

FOREWORD

This manual is divided into two separate parts.

The first part is for use by both the end user and the **Skilled Technician**; the second part is only for use by the **Skilled Technician**.

This manual is completed by another, specific for each series of pumps, which contains exploded views, overall dimensions, technical data, detailed specifications, etc...

By **Skilled Technician** is meant:

- the Manufacturer of the machine (e.g. motor driven pump) in which the pump is integrated (from now on, when reference is made to “machine in which the pump is integrated”, this may also refer to “system in which the pump is integrated”, such as, for example, in the case of a pumping station);
- a person, generally from the service centre, who has received appropriate training and is authorised to carry out special maintenance and repairs on the pump and on the machine which incorporates the pump. Any work on its electrical parts must be carried out by a **Skilled Technician** who is also a **Qualified Electrician**, i.e. a person with professional training who is authorised to check, install and repair electrical equipment correctly and according to current regulations in the country where the pump is installed.

PART ONE

GENERAL INFORMATION

Carefully read the pump manuals and that of the machine in which the pump is integrated: **carefully comply with the instructions contained in them.**

Special care must be given to reading the parts of the text marked by the symbol:



inasmuch as these contain important safety instructions concerning pump operation.

The Manufacturer disclaims all liability relating to damage caused by:

- failure to abide by the contents of the pump manuals and the manual of the machine in which the pump is integrated;
- the pump being used in ways other than those indicated in the “**INTENDED USE**” paragraph;
- the pump being used in ways contrary to applicable laws on safety and prevention of work accidents;
- tampering with the safety and max operating pressure limitation devices;
- incorrect assembly and installation;
- incorrect maintenance;
- changes made or jobs done on the pump without the permission of the Manufacturer;
- use of non-original spare parts or which are not suitable for the pump model;
- repairs not performed by a **Skilled Technician**.

USING AND LOOKING AFTER THE MANUALS

WARNING

- *The pump manuals complete that of the machine in which the pump is integrated: **read all the manuals carefully.***

The manuals must be deemed an integral part of the pump and must be looked after for future reference and kept in a protected place where they can easily be referred to in case of need.

The manuals contain safety precautions for the operator and those surrounding him/her and for the protection of the environment.

In case of deterioration or loss, a new copy must be requested from the Manufacturer or from a **Skilled Technician**.

In the event of the machine in which the pump is integrated being transferred to another user, please also include the relevant manuals.

The Manufacturer reserves the right to make all the amendments required to update and correct these publications without prior notice.

SYMBOLS

The symbol:  **WARNING**

marking certain parts of the text indicates a likely chance of injury to persons unless the relative prescriptions and indications are followed.

The symbol: **CAUTION**

marking certain parts of the text indicates the possibility of damaging the pump unless the relative instructions are followed.

The symbol: (**→MS**)

indicates that reference must be made to the manual of the specific series of pumps.

IDENTIFICATION OF COMPONENTS

Refer to **Figure 1** at the beginning of the manual.

- | | |
|--------------------------------------|---------------------------------|
| 1. Pump support | 9. Pump crankcase |
| 2. Valve | 10. Intake manifold |
| 3. Pump shaft | 11. Delivery manifold |
| 4. Volumetric oil compensator | 12. Safety valve |
| 5. Pressure accumulator | 13. Delivery coupling |
| 6. Pump head | 14. Oil cap |
| 7. Intake coupling | 15. Identification label |
| 8. Intake /delivery valve cap | |

PUMP IDENTIFICATION PLATE

WARNING

- *Should the identification plate deteriorate during use, contact the Manufacturer or a **Skilled Technician** to have it restored.*

The identification plate shows : the pump model, the serial number, the maximum rotation speed, the maximum pressure, the maximum flow rate.

SAFETY DEVICES

WARNING

- *The machine integrating the pump must always feature at least the safety devices mentioned below.*
- *In case of repeated tripping of the safety valve, stop using the machine in which the pump is integrated immediately and have it inspected by a **Skilled Technician**.*

Pressure unloader/regulation valve.

This is standard for certain versions and is available as an optional accessory for others. This valve, suitably set by the Manufacturer, allows regulating the operating pressure and permits the pumped fluid to flow back towards the bypass duct, thus preventing the accumulation of dangerous pressures when the delivery line is closed or when attempts are made to set pressure values above the maximum ones allowed. If a pressure limit/adjustment valve has devices to intercept/distribute the pumped liquid (e.g. taps), it is usually called a **PUMP CONTROL UNIT**. To keep things simple, in the manuals the term **CONTROL UNIT** will be used both for the pressure unloader/regulation valve and for the pump control unit.

Safety valve.

This is standard for certain versions and is available as an optional accessory for others. This valve is suitably calibrated by the Manufacturer. It releases any overpressures in case of a fault occurring in the pressure adjustment system.

Pump shaft protection.

This is standard for certain versions and is available as an optional accessory for others. It is to prevent the operator from coming into contact with the moving parts of the pump shaft

WARNING

- *The pressure unloader/regulation valve and the safety valve are calibrated either by the pump Manufacturer or by the Manufacturer of the machine in which the pump is integrated. **Never alter the calibration of the pressure unloader/regulation valve: only ever operate on this by means of the relative knob. Never alter the calibration of the safety valve.***
- *Any drainage from the safety valve must not leak into the environment.*
- *Should the protection of the pump shaft break or be damaged, the machine which incorporates the pump must not be used until it has been tested by a **Skilled Technician**.*
- *Do not place hands or feet on the pump shaft protection*

INTENDED USE

WARNING

- **The pump must not be run by itself. It is only meant to be integrated in a machine.**
- *The pump must only be integrated in machines used for the following purposes:*
 - *treating crops in agricultural and gardening applications;*
 - *pumping water-based detergents and dyes;*
 - *pumping water which is not for human consumption.*
- *The pump must not be integrated in machines for pumping:*
 - *water based solutions whose density and viscosity is greater than those of water;*
 - *solutions of chemical products if it is not known that they are compatible with the construction materials of the pump*
 - *seawater or water with high salt concentration;*
 - *fuels and lubricants of all kinds and types;*
 - *flammable liquids or liquefied gases;*
 - *edible liquids;*
 - *solvents and thinners of all kinds and types;*
 - *paints;*

- liquids with temperatures and pressures outside the window indicated for the specific pump series (→MS);
 - liquids containing granules or solid parts in suspension.
 - The pump must not be integrated in machines designed to wash: people, animals, energized electrical apparatus, delicate objects, the pump itself or the machine in which it is integrated.
 - The pump is not suitable for being integrated in machines designed to operate in environments with special conditions such as, for example, corrosive or explosive atmospheres.
 - For integration in machines designed to operate on board vehicles, ships or planes, contact the Manufacturer's Technical After-Sales Service, inasmuch as additional requirements may be necessary. **All other uses are to be deemed incorrect.**
- The Manufacturer disclaims all liability for any damage deriving from incorrect or erroneous uses.**

OPTIONAL ACCESSORIES

WARNING

- The operation of the pump may be impaired if unsuitable accessories are used and they may even make it dangerous. Only use original accessories endorsed by the Manufacturer.
- Refer to the documents provided with the optional accessories for information regarding their general use, safety warnings, installation and maintenance

The standard accessories for the pump can be integrated with the following range of accessories:

- safety valve
- protection for pump shaft
- control unit
- intake filter (deep filter)
- various shapes and sizes of intake couplings
- pressure gauge
- high pressure delivery pipe
- pipe reel
- various types of sprinkler lances
- indicator of ruptured diaphragm (for diaphragm pumps only).

Please contact your dealer for further information.

PRELIMINARY ACTIVITIES

WARNING

- **The pump cannot be operated unless the machine in which it is integrated conforms to the safety requirements laid down by European directives. Such conformity is indicated by CE markings and by the declaration of conformity of the Manufacturer of the machine in which the pump is integrated.**
- Before starting the pump, carefully read the instructions in its manuals and in the manual of the machine in which the pump is integrated. In particular, make sure you have correctly understood how the pump and the machine in which it is integrated work as regards liquid on/off operations.
- Perform the preliminary operations indicated by the Manufacturer of the machine in which the pump is integrated.
- Make sure all deliveries are off or connected to accessories that have been turned off (e.g., tap closed or sprinkler lance in closed position).
- Make sure that the moving parts of the pump are suitably protected and that they are not accessible to unauthorised persons.
- Do not exceed the maximum level of accumulator inflation pressure (when present), indicated in the following table, at any time.
- In the application in which the pump is driven by a Cardan shaft, avoid any pushing on the pump shaft due to lack of lubrication of sliding parts.

- Do not use the pump (and therefore the machine in which it is integrated) in the event of:
 - the safety devices being damaged;
 - its having suffered heavy knocks;
 - evident oil leaks;
 - evident leaks of pumped liquid.
- In such cases, have the pump and the machine in which it is integrated checked by a **Skilled Technician**.
- Have a **Skilled Technician** perform the inspections required by special maintenance.
- Wear clothing and personal protective equipment able to provide adequate protection from any high-pressure jets and chemical products used.

CAUTION

- In case of operation at very low temperatures, make sure there is no ice inside the pump and pipes.
- Perform the checks required by routine maintenance, with special reference to those relating to the oil.

Carry out the preliminary activities indicated in the manual of the machine in which the pump is integrated; unless otherwise indicated, with respect to the pump, always remember the following:

- Replace the oil cap without vent with oil cap with vent and dip-stick; this operation may already have been performed by the Manufacturer of the machine in which the pump is integrated (only for positive displacement piston pumps).
- Check the oil level when the pump is stopped and completely cooled down:
To make any top-ups, refer to the lubricant shown in the specific manual of the series (→MS).

WARNING

- For some pump models, a **Skilled Technician** will have to be called in to top up the oil; because there is no volumetric compensator, make reference to the indications in the specific manual of the series (→MS).
- Check that the inflation of the pressure accumulator, if present, is correct using a common compressed air gun with a pressure gauge, i.e. the type used to check the pressure of motor vehicle tyres. Inflation depends on the range of pressure that the pump must operate in, according to the following table:

PUMP OPERATING PRESSURE		INFLATION PRESSURE OF ACCUMULATOR	
bar	psi	bar	psi
2-5	29-73	2	29
5-10	73-145	2-5	29-73
10-20	145-290	5-7	73-102
20-50	290-725	7	102

- Refer to the operation and maintenance manual of the machine in which the pump is integrated and make sure:
 - the suction filter is clean;
 - the suction and delivery circuits are in good conditions;
 - the pump has primed correctly.

HYDRAULIC CONNECTIONS

WARNING

- **Also follow the instructions contained in the manual of the machine in which the pump is integrated.**
- Follow the water mains connection instructions applicable in the country where the machine in which the pump is integrated is installed.

- All the pipes must be securely fastened to the respective couplings.

Refer to **fig. 2** for the hydraulic intake, delivery and bypass connections: this depicts the general layout of a hypothetical machine incorporating the pump. Also refer to the following table:

1	Tank
2	Intake filter
3	Intake circuit (with canal priming)
4	Intake pipe
5	Pump
6	Delivery pipe
7	By pass circuit
8	Control unit
9	Delivery pipes to users

CAUTION

- Follow the water mains connection instructions shown in the **“INTENDED USE”** paragraph and in the specific manual of the series (→**MS**), with special reference to the priming depth and supply pressure and temperature: in case of any doubts, contact a **Skilled Technician**.
- The pump suction unit must always be equipped with a suitably-sized filter: **frequently make sure this is clean in accordance with the blockage times tied to the specific operating conditions of each application.**
- The internal diameter of the intake and bypass pipes must be equal to the external diameter of the intake and bypass couplings respectively. They must have a nominal pressure of 10 bar /145 psi
- The internal diameter of the delivery pipes must be equal to the external diameter of the delivery couplings. Their nominal pressure must not below the maximum pressure of the pump
- Never operate the pump:
 - without water supply;
 - with salt water or water containing impurities: if this occurs, have it operate for a few minutes with clean water.

STANDARD OPERATION (HIGH PRESSURE)



WARNING

- **Also follow the instructions contained in the manual of the machine in which the pump is integrated with special reference to the parts relating to the safety precautions, any use of personal protective equipment (safety goggles, ear muffs, face masks etc.) and handling.**
- Comply with the safety information in the operating and maintenance manual of any optional accessories that are used
- Before starting up the pump carefully read the instructions contained in its manuals and in the manual in which the pump is integrated. In particular, make sure you have fully understood how the pump and the machine in which it is integrated work as regards liquid on/off operations.
- The pump and the machine in which it is integrated are not intended to be used by people (including children) with reduced physical, sensorial or mental capacities, or who lack the experience and expertise, unless they are able to benefit, through the intermediation of a person responsible for their safety, from supervision or instructions concerning the use of the pump and of the machine in which it is integrated.
- Children must be supervised to make sure they do not play with the pump and with the machine in which it is integrated.
- Particular attention must be given to using the pump in environments where there are moving vehicles, which could crush or damage any delivery pipe and sprinkler lance.
- Special care must be taken when using the pump in environments where there are moving vehicles which could crush or damage any: delivery pipe, spray gun and lance.
- Before using the pump, put on individual protective gear and devices to ensure adequate protection

from wrong manoeuvres with the jet of fluid under pressure.

- **WARNING.** Do not use the pump or the machine in which it is integrated near people if these are not wearing personal protective equipment.
- **WARNING.** Do not direct high-pressure jets against yourself or other people to clean clothes or footwear.
- **WARNING.** High-pressure jets can be hazardous if incorrectly used. High-pressure jets must not be directed against people, energized electrical appliances or the pump itself or the machine in which it is integrated.
- Never run the machine in which the pump is integrated in closed premises, if this is driven by an internal combustion engine.
- **WARNING.** Explosion risk - Do not spray inflammable liquids.
- Keep clear of moving parts of the pump and of the machine in which it is integrated, even if these are adequately protected.
- Do not remove the guards of the moving parts.
- In applications in which the pump is driven by a cardan shaft, avoid any pushing on the pump shaft due to excessive steering radii, not compatible with the type of cardan used.
- Do not touch pipes containing liquids under pressure.
- Do not perform maintenance operations on the pump and on the machine in which it is integrated if this is operating.
- Read the **"INTENDED USE"** paragraph carefully.
- Do not modify in any way the installation conditions of the pump. In particular, do not modify the fastening, the hydraulic connections and the guards.
- Do not open any taps on the pump unless these are connected to an accessory that prevents the accidental escape of the pumped liquid.
- Do not deactivate or tamper with the controls and the safety devices and the pressure unloader/regulation valve.
- The connection of the machine in which the pump is integrated to the power mains must be made by a **Professional Electrician** in accordance with the regulations applicable in the country of use.
- During operation:
 - always keep an eye on the pump and the machine in which it is integrated and out of the reach of children; in particular, be very careful when using near nurseries, clinics and old-people's homes, in case of children, elderly people or disabled people without supervision;
 - do not direct high-pressure jets against materials containing asbestos or other substances harmful for the health;
 - do not cover the pump and the machine in which it is integrated and do not place them where ventilation is prevented (remember this above all when using the machine in closed environments);
 - grip any sprinkler lance used firmly because when the lever is operated, the high pressure jet causes a strong reaction;
 - when not in operation and before doing any jobs, perform the operations described in the **"STOP"** paragraph;
 - operating pressure must never exceed the maximum value set for the pump, as shown in the technical data plate;
 - use adequate personal protective equipment to safeguard against noise emissions (e.g., ear muffs).
- Read the instructions and warnings on the label of chemicals to be distributed by the pump to take the appropriate steps in order to avoid danger for the operator or for the environment.
- Store all chemicals in a safe place out of children's reach.
- Should any chemicals come into contact with your eyes, wash immediately with water. Contact a doctor without delay and remember to take the container of chemicals with you.
- If any chemicals are swallowed, do not provoke vomiting. Contact a doctor without delay and remember to take the container of chemicals with you.

Perform the steps relating to the high-pressure operation indicated in the manual relating to the machine in which the pump is integrated; unless otherwise indicated, in relation to the pump, the following should be remembered.

For the following points, please also refer to the documentation which is provided with the control unit

a) Set the delivery pressure to zero on the control unit so that it enters its "bypass" status.

b) Start up the pump so that it can prime.

c) Set the control unit to its "pressure" position.

d) Turn the pressure adjustment knob on the control unit until the required amount of pressure is reached.

 **WARNING**

- To allow the pump to prime quickly, follow the instructions at point (a) every time the pump is drained of liquid.
- **Never touch the pressure unloader/regulation valve so as not to alter its setting: only adjust this valve by means of the special knob.**
- Do not operate the pump if it is too noisy and/or there are any oil or pumped fluid leaks: in this case have it inspected by a **Skilled Technician**.

CAUTION

- During the first hours of operation, it is best to check the oil level and, if necessary, top up the level, following the instructions in the **“PRELIMINARY ACTIVITIES”** paragraph.
- Do not operate the pump if it is too noisy and/or oil is dripping from it: in this case have it checked by a **Skilled Technician**.

STOPPING OPERATION

By closing the delivery line, the pump switches to bypass operation and remains in this condition until the delivery line is opened again.

STOPPING, CLEANING AND DECOMMISSIONING

 **WARNING**

- **Follow the instructions regarding stopping, cleaning and decommissioning contained in the manual of the machine in which the pump is integrated.**

STOPPING

 **WARNING**

- Always make sure that, once stop operations have been performed, no part of the pump and of the machine in which it is integrated is moving and no pipes contain liquid under pressure. Always remember in particular to disconnect the power supply, for example:
 - to disconnect the plug from the socket (electric motors);
 - to disconnect the sparking plug contact (petrol engines);
 - to remove the ignition key (diesel engines).

Perform the stop operations contained in the manual of the machine in which the pump is integrated; unless otherwise indicated, in relation to the pump, remember the following.

- a) Reset the delivery pressure as described at a) of the **“STANDARD OPERATION (HIGH PRESSURE)”** paragraph.
- b) Stop the pump and the machine in which it is integrated.
- c) Wait for the pump and the machine in which it is integrated to cool down.

 **WARNING**

- Once the pump and the machine in which it is integrated have cooled down, be careful:
 - not to leave them unattended in the presence of children, elderly people or disabled persons without supervision;
 - to arrange them in a stable position without any risk of falling;
 - not to put them in contact or in the immediate vicinity of inflammable materials.

CLEANING AND DECOMMISSIONING

WARNING

- **WARNING.** All cleaning jobs must only be performed after carrying out the operations described in the “STOP” paragraph, meaning **without any moving parts, no pipe full of liquid under pressure and only after complete cooling. In particular, always remember to disconnect the power supply.**
- Any cleaning jobs must be performed in conditions of total stability.
- To clean, do not use thinners or solvents.
- Any anti-freeze liquid used to protect the pump from freezing must be suitably disposed of and not discarded in the environment.

CAUTION

- Refer to the use and maintenance manual for the machine that incorporates the pump. After use, complete a cleaning cycle, making the pump take up clean water. Never store the pump with pumped liquid inside it.
- **The pump is not frost proof.**
In order to prevent the formation of ice inside the pump in cold areas, we recommend making the pump take up a motor vehicle grade anti-freeze before starting the “storage” procedures (diluted as instructed for the minimum temperature that the pump will be exposed to) and then drain it completely, making it operate for a few minutes without taking up any liquid.
In case of ice, do not operate the pump.
Failure to abide by these instructions can cause serious damage to the pump.
- During storage, protect the pump from dirt and dust.

MAINTENANCE

WARNING

- **Follow the maintenance instructions contained in the manual of the machine in which the pump is integrated.**
- All maintenance jobs must only be performed after carrying out the operations described in the “STOP” paragraph, meaning **without any moving parts, no pipe full of liquid under pressure and only after complete cooling.**
In particular, always remember to disconnect the power supply.
- Any maintenance jobs must be performed in conditions of total stability.
- **WARNING.** To ensure the safety of the pump, only use original spare parts supplied by the Manufacturer or approved by it.

ROUTINE MAINTENANCE

Perform the routine maintenance jobs shown in the manual of the machine in which the pump is integrated; unless otherwise indicated, in relation to the pump, remember the following.

MAINTENANCE SCHEDULE	JOB
After every use	<ul style="list-style-type: none">• Check oil level and conditions according to instructions in “PRELIMINARY ACTIVITIES” paragraph.• Check and if necessary clean the suction filter.
Every 50 hours	<ul style="list-style-type: none">• Check the accumulator inflation pressure (when present).• Check the integrity of the suction and delivery circuit.• Check the fastening of the pump to the motor to which it is coupled and/or to the structure of the machine in which it is integrated. In the event of such fastening being precarious, do not use the machine and contact a Skilled Technician ⁽¹⁾.

⁽¹⁾ Checks must be made more frequently if the pump operates where there are strong vibrations (crawler tractors, combustion engines, etc.).

DIAPHRAGM RUPTURE

The rupture of one or more diaphragms can result in the mechanical parts of the pump being damaged by the liquids being pumped.

The following are symptoms of possible diaphragm rupture:

- oil takes on a whitish appearance (symptom of water in the oil)
- excessive consumption of oil
- sudden lack of oil in the volumetric compensator

CAUTION

- To avoid the negative consequences of this malfunction, stop operation of the pump immediately and contact a **Skilled Technician** without delay (within 24 hours) who will take the necessary action. If it is not possible to contact a **Skilled Technician** within the above time in case of diaphragm rupture, we recommend you drain the pump crankcase of the mixed oil and pumped liquid and then fill it with oil or diesel to prevent the formation of rust.
- The following are frequently the causes of diaphragm rupture:
 - bottlenecks in the intake circuit (inadequate pipe section, dirty filter, very dense liquid being pumped, etc.)
 - the use of very aggressive chemicals

SPECIAL MAINTENANCE



WARNING

- *Special maintenance jobs must only be performed by a **Skilled Technician**.*
- *The tightening torques to be used are indicated in the specific manual of the series (→MS).*
- *Dispose of waste oil correctly; do not throw it away in the environment.*

Perform the special maintenance jobs shown in the manual of the machine in which the pump is integrated; unless otherwise indicated, in relation to the pump, remember the following.

MAINTENANCE SCHEDULE	JOB
First 50 hours (piston pumps), first 300 hours (diaphragm pumps).	<ul style="list-style-type: none">• It is best to change the oil.
Every 300 hours.	<ul style="list-style-type: none">• Check the tightness of the pump screws ⁽¹⁾.• Check oil level.• Check the pressure unloader/regulation valve and the safety valve.• Check the intake and delivery valves ⁽²⁾.• Check and if necessary replace any gaskets ⁽³⁾ (piston pumps only).
At the end of every season or once a year	<ul style="list-style-type: none">• Check the tightness of the pump screws ⁽¹⁾.• Oil change.• Check and if necessary replace any gaskets ⁽³⁾ (piston pumps only).• Check diaphragms and replace if necessary ⁽⁴⁾.

⁽¹⁾ Checks should be made more frequently if the pump operates where there are strong vibrations.

⁽²⁾ Check more frequently if liquids are used with suspended abrasive particles.

⁽³⁾ If very aggressive chemical products are used it is best to replace the gaskets irrespective of their condition.

⁽⁴⁾ we recommend replacing diaphragms regardless of their condition if particularly aggressive chemicals are used.

CAUTION

- The data shown on the chart are approximate. More frequent jobs may be necessary in case of particularly heavy-duty use.

DISMANTLING AND DISPOSAL

Only qualified persons must be allowed to dismantle the pump and this operation must be performed in compliance with the laws applicable in the country where the machine in which it is integrated has been installed.

TROUBLESHOOTING

WARNING

- **Also follow the instructions contained in the manual of the machine in which the pump is integrated.**
- *Before doing any jobs, perform the operations described in the “STOP” paragraph. In the event of not being able to restore the correct operation of the pump with the aid of the information contained on the following table, contact a **Skilled Technician**.*

PROBLEMS	CAUSES	SOLUTIONS
The pump does not prime.	Suction of air.	Check the integrity of the suction circuit.
	Adjustment valve positioned under pressure	Set pressure to zero and put pump in bypass
	Suction circuit with choke points.	Check the suction circuit (especially make sure the suction filter is clean).
The pump fails to reach max pressure.	Pressure unloader/regulation valve knob not tightened enough.	Turn the knob clockwise until required pressure is reached.
	Speed of pump rotation is inadequate	Restore correct rotation speed
	Not enough water supply.	Make sure the suction flow rate is in compliance with the pump maximum rate shown in the technical data plate.
	Suction circuit with choke points.	Check the suction circuit (especially make sure the suction filter is clean).
	Unsuitable conditions of use of the accessory (e.g., nozzle worn, etc.)	Restore the correct use of the accessory.
Irregular pressure and flow rate (pulsating).	Air suction.	Check the integrity of the suction circuit.
	Suction filter dirty.	Clean the filter.
	Not enough water supply.	Make sure the suction flow rate is in compliance with the pump maximum rate shown in the technical data plate.
	The pump has not completed priming.	Comply with the indications of the “ STANDARD OPERATION (HIGH PRESSURE) ” paragraph.
	Accessory clogged (e.g. clogged nozzle).	Restore the correct use of the accessory.
Excessive vibration in delivery circuit	Pressure accumulator not correctly inflated	Restore correct inflation

(continues on the next page)

PROBLEMS	CAUSES	SOLUTIONS
Too much noise (associated with a drop in oil level only in the case of diaphragm pumps)..	Suction circuit with choke points.	Check the suction circuit (especially make sure the suction filter is clean).
	Water supply temperature too high.	Keep to the instructions indicated in the “ INTENDED USE ” paragraph and in the specific manual of the series (-> MS).
Excessive consumption of oil and/or oil is whitish colour (presence of water in oil) (for diaphragm pumps only).	Rupture of one or more diaphragms	Refer to instructions in section “ DIAPHRAGM RUPTURE ”.

PART TWO

(only for use by **Skilled Technicians**)

WARNING

- *This part of the manual is only for use by **Skilled Technicians** and is not meant to be used by the end user of the pump.*

REMOVING THE APPLIANCE FROM ITS PACKING MATERIALS

WARNING

- *Protective gloves and glasses must be worn when removing the appliance from the packing materials to prevent injury to the hands and eyes.*
- *The packing materials (plastic bags, staples etc.) must not be left in reach of children, as they are potentially dangerous.*
- *The packing materials must be disposed of according to current regulations in the country where the pump is installed.
In particular, plastic bags and packaging must never be abandoned, as they are harmful to the environment.*
- *After removing the appliance from the packing materials, check that no parts are missing and check that the identification label is present and is legible.
In case of doubt, do not use the pump under any circumstance and contact the dealer.*

STANDARD ACCESSORIES

WARNING

- *The instruction manuals, the assistance centre booklet and the warranty certificate must always accompany the pump and be made available to the end user.*

Make sure the following always accompany the pump:

- instruction manual - general section;
- instruction manual - specific section for the series;
- declaration of integration;
- warranty certificate;
- assistance centre booklet.

In case of any problems, contact the Dealer or an authorized after-sales centre.

INSTALLATION

WARNING

- The **Skilled Technician** must follow the installation instructions in this manual; in particular the specifications of the motor unit (e.g., electric or combustion motor) must be in conformity with the performance and construction features of the pump (power, rotation speed, flanging, etc.) indicated in the Manufacturer's technical documentation.
- The machine in which the pump is integrated must be made so as to ensure conformity with the safety requirements established by European directives. This fact is guaranteed by **CE** marking and by the Declaration of Conformity of the Manufacturer of the machine in which the pump is integrated.
- The pump must be installed and made to operate horizontally.
- The pump must be stably fastened.
- The pump, being of the positive-displacement type, must always be equipped with a pressure unloader/regulation valve and with a safety valve.

APPLICATIONS

WARNING

- Adequately protect the moving parts with suitable protections. **Special focus must be placed on pulley applications and the PTO of the tractor.**
- The pump must operate at a rotation speed within the window indicated in the specific manual of the series (→MS).
- The pump must be firmly fastened by means of the feet on a stable base or, when indicated, connected to the motor unit according to the provisions of the specific manual of the series (→MS).
- In the case of through shaft, do not exceed the max available power ratings indicated in the specific manual of the series (→MS).

The numerous available applications are shown in the specific manual of the series (→MS).

CAUTION

- Always contact the Dealer or Manufacturer to determine the correct application.
- Pump applications must be performed in a good mechanical workmanlike manner. The Manufacturer's Technical Assistance Service is at the installer's disposal to provide all necessary details.
- The pump must be installed in line with the mechanical drive parts (multipliers, reduction units, etc.).

HYDRAULIC CONNECTIONS

Follow the connection instructions already indicated in the "HYDRAULIC CONNECTIONS" paragraph of part one.

In particular as regards sizing the intake circuit refer to the indications of the specific manual of the series (→MS).