

# Service - Manual



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**Tandem Vibratory Roller** 

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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 Service information

#### Use only genuine BOMAG spare parts.

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

This manual is 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 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.

#### j 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

# j 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.

# **Operation of high-voltage systems**

# i Note

The rules and statutory regulations valid in the corresponding do apply in addition to the notes given here.

#### ▲ Caution

The high-voltage system must only be operated and serviced by qualified and authorized personnel.

Before starting operation the operator must check the proper condition of the system.

# Danger

Possibility of injury or even death caused by electric shock:

- · if persons come into contact with live parts,
- in case of faulty insulation of live parts,
- inadequate, unsuitable insulation,
- if melted parts flake off in case of short circuits.

# 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 engine 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.

#### 公 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, CO<sup>2</sup> 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 oxyhydrogen 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 overflown 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!

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- 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 (Microcontroller 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 clams 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 performed by appropriately trained personnel or by the after sales service of BOMAG.

# Please note

# i 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 <sup>-</sup> 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**





# ▲ 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.

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# 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 available, 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.

# j 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.



# ▲ 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 effected 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/  $mm^2$ .

The nominal tensile strength is 12 X 100 N/mm<sup>2</sup> = 1200 N/mm<sup>2</sup>.

The second number specifies 10-times the ration 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 X 1200 N/mm<sup>2</sup> = 1080 N/mm<sup>2</sup>.

# 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).

must be able to bear Nut height above 0.8	the full pre-load at the yield point. 3 d (d = nominal dimension).	5
Strength class of nut	Strength class of associated screw	×O
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





is re-contrologion

#### **Cotter pins**



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. DAC-ROMETIZATION provides excellent corrosion protection for metal surfaces by applying a mineral coating with metallic-silver appearance.

# Tightening torques for screws with metric unified thread<sup>\*</sup>

Fightening torques for scre	ews with metric unified threa	ıd <sup>*</sup>	your
O ano an alian ana alian		Tightening torques Nm	0
Screw dimension	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

\* Coefficient of friction  $\mu$  tot. = 0,14

#### Tightening torques for screws with metric unified fine thread<sup>\*</sup>

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

Coefficient of friction  $\mu$  tot. = 0,14

Corow 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

# Tightening torques for screws treated with anti-seizure paste OKS 240<sup>\*</sup> (copper paste)

\* 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.

co

# Tightening torques for wheel nuts (fine thread) \*

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

\* Coefficient of friction  $\mu$  tot. = 0,14

\*\* 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

# j 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. DAC-ROMETIZATION provides excellent corrosion protection for metal surfaces by applying a mineral coating with metallic-silver appearance.

# Tightening torques for screws with UNC thread, <sup>\*</sup> UNC Unified Coarse Thread Series, American Unified Coarse Thread

Sorow dimonsion		Tightening torques Nm		
Screw dimension	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	

\* Coefficient of friction  $\mu$  tot. = 0,14

# Tightening torques for screws with UNF thread, <sup>\*</sup> UNF Unified National Fine Thread Series, American Unified Fine Thread

Sarouu dimonsion	Tightening torques Nm		
Screw dimension	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, <sup>\*</sup> UNF Unified National Fine Thread Series, American **Unified Fine Thread**

Consultation on a long		Tightening torques Nm		]
Screw dimension	8.8	10.9	12.9	
1" - 12	930	1300	1600	5
1 1/8" - 12	1350	1900	2300	
1 1/4" - 12	1900	2700	3200	
1 3/8" - 12	2600	3700	4400	U.
1 1/2" - 12	3300	4600	5600	
* Coefficient of friction $\mu$ tot. = 0.14				1
24	BOMAG	i	008 921 86	5





*			BW 900-50	
Drive system			hydrostatic	
Driven axles			front + rear	
			none i roai	
brakes				C
Service brake			bydrostatic	xS
Parking brake			mechanical	
Steering				
Type of steering				
Steering operation			bydrostatic	
Inner track radius		in (mm)	64.8 (1647)	
Steering angle		+ °	33	
Steering operation		± •		
eteening operation		_		
Vibration system			0	
Vibrating drum			front	
Drive system			hydrostatic	
Frequency		rom (Hz)	4200 (70)	
Amplitude		in (mm)	0020 (0.5)	
Centrifugal force		bs (kN)	3395 (15.1)	
C C				
Water sprinkler system				
Type of sprinkling			Pressure sprinkling sys-	
			tem	
Filling capacities		X.		
Fuel (gasoline)		gal (I)	approx. 7 (27)	
Water	0	gal (I)	approx. 36 (137)	
Hydraulic oil		gal (I)	approx. 5 (19)	
Engine oil		gal (I)	approx. 0.5 (1.9)	
* The right for technical modifications	s remains reserved			
Additional engine data				
Engine type		Four-stroke two-cylinder eng	ine with suspended valves	
Valve clearance intake		0.0031 in ± 0	0.0079 in (0,08 ± 0,02 mm)	
Valve clearance exhaust		0.0039 in ± 0	0.0079 in (0,10 ± 0,02 mm)	
Spark plug electrode gap	mm		0.7 to 0.8	
Low idle speed	min <sup>-</sup> '		$1050 \pm 50$	
High Idle speed	min '		3300	
			VO 12	
Type Svotom			VU 13	
System Max. displacement	cm <sup>3</sup> /rov			
High pressure limitation	bar		300	
Charge pressure high idle	Ddi har		300 20	
	Dai		20	
Drum drive motor				
			TG/05	
System			Gerotor motor	
Displacement	cm <sup>3</sup> /rev		405	
Perm, leak oil rate	l/min		0.5	
	.,		0.0	
Steering/charge/vibration pu	mp			
	•			

# 008 921 86

3

System Max. displacement Starting pressure Operating pressure (soil dependent)	cm <sup>3</sup> /rev bar bar	Gear pump 5.5 220 50 to 100
<b>Vibration motor</b> System Displacement Perm. leak oil rate	cm <sup>3</sup> /rev I/min	Gear motor 4 0.5
<b>Steering valve</b> Type Manufacturer System		OSPM 80 ON Sauer-Danfoss Rotary spool valve
	nent.	Smile
untif	LiPI	
o to Discu		



# 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.
- Perform maintenance work only with the engine shut down.
- 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 engine mainly depends on the purity 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.
- Keep used filters in a separate waste container and dispose of environmentally.
- The fuel drum must rest for a longer period of time before drawing off fuel.
- Under no circumstances must the drum be rolled to the tapping point just before drawing out 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.

- Do not draw off fuel from near the bottom of the drum.
- 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 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 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.
- We recommend to use our filling and filtering unit with fine filter to fill the system. This ensures finest filtration of the hydraulic oil, prolongs the lifetime of the hydraulic oil filter and protects the hydraulic system.
- 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

The oil is an essential factor for the performance and lifetime of the engine.

Use engine oil for four-stroke engines which meets or even exceeds the requirements for API-service class SJ or higher (or equivalent).





# 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) (see diagram (Fig. 13)).

SAE10W-30 or 5W-30 is recommended for general use under any temperature.

For starting/operating temperatures between 14 °F (-10 °C) and -13 °F (-25 °C) you should use a fully synthetic oil 5W-30.

When using single purpose oil you must choose the correct viscosity for the average temperature in the area of use.

# Change intervals

The longest permissible time the lubrication oil should remain in an engine is 1/2 year or 100 operating hours.

# Fuel

# Quality

The engine has been approved for operation with unleaded gasoline with a octane number of 91 or higher (or Pump Octane Number" 86 or higher).

Use only commercially available brand fuel.

You can use unleaded standard grade petrol with maximum 10 percent by volume of ethanol (E10) or maximum 5 percent by volume of methanol.

Methanol must also contain co-solvents and corrosion inhibitors.

Using fuels with higher ethanol or methanol contents exceeding the values specified above may cause starting difficulties and/or performance problems. Damage may also occur to metal, rubber or plastic parts in the fuel system.

Engine damage and performance problems caused by the use of fuels with higher ethanol or methanol percentages than the ones specified above are not covered under warranty.

# Mineral oil based hydraulic oil

The hydraulic system is operated with hydraulic oil HV 46 (ISO) with a kinematic viscosity of 46 cSt (46 mm<sup>2</sup>/ s) at 104 °F (40 °C) and 8 cSt (8 mm<sup>2</sup>/s) at 212 °F (100 °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).

# Lubrication grease

For lubrication purposes use an EP-high pressure grease, lithium saponified (penetration 2), acc. to DIN 51502 KP 2G.

#### 3.3 Table of fuels and lubricants

Assembly	Fuel or lubricant		Quantity	
	Summer	Winter	Attention	
			Observe the level marks	
motor				
- Engine oil	Engine oil Af	PI SJ or higher	approx. 0.5 gal (approx. 1.9 l)	
	SAE 5W-30 (-			
	(-20 °C 1			
	SAE 10W-30	(5 °F to +86 °F)		
	(-15 °C 1	3 O 2		
	SAE 30 (+50 °F to +104°F)	Synthetic SAE 5W-30 (-13 °F to +104°F)	0	
	(+10 °C to +40 °C)	(-25 °C to +40 °C)		
- Fuel	Gasoline (unleaded)		approx. 7 gal (approx. 27 I)	
Hydraulic system	Hydraulic oil (ISO), HLP 46		approx. 5 gal (approx. 19	
	ester based biodeg	1)		
Sprinkler system	Water	Anti-freeze mixture water *	approx. 36 gal (approx. 137 l)	
Rear drum bearings	High pressure greas	se (lithium saponified)	as required	

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 20 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. s to the second second

# 3.5 Maintenance table

No.	Maintenance work	Comment	every 10 operating hours, daily	every 125 oper. hours	every 250 oper. hours	every 2000 oper. hours	as required	2 dr.
5.6	Check the engine oil level	Dipstick mark	Х					
5.7	Check the fuel level		Х					
5.8	Check the hydraulic oil level	Inspection glass	X					
5.9	Checking the hydraulic oil filter element	Contamination indicator	X					
5.10	Check the water level	Water level gauge	Х					
5.11	Clean the scrapers	2	Х					
5.12	Clean the cooling air intake openings		Х					
5.13	Check, clean the air filter, replace if nec- essary	in dusty environments clean every day replace at least every 2 years		Х				
5.14	Clean, check the spark plugs, replace if necessary	renew at least annually or af- ter 250 operating hours		х				-
5.15	Change engine oil and oil filter*	at least every 6 months see foot note		Х				•
5.16	Lubricate the rear drum bearings			Х				
5.17	Change the fuel pre-filter				Х			
5.18	Clean the water sprinkler system				Х			
5.19	Battery service	pole grease			Х			
5.20	Check, adjust the valve clearance	Intake valve: 0.08 mm Exhaust valve: 0.10 mm on cold engine			Х			
5.21	Check, adjust the idle speed	on cold engine			Х			1
5.22	Change the hydraulic oil**	at least every 2 years				Х		1
5.23	Change the hydraulic oil filter**	at least every 2 years				Х		1
5.24	Checking fuel lines and clamps	at least every 2 years				Х		1
5.25	Drain the water sprinkler system, mainte- nance in case of frost						Х	
5.26	Engine conservation						Х	]

\* Running-in instructions: Oil change after 20 and 125 operating hours, then every 125 operating hours

\*\* Also after repairs in the hydraulic system.




- 1 Vibration valve (Y22)
- 2 Hydraulic oil tank
- unp parts surp porter your parts coto the count of the co

- 12 Parking brake
- 13 Sprinkling pump (M02)



# 5.1 Starting with jump wires



```
Fig. 2
```

# ▲ 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. 2).
- 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.

# 5.2 Engine oil pressure monitoring

With an oil pressure below 0.5 bar the engine is shut down.



Fig. 1 Oil pressure switch

# 5.3 Proximity switches



Fig. 1 Proximity switches on travel control lever

B08	Proximity switch, travel lever "0"-position
B38	Proximity switch for vibration lock

### 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 it provides almost ideal conditions: contactless, wear-free working, high switching frequencies and switching accuracies as well as high protection against vibrations, 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. 2

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 into the response range energy is absorbed. The oscillator is thus dampened and the resulting change in current consumption is evaluated.

# **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. 4 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. 5

Proximity switches are used as breaking or making contacts. Depending on the design the switching dis-

tances are 2 or 4 mm. The maximum amperage is 300 mA.

The LED (Fig. 5) lights up, when the initiator has detected metal in its stray field.



Fig. 6 Circuit diagram, making contact

The circuit diagram (Fig. 6) shows a proximity switch with normally open contact.

Brown = voltage supply

Blue = ground supply

Black = switching output

The initiator switches the relay (K05) 50 to Discol



Fig. 1

1 K136, Timer relay seat contact (5 sec. delayed release)

- 2 K05, Relay start current
- 3 K96, Relay engine oil pressure
- 4 K69, Relay engine shut down
- 5 K31, Relay start current
- 6 K26, Relay backup warning device
- 7 K23, Relay water sprinkling pump
- 8 K29, Relay vibration
- 9 K04, Step relay vibration

# K04

This module is an electronic stepper relay. A ground switching pulse on Pin (S) sets the output (56b) (operating voltage applied to the output (56b)). The next pulse resets the output (56b) (no operating voltage applied to the outlet (56b)).

If the operating voltage (15/54) is switched off, the output will remain dead when switching on again.



#### Fig. 2

- 1 **S53** Rotary switch for working lights<sup>\*</sup>
- 2 H08 Charge control lamp
- 3 P00 Operating hour meter
- 4 H38 Fuel level warning lamp
- 5 S05 Rotary switch for sprinkling system
- 6 **S00** Ignition switch
- 7 Choke lever
- 8 S01 Emergency stop switch
- 9 A01 Rotary switch for interval sprinkling
- 10 S03 Push button for warning horn
- 11 S38 Rotary switch for flashing beacon<sup>1</sup>
- \* Optional equipment

12 S13 Vibration push button13 Travel lever14 Throttle lever15 Parking brake lever

14

834063

onto order your parts

# 5.6 Fuses



No. 1 = Fuse box

### i Note

The fuse box is located behind the steering column covering.

# ▲ Danger

# Fire hazard!

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

- (5) 25A = (F148) Fuse control MESX (potential 15)
- (6) 15A = (F41) Flashing beacon
- (7) 15A = (F06) Water sprinkling system
- (8) 20A = (F100) Working head lights



No. 2 = Main fuse



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

25A = F 00

and the second s

#### **Engine overview** 6.1

Tandem vibratory rollers type BW900-50 are powered by air cooled Honda petrol engines series GX630. This engine is a four-stroke two-cylinder engine with suspended valves.



The engine is equipped with an electric fuel shut-down solenoid (Y58), which interrupts the fuel supply to the main carburettor nozzle when energized.



- Fig. 1 Motor
- Oil dipstick 1
- Oil filler neck 2

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- Oil pressure switch (B06)
- Oil filter 8
- 9 Oil drain
- 10 Crankshaft
- 11 Exhaust outlet
- 12 Starter motor (M01)
- 13 Cooling fan



6.1

#### 6.2 Checking the engine oil level

# ▲ Caution

The machine must be in horizontal position.

For quality of oil refer to the "table of fuels and lubricants".

- Start the engine and run it 1 to 2 minutes with idle speed.
- Shut the engine down and wait 2 to 3 minutes.



Fig. 3

- Pull the dipstick (Fig. 3) out, wipe it off with a lintfree, clean cloth and reinsert it until it bottoms.
- Pull the dipstick back out.

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The oil level must always be between the "MIN"- and "MAX"-marks.

- If the oil level is too low top up oil immediately.
- If the oil level is too high, determine the cause and drain the oil off.

#### 6.3 Changing engine oil and oil filter

# Danger

Danger of scalding!

When draining off hot oil.

By hot oil when unscrewing the engine oil filter.



Drain the engine oil only when the engine is warm.

For quality and quantity of oil refer to the "table of fuels and lubricants".

### Environment

Catch running out oil and dispose of environmentally together with the oil filter cartridge.

• Unscrew the oil filler plug.



Fig. 4

- Place the drain hose (Fig. 4) into the collecting container and open the drain plug. Catch running out oil.
- Turn the oil drain plug back in with a new seal ring.





 Unscrew the filter cartridge (1) (Fig. 5) using an appropriate tool (2).

- Clean the sealing face on the filter carrier (3) from any dirt.
- Slightly oil the rubber seal (4) on the new filter cartridge.
- Turn the new filter cartridge on by hand, until the seal contacts.
- Tighten the filter cartridge for another 3/4 turn.



Fig. 6

- Fill in new engine oil (Fig. 6).
- Screw the oil filler cover back on again.

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• After a short test run check the oil level once again , if necessary top up to the top mark (Max).

# 6.4 Change the fuel pre-filter

# Danger

### Fire hazard!

When working on the fuel system do not use open fire, do not smoke.

Do not spill any fuel.

# 🛕 Danger

Health hazard!

Do not inhale any fuel fumes.

# Environment

Catch running out fuel, do not let it seep into the ground.

Dispose of the used fuel precleaners environmentally.



Fig. 7

- Loosen the hose clamps (Fig. 7).
- Pull the fuel filter out of the top and bottom hoses.
- Install the new fuel filter by observing the flow direction.
- Retighten the hose clamps.

# 6.5 Cleaning the cooling air intake openings

# ▲ Caution

6.5

Dirt in the cooling air intake openings reduces the cooling effect.



Fig. 8

• Clean the cooling air intake openings (Fig. 8).

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# 6.6 Check, clean the air filter, replace if necessary

# ▲ Caution

A dirty oil filter obstructs the air flow to the carburettor, which then reduces the engine power.

In a dusty environment you should clean the air filter every day.

Damaged air filters must be replaced in any case. It is therefore recommended to keep at least one air filter in stock.

The air filter must be changed after 500 operating hours, but at the latest after 2 years.

Incorrectly handled filter cartridges may become ineffective because of damage (e.g. cracks) and cause damage to the engine.



Fig. 9

- Unscrew the air filter cover locking nut (1) (Fig. 9) and remove the cover (2).
- Unscrew the wing nut (3).
- Take out the paper (4) and foam rubber inserts (6).
- Separate the foasm rubber element from the paper filter insert.
- Check both filter elements and replace if damaged.



Fig. 10

• Clean out the air filter housing with a cloth (Fig. 10).

# ▲ Caution

Do not use compressed air to blow out the air filter housing.







Eye injury!

Wear safety goggles.

# Caution

Do not hold the compressed air nozzle closer to the filter than 1 in (3 cm)

- · Bang the paper filter element several times against a hard surface.
- · Blow out the paper filter element with clean compressed air and a maximum air pressure (max. 30 PSI/2.1 bar) (Fig. 11).
- Clean the foam rubber element in warm soapsuds, rinse and dry thoroughly.
- Then submerge the foam rubber element in clean engine oil and finally press out all excess oil.

# Note

If the amount of oil remaining in the foam rubber element is too high, the engine will develop smoke during starting.



Fig. 12

- Place the foam rubber element (6) (Fig. 12) on the paper element (4).
- · Reinstall the assembled air filter. Make sure that the seal (5) under the air filter is present.
- Tighten the wing nut (3). Tighten the screw (3).
- Attach the filter cover (2) to the air filter housing and • secure it with the air filter cover lockl (1).

# 6.7 Clean, check the spark plugs, replace if necessary

# Danger

6.7

#### Danger of burning!

Let the engine cool down for approx. 15 minutes before unscrewing the spark plugs.

### ▲ Caution

Renew the spark plugs at the latest after 250 operating hours or once every year.



Fig. 13

- Pull off the spark plug socket (1) (Fig. 13) and clean off any dirt in the spark plug area.
- Unscrew the spark plug with a spark plug spanner (2).



- Fig. 14
- Check the spark plug visually and clean it if necessary (Fig. 14).

# ▲ Caution

In case of excessive combustion residuals or burned off electrodes replace the spark plug, ensure correct heat value of the spark plug.

Do not use spark plugs with incorrect heat value.

Recommended spark plug: ZFR5F (NGK)

- Check the electrode gap with a feeler gauge, if necessary adjust the gap to0.03 0.032 in (0.7 0.8 mm).
- Turn the spark plug carefully in by hand.
- Tighten the spark plug with a spark plug spanner, until it is correctly seated.
- Tighten a new spark plug for another 1/2 turn.
- Tighten used spark plugs by another 1/8 to 1/4 turn

# <u>∧</u> Caution

A loose spark plug can overheat and damage the engine.

# Overtightening the spark plug can damage the thread in the cylinder head.

• Press the spark plug socket back on.

# 6.8 Checking, adjusting the valve clearance

### ▲ Caution

We recommend to have this work carried out by trained personnel or our after sales service.

Check and adjust only when the engine is cold.

Adjusting values intake values: 0.0031 in  $\pm$  0.0079 in (0.08  $\pm$  0.02 mm)

Adjusting values exhaust values 0.0039 in  $\pm 0.0079$  in  $(0.10 \pm 0.02 \text{ mm})$ 



Fig. 15

- Unscrew the cylinder head cover fastening screws (1) (Fig. 15) and take off both cylinder head covers (2).
- Pull off spark plug socket (3).



Fig. 16

 Turn the flywheel (1) (Fig. 16) clockwise until the marks (2, 3) are in line.

# i Note

Cylinder 1 in top dead centre position in compression stroke. Both valves closed. If not, crank the engine for 360°)



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- A feeler gauge of appropriate thickness (Fig. 17) must fit with little resistance between rocker arm and valve.
- If the gap is too narrow or too wide for the feeler gauge, the valve must be adjusted.
- After the adjustment tighten the nut with 5.5 lbf-ft (7.5 Nm).



Fig. 18

- Turn the flywheel clockwise further (Fig. 18), until the marks (2, 3) are in line.
- Check and , if necessary, adjust the valve clearance of the 2nd cylinder.
- After checking and adjusting reassemble the cylinder head covers with new gaskets.
- Tighten the cylinder head screws.

# j Note

After a short test run check the engine for leaks.

# 6.9 Check, adjust the idle speed

# ▲ Caution

We recommend to have this work carried out by trained personnel or our after sales service.

Check and adjust only at operating temperature of the engine.

Setting: 1400 ± 150 min<sup>-1</sup>



Fig. 19

- Run the engine to warm it up to operating temperature.
- Adjust the engine idling speed with the setscrew (1) (Fig. 15).

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# 6.10 Checking fuel lines and clamps

# ▲ Danger

Danger of burning!

Perform inspection work only after the engine has cooled down and with the engine stopped.

# ▲ Caution

If fuel lines or hose clamps are found to be damaged, the corresponding parts must be immediately repaired or replaced.

After replacing lines or hose clamps the fuel system needs to be bled.

Disassembled or new fuel lines must be closed with clean cloths on both ends, to make sure that no dirt will enter into the fuel system. Dirt particles can destroy the injection pump.



Fig. 20

- Check the condition and tight fit of all fuel lines (1) (Fig. 20) and hose clamps.
- Replace damaged parts immediately with original spare parts.

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# 6.11 Engine conservation

# ▲ Caution

A machine with conserved engine must be clearly marked by attaching a clear warning label.

# i Note

Depending on weather conditions these conservation measures will protect the machine for approx. 6 to 12 months.

Before taking the machine back into service you must drain off the conservation oil and replace it with engine oil (see table of fuels and lubricants) according to API-(MIL-) classification.

Anti-corrosion oils are all oils which comply with the specification MIL-L-21260 B or TL 9150-037/2 o Nato Code C640/642.

If the engine is to be shut down for a longer period of time (e.g. over winter), we recommend the following measures to avoid corrosion:

- Clean engine and cooling system: With cold cleansing agent and water jet or, even better, with steam cleaning equipment.
- Run the engine warm and shut it down.
- Drain the still warm engine oil and fill in anti-corrosion engine oil.
- Drain the fuel from the fuel tank.
- Remove the cylinder head covers, spray the rocker chambers with anti-corrosion oil. Then fasten the covers again.
- Unscrew both spark plugs and spray anti-corrosion oil through the spark plug openings. Crank the engine several times and install the spark plugs again.
- Close air intake on air filter and exhaust opening tightly.

# 6.12 Carburettor Check Sheet



# 6.13 Engine problems

Fault	Possible cause	Remedy
Engine does not	Fuel tank empty	Fill fuel tank
start	Fuel filter clogged	Change the filter
	Fuel lines leaking	Check all line connections for leaks and tighten the fittings
	Emergency stop switch locked	Unlock the emergency stop switch
	Driver not seated (seat contact switch)	Occupy the driver's seat when starting.
	Travel lever not in neutral position	Return the travel levers to neutral posi- tion.
	Battery not charged or not connected	Charge the battery, check the pole clamps
	Operating error	see section "Starting the engine"
	Incorrect valve clearance	Adjust the valve clearance
	Lack of oil	Fill up engine oil
	Spark plugs defective, soiled, incorrect electrode gap	Unscrew the spark plugs, check, replace if necessary
Poor starting of	Battery power too low	Have battery checked
engine or en- gine works irreg- ularly with poor	Battery pole clamps loose or oxidized, causing the starter to turn too slow	Clean the pole clamps, tighten and cover them with acid-free grease
power	Especially in winter: use of too viscous en- gine oil	Use an engine oil complying with the am- bient temperatures
	Fuel supply too low, fuel system clogged	Change the fuel filter. Check the line con- nections for leaks and tighten the fittings.
	The specified valve clearance is not cor- rect	Adjust the valve clearance
	Carburettor defective	Have examined by a specialist
	Air filter dirty	Clean air filter, change if necessary
-C	Excessive play in throttle cable	Adjust the throttle cable, replace if neces- sary
Engine looses	Engine oil level too high	Drain the oil down to the top dipstick mark
power and speed, exces-	Poor quality fuel	Use specified fuel
sive exhaust	Air filter dirty	Clean air filter, change if necessary
smoke	Poor compression due to burned or bro- ken piston rings or incorrect valve clear- ance	Have piston rings and pistons examined by a specialist, adjust the valve clearance
Engine over-	Cooling air inlets heavily soiled	Clean the cooling air inlets
heating, engine must be shut down immedi- ately!	Air filter dirty	Clean air filter, change if necessary



# 7.1 Hydraulic circuit

# **Open circuit**



#### Fig. 1 Open circuit

Open in this case means that the suction line of a **pump**) (Fig. 1) normally is situated below the fluid level, the surface of which is in open contact with atmospheric pressure. Reliable equalization of pressure between the air in the hydraulic oil tank and the ambient air ensures problem free suction of the pump.

In an open circuit the hydraulic fluid is fed to the **consumer** (2 or 3) and also returned to the tank through way valves.

### **Closed circuit**



Fig. 2 Closed circuit

One talks about a closed hydraulic system, when the hydraulic oil flows from the **consumer** (3) (Fig. 2) directly back to the **pump** (2).

The closed circuit consists of a high and a low pressure side, depending on the load direction (take-off moment on the consumer).

The high pressure side is protected by **pressure relief valves** (4), which release oil into the low pressure side. The medium remains in the circuit.

Only the permanent leakage on pump and motor needs to be replenished. This is accomplished by a **charge pump** (1), which permanently delivers a sufficient amount of fluid (charge capacity) through a **check valve** (5) into the low pressure side of the closed circuit. Any excess oil delivered by the charge pump, which works in an open circuit, runs through a **charge pressure relief valve** (6) back into the tank. Charging the low pressure side enables the **pump** (2) to work with higher operating data.

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# 7.2 Pump overview

The travel pump is directly driven by the crankshaft of the engine via an elastic coupling, the pump speed is therefore identical with the engine speed.

The steering/charge/vibration pump is a directly driven gear pump, which is connected with the travel pump via a coupling. The pump speed is identical with the engine speed.



Fig. 1 Pump assembly

POS	Designation	POS	Designation
1	Travel pump	A	Work output, travel pump forward
2	Steering/charge/vibration pump	В	Work output, travel pump reverse
3	Elastic coupling	S	Pressure port for charge circuit
4	Petrol engine	IN	Suction side steering/charge/vibration pump
X		OUT	Pressure side steering/charge/vibration pump
		M <sub>A</sub>	Pressure test port, pressure A
		M <sub>B</sub>	Pressure test port, pressure B
		T <sub>1</sub>	Leak oil port

# Axial piston variable displacement pump PMVO 13S1M

### Control, mechanical

The variable displacement axial piston pump generates, controls and regulates a volumetric pressure fluid flow. It has been designed for mobile applications, e.g. in construction equipment.

# ▲ Caution

The variable displacement axial piston pump must be filled with pressure fluid and purged during startup and operation. This must also be considered for longer periods of rest, because the system may run empty through the hydraulic lines.

The PMVO is a variable displacement axial piston pump in swash plate design for hydrostatic drives in closed circuits. The volumetric flow is proportional to the drive speed and the displacement. The volumetric flow can be infinitely changed by adjusting the swash plate accordingly.



Pos	Designation	Pos	Designation
1	Drive shaft	6	Piston
2	Retracting plate	7	Slipper pad
3	Charge pressure relief valve	8	Slipping disc
4	Cylinder	9	Swashing shaft
5	Valve plate		

# Hydraulic diagram



Fig. 3

Pos	Designation	Pos	Designation
1	mechanical control	A	Work connection
2	High pressure relief valves	В	Work connection
3	Charge pressure relief valve	М	Motor
		Ma	Pressure test port, pressure A
		Mb	Pressure test port, pressure B
		PS	Control pressure inlet
		R	Ventilation
		S	Pressure port for charge circuit
		T <sub>1</sub>	Leak oil
XU		T <sub>2</sub>	Leak oil
		X <sub>1</sub> X <sub>2</sub>	Port for control pressures, pressure in front of
			nozzle

### High pressure relief and charge pressure valve

#### High pressure relief valves with integrated boost check valves

Pressure peaks occurring during very fast swashing processes, as well as the maximum pressures are safeguarded by superordinate high pressure relief valves, which open when the adjusted value is exceeded and relieve oil into the low pressure side. The fluid quantity always remains constant in the closed hydraulic circuit. Leakages in pump and motor are compensated by the charge pump. 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.

#### Charge pressure relief valve

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

# Swash plate principle, pump



#### Fig. 4

The swash plate pump is a positive displacement machine with oil displacing pistons arranged axially to the drive shaft. The pistons are thereby supported by the swash plate.

Axial piston units based on the swash plate principle with fixed or variable displacement can be used as hydraulic pumps or hydraulic motors. In pump mode the mechanical energy is converted to hydrostatic energy, when used in motor mode the hydrostatic energy is converted to mechanical energy. When used as a pump, the flow volume is proportional to the drive speed and the swashing angle. The available (pump) torque increases with the pressure drop between high and low pressure side.

Variable displacement pumps and motors can be change their displacement, i.e. the pump delivery rate or motor throughput, by simply changing the angle of the swash plate.

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# **Description of function**



1	Drive shaft	8	Through drive
2	Piston	9	Valve plate
3	Piston area	10	Top dead centre TDC
4	Piston stroke	11	Bottom dead centre BTC
5	Slipping disc	12	Control slots in suction side of swash plate (for sense of rotation shown)
6	Adjusting angle	13	Control slot on pressure side
7	Cylinder		

Driven by the engine, the drive shaft rotates and drives the cylinder via a splined connection. The cylinder rotates with the drive shaft and drives the 9 pistons. The pistons rest with their slipper pads on the sliding face of the swashing cradle and perform an axial movement. The slipper pads are held on the sliding face and are positively guided by a retaining device. During a complete rotation of the cylinder block each piston moves through the bottom and top dead centre back to its initial position. From dead centre to dead centre is performs a full piston stroke. During this process the flow volume determined by the stroke is drawn in through the control slots in the valve plate or pumped out. During the suction stroke the hydraulic fluid is drawn into the increasing piston chamber, i.e. it is actually pressed in. On the opposite side the oil is pressed out of the piston bores into the hydraulic system during the compression stroke.

The following table should be of help when performing troubleshooting This table is by no means complete. In practice you may encounter problems that have not been listed here.

# Procedure

7.4

- Always proceed systematically, even under time pressure. Indiscriminate, ill-considered disassembly and changing of settings can lead to a situation in which the original cause of a fault can no longer be detected.
- Get an overview over the function of the product in connection with the overall system.
- Try to clarify whether the product was able to deliver the required function within the overall system before the fault occurred.
- Develop a clear understanding of the troubleshooting process. If necessary ask the direct operator or machine driver.

Try to detect changes to the overall system, the product is installed in:

- Have conditions or area of application of the product been changed?
- Were changes (e.g. changeovers) or repairs made to the overall system (machine/plant, electrics, control) or to the product? If yes: What kind?
- · Has the product or the machine been operated as intended?
- How does the fault occur?

Fault	Possible cause	Remedy
Unusual noises	Insufficient suction conditions, e.g.	Machine or system manufacturer
	air in the suction line, inadequate di-	(e.g. optimize feed conditions, use
	ameter of the suction line, excessive	suitable pressure fluid).
	viscosity of the pressure fluid, ex-	Completely purge the axial piston
	treme suction height, too low suction	unit, fill the suction line with pres-
	pressure, foreign bodies in the suc-	sure fluid.
	tion line.	Remove foreign bodies from inside
	$\bullet$	the suction line.
	Inappropriate fastening of the axial	Check the fastening of the axial pis-
	piston unit.	ton unit as specified by the machine
		or plant manufacturer. Observe the
		tightening torques.
	Inappropriate fastening of attach-	Fasten attachment parts as speci-
	ment parts, e.g. coupling and hy-	fied by the coupling or fittings manu-
	draulic lines.	facturer.
	Pressure relief valves of the axial	Purge the axial piston unit, check
	piston unit (charge pressure, high	the viscosity of the pressure fluid,
	pressure, pressure override).	consult the service department.
	Mechanical damage to the axial pis-	Replace the axial piston unit, con-
	ton unit.	sult the service department.

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Fault	Possible cause	Remedy
No or insufficient volumetric flow	Faulty mechanical drive (e.g. defec-	Check and repair the drive.
	tive coupling).	Conquit the convice department
	Insufficient suction conditions e d	Completely purge the axial piston
	air in the suction line, inadequate di-	unit, fill the suction line with pres-
	ameter of the suction line, excessive	sure fluid.
	viscosity of the pressure fluid, ex-	Remove foreign bodies from inside
	treme suction height, too low suction	the suction line.
	pressure, foreign bodies in the suc-	5
	Ition line. Pressure fluid not within the optimal	Use eppropriate pressure fluid
	viscosity range.	Ose appropriate pressure nuid.
	External control and setting facilities	Check the external control.
	defective.	Check pilot and control procesure
	Pliot of control pressure too low.	Check pliot and control pressure,
	Functional disturbance in the control	Consult the service department.
	facility or the regulator on the axial	0
	piston unit.	
	Wear of the axial piston unit.	Replace the axial piston unit.
	Mechanical damage to the axial pis-	Replace the axial piston unit.
. count	duit	

Fault	Possible cause	Remedy
No or insufficient pressure	Faulty mechanical drive (e.g. defec-	Check and repair the drive.
	tive coupling).	
	Poor drive power.	Consult the service department.
	Insufficient suction conditions, e.g.	Completely purge the axial pistor
	air in the suction line, inadequate di-	unit, fill the suction line with pres
	ameter of the suction line, excessive	sure fluid.
	viscosity of the pressure fluid, ex-	Remove foreign bodies from insi
	treme suction height, too low suction	the suction line.
	pressure, foreign bodies in the suc-	
	tion line.	
	Pressure fluid not within the optimal	Use appropriate pressure fluid.
	viscosity range.	
	External control and setting facilities	Check the external control.
	defective.	
	Pilot or control pressure too low.	Check pilot and control pressure
	Functional disturbance in the control	Consult the service department.
	facility or the regulator on the axial	
	piston unit.	
	Wear of the axial piston unit	Replace the axial piston unit
	Mechanical damage to the axial pis-	Replace the axial piston unit
	ton unit	
	Drive unit defective (e.g. hydraulic	Check the drive unit replace if r
	motor or cylinder)	
Eluctuations in pressure/volumetric	Axial piston unit not or insufficiently	Completely purge the axial pisto
flow	nurged	unit
now	Insufficient suction conditions e.g.	Completely purge the axial pisto
	air in the suction line inadequate di-	unit fill the suction line with pres
	ameter of the suction line, excessive	sure fluid
	viscosity of the pressure fluid ex-	Remove foreign bodies from ins
	treme suction beight too low suction	the suction line
	pressure foreign bodies in the suc-	
	tion line	
Pressure fluid too bot	Excessive input temperature on axi-	Check the system e.g. malfunct
	al piston unit	of the cooler, pressure fluid leve
		tank too low
	Malfunction of the pressure control	Consult the service department
	valves (e.g. high pressure relief	
	valve pressure override pressure	
	controller)	
	Malfunction of the flushing value	Consult the service department
	(not for nominal size 18). Wear of the axial histon unit	Replace the axial histon unit

# Torque motor TG405, gerotor motor

Gerotor motors are slow running hydraulic motors with high torque.

With a given oil flow and a given pressure the displacement of the motor (nominal size of motor) determines both the speed and the torque.

This means:

a) that the speed is determined by the supplied oil flow and

b) the torque depends on the available pressure.



The drive sets of the hydraulic motors consist of a housing section with internal gearing and a gear wheel, the centre of which during rotation orbits around the centre of the ring gear.

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Fig. 7

# i Note

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1) 61 to 75 Nm tightening torque alternately on 7 screws.

2) Insert commutator completely with new seal. The flat side of the seal faces towards the outside.

3) Before assembling the drive shaft thoroughly grease the space between the dashed lines.

# Outer gear motors non-reversible



Fig. 8 Gear motor

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In their design gear motors are quite similar to gear pumps. The only difference is the slightly different axial pressure field. The pressure fluid flowing into the gear motor works on the gears. It generates a torque, which is then transferred by the output shaft.

External gear motors for one sense of rotation are of asymmetrical design, i.e. high and low pressure sides are predetermined. Reversing operation is not possible. The arising leak oil is internally fed to the outlet. The pressure load in the outlet is limited because of the radial seal.
## **External gear pumps**

External gear pumps mainly consist of the friction bearing mounted gear pair and the housing with front and rear covers. The drive shaft, which is sealed with a radial seal, protrudes from the front cover. The bearing forces are absorbed by friction bearings. These have been designed for high pressures and have excellent antifriction properties - particularly at low speeds. The gears have 12 teeth each. This keeps flow pulses and noise emissions at a low level.



Fig. 9 Axial compensation of gear pump

Internal sealing of the pressure chambers is achieved by flow volume dependent forces. This results in an excellent rate of efficiency. On the rear side the moveable bearing bushings are pressurized and thus tightly pressed against the gears. The pressurized pressure fields are thereby limited by special seals. Sealing around the circumference of the gears to the housing is assured by small gaps, which appears between gears and housing in dependence on the pressure.

#### Function



#### Fig. 10

The increasing volume caused by a tooth exiting a tooth gap results in a vacuum in the suction chamber. The pressure fluid is transported into the pressure chamber. There the meshing of teeth and tooth gaps displaces the pressure fluid into the upper supply line.



#### Fig. 11

_			
1	Cover	6	Gear (driven)
2	Seals and gaskets	7	Shaft
3	Housing	8	Flange
4	Gear (driving)	9	Bearing plate
5	Displacement chamber	10	Bearing plate
Go	ountrainne		

## **OSP** steering valve

The OSP steering unit works hydrostatically, i.e. there is no mechanical connection between the steering wheel and the wheels to be steered (articulated joint, drum, etc.). The mechanical link is replaced by hydraulic piping and hoses between the steering unit and the steering cylinder(s).

When the steering wheel is operated, the steering unit measures the exact oil quantity proportional to the rotation of the steering wheel. This oil quantity is directed to the steering cylinders.

The steering unit mainly comprises of a rotary spool valve and a rating pump (gear set). The steering column connects the steering unit to the steering wheel of the vehicle. When operating the steering wheel the rotary spool valve makes sure that oil from the steering pump is guided through the gear set to the cylinder ports L or R, depending on the operating direction of the steering wheel. The gear set measures the oil flow to the steering cylinder proportionally to the turning angle of the steering wheel.



1	Check valve	8	Outer spool
2	Shock valve	9	Universal shaft
3	Pressure relief valve	10	Distributor plate
4	Housing with anti-cavitation valves	11	Gear
5	Inner spool	12	Ring gear
6	Neutral setting spring	13	Cover
7	Pin		

The steering value is additionally equipped with a pressure relief value, it limits the steering pressure.

Suddenly occurring pressure peaks, which may be caused by e.g. external influences like driving against a curb stone, are compensated by two shock valves, which are integrated in the steering valve. Each of these shock valves is fitted with an additional anti-cavitation valve. These anti-cavitation valves protect the system against cavitation which could be caused by the reaction of the shock valves.

A check valve inside the steering unit makes sure that the hydraulic oil cannot flow to the steering pump if forces are introduced from outside. In such a case the steering cylinders would act as pumps and press the oil back to the pump.

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## 7.9 Travel circuit

The travel circuit is a closed hydraulic circuit, it consists mainly of the travel pump **PMVO13S** with the integrated safety elements, the travel motors and the check valve.

The travel pump has the function of supplying the travel circuit with hydraulic oil.

The travel motors are connected in series and drive the drum .

The gear pump flanged to the travel pump is responsible for vibration, steering and the charge circuit, the return flow form the steering valve passes through the charge oil filter and the charge oil port on the travel pump.

The **filter** is equipped with a **bypass valve**. This valve opens at a pressure differential (pressure difference between filter inlet and filter outlet) of  $\Delta p = 3.5$  bar. This pressure differential depends on the filter contamination and the viscosity of the hydraulic oil.



Fig. 1

The filter is equipped with a contamination indicator, the indicator pin of which pops out at a pressure differential of  $\Delta$  p = 2.5 bar.



Pos	Designation	Pos	Designation
1	Vibration valve (Y22) with pressure test port	6	Charge oil filter with pressure test port
2	Hydraulic oil tank	7	Rear drum drive motor
3	Steering valve	8	Front drum drive motor
4	Check valve 1 bar	9	Steering/charge/vibration pump
5	Travel pump	М	Pressure test ports

#### **Brake**

#### Hydrostatic braking

inverse invers During travel operation the machine is braked by the closed hydraulic circuit. When moving the travel lever to

## 7.10 Vibration circuit

The vibration drive is an open hydraulic circuit.



Fig. 1 AD-machine

Pos	Designation	Pos	Designation
1	Hydraulic oil tank	М	Pressure test port
2	Steering/charge/vibration pump		
3	Vibration motor		
4	Vibration valve (Y22) with pressure test port		

## Vibration drive

The vibration pump delivers the hydraulic oil from the tank to the vibration valve (Y22). When the vibration is switched on, hydraulic oil flows to the vibration motor.

Rotation of the vibration motor causes rotation of the exciter shaft. The eccentric weight attached to the exciter shaft generate the vibration of the drum.



## 7.11 Steering circuit

The steering circuit is an open hydraulic circuit.



Fig. 1

Pos	Designation	Pos	Designation
1	Vibration valve (Y22) with pressure test port	6	Charge oil filter with pressure test port
2	Hydraulic oil tank	7	Rear drum drive motor
3	Steering valve	8	Front drum drive motor
4	Check valve 1 bar	9	Steering/charge/vibration pump
5	Travel pump	10	Steering cylinder
		М	Pressure test ports

The steering pump delivers the hydraulic oil from the tank through the vibration valve to the steering Orbitrol and to the steering cylinder. If the steering is not operated, the complete oil flow will flow through the charge oil filter

on one of the outer the other the ot to the charge ports for the travel circuit. When turning the steering wheel the distributor valve guides the oil flow to the piston or piston rod side of the steering cylinder.

## 7.12 Checking the hydraulic oil level

#### ▲ Caution

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.

In hydraulic systems filled with Panolin HLP Synth. 46 use only the same oil to top up. With other ester based oils consult the lubrication oil service of the respective oil manufacturer.

For quality of oil refer to the "table of fuels and lubricants".



Fig. 2

• Check the oil level in the oil level inspection glass (Fig. 2).

#### i Note

At room temperature of approx. 68 °F (20 °C) the hydraulic oil level should reach approx. the middle of the inspection glass.

• If the oil level is too low top up hydraulic oil immediately.

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## 7.13 Changing the hydraulic oil

#### i Note

See also the notes on the hydraulic system in the chapter "General notes on maintenance".

#### Danger

Danger of scalding!

When draining off hot hydraulic oil!

#### ▲ Caution

The hydraulic oil must also be changed after major repairs in the hydraulic system.

Perform the oil change when the hydraulic oil is warm.

Replace the hydraulic oil filter elements with every hydraulic oil change.

Change the filter only after the hydraulic oil change and after the test run.

Clean the area round hydraulic oil tank, filler opening and breather filter.

Do not start the engine after draining the hydraulic oil.

Do not use any detergents to clean the system.

For quality and quantity of oil refer to the "table of fuels and lubricants".

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.

#### 🔮 Environment

Catch running out oil and dispose of environmentally.

- Drive the machine, until the hydraulic oil has reached operating temperature.
- Shut down the engine.



Fig. 3

Remove the cap from the hydraulic oil tank (Fig. 3).



Fig. 4

- Unscrew the plug from the hydraulic oil tank (Fig. 4), drain off and collect all hydraulic oil.
- Turn the plug tightly back in.

#### j Note

We recommend to use the BOMAG filling and filtering unit with fine filter to fill the system. This ensures finest filtration of the hydraulic oil, prolongs the lifetime of the hydraulic oil filter and protects the hydraulic system.



- Fig. 5
- Fill in new hydraulic oil.
- Check the hydraulic oil level in the inspection glass (Fig. 5).

#### ▲ Caution

The breather filter for the hydraulic oil tank is integrated in the filler cap, you must therefore replace the complete filler cap.

• Close the tank with a new cover.

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• Perform a test run and check the system for leaks.

## 7.14 Checking the hydraulic oil filter element

#### ▲ Caution

If the hydraulic oil is very cold the pin may pop up, you should therefore only check the filter and press the pin in at operating temperature.



- Check the contamination indicator (Fig. 6) at operating temperature and with the engine running at maximum speed.
- If necessary press the pin in.

Pin remains pressed

in

- Hydraulic oil filter element o.k.
- Pin pops out = Replacing the hydraulic oil filter element

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# 7.15 Change the hydraulic oil filter

#### ▲ Danger

#### Danger of scalding!

Danger of scalding by hot oil when unscrewing the oil filter.

#### ▲ Caution

If the filter has to be changed together with the hydraulic oil, the filter must only be changed after the oil change and after the test run.

Do not use the oil in the filter bowl again.

Visible dirt may be an early sign for the failure of system components and indicate the possible failure of components. In this case determine the cause and replace or repair the defective components, if necessary. Negligence may cause destruction to the entire hydraulic system.

Do not clean or reuse the filter element.

Apart from the normal oil change intervals, the filter element must also be changed after major repairs in the hydraulic system.

#### ∰ Environment

Catch running out oil, dispose of oil and filter element environmentally.



Fig. 7

- Remove filter bowl (4) (Fig. 7) with filter element (3).
- Examine the surface of the filter element thoroughly for any visible dirt.
- Take out the old filter element and clean filter bowl and thread.
- Reassemble the filter bowl with a new filter element and new loop rings (1) and (2).
- After a short test run check the filter for leaks.





5. Vacuum pump for hydraulic oil tank

BOMAG part-no.: 007 610 04 (12V)



#### Checking the rotation speeds 8.2

#### **Special tools**

Vibration reed frequency meter



Fig. 3

Caution  $|\Lambda|$ 

Perform measurements at operating temperature of the hydraulic oil (40 °C).

1. Drive the drum of the machine on an elastic base (rubber buffers) (Fig. 1) and block the rear drum additionally with suitable chocks.

2. Pull up the parking brake lever. (Fig. 2).

3. Start the engine and shift the throttle lever to max.

8.2



### Check the engine speed

1. Measure the speed, rest the tester on your thumb (Fig. 4).

Nominal value high idle speed See technical data.

2. Switch the vibration on .

#### Setpoint nominal speed

See technical data.

#### **Evaluation of test**

If the nominal value is not reached, perform trou-



## Checking the exciter shaft speed

- 1. Switch the vibration on at max. engine speed.
- 2. Measure the speed of the vibrator shaft by letting the tester rest on your thumb (Fig. 5).

#### Nominal value

See technical data.

#### **Evaluation of test**

If the nominal value is not reached, perform trouble shooting on the engine or in the vibration system.

#### 8.3 Pressure tests in the travel circuit

#### **Special tools**

Hydraulic test case

▲ Caution Perform measurements at operating temperature of the hydraulic oil (40 °C).

orderyor

1. Block the drums with suitable chocks (Fig. 1).

2. Pull up the parking brake lever. (Fig. 2).

- Fig. 3
- 3. Connect 600 bar pressure gauges to the high pressure test ports for  $M_A$  and  $M_B$  and a 60 bar pressure gauge (Fig. 3) to the charge pressure test port.

#### ▲ Caution

Do not activate the vibration and do not steer while checking the pressure.

# This would destroy the 60 bar pressure gauge.

- 4. Start the engine and shift the throttle lever to max. speed position.
- 5. Read charge and high pressure gauges.

#### Nominal value

Charge pressure gauge: See technical data. High pressure gauge: Both identical pressure (charge pressure).

834617 Fig. 1

Fig. 2

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#### **Evaluation of test**

If the nominal value is not reached, check the steering/charge pump.

6. Move the travel lever quickly forward and backward, read the pressure gauges.

#### Nominal value

See technical data.

#### **Evaluation of test**

If the charge pressure drops below the nominal value during the high pressure test, check the individual components.

If the specified high pressure is not reached, check the travel pump.

If the starting pressure is reached to one travel dicontention of the second rection only, check the high pressure relief valves.

# 8.4 Adjusting the neutral positions of the travel pump

#### Special tools

Hydraulic test case

▲ Caution

Perform measurements at operating temperature of the hydraulic oil (40 °C).

1. Raise the machine (Fig. 1), so that both drums can turn freely.

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2. Shift the travel lever to position "0" (Fig. 2).

Start the engine and run it with maximum speed.
Adjust the travel control cable (Fig. 3) so that both drums stop.

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Fig. 1

Fig. 2

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## 8.5 Travel pump high pressure test

#### Special tools

Hydraulic test case

▲ Caution

Perform measurements at operating temperature of the hydraulic oil (40 °C).

orderyou

1. Block the drums with suitable chocks (Fig. 1)

2. Pull up the parking brake lever (Fig. 2).

- Fig. 2
- 3. Connect 600 bar pressure gauges (Fig. 3) to high pressure test ports  $M_A$  and  $M_B$ .
- 4. Close high pressure ports  $\rm M_A$  and  $\rm M_B$  with plugs

834617 Fig. 1

Fig. 3



Fig. 4

### Caution

Run the following pressure test for max. 3 seconds.

5. Move the travel lever quickly to both travel directions (Fig. 4) and read the high pressure gauges.

#### Nominal value

approx. 320 bar

#### **Evaluation of test**

If the nominal value is reached to one travel direction only, check the high pressure relief valves.

e is ravelp If the nominal value is not reached to both directions check the travel pump, replace if necessary.

### 8.6 Pressure tests in the vibration circuit

#### Special tools

Hydraulic test case

#### ▲ Caution

Perform measurements at operating temperature of the hydraulic oil (40 °C).

1. Drive the front drum of the machine on an elastic base (rubber buffers) (Fig. 1) and block the rear drum additionally with suitable chocks.

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- 2. Connect a 600 bar pressure gauge to the pressure test port on the vibration valve (Fig. 2).
- 3. Start the engine and shift the throttle lever to max. speed position.

4. Switch the vibration on (Fig. 3).

#### Nominal value:

Start-up pressure = see technical data.

Operating pressure = see technical data

#### **Evaluation of test:**

#### i Note

If starting pressure is not reached, check the vibration control valve block.

If the starting pressure is reached, but the operating pressure is too low, you should also check the leakage quantity of the vibration motors.

If the operating pressure is too high, the bearings for both vibrator shafts must be checked.

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Fig. 1





#### 8.7 Vibration pump high pressure test

#### Special tools

Hydraulic test case

▲ Caution Perform measurements at operating temperature of the hydraulic oil (40 °C).

orderyo

1. Block the drums with suitable chocks (Fig. 1).

2. Pull up the parking brake lever. (Fig. 2).



Fig. 3

Fig. 2

834617 Fig. 1

▲ Caution

Run the following pressure test for max. 3 seconds.

- 3. Close the pump outlet (Fig. 3) with a 200 bar pressure relief valve
- 4. Start the engine for a moment.

#### Nominal value

approx. 200 bar

#### **Evaluation of test**

If the nominal value is not reached, replace the vibration pump.

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#### 8.8 Checking the leakage rate of the vibration motor

#### ▲ Caution

Perform measurements at operating temperature of the hydraulic oil (40 °C).

rder y

1. Drive the front drum of the machine on an elastic base (rubber buffers) (Fig. 1) and block the rear drum additionally with suitable chocks.

2. Pull up the parking brake lever. (Fig. 2).

- Fig. 2
- 3. Disconnect the leak oil hose (Fig. 3), connect a measuring hose and hold it into a measuring beaker.
- 4. Start the engine and shift the throttle lever to max. speed position.
- 5. Switch the vibration on and measure the running out leak oil during one timed minute.

#### **Nominal value**

max. 0.25 litre/min

#### **Evaluation of test**

If the permissible leak oil rate is exceeded, replace the vibration motor.

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834616 Fig. 1



#### Caution $\wedge$

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Perform measurements at operating temperature of the hydraulic oil (40 °C).

- der your parti 1. Pull up the parking brake lever. (Fig. 1).
- 2. Connect a 600 bar pressure gauge to the steering pressure test port (Fig. 2).

Fig.

Fig. 2



- 3. Engage the articulation lock (Fig. 3).
- Start the engine and run it at idle speed. 4.
- 5. Operate the steering system and read the pressure gauge.

#### Nominal value

approx. 100 bar

#### **Evaluation of test**

If the nominal value is reached, check the steering cylinder.





- 6. Disconnect the hydraulic hoses (Fig. 4) from ports L and R on the steering cylinder and close them with plugs.
- 7. Repeat the pressure test.

#### Nominal value

approx. 10 bar

#### **Evaluation of test**

If the nominal value is reached, replace the steering cylinder.

If the nominal value is not reached, check the steering/charge pump.

- 8. Reconnect the hydraulic hoses to the steering cylinders.
- 9. Close the pump outlet (Fig. 5) with a 200 bar pressure relief valve
- 10. Run the engine for a short while with idle speed and read the pressure gauge.

#### Nominal value

approx. 200 bar

#### **Evaluation of test**

If the nominal value is reached, replace the steering valve.

If the nominal value is not reached, replace the steering/charge/vibration pump.











#### 9.1 Special tools for flushing

## i Note

The following list informs about special tools for flushing. You should choose the corresponding tool for the work to be carried out. our pari

11. Filling and filtering unit

#### BOMAG part-no.: 058 240 22

- 12. Flushing filter (S connection) BOMAG part-no.: 007 000 01
- 13. Filter element 1µ

BOMAG part-no.: 079 930 52

- 14. Flushing hose 20S 25S (2 pieces) BOMAG part-no.: 055 509 19
- 15. Screw socket R1" 25S (2 pieces)

BOMAG part-no.: 055 400 52

- 16. Flushing filter (L connection) BOMAG part-no.: 079 390 29
- 17. Filter element

BOMAG part-no.: 079 390 14

18. Flushing hose 15L (2 pieces)

BOMAG part-no.: 055 510 09

19. Screw socket R3/4" -- 15L (2 pieces)

BOMAG part-no.: 055 400 89

20. SAE-flange 1" - 20S

BOMAG part-no.: 058 142 60

21. O-ring BOMAG part-no. 062 203 30

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28. Connecting socket 18L BOMAG part-no.: 055 426 06

Connecting socket 16S BOMAG part-no.: 055 459 43

30. Connecting fitting 20S BOMAG part-no.: 055 459 44



31. Connecting fitting 25S BOMAG part-no.: 055 459 45 JOUR Parts 055 459 43 Fig. 13 32. Angular fitting 18L BOMAG part-no.: 055 421 26 640 823 Fig. 14 33. Elbow fitting 16L BOMAG part-no.: 055 421 36 640 823 Fig. 15 34. Elbow 20S BOMAG part-no.: 055 421 37 640 823 Fig. 16


#### 9.2 Flushing - general

Solid particles in the circuit will very quickly cause damage to machine components.

▲ Caution

Always flush the complete oil circuit after you have replaced a component.



#### 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 $\mu$ m)

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

#### $\Lambda$ 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



Always bleed closed hydraulic circuits if • lines had been removed or connected.

#### Servicing the flushing filter kit



- Replace the filter element of the flushing fil-• ter 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.

## 9.3 Flushing schematic for travel system



10 Rear drum drive motor

#### 9.4 Flushing the travel system

$\{ \mathcal{L} \}$	Environment
<b>F</b>	

Environmental damage

Any hydraulic oil must be caught and disposed of in an environmentally friendly manner.

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 travel pump.

With the connection shown in the illustration the travel pump must therefore be actuated to forward direction.

- Disconnect the high pressure hose (8) from the travel pump (port B) and connect it with the flushing hose (6) flushing filter inlet "IN" (see chapter "Flushing schematic travel circuit).
- Connect the flushing hose (5) flushing filter outlet "OUT" to the high pressure port (B) on the travel pump.

#### Disconnect the drum drive motors

3. Take the travel motors (9 & 10) out of the hydraulic circuit and join the hoses together.











Flushing the drum drive motors

Danger

**Danger of accident!** 

The drums must be able to rotate freely. JUL Part

9. Jack or lift up the machine.

#### i Note

Keep circulating the complete tank content with the filling and filtering unit throughout the entire flushing process.

#### $\square$ 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.

- 10. Start the engine, run it with maximum speed and shift the travel lever to travel direction forward.
- 11. 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.
- 12. Shut down the engine.
- 13. Remove the flushing filter and reconnect the high pressure lines.

#### Bleeding the travel circuit

#### li Note

Bleed the travel circuit, see chapter "Bleeding the travel circuit".

#### Keep circulating the tank content.

14. After completing the bleeding process circulate the tank content with the filling and filtering unit for another 15 minutes.



Function test

- 15. Check the hydraulic oil level in the tank, fill up if necessary.
- 16. Check all connections for leaks with the engine running (visual inspection).
- 17. Perform a test drive, load the travel system in forward and reverse, e.g. by driving uphill or starting on a gradient.
- 18. Check all ports and connections for leak tightness

#### 9.5 Bleeding the travel circuit





Fig. 4





- 8. Unlock the emergency stop switch
- Connect a 60 bar pressure gauge (Fig. 5) to the charge pressure test port 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

Only 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. and the second s

#### 10.1 Special tools

1. Bell to change the rubber buffers







- 1 Drum
- Vibration motor

- Exciter shaft 4
- Goto Discount Failingent contro order your parts







# 10.3 Removing and installing the vibrating drum

Removing the drum



Any hydraulic oil must be caught and disposed of in an environmentally friendly manner.

#### Danger

#### Danger of squashing

- 1. Jack up the frame (Fig. 1) and support it, so that the rubber buffers are relieved.
- 2. Unhook the springs to unload the scrapers (1) .
- 3. Unscrew the fastening screws (2) and remove the vibration motor with its flange.
- Unscrew the fastening nuts (3) for support leg rubber buffers.
- 5. Mark the hydraulic hoses 2 (Fig. 2)and disconnect them from the ports.
- 6. Unscrew the fastening screws for the hose mounting bracket (3).
- 7. Close all hydraulic hoses and motor ports with suitable plugs.
- 8. Unscrew the support fastening screws (1) and pull out the drum with the support leg.
- 9. Check coupling hub 2 (Fig. 3) for wear.
- 10. If necessary unscrew the hexagon nut (1) and pull off the coupling hub (2) with a puller.
- 11. Remove feather key (3).





#### Installing the drum

12. Examine all rubber buffers 1 (Fig. 4) for wear, replace if necessary.



Tighten the rubber buffers with 211 Nm.

Install the drum in reverse order, for this purpose move the drum with attached travel motor and support legs parallel into the frame. Fasten the support legs under pre-load and reconnect the hydraulic hoses.

#### Adjusting the pre-load of the rubber buffers

#### Caution

Install the support legs under pre-load.

The preload of the rubber buffers is achieved by a gap "X" (Fig. 5) between support leg and spacer block when tightening.

Nominal value: Distance X = 1mm

#### i Note

If necessary attach compensation shims on either side.

Check the hydraulic oil level (Fig. 6), top up if nec-13. essary.

#### ▲ Caution

Bleed the travel circuit before starting operation.

- 14. Perform a test drive, check function of travel system, vibration and water sprinkling system.
- 15. Check all connections and fittings for leak tightness.

#### 10.4 Dismantling the vibrating drum

1. Remove the drum.

#### Removing the travel motor

#### A Danger

#### Secure the drum against unintended rolling.

- Attach the lifting tackle to the support leg 2 (Fig. 1).
- 3. Unscrew the nuts (1), remove the washers and take off the support leg with travel motor and drive disc.

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4. Unscrew fastening nut 1 (Fig. 2) and remove drive disc (2).

- R34625 Fig. 2
- 5. Disassemble fastening screws 1 (Fig. 3) with nuts and washers, lift the travel motor off the support leg.
- 6. Remove the feather key (2) from the travel motor.



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Fig. 9



Dismantling the vibrating drum

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3. Remove circlip 1 (Fig. 7).

4. Press flange 1 (Fig. 8)off the bearing flange with forcing screws (2).

5. Knock ball bearing 1 (Fig. 9) out of the flange.

m<sup>to</sup>on<sup>t</sup>

6. Take shim 1 (Fig. 10) and V-ring (2) off the bearing flange.

Fig. 11

JUI Parts

7. Remove coupling element 1 (Fig. 11).

Removing / dismantling the exciter shaft

- 8. Unscrew fastening screws 1 (Fig. 12).
- 9. Force the bearing flange off the drum using forcing screws (2).



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▲ Caution Danger of squashing!

10. Pull the exciter shaft out of the drum (Fig. 13).











- 11. Remove cylinder roller bearing 1 (Fig. 14) from the bearing flange.
- er sh 12. Pull coupling hub 1 (Fig. 15) off the exciter shaft.

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13. 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.

- 14. Remove seal ring (2) from both ends of the exciter shaft.
- 15. Unscrew fastening screws 1 (Fig. 17).

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16. Force the bearing cover off the drum using forcing screws 1 (Fig. 18).

17. Remove cylinder roller bearing 1 (Fig. 19) from the bearing cover.



#### Assembling / installing the exciter shaft

1. Cool the new cylinder roller bearing 1 (Fig. 1) down to -25°C and press it into the bearing flange until it bottoms, fill with high pressure grease.

#### i Note

Fill approx. 15 g of lithium saponified high pressure grease into the gap between the rolling elements and approx. 15 g into the grease chamber of the flanged bearing cover.

2. Cool the new cylinder roller bearing 1 (Fig. 2) down to -25°C and press it into the bearing cover, fill with grease.

#### i Note

Fill approx. 15 g of lithium saponified high pressure grease into the gap between the rolling elements and approx. 15 g into the grease chamber of the flanged bearing cover.

3. Bolt the bearing cover to the drum with fastening screws 1 (Fig. 3).















4. Install the seal ring 2 (Fig. 4) on both ends of the exciter shaft.

#### i Note

Lubricate the bearing seat areas.

#### Danger

Danger of burning! Wear protective gloves

- Heat the inner bearing races (1) up to approx. 80°C and slide them on the exciter shaft from both ends.
- 6. Install coupling hub 1 (Fig. 5).

▲ Caution Danger of squashing!

7. Guide the exciter shaft into the opposite cylinder roller bearing (Fig. 6).

8. Slide the bearing flange over the exciter shaft and fasten it with screws 1 (Fig. 7).



#### Measuring the end float

- 9. Push the exciter shaft into the bearing flange against the stop (Fig. 8).
- 10. Measure the distance between coupling and front face of bearing flange .
- 11. Pull the exciter shaft out against the stop.
- 12. Measure the distance between coupling and front face once again.

#### i Note

Subtract the second measurement from the first measurement to calculate the end float.

#### Nominal value:

min. 0.65 mm

max. 1.89 mm

13. Insert coupling element 1 (Fig. 9) into the coupling hub.



 Tig. 10

## Assembling the travel bearing on the vibration side

- 1. Attach shim 1 (Fig. 10).
- 2. Install the new V-ring (2) to the bearing flange and lubricate as shown.

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- 800 627 Fig. 12
- 800 610 Fig. 13



Fig. 14

3. Press ball bearing 1 (Fig. 11) into the flange until it bottoms.

4. Knock flange 1 (Fig. 12) onto the bearing flange using a drift punch.

5. Insert circlip 1 (Fig. 13) into the groove in the bearing flange and check the correct fit.

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- 6. Install the new V-ring 1 (Fig. 14) and grease.
- 7. Fill the ball bearing with high pressure grease

#### i Note

Fill bearings and cavities to 2/3 with lithium saponified high pressure grease.





8. Tighten all rubber buffers 1 (Fig. 15) with a matching rubber buffer mounting bell.

Tightening torque for rubber buffers: 211 Nm

#### Installing the travel motor

our parts 9. Tighten all rubber buffers 1 (Fig. 16) with a matching rubber buffer mounting bell.

#### Tightening torque for rubber buffers:

211 Nm

- 10. Mount the travel motor with fastening screws 1 (Fig. 17) and nuts to the support leg.
- 11. Assemble the feather key (2) for the travel motor.

12. Assemble the drive disc 2 (Fig. 2) with fastening nuts (1) to the travel motor.

> **Tightening torque:** 407 to 542 Nm

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Fig. 18

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13. Attach the support leg 2 (Fig. 1) with travel motor and drive disc to the drum.





1	Housing	4	Bearing housing
2	Bearing block, top	5	Bearing journal
3	Bearing block, bottom	6	Rocker bearings for steering cylinder

#### i Note

When tightening the bearing housing (4) move the bearing housing slightly to and fro to ensure a uniform wear pattern of the individual bearing rollers.



1	Bearing journal	5	Taper roller bearing
2	Bearing block, top	6	Hinge bearing
3	Bearing block, bottom	7	Taper roller bearing
4	Bearing housing		
Goto	jisount		







#### 11.2 Removing and installing the oscillating articulated joint

1. Engage the articulation lock (Fig. 1).

2. Block the drums with suitable chocks (Fig. 2).

our parts

3. Safely support front and rear frames.



#### 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!

4. Pull up the parking brake lever (Fig. 3).



5. Attach lifting tackle to the articulated joint.

6. Remove the split pin form the steering cylinder bearing bolt 1 (Fig. 4) and knock out the bolt.

- 7. Take off supporting discs (2).

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Fig. 1

Fig. 2

46295 Fig. 3

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11.3 Repairing the oscillating articulated joint

# Jer your parts Dismantling the oscillating articulated joint

1. Pull bearing blocks 1 (Fig. 4) off both sides.

2. Remove supporting discs 1 (Fig. 2), shims (2) and seal rings (3) from both sides.

3. Extract the rocker bearing (Fig. 3) with a suitable

puller.

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4. Unscrew hexagon nut 1 (Fig. 4).

**i** Note Hexagon nut secured with LOCTITE.

5. Pull bearing housing 1 (Fig. 5) off bearing journal (2).

- 6. Take disc 1 (Fig. 6) out of the bearing housing and remove O-ring (2).
- 7. Remove the Belleville springs (3).

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8. Remove taper roller bearing 1 (Fig. 7).



Fig. 10



- 9. Remove outer bearing race 1 (Fig. 8).
- Turn the bearing housing upside down and take out seal ring 1 (Fig. 9).

11. Knock the outer bearing race 1 (Fig. 10) out of the bearing housing.

12. Pull taper roller bearing 1 (Fig. 11) off the bearing journal.

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# Assembling the oscillating articulated joint

1. Press taper roller bearing 1 (Fig. 1) onto the bearing journal.

2. Press outer bearing race 1 (Fig. 2) into the bearing housing and fill to 2/3 with lithium saponified high pressure grease.

- 3. Turn the bearing housing upside down.
- 4. Press outer bearing race 1 (Fig. 3) into the bearing housing and fill to 2/3 with lithium saponified high pressure grease.






- 5. Insert a new seal ring 1 (Fig. 4) into the bearing housing.
- Mount bearing housing 1 (Fig. 5) to bearing journal (2).

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Knock taper roller bearing 1 (Fig. 6) into the bearing housing.

- 8. Insert Belleville springs 3 (Fig. 7) with the curvature pointing down.
- 9. Fit the new O-ring (2) with grease into the disc (1).
- 10. Install disc (1) into the bearing housing.

7.



11. Cover the thread on the bearing journal with LOCTITE and tighten hexagon nut 1 (Fig. 8) with

When tightening the hexagon nut (1) move the bearing housing to and fro to ensure a uniform wear pattern of the individual bearing rollers.

12. Knock the new rocker bearings (Fig. 9) in until they bottom.

## Caution

The assembly mandrel should only contact the outer race of the rocker bearing, as otherwise the bearing will be destroyed!

Install new seal rings (3) (Fig. 10), shims (2) and supporting discs (1) to the bearing journals of the bearing housing.

14. Knock both bearing blocks 1 (Fig. 11) onto the bearing journals.



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Service

# Steering unit type OSPM All standard versions

service manual

HN.21.TA.93 is new





Item		Dimension		Comments	Number per unit
1	Dust seal ring	26 x 19 x 4		Integrated column	1
2	Housing spool and sleeve			(not sold separately)	1
3	Ball	ø3/16″			1
		29		ON with check valve in P-port, item 37	1
4	Ball stop	42		PB with check valve in P-port, item 37	
		34		ON + PB, without check valve in P-port	1
		21,9 x 17,5 x 3,1			1
5	Shaft seal	23,4 x 19 x 3		Integrated column	1
7	Bearing			1	1
10	Ring			()	1
11	Cross pin				1
12	Set of springs			0	1
13	Cardan shaft	63,2		ON units	1
		76,2		PB units	1
		5,9		32 cm <sup>3</sup>	1
		12		50 cm <sup>3</sup>	1
14	Spacer	18,9		70 cm <sup>3</sup>	1
		22,3		80 cm <sup>3</sup>	1
		29,1		100 cm <sup>3</sup>	1
15	O-ring	60 x 1,5		0	1
16	Distributor plate			•	1
	Gearwheel set 32 cm <sup>3</sup>	11	0		1
	Gearwheel set 50 cm <sup>3</sup>	17,1			1
	Gearwheel set 63 cm <sup>3</sup>	21,6			1
17	Gearwheel set 70 cm <sup>3</sup>	24			1
	Gearwheel set 80 cm <sup>3</sup>	27,4			1
	Gearwheel set 100 cm <sup>3</sup>	34,2			1
18	O-ring	60 x 1,5			2
19	End cover				1
20	O-ring	10 x 1,5			5
		32,1		For OSPM 32 ON	1
		38,2		For OSPM 50 ON	1
22	Special screw, incl. O-ring	42,7		For OSPM 63 ON	1
	special sector, near or mig	44,9		For OSPM 70 ON	1
		47,6		For OSPM 80 ON	1
		55,3		For OSPM 100 ON	1
		32,1		For OSPM 32 ON / PB	4/5
		38,2		For OSPM 50 ON / PB	4/5
23	Special screw incl O-ring	42,7		For OSPM 63 ON / PB	4/5
	Special screw, men O mig	44,9		For OSPM 70 ON / PB	4/5
		47,6		For OSPM 80 ON / PB	4/5
		55,3		For OSPM 100 ON / PB	4/5
24	Name plate				1
30	Complete relief valve			(excl. spring)	1

ltem		Dimension	Comments	Number per unit	
31	Spring for relief valve 45 - 55 bar 54 - 70 bar 65 - 85 bar			1	ats
	80 - 100 bar			1	

:	seals				
	ltem		Dimension	Comments	Number per unit
	1	Dust seal	26 x 19 x 4	Integrated column	1
	5	Shaft seal	21,9 x 17,5 x 3,1		1
	5	Shart Seal	23,4 x 19 x 3	Integrated column	1
	15	O-ring	60 x 1,5	0	1
	18	O-ring	60 x 1,5		2
	20	O-ring	10 x 1,5		5
	30	O-ring	12,4 x 1,78	For relief valve adjusting screw	1

			C
Tilspændingsmoment		Tightening torqu	e 🖌
lightening torque	ltem	Nm	Lbf in
Couple de serrage	22	20 + 2	265 1 25
coupie de serrage	23	30 ± 3	205 ± 25
GO to Disco	unter	duiph	

### Tools

A Holdeværktøj, Best.nr. SJ150L9001-01

- A Holding tool, code no. SJ150L9001-01
- A Haltewerkzeug, Artikelnr. SJ150L9001-01
- A Outil de maintien, n° de commande SJ150L9001-01

B Montageværktøj for akselpakning ø17,5 Best. nr. SJ150L4011 - 01
B Assembly tool for shaft seal ø17.5, code no. code no. SJ150L4011 - 01

- B Montagewerkzeug für Wellendichtung ø17,5, Artikelnr. SJ150L4011 01
  B Outil de montage du presse-étoupe ø17,5, n° de commande SJ150L4011 01
- C Montageværktøj for akselpakning ø19,2 Best. nr. SJ150L4012 01

C Assembly tool for shaft seal ø19,2, code no. SJ150L4012 - 01

C Montagewerkzeug für Wellendichtung ø19,2 Artikelnr. SJ150L4012 - 01

- C Outil de montage du presse-étoupe ø19,2, n° de commande SJ150L4012 01
- D Montageværktøj for støvtætningsring Best. nr. SJ150L0396 -01
- D Assembly tool for dust seal ring, code no. SJ150L0396 -01
- D Montagewerkzeug für Staubdichtungsring, Artikelnr. SJ150L0396 -01
- D Outil de montage bague-étanche anti-poussière, n° de commande SJ150L0396 -01
- E Tang for stempel i trykbegrænsningsventil Best. nr. SJ150-9000 -25
- E Pliers for piston in pressure relief valve, code no. SJ150-9000 -25
- E Zange für Kolben im Druckbegrenzungsventil, Artikelnr. SJ150-9000 -25
- E Pince pour piston dans soupape de limite de pression, n° de commande SJ150-9000 -25
- F Gaffel for montage af kardanaksel (OMM) SJ 151G9000 -1
- F Fork for fitting cardan shaft (OMM) SJ 151G9000-1
- F Gabel für Montage der Kardanwelle (OMM) SJ 151G9000 -1
- F Fourche de montage de l'arbre à cardan (OMM) SJ 151G9000 -1
- G Alm. håndværktøj. Kan ikke købes hos Danfoss.
- G Ordinary hand tools. Cannot be bought from Danfoss.

G Herkömmliches Handwerkzeug. Bei Danfoss nicht erhältlich.

G Outils ordinaires. Non fournis par Danfoss.

NV 16 topnøgle (5/8 in) Skraldenøgle, 1/2" Momentnøgle: 0-70 Nm (0-7 daNm) Unbraconøgler: NV 5+ NV 8 Lille skruetrækker, skarpslebet Pincet

Socket spanner (5/8 in) Ratchet spanner, 1/2" Torque wrench: 0-70 Nm (0-7 daNm) Allen keys: 5 & 8 mm a/flats Small screwdriver, ground sharp. Pincers

SW 16 Steckschlüssel (5/8 in) Knarrenschlüssel, 1/2" Momentschlüssel: 0-70 Nm (0-7 daNm) Innensechskantschlüssel: SW 5 + SW 8 Kleiner Schraubenzieher, scharfkantig Pinzette

Clé à douille dim. 16 (5/8 in) Clé à cliquets, 1/2" Clé dynamométrique: 0-70 Nm (0-7 daNm) Clés à 6 pans: dim. 5 + dim. 8 Petit tournevis, affilé Pincette









D





H Smøremidler: H Lubricants: H Schmiermittel: H Lubrifiants: Hydraulic oil Vaseline Molykote PG75 plastslip Vaseline

### Dismantling

Dismantling	Item	Part to remove	Action
		Column	Er der ratstamme på OSPM, anbringes enheden på holdeværktøjet på de 4 styrestifter med ratstammen opad. Demonter ratstammen.
			If there is a steering column on OSPM, place the unit in the holding tool, on the four locating pins with steering column upwards. Dismantle the steering column.
			Hat die OSPM eine Lenksäule, ist die Einheit im Haltewerkzeug auf den 4 Führungsstiften mit der Lenksäule nach oben gerichtet anzubringen. Die Lenksäule demontieren.
			Si OSPM a un bras de direction, placer l'unité sur l'outil de maintien sur les 4 goupiles-guides avec le bras de direction tourné vers le haut. Démonter le bras.
	30, 31	Pressure relief valve	Er der trykbegrænsningsventil i OSPM, fjernes plastprop fra stilleskruen, som derefter skrues ud med NV5 unbraconøgle. Fjederen fjernes og med specialtang løftes ventilkeglen ud af huset.
			If there is a pressure relief valve in OSPM, remove the plastic plug from the adjusting screw and unscrew with the 5 mm a/flats Allen key. Remove the spring and use special pliers-lift the valve cone out of the housing.
			Hat die OSPM ein Druckbegrenzungsventil, ist der Kunststoffstopfen von der Stellschraube zu entfernen. Diese anschließend mit einem Innen- sechskantschlüssel NW 5 herauszuschrauben. Die Feder ist zu entfernen, und mit einer Spezialzange ist der Ventilkegel aus dem Gehäuse zu heben.
			Si OSPM a une soupape de limite de pression, enlever le bouchon plastique de la vis de réglage que l'on dévisse ensuite avec la clé à 6 pans dim. 5. Enlever le ressort et retirer du boîtier le cône de la soupape avec une pince spéciale.
			Løft OSPM fri af holdeværktøjet, vend OSPM med udgangsakslen nedad og placer den i værktøjet igen. Bemærk, at styrestiften i værktøjet kommer på plads i OSPM huset.
			Lift OPSM clear of the holding tool, turn it so that the output shaft points downwards and place it in the holding tool again. Note, the locating pin in the tool must engage with the OSPM housing.
		ii?	Die OSPM vom Haltewerkzeug entfernen, sie umdrehen, und mit der Aus- gangswelle nach unten wieder im Haltewerkzeug anbringen. Achtung, der Führungsstift des Werkzeugs muß im OSPM-Gehäuse eingreifen.
			Libérer l'OSPM de l'outil de maintien, le retourner avec l'axe de sortie tourné vers le bas et le remettre dans l'outil. Veiller à ce que la goupille-guide de l'outil soit à sa place dans le boîtier de l'OSPM.
	22, 23	Spec. srews	Skruerne demonteres med en NV16 (5/8 in) nøgle
_	<b>S</b>		Remove the screws with a 16 mm a/flats (5/8") spanner.
0~			Die Schrauben sind mit einem SW 16 (5/8") Schlüssel zu demontieren.
			Démonter les vis avec la clé dim. 16. (5/8")
	19	End cover	Fjern endedækslet sideværts.
			Remove end cover sideways.
×O			Den Verschlußdeckel seitwärts entfernen.
			Retirer sur le côté le couvercle d'extrémité.
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### Dismantling

Dismantling	ltem	Part to remove	Action
	17, 18	Gear wheel set	Hold hånden under tandsættet, så tandhjulet ikke falder ud. Fjern O-ringene.
			Hold a hand under the gearwheel set to keep the gearwheel from falling out. Remove O-rings.
			Die Hand unter dem Zahnradsatz halten, damit das Zahnrad nicht heraus- fällt. Die O-Ringe entfernen.
			Placer une main sous le jeu d'engrenages pour que la roue dentée ne tombe pas. Retirer les joints toriques.
	16	Distibutor plate	Fjern fordelerpladen.
			Remove distributor plate.
			Die Verteilerplatte entfernen.
			Enlever la plaque de répartition
	13	Cardan shaft	Fjern kardanakslen.
			Remove cardan shaft.
			Die Kardanwelle entfernen.
			Enlever l'arbre à cardan.
	15	O-ring	Fjern O-ring i huset.
			Remove O-ring from housing.
			Den O-Ring aus dem Gehäuse entfernen.
			Enlever du boîtier les joints toriques.
	3, 4, 37	Balls and ball stop	Ryst kontraventilens kugle (ikke i alle enheder), kuglestop og nødstyrings- kuglen ud. Brug evt. pincet.
			Shake out check valve ball (not in all units), ball stop and emergency steering ball. Use pincers if necessary.
			Die Kugel des Rückschlagventils (nicht in allen Einheiten), Kugelanschlag und Notlenkungskugel herausschütteln. Evt. eine Pinzette benutzen.
	Ċ		Secouer et faire sortir la bille du clapet anti-retour (n'est pas dans toutes les unités), ainsi que la butée de bille et la bille-guide d'urgence. Au besoin, employer une pincette.
×			Placer OSPM i værktøjet igen. Styreenhed og fixtur løftes samlet og drejes 90° til vandret.
J.			Place the OSPM in the tool again. Lift up steering unit and fixture in one piece and turn it 90° to horizontal.
			Den OSPM wieder ins Halteverkzeug anbringen. Lenkeinheit und Fixierung zusammen anheben und um 90° bis waagerecht drehen.
is			Placer l'OSPM dans l'outile. Soulever et tourner de 90° l'unité de comman de et sa fixation à position horizontal.
	2	Housing/spool/	Drej glidersættet, så stiften i indre og ydre glider står vandret og tryk det ud.
×O		sieeve	Turn the spool set so that the pin in spool and sleeve is horizontal and push it out
<u> </u>			Den Schiebersatz drehen, bis der Stift im inneren und äußeren Schieber waagerecht ist, und dann herausdrücken.
6			Tourner le jeu de glisseurs de sorte que la pille soit horizontale dans le glisseur interne et le glisseur externe et pousser pour le faire sortir.

### Dismantling

Dismantling	Item	Part to remove	Action
	7	Bearing	Fjern lejet fra akseltappen. Den ydre løbeskive kan til tider klæbe fast i huset. Hvis skiven ikke kommer ud med akslen, vil den komme ud, når akselpakningen item 5 trykkes ud.
			Remove bearing from shaft end. The outer washer may sometimes adhere to the housing. If the washer does not come out with the shaft, it will come out when shaft seal item 5 is being pressed out.
			Das Lager vom Wellenende entfernen. Die äußere Laufscheibe klebt gelegentlich am Gehäuse fest. Wenn sie nicht zusammen mit der Welle entfernt wird, wird sie der Wellen dichtung folgen, wenn diese herausgedrückt wird Pos. 5
			Enlever le palier du bout de l'arbre.La rondelle centrale externe peut parfois rester collée dans le boîtier. Si la rondelle ne sorte par avec l'arbre elle sortira avec le le presse-ètoupe item 5.
	10	Ring	Fjern holdering for neutralstillingsfjedre
			Den Haltering für die Neutralstellungsfedern entfernen.
			Enlever l'anneau de maintien des ressorts de position neutre.
	11	Cross pin	Tryk stiften ud af glidersættet. Tryk forsigtigt indre glider ud af ydre glider.
			Press the pin out of the spool set. Carefully press the spool out of the sleeve.
			Den Stift aus dem Schiebersatz herausdrücken. Vorsichtig den inneren Schieber aus dem äußeren Schieber heraus drücken.
			Presser la goupille hors du jeu de glisseurs. Presser doucement le glisseur interne hors du glisseur externe.
	12	Springs	Tryk neutralstillingsfjedrene ud af indre glider.
		•.•	Press the neutral position springs out of the spool.
			Die Neutralstellungsfedern aus dem inneren Schieber herausdrücken.
			Presser les ressorts de position neutre hors du glisseur interne.
	1	Dust seal	Fjern støvtætningsringen (med en "skarp" skruetrækker).
			Remove the dust seal ring (with a "sharp" screwdriver).
			Den Staubdichtungsring (mit einem scharfkantigen Schraubenzieher) entfernen.
-0			Enlever la bague-étanche anti-poussière (avec un tournevis "affilé").
	5	Shaft seal	Fjern akseltætningen (evt. med en "skarp" skruetrækker).
			Remove the shaft seal (with a "sharp" screwdriver if necessary).
			Die Wellendichtung entfernen (evt. mit einem scharfkantigen Schraubenzieher).
×O			Enlever le presse-étoupe (avec éventuellement un tournevis "affilé").
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Rensning, kontrol, udskiftning og smøring	Alle dele rengøres omhyggeligt.
	Kontroller omhyggeligt alle dele og skift dem ud hvis nødvendigt. Alle pakningsdele udskiftes i forbindelse med reparation.
	Smør alle enkeltdele ind i hydraulikolie og indfedt gummidele med vaseline før samling .
Cleaning, inspection, replace-	Clean all parts carefully.
cation	Carefully check all parts and replace imperfect parts, if any. Always replace all sealing parts during a repair.
	Before assembly, lubricate all parts with hydraulic oil and grease rubber parts with vaseline.
Reinigung, Kontrolle, Aus-	Alle Teile sorgfältig reinigen.
wechslung und Schmierung	Alle Teile sorgfältig kontrollieren und falls notwendig, auswechseln. Alle Dichtungsteile sind in Verbindung mit einer Reparatur zu erneuern.
	Alle Einzelteile vor der Montage mit Hydrauliköl einschmieren, und Gummiteile mit Vaseline einfette
Nettoyage, contrôle, remplace-	Nettoyer soigneusement toutes les pièces.
ment et graissage	Contrôler minutiesement toutes les pièces et les remplacer au besoin. Lors d'une rèparation, remplacer tous les joints.
	Avant le remontage, enduire toutes les pièces d'huile hydraulique, et graisser les pièces de caoutche
to Discours	trainprise
,	

Assembly	ltem	Part to mount	Action
	2	Housing	Placer OSPM huset horisontalt i holdeværktøjet, med hullet for udgangs- akslen ind i værktøjet. Bemærk, at styrestiften i værktøjet kommer på plads i OSPM-huset.
			Place the OSPM housing horizontally in the holding tool, with the hole for the output shaft facing the tool. Note, the locating pin in the tool must engage with in the OSPM housing.
			Das OSPM-Gehäuse horizontal ins Haltewerkzeug anbringen, mit der Bohrung für die Ausgangswelle in Richtung gegen das Werkzeug. Beachte, daß der Führungsstift des Werkzeugs im OSPM-Gehäuse eingreift.
			Placer le boîtier de l'OSPM dans l'outil de maintien avec le trou de l'arbre de sortie dans l'outil. Veiller à ce que la goupille-guide de l'outil soit à sa place dans le boîtier de l'OSPM.
	5	Shaft seal	Akselpakningen presses på plads i huset med montageværktøjet. Vær opmærksom på, at det lille styr forrest på værktøjet bliver siddende i hullet for udgangsakslen, når selve værktøjet trækkes ud af huset. Bemærk, der er to forskellige værktøjer: Et for huse til ratstammemontering (SJ150L4011-01) Et for huse med integreret ratstamme (SJ150L4012-01)
		DANFOSS A150-518.10	With the assembly tool the shaft seal must into the housing. Note that the small guide piece at the front of the tool must remain in the hole for the output shaft when the tool itself is drawn out of the housing. Note, there are two different tools: One for housings for steering column mounting (SJ150L4011-01) One for housings with integrated steering column (SJ150L4012-01).
			Die Wellendichtung mit dem Montagewerkzeug ins Gehäuse pressen. Beachte, daß sich die vorne am Werkzeug befindliche kleine Führung beim Herausziehen des Werkzeugs aus dem Gehäuse in der Bohrung für die Ausgangswelle sitzen bleibt. Achtung, es gibt zwei unterschiedliche Werkzeuge: Und zwar für Gehäuse mit Lenksäulenmontage (SJ150L4011-01), und für Gehäuse mit integrierter Lenksäule (SJ150L4012-01).
		, uill	Presser le joint de l'arbre à sa place dans le boîtier avec l'outil de montage. Faire attention que le petit guide de l'avant de l'outil reste dans l'orifice de l'arbre de sortie, même quand l'outil est retiré du boîtier. Remarquer qu'il existe deux outils différents: L'un pour les boîtiers dans le montage des arbres de direction (SJ150L4011-01) L'autre pour les boîtiers avec arbre de direction intégré (SJ150L4012-01).
	2	Spool/sleeve	Før indre og ydre glider sammen. Drej gliderne, så fjederhakkene står over for hinanden.
	<u>(</u> )		Guide spool and sleeve together, turn the spools so that the key slots are opposite each other.
_0			Den inneren und äußeren Schieber zusammenschieben. Die Schieber so drehen, daß die Federkerben einander gegenüber stehen.
iso			Remettre ensemble les glisseurs interne et externe. Tourner les glisseurs pour que les encoches des ressorts soient en face l'une de l'autre.
	12	Springs	Læg de buede fjedre ind mellem de flade og skub dem på plads. (Se skitse)
×O		ANIFOSS ANFOSS	Insert the curved springs between the flat springs and push them into place (see sketch).
-0			Die gebogenen Federn zwischen den flachen Federn legen und auf ihren Platz schieben. (Siehe Skizze).
9			Placer les ressorts courbés entre les ressorts plats et pousser le tout en place (voir schéma).

	nem	Part to mount	Action
	10	Spring retaining ring	Centrer fjedrene i glidesættet og før ringen ned over ydre glider. Bemærk: Ringen skal kunne rotere uhindret af fjedrene.
			Center the springs in the spool/sleeve set and guide the ring down over the sleeve.
			Die Federn im Schiebersatz zentrieren und den Ring über den äußeren Schieber führen.
			Achtung: Der Ring muß ohne Behinderung durch die Federn rotieren können.
			dessus du glisseur externe. Attention: la bague doit pouvoir tourner sans empêchement par les ressorts
	11	Cross pin	Monter stiften i glidersættet
			Den Stift im Schiebersatz montieren.
			Monter la goupille dans le jeu de glisseurs.
	7	Thrust bearing	Monter tyk løbeskive, nålekrans og tynd løbeskive. Udgangsakslen på indre glider skal smøres med Molekote PG plastslip 75 på fladen, der har kontakt med akseltætningen.
			Fit the thick race, needle cage and thin race. Lubricate the output shaft on the inner spool with Molykote PG plastslip 7 on the surface in contact with the shaft seal.
			Die dicke Laufscheibe, den Nadelkranz und die dünne Laufscheibe mon- tieren. Die Ausgangswelle am inneren Schieber mit Molykote PG plastslip 75 auf der mit der Wellendichtung in Berührung kommenden Fläche einschmieren.
		0 0 0 0 <u>i                              </u>	Monter la rondelle centrale épaisse, le coussinet à aiguilles et la rondelle centrale mince. L'arbre de sortie sur le glisseur interne doit être graissé au Molykote PG plastslip 75 sur la surface qui est en contact avec la garniture d'étanchéité.
	2	Housing + spoole/sleeve	Huset er stadig anbragt horisontalt i holdeværktøjet. Hold fast med den ene hånd. Tag det samlede glidersæt i den anden hånd således, at de to fingre holder stiften (11) på plads. Før glidersættet ind i huset med stif- ten (11) i horisontal position. Pas på det lille styr fra montage af akselpakningen. Det bliver presset ud ar gliderakslen.
n			With the housing still horizontal in the holding tool - secure it with one hand. With the other hand take the assembled spool/sleeve set, making sure two fingers hold the cross pin (11) in position. Guide the spool set into the housing with the cross pin (11) horizontal. Be careful with the small guide piece from mounting of the shaft seal. With it is pressed out by the shaft rotary.
OISCU			Das Gehäuse ist nach wie vor horizontal im Haltewerkzeug angebracht. Es ist mit der einen Hand festzuhalten. Den gesammelten Schiebersatz so in die andere Hand nehmen, daß zwei Finger den Stift (11) festhalten. Den Schiebersatz mit dem Stift (11) in horizontaler Position in das Gehäuse einführen. Auf die kleine Führung von der Montage der Wellendichtung achten. Sie wird von der Schieberwelle bezuggedeückt.
×O			Le boîtier est toujours horizontal dans son outil de maintien. Le tenir d'une main. Prendre de l'autre main le jeu assemblé de glisseurs, avec deux doigts maintenant la goupille (11) en place. Faire entrer le jeu de glisseurs dans le boîtier, avec la goupille (11) en position horizontale. Attention au petit guide de la montage dui joint de l'arbre.: il sera pressé hors de l'arbre dlisseur.

Assembly	ltem	Part to mount	Action
			Stadig med hus og glidersæt siddende i værktøjet løftes det hele op i verti- kal position. Stiften i glidersættet skal nu pege på P-porten i huset, enten "klokken 6 eller 12".
			With housing and spool set remaining in the tool, lift the whole unit into vertical position. The pin in the spool set must now point towards port P in the housing, either at 6 o'clock or 12 o'clock.
			Das nach wie vor im Werkzeug sitzende Gehäuse mit dem Schiebersatz zusammen in vertikale Position heben. Der Stift im Schiebersatz soll jetzt auf die P-Öffnung im Gehäuse zeigen, entweder mit Zeigerstellung "6 Uhr" oder "12 Uhr".
			Le boîtier et le jeu de glisseurs étant toujours dans l'outil, relever le tout en position verticale. La goupille du jeu de glisseurs doit maintenant pointer en direction de l'orifice P du boîtier en position soit "6 heures" soit "12 heures".
	3	Ball	Læg nødstyringskuglen i P-porten.
			Die Notlenkungskugel in die P-Öffnung legen
			Placer la bille de commande d'urgence dans l'orifice P
	4	Ball stop	Læg kuglestoppet i P-porten
			Place the ball stop in port P.
			Den Kugelanschlag in die P-Öffnung legen.
			Placer l'arrêt de la bille dans l'orifice P.
	37	Ball	Læg evt. kontraventilkuglen i P-porten
			Place the check valve ball (if required) in port P.
			Evt. die Rückschlagventilkugel in die P-Öffnung legen.
			Placer éventuellement la bille clapet anti-retour dans l'orifice P.
	15	O-ring	Monter O-ring i huset
			Fit the O-ring in the housing.
			Den O-Ring im Gehäuse montieren.
			Monter le joint torique dans le boîtier.
	16	Distributor plate anden.	Læg fordelerpladen oven på huset. Drej den, så hullerne passer over hin-
			Place the distributor plate on the housing. Turn it so that the holes line up.
O <sub>O</sub>			Die Verteilerplatte oben auf das Gehäuse legen. Drehen, bis die Löcher übereinander liegen.
ris			Placer la plaque de répartition sur le boîtier. La tourner pour que les trous soient alignés.
	13	Cardan shaft	Sæt kardanakslen i indre glider og lad den fange stiften. Brug evt. holde- gaffel SJ 151G9000-1 til at holde kardanakslen på plads.
XU			Fit the cardan shaft into the inner spool and allow it to engage with the pin. If so required use fork SJ 151G9000-1to retain the cardan shaft.
-30			Die Kardanwelle in den inneren Schieber einsetzen und mit dem Stift in Eingriff bringen. Evt. Gabel SJ 151G9000-1 verwenden um die Kardan- welle an ihrem Platz zu halten.
			Mettre l'arbre à cardan dans le glisseur interne et faire enclencher la goupille. Utiliser au besoin la fourche SJ 151G9000-1 pour tenir en place l'arbre à cardan.

Assembly	Item	Part to mount	Action
	17	Gear wheel	Når tandhjulet sættes på plads, skal det vende rigtigt inden det får indgreb med kardanakslen. Stiften i glidersættet (item 11) skal flugte med tand- bunden i stjernen (se skitse)
		DANFOSS A150-519.10	When fitting the gearwheel, it must be oriented correctly so that it engages with the cardan shaft. The cross pin (11) in the spool set must line up with the bottom of the teeth in the star (see sketch).
			Damit das Zahnrad mit der Kardanwelle in Eingriff kommen kann, muß es bevor es eingebaut wird in die richtige Richtung gedreht werden. Der Stift (11) im Schiebersatz muß mit dem Zahnfuß im Stern fluchten (siehe Skizze).
			A la mise en place de la roue dentée, il faut la tourner correctement avant qu'elle s'enclenche sur l'arbre à cardan. La goupille du jeu de glisseurs (pos. 11) doit s'aligner sur le fond denté dans l'étoile (voir schéma).
	18	O-rings	Læg O-ringene i sporene på hver side af tandkransen
			Place the O-rings in the grooves on each side of the gearwheel rim.
			Die O-Ringe in die Nuten auf beiden Seiten des Zahnkranzes ein legen.
			Placer les joints toriques dans leurs rainures de chaque côté de la couronne dentée.
	17	Gear ring	Anbring tandkransen oven på fordelerpladen så alle huller står over for hinanden.
			Place the gearwheel rim over the distributor plate so that all holes are in line with each other.
			Den Zahnkranz so oben auf der Verteilerplatte anbringen, daß alle Löcher übereinander liegen.
			Placer la couronne dentée au dessus de la plaque de répartition en alignant tous les trous respectifs.
	14	Spacer	Læg afstandstykket oven på kardanakslen.
			Place the spacer over the cardan shaft.
			Das Zwischenstück auf die Kardanwelle legen.
			Placer le manchon d'espacement au dessus de l'arbre à cardan.
	19	End cover	Anbring dækslet således, at hullet mærket "P" passer over P-porten i huset (klokken 6 eller 12).
×			Place the cover so that the hole marked "P" lines up with port P in the hou- sing ("6 o'clock" or "12 o'clock").
			Den Deckel so anbringen, daß das mit "P" gekennzeichnete Loch über die P-Öffnung des Gehäuses paßt (Zeigerstellung 6 Uhr oder 12 Uhr).
			Placer le couvercle de sorte que le trou marqué "P" s'aligne sur l'orifice P du boîtier (position 6 ou 12 heures).
O'IS	20, 22 23	Special screws	Monter bolte (med O-ringe). Fjern holdegaffel. Spænd alle 5 bolte over kryds med 30 ± 3 Nm (3 daNm). NB: Ved open centre enheder skal bolten uden hul monteres i E-porten.
			Fit screws (with O-rings). Remove the retainer fork. Tighten all five screws
XV			(cross pattern) with $30 \pm 3$ Nm (3 daNm). Note: With open centre units, the screw with no oil flow connection must be fitted in port E.
G			Die Bolzen (mit O-Ringen) montieren. Haltegabel entfernen. Alle 5 Bolzen überkreuz mit 30 $\pm$ 3 Nm (3 daNm). anziehen. NB: Bei open centre-Einheiten muß der Bolzen ohne Loch in der E-Öffnung montiert werden.
			Monter les boulons (avec joints toriques). Enlever la fourche. Serrer les boulons en diagonale avec le couple de serrage $30 \pm 3$ Nm (3 daNm). N.B. Sur les unités open centre, le boulon sans trou doit se monter dans l'orifice E.

Assembly	Item	Part to mount	Action
			Hvis OSPM skal have monteret trykbegrænsningsventil, løftes den ud af værktøjet og placeres på de 4 styrestifter med akseltappen opad.
			If the OSPM must be mounted with a pressure relief valve, lift it out of the tool and place it on the four pins with the axle journals upwards
			Wenn die OSPM mit einem Druckbegrenzungsventil montiert werden muß, die Einheit aus dem Werkzeug heben und mit dem Wellenende nach oben auf die 4 Führungsstifte anbringen.
			Avant de monter la soupape de limite de pression. Soulever l'OSPM de l'outil et le mettre sur les 4 goupilles-guides de l'outil.
	30	Piston	Monter stempel
			Fit the piston.
			Kolben montieren.
			Monter le piston.
	31	Spring	Monter fjeder.
			Fit the spring.
			Feder montieren.
			Monter le ressort.
	30	Adjustment	Skru indstillingsskruen i.
			Screw in the adjusting screw.
			Stellschraube einschrauben.
			Visser en place la vis de réglage.
		(Test)	Løft OSPM ud af værktøjet og klargør for afprøvning.
			Lift OSPM out of the tool and prepaire it for testing.
			OSPM aus dem Werkzeug anheben, und und zur Prüfung vorbereiten.
			Sulever l'OSPM del'outil et le préparer pour le'ersai.
	30	<u>v</u> dy	Indstilling af trykbegrænsningsventilen foretages enten på et prøvepanel eller et anlæg med manometer aflæsning. Plastprop monteres.
	X		The pressure relief valve can be set either on a test panel or in a system with pressure-gauge read-off. Insert plastic plug.
20	5		Die Einstellung des Druckbegrenzungsventils erfolgt entweder an einem Testpanel oder in einer Anlage mit Manometeranzeige. Kunststoffstopfen montieren.
is			Le réglage de la soupape de limite de pression s'effectue soit sur un banc d'essai, soit sur une installation avec lecture de manomêtre. Remonter les bouchons plastiques.
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Betriebsmittelliste Device tag list





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Device tag list	Betriebsmittelliste

Luncti Maters Lgnition Lgnition Contro Spark J Pressu	on text aver switch	Funktionstext	TechnKenngrößen
Maters Ignition Ignition Contro Spark J Pressuu	aver switch		_
Waters Ignition Ignition Contro Spark I Spark I Pressiu	aver switch		
Ignition Ignition Contro Spark J Spark J Pressu		Intervallschalter Berieselung	
Ignition Contro Spark J Spark J Pressuu	n coil left	Zündspule links	
Contro Spark J Spark J Pressu	i coil right	Zündspule rechts	
Spark J Spark J Pressui	ler	Regler	
Spark pressui	lug	Zündkerze	
Pressul	Division	Zündkerze	
Drovim	e switch, Engine oil	Druckschalter Motoröl	
	ty switch, travel lever '0' position	Näherungsinitiator Fahrhebel '0'-Stellung	high=1
Horn		Horn	50W
Proxim	ty switch, back up alarm	Näherungsinitiator Rückfahrwarneinrichtung	high=1
Proxim	ty switch, vibration lock	Näherungsinitiator Vibrationssperre	high=1
Float s	vitch, fuel	Schwimmerschalter Kraftstoff	
headlig	ht front	Arbeitsscheinwerfer vorne	55W
headlig	ht front	Arbeitsscheinwerfer vorne	55W
headlig	ht rear	Arbeitsscheinwerfer hinten	55W
headlig	ht rear	Arbeitsscheinwerfer hinten	55W
Rotary	beacon	Rundumkennleuchte	55W lamp 3W motor
Fuse, r	nain	Hauptsicherung	25A
Fuse vi	bration, sprinkler	Sicherung Vibration, Berieselung	15A
Fuse, r	stary beacon	Sicherung Rundumkennleuchte	15A
Fuse, V	Vorking lights	Sicherung Arbeisscheinwerfer	20A
Fuse a	introller	Sicherung Regler	25A
Battery		Batterie	45Ah
Genera	tor	Generator	20A
Charge	control	Ladekontrolle	
Back-u	o alarm buzzer	Warnsummer Rückwärtsfahrt	0,3A/110dB
Indicat	or light, fuel oil	Meldeleuchte Kraftstoff	
Toggle	relay vibration	Schrittrelais Vibration	
Relay,	starting current	Relais Startstrom	start locking
Relay s	prinkler pump	Relais Berieselungspumpe	
Relay,	back up alarm	Relais Rückfahrwarneinrichtung	
Relay,	vibration	Relais Vibration	
Relay,	starting current	Relais Startstrom	
Relay "	Engine Shut off"	Relais Motorabschaltung	
Relay,	Engine oil pressure	Relais Motoröldruck	
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from 9 82 б Page Blatt 8 Higher-level function = Anlage Function == Function == Mountition + Einbauort BONAG Device tag list BW900-50 Created T.Rau Erstellt 19.01.2011 Checked D.Nallin Geprüft 13.01.2011 0

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