

**GB** **Forced draught gas burner**

Modulating operation

**CE**

**UK  
CA**

**EAC**

CODE	MODEL	TYPE
20160293	RS 810/EV O <sub>2</sub> BLU	S032T2



**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.



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.

**1.1.3 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 is present. An explosive atmosphere is defined as a mixture of dangerous substances with air, under atmospheric conditions, 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.



**MOUNT CASING**

This symbol indicates that it is mandatory to mount casing again after maintenance, cleaning or checks.



**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

**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 installation date, 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;
- use of the burner even following an error and/or an irregularity;
- 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;
- the 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 users expressly named 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.

### 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.

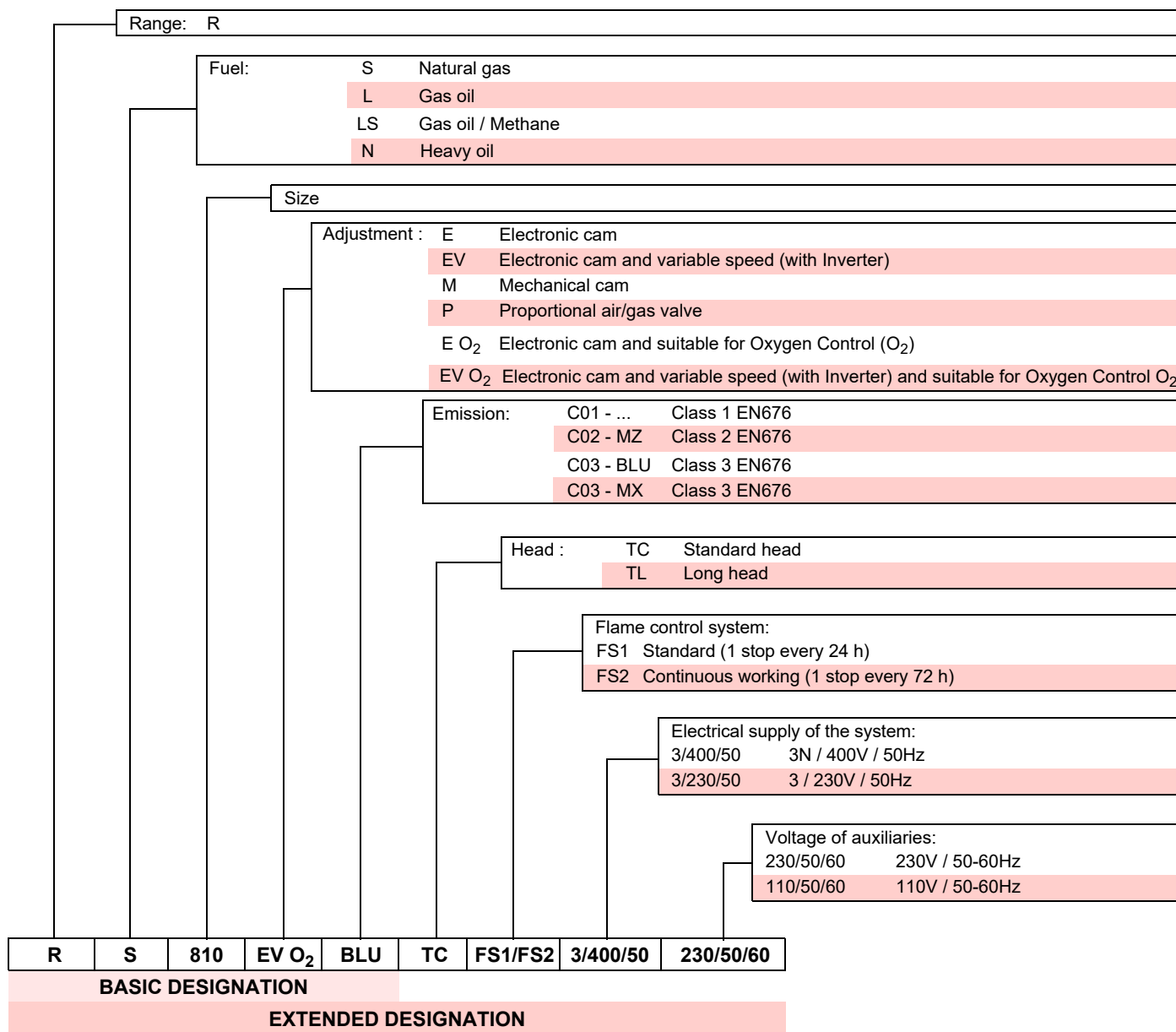
In addition:



- the user 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



#### 3.2 Models available

Designation	Voltage	Start-up	Code
RS 810/EV O <sub>2</sub> BLU	3/400/50	Inverter	20160293

Tab. A

**3.3 Burner categories - Countries of destination**

Gas category	Destination country
I <sub>2E</sub>	DE - LU - PL
I <sub>2H</sub>	AT - BG - CH - CZ - DK - EE - ES - FI - FR - GB - GR - HU - IE - IS - IT - LT - LV - NO - PT - RO - SE - SI - SK - TR
I <sub>2E(R)</sub>	BE

Tab. B

**3.4 Technical data**

Model	RS 810/EV O <sub>2</sub> BLU		
Power (1) Output (1)	min max	- kW	1000/3500 ÷ 8000
Fuels	Natural gas: G20 (methane gas) - G25		
Operation	<b>FS1:</b> Intermittent (min. 1 stop in 24 hours) <b>FS2:</b> Continuous (min. 1 stop in 72 hours) The burner leaves the factory set for the intermittent operation.		
Standard applications	Boilers: water, steam, diathermic oil		
Ambient temperature	°C		0 - 40
Combustion air temperature	°C max		60
Burner weight	Kg		300
Noise levels (2)	Sound pressure	dB(A)	88.3
	Sound power		103.00
CE	CE-0476DP3335		

Tab. C

(1) Reference conditions: Ambient temperature 20°C - Gas temperature 15°C - Barometric pressure 1013 mbar - Altitude 0 m a.s.l.

(2) 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 810/EV O <sub>2</sub> BLU		
Main electrical supply	3~ 400V +/-10% 50 Hz 1N~ 230V +/-10% 50 Hz		
Absorbed electrical power	kW max		24.5
Protection level	IP 54		

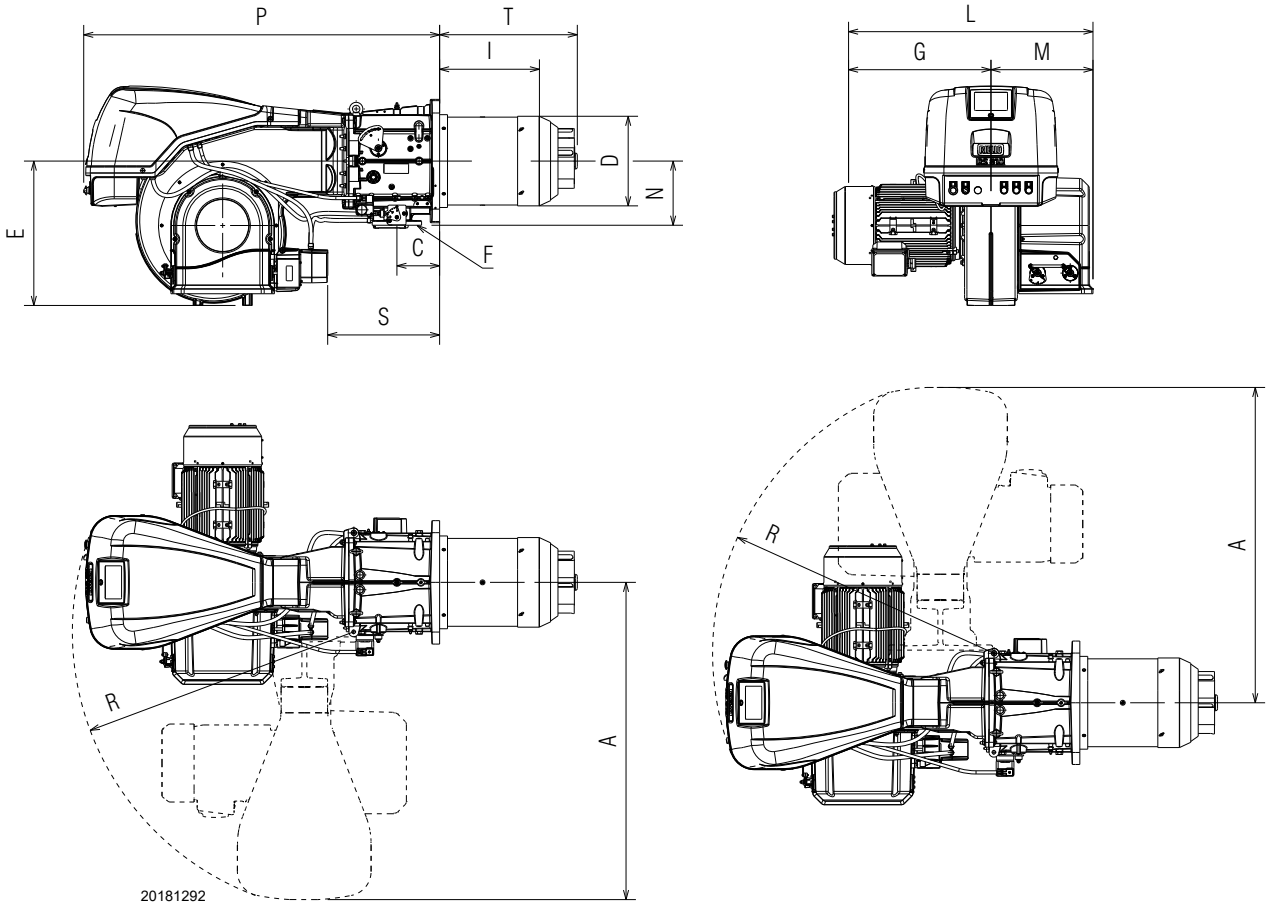
Tab. D

**3.6 Maximum dimensions**

The maximum dimensions of the burner are shown 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.



**Fig. 1**

mm	A	C	D	E	F	G	I	L	M	N	P	R	S	T
RS 810/EV O <sub>2</sub> BLU	1285	173	363	585	DN80	637	405	1050	413	260	1440	1140	452	558

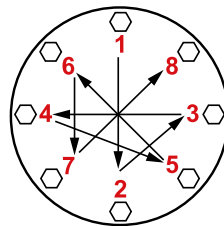
**Tab. E**

**3.7 Burner equipment**

- Thermal insulation screen ..... No. 1
- Gasket for gas train ..... No. 2
- M 12 x 16 replacement screws to secure the combustion head .. No. 2
- M18 x 70 screws to secure the burner to the boiler ..... No. 4
- Ø 18 washer to secure the burner to the boiler ..... No. 4
- M16 x 67 stud bolts to fix the gas elbow to the pipe coupling ..... No. 8
- M16 nuts to fix the gas elbow to the pipe coupling ..... No. 8
- Ø 16 washer to secure the gas flange ..... No. 8
- Pressure kit 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.

**3.8 Firing rates**

The **MAXIMUM OUTPUT** is chosen from within the diagram area (Fig. 2).

The **MINIMUM OUTPUT** must not be lower than the minimum limit of the diagram:



The firing rate value (Fig. 2) has been obtained considering an ambient temperature of 20C, an atmospheric pressure of 1013 mbar (approx. 0 m a.s.l.), and with the combustion head adjusted as shown on page 20.

Model	kW
RS 810/EV O <sub>2</sub> BLU	1000

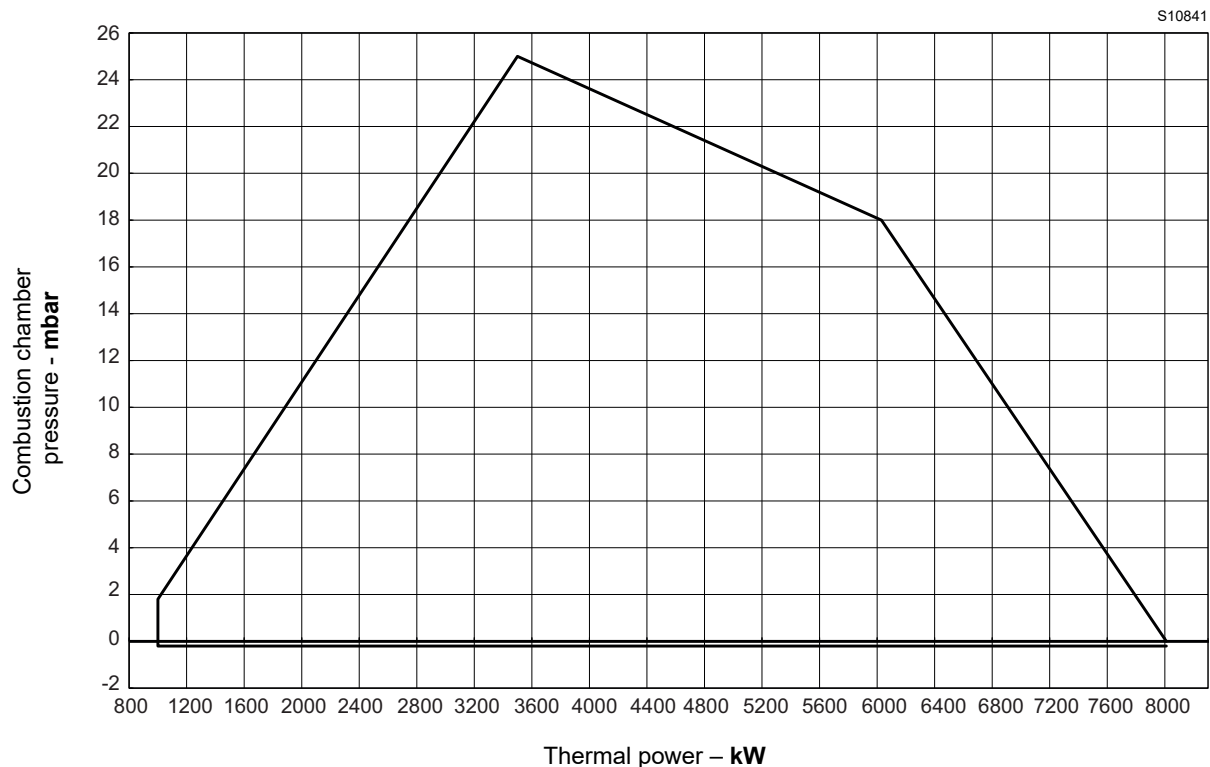


Fig. 2

**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 obtained in 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 7000 kW - diameter 120 cm - length 6 m.

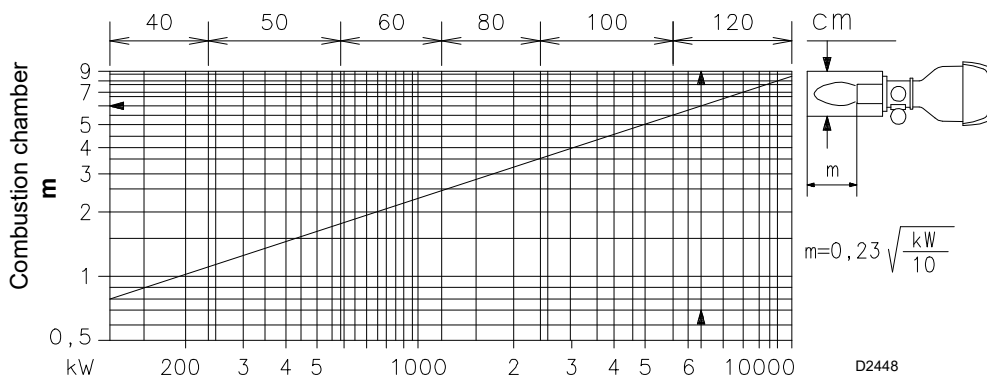


Fig. 3

### 3.10 Burner description

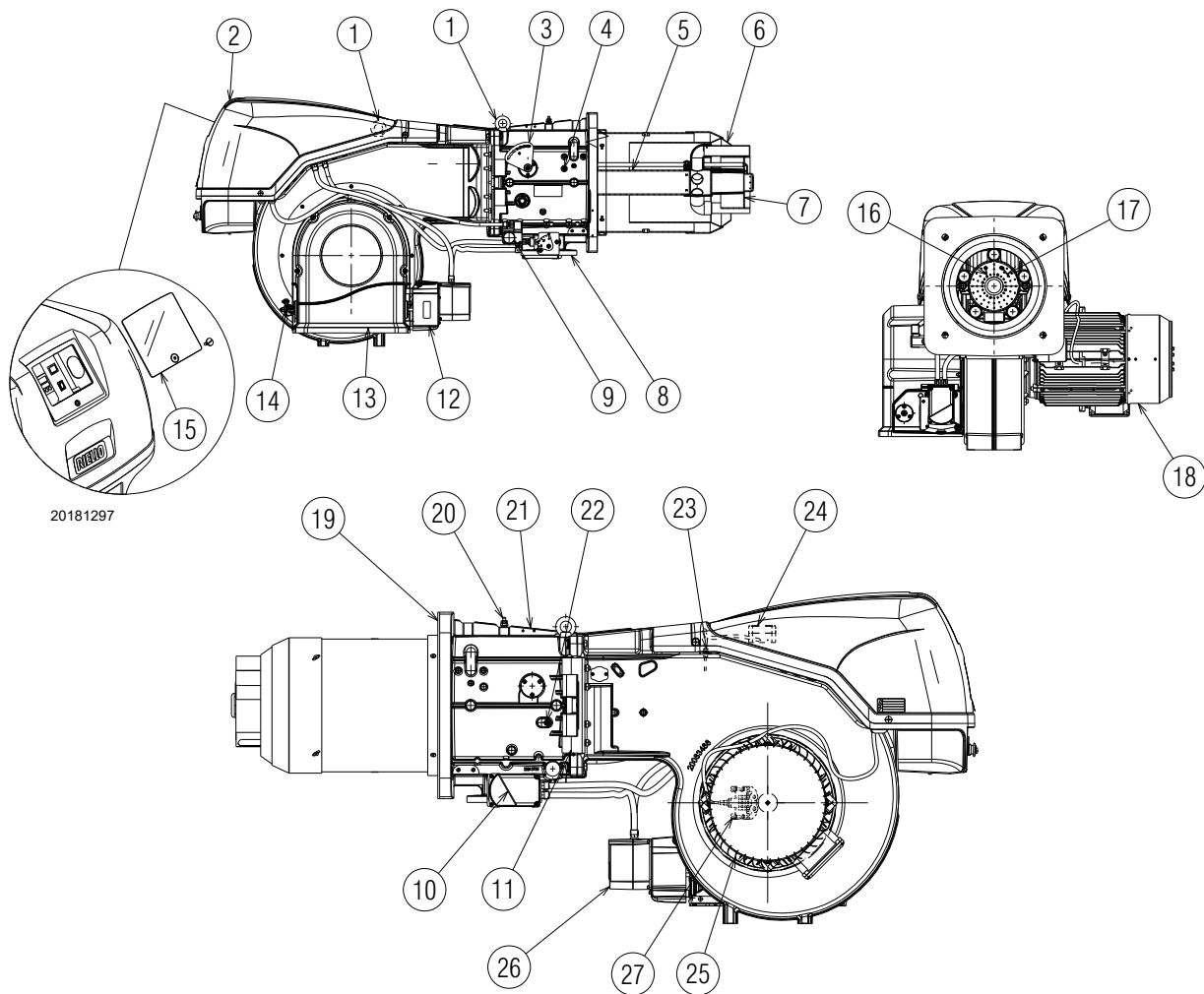


Fig. 4

- 1 Lifting rings
- 2 Cover for electrical panel
- 3 Lever for combustion head movement
- 4 Air pressure test point for combustion head
- 5 Combustion head
- 6 Shutter
- 7 Flame stability disc
- 8 Gas inlet flange
- 9 Maximum gas pressure switch
- 10 Gas servomotor
- 11 Hinge for burner opening
- 12 Protection
- 13 Air inlet for fan
- 14 Air damper control lever
- 15 Protection for viewing port
- 16 Ignition electrode
- 17 Flame sensor probe
- 18 Fan motor
- 19 Gasket for boiler fixing
- 20 Gas pressure test point for combustion head
- 21 Pipe coupling
- 22 Air pressure test point for combustion head
- 23 Pressure test point for air pressure switch "+"
- 24 Air pressure switch
- 25 Fan
- 26 Servomotor for air dampers
- 27 RPM sensor



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

When the burner is closed, the hinge can be refitted on the opposite side.

3.11 Electrical panel description

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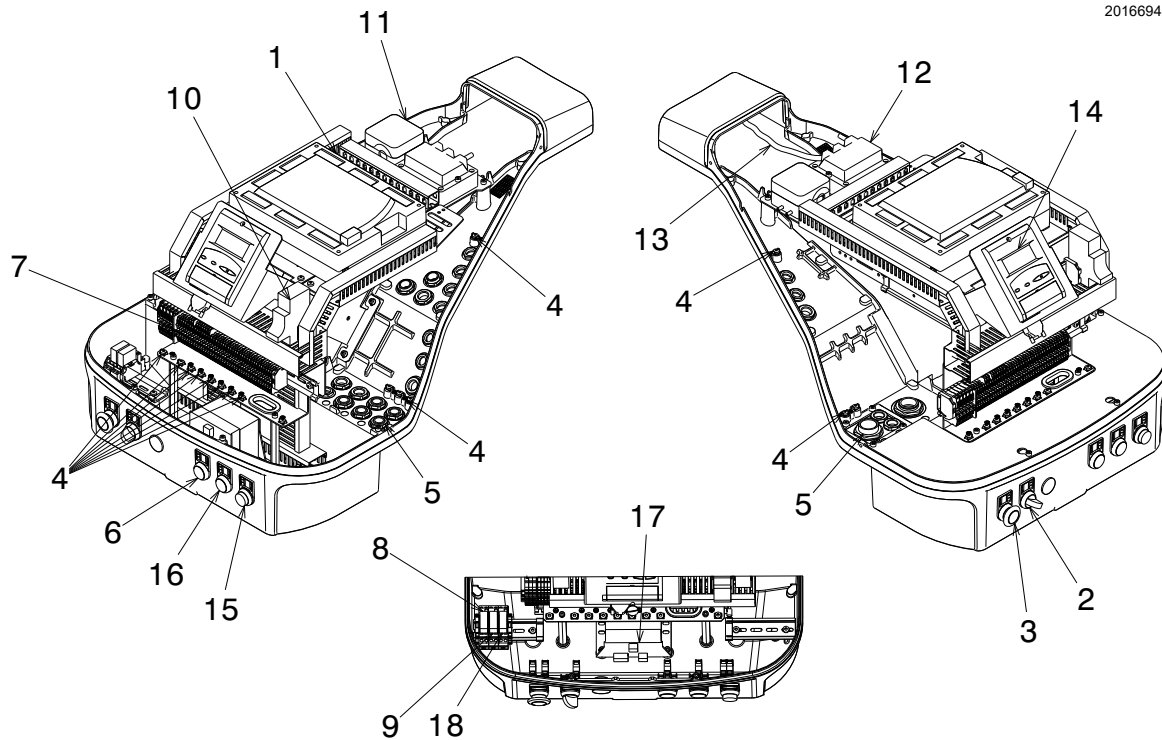


Fig. 5

- 1 Flame control
- 2 "0/AUTO" selector
- 3 Safety button
- 4 Earth terminal
- 5 Supply cables and external connections passage. See section "Electrical wiring" on page 23
- 6 Signal "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 Signal "OVERLOAD FAN MOTOR"
- 17 Electrical flame control power supply
- 18 Thermal relay (with RESET button)
- 19 Relay for clean contacts

**3.12 Flame control (LMV52...)**

**Warnings**



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... base flame control	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 'input' terminals	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	cosφ > 0.4		
Air pressure switch test valve (nominal voltage)	• Nominal current	0.5A	
	• Power factor	cosφ > 0.4	
	Load on 'output' terminals	<b>Total load on the contacts:</b>	
		• Mains voltage	AC 230 V -15 % / +10 %
• Total unit input current (safety circuit) load on contacts due to:		Max. 5 A	
– Fan motor contactor			
– Ignition transformer			
– Valve			
– Oil pump / magnetic clutch			
Cable lengths	<b>Single contact loading:</b>		
	Fan motor contactor (nominal voltage)		
	• Nominal current	1A	
	• Power factor	cosφ > 0.4	
	Alarm output (nominal voltage)		
	• Nominal current	1A	
	• Power factor	cosφ > 0.4	
	Ignition transformer (nominal voltage)		
	• Nominal current	2A	
	• Power factor	cosφ > 0.2	
	Fuel gas valve (nominal voltage)		
	• Nominal current	2A	
	• Power factor	cosφ > 0.4	
	Fuel oil valve (nominal voltage)		
• Nominal current	1A		
• Power factor	cosφ > 0.4		
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. F**



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

**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.

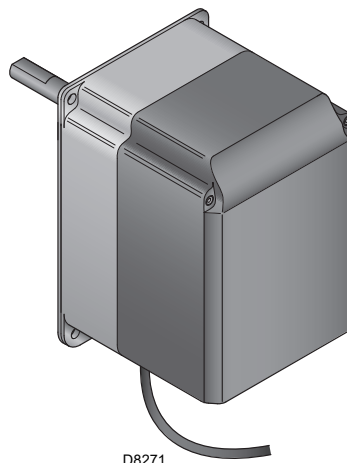
**Installation notes**

- 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.**



**Fig. 7**

**Technical data**

Model	SQM45
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. G**

**3.14 PLL52... module (optional)**

**Warnings**



**WARNING**

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 <sup>2</sup>
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. H**



**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:	
<b>Storage</b>	DIN EN 60721-3-1
Climatic conditions:	Class 1K3
Mechanical conditions:	Class 1M2
Temperature range:	-20...+60 °C
Humidity:	<95% r.h.
<b>Transport</b>	DIN EN 60721-3-2
Climatic conditions:	Class 2K2
Mechanical conditions:	Class 2M2
Temperature range:	-25...+70 °C
Humidity:	<95% r.h.
<b>Operation</b>	DIN EN 60 721-3-1
Climatic conditions:	Class 3K5
Mechanical conditions:	Class 3M2
Temperature range:	-20...+60 °C
Humidity:	< 95% r.h.

**Tab. I**

**NOTE:**

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



**WARNING**

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.

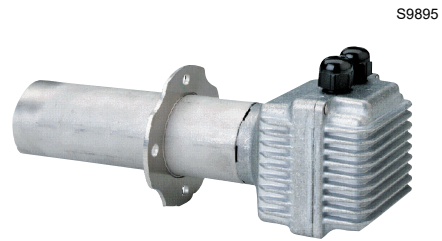


Fig. 9

## 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	LifYCY3x2x0,2 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 <sub>2</sub>
Permissible cable length	Max. 100 m
Wire diameter	<10 m
Power supply lines (Net cable)	Min. 1 mm <sup>2</sup>
– Cable diameter	QGO20.000D27: e.g. NYM 3 x 1,5
– Cable type	QGO20.000D17: UL AWM Style 1015/MTW or CSA-AWM/TEW
Required operating temperature of measuring cell	700 °C ±50 °C
<b>Environmental conditions</b>	
<b>Storage</b>	DIN EN 60721-3-1
Climatic conditions:	Class 1K3
Mechanical conditions:	Class 1M2
Temperature range:	-20...+60 °C
Humidity:	<95% r.h.
<b>Transport</b>	DIN EN 60721-3-2
Climatic conditions:	Class 2K2
Mechanical conditions:	Class 2M2
Temperature range:	-25...+70 °C
Humidity:	<95% r.h.
<b>Operation</b>	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. J**



**4.4 Operating position**



- 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.



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

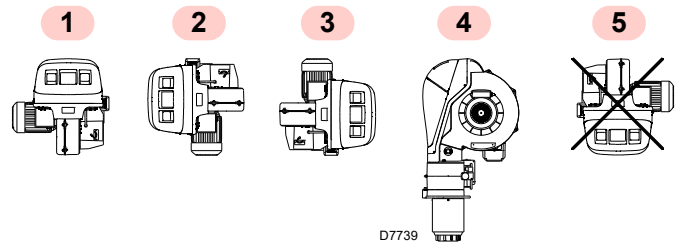


Fig. 11

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



Remove the screws and the nuts 1)-2)(Fig. 12), before installing the burner on the boiler. Replace them with the screws 3) M12 X 16 supplied with the burner.

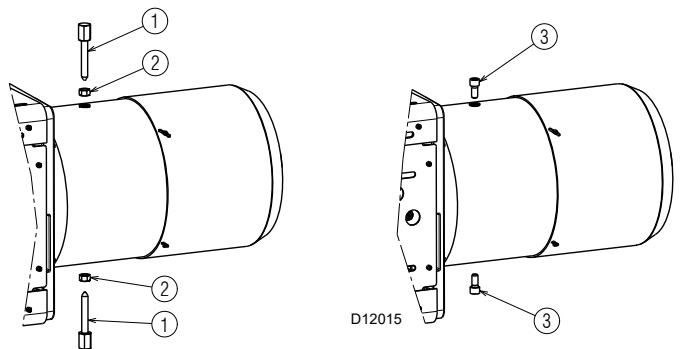


Fig. 12

**4.6 Preparing the boiler**

**4.6.1 Boring the boiler plate**

Pierce the closing plate of the combustion chamber, as in Fig. 13. The position of the threaded holes can be marked using the thermal insulation screen supplied with the burner.

**4.6.2 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 refractory.

For boilers with front flue passes 1)(Fig. 14 on page 20) or flame inversion chamber, a protection in refractory material 5) must be inserted between the boiler fettling 2) and the flame funnel 4).

This protection must not compromise the extraction of the blast tube.

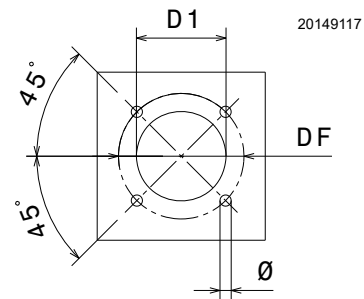


Fig. 13

mm	D1	DF	Ø
RS 810/EV O <sub>2</sub> BLU	400	495	M18

Tab. K

**4.7 Securing the burner to the boiler**



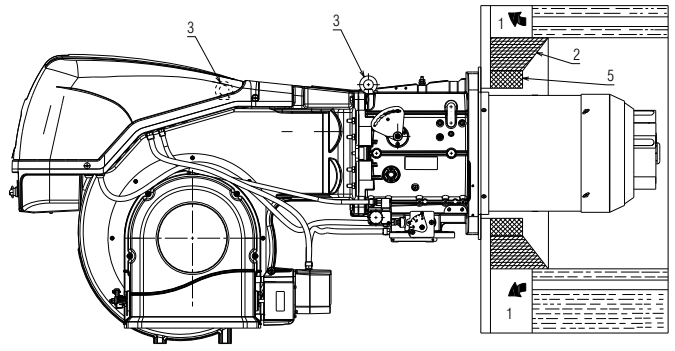
Prepare a suitable lifting system using rings 3)(Fig. 14).

- Fit the heat insulation supplied onto the blast tube.
- Fit the entire burner onto the boiler hole prepared previously (Fig. 13 on page 19), and fasten with the screws supplied.



**The seal between burner and boiler must be airtight.**

WARNING

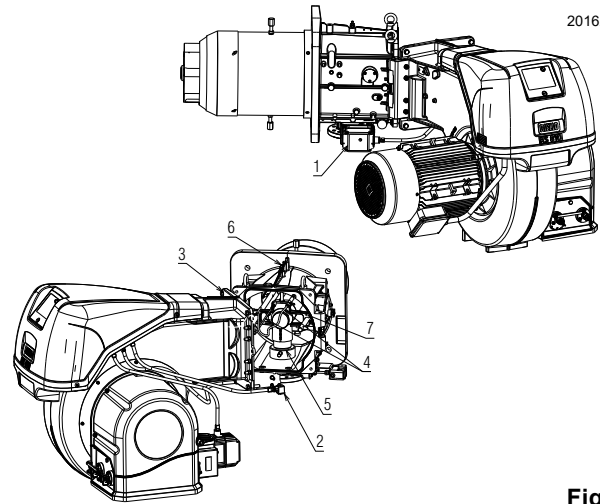


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**Fig. 14**

**4.8 Access to head internal part**

- Remove the gas servomotor.
- Disconnect the socket 2) of the gas pressure switch.
- Remove the 4 fixing screws 3).
- Open the burner on the hinge as in Fig. 15.
- Unhook the probe cables and electrode 4).
- Turn the underneath part of the elbow 5) anticlockwise up to release it from its housing.
- Undo the screw 6) with pressure test point.
- Remove the internal part of the head 7).



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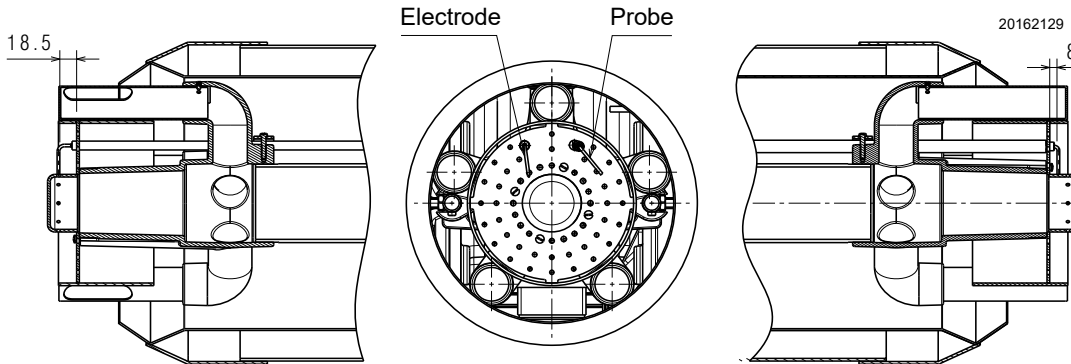
**Fig. 15**

**4.9 Probe-electrode position**



Check that the probe and the electrode are placed as in Fig. 16, according to the dimensions indicated.

WARNING



**Fig. 16**

**4.10 Combustion head adjustment**

The servomotor of the air damper changes the air flow rate depending on the output requested, while the servomotor of the combustion head changes the shutter opening.

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

**4.11 Gas feeding**



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

Precautions: avoid knocking, attrition, sparks and heat.

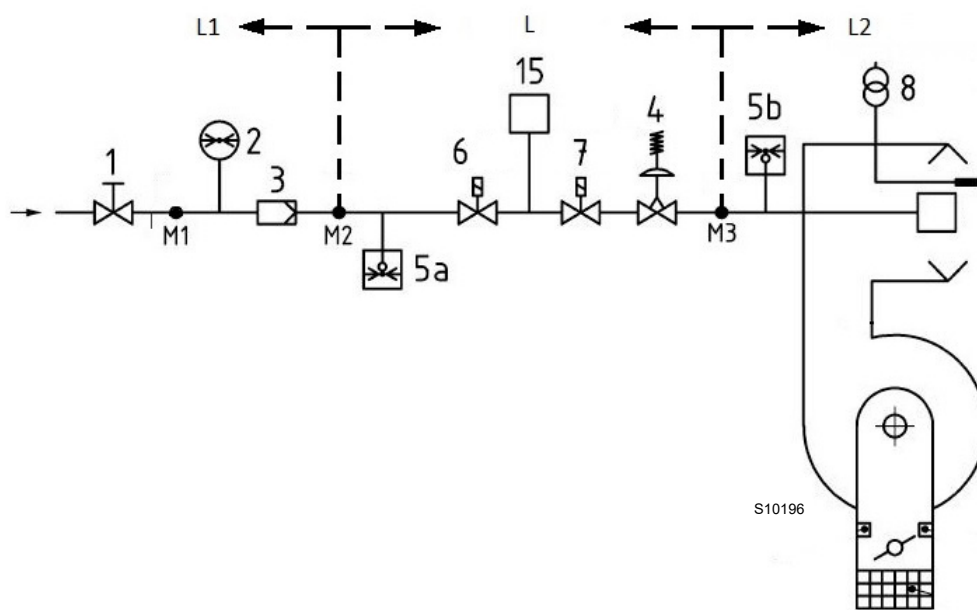
Make sure that the fuel interception tap is closed before performing any operation on the burner.



**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) - Please refer to the gas train documentation for more information**



**Fig. 17**

Key (Fig. 17)

- 1 Manually operated shut-off valve
- 2 Pressure gauge
- 3 Filter
- 4 Governor
- 5a Low pressure protection device
- 5b Maximum gas pressure switch
- 6 1st safety shut-off device
- 7 2nd safety shut-off device
- 8 Ignition device
- 15 Valve leak detection control system
- L Gas train (supplied separately)
- L1 Responsibility of the installer
- L2 Burner
- M1 Pressure test point
- M2 Pressure test point
- M3 Pressure test point

### 4.11.2 Gas train

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

### 4.11.3 Gas train installation



Disconnect the electrical power using the main system switch.



Check that there are no gas leaks.



Beware of train movements: danger of crushing of limbs.



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



The operator must use appropriate tools for installation.

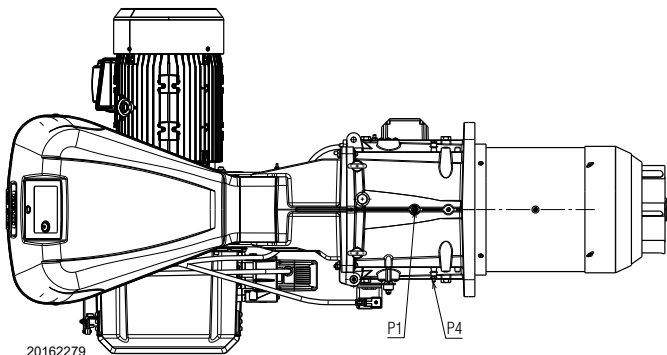


Fig. 18



The heat output and gas pressure data in the head refer to operation with gas butterfly valve fully open (90°).

### 4.11.4 Gas pressure

Tab. L indicates the minimum pressure drops along the gas supply line, depending on the maximum burner output.

The values shown in Tab. L 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

Pressure drop on combustion head.

Gas pressure measured at the test point P1) (Fig. 18), with:

- Combustion chamber at 0 mbar;
- Burner working at maximum output;
- Combustion head adjusted as in page 20.

#### Column 2

Pressure loss at gas butterfly valve with maximum opening: 90°.

Calculate the approximate maximum output of the burner in this way:

- subtract the combustion chamber pressure from the gas pressure measured at test point P1) (Fig. 18).
- Find, in the table Tab. L related to the burner concerned, the pressure value closest to the result of the subtraction.
- read the corresponding output on the left.

#### Example with G20 natural gas:

Maximum output operation

$$\begin{aligned} \text{Gas pressure at test point P1) (Fig. 18)} &= 27.6 \text{ mbar} \\ \text{Pressure in combustion chamber} &= 2 \text{ mbar} \\ 27.6 - 2 &= 25.6 \text{ mbar} \end{aligned}$$

A pressure of 25.6 mbar, column 1, corresponds in the table Tab. L to an output of 5750 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. 18), set the MAX output required from the burner operation:

- find the nearest output value in the table Tab. L for the burner in question.
- read, on the right (column 1), the pressure at the test point P1) (Fig. 18).
- Add this value to the estimated pressure in the combustion chamber.

#### Example with G20 natural gas:

Required burner maximum output operation: 5740 kW

$$\begin{aligned} \text{Gas pressure at an output of 5750 kW} &= 25.6 \text{ mbar} \\ \text{Pressure in combustion chamber} &= 2 \text{ mbar} \\ 25.6 + 2 &= 27.6 \text{ mbar} \end{aligned}$$

Pressure required at test point P1) (Fig. 18).

kW	1 Δp (mbar)		2 Δp (mbar)	
	G 20	G 25	G 20	G 25
3500	9.5	14.0	0.4	0.6
4250	14	20.6	0.6	1.0
5000	19.4	28.5	0.9	1.4
5750	25.6	37.7	1.2	1.8
6500	32.7	48.1	1.5	2.3
7250	40.7	59.9	1.9	2.9
8010	49.7	73.0	2.3	3.5

Tab. L

## 4.12 Electrical wiring

### Notes on safety for the electrical wiring



DANGER

- 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. See specific manual LMV5... for continuous/intermittent operation. 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:



DANGER

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



DANGER

Turn off the fuel interception tap.



DANGER

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. 19.

Key (Fig. 19)

- 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 factory:

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



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

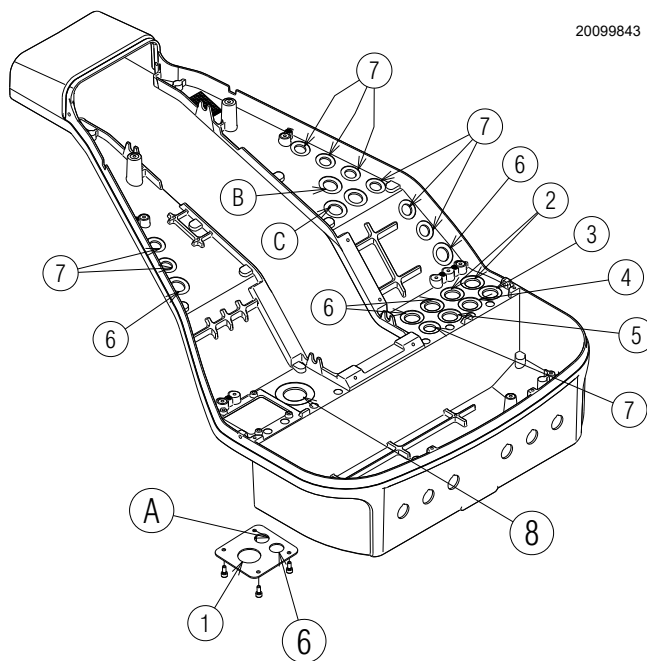


Fig. 19

## 5 Start-up, calibration and operation of the burner

### 5.1 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.



Before igniting the burner, see the paragraph “Safety test - with gas feeding closed” on page 32.



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

### 5.2 Adjustments prior to ignition

Combustion head adjustment is already described on page 20.

In addition, the following adjustments must also be made:

- open manual valves up-line 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.
- 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. 20), 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 the Tab. L on page 22.
- 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.



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.

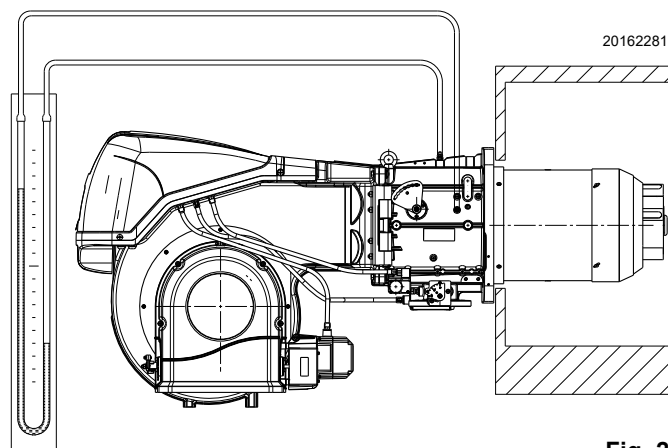


Fig. 20

**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 to position “**AUTO**” (Fig. 21).



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. 21.

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. 21 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. 20).

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



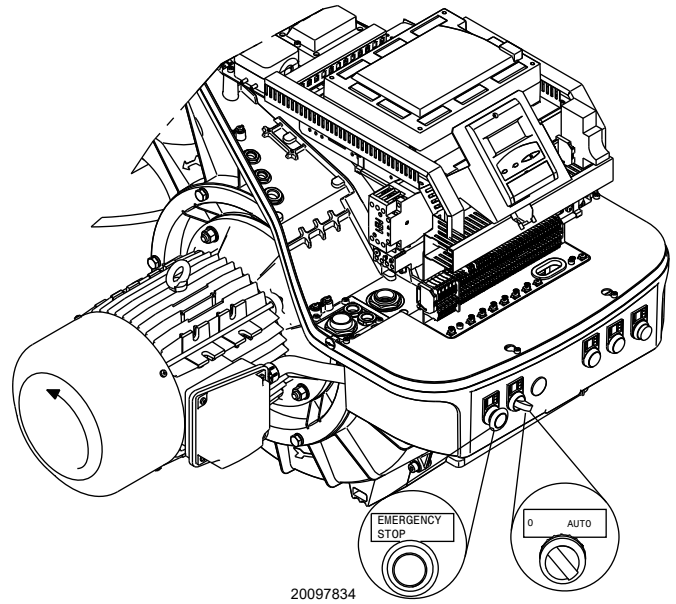
In the event of a burner lockout, more than two consecutive burner reset operations could cause damage to the installation. On the third lockout, contact the Aftersales Service.



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.



**Fig. 21**



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.

## 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 20).

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 17)(Fig. 4 on page 10).

### 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



**WARNING**

For safety purposes and correct product operation, the ignition output, if it is adjustable, must be carried out by authorized personnel and in compliance with the standards and regulations of the laws in force.

#### 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 Tab. L on page 22, just read the gas pressure on the U pressure gauge (shown in Fig. 20 on page 25) and follow the instructions:

- 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.

### 5.4.6 Minimum output

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

## 5.5 Final adjustment of the pressure switches

### 5.5.1 Air pressure switch

Adjust the air pressure switch (Fig. 22) 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 graduated 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. 22. 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. 22.

On **RS 810/EV O2 BLU** burners the air pressure switch is fitted in an "absolute" mode, that is, connected only to the pressure test point "+" 22)(Fig. 4 on page 10).



**WARNING** Connecting the air pressure switch in differential mode, the burner will no longer be certified according to the EN 676 standard.

### 5.5.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 23) 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.

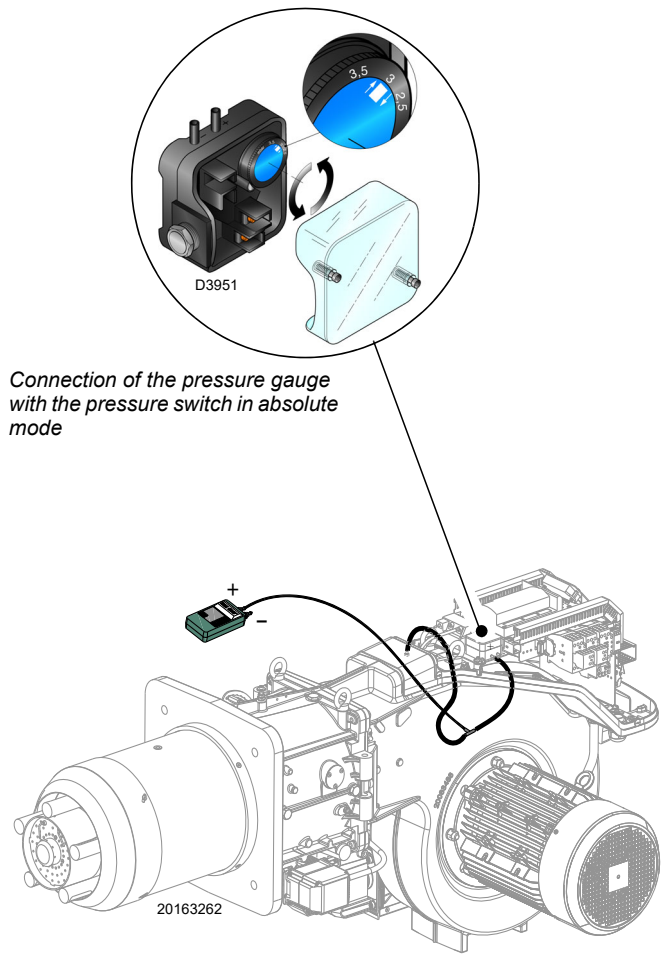


Fig. 22

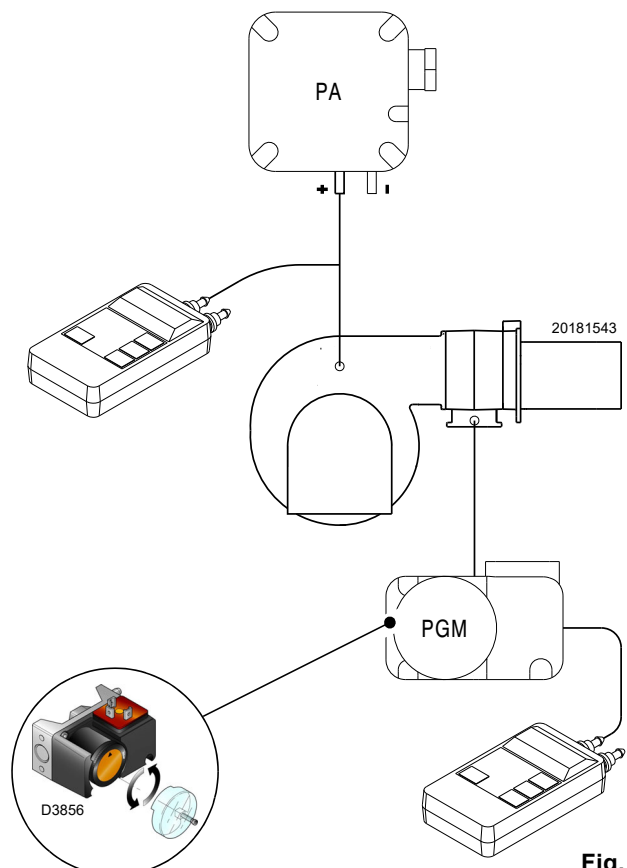


Fig. 23

### 5.5.3 Minimum gas pressure switch

The purpose of the minimum gas pressure switch is to prevent the burner from operating in an unsuitable way due to too low gas pressure.

Adjust the minimum gas pressure switch (Fig. 24) 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 shutdown;
- remove the pressure gauge and close the cock of the gas pressure test point used for the measurement;
- open completely the manual gas cock.



1 Kpa = 10 mbar

WARNING

### 5.5.4 PVP pressure switch kit

Adjust the pressure switch for the leak detection control (PVP kit) (Fig. 25) according to the instructions supplied with the kit.

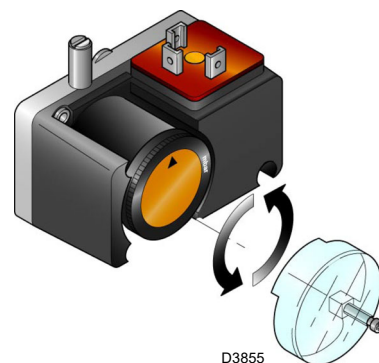


Fig. 24

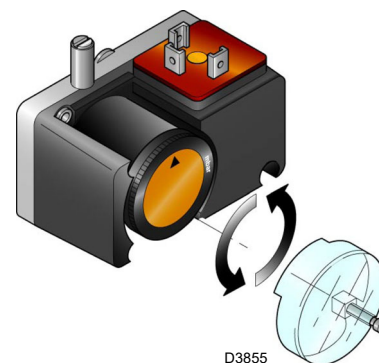






Fig. 25

## 5.6 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 operator panel according to the manual lockout procedure;
- using the switch **0-AUTO** of Fig. 21 on page 26.

## 5.7 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 knob 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 connector of the ionisation probe</li> </ul>		The burner must stop in lockout due to ignition failure

**Tab. M**



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

## 5.8 Description of O<sub>2</sub> trim control (optional)

A special feature of the LMV52... is control of the residual O<sub>2</sub> 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 O<sub>2</sub> 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. 26).

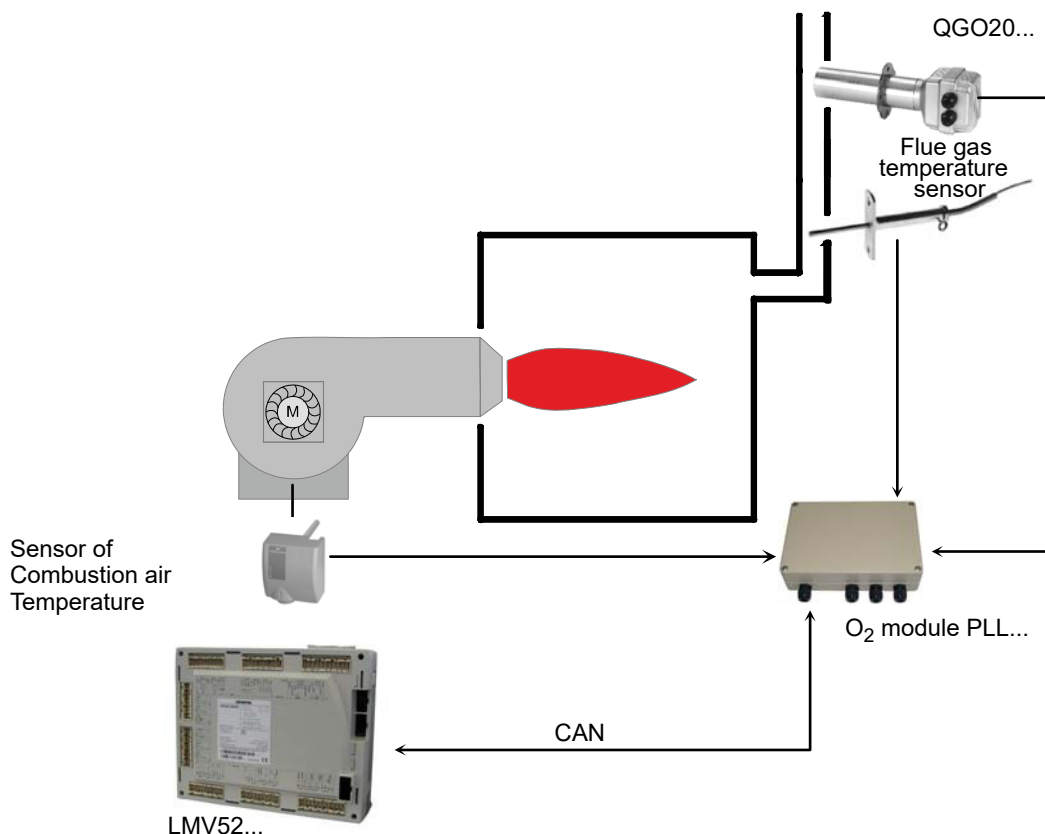


Fig. 26

### 5.8.1 Operating principle of O<sub>2</sub> trim control

The residual O<sub>2</sub> control system reduces the amount of combustion air depending on the control deviation (O<sub>2</sub> setpoint minus actual of O<sub>2</sub>). 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.

O<sub>2</sub> trim control is supported by **precontrol**.

**Precontrol calculates the air rate reduction such that changes in burner load do not require the O<sub>2</sub> 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.



Close 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 feeding closed**

For its safe commissioning it is very important to make sure that the electrical wiring has been carried out correctly between the gas valves and the burner.

To this end, after checking that the connections have been made in conformity with the burner's wiring diagram, a starting cycle should be carried out with the gas tap closed (dry test).

- 1 The manual gas valve should be closed with the locking/releasing device ("lock-out / tag out" procedure).
- 2 Make sure the limit electric contacts of the burner close
- 3 Make sure the contact of the minimum gas pressure switch closes
- 4 Proceed with a tentative start up of the burner.

The starting cycle should occur with the following phases:

- Starting the fan motor for pre-purging
- Carrying out the gas valve leak detection control, if applicable
- Completing the pre-purging
- Reaching the ignition point
- Power supply of the ignition transformer
- Power supply of the gas valves.

Since the gas is closed, the burner will not be able to start and its flame control will stop or go into a safety lockout.

The effective supplying of the gas valves can be checked with the insertion of a tester; some valves are fitted with light signals (or closure/opening position indicators) that are activated when the electrical supply arrives.



**IF THE ELECTRICAL SUPPLY OF THE GAS VALVES OCCURS AT AN UNEXPECTED MOMENT, DO NOT OPEN THE MANUAL VALVE, DISCONNECT THE ELECTRICAL SUPPLY, CHECK THE WIRING; CORRECT THE ERRORS AND CARRY OUT THE ENTIRE TEST AGAIN.**

**6.2.3 Checking and cleaning**



The operator must use the required equipment during maintenance.

**Combustion**

Carry out an analysis of the combustion discharge gases. Significant differences with respect to the previous check 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.

**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.

**6.2.4 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 4 µA.

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 µA, as shown in Fig. 27.



Carefully check the polarities!

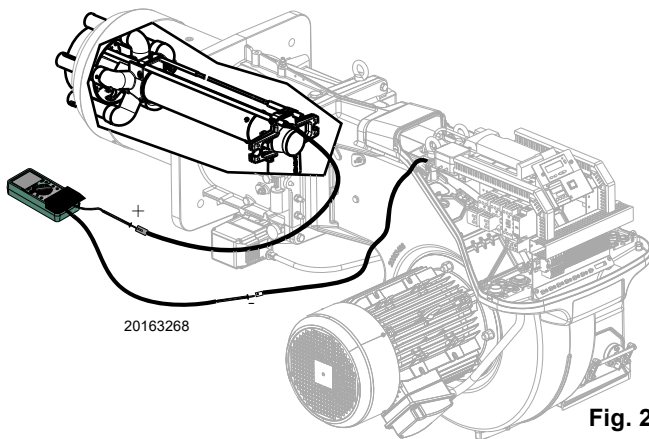


Fig. 27

**Gas leaks**

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

**Gas filter**

Replace the gas filter when it is dirty.

**Combustion**

If the combustion values measured before starting maintenance do not comply with applicable legislation or do not indicate efficient combustion, consult the Tab. N 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. N.

EN 676		Air excess			
		Max. output $\lambda \leq 1.2$		Min. output $\lambda \leq 1.3$	
GAS	CO <sub>2</sub> theoretical max. 0% O <sub>2</sub>	CO <sub>2</sub> % Calibration		CO	NO <sub>x</sub>
		$\lambda = 1.2$	$\lambda = 1.3$	mg/kWh	mg/kWh
G 20	11.7	9.7	9.0	≤ 100	≤ 170
G 25	11.5	9.5	8.8	≤ 100	≤ 170
G 30	14.0	11.6	10.7	≤ 100	≤ 230
G 31	13.7	11.4	10.5	≤ 100	≤ 230

Tab. N

**6.2.5 Safety components**

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

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
Flame sensor	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)	10 years or 250.000 operation cycles
Oil valve (solenoid)	10 years or 250.000 operation cycles
Oil regulator	10 years or 250.000 operation cycles
Pipes/ oil fittings (metallic)	10 years
Fan impeller	10 years or 500.000 start-ups

Tab. O

### 6.3 Checking the position of the rpm sensor

To calibrate the rpm sensor 6)(Fig. 28), proceed as follows:

- remove the cover 1) unscrewing the screws 2);
- unscrew or screw the nuts 3) - 5) and the rpm detection disc 4) so that its distance from the sensor 6) is about 2 mm.;
- support the rpm detection disc 4) to the nut 5) and fix it by the lock nut 3);
- close the cover 1) screwing the screws 2).

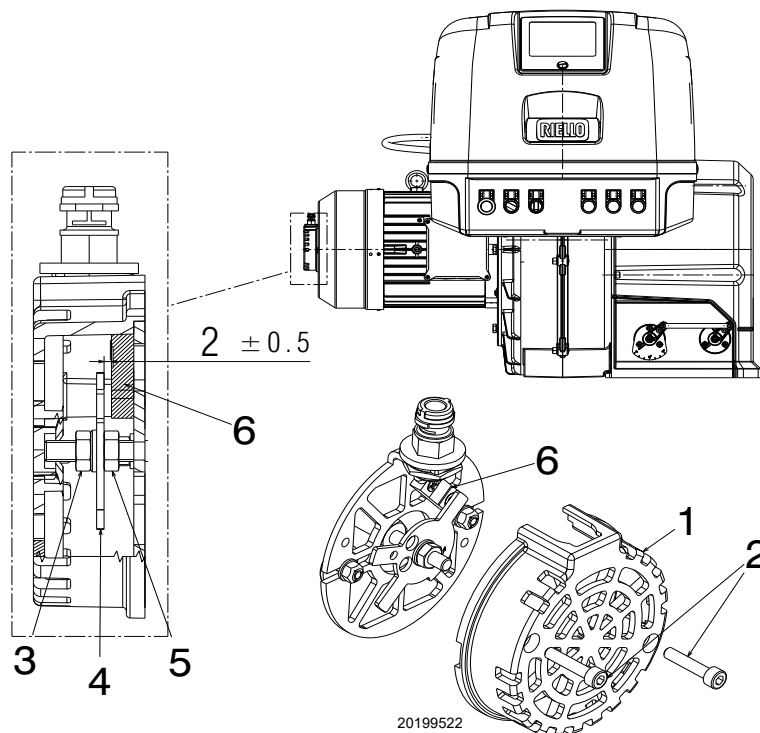


Fig. 28

Key (Fig. 28)

- 1 - Cover
- 2 - Screws for cover fixing
- 3 - Lock nut
- 4 - Rpm detection disc
- 5 - Lower nut
- 6 - Rpm sensor

### 6.4 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.



Close the fuel interception tap.

See "Access to head internal part" on page 20.

### 6.5 Closing the burner

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



Carry out all maintenance work and mount the casing again.

**7**   **Faults - Possible causes - Solutions**

If faults arise in ignition or operations, the burner performs a "safety stop", which is signalled by the red burner lockout LED. The display of the operator panel visualises alternately the lock-out code and the relative diagnostic. When the burner starts up again, the red LED goes out.



**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.

**A Appendix - Accessories****Kit for modulating operation**

Burner	Probe	Adjustment field	Code
RS 810/EV O <sub>2</sub> BLU	PT 100 temperature	- 100...+ 500°C	3010110
	4 - 20 mA pressure	0...2.5 bar	3010213
	4 - 20 mA pressure	0...16 bar	3010214
	4-20 mA pressure	0...25 bar	3090873

**Soundproofing box kit**

Burner	Type	dB(A)	Code
RS 810/EV O <sub>2</sub> BLU	R 810	10	20177776

**Continuous purging kit**

Burner	Code
RS 810/EV O <sub>2</sub> BLU	20077810

**Software interface kit (ACS450)**

Burner	Code
RS 810/EV O <sub>2</sub> BLU	3010388

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

Burner	Ramp type	Code
RS 810/EV O <sub>2</sub> BLU	MB - CB	3010344

**Spacer kit**

Burner	Code
RS 810/EV O <sub>2</sub> BLU	20008903

**Inverter kit (VSD)**

Burner	Line voltage	Motor Output (kW)	Inverter Output (kW)	Code
RS 810/EV O <sub>2</sub> BLU	400V	22	22	20163099



The use of inverters other than those indicated by the manufacturer may lead to burner failure and, in extreme cases, a potential risk of harm to people and damage to property.

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

**Efficiency kit with oxygen control kit**

Burner	Code
RS 810/EV O <sub>2</sub> BLU	3010377

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**Oxygen control kit**

---

Burner	Code
RS 810/EV O <sub>2</sub> BLU	20045187

---

**Additional transformer kit**

---

Burner	Code
RS 810/EV O <sub>2</sub> BLU	20044117

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**Gas trains in compliance with EN 676**

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Please refer to manual.

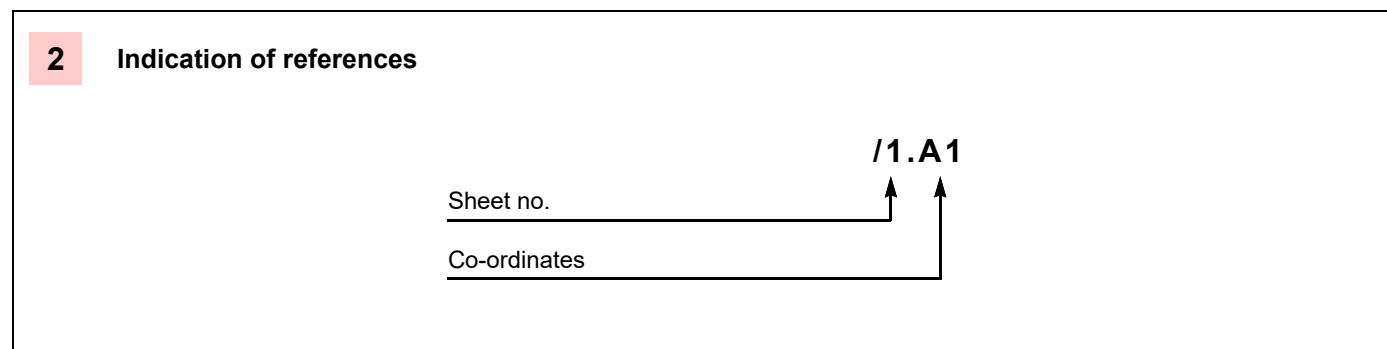


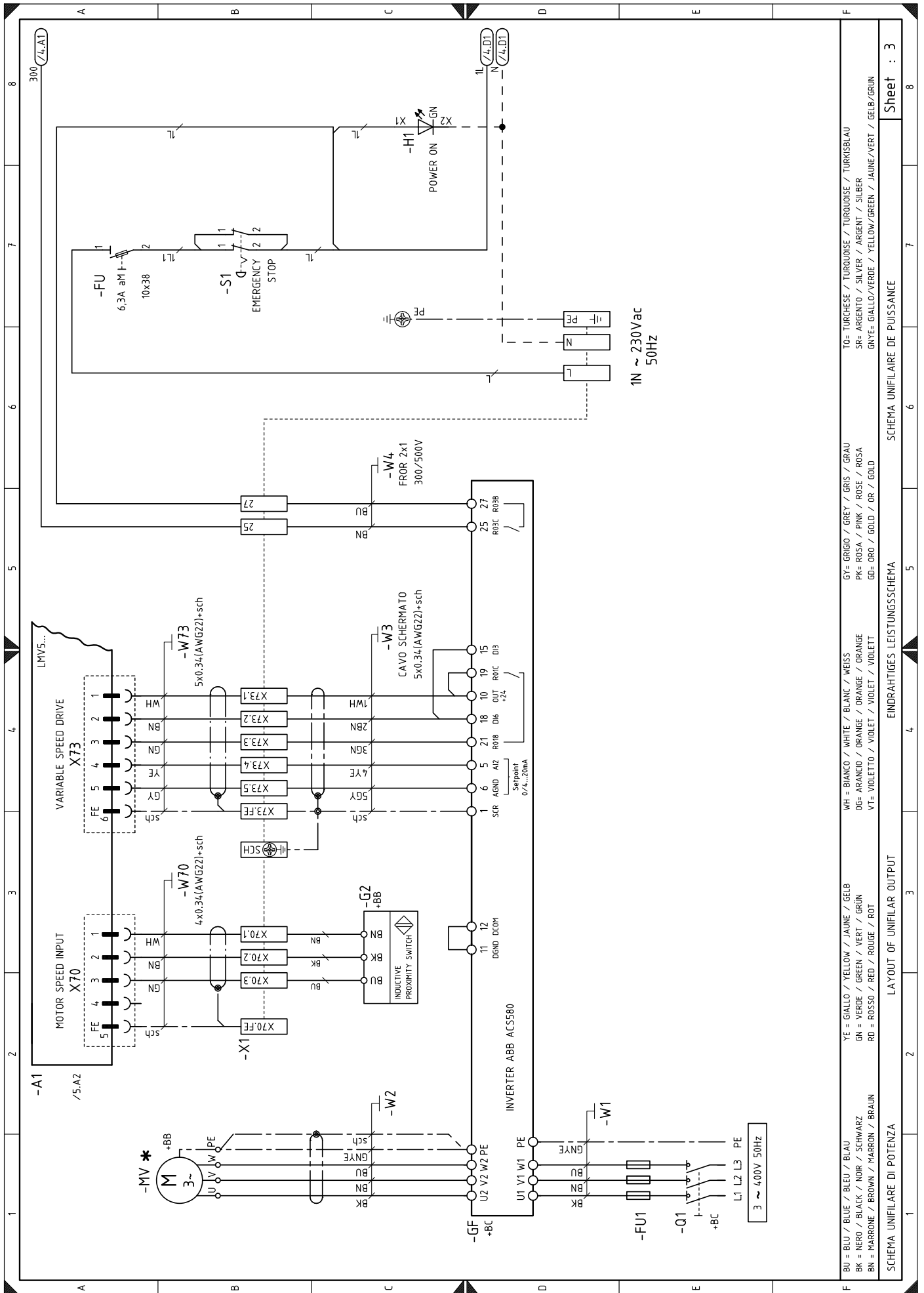
**WARNING**

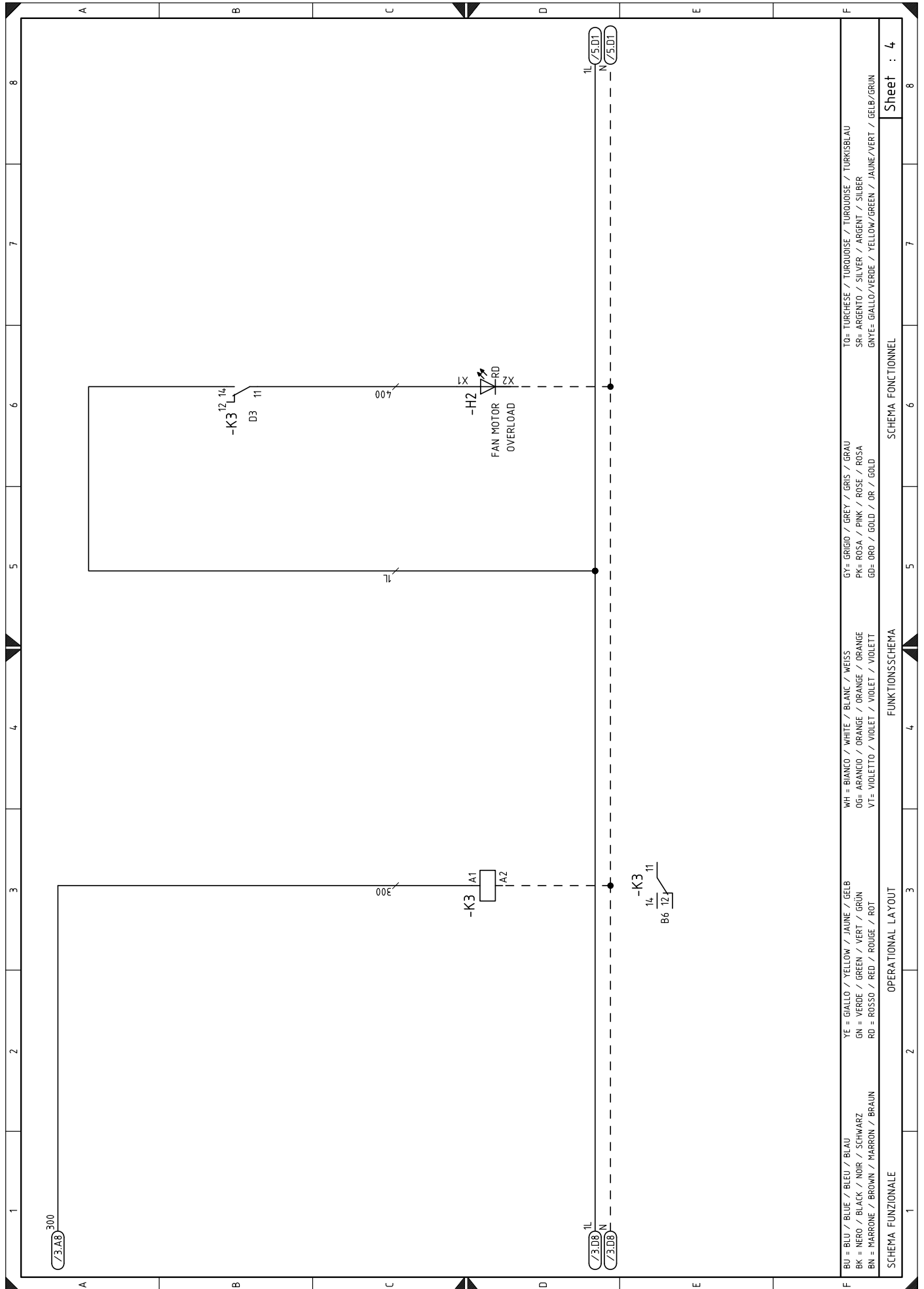
The installer is responsible for the addition of any safety device not foreseen in this manual.

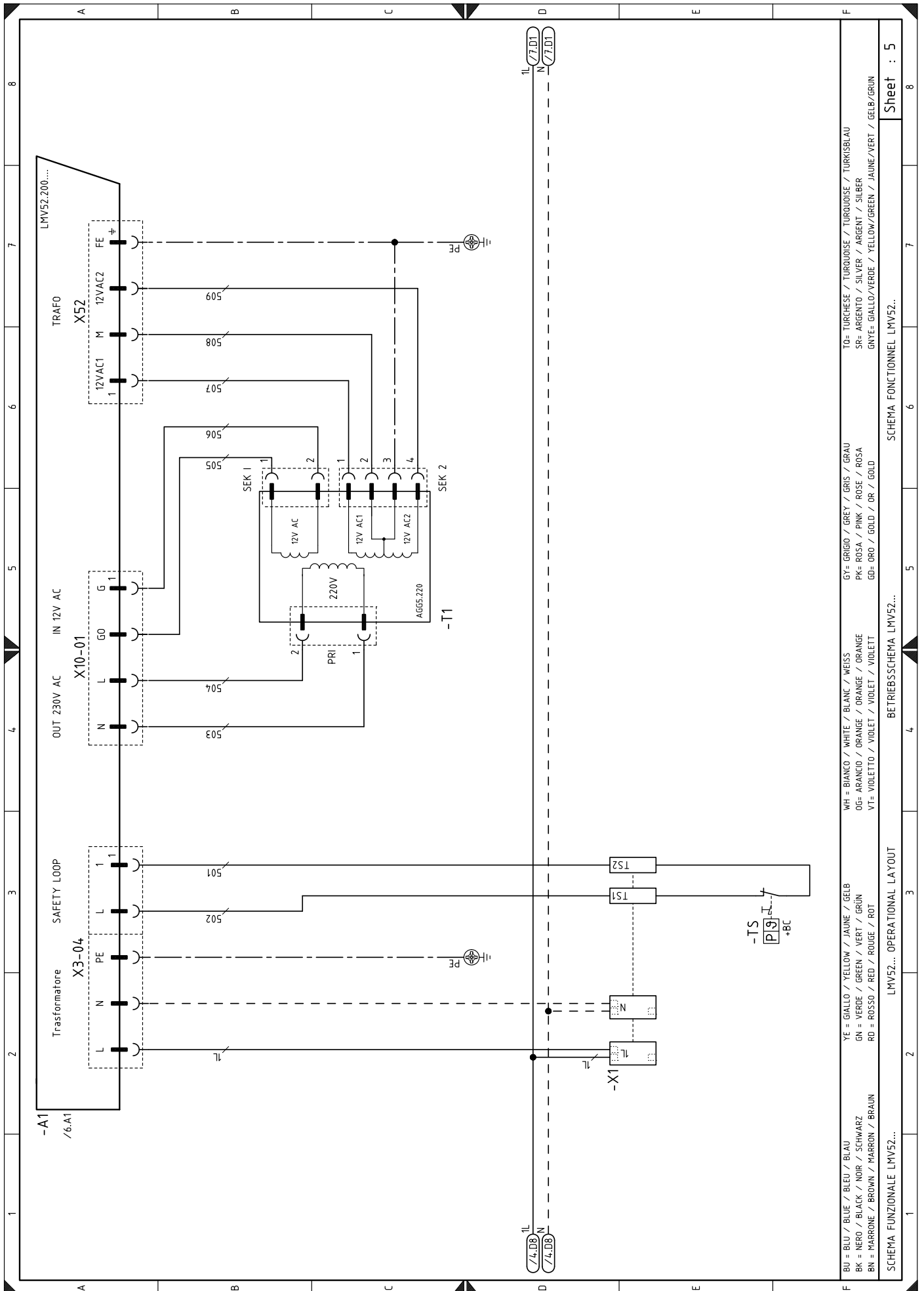
**B Appendix - Electrical panel layout**

<b>1</b>	<b>Index of layouts</b>
<b>2</b>	Indication of references
<b>3</b>	Layout of unifilar output
<b>4</b>	Layout of unifilar output
<b>5</b>	LMV 52 ... operational layout
<b>6</b>	LMV 52 ... operational layout
<b>7</b>	LMV 52 ... operational layout
<b>8</b>	LMV 52 ... operational layout
<b>9</b>	LMV 52 ... operational layout
<b>10</b>	LMV 52 ... operational layout
<b>11</b>	LMV 52 ... operational layout
<b>12</b>	PLL52.../QG020 ... operational layout with O2 kit
<b>12B</b>	PLL52.../QG020 ... operational layout with O2 kit
<b>13</b>	Electrical connections set by installer
<b>14</b>	Electrical connections set by installer



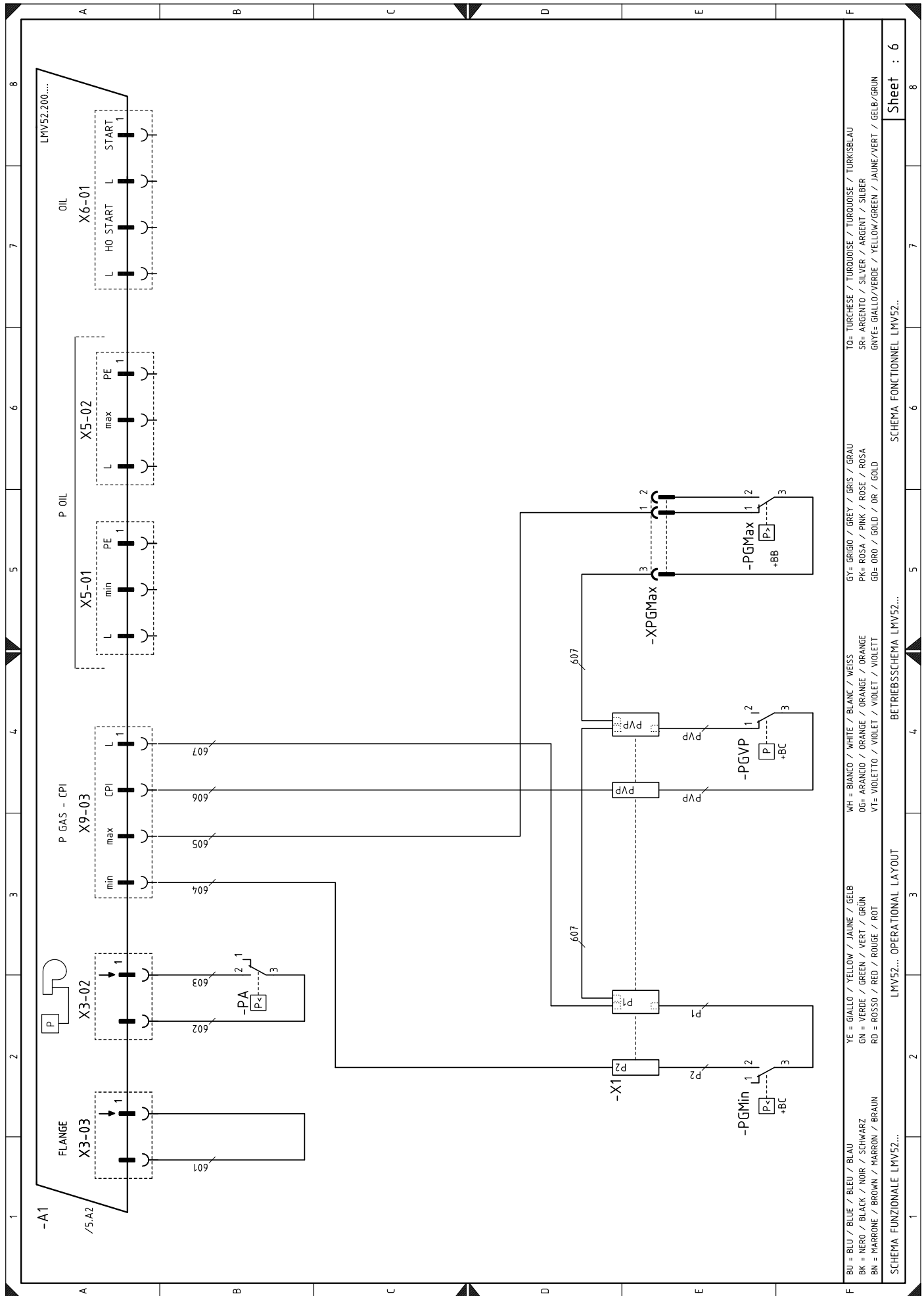


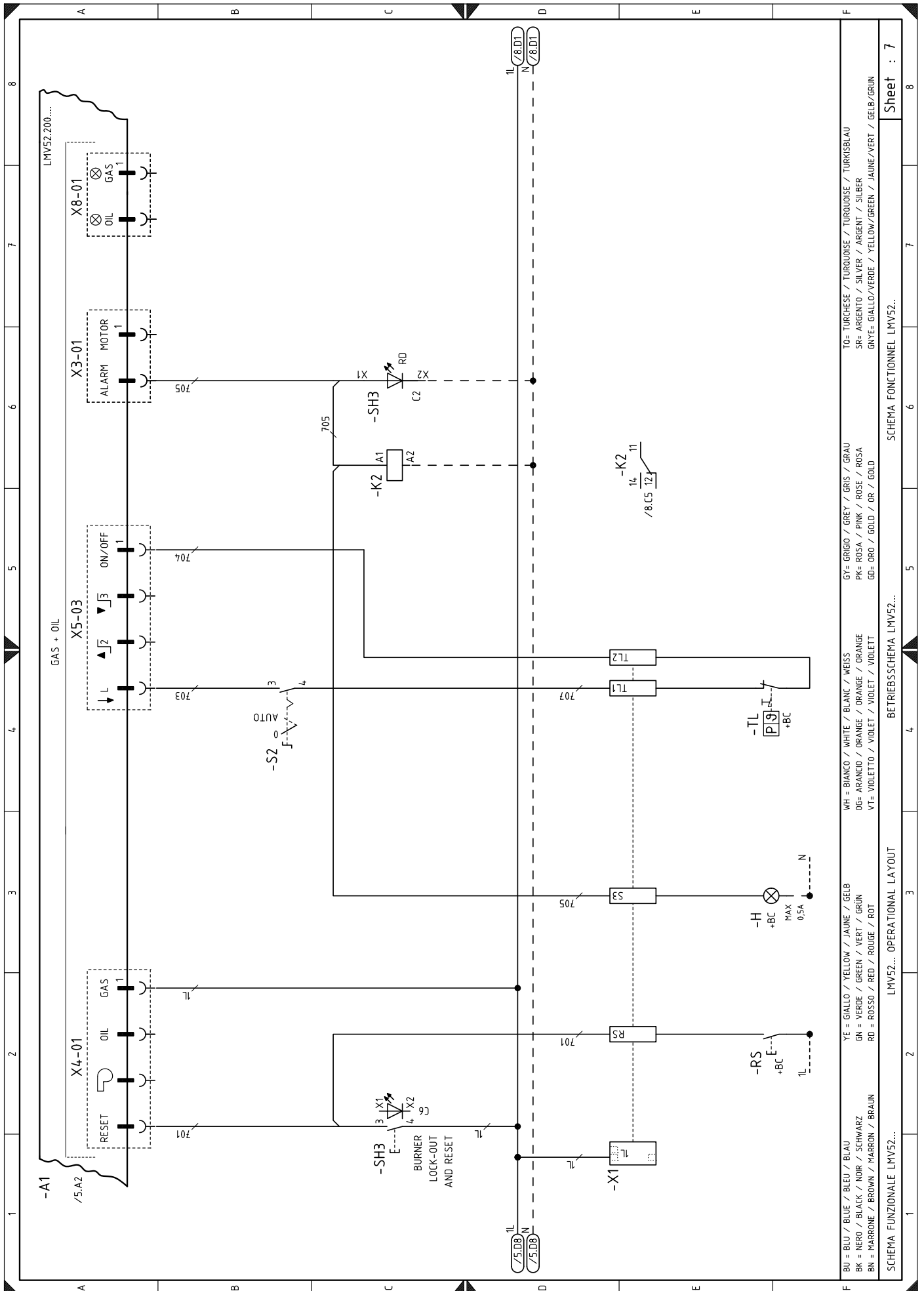




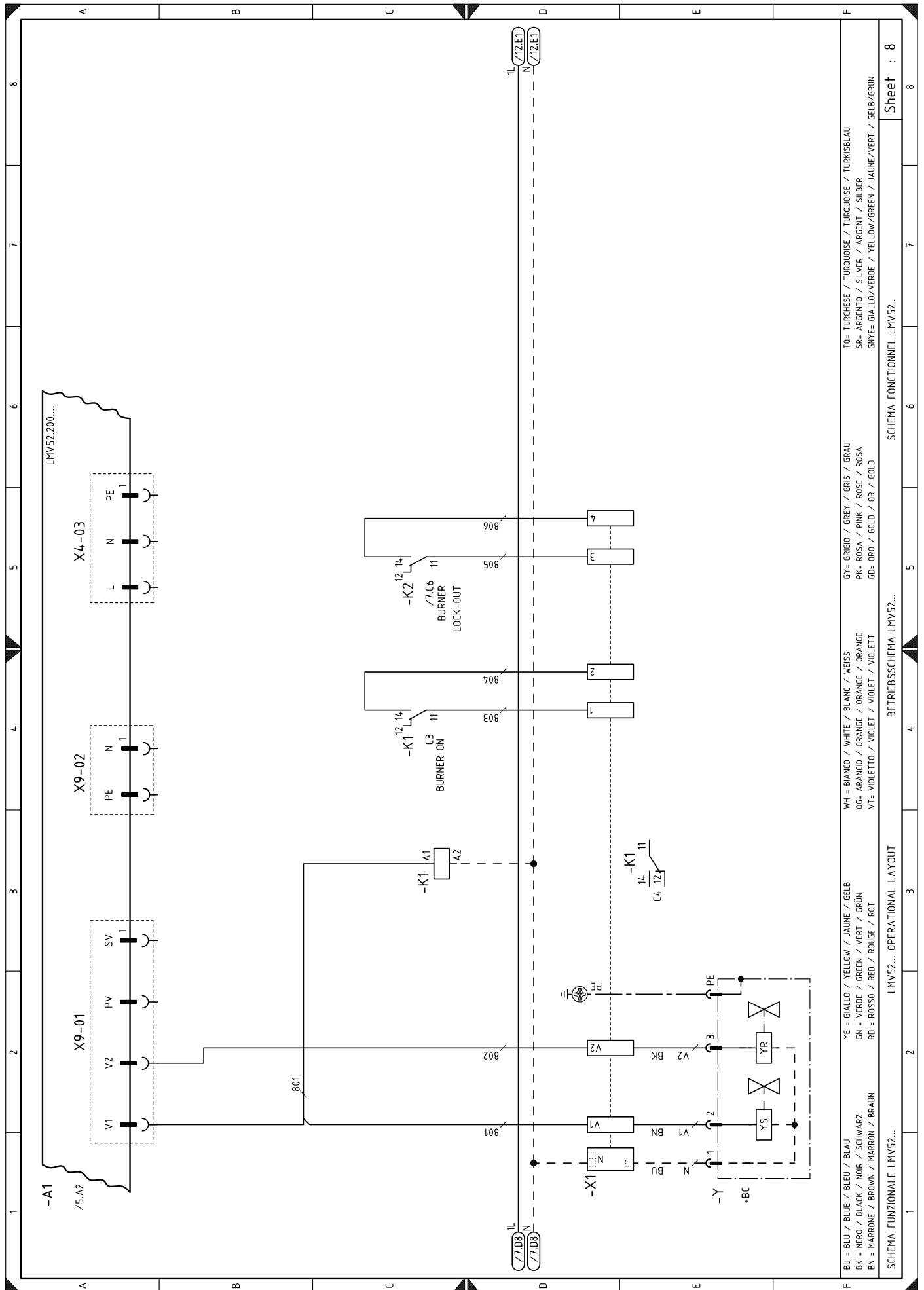
SCHEMA FUNZIONALE LMV52...  
 SCHEMA FONCTIONNEL LMV52...  
 BETREBSSCHEMA LMV52...  
 OPERATIONAL LAYOUT  
 LMV52... OPERATIONAL LAYOUT

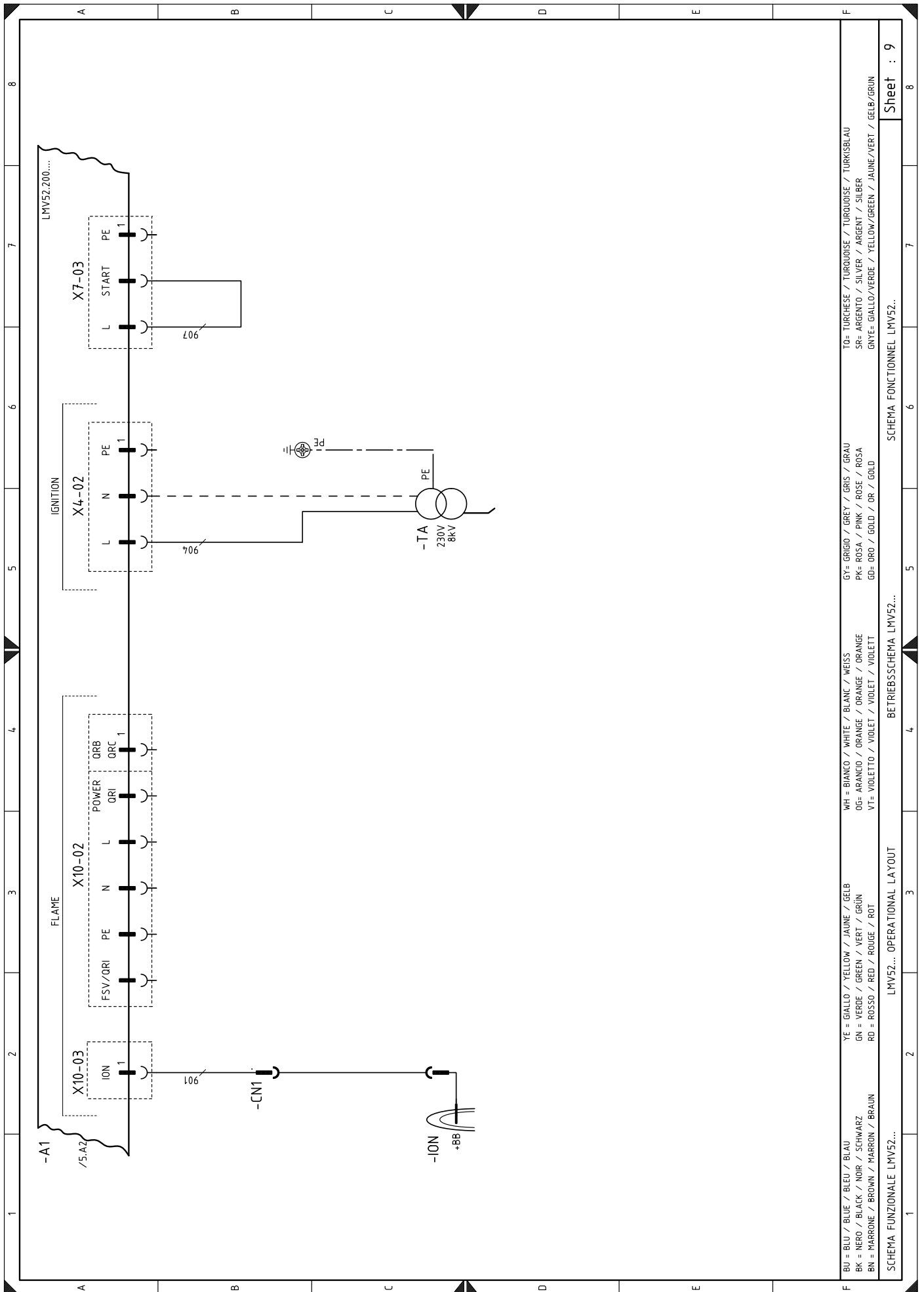
Sheet : 5





SCHEMA FUNZIONALE LMV52...  
 SCHEMA FONCTIONNEL LMV52...  
 SCHEMA FUNCTIONAL LAYOUT LMV52...  
 BETREBSSCHEMA LMV52...  
 TO= TURCHESE / TURQUOISE / TURKISBLAU  
 SR= ARGENTO / SILVER / ARGENT / SILBER  
 GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRUN  
 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= VIOLETTO / VIOLET / VIOLET / VIOLETT  
 YE= GIALLO / YELLOW / JAUNE / GELB  
 GN= VERDE / GREEN / VERT / GRUN  
 RD= ROSSO / RED / ROUGE / ROT  
 BU= BLU / BLUE / BLEU / BLAU  
 BK= NERO / BLACK / NOIR / SCHWARZ  
 BN= MARRONE / BROWN / MARRON / BRAUN

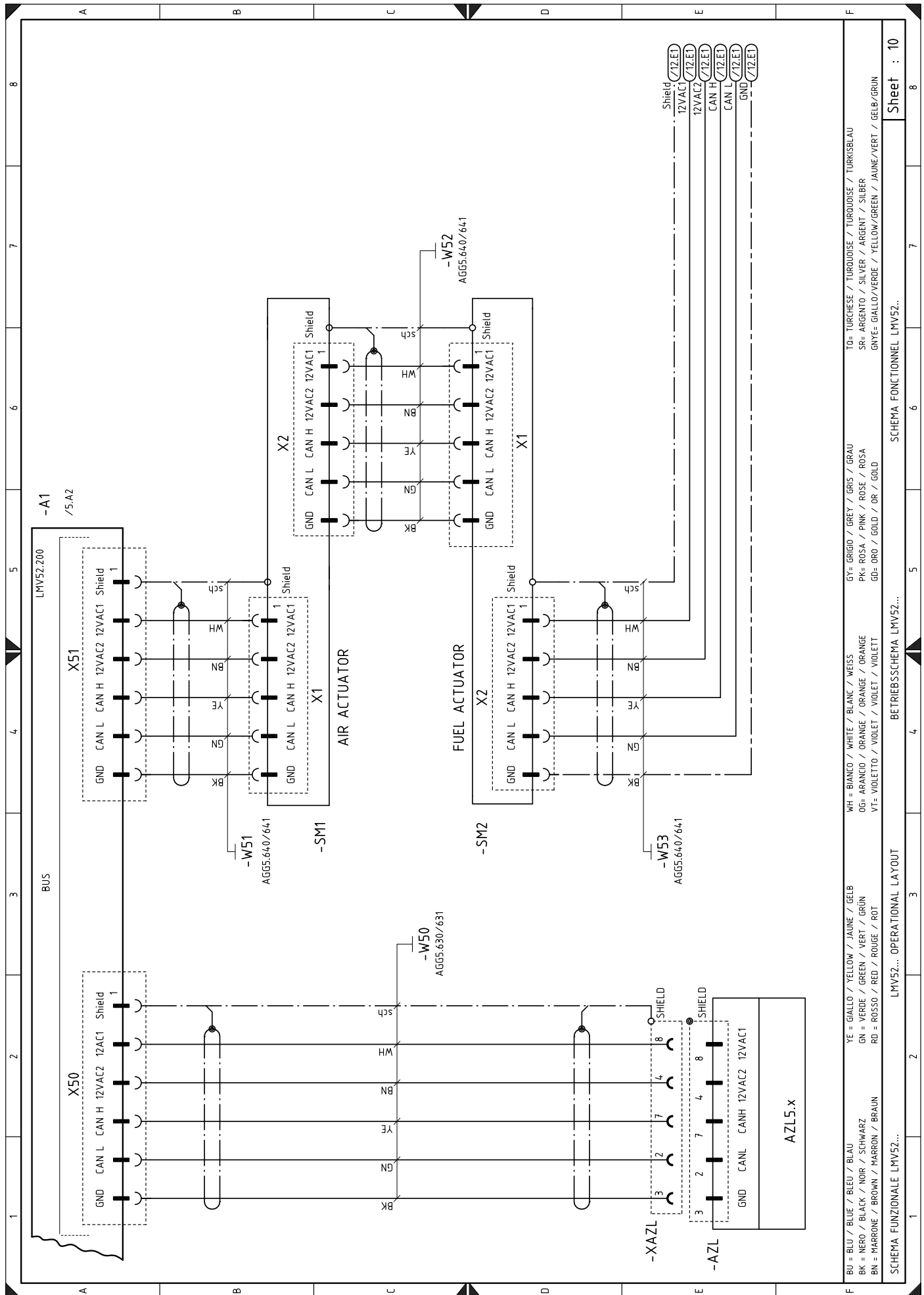


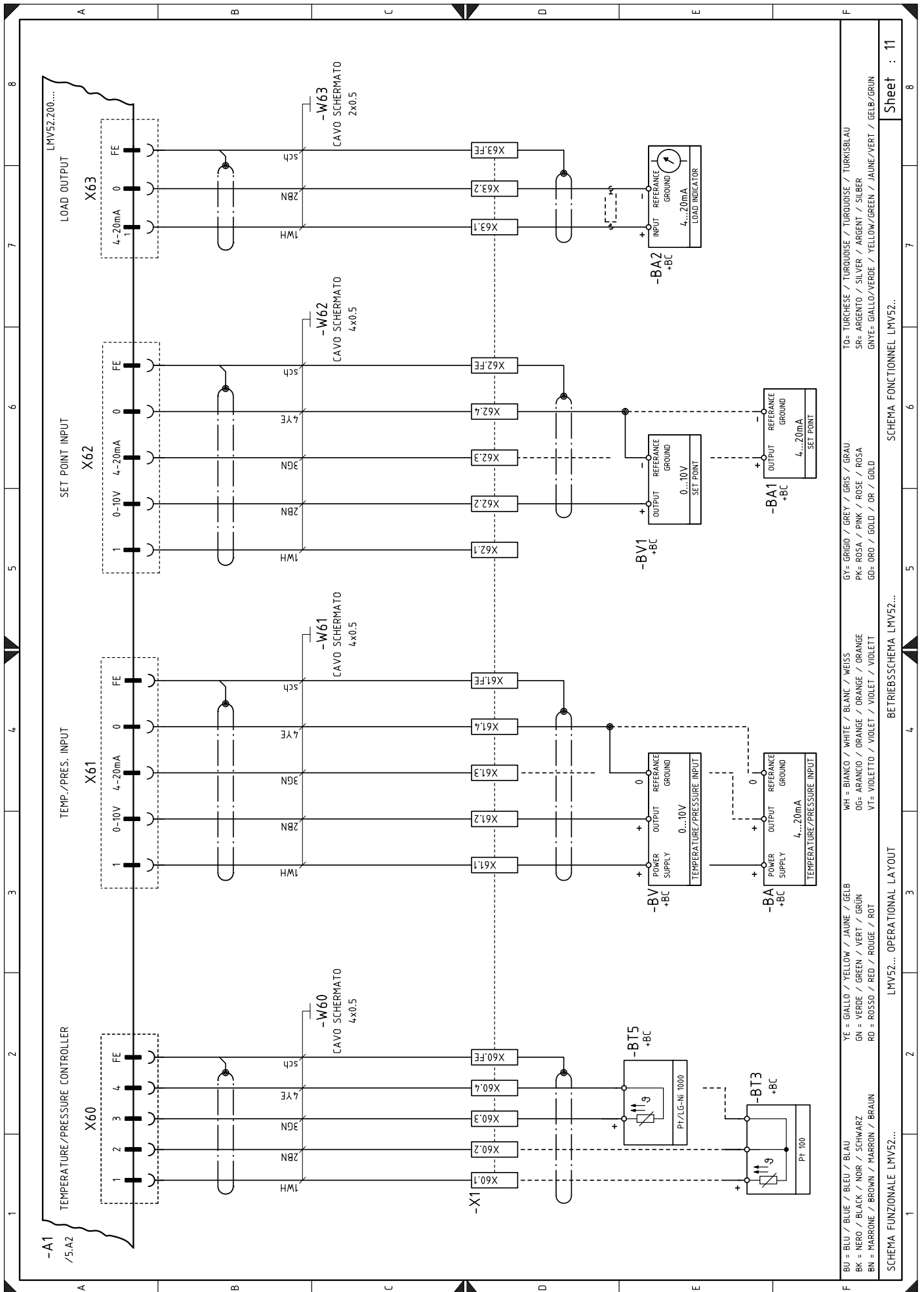


BU = BLU / BLUE / BLEU / BLAU  
 BK = NERO / BLACK / NOIR / SCHWARZ  
 BN = MARRONE / BROWN / MARRON / BRAUN  
 YE = GIALLO / YELLOW / JAUNE / GELB  
 GN = VERDE / GREEN / VERT / GRÜN  
 RD = ROSSO / RED / ROUGE / ROT  
 WH = BIANCO / WHITE / BLANC / WEISS  
 OG = ARANCIO / ORANGE / ORANGE / ORANGE 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

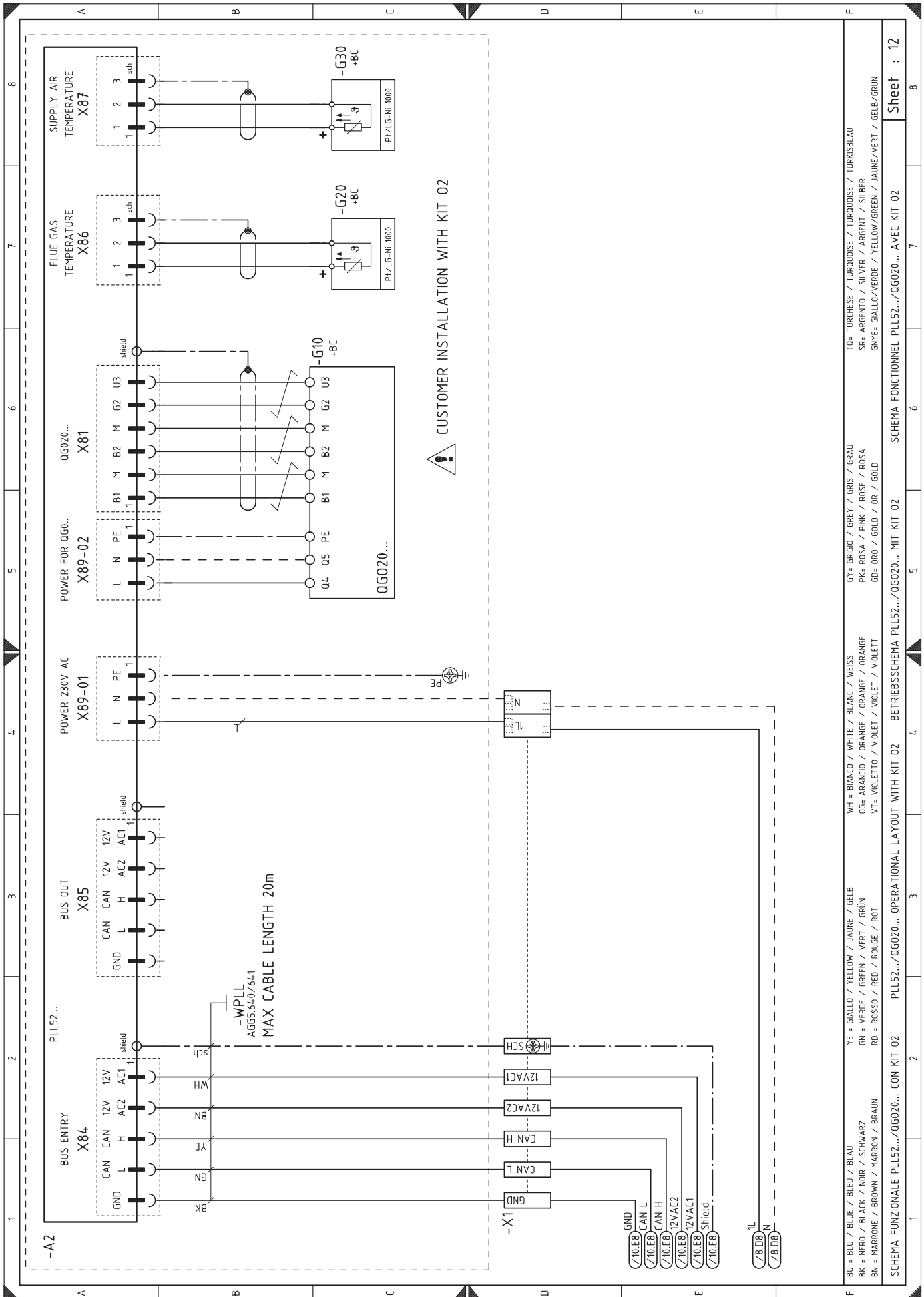
SCHEMA FUNZIONALE LMV52...  
 LMV52... OPERATIONAL LAYOUT  
 SCHEMA FONCTIONNEL LMV52...

Sheet : 9



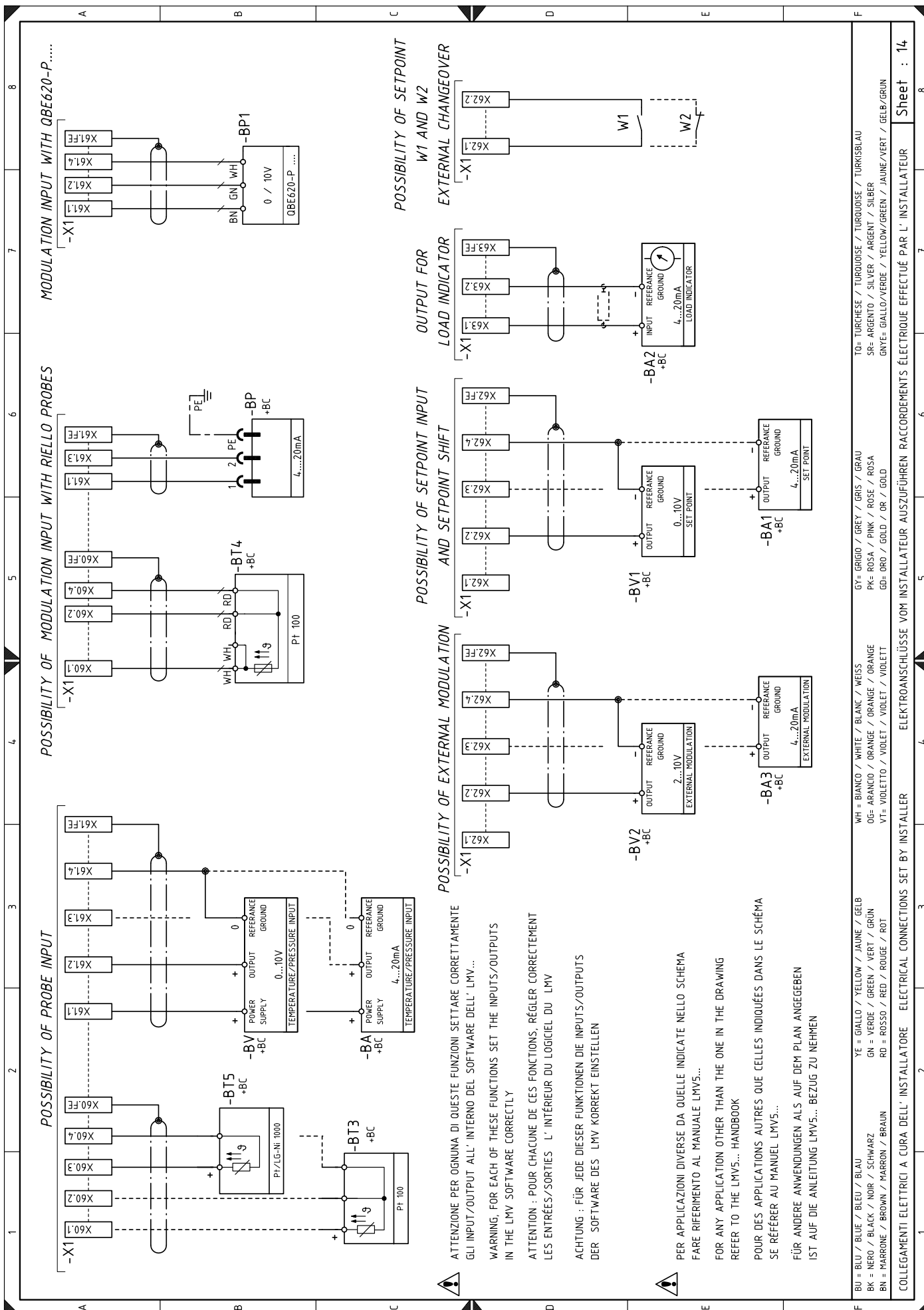


SCHEMA FUNZIONALE LMV52...  
 OPERATIONAL LAYOUT  
 BETRIEBSSCHEMA LMV52...  
 SCHEMA FONCTIONNEL LMV52...  
 TO= TURCHESE / TURQUOISE / TURKOISE / TURKSBLAU  
 SR= ARGENTO / SILVER / ARGENT / SILBER  
 GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRUN  
 YE = GIALLO / YELLOW / JAUNE / GELB  
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 VT= VIOLETTO / VIOLET / VIOLET / VIOLETT  
 GY= GRIGIO / GREY / GRIS / GRAU  
 PK= ROSA / PINK / ROSE / ROSA  
 GD= ORO / GOLD / OR / GOLD









**ATTENZIONE PER OGNIUNA DI QUESTE FUNZIONI SETTARE CORRETTAMENTE GLI INPUT/OUTPUT ALL' INTERNO DEL SOFTWARE DELL' LMV...**

**WARNING, FOR EACH OF THESE FUNCTIONS SET THE INPUTS/OUTPUTS IN THE LMV SOFTWARE CORRECTLY**

**ATTENTION : POUR CHACUNE DE CES FONCTIONS, RÉGLER CORRECTEMENT LES ENTRÉES/SORTIES L' INTÉRIEUR DU LOGICIEL DU LMV**

**ACHTUNG : FÜR JEDE DIESER FUNKTIONEN DIE INPUTS/OUTPUTS DER SOFTWARE DES LMV KORREKT EINSTELLEN**

**PER APPLICAZIONI DIVERSE DA QUELLE INDICATE NELLO SCHEMA FARE RIFERIMENTO AL MANUALE LMV5...**

**FOR ANY APPLICATION OTHER THAN THE ONE IN THE DRAWING REFER TO THE LMV5... HANDBOOK**

**POUR DES APPLICATIONS AUTRES QUE CELLES INDIQUÉES DANS LE SCHEMA SE RÉFÉRER AU MANUEL LMV5...**

**FÜR ANDERE ANWENDUNGEN ALS AUF DEM PLAN ANGEGBEN IST AUF DIE ANLEITUNG LMV5... BEZUG ZU NEHMEN**

BU = BLU / BLUE / BLEU / BLAU	YE = GIALLO / YELLOW / JAUNE / GELB
BK = NERO / BLACK / NOIR / SCHWARZ	GN = VERDE / GREEN / VERT / GRÜN
BN = MARRONE / BROWN / MARRON / BRAUN	RD = ROSSO / RED / ROUGE / ROT
	WH = BIANCO / WHITE / BLANC / WEISS
	OG= ARANCIO / ORANGE / ORANGE / ORANGE
	VT= VIOLETTA / 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
	GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN

**Wiring layout key**

A1	Electronic cam
A2	O <sub>2</sub> module
AZL	Display and calibration unit
BA	Probe with output under current
BA1	Device with output undercurrent, for modifying remote setpoint
BA2	Light signalling burner lockout and reset button
BP	Pressure probe
BP1	Pressure probe
BT3	Probe Pt100, 3 wires
BT4	Probe Pt100, 3 wires
BT5	Probe Pt100, 2 wires
BV	Output probe in voltage
BV1	Output device in voltage to modify remote setpoint
BV2	External modulation 2... 10V
BV3	External modulation 4... 20mA
CN1	Ionisation probe connector
FU	Auxiliary circuits safety fuse
FU1	Fuses for inverter supply
FU2	Fuses for phase line
GF	Inverter
G2	RPM sensor
G10	Oxygen sensor
G20	Probe for fuel temperature
G30	Probe for air temperature
H	Burner working lighting signal output
H1	Burner working signal
H2	Light signal for fan motor lock-out
ION	Ionisation probe
K1	Clean contacts output relay burner switched on
K2	Clean contacts output relay burner lockout
K3	Relay
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
Q1	Power supply disconnecting switch for inverter
Q2	Line disconnecting switch
RS	Burner reset switch
S1	Safety button
S2	<b>"0/AUTO"</b> selector
SH3	Burner lock-out signal and reset switch
SM1	Air servomotor
SM2	Gas servomotor
TA	Ignition transformer
TL	Limit thermostat/pressure switch
TS	Safety thermostat/pressure switch
T1	Transformer for electronic cam
T2	Auxiliary transformer for servomotors
Y	Gas regulator valve + gas safety valve
X1	Main terminal supply board
XAZL	Plug for on board display
XPGVP	Maximum gas pressure switch connector



---

**RIELLO**

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