

# USE - SAFETY AND MAINTENANCE MANUAL

October 2014 - V EDITION

## SUBMERSIBLE TRASH PUMP WITH HYDRAULIC MOTOR



**SP 20**

**WP 25**

**SP 35**

**SP 45**

### IMPORTANT

**READ MANUAL BEFORE USE**

**KEEP THIS MANUAL FOR  
FUTURE CONSULTATIONS**



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# INTRODUCTION

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Dear customer,

congratulations for having purchased a **DOA** product. The tool you bought was manufactured with high quality materials and components to assure your maximum satisfaction and a long lasting service without problems. For your safety and obtaining the best result, we recommend to read this manual and respect the simple instructions contained, this will protect you from accidents and avoid damages to the equipment and things.

Keep it always available together with its enclosures, so that it can be consulted when necessary.



**BE CAREFUL WHEN YOU CONNECT A HYDRAULIC TOOL TO AN OPERATING MACHINE WHERE THE HYDRAULIC MAXIMUM VALUES OF PRESSURE AND FLOW ARE UNKNOWN. FOR AVOIDING ACCIDENTS AND DAMAGES TO THE EQUIPMENT, BE SURE THAT THE MAXIMUM VALUES OF PRESSURE AND FLOW ARE COMPATIBLE WITH THOSE ONES OF THE TOOL ITSELF.**

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## **SAFETY SYMBOLS**

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This manual contains safety warnings represented by symbols indicating three different levels of danger:



This symbol indicates an operation or situation extremely dangerous which can cause serious accidents or death if proper precautions are not respected.



This symbol indicates a dangerous operation or situation that can cause serious accidents or death.



This symbol warns about generic danger that can cause accidents and damages to the equipment or the properties.



This symbol indicates important information.

### **IMPORTANT:**

WHEN THE EFFECTS OF A CERTAIN ACTION ARE NOT EXACTLY KNOWN, REMIND THAT EVEN THE SIMPLEST OPERATION MAY HIDE DANGERS.

**IN CASE OF DOUBTS DO NOT RISK – DO NOT MAKE EXPERIMENTS!**

ASK YOUR **DOA** DEALER OR YOUR FOREMAN.

## DESCRIPTION OF THE PRODUCT

**WP 25 – SP20 - SP 45** are hydraulic submersible clear water and trash pumps centrifugal type - open impeller, **SP 35** is monocanal closed impeller.

These tools can pump suspended solids in the liquid with dimension up to mm 12 the **WP 25**, mm 30 the **SP 20**, mm 50 the **SP 35** and mm 70 the **SP 45**.

Thanks to the hydraulic functioning and manufacturing quality, pumps give very high performances and possibility to run dry without damages.

## TYPICAL APPLICATIONS

**WP 25 – SP 20 – SP35** general pumping works of clear and moderately muddy waters.  
**SP 45** pumping of slurries and muddy waters and thick liquids.

All pumps are ideal in the emergency pumping of great volumes of water pumping and emptying of water from excavations and manholes pumping of flammable and aggressive liquids.

## ACCESSORIES

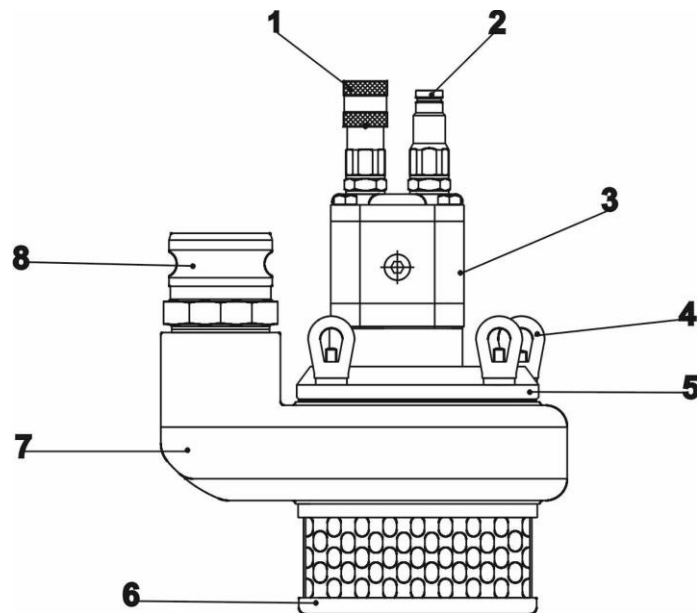
- **ALL PUMPS** oil flexible hydraulic hoses length m 7 and m10 and multiples.

## TYPICAL POWERING MACHINES

Hydraulic power packs – mini excavators – tractors – trucks – all-terrain vehicles – earth-moving machines – all the vehicles equipped with a sufficient hydraulic circuit.

# WP 25 TECHNICAL CHARACTERISTICS

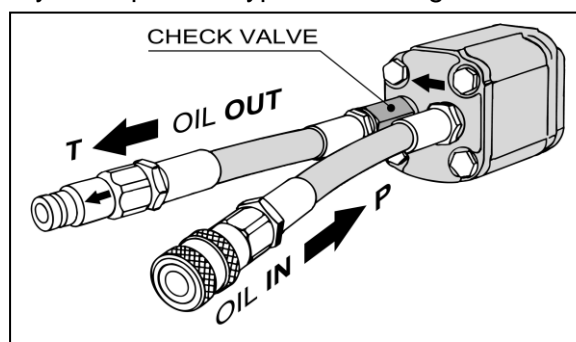
## GENERAL VIEW – MAIN COMPONENTS AND THEIR FUNCTIONS



1. **FEMALE QUICK COUPLER** – Oil enters in pump from this female coupler ( PRESSURE LINE ).
2. **MALE QUICK COUPLER** – Oil exit pump from this male coupler ( RETURN LINE ).

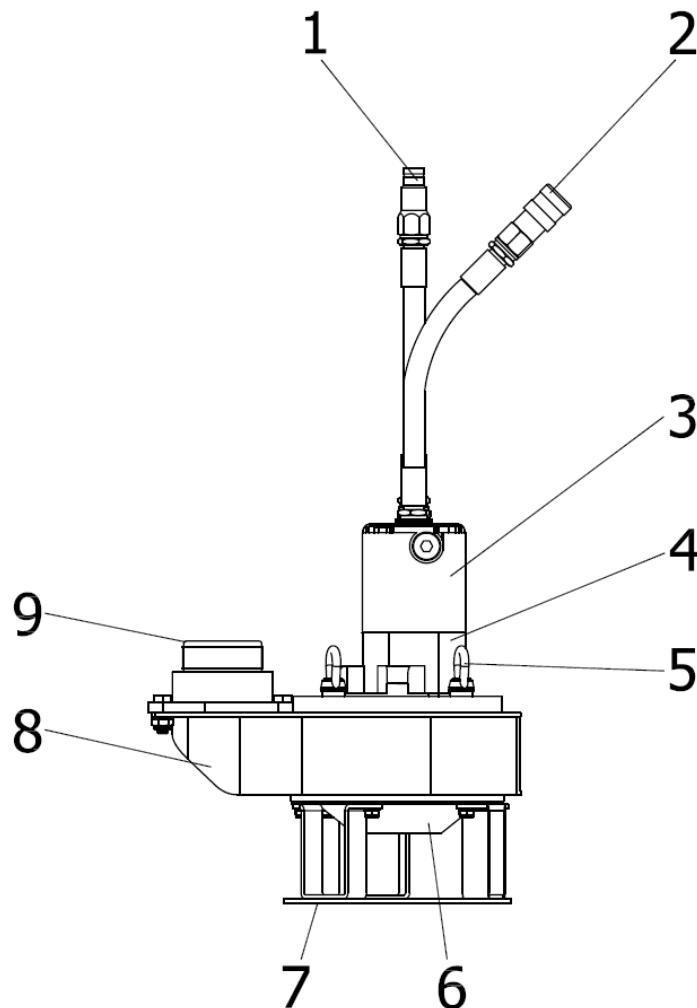
**SHORT HOSES (illustrated in the picture below)** on some pumps are installed short hoses that have the function to get installation of couplers in an elastic position, on the hose with the MALE coupler there is installed a check valve that have the function to prevent at the oil to enter in the pump from this side, this is possible when are made wrong installation of the hoses.

3. **HYDRAULIC MOTOR**
4. **RING NUT** – allow to open the pump body for cleaning and inspection.
5. **COUPLING PLATE** – between motor and pump body.
6. **GRILLE** – ( only on model WP25 the models SP20, SP35, SP45 do not have the grille ), the grille is a kind of filter that prevents the passage of objects no lager then 15 mm.
7. **PUMP BODY – VOLUTE** inside there is the pumping chamber.
8. **ADAPTOR** not installed on all units, the adaptor can be of different type depending from country to country and upon the type of discharge line or water discharge hose used.



# SP 20 - SP35 TECHNICAL CHARACTERISTICS

## GENERAL VIEW – MAIN COMPONENTS AND THEIR FUNCTIONS

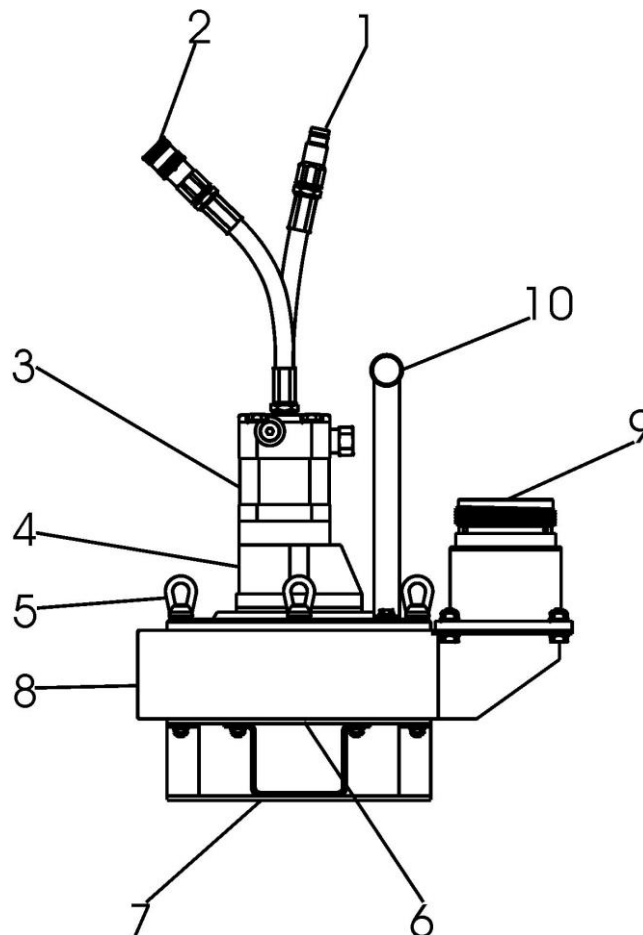


- 1. MALE QUICK COUPLER** - oil exits the pump from this coupler.
- 2. FEMALE QUICK COUPLER** - oil enters in the pump from this coupler.
- 3. HYDRAULIC MOTOR**
- 4. COUPLING PLATE** - fixes the motor to the pump body.
- 5. RING NUTS** - ( SP35 only - Not installed on SP20 ) allow to open the pump in few seconds for cleaning and inspection.
- 6. SUCTION HOLE** - liquid is sucked into the pump from this hole.
- 7. GRILLE** - fabricated in stainless steel has the function of elevating the suction hole.
- 8. PUMP BODY - VOLUTE** Stainless steel.

9. **CAMLOCK or UNI70 MALE ADAPTOR** allow the connection of the discharge hose to the pump.

## **SP 45 TECHNICAL CHARACTERISTICS**

### **GENERAL VIEW – MAIN COMPONENTS AND THEIR FUNCTIONS**



1. **MALE QUICK COUPLER** - oil exits the pump from this coupler.
2. **FEMALE QUICK COUPLER** - oil enters in the pump from this coupler.
3. **HYDRAULIC MOTOR**
4. **COUPLING PLATE** - fixes the motor to the pump body.
5. **RING NUTS** - allow to open the pump in few seconds for cleaning and inspection.
6. **SUCTION HOLE** - liquid is sucked into the pump from this hole.
7. **GRILLE** - fabricated in stainless steel has the function of elevating the suction hole.
8. **PUMP BODY - VOLUTE** fabricated in stainless with high resistance to abrasion and impacts, the internal part is called the "pumping chamber".
9. **CAMLOCK or UNI70 MALE ADAPTOR** allow the connection of the discharge hose to the pump.

10. HANDLE - allow to lift the pump either by hand or by crane.

## **WP 25 TECHNICAL CHARACTERISTICS**

### **WEIGHT AND DIMENSIONS**

TYPE	submersible centrifugal pump with open impeller	
WEIGHT	Kg.	9.5
HEIGHT	cm	30 without pig tail hoses
LENGTH	cm	30
MATERIAL	Aluminium - steel - nylon	

### **PUMPING PERFORMANCES**

OUT PUT FLOW	1600 l/min (96 Cubic mxh)
WATER HEAD (PRESSURE )	45 metres
DIMENSION OF DISCHARGE HOLE	2 1/2" BSP female
CONNECTION OF DISCHARGE HOSE	UNI 70 type
DIMENSION OF SOLIDS WHICH CAN BE SUCKED	MAX 12 mm

-The WP 25 can run dry without damages.

### **HYDRAULIC CHARACTERISTICS**

FLOW	15 - 38 l/min
IDEAL FLOW	30 l/min
PRESSURE	100 - 210 bar
TOLERABLE BACK PRESSURE	max 17 bar
EHTMA GROUP	C - D



**DO NOT EXCEED A FLOW OF 38 l/min TO THE PUMP FOR AVOIDING EXCESS OF BACK PRESSURE, OIL OVER HEATING AND POSSIBLE DAMAGES TO THE EQUIPMENT.**

### **ACCESSORIES - TYPE AND DIMENSIONS**

- THE DISCHARGE HOSE CAN HAVE DIAMETERS FROM 65 mm. TO 75 mm. (2.1/2" - 3") AND STANDARD LENGTH OF 10 m AND MULTIPLES.



# SP20 TECHNICAL CHARACTERISTICS

## WEIGHT AND DIMENSIONS

TYPE	submersible centrifugal open impeller	
WEIGHT	Kg	8
HEIGHT	cm	30 without short hoses
LENGTH	cm	22
MATERIAL	Aluminium – stainless steel	

## PUMPING PERFORMANCES

OUT PUT FLOW	800 l/min (48 Cubic mxh)
WATER HEAD (PRESSURE )	35 metres
DIMENSION OF DISCHARGE HOLE	2" BSP female
CONNECTION OF DISCHARGE HOSE	UNI 45 type
DIMENSION OF PUMPABLE SOLIDS	MAX 30 mm

- SP20 pump can run dry without damages.

## HYDRAULIC CHARACTERISTICS

FLOW	15 - 30 l/min
IDEAL FLOW	20 l/min
PRESSURE	100 - 210 bar
TOLERABLE BACK PRESSURE	max 17 bar
EHTMA GROUP	C – D



DO NOT EXCEED A FLOW OF 30 L/min TO THE PUMPS FOR AVOIDING EXCESS OF BACK PRESSURE, OIL OVER HEATING AND POSSIBLE DAMAGES TO THE EQUIPMENT.

## ACCESSORIES - TYPE AND DIMENSIONS

- DISCHARGE HOSES WITH “UNI 45” CONNECTIONS.

# SP 35 TECHNICAL CHARACTERISTICS

## WEIGHT AND DIMENSIONS

TYPE	Submersible mono canal closed impeller	
WEIGHT	Kg	17
HEIGHT	cm	37 without short hoses
LENGTH	cm	35
MATERIAL	Aluminium – stainless steel	

## PUMPING PERFORMANCES

OUT PUT FLOW	1600 l/min (96 Cubic mxh)
WATER HEAD (PRESSURE )	50 metres
DIMENSION OF DISCHARGE HOLE	3" BSP female
CONNECTION OF DISCHARGE HOSE	UNI 70 type
DIMENSION OF PUMPABLE SOLIDS	MAX 50 mm
- SP 35 pump can run dry without damages.	

## HYDRAULIC CHARACTERISTICS

FLOW	15 - 38 l/min
IDEAL FLOW	30 l/min
PRESSURE	100 - 210 bar
TOLERABLE BACK PRESSURE	max 17 bar
EHTMA GROUP	C – D



DO NOT EXCEED A FLOW OF and 38 L/min TO THE PUMPS FOR AVOIDING EXCESS OF BACK PRESSURE, OIL OVER HEATING AND POSSIBLE DAMAGES TO THE EQUIPMENT.

## ACCESSORIES - TYPE AND DIMENSIONS

- DISCHARGE HOSES WITH “UNI 70” CONNECTIONS.

# SP 45 TECHNICAL CHARACTERISTICS

## WEIGHT AND DIMENSIONS

TYPE	submersible centrifugal pump with open impeller		
WEIGHT	Kg	28	
HEIGHT	cm	50	without pig tail hoses
LENGTH	cm	40	
MATERIAL	body and impeller in stainless steel – wear plate in urethane		

## PUMPING PERFORMANCES

OUT PUT FLOW	3000 l/min (180 Cubic mxh)
WATER HEAD (PRESSURE )	16 metres
DIMENSION OF DISCHARGE HOLE	4 BSP female
CONNECTION OF DISCHARGE HOSE	UNI 100 type
DIMENSION OF SOLIDS WHICH CAN BE SUCKED	MAX 70 mm

-The SP 45 pump can run dry without damages.

## HYDRAULIC CHARACTERISTICS

FLOW	30 - 45 l/min
IDEAL FLOW	38 l/min
PRESSURE	140 - 210 bar
TOLERABLE BACK PRESSURE	max 17 bar
EHTMA GROUP	D - E



DO NOT EXCEED A FLOW OF 45 l/min TO THE PUMP FOR AVOIDING EXCESS OF BACK PRESSURE, OIL OVER HEATING AND POSSIBLE DAMAGES TO THE EQUIPMENT.

## ACCESSORIES - TYPE AND DIMENSIONS

- DISCHARGE HOSES WITH “UNI 100” CONNECTIONS.
- THE DISCHARGE HOSE CAN HAVE DIAMETERS FROM 85mm TO 100 mm. (3.1/2” - 4”) AND STANDARD LENGTH OF 10 m AND MULTIPLES.

# GENERAL SAFETY NORMS

## GENERAL SAFETY INSTRUCTIONS.



**THE FOLLOWING INSTRUCTIONS ARE GENERAL SAFETY RULES AND HAVE TO BE RESPECTED IN EVERY WORKS WITH HAND TOOLS. WE RECOMMEND TO FOLLOW THEM CAREFULLY IN ORDER TO AVOID ACCIDENTS AND DAMAGES TO THE EQUIPMENT AND THINGS.**

- Wear ALWAYS the hard-helmet, safety goggles, gloves, safety shoes, ear protections and, when it is prescribed, a dust mask.
- Wear tight-fitting clothes and avoid operating with short trousers or t-shirts, or other bare parts of the body. Pay attention to long loose hair, gather them to prevent they get in contact and trapped in moving parts.
- Before operating, PREPARE ALWAYS A WORKING PLAN that considers and foresees problems, interruptions and avoids most of all dangerous situations. This little operation strategy, guarantees safety and improves productivity.
- Pay the maximum attention when you approach the water in steep and slippery points for preventing falls and accidents. The approaching point to the water should be the best for granting easy operations and successive easy extraction of the pump from the water.
- Work only in good physical and mental conditions. Always pay the maximum attention!
- When you operate in difficult positions, do not reach out and never lean against the tool. Keep the balance on your legs.
- Be sure that the equipment is in perfect working conditions, without oil leaks.
- Keep the protection devices always in good conditions and preserve the readability of the safety stickers. Do not work with the pump without the impeller protecting grille.
- The working area must be examined and well-known. If you work along roads, make well visible your position and warn the traffic by the use of signals, flashing lights, or other prescribed road signs.
- Work only if the equipment engines are outside or in a well ventilated point. The inhalation of exhaust gas can be fatal. The water is an electricity conductor; the contact of the water with electric lines can cause serious accidents and even death.
- Pay the maximum attention when you work near energized electric lines that can be buried, walled or hidden. Be very careful also to gas and water pipes, telephone lines or other buried cables or ducts.



## **THE CONTACT OF THE WATER WITH ELECTRIC ENERGIZED LINES CAN CAUSE SERIOUS ACCIDENTS AND THE DEATH.**

- The working area must be free from objects that may fall, get spoiled, catch fire, make trip up or make the operation difficult or dangerous.
- Warn and move away imprudent bystanders or other people not authorized or involved with the job.
- If you work in narrow or closed rooms always plan an escape way out that must be kept free.
- Make sure that the operation point is the right one and that there are the proper authorizations of the owners before starting the works.
- Before working always foresee the effect and where the water pumped is going to stop and plan the opportune defences and counter measures for preventing possible damages or dangerous situations.
- Before using the equipment make sure and prevent vehicles, machines or people from passing on the equipment discharge hoses or hydraulic connections.
- Always connect tools to the operating machine or power pack before starting the engine.
- Do not inspect or disassemble the pump with the hydraulic hoses connected to tool.
- Keep in a safe dry place this manual and its enclosures, so they can be always available for future consultations.

# USE OF THE PRODUCT

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## WHAT NOT TO DO



**THE FOLLOWING RULES ARE GIVEN FOR DESCRIBING THE MORE COMMON ERRORS OR IMPROPER AND DANGEROUS USE OF THE TOOL.**

**SINCE IT IS IMPOSSIBLE TO FORESEE ANY ABUSE OR DANGEROUS SITUATIONS, THE RULES ARE NOT SUFFICIENT TO GUARANTEE THE TOTAL SAFETY.**

**IT'S RECOMMENDED TO USE ALWAYS THE MAXIMUM CAUTION IN EVERY CIRCUMSTANCE.**

**IN CASE OF DOUBT DO NOT RISK, BUT ASK YOUR FOREMAN.**

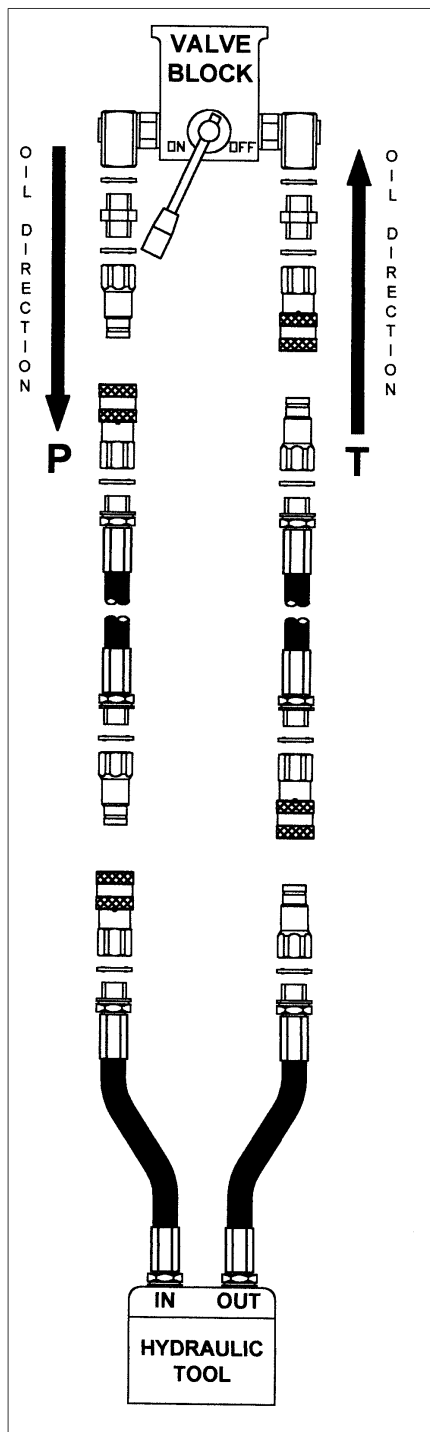
### WHAT NOT TO DO:

- DO NOT START THE PUMP IF THERE COULD BE THE POSSIBILITY OF GETTING IN CONTACT WITH ENERGIZED ELECTRIC LINES OR PRESSURIZED PIPES.
- DO NOT START OR USE THE POWER PACK AND TOOL IN CLOSED ROOMS WITHOUT VENTILATION, BE CAREFUL IF THERE ARE STRANGE ODOURS, THEY MAY BE DANGEROUS GASES OR EXHALATIONS.
- DO NOT START THE PUMP IF IT IS DAMAGED, IF THERE ARE OIL LEAKS OR SOME PARTS ARE MISSING OR WRONGLY INSTALLED. IF THE PUMP VIBRATES DURING IDLING, THE IMPELLER COULD BE DAMAGED AND UNBALANCED, STOP THE OPERATIONS IMMEDIATELY.
- DO NOT START THE PUMP CONNECTED TO POWER PACKS OR OTHER EARTH-MOVING MACHINES WHOSE MAXIMUM VALUES OF PRESSURE AND FLOW ARE NOT KNOWN. IF THE PUMP IS STARTED WITH FLOWS HIGHER THAN 34 l/min AND PRESSURE HIGHER THAN 150 bar, THIS CAN CAUSE THE BREAK OF THE EQUIPMENT AND EVEN ACCIDENTS.
- DO NOT ALLOW THE USE OF THE EQUIPMENT TO PEOPLE THAT ARE NOT TRAINED OR WHO HAVE NOT READ THIS MANUAL.
- DO NOT WORK IF YOU ARE NOT IN PERFECT PHYSICAL AND MENTAL CONDITIONS.
- DO NOT WORK ALONE WHEN IT IS POSSIBLE; MAKE SURE THAT SOMEBODY KNOWS WHERE YOU ARE AND WHAT YOU ARE DOING.
- DO NOT CARRY OUT REPAIRS, INSPECTIONS OR CLEANING OF THE PUMP WITH THE HYDRAULIC HOSES CONNECTED OR EVEN WORSE WITH THE PUMP WORKING.
- DO NOT USE AND DISCARD IMMEDIATELY FLEXIBLE WATER DISCHARGE HOSES BADLY CONNECTED TO THE METAL ENDS. IMPROVISED FASTENINGS WITH WIRES OR CLAMPS SHOULD BE AVOIDED FOR PREVENTING ACCIDENTAL REMOVAL OF THE DISCHARGE HOSE WITH CONSEQUENT DANGEROUS SITUATIONS.
- DO NOT WORK, AND IF IT IS NECESSARY PAY THE MAXIMUM ATTENTION, WHEN YOU WORK ON STEEP AND SLIPPERY BANKS, WHICH COULD CAUSE VERY DANGEROUS FALLS INTO THE WATER.
- DO NOT MAKE THE PUMP WORK HANGED TO THE HOSES. WHEN IT IS POSSIBLE MAKE THE PUMP WORK LEAVING IT ON THE WATER BOTTOM.

## BEFORE WORKING

### CONNECTION OF THE PUMP TO THE POWER PACK OR OTHER HYDRAULIC SOURCE

1. Lay down the flexible hydraulic hoses avoiding the contact of the couplers with the mud or dirt.
2. Put the tool on the ground limiting the contact with the dirt. Make sure that the tool is in perfect condition and its accessories are efficient and well installed.
3. First connect the flexible hoses to the power pack whose engine must be OFF. Connect the female coupler of the hose to the male coupler of the power pack, and then connect the other hose.



4. Now connect the flexible hose to the pump, connecting first the return hose corresponding to the hole with a **T** or **OUT** symbol punched on the tool.
5. Thus the hydraulic connection is completed.
6. Start the power pack (or other hydraulic source ) leaving it at idle for a few minutes allowing engine and oil warm up
7. Bring the flow lever of the power pack to **ON** position making circulate the oil. Leave the equipment in this condition for a few minutes without using the tool and warming engine and the hydraulic oil. The pump will start idling emitting the characteristic noise. Check that there are not hydraulic oil leaks.

**NOTE !**

IF CORRECTLY INSTALLED, THE MALE COUPLER OF THE POWER PACK IS THE ONE CORRESPONDING TO THE PRESSURE LINE, WHERE THE OIL “GETS OUT” FROM THE POWER PACK, THE CORRECT SEQUENCE OF COUPLERS INSTALLATION DEPENDS ON THE POSITIONING OF THE FIRST MALE COUPLER.



IF A FLEXIBLE HOSE FULL OF OIL REMAINS UNDER THE SUN, THE OIL EXPANSION DUE TO THE HEAT CAN CAUSE A PRESSURE INCREASE AND PREVENT THE CONNECTION OF THE QUICK COUPLERS. IN THIS CASE THE HOSES SHOULD BE DEPRESSURIZED UNSCREWING THE QUICK COUPLERS DRIPPING SOME OIL DROPS.

**NOTE !**

IF THE AMBIENT TEMPERATURE IS VERY COLD, THE HEATING OPERATION SHOULD BE PROLONGED UNTIL THE HYDRAULIC OIL TANK WILL BE WARM TOUCHING IT. DO NOT WORK IMMEDIATELY IF THE OIL IS COLD. AT LOW TEMPERATURES THE OIL CAN BE VERY VISCOUS (HARD) AND CAN CAUSE HARMFUL INCREASES IN THE BACK PRESSURE AND DIFFICULT SUCTION OF THE PUMP ( CAVITATION PHENOMENON )

8. Unroll the discharge hose and lay it on the ground. Connect the water discharge hose to the pump.
9. The tool is now ready for the starting, prepare a safe approach to the water trying to avoid all the possible dangerous situations.
10. Direct the final discharge of the discharge hose in the safest and most favourable direction, for avoiding dangerous situations.

## USE OF THE PUMP

Read and follow carefully the instructions described in the previous paragraphs:

### PUMPING OPERATIONS

The **WP 25 – SP 20 - SP 35 – SP 45** are a **submersible** pumps.

They suck and pump when are submerged in water. the water is sucked from the suction hole in the bottom of the pumps body, or from the grille in the model **WP 25**.

If the pump is layed on a very muddy bottom the excess of mud may plug the suction holes preventing the normal suction function.





**DURING PUMPING OPERATIONS IN STEEP AREAS OR WHERE THE ACCESS TO THE WATER IS DIFFICULT AND DANGEROUS, TRY TO KEEP A GOOD BALANCE AND FORESEE AN EASY EXTRACTION OF THE PUMP FROM THE WATER.**

**OPERATIONS OF WATER APPROACHING IN STEEP AND SLIPPERY POINTS COULD CAUSE FALLS INTO THE WATER AND SERIOUS ACCIDENTS.**

**DO NOT CARRY OUT CHECKS OR MAINTENANCE OR CLEANING WITH THE PUMP MOVING IMPELLER OR EVEN WORSE WITHOUT THE PROTECTION GRILLE - AN ACCIDENTAL CONTACT WITH THE MOVING IMPELLER CAN CAUSE SERIOUS ACCIDENTS.**

**DO NOT OPERATE THE PUMP CONNECTED TO POWER PACKS OR MACHINES WHICH ARE NOT KNOWN THE MAXIMUM HYDRAULIC VALUES OF PRESSURE AND FLOW.**

**IF THE PUMP IS OPERATED AT HYDRAULIC FLOWS HIGHER THAN THOSE RECOMMENDED AND PRESSURES HIGHER THAN 150 bar THIS COULD CAUSE DAMAGE TO THE EQUIPMENT AND EVEN ACCIDENTS.**

1. If it has not been carried out previously, connect the water discharge hose to the pump being sure that the assembly has been well connected and the discharge hose is well stretched without sharp bends and twisting the water should freely flow away.
2. Submerge the pump into the water and direct the free end of the discharge hose in the most appropriate directions.
3. Open the oil pressure lever of the power pack delivering oil to the pump. The water will begin to fill the discharge hose going out from the free end.



**CHECK THAT THERE ARE NOT OIL SPOTS IN THE WATER. THEY ARE EASILY VISUALIZED THROUGH THE CHARACTERISTIC IRRIDESCENT SPOTS. IN THIS CASE, TAKE THE PUMP OUT OF THE WATER, CARRY OUT A CONTROL FOR BEING SURE THAT THERE ARE NOT OIL LEAKS FROM THE PUMP, FOR PREVENTING HARMFUL OIL LEAKS FROM THE EQUIPMENT AND POSSIBLE ENVIRONMENTAL DAMAGES.**

4. An excessive presence of solid particles in the water could create a sometimes high decrease in the flow. In this case the pump should be repositioned.



**IN CERTAIN CONDITIONS THE PUMPED WATER COULD BE SLOWED DOWN SO THAT THE SOLID PARTICLES SUSPENDED IN THE LIQUID FALL CONTINUOUSLY INTO THE "PUMPING CHAMBER" CAUSING FURTHER RESTRICTIONS AND TRANSFORMING THE IMPELLER INTO A SORT OF MIXER.**

**THESE DISFAVOURABLE WORKING CONDITIONS DECREASE THE IMPELLER LIFE.**

**These are the most common causes of flow decrease:**

- The pump sinks in the solid material (mud, gravel, leaves, weeds, sediments);
- The head is too high, thus the pump cannot raise and eject the water column;

- The pressure and hydraulic flow are low and insufficient thus the pump cannot give adequate performance;
- The discharge hose makes a too sharp bend, in its length, chocking the water passage.

## PUMPING OPERATIONS AT LOW TEMPERATURES

If the ambient temperature is near or below zero centigrades, it is advisable to run the oil in the hoses at idle for a few minutes until it is lukewarm at contact.

A too viscous – hard oil could cause problems to the hydraulic circuit and the pump itself.

## CLEANING OF THE PUMPING CHAMBER

The internal part of the pump, or pumping chamber, can be easily opened for cleaning and checking. this is necessary when the tool cannot pump because of debris blocked inside.

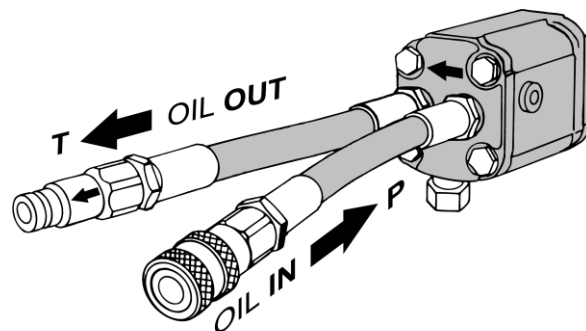
The pump can be opened and cleaned unscrewing the ring nuts.

This operation can be done also introducing a screwdriver into the ring. the cleaning should be carried out only with the engine **OFF** and with the oil hoses disconnected for preventing accidents.

After having eliminated the obstruction, assemble the coupling plate and pertaining ring nuts tightening them without exaggeration.

## END OF THE OPERATIONS

1. Put the flow lever of the power pack in **OFF** position, extract the pump from the water pulling it from the discharge hose.
2. Lay the pump on the ground avoiding and limiting contacts with the mud and dirt, if it is possible.
3. Put the flow lever of the power pack in **OFF** position, blocking the oil circulation and pressure to the pump.
4. Stop the engine of the power pack or other hydraulic machine.
5. Disconnect the pump from the oil flexible hose releasing **FIRST THE PRESSURE HOSE** corresponding to the hole with **P** punched on the tool. This operation will prevent accidental pressure trapping inside the pump.



6. Disconnect the flexible oil hose from the power pack and also the water discharge hose and discharge the residual water completely. If a viscous liquid or sewage has been pumped, it is

advisable to pump clean waters for washing inside and outside the discharge hose and the pump itself.

7. Roll up the oil flexible hose in circles of about 60 cm of diameter, connecting the quick couplers at the extremities in the “head/tail” way. This operation will protect the oil couplers against impacts or scraping and will also help in keeping the hose well rolled up.
8. Roll up the water discharge hose.
9. Store the equipment in a safe place repaired from bumps and atmospheric agents.
10. If the equipment should be transported on vehicles or trucks, take care that it is loaded and blocked in a proper way for avoiding tilting and damages.

## **MAINTENANCE AND CARE OF THE PRODUCT**

### **CLEANING OF THE PUMP**

The cleaning is very important for the good functioning of the equipment.  
A clean product will immediately allow to find oil leaks or causes of malfunctioning.  
A clean tool is also more comfortable for the operator and guarantees a firm grip.

#### **CLEANING OF THE GRILLE OF WP 25**

The grille of WP 25 should be cleaned carefully before and after every use of the equipment removing any object or debris which could limit the access of water to the impeller.  
Periodically inspect the impeller and its blades that must be in good conditions.  
A very worn impeller causes a high reduction in performance and should be replaced promptly.

#### **CLEANING WITH HYDRO CLEANER**

- The cleaning with hydro cleaner- pressure cleaner assures the best results. Put the tool on a clean surface or a wooden pallet turning the tool in order that all the surfaces are reached by the pressure jet. Do not to use too much the water nozzle near the tool to avoid the removal of safety stickers and paint, in particular if hot water is used.



- **A HOT WASHING WITH VERY HIGH PRESSURE AND WITH THE NOZZLE VERY CLOSE TO THE SURFACES, CAN CAUSE THE REMOVAL OF THE PAINT AND SAFETY ADHESIVES AND LABELS**
- After the pressure washing, let the water drip from the tool also by moving it for helping the water drain from cavities or recessed points.
- With an air gun **blow all over the tool** eliminating every trace of water and moisture. Insist with air jet in particular on cavities or recessed points
- With the tool perfectly dry, spray a protective-dewatering product (CRC or WD40) on all chromed parts and near the quick couplers.

## CLEANING WITH CLOTHS OR PAPER

- The tool can also be cleaned with a damp rag, using a brush with gasohol or an air gun for eliminating all traces of dirt and oil.
- Clean in particular the recessed points and cavities and the connection surface of the quick couplers.
- With the tool perfectly dry, spray a protective-dewatering product (CRC-or WD40) on the quick couplers.

## PERIODICAL CONTROLS AND SUBSTITUTION OF THE WEARING PARTS

- **EVERY TIME THE EQUIPMENT IS USED :**

1. Check the hydraulic oil level of the power pack or other hydraulic source.
2. Clean the pump grille ( of WP 25 ) and the pump itself carefully from any debris.
3. Carry out a general check of the equipment and control the condition of the discharge hoses with special care to the conditions of the terminal metal parts and clips.
4. Carry out a brief working test at idle with the pump for checking that there are not hydraulic oil leaks.

- **EVERY 50 HOURS OF WORK:**

1. Carry out all the controls of the previous paragraph.
2. Check that all bolts and fastenings are well tightened and there are not hydraulic oil leaks.
3. Disassemble the protection grille of the impeller and expose the impeller for checking the wear condition of the blades. Substitute the too worn impellers.
4. Check that the hydraulic oil is transparent, without foam and torbity. In this case substitute it completely emptying also the oil in the flexible hoses and in the tool.
5. Clean the equipment carefully.

## MAINTENANCE OF THE ACCESSORIES

### IMPORTANT

A correct maintenance of the accessories (hydraulic hoses – quick couplers – discharge hoses – hose metal end fittings – etc.) guarantees the safety, the best performance of the equipment and reduces the operators' fatigue.

Accessories not well preserved or in bad conditions may make the operation difficult and can also cause accidents or dangerous situations.

In order to obtain the best performance it's important to use the right accessory.

Remind that a wrong or inadequate accessory can cause accidents and make the operations difficult.

Accessories must be often inspected with care eliminating promptly those which are faulty or non maintainable, also for avoiding that other persons may incautiously use them again.

### **INSPECTION AND MAINTENANCE OF THE OIL FLEXIBLE HOSE:**

- Lay the flexible hoses on the floor and control if there are oil leaks and the hose surfaces are integral without peeled sections showing metallic braid with broken steel wires.
- The presence of little sections of wire braid can be tolerated only if the wires are not broken and still braided.
- Control the pressed bushing at the extremity of the hydraulic hoses and discard immediately hoses showing bending, squeezing, or deformations.
- Check that the quick couplers are well dry, without oil leaks and that the knurled bushing on the female quick coupler is intact and can slide freely during the connections. The male coupler should be intact, without dents and deformations. If you try to force the connection of a damaged male coupler, this will damage irremediably also the female.
- If the oil flexible hose and quick couplers show oil leaks, even if the couplers are well screwed into the hose fittings, they should be immediately substituted with new parts.
- Replace hoses that show squeezing, unnatural bending, deformations, swellings, etc..

### **CARE AND MAINTENANCE OF THE OIL FLEXIBLE HOSES:**

The flexible hose can be cleaned with a hydro cleaner or pressure washer after having laid it on a clean surface.

Clean with the water jet in particular near the area of the clips where the dirt is going to deposit.

Move the hoses and wash completely in particular the quick couplers.

Blow the hoses with an air gun in particular in the area of the quick couplers.

Roll up the flexible hoses in a roll having a diameter of about 60-70 cm and connect the quick couplers at the ends in the "head/tail" way.

This operation will protect them against impacts or scraping.

Place the hose in a safe and dry place, protected from bumps and weather.



**IF A FLEXIBLE HOSE FULL OF OIL REMAINS UNDER THE SUN, THE OIL EXPANSION DUE TO THE HEAT CAN CAUSE A PRESSURE INCREASE AND PREVENT THE CONNECTION OF THE QUICK COUPLERS. TO DECREASE PRESSURE, LOOSEN THE QUICK COUPLERS, DRIPPING SOME OIL DROPS DE-PRESSURIZING THE HOSE.**

**NOTE !**

**THE FLEXIBLE HOSE ALWAYS REMAINS FULL OF OIL THAT, DEPENDING ON THE HOSE LENGTH, CAN HAVE A RELEVANT VOLUME. IF YOU CHANGE THE HYDRAULIC OIL IN THE POWER PACK, IT IS RECOMMENDED TO REPLACE ALSO THE OIL IN THE HOSES. THIS WILL ASSURE A FULL REPLACEMENT AND AVOID THE CONTAMINATION OF THE NEW OIL.**

**MAINTENANCE OF THE WATER DISCHARGE HOSES:**

- Lay the discharge hose on a clean surface and control the integrity of the surfaces on both sides.
- Control the condition of the terminal fittings (that could be either “CAMLOCK” or “UNI” type) trying a connection between the male and female part. If there are breaks or deformations, discard the end fittings).

**NOTE !**

- **OBVIOUSLY A POSSIBLE BREAKAGE OF THE DISCHARGE HOSE IS MORE EASILY VISIBLE WHEN IT IS PRESSURIZED BY THE THE WATER PUMPED, WHICH WILL SPRAY OUT FROM THE DAMAGED AREA MAKING THE RUPTURE EVIDENT AND VISIBLE.**
- Control that the fixing clips fastening the terminals to the discharge hose have not cut the hose and the connection is tight.
- Once you have controlled the good efficiency of the discharge hoses, wash them with water removing all dirt and mud.
- **For rolling up the discharge hoses** it is advantageous to use this system:
- Make a “U” bend on the discharge hose overlapping the two folded parts while keeping the two ends equal.
- Roll up the discharge hose beginning from the end with the fold, bending in very tight turns forming a compact “donut” where the two stiff ends will protrude from the last turn.

This type of rolling allows to:

- eject completely the water
- form a compact package
- allow a quickunroll launching the discharge hose keeping the ends.

At the end of the maintenance operations, store the discharge hoses in a safe dry place protected from impacts and bad temperatures.

## DISPOSAL AND SCRAPING

### IMPORTANT

THE HYDRAULIC OIL –  
HYDRAULIC OIL FILTERS –  
ENGINE OIL –  
ENGINE OIL FILTERS –

BATTERIES OF THE POWER PACKS  
ACID OF THE BATTERIES  
FLEXIBLE HOSES FULL OF OIL  
ALL FUELS

### ARE DANGEROUS WASTES

THAT MUST BE DISPOSED ACCORDING TO THE LOCAL REGULATION OF YOUR COUNTRY OR MUNICIPALITY.



**DON'T THROW AWAY THE LIQUIDS AND MATERIALS OF THE ABOVE-MENTIONED LIST. THE INFRINGEMENT OF THE RULES REGARDING THE DISPOSAL OF DANGEROUS WASTES IMPLIES LEGAL RESPONSIBILITIES.**

Also the storing and charging/discharging management of the materials of the above-mentioned list have to be run according to the specific regulation.

For information about the handling and disposal of the dangerous wastes contact the ENVIRONMENT department of your municipality.

### NOTE !

Except for the liquids and materials of the previous list, the other components of the products manufactured by **DOA** are fabricated with recyclable materials that can be stored, disposed and scrapped without particular cautions.

**MATERIALS AND COMPONENTS USED BY DOA DO NOT CONTAIN ASBESTOS OR OTHER TOXIC ELEMENTS THAT REQUIRE SPECIAL CAUTION FOR THEIR USE.**

## REPAIR

**DISASSEMBLY – INSPECTION OF THE PARTS – REASSEMBLY:**



**DOA HYDRAULIC TOOLS ARE PROFESSIONAL PRODUCTS THAT SHOULD BE REPAIRED ONLY BY QUALIFIED PERSONNEL.**

**THE TOOL REPAIR MAY REQUIRE TECHNICAL LITERATURE AND INSTRUMENTS FOR THE CONTROL OF THE HYDRAULIC VALUES AND AN ADEQUATE HYDRAULIC SOURCE NECESSARY FOR CARRYING OUT THE TOOL FUNCTIONING TESTS.**

**IT IS THEREFORE ADVISABLE NOT TO START THE COMPLETE DISASSEMBLY OF THE PRODUCT IF YOU ARE NOT A TECHNICIAN AND IF PROFESSIONAL TOOLS AND EQUIPMENT ARE NOT AVAILABLE**

### REPARATION OF PRODUCTS UNDER WARRANTY

**IMPORTANT**

If the products are still under warranty, the repairs must be carried out only by **DOA** authorized service agents otherwise the warranty will be automatically nullified.

### GENERAL INFORMATION

Although we recommend that the repairs have to be carried out only by authorized **DOA** service agents, some minor repairs can be carried out also by other engineers, in this case follow these instructions:

#### BEFORE DISASSEMBLY

- Clean accurately the product and remove any trace of dirt.
- Keep available a clean working surface, paper, rags, tools, an air gun, a rubber hammer, a brass punch, a vice with soft protection for the jaws, a clean container for collecting the tool oil.
- Keep available an exploded view of the tool and part list.
- Consider that when the tool is completely disassembled, it's recommended to replace all exposed seals.

**NOTE !**

**OFTEN THE CAUSE OF FAILURE IS NOT DUE TO PROBLEMS OF THE HYDRAULIC TOOLS, BUT TO PROBLEMS OF THE HYDRAULIC CIRCUITS WHICH COULD NOT HAVE PRESSURE AND FLOW CORRECT VALUES. IF YOU SUPPOSE THIS, DO NOT DISASSEMBLE THE TOOL, DO NOT MAKE EXPERIMENTS AND CONTACT THE NEAREST AUTHORIZED DOA CENTRE.**



## GENERAL PRE-INSPECTION

- Control that the tool is integral and complete, and that all bolts and nuts are in their place and well tightened.
- Check that possible safety devices and the grille are efficient, without deformations and in their original state. If they have been modified or repaired adapting them, discard them and order new parts.
- If safety or warning stickers are damaged, illegible or missing, order new parts checking the part number on the tool part list.
- Control the accessories: water discharge hoses and their couplers, hydraulic flexible hoses and quick couplers are of the right type and integral, oriented in the right way and they are not the cause of the problems.
- Control the quick couplers on the tool and on the flexible hoses, make sure they are correctly installed, that they can be connected in the right way to assure the right oil direction.
- Control the flexible hoses, discarding those damaged, worn, squeezed, etc., control also that there are not exposed braids.

## DISASSEMBLY

- Remove the pig-tail hoses or the quick couplers from the tools, memorizing the original position of the parts. Remind that the female quick couplers should be installed on the pump in the hole with **P** punched (oil enters the tool), collect the dripping oil in a clean container. Check if the oil is dirty, or with impurities, this will help in finding some causes of problems.
- If a vice is used for holding the tool, always cover the jaws of the vice with soft protections, and block the tool in its more solid point, for not deforming the parts.
- If it is possible to memorize the original position of the screws and their tension.
- If it is possible to disassemble only the part involved in the problem, memorizing their original position and the orientation of the seals.

## **IMPORTANT**

**THE HYDRAULIC COMPONENTS OF DOA PRODUCTS ARE MANUFACTURED WITH FINE WORKMANSHIP AND STRICT TOLERANCES. BE CAREFUL NOT TO DEFORM AND DROP THEM. IT IS COMPULSORY TO KEEP EVERYTHING CLEAN. WHEN IT IS POSSIBLE INSTALL PARTS WITH MORE THAN ONE INSTALLABLE POSITION, IN THE ORIGINAL POSITION.**

## HYDRAULIC COMPONENTS INSPECTION:

### SHAFTS – GEARS – BEARINGS – BUSHINGS

- Control that the state of the wear is standard.
- Control that the sliding surfaces, in contact with the seals, are in good state and can guarantee a good sealing. Discard shafts or other sliding parts too worn.
- Control that bushings and bearings slide well and don't show blue marks indicating suffering and seizing. In this case substitute them immediately. The bearings are sealed self-lubricating and they do not need grease.
- Control that the gears are integral and efficient, control in particular that in the area near the key-way there are no cracks.
- Control the key conditions and their seats in the shafts and gears.
- Control that the shafts are straight, without distortions making them turn on a lathe.

### SEALS - O-RINGS

- Control the condition and area of wear, trying to find the cause (dirty oil, excess of turns, other). It is always better to replace all seals that have been disassembled, in particular the "dynamic seals", which seal moving or rotating parts. These seals are more subject to wear.

### SLIDING SURFACES

- Control that there are not signs of seizing, dents, cracks, or blue marks for overheating.

## REASSEMBLY:

- After having checked the parts and replaced the damaged ones, clean the parts and damp them with a veil of oil.
- Put the new parts in order putting them on clean paper.
- If a vice is used in the assembly, do not tighten too much and always use the vice jaws with soft protections, use only plastic hammers and brass punchers.
- Reassemble all parts in the memorized order, taking care that the seal lips are correctly oriented. The seals must be well lubricated and should be seated in their grooves without twisting or cutting. Also the seats and surfaces where the seal is going to be fit should be well lubricated.
- It's a good practice that parts such as flanges, bearings, covers, with more than one installation position are installed in the same original position.
- Tightening the screws, be careful not to put too much strength for avoiding to damage the thread, in particular, when the screws are screwed into cast, cast iron, aluminium, plastic, brass, bronze parts, etc.
- Once the tool is completely assembled, clean the excess of oil which make it slipped out of the hands, in particular in the area of the handles. This will assure a firm grip and will immediately show if there is an oil leak.
- With the tool completely assembled, wait that the tool is tested before putting new safety stickers.
- Connect the tool to an appropriate hydraulic source, capable of supplying the right hydraulic values for the tools and start the tool. Follow the steps of the paragraph **TEST OF THE TOOL IN OPERATIVE CONDITIONS**.
- Verify that the tool works properly, control the absence of leaks and only when these controls are made, the new stickers can be put on the tool.

## NOTE !

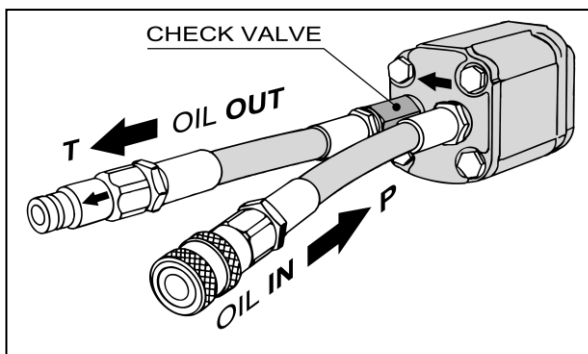
If working problems reoccur over and over, the cause or causes of malfunctioning are probably in the hydraulic circuit. For solving these problems, contact the nearest **DOA** service agent. The trouble shooting chart **PROBLEM-CAUSE-SOLUTION** at the end of this manual gives some general information about functioning problems linked with hydraulic circuits.

## WORKING TESTS OF THE TOOL

### BEFORE TESTING:

With the tool completely assembled and after having been adequately protected against accidents as specified previously in this manual, make sure that:

1. A female coupler is installed on the tool in correspondance of the oil inlet hole marked with **P**. The hydraulic motor shows also an arrow indicating the oil direction in the motor itself.



2. The hydraulic source is capable to supply the right hydraulic values of flow and pressure for the tool.
3. The assembly sequence of the quick couplers is correct and corresponds to the correct oil direction from and to the tool.
4. Unscrew the four ring nuts, keeping the motor / impeller assembly and separate it from the volute/grille assembly, this will allow to visualize the functional revolving parts of the pump.
5. The motor / impeller assembly must be kept in a safe position with a vice without deforming the parts



**IN THIS CONDITION THE MOTOR / IMPELLER ASSEMBLY IS WITH THE IMPELLER COMPLETELY EXPOSED AND WITHOUT GUARDS. TAKE THE MAXIMUM CARE IN THE FOLLOWING OPERATIONS FOR PREVENTING CONTACTS WITH THE MOVING IMPELLER AND POSSIBLE DANGEROUS SITUATIONS AND ACCIDENTS**

## TEST NOT IN USE:

1. Start the power pack heating both the engine and the hydraulic oil which should be lukewarm at touch. Connect the pump to the hoses and power pack with the engine **OFF**.
2. Start the power pack and bring the flow lever in **ON** position giving pressure to the tool, if it is possible keep the power pack engine at minimum giving a low oil flow, the pump will begin to idle. Keep the face away from the pump during this operation.
3. Check that there are not oil leaks during this first phase, do not “touch” and approach too much the moving impeller.
4. Be sure that there are not vibrations caused by a possible damaged and unbalanced impeller.
5. Accelerate the power pack or other hydraulic source in order to supply the maximum flow of 34 l/min to the pump, simulating the maximum rotation rating.
6. If there are oil leaks, repair properly or contact the closest **DOA** assistance centre. If the tool works without problem, carry out the working test “in use”.

## WORKING TEST IN USE:



**THIS TEST HAS TO BE PERFORMED WITH CAUTION AND ONLY AFTER HAVING CARRIED OUT AND PASSED THE PREVIOUS TEST AND THE PUMP HAS BEEN COMPLETELY REASSEMBLED.**

1. Install the hoses and connect the pump to the power pack, assemble the discharge hose on the pump and prepare a tank with water for recreating the standard pumping situation.
2. Immerse the pump into the water and with caution, send hydraulic pressure to the tool and start the pump for about one minute.
3. Verify that there are no oil leaks and that the tool works correctly giving adequate performance.
4. If an oil leak appears, do not check with bare hands in the area of the leak, in particular if it is in a recessed point.
5. If the oil leak cannot be easily found and repaired, contact the nearest **DOA** service agent.
6. If the tool shows an erratic or irregular functioning, do not insist and contact the nearest **DOA** service agent.
7. If the tool works correctly and performance is adequate, clean the tool leaving it perfectly dry to assure a firm grip.
8. Now replace the safety stickers on the tool with new ones if they have been damaged during previous use.

**IMPORTANT**

### IF THE PRODUCT SHOULD BE SHIPPED:

Drip the tool completely and make sure that the tool is perfectly sealed and that there are not oil or water leaks during the transport.

Use an adequate container or packaging, sufficiently strong and proportional to the tool weight, in order to protect the tool and maintain its integrity.

## PROBLEM / CAUSE / SOLUTION TRUBLE SHOOTING CHART

The following table is a guide for finding and solving the most common working problems. The causes of malfunction often depend on inadequate values of the hydraulic circuit. The control of the PRESSURE-FLOW-BACK PRESSURE values should be carried out with proper instruments and oil at a temperature of **about 40° C**.

**PROBLEM:**

**THE PUMP DOES NOT TURN**

<i>CAUSE</i>	<i>SOLUTION</i>
Oil does not reach the pump No pressure – no flow	Verify that correct hydraulic values reach the pump
Blocked quick couplers	Verify functioning and remove flow obstruction
Impeller blocked by debris	Inspect and clean the pumping chamber
Interruption of the oil circulation or one of the hoses is detached	Control the oil circulation and reconnect the hose
Faulty hydraulic motor	Disassemble and check
The impeller is blocked by debris or other objects	Clean the pumping chamber and remove debris or other objects
Inverted pressure and return hoses	Verify that the pressure pipe enters the pump from the hole with <b>T</b> See arrow indicating the oil direction on the hydraulic motor

**PROBLEM:**

**POOR PERFORMANCES OF THE PUMP**

<b>CAUSE</b>	<b>SOLUTION</b>
Excessive or insufficient oil pressure and flow conditions	Verify that correct hydraulic values reach the pump
Excessive back pressure (Excessive oil hoses length)	Reduce the back pressure value using oil hoses with a greater diameter or reducing the length
The pump is submerged in sediments (mud, leaves)	Lift the pump from sediments allowing the water enter the pump
Discharge hose with narrowing elbows or sharp bends obstruct the water passage	-Lay the discharge hose properly or use stiff discharge hoses.  -Be sure that no objects or material are blocked in the discharge hose
Too high water column	Lower the high end of the discharge hose reducing the head
Impeller or wear plate excessively worn	Replace the wear plate or impeller

**PROBLEM:**

**POOR PERFORMANCE OF THE PUMP WITH PREMATURE WEAR OF  
THE MOVING PARTS**

<b>CAUSE</b>	<b>SOLUTION</b>
Too many solid abrasive particles in suspension in the water or fluid too thick	Reduce the quantity of solids in suspension in the water
Discharge hose with too small diameter	Use the discharge hoses with internal diameter of at least 60 mm for WP 25 and SP 35 and 100 mm for SP 45
Bad filtration of hydraulic oil or bad quality oil	Reset the correct filtration values and substitute the hydraulic oil

## **WARRANTY**

All parts produced by **DOA** s.r.l. are guaranteed for a period of twelve months from the date of delivery to the final customer, against defect of: material, workmanship-assembly.

Cost of labour and transports are not covered by warranty and should be paid by the customer.

Parts and complete components not produced by **DOA** such as engines, compressors, alternators, etc., are covered by the warranty of the manufacturer.

Batteries of power packs and “worn out “ accessories, such as chisel bits, drill bits, cut off discs, flexible hoses, quick couplers, or other accessories that have not an identification number, are covered by a **LIMITED WARRANTY OF THREE MONTHS** from the date of starting.

**DOA** reserves the right to substitute only those parts recognized to be defective after an inspection of **DOA** engineers under warranty at its own expenses and in its own plant.

If the repairs during the warranty period are performed by the customers, **DOA** will reject any charge for labour expenses.

### **THE WARRANTY WILL BE AUTOMATICALLY VOIDED IF:**

- Repairs are performed using non original, adapted or modified parts.
- The maximum hydraulic values of pressure, back pressure and flow are exceeded, or the filtration and other operative conditions of the hydraulic circuits are inadequate to power **DOA** tools.
- If the tool has been modified or used in excessive heavy applications or different from its natural applications.
- If the attached WARRANTY CARD is not properly filled and mailed to **DOA**.

In any case the warranty excludes any redraft or reimbursement for damages of any kind and there are not other explicit or implicit warranties besides the above mentioned one.

**FOR ANY CONTROVERSY, THE COMPETENT COURT IS IN COMO-ITALY.**