

GB Forced draught gas burners

Modulating operation



| CODE | MODEL | TYPE |
|----------|-----------------|--------|
| 20205464 | RS 310/E O2 ULX | S045T1 |
| 20205466 | RS 510/E O2 ULX | S046T1 |



Translation of the original instructions

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1 Information and general warnings

1.1 Information about the instruction manual

1.1.1 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.

1.1.2 General dangers

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



DANGER

Maximum danger level!

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



WARNING

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



CAUTION

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

1.1.3 Other symbols



DANGER

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 COVER AND ALL THE SAFETY AND PROTECTION DEVICES

This symbol signals the obligation to reassemble the cover 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.



IMPORTANT

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 |

1.1.4 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.

1.2 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.

2 Safety and prevention

2.1 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.



WARNING

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

2.2 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.

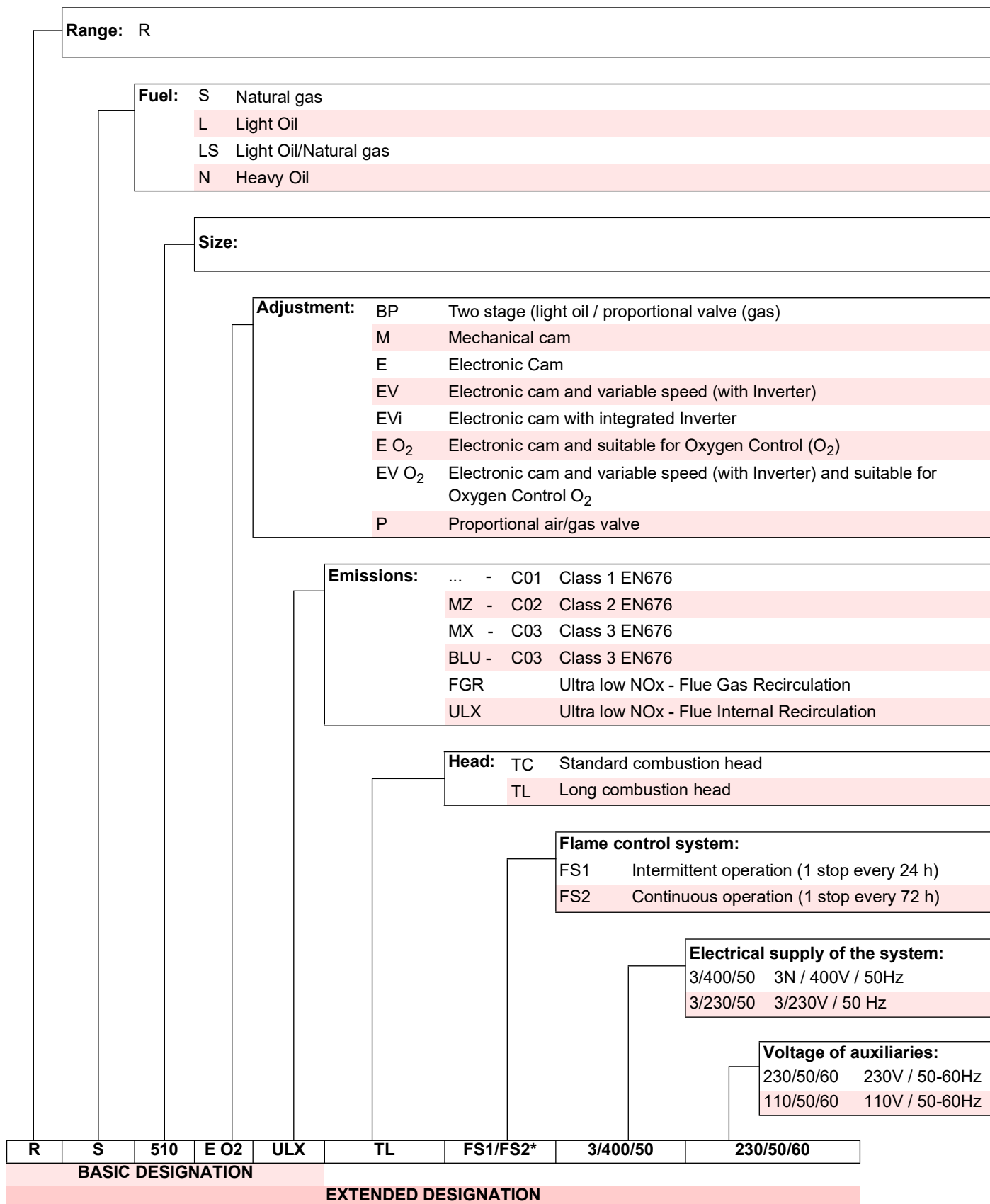
In addition:



- 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.

3 Technical description of the burner

3.1 Burner designation



*The burner leaves the factory set up for FS1 operation. If FS2 operation is required, refer the specific manual to LMV 5...

3.2 Models available

| Designation | Voltage | Start-up | Code |
|-------------------------|----------|------------|----------|
| RS 310/E O2 ULX FS1/FS2 | 3/400/50 | Direct | 20205464 |
| RS 510/E O2 ULX FS1/FS2 | 3/400/50 | Star/Delta | 20205466 |

Tab. A

3.3 Burner categories - Countries of destination

| Gas category | Destination country |
|--------------|--|
| I2E | LU - PL |
| I2E(R) | BE |
| I2EK | NL |
| I2ELL | DE |
| I2Er | FR |
| I2H | AT-GB-CH-CZ-DK-EE-ES-FI-GB-GR-HU-IE-IS-IT-LT-LV-NO-PT-RO-SE-SI-SK-TR |

Tab. B

3.4 Technical data

| Model | | | RS 310/E O2 ULX | RS 510/E O2 ULX |
|---|----------------|--------|--|-----------------|
| Type | | | S045T1 | S046T1 |
| Power ₍₁₎ | Min. - Max. | kW | 370/1250 ÷ 3700 | 570/1900 ÷ 4600 |
| Fuels | | | Natural gas: G20 (methane gas) | |
| Gas pressure at max. output ₍₂₎ Gas: | - G20 | mbar | 280 | 210 |
| | - G25 | mbar | 375 | 290 |
| Operation | | | FS1: Intermittent (min. 1 stop in 24 hours) FS2: Continuous (min. 1 stop in 72 hours) | |
| Standard applications | | | Boilers: water, steam, diathermic oil | |
| Ambient temperature | | °C | 0 - 50 | |
| Combustion air temperature | | °C max | 60 | |
| Noise levels ₍₃₎ | Sound pressure | dB(A) | 78 | 80 |
| | Sound power | dB(A) | 89 | 93 |
| Burner net weight | | kg | 250 | 250 |
| CE | | | CE-0123DN1089 | |

Tab. C

- (1) Reference conditions: Room temperature 20°C - Gas temperature 15°C - Barometric pressure 1013 mbar - Altitude 0 m a.s.l.
 (2) Pressure at the test point 5)(Fig. 4 on page 11) with zero pressure in the combustion chamber and at maximum burner output.
 (3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output. The sound power is measured with the "Free Field" method, as per EN 15036, and according to an "Accuracy: Category 3" measuring accuracy, as set out in EN ISO 3746.

3.5 Electrical data

| Model | | RS 310/E O2 ULX | RS 510/E O2 ULX |
|---------------------------|--------|------------------------|-----------------|
| Main electrical supply | | 3N ~ 400V +/-10% 50 Hz | |
| Absorbed electrical power | kW max | 8.8 | 13.8 |
| Protection level | | IP 54 | |

Tab. D

3.6 Maximum 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 and the rear part turned on the hinge.
The maximum dimensions of the open burner are indicated by the A and R positions.

The I position is reference for the refractory thickness of the boiler door.



* The gas adaptor is set also for DN 80 bore.

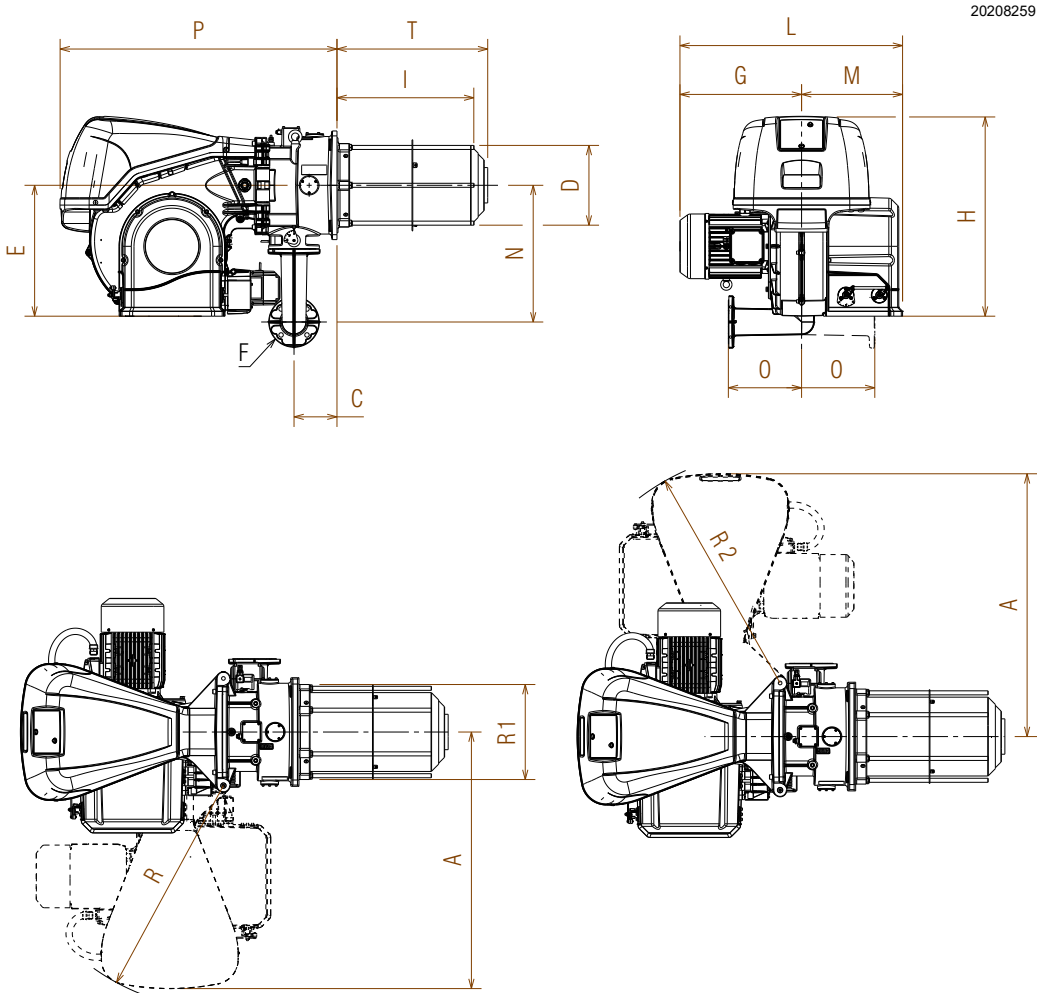


Fig. 1

| mm | A | C | D | E | F* | G | H | I | L | M | N | O | P | R | R1 | R2 | T |
|-----------------|------|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|
| RS 310/E O2 ULX | 1015 | 176 | 312 | 518 | DN65 | 480 | 790 | 525 | 880 | 400 | 541 | 290 | 1104 | 886 | 376 | 886 | 590 |
| RS 510/E O2 ULX | 1105 | 170 | 316 | 518 | DN65 | 529 | 792 | 531 | 929 | 400 | 541 | 290 | 1186 | 966 | 376 | 966 | 597 |

Tab. E

3.7 Burner equipment

- Gas elbow No. 1
- DN65 gasket No. 1
- Thermal insulation screen No. 1
- M20 fittings for inlet of optional electrical connections No. 4
- N16 nuts No. 4
- M 18 x 60 screws No. 4
- M 16 x 60 screws No. 4
- M16 x 67 stud bolts No. 4
- GW 150 gas pressure switch No. 1
- Instructions No. 1
- Spare parts list No. 1



It is recommended to tighten the screws of the gas flange with a tightening torque of **40 Nm ±10%**.



Tighten the nuts gradually (first to 30%, then to 60% up to 100%) according to the cross pattern shown in the figure.



For the use of the gas pressure switch GW 150 (supplied separately), refer to paragraphs “Firing rates” on page 9 and “Maximum gas pressure switch” on page 33.

3.8 Firing rates

The **maximum output** must be higher than the following values (Tab. F):

| Model | kW |
|-----------------|------|
| RS 310/E O2 ULX | 1250 |
| RS 510/E O2 ULX | 1900 |

Tab. F



If the chosen maximum output is exactly equal to these values (Tab. F), the central gas calibration must be modified (see "Central gas adjustment" on page 23).

If the chosen maximum output is lower than the following values (Tab. G):

| Model | kW |
|-----------------|------|
| RS 310/E O2 ULX | 1860 |
| RS 510/E O2 ULX | 2800 |

Tab. G



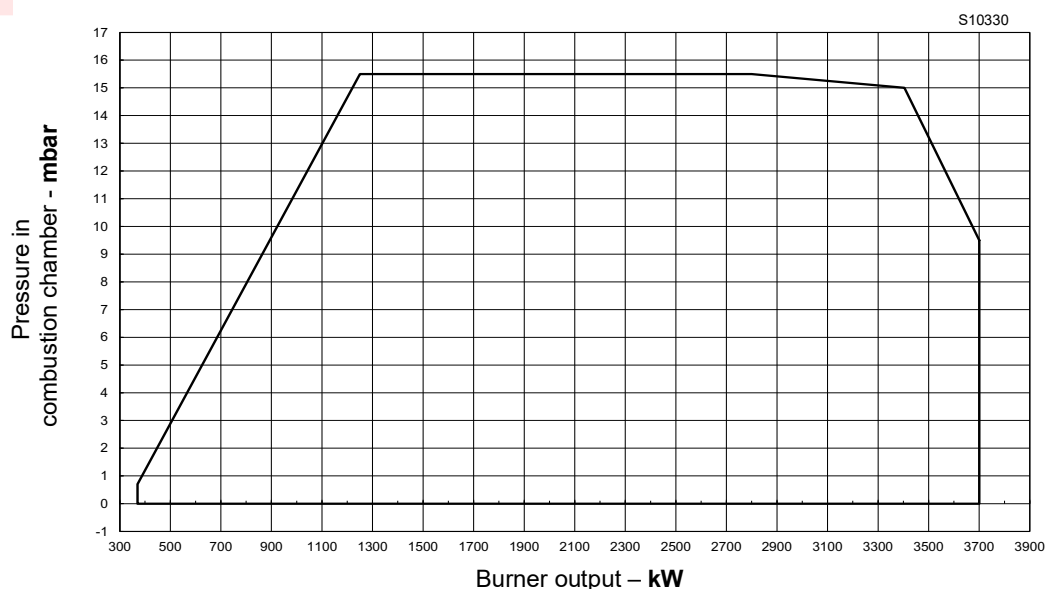
Replace the GW 500 maximum pressure switch (Fig. 4 on page 11) installed on the burner with the GW 150 gas pressure switch supplied as equipment.

The **minimum output** must not be lower than the minimum limit of the diagram (Fig. 2).



The firing rate was obtained considering a room temperature of 20°C and an atmospheric pressure of 1013 mbar (approx. 0 m above sea level), with the combustion head adjusted as shown at page 22.

RS 310/E O2 ULX



RS 510/E O2 ULX

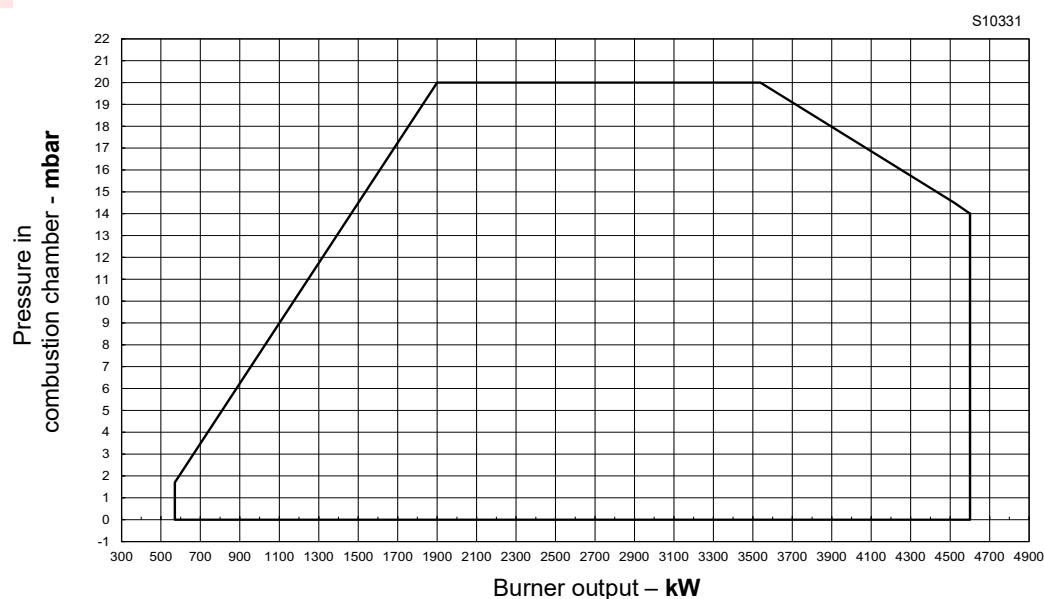


Fig. 2

3.9 Test boiler

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

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

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

In Fig. 3 you can see the diameter and length of the test combustion chamber.

Example:

Output 5000 kW - diameter 100 cm - length 5m

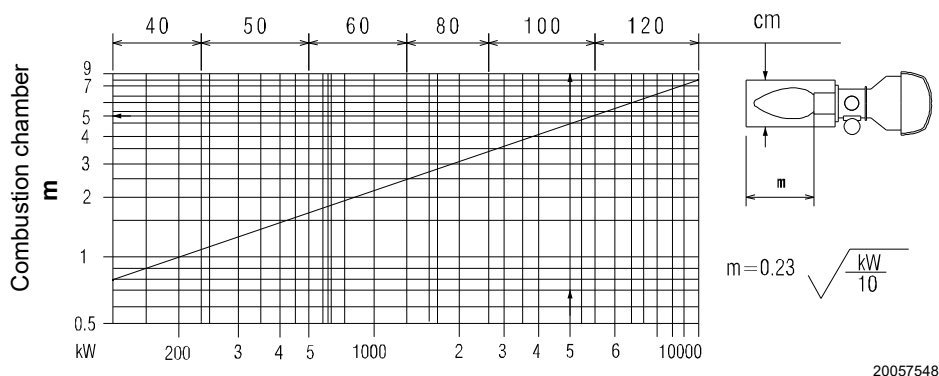
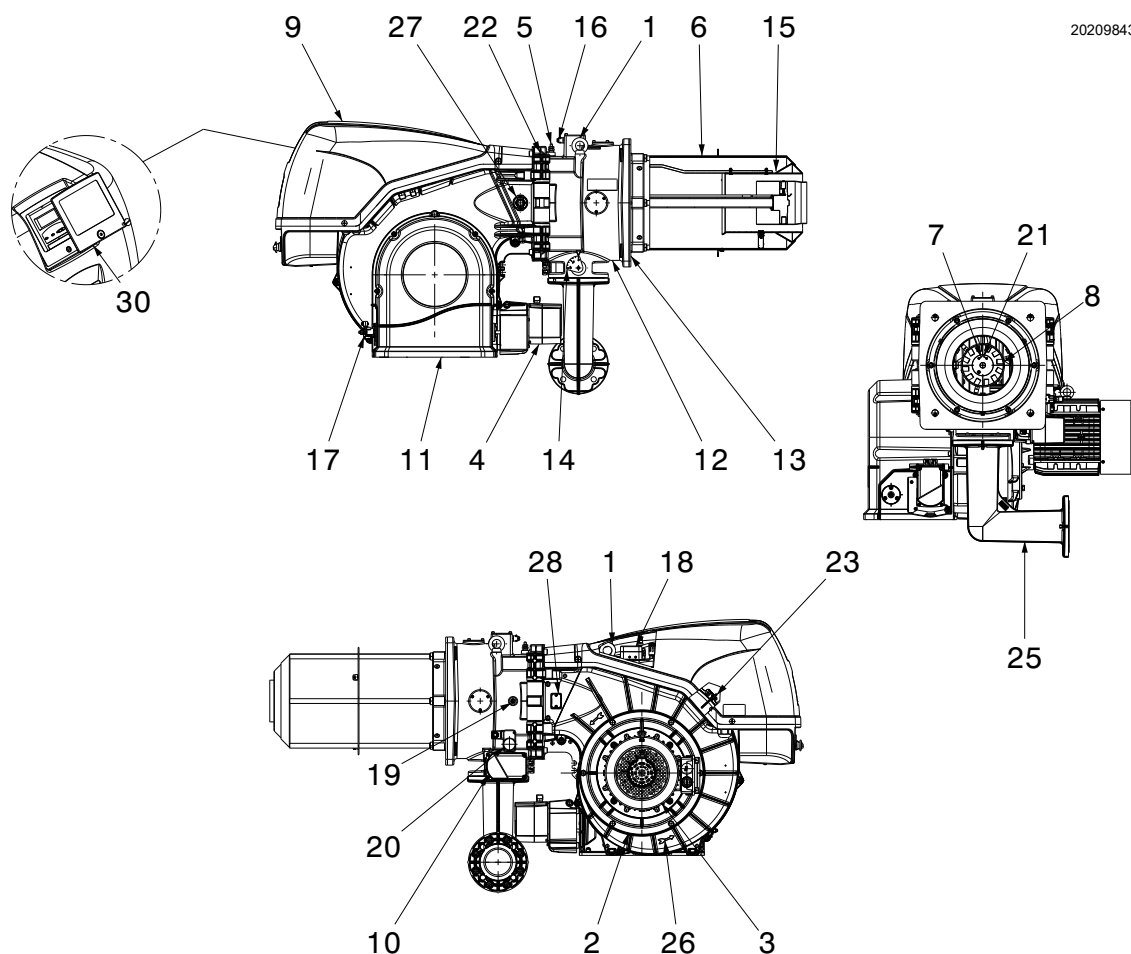


Fig. 3

3.10 Burner description



20209843

Fig. 4

- 1 Lifting rings
- 2 Fan
- 3 Fan motor
- 4 Air damper servomotor
- 5 Combustion head gas pressure test point
- 6 Combustion head
- 7 Ignition electrode
- 8 Flame stability disk
- 9 Electrical panel casing
- 10 Gas butterfly valve servomotor
- 11 Fan air inlet
- 12 Pipe coupling
- 13 Gasket for boiler fixing
- 14 Gas butterfly valve
- 15 Shutter
- 16 Combustion head movement screw
- 17 Lever for controlling the dampers with graduated scale
- 18 Air pressure switch
- 19 Combustion head air pressure test point
- 20 Maximum gas pressure switch with pressure test point
- 21 Flame sensor probe
- 22 Hinge for opening the burner
- 23 Pressure test point for air pressure switch "+"
- 25 Gas train adapter
- 26 Indication for checking the rotation direction of the purging motor
- 27 Flame inspection window
- 28 Adapt for flame sensor kit
- 30 Transparent protection



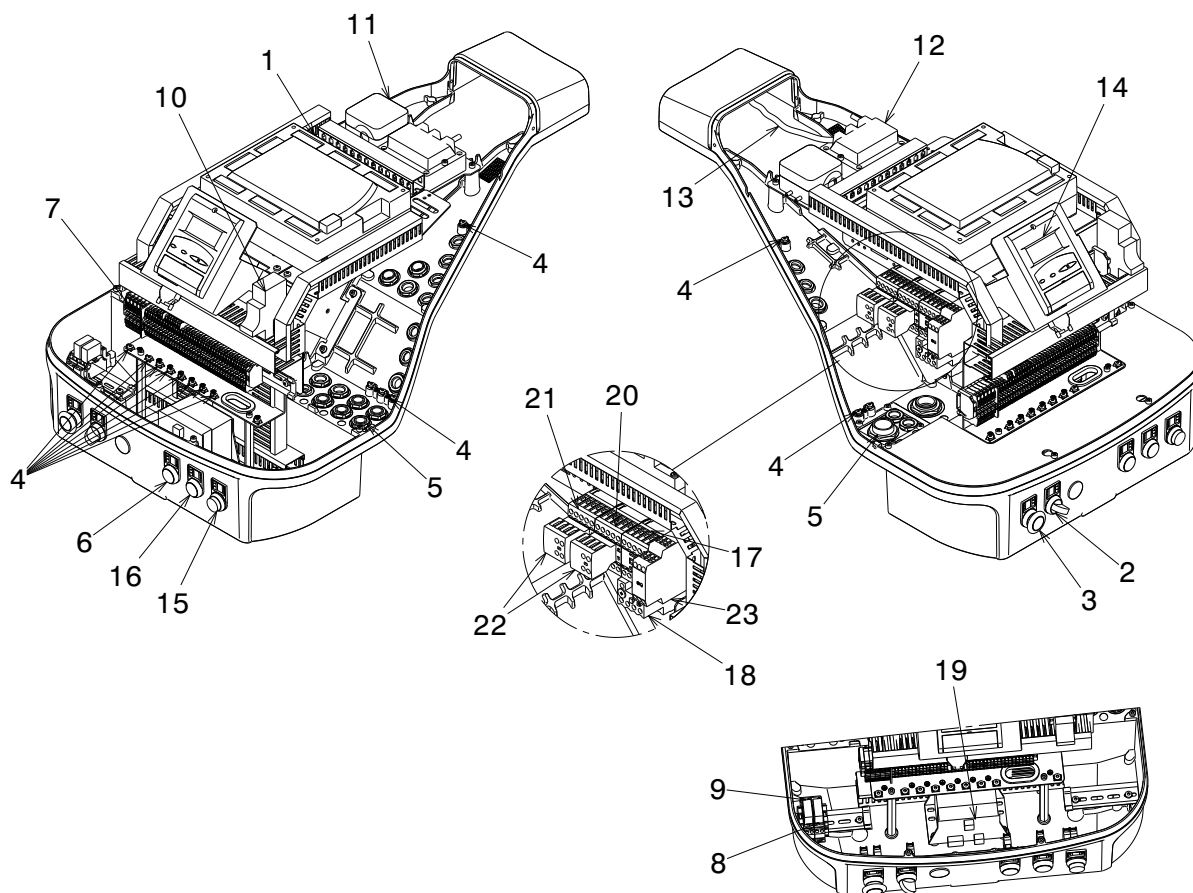
The burner can be opened to the right or to the left without links to the fuel supply side.



To open the burner see section "Access to head internal part" on page 21.

3.11 Electrical panel description

20206608


Fig. 5

- 1 Flame control
- 2 O/AUTO selector
- 3 Safety button
- 4 Earth terminal
- 5 Supply cables and external connections passage. See section "Electrical wiring" on page 27
- 6 Light signalling "POWER ON"
- 7 Main terminal supply board
- 8 Relay with clean contacts for signalling the burner is in lock-out
- 9 Relay with clean contacts for signalling the burner is operating
- 10 Auxiliary circuits fuse
- 11 Air pressure switch
- 12 Ignition transformer
- 13 Ionisation probe cable
- 14 Operator panel with LCD display
- 15 Light signalling burner lockout and reset button
- 16 Light signalling "OVERLOAD FAN MOTOR"
- 17 Line contactor for direct start
- 18 Thermal relay (with RESET button)
- 19 Flame control power supply
- 20 Triangle contactor (Star/triangle start-up)
- 21 Star contactor (Star/triangle start-up)
- 22 Auxiliary contacts
- 23 Star/triangle starter timer

3.12 Flame control for the air/fuel ratio (LMV52...)

Warnings



WARNING

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

The LMV52 flame control... 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!

Risk of explosion!

An incorrect configuration can provoke fuel overcharging, with the consequential risk of explosion! Operators must be aware that incorrect settings made on the AZL5... display and operating unit and incorrect settings of the fuel and / or air actuator positions can lead to dangerous burner operating conditions.

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Before modifying the wiring in the LMV52 flame control connection area, fully disconnect the system from the power supply (omnipolar separation). Check the system is not powered and cannot be accidentally reconnected. Failure to do this will lead to the risk of electrocution.
- Protection against electrocution from the LMV5... flame control and all connected electric components is obtained with 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 flame control must not be operated, even if it displays no evident damage.
- In programming mode, the position check of actuators and VSD (checking electronic fuel / air ratio control) is different from the check during automatic operation. As for automatic operation, the actuators are guided together to the positions requested and, if an actuator does not reach the position requested, adjustments are made until the position is actually reached. However, in contrast to automatic operation, there are no time limits to these corrective actions. The other actuators maintain their positions until all actuators have reached the positions currently required. This is absolutely important to set the fuel / air ratio control system.
During the time the fuel / air ratio curves are being programmed, the person making the plant settings must continuously monitor the quality of the combustion process (e.g. by means of a flue gas analyser). Also, if combustion levels are poor, or in the event of dangerous situations, the commissioning engineer must take appropriate action (e.g. switching off manually).

To ensure the safety and reliability of the LMV5... system, the following instructions must also be followed:

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



D9301

Fig. 6

Mechanical structure

The LMV5... flame control is a system to check the burners, based on a microprocessor and equipped with components to adjust and monitor medium and large capacity forced draught burners.

The base flame control of the LMV5... system incorporates the following components:

- Burner adjustment device with system for checking the seal of the gas valves
- Electronic fuel/air ratio monitoring device with a maximum of 6 (LMV52...) actuators
- Optional PID temperature / pressure controller (load controller)
- Optional VSD module Mechanical design.

Electrical connection of flame sensor

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:

- Line capacitance reduces the magnitude of the flame signal.
- Use a separate cable.

- Respect the allowed cable lengths.

Technical data

| | | | |
|---------------------------|-----------------------|--|---|
| LMV52... flame control | base | Mains voltage | AC 230V -15% / +10% |
| | | Mains frequency | 50 / 60 Hz ± 6 % |
| | | Power absorption | < 30W (normal) |
| | | Safety class | I, with components in compliance with II and III, according to DIN EN 60730-1 |
| Load on terminals | 'input' | F1 unit fuse (internal) | 6.3 AT |
| | | Main fuse of perm. network (external) | Max. 16 AT |
| | | Undervoltage | |
| | | • Safety switch-off from operating position to mains voltage | < AC 186 V |
| | | • Restart when mains voltage picks up | > AC 188 V |
| | | Oil pump / magnetic clutch (nominal voltage) | |
| | | • Nominal current | 2A |
| | | • Power factor | $\cos\phi > 0.4$ |
| | | Air pressure switch test valve (nominal voltage) | |
| | | • Nominal current | 0.5A |
| | | • Power factor | $\cos\phi > 0.4$ |
| Load on terminals | 'output' | Total load on the contacts: | |
| | | • Mains voltage | AC 230 V -15 % / +10 % |
| | | • Total unit input current (safety circuit) | Max. 5 A |
| | | load on contacts due to: | |
| | | - Fan motor contactor | |
| | | - Ignition transformer | |
| | | - Valve | |
| | | - Oil pump / magnetic clutch | |
| | | Single contact loading: | |
| | | Fan motor contactor (nominal voltage) | |
| | | • Nominal current | 1A |
| | | • Power factor | $\cos\phi > 0.4$ |
| | | Alarm output (nominal voltage) | |
| | | • Nominal current | 1A |
| | | • Power factor | $\cos\phi > 0.4$ |
| | | Ignition transformer (nominal voltage) | |
| | | • Nominal current | 2A |
| | | • Power factor | $\cos\phi > 0.2$ |
| | | Fuel gas valve (nominal voltage) | |
| | | • Nominal current | 2A |
| | | • Power factor | $\cos\phi > 0.4$ |
| | | Fuel oil valve (nominal voltage) | |
| | | • Nominal current | 1A |
| | | • Power factor | $\cos\phi > 0.4$ |
| Cable lengths | Main line | | Max. 100 m (100 pF/m) |
| Environmental conditions | Operation | | DIN EN 60721-3-3 |
| | Climatic conditions | | Class 3K3 |
| | Mechanical conditions | | Class 3M3 |
| | Temperature range | | -20...+60°C |
| | Humidity | | < 95% RH |

Tab. H

3.13 Actuator

Warning notes



WARNING

To avoid injury to persons, damage to property or the environment, the following warning notes should be observed!

Do not open, interfere with or modify the actuators!

- All activities (mounting, installation and service work, etc.) must be performed by qualified staff.
- Before making any wiring changes in the connection area of the actuator, completely isolate the burner control from the mains supply (all-polar disconnection).
- Ensure protection against electric shock hazard by providing adequate protection for the connection terminals and by securing the housing cover.
- Check to ensure that wiring is in an orderly state.
- Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage.



WARNING

The housing cover may only be removed for short periods of time for wiring or when making the addressing. It must be made certain that dust or dirt will not get inside the actuator while such work is carried out.

Use

The actuator (Fig. 7) is used to drive and position the air damper and the gas butterfly valve, without mechanical leverages but via the interposition of an elastic coupling.

When used in connection with burner controls or electronic fuel / air ratio control, the associated controlling elements are controlled depending on burner output.

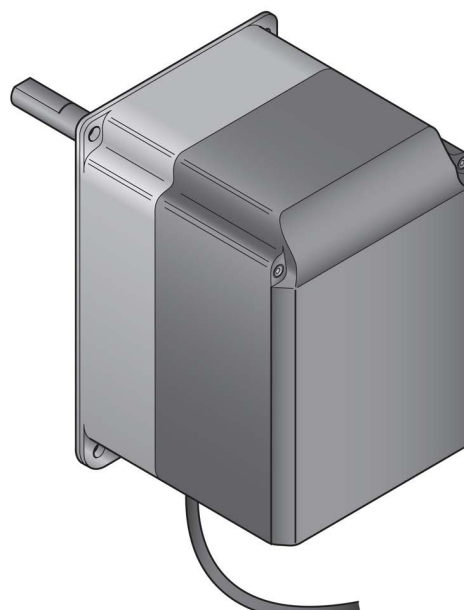
Installation notes

- Always run the high-voltage ignition cables separate from the unit and other cables while observing the greatest possible distance.
- The holding torque is reduced when the actuator's power supply is switched off.



WARNING

When servicing or replacing the actuator, take care not to invert the connectors.



D8271

Fig. 7

Technical data

| Model | SQM45.295A9 |
|---|---|
| Operating voltage | AC 2 x 12 V via bus cable from the basic unit or via a separate transformer |
| Safety class | Extra low-voltage with safe isolation from mains voltage |
| Power consumption | 9...15 VA |
| Degree of protection | To EN 60 529, IP 54, provided adequate cable entries are used |
| Electrical connections | RAST3.5 terminals |
| Direction of rotation (when facing the shaft) | - Standard: counterclockwise - Reverse: clockwise |
| Running time (min.) for 90° | 10 s. |
| Holding torque (max.) | 1.5 Nm |
| Nominal torque (max.) | 3 Nm |
| Weight | approx. 1 kg |
| Environmental conditions: | |
| Operation | DIN EN 60721-3-1 |
| Climatic conditions | class 1K3 |
| Mechanical conditions | class 1M2 |
| Temperature range | -20...+60 °C |
| Humidity | < 95 % r.h. |

Tab. I



WARNING

Condensation, the formation of ice and the entry of water are prohibited!

3.14 PLL52... module (optional)

Warnings



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

Avoid opening, modifying or forcing the device.

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Falls and collisions can negatively affect the safety functions. In this case, the unit must not be operated, even if it displays no evident damage.

Assembly notes

- Check the relevant national safety standards are respected.

3.14.1 Terminal ratings, cable lengths and cross-sectional areas

| Cable lengths / cross-sectional areas | |
|---------------------------------------|--|
| Electrical connection "X89" | Screw terminals up to max. 2.5 mm ² |
| Cable lengths | ≤ 10 m fino a QGO20... |
| Cross-sectional areas | Refer to description of QGO20... |
| Analog inputs | |
| Air temperature detector | Pt1000 / LG-Ni1000 |
| Flue gas temperature | Pt1000 / LG-Ni1000 |
| QGO20... | Refer to data sheet N7842 |
| Interface | Communication bus for LMV52... |

Tab. J



Fig. 8

Technical data

| Model | PLL52... |
|---------------------------|---|
| Mains voltage "X89-01" | AC 230 V -15%/10% |
| Safety class | I class with parts according to II class (DIN EN 60730-1) |
| Mains frequency | 50 / 60 Hz ±6 % |
| Power consumption | Ca. 4 VA |
| Degree protection | IP54, housing closed |
| Transformer AGG5.220 | |
| - Primary side | AC 230V |
| - Secondary side | AC 12 V (3x) |
| Environmental conditions: | |
| Storage | DIN EN 60721-3-1 |
| Climatic conditions: | Class 1K3 |
| Mechanical conditions: | Class 1M2 |
| Temperature range: | -20...+60 °C |
| Humidity: | <95% r.h. |
| Transport | DIN EN 60721-3-2 |
| Climatic conditions: | Class 2K2 |
| Mechanical conditions: | Class 2M2 |
| Temperature range: | -25...+70 °C |
| Humidity: | <95% r.h. |
| Operation | DIN EN 60 721-3-1 |
| Climatic conditions: | Class 3K5 |
| Mechanical conditions: | Class 3M2 |
| Temperature range: | -20...+60 °C |
| Humidity: | < 95% r.h. |

Tab. K

NOTE:

For detailed information, refer to the specific manual of PLL52 module.



Condensation, formation of ice and the entrance of water are not permitted!

3.15 Oxygen sensor QGO20 ... (optional)

Warnings



WARNING

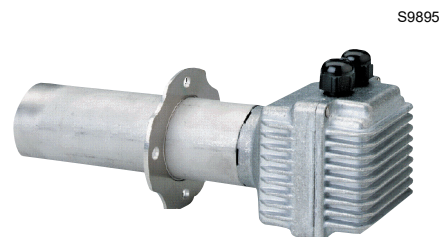
To avoid accidents, material or environmental damage, observe the following instructions!

Avoid opening, modifying or forcing the oxygen sensor.

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Before modifying the wiring in the sensor connection area, fully disconnect the burner control device from the power supply (omnipolar separation).
- Ensure that the sensor cannot be inadvertently switched on again and check this by making a voltage test.
- To avoid the risk of electrocution, protect the connection terminals in a suitable manner and correctly fix the cover.
- During operation, the flange of the sensor connection must be kept closed; all screws must be tightened securely.
- Check the wiring is in order.
- Falls and collisions can negatively affect the safety functions. In this case, the unit must not be operated, even if it displays no evident damage.
- Ensure that the device does not get into contact with explosive or inflammable gases.
- There is a risk of burning since the measuring cell works at an operating temperature of 700 °C and other accessible parts can get very hot too (> 60 °C).
- To prevent injury caused by the hot immersion tube, remove the device only after the equipment has cooled down.
- Make certain that the sensor's inlet and outlet are always kept free from dirt.
- Before cleaning the inlet and outlet, allow the sensor to cool down for at least 1 hour.
- Mount the sensor such that the connecting part (head to flange) is free so that the exchange of air is ensured. Otherwise, measurements might get distorted, possibly leading to dangerous situations.
- Ensure that there are no chemicals, such as solvent vapors, near the sensor.

Installation notes

- The flue gas flow passing the measuring cell must be homogeneous, with no or only little turbulence. When mounted too close to air dampers or pipe bends, faulty measurements can occur.
- A number of faults can distort the measurements (this can lead to dangerous situations in connection with oxygen trim control):
 - If the stack is not tight, false air can join the flue gases.
 - In that case, the residual oxygen content indicated by the sensor is higher than it actually is.
 - If the flue gas velocity is low, the sensor's response is slower, since the flue gases take more time to pass the measuring cell. In that case, it is recommended to mount the sensor in an inclined position (refer to the manual).
 - The greater the sensor's distance from the flame, the longer the dead time.



S9895

Fig. 9

NOTE:

For further explanations about the wiring connetions, please refer to the manual supplied with the accessory code 20045187.



WARNING

Condensation, formation of ice and the entrance of water are not permitted!

3.15.1 Technical data QGO20

| | |
|--|---|
| Operating voltage of measuring cell's: | |
| – QGO20.000D27 | AC 230 V ±15 % |
| – QGO20.000D17 | AC 120 V ±15 % (only with LMV52 ... with PLL52...) |
| Mains frequency: | 50...60 Hz ±6 % |
| Power consumption: | Max. 90 W, typical value 35 W (controlled) |
| Permissible mounting position: | Refer to mounting Instructions M7842 |
| Degree of protection: | IP40, to be ensured through installation |
| Weight (net): | approx. 0.9 kg |
| Signal lines | |
| – Shielded 6-wires cable | Twisted pairs |
| – Shielding connected to terminal GND of the PL52... | |
| Wire diameter | LiFCY3x2x0,2 o LYCY3x2x0,2 |
| Measuring system | Zirconium dioxide measuring cell as an oxygen ion conductor |
| Permissible flue gas velocity (only with AGO20...) | 1...10 m/s |
| Fuel type | Fuel oil EL or Natural gas H |
| Measuring range | 0.2...20.9 % O ₂ |
| Permissible cable length | Max. 100 m |
| Wire diameter | <10 m |
| Power supply lines (Net cable) | |
| – Cable diameter | Min. 1 mm ² |
| – Cable type | QGO20.000D27: e.g. NYM 3 x 1,5 QGO20.000D17: UL AWM Style 1015/MTW or CSA-AWM/TEW |
| Required operating temperature of measuring cell | 700 °C ±50 °C |
| Environmental conditions | |
| Storage | |
| | DIN EN 60721-3-1 |
| Climatic conditions: | Class 1K3 |
| Mechanical conditions: | Class 1M2 |
| Temperature range: | -20...+60 °C |
| Humidity: | <95% r.h. |
| Transport | |
| | DIN EN 60721-3-2 |
| Climatic conditions: | Class 2K2 |
| Mechanical conditions: | Class 2M2 |
| Temperature range: | -25...+70 °C |
| Humidity: | <95% r.h. |
| Operation | |
| | DIN EN 60721-3-3 |
| Climatic conditions: | Class 3K5 |
| Mechanical conditions: | Class 3M2 |
| Temperature range: | |
| – Flange | Max. 250 °C |
| – Connecting head | Max. 70 °C |
| – Flue gases | ≤300 °C |
| Humidity: | <95% r.h. |
| Installation altitude: | Max. 2000 m a.s.l. |

Tab. L

4 Installation

4.1 Notes on safety for the installation

After carefully cleaning all around the area where the burner is to be installed, and arranging for the environment to be illuminated correctly, 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.



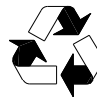
Combustion air inside the boiler must be free from hazardous mixes (e.g.: chloride, fluoride, halogen); if present, it is highly recommended to carry out cleaning and maintenance more frequently.

4.2 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 20-25 cm 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.



Release the burner from the wooden platform by removing the bolts/nuts/screws that secure the burner to the platform.

Handle the burner following the safety standards and regulations of the laws in force and using the eyebolts supplied as equipment.

4.3 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; but should be collected and disposed of in the appropriate places.

20178681

| | | | | | |
|---------------|--|------|--|------|--|
| R.B.L. | | A | | B | |
| | | D | | C | |
| E | | — | | F kW | |
| G | | mbar | | H kW | |
| G | | mbar | | H kW | |
| I | | I | | I | |
| E | | A | | A | |
| E | | A | | Kg | |
| | | | | | |

Fig. 10

Checking the characteristics of the burner

Check the identification label of the burner, showing:

- the model (A) (Fig. 10) 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 absorbed electrical 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 burner output must be within the boiler's firing rate;

- the category of the appliance/countries of destination (I).



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

4.4 Operating position



WARNING

- The burner is designed to operate only in positions 1, 2, 3 and 4 (Fig. 11).
- 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.



DANGER

- Any other position could compromise the correct operation of the appliance.
- Installation 5 is prohibited for safety reasons.

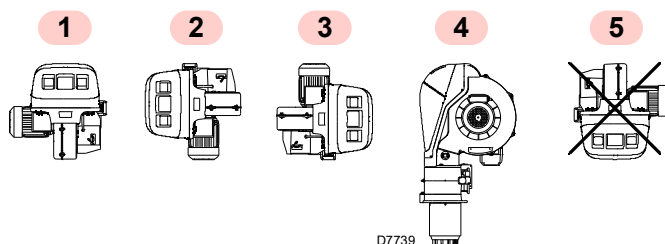


Fig. 11

4.5 Preparing the boiler

4.5.1 Boring the boiler plate

Drill the combustion chamber locking plate as shown in Fig. 12 (Tab. M). The position of the threaded holes can be marked using the thermal screen supplied with the burner.

4.5.2 Blast tube length

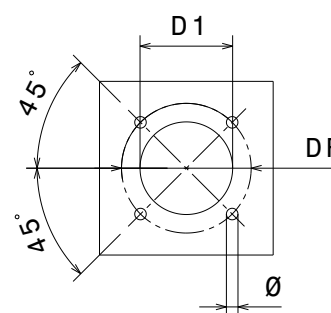
The length of the blast tube must be greater than the thickness of the boiler door complete with its fettling.

For boilers with front flue passes 1)(Fig. 13) or flame inversion chamber, a protection in refractory material 5) must be inserted between the boiler fettling 2) and the blast tube 4).

The refractory can have a conical shape (minimum 60°).

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

For boilers with a water-cooled front piece, a refractory lining 2)-5)(Fig. 13) is not necessary, unless expressly requested by the boiler manufacturer.



20149117

Fig. 12

| mm | D1 | DF | Ø |
|-----------------|-----|-----|-----|
| RS 310/E O2 ULX | 390 | 452 | M18 |
| RS 510/E O2 ULX | 390 | 452 | M18 |

Tab. M

4.6 Securing the burner to the boiler



WARNING

Prepare a suitable lifting system using the rings 3)(Fig. 13), after removing the fixing screws 7) of the casing 8).

- Fit the heat insulation supplied onto the blast tube 4)(Fig. 13).
- Fit the entire burner onto the boiler hole prepared previously (Fig. 12), and fasten with the screws supplied.



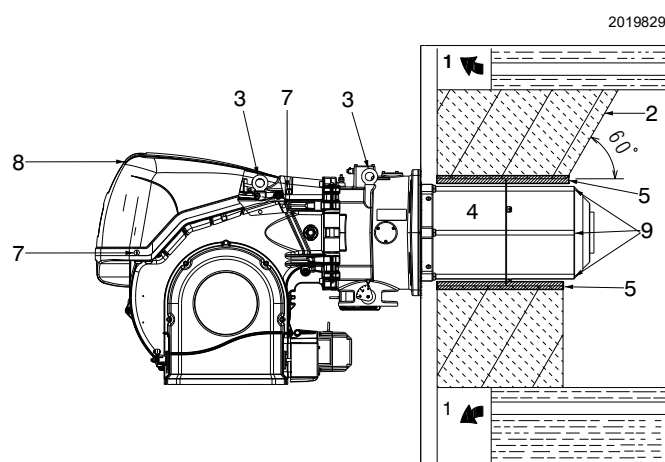
WARNING

The seal between burner and boiler must be airtight.



WARNING

Pay particularly attention to the external gas pipes 9)(Fig. 13) during the burner fixing to the boiler in order to avoid to damage them.



20198297

Fig. 13

4.7 Access to head internal part

The burner leaves the factory set for opening to the right, therefore maintaining the pin 1)(Fig. 14) in the housing.

To open the burner towards the right, proceed as follows:

- A disconnect the plug/socket 6)(Fig. 14) of the maximum gas pressure switch;
- B remove the screws 2);
- C open the burner to a maximum of 100-150 mm by rotating around the hinge and release the cables of electrodes and the ionisation probe 5);
- D fully open the burner as in Fig. 14;
- E undo the screw 4) with pressure test point;
- F release the combustion head by lifting it from its housing 3), then take out the combustion head.



WARNING

To open the burner from the opposite side, before removing the pin 1)(Fig. 14), make sure that the 4 screws 2) are tight.

Then shift the pin 1) to the opposite side and then proceed as described above at point A).

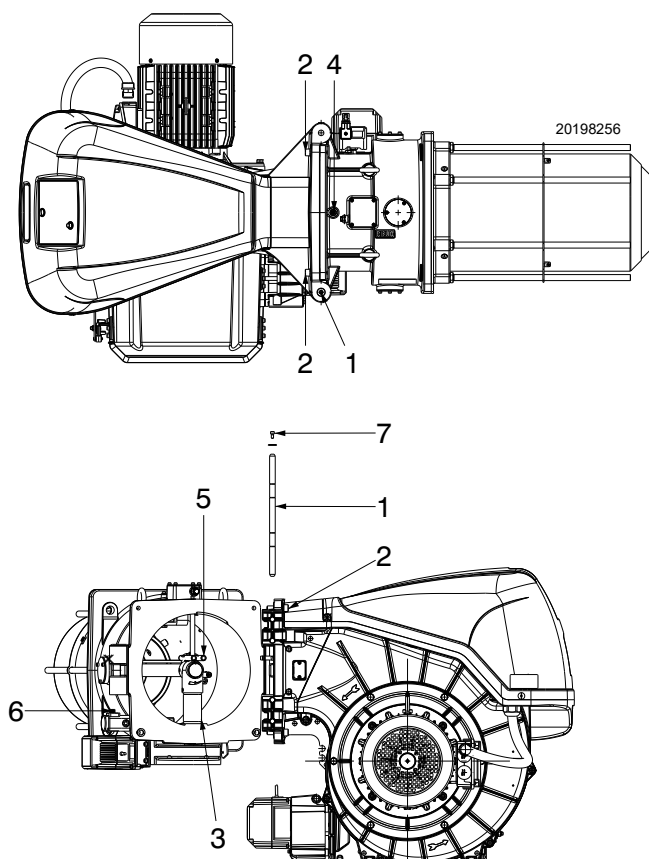


Fig. 14

4.8 Ionization probe and electrodes position



WARNING

Check that the ionization probe and electrodes are placed as in Fig. 15, according to the dimensions indicated.

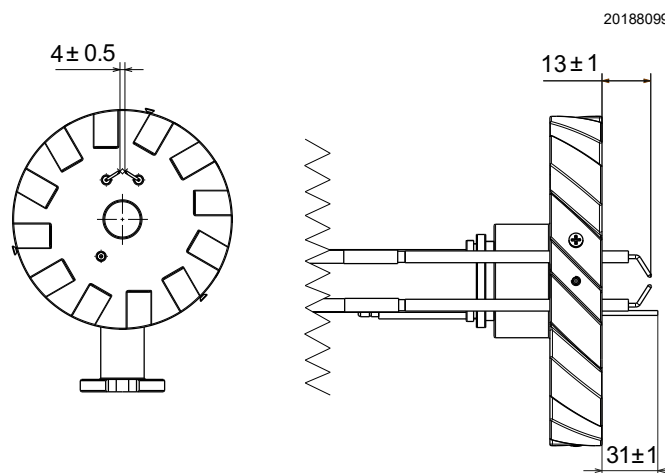


Fig. 15

4.9 Combustion head adjustment

Rotate the screw 1) until the notch you have found corresponds with the front surface of the screw itself.

The combustion head is opened by turning the screw 1) anti-clockwise.

The combustion head is closed by turning the screw 1) clockwise (Fig. 16)



WARNING

The burner leaves the factory with the combustion head set at notch 0 (Fig. 16).

This setting allows to secure the movable components during the transport of the burner.

NOTE:

Depending on the specific application, the adjustment can be modified.



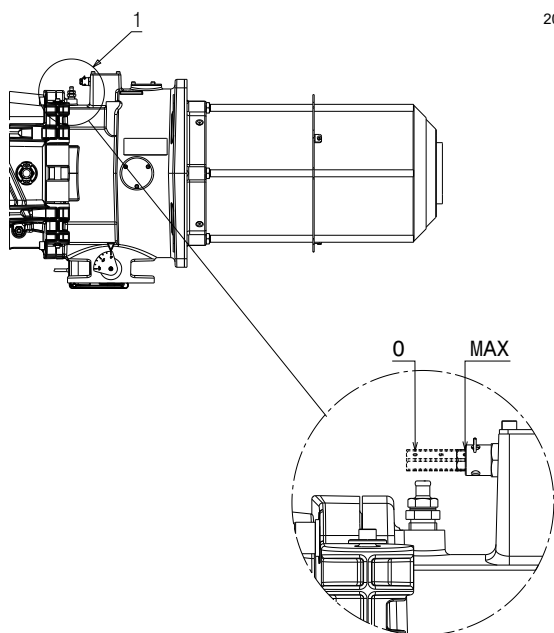
WARNING

The combustion head can be adjusted within the following ranges:

RS 310/E O2 ULX: **0 - 10**

RS 510/E O2 ULX: **0 - 10**

The adjustment cannot be carried out outside these ranges.

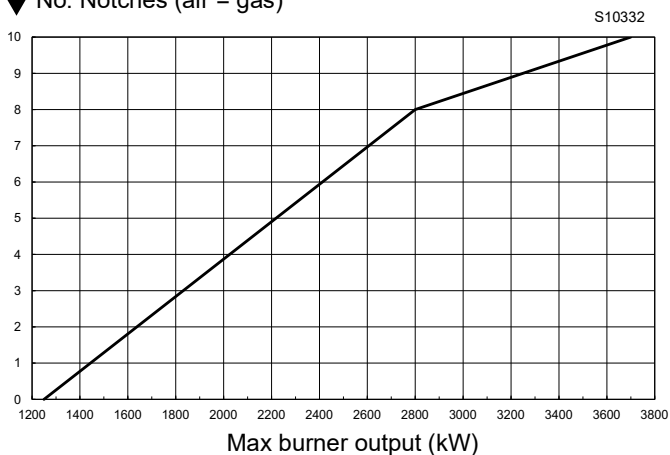


20198298

Fig. 16

RS 310/E O2 ULX

↓ No. Notches (air = gas)



RS 510/E O2 ULX

↓ No. Notches (air = gas)

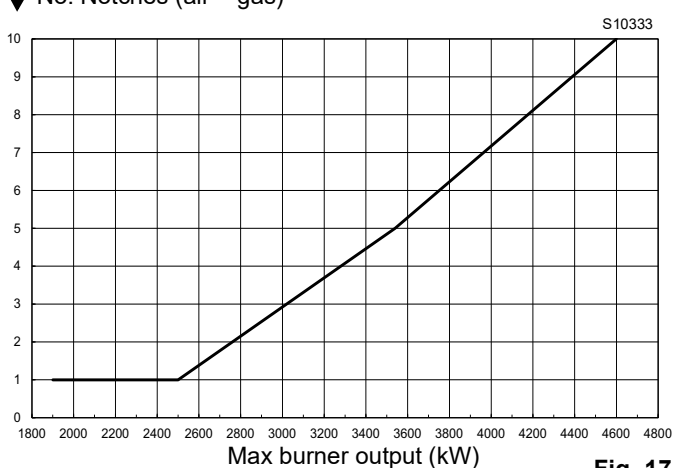


Fig. 17

Before starting up the burner, carry out the settings according to the required output and indicated in the diagram (Fig. 17).

4.10 Central gas adjustment

As you can see in Fig. 18 the gas flows through the combustion head in two different ways:

- external gas flows from the pipes 1) that surrounds the combustion head;
- central gas flows from the tube 2) and then through the plates 3) behind the flame disc.

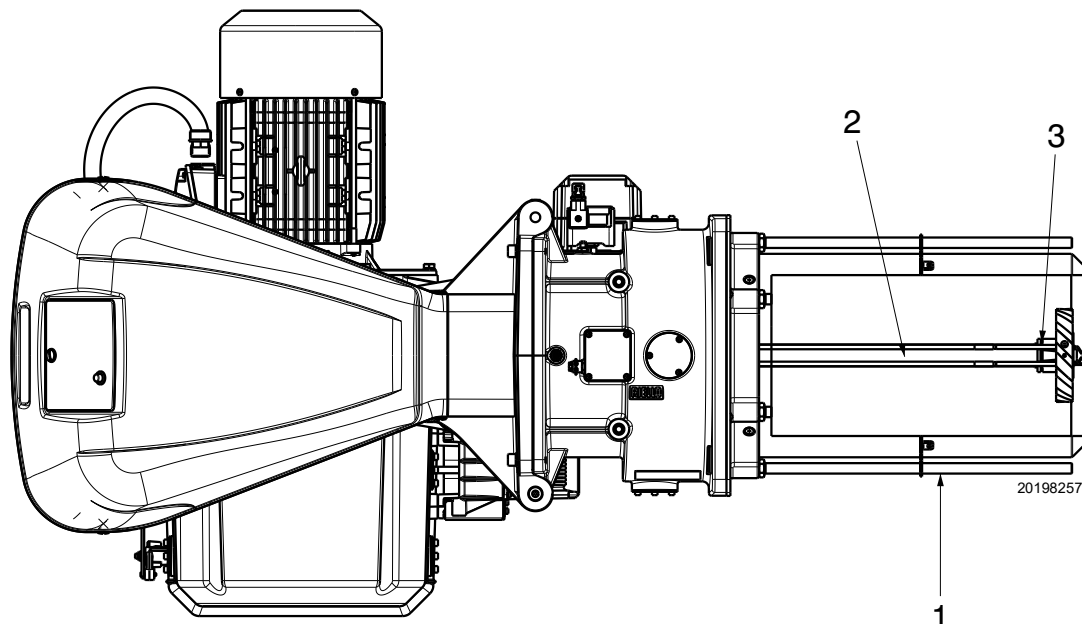


Fig. 18

4.10.1 Central gas setting

The factory setting for the central gas is with the following passage holes (Fig. 19).

RS 310/E O2 ULX Central hole + 2 open holes

RS 510/E O2 ULX Central hole + 2 open holes

If necessary, modify as indicated in "Firing rates" on page 9:

- hook the combustion head as indicated in the paragraph "Access to head internal part" on page 21;
- remove or add one or more screws 1) (Fig. 19) as follows:

RS 310/E O2 ULX Open central hole

RS 510/E O2 ULX Open central hole

- re-assemble the combustion head.

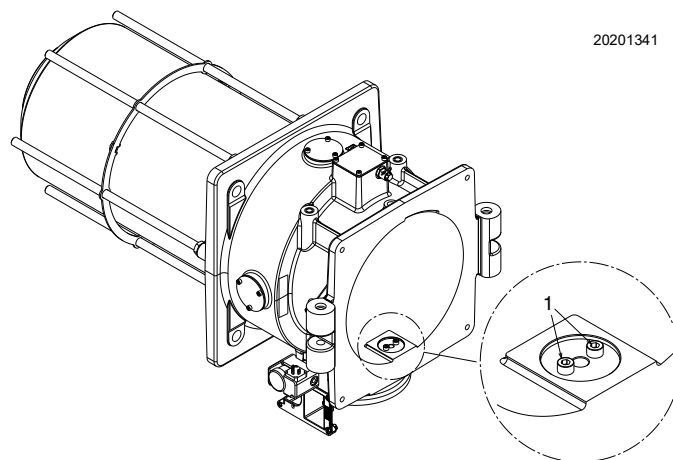


Fig. 19

4.11 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.



WARNING

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

4.11.1 Gas feeding line (Example) - For functional details refer to the gas train manual

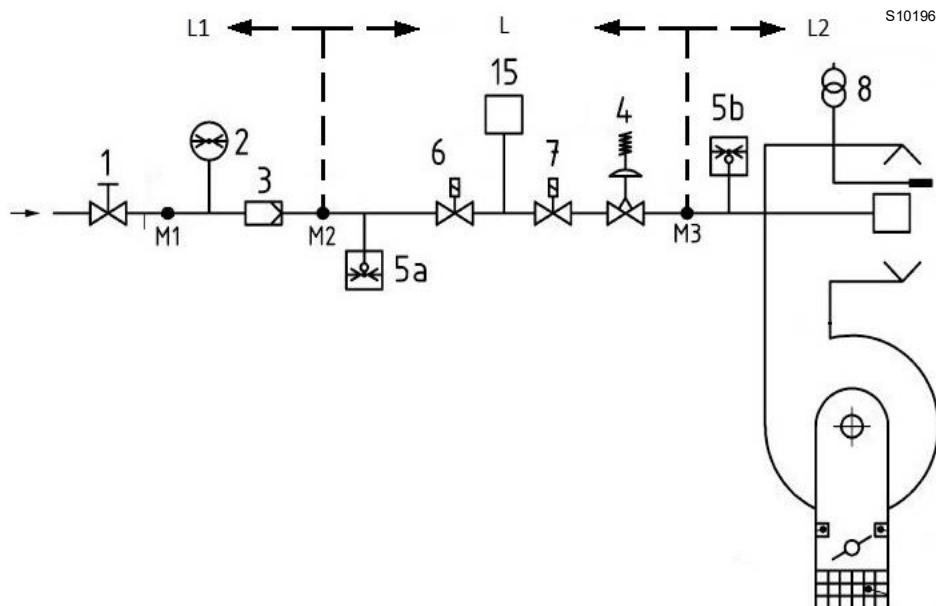


Fig. 20

Key (Fig. 20)

- 1 Manually operated shut-off valve
- 2 Pressure gauge
- 3 Filter
- 4 Governor
- 5a Low pressure protection device
- 5b Max gas pressure switch
- 6 1st safety shut-off valve
- 7 2nd safety shut-off valve
- 8 Ignition device
- 15 Valve proving system
- L Gas train - supplied loose
- L1 Installer responsibility
- L2 Burner
- M1 Pressure outlet
- M2 Pressure outlet
- M3 Pressure outlet

4.11.2 Gas train

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

4.11.3 Gas train installation



DANGER

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.

4.11.4 Gas pressure

Each diagram indicate the minimum pressure drops depending on the maximum burner output.

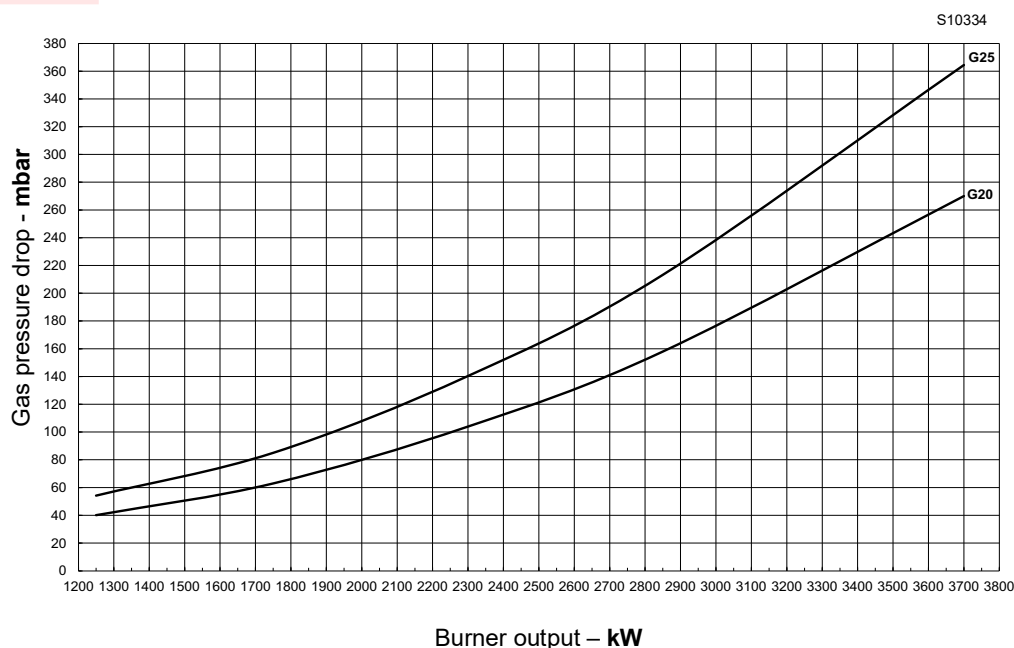
The values shown, refer to:

- Natural gas G 20 NCV 9.45 kWh/Sm³ (8.2 Mcal/Sm³)

Each line is the sum of gas pressure drop through:

- 1 gas butterfly with maximum opening;
- 2 combustion head (with 0 mbar backpressure and combustion head adjusted as indicated on page 22).

RS 310/E O2 ULX



RS 510/E O2 ULX

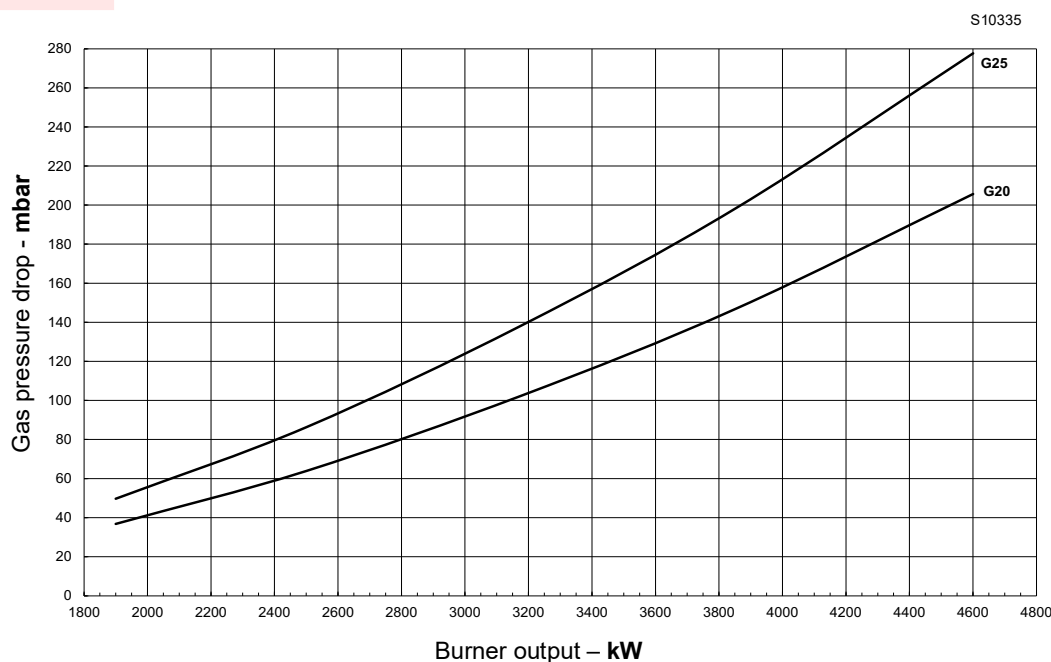


Fig. 21

Calculate the approximate output of the burner in this way:

- subtract the combustion chamber pressure from the gas pressure measured at test point P1 (Fig. 22).
- Enter the mbar scale (Fig. 21) and read the corresponding output by reading on the dashed line.

Example RS 510/E O2 ULX with G20 natural gas:

Fixed Output operation

Gas pressure at test point P1 = 100 mbar

Pressure in combustion chamber = 10 mbar

100 - 10 = 90 mbar

A pressure of 90 mbar, corresponds to an output of 3000 kW with factory setting for central gas.

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. 22), set the MAX output required from the burner operation:

- find the nearest output value.
- Read the pressure at the test point P1)(Fig. 21).
- Add this value to the estimated pressure in the combustion chamber.

Example for RS 510/E O2 ULX with G20 natural gas:

Required burner maximum output operation: 3000 kW

Gas pressure at an output of 3000 kW = 90 mbar

Pressure in combustion chamber = 10 mbar

$90 + 10 = 100$ mbar

Pressure required at test point P1)(Fig. 21).



WARNING

The output and gas pressure data refer to operation with gas butterfly valve fully open (90°) on the whole firing rate.

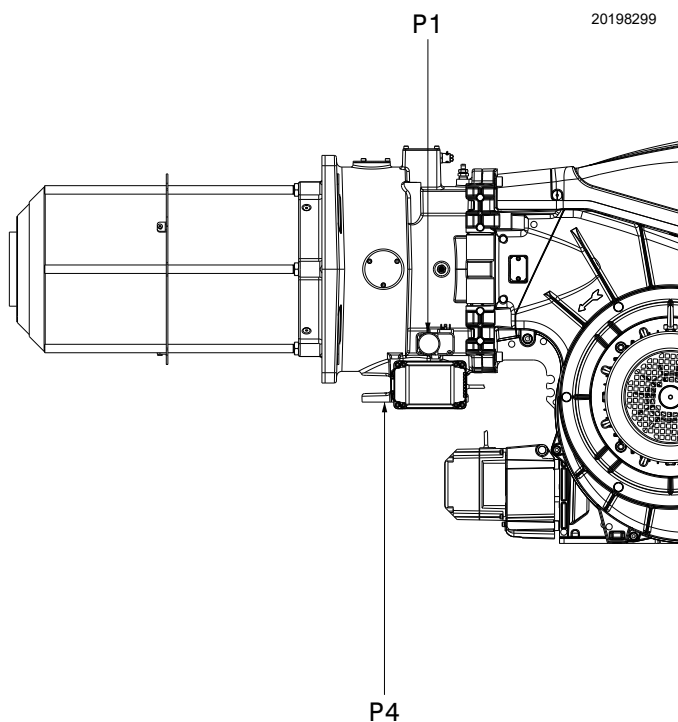


Fig. 22

4.12 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 burners equipped with LMV5... can operate in FS1 or FS2 mode (continuous/intermittent operation), see specific manual LMV5... . Refer to the following notes for the type of operation that has been set.
- The FS1 burners have been set for intermittent operation. This means that the burner should compulsorily be stopped at least once every 24 hours to enable the electric flame control to check its own safety and efficiency at start-up. Normally the boiler's thermostat/pressure switch ensures that the burner stops. If this is not the case, a time switch should be fitted in series to TL to stop the FS1 burner at least once every 24 hours. Refer to the wiring diagrams.
- The FS2 burners have been set for continuous operation. This means that the burner should compulsorily be stopped at least once every 72 hours to enable the electric flame control to check its own safety and efficiency at start-up. 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 FS2 burner at least once every 72 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 3 mm 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.
- Check the electric wiring inside the boiler complies with the national and local safety regulations.
- Live and neutral should not be mixed up (this could cause dangerous malfunctions, a loss of protection against electric shocks, etc.).
- Make sure the cable grommets of the connected cables comply with the relevant standards (e.g. EN60730 and EN60 335).
- When wiring the unit, make sure that AC 230V mains voltage cables are run strictly separate from extra low-voltage cables to avoid risks of electrical shock hazard.

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.

4.12.1 Supply cables and external connections passage

All the cables to be connected to the burner must be threaded through cable grommets. The use of the cable grommets can take various forms; by way of example see Fig. 23.

Key (Fig. 23)

- 1 Electrical supply - Bore for M32
- 2 Consents and safety devices - Bore for M20
- 3 Minimum gas pressure switch - Bore for M20
- 4 VPS gas valve leak detection control kit- Bore for M20
- 5 Gas train - Bore for M20
- 6 Available - Bore for M20
- 7 Available - Bore for M16
- 8 Available - Bore for M32

Cable grommets used in the factory:

- A Rpm sensor
- B Maximum gas pressure switch
- C Servomotors

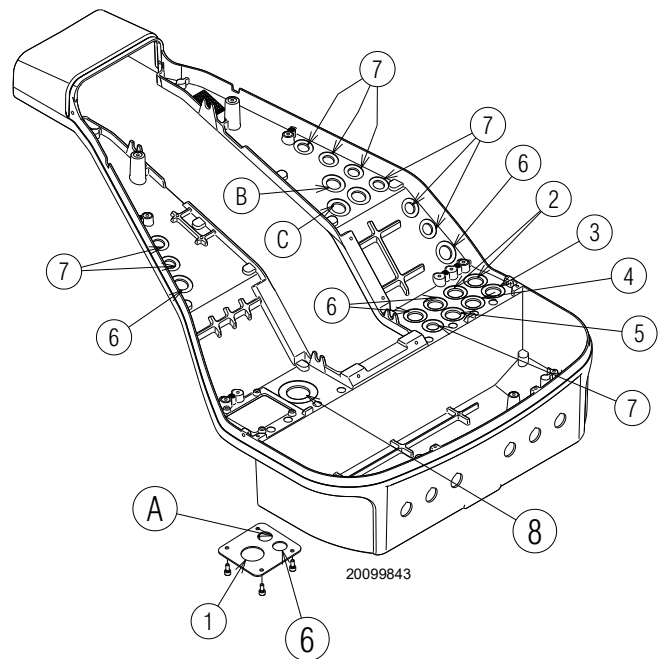


Fig. 23



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

5 Start-up, calibration and operation of the burner

5.1 Notes on safety for the first start-up



WARNING

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.



WARNING

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



WARNING

Refer to paragraph “Safety test - with gas ball valve closed” on page 36 before the first start-up.

5.2 Adjustments prior to ignition

Combustion head adjustment has already been described in the section “Combustion head adjustment” on page 22.

In addition, the following adjustments must also be made:

- open manual valves upstream from the gas train.
- Adjust the minimum gas pressure switch to the start of the scale.
- Adjust the maximum gas pressure switch to the end of the scale.
- Adjust the air pressure switch to the start of the scale.
- Adjust the pressure switch for the leak detection control (PVP kit)(Fig. 29 on page 33) according to the instructions supplied with the kit.
- Purge the air from the gas line.
We recommend using a plastic tube routed outside the building and to purge air until gas is smelt.
- Fit a U-type pressure gauge or a differential pressure gauge (Fig. 24), with socket (+) on the gas pressure of the pipe coupling and (-) in the combustion chamber. The manometer readings are used to calculate MAX burner output using Fig. 20 and Fig. 21 on page 25.
- Connect two lamps or testers to the two gas line solenoids to check the exact moment in which voltage is supplied. This operation is unnecessary if each of the two solenoids is equipped with a pilot light that signals voltage passing through.



CAUTION

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.



WARNING

The factory setting for burners with inverter at the ignition point is maximum rpm speed. Do not change this parameter.

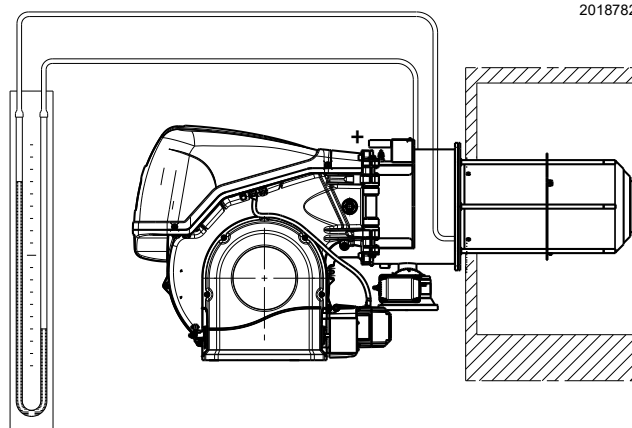


Fig. 24

5.3 Burner start-up

Feed electricity to the burner via the disconnecting switch on the boiler panel.

Close the thermostats/pressure switches. Turn the switch of Fig. 25 to position “**AUTO**”.



Make sure that the lamps or testers connected to the solenoids, or indicator lights on the solenoids themselves, show that no voltage is present. If voltage is present, stop the burner **immediately** and check the electrical wiring. When the burner starts, check the direction of the motor rotation, as indicated in Fig. 25.

As the burner is not fitted with a device to check the sequence of the phases, the motor rotation may be incorrect. As soon as the burner starts up, go in front of the cooling fan of the fan motor and check it is rotating anticlockwise.

If this is not the case:

- place the switch of Fig. 25 in position “**0**” and wait for the flame control to carry out the switch-off phase;
- disconnect the electrical supply from the burner;

invert the phases on the three-phase power supply.

Once the above steps are complete, the burner should light.

If the motor starts up, but the flame does not appear and the flame control goes into lockout, reset it and wait for a new ignition attempt.

If ignition 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 ignition delivery.

The arrival of gas at the pipe coupling is indicated by the U-type pressure gauge (Fig. 24 on page 29).

If further burner lockouts occur, refer to the “Release procedure” given in the equipment manual supplied.



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



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

Once the burner has ignited, proceed with the global adjustment of the burner.

Further interfaces and communication functions with computers, for remote control or integration in central supervision systems are available on the basis of the configuration of the system.



The first start up and every further internal setting operation of the adjustment system or the expansion of the base functions require access by means of password and are to be carried out by service personnel who are especially trained for the internal programming of the instrument and the specific application created with this burner.

The first start-up and curve synchronisation manual is supplied with the burner.

At request, the complete manual for the control and setting of all parameters is available.

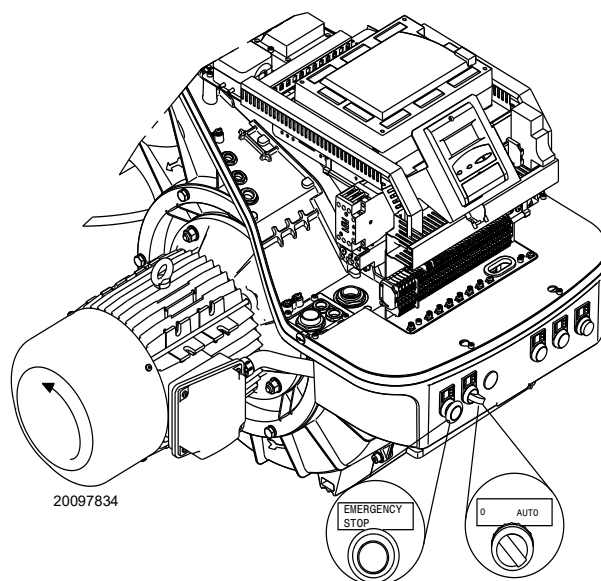


Fig. 25

5.4 Air / fuel adjustment

Air/fuel synchronisation is carried out with the relevant air and gas servomotors by logging a calibration curve by using the electronic cam.

It is advisable, to reduce the loss and for a wide calibration field, to adjust the servomotors to the maximum of the output used, the nearest possible to the maximum opening (90°).

The choking of the air, taking into account the maximum combustion output, takes place by varying the adjustment of the combustion head (see "Combustion head adjustment" on page 22).

On the gas butterfly valve, the fuel step according to the burner output required, with servomotor completely open, is carried out by the pressure stabiliser on the gas train.

5.4.1 Air adjustment for maximum output

- Adjust the servomotor to maximum opening (nearly 90°) so that the air butterfly valves are entirely open.

5.4.2 Air/fuel adjustment and output modulation system

The air/gas regulator and output modulation system equipping RS/E series burners performs a number of integrated functions to optimise burner function, in both individual installations and in combination with other units (e.g. double furnace boiler or multiple heat generators in parallel).

The basic system functions control:

- 1 The dosage of the air and fuel through positioning using direct servocommands of the relevant valves eliminating the possible play in the calibration systems with mechanical cam lever mechanisms, used on traditional modulating burners.
- 2 The modulation of the burner output in accordance with the load required by the system, with maintenance of the pressure or temperature of the boiler at the operating values set.
- 3 The sequence (cascade adjustment) of more than one boiler through the suitable connection of the various units and the activation of the internal software of the individual systems (option).

Further interfaces and communication functions with computers, for remote control or integration in central supervision systems are available on the basis of the configuration of the system.



WARNING

The first start up and every further internal setting operation of the adjustment system or the expansion of the base functions require access by means of password and are to be carried out by service personnel who are especially trained for the internal programming of the instrument and the specific application created with this burner.

5.4.3 Burner adjustment

The optimum adjustment of the burner requires an analysis of flue gases at the boiler outlet.

Adjust in sequence:

- 1 - Output upon ignition
- 2 - MAX output
- 3 - MIN output
- 4 - Intermediate outputs between Min. and Max.
- 5 - Air pressure switch
- 6 - Maximum gas pressure switch
- 7 - Minimum gas pressure switch

5.4.4 Output upon ignition

Ignition must occur at a lower output than the max. operation output. Regulations provide that the ignition output of this burner must be equal to or less than 1/3 of the MAX operation output.

Example:

MAX operation output of 600 kW.

The ignition output must be equal to or less than 200 kW with $t_s = 3s$

In order to measure the ignition output:

- disconnect the plug-socket on the ionisation probe cable (the burner will fire and then go into lockout after the safety time has elapsed);
- perform 10 consecutive ignitions with lockouts;
- on the meter, read the quantity of gas burned: This quantity must be equal to, or lower than, the quantity given by the formula, for $t_s = 3s$:

$$V_g = \frac{Q_a \text{ (max. burner delivery)} \times n \times t_s}{3600}$$

V_g volume supplied in ignitions carried out (Sm³)

Q_{ai} ignition delivery (Sm³/h)

n number of ignitions (10)

t_s safety time (sec)

Example for gas G20 (9.45 kWh/Sm³):

ignition output 200 kW corresponding to

$$\frac{200}{9.45} = 21.16 \text{ Sm}^3/\text{h}$$

After 10 ignitions with their lockouts, the delivery indicated on the meter must be equal to or less than:

$$V_g = \frac{21.16 \times 10 \times 3}{3600} = 0.176 \text{ Sm}^3$$

Air adjustment

The adjustment of the air is carried out by changing the angle of the air damper changing the degrees of the air servomotor inside the electronic cam programme.

5.4.5 Maximum output

The MAX output must be set within the firing rate (Fig. 2 on page 9).

Adjustment of gas delivery

Measure the gas delivery on the gas meter. As an indicative guide it can be taken from Fig. 20 and Fig. 21 on page 25, just read the gas pressure on the pressure gauge (shown in Fig. 32 on page 37) and follow the instructions given on page 25.

- If it is necessary to reduce it, lower the output gas pressure via the pressure adjuster located beneath the gas valve.
- If delivery needs to be increased, increase the adjuster outlet gas pressure.

Air adjustment

If necessary vary the degrees of the air servomotor.

Indication for the burner ignition

In Tab. N the calibrations of the air and gas servomotors at the ignition point for each model are summarized according to the change of the maximum burnt power.

Ignition point - RS 310 ULX -

| | | | |
|-------------------------------|------|------|------|
| Maximum power input (kW) | 3700 | 3400 | 1250 |
| Gas motor/butterfly setting | 5° | 5° | 8° |
| Air servomotor/damper setting | 6° | 6° | 1° |

Ignition point - RS 510 ULX -

| | | | |
|-------------------------------|------|------|------|
| Maximum power input (kW) | 4600 | 3550 | 1900 |
| Gas motor/butterfly setting | 8° | 8° | 8° |
| Air servomotor/damper setting | 3° | 3° | 1° |

Tab. N

To determine the calibrations to use at the first start, proceed as follows:

- 1 Determine the maximum power required by the burner.
- 2 Open the combustion head as indicated in Fig. 16 on page 22.

5.5 Final adjustment of the pressure switches

5.5.1 Air pressure switch

Adjust the air pressure switch (Fig. 26) after performing all other burner adjustments with the air pressure switch set to the start of the scale.

With the burner operating at minimum output, insert a combustion analyser in the stack, slowly close the suction inlet of the fan (for example, with a piece of cardboard) until the CO value does not exceed 100 ppm.

Slowly turn the appropriate knob clockwise until the burner goes into lockout.

Check the indication of the arrow pointing upwards on the graduated scale. Turn the knob clockwise again, until the value shown on the scale corresponds with the arrow pointing downwards, and so recovering the hysteresis of the pressure switch shown by the white mark on a blue background, between the two arrows.

Now check the correct start-up of the burner. If the burner locks out again, turn the knob anti-clockwise a little bit more. During these operations it may be useful to measure the air pressure with a pressure gauge.

The connection of the pressure gauge is shown in Fig. 26. The standard configuration is that with the air pressure switch connected in absolute mode. Note the presence of a "T" connection, not supplied.

In certain applications in strong depression situations, the connection of the pressure switch does not allow it to change over. In this case it is necessary to connect the pressure switch in differential mode, applying a second tube between the air pressure switch and the fan suction line mouth.

In this case also, the pressure gauge must be connected in differential mode, as shown in Fig. 26.

- 3 Calculate the pressure required downstream of the gas train: this value is given by the sum of the boiler back pressure at the maximum burnt power and the pressure drop read on the diagrams of Fig. 21 on page 25.
- 4 Set the air and gas servomotors as suggested in Tab. N. If the maximum power falls between two indicated values, take an intermediate value between the two according to the opening degrees of the air and gas servomotors.



At the first ignition it is not recommended to use an air servomotor setting that exceeds the suggested setting by 10% .

5.4.6 Minimum output

The MIN output must be set within the firing rate (Fig. 2 on page 9).

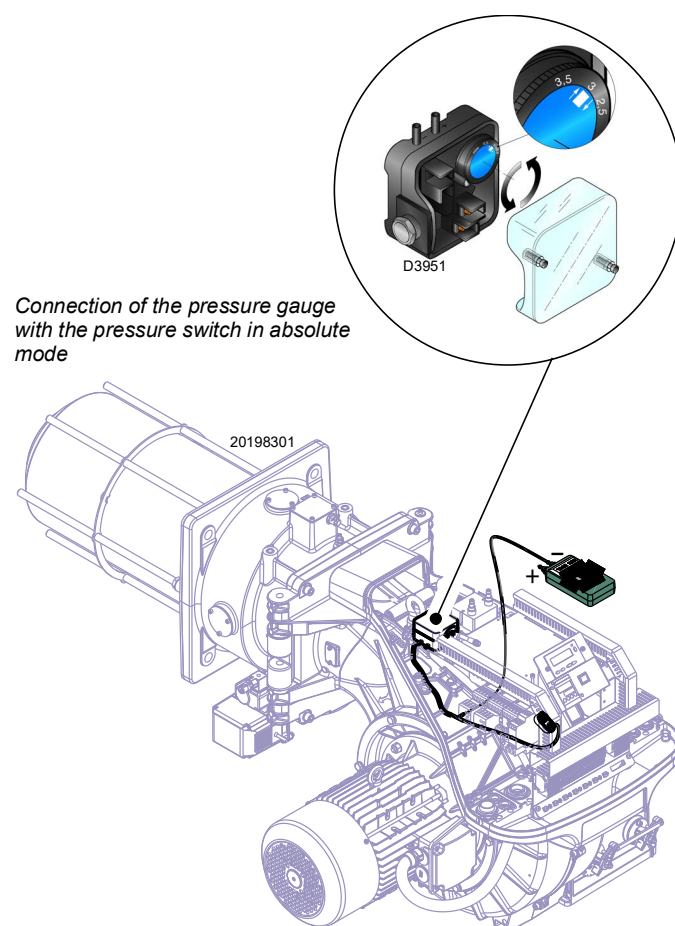


Fig. 26

5.5.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 27) after making all other burner adjustments with the maximum gas pressure switch set to the end of the scale.

To calibrate the maximum gas pressure switch, open the tap and then connect a pressure gauge to its pressure test point.

The maximum gas pressure switch must be regulated to a value no higher than 30% of the measurement read on the gauge when the burner is working at maximum output.

After making the adjustment, remove the pressure gauge and close the tap.

5.5.3 Minimum gas pressure switch

Adjust the minimum gas pressure switch (Fig. 28) after having adjusted the burner, the gas valves and the gas train stabiliser. With the burner operating at maximum output:

- install a pressure gauge downstream of the gas train stabiliser (for example at the gas pressure test point on the burner combustion head);
- choke slowly the manual gas cock until the pressure gauge detects a decrease in the pressure read of about 0.1 kPa (1 mbar). In this phase, verify the CO value which must always be less than 100 mg/kWh (93 ppm).
- Increase the adjustment of the gas pressure switch until it intervenes, causing the burner shut-down;
- remove the pressure gauge and close the cock of the gas pressure test point used for the measurement;
- open completely the manual gas cock.



WARNING

1 kPa = 10 mbar

5.5.4 PVP pressure switch kit

Adjust the pressure switch for the leak detection control (PVP kit) (Fig. 29) according to the instructions supplied with the kit.

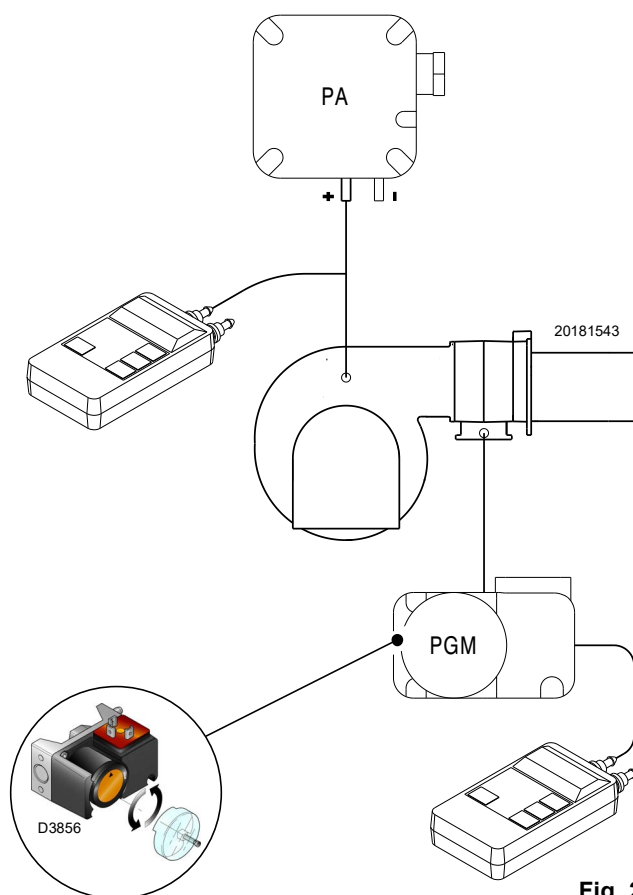


Fig. 27

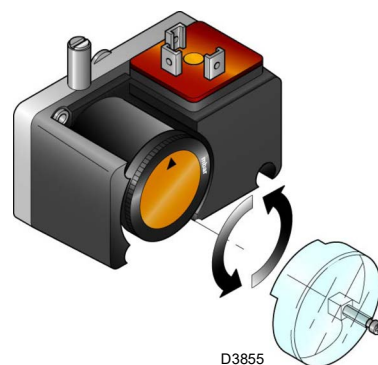


Fig. 28

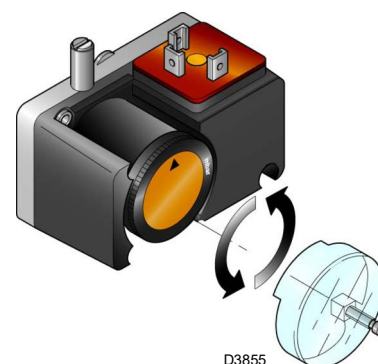


Fig. 29

5.6 Operation

Once the start-up cycle is completed, the servomotor command moves on to the thermostat/pressure switch TR that controls the pressure or the temperature in the boiler.

- If the temperature or the pressure is low, the burner progressively increases the output as far as the MAX value.
- If the temperature or the pressure increases, the burner progressively reduces the output as far as the MIN value. The sequence repeats endlessly.

- The burner stops when the heat request is less than the heat supplied by the burner at MIN output.
- The thermostat/pressure switch TL opens, the flame control carries out the switching off phase.
- The air damper closes completely to reduce heat losses to a minimum.

5.7 Ignition failure

If the burner does not switch on, there is a lockout within 3s of the electrical supply reaching the gas valve.

It may be that the gas does not arrive at the combustion head within the safety time of 3s.

In this case increase gas ignition flow rate. The arrival of gas to the pipe coupling is displayed on the pressure gauge, as shown in Fig. 32 on page 37.



WARNING

In the event the burner stops, in order to prevent any damage to the installation, do not unblock the burner more than twice in a row.

If the burner locks out for a third time, contact the customer service.



DANGER

In the event there are further lockouts or faults with the burner, the maintenance interventions 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.

5.8 Burner flame goes out during operation

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

5.9 Stopping of the burner

The burner can be stopped by:

- intervening on the disconnecting switch of the electrical supply line, located on the boiler panel;
- using the switch "0-AUTO" of Fig. 25 on page 30.

5.10 Final checks (with burner operating)

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

Tab. O



WARNING

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

5.11 Description of O₂ trim control (optional)

A special feature of the LMV52... is control of the residual O₂ content to increase the boiler's efficiency. The LMV52... uses a QGO20..., an external PLL52..., and the standard components of the LMV51... The PLL52... is a detached measuring module for the O₂ sensor and for 2 temperature sensors (Pt1000 / LG-Ni1000). The module communicates with the LMV52... via CAN bus.

The following generic diagram shows the system (Fig. 30).

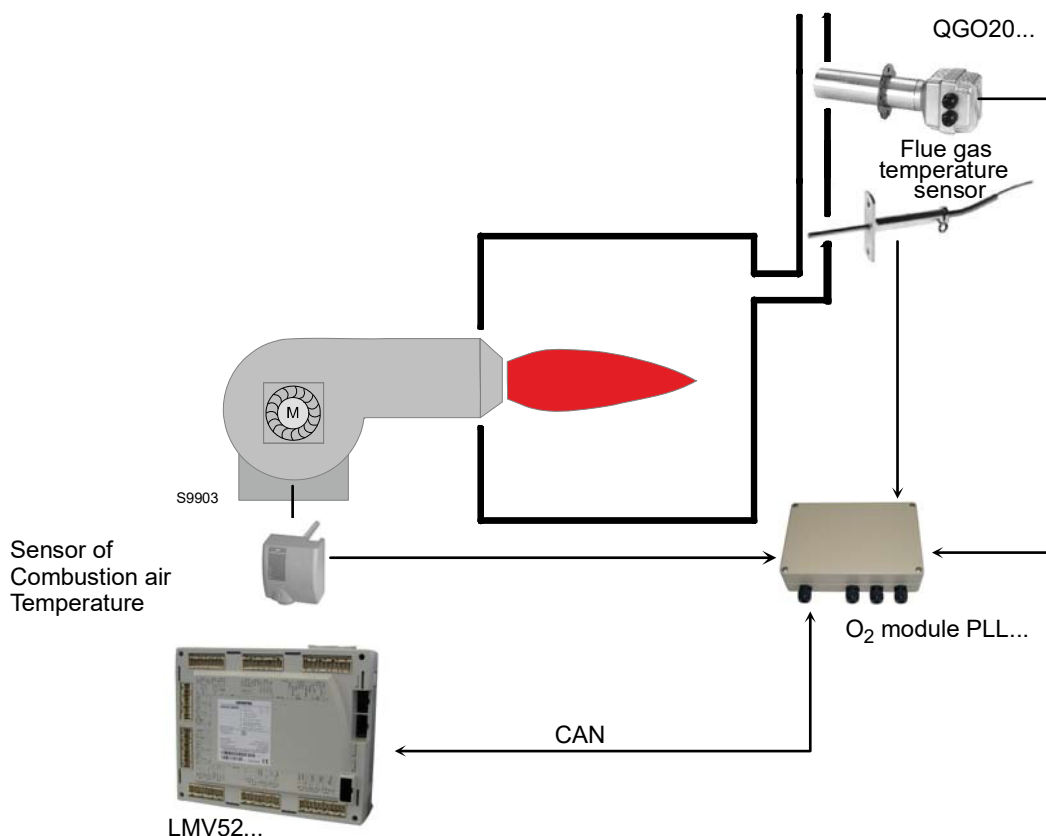


Fig. 30

5.11.1 Operating principle of O₂ trim control

The residual O₂ control system reduces the amount of combustion air depending on the control deviation (O₂ setpoint minus actual of O₂). The amount of combustion air is normally influenced by several actuators and, if used, by a VSD. **Reduction of the amount of air is reached by reducing the «air rate» of the air-regulating actuators.**

For that purpose, the damper positions of these actuators are calculated from some other load point on the ratio control curves. Hence, due to the parameterized ratio control curves, the air-regulating actuators are in a fixed relation to one another.

O₂ trim control is supported by **precontrol**. It calculates the air rate reduction such that changes in burner load do not require the O₂ trim controller to interfere. Consideration is given to a number of measured values that are ascertained when the burner is set. This means that the controller only becomes active when environmental conditions (temperature, pressure) change, and not when the burner load changes.



The installation and setting of the system must be carried out by qualified personnel, as indicated in the specific documentation of the device.

6 Maintenance

6.1 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.

6.2 Maintenance programme

6.2.1 Maintenance frequency



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

6.2.2 Safety test - with gas ball valve closed

It is fundamental to ensure the correct execution of the electrical connections between the gas solenoid valves and the burner to perform safely the commissioning.

For this purpose, after checking that the connections have been carried out in accordance with the burner's electrical diagrams, an ignition cycle with closed gas ball valve -dry test- must be performed.

- 1 The manual ball gas valve must be closed
- 2 The electrical contacts of the burner limit switch need to be closed
- 3 Ensures closed the contact of the low gas pressure switch
- 4 Make a trial for burner ignition

The start-up cycle must be as follows:

- Starting the fan for pre-ventilation
- Performing the gas valve seal control, if provided
- Completion of pre-ventilation
- Arrival of the ignition point
- Power supply of the ignition transformer
- Electrical Supply of solenoid gas valves

Since the manual gas ball valve is closed, the burner will not light up and its flame control will go to a safety lockout condition.

The actual electrical supply of the solenoid gas valves can be verified by inserting a tester. Some valves are equipped with light signals (or close/open position indicator) that turn on at the same time as their power supply.



IF THE ELECTRICAL SUPPLY OF THE GAS VALVES OCCURS AT UNEXPECTED TIMES, DO NOT OPEN MANUAL GAS BALL VALVE, SWITCH OFF POWER LINE; CHECK THE WIRES; CORRECT THE ERRORS AND REPEAT THE COMPLETE TEST.

6.2.3 Checking and cleaning



The operator must use the required equipment 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.

Burner

Check that there are not excess wear or loosen screws.

Clean the outside of the burner.

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.

Gas leaks

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

Gas filter

Change the gas filter when it is dirty.

Electric current to the flame sensor

Clean the ionization probe from any dust.

Check the mechanical integrity of the component and the flame signal measured by the flame control.

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 most care should be exercised during maintenance. If the combustion values measured before starting maintenance do not comply with applicable legislation or do not indicate efficient combustion, consult the Tab. P or contact our Technical Support Service to implement the necessary adjustments.

It is advisable to set the burner according to the type of gas used and following the indications in Tab. P.

| EN 676 | | Air excess | | | |
|--------|--|------------------------------------|-----------------|------------------------------------|-----------------|
| | | Max. output. $\lambda \leq 1,2$ | | Min. output. $\lambda \leq 1,3$ | |
| | | CO ₂ % Calibration | | CO | NO _x |
| GAS | CO ₂ theoretic al max. 0% O ₂ | $\lambda = 1.2$ | $\lambda = 1.3$ | mg/kWh | mg/kWh |
| G 20 | 11.7 | 9.7 | 9.0 | ≤ 100 | ≤ 170 |
| G 25 | 11.5 | 9.5 | 8.8 | ≤ 100 | ≤ 170 |

Tab. P

6.2.4 Safety components

The safety components should be replaced at the end of their life cycle indicated in the Tab. Q.

The specified life cycles do not refer to the warranty terms indicated in the delivery or payment conditions.

Safety**component****Life cycle**

| | |
|---|--------------------------------------|
| Flame control | 10 years or 250,000 operation cycles |
| Gas valves (solenoid) | 10 years or 250,000 operation cycles |
| Pressure switches | 10 years or 250,000 operation cycles |
| Pressure adjuster | 15 years |
| Servomotor (electronic cam (if present)) | 10 years or 250,000 operation cycles |
| Oil valve (solenoid) (if present) | 10 years or 250,000 operation cycles |
| Oil regulator (if present) | 10 years or 250,000 operation cycles |
| Oil pipes/couplings (metallic) (if present) | 10 years |
| Fan impeller | 10 years or 500,000 start-ups |

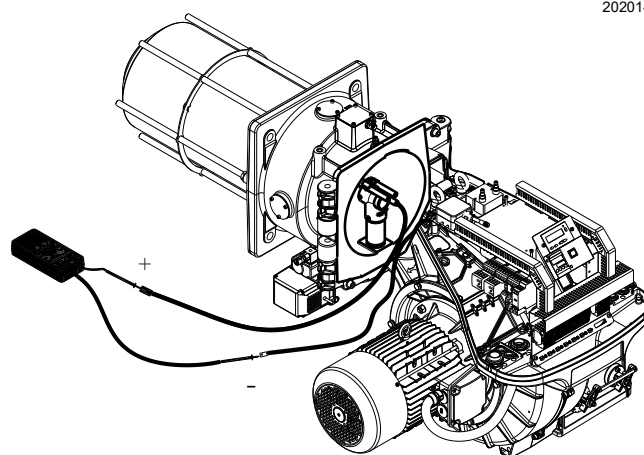
Tab. Q

6.2.5 Measuring the ionisation current

The burner is fitted with an ionisation system to check that a flame is present. The minimum current for flame control operation is 6 μ A. The burner provides a much higher current, so controls are not normally required. However, if it is necessary to measure the ionisation current, disconnect the plug-socket on the ionisation probe cable and insert a direct current microammeter with a base scale of 100 μ A, as shown in Fig. 31.



Carefully check the polarities!

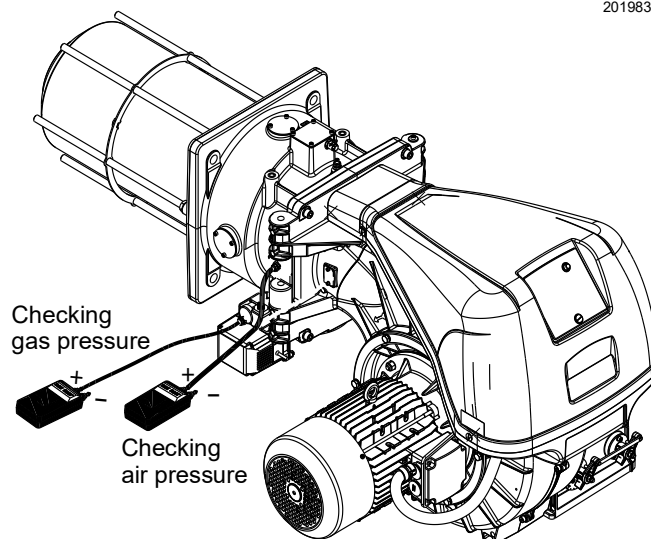


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Fig. 31

6.2.6 Checking the air and gas pressure on the combustion head

To carry out this operation it is necessary to use a pressure gauge to measure the air and gas pressure at the combustion head, as shown in Fig. 32.



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Fig. 32

6.3 Opening the burner



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



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



Turn off the fuel interception tap.

To open the burner, use the same procedure set out in “Access to head internal part” on page 21.

6.4 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 cover and all the safety and protection devices of the burner.

A Appendix - Accessories**Soundproofing box kit**

| Burner | Type | dB(A) | Code |
|------------|------|-------|---------|
| All models | C7 | 10 | 3010376 |

Flame sensor kit

| Burner | Code |
|------------|-----------|
| All models | ON DEMAND |

Continuous purging kit

| Burner | Code |
|------------|----------|
| All models | 20077810 |

Software interface kit (ACS450)

| Burner | Code |
|------------|---------|
| All models | 3010436 |

Efficiency kit with oxygen control kit

| Burner | Code |
|------------|---------|
| All models | 3010377 |

Oxygen control kit

| Burner | Code |
|------------|----------|
| All models | 20045187 |

PVP kit (Seal control function - See gas train booklet)

| Burner | Ramp type | Code |
|------------|-----------|---------|
| All models | MB - CB | 3010344 |

Additional transformer kit

| Burner | Code |
|-----------------|----------|
| Tutti i modelli | 20044177 |

Gas trains in compliance with EN 676

Please refer to manual.



The installer is responsible for the addition of any safety device not foreseen in this manual.

B Appendix - Electrical panel layout

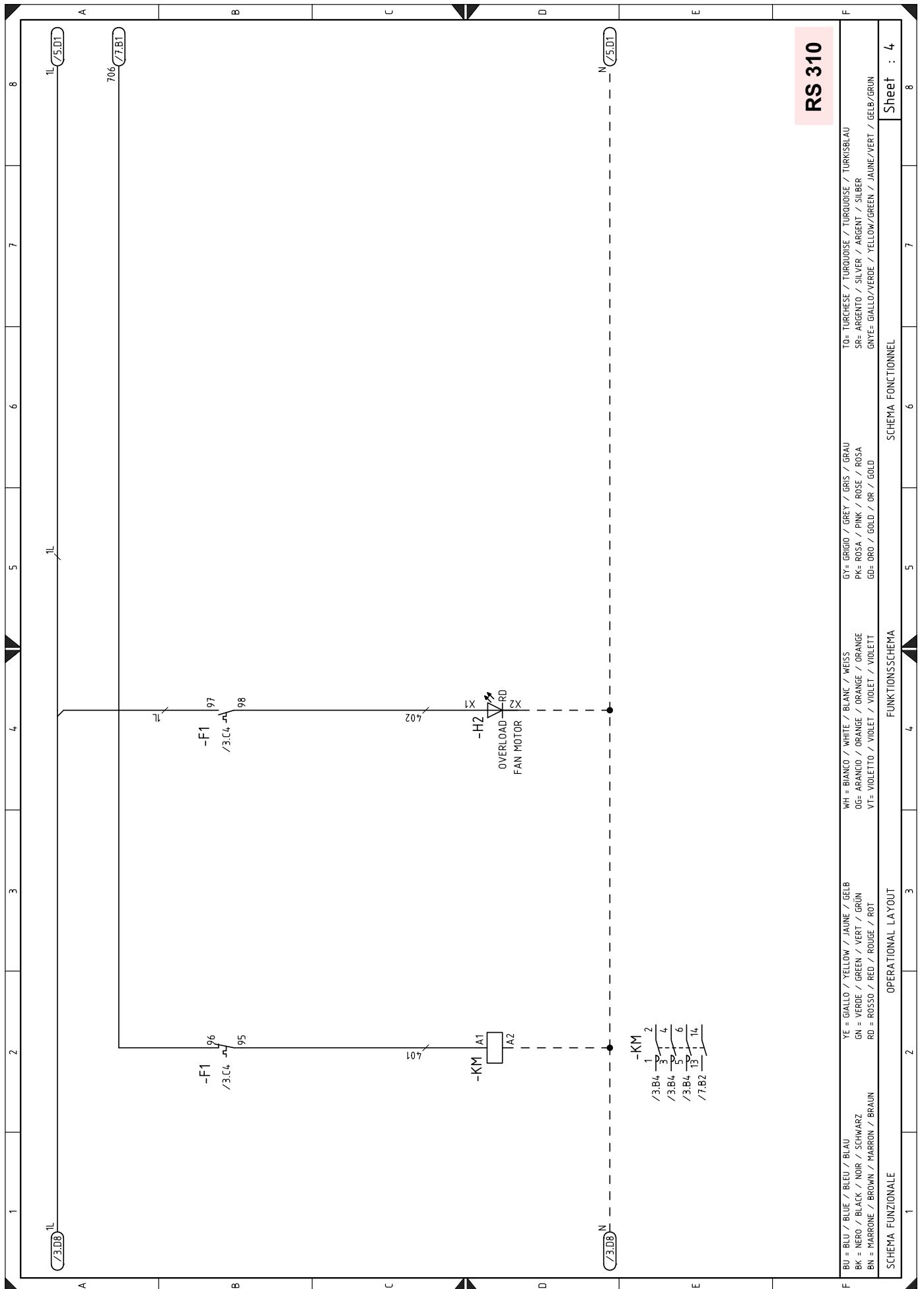
| | |
|------------|---|
| 1 | Index of layouts |
| 2 | Indication of references |
| 3 | Single-wire output layout |
| 4 | Functional layout |
| 5 | Functional layout LMV 52... |
| 6 | Functional layout LMV 52... |
| 7 | Functional layout LMV 52... |
| 8 | Functional layout LMV 52... |
| 9 | Functional layout LMV 52... |
| 10 | Functional layout LMV 52... with Kit O ₂ |
| 11 | Functional layout LMV 52... |
| 12 | Functional layout PLL 52.../QGO 20... with Kit O ₂ |
| 12B | Functional layout PLL 52.../QGO 20... with Kit O ₂ |
| 13 | Electrical wiring that the installer is responsible for |
| 14 | Electrical wiring that the installer is responsible for |

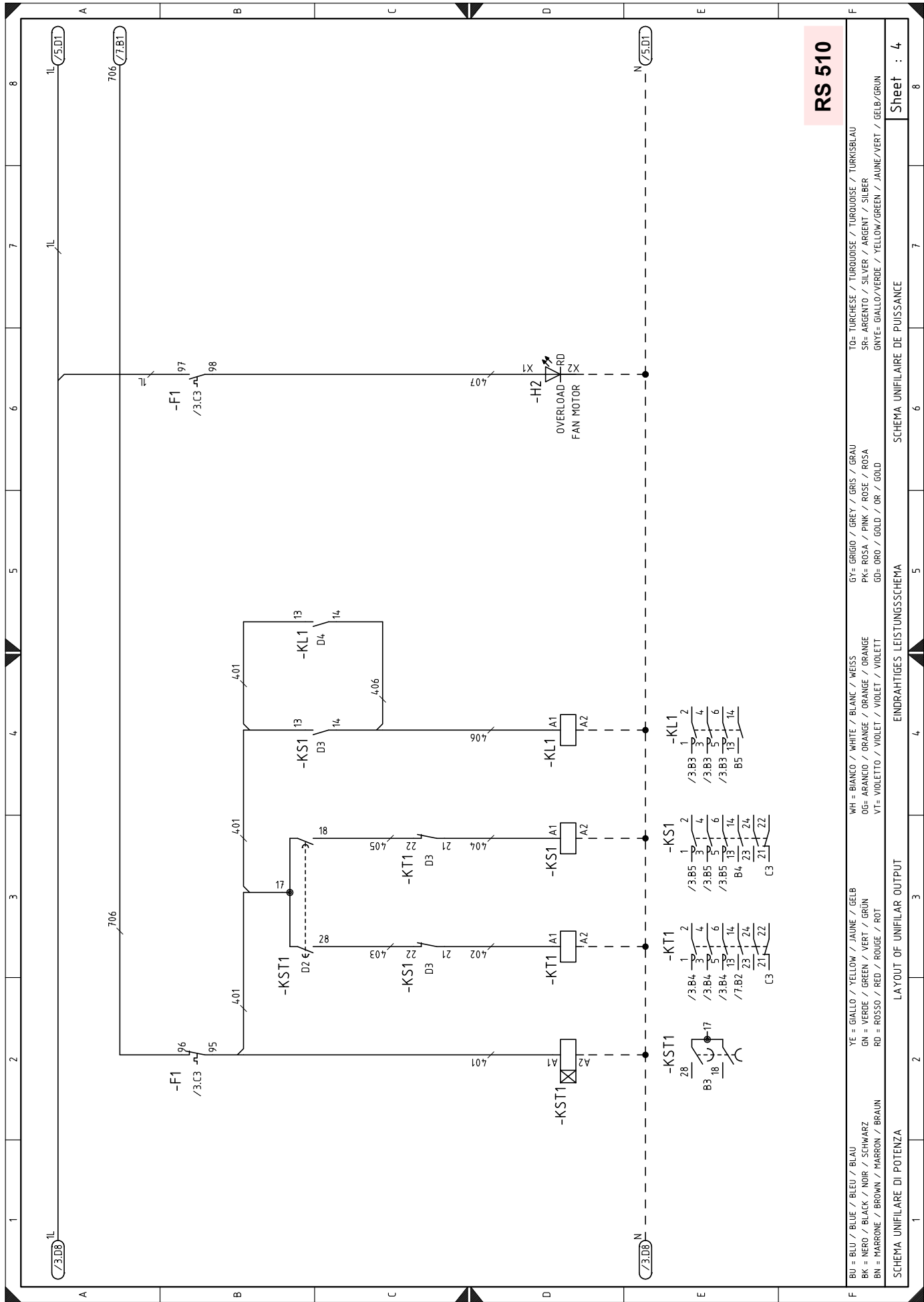
2 Indication of references

Sheet no. /1.A1
 Co-ordinates

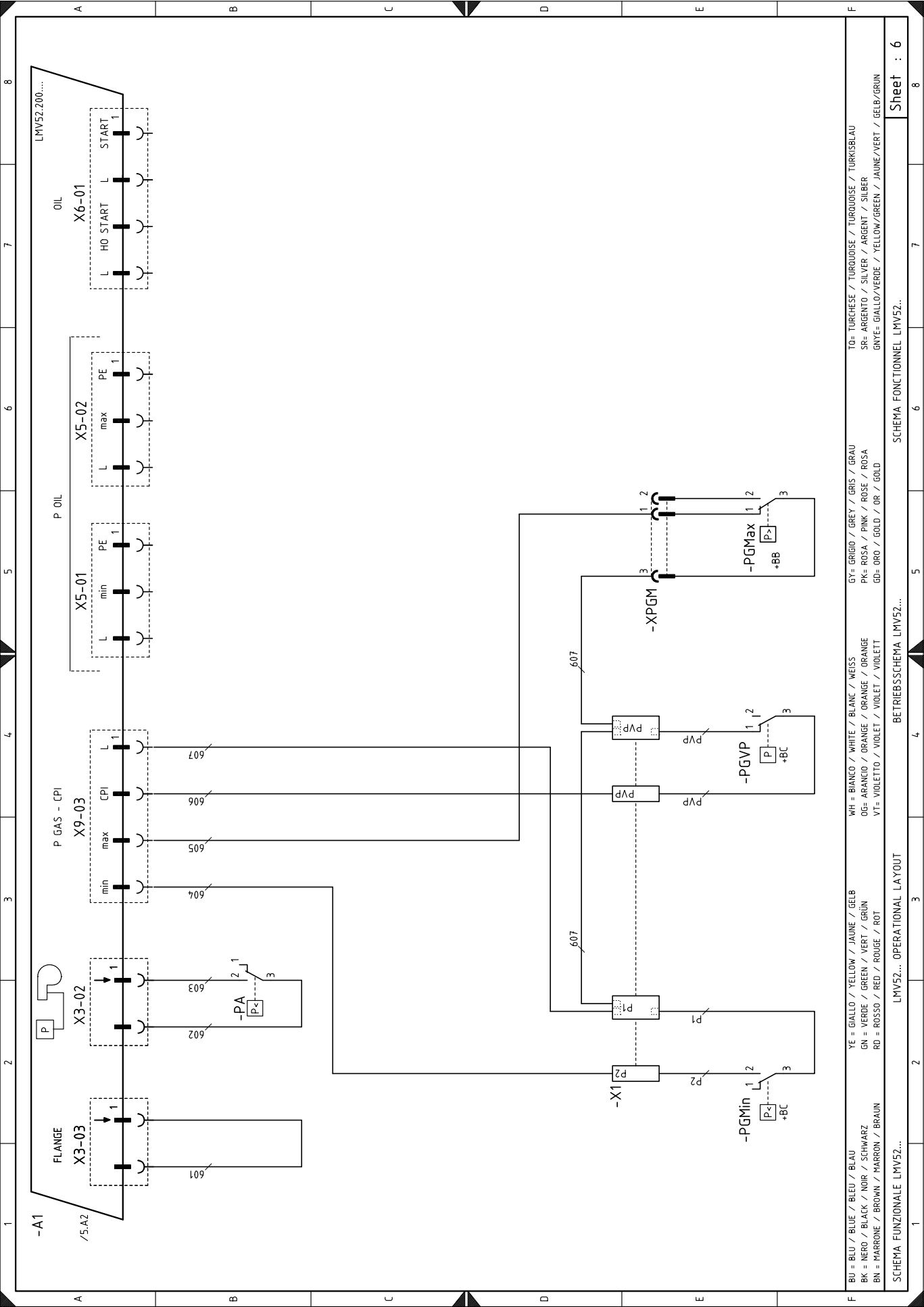


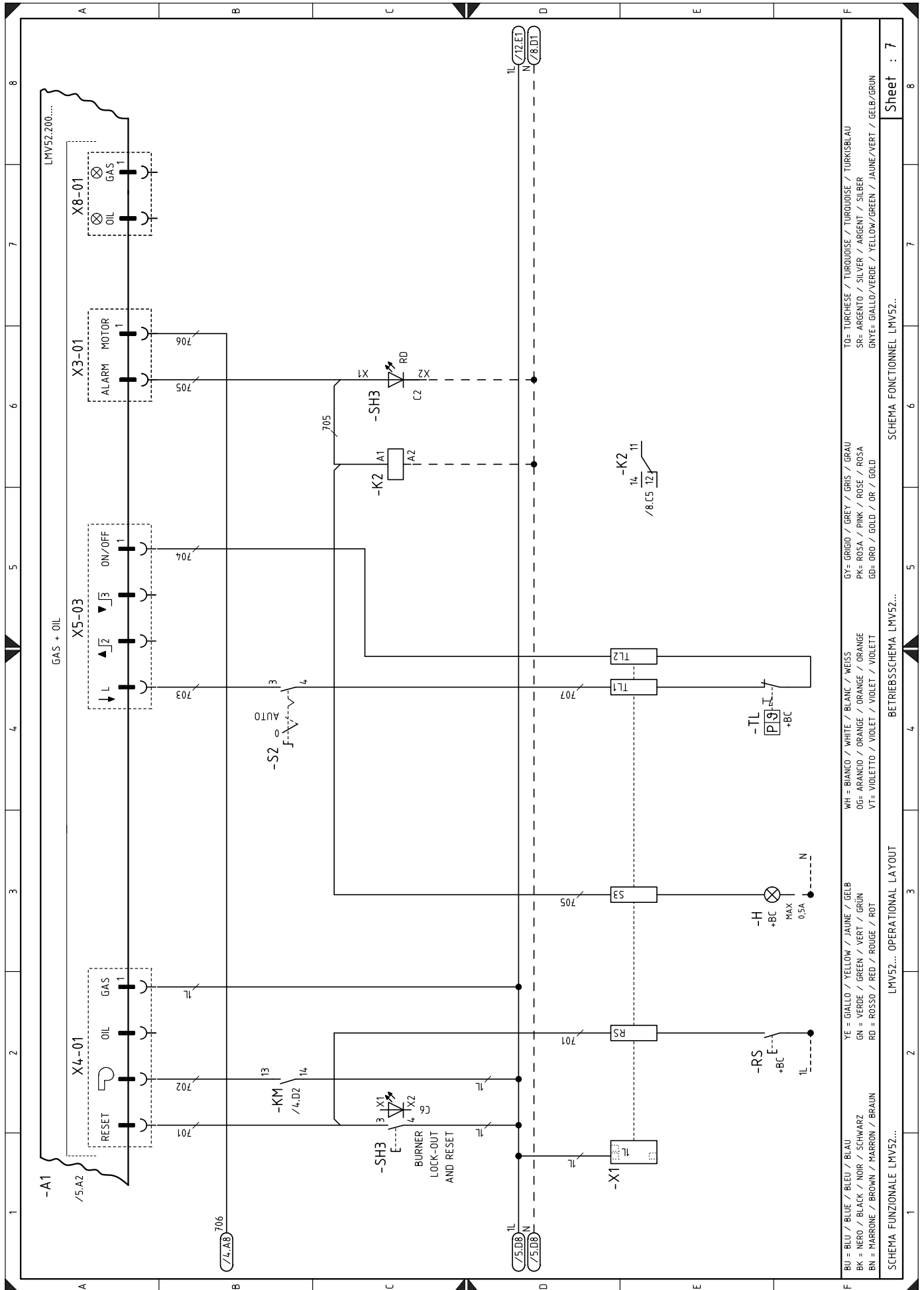


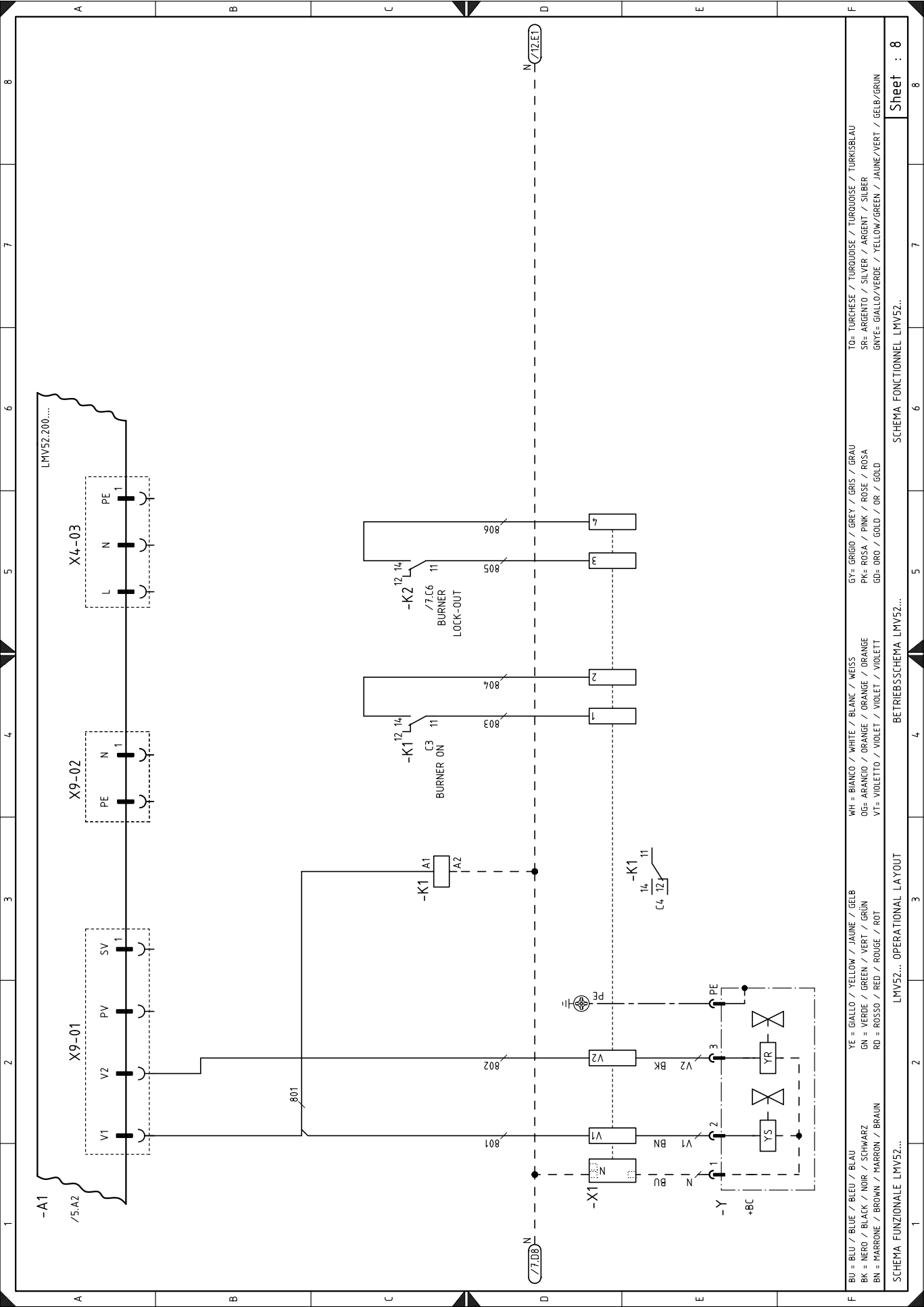




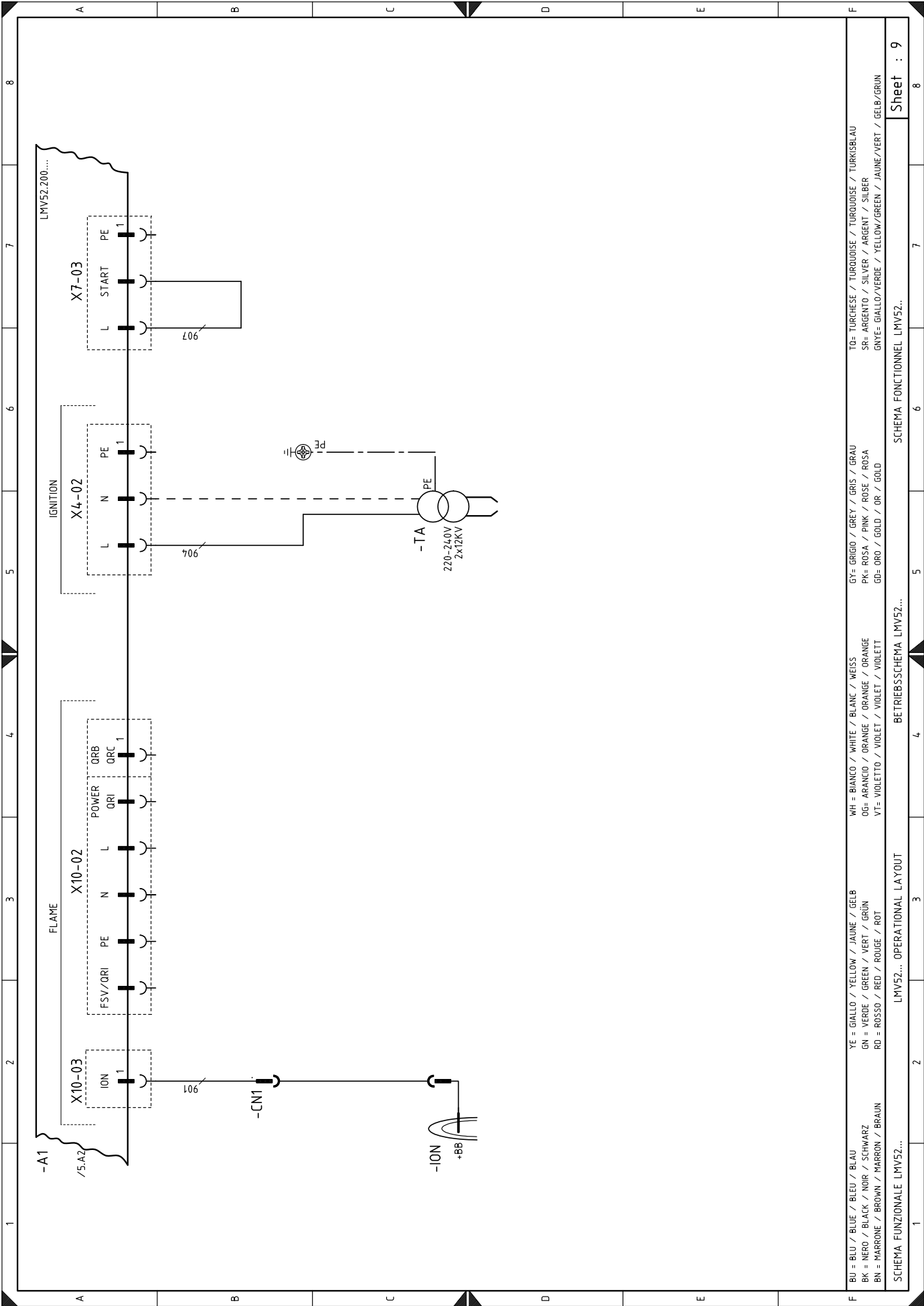


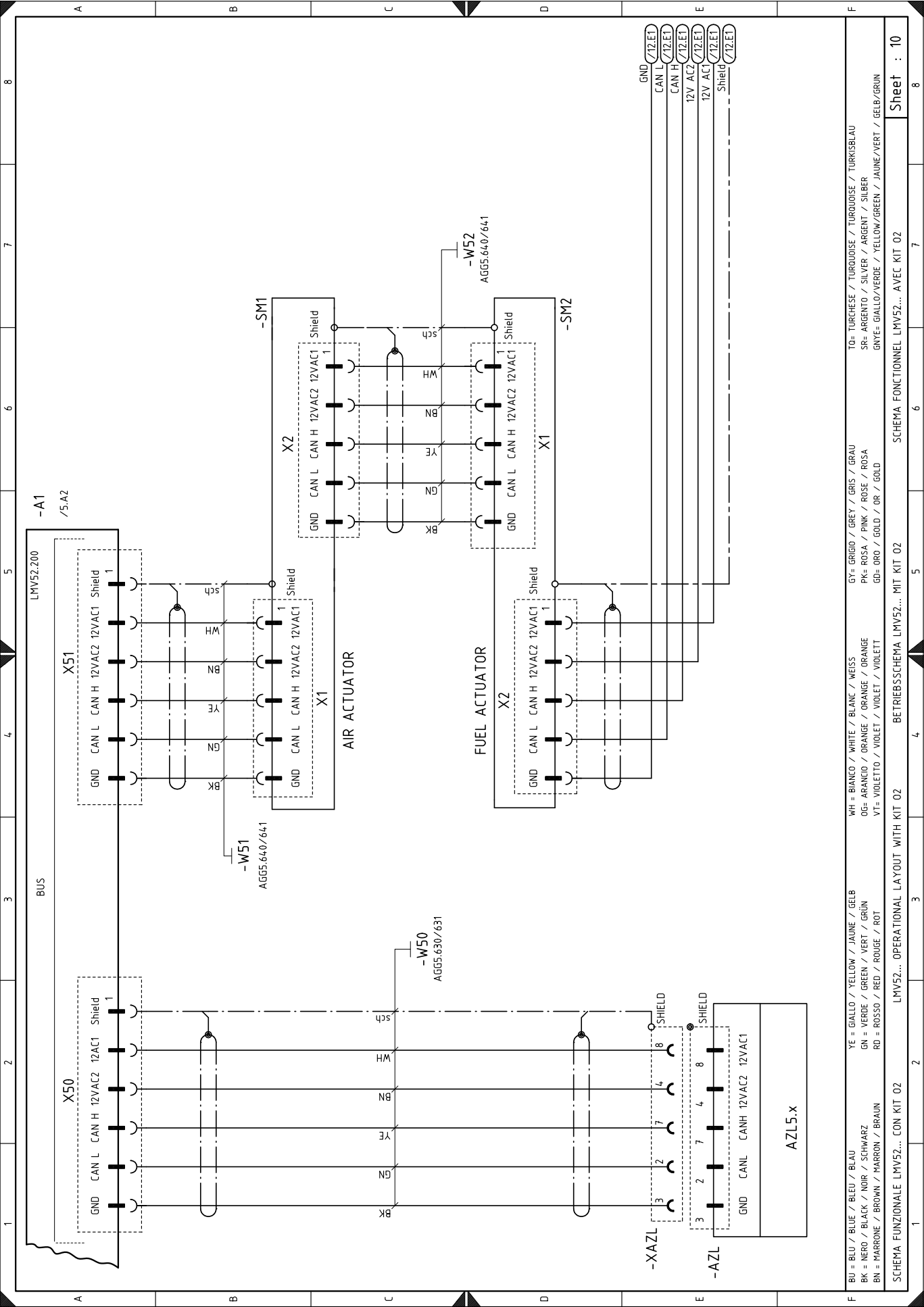


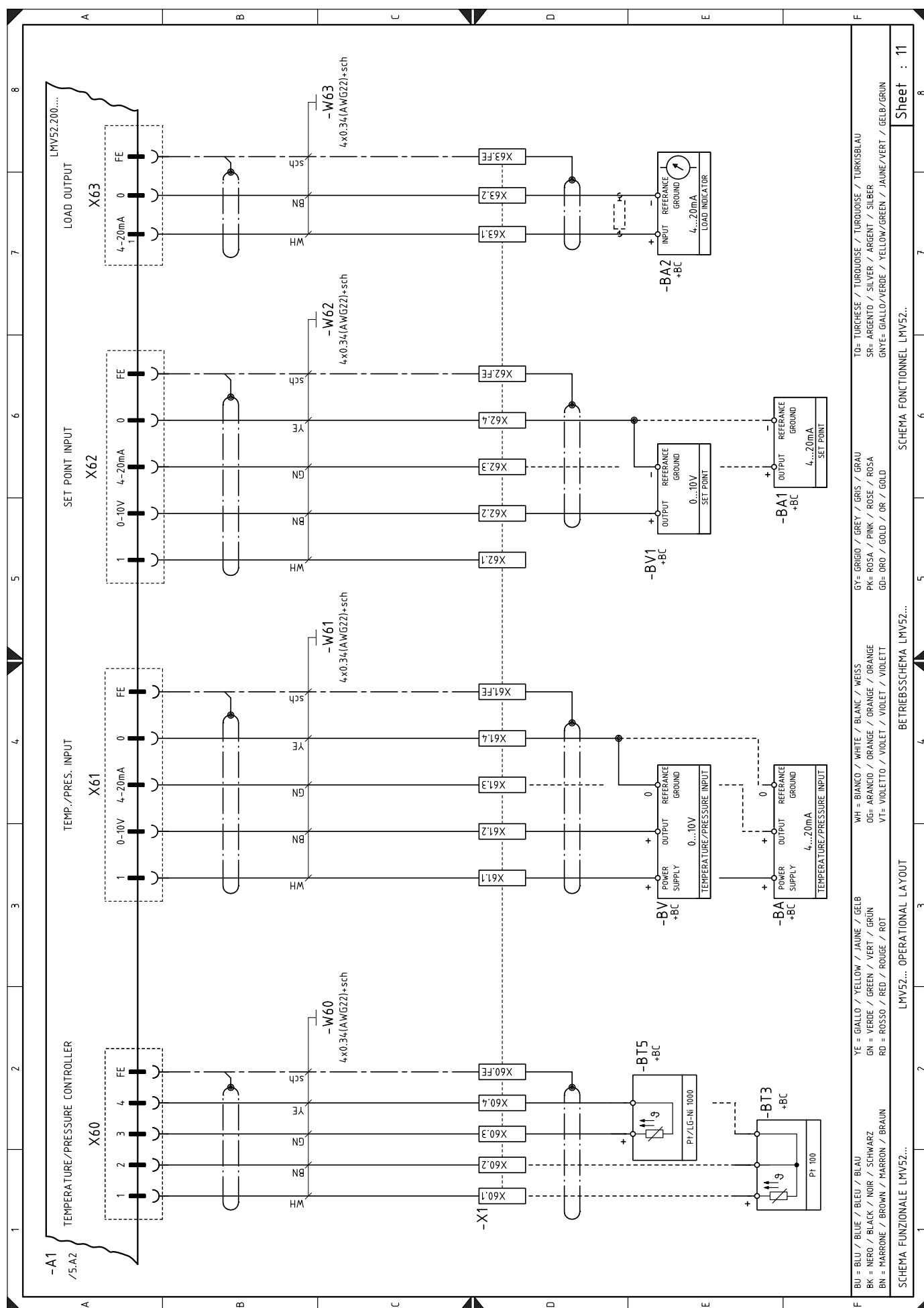


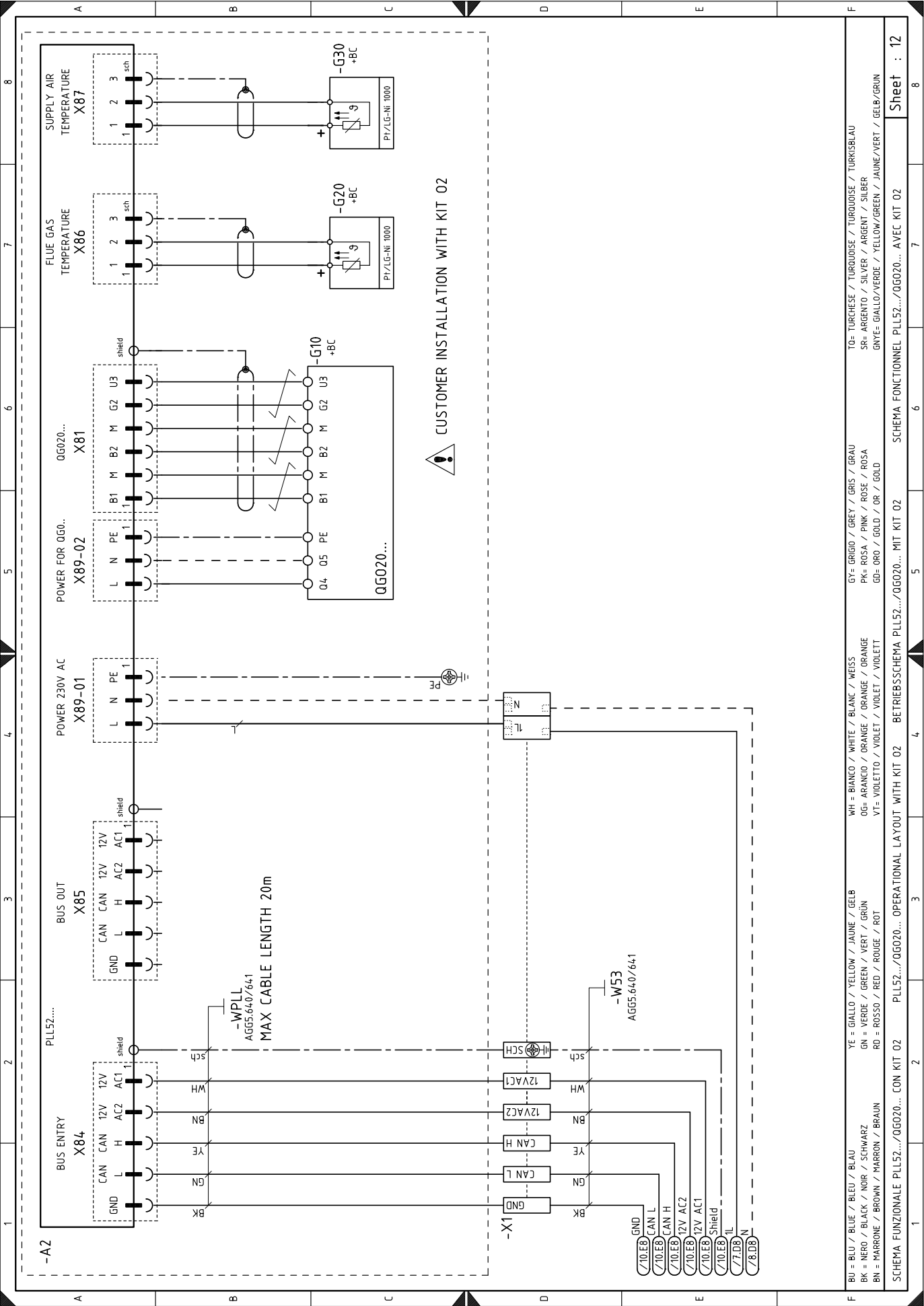


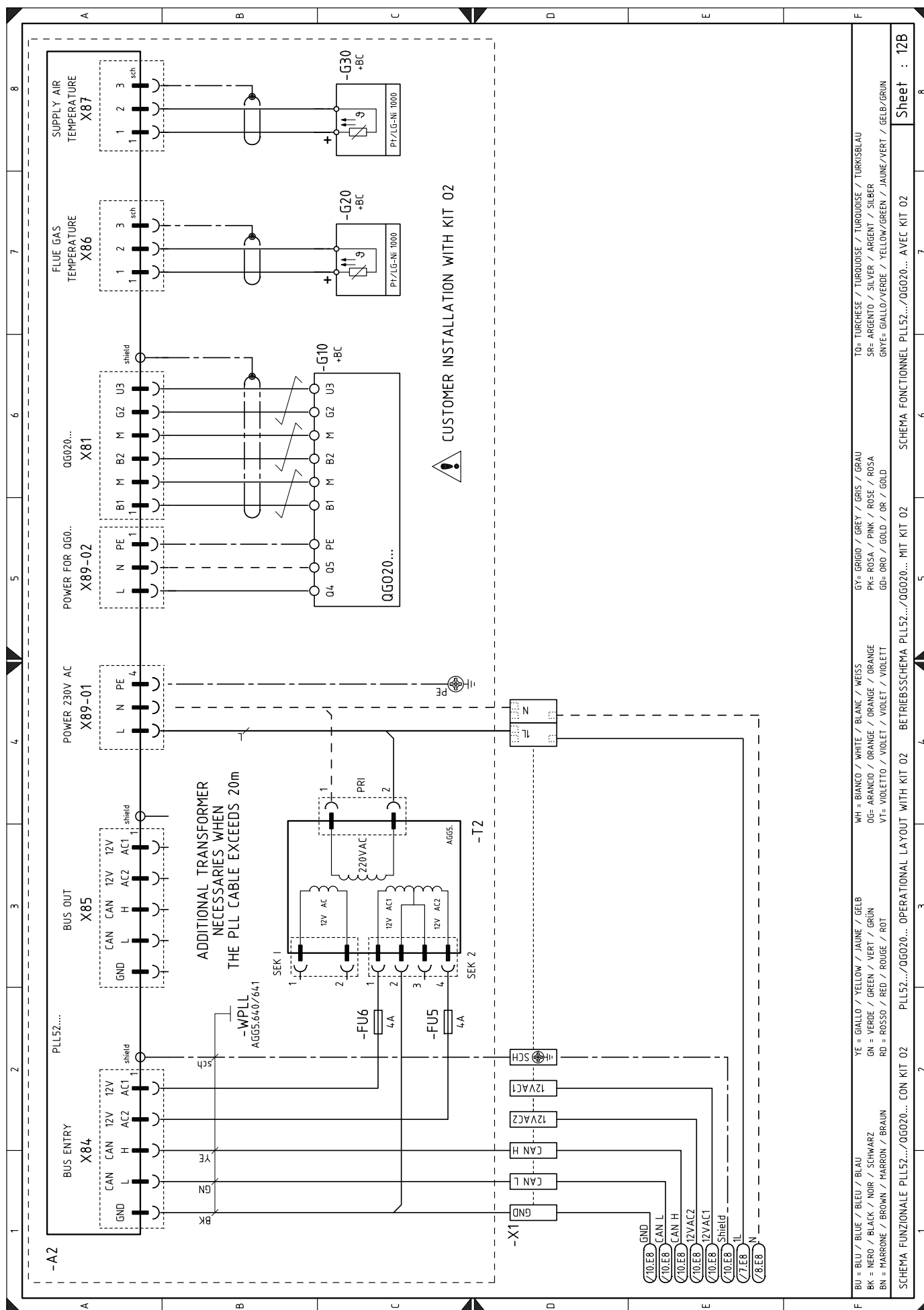
| | | | | |
|---------------------------------------|-------------------------------------|---|----------------------------------|---|
| BU = BLU / BLUE / BLEU / BLAU | YE = GIALLO / YELLOW / JAUNE / GELB | WH = BIANCO / WHITE / BLANC / WEISS | GY = GRIGIO / GREY / GRIS / GRAU | TO = TURCHESE / TURQUOISE / 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 = VIOLETTO / VIOLET / VIOLET / VIOLETT | GD = ORO / GOLD / OR / GOLD | GNYE = GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN |
| SCHEMA FUNZIONALE LMV52... | | | | SCHEMA FONCTIONNEL LMV52... |
| LMV52... OPERATIONAL LAYOUT | | | | Sheet : 8 |

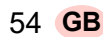




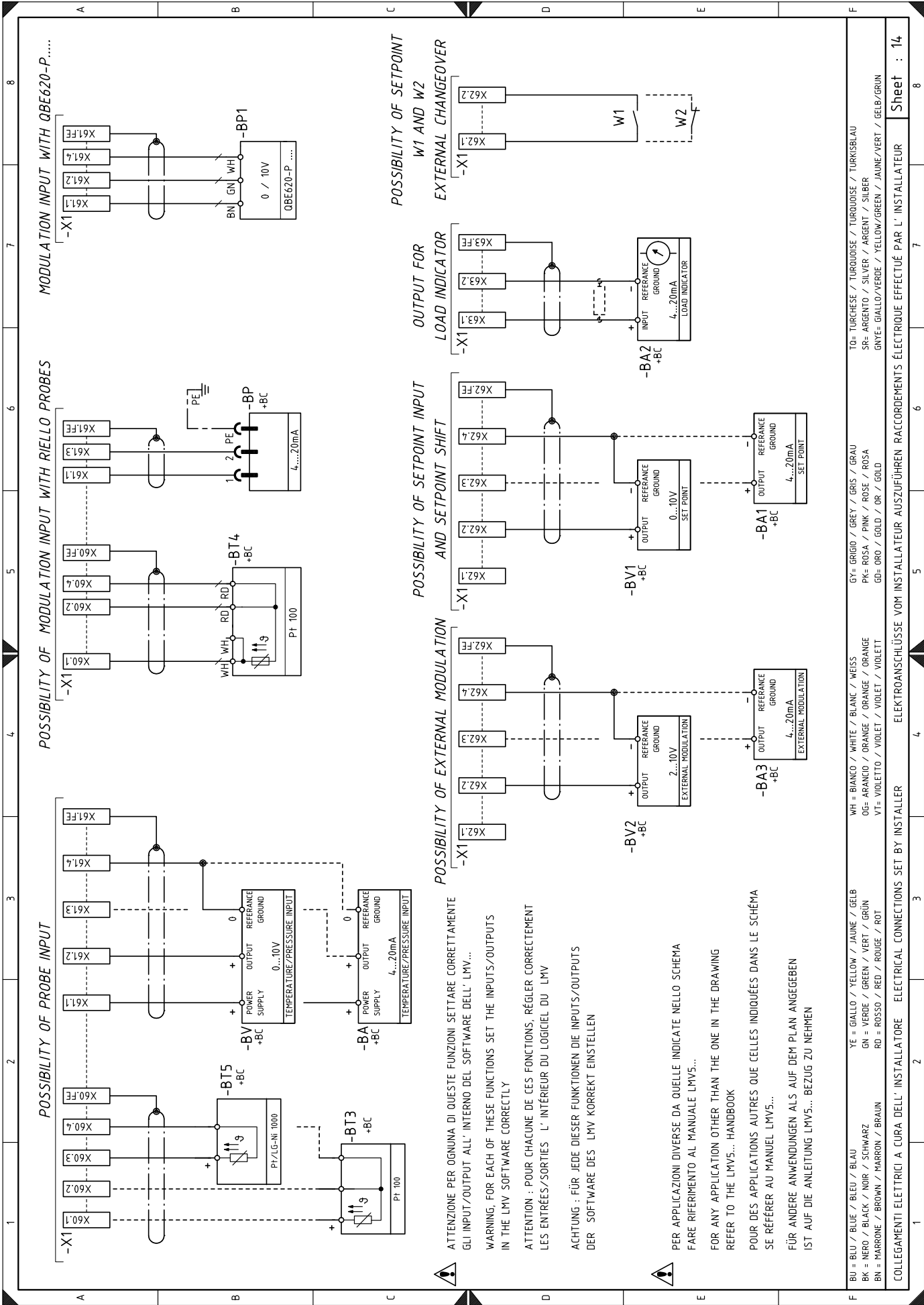












Wiring layout key

| | |
|--------|--|
| A1 | Flame control |
| A2 | O2 module PLL.. type |
| AZL | Display and calibration unit |
| BA | Output probe in current |
| BA1 | Device with output undercurrent, for modifying remote setpoint |
| BA2 | Load indicator |
| BA3 | Input in current DC 4...20 mA |
| BP | Pressure probe |
| BP1 | Pressure probe |
| BT3 | Probe Pt100, 3 wires |
| BT4 | Probe Pt100, 3 wires |
| BT5 | PT/LG-Ni1000 probe |
| BV | Output probe in voltage |
| BV1 | Output device in voltage to modify remote setpoint |
| CN1 | Ionisation probe connector |
| FU | Auxiliary circuits safety fuse |
| KL1 | Line contactor for star/triangle start-up |
| KT1 | Triangle contactor for star/triangle start-up |
| KS1 | Star contactor for star/triangle start-up |
| KST1 | Timer for star/triangle start-up |
| G10 | O2 sensor OGO20 type |
| G20 | Combustion fume temperature sensor probe |
| G30 | Air temperature control probe |
| H | Burner working lighting signal output |
| H1 | Light signalling of mains live state |
| H2 | Fan motor lock-out warning lamp |
| ION | Ionisation probe |
| K1 | Clean contacts output relay burner switched on |
| K2 | Clean contacts output relay burner lockout |
| K3 | Clean contacts output relay VSD alarm |
| MV | Fan motor |
| PA | Air pressure switch |
| PE | Burner earth |
| PGMax | Maximum gas pressure switch |
| PGMin | Minimum gas pressure switch |
| PGVP | Gas pressure switch for valve leak detection control device |
| RS | Burner reset switch |
| SM1 | Air servomotor |
| SM2 | Gas servomotor |
| S1 | Emergency stop button |
| S2 | Automatic / off selector |
| SH3 | Burner reset button and light signalling of lock-out signal |
| TA | Ignition transformer |
| TL | Limit thermostat/pressure switch |
| TS | Safety thermostat/pressure switch |
| T1 | Electronic cam transformer |
| T2 | Additional transformer |
| Y | Gas regulator valve + gas safety valve |
| X1 | Main terminal supply board |
| XAZL | Plug for on board display |
| XPGMax | Maximum gas pressure switch connector |

The logo consists of the word "RIELLO" in a bold, red, sans-serif typeface.

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