

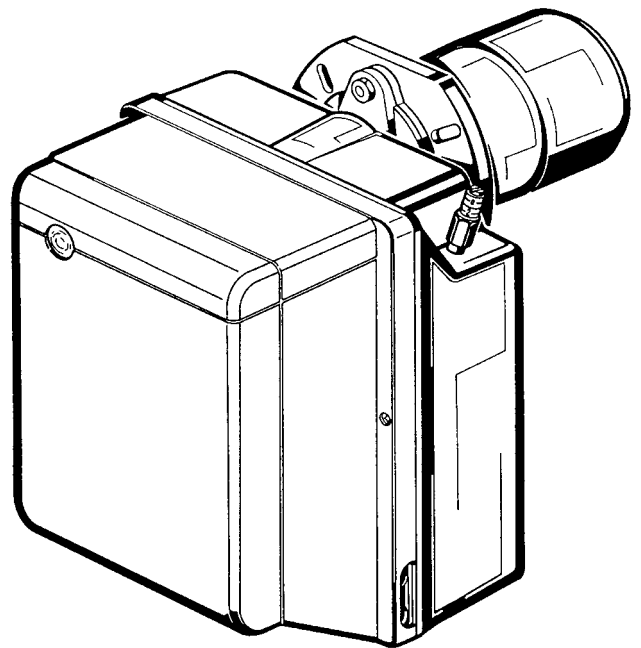
**GB** Light oil burner

**CN** 轻油燃烧器

Two stage operation  
两段火运行



*Gulliver*



CODE - 编码

MODEL - 型号

TYPE - 型号

20023829

RG5D

398T1



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## 1. BURNER DESCRIPTION

Two stage light 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 - 2004/108/EC, Low Voltage 73/23/EEC - 2006/95/EC, Machines 98/37/EEC - 2006/42/EC and Efficiency 92/42/EEC.

- 1 – Pump
- 2 – Electronic start delaying device
- 3 – Control-box
- 4 – Reset button with lock-out lamp
- 5 – Flange with insulating gasket
- 6 – 2nd stage air damper adjustment assembly
- 7 – Nozzles holder assembly
- 8 – Photoresistance
- 9 – Hydraulic jack
- 10 – 4 pole socket
- 11 – 2nd stage valve
- 12 – 1st stage valve
- 13 – Valve casing assembly

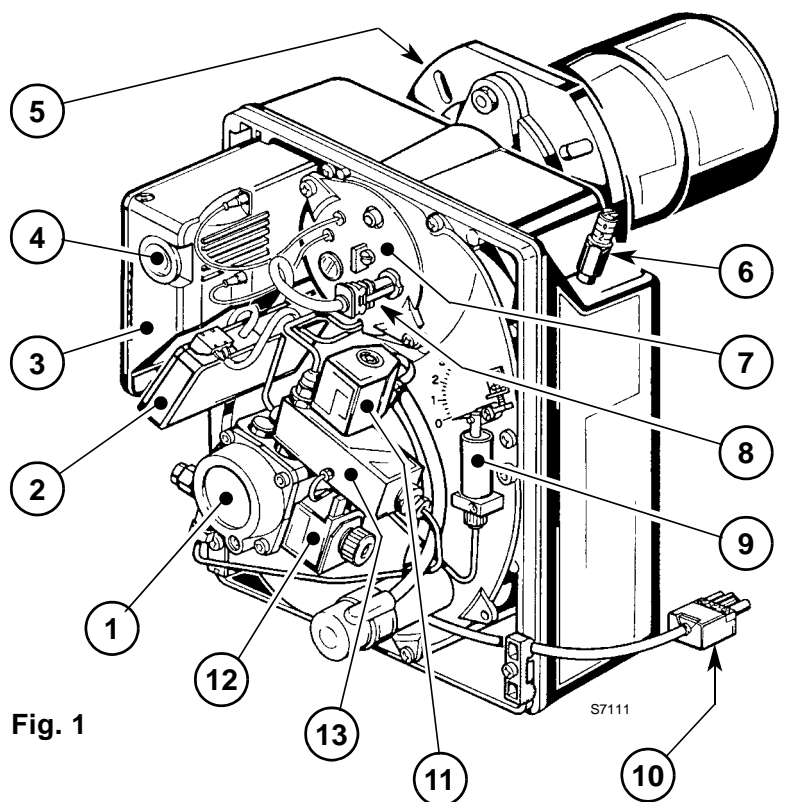


Fig. 1

### 1.1 BURNER EQUIPMENT

Flange with insulating gasket . . . .No. 1  
Screw and nuts for flange . . . . .No. 1  
7 pin plug . . . . .No. 1

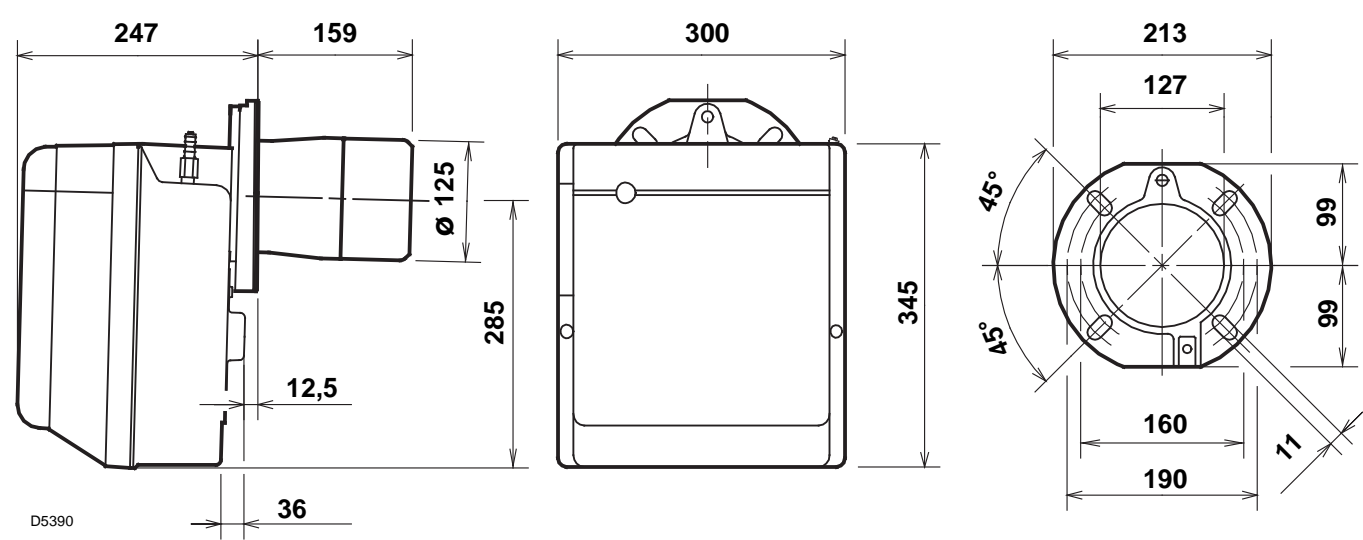
Screw and nuts for flange to be fixed to boiler . . . No. 4  
Flexible oil pipes with nipples . . . . .No. 2  
4 pin plug . . . . .No. 1

2. TECHNICAL DATA

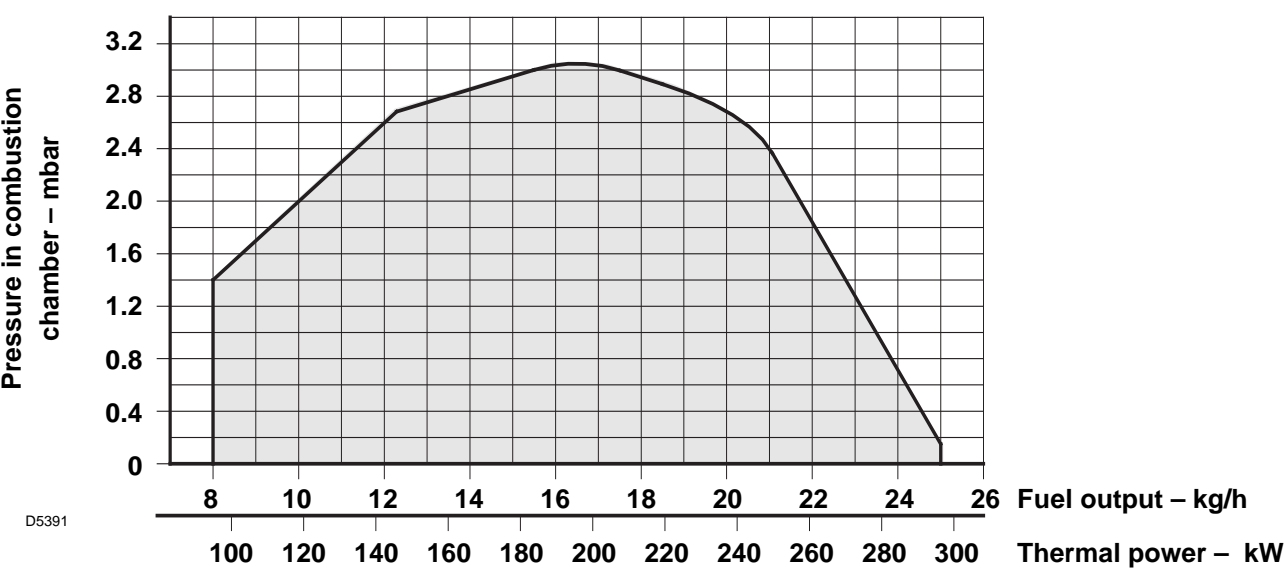
2.1 TECHNICAL DATA

TYPE	398 T1
Output - Thermal power	8 / 12 – 25 kg/h – 95 / 142 – 296 kW
Fuel	Light oil, viscosity 4 – 6 mm <sup>2</sup> /s at 20 °C
Electrical supply	Single phase, ~ 50Hz 230V ± 10%
Motor	Run current 2.1 A - 2730 rpm - 286 rad/s
Capacitor	8 µF
Ignition transformer	Secondary 8 kV - 16 mA
Pump	Pressure: 8 – 15 bar
Absorbed electrical power	0.47 kW

2.2 OVERALL DIMENSIONS



2.3 WORKING FIELD (as EN 267)

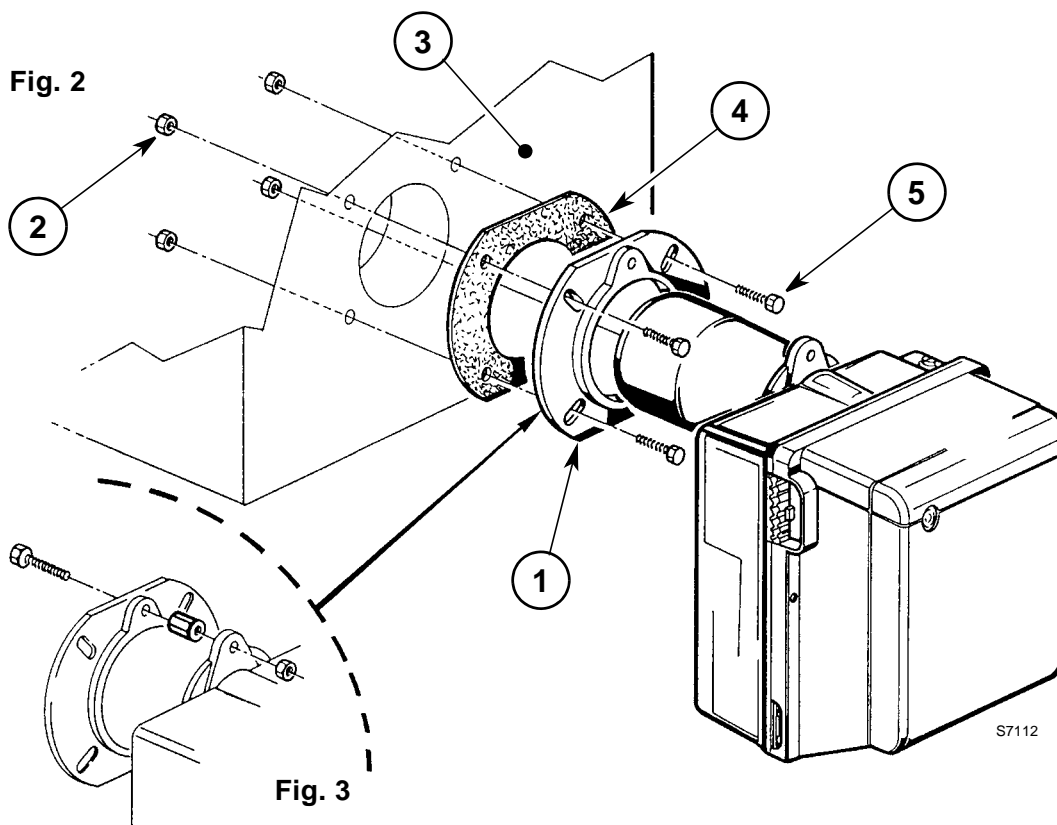


### 3. INSTALLATION

THE BURNER MUST BE INSTALLED IN CONFORMITY WITH LEGISLATION AND LOCAL STANDARDS.

#### 3.1 BOILER FIXING

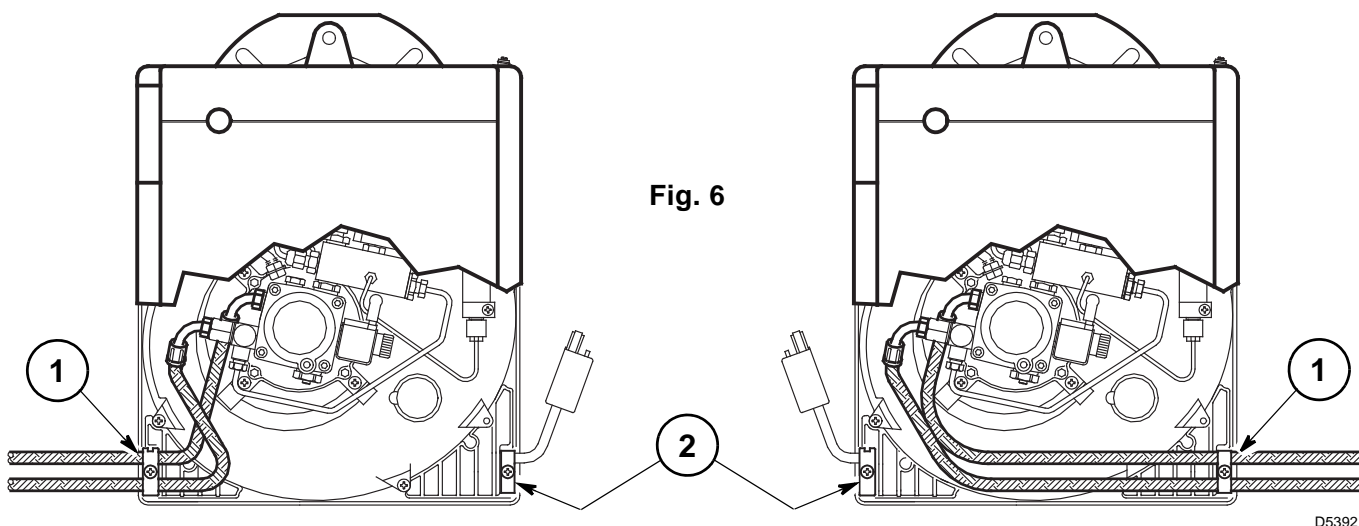
- › Put on the flange (1) the screw and two nuts, (see fig. 3).
- › Widen, if necessary, the insulating gasket holes (4), (see fig. 4).
- › Fix the flange (1) to the boiler door (3) using screws (5) and *(if necessary)* the nuts (2) **interposing the insulating gasket (4)**, (see fig. 2).
- › After installation ensure that burner is lightly inclined as in fig. 5.



#### 3.2 FUEL SUPPLY

The burner is designed to allow entry of the oil supply pipes on either side.

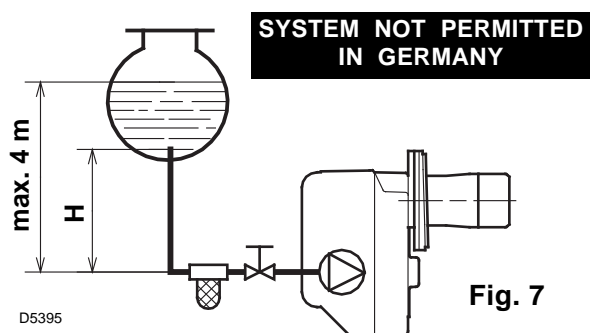
Depending on the oil supply pipes position (to the right or to the left hand side of the burner) the fixing plate (1) and cable clamp (2) should be reversed, (see fig. 6).



### 3.3 HYDRAULIC SYSTEMS

#### WARNING:

- The pump is designed to allow working with two pipes. In order to obtain one pipe working it is necessary to unscrew the return plug (2), remove the by-pass screw (3) and then screw again the plug (2), (see fig. 8).
- Before starting the burner make sure that the return pipe-line is not clogged. An excessive back pressure would cause the damage of the pump seal.



#### PRIMING PUMP:

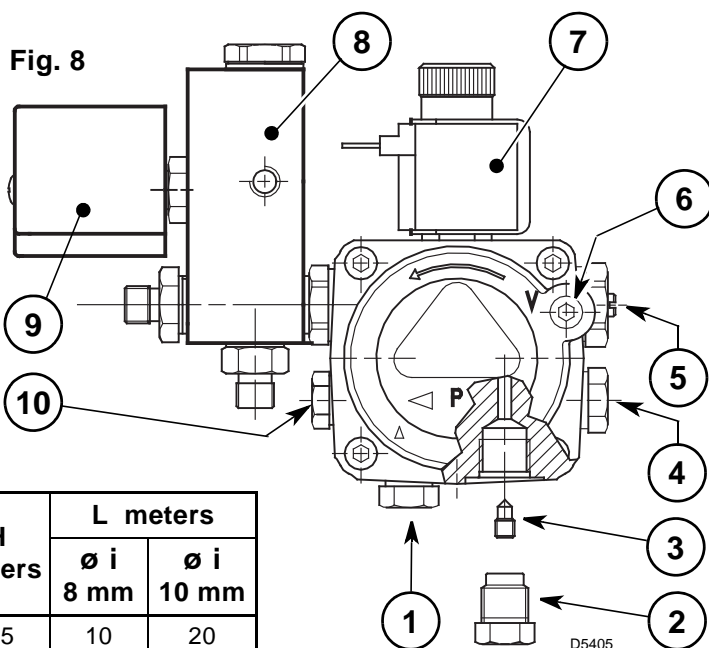
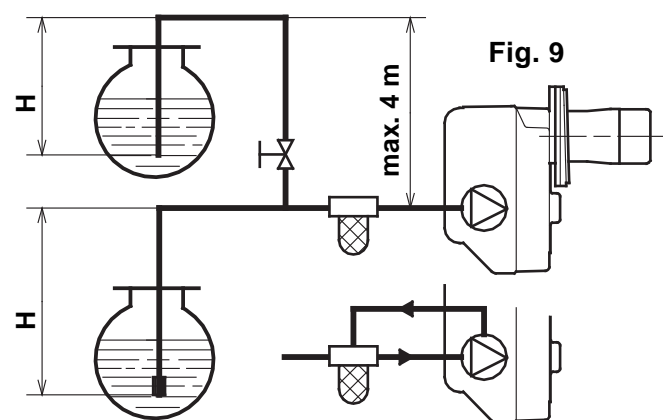
On the system in fig. 7 it is sufficient to loosen the suction gauge connection (6, fig. 8) and wait until oil flows out.

On the systems in fig. 9 and 10 start the burner and wait for the priming. Should lock-out occur prior to the arrival of the fuel, await at least 20 seconds before repeating the operation.

The pump suction should not exceed a maximum of 0.4 bar (30 cm Hg). Beyond this limit gas is released from the oil. Oil pipes must be completely tight.

In the vacuum systems (fig. 10) the return line should terminate within the oil tank at the same level as the suction line. In this case a non-return valve is not required. Should however the return line arrive over the fuel level, a non-return valve is required.

This solution however is less safe than previous one, due to the possibility of leakage of the valve.



H meters	L meters	
	ø i 8 mm	ø i 10 mm
0.5	10	20
1	20	40
1.5	40	80
2	60	100

1 - Suction line

2 - Return line

3 - By-pass screw

4 - Gauge connection

5 - 2nd stage pressure adjuster

6 - Suction gauge connection

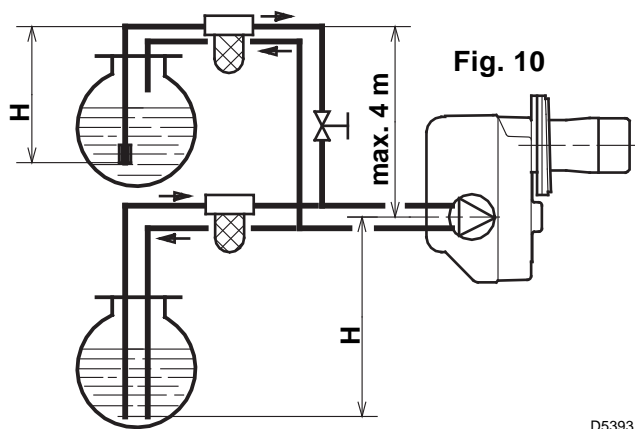
7 - 1st stage valve

8 - Valve casing assembly

9 - 2nd stage valve

10 - Auxiliary pressure test point

H meters	L meters	
	ø i 8 mm	ø i 10 mm
0	35	100
0.5	30	100
1	25	100
1.5	20	90
2	15	70
3	8	30
3.5	6	20



It is necessary to install a filter on the fuel supply line.

H = difference of level; L = max. length of the suction line;

I. D. = internal diameter of the oil pipes.

### 3.4 ELECTRICAL WIRING

## WARNING

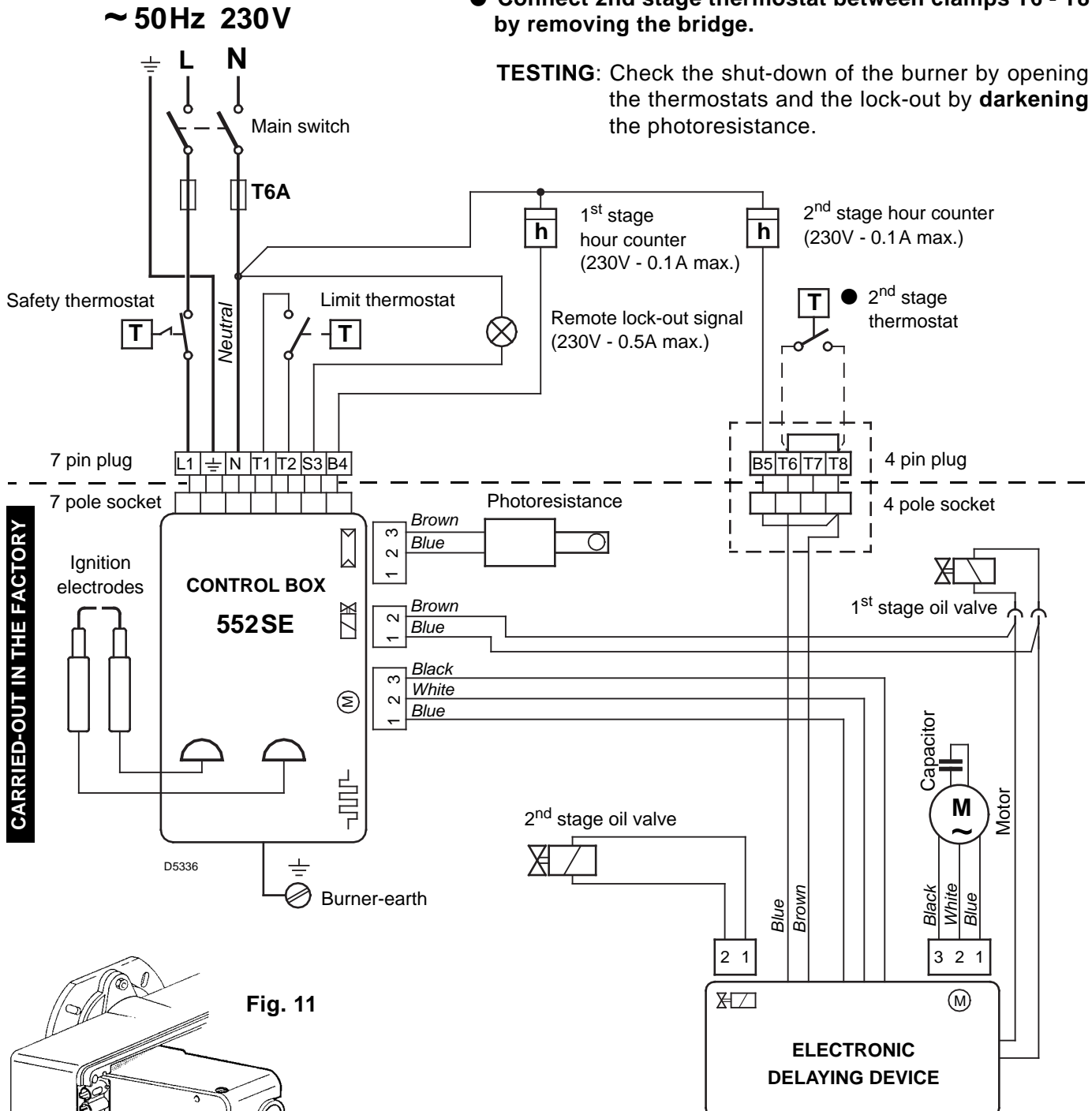
**DO NOT EXCHANGE  
NEUTRAL WITH PHASE**

**NOTES:**

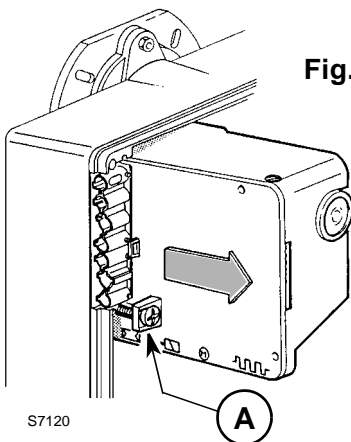
- Wires of min. 1 mm<sup>2</sup> section. *(Unless requested otherwise by local standards and legislation).*
- The electrical wiring carried out by the installer must be in compliance with the rules in force in the Country.

- **Connect 2nd stage thermostat between clamps T6 - T8 by removing the bridge.**

**TESTING:** Check the shut-down of the burner by opening the thermostats and the lock-out by **darkening** the photoresistance.



**Fig. 11**



## CONTROL BOX

To remove the control-box from the burner, loosen screw (**A**, fig. 11) and pull to the arrow direction, after removing all components, the 7 pin plug **and earth wire**.

**In case of disassembly of the control box, retighten the screw (A) with a torque wrench setting of 1 – 1.2 Nm.**

## 4. WORKING

### 4.1 COMBUSTION ADJUSTMENT

In conformity with Efficiency Directive 92/42/EEC the application of the burner on the boiler, adjustment and testing must be carried out observing the instruction manual of the boiler, including verification of the CO and CO<sub>2</sub> concentration in the flue gases, their temperatures and the average temperature of the water in the boiler.

To suit the required appliance output, choose the proper nozzle and adjust the pump pressure, the setting of the combustion head, and the air damper opening in accordance with the following schedule.

The values shown in the table are measured on a CEN boiler (as per EN 267).

They refer to 12.5% CO<sub>2</sub> at sea level and with light oil and room temperature of 20 °C.

Nozzles			Pump pressure	Burner output		Combustion head adjustment	Air damper adjustment	
GPH		Angle		kg/h ± 4%			1 <sup>st</sup> stage	2 <sup>nd</sup> stage
1 <sup>st</sup> stage	2 <sup>nd</sup> stage			bar	1 <sup>st</sup> stage	2 <sup>nd</sup> stage	Set-point	Set-point
2.00	1.00	60°	12	8.0	12.4	0	0.25	2.1
2.00	2.00	60°	12	8.0	16.4	3	0.15	3.0
2.50	2.50	60°	12	10.3	20.5	6	0.3	4.4
3.00	3.00	60°	12.5	12.6	25,0	8	0,6	6,0

### 4.2 RECOMMENDED NOZZLES

Delavan type W - B

Steinen type Q

Danfoss type S

**N.B.:** If necessary the 1<sup>st</sup> stage nozzle can have an output exceeding 50% of the total output.

**TO FIT NOZZLES CARRY OUT THE FOLLOWING ACTIONS:** (see fig. 12)

- › Remove nozzle-holder assembly (1) after loosening screws (2) and nuts (3), remove the small cables (4) from the control box and the photoresistance (5).
- › Withdraw the small cables (4) from the electrodes, remove the diffuser disc assembly (8) from the nozzle-holder assembly (1) after loosening screws (9).
- › Screw the nozzles (10) correctly and tighten it as shown in figure.

#### ATTENTION

During the reassembly of the nozzle-holder assembly screw the nuts (3) as shown in the figure below.

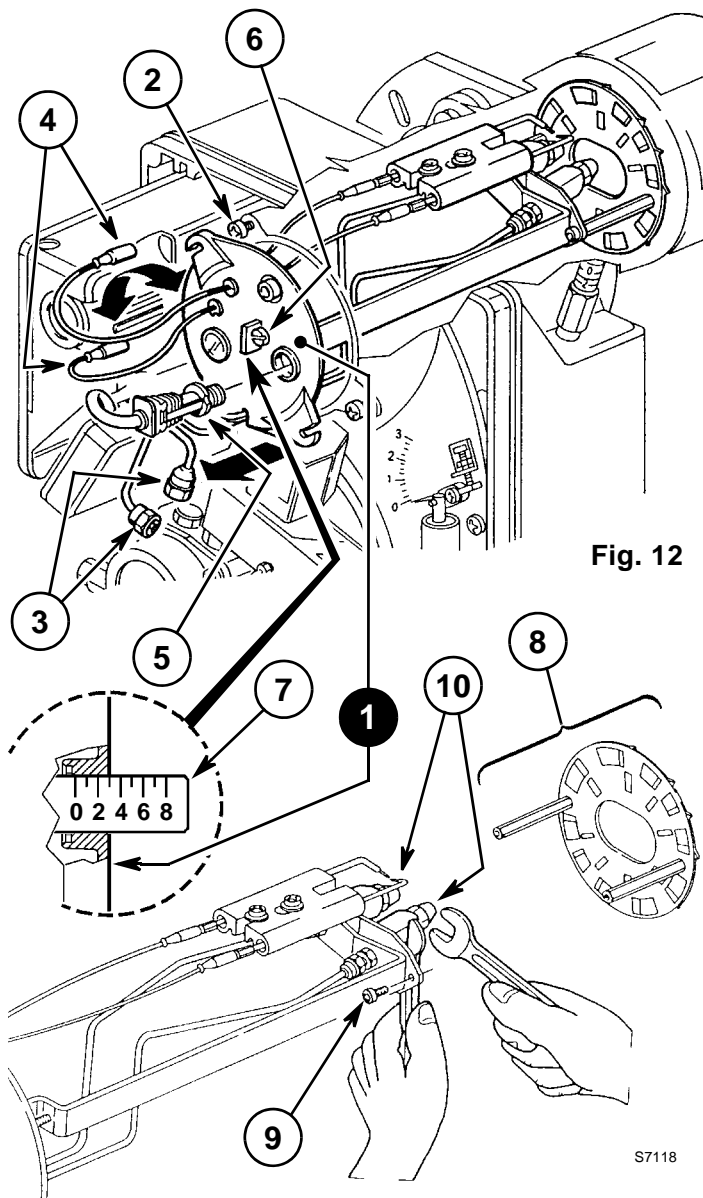
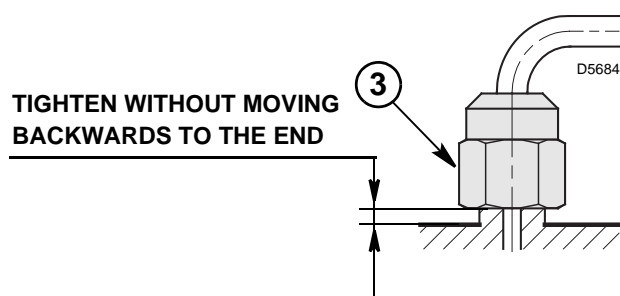


Fig. 12

S7118



### 4.3 COMBUSTION HEAD SETTING (see fig. 12, page 6)

It depends on the output of the burner and is carried out by rotating clockwise or counterclockwise the setting screw (6) until the set-point marked on the regulating rod (7) is level with the outside plane of the nozzles-holder assembly (1).

► In the sketch the combustion head is set for an output of 2.00 + 2.00 GPH at 12 bar.

The set-point **3** of the regulating rod is at the same level with the outside plane of the nozzles-holder assembly as shown in the schedule.

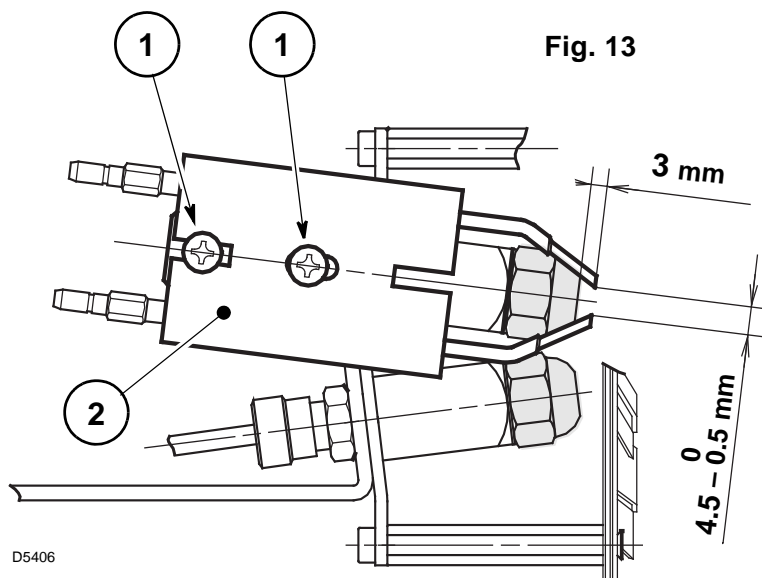
### 4.4 ELECTRODES ADJUSTMENT

#### WARNING

#### MEASURES MUST BE RESPECTED.

For prospective adjustments loosen screws (1) and move the electrodes assembly (2), (see fig. 13).

To have access to the electrodes carry out operation as described in **chapter "4.2 RECOMMENDED NOZZLES"** (page 6).



### 4.5 PUMP PRESSURE AND AIR OUTPUT

#### ■ 1<sup>st</sup> STAGE ADJUSTMENT

##### ADJUSTMENT OF AIR SHUTTER

Unloosen the nut (1), turn the screw (2) until the indicator (3) reaches the position desired. Then lock the nut (1), (see fig. 14).

#### ■ 2<sup>nd</sup> STAGE ADJUSTMENT

##### ADJUSTMENT OF AIR SHUTTER

Unloosen the nut (4), turn the screw (5) until the indicator (6) reaches the position desired.

Then lock the nut (4), (see fig. 14).

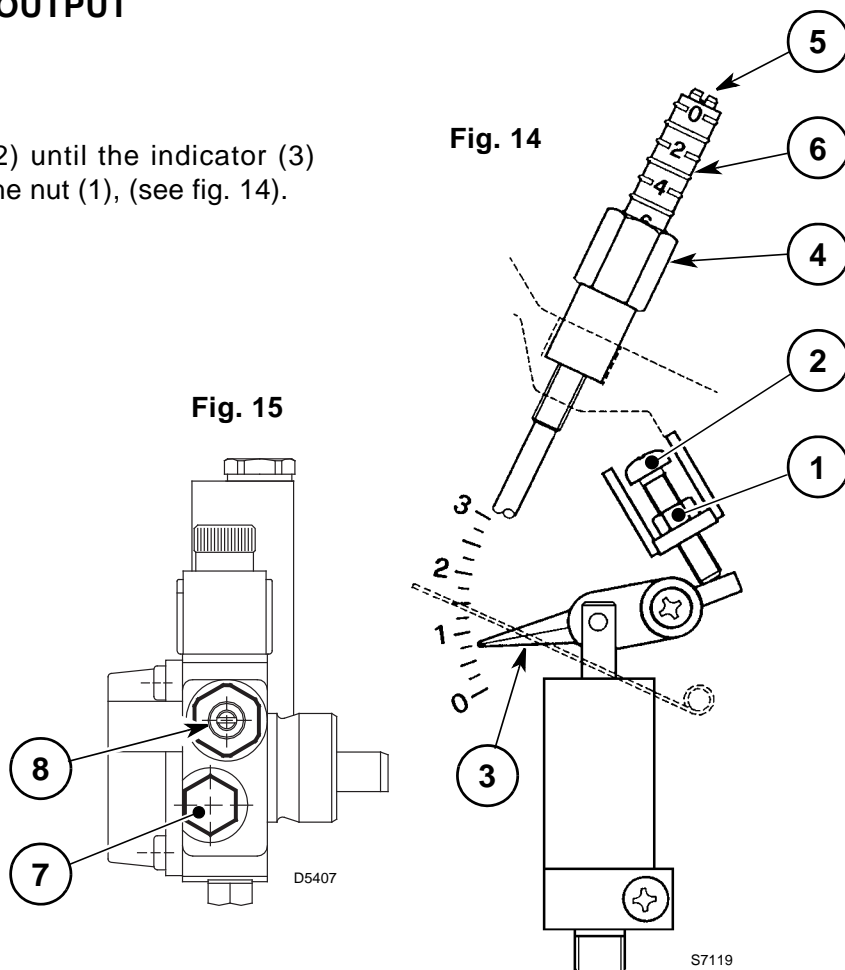
##### PRESSURE REGULATION

This is set at 12 bar at the factory.

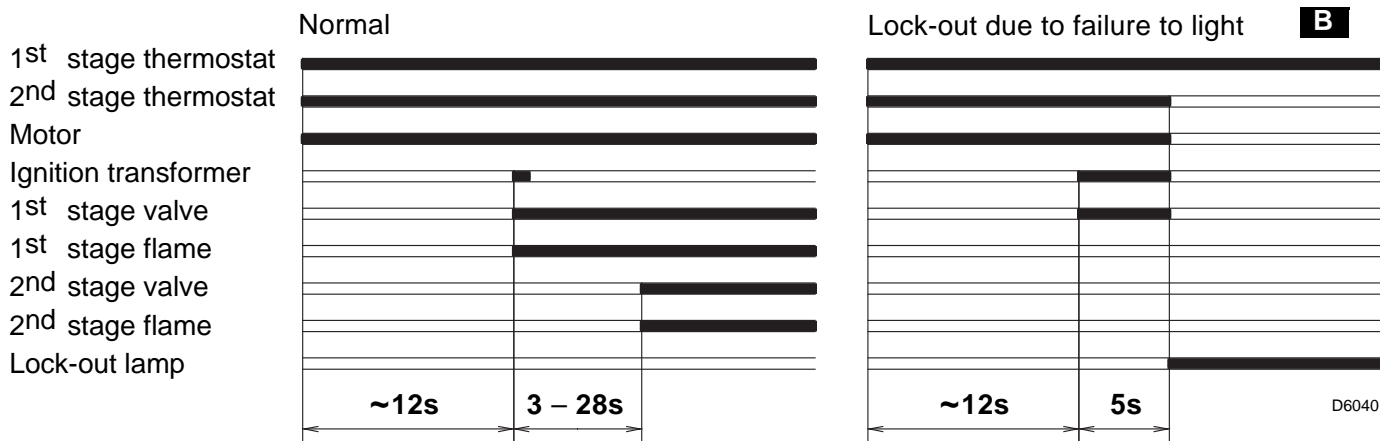
Should it be necessary to re-set or alter such pressure, this can be done, by adjusting screw (8).

The pressure gauge must be mounted in place of cap (7), (see fig. 15).

When burner shuts down the air damper automatically closes till a **max. chimney depressure of 0.5 mbar**.



## 4.6 BURNER START-UP CYCLE



**B** Lock out is indicated by a lamp on the control box (4, fig. 1, page 1).

## 5. MAINTENANCE

The burner requires periodic maintenance carried out by a qualified and authorised technician **in conformity with legislation and local standards**.

Maintenance is essential for the reliability of the burner, avoiding the excessive consumption of fuel and consequent pollution.

**Before carrying out any cleaning or control always first switch off the electrical supply to the burner acting on the main switch of the system.**

### THE BASIC CHECKS ARE:

- › Check that there are not obstructions or dents in the supply or return oil pipes.
- › Clean the filter in the oil suction line and in the pump.
- › Clean the photoresistance, (8, fig. 1, page 1).
- › Check for correct fuel consumption.
- › Replace the nozzles (see fig. 12, page 6) and check the correct position of electrodes (fig. 13, page 7).
- › Clean the combustion head in the fuel exit area, on the diffuser disc.
- › Leave the burner working without interruptions for 10 min. and check the right settings at 1<sup>st</sup> and 2<sup>nd</sup> stage of all components stated in this manual. **Then carry out a combustion check verifying:**
  - Smoke temperature at the chimney;      ● Content of CO<sub>2</sub> (%);      ● Content of CO (ppm);
  - Smoke value according to opacity smokes index according to Bacharach scale.

## 6. FAULTS / SOLUTIONS

Here below you can find some causes and the possible solutions for problems that could cause a failure to start or a bad working of the burner.

A fault usually makes the lock-out lamp light which is situated inside the reset button of the control box (4, fig. 1, page 1).

When lock out lamp lights the burner will attempt to light only after pushing the reset button. After this if the burner functions correctly, the lock-out can be attributed to a temporary fault.

If however the lock out continues the cause must be determined and the solution found.

FAULTS	POSSIBLE CAUSES	SOLUTION
<b>The burner doesn't start when the limit thermostat closes.</b>	Lack of electrical supply.	Check presence of voltage in the L1 - N clamps of the 7 pin plug.
		Check the conditions of the fuses.
		Check that safety thermostat is not lock out.
	The photoresistance sees false light.	Eliminate the light.
	Thermostats are faulty.	Replace them.
	The connections in the control box are wrongly inserted.	Check and connect completely all the plugs.
<b>Burner runs normally in the prepurge and ignition cycle and locks out after 5 seconds ca.</b>	The photoresistance is dirty.	Clear it.
	The photoresistance is defective	Change it.
	Flame moves away or fails.	Check pressure and output of the fuel.
		Check air output.
		Change nozzle.
		Check the coil of solenoid valve 1 <sup>st</sup> stage.
<b>Burner starts with an ignition delay.</b>	The ignition electrodes are wrongly positioned.	Adjust them according to the instructions of this manual.
	Air output is too high.	Set the air output according to the instructions of this manual.
	Nozzle dirty or worn.	Replace it.

### WARNING

The manufacturer cannot accept responsibility for any damage to persons, animals or property due to error in installation or in the burner adjustment, or due to improper or unreasonable use or non observance of the technical instruction enclosed with the burner, or due to the intervention of unqualified personnel.



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1. 燃烧器描述

两段火轻油燃烧器 .

- 燃烧器保护等级为 IP 40, EN 60529.
- 燃烧器符合下列标准：EMC 89/336/EEC - 2004/108/EC, 低电压 73/23/EEC - 2006/95/EC, 机械 98/37/EEC - 2006/42/EC 和效率 92/42/EEC.

- 1 – 带调压器的油泵
- 2 – 电气延迟装置
- 3 – 控制盒
- 4 – 带锁定指示灯的复位按钮
- 5 – 带绝热石棉垫的法兰
- 6 – 2 段火风门调节机构
- 7 – 喷嘴座
- 8 – 光电管
- 9 – 液压装置
- 10 – 4 孔插座
- 11 – 2 段火阀
- 12 – 1 段火阀
- 13 – 阀体

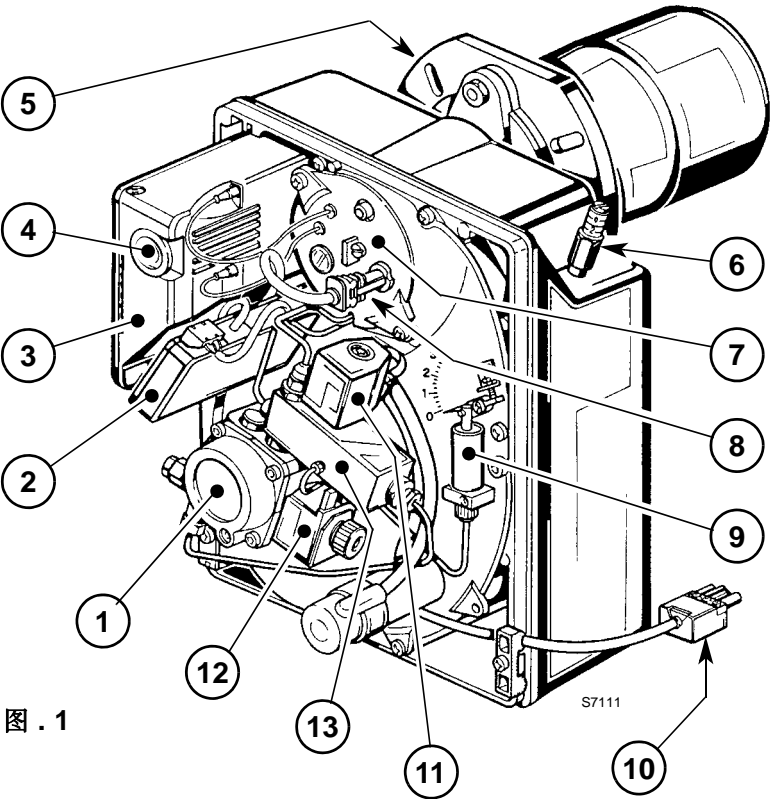


图 . 1

1.1 燃烧器附件

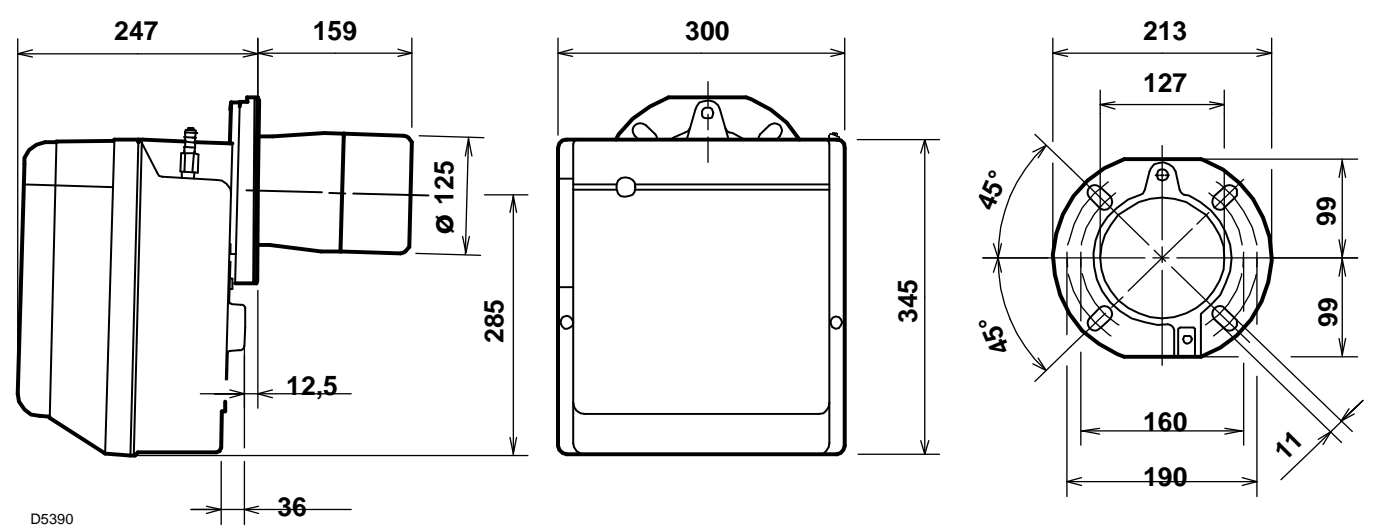
- |                     |        |                          |        |
|---------------------|--------|--------------------------|--------|
| 带绝热石棉垫的法兰 . . . . . | 数量 . 1 | 将法兰安装到锅炉上的螺栓螺母 . . . . . | 数量 . 4 |
| 法兰用螺栓螺母 . . . . .   | 数量 . 1 | 带变径头的油软管 . . . . .       | 数量 . 2 |
| 7 针插头 . . . . .     | 数量 . 1 | 4 针插头 . . . . .          | 数量 . 1 |

2. 技术参数

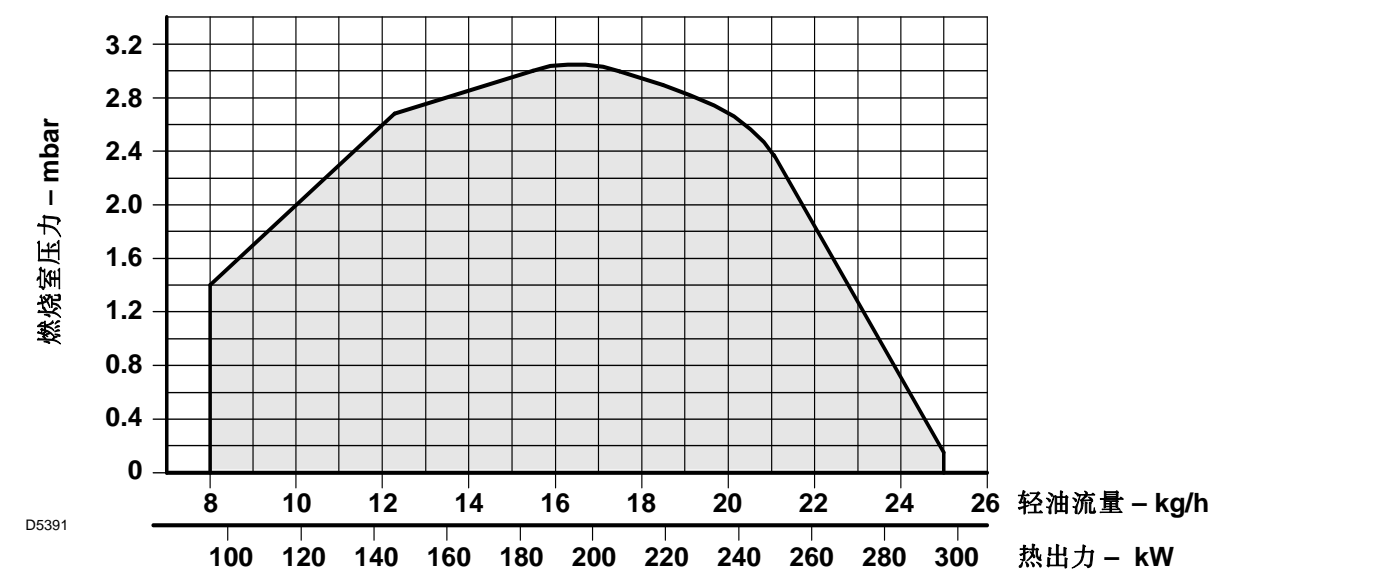
2.1 技术参数

类型	398T1
热出力	8 / 12 – 25 kg/h – 95 / 142 – 296 kW
燃料	轻油，在 20 °C 时粘度 4 – 6 mm <sup>2</sup> /s
电源	单相， ~ 50Hz 230V ± 10%
马达	运行电流 2.1 A - 2730 rpm - 286 rad/s
电容	8 µF
点火变压器	次级 8 kV - 16 mA
油泵	压力： 8 – 15 bar
电功耗	0.47 kW

2.2 外观尺寸



2.3 工作范围 (按照 EN 267)

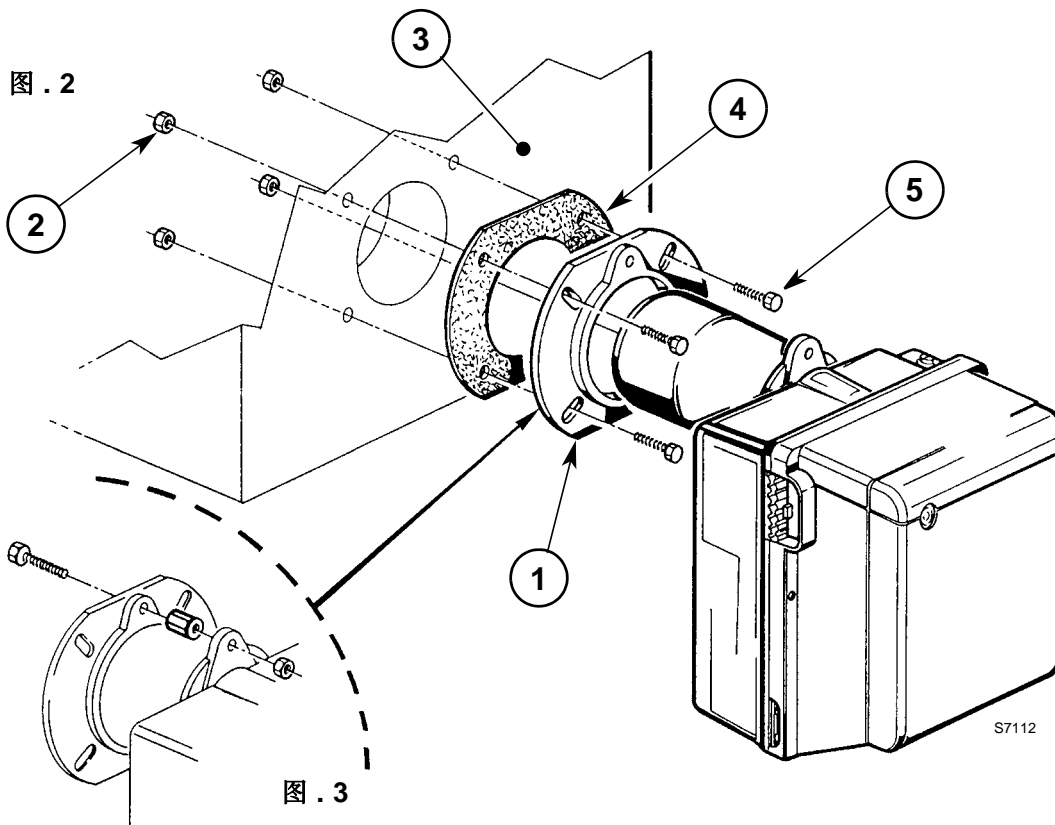


### 3. 安装

燃烧器的安装必须符合法规和当地标准。

#### 3.1 锅炉安装

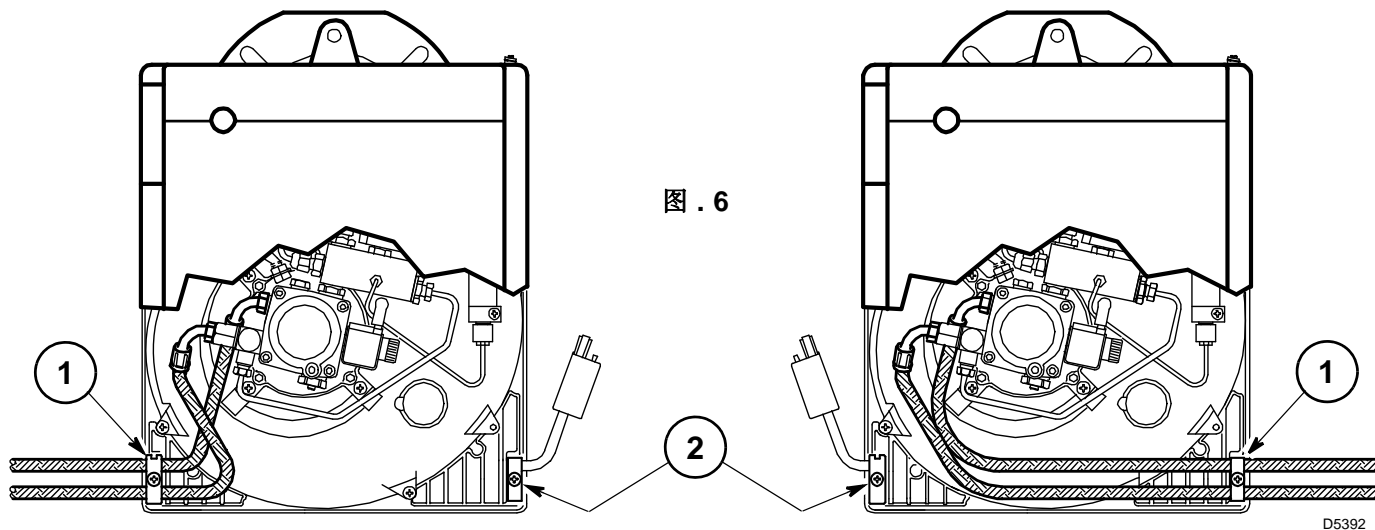
- 将螺栓和螺母放在法兰 (1) 上, (参见图 . 3).
- 如有必要, 对石棉垫扩孔 (4), (参见图 . 4).
- 用螺栓 (5) 和螺母 (2) 将法兰 (1) 安装到炉门 (3) 上, 必须将石棉垫 (4) 放在中间, (参见图 . 2).
- 安装后, 确保燃烧器如图 5 所示, 燃烧器微微向上倾斜。



#### 3.2 燃料供给

燃烧器允许油软管从任何一边进入, 左侧或右侧。

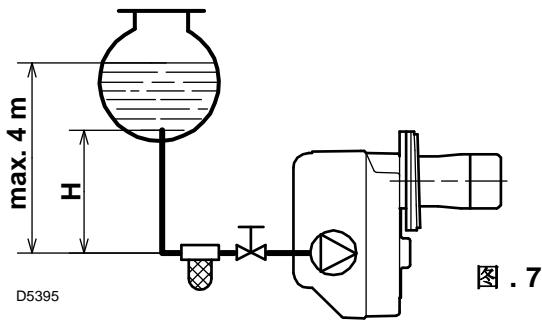
根据燃油管线的位置 (到燃烧器的右侧或左侧) 对应的连接板 (1) 和堵塞板 (2) 应保留, (参见图 . 6)。



3.3 液压系统

警告：

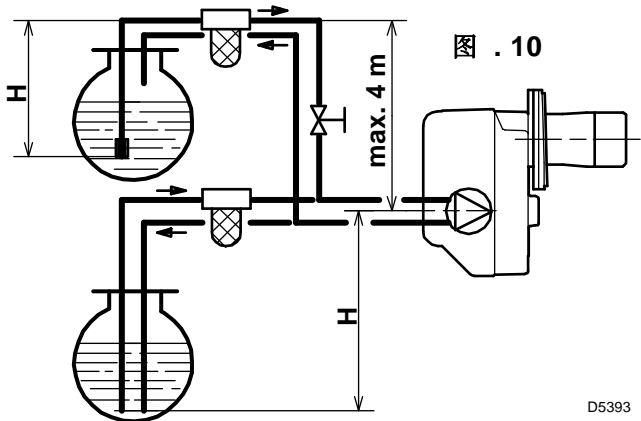
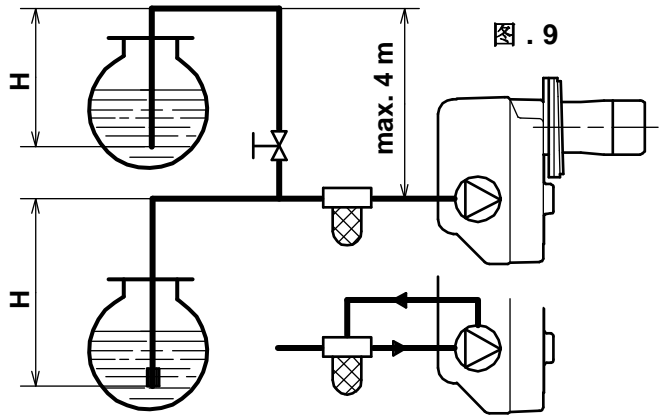
- 设计时泵是按双管运行的。如单管运行，须拧下回油螺钉 (2), 移开旁路螺钉 (3) 后再拧紧螺钉 (2). (参见图 .8)..
- 启动燃烧器之前，确保回油管无堵塞。过大的背压会使泵的密封损坏。



H meters	L meters	
	ø i 8 mm	ø i 10 mm
0.5	10	20
1	20	40
1.5	40	80
2	60	100

油泵启动：

在图 .7 所示系统中，松开油压表接口螺钉 (6, 图 .8) 直到有油流出就可以了。  
在图 .9 和图 .10 所示系统中 启动燃烧器直到油泵充油。如在燃料到达油泵之前锁定，至少等 20 秒才能再次启动。油泵进油真空度不能超过 0.4 bar (30 cm Hg)。大于这一值，气体可能从油中分离出来，所以油管一定要完全拧紧。  
在低位油箱系统中 (图 .10) 回油管应回到油箱中与入油管相同的水平高度，在这种情况下，不需止回阀，然而如果回油管回到比燃料表面高的位置，必须装一个止回阀。  
这种方法不如前一种方法，因为阀门有可能漏油。



在供油管路上必须装滤网。

H = 高度差； L = 供油管最大长度； I. D. = 油管内径。



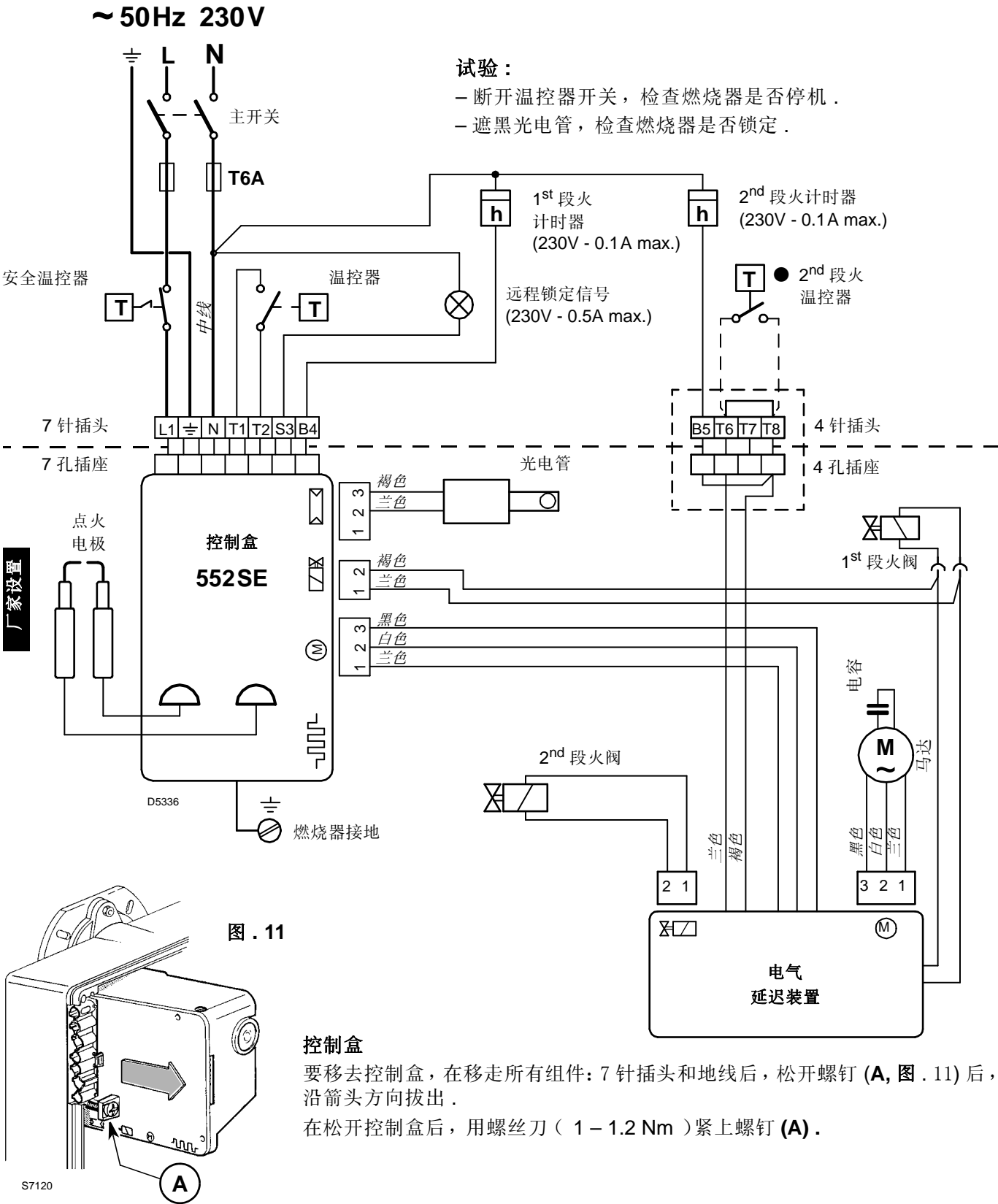
3.4 电气连接

警告

不要将火线与零线接反

注意：

- 电线截面积最小：1 mm<sup>2</sup> .  
(除非有当地的法规和标准) .
- 连线的安装必须符合所在国家的强制规定 .
- 移开 T6 和 T8 之间的短接线，连接上 2 段火温控器 .



4. 工作

4.1 燃烧调节

根据效率标准 92/42/EEC，调试燃烧器必须参考锅炉的使用说明，这一工作包括调整烟气中的 CO 和 CO<sub>2</sub>，烟温及锅炉中的平均水温。

要达到所需要的出力，应按下表选择合适的喷嘴，调整泵压，设定燃烧头和风门。

表中的数值由 CEN 锅炉测得 (按照 EN 267)。

参考条件：12.5% CO<sub>2</sub>，在海平面，油温和室温为 20 °C。

喷嘴			泵压	燃烧器出力		燃烧头设置	风门调节	
GPH		角度		kg/h ± 4%			1 <sup>st</sup> 段火	2 <sup>nd</sup> 段火
1 <sup>st</sup> 段火	2 <sup>nd</sup> 段火			bar	1 <sup>st</sup> 段火		2 <sup>nd</sup> 段火	设定点
2.00	1.00	60°	12	8.0	12.4	0	0.25	2.1
2.00	2.00	60°	12	8.0	16.4	3	0.15	3.0
2.50	2.50	60°	12	10.3	20.5	6	0.3	4.4
3.00	3.00	60°	12.5	12.6	25,0	8	0,6	6,0

4.2 推荐的喷嘴

Delavan 类型 W - B

Steinen 类型 Q

Danfoss 类型 S

注意：如需要，1<sup>st</sup> 段火喷嘴出力可大于总出力的 50%。

按如下步骤安装喷嘴 (参见图 . 12)

- ▶ 拧松螺钉 (2) 和 螺母 (3) 后取下喷嘴座 (1), 从控制盒和光电管 (5) 取下连接电缆 (4)。
- ▶ 从电极上移去电缆 (4)，松开螺钉 (9) 后从喷嘴座 (1) 上移去 旋流盘 (8)。
- ▶ 正确地拧上喷嘴 (10) 按图所示拧紧。

注意

如图所示，在重新安装喷嘴座时应拧紧螺母 (3)。

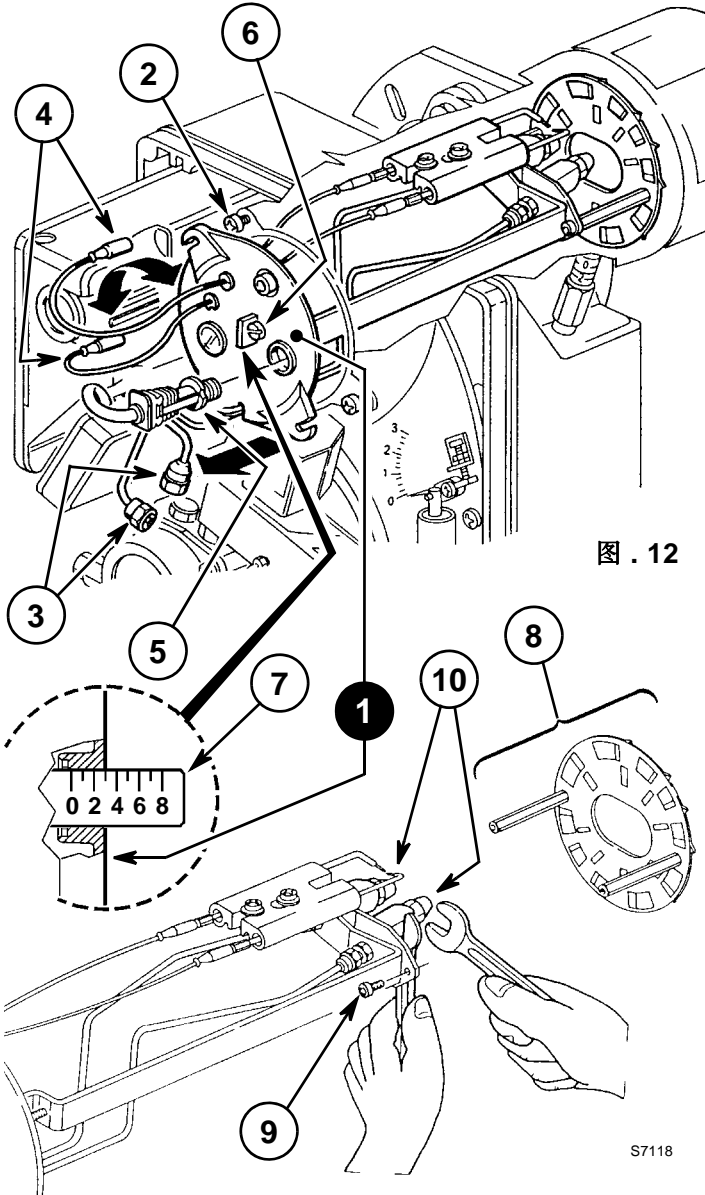
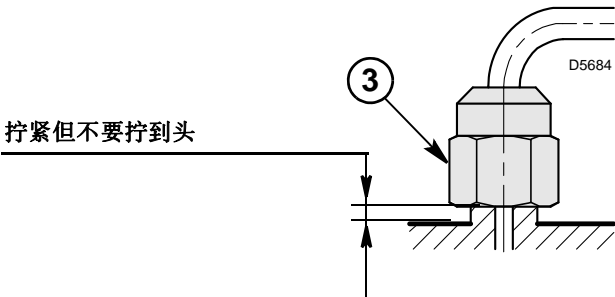


图 . 12

S7118

### 4.3 燃烧头设定 (参见图 . 12,P. 6)

根据燃烧器的出力，通过顺时针和逆时针转动设定螺丝 (6) 来进行，直到设定的调节杆 (7) 上的刻度点与喷嘴座 (1) 的外边缘对齐。

- ▶ 在简图中，燃烧器的设定对应于 4.00 GPH 油压为 12 bar 时的出力。  
如图所示，调节杆上的设定点 3 与喷嘴座的外边缘对齐。

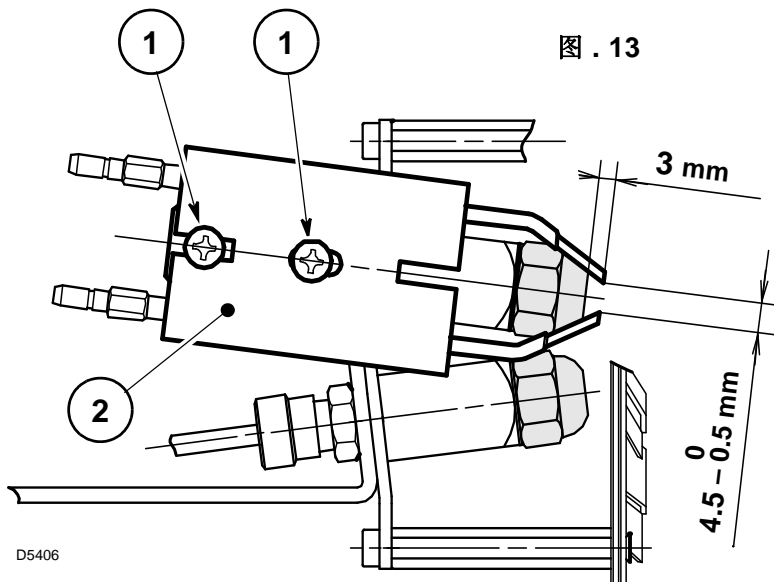
### 4.4 电极的调整

#### 警告

应考虑进行测量。

如要调整松开螺钉 (1) 移动电极组件 (2), (参见图 . 13).

要转动电极，按节“4.2 推荐的喷嘴”所述来进行 (P. 6)。



### 4.5 泵压及空气输出

#### ■ 1st 段火调整

##### 风门的调整

松开螺母 (1)，转动螺钉 (2) 直到指示器 (3) 到达预期点。然后锁紧螺母 (1)，(参见图 . 14)。

#### ■ 2nd 段火调整

##### 风门的调节

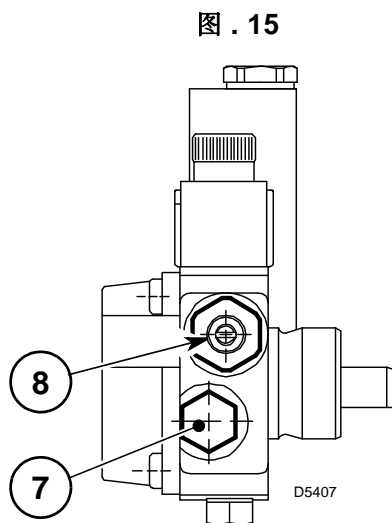
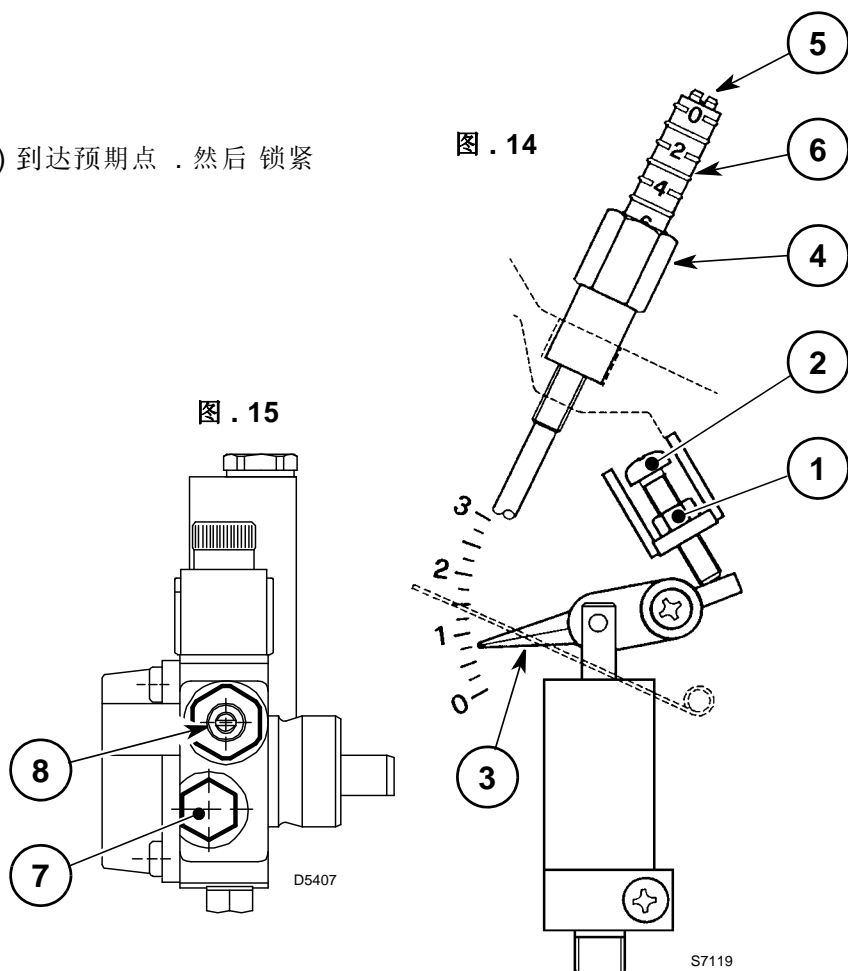
松开螺母 (4)，转动螺杆 (5) 直到指示器 (6) 到达预期点。然后锁紧螺母 (4)，(参见图 . 14)。

##### 油压调节

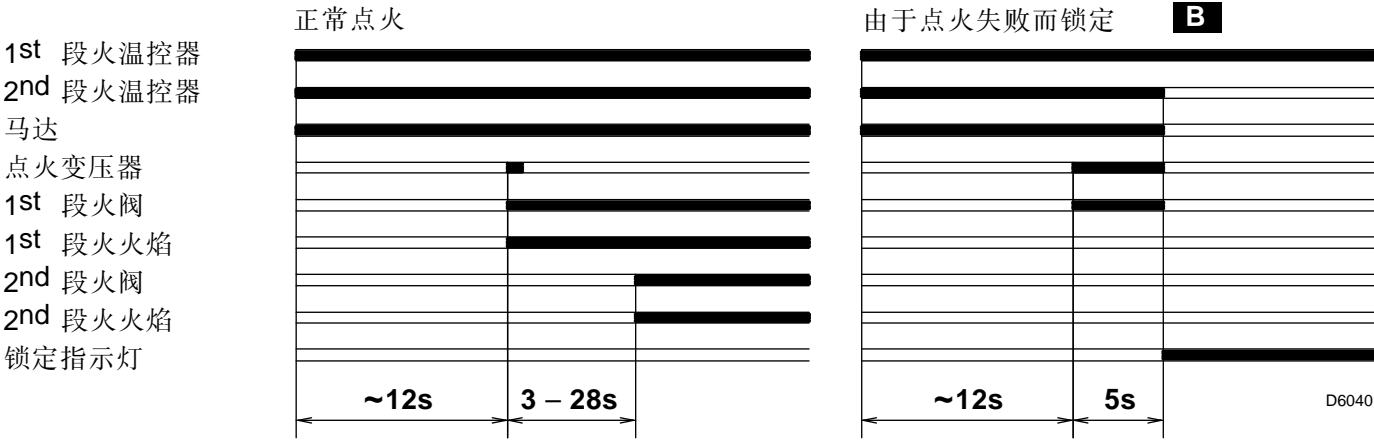
出厂设定为 12 bar。

如要调整油压，可调整螺钉 (8) 来实现。压力表必须接在接口 (7)，(参见图 . 15)。

燃烧器关机后，风门会自动关闭，除非烟囱处的最大负压超过 0.5mbar。



4.6 燃烧器启动程序



**B** 由控制盒上的信号灯指示燃烧器锁定 (4, 图 . 1, 页 1).

5. 维护

燃烧器需要由有资格的技术人员按照当地法规和标准进行定期性的维护 .  
维护对于燃烧器的可靠性是必要的 , 可避免燃料的过量消耗以及随之而来的污染 .  
在进行维护清理之前 , 必须将系统的主电源开关关掉 , 以切断燃烧器的电源 .

基本的检查有 :

- 检查进油管及回油管是否有堵塞或凹陷 .
- 清理进油管及油泵中的过滤器 .
- 清理光电管 , (8, 图 . 1, P. 1).
- 检查燃料消耗是否正常 .
- 如需要更换喷嘴 ( 图 . 12,P. 6) 和检查电极的位置 ( 图 . 13, P. 7).
- 清理燃烧头中燃料出口和旋流盘 .
- 让燃烧器不间断地运行 10 分钟 , 按手册正确设置所有组件 , 然后进行燃烧测试以检查以下各项 :
  - 烟囱处的烟温 ;
  - CO<sub>2</sub> (%) 的含量 ;
  - CO (ppm) 的含量 ;
  - 测量烟气中的黑度值 .

6. 故障 / 解决方法

下面是造成启动故障或燃烧器非正常运行等问题的原因及相应的解决方法。  
故障通常会造成位于控制盒 (4, 图 . 1, P. 1) 复位按钮键中的锁定指示灯亮。  
当锁定灯亮时，只有按复位按钮燃烧器才会重新启动，此后如果燃烧器运行正常，锁定可以归因于暂时故障。  
如果继续锁定，一定要查找原因，并加以解决。

故障	可能的原因	解决方法
当温控器闭合时，燃烧器不启动。	无电源。	检查 7 针插头中的 L1-N 线之间的电压是否存在。
		检查保险丝的状况。
		检查安全温控器是否锁定。
	光电管感受到虚假火焰。	消除光源。
	温控器失效。	更换。
	控制盒的接线错误。	检查并重新连接
在预吹扫及点火周期时燃烧器运行正常，但 5 秒后锁定。	光电管脏。	清理。
	光电管失效。	更换。
	脱火或熄火。	检查油泵压力及燃料的输出。
		检查风量。
		更换喷嘴。
		检查 1 段火电磁阀线圈。
燃烧器启动并有点火延迟。	点火电极位置不对。	按手册的说明进行调节。
	风量过大。	按手册的说明设定空气出力。
	喷嘴脏或损坏。	更换。

**注意**  
制造商不能对由于安装或燃烧器调节错误，由于不合适的或不合理的应用，由于未按照说明书指示操作，或由于非专业人员的参与而造成的人，动物的伤害负责任。







Registered Office - 公司注册所在地：  
RIELLO S.p.A.  
I-37045 Legnago (VR)  
Tel.: +39.0442.630111  
[http:// www.riello.it](http://www.riello.it)  
[http:// www.rielloburners.com](http://www.rielloburners.com)

Manufacturing site:  
Riello Heating Equipment (Shanghai) CO., LTD  
No. 388, Jinbai Road - Jinshan Industrial Zone  
201506 - Shanghai  
CHINA

生产场所：  
Riello Heating Equipment (Shanghai) CO., LTD  
利雅路热能设备（上海）有限公司  
上海市金山工业区金百路 388 号