EN

Instructions
for use

# Manuale
# istruzioni per l'uso.

baltur
TECNOLOGIE PER IL CLIMA

# GI MIST 1000 DSPNM-D

- TWO STAGES PROGRESSIVE / MODULATING NATURAL GAS / HEAVY OIL MIXED BURNERS



CE

ISTRUZIONI ORIGINALI (IT)

0006080766

- Before using the burner for the first time please carefully read the chapter “WARNINGS NOTES FOR THE USER : HOW TO USE THE BURNER SAFELY” in this instruction manual, which is an integral and essential part of the product. The works on the burner and on the esystem have to be carried out only by competent people.
- Read carefully the instructions before starting the burner and service it.
- The system electric feeding must be disconnected before starting working on it.
- If the works are not carried out correctly it is possible to cause dangerous accidents.

# WARNING NOTES FOR THE USER HOW TO USE THE BURNER SAFELY

## FOREWORD

These warning notes are aimed at ensuring the safe use of the components of heating systems for civil use and the production of hot water. They indicate how to act to avoid the essential safety of the components being compromised by incorrect or erroneous installation and by improper or unreasonable use. The warning notes provided in this guide also seek to make the consumer more aware of safety problems in general, using necessarily technical but easily understood language. The manufacturer is not liable contractually or extra contractually for any damage caused by errors in installation and in use, or where there has been any failure to follow the manufacturer's instructions.

## GENERAL WARNING NOTES

- The instruction booklet is an integral and essential part of the product and must be given to the user. Carefully read the warnings in the booklet as they contain important information regarding safe installation, use and maintenance. Keep the booklet to hand for consultation when needed.
- Equipment must be installed in accordance with current regulations, with the manufacturer's instructions and by qualified technicians. By the term 'qualified technicians' is meant persons that are competent in the field of heating components for civil use and for the production of hot water and, in particular, assistance centres authorised by the manufacturer. Incorrect installation may cause damage or injury to persons, animals or things. The manufacturer will not in such cases be liable.
- After removing all the packaging make sure the contents are complete and intact. If in doubt do not use the equipment and return it to the supplier. The packaging materials (wooden crates, nails, staples, plastic bags, expanded polystyrene, etc.) must not be left within reach of children as they may be dangerous to them. They should also be collected and disposed on in suitably prepared places so that they do no pollute the environment.
- Before carrying out any cleaning or maintenance, switch off the equipment at the mains supply, using the system's switch or shut-off systems.
- If there is any fault or if the equipment is not working properly, de-activate the equipment and do not attempt to repair it or tamper with it directly. In such case get in touch with only qualified technicians. Any product repairs must only be carried out by BALTUR authorised assistance centres using only original spare parts. Failure to act as above may jeopardise the safety of the equipment. To ensure the efficiency and correct working of the equipment, it is essential to have periodic maintenance carried out by qualified technicians following the manufacturer's instructions.
- If the equipment is sold or transferred to another owner or if the owner moves and leaves the equipment, make sure that the booklet always goes with the equipment so it can be consulted by the new owner and/or installer.
- For all equipment with optionals or kits (including electrical), only original accessories must be used.

## BURNERS

- This equipment must be used only for its expressly stated use: applied to boilers, hot air boilers, ovens or other similar equipment and not exposed to atmospheric agents. Any other use must be regarded as improper use and hence dangerous.
- The burner must be installed in a suitable room that has ventilation in accordance with current regulations and in any case sufficient to ensure correct combustion
- Do not obstruct or reduce the size of the burner' air intake grills or the ventilation openings for the room where a burner or a boiler is installed or dangerous mixtures of toxic and explosive gases may form.
- Before connecting the burner check that the details on the plate correspond to those of the utility supplies (electricity, gas, light oil or other fuel).
- Do not touch hot parts of the burner. These, normally in the areas near to the flame and any fuel pre-heating system, become hot when the equipment is working and stay hot for some time after the burner has stopped.
- If it is decided not to use the burner any more, the following actions must be performed by qualified technicians:

  a) Switch off the electrical supply by disconnecting the power cable from the master switch.

  b) Cut off the fuel supply using the shut-off valve and remove the control wheels from their position.

  c) Render harmless any potentially dangerous parts.

### Special warning notes

- Check that the person who carried out the installation of the burner fixed it securely to the heat generator so that the flame is generated inside the combustion chamber of the generator itself.
- Before starting up the burner, and at least once a year, have qualified technicians perform the following operations:

  a) Set the burner fuel capacity to the power required by the heat generator.

  b) Adjust the combustion air flow to obtain combustion yield of at least the minimum set by current regulations.

  c) Carry out a check on combustion to ensure the production of noxious or polluting unburnt gases does not exceed limits permitted by current regulations.

  d) Check the adjustment and safety devices are working properly.

  e) Check the efficiency of the combustion products exhaust duct.

  f) Check at the end of the adjustments that all the adjustment devices mechanical securing systems are properly tightened.

  g) Make sure that the use and maintenance manual for the burner is in the boiler room.
- If the burner repeatedly stops in lock-out, do not keep trying to manually reset but call a qualified technicians to sort out the problem.
- The running and maintenance of the equipment must only be carried out by qualified technicians, in compliance with current regulations.

## WARNING NOTES FOR THE USER HOW TO USE THE BURNER SAFELY

### ELECTRICAL SUPPLY

- The equipment is electrically safe only when it is correctly connected to an efficient ground connection carried out in accordance with current safety regulations. It is necessary to check this essential safety requirement. If in doubt, call for a careful electrical check by a qualified technicians, since the manufacturer will not be liable for any damage caused by a poor ground connection.
- Have qualified technicians check that the wiring is suitable for the maximum power absorption of the equipment, as indicated in the technical plate, making sure in particular that the diameter of cables is sufficient for the equipment's power absorption.
- Adapters, multiple plugs and extension cables may not be used for the equipment's power supply.
- An ominpolar switch in accordance with current safety regulations is required for the mains supply connection.
- The electrical supply to the burner must have neutral to ground connection. If the ionisation current has control with neutral not to ground it is essential to make a connection between terminal 2 (neutral) and the ground for the RC circuit.
- The use of any components that use electricity means that certain fundamental rules have to followed, including the following:

  - do not touch the equipment with parts of the body that are wet or damp or with damp feet

  - do not pull on electrical cables

  - do not leave the equipment exposed to atmospheric agents (such as rain or sun etc.) unless there is express provision for this.

  - do not allow the equipment to be used by children or inexpert persons.
- The power supply cable for the equipment not must be replaced by the user. If the cable gets damaged, switch off the equipment, and call only on qualified technicians for its replacement.
- If you decide not to use the equipment for a while it is advisable to switch off the electrical power supply to all components in the system that use electricity (pumps, burner, etc.).

### GAS, LIGHT OIL, OR OTHER FUEL SUPPLIES

General warning notes

- Installation of the burner must be carried out by qualified technicians and in compliance with current law and regulations, since incorrect installation may cause damage to person, animals or things, for which damage the manufacturer shall not can be held responsible.
- Before installation it is advisable to carry out careful internal cleaning of all tubing for the fuel feed system to remove any residues that could jeopardise the proper working of the burner.
- For first start up of the equipment have qualified technicians carry out the following checks:
- If you decide not to use the burner for a while, close the tap or taps that supply the fuel.

Special warning notes when using gas

- Have qualified technicians check the following:

  a) that the feed line and the train comply with current law and regulations.

  b) that all the gas connections are properly sealed.
- Do not use the gas pipes to ground electrical equipment.
- Do not leave the equipment on when it is not in use and always close the gas tap.
- If the user of is away for some time, close the main gas feed tap to the burner.
- If you smell gas:

  a) do not use any electrical switches, the telephone or any other object that could produce a spark;

  b) immediately open doors and windows to create a current of air that will purify the room;

  c) close the gas taps;

  d) ask for the help of qualified technicians.
- Do not block ventilation openings in the room where there is gas equipment or dangerous situations may arise with the build up of toxic and explosive mixtures.

### FLUES FOR HIGH EFFICIENCY BOILERS AND SIMILAR

It should be pointed out that high efficiency boilers and similar discharge combustion products (fumes) at relatively low temperatures into the flue. In the above situation, traditional flues (in terms of their diameter and heat insulation) may be suitable because the significant cooling of the combustion products in these permits temperatures to fall even below the condensation point. In a flue that works with condensation there is soot at the point the exhaust reaches the atmosphere when burning light oil or heavy oil or the presence of condensate water along the flue itself when gas is being burnt (methane, LPG, etc.). Flues connected to high efficiency boilers and similar must therefore be of a size (section and heat insulation) for the specific use to avoid such problems as those described above.

## TECHNICAL SPECIFICATIONS

| | MOD. | | | GI mist 1000 DSPNM<br>GI mist 1000 DSPNM-D |
|---|---|---|---|---|
| NATURAL GAS | THERMIC CAPACITY | MAX | kW | 10 500 |
| | | MIN | kW | 2 500 |
| | FLOW RATE | MAX | kW | 1 056 |
| | | MIN | kW | 251 |
| | MIN. PRESSURE<br>(In order to obtain the maximum flow rate) | MAX | mbar | 500 |
| | NATURAL GAS TRANSFORMER | | | 8kV - 20mA |
| HEAVY OIL | THERMIC CAPACITY | MAX | kW | 10 500 |
| | | MIN | kW | 2 500 |
| | FLOW RATE | MAX | kg/h | 940 |
| | | MIN | kg/h | 224 |
| | MAXIMUM FUEL VISCOSITY | | | 50° E - 50° C |
| | HEAVY OIL TRANSFORMER | | | 8kV - 30mA |
| | VOLTAGE | | Volt | 3N ~ 400V - 50 Hz |
| | FAN MOTOR | | kW | 22 x 2800 r.p.m |
| | PUMP MOTOR | | kW | 4 x 1400 r.p.m. |
| | ABSORBED ELECTRICAL POWER | | kW | 26,6 |
| | STANDARD ACCESSORIES | | | |
| | BURNER FIXING FLANGE | | | n° 1 |
| | INSULATING GASKET | | | n° 2 |
| | FILTER | | | n° 1 - Rp 2” |
| | FLEXIBLE PIPE | | | n° 2 -1”1/2 X 1500 |
| | STUD BOLTS | | | n° 8 M16 x 72 |
| | EXAGONAL NUTS | | | n° 8 M16 |
| | FLAT WASHERS | | | n° 8 M16 |

*) The electrical preheaters are not mounted on the burner

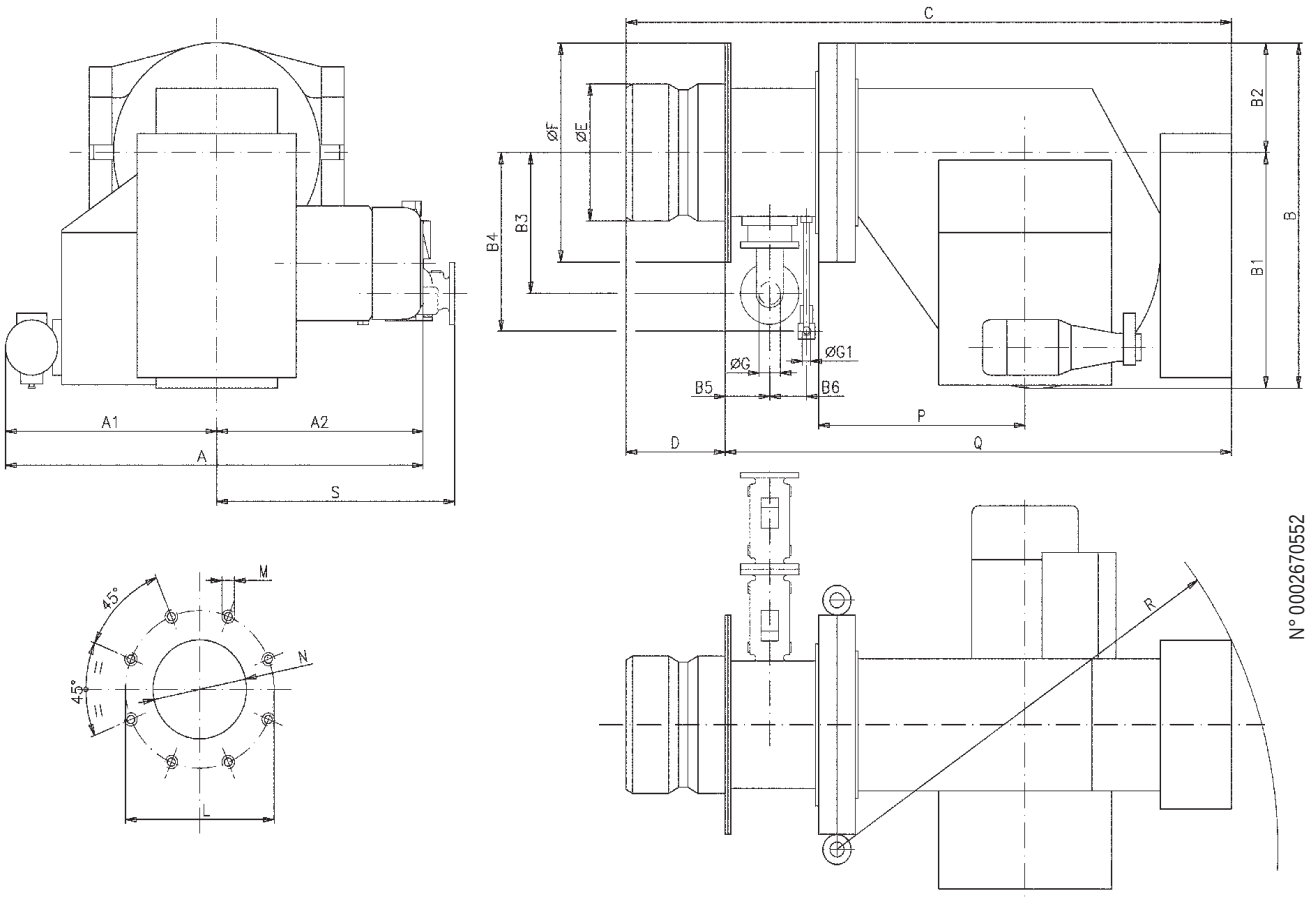
Methane gas: Hi = 35.80 MJ/m$^3$ = 8550 kcal/h, at the reference conditions 0° C, 1013 mbar

Fuel oil: Hi = 40.19 MJ/kg = 9600 kcal/kg

## TECHNICAL AND FUNCTIONAL CHARACTERISTICS

- Alternate methane gas /fuel oil burner.
- Two-stage progressive output operation.
- Ability to operate with output modulation by means of automatic RWF40 regulator mounted on the control panel (to be ordered separately with the modulation kit).
- Ability to operate with any type of combustion chamber.
- Air-gas mixing at combustion head and high pressure mechanical atomisation of fuel using nozzle.
- Ability to obtain optimal combustion values by regulating combustion air and combustion head.
- Maintenance facilitated by the fact that the mixing unit and the atomisation unit can be removed without having to remove the burner from the boiler.
- Minimum and maximum air flow regulation for first and second stage by means of electric servomotor with pause closure of shutter to prevent any heat dispersion to flue.
- On demand it is possible to integrate the burner with a supplementary fuel oil preheater operating by vapour which allows, at a rate of flow, to heat the fuel with vapour from the boiler, hence obtaining electrical energy savings.
- Valves tightness control device compliant with European standard EN676.
- Prepared for automatic fuel switching.
- Equipped with 1 insulating gasket to be fixed to the boiler, 2 flexible pipes, 1 self-cleaning filter with resistor; nozzle not included and to be ordered seperately according to capability required.
- Optional: vapour preheater

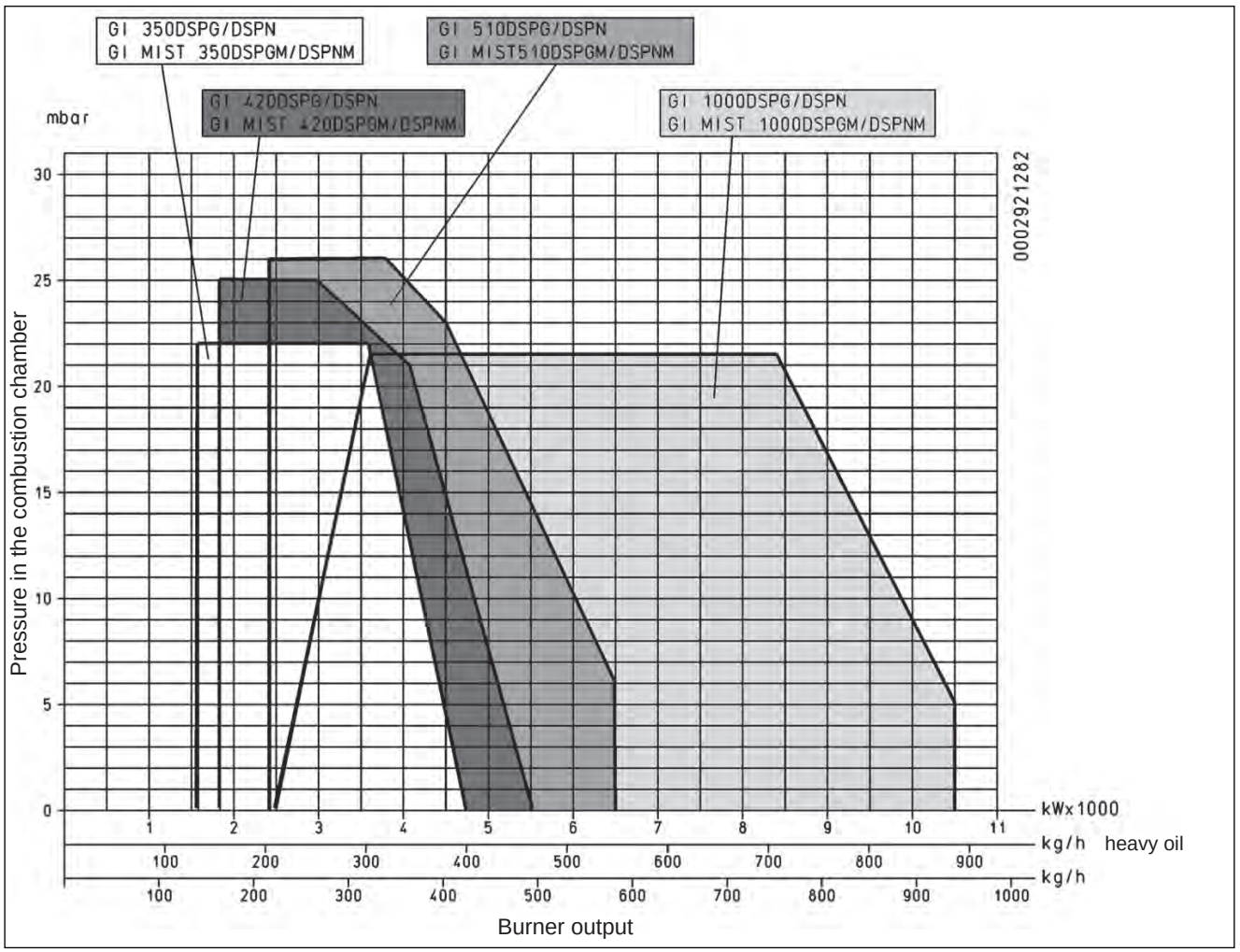
## OVERALL DIMENSIONS




| Mod. | A | A1 | A2 | B | B1 | B2 | B3 | B4 | B5 | B6 | C | D | E Ø |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GI mist 1000 DSPNM-D** | 1465 | 800 | 665 | 1257 | 855 | 402 | 450 | 575 | 175 | 163 | 2350 | 440 | 480 |

| Mod. | F Ø | G | G1 | L Ø | M | N Ø | P | Q | R | S |
|---|---|---|---|---|---|---|---|---|---|---|
| **GI mist 1000 DSPNM-D** | 685 | DN80 | Rp1/2 | 630 | M16 | 495 | 740 | 1910 | 1575 | 795 |

## OPERATING RANGE




## DESCRIPTION OF SERIES GI 1000 INDUSTRIAL BURNERS

The GI 1000 burner is a packaged version made up of separately supplied units; these components must be connected at the burner installation site in full observance of the instructions given by BALTUR.

A - Combustion head with fan

B - Power board

C - Pumping unit for liquid fuels. If heavy oil is to be used this unit also includes an electric heavy oil preheater and, on request, an auxiliary steam preheater.

D - Gas valve unit for burners employing gaseous fuels (usually methane).

These burners are available in a range of versions to suit the employed fuel type. More specifically, these are:

- GAS (Methane) version DSPGN
- LIGHT OIL version DSPG
- HEAVY OIL (rated viscosity max. 50°E at 50°C) version DSPN-D
- GAS (Methane) / HEAVY OIL (rated viscosity max. 5°E at 50°C) version GI Mist ... DSPNM
- GAS (Methane) / LIGHT OIL version GI-Mist ... DSPGM

Note that the GI-Mist 1000 DSPGM and GI-Mist 1000 DSPNM burners have been designed for operation with methane gas or with liquid fuel.

- The "GI 1000" burner is a modulating burner with a modulation range of 1 - 4. Adjustment to current heat requirements is provided by means of a servomotor that regulates the combined quantity of combustion air and fuel according to the signals from the in-boiler probe.
- The burner is fitted with a device that automatically varies the cross-section of the air passage in the combustion head, doing so proportionately to variations in load. This device gives optimum combustion under all load conditions as a result of optimisation of the air/fuel mix; there thus results reduced excess of air with better quality combustion.

## FIXING THE BURNER TO THE BOILER

- Make a hole in the iron plate of the boiler in respect to the drill plate,
- Fix the stud bolts supplied with the accessories. It is advisable to electrically solder the bolts to the internal part of the plate to avoid losing them, such as in the event of the disassembly of the burner.
- If the iron plate doesn't have insulation protection, it is necessary to fit insulation protection between the iron plate and the heater that is at least 10 mm thick. Check that combustion head penetrates the combustion chamber by the measure requested by the manufacturer of the boiler.

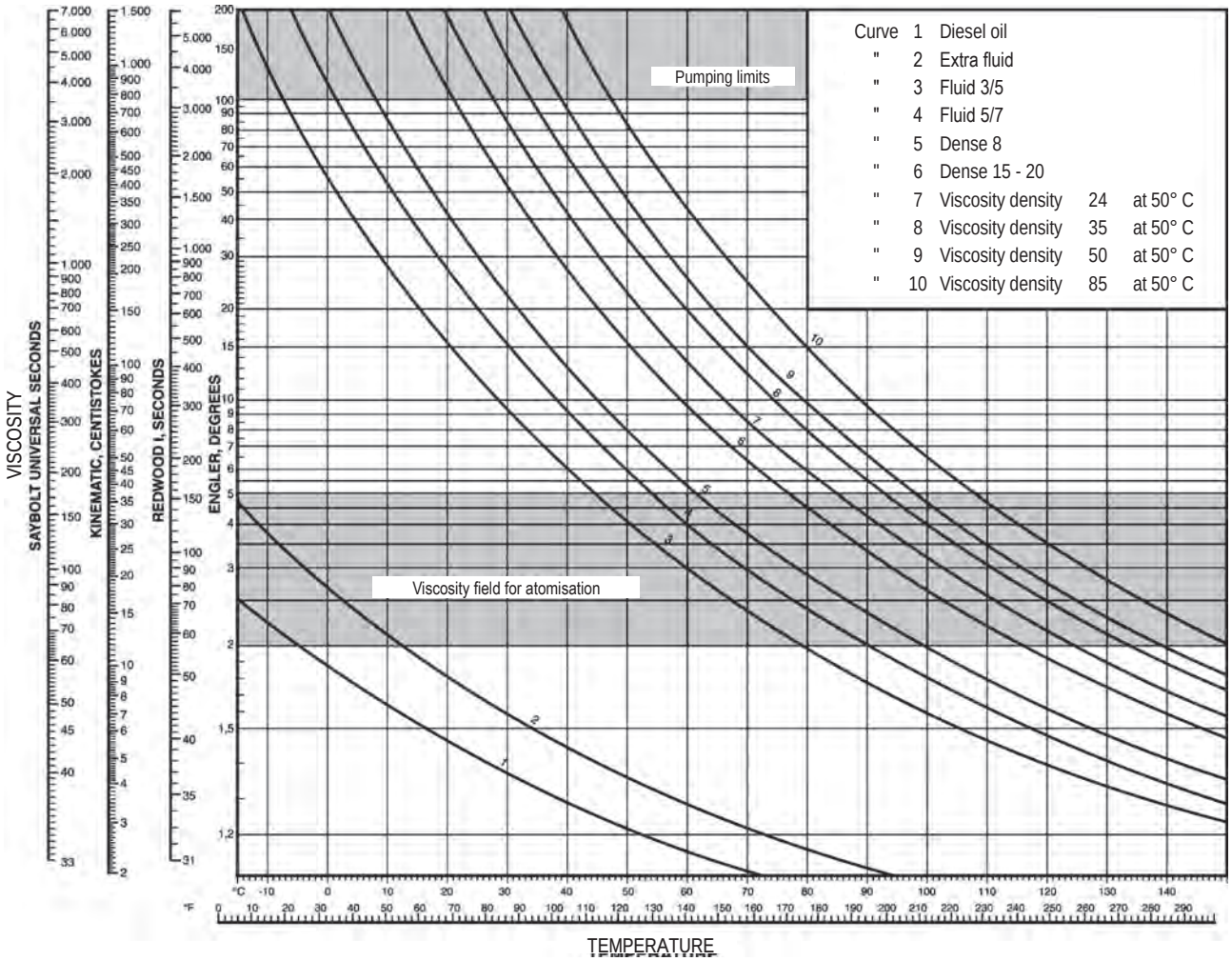
## CONNECTING THE BURNER TO THE GAS SUPPLY PIPE

After you have secured the burner to the boiler, remember that the burner head must penetrate the combustion chamber to the extent prescribed by the boiler manufacturer. Connect the burner to the gas pipe. We advise you to install a twin-flange union on the pipe as close as possible to the burner, to facilitate opening the boiler hatch and/or to dismantle the burner. Before you close this union - with due precautions and with doors and windows open - vent the air in the gas pipe. The tightness of the pipe fitting should be checked before switching on the burner.

## ELECTRICAL CONNECTIONS

It is advisable to effect all electrical connections with flexible electrical wire. Electrical lines must be kept away from hot parts.
Make sure that the power line to which you intend to connect the unit is of voltage and frequency suitable for the burner. Make sure that the main power line, the relative fuse-equipped switch (indispensable)and any limiter are able to withstand the maximum current absorbed by the burner. For details see the specific wiring diagrams for each individual burner.

VISCOSITY - TEMPERATURE DIAGRAM

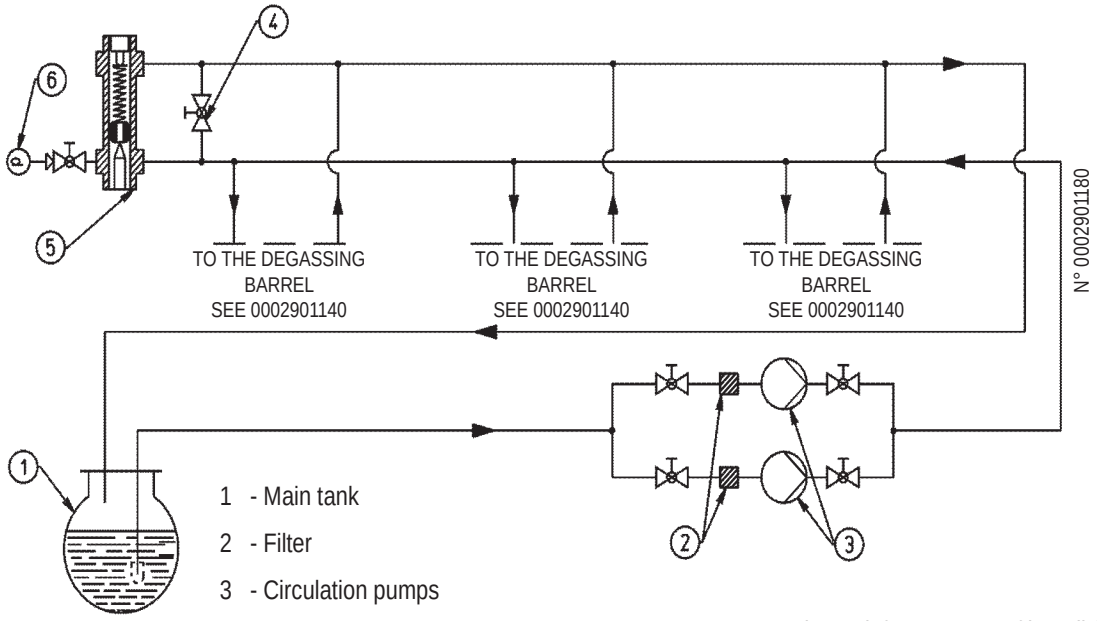


## FUEL FEED UNIT

The burner pump must receive the fuel from a suitable feed circuit with an auxiliary pump having a pressure that is adjustable between 0.5 and 2 bar; if fuel of a rated viscosity greater than 5° E at 50° C is to be used, it must be preheated to 50 - 60° C.
Fuel feed pressure at the burner pump (0.5 - 2 bar) must be practically constant both with the burner at standstill and with the burner working at the maximum fuel feed rate requested by the boiler.
The feed circuit must be as illustrated in our drawings (shown below) even where low viscosity fuels are used.
Piping must be sized as a function of both its length and the flow-rate of the employed pump. Our instructions regard only that which is necessary for proper operation.

With regarding the fuel feed system, comply to local anti-pollution laws where the burner is installed

## HYDRAULIC DIAGRAM OPERATING FOR ONE OR MORE BURNERS WITH MAX NOMINAL VISCOSITY 5° E AT 50° C

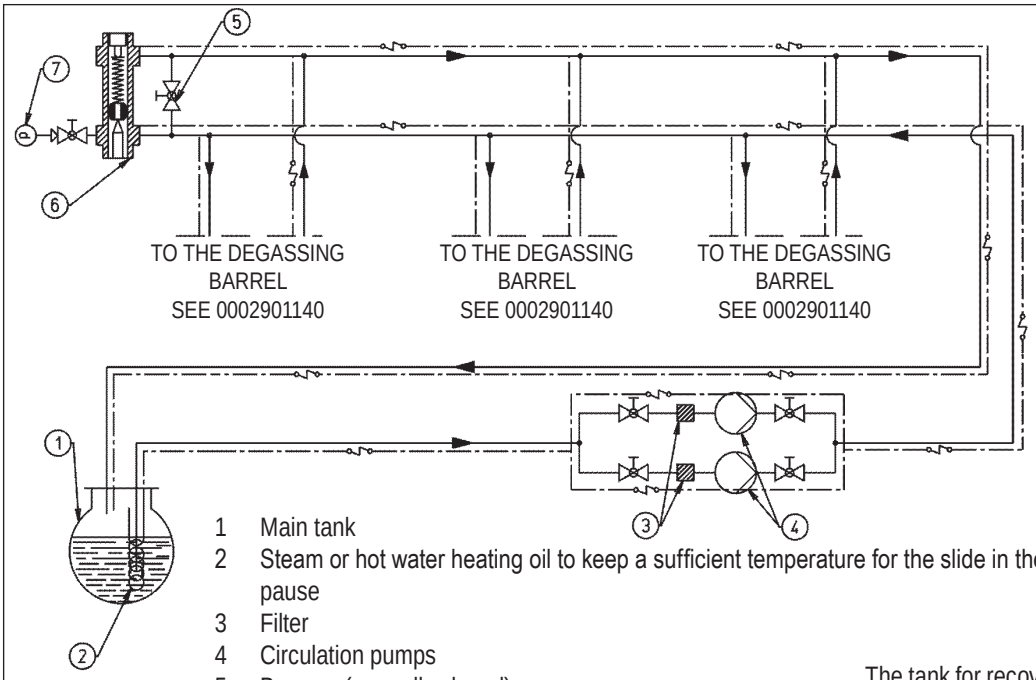



1 - Main tank
2 - Filter
3 - Circulation pumps
4 - By pass (normally closed)
5 - Pressure regulator adjustable from 0,5 to 2 bar
6 - Pressure gauge (0 ÷ 4 bar)

The tank for recovery of hot oil (diameter 150 mm height 400 mm) schould be installed as near as possible to the burner and about 0.5 m above the pump.

## HYDRAULIC DIAGRAM FOR ONE OR MORE MODULATING BURNERS OPERATING WITH HEAVY OIL (15° E AT 50° C)

N° 0002901190

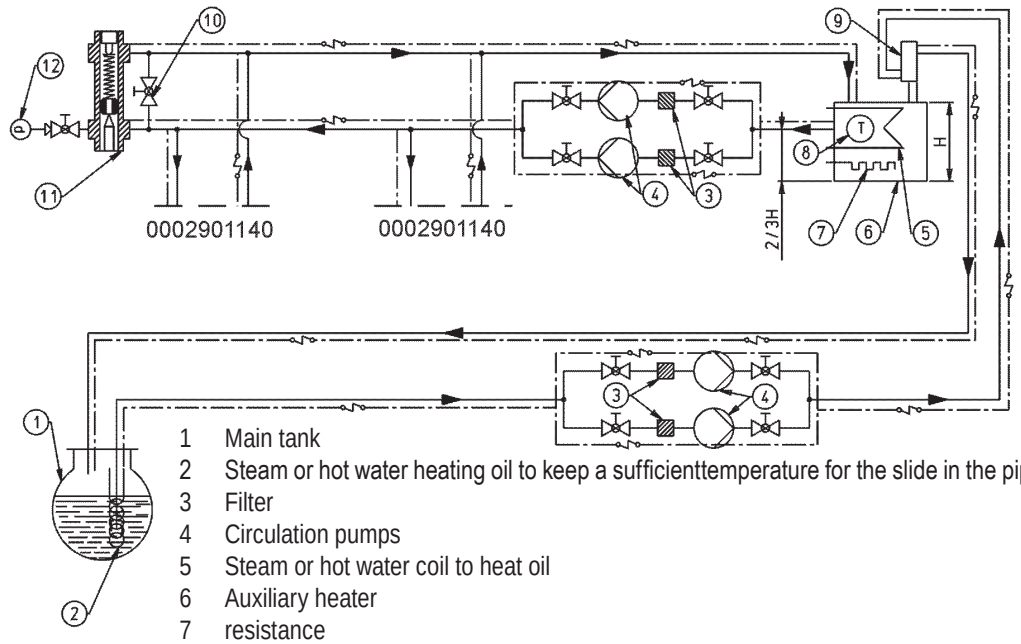



1 Main tank
2 Steam or hot water heating oil to keep a sufficient temperature for the slide in the pipe-line also during the pause
3 Filter
4 Circulation pumps
5 By pass (normally closed)
6 Pressure regulator adjustable from 0,5 to 2 bar
7 Pressure gauge (0 ÷ 4 bar)
Electric heating wires

The tank for recovery of hot oil (diameter 150 mm height 400 mm) schould be installed as near as possible to the burner and about 0.5 m above the pump.

## HYDRAULIC DIAGRAM FOR ONE OR MORE MODULATING BURNERS OPERATING WITH HEAVY OIL (50°E AT 50°C) WITH AUXILIARY HEATER

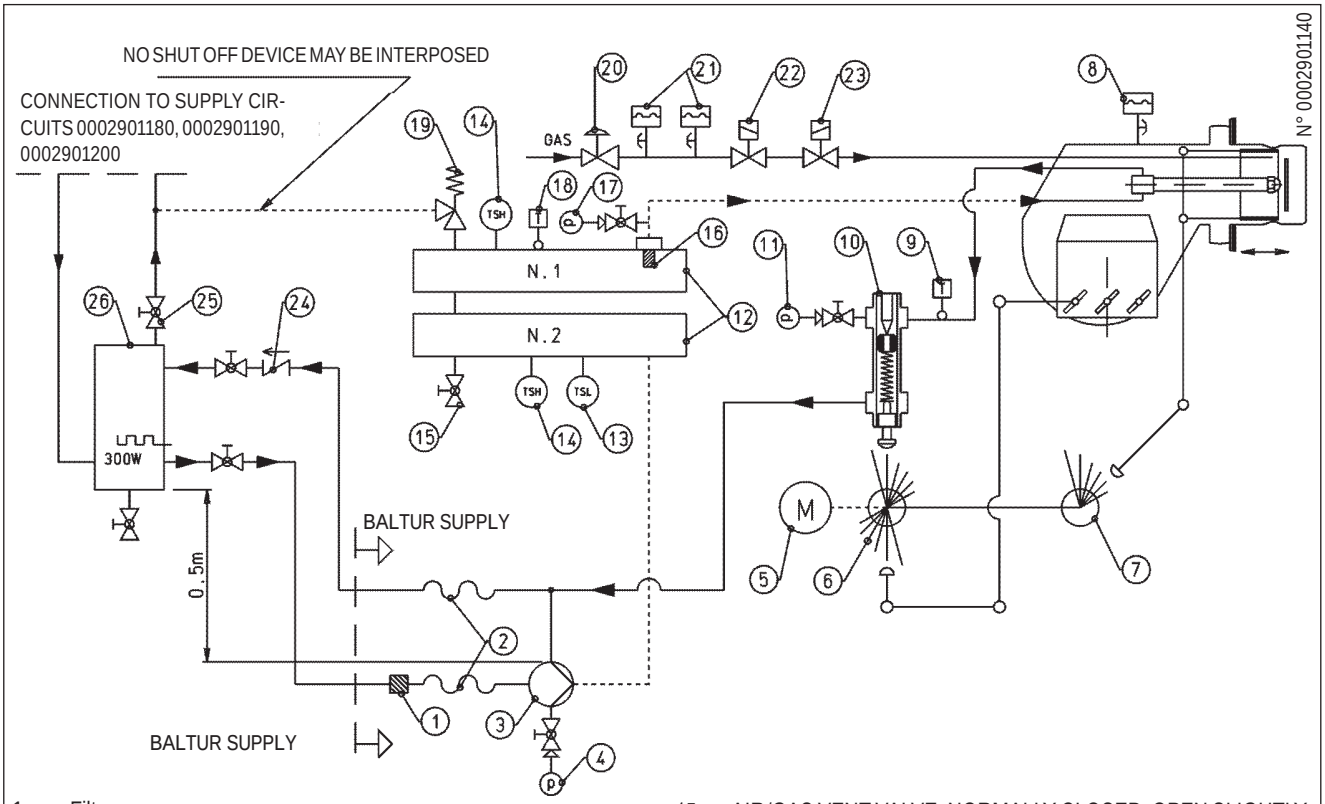
N° 0002901200




1 Main tank
2 Steam or hot water heating oil to keep a sufficienttemperature for the slide in the pipe-line also during the pause
3 Filter
4 Circulation pumps
5 Steam or hot water coil to heat oil
6 Auxiliary heater
7 resistance
8 Thermometer
9 Degasifier (Ø = 100 mm - H = 300 mm)
10 By pass (normally closed)
11 Pressure regulator adjustable from 0,5 to 2 bar
12 Pressure gauge (0 ÷ 4 bar)
Electric heating wires

The tank for recovery of hot oil (diameter 150 mm height 400 mm) schould be installed as near as possible to the burner and about 0.5 m above the pump.

## HYDRAULIC DIAGRAM BURNERS




1 - Filter
2 - Flexible pipe
3 - Burner pump
4 - Pressure gauge (0 ÷ 40 bar)
5 - Modulation servomotor
6 - DISK WITH SCREWS FOR AIR/FUEL SUPPLY REGULATION
7 - DISK WITH ADJUSTMENT SCREWS FOR THE OPENING AND CLOSING OF AIR TO THE COMBUSTION HEAD
8 - Air pressure
9 - NOZZLE RETURN THERMOSTAT
10 - Return pressure regulator MIN 10-12 bar MAX 18-20 bar
11 - Pressure gauge (0 ÷ 40 bar)
12 - Electrics pre-heaters
13 - MINIMUM PRE-HEAT THERMOSTAT
14 - PRE-HEAT MAXIMUM THERMOSTAT
15 - AIR/GAS VENT VALVE, NORMALLY CLOSED, OPEN SLIGHTLY ONLY IN CASE OF GAS DISCHARGE
16 - Self cleanig filter 0.3 mm
17 - Pressure gauge (0 ÷ 40 bar)
18 - THERMOSTAT (PT100) AND THERMOMETER
19 - PRE-HEATER SAFETY VALVE (SET AT 32 BAR)
20 - REDUCTION UNIT OR (PILOT) PRESSURE STABILISER
21 - GAS MINIMUM AND MAXIMUM PRESSURE SWITCH WITH (PILOT) PRESSURE INTAKES
22 - PILOT LIGHT IGNITION SAFETY VALVE
23 - MAIN GAS VALVE FOR IGNITION FLAME
24 - NONRETURN VALVE
25 - AIR-GAS DISCHARGE NORMALLY CLOSED
26 - FUEL RECYCLING TANK AND DEGASSER WITH RESISTOR
- - - PIPING TO BE CARRIED OUT BY THE INSTALLING TECHNICIAN

## DESCRIPTION OF OPERATION WITH HEAVY OIL (See 0002900311)

Turn the main isolating switch "Q1" to on: the power indicator light will come on, as will the auxiliary elements of the pump, filter, atomising unit and regulating valve (.....N-D version only).
Turn the start/stop switch "S1" to on: power reaches the "LFL..." control box at terminal "1" and the preheater regulation thermostats. The voltage crosses the thermostat contacts and reaches the "KR1" and "KR2" element contactor coils which come on and heat the fuel contained in the preheaters.
The preheater minimum thermostats come on when the temperature reaches the value to which they are set, thus turning on the control box via the pressure switch line.
The cyclic relay control box carries out the ignition programme by running the fan motor to effect pre-ventilation.
If the air pressure supplied by the fan is sufficient to trip the relative pressure switch then the motor of the pump which pre-circulates the hot air in the burner conduits starts immediately.
The oil flows from pump to preheater, passes through the latter, heats up to the set temperature and exits via a filter where it then reaches the atomising unit. The hot oil circulates in the atomising unit without exiting the nozzle because the passageways towards the nozzle (delivery) and from the nozzle (return) are closed. Closure is effected by means of the "closing cones" applied to the rod extremities.
These "cones" are pressed against the seats by strong springs fitted at the opposite end of the rods. The oil circulates and exits from the atomising unit return via the sump where the TRU thermostat is inserted. It then arrives at the return pressure regulator, passes through it and reaches the pump return. From this, it is discharged into the return. The above-described hot oil circuit is effected at a pressure slightly higher (a few atmospheres higher) than the minimum to which the return pressure regulator is set (10 - 12 bar).
This oil pre-ventilation stage lasts 22.5 seconds. This time can be extended (in theory, indefinitely) because the design of the electrical circuit does not allow the ignition programme to proceed until the fuel in the nozzle return piping has reached the temperature to which the TRU (Thermostat on Nozzle Return) is set.
This special design feature stops the fuel passing through the nozzle until the fuel itself reaches at least the temperature to which the TRU thermostat is set. The TRU thermostat usually trips within the standard pre-ventilation time (37.5 seconds); if it does not, heavy oil pre-ventilation and pre-circulation are extended until the TRU trips. When the TRU trips (circulating oil hot enough) it allows the control box to proceed with the ignition programme by switching on the ignition transformer and then the gas pilot flame valves.
The high voltage between the burner electrode and its ground causes the spark which ignites the gas/air mix. Flow is regulated by the flow-rate regulator incorporated in one of the two pilot flame valves. The flame is detected by the UV photocell.

! If the UV photocell does not detect the flame then the burner locks out. When more than one burner is operating in the combustion chamber, you must make sure that the UV photocell of one burner does not detect the flame of the other. This is prevented by installing the photocell on a rotatable support so that it can be positioned to avoid the above-described interference.

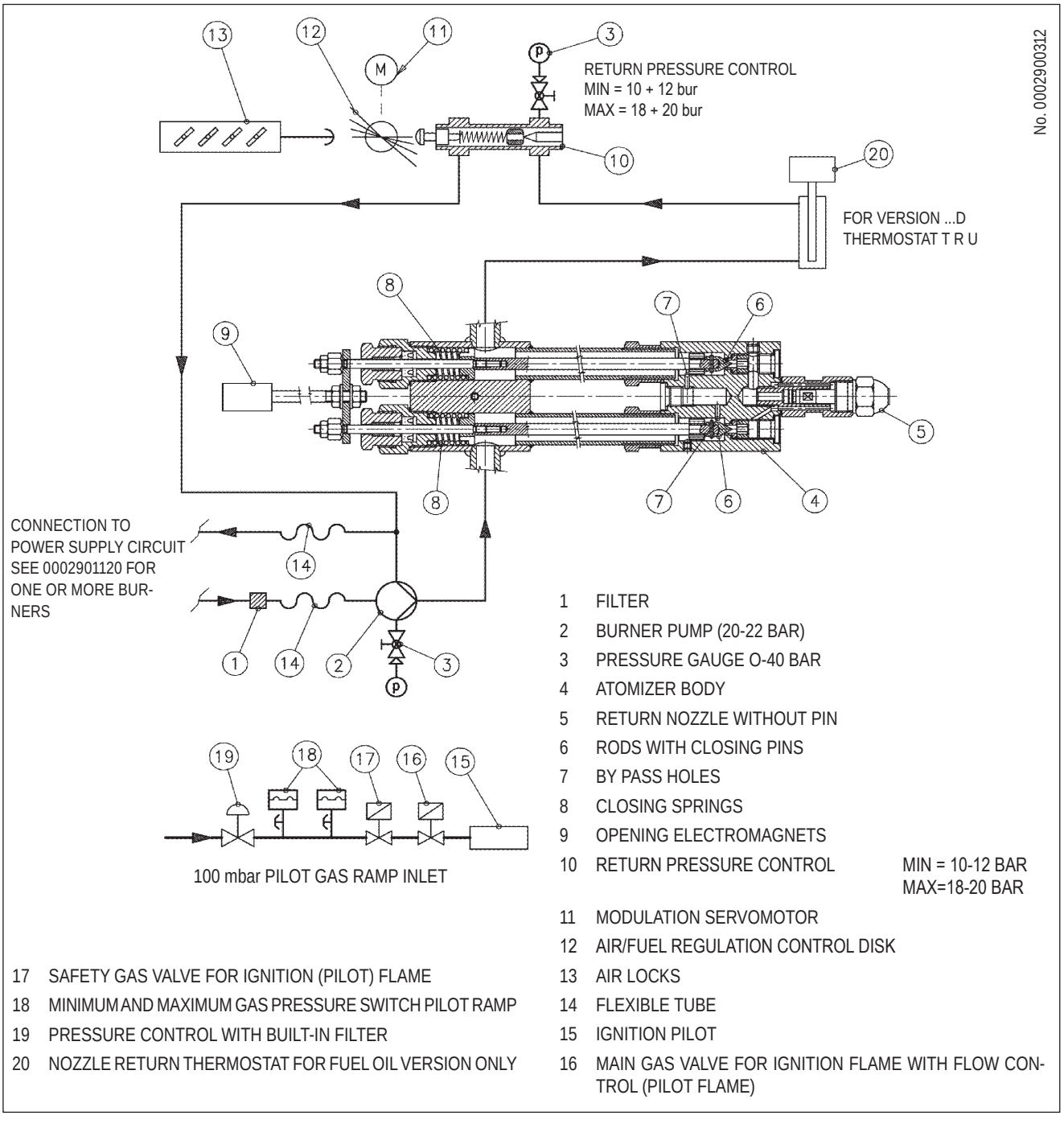
Just 2.5 seconds after the ignition of the pilot flame, the control box powers the magnet which, via a series of lever mechanisms, moves the two nozzle fuel flow (delivery and return) interception rods.
The moving of these rods causes closure of the by-pass inside the atomising unit; consequently, the in-pump pressure is brought to the standard value of about 20 - 22 bar. The shifting of the two rods from the closure seats now lets the fuel flow into the nozzle at a pump-regulated pressure of 20 - 22 bar and exit the nozzle properly atomised. The return pressure, which determines the flow in the chamber, is adjusted by the return pressure regulator.
For ignition flow rate (minimum delivery) this value is about 10 - 12 bar. The atomised fuel which exits the nozzle mixes with the fan-fed air and is ignited by the already-lit gas pilot flame.
After the magnet is switched on the pilot flame is switched off and the burner is run at the modulation minimum.
Flow increase occurs automatically and continuously according to the signals from the modulation probe: increase is effected by means of a servomotor. The modulation motor controls a simultaneous increase in the flow of both fuel and combustion air.
The increase in the flow of fuel is determined by the variable-profile disk which, by rotating, causes greater compression of the return pressure regulator spring and thus an increase in return pressure corresponds to an increase in fuel flow.
An increase in fuel flow must correspond to an increase (of adequate quantity) of combustion air. This condition is brought about during the first adjustment by acting on the screws that vary the combustion air adjuster control disk profile.
Fuel flow and, at the same time, combustion air flow, increase up to maximum pressure (fuel pressure at return pressure regulator of about 18 - 20 bar) if pressure at the pump is 20 - 22 bar.
Fuel and combustion air flow rates remain at maximum until boiler temperature (pressure in the case of a steam boiler) nears the set value and causes the modulation control motor to invert rotation.
The return movement of the modulation motor causes a reduction in the flow of fuel and relative combustion air.
The modulation system reaches a position of equilibrium which corresponds to a flow of fuel and relative combustion air equal to the quantity of heat requested by the boiler.
With the burner working the in-boiler probe detects variations in boiler load and automatically sends a signal to the modulation motor to adjust the flow of fuel and relative combustion air accordingly.
If, even with just the minimum flow of fuel and combustion air, the maximum temperature (or pressure in the case of a steam boiler) is reached, the thermostat (pressure switch in the case of a steam boiler) will shut down the burner completely.
Subsequently, the temperature (or pressure in the case of a steam boiler) will drop back below the shutdown setting and the burner will re-ignite as described above. Bear in mind that the possible flow range, with good combustion, is approximately from 1 to 1/3 of the max flow rate indicated on the ID plate.
Should the flame fail to appear within two seconds of the pilot flame igniting, the control box places the unit in "lock-out" (complete shutdown of burner with relative warning light).
To "reset" the control box press the appropriate reset button.

! The air pressure switch must be adjusted on igniting the burner as a function of the pressure value observed for operation with the pilot flame.

## CONTROL BOX CHARACTERISTICS

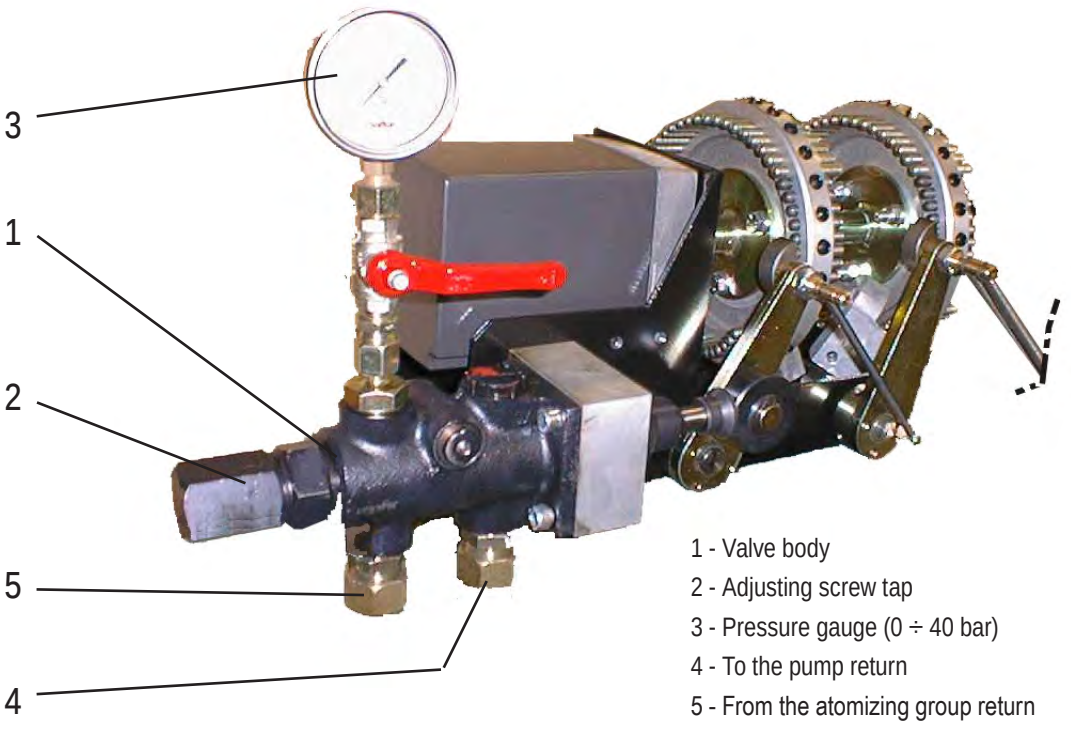
| Control box and programmer | Safety time in seconds | Pre-ventilation and pre-circulation time in seconds | Pre-ignition in seconds | Post-ignition in seconds | Time between 1st (pilot) flame and start of modulation in seconds |
|---|---|---|---|---|---|
| LFL 1.335 Cyclic relay | 2.5 | 37.5 | 5 | 2.5 | 12.5 |

## DETAIL OF BURNER WITH ATOMIZER UNIT, MODULATION SERVOMOTOR, RETURN PRESSURE CONTROL, AIR WITH LPG OR NATURAL GAS PILOT BURNER




1 FILTER
2 BURNER PUMP (20-22 BAR)
3 PRESSURE GAUGE O-40 BAR
4 ATOMIZER BODY
5 RETURN NOZZLE WITHOUT PIN
6 RODS WITH CLOSING PINS
7 BY PASS HOLES
8 CLOSING SPRINGS
9 OPENING ELECTROMAGNETS
10 RETURN PRESSURE CONTROL — MIN = 10-12 BAR, MAX=18-20 BAR
11 MODULATION SERVOMOTOR
12 AIR/FUEL REGULATION CONTROL DISK
13 AIR LOCKS
14 FLEXIBLE TUBE
15 IGNITION PILOT
16 MAIN GAS VALVE FOR IGNITION FLAME WITH FLOW CONTROL (PILOT FLAME)
17 SAFETY GAS VALVE FOR IGNITION (PILOT) FLAME
18 MINIMUM AND MAXIMUM GAS PRESSURE SWITCH PILOT RAMP
19 PRESSURE CONTROL WITH BUILT-IN FILTER
20 NOZZLE RETURN THERMOSTAT FOR FUEL OIL VERSION ONLY

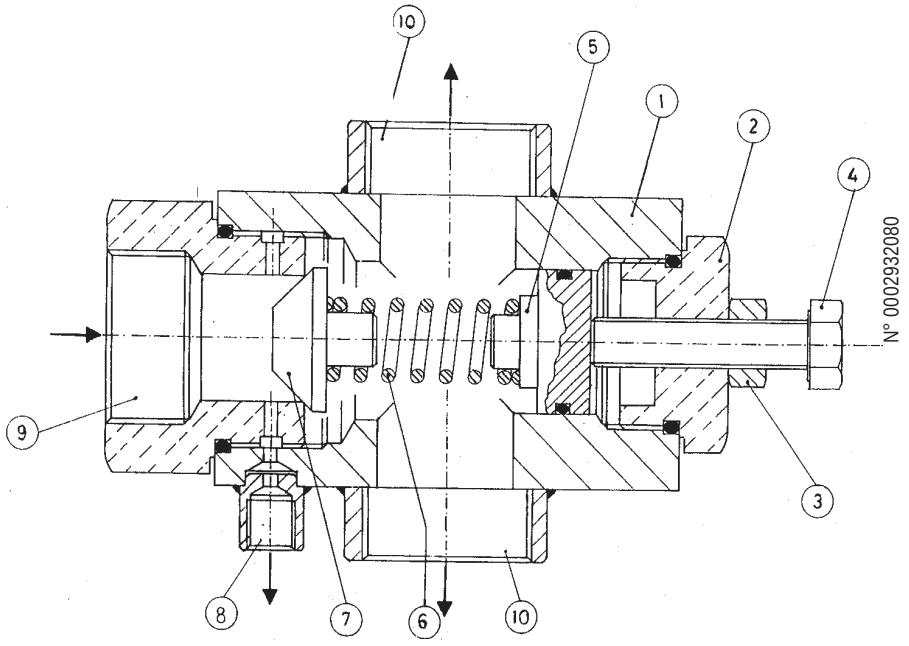
## DETAIL OF FUEL PRESSURE ADJUSTING VALVE




N° 0002933990

1 - Valve body
2 - Adjusting screw tap
3 - Pressure gauge (0 ÷ 40 bar)
4 - To the pump return
5 - From the atomizing group return

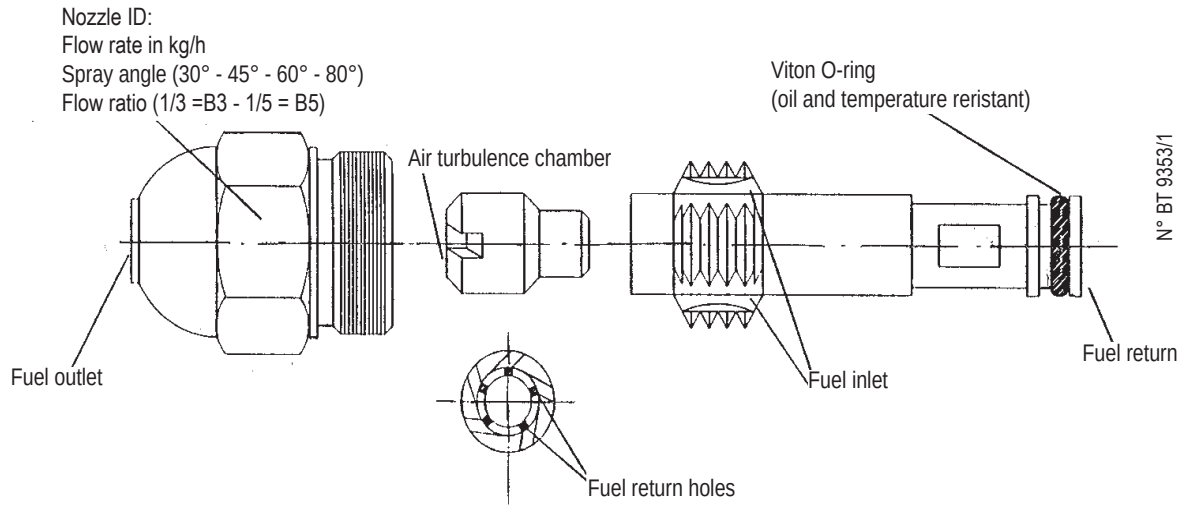
## DETAIL OF FUEL PRESSURE ADJUSTING VALVE FOR AUXILIARY CIRCUIT




N° 0002932080

1 - Valve body
2 - Adjusting screw support plug
3 - Adjusting screw stop nut
4 - Adjusting screw
5 - Spring centering bush
6 - Spring
7 - Shutter
8 - Pressure gauge connection
9 - Fuel inlet
10- Fuel outlet

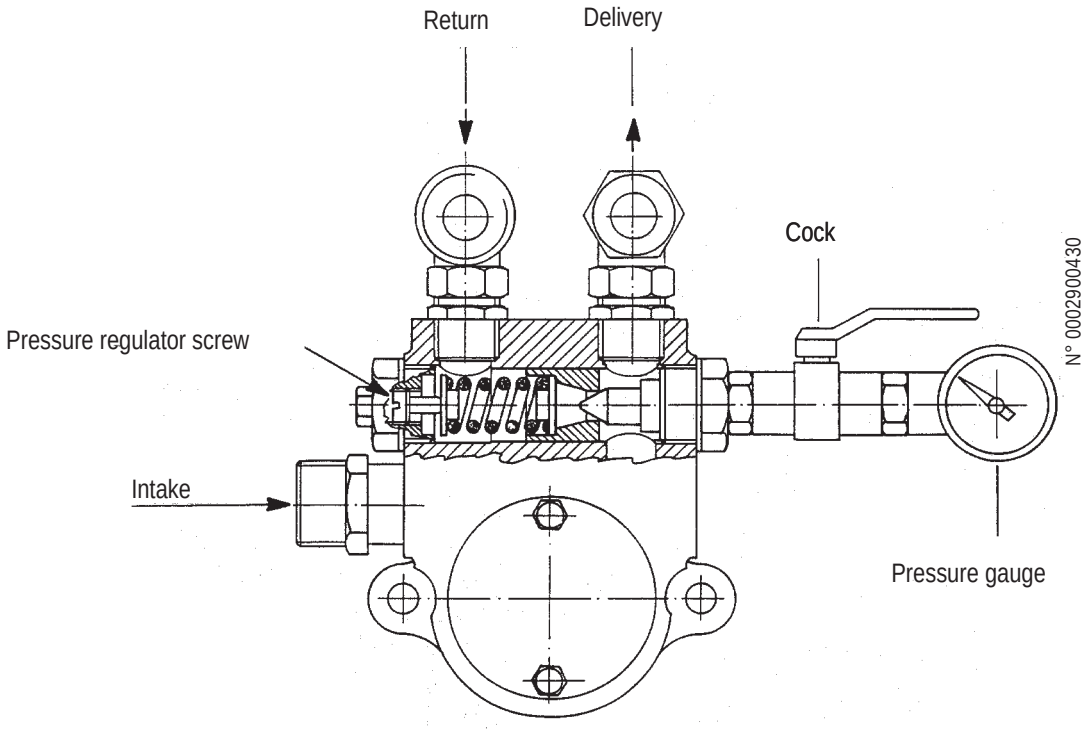
## DIAGRAM OF A DISMANTLED (CB) CHARLES BERGONZO NOZZLE (WITHOUT PIN)




N.B. For the nozzle to operate properly, its “return” section must never be completely closed.
This is achievedby regulating when the burner is started up for the first time. In practice, when the nozzle is operating at the maximum flow rate, the difference in pressure between the “delivery” (pump pressure) and “return” (pressure at hte returnpressure regulator) pressures (running to and from the nozzle) must be at least 2÷3 bar.

| | | | | |
|---|---|---|---|---|
| Example: | Pump pressure | 20 bar | Pump pressure | 22 bar |
| | Return pressure | 20 - 2 = 18 | Return pressure | 22 - 3 = 19 bar |
| | | 20 - 3 = 17 | | 22 - 2 = 20 bar |

## WIRING DIAGRAM FOR DANDOSS PUMP MODEL KSVB 1000 ÷ 6000 R



## IGNITION AND ADJUSTMENT WITH HEAVY OIL

1) Check that nozzle characteristics (flow and spray angle) are suitable for the combustion chamber (see BT 9353); if they are not replace the nozzle with one that is suitable.

2) Check that there is fuel in the tank and that it is, at least on a visual check, suitable for the burner.

3) Check that there is water in the boiler and that system gate valves are open.

4) Check with absolute certainty, that combustion products are able to escape freely (boiler damper and flue open).

5) Check that the voltage on the power line to which you intend to connect corresponds with that required by the burner and that all motor and heating element connections are properly arranged for the available voltage. Check that all electrical connections made at the installation site are carried out properly as per our wiring diagram.

6) Make sure that the combustion head penetrates into the combustion chamber to the extent requested by the boiler makers.
Check that the air adjuster device on the combustion head is in a position assumed to be suitable for supply of the relevant fuel (the air passage between disk and head must be significantly closed where fuel flow is relatively reduced; on the other hand, where nozzle flow is rather high, the air passage between disk and head must be relatively open). See the chapter "Adjusting the combustion head".

7) Remove the cover from the rotating disk (on the modulation motor) where the adjuster screws that control fuel and relative combustion air are housed.

8) Turn the two modulation switches in the "MIN" (minimum) position to "MAN" (manual).

9) Adjust the element control thermostat incorporated in the line filter to around 50° C. Adjust the minimum thermostat "Tmin" in the preheater thermostats unit to a temperature thought to be adequate. The temperature to which the minimum thermostat must be adjusted depends on the type of fuel used. Consult the viscosity-temperature chart, bearing in mind that the fuel must reach the nozzle with viscosity no greater than 2° E. Heavy oil heating temperature can be modified via the adjuster thermostat or (where installed) via the "MS 30" electronic regulator; such temperature must be around 20° C higher than the setting on the minimum thermostat.

The specific instructions for the electronic regulator are given on the following pages.

10) Start up the auxiliary fuel feed circuit, check that it is working efficiently and adjust pressure to approximately 1 bar.

11) Remove the plug (on the vacuum meter coupling seat) from the burner pump and then slightly open the gate valve on the fuel infeed pipe. Wait for the fuel to exit the hole (there should be no air bubbles) and then re-close the gate valve.

12) Fit a pressure gauge (end of scale approx. 3 bar) to the on-pump vacuum meter coupling seat in order to check the pressure at which fuel arrives at the burner pump. Apply a pressure gauge (end of scale approx. 30 bar) to the on-pump pressure gauge coupling seat in order to check the working pressure of the pump itself. Apply a pressure gauge (end of scale approx. 30 bar) to the return pressure regulator coupling to check the value that determines flow (see drawing. n° 0002900311).

13) Turn the main switch "Q1" to on and the start/stop switch "S1" to "0" (off) to prevent the elements being switched on with the tank empty. Make sure that the fan motor and pump motor turn the right way. For the pump motor turn the switch "S1" to on and press the tank loading switch; for the fan motor manually close contactors "KL" (line) and "KY" (star) simultaneously by pushing the mobile part of the contactor; do not close "KD" (triangle). To invert the direction of rotation exchange two power line wires relative to the motor which turns the wrong way.

WARNING. Pressing the tank loading button cuts power to the control box and the heating elements on the preheaters are therefore off. Nevertheless, do not turn on the preheater elements with the preheater tank empty.

14) Run the burner pump by pressing the tank filling button until the gauge that reads the working pressure of the pump shows slight pressure. Slight pressure in the circuit confirms that preheater tank filling has been completed.

15) Close burner switch "S1" and the main switch. The elements contained in the fuel preheaters are thus turned on. Switching on of the elements is signalled by the relative control panel indicator lights. The contactor coils on elements "KR1" and "KR2" are powered via contacts "Y1" and "Y2" of the "MS 30" electronic temperature regulator (where applicable) or the regulator thermostat. The burner still does not start because minimum thermostat consensus is absent (i.e. the fuel in the preheater is not hot enough).

Do not turn on the elements with the tank empty as doing so could damage them.

16) The minimum thermostat closes its contact (i.e. comes on) when the temperature in the preheater reaches its setting value. Tripping of the minimum thermostat immediately causes switching on of the burner control box (as long as boiler safety thermostats/pressure switches are closed). With the burner control box now on the burner ignition sequence begins. The programme includes simultaneous pre-ventilation and pre-circulation, with low pressure hot oil, throughout the burner fuel circuit. Burner ignition is as described in the previous chapter, "Description of Operation"; the burner is ignited at its minimum.

To adjust the gas pilot flame proceed as follows:

- disconnect the wire from terminal n° 18 of the LFL... control box to prevent the electromagnet being switched on.
- disconnect the wire from terminal n° 17 of the LFL... control box (intermittent pilot) and connect it to terminal n° 18 (pilot always on).

- ignite the burner, adjust the quantity of gas and air for the pilot flame and check for proper ignition several times.
- when adjustment is over restore the original connections.

UV CELL

Detection of the pilot flame is effected by a UV cell: the following information should be born in mind. Even slight greasiness will compromise passage of the UV rays through the UV photocell bulb, thus preventing the sensitive device inside it receiving the quantity of radiation needed for correct operation. If the bulb is smeared with light oil, heavy oil, etc. it must be cleaned thoroughly. Note that even gentle contact with fingers can leave a slight film of grease which is sufficient to compromise proper UV photocell operation. The UV cell does not "see" daylight or the light emitted by a common bulb. A sensitivity check can be carried out using a flame (lighter, candle) or the spark generated between the electrodes of a common ignition transformer. To ensure proper operation the UV cell current must be sufficiently stable and must not drop below the minimum required by the specific control box. It may be necessary to try different positions in order to find the best one: do this by shifting (axial or rotary shift) the body that contains the photocell with respect to the attachment strap. The check is effected by connecting a micro-ammeter (with suitable scale), in series, to one of the two UV photocell connection wires; it is, of course, necessary to observe polarity ( + and - ). The cell current needed to ensure proper control box operation is given on the wiring diagram.

17) When the burner is working at "minimum" adjust the air to the quantity needed to ensure good combustion. Turn the adjuster screws in or out at the point of contact with the lever that transmits combustion air regulation damper movement. The quantity of air at "minimum" should be a little scarce so as to ensure perfect ignition even under the most demanding circumstances.

18) After adjusting the air for the "minimum" turn the modulation switches to position "MAN" and to position "MAX".

19) The modulation motor starts moving: wait for the disk (on which the adjuster screws are fitted) to sweep through an angle of about 12° (this corresponds to the space taken up by three screws) and then stop modulation by turning the switch back to position "0". Run a visual check on the flame and, if necessary, regulate combustion air as described in point 17. Then check combustion using the appropriate instruments and, if necessary, correct the adjustment previously made by way of visual check. The above-described operation must be repeated by proceeding progressively (by advancing the disk about 12° at a time) and, each time, modifying, where necessary, the fuel-air ratio throughout the entire modulation range. It is necessary to make sure that fuel feed progression occurs gradually and that maximum fuel flow occurs at the end of the modulation range. This condition is necessary for attainment of smooth, gradual modulation. If necessary modify the position of the fuel control screws to obtain that specified above. Note that maximum flow is attained when return pressure is about 2 - 3 bar less than delivery pressure (generally 20 - 22 bar). A correct air-fuel ratio should give a carbon dioxide ($CO_2$) value that increases as fuel flow increases: as a rough guide, it should be at least 10% at minimum flow and reach an optimum of about 13 % at maximum flow.
It is inadvisable to exceed a $CO_2$ figure of 13% so as to prevent operation with a rather limited excess of air, possibly leading to a significant increase in smoke number owing to unavoidable causes (changes in atmospheric pressure, small dust deposits in the fan air ducts etc.). The resulting smoke (i.e. fume) number is closely linked to the type of fuel used (latest regulations indicate n° 6 on the Bacharach scale as a maximum). it is advisable, if possible, to keep the smoke number below n° 6 on the Bacharach scale even if the $CO_2$ value could, as a consequence, be slightly lower. Reduced opacity (i.e. a lower smoke number) soils the boiler less and the average efficiency of the latter is normally higher even if $CO_2$ levels are slightly lower. Remember that to achieve proper adjustment system water must be up to normal working temperature and that the burner must have been working for at least fifteen minutes. In the absence of proper instrumentation use fume colour as a guide. We recommend that adjustment be effected so as to obtain a light orange flame; avoid red flames with smoke and white flames with an exaggerated excess of air.

20) The purpose of the air pressure switch is to place the control box in lock-out (safety mode) if air pressure is incorrect. The pressure switch must be adjusted so that it trips by closing the N.O. (Normally Open) contact when air pressure in the burner reaches a sufficient value. The pressure switch connection circuit features self-control so it is necessary that the N.C. (Normally Closed) contact (with fan at standstill and therefore no air pressure in burner) actually brings about this condition. If it does not the control box is not switched on (the burner stays off). More precisely, note that if the contact designed to be closed when working fails to close (air pressure too low) then the control box goes through its cycle but the ignition transformer does not come on, the pilot flame gas valves stay closed and the burner thus shuts down in "lock-out". To check that the air pressure switch is working properly it is necessary, with the burner at minimum flow rate to increase the adjustment value until it trips: immediate burner "lock-out" must follow. Reset the burner by pressing the appropriate button and adjust the pressure switch to a value sufficient to detect the air pressure during pre-ventilation.

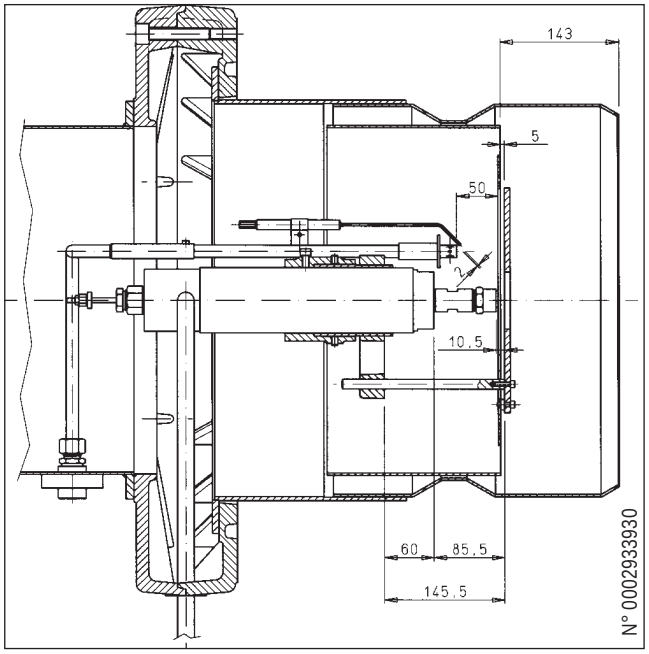
21) The gas pressure switches (minimum and maximum) are designed to stop the burner working when gas pressure is outside the set range. Given the specific function of the pressure switches it is evident that the minimum pressure control switch must utilise the closed contact when the pressure switch detects a pressure higher than that to which it is set. It is also evident that the maximum pressure switch must utilise the closed contact when it detects a pressure lower than that to which it is set. Adjustment of minimum and maximum gas pressure switches must therefore be effected during burner testing as a function of actual pressure at each individual installation. The pressure switches are electrically connected in series; consequently, if any one of the pressure switches trips (i.e. opening of the circuit) when the burner is working (flame lit) the burner shuts down immediately. When testing the burner it is extremely important to check that pressure switches are working properly. Proper pressure

switch operation (opening of the circuit) must cause burner shutdown: this can be checked for by acting on the relevant adjustment devices.

22) Now check that modulation works properly in automatic mode. Turn the AUT - O - MAN switch to “AUT” and the MIN - O - MAX switch to “O”. The modulation system is now on and under the exclusive automatic control of the boiler probe. It is not normally necessary to act on the internal adjusters of the “RWF 40” power regulator; however, the relevant instructions are contained in the pamphlet.

23) Check that preheater thermostats are not adjusted in such a way as to cause anomalies (poor ignition, smoke, formation of gas in the preheater etc.). Note that good atomisation can only be obtained when the heavy oil arrives at the nozzle with viscosity no greater than 2° E. Therefore adjust the “MS 30” electronic regulator or regulation thermostat accordingly. For the minimum thermostat we advise a temperature setting approximately 20° C lower than the “MS 30” electronic regulator setting.
As a guideline consult the viscosity-temperature chart for the type of oil used.

## BURNER GI 1000 DSPN-D GAS PILOT ADJUSTMENT PRINCIPLE DIAGRAM




## DESCRIPTION OF OPERATIONS WITH METHANE GAS (See n° 0002910771)

The through put rate variation range available is approximately from 1 to 1/5 in respect to the maximum throughput rate of the appliance.
The burner is equipped with a limit microswitch which inhibits start-up if the flow regulator is not set to minimum.
In accordance with safety standards, burner ignition is preceded by a pre-purge stage of the combustion chamber.

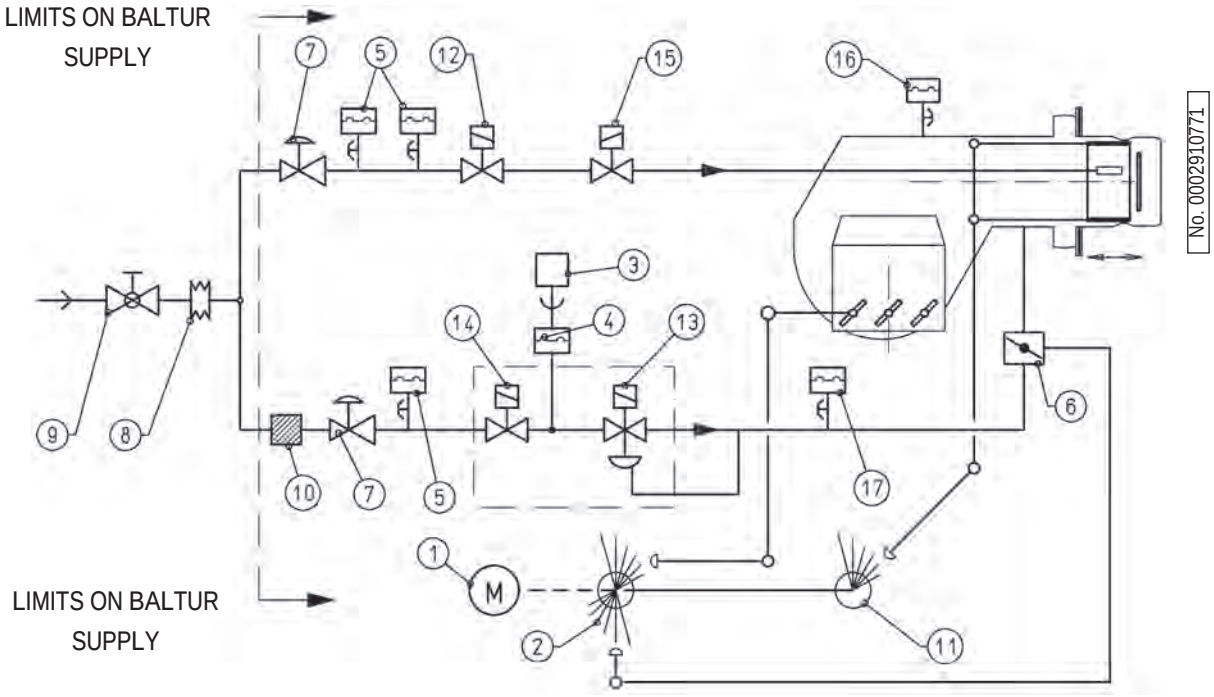
During the pre-purge stage the air and gas supply regulating servomotor provides the maximum aperture, so that pre-purge, takes place with the maximum aperture for air intake.
From the above, the total pre-ventilation time is provided by: air shutter opening time + pre-purge time + time for return of air shutter to minimum position .

If sufficient pressure is detected by the ventilation air pressurestat, the ignition transformer will cut in at the end of the ventilation phase and later the pilot flame valves will open. The gas will now reach the combustion head, mix with the air delivered by the fan, and ignite.
Gas throughput is regulated by the flow regulator incorporated in one of the two pilot flame valves. The ignition transformer disconnects after the pilot flame valves open. At the end of this sequence of events the burner will be running on pilot only.
Pilot flame presence is monitored by the UV photocell.
At this point the programmer relay resets lockout position and supplies power to the main valves causing them to open. The gas passes trough the main valves and flows out of the combustion head in the quantity permitted by the “minimum” setting of the flow regulator valve. The main flame of the burner is now ignited at the minimum setting. The pilot circuit cuts out after the main valves open.
The modulator servo-motor cuts in after the main valves open, and on a consent signal from the modulating thermostat or pressurestat (assuming they are set a temperature or pressure value in excess of the temperature or pressure in the boiler), the servo-motor will start turning to provide a gradual increase in the supply of gas and combustion air until the maximum rated flow at which the burner has been set is obtained.

! Gas distribution is not determined by the main valve but by the position of the gas distribution adjustment valve (see drawing 0002933530).

The burner continues to operate under maximum flow conditions until temperature or pressure reach a level that is sufficient to cause one of the modulation detectors to cut in; at this point the modulator servo-motor will turn in a reverse direction. Reverse rotation of the servo-motor, and consequently reduction in throughput of gas and combustion air, is effected in a series of short steps.
By this method, the modulation system operates towards bringing into line the amount of heat supplied to the boiler and the heat that the boiler puts out to the service.
During operation of the burner, the modulating detector mounted on the boiler detects variations in the demand and automatically adjusts the supply of fuel and combustion air by causing the modulating servo-motor to turn in increase or decrease direction. If even at minimum throughput the threshold value (temperature or pressure) setting of the shut down device is reached, the shut down device will operate and the burner will turn off.
When the temperature or pressure drops below the shut down device intervention threshold, the burner will cut in once again, following the sequence of events described above. If a flame is not detected within the safeti time, the control equipment goes into “lockout” mode (complete shut down of the burner and illumination of the lockout indicator light). To release the lockout condition, press the reset button.

## BASIC DIAGRAM OF GAS TRAIN

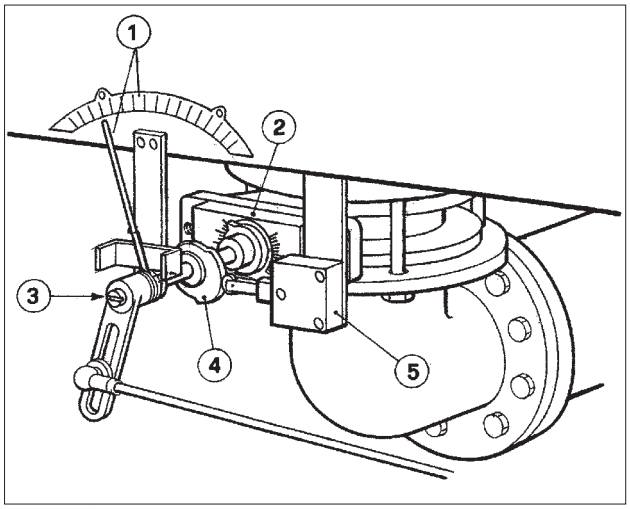



1 MODULATION SERVOMOTOR
2 DISC WITH SCREWS FOR CONTROLLING AIR/GAS SUPPLY
3 VALVE SEAL CONTROL DEVICE AND PRESSURE SWITCH (LDU)
4 MAIN GAS FLAME VALVE
5 MINIMUM GAS PRESSURE SWITCH AND MAXIMUM PILOT RAMP
6 GAS SUPPLY MODULATING CONTROL BUTTERFLY VALVE
7 GAS PRESSURE CONTROL WITH BUILT-IN FILTER
8 VIBRATION-PROOF JOINT
9 BALL COCK
10 GAS FILTER
11 DISC WITH ADJUSTMENT SCREWS FOR OPENING AND CLOSING AIR SUPPLY TO HEAD
12 FLAME SAFETY GAS IGNITION (PILOT) VALVE
13 OPERATING GAS VALVE WITH PRESSURE CONTROL
14 SAFETY GAS VALVE
15 MAIN GAS VALVE FOR IGNITION FLAME (PILOT FLAME) WITH FLOW CONTROL
16 AIR PRESSURE SWITCH
17 MAXIMUM MAIN RAMP GAS PRESSURE SWITCH

## DETAIL OF BUTTERFLY VALVE DAMPER REGULATING GAS FLOW FOR GI 1000 SERIES BURNERS

N°0002933530

1 - Indicator position of the gas butterfly valve
2 - Gas butterfly valve
3 - The slot on the end of the shaft indicates the position of the butterfly valve (damper)
4 - Gas valve minimum position micro-switch control cam
5 - Micro-switch



## STARTING UP AND REGULATION WITH METHANE GAS

1) If not already done at the moment of connecting the burner to the gas pipeline, it is indispensable to carry out a purge of the air contained in the pipeline. As a precaution, special care should be taken and doors and windows should be opened. Open the pipe union on the pipeline situated near the burner and then open a little the gas cut-off cock (or cocks). When the characteristic odour of gas can be smelled, close the cut-off cock. Wait until the gas present in the room has dispersed, and then reconnect the burner to the gas pipeline. Subsequently, re-open the gas cut-off cock.

2) Check that there is water in the boiler and that the system's gate valves are open.

3) Check, with absolute certainty that the discharge of combustion products can take place freely (boiler and chimney lock-gates should be open).

4) Make sure that the voltage of the electric line to which the burner is to be connected, corresponds to that required by the burner and that the electrical connections (motor or principle line) have been prepared to match the voltage rating available. Also check that all the electrical connections carried out on the spot are in accordance with our electric wiring diagram.

5) Make sure that the combustion head is long enough to enter the furnace to the extent specified by the boiler manufacturer.

6) Remove the protection cover from the disk carrying the air and gas flow regulator screws and slacken the screws that block the regulator screws.

7) Check that the air regulator device on the combustion head is in correct position for the fuel throughput required (the air passage between the diffusor disk and the head must be small for low throughput and relatively wide when throughput is higher). See "Combustion head airflow regulation" heading.

8) Fit a pressure gauge with suitable full scale (where the pressure level envisaged allows, a liquid manometer is preferable; do not use pointer gauges for low pressures) to the pressure outlet port on the gas pressurestat.

9) Open, as far as considered necessary, the flow regulator incorporated in the pilot flame valve(s). Also check that the combustion airflow control shutter is sufficiently open; if necessary, alter the position by acting on the regulator screws on the regulator disk.

10) With the burner panel switch on "O" and the master switch in 'make', that the fan motor rotates in the correct direction. If necessary, reverse two phases of the motor power supply line to change the direction.

11) Now switch the panel switch to "I" and turn the modulation switches to MIN (minimum) and MAN (manual). With the control system receiving electrical power, the programmer will cause the burner to start up as described under the foregoing heading "Description of natural gas operation". During pre-purge time, check for operation of the air pressurestat, the contacts of which should change from a pressure-zero 'make' to a pressure-positive 'make'. In the event that the pressure is sufficient and the pressurestat fails to respond, neither the ignition transformer nor the pilot flame gas valves will operate so the burner will shut down in lockout.
Note that lockouts during this first ignition sequence should be considered normal since the fuel supply line will still contain air which must be purged before a stable flame can be obtained. Press the "reset" button to re-start.

UV Cell
If flame detection is carried out with the UV cell, the following should be taken into consideration.
Even the slightest greasiness will compromise the passage of the ultraviolet rays through the UV photoelectric cell bulb, thus preventing the sensitive internal element from receiving the quantity of radiation necessary for it to function properly. Should the bulb be fouled by light oil, fuel oil, etc., it is indispensable to clean it thoroughly. It should be pointed out that even by simply touching the bulb with the fingers, it is possible to leave a slight greasiness which could compromise the working of the UV photoelectric cell. The UV cell does not "see" daylight or light from an ordinary lamp. It is possible to verify its sensibility with a flame (or cigarette lighter or a candle) or with the electric spark that occurs between electrodes in an ordinary ignition transformer.
To ensure that the UV cell works properly, its current value should be sufficiently stable so as not to fall below the minimum value required for the specific control box. It may be necessary to search experimentally for the best position by sliding (axial or rotation movement) the body that contains the photoelectric cell in respect to the fastening clamp. An inspection can be carried out by inserting a microammeter, with an adequate scale, in series to one of the two UV photoelectric cell connection wires. It is obviously necessary to respect the polarity (+ e -). The minimum cell current value, to ensure the correct operation of the control box, is shiwn on the wirung diagram.

12) As soon as the burner is ignited at low flame (main flame valve open and modulator on minimum) make a visual inspection of the strength and appearance of the flame, making any corrections required (adjust the gas or air regulator screws on the modulating disk). The next step is to take a meter reading of the volume of gas put through the burner (see the "Meter Reading" section). If necessary, a further correction in the gas flow may be made as described above. Once fuel and air flow are satisfactorily regulated, a check must be made on combustion characteristics, using the appropriate instruments. If the air/gas ratio is correct the level of carbon dioxide ($CO_2$) per unit of fuel put through should be approximately - in the case of natural gas - 8% at minimum burner output, rising to an optimum 10% at maximum output. We recommend that the value of 10% should not be exceeded, as operation in too limited an excess of air can give rise to unacceptable carbon monoxide (CO) levels (due to variations in atmospheric pressure, or dust deposits in the air lines). It is essential to verify, using the appropriate instrument, that the percentage of CO in flue gases does not exceed the maximum permissible level of 0,1%.

13) After having regulated gas throughput for the minimum flame setting, set the modulation switches to “MAN” (manual) and “MAX” (maximum).

14) The modulating servo-motor will now start up. wait until the modulator disk has moved through an angle of about 12° (corresponding to the space occupied by three screws) and then interrupt modulation by turning the switch back to “O”. Make a visual check on the flame and if necessary regulate gas and air throughput rates using the regulator screws on the modulator disk. This procedure must be repeated throughout the whole modulation travel of the disk, making adjustments in air and gas throughput at 12° intervals. It is important to check that the gas and air flows rates rise gradually and that maximum rates are obtained at the end of the modulation range. This conditions is essential to ensure that the modulation provides smooth and gradual increase or decrease in burner output. If necessary, change the position of the screws controlling fuel throughput to obtain this result.

15) At this point, with the burner providing the maximum heat output required by the boiler, check combustion using the appropriate instruments and, if necessary, modify the previous setting made solely on the basis of visual inspection. ($CO_2$ max. = 10% which corresponds to an $O_2$ value of about 3% - CO max. = 0,1%).

16) It is very important to carry out an instrument assisted check on combustion and modify, where necessary, the initial visual setting, this must also be effected in a series of intermediate positions of the modulation range.

17) Now check that the modulation system is operating correctly by turning the AUT - O - MAN switch to “AUT” and the MIN - O - MAX switch to “O”. With this setting the modulation function will cut in automatically only in response to requests from the boiler detector. Under normal conditions there will be no need to alter the internal adjustment of the RWF 40 controller; in case this should become necessary, however, instructions have been included under a separate heading in this manual.

18) The air pressurestat has the task of locking out the burner when air pressure is not within the planned range. The pressurestat must therefore be set close (the contact is designed to be closed when the burner is operating) when the burner air pressure reaches the minimum permissible value. The air pressurestat circuit features a self-test function and incorporates a contact that should be closed when the burner is in the “rest” mode (fan idle, zero air pressure in burner):
ensure that this contact is made; if this is not the case the self-test and command circuit will not operate (the burner will not start). Note that if the contact designed to be closed during operation fails to close (insufficient air pressure), the appliance goes through the ignition cycle but the ignition transformer remains inhibited and the gas pilot valves will not open; the burner will consequently shut down in lockout. To check that the air pressurestat is operating correctly, steadily increase the pressurestat regulation value with the burner operating at minimum output until such a time as the pressurestat cuts in: the burner must immediately shut down in lockout. Reset the burner by pressing the “reset” button and return the pressurestat setting to a value that enables it to detect the air pressure created during the pre-purge stage.

19) The gas pressurestats (minimum and maximum pressure) prevent the burner from operating when gas pressure is not within planned range. Given the specific functions of these pressurestats, it follows that the minimum pressure control switch must utilize the contact that is closed when the switch detects pressure higher than its own setting. The maximum pressure control switch, on the other hand, must utilize the contact that is closed when the switch detects pressure lower than its own setting. Minimum and maximum gas pressurestats must be set during burner testing, in relation to the pressure values detected from time to time. The pressurestats are connected in series, therefore operation (i.e. opening of the circuit) of either one of the switches does not consent switch-on of the equipment. Correct gas pressurestat operation must be checked during burner testing. By using the adjustment devices, it can be verified whether the pressurestat that must stop the burner (by opening the circuit) effectively operates.

20) Check that the flame supervision device (UV photocell) is operating correctly by sliding it out of its seat on the burner and checking that the burner effectively locks out.

21) Check that the boiler thermostats or pressurestats are operating correctly they must cause the boiler to shut down when they cut in.

## USE OF THE BURNER

The burner operates fully automatically: it is activated by closing the main switch and the control board switch.
Burner operations are controlled by commend and control devices, as described in the chapter “Description of Operations”. The “shut down” position is a safety position automatically taken up by the burner when a particular part of the burner or of the system is inefficient. Therefore, it is good practice, before unblocking the burner and starting it up again, to check that there are no defects in the heating plant. The length of time that the burner rests in the “shut down” position is without limit.
To unblock the control box, press the appropriate pushbutton. “Shut down” can be caused by transitory flows (a little water in the fuel, air in the pipes, etc.); in these cases, if unblocked, the burner will start up normally. When, however, shutdowns occur repeatedly (3 or 4 times), do not persist in trying to unblock the burner, first check that there is fuel in the tank and then call the local service to repair the defect.

## SERVICING

The burners do not require particular servicing, it is good practice, however, that authorized personell performs the following operations, at least at the end of the heating season:

1) For gas burners, periodically check that the gas filter is clean.
2) Clean the combustion head by dismantling the blast pipe into its component parts.

Take care during reassembly that the ignition electrode is correctly positioned, checking that the spark jumps only between the electrode and the central drilled pilot flame disk.

## ADJUSTING AIR ON THE COMBUSTION HEAD

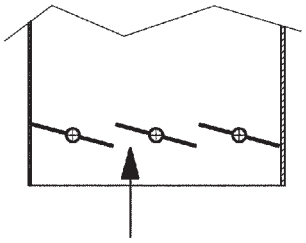
The combustion head is equipped with a device that automatically regulates the passage between the diffusor disk and the head, admitting combustion air to the head. This passage can be restricted to obtain high pressure upstream of the diffusor disk, even with low fuel throughput, so that high velocity and turbulence ensure that the air penetrates the gas more thoroughly, giving an optimum fuel/air mixture and a stable flame. With gas burners, it can be essential to have high air pressure on the diffusor inlet side if pulsation of the flame is to be prevented, especially where the burner operates in a high pressure combustion chamber, or in high thermal load conditions.

Accordingly, the head must be adjusted in such a way that a substantially high pressure is always generated upstream of the diffusor. It is recommended that the passage of air allowed through to the head be restricted in such a way that there is a generous opening of the air shutter regulating the air flow supplied by the burner fan. To achieve this, adjust the screws on the modulation disk.
When the regulation is complete, remember to tighten the screws locking the regulator screws.

## AIR FEEDING ADJUSTMENT PRINCIPLE DIAGRAM

N° 0002936230

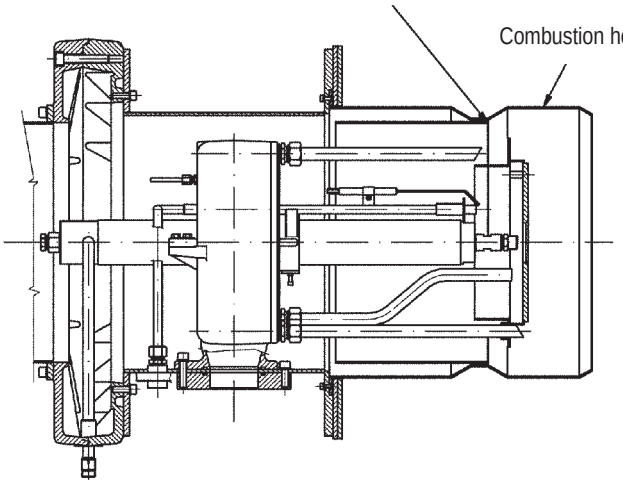
WRONG ADJUSTMENT



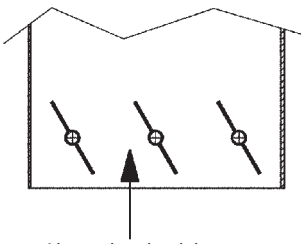
Air combustion inlet,
air gates very closed

Big air passage opening

Combustion head



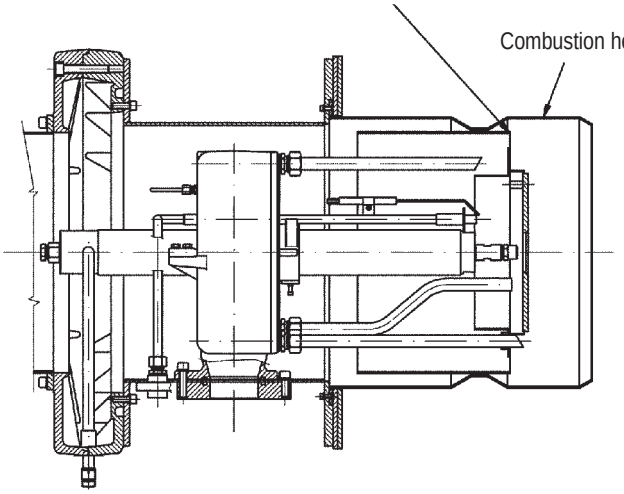
CORRECT ADJUSTMENT



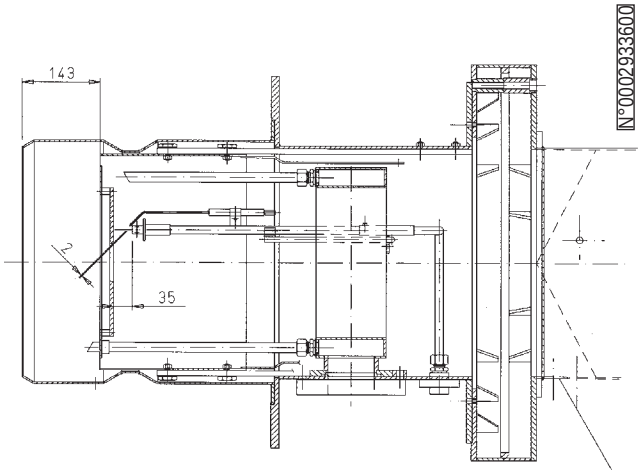
Air combustion inlet,
air gates sensibly open

Air passage relatively closed.
ATTENTION:
Avoid complete closure

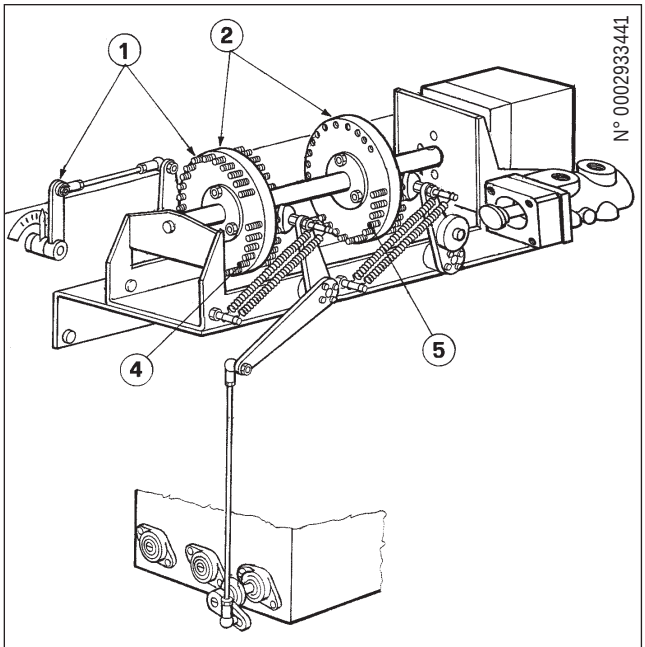
Combustion head



## BURNER GI 1000 DSPGN GAS PILOT ADJUSTMENT PRINCIPLE DIAGRAM



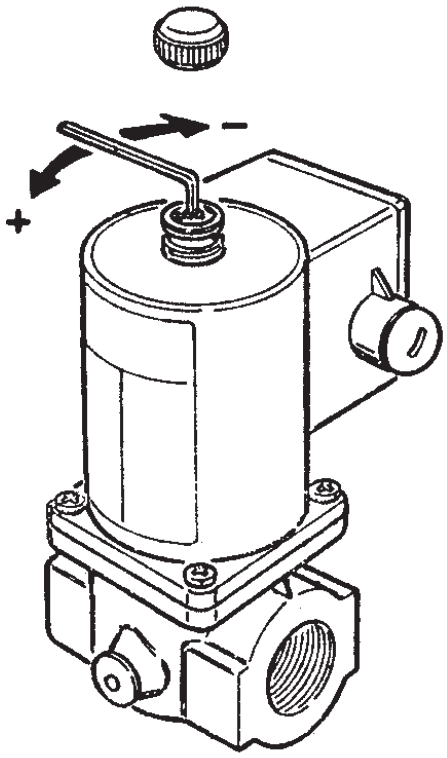

## BURNER MODEL GI 1000 DSPGN MODULATION GROUP DETAIL WITH SERVOMOTOR




1 - Device for the air regulation at the head
2 - Modulating disks
4 - Air combustion gate adjustment screws
5 - Butterfly valve, controlling the gas delivery, adjustment screws
6 - Butterfly valve, controlling the gas delivery adjustment, minimum position micro-switch cam

## INSTRUCTIONS FOR HONEYWELL GAS VALVES UNIVERSAL GAS VALVES TYPE: VE 4000B1 (....B.... = OPENING - CLOSURE, RAPID. FLOW REGULATOR)

**fig.1**




*FEATURES*

- Valve normally closed
- With flow regulator
- Rapid opening and closing

The VE4000B1 valves are Class A solenoid valves, normally closed. They may be used as ON/OFF valves in the supply trains with Natural Gas, Manufactured Gas or GPL, on burners or combustion plants.
They are provided with M.I. and CE Approval for EN 161.

*ADJUSTMENT*
For models VE 4000B1 (see fig. 1)

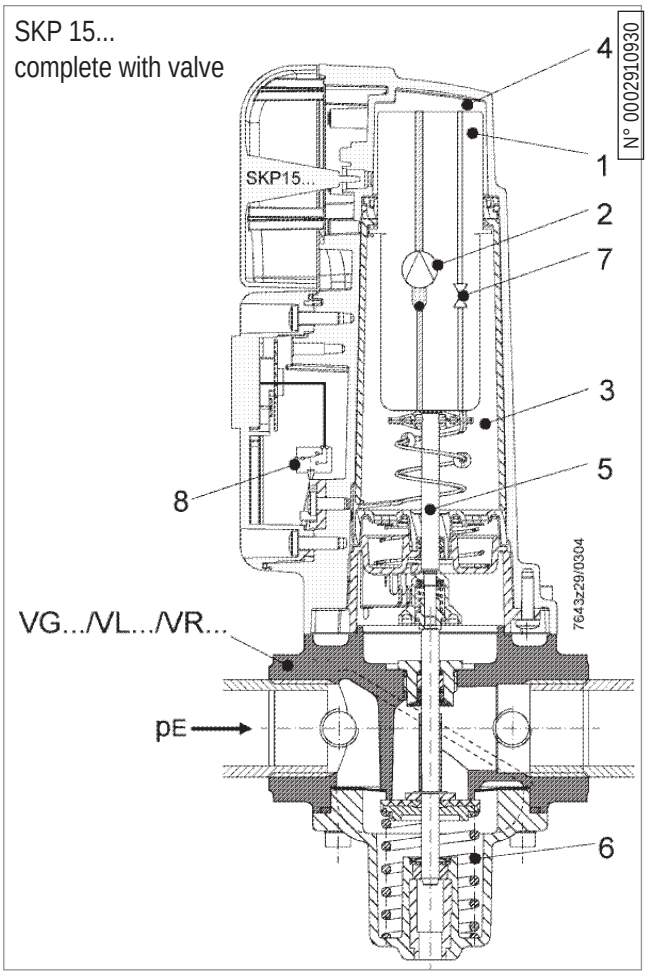
**Adjustment to the flow**

- Remove the cover from the upper section of the coil.
- Insert a hexagonal Allen key into the central section at the top.
- Turn clockwise to decrease the flow or anti-clockwise to increase it.
- Replace the cover and tighten it.

*ATTENTION*

- The adjustment must only be carried out by qualified personnel.
- Per la chiusura della valvola è necessario che la tensione ai terminali della bobina sia 0 volt.
- The flow regulator of the VE 4100 valve series is situated in the lower section.

# INSTRUCTIONS FOR SETTING SIEMENS SKP 15.000 E2 GAS VALVE




## DESCRIPTION OF HOW THE VALVE OPERATES

### Single-stage valves

When the valve receives the signal to open, the pump cuts in and the magnetic valve closes. The pump transfers the oil from under the piston to above it, forcing the piston downward, which compresses the closure return spring with the rod and plate. The valve remains in the open position while the pump and magnetic valve remain powered.

When the unit receives the signal to close (or if power supply is cut off) the pump shuts down, the magnetic valve opens decompressing the chamber above the piston. The plate is closed both by the return spring and by gas pressure. The flow rate for this valve is calculated to ensure full closure in less than 0.6 seconds.

This type of valve cannot regulate the gas flow rate (closure/ opening).

# INSTRUCTIONS FOR REGULATING SIEMENS GAS VALVE SKP 25.003 E2 WITH PRESSURE REGULATOR

N° 0002910940

## EXECUTION

### Servo motor

The hydraulic control system consists of a cylinder full of oil and a pump with oscillating piston. There is also a solenoid valve between the aspiration chamber and the pump thrust chamber, for closure. The piston moves on a liquid tight joint in a cylinder that at the same time hydraulically separates the suction chamber from the delivery chamber. The piston transmits the movement of the stroke directly to the valve. A red scale that is visible through a transparent slit in the body of the servo motor indicates valve travel.

### Pressure regulator

The pressure regulator consists of a membrane (there is a safety supplementary membrane), a spring of the prescribed calibre and an oscillating system that activates a ball valve on the by-pass between the suction chamber and the hydraulic system delivery (see also the section"). "Working"). Regulation field: 0...22 mbar or (on spring replacement) up to 250 mbar. The set value adjustment can be placed under seal. Rp 1/4 gas pressure take-off.

The maximum input pressure depends on the valve diameter.

For diameters of 3/4" and 1" the maximum input pressure is 1200 mbar.

For diameters of 1"1/2 and 2" the maximum input pressure is 600 mbar:

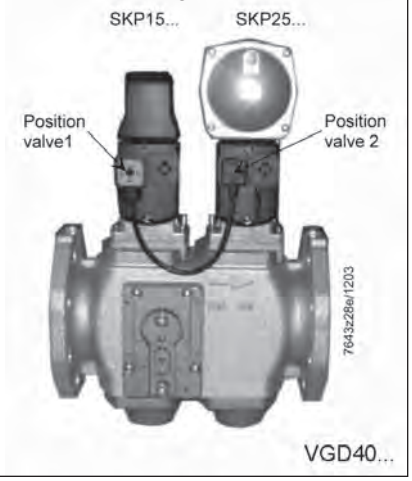
For diameters DN 65 and DN 80 the maximum input pressure is 700 mbar.

Where there is seal control a depression of up to 200 mbar can be withstood. The body of the servo motor and of the pressure regulator are made of die-cast aluminium.

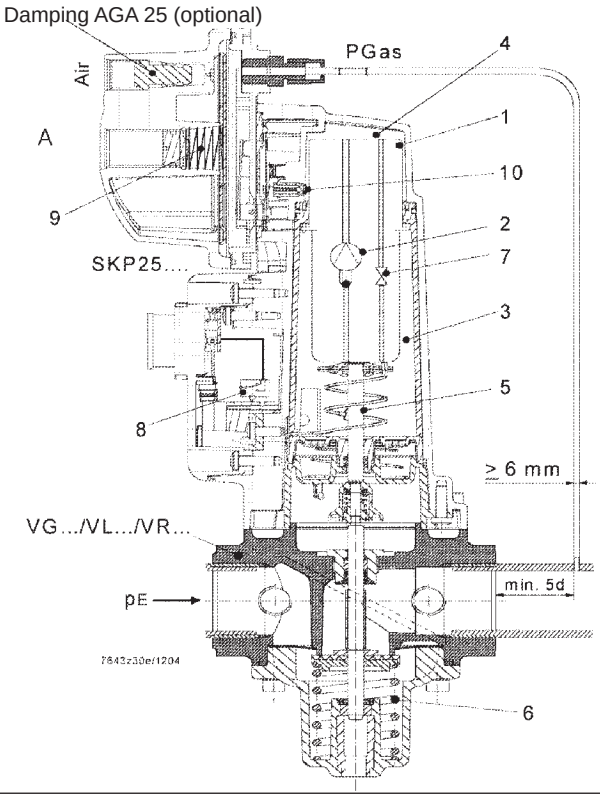
### Functioning of valve with pressure regulator

Using the valve with pressure regulator, the valve's outlet pressure acts as a comparative value on a membrane assisted by a spring. The resistance of the spring can be adjusted an constitutes the "prescribed value" (set pressure value). The membrane acts by means of an oscillating system on a by-pass ball valve between the upper chamber and the servo-control. If the comparative value is lower than the prescribed value, the by-pass is then closed so that the servocontrol can open the gas valve. If, on the other hand, the comparative value is greater than the prescribed value, the by-pass is to a greater or lesser extent open so that the oil can go to the lower chamber; the gas valve progressively closes until when the prescribed value and the comparative value of the pressure are the same. In this state of balance, the by-pass is open so that its flow capacity is equal to that of the pump. In this way the regulator acts as a proportional regulator over a very narrow band. The adjustment is nevertheless stable since the speed of travel variations is limited. Removing the screwed plug gives access to screw "A" which adjusts the pressure. Tighten to increase the pressure or slacken to reduce the pressure.

SKP 15../ 25.. with connecting cable AGA62.000A000




SKP 25... complete with valve

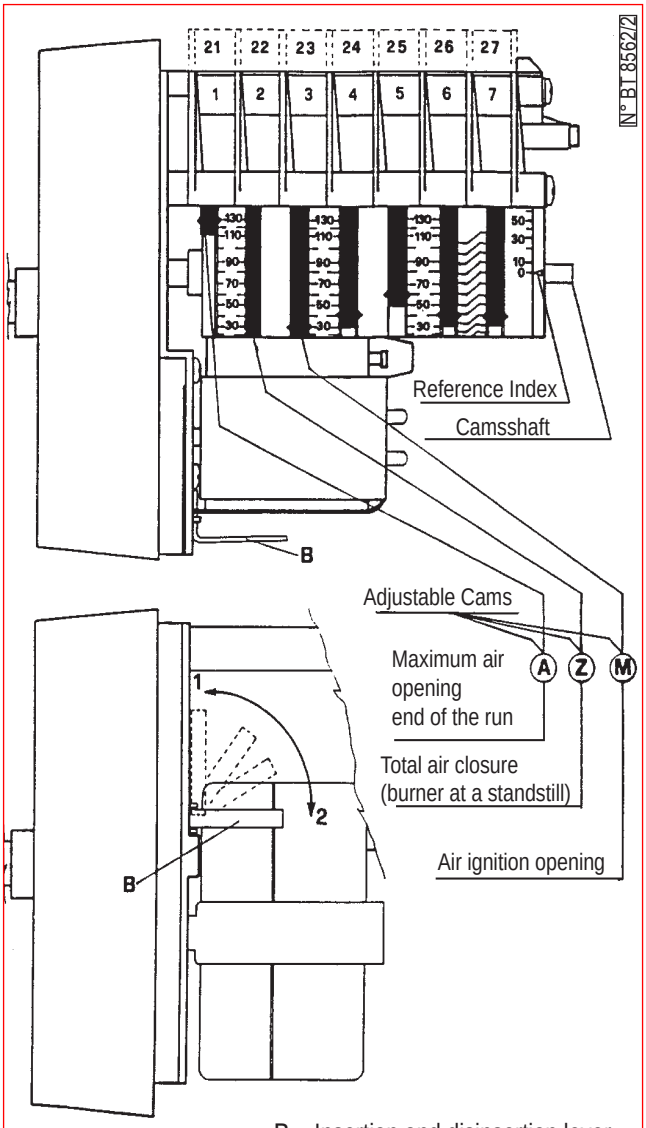



Legend:

| | | | |
|---|---|---|---|
| 1 | Piston | 6 | Closing spring |
| 2 | Oscillating pump | 7 | Work valve |
| 3 | Oil tank | 8 | Limit switch (optional) |
| 4 | Pressioner chamber | 9 | Adjustment spring |
| 5 | Shaft | 10 | Ball valve |

| type | P gas (in delivery) (mbar) | Spring colour |
|---|---|---|
| -- | 0... 22 | bright |
| AGA22 | 15...120 | yellov |
| AGA 23 | 100...250 | red |

## DETAILS OF THE MODULATION CONTROL MOTOR SQM 10 AND SQM 20 FOR REGULATION OF CAMS




B = Insertion and disinsertion lever motor connection Camshaft

Position 1 = Disinsertion
Position 2 = Insertion

To modify the regulation of the 3 cams utilized, operate the respective red rings ( A - Z - M ).
By pushing with enough force, in the direction desired, each red ring will rotate with respect to the reference scale. The index of the red ring indicates on the respective reference scale the rotation angle taken up for each cam.

## INSTRUCTIONS LFL 1.... CONTROL BOX

Control box for burners of average and high power, with forced draught, intermittent service (*), 1 or 2 stages, or modulating types, with supervision of the air pressure for controlling the air damper.
This control box bears the EC mark, in accordance with the Gas and Electromagnetic Compatibility Directive.
* For reasons of safety, it is necessary to make at least one controlled stop every 24 hours!

*As regards the standards*

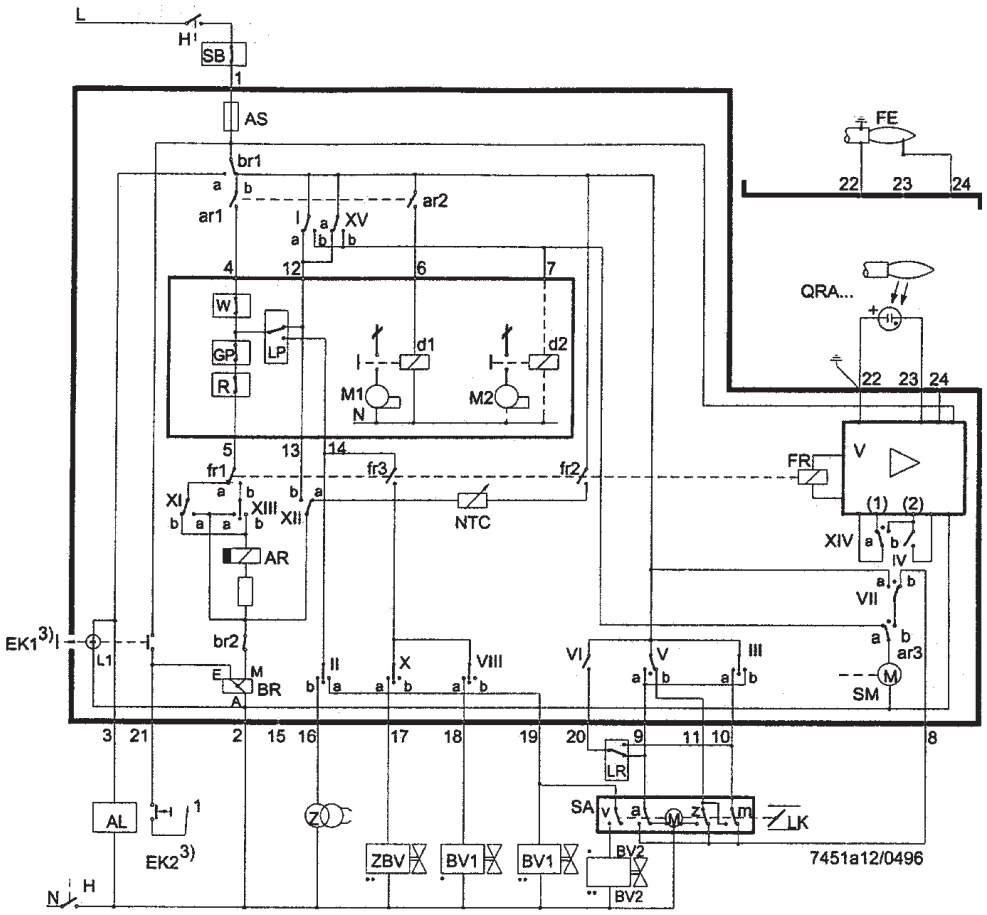
The following LFL1... features exceed the standards, offering a high level of additional safety:

- The flame detector test and false flame test start immediately after the tolerated post-combustion time. If the valves remain open, or do not close completely after adjustment stops, a lock-out stop is triggered at the end of the tolerated post-combustion period. The tests will end only at the end of the pre-ventilation time of the next start-up.
- The validity of working of the flame control circuit is checked each time the burner starts up.
- The fuel valve control contacts are checked for wear during the post-ventilation time.
- A built-in fuse in the appliance protects the control contacts from any overloads that may occur.

*As regards the burner control*

- The equipment allows operation with or without post-ventilation.
- Controlled activation of the air damper to ensure pre-ventilation with nominal airflows. Positions checked: CLOSED or MIN (position of ignition flame on start-up); OPEN at the beginning and MIN at the end of the pre-ventilation time. If the servomotor does not position the air damper at the points described, the burner does not start-up.
- Ionization current minimum value = 6mA
- UV cell current minimum value = 70mA
- Phase and neutral must not be inverted.
- Any place may be used for installation and assembly (IP40 protection).

## Electrical connections




The burner manufacturer's diagram is valid for the relief valve connections.

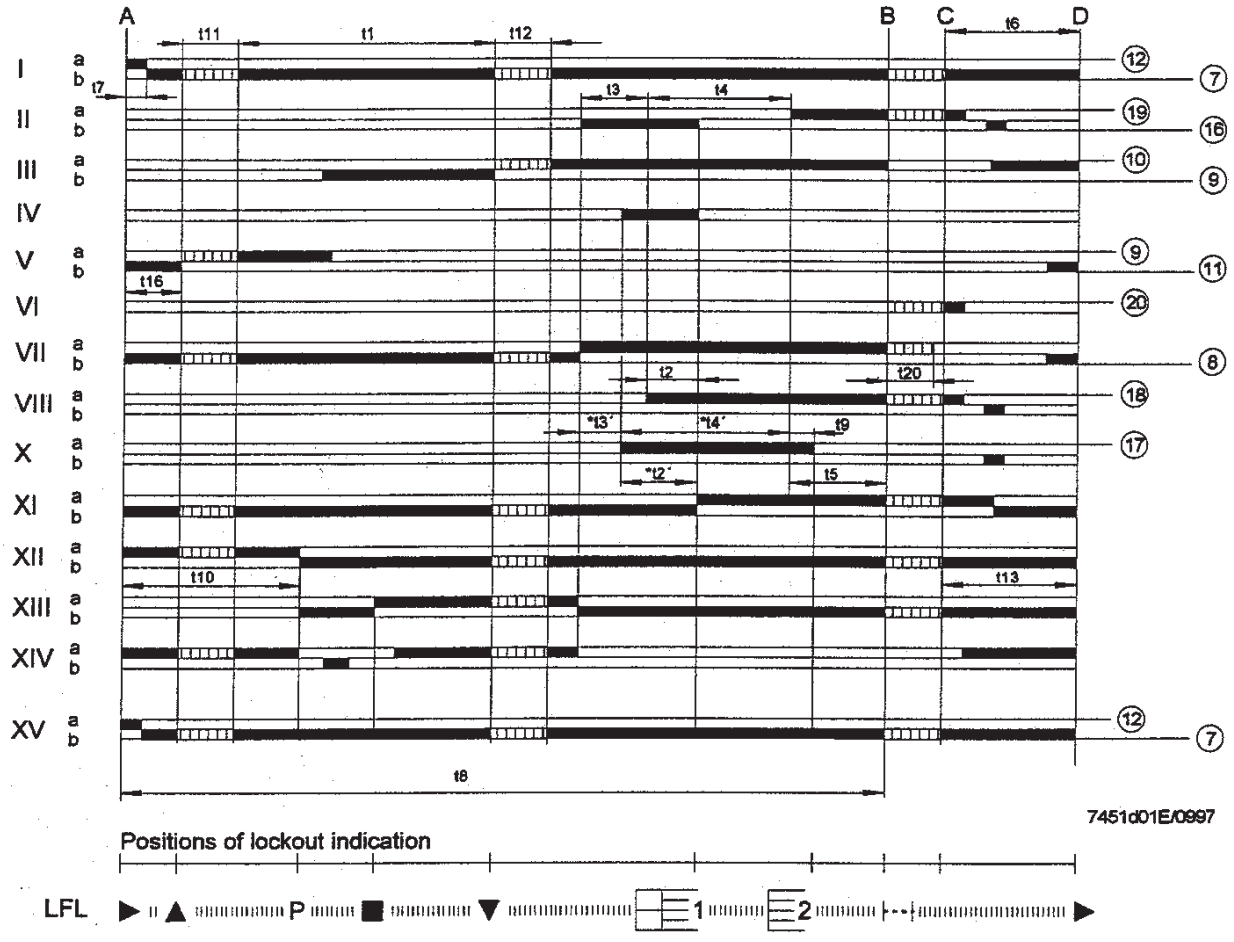
LEGEND

For the entire catalogue sheet

| | |
|---|---|
| a | Limit switch commutation contact for air damper OPEN position |
| AL | Remote signalling of lock-out stop (alarm) |
| AR | Main relay (operating relay) with "ar..." contacts |
| AS | Appliance fuse |
| BR | Lock-out relay with "br..." contacts |
| BV | Fuel valve |
| bv... | Control contact for gas valve CLOSED position |
| d... | Remote control switch or relay |
| EK... | Lock-out push-button |
| FE | Ionization current probe electrode |
| FR | Flame relay with "fr..." contacts |
| GP | Gas pressure switch |
| H | Main switch |
| L1 | Fault indicator light |
| L3 | Ready for operation indicator |
| LK | Air damper |
| LP | Air pressure switch |
| LR | Power regulator |
| m | Auxiliary commutation contact for air damper MIN position |
| M... | Motor fan or burner |
| NTC | NTC resistor |
| QRA.. | UV probe |
| R | Thermostat or pressure probe |
| RV | Fuel valve with continuous regulation |
| S | Fuse |
| SA | Air damper servomotor |
| SB | Safety limiter (temperature, pressure, etc.) |
| SM | Programmer synchronous motor |
| v | In the case of servomotor: auxiliary contact for consensus for fuel valve depending on air damper position |
| V | Flame signal amplifier |
| W | Thermostat or safety pressure switch |
| z | In the case of servomotor: limit switch commutation contact for air damper CLOSED position |
| Z | Ignition transformer |
| ZBV | Pilot burner fuel valve |
| • | Valid for forced draught burners, with obe tube |
| •• | Valid for pilot burners with intermittent operation |
| (1) | Input for increasing operating voltage for UV probe (probe test) |
| (2) | Input for forced energizing of flame relay during functional test of flame supervision circuit (contact XIV) and during safety time t2 (contact IV) |
| 3) | **Do not press EK for more than 10 seconds** |

**Notes on the programmer**
**Programmer sequence**

Output signals on terminal




## Times Legend

time (50 Hz) in seconds

| | | |
|---|---|---|
| 31.5..... | t1 | Pre-ventilation time with air damper open |
| 3..... | t2 | Safety time |
| - ..... | t2' | Safety time or safety time with burners that use pilot burners |
| 6..... | t3 | Short pre-ignition time (ignition transformer on terminal 16) |
| - ..... | t3' | Long pre-ignition time (ignition transformer on terminal 15) |
| 12..... | t4 | Time between beginning of t2' and valve consensus on terminal 19 with t2 |
| - ..... | t4' | Time between beginning of t2' and valve consensus on terminal 19 |
| 12..... | t5 | Time between end of t4 and consensus at power regulator or at valve on terminal 20 |
| 18..... | t6 | Post-ventilation time (with M2) |
| 3..... | t7 | Time between consensus for start-up and voltage at terminal 7 (start delay for fan motor M2) |
| 72..... | t8 | Start-up duration (without t11 and t12) |
| 3..... | t9 | Second safety time for burners that use pilot burners |
| 12..... | t10 | Time from start-up to beginning of air pressure control without air damper travel time |
| | t11 | Air damper opening travel time |
| | t12 | Air damper in flow flame position (MIN) travel time |
| 18..... | t13 | Permitted post-combustion time |
| 6..... | t16 | Initial delay of consensus for air damper OPENING |
| 27..... | t20 | Time up to automatic closure of programmer mechanism after burner start-up |

**NOTE:** With voltages at 60 Hz, the times are reduced by about 20%.

**t2', t3', t3':**
These times are valid **only** for **series 01** or LFL1.335, LFL1.635, LFL1.638 burner control and command equipment. They are not valid for types of Series 032, since they involve **simultaneous activation of cams X and VIII**.

## Working

The above diagrams illustrate both the connection circuit and the sequencer mechanism control program.

**A** Consensus for start-up by means of installation thermostat or pressure switch "R".

**A-B** Start-up program

**B-C** Normal burner operation (on the basis of "LR" power regulator control commands)

**C** Stop controlled by "R"

**C-D** Return of programmer to start-up position "A", post-ventilation.
During periods of inactivity of the burner, only the command outputs 11 and 12 are powered, and the air damper is in the CLOSED position, determined by limit switch "z" of the air damper servo motor. During the probe test and false flame test, the flame supervision test is also powered (terminals 22/23 and 22/24).

### Safety standards

- In association with the use of QRA..., earthing of terminal 22 is compulsory.
- The power cables must conform to existing national and local standards.
- LFL1... is a safety device, and it is therefore forbidden to open it, tamper with it or modify it!
- The LFL1... device must be completely insulated from the mains before carrying out any operations on it!
- Check all the safety functions before activating the unit or after replacing a fuse!
- Provide protection against electric shock on the unit and all electric connections. This is ensured by following the assembly instructions correctly!
- During operation and maintenance, prevent infiltration of condensate into the command and control equipment.
- Electromagnetic discharges must be checked on the application plan.

Control program in the event of stopping, indicating position of stop
As a rule, in the event of any kind of stop, the fuel flow is cut off immediately. At the same time, the programmer remains immobile, as does the switch position indicator. The symbol visible on the indicator reading disk indicates the type of fault.

◀ No start-up, because of failure in closing of a contact or lock-out stop during or at the end of the command sequence because of external lights (for example: flames not extinguished, loss at the level of the fuel valve, defects in the flame control circuit, etc.)

▲ Start-up sequence stops, because the OPEN signal was not sent to terminal 8 by limit switch contact "a". Terminals 6, 7 and 15 remain powered until the defect is eliminated.

P Lock-out stop, because of lack of air pressure signal. Any lack of pressure from this moment onwards will cause a lock-out stop!

■ Lock-out stop because of flame detection circuit malfunction.

▼ Start-up sequence stops, because the position signal for low flame was not sent to terminal 8 by auxiliary switch "m". Terminals 6, 7 and 15 remain powered until the fault is eliminated.

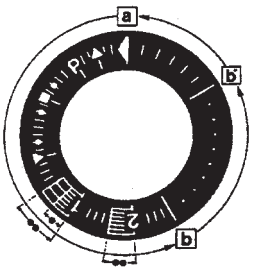
1 Lock-out stop, due to lack of flame signal at the end of the first safety time.

2 Lock-out stop, because no flame signal was received at the end of the second safety time (main flame signal with pilot burners at intermittent operation).

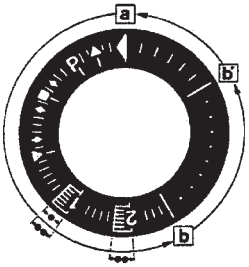
| Lock-out stop, due to lack of flame signal during burner operation.

If a lock-out stop occurs at any moment between the start and pre-ignition without a symbol, the cause is generally to be attributed to a premature or abnormal flame signal caused, for example, by self-ignition of
a UV tube.

### Stop indications




**LFL ..., Series 01**




**LFL ..., Series 02**

**a-b** Start-up program
**b-b'** "Trips" (without contact confirmation)
**b(b')-a** Post-ventilation program

## LDU 11.. GAS VALVE TIGHTNESS CONTROL EQUIPMENT

### Use

LDU 11 equipment is used to verify tightness of valves on natural gas burners.
The LDU 11 combined with a normal pressure switch automatically verifies tightness of natural gas burners valves, before every start up and immediately after each stop. Tightness control is carried out by two-stage verification of gas circuit pressure in the section between the two burner valves.

### Operation

During the first stage of the tightness control (TEST 1), the pipeline between the valves being checked must be at atmospheric pressure. In plant without atmospheric pressure setting pipes, this pressure is achieved by tightness control equipment. The latter opens the valve on the furnace side for 5 seconds during "**t4**" time.
When the 5 seconds are up, the furnace side valve is closed. During the first phase (**TEST 1**) the control equipment ensures that atmospheric pressure in the pipes is kept constant.
Surveillance is carried out by the "**DW**" thermostat.
If there is blow-by in the safety valve while closing, pressure increases and as a result the "**DW**" pressure switch operates. For this reason, in addition to indicating pressure, the equipment goes into fault state and the position indicator stops blocked in the "**TEST 1**" position (red pilot lamp lit).
Vice-versa, if pressure does not increase because there is no blow-by in the relief valve as it closes, the equipment immediately programmes the second stage "**TEST 2**".
Under these conditions, the relief valve opens for 5 seconds during "**t3**" time and introduces gas pressure into the pipeline ("filling operation"). During the second verification stage, this pressure must remain constant. Should it drop, this means that the burner on the furnace side has a blow-by (fault) when closing.Therefore the "**DW**" pressure switch operates and the tightness control equipment prevents burner start-up and stops in blocked state (red pilot lamp lit). If second stage verification is positive, the LDU 11 equipment closes the internal control circuit between terminals **3** and **6** (terminal **3** - contact **ar2** - outer cross-connection for terminals **4** and **5** - contact **III** - terminal **6**). This is the circuit that usually enables the equipment start-up control circuit. After circuit between terminals **3** and **6** has closed, the LDU 11's programmer returns to rest position and stops. This means it enables fresh verification without changing the position of the programmer's control contacts.

**N.B.** Adjust the "**DW**" pressure switch to about half the pressure of the gas supply network.

**Key to symbols:**

**}** Start-up = operating position

In plants without a bleed valve = test circuit put under atmospheric pressure by opening of valve on the furnace side of the burner.

**TEST 1** "TEST 1" pipeline at atmospheric pressure (blow-by verification at closure of relief valve)

Putting test circuit gas under pressure by opening of relief valve

**TEST 2** "TEST 2" pipeline at gas pressure (blow-by verification of valve on furnace side of burner)

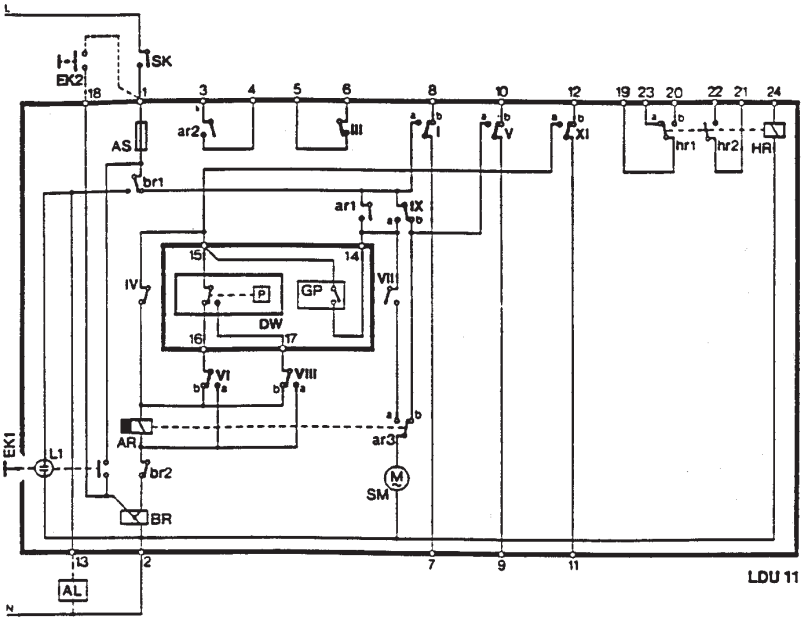
**III** Automatic zero (or inoperative mode) reset of programmer

**}** Operation = set for new blow-by verification

If trouble is signalled, there is no voltage in all control equipment terminals excepting terminals **13** which gives remote, visual indication of trouble. When verification is over, the programmer automatically returns to rest position, and is ready to carry out a further programme for checking tightness of valves as they close.

Control programme

| | | |
|---|---|---|
| $t_4$ | 5s | Putting control circuit under atmospheric pressure |
| $t_6$ | 7,5s | Time between start-up and energizing of main “AR” relay |
| $t_1$ | 22,5s | 1st verification stage at atmospheric pressure |
| $t_3$ | 5s | Putting control circuit gas under pressure |
| $t_2$ | 27,5s | 2nd verification stage at gas pressure |
| $t_5$ | 67,5s | Total time of tightness control, up to burner operation consent |
| $t_{20}$ | 22,5s | Return of programmer to rest position = fresh verification is enabled |




AL remote alarm signalling

AR main relay with “ar” contacts

AS equipment fuse

BR blocking relay with “ar” contacts

DW outer pressure switch (tightness control)

EK... unblocking button

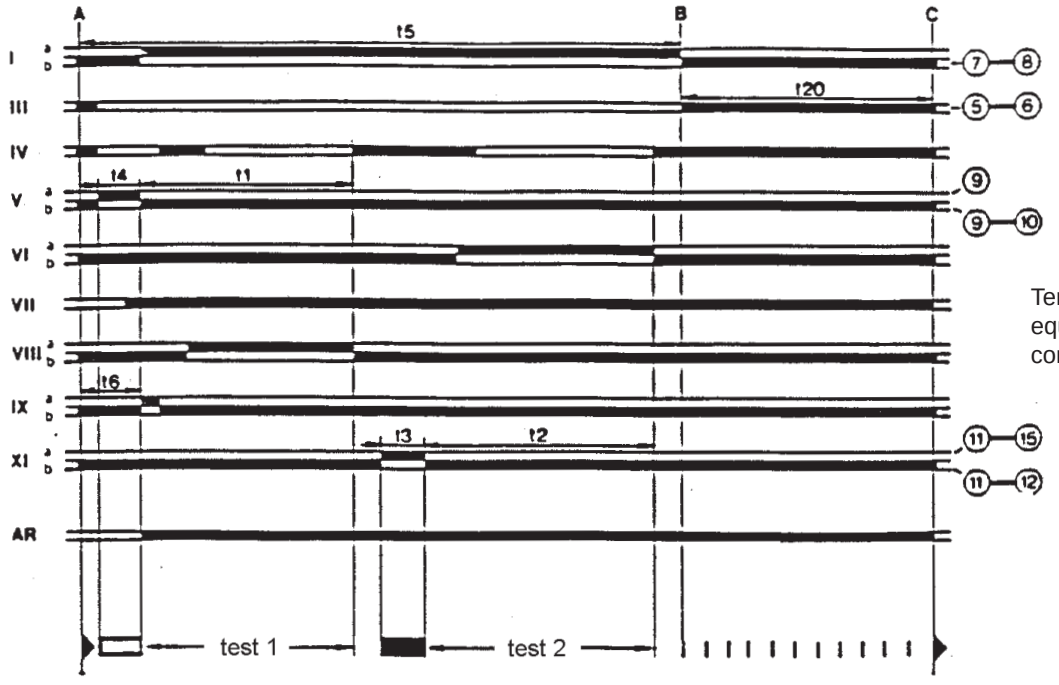
GP outer pressure switch (for mains gas pressure)

HR auxiliary relay with “ar” contacts

L1 equipment trouble signalling lamp

SK line switch

I...XI programmer cam contacts




Course of programme

Terminals activated by equipment or by electric connections

## INSTRUCTIONS FOR ASCON ELECTRONIC TEMPERATURE CONTROLLER MODEL MS 30/099 FOR HEAVY OIL IN BURNER PREHEATER(S)

The “MS 30” electronic controller cab be used in various ways and must be correctly programmed (configured) as a function of the use that is to be made of it. Use and configuration will depend on the number of electric preheaters on the burner.

When supplied to us by the manufacturer ASCON, the new controller has not been configured (configuration 9999) and is therefore not able to perform the function required. Likewise, when the controller is ordered from us as a “replacement” or “spare”, it is not capable of performing the function in question.
The “MS 30” electronic regulator uses two output circuits, Y1 and Y2.
Circuit Y1 controls 1 or 2 preheaters using proportional, integral, derivative (PID) regulation.
Circuit Y2 controls 1 or 2 preheaters with ON – OFF regulation.

### Using the “MS 30” regulator with just one electric preheater

The regulator uses contact Y1 (proportional, integral, derivative regulation known as PID regulation) as a regulation thermostat to control the preheater elements, while contact Y2 (ON-OFF regulation) is used as a minimum thermostat.

Configuration for one electric preheater

| | | | |
|---|---|---|---|
| C = 1 | D = 0 | E = 4 | F = 5 |

Indicative parameters

| | | |
|---|---|---|
| SP = 130.0 °C | t.d. = 0.8 minutes | S.P.L.1 = 100 °C |
| SP.2 = 110.0 °C | t.c. = 10 seconds | S.P.L.h. = 250 °C |
| P.b. = 6 % | Yh = 100% | SLOP = 0 |
| t.i. = 4 minutes | Hy.2 = 1% | |

To all intents and purposes, this configuration is suitable for most users, but we cannot exclude the possibility of changes being necessary in certain cases.

### Using the “MS 30” regulator with two or more electric preheaters

It should be noted that the two or more preheaters constitute two or more resistor arrays.
One array is controlled by circuit Y1 of the controller (PID control = Proportional, Integral, Derivative). The other array is controlled by circuit Y2 of the controller (ON - OFF control).The two or more preheaters are hydraulically connected in series. The preheater that the fuel first enters must be controlled by circuit Y2 (ON - OFF control, approximately 110 °C). The fuel leaves the first preheater heated to 110 °C and enters the second that is controlled by circuit Y1 (PID control, approximately 130 °C). In the second preheater, the temperature of the fuel is increased to 130 °C.

Configuration for two or more electric preheaters

| | | | |
|---|---|---|---|
| C = 1 | D = 0 | E = 4 | F = 6 |

Indicative parameters

| | | |
|---|---|---|
| SP = 130.0 °C | t.d. = 0.8 minutes | S.P.L.1 = 100 °C |
| SP.2 = 110.0 °C | t.c. = 10 seconds | S.P.L.h. = 250 °C |
| P.b. = 6 % | Yh = 100% | SLOP = 0 |
| t.i. = 4 minutes | Hy.2 = 1% | |

To all intents and purposes, this configuration is suitable for most users, but we cannot exclude the possibility of changes being necessary in certain cases.

CONFIGURATION
This operation enables setting of controller functions C - D - E - F in accordance with required use; The number specified in the table above is set for each function.
C = 1 = Use of probe PT 100 (temperature can be set within the range - 100 to + 300 °C).

D = 0 = Use of relay output Y1 (3A - 250V), terminals 13 - 14.

E = 4 = “Reverse” control of circuit Y1, contact closed with probe “cold” and open with probe “hot”. PID control (Proportional, Integral, Derivative). Safety = 0% = in case of failure of probe PT 100, contact Y1 opens and therefore cuts off power supply to the load (contactor and thyristor that controls the resistors).

F = 5 = ON-OFF control (independent of Y1) for circuit Y2, terminals 11 - 12. Contact closed with probe “hot” (active high) and therefore contact open with probe “cold”.

F = 6 = ON - OFF control (independent from Y1) for circuit Y2, terminals 11 - 12. Contact closed with probe “cold” (active low) and contact open with probe “hot”.

HOW TO USE THE KEYS:

F Press once to move to the next function. Press repeatedly to return to the previous function.

► Press once to enable changes starting with the last figure on the right that begins to flash. Press again to confirm and enter the flashing figure.

◄ Press in order to move to the figure on the left that begins to flash and at the same confirm (enter) the flashing figure.

◄ Press to alter the flashing figure.

WARNING: The time available after pressing a key is 10 seconds. After10 seconds have passed, the display returns to its initial position.

In order to proceed with configuration, the controller must be fitted to the switchboard and connected to both probe PT 100 and the power supply (230V).
The display lights up (numbers and/or letters). Press F key repeatedly until obtaining the wording ConF. Press key twice and the wording PASS will appear (at the bottom) and 9999 (at the top) with the last 9 on the right flashing.
It is necessary to enter the PASSword (access password = 3333).

1) Press ▲ key and the flashing figure will change, press key again until obtaining 3. Press ◄ to confirm the flashing 3 that becomes fixed. It is now possible to edit the figure further to the left that begins to flash. Press ▲ key in order to change the figure now flashing to 3 and then ◄ in order to confirm this value and move to the figure further to the left. This operation must be repeated until obtaining the number 3 four times = 3333. Press ► **key to confirm the** PASSword. We are now **in a position to configure or reconfigure the controller.** For one electric preheater you need to set n° 1045. For two or more preheaters you need to set n° 1046.

2) At this point go through the procedure illustrated in point 1 to set n° 1045 or n° 1046.

3) We can now set parameters (control values) as detailed in the previous table.

4) Press F key, repeatedly if necessary, until the wording SP appears. Press ► key and the figure furthest to the right will start to flash. Next proceed as per point 1 in order to enter the required value (130 °C). Having set the desired temperature, press ► to confirm and the temperature setting will appear at the bottom of the display.

5) It is now necessary to set value SP.2. Press F key repeatedly until wording Par appears. Press ► key to confirm and the wording SP.2 will appear. Proceed as per point 1 in order to set value given in the table for SP.2 = 110 °C.

6) Press F key and the wording Pb will appear. Proceed as per point 1 in order to set table value = 6. Press ► to confirm this value and the wording t.i will appear.

7) Proceed as previously described in order to set value t.i = 4 as per table. Press ► to confirm this value and move to t.d.

8) Proceed as previously described in order to set value t.d. = 0.8 as per table. Press ► to confirm this value and move to t.c.

9) Proceed as previously described in order to set value t.c. = 10 as per table. Press ► to confirm this value and move to Yh.

10) Proceed as previously described in order to set value Yh = 100 as per table. Confirm this value by pressing ► and the display will return to Pb.

11) Press F key in order to move to Hy2. Proceed as per point 1 and set value Hy2 = 1. Press ► key to confirm and remain at Hy2.

12) Press F key in order to move to SPL 1. Proceed as before and set SPL 1 = 100 °C. Press ► to confirm and move to SPL h. Set SPL h = 250 °C in the usual manner. Press ► to confirm and move to SLOP.

13) Proceed as before in order to set SLOP = 0 and confirm with ► key. The controller is now configured and capable of functioning using set values. Should it be necessary to modify any temperature setting, proceed as previously described at specific points 4 for SP and 5 for SP2.

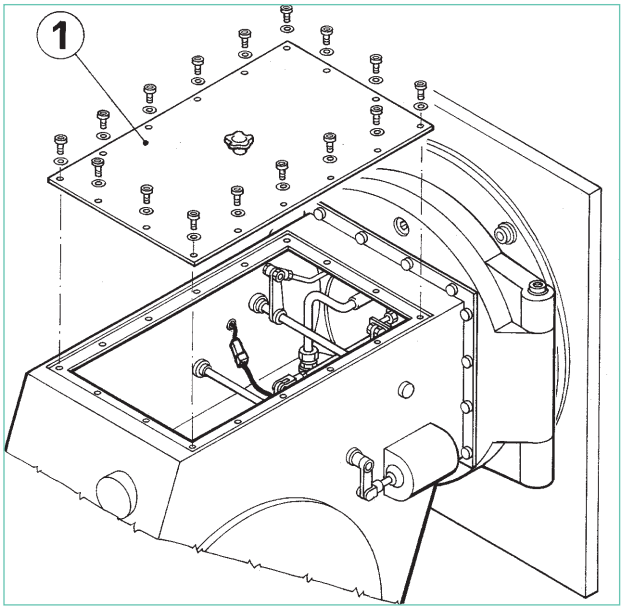
! The controller is supplied with the instructions given by the manufacturer ASCON that contain the respective “flow diagram”.

14) Proceed as follows if wishing to check the default configuration set by us (1045 or 1046):

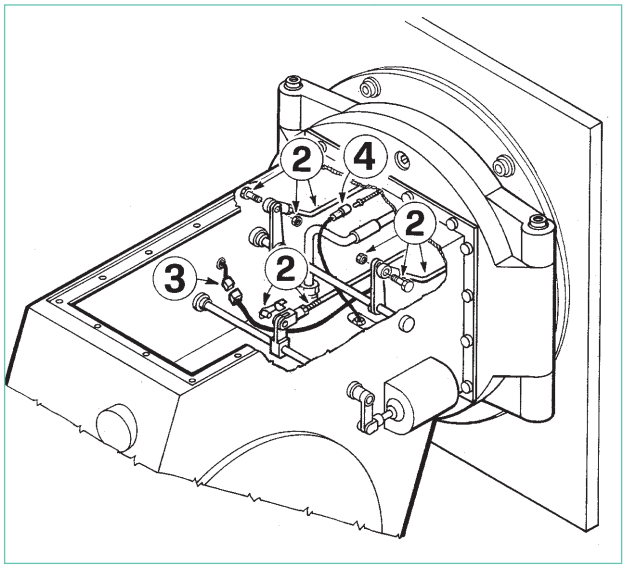
Press F key repeatedly until the wording ConF appears. Press ► key once and the configuration set will appear (1045 or 1046 - Conf.). From this position, if wishing to alter the configuration press ► once and the wording 9999 - PASS will appear (9 furthest to the right flashing). It is necessary to enter the PASSword (= 3333) as described at point 1. It is now possible to change the configuration if desired by following the instructions of point 1.

## OPENING THE BURNER - DISMOUNTING OF THE ATOMIZING GROUP AND FLAME DISK

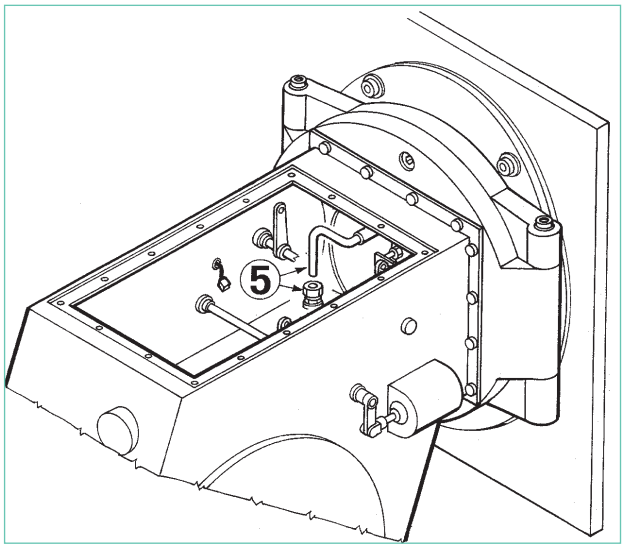
N° 0002933430



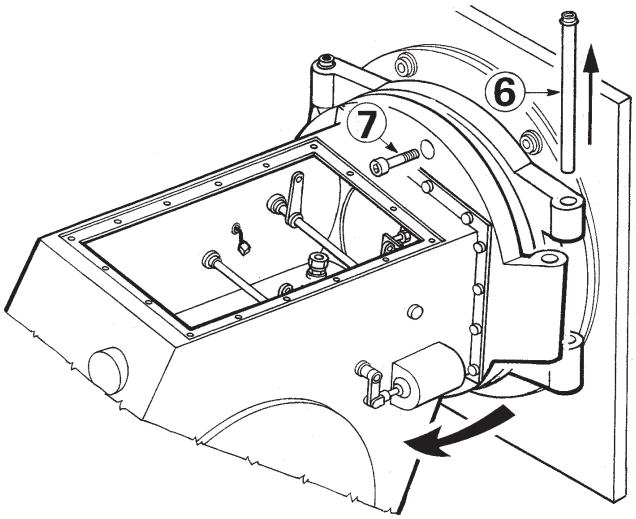

1 - Take out the burner cover



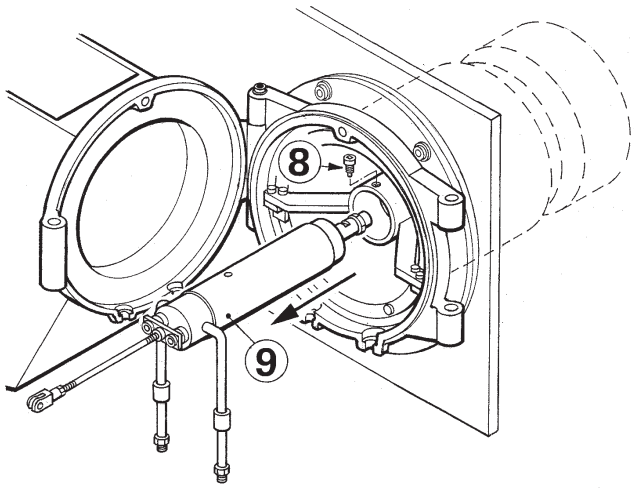

2 - Disconnect the atomising group and head tie rods
3 - Disconnect the heating element connector
4 - Disconnect the ignition electrode cable



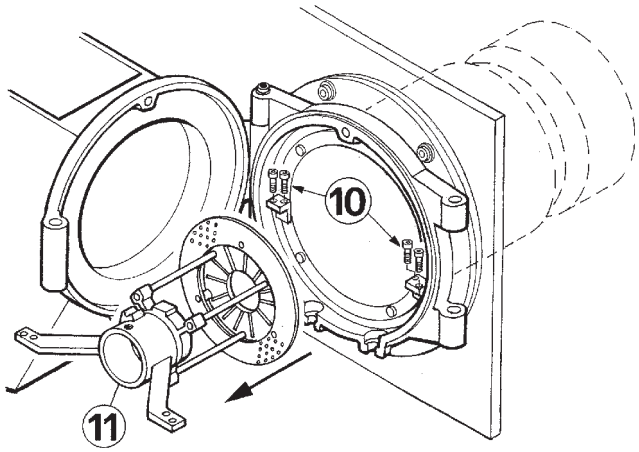

5 - Unscrew the Woss coupling nut to take out the pilot tube




6 - Take out the hinge pivot
7 - Take out the hinge upper screw and open the burner




8 - Take out the blocking screw of the atomising group
9 - Take out the atomising group to dismount the nozzle




10 - Take out the four fixing screws of the group holder
11 - Take out the group holder and flame disks

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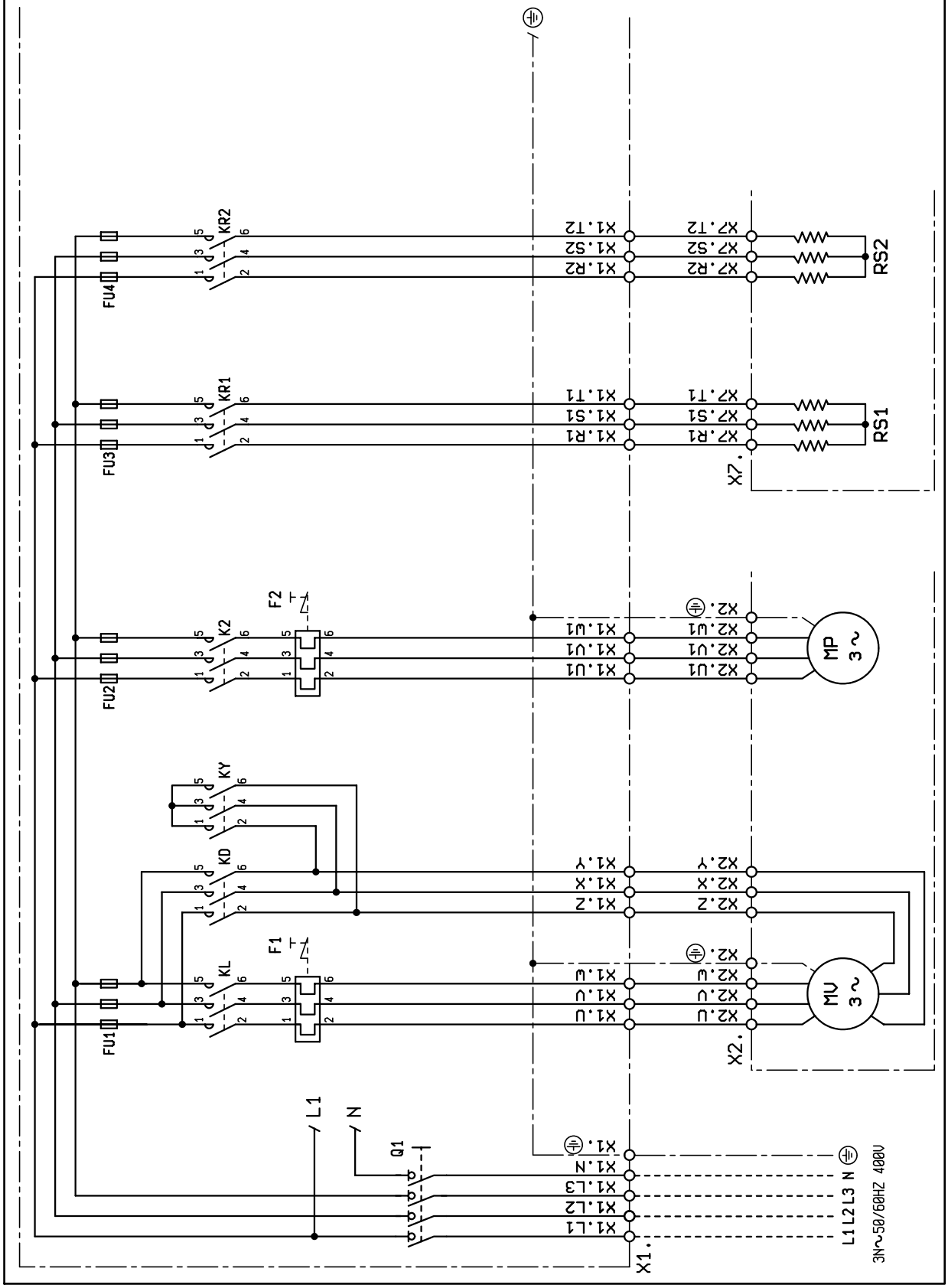
CENTO (FE)

SCHEMA ELETTRICO GI-MIST 1000DSPNM DSPNM-D
SCHEMA ELECTRIQUE GI-MIST 1000DSPNM, DSPNM-D
ELECTRIC DIAGRAM FOR GI-MIST 1000DSPNM, DSPNM-D
SCHALTPLAN GI-MIST 1000DSPNM, DSPNM-D
ESQUEMA ELECTRICO GI-MIST 1000DSPNM, DSPNM-D

CE

N° 0002630401N1
foglio N. 1 di 11
data 08/04/2005
Dis. V.B.
Visto S.M.



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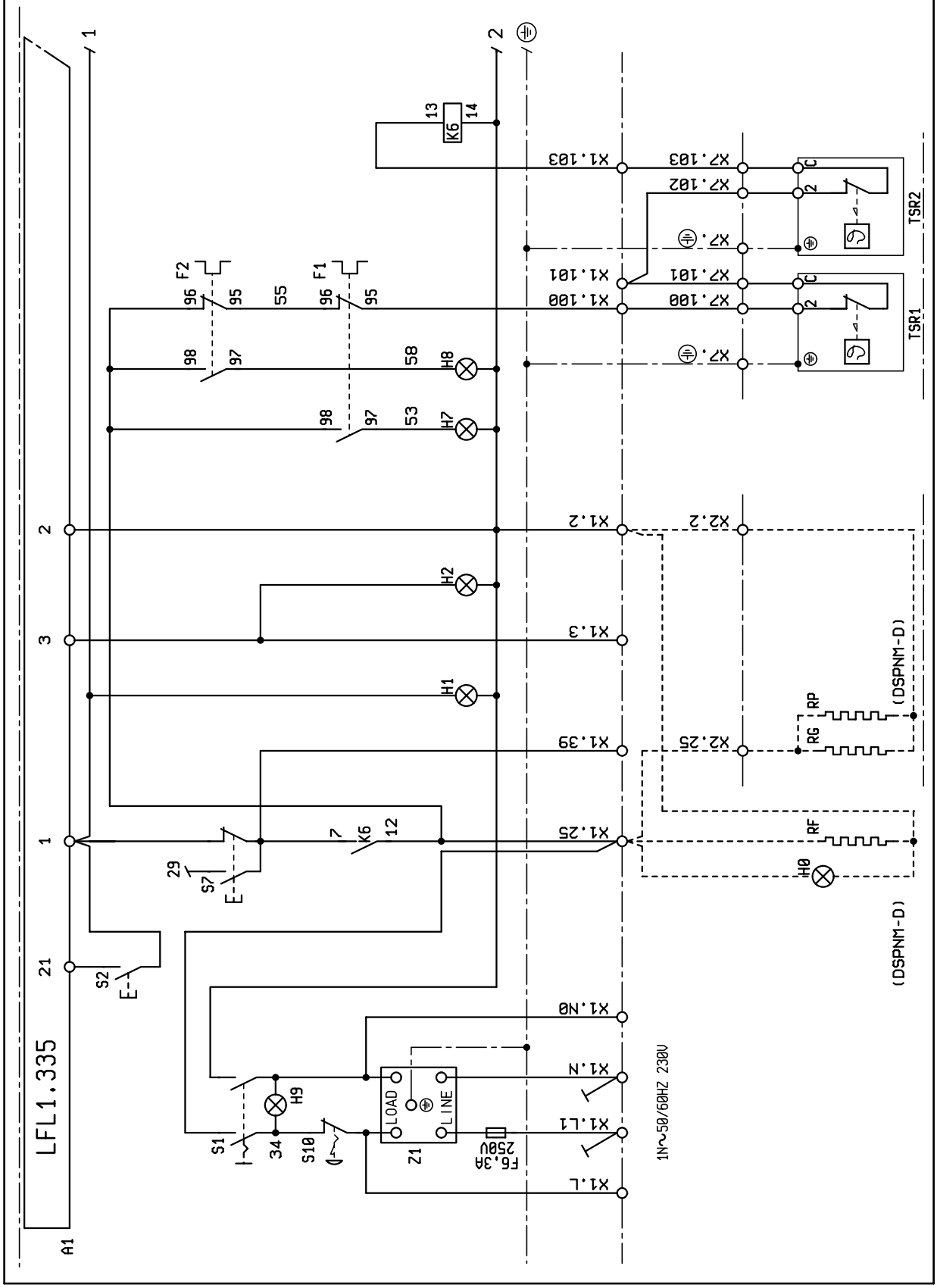
CENTO (FE)

SCHEMA ELETTRICO GI-MIST 1000DSPNM, DSPNM-D
SCHEMA ELECTRIQUE GI-MIST 1000DSPNM, DSPNM-D
ELECTRIC DIAGRAM FOR GI-MIST 1000DSPNM, DSPNM-D
SCHALTPLAN GI-MIST 1000DSPNM, DSPNM-D
ESQUEMA ELECTRICO GI-MIST 1000DSPNM, DSPNM-D

CE

N° 0002630401N2
foglio N. 2 di 11
data 08/04/2005
Dis. V.B.
Visto S.M.



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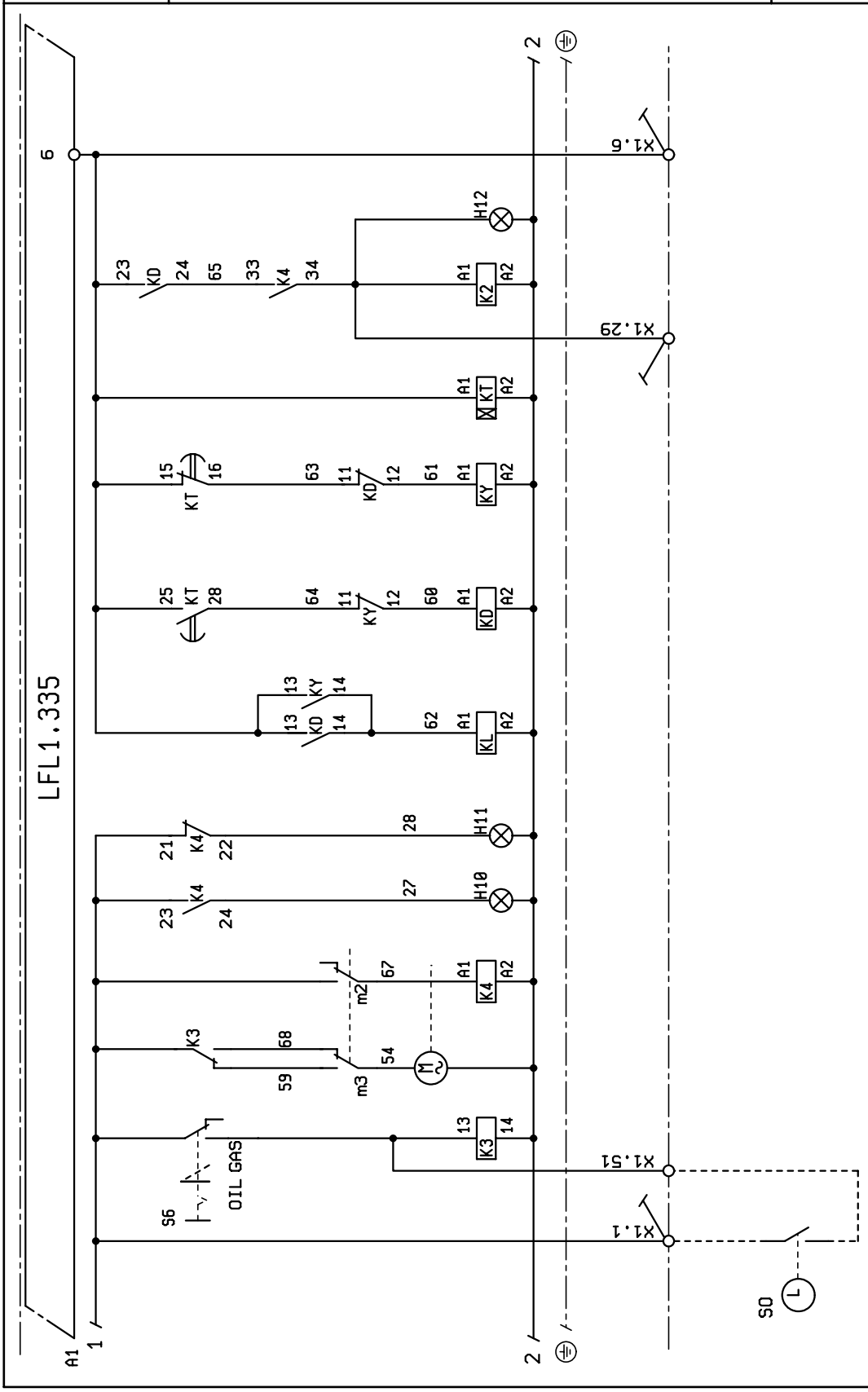
CENTO (FE)

SCHEMA ELETTRICO GI-MIST 1000DSPNM, DSPNM-D
SCHEMA ELECTRIQUE GI-MIST 1000DSPNM, DSPNM-D
ELECTRIC DIAGRAM FOR GI-MIST 1000DSPNM, DSPNM-D
SCHALTPLAN GI-MIST 1000DSPNM, DSPNM-D
ESQUEMA ELECTRICO GI-MIST 1000DSPNM, DSPNM-D

CE

N° 0002630401N3
foglio N. 3 di 11
data 08/04/2005
Dis. V.B.
Visto S.M.



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CENTO (FE)

SCHEMA ELETTRICO GI-MIST 1000DSPNM, DSPNM-D
SCHEMA ELECTRIQUE GI-MIST 1000DSPNM, DSPNM-D
ELECTRIC DIAGRAM FOR GI-MIST 1000DSPNM, DSPNM-D
SCHALTPLAN GI-MIST 1000DSPNM, DSPNM-D
ESQUEMA ELECTRICO GI-MIST 1000DSPNM, DSPNM-D

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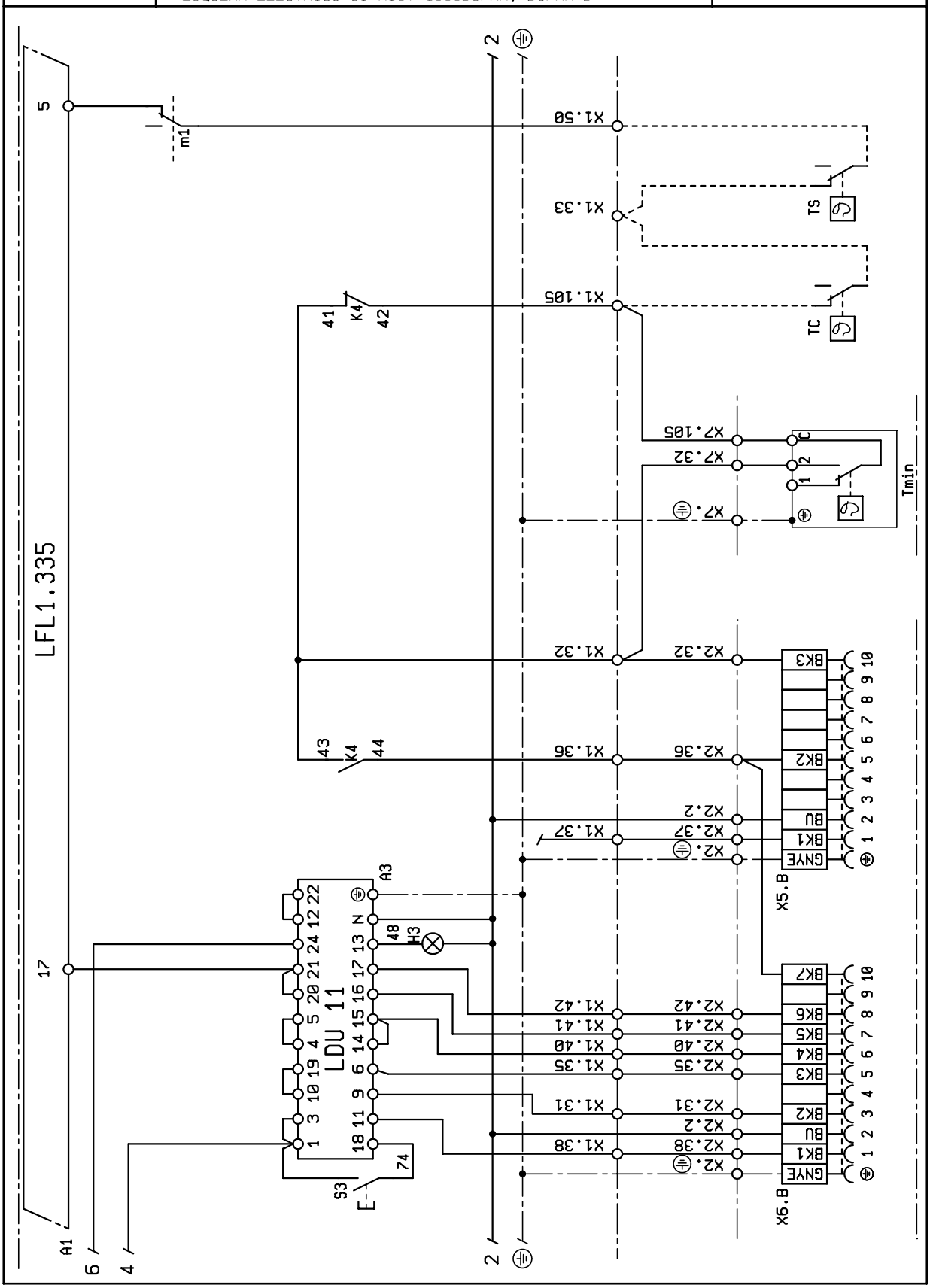
N° 0002630401N4
foglio N. 4 di 11
data 08/04/2005
Dis. V.B.
Visto S.M.



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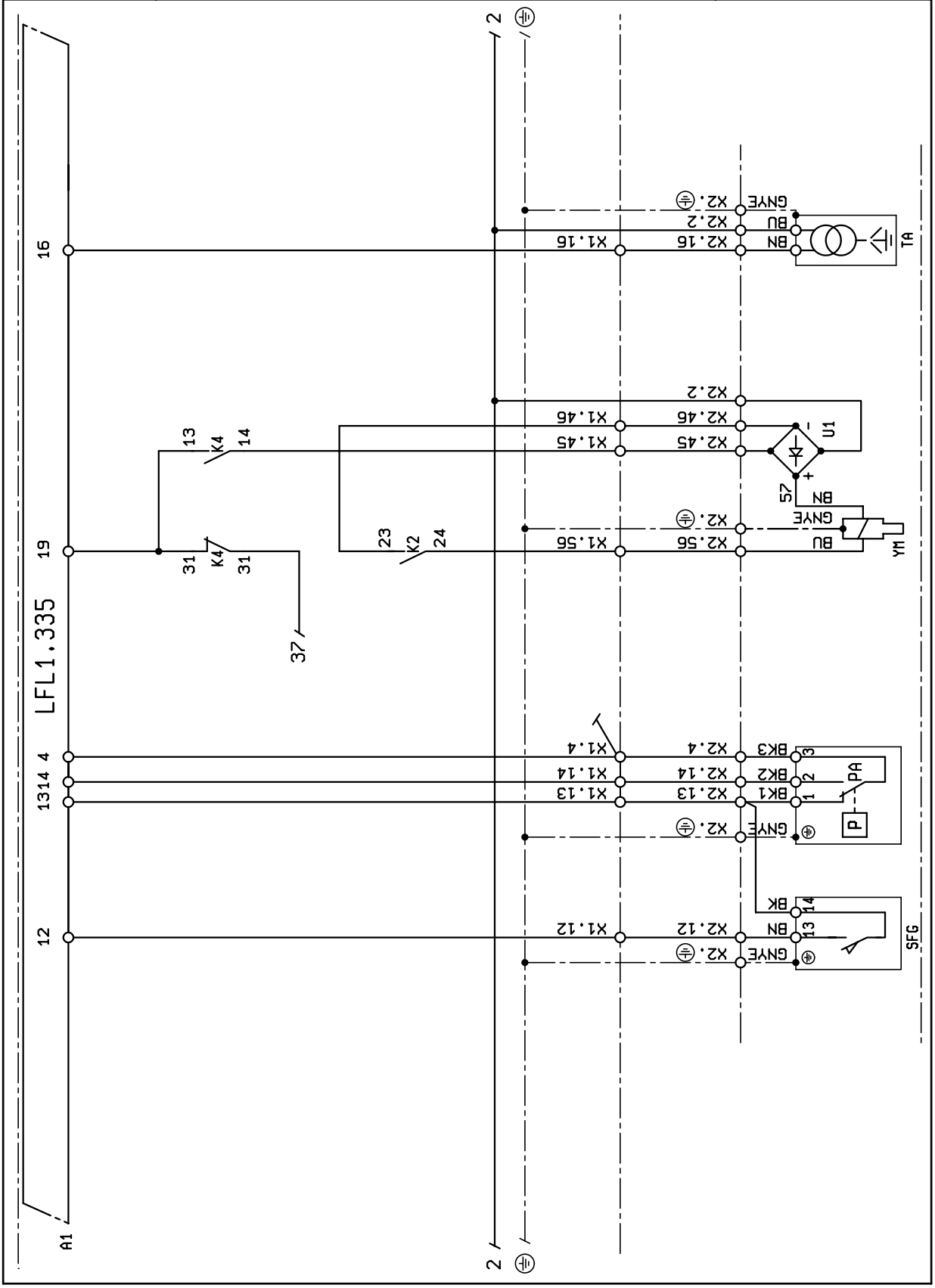
CENTO (FE)

SCHEMA ELETTRICO GI-MIST 1000DSPNM, DSPNM-D
SCHEMA ELECTRIQUE GI-MIST 1000DSPNM, DSPNM-D
ELECTRIC DIAGRAM FOR GI-MIST 1000DSPNM, DSPNM-D
SCHALTPLAN GI-MIST 1000DSPNM, DSPNM-D
ESQUEMA ELECTRICO GI-MIST 1000DSPNM, DSPNM-D

CE

N° 0002630401N5
foglio N. 5 di 11
data 08/04/2005
Dis. V.B.
Visto S.M.



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CENTO (FE)

SCHEMA ELETTRICO GI-MIST 1000DSPNM, DSPNM-D
SCHEMA ELECTRIQUE GI-MIST 1000DSPNM, DSPNM-D
ELECTRIC DIAGRAM FOR GI-MIST 1000DSPNM, DSPNM-D
SCHALTPLAN GI-MIST 1000DSPNM, DSPNM-D
ESQUEMA ELECTRICO GI-MIST 1000DSPNM, DSPNM-D

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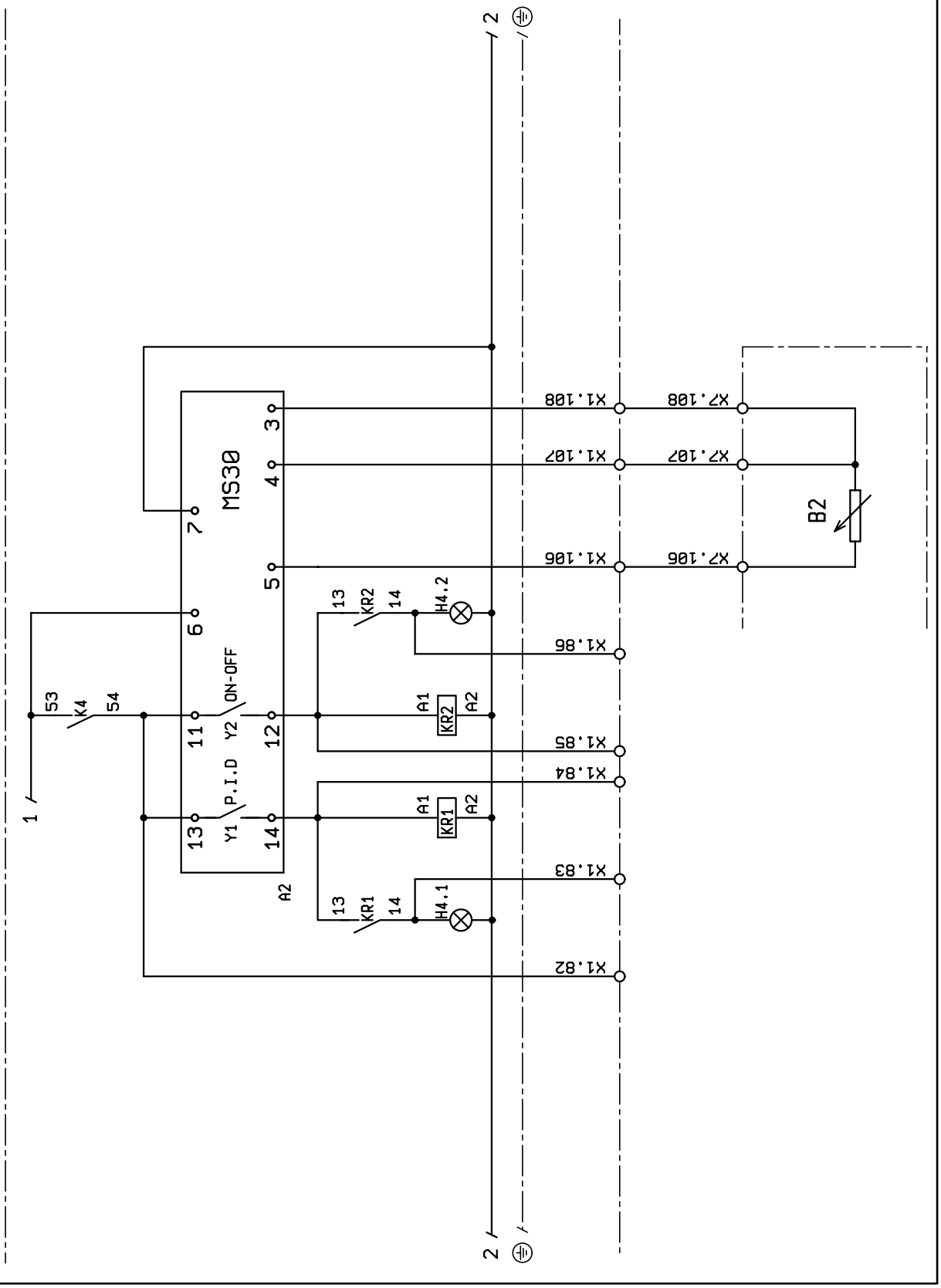
N° 0002630401N6
foglio N. 6 di 11
data 08/04/2005
Dis. V.B.
Visto S.M.



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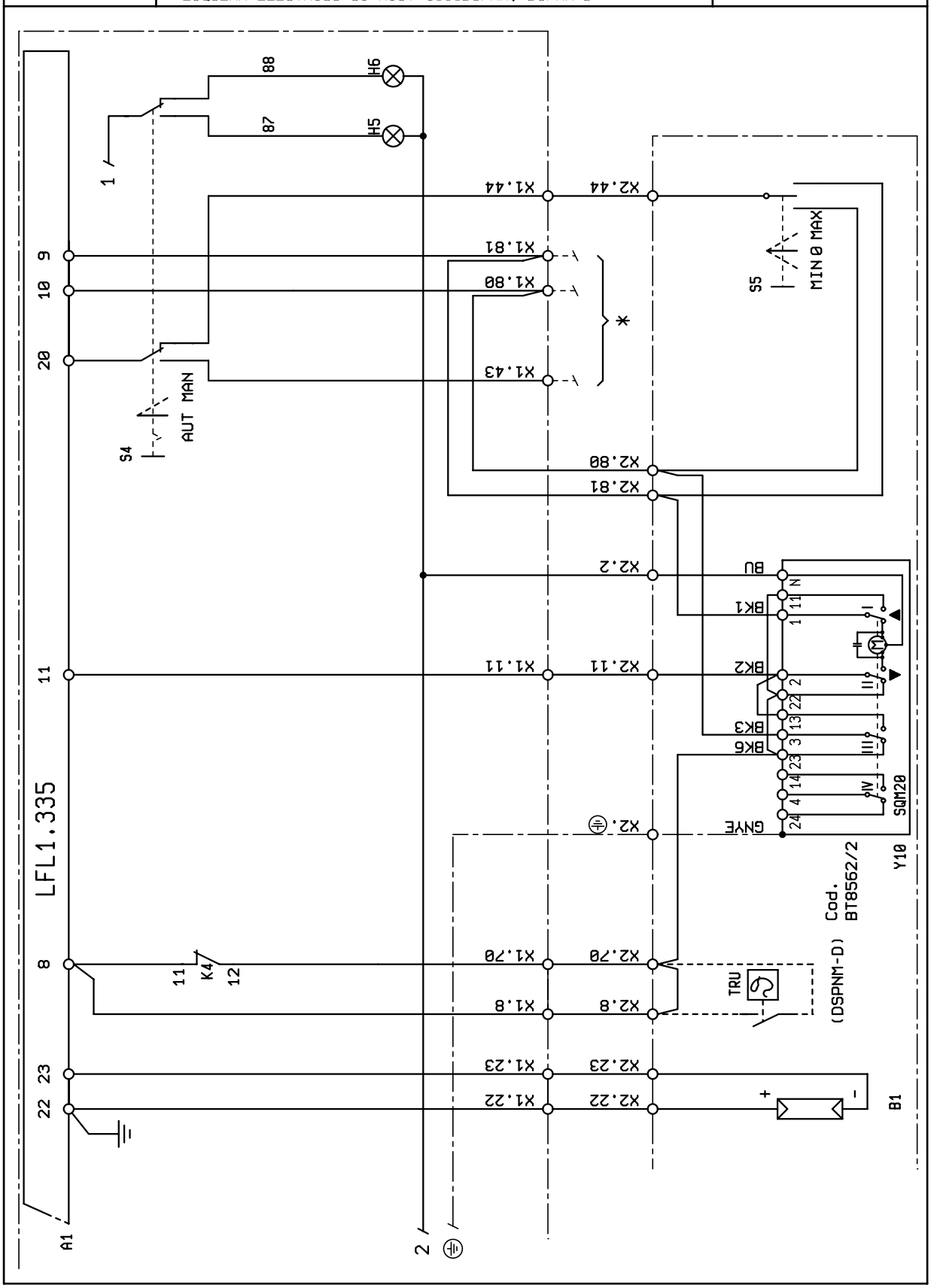
CENTO (FE)

SCHEMA ELETTRICO GI-MIST 1000DSPNM, DSPNM-D
SCHEMA ELECTRIQUE GI-MIST 1000DSPNM, DSPNM-D
ELECTRIC DIAGRAM FOR GI-MIST 1000DSPNM, DSPNM-D
SCHALTPLAN GI-MIST 1000DSPNM, DSPNM-D
ESQUEMA ELECTRICO GI-MIST 1000DSPNM, DSPNM-D

CE

N° 0002630401N7
foglio N. 7 di 11
data 08/04/2005
Dis. V.B.
Visto S.M.



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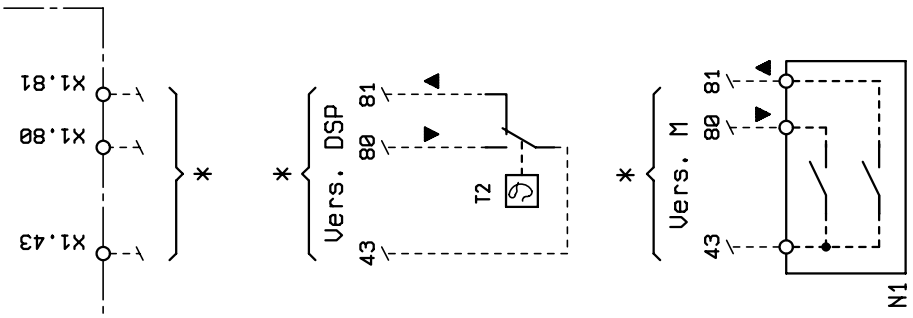
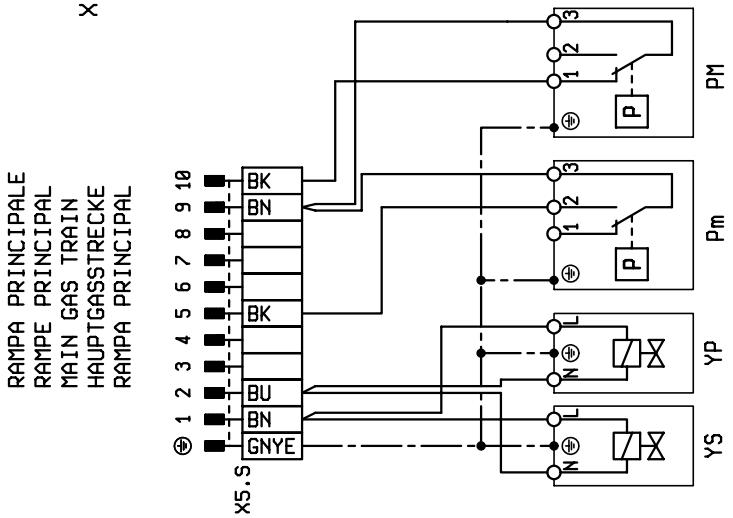
CENTO (FE)

SCHEMA ELETTRICO GI-MIST 1000DSPNM, DSPNM-D
SCHEMA ELECTRIQUE GI-MIST 1000DSPNM, DSPNM-D
ELECTRIC DIAGRAM FOR GI-MIST 1000DSPNM, DSPNM-D
SCHALTPLAN GI-MIST 1000DSPNM, DSPNM-D
ESQUEMA ELECTRICO GI-MIST 1000DSPNM, DSPNM-D

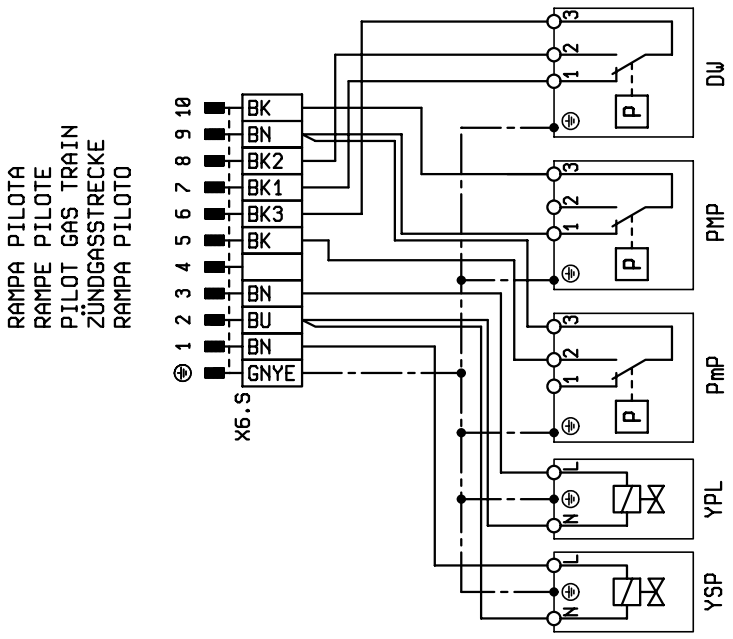
CE

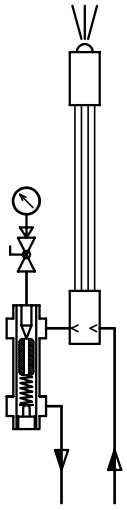
N° 0002630401N8
foglio N. 8 di 11
data 08/04/2005
Dis. V.B.
Visto S.M.

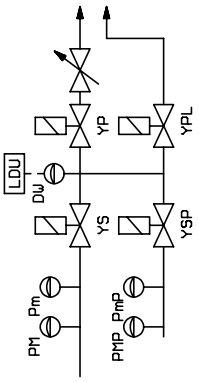



| DIN / IEC | IT | GB | FR | ES |
|---|---|---|---|---|
| GNYE | VERDE / GIALLO | GREEN / YELLOW | VERT / JAUNE | VERDE / AMARILLO |
| BU | BLU | BLUE | BLEU | AZUL |
| BN | BRUNO | BROWN | MARRON | MARRÓN |
| BK | NERO | BLACK | NOIR | NEGRO |
| BK* | CONNETTORE NERO CON SOVRASTAMPA | BLACK WIRE WITH INPRINT | CONDUCTEUR NOIR AVEC SURIMPRESSION | CONDUCTOR NEGRO CON IMPRESIÓN |





| SIGLA | IT | GB |
|---|---|---|
| A1 | APPARECCHIATURA | CONTROL BOX |
| A2 | TERMOSTATO ELETRONICO | ELECTRONIC THERMOSTAT |
| A3 | CONTROLLO TENUTA VALVOLE | VALVES TIGHTNESS CONTROL |
| B1 | FOTOCELLULA UV | UV PHOTOCELL |
| B2 | TERMORESISTENZA PT100 | THERMORESISTANCE PT100 |
| DW | PRESSOSTATO CONTROLLO TENUTA VALVOLE | PRESSURE SWITCH FOR VALVE TIGHTNESS CONTROL |
| F1 | RELE' TERMICO | THERMAL RELAY |
| F2 | RELE' TERMICO POMPA | PUMP THERMAL RELAY |
| FU1÷4 | FUSIBILI | FUSES |
| HO | LAMPADA FUNZIONAMENTO RESISTENZE AUSILIARIE | AUXILIARY RESISTANCES LAMP |
| H1 | SPIA DI FUNZIONAMENTO | OPERATION LIGHT |
| H10 | SPIA FUNZIONAMENTO OLIO | OIL SIGNAL LAMP |
| H11 | SPIA FUNZIONAMENTO GAS | NATURAL GAS SIGNAL LAMP |
| H12 | LAMPADA CARICAMENTO SERBATOIO | TANK LOADING LAMP |
| H2 | SPIA DI BLOCCO | LOCK-OUT SIGNAL LAMP |
| H3 | SPIA DI BLOCCO LDU11 | LDU11 BLOCK LAMP |
| H4.1 / 4,2 | SPIA RESISTENZE | RESISTANCES LAMP |
| H5 | LAMPADA FUNZIONAMENTO AUTOMATICO | AUTOMATIC LAMP OPERATION |
| H6 | LAMPADA FUNZIONAMENTO MANUALE | MANUAL LAMP OPERATION |
| H7 | LAMPADA BLOCCO RELE' TERMICO MOTORE VENTOLA | FAN MOTOR THERMAL SWITCH RELAY BLOCK LAMP |
| H8 | LAMPADA BLOCCO TERMICO MOTORE POMPA | LAMP PUMP MOTOR THERMAL STOP |
| H9 | LAMPADA TENSIONE QUADRO ELETTRICO | CONTROL PANEL VOLTAGE LAMP |
| K2 | CONTATTORE MOTORE POMPA | PUMP MOTOR CONTACTOR |
| K3 | RELE' AUSILIARIO MOTORINO CICLICO | AUXILIARY RELAY CICLIC MOTOR |
| K4 | CONTATTORE CAMBIO COMBUSTIBILE | CONTACTOR OIL CHANGING |
| K6 | RELE' AUSILIARIO PER RESISTENZE | AUXILIARY RELE' FOR RESISTANCES |
| KD | CONTATTORE TRIANGOLO | TRIANGLE CONTACTOR |
| KL | CONTATTORE DI LINEA | LINE CONTACTOR |
| KR1 / KR2 | CONTATTORE RESISTENZE | RESISTANCES CONTACTOR |
| KT | TEMPORIZZATORE | TIMER |
| KY | CONTATTORE DI STELLA | STAR CONTACTOR |
| M | MOTORINO CICLICO CON CONTATTI M1-M2-M3 | CYCLIC MOTOR WITH M1-M2-M3 CONTACTS |
| MP | MOTORE POMPA | PUMP MOTOR |
| MV | MOTORE | MOTOR |
| N1 | REGOLATORE ELETTRONICO | REGULATEUR ELECTRONIQUE |
| P M | PRESSOSTATO DI MASSIMA | GAS MAX. PRESSURE SWITCH |
| PA | PRESSOSTATO ARIA | AIR PRESSURE SWITCH |
| Pm | PRESSOSTATO DI MINIMA | GAS MIN. PRESSURE SWITCH |
| PmP | PRESSOSTATO DI MINIMA RAMPA PILOTA | PILOT TRAIN MINIMUM PRESSURE SWITCH |
| PMP. | PRESSOSTATO DI MASSIMA RAMPA PILOTA | PILOT TRAIN MAXIMUM PRESSURE SWITCH |
| Q1 | SEZIONATORE GENERALE BLOCCO PORTA | MAIN DOOR LOCK SWITCH |
| RP.RF.RG | RESISTENZE POMPA,FILTRO,GRUPPO | GROUP,FILTER,PUMP RESISTANCES |
| RS1/RS2 | RESISTENZE | RESISTANCES |
| S1 | INTERRUTTORE MARCIA ARRESTO | ON-OFF SWITCH |
| S2 | PULSANTE SBLOCCO | RE-SET PUSH BUTTON |
| S3 | PULSANTE SBLOCCO LDU11 | LDU11 RE-SET PUSH BUTTON |
| S4 | SELETTORE AUT-MAN | AUT-MAN SELECTOR |
| S5 | COMMUTATORE MIN-MAX | MIN-MAX COMMUTATOR |
| S6 | SELETTORE GAS-OLIO | GAS-OIL SELECTOR |
| S7 | PULSANTE CARICAMENTO SERBATOIO | TANK LOADING SWITCH |
| S10 | PULSANTE A FUNGO DI EMERGENZA | EMERGENCY MUSHROOM-HEAD BUTTON |
| SFG | MICRO FINE CORSA SERRANDA GAS | GAS GATE MICRO LIMIT SWITCH |
| SO | COMANDO CAMBIO COMBUSTIBILE A DISTANZA (APERTO=GAS, CHIUSO=OLIO) | REMOTE FUEL CHANGE AUTOMATIC CONTROL (OPEN=GAS, CLOSE=HEAVYOIL) |
| T2 | TERMOSTATO 2 STADIO | 2ND STAGE THERMOSTAT |
| TA | TRASFORMATORE D'ACCENSIONE | IGNITION TRANSFORMER |
| TC | TERMOSTATO CALDAIA | BOILER THERMOSTAT |
| Tmin | TERMOSTATO DI MINIMA | MIN. THERMOSTAT |
| TRU | TERMOSTATO RITORNO UGELLO | NOZZLE RETURN THERMOSTAT |
| TS | TERMOSTATO DI SICUREZZA | SAFETY THERMOSTAT |
| TSR1/TSR2 | TERMOSTATO SICUREZZA RESISTENZE | RESISTANCES SAFETY THERMOSTAT |
| U1 | PONTE RADDRIZZATORE | RECTIFIER BRIDGE |
| X1 | MORSETTIERA BRUCIATORE | BURNER TERMINAL |
| X2 | MORSETTIERA BRUCIATORE | BORNES DE RACCORD |
| X5.B, X5.S | CONNETTORE MOBILE RAMPA GAS PRINCIPALE | MAIN GAS TRAIN FLOATING PLUG |
| X6.B, X6.S | CONNETTORE MOBILE RAMPA GAS PILOTA | PILOT GAS TRAIN FLOATING PLUG |
| X7 | MORSETTIERA QUADRO PRERISCALDAMENTO | PREHEATING PANEL TERMINAL BOARD |
| Y M | ELETTROMAGNETE | ELECTROMAGNET |
| Y1/Y2 | ELETTROVALVOLA | ELECTROVALVE |
| Y10 | SERVOMOTORE ARIA | AIR SERVOMOTOR |
| YP | ELETTROVALVOLA PRINCIPALE | MAIN ELECTROVALVE |
| YPL | ELETTROVALVOLA GAS PILOTA | PILOT ELECTROVALVE |
| YS | ELETTROVALVOLA DI SICUREZZA | SAFETY VALVE |
| YSP | ELETTROVALVOLA DI SICUREZZA RAMPA PILOTA | PILOT TRAIN SAFETY SOLENOID VALVE |
| Z1 | FILTRO | FILTER |

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