

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

Two stage progressive or modulating operation



CODE	MODEL	TYPE
20169213	ENNE/EMME 1400	618 M
20169214	ENNE/EMME 2000	619 M
20169215	ENNE/EMME 2000	619 M
20169216	ENNE/EMME 3000	620 M
20169217	ENNE/EMME 4500	621 M



**Translation of the original instructions**

<b>1</b>	<b>Declarations</b>	<b>3</b>
<b>2</b>	<b>Information and general warnings</b>	<b>4</b>
2.1	Information about the instruction manual	4
2.1.1	Introduction	4
2.1.2	General dangers	4
2.1.3	Other symbols	4
2.1.4	Delivery of the system and the instruction manual	5
2.2	Guarantee and responsibility	5
<b>3</b>	<b>Safety and prevention</b>	<b>6</b>
3.1	Introduction	6
3.2	Personnel training	6
<b>4</b>	<b>Technical description of the burner</b>	<b>7</b>
4.1	Burner designation	7
4.2	Models available	7
4.3	Burner categories - Countries of destination	8
4.4	Technical data	8
4.5	Electrical data	9
4.6	Maximum dimensions	9
4.7	Firing rates	10
4.8	Test boiler	10
4.9	Burner description	11
4.10	Electrical panel description	12
4.11	Burner equipment	12
4.12	Control box RFGO-A22	13
4.13	Servomotor SQM40	14
<b>5</b>	<b>Installation</b>	<b>15</b>
5.1	Notes on safety for the installation	15
5.2	Handling	15
5.3	Preliminary checks	15
5.4	Operating position	16
5.5	Preparing the boiler	16
5.5.1	Boring the boiler plate	16
5.6	Mounting the burner on the boiler	17
5.7	Positioning the electrode	17
5.8	Air damper setting	18
5.8.1	Modifying air damper tie-rod length	18
5.9	Nozzle installation	18
5.9.1	Recommended nozzle	18
5.9.2	Adjusting the nozzle pin opening rod	18
5.9.3	Relationship between: nozzle type and delivery-return pressure	19
5.10	Combustion head adjustment	20
5.11	Heavy oil supply	21
5.11.1	Hydraulic system	21
5.12	Hydraulic operation diagram	22
5.12.1	Oil pressure switch	22
5.13	Pressure variator	22
5.14	Pump	23
5.14.1	Technical data	23
5.14.2	Priming pump	23
5.15	Gas supply	24
5.15.1	Gas feeding line	24
5.15.2	Gas train	25
5.15.3	Gas train installation	25

5.15.4	Gas pressure .....	25
5.16	Electrical connections .....	27
5.17	Calibration of the thermal relay .....	28
5.18	Motor rotation .....	28
<b>6</b>	<b>Start-up, calibration and operation of the burner .....</b>	<b>29</b>
6.1	Notes on safety for the first start-up .....	29
6.2	Adjustments prior to ignition (heavy oil) .....	29
6.2.1	Nozzle .....	29
6.2.2	Combustion head .....	29
6.2.3	Pump pressure .....	29
6.2.4	Air damper .....	29
6.2.5	Timer .....	29
6.2.6	Servomotor .....	29
6.3	Burner ignition (oil fuel) .....	29
6.4	Adjustments prior to ignition (gas) .....	30
6.5	Burner start-up (gas) .....	30
6.6	Burner ignition .....	30
6.7	Servomotor adjustment .....	31
6.8	Pressure switch adjustment .....	32
6.8.1	Air pressure switch .....	32
6.8.2	Maximum gas pressure switch .....	32
6.8.3	Minimum gas pressure switch .....	32
6.8.4	Maximum oil pressure switch .....	33
6.8.5	Air bleeding .....	33
6.8.6	Gas butterfly valve .....	33
6.9	Spray temperature adjustment .....	34
6.9.1	Electronic adjustment thermostat .....	34
6.10	Burner operation .....	35
6.11	Final checks (with burner operating) .....	36
<b>7</b>	<b>Maintenance .....</b>	<b>37</b>
7.1	Notes on safety for the maintenance .....	37
7.2	Maintenance programme .....	37
7.2.1	Maintenance frequency .....	37
7.2.2	Safety test - with no gas supply .....	37
7.2.3	Checking and cleaning .....	37
7.2.4	Safety components .....	38
7.3	Opening the burner .....	40
7.4	Closing the burner .....	40
<b>8</b>	<b>LED indicator and special function .....</b>	<b>41</b>
8.1	Description of LED lamps .....	41
8.2	Check mode function .....	41
8.3	Flame control lock-out or emergency stop condition .....	41
8.4	LED lamps: burner operating status .....	42
<b>9</b>	<b>Problems - Causes - Remedies signalled by LED indicators .....</b>	<b>43</b>
<b>A</b>	<b>Appendix - Accessories .....</b>	<b>48</b>
<b>B</b>	<b>Appendix - Electrical panel layout .....</b>	<b>50</b>

**1 Declarations**

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

Manufacturer:	RIELLO S.p.A.		
Address:	Via Pilade Riello, 7 37045 Legnago (VR)		
Product:	Dual fuel heavy oil/gas burners		
Model and type:	ENNE/EMME 1400		618 M
	ENNE/EMME 2000		619 M
	ENNE/EMME 3000		620 M
	ENNE/EMME 4500		621 M
These products are in compliance with the following Technical Standards:			
EN 676			
EN 267			
EN 12100			
and according to the European Directives:			
MD	2006/42/EC		Machine Directive
LVD	2014/35/EU		Low Voltage Directive
EMC	2014/30/EU		Electromagnetic Compatibility

**The quality is guaranteed by a quality and management system certified in accordance with ISO 9001:2015.**

Legnago, 03.05.2021

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

Mr. F. Maltempi



**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 Centre of the area;
- is designed for use by qualified personnel;
- offers important indications and instructions relating to the installation safety, start-up, use and maintenance of the burner.

**Symbols used in the manual**

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

**2.1.2 General dangers**

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



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



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



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

**2.1.3 Other symbols**



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



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



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



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



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



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



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



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



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



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

- This symbol indicates a list.

**Abbreviations used**

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

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

When the system is delivered, it is important that:

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

.....

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

.....  
 .....  
 .....

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

**2.2 Guarantee and responsibility**

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



**ATTENTION**

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

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

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

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

**3 Safety and prevention**

**3.1 Introduction**

The burners have been designed and built in compliance with current regulations and directives, applying the known technical safety rules 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.

Specifically:

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 ambient temperature must all be within the values indicated in the instruction manual.

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



**ATTENTION**

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

**3.2 Personnel training**

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

The user:

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

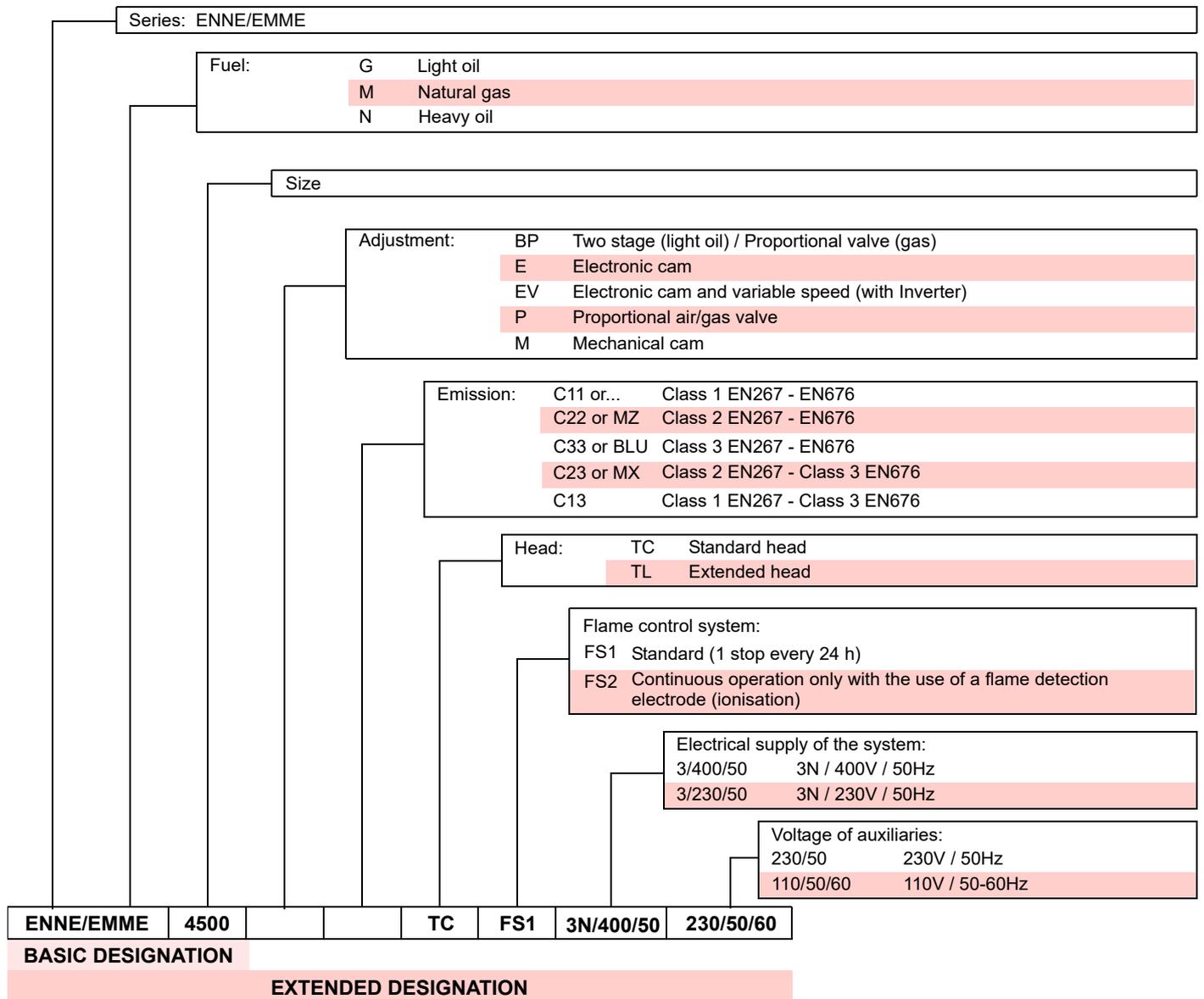
In addition:



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

**4 Technical description of the burner**

**4.1 Burner designation**



**4.2 Models available**

Designation			Voltage	Start-up	Code
ENNE/EMME 1400	TC	FS1	3N ~ 230/400V 50 Hz	Direct	20169213
ENNE/EMME 2000	TC	FS1	3N ~ 230/400V 50 Hz	Direct	20169214
ENNE/EMME 2000	TL	FS1	3N ~ 230/400V 50 Hz	Direct	20169215
ENNE/EMME 3000	TC	FS1	3N ~ 230/400V 50 Hz	Direct	20169216
ENNE/EMME 4500	TC	FS1	3N ~ 400V - 50 Hz	Star-Triangle	20169217

Tab. A

### 4.3 Burner categories - Countries of destination

Country of destination	Gas category
SE - FI - AT - GR - DK - ES - GB - IT - IE - PT - IS - CH - NO	I <sub>2H</sub>
DE	I <sub>2ELL</sub>
NL	I <sub>2L</sub> - I <sub>2E</sub> - I <sub>2</sub> (43.46 ÷ 45.3 MJ/m <sup>3</sup> (0°C))
FR	I <sub>2Er</sub>
BE	I <sub>2E(R)B</sub>
LU - PL	I <sub>2E</sub>

Tab. B

### 4.4 Technical data

Model			ENNE/EMME 1400	ENNE/EMME 2000	ENNE/EMME 3000	ENNE/EMME 4500
Type			618 M	619 M	620 M	621 M
Minimum	Modulation Output	Kcal/h	350,000	500,000	750,000	1,000,000
		kW	407	581	872	1,163
	Minimum operating output	Kcal/h	700,000	1,000,000	1,500,000	2,000,000
		kW	814	1,163	1,744	2,325
	Maximum operating output	Kcal/h	1,400,000	2,000,000	3,000,000	4,300,000
		kW	1,628	2,325	3,488	5,000
Fuel			Methane gas: 8 - 10 kWh/Nm <sup>3</sup> Heavy oil: max. viscosity at 20 °C 6 cSt (1.5°E)			
Maximum gas pressure		mbar	200	360	360	360
Minimum gas pressure (1)		mbar	20	26	30	39
Operation			<ul style="list-style-type: none"> <li>- Intermittent (min. 1 stop in 24 hours)</li> <li>- Progressive two-stage or modulating by kit (see accessories)</li> </ul>			
Pump:		type	E7NC1069-5P	TA2C4010-5	TA3C4010-5	TA4C4010-7
- Output		kg/h	235	350	540	730
- Pressure range		bar	14 - 30	7 - 40	7 - 40	7 - 40
Standard applications			Boilers: water, steam, diathermic oil			
Ambient temperature		°C	0 - 50			
Combustion air temperature		°C max	60			
Noise levels (2)	Sound pressure	dB(A)	75	78	82	84
	Sound power		85	88	92	94
Weight		Kg	265	265	280	500

Tab. C

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

(2) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum output. The sound power is measured using the "Free Field" method, required by EN 15036 standard, and according to an "Accuracy: Category 3" measurement, as described in EN ISO 3746.

**4.5 Electrical data**

Model		ENNE/EMME 1400	ENNE/EMME 2000	ENNE/EMME 3000	ENNE/EMME 4500
Code		618 M	619 M	620 M	621 M
Electrical power supply		3N ~ 230/400V +/-10% 50 Hz			3N ~ 400V 50 Hz
Fan motor IE3	rpm	2900	2900	2930	2915
	kW	3	4	9.2	15
	V	230/400	230/400	230/400	400/690
	A	9.7/5.6	13.3/7	28.6/16.5	26.8/15.5
Pump motor IE3	rpm	1440		1458	
	kW	1,1		2,2	
	V	230/400		220/380	
	A	4/2,4		9,3/5,4	
Heater	kW	14		19,6	
Ignition transformer	V1 - V2 I1 - I2	230 V - 2 x 6 kV 2.3 A - 35 mA			
Absorbed electric power (Heavy oil)	kW max	19.2	20.1	32.9	39.1
Absorbed electric power (Gas)	kW max	3.8	4.8	10.9	17
Protection level		IP 40			

**Tab. D**

**4.6 Maximum dimensions**

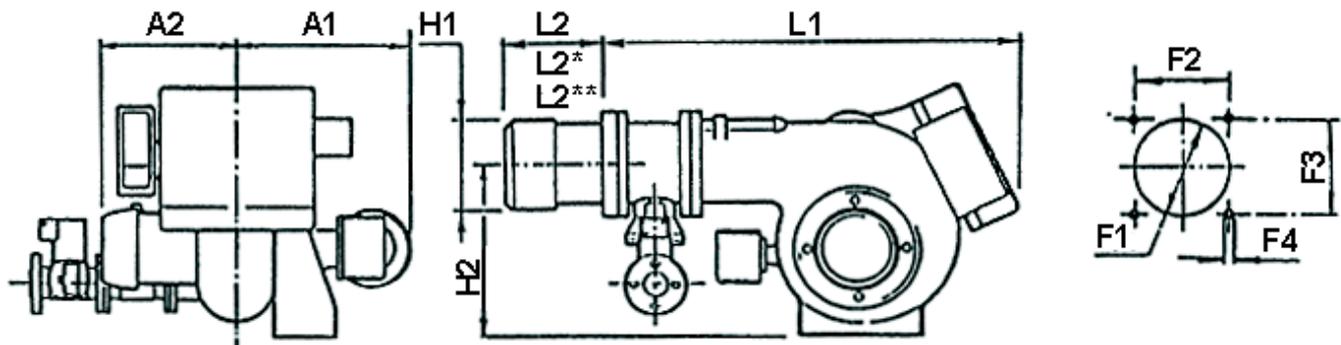
The dimensions of the burner are given in Fig. 1.

Bear in mind that inspection of the combustion head requires the burner to be opened and the rear part drawn back (see "Mounting the burner on the boiler" on page 17).

**L2** Short head blast tube length + spacer

**L2\*** Short head blast tube length

**L2\*\*** Long head blast tube length



S7960

**Fig. 1**

TYPE	A1	A2	L1	L2	L2*	L2**	H1	H2	F1	F2-F3	F4
<b>ENNE/EMME 1400</b>	516	376	1090	275	385	495	250	467	255	260	M 16
<b>ENNE/EMME 2000</b>	516	396	1090	275	385	495	260	467	265	260	M 16
<b>ENNE/EMME 3000</b>	553	447	1320	346	476	606	336	525	340	310	M 20
<b>ENNE/EMME 4500</b>	553	508	1320	346	476	606	336	525	340	310	M 20

**Tab. E**

**4.7 Firing rates**

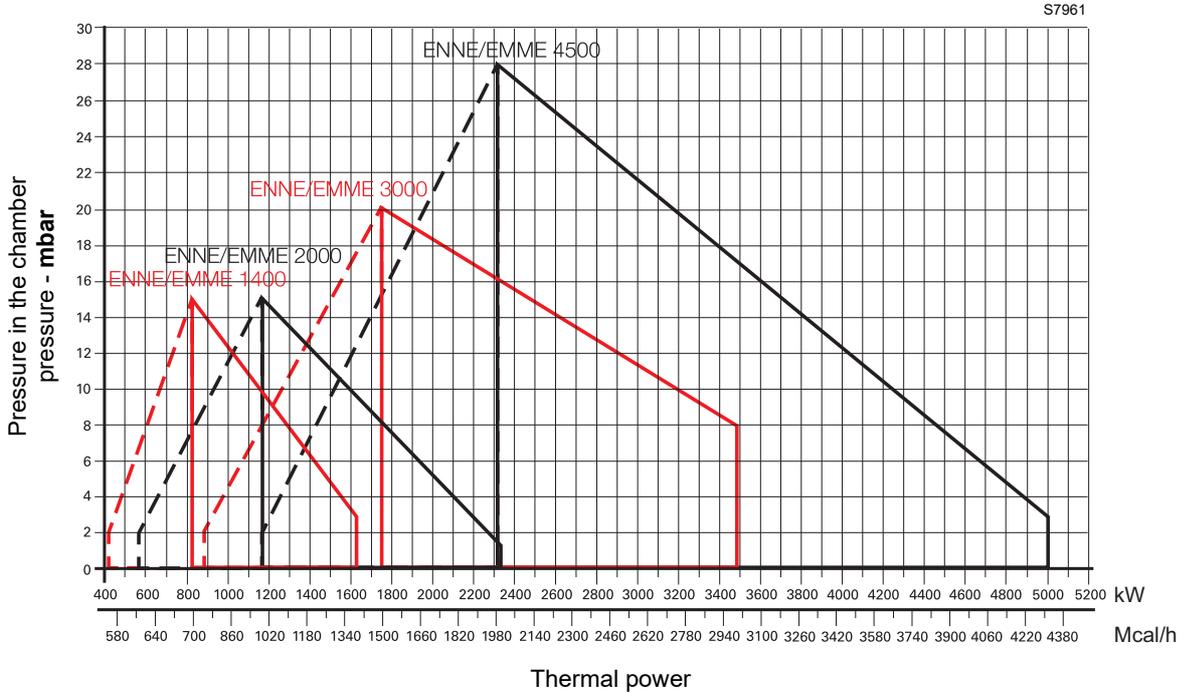
The **MAXIMUM OUTPUT** is chosen from within the continuous diagram area (Fig. 2).

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

- GI/EMME 1400 = 407 kW
- GI/EMME 2000 = 581 kW
- GI/EMME 3000 = 872 kW
- GI/EMME 4500 = 1163 kW



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



**Fig. 2**

**4.8 Test boiler**

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

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

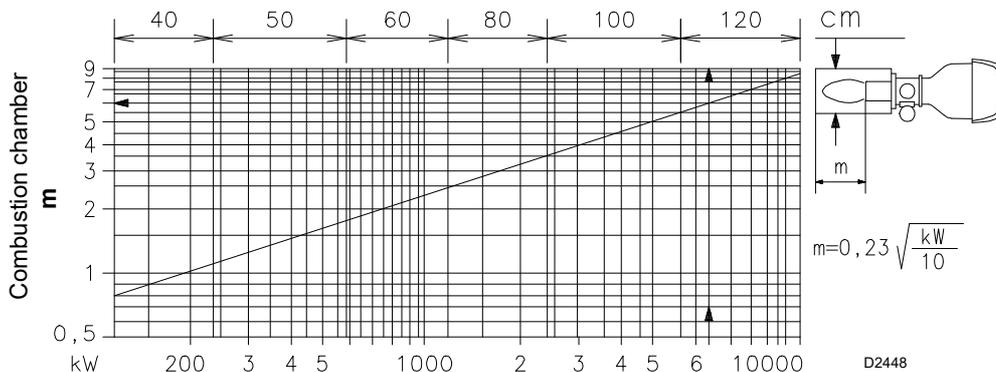
The firing rates were obtained in special test boilers, according to EN 676 standard.

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

**Example:**  
Output 7000 kW - diameter 120 cm - length 6 m

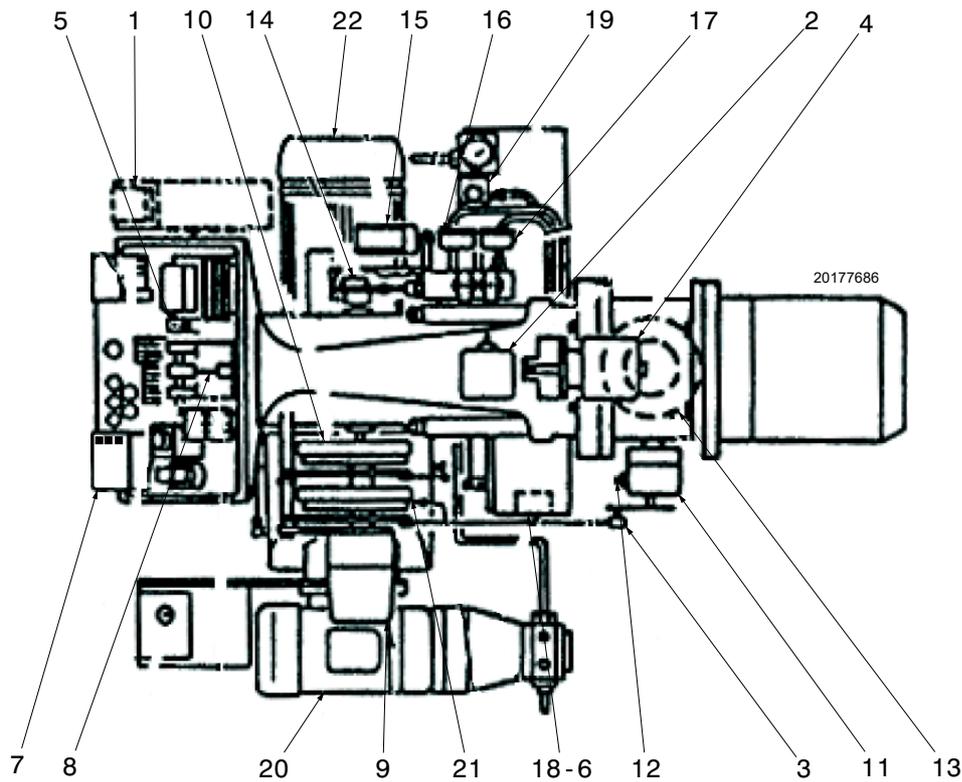
**MODULATING RATIO**

The modulating ratio, obtained in test boilers, according to standard (EN 676 for gas, EN 267 for heavy oil), is of 4:1 for heavy oil and 7:1 for gas.



**Fig. 3**

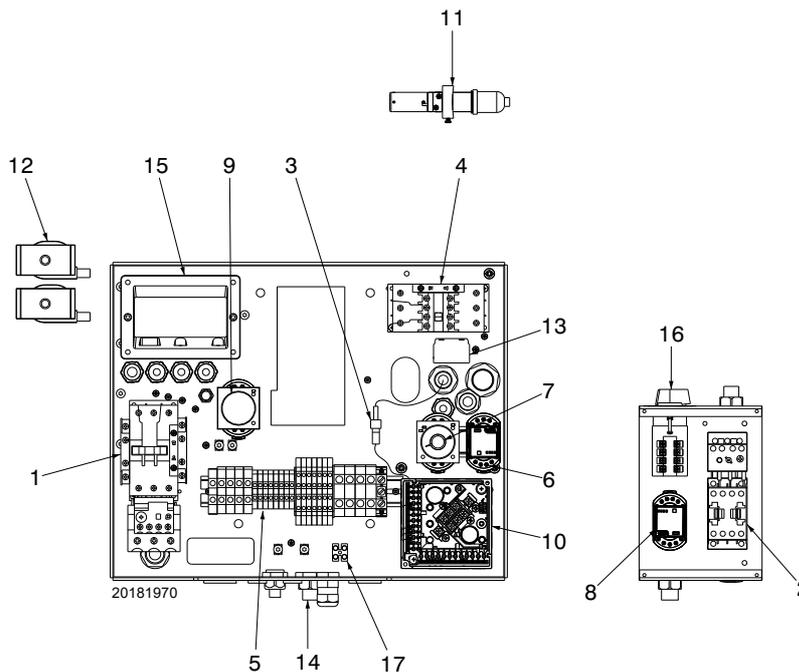
**4.9 Burner description**



**Fig. 4**

- 1 Power modulation unit (only on modulating version)
- 2 Air pressure switch
- 3 Gas butterfly control rod
- 4 Nozzle pin aperture magnet
- 5 Oil control thermostat
- 6 High limit thermostat
- 7 Control box release push-button with lock signal
- 8 Head drive rod
- 9 Servomotor
- 10 Air adjustment cam
- 11 Max. gas pressure switch
- 12 Gas pressure socket to sleeve
- 13 Gas regulator
- 14 Return pressure adjustment cam
- 15 Oil pressure switch
- 16 Pressure gauge on return
- 17 Pressure gauge on delivery
- 18 Low limit thermostat
- 19 Filter
- 20 Pump unit
- 21 Gas adjustment cam
- 22 Fan motor

**4.10 Electrical panel description**



**Fig. 5**

- 1 Contactor and thermal relay for fan motor (only for direct start-up)
- 2 Contactor and thermal relay for pump motor
- 3 Plug-socket on servomotor cable
- 4 Resistors contactor
- 5 Terminal board
- 6 Relay
- 7 Time relay
- 8 Relay
- 9 Electronic thermostat
- 10 Control box base
- 11 Flame sensor
- 12 Coils for oil valves
- 13 Suppressor (only for ENNE/EMME 3000-4500 models)
- 14 Cable grommets for external wirings (to be carried out by the installer)
- 15 Ignition transformer
- 16 Selector switch **OIL-0-GAS**
- 17 Terminal board

**4.11 Burner equipment**

- Seal for gas train . . . . . No. 1
- Extensions . . . . . No. 2
- Screws . . . . . No. 12
- Insulating flange gasket . . . . . No. 1
- Flexible hoses . . . . . No. 2
- Nipples . . . . . No. 2
- Cable grommets . . . . . No. 4
- Washers . . . . . No. 8
- Instruction . . . . . No. 1
- Spare parts list . . . . . No. 1

## 4.12 Control box RFGO-A22

### Important notes



**ATTENTION**

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

The control box is a safety device! Avoid opening or modifying it, or forcing its operation. The Manufacturer cannot assume any responsibility for damage resulting from unauthorised work!

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

For safety and reliability, comply with the following instructions:

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

### Use

The control box is a control and supervision system of medium and large capacity forced draught burners.

If used with the flame detection electrode the system can operate continuously whereas, with the use of UV sensors it operates intermittently with stop and restart request at least once every 24h.

### Installation notes

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



**Fig. 6**

### Technical data

Mains voltage	AC 230 V -15 % / +10%
Mains frequency	50 / 60 Hz
Primary fuse (external)	Refer to the electric system
Weight	approx. 1.1 kg
Power absorption	approx. AC 7 VA
Protection level	IP40
Safety class	II
Environmental conditions	
Operation	DIN EN 60721-3-1
Climatic conditions	Class 1K2
Mechanical conditions	Class 1M2
Temperature range	-40...+60°C
Humidity	< 90% RH (non-condensing)

**Tab. F**

### Electrical wiring of the flame detector

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

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

## 4.13 Servomotor SQM40 ...

## Important notes



ATTENTION

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

Avoid opening, modifying or forcing the servomotor.

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Falls and collisions can negatively affect the safety functions. In this case, the servomotor must not be operated, even if it displays no evident damage.
- Fully disconnect the burner from the mains when working near terminals and servomotor connections.
- Condensation and exposure to water are not allowed.
- For safety reasons, the servomotor must be checked after long periods of non-use.



Fig. 7

S8907

**Technical data**

Mains voltage	230 V -15% +10%
Mains frequency	50 / 60 Hz
Power absorption	10 VA
Motor	Synchronous
Drive angle	Varying between 0° and 135°
Protection level	Max. IP 66, with appropriate cable entry
Cable entry	2 x M20
Cable connection	terminal board for 0.5mm <sup>2</sup> (min.) and 2.5mm <sup>2</sup> (max.)
Rotation direction	Anticlockwise
Rated torque (max.)	10 Nm
Holding torque	5 Nm
Operation time	30 s. at 90°
Weight	approx. 2 kg
Environmental conditions:	
Operation	-20....+60° C
Transport and storage	-20...+60°C

**5 Installation**

**5.1 Notes on safety for the installation**

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



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



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



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

**5.2 Handling**

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



Burner handling operations can be highly dangerous if not carried out with the greatest attention: distance unauthorised personnel, check integrity and suitability of the means available. 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). During handling, keep the load at no 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.

**Checking the characteristics of the burner**

Check the identification label of the burner, showing:

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

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

- the category of the appliance/countries of destination (I);
- heavy oil maximum viscosity (L).

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

D9243

**Fig. 8**



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 Operating position



- The burner is designed to operate only in positions **1**, **2**, **3** and **4** (Fig. 9).
- Installation **1** is preferable, as it is the only one that allows the maintenance operations as described in this manual.
- Installations **2**, **3** and **4** allow operation but make maintenance and inspection of the combustion head more difficult.



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

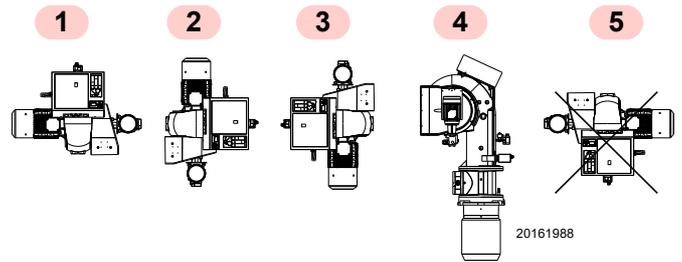


Fig. 9

### 5.5 Preparing the boiler

#### 5.5.1 Boring the boiler plate

Pierce the closing plate of the combustion chamber, as in Fig. 10.

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

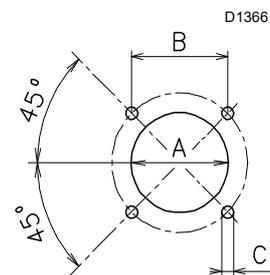


Fig. 10

mm	A	B	C
ENNE/EMME 1400	255	368	M16
ENNE/EMME 2000	265	368	M16
ENNE/EMME 3000	340	438	M20
ENNE/EMME 4500	340	438	M20

Tab. G

**5.6 Mounting the burner on the boiler**



Provide an adequate lifting system (Fig. 11).  
Lift the burner by means of the hooks to fix it to the boiler without separating it from the combustion head.



Be careful as some drops of fuel may leak out during this phase.

To detach the burner from the combustion head, proceed as follows:

- remove the cover from bracket 1)(Fig. 11), pin 2), stops 4) and screws 3);
- detach hoses 6);
- release the tie-rod on the gas butterfly, removing screw 11);
- remove screw and plate 12), pins 13) and 14) and slide out lever 15);
- slide the burner out of the combustion head by about 100-120 mm, and release the drive fork 7) by removing screws 10);
- remove the two electrical wires from the terminal strip 18);
- it's now possible to slide the burner fully out on pins 5);

- secure the tube to the boiler, inserting the insulating screen 9);
- Slide the burner in on pins 5), leaving it open by about 100-120 mm;
- refit the two electrical wires into the terminal strip 18);
- refit fork 7), securing it with screws 10);
- completely close the burner, securing it with screws 3), fit stops 4), pin with cotter 2), gas butterfly tie-rod 11) and hoses 6);
- slide in lever 15), securing it to tie-rod 16), replace pins 13) and 14) and re-close the hole with plate and screw 12);
- when the burner is open, it is possible to detach gas sleeve 8) from the tube.



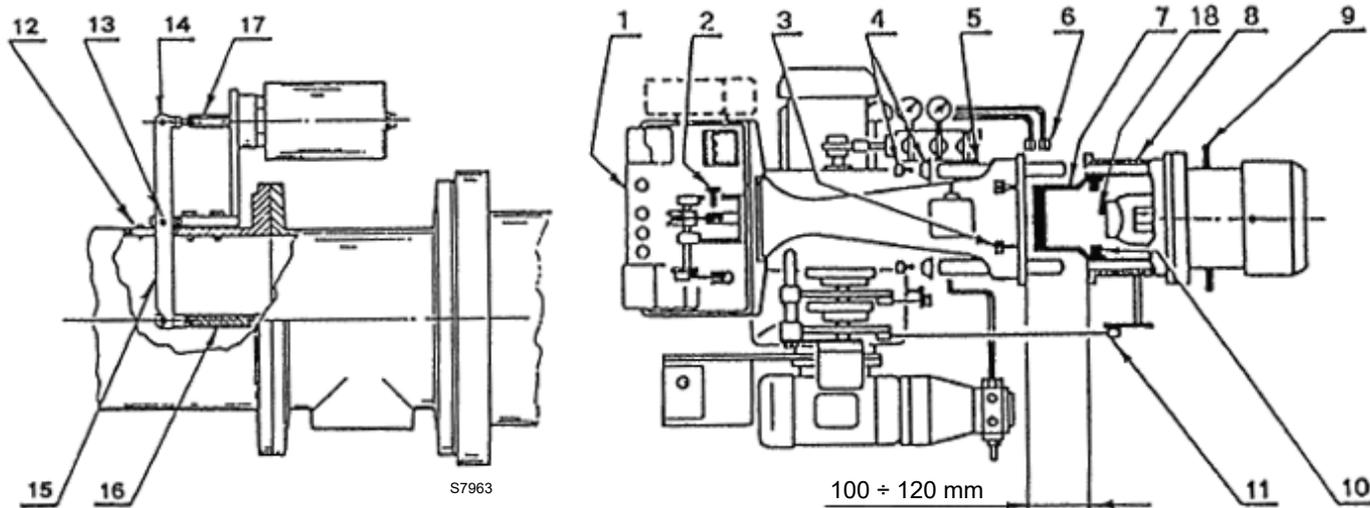
**ATTENTION**

Before fitting the burner on the boiler it is advised to fit the nozzle as specified later.



**ATTENTION**

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



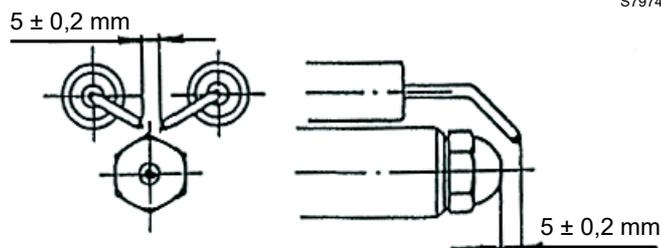
**Fig. 11**

**5.7 Positioning the electrode**



**ATTENTION**

Position the electrode according to the dimensions shown in Fig. 12.



**Fig. 12**

**5.8 Air damper setting**

Air damper adjustment is performed by acting on the variable profile cam. This operation is performed after having adjusted the pressure variator and the combustion head.

With the burner on, remove voltage from the servomotor, detaching the fast-on pin located on the electrical control panel, and release movement by pressing on release.

Calibrate maximum output, minimum output and intermediate outputs in this order.

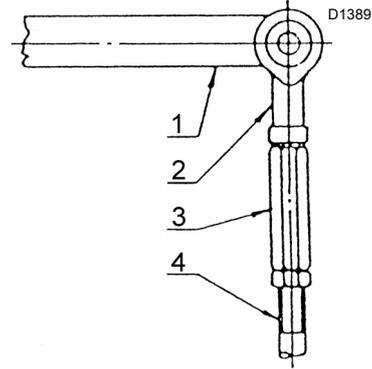
Having completed the adjustment, re-check all calibrations, reset the electrical connections of the servomotor and secure the adjustment screws with the crossways screws.

**5.8.1 Modifying air damper tie-rod length**

It is recommended to extend the tie-rod when the air gate valve moves within a reduced angle (air damper at about half travel of maximum output); this helps avoid giving the cam too curved a profile.

With the burner off, proceed as follows:

- detach ball-joint 2) from lever 1);
- unscrew extension 3) a few turns from tie-rod 4);
- reconnect the ball-joint to the lever and raise the cam profile until the air damper index returns to 0 with the servomotor at 0°.



**Fig. 13**

**Key**

- 1 Lever
- 2 Articulated coupling
- 3 Extension
- 4 Tie-rod

**5.9 Nozzle installation**

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

**5.9.1 Recommended nozzle**

Select the nozzle, with nominal output slightly higher than the one actually required, among the following types:

Model	Nozzle
Fluidics	type W2
Bergonzo	type B3 or B5

Angles of 45° - 50° are normally recommended. For narrow combustion chambers, use nozzles with angles of 30° - 35°.

**5.9.2 Adjusting the nozzle pin opening rod**

When installing for the first time and after performing any maintenance work or changing the nozzle, reset lever as specified below:

- with the nozzle fitted, loosen the nut with extension
- screw in extension by hand until you have eliminated all play on lever;
- unscrew by a half turn (lever with approx. 0.5 mm of play).

**NOTE:**

**The nozzle pin's stroke varies depending on the size and make of the nozzle (Bergonzo o Fluidics).**



**ATTENTION**

We advise you to use maximum stroke, as described above, to ensure the nozzle pin opens fully; incomplete opening results in poor atomisation.



**ATTENTION**

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



**CAUTION**

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

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



**ATTENTION**

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

**5.9.3 Relationship between: nozzle type and delivery-return pressure**

To set the delivery range within which the nozzle must operate, adjust the maximum and minimum fuel pressure on the nozzle return, according to the diagrams shown.

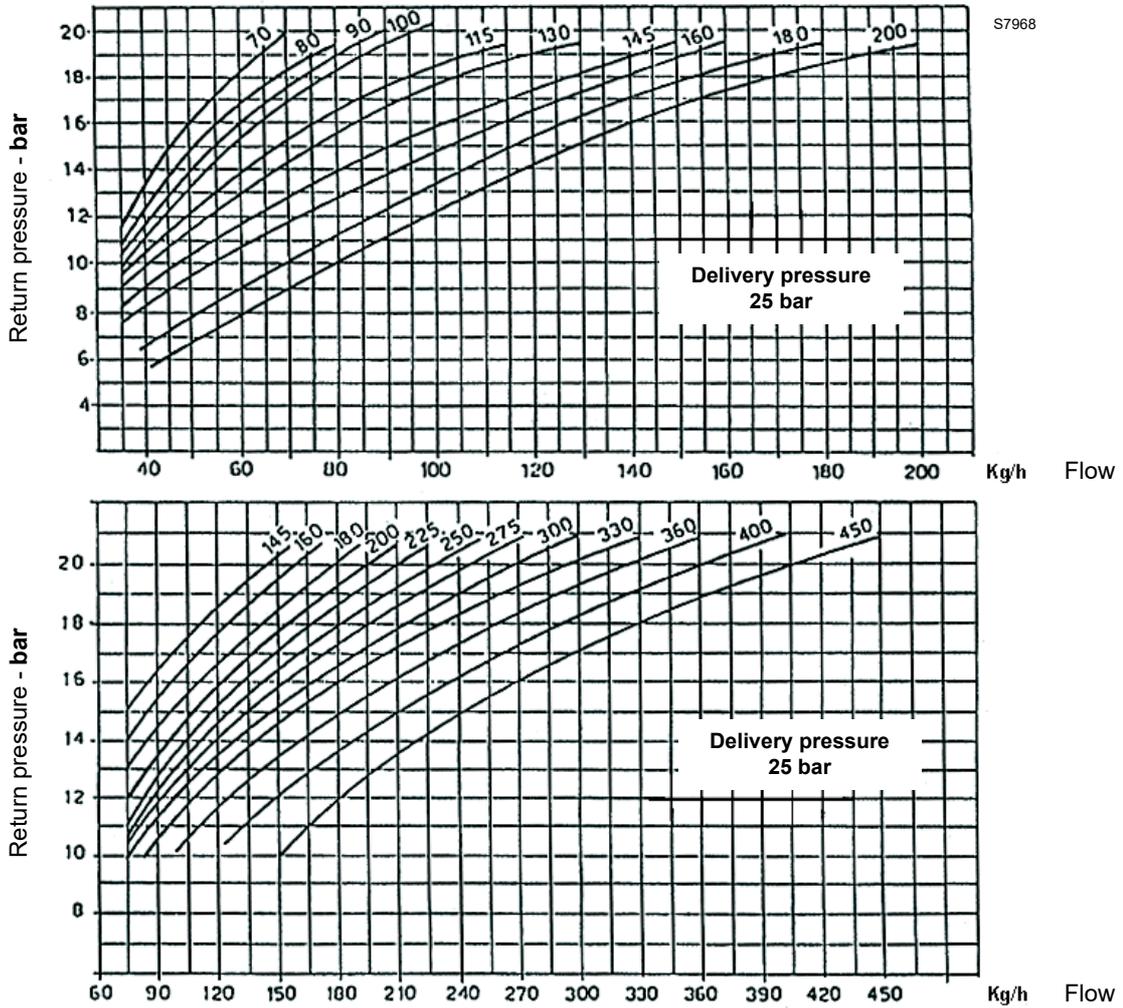


Fig. 14

**5.10 Combustion head adjustment**

The combustion head moves simultaneously with cam 8)(Fig. 19), the variable profile cams and the gas butterfly. Head position can be seen on cylinder 2)(Fig. 15).

The head control lever systems are factory-calibrated for maximum travel.

If a different modulation range is required, these levers must be recalibrated so that head travel takes place as illustrated in the following graph (Fig. 16).



**ATTENTION**

**For ignition difficulty proceed as follows:**

- Adjust the fuel pressure on the return line between 5 ÷ 8 bar and regulate the air for a correct combustion.
- If difficulties persist, set the combustion head to the minimum on notch 2 ÷ 3, keeping the adjustment of the maximum delivery as in the diagram.

**Example:**

With burner 4500, for modulation from 1.400.000 to 3.400.000 kcal/h you see from the graph: notch I for 1.400.000 kcal/h. notch 6,5 for 3.400.000 kcal/h, with a travel of a 5.5 notches.

**NOTE:**

To avoid causing knocking, never exceed maximum and minimum aperture positions corresponding, respectively, on cylinder 2)(Fig. 15), to notch 9 with the servomotor at 130° and notch 0 with the servomotor at 0°.

**To modify combustion head travel, proceed as follows:**

- Con-rod 1), which controls drive rod of the combustion head, is fitted with a slot; when tie-rod 9) is moved towards the outside of the slot, head travel decreases by about 20 mm (approx. 4 notches).

If a larger reduction is required, proceed as follows:

- With the servo-motor at 0°, slacken screws 5) and push ring 6) under the variable - profile cam in the direction of the arrow. This reduces eccentricity and thus decreases travel.
- Having established the required travel, fully secure screws 5).

In the previous example (travel of 5.5 notches), travel start-end must coincide with the required values of 1 and 6.5.

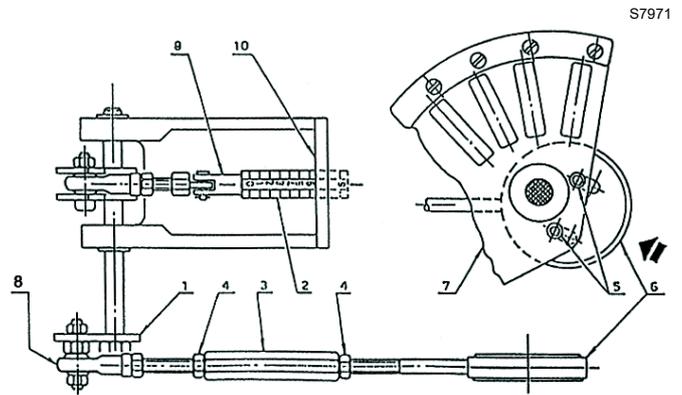
To obtain this, turn hex. sleeve 3) one way or the other after having slackened nuts 4).

With the servo-motor positioned at 0°, notch 1) must coincide with reference surface 10); when the servo-motor is positioned at 130°, it must coincide with notch 6.5.

Having completed the adjustment, fully secure nuts 4) with ball-joint 8) positioned as shown in the Fig. 15.

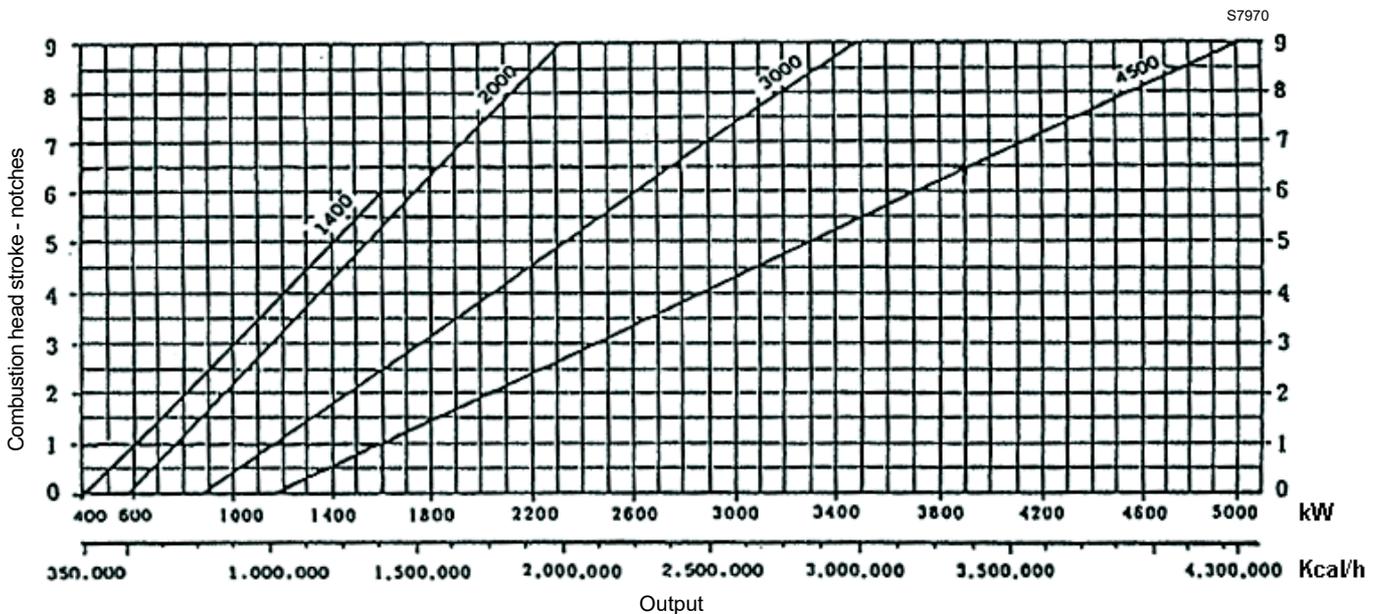
Head calibrations are performed with the burner closed and not operating and with the servo-motor released.

Having completed the adjustment, manually check cam 7) travel to ensure there is no knocking between 0° and 130°.



S7971

**Fig. 15**



S7970

**Fig. 16**

**5.11 Heavy oil supply**



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

Precautions: avoid knocking, attrition, sparks and heat.

Make sure the fuel shut-off valve is closed before performing any operation on the burner.



ATTENTION

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

**5.11.1 Hydraulic system**



CAUTION

➤ Make sure that the hoses to the pump supply and return line are installed correctly.



ATTENTION

Follow the instructions below:

- Tighten the flexible hoses with the supplied gaskets.
- During the installation, hoses must not be stressed with twisting.
- Position hoses so that they cannot be stepped on or get into contact with hot parts of the boiler and so that they allow burner opening.
- Finally, connect the other end of the flexible hoses to the suction and return line ducts.



ATTENTION

Before starting the burner make sure that the return pipe line is not clogged. Any obstruction would cause the pump seals to break.

- To facilitate fuel flow, all hoses must be of appropriate dimensions, insulated and heated (electrically or by means of steam or hot water).
- To limit the formation of gas or vapours, the fuel pressure in degassing unit 10)(Fig. 17) must be regulated in relation to the feed temperature, as shown in the table opposite.
- The transfer pump must have a delivery at least twice that of the burner. When more than one burner is fed by the same loop, the pump must provide a delivery of at least 50% more than the total delivery of the combined burners.
- For start-up: circulate fuel in the feed loop, having first cut-out the burner using gate valves 5). Once operating level circulation is achieved, open the gate valves and feed the burner as normal.



ATTENTION

Oil pipes must be completely airtight.

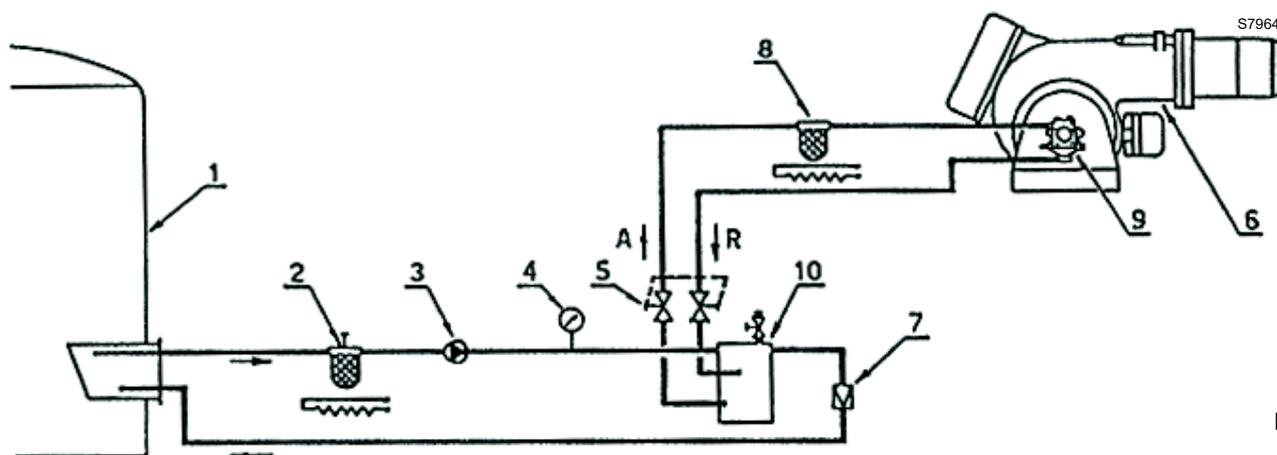


Fig. 17

Key (Fig. 17)

- 1 Tank (heated for heavy oil)
- 2 Filter (with resistor for oil viscosity > 7°E/50°C)
- 3 Transfer pump
- 4 Control pressure gauge
- 5 Gate valves for burner cut-out (coupled)
- 6 Burner (with kit for heavy oil)
- 7 Pressure regulator (calibrated as table below)
- 8 Filter (with resistor for oil viscosity > 7°E/50°C)
- 9 Burner pump
- 10 Degassing unit

Heavy oil temperature °C	Pressure bar
Up to 80	1.0
90	1.5
100	2.0
110	2.5
120	3.0

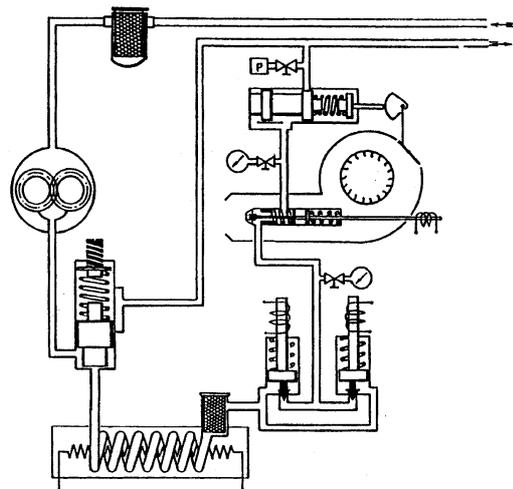
Tab. H

### 5.12 Hydraulic operation diagram

#### 5.12.1 Oil pressure switch

Burner halt condition

Can be adjusted between 2 and 15 bar; in the event of excessive counter-pressure on the fuel return line, it brings the burner to a halt, (recommended calibration: 5 bar).



S7980

Fig. 18

#### Key (Fig. 18)

- Cn** - Control cams
- FO** - Oil filter
- MM** - Delivery pressure gauge
- MR** - Return pressure gauge
- MV** - Fan motor
- P** - Pump with pressure adjuster
- POM** - Maximum oil pressure switch
- RO** - Pressure adjuster on return line
- Vn** - Valves

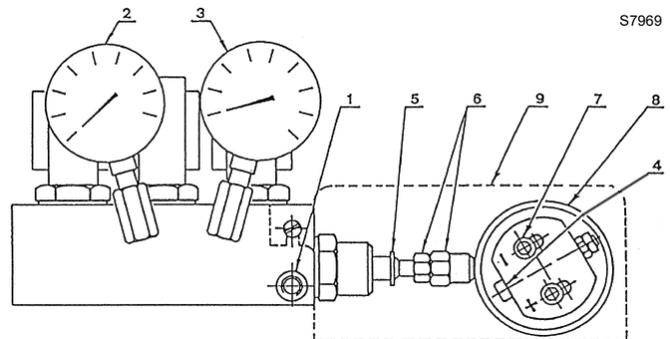
### 5.13 Pressure variator

To calibrate cam 8)(Fig. 19):

- remove gear-case 9), slacken screws 7), and act on screw 4) until required eccentricity is obtained.
- Turning screw 4) to the right (+ sign), eccentricity is increased, thus increasing the difference between nozzle maximum and minimum delivery.
- Turning screw 4) to the left (- sign), eccentricity is reduced, thereby reducing the difference between nozzle maximum and minimum delivery.
- Every variation of eccentricity may require a travel offset using nut and locknut 6).

#### Note

- To obtain correct calibration, cam 8) must operate over the full travel range of the servomotor (20° - 130°): every variation of the servomotor must be matched by a variation in pressure.
- Never give the variator piston a snug fit: stop ring 5) sets maximum travel.
- When the adjustment has been made, manually check that there is no Knocking between 20° and 130° and that maximum and minimum pressures match pre-selected values as indicated on the graph (Fig. 14 on page 19).
- If, at maximum nozzle delivery (maximum return pressure), pressure oscillations are seen on pressure gauge 3), slightly reduce pressure until the oscillations are eliminated.



S7969

Fig. 19

#### Key

- 1 Pressure switch fitting
- 2 Delivery pressure gauge
- 3 Return pressure gauge
- 4 Cam adjustment screw
- 5 Piston halt ring
- 6 Piston calibration nut and locknut
- 7 Cam locking screws
- 8 Variable cam
- 9 Cover

**5.14 Pump**

**5.14.1 Technical data**

Pump Burner		TA3C4010-5 ENNE/EMME 1400	TA4C4010-7 ENNE/EMME 2000	NVBHRPDC ENNE/EMME 3000	NVBHRMDC ENNE/EMME 4500
Min. delivery rate at 30 bar pressure (1400)					
Min. delivery rate at 40 bar pressure (2000-3000-4500)	kg/h	540	730	1000	1500
Delivery pressure range	bar	7 - 40	7 - 40	15 - 40	15 - 40
Max. suction depression	cm Hg	30	30	-	-
Viscosity range	cSt	4 - 800	4 - 75	4 - 500	4 - 500
Maximum heavy oil temperature	°C	140	140	140	140
Max. suction and return pressure	bar	5	5	9	9
Pressure calibration in the factory	bar	25	25	25	25

Tab. I

**5.14.2 Priming pump**



Before starting the burner, make sure that the tank return line is not clogged. Obstructions in the line could cause the sealing organ located on the pump shaft to break.

- In order for self-priming to take place, the cap 4) on the pump (Fig. 20) must be loosened to bleed off the air contained in the suction line.
- Start the burner by closing the remote controls. As soon as the burner starts, check the direction of rotation of the fan blade.
- The pump can be considered to be primed when the heavy oil starts coming out of the cap 4).
- Close the burner and tighten the cap 4).

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

If the pump fails to prime at first start-up and the burner locks out, wait approx. 15 seconds, reset the burner, and then repeat the start-up operation. And so on.

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

Do not light the flame sensor in order to prevent the burner lockout; the burner locks out in any case about ten seconds after its start.



The above-mentioned 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 vacuumeter 3)(Fig. 20) 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.

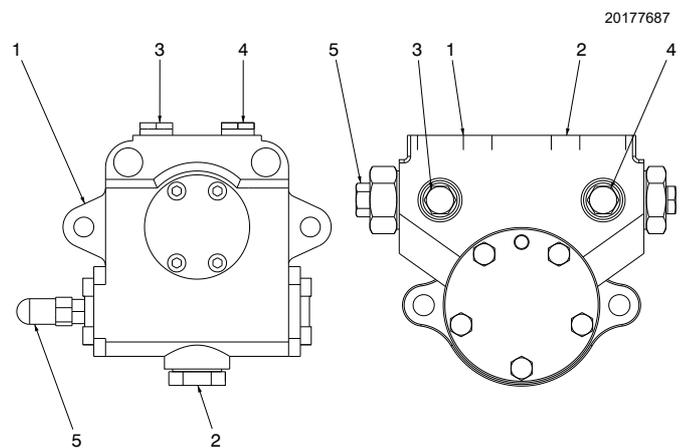


Fig. 20

Key (Fig. 20)

- 1 Suction line
- 2 Return line
- 3 Vacuumeter connection
- 4 Pressure gauge connection
- 5 Pressure adjustment

### 5.15 Gas supply



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

Precautions: avoid knocking, attrition, sparks and heat.

Make sure the fuel shut-off valve is closed before performing any operation on the burner.



ATTENTION

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

#### 5.15.1 Gas feeding line

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

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

MBC "threaded"

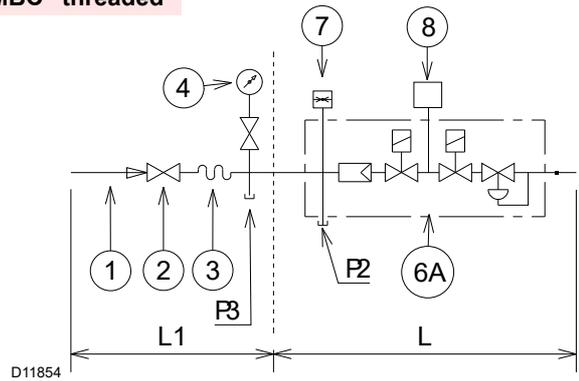


Fig. 21

MBC "flanged"-VGD

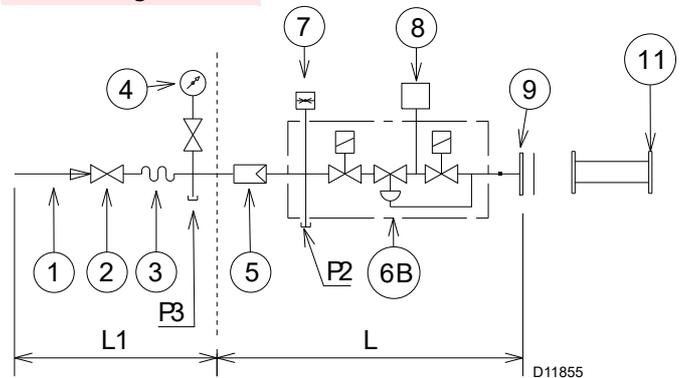


Fig. 22

DMV "flanged or threaded"

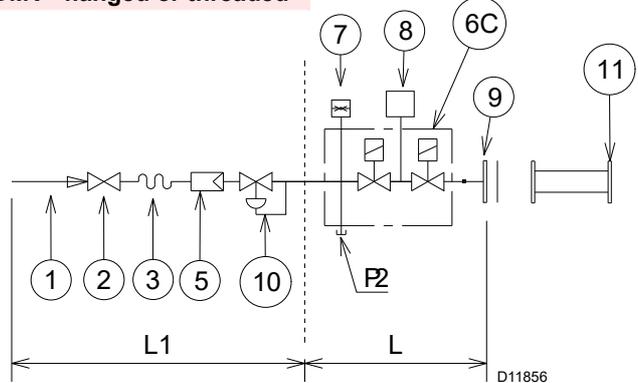


Fig. 23

CB "flanged or threaded"

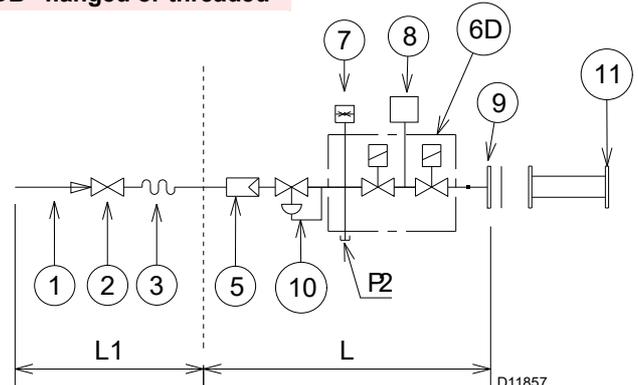


Fig. 24

**5.15.2 Gas train**

Type-approved in accordance with EN 676 and supplied separately from the burner.

**5.15.3 Gas train installation**



Disconnect the power supply using the system main switch.



Check that there are no gas leaks.



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



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



The operator must use the required equipment during installation.

The gas train is prearranged to be connected to the burner by the flange 1)(Fig. 25).

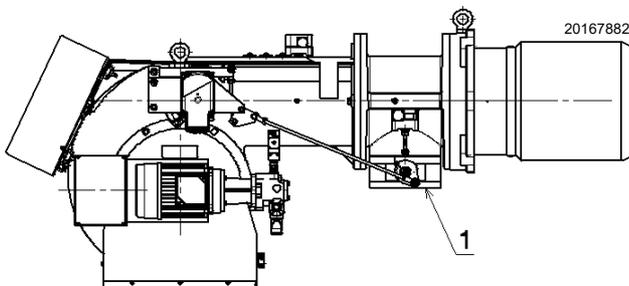


Fig. 25

**5.15.4 Gas pressure**

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

	kW	1 Δp (mbar)	
		G 20	G 25
ENNE/EMME 1400	800	10	14.9
	889	11.1	16.5
	978	12.2	18.2
	1067	13.3	19.8
	1156	14.4	21.5
	1244	15.6	23.2
	1333	16.7	24.9
	1422	17.8	26.5
	1511	18.9	28.2
	1600	20	29.8
ENNE/EMME 2000	1150	9.8	14.6
	1258	11.7	17.4
	1366	13.3	19.8
	1473	14.6	21.8
	1581	15.9	23.7
	1689	17.2	25.6
	1797	18.7	27.9
	1904	20.6	30.7
	2012	22.9	34.1
	2120	25.8	38.4
ENNE/EMME 3000	1750	17	25.3
	1956	18.2	27.1
	2161	19.8	29.5
	2367	21.6	32.2
	2572	23.6	35.2
	2778	25.7	38.3
	2983	27.9	41.6
	3189	30	44.7
	3394	32.1	47.8
	3600	34	50.7
ENNE/EMME 4500	2350	18	26.8
	2606	20.8	31
	2861	23.6	35.2
	3117	26.5	39.5
	3372	29.4	43.8
	3628	32.3	48.1
	3883	35.1	52.3
	4139	37.8	56.3
	4394	40.5	60.3
	4650	43	64.1

Tab. J



Data of head thermal power and gas pressure refer to operation with gas butterfly valve fully open (90°).

The values shown in Tab. J refer to:

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

**Column 1**

Combustion head pressure drop.

Gas pressure measured at test point 2)(Fig. 26), with:

- combustion chamber at 0 mbar;
- burner working at maximum modulating output;
- combustion head adjusted as in page 20.

**Column 2**

Pressure drop at gas butterfly valve 1)(Fig. 26) with maximum opening: 90°.

To calculate the approximate output at which the burner operates:

- subtract the combustion chamber pressure from the gas pressure measured at test point 2)(Fig. 26).
- Find in Tab. J related to the burner concerned, the pressure value closest to the result of the subtraction.
- Read the corresponding output on the left.

**Example N/M 3000 with natural gas G20:**

Operation at maximum modulating output

Gas pressure at test point 2)(Fig. 26)	=	32.9 mbar
Pressure in combustion chamber	=	5 mbar
$32.9 - 5$	=	27.9 mbar

A pressure of 27.9 mbar, column 1, corresponds in Tab. J to an output of 2983 kW.

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

To calculate the required gas pressure at test point 2)(Fig. 26), set the maximum modulating output required from the burner operation:

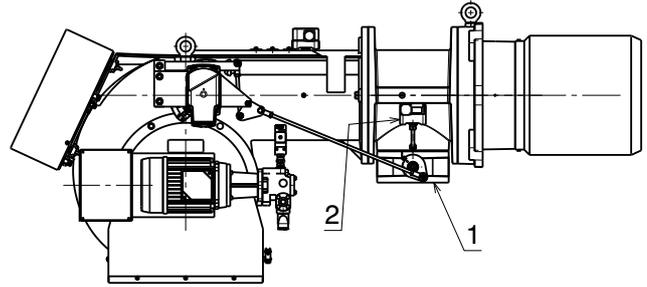
- find the nearest output value in the table Tab. J for the burner in question.
- Read, on the right (column 1), the pressure at the test point 2)(Fig. 26).
- Add this value to the estimated pressure in combustion chamber.

**Example N/M 3000 with natural gas G20:**

Operation at maximum modulating output

Gas pressure at an output of 8000 kW	=	27.9 mbar
Pressure in combustion chamber	=	5 mbar
$27.9 + 5$	=	32.9 mbar

pressure required at test point 2)(Fig. 26).



**Fig. 26**

## 5.16 Electrical connections

### Notes on safety for the electrical wiring



**DANGER**

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be made in accordance with the regulations currently in force in the country of destination and by qualified personnel. Refer to the wiring diagrams.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the wiring diagrams.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- The burners have been set for intermittent operation (FS1).
- The RFGO safety device features two built-in flame amplifiers which allow using it for applications with UV sensor only, FR sensor only or with both sensors (UV+FR). The FR amplifier circuit is subject to constant auto-control, which allows to use it for applications requiring a burner operating cycle longer than 24 hours. When it is used as a UV control, the system is considered as non-permanent, requiring one burner recycle every 24 hours. Normally, burner stopping is guaranteed by the boiler's thermostat/pressure switch. If this is not the case, a time switch must be applied to L-N in series, to stop the burner at least once every 24 hours. Refer to the wiring diagrams.
- The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards. It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel. Do not use the gas tubes as an earthing system for electrical devices.
- The electrical system must be suitable for the maximum 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, in compliance with 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 system main switch.



**DANGER**

Close the fuel shut-off valve.



**DANGER**

Avoid condensate, ice and water leaks from forming.

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

Use flexible cables according to EN 60 335-1 standard.

### 5.17 Calibration of the thermal relay

The thermal relay (Fig. 27) serves to avoid damage to the motor due to an excessive absorption increase or if a phase is missing. For calibration 2), refer to the table indicated in the electrical layout (electrical wiring by the installer).

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

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

Insert a screwdriver in the window "TEST/TRIP" 4) and move it in the arrow direction (to the right) to carry out the thermal relay test.

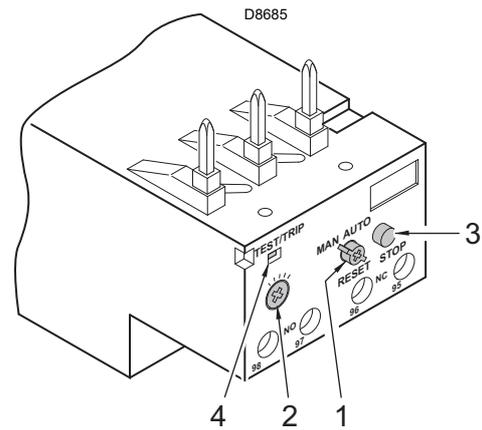


Fig. 27



ATTENTION

The automatic reset can be dangerous.

This operation is not foreseen in the burner operation.

### 5.18 Motor rotation

As soon as the burner starts, place yourself in front of the cooling fan of the fan motor and check that it turns anticlockwise (Fig. 28).

If this is not the case:

- put the switch of the burner to "0" (off) and wait until the control box carries out the switching off phase.



DANGER

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

- Invert the phases on the three-phase motor power supply.

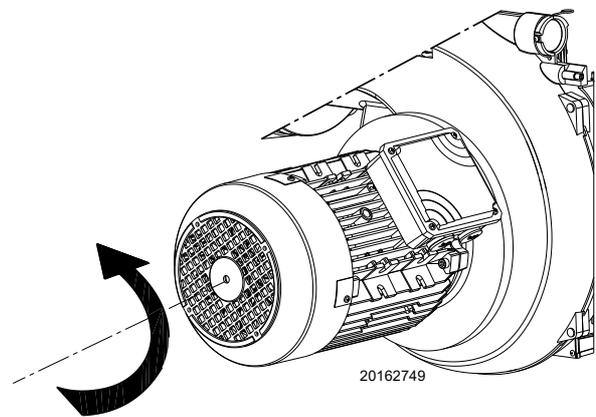


Fig. 28

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

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



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



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



Before starting up the burner, refer to section "Safety test - with no gas supply" on page 37.

### 6.2 Adjustments prior to ignition (heavy oil)



It is recommended to adjust first the heavy oil burner and then the gas burner.

Carry out the fuel change with burner off.

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

#### 6.2.1 Nozzle

See information on page 18.

#### 6.2.2 Combustion head

The adjustment of the combustion head already carried out on page 20 need not to be altered unless the 2nd stage output of the burner is changed.

#### 6.2.3 Pump pressure

Factory-set at 25 bar. See information on page 23.

#### 6.2.4 Air damper

Refer to the adjustment of the air damper on page 18.

#### 6.2.5 Timer

Sets pre-wash stage duration and is factory-set between 15 and 20 seconds (For heavy oil, see conversion kit).

#### 6.2.6 Servomotor

Refer to the adjustment of the servomotor on page 31.

### 6.3 Burner ignition (oil fuel)

Position the selector 16)(Fig. 5 on page 12) on "OIL".

When the limit thermostat (TL) is closed, the request is sent and the burner begins the starting cycle.

At first ignition, there is a momentary drop in fuel pressure due to the filling of the nozzle piping. This lowering of the fuel pressure can cause the burner to lockout and can sometimes give rise to pulsations.

If the burner locks out again, refer to chapter "Problems - Causes - Remedies signalled by LED indicators" on page 43.

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

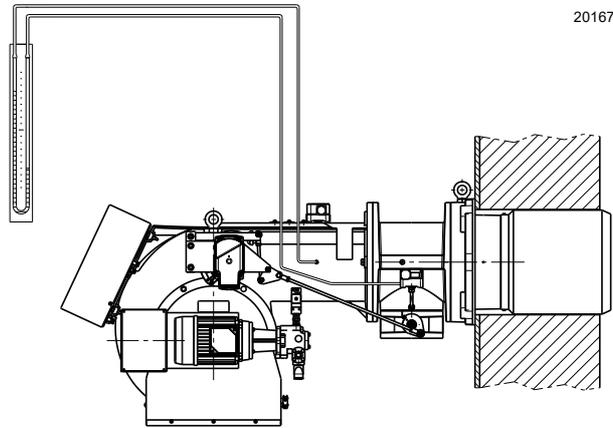
**6.4 Adjustments prior to ignition (gas)**

In addition, the following adjustments must also be made:

- Slowly open the manual valves situated upstream of the gas train.
- Adjust the minimum gas pressure switch (Fig. 33 on page 32) to the start of the scale.
- Adjust the maximum gas pressure switch (Fig. 32 on page 32) to the end of the scale.
- Adjust the air pressure switch (Fig. 31 on page 32) to the start of the scale.
- Purge the air from the gas line.  
We recommend using a plastic tube routed outside the building and to purge air until gas is smelt.
- Fit a U-type pressure gauge or a differential pressure gauge (Fig. 29), with socket (+) on the gas pressure of the pipe coupling and (-) in the combustion chamber. Used to approximately calculate the MAX burner output.
- Connect two lamps or testers to the two gas line solenoid valves to check the exact moment in which voltage is supplied.  
This operation is not required 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. 29**

**6.5 Burner start-up (gas)**

Close the remote controls and set the switch 16)(Fig. 5 on page 12) to “**GAS**”.

Check that the lamps or testers connected to the solenoid valves, or the pilot lights on the solenoid valves, indicate that no voltage is present. If they indicate the presence of voltage, stop the burner immediately and check the electric connections.

When the limit thermostat (TL) closes, the heat request is sent and the burner begins the starting cycle.

**6.6 Burner ignition**

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

If ignition does not occur, it is possible that gas is not reaching the combustion head within the safety time period of 3 seconds. Therefore, it is necessary to increase gas ignition delivery.

The arrival of gas to the sleeve is indicated by the U-type pressure gauge (Fig. 29).

If the burner locks out again, refer to chapter "Problems - Causes - Remedies signalled by LED indicators" on page 43.



In the event the burner stops, in order to prevent any damage to the installation, do not unblock the burner more than twice in a row. If the burner locks out for a third time, contact the customer service.



In the event there are further lockouts or faults with the burner, the maintenance interventions must only be carried out by qualified, authorised personnel, in accordance with the contents of this manual and in compliance with the standards and regulations of current laws.

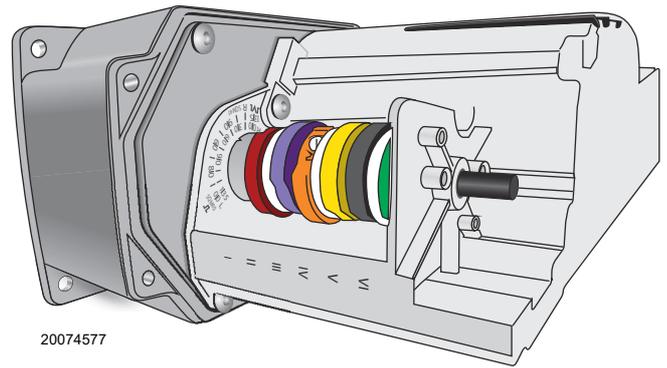
Once ignition has taken place, proceed with burner global calibration operations.

**6.7 Servomotor adjustment**

The servomotor adjusts simultaneously, through driving gears, the output and pressure of the air and the delivery of the fuel in use. It performs a 130° rotation in 45s. After the adjustment made in the factory to its 6 cams to allow an initial ignition.

Check that they are as shown below.

In the event of a modification, follow what is described below for each cam:



**Fig. 30**

**Cam I (RED):** **130°** (The same for all models).  
Limits rotation toward maximum position.



Do not make any adjustments.

ATTENTION

**Cam II (BLUE):** **0°** (The same for all models).  
Limits rotation toward minimum position. With the burner off, the air damper is completely closed: 0°



It is recommended that no adjustments are made.

ATTENTION

**Cam III (ORANGE):** Not used.

**Cam IV (YELLOW):** **20°** (The same for all models).  
Adjusts the position of the minimum output.

**Cam V (BLACK):** Not used.

**Cam VI (GREEN):** Not used.

**6.8 Pressure switch adjustment**

**6.8.1 Air pressure switch**

The air pressure switch is set after all other adjustments have been made. Begin with the switch at the start of the scale. With the burner operating, increase adjustment pressure by slowly turning the relevant knob clockwise until the burner stops. Then turn the knob anticlockwise by 0.1 kPa (1 mbar) and repeat burner start-up to ensure it is operating regularly.

If the burner locks out again, turn the knob again anti-clockwise by 0.5 mbar.



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

To check this, insert a combustion analyser in the flue, slowly reduce the burner air setting (for example with a piece of cardboard) and verify that the burner locks out before the CO value in the flue gases exceeds 1%.

**6.8.2 Maximum gas pressure switch**

Adjust the maximum gas pressure switch (Fig. 32) after making all other burner adjustments with the maximum gas pressure switch set to the end of the scale.

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

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

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

**6.8.3 Minimum gas pressure switch**

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

Adjust the minimum gas pressure switch (Fig. 33) after having adjusted the burner, the gas valves and the gas train stabiliser. With the burner operating at maximum output:

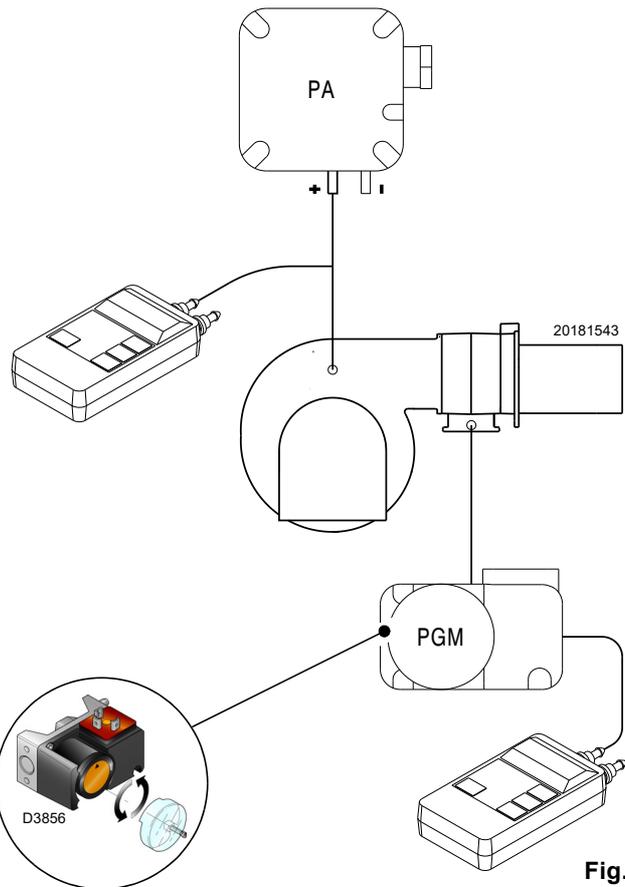
- install a pressure gauge downstream of the gas train stabiliser (for example at the gas pressure test point on the burner combustion head);
- choke slowly the manual gas cock until the pressure gauge detects a decrease in the pressure read of about 0.1 kPa (1 mbar). In this phase, verify the CO value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



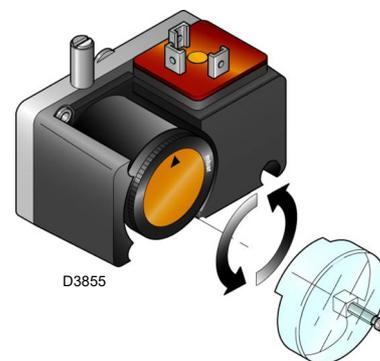
1 kPa = 10 mbar



**Fig. 31**



**Fig. 32**



**Fig. 33**

**6.8.4 Maximum oil pressure switch**

The maximum oil pressure switch is calibrated in the factory at 4-5 bar. If the oil pressure in the return line goes above this value, the pressure switch stops the burner in a lockout.

To adjust the pressure switches, use a tool to operate the adjustment screw (Fig. 34).

**6.8.5 Air bleeding**

It is carried out by opening the relevant screw placed on the minimum gas pressure switch fitted on the gas train.

**6.8.6 Gas butterfly valve**

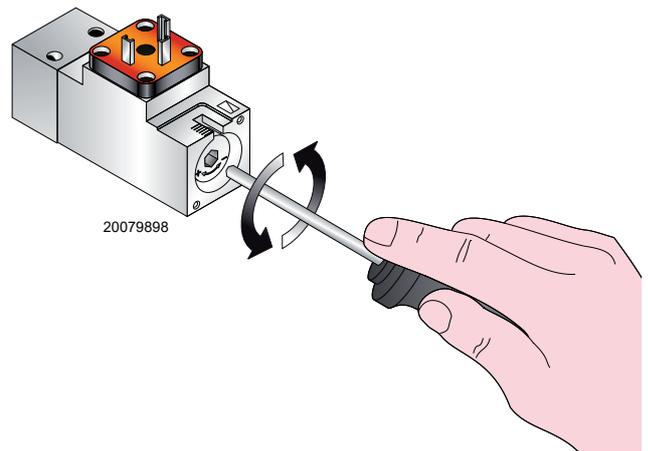
The gas butterfly valve is equipped with an external adjustment, see Fig. 36, that can facilitate the following calibration of the cam in case of low pressure values available in the network. By means of ring nut **B** it is possible to modify the passage section to the minimum setting.

- 0 minimum opening
- 2 maximum opening

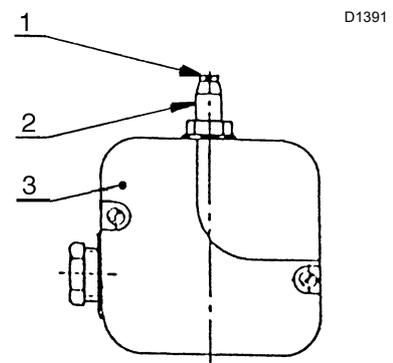
At the end of the adjustment lock with dowel **A**.

**AIR / GAS ratio adjustment**

The adjustment of the gas delivery to that of the air must be carried out after defining the heavy oil operation conditions, and can be obtained by varying the cam profile.



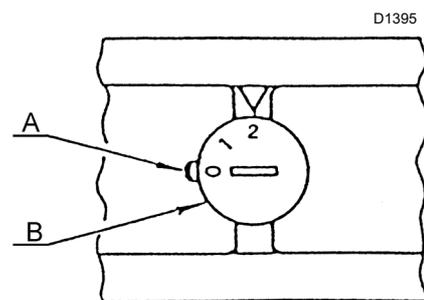
**Fig. 34**



**Fig. 35**

**Key (Fig. 35)**

- 1 - Screw
- 2 - Connection for pressure measurement
- 3 - Pressure switch

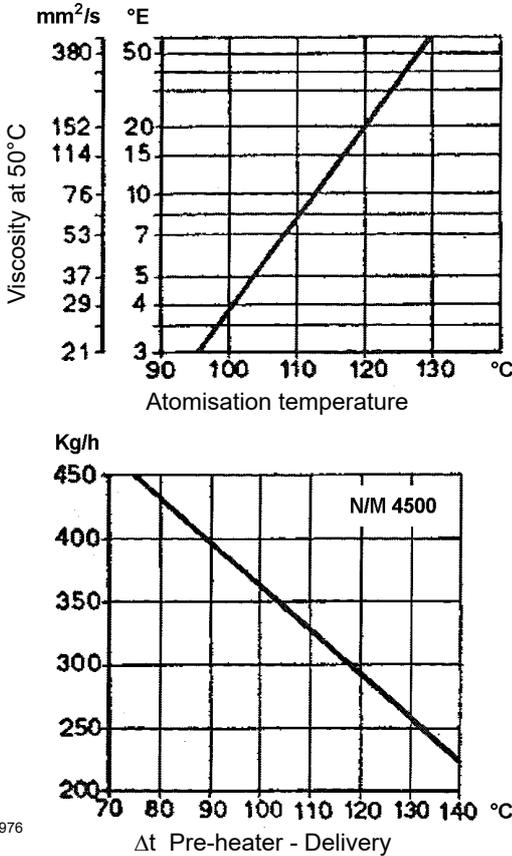


**Fig. 36**

**6.9 Spray temperature adjustment**

**6.9.1 Electronic adjustment thermostat**

By means of information relayed from a PT 100 probe immersed in the oil in the delivery manifold, the thermostat adjusts spray temperature. (The correct conditions for fuel spray are shown in the temperature/viscosity graph below).



**Fig. 37**

**Example:** fuel oil with 7° E viscosity at 50° C is pre-heated to approximately 110° C.



Although the temperature set on the thermostat should correspond to the temperature of the fluid, it is good practice to check that the thermometer shows the correct reading once the unit has been in operation for a few minutes. The led will illuminate to indicate that the heating resistances are working properly.

**Important, only for N/M 4500.**

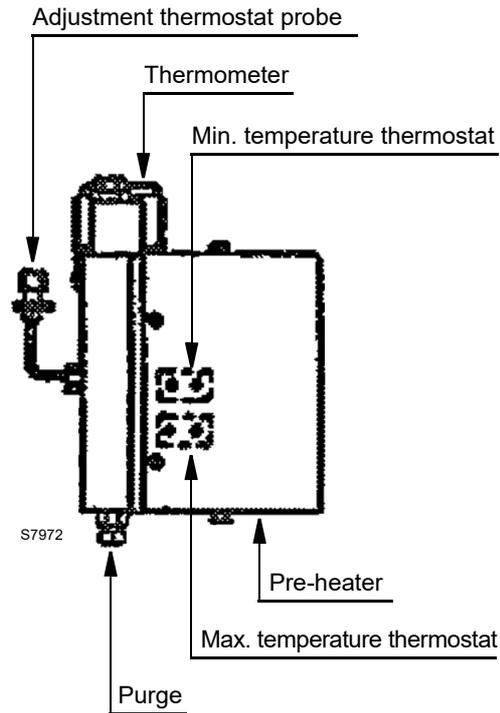
The pre-heater fitted to the burner supplies a Δt of 75°C at 450 kg/h (right-hand graph).

If there is a Δt shortfall, this can be made up by an auxiliary pre-heater.

**Minimum temperature thermostat**, in addition to shutting down the burner if the fuel temperature should fall below the critical value for correct combustion, this thermostat also provides a permissive signal at the time of burner start-up. (Factory set at approximately 80°C, adjustable by removing the pre-heater cover and relative plate).

**Maximum temperature thermostat**, this switches off the resistances when, because of failure of the adjustment thermostat, the temperature of the pre-heater increases to unacceptable levels;

a "high temperature" alarm output is provided on the burner terminal strip. (Factory set is approximately 180°C).



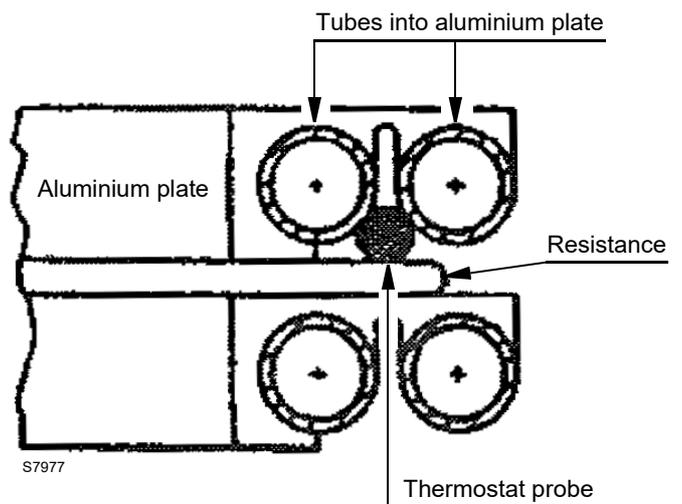
**Fig. 38**

**Renewing the minimum and maximum temperature thermostats**

Reposition the probe of the new thermostat, after having first loosened the plate pack securing screws. Make sure that the probe is touching the resistance and the plate pack as shown in the adjacent figure.

The same precautions should be taken when renewing the resistances in contact with the thermostat probes.

If the pre-heater should malfunction, use an ohmmeter to check that the resistances located in contact with the temperature probes are not burnt out (reading of approximately 35 Ohm).



**Fig. 39**

**Changing the PT 100 probe in the oil delivery manifold**

Fit the supplied nut and biconical collar on the new probe, insert a length of approximately 40 mm in the manifold, and secure firmly into place.

At this point, the section remaining outside the manifold can be bent as required (with no risk of damaging the resistance).

6.10 Burner operation

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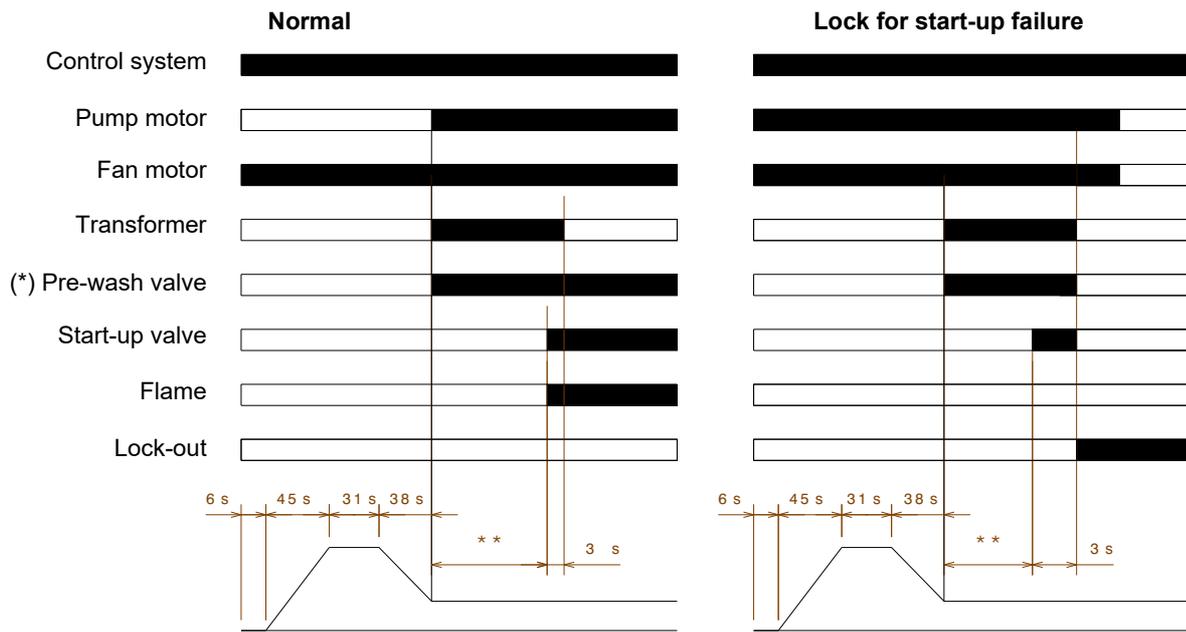


Fig. 40

(\*) oil only

(\*\*) Adjusted by timer 6) for oil (6s for gas operations)

**MOTOR LOCK:** this is brought about by the overload cut-out thermal relay when a phase is missing.

### 6.11 Final checks (with burner operating)

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

**Tab. K**



**ATTENTION**

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

## 7 Maintenance

### 7.1 Notes on safety for the maintenance

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

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



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

Before carrying out any maintenance, cleaning or checking operations:



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



Close the fuel shut-off valve.



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

### 7.2 Maintenance programme

#### 7.2.1 Maintenance frequency



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

#### 7.2.2 Safety test - with no gas supply

To perform commissioning in safety conditions, it is very important to check correct wiring between gas valves and burner.

For this purpose, after checking that connections comply with the burner wiring diagrams, it is necessary to carry out a start-up cycle with gas cock closed (dry test).

- 1 The manual gas valve must be closed using the locking/unlocking device ("Lock-out / tag out" procedure).
- 2 Ensure that burner limit electrical contacts are closed
- 3 Ensure that minimum gas pressure switch contact is closed
- 4 Try to start the burner

The start-up cycle must occur according to the following steps:

- Fan motor start-up for pre-purging
- Gas valve leak detection control, if applicable
- Pre-purging completion
- Achievement of the ignition point
- Power supply of the ignition transformer
- Supply of gas valves

As gas is closed, the burner cannot ignite and its control box will switch to stop or safety lockout condition.

The actual supply of gas valves can be checked by inserting a tester; some valves are equipped with lights (or closing/opening position indicators) that activate as soon as they are powered.



**IF POWER SUPPLY OF GAS VALVES OCCURS IN UNEXPECTED MOMENTS, DO NOT OPEN THE MANUAL VALVE, DISCONNECT POWER SUPPLY, CHECK WIRINGS, CORRECT THE ERRORS AND CARRY OUT THE WHOLE TEST AGAIN.**

#### 7.2.3 Checking and cleaning



The operator must use the required equipment during maintenance.

#### Combustion

Carry out an analysis of the combustion flue gases.

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

#### Combustion head

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

#### Combustion head maintenance



During burner opening, it is recommended to support its weight with suitable means or through the relevant wheeled support supplied upon request.

Repeat the operations described in paragraph "Mounting the burner on the boiler" on page 17 using the relevant extensions, for pins 5), supplied as standard.

### Burner

Check that there is no excess wear or loosen screws, especially on cams III (Fig. 30 on page 31).

Clean the outside of the burner.

Clean and grease the adjustable profile of the cams.

### Fan

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

### Boiler

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

### Check Mode

With burner flame on:

- hold the reset button on the flame control pressed for at least 3 sec.;
- the button colour will change from green to yellow;
- each operating status signalling LED will be compared to 20% of the maximum brightness;
- press the reset button again (<0.5sec) to reset the standard operation of the signalling LEDs.

### 7.2.4 Safety components

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



ATTENTION

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

Safety component	Life cycle
Flame control	10 years or 250,000 operation cycles
Flame sensor	10 years or 250,000 operation cycles
Gas valves (solenoid)	10 years or 250,000 operation cycles
Pressure switches	10 years or 250,000 operation cycles
Pressure adjuster	15 years
Servomotor (electronic cam)(if any)	10 years or 250,000 operation cycles
Oil valve (solenoid) (if any)	10 years or 250,000 operation cycles
Oil regulator (if present)	10 years or 250,000 operation cycles
Oil pipes/ couplings (metallic) (if present)	10 years
Flexible hoses (if present)	5 years or 30,000 pressurised cycles
Fan impeller	10 years or 500,000 start-ups

Tab. L

**HEAVY OIL OPERATION**

**GAS OPERATION**

**Pump**

The delivery pressure must comply with the graph on page 18.

The depression must be less than 0.45 bar.

Unusual noise must not be evident during pump operation.

If the pressure is unstable, or 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 problem lies in the suction line, check the filter is clean and that air is not entering the piping.

**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.

**Nozzles**

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

Do not clean the nozzle openings.

**Flexible hoses**

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

**Fuel tank**

Approximately every 5 years, suck any water on the bottom of the tank using a separate pump.

**Combustion**

If the combustion values measured before starting maintenance do not comply with applicable Standards or do not indicate efficient combustion, consult the table below or contact our Technical Support Service to implement the necessary adjustments.

**Gas leaks**

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

**Gas filter**

Change the gas filter when it is dirty.

**Combustion**

If the combustion values measured before starting maintenance do not comply with applicable Standards or do not indicate efficient combustion, consult the table below or contact our Technical Support Service to implement the necessary adjustments.

EN 676		Air excess			CO
		Max. output $\lambda \leq 1.2$		Max. output $\lambda \leq 1.3$	
GAS	Theoretical max CO <sub>2</sub> 0 % O <sub>2</sub>	CO <sub>2</sub> % Calibration			mg/kWh
		$\lambda = 1.2$		$\lambda = 1.3$	
G 20	11.7	9.7	9.0	≤ 100	G 20
G 25	11.5	9.5	8.8	≤ 100	G 25
G 30	14.0	11.6	10.7	≤ 100	G 30
G 31	13.7	11.4	10.5	≤ 100	G 31

**Tab. N**

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

**Tab. M**

**7.3 Opening the burner**

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



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



Close the fuel shut-off valve.

**7.4 Closing the burner**

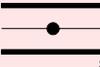
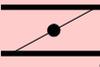
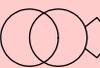
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After carrying out maintenance, cleaning or checking operations, reassemble the cover and all the safety and protection devices of the burner.

## 8 LED indicator and special function

### 8.1 Description of LED lamps

 S9740	Fan	It turns on when the fan motor is powered (T6) and blinks when RUN/CHECK switch is set to "CHECK" during damper movement phases, PTFI AND MTFI.
 S9741	Damper open	It blinks when the air damper is moving towards the maximum opening position until the position-reached feedback sent by the servomotor is received, then it stays steadily on for the time set by the flame control.
 S9742	Damper closed	If blinks when the air damper is moving towards the minimum opening position until the position-reached feedback sent by the servomotor is received, then it stays steadily on until the end of the pre-purging time.
 S9743	Auto	It indicates that the burner is ready for the output modulation.
 S9744	Ignition	It blinks during the ignition phase (1st safety time) and stays steadily on during the MTFI.
	Flame	It blinks during the first safety time and stays steadily on if the flame detection has been correctly performed.
 S9746	Alarm	It turns on in red when a lock-out condition occurs. Together with the other indicators, it indicates the type of fault during the lock-out phase. Together with the other LEDs, it indicates the operating status during the normal cycle.

Tab. O

T = Terminal

PTFI = Pilot ignition attempt

MTFI = Ignition attempt with main fuel valve

### 8.2 Check mode function

By means of the reset button on-board the flame control, it is possible to use a control function during start-up phases. (pre-purging, ignition, 1st safety time and 2nd safety time).

This function, indicated as CHECK MODE, is designed to facilitate checking the phases of the burner and of the safety devices monitored by the flame control.

This function is particularly useful during the burner first commissioning or during maintenance.

To enable the check mode function:

- keep the reset button pressed, see "LED lamps: burner operating status" on page 42, for more details, for at least 3 seconds, the status LED changes from green to yellow to signal that the control device is in check mode;
- the control device locks out during pre-purging, after a time-out of max 30 minutes the flame control will automatically exit the check mode function;

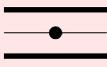
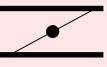
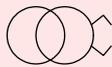
- check mode has a 2 minute timeout during the 2nd safety time. When it ends, the flame control goes back to the normal operating status;
- check mode has a 2 minute timeout during the MTFI status. When it ends, the flame control goes back to the normal operating status;
- during the check mode 1st or 2nd safety time, the flame signal level can be indicated by the 5 central LEDs on the flame control central panel, which turn on proportionally. Each lit LED (starting from the flame LED) represents 20% of the signal power.  
To exit the check mode function, press the reset button; the flame control will go back to the normal operating mode.

### 8.3 Flame control lock-out or emergency stop condition

The RFGO control device can be locked out (emergency stop) at any time during the operating cycle and unlocked when already locked (lock-out) by simply pressing the key on the front panel or by means of the terminal T21 on the support base.

### 8.4 LED lamps: burner operating status

#### OPERATING STATUSES INDICATED BY LEDS DURING NORMAL OPERATION AND CHECK MODE

Operation LED ● = ON	Fan	Damper open	Damper closed	Modulation	Ignition	Flame	Status
Icon	 S9740	 S9741	 S9742	 S9743	 S9744	 S9745	 S9746
Power OFF/ON							OFF
Not ready/ Diagnostics							Green
Standby			●				Green
Servomotor movement (Note 3)	●	OFF Flashing ●	Flashing ●				Green
Waiting for closing	Green blinking						Green
OPEN (before ignition)	●	●					Green
Minimum (before ignition)	●		●				Green
Ignition	●		●		●		Green
PTFI	●		●		●	Green blinking	Green
MTFI	●		●			●	Green
Active modulation	●			●		●	Green
Minimum output position	●		●			●	Green
With flame present	●	●				●	Green
Economy mode	●		●				Green
Check during maximum opening phase	Flashing	●					Yellow
Check during minimum closing phase	Flashing		●				Yellow
Check during ignition phase with pilot PTFI	Flashing	● Note 1	● Note 1	● Note 1	● Note 1	● Note 1	Yellow
Check during ignition phase with main fuel valve MTFI	Flashing	● Note 1	● Note 1	● Note 1	● Note 1	● Note 1	Yellow
Fault/lock-out	● Note 2	● Note 2	Red				
End of the cycle	●		●	●			Green

Tab. P

- LEDs form a progress bar which indicates the Flame Signal Power in order to orientate the sensors during commissioning (LEDs "Grow" upwards, moving away from the Status at 20% intervals of flame power.)
- LEDs indicate the error or lock-out code for troubleshooting.
- LEDs change from ON to BLINKING to OFF showing the servomotor movement control until the position-reached feedback is received see "Problems - Causes - Remedies signalled by LED indicators" on page 43".

## 9 Problems - Causes - Remedies signalled by LED indicators

When an emergency stop occurs, the control device LEDs indicate the cause of the stop.

The terminal T3 is not powered.

The device operating status is internally memorised in case of any lack of power supply.

The device lock-out condition can be caused by pressing (<1sec.) the reset button on the flame control front side or through the remote reset - terminal T21 on the base.

Since the reset button is very sensitive, do not press it strongly during the reset operation.

### Unlocking the control device

The RFGO control device can be reset in two ways: reset button and remote reset terminal.

The remote reset must be a normally open connected button between T21 and flame control power supply voltage (see illustrative diagrams):

- the reset is performed when a faulty condition is detected by the flame control.
- Press the reset button to reset the system after a lock-out.
- Pressing the reset button during operation will cause an emergency stop.
- The reset or emergency stop condition can be obtained also by using the remote reset with the same modalities.
- The number of reset attempts is limited to a maximum of 5 within 15 minutes.

### Error / RFGO LED lock-out Codes

During an alarm condition, the status LED becomes steady red. The remaining LEDs turn on according to a coded sequence which identifies the lock-out cause.

The following table shows the different LED Lock-out codes.



The device described in this manual can cause material problems, severe injuries or death.

It is the owner or user's responsibility to make sure that the equipment described is installed, used and commissioned in compliance with the requirements provided both by national and local law. The lock-out condition indicates the presence of a fault which occurred during the operating cycle or during stand-by mode.

Before performing an unlock attempt, it is necessary to restore the original optimal operating conditions.



Thermal unit's operation, maintenance and troubleshooting interventions must be carried out by trained personnel.

The persons who solve lock-out problems or reset the control device must observe the error codes to solve the problems described in this product technical data sheet.

It is not admitted to tamper with or act on the system or control in a way that could compromise the product safety or warranty.

Any tests on safety devices or on loads, such as fan motor, valves, igniter, flame sensors, must be performed with the shut-off valves closed and by qualified personnel.

Do not by-pass nor exclude the safety devices connected to the flame control.

Failure to observe these guidelines will exclude any liability.



The regulation prohibits the system from allowing more than 5 remote reset attempts within a 15 minute time window.

If more than 5 attempts are performed without solving the lock-out, the system will prevent the user to perform further remote resets and force him/her to wait for the 15 minutes to elapse.

The remote reset operation will be restored at the end of the waiting time.

It is recommended that qualified personnel evaluate the lock-out condition and implement the solution which is suitable for the fault to be solved.

### Error / RFGO LED lock-out codes

No.	Faults	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7
	Operation LED ● = ON	Fan	Open damper	Closed damper	Auto	Ignition	Flame	Status
	Icon	 S9740	 S9741	 S9742	 S9743	 S9744	 S9745	 S9746
1	Post-diagnostics fault	●						Red
2	Local reset		●					Red
3	Combustion air fan fault	●	●					Red
4	Supervisor processor diagnostics fault			●				Red
5	FR- NO Flame at the end of the 2 <sup>nd</sup> safety time (MTFI)	●		●				Red
6	FR: internal circuit fault		●	●				Red
7	Internal communication fault	●	●	●				Red
8	Remote reset				●			Red
9	FR: internal fault	●			●			Red
10	Main processor fault		●		●			Red
11	Data memory test fault	●	●		●			Red
12	Data memory test fault			●	●			Red
13	Mains voltage or frequent fault	●		●	●			Red
14	Internal processor fault		●	●	●			Red
15	Internal processor fault	●	●	●	●			Red
16	No flame: 1 <sup>st</sup> safety time (PTFI)	●				●		Red
17	Wiring fault		●			●		Red
18	Safety relay fault	●	●			●		Red
19	Combustion airflow switch fault in the rest position			●		●		Red
20	UV: no flame at the end of the 2 <sup>nd</sup> safety time (MTFI)	●		●		●		Red
21	Safety relay fault		●	●		●		Red
22	Supervisor processor fault	●	●	●		●		Red
23	Supervisor memory test fault				●	●		Red
24	Flame loss during the operation (AUTO)	●			●	●		Red
25	Supervisor processor data memory fault		●		●	●		Red
26	Supervisor processor internal fault	●	●		●	●		Red
27	Not used							
28	Not used							
29	Operating temperature out of range		●	●	●	●		Red
30	Code memory fault	●	●	●	●	●		Red
31	FR: external short circuit						●	Red
32	Check mode timeout (manual)	●					●	Red
33	False flame in stand-by mode		●				●	Red
34	Not used							
35	Internal processor timeout			●			●	Red
36	Internal processor timeout	●		●			●	Red
37	Combustion air check timeout		●	●			●	Red
38	Internal processor timeout	●	●	●			●	Red
39	Internal processor timeout				●		●	Red
40	Internal hardware fault	●			●		●	Red
41	Internal hardware fault		●		●		●	Red
42	Main processor fault	●	●		●		●	Red
43	Supervisor processor fault			●	●		●	Red
44	Supervisor processor timeout	●		●	●		●	Red
45	Off-specification mains voltage		●	●	●		●	Red

No.	Faults	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7
46	Off-specification mains voltage	•	•	•	•		•	Red
47	UV: Internal fault					•	•	Red
48	Supervisor processor fault	•				•	•	Red
49	Main processor fault		•			•	•	Red
50	Ignition feedback fault	•	•			•	•	Red
51	Pilot feedback fault			•		•	•	Red
52	Piloted valve feedback fault	•		•		•	•	Red
53	Actuator feedback waiting time expired		•	•		•	•	Red
54	Direct ignition valve feedback fault	•	•	•		•	•	Red
55	Internal processor fault				•	•	•	Red
56	UV: false flame during operation			•	•	•	•	Red
57	FR: false flame during operation	•		•	•	•	•	Red
58	T8 inlet fault		•	•	•	•	•	Red
59	Internal hardware fault	•			•	•	•	Red
60	Local reset fault	•	•	•	•	•	•	Red
61	Open POC fault		•		•	•	•	Red
62	UV: strong UV flame fault	•	•		•	•	•	Red
63	Internal hardware fault					•		Red

Tab. Q

### Fault explanation

No.	Faults	Cause	Solution
1	Post-diagnostics fault	Initial power diagnostics fault Make sure that the status of inlets and outlets is correct upon ignition	Check T12, T13 and T14
2	Local reset	The user started the manual reset or the reset switch is faulty	Check T21 inlet or reset for normal operation
3	Combustion air fan fault	No Air Check signal (T14) during the bleed cycle or Air Check signal loss during the burner operation	Check the fan or the air pressure switch
4	Supervisor processor diagnostics fault	The system detected the presence of voltage on T16, T17, T18 or T19 at the wrong moment or there is no voltage when necessary	Check the wiring and make sure that the system is operating on a single-phase line (50/60Hz)
5	FR- No flame at the end of the 2 <sup>nd</sup> safety time (MTFI)	No flame at the end of the second safety time	Inspect the system, check the gas pressure, inspect the flame detection electrode, check the wiring, etc.
6	FR: internal circuit fault	Internal fault	Replace the control device
7	Internal communication fault	Internal fault	Replace the control device
8	Remote reset	The user pressed the remote reset button or the reset switch is discontinuous/dynamic	Check the remote switch
9	FR: internal fault	Internal fault	Replace the control device
10	Main processor fault	Internal fault	Replace the control device
11	Data memory test fault	Internal fault	Replace the control device
12	Data memory test fault	Internal fault	Replace the control device
13	Mains voltage or frequent fault	Off-specification power supply voltage and/or frequency	Check the input power supply
14	Internal processor fault	Internal fault	Replace the control device
15	Internal processor fault	Internal fault	Replace the control device
16	No flame: 1 <sup>st</sup> safety time (PTFI)	No flame at the end of the first safety time	Inspect the system, check the gas pressure, check the UV scanner, check the wiring, etc.
17	Wiring fault	The system detected the presence of voltage on critical terminals (T16, T17, T18 or T19) at the wrong moment or there is no voltage when necessary	Inspect the wiring and make sure that the system is operating on a single-phase line (50/60Hz)
18	Safety relay fault	Internal fault	Replace the control device
19	Combustion airflow switch fault in the rest position	Open the circuit upon T13 start-up	Check the wiring for the air pressure switch
20	UV: no flame at the end of the 2 <sup>nd</sup> safety time (MTFI)	No flame at the end of the 2 <sup>nd</sup> safety time	Inspect the system, check the gas pressure, check the UV scanner, check the wiring, etc.
21	Safety relay fault	Internal fault	Replace the control device
22	Supervisor processor fault	Internal fault	Replace the control device
23	Supervisor memory test fault	Internal fault	Replace the control device
24	Flame loss during the operation (AUTO)	Loss of flame	Check the scanner or the fuel flow line
25	Supervisor processor data memory fault	Internal fault	Replace the control device
26	Supervisor processor internal fault	Internal fault	Replace the control device
27	Not used		
28	Not used		
29	Operating temperature out of range	Operating temperature below -40°C or above 70°C	Bring the control device within the specified temperature nominal values
30	Code memory fault	Internal fault	Replace the control device
31	FR: external short circuit	External short circuit between T24 and EARTH	Inspect the flame detection electrode
32	Check mode timeout (manual)	The interval for the manual mode (30 minutes) to end has elapsed	Exit the manual mode correctly to avoid timeout
33	False flame in stand-by mode	Unexpected flame (false or parasitic flame) detected during the Stand-by status	Check scanner or interference

No.	Faults	Cause	Solution
34	Not used		
35	Internal processor timeout	Internal fault	Replace the control device
36	Internal processor timeout	Internal fault	Replace the control device
37	Combustion air check timeout	The system could not perform verification tests of the combustion air during the burner sequence	Check the wiring or the air pressure switch
38	Internal processor timeout	Internal fault	Replace the control device
39	Internal processor timeout	Internal fault	Replace the control device
40	Internal hardware fault	Internal fault	Replace the control device
41	Internal hardware fault	Internal fault	Replace the control device
42	Main processor fault	Internal fault	Replace the control device
43	Supervisor processor fault	Internal fault	Replace the control device
44	Supervisor processor timeout	Internal fault	Replace the control device
45	Off-specification mains voltage	Off-specification mains voltage/frequency	Check the mains voltage level or the frequency. Contact the factory if the problem persists
46	Off-specification mains voltage	Off-specification mains voltage/frequency	Check the mains voltage level or the frequency. Contact the factory if the problem persists
47	UV: Internal fault	Internal fault	Replace the control device
48	Supervisor processor fault	Internal fault	Replace the control device
49	Main processor fault	Internal fault	Replace the control device
50	Ignition feedback fault	The system detected the presence of voltage on T16 at the wrong moment or there is no voltage when necessary	Check the wiring and make sure that the earthing is appropriate If the problem persists, contact the distributor/factory
51	Pilot feedback fault	The system detected the presence of voltage on T17 at the wrong moment or there is no voltage when necessary	Check the wiring and make sure that the earthing is appropriate. If the problem persists, contact the distributor/factory
52	Piloted valve feedback fault	The system detected the presence of voltage on T19 at the wrong moment or there is no voltage when necessary	Check the wiring and make sure that the earthing is appropriate If the problem persists, contact the distributor/factory
53	Actuator feedback waiting time expired	No actuator feedback on T8 for more than 10 minutes	Check the wiring Check the modulation equipment
54	Direct ignition valve feedback fault	The system detected the presence of voltage on T18 at the wrong moment or there is no voltage when necessary	Check the wiring and make sure that the earthing is appropriate. If the problem persists, contact the distributor/factory
55	Internal processor fault	Internal fault	Replace the control device
56	UV: false flame during operation	False flame detected before ignition	Check the scanner
57	FR: false flame during operation	False flame detected before ignition	Check the wiring Check the scanner Make sure that earthing is appropriate
58	T8 inlet fault	The system detected the presence of voltage on T8 at the wrong moment or there is no voltage when necessary	Check the wiring Check the actuator
59	Internal hardware fault	Internal fault	Replace the control device
60	Local reset fault	Local reset button pressed for more than 10 seconds or reset button locked	If the problem persists, replace the control device
61	Open POC fault	The fuel valve is open at the wrong moment	Check the wiring
62	UV: strong UV flame fault	The scanner is too close to the flame	Increase the distance between the scanner and the flame OR use an orifice to reduce the view field
63	Internal hardware fault	Internal fault	Replace the control device

Tab. R

## A Appendix - Accessories

### Output regulator kit for modulating operation

With modulating operation, the burner continuously adjusts its output to the heat request, thereby ensuring a great stability of the controlled parameter: temperature or pressure.

The parts to be ordered are two:

- output regulator to be installed to the burner;
- probe to be installed to heat generator.

Parameter to be controlled		Probe		Output regulator	
	Adjustment field	Type	Code	Type	Code
Temperature	- 100...+ 500°C	PT 100	3010110	RWF50.2 RWF55.5	20100018 20101965
Pressure	0...2.5 bar	Output probe 4...20 mA	3010213		
	0...16 bar		3010214		
	0...25 bar		3090873		

### Potentiometer kit

Burner	Code
ENNE/EMME 1400 - 2000 ENNE/EMME 3000 - 4500	20074487

### Spacer kit

Burner	Thickness (mm)	Code
ENNE/EMME 1400 - 2000	102	3000722
ENNE/EMME 3000 - 4500	130	3000751

### Soundproofing box kit

Burner	Type	dB(A)	Code
ENNE/EMME 1400 - 2000 ENNE/EMME 3000 - 4500	C7	10	3010376

### LPG kit

Burner	Code
ENNE/EMME 1400 - 2000	3010063
ENNE/EMME 3000	3090223
ENNE/EMME 4500	3090937

### Burner support kit

Burner	Code
ENNE/EMME 1400 - 2000 ENNE/EMME 3000 - 4500	3000731

### Degasing unit kit

Bruciatore	Code
ENNE/EMME 1400 - 2000	3000748
ENNE/EMME 3000 - 4500	3010012

**Thermal relay kit**

Bruciatore	Code
ENNE/EMME 3000	20163347

**Gas trains in compliance with EN 676**

Please refer to manual.



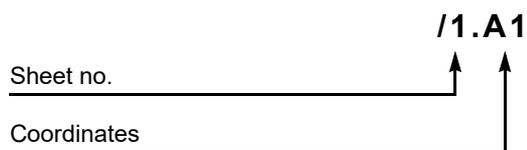
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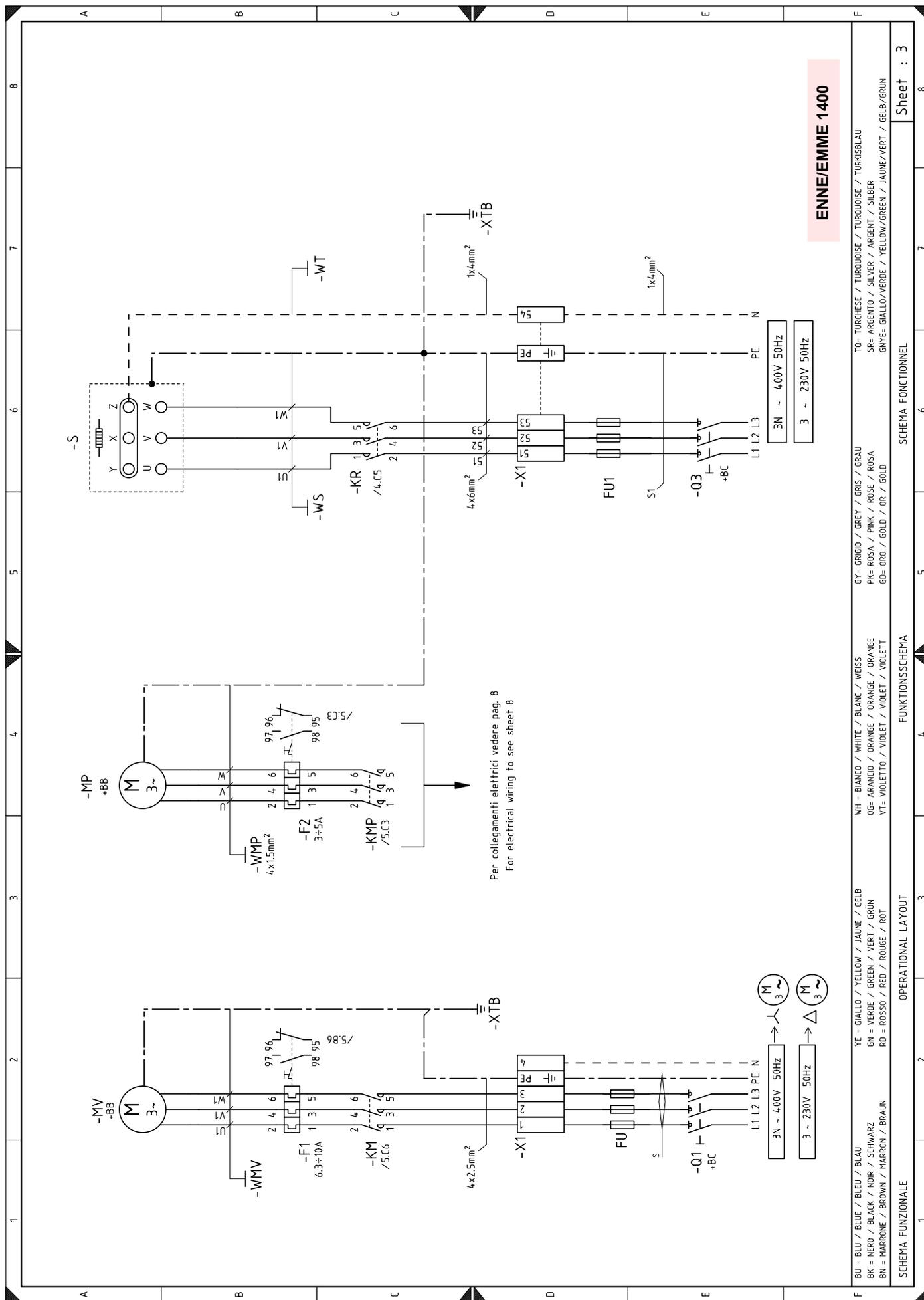
The installer is responsible for the addition of any safety device not foreseen in this manual.

**B Appendix - Electrical panel layout**

<b>1</b>	<b>Index of layouts</b>
<b>2</b>	Indication of references
<b>3</b>	Functional layout
<b>4</b>	Functional layout RFGO-A22
<b>5</b>	Functional layout RFGO-A22
<b>6</b>	Functional layout RFGO-A22
<b>7</b>	Functional layout RFGO-A22
<b>8</b>	Electrical wiring that is the responsibility of the installer
<b>9</b>	Electrical wiring that is the responsibility of the installer
<b>10</b>	Electrical wiring that is the responsibility of the installer
<b>11</b>	Electrical wiring kit RWF50 external

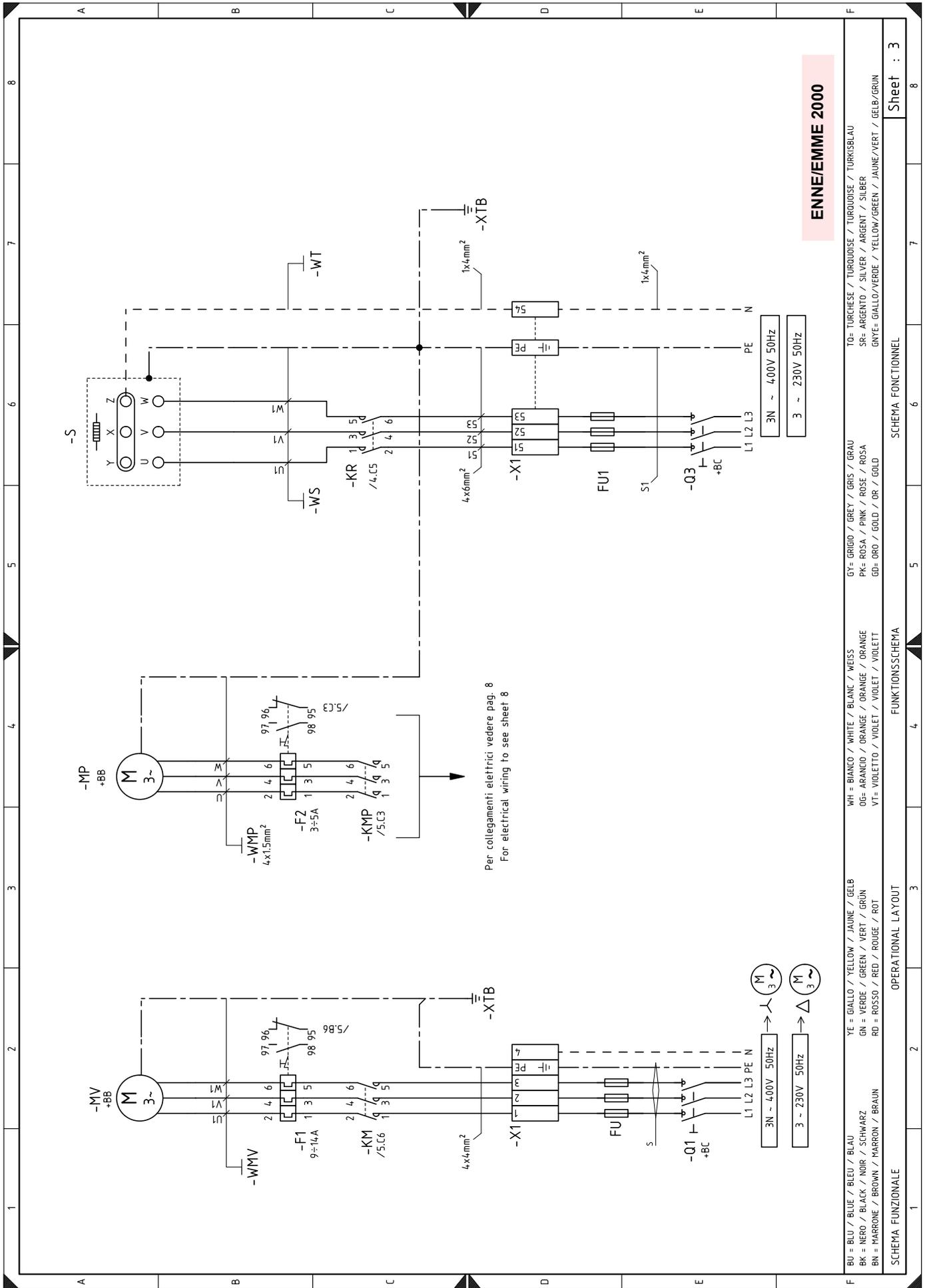
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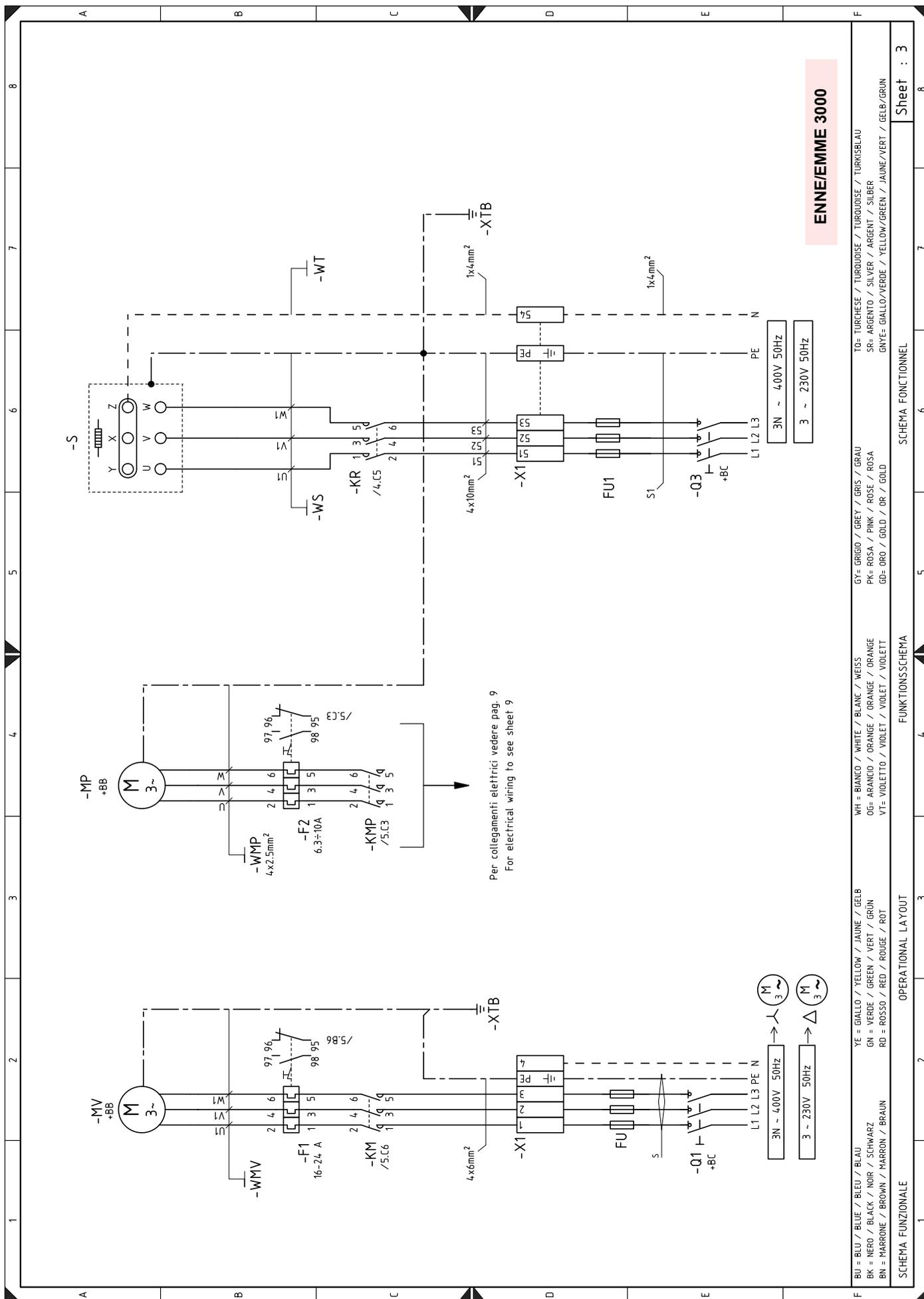




**ENNE/EMME 1400**

BU = BLU / BLUE / BLEU / BLAU BK = NERO / BLACK / NOIR / SCHWARZ BN = MARRONE / BROWN / MARRON / BRAUN	YE = GIALLO / YELLOW / JAUNE / GELB GN = VERDE / GREEN / VERT / GRÜN RD = ROSSO / RED / ROUGE / ROT	WH = BIANCO / WHITE / BLANC / WEISS OG = ARANCIO / ORANGE / ORANGE / ORANGE VT = VIOLETTO / VIOLET / VIOLET / VIOLETT	GY = GRIGIO / GREY / GRIS / GRAU PK = ROSA / PINK / ROSE / ROSA GD = ORO / GOLD / OR / GOLD	TO = TURCHESE / TURQUOISE / TURKOISE / TURKISBLAU SR = ARGENTO / SILVER / ARGENT / SILBER GNYE = GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN
SCHEMA FUNZIONALE		OPERATIONAL LAYOUT		SCHEMA FONCTIONNEL
				Sheet : 3



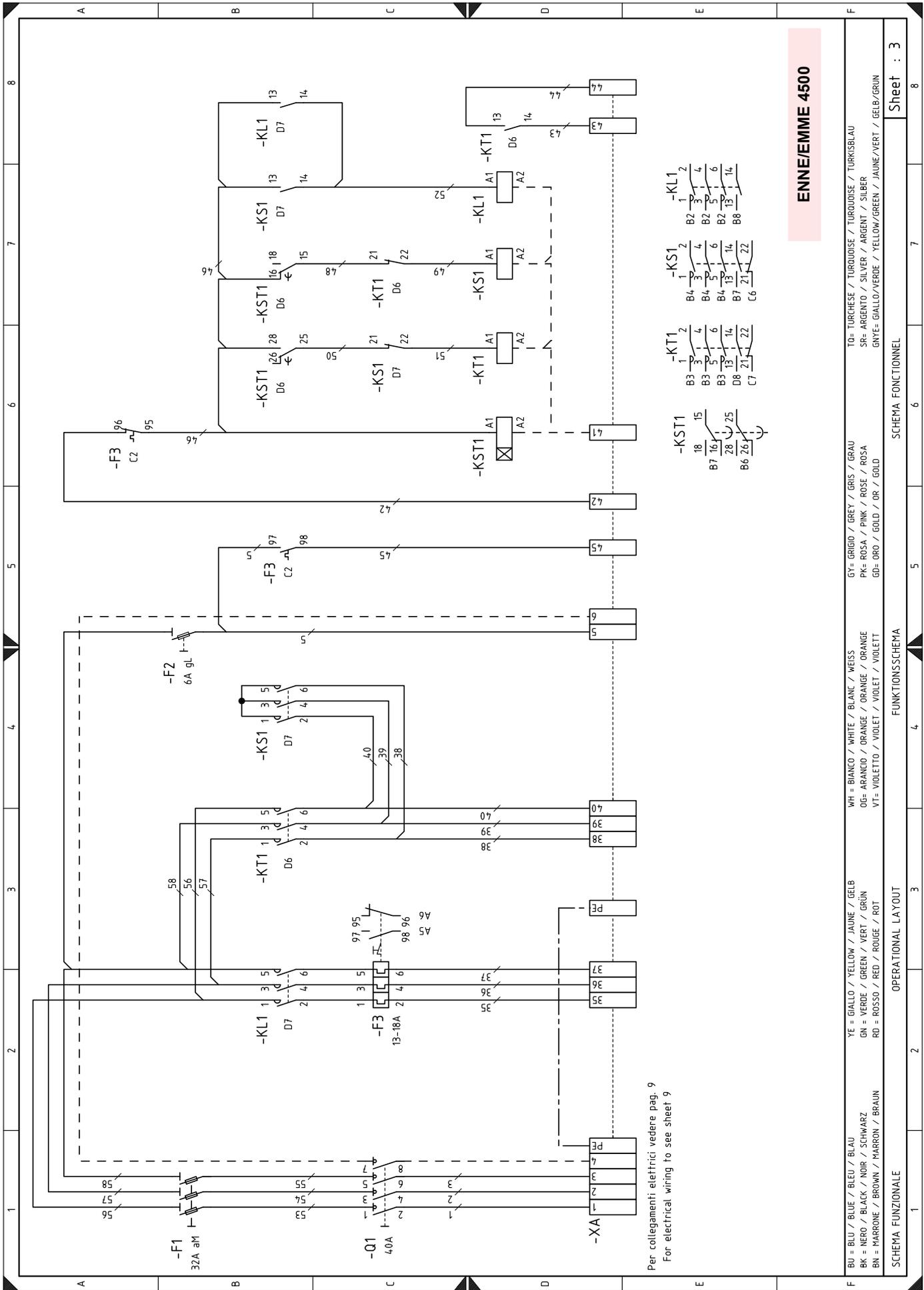


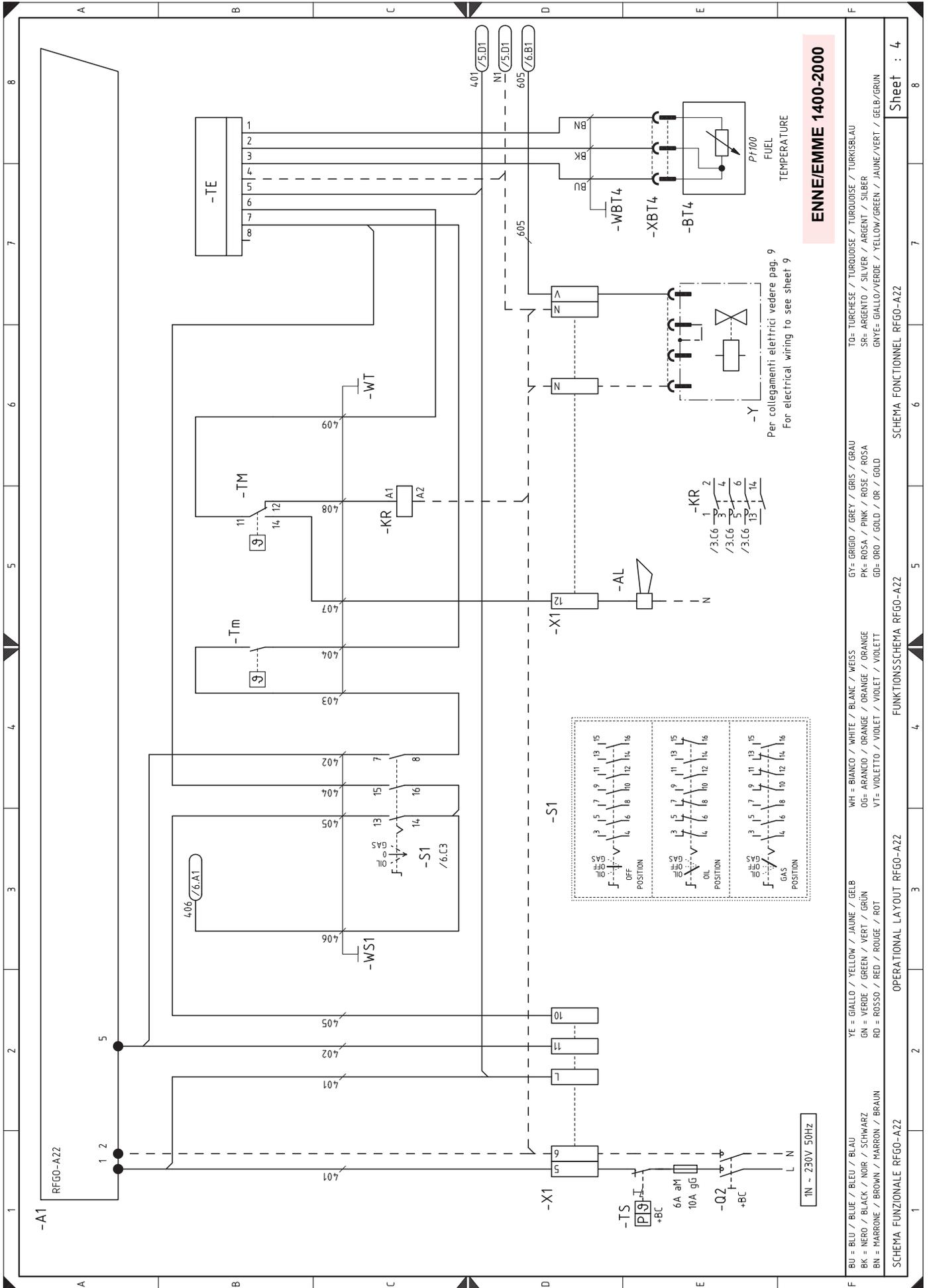
ENNE/EMME 3000

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BK = NERO / BLACK / NOIR / SCHWARZ	GN = VERDE / GREEN / VERT / GRÜN	OG = ARANCIO / ORANGE / ORANGE / ORANGE	PK = ROSA / PINK / ROSE / ROSA	SR = ARGENTO / SILVER / ARGENT / SILBER
BN = MARRONE / BROWN / MARRON / BRAUN	RD = ROSSO / RED / ROUGE / ROT	VT = VIOLETTO / VIOLET / VIOLET / VIOLETT	GD = ORO / GOLD / OR / GOLD	GNVE = GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN

SCHEMA FUNZIONALE      OPERATIONAL LAYOUT      FUNKTIONSSCHEMA

SCHEMA FONCTIONNEL      Sheet : 3



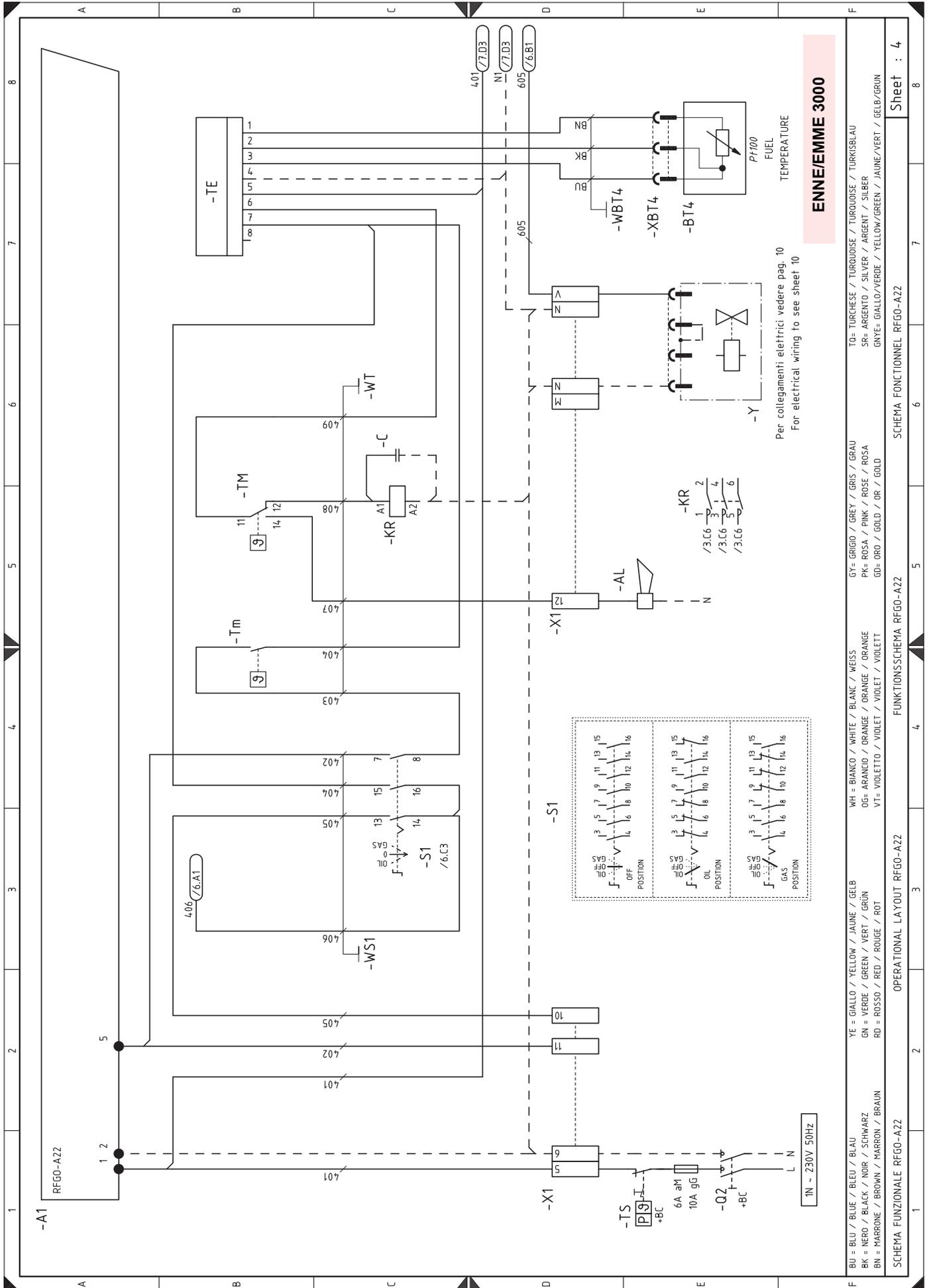


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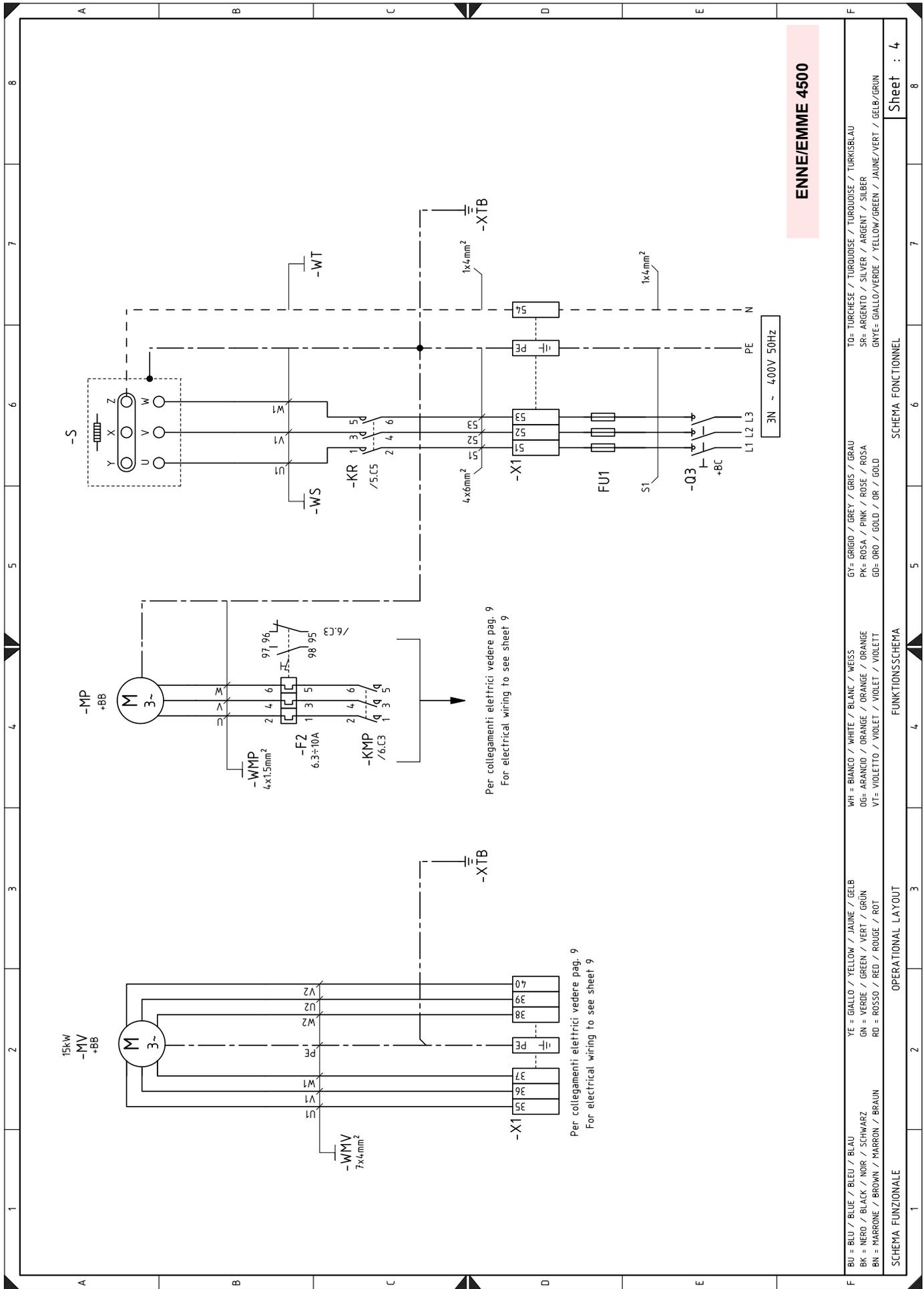
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BK = NERO / BLACK / NOIR / SCHWARZ	OG = ARANCIO / ORANGE / ORANGE / ROSA	PK = ROSA / PINK / ROSE / ROSA	SR = ARGENTO / SILVER / ARGENT / SILBER
BN = MARRONE / BROWN / MARRON / BRAUN	VT = VIOLETTO / VIOLET / VIOLET / VIOLETT	GD = ORO / GOLD / OR / GOLD	GN = GIALLO / YELLOW / JAUNE / VERT / GELB / GRÜN
YE = GIALLO / YELLOW / JAUNE / GELB			
GN = VERDE / GREEN / VERT / GRÜN			
RD = ROSSO / RED / ROUGE / ROT			

SCHEMA FUNZIONALE RFGO-AZZ      OPERATIONAL LAYOUT RFGO-AZZ      FUNKTIONSSCHEMA RFGO-AZZ      SCHEMA FONCTIONNEL RFGO-AZZ

Sheet : 4



**ENNE/EMME 4500**



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BN = MARRONE / BROWN / MARRON / BRAUN	GD = ORO / GOLD / OR / GOLD	GNVE = GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN
YE = GIALLO / YELLOW / JAUNE / GELB	WH = BIANCO / WHITE / BLANC / WEISS	
GN = VERDE / GREEN / VERT / GRÜN	OG = ARANCIO / ORANGE / ORANGE / ORANGE	
RD = ROSSO / RED / ROUGE / ROT	VT = VIOLETTO / VIOLET / VIOLET / VIOLETT	

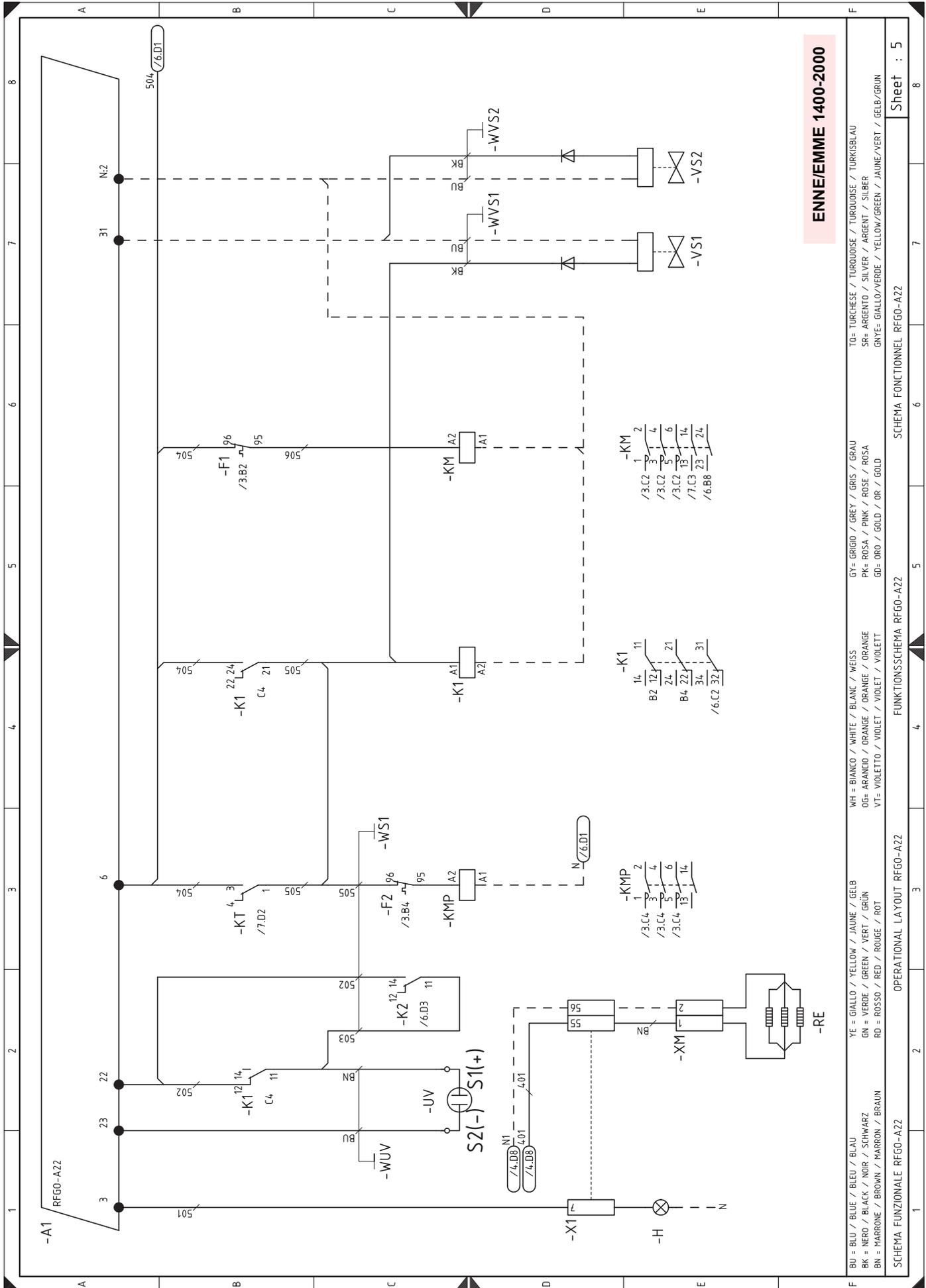
SCHEMA FUNZIONALE

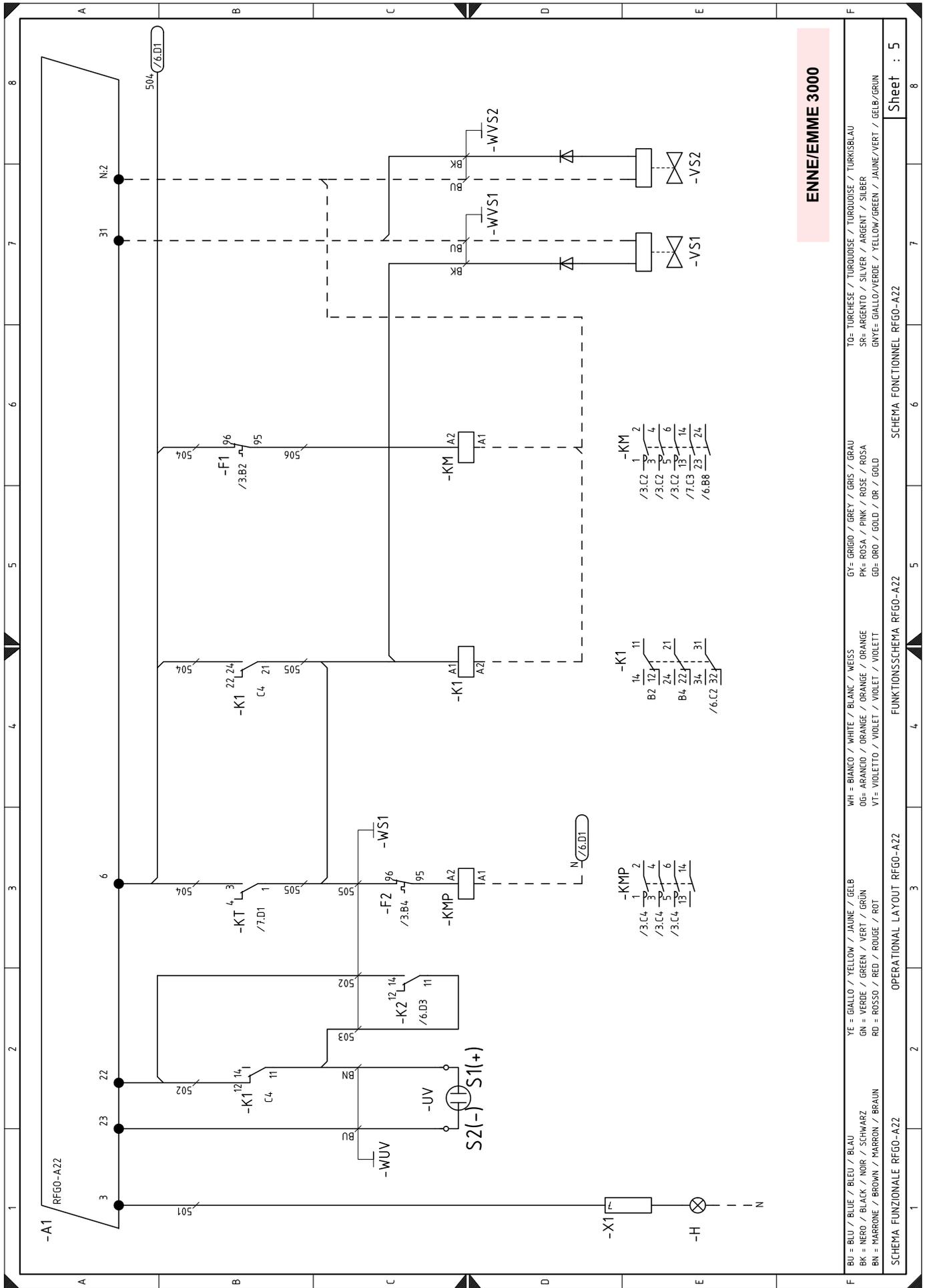
OPERATIONAL LAYOUT

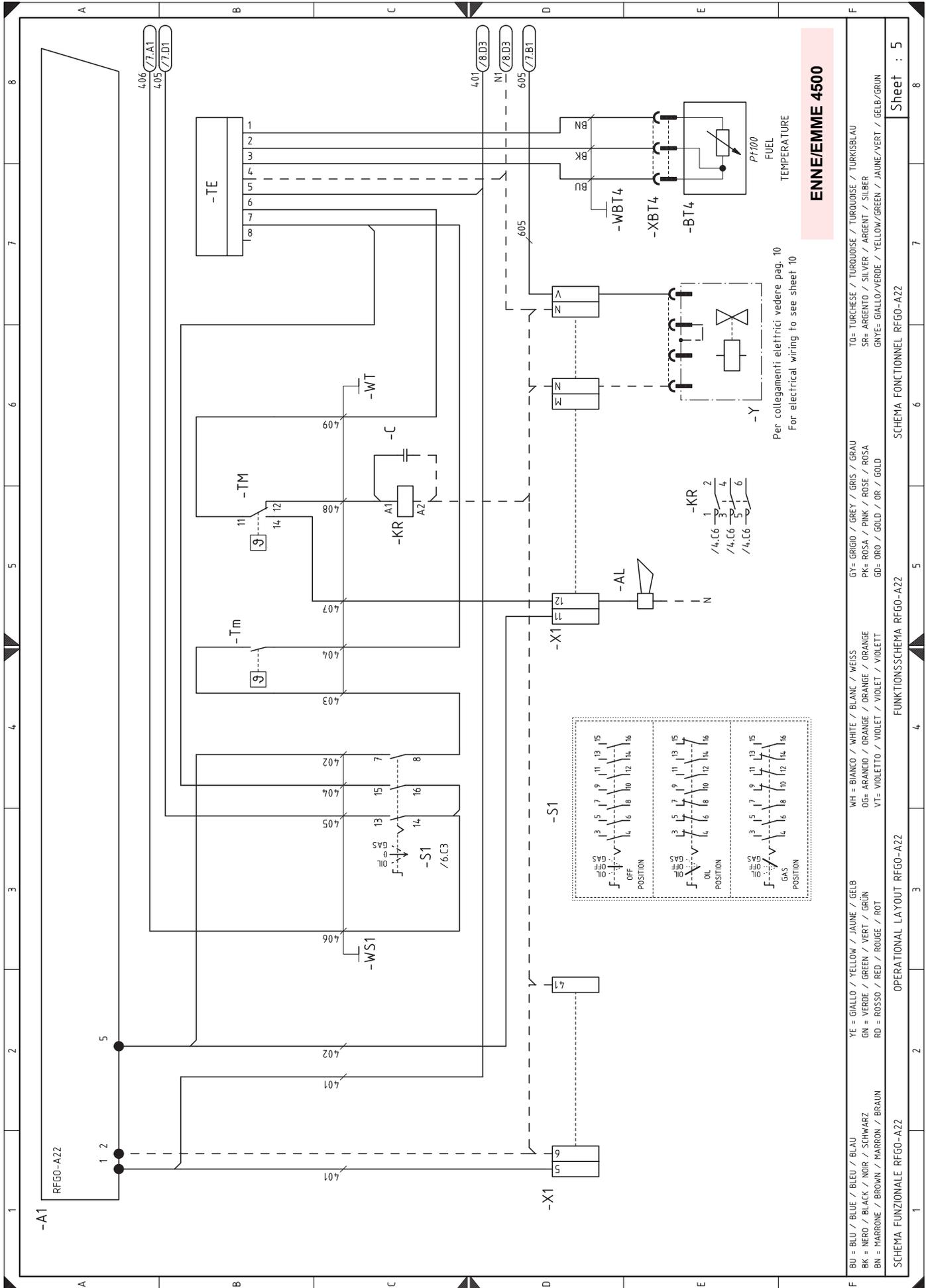
FUNKTIONSSCHEMA

SCHEMA FONCTIONNEL

Sheet : 4

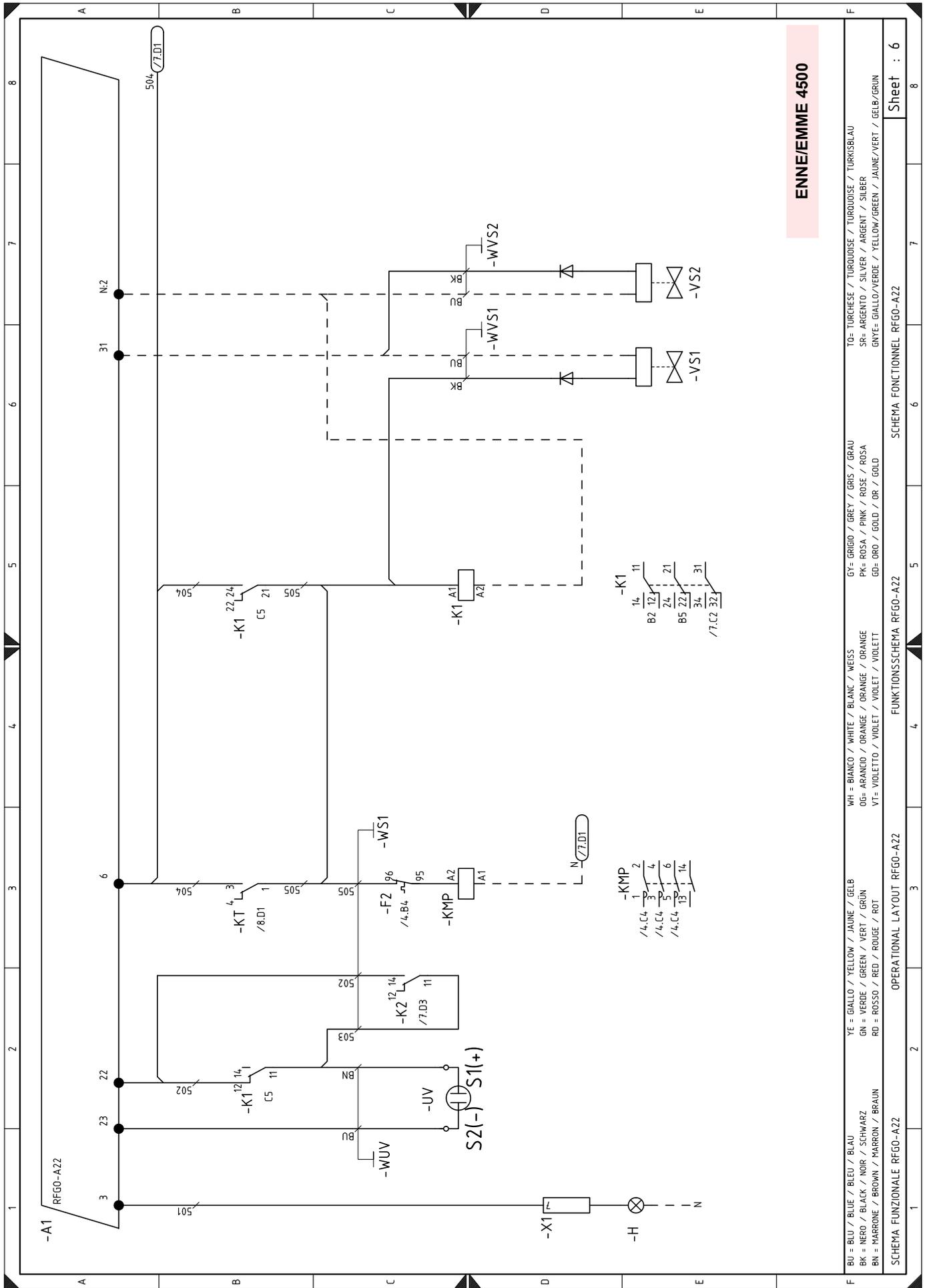


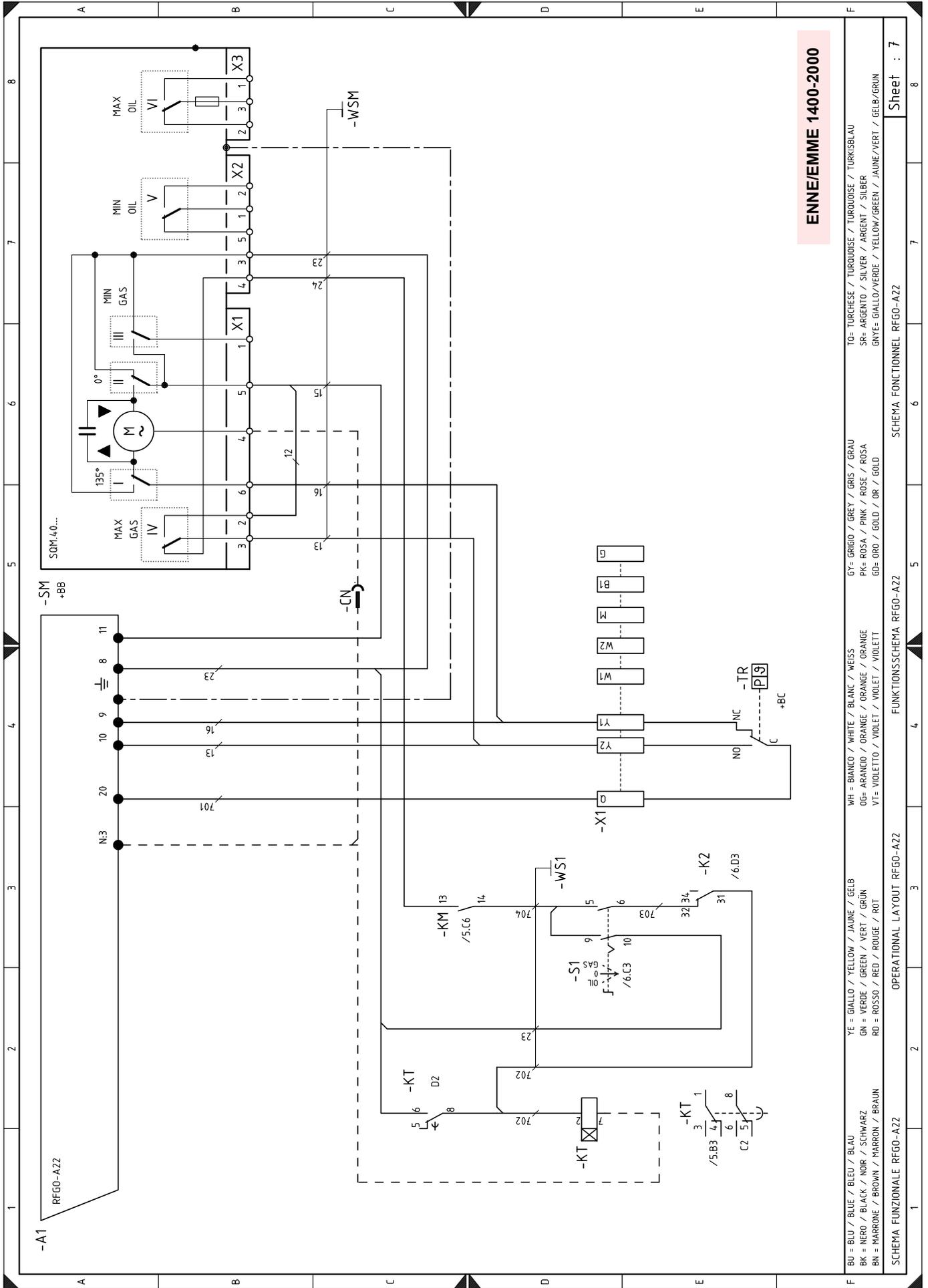








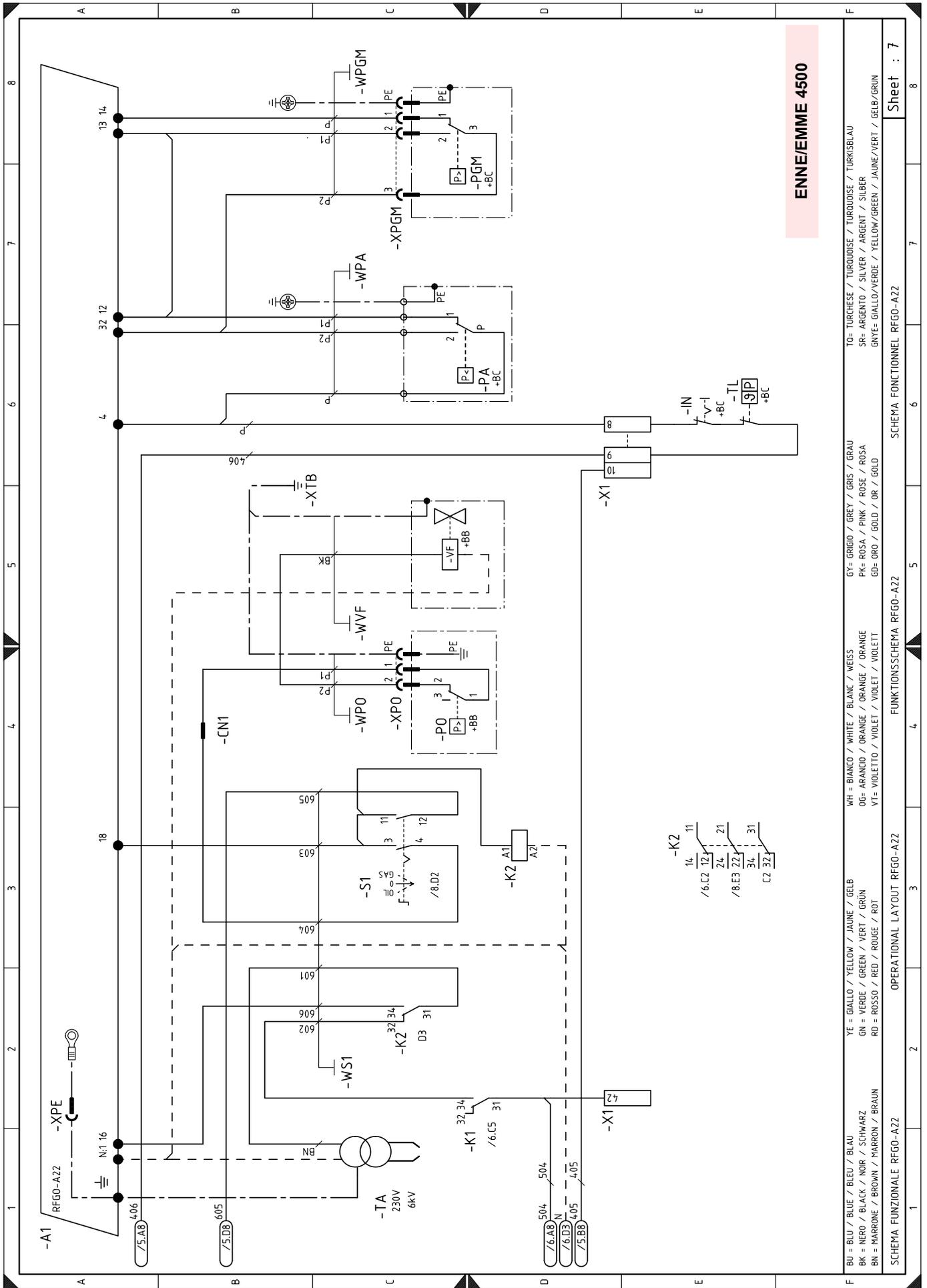


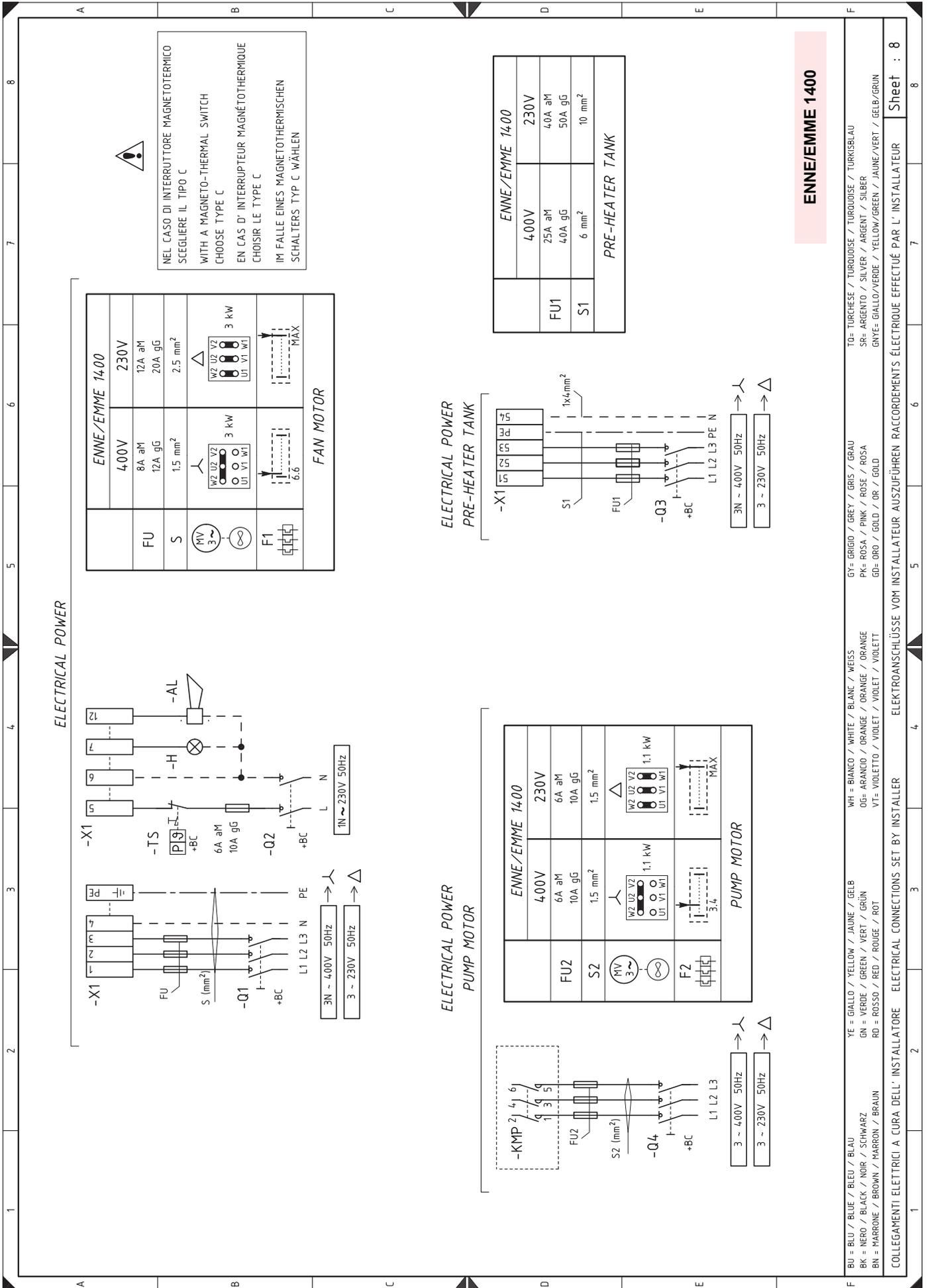


**ENNE/EMME 1400-2000**

BU = BLU / BLUE / BLEU / BLAU	YE = GIALLO / YELLOW / JAUNE / GELB	WH = BIANCO / WHITE / BLANC / WEISS	GY = GRIGIO / GREY / GRIS / GRAU	TO = TURCHESE / TURQUOISE / TURKISBLAU
BK = NERO / BLACK / NOIR / SCHWARZ	GN = VERDE / GREEN / VERT / GRUN	OG = ARANCIO / ORANGE / ORANGE / ORANGE	PK = ROSA / PINK / ROSE / ROSA	SRA = ARGENTO / SILVER / ARGENT / SILBER
BN = MARRONE / BROWN / MARRON / BRAUN	RD = ROSSO / RED / ROUGE / ROT	VT = VIOLETT / VIOLET / VIOLET / VIOLETT	GD = ORO / GOLD / OR / GOLD	GNVE = GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRUN
SCHEMA FUNZIONALE RFGO-AZZ		OPERATIONAL LAYOUT RFGO-AZZ		SCHEMA FONCTIONNEL RFGO-AZZ
				Sheet : 7







**ENNE/EMME 1400**

TO= TURCHESE / TURKOISE / TURKOISE / TURKISBLAU  
 SR= ARGENTO / SILVER / ARGENT / SILBER  
 GNVE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN

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

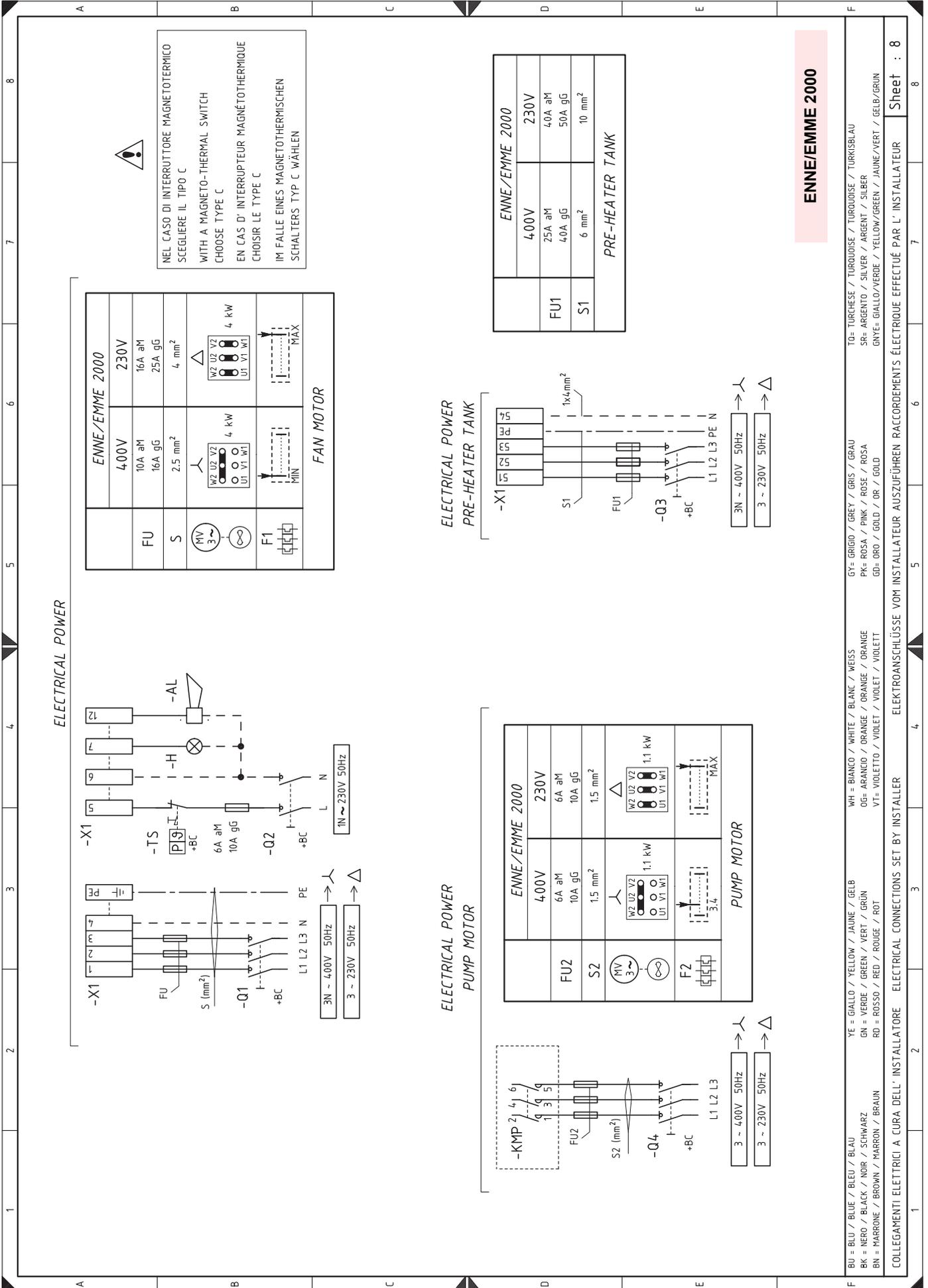
WH= BIANCO / WHITE / BLANK / WEISS  
 OG= ARANCIO / ORANGE / ORANGE / ORANGE  
 VT= VIOLETTO / VIOLET / VIOLET / VIOLETT

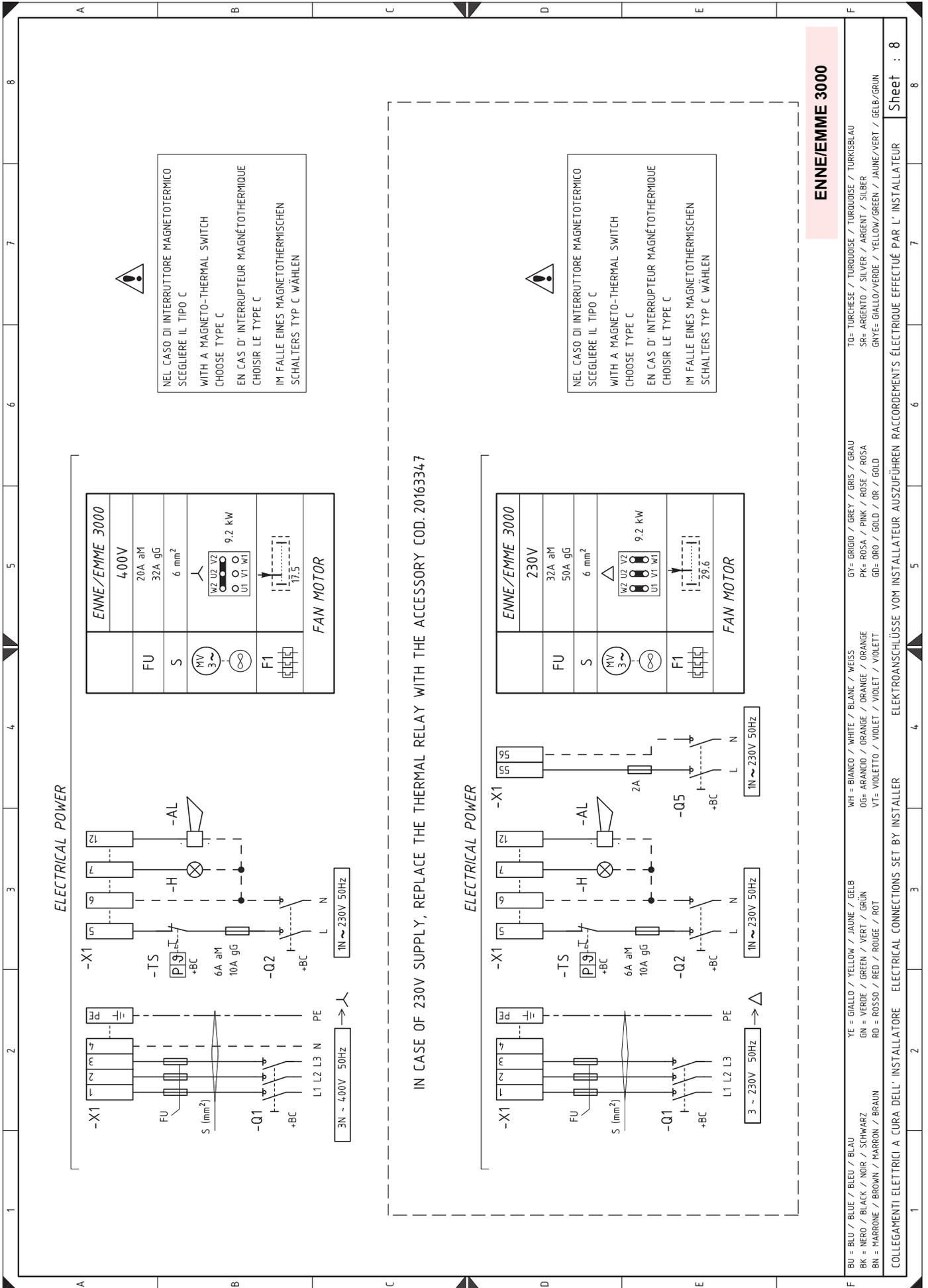
YE= GIALLO / YELLOW / JAUNE / GELB  
 GN= VERDE / GREEN / VERT / GRÜN  
 RD= ROSSO / RED / ROUGE / ROT

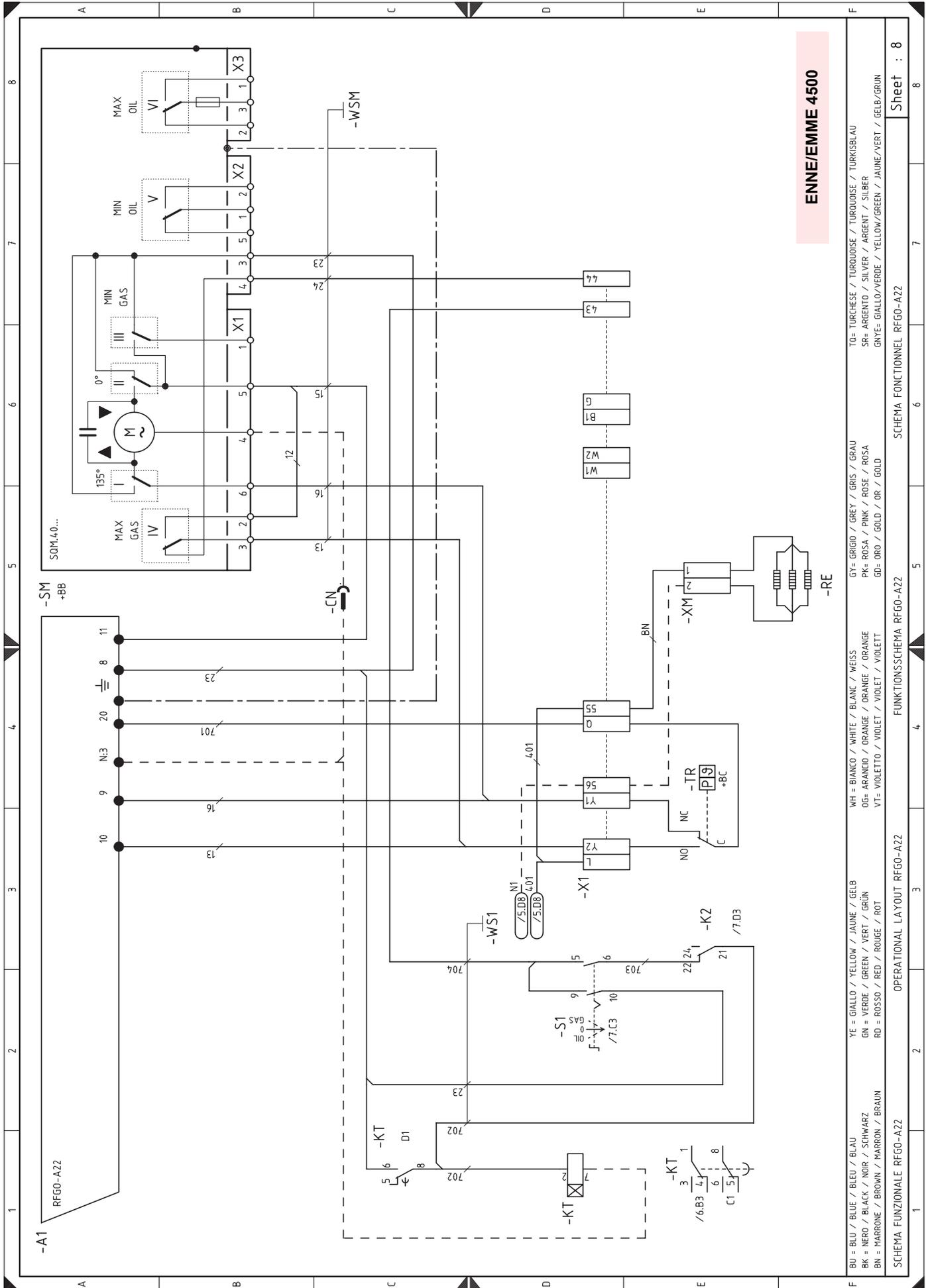
BK= NERO / BLACK / NOIR / SCHWARZ  
 BN= MARRONE / BROWN / MARRON / BRAUN

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

Sheet : 8





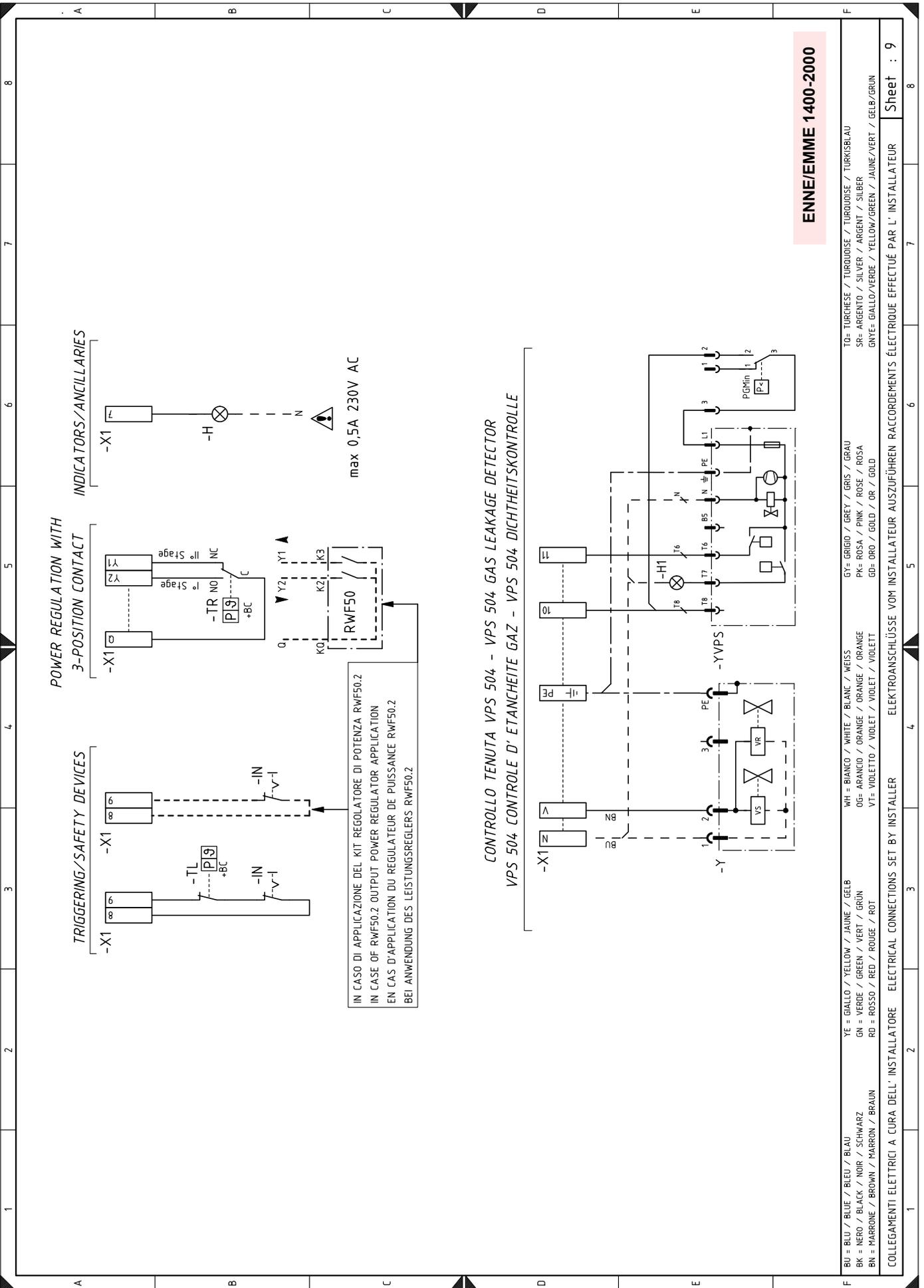


**ENNE/EMME 4500**

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

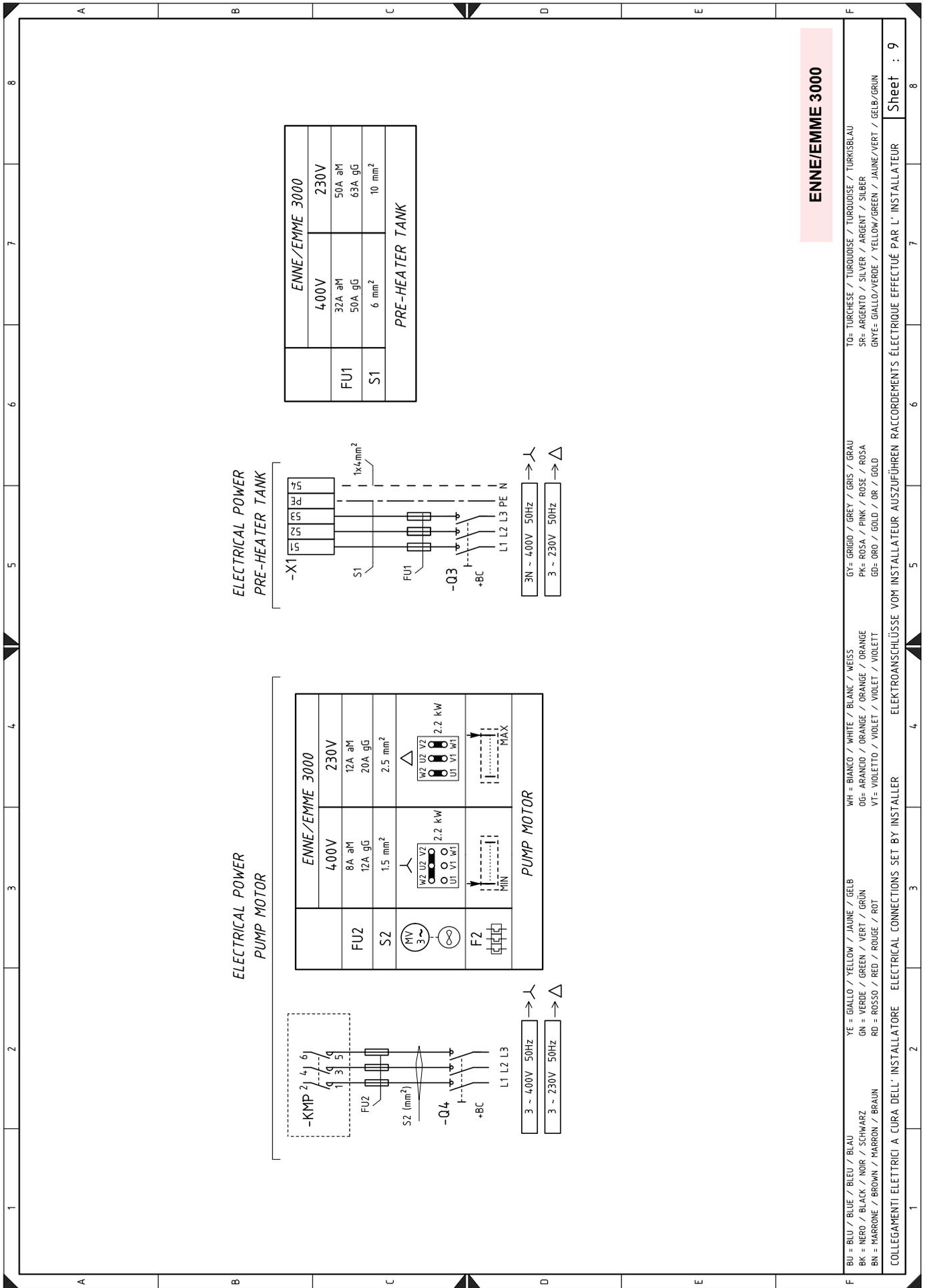
SCHEMA FUNZIONALE RFGO-AZZ  
 OPERATIONAL LAYOUT RFGO-AZZ  
 FUNKTIONSSCHEMA RFGO-AZZ  
 SCHEMA FONCTIONNEL RFGO-AZZ

Sheet : 8

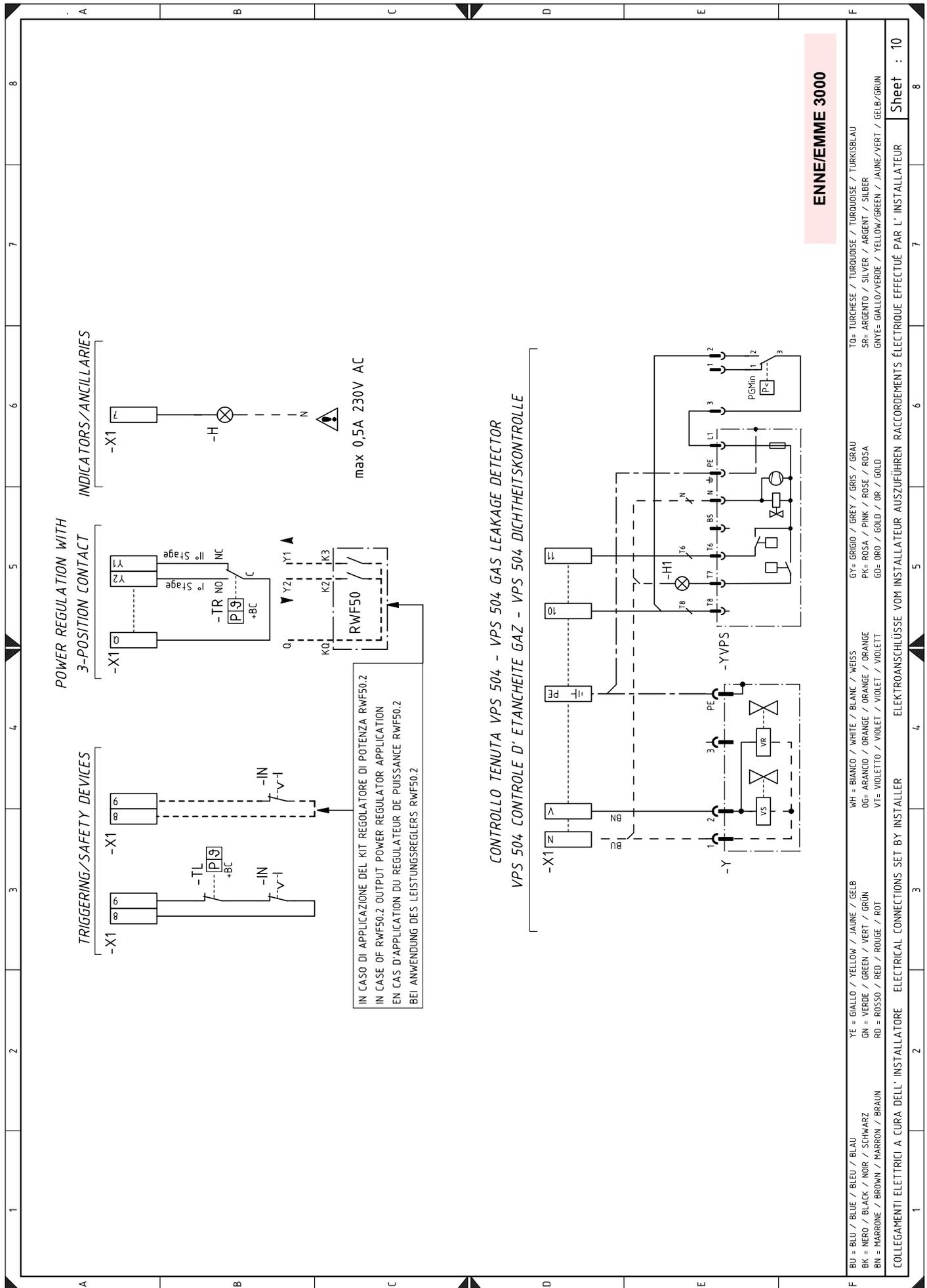


**ENNE/EMME 1400-2000**

BU = BLU / BLUE / BLEU / BLAU	YE = GIALLO / YELLOW / JAUNE / GELB	WH = BIANCO / WHITE / BLANC / WEISS	GY = GRIGIO / GREY / GRIS / GRAU	T0= TURCHESE / TURQUOISE / TURKOISE / TURKISBLAU
BK = NERO / BLACK / NOIR / SCHWARZ	GN = VERDE / GREEN / VERT / GRÜN	OG= ARANCIO / ORANGE / ORANGE / ORANGE	PK= ROSA / PINK / ROSE / ROSA	SR= ARGENTO / SILVER / ARGENT / SILBER
BN = MARRONE / BROWN / MARRON / BRAUN	RD = ROSSO / RED / ROUGE / ROT	VT= VIOLETTA / VIOLET / VIOLET / VIOLETT	GD= ORO / GOLD / OR / GOLD	GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN
COLLEGAMENTI ELETTRICI A CURA DELL'INSTALLATORE				ELEKTROANSCHLÜSSE VOM INSTALLATEUR AUSZUFÜHREN
ELECTRICAL CONNECTIONS SET BY INSTALLER				RACCORDI ELETTRICI EFFETTUÉ PAR L'INSTALLATEUR
				Sheet : 9











**Wiring layout key**

A1	Electrical control box	SM	Servomotor
AL	Oil high temperature alarm	TA	Ignition transformer
B1	RWF50 output power regulator	TE	Electronic thermostat
BA	Current input DC 4...20mA	TL	Limit thermostat/pressure switch
BA1	Current input DC 4...20mA for remote setpoint change	TM	Maximum thermostat
BP	Pressure probe	Tm	Minimum thermostat
BP1	Pressure probe	TR	Adjustment thermostat/pressure switch
BR	Remote setpoint potentiometer	TS	Safety thermostat/pressure switch
BT1	Thermocouple probe	UV	Flame sensor
BT2	Probe Pt100, 2 wires	VF	Oil operation valve
BT3	Probe Pt100, 3 wires	VS1-VS2	Safety oil valve
BT4	Probe for heavy oil temperature	XBT4	Probe connector PT100 with 3 wires
BTEXT	External probe for climatic compensation of the setpoint	XPE	Control box earth
BV	Voltage input DC 0...10V	XPGM	Maximum gas pressure switch connector
BV1	Voltage input DC 0...10V for remote setpoint change	XPO	Connector for maximum oil pressure switch
C	Suppressor	XRWF	RWF50 terminal board
CN	Servomotor connector	X1	Burner terminal strip
CN1	Connector	XA	Starter terminal strip
F1	Thermal relay for fan motor - three phase line	XM	Terminal board
F2	Thermal relay for pump motor - single phase line fuses	XTB	Burner earth
F3	Thermal relay for fan motor	YVPS	Leak test
FU	Three-phase line fuses	Y	Gas adjustment valve + gas safety valve
FU1	Three-phase line fuses		
FU2	Three-phase line fuses		
H	Remote lockout signal		
H1	Remote lockout signal due to leak detection control		
IN	Burner manual stop switch		
K1	Relay		
K2	Relay		
KM	Fan motor contactor		
KMP	Pump motor contactor		
KT	Time relay		
KT1	Triangle contactor		
KS1	Star contactor		
KL1	Line contactor		
KST1	Timing relay for switching from star to triangle		
KR	Contact for oil resistors		
MP	Pump motor		
MV	Fan motor		
PA	Air pressure switch		
PO	Maximum oil pressure switch		
PGM	Maximum gas pressure switch		
PGMin	Minimum gas pressure switch		
Q1	Switch/breaker		
Q2	Switch/breaker		
Q3	Switch/breaker		
Q4	Switch/breaker		
Q5	Switch/breaker		
RE	Pre-heater resistors		
S	Resistor for oil tank		
S1	OIL/0/GAS selector		

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