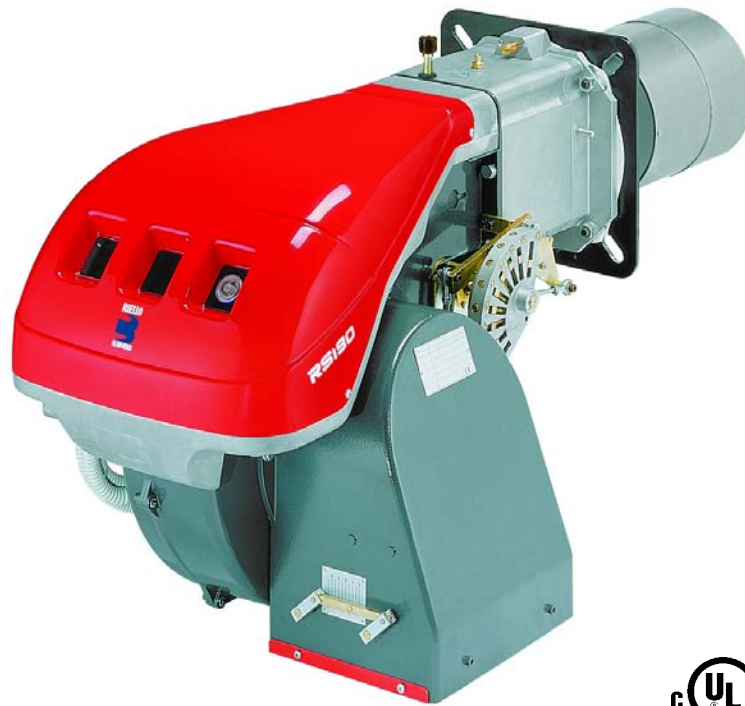


## Gas Burners



### RS 160/M LN

## Low-High-Low or Modulating Operation

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## WARNING

If you smell gas:

- Do not touch any electrical items.
- Open all windows.
- Close all gas supply valves.
- Contact your local gas authority immediately.

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to this manual for instructional or additional information. Consult a certified installer, service representative or the gas supplier for further assistance.

Burner shall be installed in accordance with manufacturers requirements as outlined in this manual, local codes and authorities having jurisdiction.

## TECHNICAL DATA

| MODEL                                      |      |                         | RS 160/M LN   |
|--|------|-------------------------|---|
| Output <sup>(1)</sup>                      | MAX. | kW<br>MBtu/hr           | 1032 - 2065 (1847 *)<br>3521 - 7046 (6302 *)                  |
|  | MIN. | kW<br>MBtu/hr           | 333<br>1136   |
| Fuel                                       |      |                         | Natural gas   |
| - max. delivery                            |      | SCFH                    | 7046  |
| - pressure at max. delivery <sup>(2)</sup> |      | " WC                    | 7   |
| Operation                                  |      |                         | Low - high or modulating                                      |
| Standard applications                      |      |                         | Boilers: water, steam, thermal oil                            |
| Ambient temperature                        |      | °F                      | 32 - 104 (0 - 40 °C)  |
| Combustion air temperature                 |      | °F max                  | 140 (60 °C)   |
| Main power supply (+/-10%)                 |      | V/Ph/Hz                 | 208 - 230/460/575/3/60  |
| Fan motor                                  |      | rpm<br>W - HP<br>V<br>A | 3400<br>4000 - 5.5<br>208 - 230 / 460 / 575<br>15.8 - 9.1 - 6 |
| Ignition transformer                       |      | V1 - V2<br>I1 - I2      | 120 V - 1 x 7 kV<br>1.6 A - 23 mA                             |
| Electrical power consumption               |      | W max                   | 5500  |
| Electrical protection                      |      |                         | NEMA 1  |
| Noise levels <sup>(3)</sup>                |      | dBA                     | 83.1  |

(1) Reference conditions: Ambient temperature 68 °F (20 °C) - Barometric pressure 394" WC - Altitude 329 ft.

(2) Pressure at test point 17)(A)p.4, with zero pressure in the combustion chamber, with open gas ring 2)(B)p.6 at maximum burner output

(3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output.

\* Firing rate for C-UL Canadian Listing (CNL)

### Burner models designations:

| Model       | Code               | Voltage          | Flame safeguard                         |
|-------------|--------------------|------------------|---|
| RS 160/M LN | C9544000 (3788070) | 208-230/460/3/60 | Burner mounted                          |
|             | C9544001 (3788075) | 575/3/60         | Burner mounted                          |
|             | C9744000 (3788073) | 208-230/460/3/60 | In an auxiliary panel (see Accessories) |
|             | C9744001 (3788073) | 575/3/60         | In an auxiliary panel (see Accessories) |

### ACCESSORIES (optional):

#### • Available auxiliary panels

| Control panel code | Flame safeguard type |
|--------------------|----------------------|
| 3010332            | Fireeye              |
| 3010336            | Landis               |
| 3010338            | Honeywell            |

• TUBES KIT (see page 5): cod. **3010249**

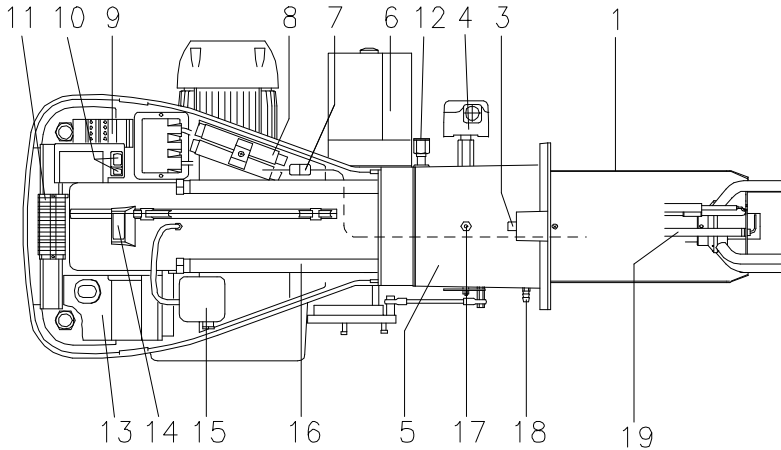
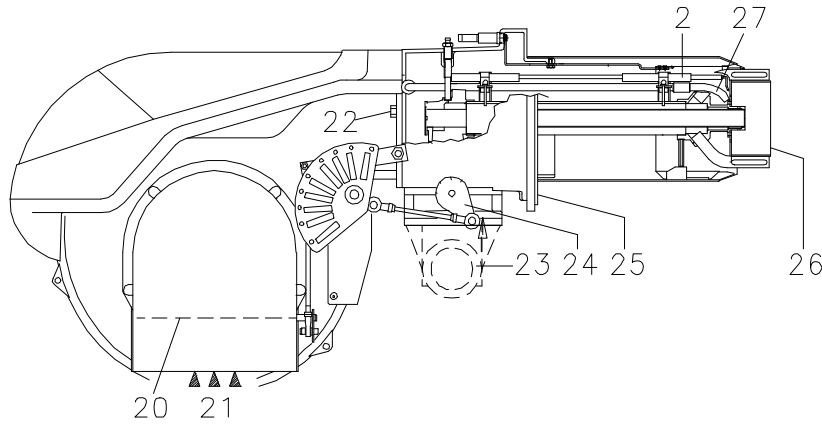
• GAS TRAIN ACCORDING TO UL STANDARDS: see page 9.

#### Important:

The installer is responsible for the supply and installation of any safety device(s) not indicated in this manual.



**3013980:** Thermal overload for 460 V power supply.

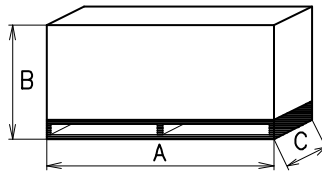


**BURNER DESCRIPTION (A)**

- 1 Combustion head
- 2 Ignition electrode
- 3 Screw for combustion head adjustment
- 4 High gas pressure switch
- 5 Sleeve
- 6 Servomotor controlling the gas butterfly valve and the air damper (by means of a variable profile cam mechanism).  
When the burner is stopped the air damper will be completely closed to reduce heat loss.
- 7 Plug-socket on flame rod cable
- 8 Extensions for slide bars 16) (supplied by kit)
- 9 Motor contactor and thermal overload with reset button
- 10 Power switch for different operations:  
automatic - manual - off  
Button for:  
Power increase - power reduction
- 11 Terminal strip for electrical connection
- 12 Pilot burner attachment
- 13 Flame safeguard with lock-out pilot light and lock-out reset button
- 14 Flame inspection window
- 15 Low air pressure switch (differential operating type)
- 16 Slide bars for opening the burner and inspecting the combustion head
- 17 Gas pressure test point and head fixing screw
- 18 Air pressure test point
- 19 Flame sensor probe (flame rod)
- 20 Air damper
- 21 Air inlet to fan
- 22 Screws securing fan to sleeve
- 23 Gas input pipework
- 24 Gas butterfly valve
- 25 Boiler mounting flange
- 26 Flame stability disk
- 27 Pilot burner

(A) D2791

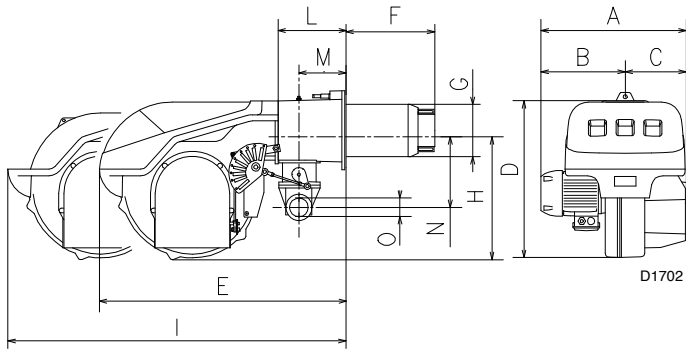
| A                                | B                                | C                                  | lbs |
|----------------------------------|----------------------------------|------------------------------------|-----|
| 52 <sup>3</sup> / <sub>4</sub> " | 28 <sup>1</sup> / <sub>2</sub> " | 30 <sup>29</sup> / <sub>32</sub> " | 198 |



(B) D36

Two types of burner failure may occur:

- **FLAME SAFEGUARD LOCK-OUT:**  
if the flame relay 13)(A) pushbutton lights up, it indicates that the burner is in lock-out.  
To reset, press the pushbutton.
- **MOTOR TRIP:**  
release by pressing the pushbutton on thermal overload 9)(A).



**PACKAGING - WEIGHT (B)** - Approximate measurements

- The burners are shipped skid mounted.
- Outer dimensions of packaging are indicated in (B).
- The weight of the burner complete with packaging is indicated in Table (B).

**MAX. DIMENSIONS (C)** - Approximate measurements  
The maximum dimensions of the burners are given in (C).

Bear in mind that inspection of the combustion head requires the burner to be opened by withdrawing the rear part on the slide bars.  
The maximum dimension of the burner, when open is give by measurement I.

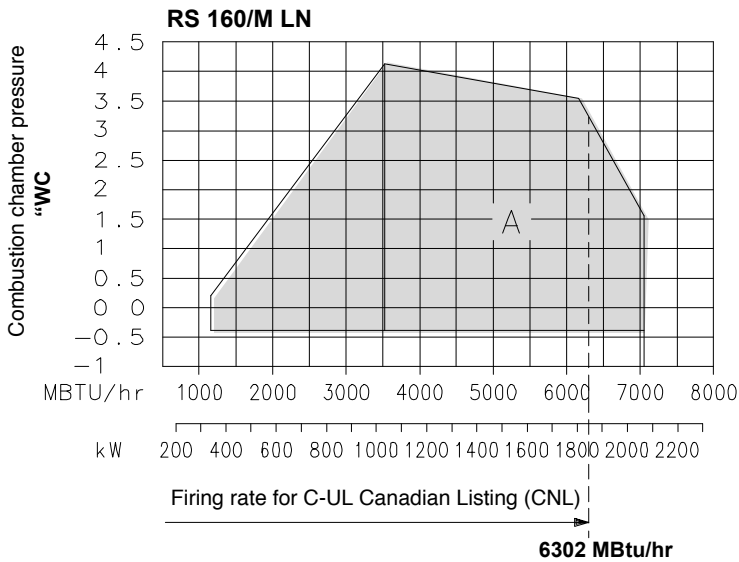
| A                                  | B                                  | C                                  | D                                  | E                                  | F (1)   | G                                 | H                                  | I (1)   | L                                 | M                                 | N                                | O  |
|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|---|-----------------------------------|------------------------------------|---|-----------------------------------|-----------------------------------|----------------------------------|----|
| 26 <sup>13</sup> / <sub>16</sub> " | 14 <sup>13</sup> / <sub>32</sub> " | 12 <sup>13</sup> / <sub>32</sub> " | 21 <sup>27</sup> / <sub>32</sub> " | 33 <sup>31</sup> / <sub>32</sub> " | 14 <sup>11</sup> / <sub>16</sub> "-19 <sup>13</sup> / <sub>16</sub> " | 8 <sup>11</sup> / <sub>16</sub> " | 16 <sup>15</sup> / <sub>16</sub> " | 56 <sup>49</sup> / <sub>64</sub> "-62 <sup>31</sup> / <sub>64</sub> " | 9 <sup>21</sup> / <sub>64</sub> " | 5 <sup>29</sup> / <sub>32</sub> " | 7 <sup>5</sup> / <sub>16</sub> " | 2" |

(1) Blast tube: short - long (with kit)

(C)

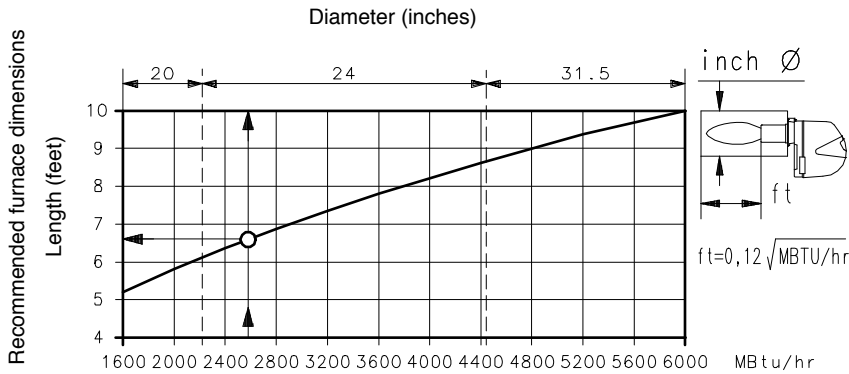
**STANDARD EQUIPMENT**

- 1 - Gas train flange
- 1 - Flange gasket
- 4 - Flange fixing screws
- 1 - Burner head gasket
- 4 - Screws to secure the burner flange to the boiler:  
1/2 W x 13/8"
- 1 - Cap for combustion head
- 1 - Disc for combustion head
- 1 - Instruction booklet
- 1 - Spare parts list



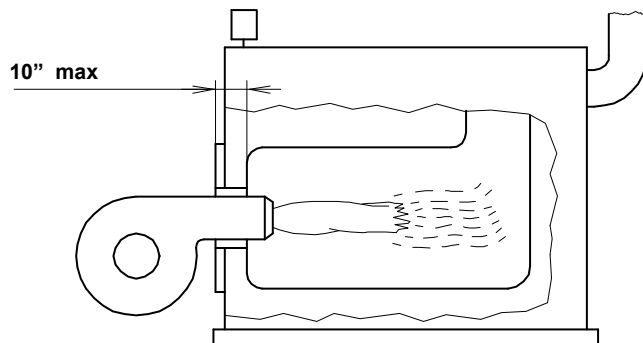
(A)

D2798



(B)

D2919



(C)

D1079

## FIRING RATES (A)

During operation, burner output varies between:

- **MAXIMUM OUTPUT**, selected within area A,
- and **MINIMUM OUTPUT**, which must not be lower than the minimum limit in the diagram.

RS 160 /M LN = 1136 MBtu/hr = 333 kW

### Important

The FIRING RATE area values have been obtained considering an ambient temperature of 68 °F (20 °C), and an atmospheric pressure of 394 "WC and with the combustion head adjusted as shown on page 8.

### Note:

The FIRING RATE areas given in figure (A) have been reduced by 10% with respect to the maximum range that can be reached.

Consult Procedure on page 15 to refer burner operating condition in high altitude plants.

## MINIMUM FURNACE DIMENSIONS (B)

The firing rates were set in relation to certified test boilers.

Figure (B) indicates the diameter and length of the test combustion chamber.

### Example:

Output 2579 MBtu/hr:

diameter = 23.6 inch; length 6.6 ft

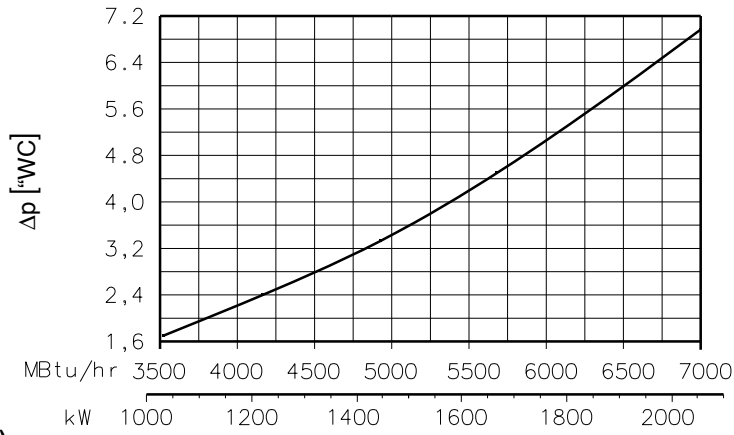
## COMMERCIAL BOILERS (C) - IMPORTANT

The RS 160/M LN burner is suitable for operation on either flame-inversion boilers\* or boilers with combustion chambers featuring flow from the base (three flue passes) on which the best results are obtained in terms of low NOx emissions.

The maximum thickness of the boiler's front door must not exceed 10" (see fig. C).

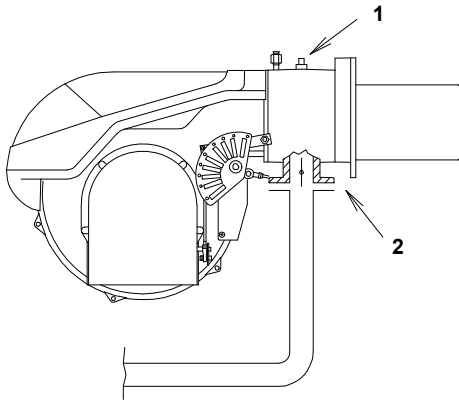
(\* ) For flame inversion boilers, a kit is available to reduce CO emissions if required.

The kit includes 5 gas pipes, identical to the other 5 already fitted to the burner head. In standard conditions, the burner head is fitted with a second group of pipes, with gas outlet in a different direction with respect to the others. With this Kit, the second group of pipes is replaced, so that all the pipes are the same. After fitting the kit, ensure they work correctly by measuring the CO and flue gases emissions.



(A)

D3188



(B)

D2441

## GAS PRESSURE

The adjacent diagram shows minimum pressure losses along the gas supply line depending on the maximum burner output operation with natural gas.

### Column 1

Gas manifold pressure measured at test point 1)(B), with:

- Combustion chamber at 0" WC;
- Burner operating at maximum output;
- Combustion head adjusted as indicated in diagram (C)p. 8.

Calculate the approximate maximum output of the burner as follows:

- subtract the combustion chamber pressure from the gas pressure measured at test point 1)(B).
- Find the nearest pressure value to your result in diagram (A).
- Read off the corresponding output on the left.

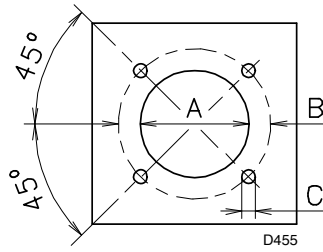
### Example

- Maximum output operation
  - Natural gas
  - Gas pressure at test point 1)(B) = 4.09" WC
  - Pressure in combustion chamber = 1.18" WC
- $$4.09 - 1.18 = 2.91" \text{ WC}$$

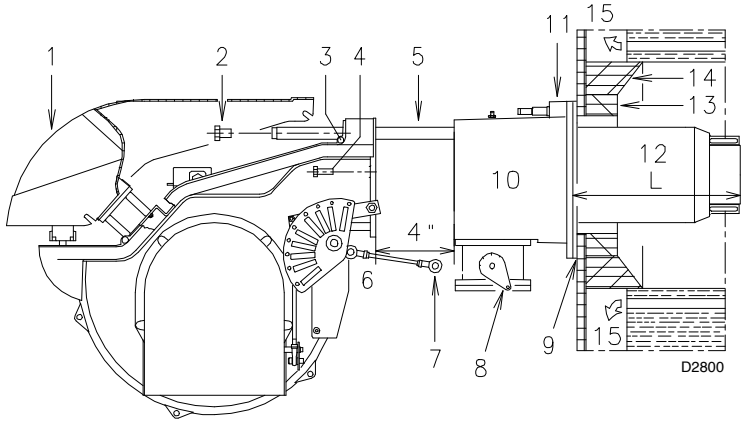
A maximum output of 4094 MBtu/hr shown in diagram (A) corresponds to 2.91" WC pressure.

This value serves as a rough guide, the effective delivery must be measured at the gas meter.

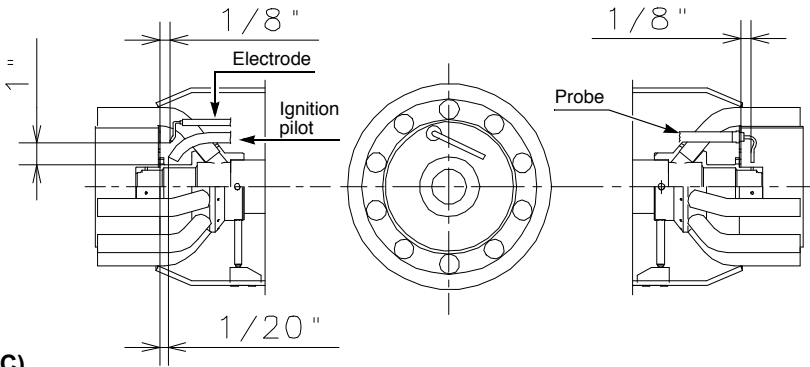
| A       | B                   | C     |
|---------|---------------------|-------|
| 9 1/16" | 12 25/32" - 14 1/2" | 5/8 W |



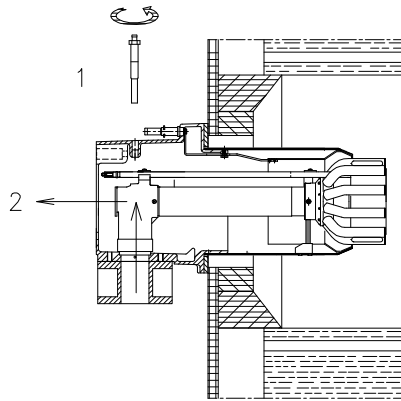
(A)



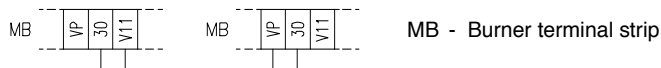
(B)



(C)



(D)



(E)

## INSTALLATION

### BOILER PLATE (A)

Drill the combustion chamber mounting plate as shown in (A). The position of the threaded holes can be marked using the burner head gasket supplied with the burner.

### BLAST TUBE LENGTH (B)

The length of the blast tube must be selected according to the indications provided by the manufacturer of the boiler, it must be greater than the thickness of the boiler door complete with its insulation. The length available, L (inches), is 14 11/16".

For boilers with front flue passes (15) or flame inversion chambers, protective insulation material (13), must be inserted between the boiler refractory (14) and the blast tube (12).

This protective insulation must not compromise the extraction of the blast tube.

For boilers having a water-cooled front, the insulation (13)-14) is not required unless it is required by the boiler manufacturer.

### SECURING THE BURNER TO THE BOILER (B)

Before securing the burner to the boiler, check through the blast tube opening to make sure that the flame sensor probe (flame rod) is correctly set in position, as shown in (C).

Now detach the combustion head from the burner, fig. (B):

- loosen the four screws (3) and remove the cover (1);
- disengage the swivel joint (7) from the graduated sector (8);
- remove the screws (2) from the slide bars (5);
- remove the two screws (4) and pull the burner back on slide bars (5) by about 4";
- disconnect the wires from the flame rod and the electrode and then pull the burner completely off the slide bars.

Secure the flange (11)(B) to the boiler plate, inserting the gasket (9)(B). Use the 4 screws, also supplied with the unit, after first protecting the thread with an anti-locking product.

The seal between burner and boiler must be airtight.

If you noticed any irregularities in the positions of the flame rod or ignition electrode during the check mentioned above, remove screw (1)(D), extract the internal part (2)(D) of the head and set up the two components correctly.

### IGNITION PILOT ADJUSTMENT

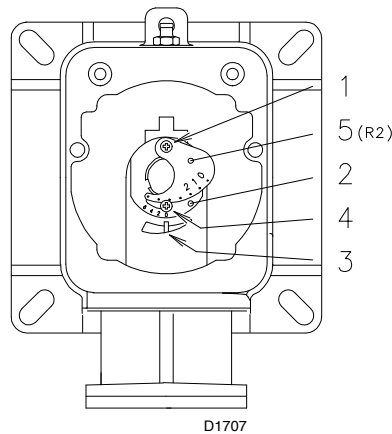
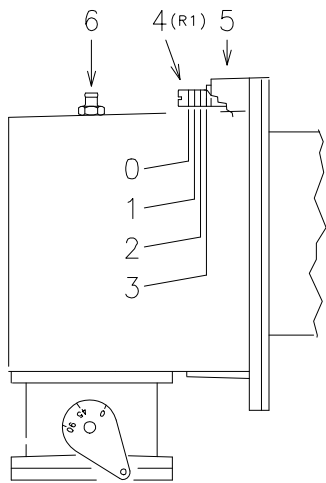
Place the pilot and electrode as shown in fig. (C).

The pilot works correctly at pressures ranging from 5 - 12" WC.

#### Important

To set the pilot without main burner operation, proceed as follows:

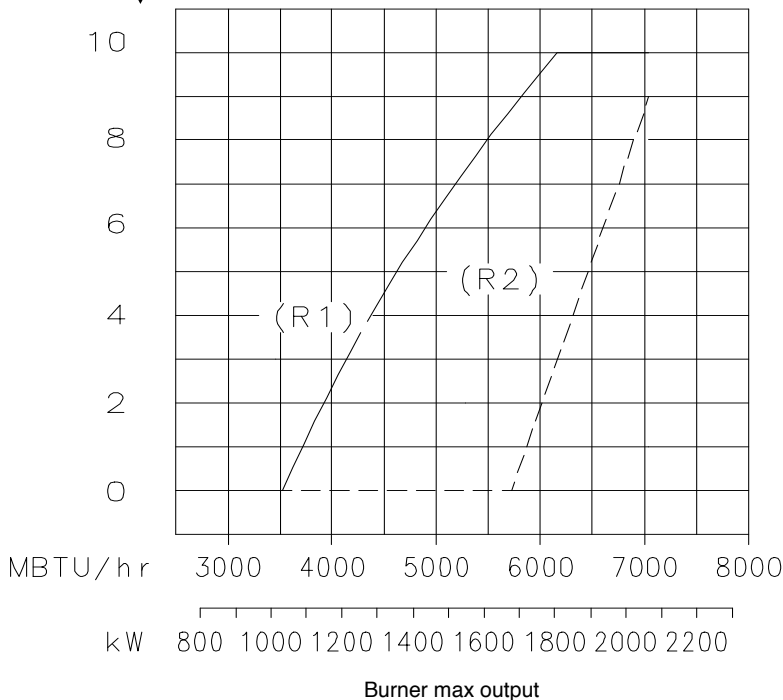
- Move the jumper from terminals "30-V11" to terminals "30-VP", as given in fig. (E), this way the main valve is cut out.
- With the burner in the manual position, hold the air damper in the minimum position and make the setting.
- When the setting is correct, replace the jumper on "30-V11".



(A)

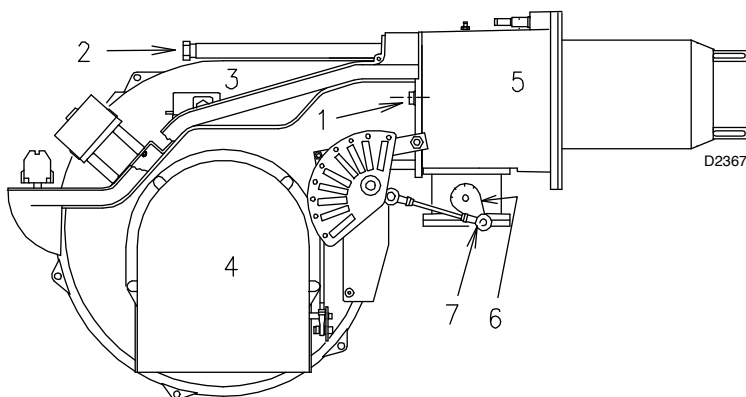
(B)

Notches (Air = Gas)



(C)

D2801



(D)

## COMBUSTION HEAD ADJUSTMENT

Installation operations are now at the stage where the blast tube and sleeve are secured to the boiler as shown in fig. (A). It is now a very simple matter to set up the combustion head, as this depends solely on the maximum output developed by the burner.

It is therefore essential to establish this value before proceeding to set up the combustion head.

There are two adjustments to make on the head:

- outside air R1;
- central air R2.

In diagram (C) find the notch for:

### Outside air adjustment R1 (A)

Turn screw 4)(A) until the notch identified is aligned with the front surface 5)(A) of the connector.

**IMPORTANT:** In order to facilitate adjustment, loosen screw 6)(A), adjust and then tighten.

### Central air adjustment R2 (B)

Loosen the 3 screws 1)(B) and turn ring 2) until the notch identified is aligned with index 3). Tighten the 3 screws 1) fully down.

### Example

RS 160 / M LN

max. burner output = 5681 MBtu/hr

If we consult diagram (C) we find that for this output the adjustments are:

- outside air: R1 = notch 8.6;
- central air: R2 = notch 0.

### NOTES

- R2 adjustment (diagram C) is an indication only. If possible, always keep the ring nut closed (notch 0); if air recovery is required the nut may be opened following the indications in diagram (C).

- Diagram (C) indicates an optimal regulation for a type of boiler seen in fig. (B) page 5.

Make sure that the combustion characteristics are satisfactory and free of pulsations.

Once you have finished setting up the head, refit the burner to the slide bars 3)(D) at approximately 4" from the sleeve 4)(D) - burner positioned as shown in fig. (B) pag. 7 - insert the flame rod cable and the ignition electrode cable and then slide the burner up to the sleeve so that it is positioned as shown in fig. (D).

Refit screws 2) on slide bars 3) after mounting the extension bracket and relative extensions.

Secure the burner to the sleeve by tightening screw 1).

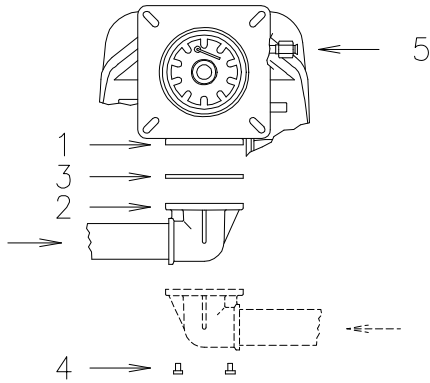
Reconnect the swivel joint 7) to the graduated sector 6).

Connect gas train and pilot train as shown in fig. (A) page 9.

### Important

When fitting the burner on the two slide bars, it is advisable to gently draw out the high tension cable and flame detection probe cable until they are slightly stretched.





**(A)**

D2846

TYPICAL UL SCHEMATIC GAS PIPING

**GAS PIPING**

- The main gas train must be connected to the gas attachment 1)(A), using flange 2), gasket 3) and screws 4) supplied with the burner.
- The gas train can enter the burner from the right or left side, depending on which is the most convenient, see fig. (A).
- The gas safety shut-off valves 5)-6)(A) must be as close as possible to the burner to ensure gas reaches the combustion head within the safety time range.
- The pilot gas train must be connected to the gas attachment 5)(A).

**GAS TRAIN (B)**

It must be type-approved according to required standards and is supplied separately from the burner.

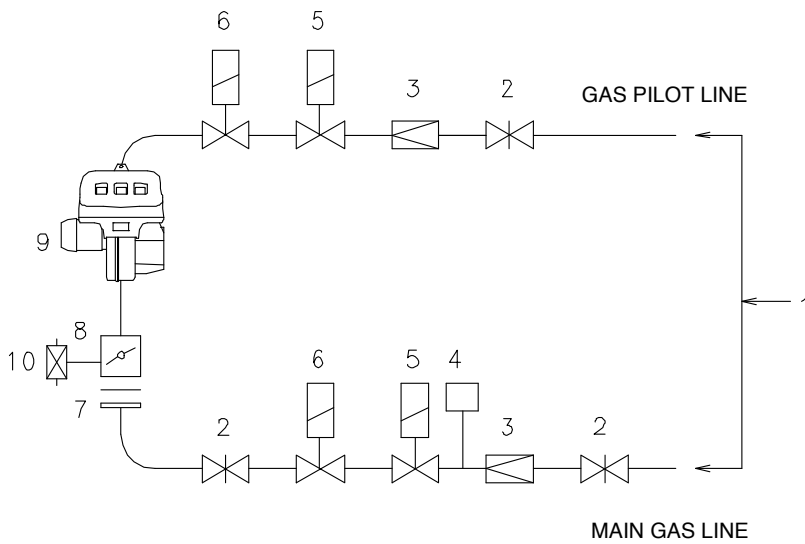
**Note**

See the accompanying instructions for the adjustment of the gas train.

**KEY (A)**

- 1 - Gas input pipe
- 2 - Manual valve
- 3 - Pressure regulator
- 4 - Low gas pressure switch
- 5 - 1st safety shut off valve
- 6 - 2nd safety shut off valve
- 7 - Standard issue burner with flange gasket
- 8 - Gas adjustment butterfly valve \*
- 9 - Burner
- 10 - High gas pressure switch \*

\* On the burner

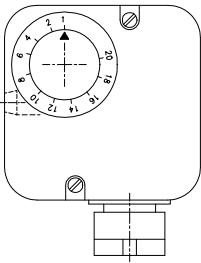


**(B)**

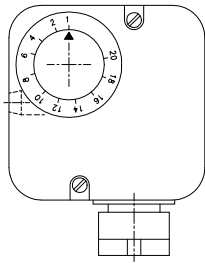
D2438

LOW GAS PRESSURE SWITCH    HIGH GAS PRESSURE SWITCH

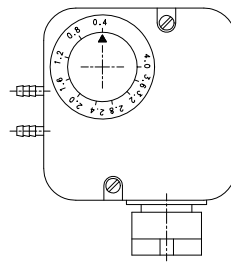
AIR PRESSURE SWITCH



(A)



(B)



(C)

### ADJUSTMENTS BEFORE FIRST FIRING

Adjustment of the combustion head, and air and gas deliveries has been illustrated on page 8.

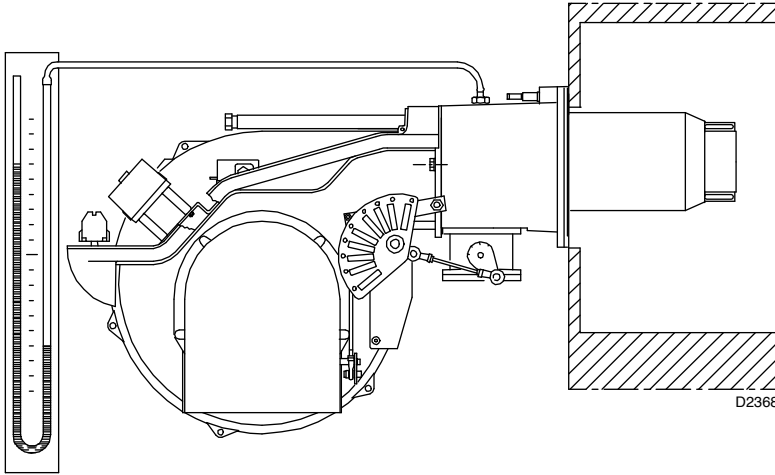
In addition, the following adjustments must also be made:

- Open manual valves up-stream from the gas train.
- Adjust the low gas pressure switch to the start of the scale (A).
- Adjust the high gas pressure switch to the end of the scale (B).
- Adjust the air pressure switch to the zero position of the scale (C).
- Purge the air from the gas line.

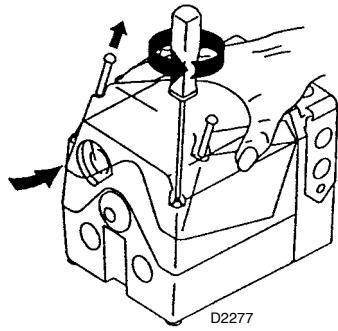
Fit a U-type manometer (D) to the gas pressure test point on the sleeve.

The manometer readings are used to calculate the MAX. burner power using the diagram on page 6.

Before starting up the burner it is good practice to adjust the gas train so that ignition takes place in conditions of maximum safety, i.e. with gas delivery at the minimum.



(D)



(A)

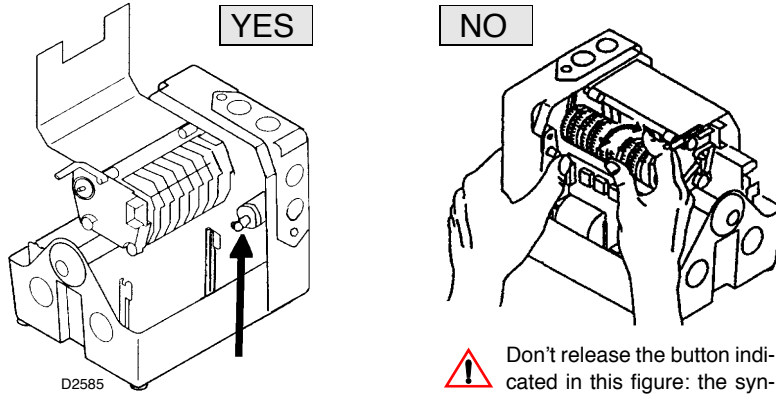
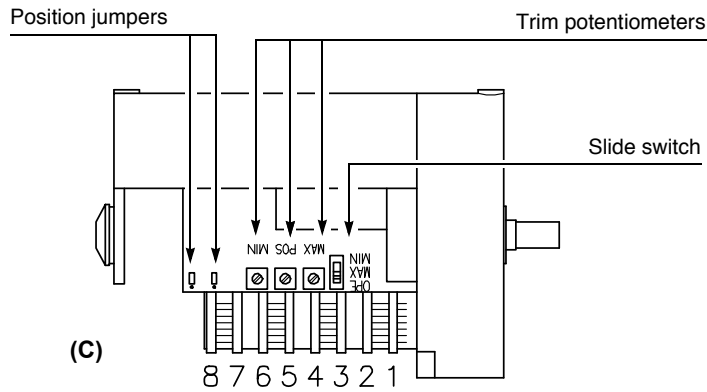


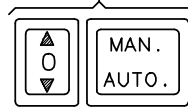
Figure above shows how the servomotor is released to manually check there is no binding through its motion.

Don't release the button indicated in this figure: the synchronization of the cams made in factory would be changed.

(B)

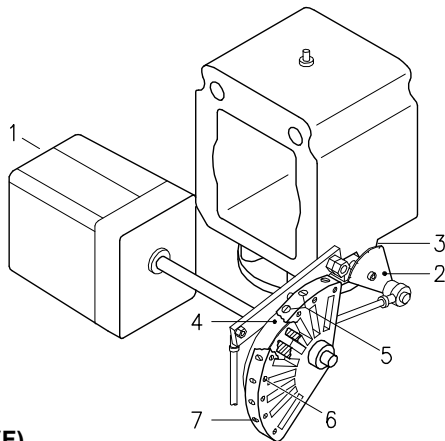


(C)



(D) (E)

D2593



- 1 Servomotor
- 2 Graduated sector for gas butterfly valve
- 3 Index for graduated sector 2
- 4 Adjustable profile cam
- 5 Adjustment screws for cam starting profile
- 6 Adjustment fixing screws
- 7 Adjustment screws for cam and profile

(F)

D2594

## SERVOMOTOR

The servomotor gives simultaneous regulation of the air damper through the variable cam profile 4(F) and the gas butterfly valve.

It rotates by 130° in approx. 35 s.

The factory settings must not be changed for the first firing, just check that they comply with the details below.

To open the servomotor, remove the screws and pull the cover outward, fig. (A).

## CAMS AND TRIM POTENTIOMETERS FUNCTIONS

**Cam 1: 130°**

Limits rotation towards maximum for gas.

**Cam 2: 0°**

Limits rotation towards minimum, air damper closed on stand by.

**Cam 3: 20°**

Limits gas ignition position.

**Cams 4 - 5 - 6 - 7 - 8: not used**

**Trim potentiometer MAX**

Limits maximum modulation.

It must be set near the stroke end (cam 1) to exploit as far as possible the variable stroke profile cam and maximum opening of the gas butterfly valve.

**Trim potentiometer MIN**

Limits minimum modulation.

It must be set near the stroke end (cam 2) to exploit as far as possible the variable profile cam.

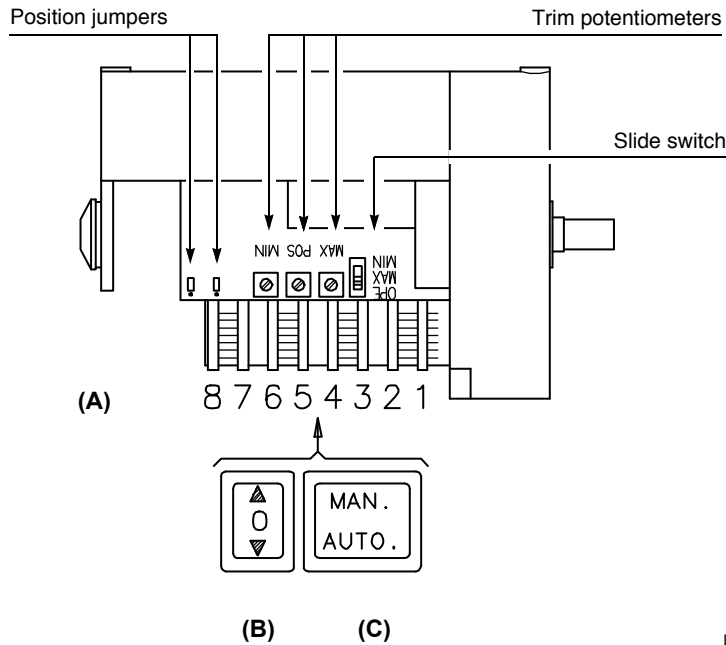
**Trim potentiometer POS**

Limits an intermediate operating position between MAX and MIN, supplying power to the "P" terminal in the servomotor (through an external command). This function cuts out any external signals.

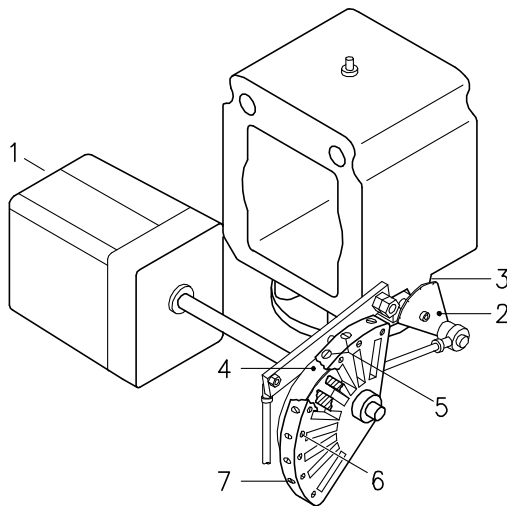
**Note**

Using the slide switch to select MAX or MIN, the servomotor goes into the position for the respective settings of the MAX and MIN TRIM POTENTIOMETERS.

When the settings are complete, place the slide switch on OPE.



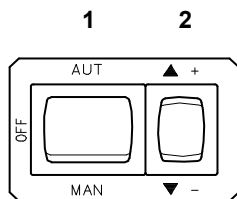
D2593



- 1 Servomotor
- 2 Graduated sector for gas butterfly valve
- 3 Index for graduated sector 2
- 4 Adjustable profile cam
- 5 Adjustment screws for cam starting profile
- 6 Adjustment fixing screws
- 7 Adjustment screws for cam and profile

(D)

D2594



(E)

D791

## BURNER STARTING

Close the control circuit, with the switch in fig. C) in the AUTO position.

On firing (pilot burner and main valve) turn the switch (C) to MAN and the switch 1)(E) in the AUT position.

## MAXIMUM OUTPUT

Using button (B), "increase output" until it stops, app. 130° (cam 1).

Place the slide switch on MAX and set the relative MAX trim potentiometer (setting must be very near to 130°) to exploit as far as possible the variable profile cam 4)(D) and have the gas butterfly valve on maximum opening, graduated sector 2) on index 3) fig. (D).

The setting of the gas flow must be made on the gas train regulator and, if necessary, on the gas valve.

The air setting must be made on the variable profile cam 4)(D) by turning the screws 5), after loosening the screws 6).

## MINIMUM OUTPUT

With the slide switch on the OPE position, use button (B) "decrease output" until it stops at app. 20° (cam 3).

Put the slide switch in the MIN position and set the modulation minimum using the relative MIN trim potentiometer.

Set the air using the variable profile cam 4)(D).

If a lower modulation minimum is required than the level set on cam 3 of the servomotor (20°), decrease the cam setting.

## INTERMEDIATE OUTPUTS

With the switch (C) in the AUTO position, the slide switch in the OPE position and the switch 1)(E) in the MAN position, move the button 2)(E) in various intermediate levels between maximum and minimum and set the variable profile cam 4)(D) to achieve optimum combustion, by turning the screws 5).

If possible, do not change the previously set maximum and minimum levels.

Check the various setting levels with a combustion analysis.

## Important

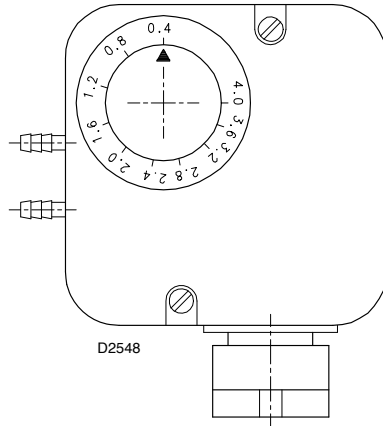
Make a progressive adjustment of the profile, without sharp changes.

When the setting is complete, lock the cam profile using screws 6)(D).

Turn the burner off, release the servomotor as shown in fig. (B) page 11 and manually turn cam 4)(D) to check there is no binding.

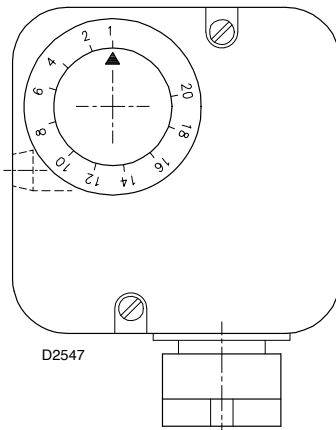
Finally fix the adjustment by turning the screws 6)(D).

**AIR PRESSURE SWITCH**



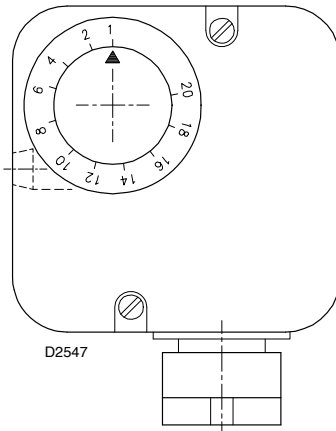
**(A)**

**HIGH GAS PRESSURE SWITCH**

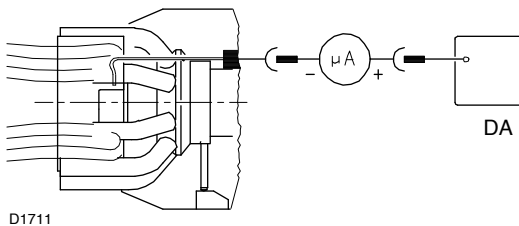


**(B)**

**LOW GAS PRESSURE SWITCH**



**(C)**



**(D)**

**AIR PRESSURE SWITCH (A)**

Adjust the air pressure switch after having performed all other burner adjustments with the air pressure switch set to the start of the scale (A).

With the burner operating at min. output, increase adjustment pressure by slowly turning the relative dial clockwise until the burner locks out.

Then turn the dial anti-clockwise by about 20% of the set point and repeat burner starting to ensure it is correct. If the burner locks out again, turn the dial anti-clockwise a little bit more.

**Attention:**

As a rule, the air pressure switch must prevent the formation of CO.

To check this, insert a combustion analyser into the chimney, slowly close the fan suction inlet (for example with cardboard) and check that the burner locks out, before the CO in the fumes exceeds 400 ppm.

The air pressure switch may operate in "differential" operation in two pipe system. If a negative pressure in the combustion chamber during pre-purging prevents the air pressure switch from switching, switching may be obtained by fitting a second pipe between the air pressure switch and the suction inlet of the fan. In such a manner the air pressure switch operates as differential pressure switch.

**HIGH GAS PRESSURE SWITCH (B)**

Adjust the high gas pressure switch after having performed all other burner adjustments with the maximum gas pressure switch set to the end of the scale (B).

With the burner operating at MAX output, reduce the adjustment pressure by slowly turning the adjustment dial anticlockwise until the burner locks out.

Then turn the dial clockwise by 0.8" WC and repeat burner firing.

If the burner locks out again, turn the dial again clockwise by 0.4" WC.

**LOW GAS PRESSURE SWITCH (C)**

Adjust the low gas pressure switch after having performed all the other burner adjustments with the pressure switch set at the start of the scale (C).

With the burner operating at MAX output, increase adjustment pressure by slowly turning the relative dial clockwise until the burner locks out.

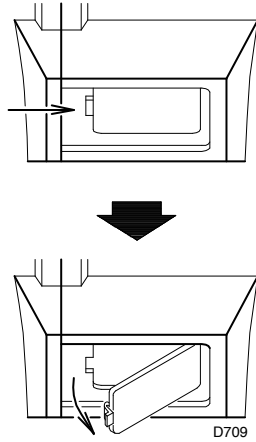
Then turn the dial anti-clockwise by 0.8" WC and repeat burner starting to ensure it is uniform.

If the burner locks out again, turn the dial anti-clockwise again by 0.4" WC.

**FLAME PRESENT CHECK (D)**

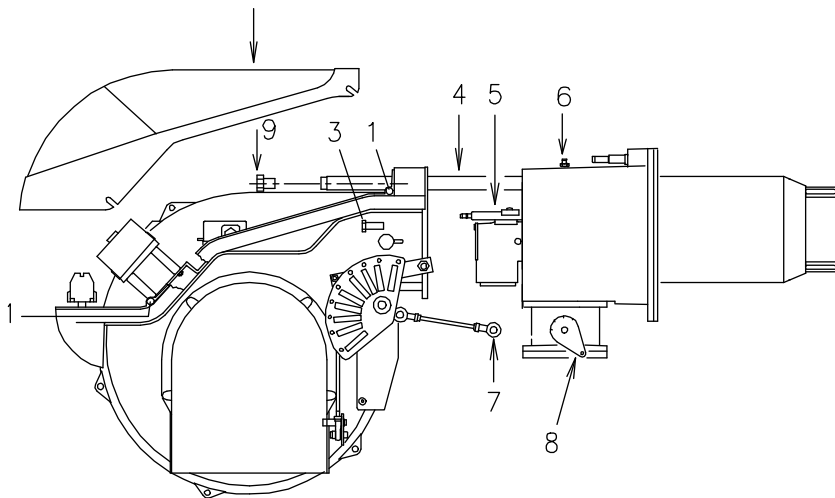
The burner is fitted with an ionisation (flame rod) system which ensures that a flame is present. The minimum current for reliable operation is 6 μA (see manufacturers documentation). The burner provides a much higher current, so that controls are not normally required. However, if it is necessary to measure the ionisation current, disconnect the plug-socket 7)(A)p.4 on the ionisation probe cable and insert a direct current microammeter with a base scale of 100 μA. Carefully check polarities.

**FLAME INSPECTION WINDOW**



**(A)**

**OPENING THE BURNER**



D2369

**(B)**

**MAINTENANCE**

**Combustion**

The optimum calibration of the burner requires an analysis of the flue gases. Significant differences with respect to the previous measurements indicate the points where more care should be exercised during maintenance.

**Gas leaks**

Make sure that there are no gas leaks on the pipework between the gas meter and the burner.

**Flame inspection window**

Clean the flame inspection window (A).

**Combustion head**

Open the burner and make sure that all components of the combustion head are in good condition, not deformed by the high temperatures, free of impurities from the surroundings and correctly positioned. If in doubt, disassemble the elbow fitting 5)(B).

**Servomotor**

Disengage the cam 4)(D)p. 12 from the servomotor and turn it backwards and forwards by hand to make sure it moves freely.

**Burner**

Check for excess wear or loose screws in the mechanisms controlling the air damper and the gas butterfly valve. Also make sure that the screws securing the electrical leads in the burner terminal strip are fully tightened.

Clean the outside of the burner, taking special care with the swivel joints and cam.

**Combustion**

Adjust the burner if the combustion values found at the beginning of the operation do not comply with the regulations in force, or do not correspond to good combustion. Record the new combustion values; they will be useful for subsequent controls.

**TO OPEN THE BURNER (B):**

- Switch off the electrical power.
- Loosen screws 1) and withdraw cover 2).
- Disengage the swivel joint 7) from the graduated sector 8).
- Fit the two extensions onto the slide bars 4).
- Remove screws 3), and pull the burner back by about 4" on the slide bars 4). Disconnect the probe and electrode leads and then pull the burner fully back.
- Now extract the gas distributor 5) after having removed the screw 6) and disconnecting the pilot gas line.

**TO CLOSE THE BURNER (B):**

- Push the burner until it is about 4" from the sleeve.
- Re-connect the leads and slide in the burner until it comes to a stop.
- Refit screws 3), and pull the probe and electrode leads gently out until they are slightly stretched.
- Re-couple the swivel joint 7) to the graduated sector 8).
- Remove the two extensions from the slide bars 4).
- Connect the pilot gas line.

**PROCEDURE TO REFER BURNER OPERATING CONDITION IN HIGH ALTITUDE PLANTS**

- Find the **corrected burner capacity** for the plant's altitude in chart 1 and the **corrected pressure** in chart 2.
- Check in the firing rate graph of the burner (page 5), if the working point defined by the values above is within the range limits. If not, higher burner size is needed.

**Note**

Charts are based only on altitude variation (reference temperature = 68°F , 20°C)

To get the combined correction in case of different air temperature, a compensation of **1000 ft each 20°F (305 m each 11°C)** is applicable.

**Example**

Rated capacity = 3000 MBtu/hr - Rated air pressure = 1.5" w.c.

Real altitude = 5000 ft - Real temperature = 108°F

$\Delta = 108^\circ\text{F} - 68^\circ\text{F}$  (reference temp.) = 40°F (equivalent 2000 ft variation)

Proceeding as described above and considering a "virtual altitude" of (5000 + 2000) ft:

- the corrected capacity is 3847 MBtu/hr;

- the corrected burner air pressure is 1.92.



**Burner RS 160/M LN is OK**

**1**

**CORRECTED BURNER CAPACITY ACCORDING TO ALTITUDE**

| Rated Capacity                     | Altitude              |      |       |       |       |       |       |       |        |       |       |
|------------------------------------|-----------------------|------|-------|-------|-------|-------|-------|-------|--------|-------|-------|
|                                    | m. a.s.l.<br>ft a.s.l | 0    | 100   | 305   | 610   | 915   | 1220  | 1525  | 1830   | 2135  | 2440  |
| 500                                |                       | 494  | 500   | 512   | 530   | 551   | 571   | 593   | 616    | 641   | 669   |
| 1000                               |                       | 987  | 1000  | 1023  | 1061  | 1101  | 1142  | 1186  | 1232   | 1282  | 1337  |
| 1500                               |                       | 1481 | 1500  | 1535  | 1591  | 1652  | 1713  | 1778  | 1848   | 1924  | 2006  |
| 2000                               |                       | 1974 | 2000  | 2046  | 2121  | 2202  | 2284  | 2371  | 2464   | 2565  | 2675  |
| 2500                               |                       | 2468 | 2500  | 2558  | 2652  | 2753  | 2855  | 2964  | 3079   | 3206  | 3343  |
| 3000                               |                       | 2962 | 3000  | 3069  | 3182  | 3303  | 3425  | 3557  | 3695   | 3847  | 4012  |
| 3500                               |                       | 3455 | 3500  | 3581  | 3712  | 3854  | 3996  | 4149  | 4311   | 4488  | 4680  |
| 4000                               |                       | 3949 | 4000  | 4092  | 4243  | 4404  | 4567  | 4742  | 4927   | 5130  | 5349  |
| 4500                               |                       | 4442 | 4500  | 4604  | 4773  | 4955  | 5138  | 5335  | 5543   | 5771  | 6018  |
| 5000                               |                       | 4936 | 5000  | 5116  | 5303  | 5505  | 5709  | 5928  | 6159   | 6412  | 6686  |
| 5500                               |                       | 5429 | 5500  | 5627  | 5834  | 6056  | 6280  | 6520  | 6775   | 7053  | 7355  |
| 6000                               |                       | 5923 | 6000  | 6139  | 6364  | 6606  | 6851  | 7113  | 7391   | 7694  | 8024  |
| 6500                               |                       | 6417 | 6500  | 6650  | 6894  | 7157  | 7422  | 7706  | 8006   | 8335  | 8692  |
| 7000                               |                       | 6910 | 7000  | 7162  | 7425  | 7708  | 7993  | 8299  | 8622   | 8977  | 9361  |
| 7500                               |                       | 7404 | 7500  | 7673  | 7955  | 8258  | 8564  | 8892  | 9238   | 9618  | 10029 |
| 8000                               |                       | 7897 | 8000  | 8185  | 8485  | 8809  | 9135  | 9484  | 9854   | 10259 | 10698 |
| 8500                               |                       | 8391 | 8500  | 8697  | 9016  | 9359  | 9705  | 10077 | 10470  | 10900 | 11367 |
| 9000                               |                       | 8885 | 9000  | 9208  | 9546  | 9910  | 10276 | 10670 | 11086  | 11541 | 12035 |
| 9500                               |                       | 9378 | 9500  | 9720  | 10076 | 10460 | 10847 | 11263 | 11702  | 12183 | 12704 |
| 10000                              |                       | 9872 | 10000 | 10231 | 10607 | 11011 | 11448 | 11855 | 12318  | 12824 | 13373 |
| Average barometric Pressure (20°C) | mbar                  | 1013 | 1000  | 977,4 | 942,8 | 908,2 | 875,8 | 843,5 | 811,85 | 779,8 | 747,8 |
| Average barometric Pressure (68°F) | "w.c.                 | 399  | 394   | 385   | 371   | 358   | 345   | 332   | 320    | 307   | 294   |

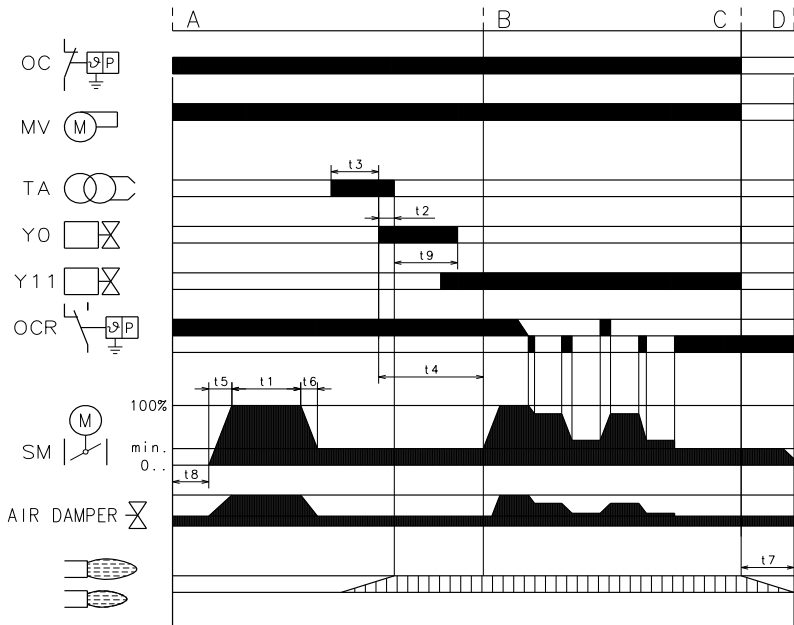
**2**

**CORRECTED BURNER AIR PRESSURE ACCORDING TO ALTITUDE**

| Rated Pressure                     | Altitude              |      |       |       |       |       |       |       |        |       |       |
|------------------------------------|-----------------------|------|-------|-------|-------|-------|-------|-------|--------|-------|-------|
|                                    | m. a.s.l.<br>ft a.s.l | 0    | 100   | 305   | 610   | 915   | 1220  | 1525  | 1830   | 2135  | 2440  |
| 0,50                               |                       | 0,49 | 0,50  | 0,51  | 0,53  | 0,55  | 0,57  | 0,59  | 0,62   | 0,64  | 0,67  |
| 1,00                               |                       | 0,99 | 1,00  | 1,02  | 1,06  | 1,10  | 1,14  | 1,19  | 1,23   | 1,28  | 1,34  |
| 1,50                               |                       | 1,48 | 1,50  | 1,53  | 1,59  | 1,65  | 1,71  | 1,78  | 1,85   | 1,92  | 2,01  |
| 2,00                               |                       | 1,97 | 2,00  | 2,05  | 2,12  | 2,20  | 2,28  | 2,37  | 2,46   | 2,56  | 2,67  |
| 2,50                               |                       | 2,47 | 2,50  | 2,56  | 2,65  | 2,75  | 2,85  | 2,96  | 3,08   | 3,21  | 3,34  |
| 3,00                               |                       | 2,96 | 3,00  | 3,07  | 3,18  | 3,30  | 3,43  | 3,56  | 3,70   | 3,85  | 4,01  |
| 3,50                               |                       | 3,46 | 3,50  | 3,58  | 3,71  | 3,85  | 4,00  | 4,15  | 4,31   | 4,49  | 4,68  |
| 4,00                               |                       | 3,95 | 4,00  | 4,09  | 4,24  | 4,40  | 4,57  | 4,74  | 4,93   | 5,13  | 5,35  |
| 4,50                               |                       | 4,44 | 4,50  | 4,60  | 4,77  | 4,95  | 5,14  | 5,33  | 5,54   | 5,77  | 6,02  |
| 5,00                               |                       | 4,94 | 5,00  | 5,12  | 5,30  | 5,51  | 5,71  | 5,93  | 6,16   | 6,41  | 6,69  |
| 5,50                               |                       | 5,43 | 5,50  | 5,63  | 5,83  | 6,06  | 6,28  | 6,52  | 6,77   | 7,05  | 7,35  |
| 6,00                               |                       | 5,92 | 6,00  | 6,14  | 6,36  | 6,61  | 6,85  | 7,11  | 7,39   | 7,69  | 8,02  |
| 6,50                               |                       | 6,42 | 6,50  | 6,65  | 6,89  | 7,16  | 7,42  | 7,71  | 8,01   | 8,34  | 8,69  |
| 7,00                               |                       | 6,91 | 7,00  | 7,16  | 7,42  | 7,71  | 7,99  | 8,30  | 8,62   | 8,98  | 9,36  |
| 7,50                               |                       | 7,40 | 7,50  | 7,67  | 7,96  | 8,26  | 8,56  | 8,89  | 9,24   | 9,62  | 10,03 |
| 8,00                               |                       | 7,90 | 8,00  | 8,18  | 8,49  | 8,81  | 9,13  | 9,48  | 9,85   | 10,26 | 10,70 |
| 8,50                               |                       | 8,39 | 8,50  | 8,70  | 9,02  | 9,36  | 9,71  | 10,08 | 10,47  | 10,90 | 11,37 |
| 9,00                               |                       | 8,88 | 9,00  | 9,21  | 9,55  | 9,91  | 10,28 | 10,67 | 11,09  | 11,54 | 12,04 |
| 9,50                               |                       | 9,38 | 9,50  | 9,72  | 10,08 | 10,46 | 10,85 | 11,26 | 11,70  | 12,18 | 12,70 |
| 10,00                              |                       | 9,87 | 10,00 | 10,23 | 10,61 | 11,01 | 11,42 | 11,86 | 12,32  | 12,82 | 13,37 |
| Average barometric Pressure (20°C) | mbar                  | 1013 | 1000  | 977,4 | 942,8 | 908,2 | 875,8 | 843,5 | 811,85 | 779,8 | 747,8 |
| Average barometric Pressure (68°F) | "w.c.                 | 399  | 394   | 385   | 371   | 358   | 345   | 332   | 320    | 307   | 294   |

Reference conditions (Charts 1-2): Ambient temperature 68 °F (20 °C) - Barometric pressure 394" WC (1000 mbar) - Altitude 328 ft a.s.l. (100 m a.s.l.)

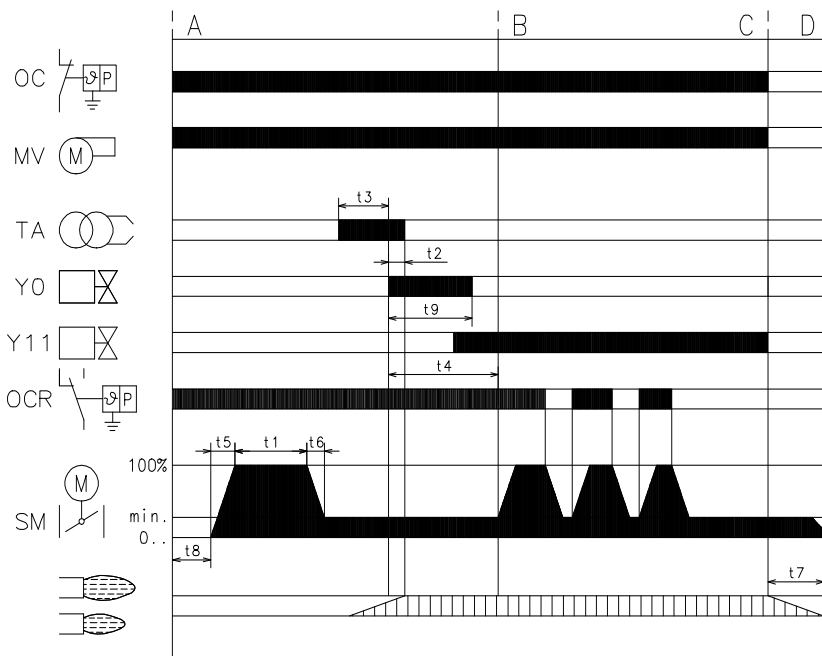
Full Modulation



(A)

D2273

Low - High



(B)

D2274

BURNER OPERATION

BURNER STARTING

- Load control close.  
Fan motor starts.
- Servomotor starts:  
130° rotation to right, until contact is made on cam 1)(A) page 12.  
The air damper is positioned to MAX. output.
- Pre-purge stage with air delivery at MAX. output.
- After pre-purge stage, servomotor rotates to left up to the angle set on cam 3)(A) page 12 for MIN. output.
- The air damper and the gas butterfly are positioned to MIN. output.
- Ignition electrode strikes a spark.
- Pilot valve opens. The pilot flame is ignited.
- After about 12 s the main flame ignites and starting cycle ends.

STEADY STATE OPERATION

At the end of the starting cycle, the servomotor control then passes to the load control for boiler pressure or temperature.

(The control box continues, however, to check that the flame is present and that the air pressure switch is in the correct position.)

- If the temperature or pressure is low, the burner progressively increases its output to the MAX. value.
- If the temperature or pressure is high, the burner progressively decreases its output to the MIN. value.  
And so on.
- The burner locks out when demand for heat is less than the heat supplied by the burner at min. output.

Load control opens. The servomotor returns to the 0° angle limited by contact with cam 2. The air damper closes completely to reduce thermal dispersion to a minimum.

Every time output is changed, the servomotor automatically modifies gas delivery (gas butterfly valve) and air delivery (fan air damper).

Switching times are given in seconds, in the burner start-up sequence.

LFL 1.335 Series 01

|    |    |    |          |
|----|----|----|----------|
| t1 | 30 | t5 | optional |
| t2 | 2  | t6 | optional |
| t3 | 4  | t7 | 12       |
| t4 | 20 | t8 | 4        |

Legend for the times

- t1 Pre-purge time with air damper open
- t2 Safety time
- t3 Pre-ignition time, short (ignition transformer on terminal 16)
- t4 Interval between start of t2 and release of valve at terminal 19
- t5 Interval between end of t4 and release of load controller or valve at terminal 20
- t5 Running time of air damper into OPEN position
- t6 Running time of air damper into low-flame position (MIN)
- t7 Permissible after-burn time
- t8 Interval until OPEN command for the air damper is given

FIRING FAILURE

If the burner does not fire, it locks out within 2.5 seconds from opening the pilot valve and then within 5 seconds from opening the main valves.

BURNER FLAME GOES OUT DURING OPERATION

If the flame should accidentally go out during operation, the burner will lock out within 1s.



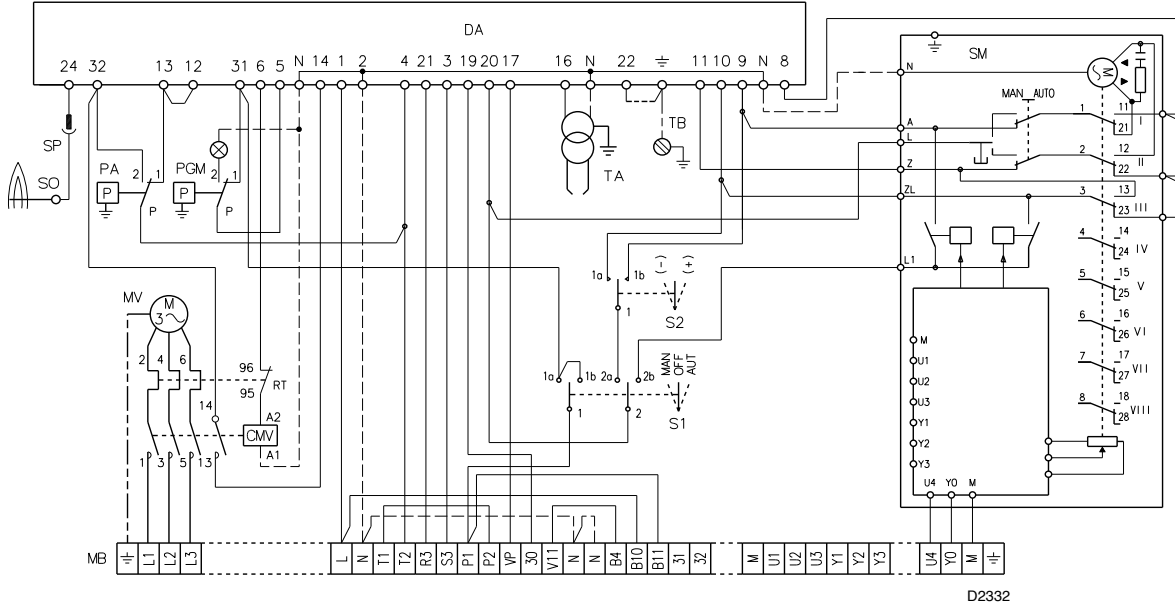
**Control program under fault conditions and lock-out indication**

In case of any disturbance, the sequence mechanism stops and with it the lock-out indicator. The symbol above the reading mark of the indicator gives the type of disturbance:

- ◀ **No start**, e.g. because one contact is not closed. Lock-out during or after control program sequence due to extraneous light (e.g. non-extinguished flames, leaking fuel valves, defects in the flame supervision circuit, etc.)
  
- ▲ **Interruption of startup sequence**, because the OPEN signal has not been delivered to terminal 8 by limit switch "a". Terminals 6, 7 and 14 remain under voltage until the fault has been corrected!
  
- P **Lockout**, because there is no air pressure indication at the beginning of air pressure control. **Every air pressure failure after this moment in time leads to lock-out, too!**
  
- **Lock-out** due to a fault in the flame supervision circuit.
  
- ▼ **Interruption of startup sequence**, because the position signal for the low-flame position has not been delivered to terminal 8 by auxiliary switch "m". Terminals 6, 7 and 14 remain under voltage until the fault has been corrected!
  
- 1 **Lock-out**, because no flame signal is present after completion of the (1st) safety time.
  
- 2 **Lock-out**, because no flame signal has been received on completion of the 2nd safety time (flame signal of the main flame with interrupted pilot burners).
  
- | **Lock-out**, because the flame signal has been lost during burner operation.

If lock-out occurs at any other moment in time between the start and the pre-ignition which is not marked by a symbol, this is usually caused by a premature, i.e. faulty flame signal, e.g. caused by a self-igniting UV tube.

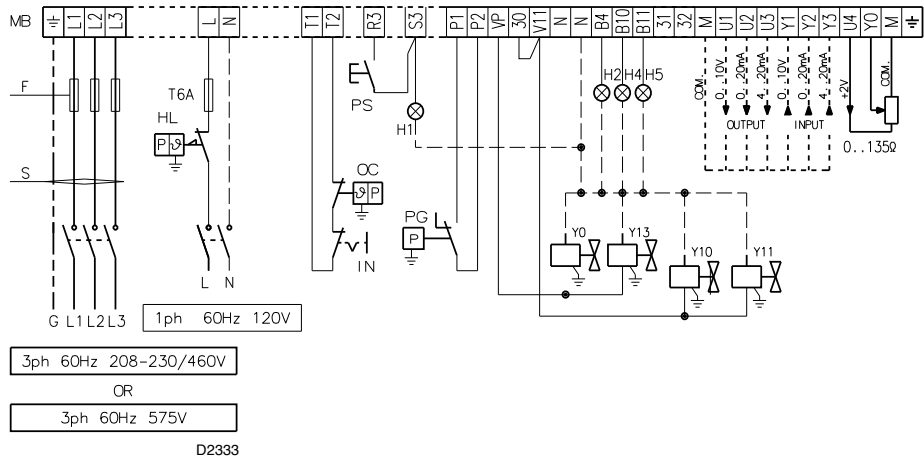
**Factory Wiring Diagram**  
**RS 160/M LN**  
 with burner mounted Siemens LFL control



D2332

(A)

**Field Wiring Diagram**  
**RS 160/M LN**  
 with burner mounted Siemens LFL control

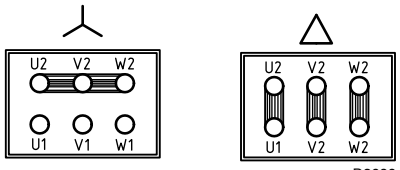


D2333

|   |     | RS 160/M LN |       |       |
|---|-----|-------------|-------|-------|
|   |     | 208 - 230 V | 460 V | 575 V |
| F | A   | T25         | T20   | T15   |
| S | AWG | 12          | 12    | 12    |

Wire size when not indicated: AWG18.

**Motor Connection**



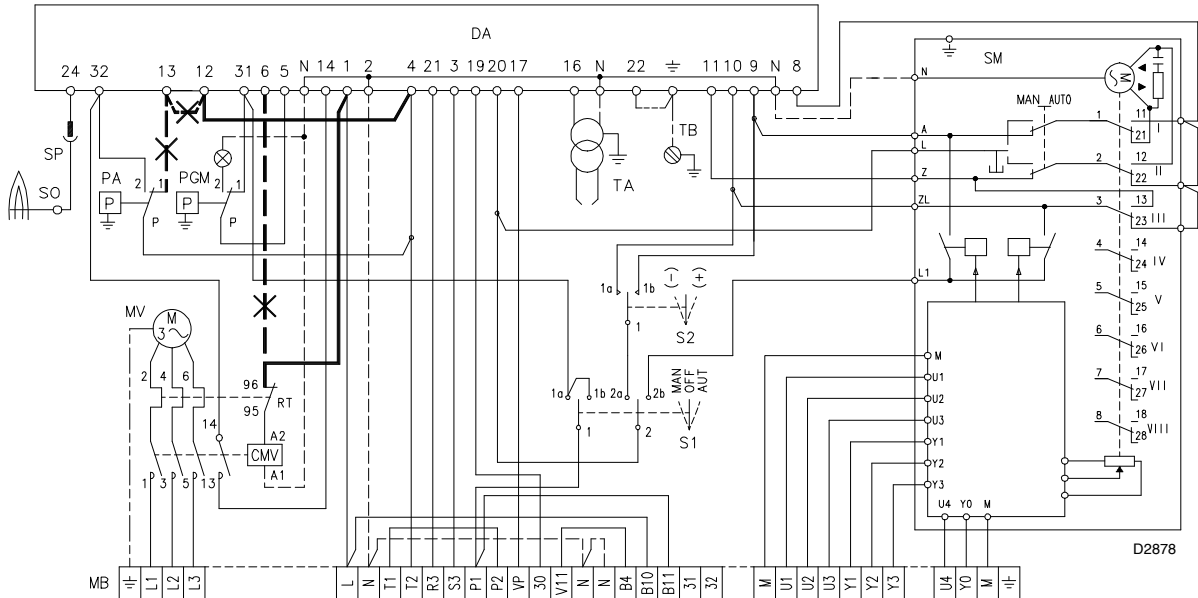
D3686

(B)

**Factory Wiring Diagram**  
**RS 160/M LN**  
**with burner mounted Siemens LFL control**

**Continuous fan operation**

Change the wire connection from terminal 6 to terminal 1, move the jumper from terminals 12-13 to terminals 4-12 and remove the wire from terminal 13 of control box as indicated below.



(C)

**LAYOUT (A) - (B) - (C)**  
**Burner RS 160/M LN**

**Key to Layouts**

- CMV - Motor contactor
- DA - LFL Control box
- HL - High limit
- H1 - Remote lock-out signal
- H2 - Burner on signal
- H4 - Power on signal
- H5 - Permission ok
- IN - Burner manual stop switch
- MB - Burner terminal strip
- MV - Fan motor
- OC - Operating control
- OC2 - High-low control

- PA - Air pressure switch
- PG - Min. gas pressure switch
- PGM - High gas pressure switch
- PS - Remote lock-out reset
- RT - Thermal overload
- SM - Servomotor
- SO - Ionisation probe (flame rod)
- SP - Plug-socket
- TA - Ignition transformer
- TB - Burner ground
- Y0 - Pilot adjustment valve
- Y10 - Adjustment valve
- Y11 - Safety valve
- Y13 - Pilot valve (safety)

**NOTES**

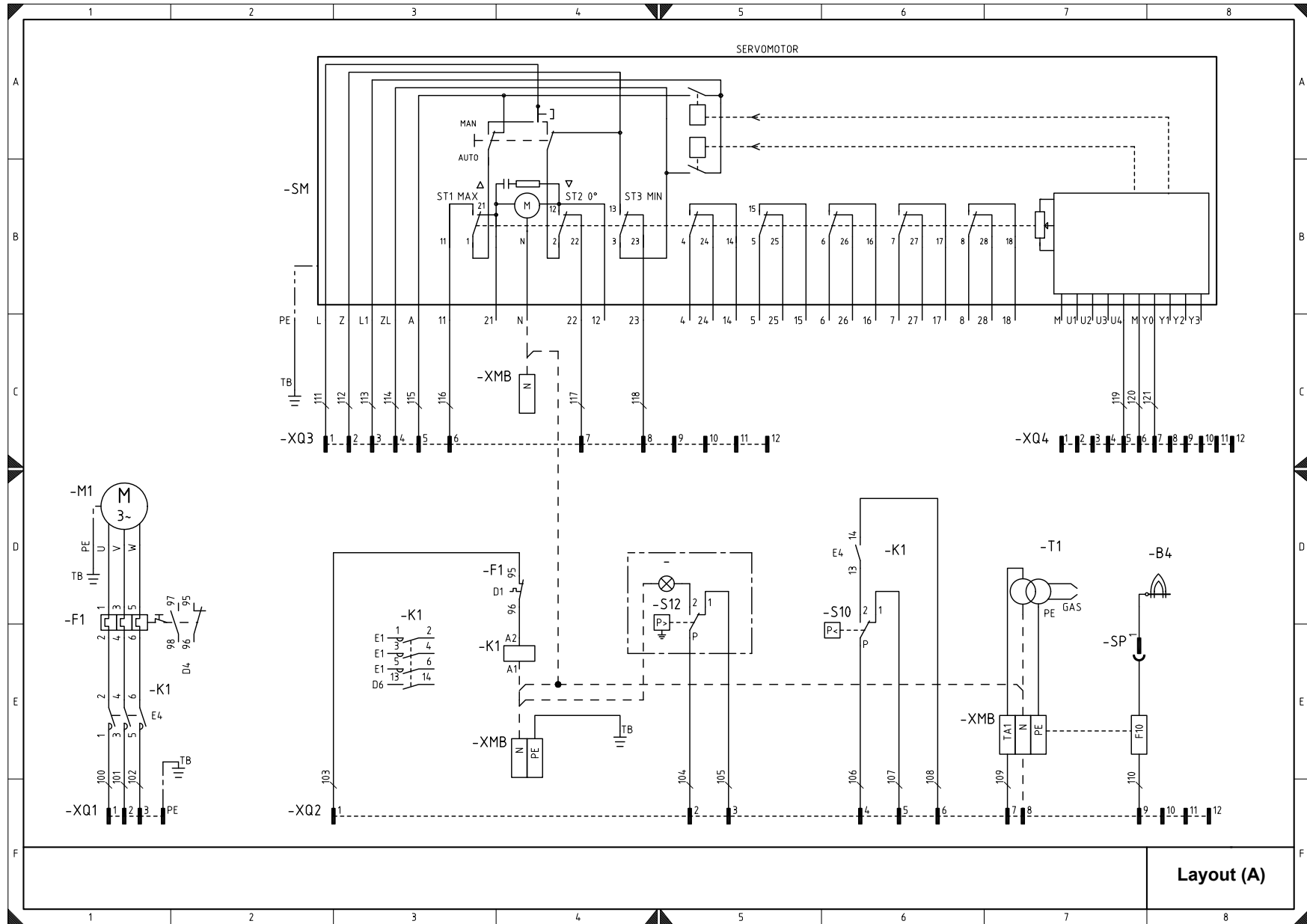
- For electrical connection use flexible cables according to local Regulations.
- The setting of the thermal overload must be according to the total burner amperage draw.
- The RS 160/M LN burners leave the factory preset for:
  - **208-230 V** power supply: only in this case, if 460 V power supply is required, change the fan motor connection from delta to star and change the thermal overload as well (see page 3);
  - or **575 V** power supply; depending on the burner model (see page 3).
- The RS 160/M LN burners have been type-approved for intermittent operation. This means they should compulsorily be stopped at least once every 24 hours to enable the control box to check its own efficiency at start-up. Burner halts are normally provided for automatically by the boiler load control system. If this is not the case, a time switch should be fitted in series to IN to provide for burner shut-down at least once every 24 hours.



**Important note**

When installing for the first time and after any maintenance work, make sure the gas valves are connected properly to the orange terminals before proceeding to ignite the burner. Insert auxiliary lamps or check, with the aid of a tester, that power is not being supplied to the valves during standby or pre-purging. Burner ignition with the gas valves open during pre-purging may cause an explosive condition.

**Factory Wiring Diagram**  
**RS 160/M LN with auxiliary control panel**



**LAYOUT (A) page 20**

**Burner RS 160/M LN**

The flame safeguard is in an auxiliary panel.

See the internal electrical systems of the auxiliary panel in order to have the complete wiring diagram.

**Key to layout**

|     |                                    |
|-----|------------------------------------|
| B4  | - Ionisation probe (flame rod)     |
| F1  | - Fan motor thermal overload       |
| K1  | - Fan motor contactor              |
| MB  | - Burner terminal strip            |
| MV  | - Fan motor                        |
| S10 | - Air pressure switch              |
| S12 | - High gas pressure switch         |
| SM  | - Servomotor                       |
| T1  | - Ignition transformer             |
| TB  | - Burner ground (earth) connection |
| XQ1 | - Plug                             |
| XQ2 | - Plug                             |
| XQ3 | - Plug                             |
| XQ4 | - Plug                             |



| N. | CODE             |                    |                    |                     |                     | DESCRIPTION                 | DESCRIZIONE                 | BURNER SERIAL NUMBER<br>MATICOLA BRUCIATORE |
|----|------------------|--------------------|--------------------|---------------------|---------------------|-----------------------------|-----------------------------|---|
|    |                  | C9544000 (3788070) | C9544001 (3788075) | C9744000 (3788073)* | C9744001 (3788073)* |                             |                             |   |
| 1  | 3012583          | •                  | •                  | •                   | •                   | AIR DAMPER ASSEMBLY         | GRUPPO SERRANDA             | ≤ 02356XXXXXX                               |
| 1  | 3013684          | •                  | •                  | •                   | •                   | AIR DAMPER ASSEMBLY         | GRUPPO SERRANDA             | ≥ 02366XXXXXX                               |
| 2  | 3003086          | •                  | •                  | •                   | •                   | GRID                        | PROTEZIONE                  | ≤ 02356XXXXXX                               |
| 2  | 3013683          | •                  | •                  | •                   | •                   | GRID                        | PROTEZIONE                  | ≥ 02366XXXXXX                               |
| 3  | 3012553          | •                  | •                  | •                   | •                   | SOUND DAMPING               | FONOASSORBENTE              | ≤ 02356XXXXXX                               |
| 3  | 3013682          | •                  | •                  | •                   | •                   | SOUND DAMPING               | FONOASSORBENTE              | ≥ 02366XXXXXX                               |
| 4  | 3003763          | •                  | •                  | •                   | •                   | INSPECTION WINDOW           | VISORE                      |   |
| 5  | 3013090          | •                  | •                  | •                   | •                   | PILOT TUBE                  | TUBO PILOTA                 |   |
| 6  | 3012976          | •                  | •                  | •                   | •                   | FAN                         | GIRANTE                     |   |
| 7  | 3013137          | •                  |                    |                     |                     | OVERLOAD+CONTACTOR 208-230V | RELE' + CONTATTORE 208-230V |   |
| 7  | 3013126          | •                  | •                  |                     |                     | OVERLOAD+CONTACTOR 575V     | RELE' + CONTATTORE 575V     |   |
| 8  | 3012080          | •                  | •                  |                     |                     | SWITCH                      | INTERRUTTORE                |   |
| 9  | 3012956          | •                  | •                  | •                   | •                   | TRANSFORMER                 | TRASFORMATORE               |   |
| 10 | 3013001          | •                  | •                  | •                   | •                   | U BOLT                      | CAVALLOTTO                  |   |
| 11 | 3012627          | •                  | •                  | •                   | •                   | BAR EXTENSION               | PROLUNGA PERNO              | ≤ 02356XXXXXX                               |
| 11 | 3013686          | •                  | •                  | •                   | •                   | BAR EXTENSION               | PROLUNGA PERNO              | ≥ 02366XXXXXX                               |
| 12 | 3012948          | •                  | •                  | •                   | •                   | AIR PRESSURE SWITCH         | PRESSOSTATO ARIA            |   |
| 13 | 3013127          | •                  | •                  |                     |                     | BASE PLATE                  | MENSOLA                     |   |
| 13 | 3013205          | •                  |                    | •                   | •                   | BASE PLATE                  | MENSOLA                     |   |
| 14 | C5360008 3012955 | •                  | •                  |                     |                     | CONTROL BOX LFL 1.335       | APPRECCHIATURA LFL 1.335    |   |
| 15 | 3012014          | •                  | •                  | •                   | •                   | FERRULE                     | GHIERA                      |   |
| 16 | 3006096          | •                  | •                  | •                   | •                   | GAS REGULATOR               | REGOLATORE GAS              |   |
| 17 | 3012343          | •                  | •                  | •                   | •                   | SUPPORT                     | SUPPORTO                    |   |
| 18 | 3006097          | •                  | •                  | •                   | •                   | FLAT SPRING                 | MOLLA                       |   |
| 19 | 3007627          | •                  | •                  | •                   | •                   | MEMBRAN                     | MEMBRANA                    |   |
| 20 | 3012934          | •                  | •                  | •                   | •                   | COVER                       | COFANO                      |   |
| 21 | 3012978          | •                  |                    | •                   |                     | MOTOR                       | MOTORE 208-230/460V         |   |
| 21 | 3013062          | •                  | •                  |                     |                     | MOTOR                       | MOTORE 575V                 |   |
| 22 | 3012979          | •                  | •                  | •                   | •                   | ANCHOR PLATE                | PIASTRA                     |   |
| 23 | 3012944          | •                  | •                  | •                   | •                   | SERVOMOTOR                  | SERVOMOTORE                 |   |
| 24 | 3012972          | •                  | •                  | •                   | •                   | SHAFT                       | ALBERO                      |   |
| 25 | 3012587          | •                  | •                  | •                   | •                   | HALF-SHELL                  | GUSCIO                      |   |
| 26 | 3003481          | •                  | •                  | •                   | •                   | SCREW                       | VITE                        | ≤ 02356XXXXXX                               |
| 26 | 3013681          | •                  | •                  | •                   | •                   | SCREW                       | VITE                        | ≥ 02366XXXXXX                               |
| 27 | 3003891          | •                  | •                  | •                   | •                   | CONNECTOR                   | RACCORDO                    |   |
| 28 | 3012628          | •                  | •                  | •                   | •                   | BAR                         | PERNO                       | ≤ 02356XXXXXX                               |
| 29 | 3012629          | •                  | •                  | •                   | •                   | BRACKET                     | STAFFA                      | ≤ 02356XXXXXX                               |
| 30 | 3012959          | •                  | •                  | •                   | •                   | H.T. LEAD                   | COLLEGAMENTO ELETTRODO      |   |
| 31 | 3013091          | •                  | •                  | •                   | •                   | ELECTROD                    | ELETTRODO                   |   |
| 32 | 3012178          | •                  | •                  | •                   | •                   | PROBE                       | SONDA                       |   |
| 33 | 3012631          | •                  | •                  | •                   | •                   | TUBE                        | TUBETTO                     |   |
| 34 | 3013092          | •                  | •                  | •                   | •                   | AIR DIFFUSER                | TAZZA                       |   |
| 35 | 3012633          | •                  | •                  | •                   | •                   | GAS HEAD                    | DISTRIBUTORE                |   |
| 36 | 3012634          | •                  | •                  | •                   | •                   | INTERIOR TUBE               | TUBO INTERNO                |   |
| 37 | 3013093          | •                  | •                  | •                   | •                   | SUPPORT                     | SUPPORTO                    |   |

\* = Versione minima - Minimum Version

| N. | CODE     |                    |                    |                     |                     | DESCRIPTION         | DESCRIZIONE         | BURNER SERIAL NUMBER<br>MATRICOLA BRUCIATORE |
|----|----------|--------------------|--------------------|---------------------|---------------------|---------------------|---------------------|--|
|    |          | C9544000 (3788070) | C9544001 (3788075) | C9744000 (3788073)* | C9744001 (3788073)* |                     |                     |  |
| 38 |          | 3013094            | •                  | •                   | •                   | EXTERIOR TUBE       | TUBO ESTERNO        |  |
| 39 |          | 3012637            | •                  | •                   | •                   | ELBOW               | GOMITO              |  |
| 40 |          | 3012958            | •                  | •                   | •                   | PROBE LEAD          | COLLEGAMENTO SONDA  |  |
| 41 |          | 3007891            | •                  | •                   | •                   | SEAL                | GUARNIZIONE         |  |
| 42 |          | 3013095            | •                  | •                   | •                   | CONNECTOR           | RACCORDO            |  |
| 43 | C5332011 | 3012969            | •                  | •                   | •                   | GAS PRESSURE SWITCH | PRESSOSTATO GAS     |  |
| 44 |          | 3003996            | •                  | •                   | •                   | PLUG                | TAPPO               |  |
| 45 |          | 3005482            | •                  | •                   | •                   | SEAL                | GUARNIZIONE         |  |
| 46 |          | 3012971            | •                  | •                   | •                   | FLANGE AND ELBOW    | FLANGIA E GOMITO    |  |
| 47 |          | 3012352            | •                  | •                   | •                   | BAR                 | PERNO               |  |
| 48 |          | 3003841            | •                  | •                   | •                   | BEARING             | CUSCINETTO          |  |
| 49 |          | 3012356            | •                  | •                   | •                   | SPRING              | MOLLA               |  |
| 50 |          | 3012646            | •                  | •                   | •                   | TIE ROD             | TIRANTE             |  |
| 51 |          | 3012594            | •                  | •                   | •                   | ANCHOR PLATE        | PIASTRA             |  |
| 52 |          | 3012595            | •                  | •                   | •                   | AIR INTAKE          | BOCCA D'ASPIRAZIONE | ≤ 02356XXXXXX                                |
| 53 |          | 3012049            | •                  | •                   | •                   | SCREW               | VITE                |  |
| 54 |          | 3012639            | •                  | •                   | •                   | CONTROL DEVICE      | GRUPPO REGOLATORE   |  |
| 55 |          | 3012640            | •                  | •                   | •                   | SLEEVE              | CILINDRO            |  |
| 56 |          | 3012641            | •                  | •                   | •                   | BRACKET             | STAFFA              |  |
| 57 |          | 3012642            | •                  | •                   | •                   | SHUTTER             | OTTURATORE          |  |
| 58 |          | 3012643            | •                  | •                   | •                   | END CONE            | IMBUTO FIAMMA       |  |
| 59 |          | 3012647            | •                  | •                   | •                   | CENTERING SUPPORT   | BASSETTA            |  |
| 60 |          | 3003322            | •                  | •                   | •                   | CONNECTOR           | RACCORDO            |  |
| 61 |          | 3013096            | •                  | •                   | •                   | MANIFOLD            | MANICOTTO           | ≤ 02356XXXXXX                                |
| 62 |          | 3006132            | •                  | •                   | •                   | SHAFT AND RING      | ALBERO E ANELLO     |  |
| 63 |          | 3012644            | •                  | •                   | •                   | GRADUATE SECTOR     | QUADRANTE           |  |
| 64 |          | 3012600            | •                  | •                   | •                   | TIE ROD             | TIRANTE             | ≤ 02356XXXXXX                                |
| 64 |          | 3003543            | •                  | •                   | •                   | TIE ROD             | TIRANTE             | ≥ 02366XXXXXX                                |
| 65 |          | 3006098            | •                  | •                   | •                   | PIN JOINT           | SNODO SFERICO       |  |
| 66 |          | 3012601            | •                  | •                   | •                   | LEVER               | LEVA                |  |
| 67 |          | 3012354            | •                  | •                   | •                   | LEVER               | LEVA                |  |
| 68 |          | 3012358            | •                  | •                   | •                   | CAM                 | CAMMA               |  |
| 69 |          | 3012350            | •                  | •                   | •                   | LEVER               | LEVA                |  |
| 70 |          | 3012357            | •                  | •                   | •                   | BEARING             | CUSCINETTO          |  |
| 71 |          | 3012602            | •                  | •                   | •                   | SUPPORT             | SUPPORTO            |  |
| 72 |          | 3012603            | •                  | •                   | •                   | BAR                 | PERNO               |  |
| 73 |          | 3013055            | •                  | •                   | •                   | TUBE                | TUBO                |  |
| 74 | C5360002 | 3013010            | •                  | •                   | •                   | CONTROL BOX BASE    | ZOCCOLO             |  |
| 75 |          | 3013229            | •                  | •                   | •                   | PLUG                | SPINA               |  |
| 76 |          | 3013685            | •                  | •                   | •                   | PLATES ASSEMBLY     | GRUPPO PIASTRE      | ≥ 02366XXXXXX                                |

\* = Versione minima - Minimum Version



# BURNER START UP REPORT

|                              |                      |
|------------------------------|----------------------|
| Model number: _____          | Serial number: _____ |
| Project name: _____          | Start-up date: _____ |
| Installing contractor: _____ | Phone number: _____  |

|                               |                                    |                  |       |
|-------------------------------|------------------------------------|------------------|-------|
| <b>GAS OPERATION</b>          |                                    |                  |       |
| Gas Supply Pressure: _____    | CO <sub>2</sub> : Low Fire _____   | High Fire _____  | _____ |
| Main Power Supply: _____      | O <sub>2</sub> : Low Fire _____    | High Fire _____  | _____ |
| Control Power Supply: _____   | CO: Low Fire _____                 | High Fire _____  | _____ |
| Burner Firing Rate: _____     | NO <sub>x</sub> : Low Fire _____   | High Fire _____  | _____ |
| Manifold Pressure: _____      | Net Stack Temp - Low Fire: _____   | High Fire: _____ | _____ |
| Pilot Flame Signal: _____     | Comb. Efficiency - Low Fire: _____ | High Fire: _____ | _____ |
| Low Fire Flame Signal: _____  | Overfire Draft: _____              | _____            | _____ |
| High Fire Flame Signal: _____ | _____                              | _____            | _____ |

|                               |                                    |                  |       |
|-------------------------------|------------------------------------|------------------|-------|
| <b>OIL OPERATION</b>          |                                    |                  |       |
| Oil supply pressure: _____    | CO <sub>2</sub> : Low Fire _____   | High Fire _____  | _____ |
| Oil suction pressure: _____   | O <sub>2</sub> : Low Fire _____    | High Fire _____  | _____ |
| Control Power Supply: _____   | CO: Low Fire _____                 | High Fire _____  | _____ |
| Burner Firing Rate: _____     | NO <sub>x</sub> : Low Fire _____   | High Fire _____  | _____ |
| Low Fire Flame Signal: _____  | Net Stack Temp - Low Fire: _____   | High Fire: _____ | _____ |
| High Fire Flame Signal: _____ | Comb. Efficiency - Low Fire: _____ | High Fire: _____ | _____ |
| Low Fire Nozzle Size: _____   | Overfire Draft: _____              | _____            | _____ |
| High Fire Nozzle Size: _____  | Smoke number: _____                | _____            | _____ |

|                            |                                     |       |       |
|----------------------------|-------------------------------------|-------|-------|
| <b>CONTROL SETTINGS</b>    |                                     |       |       |
| Operating Setpoint: _____  | Low Oil Pressure: _____             | _____ | _____ |
| High Limit Setpoint: _____ | High Oil Pressure: _____            | _____ | _____ |
| Low Gas Pressure: _____    | Flame Safeguard Model Number: _____ | _____ | _____ |
| High Gas Pressure: _____   | Modulating Signal Type: _____       | _____ | _____ |

|              |
|--------------|
| <b>NOTES</b> |
| _____        |
| _____        |
| _____        |
| _____        |







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