

GB Forced draught gas burners

Modulating operation



CODE	MODEL	TYPE
20074125 - 20074121 20074122	RS 310/M BLU FS1	1138T
20074126 - 20074123 20074124	RS 410/M BLU FS1	1135T
20074127	RS 510/M BLU FS1	1136T
20074128	RS 610/M BLU FS1	1137T
20074133 - 20074129 20074130	RS 310/M BLU FS2	1138T
20074134 - 20074131 20074132	RS 410/M BLU FS2	1135T
20074135	RS 510/M BLU FS2	1136T
20074136	RS 610/M BLU FS2	1137T



Translation of the original instructions

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1 Declarations

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

Manufacturer:	RIELLO S.p.A.		
Address:	Via Pilade Riello, 7 37045 Legnago (VR)		
Product:	Forced draught gas burners		
Model and type:	RS 310/M BLU FS1	1138T	
	RS 410/M BLU FS1	1135T	
	RS 510/M BLU FS1	1136T	
	RS 610/M BLU FS1	1137T	
	RS 310/M BLU FS2	1138T	
	RS 410/M BLU FS2	1135T	
	RS 510/M BLU FS2	1136T	
	RS 610/M BLU FS2	1137T	

These products are in compliance with the following Technical Standards:

EN 676

EN 12100

and according to the European Directives:

GAD	2009/142/EC	Gas Devices Directive
MD	2006/42/EC	Machine Directive
LVD	2014/35/UE	Low Voltage Directive
EMC	2014/30/UE	Electromagnetic Compatibility

Such products are marked as follows:



0085

CE-0085CP0166	RS 310/M BLU FS1 - FS2 (Class 3 EN 676)
CE-0085CP0166	RS 410/M BLU FS1 - FS2 (Class 3 EN 676)
CE-0085CP0166	RS 510/M BLU FS1 - FS2 (Class 3 EN 676)
CE-0085CP0166	RS 610/M BLU FS1 - FS2 (Class 3 EN 676)

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

Manufacturer's Declaration

RIELLO S.p.A. declares that the following products comply with the NOx emission limits specified by German standard "1. BIm-SchV revision 26.01.2010".

Product	Model	Type	Output
Forced draught gas burners	RS 310/M BLU FS1	1138T	400 - 3630 kW
	RS 410/M BLU FS1	1135T	500 - 4450 kW
	RS 510/M BLU FS1	1136T	680 - 5250 kW
	RS 610/M BLU FS1	1137T	1000 - 6250 kW
	RS 310/M BLU FS2	1138T	400 - 3630 kW
	RS 410/M BLU FS2	1135T	500 - 4450 kW
	RS 510/M BLU FS2	1136T	680 - 5250 kW
	RS 610/M BLU FS2	1137T	1000 - 6250 kW

Legnago, 21.05.2015

Executive General Manager
RIELLO S.p.A. -
Burner Department

Mr. U. Ferretti

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

Mr. F. Comencini

2 Information and general warnings

2.1 Information about the instruction manual

2.1.1 Introduction

The instruction manual supplied with the burner:

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

Symbols used in the manual

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

2.1.2 General dangers

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



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.

2.1.3 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.



This symbol indicates a list.

Abbreviations used

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

2.1.4 Delivery of the system and the instruction manual

When the system is delivered, it is important that:

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

.....

- the address and telephone number of the nearest Assistance Centre;

.....

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

2.2 Guarantee and responsibility

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



WARNING

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

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

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

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

3 Safety and prevention

3.1 Introduction

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

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

It is a good idea to remember the following:

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

In particular:

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

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

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



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

3.2 Personnel training

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

The user:

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

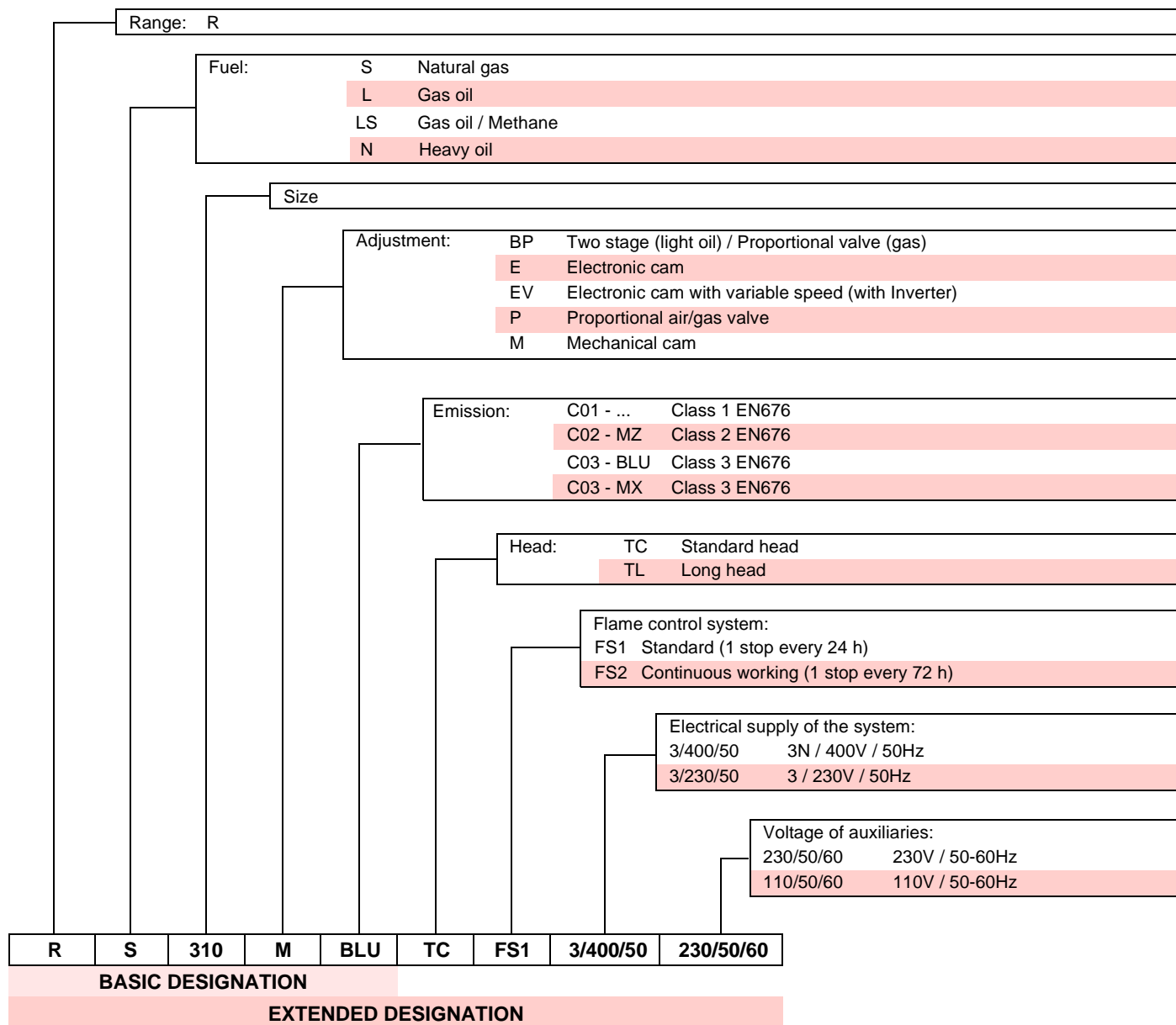
In addition:



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

4 Technical description of the burner

4.1 Burner designation



4.2 Models available
Version FS1

Designation	Voltage	Start-up	Code
RS 310/M BLU FS1	3/400/50	Star/Triangle	20074125
	3/230/50	Direct	20074121
	3/400/50	Direct	20074122
RS 410/M BLU FS1	3/400/50	Star/Triangle	20074126
	3/230/50	Direct	20074123
	3/400/50	Direct	20074124
RS 510/M BLU FS1	3/400/50	Star/Triangle	20074127
RS 610/M BLU FS1	3/400/50	Star/Triangle	20074128

Version FS2

Designation	Voltage	Start-up	Code
RS 310/M BLU FS2	3/400/50	Star/Triangle	20074133
	3/230/50	Direct	20074129
	3/400/50	Direct	20074130
RS 410/M BLU FS2	3/400/50	Star/Triangle	20074134
	3/230/50	Direct	20074131
	3/400/50	Direct	20074132
RS 510/M BLU FS2	3/400/50	Star/Triangle	20074135
RS 610/M BLU FS2	3/400/50	Star/Triangle	20074136

Tab. A
4.3 Burner categories - Countries of destination

Gas category	Destination country
I ₂ H	SE - FI - AT - GR - DK - ES - GB - IT - IE - PT - IS - CH - NO
I ₂ ELL	DE
I ₂ L	NL
I ₂ Er	FR
I ₂ E(R)B	BE
I ₂ E	LU - PL

Tab. B

4.4 Technical data

Model			RS 310/M BLU	RS 410/M BLU	RS 510/M BLU	RS 610/M BLU
Type		FS1 FS2	1138T	1135T	1136T	1137T
Power ⁽¹⁾ Delivery ⁽¹⁾	min - max	kW	400/1200 ÷ 3630	500/1500 ÷ 4450	680/1800 ÷ 5250	1000/2200 ÷ 6250
Fuels			Natural gas: G20 (methane gas) - G21 - G22 - G23 - G25			
Gas pressure at max. output ⁽²⁾ Gas: G20/G25		mbar	50.1/74.7	53.1/79.2	59.7/89.1	77.6/115.8
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 - 40			
Combustion air temperature		°C max	60			
Noise levels ⁽³⁾	Sound pressure	dB(A)	78	80	82.5	85
	Sound power		89	91	93,5	96

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 on the socket 5) (Fig. 5) 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.

4.5 Electrical data

DIRECT START UP

Model			RS 310/M BLU	RS 410/M BLU
Code	FS1 FS2		20074121 - 20074122 20074129 - 20074130	20074123 - 20074124 20074131 - 20074132
Main electrical supply			3 ~ 230/400V +/-10% 50 Hz	
Fan motor IE2	rpm		2900	2920
	V		230/400	230/400
	kW		7.5	9.2
	A		23.9/13.8	29.3/16.9
Ignition transformer	V1 - V2 I1 - I2		230 V - 1 x 8 kV 1 A - 20 mA	
Absorbed electrical power	kW max		9.1	10.8
Protection level			IP 54	

STAR - TRIANGLE START UP

Model			RS 310/M BLU	RS 410/M BLU	RS 510/M BLU	RS 610/M BLU
Code	FS1 FS2		20074125 20074133	20074126 20074134	20074127 20074135	20074128 20074136
Main electrical supply			3N ~ 400V +/-10% 50 Hz			
Fan motor IE2	rpm		2900	2920	2880	2920
	V		400/690	400/690	400/690	400/690
	kW		7.5	9.2	12	15
	A		13.8/8	16.9/9.7	21.2/12.2	29.5/17
Ignition transformer	V1 - V2 I1 - I2		230V - 1 x 8 kV 1A - 20mA			
Absorbed electrical power	kW max		9.1	10.8	14	17
Protection level			IP 54			

Tab. D

DIRECT START UP

Model		RS 310/M BLU	RS 410/M BLU
Code	FS1 FS2	20074121 - 20074122 20074129 - 20074130	20074123 - 20074124 20074131 - 20074132
Main electrical supply		3 ~ 230/400V +/-10% 50 Hz	
Fan motor IE3	rpm	2900	2920
	V	230/400	230/400
	kW	7.5	9.2
	A	24/14	28.6/16.5
Ignition transformer	V1 - V2 I1 - I2	230 V - 1 x 8 kV 1 A - 20 mA	
Absorbed electrical power	kW max	9.1	10.6
Protection level		IP 54	

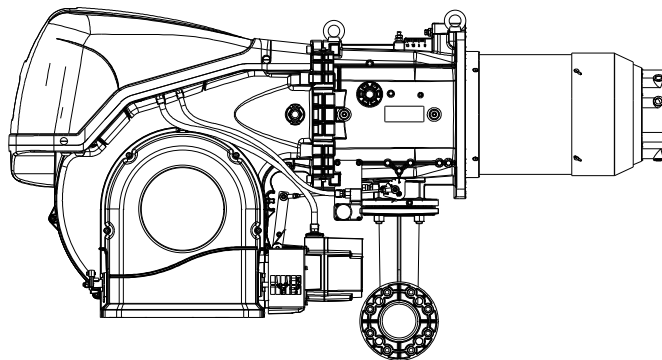
STAR - TRIANGLE START UP

Model		RS 310/M BLU	RS 410/M BLU	RS 510/M BLU	RS 610/M BLU
Code	FS1 FS2	20074125 20074133	20074126 20074134	20074127 20074135	20074128 20074136
Main electrical supply		3N ~ 400V +/-10% 50 Hz			
Fan motor IE3	rpm	2920	2920	2880	2880
	V	400/690	400/690	400/690	400/690
	kW	7.5	9.2	12	15
	A	14/8.1	16.8/9.7	21.8/12.6	27/15.6
Ignition transformer	V1 - V2 I1 - I2	230 V - 1 x 8 kV 1 A - 20 mA			
Absorbed electrical power	kW max	8.8	10.6	13.9	16.9
Protection level		IP 54			

Tab. E
4.6 Burner weight

The weight of the burner complete with its packaging is shown in Tab. F.

Model	kg
RS 310/M BLU	250
RS 410/M BLU	250
RS 510/M BLU	250
RS 610/M BLU	280

Tab. F


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Fig. 1

4.7 Maximum dimensions

The maximum dimensions of the burner are given in Fig. 2.

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 L 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.

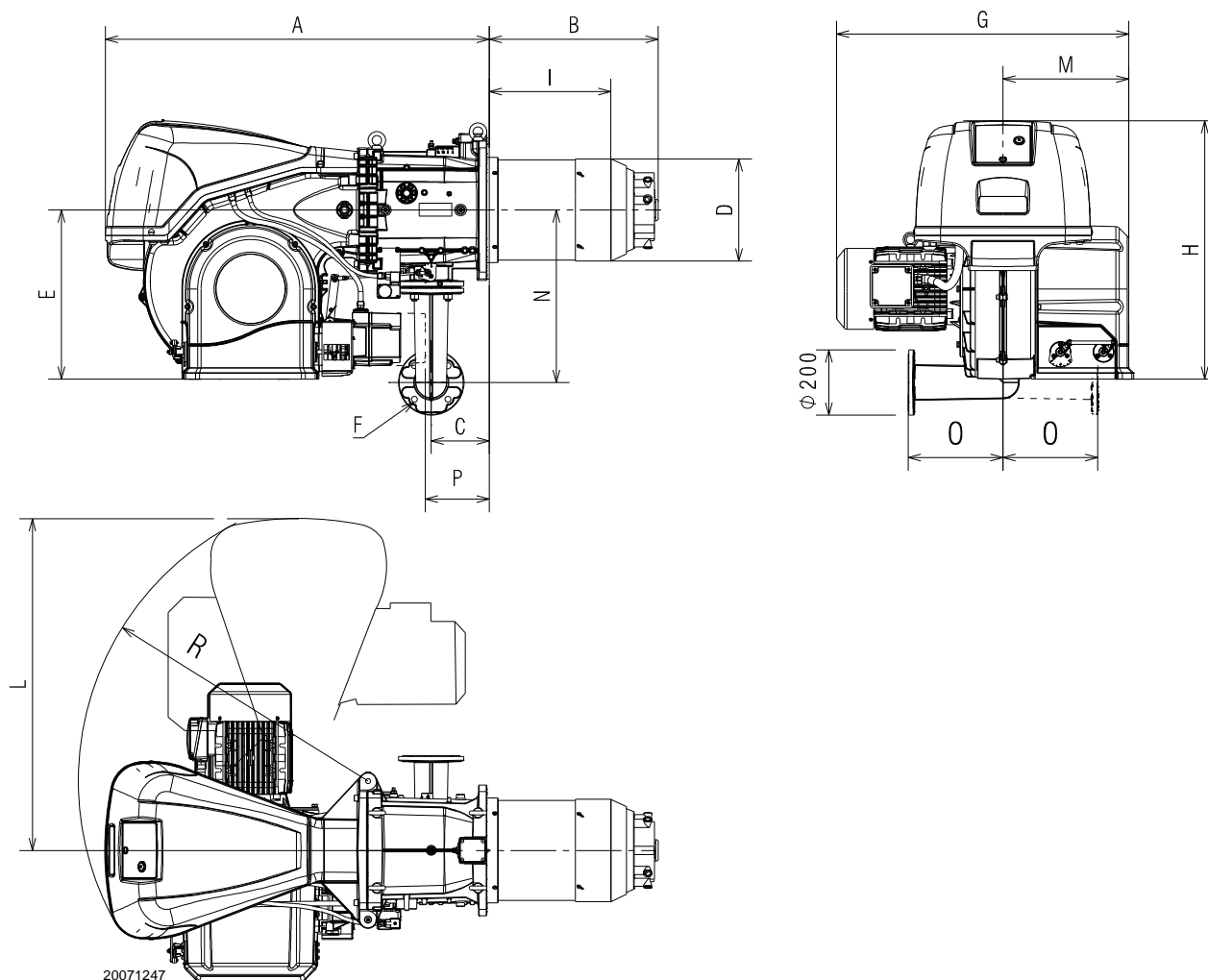


Fig. 2

mm	A	B	C	D	E	F*	G	H	I	L	M	N	O	P**	R
RS 310/M BLU	1178	465	178	306	520	DN65	890	790	346	1015	400	528	290	177	890
RS 410/M BLU	1178	517	178	313	520	DN65	908	790	340	1015	400	528	290	177	890
RS 510/M BLU	1178	517	178	313	520	DN65	908	790	340	1015	400	528	290	177	890
RS 610/M BLU	1178	517	178	334	520	DN65	980	790	365	1015	400	528	290	177	890

Tab. G

** Maximum position for the extraction of the servomotor cover.

4.8 Firing rates

The **MAXIMUM OUTPUT** is chosen from within the diagram area (Fig. 3).

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

Model	kW
RS 310/M BLU	400
RS 410/M BLU	500
RS 510/M BLU	680
RS 610/M BLU	1000

Tab. H



The firing rate value (Fig. 3) has been obtained considering an ambient temperature of 20°C, an atmospheric pressure of 1013 mbar (approx. 0 m a.s.l.), and with the combustion head adjusted as shown on page 23.

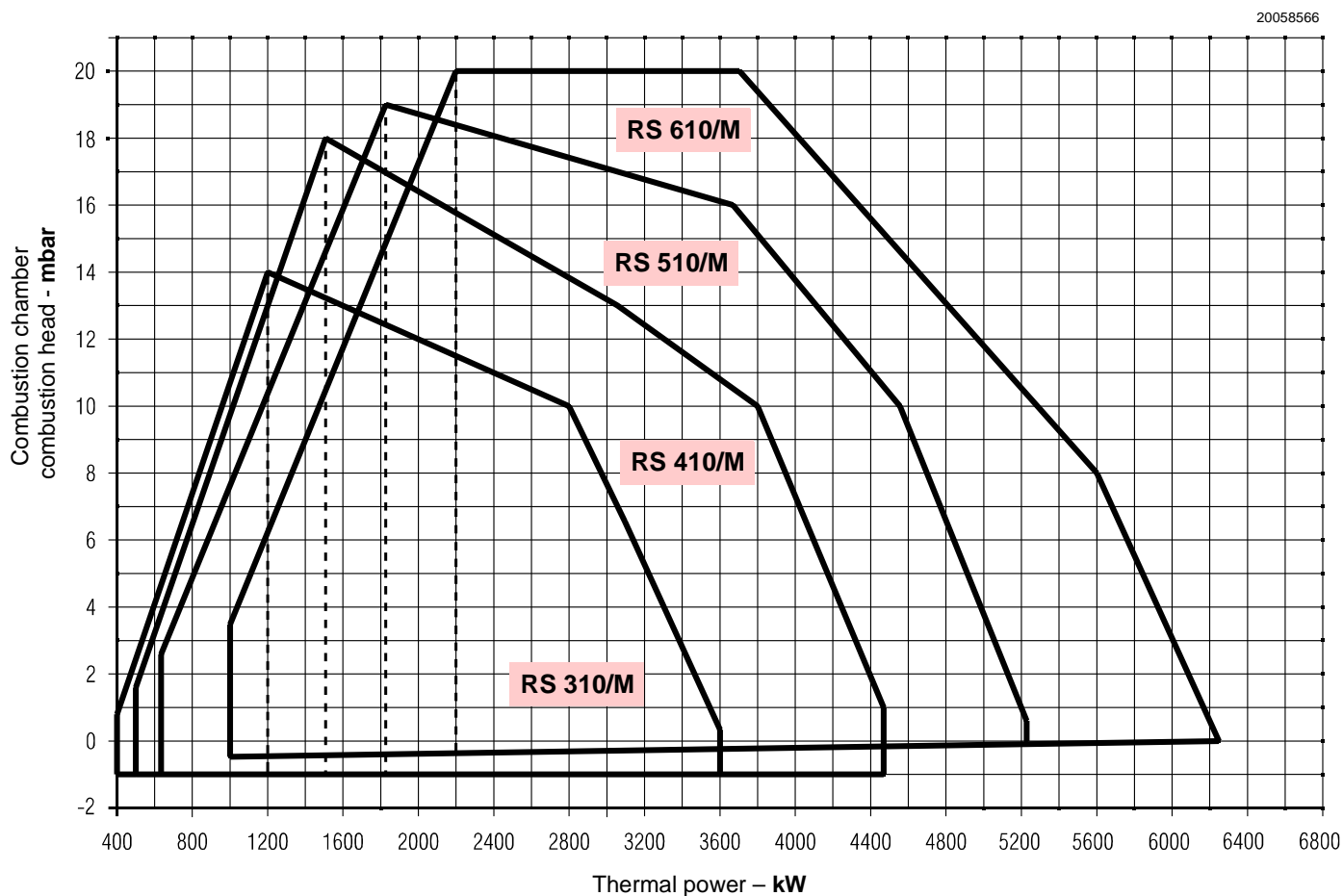


Fig. 3

4.9 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. 4).

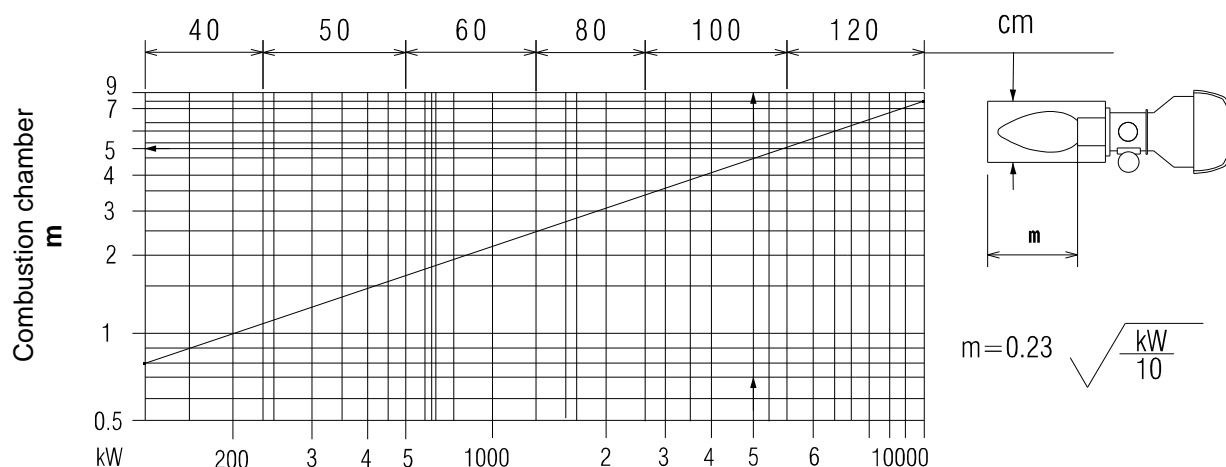
If the burner must be combined with a boiler that has not been EC approved and/or its combustion chamber dimensions are clearly smaller than those indicated in the diagram, consult the manufacturer.

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

In Fig. 4 you can see the diameter and length of the test combustion chamber.

Example: RS 610/M BLU

Output 5000 kW - diameter 100 cm - length 5 m

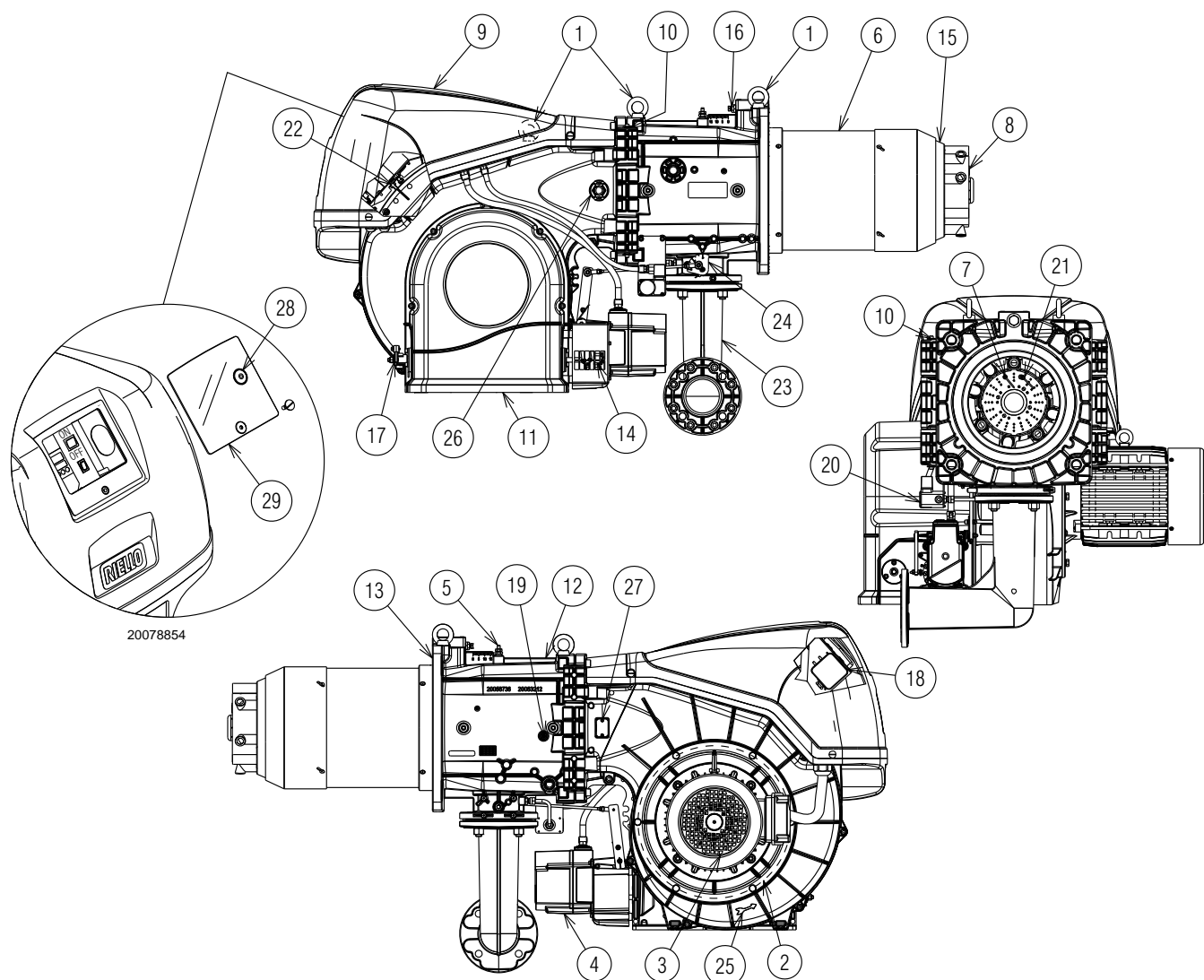


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Fig. 4

4.10 Burner equipment

Gasket for gas train adaptor	No. 1
Adaptor for gas train	No. 1
Screws for fixing the gas train adaptor: M 16 x 70	No. 4
Thermal insulation screen	No. 1
M 18 x 60 screws to secure the burner flange to the boiler.	No. 4
Cable grommets kit for optional electrical wiring input	No. 1
M16 x 6 studs for fixing the gas elbow to the pipe coupling	No. 4
M16 nuts to fix the gas elbow to the pipe coupling.	No. 4
Instructions	No. 1
Spare parts list	No. 1

4.11 Burner description

Fig. 5

- | | | | |
|----|---|----|------------------------|
| 1 | Lifting rings | 28 | Reset button |
| 2 | Fan | 29 | Transparent protection |
| 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 | Hinge for opening the burner | | |
| 11 | Fan air inlet | | |
| 12 | Pipe coupling | | |
| 13 | Gasket for boiler fixing | | |
| 14 | Adjustable profile cam | | |
| 15 | Shutter | | |
| 16 | Combustion head movement screw | | |
| 17 | Air damper control lever | | |
| 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 | Pressure test point for air pressure switch "+" | | |
| 23 | Gas train adapter | | |
| 24 | Gas butterfly valve control lever | | |
| 25 | Indication for checking the rotation direction of the purging motor | | |
| 26 | Flame inspection window | | |
| 27 | Provision for UV sensor kit | | |



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

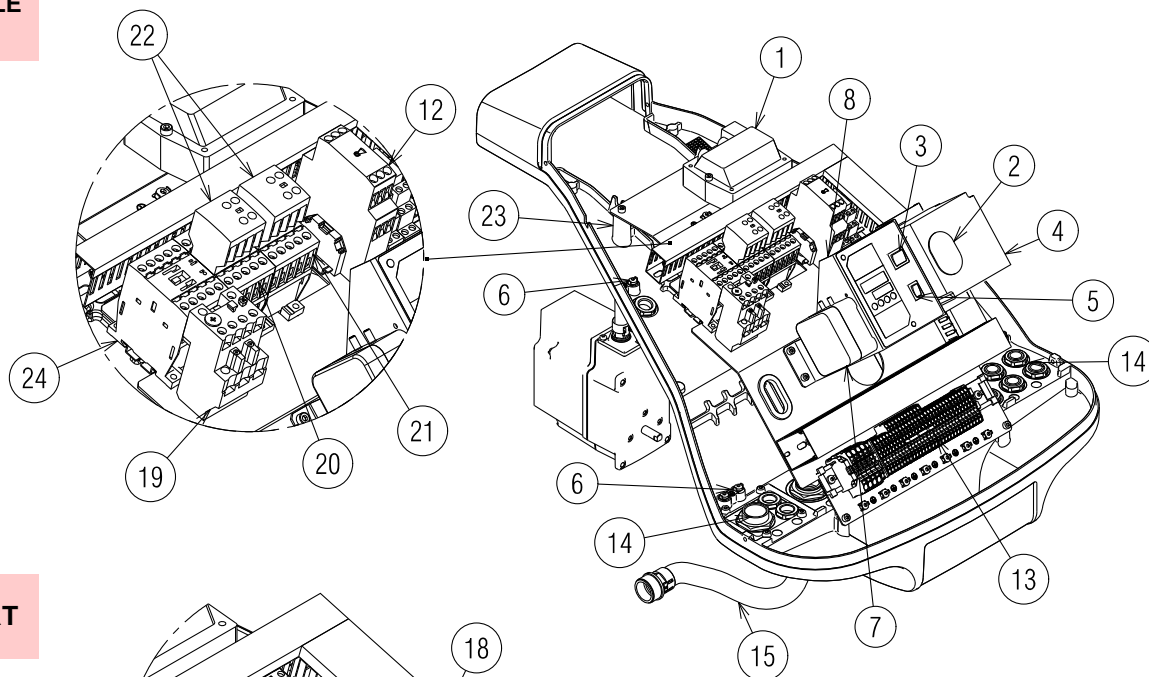


WARNING

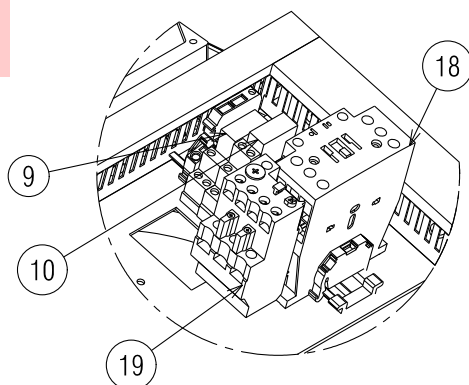
To open the burner see section "Access to head internal part" on page 21.

4.12 Electrical panel description

STAR/TRIANGLE STARTER



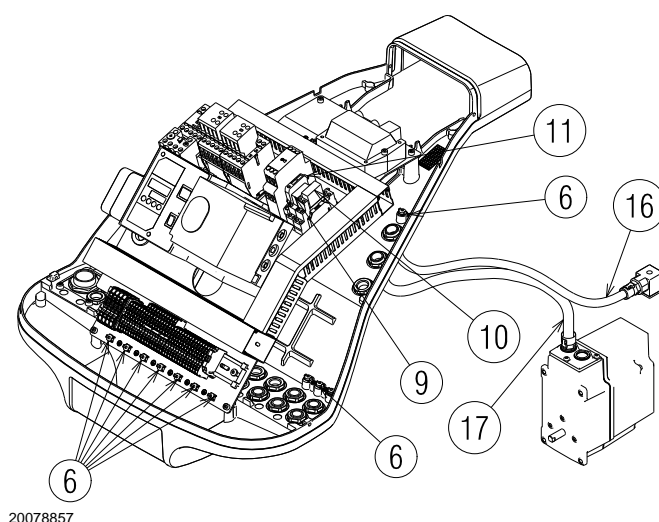
DIRECT START



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Fig. 6

- 1 Ignition transformer
- 2 Burner state indicator light and reset button. For further information see section "Burner ignition" on page 30
- 3 OFF-automatic-manual selector
- 4 Electrical control box
- 5 Power increase - power reduction selector
- 6 Earth terminal
- 7 Air pressure switch
- 8 Bracket for applying the kits
- 9 Relay with clean contacts for signalling the burner is operating
- 10 Relay with clean contacts for signalling the burner is in lock-out
- 11 Auxiliary circuits fuse (includes a spare fuse)
- 12 Timer for star/triangle start up
- 13 Main terminal supply board
- 14 Supply cables and external connections passage. See section "Electrical wiring" on page 27
- 15 Motor cables sheath
- 16 Maximum gas pressure switch sheath
- 17 Servomotor sheath
- 18 Direct start up line contactor
- 19 Thermal relay (with reset button)
- 20 Triangle contactor (Star/triangle start up)
- 21 Star contactor (Star/triangle start up)
- 22 Auxiliary contacts (Star/triangle start up)
- 23 Ionisation probe cable
- 24 Star/triangle start-up line contactor



20078857

Fig. 7

4.13 LFL/LGK control box

Warnings



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

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

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Before modifying the wiring in the control box 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 control box and all connected electric components is obtained with the correct assembly.
- Before any intervention (assembly and installation operations, assistance, etc.), ensure the wiring is in order and that the parameters are correctly set, then make the safety checks.
- Falls and collisions can negatively affect the safety functions.
In this case, the control box must not be operated, even if it displays no evident damage.
- Press the reset button of the burner lockout command or the reset button (by applying a force of not more than 10 N), without the aid of tools or sharp objects. Do not keep the button pressed for more than 10 seconds since it would damage the internal relay.

For the safety and reliability of the control box, comply with the following instructions:

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



Fig. 8

S8986

Technical data

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

Mechanical structure

The control box is made of plastic to resist knocks, heat and flame propagation.

The electronic flame signal amplifier is integrated into the control box.

4.14 Servomotor SQM40 ...

Warnings



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

Avoid opening, modifying or forcing the servomotor.

- 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 servomotor must not be operated, even if it displays no evident damage.
- Fully disconnect the burner from the mains when working near terminals and servomotor connections.
- Condensation and exposure to water are not allowed.
- For safety reasons, the servomotor must be checked after long periods of non-use.



Fig. 9

S8907

Technical data

Mains voltage	230 V -15% +10%
Mains frequency	50 / 60 Hz
Power absorption	7 ... 15 VA
Motor	Synchronous
Drive angle	Varying between 0° and 135°



Absolutely do not adjust the red cam No. 1 more than 90° to prevent serious or irreversible damage to the mechanical adjustment parts.

Protection level	Max. IP 66, with appropriate cable entry
Cable entry	2 x M16
Cable connection	terminal board for 0.5mm ² (min.) and 2.5mm ² (max.)
Rotation direction	Anticlockwise
Rated torque (max.)	10 Nm
Holding torque	5 Nm
Operation time	30 s. at 90°
Weight	approx. 2 kg
Environmental conditions:	
Operation	-20...+60° C
Transport and storage	-20...+60°C

4.15 Calibration of the thermal relay

The thermal relay serves to avoid damage to the motor due to an excessive absorption increase or if a phase is missing.

For calibration **2)**, see the table in the wiring diagram.

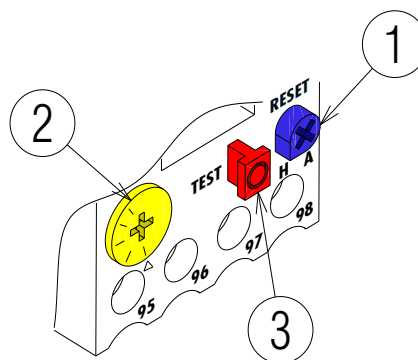
To reset, in case of an intervention of the thermal relay, press the "RESET" button 1) of Fig. 10.

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



CAUTION

The automatic reset can be dangerous. This operation is not foreseen in the burner operation. **Therefore do not position the "RESET" button 1) on "A".**



20073932

Fig. 10

5 Installation

5.1 Notes on safety for the installation

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



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



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



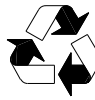
Combustion air inside the boiler must be free from hazardous mixes (e.g.: chloride, fluoride, halogen); if present, it is highly recommended to carry out cleaning and maintenance more frequently.

5.2 Handling

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



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



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



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

5.3 Preliminary checks

Checking the consignment



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



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

RBL	A		B	C
D	E		F	
GAS: KAASU	<input checked="" type="checkbox"/>	G	H	
GAZ: AERIO		G	H	
I				RIELLO spa I-37045 Legnago (VR)
				CE

D10411

Fig. 11

Checking the characteristics of the burner

Check the identification label of the burner, showing:

- the model (A)(Fig. 11) 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

5.4 Operating position



- The burner is designed to operate only in positions 1, 2, 3 and 4 (Fig. 12).
- 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.

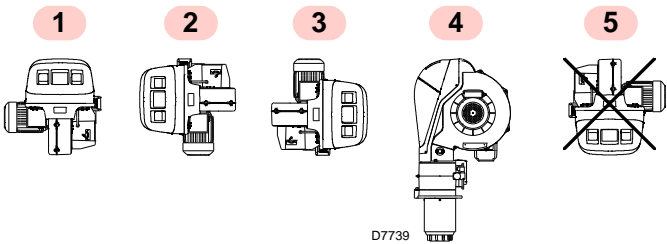


Fig. 12

5.5 Preparing the boiler

5.5.1 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.

5.5.2 Blast tube length

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

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

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

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. 14) is not necessary, unless expressly requested by the boiler manufacturer.

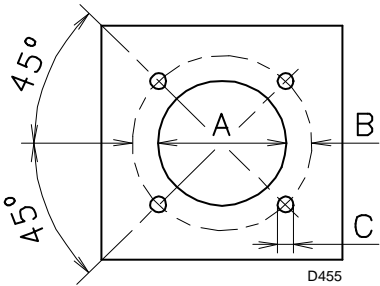


Fig. 13

mm	A	B	C
RS 310/M BLU	335	452	M18
RS 410/M BLU	335	452	M18
RS 510/M BLU	335	452	M18
RS 610/M BLU	350	452	M18

Tab. I

5.6 Securing the burner to the boiler



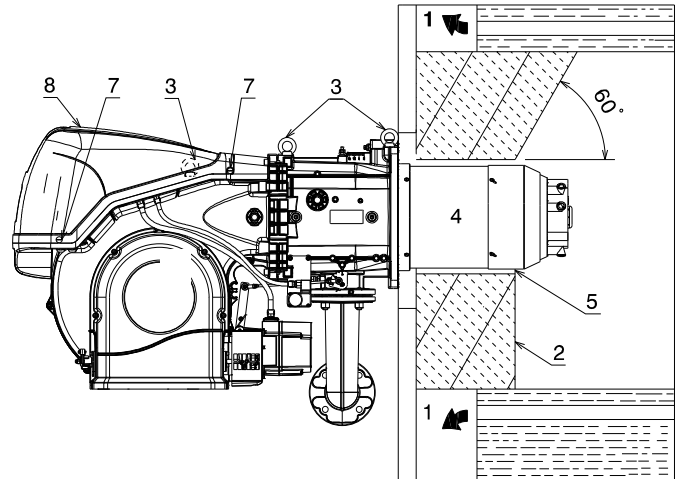
Prepare a suitable lifting system using rings 3)(Fig. 14).

- Fit the heat insulation supplied onto the blast tube (4) (Fig. 14).
- Fit the entire burner onto the boiler hole prepared previously (Fig. 13), and fasten with the screws supplied.



WARNING

The seal between burner and boiler must be airtight.



20071249

Fig. 14

5.7 Access to head internal part

The burner leaves the factory set for opening to the left, therefore maintaining the pin 1)(Fig. 15) in the housing.

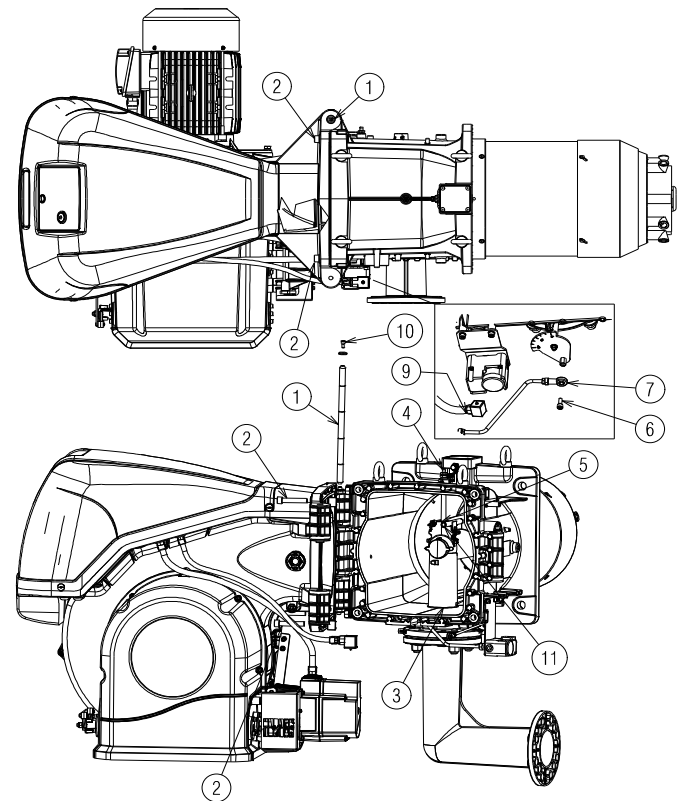
To open the burner towards the left, proceed as follows:

- A** Remove the screw 6) releasing the tie-rod 7)(Fig. 15);
- B** Disconnect the plug/socket 9)(Fig. 15) of the maximum gas pressure switch;
- C** Remove the screws 2);
- D** Open the burner to a maximum of 100-150 mm by rotating around the hinge and release the cables of the probe 5) and electrode 11);
- E** Fully open the burner as in Fig. 15;
- F** Undo the screw 4) with pressure test point.
- G** Release the 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. 15), make sure that the 4 screws 2) are tight. Then shift the pin 1) to the opposite side, only then is it possible to remove the screws 2); then proceed as described in point C.



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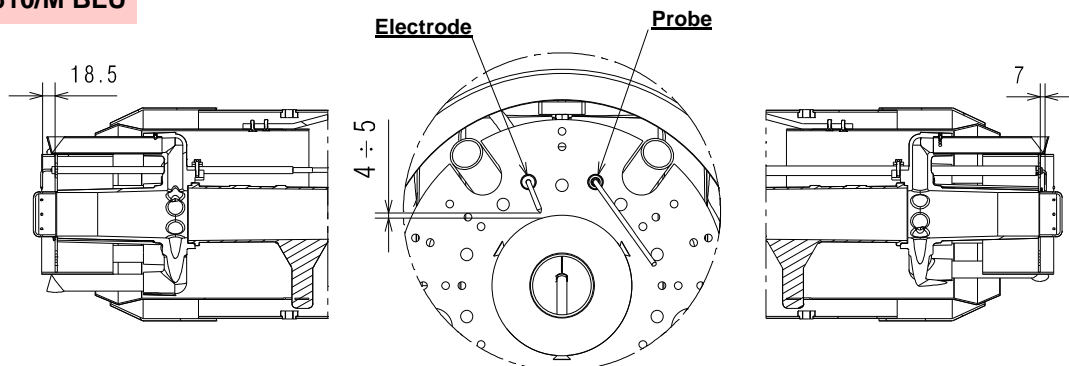
Fig. 15

5.8 Probe-electrode position

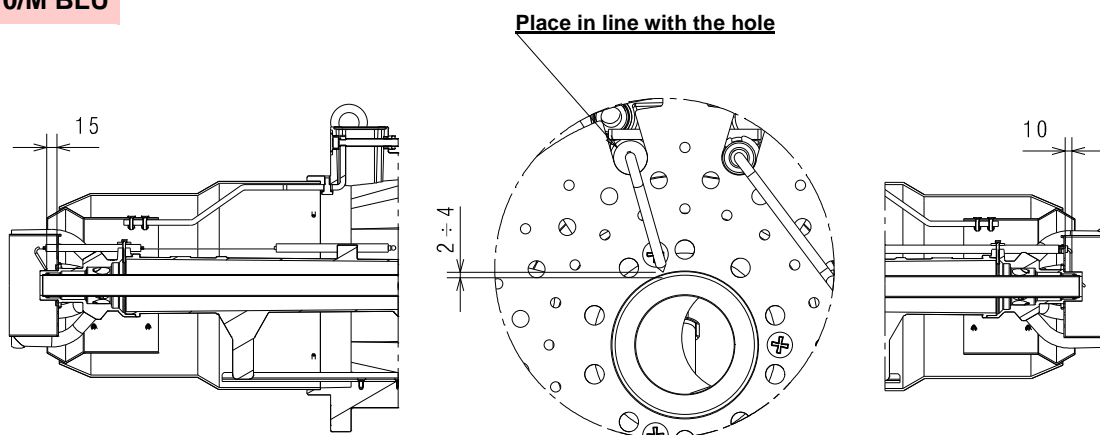


Check that the probe and the electrode are placed as in Fig. 16, according to the dimensions indicated.

RS 410-510-610/M BLU



RS 310/M BLU

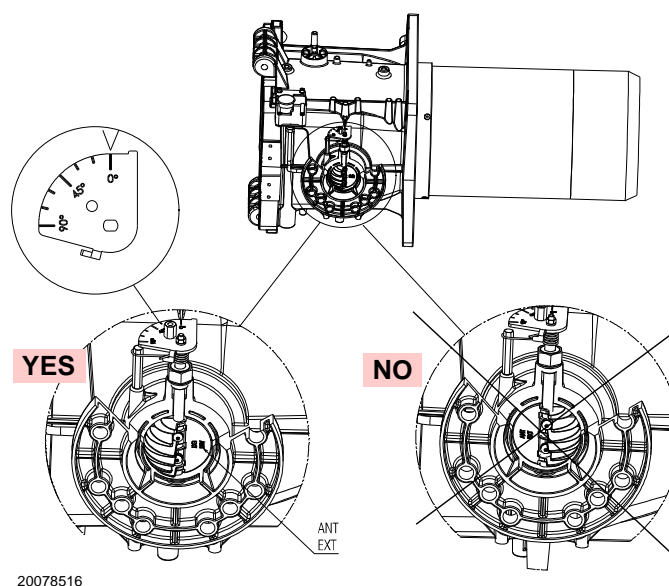


20071251

Fig. 16

5.9 Gas butterfly valve

If necessary, replace the gas butterfly valve. The correct position is shown in Fig. 17.



20078516

Fig. 17

5.10 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. 18)



The burner leaves the factory with the combustion head set at notch 0 (Fig. 18).

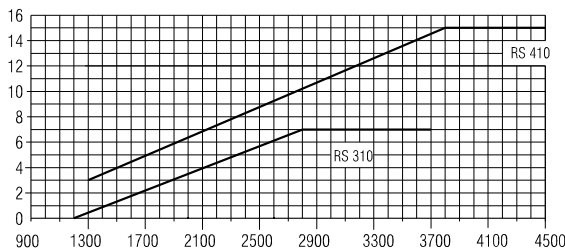
This setting allows to secure the movable components during the transport of the burner.

Before starting up the burner, carry out the settings according to the required output and indicated in the diagram (Fig. 19).

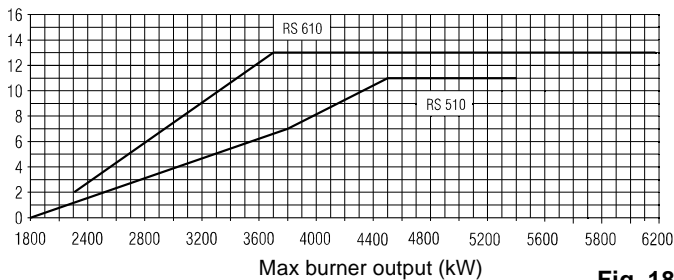
NOTE:

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

↓ No. Notches (air = gas)

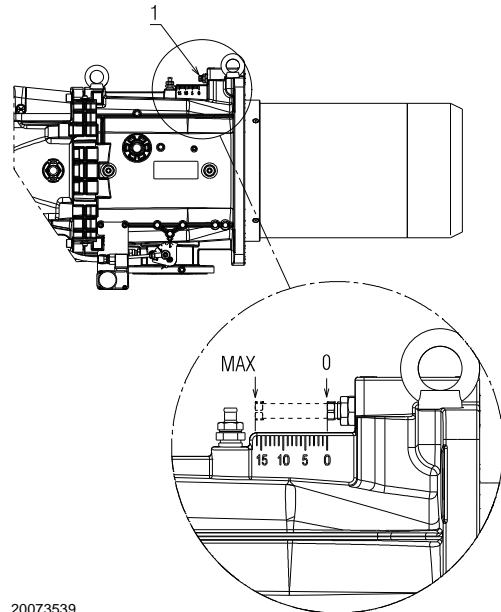


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Max burner output (kW)

Fig. 18



20073539

Fig. 19

Only for the RS 310 BLU model:

The RS 310 BLU burner is equipped with central air/gas adjustment. The factory setting is the following:

AIR = notch 9

GAS = notch 0.



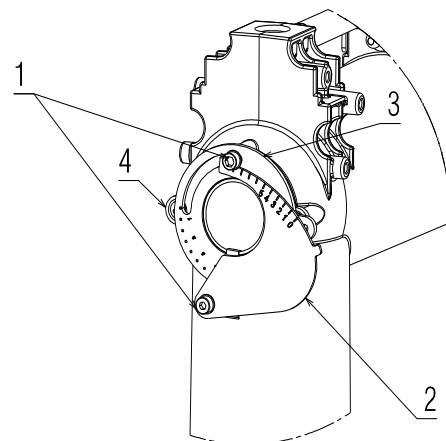
Do not change these settings!

Only for specific cases, to change the central gas setting, do as follows:

- loosen the screws 1) and rotate the ring nut 3) until the notch you have found corresponds with the indicator 4) (Fig. 20).

To change the central air setting, do as follows:

- loosen the screws 1) and rotate the ring nut 2) until the notch you have found corresponds with the screw 1);
- Block the 2 screws 1) (Fig. 20).



20084828

Fig. 20

5.11 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.

5.11.1 Gas feeding line

Key (Fig. 21 - Fig. 22 - Fig. 23 - Fig. 24)

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

MBC "threaded"

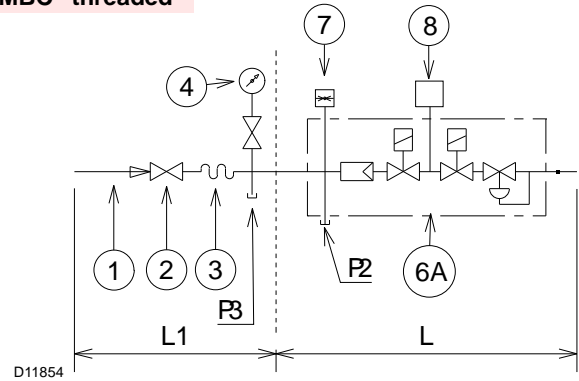


Fig. 21

MBC "flanged"

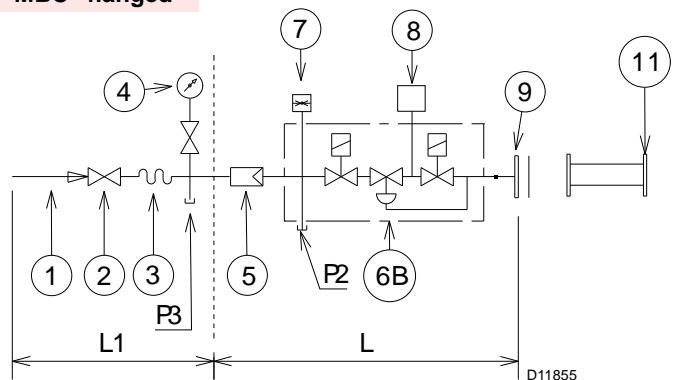


Fig. 22

DMV "flanged or threaded"

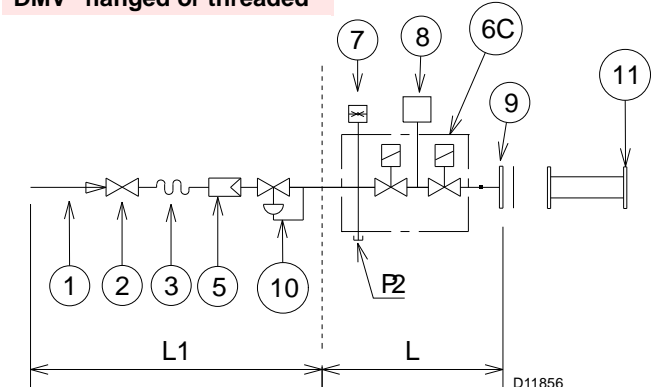


Fig. 23

CB "flanged or threaded"

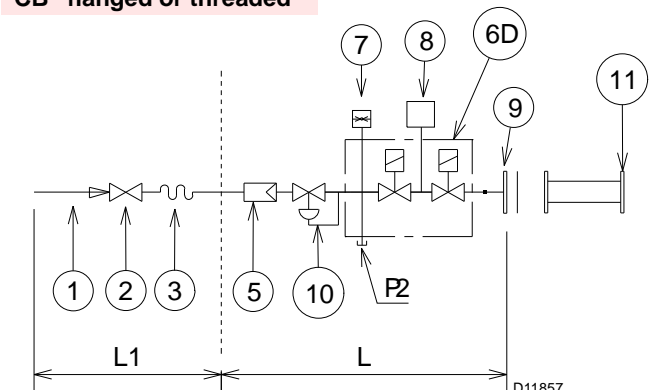


Fig. 24

5.11.2 Gas train

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

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



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.

5.11.3 Gas train installation



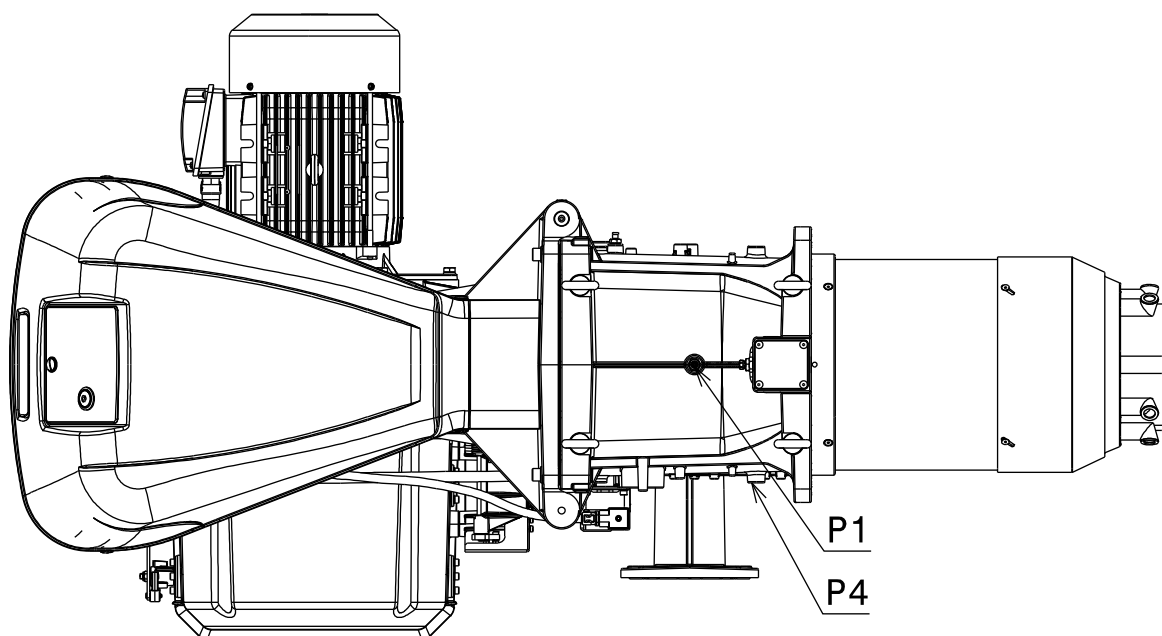
Disconnect the electrical power using the main switch.



Check that there are no gas leaks.



The operator must use the required equipment during installation.



20071252

Fig. 25

5.11.4 Gas pressure

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

The values shown in Tab. J refer to:

- Natural gas G 20 NCV 9.45 kWh/Sm³ (8.2 Mcal/Sm³)
- Natural gas G 25 NCV 8.13 kWh/Sm³ (7.0 Mcal/Sm³)

Column 1

Combustion head pressure drop.

Gas pressure measured at the test point P1)(Fig. 25), with:

- Combustion chamber at 0 mbar;
- Burner working at maximum output;
- Combustion head adjusted as in page 23.

Column 2

Pressure loss at gas butterfly valve 4)(Fig. 31 on page 31) 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. 25).
- Find, in the table Tab. J related to the burner concerned, the pressure value closest to the result of the subtraction.
- read the corresponding output on the left.

Example for RS 410/M BLU with G20 natural gas:

Maximum output operation

Gas pressure at test point P1)(Fig. 25) = 58.1 mbar

Pressure in combustion chamber = 5 mbar

58.1 - 5 = 53.1 mbar

A pressure of 53.1 mbar, column 1, corresponds in the table Tab. J to an output of 4450 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. 25), set the MAX output required from the burner operation:

- find the nearest output value in the table Tab. J for the burner in question.
- read, on the right (column 1), the pressure at the test point P1)(Fig. 25).
- Add this value to the estimated pressure in the combustion chamber.

Example for RS 410/M BLU with G20 natural gas:

Required burner maximum output operation: 4450 kW

Gas pressure at an output of 4450 kW = 53.1 mbar

Pressure in combustion chamber = 5 mbar

53.1 + 5 = 58.1 mbar

Pressure required at test point P1)(Fig. 25).

	kW	1 Δp (mbar)		2 Δp (mbar)	
		G 20	G 25	G 20	G 25
RS 310/M BLU	1200	23.1	34.5	0.1	0.1
	1440	23.6	35.2	0.5	0.7
	1690	24.1	36.0	1.1	1.6
	1930	24.6	36.7	2.1	3.1
	2170	25.1	37.4	3.1	4.6
	2420	26.7	39.8	4.2	6.3
	2660	29.6	44.2	5.3	7.9
	2900	33.4	49.8	6.4	9.5
	3140	38	56.7	7.6	11.3
	3390	43.7	65.2	8.8	13.1
RS 410/M BLU	3630	50.1	74.7	10	14.9
	1500	2.6	3.9	0.3	0.5
	1800	7.1	10.6	1.5	2.2
	2090	11.5	17.2	2.8	4.2
	2380	16.1	24.0	4.0	6.0
	2680	21.1	31.5	5.4	8.1
	2980	26.1	38.9	6.8	10.1
	3270	31.2	46.6	8.2	12.2
	3560	36.3	54.2	9.6	14.3
	3860	41.9	62.5	11.2	16.7
RS 510/M BLU	4160	47.5	70.9	12.7	18.9
	4450	53.1	79.2	14.3	21.3
	1800	14.0	20.9	1.5	2.2
	2140	15.5	23.1	3.0	4.5
	2490	17.8	26.6	4.5	6.7
	2840	20.7	30.9	6.1	9.1
	3180	24.2	36.1	7.8	11.6
	3520	28.3	42.2	9.4	14.0
	3870	33.3	49.7	11.2	16.7
	4220	39.0	58.2	13.0	19.4
RS 610/M BLU	4560	45.2	67.4	14.9	22.2
	4900	52.0	77.6	16.8	25.1
	5250	59.7	89.1	18.8	28.0
	2200	9.3	13.9	3.3	4.9
	2600	13.6	20.3	5.0	7.5
	3010	18.6	27.8	7.0	10.4
	3420	24.1	36.0	8.9	13.3
	3820	30.1	44.9	11.0	16.4
	4220	36.5	54.5	13.0	19.4
	4630	43.7	65.2	15.3	22.8
	5040	51.5	76.8	17.6	26.3
	5440	59.6	88.9	19.9	29.7
	5840	68.2	101.8	22.3	33.3
	6250	77.6	115.8	27.8	37.0

Tab. J

5.12 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 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 control box 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 control box 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.

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.

5.12.1 Supply cables and external connections passage

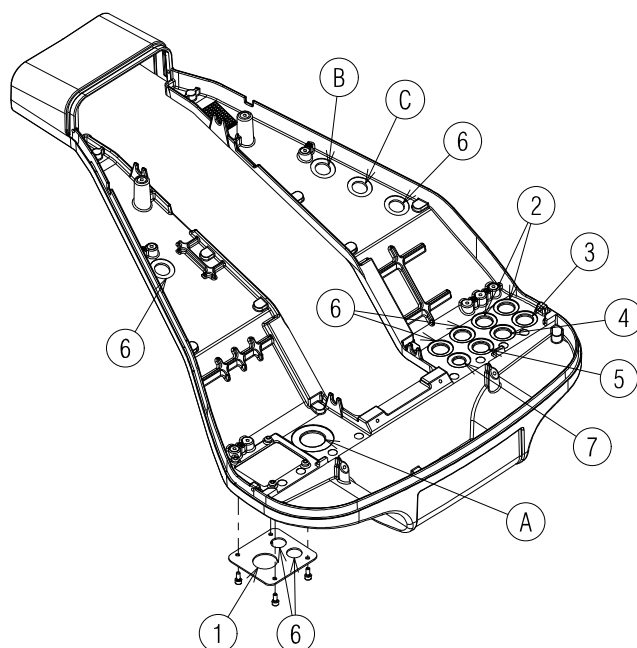
All the cables to be connected to the burner must be threaded through cable grommets. The use of the cable grommets can take various forms; by way of example see Fig. 26.

Key (Fig. 26)

- 1 Electrical supply - Bore for M32
- 2 Consents / 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

Cable grommets used in the factory:

- A - Fan motor
- B - Maximum gas pressure switch
- C - Air/gas servomotor



20073934

Fig. 26



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

6 Start-up, calibration and operation of the burner

6.1 Notes on safety for the first start-up



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



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

6.2 Adjustments prior to ignition

Combustion head adjustment is already described on page 23.

In addition, the following adjustments must also be made:

- Open manual valves upline 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. 27), 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. J.
- 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.

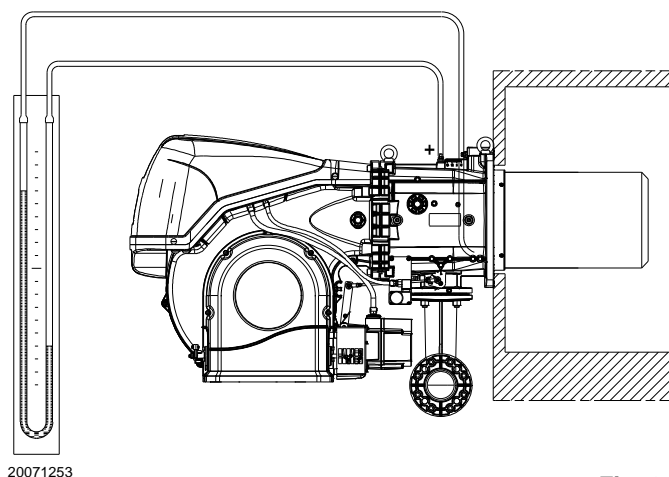


Fig. 27

6.3 Servomotor adjustment

The servomotor (Fig. 28) provides simultaneous adjustment for the air damper, by means of the adjustable profile cam and the gas butterfly valve. Completes a rotation of 90° in 30 s. After the adjustment made in the factory to its 6 cams to allow an initial ignition. Check that they are as shown below. In the event of a modification, follow what is described below for each cam:

Cam I (RED): 90° (The same for all models)
Limits the rotation towards the maximum.



In the event of a variation, absolutely do not adjust beyond 90°.

Cam II (BLUE): 0° (The same for all models)
Limits the rotation towards the minimum.

With the burner off the air damper and the gas butterfly valve should be closed: 0°

It is recommended that no adjustments are made.

Cam III (ORANGE): (See Tab. K)
Adjusts the ignition position and MIN. output

Cam IV-V-VI (YELLOW/BLACK/GREEN):

Do not use, they have no effect on the operation of the burner.

CALIBRATION	RS 310/M	RS 410/M	RS 510/M	RS 610/M
CAM 3 (ORANGE)	5°	5°	5°	10°

Tab. K

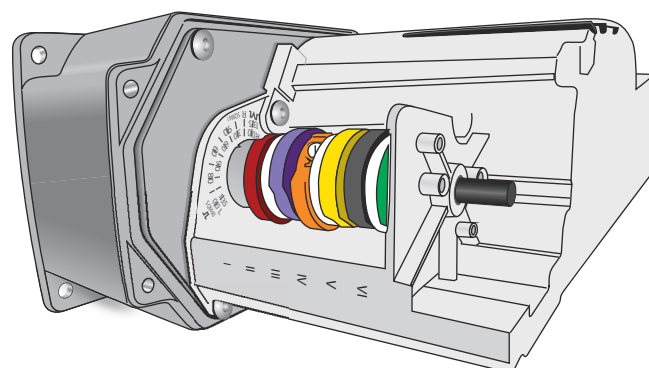


Fig. 28

20074577

6.4 Burner start-up

Turn off the thermostats/pressure switches and check the light signal 2) comes on (Fig. 6 on page 15).

Put the selector 1)(Fig. 29) in position "MAN".

Start of the fan motor. 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 fan motor cooling fan and check it is rotating anticlockwise or else in the direction of the arrow shown in the diagram (burner description).

If this is not the case:

- put the switch 1) of (Fig. 29) to "OFF" and wait for the control box carries out the switching off phase;



disconnect the burner's electrical supply, since this operation should be carried out in the absence of the electrical supply;

- invert the phases on the three-phase power supply;
- repeat the start-up procedure.



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

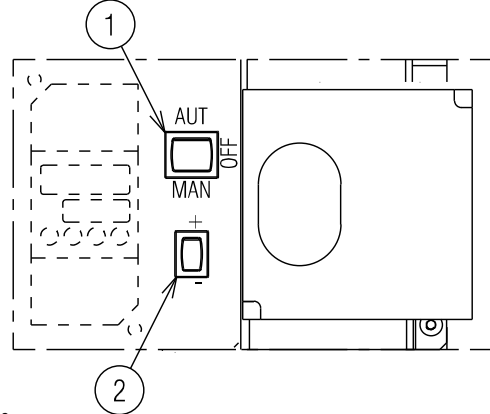


Fig. 29

6.5 Burner ignition

The burner should light after having performed the above steps.

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

Two types of burner failure may occur:

- **Control box lockout:** when the control box button comes on (light signal) 2)(Fig. 6 on page 15) it warns you that the burner is in lockout. See "Faults - Possible causes - Solutions" on page 37 for the causes of the lockout. release by pressing the push-button 2)(Fig. 6 on page 15). See control box reset.

- **Motor lockout because of thermal relay intervention:** because of an erroneous calibration of the thermal relay or problems with the motor or the main power supply. Release by pressing the button on thermal relay, see section 4.15 on page 18.

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. 27).

Once the burner has fired, now proceed with global calibration operations.

6.6 Air / fuel adjustment

The air/fuel synchronisation is carried out using a servomotor 1)(Fig. 30) which, when connected directly to the air dampers, acts on the gas butterfly valve by means of an adjustable profile cam 2) and suitable leverage.



**WARNING!
MOVING PARTS**



DANGER: CRUSHING OF LIMBS

It is advisable, to reduce the loss and for a wide calibration field, to adjust the servomotor 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 23.).

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

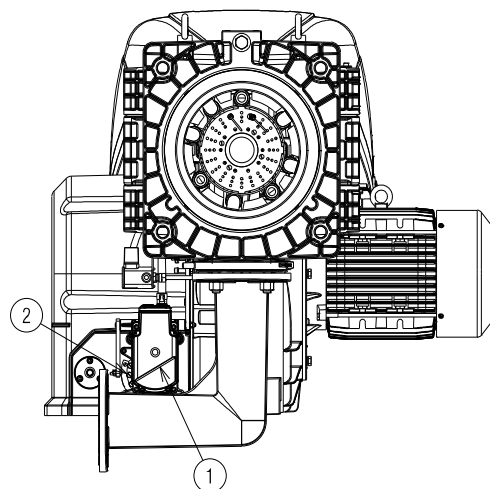


Fig. 30

6.6.1 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

6.6.2 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.

Ignition output must be equal to or lower than:

200 kW with $t_s = 3$ s.

In order to measure the ignition output:

- Disconnect the plug-socket 23)(Fig. 6 on page 15) on the ionisation probe cable (the burner starts up and then goes into lockout after the safety time has elapsed).
- Perform 10 ignitions with consecutive lockouts.
- Read the quantity of gas burned on the meter.
- This quantity must be equal to or lower than the quantity given by the formula:

$$\frac{\text{Sm}^3/\text{h} \text{ (max. burner delivery)}}{360}$$

Example for G 20 gas (9.45 kWh/Sm³):

Max. operation output: 600 kW corresponding to 63.5 Sm³/h.

After 10 ignitions with their lockouts, the delivery indicated on the meter must be equal to or less than: $63.5 : 360 = 0.176 \text{ Sm}^3$

Air adjustment

The air is adjusted by varying the angle of cam III) (Fig. 28) and by using the selector 2)(Fig. 29). To adjust the cam of the servomotor, see Fig. 32 A).

6.6.3 Maximum output

The MAX output must be set within the firing rate indicated in Fig. 3 on page 12.

In the above instructions we left the burner running at the MIN output. Now press the "increase output" button 2)(Fig. 29 on page 30), and keep it pressed until the servomotor has opened the air damper and the gas butterfly valve.

Adjustment of gas delivery

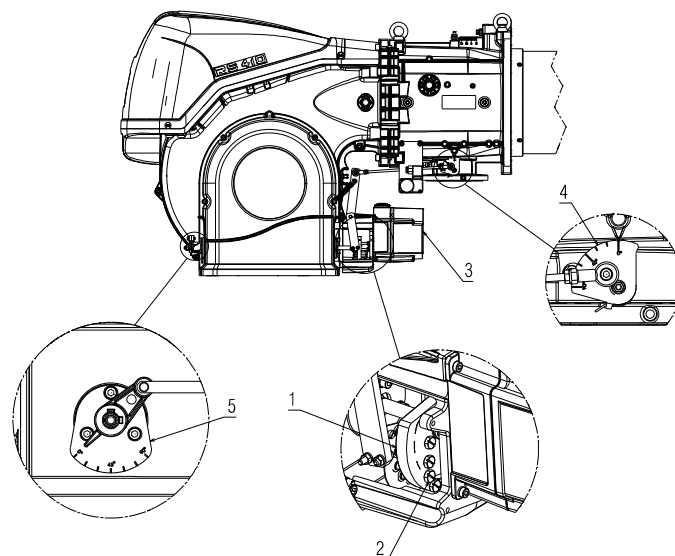
Measure the gas delivery on the gas meter.

A rough indication can be obtained from Tab. J on page 26, just read the gas pressure on the "U" pressure gauge, see Fig. 27 on page 29, and follow the indications.

- If delivery needs to be reduced, diminish outlet gas pressure; if it is already very low, slightly close the VR adjustment valve.
- If delivery needs to be increased, increase the adjuster outlet gas pressure.

Air adjustment

The air is adjusted by varying the angle of cam I) (Fig. 28 on page 29) and by using the selector 2)(Fig. 29 on page 30). To adjust the cam of the servomotor, see Fig. 32 A).

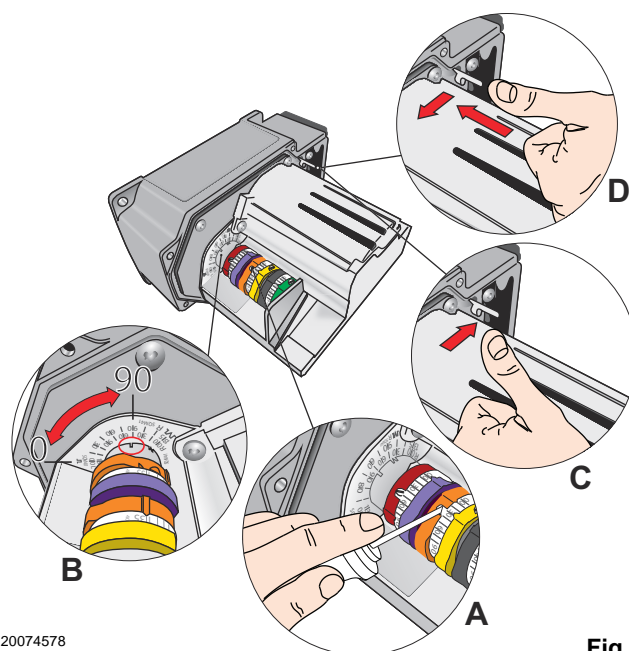


20073575

Fig. 31

Key (Fig. 31)

- 1 Cam
- 2 Adjustment screws
- 3 Servomotor
- 4 Graduated sector for gas butterfly valve
- 5 Air damper graduated sector



20074578

Fig. 32

6.6.4 Minimum output

Min output must be selected within the firing rate range shown on Fig. 3 on page 12.

Press button 2)(Fig. 29 on page 30) "Diminishing output" and keep it pressed until the servomotor regains (Fig. 32 B) the adjustment made in the factory: See Tab. K on page 29 and as a consequence adjusting the air damper 5) and the gas butterfly valve 4) (Fig. 31 on page 31).

Adjustment of gas delivery

Progressively adjust the end profile of the mechanical cam 1) Fig. 31 on page 31, using the screws 2).

For example, calibrate the minimum output to 800 kW, check the emissions and if necessary increase or decrease the opening of the air damper (see "Air adjustment" on page 31.). Bring the output to 800 kW using the screws 2) of the mechanical cam (Fig. 31 on page 31) and check the emissions.

Air adjustment

The regulation of the air is carried out using the angle of the cam III) of the servomotor (Fig. 28 on page 29) and by using the selector 2)(Fig. 29 on page 30). To adjust the cam of the servomotor, see Fig. 32 A).

NOTE:

The servomotor follows the adjustment of cam III only when the angle of the cam is reduced. If it is necessary to increase the angle of the cam, you must first increase the angle of the servomotor by means of the "output increase" key, then increase the angle of cam III, and finally bring the servomotor to the position of MIN output, with the "Output reduction" key.

To adjust the cam III, see Fig. 32 A) e B).

6.6.5 Intermediate outputs

Air adjustment

No adjustment is required

Adjustment of gas delivery

After adjusting the maximum and minimum output of the burner, carry out air adjustment on higher intermediate positions of the servomotor. The passage from one position to the next one is obtained by pressing the button 2) on the symbol (+) or (-) (Fig. 29 on page 30). For a brief period press the button 2)(Fig. 29 on page 30) "Output increase" so that the servomotor rotates by about 20°, see servomotor graduated index Fig. 32 B) and the air damper graduated index 5) (Fig. 31 on page 31).

Screw or unscrew the screw 2) of the mechanical cam (Fig. 31 on page 31) to increase or decrease the gas output so as to adjust it to the corresponding air output, to obtain optimal combustion.

Proceed in the same way with the other screws.



WARNING

Take care that the cam profile variation is progressive.

Switch off the burner using the switch 1)(Fig. 29), OFF position, release the mechanical cam I)(Fig. 31) to separate the gears of the servomotor, pressing and shifting downwards the button 3)(Fig. 32 D) and check a few times, by rotating the mechanical cam I)(Fig. 31) manually backwards and forwards, that the movement is smooth and without any hindrance.



WARNING

It is recommended that the mechanical cam I)(Fig. 31 on page 31) be bound again to the servomotor by shifting button 3)(Fig. 32 C) upwards.

As far as is possible, try not to move those screws at the ends of the mechanical cam that were previously adjusted for the opening of the gas butterfly valve to MAX and MIN output.

NOTE:

Once you have finished adjusting the "MAX - MIN - INTERMEDIATE" outputs, check ignition once again: noise emission at this stage must be identical to the following stage of operation. If you notice any sign of pulsations, reduce the ignition stage delivery.

6.7 Pressure switch adjustment

6.7.1 Air pressure switch - check CO

Adjust the air pressure switch (Fig. 33) after performing all other burner adjustments with the air pressure switch set to the start of the scale.

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

Then turn the knob anti-clockwise by about 20% of the set point and repeat burner starting to ensure it is correct.

If the burner locks out again, turn the knob anticlockwise a little bit more.



WARNING

In conformity with the standard, the air pressure switch must prevent the air pressure falling below 80% of the adjusted value and the CO in the flue gases exceeding 1% (10,000 ppm).

To check this, insert a combustion analyser into the chimney, slowly close the fan suction inlet (for example with cardboard) and check that the burner locks out, before the CO in the fumes exceeds 1%.



Fig. 33

6.7.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 34) after performing all other burner adjustments with the maximum gas pressure switch set to the end of the scale.

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

Turn the knob clockwise by 0.2 kPa (2 mbar) and repeat the start-up of the burner.

If the burner locks out again, turn the knob clockwise again by 0.1 kPa (1 mbar).

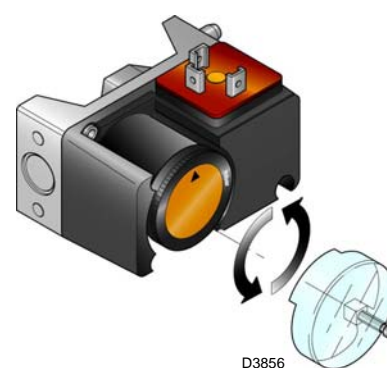


Fig. 34

6.7.3 Minimum gas pressure switch

Adjust the minimum gas pressure switch (Fig. 35) after performing all the other burner adjustments with the pressure switch set to the start of the scale.

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

Then turn the knob anticlockwise by 0.2 kPa (2 mbar) and repeat burner start-up to ensure it is uniform.

If the burner locks out again, turn the knob anticlockwise again by 0.1 kPa (1 mbar).

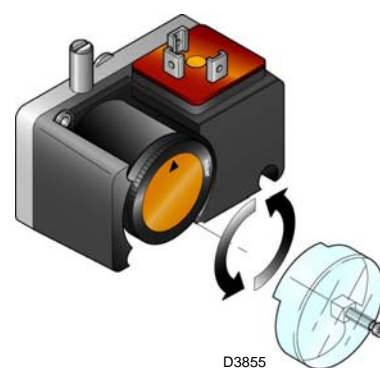


Fig. 35



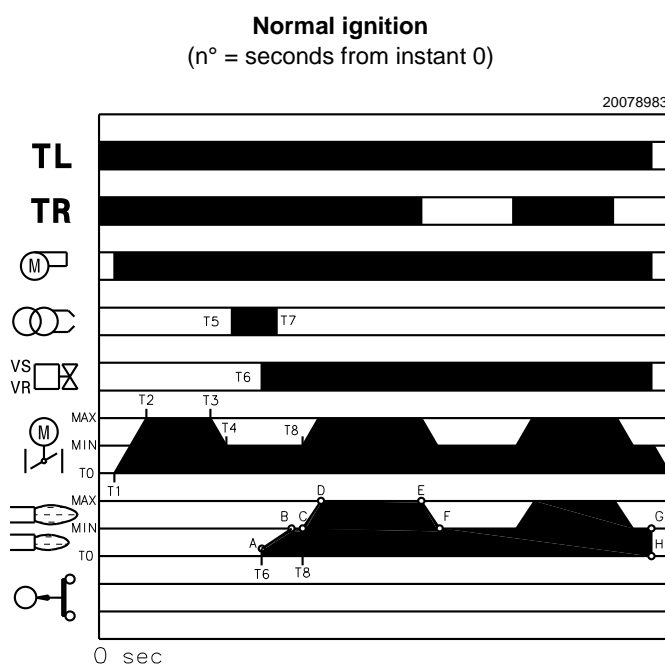
WARNING

1 Kpa = 10 mbar

6.8 Operation sequence of the burner

6.8.1 Burner start-up

T0	0s	TL thermostat/pressure switch closure.
T1	06	Fan motor start. Servomotor starts: rotates 90° towards the right, i.e. until the intervention of the contact on the cam 4)
T2	38s	The air damper is positioned to MAX output.
T2	38s	Pre-purging phase with air delivery of the MAX output. Duration 32 seconds.
T3	70s	The servomotor rotates left up to the angle set on the cam 2).
T4	102s	The air damper and the gas butterfly valve set to MIN output (with cam 2).
T5	103s	Ignition electrode strikes a spark.
T6	109s	The VS safety valve and the VR adjustment valve open (rapid opening). The flame is ignited at a low output level, point A (Fig. 36). There follows a progressive increase of the input, slow opening of the valve, up to the MIN output, point B (Fig. 36).
T7	112s	The spark goes out.
T8	133s	The starting cycle of the electrical equipment ends.


Fig. 36

6.8.2 Operation

Burner without the RWF ... output power regulator

Once the starting cycle is completed, the servomotor command moves on to the TR thermostat/pressure switch that controls the pressure or the temperature in the boiler, point C (Fig. 36). (The electrical control box continues to check the presence of the flame and the correct position of the air and gas maximum pressure switches).

- If the temperature or the pressure is low so the thermostat/pressure switch TR is closed, the burner progressively increases the output up to the MAX value (section C-D).
- If subsequently the temperature or pressure increases until TR opens, the burner progressively decreases its output to the MIN value (section E-F). The sequence repeats endlessly.
- The burner locks out when the heat request is less than the heat supplied by the burner at MIN output, (section G-H). The TL thermostat/pressure switch opens, and the servomotor returns to angle 0° limited by the contact of the cam 2). The air damper closes completely to reduce heat losses to a minimum.

For every change of output, the servomotor will automatically change the gas output (butterfly valve), the air output (fan damper) and the air pressure.

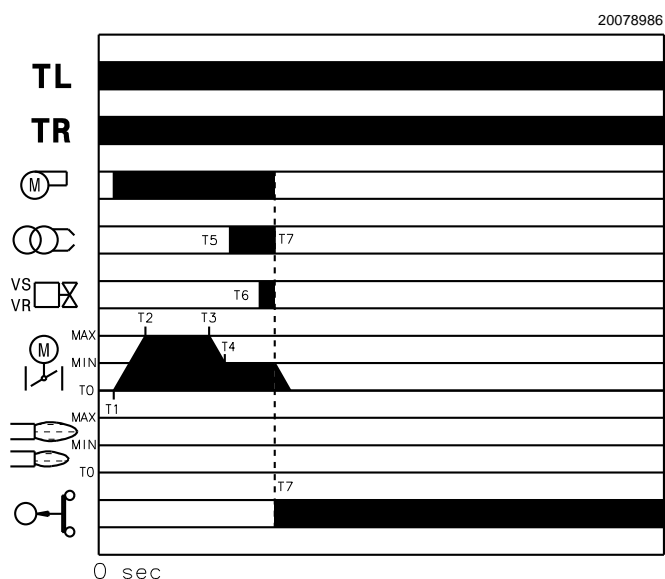
Burner with the RWF ... output power regulator

See manual enclosed with the adjuster.

6.8.3 Burner flame goes out during operation

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

Ignition failure


Fig. 37

6.8.4 Ignition failure

If the burner does not fire (Fig. 37), it goes into lockout within 3 sec. after the gas valve opens and 122 seconds after the control device TL closes.

6.8.5 Control box reset

To carry out the control box reset, proceed as follows:

- Press the reset button 2) (Fig. 6 on page 15).

7 Maintenance

7.1 Notes on safety for the maintenance

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

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



DANGER

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:



DANGER

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



DANGER

Turn off the fuel interception tap.



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

7.2 Maintenance programme

7.2.1 Maintenance frequency



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

7.2.2 Checking and cleaning



The operator must use the required equipment during maintenance.

Combustion

The optimum calibration of the burner requires an analysis of the flue gases.

Significant differences with respect to the previous measurements indicate the points where most 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

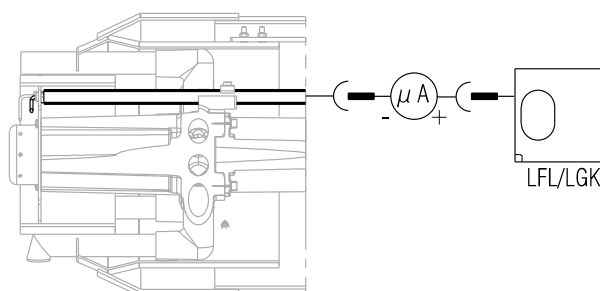
Check that there are not excess wear or loosen screws.
Clean the outside of the burner.

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.

Flame presence check

The burner is fitted with an ionisation system to check that a flame is present (Fig. 38). The minimum current for control box operation is 6 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 . Carefully check polarities!



20078864

Fig. 38

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.

Combustion

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

EN 676		Air excess			
		Max. output $\lambda \leq 1.2$		Min. output $\lambda \leq 1.3$	
GAS	CO ₂ theoretical max. 0% O ₂	CO ₂ % Calibration		CO	NO _x
		$\lambda = 1.2$	$\lambda = 1.3$	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. L

7.2.3 Safety components

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



WARNING

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) (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
Flexible hoses (if present)	5 years or 30,000 pressurised cycles
Fan impeller	10 years or 500,000 start-ups

Tab. M

7.3 Opening the burner



DANGER

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



DANGER

Turn off the fuel interception tap.



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

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

7.4 Closing the burner

Refit following the steps described in "Access to head internal part" on page 21, but in reverse order; refit all burner components as they were originally assembled.

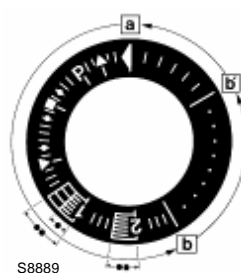


After carrying out maintenance, cleaning or checking operations, reassemble the cover and all the safety and protection devices of the burner.

8 Faults - Possible causes - Solutions

The LFL1.333RL control box is equipped with a lockout indicator (Fig. 39) that turns during the start-up programme, and is visible from the small lockout window.

When the burner does not start or stops, due to a failure, the symbol that appears on the indicator indicates the type of interruption. The positions of the lockout indicator are shown in Fig. 40.



Lockout indicator

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

Fig. 39

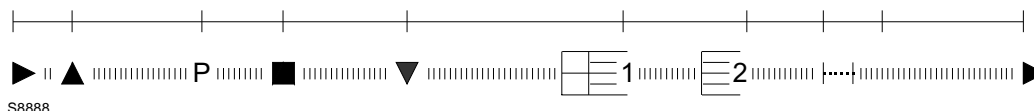


Fig. 40

Fuse replacement

The fuse 2)(Fig. 41) is in the rear part of the control box. A spare fuse 1) is also available: it can be extracted after breaking the panel tab A) that houses it. In the event that fuse 2) has been tripped, replace it as shown in Fig. 41.

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

If a burner malfunction is detected, first of all:

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



WARNING

In the event 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.

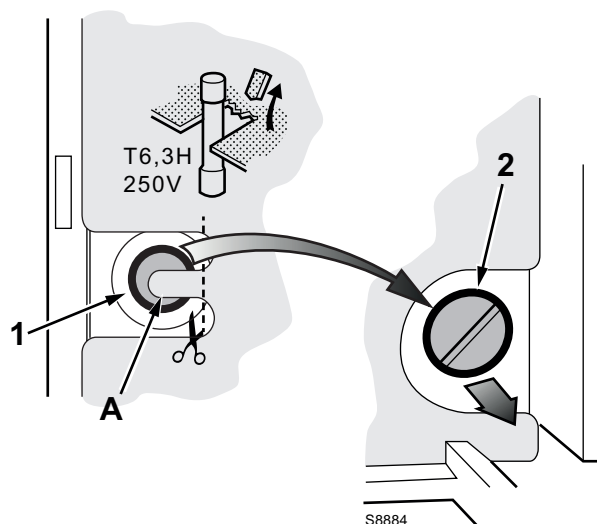


Fig. 41

Symbol	Problem	Possible cause	Recommended remedy
◀	The burner does not start	No electrical power supply	Close all switches and check connections
		A limit or safety thermostat/pressure switch open	Adjust or replace
		Control box lockout	Release the control box
		Control box fuse interrupted	Replace it as indicated in Fig. 41
		Incorrect electrical wiring	Check
		Defective control box	Replace
		No gas supply	Open the manual valves between meter and train
		Mains gas pressure insufficient	Contact your gas company
		Minimum gas pressure switch fails to close	Adjust or replace
		Air pressure switch in operating position	Adjust or replace
		The servomotor contact does not intervene (closure cam 0°)	Adjust the closure cam 0° or replace the servomotor
	The burner does not switch on, and the lock-out appears	Flame simulation	Replace the control box
		Faulty motor remote control switch	Replace
		Defective electrical motor	Replace
		Motor lockout	Release the thermal relay
▲	The burner starts up but stops at the damper maximum opening	The servomotor contact does not intervene (maximum cam opening)	Cam adjustment (maximum opening) or replace the servomotor
P	The burner switches on, but then stops in lockout	Air pressure switch does not switch owing to lack of air pressure:	
		Air pressure switch poorly adjusted	Adjust or replace
		Pressure switch pressure point pipe blocked	Clean
		Poorly adjusted head	Adjust
		Dirty fan	Clean
		High depression in the furnace	Contact our Technical Department
■	The burner turns on and then remains in lockout mode	Failure to the flame detection circuit	Replace the control box
▼	The burner remains in pre-purging phase	The servomotor contact does not intervene (minimum cam)	Cam adjustment (minimum) or replace the servomotor
1	Once the pre-purging and the safety time has elapsed the burner goes into lockout without the flame appearing	Gas pressure too low	Increase pressure at governor
		Ignition electrode incorrectly adjusted	Adjust it
		Electrode grounded due to broken insulation	Replace
		Faulty or grounded high voltage cable	Replace
		High voltage cable deformed by high temperature	Replace and protect
		Faulty ignition transformer	Replace
		Incorrect valve or ignition transformer connections	Redo them
		Defective control box	Replace
		A closed valve upline the gas train	Open
		Air in pipework	Bleed air
	Lockout with flame appearing	The VS or VR solenoids let too little gas through	Increase
		Dirty flame sensor	Check, replace flame sensor
		Faulty connection	Check, replace flame sensor
		Insufficient detection current (min. 6 µA)	Measure current, replace flame sensor
		Flame sensor exhausted, faulty	Replace
		Maximum gas pressure switch intervention	Adjust or replace
		Defective control box	Replace

Symbol	Problem	Possible cause	Recommended remedy
	The burner continues to repeat the start-up cycle, without lockout	<p>The gas pressure in the gas mains lies very close to the value to which the minimum gas pressure switch has been set.</p> <p>The sudden drop in pressure after valve opening causes temporary opening of the pressure switch itself, the valve immediately closes and the burner comes to a halt.</p> <p>Pressure increases again, the pressure switch closes again and the ignition cycle is repeated. The sequence repeats endlessly.</p>	<p>Reduce the minimum gas pressure switch intervention pressure.</p> <p>Replace the gas filter cartridge</p>
	Lockout without symbol indication	Flame simulation	Replace the control box
	Burner goes into lockout during operation	Faulty flame sensor	Replace worn parts
		Air pressure switch faulty	Replace
		Maximum gas pressure switch intervention	Adjust or replace
◀	Lockout when the burner stops	Permanent flame in the combustion head or flame simulation	Eliminate permanency of flame or replace the control box
	Ignition with pulsations	Poorly adjusted head	Adjust
		Ignition electrode incorrectly adjusted	Adjust it
		Incorrectly adjusted fan air damper: too much air	Adjust
		Output during ionisation phase is too high	Reduce

Tab. N

A Appendix - Accessories**Analogue control signal converter kit**

Burner	Type	Code
All models	0/2 - 10V 0/4 - 20mA	20074479

Kit for modulating operation

Burner	Output regulator	Code
All models	RWF 50.2 3-POINT OUTLET	20085417
All models	RWF 55.5 COMPLETE WITH RS-485 INTERFACE	20074441
All models	RWF 55.6 COMPLETE WITH RS-485/PROFIBUS INTERFACE	20074442

Burner	Probe	Adjustment field	Code
All models	PT 100 temperature	- 100...+ 500°C	3010110
All models	4 - 20 mA pressure	0...2.5 bar	3010213
All models	4 - 20 mA pressure	0...16 bar	3010214

Potentiometer kit

Burner	Code
All models	20074487

Continuous purging kit

Burner	Code
All models	20074542

UV photocell kit

Burner	Code
All models	20079707

Soundproofing box kit

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

Spacer kit

Burner	Code
All models	20008903

Gas trains in compliance with EN 676

Please refer to manual.

B Appendix - Electrical panel layout

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2 Indication of references

/1.A1

Sheet no. _____ ↑

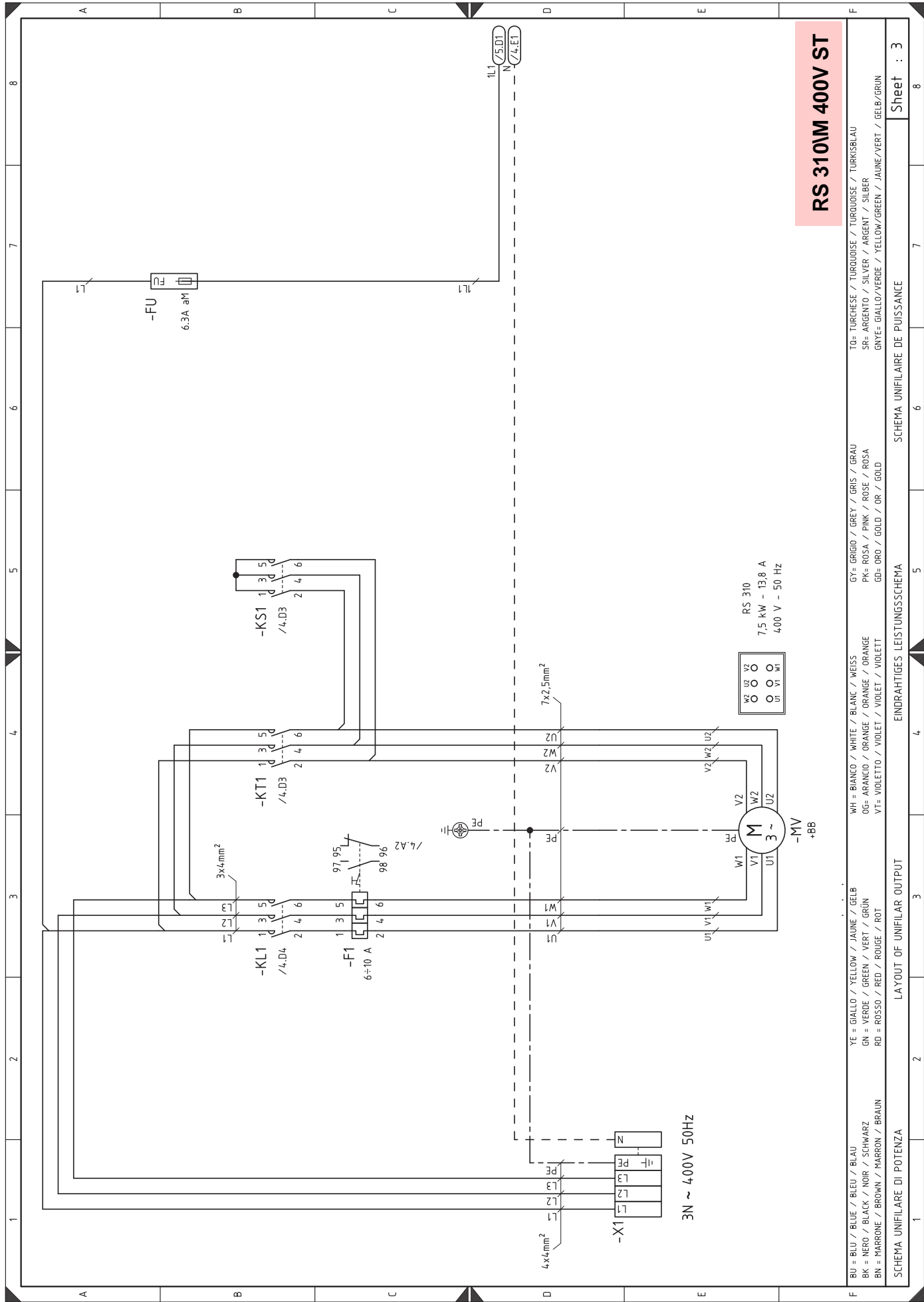
Co-ordinates _____ ↑



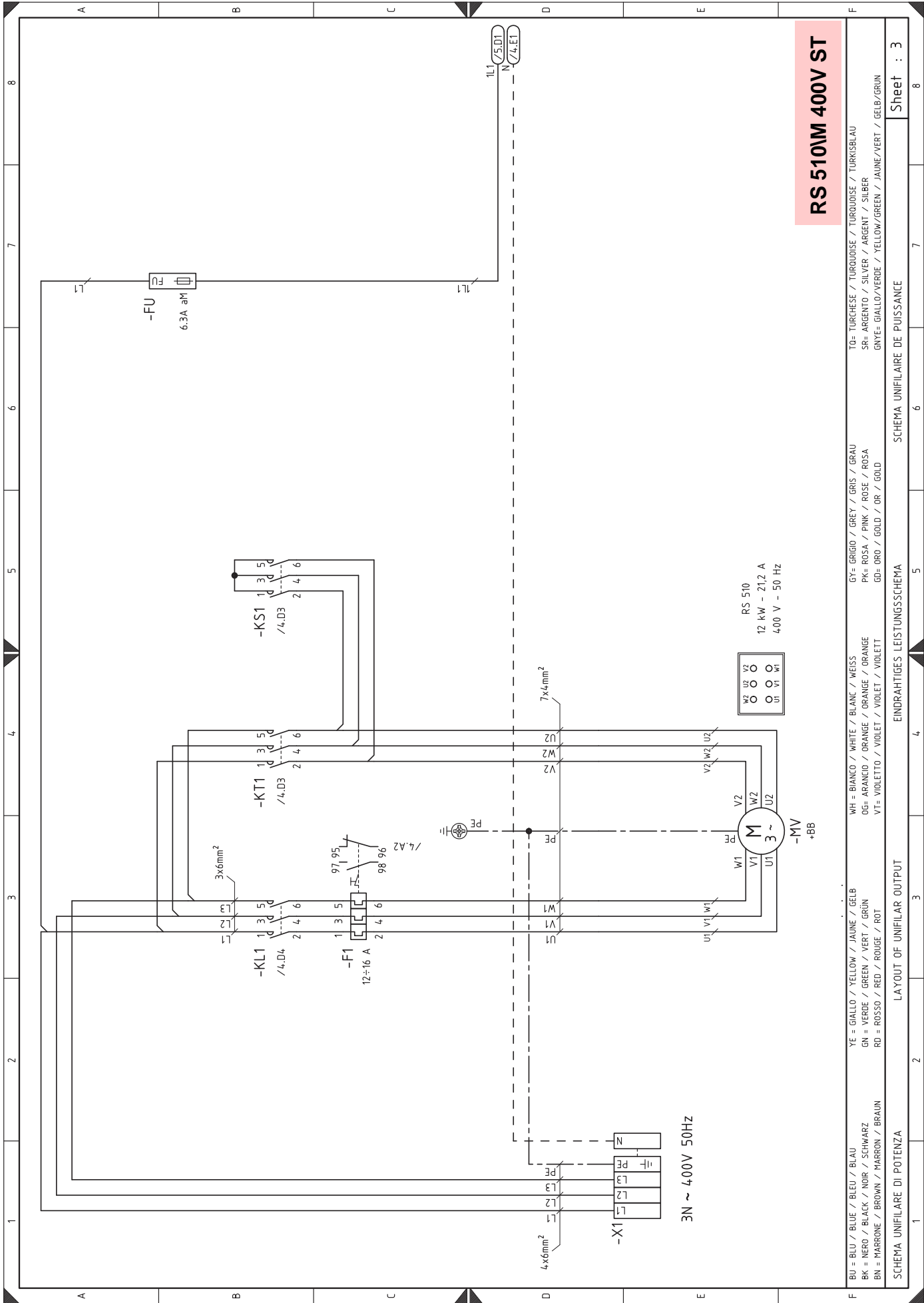


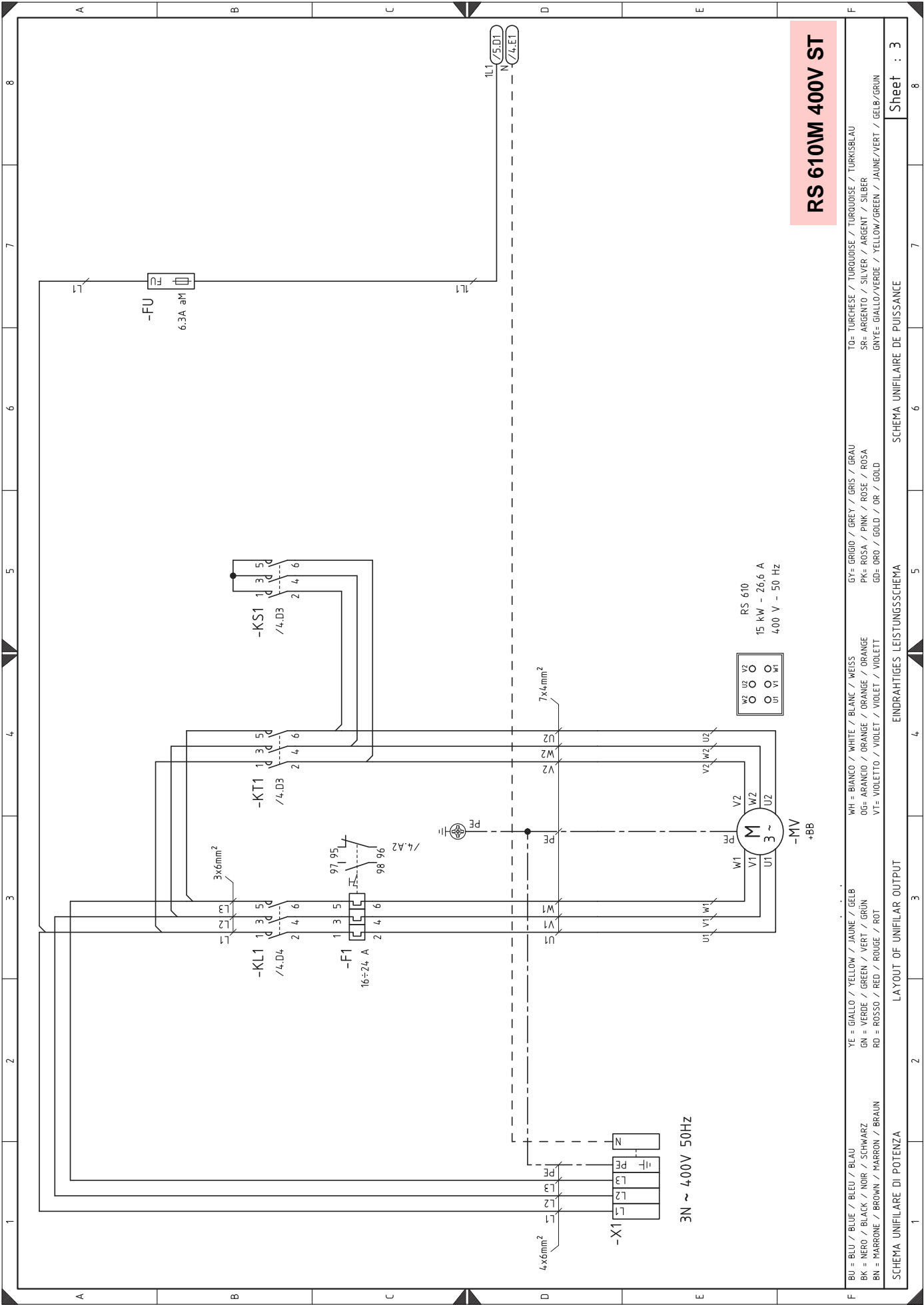




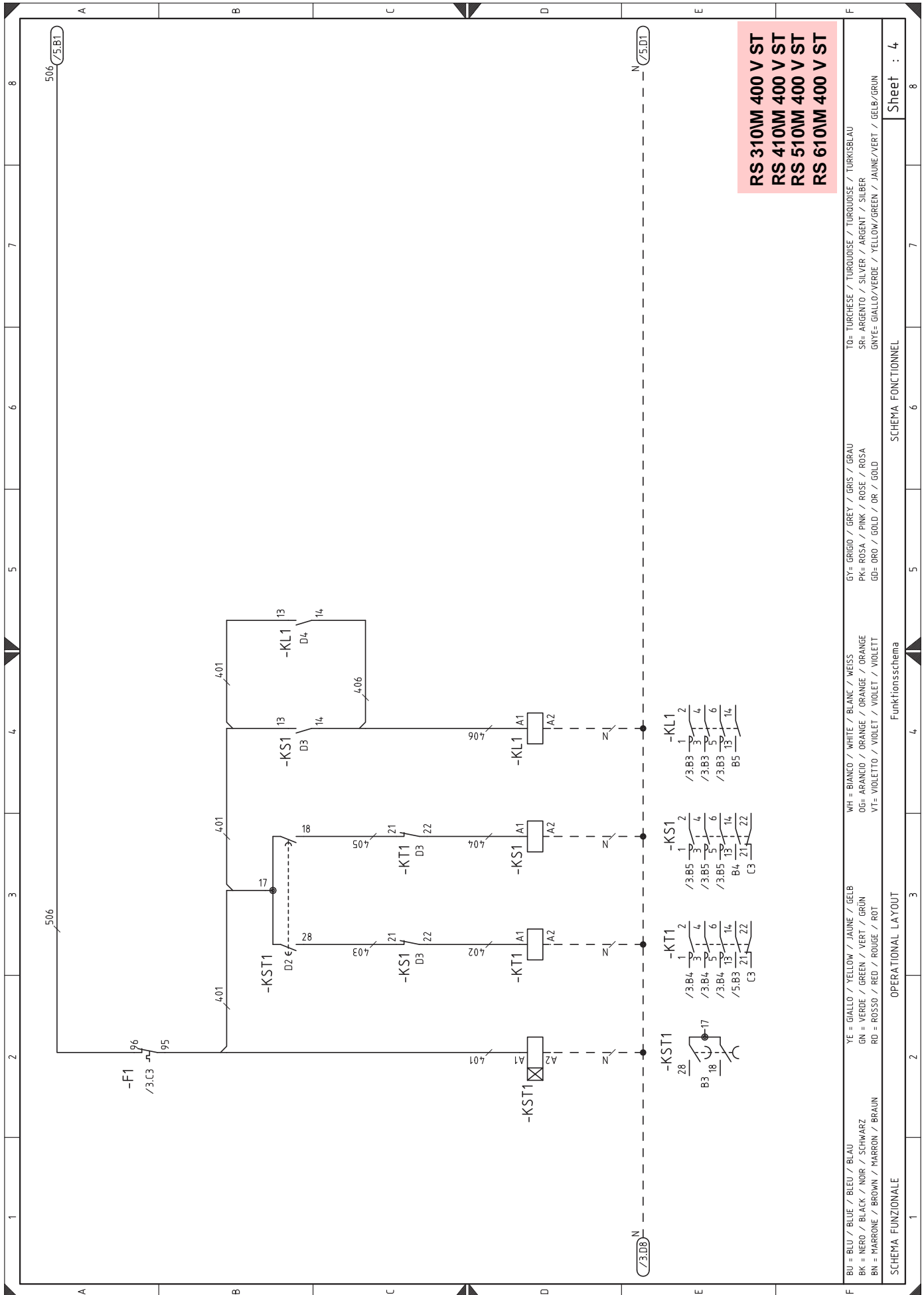


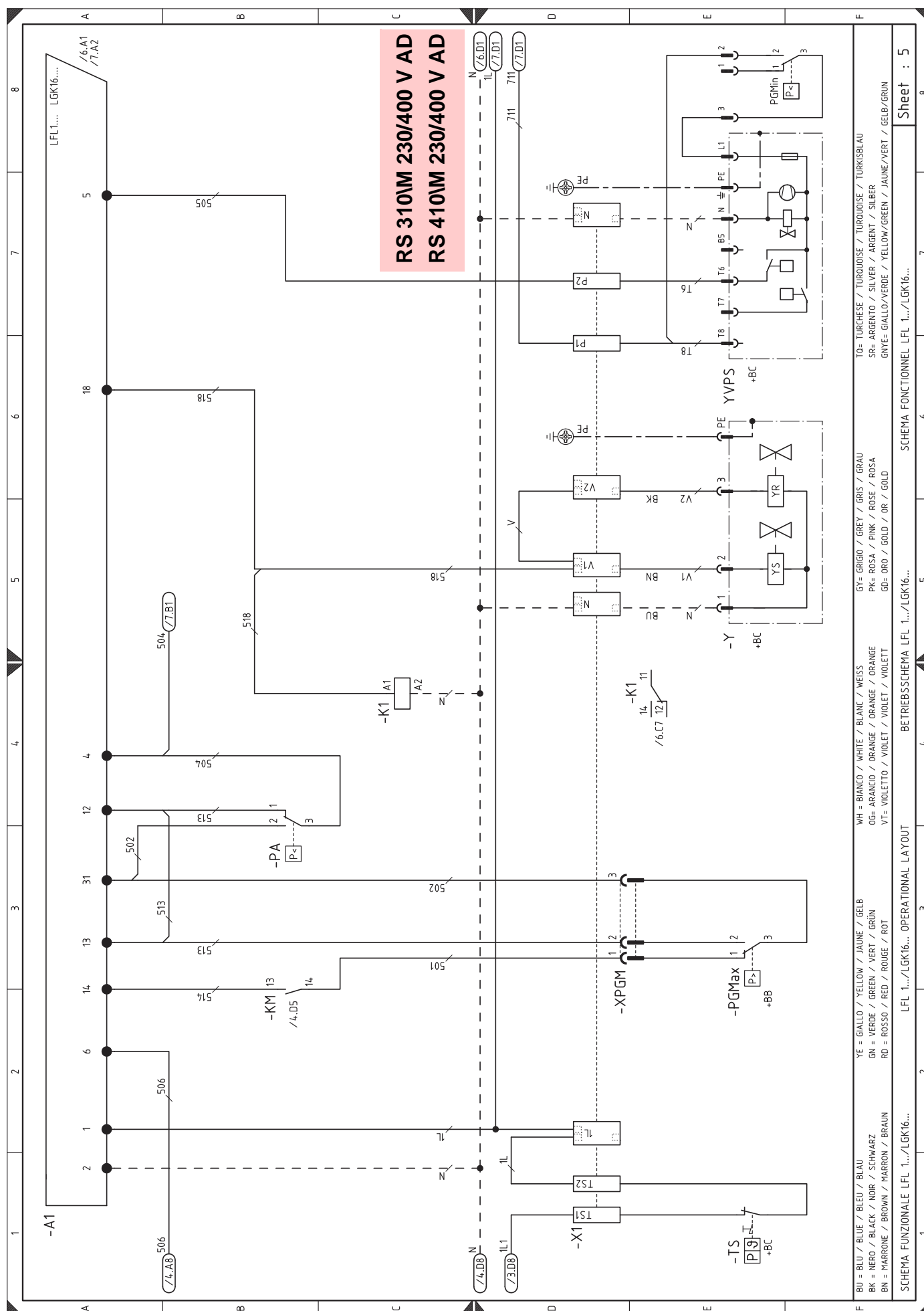


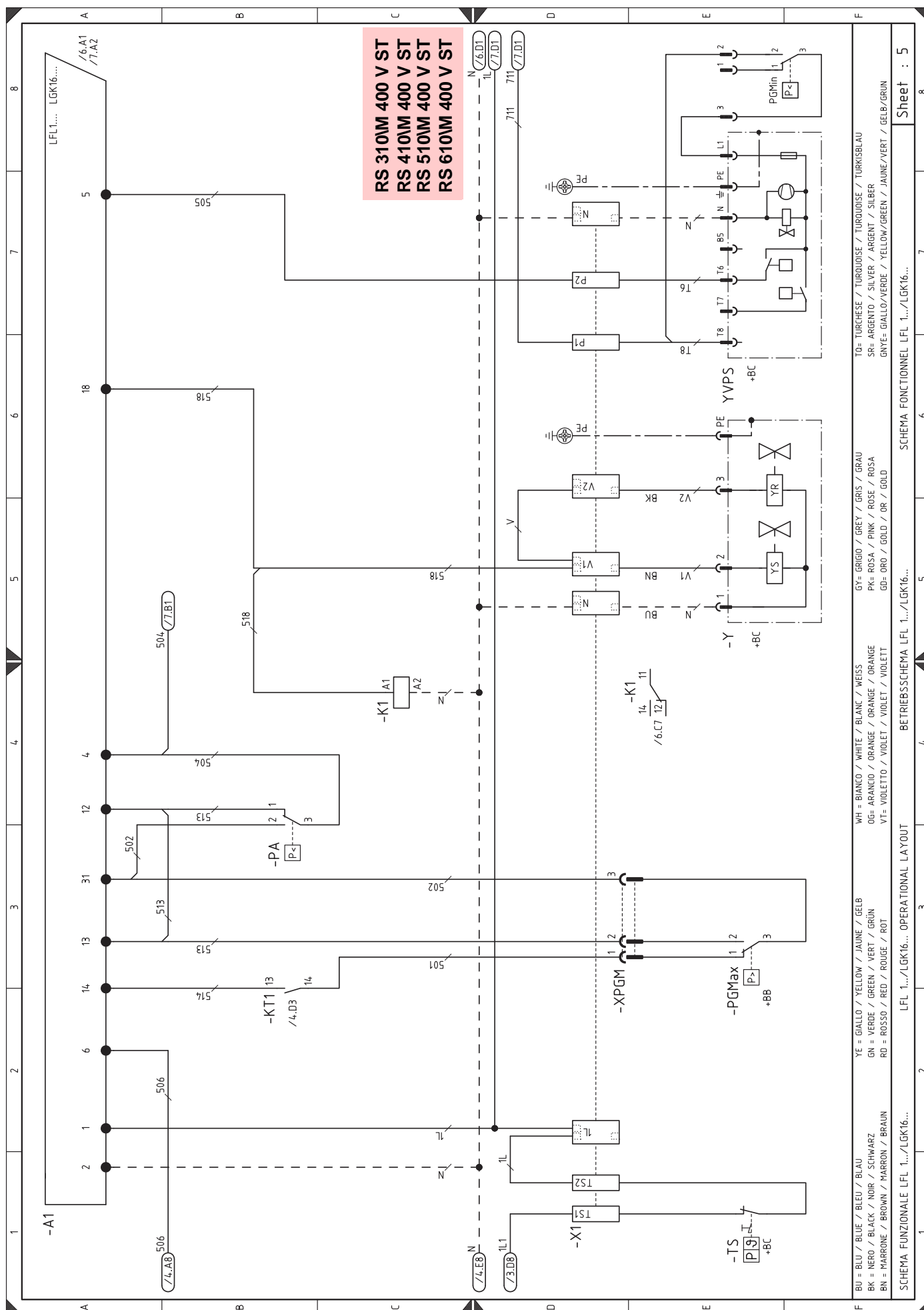






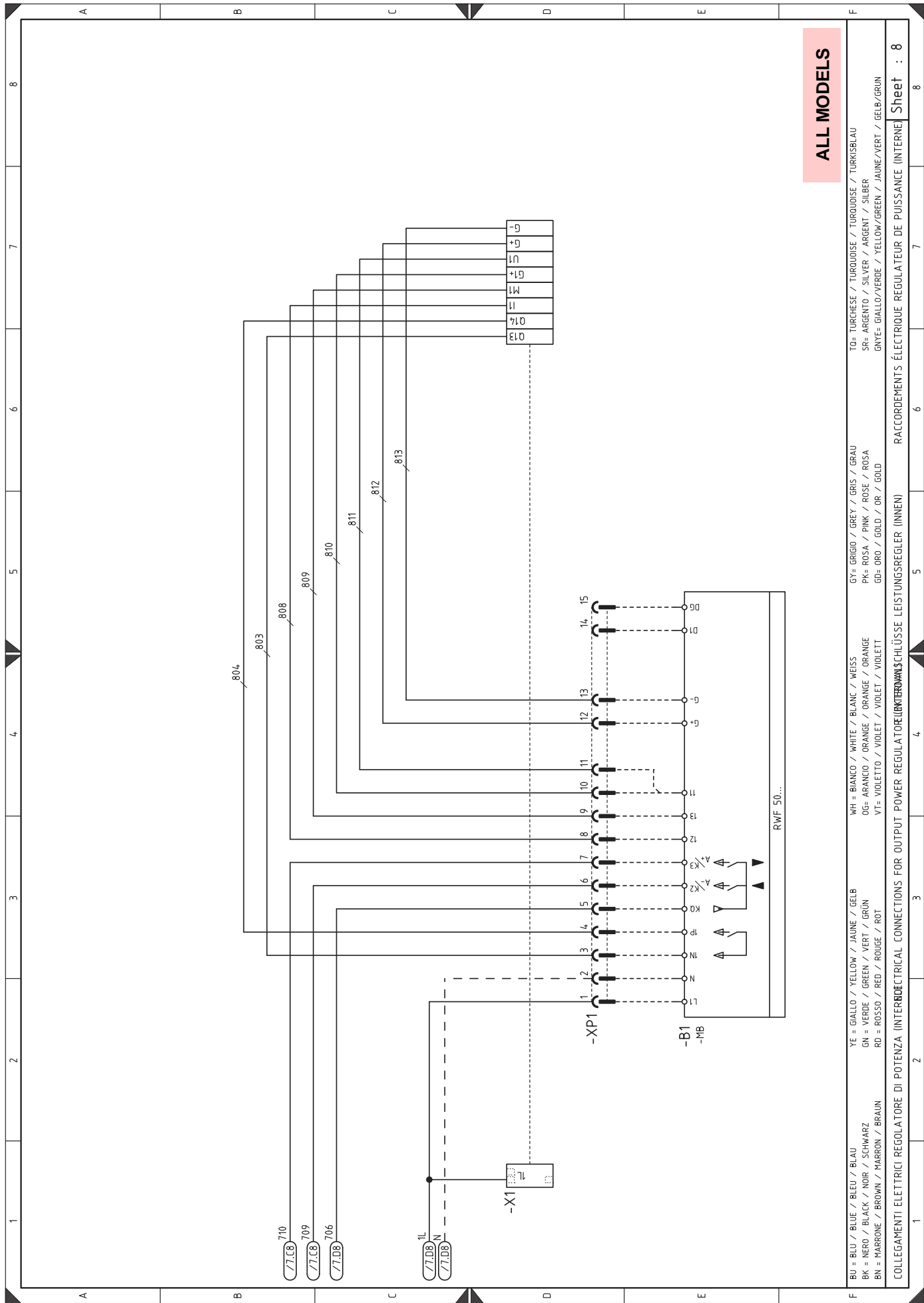


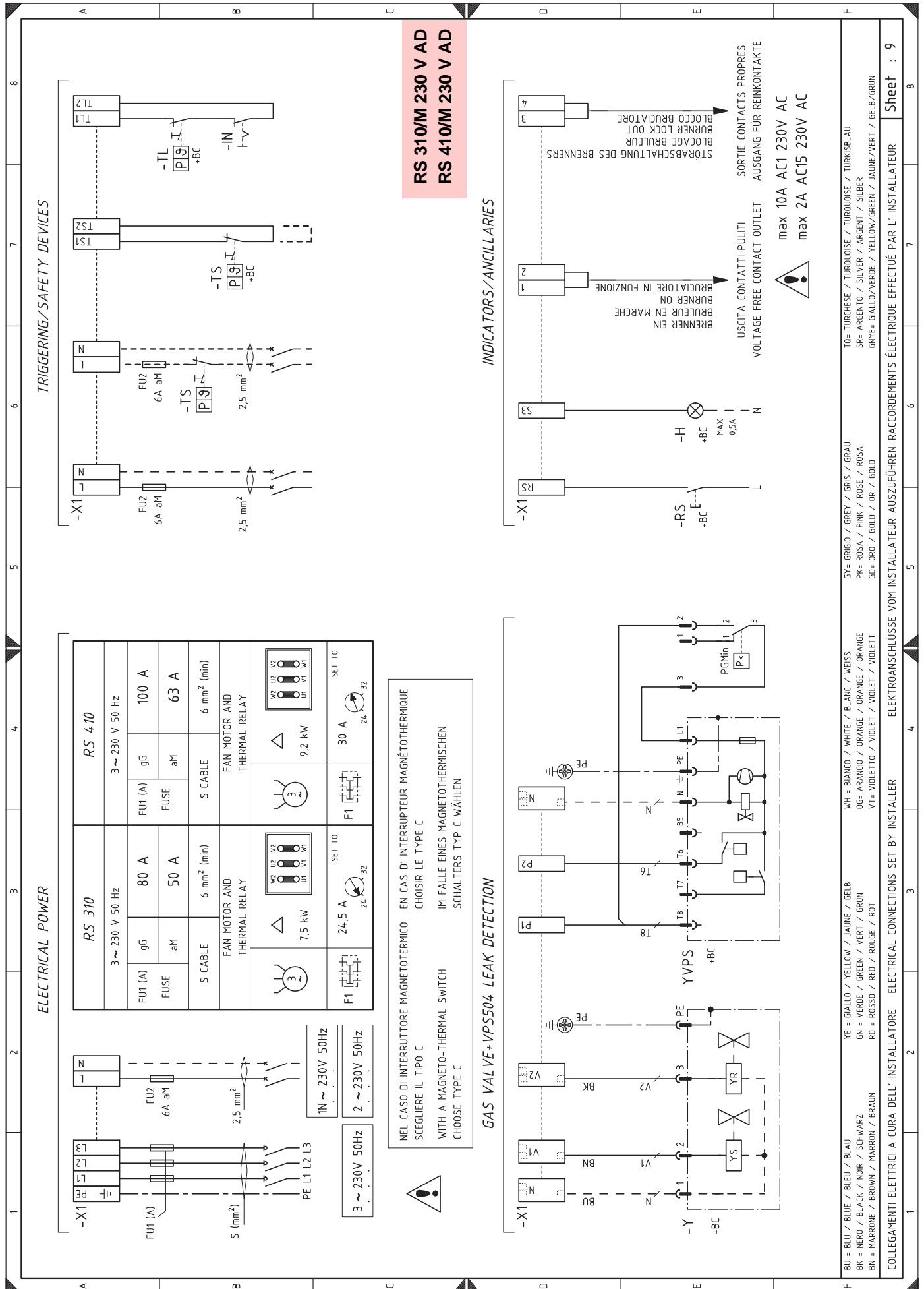




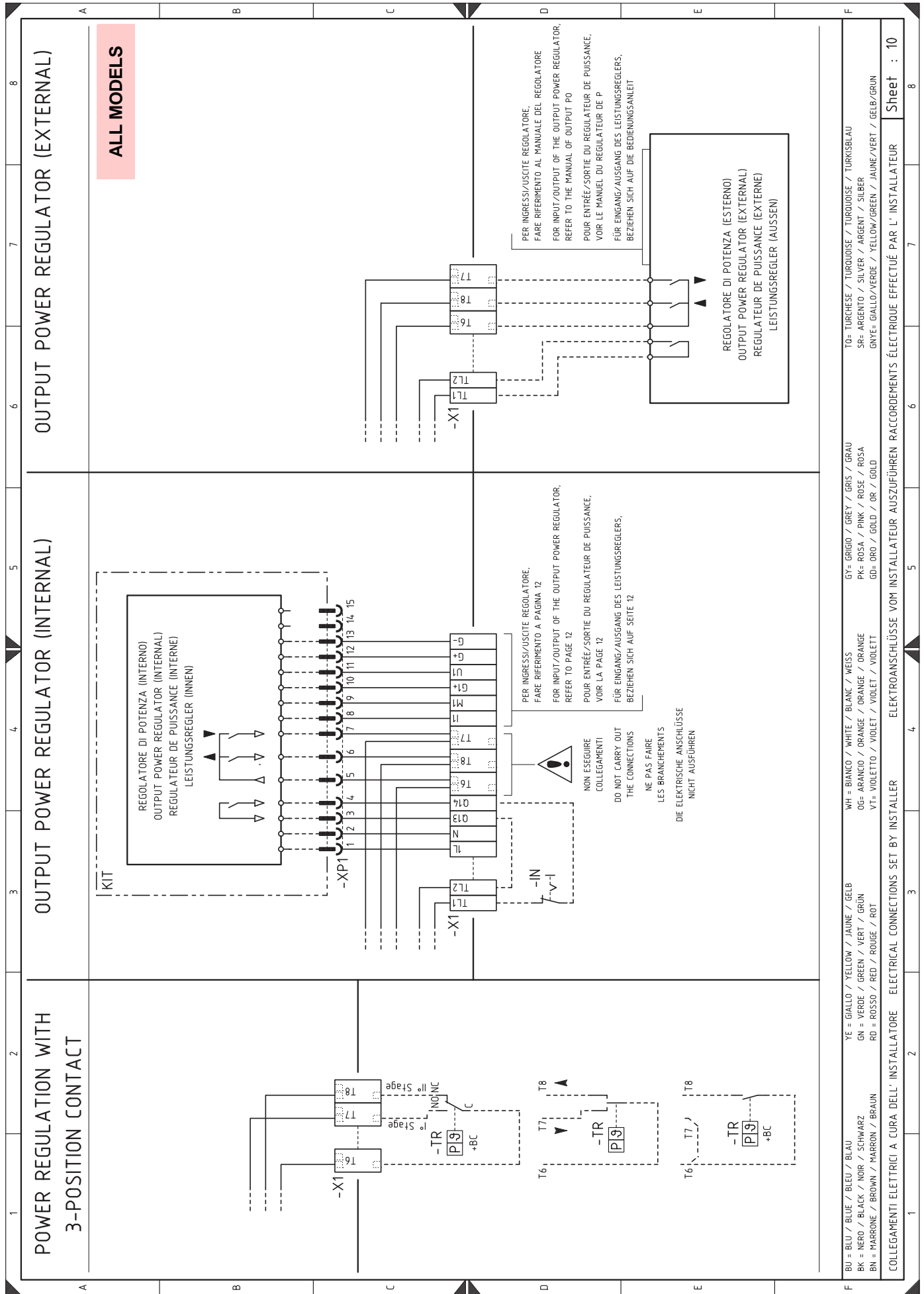








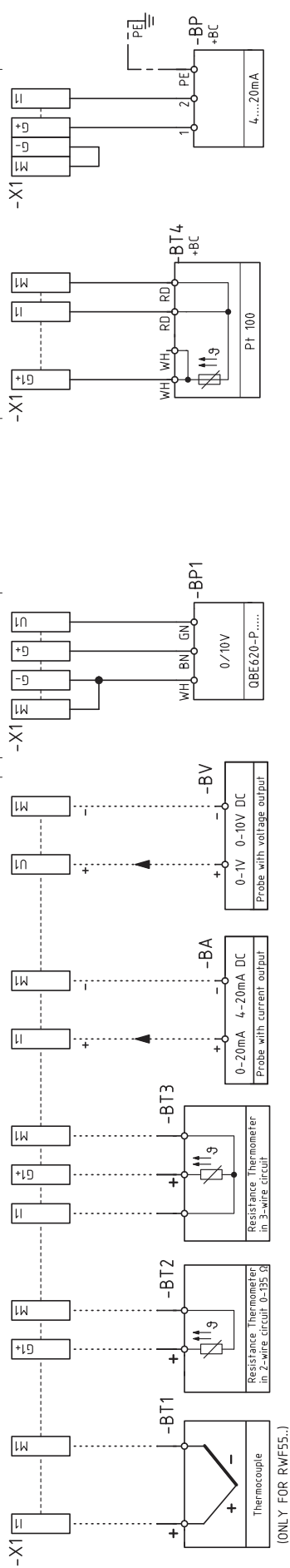




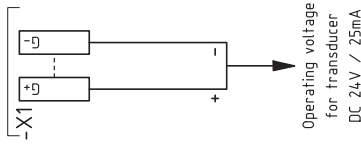
ALL MODELS

POSSIBILITY OF PROBE INPUT

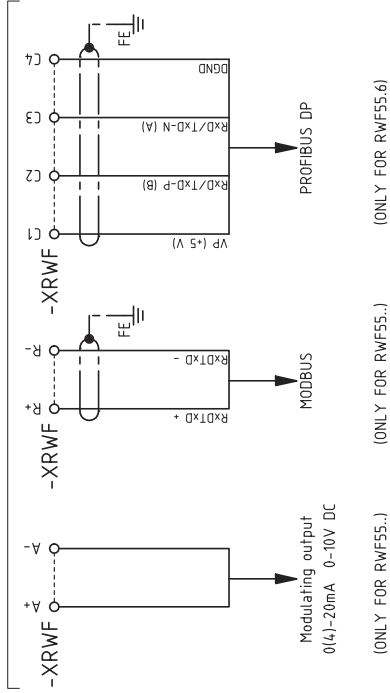
MODULATION INPUT WITH QBE620-P.... POSSIBILITY OF MODULATION INPUT WITH RIELLO PROBES



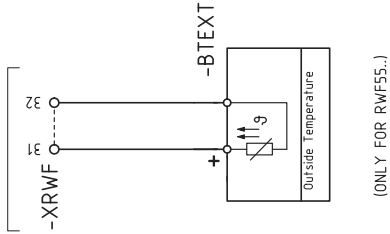
SERVICE



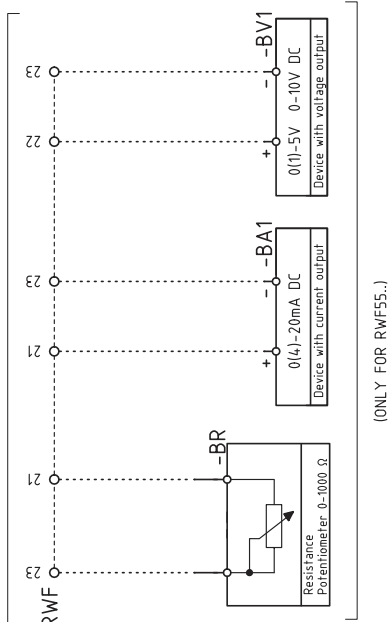
OPTIONAL



CLIMATIC COMPENSATION



POSSIBILITY OF SETPOINT INPUT AND SETPOINT SHIFT



BU = BLU / BLUE / BLEU / BLAU	YE = GIALLO / YELLOW / JAUNE / GELB	WH = BIANCO / WHITE / BLANC / WEISS	GY = GRIGIO / GREY / GRIS / GRAU	TQ= 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= VIOLETT / VIOLET / VIOLET / VIOLETT	GD= ORO / GOLD / OR / GOLD	GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN
INGRESSI/USCITE REGOLATORE		INPUT/OUTPUT OF THE OUTPUT POWER REGULATOR		ENTRÉE/SORTIE DU REGULATEUR DE PUISSANCE
				Sheet : 11

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Wiring layout key

A1	Electrical control box
B1	Output power regulator RWF40 internal
BA	Input in current DC 0...20 mA, 4...20 mA
BA1	Input in current DC 0...20 mA, 4...20 mA to modify remote setpoint
BP	Pressure probe
BP1	Pressure probe
BR	Remote setpoint potentiometer
BT1	Thermocouple probe
BT2	Probe Pt100, 2 wires
BT3	Probe Pt100, 3 wires
BT4	Probe Pt100, 3 wires
BTEXT	External probe for climatic compensation of the setpoint
BV	Input in voltage DC 0...1 V, 0...10 V
BV1	Input in voltage DC 0...1 V, 0...10 V to modify remote setpoint
F1	Fan motor thermal relay
FU	Auxiliary circuits safety fuse
G	Signal converter for UV cell
H	Burner working lighting signal output
IN	Burner manual stop electric switch
ION	Ionisation probe
KL1	Star/triangle starter line contactor
KM	Direct start up contactor
KT1	Star/triangle starter triangle contactor
KS1	Star/triangle starter star contactor
KST1	Star/triangle starter timer
K1	Clean contacts output relay burner operating
K2	Clean contacts output relay burner lockout
MV	Fan motor
PA	Air pressure switch
PE	Burner earth
PGMin	Minimum gas pressure switch
PGMax	Maximum gas pressure switch
RS	Remote reset switch
S2	Off / automatic / manual selector
S3	Power increase / power reduction selector
SM	Servomotor
TA	Ignition transformer
TL	Limit thermostat/pressure switch
TR	Adjustment thermostat/pressure switch
TS	Safety thermostat/pressure switch
Y	Gas adjustment valve + gas safety valve
YVPS	Valve leak detection device
X1	Main terminal supply board
XM1	Servomotor connector 1
XM2	Servomotor connector 2
XM3	Servomotor connector 3
XP1	Connector for RWF output power regulator kit ... or signal converter
XPGM	Maximum gas pressure switch connector
XRWF	Terminal board for output power regulator RWF ...
UV	UV Photocell (Optional only with kit)



If there is a problem with the fuse **FU**, there is a spare one in the fuse holder.



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