

## Light oil burners

# CE

CODE	MODEL	ТҮРЕ
3477785	P200 T/G	477 T80
3477786	P200 T/G	477 T80

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#### **TECHNICAL DATA**

Thermal power - Output	530 / 2370 kW - 45 / 200 kg/h (see page 2)
Operation	1 <sup>st</sup> stage - 2 <sup>nd</sup> stage - 3 <sup>rd</sup> stage
Fuel	Light oil, max. viscosity at 20° C: 6 mm <sup>2</sup> /s (1.5° E)

#### ELECTRICAL DATA

#### Motor IE1

Electrical supply	Three-phase 220V +10% -10% ~ 60Hz without neutral 380V +10% -10% ~ 60Hz with neutral
Motor	15.9 A / 220V - 9.2A / 380V
Ignition transformer	Primary: 2 A - Secondary: 2x 6.5 kV - 35 mA
Absorbed electrical power	5.5 kW

#### Motor IE2

Electrical supply	Three-phase 220V +10% -10% ~ 60Hz without neutral 380V +10% -10% ~ 60Hz with neutral
Motor	14.6 A / 220V - 8.5A / 380V
Ignition transformer	Primary: 2 A - Secondary: 2x 6.5 kV - 35 mA
Absorbed electrical power	5.5 kW



- 1 Suction line
- 2 Return line
- 3 Pump pressure adjustment screws
- 4 Manometer plug (G 1/8)
- 5 Vacuometer plug (G 1/2)
- 6 Reset push-button of the motor overload relay
- 7 Wiring terminal board
- 8 Control box reset push-button and lock-out lamp
- 9 Cable clamps
- **10** Ignition transformer
- 11 Regulating bush for combustion head
- 12 Valves group with hydraulic jacks
- 13 Electric board

Quantity	Accessories
2	Flexibles tubes
2	Nipples
4	Screws
1	Gasket for flange
4	Cable clamps

#### **DIMENSIONS (mm)**



\* It is possible with a spacer upon request.

#### **OPERATION AND EFFICIENCY OF THE BURNER**

		POWER AND OUTPUT			
1 <sup>st</sup> STAGE	MINIMUM		MAXIMUM		
		kg/h	kW	kg/h	
1 <sup>st</sup> nozzle: ignition phase	391	33	782	66	
1 <sup>st</sup> + 2 <sup>nd</sup> nozzle: intermediate phase	794	67	1576	133	
1 <sup>st</sup> + 2 <sup>nd</sup> + 3 <sup>rd</sup> nozzle: operation phase	1186	100	2372	200	

		POWER AND OUTPUT			
2 <sup>nd</sup> STAGE	MINIMUM		MAXIMUM		
	kW	kg/h	kW	kg/h	
1 <sup>st</sup> nozzle: ignition phase	391	33	782	66	
1 <sup>st</sup> + 2 <sup>nd</sup> nozzle: 1 <sup>st</sup> stage of operation	794	67	1576	33	
1 <sup>st</sup> + 2 <sup>nd</sup> + 3 <sup>rd</sup> nozzle: 2 <sup>nd</sup> stage of operation	1186	100	2372	200	

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

### 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.



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 CHAMBER

(in compliance with ISO 5063 - 1978)



D = Boiler diameter in mm

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 the boilers with frontal smoke box are used.



1'600 1'400 1'200 1'000 100 120 140 200 kg/h

Testing thermal load

5906

#### SUPPLY LINE

#### NOTICE

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



Н L meters meters I.D. 14 mm I.D. 16 mm 0 0 5 5 0,5 10 1 10 20 20 40 1,5 2 30 50

Pay attention to do not overce

Н	L meters			
meters	I.D. 14 mm	I.D. 16 mm		
0	50	100		
0.5	40	80		
1	30	60		
1.5	20	40		
2	10	20		
3	5	10		

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.

<u>Pump priming</u>: Fill the pump with the light oil from the vacuometer 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.

- $\boldsymbol{\mathsf{H}}=\mathsf{Difference}$  in the pipes height
- L = Total length of the suction tube

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

<u>Pump priming</u>: Loose the tap from the vacuometer plug 5 (fig. 1) and wait for the flow of the fuel.

#### **INTERNAL WIRING DIAGRAM**

(carried out by the factory)



#### **KEY TO LAYOUT**

- Fan motor contactor CMV
- со Commutator
- FR Photocell
- 1 st stage hourcounter h 1
- 2 <sup>nd</sup> stage hourcounter h 2
- 3 rd stage hourcounter h 3
- 1 <sup>st</sup> stage lamp 2 <sup>nd</sup> stage lamp L1
- L2
- 3 <sup>rd</sup> stage lamp L3
- L4 Lock - out motor lamp

- MB Wiring terminal board
- Fan motor ΜV
- RT Thermal relay
- TΑ Ignition transformer
- Burner ground (earth) connection ΤВ
- Safety solenoid valve VS
- V1
- 1 <sup>st</sup> stage solenoid valve 2 <sup>nd</sup> stage solenoid valve 3 <sup>rd</sup> stage solenoid valve V2
- V3

#### ELECTRICAL CONNECTIONS TO THE WIRING TERMINAL BLOCK (to be carried out by the installer)



	220V	380V
F Ampere	T35	T25
S mm <sup>2</sup>	4,0	2,5

#### **KEY TO LAYOUT**

- H Remote lock out signal
- I1 Burner manual stop switch
- MB Wiring terminal board
- PS Reset push button
- TB Burner ground (earth) connection

- TL Load limit remote control system
- **TS** Safety load control system
- T2 2<sup>nd</sup> stage load control system
- **T3** 3 <sup>rd</sup> stage load control system

#### Important:

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

#### 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-inter face kit item number 3010386.

#### **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 or B three related nozzles. Nozzles: 60° - Pump pressure: 12 bar

For three-stage operation (up to 170 kg/h)  $1^{st}$  and  $2^{nd}$  nozzle are not equal to the  $3^{rd}$  one. Follow this procedure in order to obtain higher values of CO<sub>2</sub> (during  $1^{st}$  and  $2^{nd}$  stage of operation), complying with German Standard DIN.

- The references on the table C have to 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 1<sup>st</sup> and 2<sup>nd</sup> stage.

#### SUGGESTED NOZZLES



	1 <sup>st</sup> Stage / 2 <sup>nd</sup> Stage				
4	Nozzles 60° Pump 12 bar (1)			Total delivery kg/h	
		GPH			
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	1 <sup>st</sup> + 2 <sup>nd</sup> + 3 <sup>rd</sup>	
	8.00	8.00	8.00	102.90	
	8.30	8.30	8.30	106.80	
	8.50	8.50	8.50	109.50	
	9.00	9.00	9.00	115.80	
	9.50	9.50	9.50	122.40	
	10.00	10.00	10.00	128.70	
	10.50	10.50	10.50	135.30	
	11.00	11.00	11.00	141.60	
	12.00	12.00	12.00	154.50	
	13.00	13.00	13.00	167.40	
	13.80	13.80	13.80	177.60	
	14.00	14.00	14.00	180.30	
	15.00	15.00	15.00	193.20	
	15.30	15.30	15.30	197.10	

)	Total delivery kg/h	E	3	No Pum	
3 <sup>rd</sup>	1 <sup>st</sup> + 2 <sup>nd</sup> + 3 <sup>rd</sup>			1 <sup>st</sup>	
.00	102.90			10.00	
.30	106.80			10.50	
.50	109.50			10.50	•
.00	115.80			11.00	
.50	122.40			12.00	•
0.00	128.70			12.00	
.50	135.30			13.00	•
.00	141.60			13.80	•
2.00	154.50			13.80	•
8.00	167.40			13.80	
8.80	177.60			13.80	
.00	180.30			14.00	•
5.00	193.20			15.00	
5.30	197.10			15.30	

3 <sup>rd</sup> Stage				
3	Ne Pun	ozzles 6 1p 12 ba	Total delivery kg/h	
		GPH		
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	1 <sup>st</sup> + 2 <sup>nd</sup> + 3 <sup>rd</sup>
	10.00	10.00	5.00	107.30
	10.50	10.50	5.00	111.70
	10.50	10.50	6.00	115.90
	11.00	11.00	6.50	122.30
	12.00	12.00	6.50	130.90
	12.00	12.00	7.50	135.20
	13.00	13.00	7.50	143.80
	13.80	13.80	7.50	150.70
	13.80	13.80	10.00	161.30
	13.80	13.80	12.00	169.90
	13.80	13.80	13.80	177.60
	14.00	14.00	14.00	180.30
	15.00	15.00	15.00	193.20
	15.30	15.30	15.30	197.10

(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.

#### Nozzles delivery Pump pressure

					С	kg/h 	
bar GPH	10	11	12	13	14	210 200 200	
8.00	31.1	32.8	34.3	35.9	37.3	190	$\mathbb{H}$
8.30	32.3	34.0	35.6	37.2	38.7	180	$\mathbb{H}$
8.50	33.1	34.8	36.5	38.1	39.7	170	+-
9.00	35.0	36.9	38.6	40.3	42.0	160	$\square$
9.50	37.0	38.9	40.8	42.6	44.3	150	$\square$
10.00	38.9	41.0	42.9	44.8	46.7	140	
10.50	40.8	43.0	45.1	47.1	49.0	130	
11.00	42.8	45.0	47.2	49.3	51.3	120	
12.00	46.7	49.1	51.5	53.8	56.0	110	
13.00	50.6	53.2	55.8	58.3	60.6		
13.80	53.7	56.5	59.2	61.9	64.4		
14.00	54.5	57.3	60.1	62.8	65.3	90	+
15.00	58.4	61.4	64.4	67.2	70.0		10
15.30	59.5	62.8	65.7	68.6	71.4	Combustion head adjustment	

#### Combustion head adjustment Maximum output

(set-point)

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 screws A till the set-point (see diagram) is on the line with the washer B.



#### 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 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 hexagonal body (2) in order to decrease the air flow, and counterclocwise 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 (see page 10) should be set to the position corresponding to the burner stage to be controlled.

#### ELECTRIC PANEL



#### Hourcounter

Deducting the number of hours of 2<sup>nd</sup> nozzle hourcounter from those indicated in the 1<sup>st</sup> nozzle hourcounter you could know how many hours the burner has been performing only at 1<sup>st</sup> stage; the same procedure to detect the performance hours of the 2<sup>nd</sup> stage alone - deduct from the 2<sup>nd</sup> stage hourcounter the hours indicated in the 3<sup>rd</sup> nozzle hourcounter -. The hours of 3<sup>rd</sup> stage operation are shown rightly on the 3<sup>rd</sup> nozzle hourcounter.

#### Commutator

Pos. 0: Burner stop Pos. 1: Burner operation only at 1<sup>st</sup> stage Pos. 2: Burner operation at 1<sup>st</sup> and 2<sup>nd</sup> stage

Pos. 3: Burner operation at 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> stage

#### MOTOR LOCK-OUT

It is caused by the overload relay in case of overload or no electric supply. Push the proper reset button (after removal of the protective cover).

#### **BBURNER START-UP CYCLE**



#### **ALTERNATIVE START-UP CYCLES**

- 1) If you desire the pre-ignition being present during the complete pre-purge phase (29,5 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 29,5 s to 16 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



#### **BURNER 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: O Off • Yellow	Green A Red			

#### **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.

RED LED on wait at least 10 s	Press button for > 3 s	Signal	Interval 3 s	Signal
		• • • • • •		• • • • • •

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:



In the event of a burner lockout, more than two consecutive burner reset operations could cause damage to the installation. On the third lockout, contact the Aftersales Service.



If further lockouts or burner faults occur, interventions must only be made by qualified, authorised personnel (as indicated in this manual, and in compliance with the laws and regulations currently in force).

SIGNAL	PROBABLE CAUSE	
2 flashes ● ●	The flame does not stabilise at the end of the safety time: – faulty photocell; – faulty or soiled oil valves; – neutral/phase exchange; – faulty ignition transformer – poor burner regulation (insufficient gas oil).	
3 flashes ● ● ●	<ul> <li>Min. air pressure switch (if installed) does not close:</li> <li>air pressure switch faulty;</li> <li>air pressure switch incorrectly regulated;</li> <li>max. air pressure switch triggered (if installed).</li> </ul>	
4 flashes ● ● ● ●	<ul> <li>Min. air pressure switch (if installed) does not open or light in the chamber before firing:</li> <li>air pressure switch faulty;</li> <li>air pressure switch incorrectly regulated.</li> </ul>	
7 flashes ● ● ● ● ● ●	Loss of flame during operations: – poor burner regulation (insufficient gas oil); – faulty or soiled oil valves; – short circuit between photocell and earth.	
8 flashes ● ● ● ● ● ● ● ●	<ul> <li>Oil enabling thermostat fault;</li> <li>Break in heating elements.</li> </ul>	
10 flashes ● ● ● ● ● ● ● ● ● ●	<ul> <li>Wiring error or internal fault;</li> <li>Presence of electromagnetic disturbance: use the radio disturbance protection kit</li> </ul>	



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