

**GB** **Dual fuel light oil/gas burners**

Progressive two-stage or modulating operation



| CODE               | MODEL        | TYPE   |
|--------------------|--------------|--------|
| 20006817 - 3911112 | RLS 800/M MX | 1301 T |



**Translation of the original instructions**


|          |  |           |
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**1** Declarations

**Declaration of conformity in accordance with ISO / IEC 17050-1**

Manufacturer: RIELLO S.p.A.  
 Address: Via Pilade Riello, 7  
 37045 Legnago (VR)  
 Product: Dual fuel light oil/gas burners  
 Model: RLS 800/M MX  
 These products are in compliance with the following Technical Standards:  
 EN 676  
 EN 267  
 EN 12100  
 and according to the European Directives:  
 GAD 2009/142/EC Gas Devices Directive  
 MD 2006/42/EC Machine Directive  
 LVD 2014/35/UE Low Voltage Directive  
 EMC 2014/30/UE Electromagnetic Compatibility  
 Such products are marked as follows:



CE-0085CL0422 Class 3 (EN 676) - Class 2 (EN 267)

The quality is guaranteed by a quality and management system certified in accordance with UNI EN ISO 9001.

**Manufacturer's Declaration**

**RIELLO S.p.A.** declares that the following products comply with the NOx emission limits specified by German standard "1. BImSchV release 26.01.2010".

| Product                         | Type   | Model        | Power          |
|---------------------------------|--------|--------------|----------------|
| Dual fuel light oil/gas burners | 1301 T | RLS 800/M MX | 1750 - 8000 kW |

Legnago, 01.12.2015

Executive General Manager  
 RIELLO S.p.A. - Burner Department  
 Mr. U. Ferretti

Research & Development Director  
 RIELLO S.p.A. - Burner Department  
 Mr. F. Comencini

**2 Information and general instructions**

**2.1 Information about the instruction manual**

**2.1.1 Introduction**

The instruction manual supplied with the burner:

- is an integral and essential part of the product and must not be separated from it; it must therefore be kept carefully for any necessary consultation and must accompany the burner even if it is transferred to another owner or user, or to another system. If the manual is lost or damaged, another copy must be requested from the Technical Assistance Service of the area;
- is designed for use by qualified personnel;
- offers important indications and instructions relating to the installation safety, start-up, use and maintenance of the burner.

**Symbols used in the manual**

In some parts of the manual you will see triangular DANGER signs. Pay great attention to these, as they indicate a situation of potential danger.

**2.1.2 General dangers**

The **dangers** can be of **3 levels**, as indicated below.



Maximum danger level!  
This symbol indicates operations which, if not carried out correctly, cause serious injury, death or long-term health risks.



This symbol indicates operations which, if not carried out correctly, may cause serious injury, death or long-term health risks.



This symbol indicates operations which, if not carried out correctly, may cause damage to the machine and/or injury to people.

**2.1.3 Other symbols**



**DANGER: LIVE COMPONENTS**  
This symbol indicates operations which, if not carried out correctly, lead to electric shocks with lethal consequences.



**DANGER: FLAMMABLE MATERIAL**  
This symbol indicates the presence of flammable materials.



**DANGER: BURNING**  
This symbol indicates the risks of burns due to high temperatures.



**DANGER: CRUSHING OF LIMBS**  
This symbol indicates the presence of moving parts: danger of crushing of limbs.



**WARNING: MOVING PARTS**  
This symbol indicates that you must keep limbs away from moving mechanical parts; danger of crushing.



**DANGER: EXPLOSION**  
This symbol signals places where an explosive atmosphere may be present. An explosive atmosphere is defined as a mixture - under atmospheric conditions - of air and flammable substances in the form of gases, vapours, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture.



**PERSONAL PROTECTION EQUIPMENT**  
These symbols indicate the equipment that must be worn and kept by the operator for protection against threats against safety and/or health while at work.



**OBLIGATION TO ASSEMBLE THE HOOD AND ALL THE SAFETY AND PROTECTION DEVICES**  
This symbol signals the obligation to reassemble the hood and all the safety and protection devices of the burner after any maintenance, cleaning or checking operations.



**ENVIRONMENTAL PROTECTION**  
This symbol gives indications for the use of the machine with respect for the environment.



**IMPORTANT INFORMATION**  
This symbol indicates important information that you must bear in mind.

- This symbol indicates a list.

**Abbreviations used**

|      |         |
|------|---------|
| Ch.  | Chapter |
| Fig. | Figure  |
| Page | Page    |
| Sec. | Section |
| Tab. | Table   |

**2.1.4 Delivery of the system and the instruction manual**

When the system is delivered, it is important that:

- the instruction manual is delivered to the user by the system manufacturer, with the recommendation to keep it in the room where the heat generator is to be installed.
- The instruction manual shows:
  - the serial number of the burner;

.....

- the address and telephone number of the nearest Assistance Centre

.....

.....

.....

- The system supplier must carefully inform the user about:
  - the use of the system;
  - any further tests that may be required before activating the system;
  - maintenance, and the need to have the system checked at least once a year by a representative of the manufacturer or another specialised technician.
 To ensure a periodic check, the manufacturer recommends the drawing up of a Maintenance Contract.

**2.2 Guarantee and responsibility**

The manufacturer guarantees its new products from the date of installation, in accordance with the regulations in force and/or the sales contract. At the moment of the first start-up, check that the burner is integral and complete.



**WARNING**

Failure to observe the information given in this manual, operating negligence, incorrect installation and carrying out of non authorised modifications will result in the annulment by the manufacturer of the guarantee that it supplies with the burner.

In particular, the rights to the guarantee and the responsibility will no longer be valid, in the event of damage to things or injury to people, if such damage/injury was due to any of the following causes:

- incorrect installation, start-up, use and maintenance of the burner;
- improper, incorrect or unreasonable use of the burner;
- intervention of unqualified personnel;
- carrying out of unauthorised modifications on the equipment;
- use of the burner with safety devices that are faulty, incorrectly applied and/or not working;
- installation of untested supplementary components on the burner;
- powering of the burner with unsuitable fuels;
- faults in the fuel supply system;
- continuation of use of the burner when a fault has occurred;
- repairs and/or overhauls incorrectly carried out;
- modification of the combustion chamber with inserts that prevent the regular development of the structurally established flame;
- insufficient and inappropriate surveillance and care of those burner components most likely to be subject to wear and tear;
- use of non-original components, including spare parts, kits, accessories and optional;
- force majeure.

**The manufacturer furthermore declines any and every responsibility for the failure to observe the contents of this manual.**

## 3 Safety and prevention

### 3.1 Introduction

The burners have been designed and built in compliance with current regulations and directives, applying the known technical rules of safety and envisaging all the potential danger situations.

It is necessary, however, to bear in mind that the imprudent and clumsy use of the equipment may lead to situations of death risk for the user or third parties, as well as the damaging of the burner or other items. Inattention, thoughtlessness and excessive confidence often cause accidents; the same applies to tiredness and sleepiness.

It is a good idea to remember the following:

- The burner must only be used as expressly described. Any other use should be considered improper and therefore dangerous.

In particular:

it can be applied to boilers operating with water, steam, diathermic oil, and to other uses expressly foreseen by the manufacturer;

the type and pressure of the fuel, the voltage and frequency of the electrical power supply, the minimum and maximum deliveries for which the burner has been regulated, the pressurisation of the combustion chamber, the dimensions of the combustion chamber and the room temperature must all be within the values indicated in the instruction manual.

- Modification of the burner to alter its performance and destinations is not allowed.
- The burner must be used in exemplary technical safety conditions. Any disturbances that could compromise safety must be quickly eliminated.
- Opening or tampering with the burner components is not allowed, apart from the parts requiring maintenance.
- Only those parts envisaged by the manufacturer can be replaced.



The manufacturer guarantees safety and proper functioning only if all burner components are intact and positioned correctly.

### 3.2 Personnel training

The user is the person, body or company that has acquired the machine and intends to use it for the specific purpose. He is responsible for the machine and for the training of the people working around it.

The user:

- undertakes to entrust the machine exclusively to suitably trained and qualified personnel;
- undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties;
- personnel must observe all the danger and caution indications shown on the machine.
- Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.
- Personnel must inform their superiors of every problem or dangerous situation that may arise.
- The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The manufacturer therefore declines any and every responsibility for any damage that may be caused by the use of non-original parts.

In addition:

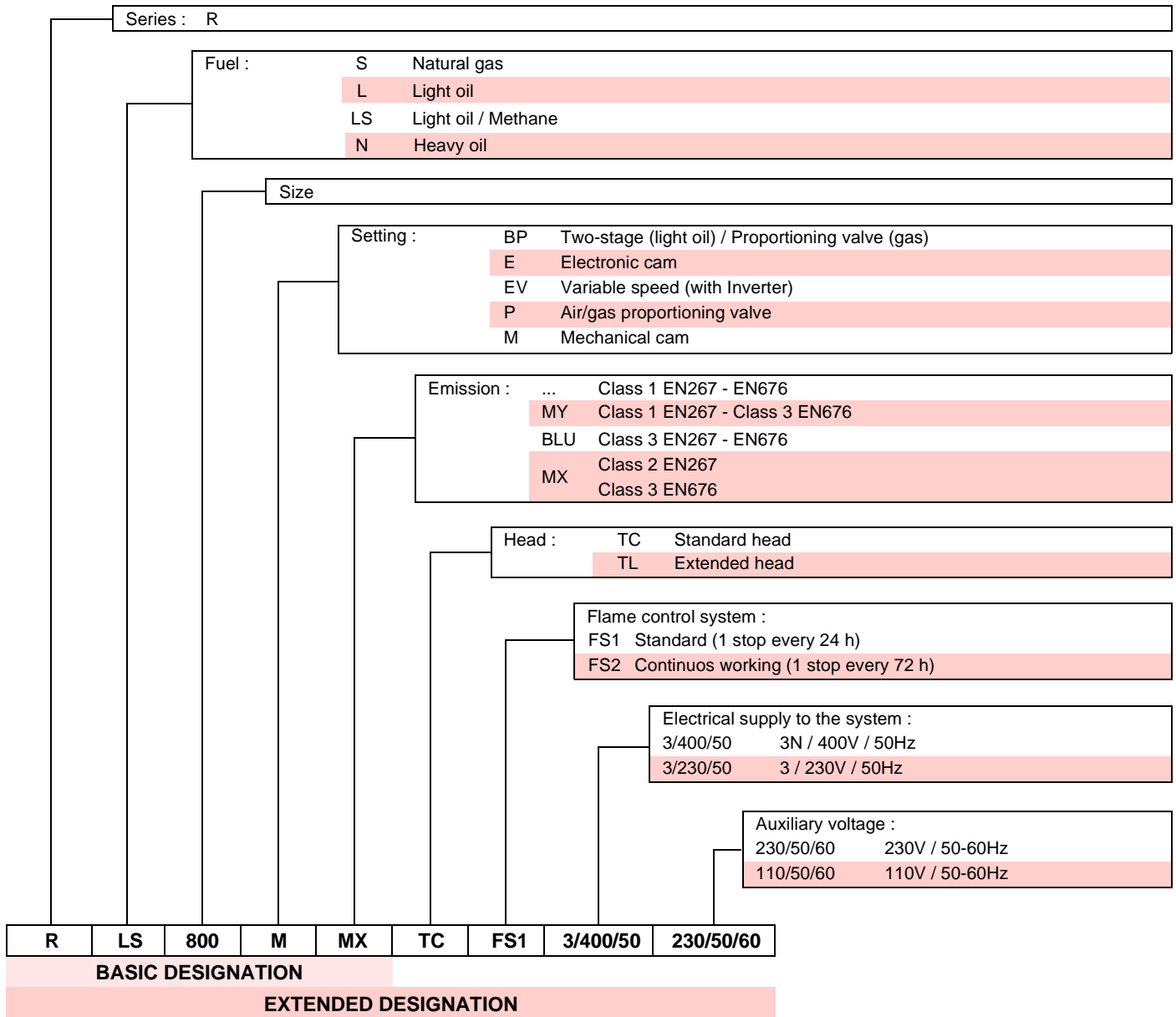


- must take all the measures necessary to prevent unauthorised people gaining access to the machine;
- the user must inform the manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation;
- personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.



**4 Technical description of the burner**

**4.1 Burner designation**



**4.2 Models available**

| Designation  | Electrical supply | Starting | Code       |                    |
|--------------|-------------------|----------|------------|--------------------|
| RLS 800/M MX | TC                | 3/400/50 | Star/Delta | 20006817 - 3911112 |

**4.3 Burner categories - Countries of destination**

| Country of destination   | Gas category        |
|--|---------------------|
| SE - FI - AT - GR - DK - ES - GB - IT - IE - PT - IS - CH - NO | I <sub>2H</sub>     |
| DE   | I <sub>2ELL</sub>   |
| NL   | I <sub>2L</sub>     |
| FR   | I <sub>2Er</sub>    |
| BE   | I <sub>2E(R)B</sub> |
| LU - PL  | I <sub>2E</sub>     |

**4.4 Technical data**

| Model   |                |        | RLS 800/M MX  |
|---|----------------|--------|---|
| Type  |                |        | 1301 T  |
| Output (1)  | MIN - MAX      | kW     | 1750/3500 ÷ 8000  |
| Delivery (1)  |                | kg/h   | 147/295 ÷ 674   |
| Fuel  |                |        | - LIGHT OIL, viscosity at 20 °C: 6 mm <sup>2</sup> /s (1.5 °E - 6 cSt)<br>- NATURAL GAS: G20 (methane) - G21 - G22 - G23 - G25<br>- GPL: G31 - PCI 26 kWh/Nm <sup>3</sup> |
| Gas pressure at maximum delivery (2) - Gas: G20/G25 |                | mbar   | 50.6 / 75.4   |
| Operation   |                |        | - Intermittent (min. 1 stop in 24 hours)<br>- Progressive two-stage or modulating by kit (see accessoires)  |
| Pump delivery (at 16.5 bar)                         |                | kg/h   | 560   |
| pressure range                                      |                | bar    | 6 - 30  |
| fuel temperature                                    |                | °C max | 140   |
| Nozzles   |                | number | 1   |
| Standard applications                               |                |        | Boilers: water, steam, diathermic oil   |
| Room temperature                                    |                | °C     | 0 - 50  |
| Combustion air temperature                          |                | °C max | 60  |
| Noise level (3)                                     | Sound pressure | dB (A) | 89.6  |
|   | Sound power    |        | 103.9   |
| Weight  |                | kg     | 320   |

**Tab. A**

- (1) Reference conditions: Ambient temperature 20°C - Gas temperature 15°C - Barometric pressure 1013 mbar - Altitude 0 m a.s.l.  
 (2) Pressure at test point 5)(Fig. 4) with zero pressure in the combustion chamber and maximum burner output.  
 (3) Noise emission tests carried out as specified in EN 15036-1 with measurement accuracy  $\sigma = \pm 1.5$  dB, in the manufacturer's combustion chamber with burner operating on test boiler at maximum output.

**4.5 Electrical data**

| Model                        |           |         | RLS 800/M MX           |
|------------------------------|-----------|---------|------------------------|
| Electrical supply            |           |         | 3N ~ 400V +/-10% 50 Hz |
| Fan motor IE2                |           | rpm     | 2964                   |
|                              |           | V       | 400/690                |
|                              |           | kW      | 21                     |
|                              |           | A       | 41.8/24.2              |
| Pump motor                   |           | rpm     | 2870                   |
|                              |           | V       | 220-240/380-415        |
|                              |           | kW      | 1,5                    |
|                              |           | A       | 5.9/3.4                |
| Ignition transformer         |           | V1 - V2 | 230 V - 1 x 5 kV       |
|                              |           | I1 - I2 | 1 A - 20 $\mu$ A       |
| Electrical power consumption | Light oil | kW max  | 25,8                   |
|                              | Gas       |         | 24                     |
| Protection level             |           |         | IP 54                  |

**Tab. B**

| Model                        |           | RLS 800/M MX           |                  |
|------------------------------|-----------|------------------------|------------------|
| Electrical supply            |           | 3N ~ 400V +/-10% 50 Hz |                  |
| Fan motor IE3                | rpm       | 2880                   |                  |
|                              | V         | 400/690                |                  |
|                              | kW        | 22                     |                  |
|                              | A         | 38.2/22.3              |                  |
| Pump motor                   | rpm       | 2870                   |                  |
|                              | V         | 220-240/380-415        |                  |
|                              | kW        | 1,5                    |                  |
|                              | A         | 5.9/3.4                |                  |
| Ignition transformer         |           | V1 - V2                | 230 V - 1 x 5 kV |
|                              |           | I1 - I2                | 1 A - 20 μA      |
| Electrical power consumption | Light oil | kW max                 | 25.8             |
|                              | Gas       |                        | 24               |
| Protection level             |           |                        | IP 54            |

Tab. C

**4.6 Overall dimensions**

The maximum dimensions of the burner are given in (Fig. 1). Bear in mind that inspection of the combustion head requires the burner to be opened by rotating the rear part on the hinge.

The overall dimensions of the burner when open are indicated by L and R.

Position I is a reference for the thickness of the boiler door refractory fettling.

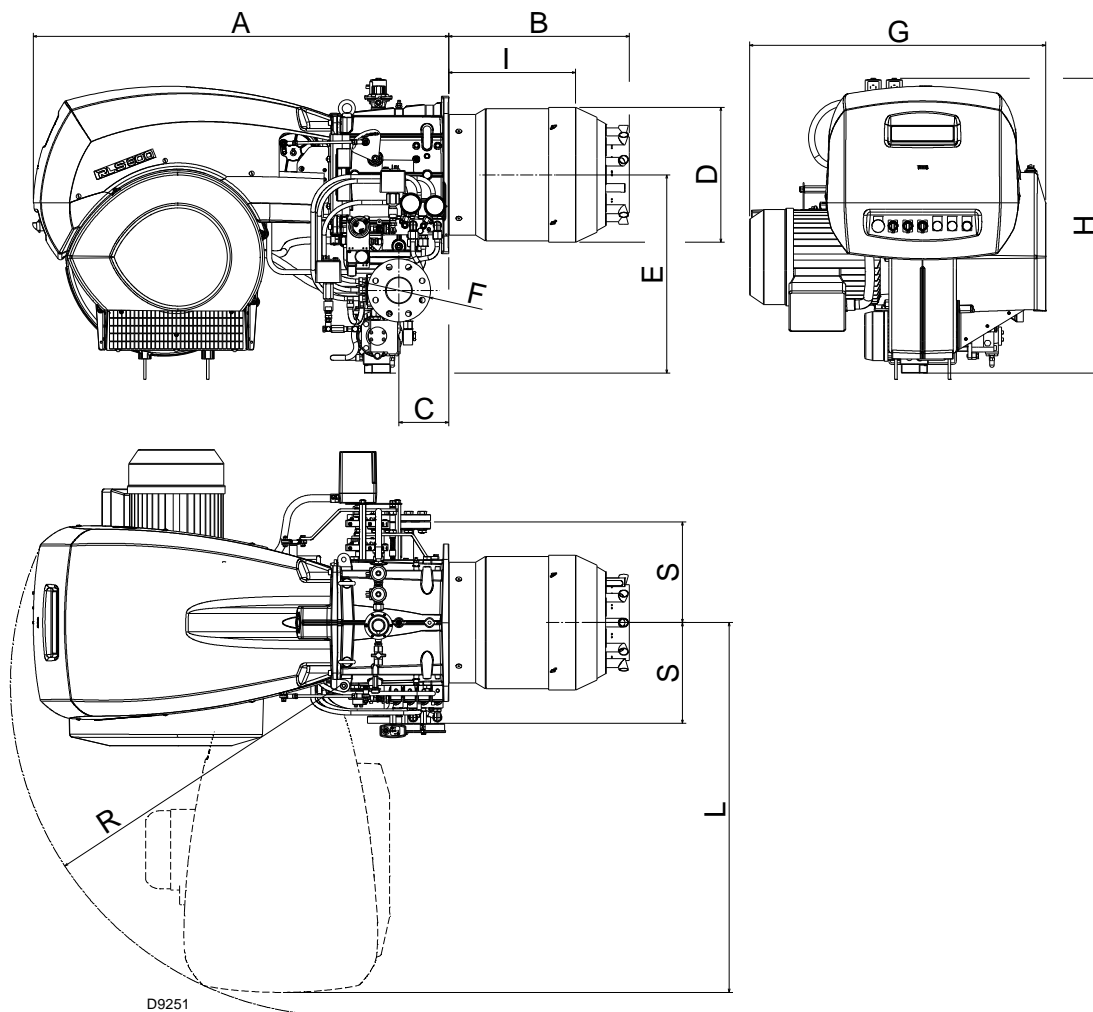


Fig. 1

| mm           | A    | B   | C   | D   | E   | F    | G   | H   | I   | L    | R    | S   |
|--------------|------|-----|-----|-----|-----|------|-----|-----|-----|------|------|-----|
| RLS 800/M MX | 1325 | 575 | 164 | 428 | 630 | DN80 | 940 | 937 | 405 | 1190 | 1055 | 320 |

Tab. D

**4.7 Firing rate**

MAXIMUM OUTPUT must be selected in the hatched area of the diagram. (Fig. 2)

MINIMUM OUTPUT must not be lower than the minimum limit shown in the diagram:

RLS 800/M MX = 1750 kW



The FIRING RATE area values (Fig. 2) have been obtained considering a surrounding temperature of 20 °C, and an atmospheric pressure of 1013 mbar (approx. 0 m above sea level) and with the combustion head adjusted as shown on page 19.

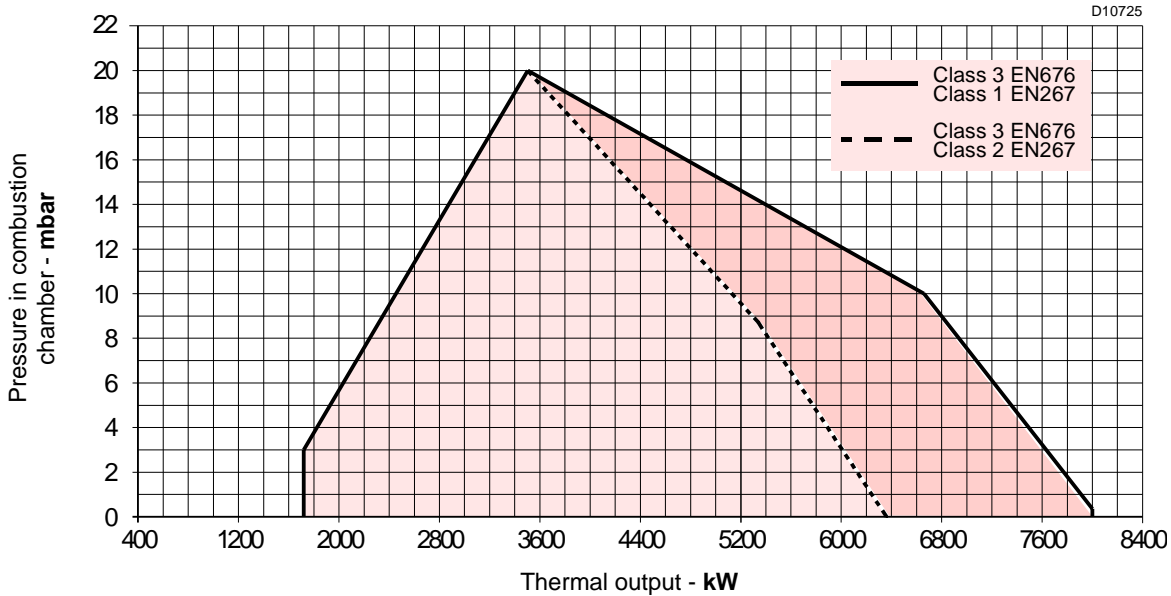


Fig. 2

**4.8 Test boiler**

The burner/boiler matching does not pose any problems if the boiler is CE type-approved and its combustion chamber dimensions are similar to those indicated in diagram (Fig. 3).

If the burner must be combined with a boiler that has not been CE type-approved and/or its combustion chamber dimensions are clearly smaller than those indicated in diagram (Fig. 3), consult the manufacturer.

The firing rates were set in relation to special test boilers, according to EN 676 regulations.

Fig. 3 indicates the diameter and length of the test combustion chamber.

**Example:**

Output 7000 kW:  
diameter 120 cm,  
length 6m.

**MODULATION RATIO**

The modulation ratio, determined using test boilers according to standard (EN 676 for gas, EN 267 for light oil), is 2.5 : 1.

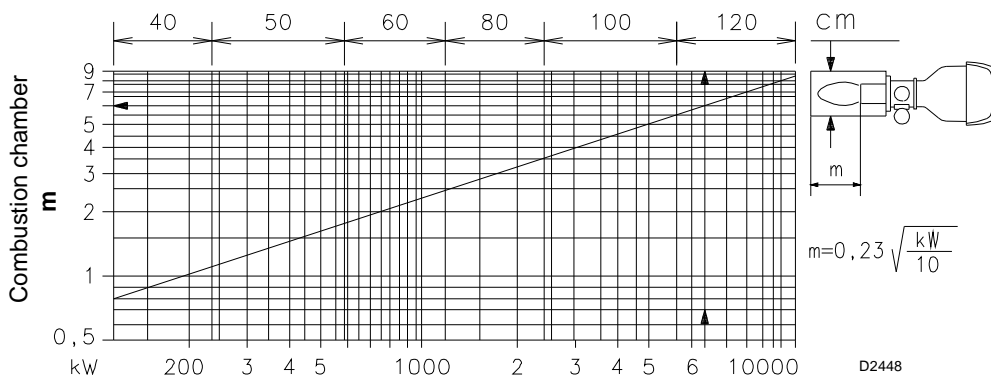


Fig. 3

4.9 Burner description

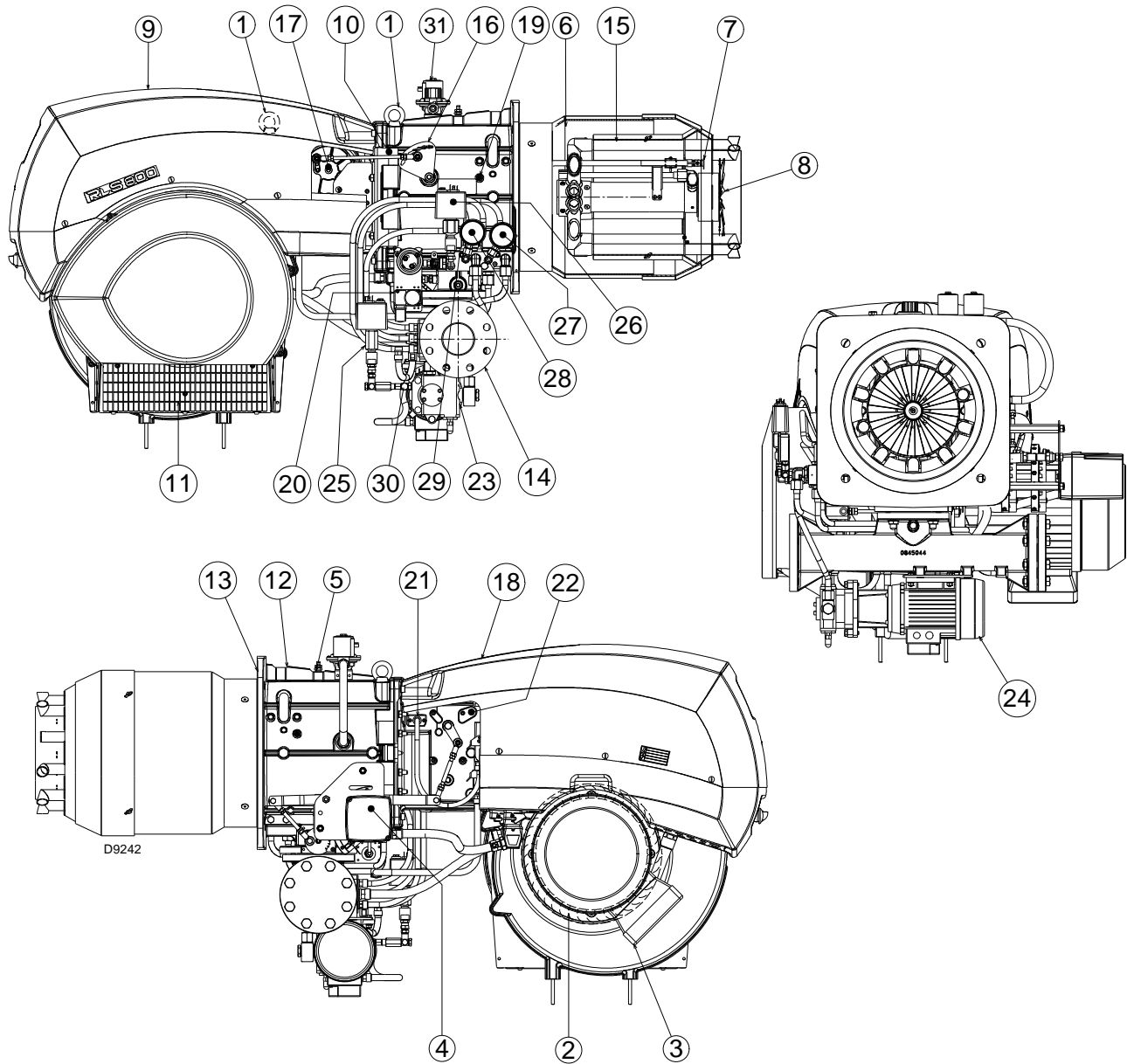


Fig. 4

- |  |  |
|--|--|
| 1 Lifting eyebolts   | 21 QRI cell  |
| 2 Fan  | 22 Air pressure test point pressure test point "+" |
| 3 Fan motor  | 23 Pump  |
| 4 Servomotor   | 24 Pump motor                                      |
| 5 Gas pressure test point                                  | 25 Minimum oil pressure switch                     |
| 6 Combustion head  | 26 Maximum oil pressure switch                     |
| 7 Ignition pilot   | 27 Pressure gauge for pressure on nozzle return    |
| 8 Flame stability disk                                     | 28 Nozzle delivery pressure gauge                  |
| 9 Electric panel board - cover                             | 29 Oil modulator                                   |
| 10 Hinge for opening burner                                | 30 Pressure gauge attachment                       |
| 11 Air inlet to fan  | 31 Pilot gas train                                 |
| 12 Manifold  |  |
| 13 Thermal insulation screen for securing burner to boiler |  |
| 14 Gas train flange  |  |
| 15 Shutter   |  |
| 16 Lever for movement of combustion head                   |  |
| 17 Gears for movement of air damper                        |  |
| 18 Air pressure switch (differential operating type)       |  |
| 19 Air pressure test point                                 |  |
| 20 Maximum gas pressure switch with pressure test point    |  |



CAUTION

The burner can be opened either on the right or left sides, irrespective of the side from which fuel is supplied.

When the burner is closed, the hinge can be re-positioned on the opposite side.

**4.10 Description of panel board**

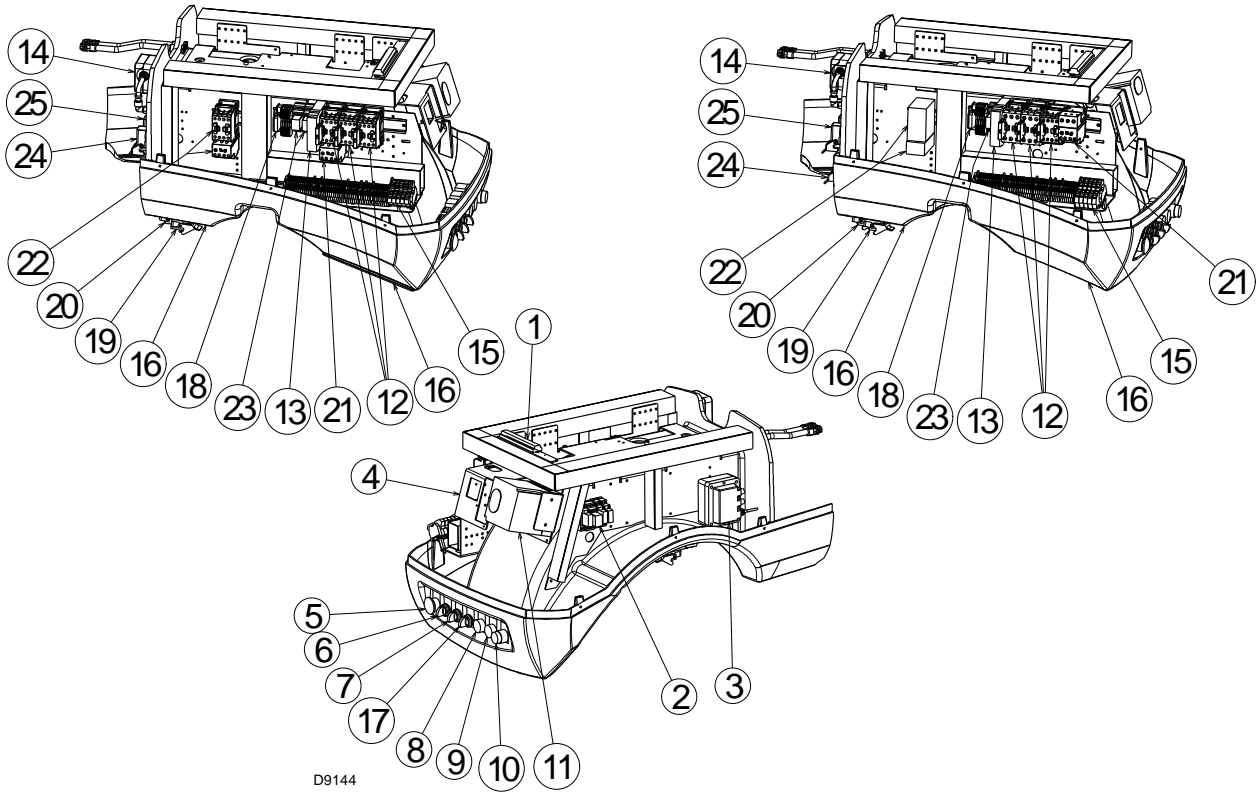


Fig. 5

- 1 Terminal strip for kits
- 2 Relay outlet - clean contacts
- 3 Ignition transformer
- 4 Bracket for mounting the power regulator RWF40
- 5 Stop push-button
- 6 Dial for off - automatic - manual
- 7 Power dial for increase - decrease of power
- 8 Start enabled light
- 9 Motor thermal cutout tripped warning light
- 10 Signal light for burner failure and lock-out reset button
- 11 Control box
- 12 Star-powered/delta-powered starter
- 13 Timer
- 14 Air pressure switch
- 15 Main supply terminal strip
- 16 Entry for power cables and external leads
- 17 Fuel selector and remote fuel selector enabling
- 18 Auxiliary circuits fuse

- 19 Servomotor plug/socket
- 20 Plug-socket valve /Pump motor
- 21 Fan motor thermal cut-out
- 22 Pump motor contactor and thermal cut-out
- 23 Oil/gas selection relay
- 24 Plug-socket maximum gas pressure switch
- 25 Plug-socket flame sensor

**NOTE**

Two types of burner failure may occur:

- **Control box lock-out:** if the control box 11)(Fig. 5) pushbutton (**red led**) and the reset button 10)(Fig. 5) light up, it indicates that the burner is in lock-out. To reset, press the pushbutton 10)(Fig. 5).
- **Motors trip:** release by pressing the push button on thermal.

**4.11 Burner equipment**

|   |      |
|---|------|
| Flange gasket. . . . .                            | N. 1 |
| Flange fixing screws M 16 x 50 . . . . .          | N. 8 |
| Thermal screen . . . . .                          | N. 1 |
| Screws to secure the burner flange to the boiler: |      |
| M 18 x 70 . . . . .                               | N. 4 |
| Spacers (see Fig. 17). . . . .                    | N. 2 |
| Instruction. . . . .                              | N. 1 |
| Spare parts. . . . .                              | N. 1 |

**4.12 Control box (LFL1.333..)**

**Warnings**



To avoid accidents, material or environmental damage, observe the following instructions!

The control box LFL1.333.. is a safety device! Avoid opening or modifying it, or forcing its operation. Riello S.p.A. cannot assume any responsibility for damage resulting from unauthorised interventions!

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Before modifying the wiring in the LFL1.333...control box connection area, fully disconnect the system from the power supply (omnipolar separation).
- Protection against electrocution from the control box and all connected electric components is obtained with the correct assembly.
- Before any intervention (assembly and installation operations, assistance, etc.), ensure the wiring is in order and that the parameters are correctly set, then make the safety checks.
- Falls and collisions can negatively affect the safety functions. In this case, the control box must not be operated, even if it displays no evident damage.
- Do not press the reset button or the remote reset button of the control box for more than 10 seconds because this will damage the internal relay.

For safety and reliability, comply with the following instructions:

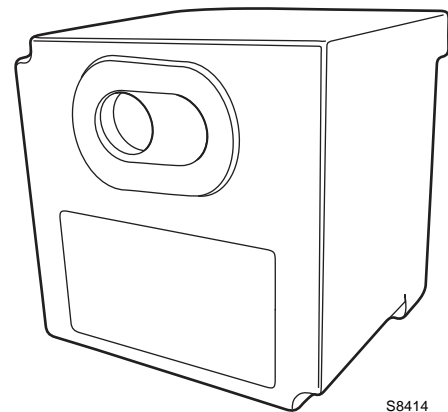
- avoid conditions that can favour the development of condensate and humidity. Otherwise, before switching on again, make sure that the entire control box is perfectly dry!
- Static charges must be avoided since they can damage the control box's electronic components when touched.

**Use**

The control box LFL1.333.. is a control and supervision system of medium and large capacity forced draught burners for intermittent operation (at least one controlled shut-down every 24 hours).

**Installation notes**

- Check the electric wiring inside the boiler complies with the national and local safety regulations.
- Do not confuse the powered conductors with the neutral ones.
- Ensure that spliced wires cannot get into contact with neighbouring terminals. Use adequate ferrules.
- Arrange the H.V. ignition cables separately, as far as possible from the control box and the other cables.
- When wiring the unit, make sure that AC 230 V mains voltage cables are run strictly separate from extra low-voltage cables to avoid risks of electrical shock hazard.



**Fig. 6**

**Electrical wiring of the flame detector**

It is important for signal transmission to be almost totally free of any disturbances or loss:

- Always separate the detector cables from the other cables:
  - The capacitive reactance of the line reduces the size of the flame signal.
  - Use a separate cable.
- Respect the allowed cable lengths.
- The ionisation probe is not protected against the risk of electrocution. When connected to the electricity supply, the ionisation probe must be protected against any accidental contact.
- Position the ignition electrode and the ionisation probe so that the ignition spark cannot form an arc on the probe (risk of electric overcharge).

**Technical data**

|                               |   |
|-------------------------------|---|
| Mains voltage                 | AC 230V -15% / +10%                         |
| Mains frequency               | 50 / 60 Hz ±6 %                             |
| Fuse (Internal)               | T6.3H250V                                   |
| Primary fuse (external)       | max. 10 A                                   |
| Weight                        | approx. 1 kg                                |
| Power absorption              | approx. AC 3.5 VA                           |
| Protection level              | IP40  |
| Safety class                  | II  |
| Input current at terminal 1   | max. 5 A continuous (peaks of 20 A / 20 ms) |
| Load on the control terminals | max. 4 A continuous (peaks of 20 A / 20 ms) |
| Environmental conditions      |   |
| Operation                     | DIN EN 60721-3-1                            |
| Climatic conditions           | Class 1K3                                   |
| Mechanical conditions         | Class 1M2                                   |
| Temperature range             | -20...+60°C                                 |
| Humidity                      | < 95% RH                                    |

**Tab. E**

**4.13 Servomotor (SQM10.1....)**

**Warnings**



To avoid accidents, material or environmental damage, observe the following instructions!

Avoid opening, modifying or forcing the actuators.

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Before modifying the wiring in the connection area of the servomotor, fully disconnect the burner control device from the power supply (omnipolar separation).
- To avoid the risk of electrocution, protect the connection terminals in a suitable manner and correctly fix the cover.
- Check the wiring is in order.
- Falls and collisions can negatively affect the safety functions. In this case, the servomotor must not be operated, even if it displays no evident damage.

**Assembly notes**

- Check the relevant national safety standards are respected.
- When assembling the servomotor and connecting the damper, the gears can be disengaged by means of a lever, allowing the drive shaft to be easily adjusted in both directions of rotation.



**Fig. 7**

**Technical data**

|   |   |
|---|---|
| Operating voltage                               | AC 220...240V, 50 Hz -15 % / +10 %<br>AC 220 V, 60 Hz -15 % / +10 % |
| Auxiliary and limit switches switching capacity | 10 (3) A, AC 24...250 V   |
| Angular positioning                             | up to 160 ° (base scale)  |
| Assembly position                               | optional  |
| Electrical protection                           | IP 54, DIN 40050  |
| Safety class                                    | GB  |
| Weight  | approx. 1.7 kg  |
| Actuator motor                                  | synchronous motor   |
| Power absorption                                | 9 VA  |
| Environmental conditions:                       |   |
| Operation                                       | DIN EN 60 721-3-1   |
| Climatic conditions                             | Class 1K3   |
| Mechanical conditions                           | Class 1M2   |
| Temperature range                               | -20...+70°C   |
| Humidity  | < 95% RH  |

**Tab. F**



**5 Installation**

**5.1 Notes on safety for the installation**

After carefully cleaning all around the area where the burner will be installed, and arranging the correct lighting of the environment, proceed with the installation operations.



All the installation, maintenance and disassembly operations must be carried out with the electricity supply disconnected.



The installation of the burner must be carried out by qualified personnel, as indicated in this manual and in compliance with the standards and regulations of the laws in force.



Combustion air inside the boiler must be free from hazardous mixes (e.g.: chloride, fluoride, halogen); if present, it is highly recommended to carry out cleaning and maintenance more frequently.

**5.2 Handling**

The burner packaging includes a wooden platform, it is therefore possible to move the burner (still packaged) with a transpallet truck or fork lift truck.



The handling operations for the burner can be highly dangerous if not carried out with the greatest attention: keep any unauthorised people at a distance; check the integrity and suitability of the available means of handling. Check also that the area in which you are working is empty and that there is an adequate escape area (i.e. a free, safe area to which you can quickly move if the burner should fall). When handling, keep the load at not more than 20-25cm from the ground.



After positioning the burner near the installation point, correctly dispose of all residual packaging, separating the various types of material.



Before proceeding with the installation operations, carefully clean all around the area where the burner will be installed.

**5.3 Preliminary checks**

**Checking the consignment**



After removing all the packaging, check the integrity of the contents. In the event of doubt, do not use the burner; contact the supplier.



The packaging elements (wooden cage or cardboard box, nails, clips, plastic bags, etc.) must not be abandoned as they are potential sources of danger and pollution; they should be collected and disposed of in the appropriate places.

|   |   |   |         |
|---|---|---|---------|
| RBL   | A | B | C       |
| D   | E |   | F       |
| GAS KAASU <input checked="" type="checkbox"/> | G | H |         |
| GAZ-AEIO                                      | G | H |         |
| I   |   |   |         |
| HEZŐFÜEL                                      | L |   |         |
| RIELLO SpA<br>I-37045 Legnago (VR)            |   |   | CE 0085 |

D9243

**Fig. 8**

**Checking the characteristics of the burner**

Check the identification label of the burner, showing:

- the model (see **A** in Fig. 8) and type of burner (**B**);
- the year of manufacture, in cryptographic form (**C**);
- the serial number (**D**);
- the data for electrical supply and the protection level (**E**);
- the electrical input power (**F**);
- the types of gas used and the relative supply pressures (**G**);
- the data of the burner's minimum and maximum output possibilities (**H**) (see Firing rate)

**Warning.** The output of the burner must be within the boiler's firing rate;

- the category of the device/countries of destination (**I**).
- light oil (**L**) max. viscosity.



A burner label that has been tampered with, removed or is missing, along with anything else that prevents the definite identification of the burner makes any installation or maintenance work difficult.

**5.4 Operation position**

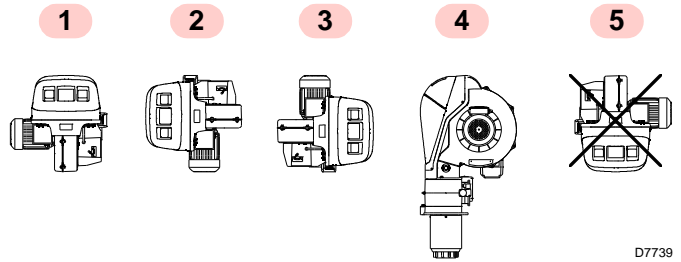
The burner is designed to operate only in the positions **1, 2, 3 and 4**.

Installation **1** is preferable, as it is the only one that allows the maintenance operations as described in this manual.

Installations **2, 3 and 4** permit operation but make maintenance and inspection of the combustion head more difficult.

Any other position could compromise the correct operation of the appliance.

Installation **5** is prohibited for safety reasons.



D7739

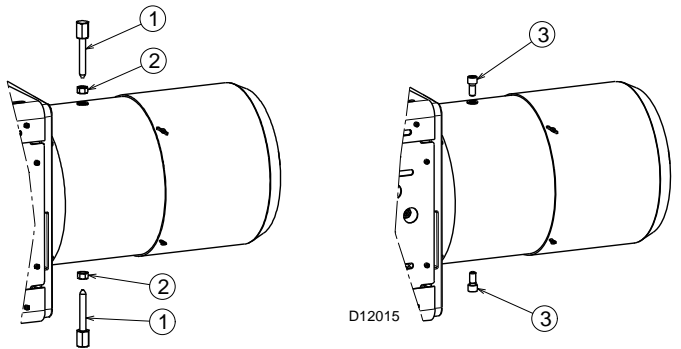
**Fig. 9**

**5.5 Removal of the locking screws from the shutter**



Remove the screws and the nuts 1)-2)(Fig. 10), before installing the burner on the boiler.

Replace them with the screws 3) M12 X 25 supplied with the burner.



**Fig. 10**

**5.6 Preparing the boiler**

**5.6.1 Boring the boiler plate**

Drill the combustion chamber locking plate as shown in (Fig. 11).

The position of the threaded holes can be marked using the thermal screen supplied with the burner.

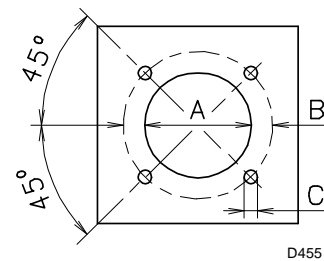
**5.6.2 Blast tube length**

The length of the blast tube must be selected according to the indications provided by the manufacturer of the boiler, and in any case it must be greater than the thickness of the boiler door complete with its fettling.

For boilers with front flue passes 1) (Fig. 12) or flame inversion chambers, protective fettling in refractory material 5) must be inserted between the boiler fettling 2) and the blast tube 4).

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

For boilers having a water-cooled front the refractory fettling 2)-5)(Fig. 12) is not required unless it is expressly requested by the boiler manufacturer.



**Fig. 11**

| mm           | A   | B   | C    |
|--------------|-----|-----|------|
| RLS 800/M MX | 440 | 495 | M 18 |

**Tab. G**

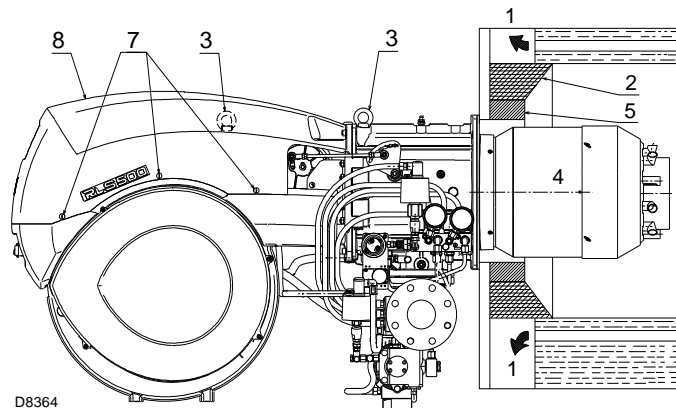
**5.7 Securing the burner to the boiler**

Prepare an adequate system of hoisting by hooking onto the rings 3) (Fig. 12).

- Slip the thermal protection (standard equipment) onto the blast tube 4) (Fig. 12).
- Place entire burner on the boiler hole arranged previously, see (Fig. 11), and fasten with the screws given as standard equipment.



**The burner-boiler seal must be airtight.**



**Fig. 12**

**5.8 Accessibility to the interior of the combustion head**

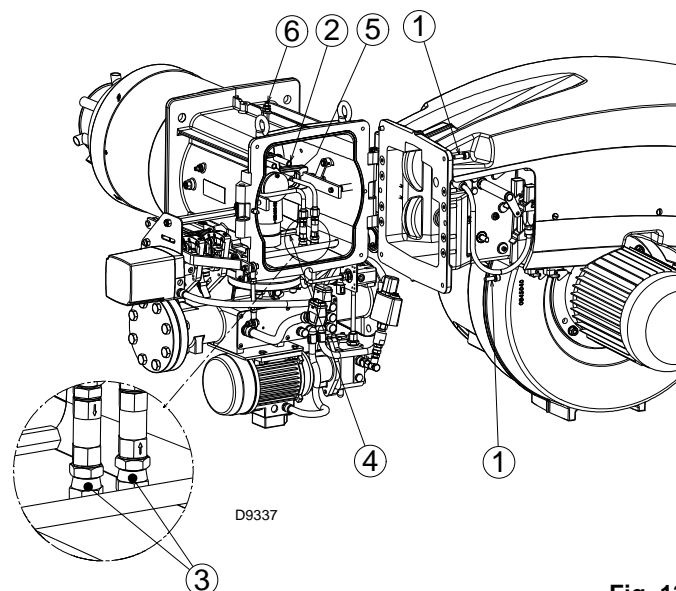
In order to reach inside the combustion head (Fig. 13) proceed as follows:

- disconnect the electrical wiring related to oil pump/servomotor, air servomotor and gas pressure switch;
- disconnect the leverages related to air damper and head movement;
- unscrew the 4 x fixing screws 1);
- Release the cable of the electrode 2);
- Disconnect the oil pipes by unscrewing the two connectors 3).



**While unscrewing, some fuel may leak out.**

- Release the ignition pilot retainer;
- Remove the screw/gas pressure test point 6) of the combustion head;
- unscrew the under part of the elbow until it comes free of its slot;
- Extract the internal part 5) of the combustion head.

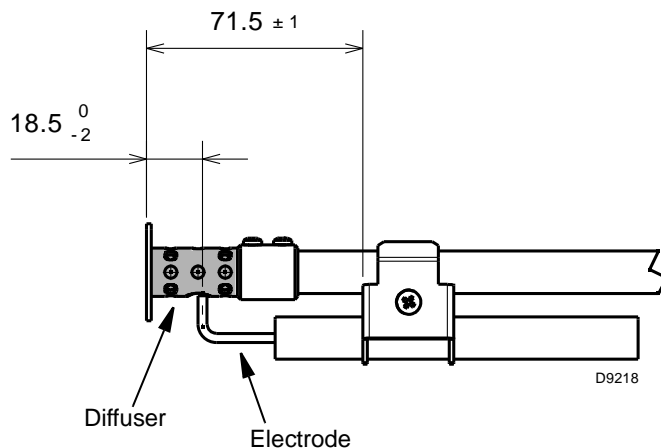


**Fig. 13**

**5.9 Position of electrode**



Place the electrode on the ignition pilot observing the dimensions specified in Fig. 14.



**Fig. 14**

### 5.10 Nozzle installation

The burner complies with the emission requirements of the EN 267 standard. In order to guarantee that emissions do not vary, recommended and/or alternative nozzles specified by Riello in the Instruction and warning booklet should be used.



**WARNING**

It is advisable to replace the nozzle once a year during periodical maintenance.

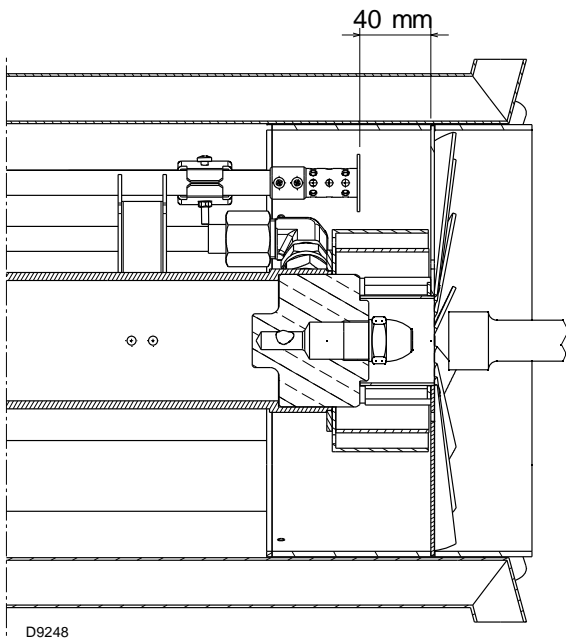


**CAUTION**

The use of nozzles other than those specified by Riello S.p.A. and inadequate regular maintenance may result into emission limits non-conforming to the values set forth by the regulations in force, and in extremely serious cases, into potential hazards to people and objects.

The manufacturing company shall not be liable for any such damage arising from non-observance of the requirements contained in this manual.

Fit the nozzle with the box spanner, fitting the spanner through the central hole in the flame stability disk (Fig. 15).



**Fig. 15**

Nozzles with no fuel shutoff needle must be fitted on the nozzle holder.

To set the delivery range within which the nozzle must work, nozzle return line fuel pressure must be adjusted according to Tab. H and Tab. I.



**WARNING**

- Do not use any sealing products such as gaskets, sealing compound, or tape.
- Be careful to avoid damaging the nozzle sealing seat.
- The nozzles must be screwed into place tightly but not to the maximum torque value provided by the wrench.

#### 5.10.1 Recommended nozzle

- **Bergonzo type B5 45°**
- **Fluidics type N4 45°**

Intermediate flow rates may be obtained by choosing the nozzle with a nominal flow rate slightly higher than that actually required.

#### Complete range of nozzles:

##### ➤ **Bergonzo type B5 45°:**

350 - 375 - 400 - 425 - 450 - 475 - 500 - 525 - 550 - 575 - 600 - 650 - 700 - 750. We normally recommend 45° angles of pulverisation.

| kg/h | Delivery pressure bar | Return pressure bar | kg/h | kW   |
|------|-----------------------|---------------------|------|------|
| 375  | 20                    | 11.5                | 147  | 1750 |
|      | 20                    | 17                  | 295  | 3500 |
| 550  | 20                    | 10                  | 170  | 2000 |
|      | 20                    | 17                  | 421  | 5000 |
| 650  | 20                    | 8                   | 180  | 2150 |
|      | 20                    | 16.5                | 565  | 6650 |
| 750  | 25                    | 11.5                | 227  | 2700 |
|      | 25                    | 20.5                | 675  | 8000 |

**Tab. H**

##### ➤ **Fluidics type N4 45°:**

375 - 400 - 450 - 500 - 550 - 600 - 650 - 700 - 750. We normally recommend 45° angles of pulverisation.

| kg/h | Delivery pressure bar | Return pressure bar | kg/h | kW   |
|------|-----------------------|---------------------|------|------|
| 375  | 20                    | 12                  | 147  | 1750 |
|      | 20                    | 18.5                | 295  | 3500 |
| 550  | 20                    | 7                   | 170  | 2000 |
|      | 20                    | 16                  | 421  | 5000 |
| 650  | 20                    | 6                   | 180  | 2150 |
|      | 20                    | 17                  | 565  | 6650 |
| 750  | 25                    | 17                  | 227  | 2700 |
|      | 25                    | 22                  | 675  | 8000 |

**Tab. I**

**5.11 Combustion head setting**

In addition to varying air flow depending on the output requested, the air gate valve servomotor 4) (Fig. 4) by means of a lifting assembly - varies the setting of the combustion head.

This system allows an optimal setting even at a minimum firing rate.

For the same servomotor rotation, combustion head opening can be varied by moving the tie rod onto holes 1-2-3) (Fig. 16).

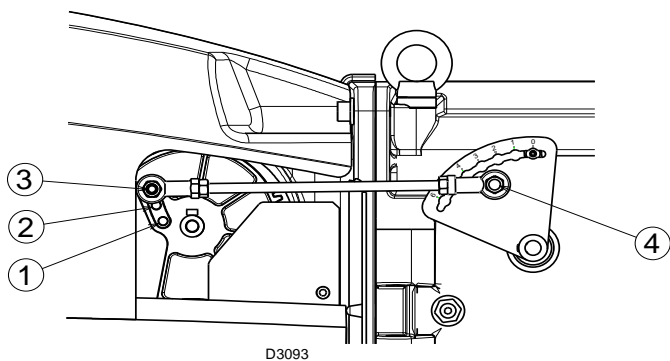


Fig. 16

The choice of the hole (1-2-3) to be used is decided on the basis of diagram (Fig. 18) against the required maximum output.

Setting is pre-arranged in the plant for the maximum run (hole 3, Fig. 16).

If combustion requirements require you to move spacer 1) (Fig. 17) onto the 1st or 2nd hole of the gear and, at the same time, the hinge is on the right, you need to fit the spacers 4) (Fig. 17) supplied with the burner.

Proceed as follows (Fig. 17):

- unscrew nuts 2), remove tie rod 3);
- unscrew spacer 1) and position it on the hole you want;
- screw the spacers 4) onto spacer (1) and screw (5) respectively;
- Refit the tie rod and nuts.

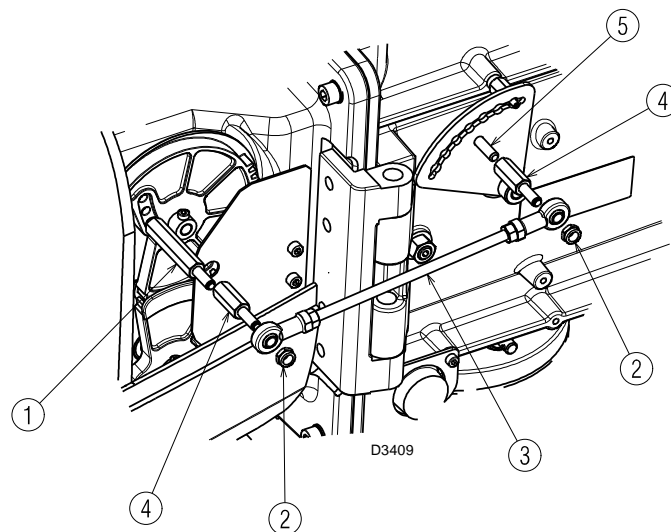


Fig. 17

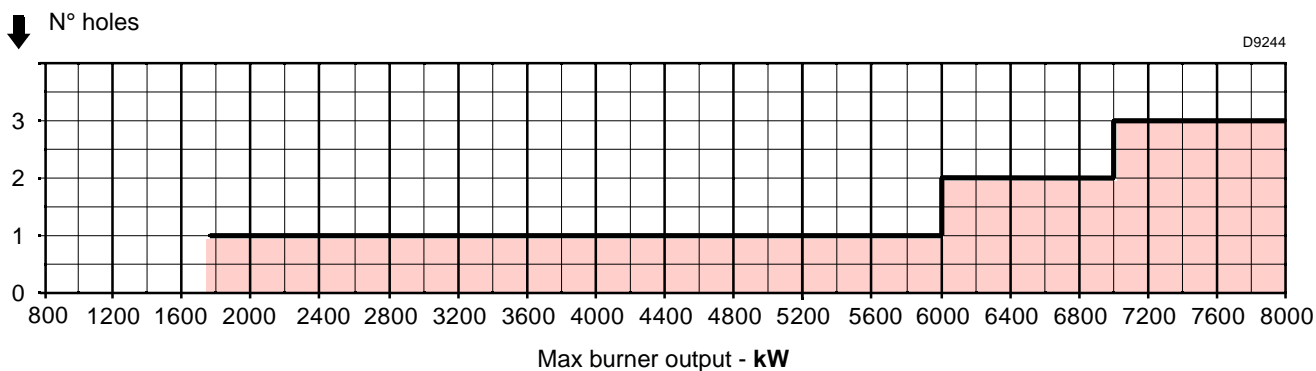


Fig. 18

**5.12 Light oil supply**



Explosion danger due to fuel leaks in the presence of a flammable source.

Precautions: avoid knocking, attrition, sparks and heat.

Make sure the fuel interception tap is closed before performing any operation on the burner.



**WARNING**

The fuel supply line must be installed by qualified personnel, in compliance with current standards and laws.

**5.12.1 Double-pipe circuit**

The burner is equipped with a self-priming pump which is capable of feeding itself within the limits listed in the table at the side.

**The tank higher than the burner A (Fig. 19)**

The distance "P" must not exceed 10 meters in order to avoid subjecting the pump's seal to excessive strain; the distance "V" must not exceed 4 meters in order to permit pump self-priming even when the tank is almost completely empty.

**The tank lower than the burner B (Fig. 19)**

Pump depression values higher than 0.45 bar (35 cm Hg) must not be exceeded because at higher levels gas is released from the fuel, the pump starts making noise and its working life-span decreases.

It is good practice to ensure that the return and suction lines enter the burner from the same height; in this way it will be less probable that the suction line fails to prime or stops priming.

**5.12.2 The loop circuit**

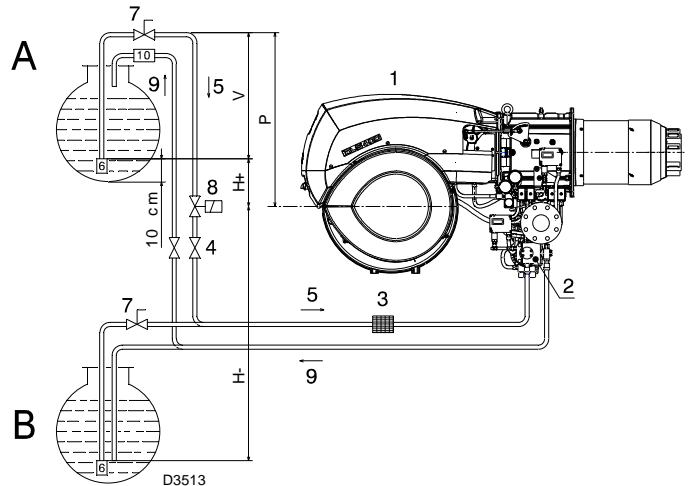
A loop circuit consists of a loop of piping departing from and returning to the tank with an auxiliary pump that circulates the fuel under pressure.

A branch connection from the loop goes to feed the burner.

This circuit is extremely useful whenever the burner pump does not succeed in self-priming because the tank distance and/or height difference are higher than the values listed in the Table.

| H (m) | L (m)  |    |    |    |
|-------|--------|----|----|----|
|       | Ø (mm) |    |    |    |
|       | 10     | 12 | 14 | 16 |
| 4     | 14     | 30 | 55 | 95 |
| 3,5   | 13     | 28 | 52 | 89 |
| 3     | 12     | 26 | 48 | 82 |
| 2,5   | 11     | 24 | 44 | 76 |
| 2     | 10     | 22 | 41 | 70 |
| 1,5   | 9      | 20 | 37 | 63 |
| 1     | 8      | 18 | 33 | 57 |
| 0,5   | 7      | 16 | 29 | 51 |
| 0     | 6      | 14 | 26 | 44 |
| -0,5  | 5      | 12 | 22 | 38 |
| -1    | 4      | 10 | 18 | 32 |
| -1,5  | 3      | 8  | 15 | 25 |
| -2    |        | 6  | 11 | 19 |
| -2,5  |        | 4  | 7  | 13 |
| -3    |        |    | 4  | 7  |

**Tab. J**



**Fig. 19**

**Key to layout (Fig. 19)**

- H = Pump/foot valve height difference
- L = Piping length
- Ø = Inside pipe diameter
- 1 = Burner
- 2 = Pump
- 3 = Filter
- 4 = Manual on/off valve
- 5 = Suction line
- 6 = Foot valve
- 7 = Rapid closing manual valve remote controlled (only Italy)
- 8 = On/off solenoid valve (only Italy). See layout of electric panel board. Electrical connections set by installer (SV)
- 9 = Return line
- 10 = Check valve (only Italy)

**5.12.3 Hydraulic connections**

The pumps are equipped with a by-pass that connects return line with suction line.

The pumps are installed on the burner with the by-pass closed by screw 6) ( Fig. 22).

It is therefore necessary to connect both hoses to the pump.

The pump will break down immediately if it is run with the return line closed and the by-pass screw inserted.

Remove the plugs from the suction and return connections of the pump.

Insert the hose connections with the supplied seals into the connections and screw them down.

Take care that the hoses are not stretched or twisted during installation.

Install the hoses where they cannot be stepped on or come into contact with hot surfaces of the boiler and where they do not hamper the opening of the burner.

Now connect the other end of the hoses to the suction and return lines by using the supplied nipples.

### 5.12.4 Pressure regulator

#### Calibration pressure on return line

With a servomotor position of 20°, the nut and the corresponding lock nut 6)(Fig. 20), are fixed in contact with the eccentric 8).

During the rotation towards 130° of the servomotor, the eccentric will push the modulator shaft, taking the pressure, read on the pressure gauge 3)(Fig. 20), to the desired value.

To calibrate the eccentric, proceed as follow:

- loosen the screws 7), and act on the screw 4) to obtain the desired eccentricity.
- Turn clockwise (+) the screw 4) to increase the eccentricity, increasing the difference between the min. and max. capacity of the nozzle.
- Turn anticlockwise (-) to decrease the eccentricity and, consequently the difference between the min. and max. capacity of the nozzle.

#### Calibration pressure on delivery line

To adjust the delivery pressure, operate on the pump as described on page 22.

#### Example:

if you use a 650 kg/h nozzle and you want to obtain power of 6650 kW, the pressure on the pressure gauge 3)(Fig. 20) (maximum pressure on return circuit) must be about 16.5 bar.

Relevant delivery pressure read on the pressure gauge 2), must be 20 bar (see Table H on page 18).

#### IMPORTANT

- The proper setting of the eccentric 8) is possible when its operation field follows the servomotor operation field (20° ÷ 130°): so, that every variation of the servomotor position corresponds to a pressure variation.
- Never let the piston batter: the stop ring 5) determines the max. stroke.
- If you wish to check the delivery capacity of the nozzle, proceed as follows:  
open the burner according to instructions at page 17, place the nozzle, simulate the start-up and then proceed with the weighing at the maximum and minimum pressures.
- If at maximum capacity of the nozzle (maximum pressure in the return line) pressure fluctuations are detected on the manometer 3), slightly decrease the pressure till their complete elimination.

#### NOTE:

the burner is calibrated from factory with maximum pressure on the return line of approximately 16.5 bar and delivery pressure of approximately 20 bar.

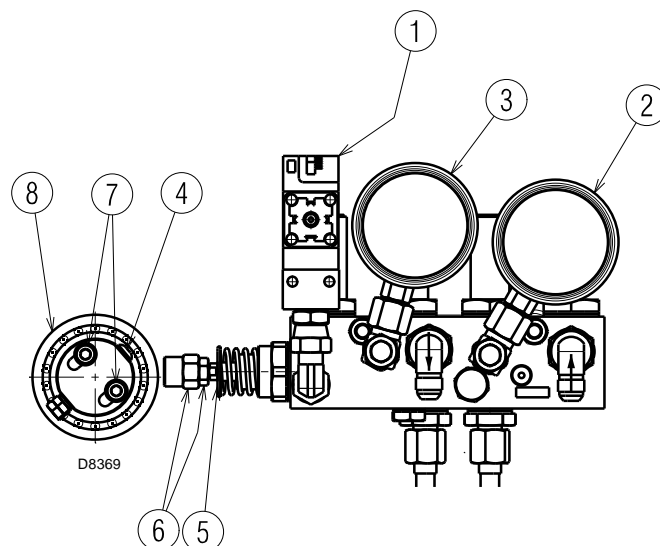


Fig. 20

#### Key to layout (Fig. 20)

- 1 Maximum oil pressure switch
- 2 Manometer for pressure in delivery line
- 3 Manometer for pressure in return line
- 4 Eccentric adjusting screw
- 5 Ring for piston stop
- 6 Nut and lock-nut for piston setting
- 7 Eccentric locking screws
- 8 Variable eccentric

### 5.12.5 Hydraulic system layout

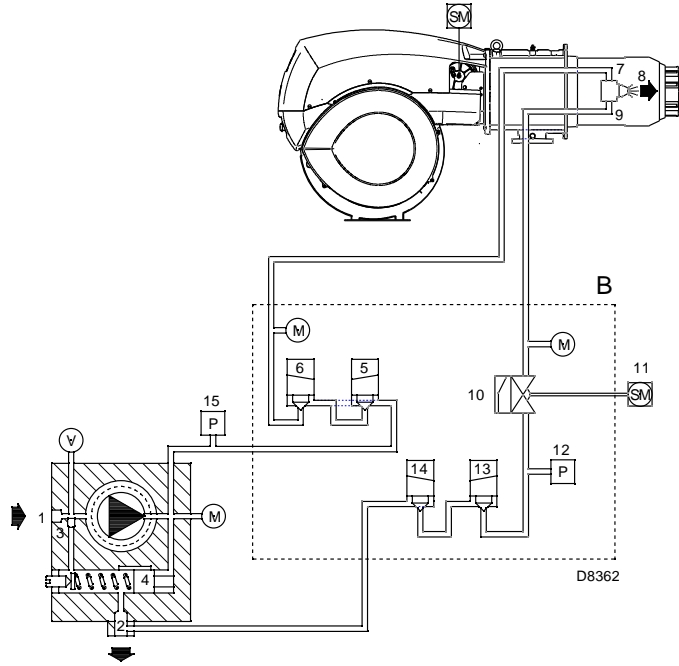


Fig. 21

#### Key to layout (Fig. 21)

- 1 Pump suction
- 2 Pump and nozzle return
- 3 By-pass screw in pump
- 4 Pump pressure governor
- 5 Safety solenoid
- 6 Safety solenoid
- 7 Nozzle delivery
- 8 Nozzle without interception pin
- 9 Nozzle return
- 10 Pressure regulator on nozzle return
- 11 Servomotor
- 12 Pressure switch on nozzle return
- 13 Safety valve on nozzle return
- 14 Safety valve on nozzle return
- 15 Pressure switch on pump delivery
- B Oil valve assembly and pressure variator
- M Pressure gauge
- V Vacuumeter

#### OPERATION

Pre-purging phase:  
of closed valves 5), 6), 13) and 14).

Firing phase and operation:  
of opened valves 5), 6), 13) and 14).

Halt: All the valves closed.

### 5.12.6 Pump priming



**WARNING**

Before starting the burner, make sure that the tank return line is not clogged.

Obstructions in the line could cause the sealing organ located on the pump shaft to break.

- In order for self-priming to take place, one of the screw 4) (Fig. 22) of the pump must be loosened in order to bleed off the air contained in the suction line.
- Start the burner by closing the remote controls. Check the fan wheel rotation direction as soon as the burner starts.

- The pump can be considered primed when the light oil starts coming out of the screw 4). Stop the burner and screw screw 4) in.

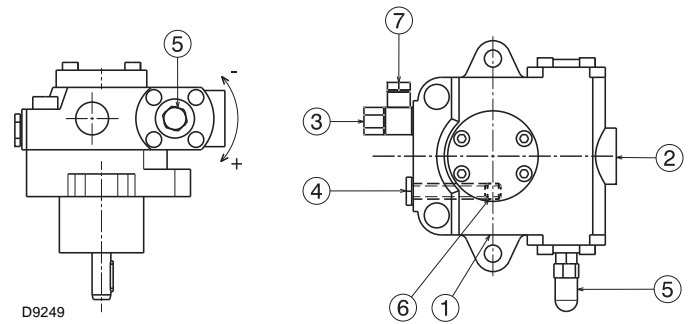


Fig. 22

#### Key to layout (Fig. 22)

- 1 Suction G 1/2"
- 2 Return G 1/2"
- 3 Pressure switch attachment G 1/4"
- 4 Vacuum meter connection G 1/4"
- 5 Pressure governor
- 6 Screw for by-pass
- 7 Pressure gauge connection G 1/4"

#### PUMP SUNTEC TA5

|  |             |
|--|-------------|
| Min delivery rate at 16,5 bar pressure | 560 kg/h    |
| Delivery pressure range                | 6 - 30 bar  |
| Max. suction depression                | 0,45 bar    |
| Viscosity range                        | 4 - 800 cSt |
| Light oil max. temperature             | 140 °C      |
| Max. suction and return pressure       | 5 bar       |
| Pressure calibration in the factory    | 22-20 bar   |

The time required for this operation depends upon the diameter and length of the suction tubing.

If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner, as often as required. After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

Do not illuminate the QRI cell or the burner will lock out; the burner should lock out anyway about 10 seconds after it starts.



**WARNING**

The a.m. operation is possible because the pump is already full of fuel when it leaves the factory. If the pump has been drained, fill it with fuel through the opening on the vacuum meter 4) (Fig. 22) prior to starting; otherwise, the pump will seize.

Whenever the length of the suction piping exceeds 20-30 meters, the supply line must be filled using a separate pump.



**5.13 Gas feeding**



Explosion danger due to fuel leaks in the presence of a flammable source.

Precautions: avoid knocking, attrition, sparks and heat.

Make sure the fuel interception tap is closed before performing any operation on the burner.



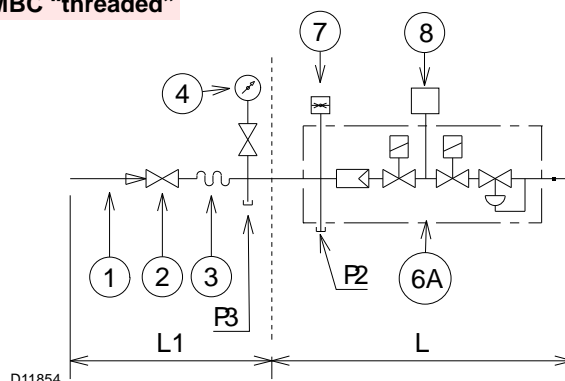
The fuel supply line must be installed by qualified personnel, in compliance with current standards and laws.

**5.13.1 Gas feeding line**

Key (Fig. 23 - Fig. 24 - Fig. 25 - Fig. 26)

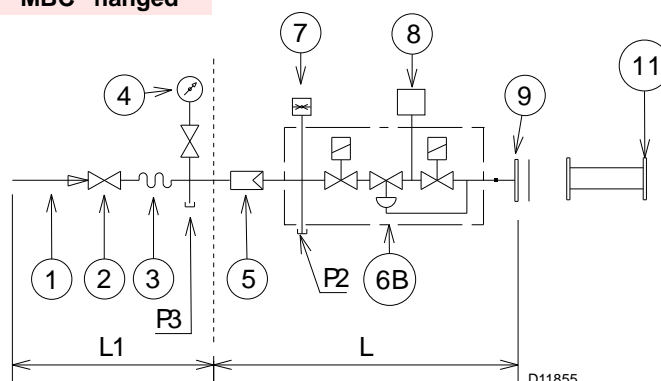
- 1 Gas input pipe
- 2 Manual valve
- 3 Vibration damping joint
- 4 Pressure gauge with pushbutton cock
- 5 Filter
- 6A Includes:
  - filter
  - working valve
  - safety valve
  - pressure adjuster
- 6B Includes
  - working valve
  - safety valve
  - pressure adjuster
- 6C Includes
  - safety valve
  - working valve
- 6D Includes:
  - safety valve
  - working valve
- 7 Minimum gas pressure switch
- 8 Leak detection control, provided as an accessory or integrated, based on the gas train code. In compliance with the EN 676 standard, the leak detection control is compulsory for burners with maximum outputs over 1200 kW.
- 9 Gasket, for "flanged" versions only
- 10 Pressure adjuster
- 11 Train-Burner adaptor, supplied separately
- P2 Upline pressure of valves/adjuster
- P3 Upstream pressure of the filter
- L Gas train, supplied separately
- L1 The responsibility of the installer

**MBC "threaded"**



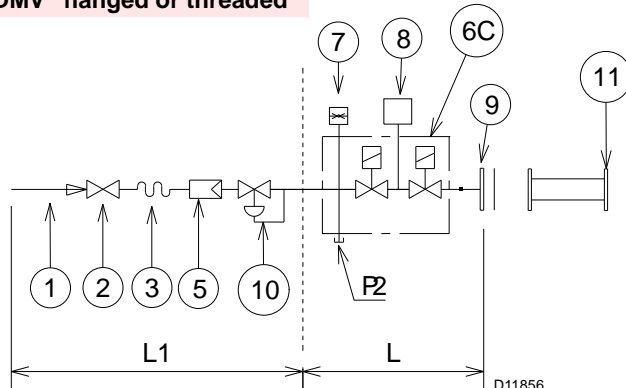
**Fig. 23**

**MBC "flanged"**



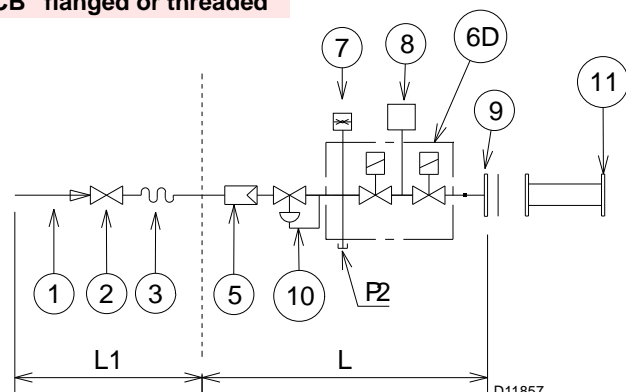
**Fig. 24**

**DMV "flanged or threaded"**



**Fig. 25**

**CB "flanged or threaded"**



**Fig. 26**

### 5.13.2 Gas train

Approved according to standard EN 676 and provided separately from the burner.

To select the correct gas train model, refer to the supplied "Burner-gas train combination" manual.

### 5.13.3 Gas train installation



Disconnect the electrical power using the main switch.



Check that there are no gas leaks.



Pay attention when handling the train: danger of crushing of limbs.



Make sure that the gas train is properly installed by checking for any fuel leaks.



The operator must use the required equipment during installation.

The gas train is to be connected on the right of the burner, by flange 1) (Fig. 27).

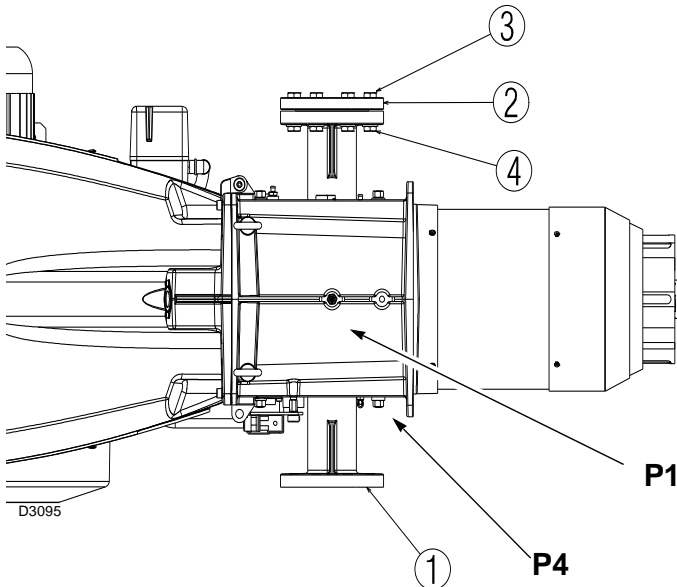


Fig. 27

### 5.13.4 Gas pressure

Tab. K indicates the pressure drop of the combustion head and the gas butterfly valve depending on the operating output of the burner.

| kW   | 1 Δp (mbar) |      | 2 Δp (mbar) |      |
|------|-------------|------|-------------|------|
|      | G 20        | G 25 | G 20        | G 25 |
| 3500 | 11,5        | 16,5 | 2,7         | 3,5  |
| 4000 | 15,2        | 22,3 | 3,6         | 4,6  |
| 4500 | 19,0        | 28,1 | 4,5         | 5,8  |
| 5000 | 22,7        | 33,9 | 5,5         | 7,2  |
| 5500 | 26,4        | 39,7 | 6,7         | 8,7  |
| 6000 | 30,2        | 45,5 | 8,0         | 10,3 |
| 6500 | 35,4        | 51,3 | 9,4         | 12,1 |
| 7000 | 38,9        | 57,9 | 10,9        | 14,0 |
| 7500 | 44,8        | 66,6 | 12,5        | 16,1 |
| 8000 | 50,6        | 75,4 | 14,2        | 18,3 |

Tab. K

The values shown in Tab. K refer to:

- Natural gas G 20 NCV 9.45 kWh/Sm<sup>3</sup> (8.2 Mcal/Sm<sup>3</sup>)
- Natural gas G 25 NCV 8.13 kWh/Sm<sup>3</sup> (7.0 Mcal/Sm<sup>3</sup>)

#### Column 1

Combustion head pressure drop.

Gas pressure measured at test point P1)(Fig. 28), with:

- combustion chamber at 0 mbar;
- burner working at maximum modulating output;
- combustion head set as on page 19.

#### Column 2

Pressure loss at gas butterfly valve P2)(Fig. 28) with maximum opening: 90°.

To calculate the approximate output at which the burner operates:

- subtract the combustion chamber pressure from the gas pressure measured at test point P1)(Fig. 28).
- Find, in Tab. K related to the burner concerned, the pressure value closest to the result of the subtraction.
- Read off the corresponding output on the left.

**Example with natural gas G20:**

Operation at maximum modulating output

Gas pressure at test point P1)(Fig. 28) = 35.2 mbar  
 Pressure in combustion chamber = 5 mbar  
 $35.2 - 5 = 30.2$  mbar

A pressure of 30.2 mbar, column 1, corresponds in Tab. K to an output of 6000 kW.

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

To calculate the required gas pressure at test point P1)(Fig. 28), set the maximum modulating output required from the burner operation:

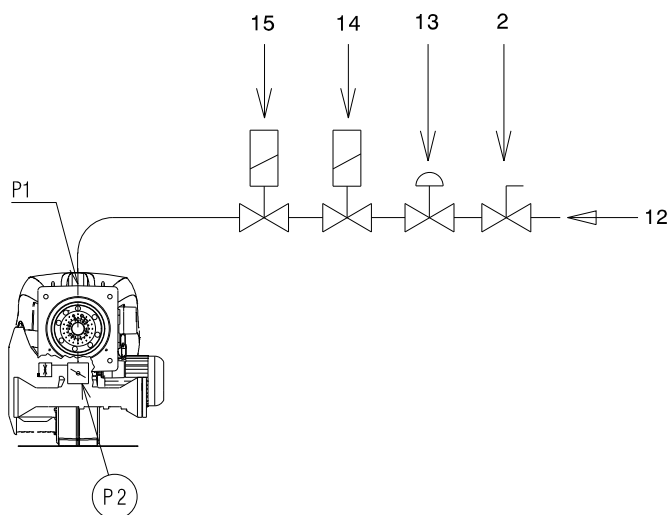
- find the nearest output value in Tab. K for the burner in question.
- Read, on the right (column 1), the pressure at the test point P1) (Fig. 28).
- Add this value to the estimated pressure in the combustion chamber.

**Example with natural gas G20:**

Operation at maximum modulating output

Gas pressure at an output of 6000 kW = 30.2 mbar  
 Pressure in combustion chamber = 5 mbar  
 $30.2 + 5 = 35.2$  mbar

pressure required at test point P1)(Fig. 28).



20070790

Fig. 28

Key (Fig. 28)

- P1 Pressure test point at the combustion head
- P2 Pressure test point at the gas butterfly valve
- 2 Manual on/off valve
- 12 Pilot gas supply
- 13 Pressure adjuster of pilot line
- 14 Safety valve
- 15 Operation valve

**5.13.5 Pilot - gas train connection**

The burner is fitted with a dedicated gas train that is fixed to the pipe coupling.

- It should be connected to the main train downstream the filter or the pressure adjuster (depending on configuration).

Oil burners (with LPG pilot) can be directly connected to the LPG cylinder.



Supply pressure  $68 \div 500$  mbar.

**5.13.6 Ignition pilot burner**

For proper operation, adjust gas pressure (measured at pressure test point 1)(Fig. 29) as follows: 16 mbar ( $7.3 \text{ Nm}^3/\text{h}$ ).



Check pilot flame stability before starting up the main burner.

In the case of ignition problems check:

- correct positioning of the ignition electrode;
- the gas pressure, according to indications.

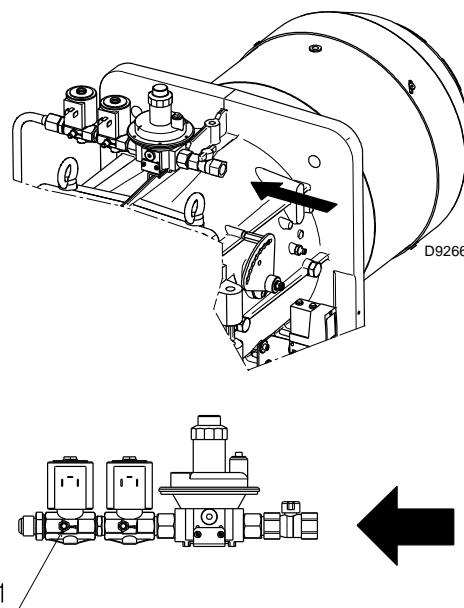


Fig. 29

**5.14 Electrical wiring**

**Notes on safety for the electrical wiring**



- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be made in accordance with the regulations currently in force in the country of destination and by qualified personnel. Refer to the wiring diagrams.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the wiring diagrams.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- The burner has been type-approved for intermittent use. This means they should compulsorily be stopped at least once every 24 hours to enable the control box to perform checks of its own start-up efficiency. Normally, burner stopping is guaranteed by the boiler's thermostat/pressure switch.
- If this is not the case, a time switch should be fitted in series to TL to stop the burner at least once every 24 hours. Refer to the wiring diagrams.
- The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards. It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel. Do not use the gas tubes as an earthing system for electrical devices.
- The electrical system must be suitable for the maximum power absorption of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for that level of power absorption.
- For the main power supply of the device from the electricity mains:
  - do not use adapters, multiple sockets or extensions;
  - use a multiple pole switch with at least a 3mm gap between the contacts (overvoltage category III), as envisaged by the present safety standards.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

Before carrying out any maintenance, cleaning or checking operations:



Disconnect the electrical supply from the burner by means of the main system switch.



Turn off the fuel interception tap.



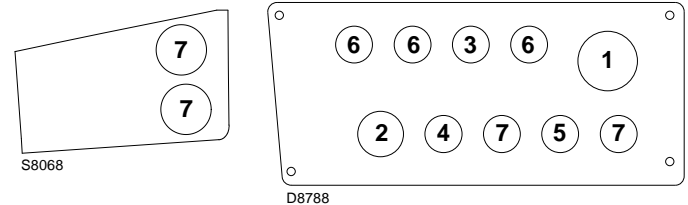
Avoid condensate, ice and water leaks from forming.

If the cover is still present, remove it and proceed with the electrical wiring according to the wiring diagrams.

Use flexible cables in compliance with the EN 60 335-1 standard.

**5.14.1 Supply cables and external connections passage**

All the cables to be connected to the burner are fed through the grommets, as shown in Fig. 30.



**Fig. 30**

**Key to layout (Fig. 30)**

- 1 Electrical supply
- 2 Fan motor
- 3 Minimum gas pressure switch
- 4 Pressure switch for gas leak detection control device VPS
- 5 Gas train
- 6 Triggering / Safety devices
- 7 Available



After carrying out maintenance, cleaning or checking operations, reassemble the hood and all the safety and protection devices of the burner.

### 5.15 Calibration of the thermal relay

The thermal relay (Fig. 31) is used to avoid damage to the motor owing to a strong increase in absorption or the lack of a phase.

For the calibration 2), refer to the table given in electrical layout (Electrical connections set by installer).

To reset, in the case of an intervention of the thermal relay, press the button "RESET" 1).

The button "STOP" 3) opens the NC (95-96) contact and stops the motor.

To test the thermal relay, insert a screwdriver in the window "TEST/TRIP" 4) and move it in the sense of the arrow (towards right)



**Automatic resetting can be dangerous.  
This action is not provided for the burner operation.**

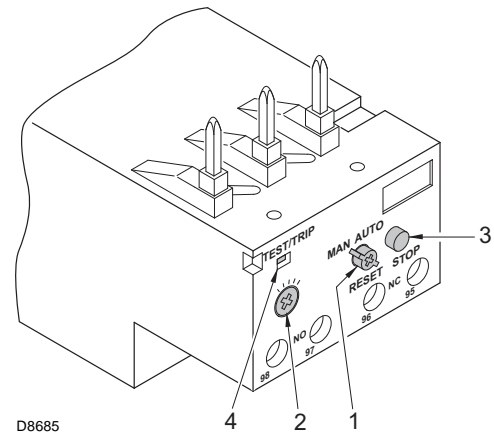


Fig. 31

**6 Start-up, calibration and operation of the burner**

**6.1 Notes on safety for the first start-up**



The first start-up of the burner must be carried out by qualified personnel, as indicated in this manual and in compliance with the standards and regulations of the laws in force.



Check the correct working of the adjustment, command and safety devices.

**6.2 Burner calibration**

It is advisable to first set the burner for operating on oil and then for gas.



**Execute the fuel exchange when the burner is off.**

The optimum calibration of the burner requires an analysis of the flue gases at the boiler outlet and interventions on the following points:

- **Nozzles**  
See the information listed on page 18.

- **Combustion head**  
The adjustment of the combustion head already carried out (page 19) need not be altered unless the 2nd stage delivery of the burner is changed.
- **Pump pressure:**  
In order to adjust pump pressure, use the relevant screw 5) (Fig. 22). See the information listed on page 18.
- **Fan air gate valve**  
See adjustments page 32 (Servomotor).

**6.3 Adjustments before first firing**

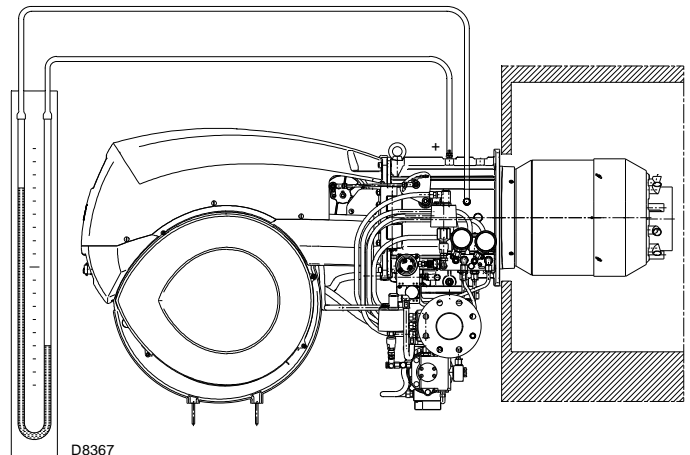
Adjustment of the combustion head has been illustrated on page 19.

In addition, the following adjustments must also be made:

- Slowly open the manual valves situated upstream of the gas train.
- Adjust the minimum gas pressure switch to the start of the scale.
- Adjust the maximum gas pressure switch to the start of the scale.
- Adjust the air pressure switch to the zero position of the scale.
- Purge the air from the gas line.  
Continue to purge the air (we recommend using a plastic tube routed outside the building) until gas is smelt.
- Fit a U-type manometer or a differential pressure gauge (Fig. 32), with the (+) fitting on the header gas pressure tap and (-) fitting in the combustion chamber.  
The manometer readings are used to calculate MAX. burner power using the table on page 24.
- Connect two lamps or testers to the two gas line solenoid valves to check the exact moment at which voltage is supplied. This operation is unnecessary if each of the two solenoid valves is equipped with a pilot light that signals voltage passing through.



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.



**Fig. 32**

### 6.4 Burner starting

Close load controls and set switch 1) (Fig. 33) to "MAN".

Make sure that the lamps or testers connected to the solenoids, or pilot lights on the solenoids themselves, indicate that no voltage is present. If voltage is present, then immediately stop the burner and check electrical connections.

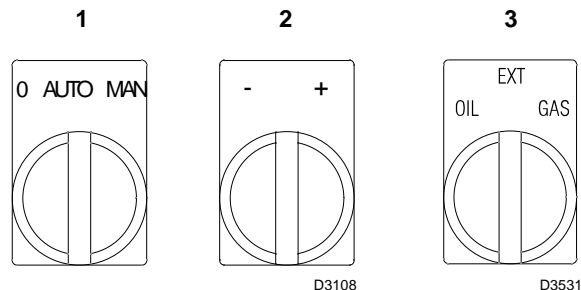


Fig. 33

### 6.5 Burner firing

Having completed the checks indicated in the previous heading, the burner should fire.

If the motor starts but the flame does not appear and the control box goes into lock-out, reset and wait for a new firing attempt.

If firing is still not achieved, it may be that gas is not reaching the combustion head within the safety time period of 3 seconds.

In this case increase gas firing delivery.

The arrival of gas at the sleeve is indicated by the U-type manometer (Fig. 32).

After burner firing a complete burner adjustment should be performed.

### 6.6 Fuel change

There are two possible options for changing fuel:

- 1 using selector 3) (Fig. 33);
- 2 using a remote selector connected to the main terminal board.

By setting selector 3) (Fig. 33) to EXT, you activate the remote fuel selection facility.

In this position, if no remote selector is fitted, the display shows the priority fuel.

### 6.7 Combustion air adjustment

Fuel/combustion air is synchronised by means of a servomotor connected to two variable-profile cams which operate the air delivery 1) (Fig. 34) and fuel delivery 2) (Fig. 34) dampers and, by means of suitable leverages, the combustion head.

To reduce pressure loss and to have a wider adjustment range, it is best to set the servomotor to the maximum output used, as near to maximum opening (130°) as possible.

On the gas butterfly valve, the fuel's partial setting adjustment based on required output, with the servomotor fully open, is made by using the pressure stabilizer on the train.

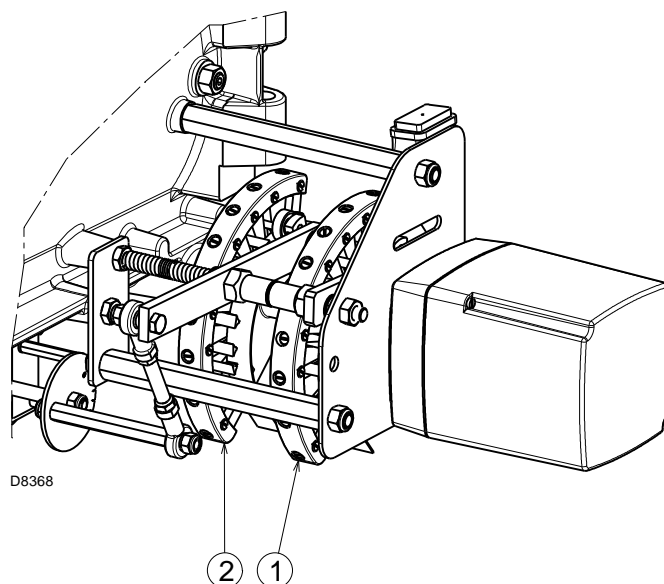
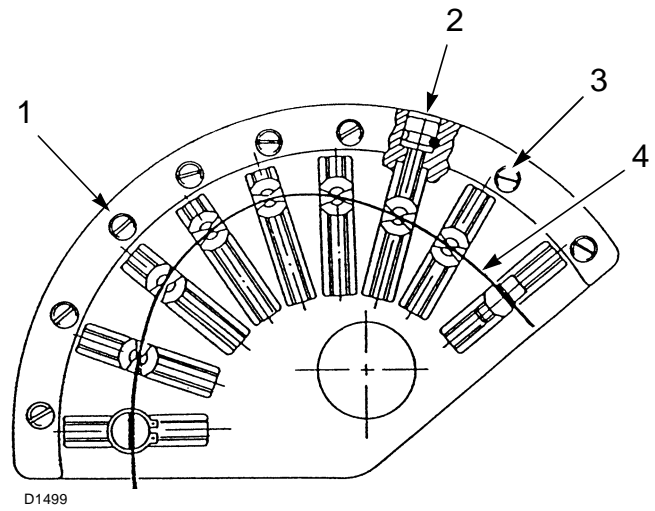


Fig. 34

The value reported in the table can be a reference for a good combustion setting.

| EN 676 |  | Excess air                       |                 |                                  |
|--------|--|----------------------------------|-----------------|----------------------------------|
|        |  | Max output<br>$\lambda \leq 1,2$ |                 | Min output<br>$\lambda \leq 1,3$ |
| GAS    | Theoretical max. CO <sub>2</sub><br>0 % O <sub>2</sub> | Calibration CO <sub>2</sub> %    |                 | CO<br>mg/kWh                     |
|        |  | $\lambda = 1,2$                  | $\lambda = 1,3$ |                                  |
| G 20   | 11,7   | 9,7                              | 9.0             | ≤ 100                            |
| G 25   | 11,5   | 9,5                              | 8.8             | ≤ 100                            |
| G 30   | 14.0   | 11,6                             | 10,7            | ≤ 100                            |
| G 31   | 13,7   | 11,4                             | 10.5            | ≤ 100                            |

| EN 267   |  | Excess air                       |                 |                                  |
|--|--|----------------------------------|-----------------|----------------------------------|
|  |  | Max output<br>$\lambda \leq 1,2$ |                 | Min output<br>$\lambda \leq 1,3$ |
| Theoretical max. CO <sub>2</sub><br>0 % O <sub>2</sub> |  | Calibration CO <sub>2</sub> %    |                 | CO<br>mg/kWh                     |
|  |  | $\lambda = 1,2$                  | $\lambda = 1,3$ |                                  |
| 15,2   |  | 12,6                             | 11,5            | ≤ 100                            |



**Fig. 35**

**Key to layout (Fig. 35)**

- 1 Cam
- 2 Adjustment screws
- 3 Fixing screws
- 4 Variable profile

**6.7.1 Maximum output**

Set the servomotor to maximum opening so that the air dampers are fully open.

**6.7.2 Minimum output**

Max output of the burner must be set within the firing rate range shown on page 10.

Turn the "decrease output" selector 2) (Fig. 33) and keep it turned towards "-" until the servomotor has closed the air damper and the gas butterfly valve is at 35° (factory setting).

**Adjustment of air delivery**

Progressively adjust the starting profile of cam 1) (Fig. 35) by turning the screws 2) (Fig. 35).

It is preferable not to turn the first screw since this is used to set the air gate valve to its fully-closed position.

**6.7.3 Intermediate outputs**

Once you have adjusted the burner's maximum and minimum output, the next step is to adjust air and gas at the various intermediate servomotor positions.

You can switch from one position to the next by holding selector 2) (Fig. 33) on the (+) or (-) symbol.

For improved adjustment repeatability, make sure you stop rotation of the cam assembly when the upper bearing running on the profile 4) (Fig. 35) is aligned with one of the adjusting screws 2) (Fig. 35).

Tighten or loosen the preselected screw 2) (Fig. 35) to increase or decrease airflow so as to adapt it to the corresponding gas flow.

Once output adjustments (maximum, medium and intermediate) have been carried out, it is important you secure all the air regulation screws 2) (Fig. 35) with the locking screws 3) (Fig. 35) so as to prevent possible shifting of air-gas setting positions.



**6.8 Air/fuel adjustment**

When setting the air/fuel ratio for oil burners, the following adjustments must be made:

- A Delivery pressure of the oil pump:**  
turn the screw 5) (Fig. 22), on the pump.
- B Air cam:**  
turn the threaded regulators 2) (Fig. 35) after loosening the screws 3) (Fig. 35).
- C Gas cam:**  
adjust set screws 2) (Fig. 35) after loosening the screws 3) (Fig. 35).
- D Oil cam:**  
change eccentricity by turning the screw 4) (Fig. 36) after loosening the screws 7) (Fig. 36).  
By tightening the screw 4) (Fig. 36) eccentricity increases, in this way the difference increases between maximum and minimum return pressure to the nozzle.

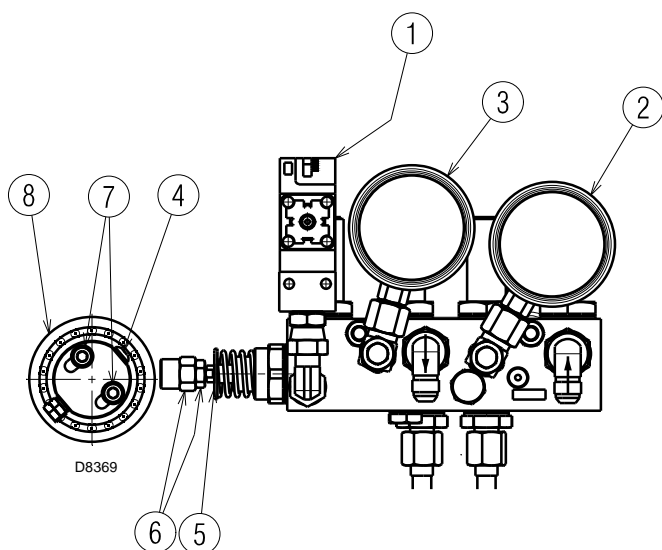


Fig. 36

**Key to layout (Fig. 36)**

- 1 Maximum oil pressure switch
- 2 Manometer for pressure in delivery line
- 3 Manometer for pressure in return line
- 4 Eccentric adjusting screw
- 5 Ring for piston stop
- 6 Nut and lock-nut for piston setting
- 7 Eccentric locking screws
- 8 Variable eccentric

**Procedures for setting the burner**

- Fit the suitable nozzle to obtain the maximum required delivery.
- Check that the eccentricity of the oil cam is sufficient for a run of approx. 8 mm for the oil modulator shaft. Normally, with an 8 mm run for the shaft, the pressure variation required for modulating the output from minimum to maximum is obtained.  
To carry out this control, manually turn the cam after releasing the servomotor using the lever 7)(Fig. 37), so that the shaft run is not excessive or insufficient. When the control is terminated, remember to block the servomotor.
- Ignite the burner with the selector switch on the control panel in the manual position 1)(Fig. 33).  
At this point, after the pre-ventilation phase, the servomotor will stop at approx. 20°.
- Adjust the pump delivery pressure as given in point **A (delivery pressure of the oil pump)**, to obtain a delivery pressure of 24 - 25 bar.
- Adjust the return pressure to a minimum of approx. 6 bar. To do this, the length of the shaft 5)(Fig. 36) must be adjusted, by turning the nut 6)(Fig. 36).
- Proceed with setting the air delivery by adjusting the variable profile cam, by turning the screws 2)(Fig. 35).
- After this first adjustment, increase supply output using the automatic return selection switch on the control panel. Stop when the servomotor has turned by 15° and then effect a new adjustment using the variable profile air cam.  
We recommend sufficient setting so as not to create a smoky flame and to reach maximum output as soon as possible (maximum run for the servomotor 130°): set the return pressure on the eccentric (screw 4, Fig. 36) to obtain the output required by the nozzle and then continue with setting the intermediate levels.
- Check the levels of the combustion parameters at the various modulation outputs and adjust if necessary.
- Move selector 3)(Fig. 33) to **GAS** and check the correct operation on gas at the desired power.  
If operation was not correct, calibrate gas cam according to the above mentioned point **C (Gas cam)**.
- When perfect adjustment has been reached, remember to block the adjustment screws of the cam profiles by tightening the screws 3)(Fig. 35).



**WARNING**

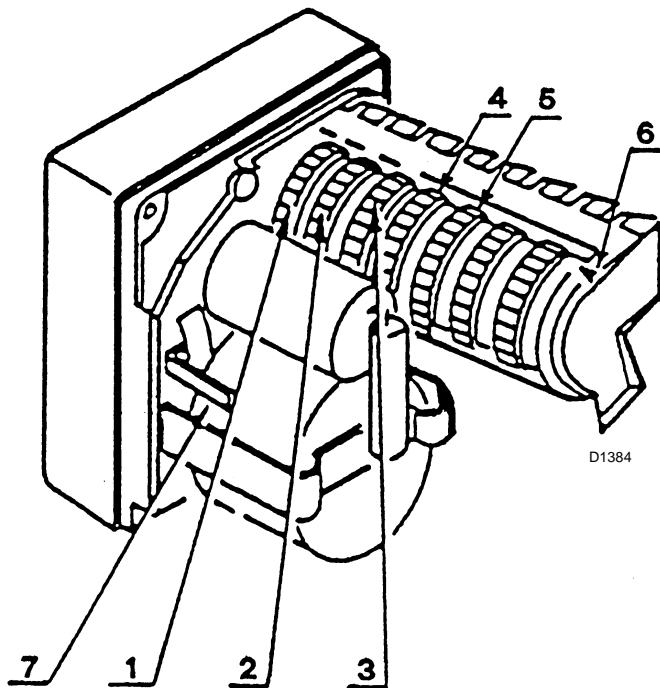
When setting the cams, do not exceed the servomotor run limits 0° ÷ 130°, to avoid crawling. Check, by effecting a manual movement of the cam of 0-130°, that there are no mechanical blocks before the micro-switches 1-2 on the servomotor trigger.

**6.9 Servomotor**

The servomotor (Fig. 37) simultaneously regulates, through a transmission system, air delivery and pressure and delivery of the fuel in use.

It is fitted with adjustable cams which drive a similar number of selector switches.

- Cam 1:** Sets the servomotor limit switch to max. position (130° ca.). (Oil operation).
- Cam 2:** Sets the servomotor limit switch to 0° position. When the burner is off, the air damper is completely closed. (Oil and gas operation).
- Cam 3:** Regulates minimum modulation delivery. It is factory calibrated in the 45°. (Oil operation at minimum).
- Cam 4:** Sets the servomotor limit switch to max. position (130° ca.). (Gas operation).
- Cam 5:** Regulates minimum modulation delivery. It is factory calibrated in the 45°. (Gas operation).
- Rem. cam:** No utilized.
- Lever 7:** Servomotor release.



D1384

**Fig. 37**

**6.10 Adjustment pressure switches**

**6.10.1 Air pressure switch - CO check**

Adjust the air pressure switch after having performed all other burner adjustments with the air pressure switch set to the start of the scale (Fig. 38).

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

Then turn the knob 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 knob anti-clockwise a little bit more.

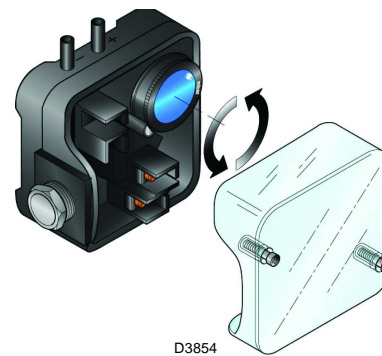


**WARNING**

As a rule, the air pressure switch must prevent the air pressure from lowering below 80% of the adjustment value as well as preventing the CO in the fumes from exceeding 1% (10,000 ppm).

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 1%.

The air pressure switch is fitted in an “absolute” mode, that is, connected only to the pressure test point “+” 22)(Fig. 4).



**Fig. 38**

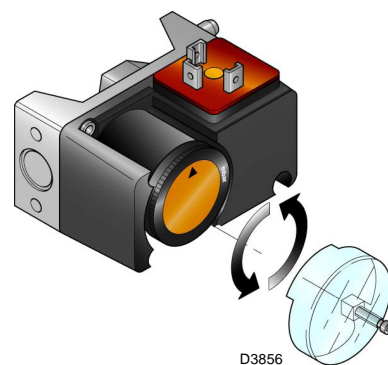
**6.10.2 Max. gas pressure switch**

Adjust the maximum gas pressure switch after having performed all the other burner adjustments with the pressure switch set at the end of the scale (Fig. 39).

With the burner operating at maximum output, decrease adjustment pressure by slowly turning the relative knob anti-clockwise until the burner locks out.

Then turn the knob clockwise by 0,2 kPa (2 mbar) and repeat burner starting to ensure it is uniform.

If the burner locks out again, turn the knob anti-clockwise again by 0,1 kPa (1 mbar).



**Fig. 39**

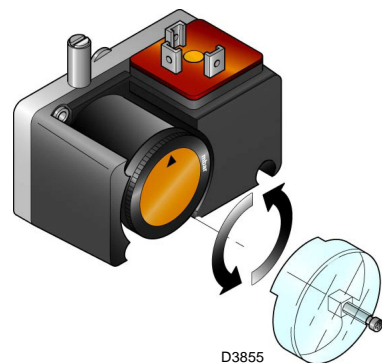
**6.10.3 Min. gas pressure switch**

Adjust the minimum gas pressure switch after having performed all the other burner adjustments with the pressure switch set at the start of the scale (Fig. 40).

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

Then turn the knob anti-clockwise by 0,2 kPa (2 mbar) and repeat burner starting to ensure it is uniform.

If the burner locks out again, turn the knob anti-clockwise again by 0,1 kPa (1 mbar).



**Fig. 40**



**WARNING**

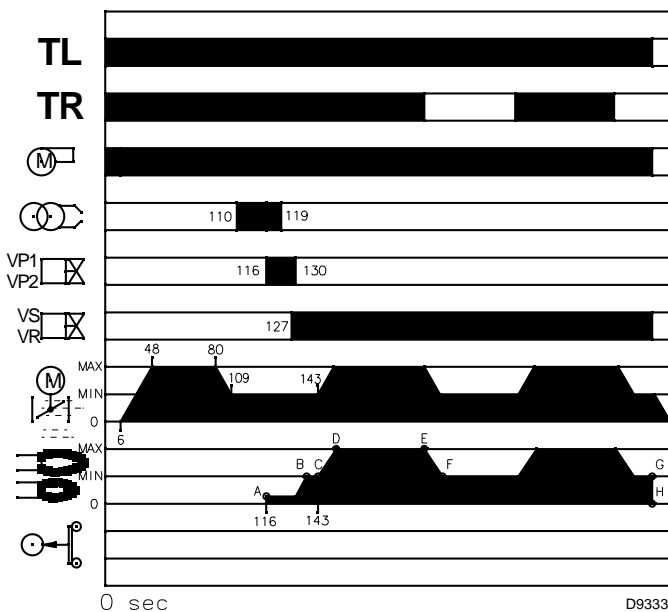
1 kPa = 10 mbar

**6.11 Operation sequence of the burner**

**6.11.1 Burner starting**

- 0s : Thermostat/pressure switch TL closes.  
Fan motor starts.
- 6s : Motor starts. Servomotor starts: 130° rotation to right, until contact is made on cam 1) with light oil operation, or cam 4) with gas operation.
- 48s The air gate valve is positioned on MAX. output. Pre-purge stage with air delivery at MAX. output.
- 80s : Servomotor rotates to left up to the angle set on cam 3). with light oil operation, or cam 5) with gas operation.
- 109s : The air gate valve and the gas butterfly are positioned to MIN. output.
- 113 s : Ignition electrode strikes a spark.
- 116s Pilot valve VP1 and VP2 open.  
The flame is ignited at a low output level point A (Fig. 41).
- 119 s :The spark goes out.
- 130s : Safety valve VS and adjustment valve VR (rapid stroke) open.  
Delivery is then progressively increased, with the valve opening slowly up to MIN output, point B (Fig. 41).
- 143s : The control box starting cycle ends.

**NORMAL FIRING**



**Fig. 41**

**6.11.2 Steady state operation**

► Burner without output regulator RWF40

At the end of the starting cycle, the servomotor control then passes to the thermostat/pressure switch TR for boiler pressure or temperature point C (Fig. 41).

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

- If the temperature or pressure is low (and the thermostat/pressure switch TR is consequently closed), the burner progressively increases its output to the MAX. value, (section C-D).
- If subsequently the temperature or pressure increases until thermostat/pressure switch TR opens, the burner progressively decreases its output to the MIN. value (section E-F). And so on.
- The burner locks out when demand for heat is less than the heat supplied by the burner at min. output (section G-H). Thermostat/pressure switch TL opens. The servomotor returns to the 0° angle limited by contact with cam 2). The gate valve closes completely to reduce thermal dispersion to a minimum.

Every time output is changed, the servomotor automatically modifies gas delivery (gas butterfly valve), air delivery (fan gate valve) and air pressure (2 shutters in the combustion head).

► Burner with output regulator RWF40

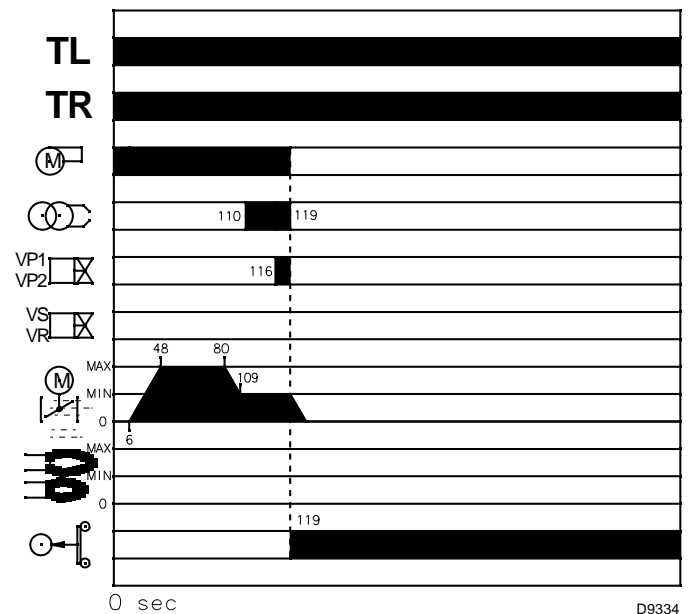
See the handbook enclosed with the regulator.

**6.11.3 Undesired shutdown during operation**

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





**6.11.4 Firing failure**

If the burner does not fire, it goes into lock-out within (Fig. 42) 3 s of the opening of the gas solenoid valve and 119 s after the closing of control device TL.



**Fig. 42**

**6.12 Final checks (with burner operating)**

|   |   |   |
|---|---|---|
| <ul style="list-style-type: none"> <li>➤ Open the thermostat/pressure switch TL</li> <li>➤ Open the thermostat/pressure switch TS</li> </ul>  |  | The burner must stop                                    |
| <ul style="list-style-type: none"> <li>➤ Turn the gas maximum pressure switch knob to the minimum end of scale position</li> <li>➤ Turn the air pressure switch to the maximum end of scale position</li> </ul> |  | The burner must stop in lockout                         |
| <ul style="list-style-type: none"> <li>➤ Turn off the burner and cut off the power</li> <li>➤ Disconnect the minimum gas pressure switch connector</li> </ul>   |  | The burner must not start                               |
| <ul style="list-style-type: none"> <li>➤ Disconnect the UV probe wire</li> </ul>  |  | The burner must stop in lockout due to ignition failure |

**Tab. L**



Make sure that the mechanical locking systems on the various adjustment devices are fully tightened.

**7 Maintenance**

**7.1 Notes on safety for the maintenance**

The periodic maintenance is essential for the good operation, safety, yield and duration of the burner.

It allows you to reduce consumption and polluting emissions and to keep the product in a reliable state over time.



The maintenance interventions and the calibration of the burner must only be carried out by qualified, authorised personnel, in accordance with the contents of this manual and in compliance with the standards and regulations of current laws.

Before carrying out any maintenance, cleaning or checking operations:



Disconnect the electrical supply from the burner by means of the main system switch.



Turn off the fuel interception tap.



Wait for the components in contact with heat sources to cool down completely.

**7.2 Maintenance programme**

**7.2.1 Maintenance frequency**



The gas combustion system should be checked at least once a year by a representative of the manufacturer or another specialised technician.

**7.2.2 Checking and cleaning**



The operator must use the required equipment during 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.

**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.

**Current to the UV photocell (Fig. 43)**

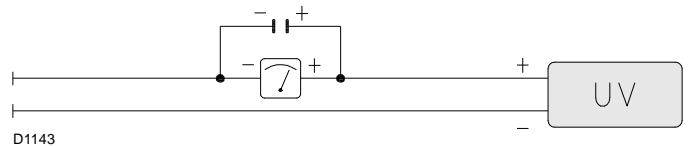
Clean the glass cover from any dust that may have accumulated. Photocell is held in position by a pressure fit and can therefore be removed by pulling it outward forcefully.

Min value for a good work: 70 µA.

If the value is lower, it can depend on:

- exhausted photocell
- low current (lower than 187 V)
- bad regulation of the burner.

In order to measure the current, use a microammeter of 100 µA c.c., connected to the photocell, as in the scheme, with a capacitor of 100 µF - 1V c.c. at the same level of the instrument.



**Fig. 43**

**Burner**

Check for excess wear or loose screws, especially on cams 3) (Fig. 35).

Clean the outside of the burner.

Clean and grease the cam variable profile.

**Fan**

Check to make sure that no dust has accumulated inside the fan or on its blades, as this condition will cause a reduction in the air flow rate and provoke polluting combustion.

**Boiler**

Clean the boiler as indicated in its accompanying instructions in order to maintain all the original combustion characteristics intact, especially the flue gas temperature and combustion chamber pressure.

**LIGHT OIL OPERATION**

**Filters (Fig. 44)**

Check the filtering baskets on line 1) and at nozzle 2) present in the system.

Clean or replace if necessary.

If rust or other impurities are observed inside the pump, use a separate pump to lift any water and other impurities that may have deposited on the bottom of the tank.

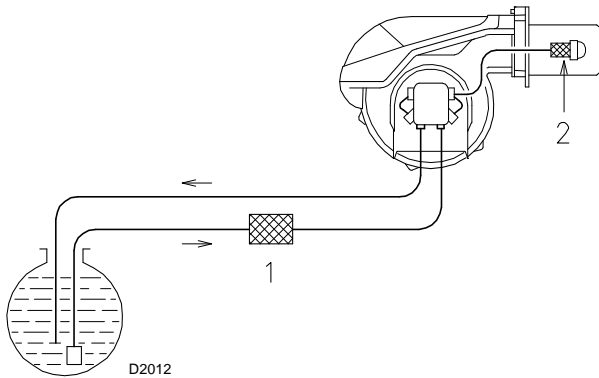


Fig. 44

**Pump**

Delivery pressure must correspond with the table on page 18.

The depression must be less than 0.45 bar.

Unusual noise must not be evident during pump operation.

If the pressure is found to be unstable or if the pump runs noisily, the flexible hose must be detached from the line filter and the fuel must be sucked from a tank located near the burner. This measure permits the cause of the anomaly to be traced to either the suction line or the pump.

If the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping.

**Nozzles**

It is advisable to replace nozzles every year during regular maintenance operations.

Do not clean the nozzle openings; do not even open them.

**Flexible hoses**

Check to make sure that the flexible hoses are still in good condition.

**Fuel tank**

Approximately every 5 years, or whenever necessary, suck any water or other impurities present on the bottom of the tank using a separate pump.

**Combustion**

In case the combustion values found at the beginning of the intervention do not respect the standards in force or, in any case, do not correspond to a proper combustion, contact the Technical Assistant and have him carry out the necessary adjustments.

**GAS OPERATION**

**Gas leaks**

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

**Gas filter**

Change the gas filter when it is dirty.

**Combustion**

In case the combustion values found at the beginning of the intervention do not respect the standards in force or, in any case, do not correspond to a proper combustion, contact the Technical Assistant and have him carry out the necessary adjustments.

| EN 676 |   | Excess air                       |                 |                                  |
|--------|---|----------------------------------|-----------------|----------------------------------|
|        |   | Max output<br>$\lambda \leq 1,2$ |                 | Min output<br>$\lambda \leq 1,3$ |
| GAS    | Theoretical max.<br>CO <sub>2</sub><br>0 % O <sub>2</sub> | Calibration<br>CO <sub>2</sub> % |                 | CO<br>mg/kWh                     |
|        |   | $\lambda = 1,2$                  | $\lambda = 1,3$ |                                  |
| G 20   | 11,7  | 9,7                              | 9,0             | ≤ 100                            |
| G 25   | 11,5  | 9,5                              | 8,8             | ≤ 100                            |
| G 30   | 14,0  | 11,6                             | 10,7            | ≤ 100                            |
| G 31   | 13,7  | 11,4                             | 10,5            | ≤ 100                            |

| EN 267   | Excess air                       |                 |                                  |
|--|----------------------------------|-----------------|----------------------------------|
|  | Max output<br>$\lambda \leq 1,2$ |                 | Min output<br>$\lambda \leq 1,3$ |
| Theoretical max. CO <sub>2</sub><br>0 % O <sub>2</sub> | Calibration CO <sub>2</sub> %    |                 | CO<br>mg/kWh                     |
|  | $\lambda = 1,2$                  | $\lambda = 1,3$ |                                  |
| 15,2   | 12,6                             | 11,5            | ≤ 100                            |

**7.3 Opening the burner**



Disconnect the electrical supply from the burner by means of the main system switch.

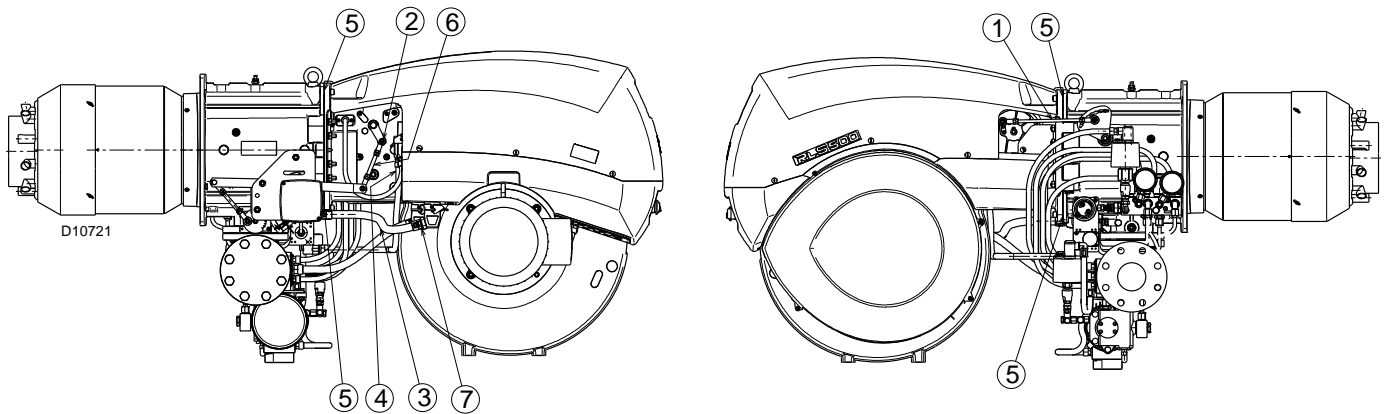


Turn off the fuel interception tap.



Wait for the components in contact with heat sources to cool down completely.

- Remove the tie rods 1) and 6) (Fig. 45) of the head movement and damper opening lever by loosening nuts 2).
- Disconnect servomotor socket 3).
- Disconnect derivation unit socket 7).
- Disconnect the gas pressure switch socket 4).
- Remove screws 5).
- At this point it is possible to open the burner at the hinge.



**Fig. 45**

**7.4 Closing the burner**

Refit following the steps described but in reverse order; refit all burner components as they were originally assembled.



After carrying out maintenance, cleaning or checking operations, reassemble the hood and all the safety and protection devices of the burner.



**8** Faults - Possible causes - Solutions

The LFL1.333RL control box is equipped with a lockout indicator (Fig. 46) that turns during the start-up programme, and is visible from the small lockout window.

When the burner does not start or stops, due to a failure, the symbol that appears on the indicator indicates the type of interruption.

The positions of the lockout indicator are shown in Fig. 47.



**Lockout indicator**

- a-b Start-up sequence
- b-b' Idle stages (without contact confirmation)
- b(b')-a Post-purging programme

Fig. 46

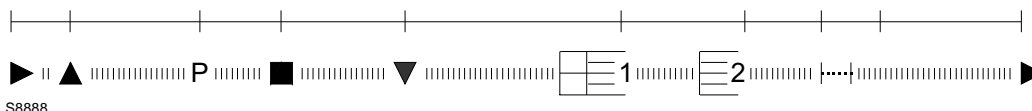


Fig. 47

**Fuse replacement**

The fuse 2)(Fig. 48) is in the rear part of the control box. A spare fuse 1) is also available: it can be extracted after breaking the panel tab A) that houses it. In the event that fuse 2) has been tripped, replace it as shown in Fig. 48.

Find a list of faults, causes and possible solutions for a set of failures that may occur and result in irregular burner operation or no functioning at all.

If a burner malfunction is detected, first of all:

- check that the electrical wiring is adequately connected;
- check whether fuel is delivered;
- check that every adjustment parameter is adequately set.



**WARNING**

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.



**DANGER**

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).

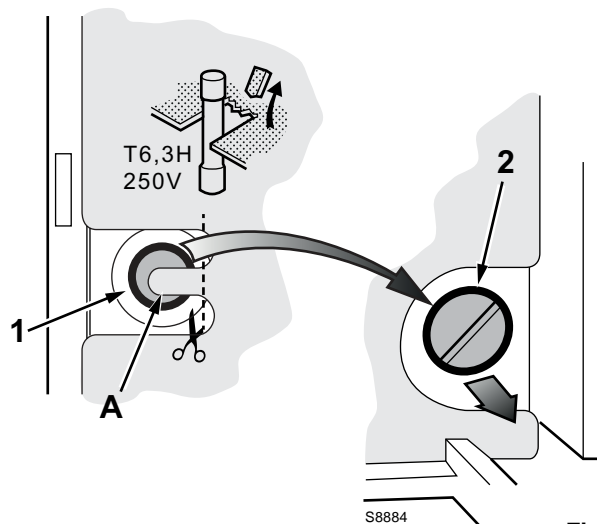


Fig. 48

### 8.1 Gas operation

| SYMBOL                                 | FAULT  | PROBABLE CAUSE  | SUGGESTED REMEDY                               |
|--|--|---|--|
| ◀                                      | The burner does not start  | No electrical power supply  | Close all switches and check connections       |
|  |  | A limiter or safety control device is open                        | Adjust or replace                              |
|  |  | Control box lock-out  | Reset control box                              |
|  |  | Control box fuse blown  | Replace (2)                                    |
|  |  | Erroneous electrical connections                                  | Check  |
|  |  | Defective control box   | Replace  |
|  |  | No gas supply   | Open the manual valves between meter and train |
|  |  | Mains gas pressure insufficient                                   | Contact your GAS COMPANY                       |
|  |  | Minimum gas pressure switch fails to close                        | Adjust or replace                              |
|  |  | Air pressure switch in operating position                         | Adjust or replace                              |
|  | Contact (locking cam) of servomotor does not operate   | Adjust locking cam or replace servomotor                          |  |
|  | The burner does not start and a function lock-out occurs                                       | Flame simulation  | Replace control box                            |
| Defective motor command control device |  | Replace   |  |
| Defective electrical motor             |  | Replace   |  |
| Motor protection tripped               |  | Reset thermal cut-out   |  |
| ▲                                      | The burner starts but stops at maximum air damper setting                                      | Contact of servomotor does not operate (Cam-max. opening)         | Adjust cam (max.) or replace servomotor        |
| P                                      | The burner starts and then goes into lock-out  | Air pressure switch inoperative due to insufficient air pressure: |  |
|  |  | Air pressure switch adjusted badly                                | Adjust or replace                              |
|  |  | Pressure switch pressure point pipe blocked                       | Clean  |
|  |  | Poorly adjusted head  | Adjust   |
|  |  | Dirty fan   | Clean  |
|  |  | High negative draft in chamber                                    | Ask our technical office                       |
| ■                                      | The burner starts and then goes into lock-out  | Fault in flame detection circuit                                  | Replace control box                            |
| ▼                                      | The burner remains in pre-purging phase  | Contact servomotor does not operate (Minimum cam)                 | Adjust cam (minimum) or replace servomotor     |
| 1                                      | After pre-purge and the safety time, the burner goes to lock-out and the flame does not appear | The solenoid VP1 allows little gas through                        | Increase                                       |
|  |  | Solenoid valves VP1 or VP2 fail to open                           | Renew the coil or rectifier panel              |
|  |  | Gas pressure too low  | Increase pressure at governor                  |
|  |  | Ignition electrode wrongly adjusted                               | Adjust   |
|  |  | Grounded electrode due to broken insulation                       | Replace  |
|  |  | High voltage cable defective or grounded                          | Replace  |
|  |  | High voltage cable deformed by high temperature                   | Replace and protect                            |
|  |  | Ignition transformer defective                                    | Replace  |
|  |  | Erroneous valves or transformer electrical connections            | Repeat connection                              |
|  |  | Defective control box   | Replace  |
|  |  | A cock down-line of the gas train is closed                       | Open   |
|  |  | Air in pipework   | Bleed air                                      |
|  | The burner goes to lock-out right after flame appearance                                       | The solenoid VP1 or VP2 allows little gas through                 | Increase                                       |
|  |  | Dirty flame sensor  | Check, replace flame sensor                    |
|  |  | Defective connection  | Check, replace flame sensor                    |
|  |  | Insufficient defection current (min.70 µA)                        | Measure current, replace flame sensor          |
|  |  | Exhausted, defective flame sensor                                 | Replace  |
|  |  | Max. gas pressure switch operates                                 | Adjust or replace                              |
| Defective control box                  | Replace  |   |  |

| SYMBOL | FAULT  | PROBABLE CAUSE   | SUGGESTED REMEDY   |
|--------|--|--|--|
|        | The burner repeats the starting cycle without lock out | Mains gas pressure is near the valve to which the min. gas pressure switch gas is adjusted. The repeated drop in pressure which follows valve opening causes temporary opening of the pressure switch itself, the valve immediately closes and the burner comes to a halt. Pressure increases again, the pressure switch closes again and the firing cycle is repeated. And so on. | Reduce operating pressure of minimum gas pressure switch. Replace gas filter |
|        | Lock out without symbol indication                     | Flame simulation   | Replace control box  |
|        | During operation, the burner stops in lock out         | Defective flame sensor   | Replace worn parts   |
|        |  | Fault on air pressure switch   | Replace  |
|        |  | Max. gas pressure switch operates  | Adjust or replace  |
| ◀      | Lock out when burner stops                             | Flame remains in combustion head or flame simulation   | Eliminate persistence of flame or replace control box                        |
|        | Ignition with pulsation                                | Poorly adjusted head   | Adjust   |
|        |  | Ignition electrode wrongly adjusted  | Adjust   |
|        |  | Poorly adjusted fan air gate: too much air   | Adjust   |
|        |  | Output during ionisation phase is too high   | Reduce   |

Tab. M

**8.2 Light oil operation**

| SYMBOL                                   | FAULT  | PROBABLE CAUSE  | SUGGESTED REMEDY                                 |
|--|--|---|--|
| ◀  | The burner does not start  | A limit or safety control device is open                              | Adjust or replace                                |
|  |  | Control box lock-out  | Reset  |
|  |  | Fan motor blocked   | Reset thermal cut-out                            |
|  |  | Oil pressure switch intervenes  | Adjust pressure switch or eliminate overpressure |
|  |  | No electrical power supply  | Close all switches - Check connections           |
|  |  | No light oil  | Check the light oil supply circuit               |
|  |  | Control box fuse blown  | Replace  |
|  |  | Pump is jammed  | Replace  |
|  |  | Defective motor command control device                                | Replace  |
|  |  | Defective control box   | Replace  |
|  |  | Defective electrical motor  | Replace  |
|  |  | The pilot burner does not work  | Check  |
|  |  | Defective safety solenoid valve                                       | Replace  |
|  | Defective oil modulator  | Recondition or replace  |  |
|  | The burner does not start and a function lock-out occurs                                       | Flame simulation  | Replace control box                              |
| Photocell short-circuit                  |  | Replace photocell   |  |
| 2-phase power supply thermal relay trips |  | Reset thermal cut-out when third phase is re-connected                |  |
| ▲  | The burner starts but stops at maximum air damper setting                                      | Contact 1 of servomotor does not operate control box terminals 9-8    | Adjust cam I or replace servomotor               |
| P  | The burner starts and then goes into lock-out  | Air pressure switch adjusted badly                                    | Adjust   |
|  |  | Pressure switch pressure point pipe blocked                           | Clean  |
| ■  | The burner starts and then goes into lock-out  | Fault in flame detection circuit                                      | Replace control box                              |
| ▼  | The burner remains in pre-purging phase  | Contact III of servomotor does not operate control box terminals 10-8 | Adjust cam III or replace servomotor             |
| 1  | After pre-purge and the safety time, the burner goes to lock-out and the flame does not appear | The solenoid VP1 allows little gas through                            | Increase   |
|  |  | Solenoid valves VP1 or VP2 fail to open                               | Renew the coil or rectifier panel                |
|  |  | No fuel in tank; water on tank bottom                                 | Top up fuel level or suck up water               |
|  |  | Inappropriate head and air gate valve adjustments                     | Adjust   |
|  |  | High voltage cable defective or grounded                              | Replace  |
|  |  | High voltage cable deformed by high temperature                       | Replace and protect                              |
|  |  | Erroneous valves or transformer electrical connections                | Check  |
|  |  | Pump unprimed   | Prime  |
|  |  | Pump suction line connected to return line                            | Correct connection                               |
|  |  | Filters dirty (on line 1 at the nozzle)                               | Clean  |
|  |  | Valves up-line from pump closed                                       | Open   |
|  |  | Incorrect motor rotation direction                                    | Change motor electrical connections              |
|  |  | Light oil solenoid valves fail to open                                | Check the connections and the solenoid valves    |
|  |  | Nozzle clogged, dirty, or deformed                                    | Clean or replace                                 |
|  |  | The pilot burner does not work  | Check  |
|  |  | Defective control box   | Replace  |
|  |  | Ignition electrode wrongly adjusted                                   | Adjust   |
|  |  | Grounded electrode due to broken insulation                           | Replace  |
|  |  | Pump/motor coupling broken  | Replace  |
|  |  | Ignition transformer defective  | Replace  |
|  | The flame ignites normally but the burner locks out when the safety time has elapsed           | Defective photocell or control box                                    | Replace photocell or control box                 |
|  |  | Dirty photocell   | Clean  |

| SYMBOL | FAULT  | PROBABLE CAUSE   | SUGGESTED REMEDY                               |
|--------|--|--|--|
|        | Smoke in flame - dark Bacharach                            | Not enough air   | Adjust head and fan gate                       |
|        |  | Erroneous pump pressure                                | Adjust   |
|        |  | Nozzle filter clogged                                  | Clean or replace                               |
|        |  | Boiler room air vents insufficient                     | Increase                                       |
|        |  | Nozzle worn or dirty                                   | Replace  |
|        |  | Flame disk dirty, loose, or deformed                   | Clean, tighten in place, or replace            |
|        | Smoke in flame (yellow Bacharach)                          | Too much air   | Adjust head and air gate                       |
|        | Firing with pulsations or flame detachment, delayed firing | Poorly adjusted head                                   | Adjust   |
|        |  | Poorly adjusted fan air gate: too much air             | Adjust   |
|        |  | Nozzle unsuited for burner or boiler                   | See Nozzle Table                               |
|        |  | Defective nozzle                                       | Replace  |
|        |  | Inappropriate pump pressure                            | Adjust   |
|        |  | Poorly adjusted or dirty firing electrodes             | Adjust   |
|        |  | Output during ionisation phase is too high             | Reduce   |
|        | The burner does not pass to 2nd stage                      | Control device TR does not close                       | Adjust or replace                              |
|        |  | Defective control box                                  | Replace  |
|        | Uneven fuel supply   | Check if cause is in pump or in the fuel supply system | Feed the burner from a tank located nearby     |
|        | Rusty pump internal parts                                  | Water in tank  | Suck water from tank bottom with separate pump |
|        | Noisy pump, unstable pressure                              | Air has entered the suction line                       | Tighten connectors                             |
|        |  | Depression value too high (higher than 35 cm Hg):      |  |
|        |  | Tank/burner height difference too great                | Feed burner with loop circuit                  |
|        |  | Piping diameter too small                              | Increase                                       |
|        |  | Suction filters clogged                                | Clean  |
|        |  | Suction valves closed                                  | Open   |
|        |  | Paraffin solidified due to low temperature             | Add additive to light oil                      |
|        | Pump unprimes after prolonged pause                        | Return pipe not immersed in fuel                       | Bring to same height as suction pipe           |
|        |  | Air enters suction piping                              | Tighten connectors                             |
|        | Pump leaks light oil                                       | Leakage from sealing organ                             | Replace pump                                   |
|        | Dirty combustion head                                      | Nozzle or filter dirty                                 | Replace  |
|        |  | Unsuitable nozzle delivery or angle                    | See recommended nozzles                        |
|        |  | Loose nozzle   | Tighten  |
|        |  | Impurities on flame stability disk                     | Clean  |
|        |  | Erroneous head adjustment or not enough air            | Adjust, open air damper                        |
|        |  | Blast tube length unsuited to boiler                   | Contact boiler manufacturer                    |
| I      | During operation, the burner stops in lock out             | Dirty or defective photocell                           | Clean or replace                               |
|        |  | Defective air pressure switch                          | Replace  |

Tab. N

### A Appendix - Accessories

#### Output power regulator kit for modulating operation

With the modulating operation, the burner continually adapts the power to the request for heat, ensuring great stability for the parameter controlled: temperature or pressure.

Two components should be ordered:

- the output regulator to install on the burner;
- the probe to install on the heat generator.

| Parameter to control |                 | Probe                          |         | Output power regulator    |                                  |
|----------------------|-----------------|--------------------------------|---------|---------------------------|----------------------------------|
|                      | Range           | Type                           | Code    | Type                      | Code                             |
| Temperature          | - 100...+ 500°C | PT 100                         | 3010110 | RWF40 BASIC<br>RWF40 HIGH | <b>3010356</b><br><b>3010357</b> |
| Pressure             | 0...2,5 bar     | Probe with output<br>4...20 µA | 3010213 |                           |                                  |
|                      | 0...16 bar      |                                | 3010214 |                           |                                  |

#### Output power regulator with signal 4-20 µA, 0-10V

Two components should be ordered:

- the Analogic signal converter;
- the Potentiometer

| Burner       | Potentiometer |         | Analogic signal converter |         |
|--------------|---------------|---------|---------------------------|---------|
|              | Type          | Code    | Type                      | Code    |
| RLS 800/M MX | ASZ...        | 3010402 | E5202                     | 3010390 |

#### Potentiometer kit for the indication of load position

| Burner       | Code           |
|--------------|----------------|
| RLS 800/M MX | <b>3010402</b> |

#### Soundproofing box kit

| Burner       | Code           |
|--------------|----------------|
| RLS 800/M MX | <b>3010376</b> |

#### Kit for the remote fuel selection

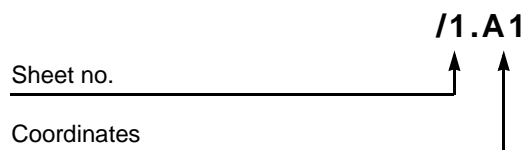
| Burner       | Code           |
|--------------|----------------|
| RLS 800/M MX | <b>3010372</b> |

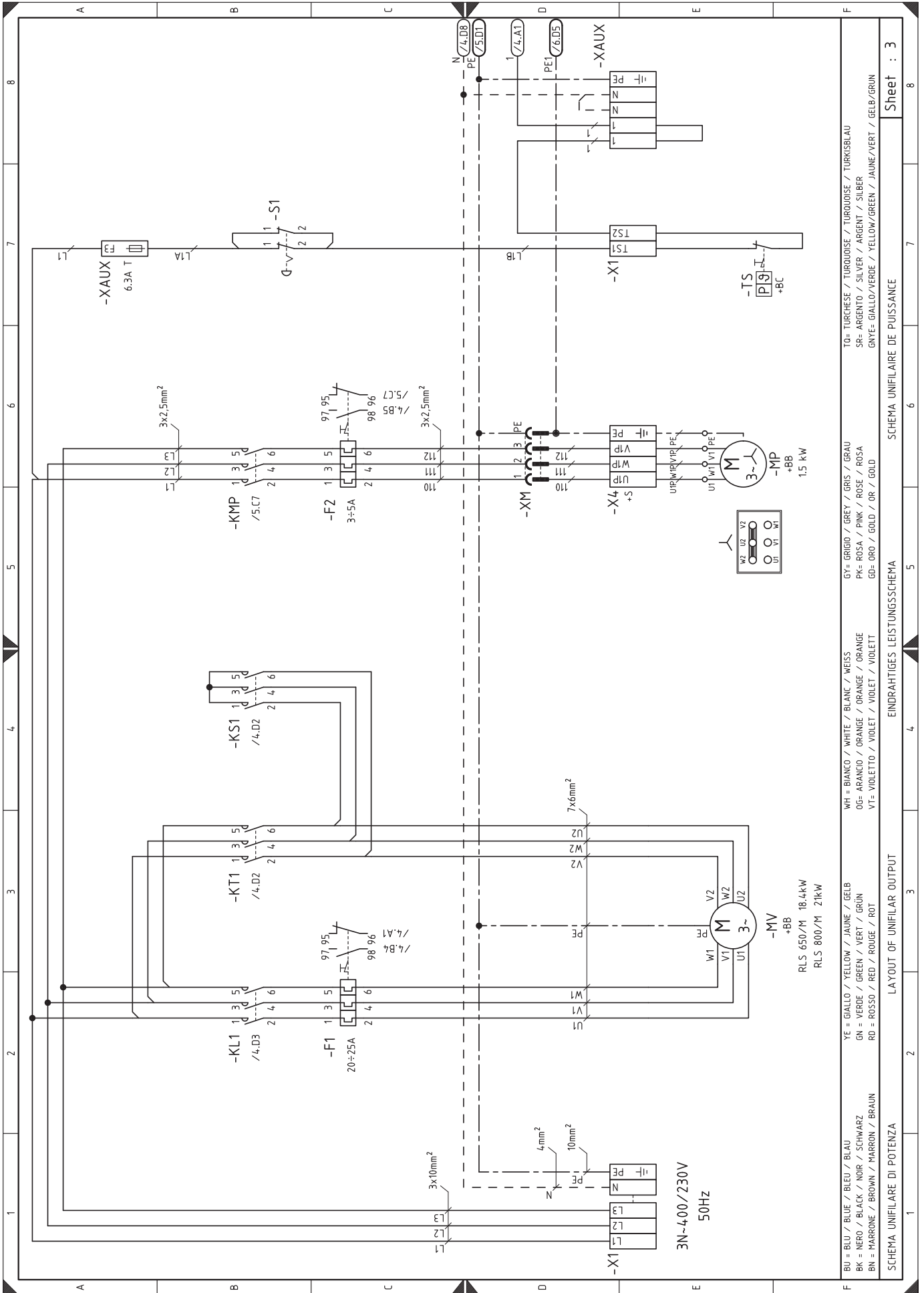
#### Gas trains approved according to EN 676

Refer to the instruction manual.

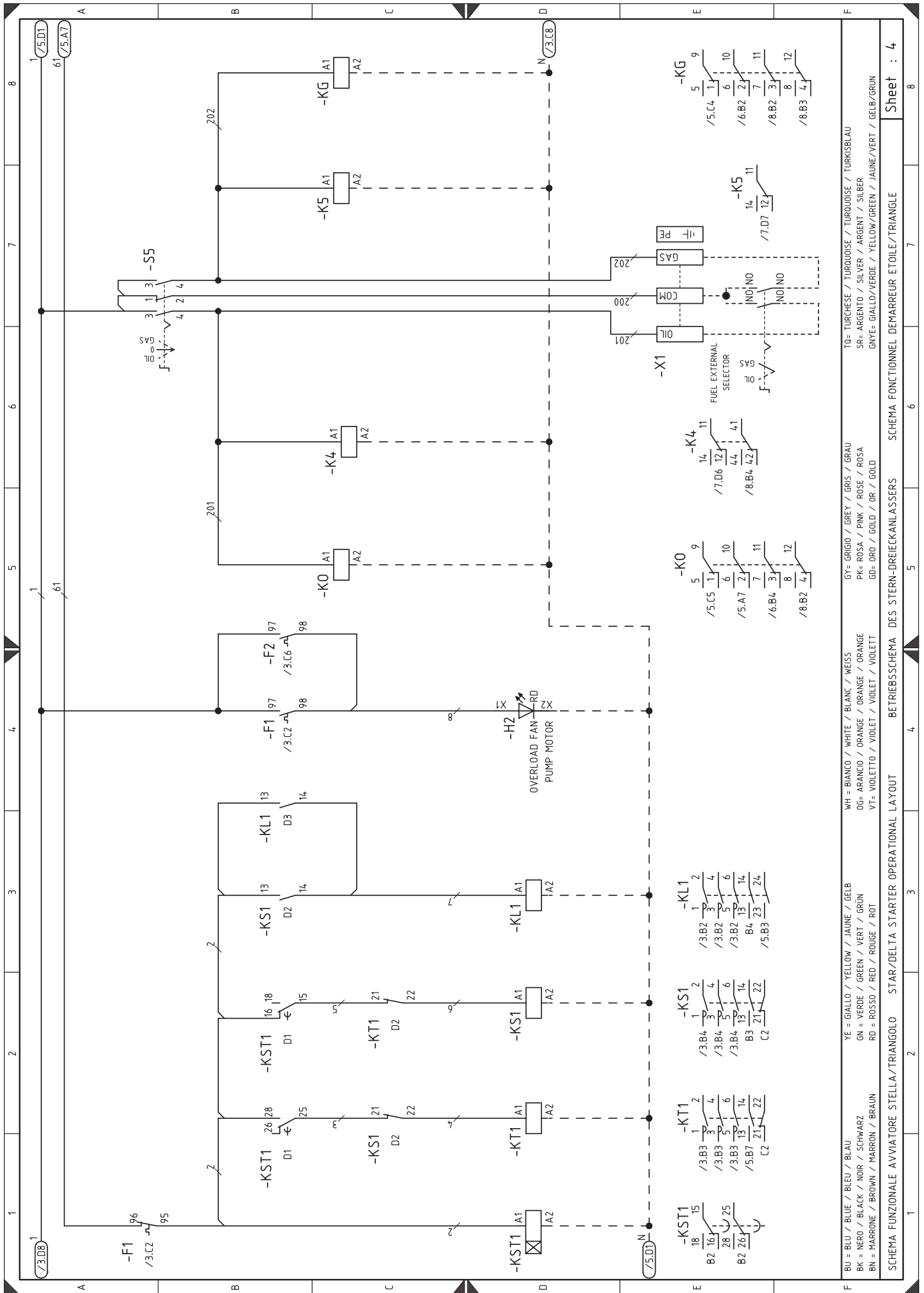
**B Appendix - Electrical panel layout**

|           |   |
|-----------|---|
| <b>1</b>  | <b>Index of layouts</b>                                       |
| <b>2</b>  | References layout   |
| <b>3</b>  | Layout of unifilar output                                     |
| <b>4</b>  | Operational layout star-powered starter/delta-powered starter |
| <b>5</b>  | Operational layout LFL 1...                                   |
| <b>6</b>  | Operational layout LFL 1...                                   |
| <b>7</b>  | Operational layout LFL 1...                                   |
| <b>8</b>  | Operational layout LFL 1...                                   |
| <b>9</b>  | Operational layout  |
| <b>10</b> | Electrical connections set by installer                       |
| <b>11</b> | Electrical connections for internal RWF40 kit                 |
| <b>12</b> | Electrical connections for external RWF40 kit                 |

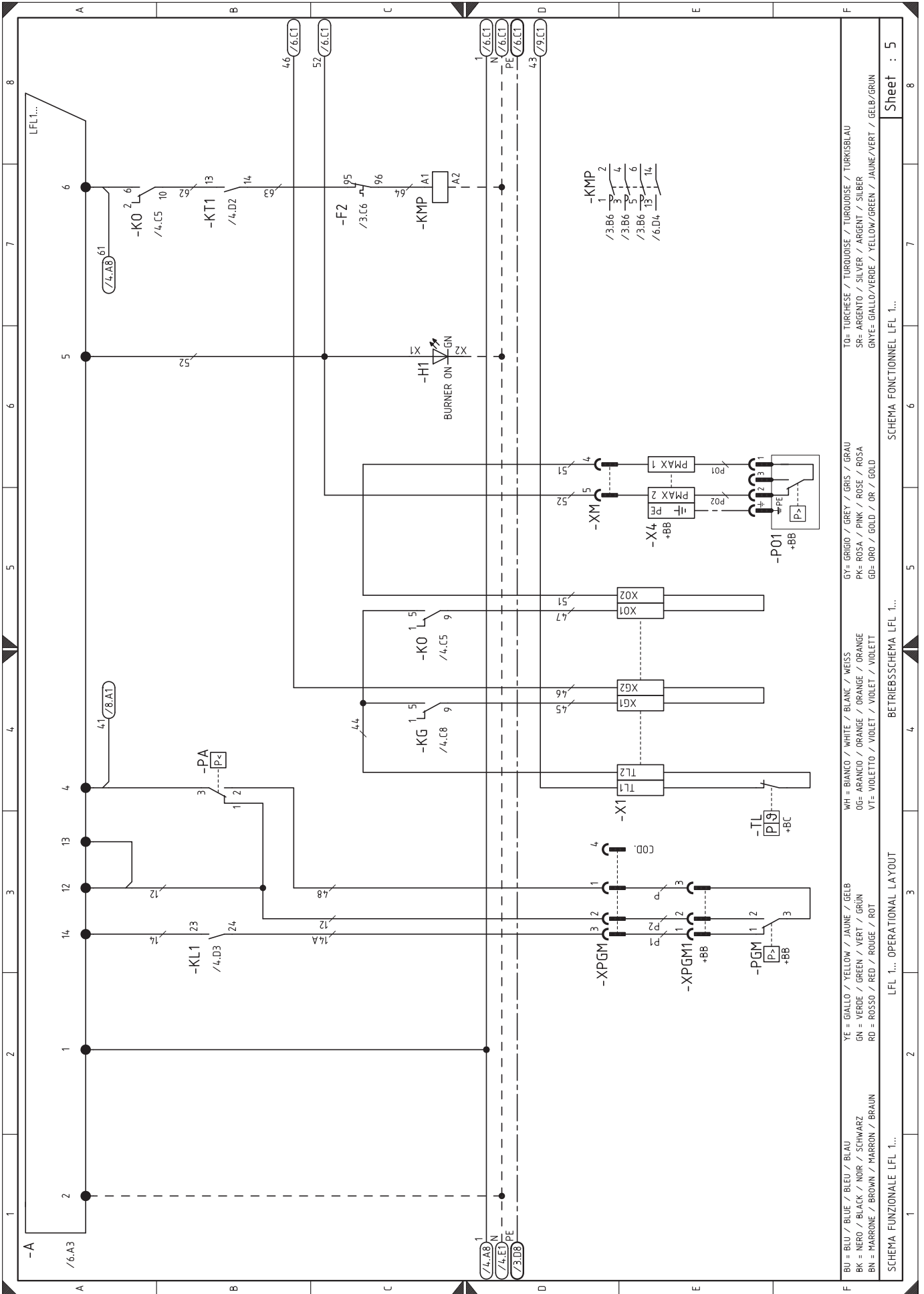
**2 Reference layout**

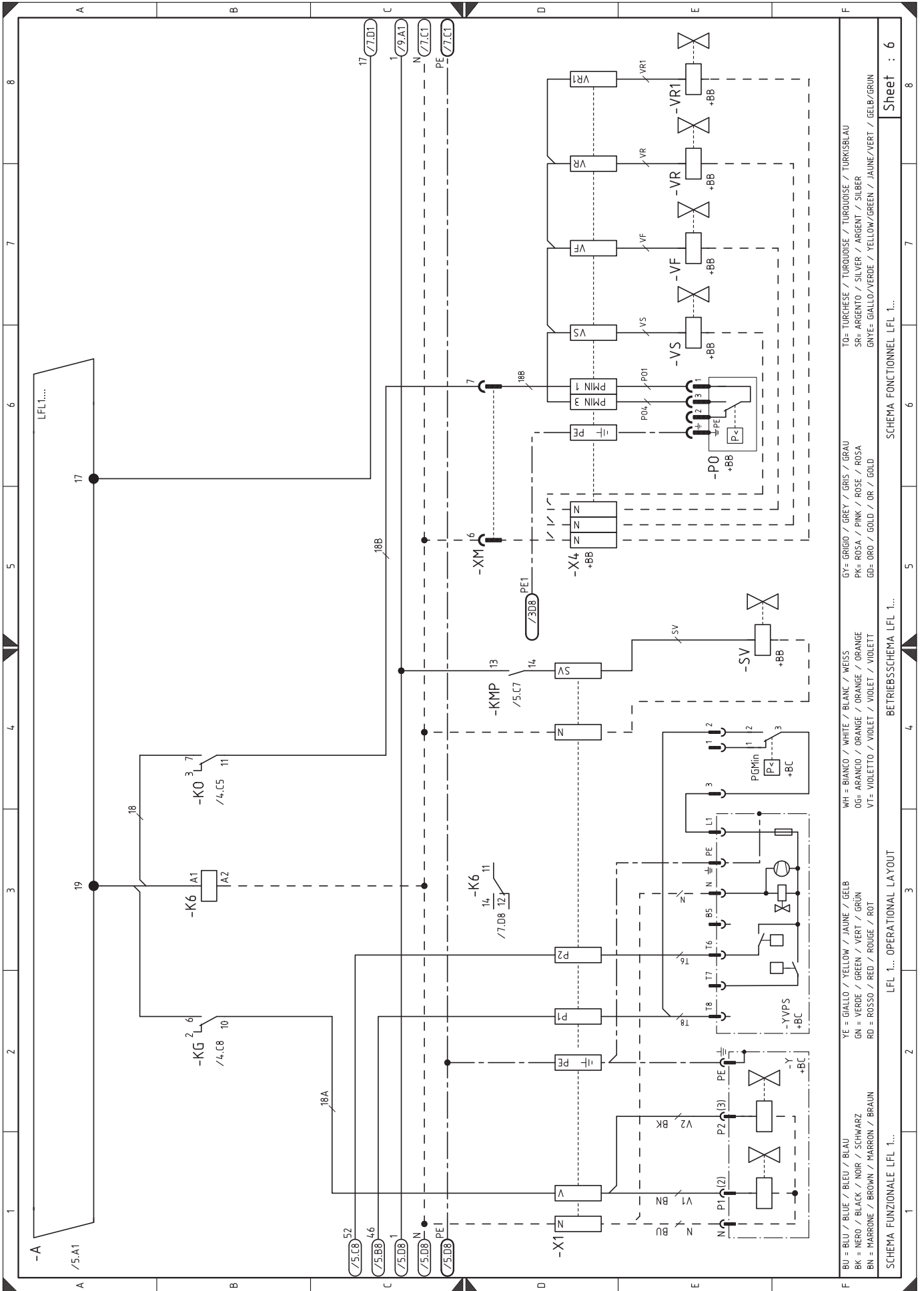




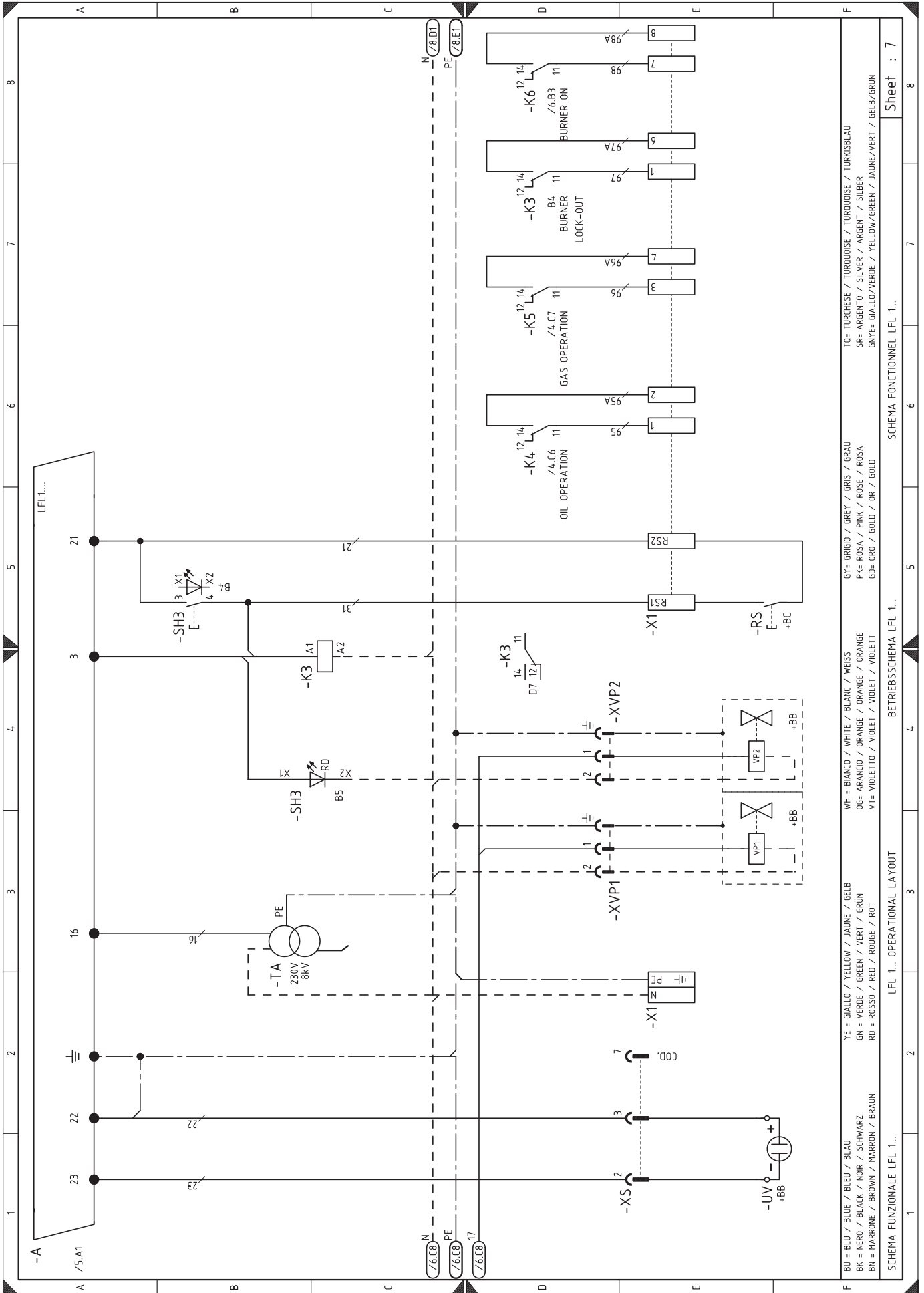


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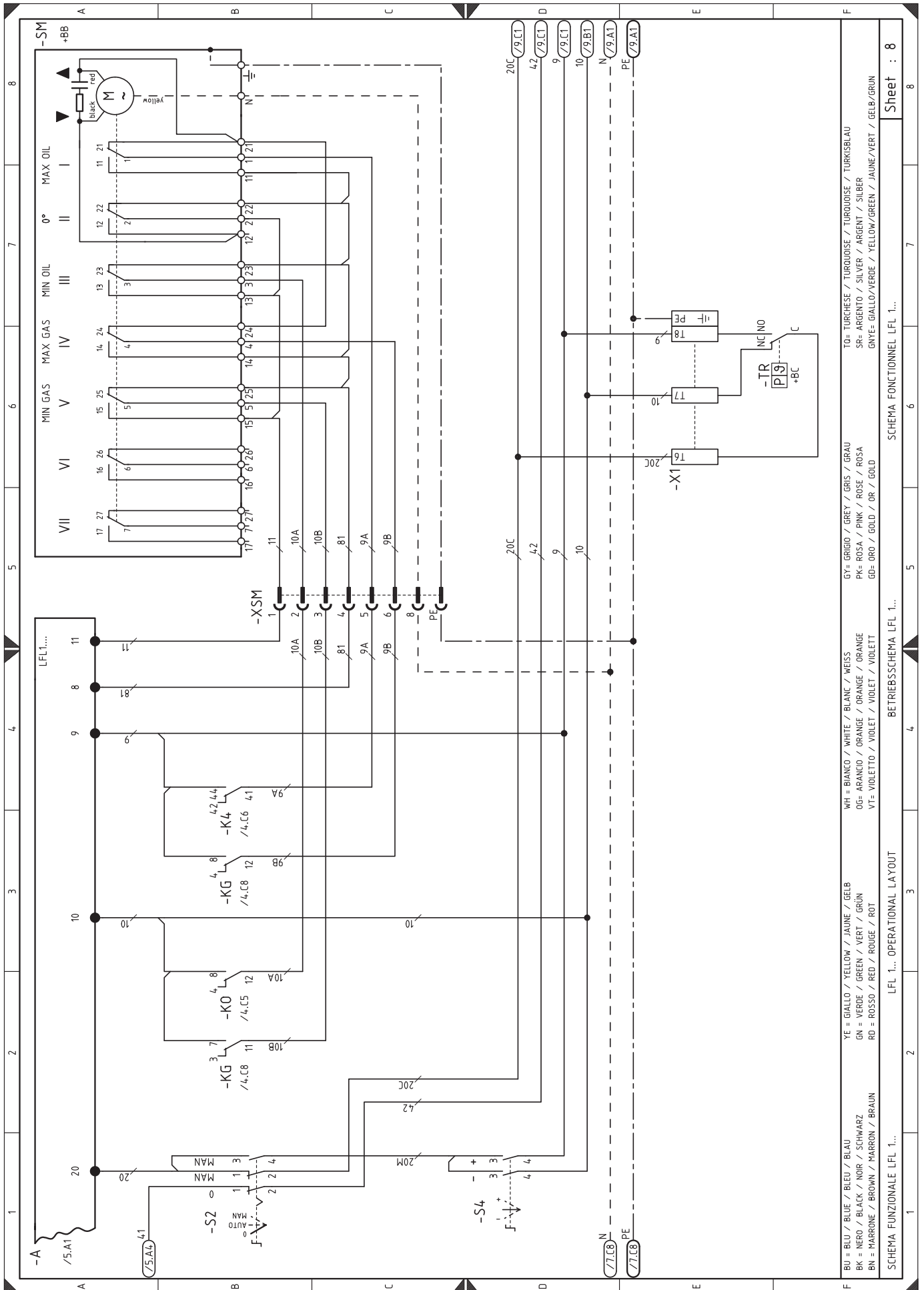




TO= TURCHESE / TURQUOISE / TURQUOISE / TURKISBLAU  
 SR= ARGENTO / SILVER / ARGENT / SILBER  
 GN= GIALLO / VERDE / YELLOW / GREEN / JAUNE / VERT / GELB / GRÜN  
 GY= GRIGIO / GREY / GRIS / GRAU  
 PK= ROSA / PINK / ROSE / ROSA  
 GD= ORO / GOLD / OR / GOLD  
 WH= BIANCO / WHITE / BLANC / WEISS  
 OG= ARANCIO / ORANGE / ORANGE / ORANGE  
 VT= VIOLETT / VIOLET / VIOLET / VIOLETT  
 YE= GIALLO / YELLOW / JAUNE / GELB  
 GN= VERDE / GREEN / VERT / GRÜN  
 RD= ROSSO / RED / ROUGE / ROT  
 BU= BLU / BLUE / BLEU / BLAU  
 BK= NERO / BLACK / NOIR / SCHWARZ  
 BN= MARRONE / BROWN / MARRON / BRAUN



BU = BLU / BLUE / BLEU / BLAU  
 BK = NERO / BLACK / NOIR / SCHWARZ  
 BN = MARRONE / BROWN / MARRON / BRAUN  
 YE = GIALLO / YELLOW / JAUNE / GELB  
 GN = VERDE / GREEN / VERT / GRÜN  
 RD = ROSSO / RED / ROUGE / ROT  
 WH = BIANCO / WHITE / BLANC / WEISS  
 OG= ARANCIO / ORANGE / ORANGE / ORANGE  
 VT= VIOLETTO / VIOLET / VIOLET / VIOLETT  
 GY= GRIGIO / GREY / GRIS / GRAU  
 PK= ROSA / PINK / ROSE / ROSA  
 GD= ORO / GOLD / OR / GOLD  
 TO= TURCHESE / TURQUOISE / TURQUOISE / TURKISBLAU  
 SR= ARGENTO / SILVER / ARGENT / SILBER  
 GNVE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN



TO= TURCHESE / TURQUOISE / TURQUOISE / TURKISBLAU  
 SR= ARGENTO / SILVER / ARGENT / SILBER  
 GN=VE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN

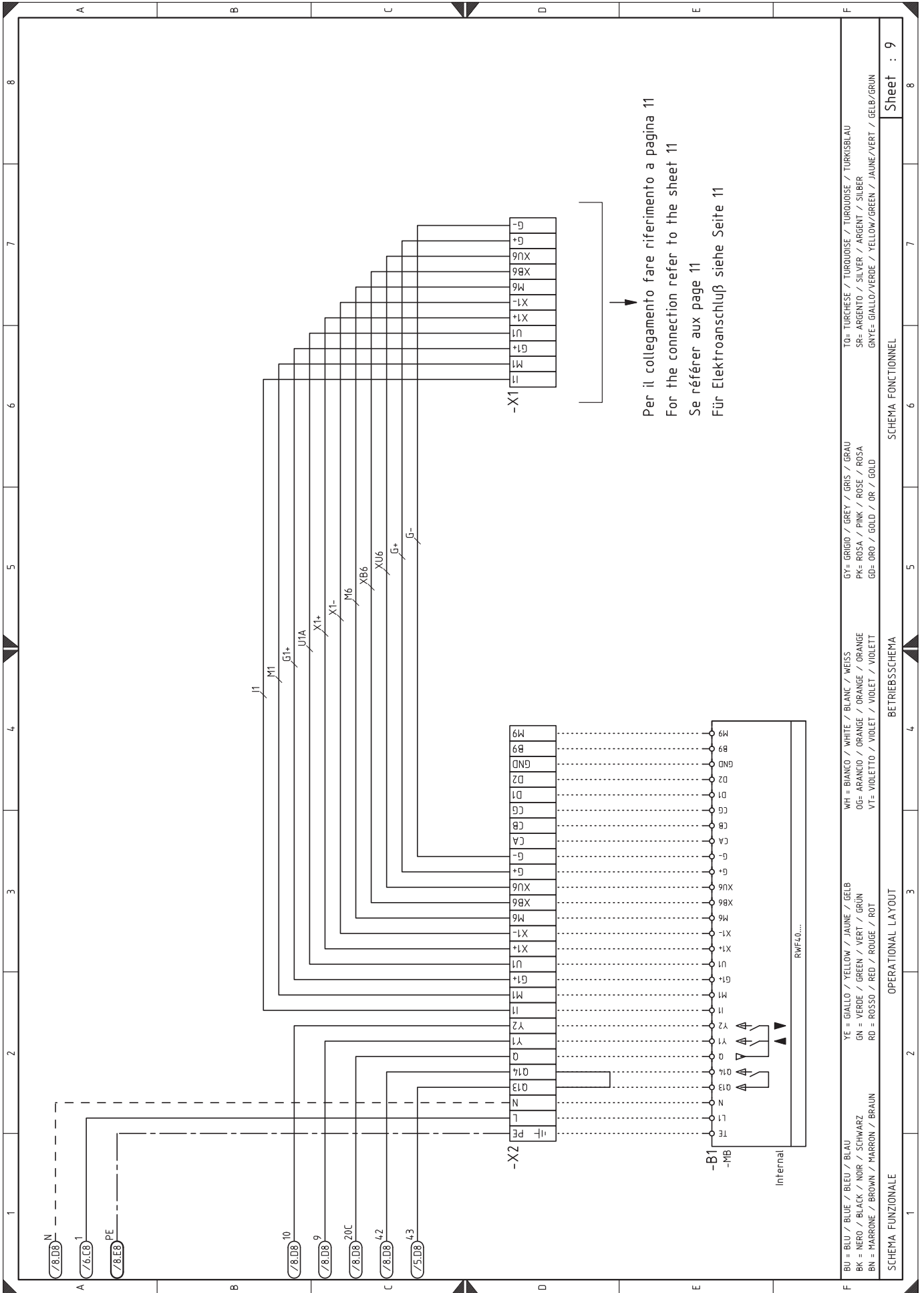
WH = BIANCO / WHITE / BLANC / WEISS  
 OG= ARANCIO / ORANGE / ORANGE / ORANGE  
 VT= VIOLETT / VIOLET / VIOLET / VIOLETT

GY= GRIGIO / GREY / GRIS / GRAU  
 PK= ROSA / PINK / ROSE / ROSA  
 GP= ORO / GOLD / OR / GOLD

YE = GIALLO / YELLOW / JAUNE / GELB  
 GN = VERDE / GREEN / VERT / GRÜN  
 RD = ROSSO / RED / ROUGE / ROT

BU = BLU / BLUE / BLEU / BLAU  
 BK = NERO / BLACK / NOIR / SCHWARZ  
 BN = MARRONE / BROWN / MARRON / BRAUN

SCHEMA FUNZIONALE LFL 1...  
 LFL 1... OPERATIONAL LAYOUT  
 BETRIEBSSCHEMA LFL 1...  
 SCHEMA FONCTIONNEL LFL 1...  
 Sheet : 8

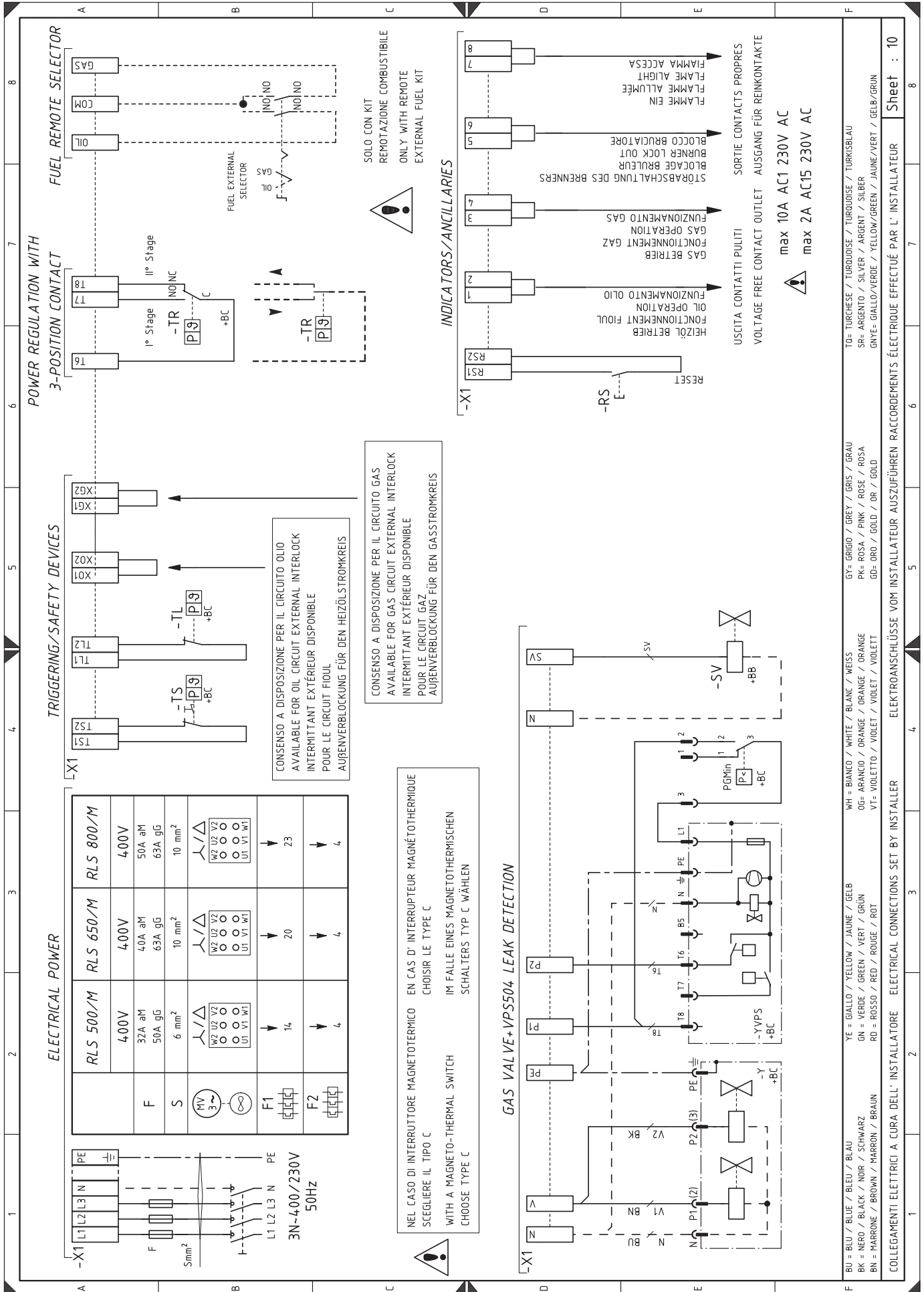


Per il collegamento fare riferimento a pagina 11  
 For the connection refer to the sheet 11  
 Se référer aux page 11  
 Für Elektroanschluss siehe Seite 11

|                                       |                                     |  |                                  |  |
|---------------------------------------|-------------------------------------|--|----------------------------------|--|
| BU = BLU / BLEU / BLAU                | YE = GIALLO / YELLOW / JAUNE / GELB | WH = BIANCO / WHITE / BLANC / WEISS      | GY = GRIGIO / GREY / GRIS / GRAU | TO= TURCHESE / TURQUOISE / TURKOISE / TURKISBLAU           |
| BK = NERO / BLACK / NOIR / SCHWARZ    | GN = VERDE / GREEN / VERT / GRÜN    | OG= ARANCIO / ORANGE / ORANGE / ORANGE   | PK= ROSA / PINK / ROSE / ROSA    | SR= ARGENTO / SILVER / ARGENT / SILBER                     |
| BN = MARRONE / BROWN / MARRON / BRAUN | RD = ROSSO / RED / ROUGE / ROT      | VT= VIOLETT / VIOLET / VIOLETT / VIOLETT | GD= ORO / GOLD / OR / GOLD       | GNVE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN |

SCHEMA FUNZIONALE      OPERATIONAL LAYOUT      BETRIEBSSCHEMA      SCHEMA FONCTIONNEL

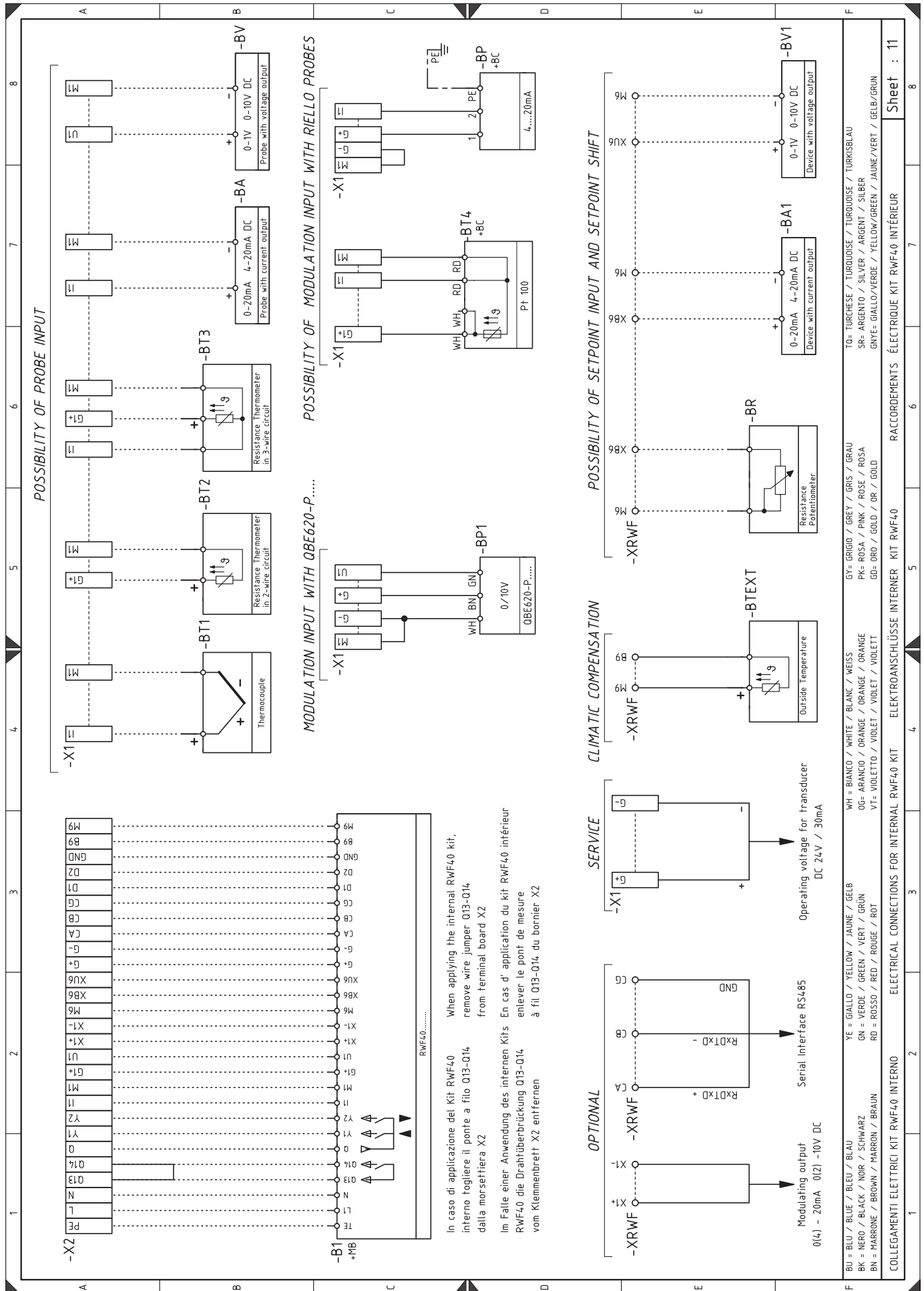
Sheet : 9



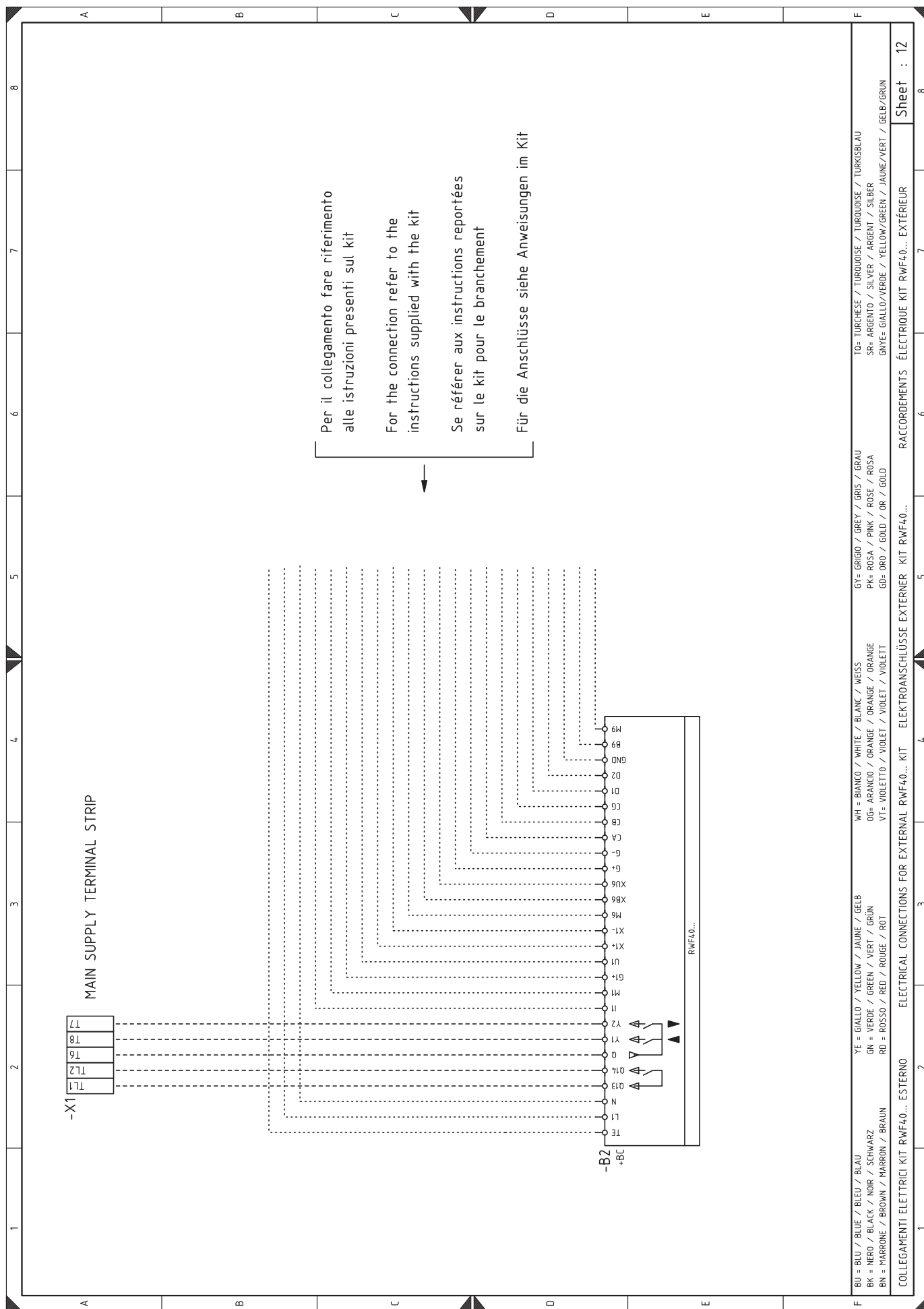
TO= TURKISE / TURKOISE / TURKOISE / TURKISBLAU  
 SR= ARGENTO / SILVER / ARGENT / SILBER  
 GN= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN  
 GR= GRIGIO / GREY / GRIS / GRAU  
 PK= ROSA / PINK / ROSE / ROSA  
 GD= ORO / GOLD / OR / GOLD  
 WH = BIANCO / WHITE / BLANC / WEISS  
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 BK = NERO / BLACK / NOIR / SCHWARZ  
 BN = MARRONE / BROWN / MARRON / BRAUN

COLLEGAMENTI ELETTRICI A CURA DELL'INSTALLATORE ELECTRICAL CONNECTIONS SET BY INSTALLER  
 ELEKTROANSCHLÜSSE VOM INSTALLATEUR AUSZUFÜHREN RACCORDEMENTS ÉLECTRIQUE EFFECTUÉ PAR L'INSTALLATEUR

Sheet : 10







**Wiring layout key**

|       |  |       |   |
|-------|--|-------|---|
| A     | Control box  | UV    | Flame sensor                                |
| B1    | Internal output power regulator RWF40                        | Y     | Gas adjustment valve + gas safety valve     |
| B2    | External output power regulator RWF40                        | YVPS  | Gas valve leak detection control device     |
| BA    | Probe with current output                                    | X1    | Main supply terminal strip                  |
| BA1   | Device with current output for editing remote setpoint       | X2    | RWF40 terminal strip                        |
| BP    | Pressure probe   | X4    | Light oil assembly terminal block           |
| BP1   | Pressure probe   | XAUX  | Auxiliary terminal strip                    |
| BR    | Remote setpoint voltage divider                              | XM    | Light oil assembly connector                |
| BT1   | Thermocouple probe   | XPGM  | Maximum gas pressure switch connection plug |
| BT2   | Probe Pt100 with 2 wires                                     | XPGM1 | Minimum gas pressure switch connection plug |
| BT3   | Probe Pt100 with 3 wires                                     | XRWF  | Output power regulator RWF40 terminal strip |
| BT4   | Probe Pt100 with 3 wires                                     | XS    | Flame detectors connector                   |
| BTEXT | External probe for the climatic compensation of the setpoint | XSM   | Air and gas servomotors connector           |
| BV    | Probe with voltage output                                    | VF    | Light oil operation valve                   |
| BV1   | Device with voltage output for editing remote setpoint       | VP1   | Pilot valve 1                               |
| F1    | Fan motor thermal cut-out                                    | VP2   | Pilot valve 2                               |
| F2    | Pump motor thermal cut-out                                   | VR    | Light oil return valve                      |
| F3    | Auxiliary fuse   | VR1   | Light oil return valve                      |
| H1    | Signal light for burner on                                   | VS    | Light oil safety valve                      |
| H2    | Signal light for fan and pump motors trip                    |       |   |
| KL1   | Direct start and star/delta starter line contactor           |       |   |
| KMP   | Pump motor contactor   |       |   |
| KT1   | Star-powered/delta-powered starter /delta contactor          |       |   |
| KS1   | Star-powered/delta-powered starter /star-powered contactor   |       |   |
| KST1  | Star-powered/delta -powered starter timer                    |       |   |
| K3    | Burner lock-out voltage free contact relay                   |       |   |
| K4    | Light oil operation voltage free contact relay               |       |   |
| K5    | Gas operation voltage free contact relay                     |       |   |
| K6    | Fuelled burner ON clean contacts output relay                |       |   |
| KG    | Gas operation relay  |       |   |
| KO    | Light oil operation relay                                    |       |   |
| MP    | Pump motor   |       |   |
| MV    | Fan motor  |       |   |
| PA    | Air pressure switch  |       |   |
| PE    | Burner ground (earth) connection                             |       |   |
| PGM   | Maximum gas pressure switch                                  |       |   |
| PGMin | Minimum gas pressure switch                                  |       |   |
| PO    | Oil pressure switch  |       |   |
| PO1   | High-limit oil pressure switch on return line                |       |   |
| RS    | Remote lock-out reset button                                 |       |   |
| S1    | Emergency stop push-button                                   |       |   |
| S2    | Dial for off - automatic - manual                            |       |   |
| S4    | Power dial for increase - decrease of power                  |       |   |
| S5    | Fuel selector and remote fuel selector enabling              |       |   |
| SH3   | Burner reset button and lockout warning                      |       |   |
| SM    | Servomotor   |       |   |
| TA    | Ignition transformer   |       |   |
| TL    | Limit pressure switch/thermostat                             |       |   |
| TR    | Control pressure switch/thermostat                           |       |   |
| TS    | Safety pressure switch/thermostat                            |       |   |



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