GB

Heavy oil burner

CODE	MODELE - MODEL	TYPE
3438958	PRESS 300 T/N	468 M1
3438959	PRESS 300 T/N	468 M1
3438960	PRESS 300 T/N	468 M1
3438961	PRESS 300 T/N	468 M1
3438962	PRESS 300 T/N	468 M1
3438963	PRESS 300 T/N	468 M1

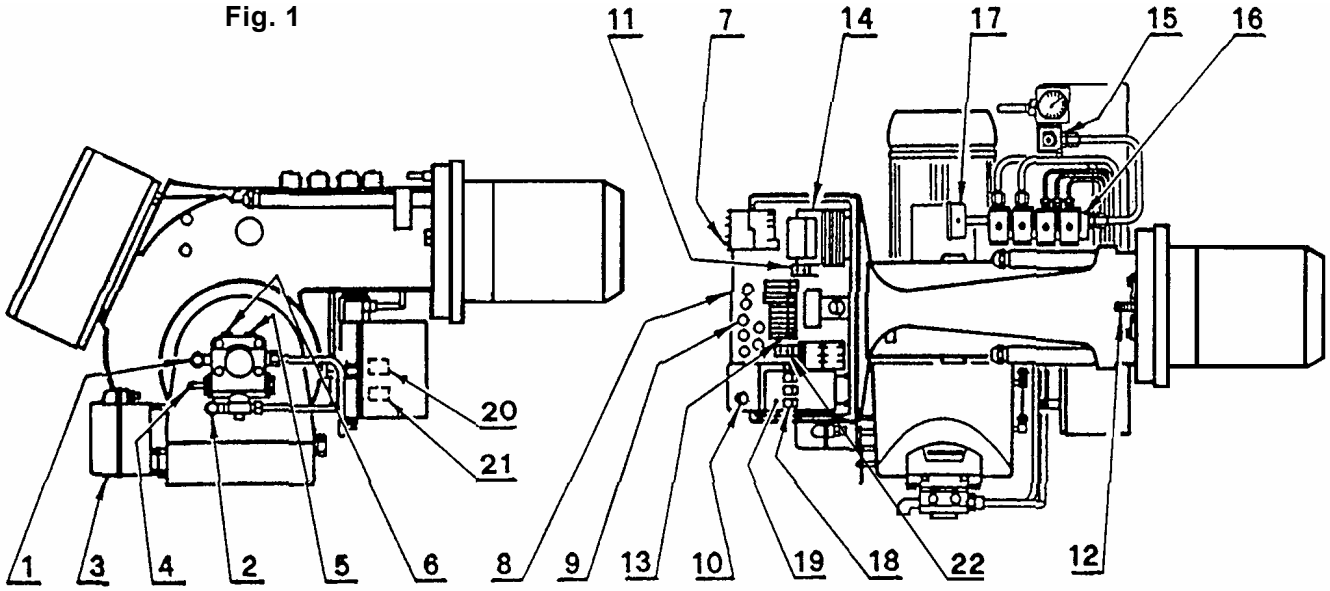
INDEX

1. BURNER DESCRIPTION

One, two, third stage heavy oil burner.

- The burner meets protection level of IP 40, EN 60529.
- Burner with CE marking in conformity with EEC directives: EMC 89/336/EEC, Low Voltage 73/23/EEC and Machines 98/37/EEC.

Fig. 1



1 - Suction line
2 - Return line
3 - Air shutter opening motor
4 - Pump pressure adjustment screw
5 - Manometer plug (G1/4)
6 - Vacuometer plug (G1/4)
7 - Reset push-button of the motor overload relay
8 - Electric board
9 - Cable clamps
10 - Control box reset push-button and lock-out lamp
11 - Adjustment thermostat
12 - Regulating bush for combustion head
13 - Wiring terminal board
14 - Ignition transformer
15 - Filter
16 - Valves group
17 - Manometer
18 - Lamp
19 - Commutator
20 - Low limit thermostat
21 - High limit thermostat
22 - Timer

1.1 BURNER EQUIPMENT

Flexible tubes . . . . . No. 2
Cable clamps . . . . . No. 5
Gasket for flange . . . . . No. 1
Extensions (only long head) . . . . . No. 2
Nipples . . . . . No. 2
Screws . . . . . No. 4
Nozzles . . . . . No. 3

2. TECHNICAL DATA

2.1 TECHNICAL DATA

TYPE	468 M1
Thermal power - Output	626 - 3420 kW – 55 - 300 kg/h (see tables below)
Fuel	Oil with max. viscosity at 50° C 50 mm^2/s (7° E) for oil up to 500 mm^2/s (65° E) with kit
Electrical supply	Three-phase, 230 V ± 10% ~ 50Hz without neutral 400 V ± 10% ~ 50Hz with neutral
Motor (with starter ⅄–Δ)	30 A / 230V – 17.5 A / 400V
Ignition transformer	Primary 2 A – Secondary 2 x 6.5 kV – 35 mA
Heaters	19.6 kW
Absorbed electrical power	30 kW
Pump	470 kg/h at 25 bar

OPERATION AND EFFICIENCY OF THE BURNER

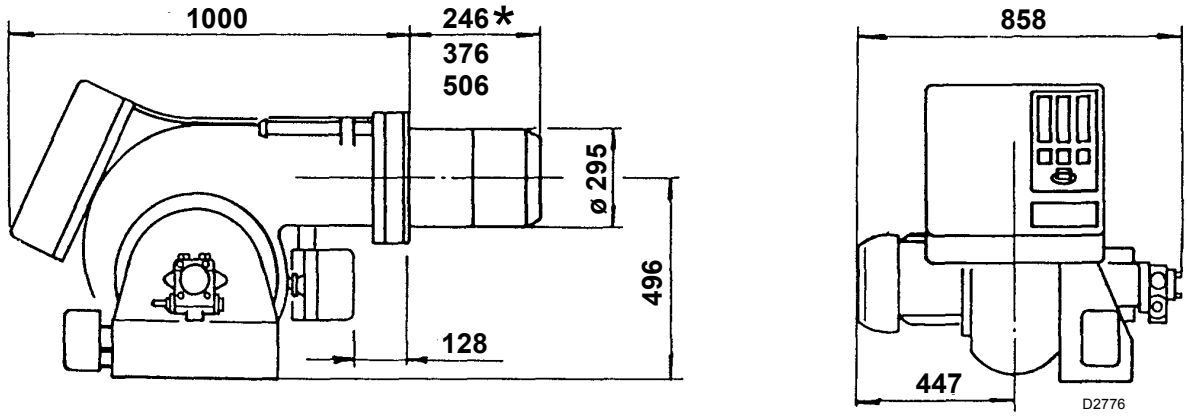
1st STAGE		Thermal power - Output			
		Minimum		Maximum	
		kW	kg/h	kW	kg/h
1st nozzle:	ignition phase	570	50	1140	100
1st+2nd nozzle:	intermediate phase	1140	100	2280	200
1st+2nd+3rd nozzle:	operation phase	1710	**150**	3420	**300**

2nd STAGE		Thermal power - Output			
		Minimum		Maximum	
		kW	kg/h	kW	kg/h
1st nozzle:	ignition phase	570	50	1140	100
1st+2nd nozzle:	1st stage of operation	1140	**100**	2280	**200**
1st+2nd+3rd nozzle:	2nd stage of operation	1710	**150**	3420	**300**

3rd STAGE		Thermal power - Output			
		Minimum		Maximum	
		kW	kg/h	kW	kg/h
1st nozzle:	1st stage of operation	570	**50**	1140	**100**
1st+2nd nozzle:	2nd stage of operation	1140	**100**	2280	**200**
1st+2nd+3rd nozzle:	3rd stage of operation	1710	**150**	3420	**300**

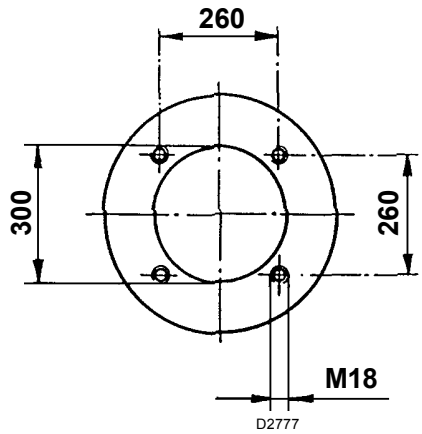
2.2 OVERALL DIMENSIONS

Burner



* It is possible with a spacer, upon request.

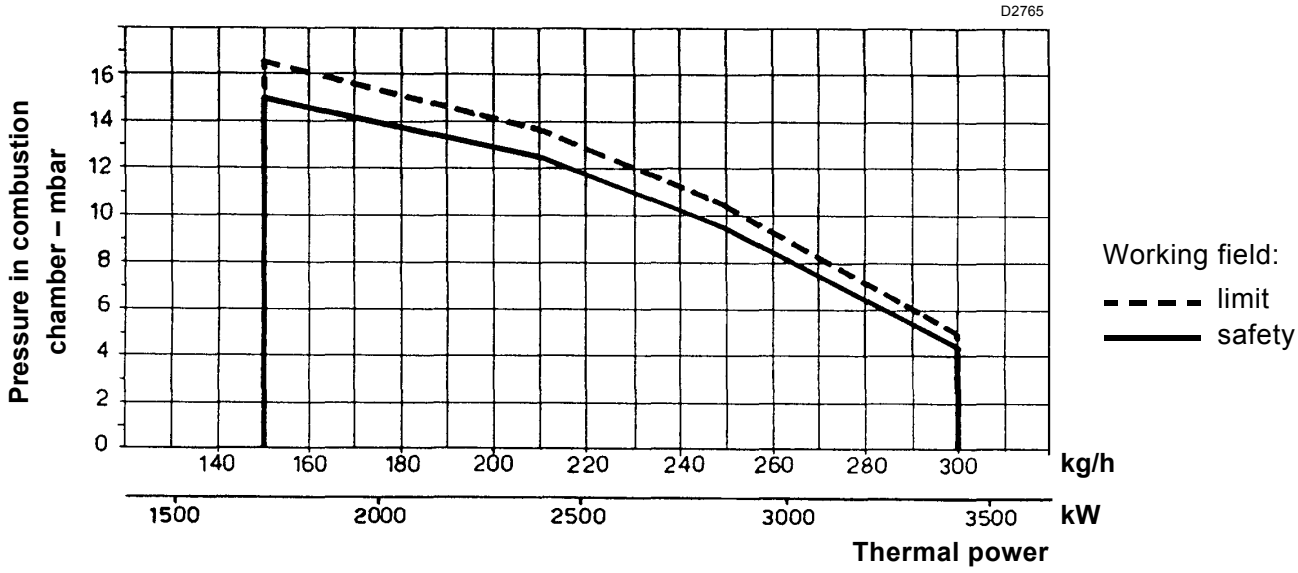
Boiler front plate drilling



COMBUSTION HEAD PROJECTION

For the combustion head projection carefully follow the boiler manufacturer indications.
A proper protection with refractory material on the combustion head projecting into the combustion chamber shall be made, when boilers with frontal smoke box are used.

2.3 WORKING FIELD (3 nozzles in operation)



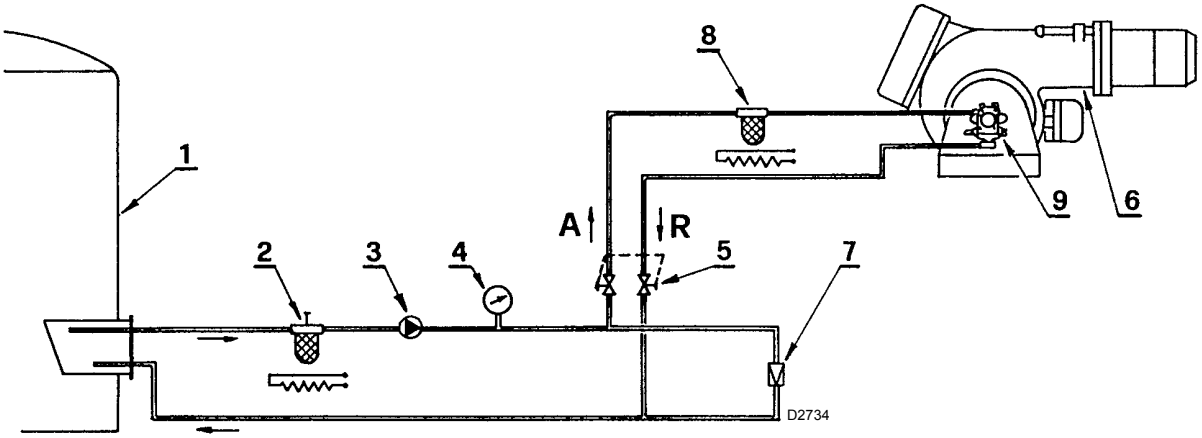
When the burner operates with only one or two nozzles, the pressurization conditions are improved and no problems arise.

3. INSTALLATION

3.1 HEAVY OIL SUPPLY LINE

RING SUPPLY LINE

For heavy oil with viscosity up to 50°E/50°C.



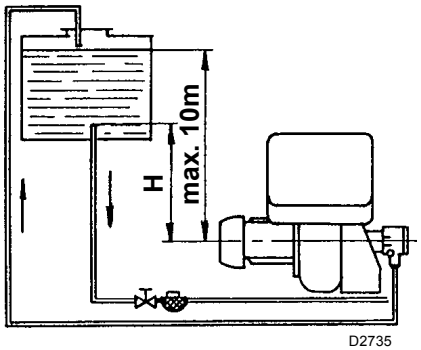
1 - Tank (heated for heavy oil)
2 - Filter (with resistance for oil > 7°E/50°C)
3 - Forwarding pump
4 - Control manometer
5 - Shutter valves (in couple) excluding the burner
6 - Burner (provided with kit for heavy oil code no. 3000721)
7 - Pressure adjuster
8 - Filter (with resistance for oil > 7°E/50°C)
9 - Burner pump

WARNING

- The oil could easily flow through the pipes if those are properly seized, protected and heated (by electricity, steam or hot water).
- The forwarding pump capacity should be all the least double of that of the burner pump.
  If several burners are supplied through the same ring supply line, the forwarding pump should have a capacity of approx. 30% more than the sum of the single burners outputs.
- For starting-up: after excluding the burner by the shutter valves (5) let the oil flow into the supply ring up to reach the required circulation; after than open the valves and supply normally the burner.

GRAVITY SUPPLY LINE

Only for oil with max. viscosity up to 7°E/50°C.



Pump priming:
loose the tap of the vacuometer plug (6, fig. 1) and wait for the oil flow.

H: Difference in the pipes height
L: Total length of the suction tube

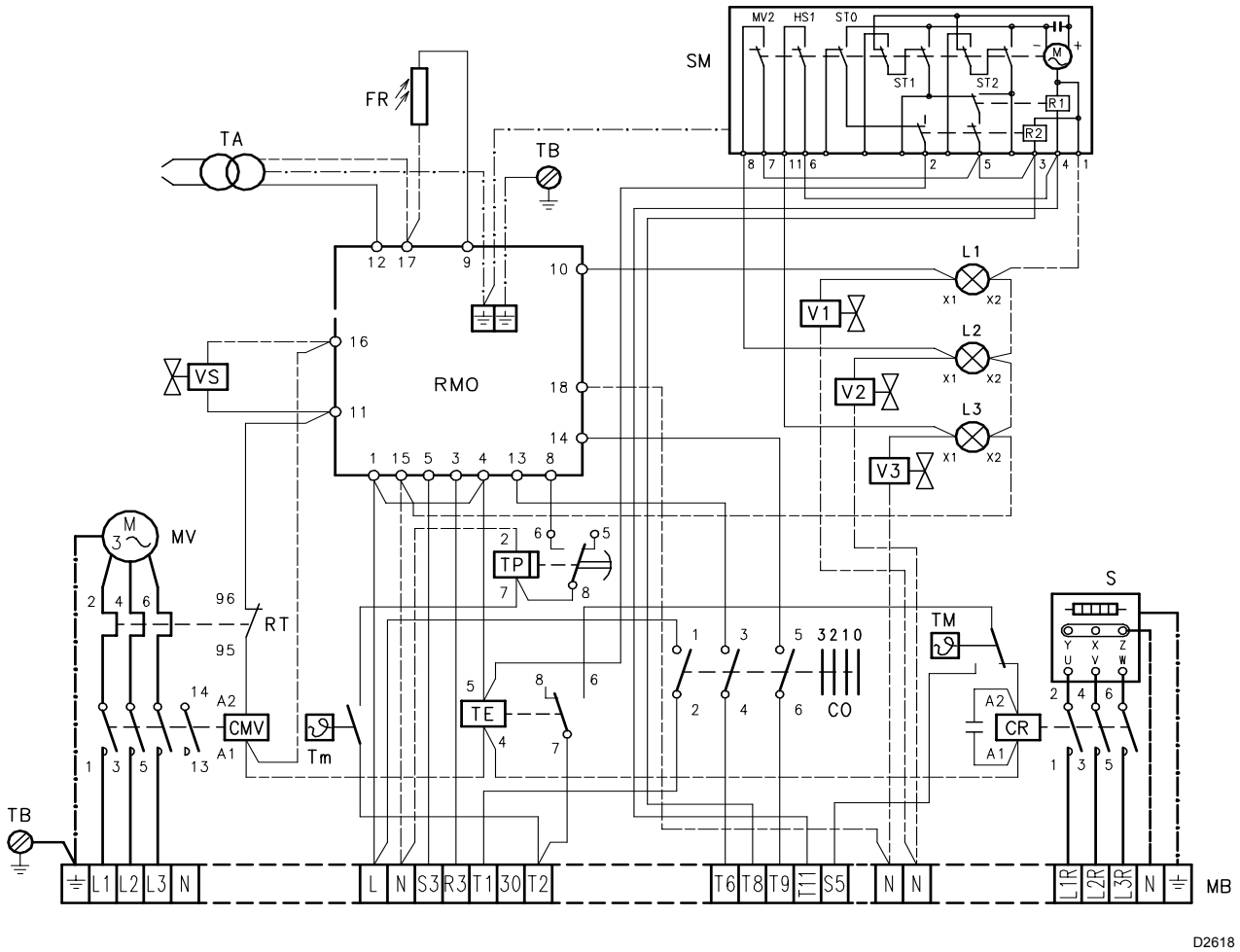
H meters	L meters	
	ø 1”	ø 1 1/4”
0	2	10
0.5	3	11
1	4	12
1.5	5	13
2	6	14

Attention:

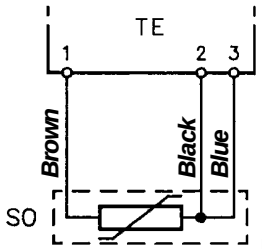
before placing the burner in operation, ensure that the return line is open. Any obstruction may damage the pump seal.

3.2 ELECTRICAL SYSTEM

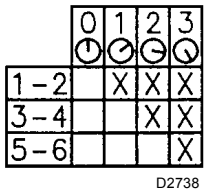
DIRECT START-UP
(carried out by the factory)



PRE-HEATER CONNECTION PROBE TO ELECTRONIC THERMOSTAT

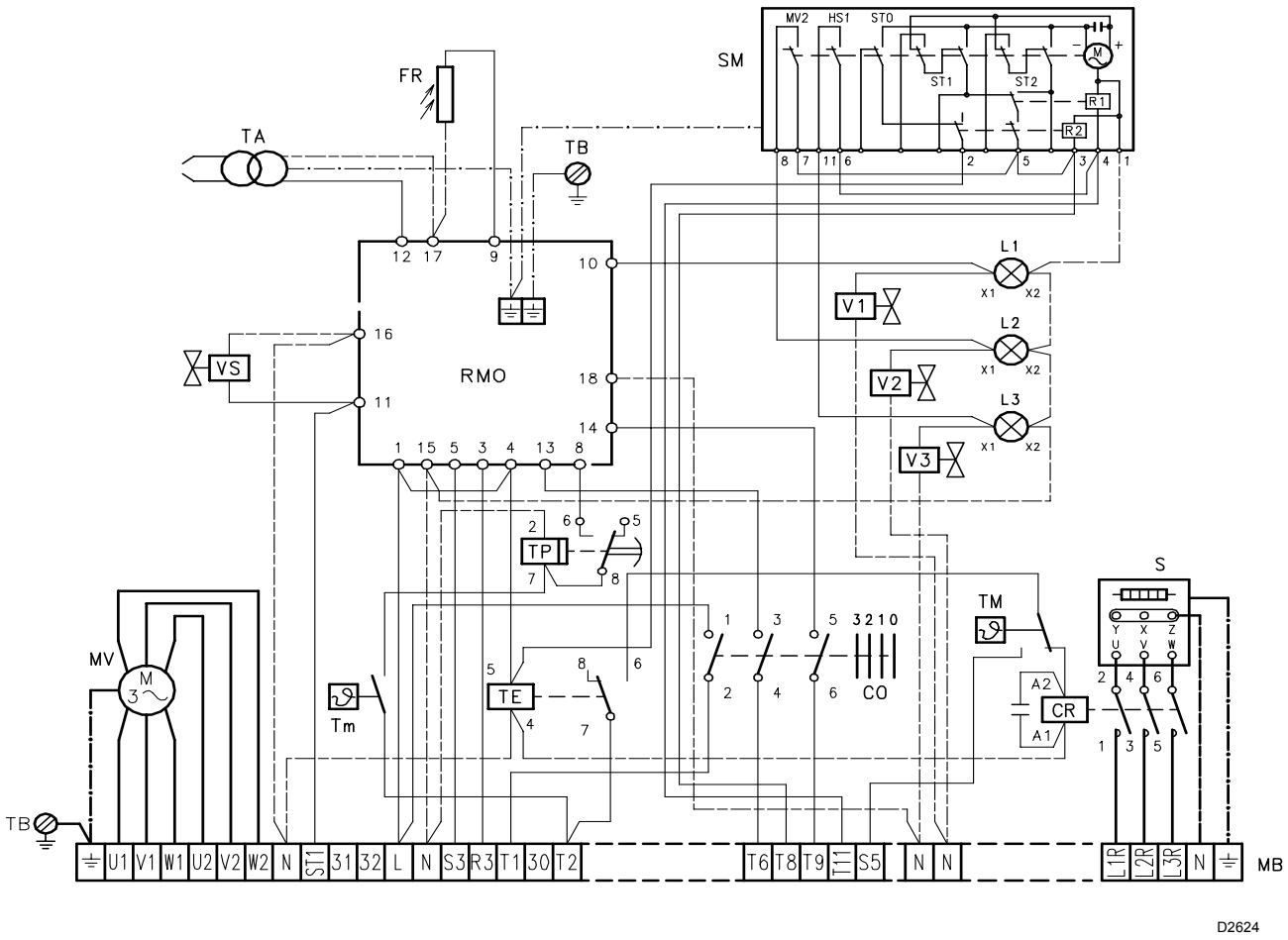


COMMUTATOR



CMV Fan motor contact maker
CR Resistor contact maker
CO Commutator
FR Photoresistence
L1 Lamps for 1st stage
L2 Lamps for 2nd stage
L3 Lamps for 3rd stage
MB Burner terminal strip
MV Fan motor
RMO Control box
RT Overload
S Pre-heater tank
SM Air-damper actuator
SO Probe PT100
TA Ignition transformer
TB Burner earth
TE Electronic thermostat
Tm Minimal thermostat
TM Maximal thermostat
TP Timer
V1 Oil valves for 1st stage
V2 Oil valves for 2nd stage
V3 Oil valves for 3rd stage
VS Safety valve

STAR-TRIANGLE START-UP
(carried out by the factory)



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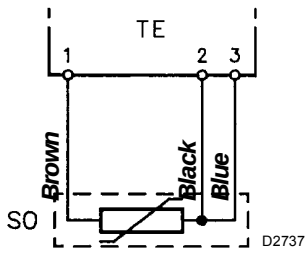
PRE-HEATER CONNECTION PROBE TO ELECTRONIC THERMOSTAT



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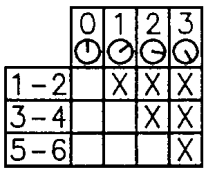
COMMUTATOR



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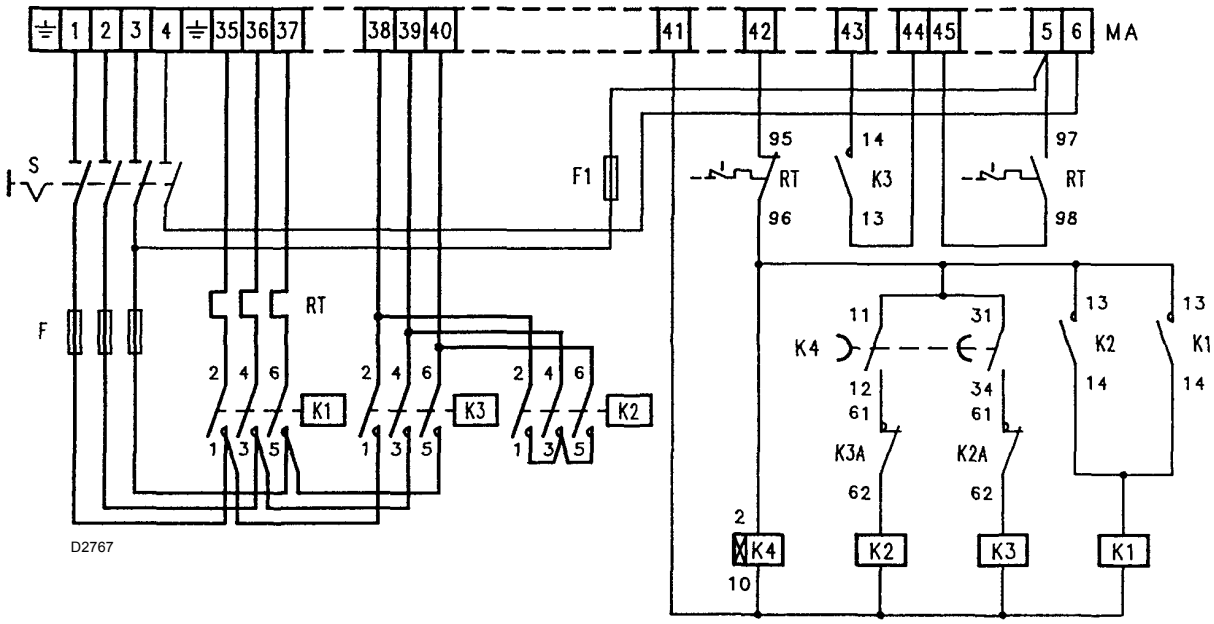
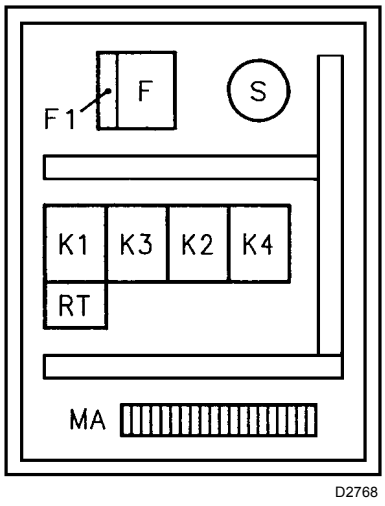
CR Resistor contact maker
CO Commutator
FR Photoresistence
L1 Lamps for 1st stage
L2 Lamps for 2nd stage
L3 Lamps for 3rd stage
MB Burner terminal strip
MV Fan motor
RMO Control box
S Pre-heater tank
SM Air-damper actuator
SO Probe PT100
TA Ignition transformer
TB Burner earth
TE Electronic thermostat
Tm Minimal thermostat
TM Maximal thermostat
TP Timer
V1 Oil valves for 1st stage
V2 Oil valves for 2nd stage
V3 Oil valves for 3rd stage
VS Safety valve

STAR-TRIANGLE STARTER

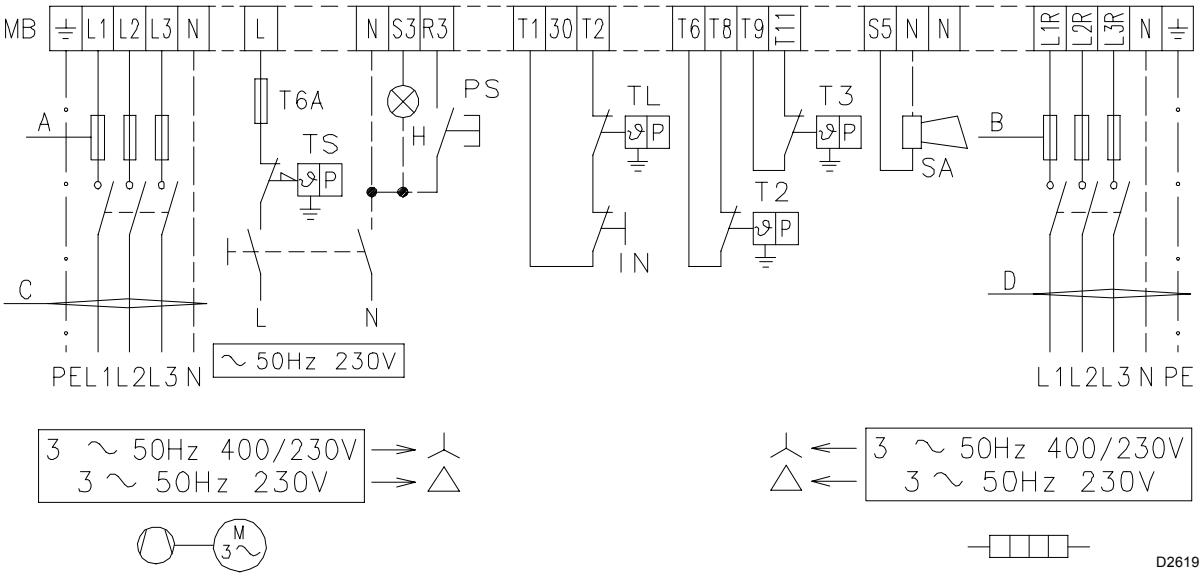




MA Starter terminal strip
S Disconnecting switch with interlock
F Power line fuses
F1 Control devices fuse
K1 Line contact maker
K2 Star contact maker
K3 Delta contact maker
K4 Timer relay for switching from star to delta (factory calibration at 10s)
K2A Auxiliary contact block on k2
K3A Auxiliary contact block on k3
RT Thermal relay to be set at 9A for 400V or at 18A for 230V

3.3 ELECTRICAL CONNECTIONS TO THE BURNER TERMINAL STRIP

DIRECT START-UP
(to be carried out by the installer)



	230V	400V
A Ampere	T63	T50
B Ampere	T63	T50
C mm²	6	4
D mm²	10	6

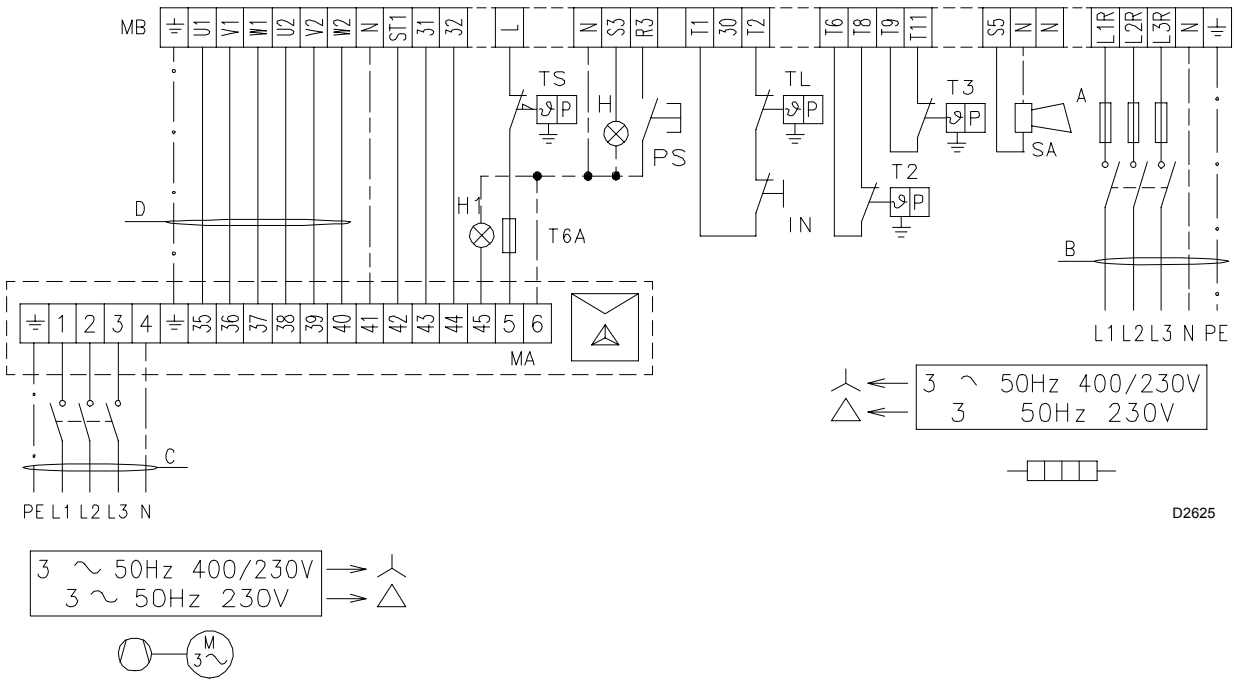
H Remote lock-out signal
IN Optional switch on-off burner
MB Burner terminal strip
PS Reset push - button
SA High temperature oil alarm
TL Limit control device system
TS Safety control device system
T2 Load control system for 2nd stage
T3 Load control system for 3rd stage

NOTE:

➤ Check the lock-out by darkening the photo-cell after removal of the cover.
ATTENTION HIGH VOLTAGE.

➤ In case of supply 230V without neutral, connect the motor and the pre-heater thank through delta (the “star” connection is the original one, made for 400V).

STAR-TIRANGLE START-UP
(to be carried out by the installer)



	230V	400V
A Ampere	T63	T50
B mm²	10	6
C mm²	6	4
D mm²	4	2,5

H Remote lock-out signal
H1 Motor trip signal
IN Optional switch on-off burne
MA Start-up terminal strip
MB Burner terminal strip
PS Reset push - button
SA High temperature oil alarm
TL Limit control device system
TS Safety control device system
T2 Load control system for 2nd stage
T3 Load control system for 3rd stage

NOTE:

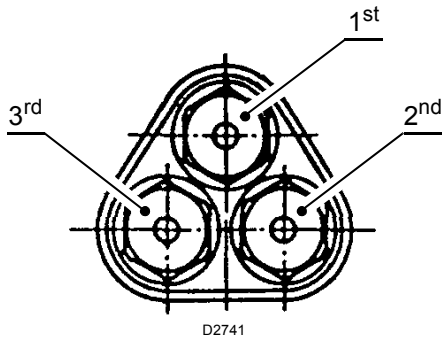
➤ Check the lock-out by darkening the photo-cell after removal of the cover.
ATTENTION HIGH VOLTAGE.

➤ In case of supply 230V without neutral, connect the pre-heater thank through delta (the “star” connection is the original one, made for 400V).

4. WORKING

4.1 CHOICE OF NOZZLES

First of all state the maximum output required with all three nozzles in operation.
On the base of the maximum output choose, from **table A**, three related nozzles.
Nozzles: 60° - Pump pressure: 25 bar.



The references of **table B** should be followed in case of need of:
- modification of the pump pressure in order to vary the output,
- diverse composition of the 3 nozzles group,
- knowledge of the output in 1st and 2nd stage.

A

Nozzles GPH 60°			Total output kg/h 1st+2nd+3rd	
1st	2nd	3rd	25 bar	28 bar
8.00	8.00	8.00	150	159
8.30	8.30	8.30	156	165
8.50	8.50	8.50	159	171
9.00	9.00	9.00	168	180
9.50	9.50	9.50	177	189
10.00	10.00	10.00	186	198
10.50	10.50	10.50	195	210
11.00	11.00	11.00	207	219
12.00	12.00	12.00	228	240
13.00	13.00	13.00	246	261
13.80	13.80	13.80	258	279
14.00	14.00	14.00	264	282
15.00	15.00	15.00	285	300
15.30	15.30	15.30	291	–
16.00	16.00	16.00	300	

4.2 PUMP PRESSURE

The pump pressure is referred to all three nozzles operating.
The pump pressure increases automatically when two nozzles are operating and becomes higher with only one nozzle.

Suggested pressure:
- Light oil: 25 bar
- Heavy oil: 28 bar (transformation kit)

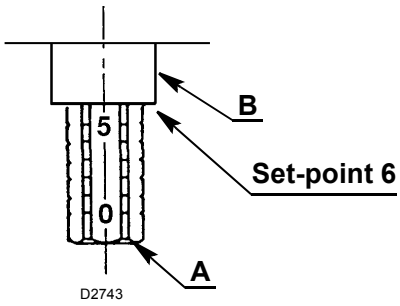
Rated nozzles deliveries are listed on the table.
A tolerance of ±5% concerns the real delivery against the rated one.
The pump leaves the factory set at 25 bar.

B

GPH	25 bar kg/h	28 bar kg/h
8.00	50	53
8.30	52	55
8.50	53	57
9.00	56	60
9.50	59	63
10.00	62	66
10.50	65	70
11.00	69	73
12.00	76	80
13.00	82	87
13.80	86	93
14.00	88	94
15.00	95	100
15.30	97	102
16.00	100	107

4.3 COMBUSTION HEAD ADJUSTMENT

On the base of the maximum delivery detect, from **diagramm C**, the combustion head adjustment.
The adjustment should be made by turning the screw **A** till the set-point (see diagram) is on the line with the washer **B**.



4.4 AIR SHUTTERS ADJUSTMENTS

The adjustment of the air shutters shall be set each time, with reference to the nozzles deliveries and the combustion chamber pressurization.
Fig. 2 shows the positioning of the air shutters.
Fig. 3 shows the positioning of the cams of the motor.

1st STAGE adjustment:
manual regulation carried out by acting on the sector A, fig. 2.

2nd - 3rd STAGE adjustment:
carried out by acting on the coloured levers of the motor fig. 3:

Blue lever:
adjustment not necessary. Positioned by the factory on the vertical of the motor axis. It maintains the shutters of 2nd and 3rd stage closed during the 1st stage operation and in the stop periods. Do not turn clockwise (**–**) the lever to avoid crawlings of the air shutters, turning the lever anticlockwise (**+**) the motor will be in different position during the passage from 2nd to 1st stage or during the stop.

Orange lever:
for 2nd stage air shutters adjustment, it is adjustable both in opening and in closing position.

Red lever:
for 3rd stage air shutters adjustment, it is adjustable both in opening and in closing position.

Black lever:
it controls the opening of the 2nd stage oil valve. It has always to anticipate the orange lever.
The control of the 3rd stage valve is automatic through one of the cam next to the red lever.

C

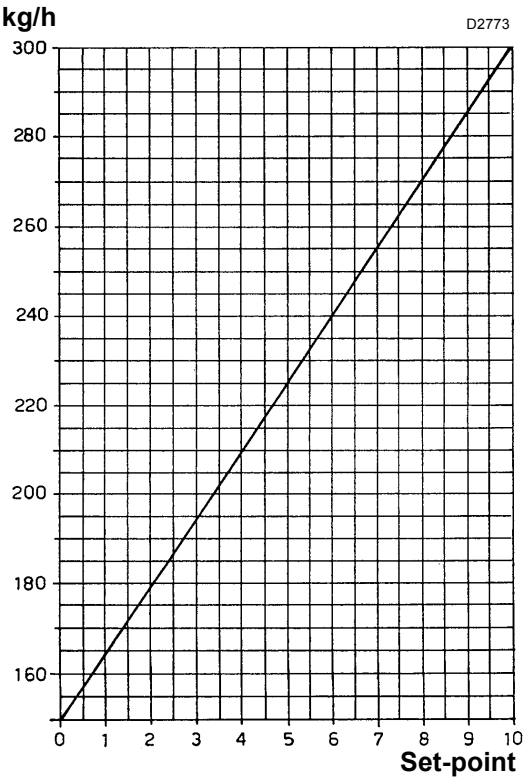


Fig. 2

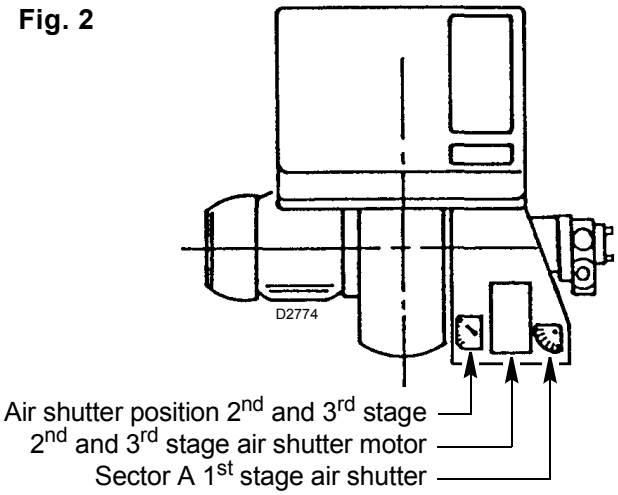
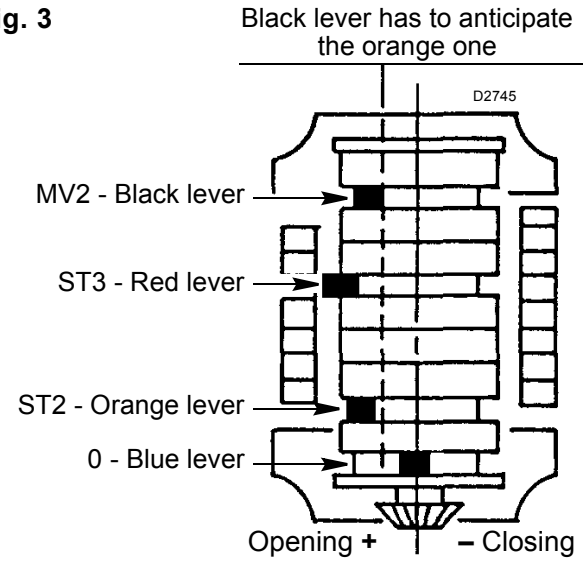


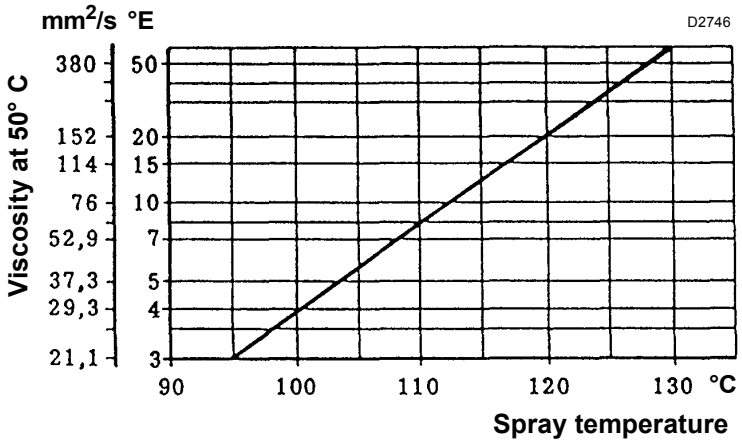
Fig. 3

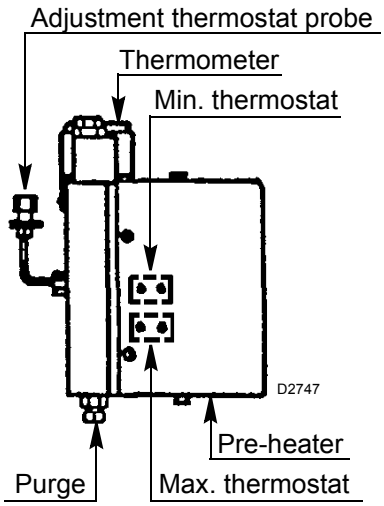


4.5 SPRAY TEMPERATURE ADJUSTMENT

Thermostat for adjustment - maximum value - minimum value

Electronic adjustment thermostat by means of information relayed from a PT100 probe immersed in the oil in the delivery manifold, the thermostat adjusts spray temperature. (The correct conditions for fuel spray are shown in the temperature/viscosity graph below).





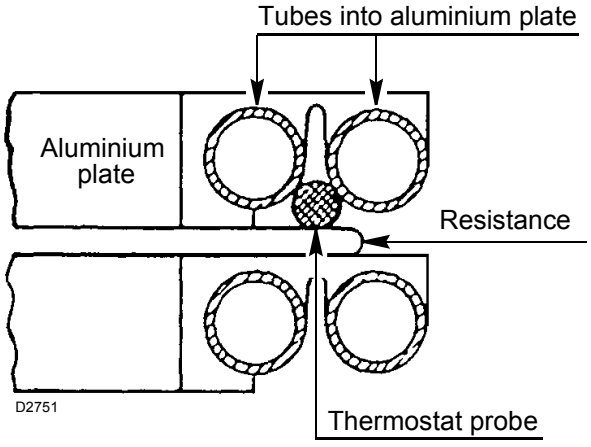
Example: fuel oil with 7 °E viscosity at 50 °C is pre-heated to approximately 110 °C.

Important: although the temperature set on the thermostat should correspond to the temperature of the fluid, it is good practice to check that the thermometer shows the correct reading once the unit has been in operation for a few minutes. The LED will illuminate to indicate that the heating resistances are working properly.

Minimum temperature thermostat, in addition to shutting down the burner if the fuel temperature should fall below the critical value for correct combustion, this thermostat also provides a permissive signal at the time of burner start-up. (Factory set at approximately 80°C, adjustable by removing the pre-heater cover and relative plate).

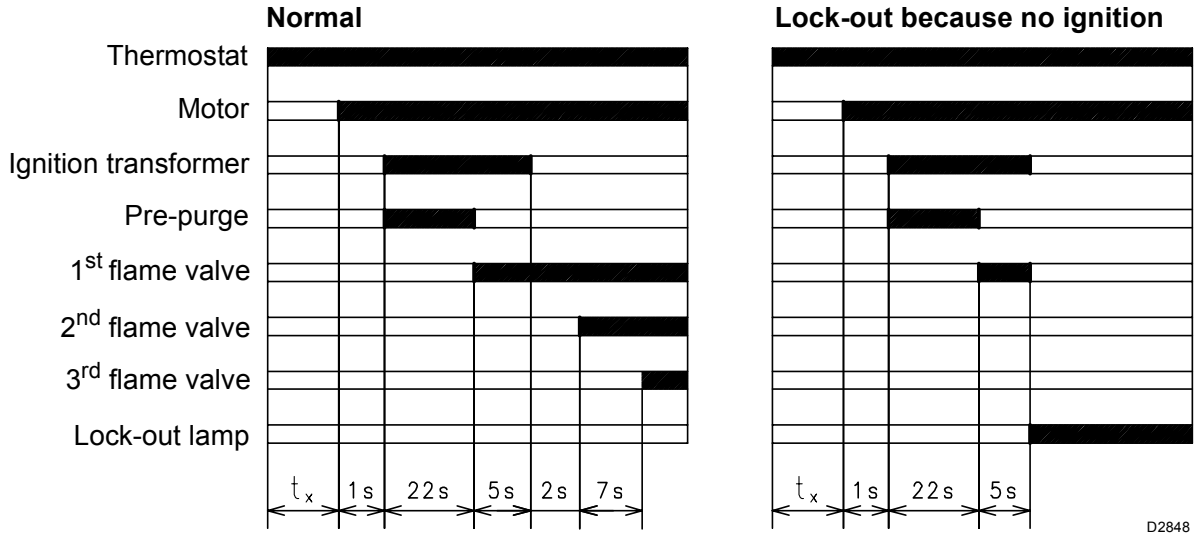
Maximum temperature thermostat this switches off the resistance when, because of failure of the adjustment thermostat, the temperature of the pre-heater increases to unacceptable levels; a “high temperature” alarm output is provided on the burner terminal strip. (Factory setting is approximately 180°C).

Renewing the minimum and maximum temperature thermostats.
Reposition the probes of the new thermostat, after having first loosened the plate pack securing screws. Make sure that the probe is touching the resistance and the plate pack as shown in the adjacent figure. The same precautions should be taken when renewing the resistances in contact with the thermostat probes.
If the pre-heater should malfunction, use an ohmmeter to check that the resistances located in contact with the temperature probes are not burnt out (reading of approximately 35 Ohm).



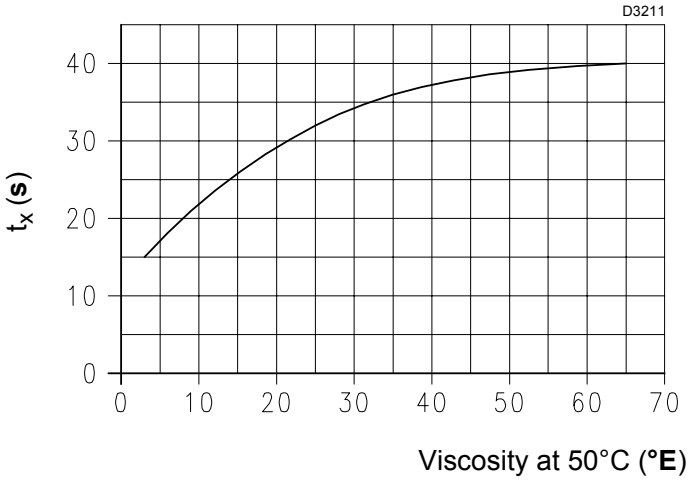
Changing the PT100 probe in the oil delivery manifold.
Fit the supplied nut and biconical collar on the new probe, insert a length of approximately 40mm in the manifold, and secure firmly into place. At this point, the section remaining outside the manifold can be bent as required, with no risk of damaging the resistance.

4.6 BURNER START-UP CYCLE



(t_x) Factory setting: 20 s.
This time determines the heavy oil temperature at ignition. It can be adjusted, according to the fuel's viscosity, by the timer 22) (Fig. 1).
The adjacent diagram shows the suggested settings.

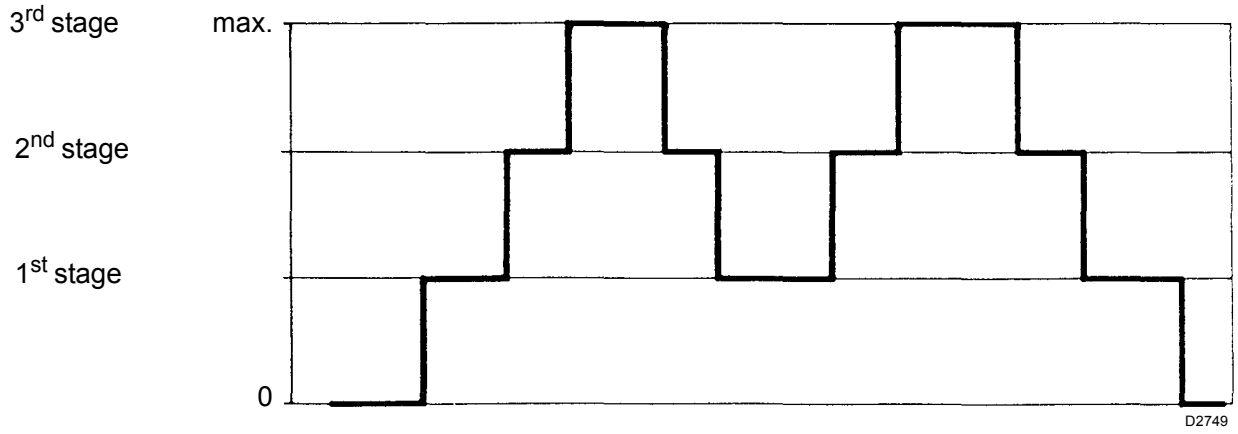
t_x max = 60 s



Motor lock-out
It is caused by the over load relay when overload occurs or no current supply.
Re-set: push button 7) and 10) (fig. 1).

NB.: Periodically clean the filter of the pre-heater tank.

4.7 THREE STAGE OPERATION



4.8 BURNERS START-UP CYCLE DIAGNOSTICS

During start-up, indication is according to the followin table:

COLOUR CODE TABLE	
Sequences	**Colour code**
Pre-purging	●●●●●●●●●●●
Ignition phase	●❍●❍●❍●❍●❍●
Operation, flame ok	❑❑❑❑❑❑❑❑❑❑❑❑
Operating with weak flame signal	❑❍❑❍❑❍❑❍❑❍
Electrical supply lower than ~ 170V	●▲●▲●▲●▲●▲●
Lock-out	▲▲▲▲▲▲▲▲▲▲▲
Extraneous light	▲❑▲❑▲❑▲❑▲❑▲
Key: ❍ Off ● Yellow ❑ Green ▲ Red	

4.9 OPERATING FAULT DIAGNOSTICS

The control box has a self-diagnostic system, which easily allows identifying the operating faults (**RED LED** signal).
ITo use this function, wait at least ten seconds from the safety lock out, and then press the reset button for a minimum of 3 seconds.
After releasing the button, the RED LED starts flashing as shown in the diagram below.

The pulses of the LED constitute a signal spaced by approximately 3 seconds.
The number of pulses will provide the information on the possible faults, according to the table below:

SIGNAL	PROBABLE CAUSE
2 flashes ● ●	The flame does not stabilise at the end of the safety time: – faulty photocell; – faulty or soiled oil valves; – faulty ignition transformer – poor burner regulation.
3 flashes ● ● ●	– Not used.
4 flashes ● ● ● ●	– Light in the chamber before firing.
7 flashes ● ● ● ● ● ● ●	Loss of flame during operations: – poor burner regulation; – faulty or soiled oil valves.
8 flashes ● ● ● ● ● ● ● ●	– Faulty thermostat for oil permissive signal; – Heating resistances blown.
10 flashes ● ● ● ● ● ● ● ● ● ●	– Wiring error or internal fault.