

GB Dual fuel kerosene and gas oil/ gas burners

Two stage progressive or modulating operation gas side/
two stage gas oil side



RLS B₁₀

CODE	MODEL	TYPE
20034844	RLS 300/BP MX	782 T
20034845	RLS 400/BP MX	783 T

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

Manufacturer: RIELLO S.p.A.

Address: Via Pilade Riello, 7
37045 Legnago (VR)

Product: Dual fuel kerosene and gas oil/ gas burner

Model: RLS 300/BP MX
RLS 400/BP MX

These products are in compliance with the following Technical Standards:

EN 676

EN 267

EN 12100

and according to the European Directives:

GAD	2009/142	Gas Devices Directive
MD	2006/42/EC	Machine Directive
LVD	2006/95/EC	Low Voltage Directive
EMC	2004/108/EC	Electromagnetic Compatibility

Such products are marked as follows:

RLS 300/BP MX
RLS 400/BP MXCE - 0085BP5534
CE - 0085BP5535

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 release 26.01.2010".

Product	Type	Model	Power
Dual fuel kerosene and gas oil/ gas burner	782T - 782T80	RLS 300/BP MX	600 - 3650 kW
	783T	RLS 400/BP MX	800 - 4500 kW

Legnago, 10.10.2013

Executive Director
RIELLO S.p.A. - Burner Department
Mr. G. Conticini

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

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.



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



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



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

2.1.3 Danger: live components



This symbol indicates operations which, if not carried out correctly, lead to electric shocks with lethal consequences.

Other symbols



ENVIRONMENTAL PROTECTION

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

- This symbol indicates a list.

Abbreviations used

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

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 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;
- 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;
- 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.

Riello warranty is subject to correct burner, appliance and application matching, and set up in line with Riello's instructions and guidelines. All components within the hydraulic circuit suitable for bio fuel use and supplied by Riello will be identified as Bio compatible. No warranty is given in relation to the use of components which are not so identified with bio fuel blends. If in any doubt please contact Riello for further advice.

If any Riello burners are used with fuel with a bio content >10% then the components within the hydraulic circuit maybe affected and are not covered under warranty. The hydraulic circuit consists of;

- Pump
 - Hydraulic ram (where applicable)
 - Valve block
 - Flexible oil lines (considered as a consumable component)
1. Irrespective of any warranty given by Riello in relation to normal use and manufacturing defects, when fuels not meeting the relevant standards are used, or where fuel storage issues have not been addressed correctly, or the equipment used is not compatible, if failures occur which are directly or indirectly attributed to such issues and/or to the non-observance of this guidance, then no warranty or liability is implied or accepted by Riello.
 2. Riello have carefully chosen the specification of the bio compatible components including the flexible oil lines to protect the pump, safety valve and nozzle. The Riello warranty is dependent upon the use of Riello genuine components including the oil lines, being used.
 3. Riello warranty does not cover defects arising from incorrect commissioning or servicing by non Riello employed service engineers, and any issues impacting the burner arising from external site related issues.

2.3 Guidance for the use of bio fuel blends up to 10%

Background

With increasing focus on renewable and sustainable energy requirements, Bio fuel usage is set to increase. Riello is committed to promoting energy conservation and the use of renewable energy from sustainable resources including liquid bio fuels, however there are some technical aspects that must be considered at the planning stage of using such fuels to reduce the potential for equipment failure or the risks of fuel leakage.

Liquid Bio fuel is a generic description used for oil that can come from numerous feed stocks including recycled cooking oils. These types of oils have to be considered and treated differently from standard mineral or fossil fuels, as they are generally more acidic, hygroscopic and less stable.

Due to this, a holistic approach is needed from the specification of the liquid Bio fuel, the storage of the fuel, its oil supply line and ancillary equipment, and very importantly the oil filtration and the burner itself. The specification for FAME (Fatty Acids Methyl Ester) liquid Bio fuel is critical to reliable equipment operation.

It is a minimum requirement that the fuel blend (up to 10% Bio) is obtained with gasoil in accordance with the relevant EN standards, regional regulations and FAME in accordance with EN 14214. It is also important that the fuel blends meet the require-

ments related to operational environment conditions within the relevant EN standards.

When choosing your Riello oil products where you know Bio fuels will be in use, please make sure that a Bio compatible burner and/or components have been supplied. If an existing burner is to be used with a liquid Bio fuel then a kit may be required to make it compatible and the guidance notes enclosed concerning oil storage and filtration must be adhered to. The end user is responsible for the thorough verification of the potential risks associated with the introduction of a bio fuel blend and the suitability of the appliances and installation applicable.

Irrespective of any warranty given by Riello in relation to normal use and manufacturing defects, when fuels not meeting the relevant standards are used, or where fuel storage issues have not been addressed correctly, or the equipment used is not compatible, if failures occur which are directly or indirectly attributed to such issues and/or to the non-observance of this guidance, then no warranty or liability is implied or accepted by Riello.

2.3.1 Information and general instructions

To ensure consistency, the supplier of the fuel must be able to demonstrate compliance with a recognised Quality Control and management system to ensure high standards are maintained within the storage, blending and delivery processes. The installation oil storage tank and its ancillaries must also be prepared BEFORE liquid Bio fuel is introduced. Checks and preparation should include;

- For new installations, make sure that all materials and seals in the oil storage and supply line to the burner are compatible with Bio fuels. For all installations, there must be a good quality bio compatible oil filter at the tank and then a secondary filter of 100 Microns protecting the burner from contamination.
- If an existing oil storage tank is to be used then in addition to the materials checks as detailed above, it will be essential that the tank is first inspected for condition and checked for water or other contamination. Riello strongly recommends that the tank is cleaned and oil filters replaced prior to Bio fuel delivery. If this is not completed then due to the hydroscopic nature of Bio fuel, it will effectively clean the tank, absorb water present which in turn will result in equipment failure that is not covered by the manufacturer's warranty.
- Depending on the capacity of the oil storage tank and oil usage, fuels may remain static within the tank for some considerable time and so Riello recommends that the oil distributor is consulted regarding the use of additional Biocides within the fuel to prevent microbial growth from occurring within the tank. Riello suggests that fuel suppliers and or service companies are contacted for guidance on fuel filtration. Special attention should be applied to fuel applications where oil may be stored for long periods of time.
- The burner must be set according to the appliance application and commissioned checking that all combustion parameters are as recommended in the appliance technical manual.
- Riello recommends that the in line and burner oil pump filters are inspected and if required replaced at least every 4 months during burner use, before the burner start-up following a long period of discontinue operation and even more frequently where contamination has occurred. Particular attention is needed when inspecting and checking for fuel leakages from seals, gaskets and hoses.

2.3.2 Product Disclaimer Statement

CAREFULLY READ THE FOLLOWING DISCLAIMER. YOU ACCEPT AND AGREE TO BE BOUND BY THIS DISCLAIMER BY PURCHASING RIELLO BIO COMPATIBLE BURNERS AND/OR COMPONENTS.

Although the information and recommendations (hereinafter "Information") in this guidance is presented in good faith, believed to be correct and has been carefully checked, Riello (and its subsidiaries) makes no representations or warranties as to the completeness or accuracy of the Information. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Riello (and its subsidiaries) be responsible for damages of any nature whatsoever resulting from the use of or reliance upon Information.

Other than set forth herein, Riello (and its subsidiaries) makes no additional warranties with respect to the bio compatible burner, either express or implied, including that of merchantability or fitness for a particular purpose or use.

In no event shall Riello (and its subsidiaries) be liable for any indirect, incidental, special or consequential damages including, without limitation, loss of profits, damages for loss of business profits, business interruption, loss of business information, loss of equipment, or other pecuniary loss or compensation for services whether or not it is advised of the possibility of such damages.

With the exception of injuries to persons, Riello's liability is limited to the customer's right to return defective/non-conforming products as provided by the relevant product warranty.

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 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 detailed as available as spare parts by the Manufacturer can be replaced.

3.2 Safety warnings

The dimension of the boiler's combustion chamber must respond to specific values, in order to guarantee a combustion with the lowest polluting emissions rate.

The Technical Service Personnel will be glad to give you all the information for a correct matching of this burner to the boiler.

This burner must only be used for the application it was designed for.

The manufacturer accepts no liability within or without the contract for any damage caused to people, animals and property due to installation, adjustment and maintenance errors or to improper use.

3.3 Basic safety rules

- Children or inexperienced persons must not use the appliance.
- Under no circumstances must the intake grids, dissipation grids and ventilation vents in the installation room be covered up with cloths, paper or any other material.
- Unauthorised persons must not attempt to repair the appliance.
- It is dangerous to pull or twist the electric leads.
- Cleaning operations must not be performed if the appliance is not disconnected from the main power supply.
- Do not clean the burner or its parts with inflammable substances (e.g. petrol, alcohol, etc.). The cover must be cleaned with soapy water.
- Do not place anything on the burner.
- Do not block or reduce the size of the ventilation vents in the installation room.
- Do not leave containers and inflammable products or combustible materials in the installation room.

3.4 Personnel training

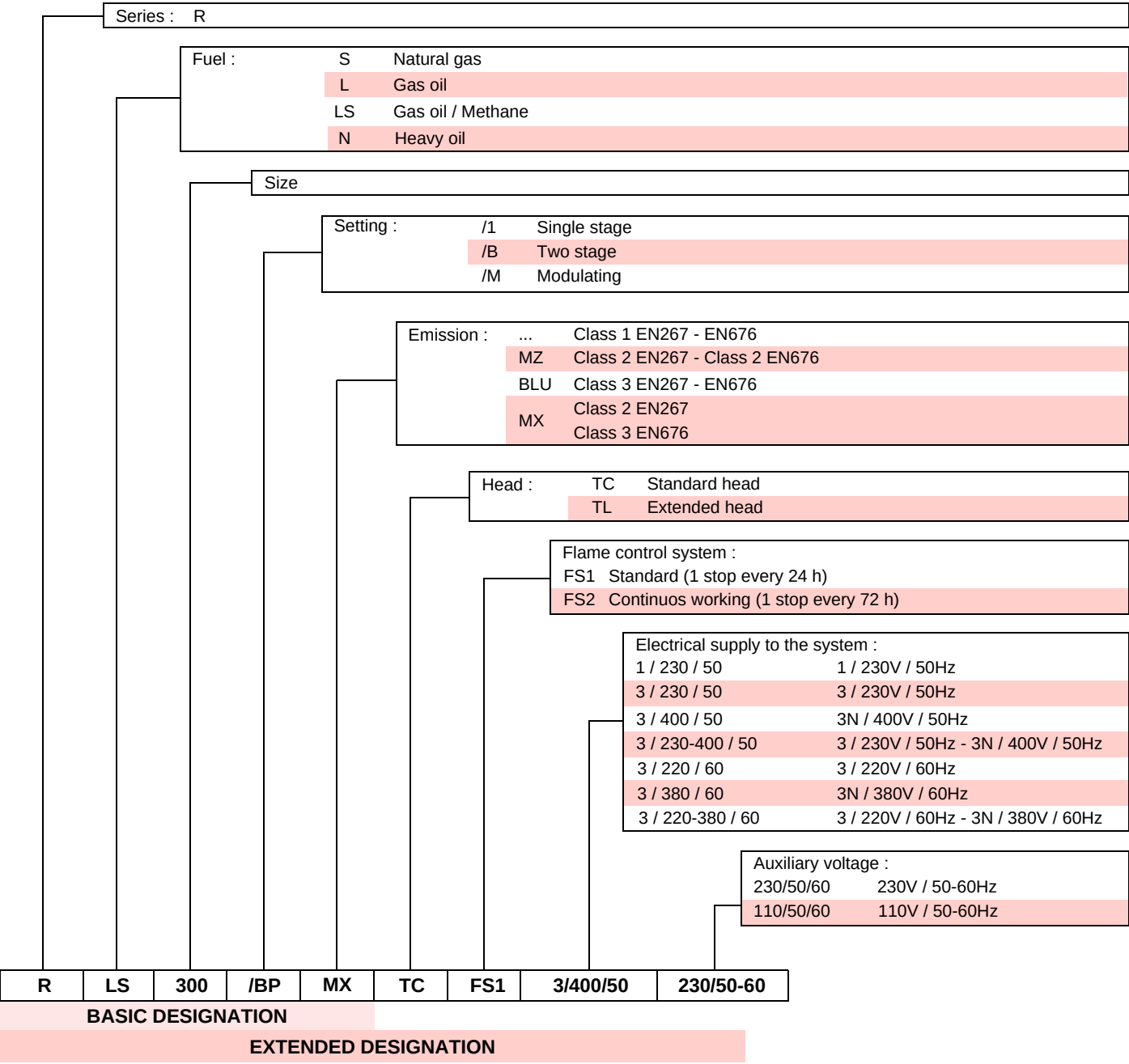
The user is the person, body or company that has acquired the machine and intends to use it for the specific purpose. He is responsible for the machine and for the training of the people working around it.

The user:

- undertakes to entrust the machine exclusively to suitably trained and qualified personnel;
- must take all the measures necessary to prevent unauthorised people gaining access to the machine;
- 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;
- 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.
- 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.

4 Technical description of the burner

4.1 Burner designation



4.2 Models available

Designation		Electrical supply		Starting	Code
RLS 300/BP MX	TC	3/400/50		Direct	20034844
RLS 400/BP MX	TC	3/400/50		Star/Delta	20034845

4.3 Technical data

Model			RLS 300/BP MX	RLS 400/BP MX
Type			782 T	783 T
Output ⁽¹⁾ Delivery ⁽¹⁾	2 nd stage	kW kg/h	1250 - 3650 105 - 302.5	2000 - 4500 169 - 372
	1 st stage	kW kg/h	600 50	800 80
Fuel			Gas oil and Blends of gas oil and bio fuel (FAME in accordance with EN 14214) up to 10%	
Kerosene	net calorific value	kWh/kg Mcal/kg	11.97 10.3 (10.300 kcal/kg)	
	density	kg/dm ³	0.77 - 0.83	
	viscosity at 20 °C	mm ² /s max	6 (1.5 °E - 6 cSt)	
Gas oil	net calorific value	kWh/kg Mcal/kg	11.86 10.2 (10.200 kcal/kg)	
	density	kg/dm ³	0.82 - 0.85	
	viscosity at 20 °C	mm ² /s max	6 (1.5 °E - 6 cSt)	
Natural gas			G20 (methane) - G21 - G22 - G23 - G25	
Gas pressure at maximum delivery ⁽²⁾ Gas: G20 / G25		mbar	26 / 37	34 / 39
Operation			- Intermittent (min. 1 stop in 24 hours) - Gas oil: two stage (high and low flame) and single stage (all - nothing) - Gas: Progressive two stage or modulating by kit (see accessoires)	
Nozzles		number	2	
Standard applications			Boilers: water, steam, diathermic oil	
Ambient temperatur		°C	0 - 40	
Combustion air temperature		°C max	60	
Pump	delivery (at 20 bar)	kg/h	380	
	pressure range	bar	7 - 40	
	fuel temperatur	°C max	140	
Noise levels ⁽³⁾		dB(A)	83	85

Tab. A

- (1) Reference conditions: ambient temperature 20°C - Barometric pressure 1013 mbar - Altitude 0 m a.s.l.
(2) Pressure at test point 5)(Fig. 5 at page 14) with zero pressure in the combustion chamber and maximum burner output.
(3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output.

4.4 Electrical data
Motor IE1

Model		RLS 300/BP MX	RLS 400/BP MX
Electrical supply	V/Ph/Hz	400/3/50	
Auxiliary power supply	V/Ph/Hz	230/1/50	
Electric motor	rpm	2860	2900
	W	4500	7500
	V	230/400	400/690
	A	15.8/9.1	15.6/9
Ignition transformer	V1 - V2 I1 - I2	230 V - 2 x 5 kV 1.9 A - 35 mA	
Pump motor	rpm	2800	
	W	1100	
	V	220/380	
	A	4.7/2.7	
Electrical power consumption	W max	7000	10500
Electrical protection		IP 54	

Motor IE2

Model		RLS 300/BP MX	RLS 400/BP MX
Electrical supply	V/Ph/Hz	400/3/50	
Auxiliary power supply	V/Ph/Hz	230/1/50	
Electric motor	rpm	2900	2900
	W	4500	7500
	V	230/400	400/690
	A	15/8.7	13.8/8
Ignition transformer	V1 - V2 I1 - I2	230 V - 2 x 5 kV 1.9 A - 35 mA	
Pump motor	rpm	2790	
	W	1100	
	V	220/380	
	A	4.5/2.6	
Electrical power consumption	W max	7000	10500
Electrical protection		IP 54	

4.5 Countries of destination - Burner categories

Country of destination	Gas category
IT - AT - GR - DK - FI - SE - EE - CZ - HU - LT - SK - BG - LV - SI - PL	I ² H3B/P
ES - GB - IE - PT	I ² H3P
NL	I ² L3B/P
FR	I ² Er3P
DE	I ² ELL3B/P
BE	I ² E(R)B, I ³ P
LU	I ² E3B/P
NO - CY - MT	I ³ B/P
RO	I ² H

4.6 Overall dimensions

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

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

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

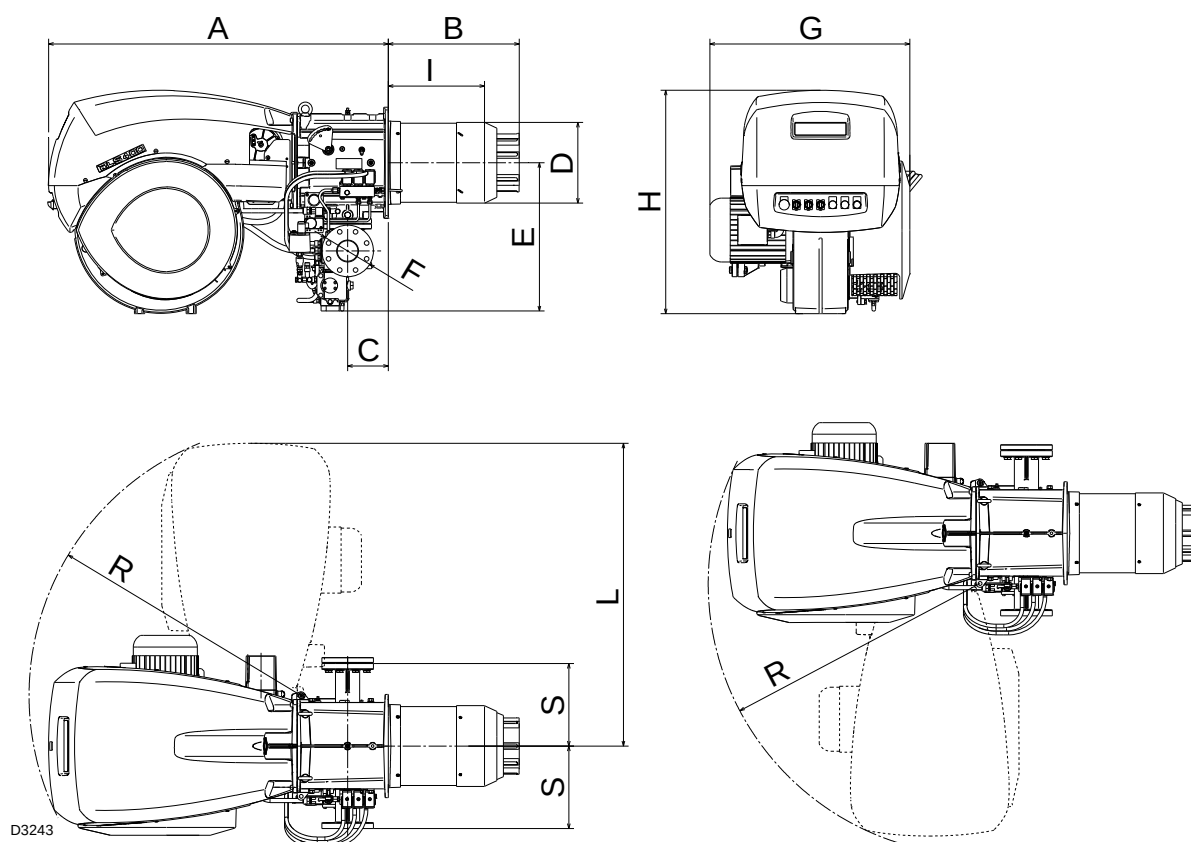


Fig. 1

mm	A	B	C	D	E	F	G	H	I	L	R	S
RLS 300/BP MX	1325	510	164	313	605	DN80	720	890	370	1175	1055	320
RLS 400/BP MX	1325	510	164	313	605	DN80	775	890	370	1175	1055	320

Tab. B

4.7 Packaging - Weight

- The burners stands on a wooden base which can be lifted by fork-lifts. Outer dimensions of packaging are indicated in Tab. C.
- The weight of the burner complete with packaging is indicated in Tab. C.

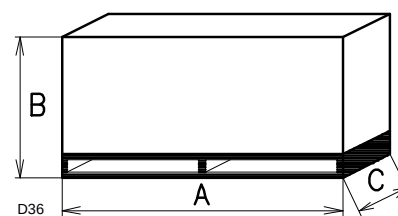


Fig. 2

mm	A	B	C	kg
RLS 300/BP MX	1960	940	970	240
RLS 400/BP MX	1960	940	970	250

Tab. C

4.8 Firing rates

MAXIMUM OUTPUT must be selected in the hatched area of the diagram (Fig. 3).

MINIMUM OUTPUT must not be lower than the minimum limit shown in the diagram Fig. 3:

RLS 300/BP MX = 600 kW

RLS 400/BP MX = 800 kW



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 above sea level), and with the combustion head adjusted as shown on page 26.

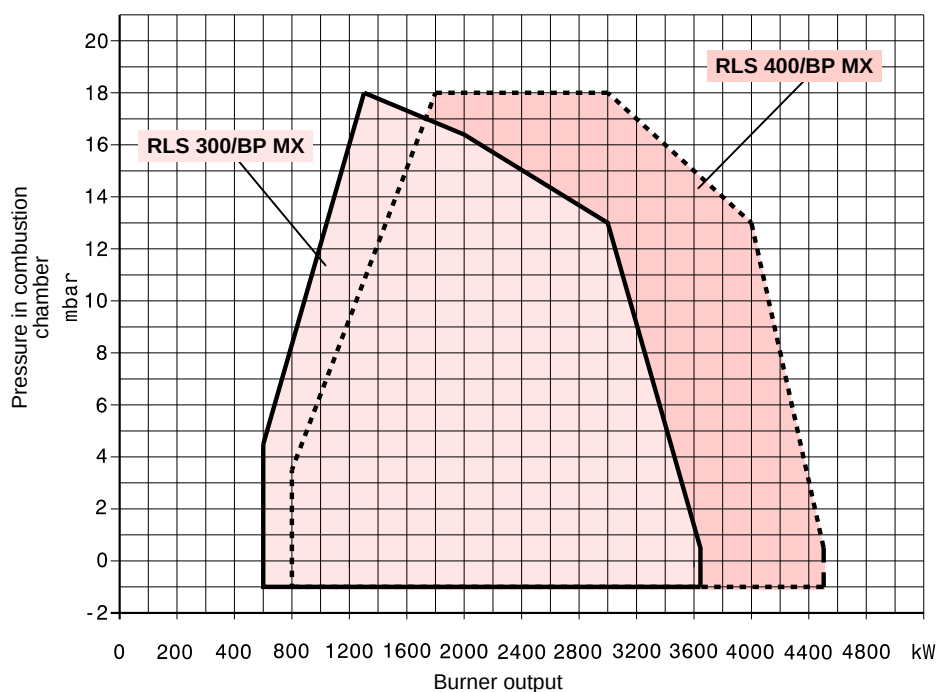


Fig. 3

4.8.1 Modulation ratio

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

- 4 : 1 (gas);
- 3 : 1 (gas oil)

In case of gas operation the burner can be used with a different modulation ratio depending on the application - contact the manufacturer for further information.

4.8.2 Test boiler



CAUTION

The burner/boiler matching does not pose any problems if the boiler is CE type-approved and its combustion chamber dimensions are similar to those indicated in diagram (Fig. 4).

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

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

Fig. 4 indicates the diameter and length of the test combustion chamber.

Example for RLS 400/BP MX:

output 3000 kW: diameter 100 cm - length 4 m.

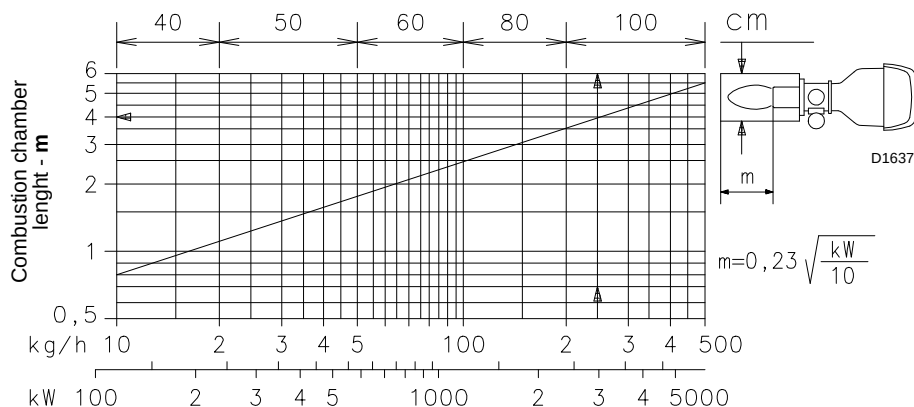


Fig. 4

4.9 Standard equipment

- 1 Flange gasket
- 4 Flange fixing screws M 16 x 50
- 1 Thermal insulation screen
- 4 Screws to secure the burner flange to the boiler: M 18 x 70
- 1 Instruction booklet
- 1 Spare parts list



WARNING

In case of use with gas oil containing up to 10% Bio blend, it will be essential to use flexible oil lines suitable for bio fuel use. Please contact Riello for further information.

4.10 Burner description

- 1 Lifting eyebolts
- 2 Fan
- 3 Fan motor
- 4 Air gate valve servomotor
- 5 Gas pressure test point
- 6 Combustion head
- 7 Ignition electrodes
- 8 Flame stability disk
- 9 Electric panel board - cover
- 10 Hinge for opening burner
- 11 Air inlet to fan
- 12 Manifold
- 13 Thermal insulation screen for securing burner to boiler
- 14 Gas train flange
- 15 Shutter
- 16 Lever for movement of combustion head
- 17 Gears for movement of air damper
- 18 Air pressure switch (differential operating type)
- 19 Air pressure test point
- 20 Maximum gas pressure switch with pressure test point
- 21 UV cell
- 22 Air pressure test point pressure test point "+"
- 23 Air pressure test point
- 24 Pump
- 25 Pump motor
- 26 Minimum oil pressure switch

The burner can be opened either on the right or left sides, irrespective of the side from which fuel is supplied.
When the burner is closed, the hinge can be re-positioned on the opposite side.

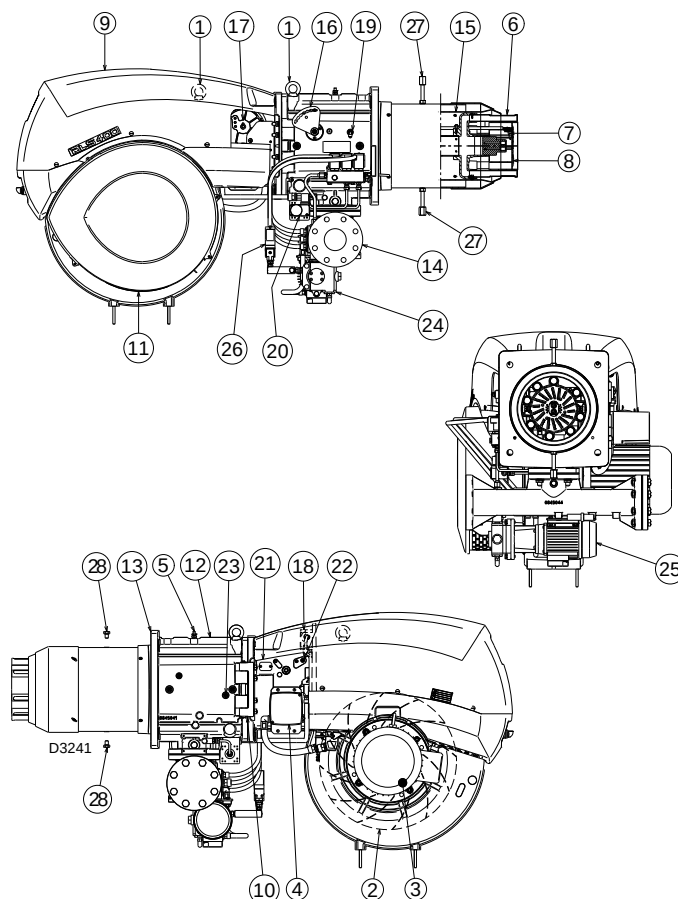


Fig. 5

4.10.1 Description of panel board

- 1 Oil/gas selector
- 2 Relay outlet - voltage free contacts
- 3 Ignition transformer
- 4 Bracket for mounting the power regulator RWF40
- 5 Stop push-button
- 6 Dial for off - automatic - manual
- 7 Power dial for increase - decrease of power
- 8 Signal light for auxiliary voltage
- 9 Motor thermal cutout tripped warning light
- 10 Signal light for burner failure and lock-out reset button
- 11 Control box
- 12 Star-powered/delta-powered starter (RLS 400/BP MX only)
- 13 Timer
- 14 Air pressure switch (differential operating type)
- 15 Main supply terminal strip
- 16 Entry for power cables and external leads, see Fig. 21
- 17 Relè selezione gas
- 18 Relè selezione olio
- 19 Contattore e relè termico motore pompa

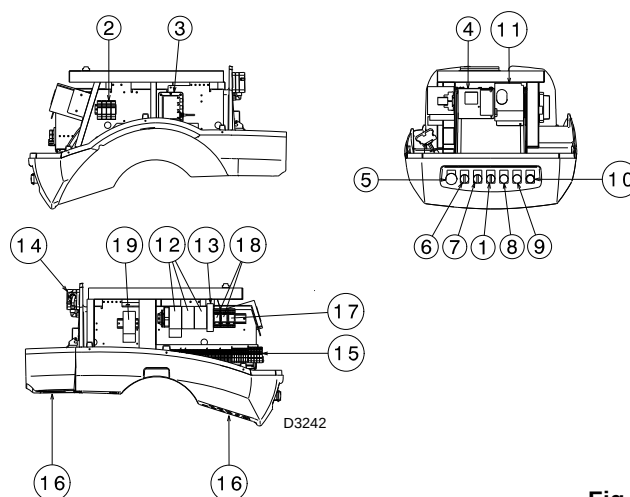


Fig. 6

Two types of burner failure may occur:

Control box lock-out:

if the control box 11)(Fig. 6) pushbutton (**red led**) and the reset button 10)(Fig. 6) light up, it indicates that the burner is in lock-out. To reset, hold the pushbutton down for between 1 and 3 seconds.

Motors trip:

release by pressing the push button of the relevant thermal cutout relay.

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.

5.2 Handling

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



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



After positioning the burner near the installation point, correctly dispose of all residual packaging, separating the various types of material. Before proceeding with the installation operations, carefully clean all around the area where the burner will be installed.

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		☒	G		H		
GAZ-AERIO			G		H		
I							
HEIZÖL-FUEL		L					
RIELLO Sp.A I-37045 Legnago (VR)						CE 0085	

D9243

Fig. 7

Checking the characteristics of the burner

Check the identification label of the burner, showing:

- the model (A)(Fig. 7) and type of burner (B);
- the year of manufacture, in cryptographic form (C);
- the serial number (D);
- the data for electrical supply and the protection level (E);
- the electrical input power (F);
- the types of gas used and the relative supply pressures (G);
- the data of the burner's minimum and maximum output possibilities (H) (see Firing rates)

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

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



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

5.4 Installer/Service notes for the use of Gas oil with Bio blends up to 10%

- During the burner installation, check that the gasoil and bio fuel blends are in accordance with Riello specifications (please refer to the chapters "Technical Data" and "Guidance for the use of bio fuel blends up to 10%" within the burner technical manual).
- If a Bio blend is in use the installer must seek information from the end user that their fuel supplier can evidence that the blends of fuel conform to the relevant standards.
- Check that the materials used in the construction of the oil tank and ancillary equipment are suitable for bio fuels, If not these must be upgraded or replaced with Bio compatible parts.
- Particular attention should be given to the oil storage tank and supply to the burner. Riello recommends that existing oil storage tanks are cleaned, inspected and any traces of water are removed BEFORE bio fuel is introduced (Contact the tank manufacturer or oil supplier for further advice). If these recommendations are not respected this will increase the risk of contamination and possible equipment failure.
- In line oil filters should be replaced making sure that they are Bio compatible. Riello recommends a good quality bio compatible oil filter at the tank and a secondary 100 micron filter are used to protect the burner pump and nozzle from contamination.
- The burner hydraulic components and flexible oil lines must be suitable for bio fuel use (check with Riello if in doubt). Riello have carefully chosen the specification of the bio compatible components including the flexible oil lines to protect the pump, safety valve and nozzle. The Riello warranty is dependent upon the use of Riello genuine components including the oil lines, being used. The burner must be commissioned and combustion parameters set to appliance manufacturer's recommendations.
- Regularly check visually for signs of oil leakage from seals, gaskets and hoses.
- It is strongly recommended that with Bio fuel use, oil filters are inspected and replaced every 4 months. More regularly where contamination is experienced.
- During extended periods of non operation and/or where burners are using oil as a standby fuel, it is strongly recommended that the burner is put into operation for short periods at least every three months.

5.5 Operating position

The burner is designed to work only in the positions **1, 2, 3** and **4**. Installation **1** is preferable, as it is the only one that allows performing maintenance operations as described in this manual. Installations **2, 3** and **4** permit operation but make maintenance and inspection of the combustion head difficult, page 33.



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

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

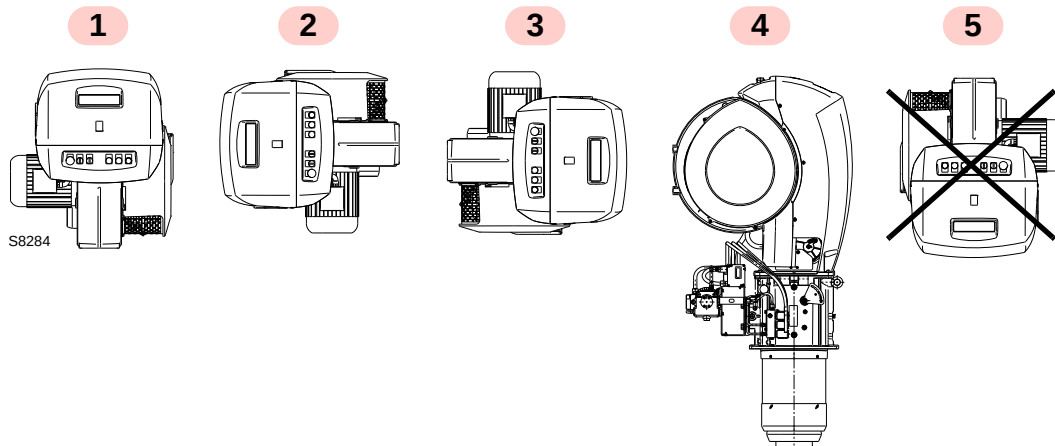


Fig. 8

5.6 Removal of the locking screws from the shutter



Remove the screws and the nuts 1)-2)(Fig. 9), before installing the burner on the boiler.

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

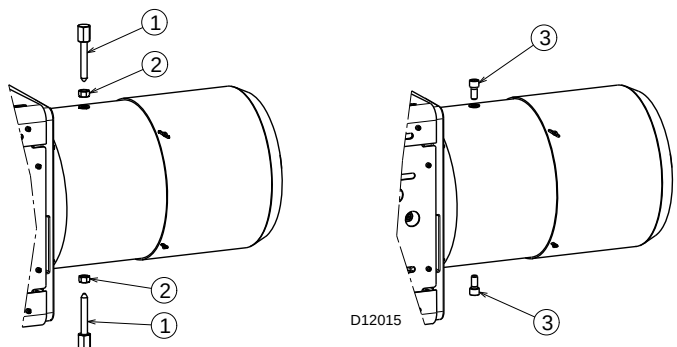


Fig. 9

5.7 Boiler plate

Drill the combustion chamber locking plate as shown in Fig. 10. The position of the threaded holes can be marked using the thermal screen supplied with the burner.

mm	A	B	C	D
RLS 300/BP MX	350	452	M 18	354
RLS 400/BP MX	350	452	M 18	354

Tab. D

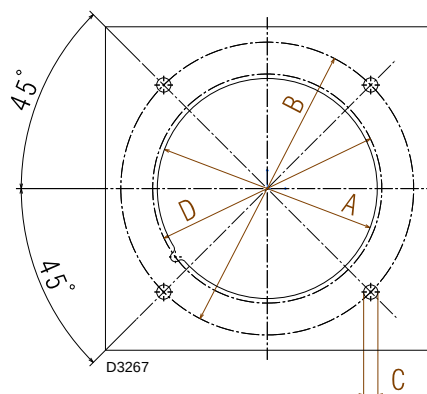


Fig. 10

5.8 Blast tube length

The length of the blast tube 4)(Fig. 11) must be selected according to the indications provided by the manufacturer of the boiler, and in any case it must be greater than the thickness of the boiler door complete with its fettling.

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

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

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

5.9 Securing the burner to the boiler

Prepare an adequate system of hoisting by hooking onto the rings 3)(Fig. 11).

Slip the thermal protection (standard equipment) onto the blast tube 4).

Place entire burner on the boiler hole (arranged previously, see Fig. 10), and fasten with the screws given as standard equipment.



The coupling of the burner-boiler must be air-tight.

WARNING

5.9.1 Accessibility to the interior of the combustion head

- Open burner at hinge (Fig. 12) after removing the 4 fixing screws 1).
- Disconnect the wires 2) from the electrodes)
- Disconnect the oil pipes by unscrewing the two connectors 3).



While unscrewing, some fuel may leak out.

CAUTION

- Unscrew the under part of the elbow 4) until it comes free of its slot.
- Extract the internal part 5) of the combustion head.

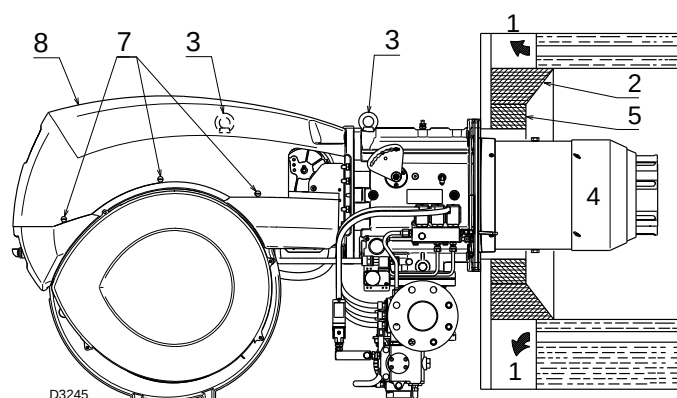


Fig. 11

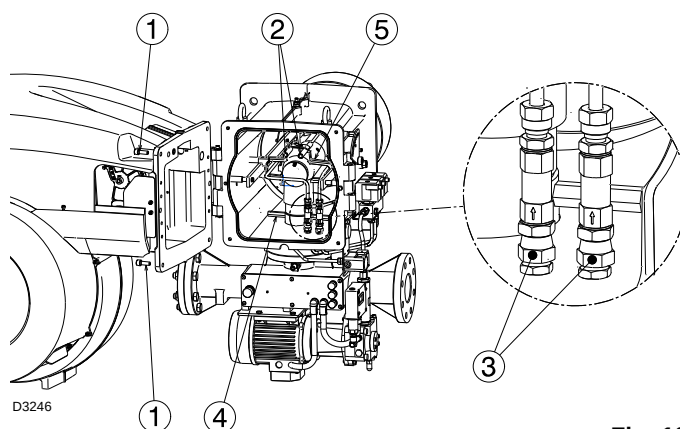


Fig. 12

5.10 Nozzle

The burner complies with the emission requirements of the EN 267 standard.

In order to guarantee that emissions do not vary, recommended and/or alternative nozzles specified by Riello in the Instruction and warning booklet should be used.



WARNING

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



CAUTION

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

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

5.10.1 Nozzles recommended

- Type **HAGO S-S - 60°** angle
- Type **HAGO LC - 60°** angle

5.10.2 Choice of nozzles for 1st and 2nd stage

Both nozzles must be chosen from among those listed in Tab. E.

- The first nozzle determines the delivery of the burner in the 1st stage.
- The second nozzle works together with the 1st nozzle to determine the delivery of the burner in the 2nd stage.

The deliveries of the 1st and 2nd stages must be contained within the value range indicated on page 9.



WARNING

Use nozzles with a 60° spray angle at the recommended pressure of 12 bar.

As a rule the two nozzles have equal deliveries but the 1st stage nozzle may have a delivery less than 50% of the total delivery when a reduction of the counter-pressure peak is desired at the moment of starting (the burner allows good combustion rates also with a 33 - 100 % ratio between the 1st and 2nd stage).

Example:

Boiler output = 1630 kW - efficiency 90 %

Output required by the burner = $1630 : 0.9 = 1812$ kW;

$1812 : 2 = 906$ KW per nozzle;

therefore, two equal, 60°, 12 bar nozzles are required:

1° = 18 GPH - 2° = 18 GPH

or the following two different nozzles:

1° = 15 GPH - 2° = 21 GPH

5.10.3 Nozzle assembly

Fit two nozzles with the box spanner 1)(Fig. 13) (16 mm), after having removed the plastic plugs 2), fitting the spanner through the central hole in the flame stability disk 3).



WARNING

Do not use any sealing products such as gaskets, sealing compound, or tape.

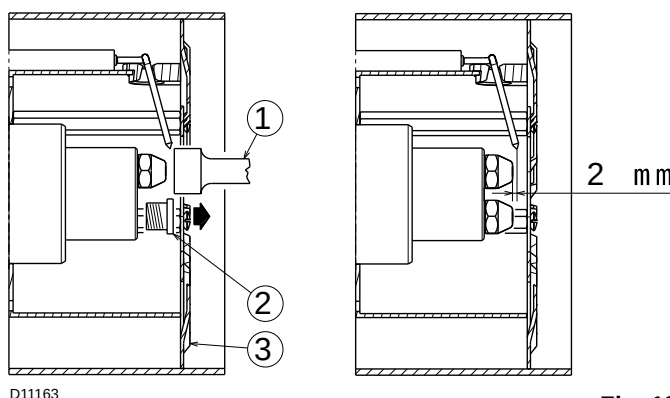
Be careful to avoid damaging the nozzle sealing seat.

The nozzles must be screwed into place tightly but not to the maximum torque value provided by the wrench.

The nozzle for the 1st stage of operation is the one lying beneath the firing electrodes Fig. 14.

Type	GPH	kg/h			kW 12 bar
		10 bar	12 bar	14 bar	
HAGO S-S - 60°	12.0	44.16	48.73	52.96	582.36
	13.0	47.84	52.79	57.38	630.89
	14.0	51.52	56.86	61.79	679.42
	15.0	55.20	60.92	66.20	727.95
	16.0	58.88	64.98	70.62	776.48
	17.0	62.57	69.04	75.03	825.01
	18.0	66.25	73.10	79.44	873.54
	19.0	69.93	77.16	83.86	922.07
	20.0	73.61	81.22	88.27	970.60
	22.0	80.97	89.34	97.10	1067.66
	24.0	88.33	97.47	105.93	1164.72
	26.0	95.69	105.59	114.75	1261.78
	28.0	103.05	113.71	123.58	1358.84
	30.0	110.41	121.83	132.41	1455.90
HAGO LC - 60°	35.0	128.81	142.14	154.48	1698.55
	40.0	147.21	162.44	176.54	1941.20
	45.0	165.61	182.75	198.61	2183.85
	50.0	184.02	203.05	220.68	2426.50
	55.0	202.42	223.36	242.75	2669.15
	60.0	220.82	243.67	264.82	2911.80
	65.0	239.22	263.97	286.88	3154.45
	70.0	257.62	284.28	308.95	3397.10

Tab. E



D11163

Fig. 13

5.11 Position of electrodes

Make sure that the electrodes are positioned as shown in Fig. 14.

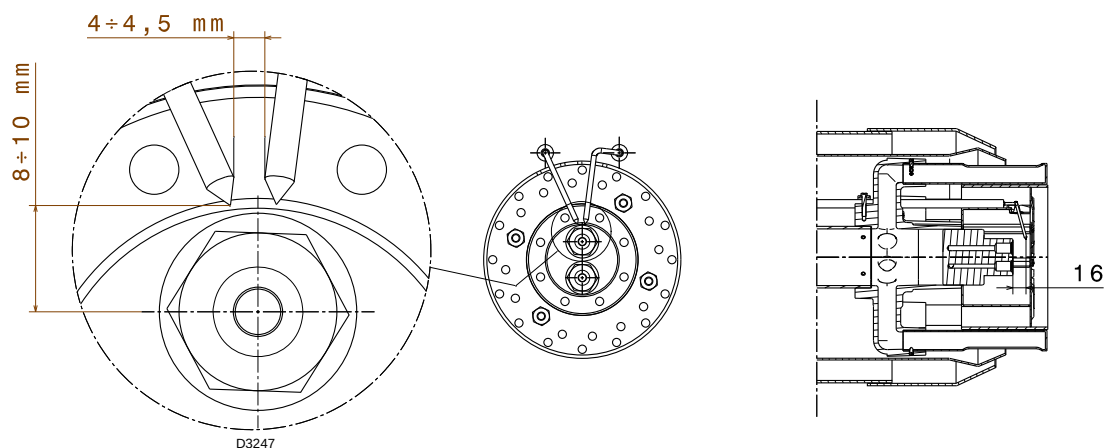


Fig. 14

5.12 Gas oil supply



WARNING

Where gas oil containing bio diesel is in use, it is recommended to avoid over oxygenation of the blended fuels.

Where at all possible avoid the use of two pipe systems where the circulated fuel is returned to the tank.

If this cannot be avoided make sure that the return pipe is normally below the surface of the fuel level within the storage tank.



WARNING

In case of use with gas oil containing up to 10% Bio blend, it will be essential to use flexible oil lines suitable for bio fuel use.

Please contact Riello for further information.



DANGER

It is strongly recommended a periodic check of the pump pressure operation (annually or better every six months, if the burner operation is continuous).



CAUTION

You are advised to use additional filters on the fuel supply line.

Riello recommends a good quality fuel filter at the tank (Fig. 15 - Fig. 16) and a secondary filter (100 µ for gas oil and 15 µ for kerosene) are used to protect the burner pump and nozzle from contamination.

In case of Biodiesel use, pay attention to install Biocompatible filters.

5.12.1 Double-pipe circuit

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

The tank higher than the burner A (Fig. 15)

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

The tank lower than the burner B (Fig. 15)

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

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

5.12.2 The loop circuit

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

A branch connection from the loop goes to feed the burner. This circuit is extremely useful whenever the burner pump does not succeed in self-priming because the tank distance and/or height difference are higher than the values listed in the Tab. F.

Note:

we advise you to fit, on the loop circuit, an oil pressure switch connected to the thermostatic series. It will provide clearance to the burner only if there is pressure.

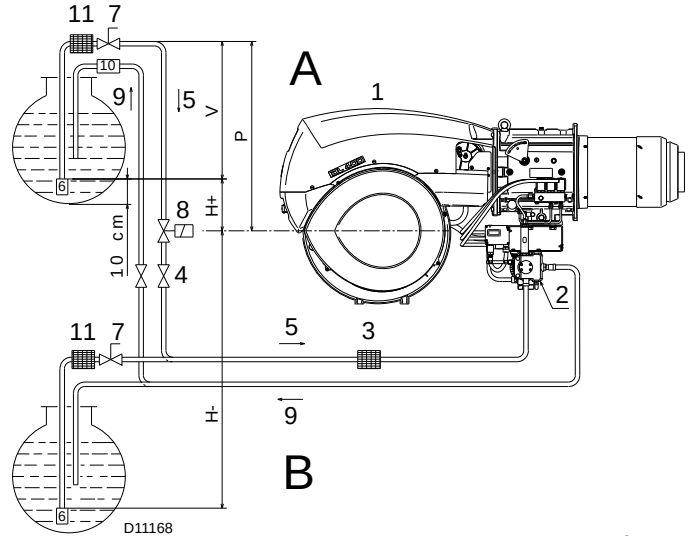


Fig. 15

Key (Fig. 15)

- H Pump/Foot valve height difference
- L Piping length
- Ø Inside pipe diameter
- 1 Burner
- 2 Pump
- 3 Filter
- 4 Manual on/off valve
- 5 Suction line
- 6 Foot valve
- 7 Rapid closing manual valve remote controlled (only Italy)
- 8 On/off solenoid valve (only Italy)
- 9 Return line
- 10 Check valve (only Italy)
- 11 Tank filter

+/- H (meters)	L (meters)	
	Ø 16 (mm)	Ø 18 (mm)
+ 4.0	60	80
+ 3.0	50	70
+ 2.0	40	60
+ 1.5	35	55
+ 1.0	30	50
+ 0.5	25	45
0	20	40
- 0.5	18	35
- 1.0	15	30
- 1.5	13	25
- 2.0	10	20
- 3.0	5	10
- 4.0	-	6

Tab. F

5.12.3 Single-pipe circuit

In order to obtain single-pipe working it is necessary to unscrew the return hose, remove the by-pass screw 6)(Fig. 17) and then screw the plug 7).

The distance "P" must not exceed 10 meters in order to avoid subjecting the pump's seal to excessive strain; the distance "V" must not exceed 4 meters.

For the priming pump loosen the screw 4)(Fig. 18) in order to bleed off the air contained in the suction line and wait until the fuel flows out.

Key (Fig. 16)

- H Pump/Foot valve height difference
- L Piping length
- Ø Inside pipe diameter
- 1 Burner
- 2 Pump
- 3 Filter
- 4 Manual on/off valve
- 5 Suction line
- 6 Foot valve
- 7 Rapid closing manual valve remote controlled (only Italy)
- 8 On/off solenoid valve (only Italy)
- 11 Tank filter

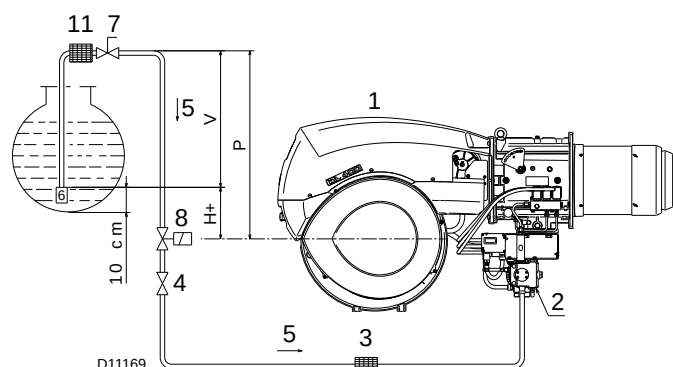


Fig. 16

+/- H (meters)	L (meters)	
	Ø 16 (mm)	Ø 18 (mm)
+ 4.0	60	80
+ 3.0	50	70
+ 2.0	40	60
+ 1.5	35	55
+ 1.0	30	50
+ 0.5	25	45

Tab. G

5.13 Hydraulic connections

The pumps are equipped with a by-pass that connects return line and suction line. The pumps are installed on the burner with the by-pass closed by screw 6)(Fig. 17).

It is therefore necessary to connect both hoses to the pump. The pump will break immediately if it is run with the return line closed and the by-pass screw inserted.

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

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



WARNING

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

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

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

5.14 Hydraulic system layout

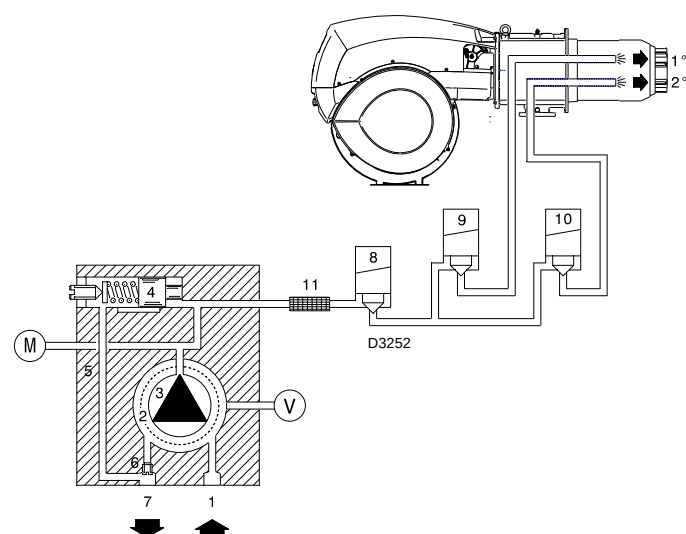


Fig. 17

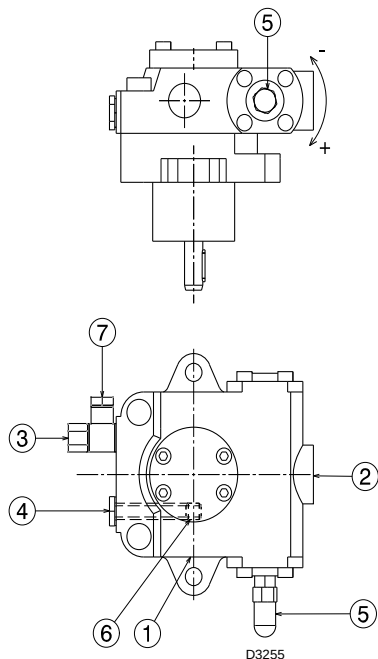
Key (Fig. 17)

- 1 Pump suction
- 2 Filter
- 3 Pump
- 4 Pressure governor
- 5 Return pipe
- 6 By-pass screw
- 7 Pump return
- 8 Safety solenoid
- 9 1st stage valve
- 10 2nd stage valve
- 11 Filter
- M Pressure gauge
- V Vacuumeter

5.15 Pump



In case of use with gas oil containing up to 10% Bio blend, it will be essential to use flexible oil lines suitable for bio fuel use. Please contact Riello for further information.



- Key (Fig. 18)
- | | | |
|---|----------------------------|--------|
| 1 | Suction | G 1/2" |
| 2 | Return | G 1/2" |
| 3 | Pressure switch attachment | G 1/8" |
| 4 | Vacuum meter attachment | G 1/8" |
| 5 | Pressure adjustment screw | |
| 6 | Screw for by-pass | |
| 7 | Pressure gauge attachment | G 1/4" |

Fig. 18

5.15.1 Technical data

Suntec TA2

Min. delivery rate at 12 bar pressure	kg/h	480
Delivery pressure range	bar	7 - 40
Max. suction depression	bar	0.45
Viscosity range	mm ² /s (cSt)	3 - 75
Max. gas oil temperature	°C	140
Max. suction and return pressure	bar	5
Pressure calibration in the factory	bar	30

Tab. H

5.15.2 Pump priming



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

Obstructions in the line could cause the sealing organ located on the pump shaft to break. (The pump leaves the factory with the by-pass closed).

- For self-priming to take place, the screw 4)(Fig. 18) of the pump must be loosened in order to bleed off the air contained in the suction line.
- Start the burner by closing the remote controls. Check the fan wheel rotation direction as soon as the burner starts.
- The pump is primed when gas oil comes out of screw 4)(Fig. 18). Stop the burner and screw screw 4) in.

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

If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner, and then repeat the starting operation as often as required.

After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

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



The a.m. operation is possible because the pump is already full of fuel when it leaves the factory.

If the pump has been drained, fill it with fuel through the opening on the vacuum meter 4)(Fig. 18) prior to starting; otherwise, the pump will seize.

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

5.16 Gas supply

5.16.1 Gas line

The gas train is to be connected on the right of the burner, by flange 1)(Fig. 19).

- If it is necessary to connect it on the left of the burner,
- loosen nuts and screws 3) and 4),
- remove blind flange 2) together with its gasket and fit them to flange 1) tightening the nuts and screws.



Once assembled the gas train, check for leaks.

5.16.2 Gas train

It is type-approved according to EN 676 Standards and is supplied separately from the burner with the code indicated in Tab. I.

Type	Ø	Code	9 (VPS)
VGDF 50	2"	3970215	3010367
VGDF 65	DN 65	3970212	3010367
VGDF 80	DN 80	3970213	3010367
VGDF 100	DN 100	3970214	3010367

Tab. I

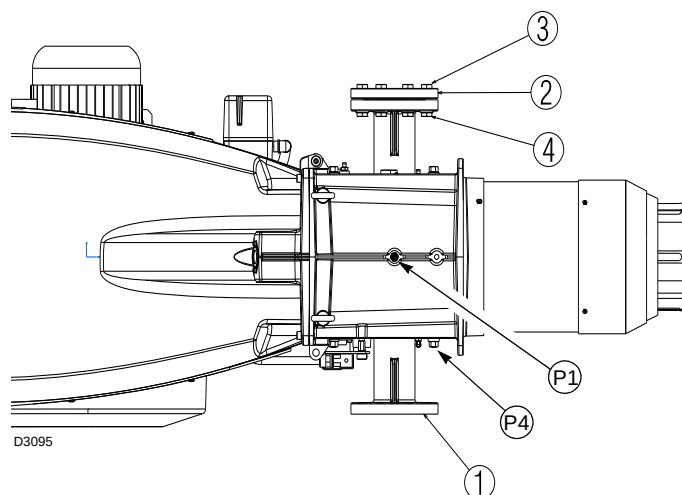


Fig. 19

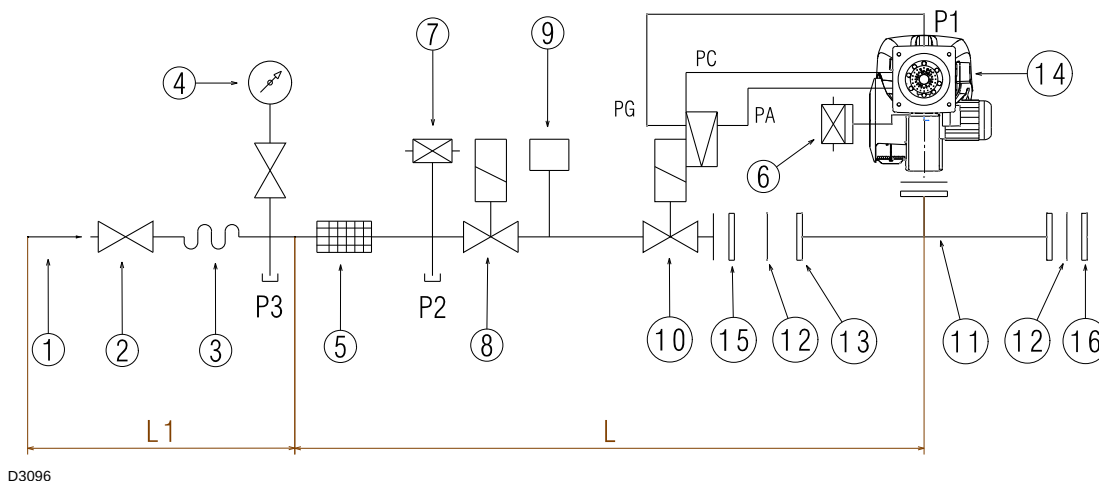


Fig. 20

Key (Fig. 20)

- 1 Gas input pipe
- 2 Manual valve
- 3 Vibration damping joint
- 4 Pressure gauge with pushbutton cock
- 5 Filter
- 6 Maximum gas pressure switch
- 7 Minimum gas pressure switch
- 8 Safety solenoid VS
- 9 Gas valve 8)-9) leak detection control device. In accordance with EN 676 Standards, gas valve leak detection control devices are compulsory for burners with maximum outputs of more than 1200 kW.
- 10 Adjustment solenoid
- 11 Gas train/burner adapter
- 12 Standard issue burner gasket with flange
- 13 Flange gasket
- 14 Burner
- 15 Gas train / burner adapter (not present on gas train DN80). Use adapter code 3010222 if the burner is fitted on the LH side with hinge on the left.

16 Blind flange

P1 Pressure at combustion head

P2 Pressure down-line from the filter

P3 Pressure up-line from the filter

PA Air pressure

PC Combustion chamber pressure

PG Gas pressure

L Gas train supplied separately with the code indicated in Tab. I.

L1 The responsibility of the installer.

NOTE

See the accompanying instructions for the adjustment of the gas train.

5.16.3 Gas pressure

The Tab. J shows minimum pressure losses along the gas supply line depending on the maximum burner output operation.

	kW	1 Δp (mbar)		2 Δp (8 - 10) (mbar)							
				3970215		3970212		3970213		3970214	
		G 20	G 25	G 20	G 25	G 20	G 25	G 20	G 25	G 20	G 25
RLS 300/BP MX	1250	2.7	4.0	12.4	18.3	4.7	7.0	2.9	4.2	1.1	1.5
	1500	5.3	7.9	17.7	25.9	6.7	9.8	4.1	6.0	1.5	2.1
	1750	7.9	11.8	23.8	34.8	9.0	13.3	5.5	8.0	2.0	2.9
	2000	10.5	15.7	30.6	44.8	11.6	17.1	7.1	10.3	2.5	3.7
	2250	12.9	19.2	38.4	56.2	14.7	21.4	8.8	12.8	3.2	4.7
	2500	15.3	22.8	46.8	68.8	17.9	26.1	10.7	15.6	3.9	5.7
	2750	17.6	26.3	56.3	82.4	21.4	31.2	12.8	18.7	4.7	6.9
	3000	20.0	29.8	66.6	97.3	25.2	36.9	15.1	22.2	5.5	8.0
	3250	23.5	35.0	77.5	113.5	29.3	43.1	17.5	25.9	6.4	9.3
	3500	26.9	40.1	89.2	130.8	33.8	49.8	20.3	29.8	7.4	10.8
	3650	29.0	43.2	96.6	141.8	36.6	54.1	22.0	32.3	8.0	11.7
RLS 400/BP MX	1800	7.0	11.4	25.1	36.7	9.5	14.0	5.8	8.5	2.1	3.0
	2050	9.8	14.7	32.1	46.9	12.2	18.0	7.4	10.8	2.7	3.9
	2300	12.6	18.1	40.0	58.6	15.3	22.3	9.2	13.3	3.3	4.9
	2550	15.4	21.4	48.6	71.4	18.6	27.0	11.1	16.2	4.0	5.9
	2800	18.3	24.7	58.3	85.3	22.2	32.3	13.3	19.4	4.9	7.1
	3050	20.9	28.0	68.7	100.4	26.0	38.1	15.6	22.9	5.7	8.3
	3300	22.4	31.5	79.8	116.9	30.2	44.4	18.1	26.7	6.6	9.6
	3550	23.9	34.9	91.6	134.4	34.8	51.2	20.9	30.6	7.6	11.1
	3800	25.4	38.3	104.4	153.2	39.6	58.4	23.8	34.8	8.6	12.6
	4050	27.4	41.8	118.0	173.2	44.9	65.9	26.9	39.2	9.7	14.2
	4300	31.3	46.6	132.4	194.4	50.4	73.8	30.2	44.0	10.9	15.8
	4500	36.0	50.0	150.7	212.1	57.5	80.5	34.3	48.1	12.4	17.3

Tab. J

Column 1 (Tab. J)

Pressure loss at combustion head.

Gas pressure measured at test point P1)(Fig. 19), with:

- combustion chamber at 0 mbar
- combustion head adjusted as indicated in diagram (Fig. 24 at page 26).

Column 2 (Tab. J)

Pressure loss of gas train with gas G20 includes:

- adjustment solenoid
- safety solenoid
- min gas pressure switch
- filter

The values shown in the Tab. J refer to:

natural gas G 20 PCI 10 kWh/Nm³ (8.6 Mcal/Nm³)

With:

natural gas G 25 PCI 8.6 kWh/Nm³ (7.4 Mcal/Nm³) multiply tabulated values:

- column 1: by 1.3
- column 2: by 1.49

Calculate the approximate maximum output of the burner thus:

- subtract the combustion chamber pressure from the gas pressure measured at test point P1)(Fig. 19).
- Find the nearest pressure value to your result in column 1 of the Tab. J.
- Read off the corresponding output on the left.

Example with natural gas G20 - RLS 400/BP MX model

- Maximum output operation
- Gas pressure at test point P1)(Fig. 19) = 19.4 mbar
- Pressure in combustion chamber = 3 mbar

$$22.4 - 3 = 22.4 \text{ mbar}$$

A maximum output of 3300 kW shown in Tab. J corresponds to 22.4 mbar pressure, column 1, gas G20.

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

To calculate the required gas pressure at test point P1)(Fig. 19), set the maximum output required from the burner operation:

- find the nearest output value in the Tab. J.
- Read off the pressure at test point P1)(Fig. 19) on the right in column 1.
- Add this value to the estimated pressure in the combustion chamber.

Example with natural gas G20 - RLS 400/BP MX model

- Required burner maximum output operation: 3300 kW
- Gas pressure at burner output of 3300 kW, column 1 = 22.4 mbar
- Pressure in combustion chamber = 3 mbar

$$22.4 + 3 = 25.8 \text{ mbar}$$

pressure required at test point P1)(Fig. 19).

6 Electrical system

6.1 Notes on safety for the electrical wiring



DANGER

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination. Refer to the wiring diagrams.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the wiring diagrams.
- Do not invert the neutral with the phase in the electrical supply line. Any inversion would cause a lockout due to firing failure.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- The burners have been set for intermittent operation. This means they should compulsorily be stopped at least once every 24 hours to enable the control box to perform checks of its own start-up efficiency. Normally the boiler's thermostat/pressure switch ensures the stopping of the burner. If this is not the case, it is necessary to apply in series with IN a timer switch that turns off the burner at least once every twenty-four 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.
- The electrical system must be suitable for the maximum input power of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the device.
- For the main power supply of the device from the electricity mains:
 - do not use adapters, multiple sockets or extensions;
 - use an omnipolar switch, as indicated by the current 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

isolate the fuel supply.

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

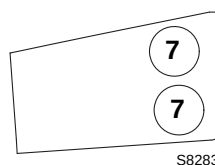
6.2 Electrical connections



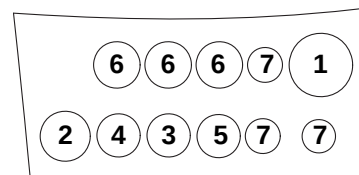
WARNING

Electrical wiring must be made in accordance with the regulations currently in force in the country of destination and by qualified personnel.

Riello S.p.A. declines all liability for modifications or connections other than those shown on these diagrams.



S8283



6.2.1 Entry for power cables and external leads

Key (Fig. 21)

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

Fig. 21

7 Start-up, calibration and operation of the burner

7.1 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.

7.2 Burner firing

Set switch 1)(Fig. 22) to "MAN" position.

During the first firing, during the passage from the 1st to the 2nd stage, there is a momentary lowering of the fuel pressure caused by the filling of the 2nd stage nozzle tubing.

This lowering of the fuel pressure can cause the burner to lock-out and can sometimes give rise to pulsations.

Once the following adjustments have been made, the firing of the burner must generate a noise similar to the noise generated during operation.

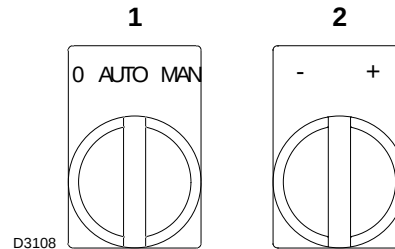


Fig. 22

7.3 Adjustment before first firing (gas oil operation)

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

Adjust successively:

- Combustion head
- 1st and 2nd stage nozzles
- Pump pressure
- 1st and 2nd stage fan air gate valve

7.3.1 Combustion head setting

The setting of the combustion head depends exclusively on the burner delivery.

Loosen the screw 1)(Fig. 23) and turn the graduated sector 2) according diagram (Fig. 24).

Example:

the burner RLS 400/BP MX with two 60 GPH nozzles and 12 bar pump pressure.

Find the delivery of the two 30 GPH nozzles in (Tab. E at page 18): $1455.9 + 1455.9 = 2911.8$ kW.

Diagram (Fig. 24) indicates that for a delivery of 2911.8 kW the burner requires the combustion head to be set to approx. 2 notches.

7.3.2 1st and 2nd stage nozzles

See the information listed at page 18.

7.3.3 Pump pressure

12 bar: this is the pressure calibrated in the factory which is usually sufficient for most purposes.

Sometimes, this pressure must be adjusted to:

10 bar: in order to reduce fuel delivery. This adjustment is possible only if the surrounding temperature remains above 0 °C;

14 bar: in order to increase fuel delivery or to ensure firings even at temperatures of less than 0 °C. In order to adjust pump pressure, use the screw 5)(Fig. 18 at page 22).

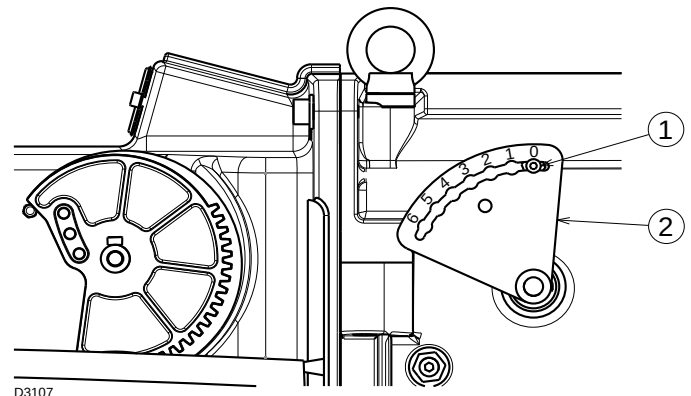


Fig. 23

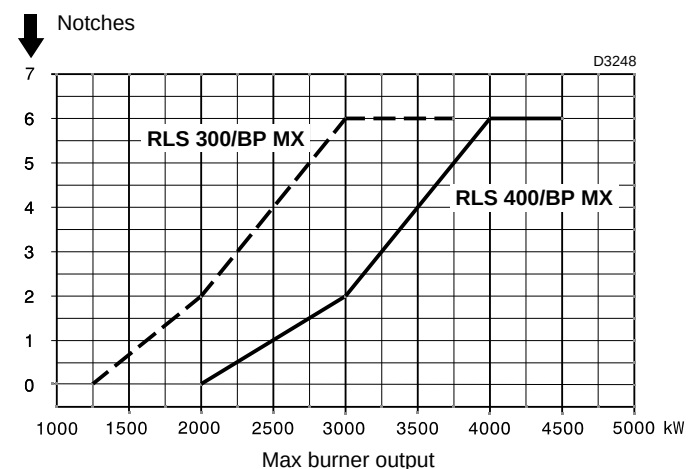


Fig. 24

7.3.4 1st and 2nd stage fan air gate valve

See adjustments of the "Servomotor" at page 27.

7.4 Servomotor

The servomotor (Fig. 25) simultaneously regulates, through a transmission system, air delivery and pressure and delivery of the fuel in use.

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

- Cam 1:** Sets the servomotor limit switch to max. position (80° ca.) (gas oil and gas operation).
- Cam 2:** Sets the servomotor limit switch to 0° position. When the burner is off, the air damper is completely closed.
- Cam 3:** Regulates minimum modulation delivery. It is factory calibrated in the 20° position (gas operation at minimum).
- Cam 4:** Sets the servomotor limit switch to max position (30° ca) (gas oil operation at minimum).
- Cam 5:** Regulates minimum modulation delivery. It is factory calibrated in the 50° (gas oil operation at 2nd stage).

Rem. cam: No utilized.

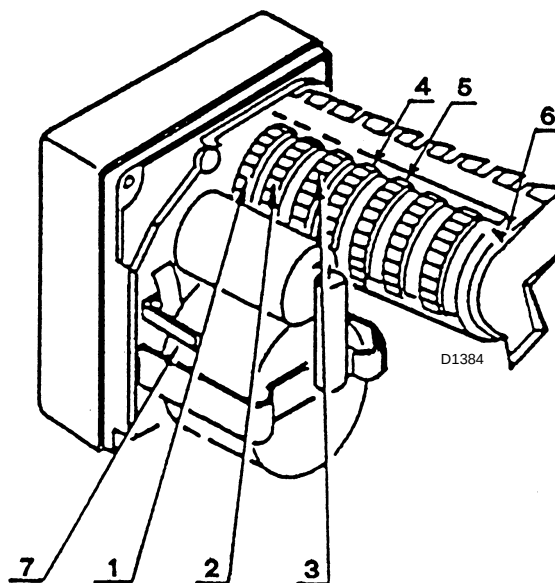


Fig. 25

7.5 Combustion air adjustment

Fuel/combustion air must be synchronized using the proportioning valve.

To reduce pressure loss and to have a wider adjustment range, it is best to set the servomotor to the maximum output used, as near to maximum opening (90°) as possible.

7.5.1 Air adjustment for maximum output

Set the servomotor to maximum opening (near 90°) so that the air butterfly valves are fully open.

Loosen screw 2)(Fig. 26) under the burner's intake and close grille 1) progressively until you achieve the required output.

The only time reducing intake to a partial setting is not necessary is when the burner is working at the top of the operating range given at page 12.



WARNING

We recommend you achieve the maximum output required manually, and adjust intake to the partial setting, define gas pressure and adjust the combustion head before completing the setting.

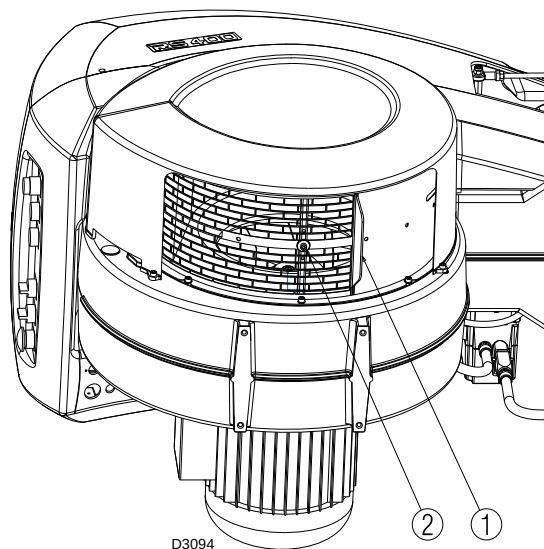


Fig. 26

7.6 Adjustment before first firing (gas operation)

Adjustment of the combustion head has been illustrated on page 26.

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 start of the scale.
- Adjust the air pressure switch to the zero position of the scale.
- Purge the air from the gas line.
Continue to purge the air (we recommend using a plastic tube routed outside the building) until gas is smelt.
- Fit a U-type manometer or a differential pressure gauge (Fig. 27), with the (+) fitting on the header gas pressure tap and (-) fitting in the combustion chamber.
The manometer readings are used to calculate MAX. burner power using the Tab. J at page 24.
- Connect two lamps or testers to the two gas line solenoid valves to check the exact moment at which voltage is supplied.
This operation is unnecessary if each of the two solenoid valves is equipped with a pilot light that signals voltage passing through.

Before starting up the burner it is good practice to adjust the gas train so that ignition takes place in conditions of maximum safety, i.e. with gas delivery at the minimum.

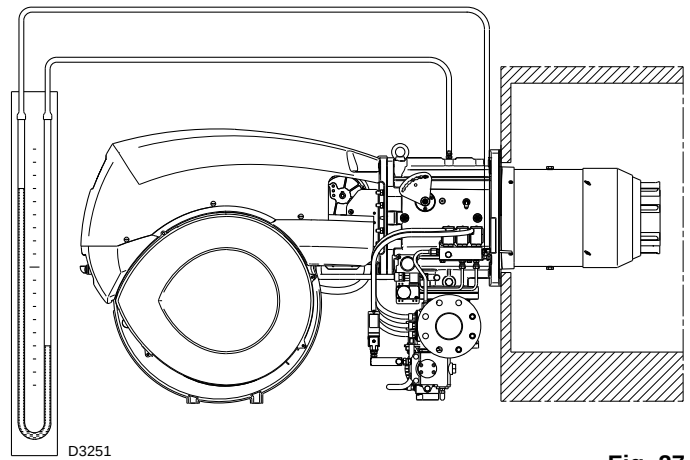


Fig. 27

7.7 Burner starting

Close the control devices and set switch 1)(Fig. 28) to "MAN" position.

Make sure that the lamps or testers connected to the solenoids, or pilot lights on the solenoids themselves, indicate that no voltage is present.

If voltage is present, then immediately stop the burner and check electrical connections.

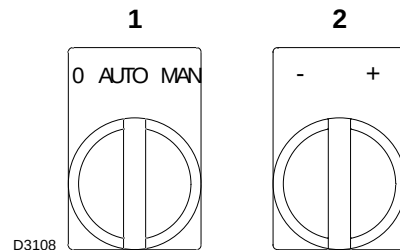


Fig. 28

7.8 Burner firing

Having completed the checks indicated in the previous heading, the burner should fire. If the motor starts but the flame does not appear and the control box goes into lock-out, reset and wait for a new firing attempt.

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

In this case increase gas firing delivery. The arrival of gas at the sleeve is indicated by the U-type manometer (Fig. 27).

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

7.9 Proportioning gas valve with air/gas ratio controller

7.9.1 Description

The SKP75 controls the gas pressure as a function of the combustion air pressure so that the gas to air ratio remains constant over the entire output range of the burner.

Using the SKP75, a separate gas pressure governor is not required. The gas train is thus shorter, simpler and offers considerable savings.

Design features of the controller

The controller is fitted to the housing of the valve actuator and has two diaphragms 1)(Fig. 29) which, via a lever system, act on a ball valve 2) located in a bypass 3) of the pump 4).

The pressure of the combustion air acts on one diaphragm, the gas pressure downstream of the valve on the other.

The gas to air pressure ratio can be adjusted from 0.4 to 9 and the selected value is indicated in a viewing glass.

The selected characteristic for the pressure ratio can also be displaced parallel (+/-), either towards "excess air" or "lack of air", to increase the amount of air at low-fire levels, for example.

The extent of parallel displacement is indicated in another viewing glass. The controller can be adjusted during burner operation. Depending on pressure conditions, the control accuracy is between 2 and 10%.

Safety Shutoff Function

The electro-hydraulic actuator consists of a cylinder filled with oil and a piston containing an electric oscillating pump and a hydraulic relief system.

When power is supplied to the actuator, the pump located at the base of the piston moves oil from the reservoir (through an orifice) into the pressure chamber.

The oil flow from the pump through the orifice creates a pressure difference moving the diaphragm and the attached spring loaded plug to the left, closing the return flow path from the pressure chamber to the reservoir.

This action causes the piston to move downward in the cylinder opening the gas valve.

When power to the pump is interrupted, the pressure difference across the orifice instantly reduces to zero.

The plug is immediately pushed to the right allowing the oil to flow back from the pressure chamber into the reservoir, closing the valve in less than 0.8 seconds.

This unique hydraulic relief system provides definite closure of the associated gas valve guaranteeing fail safe operation.

A visible disk fitted to the pump shaft indicates the entire stroke range of the actuator.

The disk also operates optional potential free switches via a set of levers.

The switching position of the auxiliary switch is adjustable over the entire stroke. The proof of closure switch is non-adjustable.

Regulating function

When the gas valve is closed, i.e. during the pre-purge and pre-ignition time, only the air supplied by the fan acts on the controller. It causes the air diaphragm to move to the left and, via the lever system, the gas diaphragm to move to the left, thus closing the by-pass valve in the actuator of the gas valve.

The actuator can therefore open the gas valve if, at the beginning of the safety time, the burner control gives the appropriate command.

When the gas valve opens, the pressure downstream of the valve increases immediately and thus the pressure at the gas diaphragm.

As soon as the forces acting on both diaphragms are in balance, the by-pass valve in the actuator is opened to such an extent that the return flow through the by-pass valve and the flow supplied by the pump are identical.

This means that the piston of the actuator and thus the disc of the valve remain in the position reached.

If heat demand increases and the air damper opens further, or the speed of the fan increases, the controller closes again the by-pass valve, due to the greater pressure on the air diaphragm, so that the actuator opens the gas valve further until the forces acting on the diaphragms are in balance again.

The gas to air pressure ratio and thus the gas to air volume ratio remain constant over the entire output range, provided the orifices in the burner head do not change during output variations either for the combustion air or for the gas.

Because of the small mixing energy at the low-fire level it is often necessary to provide somewhat more air in order to achieve optimum combustion.

The characteristic of the controller can therefore be displaced parallel.

Very simplified sectional view

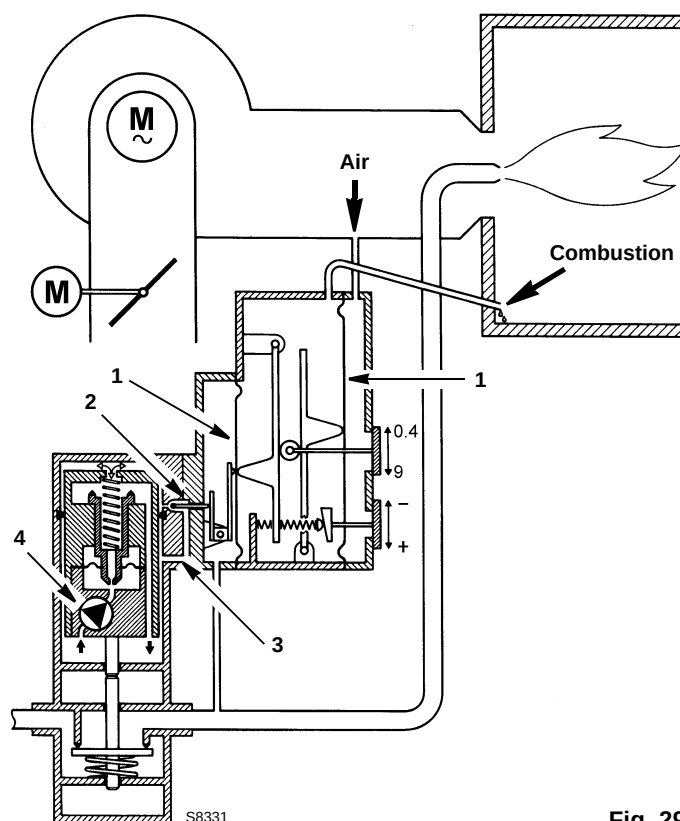


Fig. 29

Key (Fig. 29)

- 1 Diaphragms
- 2 Ball valve
- 3 By-pass
- 4 Pump

Controller's working characteristic (Fig. 30)

- A Gas to air ratio for stoichiometric combustion.
- B Adjusted gas to air ratio for burner operation with excess air. The excess air in percent is constant over the entire range.
- C When the working characteristic is displaced parallel, the amount of excess air in percent in low-fire operation is greater. The controller permits a parallel displacement either towards "excess air" or "lack of air".

Resulting effects on pressure

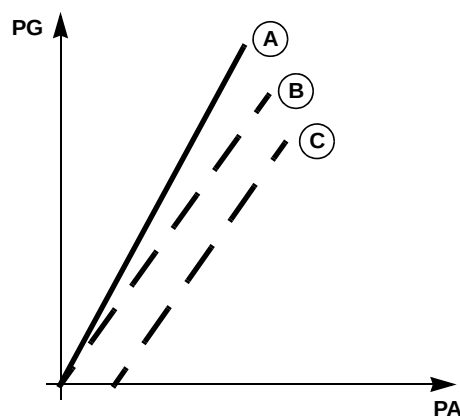


Fig. 30

Considering the pressure in the combustion chamber

If the resistance value of the system "Combustion chamber - flue-ways - stack" is constant, the combustion chamber pressure changes in proportion to the gas and combustion air pressure as the burner's output changes.

If, however, the combustion chamber pressure does not change in proportion to the gas or air pressure, which is the case in plants using a flue gas fan or a modulating flue gas damper, for instance, a compensating circuit is required.

This circuit should also be used if pressure shocks or vibrations, which adversely affect burner start-up, occur in the combustion chamber during the start-up sequence.

It must always be taken into account that the burner output decreases as the combustion chamber pressure increases, and vice versa.

7.9.2 Installation



All installation must be carried out by qualified personnel only.

SKP75 is easily mounted on the square flange of any VG... valve by means of 4 screws.

No gaskets or seals are required when mounting the actuator.

The square mounting flange can be rotated in steps of 90° providing four different mounting positions. The actuator can be mounted or replaced while the gas valve is under pressure.

The actuator should be mounted so that the stroke position indicator is clearly visible.



The pressure connection pipes should be as short as possible to allow the regulator to react to sudden changes.

The connection pipe for the combustion chamber pressure must be installed so that condensing flue gases cannot enter into the regulator but run back into the combustion chamber. If necessary, a water separator must be installed.

7.9.3 Start-up

- 1 Set the gas to air ratio to the desired value using adjusting screw 1 on the left (rough setting) and then set the working characteristic using adjusting screw 2)(Fig. 31) with the small flame symbol, moving it towards zero.
- 2 Start the burner and run it at approximately 90% of full capacity.
- 3 Measure CO₂ or O₂ content in the flue gases and correct the ratio by adjusting screw 1 until optimum values are obtained.
- 4 Return to low fire and measure the CO₂ or O₂ content in the flue gases.
If necessary, correct the setting by adjusting screw 2)(Fig. 31) until optimum values are obtained.
- 5 Limit the damper position for low fire operation (see servomotor adjustment).

The markings on the adjusting screws have the following meaning:

- + more gas
- less gas

If a significant parallel displacement of the working characteristic was necessary to obtain optimum CO₂ and O₂ values at minimum output operation, the adjustment of the pressure ratio at nominal load or at 90% of the nominal load must be checked again and corrected if necessary.

- 6 Run the burner at the required output and limit the air damper position or adjust intake to a partial setting.
If, with the servomotor fully opened, the air is insufficient to guarantee the maximum required output, reset the combustion head to the following numerically higher notch, thus increasing head opening and therefore air delivery.
In any case air pressure (PA) at burner head must not exceed the maximum value of 50 mbar.
- 7 Check the flue gas values at several intermediate output levels. If corrections are necessary, note the following:
 - adjust the pressure ratio screw 1)(Fig. 31) at high fire operation only;
 - adjust the bias screw 2)(Fig. 31) at low fire operation only.



When firing at maximum burner capacity, ensure that the SKP75... /VG... is not in the fully open position. If this is the case, either the gas valve is sized too small or the gas supply pressure is too low.

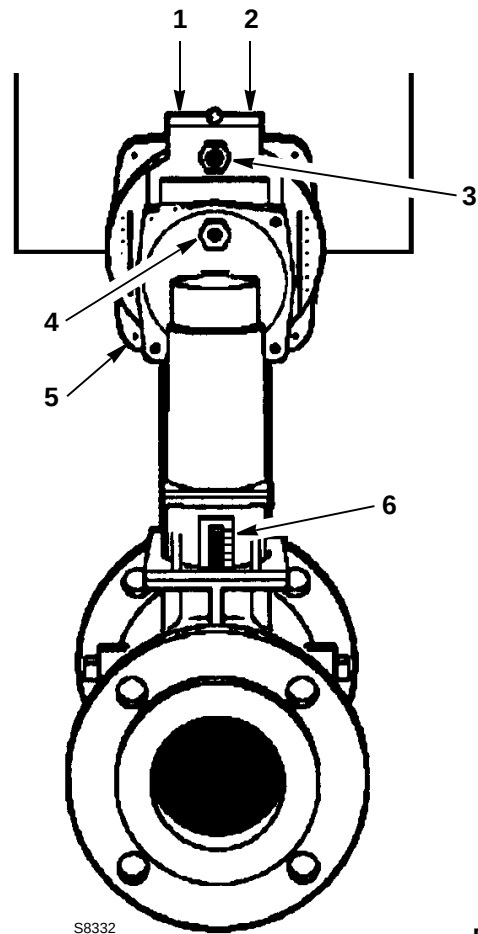


Fig. 31

Key (Fig. 31)

- 1 Adjustment and indication of the gas to air ratio
- 2 Adjustment and indication of working characteristic's parallel displacement
- 3 Test point for the combustion chamber pressure
- 4 Test point for the gas pressure
- 5 Test point for the combustion air pressure
- 6 Stroke indication

7.10 Pressure switches final calibration

7.10.1 Air pressure switch - CO check

If burners feature a gas proportioning valve with air/gas ratio regulator, the only purpose of the air pressure switch is to report whether there is air or not.

Setting is recommended nonetheless.

Adjust the air pressure switch (Fig. 32) after having performed all other burner adjustments with the air pressure switch set to the start of the scale.

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

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

If the burner locks out again, turn the knob anti-clockwise a little bit more.

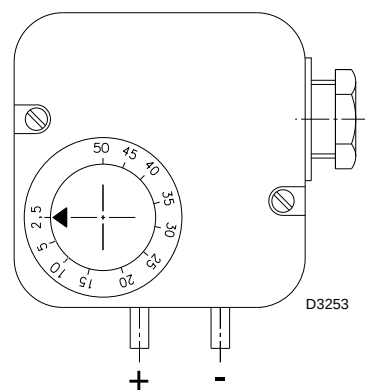


Fig. 32

7.10.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 33) after having performed all the other burner adjustments with the pressure switch set at the end of the scale.

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

Then turn the knob clockwise by 2 mbar and repeat burner starting to ensure it is uniform.

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

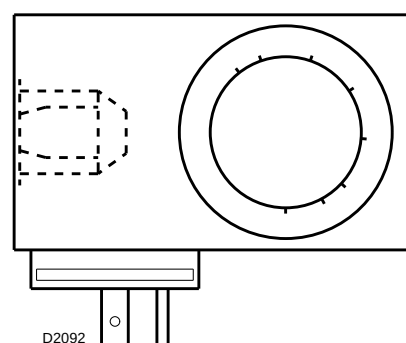


Fig. 33

7.10.3 Minimum gas pressure switch

Adjust the minimum gas pressure switch (Fig. 34) after having performed all the other burner adjustments with the pressure switch set at 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 anti-clockwise by 2 mbar and repeat burner starting to ensure it is uniform.

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

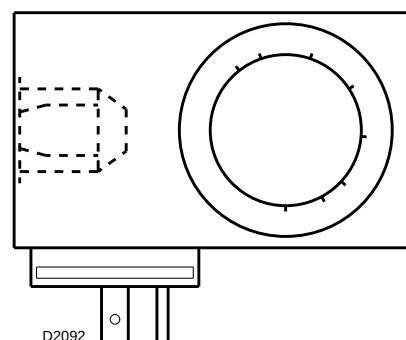
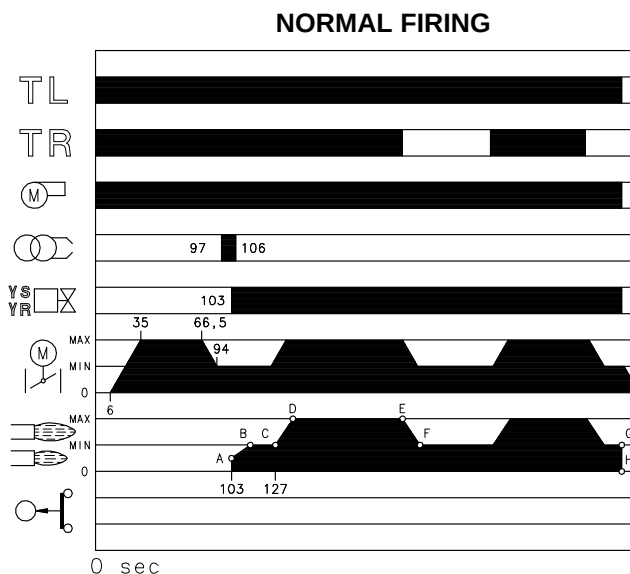


Fig. 34

7.11 Burner operation

7.11.1 Burner starting

- 0s: Load control TL closes.
Fan motor starts.
- 6s: Servomotor starts: 90° rotation to right, until contact is made on cam 1)(Fig. 25 at page 27).
The air gate valve is positioned to MAX. output.
- 35s: Pre-purge stage with air delivery at MAX. output.
Duration 31.5 seconds.
- 66.5s: Servomotor rotates to left up to the angle set on cam 3)(Fig. 25 at page 27) (between 3 and 10°).
- 94s: The air gate valve and the gas butterfly are positioned to MIN. output. (with cam 3)(Fig. 25 at page 27) at 3°).
- 97s: Ignition electrode strikes a spark.
- 103s: Safety valve YS and adjustment valve YR (rapid stroke) open. The flame is ignited at a low output level (point A).
Delivery is then progressively increased, with the valve opening slowly up to MIN output, point B.
- 106s: The spark goes out.
- 127s: The control box starting cycle ends.



7.11.2 Burner flame goes out during operation

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

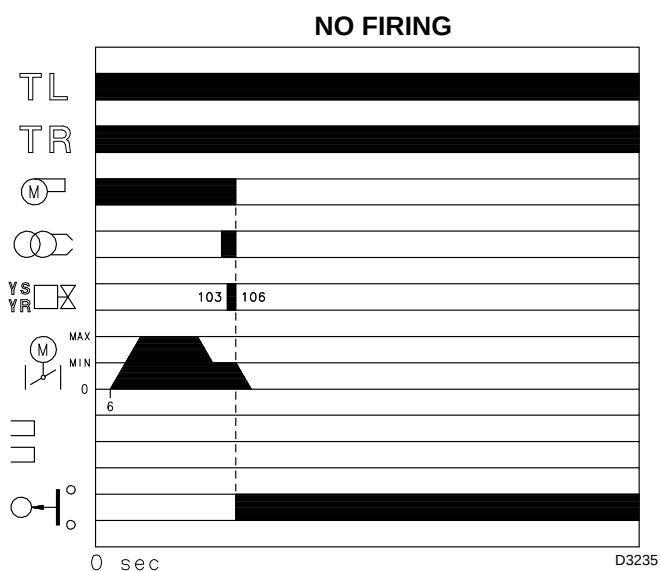


Fig. 35

8 Maintenance

8.1 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.

8.2 Maintenance programme

8.2.1 Maintenance frequency

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

8.2.2 Checking and cleaning

Combustion

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

Significant differences with respect to the previous measurements indicate the points where more care should be exercised during maintenance.

Combustion head

Open the burner and make sure that all components of the combustion head are in good condition, not deformed by the high temperatures, free of impurities from the surroundings and correctly positioned. If in doubt, extract the internal part.

Current to the UV photocell

Min value for a good work: 70 μ A.

If the value is lower, it can depend on:

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

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

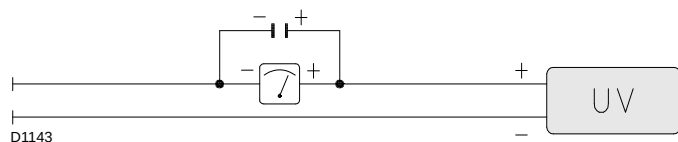


Fig. 36

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.

Burner

Check for excess wear or loose screws in the mechanisms controlling the air gate valve and the gas butterfly valve. Also make sure that the screws securing the electrical leads in the burner terminal strip are fully tightened. Clean the outside of the burner.

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 OIL OPERATION

Filters

Check the filtering baskets on line and at nozzle present in the system. Clean or replace if necessary.

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

Pump

The delivery pressure must be stable. The depression must be less than 0.4 bar. Unusual noise must not be evident during pump operation.

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

If the pump is found to be responsible, check to make sure that the filter is not dirty. The vacuum gauge is installed upstream from the filter and consequently will not indicate whether the filter is clogged or not. Contrarily, if the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping.

Please check that the supply line and filters are clear. The use of a pump vacuum gauge will assist in this. This measure permits the cause of the anomaly to be traced to either the suction line or the pump.

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

Hoses

- Check periodically the flexible pipes conditions. They have to be replaced at least **every 2 years**.
- In case of use of gas oil and bio fuel blends, it is strongly recommended to inspect **even more frequently** the hoses and replace them where contamination has occurred.
- Check to make sure that the hoses are still in good condition.

Nozzles

Do not clean the nozzle openings; do not even open them. The nozzle filters however may be cleaned or replaced as required. It is advisable to replace nozzles every year during regular maintenance operations. Combustion must be checked after the nozzles have been changed.

Fuel tank

If water or contamination is present within the fuel tank, it is essential that this is removed before the equipment is to be used. This is extremely important when gas oil containing Bio diesel is in use. If in doubt about how to achieve this then please contact the fuel or oil tank supplier.

Combustion

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

EN 267	Excess air		
	Max output $\lambda \leq 1.2$		Min output $\lambda \leq 1.3$
	Calibration CO ₂ %		CO mg/kWh
Theoretical max. CO ₂ 0 % O ₂	$\lambda = 1,2$	$\lambda = 1,3$	
15.2	12.6	11.5	≤ 100

GAS OPERATION

Gas leaks

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

Gas filter

Change the gas filter when it is dirty.

Combustion

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

EN 676		Excess air		
		Max output $\lambda \leq 1,2$		Min output $\lambda \leq 1,3$
		Calibration CO ₂ %		CO mg/kWh
GAS	Theoretical max. CO ₂ 0 % O ₂	$\lambda = 1,2$	$\lambda = 1,3$	
G 20	11.7	9.7	9.0	≤ 100
G 25	11.5	9.5	8.8	≤ 100
G 30	14.0	11.6	10.7	≤ 100
G 31	13.7	11.4	10.5	≤ 100

9 Faults - Possible causes - Solutions

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.

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

GAS OIL OPERATION			
SYMBOL ⁽¹⁾	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
1		Defective control box	Replace
		Ignition electrode wrongly adjusted	Adjust
		Grounded electrode due to broken insulation	Replace
		Pump/motor coupling broken	Replace
		Ignition transformer defective	Replace
	The flame ignites normally but the burner locks out when the safety time has elapsed	Defective photocell or control box	Replace photocell or control box
		Dirty photocell	Clean
	Smoke in flame - dark Bacharach	Not enough air	Adjust head and fan gate
		Erroneous pump pressure	Adjust
		Nozzle filter clogged	Clean or replace
		Boiler room air vents insufficient	Increase
		Nozzle worn or dirty	Replace
		Flame disk dirty, loose, or deformed	Clean, tighten in place, or replace
	Smoke in flame (yellow Bacharach)	Too much air	Adjust head and air gate
	Firing with pulsations or flame detachment, delayed firing	Poorly adjusted head	Adjust
		Poorly adjusted fan air gate: too much air	Adjust
		Nozzle unsuited for burner or boiler	See Nozzle Table
		Defective nozzle	Replace
		Inappropriate pump pressure	Adjust
		Poorly adjusted or dirty firing electrodes	Adjust
		Output during ionisation phase is too high	Reduce
	The burner does not pass to 2nd stage	Control device TR does not close	Adjust or replace
		Defective control box	Replace
	Uneven fuel supply	Check if cause is in pump or in the fuel supply system	Feed the burner from a tank located nearby
	Rusty pump internal parts	Water in tank	Suck water from tank bottom with separate pump
	Noisy pump, unstable pressure	Air has entered the suction line	Tighten connectors
		Depression value too high (higher than 35 cm Hg):	
		Tank/burner height difference too great	Feed burner with loop circuit
		Piping diameter too small	Increase
		Suction filters clogged	Clean
		Suction valves closed	Open
		Paraffin solidified due to low temperature	Add additive to gas oil
	Pump unprimes after prolonged pause	Return pipe not immersed in fuel	Bring to same height as suction pipe
		Air enters suction piping	Tighten connectors
	Pump leaks gas oil	Leakage from sealing organ	Replace pump
	Dirty combustion head	Nozzle or filter dirty	Replace
		Unsuitable nozzle delivery or angle	See recommended nozzles
		Loose nozzle	Tighten
		Impurities on flame stability disk	Clean
		Erroneous head adjustment or not enough air	Adjust, open air damper
		Blast tube length unsuited to boiler	Contact boiler manufacturer
I	During operation, the burner stops in lock out	Dirty or defective photocell	Clean or replace
		Defective air pressure switch	Replace

- (1) The control box is fitted with a disc rotates during the firing programme, which can be seen through the transparent lock-out reset button.
When the burner does not fire or comes to a halt following a fault, the symbol which appears behind the reset button indicates the type of problem.

GAS OPERATION

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

GAS OPERATION

SYMBOL ⁽¹⁾	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
	The burner repeats the starting cycle without lock out	Mains gas pressure is near the valve to which the min. gas pressure switch gas is adjusted. The repeated drop in pressure which follows valve opening causes temporary opening of the pressure switch itself, the valve immediately closes and the burner comes to a halt. Pressure increases again, the pressure switch closes again and the firing cycle is repeated. And so on.	Reduce operating pressure of minimum gas pressure switch. Replace gas filter
	Lock out without symbol indication	Flame simulation	Replace control box
I	During operation, the burner stops in lock out	Defective flame sensor	Replace worn parts
		Fault on air pressure switch	Replace
		Max. gas pressure switch operates	Adjust or replace
◀	Lock out when burner stops	Flame remains in combustion head or flame simulation	Eliminate persistence of flame or replace control box
	Ignition with pulsation	Poorly adjusted head	Adjust
		Ignition electrode wrongly adjusted	Adjust
		Poorly adjusted fan air gate: too much air	Adjust
		Output during ionisation phase is too high	Reduce

(1) The control box is fitted with a disc rotates during the firing programme, which can be seen through the transparent lock-out reset button.

When the burner does not fire or comes to a halt following a fault, the symbol which appears behind the reset button indicates the type of problem.

(2) The fuse is located in the rear part of the control box. A pull-out fuse is also available as a spare part which can be fitted after breaking the tag on the panel which holds in place.

A

Appendix - Accessories (optional)

OUTPUT POWER REGULATOR KIT RWF 40

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

Two components should be ordered:

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

Parameter to control		Probe		Output power regulator	
	Range	Type	Code	Type	Code
Temperature	- 100...+ 500°C	PT 100	3010110	RWF40 BASIC RWF40 HIGH	3010356
Pressure	0...2.5 bar 0...16 bar	Probe with output 4...20 µA	3010213 3010214		3010357

SPACER KIT

If burner head penetration into the combustion chamber needs reducing, varying thickness spacers are available, as given in the following table.

Burner	Code
RLS 300-400/BP MX	20008903

SOUND PROOFING BOX

If noise emission needs reducing even further, sound-proofing boxes is available.

Burner	Box type	Average noise reduction [dB(A)]	Code
RLS 300-400/BP MX	C7	10	3010376

DEGASSING UNIT

It may occur that a certain amount of air is contained in the fuel sucked up by the pump.

This air may originate from the fuel itself as a consequence of de-pressurisation or air leaking past imperfect seals.

In double-pipe systems, the air returns to the tank from the return pipe; in single-pipe systems, the air remains in circulation causing pressure variations in the pump and burner malfunctions.

For this reason, we advise installing a degassing unit near the burner in single-pipe installations.

Degassing units are provided in two versions:

Burner	Code
RLS 300-400/BP MX (without filter)	20034277
RLS 300-400/BP MX (with filter)	20034281

Degassing unit characteristics

Burner output	80 kg/h max
Fuel pressure	0.7 bar max
Ambient temperature	40 °C max
Fuel temperature	40 °C max
Attachment connectors (without filter)	FF G 1/4 tank side FM G 3/8 conic burner side
Attachment connectors (with filter)	FF G 3/8 tank side FM G3/8 conic burner side

CONTINUOUS VENTILATION KIT

If the burner requires continuous ventilation in the stages without fl ame, a special kit is available as given in the following table.

Burner	Code
RLS 300-400/BP MX	3010030

SEAL CONTROL KIT

To test the valve seals on the gas train, a special "seal control kit" is available. The valve seal control device is compulsory (EN 676) on gas trains to burners with a maximum output over 1200 kW. The seal control is type VPS 504.

Burner	Code
RLS 300-400/BP MX	3010367

FUEL REMOTE SELECTION KIT

Burner	Code
RLS 300-400/BP MX	3010372

GAS TRAINS APPROVED ACCORDING TO EN 676

Refer to the instruction manual.

B

Appendix - Electrical panel layout

1	Index of layouts	
2	Reference layout	
3	Layout of unifilar output	
4	Operational layout of fuel selection	
5	RLS 300/BP MX RLS 400/BP MX	Operational layout Star/delta starter operational layout
6	LFL 1... Operational layout	
7	LFL 1... Operational layout	
8	LFL 1... Operational layout	
9	LFL 1... Operational layout	
10	Electrical connections for internal RWF40 kit	
11	Electrical connections set by installer	
12	RWF40... Operational layout	
13	Electrical connections for external RWF40 kit	

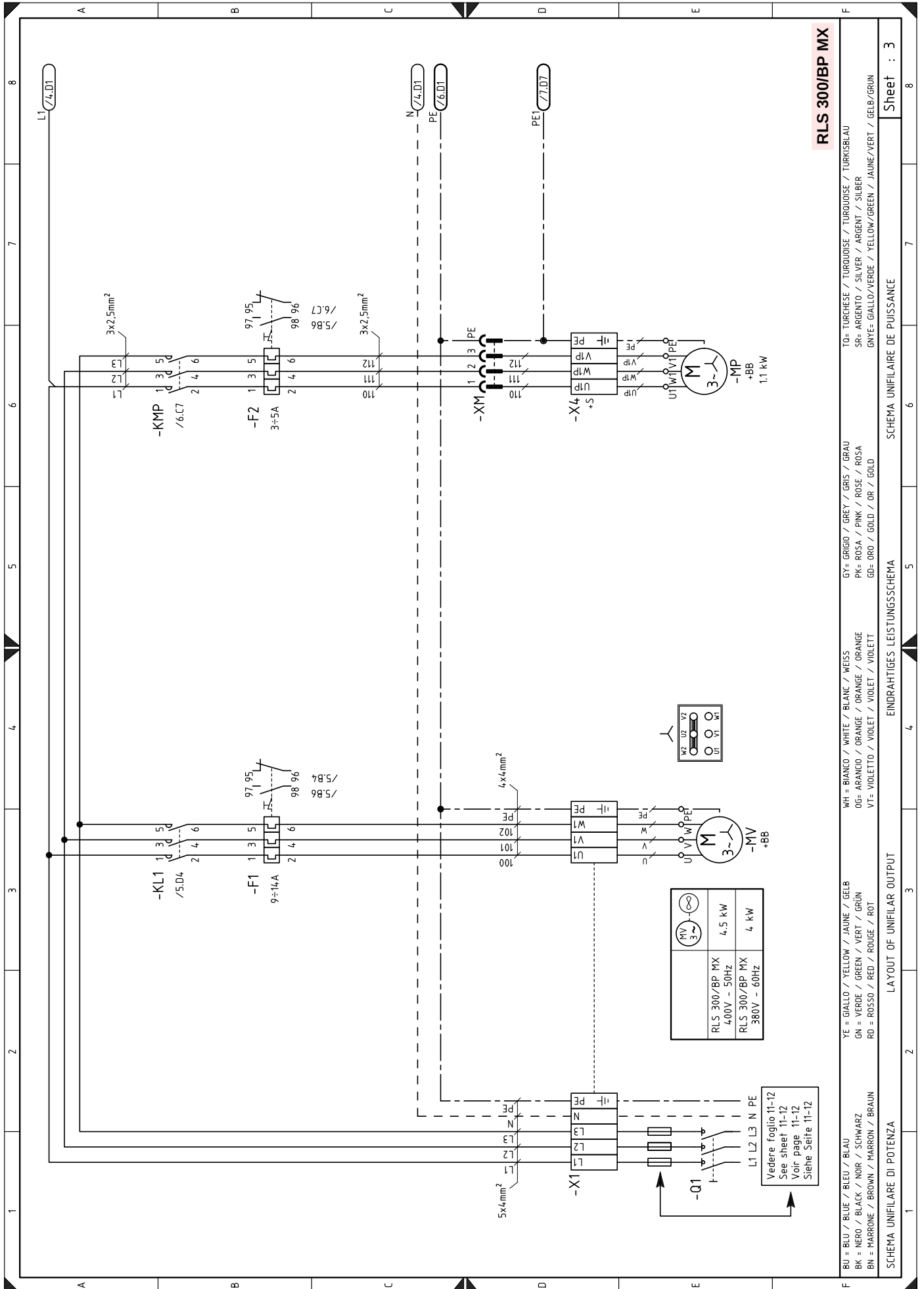
2

Reference layout

Sheet no.

Coordinates

/1.A1



RLS 300/BP MX

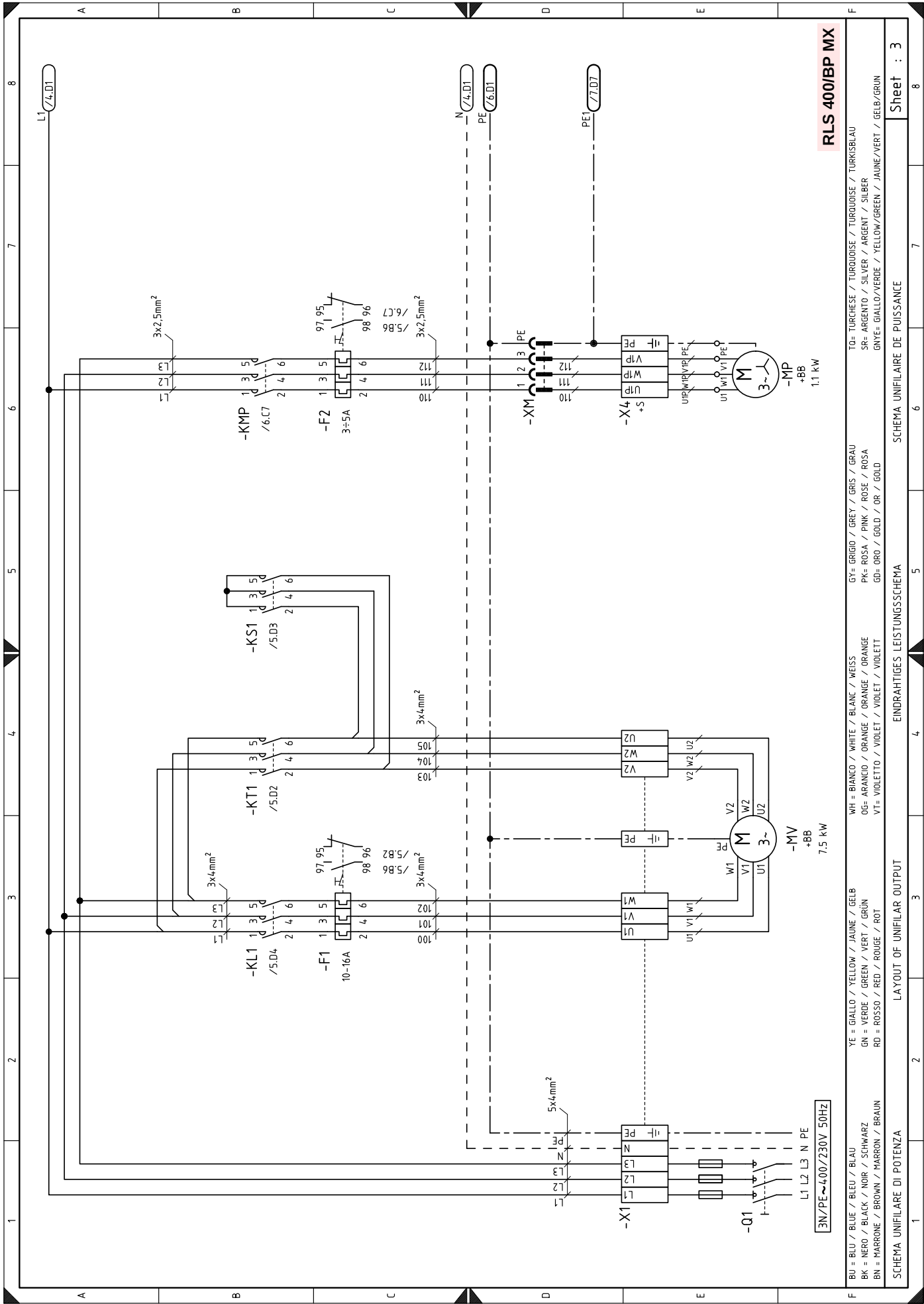
SCHEMA UNIFILARE DI POTENZA

LAYOUT OF UNIFILAR OUTPUT

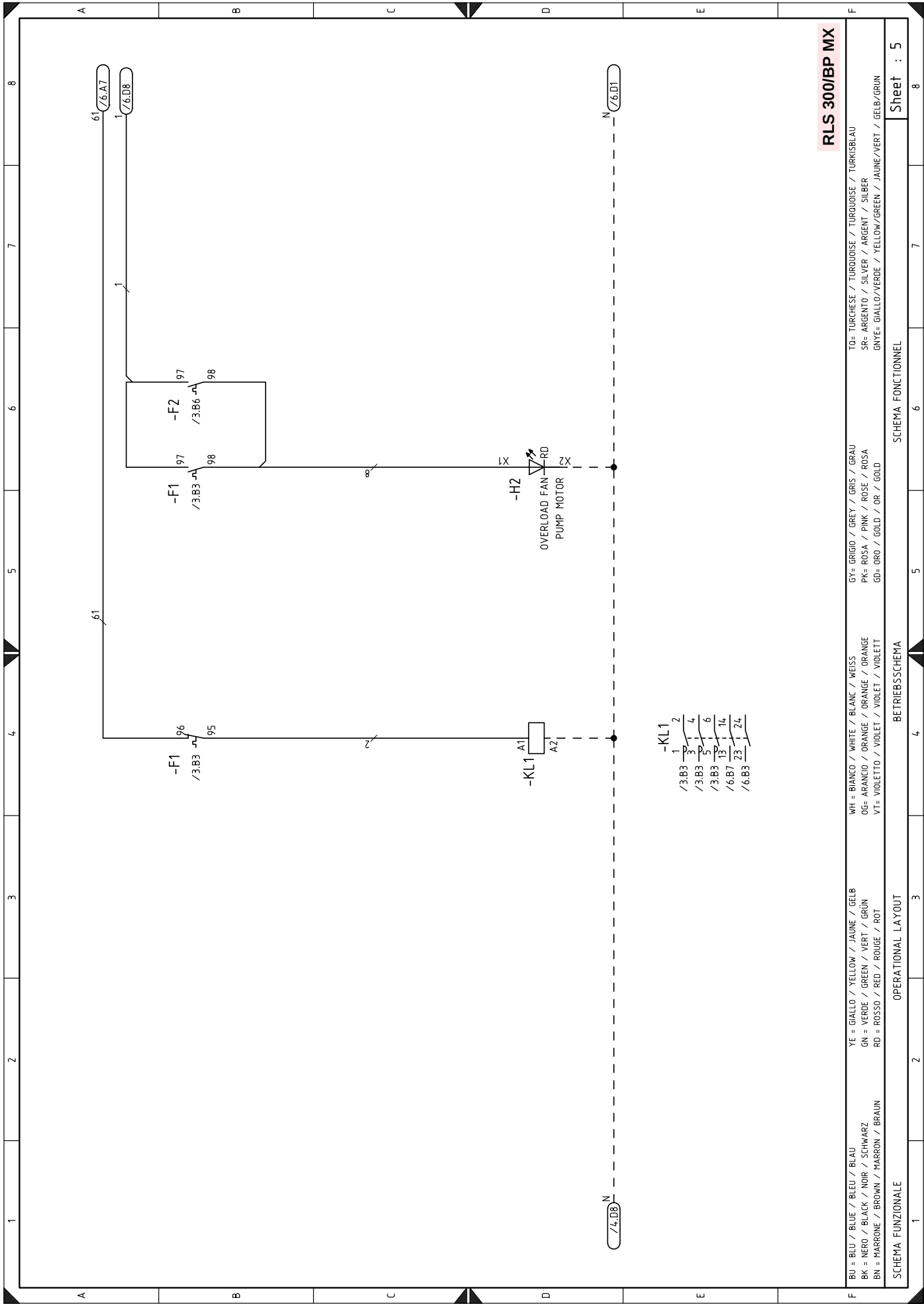
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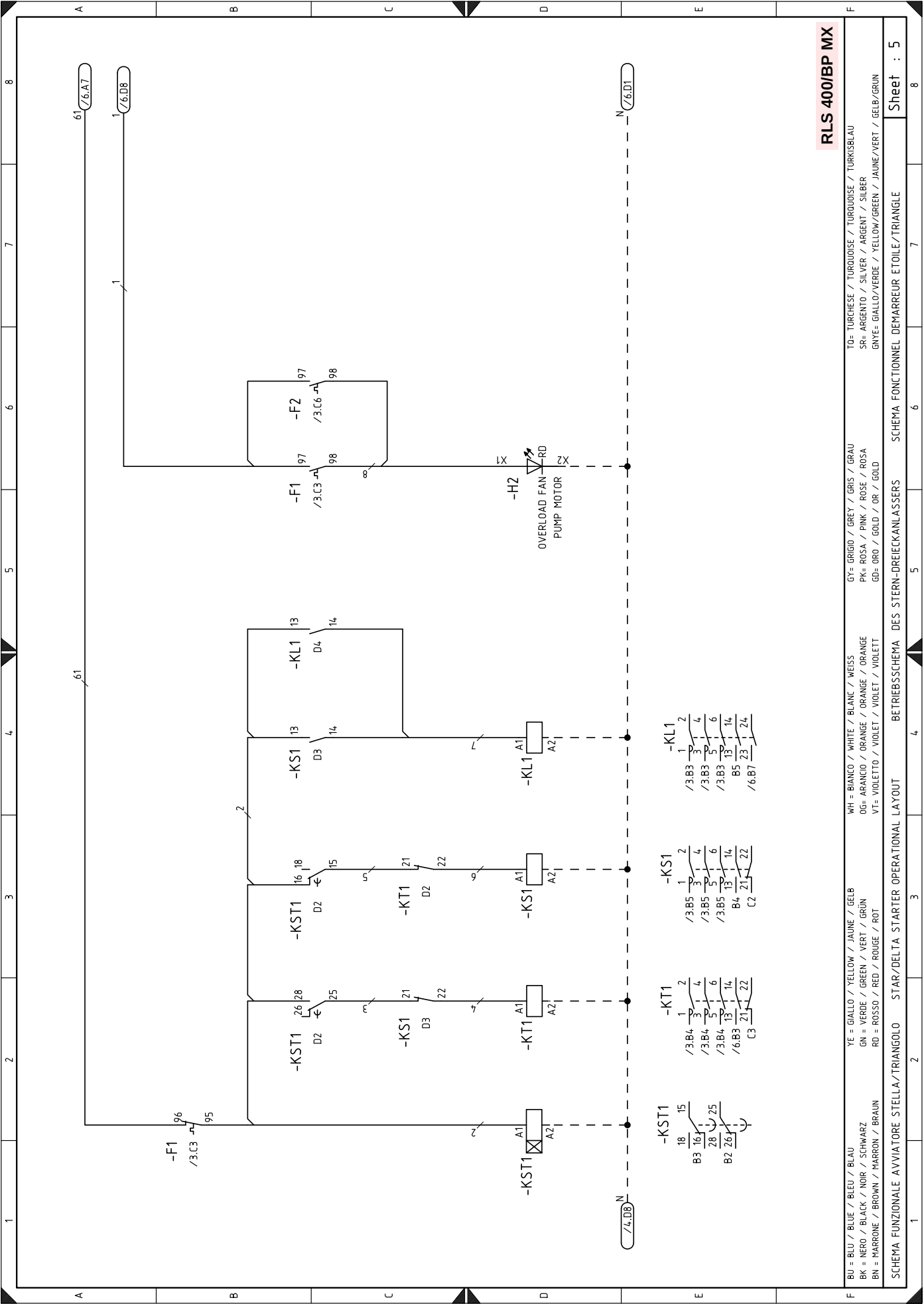
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Sheet : 3

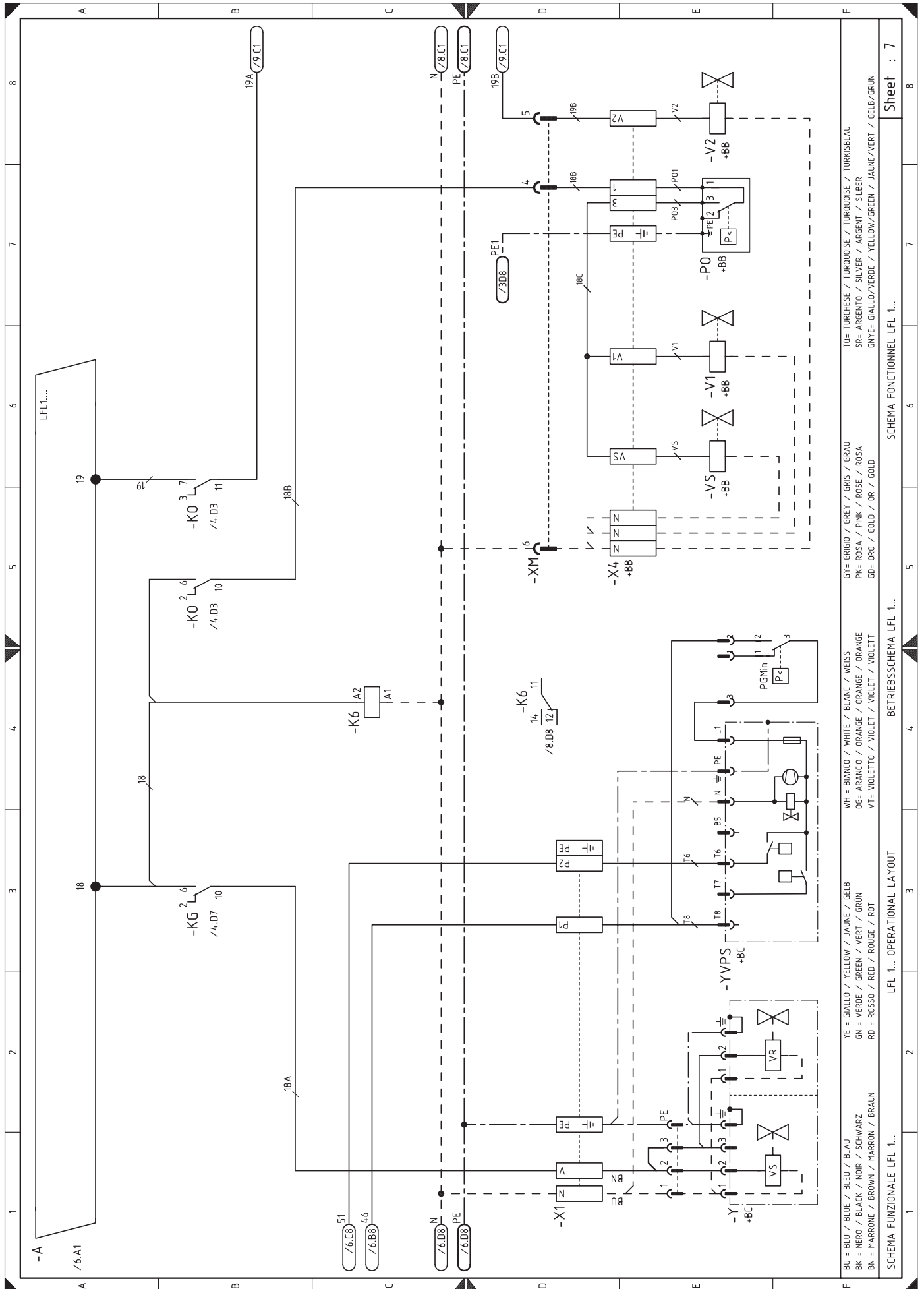


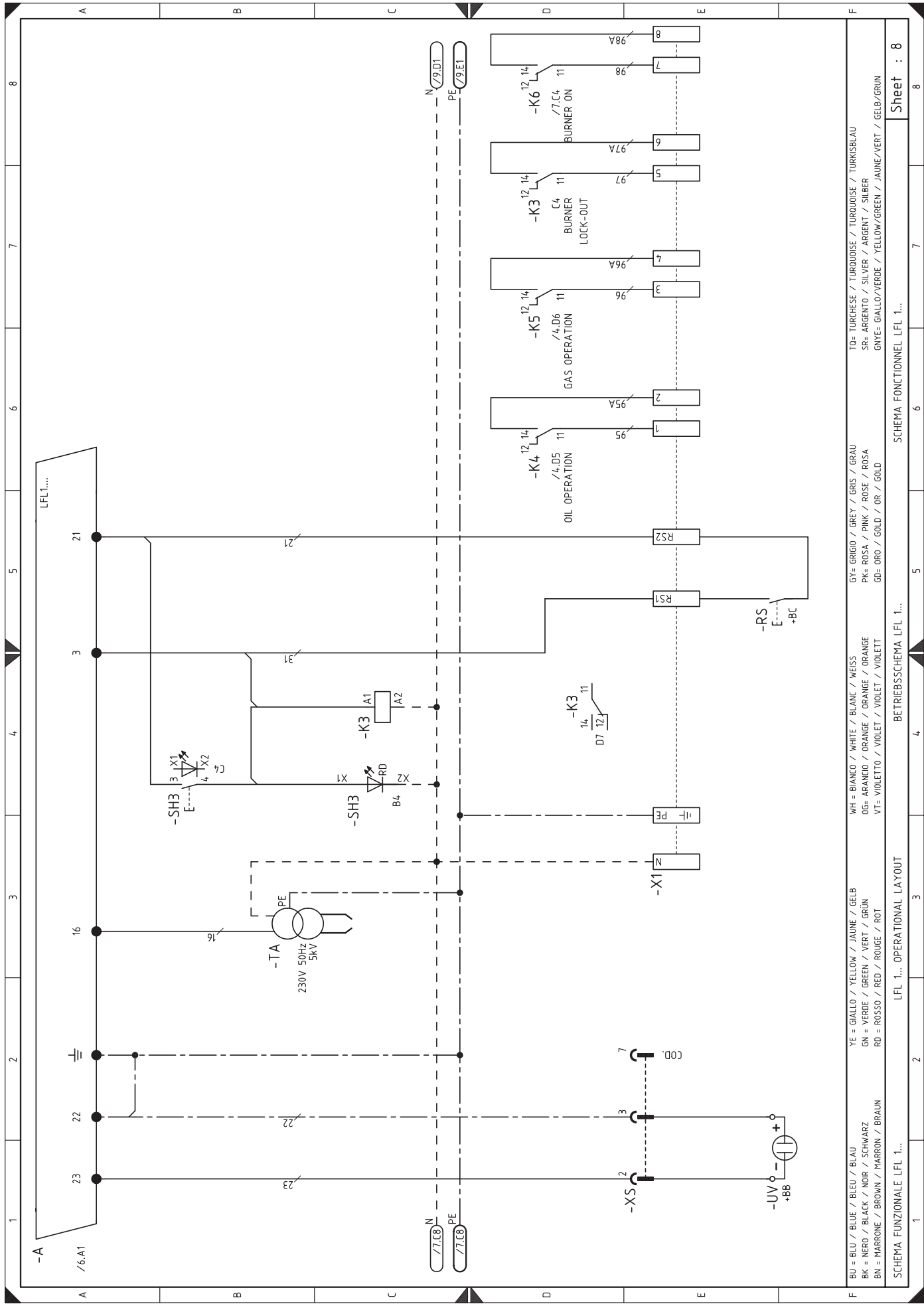


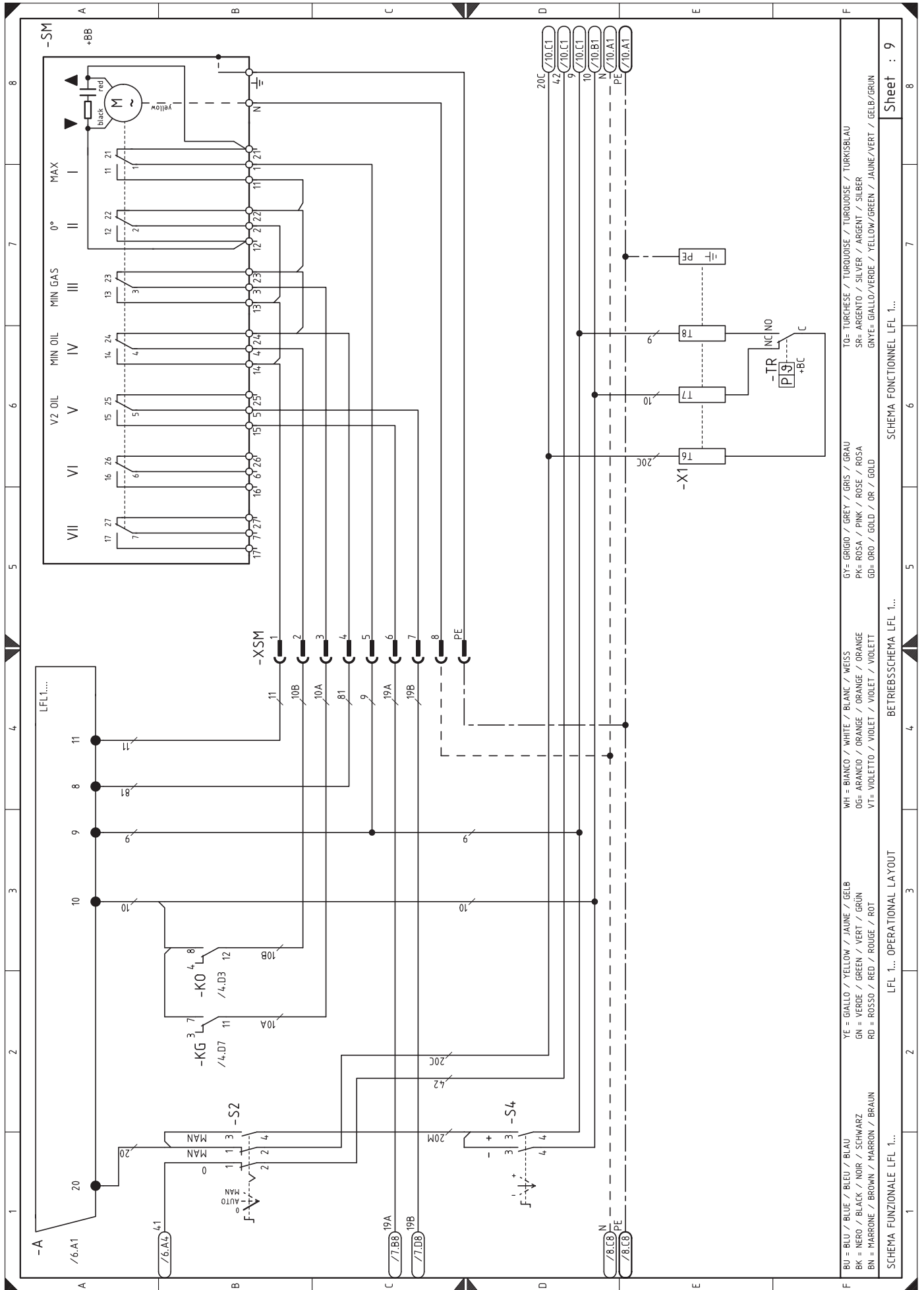


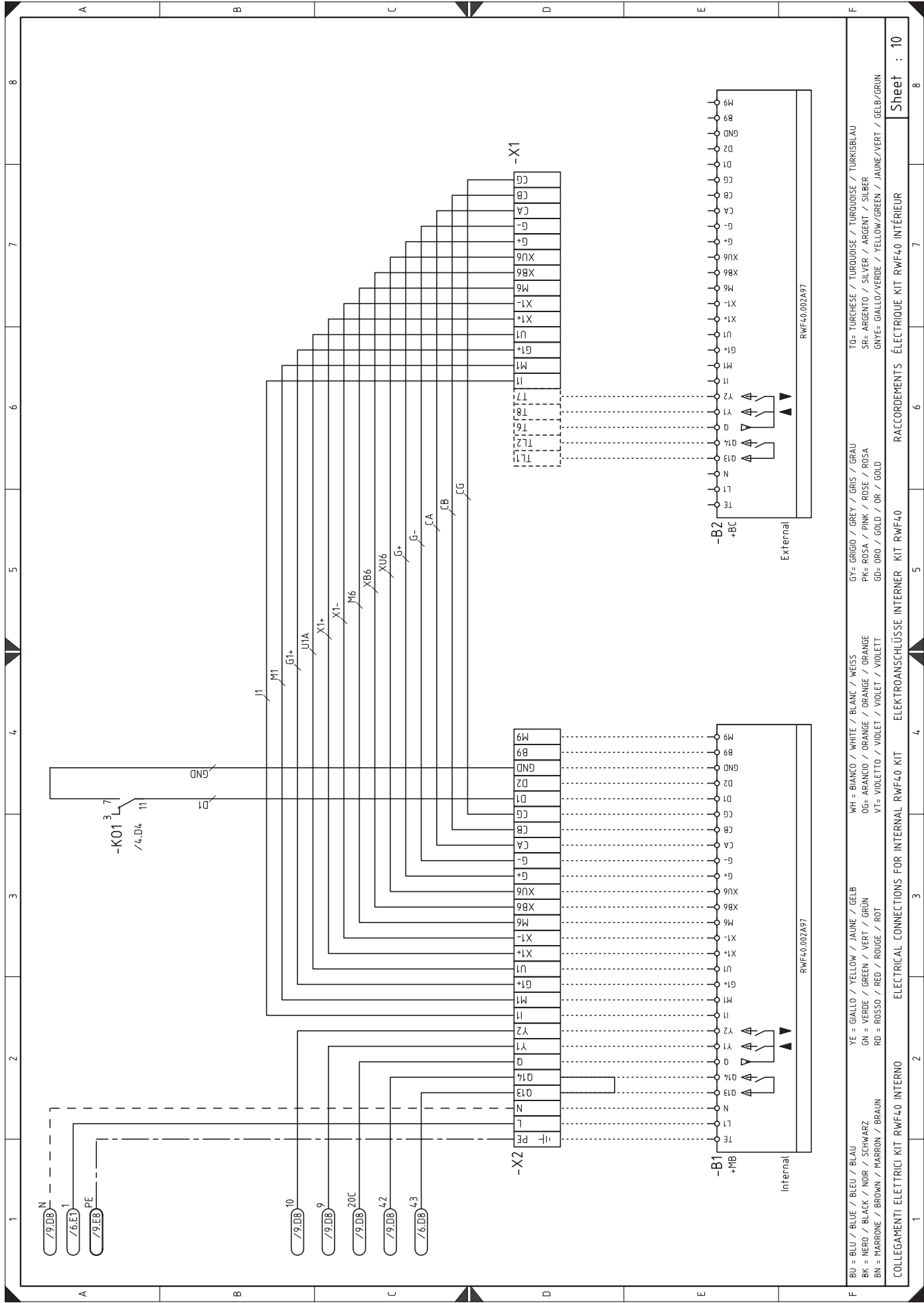




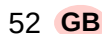


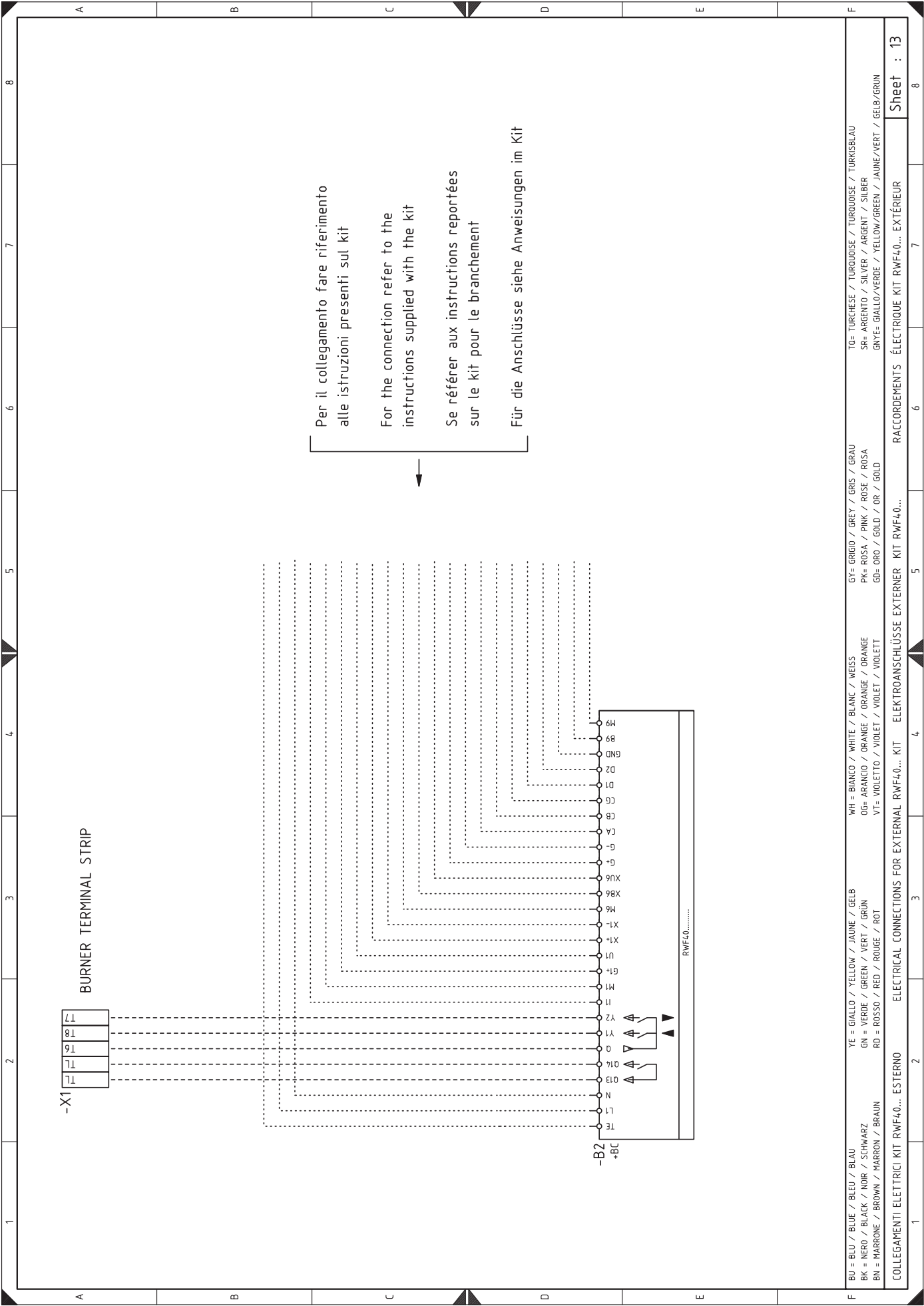












Key to layouts

A	- Control box	X4	- Light oil assembly terminal block
B1	- Internal output power regulator RWF40	XAUX	- Auxiliary terminal strip
B2	- External output power regulator RWF40	XM	- Light oil assembly connector
BA	- DC input 0...20 mA, 4...20 mA	XPA	- Air pressure switch connection plug
BA1	- DC input 0...20 mA, 4...20 mA for modifying the remote setpoint	XPGM	- Maximum gas pressure switch connection plug
BP	- Pressure probe	XPGM1	- Maximum gas pressure switch connector
BP1	- Pressure probe	XS	- Flame detectors connector
BR	- Remote setpoint voltage divider	XSM	- Air and gas servomotors connector
BT1	- Thermocouple probe	UV	- UV cell
BT2	- Probe Pt100 with 2 wires	V1	- Light oil 1st stage valve
BT3	- Probe Pt100 with 3 wires	V2	- Light oil 2nd stage valve
BT4	- Probe Pt100 with 3 wires	VS	- Light oil safety valve
BTEXT	- External probe for the climatic compensation of the setpoint		
BV	- DC voltage input 0...1 V, 0...10 V		
BV1	- DC voltage input 0...1 V, 0...10 V for modifying the remote setpoint		
F1	- Fan motor thermal cut-out		
F2	- Pump motor thermal cut-out		
F3	- Auxiliary fuse		
G	- Signal converter for UV cell		
H1	- Signal light for burner on		
H2	- Signal light for motor trip		
H3	- Signal light for burner lock-out		
KO	- Light oil circuit relay		
KO1	- Light oil circuit relay		
KG	- Gas circuit relay		
KL	- Direct startup contactor		
KL1	- Star-powered/delta-powered line contactor		
KMP	- Pump motor contactor		
KT1	- Star-powered/delta-powered starter /delta contactor		
KS1	- Star-powered/delta-powered starter /star-powered contactor		
KSM	- Relay		
KST1	- Star-powered/delta -powered starter timer		
K1	- Fan on voltage free contact relay		
K2	- Motor lock-out voltage free contact relay		
K3	- Burner lock-out voltage free contact relay		
K4	- Light oil operation voltage free contact relay		
K5	- Gas operation voltage free contact relay		
K6	- Burner on voltage free contact relay		
MP	- Pump motor		
MV	- Fan motor		
PA	- Air pressure switch		
PE	- Burner ground		
PGMin	- Minimum gas pressure switch		
PGM	- Maximum gas pressure switch		
PO	- Oil pressure switch		
RS	- Remote lock-out reset button		
S1	- Emergency stop push-button		
S2	- Switch for following operations: off-automatic-manual		
S3	- Lock-out reset button		
S4	- Button for: power increase/reduction		
S5	- Fuel selector		
SH3	- Burner reset button and lockout warning		
SM	- Servomotor		
TA	- Ignition transformer		
TL	- Load limit remote control system		
TR	- High-low mode load remote control system		
TS	- Safety control device system		
Y	- Gas adjustment valve + gas safety valve		
YVPS	- Gas leak detection control device		
X1	- Main supply terminal strip		
X2	- RWF40 and UV cell terminal strip		



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