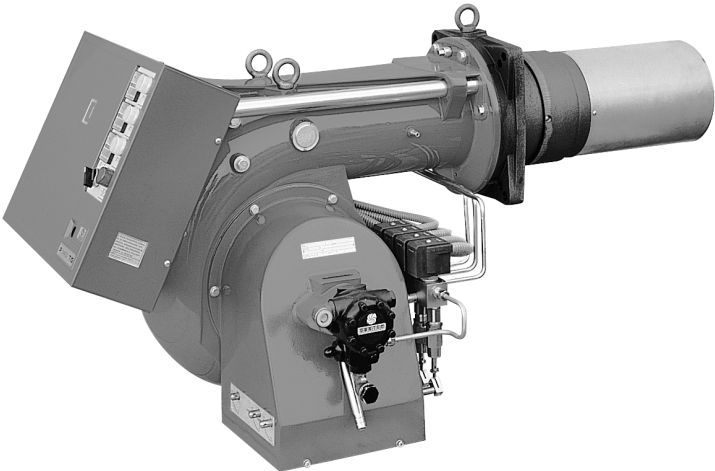


GB **Light oil burners**

Three-stage operation



CODE	MODELLO - MODELL MODELE - MODEL	TIPO - TYP TYPE
3476821 - 3476823	P 140 T/G	476 M1
3476822 - 3476824	P 140 T/G	476 M1
3477721 - 3477723	P 200 T/G	477 M1
3477722 - 3477724	P 200 T/G	477 M1
3478831 - 3478837	P 300 T/G	478 M1
3478832 - 3478838	P 300 T/G	478 M1
3478833 - 3478839	P 300 T/G	478 M1
3478834 - 3478840	P 300 T/G	478 M1
3478835 - 3478841	P 300 T/G	478 M1
3478836 - 3478842	P 300 T/G	478 M1
3479331 - 3479336	P 450 T/G	479 M1
3479332 - 3479337	P 450 T/G	479 M1
3479333 - 3479338	P 450 T/G	479 M1
3479334 - 3479339	P 450 T/G	479 M1

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1. BURNER DESCRIPTION

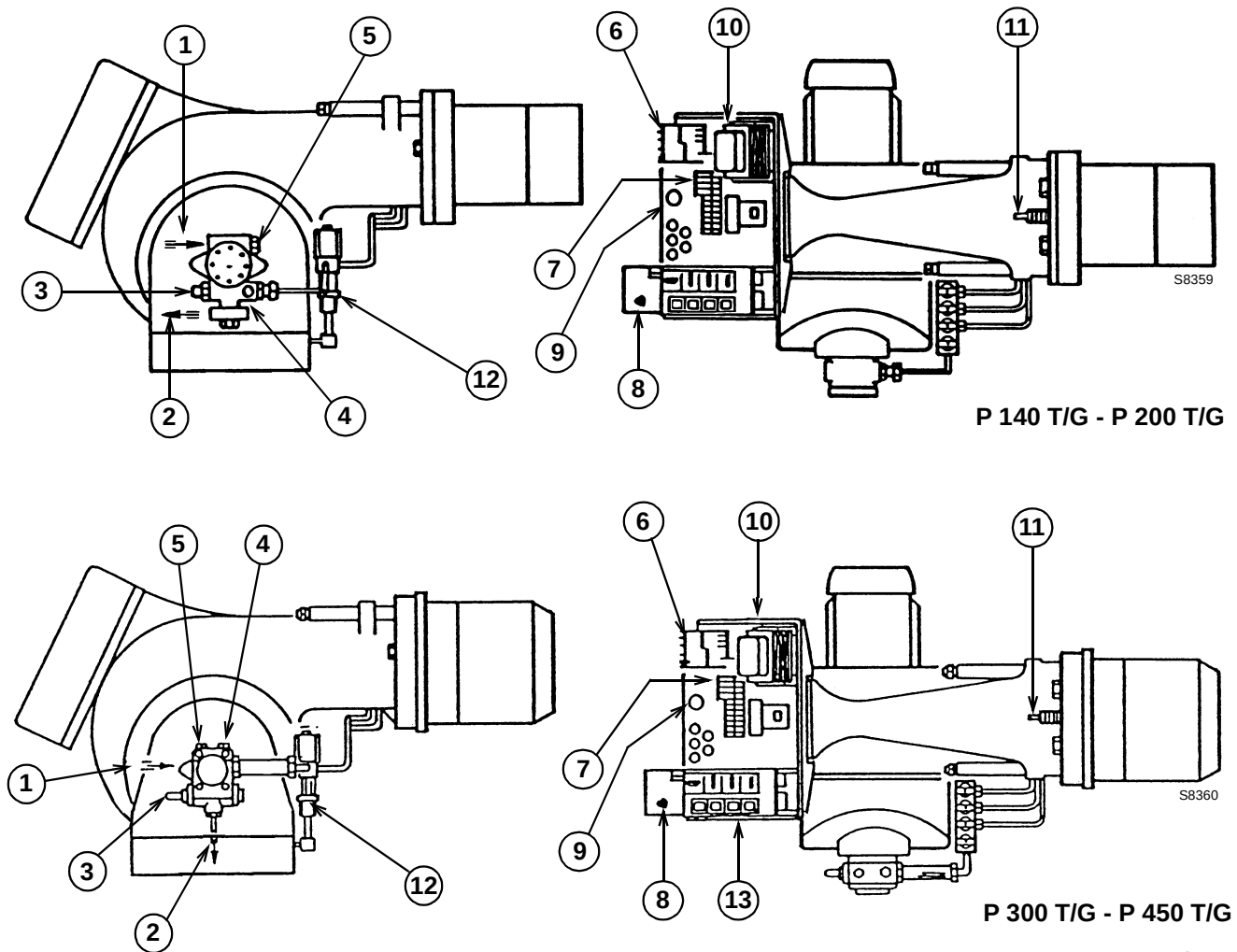


Fig. 1

- | | |
|--|---|
| 1 - Suction line | 7 - Terminal strip |
| 2 - Return line | 8 - Control box reset push-button and lock-out lamp |
| 3 - Pump pressure adjustment screw | 9 - Fairleads |
| 4 - Manometer plug
(G 1/8 for P 140 T/G and P 200 T/G;
G 1/4 for P 300 T/G and P 450 T/G) | 10 - Ignition transformer |
| 5 - Vacuumometer plug
(G 1/2 for P 140 T/G and P 200 T/G;
G 1/4 for P 300 T/G and P 450 T/G) | 11 - Regulating bush for combustion head |
| 6 - Reset-push-button of the motor
(P 140 T/G, P 200 T/G, P 300 T/G) | 12 - Valves group with hydraulic jacks |
| | 13 - Electric board |

1.1 STANDARD EQUIPMENT

Flexible hoses N° 2
 Nipples N° 2
 Screws N° 4
 Gasket for flange N° 1
 Nozzles N° 3

Fairleads * N° 1
 Starter N° 4
 Extensions (P 300 T/G, P 450 T/G: for
 long head only) N° 2
 Diffuser disc (P 450 T/G) N° 1

* For versions with star-delta starting

2. TECHNICAL DATA

2.1 TECHNICAL DATA

MODEL	P 140 T/G	P 200 T/G	P 300 T/G	P 450 T/G
TYPE	476 M1	477 M1	478 M1	479 M1
THERMAL POWER	380÷1660 kW	557÷2370 kW	710÷3560 kW	890÷5340 kW
OUTPUT	32÷140 kg/h	47÷200 kg/h	60÷300 kg/h	75÷450 kg/h
OPERATION	1 stage - 2 stage - 3 stage			
FUEL	Light oil, max. viscosity at 20 °C: 6 mm ² /s (1,5 °E)			
IN CONFORMITY WITH EC DIRECTIVES	2004/108 - 2006/95 - 2006/42			
APPROVAL	0441/B (according to Machine Directive 2006/42/EC)			

2.2 ELECTRICAL DATA

MOTOR IE2

MODEL	P 140 T/G	P 200 T/G	P 300 T/G	P 300 T/G
CODE	3476821-3476823 3476822-3476824	3477721-3477723 3477722-3477724	3478831-3478837 3478832-3478838 3478833-3478839 3478834-3478840	3478835-3478841 3478836-3478842
ELECTRICAL SUPPLY	3N ~ 50 Hz 400 V 3 ~ 50 Hz 230 V			
MOTOR *	13.5 A / 230 V 7.8 A / 400 V	13.5 A / 230 V 7.8 A / 400 V	29.3 A / 230 V 16.9 A / 400 V	16.9 A / 400 V 9.7 A / 690 V
IGNITION TRANSFORMER	Prim.: 2 A - Sec.: 2 x 6.5 kV - 35 mA			
ABSORBED ELECTRICAL POWER	5.2 kW	5.3 kW	10.9 kW	10.9 kW
ELECTRICAL PROTECTION	IP 40 in accordance with EN 60529 (IEC 529 - 1989)			

MODEL	P 450 T/G	P 450 T/G
CODE	3479331-3479336 3479332-3479337	3479333-3479338 3479334-3479339
ELECTRICAL SUPPLY	3N ~ 50 Hz 400 V 3 ~ 50 Hz 230 V	
MOTOR *	46.8 A / 230 V 27 A / 400 V	26.6 A / 400 V 15.4 A / 690 V
IGNITION TRANSFORMER	Prim.: 2 A - Sec.: 2 x 6.5 kV - 35 mA	
ABSORBED ELECTRICAL POWER	17.3 kW	17.3 kW
ELECTRICAL PROTECTION	IP 40 in accordance with EN 60529 (IEC 529 - 1989)	

* Only with star-delta starter for P 450 T/G burner model

MOTOR IE3

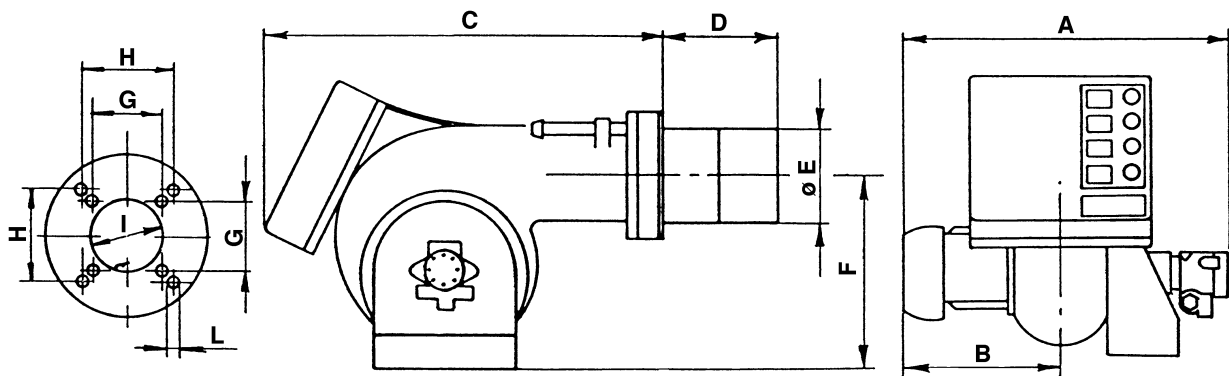
MODEL		P 300 T/G	P 300 T/G	P 450 T/G	P 450 T/G
CODE		3478831-3478837 3478832-3478838 3478833-3478839 3478834-3478840	3478835-3478841 3478836-3478842	3479331-3479336 3479332-3479337	3479333-3479338 3479334-3479339
ELECTRICAL SUPPLY		3N ~ 50 Hz 400 V 3 ~ 50 Hz 230 V		3N ~ 50 Hz 400 V 3 ~ 50 Hz 230 V	
MOTOR *	rpm V kW A	2920 230/400 9.2 28.6/16.5	2880 400/690 9.2 16.8/9.7	2920 230/400 15 46.8/27	2880 400/690 15 27/15.6
IGNITION TRANSFORMER		Prim.: 2 A - Sec.: 2 x 6.5 kV - 35 mA			
ABSORBED ELECTRICAL POWER	kW	10.9	10.6	16.9	16.9
ELECTRICAL PROTECTION		IP 40 in accordance with EN 60529 (IEC 529 - 1989)			

* Only with star-delta starter for P 450 T/G burner model

2.3 DIMENSIONS

Boiler front-plate
drilling

Burner



mm	A	B	C	D	E	F	G	H	I	L
P 140 T/G	765	365	890	253*-363-473	222	467	230	260	225	M14
P 200 T/G	795	396	890	281*-391-501	250	467	-	260	255	M16
P 300 T/G	858	447	1000	314*-444-574	295	496	-	260	300	M18
P 450 T/G	950	508	1070	346*-476-606	336	525	-	310	350	M20

* It is possible with a spacer upon request

2.4 OPERATION AND EFFICIENCY OF THE BURNER

P 140 T/G	3 rd STAGE	POWER AND OUTPUT			
		MINIMUM		MAXIMUM	
		kW	kg/h	kW	kg/h
	1 st nozzle : 1 st stage of operation	380	32	545	46
	1 st + 2 nd nozzle : 2 nd stage of operation	664	56	1103	93
	1 st + 2 nd + 3 rd nozzle : 3 rd stage of operation	830	70	1660	140

P 200 T/G	3 rd STAGE	POWER AND OUTPUT			
		MINIMUM		MAXIMUM	
		kW	kg/h	kW	kg/h
	1 st nozzle : 1 st stage of operation	557	47	794	67
	1 st + 2 nd nozzle : 2 nd stage of operation	1067	90	1576	133
	1 st + 2 nd + 3 rd nozzle : 3 rd stage of operation	1186	100	2372	200

P 300 T/G	3 rd STAGE	POWER AND OUTPUT			
		MINIMUM		MAXIMUM	
		kW	kg/h	kW	kg/h
	1 st nozzle : 1 st stage of operation	712	60	1186	100
	1 st + 2 nd nozzle : 2 nd stage of operation	1245	105	2372	200
	1 st + 2 nd + 3 rd nozzle : 3 rd stage of operation	1779	150	3558	300

P 450 T/G	3 rd STAGE	POWER AND OUTPUT			
		MINIMUM		MAXIMUM	
		kW	kg/h	kW	kg/h
	1 st nozzle : 1 st stage of operation	890	75	1780	150
	1 st + 2 nd nozzle : 2 nd stage of operation	1780	150	3560	300
	1 st + 2 nd + 3 rd nozzle : 3 rd stage of operation	2670	225	5340	450

ACCESSOIRES

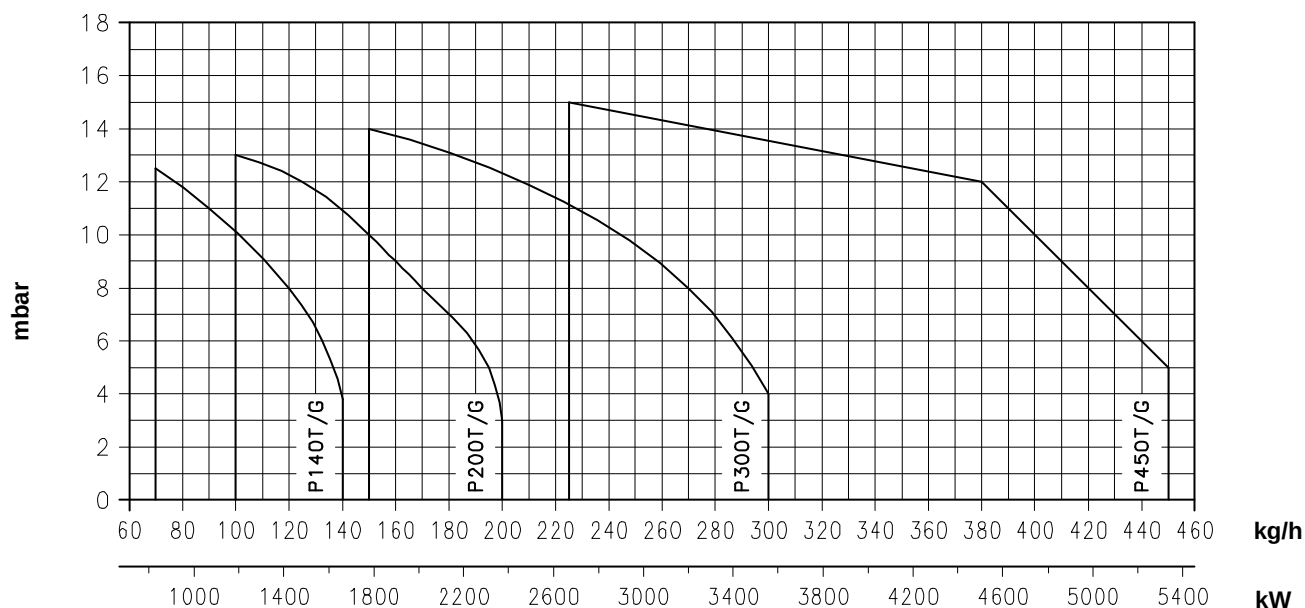
RADIO DISTURBANCE PROTECTION KIT: Code 3010386

If the burner is installed in places particularly subject to radio disturbance (emission of signals exceeding 10 V/m) owing to the presence of an INVERTER, or in applications where the length of the thermostat connections exceeds 20 metres, a protection kit is available as an interface between the control box and the burner.

2.5 FIRING RATES (in accordance with DIN 4787)

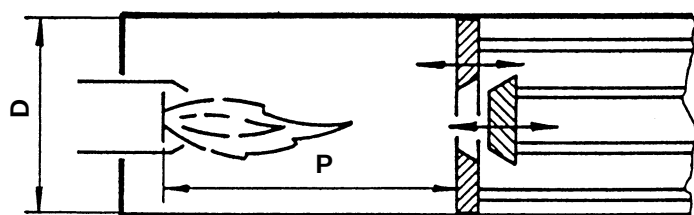
Combustion chamber pressure - Maximum output

(three nozzles in operation)



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

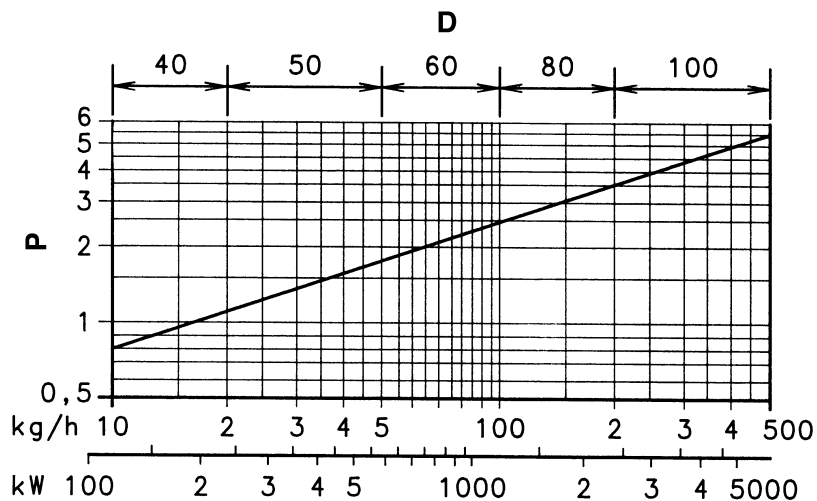
DIMENSIONS OF THE TESTING COMBUSTION CHAMBRE (ISO 5063 - 1978)



D - Boiler diameter (cm)

P - Position of the boiler movable wall (m)

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



3. HYDRAULIC SYSTEMS

ATTENTION:

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

H meters	P 140-200-300 T/G		P 450 T/G	
	L meters		L meters	
	øi 14 mm	øi 16 mm	øi 16 mm	øi 18 mm
0	20	40	20	40
0,5	25	45	25	45
1	30	50	30	50
1,5	35	55	35	55
2	40	60	40	60

Pay attention to do not overcome the max. depression of 0.45 bar (35 cm Hg), over this value the fuel may turn into gas.

Check the pipes are perfectly sealed.

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

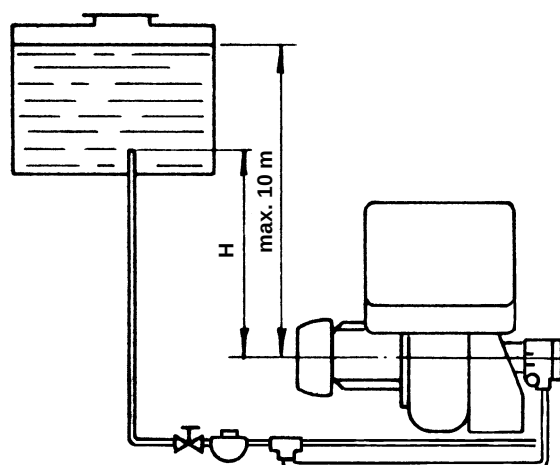
Should the return line arrive over the fuel level, the foot valve is indispensable. Notice that this solution is less safe than the previous one, because it is possible the valve has not a good sealing.

H meters	P 140-200-300 T/G		P 450 T/G	
	L meters		L meters	
	øi 14 mm	øi 16 mm	øi 16 mm	øi 18 mm
0	50	60	20	40
0,5	40	50	18	35
1	30	40	15	30
1,5	20	30	13	25
2	10	20	10	20
3	5	10	5	10

H = Difference in the pipes heights;

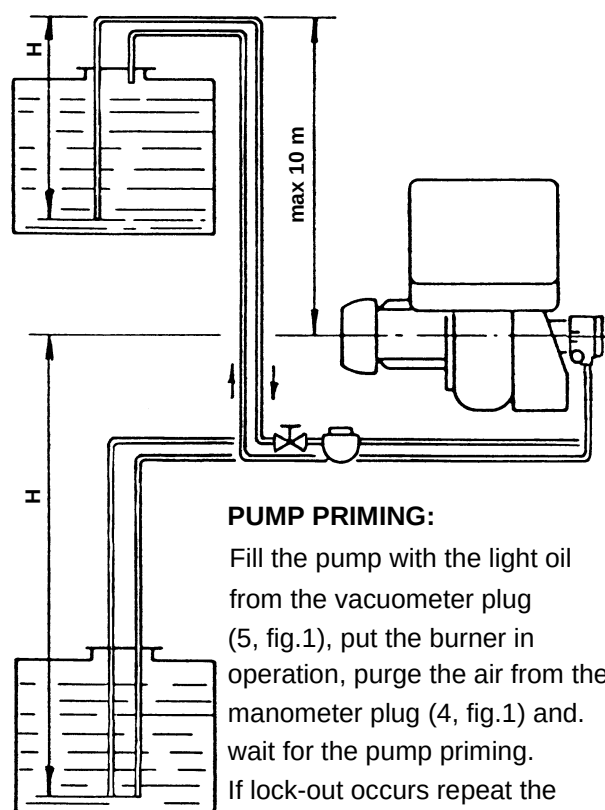
L = Total lenght of the suction tube;

øi = Internal diameter of the tube. Copper tubes øi 14 mm could be replaced by steel tubes G 1/2"; copper tubes øi 16 and 18 mm could be replaced by steel tubes G 3/4".



PUMP PRIMING:

Loose the tap from the vacuumeter plug (5, fig.1) and wait for the flow of the fuel.



PUMP PRIMING:

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

P 140 - 200 - 300 T/G DIRECT MOTOR STARTING



KEY TO LAYOUTS (A) - (B)

CMV - Motor contactor

CO - Commutator

FR - Photocell

h_{1,2,3} - 1., 2., 3. stage hourcounters

L1,2,3 - 1., 2., 3. stage lamps

L4 - Lock-out motor lamp

MB - Burner terminal strip

MV - Fan motor

RT - Thermal relay

TA - Ignition transformer

TB - Burner ground (earth)
connection

VS - Safety solenoid valve

V1,2,3 - 1., 2., 3. stage solenoid valves

KEY TO LAYOUT (C)

F1 - Power line fuses

F2 - Control devices fuse

F3 - Thermal relay - Factory calibration at:

P 300 T/G: 10.2 A for 400 V

17.6 A for 230 V

P 450 T/G: 16.7 A for 400 V

29 A for 230 V

KL1 - Line Contact-maker

KS1 - Star Contact-maker

KST1- Timer relay for switching from star to delta (factory calibration at 10 s.)

KT1 - Delta Contact-maker

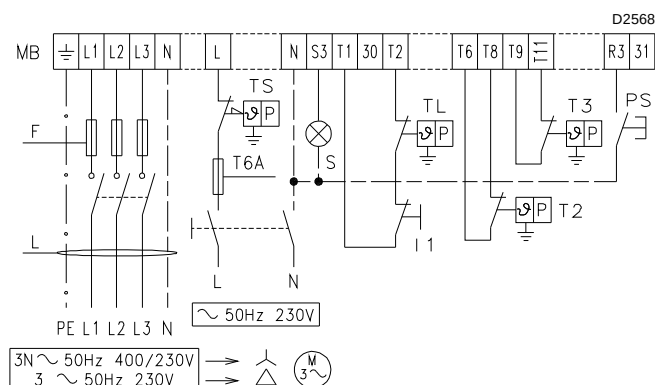
MA - Starter terminal strip

Q1 - Disconnecting switch with
interlock

4.2 ELECTRICAL CONNECTION TO THE TERMINAL STRIP (installer-set)

P 140 - 200 - 300 T/G

DIRECT MOTOR STARTING



LAYOUT (A) - Electrical connection P 140-200-300 T/G burners with direct motor starting

Cables cross-section

		P 140 T/G		P 200 T/G		P 300 T/G	
		230 V	400 V	230 V	400 V	230 V	400 V
F	A gG/gL	25	25	40	25	63	50
L	mm ²	2,5	2,5	4	2,5	6	4

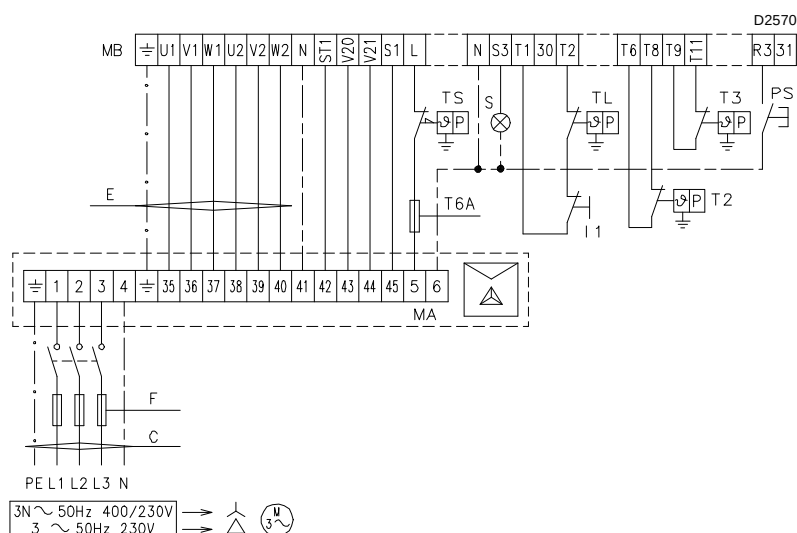
LAYOUT (B) - Electrical connection P 300-450 T/G burners with star-delta motor starting

Cables cross-section

(A)

P 300 - 450 T/G

STAR-DELTA MOTOR STARTING



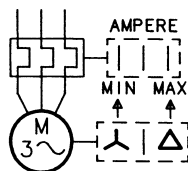
		P 300 T/G		P 450 T/G	
		230 V	400 V	230 V	400 V
F	A gG/gL	50	40	63	50
L	mm ²	6	4	10	6
E	mm ²	4	2,5	6	4

KEY TO LAYOUTS (A) - (B)

- I1 - Burner manual stop switch
- MA - Star-delta starter terminal strip
- MB - Burner terminal strip
- PS - Reset push-button
- S - Remote lock-out signal
- TL - Load limit remote control system:
shut down the burner when the boiler temperature or pressure reaches the maximum preset value
- TS - Safety load control system:
operates when TL is faulty
- T2 - 2nd stage load control system
- T3 - 3rd stage load control system

(B)

THERMAL RELAY



(C)

Important:

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

SCHEMA (C) - Calibration of thermal relay

This is required to avoid motor burn-out in the event of a significant increase in power absorption caused by a missing phase.

- If the motor is star-powered, **400 V**, the cursor should be positioned to "MIN".
- If it is delta-powered, **230 V**, the cursor should be positioned to "MAX".

If the scale of the thermal relay does not include rated motor absorption at 400 V, protection is still ensured.

NOTE

In systems where the run of wiring connecting the thermostat exceeds 20 metres in length, or in places where the burner is subject to particularly disturbing electromagnetic interference (over 10 v/m), you must insert the relay-interface kit item number 3010386.

5. CHOICE OF NOZZLES, PUMP PRESSURE, COMBUSTION HEAD ADJUSTMENT

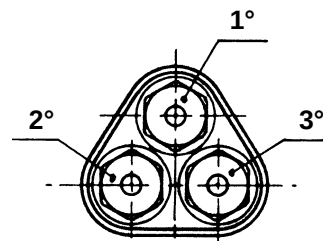
- State, first of all, the maximum output required with all three nozzles in operation.
- On the base of the maximum required output, choose, from table A, three related nozzles.

Use nozzles with a 60° spray angle at the recommended pressure of 12 bar.

For three-stage operation, up to:

- 116 kg/h (P 140 T/G)
- 170 kg/h (P 200 T/G)
- 193 kg/h (P 300 T/G)

1st and 2nd nozzle are not equal to the 3rd one. Follow this procedure in order to obtain higher values of CO₂ (during 1st and 2nd stage of operation), complying with German Standard DIN.



A

THREE-STAGE OPERATION SUGGESTED NOZZLES:

P 140 T/G

NOZZLES 60° PUMP 12 BAR *			TOTAL DELIVERY
GPH			kg/h
1°	2°	3°	1°+2°+3°
6,5	6,5	3,5	71,1
7	7	4	77,2
7,5	7,5	4	81,6
8	8	4	85,8
8,3	8,3	4	88,4
8,5	8,5	4,5	92,3
9	9	5	98,7
9,5	9,5	6	107,4
9,5	9,5	8	115,9
9,5	9,5	9,5	122,4
10	10	10	128,7
10,5	10,5	10,5	135,3
11	11	11	141,6

P 200 T/G

NOZZLES 60° PUMP 12 BAR *			TOTAL DELIVERY
GPH			kg/h
1°	2°	3°	1°+2°+3°
10	10	5	107,3
10,5	10,5	5	111,7
10,5	10,5	6	115,9
11	11	6,5	122,3
12	12	6,5	130,9
12	12	7,5	135,2
13	13	7,5	143,8
13,8	13,8	7,5	150,7
13,8	13,8	10	161,3
13,8	13,8	12	169,9
13,8	13,8	13,8	177,6
14	14	14	180,3
15	15	15	193,2
15,3	15,3	15,3	197,1

- * The pump pressure is referred to all three nozzles operating, the pressure increases automatically with two nozzles in operation and more with only one.

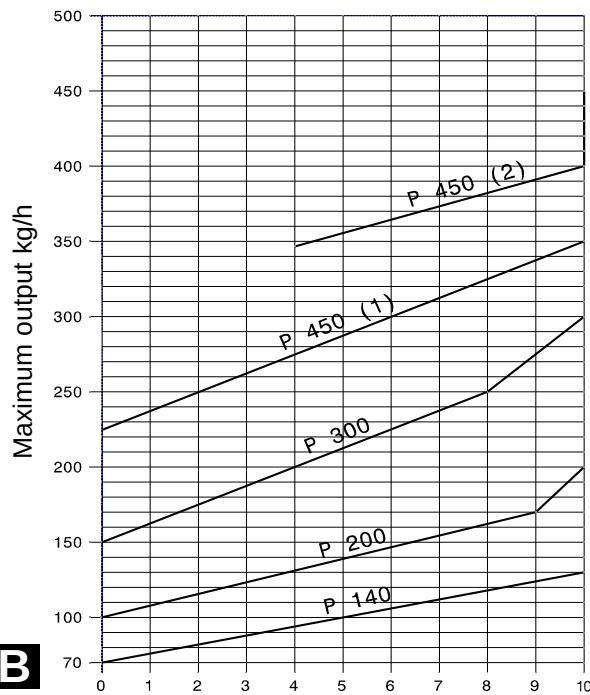
P 300 T/G

NOZZLES 60° PUMP 12 BAR *			TOTAL DELIVERY
1°	2°	3°	kg/h 1°+2°+3°
13,8	10,5	10,5	149,4
13,8	11,0	11,0	153,6
13,8	12,0	12,0	162,2
14,0	13,0	13,0	171,7
15,3	13,8	13,8	184,1
15,0	14,0	14,0	184,6
15,0	15,0	15,0	193,2
15,3	15,3	15,3	197,1
16,0	16,0	16,0	206,1
17,0	17,0	17,0	219,0
17,5	17,5	17,5	225,3
18,0	18,0	18,0	231,9
19,0	19,0	19,0	244,8
19,5	19,5	19,5	251,1
20,0	20,0	20,0	257,7
21,5	21,5	21,5	276,9
22,0	22,0	22,0	283,2
24,0	24,0	24,0	309,0

P 450 T/G

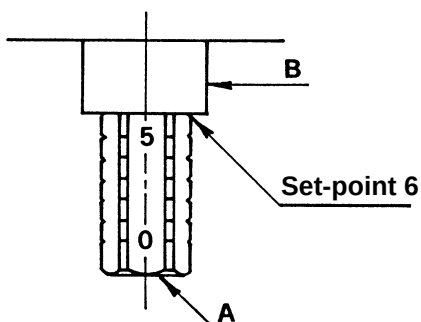
NOZZLES 60° PUMP 12 BAR *			TOTAL DELIVERY
1°	2°	3°	kg/h 1°+2°+3°
17,5	17,5	17,5	225,3
18	18	18	231,9
19	19	19	244,8
19,5	19,5	19,5	251,1
20,0	20,0	20,0	257,7
21,5	21,5	21,5	276,9
22,0	22,0	22,0	283,2
24,0	24,0	24,0	309,0
26,0	26,0	26,0	334,7
28,0	28,0	28,0	360,5
30,0	30,0	30,0	386,3
32,0	32,0	32,0	412,0
35,0	35,0	35,0	450,6

* The pump pressure is referred to all three nozzles operating, the pressure increases automatically with two nozzles in operation and more with only one.



Combustion head adjustment (set-point N°)

P 450: 1) With diffuser disc ø 192 (standard issue ready fitted)
P 450: 2) With diffuser disc ø 215 (supplied)



Rated nozzles delivery are shown in the table. The real nozzle delivery may vary from the rated one up to $\pm 5\%$, its detection is made by weighing the oil sprayed out from the nozzle inserted in a tube. The pump leaves the factory rated at 12 bar. Pay attention to not overcome the pump pressure values of 10 and 14 bar.

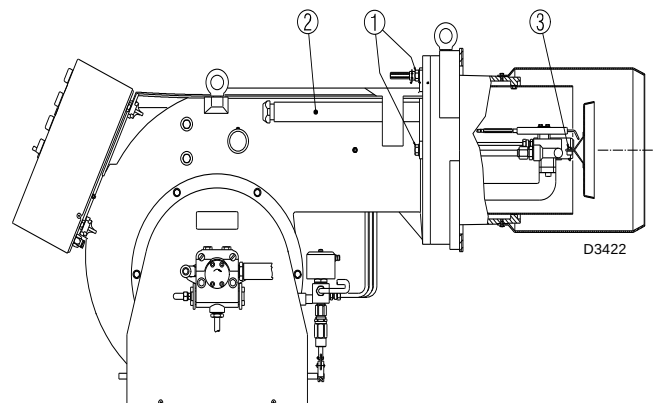
At the end, on the base of the maximum output, you obtain the combustion head adjustment from the diagram D.

The adjustment should be made by turning the screw A till the set-point (see diagram) is on the line with the washer B (Fig. C).

NOTE (for P 450 T/G only):

depending on the desired output, you can use the ready-fitted standard-issue diffuser disc or the disc supplied (see diagram B). To replace the diffuser disc, proceed as follows (Fig. D):

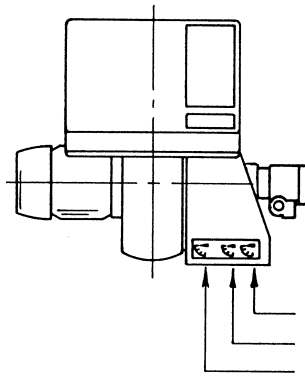
- unscrew screws 1);
- slide the ventilating part back on pins 2);
- first unscrew screws 3), then replace diffuser disc;
- refit all parts following the above procedure in reverse order.



6. AIR DAMPER ADJUSTMENT

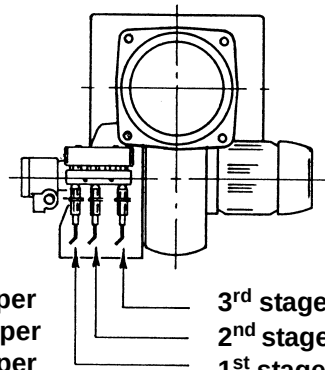
The air dampers adjustment shall be set each time in relation with the nozzles delivery and the combustion chamber pressurization.

Fig. 2



1st stage air damper
2nd stage air damper
3rd stage air damper

Fig. 3



3rd stage hyd. jack
2nd stage hyd. jack
1st stage hyd. jack

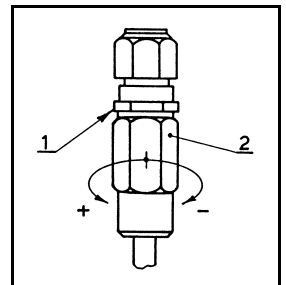
Fig. 2 shows the placement of the air dampers as fig. 3 their correspondent hydraulic jacks.

To open or close the air dampers proceed as follows:

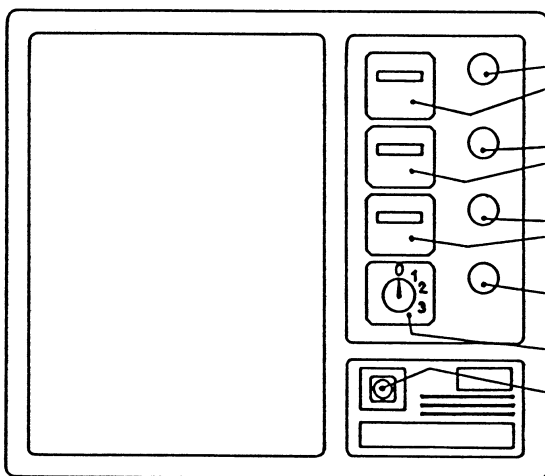
loose the ring nut 1), turn clockwise the exagonal body 2) in order to decrease the air flow, and counterclockwise to increase it.

The right adjustment of the air dampers may be detect by checking the combustion results in the three stages of burner operation.

To check the combustion during the different stages, the commutator should be set to the position corresponding to the burner stage to be controlled.



7. ELECTRIC PANEL



1st nozzle hourcounter with operation signal

2nd nozzle hourcounter with operation signal

3rd nozzle hourcounter with operation signal

Motor lock-out signal

4 positions commutator

Control box lock-out signal with re-set push-button

HOURLCOUNTER

Deducting the number of hours of 2nd nozzle hourcounter from those indicated in the 1st nozzle hourcounter you could know how many hours the burner has been performing only at 1st stage; the same procedure to detect the performance hours of the 2nd stage alone, deduct from the 2nd stage hourcounter the hours indicated in the 3rd nozzle hourcounter.

The hours of 3rd stage operation are shown rightly on the 3rd nozzle hourcounter.

COMMUTATOR

Pos. 0: Burner stop

Pos. 1: Burner operation only at 1st stage

Pos. 2: Burner operation at 1st and 2nd stage

Pos. 3: Burner operation at 1st, 2nd, 3rd stage

MOTOR LOCK-OUT

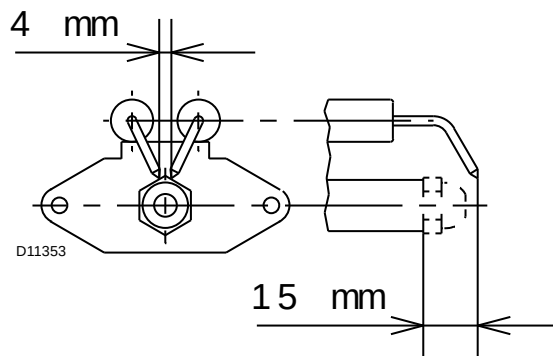
It is caused by the overload relay in case of overload or no electric supply.

Release by pressing the pushbutton on thermal relay.

8. ELECTRODES ADJUSTMENT

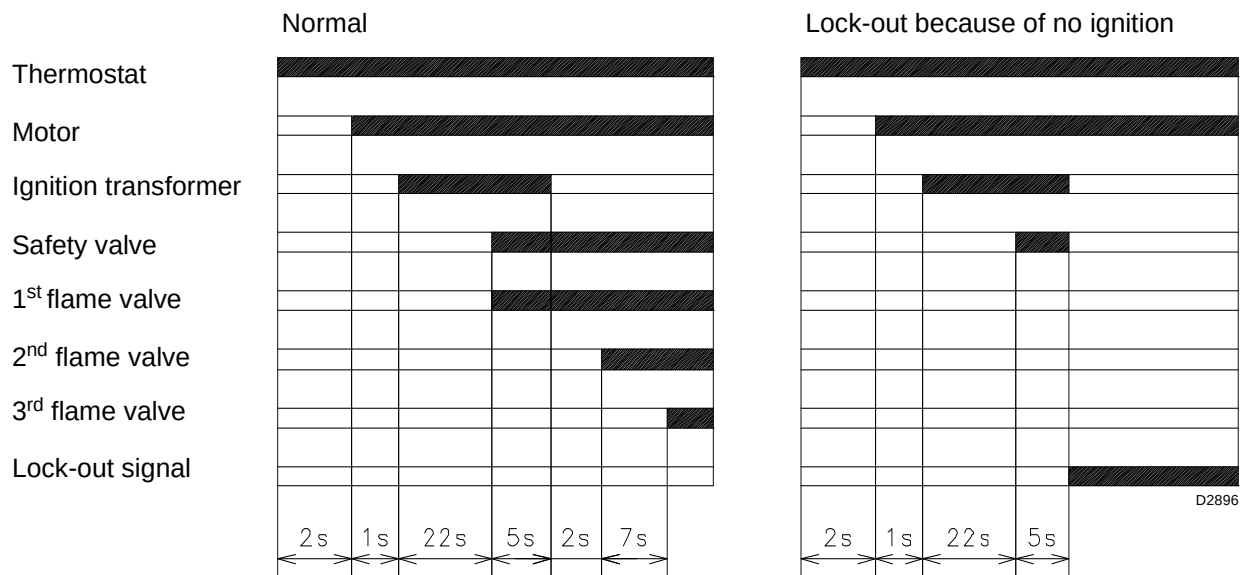


The measures must be respected.



9. BURNER OPERATION

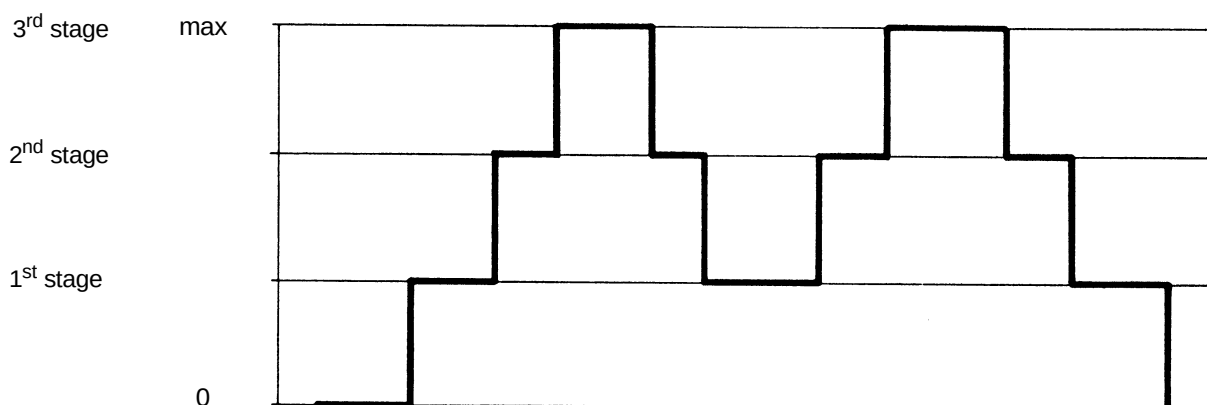
9.1 BURNER START UP CYCLE



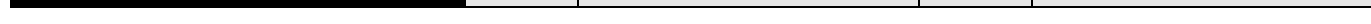
ALTERNATIVE START-UP CYCLES

- 1) If you desire the pre-ignition being present during the complete pre-purge phase (37 s): remove the bridge from the terminals 11 - 3 and put it on the terminals 11 - 7 of the control box.
- 2) If you desire to reduce the pre-purge period from 37 to 20 s (with contemporaneous presence of the pre-ignition) remove the wire from the terminal no. 7 to the no. 3 of the control box (maintaining the bridge to the terminals 11 - 3).

THREE STAGE OPERATION



To 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.



The number of pulses will provide the information on the possible faults, according to the table below:

[illegible]