

**LX60**

**LX65**

**LX72**

***Gas burners***

**MANUAL OF INSTALLATION - USE - MAINTENANCE**

***CIB UNIGAS***

**BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ**

---

## TABLE OF CONTENTS

<b>WARNINGS .....</b>	<b>3</b>
<b>PART I: INSTALLATION .....</b>	<b>6</b>
BURNERS SPECIFICATIONS .....	6
Specifications .....	6
Country and usefulness gas categories .....	7
Matching the burner to the boiler .....	7
Overall dimensions (mm) .....	9
Performance curves .....	12
MOUNTINGS AND CONNECTIONS .....	13
Packing .....	13
Fitting the burner to the boiler .....	13
GAS TRAIN CONNECTIONS .....	14
Assembling the gas grain .....	15
Siemens VGD20.. and VGD40.. gas valves - with SKP2.. (pressure governor) .....	16
Pressure adjusting range .....	17
Gas Proving System VPS504 .....	18
ELECTRICAL CONNECTIONS .....	19
Note on electrical supply .....	19
Connection diagram .....	20
Rotation of fan motor .....	20
ADJUSTMENTS .....	21
Combustion head pressure curves vs. the gas flow rate .....	21
Measuring the gas pressure in the combustion head .....	21
Gas pressure in combustion head vs. gas flow rate curves .....	22
Adjusting air and gas flow rates .....	23
Startup Output .....	23
Adjustments - brief description .....	23
Adjusting procedure .....	24
Progressive burners .....	27
Fully modulating burners .....	28
Calibration of air and gas pressure switches .....	28
Calibration of air pressure switch .....	28
Calibration of low gas pressure switch .....	28
Adjusting the high gas pressure switch (when provided) .....	28
<b>PART II: OPERATION .....</b>	<b>29</b>
OPERATION .....	30
<b>PART III: MAINTENANCE .....</b>	<b>32</b>
ROUTINE MAINTENANCE .....	32
Removing the filter in the MULTIBLOC DUNGS MB-DLE 415 - 420 B01 1" 1/2 - 2" .....	32
Inspection and replacement of the MULTIBLOC DUNGS MBC..SE filter (Threaded valves group) .....	33
Gas filter maintenance .....	33
Adjusting the electrodes .....	34
Replacing the electrodes .....	35
Checking the detection current .....	35
Seasonal stop .....	35
TROUBLESHOOTING .....	36
BURNER EXPLODED VIEW .....	37
WIRING DIAGRAMS .....	42
<b>APPENDIX</b>	

## DANGERS, WARNINGS AND NOTES OF CAUTION

**THIS MANUAL IS SUPPLIED AS AN INTEGRAL AND ESSENTIAL PART OF THE PRODUCT AND MUST BE DELIVERED TO THE USER.**

**INFORMATION INCLUDED IN THIS SECTION ARE DEDICATED BOTH TO THE USER AND TO PERSONNEL FOLLOWING PRODUCT INSTALLATION AND MAINTENANCE.**

**THE USER WILL FIND FURTHER INFORMATION ABOUT OPERATING AND USE RESTRICTIONS, IN THE SECOND SECTION OF THIS MANUAL. WE HIGHLY RECOMMEND TO READ IT.**

**CAREFULLY KEEP THIS MANUAL FOR FUTURE REFERENCE.**

### 1) GENERAL INTRODUCTION

- The equipment must be installed in compliance with the regulations in force, following the manufacturer's instructions, by qualified personnel.
- Qualified personnel means those having technical knowledge in the field of components for civil or industrial heating systems, sanitary hot water generation and particularly service centres authorised by the manufacturer.
- Improper installation may cause injury to people and animals, or damage to property, for which the manufacturer cannot be held liable.
- Remove all packaging material and inspect the equipment for integrity. In case of any doubt, do not use the unit - contact the supplier.

The packaging materials (wooden crate, nails, fastening devices, plastic bags, foamed polystyrene, etc), should not be left within the reach of children, as they may prove harmful.

- Before any cleaning or servicing operation, disconnect the unit from the mains by turning the master switch OFF, and/or through the cut-out devices that are provided.
- Make sure that inlet or exhaust grilles are unobstructed.
- In case of breakdown and/or defective unit operation, disconnect the unit. Make no attempt to repair the unit or take any direct action.

Contact qualified personnel only.

Units shall be repaired exclusively by a servicing centre, duly authorised by the manufacturer, with original spare parts and accessories.

Failure to comply with the above instructions is likely to impair the unit's safety.

To ensure equipment efficiency and proper operation, it is essential that maintenance operations are performed by qualified personnel at regular intervals, following the manufacturer's instructions.

- When a decision is made to discontinue the use of the equipment, those parts likely to constitute sources of danger shall be made harmless.
- In case the equipment is to be sold or transferred to another user, or in case the original user should move and leave the unit behind, make sure that these instructions accompany the equipment at all times so that they can be consulted by the new owner and/or the installer.
- This unit shall be employed exclusively for the use for which it is meant. Any other use shall be considered as improper and, therefore, dangerous.

The manufacturer shall not be held liable, by agreement or otherwise, for damages resulting from improper installation, use and failure to comply with the instructions supplied by the manufacturer. The occurrence of any of the following circumstances may cause explosions, polluting unburnt gases (example: carbon monoxide CO), burns, serious harm to people, animals and things:

- Failure to comply with one of the WARNINGS in this chapter
- Incorrect handling, installation, adjustment or maintenance of the burner
- Incorrect use of the burner or incorrect use of its parts or optional supply

### 2) SPECIAL INSTRUCTIONS FOR BURNERS

- The burner should be installed in a suitable room, with ventilation openings complying with the requirements of the regulations in force, and sufficient for good combustion.
- Only burners designed according to the regulations in force should be used.
- This burner should be employed exclusively for the use for which it was designed.
- Before connecting the burner, make sure that the unit rating is the same as delivery mains (electricity, gas oil, or other fuel).
- Observe caution with hot burner components. These are, usually, near to the flame and the fuel pre-heating system, they become hot during the unit operation and will remain hot for some time after the burner has stopped.

When the decision is made to discontinue the use of the burner, the user shall have qualified personnel carry out the following operations:

- a Remove the power supply by disconnecting the power cord from the mains.
- b Disconnect the fuel supply by means of the hand-operated shut-off valve and remove the control handwheels from their spindles.

#### Special warnings

- Make sure that the burner has, on installation, been firmly secured to the appliance, so that the flame is generated inside the appliance fire-box.
- Before the burner is started and, thereafter, at least once a year, have qualified personnel perform the following operations:
  - a set the burner fuel flow rate depending on the heat input of the appliance;
  - b set the flow rate of the combustion-supporting air to obtain a combustion efficiency level at least equal to the lower level required by the regulations in force;
  - c check the unit operation for proper combustion, to avoid any harmful or polluting unburnt gases in excess of the limits permitted by the regulations in force;
  - d make sure that control and safety devices are operating properly;
  - e make sure that exhaust ducts intended to discharge the products of combustion are operating properly;
  - f on completion of setting and adjustment operations, make sure that all mechanical locking devices of controls have been duly tightened;
  - g make sure that a copy of the burner use and maintenance instructions is available in the boiler room.
- In case of a burner shut-down, reset the control box by means of the RESET pushbutton. If a second shut-down takes place, call the Technical Service, **without trying to RESET further**.
- The unit shall be operated and serviced by qualified personnel only, in compliance with the regulations in force.

### 3) GENERAL INSTRUCTIONS DEPENDING ON FUEL USED

#### 3a) ELECTRICAL CONNECTION

- For safety reasons the unit must be efficiently earthed and installed as required by current safety regulations.
- It is vital that all safety requirements are met. In case of any doubt, ask for an accurate inspection of electrics by qualified personnel, since the manufacturer cannot be held liable for damages that may be caused by failure to correctly earth the equipment.
- Qualified personnel must inspect the system to make sure that it is adequate to take the maximum power used by the equipment shown on the equipment rating plate. In particular, make sure that the system cable cross section is adequate for the power absorbed by the unit.
- No adaptors, multiple outlet sockets and/or extension cables are permitted to connect the unit to the electric mains.
- An omnipolar switch shall be provided for connection to mains, as required by the current safety regulations.
- The use of any power-operated component implies observance of a few basic rules, for example:
  - do not touch the unit with wet or damp parts of the body and/or with bare feet;
  - do not pull electric cables;
  - do not leave the equipment exposed to weather (rain, sun, etc.) unless expressly required to do so;
  - do not allow children or inexperienced persons to use equipment;
- The unit input cable shall not be replaced by the user. In case of damage to the cable, switch off the unit and contact qualified personnel to replace. When the unit is out of use for some time the electric switch supplying all the power-driven components in the system (i.e. pumps, burner, etc.) should be switched off.

### 3b) FIRING WITH GAS, LIGHT OIL OR OTHER FUELS

#### GENERAL

- The burner shall be installed by qualified personnel and in compliance with regulations and provisions in force; wrong installation can cause injuries to people and animals, or damage to property, for which the manufacturer cannot be held liable.
- Before installation, it is recommended that all the fuel supply system pipes be carefully cleaned inside, to remove foreign matter that might impair the burner operation.
- Before the burner is commissioned, qualified personnel should inspect the following:
  - a the fuel supply system, for proper sealing;
  - b the fuel flow rate, to make sure that it has been set based on the firing rate required of the burner;
  - c the burner firing system, to make sure that it is supplied for the designed fuel type;
  - d the fuel supply pressure, to make sure that it is included in the range shown on the rating plate;
  - e the fuel supply system, to make sure that the system dimensions are adequate to the burner firing rate, and that the system is equipped with all the safety and control devices required by the regulations in force.
- When the burner is to remain idle for some time, the fuel supply tap or taps should be closed.

#### SPECIAL INSTRUCTIONS FOR USING GAS

Have qualified personnel inspect the installation to ensure that:

- a the gas delivery line and train are in compliance with the regulations and provisions in force;
- b all gas connections are tight;
- c the boiler room ventilation openings are such that they ensure the air supply flow required by the current regulations, and in any case are sufficient for proper combustion.
- Do not use gas pipes to earth electrical equipment.
- Never leave the burner connected when not in use. Always shut the gas valve off.
- In case of prolonged absence of the user, the main gas delivery valve to the burner should be shut off.

#### Precautions if you can smell gas

- a do not operate electric switches, the telephone, or any other item likely to generate sparks;
- b immediately open doors and windows to create an air flow to purge the room;
- c close the gas valves;
- d contact qualified personnel.
- Do not obstruct the ventilation openings of the room where gas appliances are installed, to avoid dangerous conditions such as the development of toxic or explosive mixtures.

### DIRECTIVES AND STANDARDS

#### *Gas burners*

##### European directives

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

##### Harmonized standards

- UNI EN 676 (Automatic forced draught burners for gaseous fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

#### *Light oil burners*

##### European directives

- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

##### Harmonized standards

- UNI EN 267:2011 (Automatic forced draught burners for liquid fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

#### *Heavy oil burners*

##### European Directives

- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

##### Harmonized standards

- UNI EN 267 (Automatic forced draught burners for liquid fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);



### Gas - Light oil burners

#### European Directives

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

#### Harmonized standards

- UNI EN 676 (Automatic forced draught burners for gaseous fuels)
- UNI EN 267 (Automatic forced draught burners for liquid fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

### Gas - Heavy oil burners

#### European directives:

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

#### Harmonized standards

- UNI EN 676 (Automatic forced draught burners for gaseous fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

### Industrial burners

#### European directives

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

#### Harmonized standards

- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 746-2 (Industrial thermoprocessing equipment - Part 2: Safety requirements for combustion and fuel handling systems)
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- EN 60335-2 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements)

### Burner data plate

For the following information, please refer to the data plate:

- burner type and burner model: must be reported in any communication with the supplier
- burner ID (serial number): must be reported in any communication with the supplier
- date of production (year and month)
- information about fuel type and network pressure

Type	--
Model	--
Year	--
S.Number	--
Output	--
Oil Flow	--
Fuel	--
Category	--
Gas Pressure	--
Viscosity	--
El. Supply	--
El. Consump.	--
Fan Motor	--
Protection	--
Drwaing n°	--
P.I.N.	--

### SYMBOLS USED



#### WARNING!

Failure to observe the warning may result in irreparable damage to the unit or damage to the environment



#### DANGER!

Failure to observe the warning may result in serious injuries or death.



#### WARNING!

Failure to observe the warning may result in electric shock with lethal consequences

Figures, illustrations and images used in this manual may differ in appearance from the actual product.

### BURNER SAFETY

The burners - and the configurations described below - comply with the regulations in force regarding health, safety and the environment. For more in-depth information, refer to the declarations of conformity that are an integral part of this Manual.



**DANGER! Incorrect motor rotation can seriously damage property and injure people.**

### Residual risks deriving from misuse and prohibitions

The burner has been built in order to make its operation safe; there are, however, residual risks.



Do not touch any mechanical moving parts with your hands or any other part of your body. Injury hazard  
Do not touch any parts containing fuel (i.e. tank and pipes). Scalding hazard  
Do not use the burner in situations other than the ones provided for in the data plate.  
Do not use fuels other than the ones stated.  
Do not use the burner in potentially explosive environments.  
Do not remove or by-pass any machine safety devices.  
Do not remove any protection devices or open the burner or any other component while the burner is running.  
Do not disconnect any part of the burner or its components while the burner is running.  
Untrained staff must not modify any linkages.



After any maintenance, it is important to restore the protection devices before restarting the machine.  
All safety devices must be kept in perfect working order.  
Personnel authorized to maintain the machine must always be provided with suitable protections.



ATTENTION: while running, the parts of the burner near the generator (coupling flange) are subject to overheating. Where necessary, avoid any contact risks by wearing suitable PPE.

## PART I: INSTALLATION

**Burner model identification**

Burners are identified by burner type and model. Burner model identification is described as follows.

Type	LX72	Model	M-.	AB.	S.	.*	A.	0.	50
	(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	BURNER TYPE						LX60 - LX65 - LX72		
(2)	FUEL						M - Natural gas		
(3)	OPERATION (Available versions)						PR - Progressive MD - Fully modulating AB - Double stage		
(4)	BLAST TUBE						S - Standard      L - Extended		
(5)	DESTINATION COUNTRY						* - see data plate		
(6)	BURNER VERSION						A - Standard		
(7)	EQUIPMENT						0 = 2 gas valves 1 = 2 gas valves + gas proving system 8 = 2 gas valves + gas proving system + maximum gas pressure switch		
(8)	GAS CONNECTION see Specifications						40 = Rp1 $\frac{1}{2}$ 50 = Rp2      65 = DN65      80 = DN80		

**Specifications**

BURNERS		LX60 M-...0.40	LX60 M-...0.50	LX60 M-...0.65	LX65 M-...0.50	LX65 M-...0.65	LX72 M-...0.50	LX72 M-...0.65	LX72 M-...0.80
Output	min. - max kW	165 - 720			245 - 760			241 - 1040	
Fuel		Natural gas							
Gas category		(see next paragraph)							
Gas rate	min.- max Stm <sup>3</sup> /h	17.5 - 76			26 - 80			25.5 - 110	
Gas pressure	min. - max. mbar	(see Note 2)							
Protection		IP40							
Approx. weight	kg	58	58	65	80	95	85	105	115
Operation		Two stages - Progressive - Fully modulating							
Valves size / Gas connection		1" <sup>1</sup> / <sub>2</sub> / Rp1 <sup>1</sup> / <sub>2</sub>	2" / Rp2	2" <sup>1</sup> / <sub>2</sub> / DN65	2" / Rp2	2" <sup>1</sup> / <sub>2</sub> / DN65	2" / Rp2	2" <sup>1</sup> / <sub>2</sub> / DN65	3" / DN80
Operating temperature	°C	-10 ÷ +50							
Storage Temperature	°C	-20 ÷ +60							
Working service*		Intermitent							

**Electrical data 50 Hz**

Possible voltages, check the actual three-phase and single-phase supply voltage on the burner data plate.

Power supply triphase	V	230 / 400 3 a.c.							
	V	115 2 a.c. / 220 2 a.c. / 230 1N a.c.							
	Hz	50							
Total power consumption	kW	1.6	1.6	1.6	2	2	2	2.7	2.7
Electric motor	kW	1.1	1.1	1.1	1.5	1.5	1.5	2.2	2.2

**Electrical data 60 Hz**

Possible voltages, check the actual three-phase and single-phase supply voltage on the burner data plate.

Power supply triphase	V	220 / 230 / 265 / 277 / 380 / 440 / 460 / 480 / 525 3 a.c.							
	V	110 / 120 / 230 2 a.c.							
	Hz	60							
Total power consumption	kW	1.82	1.82	1.82	2.3	2.3	2.3	3.14	3.14
Electric motor	kW	1.32	1.32	1.32	1.8	1.8	1.8	2.64	2.64

<b>Note1:</b>	All gas flow rates are referred to $\text{Stm}^3/\text{h}$ (1013 mbar absolute pressure, 15 °C temperature) and are valid for G20 gas (net calorific value $H_i = 34.02 \text{ MJ/Stm}^3$ );
<b>Note2:</b>	Maximum gas pressure = 360mbar (with Dungs MBDLE) Maximum gas pressure = 500mbar (with Siemens VGD) Minimum gas pressure = see gas curves.

**\* NOTE ON THE WORKING SERVICE:** the control box automatically stops after 24h of continuous working. The control box immediately starts up, automatically.

### Country and usefulness gas categories

GAS CATEGORY	COUNTRY																								
	AT	ES	GR	SE	FI	IE	HU	IS	NO	CZ	DK	GB	IT	PT	CY	EE	LV	SI	MT	SK	BG	LT	RO	TR	CH
I <sub>2H</sub>																									
I <sub>2E</sub>	LU	PL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I <sub>2E( R ) B</sub>	BE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(*) I <sub>2EK</sub>	NL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I <sub>2ELL</sub>	DE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I <sub>2Er</sub>	FR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(*) <b>Only for I<sub>2EK</sub></b> : the appliance was configured for the appliance category K (I2K) and is suitable for the use of G and G+ distribution gases according to the specifications as included in the NTA 8837:2012 Annex D with a Wobbe index of 43.46 – 45.3 MJ/m3 (dry, 0 °C, upper value) or 41.23 – 42.98 (dry, 15 °C, upper value). This appliance can moreover be converted and/or be calibrated for the appliance category E (I2E). This therefore implies that the appliance "is suitable for G+ gas and H gas or is demonstrably suitable for G+ gas and can demonstrably be made suitable for H gas" within the meaning of the "Dutch Decree of 10 May 2016 regarding amendment of the Dutch Gas Appliances Decree and the Dutch Commodities (Administrative Fines) Act in connection with the changing composition of gas in the Netherlands as well as technical amendment of some other decrees.																									



The values in the diagrams refer to **natural gas** with a calorific value of 8125 kcal/Stm<sup>3</sup> (15°C, 1013 mbar) and a density of 0.714 kg/Stm<sup>3</sup>.



The values in the diagrams refer to **GPL** with a calorific value of 22300 kcal/Stm<sup>3</sup> (15°C, 1013 mbar) and a density of 2.14 kg/Stm<sup>3</sup>. When the calorific value and the density change, the pressure values should be adjusted accordingly.

Where:

$$\Delta p_2 = \Delta p_1 * \left( \frac{Q_2}{Q_1} \right)^2 * \left( \frac{\rho_2}{\rho_1} \right)$$

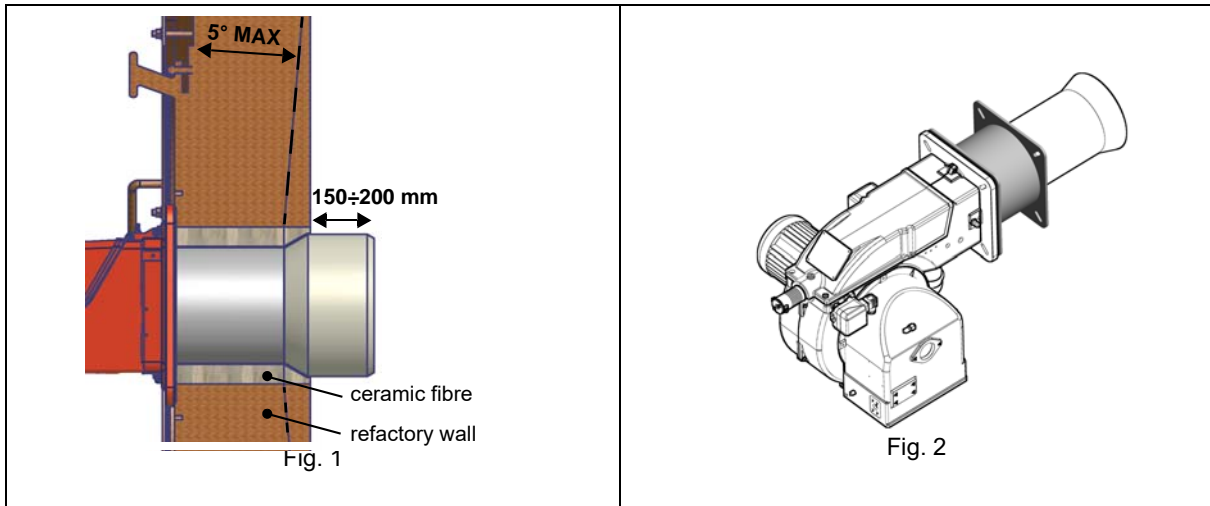
$p_1$  Natural gas pressure shown in diagram  
 $p_2$  Real gas pressure  
 $Q_1$  Natural gas flow rate shown in diagram  
 $Q_2$  Real gas flow rate  
 $\rho_1$  Natural gas density shown in diagram  
 $\rho_2$  Real gas density

### Matching the burner to the boiler

The burners described in this manual have been tested with combustion chambers that comply with EN676 regulation and whose dimensions are described in the diagram. In case the burner must be coupled with boilers with a combustion chamber smaller in diameter or shorter than those described in the diagram, please contact the supplier, to verify that a correct matching is possible, with respect of the application involved. To correctly match the burner to the boiler verify the type of the blast tube. Verify the necessary input and the pressure in combustion chamber are included in the burner performance curve; otherwise the choice of the burner must be revised consulting the burner manufacturer.

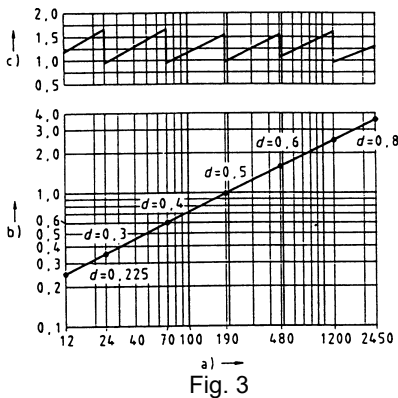
- Cast-iron boilers, three pass flue boilers (with the first pass in the rear part): the blast tube must protrude about 150÷200 mm into the combustion chamber (Fig. 1).

The length of the blast tubes does not always allow this requirement to be met, and thus it may be necessary to use a suitably-sized spacer to move the burner backwards (Fig. 2).



**ATTENTION! Carefully seal the free space between blast tube and the refractory lining with ceramic fibre rope or other suitable means.**

The length of the blast tubes does not always allow this requirement to be met, and thus it may be necessary to use a suitably-sized spacer to move the burner backwards or to design a blast tube that suits the utilisation (please, contact the manufacturer).

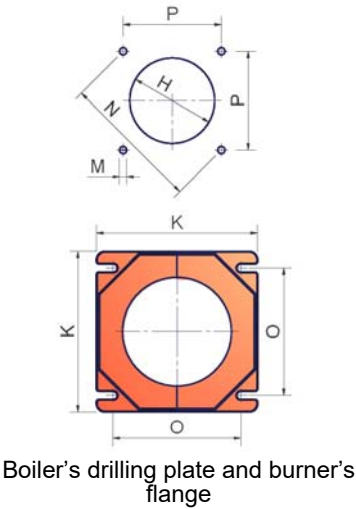
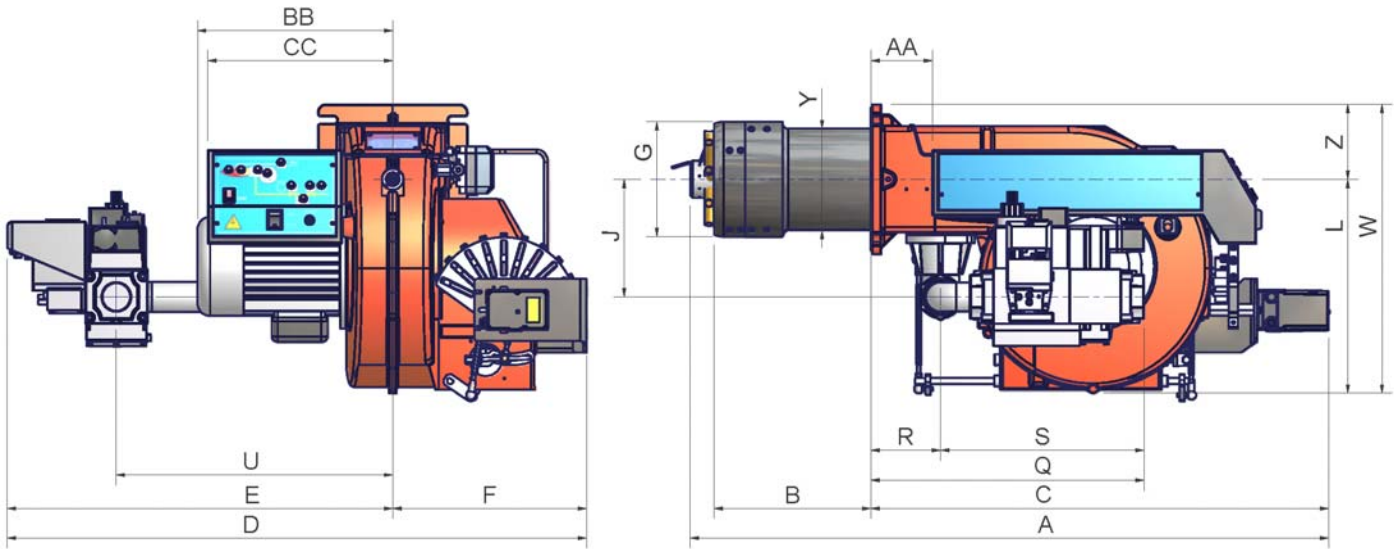


#### Key

- a) Heat output in kW
- b) Length of the flame tube in meters
- c) Flame tube firing intensity in MW/m<sup>3</sup>
- d) Combustion chamber diameter (m)

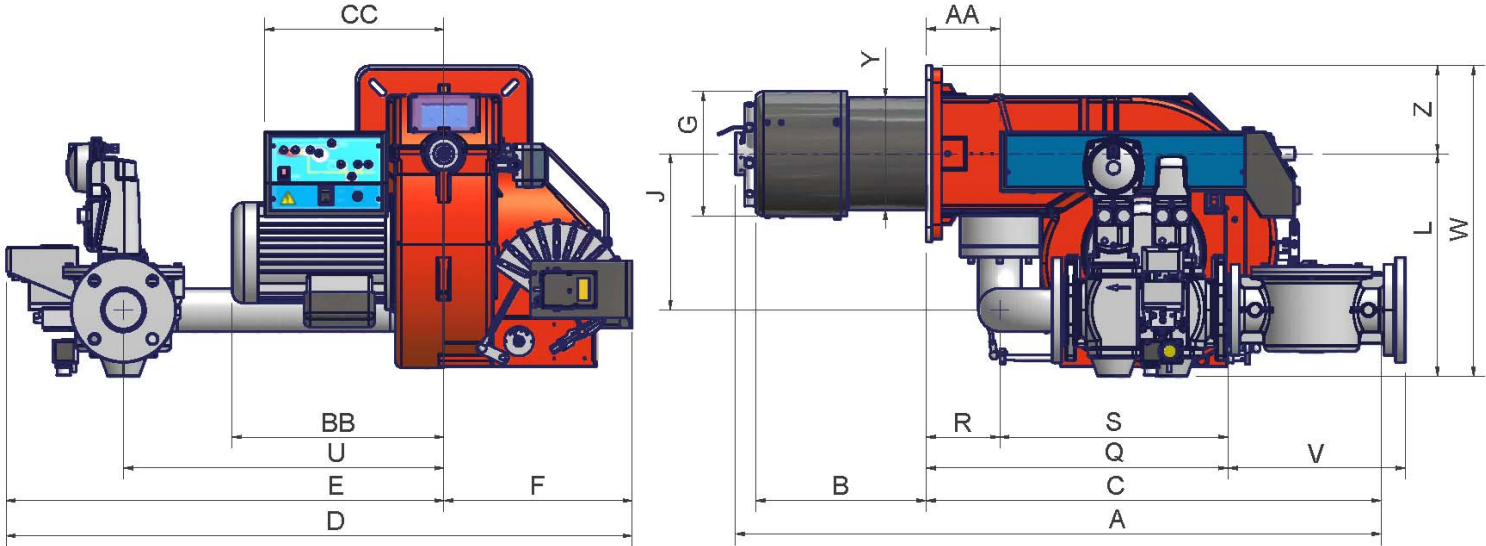
Fig. 3 - Firing intensity, diameter and length of the test flame tube as a function of the heat input in kW.

Overall dimensions (mm)  
LX60



	DN	A(S*)	A(L*)	AA	B(S*)	B(L*)	BB	C	CC	D	E	F	G	H	J	K	L	M	N	O - min	O - max	P	Q	R	S	U	V	W	Y	Z
LX60 PR - 0.40	40	1026	1206	99	252	432	314	736	298	812	500	312	185	204	210	240	344	M10	269	190	190	190	439	112	327	444	x	464	162	120
LX60 MD - 0.40	40	1026	1206	99	252	432	314	736	298	812	500	312	185	204	210	240	344	M10	269	190	190	190	439	112	327	444	x	464	162	120
LX60 AB - 0.40	40	956	1136	99	252	432	314	666	298	812	500	312	185	204	210	240	344	M10	269	190	190	190	439	112	327	444	x	464	162	120
LX60 PR - 0.50	50	1026	1206	99	252	432	314	736	298	812	500	312	185	204	210	240	344	M10	269	190	190	190	447	112	335	444	x	464	162	120
LX60 MD - 0.50	50	1026	1206	99	252	432	314	736	298	812	500	312	185	204	210	240	344	M10	269	190	190	190	447	112	335	444	x	464	162	120
LX60 AB - 0.50	50	956	1136	99	252	432	314	666	298	812	500	312	185	204	210	240	344	M10	269	190	190	190	447	112	335	444	x	464	162	120
LX60 PR - 0.65	65	1026	1206	99	252	432	314	736	298	997	685	312	185	204	250	240	420	M10	269	190	190	190	515	112	403	540	313	540	162	120
LX60 MD - 0.65	65	1026	1206	99	252	432	314	736	298	997	685	312	185	204	250	240	420	M10	269	190	190	190	515	112	403	540	313	540	162	120
LX60 AB - 0.65	65	956	1136	99	252	432	314	666	298	997	685	312	185	204	250	240	420	M10	269	190	190	190	515	112	403	540	313	540	162	120

\*S = measure referred to burner fitted with standard blast tube  
\*L = measure referred to burner fitted with extended blast tube  
Note: the gas proving system is an option.



Boiler's drilling plate and burner's flange

	DN	A(S*)	A(L*)	AA	B(S*)	B(L*)	BB	C	CC	D	E	F	G	H	J	K	L	M	N	Omin	Omax	P	Q	R	S	U	V	W	Y	Z
LX65 PR - 0.50	50	1166	1256	130	326	416	373	803	316	900	568	332	185	228	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	162	155
LX65 PR - 1.50	50	1166	1256	130	326	416	373	803	316	1026	694	332	185	228	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	162	155
LX65 AB - 0.50	50	1096	1186	130	326	416	373	733	316	900	568	332	185	228	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	162	155
LX65 AB - 1.50	50	1096	1186	130	326	416	373	733	316	1026	694	332	185	228	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	162	155
LX65 MD - 0.50	50	1166	1256	130	326	416	373	803	316	900	568	332	185	228	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	162	155
LX65 MD - 1.50	50	1166	1256	130	326	416	373	803	316	1026	694	332	185	228	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	162	155
LX65 PR - 0.65	65	1166	1256	130	326	416	373	803	316	998	666	332	185	228	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	162	155
LX65 PR - 1.65	65	1166	1256	130	326	416	373	803	316	1104	772	332	185	228	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	162	155
LX65 AB - 0.65	65	1096	1186	130	326	416	373	733	316	998	666	332	185	228	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	162	155
LX65 AB - 1.65	65	1096	1186	130	326	416	373	733	316	1104	772	332	185	228	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	162	155
LX65 MD - 0.65	65	1166	1256	130	326	416	373	803	316	998	666	332	185	228	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	162	155
LX65 MD - 1.65	65	1166	1256	130	326	416	373	803	316	1104	772	332	185	228	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	162	155

\*S = measure referred to burner fitted with standard blast tube

\*L = measure referred to burner fitted with extended blast tube

Note: the gas proving system is an option.



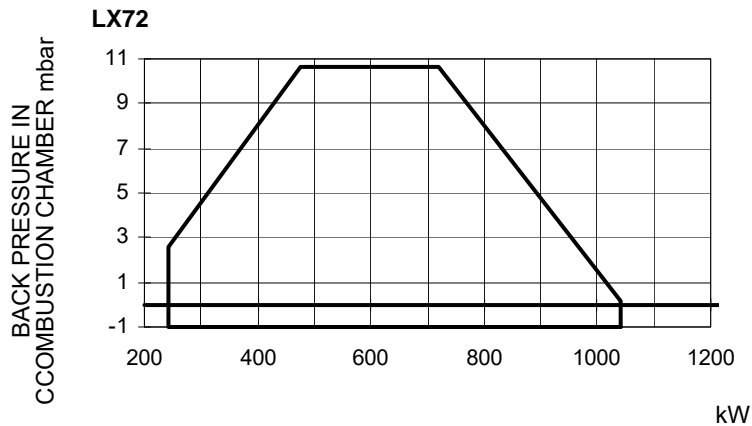
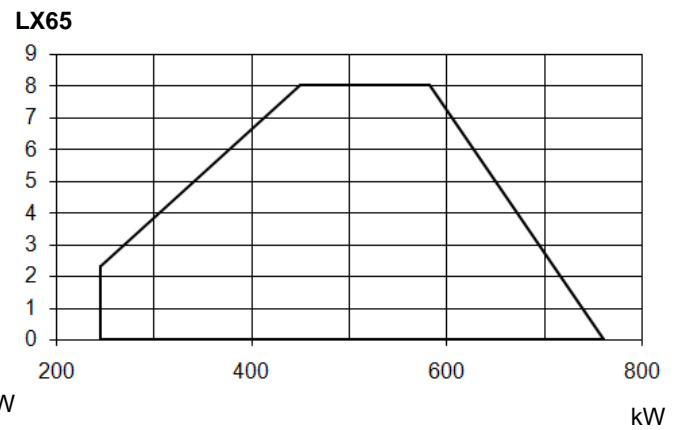
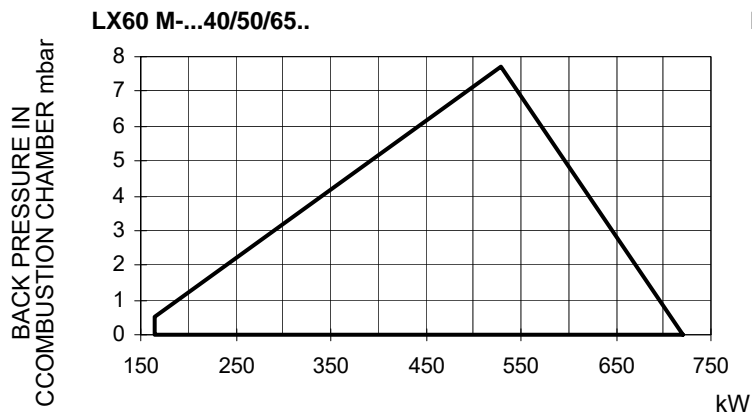
	DN	A(S*)	A(L*)	AA	B(S*)	B(L*)	BB	C	CC	D	E	F	G	H	J	K	L	M	N	Omin	Omax	P	Q	R	S	U	V	W	Y	Z
<b>LX72 PR - 0.50</b>	50	1139	1224	130	300	385	373	803	316	900	568	332	219	249	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	198	155
<b>LX72 PR - 1.50</b>	50	1139	1224	130	300	385	373	803	316	1026	694	332	219	249	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	198	155
<b>LX72 AB - 0.50</b>	50	1069	1154	130	300	385	373	733	316	900	568	332	219	249	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	198	155
<b>LX72 AB - 1.50</b>	50	1069	1154	130	300	385	373	733	316	1026	694	332	219	249	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	198	155
<b>LX72 MD - 0.50</b>	50	1139	1224	130	300	385	373	803	316	900	568	332	219	249	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	198	155
<b>LX72 MD - 1.50</b>	50	1139	1224	130	300	385	373	803	316	1026	694	332	219	249	208	300	376	M10	330	216	250	233	465	130	335	519	x	531	198	155
<b>LX72 PR - 0.65</b>	65	1139	1224	130	300	385	373	803	316	998	666	332	219	249	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	198	155
<b>LX72 PR - 1.65</b>	65	1139	1224	130	300	385	373	803	316	1104	772	332	219	249	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	198	155
<b>LX72 AB - 0.65</b>	65	1069	1154	130	300	385	373	733	316	998	666	332	219	249	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	198	155
<b>LX72 AB - 1.65</b>	65	1069	1154	130	300	385	373	733	316	1104	772	332	219	249	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	198	155
<b>LX72 MD - 0.65</b>	65	1139	1224	130	300	385	373	803	316	998	666	332	219	249	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	198	155
<b>LX72 MD - 1.65</b>	65	1139	1224	130	300	385	373	803	316	1104	772	332	219	249	275	300	393	M10	330	216	250	233	533	130	403	565	313	548	198	155
<b>LX72 PR - 0.80</b>	80	1139	1224	130	300	385	373	803	316	998	666	332	219	249	275	300	407	M10	330	216	250	233	574	130	444	565	344	562	198	155
<b>LX72 PR - 1.80</b>	80	1139	1224	130	300	385	373	803	316	1106	774	332	219	249	275	300	407	M10	330	216	250	233	574	130	444	565	344	562	198	155
<b>LX72 AB - 0.80</b>	80	1069	1154	130	300	385	373	733	316	998	666	332	219	249	275	300	407	M10	330	216	250	233	574	130	444	565	344	562	198	155
<b>LX72 AB - 1.80</b>	80	1069	1154	130	300	385	373	733	316	1106	774	332	219	249	275	300	407	M10	330	216	250	233	574	130	444	565	344	562	198	155
<b>LX72 MD - 0.80</b>	80	1139	1224	130	300	385	373	803	316	998	666	332	219	249	275	300	407	M10	330	216	250	233	574	130	444	565	344	562	198	155
<b>LX72 MD - 1.80</b>	80	1139	1224	130	300	385	373	803	316	1106	774	332	219	249	275	300	407	M10	330	216	250	233	574	130	444	565	344	562	198	155

\*S = measure referred to burner fitted with standard blast tube

\*L = measure referred to burner fitted with extended blast tube

Note: the gas proving system is an option.

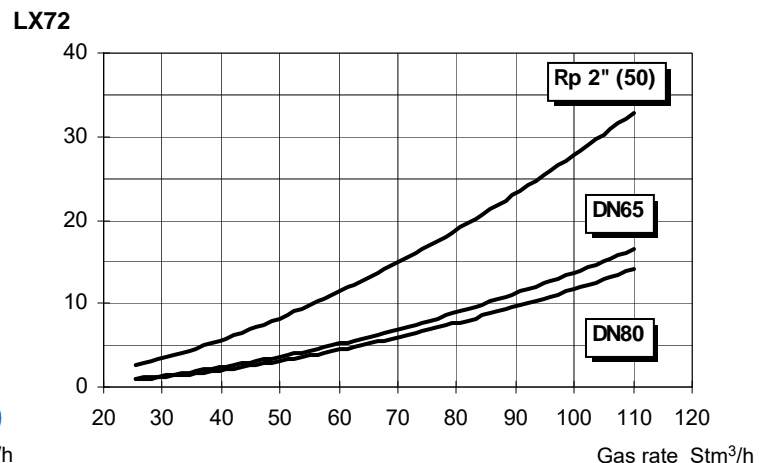
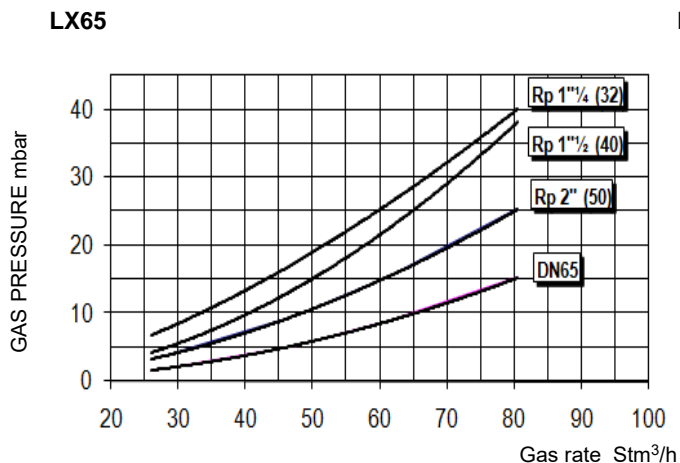
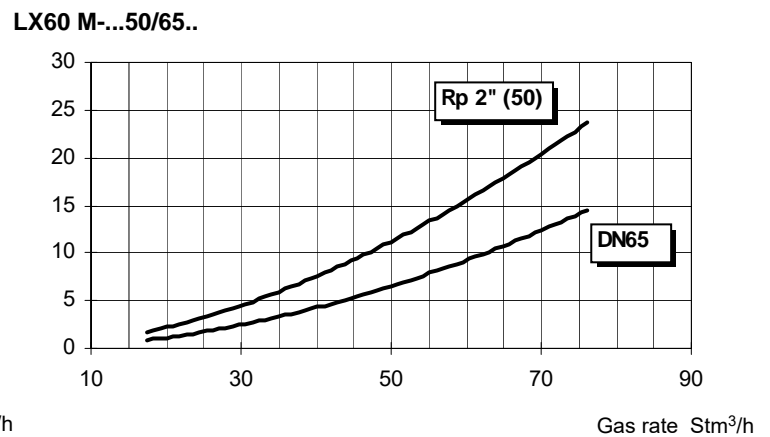
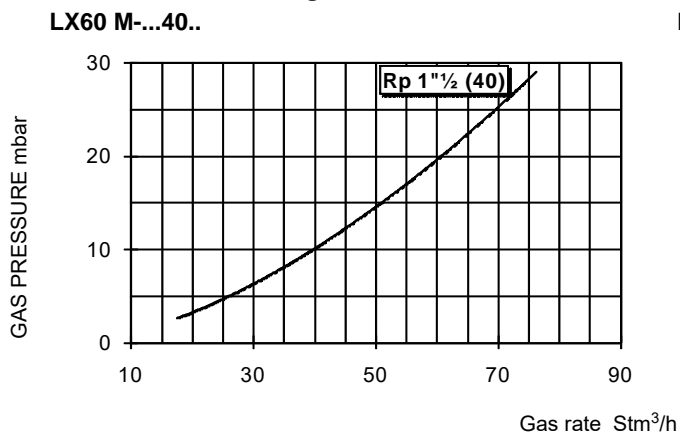
## Performance curves



To get the input in kcal/h, multiply value in kW by 860.

Data are referred to standard conditions: atmospheric pressure at 1013mbar, ambient temperature at 15°C.

## Pressure in the network/gas rate curves



## MOUNTINGS AND CONNECTIONS

### Packing

Burners are despatched in cardboard packages whose dimensions are:

- LX60: 1200mm x 670mm x 540mm (L x P x H).
- LX65 - LX72: 1280mm x 850mm x 760mm (L x P x H).

Packing cases of this type are affected by humidity; the maximum number of cases to be stacked is shown outside the packing. The following are placed in each packing case.

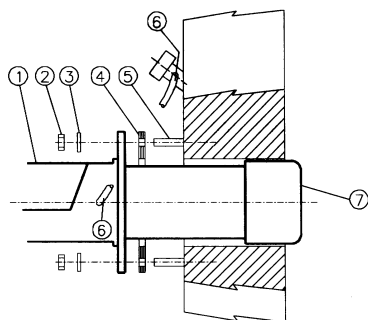
- 1 burner with gas train;
- 1 gasket to be inserted between the burner and the boiler;
- 1 envelope containing this manual

To get rid of the burner's packing, follow the procedures laid down by current laws on disposal of materials.

### Fitting the burner to the boiler

To install the burner into the boiler, proceed as follows:

- 1 make a hole on the closing door of the combustion chamber as described on paragraph "Overall dimensions")
- 2 place the burner to the boiler: lift it up and handle it according to the procedure described on paragraph "Handling the burner";
- 3 place the 4 stud bolts (5) on boiler's door, according to the burner drilling template described on paragraph "Overall dimensions";
- 4 fasten the 4 stud bolts;
- 5 place the gasket on the burner flange;
- 6 install the burner into the boiler;
- 7 fix the burner to the stud bolts, by means of the fixing nuts, according to the next picture.
- 8 After fitting the burner to the boiler, ensure that the gap between the blast tube and the refractory lining is sealed with appropriate insulating material (ceramic fibre cord or refractory cement).



#### Keys

- 1 Burner
- 2 Fixing nut
- 3 Washer
- 4 Sealing gasket
- 5 Stud bolt
- 7 Blast tube

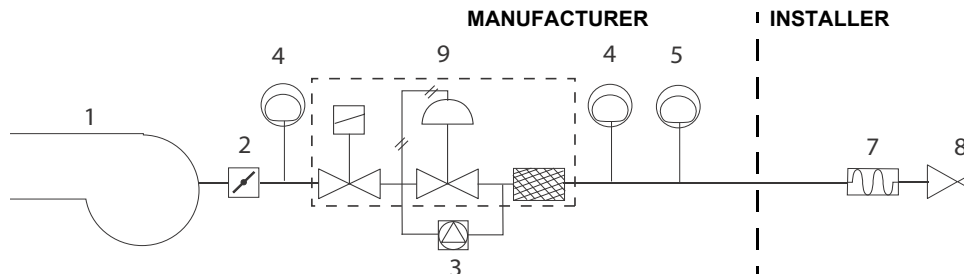
## GAS TRAIN CONNECTIONS

The next figures show the gas train components which are included in the delivery and those which must be fitted by the customer. The diagram complies with regulations in force.

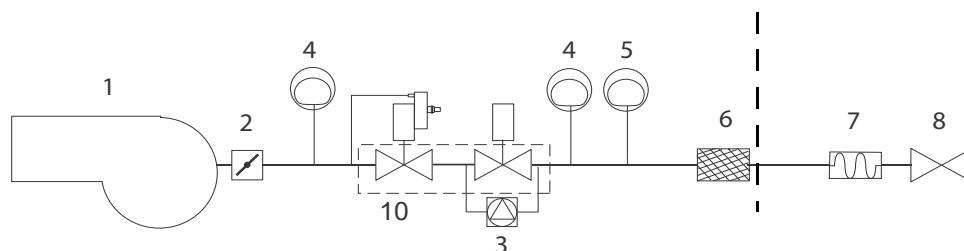


**ATTENTION:** BEFORE EXECUTING THE CONNECTIONS TO THE GAS PIPE NETWORK, BE SURE THAT THE MANUAL CUTOFF VALVES ARE CLOSED. READ CAREFULLY THE "WARNINGS" CHAPTER AT THE BEGINNING OF THIS MANUAL.

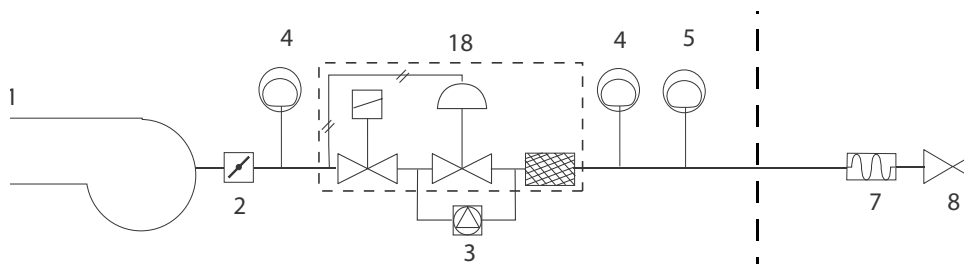
Rp1 1/2: Gas train with valves group MB-DLE (2 valves + gas filter + pressure governor + pressure switch) + leakage control VPS504



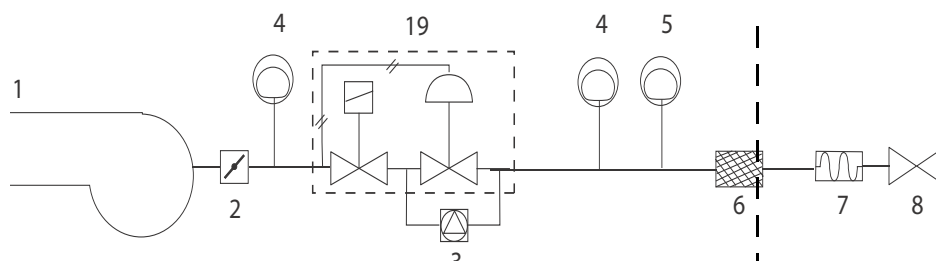
Rp2 - DN65 - DN80: Gas train with valves group VGD with built-in gas pressure governor + gas proving system VPS504



Rp2: Gas train with valves group MBC (2 valves + gas filter + pressure governor) + VPS504 gas proving system



DN65 - DN80: Gas train with valves group MBC (2 valves + pressure governor) + VPS504 gas proving system



### Key

- |  |  |
|--|--|
| 1 Burner                               | 7 Bellow joint   |
| 2 Butterfly valve                      | 8 Manual valve   |
| 3 Gas proving system (option)          | 9 MB-DLE Valves group                                      |
| 4 Minimum gas pressure switch          | 10 VGD Valves group  |
| 5 Maximum gas pressure switch (option) | 18 Valves group MBC (2", provided with filter)             |
| 6 Gas filter                           | 19 Valves group MBC (an external filter must be installed) |

## Assembling the gas grain

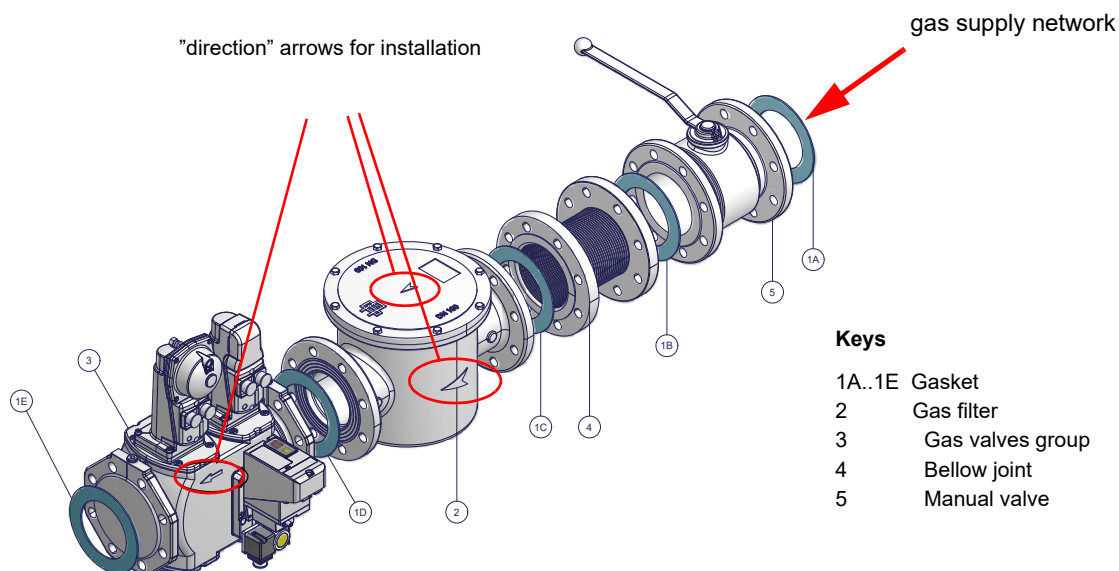


Fig. 2 - Example of gas train

To mount the gas train, proceed as follows:

1-a) in case of threaded joints: use proper seals according to the gas used;

1-b) in case of flanged joints: place a gasket (no. 1A..1E - Fig. 2) between the elements

**NOTE:** the bellow joint, the manual cock and the gaskets are not part of the standard supply.



**ATTENTION:** once the gas train is mounted according to the diagram (Fig. 2), the gas proving test must be performed, according to the procedure set by the laws in force.

The procedures of installation for the gas valves are shown in the next paragraphs, according to the gas train used:

- threaded gas trains with Multibloc Dungs MBC..SE 1200 or Siemens VGD20..
- flanged gas trains with Multibloc Dungs MBC..SE 1900-3100-5000 or Siemens VGD40..

### MULTIBLOC DUNGS MB-DLE 415..420

#### Mounting

1. Loosen screws A and B **do not** unscrew (Fig. 3 - Fig. 4).
2. unscrew screws C and D (Fig. 3 - Fig. 4).
3. Remove MultiBloc between the threaded flanges (Fig. 4).
4. After mounting, perform leakage and functional tests.

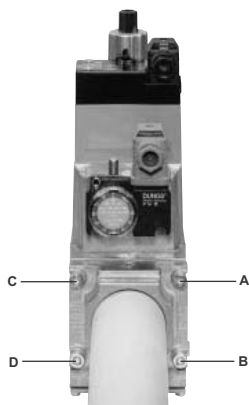


Fig. 3

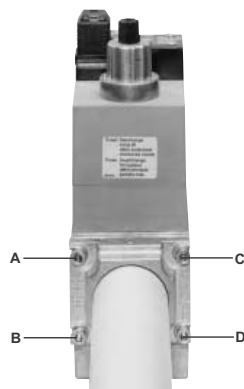


Fig. 4

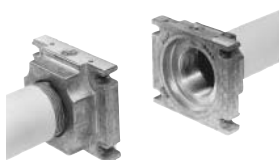


Fig. 5

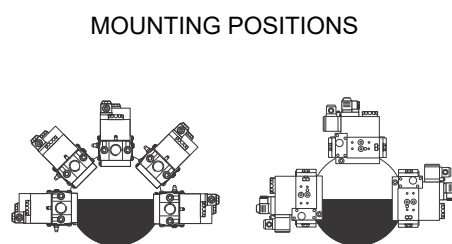


Fig. 6

**MULTIBLOC DUNGS MBC300-700-1200SE (Threaded valves group)****Mounting**

1. Mount flange onto tube lines. Use appropriate sealing agent (see Fig. 7)
2. Insert MBC...SE. Note position of O rings (see Fig. 8).
3. Tighten screws A – H
4. After installation, perform leakage and functional test.
5. Disassembly in reverse order



Fig. 7

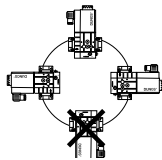
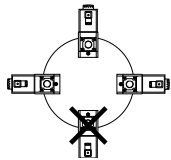
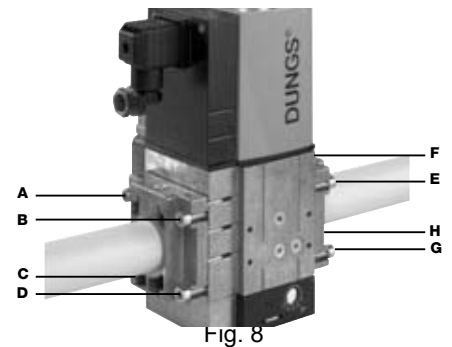
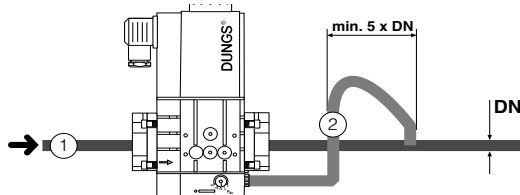
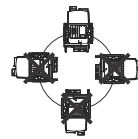
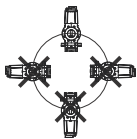
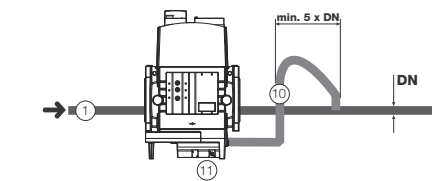
**MOUNTING****POSITIONS****OPTION**

Fig. 8

**MULTIBLOC DUNGS MBC1900-3100-5000SE (Flanged valves group)****Mounting**

1. Insert setscrews A
  2. Insert seals
  3. Insert setscrews B
  4. Tighten setscrews A + B.
- Ensure correct seating of the seal!
6. After installation, perform leakage and functional test.
  7. Disassembly in reverse order.

**Mounting positions****OPTION**

10 = pulse lines

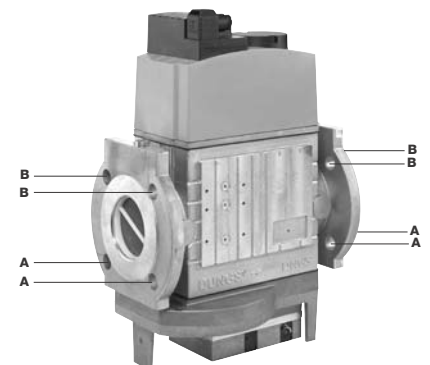


Fig. 9

**Siemens VGD20.. and VGD40.. gas valves - with SKP2.. (pressure governor)****Mounting**

- When mounting the VGD.. double gas valve, two flanges are required (as for VGD20.. model, the flanges are threaded);
  - to prevent cuttings from falling inside the valve, first fit the flanges to the piping and then clean the associated parts;
  - install the valve;
  - the direction of gas flow must be in accordance with the direction of the arrow on the valve body;
  - ensure that the bolts on the flanges are properly tightened;
  - ensure that the connections with all components are tight;
  - make certain that the O-rings and gaskets between the flanges and the double gas valve are fitted.
  - Connect the reference gas pipe (**TP** in figure; 8mm-external size pipe supplied loose), to the gas pressure nipples placed on the gas pipe, downstream the gas valves: gas pressure must be measured at a distance that must be at least 5 times the pipe size.
- Leave the blowhole free (**SA** in figure). Should the spring fitted not permit satisfactory regulation, ask one of our service centres for a suitable replacement.

**Caution:** the SKP2 diaphragm **D** must be vertical (see Fig. 12).



**⚠ WARNING: removing the four screws BS causes the device to be unserviceable!**

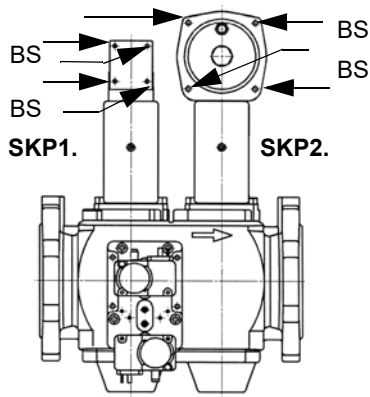


Fig. 10

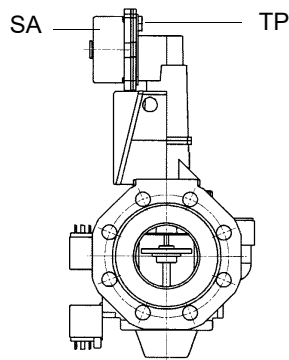


Fig. 11

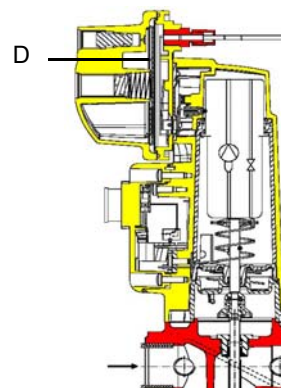


Fig. 12

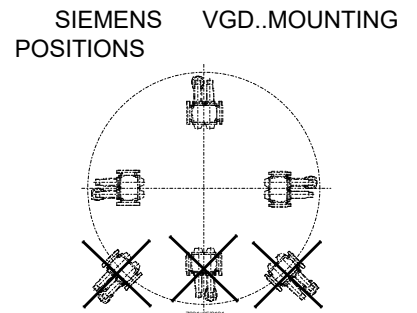


Fig. 13

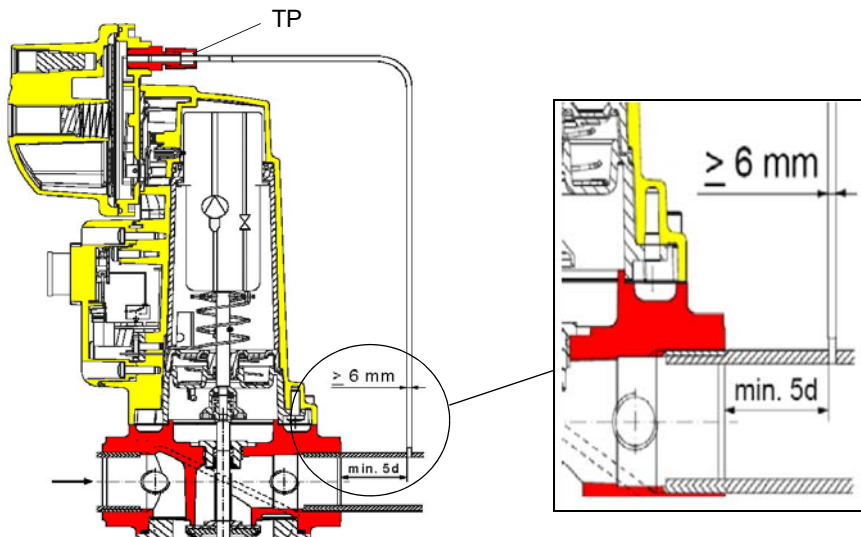
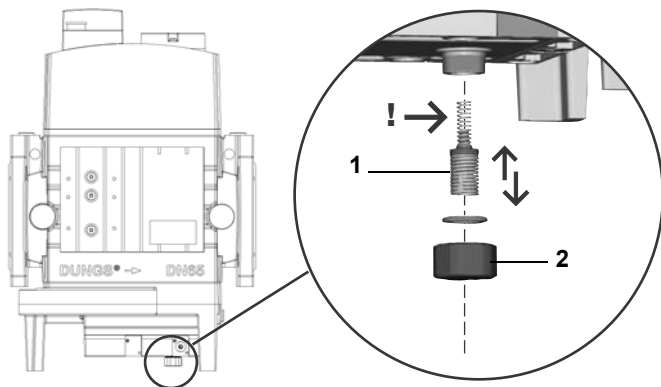


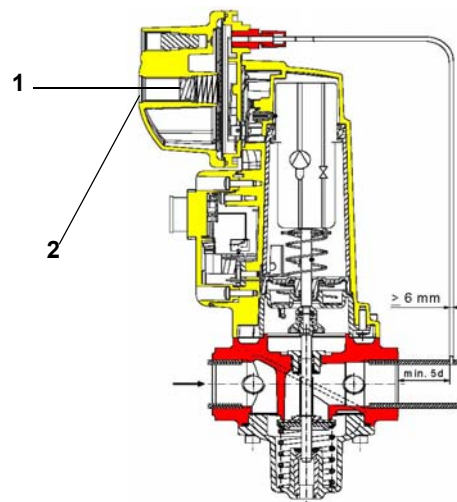
Fig. 14

### Pressure adjusting range

The pressure adjusting range, downstream the gas valves group, changes according to the spring provided with the valve group.



DUNGS MBC..SE



Siemens SKP actuator

### Keys

- 1 spring
- 2 cap

**DUNGS MBC valves:**

<b>Performance range (mbar)</b>	4 - 20	20 - 40	40 - 80	80 - 150
<b>Spring colour</b>	-	red	black	green

**Siemens VGD valves with SKP actuator :**

<b>Performance range (mbar)</b>	0 - 22	15 - 120	100 - 250
<b>Spring colour</b>	neutral	yellow	red

**Gas Proving System VPS504**

The VPS504 check the operation of the seal of the gas shut off valves. This check, carried out as soon as the boiler thermostat gives a start signal to the burner, creates, by means of the diaphragm pump inside it, a pressure in the test space of 20 mbar higher than the supply pressure.

To install the DUNGS VPS504 gas proving system on the MD-DLE valves group, proceed as follows:

- 1 turn off gas supply.;
- 2 Switch off power supply.
- 3 remove the Multibloc screw plugs (Fig. 15-A);
- 4 insert sealing rings (10,5 x 2,25) into VPS 504 (Fig. 15-B - Fig. 16)
- 5 Torque screws 3, 4, 5, 6 (M4 x16) Fig. 16-C

**Only use screws with metric thread on reassembly (modification, repair).**

- 6 On completion of work, perform a leak and functional test.

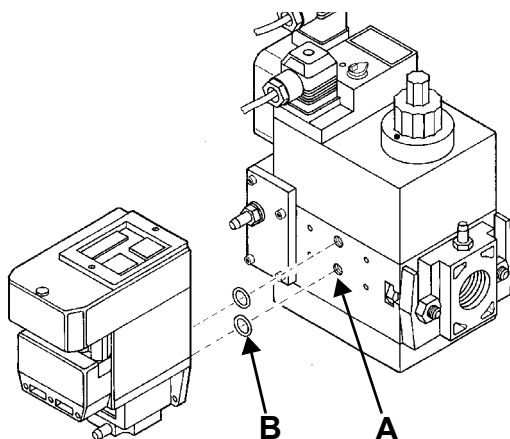


Fig. 15

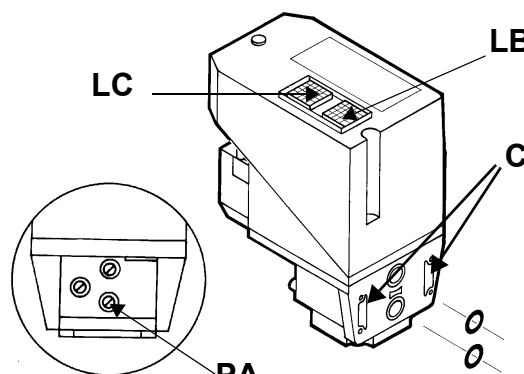


Fig. 16


When wishing to monitor the test, install a pressure gauge ranged to that of the pressure supply point **PA** (Fig. 16). If the test cycle is satisfactory, after a few seconds the consent light **LC** (yellow) comes on. In the opposite case the lockout light **LB** (red) comes on. To restart it is necessary to reset the appliance by pressing the illuminated pushbutton **LB**.


Once the train is installed, connect the gas valves group and pressure switches plugs.





**ATTENTION:** once the gas train is mounted according to the diagram, the gas proving test must be performed, according to the procedure set by the laws in force.

## ELECTRICAL CONNECTIONS

	<b>WARNING:</b> The burner is provided with a jumper between terminals 6 and 7; in the event of connecting the high/low flame thermostat remove this jumper before connecting the thermostat.
	<b>IMPORTANT:</b> while connecting electric supply wires to burner's terminal block be sure that ground wire should be longer than phase and neutral ones.

	<b>WARNING:</b> if the cable that connects the thermostats and the control box should be longer than 3 meters, insert a sectioning relay following the attached electrical wiring diagram..
---	---

	Respect the basic safety rules. make sure of the connection to the earthing system. do not reverse the phase and neutral connections. fit a differential thermal magnet switch adequate for connection to the mains.
	<b>ATTENTION:</b> before executing the electrical connections, pay attention to turn the plant's switch to OFF and be sure that the burner's main switch is in 0 position (OFF) too. Read carefully the chapter "WARNINGS", and the "Electrical connections" section..

	<b>WARNING:</b> if the cable that connects the thermostats and the control box should be longer than 3 meters, insert a sectioning relay following the attached electrical wiring diagram.
--	--

- Remove the cover of the burner electrical board.
- Perform the electrical connections to the supply terminal board as shown in Fig. 8, check the direction of the fan motor (see related paragraph) and refit the panel cover.

Wiring diagram keys on page 42.

### Note on electrical supply

If the power supply to the burner is 230V three-phase or 230V phase-phase (without a neutral), with the Siemens LME2... control box, between the terminal 2 on the board and the earth terminal, an RC Siemens RC466890660 filter must be inserted

### Key

C - Capacitor (22nF/250V)  
 LME - Siemens control box  
 R - Resistor (1Mohm)  
 RC466890660 - RC Siemens filter

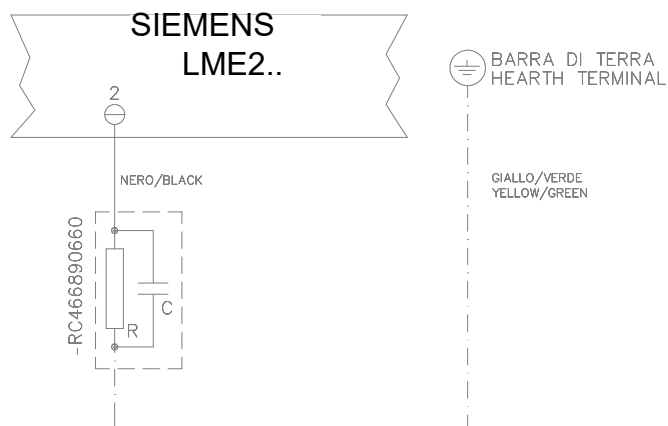


Fig. 17

## Connection diagram

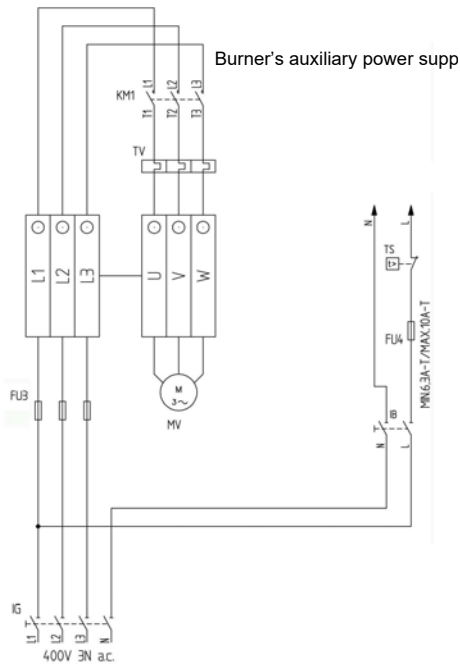


Fig. 18

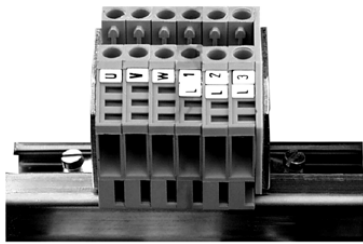


Fig. 20 - Power supply terminal block

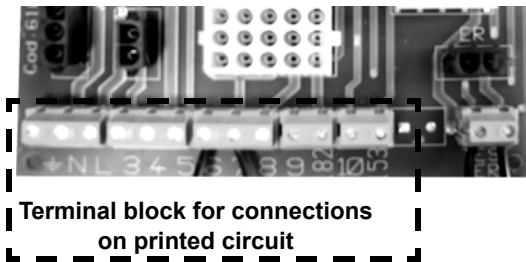


Fig. 21

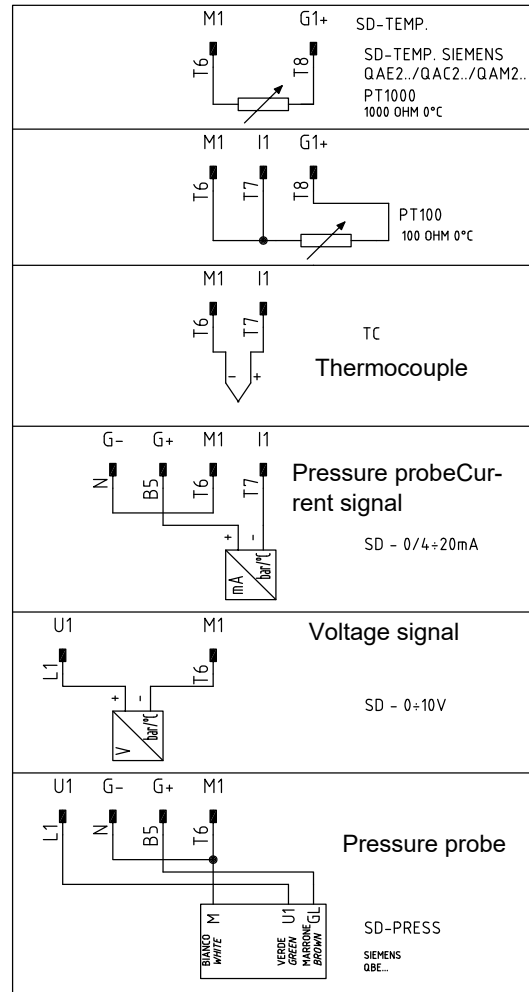


Fig. 19 - Probes connection scheme for modulating burners

### Rotation of fan motor

Once the electrical connection of the burner is executed, remember to check the rotation of the fan motor. The motor should rotate according to the "arrow" symbol on the body. In the event of wrong rotation, reverse the three-phase supply and check again the rotation of the motor.



**CAUTION:** check the motor thermal cut-out adjustment

**NOTE:** the burners are supplied for three-phase 400V supply, and in the case of three-phase 230V supply it is necessary to modify the electrical connections into the terminal box of the electric motor and replace the overload tripped relay.

## ADJUSTMENTS

### **Combustion head pressure curves vs. the gas flow rate**

**Curves are referred to pressure= 0mbar in the combustion head!**

The curves referred to the gas pressure in the combustion head, depending on the gas flow rate, are referred to the burner in the combustion stage (percentage of residual O<sub>2</sub> in the flues as shown in the "Recommended combustion values" table and CO in the standard limits). During this stage, the combustion head, the gas butterfly valve and the servocontrol are at the maximum opening. Refer to Fig. 22, showing the correct way to measure the gas pressure, considering the values of pressure in combustion chamber, surveyed by means of the pressure gauge or taken from the boiler's Technical specifications.

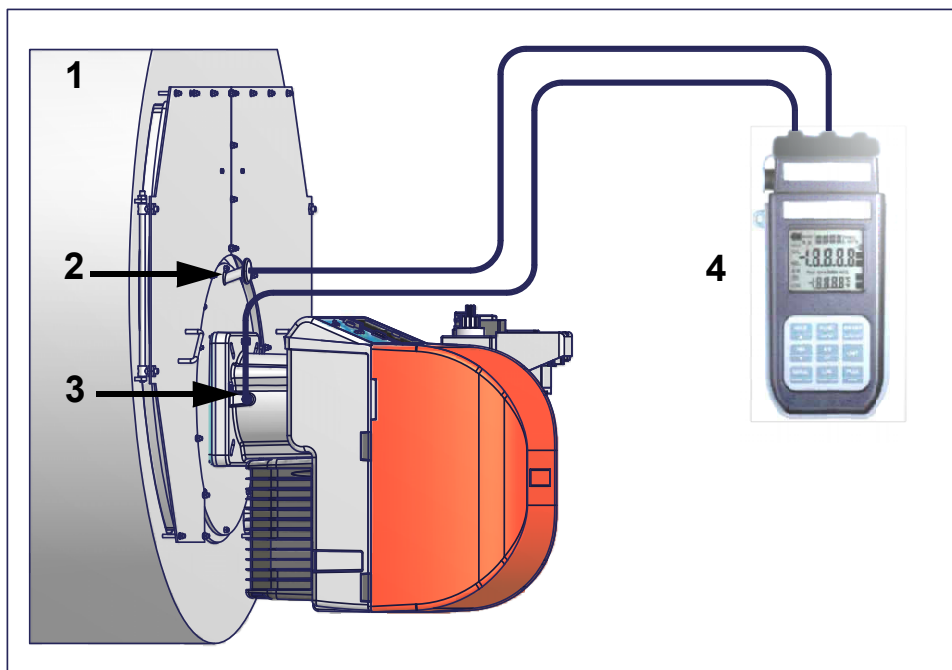


Fig. 22

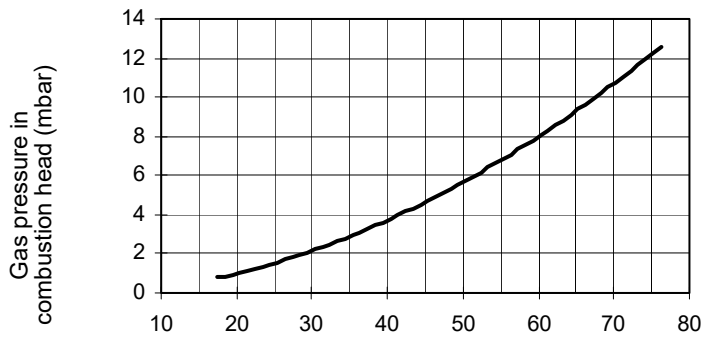
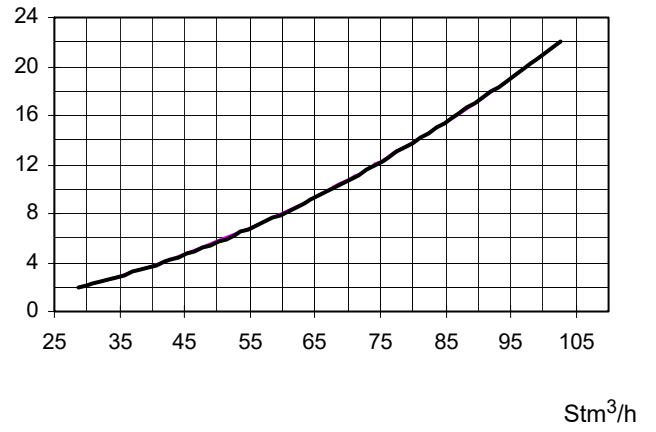
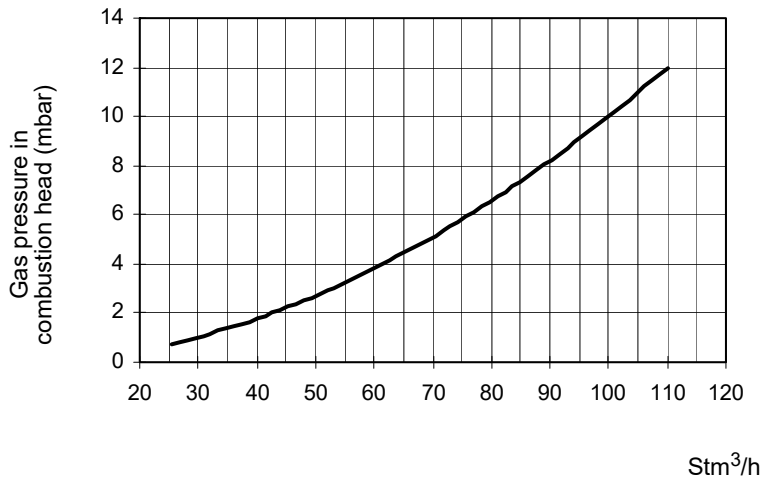
#### **Key**

- 1 Generator
- 2 Pressure outlet on the combustion chamber
- 3 Gas pressure outlet on the butterfly valve
- 4 Differential pressure gauge

### **Measuring the gas pressure in the combustion head**


In order to measure the pressure in the combustion head, insert the pressure gauge probes: one into the generator's pressure outlet (Fig. 22-2) to get the pressure in the combustion chamber and the other one into the butterfly valve's pressure outlet of the burner (Fig. 22-3). On the basis of the measured differential pressure, it is possible to get the maximum flow rate: in the pressure - rate curves (showed on the next paragraph), it is easy to get the burner output in kW or Stm<sup>3</sup>/h (quoted on the x axis) from the pressure measured in the combustion head (quoted on the y axis).

**NOTE: THE PRESSURE-RATE CURVES ARE APPROXIMATE; FOR A PROPER SETTING OF THE GAS RATE, PLEASE REFER TO THE GAS METER READING.**

**Gas pressure in combustion head vs. gas flow rate curves****LX60****LX65****LX72**




## Adjusting air and gas flow rates

	<b>ATTENTION:</b> before starting the burner up, be sure that the manual cutoff valves are open and check that the pressure upstream the gas train complies the value quoted on paragraph "Technical specifications". Be sure that the mains switch is closed.
	<b>ATTENTION:</b> During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, make the gas decrease slowly until the normal combustion values are achieved.
	<b>WARNING: NEVER LOOSE THE SEALED SCREWS! OTHERWISE, THE DEVICE WARRANTY WILL BE INVALIDATE!</b>

## Startup Output

The start-up heat output shall not exceed 1/3 of nominal output (double-stage, progressive or fully modulating burners). In order to comply with these requirements, burners are provided with butterfly valve and/or slow-opening safety valve. The low flame output must be higher than the minimum output quoted in the performance curve (see "Measuring the gas pressure in the combustion head" on page 21).

	<b>IMPORTANT!</b> the combustion air excess must be adjusted according to the in the following chart:
---	---

Recommended combustion parameters		
<i>Fuel</i>	<i>Recommended (%) CO<sub>2</sub></i>	<i>Recommended (%) O<sub>2</sub></i>
Natural gas	9 ÷ 10	3 ÷ 4.8

## Adjustments - brief description

- Adjust the air and gas flow rates at the maximum output ("high flame") first, by means of the air damper and the valves group pressure stabiliser respectively.

Check that the combustion parameters are in the suggested limits.

- Check the flow rate measuring it on the counter or, if it is not possible, check the combustion head pressure by means of a differential pressure gauge, see "Measuring the gas pressure in the combustion head" on page 21.
- Then, adjust the combustion values corresponding to the points between maximum and minimum (progressive -fully modulating burners only): set the shape of the adjusting cam foil. The adjusting cam sets the air/gas ratio in those points, regulating the opening-closing of the air damper.
- Set, now, the low flame output, acting on the low flame microswitch of the actuator in order to avoid the low flame output increasing too much or that the flues temperature gets too low to cause condensation in the chimney.

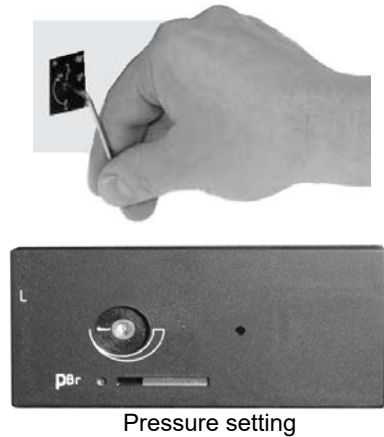
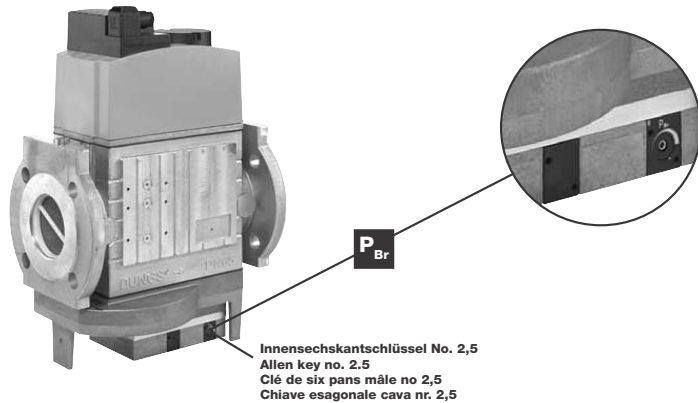
## Adjusting procedure

To change the burner setting during the testing in the plant, follows the next procedure, according to the burner operation..

**DUNGS MB-DLE gas valves group:** Before starting the burner up, adjust the valves group slow opening: to set the slow opening remove cover **T**, reverse it upside down and use it as a tool to rotate screw **VR**. Decrease the ignition flow rate by screwing, increase it by unscrewing. Do not use a screwdriver on the screw **VR**!

Note: the screw **VSB** must be removed only in case of replacement of the coil.

On the **DUNGS MBC..SE gas valves group**, set the pressure regulator to 1/3 of its stroke, using a 2.5 allen key.



- 1 Turn the burner on by means of its main switch **A**: if the burner locks (LED **B** on in the control panel-Fig. 29) press the RESET button (**C**) on the control panel (Fig. 29). See chapter "Operation" for further details.
- 2 check the fan motor rotation (see "Rotation of fan motor" on page 20)
- 3 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to safely achieve the high flame stage.
- 4 Start the burner up by means of the thermostat series and wait until the pre-purge phase comes to end and that burner starts up;
- 5 drive the burner to high flame stage, by means of the thermostat **TAB**.
- 6 Then move progressively the microswitch to higher values until it reaches the high flame position; always check the combustion values and eventually adjusting the gas by means of the valves group stabiliser.

The burner is factory-set with the combustion head at the position that refers to the "MAX" output. The maximum output setting refers to "fully-backward" position (Fig. 24). As for "fully-ahead" position, it means that the head is towards the boiler, "fully-backward" position means that the head is towards the operator. As far as the reduced output operation, progressively move the combustion head towards the "MIN" position by means of the **VRT** screw (Fig. 23). The **ID** index shows how much the combustion head moved..

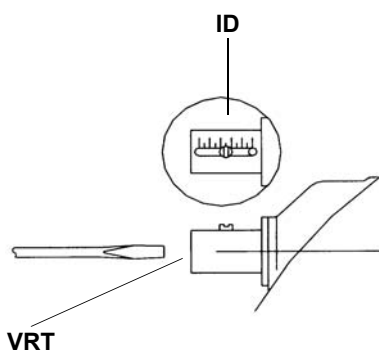


Fig. 23

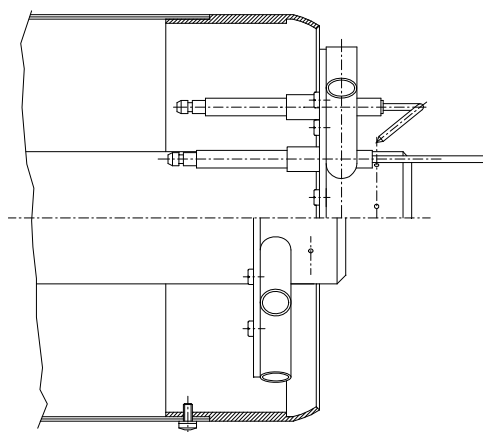


Fig. 24  
Fig. 25

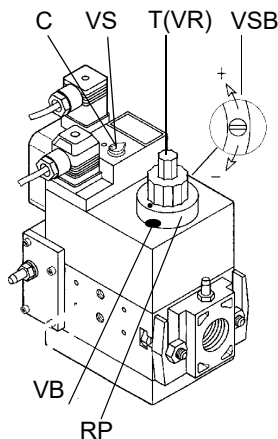
**Attention!** Change the combustion head position only if necessary. If so, repeat the air and gas adjustments described above.

- 7 go on adjusting air and gas flow rates: check, continuously, the flue gas analysis, as to avoid combustion with little air; dose the air according to the gas flow rate change following the steps quoted below;
- 8 acting on the pressure stabiliser of the valves group, adjust the **gas flow rate in the high flame stage** as to meet the values requested from the boiler/utilisation:
  - **Multibloc MB-DLE:** the valve is adjusted by means of the **RP** regulator after slackening the locking screw **VB** by a number of turns. By unscrewing the regulator **RP** the valve opens, screwing the valve closes. The pressure stabilizer is adjusted by operating

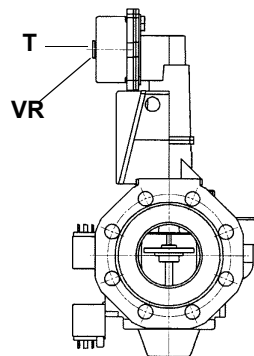
the screw **VS** located under the cover **C**. By screwing down the pressure is increased and by unscrewing it is reduced. **Note:** the screw **VSB** must be removed only in case of replacement of the coil.

- **Siemens VGD valves group:** remove cap **T** and act on the **VR** adjusting screw to increase or decrease the pressure and consequently the gas rate; screwing **VR** the rate increases, unscrewing it decreases (see next figure).

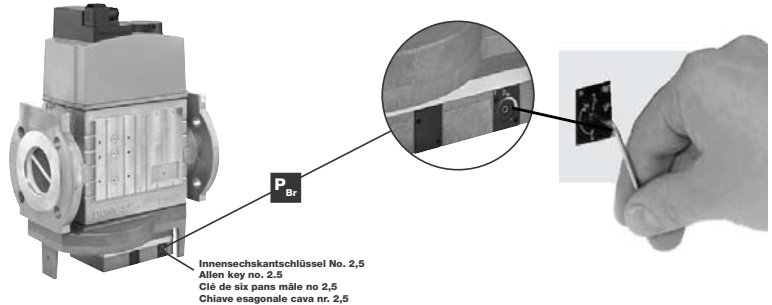
- **Dungs MBC..SE valves group:** act on its pressure governor to increase or decrease the pressure and consequently the gas rate.



**Dungs Multibloc MB-DLE**



**Siemens VGD..**

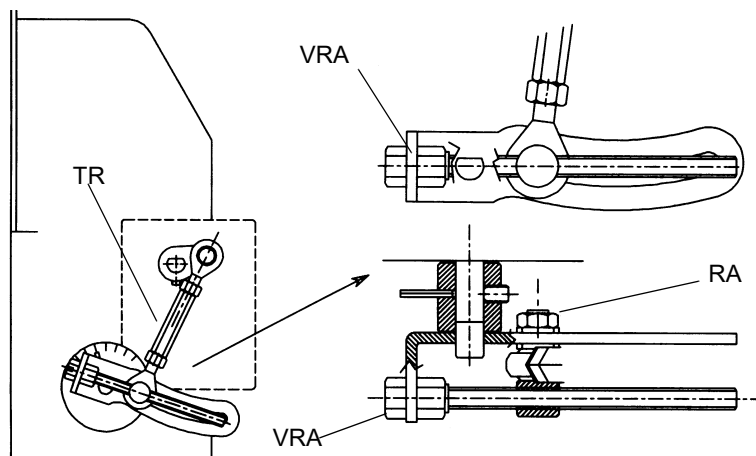


**Dungs MBC..SE**

**⚠** Pressure stabiliser is factory-set. The setting values must be locally adapted to machine conditions. Important! Follow the instructions carefully!

9 .To adjust the **air flow rate in the high flame stage**, loose the **RA** nut and screw **VRA** as to get the desired air flow rate: moving the rod **T** towards the air damper shaft, the air damper opens and consequently the air flow rate increases, moving it far from the shaft the air damper closes and the air flow rate decreases.

**Note:** once the procedure is performed, be sure that the blocking nut **RA** is fasten.



Go on adjusting the burner according to the model (double-stage, progressive, fully-modulating).

## Double-stage burners

- 10 drive the burner to the low flame stage by means of the **TAB** thermostat;
- 11 In order to change the gas flow rate slacken the nuts **DB** (Fig. 26) and adjust the opening angle of the gas butterfly valve by rotating the rod **TG** (clockwise rotation increases gas flow, anticlockwise rotation decreases it). The slot on the butterfly valve shaft shows the opening degree of the valve regarding the horizontal axis (Fig. 26).

**NOTE:** At the end of settings, make sure the locking screws **RA** and **DB** are fully tightened.

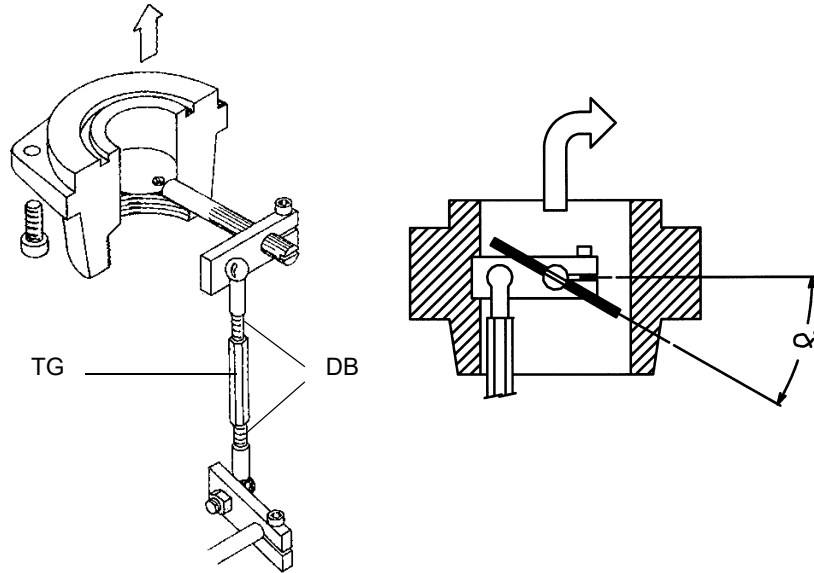
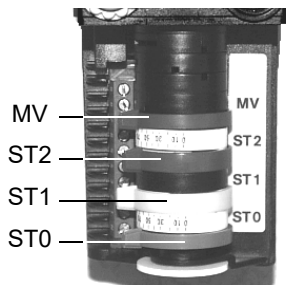


Fig. 26

- 12 Now adjust the pressure switches (see pag. 28).
- 13 If it is necessary to change the burner output in the low flame stage, move the low flame cam: the low flame position must never match the ignition position, that is why the low flame cam must be set at about 30° more than the ignition cam (when the low flame does not match the ignition cam - that is when MBC valves are provided).
- 14 Turn the burner off and then start it up again. If the adjustment is not correct, repeat the previous steps.

Berger STA6 B 3.41 (high-low flame burners)

Siemens SQN72.2A4Ax (high-low flame burners)



For DUNGS MB-DLE / Siemens VGD gas valves	Actuator cams Berger STA	Siemens SQN72
High flame position (set to 90°)	ST2	I (red)
Low flame and ignition position	ST1	III (orange)
Stand-by position (set to 0°)	ST0	II (blue)
Not used	MV	IV (black)

For DUNGS MBCgas valves	Actuator cams Berger STA	Siemens SQN72
High flame position (set to 90°)	ST2	I (red)
Stand-by position (set to 0°)	ST0	III (orange)
Ignition	ST1	II (blue)
Low flame position	MV	IV (black)

## Progressive burners

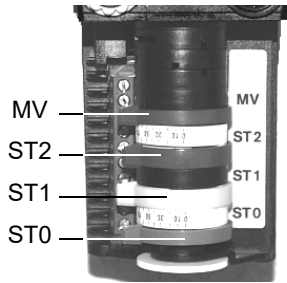
Once the procedure till step 8 described on paragraph "Adjusting procedure" on page 24 is accomplished, go on as follows:

9 set the **TAB** thermostat to the minimum in order that the actuator moves progressively towards the low flame position;

The manual air damper control is not provided on these actuators. The adjustments must be carried out by inserting a screwdriver on the screw placed inside the cam.

Berger STA6 B 3.41 (high-low flame burners)

Berger STA12B3.41 (progressive and fully modulating burners)



Siemens SQN72.2A4Axx (high-low flame burners)



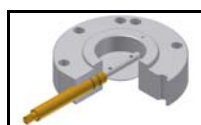
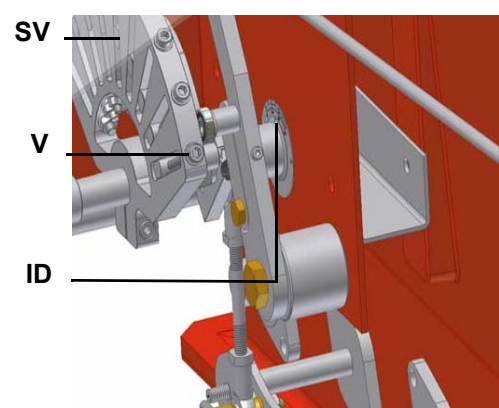
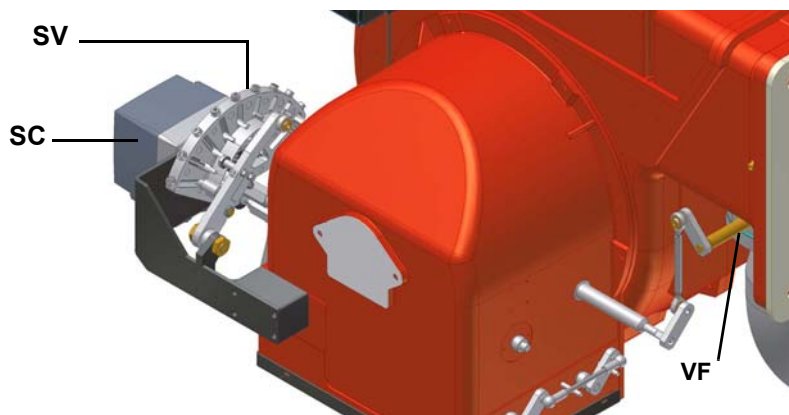
For DUNGS MB-DLE / Siemens VGD gas valves	Actuator camsBerger STA	Siemens SQN72
High flame position (set to 90°)	ST2	I (red)
Low flame and ignition position	ST1	III (orange)
Stand-by position (set to 0°)	ST0	II (blue)
Not used	MV	IV (black)

For DUNGS MBCgas valves	Actuator camsBerger STA	Siemens SQN72
High flame position (set to 90°)	ST2	I (red)
Stand-by position (set to 0°)	ST0	III (orange)
Ignition	ST1	II (blue)
Low flame position	MV	IV (black)

10 move the low flame cam to the minimum to move the actuator towards the low flame until the two bearings find the adjusting screw that refers to the lower position: screw **V** to increase the rate, unscrew to decrease.

11 Move again the low flame cam towards the minimum to meet the next screw on the adjusting cam and repeat the previous step; go on this way as to reach the desired low flame point.

12 Now adjust the pressure switches (see pag. 28).



Gas butterfly valve closed



Gas butterfly valve open

13 If it is necessary to change the burner output in the low flame stage, move the low flame cam: the low flame position must never match the ignition position, that is why the low flame cam must be set at about 30° more than the ignition cam (when the low flame can does not match the ignition cam - that is when MBC valves are provided).

Turn the burner off and then start it up again. If the adjustment is not correct, repeat the previous steps.

### **Fully modulating burners**

Once the procedure till step 8 described on paragraph "Adjusting procedure" on page 24 is accomplished, go on as follows:

To adjust the air rate in low flame and in the intermediate points, proceed as follow.

- 9 Keep pushed for 5 seconds the EXIT button on the modulator (Fig. 27); when the LED with the hand symbol lights up, press the arrow button, driving the actuator to the maximum opening position progressively;
- 10 stop its stroke when it meets each screw **V**: adjust the air rate by adjusting the **V** screw that matches each bearing.
- 11 Push the EXIT button to quit the manual mode.



Fig. 27



Fig. 28

### **Calibration of air and gas pressure switches**

The **air pressure switch** locks the control box if the air pressure is not the one requested. If it happens, unlock the burner by means of the control box unlock pushbutton, placed on the burner control panel.

The **gas pressure switches** check the pressure to avoid the burner operate when the pressure value is not in the requested pressure range.

#### **Calibration of air pressure switch**

To calibrate the air pressure switch, proceed as follows:

- Remove the transparent plastic cap.
- Once air and gas setting have been accomplished, startup the burner.
- During the pre-purge phase of the operation, turn slowly the adjusting ring nut **VR** in the clockwise direction until the burner lockout, then read the value on the pressure switch scale and set it to a value reduced by 15%.
- Repeat the ignition cycle of the burner and check it runs properly.
- Refit the transparent plastic cover on the pressure switch.

#### **Calibration of low gas pressure switch**

As for the gas pressure switch calibration, proceed as follows:

- Remove the transparent plastic cap.
- While the burner is operating at the maximum output, test the gas pressure on the low gas pressure switch port.
- Slowly close the manual shut-off valve (placed upstream the pressure switch, see gas train installation diagram), until the measured pressure is reduced by 50%. Pay attention that the CO value in the flue gas does not increase.
- Check that the burner is operating correctly.
- Screw down the pressure switch adjusting ring nut until the burner lockout.
- Fully open the manual shut-off valve.
- Refit the transparent plastic cover on the pressure switch.

#### **Adjusting the high gas pressure switch (when provided)**

To calibrate the high pressure switch, proceed as follows:

- remove the plastic cover;
- measure the gas pressure in the network, when flame is off;
- by means of the adjusting ring nut **VR**, set the value read on step 2, increased by the 30%;
- replace the plastic cover.



**PART II: OPERATION****LIMITATIONS OF USE**

THE BURNER IS AN APPLIANCE DESIGNED AND CONSTRUCTED TO OPERATE ONLY AFTER BEING CORRECTLY CONNECTED TO A HEAT GENERATOR (E.G. BOILER, HOT AIR GENERATOR, FURNACE, ETC.), ANY OTHER USE IS TO BE CONSIDERED IMPROPER AND THEREFORE DANGEROUS.

THE USER MUST GUARANTEE THE CORRECT FITTING OF THE APPLIANCE, ENTRUSTING THE INSTALLATION OF IT TO QUALIFIED PERSONNEL AND HAVING THE FIRST COMMISSIONING OF IT CARRIED OUT BY A SERVICE CENTRE AUTHORIZED BY THE COMPANY MANUFACTURING THE BURNER.

A FUNDAMENTAL FACTOR IN THIS RESPECT IS THE ELECTRICAL CONNECTION TO THE GENERATOR'S CONTROL AND SAFETY UNITS (CONTROL THERMOSTAT, SAFETY, ETC.) WHICH GUARANTEES CORRECT AND SAFE FUNCTIONING OF THE BURNER.

THEREFORE, ANY OPERATION OF THE APPLIANCE MUST BE PREVENTED WHICH DEPARTS FROM THE INSTALLATION OPERATIONS OR WHICH HAPPENS AFTER TOTAL OR PARTIAL TAMPERING WITH THESE (E.G. DISCONNECTION, EVEN PARTIAL, OF THE ELECTRICAL LEADS, OPENING THE GENERATOR DOOR, DISMANTLING OF PART OF THE BURNER).

NEVER OPEN OR DISMANTLE ANY COMPONENT OF THE MACHINE.

OPERATE ONLY THE MAIN SWITCH, WHICH THROUGH ITS EASY ACCESSIBILITY AND RAPIDITY OF OPERATION ALSO FUNCTIONS AS AN EMERGENCY SWITCH, AND ON THE RESET BUTTON.

IN CASE OF A BURNER SHUT-DOWN, RESET THE CONTROL BOX BY MEANS OF THE RESET PUSHBUTTON. IF A SECOND SHUT-DOWN TAKES PLACE, CALL THE TECHNICAL SERVICE, WITHOUT TRYING TO RESET FURTHER.

**WARNING:** DURING NORMAL OPERATION THE PARTS OF THE BURNER NEAREST TO THE GENERATOR (COUPLING FLANGE) CAN BECOME VERY HOT, AVOID TOUCHING THEM SO AS NOT TO GET BURNT.

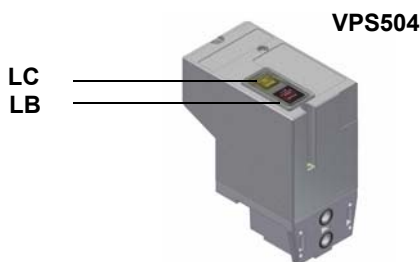
## OPERATION



ATTENTION: BEFORE STARTING THE BURNER UP, BE SURE THAT THE MANUAL CUTOFF VALVES ARE OPEN AND CHECK THAT THE PRESSURE VALUE UPSTREAM THE GAS TRAIN MATCHES THE VALUE ON PARAGRAPH "TECHNICAL SPECIFICATIONS"). CHECK THAT THE MAINS SWITCH IS CLOSED. CAREF

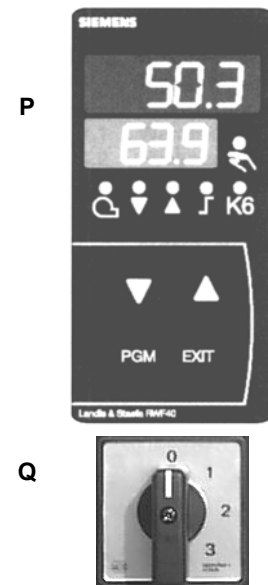
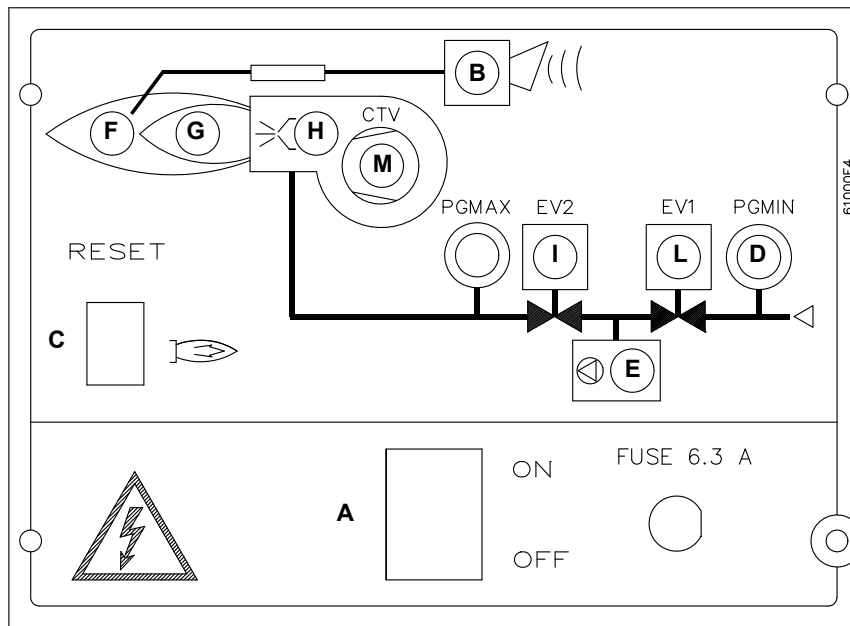
- 1 Turn to the "ON" position the main switch **A**, on the burner's control panel (see Fig. 29).
- 2 Check the flame control box is not locked (light **B**, on) and eventually release it by means of the pushbutton **C** (reset - for more information about the device, please refer to the manual's Appendix).
- 3 Check the series of thermostats or pressure switches gives the burner the start signal for operating.
- 4 Check that the gas pressure in the gas network is sufficient (if the pressure is normal, the lamp **E** lights).

**Only burners provided with the gas proving system:** the check cycle of the gas proving system starts; the end of this check is signalled by the light of the LC LED on the device (see picture below). When the valves check come to end, the startup cycle of the burner begins. In the case of a leak in a valve, the gas proving system locks and the lamp **E** lights (on the burner control panel). To reset the device press its **LB** pushbutton (see picture below).



- 5 The startup cycle begins, the actuator drives the air damper to the maximum opening position, the fan motor starts and the pre-purge phase begins. During the pre-purge phase, the complete opening of the air damper is signalled by the lamp **F** on the burner control panel.
- 6 At the end of the pre-purge phase, the air damper goes to the ignition position, the ignition transformer comes on (signalled by the lamp **H**) and few seconds later the solenoid valves EV1 and EV2 are energised (lights **I** and **L** on the control panel).
- 7 Few seconds after the opening of the valves, the ignition transformer turns off and the lamp **H** turns off as well, then:
  - **High-low flame burners:** the burner is in low flame stage (light **G** is on); some seconds later the high flame operation begins and the burner switches automatically to high flame (light **F** is on) or keeps on operating in low flame stage, according to the plant needs.
  - **Progressive and fully modulating burners** - few seconds after the gas valve opening, the ignition transformer is de-energised. The burner is in low flame operation and some seconds later the two-stages operation begins; the burner increases or decreases its output, directly driven by the external thermostat (progressive version) or by the modulator (**P** in Fig. 29, fully modulating burners only).

Fig. 29 - Control panel

**Keys**

- A Main switch on-off
- B Lockout indicator light
- C Reset pushbutton for flame control box
- D Gas pressure switch consent indicator light
- E Gas proving system lockout indicator light (only on burners with leakage control device)
- F High flame operation indicator light (or air damper open during pre-purge phase)
- G Low flame operation indicator light
- H Ignition transformer operation indicator light
- I Valve in operation indicator light for EV2
- L Valve in operation indicator light for EV1
- M Indicator light for fan motor overload tripped (only three-phase burners); to reset the overload tripped, the electrical board must be opened).
- P Modulator (fitted only on fully modulating burners)
- Q Operation manual selector: 0) stop - 1) high flame - 2) low flame - 3) automatic

## PART III: MAINTENANCE

At least once a year carry out the maintenance operations listed below. In the case of seasonal servicing, it is recommended to carry out the maintenance at the end of each heating season; in the case of continuous operation the maintenance is carried out every 6 months.



**WARNING: ALL OPERATIONS ON THE BURNER MUST BE CARRIED OUT WITH THE MAINS DISCONNECTED AND THE FUEL MANUAL CUTOFF VALVES CLOSED!**

**ATTENTION: READ CAREFULLY THE "WARNINGS" CHAPTER AT THE BEGINNING OF THIS MANUAL..**

### ROUTINE MAINTENANCE

- Clean and check the gas filter cartridge, if necessary replace it (see next paragraphs).
- Remove, check and clean the combustion head (see Fig. 34)
- Check ignition electrode, clean, adjust and, if necessary, replace (see page 34)
- Check the detection electrode, clean, adjust and, if necessary, replace; in case of doubt, check the detection circuit following the diagram in Fig. 38 and Fig. 39, after turning the burner back into operation.

.Cleaning and greasing of leverages and rotating parts.

●



**ATTENTION** when servicing, if it was necessary to disassemble the gas train parts, remember to execute the gas proving test, once the gas train is reassembled, according to the procedure imposed by the law in force.

### Removing the filter in the MULTIBLOC DUNGS MB-DLE 415 - 420 B01 1" 1/2 - 2"

- Check the filter at least once a year!
- Change the filter if the pressure difference between pressure connection 1 and 2 (Fig. 30-Fig. 31)  $\Delta p > 10$  mbar.
- Change the filter if the pressure difference between pressure connection 1 and 2 (Fig. 30-Fig. 31) is twice as high compared to the last check.

You can change the filter without removing the fitting.

- 1 Interrupt the gas supply closing the on-off valve.
- 2 Remove screws 1 ÷ 6 (Fig. 32).
- 3 Change filter insert.
- 4 Re-insert filter housing, screw in screws 1 ÷ 6 without using any force and fasten.
- 5 Perform leakage and functional test,  $p_{max.} = 360$  mbar.
- 6 Pay attention that dirt does not fall inside the valve.

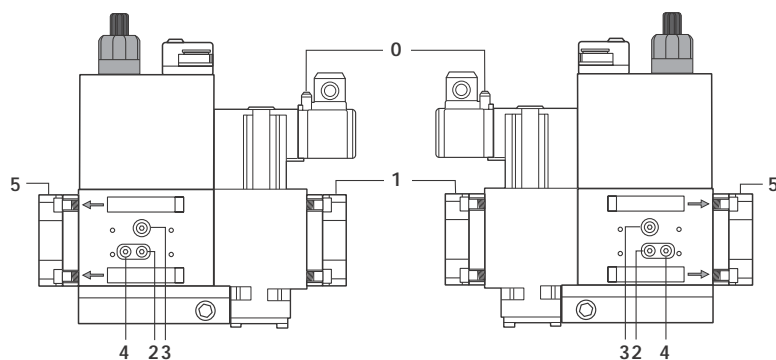


Fig. 30

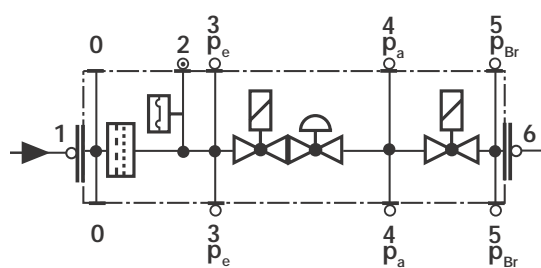


Fig. 31

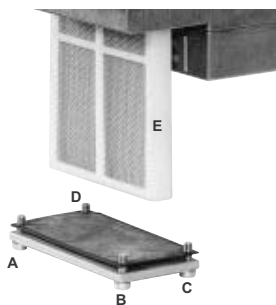


Fig. 32

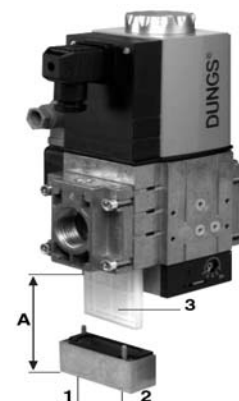
### Inspection and replacement of the MULTIBLOC DUNGS MBC..SE filter (Threaded valves group)

Inspect the filter at least once a year.

- Change the filter, if pressure value between pressure connections 1 and 2 is greater than 10 mbar.
- Change the filter, if pressure value between pressure connections 1 and 2 is twice as high compared to the last inspection.

1. Interrupt gas supply: close ball valve
  2. Remove screws 1-2
  3. Replace the filter insert 3
  4. Screw in screws 1-2 without use force to fasten.
  5. Perform leakage and function test.
  6. Pay attention that dirt does not fall inside the valve.
- Space requirements for fitting filter, A: from 150 to 230 mm.

Fig.33



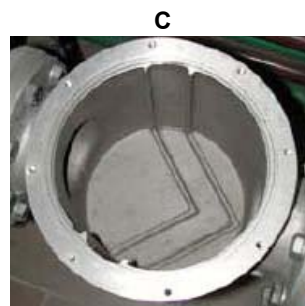
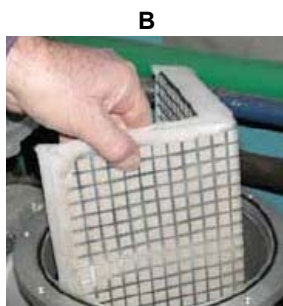
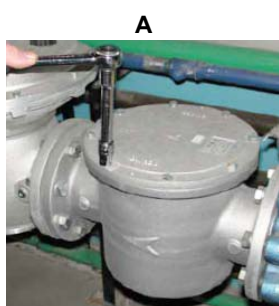
### Gas filter maintenance



**ATTENTION:** Before opening the filter, close the manual cutoff valve downstream the filter and bleed the gas; check that inside the filter there is no pressurised gas.

To clean or remove the filter, proceed as follows:

- 1 remove the cap unscrewing the fixing screws (A);
- 2 remove the filtering cartridge (B), clean it using water and soap, blow it with compressed air (or replace it, if necessary)
- 3 replace the cartridge in its proper position taking care to place it in between the guides as not to hamper the cap replacement;
- 4 be sure to replace the "O" ring into its place (C) and replace the cover fastening by the proper screws (A).



## Removing the combustion head

### Type LX60

- Remove cover C.
- Unscrew the two screws S holding in position the washer and then unscrew VRT to free the threaded rod AR.
- Unscrew the screws V holding in position the manifold G and pull out the complete group as shown in figure.

**Note:** for the subsequent assembly carry out the above described operations in the reverse order, checking the correct position of the OR ring.

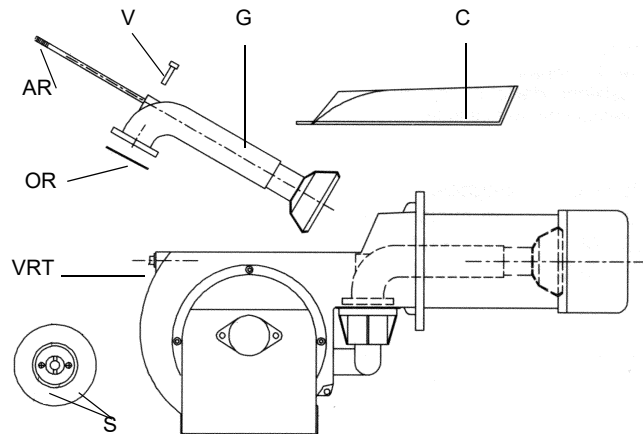


Fig. 24

### Type LX65 / LX72

- Remove the burner cover C.
- Unscrew the screws V holding in position the manifold G and pull out the complete group as shown in figure.

**Note:** for the subsequent assembly carry out the above described operations in the reverse order, checking the correct position of the OR ring.

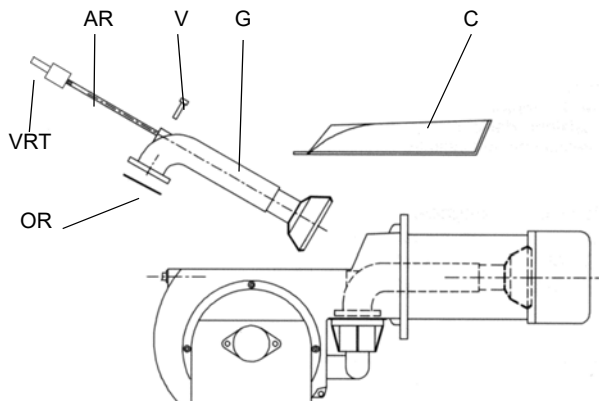


Fig. 25

## Adjusting the electrodes

**Important Note:** Check the ignition and detection electrodes after removing/adjusting the combustion head.



**ATTENTION:** avoid the ignition and detection electrodes to contact metallic parts (blast tube, head, etc.), otherwise the boiler's operation would be compromised. Check the electrodes position after any intervention on the combustion head.

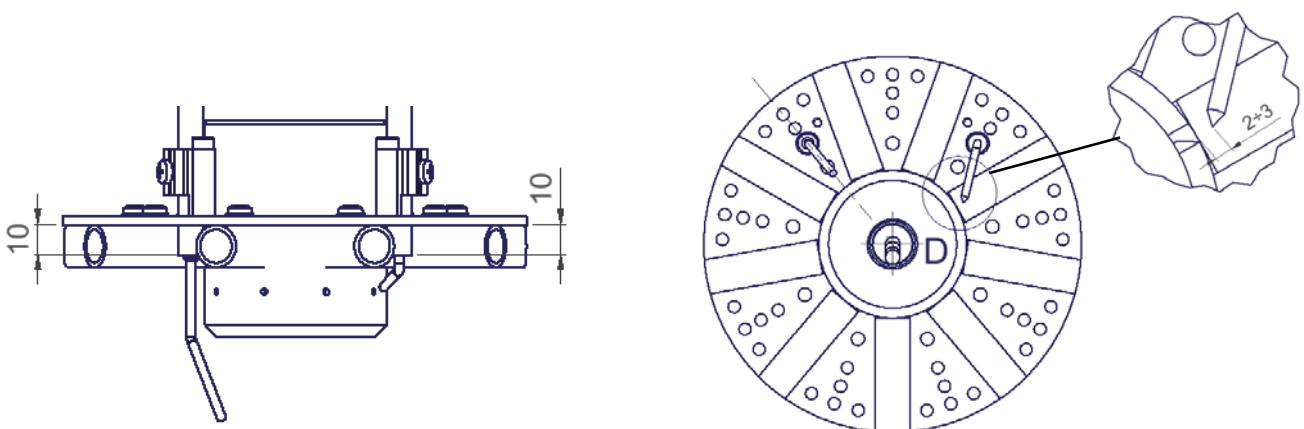


Fig. 26

## Replacing the electrodes



**ATTENTION:** avoid the ignition and detection electrodes to contact metallic parts (blast tube, head, etc.), otherwise the boiler's operation would be compromised. Check the electrodes position after any intervention on the combustion head.

To replace the electrodes, proceed as follows:

- 1 remove the burner cover
- 2 disconnect the electrodes cables;
- 3 loose the screws of the electrodes (**VB**);
- 4 remove the ignition electrodes and replace them paying attention to the measures shown in figure.

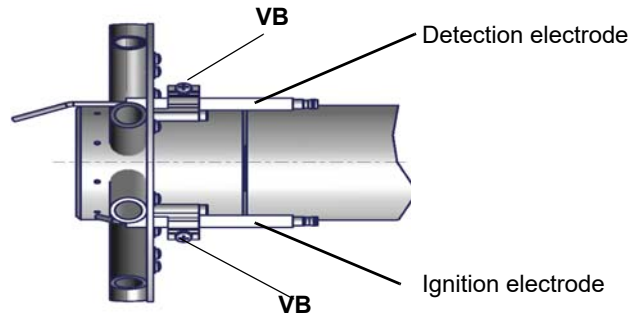


Fig. 37

## Checking the detection current

To measure the detection signals refer to the diagram on the next picture.

If the signal is less than the indicated value, check the position of the detection electrode/UV detector, the electrical contacts and if necessary replace the detection electrode/UVdetector .

Control box	Minimum detection signal
Siemens LME (with electrode)	3 $\mu$ A
Siemens LME (with UV detector)	3 $\mu$ A (Fig. 38) - 200 $\mu$ A (Fig. 39)

## Test point for burners with PCB provided

To check the detection current, remove the jumper between terminals and connect the microamperemeter (see next picture).

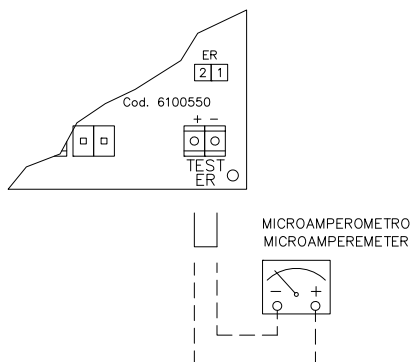


Fig. 38

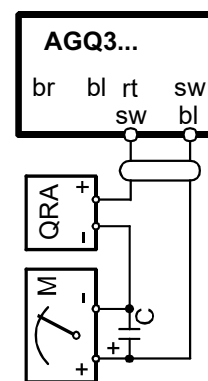


Fig. 39

## Seasonal stop

To stop the burner in the seasonal stop, proceed as follows:

- 1 turn the burner's main switch to 0 (Off position)



- 2 disconnect the power mains
- 3 close the fuel cock of the supply line

### Burner disposal

In case of disposal, follow the instructions according to the laws in force in your country about the "Disposal of materials".

## TROUBLESHOOTING

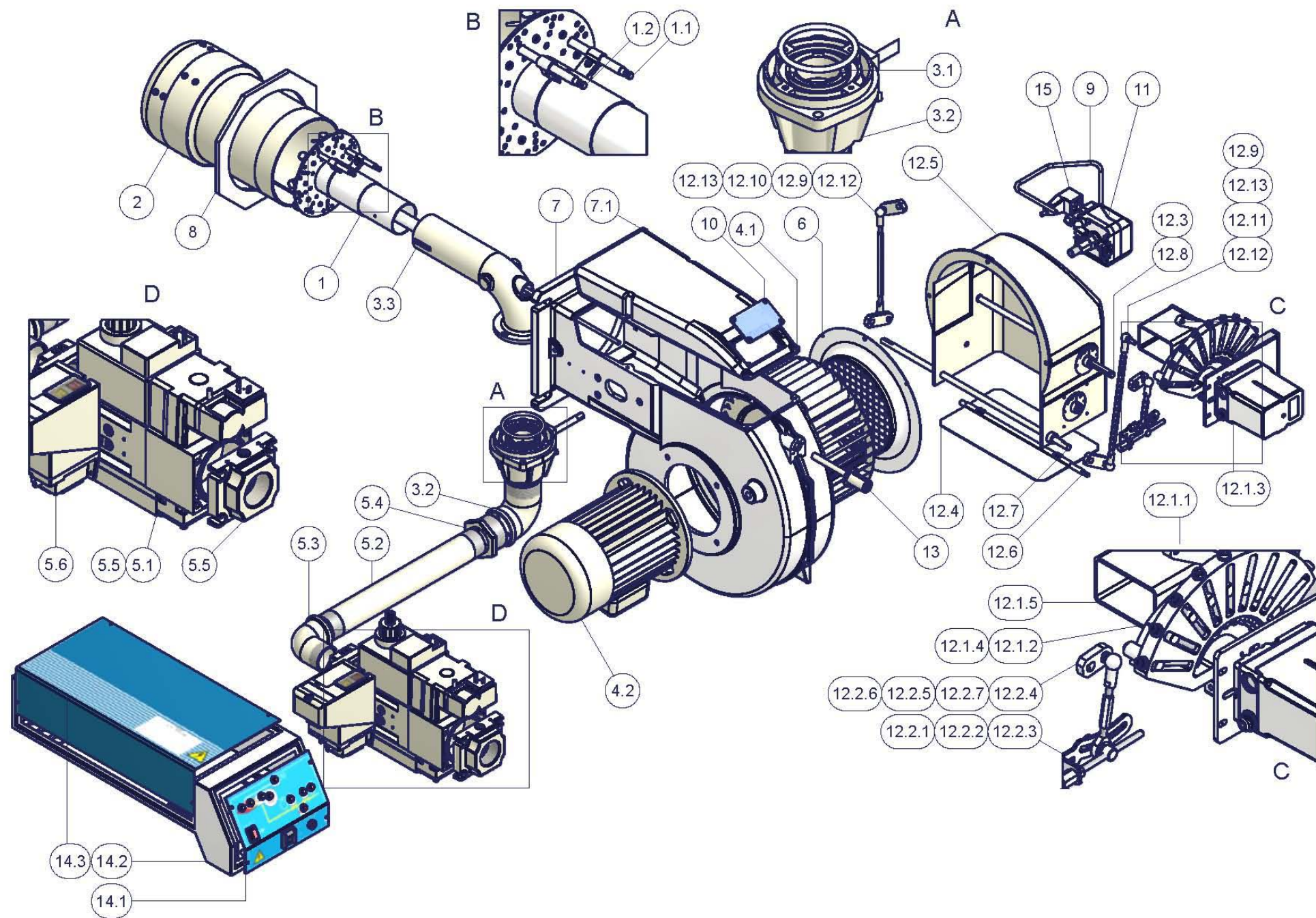
CAUSE / FAULT	BURNER DOESN'T START	CONTINUE PRE-PURGE	BURNER DOESN'T START AND LOCKS	BURNER DOESN'T START AND REPEATS THE CYCLE	BURNER STARTS AND REPEATS THE CYCLE	BURNER DOESN'T SWITCH TO HIGH FLAME	BURNER'S LOCKOUT DURING OPERATION	BURNER STOPS AND REPEATS CYCLE DURING OPERATION	BURNER'S LOCKOUT AFTER START	THE FLAME CONTROL DEV. REPEATS THE CYCLE WITHOUT GIVE CONSENT
MAIN SWITCH OPEN	●									
ABSENCE OF GAS	●									
MINIMUM GAS PRESSURE SWITCH FAULT OR BAD SETTING	●			●	●			●		
BOILER THERMOSTATS OPEN	●									
OVERLOAD TRIPPED INTERVENTION	●									
FUSES INTERVENTION	●									
AIR PRESSURE SWITCH FAULT OR BAD SETTING	●		●				●			●
DEFECTIVE FLAME CONTROL BOX	●	●	●				●			
DEFECTIVE AIR DAMPER ACTUATOR		●								
DEFECTIVE IGNITION TRANSFORMER			●							
IGNITION ELECTRODE WRONG POSITION			●							
BUTTERFLY VALVE BAD SETTING			●							
DEFECTIVE GAS GOVERNOR				●	●			●		
DEFECTIVE HI-LO FLAME THERMOSTAT						●				
ACTUATOR CAM BAD SETTING						●				
DETECTION ELECTRODE BAD POSITION OR DEFECTIVE DETECTION CIRCUIT							●		●	
REVERSED PHASE AND NEUTRAL CONNECTION									●	
PHASE-PHASE SUPPLY OR PRESENCE OF VOLTAGE ON NEUTRAL*									●	

\* In this case insert an RC filter (see Fig. 17)

**BURNER EXPLODED VIEW**  
**LX60**

ITEM	DESCRIPTION
1	COMBUSTION HEAD
1.1	DETECTION ELECTRODE
1.2	IGNITION ELECTRODE
2	BLAST TUBE
3.1	“O” RING
3.2	BUTTERFLY GAS VALVE
3.3	GAS MANIFOLD
4.1	FAN WHEEL
4.2	MOTOR
5.1	GAS VALVES GROUP WITH GOVERNOR
5.2	THREADED GAS PIPE
5.3	ELBOW
5.4	REDUCTION
5.5	FLANGE
5.6	GAS PROVING SYSTEM
6	AIR INLET CONE
7	BURNER HOUSING
7.1	COVER
8	GENERATOR GASKET
9	AIR PRESSURE SWITCH PIPE
10	INSPECTION GLASS
11	AIR PRESSURE SWITCH
12.1.1	LEVERAGE
12.1.2	ADJUSTING CAM
12.1.3	ACTUATOR
12.1.4	ACTUATOR SHAFT

ITEM	DESCRIPTION
12.1.5	BRACKET
12.2.1	SCREW
12.2.2	SCREW
12.2.3	CAM
12.2.4	LEVERAGE
12.2.5	ROD
12.2.6	JOINT
12.2.7	JOINT
12.3	INDEX LABEL
12.4	AIR INTAKE DAMPER
12.5	AIR INTAKE
12.6	LOUVER SHAFT
12.7	THROTTLE SHAFT
12.8	ADJUSTING CAM SHAFT
12.9	LEVERAGE
12.10	ROD
12.11	ROD
12.12	JOINT
12.13	JOINT
13	HEAD ADJUSTING SCREW
14.1	FRONT CONTROL PANEL
14.2	BOARD
14.3	COVER
15	CONNECTOR

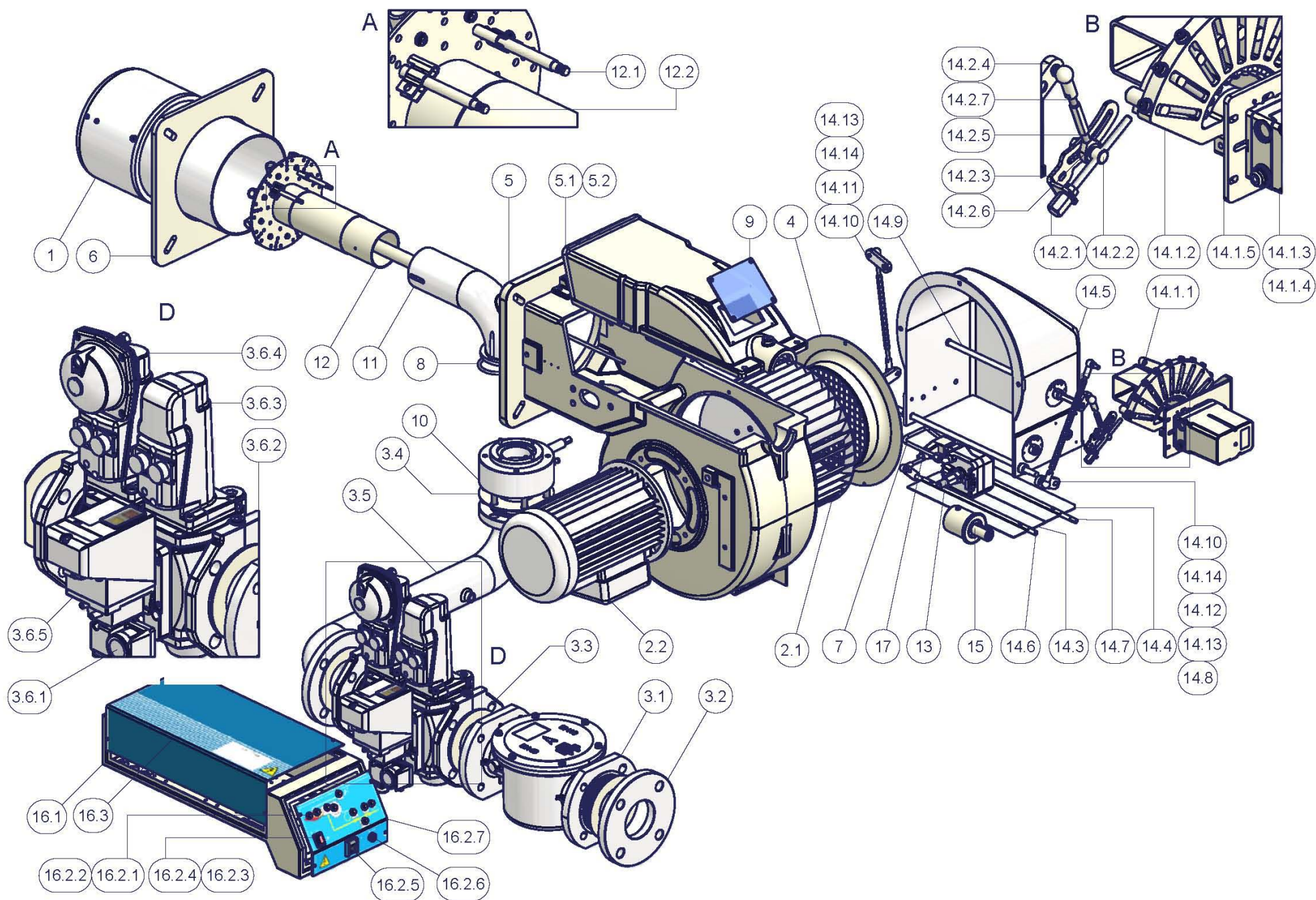


**LX65 - LX72**

ITEM	DESCRIPTION
1	BLAST TUBE
2.1	FAN WHEEL
2.2	MOTOR
3.1	GAS FILTER
3.2	FLANGE
3.3	GASKET
3.4	GASKET
3.5	FLANGED PIPE
3.6.1	PRESSURE SWITCH
3.6.2	GAS VALVE
3.6.3	"SKP" ACTUATOR
3.6.4	"SKP" ACTUATOR
3.6.5	GAS PROVING SYSTEM
4	AIR INLET CONE
5	BURNER HOUSING
5.1	COVER
5.2	COVER EXTENSION
6	GASKET
7	AIR PRESSURE SWITCH PIPE
8	"O" RING
9	INSPECTION GLASS
10	BUTTERFLY GAS VALVE
11	MANIFOLD
12	COMBUSTION HEAD
12.1	DETECTION ELECTRODE
12.2	IGNITION ELECTRODE
13	AIR PRESSURE SWITCH ASS.Y
14.1.1	LEVERAGE
14.1.2	ADJUSTING CAM
14.1.3	ACTUATOR
14.1.4	CONNECTOR

ITEM	DESCRIPTION
14.1.5	BRACKET
14.2.1	NUT
14.2.2	SCREW
14.2.3	ADJSUTING CAM
14.2.4	CONNECTING ROD
14.2.5	ROD
14.2.6	JOINT
14.2.7	JOINT
14.3	AIR DAMPER
14.4	AIR DAMPER
14.5	AIR INLET
14.6	AIR DAMPER SHAFT
14.7	AIR DAMPER SHAFT
14.8	PIN
14.9	PIN
14.10	CONNECTING ROD
14.11	ROD
14.12	ROD
14.13	JOINT
14.14	JOINT
15	SCREW
16.1	ELECTRIC BOARD
16.2.1	RED LED
16.2.2	RED LED
16.2.3	UNLOCKING PUSHBUTTON
16.2.4	BUTTON COVER
16.2.5	SWITCH
16.2.6	FUSE
16.2.7	FRONT CONTROL PANEL
16.3	BOARD COVER
17	CONNECTOR







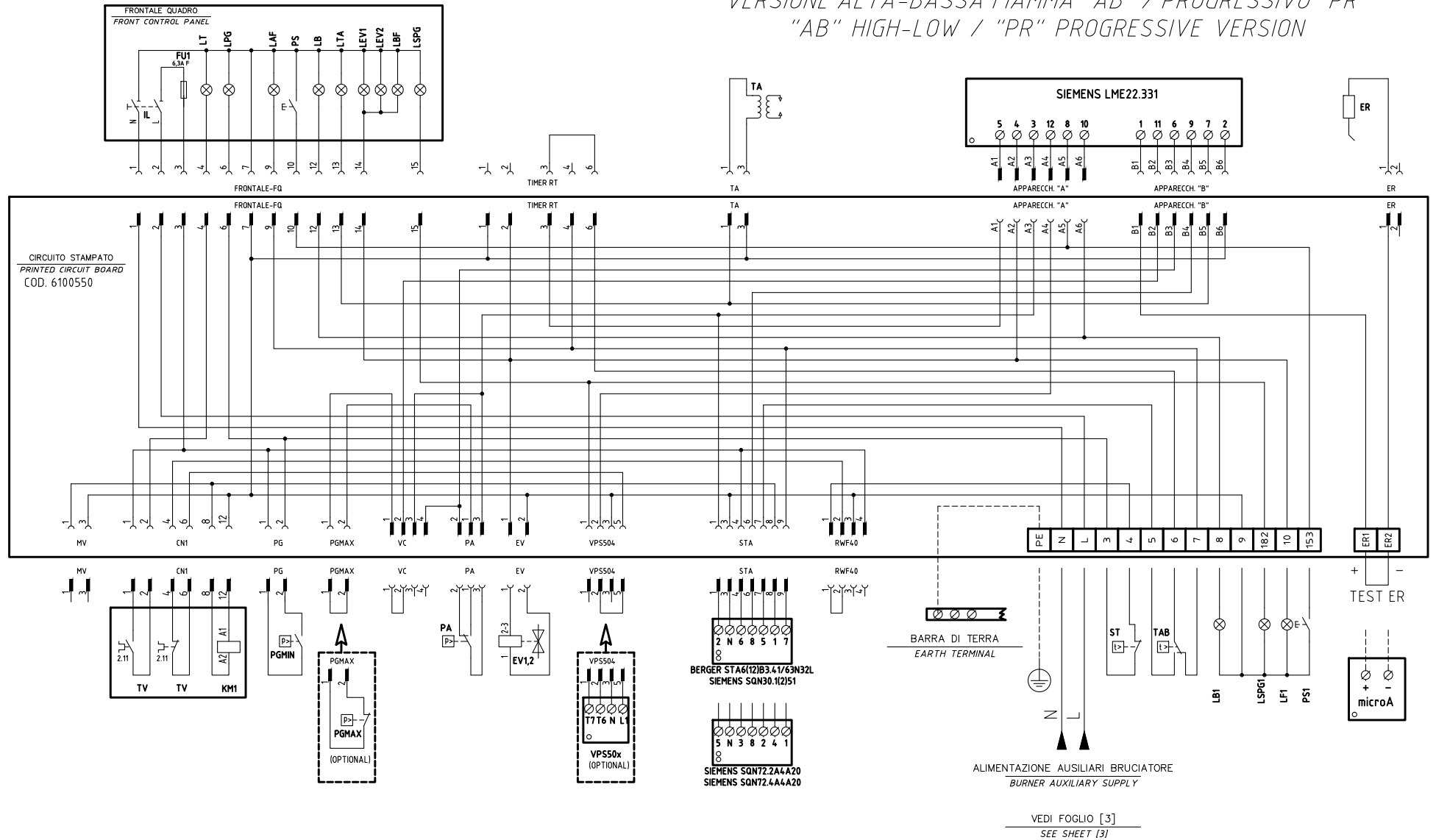
## **WIRING DIAGRAMS**

### **ATTENTION:**

- 1 - Power supply: 400V 50Hz 3N a.c.three-phase and 230V 50Hz 1N a.c. monophas
- 2 - Don't reverse phase and neutral
- 3 - Ensure the burner is properly earthed

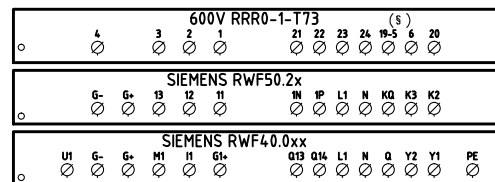
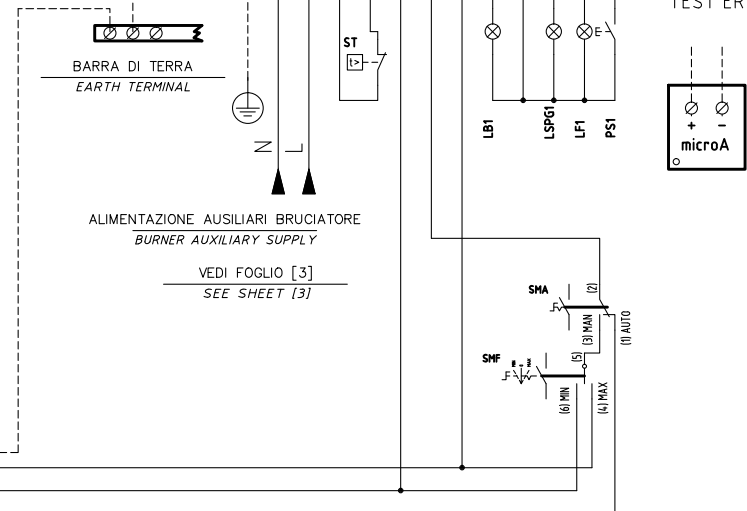
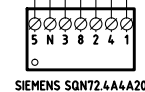
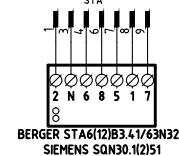
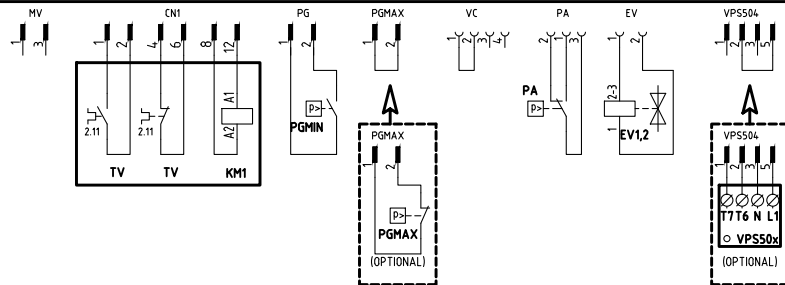
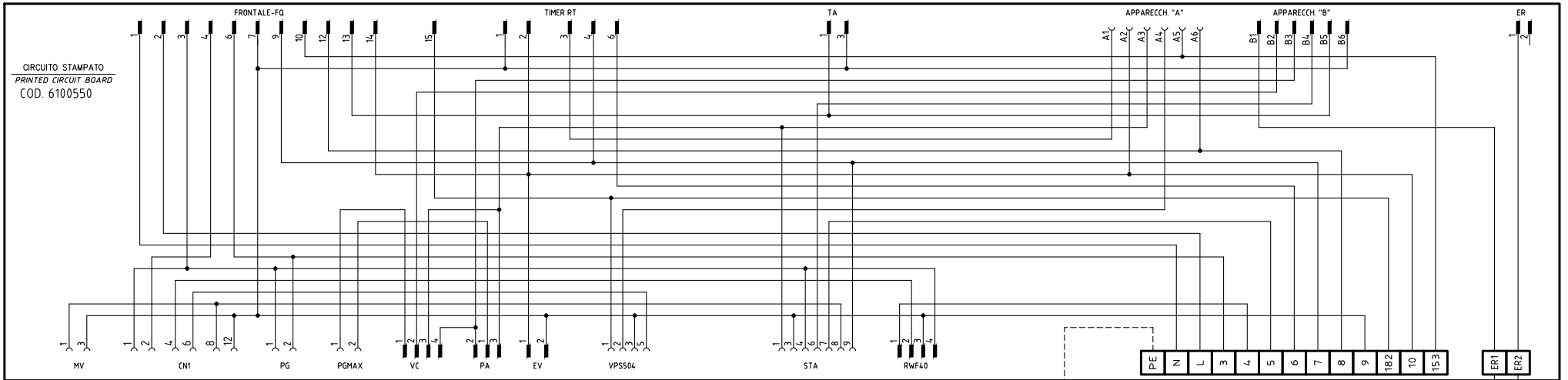
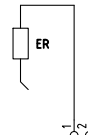
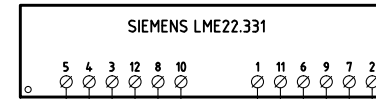
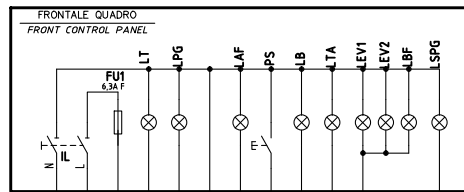


VERSIONE ALTA-BASSA FIAMMA "AB" / PROGRESSIVO "PR"  
 "AB" HIGH-LOW / "PR" PROGRESSIVE VERSION



Data	18/01/2012	PREC.	FOGLIO
Revisione	02	/	1
Dis. N.	18 - 236	SEGUE	TOTALE
		2	4

VERSIONE MODULANTE "MD"  
"MD" MODULATING VERSION

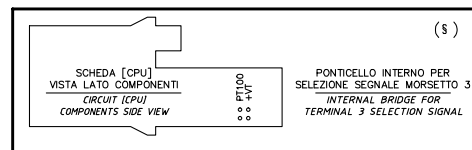


CAVO 7x0,75mmq  
7x0,75mmq CABLE

CONN. SONDE

(1) MARRONE BROWN  
(2) BLU BLUE  
(3) ROSSO RED  
(4) NERO BLACK  
(5) BIANCO WHITE  
(6) ARANCIO ORANGE

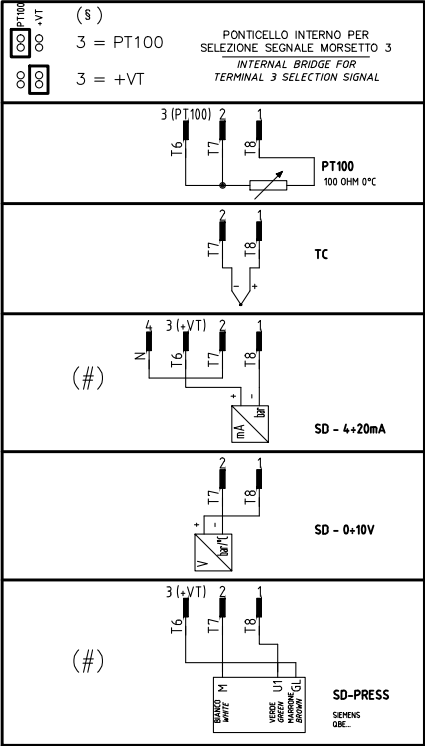
COLLEGAMENTO SONDE  
PROBE CONNECTION



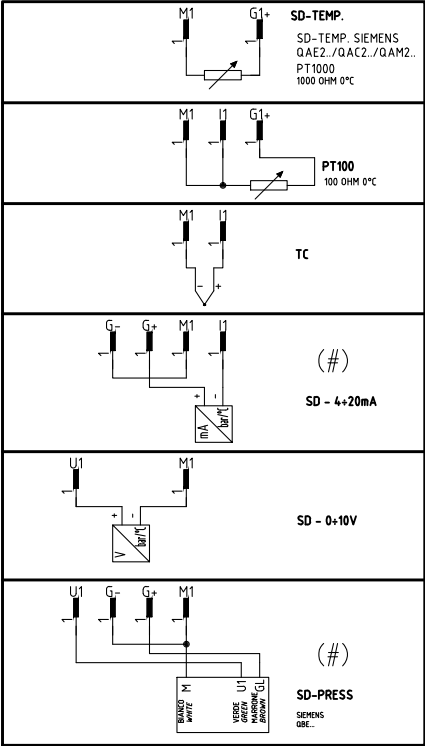
Data	18/01/2012	PREC.	FOGLIO
Revisione	02	1	2
Dis. N.	18 - 236	SEGUE	TOTALE
		3	4

(xx)  
ATTENZIONE COLLEGAMENTO SONDE CON CONNETTORE 7 POLI  
WARNING PROBE CONNECTION WITH 7 PINS CONNECTOR

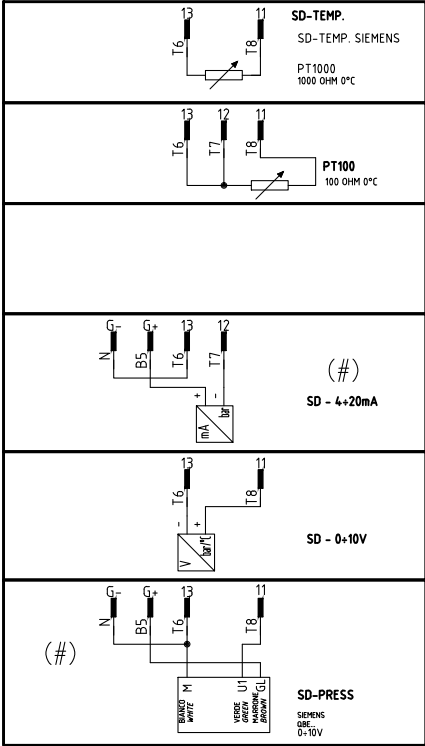
600V RRR0-1-T73



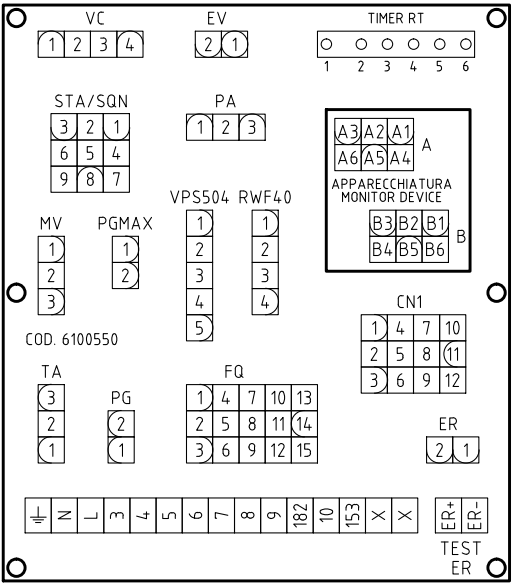
RWF40.0x0



RWF50.2x



(#)  
COLLEGAMENTO SOLO PER TRASDUTTORI PASSIVI  
TRANSDUCER PASSIVE CONNECTION ONLY



SERVOCOMANDO SERRANDA ARIA  
AIR DAMPER ACTUATOR  
BERGER STA6(12)B3.41/63N32L

ST2 ALTA FIAMMA  
HIGH FLAME

ST0 SOSTA  
STAND-BY

ST1 BASSA FIAMMA  
LOW FLAME

MV NON USATA  
NOT USED

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)  
AIR DAMPER ACTUATOR (ALTERNATIVE)  
SIEMENS SQN72.xA4.A20

I (ROSSO) ALTA FIAMMA  
I (RED) HIGH FLAME

II (BLU) SOSTA  
II (BLUE) STAND-BY

III (ARANCIO) BASSA FIAMMA  
III (ORANGE) LOW FLAME

IV (NERO) NON USATA  
IV (BLACK) NOT USED

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)  
AIR DAMPER ACTUATOR (ALTERNATIVE)  
SIEMENS SQN30.1(2)51A

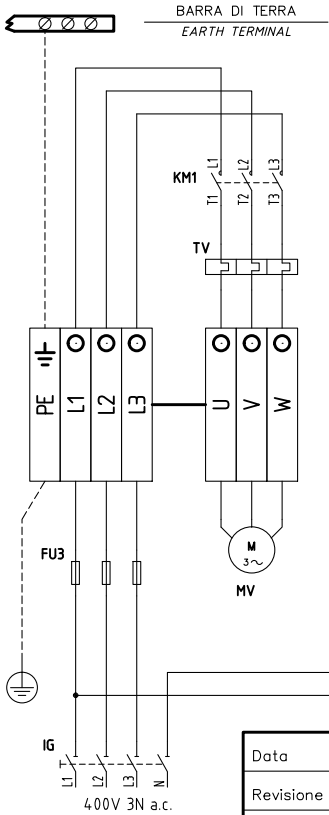
I ALTA FIAMMA  
HIGH FLAME

II SOSTA  
STAND-BY

III BASSA FIAMMA  
LOW FLAME

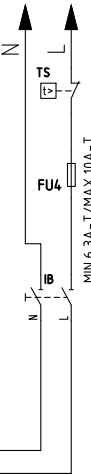
V NON USATA  
NOT USED

QG - MC1  
MORSETTIERA COLLEGAMENTO LINEA E MOTORE TRIFASE  
MOTOR THREE PHASES AND ELECTRIC SUPPLY CONNECTION TERMINAL BOARD



ALIMENTAZIONE AUSILIARI BRUCIATORE  
BURNER AUXILIARY SUPPLY

VEDI FOGLIO [1 / 2]  
SEE SHEET [1 / 2]

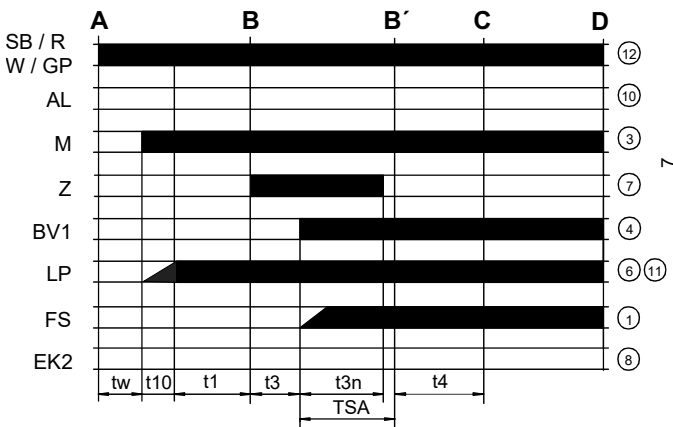


Data	18/01/2012	PREC.	FOGLIO
Revisione	02	2	3
Dis. N.	18 - 236	SEGUE	TOTALE
		4	4

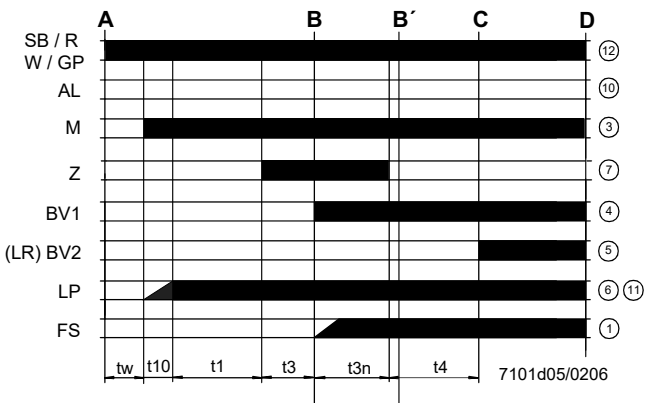
Sigla/Item	Funzione	Function
600V RRR0-1-T73	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)
BERGER STA6(12)B3.41/63N32L	SERVOCOMANDO SERRANDA ARIA	AIR DAMPER ACTUATOR
ER	ELETTRODO RILEVAZIONE FIAMMA	FLAME DETECTION ELECTRODE
EV1,2	ELETTROVALVOLE GAS (O GRUPPO VALVOLE)	GAS ELECTRO-VALVES (OR VALVES GROUP)
FU1	FUSIBILE DI LINEA	LINE FUSE
FU2	FUSIBILE AUSILIARIO	AUXILIARY FUSE
FU3	FUSIBILI LINEA MOTORE VENTILATORE	FAN MOTOR LINE FUSES
FU4	FUSIBILE DI LINEA	LINE FUSE
IB	INTERRUTTORE LINEA BRUCIATORE	BURNER LINE SWITCH
IG	INTERRUTTORE GENERALE	MAINS SWITCH
IL	INTERRUTTORE LINEA AUSILIARI	AUXILIARY LINE SWITCH
KM1	CONTATTORE MOTORE VENTILATORE	FAN MOTOR CONTACTOR
LAF	LAMPADA SEGNALE ALTA FIAMMA BRUCIATORE	BURNER IN HIGH FLAME INDICATOR LIGHT
LB	LAMPADA SEGNALE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT
LB1	LAMPADA SEGNALE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT
LBF	LAMPADA SEGNALE BASSA FIAMMA BRUCIATORE	BURNER IN LOW FLAME INDICATOR LIGHT
LEV1	LAMPADA SEGNALE APERTURA [EV1]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV1]
LEV2	LAMPADA SEGNALE APERTURA [EV2]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV2]
LF1	LAMPADA SEGNALE FUNZIONAMENTO BRUCIATORE	INDICATOR LIGHT BURNER OPERATION
LPG	LAMPADA SEGNALE PRESENZA GAS IN RETE	INDICATOR LIGHT FOR PRESENCE OF GAS IN THE NETWORK
LSPG	LAMPADA SEGNALE BLOCCO CONTROLLO TENUTA VALVOLE	INDICATOR LIGHT FOR LEAKAGE OF VALVES
LSPG1	LAMPADA SEGNALE BLOCCO CONTROLLO TENUTA VALVOLE	INDICATOR LIGHT FOR LEAKAGE OF VALVES
LT	LAMPADA SEGNALE BLOCCO TERMICO	INDICATOR LIGHT FOR MOTOR OVERLOAD THERMAL CUTOUT
LTA	LAMPADA SEGNALE TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER INDICATOR LIGHT
MV	MOTORE VENTILATORE	FAN MOTOR
PA	PRESSOSTATO ARIA	AIR PRESSURE SWITCH
PGMAX	PRESSOSTATO GAS DI MASSIMA PRESSIONE	MAXIMUM PRESSURE GAS SWITCH
PGMIN	PRESSOSTATO GAS DI MINIMA PRESSIONE	MINIMUM GAS PRESSURE SWITCH
PS	PULSANTE SBLOCCO FIAMMA	FLAME UNLOCK BUTTON
PS1	PULSANTE SBLOCCO FIAMMA	FLAME UNLOCK BUTTON
PT100	SONDA DI TEMPERATURA	TEMPERATURE PROBE
SD-PRESS	SONDA DI PRESSIONE	PRESSURE PROBE
SD-TEMP.	SONDA DI TEMPERATURA	TEMPERATURE PROBE
SD - 0÷ 10V	TRASDUTTORE USCITA IN TENSIONE	TRANSDUCER VOLTAGE OUTPUT
SD - 4÷ 20mA	TRASDUTTORE USCITA IN CORRENTE	TRANSDUCER CURRENT OUTPUT
SIEMENS LME22.331	APPARECCHIATURA CONTROLLO FIAMMA	CONTROL BOX
SIEMENS RWF40.0xx	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)
SIEMENS RWF50.2x	REGOLATORE MODULANTE	BURNER MODULATOR
SIEMENS SQN30.1(2)51	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER ACTUATOR (ALTERNATIVE)
SIEMENS SQN72.2A4A20	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER ACTUATOR (ALTERNATIVE)
SIEMENS SQN72.4A4A20	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER ACTUATOR (ALTERNATIVE)
SMA	SELETTORE MANUALE/AUTOMATICO	MANUAL/AUTOMATIC SWITCH
SMF	SELETTORE MANUALE FUNZIONAMENTO MIN-0-MAX	MIN-0-MAX MANUAL OPERATION SWITCH
ST	SERIE TERMOSTATI/PRESSOSTATI	SERIES OF THERMOSTATS OR PRESSURE SWITCHES
ST	SERIE TERMOSTATI/PRESSOSTATI	SERIES OF THERMOSTATS OR PRESSURE SWITCHES
TA	TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER
TAB	TERMOSTATO/PRESSOSTATO ALTA-BASSA FIAMMA	HIGH-LOW THERMOSTAT/PRESSURE SWITCHES
TC	TERMOCOPPIA	THERMOCOUPLE
TS	TERMOSTATO/PRESSOSTATO DI SICUREZZA	SAFETY THERMOSTAT OR PRESSURE SWITCH
TV	TERMICO MOTORE VENTILATORE	FAN MOTOR THERMAL
VPS50x	CONTROLLO DI TENUTA VALVOLE GAS (OPTIONAL)	GAS PROVING SYSTEM (OPTIONAL)
microA	MICROAMPEROMETRO	MICROAMMETER

The burner stops and the control device is ready for a new startup.

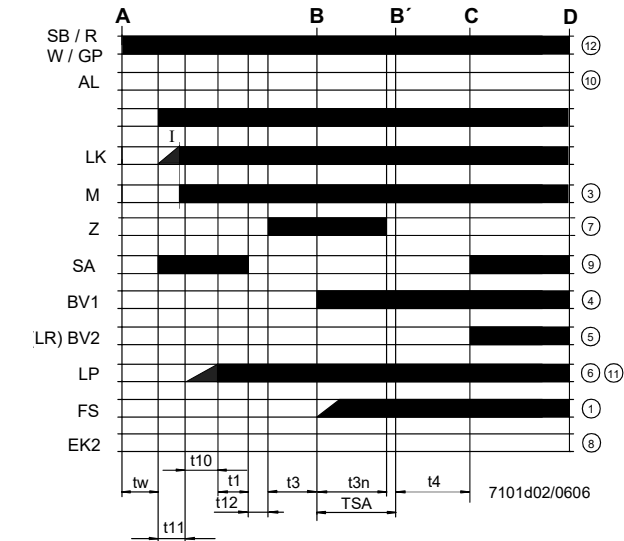
LME11 control sequence



LME21 control sequence



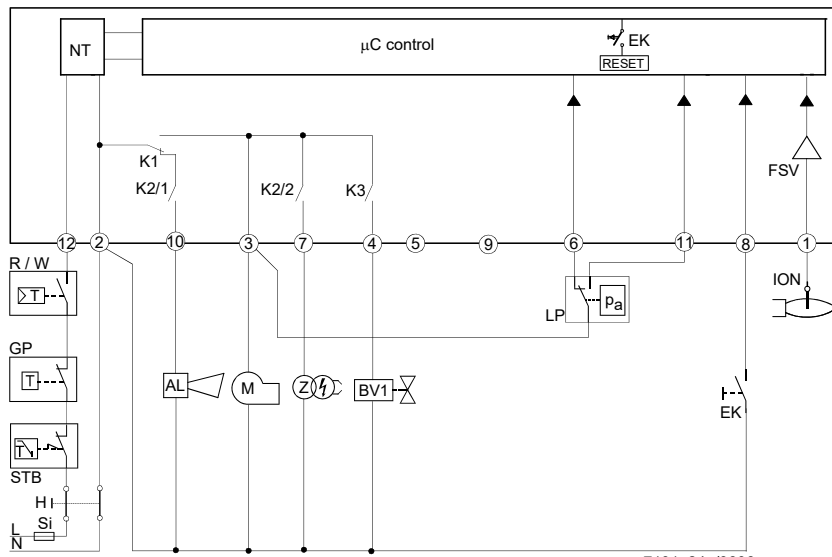
LME22 control sequence



Control sequence

- tw Waiting time
- t1 Purge time
- TSA Ignition safety time
- t3 Preignition time
- t3n Postignition time
- t4 Interval between BV1 and BV2/LR
- t10 Specified time for air pressure signal
- t11 Programmed opening time for actuator SA
- t12 Programmed closing time for actuator SA

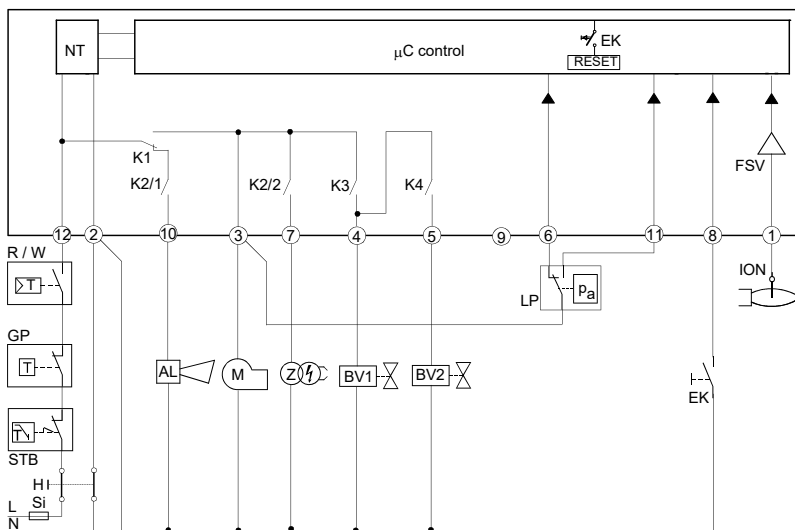
### LME11 connection diagram



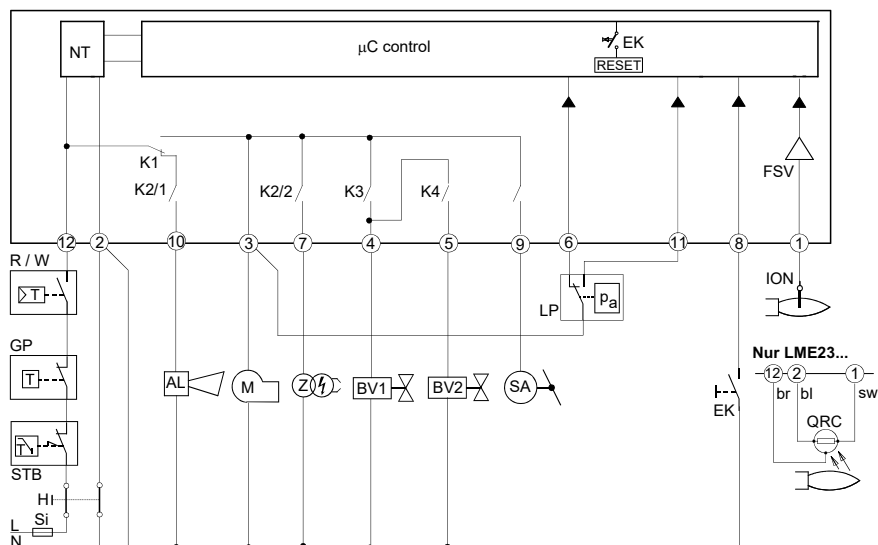
### Connection diagram

- |     |                                   |
|-----|-----------------------------------|
| AL  | Error message (alarm)             |
| BV  | Fuel valve                        |
| EK2 | Remote lockout reset button       |
| FS  | Flame signal                      |
| GP  | Gas pressure switch               |
| LP  | Air pressure switch               |
| LR  | Load controller                   |
| M   | Fan motor                         |
| R   | Control thermostat/pressurestat   |
| SB  | Safety limit thermostat           |
| W   | Limit thermostat /pressure switch |
| Z   | Ignition transformer              |

### LME21 connection diagram



### LME22 connection diagram





## CONTROL PROGRAM IN THE EVENT OF FAULT

- If a fault occurs, all outputs will immediately be deactivated (in less than 1s).
- After an interruption of power, a restart will be made with the full program sequence.
- If the operating voltage drops below the undervoltage threshold, a safety shutdown is performed.
- If the operating voltage exceeds the undervoltage threshold, a restart will be performed.
- In case of extraneous light during "t1", a lockout occurs.
- In case of extraneous light during "tw", there is a prevention of startup and a lockout after 30 seconds.
- In case of no flame at the end of TSA, there will be max. 3 repetitions of the startup cycle, followed by a lockout at the end of TSA, for mod. LME11..; directly a lockout at the end of TSA for LME21-22 models.
- For LME11 model: if a loss of flame occurs during operation, in case of an establishment of flame at the end of TSA, there will be max. 3 repetitions, otherwise a lockout will occur.
- For LME21-22 models: if a loss of flame occurs during operation, there will be a lockout.
- If the contact of air pressure monitor LP is in working position, a prevention of startup and lockout after 65 seconds will occur.
- If the contact of air pressure monitor LP is in normal position, a lockout occurs at the end of t10.
- If no air pressure signal is present after completion of t1, a lockout will occur.

## CONTROL BOX LOCKED

In the event of lockout, the LME.. remains locked and the red signal lamp (LED) will light up. The burner control can immediately be reset. This state is also maintained in the case of mains failure.

## DIAGNOSTICS OF THE CAUSE OF FAULT

- Press the lockout reset button for more than 3 seconds to activate the visual diagnostics.
- Count the number of blinks of the red signal lamp and check the fault condition on the "Error code table" (the device repeats the blinks for regular intervals).

During diagnostics, the control outputs are deactivated:

- the burner remains shut down;
- external fault indication is deactivated;
- fault status is showed by the red LED, inside the LME's lockout reset button according to the "Error code table":

ERROR CODE TABLE	
2 blinks **	<b>No establishment of flame at the end of TSA</b> <ul style="list-style-type: none"><li>- Faulty or soiled fuel valves</li><li>- Faulty or soiled flame detector</li><li>- Inadequate adjustment of burner, no fuel</li><li>- Faulty ignition equipment</li></ul>
3 blinks ***	<b>The air pressure switch does not switch or remains in idle position:</b> <ul style="list-style-type: none"><li>- LP is faulty</li><li>- Loss of air pressure signal after t10</li><li>- LP is welded in normal position.</li></ul>
4 blinks ****	- Extraneous light when burner starts up.
5 blinks *****	- LP is working position.
6 blinks *****	Free.
7 blinks *****	<b>Loss of flame during operation</b> <ul style="list-style-type: none"><li>- Faulty or soiled fuel valves</li><li>- Faulty or soiled flame detector</li><li>- Inadequate adjustment of burner</li></ul>
8 ÷ 9 blinks	Free
10 blinks *****	<b>Faulty output contacts</b> <b>Attention: "lockout" remote signal (terminal no. 10) not enabled</b> <ul style="list-style-type: none"><li>- Wiring error</li><li>- Anomalous voltage on output terminals</li><li>- Other faults</li></ul>
14 blinks ***** (only for LME4x)	- CPI contact (gas valve microswitch) not closed.

## RESETTING THE BURNER CONTROL

When lockout occurs, the burner control can immediately be reset, by pressing the lockout reset button for about 1..3 seconds. The LME.. can only be reset when all contacts in the line are closed and when there is no undervoltage.

## LIMITATION OF REPETITIONS (only for LME11.. model)

If no flame is established at the end of TSA, or if the flame is lost during operation, a maximum of 3 repetitions per controller startup can be performed via "R", otherwise lockout will be initiated. Counting of repetitions is restarted each time a controlled startup via "R" takes place.

**⚠ Condensation, formation of ice and ingress of water are not permitted!**

## TECHNICAL CHARACTERISTICS

Mains voltage	120V AC +10% / -15% 230V AC +10% / -15%
Frequency	50 ... 60 Hz +/- 6%
Power consumption	12VA
External primary fuse	max. 10 A (slow)
input current at terminal 12	max. 5 A
Detection cable length	max. 3m (for electrode)
Detection cable length	max. 20 m (laid separately, for QRA probe)
Reset cable length	max. 20 m (posato separatamente)
Term. 8 & 10 cable length	max. 20 m
Thermostat cable length and other terminals	max. 3 m
Safety class	I
Index of protection	IP40 (to be ensured during mounting)
Operating conditions	-20... +60 °C, < 95% UR
Storage conditions	-20... +60 °C, < 95% UR
Weight	approx. 160 g





C.I.B. UNIGAS S.p.A.  
Via L.Galvani, 9 - 35011 Campodarsego (PD) - ITALY  
Tel. +39 049 9200944 - Fax +39 049 9200945/9201269  
web site: [www.cibunigas.it](http://www.cibunigas.it) - e-mail: [cibunigas@cibunigas.it](mailto:cibunigas@cibunigas.it)

Note: Specifications and data subject to change. Errors and omissions excepted.



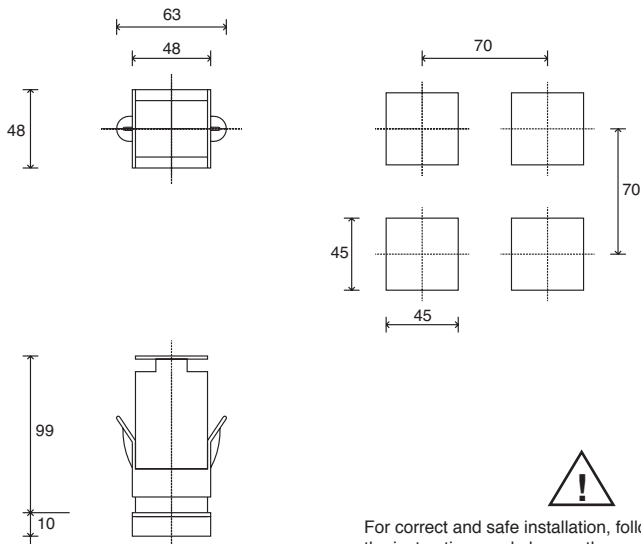
## USER'S MANUAL

COD. M12925CA Rel 1.2 08/2014

SOFTWARE VERSION 1.0x T73  
code 80379 / Edition 01 - 06/2012

## 1 • INSTALLATION

### • Dimensions and cut-out; panel mounting



For correct and safe installation, follow the instructions and observe the warnings contained in this manual.

#### Panel mounting:

To fix the unit, insert the brackets provided into the seats on either side of the case.  
To mount two or more units side by side, respect the cut-out dimensions shown in the drawing.

**CE MARKING:** The instrument conforms to the European Directives 2004/108/CE and 2006/95/CE with reference to the generic standards: **EN 61000-6-2** (immunity in industrial environment) **EN 61000-6-3** (emission in residential environment) **EN 61010-1** (safety).

**MAINTENANCE:** Repairs must be done only by trained and specialized personnel.

Cut power to the device before accessing internal parts.

Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene, etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.

**SERVICE:** GEFRAN has a service department. The warranty excludes defects caused by any use not conforming to these instructions.

EMC conformity has been tested with the following connections

FUNCTION	CABLE TYPE	LENGTH
Power supply cable	1 mm <sup>2</sup>	1 m
Relay output cable	1 mm <sup>2</sup>	3,5 m
TC input	0,8 mm <sup>2</sup> compensated	5 m
Pt100 input	1 mm <sup>2</sup>	3 m

## 2 • TECHNICAL SPECIFICATIONS

Display	2x4 digit green, high display 10 and 7mm
Keys	4 of mechanical type (Man/Aut, INC, DEC, F)
Accuracy	0.2% f.s. $\pm 1$ digit ambient temperature 25°C
Main input (settable digital filter)	TC, RTD, PTC, NTC 60mV, 1V Ri $\geq$ 1M $\Omega$ ; 5V, 10V Ri $\geq$ 10K $\Omega$ ; 20mA Ri=50 $\Omega$ Tempo di campionamento 120 msec.
Type TC Thermocouples (ITS90)	Type TC Thermocouples : J,K,R,S,T (IEC 584-1, CEI EN 60584-1, 60584-2) ; custom linearization is available / types B,E,N,L GOST,U,G,D,C are available by using the custom linearization.
Cold junction error	0,1° / °C
RTD type (scale configurable within indicated range, with or without decimal point) (ITS90) Max line resistance for RTD	DIN 43760 (Pt100), JPT100 20 $\Omega$
PTC type / NTC Type	990 $\Omega$ , 25°C / 1K $\Omega$ , 25°C
Safety	detection of short-circuit or opening of probes, LBA alarm
°C / °F selection	configurable from faceplate
Linear scale ranges	-1999 to 9999 with configurable decimal point position
Controls	PID, Self-tuning, on-off
pb - dt - it	0,0...999,9 % - 0,00...99,99 min - 0,00...99,99 min
Action	Heat / Cool
Control outputs	on / off
Maximum power limit heat / cool	0,0...100,0 %
Cycle time	0...200 sec
Main output type	relay, logic, continuous (0...10V Rload $\geq$ 250K $\Omega$ , 0/4...20mA Rload $\leq$ 500 $\Omega$ )
Softstart	0,0...500,0 min
Fault power setting	-100,0...100,0 %
Automatic blanking	Displays PV value, optional exclusion
Configurable alarms	Up to 3 alarm functions assignable to an output, configurable as: maximum, minimum, symmetrical, absolute/deviation, LBA
Alarm masking	- exclusion during warm up - latching reset from faceplate or external contact
Type of relay contact	NO (NC), 5A, 250V/30Vdc cos $\phi$ =1
Logic output for static relays	24V $\pm$ 10% (10V min at 20mA)
Transmitter power supply	15/24Vdc, max 30mA short-circuit protection
Power supply (switching type)	(std) 100 ... 240Vac $\pm$ 10% (opt.) 11...27Vac/dc $\pm$ 10%; 50/60Hz, 8VA max
Faceplate protection	IP65
Working / Storage temperature range	0...50°C / -20...70°C
Relative humidity	20 ... 85% non-condensing
Environmental conditions of use	for internal use only, altitude up to 2000m
Installation	Panel, plug-in from front
Weight	160g for the complete version

### 3 • DESCRIPTION OF FACEPLATE

#### Function indicators

Indicates modes of operation

- L1 MAN/AUTO = OFF (automatic control)  
ON (manual control)
- L2 PRE-HEATING = ON (running)
- L3 SELFTUNING = ON (enabled Self)  
OFF (disabled Self)

#### Automatic/Manual adjustment selection

Active only when PV display visualises the process variable (button pressed for at least 5 sec.)

#### "Inc" and "Dec" key

Press to increment (decrement) any numerical parameter • Increment (decrement) speed is proportional to time key stays pressed • The operation is not cyclic: once the maximum (minimum) value of a field is reached, the value will not change even if the key remains pressed.



#### Indication of output states

OUT 1 (AL1); OUT 2 (OPEN); OUT 3 (CLOSED)

#### PV Display: Indication of process variable

Error Indication: LO, HI, Sbr, Err  
**LO**= the value of process variable is < di LO\_S  
**HI**= the value of process variable is > di HI\_S  
**Sbr**= faulty sensor or input values higher than max. limits  
**Err**= PT100 third wire opened for PT100, PTC or input values lower than min. limits (i.e.: TC wrong connection)

#### SV display: Indication of setpoint

#### Function key

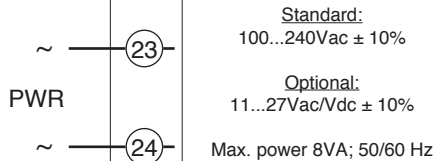
Gives access to the various configuration phases • Confirms change of set parameters and browses next or previous parameter (if Auto/Man key is pressed)

### 4 • CONNECTIONS

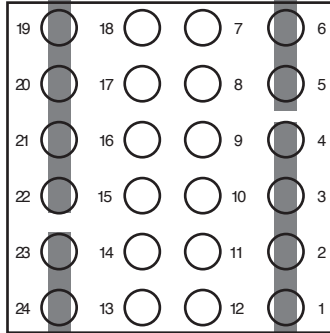
#### • Outputs



#### • Power Supply



TOP



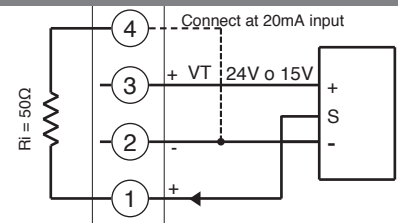
#### • Inputs

##### • TC Input

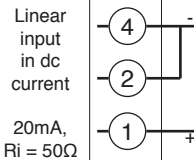
Available thermocouples:  
 J, K, R, S, T  
 (B, E, N, L, U, G, D, C custom linearization is available)  
 - Observe polarities  
 - For extensions, use the correct compensating cable for the type of TC used



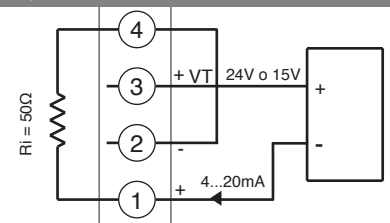
##### • Linear input with 3-wire transmitter



##### • Linear input (I)

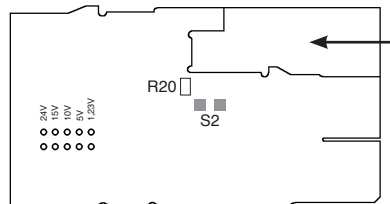


##### • Input 1 linear with transmitter 2 wires



#### • Identification of boards

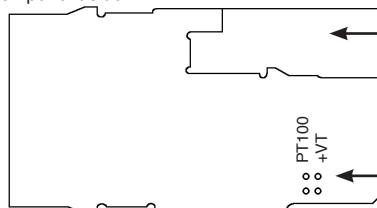
Power board - Solder side



Select transmitter voltage

**N.B. :** you can keep the **OUT1** relay energized at power-up by inserting jumper **S2** and removing resistance **R20**.

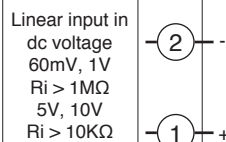
CPU board - Component side



IN/OUT boards (see appendix)

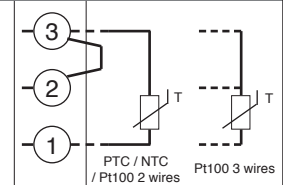
Select signal at contact 3

##### • Linear input (V)

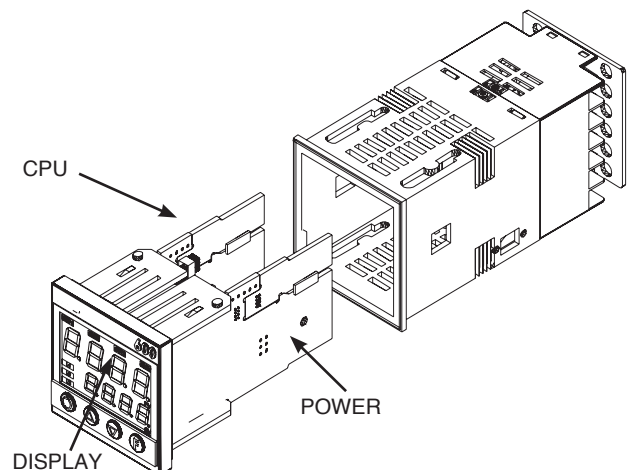


##### • Pt100 / PTC / NTC

Use wires of adequate diameter (min. 1mm²)  
 PT100, JPT100, PTC, NTC

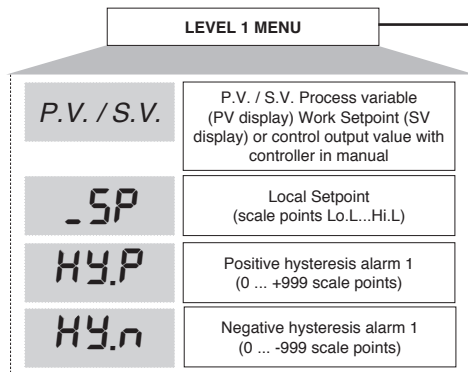


#### • Device structure



## 5 • “EASY” PROGRAMMING and CONFIGURATION

THE EASY CONFIGURATION (Pro=0...12) IS SUITABLE FOR VERSIONS WITH AL1/OPEN/CLOSED



S4 Jumper (CPU) ON

PAS

Password

PAS = 99

Pro

Protection code

• Prot

12

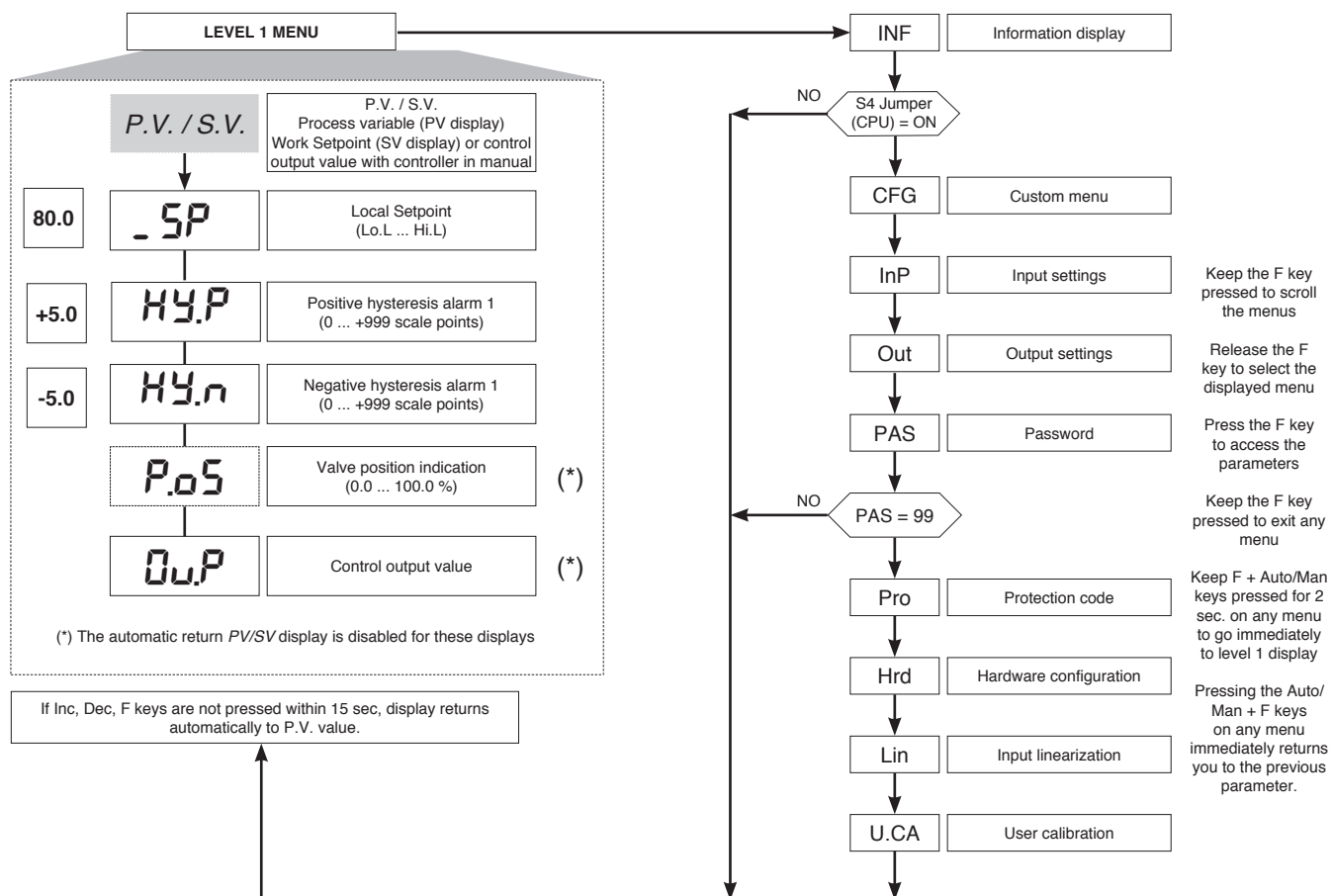
Pro

Protection code

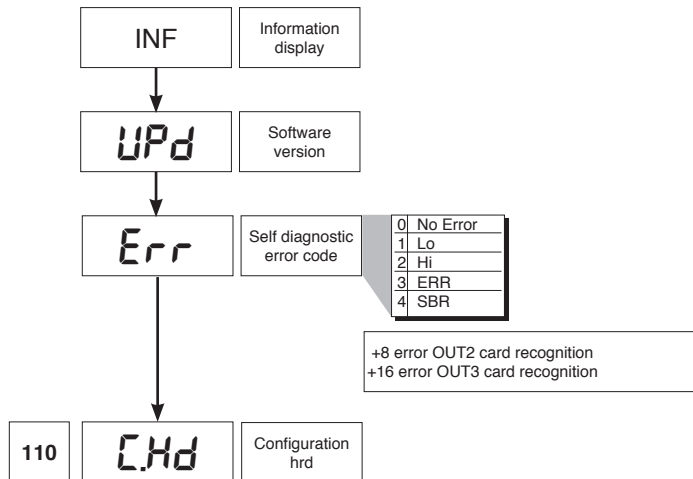
Prot	Display	Modification
0	SP, Hy.P, Hy.n	SP, Hy.P, Hy.n
1	SP, Hy.P, Hy.n	SP
2	SP	

+ 4 to disable InP, Out  
+ 8 to disable CFG

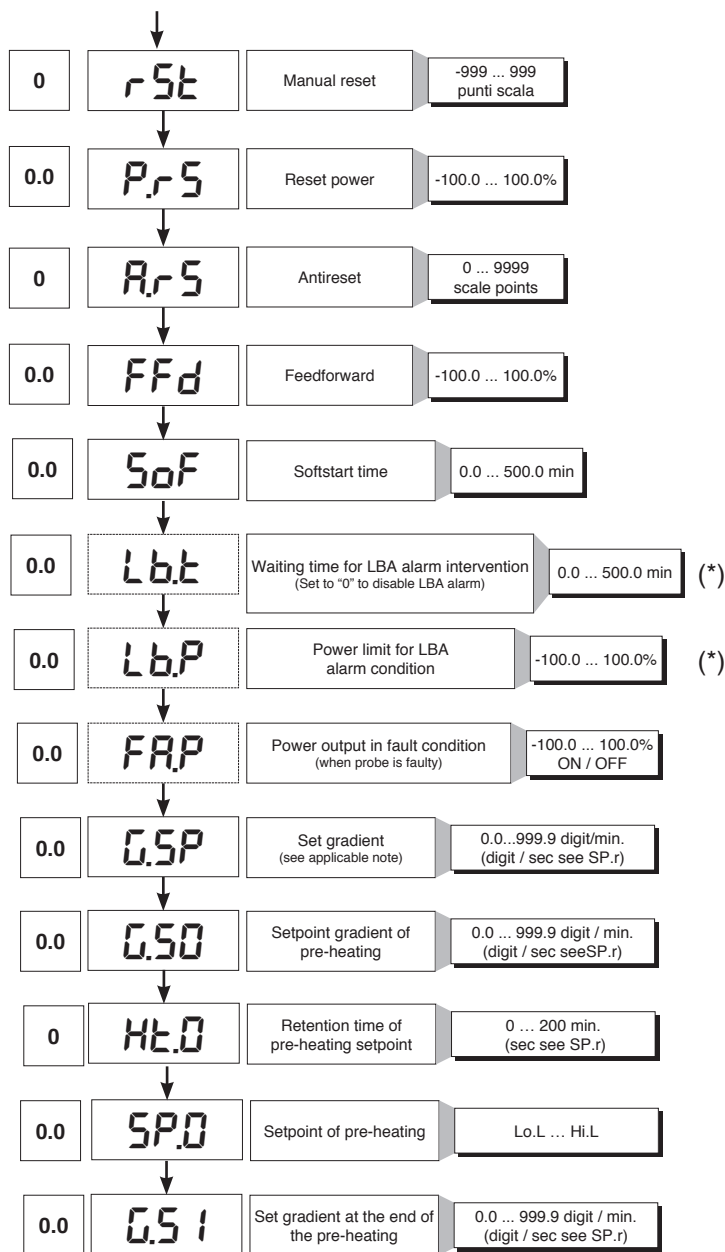
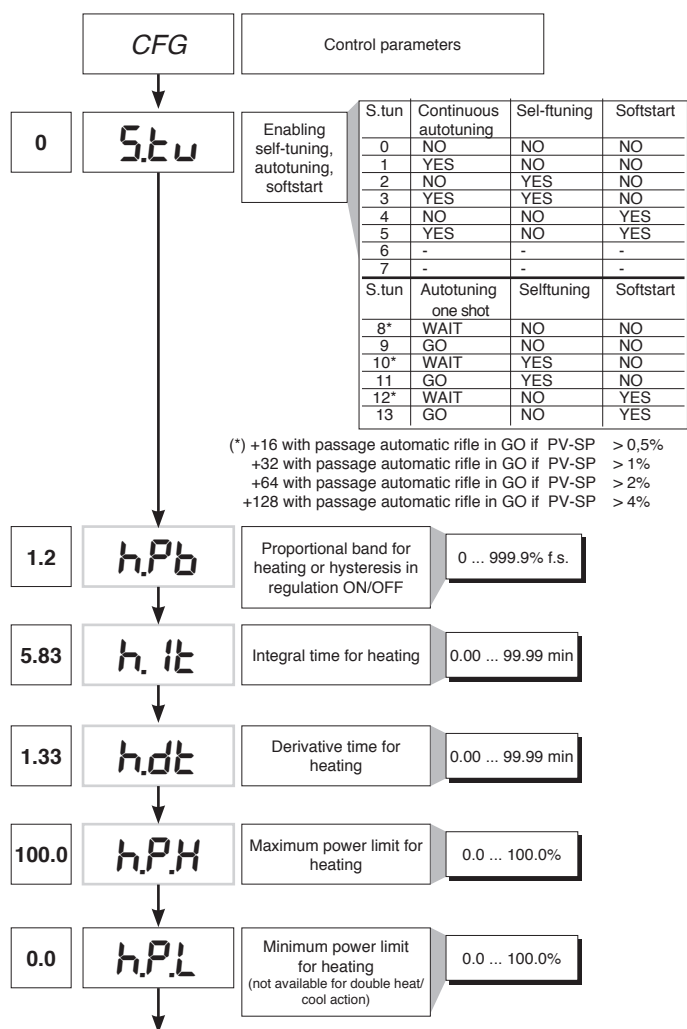
## 6 • PROGRAMMING and CONFIGURATION



**N.B.:** Once a particular configuration is entered, all unnecessary parameters are no longer displayed

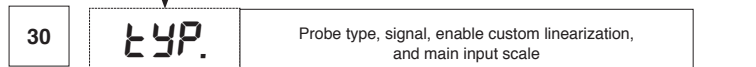
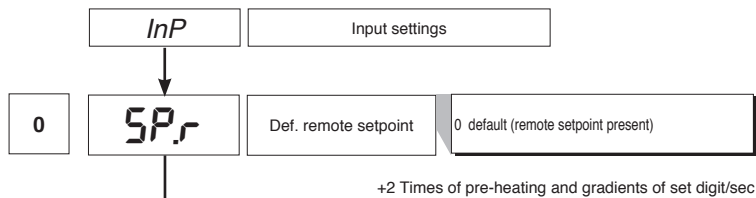


• CFG



(\*) LBA alarm may be reset by simultaneously pressing  $\Delta$  +  $\nabla$  keys when OutP is displayed or by switching to Manual.





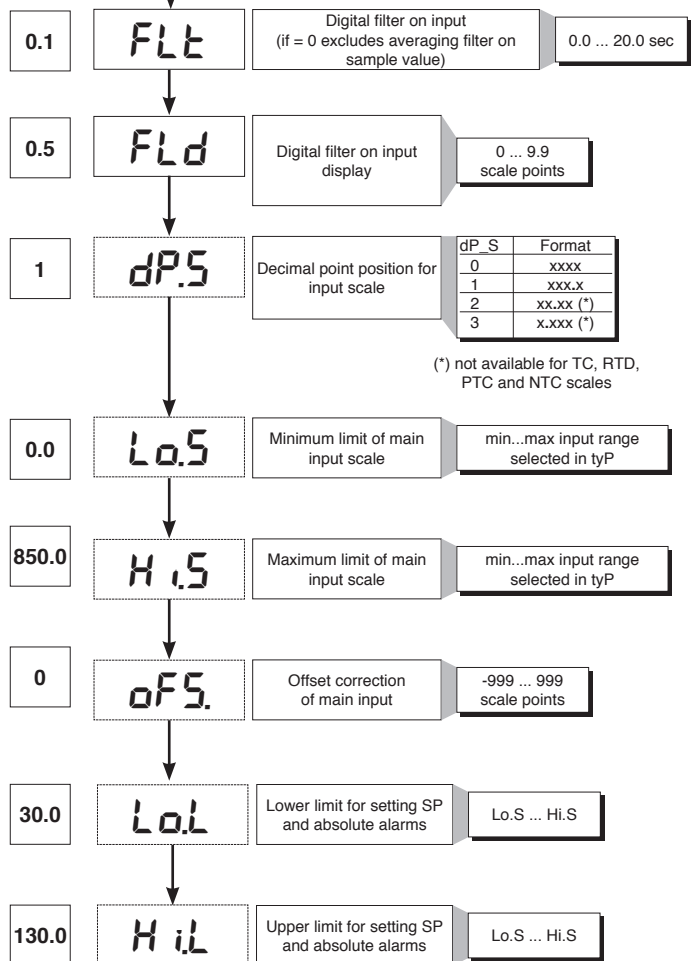
Type	Probe type	without decimal point	with decimal point
	Sensore:	TC	
0	TC J °C	0/1000	0.0/999.9
1	TC J °F	32/1832	32.0/999.9
2	TC K °C	0/1300	0.0/999.9
3	TC K °F	32/2372	32.0/999.9
4	TC R °C	0/1750	0.0/999.9
5	TC R °F	32/3182	32.0/999.9
6	TC S °C	0/1750	0.0/999.9
7	TC S °F	32/3182	32.0/999.9
8	TC T °C	-200/400	-199.9/400.0
9	TC T °F	-328/752	-199.9/752.0
28	TC	CUSTOM	CUSTOM
29	TC	CUSTOM	CUSTOM
30	PT100 °C	-200/850	-199.9/850.0
31	PT100 °F	-328/156.2	-199.9/999.9
32	JPT100 °C	-200/600	-199.9/600.0
33	JPT100 °F	-328/1112	-199.9/999.9
34	PTC °C	-55/120	-55.0/120.0
35	PTC °F	-67/248	-67.0/248.0
36	NTC °C	-10/70	-10.0/70.0
37	NTC °F	14/158	14.0/158.0
38	0...60 mV	-1999/9999	-199.9/999.9
39	0...60 mV	Custom scale	Custom scale
40	12...60 mV	-1999/9999	-199.9/999.9
41	12...60 mV	Custom scale	Custom scale
42	0...20 mA	-1999/9999	-199.9/999.9
43	0...20 mA	Custom scale	Custom scale
44	4...20 mA	-1999/9999	-199.9/999.9
45	4...20 mA	Custom scale	Custom scale
46	0...10 V	-1999/9999	-199.9/999.9
47	0...10 V	Custom scale	Custom scale
48	2...10 V	-1999/9999	-199.9/999.9
49	2...10 V	Custom scale	Custom scale
50	0...5 V	-1999/9999	-199.9/999.9
51	0...5 V	Custom scale	Custom scale
52	1...5 V	-1999/9999	-199.9/999.9
53	1...5 V	Custom scale	Custom scale
54	0...1 V	-1999/9999	-199.9/999.9
55	0...1 V	Custom scale	Custom scale
56	200mV...1V	-1999/9999	-199.9/999.9
57	200mV...1V	Custom scale	Custom scale
58	Cust10 V-20mA	-1999/9999	-199.9/999.9
59	Cust10 V-20mA	Custom scale	Custom scale
60	Cust 60mV	-1999/9999	-199.9/999.9
61	Cust 60mV	Custom scale	Custom scale
62	PT100-JPT	CUSTOM	CUSTOM
63	PTC	CUSTOM	CUSTOM
64	NTC	CUSTOM	CUSTOM

For custom linearization:  
 - LO signal is generated with variable below Lo.S or at minimum calibration value  
 - HI signal is generated with variable above Lo.S or at maximum calibration value

Max. non-linearity error for thermocouples (TC), resistors (PT100) and thermistors (PTC, NTC).  
 The error is calculated as deviation from theoretical value and is expressed as percentage of full scale (in °C).

**S, R** range 0...1750°C; error < 0.2% f.s. (t > 300°C) / for other range; error < 0.5% f.s.  
**T** error < 0.2% f.s. (t > -150°C)  
**B** range 44...1800°C; error < 0.5% f.s. (t > 300°C) / range 44,0...999,9; error < 1% f.s. (t > 300°C)  
**U** range -99,9...99,9 and -99...99°C; error < 0.5% f.s. / for other range; error < 0.2% f.s. (t > -150°C)  
**G** error < 0.2% f.s. (t > 300°C)  
**D** error < 0.2% f.s. (t > 200°C)  
**C** range 0...2300; error < 0.2% f.s. / for other range; error < 0.5% f.s.

**NTC error < 0.5% f.s.**  
 Tc: J, K, E, N, L error < 0,2% f.s.  
 JPT100 and PTC error < 0,2% f.s.  
 PT100 scale -200...850°C  
 Precision better than 0,2% f.s. at 25°C  
 In range 0...50°C:  
 • Precision better than 0,2% f.s. in range -200...400°C  
 • Precision better than 0,4% f.s. in range +400...850°C (where f.s. refers to range -200... +850°C)





12

Pro

Protection code

Prot	Display	Modification
0	SP, Hy.P, Hy.n, AL.2, AL.3, PoS, OuP, INF	SP, Hy.P, Hy.n, AL.2, AL.3, PoS
1	SP, Hy.P, Hy.n, AL.2, AL.3, PoS, OuP, INF	SP
2	SP, OuP, INF	

+ 4 to disable InP, Out  
+ 8 to disable CFG  
+ 16 to disable SW "power-up - power down"  
+ 32 disable manual power latching  
+ 64 to disable manual power modification  
+128 enables full configuration

Note: OuP and INF only display configuration extended

Hrd

Hardware configuration

0

hd.1

Enable multiset instrument control by serial

6

Ctrl

Control type

Val	Control type
0	P heat
1	
2	
3	PI heat
4	
5	
6	PID heat
7	
8	
9	ON-OFF heat
10	
11	
12	
13	
14	

Selection of derivative action sampling time:  
+ 0 sample 1 sec.  
+ 16 sample 4 sec.  
+ 32 sample 8 sec.  
+ 64 sample 240 msec.

Note: LbA alarm is not enabled with ON/OFF type control

1

AL.n

Select number of enabled alarms

AL.nr	Alarm1	Alarm 2	Alarm 3
1	enabled	disabled	disabled

1

but.

Function of M/A keys

b u t t	
0	No function (key disenabled))
1	MAN / AUTO controller
2	
3	HOLD
4	
5	
6	Start/Stop selftuning
7	Start/Stop autotuning
8	

+ 16 disables the "back menu" function (Auto/Man + F keys) in the configuration menus

0

dSP

Defining SV display function

diSP	Lower display (SV) function
0	SSP - setpoint enabled
1	PoS - valve position
2	Control output value
3	Deviation (SSP - PV)

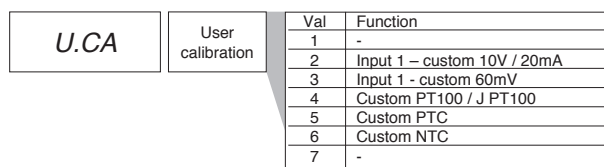


## • Lin



the n step value corresponds to input:  
 $mV \text{ beginning scale} + n \cdot \Delta mV$   
 $\Delta mV = (mV \text{ full scale} - mV \text{ beginning scale}) / 32$

## • U.CAL



## 7 • CONSENT FOR BURNER AL1



Obtain burner consent by configuring alarm 1 as inverse deviation with positive hysteresis Hy.P and negative hysteresis Hy.n

## 8 • PRE-HEATING FUNCTION

Enable the pre-heating function by setting parameters GS.0, Ht.0, GS.1 other than zero.

It consists of three phases that are activated sequentially at firing:

### - Ramp 0 phase

Enabled by setting  $GS.0 > 0$ . Starting from setpoint = PV (initial state), it reaches pre-heating set SP.0 with gradient GS.0

### - Maintenance phase

Enabled by setting  $Ht.0 > 0$ . Maintains pre-heating setpoint SP.0 for time Ht.0

### - Ramp 1 phase

Enabled by setting  $GS.1 > 0$ . Starting from pre-heating setpoint SP.0, it reaches active \_SP set with gradient GS.1

In case of selftuning, the pre-heating function is not activated



## 9 • ADJUSTMENT WITH MOTORIZED VALVE

In an adjustment process the adjustment valve has the function of varying fuel delivery (frequently corresponding to the thermal energy introduced into the process) in relation to the signal coming from the controller.

For this purpose it is provided with an actuator able to modify its opening value, overcoming the resistances produced by the fluid passing inside it.

The adjustment valves vary the delivery in a modulated manner, producing finite variations in the fluid passage inner area corresponding to finite variations of the actuator input signal, coming from the controller. The servomechanism, for example, comprises an electric motor, a reducer and a mechanical transmission system which actions the valve.

Various auxiliary components can be present such as the mechanical and electrical safety end travels, manual actioning systems.



The controller determines, on the basis of the dynamics of the process, the control output for the valve corresponding to the opening of the same in such a way so as to maintain the desired value of the process variable.

### Characteristic parameters for valves control

- Actuator time ( $A_c.t$ ) is the time employed by the valve to pass from entirely open to entirely closed (or vice-versa), and can be set with a resolution of one second. It is a mechanical feature of the valve+actuator unit.

**NOTE:** if the actuator's travel is mechanically limited it is necessary to proportionally reduce the  $A_c.t$  value.

- Minimum impulse ( $t.Lo$ ) expressed as a % of the actuator time (resolution 0.1%).

Represents the minimum change in position corresponding to a minimum change in power supplied by the instrument below which the actuator will not physically respond to the command.

This represents the minimum variation in position due to which the actuator does not physically respond to the command.

The minimum duration of the movement can be set in  $t.Lo$ , expressed as a % of actuator time.

- Impulsive intervention threshold ( $t.Hi$ ) expressed as a % of the actuator time (resolution 0.1%) represents the position displacement (requested position – real position) due to which the manoeuvre request becomes impulsive.

You can choose between 2 types of control:

1) ON time of movement =  $t.on$  and OFF time proportional to shift and greater than or equal to  $t.Lo$  (we recommend setting  $t.on = t.Lo$ ) (set  $t.oF = 0$ ).

2) ON time of movement =  $t.on$  and OFF time =  $t.oF$ . A value set for  $t.oF < t.on$  is forced to  $t.on$ . To activate this type, set  $t.oF > 0$ .

The type of movement approach allows fine control of the reverse drive valve (from potentiometer or not), especially useful in cases of high mechanical inertia.

Set  $t.Hi = 0$  to exclude modulation in positioning.

This type of modulated approach allows precise control of the feedback actioned valve, by a potentiometer or not, and is especially useful in cases of high mechanical inertia. Setting  $t.Hi = 0$  excludes modulation in positioning.

- Dead zone ( $dE.b$ ) is a displacement band between the adjustment setpoint and the process variable within which the controller does not supply any command to the valve (Open = OFF; Close = OFF). It is expressed as a percentage of the bottom scale and is positioned below the setpoint.

The dead zone is useful in an operative process to avoid straining the actuator with repeated commands and an insignificant effect on the adjustment. Setting  $dE.b = 0$  the dead zone is excluded.



Graph of behavior inside the band with integral time  $\neq 0$ .

With integral time = 0, movement ON time is always equal to OFF time.

$t_0 = t.Lo$

## Valve control modes

With the controller in manual, the setting of parameter At.y  $\geq 8$  allows direct control of the valve open and close commands through the keyboard Increments and Decrements on the front seats.

**V0** - for floating valve without potentiometer

Model V0 have similar behaviour: every manoeuvre request greater than the minimum impulse t.Lo is sent to the actuator by means of the OPEN/CLOSE relays; every action updates the presumed position of the virtual potentiometer calculated on the basis of the actuator travel declared time. In this way there is always a presumed position of the valve which is compared with the position request of the controller. Having reached a presumed extreme position (entirely open or entirely closed determined by the "virtual potentiometer") the controller provides a command in the same direction, in this way ensuring the real extreme position is reached (minimum command time = t.on). The actuators are usually protected against the OPEN command in the entirely open position or CLOSE command in the entirely closed position.

**V3** - for floating valve, PI control

When the difference between the position calculated by the controller and the only proportional component exceeds the value corresponding to the minimum impulse t.Lo the controller provides an OPEN or CLOSE command of the duration of the minimum impulse itself t.Lo. At each delivery the integral component of the command is set to zero (discharge of the integral). The frequency and duration of the impulses is correlated to the integral time (h.it or c.it).

*Non-movement behavior*

t.Hi = 0: with power = 100% or 0.0%, the corresponding open or close outputs always remain enabled (safety status).

*Movement behavior*

t.Hi  $\neq 0$ : with position attained corresponding to 100% or 0.0%, the corresponding open or close outputs are switched off.



If t.oF = 0, current function is maintained.

If t.oF  $\neq 0$  movement mode will be as shown on the graph

## 10 • CONTROL ACTIONS

*Proportional Action:*

action in which contribution to output is proportional to deviation at input (deviation = difference between controlled variable and setpoint).

*Derivative Action:*

action in which contribution to output is proportional to rate of variation input deviation.

*Integral Action:*

action in which contribution to output is proportional to integral of time of input deviation.

### Influence of Proportional, Derivative and Integral actions on response of process under control

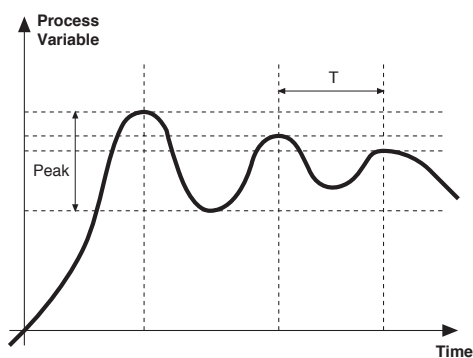
- \* An increase in P.B. reduces oscillations but increases deviation.
  - \* A reduction in P.B. reduces the deviation but provokes oscillations of the controlled variable (the system tends to be unstable if P.B. value is too low).
  - \* An increase in Derivative Action corresponds to an increase in Derivative Time, reduces deviation and prevents oscillation up to a critical value of Derivative Time, beyond which deviation increases and prolonged oscillations occur.
  - \* An increase in Integral Action corresponds to a reduction in Integral Time, and tends to eliminate deviation between the controlled variable and the setpoint when the system is running at rated speed.
- If the Integral Time value is too long (Weak integral action), deviation between the controlled variable and the setpoint may persist.

Contact GEFRA for more information on control actions.



## 11 • MANUAL TUNING

- A) Enter the setpoint at its working value.  
 B) Set the proportional band at 0.1% (with on-off type setting).  
 C) Switch to automatic and observe the behavior of the variable. It will be similar to that in the figure:



D) The PID parameters are calculated as follows: Proportional band

$$P.B. = \frac{\text{Peak}}{(V_{\max} - V_{\min})} \times 100$$

(V max - V min) is the scale range.

Integral time:  $I_t = 1.5 \times T$

Derivative time:  $d_t = I_t/4$

E) Switch the unit to manual, set the calculated parameters. Return to PID action by setting the appropriate relay output cycle time, and switch back to Automatic.

F) If possible, to optimize parameters, change the setpoint and check temporary response. If an oscillation persists, increase the proportional band. If the response is too slow, reduce it.

## 12 • SET GRADIENT

SET GRADIENT: if set to  $\neq 0$ , the setpoint is assumed equal to PV at power-on and auto/man switchover. With gradient set, it reaches the local setpoint. Every variation in setpoint is subject to a gradient.

The set gradient is inhibited at power-on when self-tuning is engaged.

If the set gradient is set to  $\neq 0$ , it is active even with variations of the local setpoint.

The control setpoint reaches the set value at the speed defined by the gradient.

## 13 • SOFTWARE ON / OFF SWITCHING FUNCTION

**How to switch the unit OFF:** hold down the "F" and "Raise" keys simultaneously for 5 seconds to deactivate the unit, which will go to the OFF state while keeping the line supply connected and keeping the process value displayed. The SV display is OFF.

All outputs (alarms and controls) are OFF (logic level 0, relays de-energized) and all unit functions are disabled except the switch-on function and digital communication.

**How to switch the unit ON:** hold down the "F" key for 5 seconds and the unit will switch OFF to ON. If there is a power failure during the OFF state, the unit will remain in OFF state at the next power-up (ON/OFF state is memorized).

The function is normally enabled, but can be disabled by setting the parameter Prot = Prot +16.

## 14 • SELF-TUNING

The function works for single output systems (heating or cooling). The self-tuning action calculates optimum control parameter values during process startup. The variable (for example, temperature) must be that assumed at zero power (room temperature).

The controller supplies maximum power until an intermediate value between starting value and setpoint is reached, after which it zeros power.

PID parameters are calculated by measuring overshoot and the time needed to reach peak. When calculations are finished, the system disables automatically and the control proceeds until the setpoint is reached.

**How to activate self-tuning:**

### A. Activation at power-on

1. Set the setpoint to the required value
2. Enable selftuning by setting the Stun parameter to 2 (CFG menu)
3. Turn off the instrument
4. Make sure the temperature is near room temperature
5. Turn on the instrument again

### B. Activation from keyboard

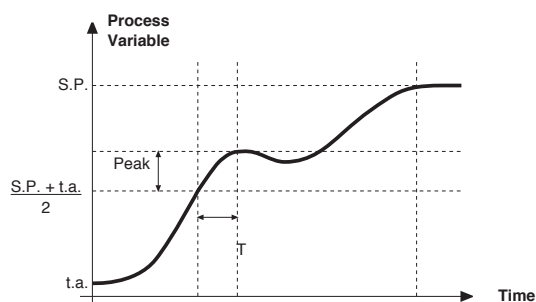
1. Make sure that key M/A is enabled for Start/Stop selftuning (code but = 6 Hrd menu)
2. Bring the temperature near room temperature
3. Set the setpoint to the required value
4. Press key M/A to activate selftuning (Attention: selftuning interrupts if the key is pressed again)

The procedure runs automatically until finished, when the new PID parameters are stored: proportional band, integral and derivative times calculated for the active action (heating or cooling). In case of double action (heating or cooling), parameters for the opposite action are calculated by maintaining the initial ratio between parameters (ex.:  $CPb = HPb \times K$ ; where  $K = CPb / HPb$  when self-tuning starts). When finished, the Stun code is automatically cancelled.

### Notes :

-The procedure does not start if the temperature is higher than the setpoint (heating control mode) or if the temperature is lower than the setpoint (cooling control mode). In this case, the Stun code is not cancelled.

-It is advisable to enable one of the configurable LEDs to signal selftuning status. By setting one of parameters LED1, LED2, LED3=4 or 20 on the Hrd menu, the respective LED will be on or flashing when selftuning is active.



## 15 • ACCESSORIES

### • Interface for instrument configuration

KIT PC USB / RS485 o TTL



Kit for PC via the USB port (Windows environment) for GEFTRAN instruments configuration:

Lets you read or write all of the parameters

- A single software for all models
- Easy and rapid configuration
- Saving and management of parameter recipes
- On-line trend and saving of historical data

Component Kit:

- Connection cable PC USB ... port TTL
- Connection cable PC USB ... RS485 port
- Serial line converter
- CD SW GF Express installation

### • ORDERING CODE

GF\_eXK-2-0-0

cod F049095

## 16 • ORDER CODE



### • WARNINGS

**WARNING:** this symbol indicates danger. It is placed near the power supply circuit and near high-voltage relay contacts.

**Read the following warnings before installing, connecting or using the device:**

- follow instructions precisely when connecting the device.
- always use cables that are suitable for the voltage and current levels indicated in the technical specifications.
- the device has no ON/OFF switch: it switches on immediately when power is turned on. For safety reasons, devices permanently connected to the power supply require a two-phase disconnecting switch with proper marking. Such switch must be located near the device and must be easily reachable by the user. A single switch can control several units.
- if the device is connected to electrically NON-ISOLATED equipment (e.g. thermocouples), a grounding wire must be applied to assure that this connection is not made directly through the machine structure.
- if the device is used in applications where there is risk of injury to persons and/or damage to machines or materials, it **MUST** be used with auxiliary alarm units. You should be able to check the correct operation of such units during normal operation of the device.
- before using the device, the user must check that all device parameters are correctly set in order to avoid injury to persons and/or damage to property.
- the device must **NOT** be used in inflammable or explosive environments. It may be connected to units operating in such environments only by means of suitable interfaces in conformity to local safety regulations.
- the device contains components that are sensitive to static electrical discharges. Therefore, take appropriate precautions when handling electronic circuit boards in order to prevent permanent damage to these components.

**Installation:** installation category II, pollution level 2, double isolation

The equipment is intended for permanent indoor installations within their own enclosure or panel mounted enclosing the rear housing and exposed terminals on the back.

- only for low power supply: supply from Class 2 or low voltage limited energy source
- power supply lines must be separated from device input and output lines; always check that the supply voltage matches the voltage indicated on the device label.
- install the instrumentation separately from the relays and power switching devices
- do not install high-power remote switches, contactors, relays, thyristor power units (particularly if "phase angle" type), motors, etc... in the same cabinet.
- avoid dust, humidity, corrosive gases and heat sources.
- do not close the ventilation holes; working temperature must be in the range of 0...50°C.

- surrounding air: 50°C
- use 60/75°C copper (Cu) conductor only, wire size range 2x No 22 - 14AWG, Solid/Stranded
- use terminal tightening torque 0.5N m

If the device has faston terminals, they must be protected and isolated; if the device has screw terminals, wires should be attached at least in pairs.

• **Power:** supplied from a disconnecting switch with fuse for the device section; path of wires from switch to devices should be as straight as possible; the same supply should not be used to power relays, contactors, solenoid valves, etc.; if the voltage waveform is strongly distorted by thyristor switching units or by electric motors, it is recommended that an isolation transformer be used only for the devices, connecting the screen to ground; it is important for the electrical system to have a good ground connection; voltage between neutral and ground must not exceed 1V and resistance must be less than 60Ωm; if the supply voltage is highly variable, use a voltage stabilizer for the device; use line filters in the vicinity of high frequency generators or arc welders; power supply lines must be separated from device input and output lines; always check that the supply voltage matches the voltage indicated on the device label.

• **Input and output connections:** external connected circuits must have double insulation; to connect analog inputs (TC, RTD) you have to: physically separate input wiring from power supply wiring, from output wiring, and from power connections; use twisted and screened cables, with screen connected to ground at only one point; to connect adjustment and alarm outputs (contactors, solenoid valves, motors, fans, etc.), install RC groups (resistor and capacitor in series) in parallel with inductive loads that work in AC (*Note: all capacitors must conform to VDE standards (class x2) and support at least 220 VAC. Resistors must be at least 2W*); fit a 1N4007 diode in parallel with the coil of inductive loads that operate in DC.

**GEFRAN spa will not be held liable for any injury to persons and/or damage to property deriving from tampering, from any incorrect or erroneous use, or from any use not conforming to the device specifications.**

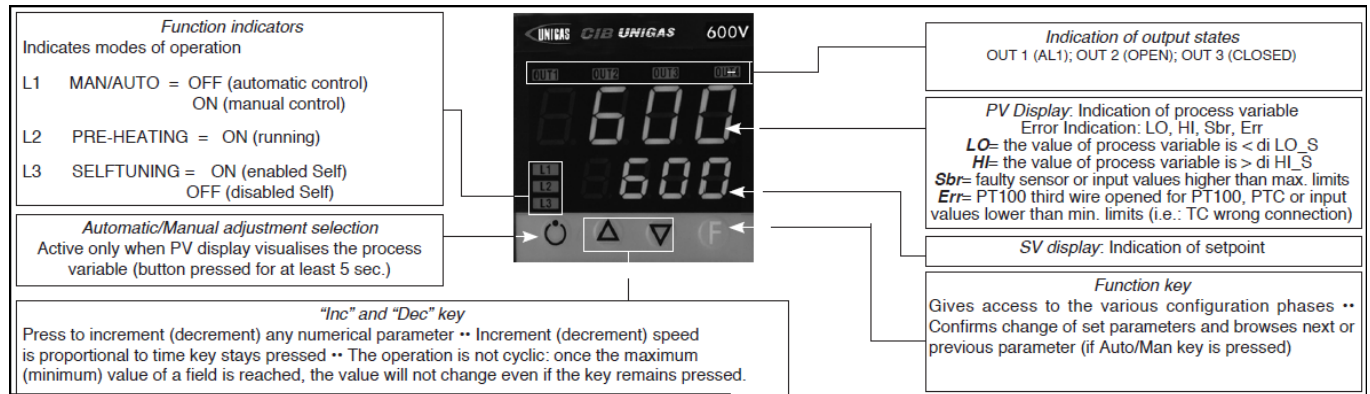


## Set-up for 600V RRR0-1-T73 regulator

### Set up for temperature probe Pt100 (ex Siemens QAE2120 130°C max.)

The regulator comes out of the factory preset with the corresponding values of the Siemens RWF40.000 and RWF50.2x

Verify wiring of the sensor



Regulation of the set-point = 80

It can be modified by using arrows "up" and "down".

By pushing **F** you go to parameters:

Hy.P	5 (hysteresis positive for output 1, terminals 21-22 (ex Q13-Q14))
Hy.n	-5 hysteresis negative for output ,1 terminals 21-22 (ex Q13-Q14)

Keep pushing **F** until you see **PASS**, release **F** and through the arrows set **99**, push **F** and visualize **Pro** (protection code) default is **12**, through the arrows set **128** and push **F**, keep it pushed until all parameters **InF**, **CFG**, **InP**, **Out**, **PASS** are visualized.

CFG	
S.tun	0
hPb	1,2
hIt	5,83
hdt	1,33
...	

InP	
....	
tyP	30 (Pt100)
...	
dP_S	1 (decimals num.)
Lo.S	0 (min. sensor scale)
Hi.S	850,0 (max sensor scale)
oFS	0 (offset of input correction)
Lo.L	30,0 (lower set-point range limit)
Hi.L	130,0 (upper set-point range limit)

Out	
A1.r	0
...	
A1.t	3 (operating mode AL1 =inverse-relative-normal)
...	
rL.1	2 (AL1)
rL.2	18 (open)
rL.3	19 (close)
rEL	0
A.ty	9 (type of servocontrol command)
Ac.t	12 (servocontrol running time: SQN72.4.../STA12..=12; SQM40.265=30)
t Lo	2
t Hi	0.0
t.on	2
t.oF	0.0
dE.b	0,1 (dead zone in % of end scale)

PAS	99 then push and keep pushed <b>F</b> until visualization of <b>Hrd</b>
Hrd	
...	
Ctrl	6 (PID warm)
AL.nr	1
but	1
diSP	0
Ld.1	1
Ld.2	28
Ld.3	20

Keep pushed **F** until you visualize **PASS**, release **F** and through the arrows set **99**, push **F** and visualize **Pro** (protection code) from **128**, through the arrows, bring it back to **12**, and keep **F** pushed until you come back to set-point value.

#### Manual operation :

Keep pushed the lower left key for at least 5 sec.

The instrument will enter the "MAN" mode (see also "Ld1" switching on).

Through the arrows, "Open" and "Close" outputs are activated.

To come back to normal working keep the lower left key pushed for at least 5 sec.

#### Software switch off :

By keeping pushed keys **Arrow up** + **F** for more than 5 sec. the instrument switches off the software, does not command the outputs and visualize only the variable of process measured by the probe.

To restore keep pushed **F** for more than 5 sec.

## Set up for temperature probe Pt100 for high temperature (350°C max.)

Verify wiring of the sensor



Regulation of the set-point = **80**

It can be modified by using arrows "up" and "down".

By pushing **F** you go to parameters:

Hy.P	10 (hysteresis positive for output 1 terminals 21-22 (ex Q13-Q14))
Hy.n	-5 (hysteresis negative for output 1 terminals 21-22 (ex Q13-Q14))

Keep pushing **F** until you see **PASS**, release **F** and through the arrows set **99**, push **F** and visualize **Pro** (protection code) default is **12**, through the arrows set **128** and push **F**, keep it pushed until all parameters **InF**, **CFG**, **InP**, **Out**, **PASS** are visualized.

CFG	
S.tun	0
hPb	1,2
hlt	5,83
hdt	1,33
...	

InP	
....	
tyP	30 (Pt100)
...	
dP_S	1 (decimals num.)
Lo.S	0 (min. sensor scale)
Hi.S	850,0 (max sensor scale)
oFS	0 (offset of input correction)
Lo.L	0,0 (lower set-point range limit)
Hi.L	350,0 (upper set-point range limit)

Out	
A1.r	0
...	
A1.t	3 (mode AL1 =inverse-relative-normal)
...	
rL.1	2 (AL1)
rL.2	18 (open)
rL.3	19 (close)
rEL	0
A.ty	9 (type of servocontrol command)
Ac.t	12 (servocontrol running time: SQN72.4.../STA12..=12; SQM40.265=30)
t Lo	2
t Hi	0.0
t.on	2
t.oF	0.0
dE.b	0,1 (dead zone in % of end scale)

PAS	99 then push and keep pushed F until visualization of Hrd
Hrd	
...	
Ctrl	6 (PID warm)
AL.nr	1
but	1
diSP	0
Ld.1	1
Ld.2	28
Ld.3	20

Keep pushed **F** until you visualize **PASS**, release **F** and through the arrows set **99**, push **F** and visualize **Pro** (protection code) from **128**, through the arrows, bring it back to **12**, and keep **F** pushed until you come back to set-point value.

#### Manual operation:

Keep pushed the lower left key for at least 5 sec.

The instrument will enter the "MAN" mode (see also "Ld1" switching on).

Through the arrows, "Open" and "Close" outputs are activated.

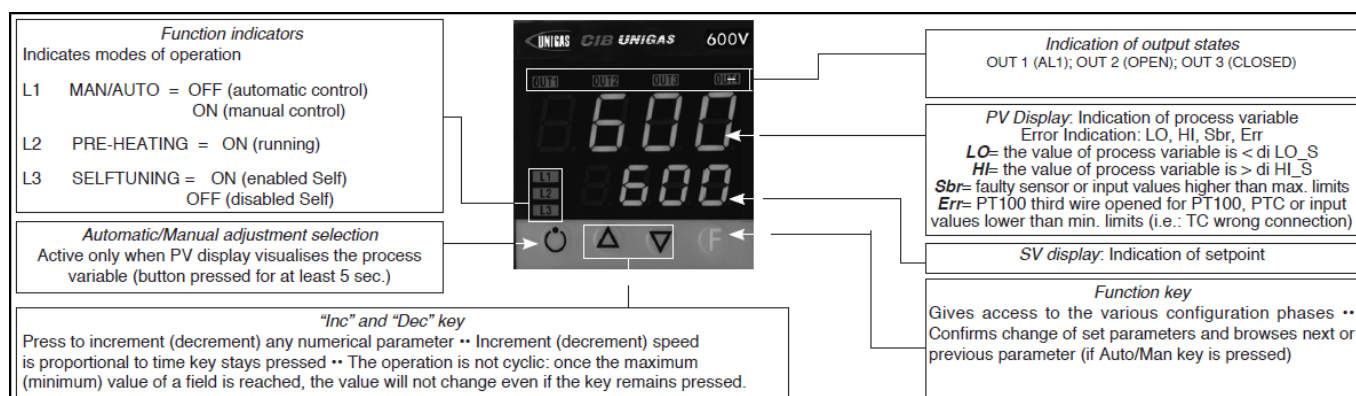
To come back to normal working keep the lower left key pushed for at least 5 sec.

#### Software switch off :

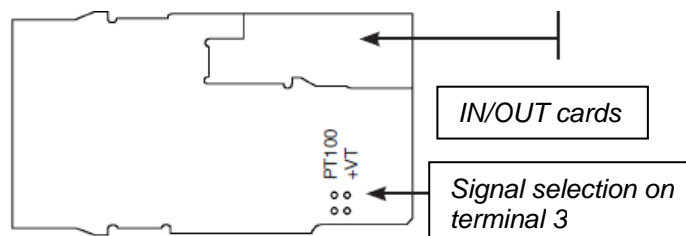
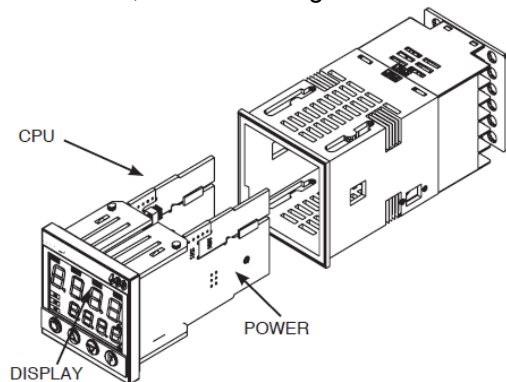
By keeping pushed keys **Arrow up** + **F** for more than 5 sec. the instrument switches off the software, does not command the outputs and visualize only the variable of process measured by the probe.

To restore keep pushed **F** for more than 5 sec.

## Set up for pressure transmitter 2 wires signal 4÷20mA



With pressure transmitters first we need to enable their power supply: remove the part as shown below, then, on the CPU unit, move the bridge from Pt100 to +Vt



Verify wiring of the sensor

Impostazione set-point

Transmitter	1,6bar	3bar	10bar	16bar	25bar	40bar
Set-point	1bar	1,5bar	6bar	6bar	6bar	6bar

To modify it directly use "up" and "down" arrows.

By pushing **F** you go to parameter:

Transmitter	1,6bar	3bar	10bar	16bar	25bar	40bar
Hy.P	0,2bar	0,5bar	0,5bar	0,8bar	1,25bar	2bar
Hy.n	0bar	0bar	0bar	0bar	0bar	0bar

Keep pushing **F** until you see **PASS**, release **F** and through the arrows set **99**, push **F** and visualize **Pro** (protection code) default is **12**, through the arrows set **128** and push **F**, keep it pushed until all parameters **InF**, **CFG**, **InP**, **Out**, **PASS** are visualized.

CFG	
S.tun	0
hPb	5
hIt	1,33
hdt	0,33
...	



InP	
....	
tyP	44 (4÷20mA)
...	
dP_S	2 (decimals num.)

Transmitter	1,6bar	3bar	10bar	16bar	25bar	40bar	
Lo.S	0,00	0,00	0,00	0,00	0,00	0,00	min. sensor scale
Hi.S	1,60	3,00	10,00	16,00	25,00	40,00	max sensor scale
oFS	0	0	0	0	0	0	offset of input correction
Lo.L	0,00	0,00	0,00	0,00	0,00	0,00	lower set-point setting
Hi.L	1,60	3,00	10,00	16,00	25,00	40,00	upper set-point setting

Out	
A1.r	0
...	
A1.t	3 (mode AL1 =inverse-relative-normal)
...	
rL.1	2 (AL1)
rL.2	18 (open)
rL.3	19 (close)
rEL	0
A.ty	9 (type of servocontrol command)
Ac.t	12 (servocontrol running time: SQN72.4.../STA12..=12; SQM40.265=30)
t Lo	2
t Hi	0.0
t.on	2
t.oF	0.0
dE.b	0,1 (dead zone in % of end scale)

<b>PAS</b>	99 then push and keep pushed <b>F</b> until visualization of <b>Hrd</b>
Hrd	
...	
Ctrl	6 (PID warm)
AL.nr	1
but	1
diSP	0
Ld.1	1
Ld.2	28
Ld.3	20

Keep pushed **F** until you visualize **PASS**, release **F** and through the arrows set **99**, push **F** and visualize **Pro** (protection code) from **128**, through the arrows, bring it back to **12**, and keep **F** pushed until you come back to set-point value.

#### Manual operation:

Keep pushed the lower left key for at least 5 sec.

The instrument will enter the "MAN" mode (see also "Ld1" switching on).

Through the arrows, "Open" and "Close" outputs are activated.

To come back to normal working keep the lower left key pushed for at least 5 sec.

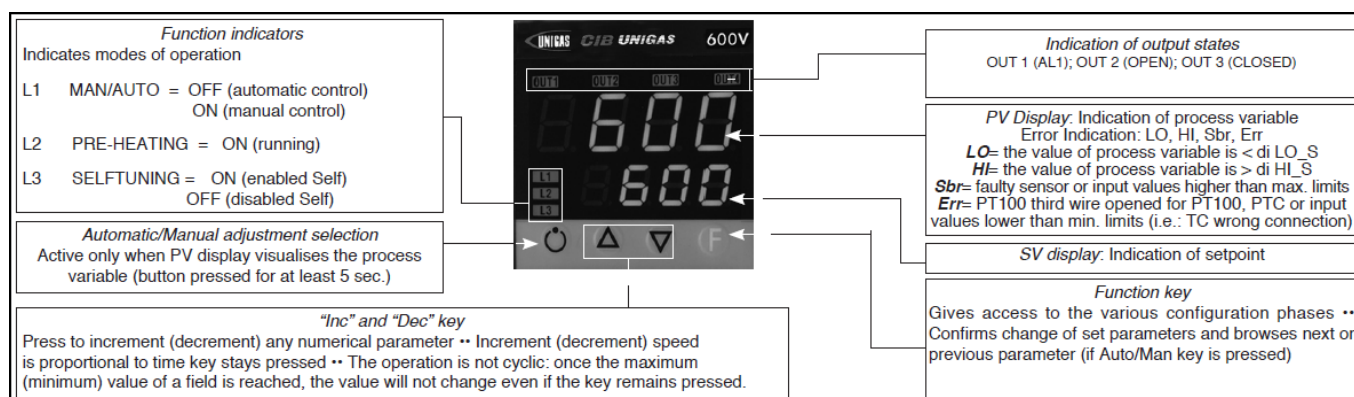
#### Software switch off :

By keeping pushed keys **Arrow up** + **F** for more than 5 sec. the instrument switches off the software, does not command the outputs and visualize only the variable of process measured by the probe.

To restore keep pushed **F** for more than 5 sec.

## Set-up for thermocouples type **K** or **J**

Verify wiring of the sensor



Regulation of the set-point = **80**

It can be modified by using arrows "up" and "down".

By pushing **F** you go to parameters:

Hy.P	10 (hysteresis positive for output 1 terminals 21-22 (ex Q13-Q14))
Hy.n	-5 (hysteresis negative for output 1 terminals 21-22 (ex Q13-Q14))

Keep pushing **F** until you see **PASS**, release **F** and through the arrows set **99**, push **F** and visualize **Pro** (protection code) default is **12**, through the arrows set **128** and push **F**, keep it pushed until all parameters **InF**, **CFG**, **InP**, **Out**, **PASS** are visualized.

CFG	
S.tun	0
hPb	1,2
hIt	5,83
hdt	1,33
...	

InP	
...	
tyP	2 (thermocouple <b>K</b> 0÷1300°C) / 0 (thermocouple <b>J</b> 0÷1000°C)
...	
dP_S	0 (no decimal) / 1 (1 decimal)
Lo.S	0 (min. sensor scale)
Hi.S	1300 (max sensor scale for tc <b>K</b> ) / 1000 (max sensor scale for tc <b>J</b> )
oFS	0 (offset of input correction)
Lo.L	0 (lower set-point range limit)
Hi.L	1300 (upper set-point range limit) per tc <b>K</b> / 1000 for tc <b>J</b>

Out	
A1.r	0
...	
A1.t	3 (mode AL1 =inverse-relative-normal)
...	
rL.1	2 (AL1)
rL.2	18 (open)
rL.3	19 (close)
rEL	0
A.ty	9 (type of servocontrol command)
Ac.t	12 (servocontrol running time: SQN72.4.../STA12..=12; SQM40.265=30)
t Lo	2
t Hi	0.0
t.on	2
t.oF	0.0
dE.b	0,1 (dead zone in % of end scale)

<b>PAS</b>	99 then push and keep pushed <b>F</b> until visualization of <b>Hrd</b>
Hrd	
...	
Ctrl	6 (PID warm)
AL.nr	1
but	1
diSP	0
Ld.1	1
Ld.2	28
Ld.3	20

Keep pushed **F** until you visualize **PASS**, release **F** and through the arrows set **99**, push **F** and visualize **Pro** (protection code) from **128**, through the arrows, bring it back to **12**, and keep **F** pushed until you come back to set-point value.

#### Manual operation:

Keep pushed the lower left key for at least 5 sec.

The instrument will enter the "MAN" mode (see also "Ld1" switching on).

Through the arrows, "Open" and "Close" outputs are activated.

To come back to normal working keep the lower left key pushed for at least 5 sec.

#### Software switch off :

By keeping pushed keys **Arrow up** + **F** for more than 5 sec. the instrument switches off the software, does not command the outputs and visualize only the variable of process measured by the probe.

To restore keep pushed **F** for more than 5 sec.





# RWF50.2x & RWF50.3x



*User manual*

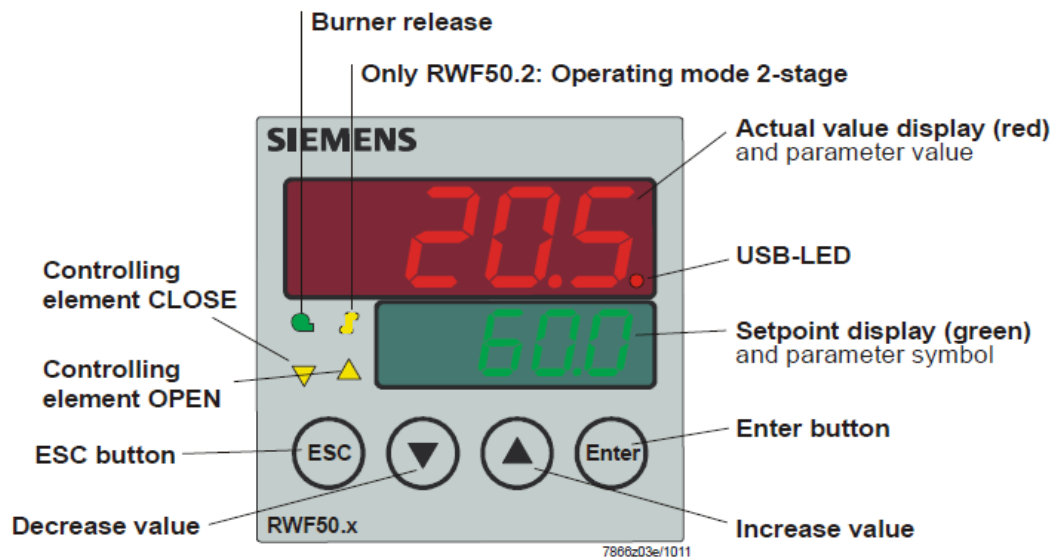
## DEVICE INSTALLATION

Install the device using the relevant tools as shown in the figure.

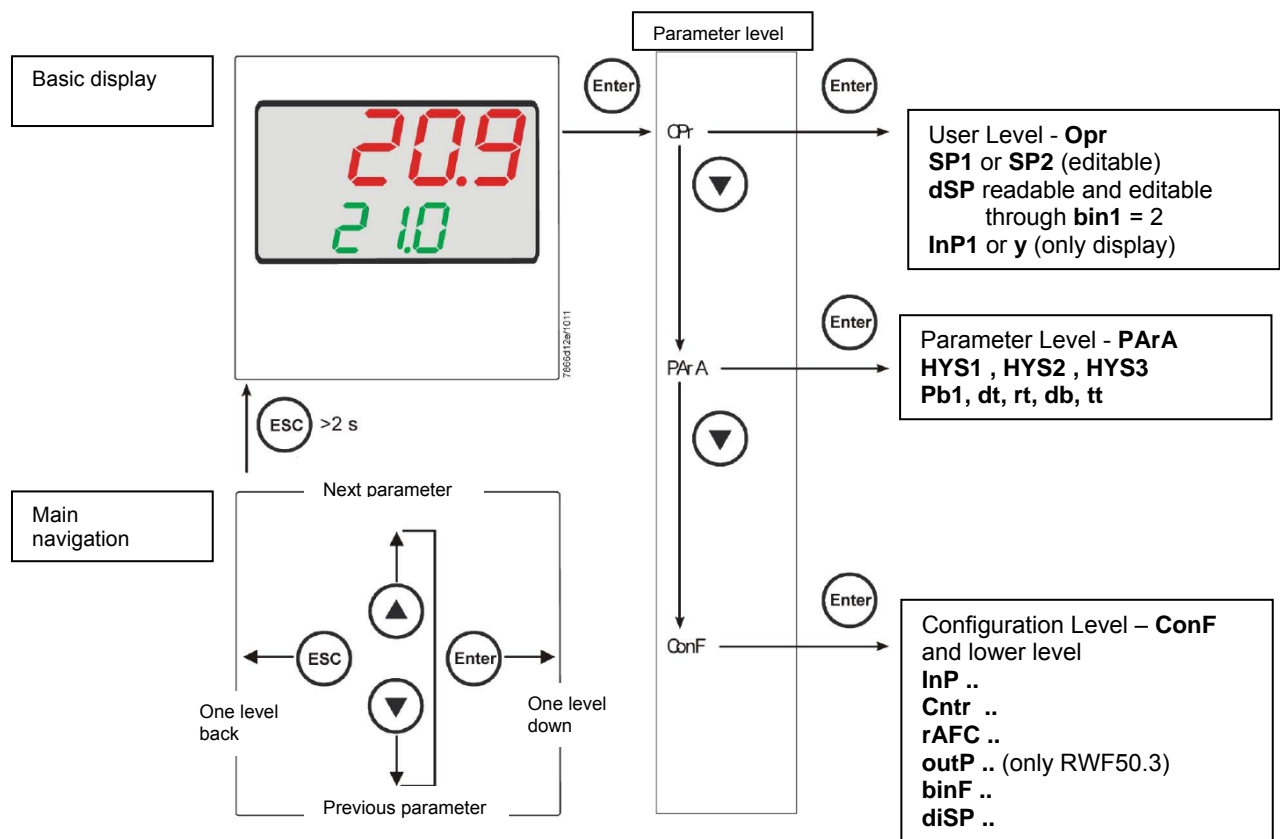
To wire the device and sensors, follow the instructions on the burner wiring diagram.



FRONT PANEL



NAVIGATION MENU





RWF5 is preset good for 90% of applications. However, you can set or edit parameters as follow:

#### Set-point: set or modification:

When the burner is in stand-by, (safety loop open, that is terminals 3-4/T1-T2 on the 7 pole plug open) push the **Enter** button: on the lower display (green) **Opr** appears; push **Enter** again and in the same display **SP1** appears. Push **Enter** again and the lower display (green **SP1**) flashes. Using the **up and down arrows** change the set-point on the upper display (red). Push **Enter** to confirm and push **ESC** more times to get the home position.

#### PID parameters set and modifications (see table below):

- Push **Enter** button, on the green display **Opr** appears; using the **down arrow**, scroll until group **PARA** is reached and push **Enter**.
- on the green display **Pb1** e appears and on the red one the set parameter.
- Push in sequence the **down or up** arrow the menu is scrolled.
- Push **Enter** to select and the **arrows** to choose the desired value. **Enter** to confirm.

Parameter	Display	Range	Factory setting	Remarks
Proportional band	PB.1	1... 9999 digit	10	Typical value for temperature
Derivative action	dt	0... 9999 sec.	80	Typical value for temperature
Integral action	rt	0... 9999 sec.	350	Typical value for temperature
Dead band (*)	db	0... 999,9 digit	1	Typical value
Servocontrol running time	tt	10... 3000 sec.	15	Set servocontrol running time
Switch-on differential (*)	HYS1	0,0... -1999 digit	-5	Value under setpoint below which the burner switches back on (1N-1P closes)
Switch-off differential 2° stage (*)	HYS2	0,0 ... HYS3	3	(enable only with parameter <b>bin1</b> = 4)
Upper switch-off differential (*)	HYS3	0,0... 9999 digit	5	Value over setpoint above which the burner switches off (1N-1P opens)
Switch-on differential on cooling controller (*)	HYS4	0,0... 9999 digit	5	Do not used (enable only with parameter <b>CACt</b> = 0)
Switch-off differential 2° stage on cooling controller (*)	HYS5	HYS6...0,0 digit	5	Do not used (enable only with parameters <b>CACt</b> = 0 and <b>bin1</b> = 4)
Upper switch-off differential on cooling controller (*)	HYS6	0,0... -1999 digit	5	Do not used (enable only with parameter <b>CACt</b> = 0)
Delay modulation	q	0,0... 999,9 digit	0	Do not alter

(\*)Parameters affected by setting of decimal place (**ConF** > **dISP** parameter **dECP**)

#### Setting the kind of sensor to be connected to the device:

- push the **Enter** button: on the lower display (green) **Opr** appears. Using the **up and down arrows** find **ConF**. Push **Enter** to confirm.
- Now on the green display the group **InP** appears. Push **Enter** and **InP1** is displayed. Enter to confirm.
- You are inside **InP1**; the green display shows **Sen1 (sensor type)**, while the red display shows the chosen sensor code
- Push **Enter** to enter the **Sen1** parameter, then choose the desired sensor using the **arrows**. Push **Enter** to confirm and **ESC** to escape.
- Once selected the sensor, you can modify all the other parameters using **up and down arrows** according to the tables here below.

#### ConF > InP > InP1

Parameter	Value	Description
SEn1 type of sensor for analog input 1	<b>1</b>	<b>Pt100 3 fili</b>
	2	Pt100 2 fili
	3	Pt1000 3 fili
	4	Pt1000 2 fili
	5	Ni1000 3 fili
	6	Ni1000 2 fili
	7	0 ÷ 135 ohm
	15	0 ÷ 20mA
	16	4 ÷ 20mA
	17	0 ÷ 10V
	18	0 ÷ 5V
	19	1 ÷ 5V
OFF1 sensor offset	-1999.. <b>0</b> .. +9999	Using the measured value correction (offset), a measured value can be corrected to a certain degree, either up or down
SCL1 scale low level	-1999.. <b>0</b> .. +9999	In the case of a measuring transducer with standard signal, the physical signal is assigned a display value here (for input ohm, mA, V)
SCH1 scale high level	-1999.. <b>100</b> .. +9999	In the case of a measuring transducer with standard signal, the physical signal is assigned a display value here (for input ohm, mA, V)
dF1 digital filter	0... <b>0,6</b> ...100	Is used to adapt the digital 2nd order input filter (time in s; 0 s = filter off)
Unit temperature unit	<b>1</b> 2	<b>1 = degrees Celsius</b> 2 = degrees Fahrenheit

(**bold** = factory settings)

#### Remark:

RWF50.2 e RWF50.3 cannot be connected to thermocouples.

If thermocouples have to be connected, convert the signal to a 4-20 mA one and set the RWF accordingly.

## ConF > Cntr

Parameter	Value	Description
CtYP controller type	<b>1</b> 2	<b>1 = 3-position controller (open-stop-close only RWF50.2)</b> 2 = continuative action controller (only RWF50.3)
CACt control action	<b>1</b> 0	<b>1 = heating controller</b> 0 = cooling controller
SPL least value of the set-point range	-1999.. <b>0</b> ..+9999	set-point limitation prevents entry of values outside the defined range
SPH maximum value of the set-point range	-1999.. <b>100</b> ..+9999	set-point limitation prevents entry of values outside the defined range
oLLo set-point limitation start, operation limit low	<b>-1999</b> .... +9999	lower working range limit
oLHi set-point limitation end, operation limit high	-1999.... <b>+9999</b>	upper working range limit

(**bold** = factory settings)

## ConF > rAFC

### Activation boiler shock termic protetion:

RWF50.. can activate the thermal shock protection only on sites where the set-point is lower than 250°C and according to **rAL** parameter.

Parameter	Value	Description
FnCT function	<b>0</b> 1 2	Choose type of range degrees/time <b>0 = deactivated</b> 1 = Kelvin degrees/minute 2 = Kelvin degrees/hour
rASL ramp rate	<b>0,0</b> ... 999,9	Slope of thermal shock protection (only with functions 1 and 2)
toLP tolerance band ramp	<b>0</b> ...9999	width of tolerance band (in K) about the set-point <b>0 = tolerance band inactive</b> 
rAL ramp limit	<b>0</b> ...250	Ramp limit. When this value is lower than the temperature set-point, the RWF controls the output increasing the temp set point step by step according to rASL. If this is over the temp set point, the control is performed in cooling.

(**bold** = factory settings)

### ConF > OutP (parameter under group only for RWF50.3)

Parameter	Value	Description
FnCt tipo di controllo	1 <b>4</b>	1 = analog input 1 doubling with possibility to convert (depending on par <b>SiGn</b> ) <b>4 = modulation controller</b>
SiGn type of output signal	<b>0</b> 1 2	physical output signal (terminals A+, A-) <b>0 = 0÷20mA</b> 1 = 4÷20mA 2 = 0÷10V
rOut Value when out of input range	<b>0...101</b>	signal (in percent) when measurement range is crossed
oPnt zero point	-1999... <b>0</b> ...+9999	value range of the output variable is assigned to a physical output signal Per default, the setting corresponds to 0...100% angular positioning for the controller outputs (terminals A+, A-) (effective only with <b>FnCt</b> = 1)
End End value	-1999... <b>100</b> ...+9999	value range of the output variable is assigned to a physical output signal Per default, the setting corresponds to 0...100% angular positioning for the controller outputs (terminals A+, A-) (effective only with <b>FnCt</b> = 1)

(**bold** = factory settings)

### ConF > binF

Parameter	Value	Description
bin1 digital inputs (terminals DG - D1)	<b>0</b> 1 2 4	<b>0 = without function</b> 1 = set-point changeover (SP1 / SP2) 2 = set-point shift ( <b>Opr</b> > <b>dSP</b> parameter = value of set-point modify) 4 = changeover of operating mode open – modulating operation; close – 2 stage operation.

(**bold** = factory settings)

### ConF > dISP

Parameter	Value	Description
diSU upper display (red)	0 <b>1</b> 4 6 7	display value for upper display: 0 = display power-off <b>1 = analog input value</b> 4 = Controller's angular positioning 6 = set-point value 7 = end value with thermal shock protection
diSL lower display (green)	0 1 4 <b>6</b> 7	display value for lower display: 0 = display power-off 1 = analog input value 4 = Controller's angular positioning <b>6 = set-point value</b> 7 = end value with thermal shock protection
tout timeout	<b>0..180</b> ..250	time (s) on completion of which the controller returns automatically to the basic display, if no button is pressed
dECP decimal point	<b>0</b> 1 2	<b>0 = no decimal place</b> 1 = one decimal place 2 = two decimal places
CodE level lockout	<b>0</b> 1 2 3	<b>0 = no lockout</b> 1 = configuration level lockout (ConF) 2 = Parameter and configuration level lockout (PArA & ConF) 3 = keyboard lockout

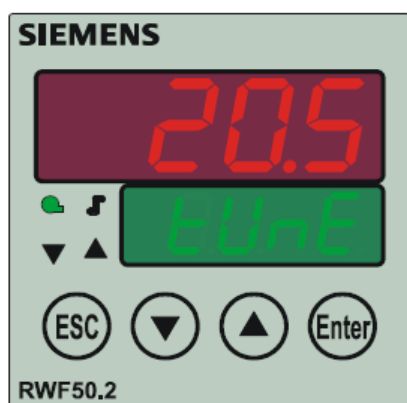
(**bold** = factory settings)

#### Manual control :

- in order to manual change the burner load, while firing keep pushing the **ESC** button for more than 5 s; on the lower green display **Hand** appears.
- using the **UP** and **DOWN** arrows, the load varies.
- Keep pushing the **ESC** button for getting the normal operation again.
- **NB:** every time the device shuts the burner down (start led switched off - contact 1N-1P open), the manual control is not active.

#### Device self-setting (auto-tuning):

If the burner in the steady state does not respond properly to heat generator requests, you can activate the Device's self-setting function, which recalculates PID values for its operation, deciding which are most suitable for the specific kind of request



Follow the below instructions:

push the **UP** and **DOWN** arrows for more than 5 s; on the green lower display **TUNE** appears. Now the device pushes the burner to increase and decrease its output. During this time, the device calculates PID parameters (**Pb1**, **dt** and **rt**). After the calculations, the TUNE is automatically deactivated and the device has already stored them.

In order to stop the Auto-tuning function while it works, push again the **UP** and **DOWN** arrows for more than 5 s. The calculated PID parameters can be manually modified following the previously described instructions.

#### Display of software version :



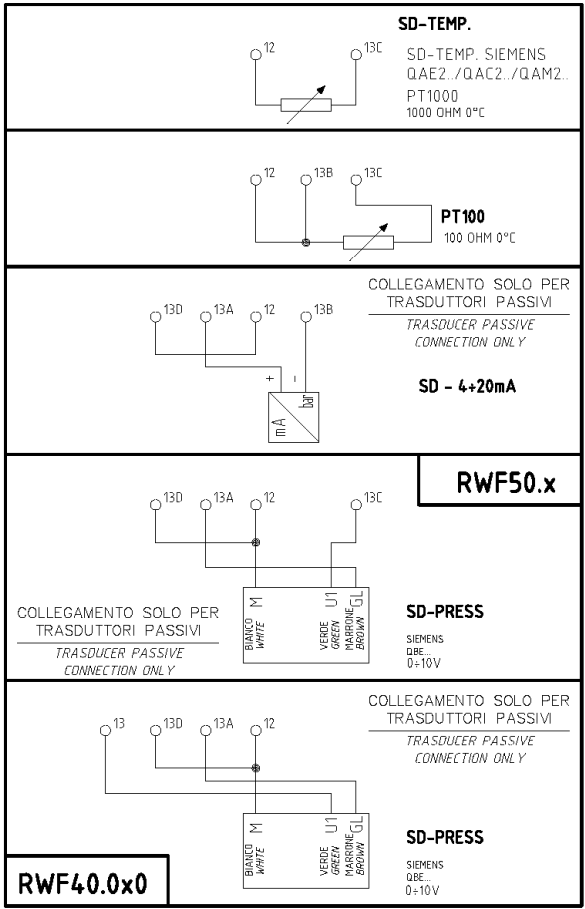
The software version is shown by pushing **Enter + UP arrow** on the upper display

Electric connection :

With 7 pins connector version



With terminals version



Matches terminals between RWF50.2 and RWF40.0x0



Parameters summarising for RWF50.2x:

Navigation menù	Conf					Conf									Opr
	Inp							diSP							
	Inp1								Cntr		PArA				
Types of probe	SEn1	OFF1	SCL1	SCH1	Unit	SPL	SPH	dECP	Pb. 1	dt	rt	tt	HYS1 (*)	HYS3 (*)	SP1 (*)
Siemens QAE2120...	6	0	needless	needless	1	30	95	1	10	80	350	(#)	-5	5	80 °C
Siemens QAM2120..	6	0	needless	needless	1	0	80	1	10	80	350	(#)	-2,5	2,5	40°C
Pt1000 (130°C max.)	4	0	needless	needless	1	30	95	1	10	80	350	(#)	-5	5	80°C
Pt1000 (350°C max.)	4	0	needless	needless	1	0	350	1	10	80	350	(#)	-5	10	80°C
Pt100 (130°C max.)	1	0	needless	needless	1	0	95	1	10	80	350	(#)	-5	5	80°C
Pt100 (350°C max)	1	0	needless	needless	1	0	350	1	10	80	350	(#)	-5	10	80°C
Probe 4÷20mA / 0÷1,6bar	16	0	0	160	needless	0	160	0	5	20	80	(#)	0	20	100 kPa
Probe 4÷20mA / 0÷3bar	16	0	0	300	needless	0	300	0	5	20	80	(#)	0	20	200 kPa
Probe 4÷20mA / 0÷10bar	16	0	0	1000	needless	0	1000	0	5	20	80	(#)	0	50	600 kPa
Probe 4÷20mA / 0÷16bar	16	0	0	1600	needless	0	1600	0	5	20	80	(#)	0	80	600 kPa
Probe 4÷20mA / 0÷25bar	16	0	0	2500	needless	0	2500	0	5	20	80	(#)	0	125	600 kPa
Probe 4÷20mA / 0÷40bar	16	0	0	4000	needless	0	4000	0	5	20	80	(#)	0	200	600 kPa
Siemens QBE2002 P4	17	0	0	400	needless	0	400	0	5	20	80	(#)	0	20	200 kPa
Siemens QBE2002 P10	17	0	0	1000	needless	0	1000	0	5	20	80	(#)	0	50	600 kPa
Siemens QBE2002 P16	17	0	0	1600	needless	0	1600	0	5	20	80	(#)	0	80	600 kPa
Siemens QBE2002 P25	17	0	0	2500	needless	0	2500	0	5	20	80	(#)	0	125	600 kPa
Siemens QBE2002 P40	17	0	0	4000	needless	0	4000	0	5	20	80	(#)	0	200	600 kPa
Segnale 0÷10V	17	0	to be fixed	to be fixed	needless	to be fixed	to be fixed	to be fixed	5	20	80	(#)	to be fixed	to be fixed	to be fixed
Segnale 4÷20mA	16	0	to be fixed	to be fixed	needless	to be fixed	to be fixed	to be fixed	5	20	80	(#)	to be fixed	to be fixed	to be fixed

**NOTE :**

(#) tt – servo control run time

SQL33 ; STM30; SQM10; SQM40; SQM50; SQM54 = **30** (secondi) - STA12B3.41; SQN30.251; SQN72.4A4A20 = **12** (secondi)

(\*)These values are factory set - values **must be** set during operation at the plant based on the real working temperature/pressure value.

**WARNING :** With pressure probes the parameters SP1, SCH, SCL, HYS1, HYS3 must be selected, and visualized in kPa (kilo Pascal). (1bar ≡ 100.000Pa ≡ 100kPa)

## APPENDIX: PROBES CONNECTION

To assure the utmost comfort, the control system needs reliable information, which can be obtained provided the sensors have been installed correctly. Sensors measure and transmit all variations encountered at their location.

Measurement is taken based on design features (time constant) and according to specific operating conditions. With wiring run in raceways, the sheath (or pipe) containing the wires must be plugged at the sensor's terminal board so that currents of air cannot affect the sensor's measurements.

### Ambient probes (or ambient thermostats)

#### Installation

The sensors (or room thermostats) must be located in reference rooms in a position where they can take real temperature measurements without being affected by foreign factors.



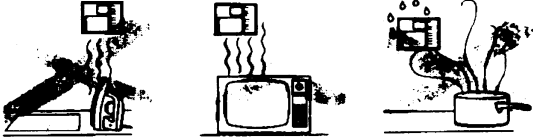
### Outside probes (weather)

#### Installation

In heating or air-conditioning systems featuring adjustment in response to outside temperature, the sensor's positioning is of paramount importance.

### It's good to be admired ...even better to be effective

Heating systems: the room sensor must not be installed in rooms with heating units complete with thermostatic valves. Avoid all sources of heat foreign to the system.



**General rule:** on the outer wall of the building where the living rooms are, never on the south-facing wall or in a position where they will be affected by morning sun. If in any doubt, place them on the north or north-east façade.

### Location

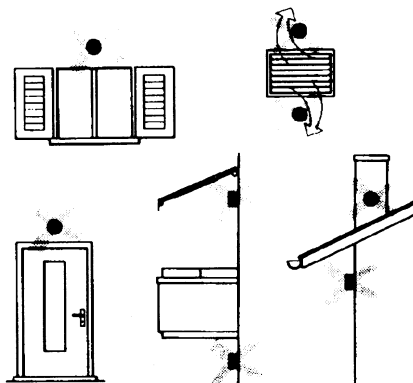
On an inner wall on the other side of the room to heating units height above floor 1.5 m, at least 1.5 m away from external sources of heat (or cold).



### Installation position to be avoided

near shelving or alcoves and recesses, near doors or windows, inside outer walls exposed to solar radiation or currents of cold air, on inner walls with heating system pipes, domestic hot water pipes, or cooling system pipes running through them.

### Positions to be avoided



Avoid installing near windows, vents, outside the boiler room, on chimney breasts or where they are protected by balconies, cantilever roofs.

**The sensor must not be painted (measurement error).**



## Duct or pipe sensors

### Installing temperature sensors

For measuring outlet air:

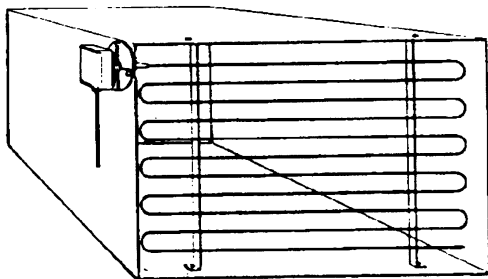
- after delivery fan or
- after coil to be controlled, at a distance of at least 0,5 m

For measuring room temperature:

- before return air intake fan and near room's return air intake. For measuring saturation temperature: after mist eliminator.



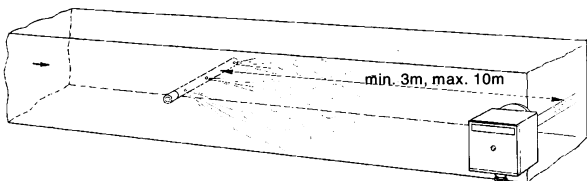
Bend 0.4m sensor by hand (never use tools) as illustrated.



Use whole cross-section of duct, min. distance from walls 50 mm, radius of curvature 10 mm for 2m or 6m sensors.

### Installing combined humidity sensors

As max. humidity limit sensor on outlet (steam humidifiers).



### Installing pressure sensors

A - installation on ducts carrying fluids at max. temperature 80°C

B - installation on ducts at temperature over 80°C and for refrigerants

C - installation on ducts at high temperatures:

- increase length of siphon
- place sensor at side to prevent it being hit by hot air coming from the pipe.



### Installing differential pressure sensors for water

- Installation with casing facing down not allowed.-With temperature over 80°C, siphons are needed.
- To avoid damaging the sensor, you must comply with the following instructions

#### when installing:

- make sure pressure difference is not greater than the value permitted by the sensor
- when there are high static pressures, make sure you insert shutoff valves A-B-C.

### Putting into operation

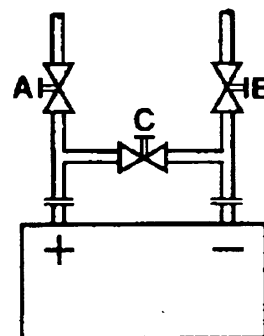
Start disable

1=open C1=open C

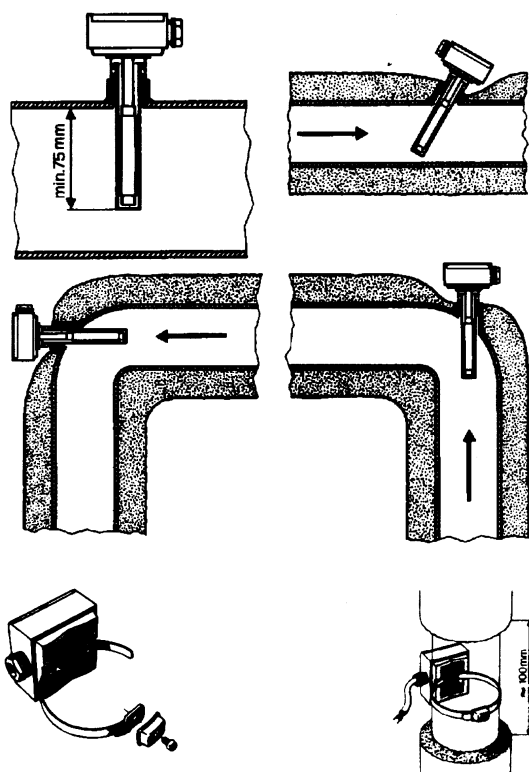
2=open A2=close B

3=open B3=close A

4= close C



## Immersion or strap-on sensors



Placing the probes (QAD22.../QAE21.../QAP21.../RCA...)

## Immersion probes installation

Sensors must be installed on the stretch of pipe in which fluid circulates all the time.

The rigid stem (sensing element doing the measuring) must be inserted by at least 75mm and must face the direction of flow.

Recommended locations: on a bend or on a straight stretch of pipe but tilted by 45° and against the flow of fluid.

Protect them to prevent water from infiltrating (dripping gates, condensation from pipes etc.)

## Installing QAD2.. strap-on sensors

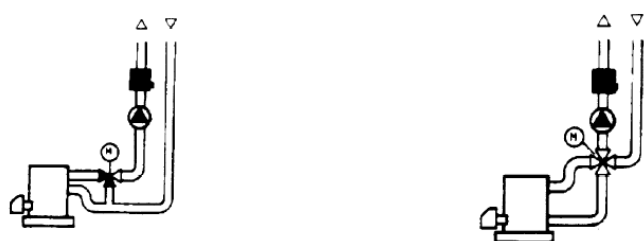
Make sure fluid is circulating in the chosen location.

Eliminate insulation and paintwork (including rust inhibitor) on a min. 100mm length of pipe.

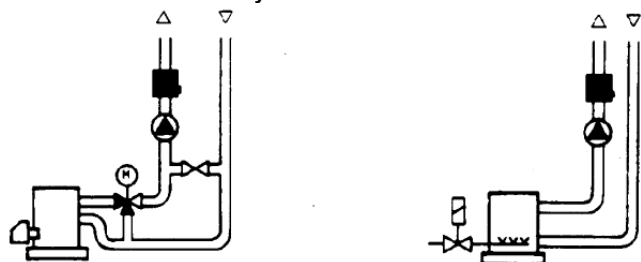
Sensors come with straps for pipes up to 100 mm in diameter

## With pumps on outlet

with 3 ways valves / with 4 ways valves



Panel system / burner control



## With pumps on return

with 3 ways valves / with 4 ways valves



## Strap-on or immersion sensors?

### QAD2.. strap-on sensors

Advantages :

- 10 sec. time constant
- Installed with system running (no plumbing work)
- Installation can be changed easily if it proves incorrect.

Limits:

- Suitable for pipe diameters max. 100 mm
- Can be affected by currents of air etc.

### QAE2... immersion sensors

Advantages:

- Measure "mean" fluid temperature
- No external influence on measurement such as: currents of air, nearby pipes etc.

Limits:

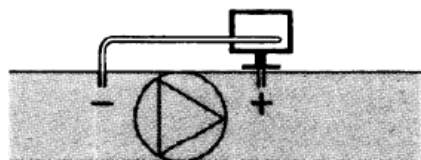
- Time constant with sheath: 20 sec.
- Hard to change installation position if it proves incorrect.

## Duct pressure switches and sensors

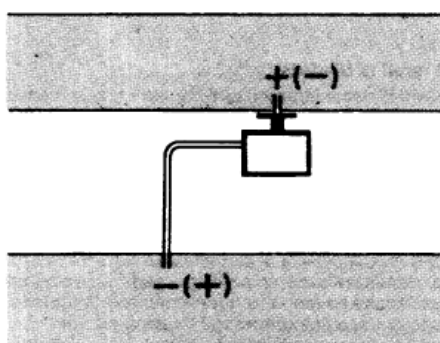
### Installing differential pressure probes for air



A - Control a filter (clogging)



B - Control a fan (upstream/downstream)



C - Measurement of difference in pressure between two ducts



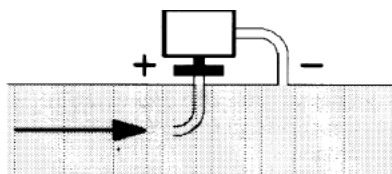
D - Measurement of difference in pressure between two rooms or of inside of duct and outside

### Basic principles

Measuring static pressure (i.e. pressure exerted by air on pipe walls)



### Measuring dynamic pressure

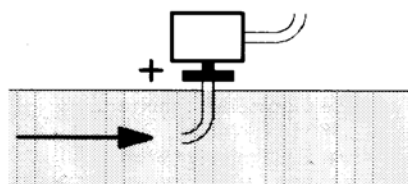


$$Pd = \frac{\gamma v^2}{2g}$$

### Key

$\gamma$	Kg/m <sup>3</sup> , specific weight of air
$v$	m/s, air speed
$g$	9.81 m/s <sup>2</sup> gravity acceleration
$Pd$	mm C.A., dynamic pressure

### Measuring total pressure



## Spare parts

Description	Code
Modulator RWF50.2 (uscita a 3 punti - apri, fermo, chiudi)	2570148
Modulator RWF50.3 (uscita continua 0÷20mA, 4÷20mA, 0÷10V)	2570149
Temperature probe Siemens QAE2120.010A (30÷130°C)	2560101
Temperature probe Siemens QAM2120.040 (-15÷+50°C)	2560135
Thermoresistor Pt1000 ø6mm L100mm (30÷130°C)	2560188
Thermoresistor Pt1000 ø10mm L200mm (0÷350°C)	2560103
Thermoresistor Pt100 ø10mm L200mm (0÷350°C)	2560145
Thermoresistor Pt100 ø8mm L85mm (0÷120°C)	25601C3
Pressure probe Siemens QBE2.. P4 (0÷4bar)	2560159
Pressure probe Siemens QBE2.. P10 (0÷10bar / signal 0÷10V)	2560160
Pressure probe Siemens QBE2.. P16 (0÷16bar / signal 0÷10V)	2560167
Pressure probe Siemens QBE2.. P25 (0÷25bar / signal 0÷10V)	2560161
Pressure probe Siemens QBE2.. P40 (0÷40bar / signal 0÷10V)	2560162
Pressure probe Danfoss MBS 3200 P 1,6 (0÷1,6bar / signal 4÷20mA)	2560189
Pressure probe Danfoss MBS 3200 P 10 (0÷10bar / signal 4÷20mA)	2560190
Pressure probe Danfoss MBS 3200 P 16 (0÷16bar / signal 4÷20mA)	2560191
Pressure probe Danfoss MBS 3200 P 25 (0÷25bar / signal 4÷20mA)	2560192
Pressure probe Danfoss MBS 3200 P 40 (0÷40bar / signal 4÷20mA)	2560193
Pressure probe Siemens 7MF1565-3BB00-1AA1 (0÷1,6bar / signal 4÷20mA)	25601A3
Pressure probe Siemens 7MF1565-3CA00-1AA1 (0÷10bar / signal 4÷20mA)	25601A4
Sonda di pressione Siemens 7MF1565-3CB00-1AA1 (0÷16bar / signal	25601A5
Pressure probe Siemens 7MF1565-3CD00-1AA1 (0÷25bar / signal 4÷20mA)	25601A6
Pressure probe Siemens 7MF1565-3CE00-1AA1 (0÷40bar / signal 4÷20mA)	25601A7
Pressure probe Gefran E3E B1V6 MV (0÷1,6bar / segnale 4÷20mA)	25601C4
Pressure probe Danfoss E3E B01D MV (0÷10bar / segnale 4÷20mA)	25601C5
Pressure probe Danfoss E3E B16U MV (0÷16bar / segnale 4÷20mA)	25601C6
Pressure probe Danfoss E3E B25U MV (0÷25bar / segnale 4÷20mA)	25601C7
Pressure probe Danfoss E3E B04D MV (0÷40bar / segnale 4÷20mA))	25601C8

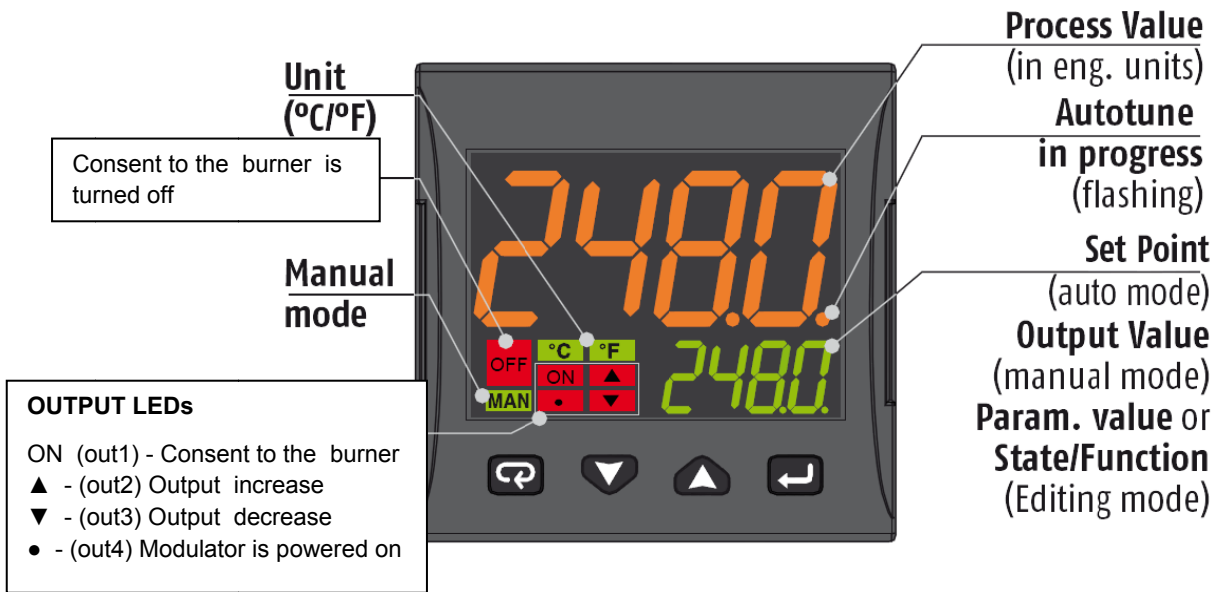
Note: Specifications and data subject to change. Errors and omissions excepted.

# **KM3 Modulator**

## **USER MANUAL**

**MOUNTING**

## DISPLAY AND KEYS



	Operator Mode	Editing Mode
	Access to: - Operator Commands (Timer, Setpoint selection ...) - Parameters - Configuration	Confirm and go to Next parameter
	Access to: - Operator additional information (Output value, running time ...)	Increase the displayed value or select the next element of the parameters list
	Access to: - Set Point	Decrease the displayed value or select the previous element
	Programmable key: Start the programmed function (Autotune, Auto/Man, Timer ...)	Exit from Operator commands/Parameter setting/Configuration



## CONNECTIONS DIAGRAM



### Probe connection:

- **PT1000/NTC/PTC:** between terminal 3 and 2
- **PT 100:** between terminal 3 and 2 with terminal 1
- **Passive pressure probe** 0/4-20 mA: between terminal 4 ( + ) e 1 ( - )  
Note: out4 must be activated ( IO4F must be set to ON )
- **Powered pressure probe** 0/4-20 mA between terminal 4 (power supply), 2 ( negative) e 1 (positive)  
Note: set IO4F to ON to activate Out4

### Power supply connection:

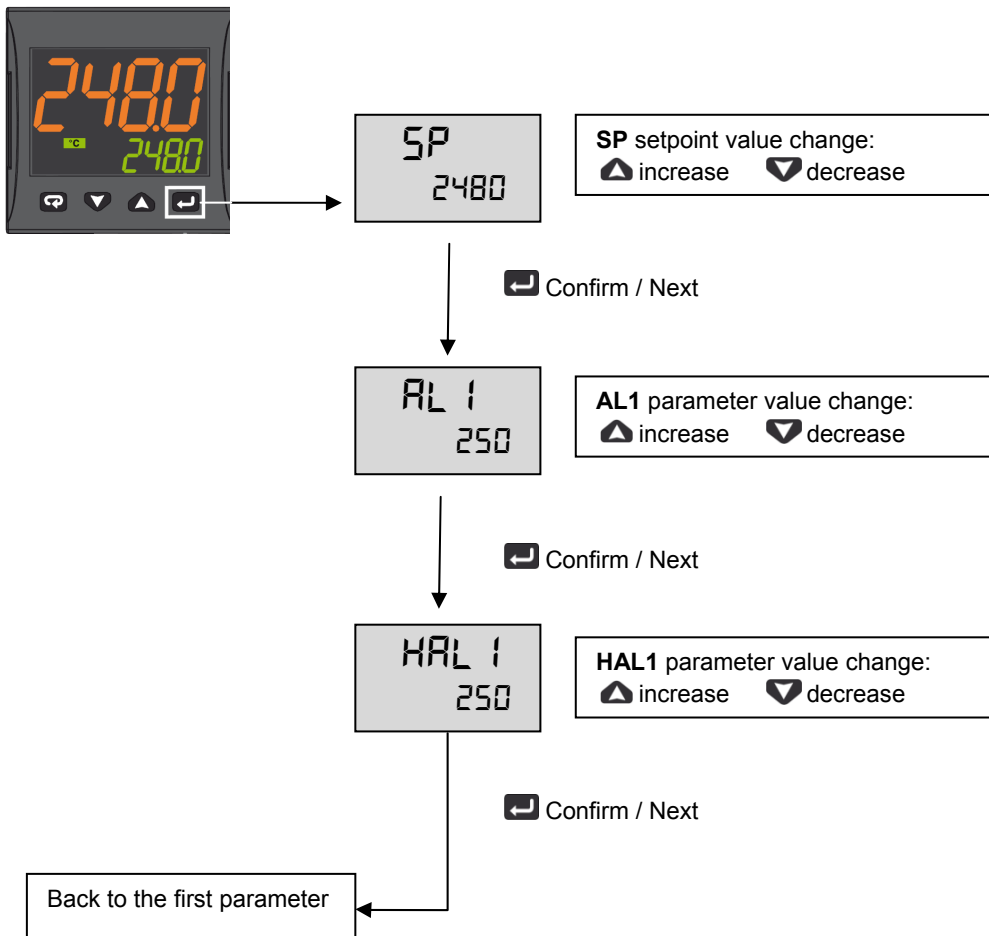
- **Neutral wire:** terminal 9
- **Phase:** terminal 10 ( 100...240 Vac )
- Close terminals 15-16 to switch to the set point 2

### Output connection:

- **Channel 1:** terminal 7 and 8 ( burner on – off )
- **Channel 2:** terminal 11 and 12 (servomotor opens)
- **Channel 3:** terminal 13 and 14 (servomotor closes)

## SETPOINT AND HYSTERESIS CONFIGURATION (SP, AL1, HAL1 parameters)

Push the  button to enter into the setpoint configuration:



To return to normal mode, press the  key for 3 seconds or wait the 10s timeout

### Operation example



## LIMITED ACCESS LEVEL

Proceed as follows to change some parameters that are not visible in standard user mode:



Param	Description	Values	Default
SEnS	Input type	Pt1 = RTD Pt100 Pt10 = RTD Pt1000 0.20 = 0..20mA 4.20 = 4..20mA Pressure probe 0.10 = 0..10V 2.10 = 2..10V crAL= Thermocouple K	Depends on the probe
SP	Set point 1	SPLL ... SPLH	See page 7
AL1	AL1 threshold	AL1L... AL1H (E.U.)	
HAL1	AL1 hysteresis	1... 9999 (E.U.)	
Pb	Proportional band	1... 9999 (E.U.)	
ti	Integral time	0 (oFF) ... 9999 (s)	
td	Derivative time	0 (oFF) ... 9999 (s)	
Str.t	Servomotor stroke time	5...1000 seconds	
db.S	Servomotor dead band	0...100%	
SPLL	Minimum set point value	-1999 ... SPLH	
SPLH	Maximum set point value	SPLL ... 9999	
dp	Decimal point position	0... 3	
SP 2	Set point 2	SPLL...SPLH	60
A.SP	Selection of the active set point	"SP" ... "nSP"	SP

To exit the parameter setting procedure press the key (for 3 s) or wait until the timeout expiration (about 30 seconds)

### Probe parameters configuration MODULATORE ASCON KM3

Parameter Group		inP							AL1		rEG					SP			
Parameter		Sens	dp	SSC	FSc	unit	IO4.F (**)	AL1 (***)	HAL1 (***)	Pb (***)	ti (***)	td (***)	Str.t	db.S	SPLL	SPHL	SP		
Probes			Dec Point	Scale Min	Scale Max			Off	On	p	i	d	servo time s	Band Mo.	SP Min	SP Max	Set point		
Pt1000 (130°C max)		Pt10	1			°C	on	5	10	10	350	1	*	5	30	95	80		
Pt1000 ( 350°C max)		PT10	1			°C	on	10	10	10	350	1	*	5	0	350	80		
Pt100 (130°C max)		PT1	1			°C	on	5	10	10	350	1	*	5	0	95	80		
Pt100 (350°C max)		Pt1	1			°C	on	10	10	10	350	1	*	5	0	350	80		
Pt100 (0÷100°C 4÷20mA)		4.20	1	0	100		on	5	10	10	350	1	*	5	0	95	80		
Thermocouple K (1200°C max)		crAL	0			°C	on	20	25	10	350	1	*	5	0	1200	80		
Thermocouple J (1000°C max)		J	0			°C	on	20	25	10	350	1	*	5	0	1000	80		
4-20mA / 0-1,6barPressure probe		4.20	0	0	160		on	20	20	5	120	1	*	5	0	160	100		
4-20mA / 0-10bar Pressure probe		4.20	0	0	1000		on	50	50	5	120	1	*	5	0	1000	600		
4-20mA / 0-16bar Pressure probe		4.20	0	0	1600		on	80	80	5	120	1	*	5	0	1600	600		
4-20mA / 0-25bar Pressure probe		4.20	0	0	2500		on	125	125	5	120	1	*	5	0	2500	600		
4-20mA / 0-40bar Pressure probe		4.20	0	0	4000		on	200	200	5	120	1	*	5	0	4000	600		
QBE2002 / 0-25bar Pressure probe		0.10	0	0	2500		On	125	125	5	120	1	*	5	0	2500	600		

Note:

(\*) Str.t - Servomotor stroke time

SQL33; STM30; SQM10; SQM40; SQM50; SQM54 = 30 (Seconds)

STA12B3.41; SQN30.251; SQN72.4A4A20 = 12 (Seconds)

**(\*\*) Out 4 ... on Display led °4 must be switched on, otherwise change the io4.F parameter value from "on" to "out4", confirm the value, quit the configuration mode then change again the io4.F parameter value from "out4" to "on".**







(\*\*\*) Factory settings. These values must be adapted to machine conditions


N.B. For pressure probe, SP, SPHL, SPLL parameters values are expressed in Kpa (1 bar = 100 Kpa).

## CONFIGURATION

### How to access configuration level

The configuration parameters are collected in various groups. Every group defines all parameters related with a specific function (e.g.: control, alarms, output functions).

1. Push the  button for more than 5 seconds. The upper display will show PASS while the lower display will show 0.
2. Using  and  buttons set the programmed password.  
According to the entered password, it is possible to see a part of the parameters listed in the "configuration parameters" section.
  - a. Enter "30" as password to view all the configuration parameters
  - b. Enter "20" as password to view the parameters of the "limited access level". At this point, only the parameters with attribute **Liv = A** or **Liv = O** will be editable.
  - c. Leave the password blank to edit "user level" parameters, that are identified by attribute **Liv = O**
3. Push the  button. If the password is correct the display will show the acronym of the first parameter group preceded by the symbol: . In other words the upper display will show:  inP (group of the **Input parameters**).

The instrument is in configuration mode. To press  for more than 5 seconds, the instrument will return to the "standard display".

#### Keyboard functions during parameter changing:

Operator Mode	
	When the upper display is showing a group and the lower display is blank, this key allows to enter in the selected group. When the upper display is showing a parameter and the lower display is showing its value, this key allows to store the selected value for the current parameter and access the next parameter within the same group.
	Allows to increase the value of the selected parameter.
	Allows to decrease the value of the selected parameter.
	Short presses allow you to exit the current group of parameters and select a new group. A long press terminates the configuration procedure (the instrument returns to the normal display).
 + 	These two keys allow to return to the previous group. Proceed as follows: Push the  button and maintaining the pressure, then push the  ; release both the buttons.

### Configuration Parameters

inP GROUP - input configuration					
Liv	N°	Param	Description	Values	Default
A	1	SEnS	Input type	Pt1 = RTD Pt100 Pt10 = RTD Pt1000 0.20 = 0..20mA 4.20 = 4..20mA Pressure probe 0.10 = 0..10V 2.10 = 2..10V crAL= Thermocouple K	Depends on the probe
A	2	dp	Decimal point position	0... 3	See page 7
A	3	SSc	Initial scale read-out for linear inputs (available only if SEnS parameter is not equal to Pt1, Pt10, crAL values)	-1999... 9999	0
C	4	FSc	Full scale read-out for linear input inputs (available only if SEnS parameter is not equal to Pt1, Pt10, crAL values)	-1999... 9999	Depends on the probe
C	5	unit	Unit of measure (present only in the case of temperature probe)	°C/°F	°C
C	6	Fil	Digital filter on the measured value	0 (= OFF)... 20.0 s	1.0
C	7	inE	Selection of the Sensor Out of Range type that will enable the safety output value	or = Over range ou = Under range our = over e under range	or

C	8	oPE	Safety output value	-100... 100	0
C	9	io4.F	I/O4 function selection	on = Out4 will be ever ON (used as a transmitter power supply) ,out4 = Uscita 4 (Used as digital output 4), dG2c = Digital input 2 for contact closure, dG2U = Digital input 2 driven by 12... 24 VDC	on
C	10	diF1	Digital input 1 function	oFF = Not used, 1 = Alarm reset, 2 = Alarm acknowledge (ACK), 3 = Hold of the measured value, 4 = Stand by mode, 5 = Manual mode, 6 = HEAt with SP1 and CoOL with SP2, 7 = Timer RUN/Hold/Reset, 8 = Timer Run, 9 = Timer Reset, 10 = Timer Run/Hold, 11 = Timer Run/Reset, 12 = Timer Run/Reset with lock, 13 = Program Start, 14 = Program Reset, 15 = Program Hold, 16 = Program Run/Hold, 17 = Program Run/Reset, 18 = Sequential SP selection, 19 = SP1 - SP2 selection, 20 = SP1... SP4 binary selection, 21 = Digital inputs in parallel	19
C	12	di.A	Digital Inputs Action (DI2 only if configured)	0 = DI1 direct action, DI2 direct action 1 = DI1 reverse action, DI2 direct action 2 = DI1 direct action, DI2 reverse action 3 = DI1 reverse action, DI2 reverse action	0

**Out GROUP- Output parameters**

Liv	N°	Param	Description	Values	Default
C	14	o1F	Out 1 function	AL = Alarm output	AL
C	15	o1AL	Initial scale value of the analog retransmission	-1999 ... Ao1H	1
C	18	o1Ac	Out 1 action	dir = Direct action rEU = Reverse action dir.r = Direct with reversed LED ReU.r = Reverse with reversed LED	rEU.r
C	19	o2F	Out 2 function	H.rEG = Heating output	H.rEG
C	21	o2Ac	Out 2 action	dir = Direct action rEU = Reverse action dir.r = Direct with reversed LED ReU.r = Reverse with reversed LED	dir
C	22	o3F	Out 3 function	H.rEG = Heating output	H.rEG
C	24	o3Ac	Out 3 action	dir = Direct action rEU = Reverse action dir.r = Direct with reversed LED ReU.r = Reverse with reversed LED	dir

**AL1 GROUP - Alarm 1 parameters**

Liv	N°	Param	Descrizione	Values	Default
C	28	AL1t	Tipo allarme AL1	nonE = Alarm not used LoAb = Absolute low alarm HiAb = Absolute high alarm LHAo = Windows alarm in alarm outside the windows LHAI = Windows alarm in alarm inside the	HidE

				windows SE.br = Sensor Break LoDE = Deviation low alarm (relative) HiDE = Deviation high alarm (relative) LHdo = Relative band alarm in alarm out of the band LHdi = Relative band alarm in alarm inside the band	
C	29	Ab1	Alarm 1 function	0... 15 +1 = Not active at power up +2 = Latched alarm (manual reset) +4 = Acknowledgeable alarm +8 = Relative alarm not active at set point change	0
C	30	AL1L	-- For High and low alarms, it is the low limit of the AL1 threshold; -- For band alarm, it is low alarm threshold	-1999... AL1H (E.U.)	-199.9
C	31	AL1H	-- For High and low alarms, it is the high limit of the AL1 threshold; -- For band alarm, it is high alarm threshold	AL1L... 9999 (E.U.)	999.9
O	32	AL1	AL1 threshold	AL1L... AL1H (E.U.)	See page 7
O	33	HAL1	AL1 hysteresis	1... 9999 (E.U.)	See page 7
C	34	AL1d	AL1 delay	0 (oFF)... 9999 (s)	oFF
C	35	AL1o	Alarm 1 enabling during Stand-by mode and out of range conditions	0 = Alarm 1 disabled during Stand by and out of range 1 = Alarm 1 enabled in stand by mode 2 = Alarm 1 enabled in out of range condition 3 = Alarm 1 enabled in stand by mode and in overrange condition	1

**GRUPPO AL2 - parametri allarme 2**

Liv	N°	Param	Description	Values	Default
C	36	AL2t	Alarm 2 type	nonE = Alarm not used LoAb = Absolute low alarm HiAb = Absolute high alarm LHAo = Windows alarm in alarm outside the windows LHAi = Windows alarm in alarm inside the windows SE.br = Sensor Break LoDE = Deviation low alarm (relative) HiDE = Deviation high alarm (relative) LHdo = Relative band alarm in alarm out of the band LHdi = Relative band alarm in alarm inside the band	SE.br
C	37	Ab2	Alarm 2 function	0... 15 +1 = Not active at power up +2 = Latched alarm (manual reset) +4 = Acknowledgeable alarm +8 = Relative alarm not active at set point change	0
C	42	AL2d	AL2 hysteresis	0 (oFF)... 9999 (s)	oFF
C	43	AL2o	Alarm 2 enabling during Stand-by mode and out of range conditions	0 = Alarm 2 disabled during Stand by and out of range 1 = Alarm 2 enabled in stand by mode 2 = Alarm 2 enabled in out of range condition 3 = Alarm 2 enabled in stand by mode and in overrange condition	0

AL3 Group - alarm 3 parameters					
Liv	N°	Param	Description	Values	Default
	44	AL3t	Alarm 3 type	nonE = Alarm not used LoAb = Absolute low alarm HiAb = Absolute high alarm LHAo = Windows alarm in alarm outside the windows LHAI = Windows alarm in alarm inside the windows SE.br = Sensor Break Lode = Deviation low alarm (relative) HidE = Deviation high alarm (relative) LHdo = Relative band alarm in alarm out of the band LHdi = Relative band alarm in alarm inside the band	nonE

LbA Group - Loop break alarm					
Liv	N°	Param	Descrizione	Values	Default
C	52	LbAt	LBA time	Da 0 (oFF) a 9999 (s)	oFF

rEG Group - Control parameters					
Liv	N°	Param	Description	Values	Default
C	56	cont	Control type	Pid = PID (heat and/or) On.FA = ON/OFF asymmetric hysteresis On.FS = ON/OFF symmetric hysteresis nr = Heat/Cool ON/OFF control with neutral zone 3Pt = Servomotor control (available only when Output 2 and Output 3 have been ordered as "M")	3pt
C	57	Auto	Autotuning selection	-4 = Oscillating auto-tune with automatic restart at power up and after all point change -3 = Oscillating auto-tune with manual start -2 = Oscillating -tune with auto-matic start at the first power up only -1 = Oscillating auto-tune with auto-matic restart at every power up 0 = Not used 1 = Fast auto tuning with automatic restart at every power up 2 = Fast auto-tune with automatic start the first power up only 3 = FAST auto-tune with manual start 4 = FAST auto-tune with automatic restart at power up and after set point change 5 = Evo-tune with automatic restart at every power up 6 = Evo-tune with automatic start the first power up only 7 = Evo-tune with manual start 8 = Evo-tune with automatic restart at power up and after a set point change	7
C	58	tunE	Manual start of the Autotuning	oFF = Not active on = Active	oFF



C	59	SELF	Self tuning enabling	no = The instrument does not perform the self-tuning YES = The instrument is performing the self-tuning	No
A	62	Pb	Proportional band	1... 9999 (E.U.)	See page 7
A	63	ti	Integral time	0 (oFF) ... 9999 (s)	See page 7
A	64	td	Derivative time	0 (oFF) ... 9999 (s)	See page 7
C	65	Fuoc	Fuzzy overshoot control	0.00... 2.00	1
C	69	rS	Manual reset (Integral pre-load)	-100.0... +100.0 (%)	0.0
A	70	Str.t	Servomotor stroke time	5...1000 seconds	See page 7
A	71	db.S	Servomotor dead band	0...100%	5
C	72	od	Delay at power up	0.00 (oFF) ... 99.59 (hh.mm)	oFF

**SP Group - Set point parameters**

Liv	N°	Param	Description	Values	Default
C	76	nSP	Number of used set points	1... 4	2
A	77	SPLL	Minimum set point value	-1999 ... SPHL	See page 7
A	78	SPHL	Maximum set point value	SPLL ... 9999	See page 7
O	79	SP	Set point 1	SPLL ... SPLH	See page 7
C	80	SP 2	Set point 2	SPLL ... SPLH	60
	83	A.SP	Selection of the active set point	"SP" ... "nSP"	SP
C	84	SP.rt	Remote set point type	RSP = The value coming from serial link is used as remote set point trin = The value will be added to the local set point selected by A.SP and the sum becomes the operative set point PERC = The value will be scaled on the input range and this value will be used as remote SP	trin
C	85	SPLr	Local/remote set point selection	Loc = Local rEn = Remote	Loc
C	86	SP.u	Rate of rise for POSITIVE set point change (ramp UP)	0.01... 99.99 (inF) Eng. units per minute	inF
C	87	SP.d	Rate of rise for NEGATIVE set point change (ramp DOWN)	0.01... 99.99 (inF) Eng. units per minute	inF

**PAn Group - Operator HMI**

Liv	N°	Param	Description	Values	Default
C	118	PAS2	Level 2 password (limited access level)	oFF (Level 2 not protected by password) 1... 200	20
C	119	PAS3	Level 3 password (complete configuration level)	3... 300	30
C	120	PAS4	Password livello (livello configurazione a codice)	201... 400	300
C	121	uSrb	button function during RUN TIME	nonE = No function tunE = Auto-tune/self-tune enabling. A single press (longer than 1 second) starts the auto-tune oPLo = Manual mode. The first pressure puts the instrument in manual mode (OPLO) while a second one puts the instrument in Auto mode	tunE

				AAC = Alarm reset ASi = Alarm acknowledge chSP = Sequential set point selection St.by = Stand by mode. The first press puts the instrument in stand by mode while a second one puts the instrument in Auto mode. Str.t = Timer run/hold/reset P.run = Program run P.rES = Program reset P.r.H.r = Program run/hold/reset	
C	122	diSP	Display management	Spo = Operative set point	SPo
C	123	di.cL	Display colour	0 = The display colour is used to show the actual deviation (PV - SP) 1 = Display red (fix) 2 = Display green (fix) 3 = Display orange (fix)	2
	125	diS.t	Display Timeout	-- oFF (display always ON) -- 0.1... 99.59 (mm.ss)	oFF
C	126	fiLd	Filter on the displayed value	-- oFF (filter disabled) -- From 0.0 (oFF) to 20.0 (E.U.)	oFF
C	128	dSPu	Instrument status at power ON	AS.Pr = Starts in the same way it was prior to the power down Auto = Starts in Auto mode oP.0 = Starts in manual mode with a power output equal to zero St.bY = Starts in stand-by mode	Auto
C	129	oPr.E	Operative modes enabling	ALL = All modes will be selectable by the next parameter Au.oP = Auto and manual (OPLO) mode only will be selectable by the next parameter Au.Sb = Auto and Stand-by modes only will be selectable by the next parameter	ALL
C	130	oPEr	Operative mode selection	If oPr.E = ALL: - Auto = Auto mode - oPLo = Manual mode - St.bY = Stand by mode If oPr.E = Au.oP: - Auto = Auto mode - oPLo = Manual mode If oPr.E = Au.Sb: - Auto = Auto mode - St.bY = Stand by mode	Auto

**SEr Group - Serial link parameter**

Liv	N°	Param	Description	Values	Default
C	131	Add	Instrument address	-- oFF -- 1... 254	1
C	132	bAud	baud rate	1200 = 1200 baud 2400 = 2400 baud 9600 = 9600 baud 19.2 = 19200 baud 38.4 = 38400 baud	9600
C	133	trSP	Selection of the value to be retransmitted (Master)	nonE = Retransmission not used (the instrument is a slave) rSP = The instrument becomes a Master and retransmits the operative set point PErc = The instrument become a Master and it retransmits the power output	nonE

con Group - Consumption parameters					
Liv	N°	Param	Description	Values	Default
C	134	Co.tY	Count type	oFF = Not used 1 = Instantaneous power (kW) 2 = Power consumption (kW/h) 3 = Energy used during program execution. This measure starts from zero when a program runs end stops at the end of the program. A new program execution will reset the value 4 = Total worked days: number of hours the instrument is turned ON divided by 24. 5 = Total worked hours: number of hours the instrument is turned ON. 6 = Total worked days with threshold: number of hours the instrument is turned ON divided by 24, the controller is forced in stand-by when Co.ty value reaches the threshold set in [137] h.Job. 7 = Total worked hours with threshold: number of hours the instrument is turned ON, the controller is forced in stand-by when Co.ty value reaches the threshold set in [137] h.Job. 8 = Totalizer of control relay worked days: number of hours the control relay has been in ON condition, divided by 24. 9 = Totalizer of control relay worked hours: number of hours the control relay has been in ON condition. 10 = Totalizer of control relay worked days with threshold: number of hours the control relay has been in ON condition divided by 24, the controller is forced in stand-by when Co.ty value reaches the threshold set in [137] h.Job. 11 = Totalizer of control relay worked hours with threshold: number of hours the control relay has been in ON condition, the controller is forced in stand-by when Co.ty value reaches the threshold set in [137] h.Job.	oFF
C	138	t.Job	Worked time (not resettable)	0... 9999 days	0

cAL Group - User calibration group					
Liv	N°	Param	Description	Values	Default
C	139	AL.P	Adjust Low Point	From -1999 to (AH.P - 10) in engineering units	0
C	140	AL.o	Adjust Low Offset	-300... +300 (E.U.)	0
C	141	AH.P	Adjust High Point	From (AL.P + 10) to 9999 engineering units	999.9
C	142	AH.o	Adjust High Offset	-300... +300	0

## OPERATIVE MODES

When the instrument is powered, it starts immediately to work according to the parameters values loaded in its memory. The instrument behaviour and its performance are governed by the value of the stored parameters.

At power ON the instrument can start in one of the following mode depending on its configuration:

**Automatic Mode** In Automatic mode the instrument drives automatically the control output according to the parameter value set and the set point/measured value.

**Manual Mode (OPLO):** In Manual mode the the upper display shows the measured value while the lower display shows the power output The lower display shows the power output [preceded by H (for heating) or C (for cooling)], MAN is lit and the instrument allows you to set manually the control output power. No Automatic action will be made.

**Stand by Mode (St.bY):** In stand-by mode the instrument operates as an indicator. It will show on the upper display the measured value and on the lower display the set point alternately to the "St.bY" messages and forces the control outputs to zero.

We define all the above described conditions as "Standard Display".

As we have seen, it is always possible to modify the value assigned to a parameter independently from the operative modes selected.



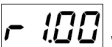

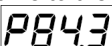



## AUTOMATIC MODE

Keyboard function when the instrument is in Auto mode:

	Modo Operatore
	Allows entry into parameter modification procedures
	Allows you to start the "Direct set point modification" function (see below).
	Allows you to display the "additional informations" (see below).
	Performs the action programmed by [121] uSrb (  button function during RUN TIME) parameter

### Additional information





This instrument is able to show you some additional informations that can help you to manage your system. The additional informations are related to how the instrument is programmed, hence in many cases, only part of this information is available.

1. When the instrument is showing the "standard display" push  button. The lower display will show H or c followed by a number. This value is the current power output applied to the process. The H show you that the action is a Heating action while the "c" show you that the action is a Cooling action
2. Push  button again. When the programmer is running the lower display will show the segment currently performed and the Event status as shown below:  
 where the first character can be r for a ramp or S for a soak, the next digit show the number of the segment (e.g. S3 means Soak number 3) and the twoless significant digits (LSD) show you the status of the two event (the LSD is the Event 2)..
3. Push  button again. When the programmer is running the lower display will show the theoretical remaining time to the end of the program preceded by a "P" letter:  

4. Push  button again. When the wattmeter function is running the lower display will show U followed by the measured energy..
5. Push  button. When the "Worked time count" is running the lower display will show "d" for days or "h" for hours followed by the measured time.
6. Push  button. The instrument returns to the "standard display".

Note: The additional information visualization is subject to a time out. If no button is pressed for more than 10 second the instrument comes automatically back to the Standard display..

**Direct set point modification**

This function allows to modify rapidly the set point value selected by [83] A.SP (selection of the active Set point) or to the set point of the segment group (of the programmer) currently in progress.

1. Push  button. The upper display shows the acronym of the selected set point (e.g. SP2) and the lower display will show its value.
2. By  and  buttons, assign to this parameter the desired value
3. Do not push any button for more than 5 second or push the  button. In both cases the instrument memorize the new value and come back to the “standard display”.

**Manual mode**

This operative mode allows you to deactivate automatic control and manually program the percentage power output to the process. When the instrument is in manual mode, the upper display shows the measured value while the lower display shows the power output [preceded by H (for heating action) or C (for cooling action)] The MAN LED is lit. When manual control is selected, the instrument will start to operate with the same power output as the last one supplied by automatic mode and can be modified using the  and  buttons.

In case of ON/OFF control, 0% corresponds to the deactivated output while any value different from 0 corresponds to the activated output. As in the case of visualization, the programmable values range from H100 (100% output power with reverse action) to C100 (100% output power with direct action).

**Notes:**

- During manual mode, the alarms are operative.
- If you set manual modes during program execution, the program will be frozen and it will restart when the instrument will come back to Auto mode.
- If you set manual modes during self-tune execution, the self- tune function will be aborted.
- During manual mode, all functions not related with the control (wattmeter, independent timer, “worked time”, etc) continue to operate normally..

**STAND-BY MODE**

This operative mode also deactivates the automatic control but forces the control output to zero. In this mode the instrument operates as an indicator. When the instrument is in stand by mode the upper display will show the measured value while the lower display will show alternately the set point and the message “St.bY”.

**Notes:**

- During stand by mode, the relative alarms are disabled while the absolute alarms are operative or not according to the ALxo (Alarm x enabling during Stand-by mode) parameter setting.
- If you set stand by mode during program execution, the program will be aborted.
- If you set stand by mode during self-tune execution, the self- tune function will be aborted.
- During stand by mode, all functions not related with the control (wattmeter, independent timer, “worked time”, etc) continue to operate normally.
- When the instrument is swapped from stand by to auto modes, the instrument will start automatically the alarm masking, the soft start functions and the auto-tune (if programmed).

**AUTOTUNE (EVOTUNE)**


Evotune is a fast and fully automatic procedure that can be started in any condition, regardless the deviation from SP. The controller selects automatically the best tune method and computes the optimum PID parameters. To activate Evotune press  button for 3 seconds.

## ERROR MESSAGES

The upper display shows the OVER-RANGE and UNDERRANGE conditions with the following indications:

Over-range: 

Under-range 

The sensor break will be signalled as an out of range: 

Note: When an over-range or an under-range is detected, the alarms operate as in presence of the maximum or the minimum measurable value respectively.

To check the out of span Error condition, proceed as follows:

1. Check the input signal source and the connecting line.
2. Make sure that the input signal is in accordance with the instrument configuration. Otherwise, modify the input configuration.
3. If no error is detected, send the instrument to your supplier to be checked.

### List of possible errors

**ErAT** Fast Auto-tune cannot start. The measure value is too close to the set point. Push the button in order to delete the error message.

**ouLd** Overload on the out 4. The messages shows that a short circuit is present on the Out 4 when it is used as output or as a transmitter power supply. When the short circuit disappears the output restart to operate..

**NoAt** Auto-tune not finished within 12 hours.

**ErEP** Possible problem of the instrument memory. The messages disappears automatically. When the error continues, send the instrument to your supplier.

**RonE** Possible problem of the firmware memory. When this error is detected, send the instrument to your supplier.

**Errt** Possible problem of the calibration memory. When this error is detected, send the instrument to your supplier.

## FACTORY RESET

Sometime, e.g. when you re-configure an instrument previously used for other works or from other people or when you have made too many errors during configuration and you decided to re-configure the instrument, it is possible to restore the factory configuration. This action allows to put the instrument in a defined condition (the same it was at the first power ON).

The default data are those typical values loaded in the instrument prior to ship it from factory. To load the factory default parameter set, proceed as follows:

1. Press the  button for more than 5 seconds. The upper display will show PASS while the lower display shows 0;
2. Using  and  buttons set the value -481;
3. Push  button;
4. The instrument will turn OFF all LEDs for a few seconds, then the upper display will show dFLt (default) and then all LEDs are turned ON for 2 seconds. At this point the instrument restarts as for a new power ON.

The procedure is complete.

Note: The complete list of the default parameters is available in Chapter "Configuration".

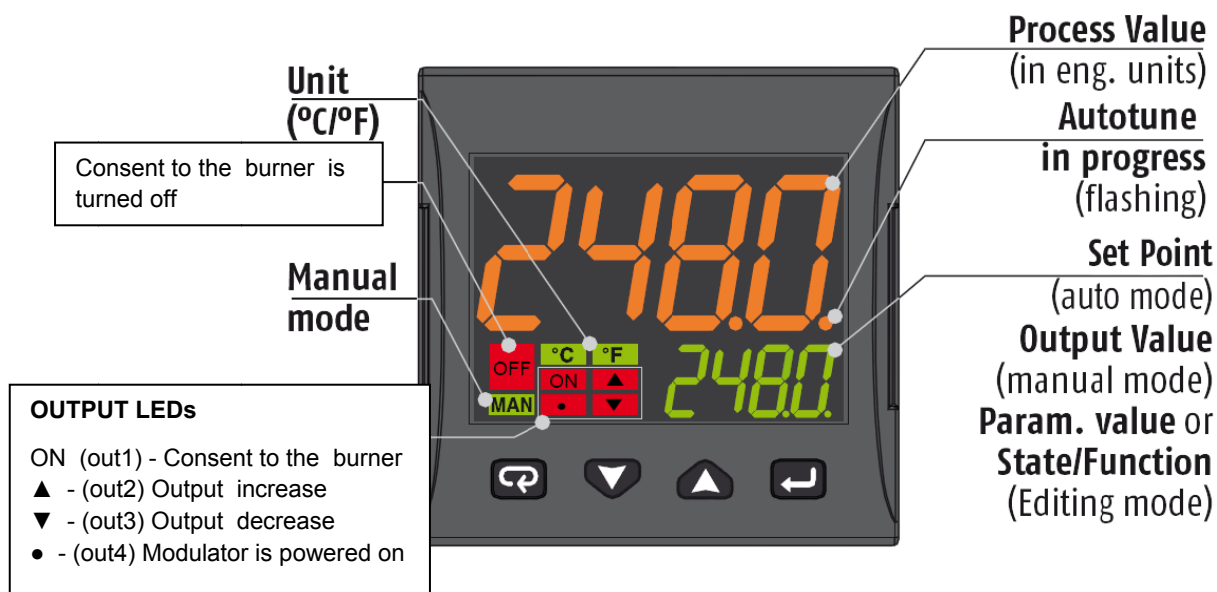
# **KM3 Modulator**





## **USER MANUAL**

**MOUNTING**



## DISPLAY AND KEYS



	Operator Mode	Editing Mode
	Access to: - Operator Commands (Timer, Setpoint selection ...) - Parameters - Configuration	Confirm and go to Next parameter
	Access to: - Operator additional information (Output value, running time ...)	Increase the displayed value or select the next element of the parameters list
	Access to: - Set Point	Decrease the displayed value or select the previous element
	Programmable key: Start the programmed function (Autotune, Auto/Man, Timer ...)	Exit from Operator commands/Parameter setting/Configuration

## CONNECTIONS DIAGRAM



### Probe connection:

- **PT1000/NTC/PTC:** between terminal 3 and 2
- **PT 100:** between terminal 3 and 2 with terminal 1
- **Passive pressure probe** 0/4-20 mA: between terminal 4 ( + ) e 1 ( - )  
Note: out4 must be activated ( IO4F must be set to ON )
- **Powered pressure probe** 0/4-20 mA between terminal 4 (power supply), 2 ( negative) e 1 (positive)  
Note: set IO4F to ON to activate Out4

### Power supply connection:

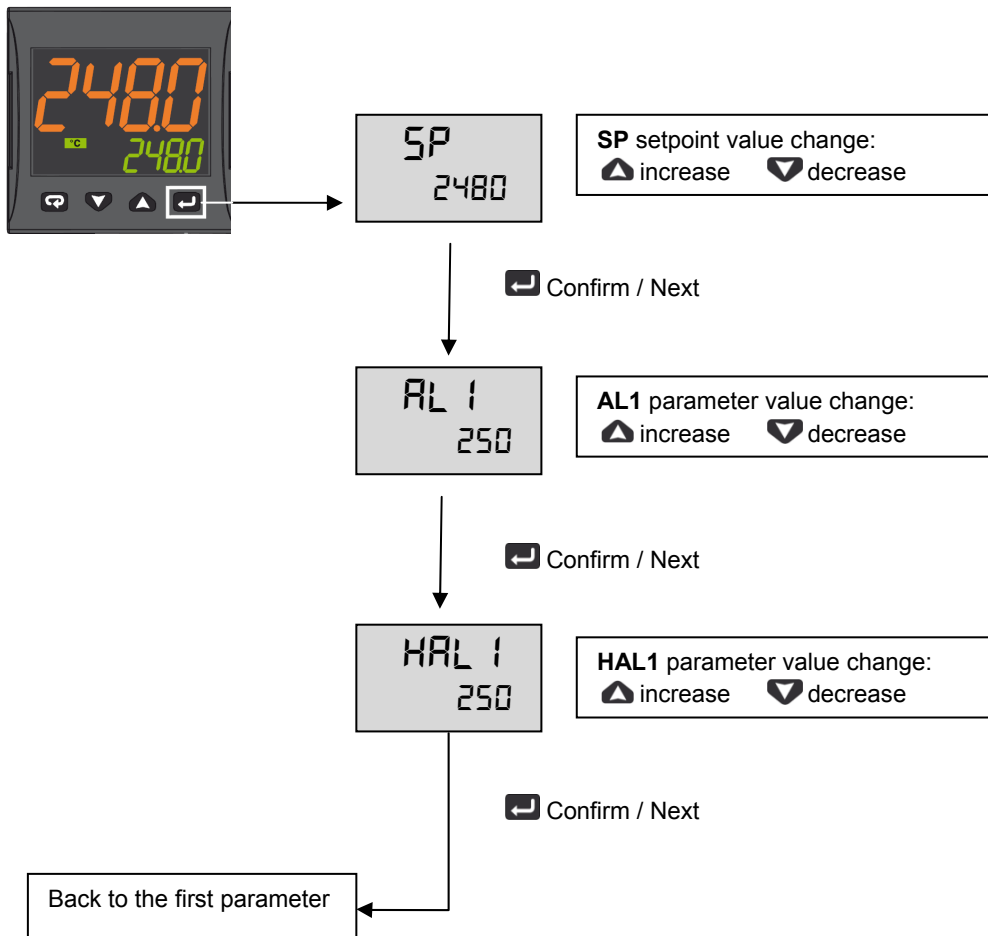
- **Neutral wire:** terminal 9
- **Phase:** terminal 10 ( 100...240 Vac )
- Close terminals 15-16 to switch to the set point 2

### Output connection:

- **Channel 1:** terminal 7 and 8 ( burner on – off )
- **Channel 2:** terminal 11 and 12 (servomotor opens)
- **Channel 3:** terminal 13 and 14 (servomotor closes)

## SETPOINT AND HYSTERESIS CONFIGURATION (SP, AL1, HAL1 parameters)

Push the  button to enter into the setpoint configuration:



To return to normal mode, press the  key for 3 seconds or wait the 10s timeout

### Operation example



## LIMITED ACCESS LEVEL

Proceed as follows to change some parameters that are not visible in standard user mode:



Param	Description	Values	Default
SEnS	Input type	Pt1 = RTD Pt100 Pt10 = RTD Pt1000 0.20 = 0..20mA 4.20 = 4..20mA Pressure probe 0.10 = 0..10V 2.10 = 2..10V crAL= Thermocouple K	Depends on the probe
SP	Set point 1	SPLL ... SPLH	See page 7
AL1	AL1 threshold	AL1L... AL1H (E.U.)	
HAL1	AL1 hysteresis	1... 9999 (E.U.)	
Pb	Proportional band	1... 9999 (E.U.)	
ti	Integral time	0 (oFF) ... 9999 (s)	
td	Derivative time	0 (oFF) ... 9999 (s)	
Str.t	Servomotor stroke time	5...1000 seconds	
db.S	Servomotor dead band	0...100%	
SPLL	Minimum set point value	-1999 ... SPLH	
SPLH	Maximum set point value	SPLL ... 9999	
dp	Decimal point position	0... 3	
SP 2	Set point 2	SPLL...SPLH	60
A.SP	Selection of the active set point	"SP" ... "nSP"	SP

To exit the parameter setting procedure press the key (for 3 s) or wait until the timeout expiration (about 30 seconds)

### Probe parameters configuration MODULATORE ASCON KM3

Parameter Group		inP							AL1		rEG					SP			
Parameter		Sens	dp	SSC	FSc	unit	IO4.F (**)	AL1 (***)	HAL1 (***)	Pb (***)	ti (***)	td (***)	Str.t	db.S	SPLL	SPHL	SP		
Probes			Dec Point	Scale Min	Scale Max			Off	On	p	i	d	servo time s	Band Mo.	SP Min	SP Max	Set point		
Pt1000 (130°C max)		Pt10	1			°C	on	5	10	10	350	1	*	5	30	95	80		
Pt1000 ( 350°C max)		PT10	1			°C	on	10	10	10	350	1	*	5	0	350	80		
Pt100 (130°C max)		PT1	1			°C	on	5	10	10	350	1	*	5	0	95	80		
Pt100 (350°C max)		Pt1	1			°C	on	10	10	10	350	1	*	5	0	350	80		
Pt100 (0÷100°C 4÷20mA)		4.20	1	0	100		on	5	10	10	350	1	*	5	0	95	80		
Thermocouple K (1200°C max)		crAL	0			°C	on	20	25	10	350	1	*	5	0	1200	80		
Thermocouple J (1000°C max)		J	0			°C	on	20	25	10	350	1	*	5	0	1000	80		
4-20mA / 0-1,6barPressure probe		4.20	0	0	160		on	20	20	5	120	1	*	5	0	160	100		
4-20mA / 0-10bar Pressure probe		4.20	0	0	1000		on	50	50	5	120	1	*	5	0	1000	600		
4-20mA / 0-16bar Pressure probe		4.20	0	0	1600		on	80	80	5	120	1	*	5	0	1600	600		
4-20mA / 0-25bar Pressure probe		4.20	0	0	2500		on	125	125	5	120	1	*	5	0	2500	600		
4-20mA / 0-40bar Pressure probe		4.20	0	0	4000		on	200	200	5	120	1	*	5	0	4000	600		
QBE2002 / 0-25bar Pressure probe		0.10	0	0	2500		On	125	125	5	120	1	*	5	0	2500	600		

Note:

(\*) Str.t - Servomotor stroke time

SQL33; STM30; SQM10; SQM40; SQM50; SQM54 = 30 (Seconds)

STA12B3.41; SQN30.251; SQN72.4A4A20 = 12 (Seconds)

**(\*\*) Out 4 ... on Display led °4 must be switched on, otherwise change the io4.F parameter value from "on" to "out4", confirm the value, quit the configuration mode then change again the io4.F parameter value from "out4" to "on".**







(\*\*\*) Factory settings. These values must be adapted to machine conditions


N.B. For pressure probe, SP, SPHL, SPLL parameters values are expressed in Kpa (1 bar = 100 Kpa).

## CONFIGURATION









### How to access configuration level

The configuration parameters are collected in various groups. Every group defines all parameters related with a specific function (e.g.: control, alarms, output functions).

1. Push the  button for more than 5 seconds. The upper display will show PASS while the lower display will show 0.
2. Using  and  buttons set the programmed password.  
According to the entered password, it is possible to see a part of the parameters listed in the "configuration parameters" section.
  - a. Enter "30" as password to view all the configuration parameters
  - b. Enter "20" as password to view the parameters of the "limited access level". At this point, only the parameters with attribute **Liv = A** or **Liv = O** will be editable.
  - c. Leave the password blank to edit "user level" parameters, that are identified by attribute **Liv = O**
3. Push the  button. If the password is correct the display will show the acronym of the first parameter group preceded by the symbol: . In other words the upper display will show:  inP (group of the **Input parameters**).

The instrument is in configuration mode. To press  for more than 5 seconds, the instrument will return to the "standard display".

#### Keyboard functions during parameter changing:

Operator Mode	
	When the upper display is showing a group and the lower display is blank, this key allows to enter in the selected group. When the upper display is showing a parameter and the lower display is showing its value, this key allows to store the selected value for the current parameter and access the next parameter within the same group.
	Allows to increase the value of the selected parameter.
	Allows to decrease the value of the selected parameter.
	Short presses allow you to exit the current group of parameters and select a new group. A long press terminates the configuration procedure (the instrument returns to the normal display).
 + 	These two keys allow to return to the previous group. Proceed as follows: Push the  button and maintaining the pressure, then push the  ; release both the buttons.

### Configuration Parameters

inP GROUP - input configuration					
Liv	N°	Param	Description	Values	Default
A	1	SEnS	Input type	Pt1 = RTD Pt100 Pt10 = RTD Pt1000 0.20 = 0..20mA 4.20 = 4..20mA Pressure probe 0.10 = 0..10V 2.10 = 2..10V crAL= Thermocouple K	Depends on the probe
A	2	dp	Decimal point position	0... 3	See page 7
A	3	SSc	Initial scale read-out for linear inputs (available only if SEnS parameter is not equal to Pt1, Pt10, crAL values)	-1999... 9999	0
C	4	FSc	Full scale read-out for linear input inputs (available only if SEnS parameter is not equal to Pt1, Pt10, crAL values)	-1999... 9999	Depends on the probe
C	5	unit	Unit of measure (present only in the case of temperature probe)	°C/°F	°C
C	6	Fil	Digital filter on the measured value	0 (= OFF)... 20.0 s	1.0
C	7	inE	Selection of the Sensor Out of Range type that will enable the safety output value	or = Over range ou = Under range our = over e under range	or

C	8	oPE	Safety output value	-100... 100	0
C	9	io4.F	I/O4 function selection	on = Out4 will be ever ON (used as a transmitter power supply) ,out4 = Uscita 4 (Used as digital output 4), dG2c = Digital input 2 for contact closure, dG2U = Digital input 2 driven by 12... 24 VDC	on
C	10	diF1	Digital input 1 function	oFF = Not used, 1 = Alarm reset, 2 = Alarm acknowledge (ACK), 3 = Hold of the measured value, 4 = Stand by mode, 5 = Manual mode, 6 = HEAt with SP1 and CoOL with SP2, 7 = Timer RUN/Hold/Reset, 8 = Timer Run, 9 = Timer Reset, 10 = Timer Run/Hold, 11 = Timer Run/Reset, 12 = Timer Run/Reset with lock, 13 = Program Start, 14 = Program Reset, 15 = Program Hold, 16 = Program Run/Hold, 17 = Program Run/Reset, 18 = Sequential SP selection, 19 = SP1 - SP2 selection, 20 = SP1... SP4 binary selection, 21 = Digital inputs in parallel	19
C	12	di.A	Digital Inputs Action (DI2 only if configured)	0 = DI1 direct action, DI2 direct action 1 = DI1 reverse action, DI2 direct action 2 = DI1 direct action, DI2 reverse action 3 = DI1 reverse action, DI2 reverse action	0

**Out GROUP- Output parameters**

Liv	N°	Param	Description	Values	Default
C	14	o1F	Out 1 function	AL = Alarm output	AL
C	15	o1AL	Initial scale value of the analog retransmission	-1999 ... Ao1H	1
C	18	o1Ac	Out 1 action	dir = Direct action rEU = Reverse action dir.r = Direct with reversed LED ReU.r = Reverse with reversed LED	rEU.r
C	19	o2F	Out 2 function	H.rEG = Heating output	H.rEG
C	21	o2Ac	Out 2 action	dir = Direct action rEU = Reverse action dir.r = Direct with reversed LED ReU.r = Reverse with reversed LED	dir
C	22	o3F	Out 3 function	H.rEG = Heating output	H.rEG
C	24	o3Ac	Out 3 action	dir = Direct action rEU = Reverse action dir.r = Direct with reversed LED ReU.r = Reverse with reversed LED	dir

**AL1 GROUP - Alarm 1 parameters**

Liv	N°	Param	Descrizione	Values	Default
C	28	AL1t	Tipo allarme AL1	nonE = Alarm not used LoAb = Absolute low alarm HiAb = Absolute high alarm LHAo = Windows alarm in alarm outside the windows LHAi = Windows alarm in alarm inside the	HidE

				windows SE.br = Sensor Break LoDE = Deviation low alarm (relative) HiDE = Deviation high alarm (relative) LHdo = Relative band alarm in alarm out of the band LHdi = Relative band alarm in alarm inside the band	
C	29	Ab1	Alarm 1 function	0... 15 +1 = Not active at power up +2 = Latched alarm (manual reset) +4 = Acknowledgeable alarm +8 = Relative alarm not active at set point change	0
C	30	AL1L	-- For High and low alarms, it is the low limit of the AL1 threshold; -- For band alarm, it is low alarm threshold	-1999... AL1H (E.U.)	-199.9
C	31	AL1H	-- For High and low alarms, it is the high limit of the AL1 threshold; -- For band alarm, it is high alarm threshold	AL1L... 9999 (E.U.)	999.9
O	32	AL1	AL1 threshold	AL1L... AL1H (E.U.)	See page 7
O	33	HAL1	AL1 hysteresis	1... 9999 (E.U.)	See page 7
C	34	AL1d	AL1 delay	0 (oFF)... 9999 (s)	oFF
C	35	AL1o	Alarm 1 enabling during Stand-by mode and out of range conditions	0 = Alarm 1 disabled during Stand by and out of range 1 = Alarm 1 enabled in stand by mode 2 = Alarm 1 enabled in out of range condition 3 = Alarm 1 enabled in stand by mode and in overrange condition	1

**GRUPPO AL2 - parametri allarme 2**

Liv	N°	Param	Description	Values	Default
C	36	AL2t	Alarm 2 type	nonE = Alarm not used LoAb = Absolute low alarm HiAb = Absolute high alarm LHAo = Windows alarm in alarm outside the windows LHAi = Windows alarm in alarm inside the windows SE.br = Sensor Break LoDE = Deviation low alarm (relative) HiDE = Deviation high alarm (relative) LHdo = Relative band alarm in alarm out of the band LHdi = Relative band alarm in alarm inside the band	SE.br
C	37	Ab2	Alarm 2 function	0... 15 +1 = Not active at power up +2 = Latched alarm (manual reset) +4 = Acknowledgeable alarm +8 = Relative alarm not active at set point change	0
C	42	AL2d	AL2 hysteresis	0 (oFF)... 9999 (s)	oFF
C	43	AL2o	Alarm 2 enabling during Stand-by mode and out of range conditions	0 = Alarm 2 disabled during Stand by and out of range 1 = Alarm 2 enabled in stand by mode 2 = Alarm 2 enabled in out of range condition 3 = Alarm 2 enabled in stand by mode and in overrange condition	0



AL3 Group - alarm 3 parameters					
Liv	N°	Param	Description	Values	Default
	44	AL3t	Alarm 3 type	nonE = Alarm not used LoAb = Absolute low alarm HiAb = Absolute high alarm LHAo = Windows alarm in alarm outside the windows LHAI = Windows alarm in alarm inside the windows SE.br = Sensor Break LodE = Deviation low alarm (relative) HidE = Deviation high alarm (relative) LHdo = Relative band alarm in alarm out of the band LHdi = Relative band alarm in alarm inside the band	nonE

LbA Group - Loop break alarm					
Liv	N°	Param	Descrizione	Values	Default
C	52	LbAt	LBA time	Da 0 (oFF) a 9999 (s)	oFF

rEG Group - Control parameters					
Liv	N°	Param	Description	Values	Default
C	56	cont	Control type	Pid = PID (heat and/or) On.FA = ON/OFF asymmetric hysteresis On.FS = ON/OFF symmetric hysteresis nr = Heat/Cool ON/OFF control with neutral zone 3Pt = Servomotor control (available only when Output 2 and Output 3 have been ordered as "M")	3pt
C	57	Auto	Autotuning selection	-4 = Oscillating auto-tune with automatic restart at power up and after all point change -3 = Oscillating auto-tune with manual start -2 = Oscillating -tune with auto-matic start at the first power up only -1 = Oscillating auto-tune with auto-matic restart at every power up 0 = Not used 1 = Fast auto tuning with automatic restart at every power up 2 = Fast auto-tune with automatic start the first power up only 3 = FAST auto-tune with manual start 4 = FAST auto-tune with automatic restart at power up and after set point change 5 = Evo-tune with automatic restart at every power up 6 = Evo-tune with automatic start the first power up only 7 = Evo-tune with manual start 8 = Evo-tune with automatic restart at power up and after a set point change	7
C	58	tunE	Manual start of the Autotuning	oFF = Not active on = Active	oFF

C	59	SELF	Self tuning enabling	no = The instrument does not perform the self-tuning YES = The instrument is performing the self-tuning	No
A	62	Pb	Proportional band	1... 9999 (E.U.)	See page 7
A	63	ti	Integral time	0 (oFF) ... 9999 (s)	See page 7
A	64	td	Derivative time	0 (oFF) ... 9999 (s)	See page 7
C	65	Fuoc	Fuzzy overshoot control	0.00... 2.00	1
C	69	rS	Manual reset (Integral pre-load)	-100.0... +100.0 (%)	0.0
A	70	Str.t	Servomotor stroke time	5...1000 seconds	See page 7
A	71	db.S	Servomotor dead band	0...100%	5
C	72	od	Delay at power up	0.00 (oFF) ... 99.59 (hh.mm)	oFF

**SP Group - Set point parameters**

Liv	N°	Param	Description	Values	Default
C	76	nSP	Number of used set points	1... 4	2
A	77	SPLL	Minimum set point value	-1999 ... SPHL	See page 7
A	78	SPHL	Maximum set point value	SPLL ... 9999	See page 7
O	79	SP	Set point 1	SPLL ... SPLH	See page 7
C	80	SP 2	Set point 2	SPLL ... SPLH	60
	83	A.SP	Selection of the active set point	"SP" ... "nSP"	SP
C	84	SP.rt	Remote set point type	RSP = The value coming from serial link is used as remote set point trin = The value will be added to the local set point selected by A.SP and the sum becomes the operative set point PERc = The value will be scaled on the input range and this value will be used as remote SP	trin
C	85	SPLr	Local/remote set point selection	Loc = Local rEn = Remote	Loc
C	86	SP.u	Rate of rise for POSITIVE set point change (ramp UP)	0.01... 99.99 (inF) Eng. units per minute	inF
C	87	SP.d	Rate of rise for NEGATIVE set point change (ramp DOWN)	0.01... 99.99 (inF) Eng. units per minute	inF

**PAn Group - Operator HMI**

Liv	N°	Param	Description	Values	Default
C	118	PAS2	Level 2 password (limited access level)	oFF (Level 2 not protected by password) 1... 200	20
C	119	PAS3	Level 3 password (complete configuration level)	3... 300	30
C	120	PAS4	Password livello (livello configurazione a codice)	201... 400	300
C	121	uSrb	button function during RUN TIME	nonE = No function tunE = Auto-tune/self-tune enabling. A single press (longer than 1 second) starts the auto-tune oPLo = Manual mode. The first pressure puts the instrument in manual mode (OPLO) while a second one puts the instrument in Auto mode	tunE

				AAC = Alarm reset ASi = Alarm acknowledge chSP = Sequential set point selection St.by = Stand by mode. The first press puts the instrument in stand by mode while a second one puts the instrument in Auto mode. Str.t = Timer run/hold/reset P.run = Program run P.rES = Program reset P.r.H.r = Program run/hold/reset	
C	122	diSP	Display management	Spo = Operative set point	SPo
C	123	di.cL	Display colour	0 = The display colour is used to show the actual deviation (PV - SP) 1 = Display red (fix) 2 = Display green (fix) 3 = Display orange (fix)	2
	125	diS.t	Display Timeout	-- oFF (display always ON) -- 0.1... 99.59 (mm.ss)	oFF
C	126	fiLd	Filter on the displayed value	-- oFF (filter disabled) -- From 0.0 (oFF) to 20.0 (E.U.)	oFF
C	128	dSPu	Instrument status at power ON	AS.Pr = Starts in the same way it was prior to the power down Auto = Starts in Auto mode oP.0 = Starts in manual mode with a power output equal to zero St.bY = Starts in stand-by mode	Auto
C	129	oPr.E	Operative modes enabling	ALL = All modes will be selectable by the next parameter Au.oP = Auto and manual (OPLO) mode only will be selectable by the next parameter Au.Sb = Auto and Stand-by modes only will be selectable by the next parameter	ALL
C	130	oPEr	Operative mode selection	If oPr.E = ALL: - Auto = Auto mode - oPLo = Manual mode - St.bY = Stand by mode If oPr.E = Au.oP: - Auto = Auto mode - oPLo = Manual mode If oPr.E = Au.Sb: - Auto = Auto mode - St.bY = Stand by mode	Auto

**SEr Group - Serial link parameter**

Liv	N°	Param	Description	Values	Default
C	131	Add	Instrument address	-- oFF -- 1... 254	1
C	132	bAud	baud rate	1200 = 1200 baud 2400 = 2400 baud 9600 = 9600 baud 19.2 = 19200 baud 38.4 = 38400 baud	9600
C	133	trSP	Selection of the value to be retransmitted (Master)	nonE = Retransmission not used (the instrument is a slave) rSP = The instrument becomes a Master and retransmits the operative set point PErc = The instrument become a Master and it retransmits the power output	nonE

con Group - Consumption parameters					
Liv	N°	Param	Description	Values	Default
C	134	Co.tY	Count type	oFF = Not used 1 = Instantaneous power (kW) 2 = Power consumption (kW/h) 3 = Energy used during program execution. This measure starts from zero when a program runs end stops at the end of the program. A new program execution will reset the value 4 = Total worked days: number of hours the instrument is turned ON divided by 24. 5 = Total worked hours: number of hours the instrument is turned ON. 6 = Total worked days with threshold: number of hours the instrument is turned ON divided by 24, the controller is forced in stand-by when Co.ty value reaches the threshold set in [137] h.Job. 7 = Total worked hours with threshold: number of hours the instrument is turned ON, the controller is forced in stand-by when Co.ty value reaches the threshold set in [137] h.Job. 8 = Totalizer of control relay worked days: number of hours the control relay has been in ON condition, divided by 24. 9 = Totalizer of control relay worked hours: number of hours the control relay has been in ON condition. 10 = Totalizer of control relay worked days with threshold: number of hours the control relay has been in ON condition divided by 24, the controller is forced in stand-by when Co.ty value reaches the threshold set in [137] h.Job. 11 = Totalizer of control relay worked hours with threshold: number of hours the control relay has been in ON condition, the controller is forced in stand-by when Co.ty value reaches the threshold set in [137] h.Job.	oFF
C	138	t.Job	Worked time (not resettable)	0... 9999 days	0

cAL Group - User calibration group					
Liv	N°	Param	Description	Values	Default
C	139	AL.P	Adjust Low Point	From -1999 to (AH.P - 10) in engineering units	0
C	140	AL.o	Adjust Low Offset	-300... +300 (E.U.)	0
C	141	AH.P	Adjust High Point	From (AL.P + 10) to 9999 engineering units	999.9
C	142	AH.o	Adjust High Offset	-300... +300	0

## OPERATIVE MODES

When the instrument is powered, it starts immediately to work according to the parameters values loaded in its memory. The instrument behaviour and its performance are governed by the value of the stored parameters.

At power ON the instrument can start in one of the following mode depending on its configuration:

**Automatic Mode** In Automatic mode the instrument drives automatically the control output according to the parameter value set and the set point/measured value.

**Manual Mode (OPLO):** In Manual mode the the upper display shows the measured value while the lower display shows the power output The lower display shows the power output [preceded by H (for heating) or C (for cooling)], MAN is lit and the instrument allows you to set manually the control output power. No Automatic action will be made.






**Stand by Mode (St.bY):** In stand-by mode the instrument operates as an indicator. It will show on the upper display the measured value and on the lower display the set point alternately to the "St.bY" messages and forces the control outputs to zero.

We define all the above described conditions as "Standard Display".

As we have seen, it is always possible to modify the value assigned to a parameter independently from the operative modes selected.



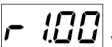

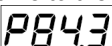



## AUTOMATIC MODE

Keyboard function when the instrument is in Auto mode:

Modo Operatore	
	Allows entry into parameter modification procedures
	Allows you to start the "Direct set point modification" function (see below).
	Allows you to display the "additional informations" (see below).
	Performs the action programmed by [121] uSrb (  button function during RUN TIME) parameter

### Additional information

This instrument is able to show you some additional informations that can help you to manage your system. The additional informations are related to how the instrument is programmed, hence in many cases, only part of this information is available.

1. When the instrument is showing the "standard display" push  button. The lower display will show H or c followed by a number. This value is the current power output applied to the process. The H show you that the action is a Heating action while the "c" show you that the action is a Cooling action
2. Push  button again. When the programmer is running the lower display will show the segment currently performed and the Event status as shown below:  
 where the first character can be r for a ramp or S for a soak, the next digit show the number of the segment (e.g. S3 means Soak number 3) and the twoless significant digits (LSD) show you the status of the two event (the LSD is the Event 2)..
3. Push  button again. When the programmer is running the lower display will show the theoretical remaining time to the end of the program preceded by a "P" letter:  

4. Push  button again. When the wattmeter function is running the lower display will show U followed by the measured energy..
5. Push  button. When the "Worked time count" is running the lower display will show "d" for days or "h" for hours followed by the measured time.
6. Push  button. The instrument returns to the "standard display".

Note: The additional information visualization is subject to a time out. If no button is pressed for more than 10 second the instrument comes automatically back to the Standard display..

**Direct set point modification**

This function allows to modify rapidly the set point value selected by [83] A.SP (selection of the active Set point) or to the set point of the segment group (of the programmer) currently in progress.

1. Push  button. The upper display shows the acronym of the selected set point (e.g. SP2) and the lower display will show its value.
2. By  and  buttons, assign to this parameter the desired value
3. Do not push any button for more than 5 second or push the  button. In both cases the instrument memorize the new value and come back to the “standard display”.

**Manual mode**

This operative mode allows you to deactivate automatic control and manually program the percentage power output to the process. When the instrument is in manual mode, the upper display shows the measured value while the lower display shows the power output [preceded by H (for heating action) or C (for cooling action)] The MAN LED is lit. When manual control is selected, the instrument will start to operate with the same power output as the last one supplied by automatic mode and can be modified using the  and  buttons.

In case of ON/OFF control, 0% corresponds to the deactivated output while any value different from 0 corresponds to the activated output. As in the case of visualization, the programmable values range from H100 (100% output power with reverse action) to C100 (100% output power with direct action).

**Notes:**

- During manual mode, the alarms are operative.
- If you set manual modes during program execution, the program will be frozen and it will restart when the instrument will come back to Auto mode.
- If you set manual modes during self-tune execution, the self- tune function will be aborted.
- During manual mode, all functions not related with the control (wattmeter, independent timer, “worked time”, etc) continue to operate normally..

**STAND-BY MODE**

This operative mode also deactivates the automatic control but forces the control output to zero. In this mode the instrument operates as an indicator. When the instrument is in stand by mode the upper display will show the measured value while the lower display will show alternately the set point and the message “St.bY”.

**Notes:**

- During stand by mode, the relative alarms are disabled while the absolute alarms are operative or not according to the ALxo (Alarm x enabling during Stand-by mode) parameter setting.
- If you set stand by mode during program execution, the program will be aborted.
- If you set stand by mode during self-tune execution, the self- tune function will be aborted.
- During stand by mode, all functions not related with the control (wattmeter, independent timer, “worked time”, etc) continue to operate normally.
- When the instrument is swapped from stand by to auto modes, the instrument will start automatically the alarm masking, the soft start functions and the auto-tune (if programmed).

**AUTOTUNE (EVOTUNE)**

Evotune is a fast and fully automatic procedure that can be started in any condition, regardless the deviation from SP. The controller selects automatically the best tune method and computes the optimum PID parameters. To activate Evotune press  button for 3 seconds.

## ERROR MESSAGES

The upper display shows the OVER-RANGE and UNDERRANGE conditions with the following indications:

Over-range: 

Under-range 

The sensor break will be signalled as an out of range: - - - -

Note: When an over-range or an under-range is detected, the alarms operate as in presence of the maximum or the minimum measurable value respectively.

To check the out of span Error condition, proceed as follows:

1. Check the input signal source and the connecting line.
2. Make sure that the input signal is in accordance with the instrument configuration. Otherwise, modify the input configuration.
3. If no error is detected, send the instrument to your supplier to be checked.

### List of possible errors

**ErAT** Fast Auto-tune cannot start. The measure value is too close to the set point. Push the button in order to delete the error message.

**ouLd** Overload on the out 4. The messages shows that a short circuit is present on the Out 4 when it is used as output or as a transmitter power supply. When the short circuit disappears the output restart to operate..

**NoAt** Auto-tune not finished within 12 hours.

**ErEP** Possible problem of the instrument memory. The messages disappears automatically. When the error continues, send the instrument to your supplier.

**RonE** Possible problem of the firmware memory. When this error is detected, send the instrument to your supplier.

**Errt** Possible problem of the calibration memory. When this error is detected, send the instrument to your supplier.

## FACTORY RESET

Sometime, e.g. when you re-configure an instrument previously used for other works or from other people or when you have made too many errors during configuration and you decided to re-configure the instrument, it is possible to restore the factory configuration. This action allows to put the instrument in a defined condition (the same it was at the first power ON).

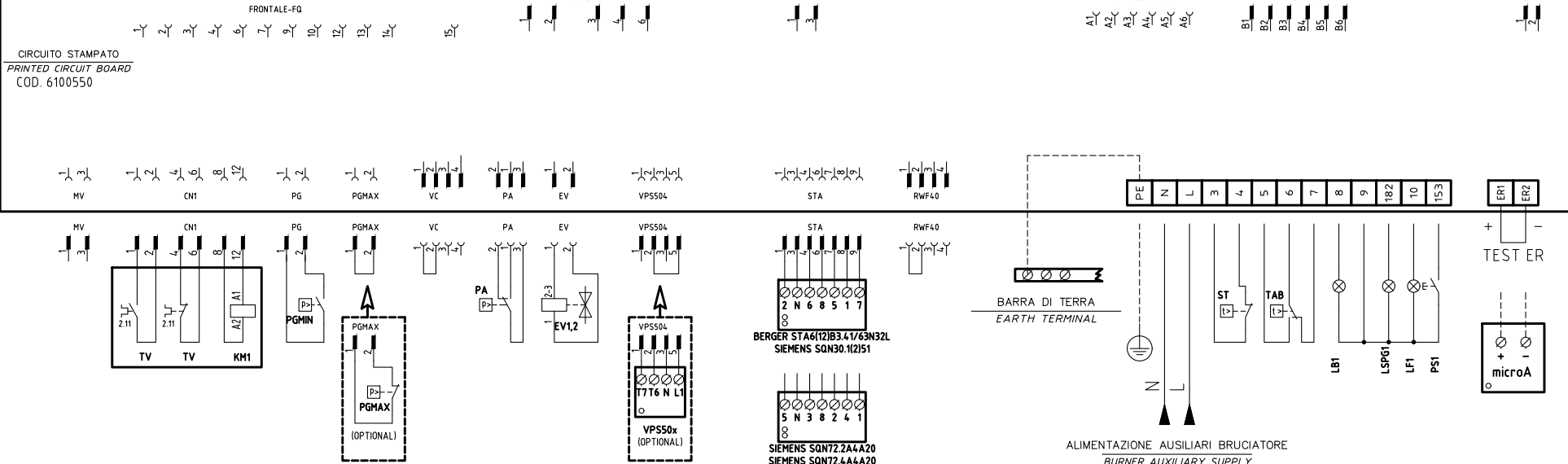
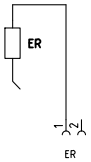
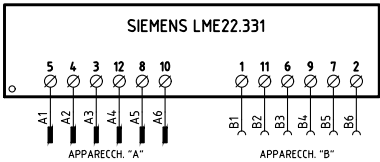
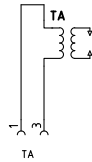
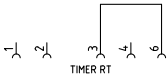
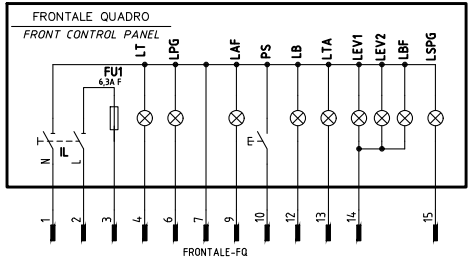
The default data are those typical values loaded in the instrument prior to ship it from factory. To load the factory default parameter set, proceed as follows:

1. Press the  button for more than 5 seconds. The upper display will show PASS while the lower display shows 0;
2. Using  and  buttons set the value -481;
3. Push  button;
4. The instrument will turn OFF all LEDs for a few seconds, then the upper display will show dFLt (default) and then all LEDs are turned ON for 2 seconds. At this point the instrument restarts as for a new power ON.

The procedure is complete.

Note: The complete list of the default parameters is available in Chapter "Configuration".

VERSIONE ALTA-BASSA FIAMMA "AB" / PROGRESSIVO "PR"  
"AB" HIGH-LOW / "PR" PROGRESSIVE VERSION



ALIMENTAZIONE AUSILIARI BRUCIATORE  
BURNER AUXILIARY SUPPLY

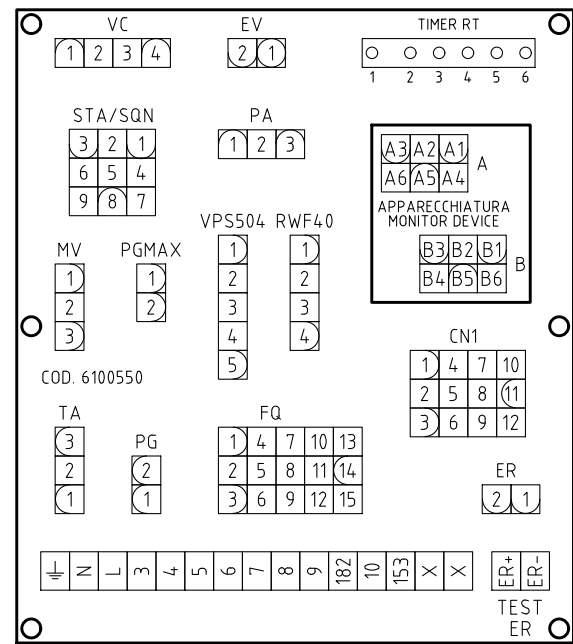
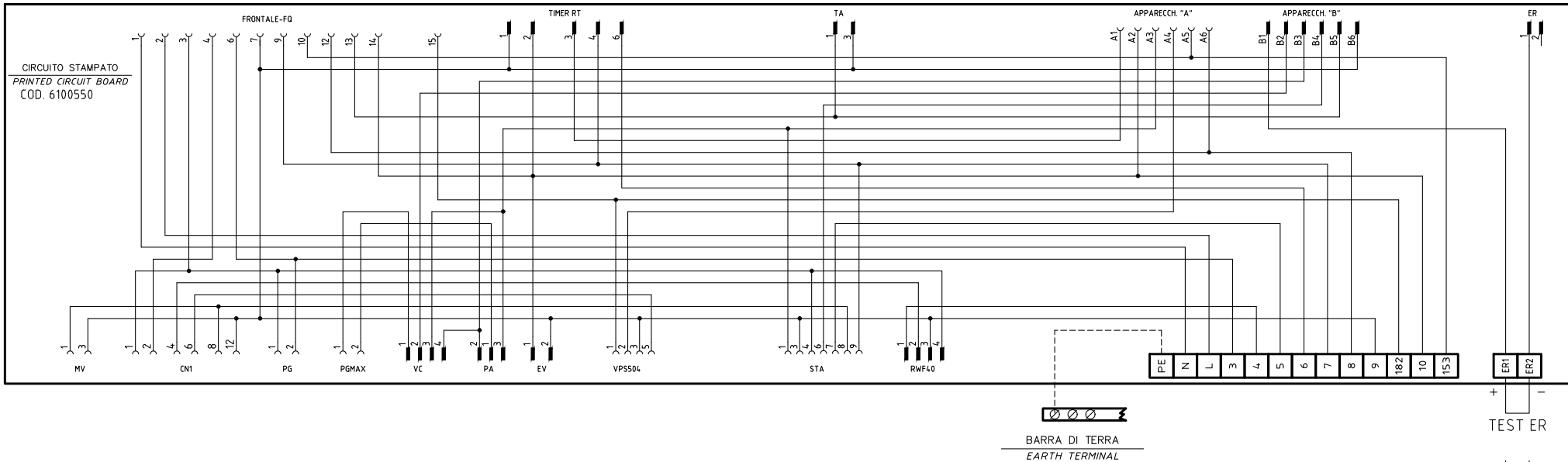
VEDI FOGLIO [3]  
SEE SHEET [3]

REV.	MODIFICA	DATA	FIRME
03	MODULATOR UPDATE	10/09/14	U. PINTON
02	AGGIUNTO/ADDED RWF40.0xx	07/03/14	U. PINTON
01	AGGIUNTO/ADDED "600V"	20/06/12	U. PINTON

	Impianto TIPI/TYPES P61 ÷ P73/LX60/LX65/LX72 MODELLO x-.AB(PR)(MD).x.xx.A.xx	Ordine		Data 18/01/2012	PREC. /	FOGLIO 1
	Descrizione VERSIONE "MD" CON RWF5x.xx / 600V / KM3 E SMA+SMF VERSION "MD" WITH RWF5x.xx / 600V / KM3 AND SMA+SMF	Commessa	Data Controllato 10/09/2014	Revisione 03	SEGUE 2	TOTALE 5
		Esecutore U. PINTON	Controllato E. CAVALLI	Dis. N. 18 - 0236		







SERVOCOMANDO SERRANDA ARIA  
AIR DAMPER ACTUATOR  
BERGER STA6(12)B3.41/63N32L

ST2 ALTA FIAMMA  
HIGH FLAME

ST0 SOSTA  
STAND-BY

ST1 BASSA FIAMMA  
LOW FLAME

MV NON USATA  
NOT USED

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)  
AIR DAMPER ACTUATOR (ALTERNATIVE)  
SIEMENS SQN30.1(2)51A

I ALTA FIAMMA  
HIGH FLAME

II SOSTA  
STAND-BY

III BASSA FIAMMA  
LOW FLAME

V NON USATA  
NOT USED

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)  
AIR DAMPER ACTUATOR (ALTERNATIVE)  
SIEMENS SQN72.xA4A20

I (ROSSO)  
I (RED) ALTA FIAMMA  
HIGH FLAME

II (BLU)  
II (BLUE) SOSTA  
STAND-BY

III (ARANCIO)  
III (ORANGE) BASSA FIAMMA  
LOW FLAME

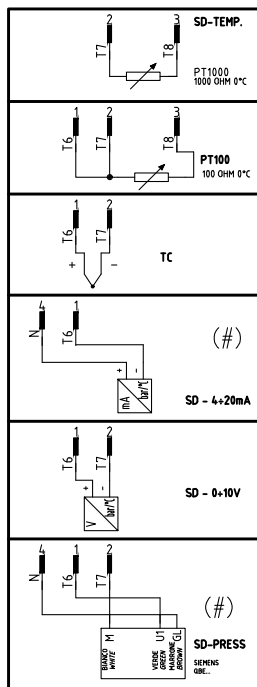
IV (NERO)  
IV (BLACK) NON USATA  
NOT USED

Data	18/01/2012	PREC.	FOGLIO
Revisione	03	2	3
Dis. N.	18 - 0236	SEGUE	TOTALE
		4	5

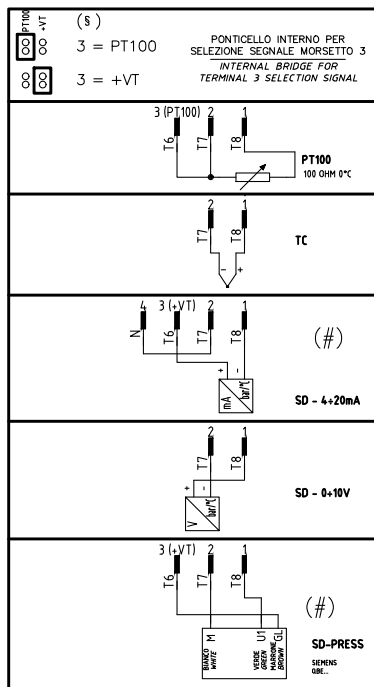
(××)

ATTENZIONE COLLEGAMENTO SONDE CON CONNETTORE 7 POLI  
WARNING PROBE CONNECTION WITH 7 PINS CONNECTOR

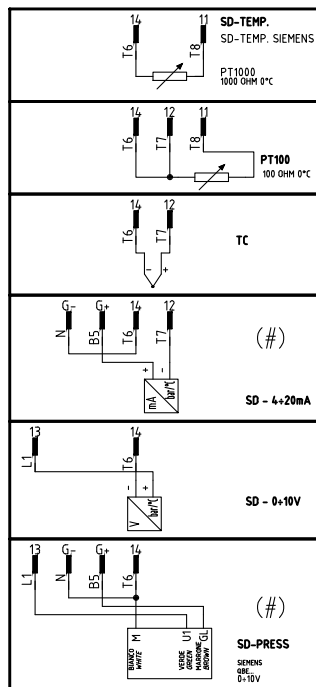
### KM3 HCRMMD



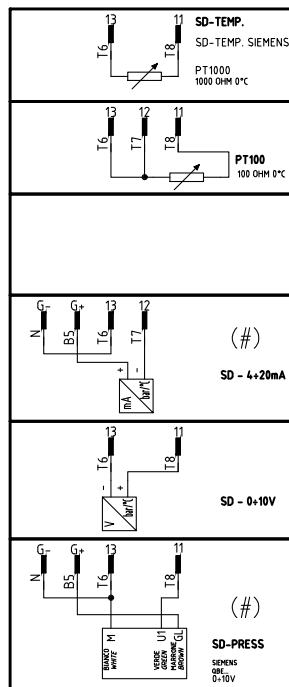
### 600V RRR0-1-T73



### RWF55.5x

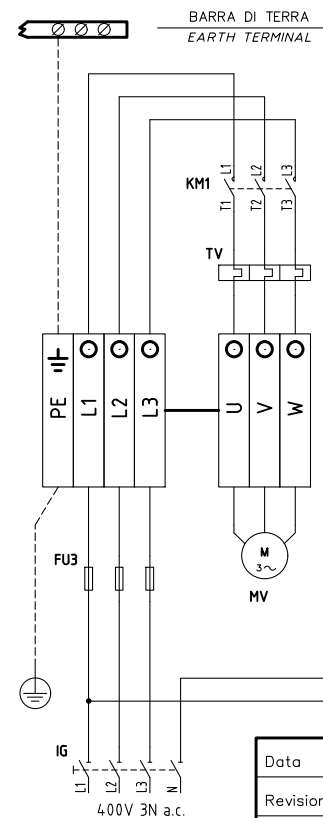


### RWF50.2x



(#)  
COLLEGAMENTO SOLO PER  
TRASDUTTORI PASSIVI  
TRANSDUCER PASSIVE  
CONNECTION ONLY

QG - MC1  
MORSETTIERA COLLEGAMENTO LINEA E MOTORE TRIFASE  
MOTOR THREE PHASES AND ELECTRIC SUPPLY CONNECTION TERMINAL BOARD



VEDI FOGLIO [1 / 2]  
SEE SHEET [1 / 2]

ALIMENTAZIONE AUSILIARI BRUCIATORE  
BURNER AUXILIARY SUPPLY

Data	18/01/2012	PREC.	FOGLIO
Revisione	03	3	4
Dis. N.	18 - 0236	SEGUE	TOTALE
		5	5

Sigla/Item	Funzione	Function
600V RRR0-1-T73	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)
BERGER STA6(12)B3.41/63N32L	SERVOCOMANDO SERRANDA ARIA	AIR DAMPER ACTUATOR
ER	ELETTRODO RILEVAZIONE FIAMMA	FLAME DETECTION ELECTRODE
EV1,2	ELETTROVALVOLE GAS (O GRUPPO VALVOLE)	GAS ELECTRO-VALVES (OR VALVES GROUP)
FU1	FUSIBILE DI LINEA	LINE FUSE
FU2	FUSIBILE AUSILIARIO	AUXILIARY FUSE
FU3	FUSIBILI LINEA MOTORE VENTILATORE	FAN MOTOR LINE FUSES
FU4	FUSIBILE DI LINEA	LINE FUSE
IB	INTERRUTTORE LINEA BRUCIATORE	BURNER LINE SWITCH
IG	INTERRUTTORE GENERALE	MAINS SWITCH
IL	INTERRUTTORE LINEA AUSILIARI	AUXILIARY LINE SWITCH
KM1	CONTATTORE MOTORE VENTILATORE	FAN MOTOR CONTACTOR
KM3 HCRMMD	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)
LAF	LAMPADA SEGNALE ALTA FIAMMA BRUCIATORE	BURNER IN HIGH FLAME INDICATOR LIGHT
LB	LAMPADA SEGNALE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT
LB1	LAMPADA SEGNALE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT
LBF	LAMPADA SEGNALE BASSA FIAMMA BRUCIATORE	BURNER IN LOW FLAME INDICATOR LIGHT
LEV1	LAMPADA SEGNALE APERTURA [EV1]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV1]
LEV2	LAMPADA SEGNALE APERTURA [EV2]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV2]
LF1	LAMPADA SEGNALE FUNZIONAMENTO BRUCIATORE	INDICATOR LIGHT BURNER OPERATION
LPG	LAMPADA SEGNALE PRESENZA GAS IN RETE	INDICATOR LIGHT FOR PRESENCE OF GAS IN THE NETWORK
LSPG	LAMPADA SEGNALE BLOCCO CONTROLLO TENUTA VALVOLE	INDICATOR LIGHT FOR LEAKAGE OF VALVES
LSPG1	LAMPADA SEGNALE BLOCCO CONTROLLO TENUTA VALVOLE	INDICATOR LIGHT FOR LEAKAGE OF VALVES
LT	LAMPADA SEGNALE BLOCCO TERMICO	INDICATOR LIGHT FOR MOTOR OVERLOAD THERMAL CUTOUT
LTA	LAMPADA SEGNALE TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER INDICATOR LIGHT
MV	MOTORE VENTILATORE	FAN MOTOR
PA	PRESSOSTATO ARIA	AIR PRESSURE SWITCH
PGMAX	PRESSOSTATO GAS DI MASSIMA PRESSIONE	MAXIMUM PRESSURE GAS SWITCH
PGMIN	PRESSOSTATO GAS DI MINIMA PRESSIONE	MINIMUM GAS PRESSURE SWITCH
PS	PULSANTE SBLOCCO FIAMMA	FLAME UNLOCK BUTTON
PS1	PULSANTE SBLOCCO FIAMMA	FLAME UNLOCK BUTTON
PT100	SONDA DI TEMPERATURA	TEMPERATURE PROBE
RWF50.2x	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)
RWF55.5x	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)
SD-PRESS	SONDA DI PRESSIONE	PRESSURE PROBE
SD-TEMP.	SONDA DI TEMPERATURA	TEMPERATURE PROBE
SD - 0÷10V	TRASDUTTORE USCITA IN TENSIONE	TRANSDUCER VOLTAGE OUTPUT
SD - 4÷20mA	TRASDUTTORE USCITA IN CORRENTE	TRANSDUCER CURRENT OUTPUT
SIEMENS LME22.331	APPARECCHIATURA CONTROLLO FIAMMA	CONTROL BOX
SIEMENS SQN30.1(2)51	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER ACTUATOR (ALTERNATIVE)
SIEMENS SQN72.2A4A20	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER ACTUATOR (ALTERNATIVE)
SIEMENS SQN72.4A4A20	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER ACTUATOR (ALTERNATIVE)
SMA	SELETTORE MANUALE/AUTOMATICO	MANUAL/AUTOMATIC SWITCH
SMF	SELETTORE MANUALE FUNZIONAMENTO MIN-0-MAX	MIN-0-MAX MANUAL OPERATION SWITCH
ST	SERIE TERMOSTATI/PRESSOSTATI	SERIES OF THERMOSTATS OR PRESSURE SWITCHES
TA	TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER
TAB	TERMOSTATO/PRESSOSTATO ALTA-BASSA FIAMMA	HIGH-LOW THERMOSTAT/PRESSURE SWITCHES
TC	TERMOCOPPIA	THERMOCOUPLE
TS	TERMOSTATO/PRESSOSTATO DI SICUREZZA	SAFETY THERMOSTAT OR PRESSURE SWITCH
TV	TERMICO MOTORE VENTILATORE	FAN MOTOR THERMAL
VPS50x	CONTROLLO DI TENUTA VALVOLE GAS (OPTIONAL)	GAS PROVING SYSTEM (OPTIONAL)
microA	MICROAMPEROMETRO	MICROAMMETER

Data	18/01/2012	PREC.	FOGLIO
Revisione	03	4	5
Dis. N.	18 - 0236	SEGUE	TOTALE
		/	5