

High Pressure Cleaner

DROP REVOLUTION



Instructions for installation and use



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Congratulations!

By purchasing a MAC high pressure cleaner, you have purchased a high technology machine that will allow you to realize, for a long time, washing operations with care, versatility and safety.

The customer and buyer must verify that the operators have read and know the content of the manual and that, therefore, attentively and meticulously follow all the indications.

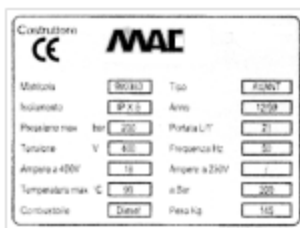
The manufacturer doesn't respond of the damages caused to things, people or animals or those suffered by the high pressure cleaner itself, if the conditions here clarified are not respected.

This manual is an integral part of the machine and must therefore be preserved with care for all the life of the high pressure cleaner, up to its demolition.

The manufacturer reserves himself the right to the change, also without warning, of his/her own products, without varying, in the case in which the changes are marginal, the documents and the relative technical documentation.

1. Field of employment

- 1.1. The high pressure cleaner is exclusively destined to the washing, by a jet of high pressure hot water, of objects and surfaces available to sustain its mechanical and thermal action, and, eventually, the chemical action of the additive liquids, detergents and disinfectants, etc...; it allows therefore the cleaning, the detersion, the disinfection, the sandblasting, the descaling, etc... using accessories, of objects and of surfaces.
- 1.2. The destination of employment of the high pressure cleaner must meticulously be respected, and every other employment must be considered improper.
- 1.3. The nameplate of identification (with the technical characteristics of the machine) is positioned on the cart and it is always present. Please make sure, when you purchase the high pressure cleaner, that the machine has this nameplate of identification. Otherwise, advise immediately the supplier. Machines without nameplate of identification have to be considered anonymous and potentially dangerous; they mustn't be used, otherwise every responsibility of the manufacturer will decay.



2. The characteristics of the personnel employed to use the high pressure cleaner

- 2.1. All those people that deal with the operation of the machine must dispose of a specific education or of an experience matured on high pressure cleaners.
- 2.2. To prevent damages to things, people or animals, we recommend to the clients to inform all the operators about the possible consequential risks caused by the installation and the use of the high pressure cleaner.
- 2.3. The operator of the machine has to use always the described means of personal protection, according to the law of the country of destination and what is given to him/her by his/her employer (safety shoes, work overalls, protective glasses, etc...).
- 2.4. The personnel employed to the installation, to the use or to the maintenance of the high pressure cleaner must be adult, experienced, mature and aware of his/her own suitable

- 2.5. assignments and must be able to correctly interpret what described in this manual, guaranteeing correctness, safety, as well as scrupulousness in the controls.
- 2.6. Possible consequential responsibilities from the employed, and authorized personnel, to the installation or to the use of the machine are delegated to the customer buyer.
- 2.7. Those people that deal with the maintenance must dispose of knowledge and specific (maintenance technician) competences that allow him to correctly interpret instructions and sketches.

3. Accident prevention

- 3.1. The instructions furnished in this manual don't replace in any way the norms related to the safety, to the installation and the use, to the technical data or the norms in force in the nation of installation or use or the norms dictated of the common sense.
- 3.2. Technicians or maintenance technicians are obliged to notify any possible defects or deteriorations that are able, in any way, to compromise the original safety of the plant.
- 3.3. The serial high pressure cleaner is not equipped for working in environments characterized by particular conditions of inflammability or explosiveness; flameproof equipment is supplied only and exclusively on specific request. It is forbidden to install the high pressure cleaner in environments where inflammable materials are present or with particles it suspended in the air: acids, inks, varnishes, resins, solvents, plastic subjects, etc.; follow the norms imposed by the fire department.
- 3.4. During the filling of the fuel tank, the high pressure cleaner must be disconnected from the electric net. At the same time it is absolutely forbidden to smoke or approaching the machine with free flames during the filling of the fuel tank.
- 3.5. The hot water high pressure cleaners are projected for an economic combustion, clean and respectful towards the environment and deprived of the residual exhaust gases. Despite this, inhaling high quantity or percentages of gases, such CO, is harmful and lethal particularly.
- 3.6. If the high pressure cleaner is installed or used in places and closed (like garages or establishments) environments, it is necessary to predispose a device of evacuation of the gases together with a recycling of the air supply and for the restoration of the air in the place or in the closed environment.
- 3.7. Never obstruct the terminal of the chimney; with objects, lance or gun, in proximity of the outlet of the smokes. It's also considered highly dangerous, both for the smokes and also for the elevated temperatures reached. To avoid possible burns, inform technicians and operators about it.
- 3.8. The high pressure cleaner and its plant as the place and the environment, are forcedly exposed to the water and the damp that injure the natural conditions of isolation of the plant. Don't use therefore unsafe electric cables, thorns or plugs, and sockets; to check the integrity and the isolation of the electric cable, together with the equipment of the operators. Don't absolutely touch the thorn or the plugs with wet hands or feet. To avoid accidental switching on, turn the interrupter on OFF before inserting or disconnecting the power supply. Don't pull the high pressure cleaner using the electrical or to extract its thorn from the socket.
- 3.9. Use with extreme care the chemical detergents not to deteriorate the environment (degradability 90%), parts or components of the machine, according to the updating of the legislative decree. Besides, always check the degradability and the aggressiveness of the used detergents. Never use acids, inks, solvents, liquid oily, varnishes, resins, etc...
- 3.10. The "cold" starting of the high pressure cleaner can cause some serious damages to the pump and the circuits; the standstill prolonged at temperatures under 0°C could cause breakups and damages to the pump and the pipes; therefore the emptying of the machine is advisable.
- 3.11. Always protect the high pressure cleaner from the atmospheric agents, from the cold and from the frost.
- 3.12. Never direct the jet of water towards people (not even to clean their clothes or their shoes) or animals, nor the machine itself or any objects under electrical tension.
- 3.13. Lance and gun, although equipped with proper hilts, they have a modest counterblow to the departure of the jet; to maintain them with strength with both the hands. Do never touch the jet of water during the operation of the idropulitrice.
- 3.14. If some defects, damages or deteriorations on the machine are found, disconnect it immediately, and call an assistance authorized center assistance authorized or to the supplier.
- 3.15. Don't leave never, without overseeing, the high pressure cleaner working in presence of children.

- 3.16. ATTENTION: if used in the correct way and it is in a good state, the high pressure cleaner sends forth a sonorous level of pressure (noisiness) less than 90 Dbas, for which necessary particular protections are not made for the operators.



4. Characteristics of the high pressure cleaners

The high pressure cleaners DROP are divided in the following models:

Model	Max.pressure (bar-psi)	Max. flow (l/min-gal/min)	Installed Power (KW)	Voltage 50Hz (V)	Weight (Kg-lb)	Water temp. (°C-°F)
120/11	120-1740	11-3	2.8	230	100-220	30-100/85-212
130/10	130-1885	10-2.6	2.8	230	100-220	30-100/85-212
160/15	160-2321	15-4	4.5	400	120-264	30-100/85-212
200/15	200-2900	15-4	5.8	400	120-264	30-100/85-212

5. Instruments of the high pressure cleaner

Q1: Main Switch

K1: Thermostat with switch

MA: Pressure gauge

SD: Detergent tank cap

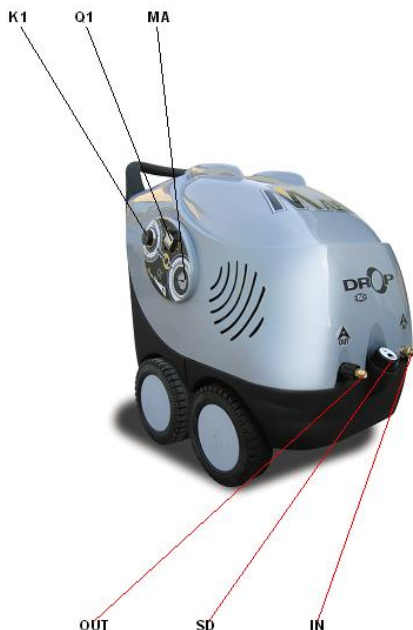
IN: Connection to the water supply (inlet)

OUT: Connection to the lance (outlet)

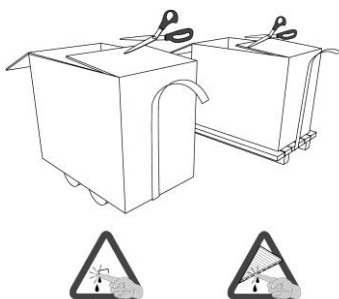
6. Transport and unpacking

6.1. Submit lifting and transport to specialized personnel. To protect the machine, especially during the transport on road, from bumps, damps or from vibrations, etc...; the high pressure cleaners are climbed on wheels and therefore they must firmly be anchored before the beginning of the transport. To underline the dangerousness in the moving of the suspended loads, operators must be warned about risks to collisions.

6.2. To unpack the high pressure cleaner, verify the one is not damaged and has got all the parts and components. In the case in which the machine is damaged, please call the supplier and do not use the machine. We remember



that the elements used in the high pressure packing could hurt the operator if not handled with care. These packings must be digested therefore and not left to the course of children or of irresponsible persons. The same is worth for the objects used in the removal of the unpacking pack (knives, scissors.). For tied up demands to unpacking and to the transport, some components are supplied not installed; proceed therefore to the installation according to the instructions of the manual.



7. Installation

- 7.1. Control carefully that the environment for the installation of the high pressure cleaner considering all the foreseen and unforeseen possibilities. The machine is equipped with insane wheels, therefore it is unadvisable to position, without precautions, on tilted surfaces. Do never tilt the high pressure cleaner to more than 20° when the tanks are full.

8. Connection to the electricity supply

- 8.1. The high pressure cleaner can be connected to alternating single phase (230V) or three phase (400 V) with frequency 50hz. For the three phase models, the high pressure cleaner is normally supplied connected to 400 V, although can be in demand connected to other connections (for instance 230v).
- 8.2. For the maximum absorption of the electricity, compare the underlying chart.
- 8.3. Verify that the electric net, to which the machine is connected with the electric cable, has the appropriate characteristics.
- 8.4. The high pressure cleaner is endowed with a magnetothermic switch that interrupts the power supply in the case the absorption of the supply overcomes the value of the setting; for the location of the switch, take a look to the electric plan attached to the machine.
- 8.5. The client buyer is kept to subsequently protect the line of the power supply by installing a lifesaver with a load not exceeding 30A.
- 8.6. The cable is supplied without plug for the connection to the net: this must be installed by the buyer, which will verify that:
 - 8.1.1. The plug is proper for the data of the voltage and the tension above described;
 - 8.1.2. The plug is conforming to the norms in force in the nation of installation and use and that in any event it is earthed.
 - 8.1.3. The connection cable and plug connection is waterproof.
 - 8.1.4. If a cable with extension is used, this must have a minimum section of 2,5 mmqs if the cable is long up to 20 mt, or of 4,0 mmqs if the cable has a superior length than 20 mt. The flying thorns and plugs are forbidden: to use some cablereels.
 - 8.1.5. If the cable of the connection is damaged, this must be immediately replaced with a proper cable: such operation must be performed by specific and authorized personnel.

KW	Motor absorption A	Thermic 230v A	Thermic 400v A
KW 2,2	13	14	0
KW 3	8	14	9
KW 4	10	16	11
KW 5,5	13	22	14
KW 7,5	15,6	28	20

9. Connection to the water supply

- 9.1. The pressure of the water supply must be at least 2 bar. If the pressure is insufficient, the pump will inhale air and will be subject to overheating and vibrations with serious damages to the pump and the car.
- 9.2. The water supply must provide a flow of water of at least of the 10% of the course of the high pressure cleaner (compare the chart with technical characteristics).
- 9.3. First of all, connect the water supply tap to the machine input pipefitting IN, using a hose with proper diameter, whether to connect the lance to the link of exit OUT.
- 9.4. For a long duration of the pump, and to avoid the use of water containing sand or other particles that jeopardize the efficiency of the valves and of the pistons or of the gaskets. To such purpose it is advisable to apply a filter to the pipe of suction to great surface and low loss of load, handling periodic substitution.
- 9.5. When the machine is equipped with a special tank, it is convenient to install a filter upstream of the tank: the pipe of water feeding must have a diameter not smaller than the link of the connection to the machine and must be prepared in such way to avoid that possible airlocks are formed.
- 9.6. The water supply can have a maximum temperature of 60°C and a maximum pressure equal to 8 bar. The gaskets and other parts and components of the pump could be irremediably damaged when the machine is made to work without of water, even if for short periods. Verify that the tap of the water supply is completely open before the high pressure cleaner is switched on.

OPERATION

10. Switching on

- 10.1. To bring the interrupter in position 1 and to maintain the thermostat to the least (rotated counterclockwise in sense) one.
- 10.2. To act on the trigger of the gun (hilt) on the lance, maintaining her/it with strength to compensate its counterblow and making to work the car for 2 or 3 minutes: this allows to bait the pump and to eliminate possible residues that could clog the nozzle; The trigger of the gun has a sure that prevents the accidental activation of the throw. To insert the sure one when the lance is not used. In this condition the car works to cold water.
- 10.3. In the case in which a detergent is used, to insert him/it in the reservoir on purpose predisposed to the purpose and to open the faucet.
- 10.4. For the water operation warm, to rotate the thermostat to regulate its temperature.
- 10.5. To press the interrupter.

11. Switching off

- 11.1. By releasing the trigger of the gun, the jet of water interrupts and the machine stops, remaining however turned on and available to the use: to stop therefore the safety catch on the trigger.
- 11.2. To switch definitely off the machine, turn the switch on 0; if the machine has worked with hot water it is opportune, before switching off the switch, to lower the temperature, that is to rotate on 0 (in sense counterclockwise) the thermostat and letting work the high pressure cleaner with cold water for about 2 minutes, to cool the coil.
- 11.3. For prolonged stand-by, before turning off the machine, it's necessary to cool the coil as previously clarified: close therefore the tap of the water supply, operating on the trigger, so that to unload completely the water from the circuit. This procedure is advisable especially in places with temperatures go under zero.
- 11.4. As soon as the water flow stops, switch the machine off by acting on the switch.
- 11.5. ATTENTION: the operation of the pump in absence of water could irreparably damage the seals of the pump.

12. Maintenance

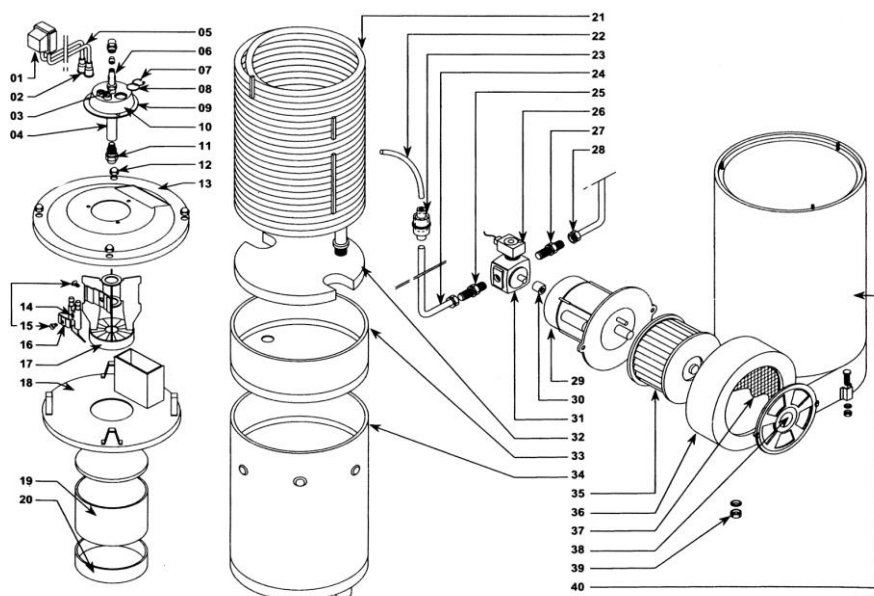
- 12.1. It is absolutely forbidden to effect controls or operations of maintenance with the machine operating or under tension: always remove the electricity supply!!! Don't even effect repairs of fortune or precarious, and never use non-original spare parts.
- 12.2. The operations of extraordinary maintenance and the control of the combustion must regularly be realized by specialized personnel.

13. Pump

- 13.1. The pump is equipped with three pistons in ceramics with automatic recovery of possible leakages.
- 13.2. If a persistent dripping is noticed under the body of the pump, replace the piston waterproofing seals. Nevertheless, in the first hours of exercise, a small loss points out only and exclusively an arrangement of the seals and not a breakdown.
- 13.3. If there are some losses of oil between the body of the pump and the head of the pump, it is necessary to remove the oil, to get off the head and to handle the substitution of the seals of the head. For this operation it is necessary to contact a specialized and authorized assistance center.
- 13.4. Restarting the pump after the maintenance to verify that this is supplied of oil. The oil must be replaced after the first 50 hours of operation and subsequently every 200 hours of operation; the ability of the reservoir of the oil is equal to 0,55 liters. Use only and exclusively oil with brand Esso Plus Motor Oil 20W30 or Shell Oil X100 20W40.

Boiler exploded view

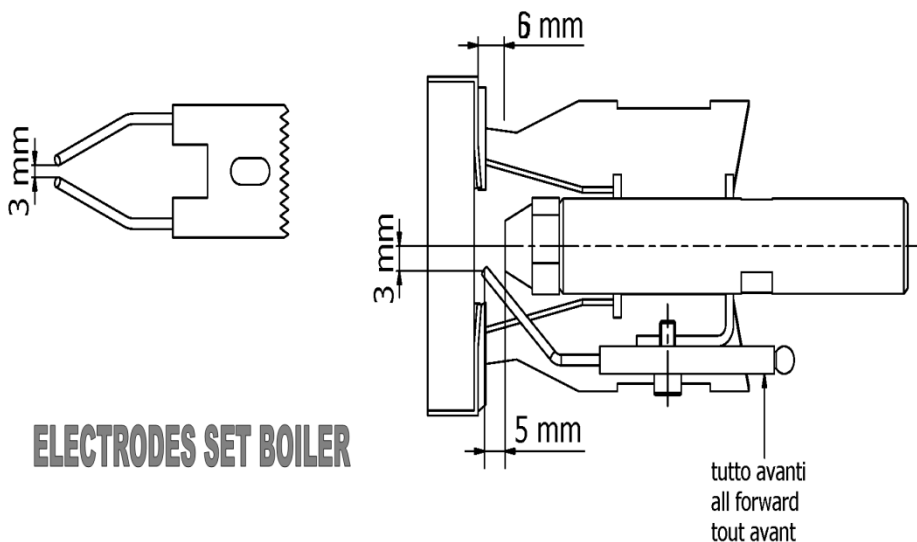
- 1) Transformer
- 2) Plug
- 3) Fitting
- 4) Nozzle support
- 5) Cable
- 6) Fitting
- 7) Seger
- 8) Glass
- 9) Seal
- 10) Shell
- 11) Fuel nozzle
- 12) Nut
- 13) Cover
- 14) Electrode
- 15) Screw
- 16) Plate
- 17) Deflector
- 18) Funnel air
- 19) Band
- 20) Ring
- 21) Coil
- 22) Hose
- 23) Filter
- 24) Hose
- 25) Nipple
- 26) Solenoid valve
- 27) Nipple
- 28) Copper pipe
- 29) Motor burner
- 30) Coupling
- 31) Fuel pump
- 32) Refractory
- 33) Band
- 34) Internal coil
- 35) Fan
- 36) Air conveyor
- 37) Net
- 38) Air regulator
- 39) Nut
- 40) External coil



- 14.1. To improve the power of the boiler, is absolutely necessary to clean the coil. Effect this operation in the following way:
 - 14.1.1. Get off the group boiler burner from the machine and to separate the boiler from the burner.
 - 14.1.2. Remove the cover of the boiler.
 - 14.1.3. Remove the band of the boiler freeing the serpentine one.
 - 14.1.4. Use a rigid brush to eliminate the soot from the serpentine and an aspirator for the dust.
 - 14.1.5. Reassemble the band, the cover and the burner again installing the group boiler burner on the machine.

15. Electrodes

- 15.1. Periodically check the position of the electrodes so that to guarantee the best combustion and to avoid the formation of the soot.



16. Fuel filter

- 16.1. To avoid the seizure or the breakup of the pump, because of the impurities in the fuel, the circuit of the fuel is equipped with a filter, that must periodically be gotten off, and cleaned with a jet of compressed air. The substitution of the filter is advisable when an effective cleaning becomes impossible.

17. Water filter

- 17.1. Monthly check the filter of the water, both that predisposed on the machine and the possible one installed by the consumer on the line of supply.

18. Demolition

- 18.1. To allow the recycling of the raw materials, it is to separate well: pack (if supplied), the exhausted oils and the lubricants, the electric motors, metallic pieces, parts and components in plastics.
- 18.2. It is compulsory to respect the norms in force related to the production, detention, harvest and disposal of the refusals, according to what established by the legislative decree 22/97. The exhausted oils must be delivered to the National Consortium Obligatory, while possible packings must be digested according to what established by the title II of the legislative decree 22/97.
- 18.3. ATTENTION: Maer Idropulitrici society does not assume any responsibility for damages to things,

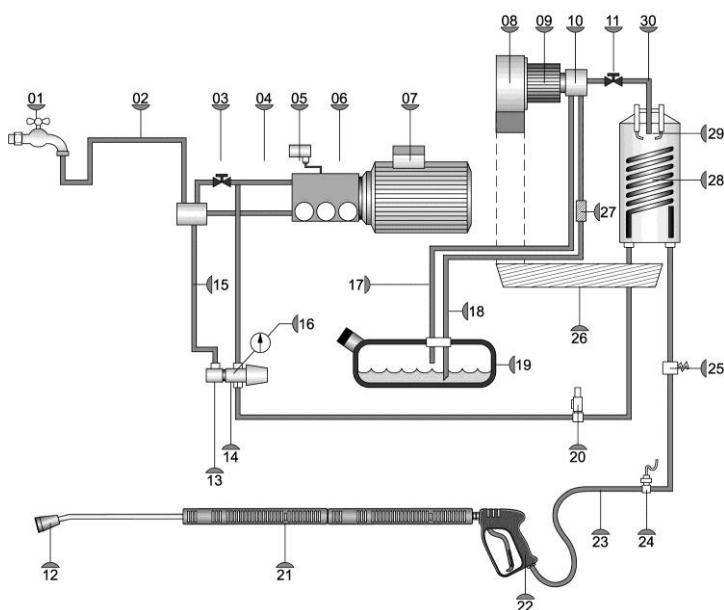
personal or animals, consequential and consequent to the re-use of the single parts or the single components of the machine for function or situation of the assemblage different and different from those original for which the high pressure cleaner has been conceived. Finally, when demolished, it is to destroy well the nameplate of identification together to every other document related to the same car.

19. Problems during the operation

Problem	Cause	Solution
The inlet hoses vibrate	<ol style="list-style-type: none"> 1. There's a foreign piece in a valve. 2. There's air suction. 	<ol style="list-style-type: none"> 1. Disassemble the valve and remove the foreign piece. 2. Identify the source of the air suction and eliminate it.
The burner doesn't switch on	<ol style="list-style-type: none"> 1. The thermostat is not engaged or too low regulated. 2. The fuel is missing. 3. The electrodes are dirty or badly positioned. 4. The electrode supply cables are earthed or burned. 5. The fuel filter is blocked. 	<ol style="list-style-type: none"> 1. Insert or adjust the thermostat. 2. Put fuel in the tank. 3. Clean the electrodes or regulate them. 4. Replace the electrode supply cables. 5. Clean the fuel filter.
The burner gives excessive smokes.	<ol style="list-style-type: none"> 1. The air suction is not sufficiently open. 2. The fuel has got an excessive pressure. 3. The boiler is too dirty. 	<ol style="list-style-type: none"> 1. Regulate the air flow by using the airlock. 2. Turn the fuel oil pressure regulation screw in clockwise direction. 3. Clean the coil of the boiler.
The water does not reach the lance although the pump is working.	<ol style="list-style-type: none"> 1. Missing water in the net. 2. There's air inside the water circuit. 3. The lance nozzle is blocked. 4. The pump intake valve is blocked. 5. The detergent intake tap is open with the empty detergent tank. 6. The detergent feeder hose is faulty. 	<ol style="list-style-type: none"> 1. Verify the connection between the water supply and filter by letting water come in. 2. Bleed the circuit. 3. Remove the nozzle and clean it. 4. Unscrew the valve and unblock it. 5. Close the tap and fill the detergent tank. 6. Replace the detergent feeder hose.
There's a weak pressure at lance although the pump is under high pressure.	<ol style="list-style-type: none"> 1. The coil of the boiler is blocked. 2. The lance nozzle is blocked. 3. The pressure valve is dirty. 4. There's lime scale encrusted inside the pressure adjustment valve. 	<ol style="list-style-type: none"> 1. Clean the coil, by washing its inside with a descaling fluid. 2. Remove and clean the nozzle. 3. Remove the valve and clean it. 4. Remove the valve, clean it and descale it carefully.
The motor doesn't switch on.	<ol style="list-style-type: none"> 1. The fuses have burnt. 2. The switch is disconnected. 	<ol style="list-style-type: none"> 1. Change the fuses. 2. Rearm the switch.

20. Hydraulic plan

- 1) Water tank with ballcock
- 2) Water inlet hose
- 3) Flow rate adjustment tap
- 4) Delivery hose
- 5) Burner pressure switch
- 6) Pump
- 7) Engine
- 8) Chemical product tap
- 9) Chemical product inlet hose
- 10) Tank
- 11) Filter
- 12) Nozzle
- 13) Micro switch
- 14) By pass valve
- 15) By pass hose
- 16) Gauge
- 17) Fuel return hose
- 18) Fuel inlet hose
- 19) Fuel tank
- 20) Safety valve
- 21) Sleeve
- 22) Handgrip
- 23) 10 mt H.P. hose
- 24) Thermostatic probe holder well
- 25) Flow meter
- 26) Boiler bottom
- 27) Fuel filter
- 28) Coil
- 29) Fuel nozzle
- 30) Fuel delivery hose
- 31) Pipe fitting
- 32) Fuel pump
- 33) Engine fan
- 34) Metering screw





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