

**PBY90 - PBY91** 

**PBY92 - PBY93** 

PBY510 - PBY515

PBY520 - PBY525

# Progressive, Fully-modulating Heavy oil Burners with pneumatic atomization (LMV2x/3x micro-processor control)

MANUAL OF INSTALLATION - USE - MAINTENANCE



BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

#### 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 cutout 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.

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
- For all the units that have been modified or have options fitted then original accessory equipment only shall be used.
- 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 circustances 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 firebox.
- 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;
- 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, reser 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 saftey 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:

- 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

- 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

- -2009/142/EC (Gas Directive)
- -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 house hold 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 house hold 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);

#### **National Standard**

-UNI 7824 (Atomizing burners of the monobloc type. Characteristics and test methods)

#### 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 house hold 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);

#### Norme nazionali / National Standard

-UNI 7824 (Atomizing burners of the monobloc type. Characteristics and test methods.

#### Gas - Light oil burners

#### **European Directives**

- -2009/142/EC (Gas Directive)
- -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 house hold 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);

#### Norme nazionali / National Standard

-UNI 7824 (Atomizing burners of the monobloc type. Characteristics and test methods.

#### Gas - Heavy oil burners

#### **European directives:**

- -2009/142/EC (Gas Directive)
- -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 house hold 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);

#### **National Standard**

 - UNI 7824 (Atomizing burners of the monobloc type. Characteristics and test methods.

#### Industrial burners

#### **European directives**

- -2009/142/EC (Gas Directive)
- -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 house hold 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

Гуре	
Model	
Year	
S.Number	
Output	
Oil Flow	
Fuel	
Category	
Gas Pressure	
√iscosity	
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!** 

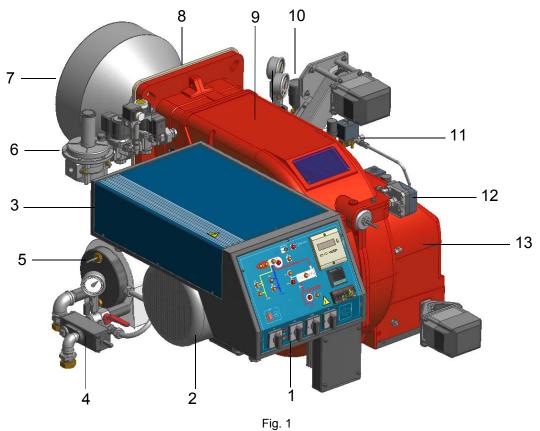
Failure to observe the warning may result in electric shock with lethal consequences

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

#### **PART I: SPECIFICATIONS**

# **GENERAL FEATURES**

This particular burner series has been studied to use compressed air or alternatively steam, to atomize heavy oil. In this way we have achieved higher efficiency compared to mechanical atomization. These burners are equipped with a low pressure nozzle which permits to save fuel and, above all, to preserve the whole system. All burners are progressive type, complete with electrical panel, with self cleaning nozzle system and oil pump motor to be separately installed by the final user. A supplying system of compressed air and steam at 8 bar must be provided on the site. All burners are ignited by means of a pilot flame burning LPG or Natural gas. The standard version of the burner uses compressed air to atomize oil fuel. If compressed air is not available on site, it is possible to use steam to atomise oil fuel by using a special kit. In any case compressed air is essential: to ignite the burner when steam is not available, to control valves and for self cleaning nozzle.



Note: the figure is indicative only.

- 1 Control panel
- 2 Fan motor
- 3 Electrical panel
- 4 Pressure governor
- 5 Oil pre-heater tank
- 6 Pilot gas train
- 7 Blast tube-combustion head
- 8 Burner flange
- 9 Burner cover
- 10 Oil train
- 11 Compressed air train
- 12 Air pressure switch
- 13 Air inlet

# **Burner model identification**

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

Type PBY90 Model H-. PR. S. A. EA. (1) (2) (3) (4) (5) (6) (7)

(1) BURNER TYPE	PBY90, PBY91, PBY92,	PBY93, PBY510, PBY515, PBY520, PBY525
(2) FUEL	H - heavy oil, max viscosi	ity 4000cSt (530°E) @ 50°C
(3) OPERATION (Available versions)	PR - Progressive	MD - Fully modulating
(4) BLAST TUBE	S - Standard	L - Extended
(5) DESTINATION COUNTRY	* - see data plate	
(6) BURNER VERSION	A - Standard	
(6) MICRO-PROCESSOR CONTROL	EA = micro-processor cor	
(0) WIGNO-I NOCESSON CONTROL	EB = micro-processor cor	ntrol, with inverter

# **Technical Specifications**

BURNER		PBY90	PBY91	PBY92	PBY93		
Output	min ÷ max kW	670 - 2000	500 - 2500	700 - 3000	900 - 3700		
Fuel		Heavy oil					
Oil viscosity		;	See "Burner model	l identification" table	е		
Heavy oil rate	min. ÷ max. kg/h	60 - 178	45 - 223	62 - 267	80 - 330		
Gas pressure	max. mbar		5	00			
Gas pressure after gas governor	mbar		1	00			
Compressed air pressure	min. ÷ max. bar		4 -	- 10			
Power supply		400V 3N a.c. 50Hz					
Total power consumption (with Cucchi Pump)	kW	12.25	13.25	18.75	26.75		
Total power consumption (with Kral Pump)	kW	11.87	12.87	18.55	26.55		
Fan motor	kW	3	4	5.5	7.5		
Pump motor (Cucchi)	kW	0.75	0.75	0.75	0.75		
Pump motor (Kral)	kW	0.37	0.37	0.55	0.55		
Pre-heater resistors	kW	8	8	12	18		
Protection			IP	240			
Approx. weight	kg	165	175	185	195		
Operation		Progressive - Fully modulating					
Operating temperature	°C	-10 ÷ +50					
Storage Temperature	°C		-20 -	÷ +60			
Working service*			Interr	mittent			

Heavy oil net calorific value (Hi): 40.43 MJ/kg (average value).

**WARNING:** the burners are supplied for 400V three phase supply; in case of three phase 230V supply, replace the thermal overload relays. Maximum output is referred to a null backpressure in the furnace.

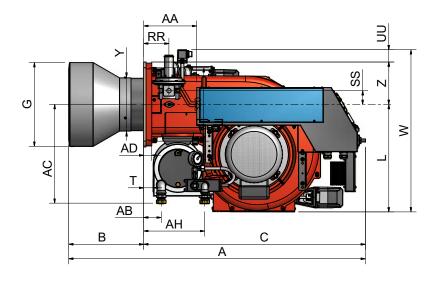
<sup>\*</sup> NOTE ON THE WORKING SERVICE: the control box automatically stops after 24h of continuous working. The control box immediately starts up, automatically.

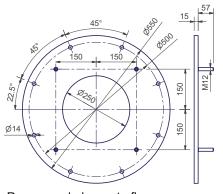
BURNER		PBY510	PBY515	PBY520	PBY525			
Output	min ÷ max kW	1100 - 5000	1200 - 6000	1200 - 6500	1800 - 7300			
Fuel			Heavy oil					
Oil viscosity		!	See "Burner model identification" table					
Heavy oil rate	min. ÷ max. kg/h	98 - 446	107 - 535	107 - 579	160 - 651			
Gas pressure	max. mbar		5	00	•			
Gas pressure after gas governor	mbar		1	00				
Compressed air pressure	min. ÷ max. bar		4 -	- 10				
Power supply		400V 3N a.c. 50Hz						
Total power consumption (with Cucchi Pump)	kW	26.75	30.25	40.25	43.75			
Total power consumption (with Kral Pump)	kW	26.55	30.05	40.05	43.55			
Fan motor	kW	7.5	11	15	18.5			
Pump motor (Cucchi)	kW	0.75	0.75	0.75	0.75			
Pump motor (Kral)	kW	0.55	0.55	0.55	0.55			
Pre-heater resistors	kW	18	18	24	24			
Protection			IF	40				
Approx. weight	kg	230	240	250	260			
Operation			Progressive - I	ully modulating				
Operating temperature	°C		-10	÷ +50				
Storage Temperature	°C		-20	÷ +60				
Working service*			Interi	mittent				

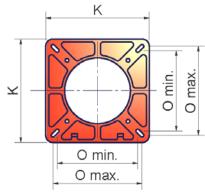
Heavy oil net calorific value (Hi): 40.43 MJ/kg (average value).

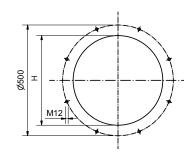
**WARNING:** the burners are supplied for 400V three phase supply; in case of three phase 230V supply, replace the thermal overload relays. Maximum output is referred to a null backpressure in the furnace.

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









Reccomended counterflange

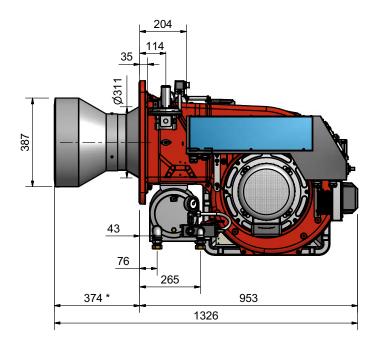
Burner flange

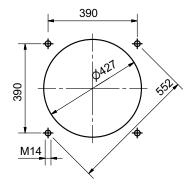
boiler recommended drilling template

PBY90, PBY91, PBY92, PBY93: A COUNTERFLANGE IS MANDATORY:a gasket must be placed between the generator and the counterflange

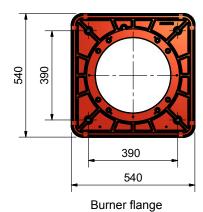
	Α	AA	AD	АН	AI	В	вв	С	СС	D	E	F	G	Н	K	L	М	O min	O max	RR	SS	Т	тт	UU	w	Υ	Z
PBY90	1282	237	35	266	497	318	455	964	525	1158	647	510	306	346	360	468	M12	280	310	110	60	41	495	53	707	228	185
PBY91	1285	237	35	266	497	321	455	964	525	1158	647	510	324	364	360	468	M12	280	310	110	60	41	495	53	707	228	185
PBY92	1291	237	35	266	497	327	455	964	525	1158	647	510	365	405	360	468	M12	280	310	110	60	41	495	53	707	228	185
PBY93	1291	237	35	266	497	327	455	964	525	1158	647	510	365	405	360	468	M12	280	310	110	60	41	495	53	707	239	185

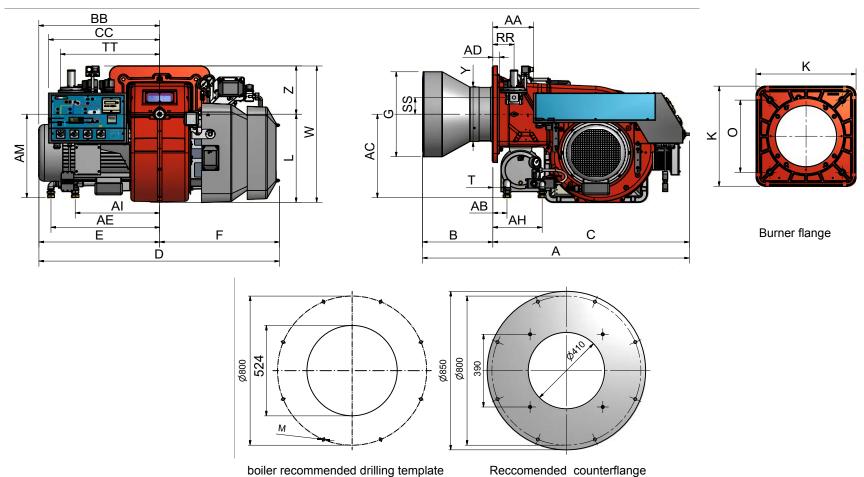
С





boiler recommended drilling template





# A COUNTERFLANGE IS MANDATORY:a gasket must be placed between the generator and the counterflange

	A (AS)	A (AL)	AA	AB	AD	AE	АН	Al	AM	B (BS)	B (BL)	BB	С	CC	D	E	F	G	K	L	M	0	RR	SS	T	TT	Υ	W	Z
PBY515	1331	1511	204	76	35	584	265	454	466	378	558	517	953	570	1249	605	644	474	540	492	M16	390	114	93	43	535	329	761	270
PBY520	1331	1511	204	76	35	584	265	454	466	378	558	517	953	570	1249	605	644	474	540	492	M16	390	114	93	43	535	329	761	270
PBY525	1434	1614	219	76	35	584	265	454	466	378	558	650	1056	597	1293	649	644	474	540	492	M16	390	114	93	43	535	329	761	270

<sup>\*</sup>S = measure referred to burner fitted with standard blast tube

<sup>\*</sup>L = measure referred to burner fitted with extended blast tube

to the tank

BY OTHERS

BY BURNER CONSTRUCTOR

$\sim$	
-	

46 47

48

3I2D-03	LEGEND		
rev.4 POS	OIL TRAIN		COMPRESSED AIR TRAIN (PURGE)
1	Filter	50	Pressure governor with filter
2	Pump with electromotor	51	Pressure gauge
3	Flexible hose	52	Solenoid valve
4	Maual valve	53	One-way valve
5	Pressure gauge		PILOT GAS TRAIN
6	Pressure governor	71	Pressure governor with filter
7	Maual valve	72	Pressure switch
8	Thermostat	73	Solenoid valve
9	Low thermostat	74	Flexible hose
10	High thermostat	75	Pilot burner
11	Electrical preheater tank	76	Pressure governor for L.P.G. tank
12	Temperature probe	77	Manual valve
13	Temperature probe	78	Pressure gauge
14	Temperature probe	79	L.P.G. tank
15	Temperature gauge		COMBUSTION AIR TRAIN
16	Pneumatic valve	80	Air damper
17	Metering valve with servomotor	81	Actuator
18	Actuator	82	Remote draught fan with electromotor
19	Maual valve	83	Pressure switch - PA
20	Pressure gauge	86	Burner
21	Flexible hose		
	COMPRESSED AIR TRAIN (ATOMIZATION)		
40	Pressure governor with filter		
41	Pressure gauge		
42	Solenoid valve		
43	Pressure switch		
44	One-way valve		
45	Metering valve		
46	Manual valve		

The following items are out of CIB UNIGAS scope of supply NOTE

77 - 78 - 79

Flexible hose

Pressure gauge

#### How to read the burner "Performance curve"

To check if the burner is suitable for the boiler to which it must be installed, the following parameters are needed:

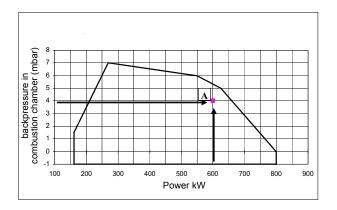
- furnace input, in kW or kcal/h (kW = kcal/h / 860);
- backpressure (data are available on the boiler ID plate or in the user's manual).

Example:

Furnace input: 600kW Backpressure: 4mbar

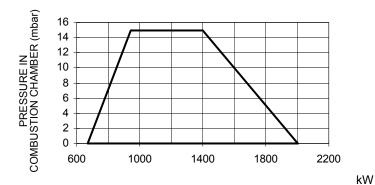
In the "Performance curve" diagram, draw a vertical line matching the furnace input value and an horizontal line matching the backpressure value. The burner is suitable if the intersection point A is inside the performance curve.

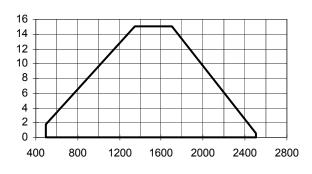
Data are referred to standard conditions: atmospheric pressure at 1013mbar, ambient temperature at 15°C.

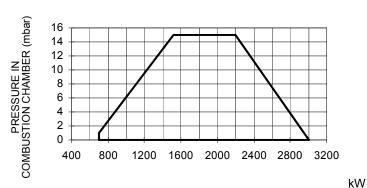


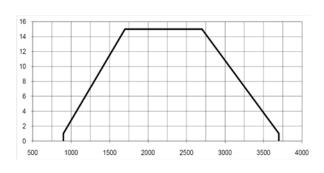
# Performance Curves

**NOTE:** The performance curve is a diagram that represents the burner performance in the type approval phase or in the laboratory tests, but does not represent the regulation range of the machine. On this diagram the maximum output point is usually reached by adjusting the combustion head to its "MAX" position (see paragraph "Adjusting the combustion head"); the minimum output point is reached setting the combustion head to its "MIN" position. During the first ignition, the combustion head is set in order to find a compromise between the burner output and the generator specifications, that is why the minimum output may be different from the Performance curve minimum.

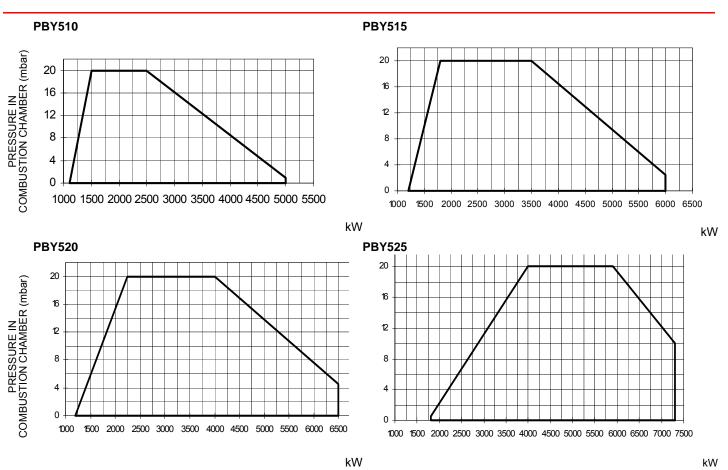








kW



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.

**NOTE:** The performance curve is a diagram that represents the burner performance in the type approval phase or in the laboratory tests, but does not represent the regulation range of the machine. On this diagram the maximum output point is usually reached by adjusting the combustion head to its "MAX" position (see paragraph "Adjusting the combustion head"); the minimum output point is reached setting the combustion head to its "MIN" position. During the first ignition, the combustion head is set in order to find a compromise between the burner output and the generator specifications, that is why the minimum output may be different from the Performance curve minimum.

#### **PART II: INSTALLATION**

# MOUNTING AND CONNECTING THE BURNER

# **Packing**

Burners are despatched in wooden crates whose dimensions are:

- PBY90-91-92-93: 1730 mm x 1280 mm x 1020 mm(L x P x H)
- PBY510-515-520-525: 1730 mm x 1430 mm x 1130 mm(L x P x H)

Packing cases of this kind are affected by humidity and are not suitable for stacking. The following are placed in each packing case:

- burner
- gasket/ceramic fiber plait to be inserted between the burner and the boiler;
- oil flexible hoses;
- oil filter;
- envelope containing this manual.

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

# Handling the burner

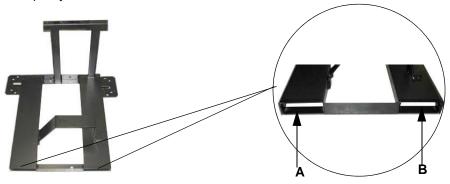


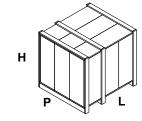
ATTENTION! The Ihandling operations must be carried out by specialised and trained personnel. If these operations are not carried out correctly, the residual risk for the burner to overturn and fall down still persists.

To move the burner, use means suitable to support its weight (see paragraph "Technical specifications").

The unpacked burner must be lifted and moved only by means of a fork lift truck.

The burner is mounted on a stirrup provided for handling the burner by means of a fork lift truck: the forks must be inserted into the A anb B ways. Remove the stirrup only once the burner is installed to the boiler.

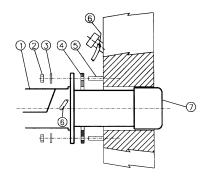




# Fitting the burner to the boiler

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).



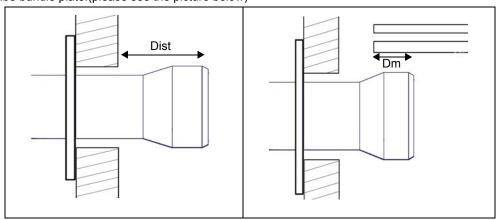
#### Keys

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

# Matching the burner to the boiler

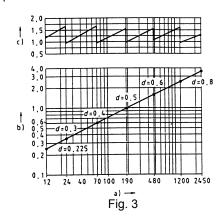
The burners described in this manual have been tested with combustion chambers that comply with EN676 regulation and whose dimensions are described in the diagram. In case the burner must be coupled with boilers with a combustion chamber smaller in diameter or shorter than those described in the diagram, 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. To choose the blast tube length follow the instructions of the boiler manufacturer. In absence of these consider the following:

- Cast-iron boilers, three pass flue boilers (with the first pass in the rear part): the blast tube must protrude no more than Dist = 100 mm into the combustion chamber. (please see the picture below)
- Pressurised boilers with flame reversal: in this case the blast tube must penetrate Dm 50 ÷ 100 mm into combustion chamber in respect to the tube bundle plate.(please see the picture below)



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 tha suites the utilisation (please, contact the manifacturer).

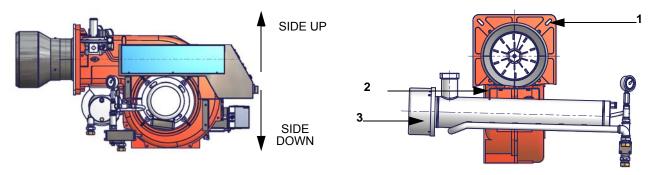


# Key

- a) Heat output in kW
- b) Lenght of the flame tube in meters
- c) Flame tube firing intensity in MW/m3
- d) Combustion chamber diameter (m)

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

The burner is designed to work positioned according to the picture below. Set the upper side of the burner flange in a horizontal position, in order to find the correct inclination of the pre-heater tank. For different installations, please contact the Technical Department.



#### Key

- 1 Burner flange (upper side indicated)
- 2 Bracket
- 3 Pre-heating tank on the burner

#### **OIL TRAIN CONNECTIONS**

#### About the use of fuel pumps

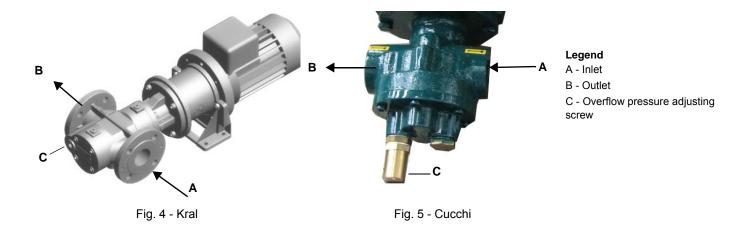
- Do not use fuel with additives to avoid the possible formation over time of compounds which may deposit between the gear teeth, thus obstructing them.
- After filling the tank, wait before starting the burner. This will give any suspended impurities time to deposit on the bottom of the
  tank, thus avoiding the possibility that they might be sucked into the pump.
- On initial commissioning a "dry" operation is foreseen for a considerable length of time (for example, when there is a long suction line to bleed). To avoid damages inject some lubrication oil into the vacuum inlet.
- Care must be taken when installing the pump not to force the pump shaft along its axis or laterally to avoid excessive wear on the
  joint, noise and overloading the gears.
- Pipes should not contain air pockets. Rapid attachment joint should therefore be avoided and threaded or mechanical seal junctions preferred. Junction threads, elbow joints and couplings should be sealed with removable sg component. The number of junctions should be kept to a minimum as they are a possible source of leakage.
- Do not use PTFE tape on the suction and return line pipes to avoid the possibility that particles enter circulation. These could deposit on the pump filter or the nozzle, reducing efficiency. Always use O-Rings or mechanical seal (copper or aluminium gaskets) junctions if possible.
- An external filter should always be installed in the suction line upstream the fuel unit.

#### Connecting the pump

According to the pump provided, proceed as follows:

- 1 emove the closing nuts A and B on the inlet and return connections of the pump;
- 2 connect the pump being careful to avoid exchanging the lines: see the arrows marked on the pump.

For further information, refer to the technical documentation of the pump.



# Heavy oil pumps

The pump provided with the burner must be installed according to the hydraulic diagram.

Pumps	capacity [l/h]	power [kW]	speed [rpm]	connection	max outlet pressure [bar]	max inlet pressure (bar)
Kral KF 10 BCB	500	0,37	1500	DN25	10	2
Kral KF 15 BCB	800	0,55	1500	DN25	10	2
Kral KF 20 BCB	1100	0,55	1500	DN25	10	2
Cucchi FMG25	1400	0.75	1500	-	10	2

For further details see the manifacturer documentation.

# Suntec TV Pressure governor

#### Pressure adjustment

Remove cap-nut 1 and the gasket 2, unscrew the lock nut 4. To increase pressure, twist adjusting screw 3 clockwise.

To decrease the pressure, twist screw counterclockwise. Tight the lock nut 4, refit the gasket 2 and the cap nut 1.

# Key

- 1 Cap nut
- 2 Gasket
- 3 Adjusting screw
- 4 Lock nut
- 5 Gasket

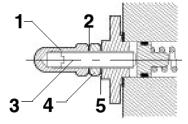
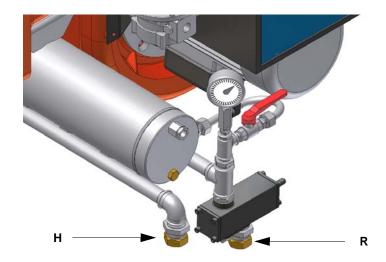


Fig. 6

# Connecting the oil flexible hoses to the burner

To connect the flexible oil hoses to the pump, proceed as follows, according to the pump provided:

- 1 remove the closing nuts **H** (on the heater) and **R** (on the oil pressure governor) of the inlet and return connections;
- 2 screw the rotating nut of the two flexible hoses on the burner **being careful to avoid exchanging the inlet and return lines**: see the arrows marked that show the inlet and the return.



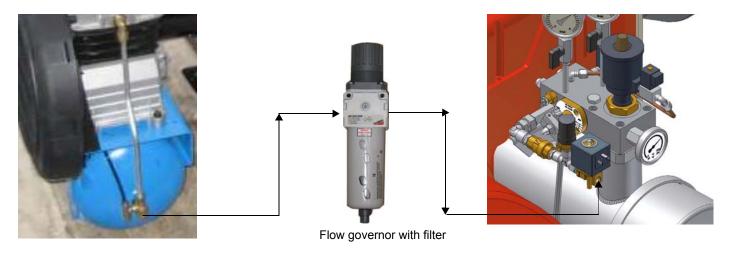
# Fuel Oil filters



	Item	Note	Connection	Max. operating pressure	Max. operating temperature	Filtering degree	Protection
4	20453	with heating elements	1" 1/2	2 bar	-20, 60 °C	300 µ	IP42

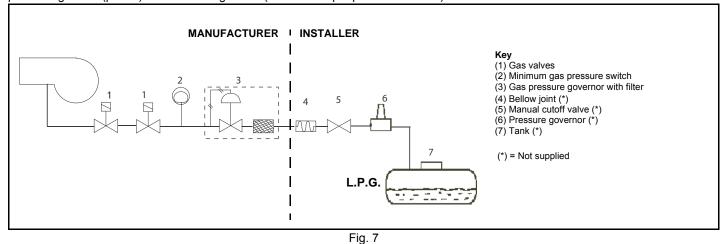
# Connecting the compressed air hoses

To connect the compressed air supply, refer to the following pictures



# Pilot gas train

The connection to the pilot gas train must be done according to the following scheme, valid for LPG. In case of natural gas, connect the pressure goveror (pos. 3) to the natural gas line (maximum input pressure = 1 bar).



The pilot gas train is already installed into the burner, the connection from the filter with stabiliser to the gas supply network must be carried out.



connection to the gas supply network - 1/2"

Once the gas train in installed, execute the electrical connections for all its items (gas valves group, pressure switch).



ATTENTION: once the gas train is mounted according to the diagram on Fig. 7, the gas proving test mus be performed, according to the procedure set by the laws in force.

#### **ELECTRICAL CONNECTIONS**

**/** 

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.

ATTENTION: 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.

IMPORTANT: Connecting electrical supply wires to the burner teminal block MA, be sure that the ground wire is longer than phase and neutral ones.



WARNING: (only for double stage and progressive burners) The burner is provided with an electrical bridge between terminals 6 and 7; when connecting the high/low flame thermostat, remove this bridge before connecting the thermostat.

To execute the electrical connections, proceed as follows:

- 1 remove the cover from the electrical board, unscrewing the fixing screws;
- 2 execute the electrical connections to the supply terminal board as shown in the attached wiring diagrams;
- 3 check the direction of the fan motor (see next paragraph);
- 4 refit the panel cover.

#### Note on elecrtical supply

If the power supply to the burner is 230V three-phase or 230V phase-phase (without a neutral), with the Siemens control box, between the terminal 2 (terminal X3-04-4 in case of LMV2x, LMV3x, LMV5x, LME7x) on the board and the earth terminal, an RC Siemens RC466890660 filter must be inserted.

#### Key

C - Capacitor (22nF/250V)

LME / LMV - Siemens control box

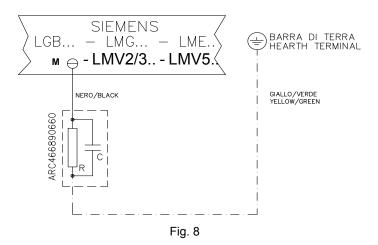
R - Resistor (1Mohm)

M - Resistor (1Mohm)

M - Terminal 2 (LGB,LMC,LME), terminal X3-04-4 (LMV2x,

LMV3x, LMV5, LME7x)

RC466890660 - RC Siemens filter



### Rotation of electric motor

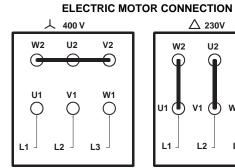
Once the electrical connection of the burner is executed, remember to check the rotation of the electric motor. The motor should rotate according to the "arrow" symbol on the body. In the event of wrong rotation, reverse the three-phase supply and check again the rotation of the motor.

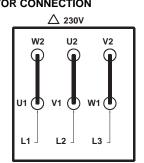


#### CAUTION: check the motor thermal cut-out adjustment

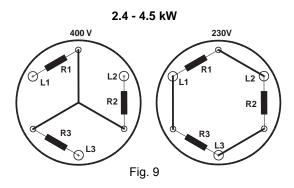
NOTE: the burners are supplied for three-phase 400V supply, and in the case of three-phase 230V supply it is necessary to modify the electrical connections into the terminal box of the electric motor and replace the overload tripped relay.

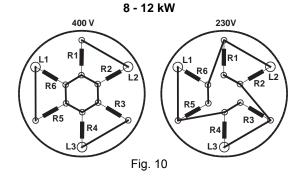


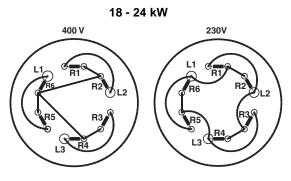




# Connecting the oil heating resistors







# Recommendations to design heavy oil feeding plants

This paragraph is intended to give some suggestions to make feeding plants for heavy oil burners. To get a regular burner operation, it is very important to design the supplying system properly. Here some suggestions will be mentioned to give a brief description.

The term "heavy oil" is generic and summarises several chemical-physical properties, above all viscosity. The excessive viscosity makes the oil impossible to be pumped, so it must be heated to let it flow in the pipeline; because of the low-boiling hydrocarbons and dissolved gases, the oil must be also pressurised. The pressurisation is also necessary to feed the burner pump avoiding its cavitation because of the high suction at the inlet. The supplying system scope is to pump and heat oil.

The oil viscosity is referred in various unit measures; the most common are: °E, cSt, Saybolt and Redwood scales. Table 3 shows thevarious unit convertions (e.g.: 132 cSt viscosity corresponds to 17.5°E viscosity).

The diagram in Fig. 12 shows how the heavy oil viscosity changes according to its temperature.

Example: an oil with 22°E viscosity at 50°C once heated to 100°C gets a 3 °E viscosity.

As far as the pumping capability, it depends on the type of the pump that pushes the oil even if on diagram in Fig. 12 a generic limit is quoted at about 100 °E, so it is recommended to refer to the specifications of the pump provided.

Usually the oil minimum temperature at the oil pump inlet increases as viscosity does, in order to make the oil easy to pump. Referring to the diagram on Fig. 13, it is possible to realise that to pump an oil with 50°E viscosity at 50°C, it must be heated at about 80°C.

### Pipe heating system

Pipe heating system must be provided, that is a system to heat pipes and plant components to mantain the viscosity in the pumping limits. Higher the oil viscosity and lower the ambient temperature, more necessary the pipe heating system.

# Inlet minimum pressure of the pump (both for supplying system and burner)

A very low pressure leads to cavitation (signalled by its peculiar noise): the pump manifacturer declares the minimum value. Therefore, check the pump technical sheets.

By increasing the oil temperature, also the minimum inlet pressure at the pump must increase, to avoid the gassification of the oil low-boiling products and the cavitation. The cavitation compromises the burner operation, it causes the pump to break too. The diagram on Fig. 14 roughly shows the inlet pump pressure according to the oil temperature.

# Pump operating maximum pressure (both for the supplying system and burner)

Remember that pumps and all the system components through which the oil circulates, feature an upper limit. Always read the technical documentation for each component. Schemes on Fig. 15 are taken from UNI 9248 "liquid fuel feeding lines from tank to burner" standard and show how a feeding line should be designed. For other countries, see related laws in force. The pipe dimensioning, the execution and the winding dimensioning and other construcitve details must be provided by the installer.

# Adjusting the supplying oil ring

According to the heavy oil viscosity used, in the table below indicative temperature and pressure values to be set are shown.

**Note:** the temperature and pressure range allowed by the supplying ring components must be checked in the specifications table of the components themselves.

HEAVY OIL VISC	COSITY AT 50 °C	PIPELINE PRESSURE	PIPELINE TEMPERATURE
cSt	(°E)	bar	°C
	< 50 (7)	1- 2	20
> 50 (7)	< 110 (15)	1- 2	50
> 110 (15)	< 400 (50)	1- 2	65
> 400 (50)	< 4000 (530)	1- 2	100

Tab. 1 - Supply pipeline hydraulic scheme 3ID0024, pump n.4



ATTENTION: Atomizing air pressure is tipically set at 1 bar lower than oil pressure.

# Viscosity units conversion table

Cinematics viscosity Centistokes (cSt)	Engler Degrees (°E)	Saybolt Seconds Universal (SSU)	Saybolt Seconds Furol (SSF)	Redwood Seconds no.1 (Standard)	Redwood Seconds no2 (Admiralty)
1	1	31		29	
2.56	1.16	35		32.1	
4.3	1.31	40		36.2	5.1
7.4	1.58	50		44.3	5.83
10.3	1.88	60		52.3	6.77
13.1	2.17	70	12.95	60.9	7.6
15.7	2.45	80	13.7	69.2	8.44
18.2	2.73	90	14.44	77.6	9.3
20.6	3.02	100	15.24	85.6	10.12
32.1	4.48	150	19.3	128	14.48
43.2	5.92	200	23.5	170	18.9
54	7.35	250	28	212	23.45
65	8.79	300	32.5	254	28
87.6	11.7	400	41.9	338	37.1
110	14.6	500	51.6	423	46.2
132	17.5	600	61.4	508	55.4
154	20.45	700	71.1	592	64.6
176	23.35	800	81	677	73.8
198	26.3	900	91	762	83
220	29.2	1000	100.7	896	92.1
330	43.8	1500	150	1270	138.2
440	58.4	2000	200	1690	184.2
550	73	2500	250	2120	230
660	87.6	3000	300	2540	276
880	117	4000	400	3380	368
1100	146	5000	500	4230	461
1320	175	6000	600	5080	553
1540	204.5	7000	700	5920	645
1760	233.5	8000	800	6770	737
1980	263	9000	900	7620	829
2200	292	10000	1000	8460	921
3300	438	15000	1500	13700	
4400	584	20000	2000	18400	

Tab. 2

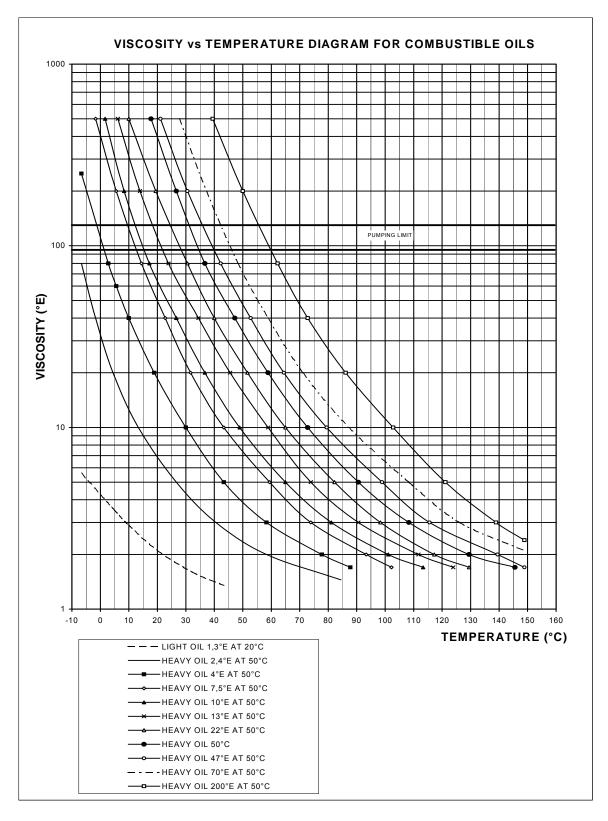


Fig. 12

# Indicative diagram showing the oil temperature at burner pump inlet vs. oil viscosity

Example: if the oil has a 50°E @ 50°C viscosity, the oil temperature at the pump inlet should be 80°C (see diagram).

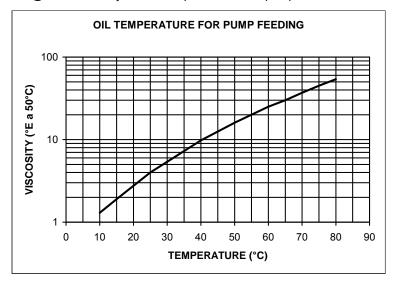


Fig. 13

# Indicative diagram showing the oil pressure according to its temperature

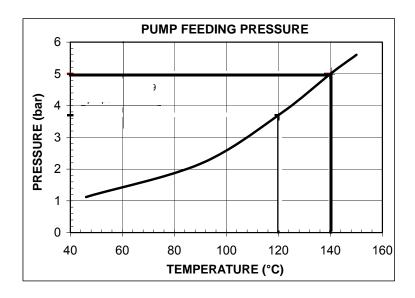
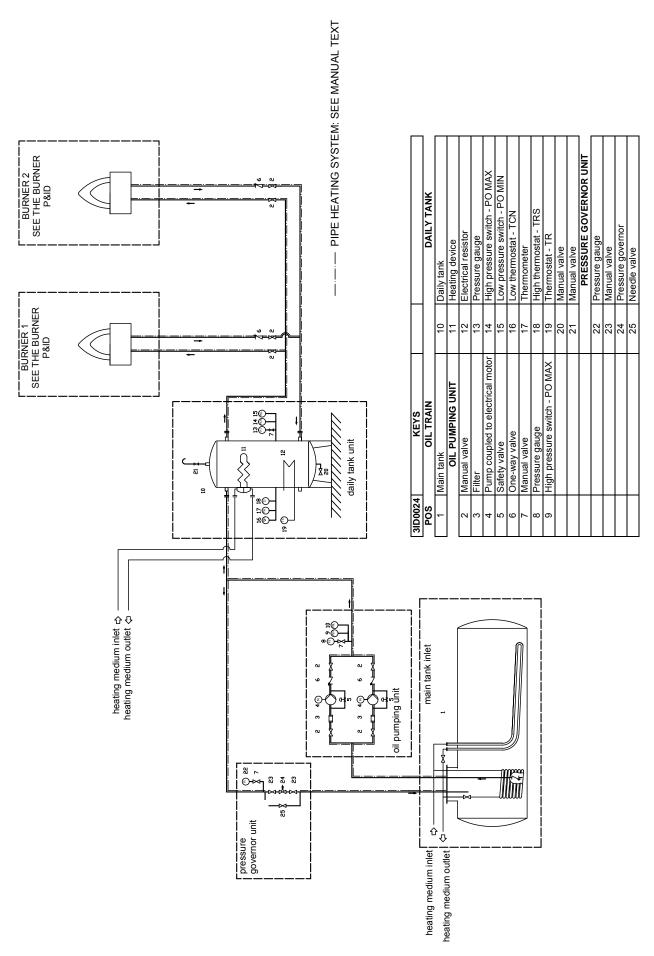


Fig. 14

Fig. 15 - Hydraulic diagram 3ID0024



#### **PART III: 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 AUTHORISED 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).

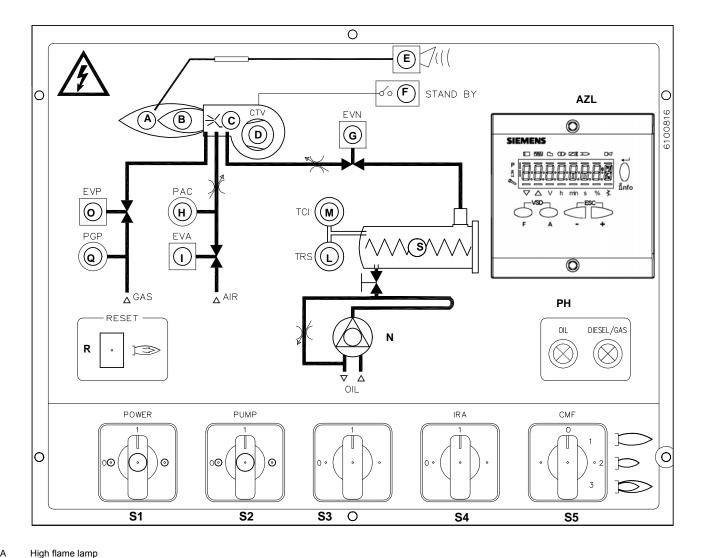
NEVER OPEN OR DISMANTLE ANY COMPONENT OF THE MACHINE EXCEPT FOR ITS MAINTENANCE.

TO SECURE THE MACHINE, ACT ON THE ISOLATOR SWITCH. IN CASE OF ANOMALIES THAT REQUIRED A SHUT DOWN OF THE BURNER, IT'S POSSIBLE TO ACT ON THE AUXILIARY LINE SWITCH, LOCATED ON THE BURNER FRONT PANEL.

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.

# Control panel



A B C D E F G H Low flame lamp Ignition transformer lamp Fan motor thermal cutout lamp Burner lockout lamp Burner stand-by lamp Solenoid valve lamp Compressed air pressure switch lamp Compressed air solenoid valve lamp Heating resistors safety thermostat lamp M AZL Plant enabling thermostat lamp Siemens output controller N O PH Q R S S1 S2 S3 S4 S5 Oil pump in operation Pilot solenoid valve lamp
Heavy oil operation lamp
Pilot gas pressure switch
Reset pushbutton for control box Pre-heater in operation lamp Main switch Pump operation selector "MAN-AUTO" Fuel operation selector Auxiliary resistors switch Operation mode manual selector

#### ADJUSTMENT FOR OIL OPERATIONS



Before starting up the burner, make sure that the return pipe to the tank is not obstructed. Any obstruction would cause the pump seal to break.



ATTENTION: before starting the burner up, be sure that the manual cutoff valves are open. Be sure that the mains switch is closed.

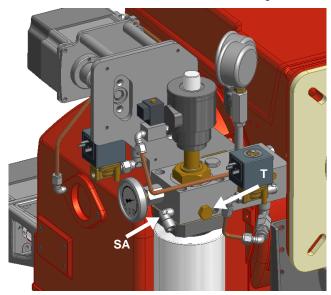
The figure below shows nozzle flow valve. Before turn on the burner, open the manual valve.



manual valve

# Air vent

Before to give tension to the eletrical resistance, release the air inside the heaters throught the SA connection acting on the T cap.



# Oil Flow Rate Settings

The light oil flow rate can be adjusted choosing a nozzle that suits the boiler/utilisation output and setting the delivery and return pressure values according to the ones quoted on the following table.

VISCOSITY AT 50 °C		OIL PRESSURE AFTER BURNER PUMP		OIL PRESSURE AFTER OIL METERING VALVE		
		min	max	min	max	
°cSt (°E)		bar		°Ċ		
	< 50 (7)	6	10	1	2	
> 50 (7)	< 110 (15)	6	10	1	2	
> 110 (15)	< 400 (50)	6	10	1	2	
> 400 (50)	<4000 (530)	6	10	1	2	

Tab. 3

The pressure values shown in the table are intended as working range. In order to obtain a more accurate indication, please refer to the nozzle pressure-flow diagrams.

# Compressed air adjustment



ATTENTION: set the pressure value about 1 bar, at the pressure gauge 47 (see Fig. 17). check it before open valve 16!

To start the burner set the oil and atomisation medium pressure at about 1 bar, as first trial, then, regulate the burner checking the combustion values at the chimney, according to the paragraph "operation", and adjust the starting point according to the regulation.



Fig. 16



Fig. 17



ATTENTION: set the pressure value about 5-10 bar, at the pressure gauge on the governor 40 (see hydraulic diagram and Fig. 2)

# Air valve for gun cleaning

As the flame is off, the purge valve 52 opens automatically the compressed air to clean the gun. With this operation, the oil between the valves and the nozzle is drained. The air pressure value for the gun cleaning must be setted to the pressure value of the atomization medium, regulated in low flame (generally 1 bar), and should be adjusted throught the item 50. (see hydraulic diagram of the burner)

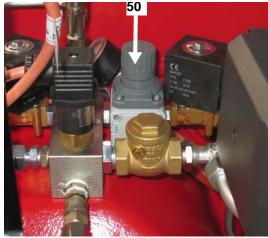
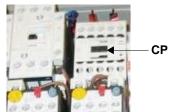


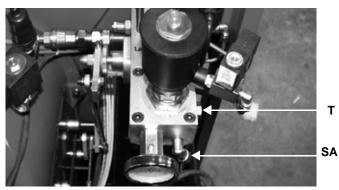
Fig. 18

#### Oil Flow Rate Settings actuator

- 1 Turn the burner on by means of the main switch on the burner control panel (see chapter "Operation");
- with the electrical panel open, prime the oil pump acting directly on the related contactor **CP** (see next picture): check the pump motor rotation and keep pressing for some seconds until the oil circuit is charged;



3 bleed the air from the SA port by loosing the cap T without removing it, then release the contactor and fasten cap T.

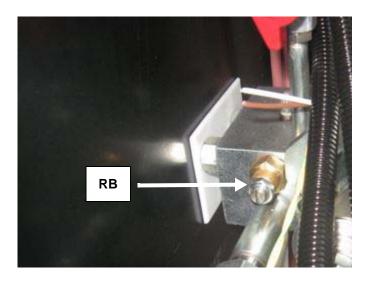


- 4 As for setting the fuel/air ratio curve, see the LMV2x/3x related manual.
- The nozzle supply pressure is already factory-set and must not be changed. Only if necessary, adjust the supply pressure as follows (see related paragraph); read the pressure on the oil pressure gauge on picture below and act on the Suntec TV governor adjusting screw VR (see picture below and description on page 20) as to get the nozzle pressure at 2bar (see step 8). If the required flow rate is not reached, increase the feeding pressure by means of the Suntec TV governor (see picture below); if it is too high, reduce it.

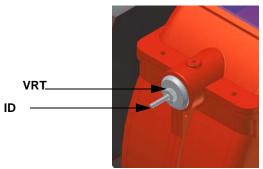




6 Set the atomisation air according to the data in the nozze diagram attached, by means of the RB knob (see picture).



If necessary, change the combustion head position: to let the burner operate at a lower output, move progressively back the combustion head towards the MIN position, by turning clockwise the **VRT** ring nut. The graduated index **ID** shows the combustion head shifting (each mark refers to 5mm).







"MAX" position

"MIN" position

Attention! if it is necessary to change the head position, repeat the air and gas adjustments described above.

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

# Calibration of air pressure switch

To calibrate the air pressure switch, proceed as follows:

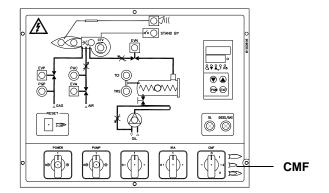
- Remove the transparent plastic cap.
- Once air and heavy oil setting have been accomplished, startup the burner.
- During the pre-purge phase o the operation, turn slowly the adjusting ring nut VR in the clockwise direction until the burner lockout, then read the value on the pressure switch scale 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.



# Fully-modulating burners

To adjust the fully-modulating burners, use the **CMF** switch on the burner control panel (see next picture), instead of the **TAB** thermostat as described on the previous paragraphs about the progressive burners. Go on adjusting the burner as described before, paying attention to use the CMF switch intead of **TAB**.

The **CMF** position sets the oprating stages: to drive the burner to the high-flame stage, set CMF=1; to drive it to the low-flame stage, set CMF=2.



CMF = 0 stop at the current position

CMF = 1 high flame operation

CMF = 2 low flame operation

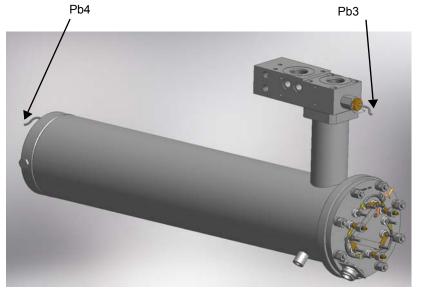
CMF = 3 automatic operation

# Oil thermostat adjustment

Progressive and fully modulanting oil burners are equipped with electronic multi-thermostat Danfoss MCX, whose operation is controlled by thyristor. (for details refer to the attached technical documentation)



Fig. 19 - Danfoss MCX



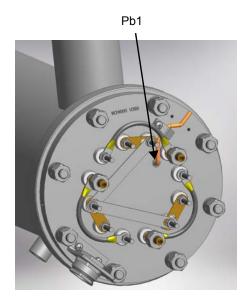


Fig. 20 - Probe connections (Danfoss MCX)

Menu path		Oil viscosity at 50 °C according to the letter shown in the							
		th		burner model					
				P	N	E	D	Н	
				89 cSt	< 50 cSt	> 50 cSt	> 110 cSt	> 400 cSt	
						< 110 cSt	< 400 cSt	< 4000 cSt	
				12 °E	< 7°E	> 7 °E	> 15 °E	> 50 °E	
						< 15 °E	< 50 °E	< 530 °E	
Par									
rEG	Pb1	tr	Oil heater temperature probe	parameter not visible					
	Pb2	tCI	Plant consent temperature probe	20 °C	70 °C	70 °C	70 °C		
			(when installed)						
	Pb3	Oil	oil heater output temperature	60-70 °C	110-120 °C	120-130 °C	130-140 °C	140-150 °C	
			probe (PID regulation);						
		SP0	Set-point oil heater with oil pump	45 °C	120 °C	130 °C	140 °C	150 °C	
			stopped (stand-by)	45 C	120 C	130 C	140 C	150 C	
	Pb4	o4 tcn	Oil heater consent temperature	40 °C	100 °C	100 °C	110 °C	120 °C	
			probe						
		trS	Safety temperature tank resistors	120 °C	400 000 °C	400 000 %0	400 000 %0	400 000 °C	
		(manual reset)	120 C	190-200 °C	190-200 °C	190-200 °C	190-200 °C		

The oil viscosity at the nozzle, should be about 1,5 °E, which guarantees correct and safe functioning of the burner. The above temperature values are suggested and refer to a plant designed according to the prescriptions in the burner user manual. The suggested values can change in reference to the fuel oil specifications.

# Adjusting the pilot gas flow rate: gas valve Brahma EG12xR and pressure governor

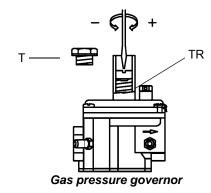
To change the pilot gas valve flow rate, proceed as follows:

- 1 remove the protection on the bottom of the valve, moving it counterclockwise (see next picture);
- 2 rotate clockwise the nut 1 as shown in to close the valve or counterclockwise to open.

To perform gas pressure adjustment, act on the pressure governor as follows (see next picture):

remove the cap **T**: to increase the gas pressure at the outlet use a screwdriver on the screw **TR** as shown in the next picture. Screw to increase the pressure, unscrew to decrease; once the regulation is performed, replace cap **T**.





#### ADJUSTING AIR AND FUEL RATE

## Adjustments - brief description

The air and fuel rates adjustments must be performed at the maximum ouptput first ("high flame"): see the LMV related manual.

- Check that the combustion parameters are in the suggested limits.
- Check the flow rate measuring it on the counter or, if it was not possible, verifying the combustion head pressure by means of a differential pressure gauge, as described on par. "Measuring the gas pressure in the combustion head".
- Then, adjust the combustion values by setting the "gas/air" ratio" curvepoints (see the LMV related manual).
- Set, now, the low flame output (according to the procedure described on the "Siemens LMV manual") 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.



.ATTENTION: 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 fuel decrease slowly until the normal combustion values are achieved.



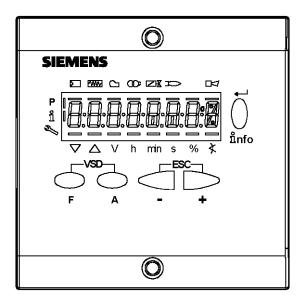
IMPORTANT! the combustion air excess must be adjusted according to the values in the following chart.

Recomm	nended combustion parameters	
Fuel	Recommended (%) CO <sub>2</sub>	Recommended (%) O <sub>2</sub>
Heavy oil	11 ÷ 12	4.2 ÷ 6.2

#### User interface

The AZL2x.. display is shown below:

The keys functions are the following:





## Key F

Used to adjust the "fuel" actuator position (Fuel): :

While pressing the **F** key, the "fuel" actuator position can be changed by means of the **+** and **-** keys.



## Key A

Used to adjust the "air" actuator position (Air):

While pressing the A key, the "air" actuator position can be changed by means of the + and - keys.



## Key F + A

While pressing the two keys contemporarly, the **code** message will appear: by entering the proper password it is possible to access the **Service** mode.

## Info and Enter keys

Š price

Used for Info and Service menues

Used as Enter key in the setting modes

Used as Reset key in the burner operation mode

Used to enter a lower level menu

## -Key -



Used to decrease a a value

Used to enter Info and Serivce during the curve adjustments

## +Key +



Used to increase a a value

Used to enter Info and Serivce during the curve adjustments

## Keys (+ & - )= ESC



By pressing + and - at the same time, the ESCAPE function is perfored:

to enter a lower level menu

The display will show these data:

Lock+unlock codes

Flame

Open valves

Ignition transformers energised

Fan motor energised

Oil pre-heater energised

Plant heat request

Parametere setting mode

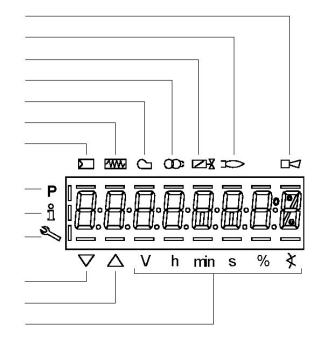
Info mode

Service mode

Closing actuator

Opening actuator

Unit measurel



The display will show these data:

## Setting menu

The setting menu is divided into different blocks:

Bloc.	Descrizione	Description	Password
100	Informazioni generali	General	OEM / Service / Info
200	Controllo bruciatore	Burner control	OEM / Service
400	Curve rapporto	Ratio curves	OEM / Service
500	Controllo rapporto	Ratio control	OEM / Service
600	Servocomandi	Actuators	OEM / Service
700	Storico errori	Error history	OEM / Service / Info
900	Dati di processo	Process data	OEM / Service / Info

The accesses to the various blocks are allowed by passwords. Passwords are divided into three levels:

- User level (info): no password needed
- Service level (Service)
- Manifacturer level (OEM)

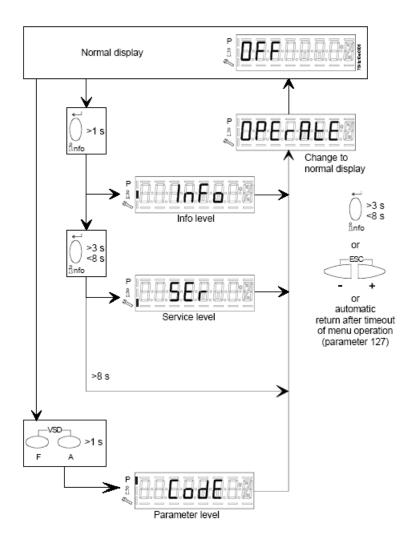
## **PHASES LIST**

During operation, the following program phases are shown. The meaning for each phase is quoted in the table below

Ph00 Fase blocco Ph01 Fase di sicurezza Ph10 t10 = tempo raggiungimento posizione riposo Ph12 Pausa Ph12 Pausa Ph12 t22 = tempo di salita ventilatore (motore ventilatore = ON, valvola intercettazione di sicurezza = ON) Ph24 Verso posizione preventilazione Ph30 t1 = tempo preventilazione Ph30 Verso posizione accensione Ph30 Verso posizione accensione Ph30 t3 = tempo preaccensione Ph30 t3 = tempo preaccensione Ph40 TSA1 = primo tempo sicurezza (trasformatore accensione Ph40 TSA1 = primo tempo sicurezza (trasformatore accensione Ph42 TSA1 = primo tempo sicurezza (trasformatore accensione Ph44 t4 = intervallo 1 Ph50 TSA2 = secondo tempo sicurezza (trasformatore accensione Ph52 t52 = intervallo 2 Ph60 Funzionamento 1 (stazionario) Ph62 preparazione per spegnimento, verso bassa fiamma) Ph70 t13 = tempo postcombustione Ph70 t80 = tempo postcombustione P	Fase /Phase	Funzione	Function
Ph10 t10 = tempo raggiungimento posizione riposo t10 = home run  Ph12 Pausa Standby (stationary)  t12 = tempo di salita ventilatore (motore ventilatore = ON, valvola intercettazione di sicurezza = ON)  Ph24 Verso posizione preventilazione Traveling to the prepurge position  Ph30 t1 = tempo preventilazione 1t1 = prepurge time  Ph36 Verso posizione accensione Traveling to the ignition position  Ph38 t3 = tempo preaccensione 13 = preignition time  Ph40 TSA1 = primo tempo sicurezza (trasformatore accensione ON)  Ph42 TSA1 = primo tempo sicurezza (trasformatore accensione ON)  Ph42 TSA1 = primo tempo sicurezza (trasformatore accensione ON)  TSA1 = 1st safety time (ignition transformer ON)  TSA1 = 1st safety time (ignition transformer ON)  TSA2 = primo tempo sicurezza (trasformatore accensione OFF)  ### 144 = intervall 0 1  Ph50 TSA2 = secondo tempo sicurezza (trasformatore accensione OFF)  ### 1552 TSA2 = secondo tempo sicurezza (trasformatore accensione OFF)  ### 1564 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time (ignition transformer OFF)  ### 1565 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time (ignition transformer OFF)  ### 1566 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time (ignition transformer OFF)  ### 1567 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time (ignition transformer OFF)  ### 1568 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time (ignition transformer OFF)  ### 1569 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time (ignition transformer OFF)  ### 1572 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time (ignition transformer OFF)  ### 1572 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time (ignition transformer OFF)  ### 1572 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time (ignition transformer OFF)  ### 1573 TSA2 = secondo tempo sicurezza (trasformatore accensione)  ### 1574 TSA2 = secondo tempo sicurezza (trasformatore accensione)  ### 1574 TSA2 = secondo tempo sicurezza (trasformatore accensione)  ### 1574 TSA2 = secondo tempo sicurezza (trasformator	Ph00	Fase blocco	Lockout phase
Ph12 Pausa Standby (stationary)  122 = tempo di salita ventilatore (motore ventilatore = ON, valvola intercettazione di sicurezza = ON)  Ph24 Verso posizione preventilazione  Ph36 Verso posizione accensione  Ph36 Verso posizione accensione  Ph38 t3 = tempo preaccensione  Ph40 TSA1 = primo tempo sicurezza (trasformatore accensione ON)  TSA1 = primo tempo sicurezza (trasformatore accensione OFF)  Ph42 t44 = intervallo 1  Ph50 TSA2 = secondo tempo sicurezza  TSA2 = 2nd safety time (ignition transformer OFF)  Ph62 t52 = intervallo 2  Ph60 Funzionamento 1 (stazionario)  Ph62 t62 = intervallo 2  Ph62 t62 = intervallo 2  Ph70 t13 = tempo postcombustione  Ph70 t13 = tempo postcombustione  Ph70 t13 = tempo postcombustione  Ph71 Verso posizione postcombustione  Ph72 Verso posizione postcombustione  Ph80 t80 = tempo evacuazione controllo tenuta valvole  Ph81 t81 = tempo perdita pressione atmosferica, prova atmosferica serica  Ph82 t82 = test perdita, test riempimento  183 = leakage test filling test, filling  183 = leakage test time gas pressure, pressure test	Ph01	Fase di sicurezza	Safety phase
Ph22   t22 = tempo di salita ventilatore (motore ventilatore = ON, valvola intercettazione di sicurezza = ON)   t22 = fan ramp up time (fan motor = ON, safety shutoff valve = ON)   Ph24   Verso posizione preventilazione   Traveling to the prepurge position   Ph30   t1 = tempo preventilazione   t1 = prepurge time   Ph36   Verso posizione accensione   Traveling to the ignition position   Ph38   t3 = tempo preaccensione   t3 = preignition time   Ph40   TSA1 = primo tempo sicurezza (trasformatore accensione ON)   TSA1 = primo tempo sicurezza (trasformatore accensione OFF)   Ph42   TSA1 = primo tempo sicurezza (trasformatore accensione OFF)   Ph44   t44 = intervallo 1   t44 = interval 1   Ph50   TSA2 = secondo tempo sicurezza   TSA2 = 2nd safety time (ignition transformer OFF)   Ph62   t52 = intervallo 2   TSA2 = zecondo tempo sicurezza   TSA2 = 2nd safety time   Ph62   funzionamento 1 (stazionario)   Operation 1 (stationary)   Ph62   funzionamento 1 (stazionario)   Operation 1 (stationary)   Ph62   funzionamento 1 (stazionario)   Operation 1 (stationary)   Ph70   t13 = tempo postcombustione   t13 = afterburn time   Ph71   t8 = tempo postcombustione   Traveling to the postpurge position   Ph71   t8 = tempo postcombustione   Traveling to the postpurge position   Ph80   t80 = tempo evacuazione controllo tenuta valvole   t80 = valve proving test evacuation time   Ph81   t81 = tempo perdita pressione atmosferica, prova atmosferica, atmospheric test   Ph82   t82 = test perdita, test riempimento   t82 = leakage test filling test, filling   Ph83   t83 = tempo perdita pressione gas, test pressione   Ph84   t83 = tempo perdita pressione gas, test pressione   Ph85   t83 = tempo perdita pressione gas, test pressione   Ph86   t83 = tempo perdita pressione gas, test pressione   Ph87   t83 = tempo perdita pressione gas, test pressione   Ph88   t83 = tempo perdita pressione gas, test pressione   Ph89   t80   t80 = tempo perdita pressione gas, test pressione   Ph89   t80   t80 = tempo perdita pressione gas, test pressione   Ph89	Ph10	t10 = tempo raggiungimento posizione riposo	t10 = home run
PN24 Verso posizione preventilazione Ph36 Verso posizione preventilazione Ph36 Verso posizione preventilazione Ph37 Verso posizione preventilazione Ph38 Usa tempo preaccensione Ph40 TSA1 = primo tempo sicurezza (trasformatore accensione ON) Ph42 TSA1 = primo tempo sicurezza (trasformatore accensione ON)  TSA1 = primo tempo sicurezza (trasformatore accensione ON)  TSA1 = primo tempo sicurezza (trasformatore accensione ON)  TSA1 = primo tempo sicurezza (trasformatore accensione OFF)  Ph42 TSA2 = primo tempo sicurezza (trasformatore accensione OFF)  Ph44 Us4 = intervallo 1  Ph50 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time (ignition transformer OFF)  Ph52 Us52 = intervallo 2  Ph60 Funzionamento 1 (stazionario) Operation 1 (stationary)  162 = massimo tempo bassa fiamma (funzionamento 2, in preparazione per spegnimento, verso bassa fiamma)  Ph70 Us13 = tempo postcombustione  Ph71 Use tempo postcombustione  Ph72 Verso posizione postcombustione  Ph74 Us0 = tempo postcombustione  Ph80 Us0 = tempo evacuazione controllo tenuta valvole  Ph81 Us0 = tempo perdita pressione atmosferica, prova atmosferica, prova atmosferica atmospheric pressure, atmospheric test  Ph82 Us0 = tempo perdita pressione gas, test pressione  Us0 = tempo gas pressure, pres sure test	Ph12	Pausa	Standby (stationary)
Ph30	Ph22		
Ph36 Verso posizione accensione Traveling to the ignition position Ph38 I3 = tempo preaccensione I3 = preignition time Ph40 TSA1 = primo tempo sicurezza (trasformatore accensione ON)  TSA1 = primo tempo sicurezza (trasformatore accensione ON)  TSA1 = primo tempo sicurezza (trasformatore accensione OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA2 = preignition time OFF  Ph44 I44 = intervallo 1  TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time  Ph50 TSA2 = secondo tempo sicurezza TSA2 = 2nd safety time  TSA2 = 2nd safety time  Ph60 Funzionamento 1 (stazionario)  Ph61 U52 = intervallo 2  Ph60 Funzionamento 1 (stazionario)  Ph62 Doperation 1 (stationary)  T62 = massimo tempo bassa fiamma (funzionamento 2, in preparing for shutdown, traveling to low-fire)  Ph70 I13 = tempo postcombustione  Ph71 I13 = tempo postcombustione  Ph72 Verso posizione postcombustione  Ph74 I8 = tempo postcombustione  Ph80 I80 = tempo evacuazione controllo tenuta valvole  Ph80 I80 = tempo perdita pressione atmosferica, prova atmosferica  Secondor time atmospheric pressure, atmospheric test  Th81 = leakage test filling test, filling  Ph83 I83 = tempo perdita pressione gas, test pressione  T854 = 1st safety time (ignition transformer TSA1 = 1st safety time (ignition transformer ON)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA2 = 2red safety time (ignition transformer OFF)  TsA1 = 1st safety time (ignition transformer OFF)  TsA1 = 1st safety time (ignition transformer OFF)  TsA1 = 1st safety time (ignition transformer OFF)  TsA2 = preignition time OFF  TsA1 = 1st safety time (ignition transformer OFF)  TsA2 = preignition time OFF  TsA1 = 1st safety time (ignition transformer OFF)  TsA2 = preignition time OFF  TsA1 = 1st safety time (ignition transformer OFF)  TsA1 = 1st safety time (ignition transformer OFF)  TsA2 =	Ph24	Verso posizione preventilazione	Traveling to the prepurge position
Ph38 t3 = tempo preaccensione t3 = priegnition time  Ph40 TSA1 = primo tempo sicurezza (trasformatore accensione ON)  TSA1 = primo tempo sicurezza (trasformatore accensione ON)  TSA1 = primo tempo sicurezza (trasformatore accensione OFF)  TSA1 = primo tempo sicurezza (trasformatore accensione OFF)  TSA1 = primo tempo sicurezza (trasformatore accensione OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = primo tempo sicurezza TSA1 = 1st safety time (ignition transformer OFF)  TSA2 = preignition time OFF  TSA1 = 1st safety time (ignition transformer OFF)  TSA2 = primo tempo OFF  TSA3 = 1st safety time (ignition transformer OFF)  TSA4 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA2 = primo it is a safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA2 = preignition time OFF  TSA1 = 1st safety time (ignition transformer OFF)  TSA2 = prespicited	Ph30	t1 = tempo preventilazione	t1 = prepurge time
Ph40 TSA1 = primo tempo sicurezza (trasformatore accensione ON)  TSA1 = primo tempo sicurezza (trasformatore accensione OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = primo tempo sicurezza TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = primo tempo oFF  TSA1 = primo tempo iscurezza TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = primo tempo oFF  TSA1 = primo tempo iscurezza TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = primo tempo oFF  TSA1 = 1st safety time (ignition transformer OFF)  TSA2 = preignition time OFF  TSA2 = preignition time OFF  TSA2 = 2nd safety time  TSA2 = 2nd safety time  TSA2 = 2nd safety time  (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA2 = preignition time OFF  TSA2 = 2nd safety time  TSA2 = 2nd safety time  162 = max. time low-fire (operation 2, preparing for shutdown, traveling to low-fire)  Traveling to shutdown, traveling to low-fire)  Traveling to the postpurge position  Traveling to the postpurge position  Traveling to the postpurge position  18 = tempo postventilazione  18 = postpurge time  18 = postpurge time  18 = leakage time test time atmospheric pressure, atmospheric test  18 = leakage test filling test, filling  18 = tempo perdita pressione gas, test pressione  18 = leakage test time gas pressure, pres sure test	Ph36	Verso posizione accensione	Traveling to the ignition position
Ph42 sione ON)  TSA1 = primo tempo sicurezza (trasformatore accensione OFF)  Ph44 t44 = intervallo 1  Ph50 TSA2 = secondo tempo sicurezza  Ph60 Funzionamento 1 (stazionario)  Ph62 funzionamento 1 (stazionario)  Ph70 t13 = tempo postcombustione  Ph70 t13 = tempo postcombustione  Ph71 t8 = tempo postventilazione  Ph80 t80 = tempo evacuazione controllo tenuta valvole  Ph80 t81 = tempo perdita pressione gas, test pressione  Ph81 t83 = tempo perdita pressione gas, test pressione  Ph83 t44 = interval 1  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA1 = 1st safety time (ignition transformer OFF)  TSA2 = preignition time OFF  TSA2 = 2nd safety time  152 = interval 2  Depration 1 (stationary)  Depration 1 (stationary)  162 = max. time low-fire (operation 2, preparing for shutdown, traveling to low-fire)  Traveling to the postpurge time  113 = afterburn time  Traveling to the postpurge position  180 = valve proving test evacuation time  181 = leakage time test time atmospheric pressure, atmospheric test  Ph82 t82 = test perdita, test riempimento  T83 = leakage test filling test, filling  T8A1 = 1st safety time (ignition transformer OFF)  T8A2 = preignition time OFF  T8A2 = 2nd safety time  182 = leakage time test time atmospheric pressure, pres sure test	Ph38	t3 = tempo preaccensione	t3 = preignition time
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Ph80 t80 = tempo evacuazione controllo tenuta valvole t80 = valve proving test evacuation time  t81 = tempo perdita pressione atmosferica, prova atmosferica pressure, atmospheric test  Ph82 t82 = test perdita, test riempimento t82 = leakage test filling test, filling  Ph83 t83 = tempo perdita pressione gas, test pressione t83 = leakage test time gas pressure, pressure test	Ph72	Verso posizione postcombustione	Traveling to the postpurge position
Ph81 t81 = tempo perdita pressione atmosferica, prova atmosferica t81 = leakage time test time atmospheric pressure, atmospheric test  Ph82 t82 = test perdita, test riempimento t82 = leakage test filling test, filling  Ph83 t83 = tempo perdita pressione gas, test pressione t83 = leakage test time gas pressure, pressure test	Ph74	t8 = tempo postventilazione	t8 = postpurge time
Ph82 t82 = test perdita, test riempimento t82 = leakage test filling test, filling  Ph83 t83 = tempo perdita pressione gas, test pressione t83 = leakage test time gas pressure, pressure test	Ph80	t80 = tempo evacuazione controllo tenuta valvole	t80 = valve proving test evacuation time
Ph83 t83 = tempo perdita pressione gas, test pressione t83 = leakage test time gas pressure, pres sure test	Ph81		
sure test	Ph82	t82 = test perdita, test riempimento	t82 = leakage test filling test, filling
Ph90 Tempo attesa "mancanza gas" Gas shortage waiting time	Ph83	t83 = tempo perdita pressione gas, test pressione	
	Ph90	Tempo attesa "mancanza gas"	Gas shortage waiting time

## Entering the Parameter levels

By means of a proper use of the keys, it is possible to enter the various level parameters, as shown in the following flow chart:



The burner and consequently the LMV2x.. are factory set; the air and fuel curves as set as well.

## Info level

To enter the Info level, proceed as follows:

1 in any menu position, press keys + and - at the same time, then the program will start again: the display will show OFF.



2 until the display will show InFo, Press the enter (InFo) key

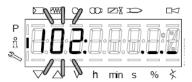


- then il will show the first code (167) flashing, on the right side it will show the data entered. By pressing + or it is possible to scroll (up or down) the parameter list.
- If a dot-line is shown on the right, there is no enough room for complete visualisation: press **enter** again the data will be completely shown for 1 to 3 seconds. By pressing **enter** or **+** and- at the same time, the system will exit the parameter visualisation and go back to the flashing number.

The Info level shows some basic parameters as:

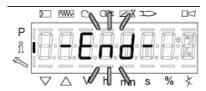
Parameter	Description
167	Cubic meters of fule (resettable)
162	Operating hours (resettable)
163	Device operating hours
164	Burners start-ups (resettable)
166	Total number of start-ups
113	Burner number (i.e. serial number)
107	Software version
102	Software date
103	Device serial number
104	Customer code
105	Version
143	Free

5 Example: choose parameter 102 to show the date



the display shows parameter 102 flashing on the left and characters .\_.\_ on the right.

- 6 press InFo for 1-3 seconds: the date will appear
- 7 press InFo to go back to parameter "102"
- by pressing + / -, it is possible to scroll up/down the parameter list (see table above), or, by pressing ESC or InFo for more seconds, the display will show
- 9 Once the last parameter is accessed (143) by pressing +, the **End** message will flash.



10 Press InFo info for more than three seconds or for more than three seconds orto return to the normal display.



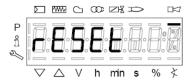
If a message like the one below is shown during operation,



it means that the burner is locked out and the Errore code is shown (in the example "error code:4"); this message is alternating with another message



Diagnostic code (in the example "diagnostic code:3"). Record the codes and find out the fault in the Error table. To perform the reset, press InFo for one second:



The unit displays an event which does not lead to shutdown.

The display shows current error code c: alternating with diagnostic code d:



Press InFo to return to the display of phases.

Example: Error code 111 / diagnostic code 0



To reset, press InFo for a second. Record the codes and check the Error List to find the type of faults.

## Service level

To enter the Service mode, press InFo until the display will show:

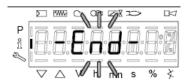


The service level shows all the information about flame intensity, actuators position, number and lock codes:

Parameter	Description
954	Flame intensity
121	% output, if set = automatic operation
922	Actuators position, 00=combustibile; 01= aria
161	Lock-outs number
701725	Lock-outs History (see chapter 23 in the LMV2x manual)



- the first parameter will be "954": the percentage of flame is shown on the right. By pressinf + or it is possible to scroll up/down the parameter list.
- 2 Once the last parameter is accessed (143) by pressing + , the End message will blink.



3 Press InFo and for more than three seconds or for more than three seconds orto return to the normal display.



For further nformation, see tha LMV2 related manual.

#### **PART IV: 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 MANAUL CUTOFF VALVES CLOSED!

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

#### ROUTINE MAINTENANCE

- Clean and examine the gas filter and replace it if necessary.
- Clean and examine the oil filter cartridge and replace it if necessary.
- Examine the flexible hoses and check for possible leaks.
- Check and clean if necessary the oil heaters and the tank, according to the fuel type and its use; remove the heaters flange fixing nuts and remove the heaters from the tank: clean by using steam or solvents and not metallic things.
- Remove and clean the combustion head (page 46).
- Examine and clean the ignition electrode, adjust and replace if necessary (see page 46).
- Examine and clean the detection probe, adjust and replace if necessary.
- Examine the detection current.
- Remove and clean the heavy oil nozzle (Important: use solvents for cleaning, not metallic tools) and at the end of the maintenance procedures, after replacing the burner, turn it on and check the shape of the flame; if in doubt replace the nozzle. Where the burner is used intensively it is recommended to replace the nozzle as a preventive measure, at the begin of the operating season.
- Clean and grease joints and rotating parts.

## IMPORTANT: Remove the combustion head before checking the ignition electrode.

- Remove and clean the compressed air regulator A in Fig. 21.
- Remove and clean the oil regulator B in Fig. 21.



CAUTION: avoid the contact of steam, solvent and other liquids with the electric terminals of the resistor. On flanged heaters, replace the seal gasket before refitting it.

Periodic inspections must be carried out to determine the frequency of cleaning.

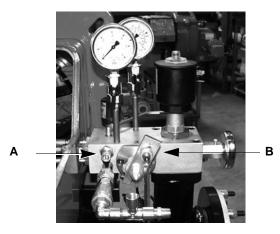


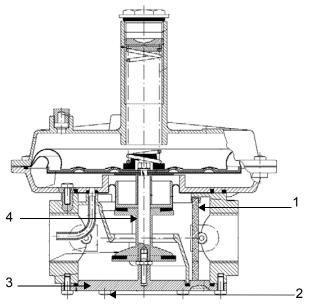
Fig. 21

## Maintenance of the pressure governor with filter (for ignitor gas train)

Before disassmbling the device, be sure that there is no pressurised gas inside it.

To check the filtering part (1) on threaded bodies (see picture Fig. 22):

- remove the bottom cover, unscrewing the fixing screws;
- remove the filtering part (1), clean it with water and soap, blow it with compressed air or replace it if necessary;
- reassemble the filtering part in its initial position checking that it is placed in its own slots (see picture Fig. 22);
- reassemble the bottom cover (3), being sure that the main bolt is centered in the bottom cover slot.



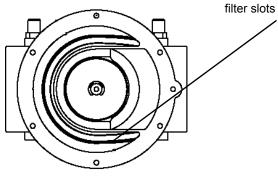
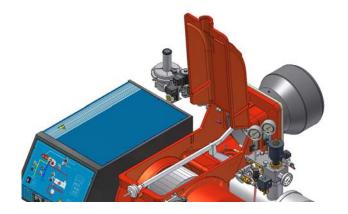


Fig. 22 - threaded body

Fig. 23 - threaded body without bottom cover

## Removing the combustion head

- Remove the cover H.
- Slide the photoresistor out of its housing.
- Unscrew the flexible hoses from the gun (burner side) and remove the whole assembly as shown on Fig. 24.



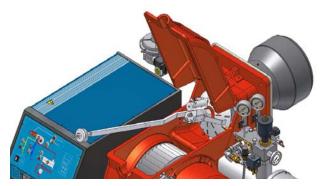


Fig. 24

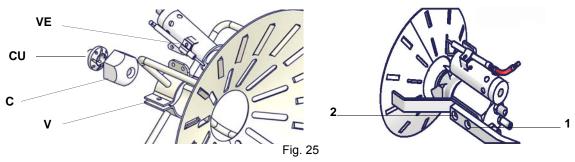
## 3.1 Removing the oil gun, replacing/adjusting the nozzle and the ignition electrode



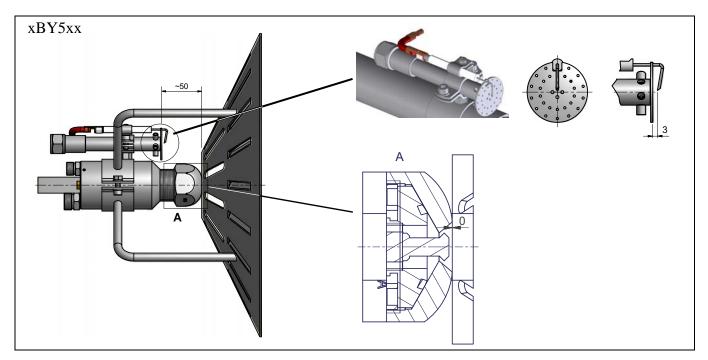
**ATTENTION:** avoid the electrode to get in touch with metallic parts (blast tube, head, etc.), otherwise the boiler operation would be compromised. Check the electrode position after any intervention on the combustion head.

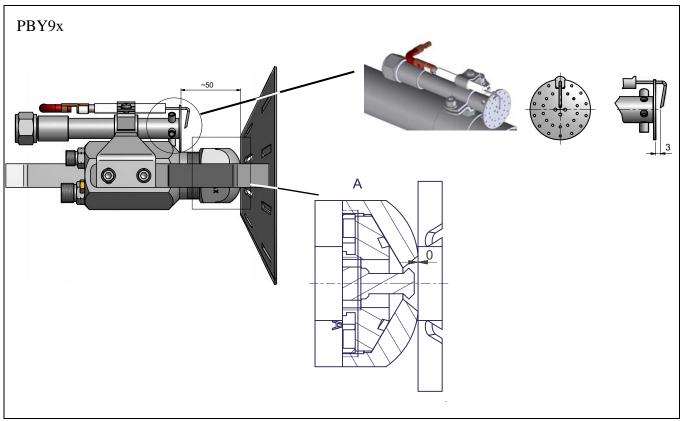
To remove the oil gun, proceed as follows:

- 1 remove the combustion head as described on the prevoius paragraph;
- 2 after removing the oil gun, to clean the nozzle remove it from its place after uncsrewing V;
- 3 unscrew cap **C** and clean the nozzle body **CU**; replace the nozzle if necessary;
- 4 in order to replace the electrode, unscrew the fixing screw and remove it: place the new electrode being careful to observe the measures (in mm) shown on next pictures and reassemble following the reversed procedure.
- To adjust the nozzle position, unscrew the fixing screw, move the nozzle backwards or forwards, then fix the screw on the new position. In the example from "1" to "2" see picture below.



To change the nozzle position, please contact the Technical Dpt.

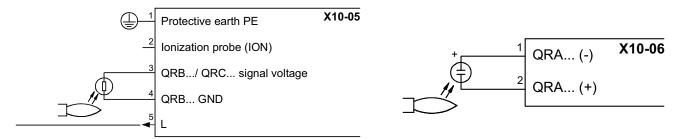




## Checking the detection current

.To check the detection signal follow the scheme in the picture below. If the signal is less than the value indicated, check the position of the detection electrode or detector, the electrical contacts and, if necessary, replace the electrode or the detector.

Device	Flame detector	Minimum detection signal	
Siemens LMV2x/3x	QRA	70 μA (intensity of flame >24%)	
	Ionization probe	4 μA (values on display: 30%)	
	QRB	<230 kΩ (intensity of flame >16%)	
	QRB4	Flame intensity (parameter 954) >16%	



## Extraneous light

Extraneous light during standby (phase 12) leads to start prevention, followed by a restart.

Extraneous light during the prepurge phase leads to immediate lockout.

If extraneous light occurs during the shutdown phase, the system switches to the safety phase.

One repetition is permitted. This means that if the error occurs again the next time the system is shut down, the unit initiates lockout.

## Seasonal stop

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

- 1 turn the burner main switch to 0 (Off position)
- 2 disconnect the power mains
- 3 close the fuel valve 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".

## **WIRING DIAGRAMS**

Refer to the attached wiring diagrams.

## WARNING

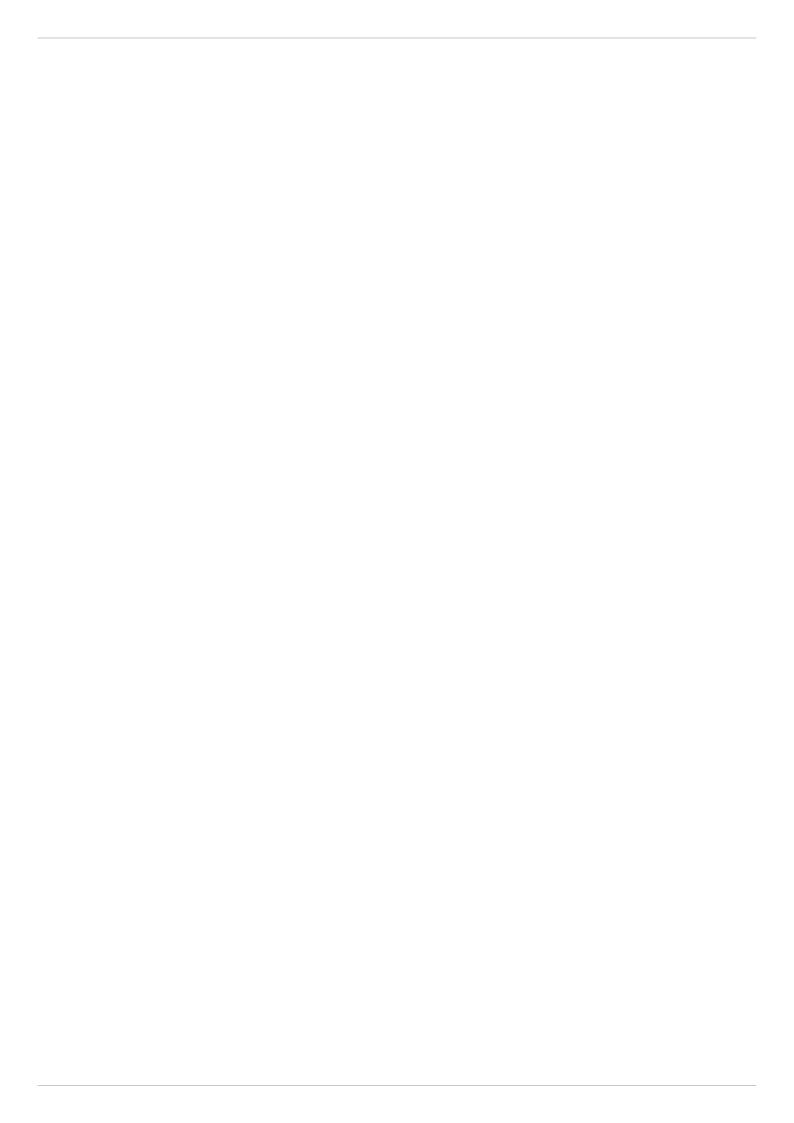
- 1 Electrical supply 230V 50Hz 1 a.c./400V 50Hz 3N a.c.
- 2 Do not reverse phase with neutral 3 Ensure burner is properly earthed

## TROUBLESHOOTING

## Heavy oil operation

	THE BURNER DOESN'T START	THE BURNER REPEATS PRE- PURGE	NOISY FUEL PUMP	THE BURNER DOESN'T START AND STOPS	THE BURNER STARTS AND STOPS	THE BURNER DOESN'T SWITCH TO HIGH FLAME	THE BURNER STOPS DURING OPERATION	THE BURNER STOPS AND REPEATS THE CYCLE DURING OPE- RATION
MAIN SWITCH OPEN	•							
LINE FUSE INTERVENTION	•							
MAX. PRESSURE SWITCH FAULT	•							•
FAN THERMAL CUTOUT INTERVENTION	•							
AUXILIARY RELAIS FUSES INTERVENTION	•							
CONTROL BOX FAULT	•	•		•	•		•	
SERVOCONTROL FAULT						•		
SMOKEY FLAME					•		•	
IGNITION TRANSFORMER FAULT				•				
IGNITION ELECTRODE DIRTY OR WRONG POSITIONED				•				
DIRTY NOZZLE				•			•	
FUEL SOLENOID VALVE DEFECTIVE				•			•	
PHOTORESISTOR DIRTY OR DEFECTIVE					•		•	
HI-LO FLAME THERMOSTAT DEFECTIVE						•		
WRONG POSITION OF SERVOCONTROL CAMS						•		
FUEL PRESSURE TOO LOW				•				
DIRTY FUEL FILTERS			•	•			•	







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Note: specifications and data subject to change. Errors and omissions exceptd.

# AZL2x - LMV2x/3x Burner Management System



Service manual

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#### 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 cutout 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.

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.
- For all the units that have been modified or have options fitted then original accessory equipment only shall be used.
- 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 circustances 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 firebox.
- 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;
- 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, reser 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 saftey 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

- 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:

- Directive 2009/142/EC Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

#### Harmonised standards:

-UNI EN 676 (Gas Burners;-EN 55014-1Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus.

-CEI EN 60335-1(Household and similar electrical appliances - Safety. Part 1: General requirements;

-EN 50165 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

-EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections)

#### Light oil burners

#### **European directives:**

- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

#### Harmonised standards:

- -CEI EN 60335-1(Household and similar electrical appliances Safety. Part 1: General requirements;
- -UNI 267 Automatic forced draught burners for liquid fuels
- -EN 55014-1Electromagnetic compatibility Requirements for household appliances, electric tools and similar apparatus.
- -EN 50165 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

#### National standards:

-UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

#### Heavy oil burners

#### **European directives:**

- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

## Harmonised standards:

- -CEI EN 60335-1 Household and similar electrical appliances SafetyPart 1: General requirements:
- -EN 55014-1Electromagnetic compatibility Requirements for household appliances, electric tools and similar apparatus.
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

#### National standards:

-UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

## Gas - Light oil burners

#### **European directives:**

- Directive 2009/142/EC Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

#### Harmonised standards:

- -UNI EN 676 Gas Burners
- -EN 55014-1Electromagnetic compatibility Requirements for household appliances, electric tools and similar apparatus.
- -UNI 267 Automatic forced draught burners for liquid fuels
- -CEI EN 60335-1(Household and similar electrical appliances Safety. Part 1: General requirements;
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

## National standards:

-UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

#### Gas - Heavy oil burners

## European directives:

- Directive 2009/142/EC Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

## Harmonised standards :

- -EN 55014-1Electromagnetic compatibility Requirements for household appliances, electric tools and similar apparatus.
- -UNI EN 676 (Gas Burners;
- -CEI EN 60335-1(Household and similar electrical appliances Safety. Part 1: General requirements;
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

#### National standards:

-UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

#### Industrial burners

#### **European directives:**

- Directive 2009/142/EC Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

#### Harmonised standards:

- -EN 55014-1Electromagnetic compatibility Requirements for household appliances, electric tools and similar apparatus.
- -EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.
- -UNI EN 746-2: Industrial thermoprocessing equipment

#### 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

Туре	
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.

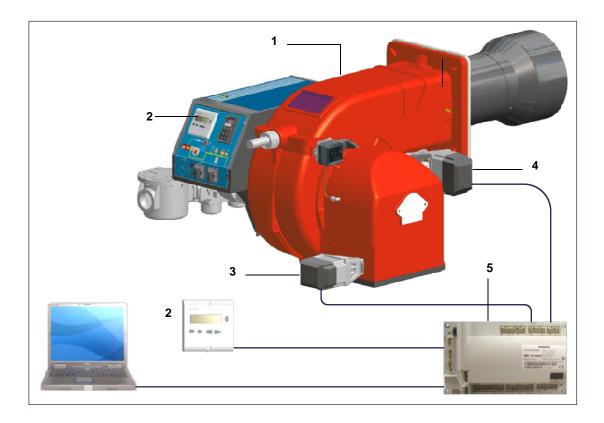


WARNING!

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

## MICROPROCESSOR CONTROLLED SYSTEM

The control system is made of the Siemens LMV central unit that performs all the burner control functions and of the Siemens AZL local programming unit that interfaces the system with the user.

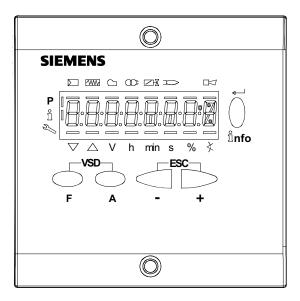


## Keys

- 1 Burner
- 2 AZL2..
- 3 Air actuator
- 4 Fuel actuator
- 5 LMV2..

## User interface

The AZL2x.. display/programming unit is shown below:



The keys functions are the following:

## Key F

Used to adjust the "fuel" actuator position (Fuel): :

While pressing the F key, the "fuel" actuator position can be changed by means of the + and - keys.



## Key A

Used to adjust the "air" actuator position (Air):

While pressing the A key, the "air" actuator position can be changed by means of the + and - keys.



## Key F + A

While pressing the two keys contemporarly, the code message will appear: by entering the proper password it is possible to access the Service mode.



## Info and Enter keys

Used for Info and Service menues

Used as Enter key in the setting modes

Used as Reset key in the burner operation mode

Used to enter a lower level menu



## -Key -

Used to decrease a a value

Used to enter Info and Serivce during the curve adjustments



Used to increase a a value

Used to enter Info and Serivce during the curve adjustments



## Keys (+ & - )= ESC

By pressing + and - at the same time, the ESCAPE function is perfored:

to enter a lower level menu

The display will show these data:

Lock+unlock codes

Flame

Open valves

Ignition transformers energised

Fan motor energised

Oil pre-heater energised

Plant heat request

Parametere setting mode

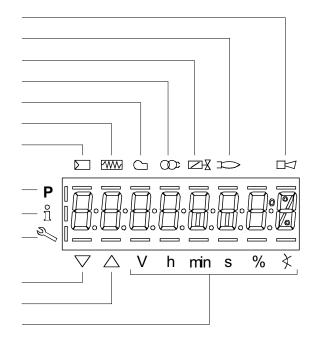
Info mode

Service mode

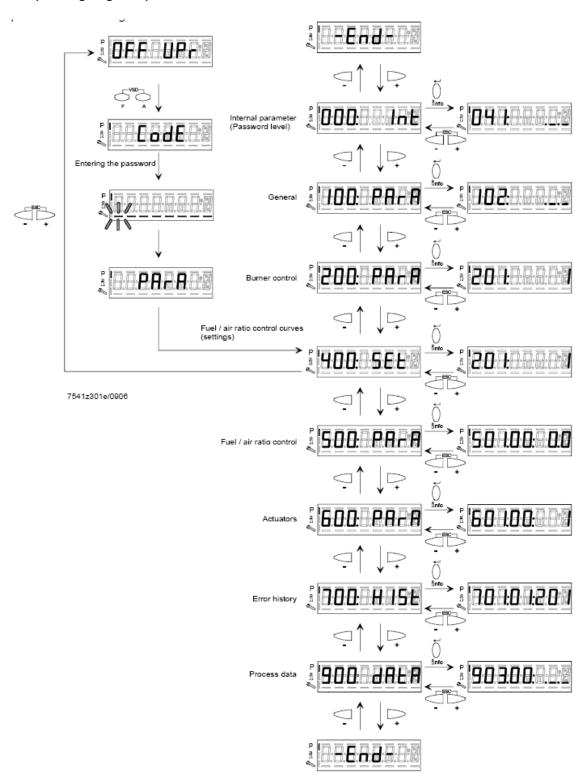
Closing actuator

Opening actuator

**IUnit** measure



## Parameters level (heating engineer)



## Setting menu

The seeting menu is divided into different blocks:

Bloc.	Descrizione	Description	Password
000		Internal parameters	OEM / Service
100	Informazioni generali	General	OEM / Service / Info
200	Controllo bruciatore	Burner control	OEM / Service
300	Controllo bruciatore (solo LMV26)	Burner control (LMV26 only)	OEM / Service
400	Curve rapporto	Ratio curves	OEM / Service
500	Controllo rapporto	Ratio control	OEM / Service
600	Servocomandi	Actuators	OEM / Service
700	Storico errori	Error history	OEM / Service / Info
900	Dati di processo	Process data	OEM / Service / Info

The access to the various blocks is allowed by passwords. Passwords are divided into three levels:

- User level (info): no password needed
- Service level (Service)
- Manifacturer level (OEM)

# Block 000: Internal Parameter

Param.	Descrizione	Description	Password
041	Password livello assistenza (ingegnere del calore)	Password heating engineer (4 characters)	OEM
042	Password livello OEM (costruttore del bruciatore)	Password OEM (5 characters)	OEM
050	Start backup/restore via AZL2x/PC	Start backup / restore via AZL2/ PC software (set parameter to 1) Index 0: Create backup Index 1: Execute restore Error diagnostics via negative values	so
		(see error code 137)	
055	Identificazione bruciatore (backup dati)	Burner identification of AZL2 backup data set	SO
056		ASN extraction of AZL2 backup data set	SO
057	Versione software creata dal set dati backup	Software version when creating the AZL2 backup data set	Service / Info

## Block 100: General information

Param.	Descrizione	Description	Password	LMV20 LMV27	LMV26	LMV37
102	Data produzione (in gg-mm-aa)	Identification date (yy-mm-dd)	Service / Info	Х	Х	Х
103	Numero identificativ	Identification number	Service / Info	Х	Х	Х
104	Set di parametri preimpostati: codice cliente	Preselected parameter set: customer code	Service / Info	Х	Х	Х
105	Set di parametri preimpostati: versione	Preselected parameter set: version	Service / Info	Х	Х	Х
107	Versione softwar	Software version	Service / Info	Х	Х	х
108	Variante software	Software variant	Service / Info	Х	Х	Х
113	Identificativo bruciatore	Burner identification	Service / Info SO password for writing	х	х	х
121	Potenza manuale Valore "Undefined = automatico Impostare un valore inferiore a = in modo che il display mostri altrimenti, il controllore rimarrà sempre in stand-by e il display mostrerà la scritta OFF lampeggiante.	Manual output Undefined = automatic mode	Service / Info	х	х	х

125	Frequenza di rete 0 = 50 Hz 1 = 60 Hz	Mains frequency 0 = 50 Hz 1 = 60 Hz	Service / Info	х	х	х
126	Luminosità display	Display brightness	Service / Info	Х	Х	Х
127	Tempo dopo il quale, se non viene premuto nessun tast il software esce dalla modalita programmazione (valore fabbrica = 60min - range impostazione: 10 - 120 min)	Timeout for menu operation (default value = 60min - range: 10 - 120 min)	OEM	х	х	х
130	Azzeramento Storico errori Impostare prima il parametro a 1 e poi a 2; se compare "0" = lo Storico è stato azzerato se compare "-1" = scaduto tempo sequ. 1_2	Delete display of error history To delete display: set to 1 then to 2; return value "0" = error history deleted return value "-1" = timeout of 1_2 sequence	OEM / Service	x	х	х
141	Attivazione comunicazione bus 0 = off 1 = Modbus 2 = riserva	Operating mode BACS 0 = off 1 = Modbus 2 = reserved	OEM / Service		x	х
142	Tempo d'arresto in caso di guasto di comunicazione	Setback time in the event of communication breakdown	OEM / Service		x	х
143	Riserva	Reserved	Service / Info		Х	Х
144	Riserva	Reserved	OEM / Service		Х	Х
145	Indirizzo dispositivo per Modbus	Device address for Modbus	OEM / Service		Х	Х
146	Velocità di trasmissione per Modbus	Baud rate for Modbus	OEM / Service		Х	Х
147	Parità per Modbus	Parity for Modbus	OEM / Service		Х	Х
148	on una interruzione della comunicazione bus:  0 19.9 = bruciatore spento  20 100 = 20 100% potenza  Per il funzionamento multistadio:  0 = bruciatore OFF,  P1, P2, P3 non valido = nessun standard di prestazione della LMV.	Performance standard at interruption of communication with building automation For modulation operation the setting range is as fol-lows: 019.9 = burner off 20100 = 20100% burner rating For multistage operation apply to setting range: 0 = burner OFF, P1, P2, P3 Invalid = no performance standards of the building auto-mation	OEM / Service		x	x
161	Numero di avarie	Number of faults	Service / Info	Х	Х	Х
162	Ore di esercizio (azzerabile da Service)	Operating hours (resettable by Service)	Service / Info	Х	Х	х
163	Ore di esercizio (con dispositivo sotto tensione)	Operating hours (when unit is live)	Service / Info	х	х	х
164	Numero di partenze (azzerabile da Service)	Number of startups (resettable by Service)	Service / Info	Х	Х	х
165	Numero di partenze	Number of startups	Service / Info	Х	Х	Х

166	Numero totale di partenze (non azzerabile)	Total number of startups	Service / Info	Х	Х	Х
167	Volume combustibile (azzerabile da OEM)	Fuel volume (resettable by OEM)	Service / Info	Х	Х	х
172	Fuel 1(secondo combustibile)Ore di esercizio (azzerabile da Service)	Fuel 1: Operation hours resettable	Service / Info		х	
174	Fuel 1 (secondo combustibile) Numero di partenze (azzerabile da Service)	Fuel 1: Number of startups resettable	Service / Info		х	
175	Fuel 1 (secondo combustibile) Numero di partenze	Fuel 1: Number of startups	Service / Info		х	
177	Fuel 1 (secondo combustibile) Volume combustibile (azzerabile da OEM)	Fuel 1: Fuel volume resettable (m³, I, ft³, gal)	Service / Info		х	

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Param.	Descrizione	Description	Password	LMV20 LMV27	LMV26	LMV37
	Modalità funzionamento bruciatore ( rampa combustibile, modulante / multistadio, servocomandi, ecc.)	Burner operating mode (fuel train, modulating / multistage, actuators, etc)				
	= non definito (cancellazione curve)	= undefined (delete curves)				
	1 = accensione diretta a gas (G mod)	1 = gas direct ignition (G mod)				
	2 = accensione tramite pilota gas con attacco tra le due elettrovalvole EV1/EV2 del gas (Gp1 mod)	2 = ignition by gas pilot connected between the two gas solenoid valves EV1/EV2 (Gp1 mod)				
	3 = accensione tramite pilota gas con attacco a monte dell'elettrovalvola EV1 del gas (Gp2 mod)	<b>3</b> = ignition by gas pilot connected upstream the gas EV1 (Gp2 mod)				x
201	<b>4</b> = accensione a gasolio - modulante (Lo mod)	4 = light oil ignition - modulating (Lo mod)	OEM / Service	v	V	
201	<b>5</b> = accensione a gasolio - bistadio (Lo 2 stage)	5 = light oil ignition - double stage (Lo 2 stage)	OEW / Service	Х	Х	
	<b>6</b> = accensione a gasolio - tristadio (Lo 3 stage)	6 = light oil ignition - three stage (Lo 3 stage)				
	<b>7</b> = accensione diretta a gas - regolazione pneumatica (G mod pneu)	<b>7</b> = gas direct ignition - pneumatic regulation (G mod pneu)				
	8 = accensione tramite pilota gas con attacco tra le due elettrovalvole EV1/EV2 del gas - regolazione pneumatica (Gp1 mod pneu)	<b>8</b> = ignition by gas pilot connected between the two gas solenoid valves EV1/EV2 - pneu- matic regulation (Gp1 mod pneu)			ı	
	<b>9</b> = accensione tramite pilota gas con attacco a monte dell'elettrovalvola EV1 del gas - regolazione pneumatica (Gp2 mod pneu)	<b>9</b> = ignition by gas pilot connected upstream the gas EV1 - pneumatic regulation (Gp2 mod pneu)				
	10 = olio modulante con accensione tramite pilota (LOGp mod)	10 = LoGp mod 11 = LoGp 2-stage				
	11 = olio 2 stadi con accensione tramite pilota (LOGp 2-stage)	12 = Lo mod 2 fuel valves				
	12 = olio modulante con 2 valvole combusti- bile (LOmod 2 valvole)	<ul><li>13 = LoGp mod 2 fuel valves</li><li>14 = G mod pneu without actuator</li></ul>				
	13 = olio modulante con 2 valvole combusti- bile e con accensione tramite pilota (LOGp 2 valvole)					
	<b>14</b> = gas modulante pneumatico senza servomotori (Gmod pneu)					

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	15 = gas rampa Gp1 modulante pneumatico senza servomotori (Gp1 mod pneu) 16 = gas rampa Gp2 modulante pneumatico senza servomotori (Gp2 mod pneu) 17 = olio LO 2 stadi senza servomotori 18 = olio LO 3 stadi senza servomotori 19 = gas Gmod con solo servomotore gas 20 = gas Gp1 mod con solo servomotore gas 21 = gas Gp2 mod con solo servomotore olio	15 = Gp1 mod pneu without actuator 16 = Gp2 mod pneu without actuator 17 = Lo 2-stage without actuator 18 = Lo 3-stage without actuator 19 = G mod gas actuator only 20 = Gp1 mod gas actuator only 21 = Gp2 mod gas actuator only 22 = Lo mod oil actuator only				
208	del programma)	Program stop  0 = deactivated  1 = pre-purge position (Ph24 - program phase 24)  2 = ignition position (Ph36 - program phase 36)  3 = interval 1 (Ph44 - program phase 44)  4 = interval 2 (Ph52 - program phase 52)	OEM / Service	x	x	x
210	Allarme impedimento avviamento  0 = non attivo  1 = attivo	Alarm in the event of start prevention <b>0</b> = deactivated <b>1</b> = activated	OEM / Service	х	х	х
211	Tempo aumento giri ventilatore (valore fabbrica = 2s - range impostazione: 2 - 60 s)	Fan ramp up time (default value = 2s - range: 2 - 60 s)	OEM / Service	х	x	х
212	Tempo massimo raggiungimento bassa fiamma (valore fabbrica = 45 s - range impostazione: 0.2 s - 10 min) Stabilisce il massimo intervallo di tempo durante il quale il bruciatore raggiunge la minima potenza e poi si spegne	Maximum time down to low-fire (default value = 45 s - range: 0.2 s - 10 min) It states the maximum time interval during which the burner drives to the low output and then turns off	OEM / Service		х	
213	Tempo minimo raggiungimento posizione di stand by (valore fabbrica = 2 s - range impostazione: 2 - 60 s)	Min. time home run (default value = 2 s - range: 2 - 60 s)	OEM	х	х	х
214	Tempo massimo inizio partenza	Max. time start release	OEM	Х	Х	х
215	Limite ripetizioni catena di sicurezza (valore fabbrica = 16 - range impostazione:1 - 16)	Repetition limit safety loop (default value = 16 - range: 1 - 16)	OEM / Service	х	х	х
217	Tempo massimo per rilevazione segnale (valore fabbrica = 30s - range impostazione: 5s - 10 min)	Max. time to detector signal (default value = 30s - range: 5s - 10 min)	OEM	х	х	х

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221	Gas: sonda rilevazione fiamma attivo (valore fabbrica = 1)	Gas: active detector flame evaluation (default value = 1)  0 = QRB/QRC  1 = ION / QRA	OEM / Service	х	х	x
222	EN676 rende obbligatoria la preventilazione. In ambito industriale, vedere i casi in cui la	Gas: Pre-purging (default value = 1)  1 = active  0 = deactivated  WARNING: in the civil field, the prepurge is mandatory according to the standard EN676. In the industrial fiels, check if the pre purge can be avoided according to the stanrds EN746-2  If the prepurge is not performed, the burner must be equipped with two valves and the proving system.	OEM / Service	х	х	x
223	Limite ripetizioni pressostato gas di minima pressione (valore fabbrica = 16 - range impostazione:1 - 16)	Repetition limit pressure switch-min-gas (default value = 16 - range:1 - 16)	OEM / Service	х	х	х
225	Gas: tempo di preventilazione (valore fabbrica = 20s - range impostazione:20s - 60min)	Gas: Prepurge time (default value = 20s - range:20s - 60min)	OEM / Service	х	х	х
226	Gas: tempo di preaccensione (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Gas: Preignition time (default value = 2s - range: 0.2s - 60min)	OEM / Service	х	х	х
227	Gas: tempo di sicurezza 1 (TSA1) (valore fabbrica = 3s - range impostazione:0.2 - 10s)	Gas: Safety time 1 (TSA1) (default value = 3s - range: 0.2 - 10s)	OEM	х	х	х
229	Gas: tempo di risposta a cadute di pressione entro TSA1 e TSA2 (valore fabbrica = 1.8s - range impostazione:0.2s - 9.8s)	Gas: time to respond to pressure faults in TSA1 e TSA2 (default value = 1.8s - range: 0.2s - 9.8s)	OEM	х	х	х
230	Gas: Intervallo 1 (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Gas: Interval 1 (default value = 2s - range: 0.2s - 60min)	OEM / Service	х	х	х
231	Gas: tempo di sicurezza 2 (TSA2) (valore fabbrica = 3s - range impostazione:0.2 - 10s)	Gas: Safety time 2 (TSA2) (default value = 3s - range:0.2 - 10s)	OEM	х	х	х
232	Gas: Intervallo 2 (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Gas: Interval 2 (default value = 2s - range:0.2s - 60min)	OEM / Service	х	х	
233	Gas: Tempo postcombustione (valore fabbrica = 8s - range impostazione:0.2s - 60s)	Gas: postcombustion time (default value = 8s - range:0.2s - 60s)	OEM / Service	х	х	х
234	Gas: Tempo postventilazione (valore fabbrica = 0.2s - range impostazione:0.2s - 180min)	Gas: Postpurge time (default value = 0.2s - range:0.2s - 180min)	OEM / Service	х	X	х

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236	0 = inattivo 1 = pressostato gas di minima (a monte val- vola V1)	Gas: Pressure switch-min input  0 = inactive  1 = pressure switch-min (upstream of fuel valve 1 (V1))  2 = valve proving via pressure switch-min (between fuel valves 1 (V1) and 2 (V2))	OEM / Service	x	x	
237	Gas: Pressostato gas di massima / ingresso-POC 0 = inattivo 1= pressostato gas di massima 2= POC 3 = pressostato controllo perdite	Gas: Pressure switch-max / POC input 0 = inactive 1 = pressure switch-max 2 = POC 3 = pressure switch valve proving			х	x
239	Gas: Forzatura al funzionamento intermittente  0 = disattivato  1 = attivato  Attenzione : di default questo parametro è attivo = (1); esso è modificabile solo su LMV37. Dal punto di vista della sicurezza, il funzionamento continuo è valido esclusivamente per bruciatori di gas con elettrodo di rilevazione.		OEM			x
240	Limite ripetizioni perdita di fiamma (valore fabbrica = 2 - range impostazione:1 - 2)	Repetition limit loss of flame (default value= 2 - range:1 - 2)	OEM	х	х	х
241	Gas: esecuzione controllo tenuta (valore fabbrica = 2)  0 = no controllo tenuta  1 = controllo tenuta in avviamento  2 = controllo tenuta in arresto  3 = controllo tenuta in arresto e in avviamento	Gas: execution proving test (default value= 2)  0 = no proving test 1 = proving test on startup 2 = proving test on shutdown 3 = proving test on shutdown and on startup	OEM / Service	х	х	х
242	Gas: tempo evacuazione controllo tenuta (valore fabbrica = 3s - range impostazione:0.2s - 10s)	Gas: proving test evacuation time (default value = 3s - range:0.2s - 10s)	OEM	х	х	х

243	Gas: tempo pressione atmosferica controllo tenuta (valore fabbrica = 10s - range impostazione:0.2s - 60s)	Gas: proving test time atmospheric pressure (default value = 10s - range:0.2s - 60s)	OEM	х	х	x
244	Gas: tempo riempimento controllo tenuta (valore fabbrica = 3s - range impostazione:0.2s - 10s)	Gas: proving test filling time (default value = 3s - range:0.2s - 10s)	OEM	х	х	х
245	Gas: tempo test pressione gas (valore fabbrica = 10s - range impostazione:0.2s - 60s)	Gas: proving test time gas pressure (default value = 10s - range:0.2s - 60s)	OEM	х	х	Х
246	Gas: tempo attesa consenso pressostato di minima (valore fabbrica = 10s - range impostazione:0.2s - 60s) Se la pressione del gas è troppo bassa, in fase 22 non verrà eseguito l'avviamento: il sistema compie un numero impostabile di tentativi finché non si arriva al blocco. Il tempo di attesa tra un tentativo e il successivo viene raddoppiato ad ogni tentativo.	Gas: waiting time gas shortage (default value = 10s - range:0.2s - 60s)  If the gas pressure is too low, in phase 22 the startup will not be performed: the system tries for a certain number of times the it locks out. The time interval between two attempts is doubled at each attempt.	OEM	x	x	x
248	Gas: Tempo di post-ventilazione 3 (abortito con regolatore di potenza (LR)-ON	Gas: Postpurge time 3 (abortion with load controller (LR)-ON	OEM / Service	x	x	x
261	Olio: sonda rilevazione fiamma attivo (valore fabbrica = 0)  0 = QRB/QRC  1 = ION / QRA	Oil: active detector flame evaluation (default value = 0) <b>0</b> = QRB/QRC <b>1</b> = ION / QRA	OEM / Service	х	х	x
262	Olio: preventilazione (valore fabbrica = 1)  1 = attivo  0 = non attivo In ambito civile la norma EN267 rende obbligatoria la preventilazione. In ambito industriale, vedere i casi in cui la norma EN746-2 prevede la possibilità di non fare la preventilazione.	Oil: prepurging (default value = 1)  0 = deactivated  1 = activated  0 = deactivated  WARNING: in the civil field, the prepurge is mandatory according to the standard EN267. In the industrial fiels, check if the pre purge can be avoided according to the standard EN746-2	OEM / Service	x	х	х
265	Olio: tempo preventilazione (valore fabbrica = 15s - range impostazione:15s - 60min)	Oil: prepurging time (default value = 15s - range:15s - 60min)	OEM / Service	х	Х	Х
266	Olio: tempo preaccensione (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Oil: preignition time (default value = 2s - range:0.2s - 60min)	OEM / Service	х	x	Х
267	Olio: tempo di sicurezza 1 (TSA1) (valore fabbrica = 5s - range impostazione:0.2 - 15s)	Oil: safety time 1 (TSA1) (default value = 5s - range:0.2 - 15s)	OEM	х	x	Х
269	Olio: tempo di risposta a cadute di pressione entro TSA1 e TSA2 (valore fabbrica = 1.8s - range impostazione:0.2s - 14.8s)	Oil: time to respond to pressure faults in TSA1 and TSA2 (default value = 1.8s - range:0.2s - 14.8s)	OEM	x	х	x

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270	Olio: Intervallo 1 (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Oil: Interval 1 (default value = 2s - range:0.2s - 60min)	OEM / Service	x	х	х
271	Olio: tempo di sicurezza 2 (TSA2) (valore fabbrica = 3s - range impostazione:0.2 - 10s)	Oil: safety time 2 (TSA2) (default value = 3s - range:0.2 - 10s)	OEM	х	х	х
272	Olio: Intervallo 2 (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Oil: Interval 2 (default value = 2s - range:0.2s - 60min)	OEM / Service	х	х	х
273	Olio: Tempo postcombustione (valore fabbrica = 8s - range impostazione:0.2s - 60s)	Oil: Postcombustion time (default value = 8s - range:0.2s - 60s)	OEM / Service	х	х	х
274	Olio: Tempo postventilazione (valore fabbrica = 0.2s - range impostazione:0.2s - 180min)	Oil: Postpurging time (default value = 0.2s - range:0.2s - 180min)	OEM / Service	х	х	х
276	Olio : Pressostato olio di minima (default = 1) 0 = inattivo 1 = attivo dalla fase 38 2 = attivo dal tempo di sicurezza (TSA)	Oil. Pressure switch-min input  0 = inactive  1 = active from phase 38  2 = active from safety time (TSA)	OEM / Service	x	x	
277	Olio: Pressostato olio di massima / ingresso- POC 0 = inattivo 1= pressostato olio di massima 2= POC	Oil: Pressure switch-max/POC input 0 = inactive 1 = pressure switch-max 2 = POC			х	
279	Olio: Forzatura al funzionamento intermittente 0 = disattivato 1 = attivato Attenzione : di default questo parametro è attivo = (1); esso è modificabile solo su LMV37	Oil: Forced intermittent operation 0 = deactivated 1 = activated	OEM		х	х
280	Limite ripetizioni perdita di fiamma (valore fabbrica = 2 - range impostazione:1 - 2)	Repetition limit value loss of flame (default value = 2 - range:1 - 2)	OEM	х	х	х
281	Olio: tempo iniezione olio (valore fabbr. = 1) <b>0</b> = preaccensione corta (Ph38 - fase programma 38) <b>1</b> = preaccensione lunga (con ventilatore) (Ph22 - fase programma 22)	Oil: time oil ignition (default value = 1) <b>0</b> = short preignition (Ph38-progr. phase 38) <b>1</b> = long preignition (with fan) (Ph22 - program phase 22)	OEM / Service	х	x	x
284	Olio: Tempo di post-ventilazione 3 (abortito con regolatore di potenza (LR)-ON	Oil: Postpurge time 3 (abortion with load controller (LR)-ON	OEM / Service	Х	х	х

## Block 300: Burner control (only with LMV26)

Param.	Descrizione	Description	Password	LMV20 LMV27	LMV26	LMV37
	Combustibile 1 : Modalità funzionamento bruciatore ( rampa combustibile, modulante / multistadio, servocomandi, ecc.)	Fuel 1 : Burner operating mode (fuel train, modulating / multistage, actuators, etc)				
	= non definito (cancellazione curve)	= undefined (delete curves)				
	1 = accensione diretta a gas (G mod)	1 = gas direct ignition (G mod)				
	2 = accensione tramite pilota gas con attacco tra le due elettrovalvole EV1/EV2 del gas (Gp1 mod)	2 = ignition by gas pilot connected between the two gas solenoid valves EV1/EV2 (Gp1 mod)				
	3 = accensione tramite pilota gas con attacco a monte dell'elettrovalvola EV1 del gas (Gp2 mod)	<b>3</b> = ignition by gas pilot connected upstream the gas EV1 (Gp2 mod)				
	<b>4</b> = accensione a gasolio - modulante (Lo mod)	4 = light oil ignition - modulating (Lo mod)				
301	<b>5</b> = accensione a gasolio - bistadio (Lo 2 stage)	5 = light oil ignition - double stage (Lo 2 stage)	OEM / Service		х	
	<b>6</b> = accensione a gasolio - tristadio (Lo 3 stage)	6 = light oil ignition - three stage (Lo 3 stage)				
	<b>7</b> = accensione diretta a gas - regolazione pneumatica (G mod pneu)	(G mod pneu)				
	<b>8</b> = accensione tramite pilota gas con attacco tra le due elettrovalvole EV1/EV2 del gas - regolazione pneumatica (Gp1 mod pneu)	<b>8</b> = ignition by gas pilot connected between the two gas solenoid valves EV1/EV2 - pneu- matic regulation (Gp1 mod pneu)				
	<b>9</b> = accensione tramite pilota gas con attacco a monte dell'elettrovalvola EV1 del gas - regolazione pneumatica (Gp2 mod pneu)	<b>9</b> = ignition by gas pilot connected upstream the gas EV1 - pneumatic regulation (Gp2 mod pneu)				
	10 = olio modulante con accensione tramite pilota (LOGp mod)	10 = LoGp mod				

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	Tee 11 2 2 11 2 2 2 2 2 2 2 2 2 2 2 2 2 2				
	11 = olio 2 stadi con accensione tramite pilota				
	(LOGp 2-stage)	12 = Lo mod 2 fuel valves			
	12 = olio modulante con 2 valvole combusti-				
	bile (LOmod 2 valvole)	<b>14</b> = G mod pneu without actuator			
	13 = olio modulante con 2 valvole combusti- bile e con accensione tramite pilota (LOGp 2				
	valvole)	16 = Gp2 mod pneu without actuator			
	<b>14</b> = gas modulante pneumatico senza servomotori (Gmod pneu)				
	15 = gas rampa Gp1 modulante pneumatico senza servomotori (Gp1 mod pneu)				
	16 = gas rampa Gp2 modulante pneumatico				
	senza servomotori (Gp2 mod pneu)				
	17 = olio LO 2 stadi senza servomotori	17 = Lo 2-stage without actuator			
	18 = olio LO 3 stadi senza servomotori	<b>18</b> = Lo 3-stage without actuator			
	19 = gas Gmod con solo servomotore gas	19 = G mod gas actuator only			
	20 = gas Gp1 mod con solo servomotore gas	20 = Gp1 mod gas actuator only		Х	
	21 = gas Gp2 mod con solo servomotore gas	21 = Gp2 mod gas actuator only			
	22 = olio LO mod con solo servomotore olio	22 = Lo mod oil actuator only			
	Combustibile 1 - Gas: sonda rilevazione	Fuel 1 - Gas: active detector flame evalua-			
004	fiamma attivo (valore fabbrica = 1) -	tion (default value = 1)			
321	<b>0</b> = QRB/QRC	<b>0</b> = QRB/QRC	OEM / Service	Х	
	1 = ION / QRA	1 = ION / QRA			
	Combustibile 1 - Gas: Preventilazione (valore fabbrica = 1)	Fuel 1 - Gas: Pre-purging (default value = 1)			
	1 = attivo	1 = active			
	0 = non attivo	0 = deactivated			
	ATTENZIONE : In ambito civile la norma	WARNING: in the civil field, the prepurge is			
322	EN676 rende obbligatoria la preventilazione.	mandatory according to the standard EN676.	OFM / Comit-		
322	In ambito industriale, vedere i casi in cui la	In the industrial fiels, check if the pre purge	OEM / Service	Х	
	norma EN746-2 prevede la possibilità di non	can be avoided according to the stanrds EN746-2			
	fare la preventilazione.				
	In questi ultimi casi il bruciatore deve essere	If the prepurge is not performed, the burner must be equipped with two valves and the			
	costruito obbligatoriamente con controllo di tenuta e valvole gas in classe A.	proving system.			
	Limite ripetizioni pressostato gas di minima	Repetition limit pressure switch-min-gas			
323	pressione (valore fabbrica = 16 - range impostazione:1 - 16)	(default value = 16 - range:1 - 16)	OEM / Service	х	
00-	Combustibile 1 - Gas: tempo di preventila-	Fuel 1 - Gas: Prepurge time (default value =			
325	zione (valore fabbrica = 20s - range imposta- zione:20s - 60min)	20s - range:20s - 60min)	OEM / Service	x	
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	Combustibile 1 - Gas: tempo di preaccen-	Fuel 1 - Gas: Preignition time (default value =			
326	sione (valore fabbrica = 2s - range imposta- zione:0.2s - 60min)	2s - range: 0.2s - 60min)	OEM / Service	х	
327	Combustibile 1 - Gas: tempo di sicurezza 1 (TSA1) (valore fabbrica = 3s - range impostazione:0.2 - 10s)	Fuel 1 - Gas: Safety time 1 (TSA1) (default value = 3s - range: 0.2 - 10s)	OEM	х	
329	Combustibile 1 - Gas: tempo di risposta a cadute di pressione entro TSA1 e TSA2 (valore fabbrica = 1.8s - range impostazione:0.2s - 9.8s)	Fuel 1 - Gas: time to respond to pressure faults in TSA1 e TSA2 (default value = 1.8s - range: 0.2s - 9.8s)	ОЕМ	х	
330	Combustibile 1 - Gas: Intervallo 1 (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Fuel 1 - Gas: Interval 1 (default value = 2s - range: 0.2s - 60min)	OEM / Service	х	
331	Combustibile 1 - Gas: tempo di sicurezza 2 (TSA2) (valore fabbrica = 3s - range impostazione:0.2 - 10s)	Fuel 1 - Gas: Safety time 2 (TSA2) (default value = 3s - range:0.2 - 10s)	OEM	х	
332	Combustibile 1 - Gas: Intervallo 2 (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Fuel 1 - Gas: Interval 2 (default value = 2s - range:0.2s - 60min)	OEM / Service	х	
333	Combustibile 1 - Gas: Tempo postcombustione (valore fabbrica = 8s - range impostazione:0.2s - 60s)	Fuel 1 - Gas: postcombustion time (default value = 8s - range:0.2s - 60s)	OEM / Service	х	
334	Combustibile 1 - Gas: Tempo postventila- zione (valore fabbrica = 0.2s - range impo- stazione:0.2s - 180min)	Fuel 1 - Gas: Postpurge time (default value = 0.2s - range:0.2s - 180min)	OEM / Service	х	
336	Combustibile 1 - Gas: Pressostato gas di minima (default = 1) 0 = inattivo 1 = pressostato gas di minima (a monte valvola V1) 2 = controllo perditavalvole via pressostato (montato tra le valvole V1 e V2)	2 = valve proving via pressure switch-min	OEM / Service	х	
337	Combustibile 1 - Gas: Pressostato gas di massima / ingressoPOC 0 = inattivo 1= pressostato gas di massima 2= POC 3 = pressostato controllo perdite	Fuel 1 - Gas: Pressure switch-max / POC input 0 = inactive 1 = pressure switch-max 2 = POC 3 = pressure switch valve proving		х	

340	Limite ripetizioni perdita di fiamma (valore fabbrica = 2 - range impostazione:1 - 2)	Repetition limit loss of flame (default value= 2 - range:1 - 2)	OEM	:	x	
341	Combustibile 1 - Gas: esecuzione controllo tenuta (valore fabbrica = 2)  0 = no controllo tenuta  1 = controllo tenuta in avviamento  2 = controllo tenuta in arresto  3 = controllo tenuta in arresto e in avviamento	Fuel 1 - Gas: execution proving test (default value= 2)  0 = no proving test 1 = proving test on startup 2 = proving test on shutdown 3 = proving test on shutdown and on startup	OEM / Service		x	
342	Combustibile 1 - Gas: tempo evacuazione controllo tenuta (valore fabbrica = 3s - range impostazione:0.2s - 10s)	Fuel 1 - Gas: proving test evacuation time (default value = 3s - range:0.2s - 10s)	OEM		x	
343	Combustibile 1 - Gas: tempo pressione atmosferica controllo tenuta (valore fabbrica = 10s - range impostazione:0.2s - 60s)	Fuel 1 - Gas: proving test time atmospheric pressure (default value = 10s - range:0.2s - 60s)	OEM	:	x	
344	Combustibile 1 - Gas: tempo riempimento controllo tenuta (valore fabbrica = 3s - range impostazione:0.2s - 10s)	Fuel 1 - Gas: proving test filling time (default value = 3s - range:0.2s - 10s)	OEM	:	x	
345	Combustibile 1 - Gas: tempo test pressione gas (valore fabbrica = 10s - range impostazione:0.2s - 60s)	Fuel 1 - Gas: proving test time gas pressure (default value = 10s - range:0.2s - 60s)	OEM	:	x	
346	Combustibile 1 - Gas: tempo attesa consenso pressostato di minima (valore fabbrica = 10s - range impostazione:0.2s - 60s) Se la pressione del gas è troppo bassa, in fase 22 non verrà eseguito l'avviamento: il sistema compie un numero impostabile di tentativi finché non si arriva al blocco. Il tempo di attesa tra un tentativo e il successivo viene raddoppiato ad ogni tentativo.	Fuel 1 - Gas: waiting time gas shortage (default value = 10s - range:0.2s - 60s) If the gas pressure is too low, in phase 22 the startup will not be performed: the system tries for a certain number of times the it locks out. The time interval between two attempts is doubled at each attempt.	OEM		x	
348	Combustibile 1 - Gas: Tempo di post-ventilazione 3 (abortito con regolatore di potenza (LR)-ON	Fuel 1 - Gas: Postpurge time 3 (abortion with load controller (LR)-ON	OEM / Service	;	x	
361	Combustibile 1 - Olio: sonda rilevazione fiamma attivo (valore fabbrica = 0)  0 = QRB/QRC  1 = ION / QRA	Fuel 1 - Oil: active detector flame evaluation (default value = 0) <b>0</b> = QRB/QRC <b>1</b> = ION / QRA	OEM / Service	:	x	

362	Combustibile 1 - Olio: preventilazione (valore fabbrica = 1)  1 = attivo  0 = non attivo In ambito civile la norma EN267 rende obbligatoria la preventilazione. In ambito industriale, vedere i casi in cui la norma EN746-2 prevede la possibilità di non fare la preventilazione.	Fuel 1 - Oil: prepurging (default value = 1)  0 = deactivated  1 = activated  0 = deactivated  WARNING: in the civil field, the prepurge is mandatory according to the standard EN267. In the industrial fiels, check if the pre purge can be avoided according to the standard EN746-2	OEM / Service	x	
365	Combustibile 1 - Olio: tempo preventilazione (valore fabbrica = 15s - range impostazione:15s - 60min)	Fuel 1 - Oil: prepurging time (default value = 15s - range:15s - 60min)	OEM / Service	х	
366	Combustibile 1 - Olio: tempo preaccensione (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Fuel 1 - Oil: preignition time (default value = 2s - range:0.2s - 60min)	OEM / Service	х	
367	Combustibile 1 - Olio: tempo di sicurezza 1 (TSA1) (valore fabbrica = 5s - range impostazione:0.2 - 15s)	Fuel 1 - Oil: safety time 1 (TSA1) (default value = 5s - range:0.2 - 15s)	OEM	х	
369	Combustibile 1 - Olio: tempo di risposta a cadute di pressione entro TSA1 e TSA2 (valore fabbrica = 1.8s - range impostazione:0.2s - 14.8s)	Fuel 1 - Oil: time to respond to pressure faults in TSA1 and TSA2 (default value = 1.8s - range:0.2s - 14.8s)	OEM	х	
370	Combustibile 1 - Olio: Intervallo 1 (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Fuel 1 - Oil: Interval 1 (default value = 2s - range:0.2s - 60min)	OEM / Service	х	
371	Combustibile 1 - Olio: tempo di sicurezza 2 (TSA2) (valore fabbrica = 3s - range impostazione:0.2 - 10s)	Fuel 1 - Oil: safety time 2 (TSA2) (default value = 3s - range:0.2 - 10s)	OEM	х	
372	Combustibile 1 - Olio: Intervallo 2 (valore fabbrica = 2s - range impostazione:0.2s - 60min)	Fuel 1 - Oil: Interval 2 (default value = 2s - range:0.2s - 60min)	OEM / Service	х	
373	Combustibile 1 - Olio: Tempo postcombustione (valore fabbrica = 8s - range impostazione:0.2s - 60s)	Fuel 1 - Oil: Postcombustion time (default value = 8s - range:0.2s - 60s)	OEM / Service	х	
374	Combustibile 1 - Olio: Tempo postventila- zione (valore fabbrica = 0.2s - range impo- stazione:0.2s - 180min)	Fuel 1 - Oil: Postpurging time (default value = 0.2s - range:0.2s - 180min)	OEM / Service	х	
377	Combustibile 1 - Olio: Pressostato olio di massima / ingressoPOC 0 = inattivo 1= pressostato olio di massima 2= POC	Fuel 1 - Oil: Pressure switch-max/POC input 0 = inactive 1 = pressure switch-max 2 = POC		х	

Limite ripetizioni perdita di fiamma (valore fabbrica = 2 - range impostazione:1 - 2)	Repetition limit value loss of flame (default value = 2 - range:1 - 2)	OEM		х	
Combustibile 1 - Olio: tempo iniezione olio (valore fabbr. = 1)	Fuel 1 - Oil: time oil ignition (default value = 1)				
<b>0</b> = preaccensione corta (Ph38 - fase programma 38)	<b>0</b> = short preignition (Ph38-progr. phase 38)	OEM / Service		х	
1 = preaccensione lunga (con ventilatore) (Ph22 - fase programma 22)	<b>1</b> = long preignition (with fan) (Ph22 - program phase 22)				
Combustibile 1 - Olio: Tempo di post-ventila- zione 3 (abortito con regolatore di potenza (LR)-ON	Fuel 1 - Oil: Postpurge time 3 (abortion with load controller (LR)-ON	OEM / Service		х	
	fabbrica = 2 - range impostazione:1 - 2)  Combustibile 1 - Olio: tempo iniezione olio (valore fabbr. = 1)  0 = preaccensione corta (Ph38 - fase programma 38)  1 = preaccensione lunga (con ventilatore) (Ph22 - fase programma 22)  Combustibile 1 - Olio: Tempo di post-ventilazione 3 (abortito con regolatore di potenza	fabbrica = 2 - range impostazione:1 - 2)  Combustibile 1 - Olio: tempo iniezione olio (valore fabbr. = 1)  O = preaccensione corta (Ph38 - fase programma 38)  1 = preaccensione lunga (con ventilatore) (Ph22 - fase programma 22)  Combustibile 1 - Olio: Tempo di post-ventilazione 3 (abortito con regolatore di potenza  value = 2 - range:1 - 2)  Fuel 1 - Oil: time oil ignition (default value = 1)  0 = short preignition (Ph38-progr. phase 38)  1 = long preignition (with fan) (Ph22 - program phase 22)  Fuel 1 - Oil: Postpurge time 3 (abortion with load controller (LR)-ON	fabbrica = 2 - range impostazione:1 - 2)  Combustibile 1 - Olio: tempo iniezione olio (valore fabbr. = 1)  O = preaccensione corta (Ph38 - fase programma 38)  1 = preaccensione lunga (con ventilatore) (Ph22 - fase programma 22)  Combustibile 1 - Olio: Tempo di post-ventilazione 3 (abortito con regolatore di potenza  value = 2 - range:1 - 2)  Fuel 1 - Oil: time oil ignition (default value = 1)  O = short preignition (Ph38-progr. phase 38)  OEM / Service	fabbrica = 2 - range impostazione:1 - 2)  Combustibile 1 - Olio: tempo iniezione olio (valore fabbr. = 1)  O = preaccensione corta (Ph38 - fase programma 38)  1 = preaccensione lunga (con ventilatore) (Ph22 - fase programma 22)  Combustibile 1 - Olio: Tempo di post-ventilazione 3 (abortito con regolatore di potenza  value = 2 - range:1 - 2)  Fuel 1 - Oil: time oil ignition (default value = 1)  O = short preignition (Ph38-progr. phase 38)  OEM / Service	fabbrica = 2 - range impostazione:1 - 2)  Combustibile 1 - Olio: tempo iniezione olio (valore fabbr. = 1)  O = preaccensione corta (Ph38 - fase programma 38)  1 = preaccensione lunga (con ventilatore) (Ph22 - fase programma 22)  Combustibile 1 - Olio: Tempo di post-ventilazione 3 (abortito con regolatore di potenza  value = 2 - range:1 - 2)  Fuel 1 - Oil: time oil ignition (default value = 1)  O = short preignition (Ph38-progr. phase 38)  1 = long preignition (with fan) (Ph22 - program phase 22)  Fuel 1 - Oil: Postpurge time 3 (abortion with load controller (LR)-ON

# Block 400: Setting air/fuel ratio curves

Param.	Descrizione	Description	Password	LMV20 LMV27	LMV26	LMV37
401	Curve controllo servocomando combustibile (F): si accede alla lista dei punti da impostare (da P0 a P9) - consultare paragrafo "Impostazione curve"	Ratio control curve fuel actuator (F): it accesses to the parameter list of the points to be set (P0 to P9) - see paragrapf "Setting the curves"	OEM / Service	х	x	х
402	Curve controllo servocomando aria (A): si accede alla lista dei punti da impostare (da P0 a P9) - consultare paragrafo "Impostazione curve"	Ratio control curve air actuator (A): it accesses to the parameter list of the points to be set (P0 to P9) - see paragraph "Setting the curves"	OEM / Service	x	x	х
403	Curve controllo inverter (F + A): si accede alla lista dei punti da impostare (da P0 a P9) - consultare paragrafo "Impostazione curve"	Ratio control curves VSD (curve setting only)	SO		x	х
404	Combustibile 1 - Curve controllo servoco- mando combustibile 1 (F): si accede alla lista dei punti da impostare (da P0 a P9) - consul- tare paragrafo "Impostazione curve"	Fuel 1: Ratio control curves fuel actuator (curve setting only)	SO		х	
405	Combustibile 1 - Curve controllo servoco- mando aria (A): si accede alla lista dei punti da impostare (da P0 a P9) - consultare para- grafo "Impostazione curve"	Fuel 1: Ratio control curves air actuator (curve setting only)	SO		х	
406	Combustibile 1 - Curve controllo inverter (F + A): si accede alla lista dei punti da impostare (da P0 a P9) - consultare paragrafo "Impostazione curve"	Fuel 1: Ratio control curves VSD (curve setting only)	SO		х	

Descrizione

Param.

Ramp down

Description

**Password** 

OEM / Service

Х

Х

523

Tempo rampa di discesa inverter

		Modulation <b>32</b> s	Parame Modulation <b>48s</b>	Modulation <b>64s</b>	Modulation <b>80s</b>			
542	Activation of VSD / PWM fan (Width Modulation) 0=deactived 1=actived	PWM = Pulse-	Activation of V3 (PWM = Pulse-	SD / PWM fan -Width Modulatio	on)	OEM / Service	x	х

				Parame	eter 544					
			Modulation <b>32s</b>	Modulation <b>48s</b>	Modulation <b>64s</b>	Modulation <b>80s</b>				
544	Actuator	Actuating speed parameter 613	Max. delta between the curve points			OEM / Service	x	x	х	
	Actuator (<= 5Nm)	5s / 90°	31°	46°	62°	77°				
	Actuator SQM33.7	17s / 90°	9° (1)	13°	18°	22°				

<sup>(1)</sup> in this case the max. position of 90° can't be reached

545	Percentuale minima di carico per modulazione (valore fabbrica = n.d range impostazione:20%-100%)	Lower load limit (default value = n.d range:20%-100%)	OEM / Service	х	х	х
546	Percentuale massima di carico per modula- zione (valore fabbrica = n.d range imposta- zione:20%-100%)	Higher load limite (default value = n.d range:20%-100%)	OEM / Service	x	x	х
565	Combustibile 1 - Percentuale minima di carico per modulazione (valore fabbrica = n.d range impostazione:20%-100%)	Fuel 1 Lower load limit (default value = n.d range:20%-100%)	OEM / Service		х	
566	Combustibile 1 - Percentuale massima di carico per modulazione (valore fabbrica = n.d range impostazione:20%-100%)	Fuel 1 Higher load limite (default value = n.d range:20%-100%)	OEM / Service		х	

Param.	Descrizione	Description	Password	LMV20 LMV27	LMV26	LMV37
601	Impostazione punto di riferimento Indice 0 = combustibile Indice 1 = aria 0 = chiuso (<0°) 1 = aperto (>90°)	Selection of reference point Index 0 = fuel Index 1 = air 0 = closed (<0°) 1 = open (>90°)	OEM	x	х	х
602	Direzione rotazione del servocomando Indice 0 = combustibile Indice 1 = aria 0 = antiorario 1 = orario VEDI MESSAGGIO DI "ATTENZIONE" RIPORTATO SOTTO.	Actuator's direction of rotation Index 0 = fuel Index 1 = air 0 = counterclockwise 1 = clockwise SEE "WARNING" MESSAGE QUOTED BELOW.	OEM	x	x	х
606	Limite tolleranza per monitoraggio posizione (0.1°)  Indice 0 = combustibile  Indice 1 = aria	Tolerance limit of position monitoring (0.1°) Index 0 = fuel Index 1 = air	OEM / Service	x	x	x
608	Combustibile 1 - Impostazione punto di riferimento Indice 0 = combustibile Indice 1 = aria 0 = chiuso (<0°) 1 = aperto (>90°)	Fuel 1 : Selection of reference point Index 0 = fuel Index 1 = air 0 = closed (<0°) 1 = open (>90°)	OEM		х	
609	Combustibile 1 - Direzione rotazione del servocomando Indice 0 = combustibile Indice 1 = aria 0 = antiorario 1 = orario VEDI MESSAGGIO DI "ATTENZIONE" RIPORTATO SOTTO.	Fuel 1: Actuator's direction of rotation Index 0 = fuel Index 1 = air 0 = counterclockwise 1 = clockwise SEE "WARNING" MESSAGE QUOTED BELOW.	OEM		x	
610	Combustibile 1 - Limite tolleranza per monitoraggio posizione (0.1°) Indice 0 = combustibile Indice 1 = aria	Fuel 1 : Tolerance limit of position monitoring (0.1°) Index 0 = fuel Index 1 = air	OEM / Service		x	

	611	Tipo di riferimento dei servocomandi index 0 = fuel (default = 0 (riferimento standard) index 1 = air (default = 0 (riferimento standard) 0 = standard 1 = fermo entro il raggio utile 2 = fermi interni (SQN1) 3 = entrambi	Type of referencing Index 0 = fuel Index 1 = air 0 = standard 1 = stop within usable range 2 = internal stop (SQN1) 3 = both	OEM	x	x	x
20	612	Combustibile 1 - Tipo di riferimento del servo- comando combustibile 0 = standard 1 = fermo entro il raggio utile 2 = fermi interni (SQN1) 3 = entrambi	Fuel 1:  Type of reference for fuel actuator  0 = standard  1 = range stop in the usable range  2 = internal range stop (SQN1)  3 = both	OEM		X	
	613	Tipo di servocomando Indice 0 = combustibile Indice 1 = aria 0 = 5s / 90° (1Nm, 1,2Nm, 3Nm) 1 = 10s / 90° (6Nm) 2 = 17s / 90° (10Nm)	Type of actuator Index 0 = fuel Index 1 = air 0 = 5 s / 90° (1Nm, 1,2Nm, 3Nm) 1 = 10 s / 90° (6Nm) 2 = 17 s / 90° (10Nm)	OEM	х	х	х
	614	Combustibile 1 :Tipo di servocomando Indice 0 = combustibile Indice 1 = aria 0 = 5s / 90° (1Nm, 1,2Nm, 3Nm) 1 = 10s / 90° (6Nm) 2 = 17s / 90° (10Nm)	Fuel 1 : Type of actuator Index 0 = fuel Index 1 = air 0 = 5 s / 90° (1Nm, 1,2Nm, 3Nm) 1 = 10 s / 90° (6Nm) 2 = 17 s / 90° (10Nm)	OEM		х	
	641	Attivazione procedura di standardizzazione inverter (riferirsi al codice errore 82) 0 = standardizzazione disattivata 1 = standardizzaione attivata	Control of speed standardization of VSD Error diagnostics of negative values (refer to error code 82)0 = no speed standardization 1 = speed standardization active			х	х

	(valore fabbrica = 0)	Configuration of analog output (default value = 0) <b>0</b> = DC 010 V <b>1</b> = DC 210 V <b>2</b> = DC 0/210 V	OEM / Service	LMV27	x	х
--	-----------------------	--	---------------	-------	---	---



**ATTENTION:** as for SQM3x actuators, set the direction according to the acutator function. As far as SQN1x actuators, set **always** the counterclockwise direction, independently from the model chosen for the specific function.

# Block 700: Error history

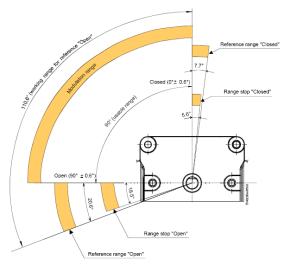
Param.	Descrizione	Description	Password
701	Storico errori: 701 - 725.01.codice	Error history: 701 - 725.01.code	Service / Info
0	Storico errori: 701 - 725.02.codice diagnostico	Error history: 701 - 725.02.diagnostic code	Service / Info
0	Storico errori: 701 - 725.03.classe errore	Error history: 701 - 725.03.error class	Service / Info
		Error history: 701 - 725.04.phase	Service / Info
0	Storico errori: 701 - 725.05.contatore avvii	Error history: 701 - 725.05.startup counter	Service / Info
725	Storico errori: 701 - 725.06.carico	Error history: 701 - 725.06.load	Service / Info

# Block 900: Process data

Param.	Descrizione	Description	Password	
		Current output (default value = 0% - range =		
903	impostazione = 0-100%)	0-100%)	Service / Info	
	Indice 0 = combustibile	Index 0 = fuel	Gervice / Illie	
	Indice 1 = aria	Index 1 = air		
922	Posizione incrementale servocomandi (valore fabbrica = 0% - range impostazione = -50% - 150%)	Incremental position of actuators (default value = 0% - range = -50% - 150%)	Service / Info	
022	Indice 0 = combustibile	Index 0 = fuel	Service / IIIIO	
	Indice 1 = aria	Index 1 = air		
935	Giri motore assoluti	Absolute speed	OEM / Service	
936	Giri motore in fase standardizzazione	Standardized speed	Service / Info	
942	Sorgente potenza attiva Active load source		OEM / Service	
	Solo con LMV26:	Actual fuel		
945	Combustibile attuale	0 = fuel 0	Service / Info	
343	0 = combustibile 0	1 = fuel 1		
	1 = combustibile 1			
947	Risultato interrogazione contatti (codifica bit)	Result of contact sensing (bit-coded)	Service / Info	
950	Stato relè (codifica bit)	Required relay state (bit-coded)	Service / Info	
	Intensità di fiamma ( 0% ÷ 100%);	Intensity of flame (range = 0% - 100%)		
954	minima corrente 30% = 4µA;	minimum current 30% = 4µA;	Service / Info	
304	massima corrente100% = 16μA;	maximum current100% = 16µA;	Service / IIIIO	
	massima corrente ammissibile = 40µA.	maximum current possible = 40μA.		
961	Stato moduli esterni e display	Status of external modules and display	Service / Info	
981	Errore memoria: codice	Error memory: code	Service / Info	
982	Errore memoria: codice diagnostica	Error memory: diagnostic code	Service / Info	
992	Flag di errore	Error Flags	OEM / Service	

#### Actuators references

An incremental transducer is used to ensure position feedback. Referencing of the actuators must be performed after power-on. In addition, at the end of each shutdown in phase 10, the actuators are referenced to ensure that individual stepping errors, which could lead to shutdown, do not accumulate. If a position error occurs, the system switches to the safety phase (phase 01), enabling the actuators with detected position errors to be referenced. During the following phase 10, the only actuators that are referenced are those that were not referenced before in the safety phase (phase 01). The position of the reference point can be selected depending on the type of burner design, either the CLOSED position (<0°) or the OPEN position (>90°).



Param.	Descrizione	Description	Password
	Impostazione punto di riferimento	Selection of reference point	
	Indice 0 = combustibile	Index 0 = fuel	
601	Indice 1 = aria	Index 1 = air	OEM
	<b>0</b> = chiuso (<0°)	<b>0</b> = closed (<0°)	
	1 = aperto (>90°)	1 = open (>90°)	

If the acutators position is exchanged (error code: 85), the burner will lockout and will try to adjust for three times, then it will lock out.

#### Gas proving system

Valve proving is only active when firing on gas. This is a leakage test designed to detect leaking gas valves and, if necessary, to prevent the valves from opening or ignition from being switched on. Lockout is initiated. When performing valve proving, the gas valve on the burner side is opened first to bring the test space to atmospheric pressure. Then, the valve is closed whereupon the pressure in the test space must not exceed a certain level, measured by the gas leakage pressure switch (PGCP). Then, the gas valve on the mains side is opened to fill the gas pipe. When the valve is closed again, the gas pressure must not drop below a certain level. Valve proving can be parameterized to take place on startup, shutdown, or on both phases.

# Air-fuel curve points

There are 10 air-fuel curve points: T

P0 = ignition position. Only for ignition; after the ignition, the burner works between Point P1 (low flame) and point P9 (high flame) without going back to P0.

P0 can be set everywhere irrespective of all the other points.

#### COMMISSIONING THE BURNER

The LMV2x complete programming must be performed on units that has never been set before or reset units (e.g. spare parts). The programming procedure is performed by setting the following main parameters:

- 1 if LMV.. is a spare part, insert burner ID (parameter 113) at least 4 digit.
- 2 type of fuel train (parameter "201")
- 3 air/fuel ratio curvepoints (Block "400")
- 4 maximum load percentage (parameter "546")
- 5 minimum load percentage (parameter "**545**")



CAUTION: if an error message as "Loc.." appears when the unit is turned to on for the first time, press ENTER (InFo) until the "Reset" message apperas. After few seconds, the message "OffUpr" will be displayed.

This message shows that the unit has not been programmed before or that the operating mode (fuel train) is not set yet or that the unit

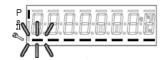
has not been completely programmed. Pree keys **F** (Fuel) and **A** (Air) at the same time unit the display shows **code** and next it will show 7 bars the first on the left is flashing. If the display shows "Off", it means that the unit already set, then see the instructions on chapter "Adjsuting the burner with LMV2x already programmed").

At the first LMV startup, the AZL display will show



It means that the unit was never set or that no mode was chisen or that some parameters have to be set furthert. Push F (fuel) and A (Air) together untilthe display shows **code** and then a 7 digit dashed line blinking on the left.



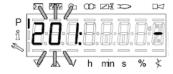


Press the "+" key until the first character of the password (the default password is 9876), then press **ENTER (InFo)**, the character now turn to a bar while the second bar starts flashing. Press "+" until the second character is entered, then press **ENTER (InFo)**. Repeat the procedure until the last character is set, then press **ENTER (InFo)**, then **ENTER** again until the message **PArA** appears: then the first parameters block ("400") will be shown:





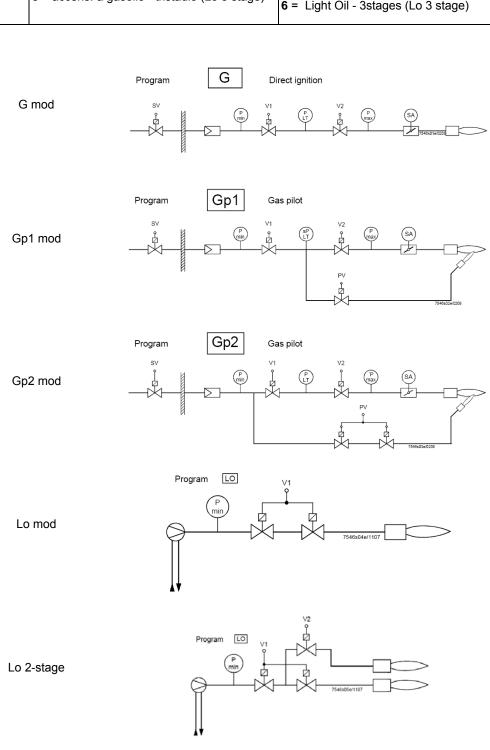
Press ENTER (InFo) again, to gain access to programming the operating mode (fuel train):

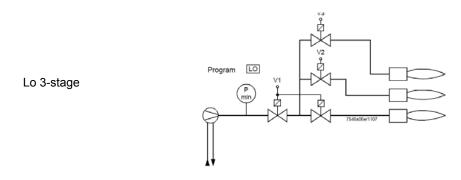


In the example, set configuration **1** = direct gas ignition (G mod). Other possibilities are below listed:

the types of fuel trains are the following:

Param.	Descrizione	Description	Password
201	Modalità funzionamento bruciatore ( rampa comb., mod. / multistadio, servocom., ecc.)  _= non definito (cancellazione curve)=  1 = accensione diretta a gas (G mod)  2 = accensione tramite pilota gas con attacco tra le due elettrovalvole EV1/EV2 gas (Gp1 mod)  3 = accens. tramite pilota gas con attacco a monte dell'elettrov. EV1 del gas (Gp2 mod)  4 = accensione a gasolio - modul. (Lo mod)  5 = accens. a gasolio - bistadio (Lo 2 stage)  6 = accens. a gasolio - tristadio (Lo 3 stage)	the two gas solenodi valves EV1/EV2 (Gp1	OEM / Service





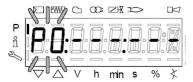
In the example the Gmod gas train has been set (Configuration "1").

Choose the fuel train by pressing ENTER, then press "+" / "-". Press ENTER to confirm: number "1" will appear on the right side of the display.





Press "+" to show the first point to be set P0.



Press **F** and "+" to increase the opening angle of the fuel actuator "**0F**" until the requested value is reached (for example 12°÷15°, see below) for the ignition point; or press **F** and "-" to decrease the angle:



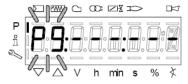
To set the air damper opening angle "0A" in the ignition point (10° for example - see below), press "A" and "+" "A" and "-" at the same time:



# LMV37:

Now the air and fuel quantities are set at the ignition point P0:

By pressing "+", point P9 can be programmed to set the air and fuel values at the maximum output



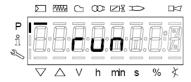
go on as described above to the the opening angles of the air actuator (A) and fuel actuator (F):





**CAUTION:** at the first burner adjustment, it is recommended to set the maximum output P9 at the same value (or little higher) of the ignition point, in order to safely reach point P9 next (see next paragraph).

By pressing "+" the display will show:



The burner is ready to startup. Now it is possible to re-set the curve points while the burner is operating ("warm setting") by pressing the ENTER (InFo) or while the burner is in stand-by mode ("cold setting") by pressing ENTEF.

### Warm setting

- Once pressed button "enter" and the chain thermostats open (X5-03 terminals), the LMV.. show Ph12. Then close the chain termostat and the unit performs the prepurge cycle (see "Phases List") and stops at the ignition point P0 without ignition anyway.
- 2 By pressing "+", the burners lights abd the air/fuel ratio can be properly set in presence of flame.
- 3 By pressing "+" again, the next point P1 is shown (eqaul to P0 as the unit automatically set P0=P1);
- 4 By pressing "+" again, the "Calc" message will be displayed: the unit is processing the sir/fuel ratio curvepoints until point P9, previuosly set. Once the processing is performed the calculated point P2 is shown. By pressing "+" again, the "Calc" message will be displayed: the unit is processing the sir/fuel ratio curvepoints until point P9, previuosly set. Once the processing is performed the calculated point P2 is shown.
- 5 By pressing "+", it is possible to go through the processed curve until point P9 is reached.

Note: if the point doesn't blink, servomotors are still running.

6 n order to set P9 with the gas flow rate according to the generator needs, follow this procedure:

Note: the purpose is to fully open the gas throttle and later on to adjust the gas flow rate through the gas pressure governor.

- Operate smoothly opening by just a few degrees the air damper and later on increasing the gas throttle opening it by a few degrees. Keep monitoring the flue through the flue analyser. Keep the air excess inside normal figures (from 3% to 7% residual O2) operating by means for the air damper servomotor;
- Keep increasing the air damper opening and then the gas throttle, as done in the sequence above, remebering to get the full firing rate with the gas throttle fully open (or the oil pressure regulator at its maximum pressure position).

See example below:



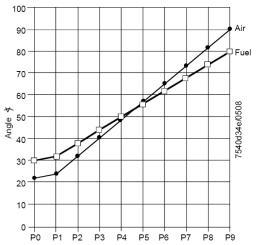
- If, while opening the gas throttle, the gas flow rate was too high, reduce it only through the gas governor and keep opening the throttle until the 60÷70° position is got.
- If the gas train is equipped with a governor and a valve with an adjustable gas flow rate, fully open also this last valve, smoothly! The gas flow rate is always set by means of the governor.
- 7 As soon as all the devices are fully open, set the gas flow rate through the governor.
- 8 Set the air damper position in order to get the reccomended air excess (3÷4.8% O2 on gas and 2.9÷4.9 % on oil).

Note1: on high flame, if the gas flow rate is changed by means of the governor, all the other points below high flame must be checked again.

9 After having set the high flame point P9, keep "-" pressed for some seconds unitl "Calc" is displayed in order to have the LMV recalculating all the points:

Fuel

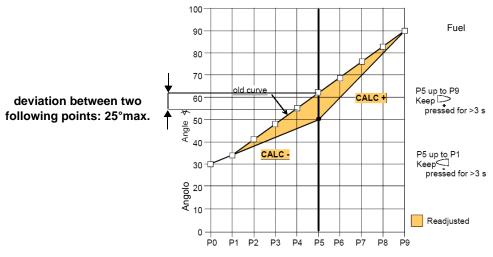
Air



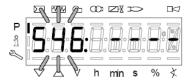
- 10 the unit will automatically reach point P8 processed: check the combustion values in this point and, if necessary, change it.
- 11 Press "-" to go down to the lower points and check the combustion values, change the points if necessary.

Note: if in an intermediate point (for example P5), the change of the actuators position is important according to the processed point

P5, keep pressing "-" unitl "Calc" is displayed. The curve will be processed again downwards point P1.



- 12 press "-" to go through the lower points and check the combustion values, if necessary change the points as described above.
- 13 By pressing ESC, at the end of the points adjusments, the parameter "**546**" (setting the maximum load) will be displayed; press ENTER (InFo), then "+" until 100%, then press ENTER (InFo) again, ESC and then "+".



14 The parameter "**545**" (setting the minimum load) is displayed: press ENTER (InFo), then "+" until 20%. Press ENTER, then press ESC for three times. The message "oP" will be displayed as well as the load percentage at the burner is working on.



he hyphen related to the symbol "P" (highlited in the picture) will be off to show that the unit exited the programmig mode. The burner will then work automatically, following the curve set.

.Note1: if the curvepoints settings is quit before end (by pressing ESC or for a faulty shutdown), the message "OFF UPr" (Start prevention) will be diplayed until all the curvepoints will be set.

**Note2:** if the gas flow rate at high flame point (maximum load) is changed by means of the pressure stabiliser, all the curvepoints must be checked by going through the curve downwards and resetting them if necessary.

Note3: if the point does not flash, it means that the actuators have not reached the set position yet.

Note4: if an error occurs causing a safety shutdwon during the processing of the curve, the processing itself will be interrupted.

# **Cold setting**

The "cold setting" (without flame) can be performed only when all the curve points values are known (for instance, in case of replacement).



When the burner is off, if you modify one curve set point, when the burner restarts the AZL2x shows OFF UPr (OFF UPr0 or OFF UPr1 for LMV26). The LMV.. then, requires a new "warm" startup (see procedure paragraph "Warm Setting") by checking again all points of curve from P0 to P9.

#### **BURNER STARTUP WITH LMV2x ALREADY PROGRAMMED**

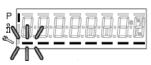
Once the LMV turns on, the AZL display will show



The burners is basically factory set. The air/fuel ratio curve is set with the maximum output point P9 a little higher or equal to P0. To adjust the burner on the plant site, adjust the maximum output point to the flow rate values really requested. Then go through the curve-points, by pressing "+" several times to reach point P9: then adjust the air actuator position (for the air damper) and the fuel acttuator (for the butterfly valve, in case of gas or the oil pressure governor incase of oil), by adjusting the fuel flow rate by means of the gas pressure stabiliser (for gas) or the oil pressure governor (for oil), checking the combustion valeus contemporarly. Once the burner is adjusted at the maximum output, press "-" for more than 5 seconds to process the curve downwards. The curve is then a straight line: go on checking the combustion values point by point; change them if necessary and in case linearise the curve again.

Before starting the burner up, press F and A at the same time



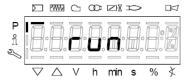


enter the password following the procedure on chapter "Programming LMV2x". Press ENTER until the display will show:





Press ENTER again: it will show



press ENTER (InFo)

finfo

: the display will show phase 12.

Ph12: *Standby* phase (stationary) Ph12: *Standby* phase (stationary)

By closing the thermostatic series, the burner startup cycle will take place:

Ph22: Fan ramp up phase (fan motor = ON, safety shutoff valve = ON)

Ph24: Traveling to prepurge position phase

Ph30: Prepurge phase

Ph36: Traveling to ignition position phase

Ph38: Preignition phase

Ph40: 1st safety time phase (ignition transformer ON)

Ph42: 1st safety time phase (ignition transformer OFF), preignition time OFF

Ph44: Interval1

The startup sequence stops at phase 44.

The burners is lit and is in "P1" position (low flame point):



Set the air/fuel ratio curvepoints as described on chapter "Programming the LMV2x"

Note: the other phases are

Ph60 = operation (OP= in modulation)

Ph62 = travelling to shutdown

Ph70 = off but in prepurge after the burntime

Ph72 = travelling to postpurging

Ph74 = postpurge (countdown is displayed)

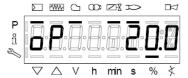
Press ESC • the parameter "546" (Setting the maximum load) is displayed

Then press to exit the programming mode.

The display will show:



Press for a second time: the display will show the load percentage the burner is working at.



When the generator reaches the programmed set-point, the burner will be in stand-by: the display will show



#### Reset / manual lockout

The system can be manually locked by simultaneously pressing the **ENTER (InFo)** button and **any other button** on the AZL2.... This function allows the user to stop the system from the operating level should an emergency occur. When making a reset, the following actions are carried out:

- Alarm relay and the fault display are off
- the lockout position is cancelled
- the unit performs a reset, then it switches to stand-by

If the unit is in the lockout position, a reset can be made by pressing the **InFo** button for 1...3 seconds. The function is available only when the unit is in the lockout position. Longer or shorter pushes on the button do not produce a reset so that the system maintains the lockout position.

Codice errore / Error code	Codice diagnostico / Diagnostic code	Descrizione / Meaning
167	2	/ Manual lockout via AZL2

## Timeout for menu operation

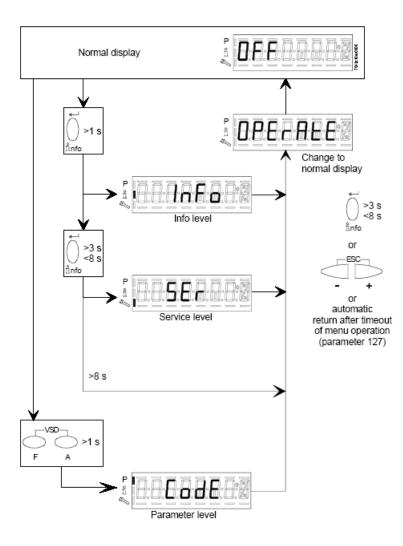
The time for automatically leaving the parameter setting level can be adjusted between 10 and 120 minutes, using the parameter 127 (Timeout for menu operation). If, during that period of time, there is no operation via the AZL2..., the parameter setting level is quit and the password level reset to *Info / Service*.

Caution! In addition, this timeout or interruption of communication between the LMV2.. and the AZL2... during the time the curves are set leads to lockout!

Codice erroreC Error code	Codice diagnostico Diagnostic code	DescrizioneMeaning
167	8	Manual locking

# Entering the Parameter levels

By means of a proper use of the keys, it is possible to enter the various level parameters, as shown in the following flow chart:



The burner and consequently the LMV2x.. are factory set; the air and fuel curves as set as well.

#### Info level

To enter the Info level, proceed as follows:

1 in any menu position, press keys + and - at the same time, then the program will start again: the display will show **OFF**.



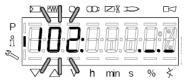
2 , until the display will show InFo, Press the enter (InFo) key



- then il will show the first code (167) flashing, on the right side it will show the data entered. By pressing + or it is possible to scroll (up or down) the parameter list.
- 4 If a dot-line is shown on the right, there is no enough room for complete visualisation: press **enter** again the data will be completely shown for 1 to 3 seconds. By pressing **enter** or **+** and- at the same time, the system will exit the parameter visualisation and go back to the flashing number. The **Info** level shows some basic parameters as:

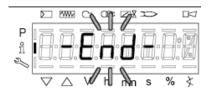
Parameter	Description
167	Cubic meters of fule (resettable)
162	Operating hours (resettable)
163	Device operating hours
164	Burners start-ups (resettable)
166	Total number of start-ups
113	Burner number (i.e. serial number)
107	Software version
102	Software date
103	Device serial number
104	Customer code
105	Version
143	Free

5 Example: choose parameter 102 to show the date



the display shows parameter 102 flashing on the left and characters .\_.\_ on the right.

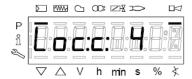
- 6 press InFo for 1-3 seconds: the date will appear
- 7 press InFo to go back to parameter "102"
- by pressing + / -, it is possible to scroll up/down the parameter list (see table above), or, by pressing ESC or InFo for more seconds, the display will show
- 9 Once the last parameter is accessed (143) by pressing +, the **End** message will flash.



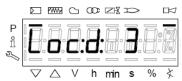
10 Press InFo and for more than three seconds or for more than three seconds orto return to the normal display.



If a message like the one below is shown during operation,



it means that the burner is locked out and the Errore code is shown (in the example "error code:4"); this message is alternating with another message

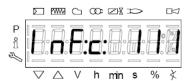


Diagnostic code (in the example "diagnostic code:3"). Record the codes and find out the fault in the Error table To perform the reset, press InFo for one second:



The unit displays an event which does not lead to shutdown.

The display shows current error code c: alternating with diagnostic code d:



Press **InFo** to return to the display of phases.

Example: Error code 111 / diagnostic code 0



To reset, press InFo for a second. Record the codes and check the Error List to find the type of faults.

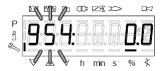
### Service level

To enter the Service mode, press InFo until the display will show:

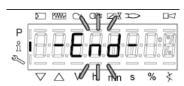


The service level shows all the information about flame intensity, actuators position, number and lock codes:

Parameter	Description	
954	Flame intensity	
121	% output, if set = automatic operation	
922	Actuators position, 00=combustibile; 01= aria	
161	Lock-outs number	
701725	Lock-outs History (see chapter 23 in the LMV2x manual)	



- 1 the first parameter will be "954": the percentage of flame is shown on the right. By pressinf + or it is possible to scroll up/down the parameter list.
- 2 Once the last parameter is accessed (143) by pressing + , the **End** message will blink.



3 Press InFo for more than three seconds or for more than three seconds orto return to the normal display.



# PHASES LIST

Fase /Phase	Funzione	Function
Ph00	Fase blocco	Lockout phase
Ph01	Fase di sicurezza	Safety phase
Ph10	t10 = tempo raggiungimento posizione riposo	t10 = home run
Ph12	Pausa	Standby (stationary)
Ph22	t22 = tempo di salita ventilatore (motore ventilatore = ON, valvola intercettazione di sicurezza = ON)	t22 = fan ramp up time (fan motor = ON, safety shutoff valve = ON)
Ph24	Verso posizione preventilazione	Traveling to the prepurge position
Ph30	t1 = tempo preventilazione	t1 = prepurge time
Ph36	Verso posizione accensione	Traveling to the ignition position
Ph38	t3 = tempo preaccensione	t3 = preignition time
Ph40	TSA1 = primo tempo sicurezza (trasformatore accensione ON)	TSA1= 1st safety time (ignition transformer ON)
Ph42	TSA1 = primo tempo sicurezza (trasformatore accensione OFF)	TSA1 = 1st safety time (ignition transformer OFF), t42 = preignition time OFF
Ph44	t44 = intervallo 1	t44 = interval 1
Ph50	TSA2 = secondo tempo sicurezza	TSA2 = 2nd safety time
Ph52	t52 = intervallo 2	t52 = interval 2
Ph60	Funzionamento 1 (stazionario)	Operation 1 (stationary)
Ph62	t62 = massimo tempo bassa fiamma (funzionamento 2, in preparazione per spegnimento, verso bassa fiamma)	t62 = max. time low-fire (operation 2, preparing for shutdown, traveling to low-fire)
Ph70	t13 = tempo postcombustione	t13 = afterburn time
Ph72	Verso posizione postcombustione	Traveling to the postpurge position
Ph74	t8 = tempo postventilazione	t8 = postpurge time
Ph80	t80 = tempo evacuazione controllo tenuta valvole	t80 = valve proving test evacuation time
Ph81	t81 = tempo perdita pressione atmosferica, prova atmosferica	t81 = leakage time test time atmospheric pressure, atmospheric test
Ph82	t82 = test perdita, test riempimento	t82 = leakage test filling test, filling
Ph83	t83 = tempo perdita pressione gas, test pressione	t83 = leakage test time gas pressure, pressure test
Ph90	Tempo attesa "mancanza gas"	Gas shortage waiting time

### **BACKUP PARAMETER WITH AZL2x**

On the AZL2x you can save the configuration to download on another appliance LMV.

To do this:

access up, press F and A at the same time





enter the password following the procedure on chapter "Programming LMV2x".

Press ENTER until the display will show:





with the button

go to the group **000** of the parameters and press

;with the buttons + and - go to **050** parameter



Press + to select parameter 050

Display: Parameter **050.** flashes, index **00:** and value **0** do not.



the disply show



press again



with the button + select 1 and start the



backup process by pressing



After about 5 seconds the backup process ends and the display shows

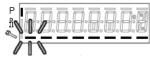


It is recommended that you perform a backup procedure whenever you change the parameters of the LMV for having a copy in AZL2x!

#### RESTORE PARAMETER FROM AZL2x TO LMV...

To copy the previously saved configuration on AZL2x proceed as follows: access up, press  $\, \mathbf{F} \,$  and  $\, \mathbf{A} \,$  at the same time





enter the password following the procedure on chapter "Programming LMV2x".

Press ENTER until the display will show:







To copy the configuration from AZL2x to LMV. It is important that the type of LMV is the same (for example LMV20 with LMV20, etc.) and that 113 "Burner ID" of the burner is the same value that is saved in the configuration you want to copy.

With the buttons

go to the group **100** of the parameters, press на



and always with the buttons + and - go to

113 parameter "Burner ID", press

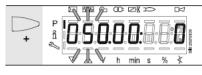
and verify (and/or change with buttons by pressing enter to confirm)

iWith the buttons

go to the group 000 of the parameters, press



end select the 050 parameter



Press + to select parameter 050

Display: Parameter  ${\bf 050.}$  flashes, index  ${\bf 00:}$  and value  ${\bf 0}$  do not.



the disply show



with the button



the display shows



press again



with the button + select 1 and start the restore process by pressing



After about 5 seconds the restore process ends and the display shows Now, LMV has the same configuration that was stored on AZL2x.

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Error	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
no Comm		No communication between LMV26 basic unit and AZL2	Check wiring for line interruption/loose contact
2	#	No flame at the end of safety time (TSA)	
	1	No flame at the end of safety time 1 (TSA1)	
	2	No flame at the end of safety time 2 (TSA2)	
3	#	Air pressure failure	
	0	Air pressure off	
	1	Air pressure on	
	4	Air pressure on – prevention of startup	
	20	Air pressure, combustion pressure – start prevention	
	68	Air pressure, POC – start prevention	
	84	Air pressure, combustion pressure, POC – start preven- tion	
4	#	Extraneous light	
	0	Extraneous light during startup	
	1	Extraneous light during shutdown	
	2	Extraneous light during startup – prevention of startup	
	6	Extraneous light during startup, air pressure – start pre- vention	
	18	Extraneous light during startup, combustion pressure – start prevention	
	24	Extraneous light during startup, air pressure, combus- tion pressure – start prevention	
	66	Extraneous light during startup, POC – start prevention	
	70	Extraneous light during startup, air pressure, POC – start prevention	
	82	Extraneous light during startup, combustion pressure, POC – start prevention	
	86	Extraneous light during startup, air pressure, combus- tion pressure, POC – start prevention	
7	#	Loss of flame	
	0	Loss of flame	
	3255	Loss of flame due to TÜV test (loss-of-flame test)	Diagnostics corresponds to the period of time from shutdown of fuel valves to the detection of loss of flame (resolution $0.2 \text{ s} \rightarrow \text{Value } 5 = 1 \text{ s}$ )

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Error	Diagnostic code	Meaning for the LMV20 system	Remedy
12	#	Valvo proving	
12	#	Valve proving	Male water and VE 04 (and another trial)
			With valve proving via X5-01 (gas pressure switch-min)
	0	Fuel valve 1 (V1) leaking	- Check if valve on the burner side is leaking
		(fuel valve 2 with valve proving via X5-01)	- Check if pressure switch for valve proving is closed, if gas pressure exist
			- Check wiring for short-circuit
		Fuel valve 2 (V2) leaking	With valve proving via X5-01 (gas pressure switch-min)
	1	(fuel valve 1 with valve proving via X5-01)	- Check if valve on the gas side is leaking
		(Idea valve / Will valve proving via Xe o i)	- Check wiring for short-circuit
	2	Valve proving not possible	Valve proving activated, but pressure switch-min selected as input function for X9-04 (check
	2	valve proving not possible	parameters 238 and 241)
	3	Valve proving not possible	Valve proving activated, but no input assigned (check parameters 236 and 237)
	4	Valve proving not possible	Valve proving activated, but 2 inputs assigned (set parameter 237 to pressure switch-max or POC)
	5	Valve proving not possible	Valve proving activated, but 2 inputs assigned (check parameters 236 and 237)
			Check to see if the valve on the gas side is leaking
	81	V1 leaking	Check wiring to see if there is an open-circuit
			Check to see if the valve on the burner side is leaking
	83	V2 leaking	Check to see if the pressure switch for the leakage test is closed when gas pressure is present
			Check wiring for short-circuit
14	#	POC	
	0	POC open	Check to see if the valve's closing contact is closed
	_		Check wiring
	1	POC close	Check to see if the valve's closing contact opens when valve is controlled
			Check wiring to see if there is a line interruption.
	64	POC open - start prevention	Check to see if the valve's closing contact is closed
			Check to see if pressure switch has closed with no combustion pressure present
19	80	Combustion pressure, POC – start prevention	Check wiring for short-circuit
20	#	Pressure switch-min (Pmin)	
	0	No minimum gas /oil pressure	Check wiring for open-circuit
	1	Gas shortage – start prevention	Check wiring for open-circuit
21	#	Pressure switch-max / POC	
		Pressure switch-max: Max. gas / oil pressure exceeded	Check wiring to see if there is a line interruption.
	0	POC: POC open (software version ≤ V02.00)	POC: Check to see if the valve's closing contact is closed.
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Error	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
22 OFF S	#	Safety loop / burner flange	
	0	Safety loop / burner flange open	
	1	Safety loop / burner flange open - prevention of startup	
	3	Safety loop/burner flange, extraneous light – start pre- vention	
	5	Safety loop/burner flange, air pressure – start preven- tion	
	17	Safety loop/burner flange, combustion pressure – start prevention	
	19	Safety loop/burner flange, extraneous light, combustion pressure – start prevention	
	21	Safety loop/burner flange, air pressure, combustion pressure – start prevention	
	23	Safety loop/burner flange, extraneous light, air pressure, combustion pressure – start prevention	
	65	Safety loop/burner flange, POC – start prevention	
	67	Safety loop/burner flange, extraneous light, POC – start prevention	
	69	Safety loop/burner flange, air pressure, POC – start prevention	
	71	Safety loop/burner flange, extraneous light, air pressure, POC – start prevention	
	81	Safety loop/burner flange, combustion pressure, POC – start prevention	
	83	Safety loop/burner flange, extraneous light, combustion pressure, POC – start prevention	
	85	Safety loop/burner flange, air pressure, combustion pressure, POC – start prevention	
	87	Safety loop/burner flange, extraneous light, air pressure, combustion pressure, POC – start prevention	
50	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
51	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
55	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
56	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
57	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit

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Error				
code	Diagnostic code	Meaning for the LMV2x/3x system	Remedy	
58	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit	
61 Fuel Chg	#	Fuel changeover		
Fuel Chg	0	Fuel 0	No error - change to Fuel 0	
Fuel Chg	1	Fuel 1	No error - change to Fuel 1	
62 Fuel Err	#	Invalid fuel signals / fuel information		
Fuel Err	0	Invalid fuel selection (Fuel 0 + 1 = 0)	Check wiring to see if there is an open-circuit  Note  Curves cannot be set.	
Fuel Err	1	Different fuel selection between the μCs	Make a reset; if error occurs repeatedly, replace the unit	
Fuel Err	2	Different fuel signals between the μCs	Make a reset; if error occurs repeatedly, replace the unit	
Fuel Err	3	Invalid fuel selection (Fuel 0 + 1 = 1)	Check wiring for short-circuit  Note Curves cannot be set.  LMV26: Optional press reset button >3 seconds.	
65	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit	
66	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit	
67	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit	
70	#	Internal error fuel-air ratio control: Position calculation modulating		
	23	Output invalid	No valid output	
	26	Curvepoints undefined	Adjust the curvepoints for all actuators	
71	#	Special position undefined		
	0	Home position	Parameterize the home position for all actuators used	
	1	Prepurge position	Parameterize the prepurge position for all actuators used	
	2	Postpurge position	Parameterize the postpurge position for all actuators used	
	3	Ignition position	Parameterize the ignition position for all actuators used	
72	#	Internal error fuel-air ratio control	Make a reset; if error occurs repeatedly, replace the unit	
73	#	Internal error fuel-air ratio control: Position calculation multistep		
,	23	Output invalid	No valid output	
	26	Curvepoints undefined	Adjust the curvepoints for all actuators	

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Error	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
75	#	Internal error fuel-air ratio control: Data clocking check	
	1	Current output different	
	2	Target output different	
	4	Target positions different	
	16	Different positions reached	Can be caused by different standardized speeds (e.g. after restore of data set) when the VSD is activated → standardize again and check adjustment of the fuel-air ratio control system
76	#	Internal error fuel-air ratio control	Make a reset; if error occurs repeatedly, replace the unit
80	#	Control range limitation of VSD	Basic unit could not correct the difference in speed and reached a control range limit.  1. Basic unit is not standardized for this motor → repeat standardization.  Caution!  Settings of fuel-air ratio control must be checked.  2. Ramp time settings of the VSD are not shorter than those of the basic unit (parameters 522, 523).  3. Characteristic of the VSD is not linear. Configuration of the voltage input at the VSD must accord with that of the basic unit (parameter 645).  4. VSD does not follow quickly enough the changes of the basic unit. Check settings of the VSD (input filter, slippage compensation, hiding different speeds)
	1	Control range limitation at the bottom	VSD speed was too high
	2	Control range limitation at the top	VSD speed was too low
81	1	Interrupt limitation speed input	Too much electromagnetic interference on the sensor line  → improve EMC

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Error	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
82	#	Error during VSD's speed standardization	
	1	Timeout of standardization (VSD ramp down time too	Timeout at the end of standardization during ramp down of the VSD
	1	long)	→ ramp time settings of the VSD are not shorter than those of the basic unit (parameter: 523)
	2	Storage of standardized speed not successful	Error during storage of the standardized speed
	2	Storage or standardized speed not successful	→ lock the basic unit, then reset it and repeat the standardization
			Basic unit receives no pulses from the speed sensor:
	3	Line interruption speed sensor	1. Motor does not turn.
	3	Line interruption speed sensor	2. Speed sensor is not connected.
			Speed sensor is not activated by the sensor disk (check distance)
			Motor has not reached a stable speed after ramp up.
			<ol> <li>Ramp time settings of the VSD are not shorter than those of the basic unit (parameters 522, 523).</li> </ol>
		Speed variation / VSD ramp up time too long / speed	2. Characteristic of the VSD is not linear. Configuration of the voltage input at the VSD must
	4	below minimum limit for standardization	accord with that of the basic unit (parameter 645).
			3. VSD does not follow quickly enough the changes of the basic unit. Check settings of the VSD
			(input filter, slippage compensation, hiding different speeds)
			4. Speed of VSD lies below the minimum for standardization (650 1/min)
			Motor's direction of rotation is wrong.
	5		Motor turns indeed in the wrong direction
		Wrong direction of rotation	→ change parameterization of the direction of rotation or interchange 2 live conductors.
			Sensor disk is fitted the wrong way
			→ turn the sensor disk.
			The required pulse pattern (60°, 120°, 180°) has not been correctly identified.
			Speed sensor does not detect all tappets of the sensor disk
			→ check distance
	6	Unplausible sensor signals	2. As the motor turns, other metal parts are detected also, in addition to the tappets → improve
			mounting.  3. Electromagnetic interference on the sensor lines
			→ check cable routing, improve EMC  The standardized speed measured does not lie in the permissible range
	7	Invalid standardized speed	
			→ motor turns too slowly or too fast  The appeals of microsomouter 1 and 2 devicted too much. This can be equived by wrong standard.
	15	Speed deviation wC4 + wC9	The speeds of microcomputer 1 and 2 deviated too much. This can be caused by wrong standard-
		Speed deviation μC1 + μC2	ized speeds (e.g. after restoring a data set to a new unit)
			→ repeat standardization and check the fuel-air ratio

Error code	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
	20	Wrong phase of phase manager	Standardization was made in a wrong phase. Permitted are only phases ≤12 → controller OFF, start standardization again
	21	Safety loop / burner flange open	Safety loop or burner flange is open → repeat standardization with safety loop closed
	22	Air actuator not referenced	Air actuator has not been referenced or has lost its referencing.  1. Check if the reference position can be approached.  2. Check if actuators have been mixed up.  3. If error only occurs after the start of standardization, the actuator might be overloaded and cannot reach its destination.
	23	VSD deactivated	Standardization was started with VSD deactivated  → activate the VSD and repeat standardization
	24	No valid operating mode	Standardization was started without valid operating mode  → activate valid operating mode and repeat standardization
	25	Pneumatic air-fuel ratio control	Standardization was started with pneumatic air-fuel ratio control  → standardization with pneumatic air-fuel ratio control not possible
	128	Running command with no preceding standardization	VSD is controlled but not standardized  → make standardization
	255	No standardized speed available	Motor turns but is not standardized  → make standardization

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Error	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
83	#	Speed error VSD	Required speed has not been reached
	Bit 0 Valency 1	Lower control range limitation of control	Speed has not been reached because control range limitation has become active  → for measures, refer to error code 80
	Bit 1 Valency 23	Upper control range limitation of control	Speed has not been reached because control range limitation has become active  → for measures, refer to error code 80
	Bit 2 Valency 47	Interruption via disturbance pulses	Speed has not been reached due to too much electromagnetic interference on the sensor line  → for measures, refer to error code 81
	Bit 3 Valency ≥ 8	Curve too steep in terms of ramp speed	Speed has not been reached because detected curve slope was too steep.  1. With a LMV26 ramp of 20 s, the curve's slope may be a maximum of 10% speed change between 2 curvepoints in modulating mode.  With a LMV26 ramp of 10 s, the curve's slope may be a maximum of 20% speed change between 2 curvepoints in modulating mode.  With a LMV26 ramp of 5 s, the curve's slope may be a maximum of 40% speed change between  2 curvepoints in modulating mode.  → Between the ignition point (P0) and the low-fire point (P1), the speed change in modulating mode may be a maximum of 40%, independent of the LMV26 ramp.  2. The setting of the VSD ramp must be about 20% faster than the ramps in the basic unit (parameters 522, 523).
	Bit 4 Valency ≥ 16	Interruption of speed signal	No speed detected in spite of control.  1. Check if the motor turns.  2. Check if the speed sensor delivers a signal (LED / check distance from the sensor disk).  3. Check wiring of the VSD.
	Bit 5 Valency ≥ 32	Quick shutdown due to excessive speed deviation	Speed deviation was for about 1 s >10% outside the anticipated range.  1. Check ramp times of the LMV26 and VSD.  2. Check wiring of the VSD.

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Error	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
84	#	Curve slope actuators	
	Bit 0 Valency 1	VSD: Curve too steep in terms of ramp speed	<ol> <li>The curve's slope may be a maximum of 10% speed change between 2 curvepoints in modulating operation, with a LMV26 ramp of 20 seconds         The curve's slope may be a maximum of 20% speed change between 2 curvepoints in modulating operation, with a LMV26 ramp of 10 seconds         The curve's slope may be a maximum of 40% speed change between 2 curvepoints in modulating operation, with a LMV26 ramp of 5 seconds</li></ol>
	Bit 1 Valency 23	Fuel actuator: Curve too steep in terms of ramp rate	The slope of the curve may be a maximum position change of 31° between 2 curvepoints in modulating mode
	Bit 2 Valency 47	Air actuator: Curve too steep in terms of ramp rate	The slope of the curve may be a maximum position change of 31° between 2 curvepoints in modulating mode
85	#	Referencing error ones actuators	
	o	Referencing error of fuel actuator	Referencing of fuel actuator not successful.  Reference point could not be reached.  1. Check to see if actuators have been mixed up.  2. Check to see if actuator is locked or overloaded.
	1	Referencing error of air actuator	Referencing of fuel actuator not successful Reference point could not be reached.  1. Check to see if actuators have been mixed up.  2. Check to see if actuator is locked or overloaded.
	Bit 7 Valency ≥ 128	Referencing error due to parameter change	Parameterization of an actuator (e.g. the reference position) has been changed.  To trigger new referencing, this error is set
86	#	Error fuel actuator	
	0	Position error	Target position could not be reached within the required tolerance band  → check to see if actuator is locked or overloaded
	Bit 0 Valency 1	Line interruption	Line interruption detected at actuator's terminals  → check wiring (voltage X54 across pin 5 or 6 and pin 2 > 0.5 V)
	Bit 3 Valency ≥8	Curve too steep in terms of ramp rate	The slope of the curve may be a maximum position change of 31° between 2 curvepoints in modulating mode
	Bit 4 Valency ≥ 16	Step deviation in comparison with last referencing	Actuator was overloaded or mechanically twisted.  1. Check to see if the actuator is blocked somewhere along its working range.  2. Check to see if the torque is sufficient for the application.

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Error	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
87	#	Error air actuator	
	o	Position error	Target position could not be reached within the required tolerance band  → check to see if actuator is locked or overloaded
	Bit 0 Valency 1	Line interruption	Line interruption detected at actuator's terminals  → check wiring (voltage X53 across pin 5 or 6 and pin 2 > 0.5 V)
	Bit 3 Valency ≥ 8	Curve too steep in terms of ramp rate	The slope of the curve may be a maximum position change of 31° between 2 curvepoints in modulating mode
	Bit 4 Valency ≥ 16	Sectional deviation in comparison with last referencing	Actuator was overloaded or mechanically twisted.  1. Check to see if the actuator is blocked somewhere along its working range.  2. Check to see if the torque is sufficient for the application.
90	#	Internal error basic unit	
91	#	Internal error basic unit	
93	#	Error flame signal acquisition	
	3	Short-circuit of sensor	Short-circuit at QRB  1. Check wiring.  2. Flame detector possibly fault.
95	#	Error relay supervision	
	3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	External power supply NO contact	Check wiring
96	#	Error relay supervision	
	3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	Relay contacts have welded	Test the contacts:  1. Unit connected to power: Fan output must be dead.  2. Disconnect power: Disconnect fan. No resistive connection between fan output and neutral conductor allowed.  If one of the 2 tests fails, release the unit since contact have definitively welded and safety can no longer be ensured.
97	#	Error relay supervision	
	0	Safety relay contacts have welded or external power supply fed to safety relay	Test the contacts:  1. Unit connected to power: Fan output must be dead.  2. Disconnect power: Disconnect fan. No resistive connection between fan output and neutral conductor allowed.  If one of the 2 tests fails, release the unit since contacts have definitively welded and safety can no longer be ensured.

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Error	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
code 98	#	Error relay supervision	
	2 Safety valve 3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	Relay does not pull in	Make a reset; if error occurs repeatedly, replace the unit
99	#	Internal error relay control	Make a reset; if error occurs repeatedly, replace the unit
	3	Internal error relay control	Make a reset. If error occurs repeatedly, replace the unit Software version V03.10: If error C:99 D:3 occurs during standardization of the VSD, deactivate temporarily function Alarm in case of start prevention (parameter number 210 = 0, when using a release contact) or interrupt the controller-ON signal
100	#	Internal error relay control	Make a reset; if error occurs repeatedly, replace the unit
105	#	Internal error contact sampling	160 - 1510
	0 Pressure switch-min 1 Pressure switch-max / POC 2 Fuel selection 0 / Reset 3 Air pressure 4 Load controller open 5 Load controller on / off 6 Load controller close 7 Safety loop / Burner flange 8 Safety valve 9 Ignition transformer 10 Fuel valve 1 11 Fuel valve 2 12 Fuel valve 3 13 Fuel selection 1 / Reset	Stuck-At failure	Can be caused by capacitive loads or supply of DC voltage to the mains voltage inputs. The diagnostic code indicates the input where the problem occurred
106	#	Internal error contact request	Make a reset; if error occurs repeatedly, replace the unit
107	#	Internal error contact request	Make a reset; if error occurs repeatedly, replace the unit
108	#	Internal error contact request	Make a reset; if error occurs repeatedly, replace the unit
110	#	Internal error voltage monitor test	Make a reset; if error occurs repeatedly, replace the unit
111	#	Power failure	Mains voltage to low  Exchange ratio diagnostics code → voltage value (230 V: 1.683)
112	0	Mains voltage recovery	Error code for triggering a reset on power restoration (no error)
113	#	Internal error mains voltage supervision	Make a reset; if error occurs repeatedly, replace the unit
115	#	Internal error system counter	
116	0	Designed life time exceeded (250'000 startups)	Warning threshold has been reached. The unit should be replaced

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Error code	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
117	0	Life time exceeded Operation no longer allowed	Switch-off threshold has been reached
120	o	Interrupt limitation fuel meter input	Too many disturbance pulses at the fuel meters input  → Improve EMC
121	#	Internal error EEPROM access	Make a reset, repeat last parameterization / check. Restore the parameter set, if error occurs repeatedly, replace the unit
122	#	Internal error EEPROM access	Make a reset, repeat last parameterization / check. Restore the parameter set, if error occurs repeatedly, replace the unit
123	#	Internal error EEPROM access	Make a reset, repeat last parameterization / check. Restore the parameter set, if error occurs repeatedly, replace the unit
124	#	Internal error EEPROM access	Make a reset, repeat last parameterization / check. Restore the parameter set, if error occurs repeatedly, replace the unit
125	#	Internal error EEPROM read access	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
126	#	Internal error EEPROM write access	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
127	#	Internal error EEPROM access	Make a reset, repeat last parameterization / check. Restore the parameter set, if error occurs repeatedly, replace the unit
128	0	Internal error EEPROM access - synchronization during initialization	Make a reset; if error occurs repeatedly, replace the unit
129	#	Internal error EEPROM access – command syn- chronization	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
130	#	Internal error EEPROM access - timeout	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
131	#	Internal error EEPROM access - page on abort	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
132	#	Internal error EEPROM register initialization	Make a reset; if error occurs repeatedly, replace the unit
133	#	Internal error EEPROM access – Request synchro- nization	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
134	#	Internal error EEPROM access – Request synchro- nization	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
135	#	Internal error EEPROM access – Request synchro- nization	Make a reset, repeat last parameterization / check. If error occurs repeatedly, replace the unit
136	1	Restore started	Restore of a backup has been started (no error)

	211 10
	242 (-14)
	243 (-13)
	244 (-12)
	245 (-11)
	246 (-10)
	247 (-9)
	248 (-8)
	249 (-7)
	250 (-6)
	251 (-5)
12	0504.0

Error	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
137	#	Internal error – backup / restore	
	157 (-99)	Restore – ok, but backup < data set of current system	Restore successful, but backup data record is smaller than in the current system
	239 (-17)	Backup – storage of backup in AZL2 faulty	Reset and repeat backup
	240 (-16)	Restore – no backup in AZL2	No backup stored in AZL2
	241 (-15)	Restore – abortion due to unsuitable product no. (ASN)	Backup has an unsuitable product no. (ASN) and must not be restored
	242 (-14)	Backup – backup made is inconsistent	Backup is faulty and cannot be transferred back
	243 (-13)	Backup – data comparison between μCs faulty	Reset and repeat backup
	244 (-12)	Backup data are incompatible	Backup data are incompatible with the current software version, restore not possible
	245 (-11)	Access error to parameter Restore_Complete	Reset and repeat backup
	246 (-10)	Restore – timeout when storing in EEPROM	Reset and repeat backup
	247 (-9)	Data received are inconsistent	Backup data record invalid, restore not possible
	248 (-8)	Restore cannot at present be made	Reset and repeat backup
	249 (-7)	Restore – abortion due to unsuitable burner identifica- tion	Backup has an unsuitable burner identification and must not be transferred to the unit
	250 (-6)	Backup – CRC of one page is not correct	Backup data record invalid, restore not possible
	251 (-5)	Backup – burner identification is not defined	Define burner identification and repeat backup
	252 (-4)	After restore, pages still on ABORT	Reset and repeat backup
	253 (-3)	Restore cannot at present be made	Reset and repeat backup
	254 (-2)	Abortion due to transmission error	Reset and repeat backup
	255 (-1)	Abortion due to timeout during backup / restore	Make a reset, check the connections and repeat backup / restore In case of repeated backup timeout, the AZL2 does not yet support backup functionality
146	#	Timeout building automation interface	Refer to Modbus User Documentation (A7541)
	1	Modbus timeout	
	2	reserved	

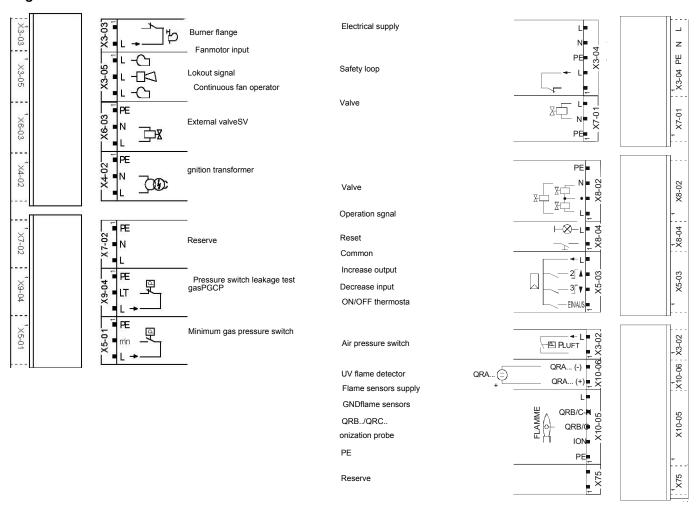
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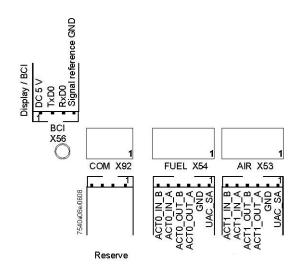
Error code	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
150	#	TÜV test	
	1 (-1)	Invalid phase	TÜV test may only be started in phase 60 (operation)
	2 (-2)	TÜV test default output too low	TÜV test default output must not be smaller than the lower output limit
	3 (-3)	TÜV test default output too high	TÜV test default output must not be greater than the upper output limit
	4 (-4)	Manual interruption	No error: Manual abortion of TÜV test by user
	5 (-5)	TÜV test timeout	No loss of flame after shutdown of fuel valves  1. Check to see if there is extraneous light  2. Check wiring to see if there is a short-circuit  3. Check to see if valve is leaking
165	#	Internal error	
166	0	Internal error watchdog reset	
167	#	Manual locking	Unit has been manually locked (no error)
	1	Manual locking by contact	
	2	Manual locking by AZL2	
	3	Manual locking by PC tool	
	8	Manual locking by the AZL2 Timeout / communication breakdown	During a curve adjustment via the AZL2, the timeout for menu operation has elapsed (setting via parameter 127), or communication between the LMV26 and the AZL2 has broken down
	9	Manual locking by the PC tool Communication breakdown	During a curve adjustment via the ACS410, communication between the LMV26 and the ACS410 was interrupted for more than 30 seconds
	33	Manual locking by the PC tool Test of lockout	PC tool made a reset attempt with an error-free system
168	#	Internal error management	Make a reset; if error occurs repeatedly, replace the unit
169	#	Internal error management	Make a reset; if error occurs repeatedly, replace the unit
170	#	Internal error management	Make a reset; if error occurs repeatedly, replace the unit
171	#	Internal error management	Make a reset; if error occurs repeatedly, replace the unit
200 OFF	#	System error-free	No error

Error code	Diagnostic code	Meaning for the LMV2x/3x system	Remedy
201 OFF UPr0 or OFF UPr1	#	Prevention of startup	Start prevention due to unparameterized unit Go to error history, entry 702, for initial cause of the error with shutdown in connection with the first curve settings
	Bit 0 Valency 1	No operating mode selected	
	Bit 1 Valency 23	No fuel train defined	
	Bit 2 Valency 47	No curves defined	
	Bit 3 Valency 815	Standardized speed undefined	
	Bit 4 Valency 1631	Backup / restore was not possible	
202	#	Internal error operating mode selection	Redefine the operating mode (parameter 201)
203	#	Internal error	Redefine the operating mode (parameter 201).  Make a reset; if error occurs repeatedly, replace the unit
204	Phase number	Program stop	Program stop is active (no error)
205	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
206	o	Inadmissible combination of units (basic unit – AZL2)	
207	#	Version compatibility basic unit – AZL2	
	0	Basic unit version too old	
	1	AZL2 version too old	
208	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
209	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
210	0	Selected operating mode is not released for the basic unit	Select a released operating mode for the basic unit
240	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
245	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit
250	#	Internal error	Make a reset; if error occurs repeatedly, replace the unit

#### **WIRING DIAGRAM**

## Wiring connection for LMV20





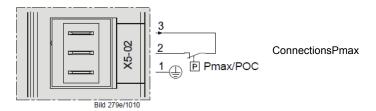
# Wiring variants for LMV27

# ConnectorX75



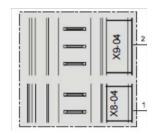
- 2 Fuel meter input
- 1 Supply fuel meter

# ConnectorX5-02



# Wiring variants for LMV26

## ConnectorX08-04 / X09-04



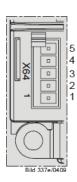
- 2 Fuel 0
- 1 Fuel1

## ConnectorX75



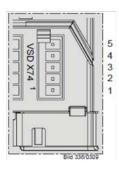
- 2 Fuel meter input
- 1 Supply fuel meter

#### ConnectorX64



- 5 -Power supply speed sensor
- 4 -Speed sensor input
- 3 PWM (Pulse Width Modulation) speed output
- 2 GND (signal reference)
- 1 -Controller input (4÷20mA)

# ConnectorX74



- 5 -Supply
- 4 -Feedback signal
- 3 PWM (Pulse Width Modulation) speed output
- 2 GND (signal reference)
- 1 -External supply 24V DC

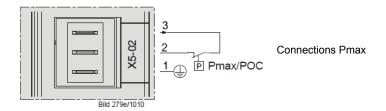
# Wiring variants for LMV37

# ConnectorX75

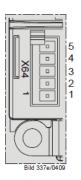


- 2 Fuel meter input
- 1 Supply fuel meter

#### ConnectorX5-02

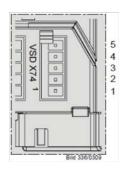


## ConnectorX64



- 5 -Power supply speed sensor
- 4 -Speed sensor input
- 3 PWM (Pulse Width Modulation) speed output
- 2 GND (signal reference)
- 1 -Controller input (4÷20mA)

## ConnectorX74



- 5 -Supply
- 4 -Feedback signal
- 3 PWM (Pulse Width Modulation) speed output
- 2 GND (signal reference)
- 1 -External supply 24V DC









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



# **CIB UNIGAS 600V**

CONTROLLER



# **USER'S MANUAL**

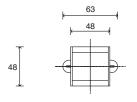
COD. M12925CA Rel 1.2 08/2014

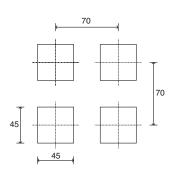
SOFTWARE VERSION 1.0x T73 code 80379 / Edition 01 - 06/2012

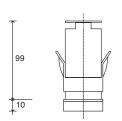
CE

# 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.

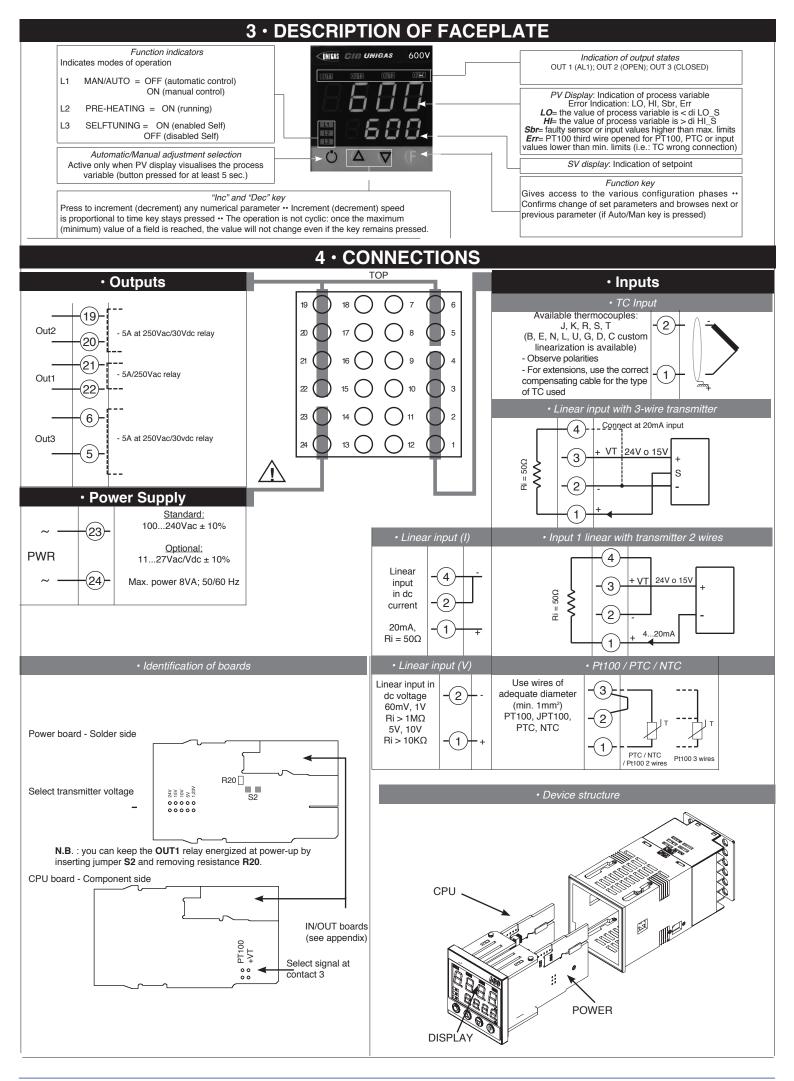
Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene, etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.

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

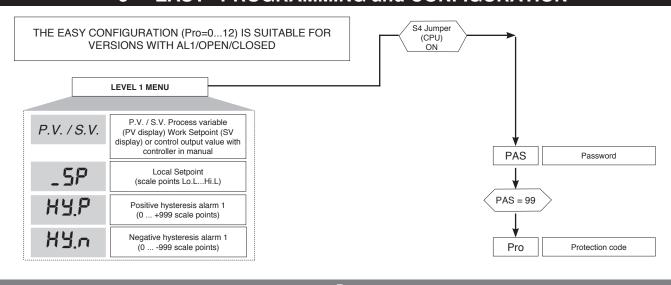
EMC conformity has been tested with the following connections

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 mm²	3 m

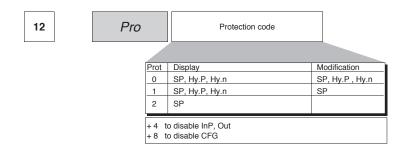
2 · TECHNICA	L SPECIFICATIONS
Display	2x4 digit green, high display 10 and 7mm
Keys	4 of mechanical type (Man/Aut, INC, DEC, F)
Accuracy	0.2% f.s. ±1 digit ambient temperature 25°C
Main input (settable digital filter)	TC, RTD, PTC, NTC 60mV,1V Ri≥1MΩ; 5V,10V Ri≥10KΩ; 20mA Ri=50Ω Tempo di campionamento 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)	DIN 43760 (Pt100), JPT100
Max line resistance for RTD	20Ω
PTC type / NTC Type	990Ω, 25°C / 1KΩ, 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 positio
Controls	PID, Self-tuning, on-off
pb - dt - it	0,0999,9 % - 0,0099,99 min - 0,0099,99 min
Action	Heat / Cool
Control outputs	on / off
Maximum power limit heat / cool	0,0100,0 %
Cycle time	0200 sec
Main output type	relay, logic, continuous (010V Rload $\ge$ 250KΩ, 0/420mA Rload $\le$ 500Ω)
Softstart	0,0500,0 min
Fault power setting	-100,0100,0 %
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 cosφ=1
Logic output for static relays	24V ±10% (10V min at 20mA)
Transmitter power supply	15/24Vdc, max 30mA short-circuit protection
Power supply (switching type)	(std) 100 240Vac ±10% (opt.) 1127Vac/dc ±10%; 50/60Hz, 8VA max
Faceplate protection	IP65
Working / Storage temperature range	050°C / -2070°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



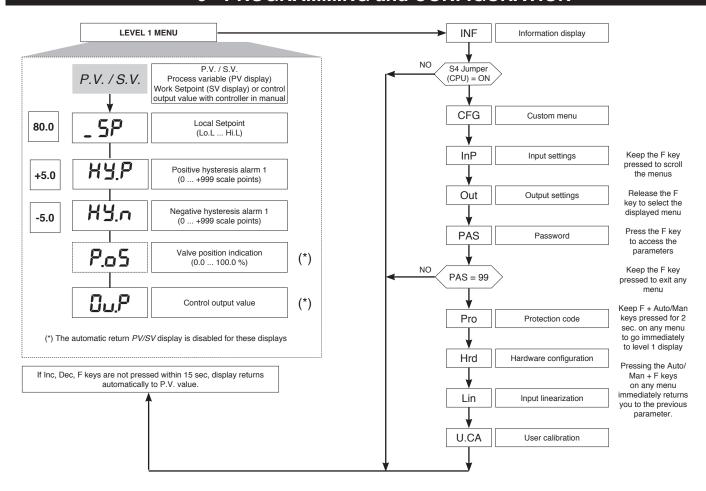
# 5 · "EASY" PROGRAMMING and CONFIGURATION



#### Prot

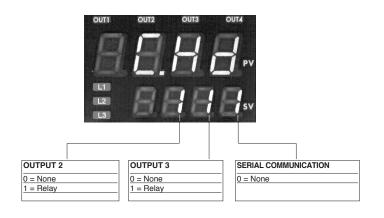


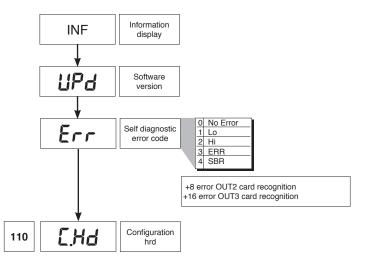
# 6 · PROGRAMMING and CONFIGURATION



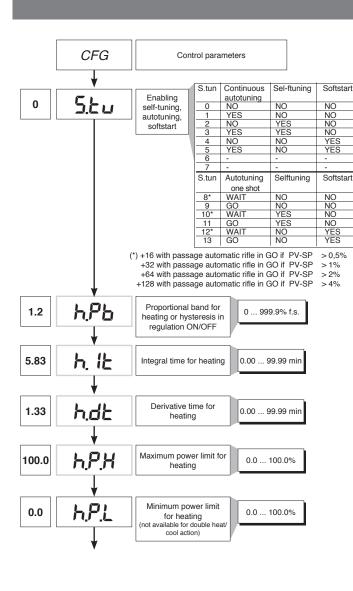
N.B.: Once a particular configuration is entered, all unnecessary parameters are no longer displayed

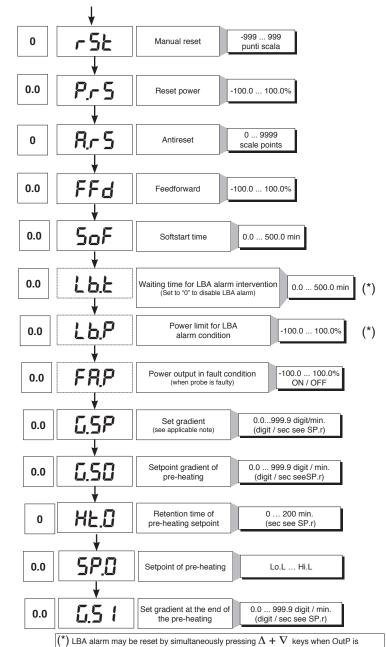
# · InFo Display

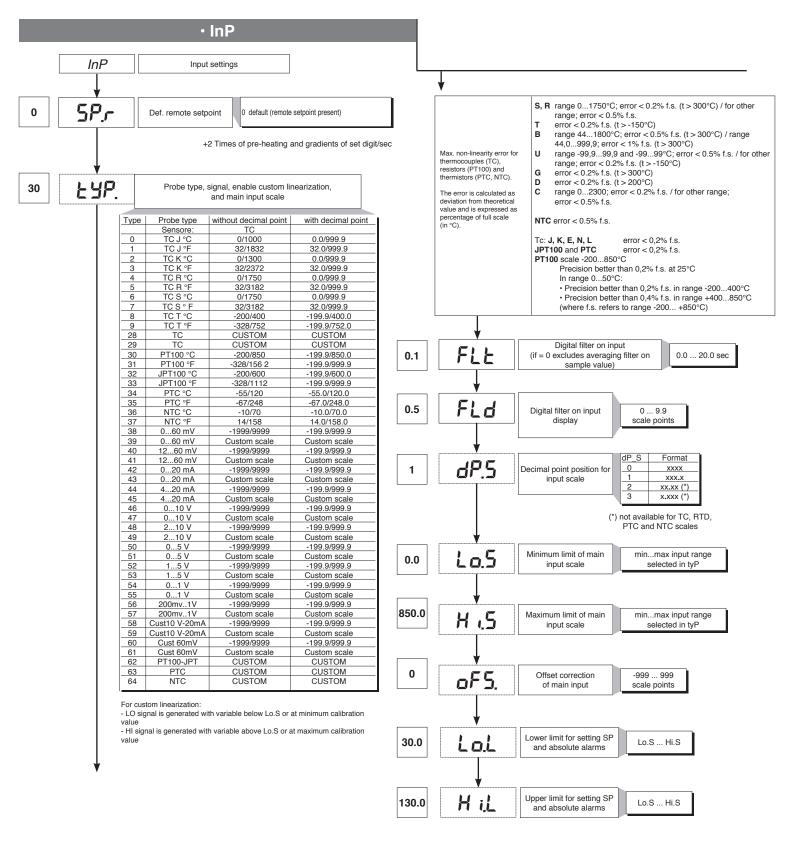


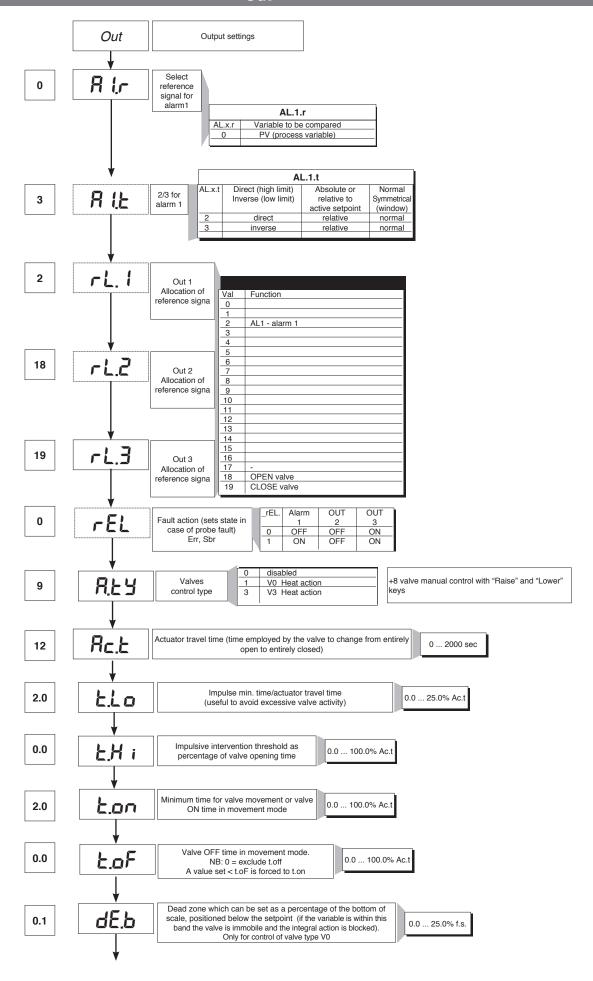


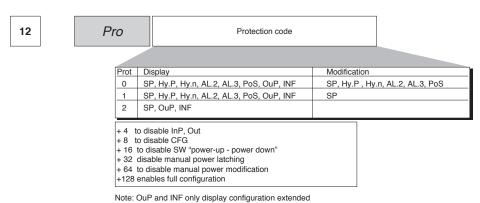
## · CFG





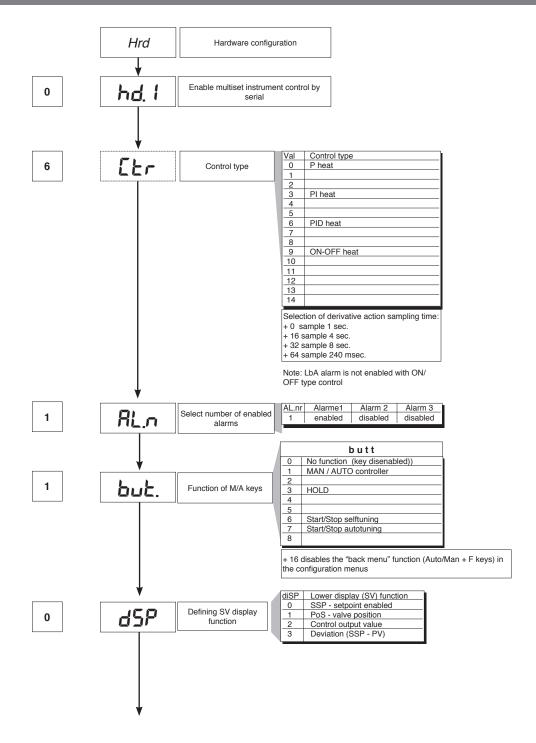


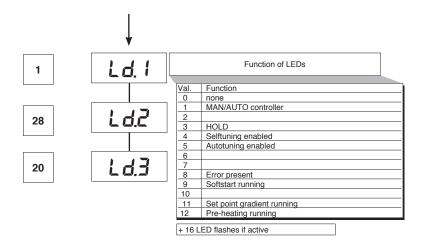




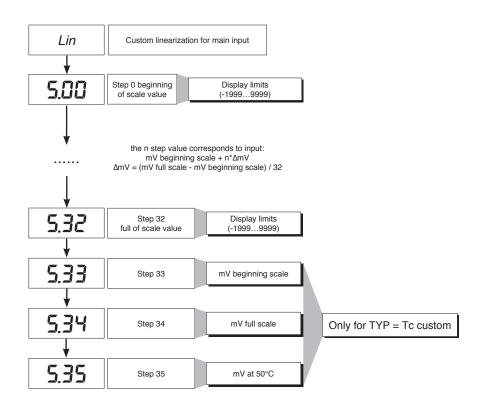
vote. Our and har only display configuration extent

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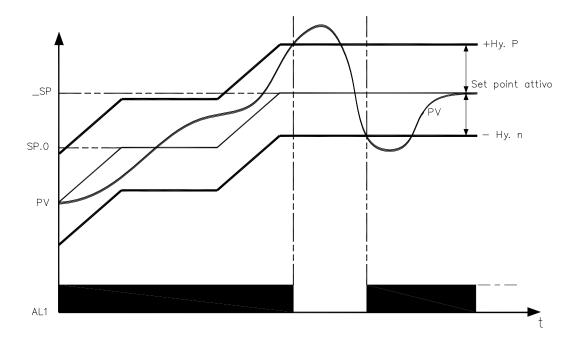


# • Lin



# · U.CAL

	Lleer		Val	Function
U.CA	User calibration		1	-
0.071			2	Input 1 - custom 10V / 20mA
			3	Input 1 - custom 60mV
	,		4	Custom PT100 / J PT100
	1	5	Custom PTC	
			6	Custom NTC
			7	-
		_		



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

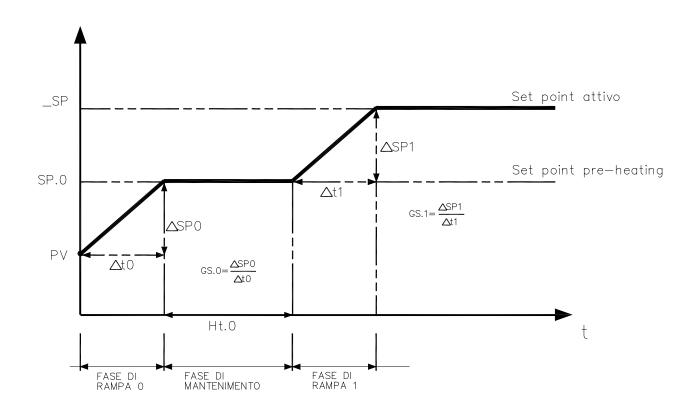
- Maintenance phase

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



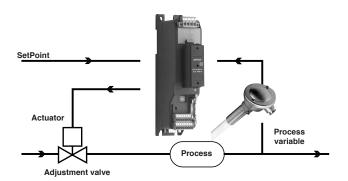
#### 9 · ADJUSTMENT WITH MOTORIZED VALVE

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.



CONTROL EXAMPLE FOR V0 VALVE

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 (Ac.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 Ac.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:

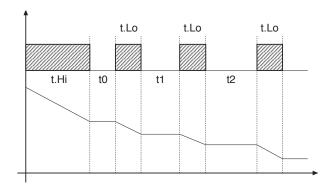
- 1) ON time of movement = t.on and OFF time proportional to shift and greater than or equal to t.Lo (we recommend setting t.on = t.Lo) (set t.oF = 0).
- 2) ON time of movement = t.on and OFF time = t.oF. A value set for t.oF < t.on is forced to t.on. To activate this type, set t.oF <> 0.

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.

t0 = t.Lo

#### Valve control modes

With the controller in manual, the setting of parameter At.y ≥ 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).

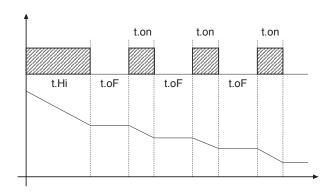
The frequency and duration of the impulses is correlated to the integral time (h.it or c.it).

#### 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 <> 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 ≠ 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

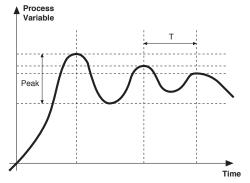
- \* An increase in P.B. reduces oscillations but increases deviation.
- \* A reduction in P.B. reduces the deviation but provokes oscillations of the controlled variable (the system tends to be unstable if P.B. value is too low).
- \* An increase in Derivative Action corresponds to an increase in Derivative 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 GEFRAN 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 s follows: Proportional band

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

Integral time:  $It = 1.5 \times T$ Derivative time: dt = It/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

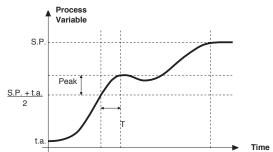
- 1. Make sure that key M/A is enabled for Start/Stop selftuning (code but = 6 Hrd menu)
- 2. Bring the temperature near room temperature
- 3. Set the setpoint to the required value
- 4. Press key M/A to activate selftuning (Attention: selftuning interrupts if the key is pressed again)

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 \* 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 Stu code is not cancelled.
- -It is advisable to eneable 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



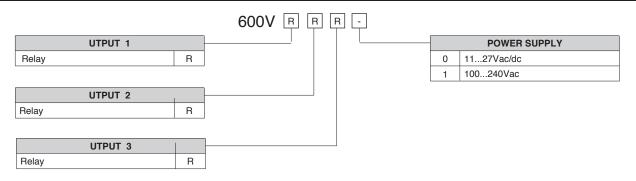
Kit for PC via the USB port (Windows environment) for GEFRAN instruments configuration:

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 twophase 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 infiammable 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 6Ohm; 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
- · 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

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.

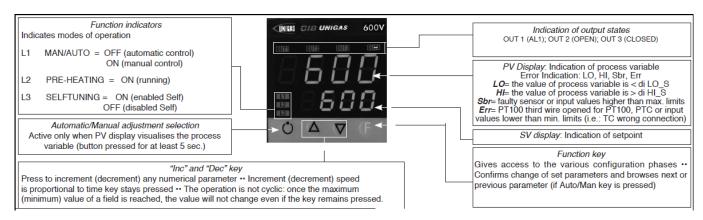


# Set-up for 600V RRR0-1-T73 regulator

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

InP	
tyP	30 (Pt100)
dP_S Lo.S	1 (decimals num.)
	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.

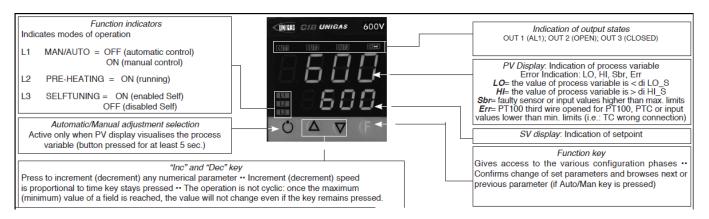
#### Software switch off:

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 hIt	1,2	
hlt	5,83	
hdt	1,33	

InP		
tyP	30 (Pt100)	
dP_S Lo.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 <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.

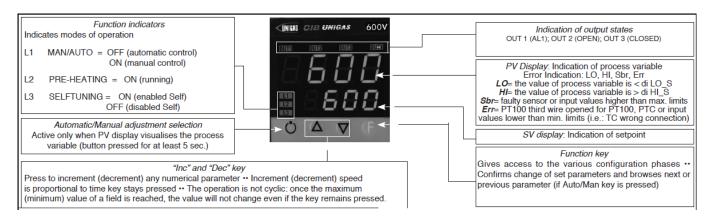
To come back to normal working keep the lower left key pushed for at least 5 sec.

## Software switch off:

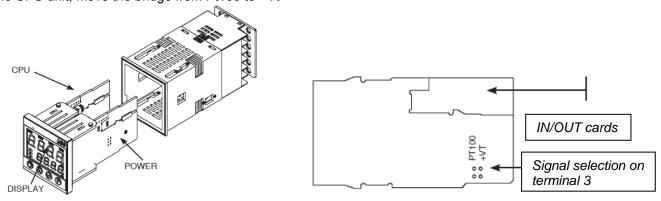
By keeping pushed keys **Arrow up** + **F** for more than 5 sec. the instrument switches off the software, does not command the outputs and visualize only the variable of process measured by the probe.

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

## Set up for 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
hlt	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)

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.

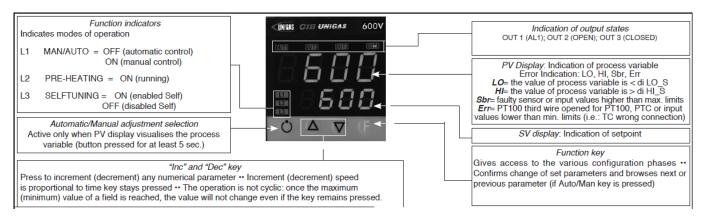
### Software switch off:

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 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	
S.tun	0
hPb	1,2
hlt	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 K) / 1000 (max sensor scale for tc J)
oFS	0 (offset of input correction)
Lo.L	0 (lower set-point range limit)
Hi.L	1300 (upper set-point range limit) per tc K / 1000 for tc J

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 <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.

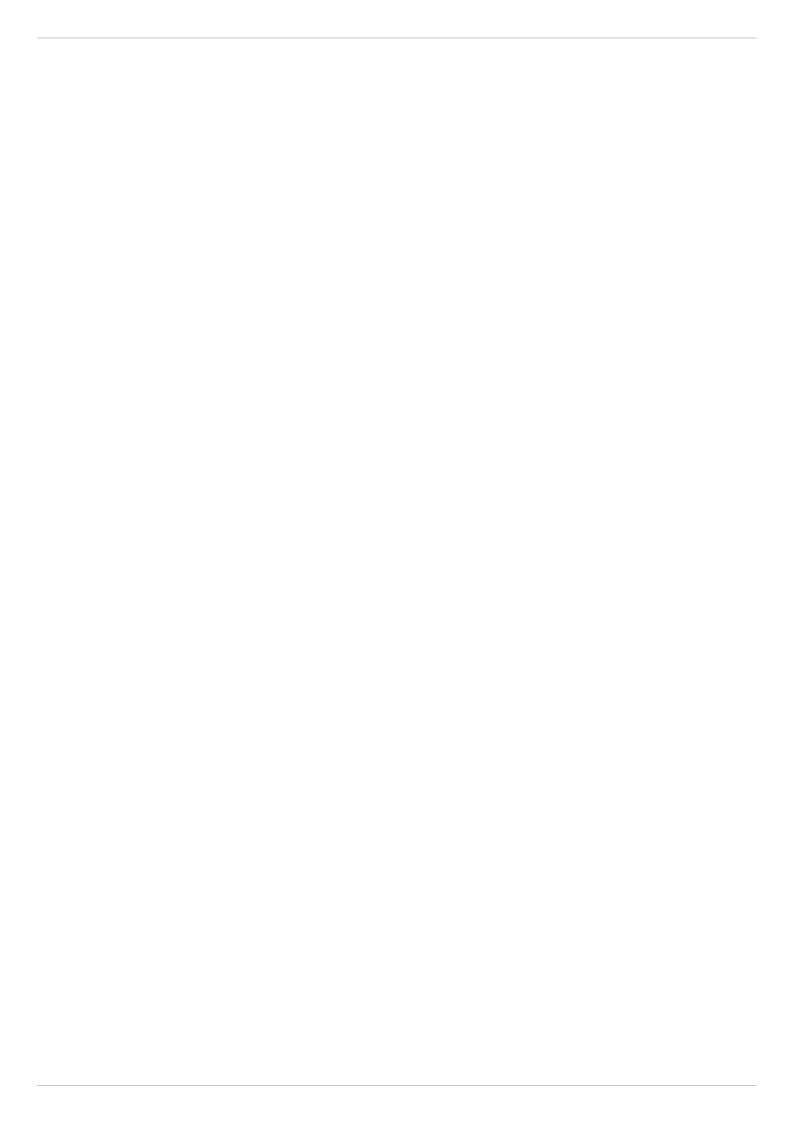
To come back to normal working keep the lower left key pushed for at least 5 sec.

#### 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.





# MANUAL FOR OPERATION AND CALIBRATION

**MODULATOR** 

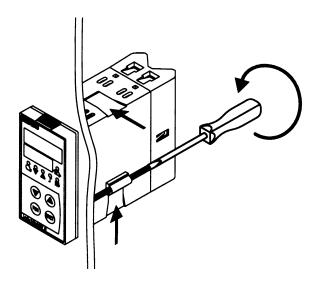
**SIEMENS RWF 40....** 

M12905CH Rev. 07 11/09

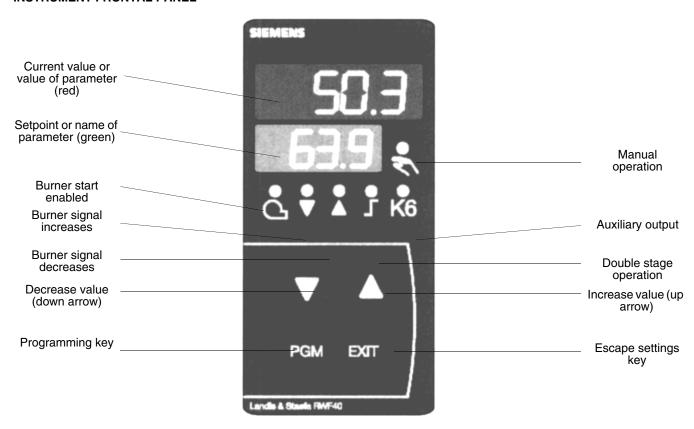
#### **INSTRUMENT MOUNTING**

Mount the instrument using the relevant mounts as illustrated in the figure.

To wire the instrument and sensors, follow the instructions given on the burner's wiring diagrams.



#### **INSTRUMENT FRONTAL PANEL**



#### **INSTRUMENT SETTINGS**

The instrument comes with a number of factory settings that are good for 90% of cases. However, you can set or edit parameters proceeding as follows

#### 1. Setting or editing of setpoint value

With the burner switched off (thermostat/pressure switch series contacts open, i.e. terminals 3-4 open), press the PGM key, holding it down for less than 2 sec.. The display at the bottom (green) reads SP1: use the up and down arrows to set the setpoint value on the display at the top (red).

To confirm the value, press the **PGM** key, then press **EXIT** to return to normal operation.

#### 2. Checking or editing the instrument's PID parameters (table 1 attached)

- Press the PGM key, holding it down for longer than 2 sec.. The code AL appears on the green display whilst the red display reads 0
- reads 0.
- To change, use the up and down arrows to change the value on the red display.
- To confirm, press PGM and the green display moves on to the next parameter.
- Repeat the previous operations for all parameters.
- To stop, press the EXIT key.
- For a list of PID parameters, see table (1) attached.

#### 3. Setting the kind of sensor to be connected to the instrument (table 2 attached)

- With the instrument in normal operating mode, press the **PGM** key, holding it down for 2 sec.. The instrument enters PID parameter configuration mode, hence press the **PGM** key for another 2 sec.
- The green display features the code C111 whilst the red display gives the code 9030.
- Each digit of the code corresponds to a settable parameter
- When the down arrow is pressed, the first digit on the left (n°9) on the red display starts flashing. Pressing the up arrow while the digit is flashing, you can change the value according to table (2) attached.
- Once you have edited the value, press the down arrow again and the second digit from the left (n°0) starts flashing and so on for all four digits. Press **PGM** to confirm and **EXIT** to exit.

Example: temperature sensor, set 9030; pressure sensor, set G030.

#### 4. C112 and C113 configurations (tables 3 & 4 attached) :

Configurations C112 and C113 enable use of an auxiliary contact (terminals Q63-Q64 and LED K6 on the front panel), which is fully configurable.

It also allows you to choose between degrees Celsius °C or Fahrenheit °F and to lock the instrument's keys.

With the instrument in normal operating mode, press the **PGM** key, holding it down for 2 sec.. The instrument enters PID parameter configuration mode, hence press the **PGM** key for another 2 sec..

The code C111 appears on the green display whilst the red display reads 9030. If you press PGM again, the green display reads C112 and the red display reads 0110.

For the instrument to work as standard, the C112 configuration should never be altered, whilst the C113 configuration should be changed when using pressure sensors or 0-10V / 0.4-20mA signals (see table (5) attached).

#### 5. Configuring process values:

With the instrument in normal operating mode, press the **PGM** key for 2 sec.. The instrument enters PID parameter configuration mode. The code **C111** appears on the green display, whilst the code 9030 (or different code depending on settings made previously) appears on the red display. If you press **PGM** again, the code becomes **C112** and the red display reads 0010. When you next press **PGM**, the code becomes **C113** and the red display reads 0110. When you next press **PGM**, the green display reads **SCL** (=lower limit [instrument range start] for analogue input 1, valid for signals 0-10V, 0-20mA, 4-20mA, 0-100ohms etc.). Use the up arrow or down arrow to set the chosen value (see table (5) attached).

If you press the **PGM** key again, the green display reads **SCH** (=upper limit [instrument range end] for analogue input 1, valid for input signals 0-10V, 0-20mA, 4-20mA, 0-100ohms etc.). Use the up and down arrow to set the chosen value (see table (5) attached).

Example: for SIEMENS pressure sensor QBE2.. P25 (25bar), the input signal used is 0-10V: set **SCL** to 0 and **SCH** to 2500. That way the instrument's scale ranges from 0 to 2500 kPa (25 bar).

Pressing the **PGM** key repeatedly calls up the following parameters in sequence. These parameters can be edited with the up and down arrows:

SCL2: lower limit for analogue input 2 (same as SCL but for input 2 - factory setting 0);

SCH2:upper limit for analogue input 2 (same as SCH but for input 2 - factory setting 100);

**SPL**: lower setpoint limit (same as SCL but for setpoint - factory setting 0);

**SPH**: upper setpoint limit (same as SCH but for setpoint - factory setting 100);

Example: for SIEMENS pressure sensor QBE2.. P25 (25bar), the input signal used is 0-10V: if you want to work between 5 and 19 bar, set **SPL** to 500 and **SPH** to 1900 (kPa). That way the setpoint scale can be set between 500 and 1900 kPa (5 and 19 bar).

OFF1:correction for analogue input 1 (factory setting 0)

OFF2:correction for analogue input 2 (factory setting 0)

OFF3:correction for analogue input 3 (factory setting 0)

HYST: "K6" auxiliary contact differential (factory setting 1)

dF1: delay applied to sensor signal to prevent transients (range 0-100sec.; factory setting 1 sec.)

#### 6. Manual control

- To control burner output manually, press the **EXIT** key for 5 sec. with the burner operating the LED with the hand symbol lights.
- At this point, use the up arrow and down arrow to increase or decrease burner output.
- To exit manual mode, press the **EXIT** key.
- NB: Every time the controller switches the burner off (start enabled LED off Q13-Q14 contact open), manual mode is disabled when the burner is switched back on.

#### 7. Instrument self-setting (auto-tuning)

- If the burner in the steady state does not respond properly to heat generator requests, you can activate the instrument's self-setting function, which recalculates PID values for its operation, deciding which are most suitable for the specific kind of request
- To activate this function, proceed as follows:
- Press the **PGM** key and down arrow at the same time.
- The green display reads tunE and the instrument forces the burner to increase and decrease output.
- During these output oscillations, the instrument calculates the PID parameters (proportional band, integral time, derivative time).
- At the end of calculations, the tunE function switches off automatically and the instrument has stored the new parameters.
- If you want to disable the self-setting function, press the up arrow once it has started.
- PID parameters calculated by the instrument can be edited at any time following the procedure illustrated earlier in point 2.

#### Note:

If no key is pressed for ~10sec. during the instrument's setting, the instrument automatically exits setting mode and returns to normal operating mode.

TABLE 1 - "PID" PARAMETERS AND RELEVANT FACTORY SETTINGS

Parameter	Display	Values range	Factory setting	Remarks
Limit value for auxiliary contact (*)	AL	from -1999 to 9999 digit	0	Do not alter
Auxiliary contact switching differential (*)	HYST	from 0 to 999.9 digit	1	Do not alter
Proportional band (*)	PB.1	from 0.1 to 9999 digit	10	Typical value for temperature
Derivative action	dt	from 0 to 9999 sec.	80	Typical value for temperature
Integral action	rt	from 0 to 9999 sec.	350	Typical value for temperature
Dead band (*)	db	from 0 to 999.9 digit	1	Typical value
Servocontrol running time	tt	from 10 to 3000 sec.	15	Set servocontrol running time
Switch-on differential (*)	HYS1	from 0.0 to -199.9 digit	-5	Value under setpoint below which the burner switches back on (Q13- Q14 closes)
Lower switch-off differential (*)	HYS2	from 0.0 to HYS3	3	Do not alter
Upper switch-off differential (*)	HYS3	from 0.0 to 999.9 digit	5	Value over setpoint above which the burner switches off (Q13-Q14 opens)
Modulating response threshold	q	from 0.0 to 999.9	0	Do not alter
Weather compensation gradient	Н	from 0.0 to 4	1	Do not alter
Ambient temperature parallel displacement (*)	Р	from -90 to +90	0	Do not alter

<sup>(\*)</sup> Parameters affected by setting of decimal place (C113 configuration 01X0)

**TABLE 2 - INPUTS CONFIGURATION C111** 

Red display				
Analog input 1	1^ digit	2^ digit	3^ digit	4^ digit
Pt100 3 wires	0	_		_
Pt100 22 wires	1			
Ni100 3 wires	2			
Ni100 22 wires	3			
Pt1000 3 wires	4			
Pt 1000 22 wires	5			
Ni1000 3 wires DIN 43760	6			
Ni1000 22 wires DIN 43760	7			
Ni1000 3 wires Siemens	8			
	9			
Ni1000 22 wires Siemens	A			
Thermocoupling K NiCr-Ni	b			
Thermocoupling T Cu-Con	С			
Thermocoupling N NiCrSil-NiSil				
Thermocoupling J Fe-Con	d			
Signal 0 ÷ 20 mA	E F			
Signal 4 ÷ 20 mA				
Signal 0 ÷ 10 V	G			
Signal 0 ÷ 1 V	Н			
Analog input 2				
none		0		
external set point WFG		1		
external set point 0 ÷ 20 mA		2		
external set point 4 ÷ 20 mA		3		
external set point 0 ÷ 10 V		4		
external set point 0 ÷ 1 V		5		
analog shift set-point WFG		6		
analog shift set-point 0 ÷ 20 mA		7		
analog shift set-point 4 ÷ 20 mA		8		
analog shift set-point 0 ÷ 10 V		9		
analog shift set-point 0 ÷ 1 V		Α		
Analog input 3				
none			0	
external themperature sensor Pt 1000 22 wires			1	
xternal themperature sensor Ni1000 22 wires DIN			2	
xternal themperature sensor Ni1000 22 wires Siemens			3	
Input D2 - Logic functions				
				0
none				1
changeover set-point				2
V shift set-point  Typical settings				_
	0	0	2	
Siemens sensors QAE2/QAC2/QAM2	9	0	3	0
Factory sensors Pt1000 30÷130 °C	5	0	3	0
Factory sensors Pt1000 0 ÷ 350 °C	5	0	3	0
Pressure probes QBE 3 wires (signal 0 ÷ 10 V)	G	0	3	0
Pressure probes MBS 2 wires (signal 4 ÷ 20 mA)	F	0	3	0
Probes Pt100 3 wires	0	0	3	0
Thermocouplings K type	Α	0	3	0
Signal 4 ÷ 20 mA	F	0	3	0

**TABLE 3 - CONFIGURATION C112** 

Red display	1^ digit	2 <sup>^</sup> digit	3^ digit	4^ digit
Auxiliary limit switch K6				
none	0			
lk1 function for input 1	1			
lk2 function for input 1	2			
lk3 function for input 1	3			
lk4 function for input 1	4			
lk5 function for input 1	5			
lk6 function for input1	6			
lk7 function for input 1	7			
lk8 function for input 2	8			
lk7 function for input 2	9			
lk8 function for input 2	Α			
lk7 function for input 3	b			
lk8 function for input 3	С			
Type of instrumentoutput control				
3 points (relay type)		0		
DC 0 ÷ 20 mA (*)		1		
DC 4 ÷ 20 mA (*)		2		
DC 0 ÷ 10 V (*)		3		
Set-point SP1				
SP1set with keys			0	
SP1 dependent on outside sensor (analogue input 3 must be configured)			1	
Parameter lock				
no keyboard lock				0
configuration level block				1
parameters level block PID				2
total block				3
Factory settings	0	0	1	0

Note: (\*) for RWF 40.002 only

#### **TABLE 4 - CONFIGURATION C113**

Red display	1^ digit	2^ digit	3 <sup>^</sup> digit	4^ digit
Instrument addresses (for RWF 40.003 only				
address 0	0			
address 1	0	1		
address				
address 99	9	9		
Unit of measurement and decimal place				
°C without decimal			0	
°C and 1 decimal			1	
°F without decimal			2	
°F and 1 decimal			3	
Activation of "K6"				
limit contact OFF				0
limit contact ON				1
Factory settings	0	1	1	0

**TABLE 5 - SUMMARY OF STANDARD PARAMETER SETTINGS** 

	PARAMETERS TO BE EDITED											
SENSORS/PROBES	C111	C113	SCL	SCH	SPL	SPH	HYS1 (*)	HYS3 (*)	Pb. 1	dt	rt	SP1 (*)
Siemens QAE2120.010	9030	0110	-	-	30	95	-5	5	10	80	350	80°C
Siemens QAM2120.040	9030	0110	-	-	0	80	-2,5	2,5	10	80	350	40°C
Pt1000 (130°C max.)	5030	0110	-	-	30	95	-5	5	10	80	350	80°C
Pt1000 (350°C max.)	5030	0110	-	-	0	350	-5	10	10	80	350	80°C
Pt100 (130°C max.)	0030	0110	-	-	0	95	-5	5	10	80	350	80°C
Pt100 (350°C max)	0030	0110	П	-	0	350	-5	10	10	80	350	80°C
Termocouple K	A030	0110	ı	=	0	1200	-5	20	10	80	350	80°C
Danfoss/Siemens 4÷20mA p 1,6 bar	F030	0100	0	160	0	160	0	20	5	20	80	100kPa
Danfoss/Siemens 4÷20mA p 10 bar	F030	0100	0	1000	0	1000	0	50	5	20	80	600kPa
Danfoss/Siemens 4÷20mA p 16 bar	F030	0100	0	1600	0	1600	0	80	5	20	80	600kPa
Danfoss/Siemens 4÷20mA p 25 bar	F030	0100	0	2500	0	2500	0	125	5	20	80	600kPa
Danfoss/Siemens 4÷20mA p 40 bar	F030	0100	0	4000	0	4000	0	200	5	20	80	600kPa
Siemens QBE2 P4	G030	0100	0	400	0	400	0	20	5	20	80	200kPa
Siemens QBE2 P10	G030	0100	0	1000	0	1000	0	50	5	20	80	600kPa
Siemens QBE2 P16	G030	0100	0	1600	0	1600	0	80	5	20	80	600kPa
Siemens QBE2 P25	G030	0100	0	2500	0	2500	0	125	5	20	80	600kPa
Siemens QBE2 P40	G030	0100	0	4000	0	4000	0	200	5	20	80	600kPa
Signal 0÷10V	G030	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	5	20	80	to be fixed
Signal 4÷20mA	F030	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	5	20	80	to be fixed
tt - servocontrol run	12 sec.	Servocontro	ol Berger S	TA12B/Si	emens SQ	N30.251/Sie	emens SQN	172.4A4A20	)			
tt - servocontrol run	13 sec.	sec. Servocontrol Berger STA13B										
tt - servocontrol run	15 sec.	sec. Servocontrol Berger STA15B										
tt - servocontrol run	30 sec.	Servocontrol Siemens SQL33.03/Siemens SQM10/Siemens SQM50/Siemens SQM54/Berger STM30/ Siemens SQM40.265							30/			

#### **NOTES**

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

#### WARNING

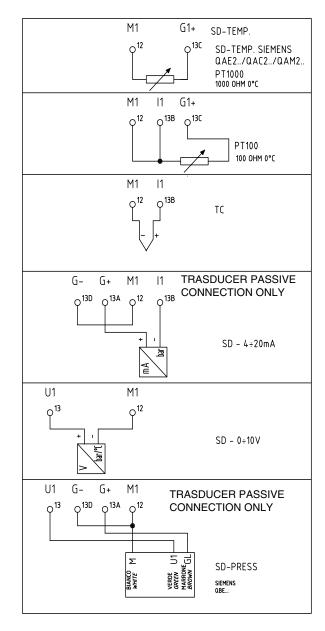
With pressure sensors, parameters SP1, SCH, SCL, HYS1, HYS3 must be selected and displayed in kPa (kilo Pascal). (1bar = 100,000Pa = 100kPa)

#### Probe electric connection:

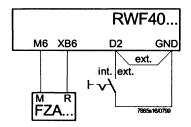
With 7 pins connector version

#### M1 G1+ SD-TEMP. SD-TEMP. SIEMENS QAE2../QAC2../QAM2.. PT1000 1000 OHM 0°C M1 11 G1+ 8 L T6\_ PT100 100 OHM 0°C M1 11 . 16 TC G-G+ M1 11 TRASDUCER PASSIVE CONNECTION ONLY SD - 0/4÷20mA M1 U1 SD - 0÷10V U1 G+ M1 G-TRASDUCER PASSIVE **CONNECTION ONLY** VERDE GREEN U1-MARRONE GL-Σ SD-PRESS SIEMENS QBE...

#### With terminals version

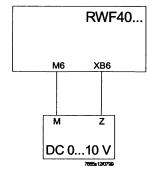


#### With external setpoint



C111 configuration code = X1X1

#### With setpoint modified by independent management system



C111 configuration code = X9XX

SCH2= 0.5x (SPH - SPL) SCL2= -0.5 x (SPH - SPL)

Example:

SPH= max. 130° C

SPL= min.  $30^{\circ}$  C

 $SCH2 = 0.5 \times (130 - 30) = 50$ 

 $SCL2 = -0.5 \times (130 - 30) = -50$ 

#### **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.



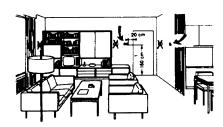
#### It's good to be admired ...even better to be effective

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.









## Outside probes (weather)

#### Installation

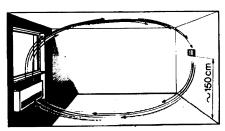
In heating or air-conditioning systems featuring adjustment in response to outside temperature, the sensor's positioning is of paramount importance.



**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

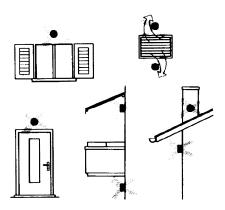
On an inner wall on the other side of the room to heating units height above floor 1.5 m, at least 1.5 m away from external sources of heat (or cold)



#### 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.

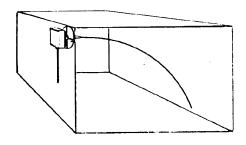
The sensor must not be painted (measurement error).

#### **Duct or pipe sensors**

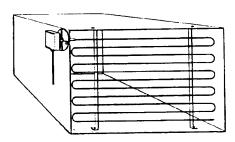
#### Installing temperature sensors

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.



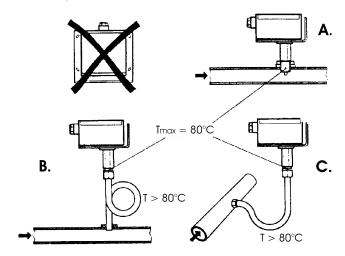
#### Bend 0.4m sensor by hand (never use tools) as illustrated.



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

#### Installing pressure sensors

- A installation on ducts carrying fluids at max. temperature  $80^{\circ}\text{C}$
- 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

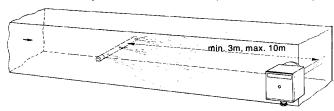
2=open A2=close B

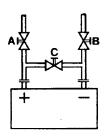
3=open B3=close A

4= close C

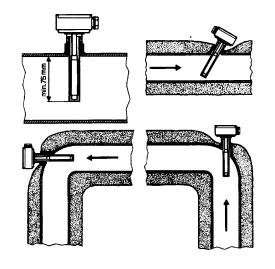
#### Installing combined humidity sensors

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





#### Immersion or strap-on sensors



#### Immersion probes mounting

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.

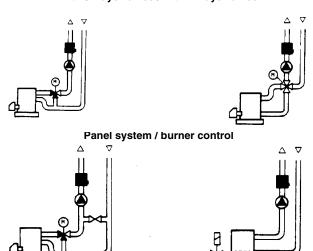
Sensors come with straps for pipes up to 100 mm in diameter



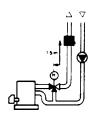
#### Placing the probes (QAD22.../QAE21.../QAP21.../RCA...)

#### With pumps on outlet

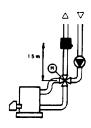
#### with 3 ways valves / with 4 ways valves



#### with 3 ways valves / with 4 ways valves



With pumps on return



# 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

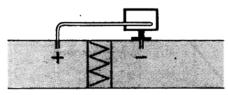
- Measure "mean" fluid temperature
- No external influence on measurement such as: currents of air, nearby pipes etc.

#### Limits

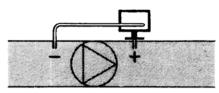
- Time constant with sheath: 20 sec.
- Hard to change installation position if it proves incorrect.

#### **Duct pressure switches and sensors**

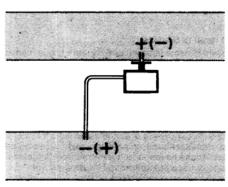
#### Installing differential pressure probes for air



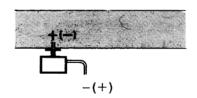
A - Control a filter (clogging)



B - Control a fan (upstream/downstream)



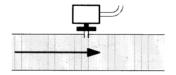
C - Measurement of difference in pressure between two ducts



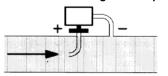
D - Measurement of difference in pressure between two rooms or of inside of duct and outside

#### **Basic principles**

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



Measuring dinamic pressure



$$Pd = \frac{y \vartheta^2}{2g}$$

#### Key

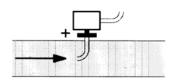
y kg/m3, specific weight of air

q m/s, air speed

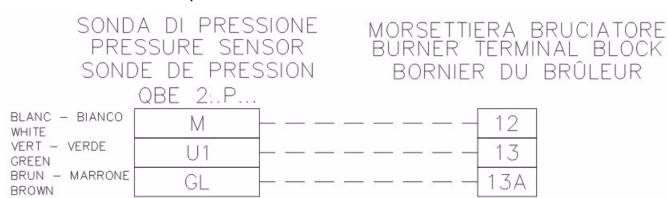
g 9.81 m/s2, gravity acceleration

Pd mm C.A., dynamic pressure

#### Measuring total pressure



#### Pressure probes connection Siemens QBE 2...P... to burner's terminal block



#### Spare parts

Description	Code
Modulator RWF40.000	2570112
Adapting frame Siemens ARG40 from RWF32 to RWF40	2570113
Temperature probe Siemens QAE2120.010A (30÷130°C)	2560101
Temperature probe Siemens QAM2120.040 (-15÷+50°C)	2560135
Thermoresistor Pt1000 ø = 6mm L = 100mm (30÷130°C)	2560188
Thermoresistor Pt1000 ø = 10mm L = 200mm (0÷350°C)	2560103
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 MBS3200 p 1,6 (0÷1,6bar / segnale 4÷20mA)	2560189
Pressure probe Danfoss MBS3200 p 10 (0÷10bar / segnale 4÷20mA)	2560190
Pressure probe Danfoss MBS3200 p 16 (0÷16bar / segnale 4÷20mA)	2560191
Pressure probe Danfoss MBS3200 p 25 (0÷25bar / segnale 4÷20mA)	2560192
Pressure probe Danfoss MBS3200 p 40 (0÷40bar / segnale 4÷20mA)	2560193
Pressure probe Siemens 7MF1564-3BB00-1AA1 (0÷1,6bar / segnale 4÷20mA)	25601A3
Pressure probe Siemens 7MF1564-3CA00-1AA1 (0÷10bar / segnale 4÷20mA)	25601A4
Pressure probe Siemens 7MF1564-3CB00-1AA1 (0÷16bar / segnale 4÷20mA)	25601A5
Pressure probe Siemens 7MF1564-3CD00-1AA1 (0÷25bar / segnale 4÷20mA)	25601A6
Pressure probe Siemens 7MF1564-3CE00-1AA1 (0÷40bar / segnale 4÷20mA)	25601A7
Thermocoupling type K ø = 10mm L = 200mm (0÷1200°C)	2560142
Thermoresistor Pt100 ø = 10mm L = 200mm (0÷350°C)	2560145

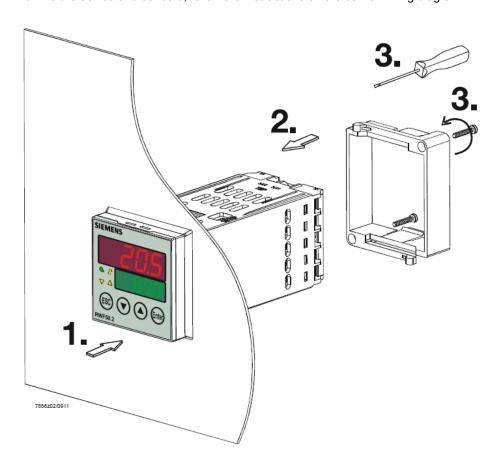
# RWF50.2x & RWF50.3x

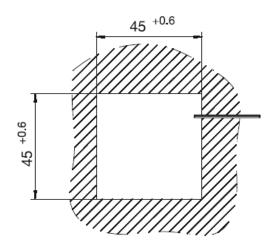


User manual

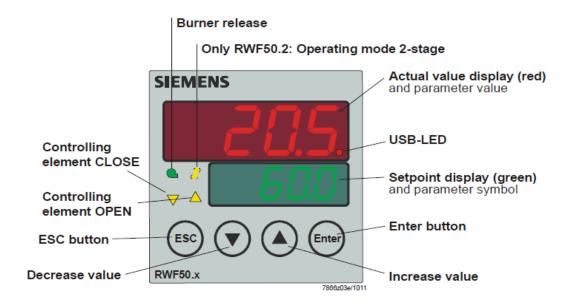
M12922CB Rel.1.0 05/2024

**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.

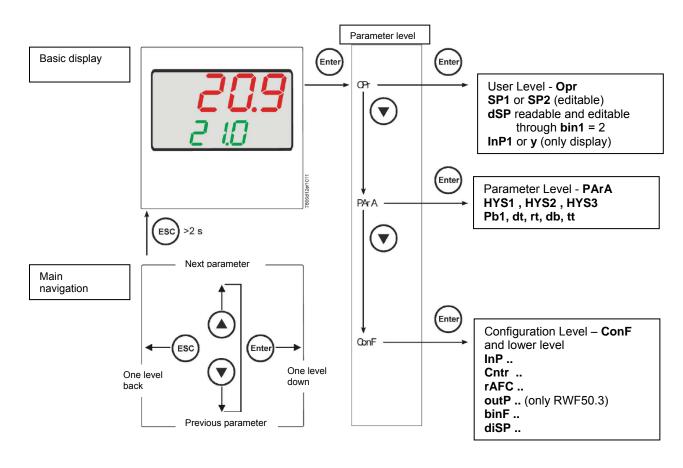




#### **FRONT PANEL**



#### **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 is 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	0,01999 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	HYS60,0 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	0,01999 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

<sup>(\*)</sup>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 displaied. 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	1	Pt100 3 fili					
type of sensor for	2	Pt100 2 fili					
analog input 1	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		Using the measured value correction (offset), a measured					
sensor offset	-1999 <b>0</b> +9999	value can be corrected to a certain degree, either up or down					
SCL1		In the case of a measuring transducer with standard signal, the					
scale low level		physical signal is assigned a display value here					
	-1999 <b>0</b> +9999	(for input ohm, mA, V)					
SCH1		In the case of a measuring transducer with standard signal, the					
scale high level		physical signal is assigned a display value here					
	-1999 <b>100</b> +9999	(for input ohm, mA, V)					
dF1		Is used to adapt the digital 2nd order input filter					
digital filter	0 <b>0,6</b> 100	(time in s; 0 s = filter off)					
Unit	1	1 = degrees Celsius					
temperature unit	2	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	1	1 = 3-position controller (open-stop-close only RWF50.2)
controller type	2	2 = continuative action controller (only RWF50.3)
CACt	1	1 = heating controller
control action	0	0 = cooling controller
SPL		
least value of the		set-point limitation prevents entry of values outside the defined
set-point range	-1999 <b>0</b> +9999	range
SPH		
maximum value of the		set-point limitation prevents entry of values outside the defined
set-point range	-1999 <b>100</b> +9999	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 Choose type of range degrees/time function 0 = deactivated 0 1 = Kelvin degrees/minute 1 2 2 = Kelvin degrees/hour rASL Slope of thermal shock protection (only with functions 1 and 2) ramp rate **0,0** ... 999,9 toLP width of tolerance band (in K) about the set-point 0 = tolerance band inactive tolerance band ramp 0...9999 40 7866d16/0911 t Ramp limit. When this value is lower than the temperature setrAL ramp limit point, the RWF controls the output increasing the temp set 0...250 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		1 = analog input 1 doubling with possibility to convert
tipo di controllo	1	(depending on par <b>SiGn</b> )
	4	4 = modulation controller
SiGn		physical output signal (terminals A+, A-)
type of output signal	0	0 = 0÷20mA
	1	1 = 4÷20mA
	2	2 = 0÷10V
rOut		
Value when out of		
input range	<b>0</b> 101	signal (in percent) when measurement range is crossed
oPnt		value range of the output variable is assigned to a physical
zero point		output signal Per default, the setting corresponds to 0100%
		angular positioning for the controller outputs (terminals A+, A-)
	-1999 <b>0</b> +9999	(effective only with <b>FnCt</b> = 1)
End		value range of the output variable is assigned to a physical
End value		output signal Per default, the setting corresponds to 0100%
		angular positioning for the controller outputs (terminals A+, A-)
	-1999 <b>100</b> +9999	(effective only with <b>FnCt</b> = 1)

(**bold** = factory settings)

### ConF > binF

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

(**bold** = factory settings)

#### ConF > dISP

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

7866z04/0911

#### Display of software version:

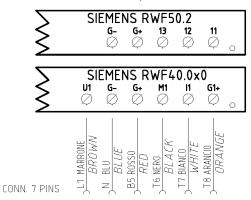


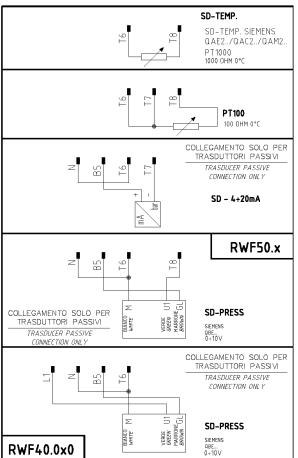
The software version is shown by pushing  $\mathbf{Enter} + \mathbf{UP} \ \mathbf{arrow}$  on the upper display

100020310911

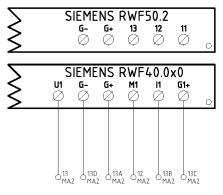
#### **Electric connection:**

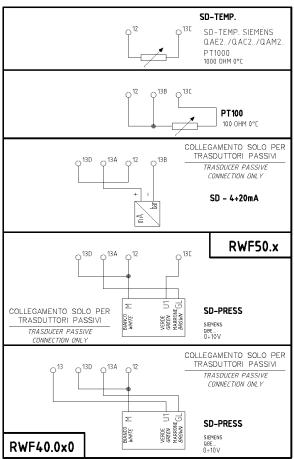
With 7 pins connector version





#### With terminals version





#### Matches terminals between RWF50.2 and RWF40.0x0

ka ⊙ ∅	K2	K3 ∅	1N	SIE 1P Ø	MENS L1 Ø	RWF N Ø	50.2		G-	G+	13	12	11 Ø	
a Ø	Y1	Y2	Q13 Ø	SIEM Q14	ENS F	RWF4	0.0×0 TE	U1 Ø	G- Ø	G+ Ø	M1	I1 Ø	G1+	

#### Parameters summarising for RWF50.2x:

Navigation menù	Conf Inp Inp1				Conf			PArA						Opr	
					Cr	ntr	diSP								
Types of probe	SEn1	OFF1	SCL	SCH	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
Sonda 4÷20mA / 0÷1,6bar	16	0	0	160	needless	0	160	0	5	20	80	(#)	0	20	100 kPa
Sonda 4÷20mA / 0÷10bar	16	0	0	1000	needless	0	1000	0	5	20	80	(#)	0	50	600 kPa
Sonda 4÷20mA / 0÷16bar	16	0	0	1600	needless	0	1600	0	5	20	80	(#)	0	80	600 kPa
Sonda 4÷20mA / 0÷25bar	16	0	0	2500	needless	0	2500	0	5	20	80	(#)	0	125	600 kPa
Sonda 4÷20mA / 0÷40bar	16	0	0	4000	needless	0	4000	0	5	20	80	(#)	0	200	600 kPa
Sonda 4÷20mA / 0÷60PSI	16	0	0	600	needless	0	600	0	5	20	80	(#)	0	30	300 (30PSI)
Sonda 4÷20mA / 0÷200PSI	16	0	0	2000	needless	0	2000	0	5	20	80	(#)	0	75	600 (60PSI)
Sonda 4÷20mA / 0÷300PSI	16	0	0	3000	needless	0	3000	0	5	20	80	(#)	0	120	600 (60PSI)
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 - Types of probe

SQL33; STM30; SQM10; SQM40; SQM50; SQM54 = <u>30</u> (second) - STA12B3.41; SQN30.251; SQN72.4A4A20 = <u>12</u> (second)

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

#### TABLE OF PARAMETERS TO BE MODIFIED FOR CALIBRATIONS RWF50.3x/RWF55.xx (CONTINUOUS OUTPUT 4÷20mA) INSTEAD OF 3 POINTS

Navigation menù			Conf OutP		
Parameter	FnCt	SiGn	rOut	0Pnt	End
	4	1 (4÷20mA)	0	0	100

NOTE: (#) tt - servocontrol travel time SQL33; STM30; SQM10; SQM40; SQM50; SQM54 = 30 (second)

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

(\*) Factory-set values, these values must be varied according to the actual working temperature/pressure of the system.

WARNING: With pressure probes in bar, parameters SP1, SCH, SCL, HYS1, HYS3 must be set, and displayed in kPa (kilo Pascal); 1bar = 100,000Pa = 100kPa. With pressure probes in PSI the parameters SP1, SCH, SCL, HYS1, HYS3 must be set, and displayed in PSI x10 (example : 150PSI > display 1500).

<sup>(\*)</sup> These values are factory set - values **MUST BE** set during operation at the plant based on the real working temperature/pressure value.

#### **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.



#### 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.

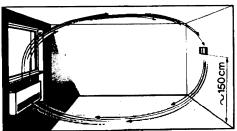






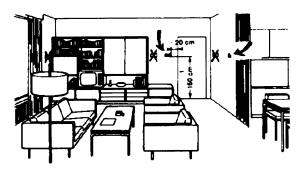
#### Location

On an inner wall on the other side of the room to heating unitsheight 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 win-dows, 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.



#### Outside probes (weather)

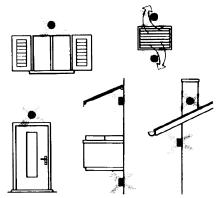
#### Installation

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



**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.

#### 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**

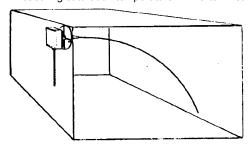
#### Installing temperature sensors

For measuring outlet air:

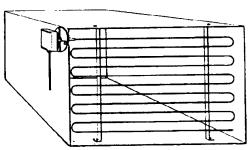
- after delivery fan or
- after coil to be controlled, at a distance of at least 0,5 m

For measuring room temperature:

 before return air intake fan and near room's return airintake. 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.

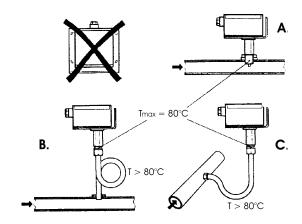
#### Installing combined humidity sensors

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 thevalue permitted by the sensor
- when there are high static pressures, make sure you insert shutoff valves A-B-C.

#### **Putting into operation**

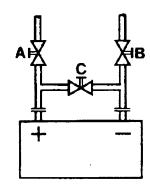
Start disable

1=open C1=open C

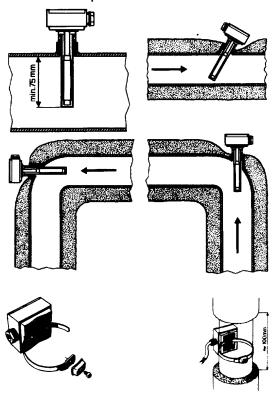
2=open A2=close B

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

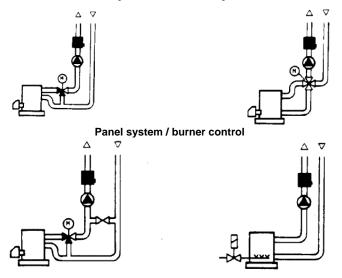
Make sure fluid is circulating in the chosen location.

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

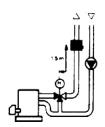
#### With pumps on outlet

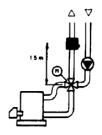
#### with 3 ways valves / with 4 ways valves



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

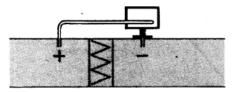
#### Advantages:

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

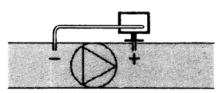
#### Limits:

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

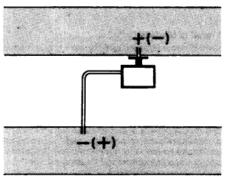
#### Installing differential pressure probes for air



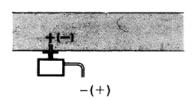
A - Control a filter (clogging)



B - Control a fan (upstream/downstream)



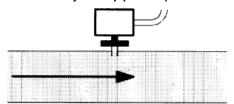
C - Measurement of difference in pressure between two ducts



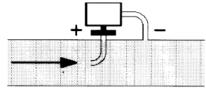
D - Measurement of difference in pressure between two rooms or of inside of duct and outside

#### **Basic principles**

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



#### Measuring dinamic pressure



$$Pd = \frac{y \vartheta^2}{2g}$$

#### Key

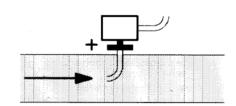
y Kg/m<sup>3</sup>, specific weight of air

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

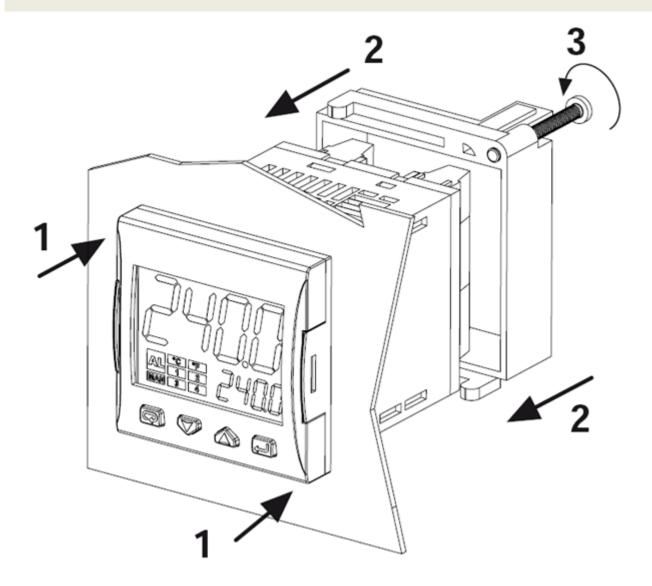
Description	Code
Modulator RWF50.2 (uscita a 3 punti - apri, fermo, chiudi) 2570148	2570148
Modulator RWF50.3 (uscita continua 0÷20mA, 4÷20mA, 0÷10V) 2570149	2570149
Temperature probe Siemens QAE2120.010A (30÷130°C) 2560101	2560101
Temperature probe Siemens QAM2120.040 (-15÷+50°C) 2560135	2560135
Thermoresistor Pt1000 ø6mm L100mm (30÷130°C) 2560188	2560188
Thermoresistor Pt1000 ø10mm L200mm (0÷350°C) 2560103	2560103
Thermoresistor Pt100 ø10mm L200mm (0÷350°C) 2560145	2560145
Thermoresistor Pt100 ø8mm L85mm (0÷120°C) 25601C3	25601C3
Pressure probe Siemens QBE2 P4 (0÷4bar) 2560159	2560159
Pressure probe Siemens QBE2 P10 (0÷10bar / signal 0÷10V) 2560160	2560160
Pressure probe Siemens QBE2 P16 (0÷16bar / signal 0÷10V) 2560167	2560167
Pressure probe Siemens QBE2 P25 (0÷25bar / signal 0÷10V) 2560161	2560161
Pressure probe Siemens QBE2 P40 (0÷40bar / signal 0÷10V) 2560162	2560162
Pressure probe Danfoss MBS 3200 P 1,6 (0÷1,6bar / signal 4÷20mA) 2560189	2560189
Pressure probe Danfoss MBS 3200 P 10 (0÷10bar / signal 4÷20mA) 2560190	2560190
Pressure probe Danfoss MBS 3200 P 16 (0÷16bar / signal 4÷20mA) 2560191	2560191
Pressure probe Danfoss MBS 3200 P 25 (0÷25bar / signal 4÷20mA) 2560192	2560192
Pressure probe Danfoss MBS 3200 P 40 (0÷40bar / signal 4÷20mA) 2560193	2560193
Pressure probe Siemens 7MF1565-3BB00-1AA1 (0÷1,6bar / signal 4÷20mA) 25601A3	25601A3
Pressure probe Siemens 7MF1565-3CA00-1AA1 (0÷10bar / signal 4÷20mA) 25601A4	25601A4
Sonda di pressione Siemens 7MF1565-3CB00-1AA1 (0÷16bar / signal 25601A5	25601A5
Pressure probe Siemens 7MF1565-3CD00-1AA1 (0÷25bar / signal 4÷20mA) 25601A6	25601A6
Pressure probe Siemens 7MF1565-3CE00-1AA1 (0÷40bar / signal 4÷20mA) 25601A7	25601A7
Pressure probe Gefran E3E B1V6 MV (0÷1,6bar / segnale 4÷20mA) 25601C4	25601C4
Pressure probe Danfoss E3E B01D MV (0÷10bar / segnale 4÷20mA) 25601C5	25601C5
Pressure probe Danfoss E3E B16U MV (0÷16bar / segnale 4÷20mA) 25601C6	25601C6
Pressure probe Danfoss E3E B25U MV (0÷25bar / segnale 4÷20mA) 25601C7	25601C7
Pressure probe Danfoss E3E B04D MV (0÷40bar / segnale 4÷20mA)) 25601C8	25601C8
Pressure probe Siemens 7MF1567-4CD00-1EA1 (0-300PSI 1/4NPT 4-20mA)	25601G0
Pressure probe Siemens 7MF1567-4BF00-1EA1 (0-60PSI 1/4NPT 4-20mA)	25601G1
Pressure probe Siemens 7MF1567-4CB00-1EA1 (0-200PSI 1/4NPT 4-20mA)	25601G2



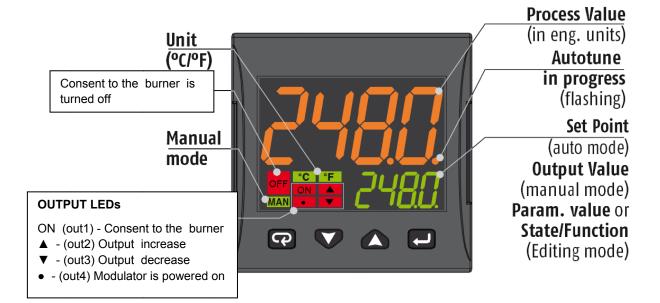
# **KM3 Modulator**

**USER MANUAL** 

# **MOUNTING**

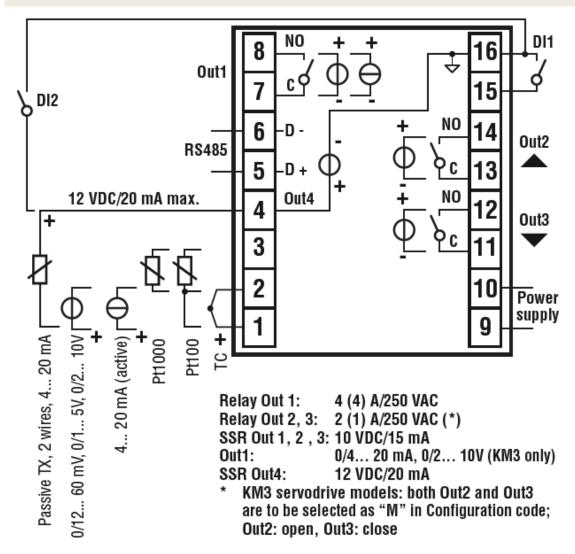


# **DISPLAY AND KEYS**



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

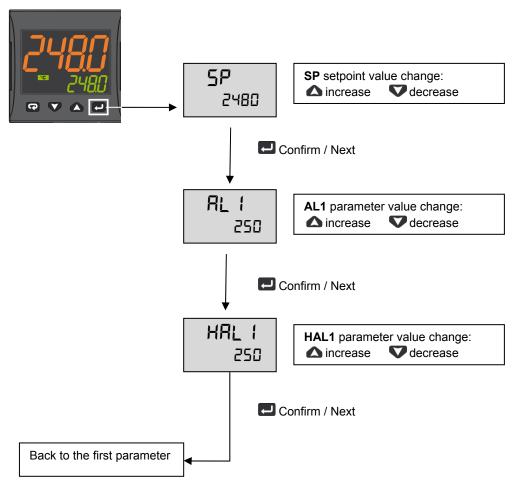
- Neutral wire: terminal 9
- Phase: terminal 10 (100...240 Vac)
- Close terminals 15-16 to switch to the set point 2

#### 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)

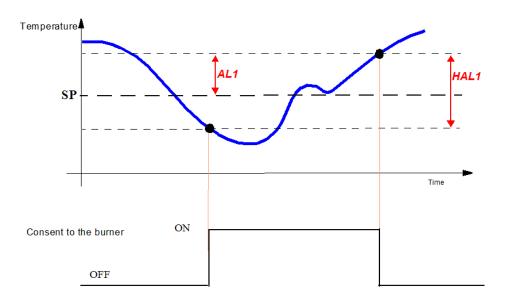
# **SETPOINT AND HYSTERESIS CONFIGURATION (SP, AL1, HAL1 parameters)**

Push the button to enter into the setpoint configuration:



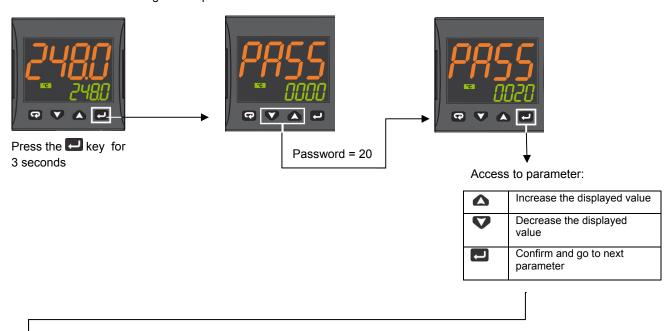
To return to normal mode, press the 🖸 key for 3 seconds or wait the 10s timeout

### 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 = 020mA 4.20 = 420mA Pressure probe 0.10 = 010V 2.10 = 210V crAL= Thermocouple K	Depends on the probe
SP	Set point 1	SPLL SPLH	
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)	See page 7
Str.t	Servomotor stroke time	51000 seconds	
db.S	Servomotor dead band	0100%	
SPLL	Minimum set point value	-1999 SPHL	
SPHL	Maximum set point value	SPLL 9999	
dp	Decimal point position	0 3	
SP 2	Set point 2	SPLLSPLH	60
A.SP	Selection of the active set point	"SP" " nSP"	SP

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

# Probe parameters configuration MODULATORE ASCON KM3

Parameter Group	lin						AL1		rEG					SP		
Parameter	Sens	dp	SSC	FSc	unit	104.F (**)	AL1 (***)	HAL1 (***)	Pb (***)	ti (***)	td (***)	Str.t	db.S	SPLL	SPHL	SP (***)
Probes		Dec	Scale	Scale			Off	On	b		ō	servo	Band	SP	SP	Set
Pt1000 (130°C max)	Pt10	-		502	ပ	o	2	10	10	350	-	*	5	30	95	80
Pt1000 ( 350°C max)	PT10	_			ပ	no	10	10	10	350	_	*	2	0	350	80
Pt100 (130°C max)	PT1	1			၁့	uo	5	10	10	350	1	*	5	0	92	80
Pt100 (350°C max)	Pt1	1			၁့	on	10	10	10	350	1	*	5	0	350	80
Pt100 (0÷100°C 4÷20mA)	4.20	1	0	100		uo	5	10	10	350	1	*	5	0	92	80
Thermocouple K (1200°C max)	crAL	0			၁့	uo	20	25	10	350	1	*	5	0	1200	80
Thermocouple J (1000°C max)	l J	0			ာ့	uo	20	25	10	350	1	*	5	0	1000	80
4-20mA / 0-1,6barPressure probe	4.20	0	0	160		uo	20	20	9	120	1	*	5	0	160	100
4-20mA / 0-10bar Pressure probe	4.20	0	0	1000		uo	20	20	9	120	1	*	5	0	1000	009
4-20mA / 0-16bar Pressure probe	4.20	0	0	1600		on	80	80	5	120	1	*	5	0	1600	009
4-20mA / 0-25bar Pressure probe	4.20	0	0	2500		on	125	125	5	120	1	*	5	0	2500	009
4-20mA / 0-40bar Pressure probe	4.20	0	0	4000		uo	200	200	9	120	1	*	5	0	4000	009
QBE2002 / 0-25bar Pressure probe 0.10	0.10	0	0	2500		0n	125	125	5	120	_	*	5	0	2500	009

.0+0

(\*) 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 Dutton for more than 5 seconds. The upper display will show PASS while the lower display will show 0.
- Using  $\triangle$  and  $\nabla$  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.

    Leave the password blank to edit "user level" parameters, that are identified by attribute Liv = O
- 3. Push the Dutton. If the password is correct the display will show the acronym of the first parameter group preceded by the symbol: J. In other words the upper display will show: In other words the upper display will show.

The instrument is in configuration mode. To press  $\square$  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.
Δ	Allows to increase the value of the selected parameter.
V	Allows to decrease the value of the selected parameter.
(P)	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	GRO	UP - inpu	t confiuration		
Liv	N°	Param	Description	Values	Default
A	1	SEnS	Input type	Pt1 = RTD Pt100 Pt10 = RTD Pt1000 0.20 = 020mA 4.20 = 420mA Pressure probe 0.10 = 010V 2.10 = 210V crAL= Thermocouple K	Depends on the probe
Α	2	dp	Decimal point position	0 3	See page 7
Α	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
С	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
С	5	unit	Unit of measure (present only in the case of temperature probe)	°C/°F	°C
С	6	Fil	Digital filter on the measured value	0 (= OFF) 20.0 s	1.0
С	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

С	8	oPE	Safety output value	-100 100	0
С	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
С	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 with lock, 13 = Program Start, 14 = Program Reset, 15 = Program Hold, 16 = Program Run/Hold, 17 = Program Run/Hold, 18 = Sequential SP selection, 19 = SP1 - SP2 selection, 20 = SP1 SP4 binary selection, 21 = Digital inputs in parallel	19
С	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	GRO	UP- Outp	out parameters		
Liv	N°	Param	Description	Values	Default
С	14	o1F	Out 1 function	AL = Alarm output	AL
С	15	o1AL	Initial scale value of the analog retransmission	-1999 Ao1H	1
С	18	o1Ac	Out 1 action	dir = Direct action rEU = Reverse action dir.r = Direct with reversed LED ReU.r = Reverse with reversed LED	rEUr.r
С	19	o2F	Out 2 function	H.rEG = Heating output	H.rEG
С	21	o2Ac	Out 2 action	dir = Direct action rEU = Reverse action dir.r = Direct with reversed LED ReU.r = Reverse with reversed LED	dir
С	22	o3F	Out 3 function	H.rEG = Heating output	H.rEG
С	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	GRO	UP - Ala	rm 1 parameters		
Liv	N°	Param	Descrizione	Values	Default
С	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	
С	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
С	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
С	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
0	32	AL1	AL1 threshold	AL1L AL1H (E.U.)	See page 7
0	33	HAL1	AL1 hysteresis	1 9999 (E.U.)	See page 7
С	34	AL1d	AL1 delay	0 (oFF) 9999 (s)	oFF
С	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

Liv	N°	Param	Description	Values	Default
С	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
С	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
С	42	AL2d	AL2 hysteresis	0 (oFF) 9999 (s)	oFF
С	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

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	Gro	up - Loo	p break alarm		
Liv	N°	Param	Descrizione	Values	Default
С	52	LbAt	LBA time	Da 0 (oFF) a 9999 (s)	oFF

rEG	rEG Group - Control parameters				
Liv	N°	Param	Description	Values	Default
С	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
С	57	Auto	Autotuning selection	-4 = Oscillating auto-tune with automaticrestart 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
С	58	tunE	Manual start of the Autotuning	oFF = Not active on = Active	oFF

С	59	SELF	Self tuning enabling	no = The instrument does not perform the self- tuning YES = The instrument is performing the self- tuning	No
Α	62	Pb	Proportional band	1 9999 (E.U.)	See page 7
Α	63	ti	Integral time	0 (oFF) 9999 (s)	See page 7
Α	64	td	Derivative time	0 (oFF) 9999 (s)	See page 7
С	65	Fuoc	Fuzzy overshoot control	0.00 2.00	1
С	69	rS	Manual reset (Integral pre-load)	-100.0 +100.0 (%)	0.0
Α	70	Str.t	Servomotor stroke time	51000 seconds	See page 7
Α	71	db.S	Servomotor dead band	0100%	5
С	72	od	Delay at power up	0.00 (oFF) 99.59 (hh.mm)	oFF

SP (	SP Group - Set point parameters					
Liv	N°	Param	Description	Values	Default	
С	76	nSP	Number of used set points	1 4	2	
Α	77	SPLL	Minimum set point value	-1999 SPHL	See page 7	
Α	78	SPHL	Maximum set point value SPLL 9999		See page 7	
0	79	SP	Set point 1 SPLL SPLH		See page 7	
С	80	SP 2	Set point 2	SPLL SPLH	60	
	83	A.SP	Selection of the active set point	"SP" " nSP"	SP	
С	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	
С	85	SPLr	Local/remote set point selection	Loc = Local rEn = Remote	Loc	
С	86	SP.u	Rate of rise for POSITIVE set point change (ramp UP)	0.01 99.99 (inF) Eng. units per minute	inF	
С	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
С	118	PAS2	Level 2 password (limited access level)	oFF (Level 2 not protected by password) 1 200	20
С	119	PAS3	Level 3 password (complete configuration level)	3 300	30
С	120	PAS4	Password livello (livello configurazione a codice)	201 400	300
С	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

С	122	diSP	Display management	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 Spo = Operative set point	SPo
С	123	di.cL	Display colour	0 = The display colour is used to show the actual	2
	123	di.CL	Display Coloui	deviation (PV - SP)  1 = Display red (fix)  2 = Display green (fix)  3 = Display orange (fix)	2
		diS.t	Display Timeout	oFF (display always ON)	oFF
	125	CI I	Elica de distribuit de la companya del companya de la companya del companya de la	0.1 99.59 (mm.ss)	
С	126	fiLd	Filter on the displayed value	oFF (filter disabled) From 0.0 (oFF) to 20.0 (E.U.)	oFF
С	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
С	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
С	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

Liv	N°	Param	Description	Values	Default
С	131	Add	Instrument address	oFF 1 254	1
С	132	bAud	baud rate	1200 = 1200 baud 2400 = 2400 baud 9600 = 9600 baud 19.2 = 19200 baud 38.4 = 38400 baud	9600
С	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	Grou	p - Cons	umption 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 worked hours: number of hours the control relay worked hours: number of hours the control relay worked hours: number of hours the control relay worked days with threshold: number of hours the control relay worked days with threshold: number of hours the control relay worked hours: number of hours the control relay worked hours 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
С	138	t.Job	Worked time (not resettable)	0 9999 days	0

cAL	cAL Group - User calibration group				
Liv	N°	Param	Description	Values	Default
С	139	AL.P	Adjust Low Point	From -1999 to (AH.P - 10) in engineering units	0
С	140	AL.o	Adjust Low Offset	-300 +300 (E.U.)	0
С	141	AH.P	Adjust High Point	From (AL.P + 10) to 9999 engineering units	999.9
С	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 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).			
V	Allows you to display the "additional informations" (see below).		
P	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:

P84.3

- 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 volution. 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  $\triangle$  and  $\nabla$  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 

U.U.U.

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 tooclose 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 suply. 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 \( \textbf{\Quad} \) and \( \textbf{\Quad} \) buttons set the value -481;
- 3. Push Dutton;
- 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".

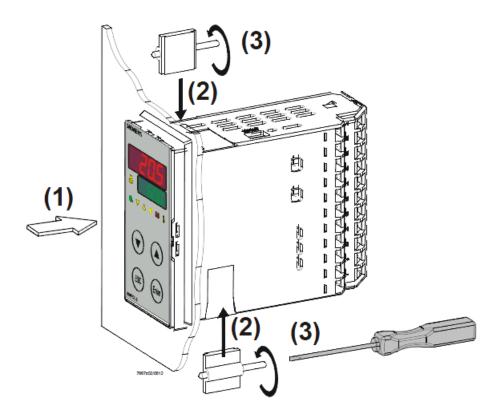
# **RWF55.5X & RWF55.6X**



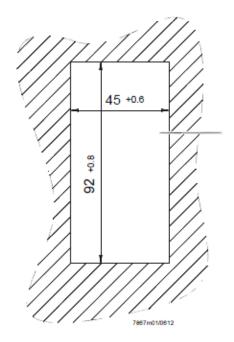
User manual

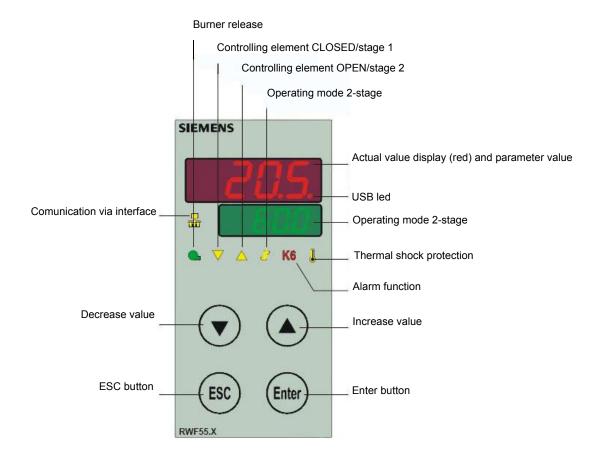
# **DEVICE INSTALLATION**

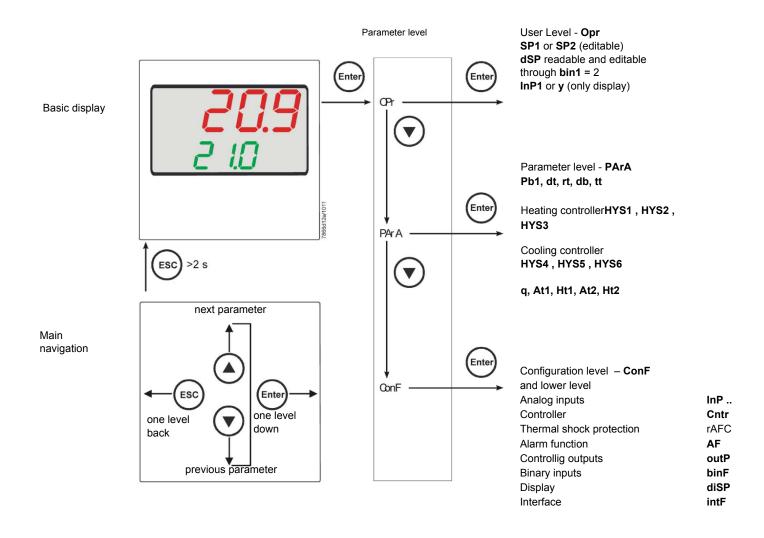
# Fixing system



# Drilling dimensions:







RWF55 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 (PArA):

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 is 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	Pb1	1 9999 digit	10	Typical value for temperature
erivative action	dt	0 9999 sec.	80	Typical value for temperature
Integral action	rt	0 9999 sec.	350	Typical value for temperatureT
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	0,01999 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 bin1 = 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	HYS60,0 digit	5	Do not used (enable only with parameter <b>CACt</b> = 0 and parameter <b>bin1</b> =0)
Upper switch-off differential on cooling controller (*)	HYS6	0,01999 digit	5	Do not used (enable only with parameter CACt = 0)
Delay modulation	q	0,0 999,9 digit	0	Do not alter
T Outside temperature Curve point 1 (*)	At1	-40120 digit	-10	First point of external temperature for climatic curve
Boiler temperature Curve point 1 (*)	Ht1	SPLSPH	60	Set-point temperature for the external temperature 1
TT Outside temperature Curve point 2 (*)	At2	-40120 digit	20	Second point of external temperature for climatic curve
Boiler temperature Curve point 2 (*)	Ht2	SPLSPH	50	Set-point temperature for the external temperature 2

<sup>(\*)</sup> 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 displaied. 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	1	Pt100 3 wire
type of sensor for analog	2	Pt100 2 wire
input 1	3	Pt1000 3 wire
'	4	Pt1000 2 wire
	5	Ni1000 3 wire
	6	Ni1000 2 wire
	7	0 ÷ 135 ohm
	8	Cu-CuNi T
	9	Fe-CuNi J
	10	NiCr-Ni K
	11	NiCrSi-NiSi N
	12	Pt10Rh-Pt S
	13	Pt13Rh-Pt R
	14	Pt30Rh-Pt6Rh B
	15	0 ÷ 20mA
	16	4 ÷ 20mA
	17	0 ÷ 10V
	18	0 ÷ 5V
	19	1 ÷ 5V
OFF1	-1999 <b>0</b> +9999	Correction value measured by the sensor
Sensor offset		
SCL1	-1999 <b>0</b> +9999	minimum scale value(for input ohm, mA, V)
scale low level		
SCH1	-1999 <b>100</b> +9999	maximum scale value(for input ohm, mA, V)
scale high level		
dF1	0 <b>0,6</b> 100	Is used to adapt the digital 2nd order input filter (time in s; 0 s = filter off)
digital filter		
Unit	1	1 = degrees Celsius
	2	2 = degrees Fahrenheit
temperature unit		

#### ConF > InP >InP2

Input 2: this input can be used to specify an external setpoint or carry out setpoint shifting

Parameter	Value	Description
FnC2	0	0= no function
	1	1= external setpoint (display <b>SPE</b> )
	2	2 =setpoint shifting (display <b>dSP</b> )
	3	3 = angular positioning feedback
SEn2	1	0 ÷ 20mA
tisensor type input 2	2	4 ÷ 20mA
31 1	3	0 ÷ 10V
	4	0 ÷ 5V
	5	1 ÷ 5V
	1	0 ÷ 20mA
OFF2	-1999 <b>0</b> +9999	Correction value measured by the sensor
Sensor offset		
SCL2	-1999 <b>0</b> +9999	minimum scale value(for input ohm, mA, V)
scale low level		
SCH2	-1999 <b>100</b> +9999	maximum scale value(for input ohm, mA, V)
scale high level		
dF2	0 <b>2</b> 100	Is used to adapt the digital 2nd order input filter (time in s; 0 s = filter off)
digital filter		

(**bold** = factory settings)

# ConF > InP >InP3

Input 3: this input is used to acquire the outside temperature

Parameter	Value	Description
SEn3	0	0 =
sensor type input 3sensor	1	1 = wire
type input 2	2	2 = wire
OFF3	-1999 <b>0</b> +9999	Correction value measured by the sensor
Sensor offset		
dF3	0 <b>1278</b> 1500	Is used to adapt the digital 2nd order input filter (time in s; 0 s = filter off)
digital filter		

#### ConF > Cntr

Here, the type of controller, operating action, setpoint limits and presettings for self-optimization are selected

Parameter	Value	Description
CtYP	1	1 = 3-position controller (open-stop-close)
controller type	2	2 = continuative action controller (0 ÷10V or 4 ÷ 20mA)
CACt	1	1 = heating controller
control action	0	0 = cooling controller
SPL	-1999 <b>0</b> +9999	minimum set-point scale
least value of the set-point range		
SPH	-1999 <b>100</b> +999	maximum set-point scale
maximum value of the set- point range		·
	0	0 = Free
Self-optimization	1	1 = Locked
		Self-optimization can only be disabled or enabled via the ACS411 setup program.
		Self-optimization is also disabled when the parameter level is locked
oLLo	<b>-1999</b> +9999	lower working range limit
set-point limitation start, operation limit low		
oLHi	-1999 <b>+9999</b>	upper working range limit
set-point limitation end, operation limit high		

(**bold** = factory settings)

#### ConF > rAFC

Activation boiler shock termic protetion:

RWF55.. can activate the thermal shock protection only on sites where the set-point is lower than 250°C and according to **rAL** parameter

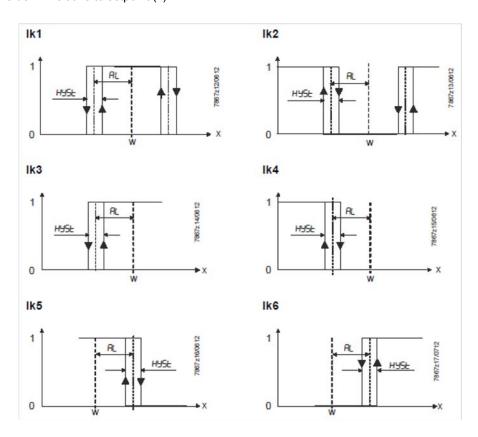
Parameter	Value	Description
FnCT		tchoose type of range degrees/time
type of contol	o	0 = deactived
	1	1 = Kelvin degrees/minute
	2	2 = Kelvin degrees/hour
rASL		Slope of thermal shock protection (only with functions 1 and 2)
ramp rate	<b>0,0</b> 999,9	
toLP	2 x (HYS1) = 109999	width of tolerance band (in K) about the set-point
tolerance band ramp		0 = tolerance band inactive
rAL	<b>0</b> 250	Ramp limit. When this value is lower than the temperature set-point, the
[· ·=	<b>u</b> 200	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 accor-
ramp limit		ding to <b>rASL</b> . If this is over the temp set point, the control is performed in cooling

#### Alarm functionAF

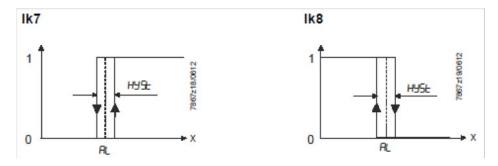
The alarm function can be used to monitor the analog inputs. If the limit value is exceeded, multifunctional relay K6 (terminals **6N** and **6P**) is activated (depending on the switching characteristic)

The alarm function can have different switching functions (lk1 to lk8) and can be set to a deviation from the active setpoint or to a fixed limit value

#### Limit value **AL** relative to setpoint (x)



#### Fixed limit value AL



#### ConF > AF

Parameter	Value	Description
FnCt	0	0 = Without function
type of control	1	lk1 = monitored input InP1
	2	lk2 = monitored input InP1
	3	lk3 = monitored input InP1
	4	lk4 = monitored input InP1
	5	lk5 = monitored input InP1
	0	lk6 = monitored input InP1
	/ R	lk7 = monitored input InP1
	9	lk8 = monitored input InP1
	10	lk7 = monitored input InP2
	11	lk8 = monitored input InP2
	12	lk7 = monitored input InP3
		lk8 = monitored input InP3
Alarm value	-1999	Limit value or deviation from setpoint to be monitored (see alarm functions
AL	0	lk1 to lk8: limit value AL)
	1999	Limit value range for <b>lk1</b> and <b>lk2</b> 09999
HySt	0	Switching differential for limit value <b>AL</b>
switching differential	1	
	9999	
ACrA	0	Switched-off
response by out of range	1	ON
		Switching state in the case of measuring range overshoot or undershoot (Out of Range)

(**bold** = factory settings)

#### ConF > OutP

For fuel-air ratio control purposes, the RWF55 has the binary outputs K2, K3 (terminals KQ,K2, K3) and the analog output (terminals A+, A-). The burner is released via relay K1 (terminals 1N, 1P).

The binary outputs of the RWF55 offer no setting choices

The RWF55 has an analog output.

The analog output offers the following setting choices:

Parameter	Value	Description
FnCt	1	1 = analog input 1 doubling with possibility to convert
type of control	2	2 = analog input 2 doubling with possibility to convert
	3	3 = analog input 3 doubling with possibility to convert
	4	4 = Controller's angular positioning is delivered (modulating controller)
SiGn		physical output signal (terminals A+, A-)
type of output signal	0	0 = 0÷20mA
	1	1 = 4÷20mA
	2	2 = 0÷10V DC
rOut	<b>0</b> 101	signal (in percent) when measurement range is crossed
value when out of input		
range		
oPnt	-1999 <b>0</b> +9999	A value range of the output variable is assigned to a physical output signal (for
zero point		FnCt = 1, 2, 3)
End	-1999 <b>100</b> +9999	A value range of the output variable is assigned to a physical output signal (for
end point		FnCt = 1, 2, 3)

#### ConF > binF

This setting decides on the use of the binary inputsD1, D2, DG

b

Parameter	Value	Description
bin1	0	0 = without function
binary imput 1 (terminals DG	1	1 = set-point changeover (SP1 / SP2)
– D1)	2	2 = Iset-point shift (Opr > dSP parameter = value of set-point modify)
	3	3 = input alarm
bin2	4	changeover of operating mode
binary imput 2 (terminalsк		DG-D2 open = modulating operation
DG – D2)		DG-D2 close = 2 stage operation

(**bold** = factory settings)

#### ConF > dISP

.Both displays can be customized to suit your needs by configuring the displayed value, decimal, time out and blocking

Parameter	Value	Description
diSU		Display value for upper display:
pper display (red)	0	0 = display power-off
	1	1 = analog input 1 (InP1) value
	2	2 = analog input 2 (InP2) value
	3	3 = analog input 3 (InP3) value
	4	4 = controller's angular positioning
	0 7	6 = set-point valueв
	,	7 = end value with thermal shock protection
diSL		Display value for lower display3:
lower display (green)	0	0 = display power-off
	1	1 = analog input 2 (InP2) value
	2	2 = analog input 2 (InP2) value
	3	3 = analog input 2 (InP2) value
	4 <b>6</b>	4 = controller's angular positioning
	<b>0</b> 7	6 = set-point valueв
	1	7 = end value with thermal shock protection
tout	0 <b>180</b> 250	time (s) on completion of which the controller returns automatically to the
timeout		basic display, if no button is pressed
dECP	0	0 = no decimal place
decimal point	1	1 = one decimal place
	2	2 = two decimal place
CodE	0	0 = no lockout
level lockout	1	1 = configuration level lockout (ConF)
	2	2 = parameter and configuration level lockout (PArA & ConF)
	3	3 = keyboard lockout

#### ConF > IntF

The controller can be integrated into a data network using an optional RS-485 (terminals R+ and R-) interface or an optional Profibus DP interface(only modelRWF55.6x terminalsC1-C2-C3-C4)

Parameter	Value	Description
bdrt	0	0 = 4800 baud
baudrate	1	1 = 9600 baud
	2	2 = 19200 baud
	3	3 = 38400 baud
Adr	0	Address in the data network
Device address Modbus	1	
	254	
dP	0 <b>125</b>	only withRWF55.6x
Device address Profibus		
dtt	0	0 = swiched-off
Remote detection time	30	
	7200s	

(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.

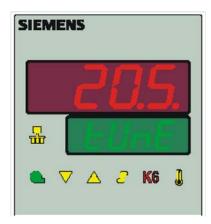
using the UP and DOWN arrows, the load varies.

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



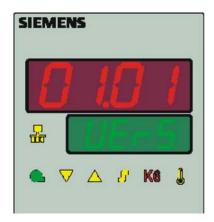
Follow the below instructions:

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.



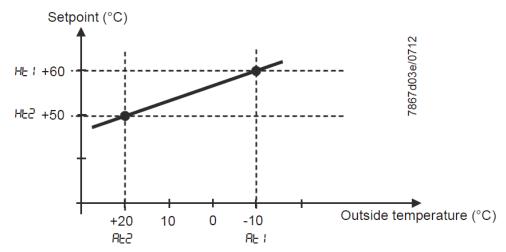
#### Weather-compensated setpoint shifting(climatic regulation):

The RWF55 can be configured so that weather-compensated setpoint shifting is activated when an LG-Ni1000 outside sensor or a Pt1000 is connected (see parameter InP3).

To take into account the time response of a building, weather-compensated setpoint shifting uses the attenuated outside temperature rather than the current outside temperature

The minimum and maximum setpoints can be set using the lower setpoint limit **SPL** and the upper setpoint limit **SPH** of the menù **Crtr**. The system also prevents the lower working range limit **oLLo** and upper working range limit **oLHi** from exceeding/dropping below the system temperature limits.

The heating curve describes the relationship between the boiler temperature setpoint and the outside temperature. It is defined by 2 curve points. For 2 outside temperatures, the user defines the boiler temperature setpoint that is required in each case. The heating curve for the weather-compensated setpoint is calculated on this basis. The effective boiler temperature setpoint is limited by the upper setpoint limit **SPH** and the lower setpoint limit **SPL**.



For setting climatic regulation function set:

PArA > parametersAt1, Ht1, At2, Ht2

ConF > InP > InP3 parametersSEn3, FnC3 = 1 (Weather-compensated setpoint).

#### Modbus interface

The tables that follow in this chapter specify the addresses of the readable and writable words that the customer is able to access. The customer may read and/or write the values using SCADA programs, PLCs, or similar.

The entries under Access have the following meanings:

R/O Read Only, value can only be read

R/W Read/Write, value can be read and written

The number of characters specified under Data type in the case of character strings includes the final \0.

Char10 means that the text is up to 9 characters long. The final \0 character is then added to this

#### **User level**

Address	Access	Data type	Signal reference	Parameter
0x0000	R/O	Float	X1	Analog input InP1
0x0002	R/O	Float	X2	Analog input InP2
0x0004	R/O	Float	X3	Analog input InP2
0x0006	R/O	Float	WR	Actual setpoint
0x0008	R/W	Float	SP1	Setpoint 1
0x000A	R/W	Float	SP2 (= dSP)	Setpoint 2
0x1035	R/O	Float		Analog input InP3 (unfiltered)
0x1043	R/O	Float		Actual angular positioning
0x1058	R/O	Word	B1	Burner alarm

#### Parameter level

Address	Access	Data type	Signal reference	Parameter
0x3000	R/W	Float	Pb1	Proportional range 1
0x3004	R/W	Float	dt	Derivative action time
0x3006	R/W	Float	rt	Integral action time
0x300C	R/W	Float	db	Dead band
0x3012	R/W	Word	tt	Controlling element running time
0x3016	R/W	Float	HYS1	Switch-on threshold
0x3018	R/W	Float	HYS2	Switch-off threshold down
0x301A	R/W	Float	HYS3	Switch-off threshold up
0x301C	R/W	Float	HYS4	Switch-on threshold (cooling)
0x301E	R/W	Float	HYS5	Switch-off threshold down (cooling)
0x3020	R/W	Float	HYS6	Switch-off threshold up (cooling)
0x3022	R/W	Float	q	Reaction threshold
0x3080	R/W	Float	At1	Outside temperature 1
0x3082	R/W	Float	Ht2	Boiler temperature 1
0x3084	R/W	Float	At2	Outside temperature 2
0x3086	R/W	Float	Ht2	Boiler temperature 2

# **Configuration level**

Address	Access	Data type	Signal reference	Parameter
0x3426	R/W	Float	SCL1	Start of display input 1
0x3428	R/W	Float	SCH1	End of display input 1
0x3432	R/W	Float	SCL2	Start value input 2
0x3434	R/W	Float	SCH2	End value input 2
0x3486	R/W	Float	SPL	Start of setpoint limitation
0x3488	R/W	Float	SPH	End of setpoint limitation
0x342A	R/W	Float	OFFS1	Offset input E1
0x3436	R/W	Float	OFFS2	Offset input E2
0x343A	R/W	Float	OFFS3	Offset input E3
0x1063	R/W	Word	FnCt	Ramp function
0x1065	R/W	Float	rASL	Ramp slope
0x1067	R/W	Float	toLP	Tolerance band ramp
0x1069	R/W	Float	rAL	Limit value
0x1075	R/W	Float	dtt	Remote Detection Timer
0x1077	R/W	Float	dF1	Filter constant input 1
0x1079	R/W	Float	dF2	Filter constant input 2
0x107B	R/W	Float	dF3	Filter constant input 3
0x107D	R/O	Float	oLLo	Lower working range limit
0x107F	R/O	Float	oLHi	Upper working range limit
0x106D	R/W	Word	FnCt	Alarm relay function
0x106F	R/W	Float	AL	Alarm relay limit value (limit value alarm)
0x1071	R/W	Float	HYSt	Alarm relay hysteresis

### Remote operation

Address	Access	Data type	Signal reference	Parameter
0x0500	R/W	Word	REM	Activation remote operation *
0x0501	R/W	Word	rOFF	Controller OFF in remote setpoint **
0x0502	R/W	Float	rHYS1	Switch-on threshold remote
0x0504	R/W	Float	rHYS2	Switch-off threshold down remote
0x0506	R/W	Float	rHYS3	Switch-off threshold up remote
0x0508	R/W	Float	SPr	Setpoint remote
0x050A	R/W	Word	RK1	Burner release remote operation
0x050B	R/W	Word	RK2	Relay K2 remote operation
0x050C	R/W	Word	RK3	Relay K3 remote operation
0x050D	R/W	Word	RK6	Relay K6 remote operation
0x050E	R/W	Word	rStEP	Step-by-step control remote operation
0x050F	R/W	Float	rY	Angular positioning output remote operation
0x0511	R/W	Float	rHYS4	Switch-on threshold remote (cooling)
0x0513	R/W	Float	rHYS5	Switch-off threshold down remote (cooling)
0x0515	R/W	Float	rHYS6	Switch-off threshold up remote (cooling)

Legend

<sup>\* =</sup> Local

<sup>\*\* =</sup> Controller OFF

# Dati dell'apparecchio

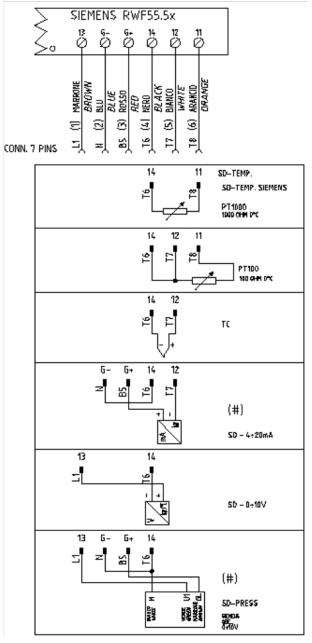
Address	Access	Data type	Signal reference	Parameter
0x8000	R/O	Char12		Software version
0x8006	R/O	Char14		VdN number

# Stato dell'apparecchio

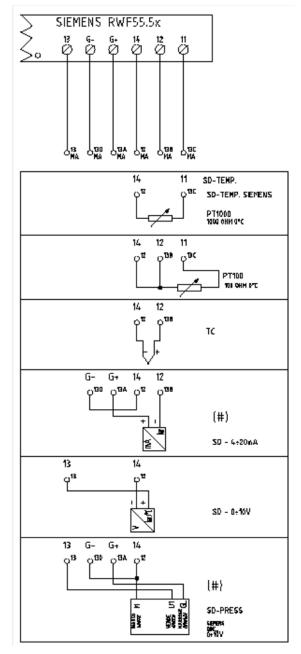
Address	Access	Data type	Signal reference	Parameter								
0x0200	R/O	Word		Outputs and states								
			Bit 0	Output 1								
			Bit 1	Output 3								
			Bit 2	Output 2								
			Bit 3	Output 4								
			Bit 8	Hysteresis limitation								
			Bit 9	Control system								
			Bit 10	Self-optimization								
			Bit 11	Second setpoint								
			Bit 12	Measuring range overshoot InP1								
			Bit 13	Measuring range overshoot InP2								
			Bit 14	Measuring range overshoot InP3								
			Bit 15	Calibration mode								
0x0201	R/O	Word		Binary signals and hardware detection								
			Bit 0	Operation mode 2-stage								
			Bit 1	Manual mode								
			Bit 2	Binary input D1								
			Bit 3	Binary input D2								
			Bit 4	Thermostat function								
			Bit 5	First controller output								
			Bit 6	Second controller output								
			Bit 7	Alarm relay								
			Bit 13	Analog output available								
			Bit 14	Interface available								

#### **Electric connections:**

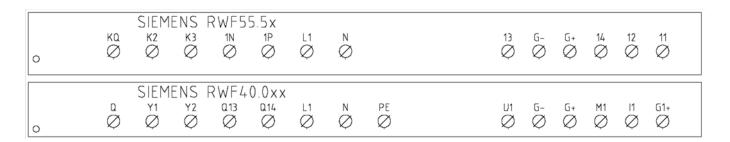
With 7 pins connector version



With terminals version



Corrispondences bornes entre RWF55.5x y RWF40.0x0Matches terminals betweenRWF55.5x and RWF40.0x0



#### 18

#### Parameters summarising for RWF55.xx:

	ConF				ConF										
Navigation menù	Inp														
	Inp1				Cntr		diSP		PArA						
Types of probe	SEn1	OFF1	SCL	SCH	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
Probe4÷20mA / 0÷1,6bar	16	0	0	160	needless	0	160	0	5	20	80	(#)	0	20	100 kPa
Probe4÷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
Probe 4÷20mA / 0÷60PSI	16	0	0	600	needless	0	600	0	5	20	80	(#)	0	30	300 (30PSI)
Probe4÷20mA / 0÷200PSI	16	0	0	2000	needless	0	2000	0	5	20	80	(#)	0	75	600 (60PSI)
Probe4÷20mA / 0÷300PSI	16	0	0	3000	needless	0	3000	0	5	20	80	(#)	0	120	600 (60PSI)
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
Signal 0÷10V	17	0	needless	needless	needless	needless	needless	needless	5	20	80	(#)			
Signal 4÷20mA	16	0	needless	needless	needless	needless	needless	needless	5	20	80	(#)			

#### 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 in bar the parameters SP1, SCH, SCL, HYS1, HYS3 must be set and displayed in kPa (kilo Pascal); 1bar = 100,000Pa = 100kPa. With pressure probes in PSI the parameters SP1, SCH, SCL, HYS1, HYS3 must be set and displayed in PSI x10 (example: 150PSI > I display 1500).

#### 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.



#### 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.

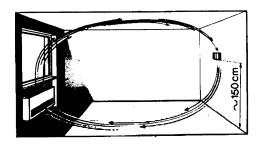






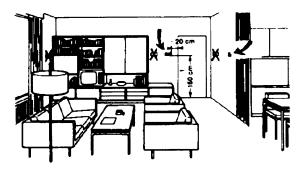
#### Location

On an inner wall on the other side of the room to heating unitsheight 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 win-dows, 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.



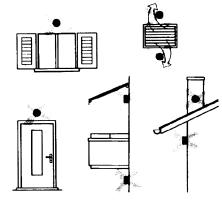
#### Outside probes (weather)Installation

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



General rule: en 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.

#### Positions to be avoidedH



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

The sensor must not be painted (measurement error) .

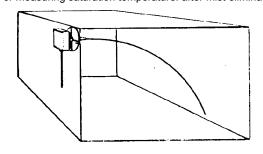
#### Duct or pipe sensors Installing temperature sensors

For measuring outlet air:

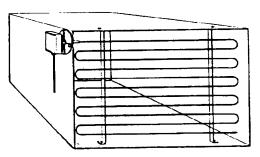
"after delivery fan or

"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 airintake.
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

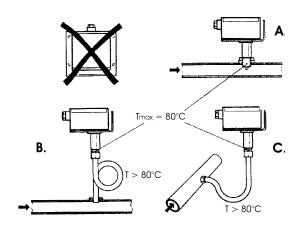
As max. humidity limit sensor on outlet (steam humidifiers) .



#### 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**

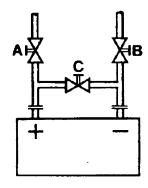
Start disable

1=open C1=open C

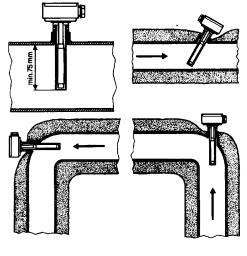
2=open A2=close B

3=open B3=close A

4= close C



#### Immersion or strap-on sensors



#### 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  $45^\circ$  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.

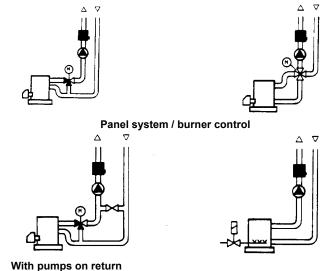
Sensors come with straps for pipes up to 100 mm in diameter .



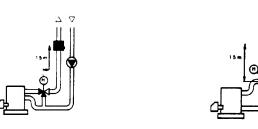
Placing the probes (QAD22.../QAE21.../QAP21.../RCA...)

#### With pumps on outlet

#### with 3 ways valves / with 4 ways valves



#### 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

#### ΠLimits:

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

#### QAE2... immersion sensors

#### Advantages:

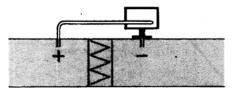
- Measure "mean" fluid temperature
- No external influence on measurement such as: currents of air, nearby pipes etc.

#### Limits:

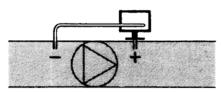
- Time constant with sheath: 20 sec.
- Hard to change installation position if it proves incorrect

#### Duct pressure switches and sensors

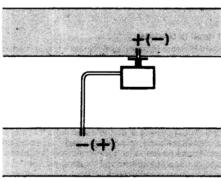
#### Installing differential pressure probes for air



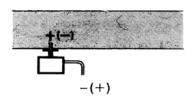
A - Control a filter (clogging)



B - Control a fan (upstream/downstream)



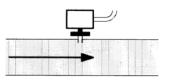
C - Measurement of difference in pressure between two ducts



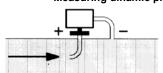
D - Measurement of difference in pressure between two rooms or of inside of duct and outside

#### **Basic principles**

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



#### Measuring dinamic pressure



$$Pd = \frac{y \vartheta^2}{2g}$$

#### Legend

y Kg/m3, specific weight of air

q m/s, air speed

g 9.81 m/s2 gravity acceleration

Pd mm C.A., dynamic pressure

#### Measuring total pressure

