BURNERS
BRULEURS
BRENNER
QUEMADORES
BRUCIATORI

MANUAL OF
- INSTALLATION
- OPERATION
- MAINTENANCE

LPG BURNERS

P20
P30
P45
P65

M03989CD Rev. 03 11/04

NOTICES

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

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

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

CAREFULLY KEEP THIS MANUAL FOR FUTURE REFERENCE.

1) GENERAL INTRODUCTION

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

In case of any doubt, do not use the unit - contact the supplier.
The packaging materials (wooden crate, nails, fastening devices, plastic bags, foamed polystyrene, etc), should not be left within the reach of children, as they may prove harmful.

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

Contact qualified personnel only.
Units shall be repaired exclusively by a servicing centre, duly authorised by the manufacturer, with original spare parts.
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.

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;

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 repeated burner shut-downs, do not continue resetting the unit manually. Contact qualified personnel to take care of such defects.
- 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

a) do not operate electric switches, the telephone, or any other item likely to generate sparks;
b) immediately open doors and windows to create an air flow to purge the room;
c) close the gas valves;
d) contact qualified personnel.

- Do not obstruct the ventilation openings of the room where gas appliances are installed, to avoid dangerous conditions such as the development of toxic or explosive mixtures.

TECHNICAL DATA
SINGLE STAGE BURNERS

BURNERS TYPE/MODEL		P20 L-....25	P20 L-....40	P30 L-....40
Input	min. kW	80	80	150
	max. kW	230	280	350
	min. kcal/h	68.800	68.800	129.000
	max. kcal/h	197.800	240.800	301.000
Fuel		LPG	LPG	LPG
Category		I_{3+}	I_{3+}	I_{3+}
Gas flow rate min.- max.	(Stm^3/h)	3 - 8.9	3 - 10.8	5.8 - 13.5
Gas pressure min.* - max.	mbar	30 - 200	30 - 200	30 - 200
Power supply		230V - 50Hz	230V - 50Hz	230V - 50Hz
Power consumption	W	650	650	650
Electric motor (2800 rpm)	W	370	370	370
Protection		IP40	IP40	IP40
Weight	Kg	30	30	30
Gas train size		1”	$1”_{1/2}$	$1”_{1/2}$
Gas connections		Rp 1	Rp $1_{1/4}$	Rp $1_{1/4}$
Operation		single stage	single stage	single stage
Destination country		*	*	*

DOUBLE STAGE, PROGRESSIVE AND FULLY MODULATING BURNERS

BURNERS TYPE/MODEL		P20 L-....25	P20 L-....40	P30 L-....40	P45 L-....40
Input	min. low flame kW	85	85	65	145
	min. high flame kW	120	120	100	220
	max. kW	230	280	350	520
	min. low flame kcal/h	73.100	73.100	55.900	124.700
	min. high flame kcal/h	103.200	103.200	86.000	189.200
	max. kcal/h	197.800	240.800	301.000	447.200
Fuel		LPG	LPG	LPG	LPG
Category		I_{3+}	I_{3+}	I_{3+}	I_{3+}
Gas flow rate min.- max.	(Stm^3/h)	3.3 - 8.9	3.3 - 10.8	2.5 - 13.5	5.6 - 20
Gas pressure min.* - max.	mbar	30 - 200	30 - 200	30 - 200	30 - 200
Power supply		230V - 50Hz	230V - 50Hz	230V - 50Hz	230V - 50Hz
Power consumption	W	650	650	650	900
Electric motor (2800 rpm)	W	370	370	370	620
Protection		IP40	IP40	IP40	IP40
Weight	Kg	30	30	30	58
Gas train size		1”	$1”_{1/2}$	$1”_{1/2}$	$1”_{1/2}$
Gas connections		Rp 1	Rp $1_{1/4}$	Rp $1_{1/4}$	Rp $1_{1/2}$
Operation		double stage progressive fully modulating	double stage progressive fully modulating	double stage progressive fully modulating	double stage progressive fully modulating
Destination country		*	*	*	*

BURNERS TYPE/MODEL		P45 L-....50	P65 L-....50	P65 L-....65
Input	min. low flame kW	145	270	270
	min. high flame kW	220	480	480
	max. kW	520	970	970
	min. low flame kcal/h	124.700	232.200	232.200
	min. high flame kcal/h	189.200	412.800	412.800
	max. kcal/h	447.200	834.200	834.200
Fuel		LPG	LPG	LPG
Category		I_{3+}	I_{3+}	I_{3+}
Gas flow rate min.- max.	(Stm^3/h)	5.6 - 20	10.4 - 37.3	10.4 - 37.3
Gas pressure min.* - max.	mbar	30 - 200	50 - 200	30 - 200
Power supply		230/400V - 50Hz	230V - 50Hz	230V - 50Hz
Power consumption	W	900	2000	2000
Electric motor (2800 rpm)	W	620	1500	1500
Protection		IP40	IP40	IP40
Weight	Kg	58	150	155
Gas train size		2”	2”	$2”_{1/2}$
Gas connections		Rp 2	Rp 2	DN 65
Operation		double stage progressive fully modulating	double stage progressive fully modulating	double stage progressive fully modulating
Destination country		*	*	*

* Minimum pressure required to get the maximum rate with any back-pressure in combustion chamber (referring to the performance curves). The burner operates correctly also with lowest pressure only if these are enough to guarantee the necessary gas rate.

BURNER MODEL IDENTIFICATION

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

Type: **P20**	Model:	**L-.**	**AB.**	**S.**	***.**	**A.**	**0.**	**40**
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)

(1)	BURNER TYPE		
(2)	FUEL		L - LPG
(3)	OPERATION	Available versions	TN - Single stage
			AB - Double stage
			PR - Progressive
			MD - Fully modulating
(4)	BLAST TUBE LENGHT	(see overall dimensions)	
		Available versions	S - Standard
			L - Long
(5)	DESTINATION COUNTRY		* - see data plate
(6)	SPECIAL VERSION		A - Standard
(7)	BURNER EQUIPMENT	Available versions	0 - 2 Valves
			1 - 2 Valves + leakage control (optional if burner input < 1200 kW)
(8)	GAS TRAIN SIZE	(See Technical data)	
		25= Rp1	40 = Rp1 1/2
		50 = Rp2	65 = DN65

OVERALL DIMENSIONS IN mm

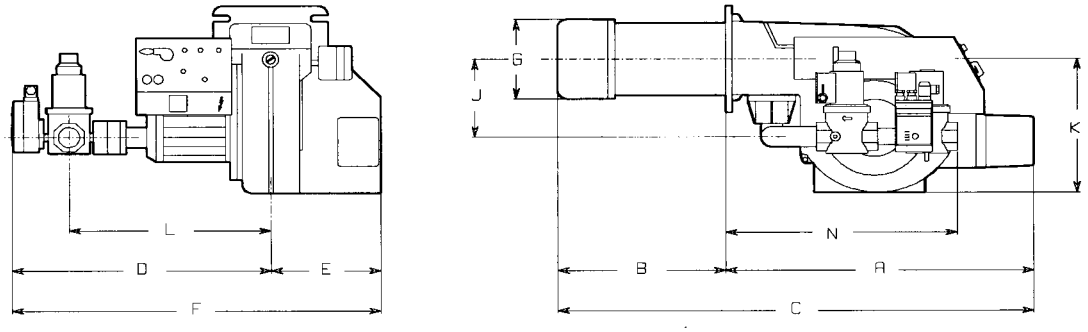
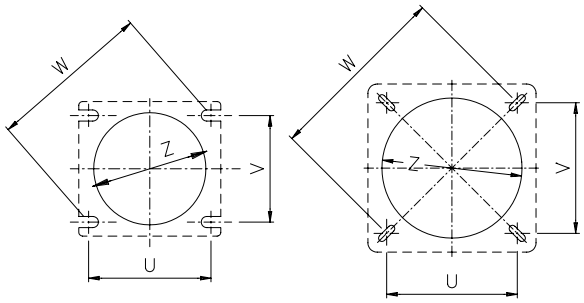


Fig. 4a



	U	V	W	Z
P20	155	155	220	160
P30	155	155	220	160
P45	215	190	287	200
P65	233	233	330	250

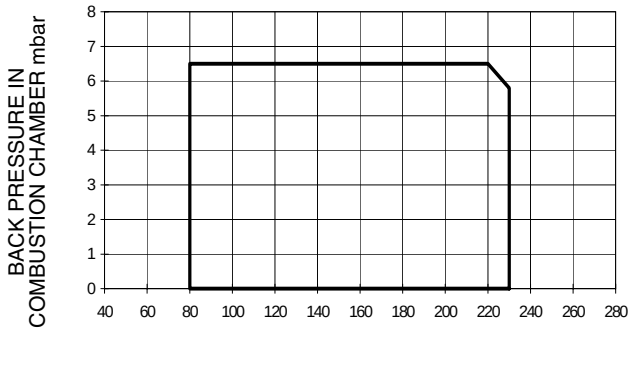
Fig. 4b - Boiler plate drilling template - Make 4 M10 threaded holes

	A	B	BL	C	CL	D	E	F	G	K	J	L	N
P20	555	210	295	765	850	510	200	710	126	290	178	360	370
P30	555	230	330	785	885	510	200	710	148	290	178	360	370
P45	660	255	355	915	1015	640	250	890	148	350	210	460	450
P65	825	325	415	1150	1240	750	350	1060	184	375	230	460	450

BL - Long blast tube

PERFORMANCE CURVES

P20 L-.TN...25

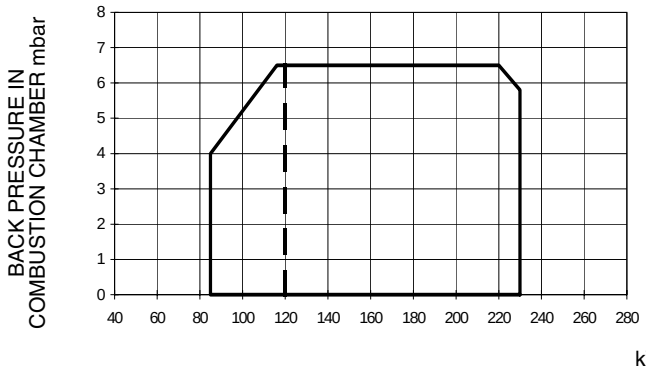


P30 L-.TN..40



Fig. 5

P20 L-.AB...25 - L-.PR...25 - L-.MD...25



P30 L-.AB...40 - L-.MD...40 - L-.PR...40

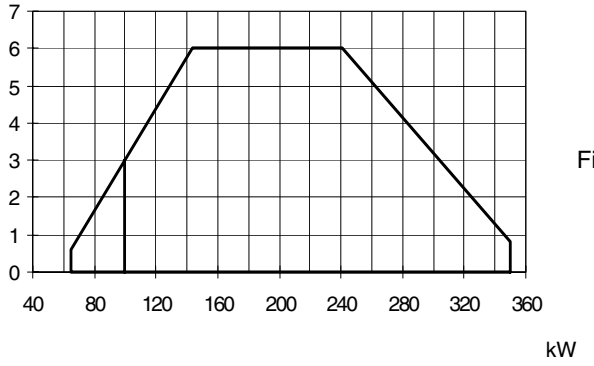
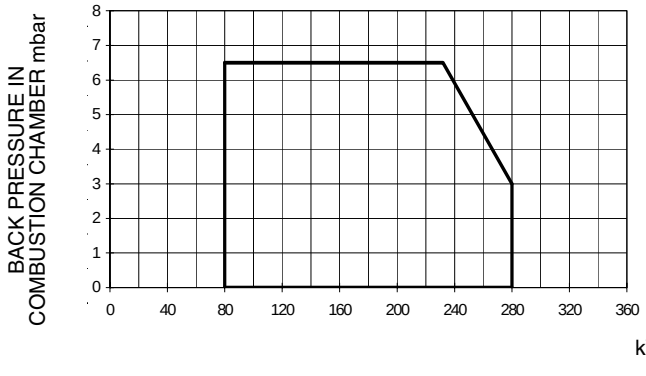


Fig. 6

P20 L-.TN...40



P45 L-.TN...xx

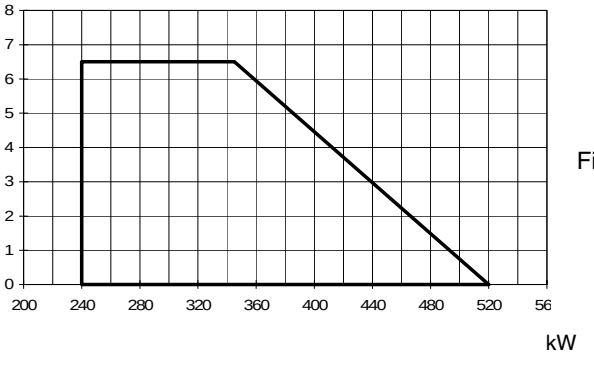
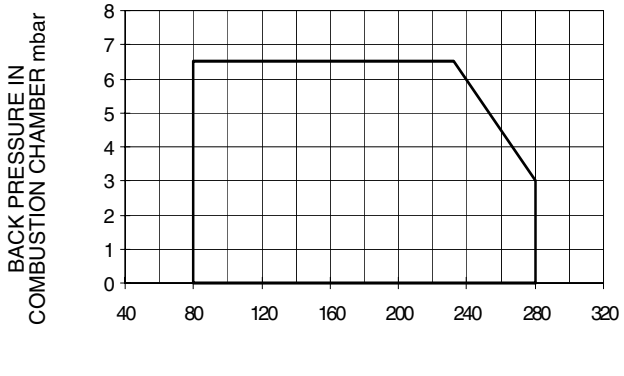


Fig. 7

P20 L-.AB...40 - L-.PR...40 - L-.MD...40



P45 L-.AB...xx - L-.PR...xx - L-.MD...xx



Fig. 8

------ Minimum high flame

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

P65 L-.AB...xx - L-.PR...xx - L-.MD...xx

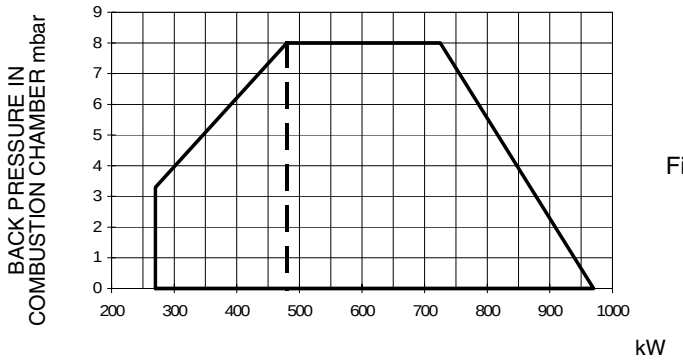


Fig. 9

------ Minimum high flame

MOUNTINGS AND CONNECTIONS

Packing

The burners are dispatched in cardboard pakages with dimensions:

P20 - P30	98 x 55 x 46	(W x H x D)
P45	118 x 67 x 57	(W x H x D)
P65	127 x 84 x 76	(W x H x D)

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

1 burner with detached gas train (but electrically connected to the burner in DN65 models);

1 gasket to be inserted between the burner and the boiler;

1 envelope containing this manual .

Unpacking the burner take care of not to damage the electrical connection between the burner and the gas train (only on DN65 models).

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

Fitting the burner to the boiler

After fitting the burner to the boiler ensure that the space between the blast tube and the refractory lining is sealed with appropriate insulating material (ceramic fibre cord or refractory cement).

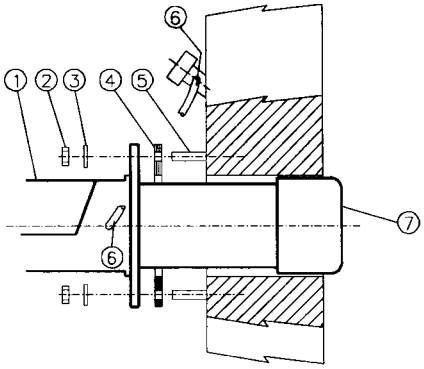


Fig. 10

Key

1 Burner
2 Fixing nut
3 Washer
4 Seal
5 Stud bolt
6 Sightglass cleaning tube
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 Fig. 11. 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 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 lenght 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 100 mm into the combustion chamber.

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.

- Pressurised boilers with flame reversal: in this case the blast tube must penetrate at least 50 - 100 mm into combustion chamber in respect to the tube bundle plate.

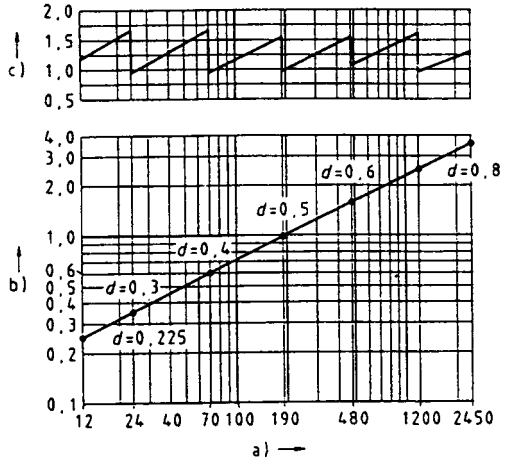


Fig. 11

Firing intensity, diameter and lenght of the test flame tube as a function of the heat input Q.

Key

a) Heat input Q in kW

b) Lenght of the flame tube in metres

c) Flame tube firing intensity in kW/m^3

d) Diameter of combustion chamber (m)

ELECTRICAL CONNECTIONS

- Remove the front panel of the electrical board on the burner.
- Carry out the connections in the power supply electrical board as shown in the following diagrams, verify the fan motor direction (only in three-phase burners) and refit the electrical board front panel.

WARNING: The burners with high-low flame operation are fitted with an electrical bridge between terminals 6 and 7; in the event of connecting the high/low flame thermostat remove this bridge before connecting the thermostat.

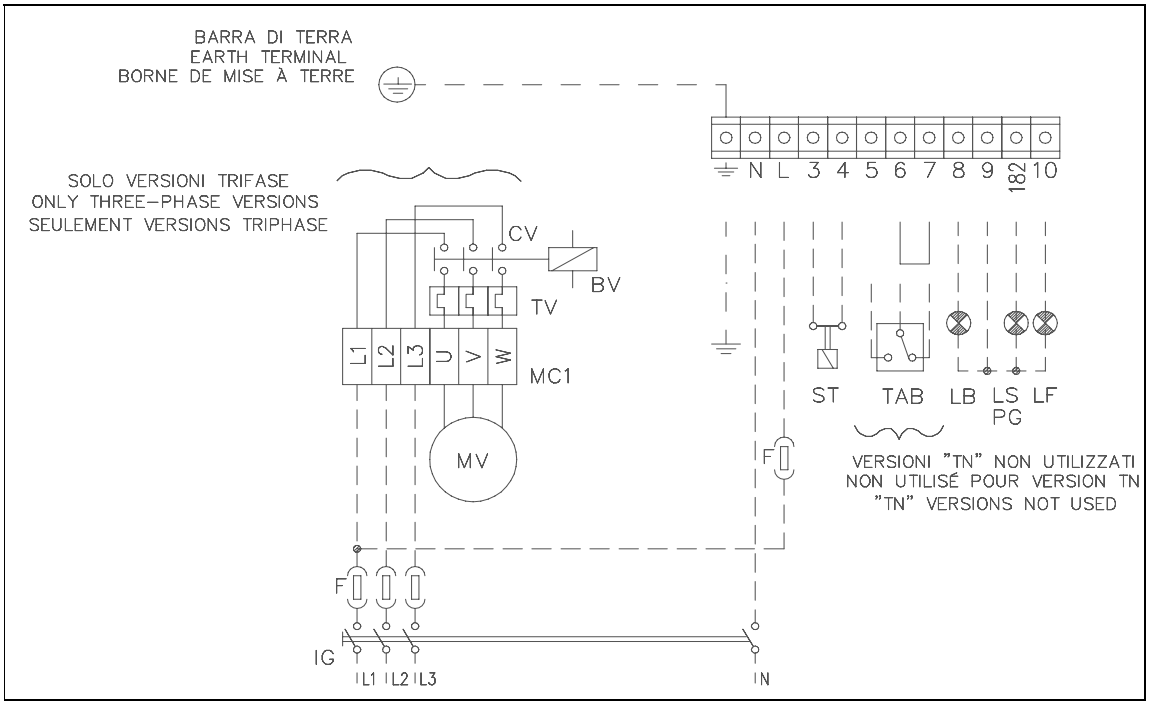
IMPORTANT: In connecting electric supply wires to burner teminal block be sure that ground wire should be longer than phase and neutral ones.

For a complete key, see on page 29 and page 37.

Diagrams for burners WITH printed circuit

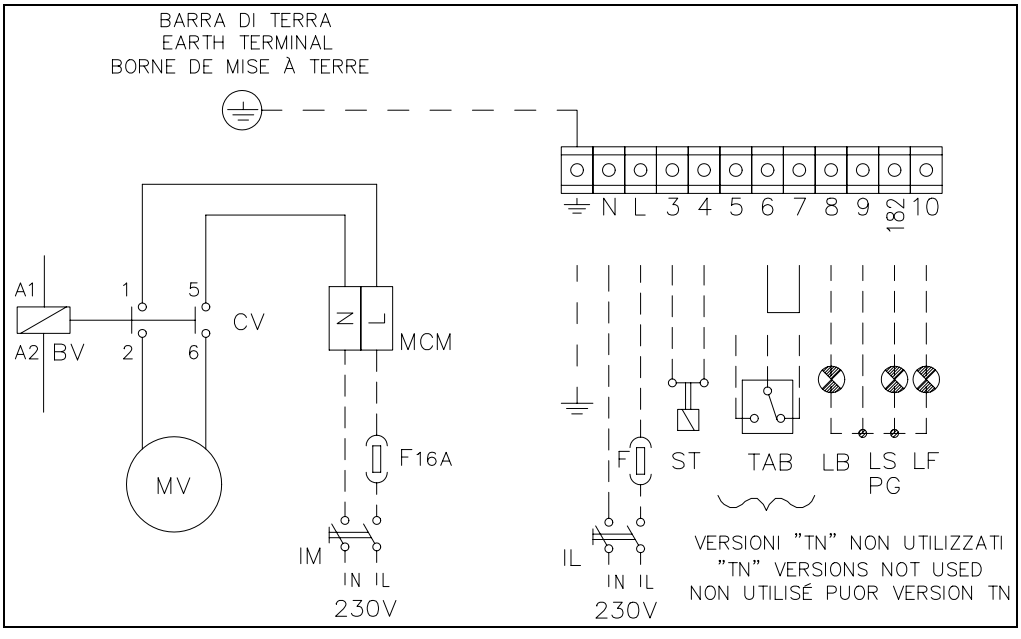
Burners type P20 - P30 - P65 single stage, double stage and progressive

Fig. 12a



Burners type P45 single stage, double stage and progressive

Fig. 12b



Power supply terminal board (three-phase burners)



Fig. 13a

Power supply terminal board for mono-phase burners type P45

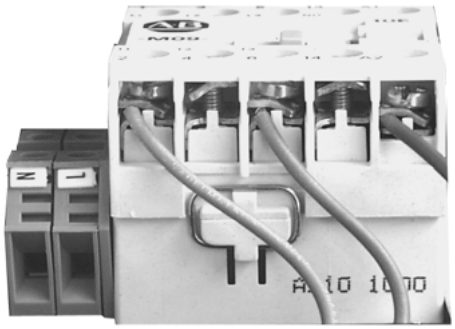


Fig. 13b

Terminal block for connections on printed circuit

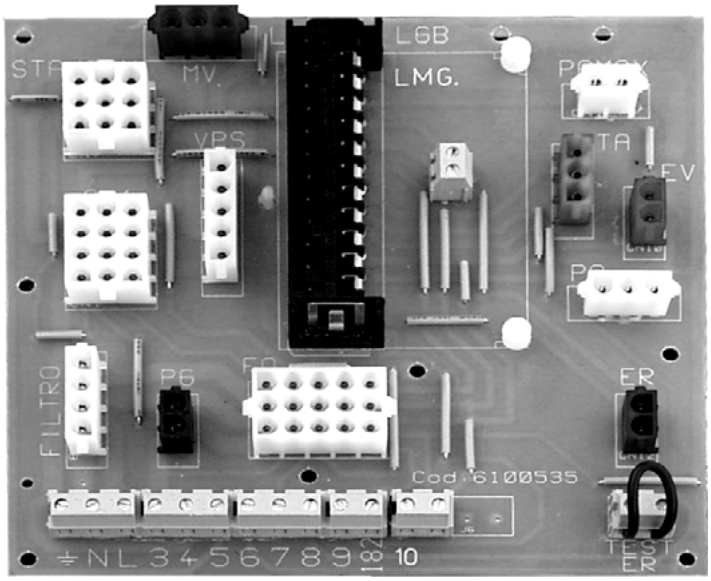
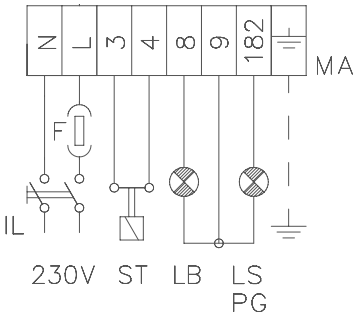


Fig. 14

Diagrams for burners WITHOUT printed circuit

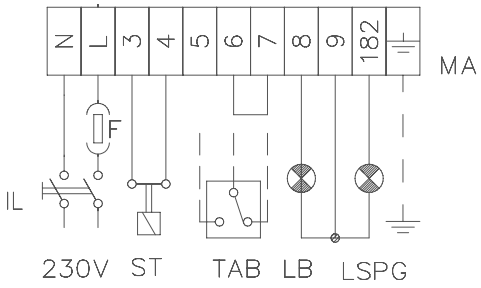
Type P20 - P30 L-.TN...

Fig. 14a



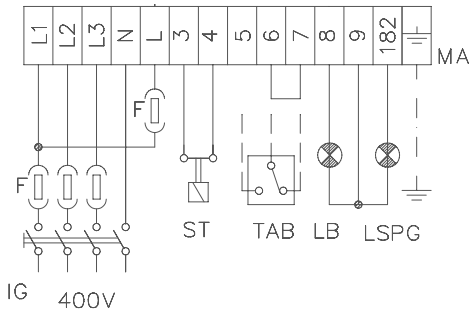
Type P20 - P30 L-.AB...

Fig. 14b



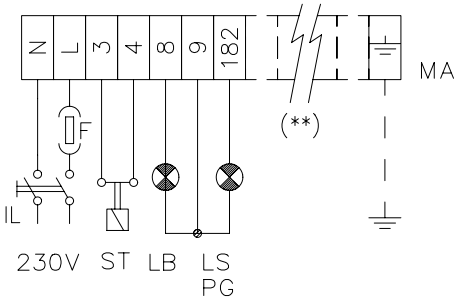
Type P65 L-.AB...

Fig. 14c



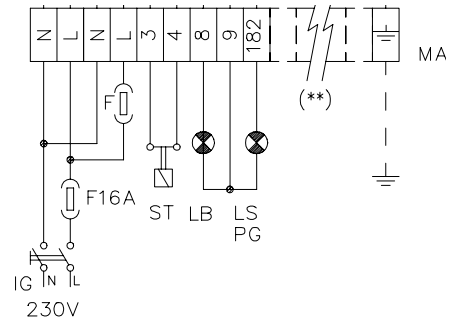
Type P20 - P30 L-.MD...

Fig. 15a



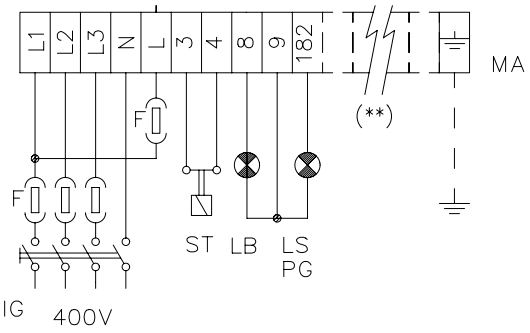
Type P45 L-.MD

Fig. 15b



Type P65 L-.MD

Fig. 15c



PROBE CONNECTION ON FULLY MODULATING BURNERS

(**)

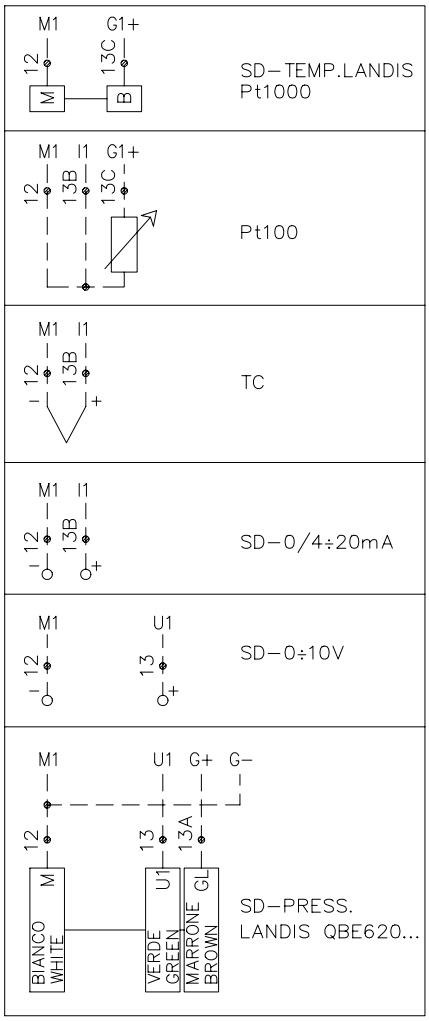


Fig. 16

(**) Probe connection, see Fig. 16

Fan motor direction

After completing the electrical connection of the burner, remember to check the rotation of the fan motor. The motor should rotate in an anti-clockwise direction looking at cooling fan. In the event of incorrect rotation reverse the three-phase supply and check again the rotation of the motor.

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

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.

GAS TRAIN INSTALLATION DIAGRAMS

The figures shown the diagrams with the gas train components wich are included in the delivery and those wich must be fitted by the customer. The diagrams complies with regulations in force.

Fig. 17a
Gas train with valves group MB-DLE (2 valves + gas filter + pressure governor + pressure switch) + leakage control VPS504

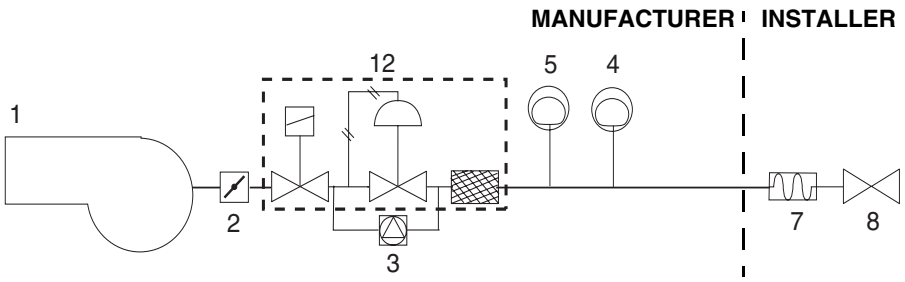


Fig. 17b
Gas train with safety valve + gas valve with built in pressure governor + leakage control VPS504

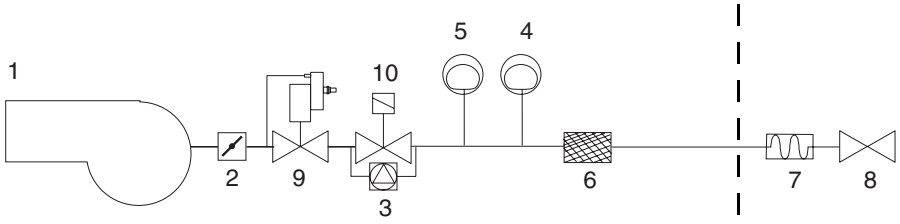
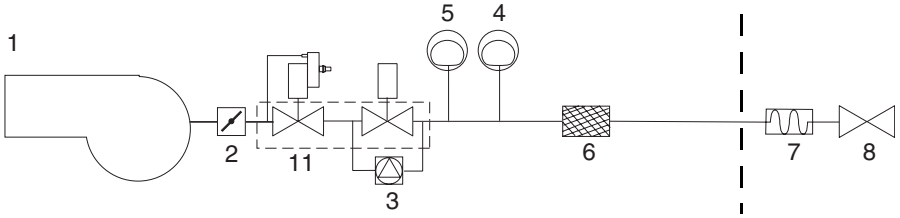


Fig. 17c
Gas train with valves group VGD with built-in gas pressure governor + leakage control VPS504



Key

1 Burner
2 Butterfly valve
3 Leakage control device (optional if output < 1200 kW)
4 Maximum gas pressure switch (optional)
5 Minimum gas pressure switch
6 Gas filter
7 Bellow joint
8 Manual cock
9 Gas valve with pressure governor
10 Safety gas valve
11 Valves group VGD
12 Valves group MB-DLE
13 Valves group DMV-DLE
14 Pressure governor with filter
15 Leakage control pressure switch
16 Gas pressure governor

Fig. 17d
Gas train with valves group VGD with built-in gas pressure governor + leakage control LDU11

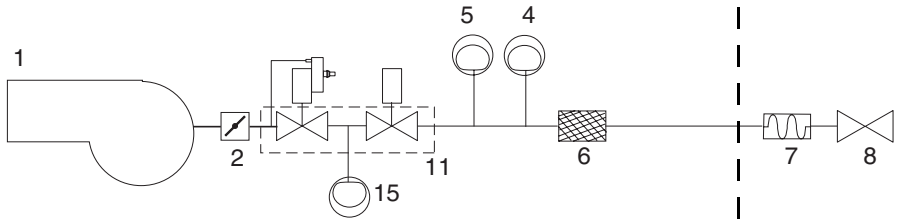


Fig. 17e
Gas train with valves group DMV-DLE + leakage control VPS504

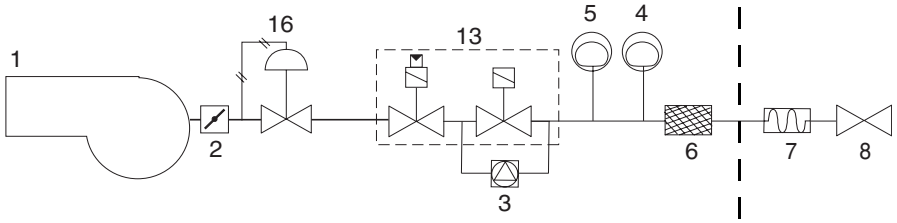
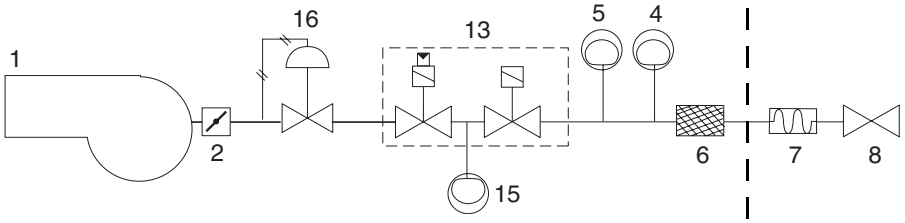


Fig. 17f
Gas train with valves group DMV-DLE + leakage control LDU11



Key

1 Burner
2 Butterfly valve
3 Leakage control device (optional if output < 1200 kW)
4 Maximum gas pressure switch (optional)
5 Minimum gas pressure switch
6 Gas filter
7 Bellow joint
8 Manual cock
9 Gas valve with pressure governor
10 Safety gas valve
11 Valves group VGD
12 Valves group MB-DLE
13 Valves group DMV-DLE
14 Pressure governor with filter
15 Leakage control pressure switch
16 Gas pressure governor

SETTINGS

WARNING!

THE SEALED SCREWS MUST NOT BE UNLOOSED!
IN A SUCH CASE THE DEVICE WARRANTY IS IMMEDIATELY INVALIDATE!

Fig. 18 - Multibloc MB-DLE - VPS504

The multibloc unit is a compact unit consisting of two valves, gas pressure switch, pressure stabilizer and gas filter. It can be paired jointly to the Dungs VPS504 sealing controls.

The valve is adjusted by means of the RP regulator after slackening the locking screw VB by a number of turns. By unscrewing the regulator RP the valve opens, screwing the valve closes.

To set the fast opening remove cover T, reverse it upside down and use it as a tool to rotate screw VR. Clockwise rotation reduces start flow rate, anticlockwise rotation increases it.

Do not use a screwdriver on the screw VR!

The pressure stabilizer is adjusted by operating the screw VS located under the cover C. By screwing down the pressure is increased and by unscrewing it is reduced.

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

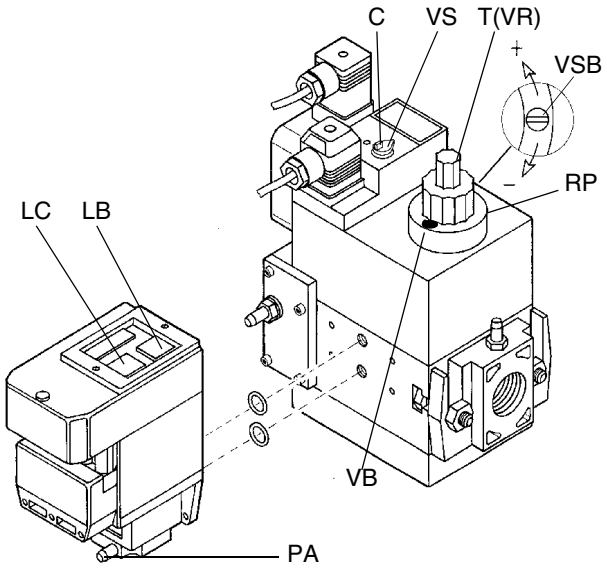


Fig. 18

Leakage control device VPS504 (Optional)

The VPS504 check the operation of the seal of the gas shut off valves costituting the MB-DLE. This check, carried out as soon as the boiler thermostat gives a start signal to the burner, creates, by means of the diaphragm pump inside it, a pressure in the test space of 20 mbar higher than the supply pressure. When wishing to monitor the test, install a pressure gauge ranged to that of the pressure supply point PA. If the test cycle is satisfactory, after a few seconds the consent light LC (yellow) comes on. In the opposite case the lockout light LB (red) comes on.

To restart it is necessary to reset the appliance by pressing the illuminated pushbutton LB.

Gas valve Dungs MV-DLE

- To adjust the gas flow rate loosen the screw VB and rotate the regulator RP as necessary. Unscrew to close the valve, screw to open.
- Tighten the screw VB.
- To set the fast opening remove cover T, reverse it upside down and use it as a tool to rotate the screw VR. Clockwise rotation reduces the ignition flow rate, anticlockwise rotation increase it.

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

Do not use a screwdriver on the screw VR!

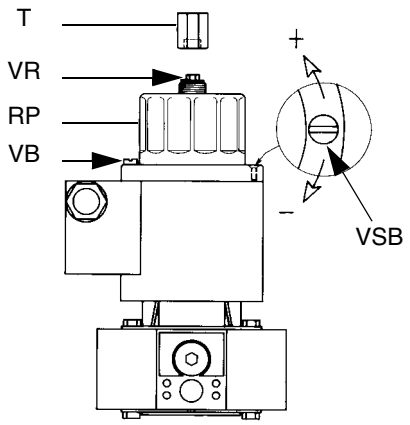


Fig. 19

Gas valve Dungs MVD

- To adjust the gas flow rate unscrew the plug T, slacken the locking nut and apply a screwdriver to the adjusting screw VR. Turn clockwise to close the valve or counterclockwise to open.
- When this operation has been completed lock the nut and screw down the plug T.
- To replace the coil remove the plug T, withdraw the coil B and after replacing the coil refit the plug T.

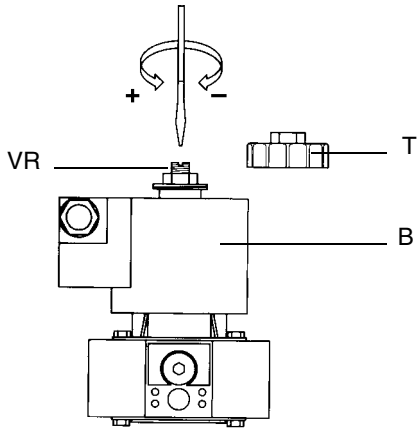


Fig. 20

Landis gas valves

Version with SKP20 (with incorporated pressure governor).

- To increase or decrease gas pressure, and therefore gas flow rate, remove the cap T and use a screwdriver to adjust the regulator screw VR. Turn clockwise to increase the flow, anti-clockwise to reduce it.
- Connect up the gas tubing to the gas pressure nipple (TP in figure).

Leave the blowhole free (SA in figure).

Should the spring fitted not permit satisfactory regulation, ask one of our service centres for a suitable replacement.

(For further informations see also the appendix)

WARNING:
removing the four screws BS drives the device to be unserviceable!

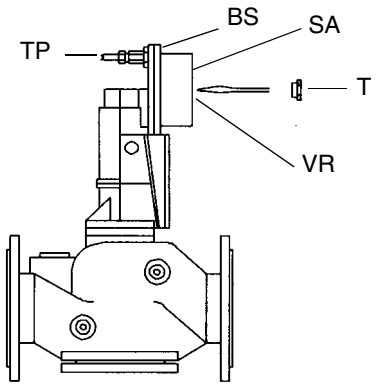


Fig. 21

Landis gas valves VGD

Version with SKP20 (with incorporated pressure governor).

- To increase or decrease gas pressure, and therefore gas flow rate, remove the cap T and use a screwdriver to adjust the regulator screw VR. Turn clockwise to increase the flow, anti-clockwise to reduce it.
- Connect up the gas tubing to the gas pressure nipple (TP in figure).

Leave the blowhole free (SA in figure).

Should the spring fitted not permit satisfactory regulation, ask one of our service centres for a suitable replacement.

(For further informations see also the appendix)

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

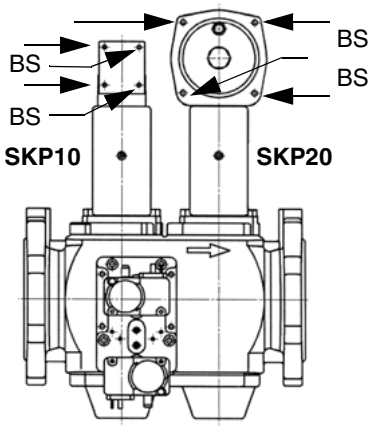


Fig. 22a

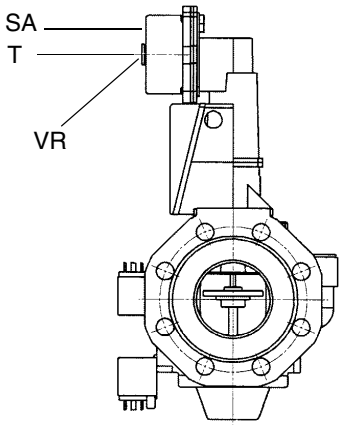


Fig. 22b

Dungs Valves

SV (without regulation)
SV-D Quick opening valve with regulation
SV-DLE Slow opening valve with regulation

SV-D...

- To adjust the valve slacken the screw VR and turn the knob G.
- Rotate clockwise to open the valve
- Rotate counterclockwise to close the valve
- Tight the screw VR at the end of setting

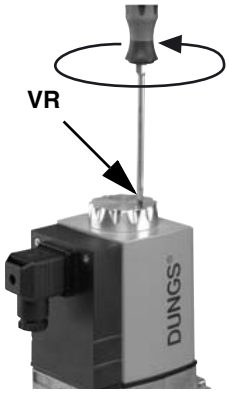


Fig. 23a

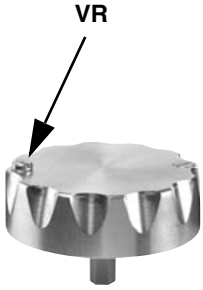


Fig. 23b

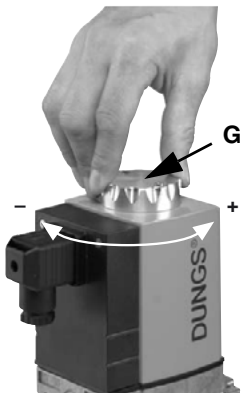


Fig. 23c

SV-DLE...

- To adjust the valve slacken the screw VR and turn the knob G.
- Rotate clockwise to open the valve
- Rotate counterclockwise to close the valve
- Tight the screw VR at the end of setting

Rapid stroke adjustment

- Unscrew the cap E from the hydraulic brake unit

Turn the adjustment cap E upside down and use it as a tool, tucking it in the regulation spindle

- Turn clockwise to increase the rapid stroke

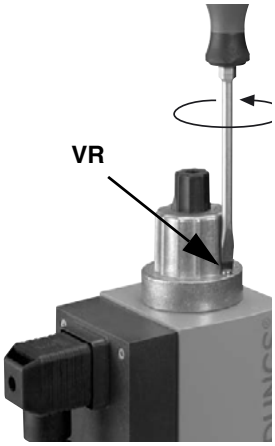


Fig. 24a

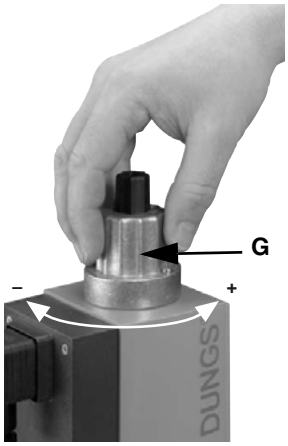


Fig. 24b

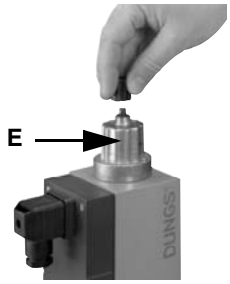


Fig. 24c

ValvesDungs DMV-DLE

Setting is carried out working on the screw V1. Turning clockwise the valve closes, turning counterclockwise the valve opens.

Fast stroke setting

- Unscrew the setting cap E.
- Turn the cap upside down and use it as a tool tucking it in the regulation spindle.

Rotate counterclockwise to increase rapid stroke.

Warning: the knob F doesn't make any setting!

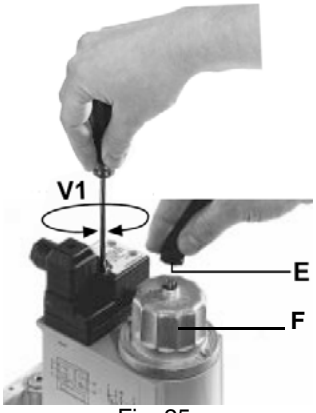


Fig. 25

Pressure regulator Dungs FRS

Adjustment

- Unscrew the protection cap A
- Rotate the regulation screw B clockwise to increase the pressure or counterclockwise to decrease it
- Check the pressure at the end of settings
- Replace the protection cap A

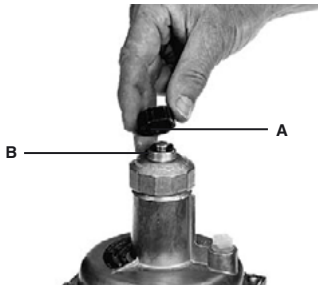


Fig. 26a

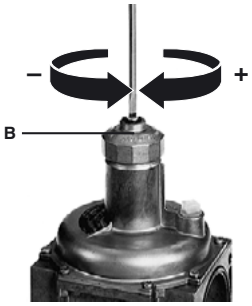


Fig. 26b

GAS FILTER

The gas filters are components that remove the dust particles carried by the gas, and prevent the elements at risk (e.g.: burners, counters and regulators) from becoming rapidly blocked. The filter is normally installed upstream from all the control and on-off devices.

GAS FILTER MAINTENANCE

Flanged fittings - Fig. 27a

After having ensured that there is no pressurised gas inside the filter, remove the cover (1) by unscrewing the fastening screws (8). Remove the filter cartridge (3), wash it in soap and water, blow it with compressed air (or replace if necessary) and put it back in its initial position, checking that it fits between the positioning guides (6) on the bottom (5) and that it does not stop the cover (1) from being put back in place. Finally, put the cover (1) back in place, making sure that the O-Ring (2) is in its seat and that the filter cartridge (3) fits neatly between the guides (6) on the cover (1), the same as those on the bottom (5).

Threaded fittings - Fig. 27b and Fig. 27c

After having ensured that there is no pressurised gas inside the filter, remove the cover (5) by unscrewing the fastening screws (1). Remove the filter cartridge (3), wash it in soap and water, blow it with compressed air (or replace if necessary) and put it back in its initial position, checking that it fits between the positioning guides (7) and that it does not stop the cover (5) from being put back in place. Finally, put the cover (5) back in place, making sure that the O-Ring (4, Fig. 27b) is in its seat.

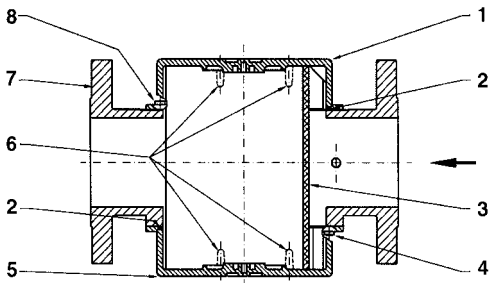


Fig. 27a

Key (Fig. 27a)

1 Cover
2 O-Ring
3 Filter cartridge
4 Screws M5 x 12
5 Bottom
6 Positioning guides
7 Body
8 Screws M5 x 14

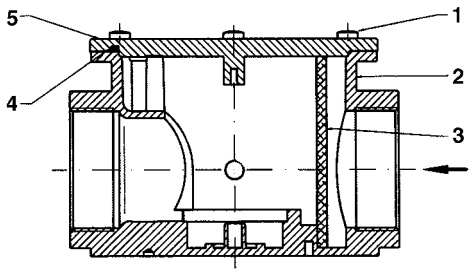


Fig. 27b

Key (Fig. 27b - Fig. 27c)

1 Fastening screws
2 Body
3 Filter cartridge
4 O-Ring
5 Cover
6 Pressure port
7 Positioning guides

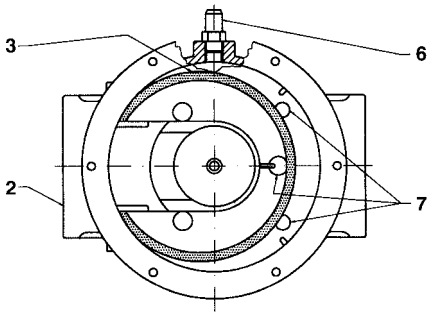


Fig. 27c - Top view, without cover

ADJUSTMENT OF GAS AND AIR FLOW RATE

WARNING: During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, shut down the burner, increase the opening of the air damper and start up the burner again to ensure the purging of the carbon monoxide from the combustion chamber.

Startup input

The start-up heat input shall not exceed 120 kW (single stage burners) or 1/3 of nominal input (2 stages or fully modulating burners). In order to comply with these requirements, single stage burners are dispatched from the factory with appropriate setting of the hydraulic brake of gas valve.

On 2 stages or modulating burners, take care to set the minimum gas flow rate lower than 1/3 of nominal input.

Burners with single stage operation

- Slacken the screw VBS shown in Fig. 28 by means of a screwdriver; set the desired air flow rate by adjusting directly the damper.
- On final adjustment tight the screw VBS.

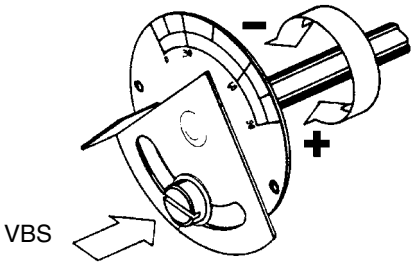


Fig. 28

Burners with hi-lo flame operation

- The rotation of the servocontrol must always be 90°, whatever the positions of high and low flame.

During testing in the factory the throttle valve, air damper and low flame are set to average values using cams of the servocontrol.

To change the settings of the burner during testing in the plant proceed as follow:

1 Turn on the burner and drive it to high flame.

2 Adjust the gas flow rate to the required value by means of the pressure governor or the valve regulator.

To adjust the air flow rate slacken the nut RA and rotate the screw VRA (clockwise rotation increases air flow, anticlockwise rotation decreases it) until the desired flow rate is obtained. (Fig. 31).

3 Drive the burner to low flame. In order to alter the gas flow rate slacken the nuts DB (Fig. 29) and adjust the opening angle of the gas throttle valve by rotating the rod TG (clockwise rotation increases gas flow, anticlockwise rotation decreases it). The slot on the throttle valve shaft shows the opening degree of the valve with respect of the horizontal axis (Fig. 30).

4 If it should be necessary to adjust the rating of the burner at low flame, adjust the corresponding cam of the servo control. After this adjustment, check the gas flow rate and repeat point 3.

N.B. At the end of settings, make sure the fastening screws RA and DB are fully tightened.

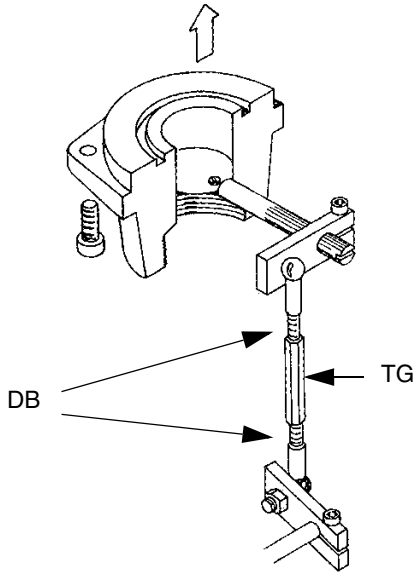


Fig. 29

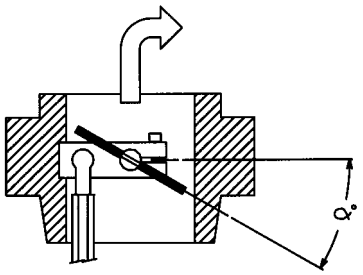
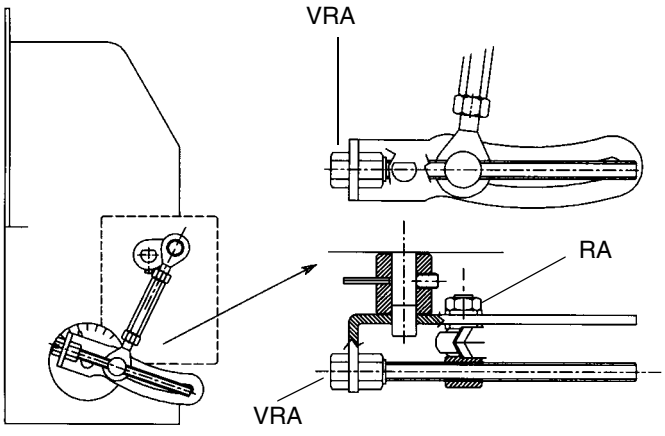


Fig. 30

Fig. 31



Burners with fully modulating or progressive operation

During the test in the factory, the gas throttle valve, air damper in low flame operation and the servocontrol are set to average values.

To recalibrate the burner on site, proceed as follows.

1 Switch on the burner and drive it to high-flame (servocontrol position = 90°).

Adjust the gas flow rate to the required figure by adjusting the pressure governor or the valve regulator. To adjust the air flow rate (Fig. 33) slacken the screw RA and rotate the screw VRA (clockwise rotation increases air flow, anticlockwise rotation decreases it) until the desired flow rate is obtained.

N.B.: at the end of settings remember to tight the screw RA.

2 Drive the burner to low flame. If it should be necessary to adjust burner capacity at low flame move the servocontrol cam accordingly (page 22).

3 Adjust the gas flow rate in the low-flame position (same position as the ingition) by means of the adjustable screws V (Fig. 33), to change the opening angle of the throttle valve (Fig. 32); rotate clockwise to increase the flow rate or anticlockwise to decrease it.

4 Turn off the burner and turn it on again. If the gas flow rate needs further regulations, repeat operations at step 3.

Fully modulating burners

To set the gas flow rate in low flame and in the intermediate points, proceed as follows.

5 Push the button EXIT on the modulator device (Fig. 37) for a time of 5 seconds; when the led with the hand simbol lights, use the arrow keys to drive the servocontrol to the maximum opening position and, stopping the movement at each screw V, use the one corresponding to the bearing to set the gas flow rate.

6 Push the EXIT button to exit the manual operation mode.

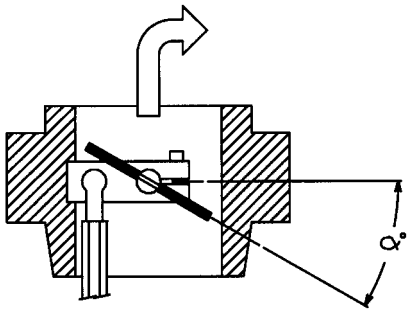


Fig. 32

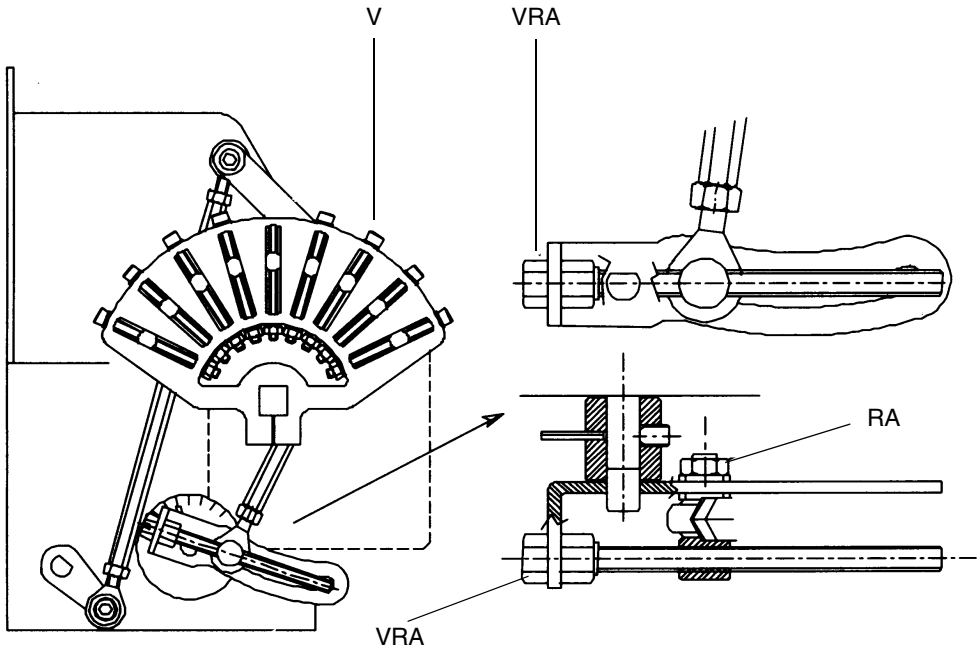
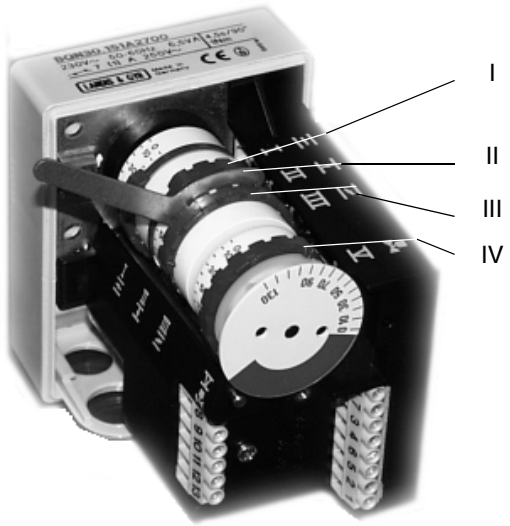


Fig. 33

SERVOCONTROL CAMS SETTING

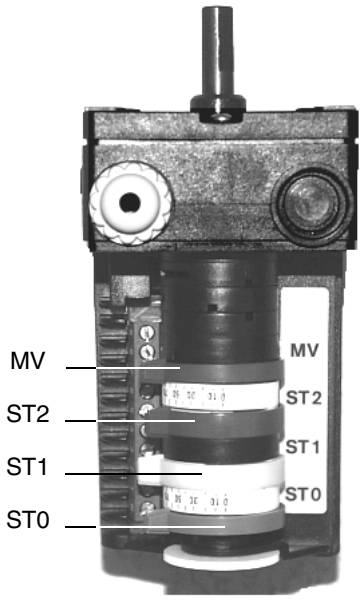
Landis SQN30.151 (hi-lo flame burners)
Landis SQN30.251 (progressive and fully modulating burners)

Fig. 34a



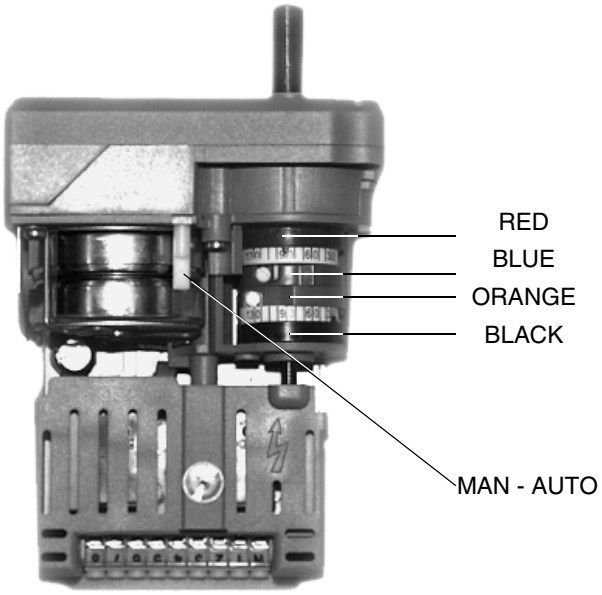
Berger STA6 B 3.41 (hi-lo flame burners)
Berger STA12B3.41 (progressive and fully modulating burners)
Berger STA15B3.41 (progressive and fully modulating burners)

Fig. 34b



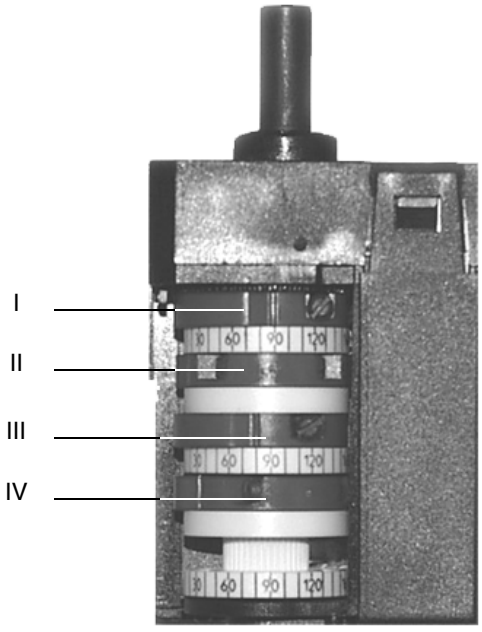
Landis SQN70.224A20 (hi-lo flame burners)
Landis SQN70.424A20 (progr. and fully modulating burners)

Fig. 34c



Berger STA4.5BO.37/6

Fig. 34d



Servocontrol cams setting

The setting procedure is the same for Berger and Landis servocontrols. Refer to the table below for the correct correspondence of cams.

	BERGER	BERGER	LANDIS	LANDIS
High flame position (set to 90°)	ST2	I	I	RED
Low flame and ignition position	ST1	IV	III	ORANGE
Stand-by position (set to 0°)	ST0	II	II	BLUE
Not used	MV	III	V	BLACK

In the servocontrols BERGER STA6B3.41 e STA4.5, the manual air damper control is not provided. The regulations are carried out by means of the appropriate tool fitted with the servocontrol (with SQN30) or by means of a screwdriver, affecting on the screw into the cam (all other servocontrols).

Calibration of air pressure switch (single stage burners)

Calibration is carried out as follows.:

- Remove the transparent plastic cap.
- With the burner in operation, after air and gas setting have been completed, slowly turn the adjusting ring nut VR in the clockwise direction until the burner lockout; read the value on the pressure switch scale and reduce it by 0.5 mbar.
- Repeat the start up cycle of the burner and check it runs properly.
- Refit the transparent plastic cover on the pressure switch.

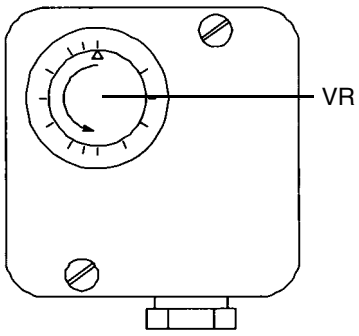


Fig. 35

Calibration of air pressure switch
(High-low flame and fully modulating burners)

Calibration is carried out as follows:

- Remove the transparent plastic cap.
- After air and gas setting have been completed, start the burner and, while pre-purge phase is running, slowly turn the adjusting ring nut VR in the clockwise direction until the burner lockout .
- Read the value on the pressure switch scale and reduce it by 15%.
- Repeat the ignition cycle of the burner and check it runs properly.
- Refit the transparent plastic cover on the pressure switch.

Calibration of minimum gas pressure switch

Calibration is carried out as follows:

- Remove the transparent plastic cap.
- With the burner in operation test the pressure on the pressure port at the input of the gas filter; slowly close the manual shut-off valve (See “Gas train installation”) until the detected pressure is reduced by 50%.
- Fully open the manual shut-off valve **(WARNING: carry out this operation ONLY with the burner turned off!).**
- Refit the transparent plastic cover on the pressure switch.

Calibrating the maximum gas pressure switch (optional)

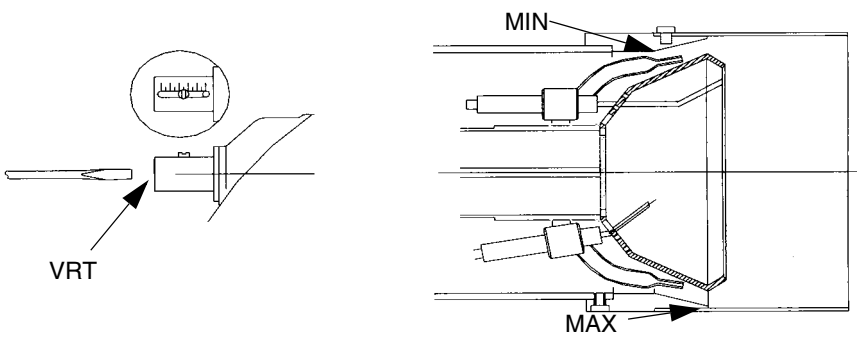
The high gas pressure switch is mounted on the burner near to the throttle valve and is connected to it by a copper tube. Calibration is carried out as follows:

- Remove the transparent plastic cap.
- Drive the burner to maximum output.
- Rotate slowly the adjustment ring nut VR clockwise, until the burner stops.
- Rotate the adjustment ring nut slightly back (increase the value indicated on the scale nut after rotation, by 30%).
- Turn on the burner and verify it operates correctly; if it shuts-off, turn back the setting knob again.
- Refit the transparent plastic cover on the pressure switch.

Adjusting the combustion head

The burner is adjusted in the factory with the combustion head in the "MAX" position, corresponding to the maximum power. To operate the burner at a lowest strenght, progressively shift back the combustion head, toward the "MIN" position, rotating the screw VRT clockwise.

Fig. 36



PART II: OPERATION

LIMITATIONS OF USE

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

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

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

IN THE EVENT OF REPEATED LOCKOUTS, DO NOT PERSIST WITH THE RESET BUTTON AND CONTACT QUALIFIED PERSONNEL WHO WILL PROCEED TO ELIMINATE THE MALFUNCTION.

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

OPERATION

- Bring to the ON position the mains switch A on the burner electrical board front panel.
- Check the flame control device is not in the lockout position (light B on), if necessary reset it by means of the pushbutton C (reset);
- Verify that the control thermostats or pressure switches give the consent to the burner to operate.
- Check the gas supply pressure is sufficient (light D on).

Only burners equipped with leakage control device: the check cycle of the leakage control device starts; the completion of this check is signalled by the light of the lamp on the device. When the valves check is finished, the start up cycle of the burner begins. In the case of a leak in a valve, the leakage control device locks and the lamp E lights.

To reset the device operate on the device pushbutton.

- When the startup cycle begins, the servocontrol drives the air damper to the maximum opening position, the fan motor starts and the pre-purgue phase begins.

During the pre-purgue phase, the complete opening of the air damper is signalled by the lamp F on the frontal panel of the electrical board.

- At the end of the pre-purgue phase, the air damper goes to the ignition position, the ignition transformer comes on (signalled by the lamp H) and 3 seconds later the solenoid valves EV1 and EV2 are energized (lights L and I on the front panel).
- 3 seconds after the opening of the valves, the ignition transformer comes off and the lamp H turns off; subsequently:

Single stage burners: the burner is on at the maximum power; the lights F and G are on;

High-low flame burners: the burner is on in low flame (light G is on); 8 seconds later the high flame operation begins and the burner switches automatically to high flame (light F is on) or remains in low flame operation, depending on the plant needs.

Fully modulating burners: after the posted time the modulating operation begins and the burner is driven by the modulator (P), depending on the needs of the plant; the light F is on until the modulator drives the burner to a rise of power.

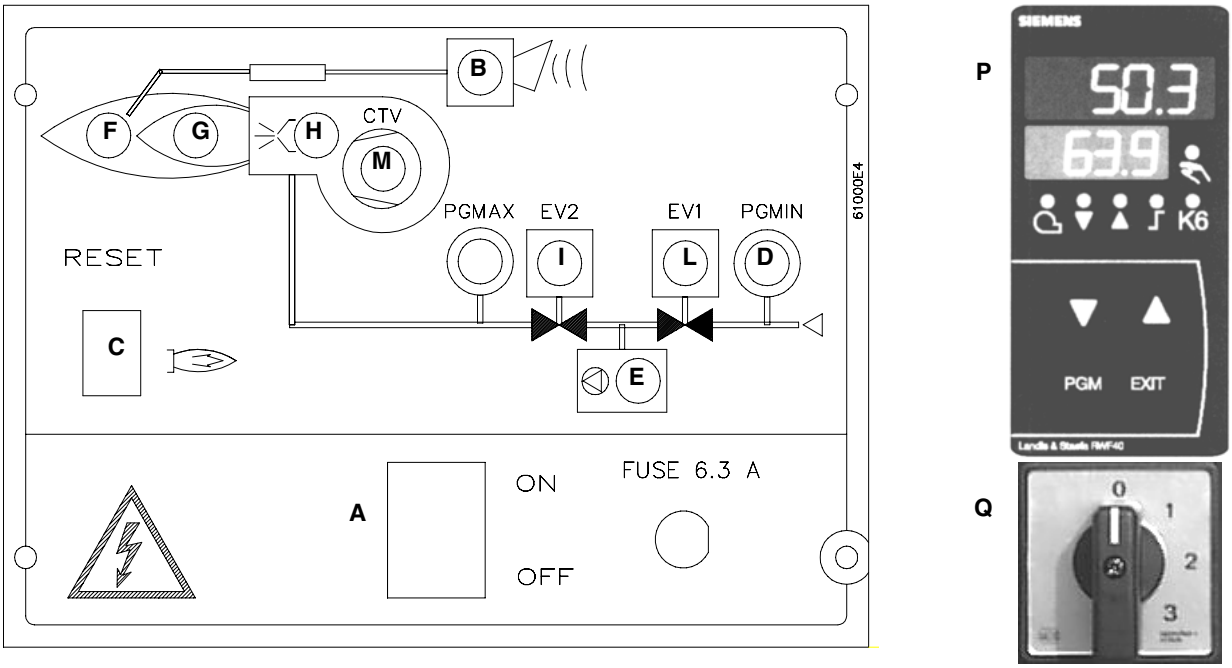


Fig. 37 - Electrical board front panel

Key

A main switch on-off
B lockout indicator light
C reset pushbutton for flame control device
D gas pressure switch consent indicator light
E leakage control device lockout indicator light (only on burners with leakage control device)
F high flame operation indicator light (or air damper open during pre-purgue phase)
G low flame operation indicator light
H ignition transformer operation indicator light
I valve in operation indicator light for EV2
L valve in operation indicator light for EV1
M indicator light for fan motor overload tripped (only three-phase burners); to reset the overload tripped, open the electrical board.
P modulator (fitted only on fully modulating burners)
Q operation manual selector: 0) stop - 1) high flame - 2) low flame - 3) automatic

PART II: OPERATION

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.

N.B. All operations on the burner must be carried out with the power disconnected

PERIODICAL OPERATIONS

- Cleaning and examining the gas filter cartridge, if necessary replace it; (see on page 19);
- Removal, examination and cleaning of the combustion head (see Fig. 38 - Fig. 39);
- Check of ignition electrode, cleaning, adjustment and, if necessary, replacement (see Fig. 40 - Fig. 41);
- Check of detection electrode, cleaning, adjustment and, if necessary, replacement (see Fig. 40 - Fig. 41); if in doubt check the detection circuit as shown in Fig. 42 - Fig. 43, with the burner in operation;
- Cleaning and greasing sliding and rotating parts.

NOTE: The check on the ignition and detection electrodes is carried out after removing the combustion head.

Removal of the combustion head

Fig. 38 - Burners P20 - P30 - P45

- Remove the lid C.
- Unscrew the 2 screws S which hold in position the washer, unscrew then the screw VRT, to free the threaded rod AR.
- Unscrew the screws V which lock the gas manifold G and extract the complete unit as shown in the figure.

Note: for subsequent assembly carry out the above described operations in the reverse order, having care to keep the OR ring in the correct position.

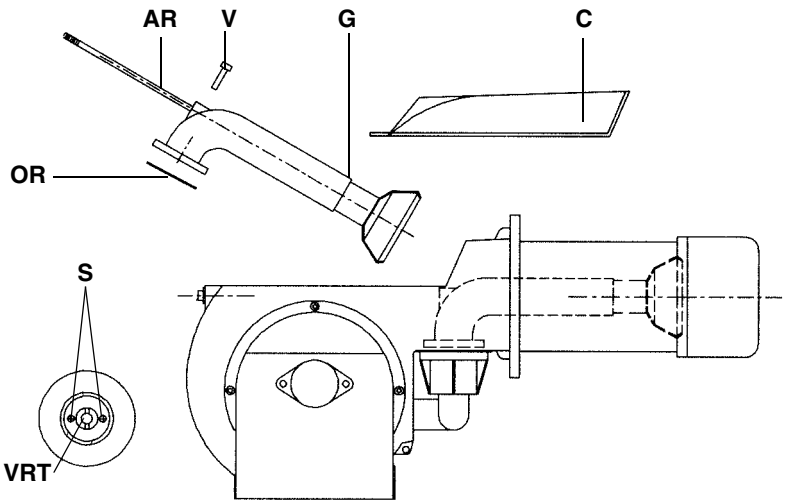


Fig. 38

Fig. 39 - Burners P65

- Remove the lid C.
- Unscrew the 2 screws V which hold in position the washer G and remove the complete set as shown in figure.

Note: for subsequent assembly carry out the above described operations in the reverse order, having care to keep the OR ring in the correct position.

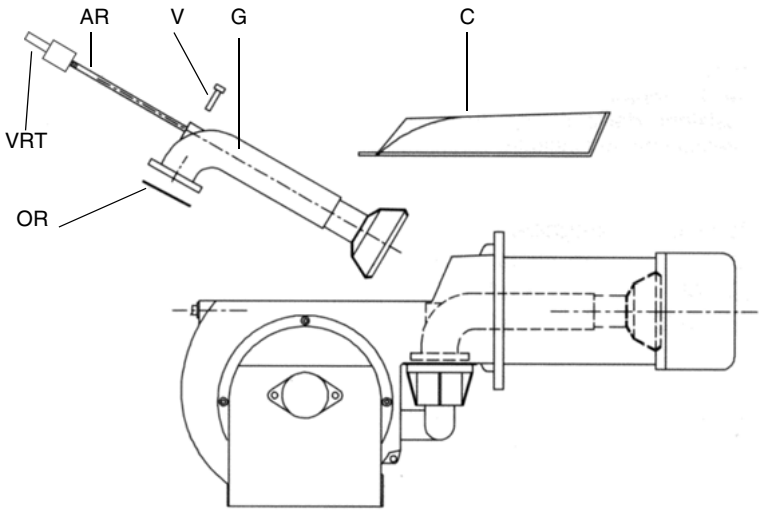


Fig. 39

Fig. 40 - Electrodes position setting P20 - P30 - P45

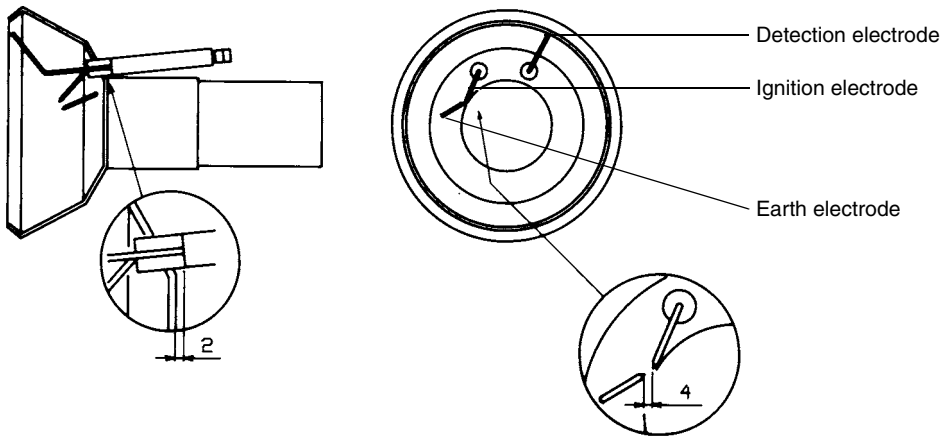
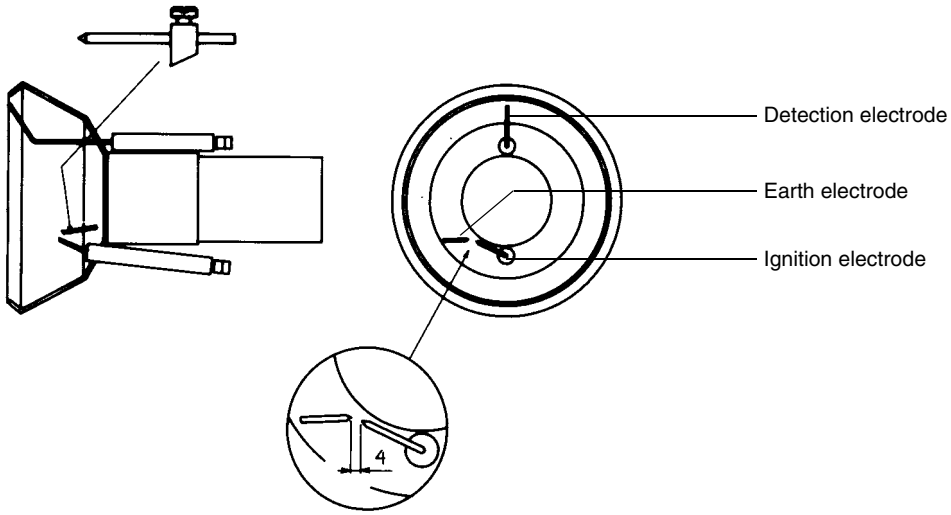


Fig. 41 - Electrodes position setting P65



Check of ionisation current

To measure the detection signals refer to the diagrams in Fig. 42 - Fig. 43. If the signal is less than the value shown, check the position of the detection electrode, the electrical contacts and if necessary replace the detection electrode.

Fig. 42

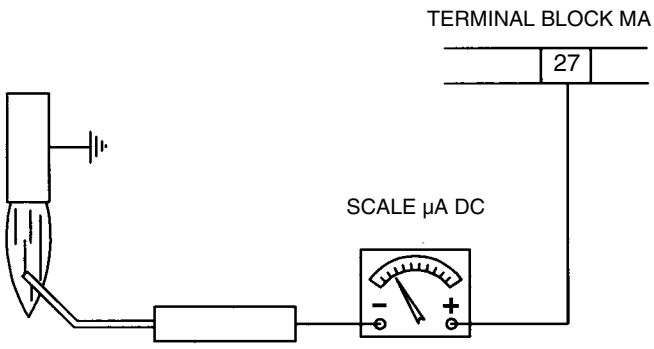
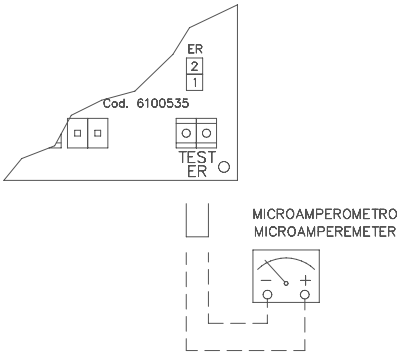


Fig. 43



Flame control device	Minimum detection signal
Landis LGB21-22	3 µA
Landis LMG21-22	3 µA

If the power supply to the burner is 230V three-phase or 230V phase-phase (without a neutral), with the Landis LGB2... o LMG2... flame control device, between the terminal 2 on the board and the earth terminal, an RC Landis RC466890660 filter must be inserted

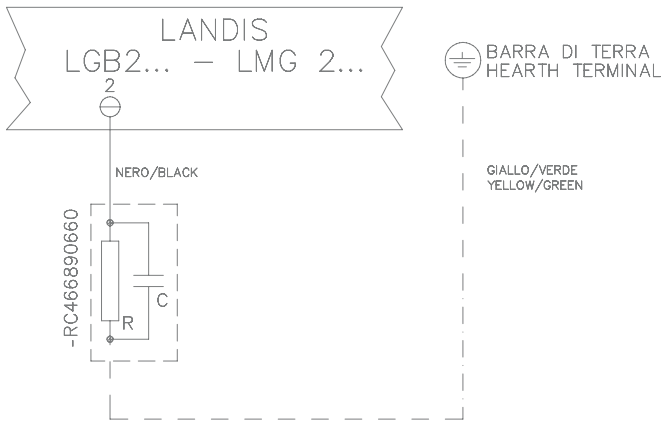


Fig. 44

Key
C - Capacitor (22nF/250V)
LGB - LMG - Landis flame control device
R - Resistor (1Mohm)
RC466890660 - RC Landis filter

TROUBLESHOOTING

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

* In this case insert an RC filter (see Fig. 44)

ELECTRICAL DIAGRAMS

Electrical diagrams code 18-009 Rev.1 and 18-020 - complete key

BV	Fan motor remote contactor coil
CTV	Contacts of fan motor overload tripped
CN1	Connector for three-phase versions
CV	Fan motor contactor contacts
ER	Flame detection electrode
EV	Valves connector
EV1	Network side solenoid gas valve (or valves group)
EV2	Burner side solenoid gas valve (or valves group)
F-FU	Fuses (FU =6,3A three-phase versions - FU =10A monophase version)
FILTRO	Filter (when necessary)
FQ	Electrical board frontal connector
IG	Main switch
IL	Line switch for auxiliaries
IM	Line switch for fan motor
L(1,2,3)	Phase
LAF	High flame operation light (only progressive and double stage burners)
LB	Burner lockout signaling light
LBF	Low flame operation light (only progressive and double stage burners)
LEV1	Signaling light for EV1 opening
LEV2	Signaling light for EV2 opening
LF	Burner in operation light (only single stage burners)
LGB/LMG21.33 (**)	Landis flame control device (single stage burners)
LGB/LMG22.33	Landis flame control device (hi-low flame and progressive burners)
LPG	Gas in the network signaling light
LSPG	Valves leakage signaling light
LT	Intervention of fan motor overload tripped signaling light (only three phase burners)
LTA	Ignition transformer in operation signaling light
MC1	Terminal block for three-phase power supply connection and three-phase motor connection
MCM	Terminal block for fan motor supply connection
MV	Fan motor
N	Neutral
PA	Air pressure switch
PE	Earth connection
PGMAX	Maximum gas pressure switch (optional, if fitted remove the bridge in the connector)
PG	Minimum gas pressure switch
PS	Reset pushbutton for flame control device
SQN30.151	Landis servocontrol for air damper (hi-lo flame burners)
SQN30.251	Landis servocontrol for air damper (progressive burners)
SQN70.224A20	Landis servocontrol for air damper (hi-lo flame burners)
SQN70.424A20	Landis servocontrol for air damper (progressive burners)
ST	Thermostats or pressure switches group
STA4.5B0.37/63N21L	Berger servocontrol for air damper (hi-lo flame burners)
STA12B3.41/63N21L	Berger servocontrol for air damper (progressive burners)
STA15B3.41/83N21L	Berger servocontrol for air damper (progressive burners)
STA6B3.41/63N21L	Berger servocontrol for air damper (hi-lo flame burners)
TA	Ignition transformer
TAB	Pressure switch for high-low flame operation (where fitted, remove the bridge between terminals 6 and 7 on terminal board MA)
TV	Fan motor overload tripped
VPS504	Dungs valves leakage control device (otional, if fitted remove the bridge on the connector)

(*) Version with separate valves and gas train connector; A - with leakage control, B - without leakage control

(**) With LGB21.33, a bridge between terminals 7 and 9 must be fitted

SERVOCONTROL CAMS

LANDIS SQN30.251	BERGER STA1xB3.41/x	LANDIS SQN70.424A20	
I	ST2	RED	High flame
II	ST0	BLUE	Stand-by
III	ST1	ORANGE	Low flame
V	MV	BLACK	Not used

ATTENTION:

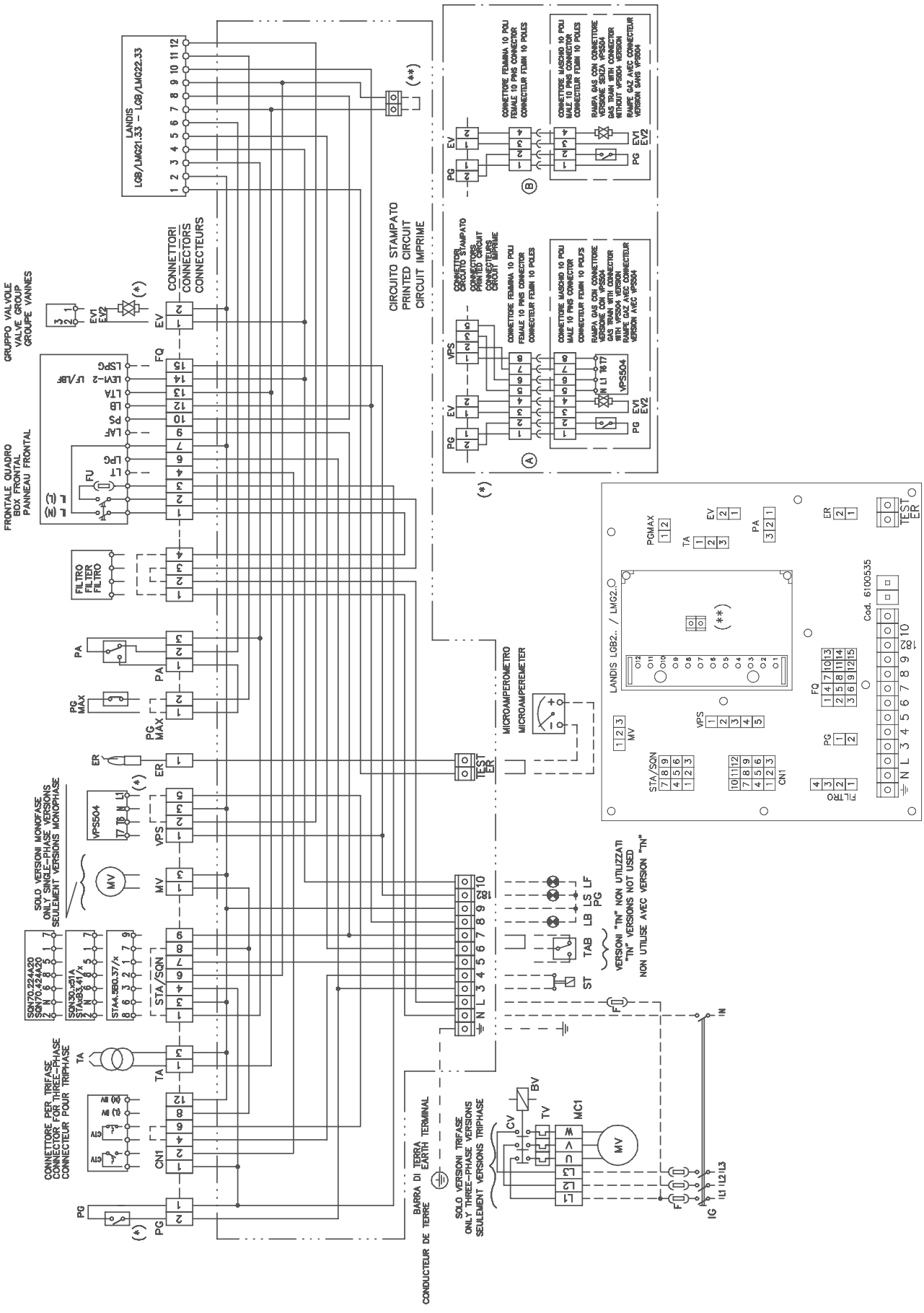
1 - Power supply: 400V 50Hz 3N a.c.three-phase and 230V 50Hz 2N a.c. monophase

2 - Don’t reverse phase and neutral

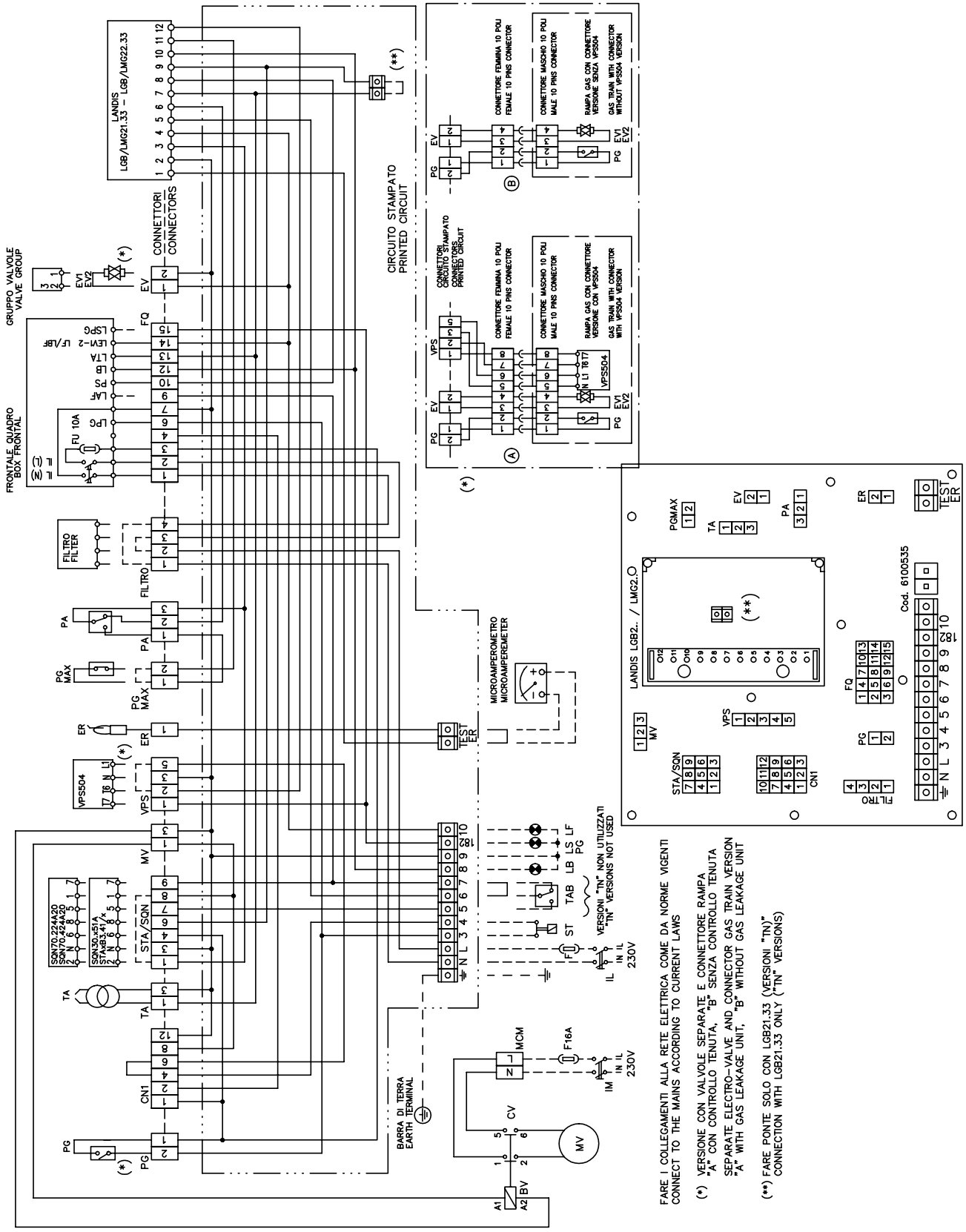
3 - Ensure the burner is properly earthed

ELECTRICAL DIAGRAMS

Electrical diagram code 18-009 Rev. 1 - Burners P20 - P30 L-.TN.., L-.AB.., L-.PR.., P65 L-. AB



Electrical diagram code 18-020 - Burners P45 L-.AB.., L-.PR..



Electrical diagrams code 04-520 Rev. 4, 04-521 Rev. 4, 04-671, 04-672, 05-581- 05-509 Rev. 4, complete key
Burners WITHOUT printed circuit

BV	Fan motor contactor coil
CTV	Fan motor overload tripped contacts
CV	Fan motor contactor contacts
ER	Flame detection electrode
EV1	Gas network side solenoid valve (or valves group)
EV2	Burner side solenoid valve (or valves group)
F	Fuse
IG	Main switch
IL	Line switch
L	Phase
LAF	Burner in high flame operation light
LB	Flame lockout light
LBF	Burner low flame operation light
LEV1	Signaling light for EV1 solenoid valve opening
LEV2	Signaling light for EV2 solenoid valve opening
LF	Burner in operation signaling light
LGB2..* / LMG2..	LANDIS flame control device
LGB2..	LANDIS flame control device
LGB22.33/LMG22.33	LANDIS flame control device
LPG	Signaling light for gas presence in the network
LPGMIN	Signaling light for low pressure in the network
LSPG	Valves leakage signaling light
LT	Motor overload tripped signaling light
LTA	Ignition transformer operation light
MA	Burner supply terminal board
MC	Burner components connection terminal board
MV	Fan motor
N	Neutral
PA	Air pressure switch
PG	Minimum gas pressure switch
PGMAX	Maximum gas pressure switch (optional, if fitted remove the bridge between terminals 156 and 158 on terminal board MC)
PGMIN	Minimum gas pressure switch
PS	Reset pushbutton for flame control device
SQN30.151	LANDIS servocontrol for air damper (hi-lo operation burners)
SQN30.251	LANDIS servocontrol for air damper (progressive operation burners)
SQN70.224A20	LANDIS servocontrol for air damper (hi-lo operation burners)
SQN70.424A20	LANDIS servocontrol for air damper (progressive operation burners)
ST	Group of thermostats or pressure switches
STA12B3.41/63N21L	BERGER servocontrol for air damper (progressive operation burners)
STA15B3.41/83N21L	BERGER servocontrol for air damper (progressive operation burners)
STA4.5B0.37/63N23L	BERGER servocontrol for air damper (hi-lo operation burners)
STA6B3.41/63N21L	BERGER servocontrol for air damper (hi-lo operation burners)
TA	Ignition transformer
TAB	High-low flame pressure switch (if fitted remove the bridge between terminals 177 and 178 on terminal board MA)
TV	Fan motor overload tripped
VPS504	Dungs valves leakage control (optional, if fitted remove the bridge between terminals 6 and 7 on terminal board MC)

* Place a bridge between terminals 7 and 9 on the LGB board, only with LGB21.33

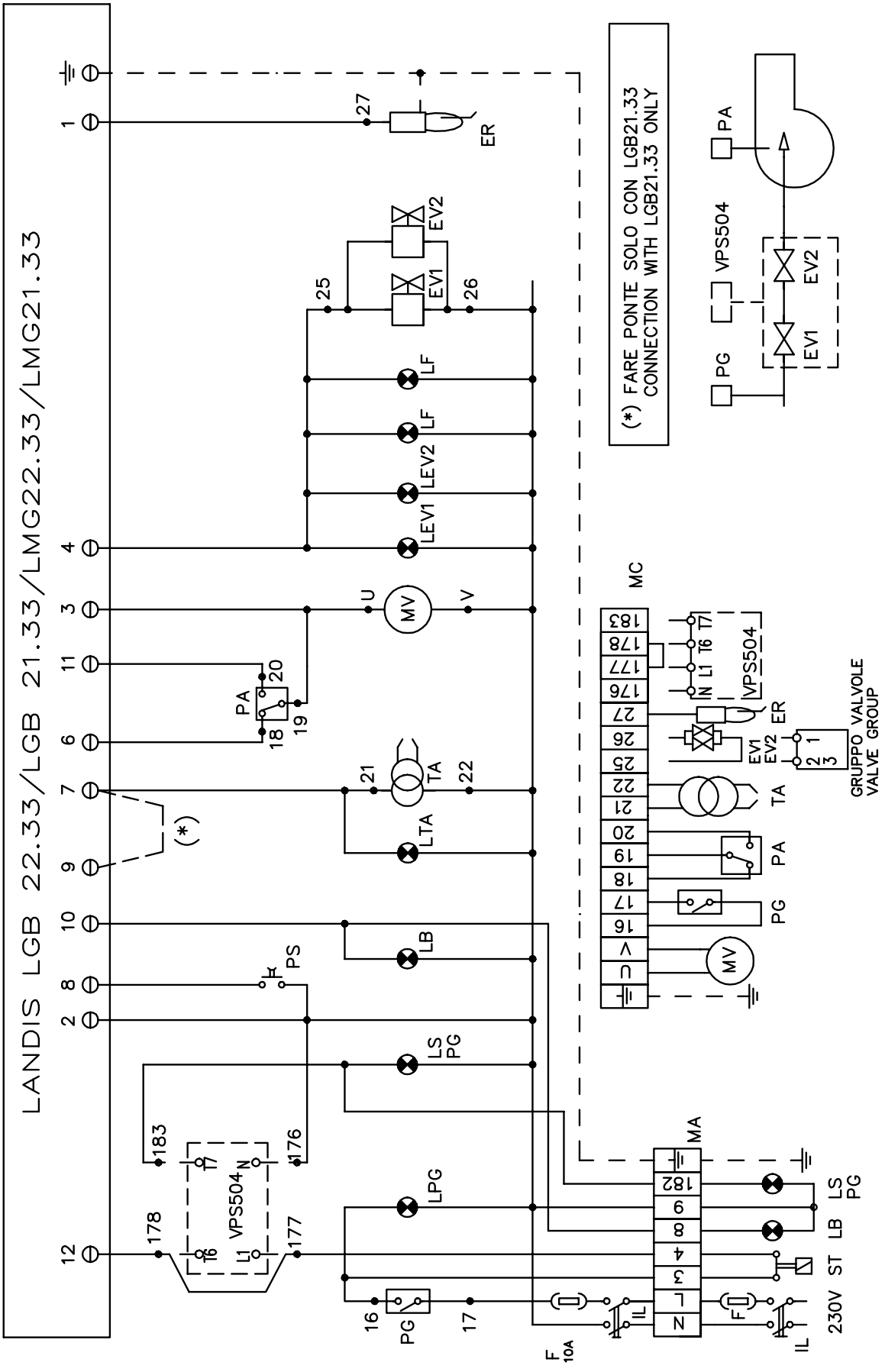
SERVOCONTROL CAMS

LANDIS SQN30.x51	BERGER STAxB3.41	BERGER STA4.5B0.37/	LANDIS SQN70.x24A20	
I	ST2	I	ROSSA	high flame
II	ST0	II	BLU	stand-by
III	ST1	IV	ARANCIO	low flame
V	MV	III	NERA	not used

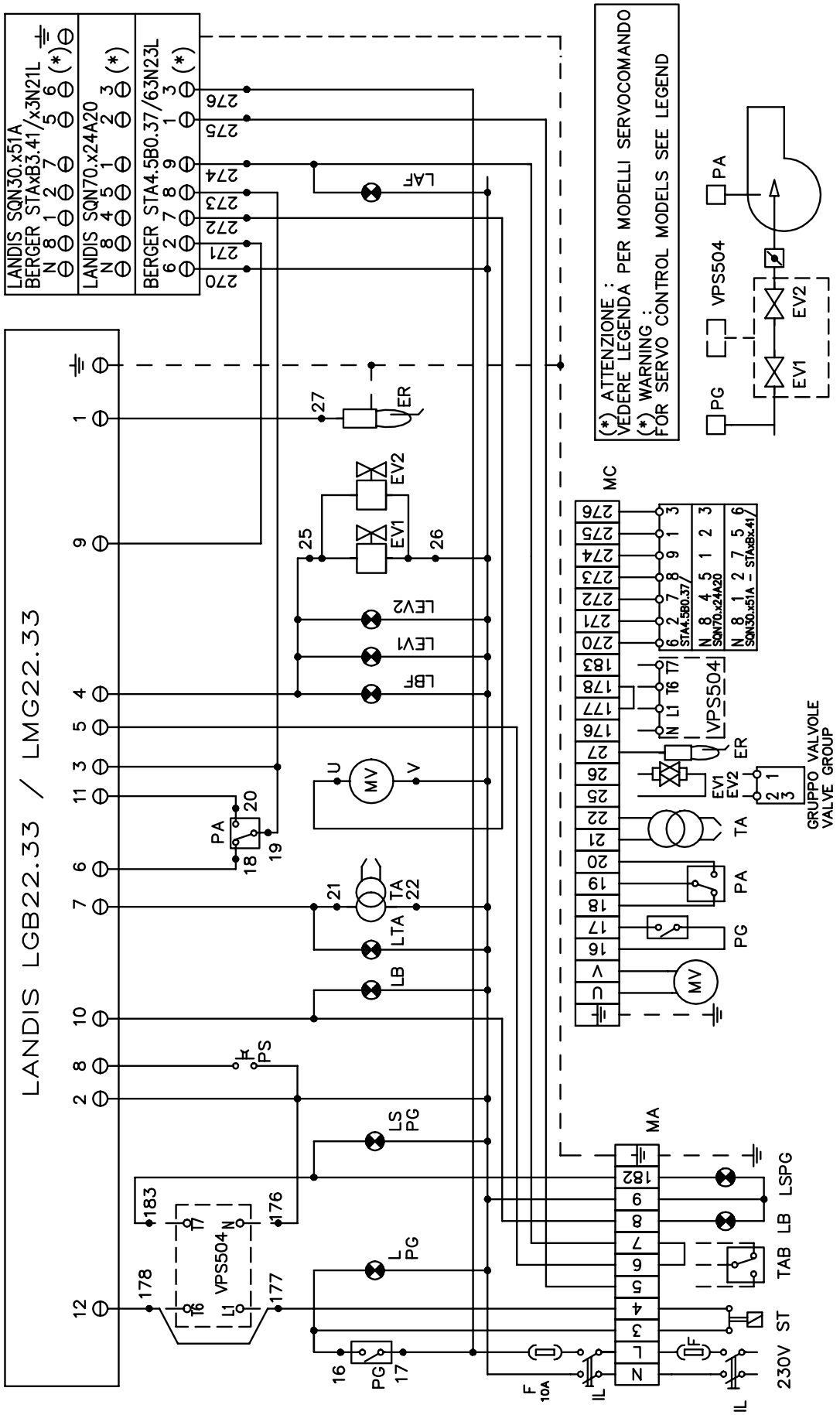
ATTENTION:

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

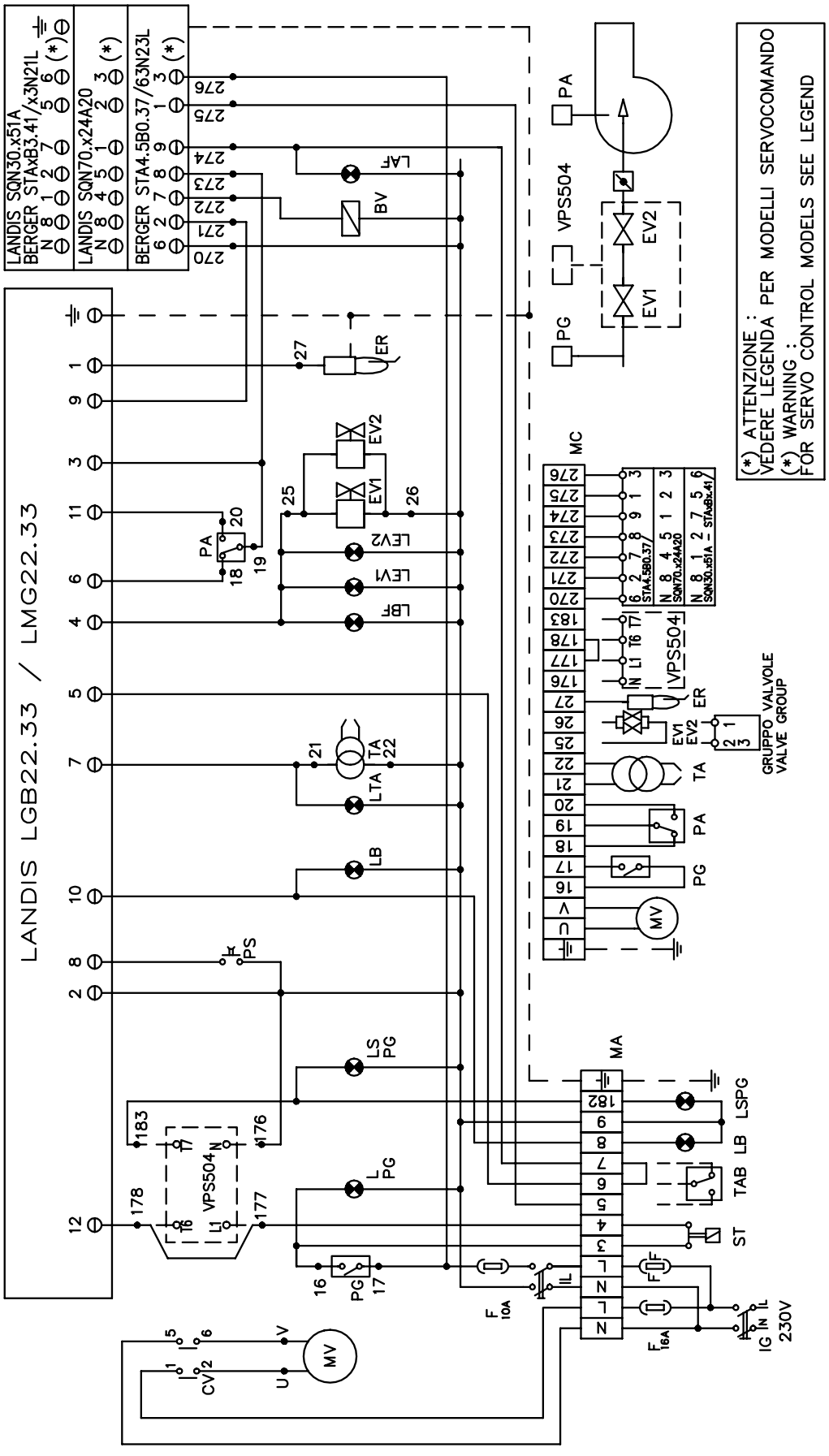
Electrical diagram 04-520 Rev. 4 - Burners P20 - P30 M-.TN..



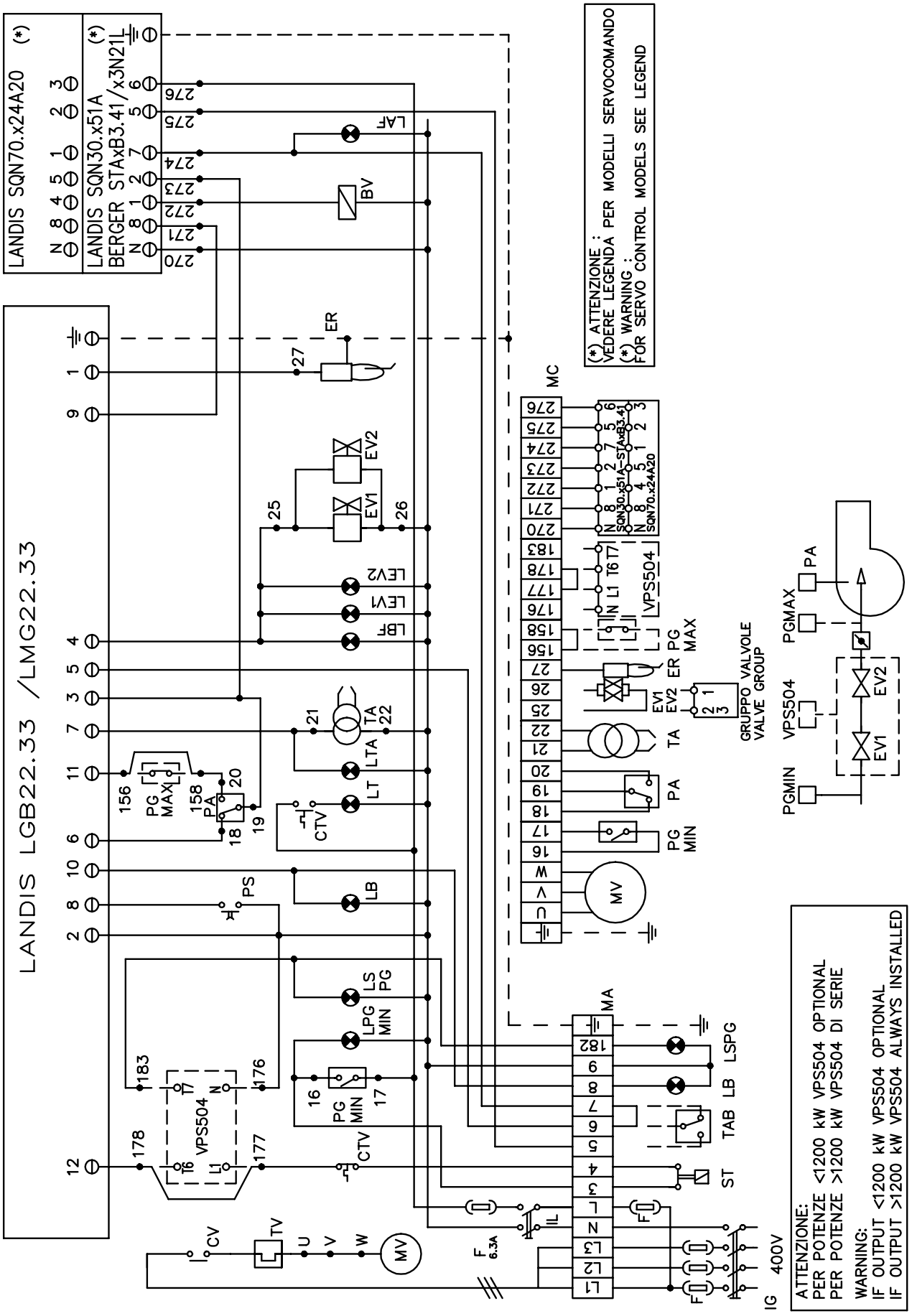
Electrical diagram 04-521 Rev. 4 - Burners P20 - P30 M-.AB



Electrical diagram 04-672 - Burners P45 M-.AB.., M-.PR..



Electrical diagram 05-509 Rev. 4 - Burners P65 M-.AB.., M-.PR..



Electrical diagrams 04-622 Rev. 1 - 04-642 Rev. 1 - 05-615 Rev. 1 - complete key

BV	Fan motor remote contactor coil
CMF	Operation manual selector: 0) stop - 1) high flame - 2) low flame - 3) automatic
CTV	Contacts of fan motor overload tripped
CV	Fan motor contactor contacts
ER	Flame detection electrode
EV1	Network side solenoid gas valve (or valves group)
EV2	Burner side solenoid gas valve (or valves group)
F÷F2	Fuses
IG	Main switch
IL	Line switch
L	Phase
LAF	Burner high flame operation signaling light (2nd stage)
LB	Burner lockout signaling light
LBF	Burner low flame operation signalization light (1st stage)
LEV1	Signalization light for EV1 opening
LEV2	Signalization light for EV2 opening
LGB22.33/LMG22.33	LANDIS flame control device
LPG	Gas in the network signaling light
LPG MIN	Low pressure in the network signaling light
LS	Burner in stand-by signaling light
LSPG	Valves leakage signaling light
LT	Intervention of fan motor overload tripped signaling light
LTA	Ignition transformer in operation signaling light
MA	Burner power supply terminal block
MC	Terminal block for burner components connection
MV	Fan motor
N	Neutral
PA	Air pressure switch
PG	Minimum gas pressure switch
PGMAX	Maximum gas pressure switch (optional, if fitted remove the bridge between terminals 156 and 158 on terminal block MC)
PGMIN	Minimum gas pressure switch
PS	Flame reset pushbutton
Pt100	Connection for thermoresistor Pt 100
RWF40.000*	Landis modulator
SD-0/4÷20mA	Probe connection with signal 0÷20mA / 4÷20mA
SD-0÷10V	Probe connection with signal 0÷10V
SD-PRESS.	3 terminals pressure probe connection (LANDIS QBE620…)
SD-TEMP	2 terminals themperature probe connection (Pt1000 o LANDIS QAE2..-QAC2..)
SQN30.251	Landis servocontrol for air damper (alternate)
SQN70.424A20	Landis servocontrol for air damper (alternate)
ST	Thermostats or pressure switches group
STA12B3.41/63N21L	Berger servocontrol for air damper
STA15B3.41/83N21L	Berger servocontrol for air damper (alternate)
TA	Ignition transformer
TC	Themperature probe connection
TV	Fan motor overload tripped
VPS504	Dungs valves leakage control device (otional, if fitted remove the bridge between terminals 177 and 178 on terminal board MC)

Link the terminal G on the RWF40 modulator with the teminal G on the probe (terminal 13 on terminal board MA) only if a probe is connected.

SERVOCONTROL CAMS

LANDIS SQN30.251	BERGER STA1xB3.41/x	LANDIS SQN70.424A20	
I	ST2	RED	High flame
II	ST0	BLUE	Stand by
III	ST1	ORANGE	Low flame
V	MV	BLACK	Not used

*The modulator includes a limit switch (trminals Q 13 and Q14 on RWF40); it stops the burner if the working parameter overcomes the set differential.

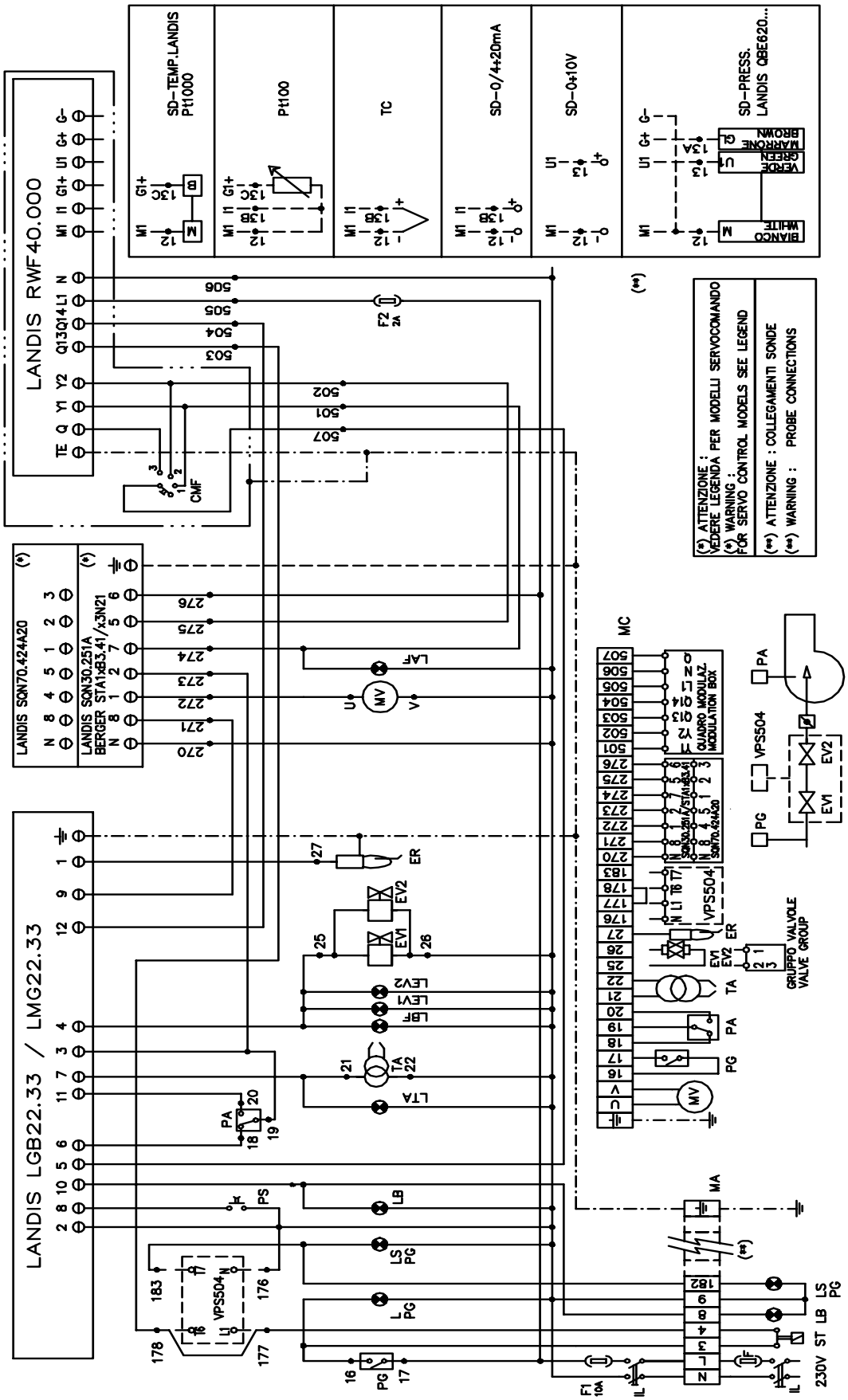
ATTENTION:

1 - Power supply: 400V 50Hz 3N a.c.three-phase and 230V 50Hz 2N a.c. monophase

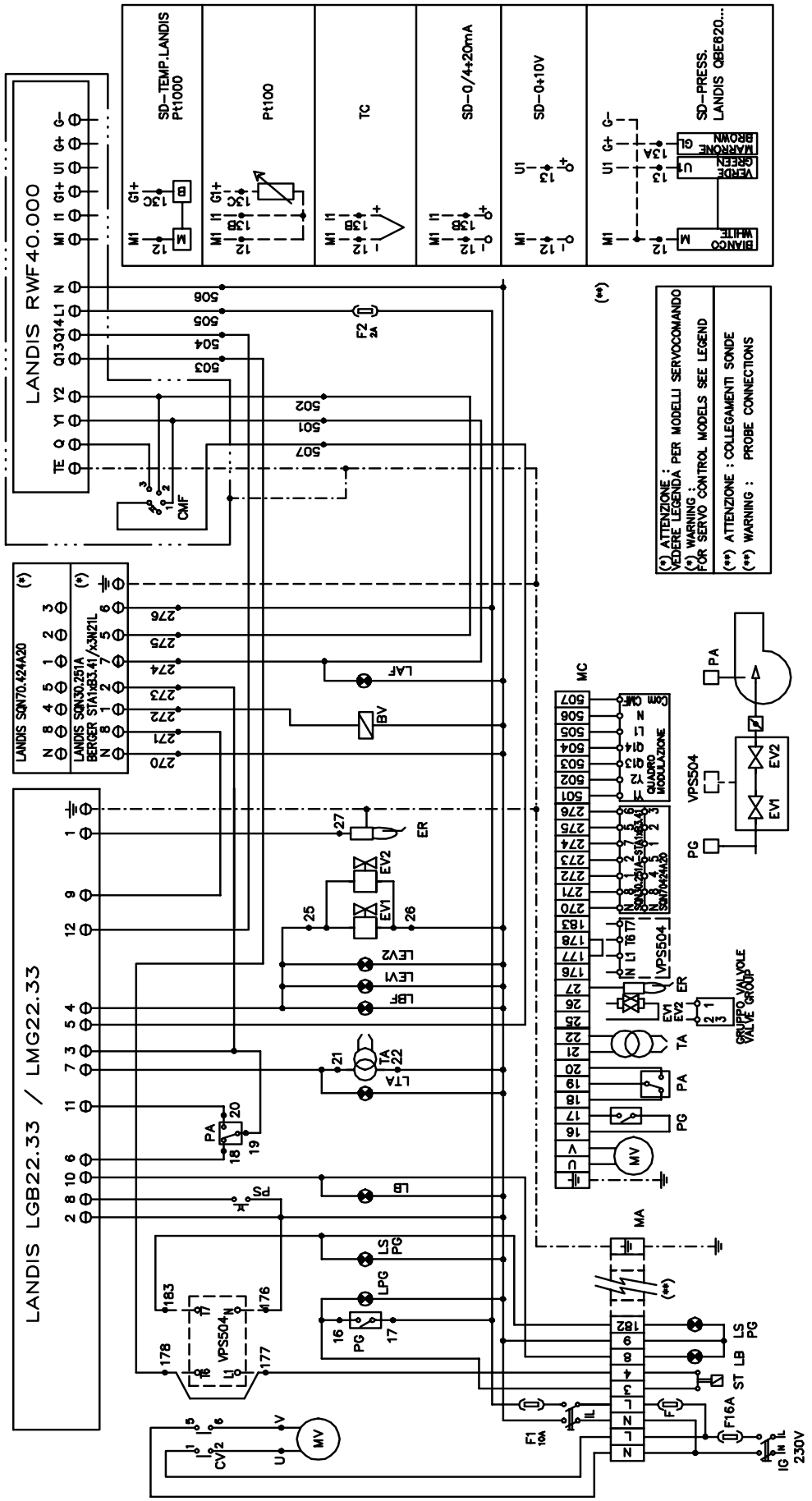
2 - Don’t reverse phase and neutral

3 - Ensure the burner is properly earthed

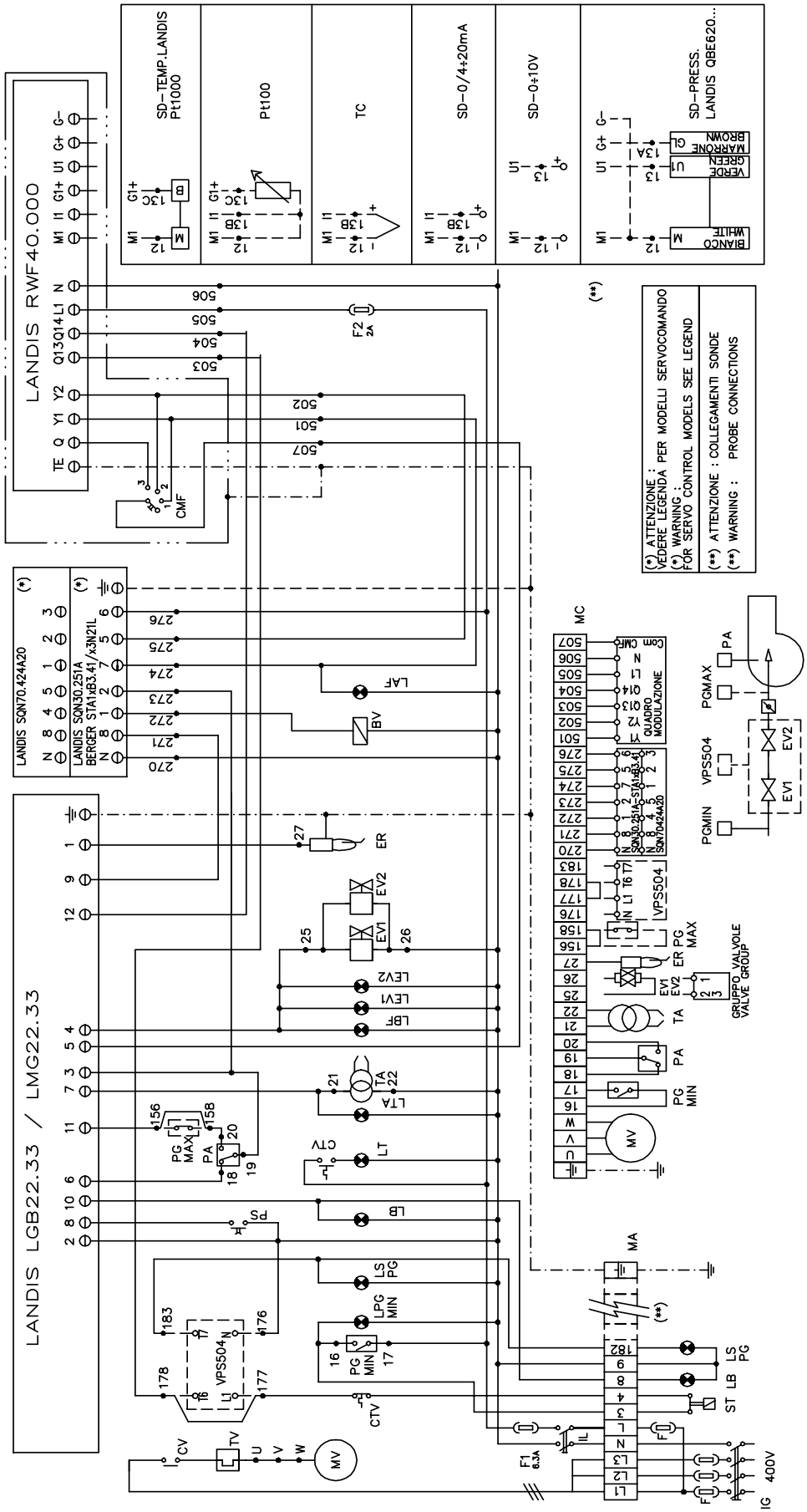
Electrical diagram code 04-622 Rev. 1 - Burners P20 - P30 M-.MD



Electrical diagram 04-642 Rev. 1 - Burners P45 M-.MD

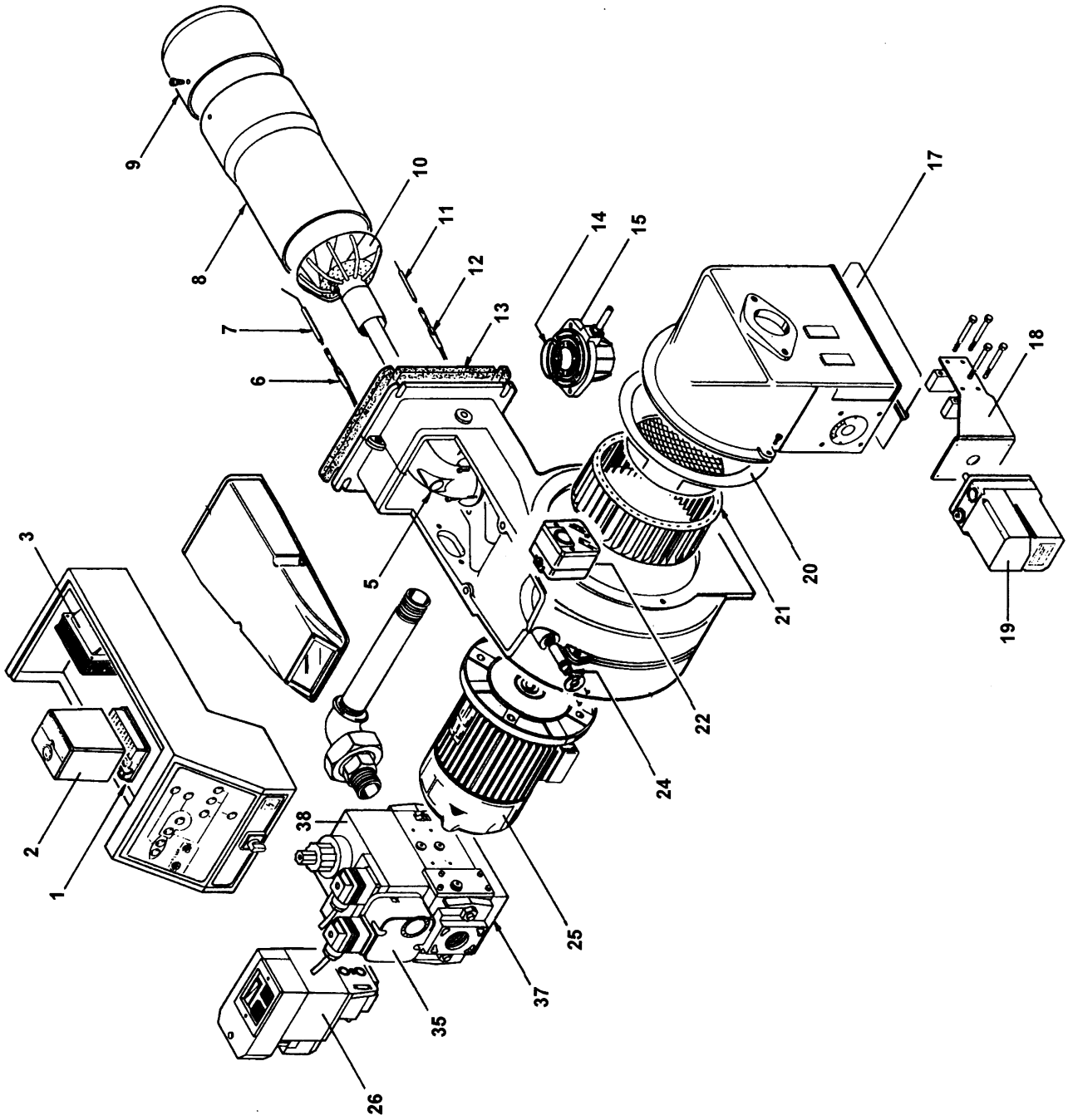


Electrical diagram code 05-615 Rev. 1 - Burner P65 M-.MD

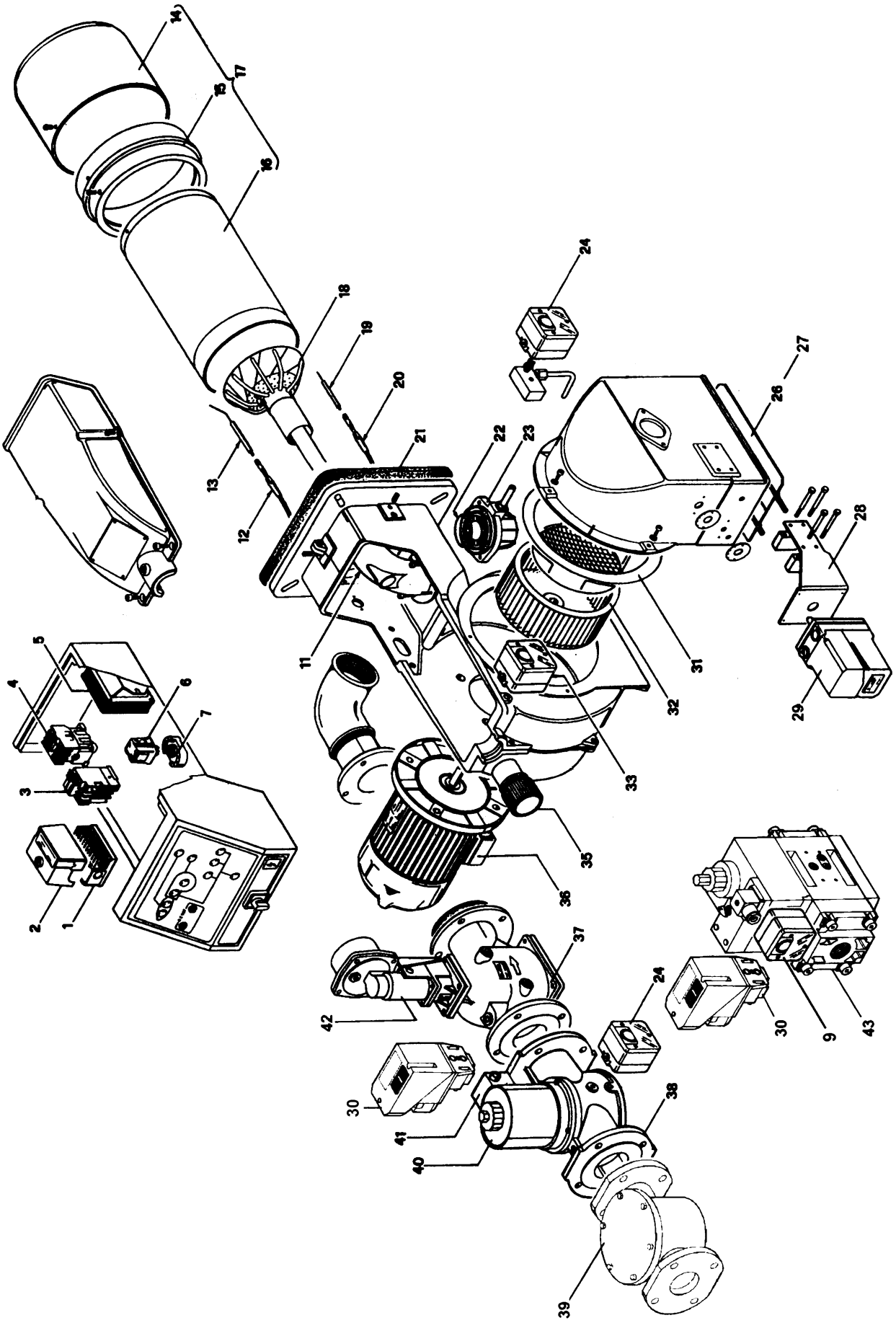


SPARE PARTS

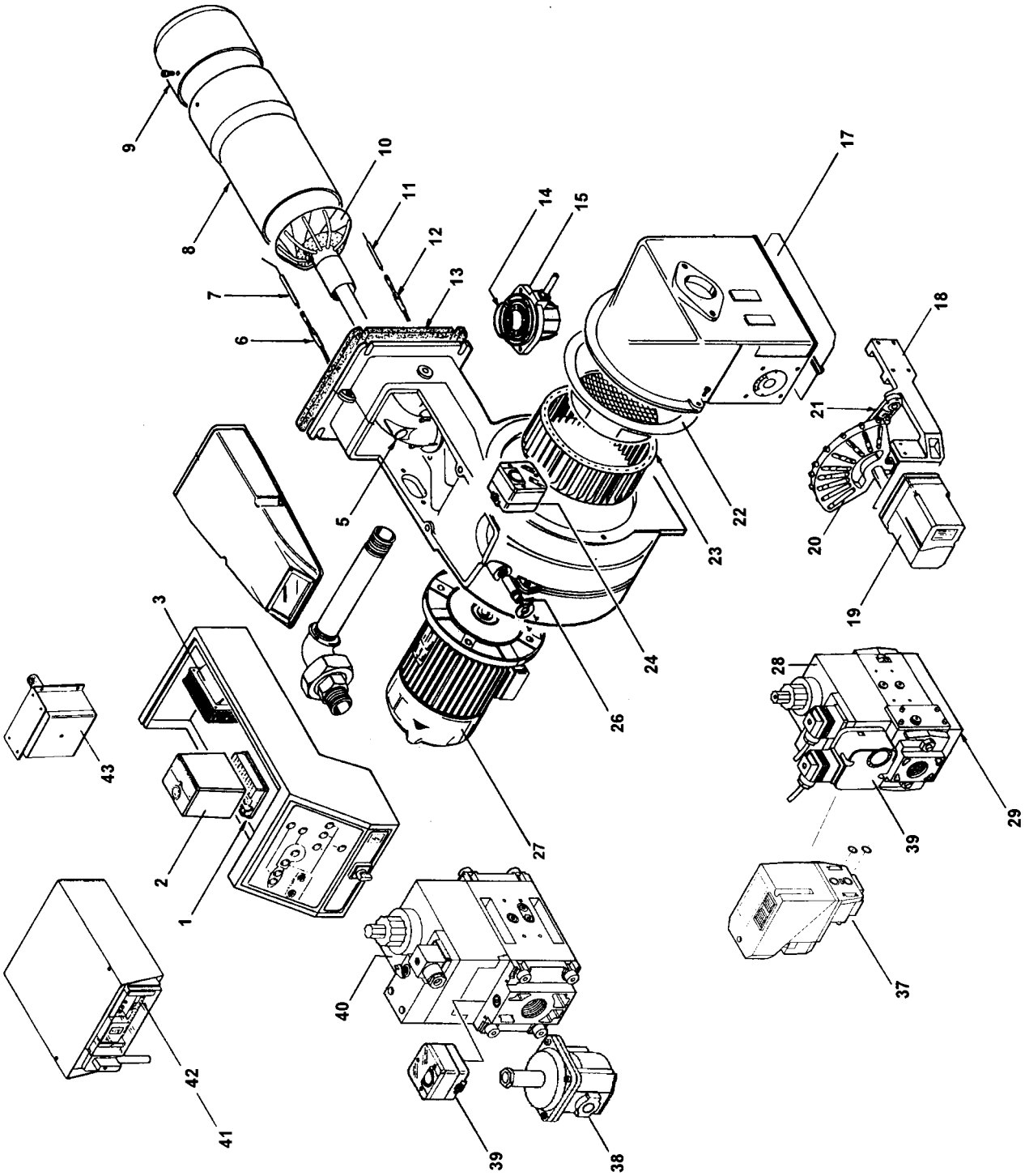
SPARE PARTS - Burners P20 - P30 L-.TN, L-.AB



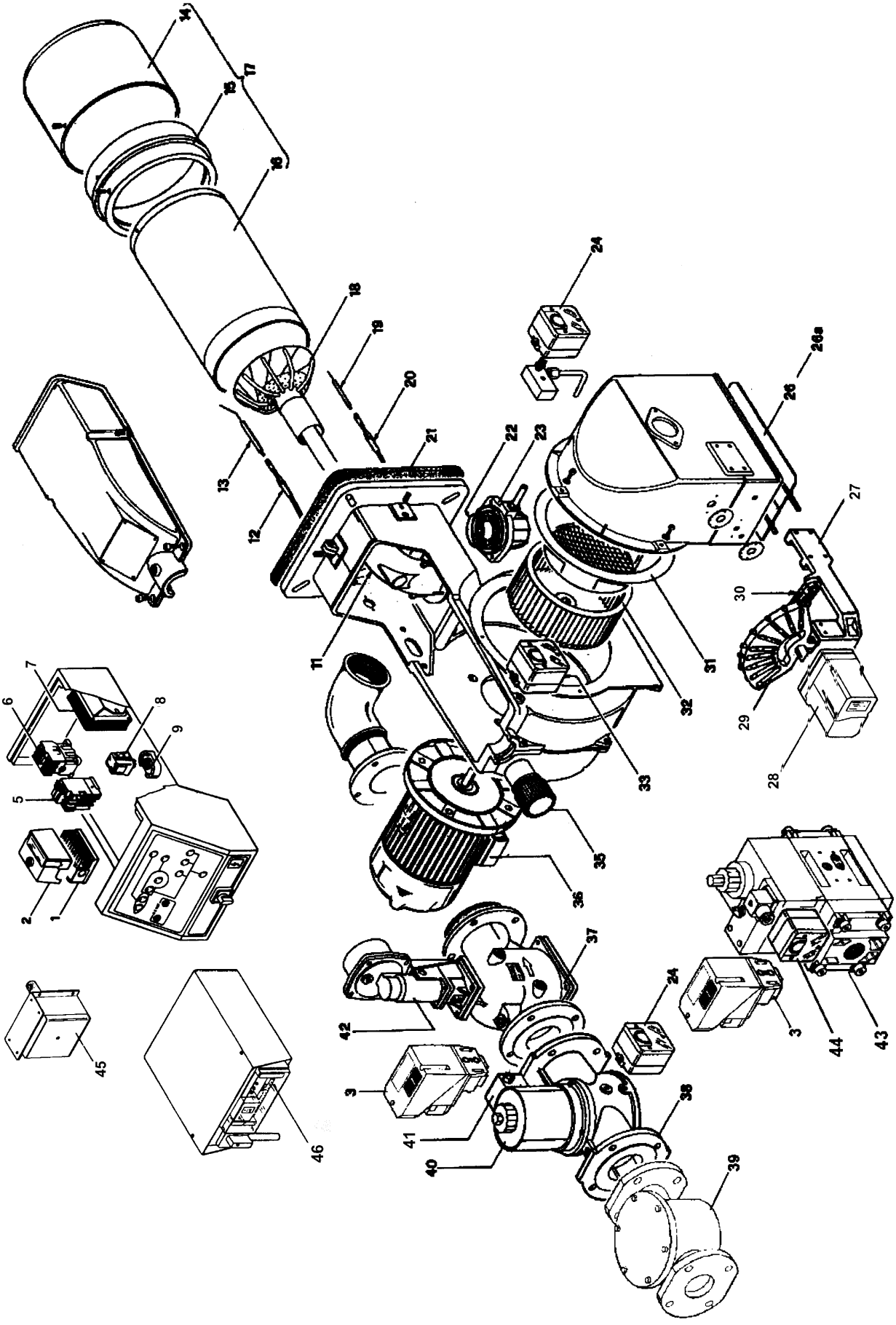
POS.	DESCRIPTION	P20 L-.XX.S.*.A.0.25	P20 L-.XX.L.*.A.0.25	P20 L-.XX.S.*.A.0.40	P20 L-.XX.L.*.A.0.40	P30 L-.XX.S.*.A.0.40	P30 L-.XX.L.*.A.0.40
1	SOCKET FOR FLAME CONTROL DEVICE	2030415	2030415	2030415	2030415	2030415	2030415
2	FLAME CONTROL DEVICE LGB21 (SINGLE STAGE)	2020443	2020443	2020443	2020443	2020443	2020443
2	FLAME CONTROL DEVICE LGB22 (HI-LO FLAME)	2020430	2020430	2020430	2020430	2020430	2020430
2	FLAME CONTROL DEVICE LMG21 (SINGLE STAGE)	2020449	2020449	2020449	2020449	2020449	2020449
2	FLAME CONTROL DEVICE LMG22 (HI-LO FLAME)	2020450	2020450	2020450	2020450	2020450	2020450
3	TANSFORMER	2170128	2170128	2170128	2170128	2170128	2170128
5	MANIFOLD	2740002	2740002	2740002	2740002	2740002	2740002
6	DETECTION CABLE	6050205	6050205	6050205	6050205	6050205	6050205
7	DETECTION ELECTRODE	2080106	2080106	2080106	2080106	2080102	2080102
8	COMPLETE BLAST TUBE	3090096	3090086	3090096	3090086	3090019	3091005
9	BLAST TUBE EXTENSION	---	---	---	---	---	2200046
10	COMBUSTION HEAD	3060073	3060072	3060073	3060072	3060005	3060005
11	IGNITION ELECTRODE	2080209	2080209	2080209	2080209	2080202	2080202
12	IGNITION CABLE	6050108	6050108	6050108	6050108	6050108	6050108
13	GASKET	2110004	2110004	2110004	2110004	2110004	2110004
14	"O" RING	2250001	2250001	2250001	2250001	2250001	2250001
15	THROTTLE VALVE (HI-LO FLAME)	2460221	2460221	2460221	2460221	2460221	2460221
15A	THROTTLE VALVE (SINGLE STAGE)	2460201	2460201	2460201	2460201	2460201	2460201
17	AIR DAMPER	2140005	2140005	2140005	2140005	2140005	2140005
18	SERVOC. SUPPORT BRACKET (HI-LO FLAME)	3050009	3050009	3050009	3050009	3050009	3050009
19	SERVOCONTROL (BERGER, VERS. HI-LO FLAME)	2480057	2480057	2480057	2480057	2480057	2480057
20	INLET CONE	2040016	2040016	2040016	2040016	2040016	2040016
21	FAN	2150006	2150006	2150006	2150006	2150006	2150006
22	AIR PRESSURE SWITCH	2140065	2140065	2140065	2140065	2140065	2140065
24	HEAD ADJUSTING SCREW	2320501	2320501	2320501	2320501	2320501	2320501
25	MOTOR	2180704	2180704	2180704	2180704	2180704	2180704
26	LEAKAGE CONTROL (OPTIONAL)	2191604	2191604	2191604	2191604	2191604	2191604
35	MINIMUM GAS PRESSURE SWITCH	2160052	2160052	2160052	2160052	2160052	2160052
37	MULTIBLOC VALVES GROUP	2190341	2190341	2190342	2190342	2190342	2190342
	PRINTED CIRCUIT	6100535	6100535	6100535	6100535	6100535	6100535
38	MULTIBLOC COIL	2580017	2580017	2580017	2580017	2580017	2580017


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POS.	DESCRIPTION	P45 L-.AB..S.. .40 L-.AB..L.. .40	P45 L-.AB..S.. .50 L-.AB..L.. .50	P65 L-.AB..S.. .50 L-.AB..L.. .50	P65 L-.AB..S.. .65 L-.AB..L.. .65
1	SOCKET FOR FLAME CONTROL DEVICE	203.04.15	203.04.15	203.04.15	203.04.15
2	CONTROL DEVICE LGB21 (SINGLE STAGE)				
2	CONTROL DEVICE LGB22 (HI-LO FLAME)	202.04.30	202.04.30	202.04.30	202.04.30
2	CONTROL DEVICE LMG21 (SINGLE STAGE)				
2	CONTROL DEVICE LMG22 (HI-LO FLAME))	202.04.50	202.04.50	202.04.50	202.04.50
3	OVERLOAD RELAY	---	---	614.00.32	614.00.32
4	CONTACTOR	---	---	613.00.16	613.00.16
5	IGNITION TRANSFORMER	217.01.28	217.01.28	217.01.28	217.01.28
6	RELAY	---	---	---	---
7	RELAY SOCKET	---	---	---	---
9	GAS PRESSURE SWITCH	216.00.76	216.00.76	216.00.76	---
11	MANIFOLD	274.00.02	274.00.02	274.00.03	274.00.03
12	DETECTION CABLE	605.02.05	605.02.05	605.02.05	605.02.05
13	DETECTION ELECTRODE	208.01.02	208.01.02	208.01.02	208.01.02
14	STANDARD BLAST TUBE EXTENSION	---	---	220.00.55	220.00.55
14	LONG BLAST TUBE EXTENSION	220.00.46	220.00.46	220.00.56	220.00.56
15	BLAST TUBE RING	---	---	247.00.37	247.00.37
16	BLAST TUBE BODY	---	---	230.00.55	230.00.55
17	STANDARD BLAST TUBE - COMPLETE	309.00.39	309.00.39	309.10.E9	309.10.E9
17	LONG BLAST TUBE - COMPLETE	309.10.F1	309.10.F1	309.10.E0	309.10.E0
18	COMBUSTION HEAD	306.00.C1	306.00.C1	306.00.C2	306.00.C2
19	IGNITION ELECTRODE	208.02.02	208.02.02	208.02.02	208.02.02
20	IGNITION CABLE	605.01.08	605.01.08	605.01.08	605.01.08
21	GASKET	211.00.13	211.00.13	211.00.33	211.00.33
22	RING "OR" FOR THROTTLE VALVE	225.00.03	225.00.03	225.00.03	225.00.03
23	THROTTLE VALVE	246.02.22	246.02.22	246.02.22	246.02.24
24	GAS PRESSURE SWITCH	216.00.10	216.00.10	218.02.03.01	218.02.03.01
26	INTERNAL AIR DAMPER	214.00.07	214.00.07	214.00.22	214.00.22
27	ESTERNAL AIR DAMPER	---	---	214.00.23	214.00.23
28	SERVOCONTROL SUPPORT BRACKET	305.00.09	305.00.09	305.00.10	305.00.10
29	SERVOCONTROL	248.00.42	248.00.42	248.00.42	248.00.42
30	LEAKAGE CONTROL	219.16.04	219.16.04	219.16.04	219.16.04
31	AIR INLET	204.00.17	204.00.17	204.00.11	204.00.11
32	FAN	215.00.21	215.00.21	215.00.18	215.00.18
33	AIR PRESSURE SWITCH	216.00.65	216.00.65	216.00.65	216.00.65
35	HEAD ADJUSTING KNOB	232.05.02	232.05.02	232.05.03	232.05.03
36	ELECTRIC MOTOR	218.00.91	218.00.91	218.02.03	218.02.03
37	GAS SOLENOID VALVE EV2	---	---	---	219.01.51
38	GAS SOLENOID VALVE EV1	---	---	---	219.03.21
39	GAS FILTER	---	---	---	209.01.17
40	COIL FOR EV1	---	---	---	258.00.05
41	PRINTED CIRCUIT FOR EV1	---	---	---	253.01.05
42	ACTUATOR WITH STABILIZER	---	---	---	219.01.20
43	MULTIBLOC VALVES GROUP	219.03.E9	219.03.E0	219.03.E0	---
	PRINTED CIRCUIT FOR ELECTRIC BOARD	610.05.35	610.05.35	610.05.35	610.05.35


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POS.	DESCRIPTION	P20 L-.MD.S.*.A.0.25	P20 L-.MD.L.*.A.0.25	P20 L-.MD.S.*.A.0.40	P20 L-.MD.L.*.A.0.40	P30 L-.MD.S.*.A.0.40	P30 L-.MD.L.*.A.0.40
1	SOCKET FOR FLAME CONTROL DEVICE	203.04.15	203.04.15	203.04.15	203.04.15	203.04.15	203.04.15
2	FLAME CONTROL DEVICE LANDIS LGB22	202.04.30	202.04.30	202.04.30	202.04.30	202.04.30	202.04.30
2	FLAME CONTROL DEVICE LANDIS LMG22	202.04.50	202.04.50	202.04.50	202.04.50	202.04.50	202.04.50
3	TRANSFORMER	217.01.02	217.01.02	217.01.02	217.01.02	217.01.02	217.01.02
5	MANIFOLD	274.00.02	274.00.02	274.00.02	274.00.02	274.00.02	274.00.02
6	DETECTION CABLE	605.02.05	605.02.05	605.02.05	605.02.05	605.02.05	605.02.05
7	DETECTION ELECTRODE	208.01.06	208.01.06	208.01.06	208.01.06	208.01.02	208.01.02
8	COMPLETE BLAST TUBE	309.00.96	309.00.86	309.00.96	309.00.86	309.00.19	309.10.05
9	BLAST TUBE EXTENSION	---	---	---	---	---	220.00.46
10	COMBUSTION HEAD	306.00.73	306.00.72	306.00.73	306.00.72	306.00.05	306.00.05
11	IGNITION ELECTRODE	208.02.09	208.02.09	208.02.09	208.02.09	208.02.02	208.02.02
12	IGNITION CABLE	60.01.08	605.01.08	605.01.08	605.01.08	605.01.08	605.01.08
13	GASKET	211.00.04	211.00.04	211.00.04	211.00.04	211.00.04	211.00.04
14	"O" RING	225.00.01	225.00.01	225.00.01	225.00.01	225.00.01	225.00.01
15	THROTTLE VALVE	246.02.21	246.02.21	246.02.21	246.02.21	246.02.21	246.02.21
17	AIR DAMPER	214.00.05	214.00.05	214.00.05	214.00.05	214.00.05	214.00.05
18	SERVOCONTROL SUPPORT BRACKET	305.00.11	305.00.11	305.00.11	305.00.11	305.00.11	305.00.11
19	SERVOCONTROL (BERGER)	248.00.53	248.00.53	248.00.53	248.00.53	248.00.53	248.00.53
20	ADJUSTABLE CAM	244.00.29	244.00.29	244.00.29	244.00.29	244.00.29	244.00.29
21	LEVER	244.00.15	244.00.15	244.00.15	244.00.15	244.00.15	244.00.15
22	INLET CONE	204.00.16	204.00.16	204.00.16	204.00.16	204.00.16	204.00.16
23	FAN	215.00.06	215.00.06	215.00.06	215.00.06	215.00.06	215.00.06
24	AIR PRESSURE SWITCH	216.00.65	216.00.65	216.00.65	216.00.65	216.00.65	216.00.65
26	HEAD ADJUSTING SCREW	232.05.01	232.05.01	232.05.01	232.05.01	232.05.01	232.05.01
27	MOTOR	218.07.04	218.07.04	218.07.04	218.07.04	218.07.04	218.07.04
28	MULTIBLOC COIL	258.00.17	258.00.17	258.00.17	258.00.17	258.00.17	258.00.17
29	MULTIBLOC VALVES GROUP	219.03.41	219.03.41	219.03.42	219.03.42	219.03.42	219.03.42
37	LEAKAGE CONTROL VPS504 (OPTIONAL)	219.16.04	219.16.04	219.16.04	219.16.04	219.16.04	219.16.04
39	MINIMUM GAS PRESSURE SWITCH	216.00.52	216.00.52	216.00.52	216.00.52	216.00.52	216.00.52
41	MODULATOR	257.00.34	257.00.34	257.00.34	257.00.34	257.00.34	257.00.34
42	FIELD ADAPTER	256.01..	256.01..	256.01..	256.01..	256.01..	256.01..
43	MODULATION PROBE	256.01..	256.01..	256.01..	256.01..	256.01..	256.01..


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POS.	DESCRIPTION	P45 L-.MD..S...40 L-.MD..L...40	P45 L-.MD..S...50 L-.MD..L...50	P65 L-.MD..S...50 L-.MD..L...50	P65 L-.MD..S...65 L-.MD..L...65
1	FLAME CONTROL DEVICE SOCKET	203.04.15	203.04.15	203.04.15	203.04.15
2	FLAME CONTROL DEVICE LANDIS LGB22	202.04.30	202.04.30	202.04.30	202.04.30
2	FLAME CONTROL DEVICE LANDIS LMG22	202.04.50	202.04.50	202.04.50	202.04.50
3	LEAKAGE CONTROL	219.16.04	219.16.04	219.16.04	219.16.04
5	OVERLOAD RELAY	---	---	614.00.32	614.00.32
6	CONTACTOR	---	---	613.00.16	613.00.16
7	IGNITION TRANSFORMER	217.01.02	217.01.02	217.01.02	217.01.02
8	RELAY	---	---	---	---
9	RELAY SOCKET	---	---	---	---
11	MANIFOLD	274.00.02	274.00.02	274.00.03	274.00.03
12	DETECTION CABLE	605.02.05	605.02.05	605.02.05	605.02.05
13	DETECTION ELECTRODE	208.01.02	208.01.02	208.01.02	208.01.02
14	STANDARD BLAST TUBE EXTENSION	---	---	220.00.55	220.00.55
14	LONG BLAST TUBE EXTENSION	220.00.46	220.00.46	220.00.56	220.00.56
15	BLAST TUBE RING	---	---	247.00.37	247.00.37
16	BLAST TUBE BODY	---	---	230.00.55	230.00.55
17	COMPLETE BLAST TUBE - STANDARD	309.00.39	309.00.39	309.10.E9	309.10.E9
17	COMPLETE BLAST TUBE - LONG	309.10.F1	309.10.F1	309.10.E0	309.10.E0
18	COMBUSTION HEAD	306.00.C1	306.00.C1	306.00.C2	306.00.C2
19	IGNITION ELECTRODE	208.02.02	208.02.02	208.02.02	208.02.02
20	IGNITION CABLE	605.01.08	605.01.08	605.01.08	605.01.08
21	GASKET	211.00.13	211.00.13	211.00.33	211.00.33
22	OR RING FOR THROTTLE VALVE	225.00.03	225.00.03	225.00.03	225.00.03
23	THROTTLE VALVE	246.02.22	246.02.22	246.02.22	246.02.24
24	GAS PRESSURE SWITCH	216.00.10	216.00.10	216.00.10	216.00.10
26	INTERNAL AIR DAMPER	214.00.07	214.00.07	214.00.22	214.00.22
26A	EXTERNAL AIR DAMPER	---	---	214.00.23	214.00.23
27	SERVOCONTROL SUPPORT BRACKET	305.00.11	305.00.11	305.00.12	305.00.12
28	SERVOCONTROL	248.00.53	248.00.53	248.00.53	248.00.53
29	ADJUSTABLE CAM	244.00.29	244.00.29	244.00.29	244.00.29
30	COMPLETE LEVER	244.00.15	244.00.15	244.00.15	244.00.15
31	INLET CONE	204.00.17	204.00.17	204.00.11	204.00.11
32	FAN	215.00.21	215.00.21	215.00.18	215.00.18
33	AIR PRESSURE SWITCH	216.00.65	216.00.65	216.00.65	216.00.65
35	HEAD ADJUSTING KNOB	232.05.02	232.05.02	232.05.03	232.05.03
36	ELECTRIC MOTOR	218.02.03.01	218.02.03.01	218.02.03.01	218.02.03.01
37	GAS SOLENOID VALVE EV2	---	---	---	219.01.51
38	GAS SOLENOID VALVE EV1	---	---	---	219.03.21
39	GAS FILTER	---	---	---	209.01.17
40	COIL FOR EV1	---	---	---	258.00.05
41	PRINTED CIRCUIT FOR EV1	---	---	---	253.01.05
42	ACTIVATOR WITH STABILIZER	---	---	---	219.01.20
43	MULTIBLOC VALVES GROUP	219.03.E9	219.03.E0	219.03.E0	---
44	GAS PRESSURE SWITCH	216.00.76	216.00.76	216.00.76	---
45	MODULATOR PROBE	256.01..	256.01..	256.01..	256.01..
46	MODULATOR RWF40	257.00.34	257.00.34	257.00.34	257.00.34
46	FIELD ADAPTER	257.01.12	257.01.12	257.01.12	257.01.12
46A	FLAME CONTROL DEVICE SOCKET	256.01..	256.01..	256.01..	256.01..

APPENDIX: COMPONENTS CHARACTERISTICS

LANDIS LGB 21/22.. FLAME CONTROLLER 51

LANDIS LMG21/22/25 FLAME CONTROLLER 54

GAS MULTIBLOC REGULATOR DUNGS MB-DLE 405-407-410-412-415-420 57

VALVE PROVING SYSTEM DUNGS VPS504 57

DOUBLE GAS VALVES VGD20 - VGD40 57

SAFETY SOLENOID VALVES DUNGS MV/5, MVD/5, MVDLE/5 SINGLE STAGE 57

LANDIS VALVES 58

SAFETY SOLENOID VALVE DUNGS SV/SV-D/SV-DLE 59

DOUBLE SOLENOID VALVE DUNGS DMV-DLE 59

PRESSURE REGULATOR DUNGS FRS 60

LANDIS LGB 21/22.. FLAME CONTROLLER

Function

The programme run is shown in the diagrams. The required and permissible input signals for the control part and flame supervision part are pictured as a hatching correspondingly in the function diagrams. If these input signals are missing, the controller interrupts the start-up programme and initiates a lock-out at the place where the safety regulations demand it.

The LGB types are fitted with under voltage protection, i.e. the load relay AR is de-energized when the supply voltage falls below 160 V. The burner control automatically attempts a new start-up when the supply voltage again exceeds 160 V

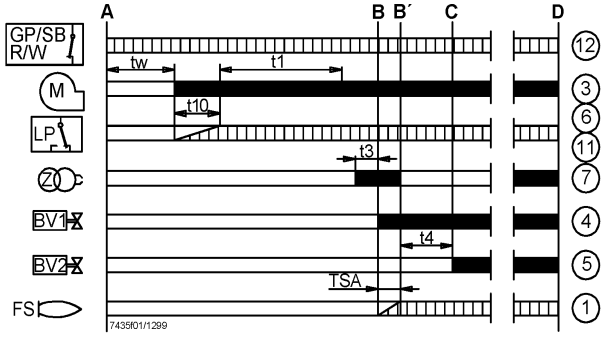
A Start-up command from the temperature or pressure controller “R”

A-C Start-up programme

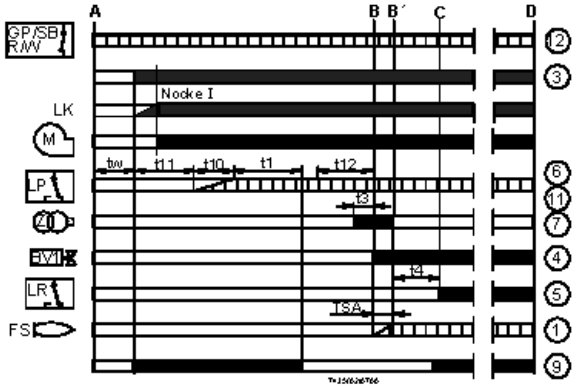
C-D Burner operation (heat production corresponding to the control commands)

D Controlled shut-down by “R”

LGB21



LGB22



Key for operation diagram

A - C Startup sequence

tw Waiting time, 8s for LGB21, 9s for LGB22

t1 Prepurge time 30s

TSA Ignition safety time 3s

t3 Preignition time, 2s for LGB21, 3s for LGB22

t4 Interval «BV1-BV2» or «BV1-LR», 8s

t10 Specified time for air pressure signal, 5s for LGB21, 3s for LGB22

t11 Programmed opening time for actuator «SA», max. 12s

t12 Programmed closing time for actuator «SA», max. 11s

BV Fuel valves

FS Flame presence signal

GP Gas pressure switch

LP Air pressure switch

LR Load controller

M Fan motor

R Temperature or pressure controller

W Safety thermostat or pressure switch

Z Ignition transformer

1...12 Terminals of the burner flame controls on AGK11's socket

Command signal from flame control

Input signals

Conditions for starting up the burner:

- The burner control must not be locked out.
- The contacts of the gas pressure switch ”GP", the temperature or pressure switch “W" and the controller “R", must be closed.

Start-up programme

A Start command (switching on)

This command is triggered by control thermostat / pressure controller «R». Terminal 12 receives voltage and the programming mechanism starts running. On completion of waiting time «tw» with the LGB21..., or after air damper «SA» has reached the nominal load position (on completion of «t11») with the LGB22..., fan motor «M» will be started.

tw Waiting time

During the waiting time, air pressure monitor «LP» and flame relay «FR» are tested for correct contact positions.

t11 Programmed opening time for actuator «SA»

(Only with LGB22...) The air damper opens until the nominal load position is reached. Only then will fan motor «M» be switched on.

t10 Specified time for air pressure signal

On completion of this period of time, the set air pressure must have built up, or else lockout will occur.

t1 Prepurge time

Purging the combustion chamber and the secondary heating surfaces: required with low-fire air volumes when using the LGB21... and with nominal load air volumes when using the LGB22.... The diagrams show the so-called prepurge time «t1» during which air pressure monitor «LP» must indicate that the required air pressure is available. The effective prepurge time «t1» comprises interval end «tw» through «t3».

t12 Programmed closing time for actuator «SA»

(Only with LGB22...)During «t12», the air damper travels to the low-fire position.

t3 Preignition time

During «t3» and up to the end of «TSA», flame relay «FR» is forced to close. On completion of «t3», the release of fuel is triggered at terminal 4.

TSA Ignition safety time

On completion of «TSA», a flame signal must be present at terminal 1. That flame signal must be continuously available until shutdown occurs, or else flame relay «FR» will be deenergized, resulting in lockout.

t4 Interval

LGB21...: time to the release of the second fuel valve «BV2»

LGB22...: on completion of «t4», the heat source is controlled depending on the load (release of load controller «LR»)

B - B' Interval for flame establishment

C Burner operation position

C - D Burner operation (heat production)
Operation of the burner at the maximum strenght or, with a flame controller for the load.

D Controlled by "R" shutdown
The burner stops, waiting for the next ignition.

Command program in the event of a defect

In the event of a defect the inflow of fuel is interrupted. When the block occurs in the preventilation time (not indicated by the symbol) the causes may be the air pressostat LP or a premature signal of flame presence.

- With voltage failure: repetition of the start-up with complete programme
- Premature presence of flame at the start of preventilation time: safety stop (block)
- Contact of air pressostat LP stuck during time tw: start-up cannot take place.
- Air pressure failure after t10: safety stop after safety time TSA
- Absence of confirmation of air pressure: safety stop(block) after t10
- Failure to start up the burner: safety stop after safety time TSA
- Absence of flame during functioning: immediate safety stop.
- Checking the ignition spark with QRE: with absence of spark there is no consent to the fuel, safety stop (block) after time t2.

Unblocking the appliance

Unblocking of the appliance can be effected immediately after the safety stop without causing modification of the programme.

Indicator of the command programme of the defective item

On the front part of the safety appliance is located a plexiglass lunette under which there is the indicator disc of programme's progress.

In the event of safety stop, the programmer stops. The disc shows, as follows, the position of the programme at which the interruption occurred:

►	no start-up, the command ring is open
IIII	interval tw or t10 on LGB21; tw or t11 on LGB22
▲	air damper open (LGB22)
P	safety stop (block) through absence of the air pressure signal (LGB21) or because (LGB22) the air damper is not open
➔➔➔	interval t1, t3 (t12)
▼	fuel consent (LGB22)
1	safety stop (block) through absence of the flame signal at the end of the 1st safety time
2	consent of the 2nd fuel valve (LGB 21) or consent at the power regulator (LGB22)
°°°°	functioning of the burner at partial or maximum power (or return to the service position)

Specifications

Supply voltage	220 V AC -15%...240 VAC +10%
Frequency	50 Hz -6%...60 Hz +6%
Consumption	3 VA
Flow rate of the contacts at terminals	
- terminal 3	max. 3 A (15 A max. for 0.5s)
- terminals 4, 5, 7	max. 2 A
- terminal 10	max. 1 A
- terminal 12 (for Umax 264 V)	max. 5 A*
Fuse max.	10 A, with slow blow-out
Radio disturbance	N - VDE0875
Protection	IP40
Permissible ambient temperature	
- operating	-20....+ 60°C
- transport and storage	-40....+ 70°C
Mounting pos. permitted	any
Mass (weight) without/with base	c. 230/310 g
Mass (weight) AGK66	c. 12 kg

*) At permissible voltage and that is 187...264 V

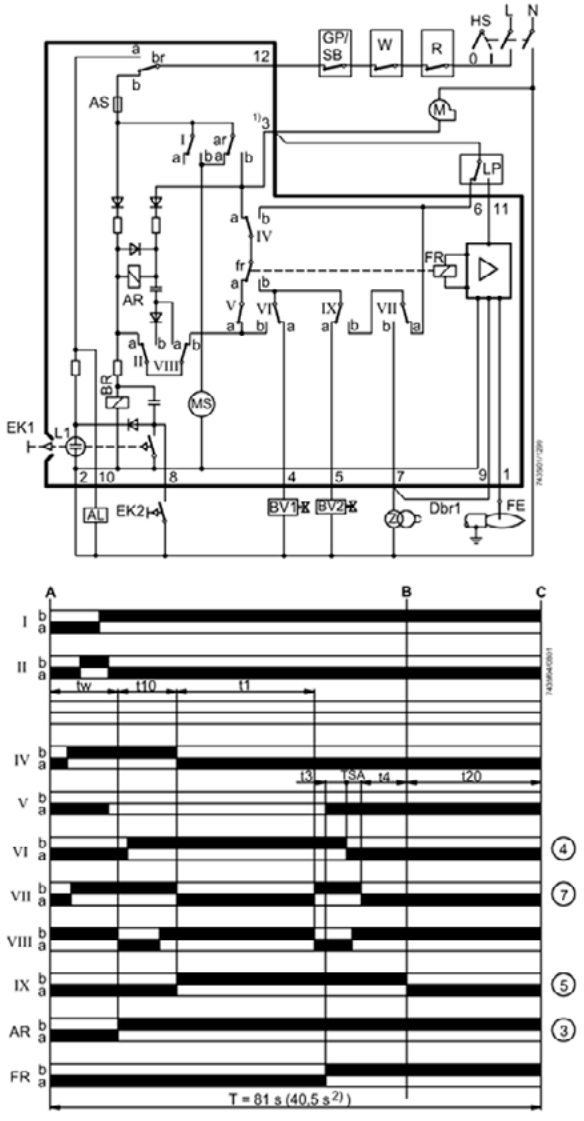
Key - internal diagram

AL	Block signal
AR	Main relay with "ar" contacts
BR	Block relay with "br" contacts
BV	Fuel valve
Dbr1	U bolt
EK	Unblocking button
FE	Detection electrode
FR	Flame relay with "fr" contacts
GP	Gas pressostat
HS	Main selector
L	Phase conductor
L1	Block light (blinking)
LP	Air pressostat
M	Fan motor
MS	Synchronous motor
N	Neutral conductor
R	Thermostat or pressostat
W	Safety thermostat or pressostat
Z	Ignition transformer

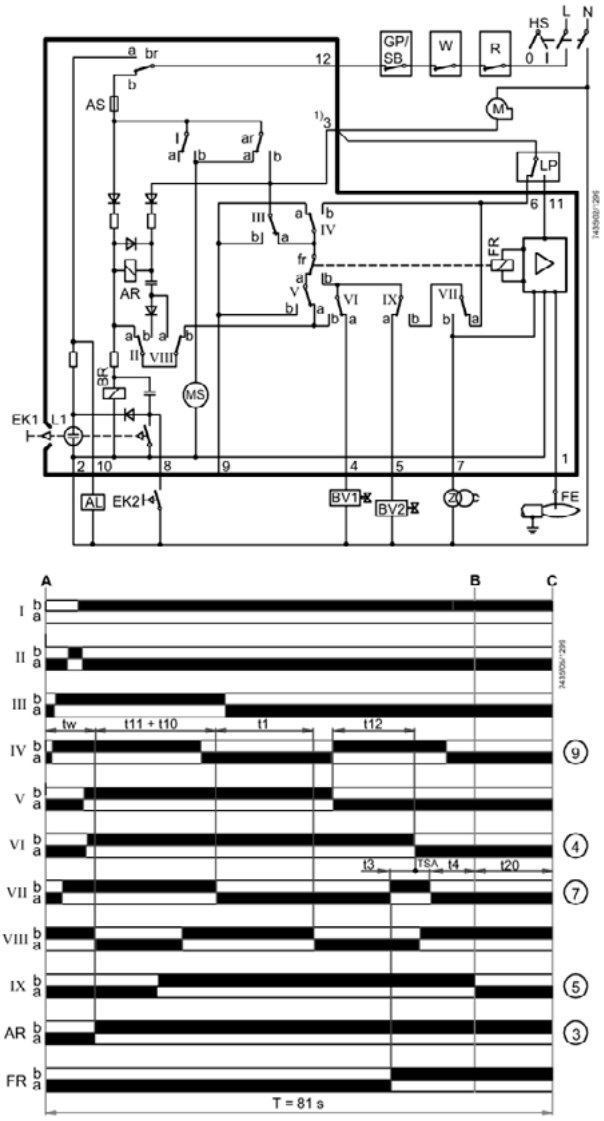
Key - programmer's diagram

A	start-up (command from regulator “R”)
B	burner operation
C	program start position (start up)
tw	waiting time
t1	preventilation time
TSA	safety time
t3	pre-ignition time
t4	interval of time BV1-BV2 or BV1-LR
t10	waiting time for confirmation of air pressure
t11	air damper movement time to open position
t12	air damper movement time to close position
t20	travel time for auto-return of the programmer
T	programmer's total time
I.IX	contacts of programmer's cams

LGB21



LGB22



LANDIS LMG21/22/25 FLAME CONTROLLER

FEATURES

The series of equipment LMG.. is interchangeable with the series LGB.., all diagrams and accessories are interchangeable, the main features are:

- Indications of error codes by a signalling red light in the release button;
- Programmer times fix for the digital management of signals.
  In case of lack of the flame during working the model LMG 25.33 doesn't stop but repeat the starting cycle
  maximum 3 times), if the problem persists, after the fourth starting the equipment stops .

Comparative table

Old series LGB	New series LMG
---	LMG 25.33
LGB 21.33	LMG 21.33
LGB 22.33	LMG 22.33

Conditions for startup

- Burner control is reset
- All contacts in the line are closed
- Fan motor "M" or AGK25 is connected
- Air pressure monitor "LP" is in idle position
- No undervoltage

Undervoltage

- Safety shutdown in the event the mains voltage is lower than typically AC 160V;
- a restart is made when the mains voltage exceeds AC 195V

Reversed polarity protection

If the connections of line (terminal 12) and neutral (terminal 2) have been exchanged, the burner control will initiatelockout at the end of "TSA"

Startup program

A Start-up, controlled by LR

Fan command after the waiting time tw for LMG21/25, or after the period t11 for LMG22.

tw Waiting time.

During this time the air pressure switch and the flame relay are tested for correct contact position.

t11 Programmed time for the opening of the servocontrol SA,

only with LMG22. The servocontrol SA moves to the low flame position.

t10 Specified time for the air pressure signal.

When this time has elapsed, the set value of air pressure must have built up, else a lock-out is initiated.

t1 Pre-purgue time.

Purguing of the combustion chamber and the secondary heating surfaces with low-load combustion head for LMG21/25, or with fully load combustion air for LMG22. The affective pre-purgue time comprises the interval between the end of tw and the start of t3.

t12 Programmed time to close the damper SA (MINIMUM)

(LMG22): During the time t12, the air damper moves to the low flame position.

t3n Postignition time

Ignition time during «TSA». Just before reaching the end of «TSA», ignition transformer «Z» will be switched off. This means that «t3n» is somewhat shorter than «TSA». This is necessary in order to give the forcedly closed flame relay «FR» sufficient time to drop out if there is no flame.

t3 Pre-ignition time.

Ignition time until the opening of BV1.

TSA Ignition safety time.

Opening of fuel valve BV1; the flame signal must be present at the terminal 1 up tho the end of TSA.

t4 Interval BV-BV2 or BV1-LR.

Interval between the end of TSA and the consent to the second fuel valve BV2 or to the load regulator LR.

B-B' Interval for the flame establishment.

C Operating position of the burner.

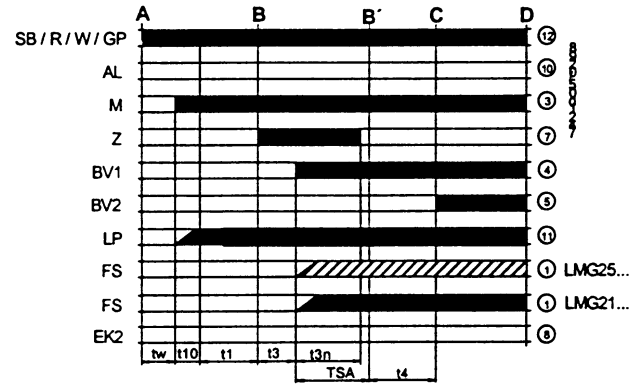
C-D Burner operation (heat production)

D Controlled shut-down by LR.

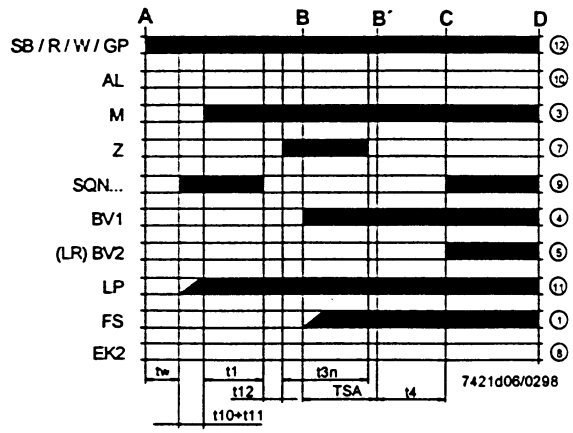
The burner is shut-off immediately and the flame control device is ready for a new start.

FUNCTIONS

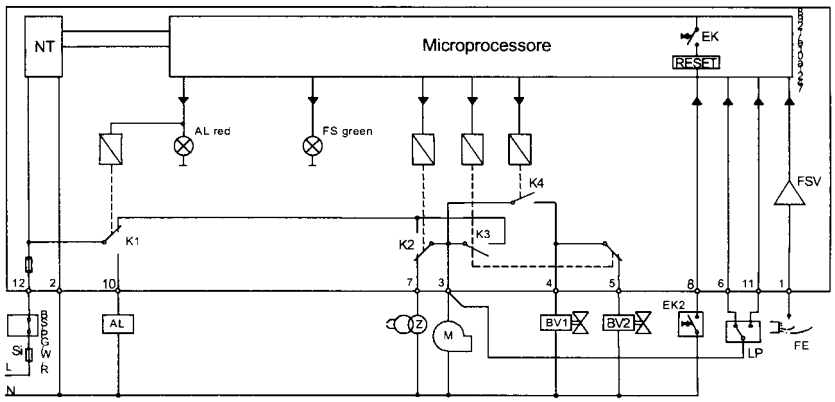
LMG21.../LMG25...



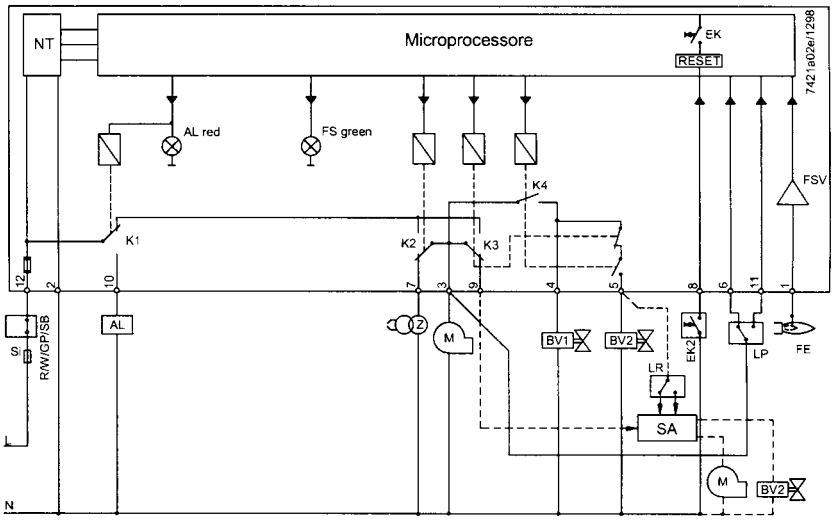
LMG22...



Internal diagram LMG21/25



Internal diagram LMG22



Operations key

AL Alarm
BV Fuel valve
EK2 Remote reset button
FS Flame presence signal
GP Gas detection pressure switch
LP Air pressure switch
LR Burner's output regulation
M Fan motor
R Safety thermostat or pressure switch
SB Safety limit
W Regulation thermostat or pressure switch
Z Ignition transformer
tw Waiting time
t1 Pre-ventilation time
TSA Ignition safety time
t3 Pre-ignition time
t3n Ignition time during “TSA”
t4 Interval BV-BV2 or BV1-LR
t10 Specified time for air pressure signal
t11 Programmed opening time for actuator SA
t12 Programmed closing time for actuator SA

Control program in the event of fault

- If a fault occurs, all outputs will immediately be deactivated (in less than 1s).
- On restoration of power, a restart will be made with the full progra sequence.
- If the operating voltage drops below the undervoltage thresold.
- If there is a premature faulty flame signal during t1, a lockout occurs.
- If the contact of air pressure monitor LP has welded in the working position, prevention of startup and, after 8.5s: lockout.
- If the contact of the air pressure monitor LP has welded in the idle position: lockout at the end of t10.
- If the burner doesn't ignite by the end of TSA: lockout
- If flame is lost during operation: lockout

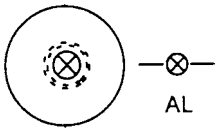
IMPORTANT:

- **The release of the equipment can be carried out after each stop pressing the release button for 0.5- 3 seconds. Then the equipment pulses to signal the happened release.**

- **To control the stop cause it is necessary to wait for 10 seconds, then press the release button for more than 3 seconds and count pulses (the equipment repeats pulses at regular intervals).**

Flame control device stopped

- Stop red lamp switched on.



Release of the flame control device

- Press the release button for 0.5 ÷ 3 seconds.

Diagnosis of troubles

- Wait at least 10s.
- Press the release button for >3s.
- - Count the number of flashing of the green lamp and compare with the “Diagnosis Table”

Diagnosis table

Number of flashing

- Possible causes

2 flashing **

No flame at the end of the "Safety time":

- Detection electrode dirty
- Fuel valve faulty
- Gas doesn't reach the burner

3 flashing ***

The air pressure switch doesn't commute or is at rest:

- Pressure switch faulty
- The fan motor doesn't work
- Air lock servocontrol (where arranged) faulty

4 flashing ****

The air pressure switch is not commuted at rest as well as on air, or it remains commuted on air:

- Pressure switch faulty
- The calibration of air pressure switch is too sensible

5 flashing *****

Foreign light

7 flashing *******

Lack of flame during working:

- Calibration of the burner not optimum
- Trouble or gag of the fuel valve

8 ÷ 17 flashing * ÷ ******

Not used

18 flashing ******************

During pre-ventilation the oressure switch commutes and then comes back to the rest:

- Air pressure switch faulty or calibration too high

19 flashing *******************

Trouble of contacts outlet:

- Errors of electric connection
- Anomalous voltage to outlet terminals

20 flashing ********************

Internal error of the flame control equipment

GAS MULTIBLOC REGULATOR DUNGS MB-DLE 405-407-410-412-415-420

Specifications

Nominal diameters - Flange with pipe threads as per ISO 7/1 (DIN 2999)
MB 405-407: Rp1/2, 3/4 and their conbinations
MB 410-412: Rp3/4, Rp1, $Rp1_{1/4}$ and their combinations
MB 415 B01: Rp1, $Rp1_{1/4}$, $Rp1_{1/2}$, Rp2 and their combinations
MB420 B01: Rp1, $Rp1_{1/4}$, $Rp1_{1/2}$, Rp2 and their combinations

Max. operating pressure	360 mbar
Output pressure range	4 mbar to 20 mbar
Pressure stage	PN1

Media gas of families 1, 2, 3 and other neutral gaseous media

Ambient temperature	-15 °C to +70 °C

Dirt trap Sieve with 0.8 mm mesh width, filter made of random laid nonwoven fabric microfilter, two-layer, changing the filter is possible without removing the valve.

Pressure switches	Types GW A5, GW A2, NB A2, ÜB A2 mountable as per DIN EN 1854.
Pressure regulator	Pressure regulator compensated for

residual pressure, leakproof seal when switched off by means of valve V1 as per DIN EN 88 Class A. Setpoint spring permanently installed (no spring exchange possible). A vent line above roof is not required. Internal pulse tap provided.

Solenooid valve 1	Valve as per DIN EN 161, Class A, Group 2, fast closing, fast opening
Solenoid valve 2	valve as per DIN EN 161, Class A, Group 2, fast closing, slow opening

Measuring/ignition gas connection
For G 1/8 as per DIN ISO 228
Burner pressure monitor pBr
Connection downstream of valve V2, pressure switch A2 mountable on adapter laterally

Closed position signal contact	Closed position signal contact type K01/1 (DIN tested), mountable on V2
Voltage/frequency	~(AC) 50-60Hz 230 V -15% +10%
Preferred voltages	240VAC, 110-120VAc, 24-28VDC, 48VDC
Electrical connection	Plug connection as per DIN 43 650, IEC 335, IEC 730 (VDE 0700, VDE 0722) for valves and pressure switches
Rating power/consumption	upon request
Switch on duration	100% ED
Degree of protection	IP54 as per IEC 529 (EN 60529)
Radio interference	Interference degreeN
Material of gas-conveying parts	
housing:	aluminium die casting;
diaphragms, seals:	NBR basis, Silopren (silicone rubber)
solenoid drive:	steel, brass, aluminium.
Installation position	
Solenoid	vertically upright or lying horizontally as well as its intermediate positions

DOUBLE GAS VALVES VGD20 - VGD40

Double gas valves for use on gas trains, consisting of 2 class «A» safety shut-off valves.

In combination with the SKP… actuators, the gas valve also serves as a shut-off valve (in connection with the SKP10) or control valve with shut-off function (in connection with the SKP20, SKP70).

The double gas valves VGD20... are of the normally closed type. The high closing force of the return spring is supported by the prevailing gas pressure (class «A» to EN 161). A strainer on the inlet side protects the valve and downstream controls against dirt.

Technical data

Class	A (EN 161)
Group	2 (EN 161)
Types of gases	Gas families I, II, III (to G260 of DVGW), air

Maximum gas pressure admissible
VGD20.503: 600 mbar - VGD40.065, 0.80, 100: 700 mbar

Built-in strainer, mesh size	0.9 mm

Permanent medium temperature-15...+60 °C

Mounting	spring housing horizontal or vertical, pointing downward

Operation

Climatic conditions	class 3K6
Mechanical conditions	class 3M2
Temperature range	-10...+60 °C
Humidity	<95%

SAFETY SOLENOID VALVES DUNGS MV/5, MVD/5, MVDLE/5 SINGLE STAGE

Specifications

Flange Connection	flange as per DIN 2501 Part1
Max. operating pressure	up to 200 mbar (20 kPa), 360 mbar (36kPa) or up to 500 (50 kPa) mbar
Solenoid valve	Valve as per EN 161, Class A, Group 2, single-stage mode
Pressure stage	PN 1
Closing time	< 1 s
Opening time	< 1 s for MVDLE approx. 20 s at room temperature 20°C and without fast stroke
Fast stroke	Adjustable
Main volume adjustment	Manually adjustable on MVD and MVDLE
Materials of gas-conveying parts	
Housing	aluminium, steel, brass
Seals	NBR basis
Voltage/frequency	230 V AC (+10 % -15 %); 50-60 Hz - other voltages on request
Rating / power consumption	Refer to type overview
Switch-on duration	100 %
Degree of protection	P 54, IP 65 on request
Electrical connection	At screw terminals via PG* 11 cable gland (* = heavy-gauge conduit thread)
Plug connection	as per DIN 43650 can be retrofitted
Switching rate	
MVD…/5	max. 1000/h MVD 2200,
MVDLE…/5	max. 100/h MV 5100/5 S, MV 2125/5 S
MV 2150/5 S	max. 20/h
Measuring/ignition gas connection	G 1/4 ISO 118, on both sides in inlet section, additionally G 3/4 on input side, form size DN 40 (flange) upwards
Dirt trap	Sieve installed, mesh width 1 mm
Ambient temperature	-15 ° C to + 60 ° C
Installation position	Solenoid from vertically upright to horizontally lying
Closed position signal contact	Type K01/1, DIN-tested, mountable on DN 10 - DN 150
Valve proving system	Type VDK 200 A S02, mountable via G1/4 test connection, Type VPS 504, mountable with adapter up to DN 80

VALVE PROVING SYSTEM DUNGS VPS504

Specifications

Operating pressure	max.500 mbar (50 kPa)
Test volume	4.0 l
Pressure increase by motor pump	20 mbar
Nominal voltage	~(AC) 230V -15%...240V +10% DC 24V
Frequency	50 Hz
Rating requirement during pumping time	approx, 60 VA, in operation 17 VA
Prefuse (provided by the customer)	10 A quick-acting fuse or 6.3 slow-blow fuse
Fuse	installed in housing cover, replaceable microfuse 6.3 A slow-blow L 250 V; IEC-127-2/III (DIN 41 662)
Degree of protection	IP40 (IP54 series 04, 05)
Ambient temperature	50 Hz 230 VAC -15°C to +70°C, others: -15°C to +60°C
Release time	Approx. 10 - 26s, depending on test volume and input pressure
Sensitivity limit	max. 50 l/h
Switch on duration of control	100%
Max. number of test cycles	20/h
Installation position	upright, horizontal, not inverted

LANDIS VALVES

Operation

Single stage valves

When the command to open the valve is given, the pump is switched on and the relief valve is simultaneously closed. From the nearly filled reservoir below the piston, the oil is now pumped into the chamber above the piston, causing the piston to move downward and thus opening the valve - against the force of the retum spring.

The pump remains energized until the command is given to close the valve.

When the valve closes (or when the electrical supply is interrupted), the pump stops and the relief valve opens the bypass thus allowing the return spríng with the aid of the pressure of the gas to push the piston upward again.

The flow characteristic of the relief valve is such that the valve fully closes in less than 0.8 second.

Actuators with gas pressure governors

With these actuators the outlet pressure represents the actual value which acts on a diaphragm. The diaphragm is supported by a spring the force of which is adjustable, representing the setpoint.

The movements of the diaphragm are transferred to a lever system which opens and closes a ball valve situated in the bypass between the pressure side and the reservoìr. If the actual value is smaller than the setpoint, the bypass is closed so that the actuator can open the valve.

If the actual value exceeds the setpoint, the bypass is opened to some extent so that some oil can return from the pressure side to the reservoír. The piston travels upward and the valve is slightly closed. This movement of the piston comes to a stand still as soon as actual value and setpoint are identical.

In this position the opening of the bypass is such that the retum flow through the bypass corresponds to the current oil output of the pump.

The control characteristic is that of a P-controller with a very small proportional band. Inspite of this the control stability is good since the piston velocities are small.

Design Features

Servocontrol

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

A solenoid valve is mounted between the suction chamber and the pump chamber as a seal.

A disc, with the aid of a lever system, also actuates the auxiliary switch to signal the "close" position or other positions, as well as the limit changeover switches for the positioning of the low-fire and high-fire stroke with high-low valves. The switching positions of these switches are adjustable over the entire stroke.

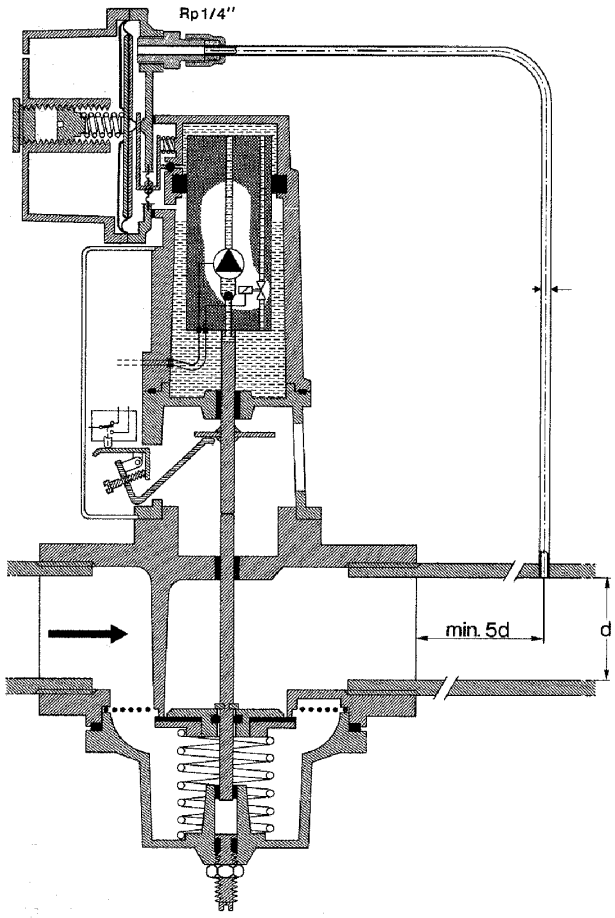
Gas pressure governor

The governor has a working diaphragm, a safety diaphragm, a set-point spring and a lever system which actuates a ball valve in the bypass between the pressure side and the reservoir of the hydraulic system (also refer to "Functions"). Setting range: 0 to 22 mbar or, replacing the spring, up to 250 mbar.

Connection of 1/4" pressure port

Due to the use of a safety diaphragm a vent pipe is not required with inlet pressures of up to 100 mbar. If employed in connection with valve proving system, the massimum permissible vacuum is 200mbar.

The housing of actuator and governor are made of die-cast aluminium.



Simplified draw of gas valve fitted with servomotor and pressure governor.

Series 01: solenoid relief valve;

Series 02: hydraulic valve pushed during shutt-off by pump's pressure

Terminal designations

V	Control input
V1	Control input stage 1
V2	Control input stage 2
N	Neutral (MP)
IV	Auxiliary switch

SAFETY SOLENOID VALVE DUNGS SV/SV-D/SV-DLE

Technical Description

The Dungs safety solenoid valve SV is a single-stage automatic shut-off valve to EN 161 for gas burners and gas burning appliances:

- Double-disc valves
- Max. operating pressure up to 0.5 bar
- Standard IP 65
- Zero current shutoff
- SV, SV-D: fast-open
- SV-DLE: slow-open with adjustable fast stroke for starting gas flow
- DC solenoid

Application

The solenoid valve is used for securing, limiting, shutting off and releasing the gas supply to gas burners and gas burning appliances. The DUNGS SV-… safety solenoid valve is suitable for gases of gas families 1, 2, 3 and other inert gaseous media.

Technical Data

Max. operating pressure	500 mbar (50 kPa)
Pressure stage	PN 1
Solenoid valve	auto shut-off valve complying with EN 161: class A, group 2
Closing time	< 1 s
Opening time	SV…, SV-D… : < 1 s
SV-DLE… :	approx. 20 s at room temperature + 20 °C and without fast stroke
Fast stroke	adjustable on SV-DLE…
Flow restrictor	adjustable on SV-D… and SV-DLE…
Materials of gas-conveying parts	
housing	aluminium, steel, free of non-ferrous metals
seals in valve seat	NBR based, suitable for gases as per G260/l
Ambient temperature	-15 °C up to +60 °C
Installation position	Solenoid arranged vertically to horizontally
Dirt trap	Integrated strainer. To protect the entire gas train, we recommend installing an upstream gas filter. Measuring gas connection G 1/8 DIN ISO 228: SV-… at valve inlet, in the centre; at output flange for SV-… 510 - 520; on both sides in front of and behind the valve seat, at the valve outlet in the centre. Pressure switch retrofittable: to the side, at the inlet and outlet flanges. Fitting a pressure switch can exclude measuring gas/ ignition gas connection.
Voltage / frequency	~(AC) 50 - 60 Hz 230 V -15 % + 10 %, other voltages on request. Standard voltages: ~(AC) 24 V, 110 V, 120 V, =(DC) 48 V, =(DC) 24 V - 28 V
Rating / power consumption	at ~(AC) 230 V, + 20 °C: see type summary
Protection	IP 65
Switch-on duration	100 % ED
Electrical connection	Plug-in connection to DIN EN 175301-803
Radio interference suppression	Interference level N
Valve proving system	Type VPS 504 S... retrofittable, on SV-… 510 - 520

DOUBLE SOLENOID VALVE DUNGS DMV-DLE

Technical description

The DUNGS double solenoid valve DMV integrates two solenoid valves in one compact fitting.

Application

Double solenoid valves are used where two single valves were mounted previously. In connection with DUNGS gas regulators and additional components, a wide variety of regulating tasks can be performed. Suitable for gases of families 1, 2, 3 and other neutral gaseous media.

Specifications

Max. operating pressure	500 mbar (50 kPa)
Pressure stage	PN 1
Solenoid valve 1	Automatic shut-off valve as per EN 161: Class A, Group 2
Solenoid valve 2	Automatic shut-off valve as per EN 161: Class A, Group 2
Closing time	< 1 s
Opening time	DMV-D…/11: < 1 s DMV-DLE…/11: approx. 20 s at room temperature +20°C and without fast stroke
Fast stroke	regolabile (Rp2) Adjustable up to approx. 70% of total stroke (DN65-80-100)
Main valve restrictor	Adjustable
Materials of gas conveying parts	
Housing:	aluminium, steel, no non-ferrous metals
Seals at valve seat:	NBR basis, suitable for gases as per G260/l
Ambient temperature	-15 °C to +60 °C
Installation position	Solenoid vertically upright to lying horizontally
Dirt trap	Sieve installed. To protect the complete gas train we recommend you to install an upstream gas filter (refer to Datasheet 2.03)
Measuring gas connection	
Rp2	G 1/8 DIN ISO 228 on both sides upstream of V1, between V1 and V2, downstream of V2 at input and output flanges. Pressure switch can be mounted to input and output flanges. By mounting a pressure switch, measuring/ignition gas connection can be partly excluded.
DN65-80-100	G 1/4 DIN ISO 228 centrally upstream of V1 and downstream of V2 G 1/8 DIN ISO 228 on both sides upstream of V1, between V1 and V2, downstream of V2
Ignition gas connection	Rp2: G 1/2 ignition gas flange as per ISO 228, possible on both sides between V1 and V2 DN65-80-100: G 3/4 ignition gas flange as per ISO 228, possible on both sides between V1 and V2
Voltage/frequency	50 - 60 Hz, 220 V - 240 V AC, -15% +10%, further voltages on request
Degree of protection	IP 54
Switch-on duration	100 % ED
Electrical connection	Rp2: Plug connection as per DIN EN 175301-803, PG* 11 cable gland on request (* = heavy-gauge conduit thread) DN65-80-100: PG* 11 cable gland, plug connection as per DIN EN 175301-803 on request (* = heavy-gauge conduit thread)
Radio interference	Degree of interference N

PRESSURE REGULATOR DUNGS FRS

Technical description

The DUNGS pressure regulator, type FRS, has an adjustable setpoint spring. The pressure regulator complies with EN 88 and DIN 3380

Application

Gas pressure regulator for gas burners and gas equipment. It does not contain any non-ferrous metals, suitable for gases of up to max. 0.1 vol.% H2S, dry. Suitable for gases of families 1, 2, 3 and other neutral gaseous media.

Specifications

Max. operating pressure	up to 500 mbar (50 kPa)
Pressure regulator	Pressure regulator as per EN 88, Class A, Group 2, DIN 3380, RG 10
Input pressure range	+ 5 mbar or p2 +2.5 mbar up to 500 mbar
Pressure stage	PN 1
Output pressure range	2.5 mbar to 150 mbar as a factor of adjustable setpoint spring
Materials of gas-conveying parts	Housing: aluminium, steel Seals and diaphragms: NBR
Ambient temperature	-15 °C to + 70 °C
Installation position	Regulator dome from vertically upright to lying horizontally
Measuring/ignition gas connections	G 1/4 ISO 228 on both sides in inlet section



CIB UNIGAS

Via C. Colombo, 9 - 35011 Campodarsego (PD) Italy
Tel. +39-049-9200944 - Fax +39-049-9200945/9201269
Internet: www.cibunigas.it - E mail: cibunigas@cibunigas.it

CIB UNIGAS 600V

CONTROLLER



CE

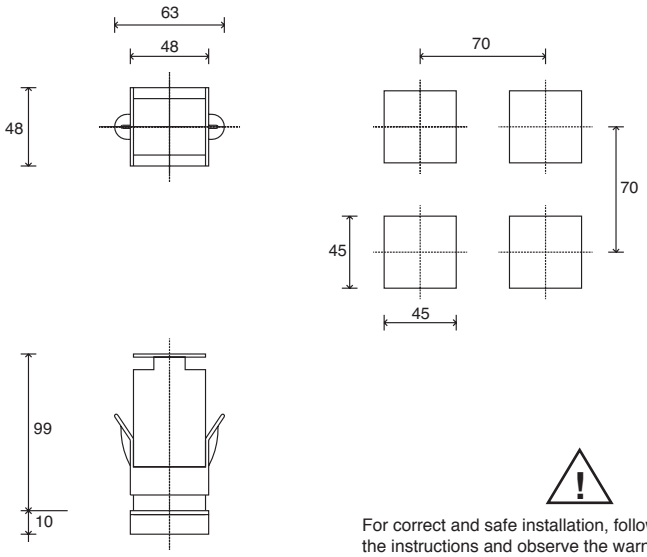
USER'S MANUAL

COD. M12925CA Rel 1.2 08/2014

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

1 • INSTALLATION

• Dimensions and cut-out; panel mounting



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

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

CE MARKING: The instrument conforms to the European Directives 2004/108/CE and 2006/95/CE with reference to the generic standards: **EN 61000-6-2** (immunity in industrial environment) **EN 61000-6-3** (emission in residential environment) **EN 61010-1** (safety).
MAINTENANCE: Repairs must be done only by trained and specialized personnel.
Cut power to the device before accessing internal parts.
Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene, etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.
SERVICE: GEFRAN has a service department. The warranty excludes defects caused by any use not conforming to these instructions.

EMC conformity has been tested with the following connections

FUNCTION	CABLE TYPE	LENGTH
Power supply cable	1 mm²	1 m
Relay output cable	1 mm²	3,5 m
TC input	0,8 mm² compensated	5 m
Pt100 input	1 mm²	3 m

2 • TECHNICAL SPECIFICATIONS

Display	2x4 digit green, high display 10 and 7mm
Keys	4 of mechanical type (Man/Aut, INC, DEC, F)
Accuracy	0.2% f.s. ±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) *Max line resistance for RTD*	DIN 43760 (Pt100), JPT100 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 position
Controls	PID, Self-tuning, on-off
pb - dt - it	0,0...999,9 % - 0,00...99,99 min - 0,00...99,99 min
Action	Heat / Cool
Control outputs	on / off
Maximum power limit heat / cool	0,0...100,0 %
Cycle time	0...200 sec
Main output type	relay, logic, continuous (0...10V Rload ≥ 250KΩ, 0/4...20mA Rload ≤ 500Ω)
Softstart	0,0...500,0 min
Fault power setting	-100,0...100,0 %
Automatic blanking	Displays PV value, optional exclusion
Configurable alarms	Up to 3 alarm functions assignable to an output, configurable as: maximum, minimum, symmetrical, absolute/deviation, LBA
Alarm masking	- exclusion during warm up - latching reset from faceplate or external contact
Type of relay contact	NO (NC), 5A, 250V/30Vdc 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.) 11...27Vac/dc ±10%; 50/60Hz, 8VA max
Faceplate protection	IP65
Working / Storage temperature range	0...50°C / -20...70°C
Relative humidity	20 ... 85% non-condensing
Environmental conditions of use	for internal use only, altitude up to 2000m
Installation	Panel, plug-in from front
Weight	160g for the complete version

3 • DESCRIPTION OF FACEPLATE

Function indicators
Indicates modes of operation

L1 MAN/AUTO = OFF (automatic control)
ON (manual control)

L2 PRE-HEATING = ON (running)

L3 SELFTUNING = ON (enabled Self)
OFF (disabled Self)

Automatic/Manual adjustment selection
Active only when PV display visualises the process variable (button pressed for at least 5 sec.)



Indication of output states
OUT 1 (AL1); OUT 2 (OPEN); OUT 3 (CLOSED)

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

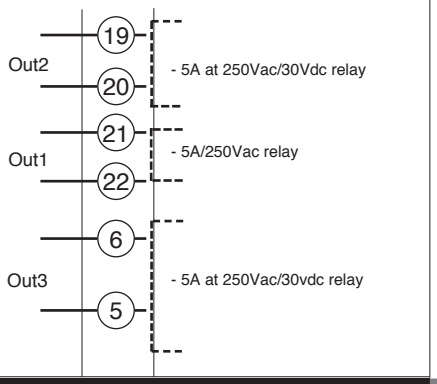
SV display: Indication of setpoint

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

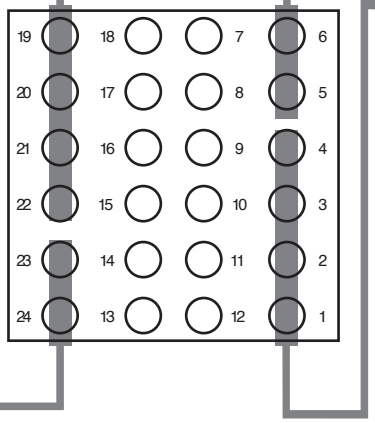
"Inc" and "Dec" key
Press to increment (decrement) any numerical parameter •• Increment (decrement) speed is proportional to time key stays pressed •• The operation is not cyclic: once the maximum (minimum) value of a field is reached, the value will not change even if the key remains pressed.

4 • CONNECTIONS

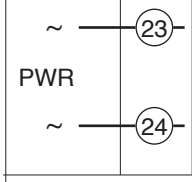
• Outputs



TOP



• Power Supply



Standard:
100...240Vac ± 10%

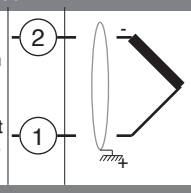
Optional:
11...27Vac/Vdc ± 10%

Max. power 8VA; 50/60 Hz

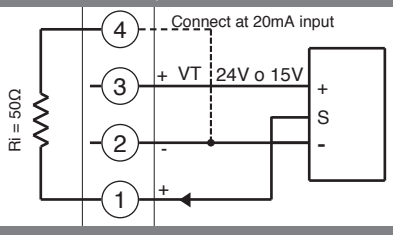
• Inputs

• TC Input

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



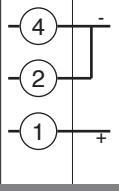
• Linear input with 3-wire transmitter



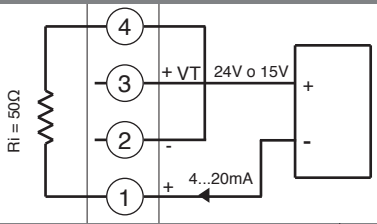
• Linear input (I)

Linear input in dc current

20mA, Ri = 50Ω

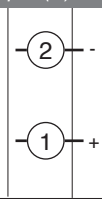


• Input 1 linear with transmitter 2 wires



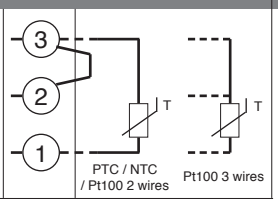
• Linear input (V)

Linear input in dc voltage
60mV, 1V
Ri > 1MΩ
5V, 10V
Ri > 10KΩ



• Pt100 / PTC / NTC

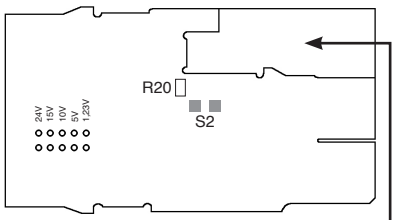
Use wires of adequate diameter (min. 1mm²)
PT100, JPT100, PTC, NTC



• Identification of boards

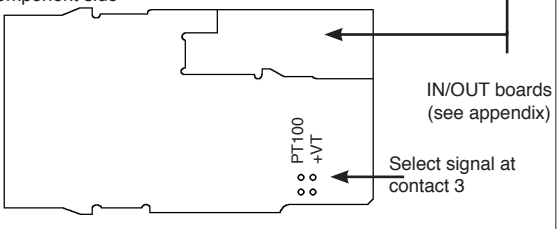
Power board - Solder side

Select transmitter voltage



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

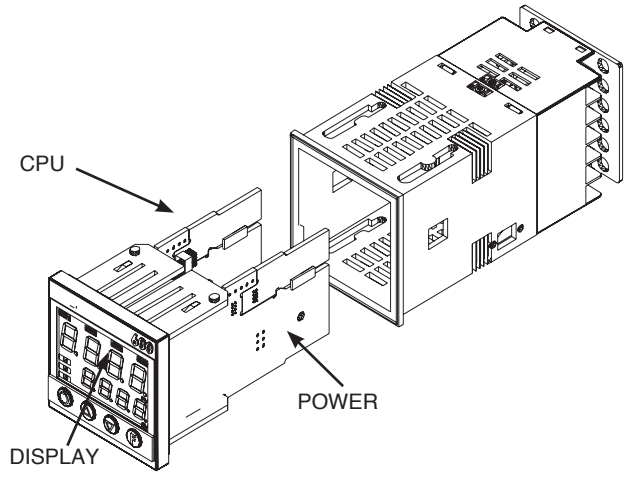
CPU board - Component side



IN/OUT boards (see appendix)

Select signal at contact 3

• Device structure



5 • "EASY" PROGRAMMING and CONFIGURATION

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

S4 Jumper (CPU) ON

LEVEL 1 MENU

P.V. / S.V.	P.V. / S.V. Process variable (PV display) Work Setpoint (SV display) or control output value with controller in manual
_SP	Local Setpoint (scale points Lo.L...Hi.L)
HY.P	Positive hysteresis alarm 1 (0 ... +999 scale points)
HY.n	Negative hysteresis alarm 1 (0 ... -999 scale points)

PAS — Password

PAS = 99

Pro — Protection code

• Prot

12 — *Pro* — Protection code

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

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

6 • PROGRAMMING and CONFIGURATION

LEVEL 1 MENU

	P.V. / S.V.	P.V. / S.V. Process variable (PV display) Work Setpoint (SV display) or control output value with controller in manual
80.0	_SP	Local Setpoint (Lo.L ... Hi.L)
+5.0	HY.P	Positive hysteresis alarm 1 (0 ... +999 scale points)
-5.0	HY.n	Negative hysteresis alarm 1 (0 ... +999 scale points)
	P.oS	Valve position indication (0.0 ... 100.0 %) (*)
	Ou.P	Control output value (*)

(*) The automatic return *PV/SV* display is disabled for these displays

If Inc, Dec, F keys are not pressed within 15 sec, display returns automatically to P.V. value.

INF — Information display

NO — S4 Jumper (CPU) = ON

CFG — Custom menu

InP — Input settings

Out — Output settings

PAS — Password

NO — PAS = 99

Pro — Protection code

Hrd — Hardware configuration

Lin — Input linearization

U.CA — User calibration

Keep the F key pressed to scroll the menus

Release the F key to select the displayed menu

Press the F key to access the parameters

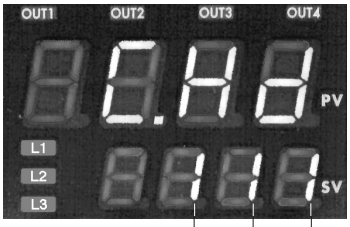
Keep the F key pressed to exit any menu

Keep F + Auto/Man keys pressed for 2 sec. on any menu to go immediately to level 1 display

Pressing the Auto/ Man + F keys on any menu immediately returns you to the previous parameter.

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

• InFo Display



OUTPUT 2
0 = None
1 = Relay

OUTPUT 3
0 = None
1 = Relay

SERIAL COMMUNICATION
0 = None

INF — Information display

UPd — Software version

Err — Self diagnostic error code

0	No Error
1	Lo
2	Hi
3	ERR
4	SBR

+8 error OUT2 card recognition
+16 error OUT3 card recognition

110 — C.Hd — Configuration hrd

• CFG

CFG — Control parameters

0 — S.tu — Enabling self-tuning, autotuning, softstart

S.tun	Continuous autotuning	Sel-ftuning	Softstart
0	NO	NO	NO
1	YES	NO	NO
2	NO	YES	NO
3	YES	YES	NO
4	NO	NO	YES
5	YES	NO	YES
6	-	-	-
7	-	-	-

S.tun	Autotuning one shot	Selftuning	Softstart
8*	WAIT	NO	NO
9	GO	NO	NO
10*	WAIT	YES	NO
11	GO	YES	NO
12*	WAIT	NO	YES
13	GO	NO	YES

(*) +16 with passage automatic rifle in GO if PV-SP > 0,5%
+32 with passage automatic rifle in GO if PV-SP > 1%
+64 with passage automatic rifle in GO if PV-SP > 2%
+128 with passage automatic rifle in GO if PV-SP > 4%

1.2 — h.Pb — Proportional band for heating or hysteresis in regulation ON/OFF — 0 ... 999.9% f.s.

5.83 — h. It — Integral time for heating — 0.00 ... 99.99 min

1.33 — h.dt — Derivative time for heating — 0.00 ... 99.99 min

100.0 — h.P.H — Maximum power limit for heating — 0.0 ... 100.0%

0.0 — h.P.L — Minimum power limit for heating (not available for double heat/ cool action) — 0.0 ... 100.0%

0 — rSt — Manual reset — -999 ... 999 punti scala

0.0 — P.rS — Reset power — -100.0 ... 100.0%

0 — A.rS — Antireset — 0 ... 9999 scale points

0.0 — FFd — Feedforward — -100.0 ... 100.0%

0.0 — SoF — Softstart time — 0.0 ... 500.0 min

0.0 — Lbt — Waiting time for LBA alarm intervention (Set to "0" to disable LBA alarm) — 0.0 ... 500.0 min (*)

0.0 — LbP — Power limit for LBA alarm condition — -100.0 ... 100.0% (*)

0.0 — FAP — Power output in fault condition (when probe is faulty) — -100.0 ... 100.0% ON / OFF

0.0 — G.SP — Set gradient (see applicable note) — 0.0...999.9 digit/min. (digit / sec see SP.r)

0.0 — G.S0 — Setpoint gradient of pre-heating — 0.0 ... 999.9 digit / min. (digit / sec seeSP.r)

0 — Ht.0 — Retention time of pre-heating setpoint — 0 … 200 min. (sec see SP.r)

0.0 — SP.0 — Setpoint of pre-heating — Lo.L … Hi.L

0.0 — G.S 1 — Set gradient at the end of the pre-heating — 0.0 ... 999.9 digit / min. (digit / sec see SP.r)

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

• InP

InP — Input settings

0 — SP.r — Def. remote setpoint — 0 default (remote setpoint present)

+2 Times of pre-heating and gradients of set digit/sec

30 — tYP. — Probe type, signal, enable custom linearization, and main input scale

Type	Probe type	without decimal point	with decimal point
	Sensore:	TC	
0	TC J °C	0/1000	0.0/999.9
1	TC J °F	32/1832	32.0/999.9
2	TC K °C	0/1300	0.0/999.9
3	TC K °F	32/2372	32.0/999.9
4	TC R °C	0/1750	0.0/999.9
5	TC R °F	32/3182	32.0/999.9
6	TC S °C	0/1750	0.0/999.9
7	TC S ° F	32/3182	32.0/999.9
8	TC T °C	-200/400	-199.9/400.0
9	TC T °F	-328/752	-199.9/752.0
28	TC	CUSTOM	CUSTOM
29	TC	CUSTOM	CUSTOM
30	PT100 °C	-200/850	-199.9/850.0
31	PT100 °F	-328/156 2	-199.9/999.9
32	JPT100 °C	-200/600	-199.9/600.0
33	JPT100 °F	-328/1112	-199.9/999.9
34	PTC °C	-55/120	-55.0/120.0
35	PTC °F	-67/248	-67.0/248.0
36	NTC °C	-10/70	-10.0/70.0
37	NTC °F	14/158	14.0/158.0
38	0...60 mV	-1999/9999	-199.9/999.9
39	0...60 mV	Custom scale	Custom scale
40	12...60 mV	-1999/9999	-199.9/999.9
41	12...60 mV	Custom scale	Custom scale
42	0...20 mA	-1999/9999	-199.9/999.9
43	0...20 mA	Custom scale	Custom scale
44	4...20 mA	-1999/9999	-199.9/999.9
45	4...20 mA	Custom scale	Custom scale
46	0...10 V	-1999/9999	-199.9/999.9
47	0...10 V	Custom scale	Custom scale
48	2...10 V	-1999/9999	-199.9/999.9
49	2...10 V	Custom scale	Custom scale
50	0...5 V	-1999/9999	-199.9/999.9
51	0...5 V	Custom scale	Custom scale
52	1...5 V	-1999/9999	-199.9/999.9
53	1...5 V	Custom scale	Custom scale
54	0...1 V	-1999/9999	-199.9/999.9
55	0...1 V	Custom scale	Custom scale
56	200mv..1V	-1999/9999	-199.9/999.9
57	200mv..1V	Custom scale	Custom scale
58	Cust10 V-20mA	-1999/9999	-199.9/999.9
59	Cust10 V-20mA	Custom scale	Custom scale
60	Cust 60mV	-1999/9999	-199.9/999.9
61	Cust 60mV	Custom scale	Custom scale
62	PT100-JPT	CUSTOM	CUSTOM
63	PTC	CUSTOM	CUSTOM
64	NTC	CUSTOM	CUSTOM

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

Max. non-linearity error for thermocouples (TC), resistors (PT100) and thermistors (PTC, NTC).

The error is calculated as deviation from theoretical value and is expressed as percentage of full scale (in °C).

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

NTC error < 0.5% f.s.

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

(where f.s. refers to range -200... +850°C)

0.1 — FLt — Digital filter on input (if = 0 excludes averaging filter on sample value) — 0.0 ... 20.0 sec

0.5 — FLd — Digital filter on input display — 0 ... 9.9 scale points

1 — dP.S — Decimal point position for input scale

dP_S	Format
0	xxxx
1	xxx.x
2	xx.xx (*)
3	x.xxx (*)

(*) not available for TC, RTD, PTC and NTC scales

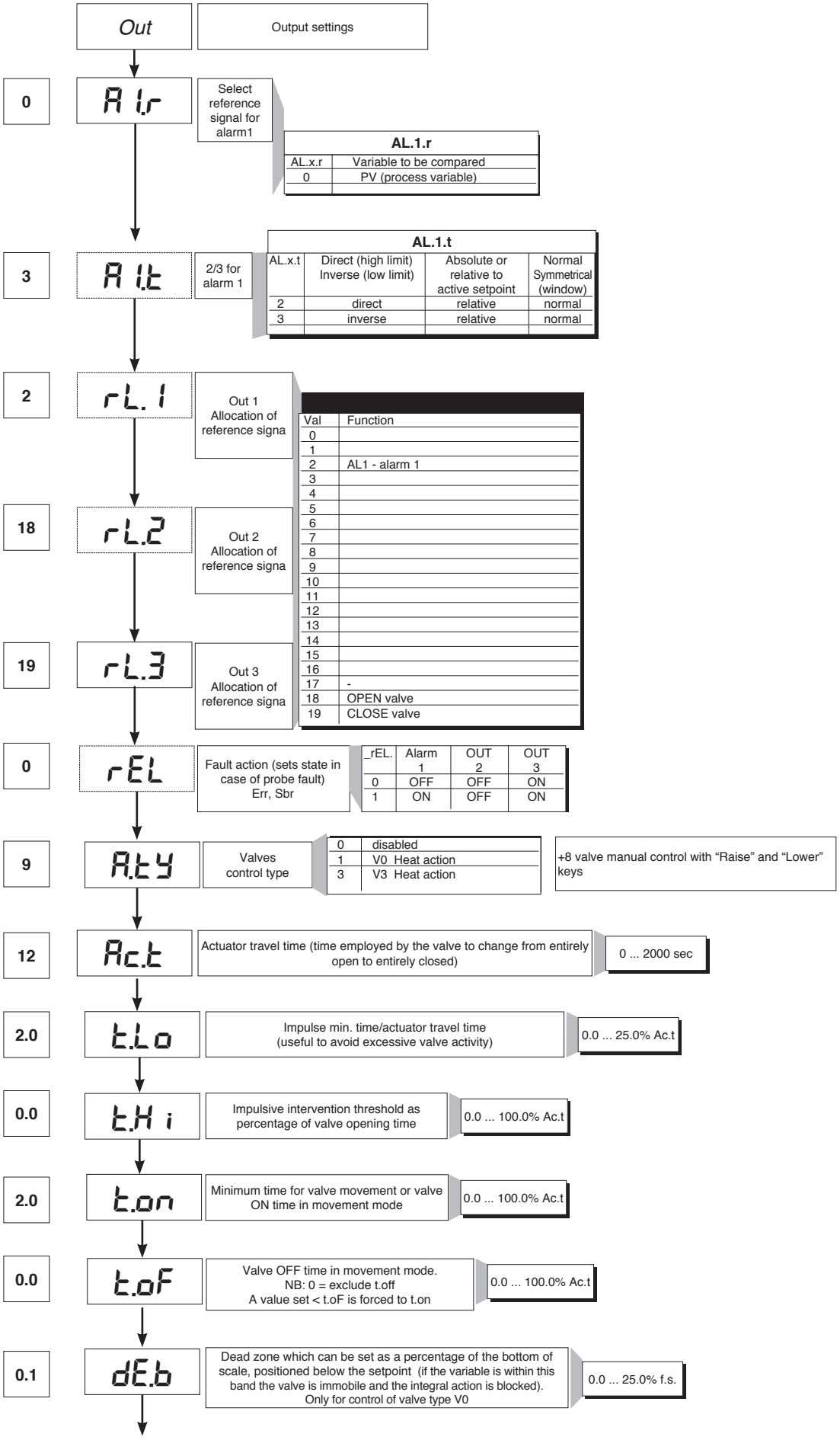
0.0 — Lo.S — Minimum limit of main input scale — min...max input range selected in tyP

850.0 — Hi.S — Maximum limit of main input scale — min...max input range selected in tyP

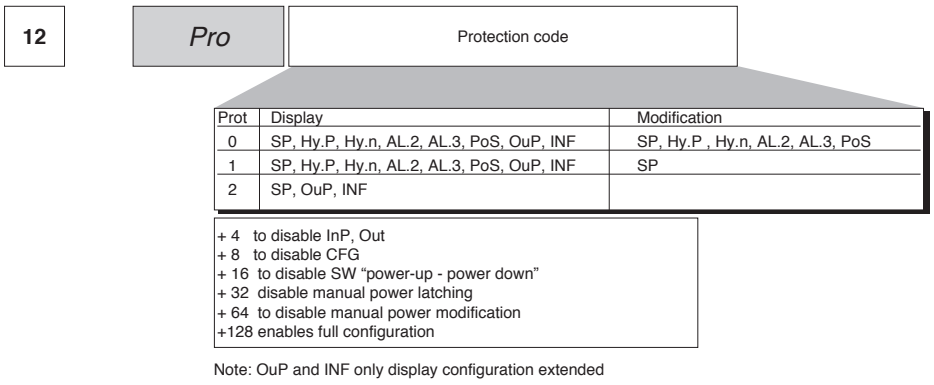
0 — oFS. — Offset correction of main input — -999 ... 999 scale points

30.0 — LoL — Lower limit for setting SP and absolute alarms — Lo.S ... Hi.S

130.0 — HiL — Upper limit for setting SP and absolute alarms — Lo.S ... Hi.S


Out
Output settings
0
A 1.r
Select reference signal for alarm1
AL.1.r
AL.x.r
Variable to be compared
0
PV (process variable)
3
A 1.t
2/3 for alarm 1
AL.1.t
AL.x.t
Direct (high limit) Inverse (low limit)
Absolute or relative to active setpoint
Normal Symmetrical (window)
2
direct
relative
normal
3
inverse
relative
normal
2
rL.1
Out 1 Allocation of reference signa
18
rL.2
Out 2 Allocation of reference signa
19
rL.3
Out 3 Allocation of reference signa
Val
Function
0
1
2
AL1 - alarm 1
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
-
18
OPEN valve
19
CLOSE valve
0
rEL
Fault action (sets state in case of probe fault) Err, Sbr
_rEL.
Alarm 1
OUT 2
OUT 3
0
OFF
OFF
ON
1
ON
OFF
ON
9
A.tY
Valves control type
0
disabled
1
V0 Heat action
3
V3 Heat action
+8 valve manual control with “Raise” and “Lower” keys
12
Ac.t
Actuator travel time (time employed by the valve to change from entirely open to entirely closed)
0 ... 2000 sec
2.0
t.Lo
Impulse min. time/actuator travel time (useful to avoid excessive valve activity)
0.0 ... 25.0% Ac.t
0.0
t.Hi
Impulsive intervention threshold as percentage of valve opening time
0.0 ... 100.0% Ac.t
2.0
t.on
Minimum time for valve movement or valve ON time in movement mode
0.0 ... 100.0% Ac.t
0.0
t.oF
Valve OFF time in movement mode. NB: 0 = exclude t.off A value set < t.oF is forced to t.on
0.0 ... 100.0% Ac.t
0.1
dE.b
Dead zone which can be set as a percentage of the bottom of scale, positioned below the setpoint (if the variable is within this band the valve is immobile and the integral action is blocked). Only for control of valve type V0
0.0 ... 25.0% f.s.

• Prot

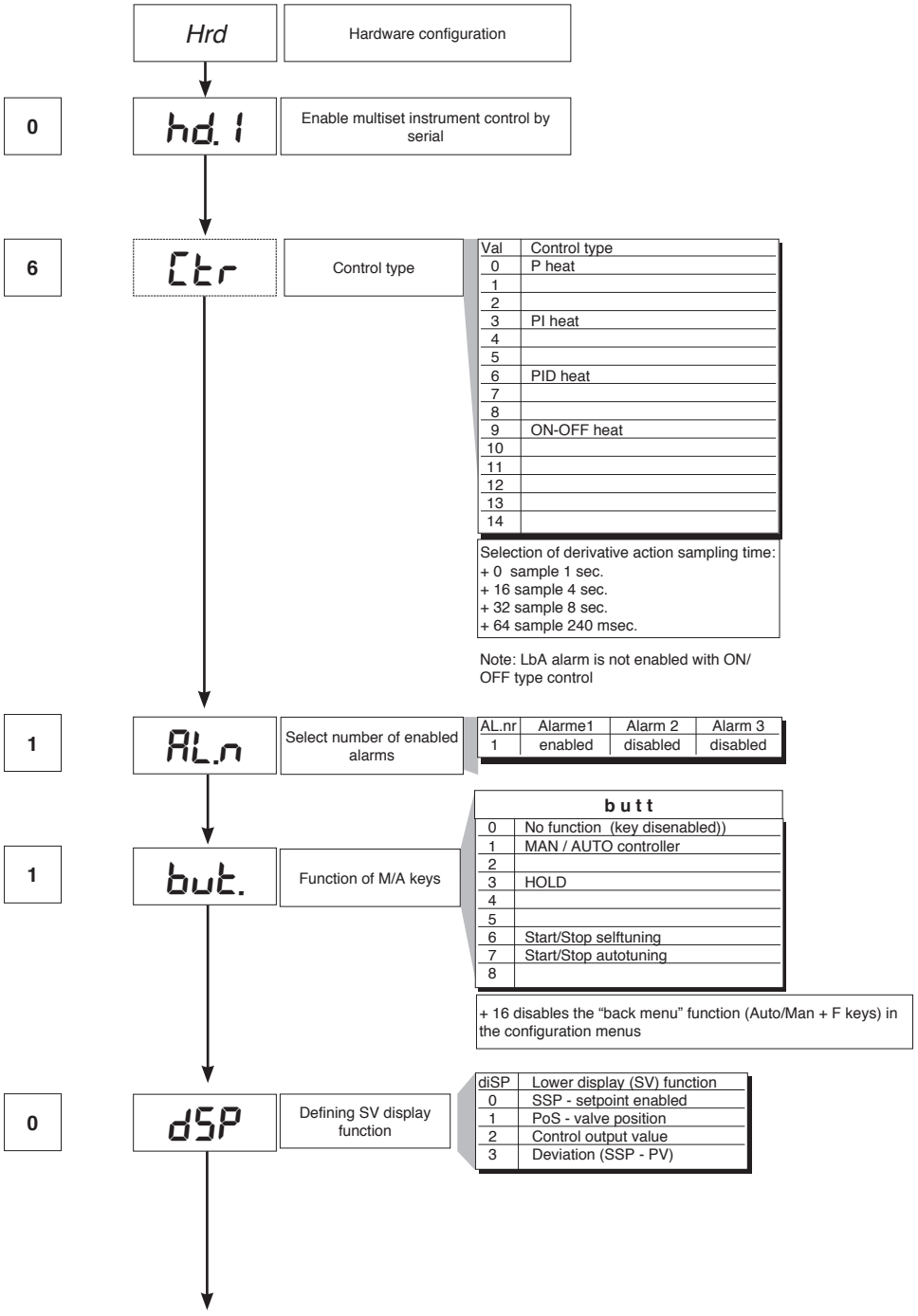


Prot	Display	Modification
0	SP, Hy.P, Hy.n, AL.2, AL.3, PoS, OuP, INF	SP, Hy.P , Hy.n, AL.2, AL.3, PoS
1	SP, Hy.P, Hy.n, AL.2, AL.3, PoS, OuP, INF	SP
2	SP, OuP, INF	

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

Note: OuP and INF only display configuration extended

• Hrd



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

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

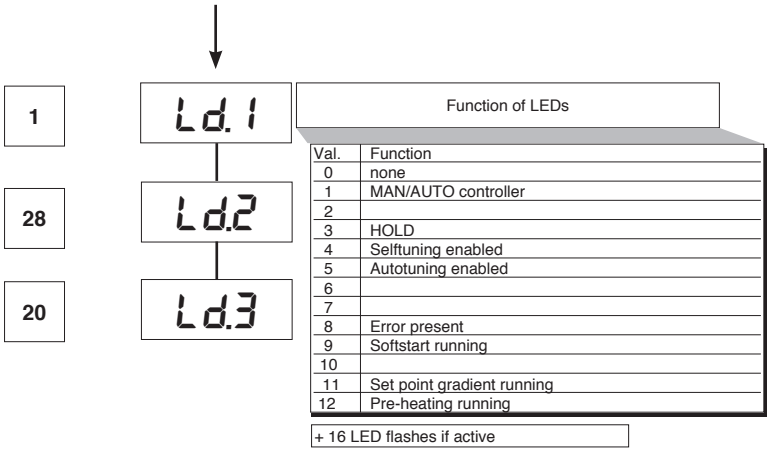
Note: LbA alarm is not enabled with ON/ OFF type control

AL.nr	Alarme1	Alarm 2	Alarm 3
1	enabled	disabled	disabled

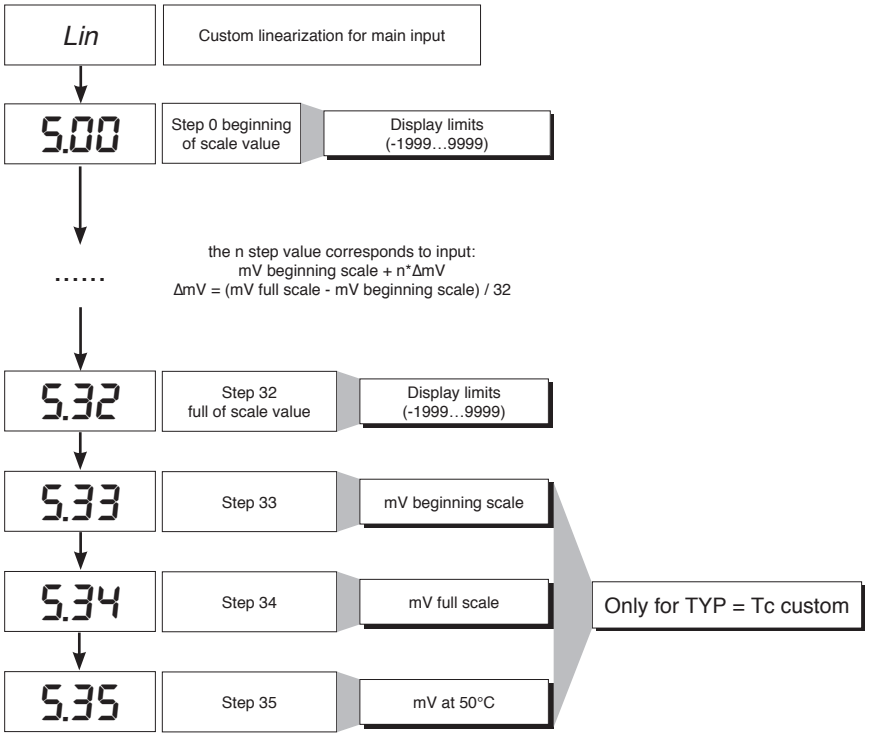
butt	
0	No function (key disenabled))
1	MAN / AUTO controller
2	
3	HOLD
4	
5	
6	Start/Stop selftuning
7	Start/Stop autotuning
8	

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

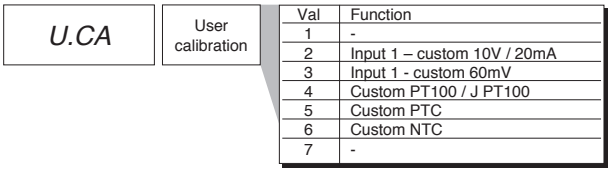
diSP	Lower display (SV) function
0	SSP - setpoint enabled
1	PoS - valve position
2	Control output value
3	Deviation (SSP - PV)


1
28
20
Ld.1
Ld.2
Ld.3
Function of LEDs
Val. Function
0 none
1 MAN/AUTO controller
2
3 HOLD
4 Selftuning enabled
5 Autotuning enabled
6
7
8 Error present
9 Softstart running
10
11 Set point gradient running
12 Pre-heating running
+ 16 LED flashes if active

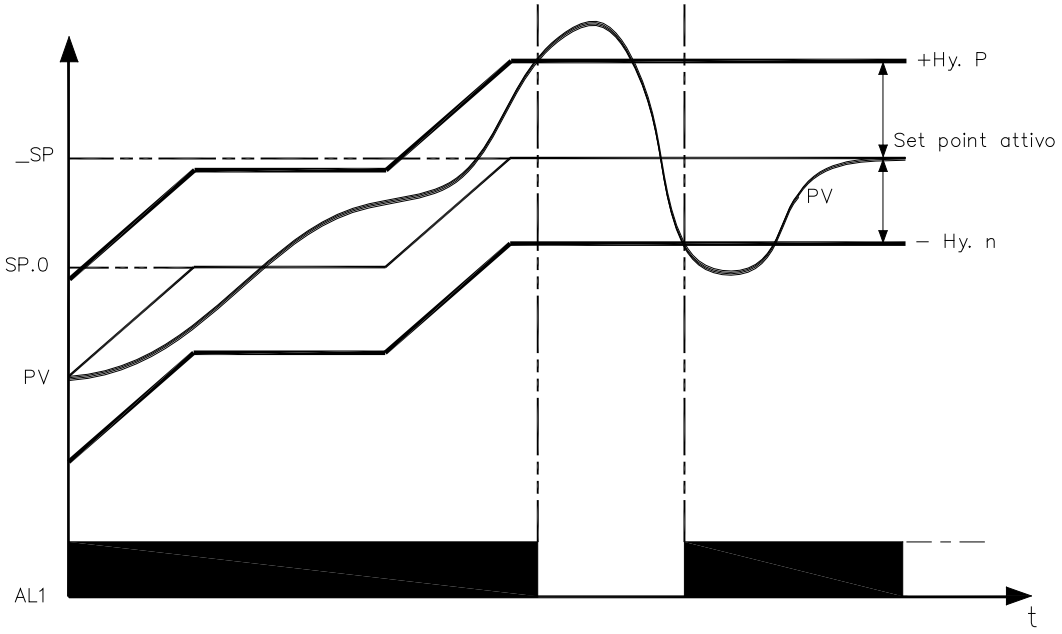
• Lin


Lin
Custom linearization for main input
5.00
Step 0 beginning of scale value
Display limits (-1999…9999)
.....
the n step value corresponds to input:
mV beginning scale + n*ΔmV
ΔmV = (mV full scale - mV beginning scale) / 32
5.32
Step 32 full of scale value
Display limits (-1999…9999)
5.33
Step 33
mV beginning scale
5.34
Step 34
mV full scale
5.35
Step 35
mV at 50°C
Only for TYP = Tc custom

• U.CAL


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

7 • CONSENT FOR BURNER AL1



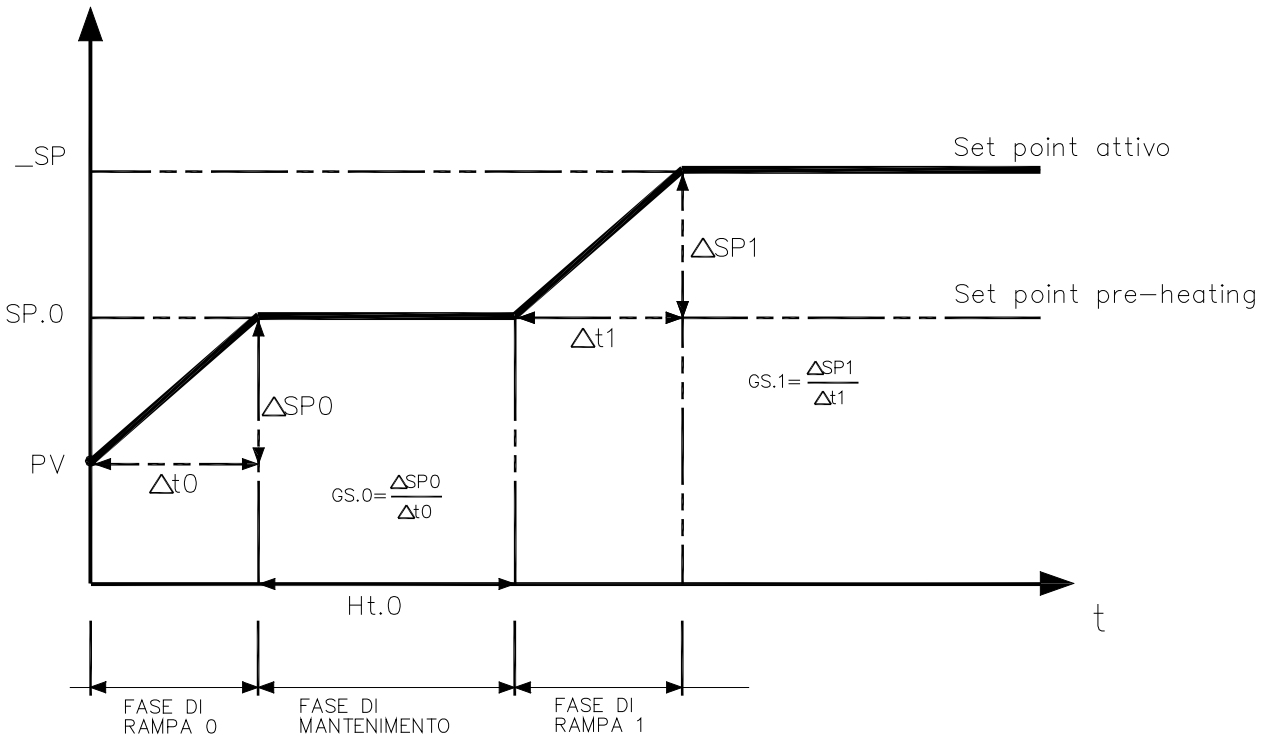
Obtain burner consent by configuring alarm 1 as inverse deviation with positive hysteresis Hy.P and negative hysteresis Hy.n

8 • PRE-HEATING FUNCTION

Enable the pre-heating function by setting parameters GS.0, Ht.0, GS.1 other than zero.
It consists of three phases that are activated sequentially at firing:

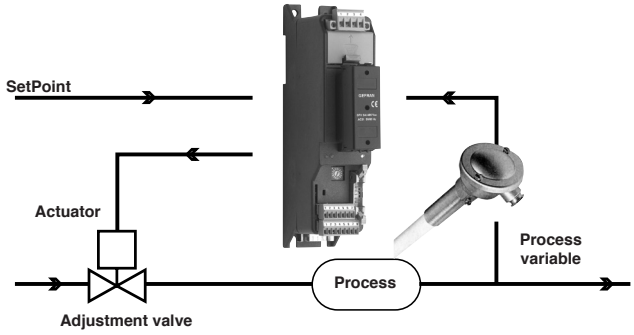
- **Ramp 0 phase**
  Enabled by setting GS.0 > 0. Starting from setpoint = PV (initial state), it reaches pre-heating set SP.0 with gradient GS.0
- **Maintenance phase**
  Enabled by setting Ht.0 > 0. Maintains pre-heating setpoint SP.0 for time Ht.0
- **Ramp 1 phase**
  Enabled by setting GS.1 > 0. Starting from pre-heating setpoint SP.0, it reaches active _SP set with gradient GS.1

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



9 • ADJUSTMENT WITH MOTORIZED VALVE

In an adjustment process the adjustment valve has the function of varying fuel delivery (frequently corresponding to the thermal energy introduced into the process) in relation to the signal coming from the controller.
For this purpose it is provided with an actuator able to modify its opening value, overcoming the resistances produced by the fluid passing inside it.
The adjustment valves vary the delivery in a modulated manner, producing finite variations in the fluid passage inner area corresponding to finite variations of the actuator input signal, coming from the controller. The servomechanism, for example, comprises an electric motor, a reducer and a mechanical transmission system which actions the valve.
Various auxiliary components can be present such as the mechanical and electrical safety end travels, manual actioning systems.



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.

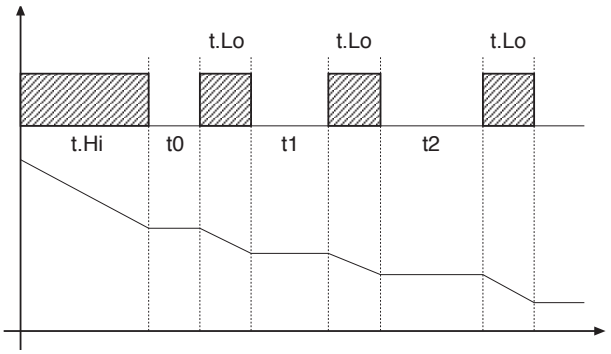
Characteristic parameters for valves control

- 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 ≠ 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

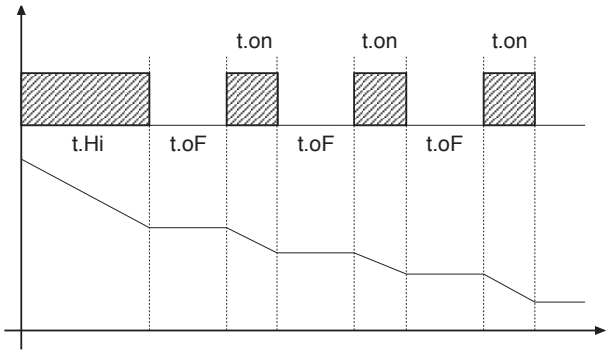
Model V0 have similar behaviour: every manoeuvre request greater than the minimum impulse t.Lo is sent to the actuator by means of the OPEN/CLOSE relays; every action updates the presumed position of the virtual potentiometer calculated on the basis of the actuator travel declared time.
In this way there 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

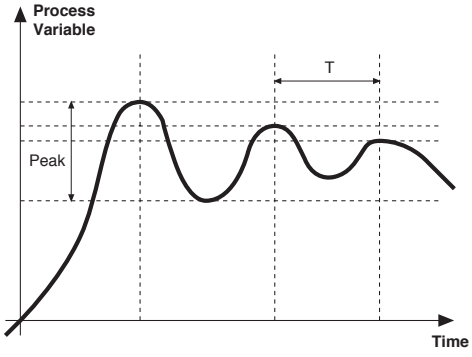
Proportional Action:
action in which contribution to output is proportional to deviation at input (deviation = difference between controlled variable and setpoint).
Derivative Action:
action in which contribution to output is proportional to rate of variation input deviation.
Integral Action:
action 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

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

(V max - V min) is the scale range.
Integral time: It = 1.5 x 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

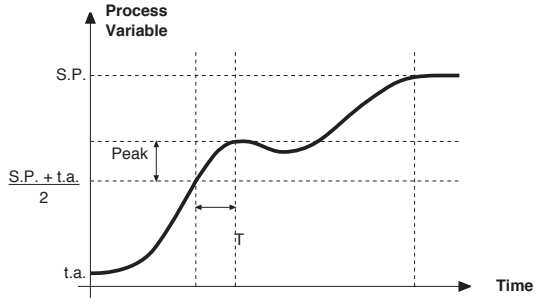
SET GRADIENT: if set to ≠0, the setpoint is assumed equal to PV at power-on and auto/man switchover. With gradient set, it reaches the local setpoint. Every variation in setpoint is subject to a gradient.
The set gradient is inhibited at power-on when self-tuning is engaged.
If the set gradient is set to ≠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 PC USB / RS485 o TTL

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

600V [R] [R] [R] [-]

UTPUT 1	
Relay	R

UTPUT 2	
Relay	R

UTPUT 3	
Relay	R

POWER SUPPLY	
0	11...27Vac/dc
1	100...240Vac

• WARNINGS

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

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

• follow instructions precisely when connecting the device.
• always use cables that are suitable for the voltage and current levels indicated in the technical specifications.
• the device has no ON/OFF switch: it switches on immediately when power is turned on. For safety reasons, devices permanently connected to the power supply require a two-phase disconnecting switch with proper marking. Such switch must be located near the device and must be easily reachable by the user. A single switch can control several units.
• if the device is connected to electrically NON-ISOLATED equipment (e.g. thermocouples), a grounding wire must be applied to assure that this connection is not made directly through the machine structure.
• if the device is used in applications where there is risk of injury to persons and/or damage to machines or materials, it MUST be used with auxiliary alarm units. You should be able to check the correct operation of such units during normal operation of the device.
• before using the device, the user must check that all device parameters are correctly set in order to avoid injury to persons and/or damage to property.
• the device must NOT be used in 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 voltage indicated on the device label.
• *Input and output connections*: external connected circuits must have double insulation; to connect analog inputs (TC, RTD) you have to: physically separate input wiring from power supply wiring, from output wiring, and from power connections; use twisted and screened cables, with screen connected to ground at only one point; to connect adjustment and alarm outputs (contactors, solenoid valves, motors, fans, etc.), install RC groups (resistor and capacitor in series) in parallel with inductive loads that work in AC *(Note: all capacitors must conform to VDE standards (class x2) and support at least 220 VAC. Resistors must be at least 2W)*; fit a 1N4007 diode in parallel with the coil of inductive loads that operate in DC.

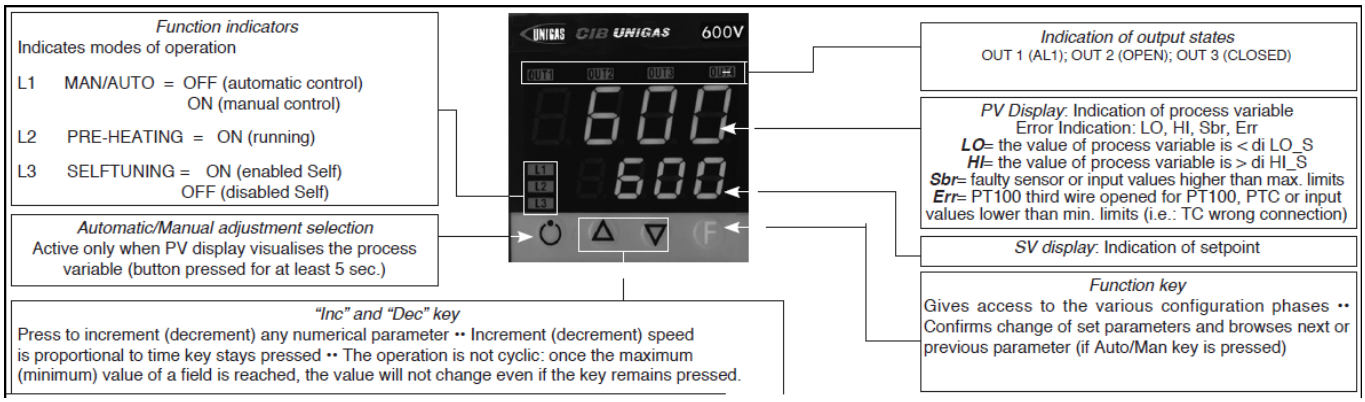
GEFRAN spa will not be held liable for any injury to persons and/or damage to property deriving from tampering, from any incorrect or erroneous use, or from any use not conforming to the device specifications.

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

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

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

Verify wiring of the sensor



Regulation of the set-point **= 80**
It can be modified by using arrows "up" and "down".
By pushing **F** you go to parameters:

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

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

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

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

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

PAS	99 then push and keep pushed **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

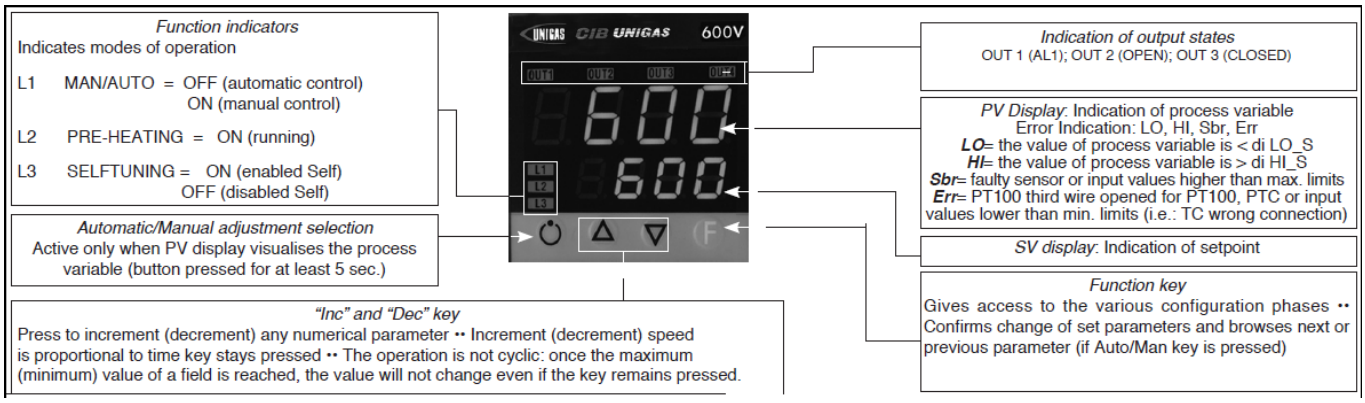
Keep pushed **F** until you visualize **PASS**, release **F** and through the arrows set **99**, push **F** and visualize **Pro** (protection code) from **128**, through the arrows, bring it back to **12,** and keep **F** pushed until you come back to set-point value.

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

Verify wiring of the sensor



Regulation of the set-point = **80**
It can be modified by using arrows "up" and "down".
By pushing **F** you go to parameters:

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

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

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

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

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

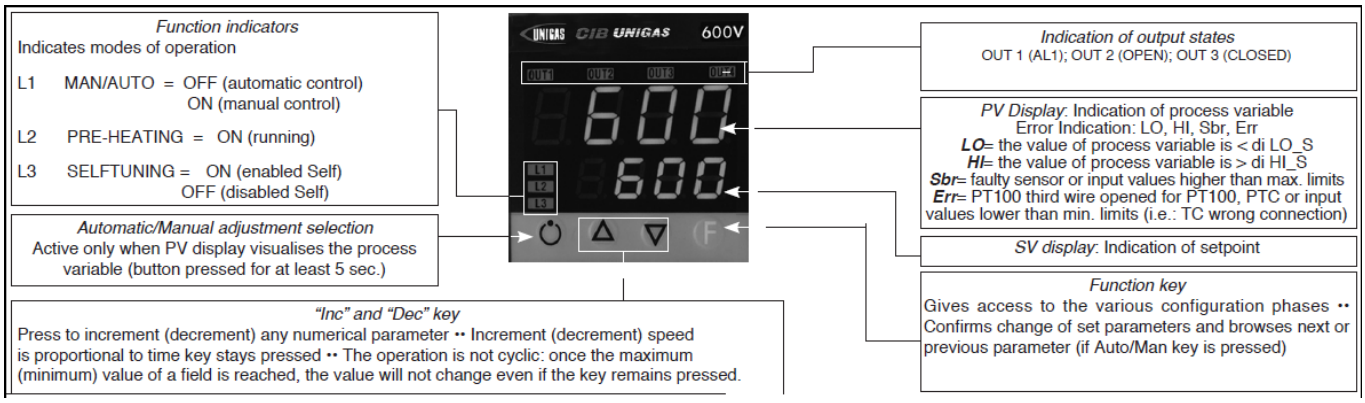
PAS	99 then push and keep pushed **F** until visualization of **Hrd**
Hrd	
…	
CtrL	6 (PID warm)
AL.nr	1
but	1
diSP	0
Ld.1	1
Ld.2	28
Ld.3	20

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

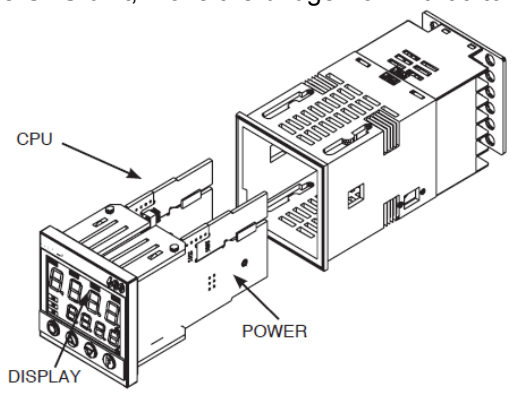
Manual operation:
Keep pushed the lower left key for at least 5 sec.
The instrument will enter the "MAN" mode (see also "Ld1" switching on).
Through the arrows, "Open" and "Close" outputs are activated.
To come back to normal working keep the lower left key pushed for at least 5 sec.

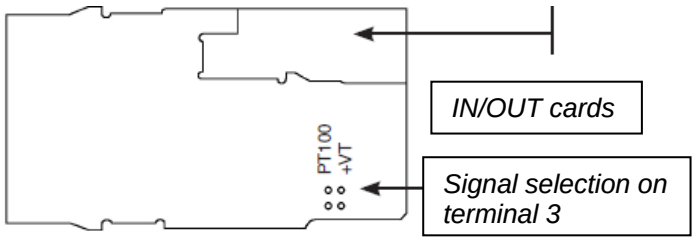
Software switch off :
By keeping pushed keys **Arrow up** + **F** for more than 5 sec. the instrument switches off the software, does not command the outputs and visualize only the variable of process measured by the probe.
To restore keep pushed **F** for more than 5 sec.

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



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





Verify wiring of the sensor

Impostazione set-point

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

To modify it directly use "up" and "down" arrows.
By pushing **F** you go to parameter:

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

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

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

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

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

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

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

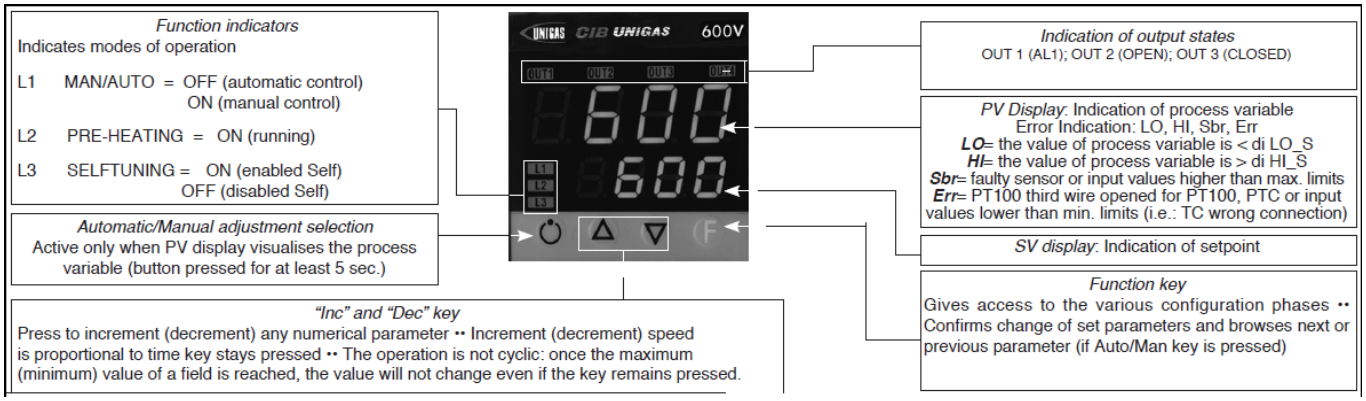
Keep pushed **F** until you visualize **PASS**, release **F** and through the arrows set **99**, push **F** and visualize **Pro** (protection code) from **128**, through the arrows, bring it back to **12,** and keep **F** pushed until you come back to set-point value.

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	0
hPb	1,2
hIt	5,83
hdt	1,33
…	

InP	
….	
tyP	2 (thermocouple **K** 0÷1300°C) / 0 (thermocouple **J** 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 **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.

RWF50.2x & RWF50.3x

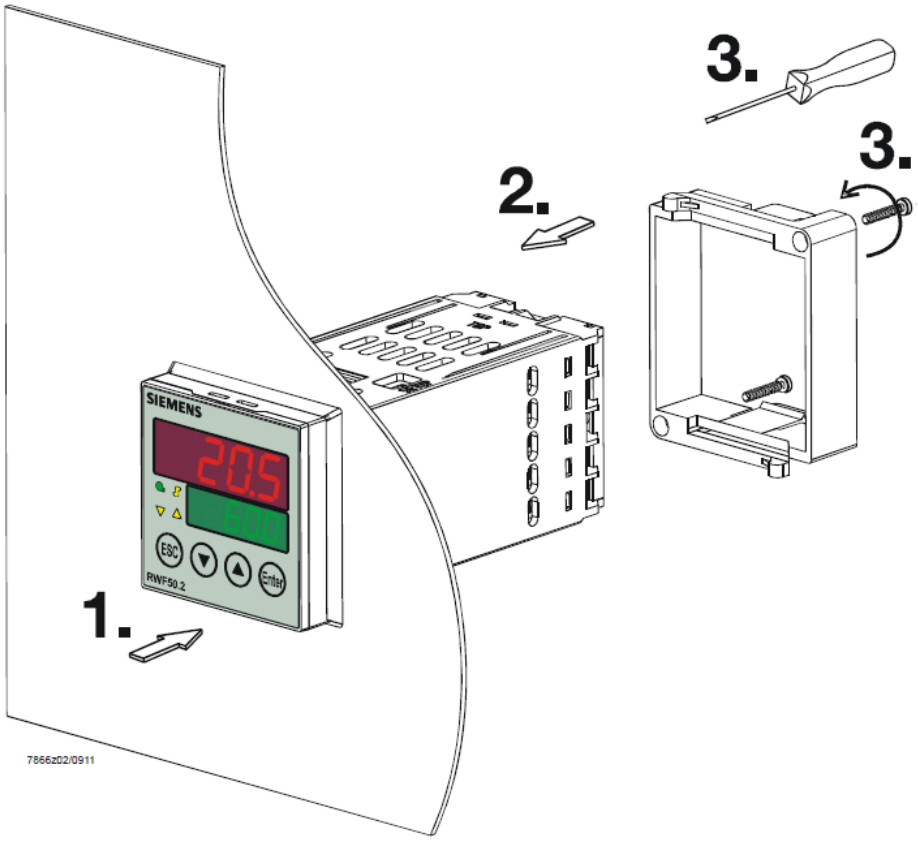


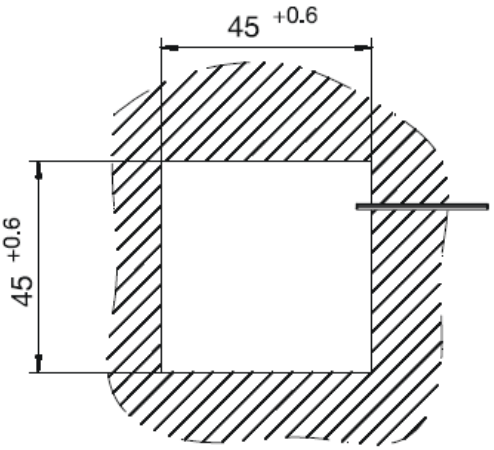
User manual

M12922CB Rel.1.0 07/2012

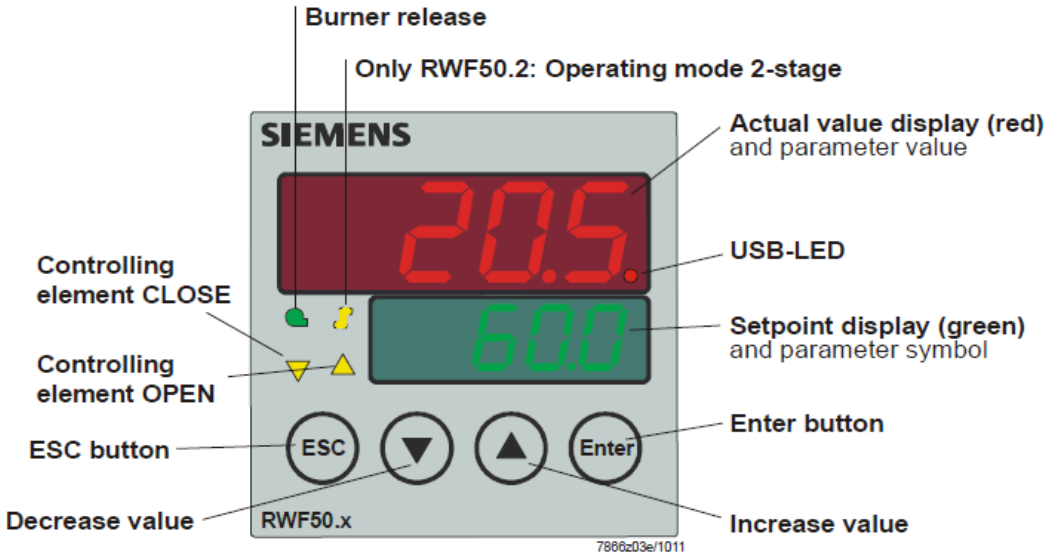
DEVICE INSTALLATION

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.

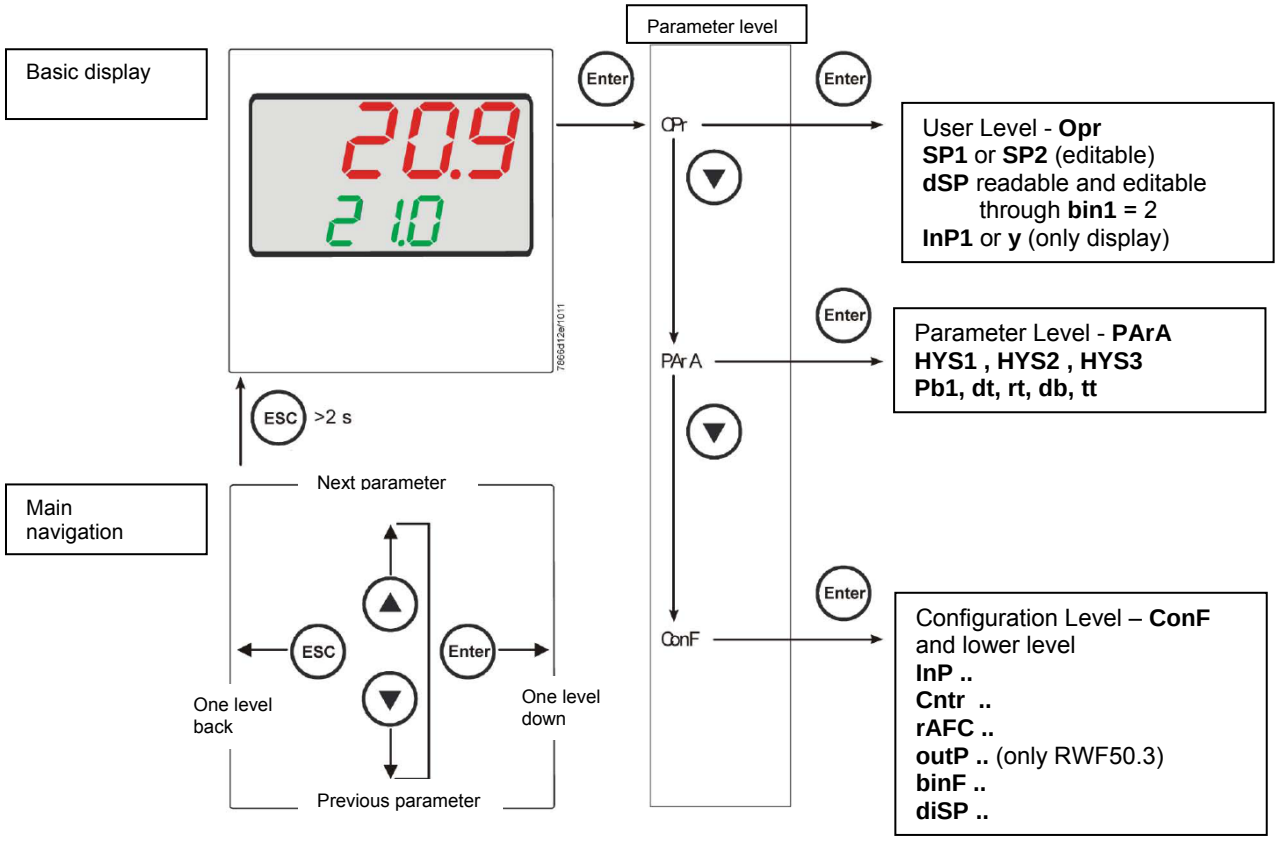




FRONT PANEL



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	0,0… -1999 digit	-5	Value under setpoint below which the burner switches back on (1N-1P closes)
Switch-off differential 2° stage (*)	HYS2	0,0 … HYS3	3	(enable only with parameter **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 **CACt** = 0)
Switch-off differential 2° stage on cooling controller (*)	HYS5	HYS6…0,0 digit	5	Do not used (enable only with parameters **CACt** = 0 and **bin1** = 4)
Upper switch-off differential on cooling controller (*)	HYS6	0,0… -1999 digit	5	Do not used (enable only with parameter **CACt** = 0)
Delay modulation	q	0,0… 999,9 digit	0	Do not alter

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

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

- push the **Enter** button: on the lower display (green) **Opr** appears. Using the **up and down arrows** find **ConF.** Push **Enter** to confirm.
- Now on the green display the group **InP** appears. Push **Enter** and **InP1** is 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 type of sensor for analog input 1	**1**	**Pt100 3 fili**
	2	Pt100 2 fili
	3	Pt1000 3 fili
	4	Pt1000 2 fili
	5	Ni1000 3 fili
	6	Ni1000 2 fili
	7	0 ÷ 135 ohm
	15	0 ÷ 20mA
	16	4 ÷ 20mA
	17	0 ÷ 10V
	18	0 ÷ 5V
	19	1 ÷ 5V
OFF1 sensor offset	-1999..**0**.. +9999	Using the measured value correction (offset), a measured value can be corrected to a certain degree, either up or down
SCL1 scale low level	-1999..**0**.. +9999	In the case of a measuring transducer with standard signal, the physical signal is assigned a display value here (for input ohm, mA, V)
SCH1 scale high level	-1999..**100**.. +9999	In the case of a measuring transducer with standard signal, the physical signal is assigned a display value here (for input ohm, mA, V)
dF1 digital filter	0…**0,6**…100	Is used to adapt the digital 2nd order input filter (time in s; 0 s = filter off)
Unit temperature unit	**1** 2	**1 = degrees Celsius** 2 = degrees Fahrenheit

(**bold** = factory settings)

Remark:
RWF50.2 e RWF50.3 cannot be connected to thermocouples.
If thermocouples have to be connected, convert the signal to a 4-20 mA one and set the RWF accordingly.

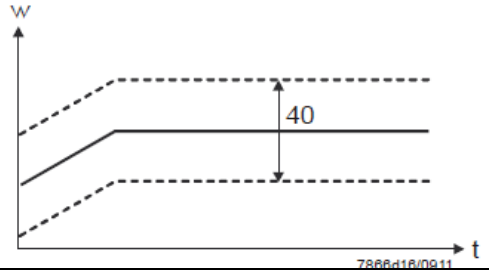
ConF > Cntr

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

(**bold** = factory settings)

ConF > rAFC

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

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

(**bold** = factory settings)

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

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

(**bold** = factory settings)

ConF > binF

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

(**bold** = factory settings)

ConF > dISP

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

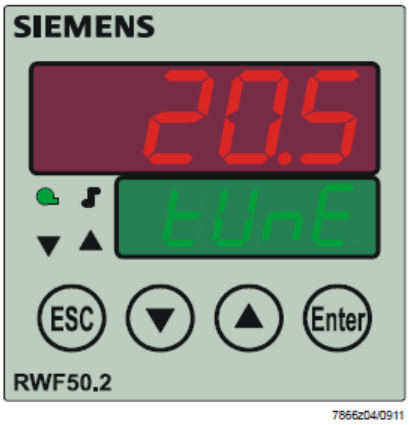
(**bold** = factory settings)

Manual control :

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

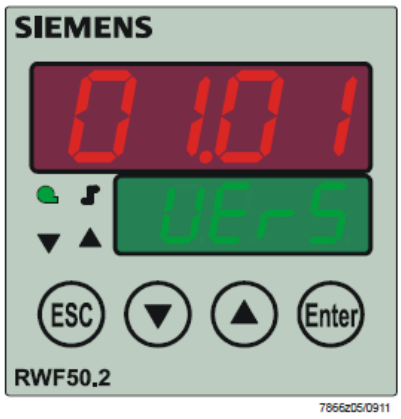
Device self-setting (auto-tuning):

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.

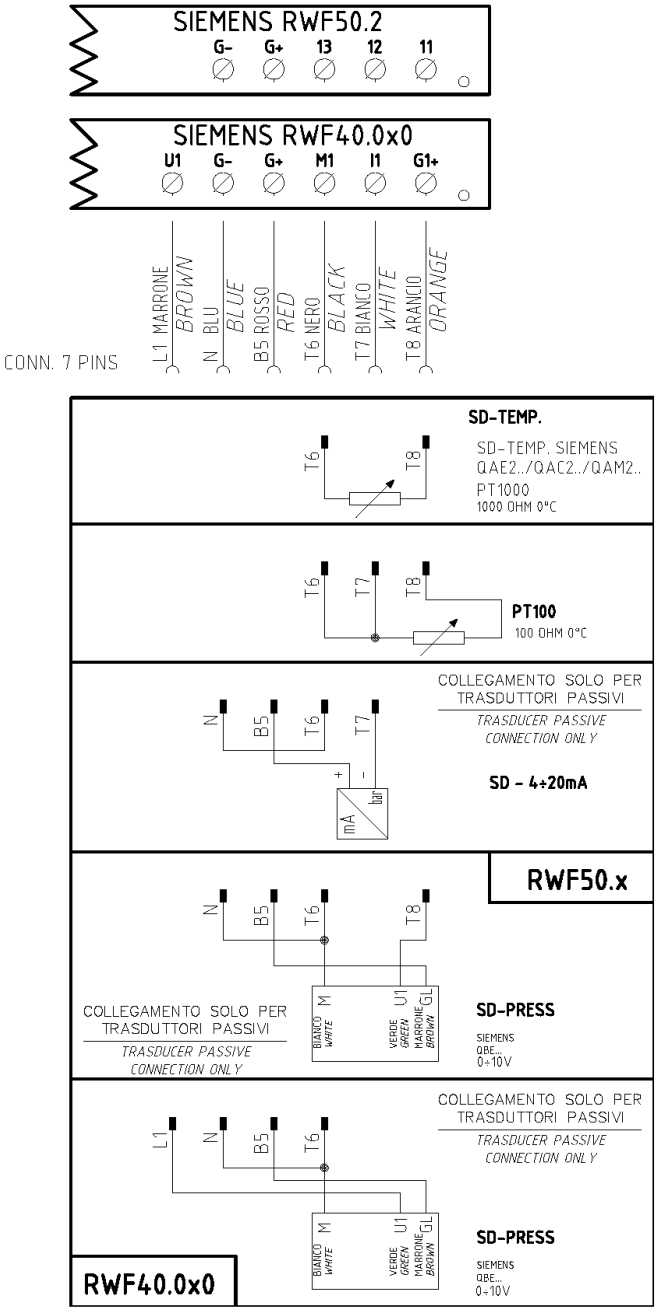
Display of software version :



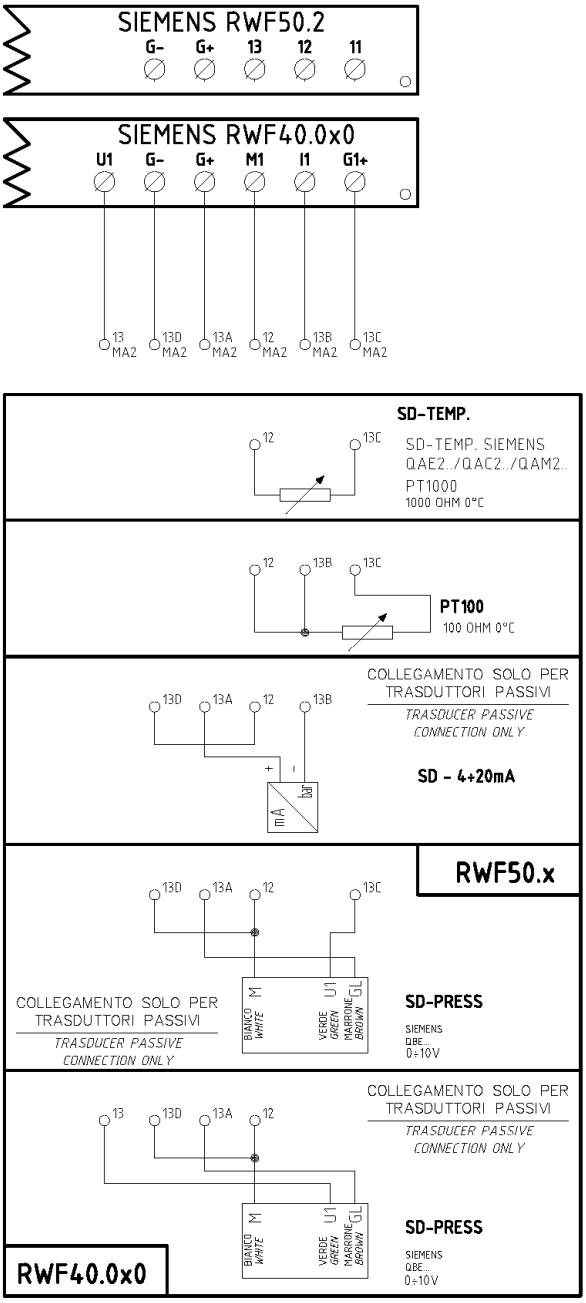
The software version is shown by pushing **Enter + UP arrow** on the upper display

Electric connection :

With 7 pins connector version



With terminals version



Matches terminals between RWF50.2 and RWF40.0x0



Parameters summarising for RWF50.2x:

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

NOTE :
(#) tt – servo control run time
SQL33 ; STM30; SQM10; SQM40; SQM50; SQM54 = **30** (secondi) - STA12B3.41; SQN30.251; SQN72.4A4A20 = **12** (secondi)
(*)These values are factory set - values **must be** set during operation at the plant based on the real working temperature/pressure value.
WARNING : With pressure probes the parameters SP1, SCH, SCL, HYS1, HYS3 must be selected, and visualized in kPa (kilo Pascal). (1bar = 100.000Pa = 100kPa)

APPENDIX: PROBES CONNECTION

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

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

Ambient probes (or ambient thermostats)

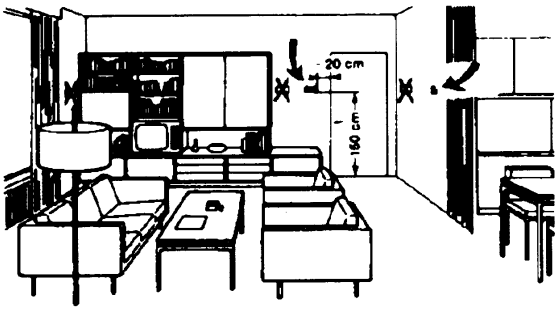
Installation

The sensors (or room thermostats) must be located in

reference rooms in a position where they can take real temperature measurements without being affected by

foreign factors.





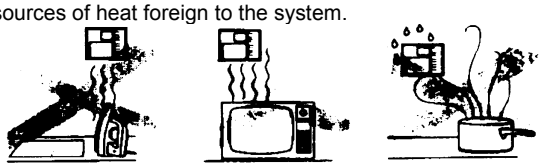
Outside probes (weather)

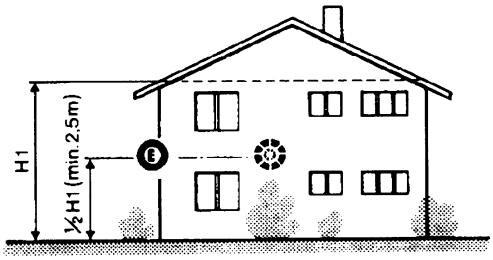
Installation

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

It's good to be admired …even better to be effective

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

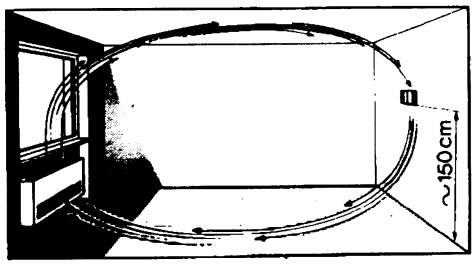




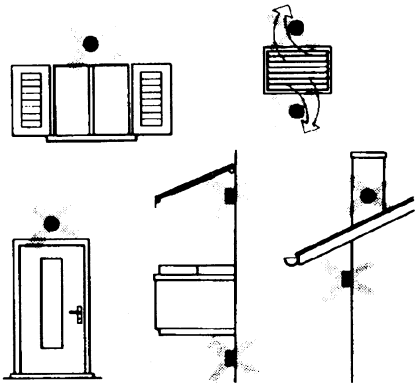
General rule: on the outer wall of the building where the living rooms are, never on the south-facing wall or in a position where they will be affected by morning sun. If in any doubt, place them on the north or north-east façade.

Location

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



Positions to be avoided



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.

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

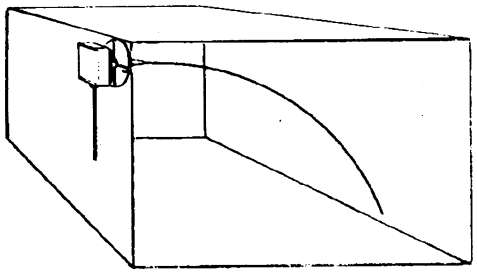
Installing temperature sensors

For measuring outlet air:

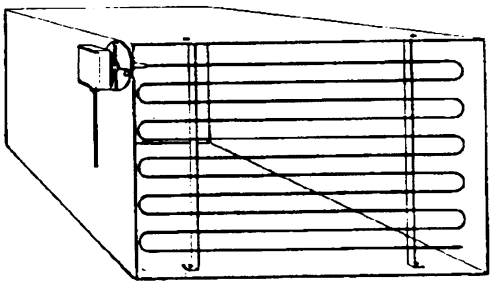
- after delivery fan or
- after coil to be controlled, at a distance of at least 0,5 m

For measuring room temperature:

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



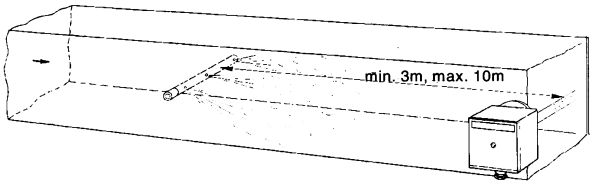
Bend 0.4m sensor by hand (never use tools) as illustrated.



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).



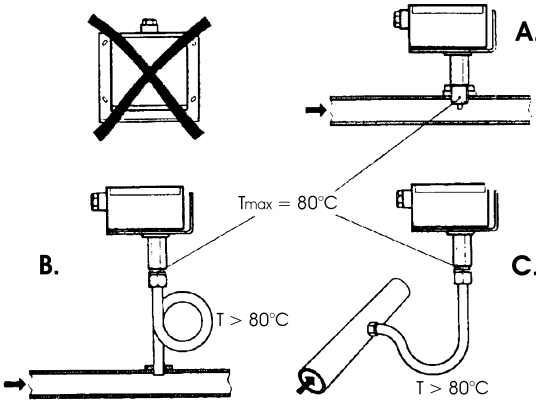
Installing pressure sensors

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

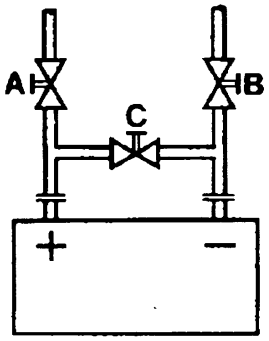
Start disable

1=open C1=open C

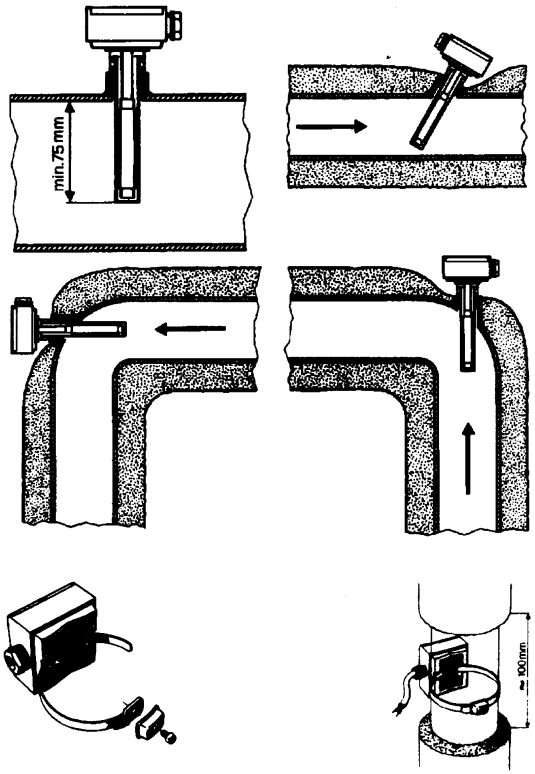
2=open A2=close B

3=open B3=close A

4= close C



Immersion or strap-on sensors



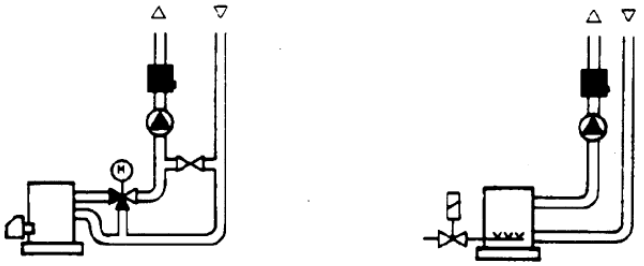
Placing the probes (QAD22.../QAE21.../QAP21.../RCA...)

With pumps on outlet

with 3 ways valves / with 4 ways valves



Panel system / burner control



With pumps on return

with 3 ways valves / with 4 ways valves



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

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

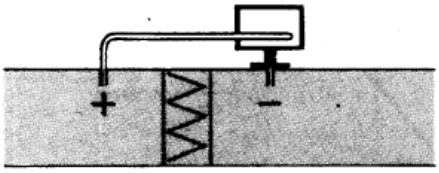
Advantages:

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

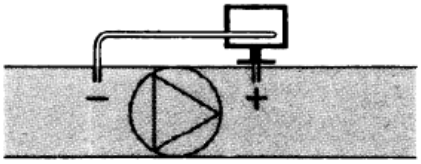
Limits:

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

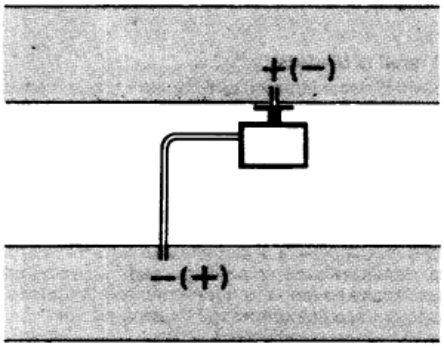
Installing differential pressure probes for air



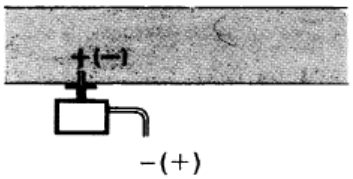
A - Control a filter (clogging)



B - Control a fan (upstream/downstream)



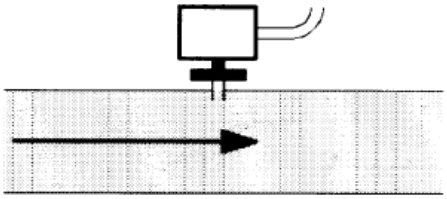
C - Measurement of difference in pressure between two ducts



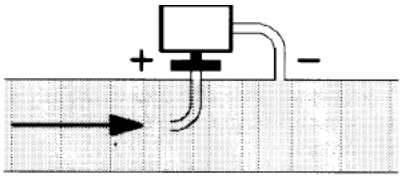
D - Measurement of difference in pressure between two rooms or of inside of duct and outside

Basic principles

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



Measuring dinamic pressure

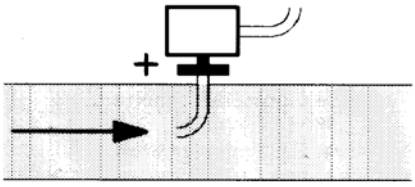


$$Pd = \frac{y\,\vartheta^2}{2g}$$

Key

y	Kg/m^3, specific weight of air
□	m/s, air speed
g	9.81 m/s^2 gravity acceleration
Pd	mm C.A., dynamic pressure

Measuring total pressure



Spare parts

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

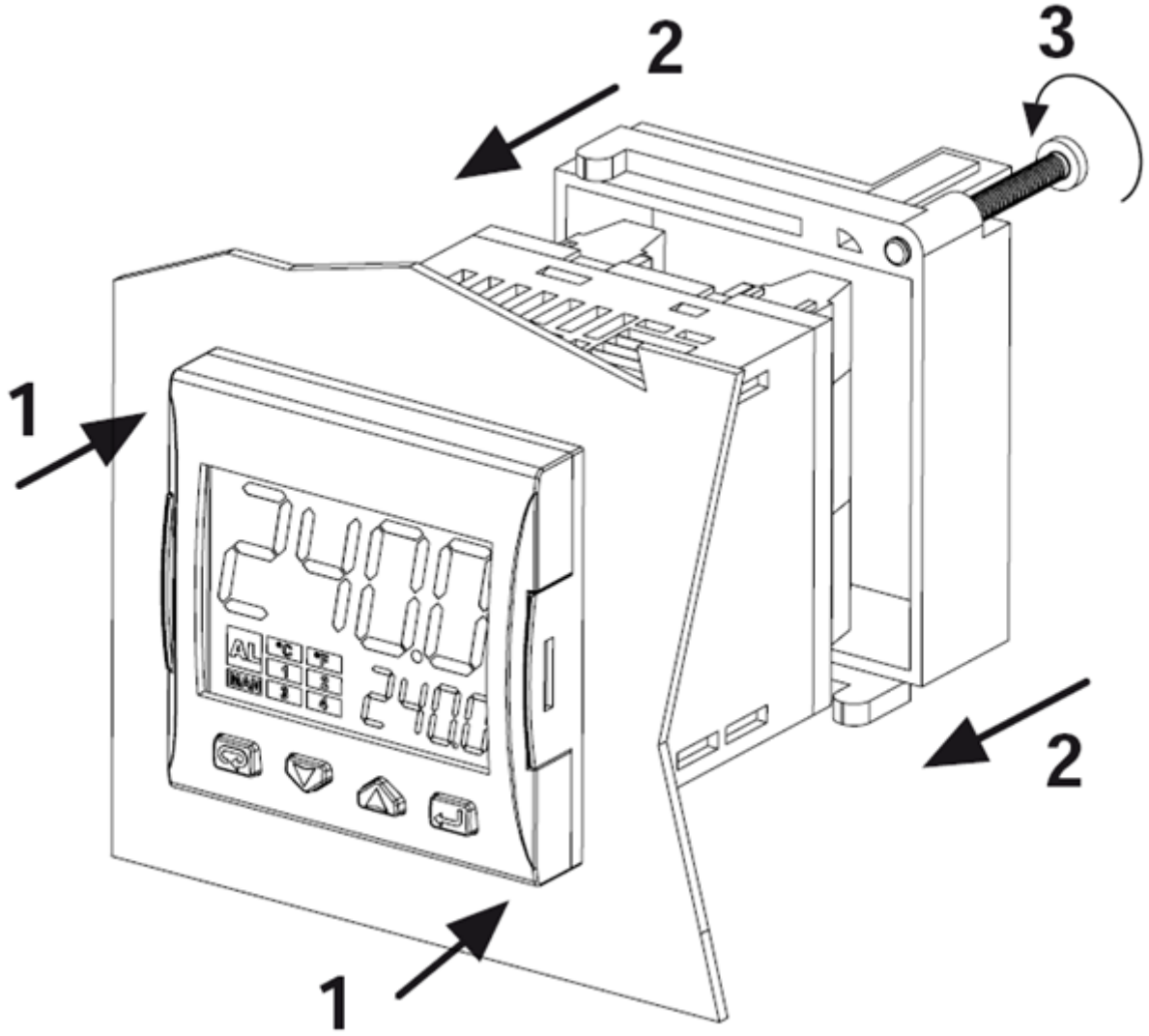
Note: Specifications and data subject to change. Errors and omissions excepted.

KM3 Modulator

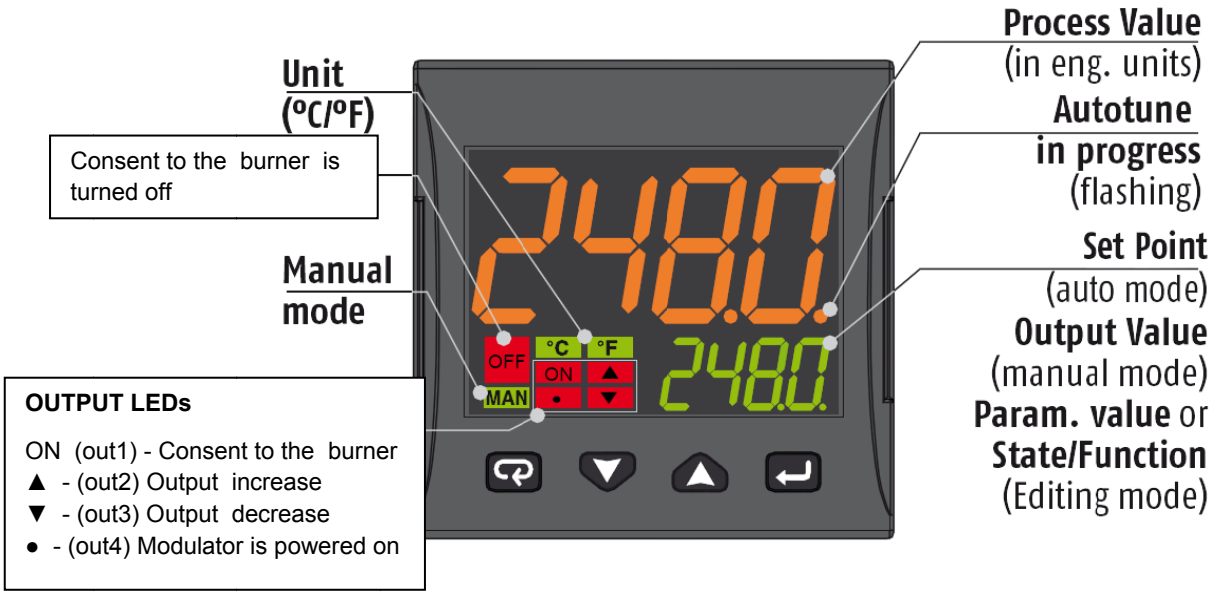
USER MANUAL

M12927CA Rel.1.0 10/2020

MOUNTING



DISPLAY AND KEYS

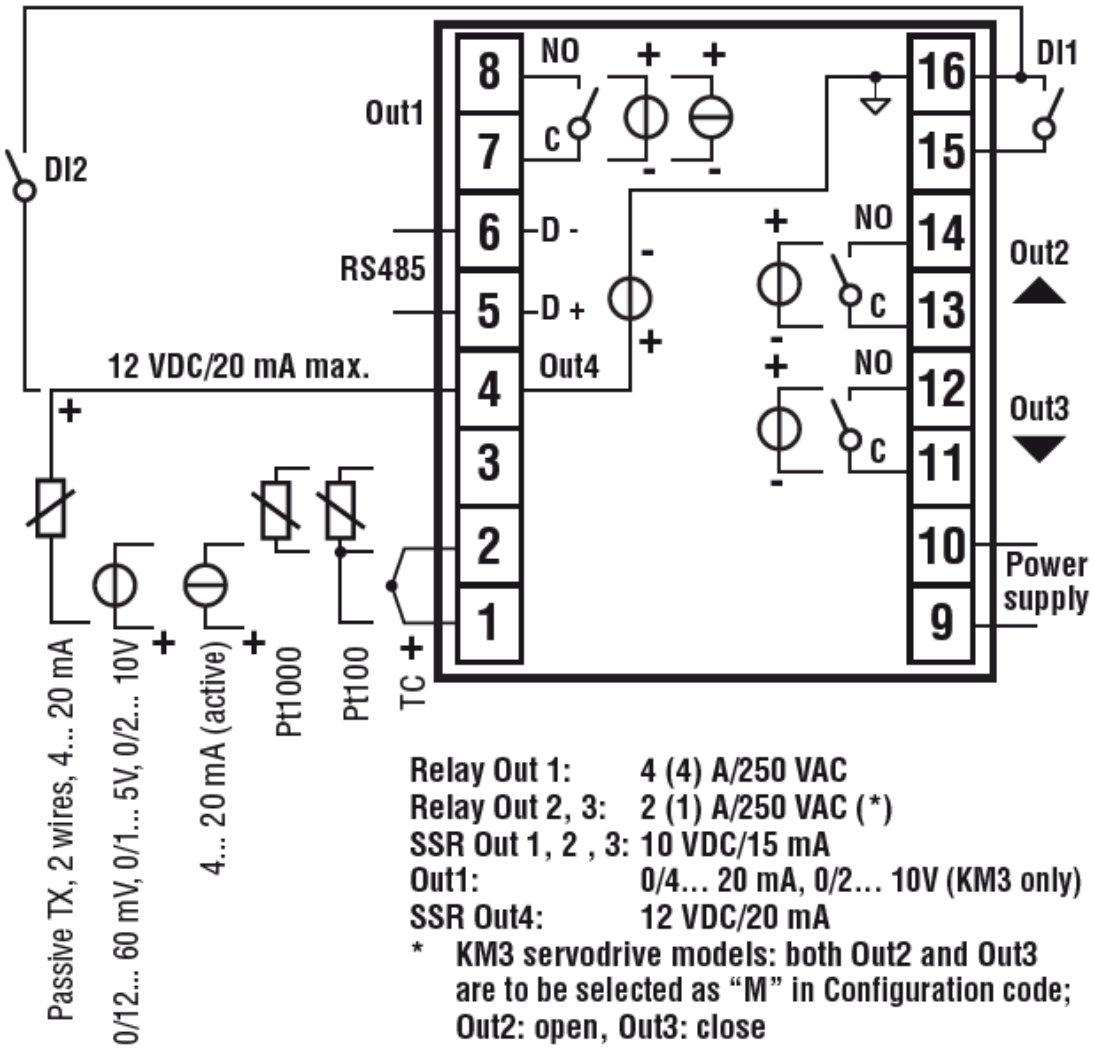


OUTPUT LEDs

ON (out1) - Consent to the burner
▲ - (out2) Output increase
▼ - (out3) Output decrease
● - (out4) Modulator is powered on

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

CONNECTIONS DIAGRAM



Probe connection:

- **PT1000/NTC/PTC**: between terminal 3 and 2
- **PT 100**: between terminal 3 and 2 with terminal 1
- **Passive pressure probe** 0/4-20 mA: between terminal 4 (+) e 1 (-)
  Note: out4 must be activated (IO4F must be 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:

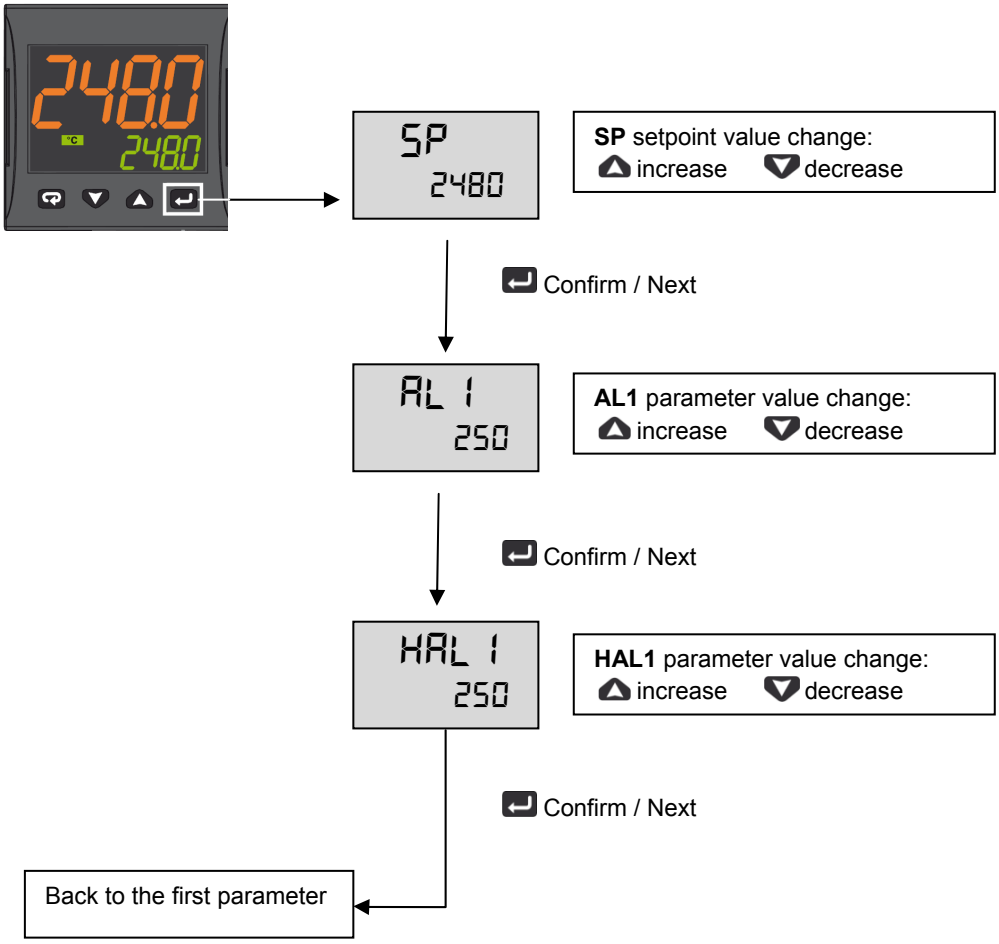
- **Neutral wire:** terminal 9
- **Phase:** terminal 10 (100…240 Vac)
- Close terminals 15-16 to switch to the set point 2

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)

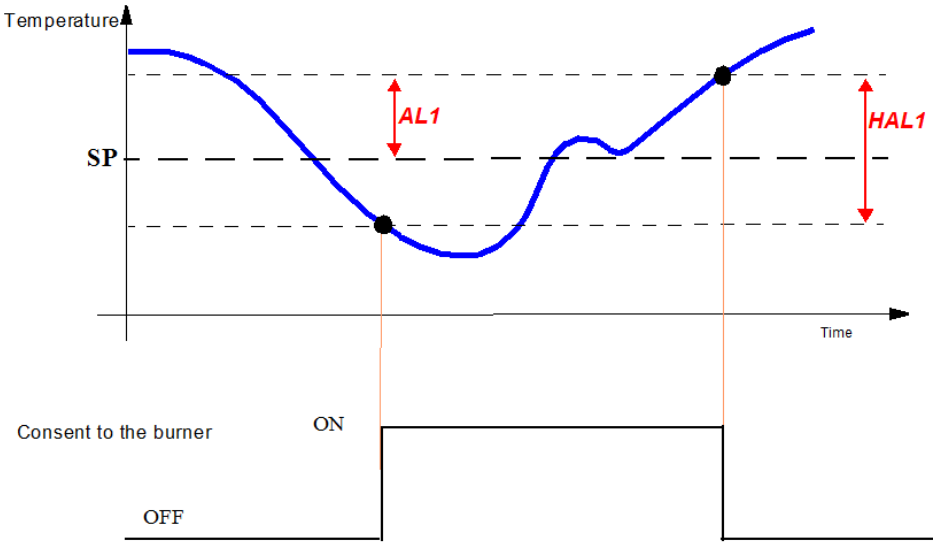
SETPOINT AND HYSTERESIS CONFIGURATION (SP, AL1, HAL1 parameters)

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:



Press the ↵ key for 3 seconds

Password = 20

Access to parameter:

▲	Increase the displayed value
▼	Decrease the displayed value
↵	Confirm and go to next parameter

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

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

Probe parameters configuration MODULATORE ASCON KM3

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

Note:

(*) Str.t - Servomotor stroke time
SQL33; STM30; SQM10; SQM40; SQM50; SQM54 = 30 (Seconds)
STA12B3.41; SQN30.251; SQN72.4A4A20 = 12 (Seconds)

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

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

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

CONFIGURATION

How to access configuration level

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

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

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

Keyboard functions during parameter changing:

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

Configuration Parameters

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

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

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

AL1 GROUP - Alarm 1 parameters					
Liv	**N°**	**Param**	**Descrizione**	**Values**	**Default**
C	28	AL1t	Tipo allarme AL1	nonE = Alarm not used LoAb = Absolute low alarm HiAb = Absolute high alarm LHAo = Windows alarm in alarm outside the windows LHAI = Windows alarm in alarm inside the	HidE

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

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

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

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

rEG Group - Control parameters					
Liv	**N°**	**Param**	**Description**	**Values**	**Default**
C	56	cont	Control type	Pid = PID (heat and/or) On.FA = ON/OFF asymmetric hysteresis On.FS = ON/OFF symmetric hysteresis nr = Heat/Cool ON/OFF control with neutral zone 3Pt = Servomotor control (available only when Output 2 and Output 3 have been ordered as “M”)	3pt
C	57	Auto	Autotuning selection	-4 = Oscillating auto-tune with 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
C	58	tunE	Manual start of the Autotuning	oFF = Not active on = Active	oFF

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

SP Group - Set point parameters

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

PAn Group - Operator HMI

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

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

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

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

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

OPERATIVE MODES

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

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

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

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

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

We define all the above described conditions as “Standard Display”.

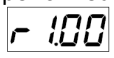
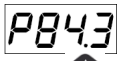
As we have seen, it is always possible to modify the value assigned to a parameter independently from the operative modes selected.

AUTOMATIC MODE

Keyboard function when the instrument is in Auto mode:

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

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

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

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

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

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

Manual mode

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

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

Notes:

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

STAND-BY MODE

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

Notes:

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

AUTOTUNE (EVOTUNE)

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

ERROR MESSAGES

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

Over-range: 

Under-range 

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

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

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

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

List of possible errors

ErAT Fast Auto-tune cannot start. The measure value is 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 ▲ and ▼ buttons set the value -481;
3. Push ↵ button;
4. The instrument will turn OFF all LEDs for a few seconds, then the upper display will show dFLt (default) and then all LEDs are turned ON for 2 seconds. At this point the instrument restarts as for a new power ON.

The procedure is complete.

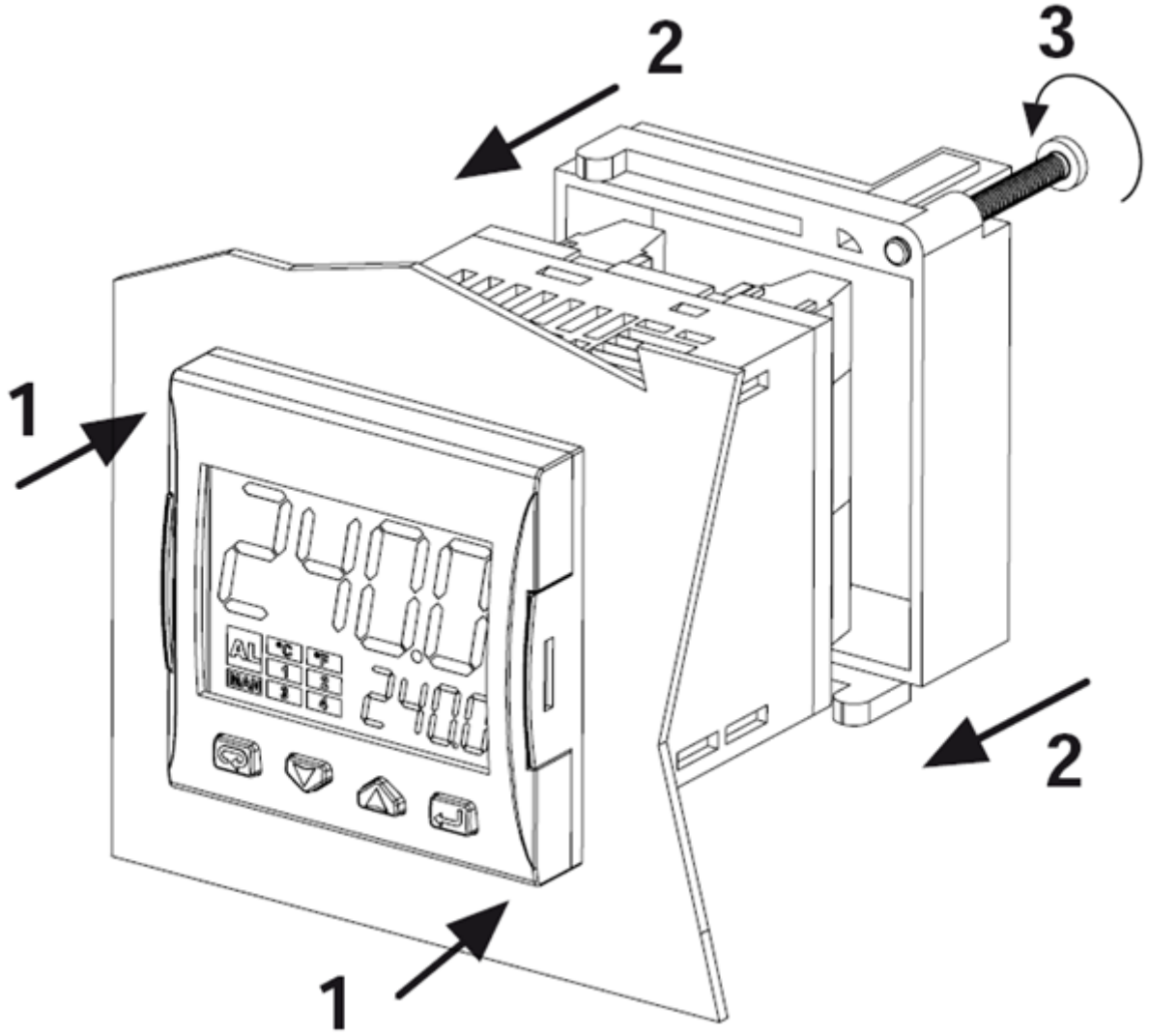
Note: The complete list of the default parameters is available in Chapter "Configuration".

KM3 Modulator

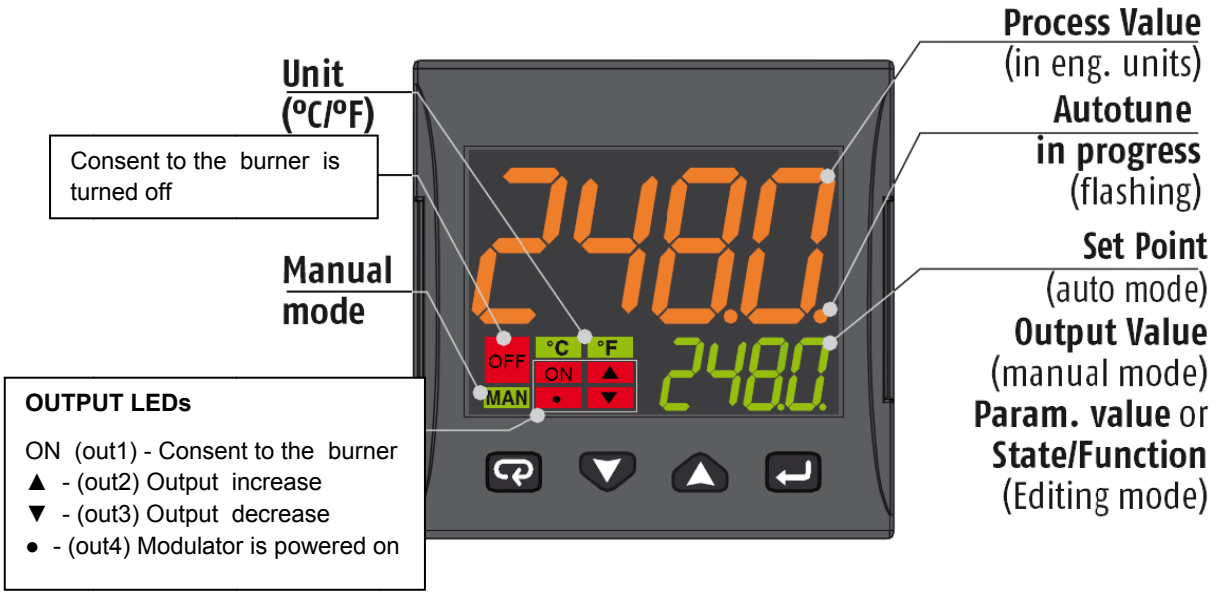
USER MANUAL

M12927CA Rel.1.0 10/2020

MOUNTING



DISPLAY AND KEYS

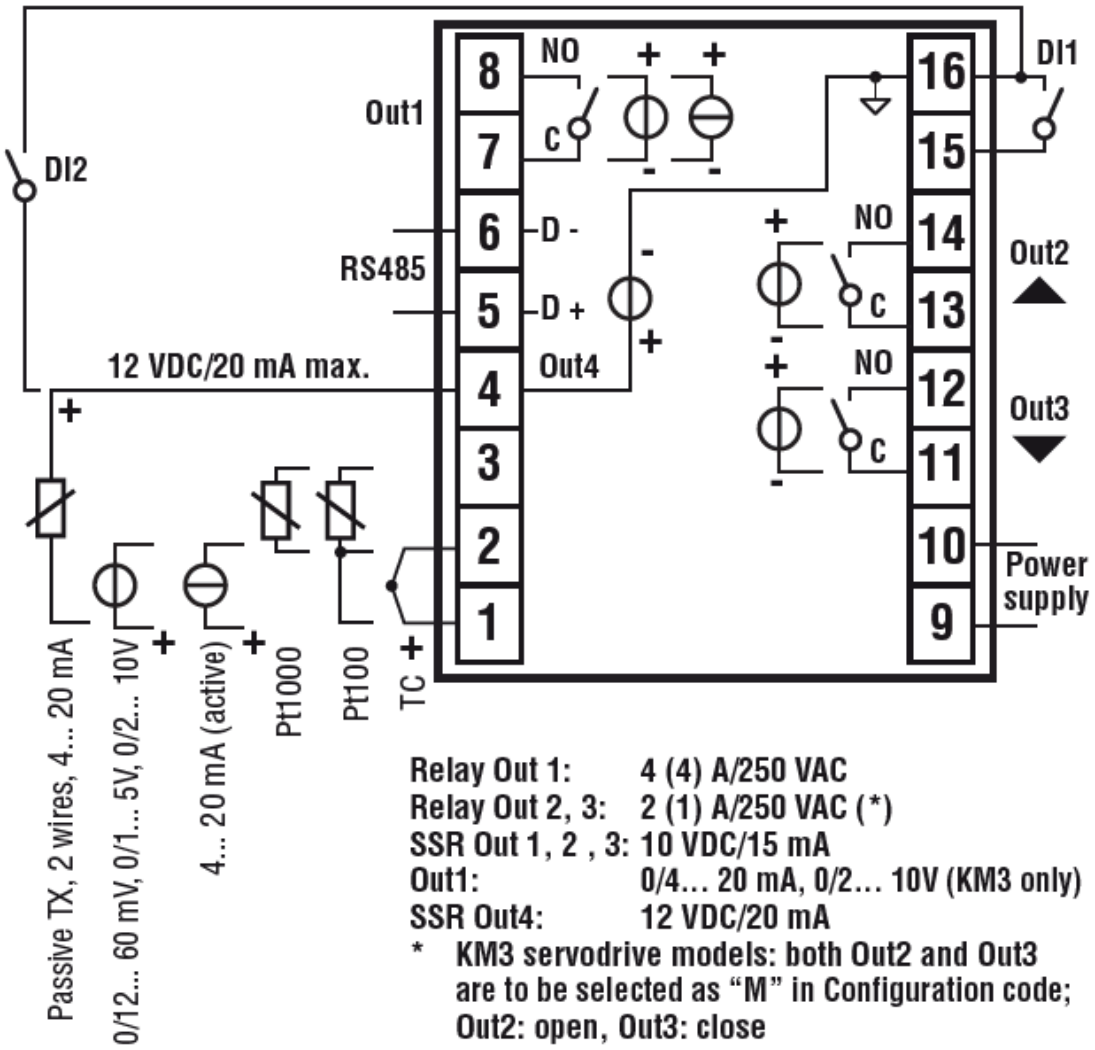


OUTPUT LEDs

ON (out1) - Consent to the burner
▲ - (out2) Output increase
▼ - (out3) Output decrease
● - (out4) Modulator is powered on

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

CONNECTIONS DIAGRAM



Probe connection:

- **PT1000/NTC/PTC**: between terminal 3 and 2
- **PT 100**: between terminal 3 and 2 with terminal 1
- **Passive pressure probe** 0/4-20 mA: between terminal 4 (+) e 1 (-)
  Note: out4 must be activated (IO4F must be 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:

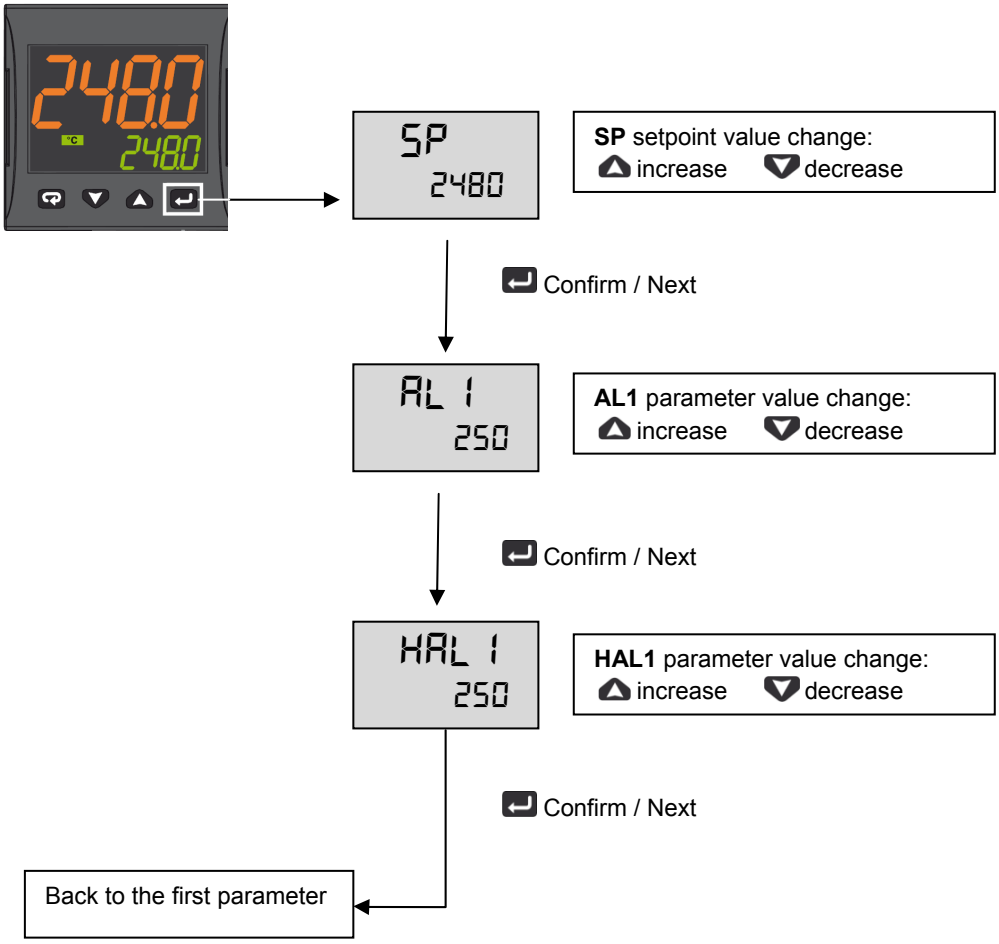
- **Neutral wire:** terminal 9
- **Phase:** terminal 10 (100…240 Vac)
- Close terminals 15-16 to switch to the set point 2

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)

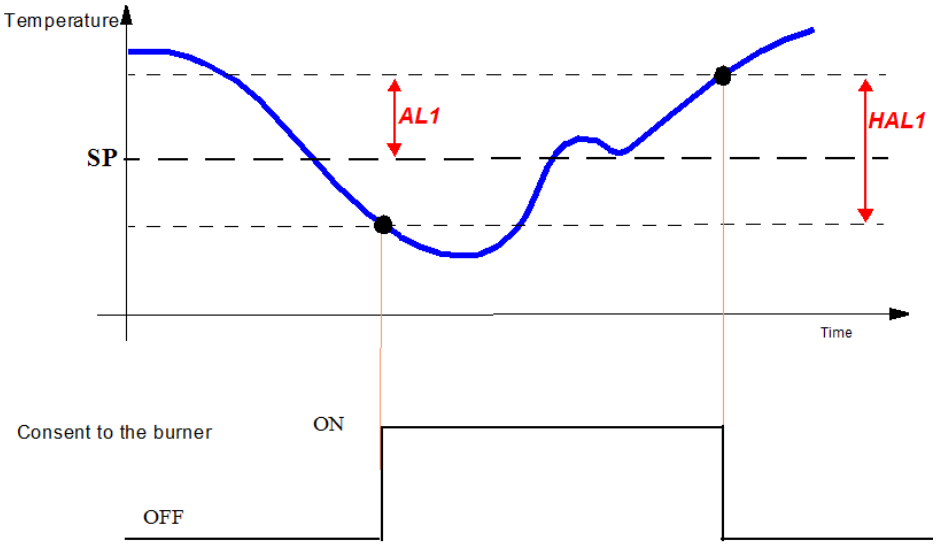
SETPOINT AND HYSTERESIS CONFIGURATION (SP, AL1, HAL1 parameters)

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:



Press the ↵ key for 3 seconds

Password = 20

Access to parameter:

▲	Increase the displayed value
▼	Decrease the displayed value
↵	Confirm and go to next parameter

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

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

Probe parameters configuration MODULATORE ASCON KM3

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

Note:

(*) Str.t - Servomotor stroke time
SQL33; STM30; SQM10; SQM40; SQM50; SQM54 = 30 (Seconds)
STA12B3.41; SQN30.251; SQN72.4A4A20 = 12 (Seconds)

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

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

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

CONFIGURATION

How to access configuration level

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

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

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

Keyboard functions during parameter changing:

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

Configuration Parameters

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

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

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

AL1 GROUP - Alarm 1 parameters					
Liv	**N°**	**Param**	**Descrizione**	**Values**	**Default**
C	28	AL1t	Tipo allarme AL1	nonE = Alarm not used LoAb = Absolute low alarm HiAb = Absolute high alarm LHAo = Windows alarm in alarm outside the windows LHAI = Windows alarm in alarm inside the	HidE

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

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

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

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

rEG Group - Control parameters					
Liv	**N°**	**Param**	**Description**	**Values**	**Default**
C	56	cont	Control type	Pid = PID (heat and/or) On.FA = ON/OFF asymmetric hysteresis On.FS = ON/OFF symmetric hysteresis nr = Heat/Cool ON/OFF control with neutral zone 3Pt = Servomotor control (available only when Output 2 and Output 3 have been ordered as “M”)	3pt
C	57	Auto	Autotuning selection	-4 = Oscillating auto-tune with 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
C	58	tunE	Manual start of the Autotuning	oFF = Not active on = Active	oFF

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

SP Group - Set point parameters

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

PAn Group - Operator HMI

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

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

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

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

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

OPERATIVE MODES

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

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

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

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

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

We define all the above described conditions as “Standard Display”.

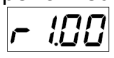
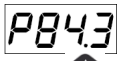
As we have seen, it is always possible to modify the value assigned to a parameter independently from the operative modes selected.

AUTOMATIC MODE

Keyboard function when the instrument is in Auto mode:

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

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

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

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

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

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

Manual mode

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

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

Notes:

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

STAND-BY MODE

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

Notes:

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

AUTOTUNE (EVOTUNE)

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

ERROR MESSAGES

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

Over-range: 

Under-range 

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

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

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

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

List of possible errors

ErAT Fast Auto-tune cannot start. The measure value is 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 ▲ and ▼ buttons set the value -481;
3. Push ↵ button;
4. The instrument will turn OFF all LEDs for a few seconds, then the upper display will show dFLt (default) and then all LEDs are turned ON for 2 seconds. At this point the instrument restarts as for a new power ON.

The procedure is complete.

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