Extracteur	FACOM U.52T	<i>Extractor</i>	
• Clé hexagonale pour tête hexagonale		<i>Hex head wrench</i>	13 17 19 22 24
• Clé dynamométrique	FACOM J 250 A	<i>Torque wrench</i>	6 à 30 N.m [4.4 to 22.1 lbf.ft]
• Clé dynamométrique	FACOM S 250 A	<i>Torque wrench</i>	50 à 240 N.m [35 to 175 lbf.ft]
• Clé dynamométrique	FACOM K 250 A	<i>Torque wrench</i>	160 à 800 N.m [120 à 600 lbf.ft]

Outillage à réaliser

Special tools

• Mandrin pour remonter la coiffe de frein ou pour comprimer la rondelle élastique

• Mandrel for reassembling the brake cover or to compress the spring washer.

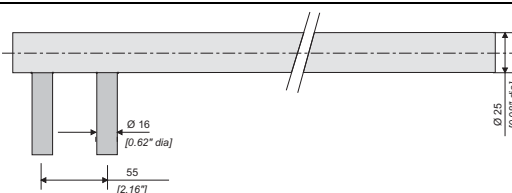


0759

		Ø A		Ø B		Ø C		Ø D		E		F		G	
		mm	[inch]	mm	[inch]	mm	[inch]	mm	[inch]	mm	[inch]	mm	[inch]	mm	[inch]
F02	M12	110	[4.3]	100	[4.3]	125	[4.9]	135	[5.3]	50	[1.96]	10	[0.39]	20	[0.78]
F03															
F04															
F05															
F07															
F08	M16	125	[4.92]	115	[4.52]	151	[5.94]	159	[6.25]	50	[1.96]	10	[0.39]	20	[0.78]
F09															
F11															
F12															
F18															
F19															
F21															

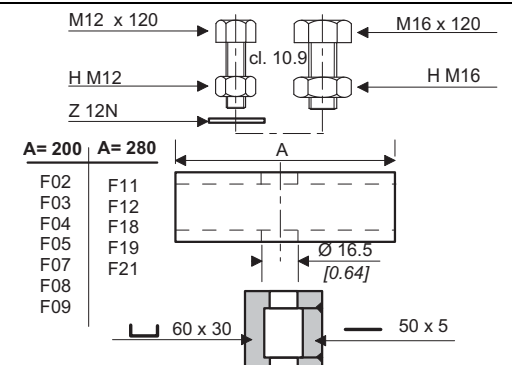
Tube pour immobiliser le moteur

Tube to immobilize the motor



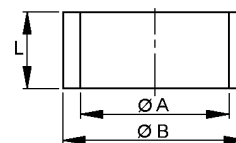
Outillage pour défreinage mécanique.

Tools for mechanical brake release



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Mandrin pour roulement de palier et *Mandrel for bearing support and*
bague d'étanchéité *sealing ring*

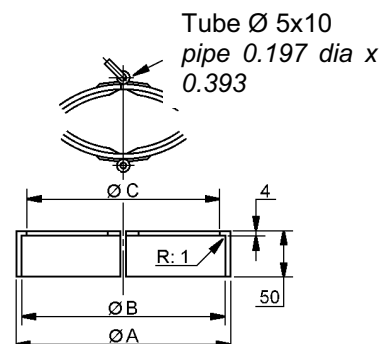


Taille de moteurs Size of motors	ØA		ØB		L	
	mm	in	mm	in	mm	in
MS02 MSE02	45	1.78	55	2.16	110	4.33
MS05 MSE05	60	2.36	70	2.75	120	4.72
MS08 MSE08	75	2.95	85	3.35	140	5.51
MS11 MSE11	85	3.35	95	3.74	160	6.3
MS18 MSE18	100	3.94	110	4.33	200	7.87

Tolérances générales : ± 0.25 mm

General tolerances : ± 0.001 in

Outillage pour montage joint-glace *Tools for mechanical seal mounting*



Taille de moteurs Size of motors	Ø A		Ø B		Ø C	
	mm	in	mm	in	mm	in
MS05 MSE05	101	3.97	94	3.70	88	3.46
MS08 MSE08	150	5.9	142	5.6	135	5.31
MS11 MSE11	155	6.1	148	5.82	139.5	5.49
MS18 MSE18	169	6.65	162	6.38	155	6.1

Tolérances générales : ± 0.25 mm

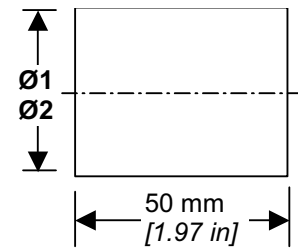
General tolerances : ± 0.001 in

Mandrin pour les bagues extérieures
des roulements de palier :

Mandrel for bearing outer race :

Ø 1 pour roulement 073
Ø 2 pour roulement 074

Ø 1 for bearing 073
Ø 2 for bearing 074



























Taille de moteurs Size of motors	Ø 1		Ø 2	
	mm	in	mm	in
MS02 C	75	2.95	75	2.95
MS02 MSE02	89	3.5	84	3.3
MS05C MSE05C	89	3.5	89	3.5
MS05 MSE05	109	4.29	99	3.9
MS08C MSE08C	119	4.68	109	4.29
MS08 MSE08	139	5.47	124	4.88
MS11C MSE11C	129	5.07	124	4.88
MS11 MSE11	159	6.26	139	5.47
MS18C MSE18C	159	6.26	144	5.67
MS18 MSE18	189	7.44	169	6.65

Résumé des couples de serrage

Tightening torque summary

Remplacement du palier (070) MS02 MS05 MS08 Vis (042) Page 43	Replacement of the bearing support (070) MS02 MS05 MS08 Screw (042) page 43	145±14 N.m 		107±10 lbf.ft
Remplacement du palier (070) MS11 MS18 Vis (042) Page 43	Replacement of the bearing support (070) MS11 MS18 Screw (042) page 43	355±35 N.m 		262±26 lbf.ft

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<p>Remplacement du palier DYNA + Page 48</p>	<p><i>Replacement of the DYNA + bearing support page 48</i></p>	<p>355±35 N.m</p> 		<p>262±26 lbf.ft</p> 
<p>Plaque de fermeture MS02 MS05 moteur non freiné Vis (066) page 63 Palier DYNA+ page 49)</p>	<p><i>End cover MS02 MS05 motor without brake Screw (066) page 63 DYNA+ bearing support page 49)</i></p>	<p>49±5 N.m</p> 		<p>36±4 lbf.ft</p> 
<p>Plaque de fermeture MS08 moteur non freiné Vis (066) page 63</p>	<p><i>End cover MS08 motor without brake Screw (066) page 63</i></p>	<p>86±9 N.m</p> 		<p>63.4±6 lbf.ft</p> 
<p>Plaque de fermeture MS11 MS18 moteur non freiné Vis (066) page 63</p>	<p><i>End cover MS11 MS18 motor without brake Screw (066) page 63</i></p>	<p>210±21 N.m</p> 		<p>155±15 lbf.ft</p> 
<p>Corps de frein sur couvercle (MS02 MS05) Vis (102) page 17</p>	<p><i>rake housing on alving (MS02 MS05) crews (102) page 17</i></p>	<p>85+(0/-16) N.m</p> 		<p>63 (+0/-12) lbf.ft</p> 
<p>Corps de frein sur couvercle (MS08) Vis (102) page 17</p>	<p><i>rake housing on alving (MS08) crews (102) page 17</i></p>	<p>145+(0/-30) N.m</p> 		<p>107 (+0/-22) lbf.ft</p> 
<p>Corps de frein sur couvercle (MS11 MS18) Vis (102) page 17</p>	<p><i>rake housing on alving (MS11-MS18) crews (102) page 17</i></p>	<p>355+(0/-70) N.m</p> 		<p>262 (+0/-52) lbf.ft</p> 
<p>Remplacement du capteur. Vis (165) Page 65</p>	<p><i>Replacing the sensor. screws (165) Page 65</i></p>	<p>35 ± 3.5 N.m</p> 		<p>26±2.6 lbf.ft</p> 



Couples de serrage standard en N.m $\pm 10\%$
 (Suivant norme DIN 912)

Standard tightening torques in [lbf.ft] $\pm 10\%$
 (According to the standard DIN 912)

Taille Size	8.8	10.9	12.9	8.8	10.9	12.9
M6	10	14	17	7.5	10	12.5
M8	25	35	41	18.4	26	30
M10	49	69	83	36	51	61
M12	86	120	145	63.4	88.4	107
M14	135	190	230	100	140	170
M16	210	295	355	155	218	262
M18	290	405	485	214	299	358
M20	410	580	690	302	428	509

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Tableau de valeur pour réparation palier

Table of repair support bearing values.

Moteurs <i>Motors</i>	Types	Standard			Industriel			Graisse		
		F (N) <i>F [lbf]</i>	S(mm) <i>S[in]</i>	C (N.m) <i>C [lbf.ft]</i>	F (N) <i>F [lbf]</i>	S mm	C Nm <i>C [lbf.ft]</i>	(cm ³) <i>[cu.in]</i>		
MS02 MSE02	1..0 13.0	45000 [10117]	0,10 [0.0039]	10 [7.3]	20000 - [4496.4] -	0 -	4 -	[2.9] -	30 -	[1.83] -
MS05 MSE05	1..0 13.0	70000 [15737.4]	0,12 0,18 [0.0047] [0.0070]	23 [16.9]	25000 18000 [5620.5] [4046.7]	0	9 [6.6]		60 25	[3.66] [1.52]
MS08 MSE08	1..0 13.0	100000 [22482]	0,15 0,20 [0.0059] [0.0078]	31 [22.8]	40000 28000 [8992.8] [6295]	0	12 [8.8]		90 30	[5.49] [1.83]
MS11 MSE11	1..0 13.0	120000 [26978.4]	0,17 0,25 [0.0066] [0.0098]	37 [27.2]	45000 31000 [10117] [6969.4]	0	12 [8.8]		65 25	[3.96] [1.52]
MS18 MSE18	1..0 13.0 14.0	170000 [38219.4]	0,20 [0.0078]	70 [51.6]	60000 42000 [13489.2] [9442.4]	0	28 [20.6]		180 150	[10.98] [9.15]
MS25	1..0 13.0	210000 [47212.2]	0,20 [0.0078]	73 60 [53.8] [44.2]	75000 52000 [16861.5] [11690.6]]	0	29 24 [21.3] [17.6]		150 140	[9.15] [8.54]
MS35	1..0 13.0	280000 170000 [62949.6] [38219.4]	0,25 0,20 [0.0098] [0.0078]	108 75 [95.8] [55.3]	60000 [13489.2]]	0	43 30 [31.7] [22.1]		- 180	- [10.98]
MS50	1..0 13.0	320000 210000 [71942.4] [47212.2]	0,30 0,20 [0.0118] [0.0078]	120 110 [88.4] [81.1]	75000 [16861.5]]	0	48 44 [35.3] [32.4]		- 150	- [9.15]
MS83	1..0 13.0	350000 250000 [78687] [56205]	0,30 0,20 [0.0118] [0.0078]	208 180 [153] [132.7]	100000 75000 [22482] [16861.5]]	0	83 72 [61.2] [53]		- -	- -
MS125	1..0 4..	350000 250000 [78687] [56205]	0,30 0,20 [0.0118] [0.0078]	170 180 [125.3] [132.7]	100000 75000 [22482]	0	68 72 [50.1] [53]		- -	- -

1..0 : Palier Moteur Roue Standard
 Types 13.0 : Palier Moteur Roue Courte.
 4 .. : Palier Moteur Compact
 Graisse (901) : ELF EPEXA RN 2

1..0 : Standard wheel motor bearing support
 Types 13.0 : Short wheel motor bearing support
 4 .. : Compact wheel motor bearing support
 Grease (901) : ELF EPEXA RN 2

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11 Circuit diagrams

11.1 Hydraulic diagram 880 100 50

S/N Hydraulic diagram 880 100 50

S/N 101 880 081 001 ⇔ 101 880 081 ... BW 120 AD-4

S/N 101 880 161 001 ⇔ 101 880 161 ... BW 100 AD-4

11.2 Hydraulic diagram 880 100 52

S/N Hydraulic diagram 880 100 52

S/N 101 880 101 001 ⇔ 101 880 101 ... BW 120 AC-4

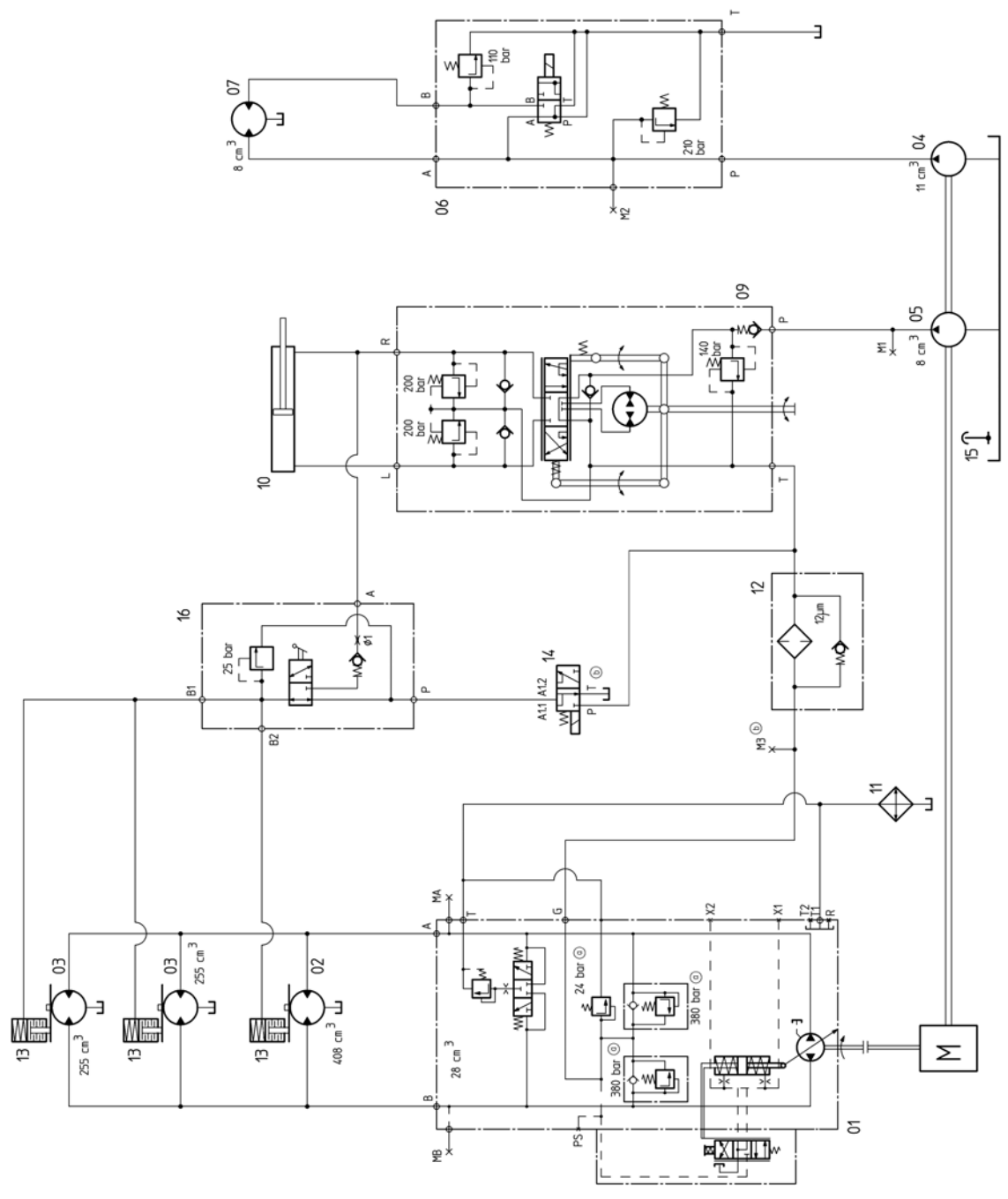
S/N 101 880 111 001 ⇔ 101 880 111 ... BW 125 AC-4

S/N 101 880 171 001 ⇔ 101 880 171 ... BW 100 AC-4

Pos.	Benennung	Description
01	Variabelpumpe	Variable displacement pump
02	Fahrmotor vorne	Travel motor front
03	Fahrmotoren hinten	Travel motors rear
04	Zahnradpumpe (Wbr.)	Gear pump (charging)
05	Zahnradpumpe (Einsp.)	Gear pump (charging)
06	Vibrationsventil	Vibration valve
07	Vibrationsmotor vorne	Vibration motor front
08	Lenkventil	Steering valve
09	Lenkzylinder	Steering cylinder
10	Ölkühler	Oil cooler
11	Ölfilter	Oil filter
12	Lichtleitbremse	Multi-disc brake
13	Brensventil	Brake valve
14	EntlüftungsfILTER	Vent filter
15	Brenslöseventil	Brake release valve
16		

Bez.	Druck (max)
MA	405 bar
MB	405 bar
M1	25 bar
M1*	170 bar
M2	220 bar
M3	25 bar

* Lenkung gegen Anschlag



B. 111-01-0010 Hydraulisches Bauglied, Messgerät, 10 l/min, Zentralschlagventil 01.01.01.01.0008 B. 111-01-0013 Zentralschlagventil, 2 bar max., 380 bar w.p., 380 bar w.p., 30 bar w.p., 2100 l/min 01.01.01.01.0008	
Hersteller: Hydraulische Bauglieder Zeichnungs-Nr.: 111-01-0010 Stückzahl: 1	Baugruppe: Hydraulik Bauteil-Nr.: 01.01.01.01.0008 Material: Stahl Maßstab: 1:1
Hydraulikschema Hydraulic schematic	
B 880 100 52 B	

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11.3 Hydraulic diagram 880 100 55

S/N Hydraulic diagram 880 100 55

S/N 101 880 091 001 ⇔ 101 880 091 ... BW 125 AD-4

11.4 Wiring diagram 880 100 63

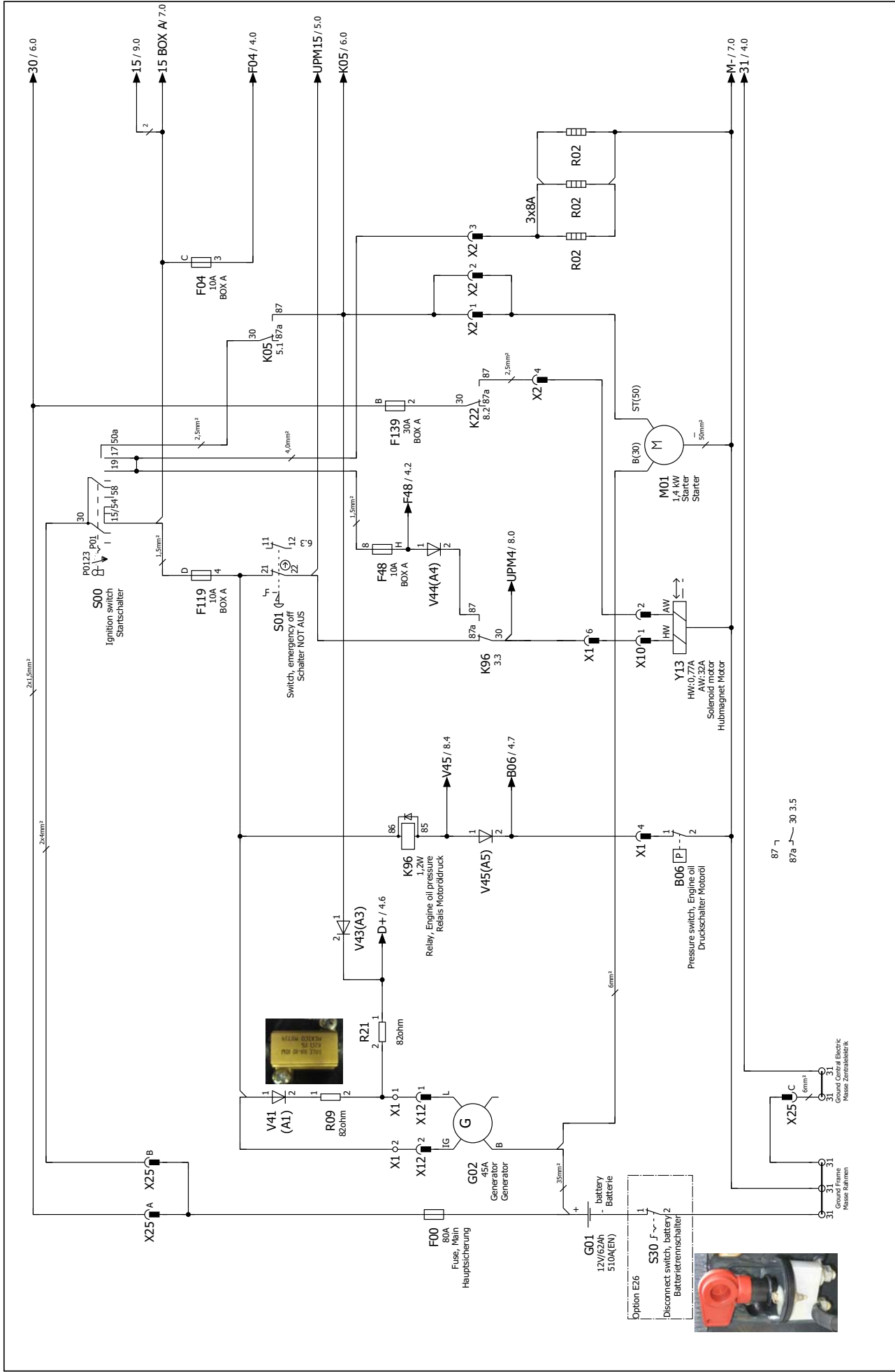
S/N Wiring diagram 880 100 63

S/N 101 880 081 001 ⇔ 101 880 081 173 BW 120 AD-4

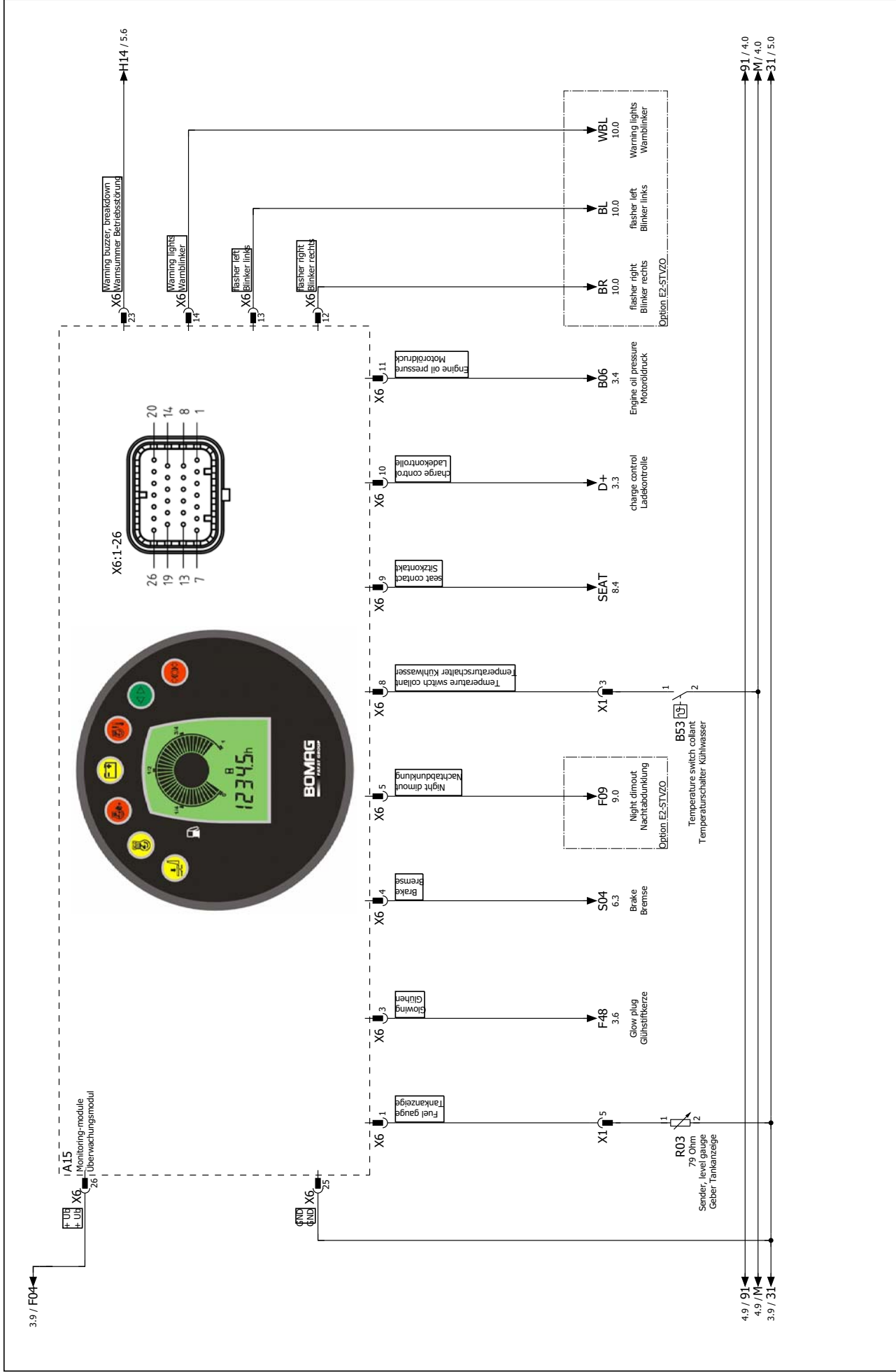
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S/N 101 880 101 001 ⇔ 101 880 101 036 BW 120 AC-4

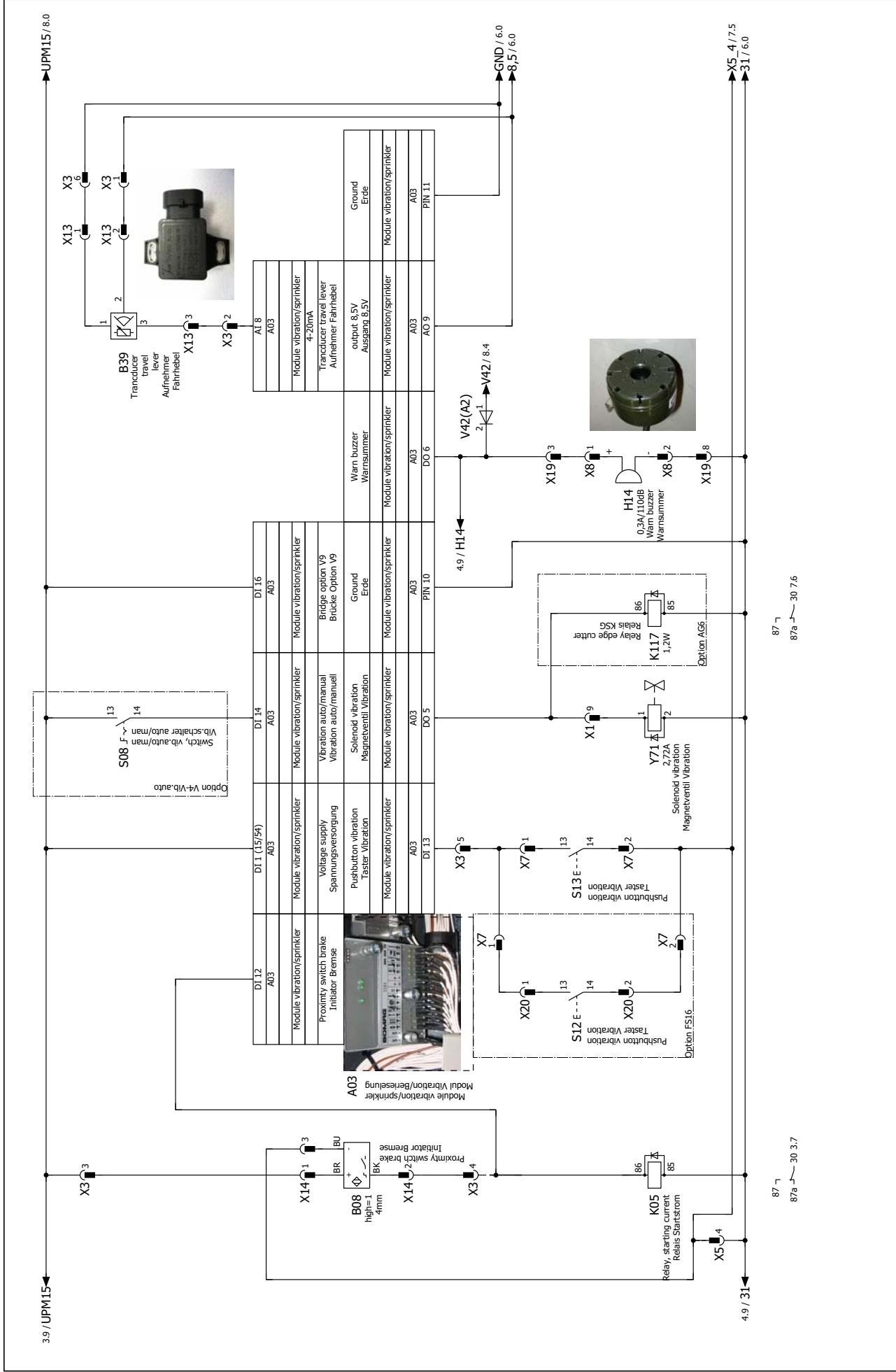
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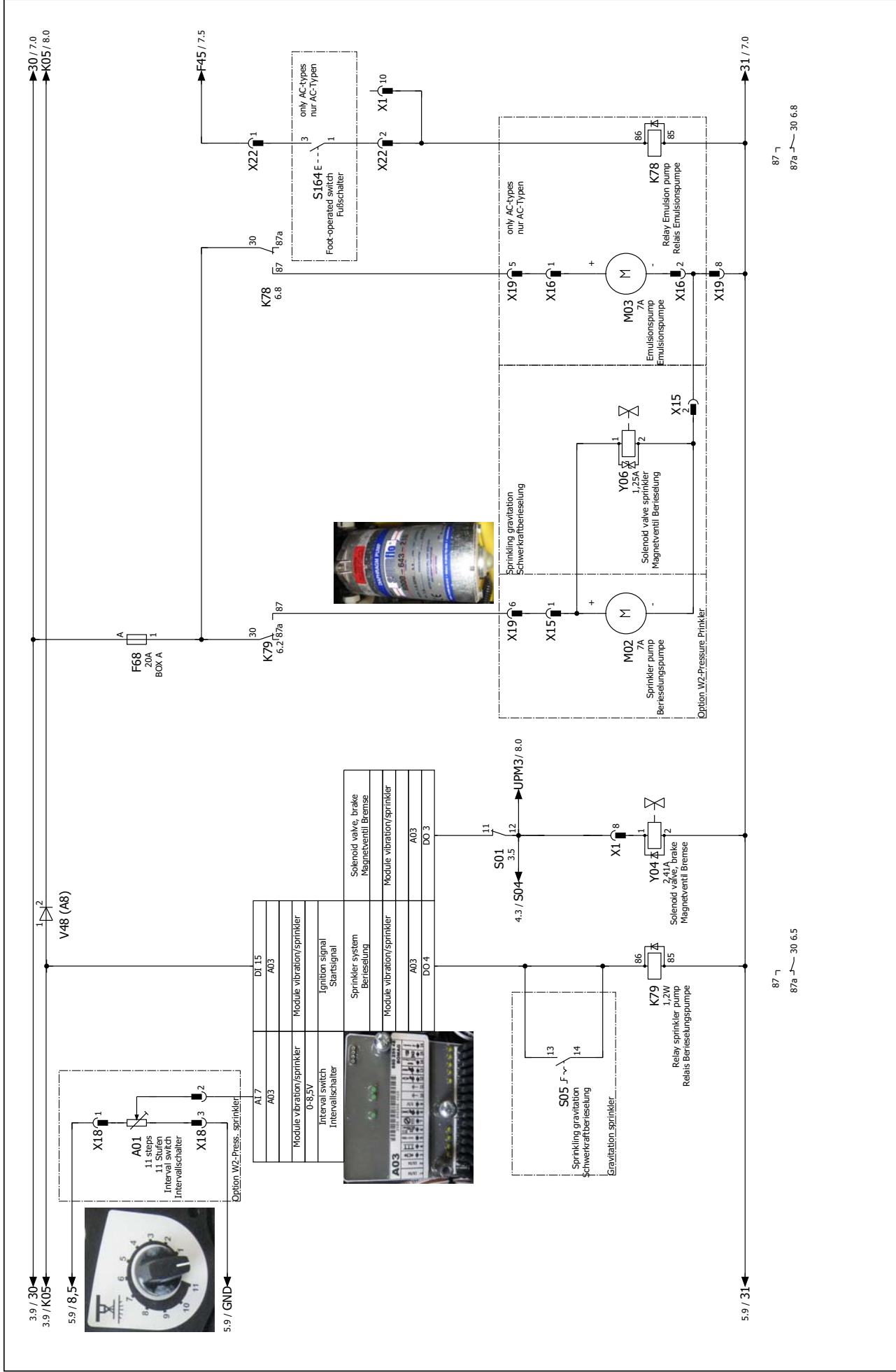


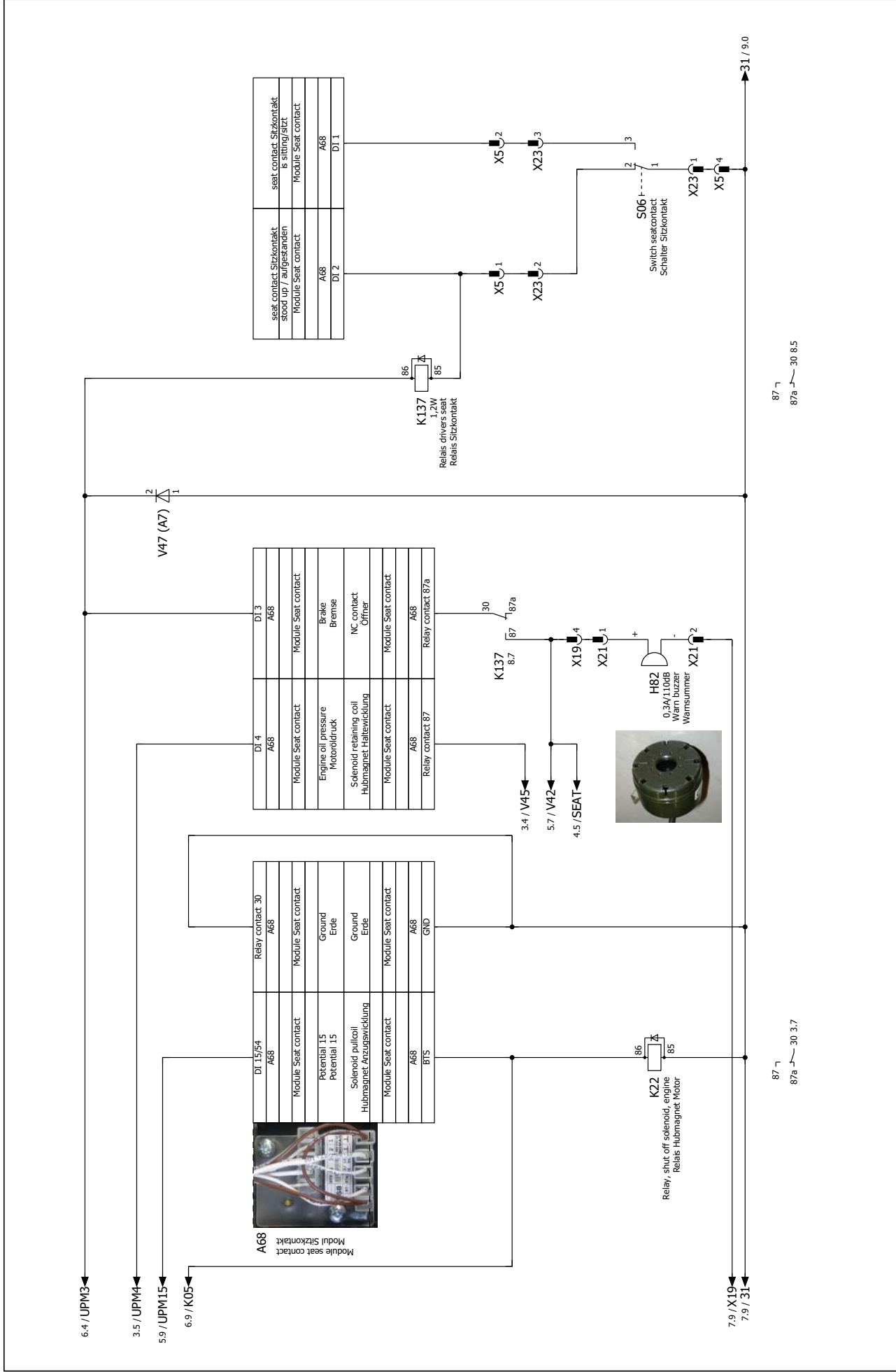
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Checked	D.Nallin							Funktion	
Gepflegt	29.07.2008							Montage location	
								Ersatzteil	

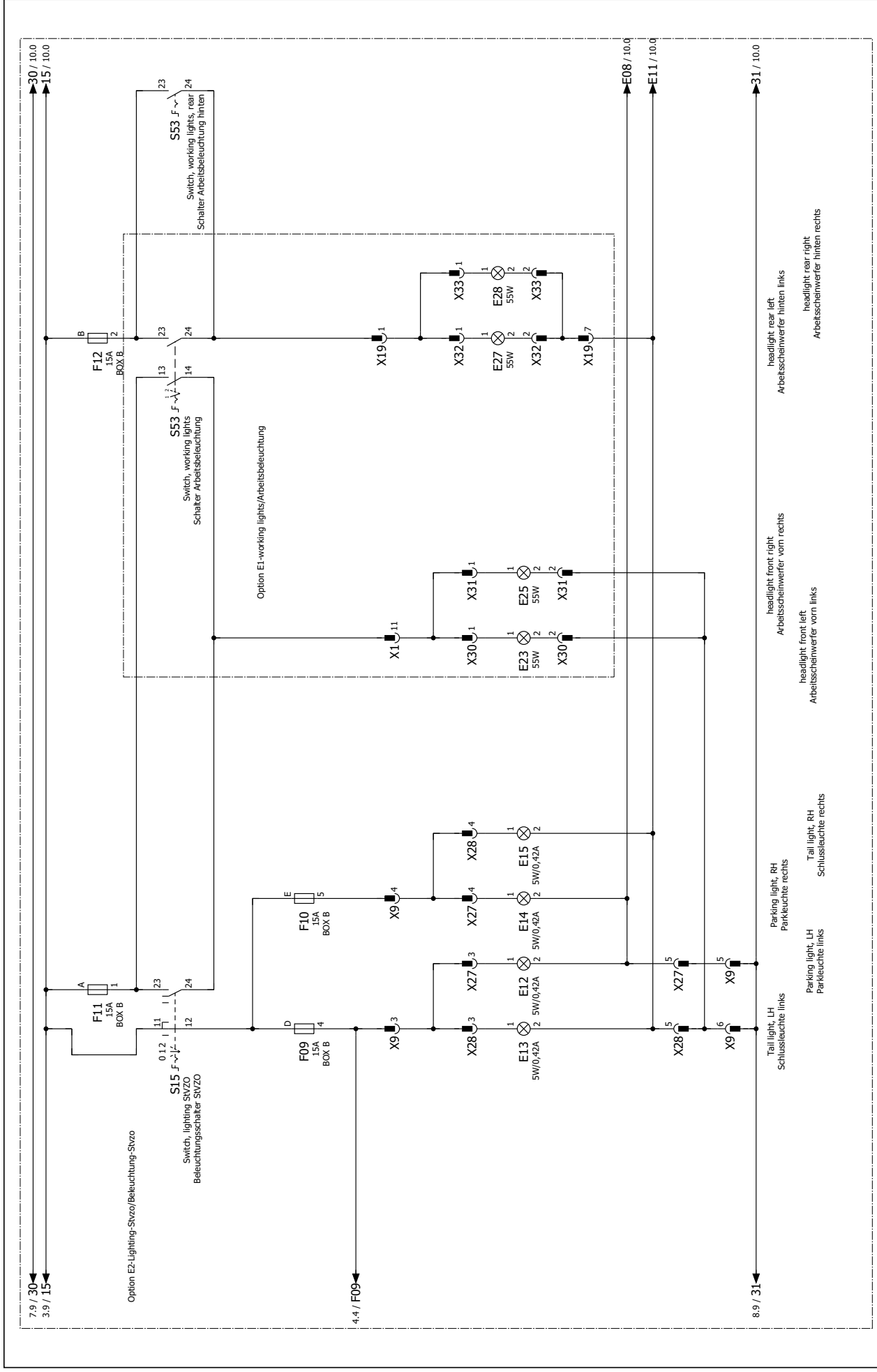


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Checked Geprüft	D. Mallin 29.07.2008							Function Funktion	880 100 63
								Mounting location Einbaustelle	/

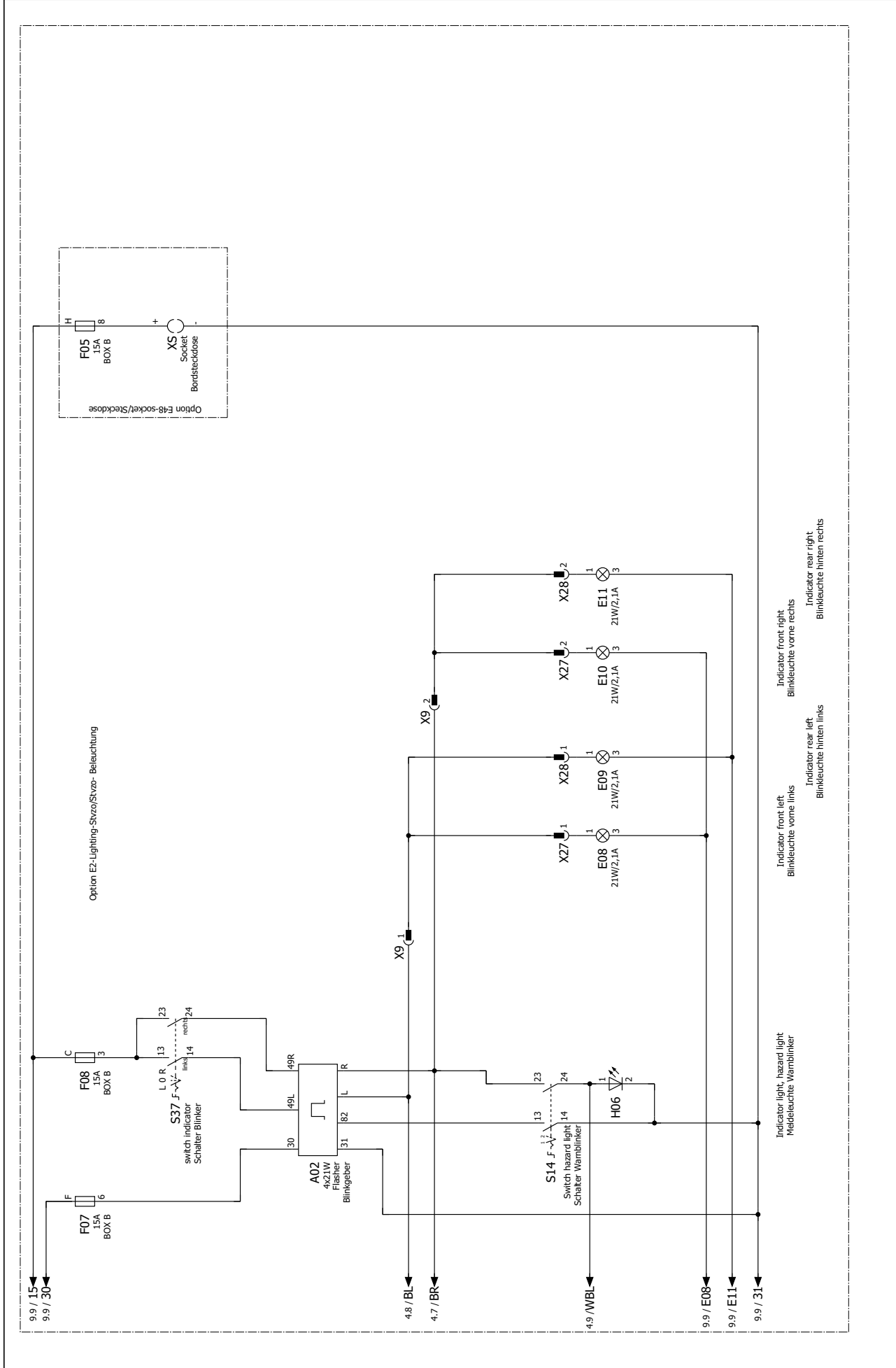






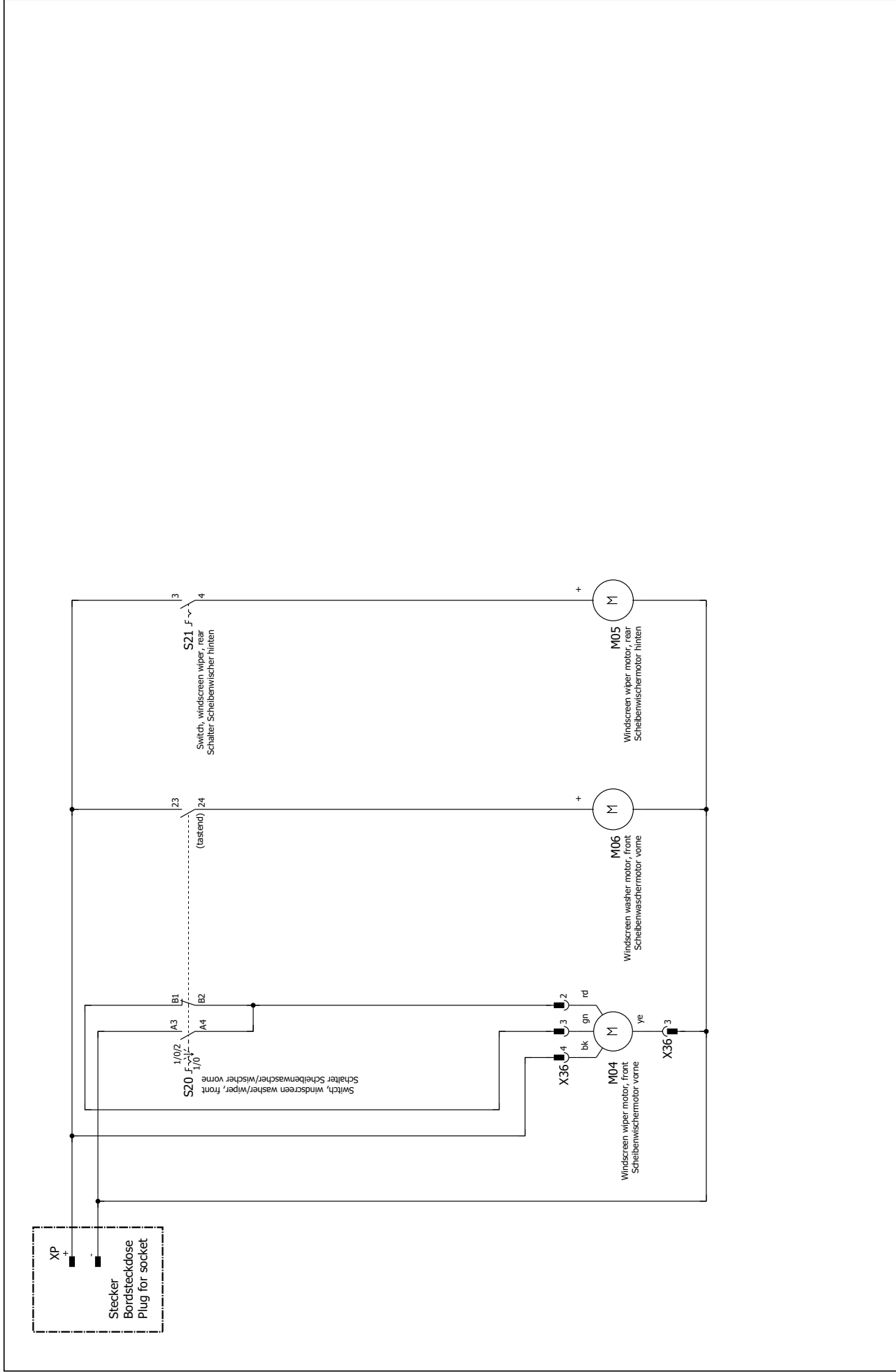


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Created	T.Rau	Working lights, StVZO-position illumination							
Erstellt	31.07.2008	Arbeitsbeleuchtung, StVZO-Positionsleuchten							
Checked	D.Nallin	Higher-level function							
Gepflegt	29.07.2008	Funktion							
		Funktion							
		Mounting location							
		Ersatzort							
		Page 9 from 23							
		880 100 63							



0	1	2	3	4	5	6	7	8	9
Created Erstellt	T.Rau 31.07.2008								Page Blatt
Checked Geprüft	D.Nallin 29.07.2008								from von
									880 100 63
									Function Funktion
									Mounting location Einbaustort
									+

BOMAG STVZO, flash and position illumination
FAYAT GROUP STVZO, Blinkbegrenzung

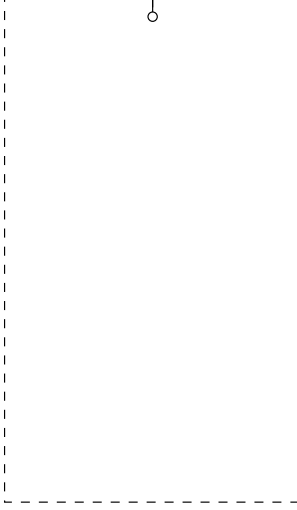


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Created Erstellt	T. Rau 31.07.2008	cabin, weather protection Wetterschutzkabine					Page Blatt	11	from von	23
Checked Geprüft	D. Mallin 29.07.2008						Function Funktion	==	Mounting location Einbaort	+ /
							880	100	63	

A67
Keyboard
Tastatur



A66
Electronic control unit
Elektronik-Steuerinheit



X43
1-3



0	1	2	3	4	5	6	7	8	9
Created Erstellt	T. Rau 31.07.2008		Electronic Burglaray protection Elektronische Diebstahlsicherung			Higher-level function Funktion		Page 12 from 23 Blatt von 23	
Checked Geprüft	D. Mallin 29.07.2008		AD/AC-4			Mounting location Einbaustort		880 100 63	

Device tag list Betriebsmittelliste

Device tag BMK	Page Blatt	Path Pfad	Mounting location Einbauort	Higher-level function Anlage	Function text	Functionstext	characteristics Techn.-Kenngrößen
A01	6	1			Interval switch	Intervallschalter	11 steps 11 Stufen
A02	10	1			Flasher	Blinkgeber	4x21W
A03	5	2			Module vibration/sprinkler	Modul Vibration/Berieselung	
A15	4	1			Monitoring-module	Überwachungsmodul	
A66	12	3			Electronic control unit	Elektronik Steuereinheit	
A67	12	6			Keyboard	Tastatur	
A68	8	1			Module seat contact	Modul Sitzkontakt	
B06	3	3			Pressure switch, Engine oil	Druckschalter Motoröl	
B08	5	1			Proximity switch brake	Initiator Bremse	high=1 4mm
B11	7	1			Horn	Horn	50W
B39	5	7			Tranducer travel lever	Aufnehmer Fahrhebel	
B53	4	4			Temperature switch coolant	Temperaturschalter Kühlwasser	
E08	10	3			Indicator front left	Blinkleuchte vorne links	21W/2,1A
E09	10	4			Indicator rear left	Blinkleuchte hinten links	21W/2,1A
E10	10	5			Indicator front right	Blinkleuchte vorne rechts	21W/2,1A
E11	10	5			Indicator rear right	Blinkleuchte hinten rechts	21W/2,1A
E12	9	2			Parking light, LH	Parkleuchte links	5W/0,42A
E13	9	2			Tail light, LH	Schlussleuchte links	5W/0,42A
E14	9	3			Parking light, RH	Parkleuchte rechts	5W/0,42A
E15	9	3			Tail light, RH	Schlussleuchte rechts	5W/0,42A
E23	9	5			headlight front left	Arbeitsscheinwerfer vorn links	55W
E25	9	5			headlight front right	Arbeitsscheinwerfer vorn rechts	55W
E27	9	7			headlight rear left	Arbeitsscheinwerfer hinten links	55W
E28	9	8			headlight rear right	Arbeitsscheinwerfer hinten rechts	55W
E32	7	3			Rotary beacon	Rundumkennleuchte	55W Glühlampe 3W Motor
F00	3	1			Fuse, Main	Hauptsicherung	80A
F04	3	8			Fuse	Sicherung	10A BOX A
F05	10	7			Fuse	Sicherung	15A BOX B
F07	10	1			Fuse	Sicherung	15A BOX B
F08	10	2			Fuse	Sicherung	15A BOX B
F09	9	2			Fuse	Sicherung	15A BOX B
F10	9	3			Fuse	Sicherung	15A BOX B
F11	9	2			Fuse	Sicherung	15A BOX B
F12	9	7			Fuse	Sicherung	15A BOX B
F23	7	1			Fuse	Sicherung	10A BOX A
F41	7	3			Fuse	Sicherung	10A BOX B
F45	7	6			Fuse	Sicherung	10A BOX A

Device tag list Betriebsmittelliste

Device tag BMK	Page Blatt	Path Pfad	Mounting location Einbauort	Higher-level function Anlage	Function text	Funktionstext	characteristics Techn.-Kenngrößen
F48	3	6			Fuse	Sicherung	10A BOX A
F68	6	5			Fuse	Sicherung	20A BOX A
F119	3	5			Fuse	Sicherung	10A BOX A
F139	3	7			Fuse	Sicherung	30A BOX A
G01	3	1			battery	Batterie	12V/62Ah 510A(EN)
G02	3	1			Generator	Generator	45A
H06	10	2			Indicator light, hazard light	Meldeleuchte Warnblinker	
H14	5	6			Warn buzzer	Warnsummer	0,3A/110dB
H82	8	5			Warn buzzer	Warnsummer	0,3A/110dB
K05	5	1			Relay, starting current	Relais Startstrom	
K11	7	2			Relay, potential 30 on 15	Relais Potential 30 auf 15	1,2W
K22	8	2			Relay, shut off solenoid, engine	Relais Hubmagnet Motor	
K78	6	8			Relay Emulsion pump	Relais Emulsionspumpe	
K79	6	2			Relay sprinkler pump	Relais Berieselungspumpe	1,2W
K96	3	3			Relay, Engine oil pressure	Relais Motoröldruck	1,2W
K117	5	5			Relay edge cutter	Relais KSG	1,2W
K137	8	7			Relais drivers seat	Relais Sitzkontakt	1,2W
M01	3	6			Starter	Starter	1,4 kW
M02	6	5			Sprinkler pump	Berieselungspumpe	7A
M03	6	8			Emulsionspump	Emulsionspumpe	7A
M04	11	2			Windscreen wiper motor, front	Scheibenwischermotor vorne	
M05	11	5			Windscreen wiper motor, rear	Scheibenwischermotor hinten	
M06	11	4			Windscreen washer motor, front	Scheibenwaschermotor vorne	
R02	3	8			Glow plug 1	Glühstiftkerze 1	
R03	4	1			Sender, level gauge	Geber Tankanzeige	79 Ohm
R09	3	2			Dropping Resistor	Vorwiderstand	82ohm
R21	3	2			Resistor	Widerstand	
S00	3	6			Ignition switch	Startschalter	
S01	3	5			Switch, emergency off	Schalter NOT AUS	
S03	7	1			Push button, warning horn	Taster Signalhorn	
S05	6	2			Sprinkling gravitation	Schwerkraftberieselung	
S06	8	8			Switch seatcontact	Schalter Sitzkontakt	
S08	5	4			Switch, vib.auto/man	Vib.schalter auto/man	
S12	5	2			Pushbutton vibration	Taster Vibration	
S13	5	3			Pushbutton vibration	Taster Vibration	
S14	10	1			Switch hazard light	Schalter Warnblinker	
S15	9	2			Switch, lighting SVZO	Beleuchtungsschalter SVZO	

Device tag list Betriebsmittelliste

Device tag BMK	Page Blatt	Path Pfad	Mounting location Einbauort	Higher-level function Anlage	Function text	Functionstext	characteristics Techn.-Kenngrößen
S20	11	2			Switch, windshield washer/wiper, front	Schalter Scheibenwascher/wischer vorne	
S21	11	5			Switch, windshield wiper, rear	Schalter Scheibenwischer hinten	
S30	3	1			Disconnect switch, battery	Batterietrennschalter	
S34	7	6			Push button edge cutter	Taster KSG	
S37	10	2			switch indicator	Schalter Blinker	
S38	7	2			Switch, Rotary beacon	Schalter Rundumkennleuchte	
S53	9	7			Switch, working lights	Schalter Arbeitsbeleuchtung	
S164	6	8			Foot-operated switch	Fußschalter	
V08	7	6			Diode	Diode	
V09	7	8			Diode	Diode	
V41(A1)	3	2			Diode	Diode	
V42(A2)	5	6			Diode	Diode	
V43(A3)	3	3			Diode	Diode	
V44(A4)	3	6			Diode	Diode	
V45(A5)	3	3			Diode	Diode	
V47 (A7)	8	6			Diode	Diode	
V48 (A8)	6	3			Diode	Diode	
XP	11	0			Plug for 12V-socket	Stecker Bordsteckdose	
Y04	6	3			Solenoid valve, brake	Magnetventil Bremse	2,41A
Y06	6	6			Solenoid valve sprinkler	Magnetventil Berieselung	1,25A
Y13	3	5			Solenoid motor	Hubmagnet Motor	HW:0,77A AW:32A
Y20	7	6			Edge cutter down	KSG ab	2,41A
Y21	7	8			Edge cutter up	KSG auf	2,41
Y48	7	7			Solenoid valve, hydr. switch over	Magnetventil Hydr.-Umschaltung	2,41A
Y71	5	4			Solenoid vibration	Magnetventil Vibration	2,72A

Plug overview Steckerübersicht

Designation Bezeichnung	Mounting location Einbautort	Function text Funktionstext
X5	Contact Kontakt	Type Typ
	10 7	socket 2pol.
X1	Contact Kontakt	Type Typ
	3 4 4	wiring harness engine Motor-Kabelbaum
	4 3 3	DT06-12SA
	5 4 1	
	6 3 5	
	7 7 1	
	8 6 3	
	9 5 4	
	10 6 9	
	11 9 5	
	X2	Contact Kontakt
1 3 7		wiring harness engine power Motor-Kabelbaum Leistung
X3	Contact Kontakt	Type Typ
	2 3 8	DTP06-4S
	3 3 8	
	4 3 7	wiring harness travel lever Kabelbaum Fahrhebel
X4	Contact Kontakt	Type Typ
	1 5 8	DT06-6S
	2 5 7	
	3 5 1	
	4 5 1	
	5 5 3	
X4	Contact Kontakt	Type Typ
	6 5 8	Rotary beacon Rundumkennleuchte
	1 7 3	DT04-2P
X5	Contact Kontakt	Type Typ
	2 7 3	wiring harness seat contact Kabelbaum Sitzkontakt
X5	Contact Kontakt	Type Typ
	1 8 8	DT06-4S
	2 8 8	
	3 7 6	
4 5 0		
4 8 8		

Designation Bezeichnung	Mounting location Einbautort	Function text Funktionstext
X6	Contact Kontakt	Type Typ
	1 4 1	Monitoring-module Überwachungsmodul
	3 4 2	SUPB26P
	4 4 3	
	5 4 4	
	8 4 4	
	9 4 5	
	10 4 6	
	11 4 7	
	12 4 7	
	13 4 7	
	14 4 7	
	23 4 7	
	25 4 1	
	26 4 1	
	X7	Contact Kontakt
1 5 3		Pushbutton vibration Taster-Vibration
X8	Contact Kontakt	Type Typ
	1 5 3	DTM06-2SA
	2 5 3	
X8	Contact Kontakt	Type Typ
	2 5 3	Warn buzzer Warnsummer
	5 3	DT06-2S
X9	Contact Kontakt	Type Typ
	1 5 6	
	2 5 6	
	3 9 2	
	4 9 3	
	5 9 2	
X9	Contact Kontakt	Type Typ
	1 10 3	Wiring harness stvzo-lighting Kabelbaum Stvzo-Beleuchtung
	2 10 4	DT04-6P
	3 9 2	
	4 9 3	
	6 9 2	

Plug overview Steckerübersicht

Designation Bezeichnung	Mounting location Einbauort	Function text Funktionstext	Type		
			Page Blatt	Path Pfad	
X10		Solenoid motor Hubmagnet Motor	SIMGF2	1	3 5
				2	3 5
X12		Generator Generator	SIMGF3	1	3 2
				2	3 1
X13		Transducer travel lever Aufnehmer Fahrhebel	SUP3B	1	5 8
				2	5 8
				3	5 7
X14		Proximity switch brake Initiator Bremse	DTM06-3SA	1	5 1
				2	5 1
				3	5 1
X15		Sprinkler pump Bereisungspumpe	DT06-2S	1	6 5
				2	6 7
X16		Emulsionspumpe Emulsionspumpe	DT06-2S	1	6 8
				2	6 8
X18		Interval switch Intervallschalter	STS4W	1	6 1
				2	6 2
				3	6 1
X19		wiring harness frame rear Kabelbaum Rahmen hinten	DT06-8SA	1	9 7
				2	7 3
				3	5 6

Designation Bezeichnung	Mounting location Einbauort	Function text Funktionstext	Type		
			Page Blatt	Path Pfad	
X19		wiring harness frame rear Kabelbaum Rahmen hinten	DT06-8SA	3	5 8
				4	8 5
				5	6 8
				6	6 5
				7	9 7
				8	5 6
				8	6 8
				8	7 3
X20		pushbutton vibration FS16 Taster Vibration FS16	DTM06-2SA	1	5 2
				2	5 2
X21		Warn buzzer Warnsummer	DT06-2S	1	8 5
				2	8 5
X22		Foot-operated switch Fußschalter	DT04-2P	1	6 8
				2	6 8
X23		seat contact Stützkontakt	DT06-3S-CE13	1	8 8
				2	8 8
				3	8 8

Plug overview Steckerübersicht

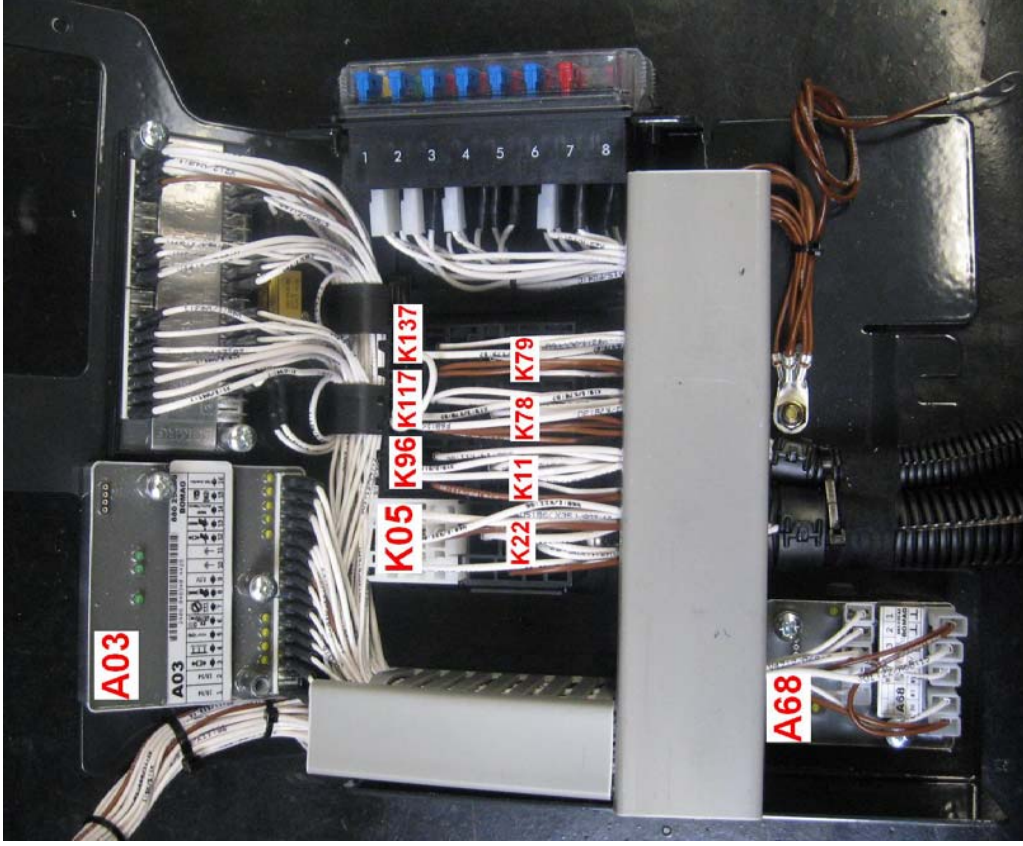
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X25	Contact Kontakt	Power connector Leistungsstecker
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	Path Pfad	
	Type Typ	
A	3	1
B	3	1
C	3	2
X27	Contact Kontakt	strozo-lighting screen front Stvozo-Beleuchtung Blende vorne
	Page Blatt	DT06-6S
	Path Pfad	
	Type Typ	
1	10	3
2	10	5
3	9	2
4	9	3
5	9	2
X28	Contact Kontakt	strozo-lighting screen rear Stvozo-Beleuchtung Blende rear
	Page Blatt	DT06-6S
	Path Pfad	
	Type Typ	
1	10	4
2	10	5
3	9	2
4	9	3
5	9	2
X30	Contact Kontakt	headlight front left Arbeitsscheinwerfer vorn links
	Page Blatt	DT06-2S
	Type Typ	
1	9	5
2	9	5
X31	Contact Kontakt	headlight front right Arbeitsscheinwerfer vorn rechts
	Page Blatt	DT06-2S
	Type Typ	
1	9	5
2	9	5
X32	Contact Kontakt	headlight rear left Arbeitsscheinwerfer hinten links
	Page Blatt	DT06-2S
	Type Typ	
1	9	7
2	9	7
X33	Contact Kontakt	headlight rear right Arbeitsscheinwerfer hinten rechts
	Page Blatt	DT06-2S
	Type Typ	
1	9	8
2	9	8

Designation Bezeichnung	Mounting location Einbauort	Function text Funktionstext	
X35	Contact Kontakt		
	Page Blatt	DT04-12PA	
	Path Pfad		
	Type Typ		
	1	12	3
	2	12	3
	3	12	3
	4	12	3
	5	12	3
	7	12	3
	8	12	3
	9	12	3
10	12	3	
11	12	3	
12	12	3	
X36	Contact Kontakt	Windscreen wiper motor, front Scheibenwischermotor vorne	
	Page Blatt	P4NAT	
	Path Pfad		
	Type Typ		
2	11	2	
3	11	2	
3	11	2	
4	11	2	
X43	Contact Kontakt		
	Page Blatt	SUB-D 9pol.	
1-9	12	7	

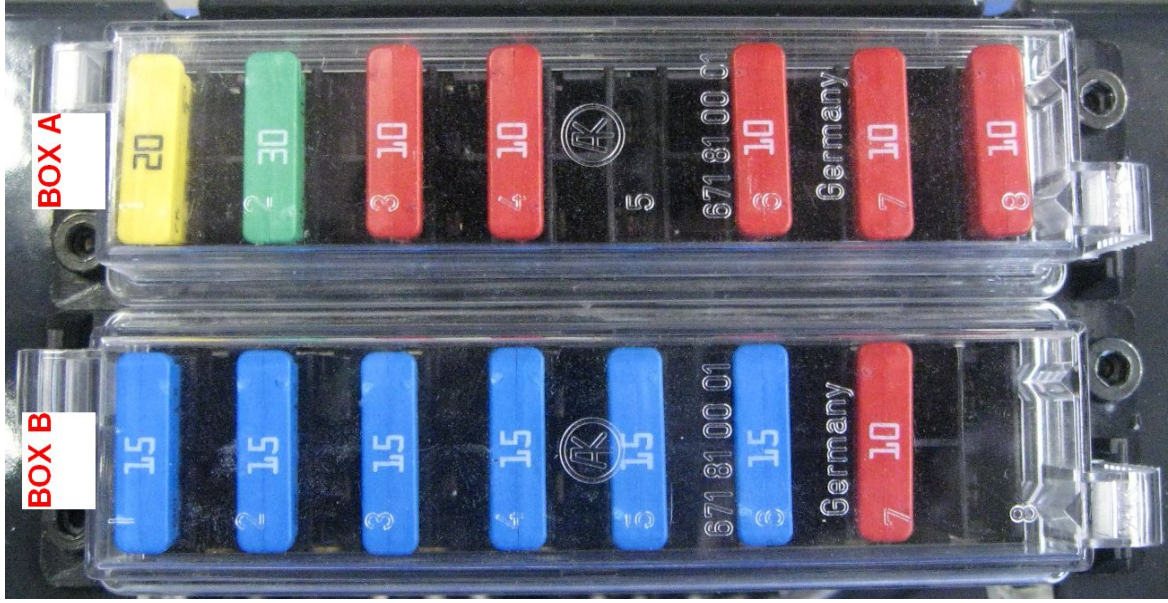
Pin overview

Pin Übersicht

A03		Module vibration/sprinkler Modul Vibration/Berieselung		Signal
Pin Kontakt	Page Blatt	Path Pfad	Description Beschreibung	Signal
:	5 2		Module vibration/sprinkler	Modul Vibration/Berieselung
:	5 2		Proximty switch brake	Initiator Bremse
:	5 3	DI 1 (15/54)	Voltage supply	Spannungsversorgung
:	5 3	DI 13	Pushbutton vibration	Taster Vibration
:	5 4	DI 14	Vibration auto/manual	Vibration auto/manuell
:	5 4	DO 5	Solenoid vibration	Magnetventil Vibration
:	5 5	DI 16	Bridge option V9	Brücke Option V9
:	5 5	PIN 10	Ground	Erde
:	5 6	DO 6	Warn buzzer	Warnsummer
:	5 7	AI 8	Tranducer travel lever	Aufnehmer Fahrhebel
:	5 7	AO 9	output 8,5V	Ausgang 8,5V
:	5 8	PIN 11	Ground	Erde
:	6 2	AI 7	Interval switch	Intervallschalter
:	6 2	DI 15	Ignition signal	Startsignal
:	6 2	DO 4	Sprinkler system	Berieselung
:	6 3	DO 3	Solenoid valve, brake	Magnetventil Bremse



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Created Erstellt	T.Rau 31.07.2008	BW 100/120/125 AD/AC-4		Overview Central Electric Übersicht Zentralelektrik		Higher-level function Funktion		=	Page 880
Checked Geprüft	D.Nellin 29.07.2008					Mounting location Einbaort		+	from 100
									to 100.63



Box B	Box A
F 11/15A	F 68/20A
F 12/15A	F 139/30A
F 08/15A	F 04/10A
F 09/15A	F 119/10A
F 10/15A	
F 07/15A	F 45/10A
F 41/10A	F 23/10A
F 05/15A	F 48/10A

008 381 04

11.5 Wiring diagram 880 100 64

S/N Wiring diagram 880 100 64

S/N 101 880 081 174 ⇔ 101 880 081 ... BW 120 AD-4

S/N 101 880 091 016 ⇔ 101 880 081 ... BW 125 AD-4

S/N 101 880 101 007 ⇔ 101 880 101 ... BW 120 AC-4

S/N 101 880 111 004 ⇔ 101 880 111 ... BW 125 AC-4

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S/N 101 880 117 001 ⇔ 101 880 117 ... BW 100 AC-4

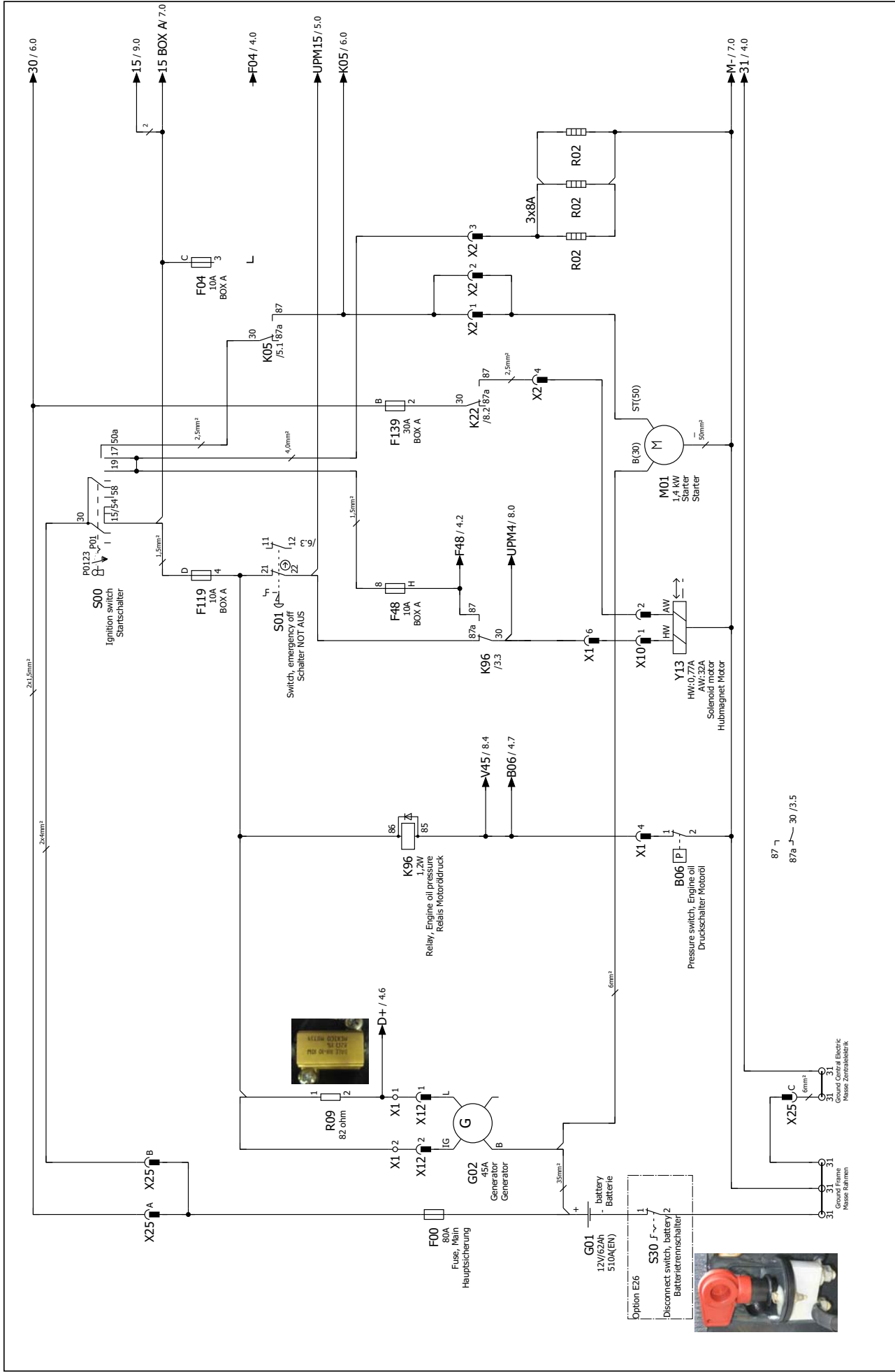


Bomag GmbH

Industriegebiet Hellerwald
D-56154 Boppard



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								Mounting location Einbaustell	+
									880 100 64



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			Page 3 from 24 Blatt 3 von 24								
			880 100 64								

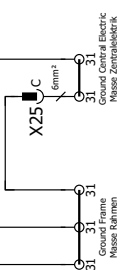
BOMAG
FAYAT GROUP

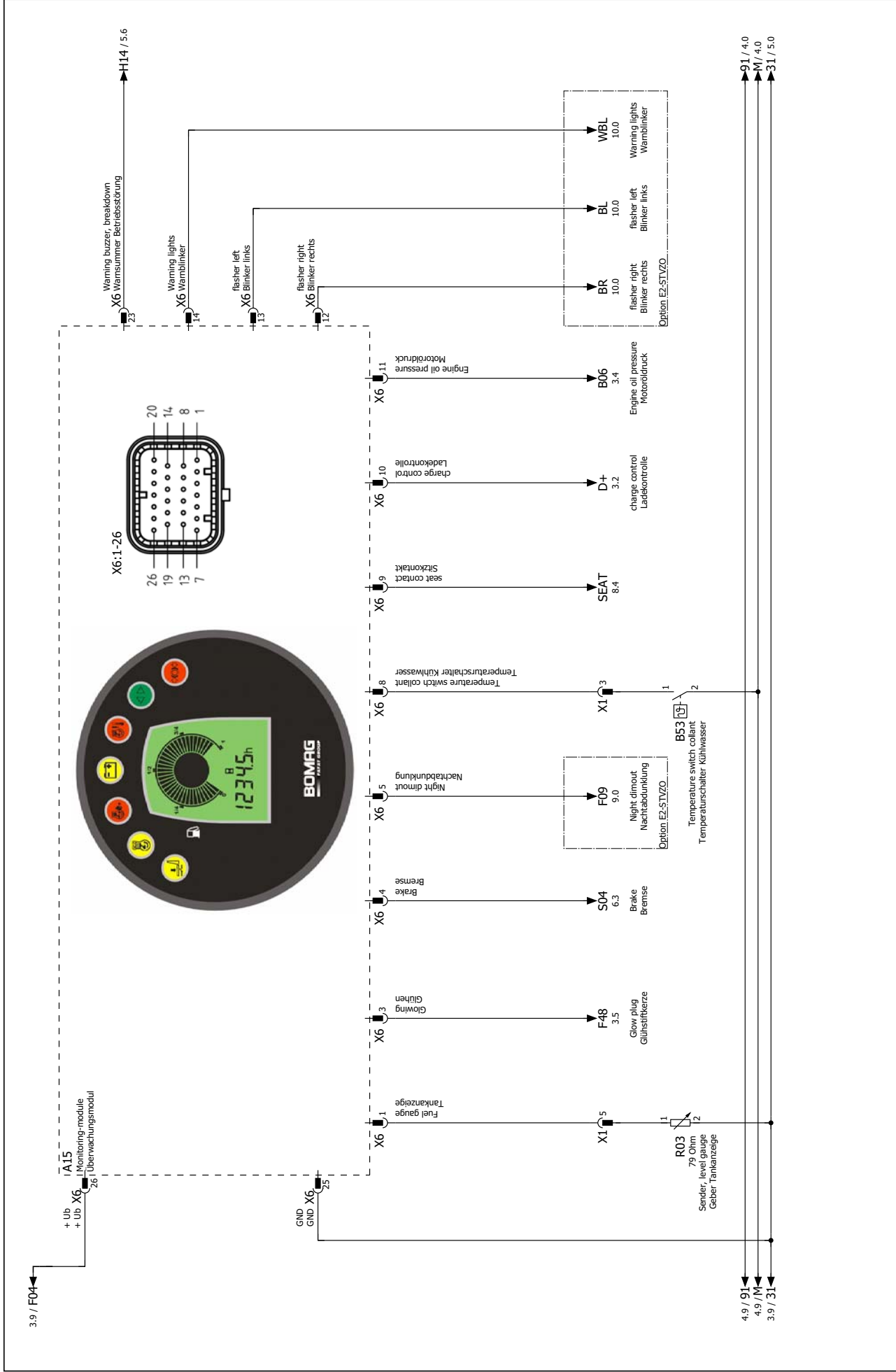
BW 100/120/125
AD/AC-4

Supply, Starting unit
Versorgung, Starten

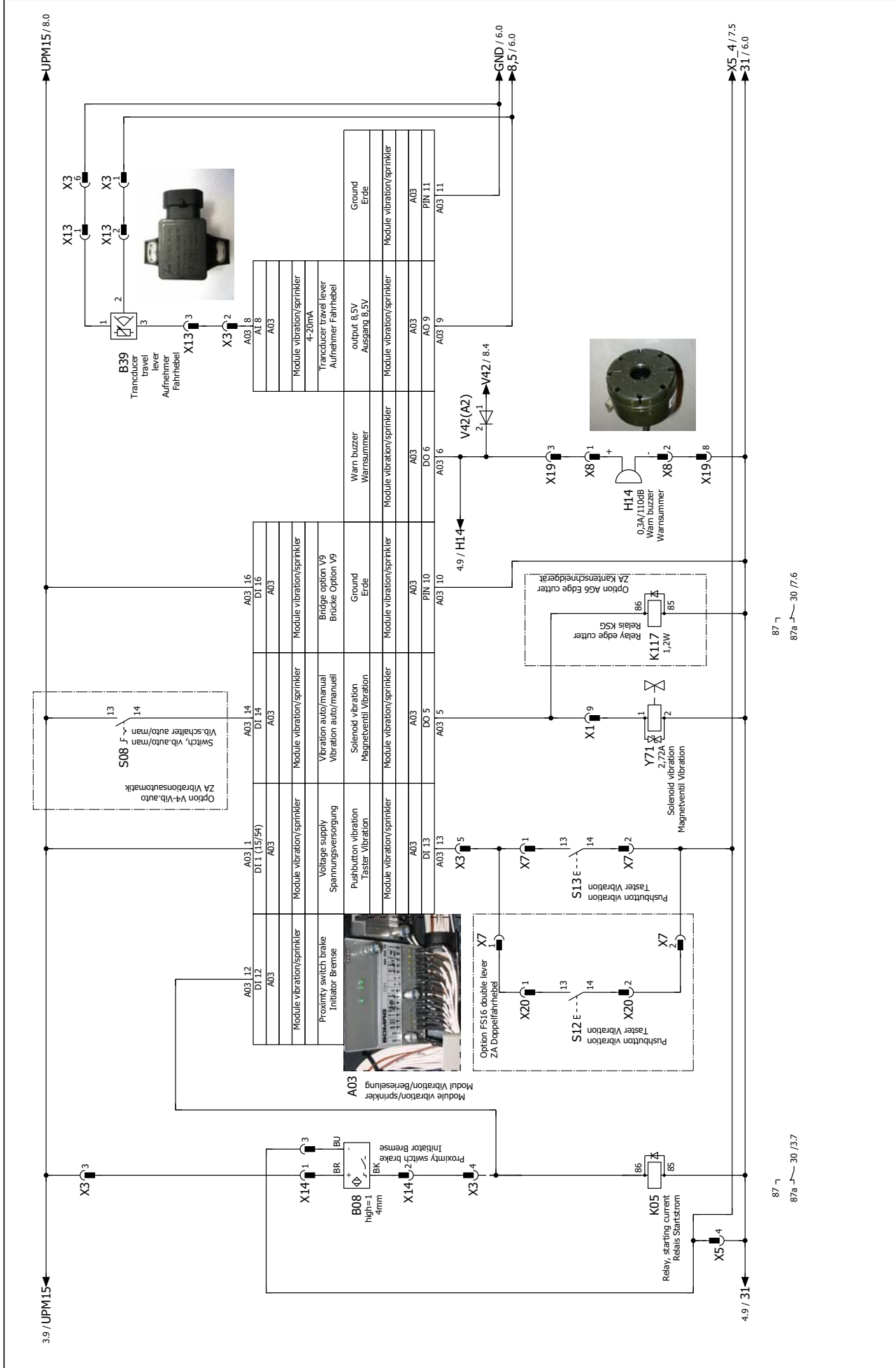


Option E26
Disconnect switch, battery/Batterietrennschalter



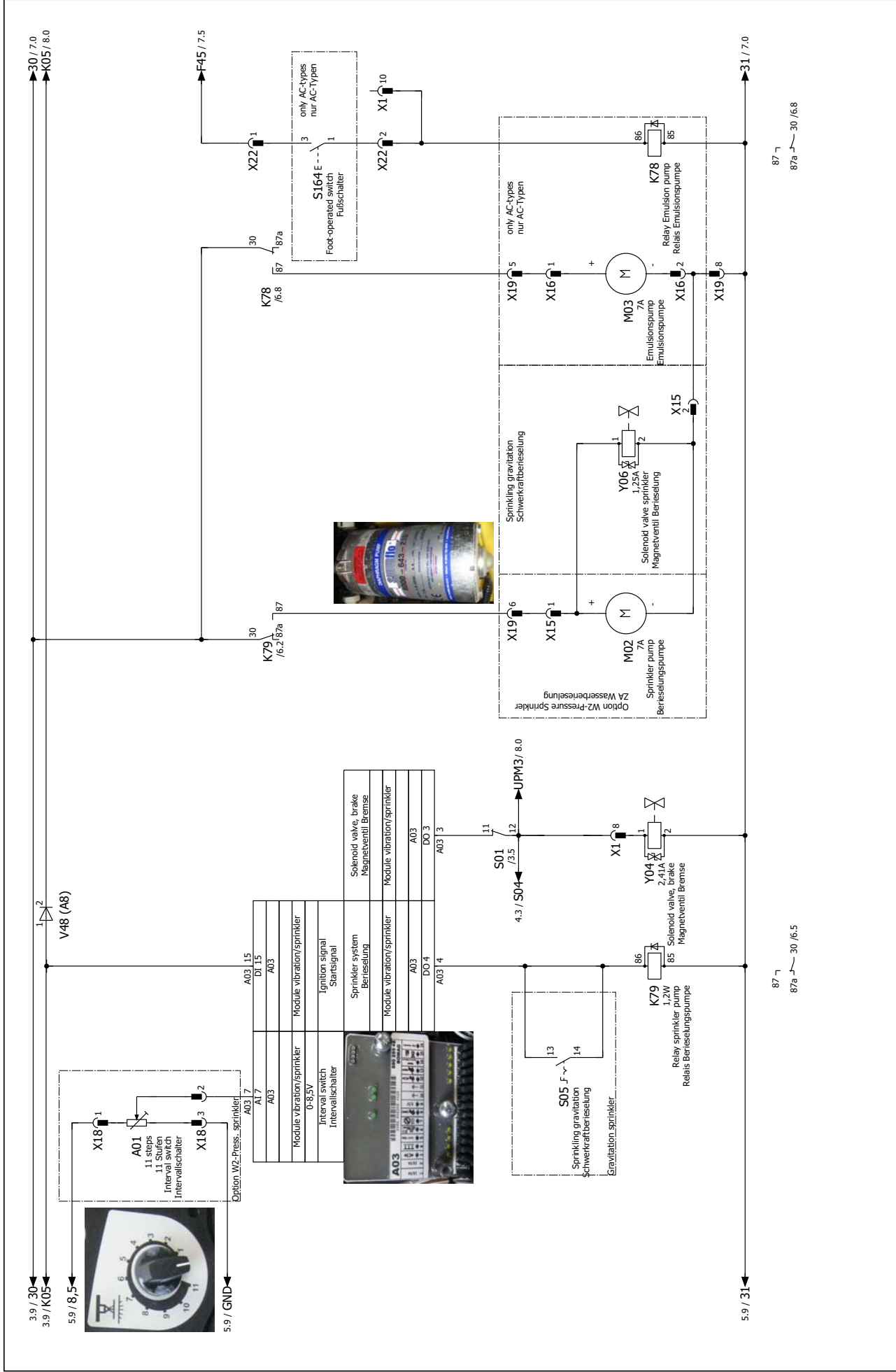


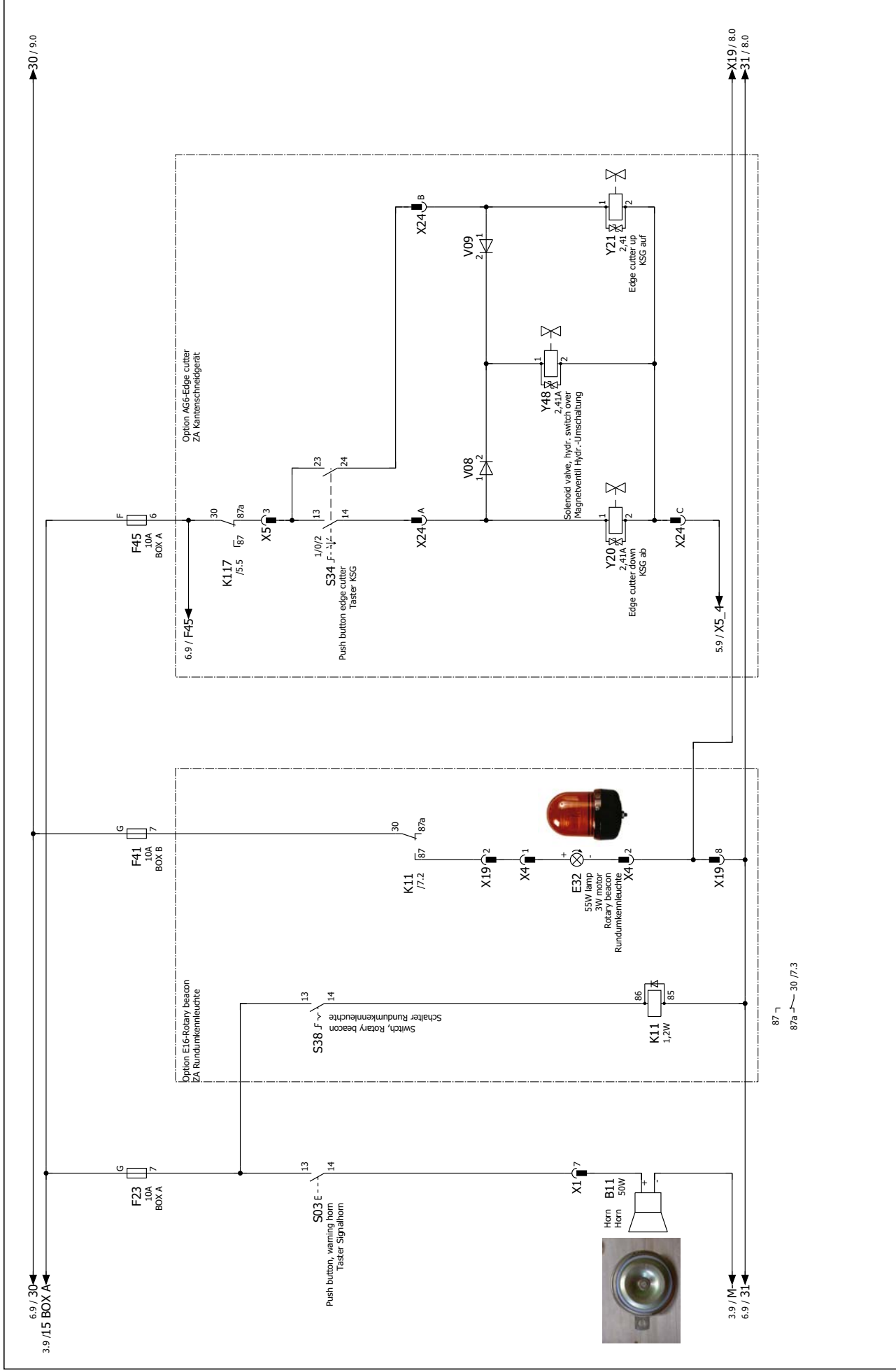
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									Mounting location Einbaustort
									+



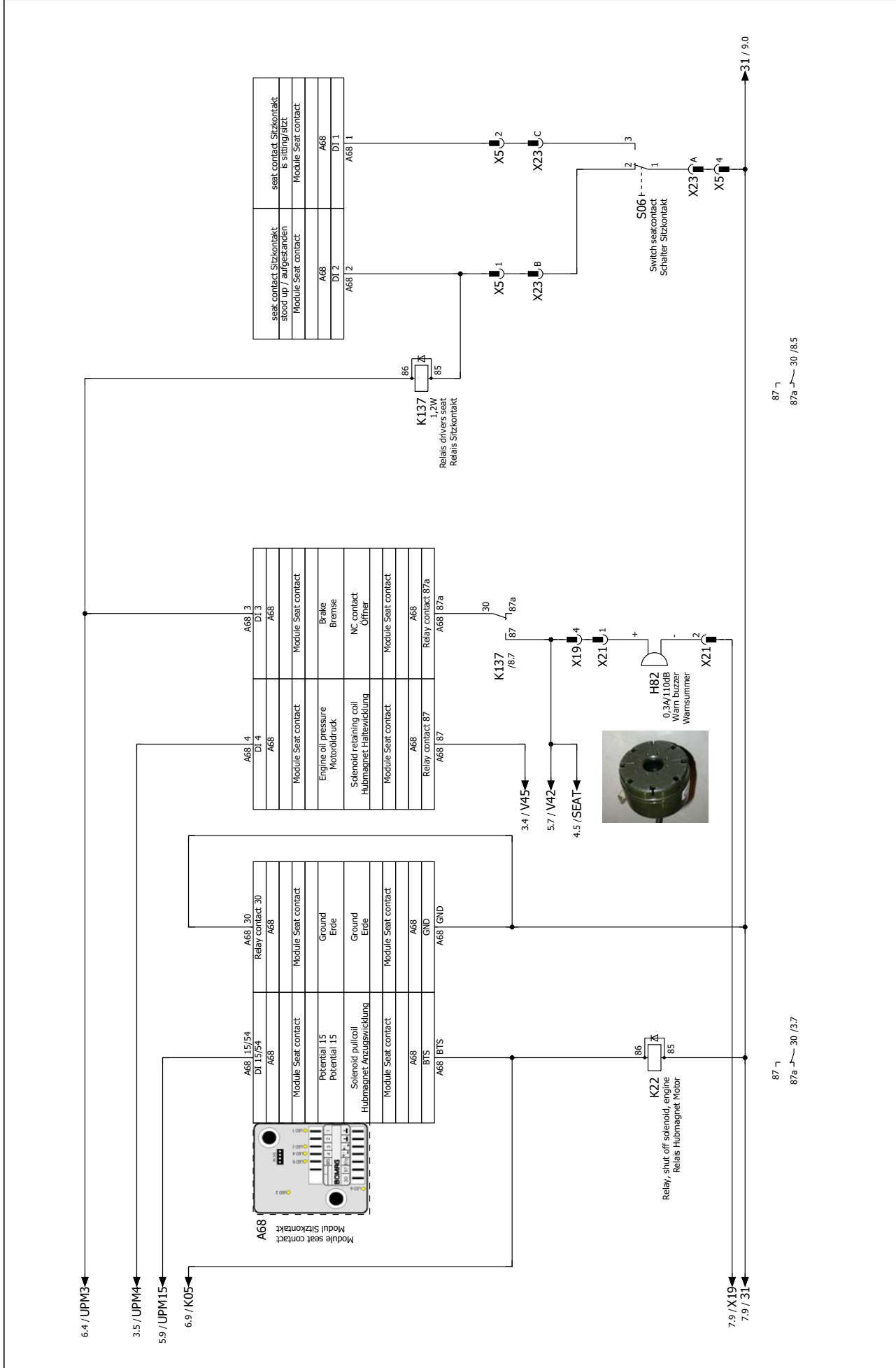
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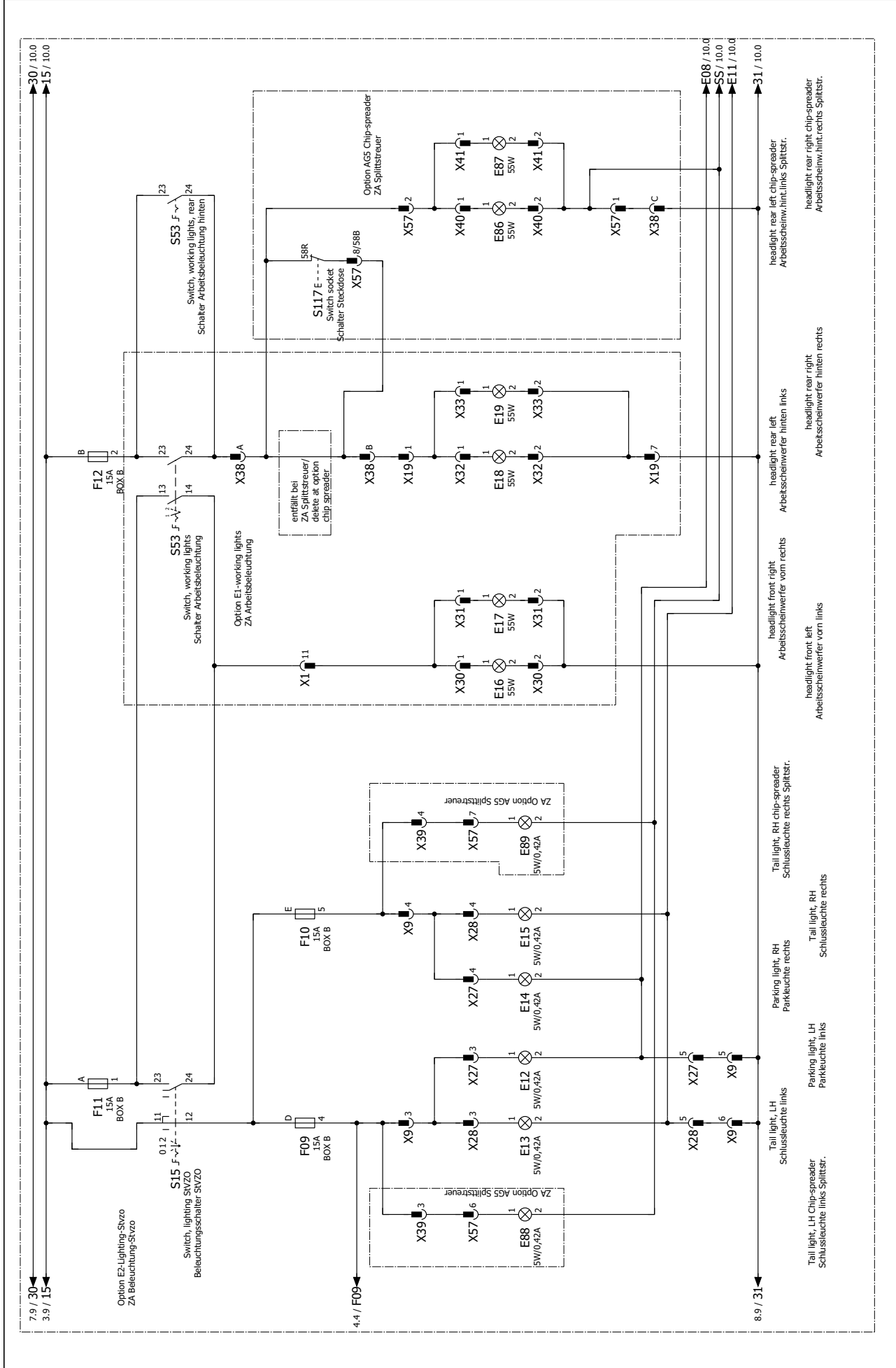
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87a 30 / 7.6



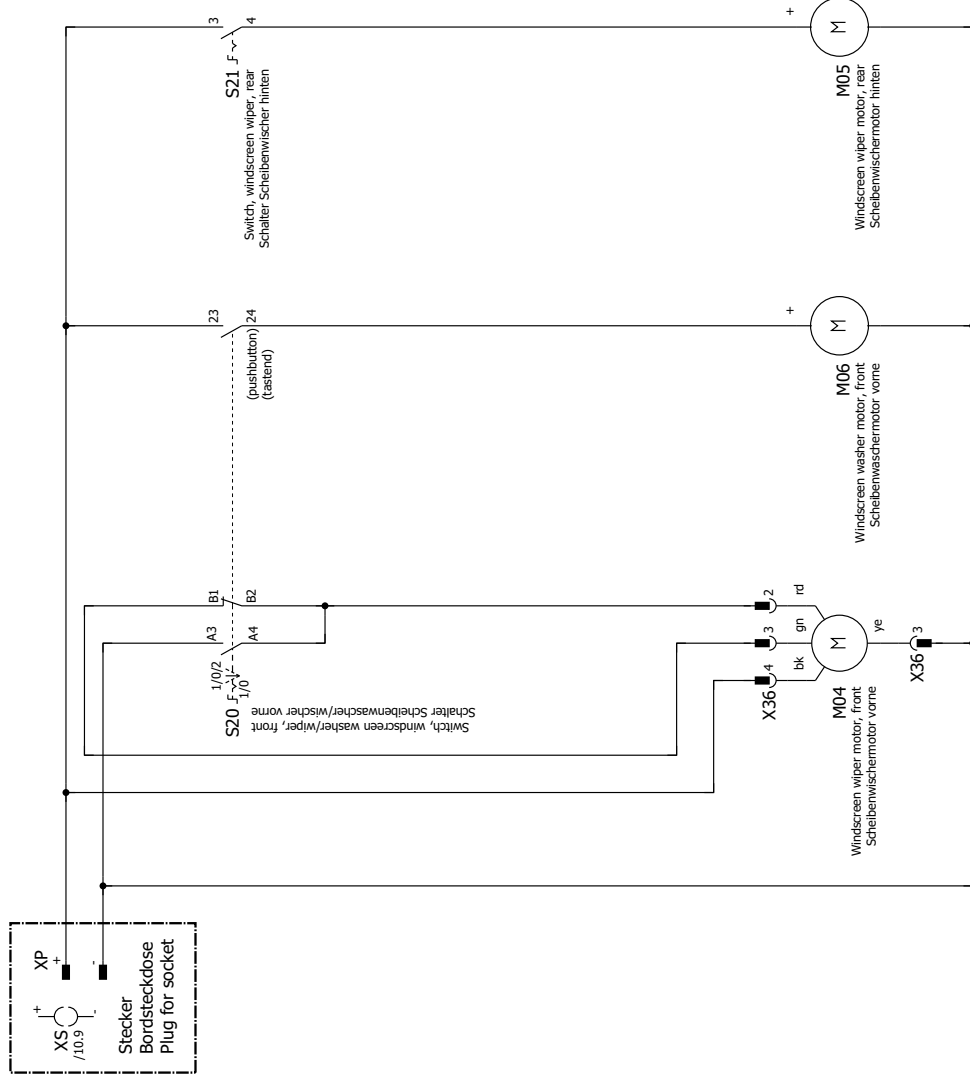


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Created T. Rau	brake, rotary beacon, edge cutter								Page 7
Erstellt 08.06.2009	Bremse, Horn, Rundumkennleuchte, KSG								von 24
Checked D. Mallin	BOMAG								Funktion ==
Gepflegt	FAYAT GROUP								Montage location +
	BW 100/120/125								880 100 64
	AD/AC-4								





0	1	2	3	4	5	6	7	8	9
Created Erstellt	T.Rau 08.06.2009	BW 100/120/125 AD/AC-4		Working lights, Stvzo-position illumination Arbeitsbeleuchtung, Stvzo-Positionsleuchten		Higher-level function Funktion		Page 9 from 24	
Checked Geprüft	D.Nallin					Function Funktion		880 100 64	
						Mounting location Einbaustort			



0	1	2	3	4	5	6	7	8	9
Created Erstellt	T. Rau 08.06.2009								
Checked Geprüft	D. Mallin								
BW 100/120/125 AD/AC-4			cabin, weather protection Wetterschutzkabine			Higher-level function Funktion Funktion Mounting location Einbaort			Page Blatt 11 880
									from von 24 100 64

Device tag list Betriebsmittelliste

Device tag BMK	Page Blatt	Path Pfad	Mounting location Einbauort	Higher-level function Anlage	Function text	Functionstext	characteristics Techn.-Kenngrößen
A01	6	1			Interval switch	Intervallschalter	11 steps 11 Stufen
A02	10	6			Flasher	Blinkgeber	6x21W
A03	5	2			Module vibration/sprinkler	Modul Vibration/Berieselung	
A15	4	1			Monitoring-module	Überwachungsmodul	
A66	12	3			Electronic control unit	Elektronik Steuereinheit	
A67	12	6			Keyboard	Tastatur	
A68	8	1			Module seat contact	Modul Sitzkontakt	
B06	3	3			Pressure switch, Engine oil	Druckschalter Motoröl	
B08	5	1			Proximity switch brake	Initiator Bremse	high=1 4mm
B11	7	1			Horn	Horn	50W
B39	5	7			Tranducer travel lever	Aufnehmer Fahrhebel	
B53	4	4			Temperature switch coolant	Temperaturschalter Kühlwasser	
E08	10	3			Indicator front left	Blinkleuchte vorne links	21W/2,1A
E09	10	4			Indicator rear left	Blinkleuchte hinten links	21W/2,1A
E10	10	4			Indicator front right	Blinkleuchte vorne rechts	21W/2,1A
E11	10	5			Indicator rear right	Blinkleuchte hinten rechts	21W/2,1A
E12	9	2			Parking light, LH	Parkleuchte links	5W/0,42A
E13	9	1			Tail light, LH	Schlussleuchte links	5W/0,42A
E14	9	2			Parking light, RH	Parkleuchte rechts	5W/0,42A
E15	9	3			Tail light, RH	Schlussleuchte rechts	5W/0,42A
E16	9	5			headlight front left	Arbeitsscheinwerfer vorn links	55W
E17	9	5			headlight front right	Arbeitsscheinwerfer vorn rechts	55W
E18	9	6			headlight rear left	Arbeitsscheinwerfer hinten links	55W
E19	9	7			headlight rear right	Arbeitsscheinwerfer hinten rechts	55W
E32	7	3			Rotary beacon	Rundumkennleuchte	55W lamp 3W motor
E86	9	8			headlight rear left chip-spreader	Arbeitsscheinw.hint.links Splittstr.	55W
E87	9	8			headlight rear right chip-spreader	Arbeitsscheinw.hint.rechts Splittstr.	55W
E88	9	1			Tail light, LH Chip-spreader	Schlussleuchte links Splittstr.	5W/0,42A
E89	9	4			Tail light, RH chip-spreader	Schlussleuchte rechts Splittstr.	5W/0,42A
E90	10	3			Indicator chip-spreader rear left	Blinkleuchte Splittstr.hinten links	21W/2,1A
E91	10	6			Indicator chip-spreader rear right	Blinkleuchte Splittstr.hinten rechts	21W/2,1A
F00	3	1			Fuse, Main	Hauptsicherung	80A
F04	3	8			Fuse	Sicherung	10A BOX A
F05	10	9			Fuse	Sicherung	15A BOX B
F07	10	1			Fuse	Sicherung	15A BOX B
F08	10	2			Fuse	Sicherung	15A BOX B
F09	9	1			Fuse	Sicherung	15A BOX B

Device tag list Betriebsmittelliste

Device tag BMK	Page Blatt	Path Pfad	Mounting location Einbauort	Higher-level function Anlage	Function text	Funktionstext	characteristics Techn.-Kenngrößen
F10	9	3			Fuse	Sicherung	15A BOX B
F11	9	2			Fuse	Sicherung	15A BOX B
F12	9	6			Fuse	Sicherung	15A BOX B
F23	7	1			Fuse	Sicherung	10A BOX A
F41	7	3			Fuse	Sicherung	10A BOX B
F45	7	6			Fuse	Sicherung	10A BOX A
F48	3	5			Fuse	Sicherung	10A BOX A
F68	6				Fuse	Sicherung	20A BOX A
F119	3	5			Fuse	Sicherung	10A BOX A
F139	3	7			Fuse	Sicherung	30A BOX A
G01	3	1			battery	Batterie	12V/62Ah 510A(EN)
G02	3	1			Generator	Generator	45A
H06	10	2			Indicator light, hazard light	Meldeleuchte Warnblinker	
H14	5	6			Warn buzzer	Warnsummer	0,3A/110dB
H82	8	5			Warn buzzer	Warnsummer	140mA/92dB
H88	10	7			Indicator light, flasher, chip spreader	Kontrollleuchte Blinker Splittstreuer	
K05	5	1			Relay, starting current	Relais Startstrom	
K11	7	2			Relay, potential 30 on 15	Relais Potential 30 auf 15	1,2W
K22	8	2			Relay, shut off solenoid, engine	Relais Hubmagnet Motor	
K78	6	8			Relay Emulsion pump	Relais Emulsionpumpe	
K79	6	2			Relay sprinkler pump	Relais Berieselungspumpe	1,2W
K96	3	3			Relay, Engine oil pressure	Relais Motoröldruck	1,2W
K117	5	5			Relay edge cutter	Relais KSG	1,2W
K137	8	7			Relais drivers seat	Relais Sitzkontakt	1,2W
M01	3	6			Starter	Starter	1,4 kW
M02	6	5			Sprinkler pump	Berieselungspumpe	7A
M03	6	8			Emulsionspump	Emulsionspumpe	7A
M04	11	2			Windscreen wiper motor, front	Scheibenwischermotor vorne	
M05	11	5			Windscreen wiper motor, rear	Scheibenwischermotor hinten	
M06	11	4			Windscreen washer motor, front	Scheibenwaschermotor vorne	
R02	3	8			Glow plug 1	Glühfestkerze 1	
R03	4	1			Sender, level gauge	Geber Tankanzeige	79 Ohm
R09	3	2			Dropping Resistor	Vorwiderstand	82 ohm
S00	3	6			Ignition switch	Startschalter	
S01	3	5			Switch, emergency off	Schalter NOT AUS	
S03	7	1			Push button, warning horn	Taster Signalhorn	
S05	6	2			Sprinkling gravitation	Schwerkraftberieselung	

Device tag list Betriebsmittelliste

Device tag BMK	Page Blatt	Path Pfad	Mounting location Einbauort	Higher-level function Anlage	Function text	Funktionstext	characteristics Techn.-Kenngrößen
S06	8	8			Switch seatcontact	Schalter Sitzkontakt	
S08	5	4			Switch, vib.auto/man	Vib.schalter auto/man	
S12	5	2			Pushbutton vibration	Taster Vibration	
S13	5	3			Pushbutton vibration	Taster Vibration	
S14	10	1			Switch hazard light	Schalter Warnblinker	
S15	9	1			Switch, lighting SVZO	Beleuchtungsschalter SVZO	
S20	11	2			Switch, windscreen washer/wiper, front	Schalter Scheibenwascher/wischer vorne	
S21	11	5			Switch, windscreen wiper, rear	Schalter Scheibenwischer hinten	
S30	3	1			Disconnect switch, battery	Batterietrennschalter	
S34	7	6			Push button edge cutter	Taster KSG	
S37	10	2			switch indicator	Schalter Blinker	
S38	7	2			Switch, Rotary beacon	Schalter Rundumkennleuchte	
S53	9	6			Switch, working lights	Schalter Arbeitsbeleuchtung	
S117	9	8			Switch socket	Schalter Steckdose	
S164	6	8			Foot-operated switch	Fußschalter	
V08	7	6			Diode	Diode	FE5B
V09	7	8			Diode	Diode	FE5B
V42(A2)	5	6			Diode	Diode	FE5B
V48 (A8)	6	3			Diode	Diode	FE5B
XP	11	0			Plug for 12V-socket	Stecker Bordsteckdose	
Y04	6	3			Solenoid valve, brake	Magnetventil Bremse	2,41A
Y06	6	6			Solenoid valve sprinkler	Magnetventil Berieselung	1,25A
Y13	3	5			Solenoid motor	Hubmagnet Motor	HW:0,77A AW:32A
Y20	7	6			Edge cutter down	KSG ab	2,41A
Y21	7	8			Edge cutter up	KSG auf	2,41
Y48	7	7			Solenoid valve, hydr. switch over	Magnetventil Hydr.-Umschaltung	2,41A
Y71	5	4			Solenoid vibration	Magnetventil Vibration	2,72A

Pin overview Pin Übersicht

A03		Module vibration/sprinkler Modul Vibration/Berieselung		Signal
Pin Kontakt	Page Blatt	Path Pfad	Description Beschreibung	Signal
:	5 2			
A03 : 1	5 3	DI 1 (15/54)	Module vibration/sprinkler	Modul Vibration/Berieselung
A03 : 3	6 3	DO 3	Voltage supply	Spannungsversorgung
A03 : 4	6 2	DO 4	Solenoid valve, brake	Magnetventil Bremse
A03 : 5	5 4	DO 5	Sprinkler system	Berieselung
A03 : 6	5 6	DO 6	Solenoid vibration	Magnetventil Vibration
A03 : 7	6 2	AI 7	Warn buzzer	Warnsummer
A03 : 8	5 7	AI 8	Interval switch	Intervallschalter
A03 : 9	5 7	AO 9	Transducer travel lever output 8,5V	Aufnehmer Fahrhebel Ausgang 8,5V
A03 : 10	5 5	PIN 10	Ground	Erde
A03 : 11	5 8	PIN 11	Ground	Erde
A03 : 12	5 2	DI 12	Proximty switch brake	Initiator Bremse
A03 : 13	5 3	DI 13	Pushbutton vibration	Taster Vibration
A03 : 14	5 4	DI 14	Vibration auto/manual	Vibration auto/manuell
A03 : 15	6 2	DI 15	Ignition signal	Startsignal
A03 : 16	5 5	DI 16	Bridge option V9	Brücke Option V9

Pin overview Pin Übersicht

A68		Module seat contact Modul Sitzkontakt		
Pin Kontakt	Page Blatt	Path Pfad	Description Beschreibung	Signal
:	8	1		
A68 : 1	8	8	DI 1	Module seat contact
A68 : 2	8	8	DI 2	seat contact
A68 : 3	8	5	DI 3	seat contact
A68 : 4	8	4	DI 4	Brake
A68 : 15/54	8	2	DI 15/54	Engine oil pressure
A68 : 30	8	3	Relay contact 30	Potential 15
A68 : 87	8	4	Relay contact 87	Ground
A68 : 87a	8	5	Relay contact 87a	Solenoid retaining coil
A68 : BTS	8	2	BTS	NC contact
A68 : GND	8	3	GND	Solenoid pullcoil
				Ground
				Erde
				Hubmagnet Anzugswicklung
				Hubmagnet Haltewicklung
				Öffner
				Hubmagnet Anzugswicklung
				Erde

Plug overview Steckerübersicht

Designation Bezeichnung	Mounting location Einbautort	Function text Funktionstext
X5	Contact Kontakt	Type Typ
	10 9	socket 2pol.
X1	Contact Kontakt	Type Typ
	3 4 4	wiring harness engine Motor-kabelbaum
	4 3 3	DT06-12SA
	5 4 1	
	6 3 5	
	7 7 1	
	8 6 3	
	9 5 4	
	10 6 9	
	11 9 5	
	X2	Contact Kontakt
1 3 7		wiring harness engine power Motor-kabelbaum Leistung
2 3 8		DTP06-4S
3 3 8		
X3	Contact Kontakt	Type Typ
	4 3 7	wiring harness travel lever Kabelbaum Fahrhebel
	1 5 8	DT06-6S
	2 5 7	
X4	Contact Kontakt	Type Typ
	3 5 1	Rotary beacon Rundumkennleuchte
	4 5 1	DT04-2P
	5 5 3	
	6 5 8	
	7 3 3	
X5	Contact Kontakt	Type Typ
	1 8 8	wiring harness seat contact Kabelbaum Sitzkontakt
	2 8 8	DT06-4S
	3 7 6	
X6	Contact Kontakt	Type Typ
	4 5 0	
	4 4 4	
	4 4 4	
X7	Contact Kontakt	Type Typ
	1 4 1	
	3 4 2	
	4 4 3	
	5 4 4	
	8 4 4	
	9 4 5	
	10 4 6	
	11 4 7	
	12 4 7	
	13 4 7	
14 4 7		
23 4 7		
25 4 1		
26 4 1		
X8	Contact Kontakt	Type Typ
	1 5 3	Pushbutton vibration Taster-Vibration
	1 5 3	DTM06-2SA
	2 5 3	
	2 5 3	
	5 3	Warn buzzer Warnsummer
X9	Contact Kontakt	Type Typ
	1 5 6	
	2 5 6	
	5 6	
	6 6	
	DT06-2S	
X10	Contact Kontakt	Type Typ
	1 10 4	Wiring harness stvzo-lighting Kabelbaum Stvzo-Beleuchtung
	2 10 4	DT04-6P
	3 9 1	
	4 9 3	
	5 9 2	
6 9 1		
X11	Contact Kontakt	Type Typ
	1 3 5	Solenoid motor Hubmagnet Motor
	2 3 5	SIMGF2
	3 5	

Plug overview Steckerübersicht

Designation Bezeichnung	Mounting location Einbautort	Function text Funktionstext
X28	Contact Kontakt	stvo-lighting screen rear Stvo-Beleuchtung Blende rear
	1	DT06-6S
	2	
	3	
	4	
X30	Contact Kontakt	headlight front left Arbeitsscheinwerfer vorn links
	1	DT06-2S
	2	
X31	Contact Kontakt	headlight front right Arbeitsscheinwerfer vorn rechts
	1	DT06-2S
	2	
X32	Contact Kontakt	headlight rear left Arbeitsscheinwerfer hinten links
	1	DT06-2S
	2	
X33	Contact Kontakt	headlight rear right Arbeitsscheinwerfer hinten rechts
	1	DT06-2S
	2	
X35	Contact Kontakt	DT04-12PA
	1	
	2	

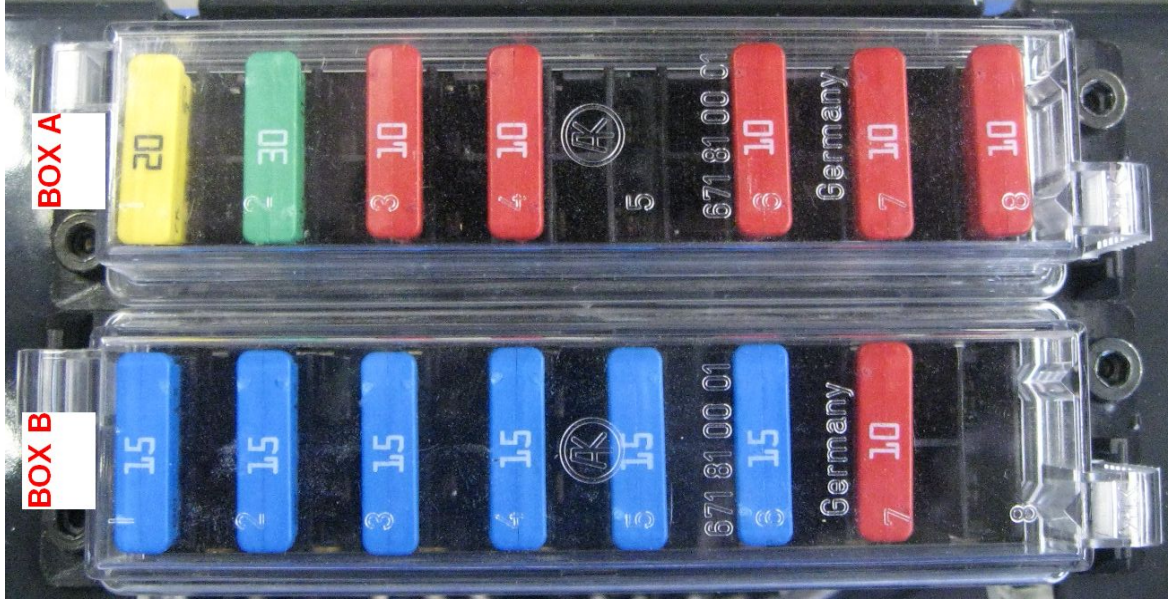
Designation Bezeichnung	Mounting location Einbautort	Function text Funktionstext
X36	Contact Kontakt	Windscreen wiper motor, front Scheibenwischermotor vorne
	2	P4NAT
	3	
	3	
	4	
X38	Contact Kontakt	headlight rear right (at option AG5) Arbeitsscheinwerfer hinten rechts
	A	DT06-2S
	B	
X39	Contact Kontakt	Plug STVZO-lighting to chip-spreader Übergabe STVZO an Splittstreuer
	1	DT06-6S
	2	
	3	
X40	Contact Kontakt	headlight rear left chip-spreader Arbeitsscheinw.hint.links Splittstr.
	1	DT06-2S
	2	
X41	Contact Kontakt	headlight rear right chip-spreader Arbeitsscheinw.hint.rechts Splittstr.
	1	DT06-2S
	2	
X43	Contact Kontakt	SUB-D 9pol.
	1-9	
	12	
X57	Contact Kontakt	Female receptacle chip-spreader Steckdose Splittstreuer
	1	BJB 001 943-011
	2	
	4	
	5	



0	1	2	3	4	5	6	7	8	9
Created T.Rau 08.06.2009	Overview Central Electric								Page 22 from 24
Checked D.Nallin	Übersicht Zentralelektrik								Br. von 880 100 64
Geprüft									Funktion ==
									Montage location +
									Erreicht

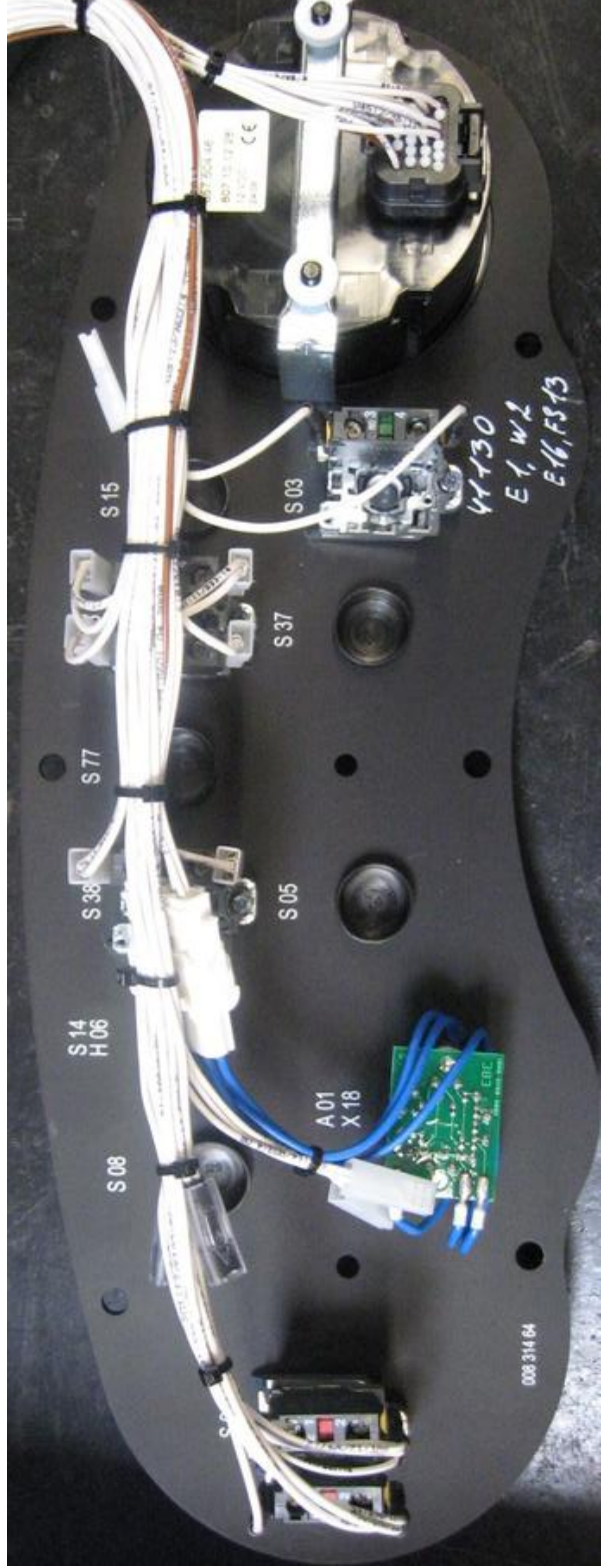


BW 100/120/125
AD/AC-4



Box B	Box A
F 11/15A	F 68/20A
F 12/15A	F 139/30A
F 08/15A	F 04/10A
F 09/15A	F 119/10A
F 10/15A	
F 07/15A	F 45/10A
F 41/10A	F 23/10A
F 05/15A	F 48/10A

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0	Created T.Rau 08.06.2009	1	2	3	4	5	6	7	8	9								
1	Checked D.Nallin	Overview Instrument board Übersicht Armaturentafel																
BW 100/120/125 AD/AC-4		<table border="1"> <tr> <td>Higher-level function</td> <td>=</td> </tr> <tr> <td>Function</td> <td>==</td> </tr> <tr> <td>Mounting location</td> <td>+</td> </tr> <tr> <td>Erbsort</td> <td></td> </tr> </table>									Higher-level function	=	Function	==	Mounting location	+	Erbsort	
Higher-level function	=																	
Function	==																	
Mounting location	+																	
Erbsort																		
		Page 24 from 24 BOMAG 880 100 64																

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