

- I Bruciatore di gasolio**
- D Ölbrenner**
- F Brûleur à fioul domestique**
- GB Light oil burner**

Funzionamento bistadio progressivo o modulante
Zweistufig gleitender oder modulierender Betrieb
Fonctionnement à deux allures progressives ou modulant
Progressive two-stage or modulating operation



MODELLO - MODELL
MODELE - MODEL

TIPO - TYP
TYPE

P 450 P/G

484 M1

Thermal power - Output	1190 ÷ 5340 kW - 100 ÷ 450 kg/h
Operation	2-stage progressive/Modulating (with kit)
Fuel	Light oil with max. viscosity: 6 mm ² /s (1,5° E) at 20 °C
Electrical supply	3N ~ 50 Hz 400 / 230 V $\blacktriangle$ 3 ~ 50 Hz 230 V $\triangle$
Motor	45A / 230V - 26A / 400V
Ignition transformer	Primary: 2A - Secondary: 2 x 6,5 kV - 35 mA
Absorbed electrical power	15 kW
Electrical protection	IP 40 according EN 60529 (IEC 529-1989)
Electromagnetic compatibility	According to Directive 89/336/EEC (Radiointerference)

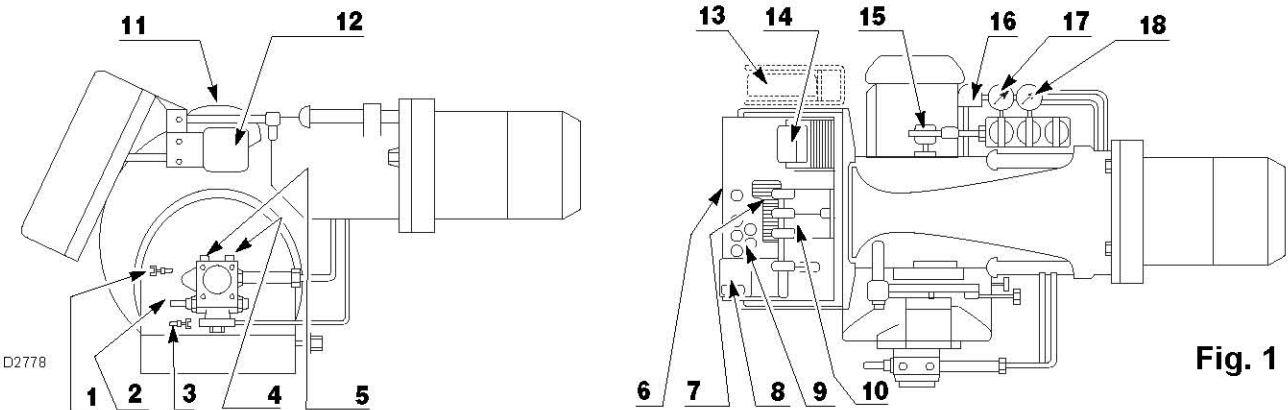


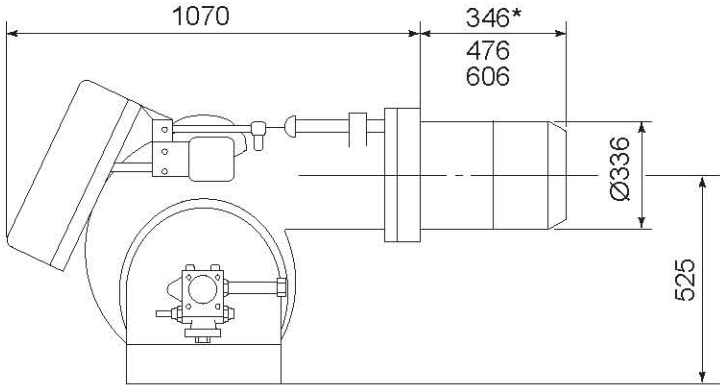
Fig. 1

- 1 - Suction line
- 2 - Pump pressure adjustment screw
- 3 - Return line
- 4 - Manometer plug (G 1/4)
- 5 - Vacuumeter plug (G 1/4)
- 6 - Electric board
- 7 - Wiring terminal board
- 8 - Control box reset push-button and lock-out lamp
- 9 - Cable clamps
- 10 - Rod for combustion head shifting
- 11 - Air regulating cam
- 12 - Servomotor
- 13 - Modulating controller (only for modulating)
- 14 - Ignition transformer

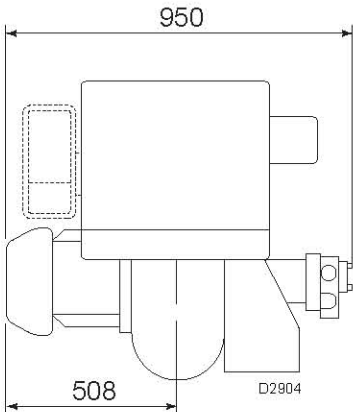
- 15 - Return pressure adjusting eccentric
- 16 - Pressure switch
- 17 - Manometer on return line
- 18 - Manometer on supply line

Quantity	Accessories
2	Flexibles tubes
2	Nipples
4	Screws
1	Gasket for flange
1	Starter
8	Cable clamps
2	Extensions (for long head only)

OVERALL DIMENSIONS

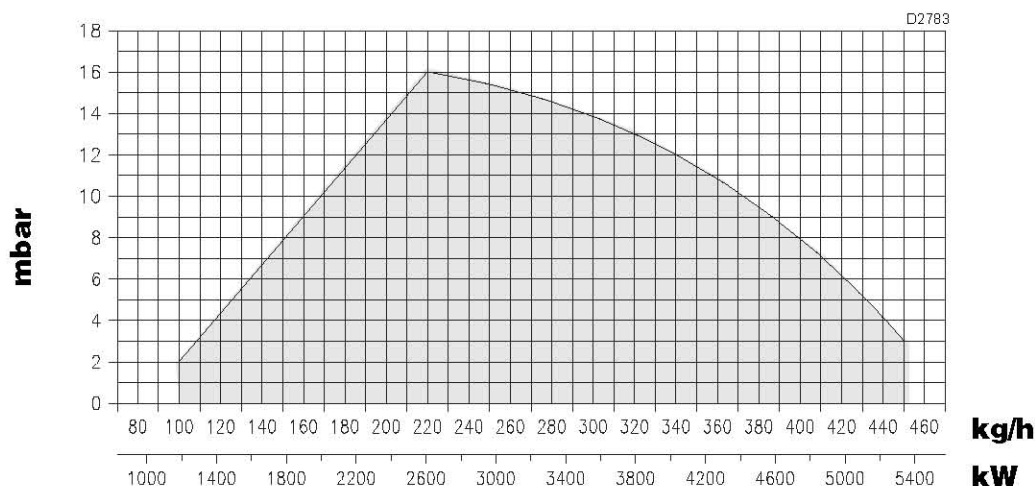


* It is possible with a spacer, upon request



The output of the burner during the operation varies from a maximum and a minimum value.
The max. output should be inside of the operating field, see drawing below.
The minimum output may decrease up to 100 kg/h.

COMBUSTION CHAMBER PRESSURE - MAXIMUM OUTPUT



MOUNTING THE BURNER ON THE BOILER

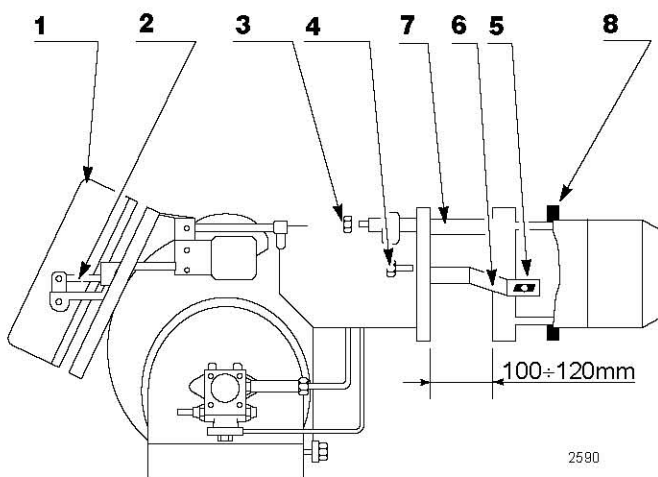
For the separation of the blast tube from the burner body, follow these instructions:

- Remove the cover (1), the split pin and the pin (2), the nuts (3) and the screws (4).
- Slide the blast tube from the burner body of approx. 100÷120 mm, release the fork of the combustion head shifting (6) removing the spit pins (5).
- Now it is possible to withdraw the blast tube from the slides (7).
- Mount the blast tube to the boiler interposing the gasket (8).
- Set up the proper nozzle and inset the slides (7) in the burner maintaining the distance of approx. 100÷120 mm.
- Mount the fork (6) and hook it by the split pins (5).
- Close the burner, fasten the screws (4), the nuts (3), the split pin and the pin (2).

Burner opening for service

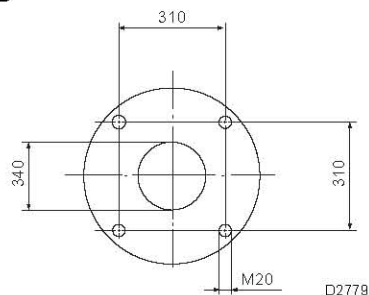
Follow the above instructions without remove the nuts (3).

By lifting the burner using the hooks it is possible to fix it to the boiler without separating from the blast tube.



BOILER FRONT PLATE DRILLING - COMBUSTION HEAD PROJECTION

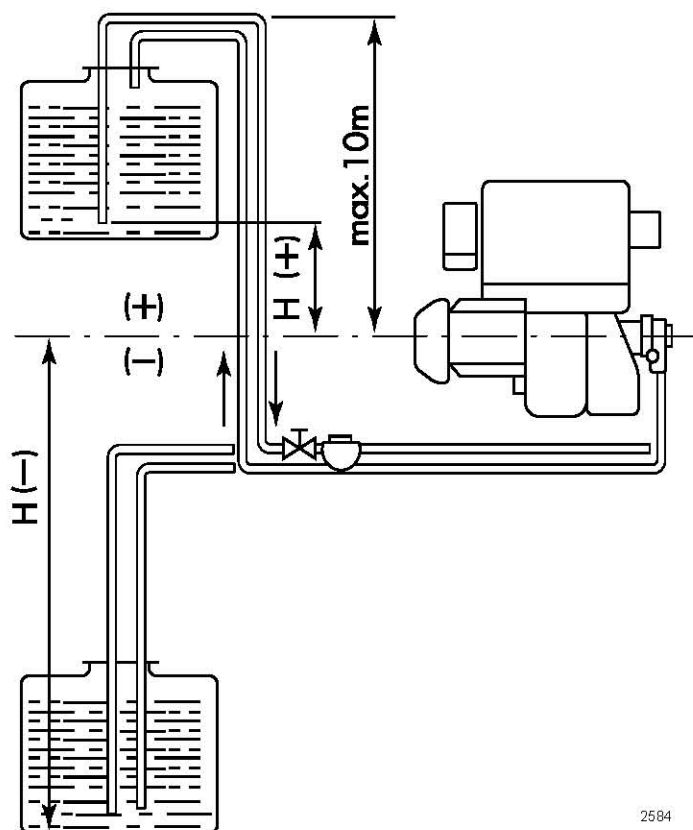
For the combustion head projection carefully follow the boiler manufacturer indications.



A proper protection with refractory material on the combustion chamber shall be made, when boilers with frontal smoke box are used.

SUPPLY LINE

Notice: Before placing the burner in operation, ensure that the return line is open. Any obstruction may damage the pump seal.



H meters	L meters	
	ø G 3/4	ø G 1
+ 2,0	55	130
+ 1,5	50	120
+ 1,0	45	110
+ 0,5	40	100
0	35	90
- 0,5	30	80
- 1,0	25	70
- 1,5	20	60
- 2,0	15	45
- 3,0	10	25

- H** Difference in the pipes height;
L Total lenght of the suction tube;
øi Internal diameter of the tube.

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Pay attention to do not overcome the max. depression of 0,45 bar (35 cm Hg), over this value the fuel may turn into gas.

Check the pipes are perfectly sealed.

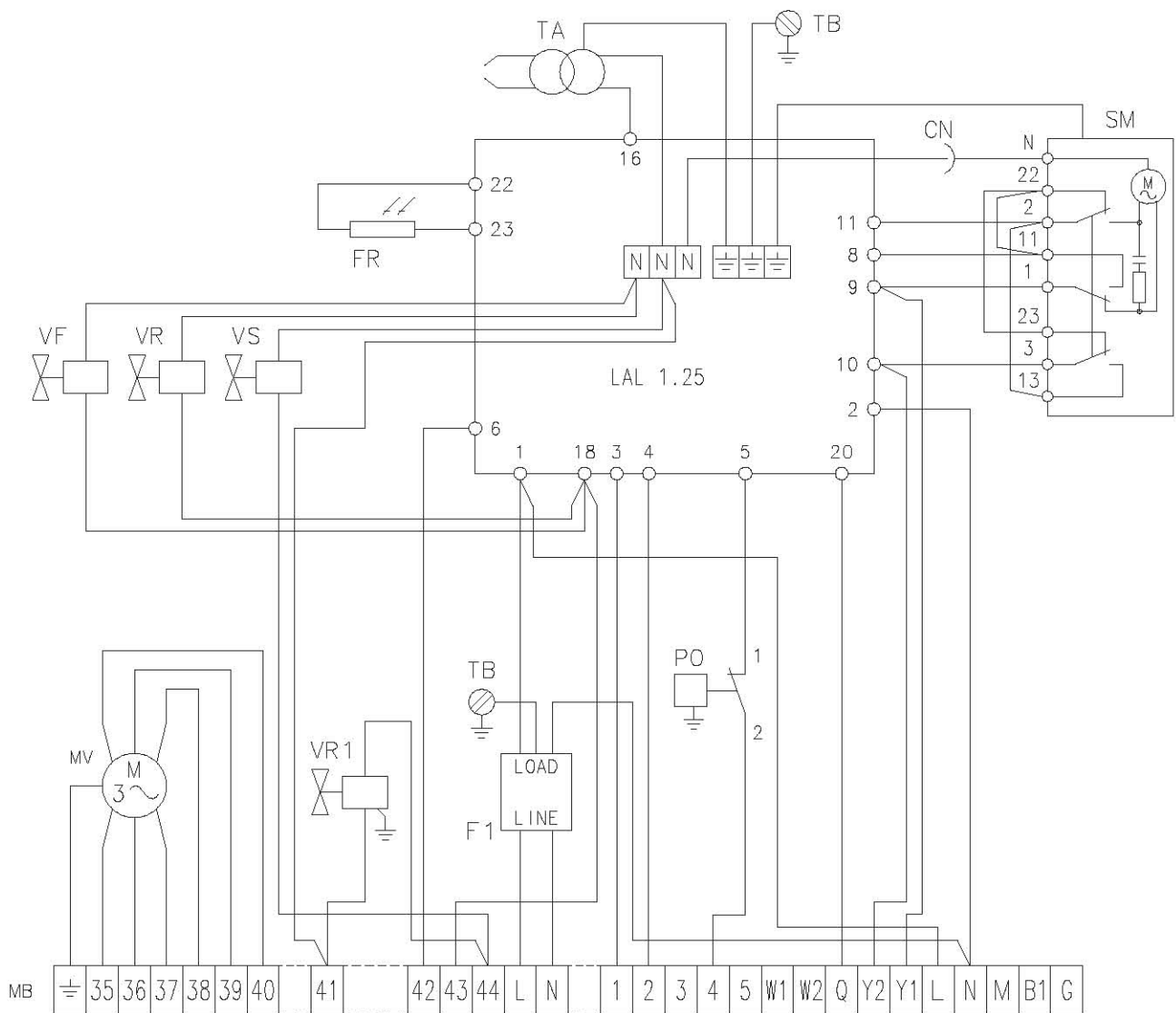
When the fuel tank is under the burner level we suggest to let the return line arrive where the suction line starts. In this case the foot valve is not necessary.

Should the return line arrive over the fuel level, the foot valve is indispensable. Notice that this solution is less safe than the previous one, because it is possible the valve has not a good sealing.

Pump priming:

Fill the pump with the light oil from the vacuumeter plug 5), fig.1), put the burner in operation, purge the air from the manometer plug 4), fig.1) and wait for the pump priming. If lock-out occurs repeat the procedure.

ELECTRICAL WIRING CONNECTIONS (carried out by the factory)

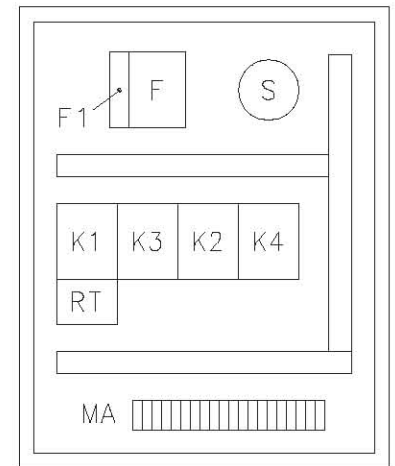
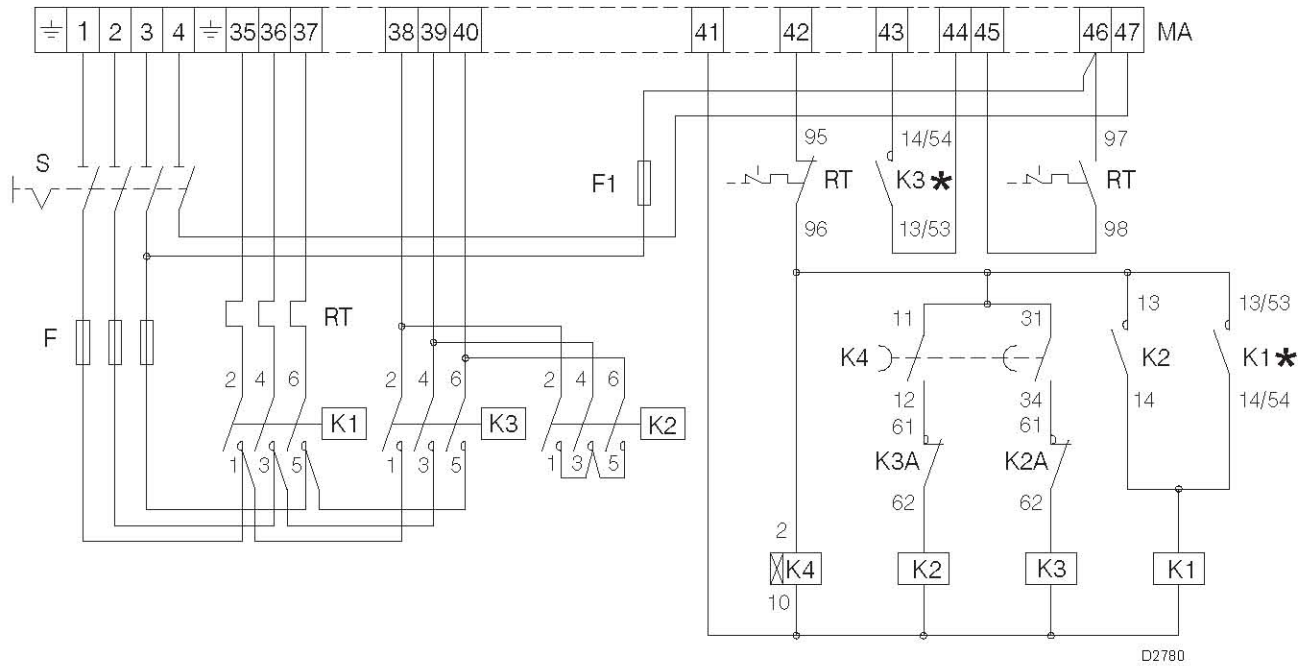


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KEY TO LAYOUT

- MB** Wiring terminal block
- MV** Fan motor
- F1** Protection against radio interference
- PO** Oil pressure switch
- TA** Ignition transformer
- SM** Servomotor
- FR** Photocell
- VF** Solenoid valve on supply line
- CN** Connector
- VS** Safety solenoid valve
- VR** Solenoid valve on return line
- VR1** Solenoid valve on return line
- TB** Burner ground (earth) connection

STAR - DELTA STARTER INSTALACIÓN ELÉCTRICA



NOTE

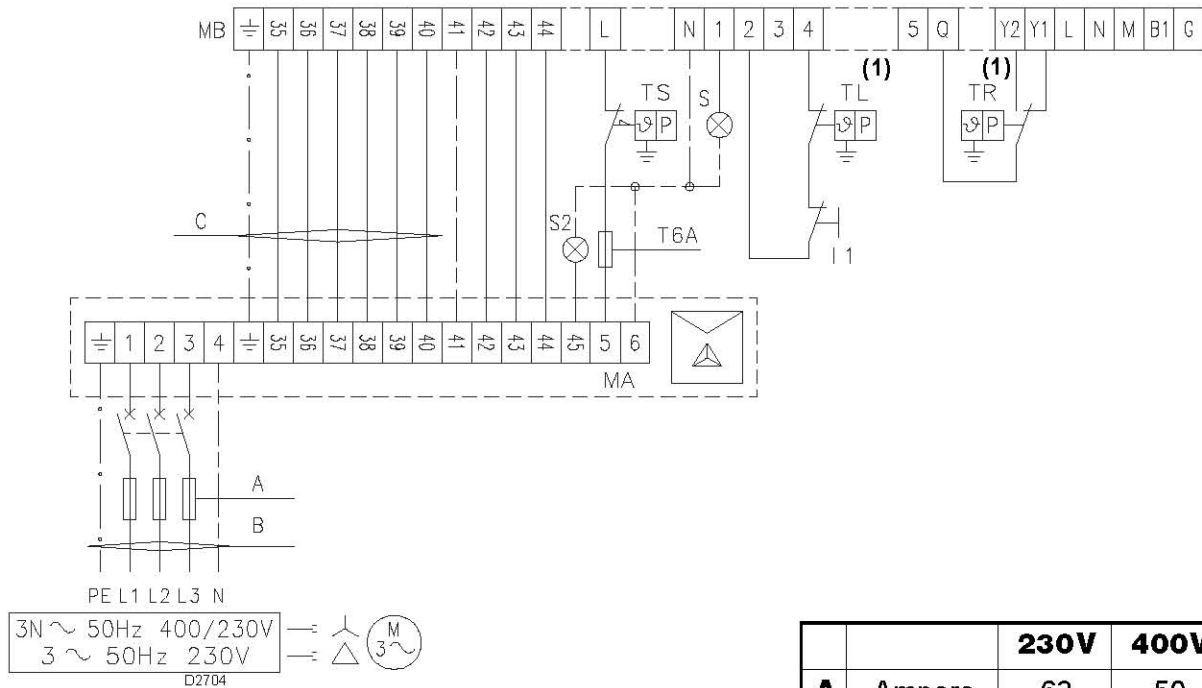
- * 13/14: for 400 V version
- 53/54: on auxiliary contact block for 230 V version

KEY TO LAYOUT

- F** Power line fuses
- F1** Control devices fuses
- K1** Line contact maker
- K2** Star contact maker
- K3** Delta contact maker
- K4** Timer relay for switching from start to delta (factory calibration at 10 s)
- K2A** Auxiliary contact block on K2
- K3A** Auxiliary contact block on K3
- MA** Starter terminal strip
- RT** Thermal relay (to be set at 9A for 400V or at 18A for 230V)
- S** Disconnecting switch with interlock

ELECTRICAL WIRING TO THE TERMINAL BOARD

(carried out by the installer)



(1): for two stages progressive version

(2): for modulating version

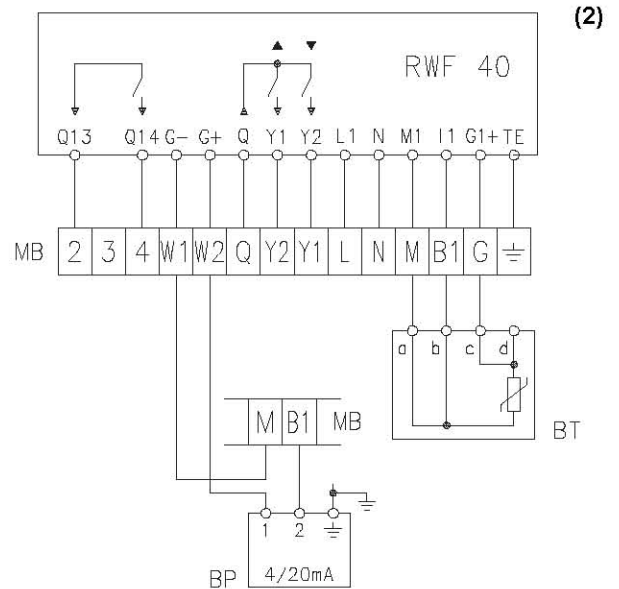
NOTE

- Check the lock-out by darkening the photo-cell after removal of the cover.

Attention: high voltage.

Key to layout

- BP** Pressure probe
- BT** Temperature probe
- I1** Burner manual stop switch
- MB** Burner terminal block
- S** Remote lock-out signal
- TL** Load limit remote control system
- TR** High-low mode load control system
- TS** Safety load control system
- a-d** Red
- b-c** White



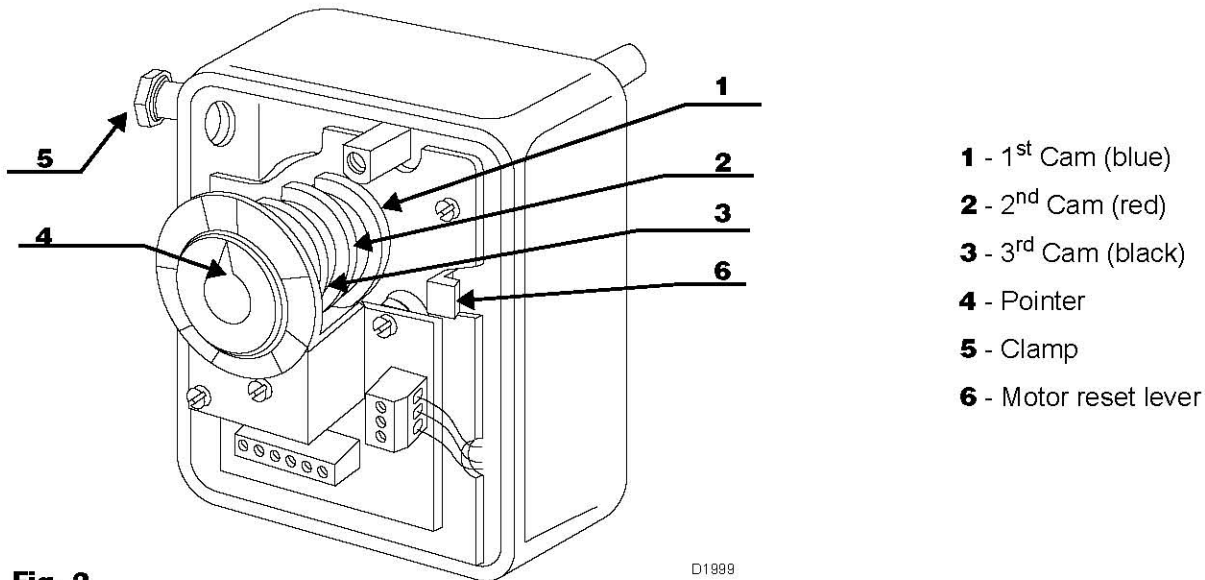
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BURNERS ITEMS SET AT THE FACTORY

Following items do not need, generally, any further adjustment:

- A** - Servomotor
- B** - Pump
- C** - Starter

A - SERVOMOTOR



The servomotor controls contemporaneously the air delivery and pressure and the fuel delivery. It is provided with three adjustable cams, controlling the corresponding switches.

- 1st cam:** it controls the stroke of the servomotor at the position of **0°**. When the burner is off the air damper is completely closed.
- 2nd cam:** it controls the stroke of the servomotor at the position of **130°**.
- 3rd cam:** it controls the minimum modulating output, leaves the factory set at **20°**.

B - PUMP

Set by the factory at 25 bar.

C - STARTER

The starter  is supplied at **230V** or **400V** according to the feeder line, for the adjustment of the temperature relay see page 5.

ADJUSTMENTS NECESSARY TO THE BURNER

When the burner is going to be put in operation, the installer has to carried out the following settings.

A - Maximum fuel delivery

B - Pressure controller

C - Combustion head

D - Air damper

A - ADJUSTMENT OF THE MAXIMUM FUEL DELIVERY

This adjustment is carried out by choosing the proper nozzle from the table here below.

Nozzle type N1 - 50°	Maximum delivery kg/h	Fuel pressure in the delivery line manometer (2) fig.3 bar	Fuel max. pressure in the return line manometer (3) fig.3 bar
450	448	25	17,2
400	398	25	18,0
360	349	25	18,0
330	326	25	18,0
300	289	25	18,0
275	265	25	18,0
250	239	25	18,0
225	215	25	18,0

If you desire a max. output intermediate between two values indicated in the table, it is useful to choose the nozzle with higher delivery.

The output decrease could be obtained later, by acting on the pressure controller, see item B.

B - ADJUSTMENT OF THE PRESSURE CONTROLLER

The variation of the pressure in the return line (manometer 3 fig. 3) modifies the fuel delivery from the nozzle.

Ratio between nozzle delivery and type - pressure in the return line

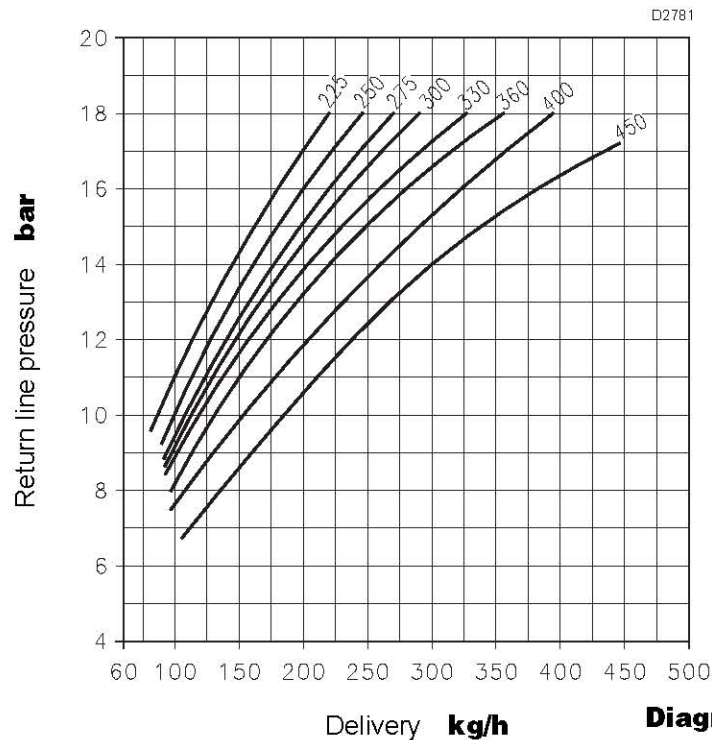


**Diagram referred to
Fluidics type N1 - 50° with
delivery pressure of 25 bar**

Suggested nozzles: Fluidics type N1
 Bergonzo type B-SA (without cut-off)

To properly rate the output range of the nozzle operation, it is necessary to set the maximum and minimum pressure of the fuel in the return line from the nozzle, in compliance with the above diagram.

- After the nozzle set-up, remove the protective cover of the servomotor 12) fig.1, and ignite the burner.
- After the burner ignition, disconnect the plug placed on the electric board 19) fig.1, to take the voltage off from the servomotor.

In this way the burner operates at the minimum output.

- Acting on the re-set lever 6) fig.2 disjoin the cam 1) fig.5 from the motor of the servomotor.
- Turn manually and slowly the cam with adjustable profil 1) fig.5 firmly connected to the eccentric 8) fig.3 and check the pressure variation by the manometer 3) fig.3.
- The output and the pressure of the nozzle are at minimum when the servomotor is on the position of 20°, while they are at maximum when the servomotor is positioned on 130°.

The fine adjustment of the pressure in the return line could be carried out by changing the setting of the eccentric 8) fig.3, of the nut and lock-nut 6) fig.3.

PRESSURE CONTROLLER

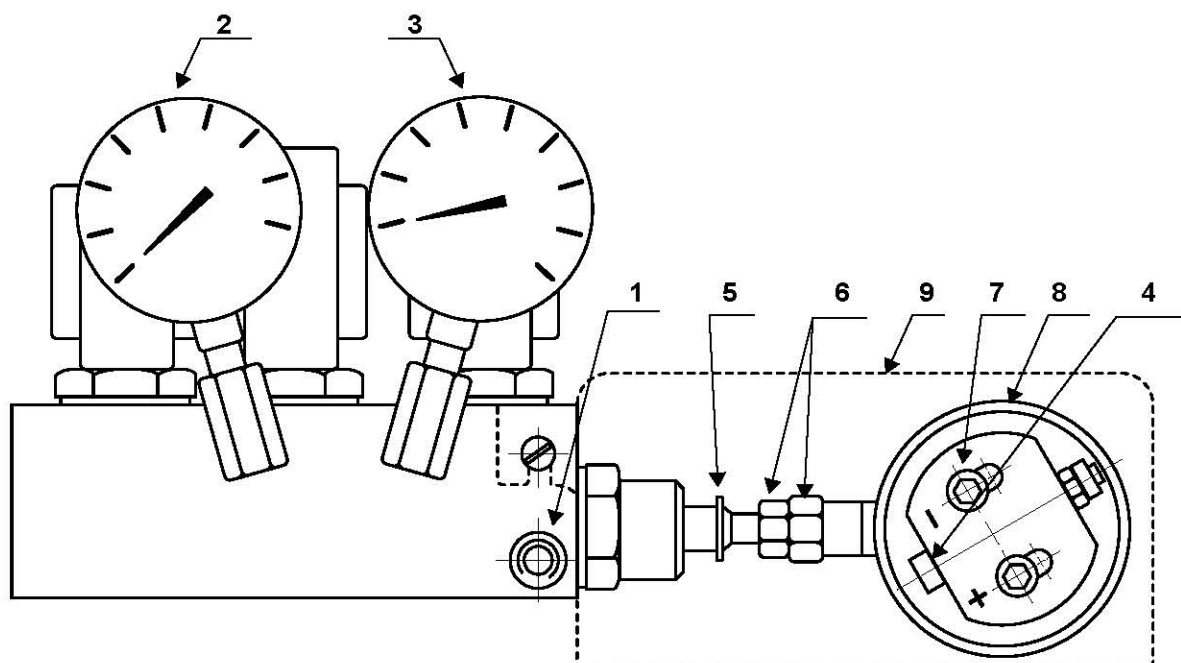


Fig. 3

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- | | |
|---|--|
| <p>1 - Pressure switch plug</p> <p>2 - Manometer for pressure in delivery line</p> <p>3 - Manometer for pressure in return line</p> <p>4 - Eccentric adjusting screw</p> <p>5 - Ring for piston stop</p> | <p>6 - Nut and lock-nut for piston rating</p> <p>7 - Eccentric locking screws</p> <p>8 - Variable eccentric</p> <p>9 - Cover</p> |
|---|--|

The eccentric (8) setting should be carried out as follows:

remove the cover (9), loosen the screws (7), and act on the screw (4) to obtain the desired eccentricity. Turn clockwise (+) the screw (4) to increase the eccentricity, increasing the difference between the min. and max. capacity of the nozzle; turn anticlockwise (-) to decrease the eccentricity and, consequently the difference between the min. and max. capacity of the nozzle.

NB. • The proper setting of the eccentric (8) is possible when its operation field follows the servomotor operation field (20° ÷ 130°): so, that any variation of the servomotor position corresponds to a pressure variation.

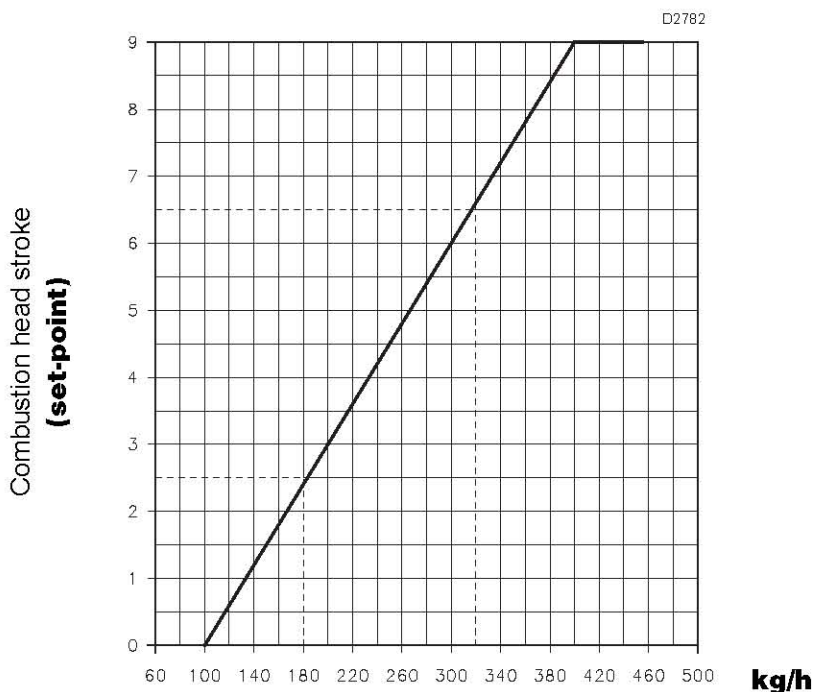
- Never let the piston batter: the stop ring (5) determines the max. stroke.
- When the setting is carried out, verify manually that no slow-down occurs between 20° and 130° and further the maximum and minimum pressures correspond to those chosen as per diagram of page 9.
- If you wish to check the delivery capacity of the nozzle, proceed as follows:
Open the burner according to instructions at page 2, place the nozzle, simulate the start-up and then proceed with the weighing at the maximum and minimum pressures.
- If at maximum capacity of the nozzle (maximum pressure in the return line) pressure fluctuations are detected on the manometer (3), slightly decrease the pressure till their complete elimination.

C - COMBUSTION HEAD ADJUSTMENT

The stroke of the combustion head is contemporaneous to the eccentric (8) fig. 3 movement and to that of the cam with adjustable profil (1) fig. 5. The combustion head position is noticed on the graduated cylinder (2) fig. 4.

The control levers of the combustion head are set, by the factory, for the max. stroke of 50 mm (the stroke is indicated by the set-point of the graduated cylinder from 0 to 9), this stroke is suitable for a modulating range from 100 - 450 kg/h.

Using a different modulating range it shall be necessary to re-set the control levers in order to get the combustion head stroke corresponding to the set-points indicated in the diagram below.



Example: modulating range 180 - 320 kg/h: following the diagram it is clear that the set-point 2,5 is the proper one for 180 kg/h and set-point 6,5 is for 320 kg/h, so the stroke of the combustion head may correspond to 4 set-points.

Caution: in order to avoid any slow-down it is necessary to not overcome the positions of min. and max. opening, corresponding to:

graduated cylinder (2) fig. 4: set-point 9 with servomotor at 130°:
set-point 0 with servomotor at 0°.

In order to vary the stroke of the combustion head, follow these indications:

the connecting rod (1) which drives the push-rod (8) of the combustion head, is provided with a slot; by moving the tension rod (9) towards the external part of the slot, the stroke of the combustion head may be shortened up to 20 mm.

If a higher reduction should be necessary, act in this way:

with the servomotor at 0° , loosen the screws (5) and push, in the arrow direction, the ring (6) placed under the cam with adjustable profil (7).

So it is obtainable a reduction of the eccentricity with the consequent reduction of the stroke.

After the setting fasten the screws (5).

With the aforesaid settings, the stroke of the combustion head is fixed.

Following the example (6 set-points) it is necessary that the start and the end of the stroke are coincident with the desired values: 1 and 7.

In order to obtain this turn the hexagonal coupling (3) clockwise or anticlockwise, after loosening of the nuts (4).

With the servomotor positioned at 0° , the set-point 1 shall be coincident with the reference plane (10), while, if the servomotor is positioned at 130° the index shall be coincident with the set-point 7.

After the setting fasten the nuts (4) with the ball joint (9), as indicated in the drawing.

The combustion head settings have to be carried out with burner closed, not in operation and with servomotor free.

After the setting verify manually the operation, by turning the cam (7), and that no slow-down exists between 0° and 130° .

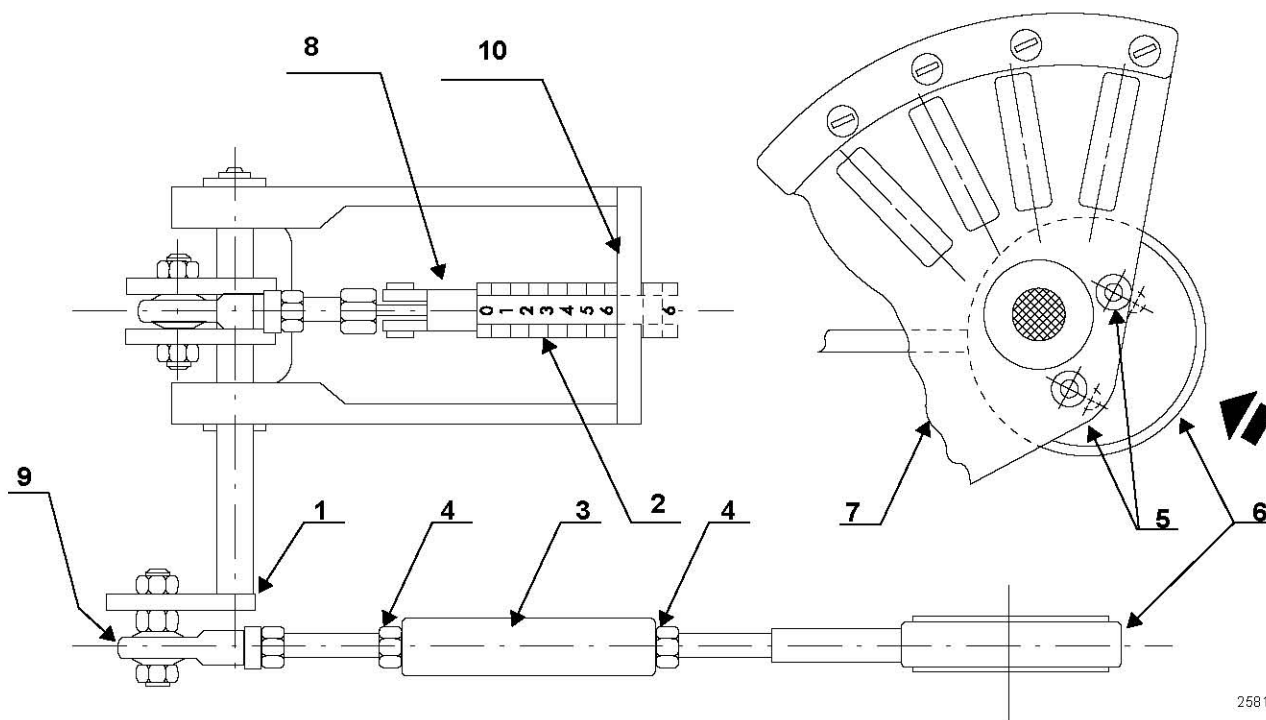
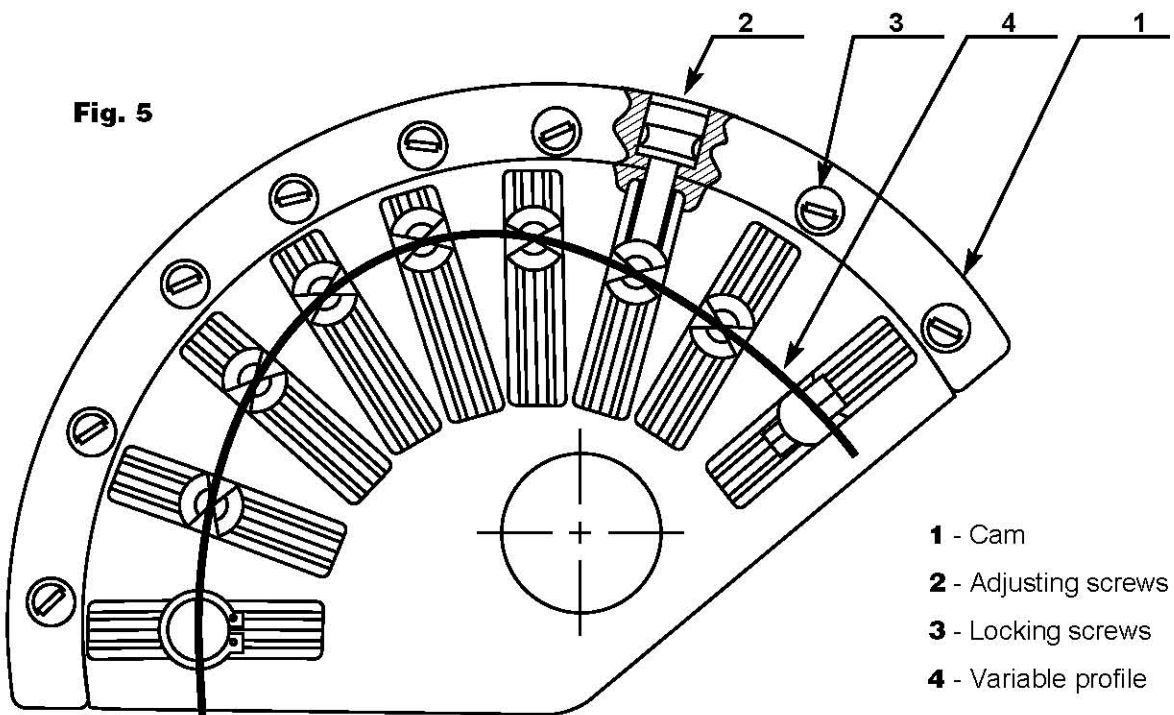


Fig. 4

D - AIR DAMPER ADJUSTMENT

Fig. 5



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The air damper adjustment is made by acting on the cam with variable profile (1).

This adjustment has to be carried out after the settings of the pressure controller and of the combustion head. With the burner in operation, switch off the elec. supply of the servomotor and re-set it by acting on the lever (6) (fig. 2).

Setting of the maximum output

Place the servomotor on 130°, lock it and vary the profile (4) by gradually acting on the screws (2).

Setting of the minimum output

Reset the servomotor again, place it manually on 20°, lock and adjust the profile (4) by gradually acting on the screws (2).

Settings of intermediate outputs

Follow the same procedure.

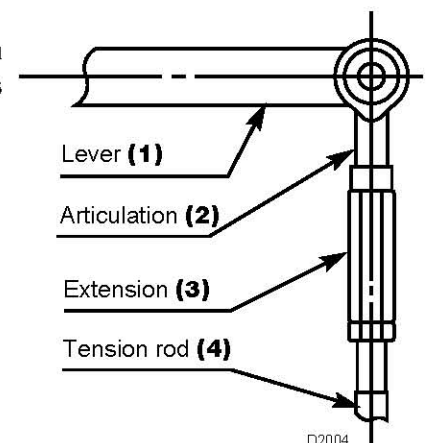
At the end of the setting, re-check all the regulations, re-connect the electrical wires to the servomotor and fasten the adjusting screws (2) by the locking screws (3).

Length variation of the air damper tension rod

It is useful to extend the tension rod when the air damper moves into a reduced angle (air damper at half stroke for the maximum output), in this way the cam profile is not too much bent (4).

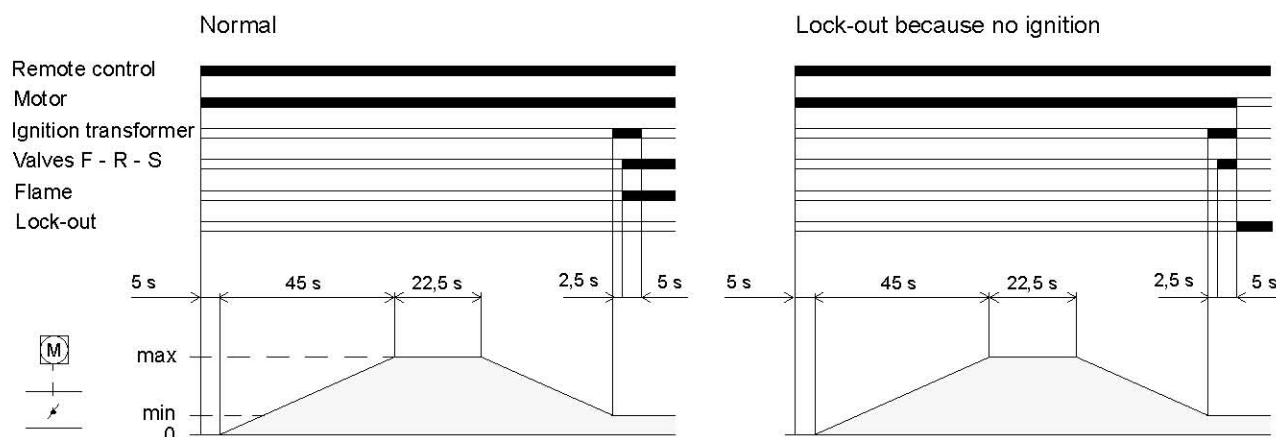
With the burner stop, act in this way:

- Disjoin the articulation (2) from the lever (1) (see drawing).
- Unscrew the extension (3) from the tension rod (4) (some rounds).
- Re-connect the articulation to the lever and move the profile (4) (fig. 5) up to reach the air damper set-point 0 with servomotor at 0°.



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BURNER START-UP PROGRAM

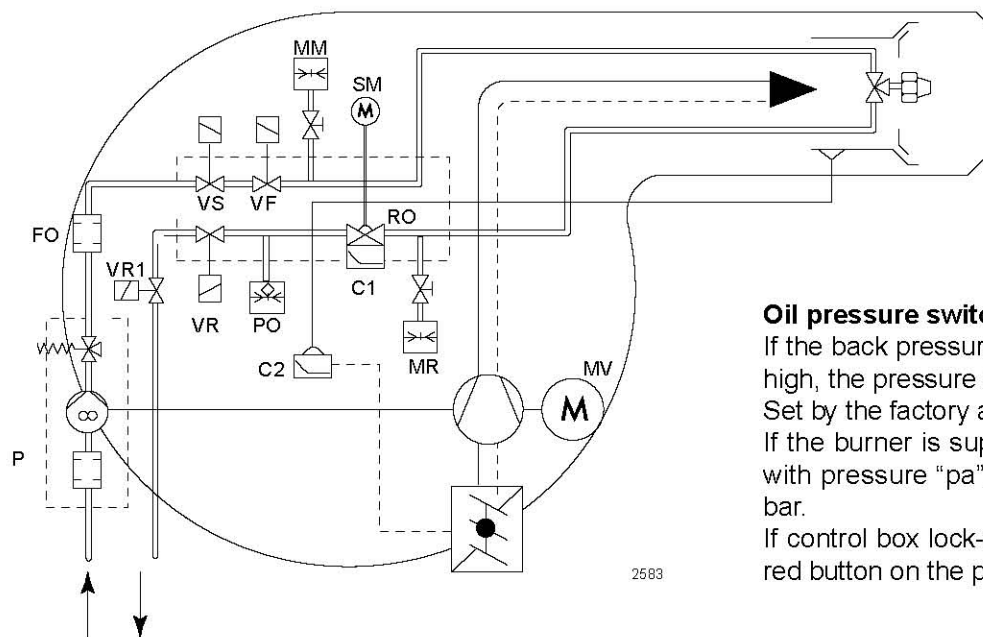


MOTOR LOCK-OUT: It is caused by the motor overload relay if, overload or no phase occurs.

Print on the data label, into the correspondent cell, the kind of performance: two stage progressive or modulating.

N.	TIPO/TYP TYPE	V~50 Hz	KW
Combust. Heizöl/Fuel	max. visc. @ °C	kg/m ³	mm ² /s (°E)
REGOLAZIONE	X →	☐ DUE STADI PROGRESSIVI GLEITEND ZWEISTUFIG	RBL
LEISTUNGSREGELUNG	X →	☐ MODULANTE MODULIEREND	

HYDRAULIC LINE SCHEMA



Oil pressure switch

If the back pressure in the fuel return line is too high, the pressure switch stops the burner. Set by the factory at 1.5 bar.

If the burner is supplied through a ring system with pressure "pa", it shall be set at "pa" + 1.5 bar.

If control box lock-out occurs (pos. P) push the red button on the pressure switch for re-setting.

MR - Oil return pressure gauge

P - Pump with filter and pressure regulator

RO - Oil return pressure regulator