

E115X

E150X

E180X

Gas burners

MANUAL OF INSTALLATION - USE - MAINTENANCE



BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

DANGERS, WARNINGS AND NOTES OF CAUTION

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

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

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

CAREFULLY KEEP THIS MANUAL FOR FUTURE REFERENCE.

1) GENERAL INTRODUCTION

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

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

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

Contact qualified personnel only.

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

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

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

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

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

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

2) SPECIAL INSTRUCTIONS FOR BURNERS

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

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

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

Special warnings

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

3) GENERAL INSTRUCTIONS DEPENDING ON FUEL USED

3a) ELECTRICAL CONNECTION

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

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

GENERAL

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

SPECIAL INSTRUCTIONS FOR USING GAS

Have qualified personnel inspect the installation to ensure that:

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

Precautions if you can smell gas

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

DIRECTIVES AND STANDARDS

Gas burners

European directives

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

Harmonized standards

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

Light oil burners

European directives

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

Harmonized standards

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

Heavy oil burners

European Directives

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

Harmonized standards

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

Gas - Light oil burners

European Directives

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

Harmonized standards

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

Gas - Heavy oil burners

European directives:

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

Harmonized standards

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

Industrial burners

European directives

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

Harmonized standards

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

Burner data plate

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

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

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

SYMBOLS USED



WARNING!

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



DANGER!

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



WARNING!

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

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

BURNER SAFETY

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



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

Residual risks deriving from misuse and prohibitions

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



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



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



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

PART I: SPECIFICATIONS

BURNERS FEATURES

Gas operation: the gas coming from the supply line passes through filter, gas valves and pressure regulator. This one forces the pressure in the utilisation limits. The electric actuator, that moves proportionally the air damper and the gas butterfly valve, uses an adjusting cam with variable shape. This one allows the optimisation of the gas flue values, as to get an efficient combustion. The combustion head positioning determines the burner's output. The combustion head determines the energetic quality and the geometry of the flame. Fuel and comburent are routed into separated ways as far as the zone of flame generation (combustion chamber).

The control panel, placed on the burner's front side, shows each operating stage.

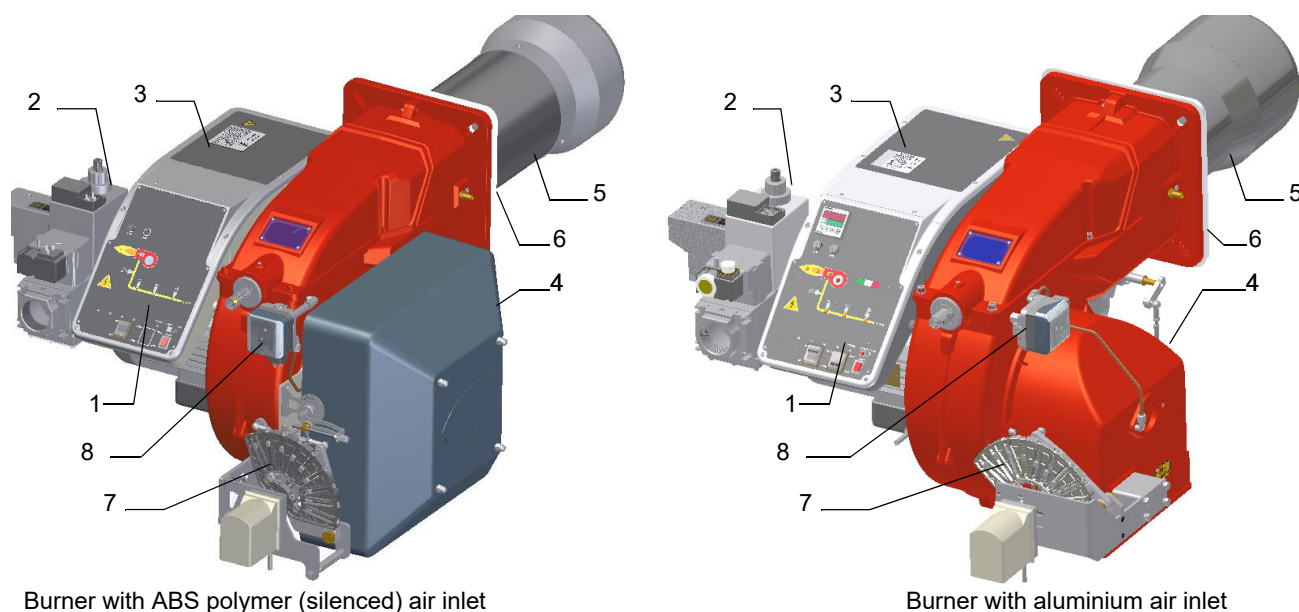


Fig. 1

Note: the figure is indicative only

- 1 Control panel with startup switch
- 2 Gas train
- 3 Electrical panel
- 4 Silencer
- 5 Blast tube + Combustion head
- 6 Flange
- 7 Adjusting cam
- 8 Air pressure switch

Gas categories and countries of application

Countries					
AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MK, MT, NO, NL, PL, PT, RO, SE, SI, SK, TR					
Models: "...M-...", "...MG...", "...MN...", "...ME...", "...MD..."			Models: "...L-...", "...LG...", "...LN..."		
Group			Group		
E	LL	Er	B/P	B	P
H	L	E (R)	3R		
EK	2R				

The above gas groups can be combined according to the standard EN437:2021 and national situation of countries.

Type of fuel used



DANGER! The burner must be used only with the fuel specified in the burner data plate.

Type	--
Model	--
Year	--
S.Number	--
Output	--
Oil Flow	--
Fuel	--
Category	--
Gas Pressure	--
Viscosity	--
El.Supply	--
El.Consump.	--

Burner model identification

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

Type	E115X	Model	M-. MD. SR. *. A. 1. 80.
	(1)		(2) (3) (4) (5) (6) (7) (8)

1	BURNER TYPE	E115X, E150X, E180X
2	FUEL	M - Natural gas L - LPG
3	OPERATION (Available versions)	PR - Progressive MD - Fully modulating AB - Double stage
4	BLAST TUBE AND AIR INLET CONFIGURATION (see the figure on page 5)	SR = Standard blast tube + ABS polymer (silenced) air intake SP = Standard blast tube + aluminium air intake LR = Extended blast tube + ABS polymer (silenced) air intake LP = Extended blast tube + aluminium air intake
5	DESTINATION COUNTRY	* - see data plate
6	BURNER VERSION	A - Standard Y - Special
7	EQUIPMENT	0 = 2 gas valves 1 = 2 gas valves + gas proving system 7 = 2 gas valves + maximum gas pressure switch 8 = 2 gas valves + gas proving system + maximum gas pressure switch
8	GAS CONNECTION	40 = Rp1 1/2, 50 = Rp2, 65 = DN65, 80 = DN80

The burner technical specifications, described in this manual, refer to natural gas (calorific net value $H_i = 9.45 \text{ kWh/Stm}^3$, density $\rho = 0.717 \text{ Kg/Stm}^3$). For different fuel such as LPG, town gas and biogas, multiply the values of flow and pressure by the corrective factors shown in the table below.

Fuel	H_i (KWh/Stm ³)	ρ (kg/Stm ³)	f_Q	f_p
LPG	26,79	2,151	0,353	0,4
Town gas	4,88	0,6023	1,936	3,3
Biogas	6,395	1,1472	1,478	3,5

For example, to obtain the flow and pressure values for the biogas:

$$Q_{biogas} = Q_{naturalGas} \cdot 1,478$$

$$p_{biogas} = p_{naturalGas} \cdot 3,5$$



ATTENTION! The combustion head type and the settings depend on the fuel. The burner must be used only for its intended purpose specified in the burner data plate.



ATTENTION! The corrective factors in the above table depend on the gas composition, so on the calorific value and the density of the gas. The above value can be taken only as reference.

Technical Specifications

BURNER TYPE		E115X M-..	E150X M-..	E180X M-..	E115X L-..	E150X L-..	E180X L-..
Output	min. - max. kW	300 - 1150	250 - 1550	320 - 1800	300 - 1150	250 - 1550	320 - 1800
Fuel		Natural gas			LPG		
Category		(see next paragraph)					
Operation		Two stages - Progressive - Fully modulating					
Operating temperature	°C	-10 ÷ +50					
Storage Temperature	°C	-20 ÷ +60					
Working service		(5)					
NOx emissions		≤ 80 mg/kWh - (Class 3 - EN676)					

Electrical data 50 Hz

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

Power supply triphase	V	230 / 400 3 a.c.					
Auxiliary power supply Mono Phase	V	115 2 a.c. / 220 2 a.c. / 230 1N a.c.					
	Hz	50					
Electric motor	kW	2,2	2,2	3	2,2	2,2	3
Total power consumption	kW	2,7	2,7	3,5	2,7	2,7	3,5

Electrical data 60 Hz

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

Power supply triphase	V	220 / 230 / 265 / 277 / 380 / 440 / 460 / 480 / 525 3 a.c.					
Auxiliary power supply Mono Phase	V	110 / 120 / 220 / 230 2 a.c.					
	Hz	60					
Electric motor	kW	2,64	2,64	3,6	2,64	2,64	3,6
Total power consumption	kW	3,14	3,14	4,1	3,14	3,14	4,1

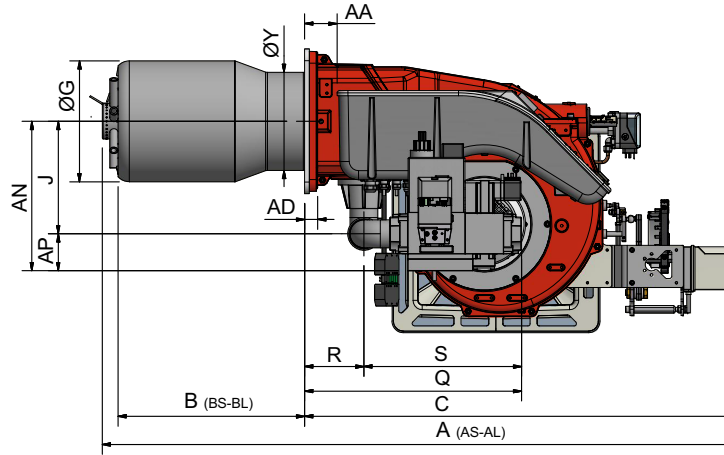
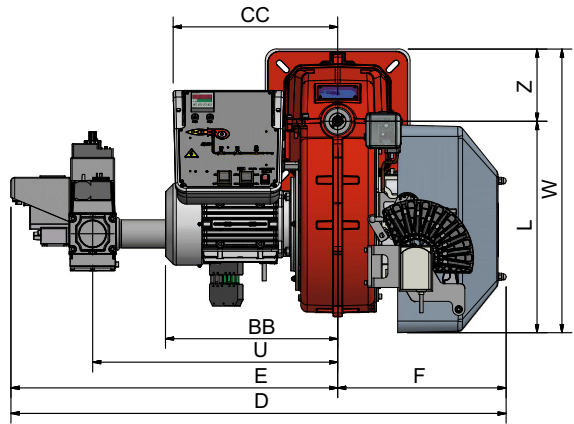
Fuel data

gas rate- Natural gas (1)	min.- max. (Stm ³ /h)	32 - 122	26 - 164	34 - 190	-	-	-
gas rate-		-	-	-	11,2 - 43	9,3 - 58	11,9 - 67
Gas pressure (2)	mbar	(see Note 2)					

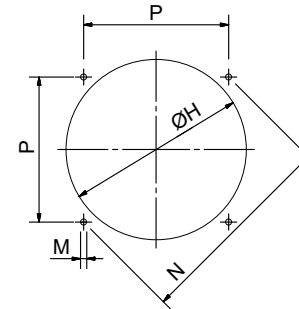
Note 1:	All gas flow rates are referred to Stm ³ / h (1.013 mbar absolute pressure, 15 °C temperature) and are valid for G20 gas (net calorific value H _i = 34,02 MJ / Stm ³); for L.P.G. (net calorific value H _i = 93,5 MJ / Stm ³).						
Note 2:	Maximum gas pressure	360 mbar (with Dungs MBDLE).					
		500 mbar (with Siemens VGD or Dungs MultiBloc MBE).					
	Minimum gas pressure	see gas curves					
Note 3:	Burners are suitable only for indoor operation with a maximum relative humidity of 80 %.						
Note 4:	With electrode: for safety reasons the burner must stop automatically every 24 hours.						
Note 5:	The type of service can be continuous (flame signal presence for more than 24 h without any stop) or intermittent (at least once every 24 h there is a work stoppage and the flame is extinguished) depending on the configuration ordered. Operation can be continuous in the presence of flame detection via ION ionisation or Siemens QRI..., QRA5..., QRA7... or Lamtec FSS... with Siemens LMV37x or LMV5x flame control equipment (BMS) and Lamtec BT3...						

Overall dimensions (mm)

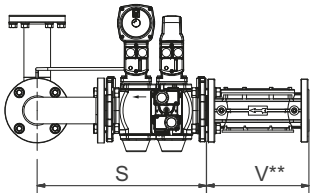
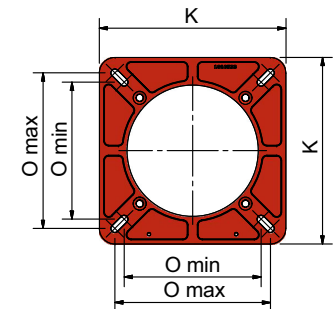
E115X, E150X, E180X



BOILER RECOMMENDED DRILLING TEMPLATE



BURNER FLANGE



(**) According to the gas train size and the burner type, MB-DLE or VGD valves are supplied. The "V" measure, refers to the gas filter, for burners provided with Siemens VGD valves. MB-DLE valves have a built-in filter.

8

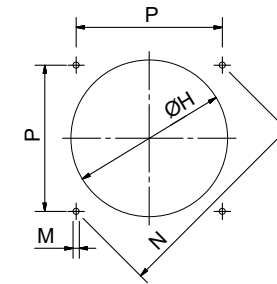
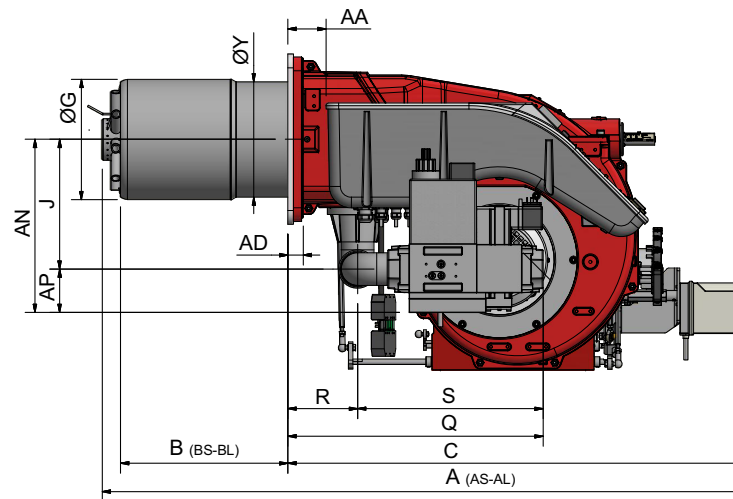
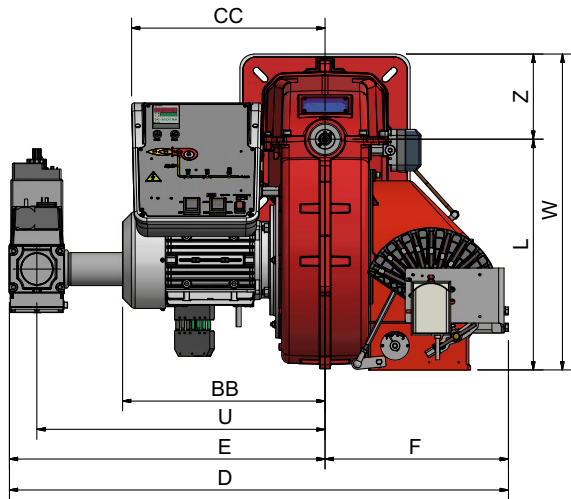
B*: SPECIAL blast tube lengths must be agreed with **Cib Unigas**

	DN (*)	AA	A _S	A _L	BB	B _S	B _L	C	CC	D	E	F	G	H	J	K	L	M	N	O _{MIN}	O _{MAX}	P	Q	R	S	U	V(**)	W	Y	Z
E115X	40	69	1267	1352	372	305	390	928	352	1078	716	362	219	249	233	300	453	M10	330	216	250	233	457	130	327	541	-	608	210	155
	50	69	1267	1352	372	305	390	928	352	1013	651	362	219	249	233	300	453	M10	330	216	250	233	472	130	342	526	-	608	210	155
	65	69	1267	1352	372	305	390	928	352	1162	800	362	219	249	233	300	453	M10	330	216	250	233	562	130	432	593	292	608	210	155
	80	69	1267	1352	372	305	390	928	352	1136	774	362	219	249	233	300	453	M10	330	216	250	233	558	130	428	565	310	608	210	155
E150X	40	69	1362	1428	372	400	500	928	352	1078	716	362	259	280	233	300	453	M10	330	216	250	233	457	130	327	541	-	608	210	155
	50	69	1362	1428	372	400	500	928	352	1013	651	362	259	280	233	300	453	M10	330	216	250	233	472	130	342	526	-	608	210	155
	65	69	1362	1428	372	400	500	928	352	1162	800	362	259	280	233	300	453	M10	330	216	250	233	562	130	432	593	292	608	210	155
	80	69	1362	1428	372	400	500	928	352	1136	774	362	259	280	233	300	453	M10	330	216	250	233	562	130	432	565	310	608	210	155
E180X	40	69	1362	1462	403	400	500	928	352	1078	716	362	259	280	235	300	453	M10	330	216	250	233	457	130	327	541	-	608	210	155
	50	69	1362	1462	403	400	500	928	352	1013	651	362	259	280	235	300	453	M10	330	216	250	233	472	130	342	526	-	608	210	155
	65	69	1362	1462	403	400	500	928	352	1162	800	362	259	280	235	300	453	M10	330	216	250	233	562	130	432	593	210	608	210	155
	80	69	1362	1462	403	400	500	928	352	1136	774	362	259	280	235	300	453	M10	330	216	250	287	558	130	428	565	210	608	210	155

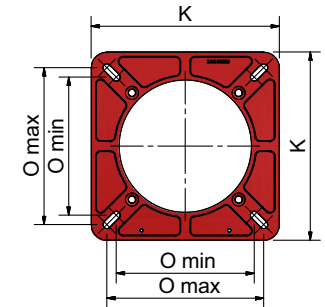
BS = standard blast tube BL = long blast tube DN = gas valves size

Overall dimensions (mm)

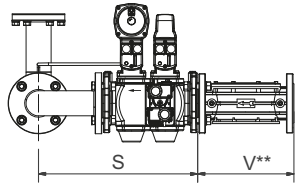
E115X, E150X, E180X - Aluminium air intake version



BOILER RECOMMENDED DRILLING TEMPLATE



BURNER FLANGE



(**) According to the gas train size and the burner type, MB-DLE or VGD valves are supplied. The "V" measure, refers to the gas filter, for burners provided with Siemens VGD valves. MB-DLE valves have a built-in filter.

6

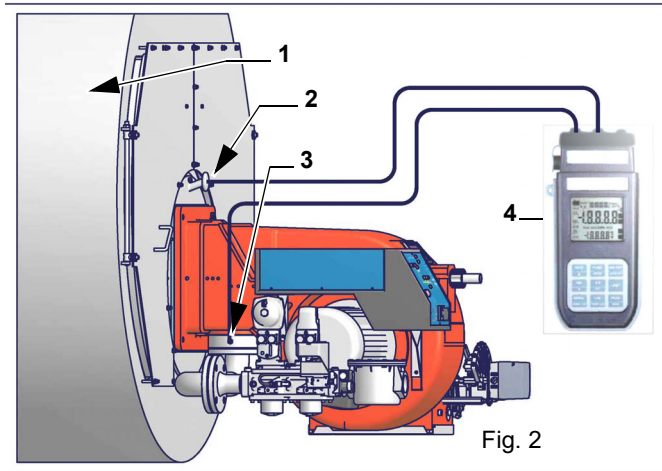
B*: SPECIAL blast tube lengths must be agreed with Cib Unigas

TIPO	DN	A (AS)	A (AL)	AA	AD	B (BS)	B (BL)	BB	C	CC	D	E	F	G	H	I	J	K	L	M	N	Omin	Omax	P	Q	R	S	U	V	W	Y	Z
E115X	1.40	1169	1253	69	28	309	390	369	830	352	679	679	333	219	249	210	235	300	420	M10	330	220	250	233	*	127	325	569	x	575	210	155
	1.50	1169	1253	69	28	309	390	369	830	352	969	969	333	219	249	210	235	300	420	M10	330	220	250	233	*	127	338	529	x	575	210	155
	1.65	1169	1253	69	28	309	390	369	830	352	1002	1002	333	219	249	210	287	300	420	M10	330	220	250	233	275	127	406	565	292	575	210	155
	1.80	1169	1253	69	28	309	390	369	830	352	1082	1082	333	219	249	210	287	300	420	M10	330	220	250	233	284	127	692	565	310	575	210	155
E150X	1.40	1264	1364	69	28	400	500	369	830	352	679	679	333	259	280	210	235	300	420	M10	330	220	250	233	*	127	325	569	x	575	210	155
	1.50	1264	1364	69	28	400	500	369	830	352	969	969	333	259	280	210	235	300	420	M10	330	220	250	233	*	127	338	529	x	575	210	155
	1.65	1264	1364	69	28	400	500	369	830	352	1002	1002	333	259	280	210	287	300	420	M10	330	220	250	233	275	127	406	565	292	575	210	155
	1.80	1264	1364	69	28	400	500	369	830	352	1082	1082	333	259	280	210	287	300	420	M10	330	220	250	233	284	127	692	565	310	575	210	155
E180X	1.40	1264	1364	69	28	400	500	403	830	352	679	679	333	259	280	210	235	300	420	M10	330	220	250	233	*	127	325	569	x	575	210	155
	1.50	1264	1364	69	28	400	500	403	830	352	969	969	333	259	280	210	235	300	420	M10	330	220	250	233	*	127	338	529	x	575	210	155
	1.65	1264	1364	69	28	400	500	403	830	352	1002	1002	333	259	280	210	287	300	420	M10	330	220	250	233	275	127	406	565	292	575	210	155
	1.80	1264	1364	69	28	400	500	403	830	352	1082	1082	333	259	280	210	287	300	420	M10	330	220	250	233	284	127	692	565	310	575	210	155

BS = standard blast tube BL = long blast tube DN = gas valves size

Combustion head gas pressure curves

Combustion head gas pressure depends on gas flow and combustion chamber backpressure. When backpressure is subtracted, it depends only on gas flow, provided combustion is properly adjusted, flue gases residual O₂ percentage complies with “Recommended combustion values” table and CO in the standard limits). During this stage, the combustion head, the gas butterfly valve and the actuator are at the maximum opening. Refer to , showing the correct way to measure the gas pressure, considering the values of pressure in combustion chamber, surveyed by means of the pressure gauge or taken from the boiler’s Technical specifications..



Note: the figure is indicative only.Key

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



ATTENTION: the burned gas rate must be read at the gas flow meter. when it is not possible, the user can refer to the pressure-rate curves as general information only.

Measuring gas pressure in the combustion head In order to measure the pressure in the combustion head, insert the pressure gauge probes: one into the combustion chamber’s pressure outlet to get the pressure in the combustion chamber and the other one into the butterfly valve’s pressure outlet of the burner. On the basis of the measured differential pressure, it is possible to get the maximum flow rate: in the pressure - rate curves (showed on the next paragraph), it is easy to find out the burner’s output in Stm³/h (quoted on the x axis) from the pressure measured in the combustion head (quoted on the y axis). The data obtained must be considered when adjusting the gas flow rate.

How to read the burner “Performance curve”

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

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

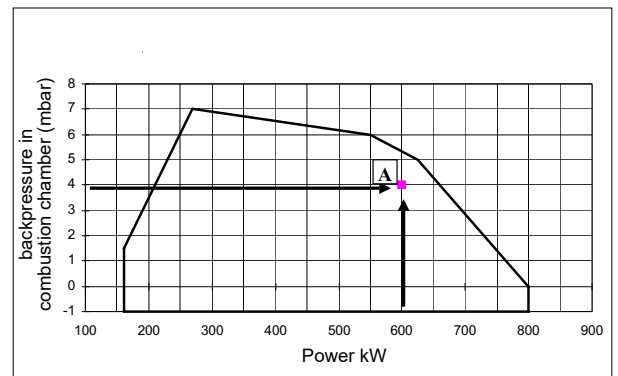
Example:

Furnace input: 600kW

Backpressure: 4 mbar

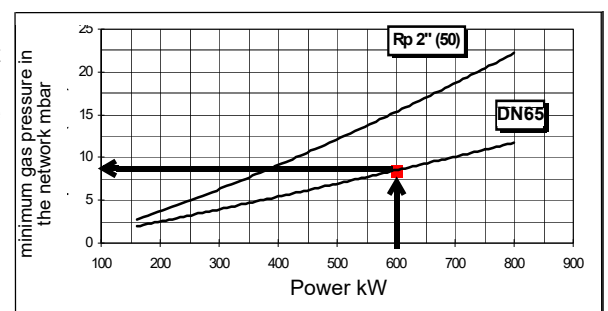
In the “Performance curve” diagram, draw a vertical line matching the furnace input value and an horizontal line matching the backpressure value. The burner is suitable if the intersection point A is inside the performance curve.

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

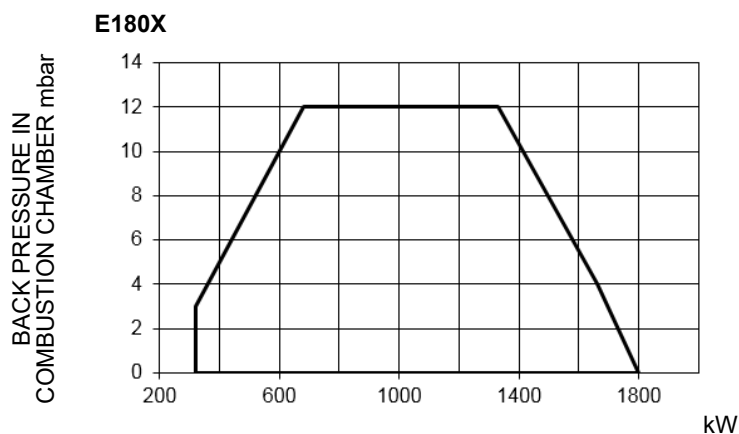
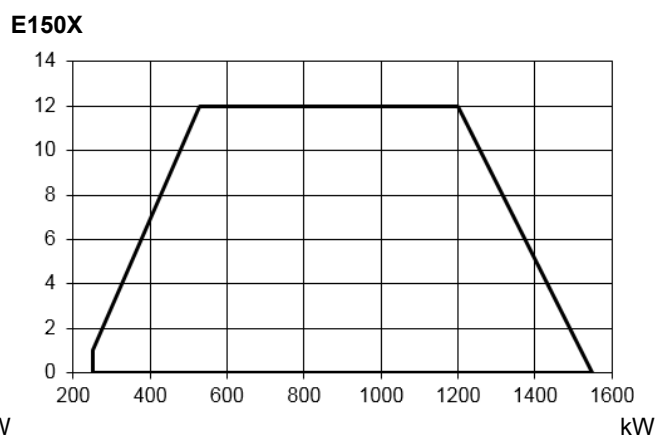
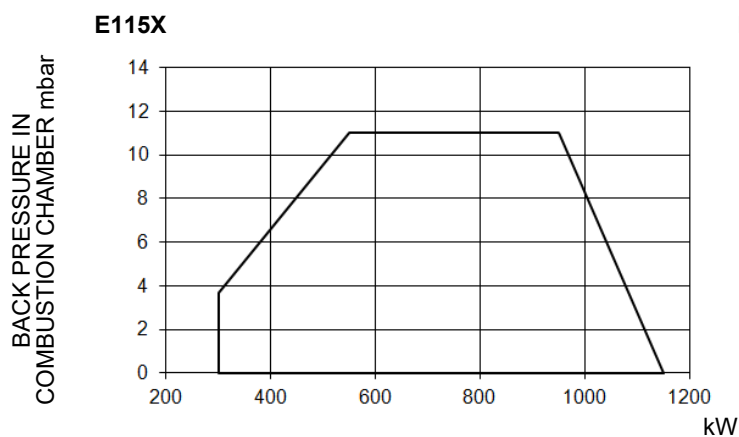


Checking the proper gas train size

To check the proper gas train size, it is necessary to the available gas pressure value upstream the burner’s gas valve. Then subtract the backpressure. The result is called **pgas**. Draw a vertical line matching the furnace input value (600kW, in the example), quoted on the x-axis, as far as intercepting the network pressure curve, according to the installed gas train (DN65, in the example). From the interception point, draw an horizontal line as far as matching, on the y-axis, the value of pressure necessary to get the requested furnace input. This value must be lower or equal to the **pgas** value, calculated before.



Performance Curves

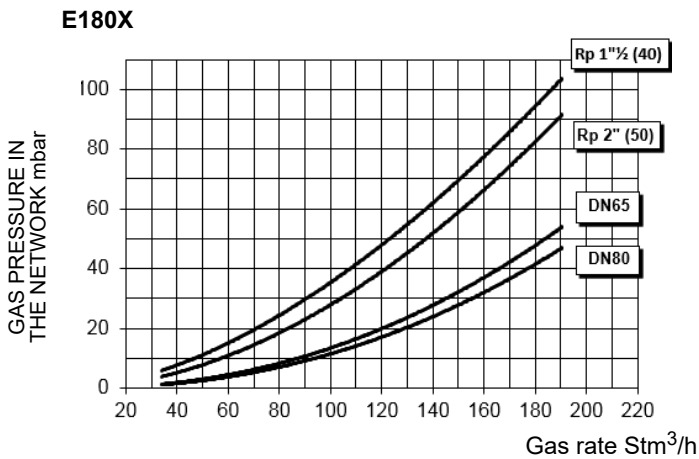
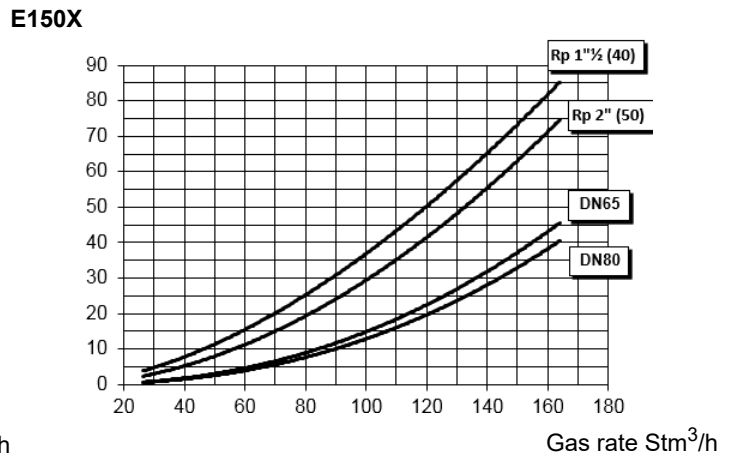
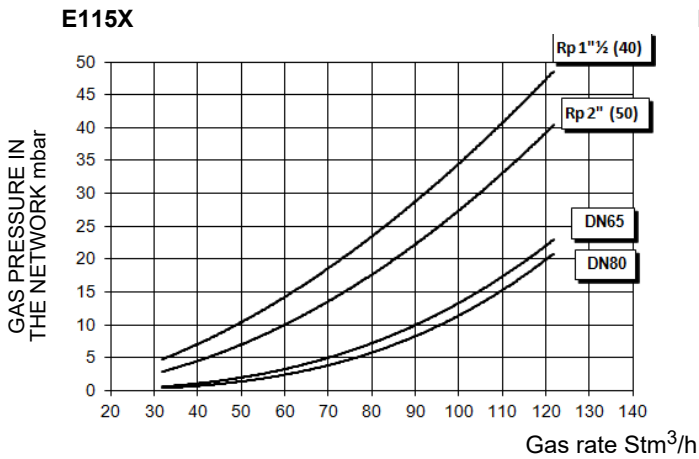


To get the input in kcal/h, multiply value in kW by 860.

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

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

Pressure in the Network / gas flow rate curves(natural gas)



ATTENTION: the gas rate value is quoted on the x-axis, the related network pressure is quoted on the y-axis (pressure value in the combustion chamber is not included). To know the minimum pressure at the gas train inlet, necessary to get the requested gas rate, add the pressure value in the combustion chamber to the value read on the y-axis.

Pressure in the Network / gas flow rate curves(L-)



The values in the diagrams refer to **natural gas** with a calorific value of 8125 kcal/Stm³ (15°C, 1013 mbar) and a density of 0.714 kg/Stm³.



The values in the diagrams refer to **GPL** with a calorific value of 22300 kcal/Stm³ (15°C, 1013 mbar) and a density of 2.14 kg/Stm³. When the calorific value and the density change, the pressure values should be adjusted accordingly.

Where:

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

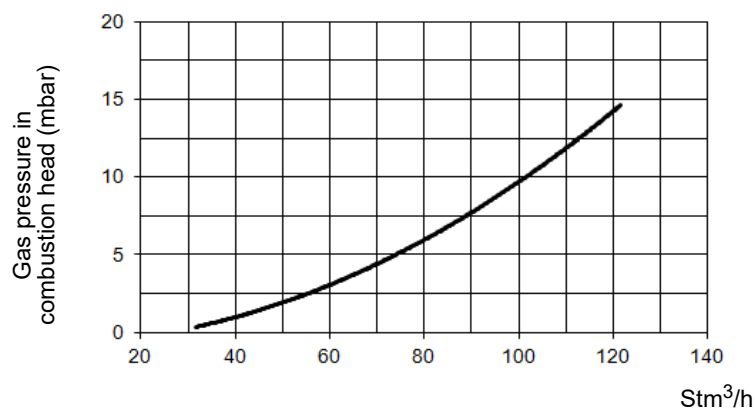
- p_1 Natural gas pressure shown in diagram
- p_2 Real gas pressure
- Q_1 Natural gas flow rate shown in diagram
- Q_2 Real gas flow rate
- ρ_1 Natural gas density shown in diagram
- ρ_2 Real gas density

Gas pressure burner head vs natural gas flow rate

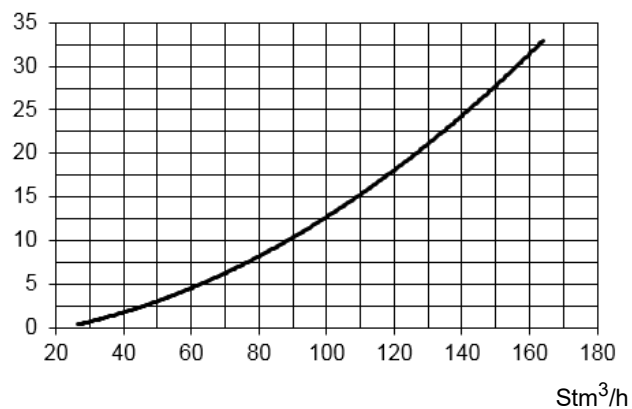


Curves are referred to pressure = 0 mbar in the combustion chamber!

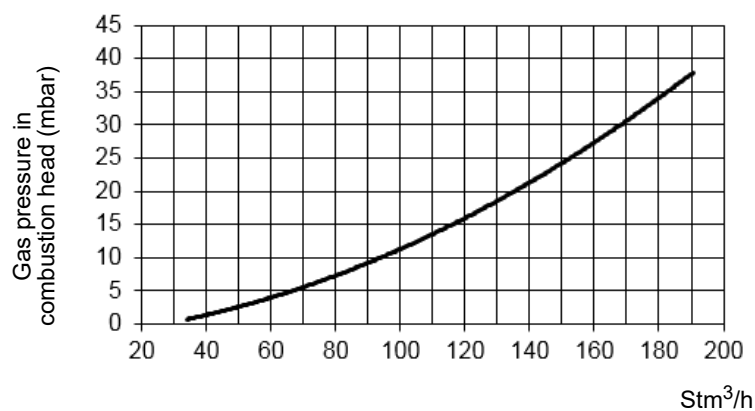
E115X M-..



E150X M-..



E180X M-..



MOUNTING AND CONNECTING THE BURNER

Transport and storage

If the product must be stored, avoid humid and corrosive places. Observe the temperatures stated in the burner data table at the beginning of this manual. The packages containing the burners must be locked inside the means of transport in such a way as to guarantee the absence of dangerous movements and avoid any possible damage.

In case of storage, the burners must be stored inside their packaging, in storerooms protected from the weather. Avoid humid or corrosive places and respect the temperatures indicated in the burner data table at the beginning of this manual.

Packing

Burners are despatched in cardboard packages whose dimensions are:

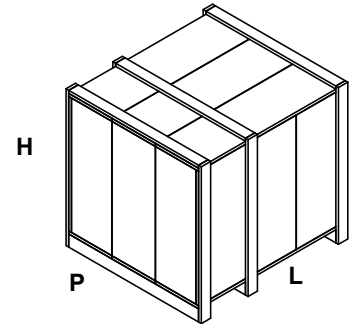
- 1636mm x 1036mm x 1016mm (L x P x H).

Such packages fear moisture and are not suitable for stacking. Packing cases of this type are affected by humidity and are not suitable for stacking.

The following are placed in each packing case: These packagings are damaged by moisture and the maximum number of overlapping packagings indicated on the outside of the packaging may not be exceeded.

- burner with detached gas train;
- gasket or ceramic fibre plait (according to burner type) to be inserted between the burner and the boiler;
- (if provided) detection photoelement detached from the burner
- envelope containing this manual and other documents.

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



Handling the burner

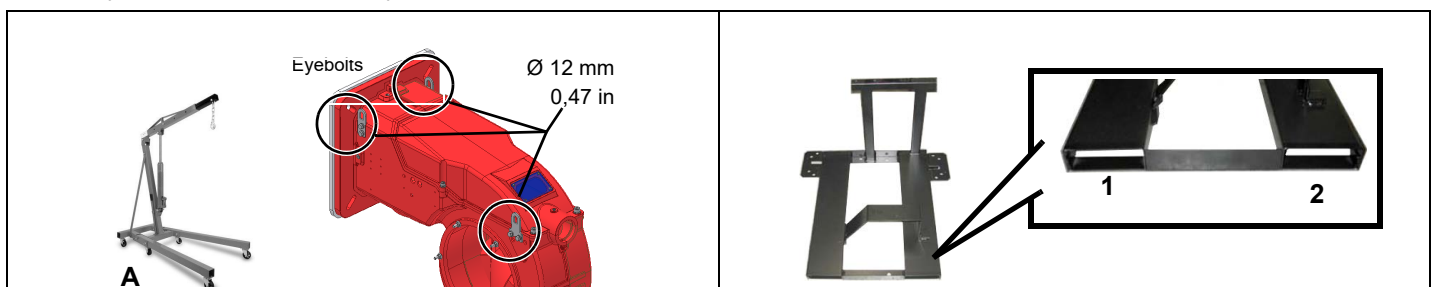
The burner is designed to work positioned according to the picture below. For different installations, please contact the Manufacture.



Warning! Don't lift the burner by the air intake silencer!



The burner is provided with eyebolts, for handling operations and it can be lifted with a hydraulic lift or a small manual crane. (A) The burner is mounted on a stirrup provided for handling the burner by means of a fork lift truck: the forks must be inserted into the A and B ways. Remove the stirrup only once the burner is installed to the boiler.



Fitting the burner to the boiler

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

- 1 make a hole on the closing door of the combustion chamber as described on paragraph "Overall dimensions")
- 2 place the burner to the boiler: lift it up and handle it according to the procedure described on paragraph "Handling the burner";
- 3 place the 4 stud bolts (5), according to the burner's drilling plate described on paragraph "Overall dimensions";
- 4 fasten the 4 stud bolts;
- 5 place the ceramic fibre plait on the burner flange;
- 6 install the burner into the boiler;
- 7 fix the burner to the stud bolts, by means of the fixing nuts, according to the next picture.



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

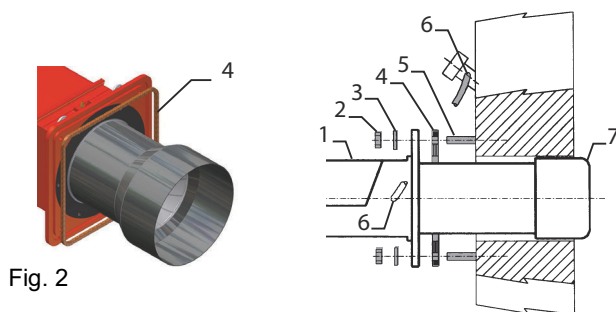


Fig. 2

Keys

- 1 Burner
- 2 Fixing nut
- 3 Washer
- 4 Ceramic fibre plait
- 5 Stud bolt
- 7 Blast tube

The burner is designed to work positioned according to the picture below. For different installations, please contact the Manufacture.

Matching the burner to the boiler (low NOx burners)

The burners described in this manual have been tested with combustion chambers that comply with EN676 regulation and whose dimensions are described in the diagram. In case the burner must be coupled with boilers with a combustion chamber smaller in diameter or shorter than those described in the diagram, please contact the supplier, to verify that a correct matching is possible, with respect of the application involved. To correctly match the burner to the boiler verify the type of the blast tube. Verify the necessary input and the pressure in combustion chamber are included in the burner performance curve; otherwise the choice of the burner must be revised consulting the burner manufacturer. To choose the blast tube length consider the following rule, even if it differs from the instructions of the boiler manufacturer: Cast-iron boilers, three pass flue boilers (with the first pass in the rear part): the blast tube must protrude at least 150÷200 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.

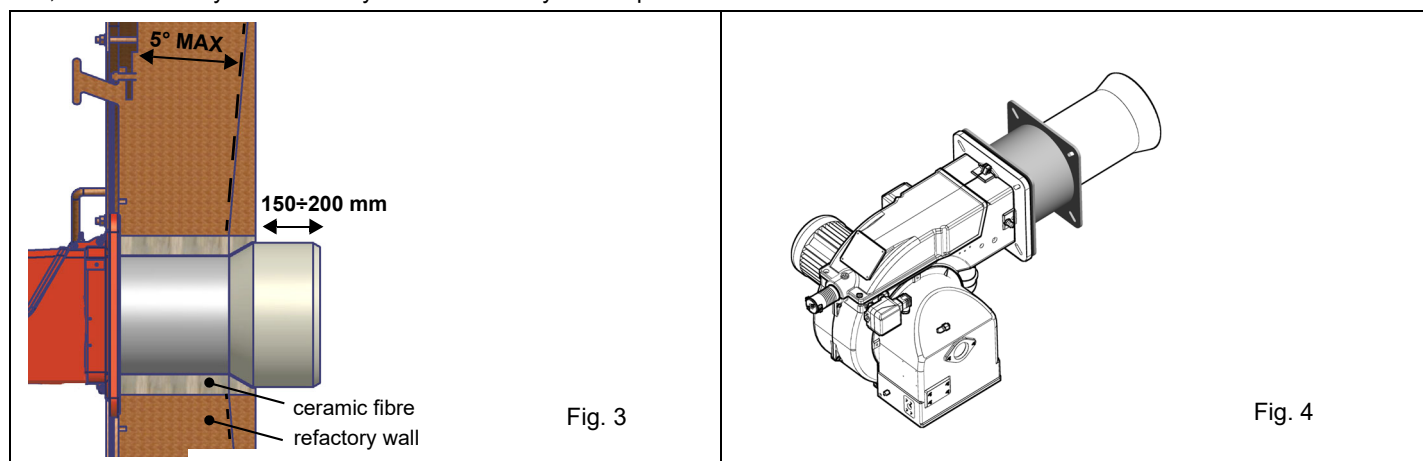


Fig. 3

Fig. 4

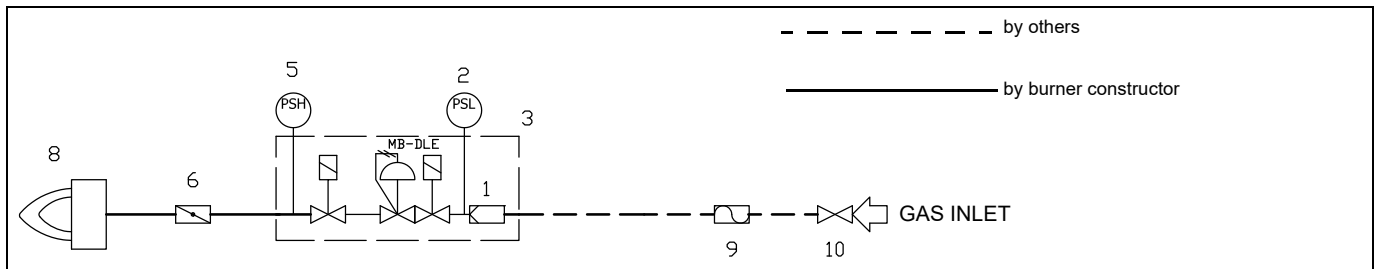


WARNING! Carefully seal the free space between blast tube and the refractory lining with ceramic fibre rope or other suitable means.

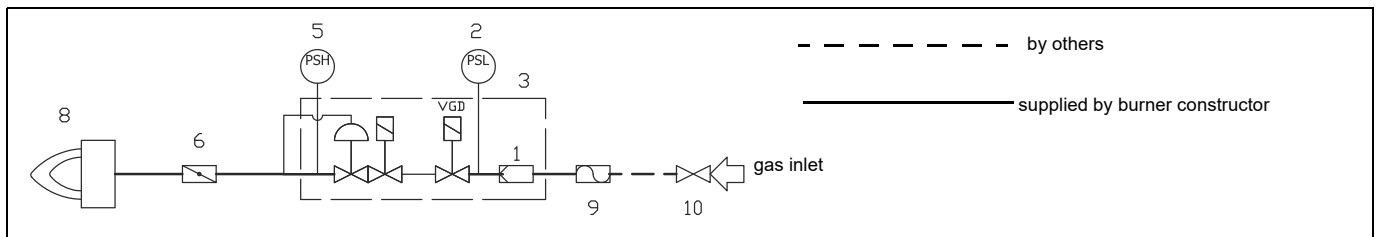
GAS TRAIN CONNECTIONS

The diagrams show the components of the gas train included in the delivery and which must be fitted by the installer. The diagrams are in compliance with the current laws.

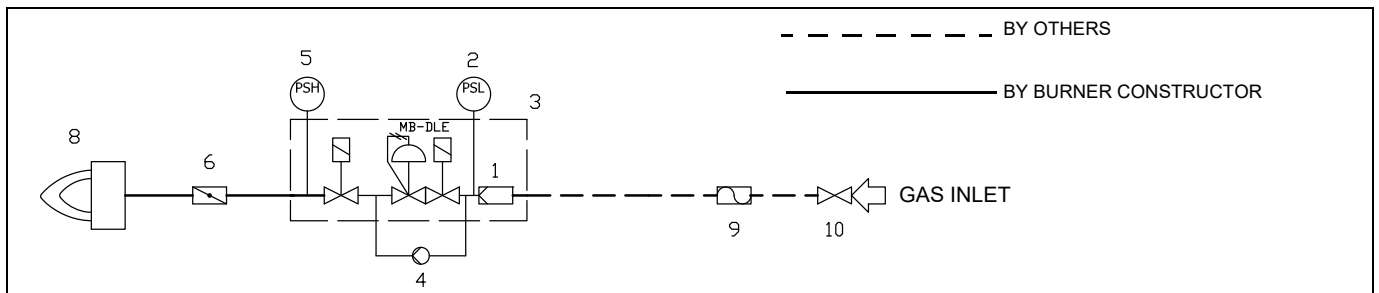
Gas train with valves group MB-DLE (2 valves + gas filter + pressure governor)



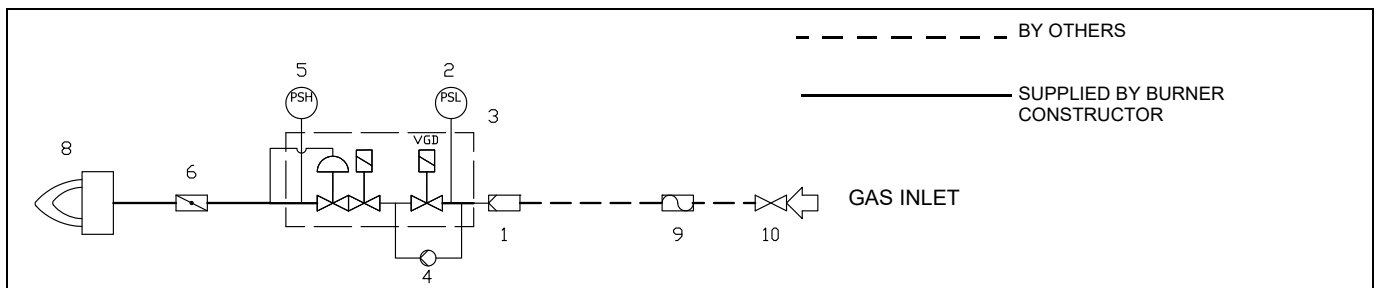
Gas train with valves group VGD with built-in gas pressure governor



Gas train with valves group MB-DLE (2 valves + gas filter + pressure governor) + VPS504 gas proving system



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



Key

1	Filter (*optional)	6	Butterfly valve
2	Pressure switch - PGMIN	8	Main burner
3	Safety valve with built in gas governor	9	Manual valve(*optional)
4	Proving system (*if provided)	10	Bellows unit(*optional)
5	Pressure switch PGMAX:included MBE, for VGD e MB-DLE Optional		

GAS TRAIN CONNECTIONS



WARNING: before executing the connections to the gas pipe network, be sure that the manual cutoff valves are closed.



ATTENTION: it is recommended to mount filter and gas valves to avoid that extraneous material drops inside the valves, during maintenance and cleaning operation of the filters (both the filters outside the valves group and the ones built-in the gas valves).



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



CAUTION: The direction of gas flow must follow the arrow on the body of the components mounted on the gas ramp (valves, filters, gaskets...).

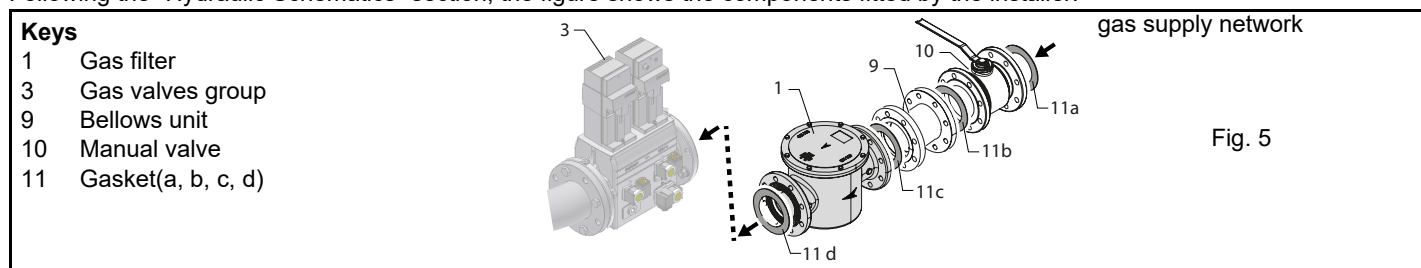


CAUTION: Remove caps and covers from units before installation.



NOTE: the bellows unit, the manual cutoff valve and the gaskets are not part of the standard supply

Following the "Hydraulic Schematics" section, the figure shows the components fitted by the installer.



Procedure to install the double gas valve unit: 2 flanges are required to mount the gas valve assemblies.

- Valves up to 2" are supplied with special threaded flanges.
- Valves of DN65 and above are supplied with PN16 flanges.

Gas Filter (if provided)

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




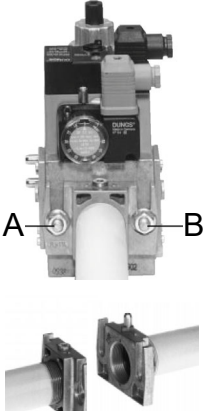
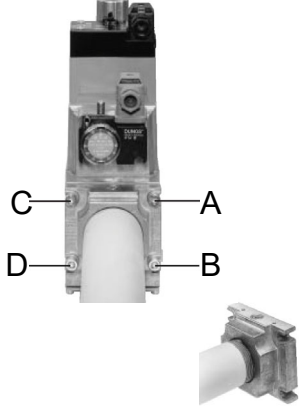
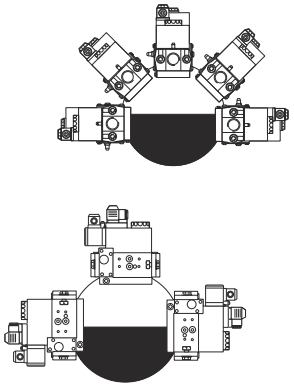
ATTENTION: it is recommended to install the filter with gas flow parallel to the floor in order to prevent dust fall on the safety valve during maintenance operation.

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

MultiBloc MB-DLE - Assembling the gas train

Mounting

- 1 Mount flange onto tube lines: use appropriate sealing agent
- 2 Insert MB-DLE: note position of O rings
- 3 Remove MultiBloc between the threaded flanges
- 4 After installation, perform leakage and functional test
- 5 Disassembly in reverse order

	MB-DLE 405.. 412	MB-DLE 415.. 420	MOUNTING POSITIONS
 <p>(O-Ring)</p>			
Fig. 6	Fig. 7	Fig. 8	Fig. 9

DUNGS MBE - Components and position of pressure switches

DUNGS MBE..
Mounting positions

On equipment versions Facile VD-R must be installed upstream valve

1 PGMIN minimum gas pressure switch	5 Actuator with integrated pressure stabiliser
2 PGMIN minimum gas pressure switch (alternative to 1)	6 On-Off actuator
3 PGCP leakage control gas pressure switch	7 Valve body (Threaded)
4 PGMAX maximum gas pressure switch	8 Valve body (Flange)

PS pressure sensor connection to VD-R actuator and gas train

min. 5 Ø

max. 7 Nm
max. 62 lb-in

SW 17
21/32"

M12 x 5 Pin

VD-R + PS

≥ 8 mm / 0.32 inch



Attention: In the case of the MBE... valve, a pressure limit switch downstream of the safety valve is mandatory.

Pressure taps MultiBloc MBE

p_{max}
70 kPa
700 mbar
10 PSI

p_{max}
60 kPa
600 mbar
8 PSI

1, 2, 3, 5 Sealing plug G1/8 ISO 228
4 G3/4 for system accessories
6, 7 Sealing plug G1/4 ISO 228
8 For version VB...L only: connection for vent line
VB-2½L=1¼"NPT
VB-3L=1½"NPT
VB-4L=2"NPT
VB-5L=2"NPT

1, 2, 3, 4 Sealing plug G1/8 ISO 228
5 Locking screw
For version VB-2L only: connection for vent line
NPT 1

Siemens VGD20.. e VGD40..

Components and position of pressure switches

1 PGMIN minimum gas pressure switch
 2 PGMIN minimum gas pressure switch (alternative to 1)
 3 PGCP leakage control gas pressure switch
 4 PGMAX maximum gas pressure switch

5 Actuator with integrated pressure stabiliser
 6 On-Off actuator
 7 Valve body (Threaded)
 8 Valve body (Flange)

SIEMENS VGD..
Mounting positions

Connection of actuator SKP2... to gas train

TP SA
 BS
 D
 SKP2

min. 5 Ø

Siemens SKP2.. (pressure governor)

- Connect the reference gas pipe (TP in figure; 8mm-external size pipe supplied loose), to the gas pressure nipples placed on the gas pipe, downstream the gas valves: gas pressure must be measured at a distance that must be at least 5 times the pipe size.
- Leave the blowhole free (SA in figure). Should the spring fitted not permit satisfactory regulation, ask one of our service centres for a suitable replacement.
- D: pressure adjustment spring seat



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

Siemens VGD Pressure taps

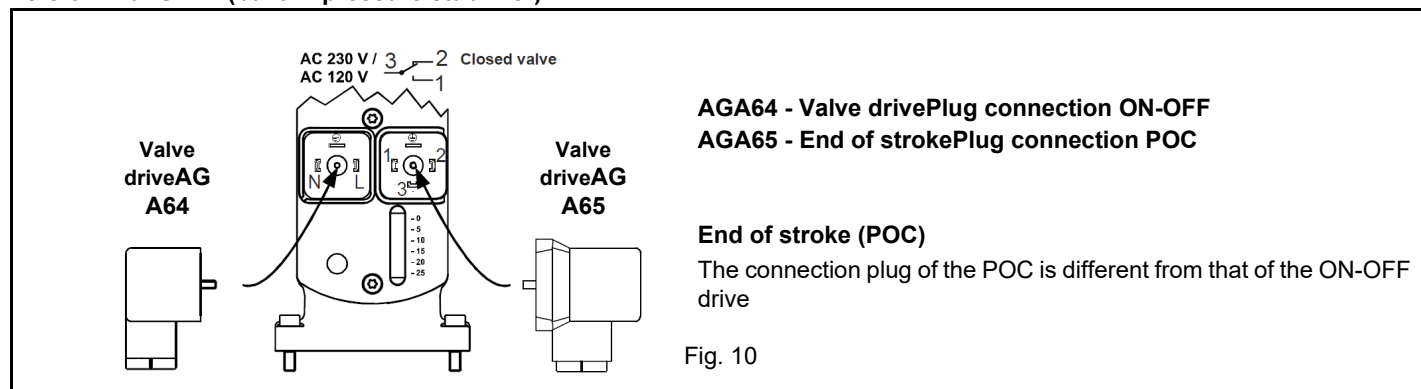
Strainer

Legend
 pi Inlet pressure
 pm Pressure between valves
 po Outlet pressure

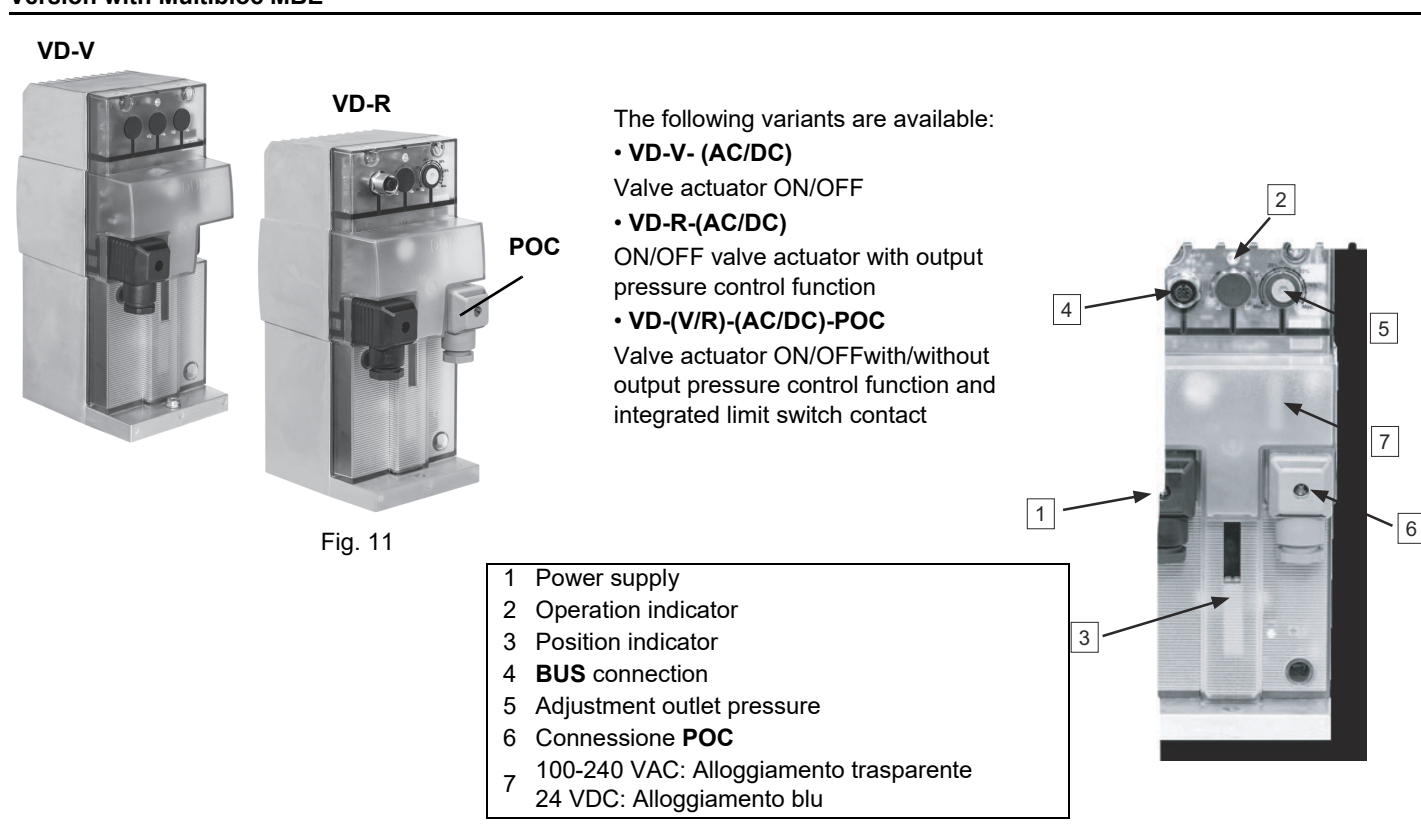
Auxiliary-optional micro switch

If the auxiliary microswitch (POC) is required, a dedicated actuator, different from the one usually supplied, must be ordered. The connection is shown in the figure.

Version with SKP2 (built-in pressure stabilizer)



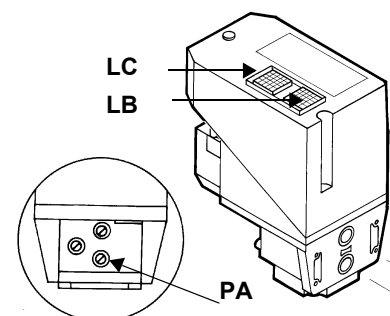
Version with Multibloc MBE



Gas Proving System VPS504 (Option)

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

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**.



ELECTRICAL CONNECTIONS



WARNING! 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. **WARNING!** before executing the electrical connections, pay attention to turn the plant's switch to OFF and be sure that the burner's main switch is in 0 position (OFF) too. Read carefully the chapter "WARNINGS", and the "Electrical connections" section.

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

To execute the electrical connections, proceed as follows:

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



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

Rotation of electric motor

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



CAUTION: check the motor thermal cut-out adjustment

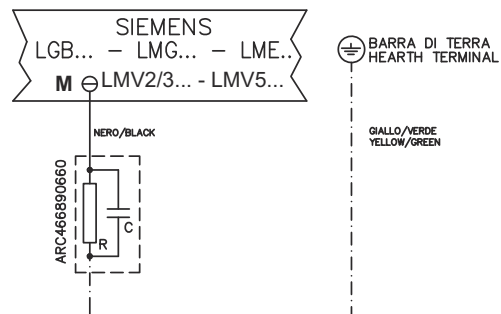
NOTE: the burners are supplied for three-phase 380/400/415/480 V supply, and in the case of three-phase 220/230/240 V supply it is necessary to modify the electrical connections into the terminal box of the electric motor and replace the overload tripped relay.

Note on electrical supply

In the case where the power supply of the AUXILIARIES of the phase-phase burner (without a neutral), for the flame detection it is necessary to connect the RC circuit Siemens between the terminal 2 (terminal X3-04-4 in case of LMV2x, LMV3x, LMV5x, LME7x) of the base and the earth terminal, RC466890660. For LMV5 control box, please refer to the labeling recommendations available on the Siemens CD attached to the burner

Key

- C - Capacitor (22 nF , 250 V)
- LME / LMV - Siemens control box
- R - Resistor (1 M Ω)
- M: Terminal 2 (LGB, LME), Terminal X3-04-4 (LMV2x, LMV3x, LMV5, LME7x)
- RC466890660 - RC Siemens filter



PART III: OPERATION

LIMITATIONS OF USE

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

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

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

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

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

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

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

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



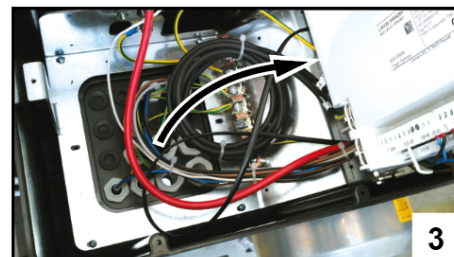
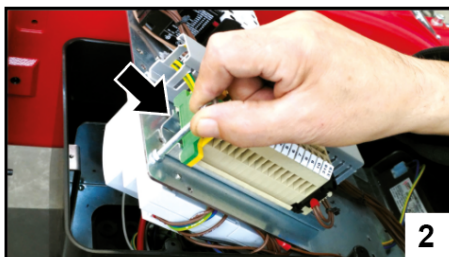
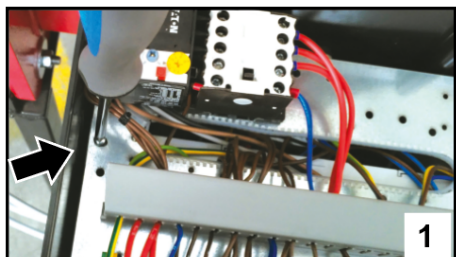
DANGER Incorrect motor rotation can seriously damage property and injure people.

DANGER During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, make the gas decrease slowly until the normal combustion values are achieved.

DANGER before starting the burner up, be sure that the manual cutoff valves are open and check that the pressure upstream the gas train complies the value quoted on paragraph "Technical specifications". Be sure that the mains switch is closed.

Procedure for accessing the equipment and making electrical connections

- 1 Unscrew the screw as shown in Fig. 1
- 2 Lift the plate using the screws as shown in Fig. 2
- 3 Make the electrical connections



Gas operation

- Turn to the ON position the mains switch S1 on the burner front panel.
- Check the flame control box is not in the lockout position (light B1 on), if necessary reset it by means of the pushbutton S2 (reset);
- Check that the control thermostats or pressure switches enable the burner to operate.
- Check the gas supply pressure is sufficient (light G3 on), if necessary, adjust the pressure switches.

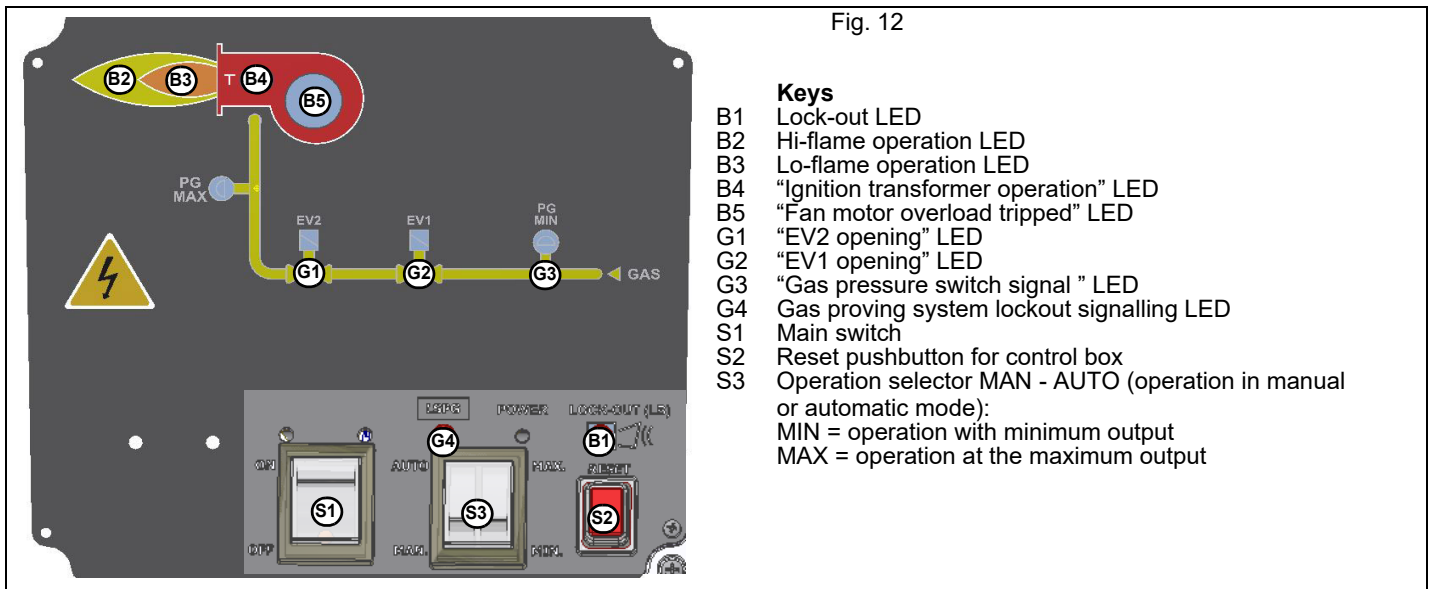
Only burners provided with the gas proving system: the check cycle of the gas proving system starts; the end of this check is signalled by the light of the lamp on the device. When the valves check is finished, the startup cycle of the burner begins. In the case of a leak in a valve, the gas proving system locks and the lamp G4 lights. To reset the device press the device pushbutton.

- The startup cycle begins, the actuator drives the air damper to the maximum opening position, the fan motor starts and the pre-purge phase begins. During the pre-purge phase, the complete opening of the air damper is signalled by the lamp B2 on the frontal panel of the electrical board.
- At the end of the pre-purge phase, the air damper goes to the ignition position, the ignition transformer turns on (signalled by the lamp B4) and few seconds later the solenoid valves EV1 and EV2 are energized (lights G1 and G2 on the front panel).
- Few seconds after the opening of the valves, the ignition transformer turns off and the lamp B4 turns off subsequently:

Double-stage burners: the burner is on in low flame stage (light G is on); some seconds later, the high flame operation begins and the burner switches automatically to high flame (light B2 is on) or remains in low flame operation, according to the plant requests.

Progressive and fully modulating burners - few seconds after the gas valve opening, the ignition transformer is de-energized. The burner is in low flame operation and some seconds later, the two-stages operation begins; the burner increases or decreases its output, directly driven by the external thermostat (progressive version) or by the modulator (fully modulating burners only).

Burner front panel



Fully modulating burners

To adjust the fully-modulating burners, use the **S3** switch on the burner control panel (see next picture), instead of the **TAB** thermostat as described on the previous paragraphs about the progressive burners. Go on adjusting the burner as described before, paying attention to use the CMF switch instead of **TAB**.

The **S3** position sets the operating stages: to drive the burner to the high-flame stage, set S3=MAX; to drive it to the low-flame stage, set S3=MIN.

To move the adjusting cam set S3=MIN or MAX and then S3=MAN.

Fig. 13



- S3** MAN stop at the current position
- MAX high flame operation
- MIN low flame operation
- AUTO opération automatique automatic operation

ADJUSTING AIR AND GAS FLOW RATES



DANGER! When adjusting the air/fuel ratio, it is mandatory to use a suitable flue gas analyser, calibrated and tested according to standard, to constantly check the correct air excess. Failure to comply with this recommendation can lead to serious danger.

WARNING! During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, make the fuel decrease slowly until the normal combustion values are achieved.

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



DANGER! Venting the air from the piping must take place in safe conditions, avoiding dangerous concentrations of fuel in the rooms. You must therefore ventilate the rooms and wait long enough for the gases to dissipate outside before switching on.

Recommended combustion parameters		
Fuel	Recommended (%) CO ₂	Recommended (%) O ₂
Natural gas	9 ÷ 10	3 ÷ 4.8
LPG	11 ÷ 12	2.8 ÷ 4.3

Adjustments - brief description

- Adjust the air and gas flow rates at the maximum output ("high flame") first, by means of the air damper and the valves group pressure stabiliser respectively.
- Check that the combustion parameters are in the suggested limits.
- Check the flow rate measuring it on the counter or, if it was not possible, verifying the combustion head pressure by means of a differential pressure gauge, as described on par. "Measuring the gas pressure in the combustion head".
- Then, adjust the combustion values corresponding to the points between maximum and minimum (progressive -fully modulating burners only): set the shape of the adjusting cam foil. The adjusting cam sets the air/gas ratio in those points, regulating the opening-closing of the air damper.
- Set, now, the low flame output, acting on the low flame microswitch of the actuator in order to avoid the low flame output increasing too much or that the flues temperature gets too low to cause condensation in the chimney.

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

(First) Start-up preliminary operations - gas supply

- 4 Recommended actions to be carried out in sequence:
 - 1 Check the burner and all its components are installed correctly
 - 2 Check that all electrical and mechanical parts are connected correctly
 - 3 Check that there is water or other vector fluids in the generator
 - 4 Check that the ventilation gates/dampers in the plant are open and the stack is free
 - 5 Connect the gauges used to adjust and check pressures on the incoming line and on the head, air and fuel side.
 - 6 Open the thermostatic series and the safety chain
 - 7 Turn the main switch on the panel front with the "ON/OFF" selector to position "ON".
 - 8 Check the phase and neutral position is correct
 - 9 Open the manual shut-off valves slowly, in order to prevent any water hammers that might seriously damage valves and pressure regulator
 - 10 Check the sense of rotation of the electrical motors
 - 11 Bleed the line, getting rid of all the air in the pipe as far as the main gas valve
 - 12 Ensure the pressure entering the main valves is not excessive due to damage to or wrong adjustment of the line pressure regulator
 - 13 Ensure the gas supply minimum pressure is at least equal to the pressure required by the pressure curves - burnt gas flow
 - 14

ADJUSTING THE GAS VALVES GROUP

Multibloc MB-DLE

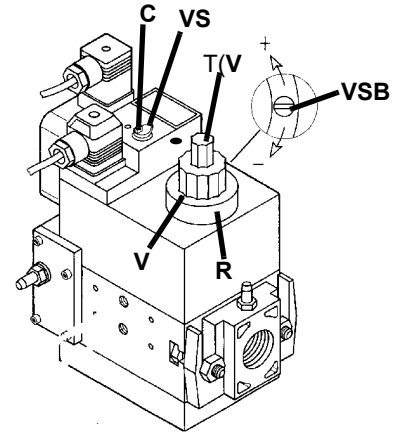
The multibloc unit is a compact unit consisting of two valves, gas pressure switch, pressure stabilizer and gas filter.

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.

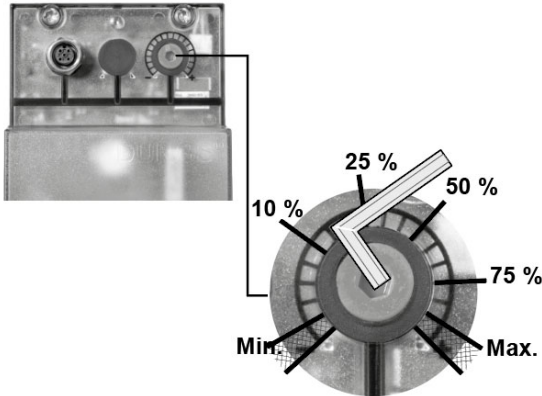
Do not use a screwdriver on the screw **VR**!

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 replacements of the coil.



MultiBloc MBE Regulation VD-R with PS



Outlet pressure	MIN	10%	25%	50%	75%	MAX
PS-10/40	4 mbar 0,4 kPa 2 "w.c.	10 mbar 1,0 kPa 4 "w.c.	25 mbar 2,5 kPa 10 "w.c.	50 mbar 5,0 kPa 20 "w.c.	75 mbar 7,5 kPa 30 "w.c.	100 mbar 10,0 kPa 40 "w.c.
PS-50/200	20 mbar 2,0 kPa 8 "w.c.	50 mbar 5,0 kPa 20 "w.c.	125 mbar 12,5 kPa 50 "w.c.	250 mbar 25,0 kPa 100 "w.c.	375 mbar 37,5 kPa 150 "w.c.	500 mbar 50,0 kPa 200 "w.c.

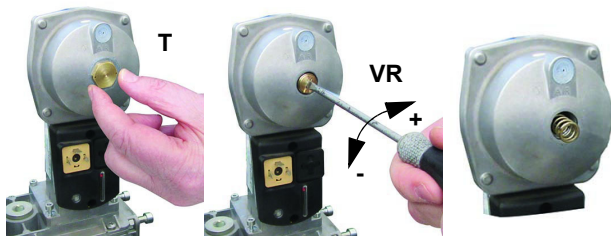


Caution: check that the range of the installed spring is compatible with the gas pressure at the burner head (see appropriate diagram) to which must be added the back pressure and approx. 5 /10 mbar for various leaks and gas line.



While making outlet pressure adjustments, do not exceed a value that creates a hazardous condition to the burner!

Siemens VGD../VRD.. version with SKP2



	Performance range (mbar)		
	neutral	yellow	red
Spring colour SKP 25.0	0 ÷ 22	15 ÷ 120	100 ÷ 250
Spring colour SKP 25.4		7 ÷ 700	150 ÷ 1500

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

To replace the spring supplied with the valve group, proceed as follows:

To increase or decrease gas pressure, and therefore gas flow rate, remove the cap **T** and use a screwdriver to adjust the regulating screw **VR**. Turn clockwise to increase the flow rate, counterclockwise to reduce it.

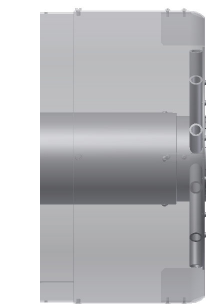
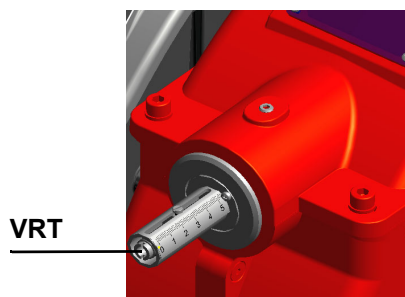
Adjusting the combustion head



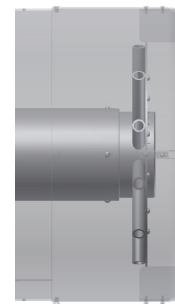
CAUTION: perform these adjustments once the burner is turned off and cooled.

Head adjusting

The combustion head position affects the flame stability. The diffuser position must be set during the commissioning according to the regulation needs. The diffuser position is factory set as shown in figure "A" ($x = 10$ mm). If different settings are required, it is possible to change the position: loosen the VB screw and slightly move the combustion head backwards, turning clockwise the knob VRT. Fasten VB screw when the adjustment is accomplished.

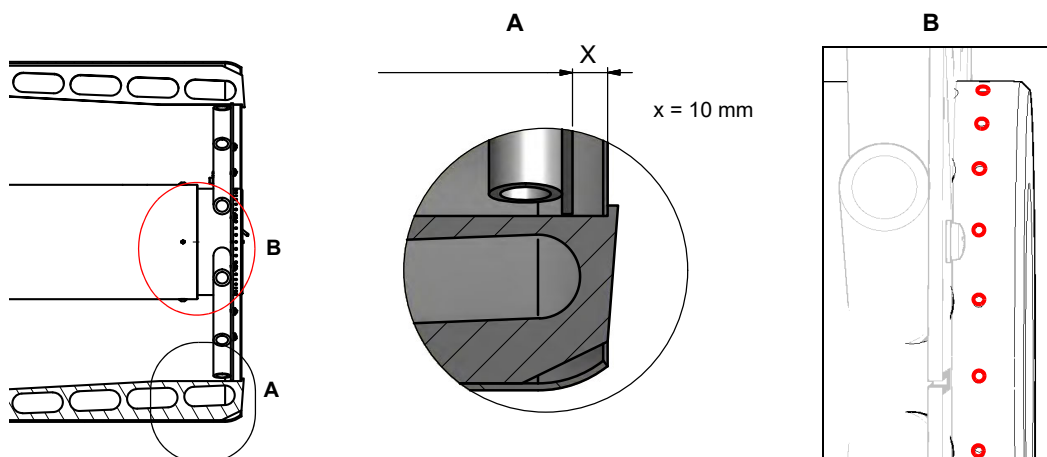


"all-ahead" position



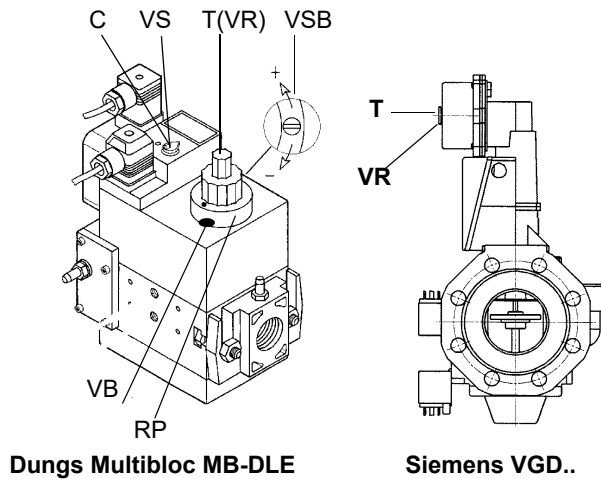
"all-backwards" head position

Depending on the boiler application, it is possible to act on the holes (figure B) to improve the flame stability and NO_x, CO emission values. If necessary, close/open the holes in figure "B" using the screws kit given with the burner.



Adjustment procedure

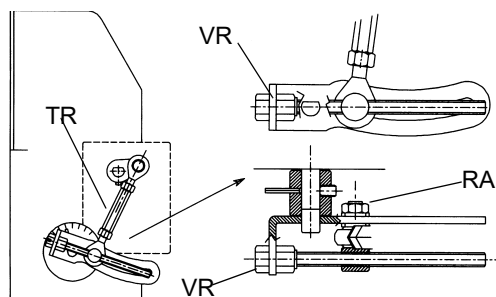
- 1 Turn the burner on by means of its main switch **S1**: if the burner locks (LED **B1** on in the control panel) press the RESET button (**S2**) on the control panel. See chapter "Operation" for further details.
- 2 check the fan motor rotation
- 3 Start the burner up by means of the thermostat series and wait until the pre-purge phase comes to end and that burner starts up;
- 4 the burner starts up in the low flame stage: drive the burner to high flame stage, by means of the "high/low flame" thermostat **TAB**.
- 5 adjust the burner combustion values in the high flame stage as described in the following steps.
- 6 go on adjusting air and gas flow rates: check, continuously, the flue gas analysis, as to avoid combustion with little air; dose the air according to the gas flow rate change following the steps quoted below;
- 7 acting on the pressure governor of the valves group, adjust the **gas flow rate in the high flame stage** as to meet the values requested by the boiler/utilisation:
 - **Multibloc MB-DLE**: the valve is adjusted by means of the **RP** regulator after slackening the locking screw **VB** by a number of turns. By unscrewing the regulator **RP** the valve opens, screwing the valve closes. The pressure stabilizer is adjusted by operating the screw **VS** located under the cover **C**. By screwing down the pressure is increased and by unscrewing it is reduced. **Note**: the screw **VSB** must be removed only in case of replacement of the coil.
 - **Siemens VGD valves group**: remove cap **T** and act on the **VR** adjusting screw to increase or decrease the pressure and consequently the gas rate; screwing **VR** the rate increases, unscrewing it decreases (see next figure).



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

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

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



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

Berger STA12: a key is provided to move the cams.

Siemens SQN72: a key is provided to move cams I and IV, the other cams can be moved by means of screws.

On the BERGER STA12B3.41 actuator, the manual air damper control is not provided. On the Siemens actuator the AUTO/MAN mode is provided (see picture).

Double-stage burners

- drive the burner to the low flame stage by means of the **TAB** thermostat;
- To change the gas flow rate in order to get an efficient combustion, slacken the nut **DB** and adjust the opening angle of the gas butterfly valve by rotating the screw **TG** (clockwise rotation increases gas flow, anticlockwise rotation decreases it). The slot on the butterfly valve shaft shows the opening degree of the valve regarding the horizontal axis. **Don't act on DE nuts.**

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

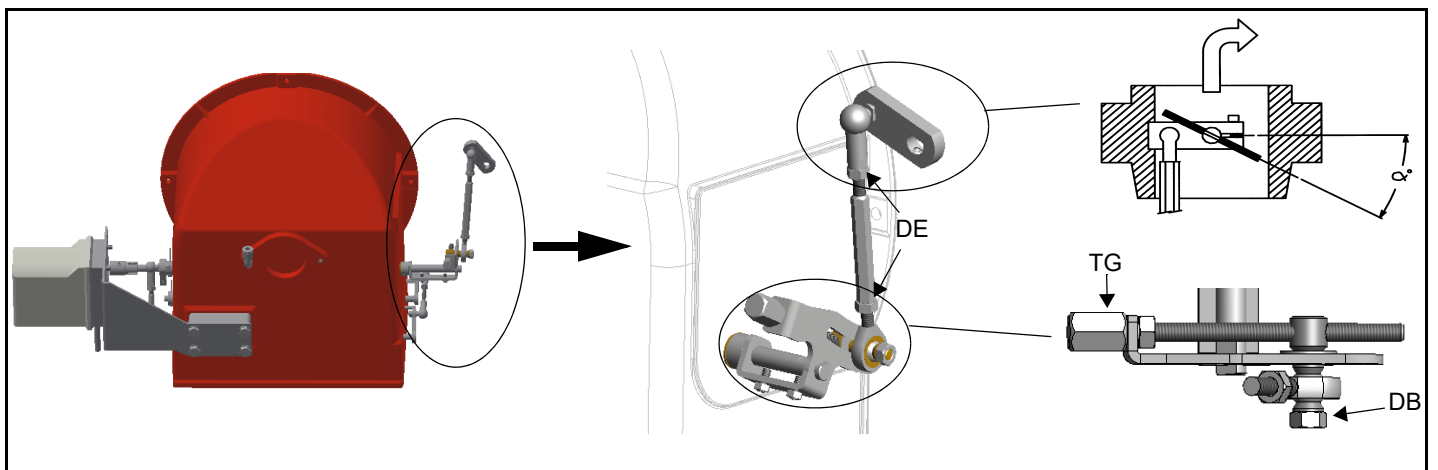
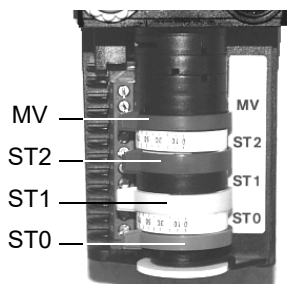


Fig. 14

- Now adjust the pressure switches.
- If it is necessary to change the burner output in the low flame stage, move the low flame cam: the low flame position matches the ignition position. As far as burners fitted with Dungs MBC gas valves, the low flame cam does not match the ignition cam position, that is why it must be set at about 30° more than the ignition cam.
- Turn the burner off and then start it up again. If the adjustment is not correct, repeat the previous steps.

Berger STA6 B 3.41 (high-low flame burners)



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



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

Berger STA12: a key is provided to move the cams.

Siemens SQN72: a key is provided to move cams I and IV, the other cams can be moved by means of screws.

On the BERGER STA12B3.41 actuator, the manual air damper control is not provided. On the Siemens actuator the AUTO/MAN mode is provided (see picture).

Progressive burners

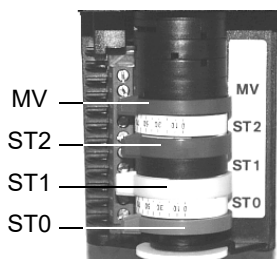
Once the procedure till step 8 described on paragraph "" on page 30, is accomplished, go on as follows:

9 set the low flame cam matching the high flame cam;

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

The manual air damper control is not provided on these actuators. The adjustments must be carried out acting manually on the cams.

Berger STA12B3.41 (progressive and fully modulating burners)



Siemens SQN72.6A4Axx (progressive and fully modulating burners)

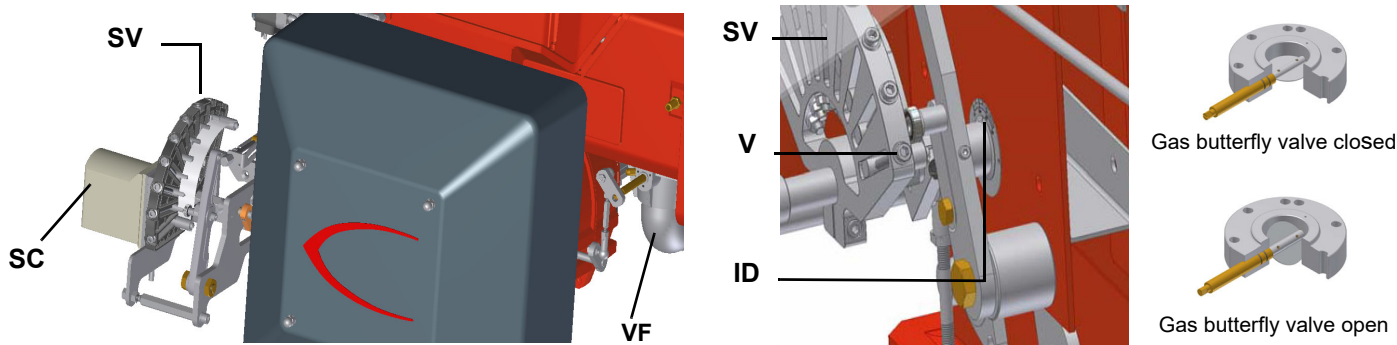


For DUNGS MB-DLE / Siemens VGD gas valves	Actuator camsBerger STA	Siemens SQN72
High flame position (set to 90°)	ST2	I (red)
Low flame and ignition position	ST1	III (orange)
Stand-by position (set to 0°)	ST0	II (blue)
Not used	MV	IV (black)

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

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

13 Now adjust the pressure switches (see page 31).



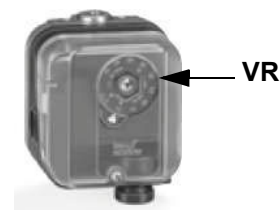
14 If it is necessary to change the burner output in the low flame stage, move the low flame cam: the low flame position matches the ignition position. As far as burners fitted with Dungs MBC gas valves, the low flame cam does not match the ignition cam position, that is why it must be set at about 30° more than the ignition cam.

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

Calibration air and gas pressure switches

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

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



Calibration the maximum gas pressure switch (when provided)

To calibrate the maximum pressure switch, proceed as follows according to its mounting position:

- remove the pressure switch plastic cover;
- if the maximum pressure switch is mounted upstream the gas valves: measure the gas pressure in the network, when flame is off; by means of the adjusting ring nut **VR**, set the value read, increased by the 30%.
- if the maximum pressure switch is mounted downstream the “gas governor-gas valves” group and upstream the butterfly valve: light the burner, adjust it according to the procedure in the previous paragraph. Then, measure the gas pressure at the operating flow rate, downstream the “gas governor-gas valves” group and upstream the butterfly valve; by means of the adjusting ring nut **VR**, set the value read on step 2, increased by the 30%;
- replace the plastic cover.

Calibration of air pressure switch

To calibrate the air pressure switch, proceed as follows:

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

Calibration of low gas pressure switch

With the burner operating at maximum power, increase the regulation pressure by slowly turning the control knob clockwise until the burner stops, taking care it does not go into lockout and the display shows the error "**Err c20 d0**".

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

- Be sure that the filter is clean.
- Remove the transparent plastic cap.
- While the burner is operating at the maximum output, test the gas pressure on the pressure port of the minimum gas pressure switch.
- Slowly close the manual cutoff valve (placed upstream the pressure switch, see gas train installation diagram), until the detected pressure is reduced by 50%. Pay attention that the CO value in the flue gas does not increase: if the CO values are higher than the limits laid down by law, slowly open the cutoff valve as to get values lower than these limits.
- Check that the burner is operating correctly.
- Clockwise turn the pressure switch adjusting ring nut (as to increase the pressure value) until the burner stops.
- Slowly fully open the manual cutoff valve.
- Refit the transparent plastic cover on the pressure switch.

Calibration the maximum gas pressure switch (when provided)

To calibrate the maximum pressure switch, proceed as follows according to its mounting position:

- remove the pressure switch plastic cover;
- if the maximum pressure switch is mounted upstream the gas valves: measure the gas pressure in the network, when flame is off; by means of the adjusting ring nut **VR**, set the value read, increased by the 30%.
- if the maximum pressure switch is mounted downstream the “gas governor-gas valves” group and upstream the butterfly valve: light the burner, adjust it according to the procedure in the previous paragraph. Then, measure the gas pressure at the operating flow rate, downstream the “gas governor-gas valves” group and upstream the butterfly valve; by means of the adjusting ring nut **VR**, set the value read on step 2, increased by the 30%;
- replace the plastic cover.



WARNING: ALL OPERATIONS ON THE BURNER MUST BE CARRIED OUT WITH THE MAINS DISCONNECTED AND THE FUEL MANUAL CUTOFF VALVES CLOSED!
ATTENTION: READ CAREFULLY THE “WARNINGS” CHAPTER AT THE BEGINNING OF THIS MANUAL.

PART V: MAINTENANCE

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



WARNING all operations on the burner must be carried out with the mains disconnected and the fuel manual cutoff valves closed

WARNING read carefully the “warnings” chapter at the beginning of this manual.



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

ATTENTION: READ CAREFULLY THE “WARNINGS” CHAPTER AT THE BEGINNING OF THIS MANUAL.

ROUTINE MAINTENANCE

-
- Before any maintenance
 - 1 - ensure that the manual valve at the gas ramp inlet is closed
 - 2 - ensure that the main switch of the installation is switched off and make sure that it cannot be switched on again by third parties
 - 3 - disconnect power to the panel. With the burner off, check that the gas meter is stopped. If it should turn, look for any leaks.
- Clean the fan using, if available, compressed air and/or a dry brush or rags. If necessary, remove the fan from the motor shaft and wash it using non-corrosive cleaning agents. Before disassembling the fan, note the measurements in relation to the motor shaft so that it can be reassembled in the same position.
- Check that all parts in contact with combustion air (air box, protective mesh and screw conveyor) are clean and free of any obstructions to free flow. Clean using compressed air and/or a dry brush or rags, if available. If necessary, wash using non-corrosive cleaning products.
- Check the condition of the combustion head. The head must be intact in all parts and the mesh adhered to the inner metal cylinder. If one or more parts are broken, punctured, cut or dislodged, it is imperative to replace the head itself. The nozzle must be replaced in the event of obvious breakage or abnormal puncture. Slight deformations that do not affect combustion can be accepted.
- Examination of ignition electrodes, cleaning, possible adjustment and, if necessary, replacement
- Check the detection electrode/photocell (depending on burner model), clean, adjust if necessary and replace if necessary. If in doubt, check the detection circuit, after the burner has been put back into operation, follow the diagrams in the manual. The gasket between combustion head and burner body flange must be replaced with a gas-tight flange suitable for the fuel used. Check the condition of the gasket between burner and generator. If necessary, replace it
- Before disassembling the burner's internal mixer, the position of the blades and position it so that it can be restored correctly after cleaning or replacement. Examination of the motor: no specific maintenance is required. In the event of abnormal noises during operation, check the condition of the bearings and replace them if necessary or replace the motor completely.
- Check and clean the gas filter cartridge; replace if necessary.
- Examination disassembly and combustion head cleaning
- Cleaning and greasing of levers and rotating parts.
-



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



- At least every 2 months, or more frequently depending on the case, clean the burner installation room.
- Avoid leaving installations, papers, nylon bags, etc., inside the room. They could be sucked by the burner and cause malfunctioning.
- Check that the room's vents are free from obstructions.

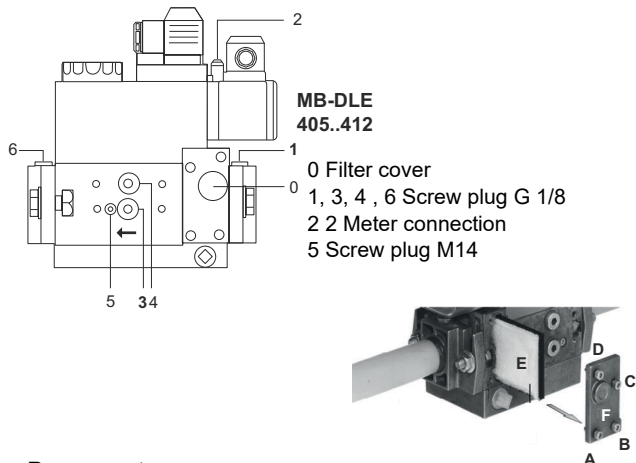
Gas filter maintenance



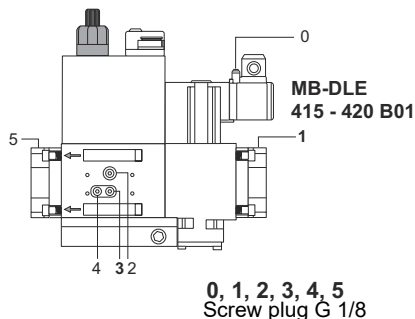
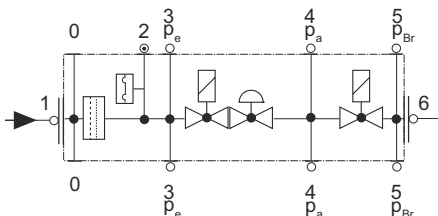
WARNING: Before opening the filter, close the manual cutoff valve downstream the filter and bleed the gas; check that inside the filter there is no pressurised gas.

Gas filter included in the valve body

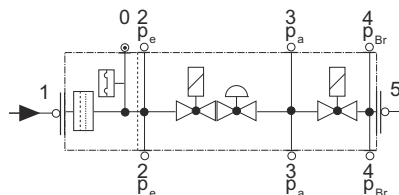
To clean or replace the gas filter, proceed as follows:



Pressure taps



Pressure taps



- Check the filter at least once a year!
- Change the filter if the pressure difference between pressure connection 1 and 3 (Fig. 1-Fig. 3) is $\Delta p > 10$ mbar.
- Change the filter if the pressure difference between pressure connection 1 and 3 (Fig. 1-Fig. 3) is twice as high compared to the last check.

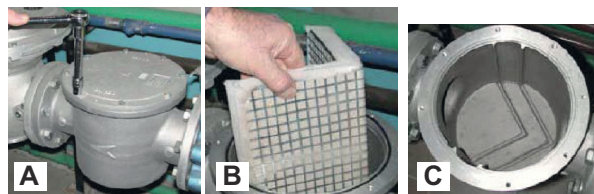
You can change the filter without removing the fitting.

- 1 Interrupt the gas supply closing the on-off valve.
- 2 Remove screws 1 ÷ 4 using the Allen key n. 3 and remove filter cover 5 in Fig. 5.
- 3 Remove the filter 6 and replace with a new one.
- 4 Replace filter cover 5 and tighten screws 1 ÷ 4 without using any force and fasten.
- 5 Perform leakage and functional test, $p_{max.} = 360$ mbar.
- 6 Pay attention that dirt does not fall inside the valve.

In-line gas filter

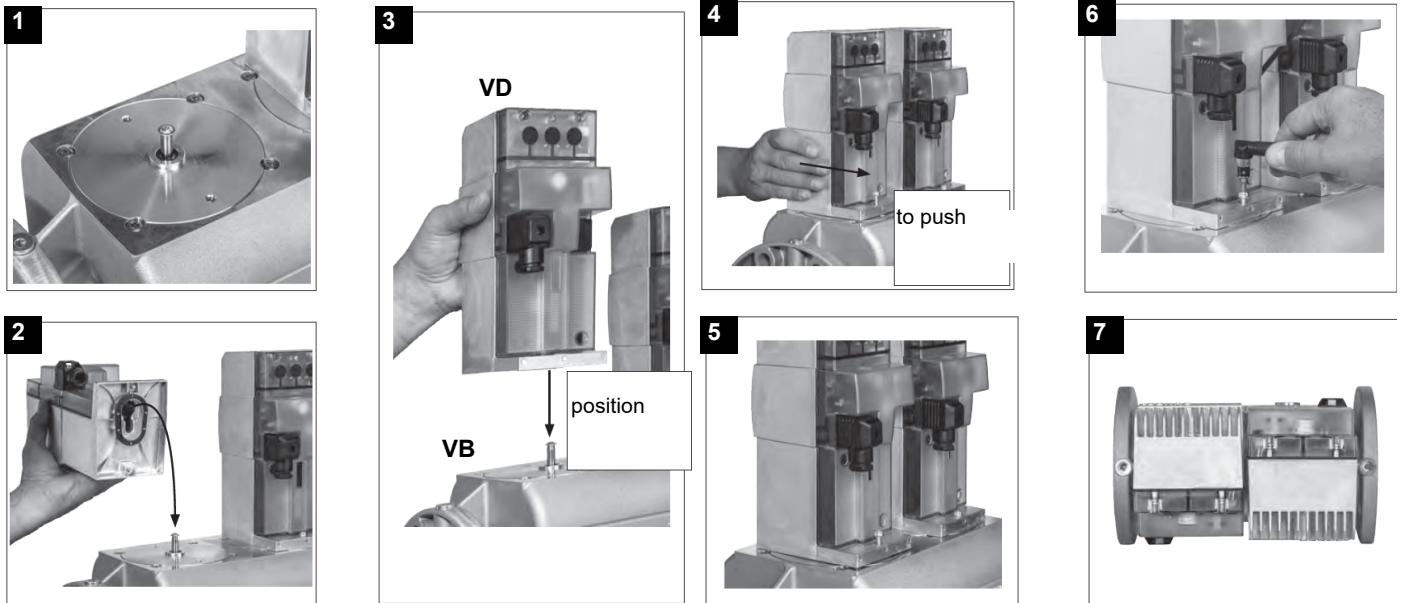
To clean or remove the filter, proceed as follows:

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



MultiBloc VD-V VD-R Mounting

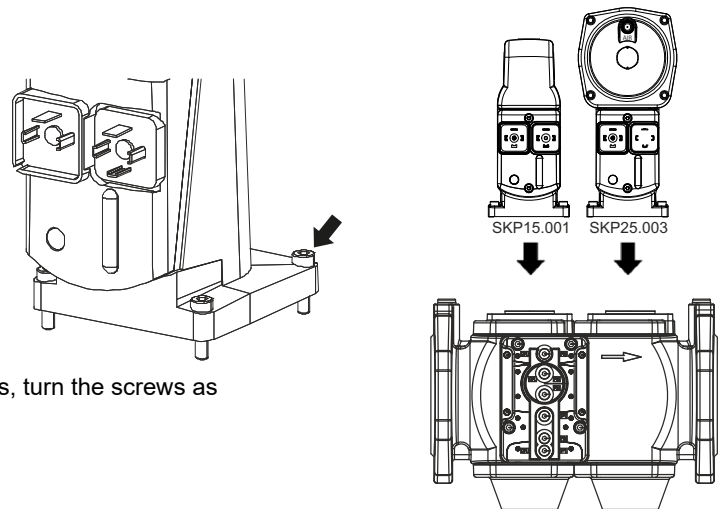
Fig. 15



1. Position VD on VB, fig. 2+3.
2. Slide VD forward up to the stop, fig. 4.
3. Screw VD on with 2 M5 screws for each, max. 5 Nm/44 in.-lb., fig. 5/6.
4. VD can be mounted rotated by 180°, fig. 7.

Siemens SKP15 e SKP25 Mounting

Fig. 16



To replace the actuators, turn the screws as shown in the drawing.

Checking the detection current

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

Control box	Minimum detection signal
Siemens LME7...	70µA (with UV detector)

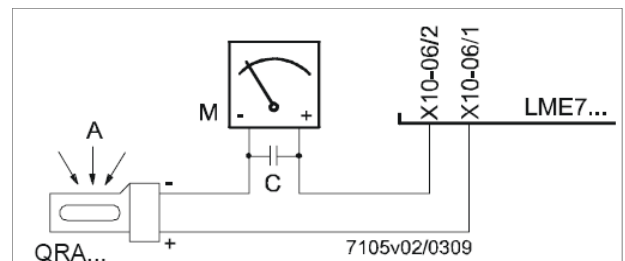


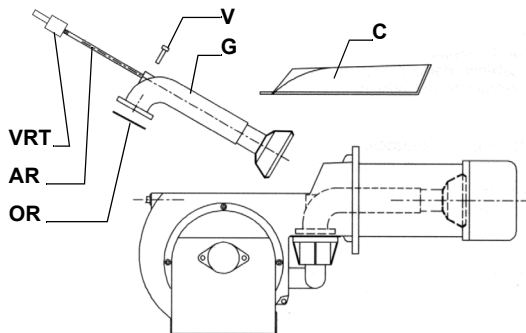
Fig. 17: Detection by photocell QRA..

Removing the combustion head

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

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

To remove the combustion head, pull it out. Once removed, check that the air and gas holes are not obstructed. Clean the combustion head by means of compressed air or scrape off the scale using a metallic brush



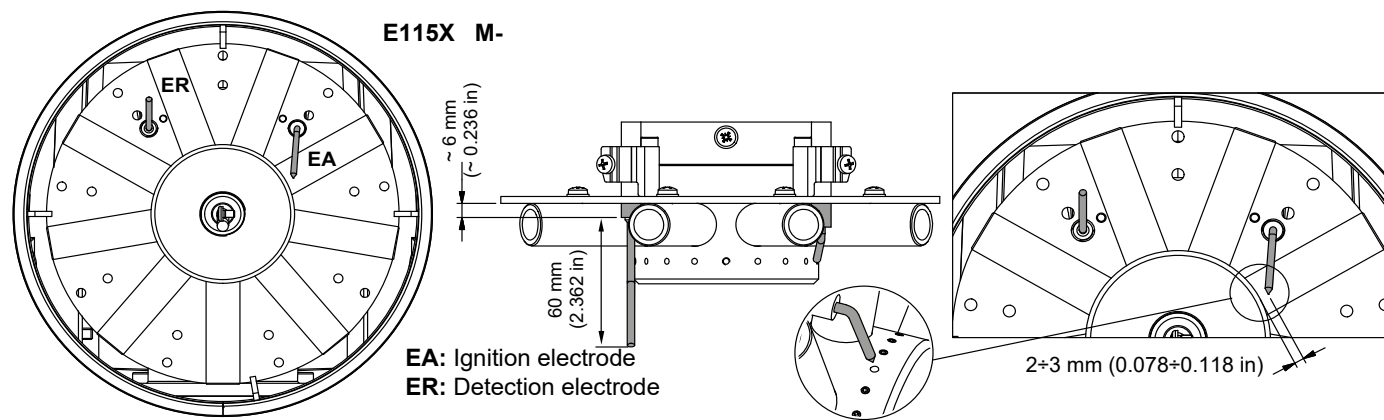
Electrodes Adjustment

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

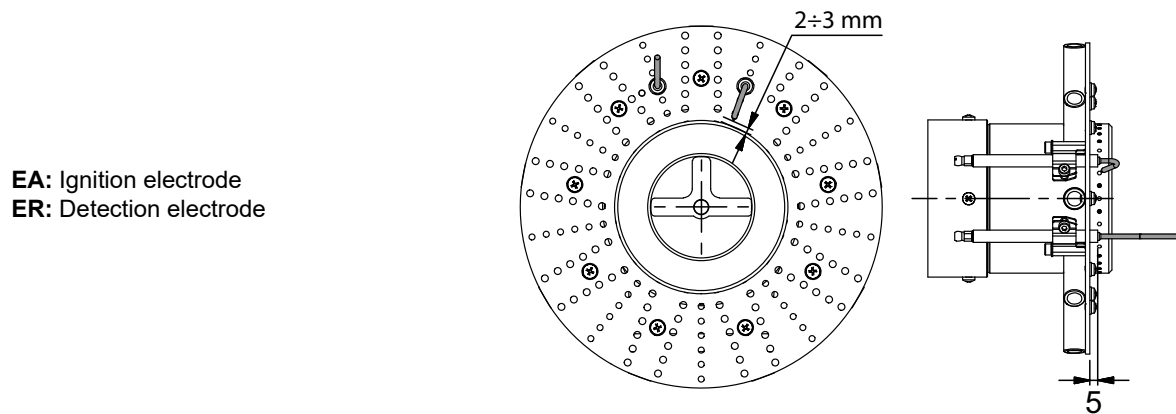


ATTENTION: avoid the ignition and detection electrodes to contact metallic parts (blast tube, head, etc.), otherwise the boiler's operation would be compromised. Check the electrodes position after any intervention on the combustion head.

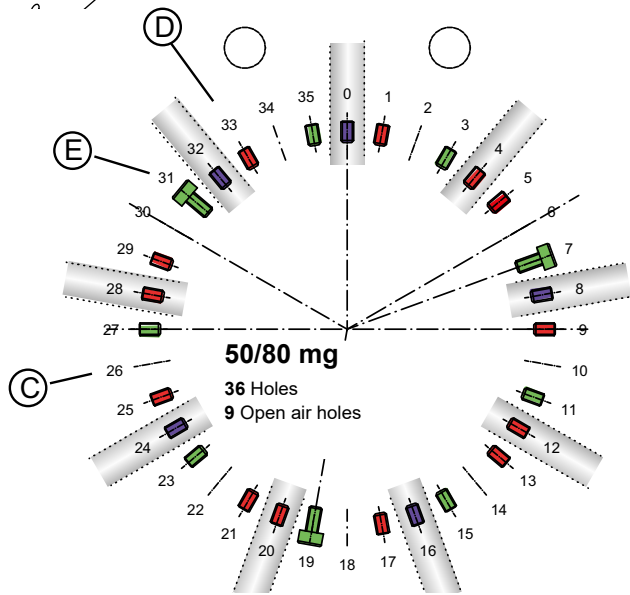
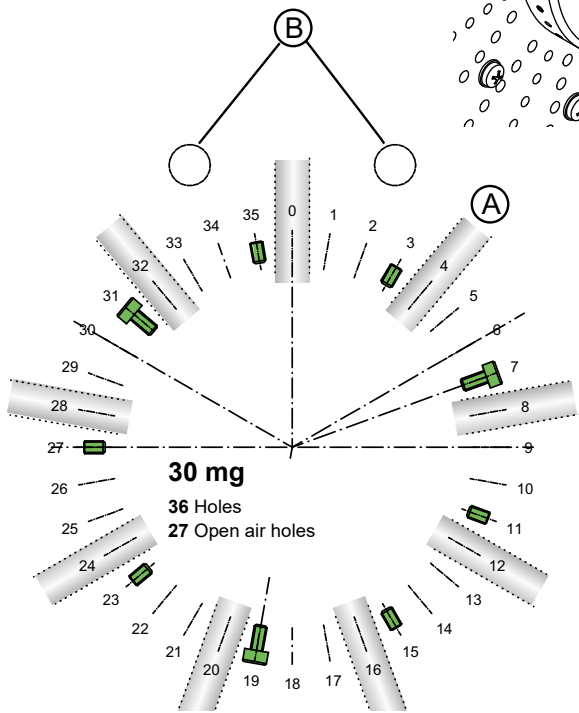
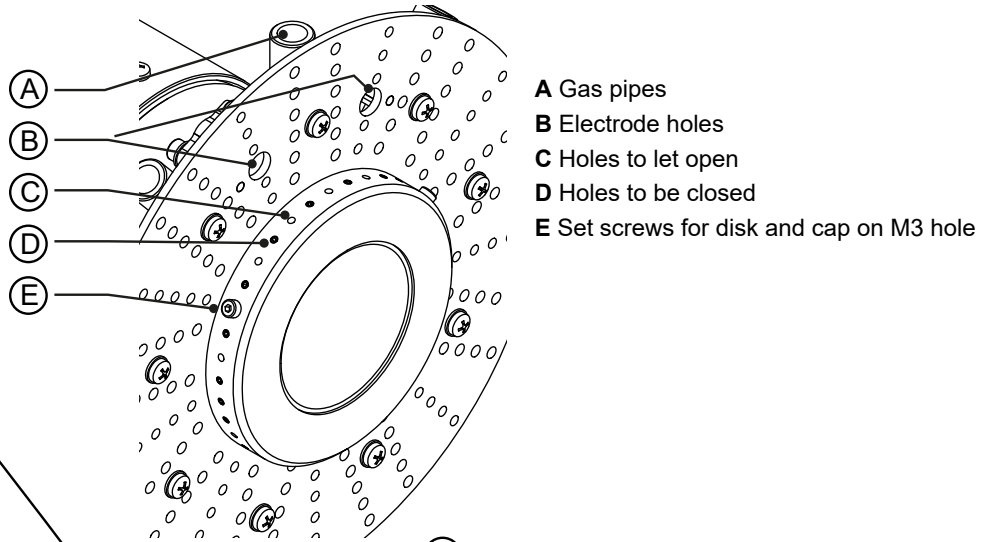
Adjust the electrodes position, according to the quotes shown othe next picture



E150X, E180X M-



Grain kit diagram



Burner service term

- In optimal operating conditions, and with preventive maintenance, the burner can last up to 20 years.
- Upon expiry of the burner service term, it is necessary to carry out a technical diagnosis and, if necessary, an overall repair.
- The burner status is considered to be at its limit if it is technically impossible to continue using it due to non-compliance with safety requirements or a decrease in performance.
- The owner makes the decision whether to finish using the burner, or replacing and disposing of it based on the actual state of the appliance and any repair costs.
- The use of the burner for other purposes after the expiry of the terms of use is strictly prohibited.

Seasonal stop

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

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

Burner disposal

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

WIRING DIAGRAMS

Refer to the attached wiring diagrams.

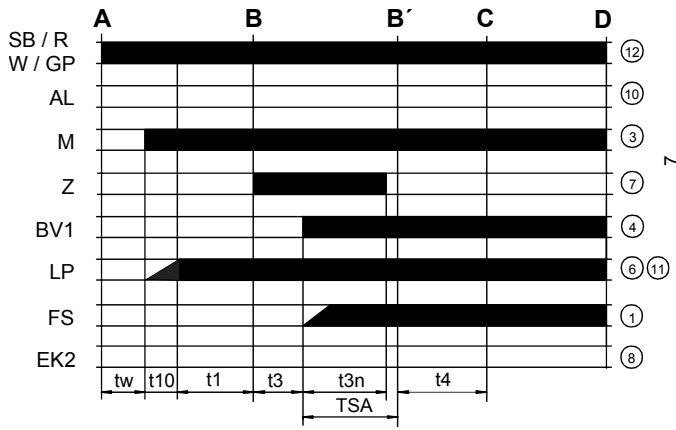
WARNING

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

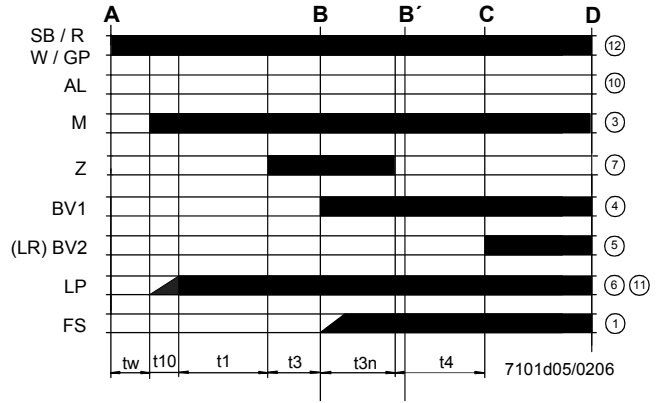
TROUBLESHOOTING GUIDE Gas operation

BURNER DOESN'T LIGHT	* No electric power supply	* Restore power supply
	* Main switch open	* Close switch
	* Thermostats open	* Check set points and thermostat connections
	* Bad thermostat set point or broken thermostat	* Reset or replace the thermostat
	* No gas pressure	* Restore gas pressure
	* Safety devices (manually operated safety thermostat, pressure switches and so on) open	* Restore safety devices; wait till boiler reaches operating temperature then check safety device functionality.
	* Broken fuses	* Replace fuses. Check current absorption
	* Fan thermal contacts open (three phases motors only)	* Reset contacts and check current absorption
	* Burner control lock out	* Reset and check its functionality
	* Burner control damaged	* Replace burner control
GAS LEAKAGE: BURNER LOCKS OUT (NO FLAME)	* Gas flow is too low	* Increase the gas flow * Check gas filter cleanness * Check butterfly valve opening when burner is starting (only Hi-Low flame and progressive)
	* Ignition electrodes discharge to ground because dirty or broken	* Clean or replace electrodes
	* Bad electrodes setting	* Check electrodes position referring to instruction manual
	* Electrical ignition cables damaged	* Replace cables
	* Bad position of cables in the ignition transformer or into the electrodes	* Improve the installation
	* Ignition transformer damaged	* Replace the transformer
BURNER LOCKS OUT WITH FLAME PRESENCE	* Wrong setting of flame detector	* Adjust flame detector
	* Flame detector damaged	* Replace flame detector
	* Bad cables of flame detector	* Check cables
	* Burner control damaged	* Replace burner control
	* Phase and neutral inverted	* Adjust connections
	* Ground missing or damaged	* Check ground continuity
	* Voltage on neutral	* Take off tension on neutral
	* Too small flame (due to not much gas)	* Adjust gas flow * Check gas filter cleanness
only FOR LME22: BURNER CONTINUES TO PERFORM ALL ITS FEATURES WITHOUT IGNITING THE BURNER	* Too much combustion air	* Adjust air flow rate
	* Air pressure switch damaged or bad links	* Check air pressure switch functions and links
BURNER LOCKS OUT WITHOUT ANY GAS FLOW	* Burner control damaged	* Replace burner control
	* Gas valves don't open	* Check voltage on valves; if necessary replace valve or the burner control * Check if the gas pressure is so high that the valve cannot open
	* Gas valves completely closed	* Open valves
	* Pressure governor too closed	* Adjust the pressure governor
	* Butterfly valve closed	* Open the butterfly valve
	* Maximum pressure switch open.	* Check connection and functionality
THE BURNER IS BLOCKED AND THE EQUIPMENT PROVIDES A LOCK CODE "CAUSE AIR PRESSURE SWITCH FAULT"	* Air pressure switch doesn't close the NO contact	* Check connections * Check pressure switch functionality
	* Air pressure switch damaged (it keeps the stand-by position or badly set)	* Check air pressure switch functionality * Reset air pressure switch
	* Air pressure switch connections wrong	* Check connections
	* Air fan damaged	* Replace motor
	* No power supply	* Reset power supply
BURNER LOCKS OUT DURING NORMAL RUNNING	* Air damper too closed	* Adjust air damper position
	* Flame detector circuit interrupted	* Check wiring * Check photocell
	* Burner control damaged	* Replace burner control
THE BURNER STARTS AND AFTER A WHILE IT REPEATS THE STARTING CYCLE.	* Maximum gas pressure switch damaged or badly set	* Reset pressure switch or replace it
	* Gas pressure switch badly set	* Reset the pressure switch
	* Gas filter dirty	* Clean gas filter
BURNER STANDS WHILE RUNNING WITHOUT ANY SWITCHING OF THERMOSTATS	* Gas governor too low or damaged	* Reset or replace the governor
	* Thermal contacts of fan motor open	* Reset contacts and check values * Check current absorption
FAN MOTOR DOESN'T START	* Replace wiring or complete motor	
	* Internal motor wiring broken	
	* Fan motor starter broken	* Replace starter
BURNER DOESN'T SWITCH TO HIGH FLAME	* Fuses broken (three phases only)	* Replace fuses and check current absorption
	* Hi-low flame thermostat badly set or damaged	* Reset or replace thermostat
mechanical only: SOMETIMES THE SERVOMOTOR RUNS IN THE WRONG WAY	* Servomotor cam badly set	* Reset servomotor cam
	* Servomotor capacitor damaged	* Replace capacitor
PHASE-TO-PHASE SUPPLY OR PRESENCE OF VOLTAGE ON NEUTRAL*	* Lights up and freezes	* In such cases, insert an RC circuit (our code 2531003).

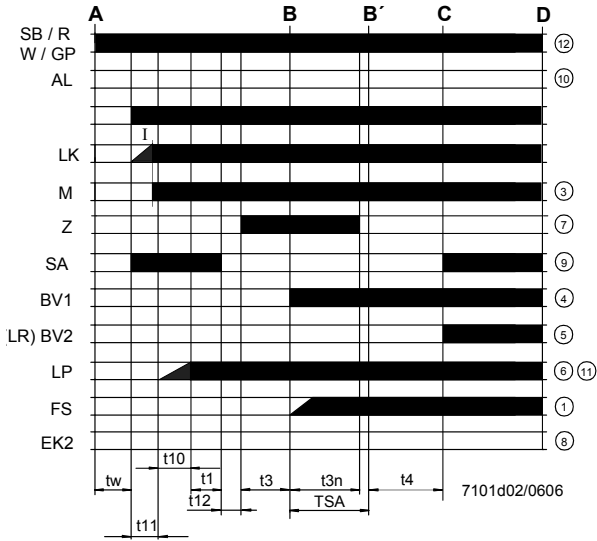
LME11 control sequence



LME21 control sequence



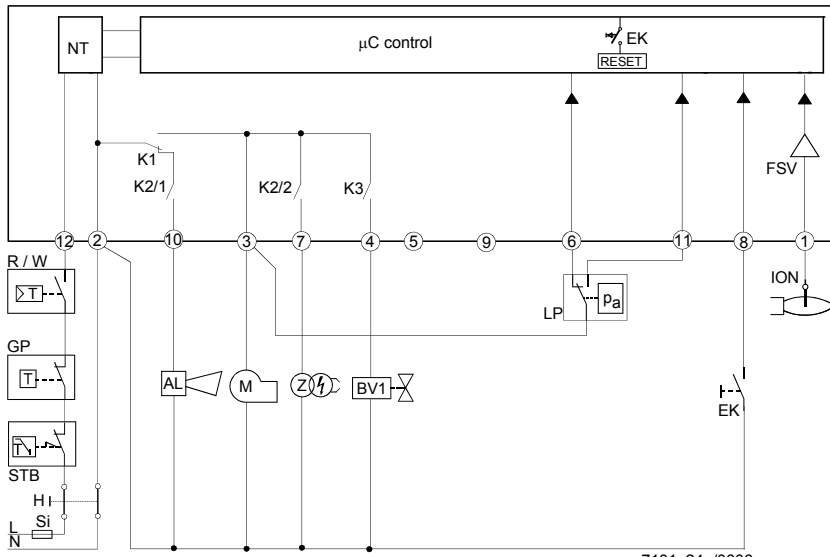
LME22 control sequence



Control sequence

- t_w Waiting time
- t_1 Purge time
- TSA Ignition safety time
- t_3 Preignition time
- t_{3n} Postignition time
- t_4 Interval between BV1 and BV2/LR
- t_{10} Specified time for air pressure signal
- t_{11} Programmed opening time for actuator SA
- t_{12} Programmed closing time for actuator SA

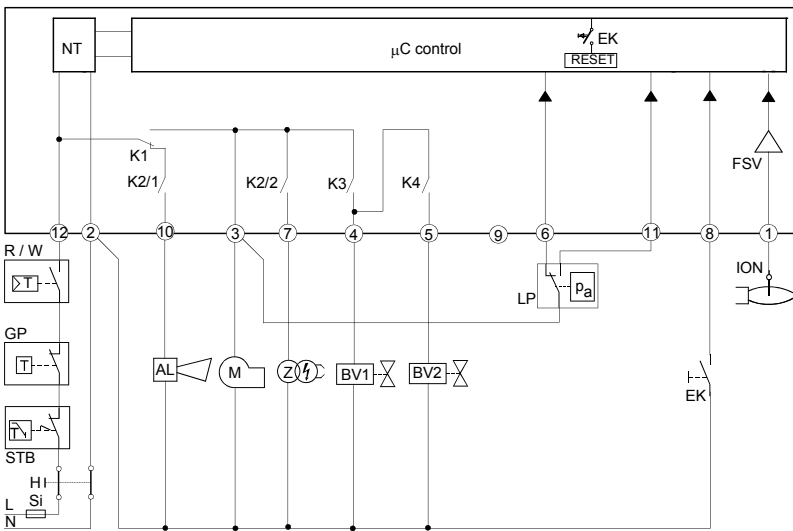
LME11 connection diagram



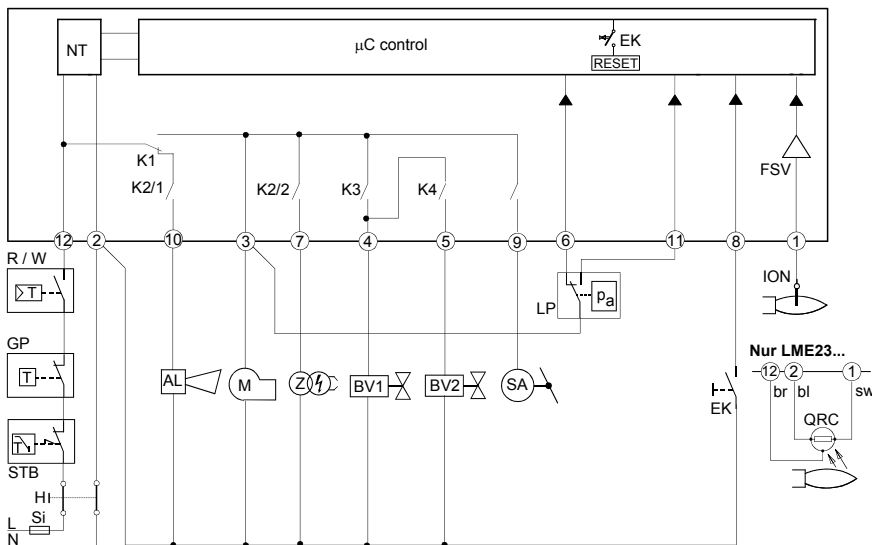
Connection diagram

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

LME21 connection diagram



LME22 connection diagram



CONTROL PROGRAM IN THE EVENT OF FAULT

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

CONTROL BOX LOCKED

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

DIAGNOSTICS OF THE CASE OF FAULT

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

During diagnostics, the control outputs are deactivated:

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


ERROR CODE TABLE	
2 blinks **	No establishment of flame at the end of TSA - Faulty or soiled fuel valves - Faulty or soiled flame detector - Inadequate adjustment of burner, no fuel - Faulty ignition equipment
3 blinks ***	The air pressure switch does not switch or remains in idle position: - LP is faulty - Loss of air pressure signal after t10 - LP is welded in normal position.
4 blinks ****	- Extraneous light when burner starts up.
5 blinks *****	- LP is working position.
6 blinks *****	Free.
7 blinks *****	Loss of flame during operation - Faulty or soiled fuel valves - Faulty or soiled flame detector - Inadequate adjustment of burner
8 ÷ 9 blinks	Free
10 blinks *****	Faulty output contacts Attention: "lockout" remote signal (terminal no. 10) not enabled - Wiring error - Anomalous voltage on output terminals - Other faults
14 blinks ***** (only for LME4x)	- CPI contact (gas valve microswitch) not closed.

RESETTING THE BURNER CONTROL

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

LIMITATION OF REPETITIONS (only for LME11.. model)

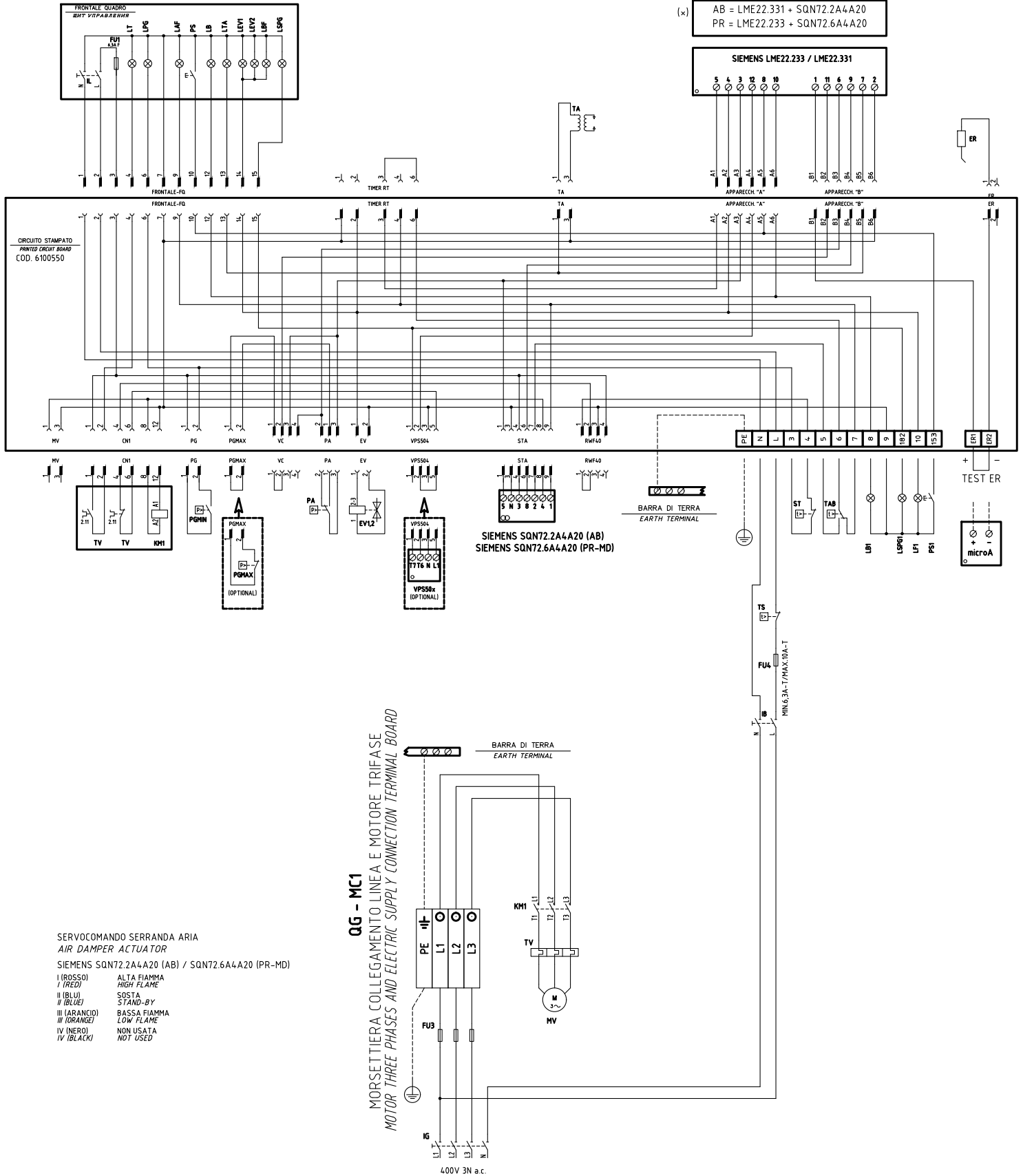
If no flame is established at the end of TSA, or if the flame is lost during operation, a maximum of 3 repetitions per controller startup can be performed via "R", otherwise lockout will be initiated. Counting of repetitions is restarted each time a controlled startup via "R" takes place.

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

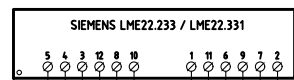
TECHNICAL CHARACTERISTICS

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

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



(x) AB = LME22.331 + SQN72.2A4A20
 PR = LME22.233 + SQN72.6A4A20

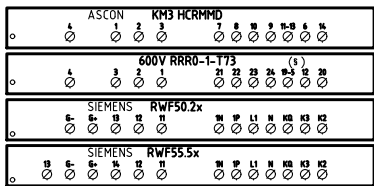
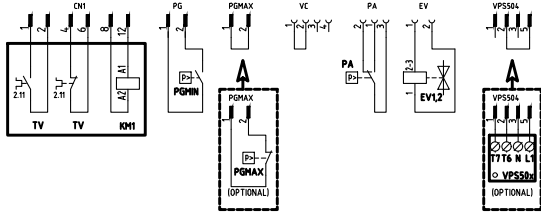
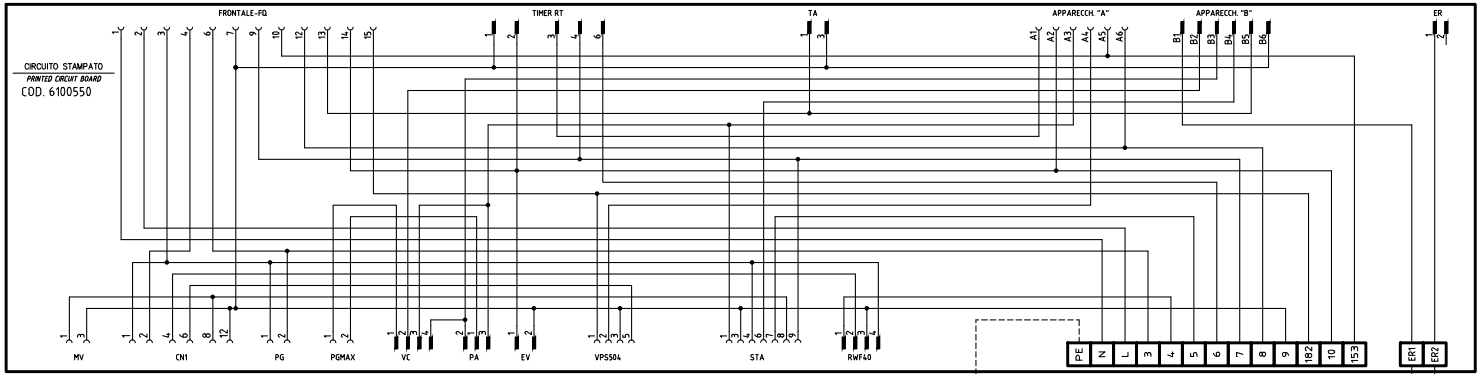
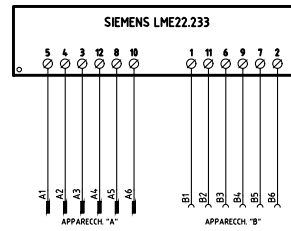
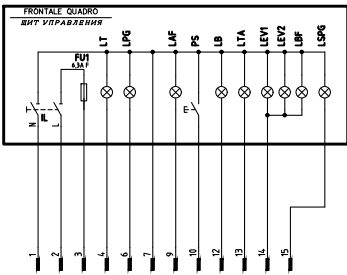
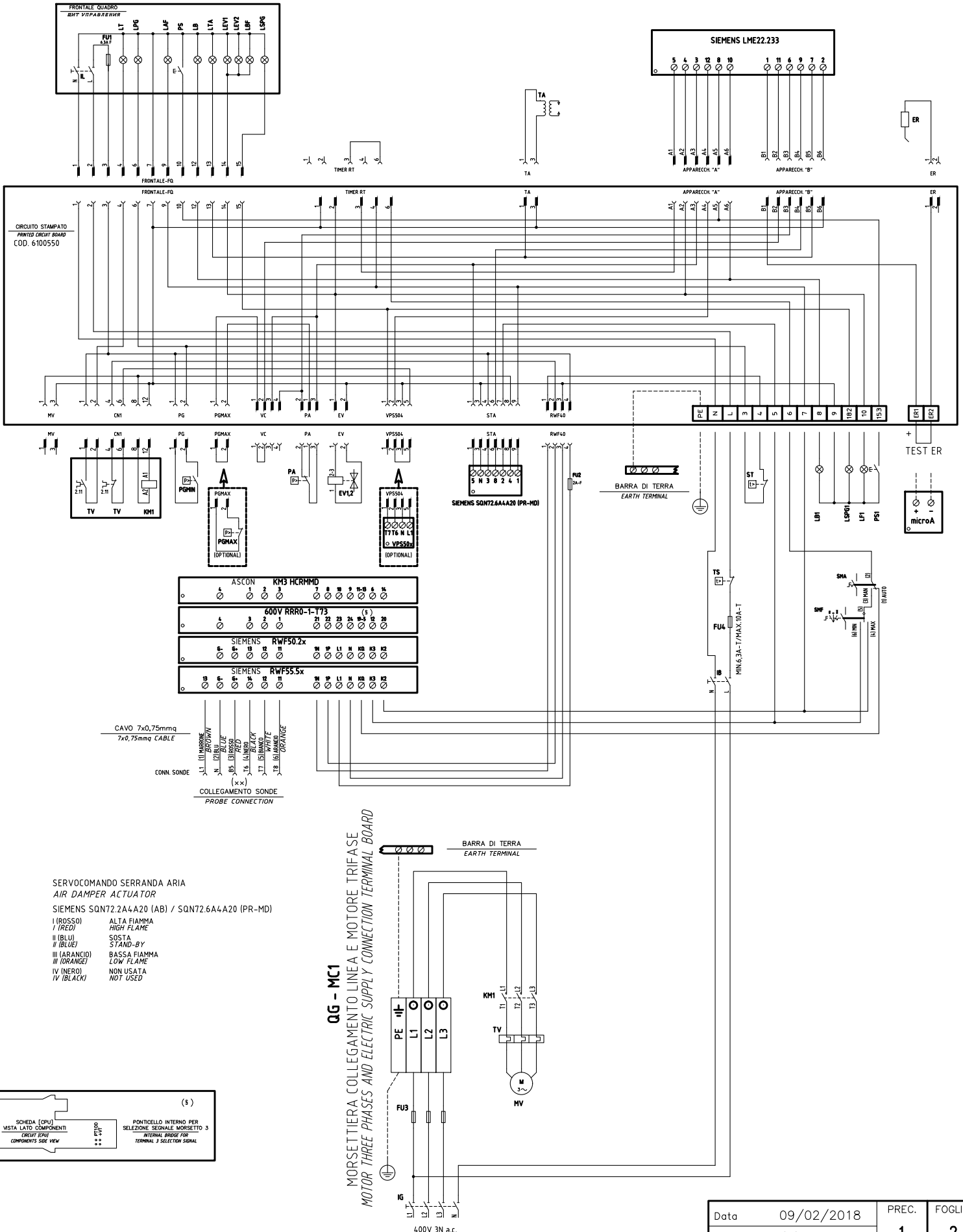


SIEMENS SQN72.2A4A20 (AB)
 SIEMENS SQN72.6A4A20 (PR-MD)

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

- SERVOCOMANDO SERRANDA ARIA
 AIR DAMPER ACTUATOR
 SIEMENS SQN72.2A4A20 (AB) / SQN72.6A4A20 (PR-MD)
- I (ROSSO) ALTA FIAMMA (RED) HIGH FLAME
 - II (BLU) SOSTA (BLUE) STAND-BY
 - III (ARANCIO) BASSA FIAMMA (ORANGE) LOW FLAME
 - IV (NERO) NON USATA (BLACK) NOT USED

Data	09/02/2018	PREC.	FOGLIO
Revisione	00	/	1
Dis. N.	18 - 0317	SEQUE	TOTALE
		2	4

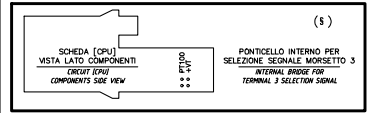
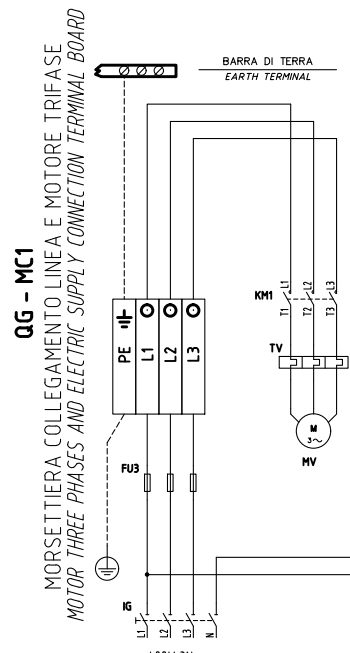


CAVO 7x0,75mmq
7x0,75mmq CABLE

CONN SONDE
COLLEGAMENTO SONDE
PROBE CONNECTION

SERVOCOMANDO SERRANDA ARIA
AIR DAMPER ACTUATOR
SIEMENS SQN72.2A4A20 (AB) / SQN72.6A4A20 (PR-MD)

I (ROSSO) ALTA FIAMMA
HIGH FLAME
II (BLU) SOSTA
STAND-BY
III (ARANCIO) BASSA FIAMMA
LOW FLAME
IV (NERO) NON USATA
NOT USED



Data	09/02/2018	PREC.	FOGLIO
Revisione	00	1	2
Dis. N.	18 - 0317	SEQUE	TOTALE
		3	4

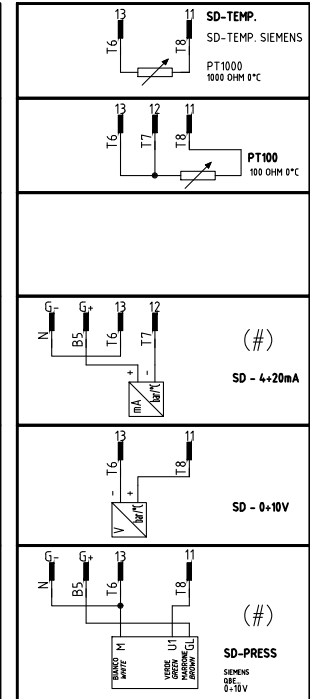
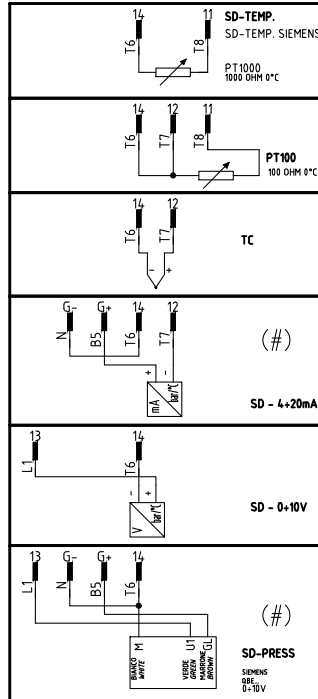
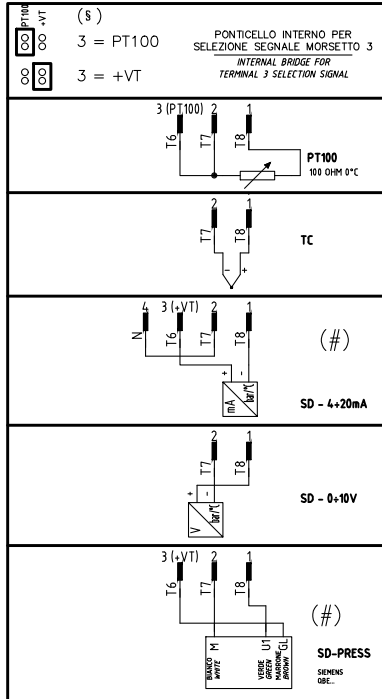
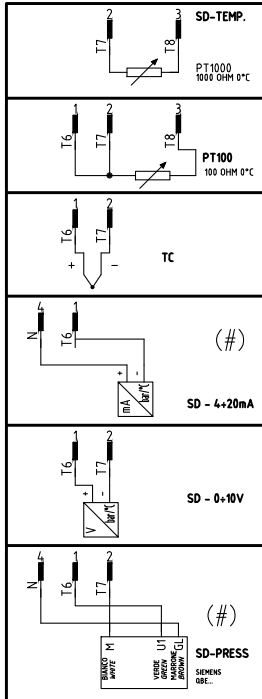
ATTENZIONE COLLEGAMENTO SONDE CON CONNETTORE 7 POLI
WARNING PROBE CONNECTION WITH 7 PINS CONNECTOR

KM3 HCRMMD

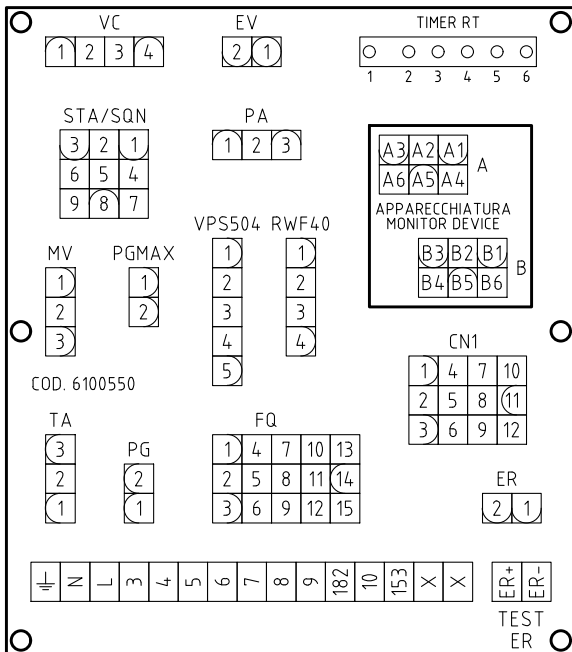
600V RRR0-1-T73

RWF55.5x

RWF50.2x



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



Data	09/02/2018	PREC.	FOGLIO
Revisione	00	2	3
Dis. N.	18 - 0317	SEQUE	TOTALE
		4	4

0	1	2	3	4	5	6	7	8	9	10
Sigla/Item	Funzione	Function								
600V RRR0-1-T73	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)								
ER	ELETTRODO RILEVAZIONE FIAMMA	FLAME DETECTION ELECTRODE								
EV1,2	ELETTROVALVOLE GAS (O GRUPPO VALVOLE)	GAS ELECTRO-VALVES (OR VALVES GROUP)								
FU1	FUSIBILE DI LINEA	LINE FUSE								
FU2	FUSIBILE AUSILIARIO	AUXILIARY FUSE								
FU3	FUSIBILI LINEA MOTORE VENTILATORE	FAN MOTOR LINE FUSES								
FU4	FUSIBILE DI LINEA	LINE FUSE								
IB	INTERRUTTORE LINEA BRUCIATORE	BURNER LINE SWITCH								
IG	INTERRUTTORE GENERALE	MAINS SWITCH								
IL	INTERRUTTORE LINEA AUSILIARI	AUXILIARY LINE SWITCH								
KM1	CONTATTORE MOTORE VENTILATORE	FAN MOTOR CONTACTOR								
KM3 HCRMMD	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)								
LAF	LAMPADA SEGNAZIONE ALTA FIAMMA BRUCIATORE	BURNER IN HIGH FLAME INDICATOR LIGHT								
LB	LAMPADA SEGNAZIONE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT								
LB1	LAMPADA SEGNAZIONE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT								
LBF	LAMPADA SEGNAZIONE BASSA FIAMMA BRUCIATORE	BURNER IN LOW FLAME INDICATOR LIGHT								
LEV1	LAMPADA SEGNAZIONE APERTURA [EV1]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV1]								
LEV2	LAMPADA SEGNAZIONE APERTURA [EV2]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV2]								
LF1	LAMPADA SEGNAZIONE FUNZIONAMENTO BRUCIATORE	INDICATOR LIGHT BURNER OPERATION								
LPG	LAMPADA SEGNAZIONE PRESENZA GAS IN RETE	INDICATOR LIGHT FOR PRESENCE OF GAS IN THE NETWORK								
LSPG	LAMPADA SEGNAZIONE BLOCCO CONTROLLO TENUTA VALVOLE	INDICATOR LIGHT FOR LEAKAGE OF VALVES								
LSPG1	LAMPADA SEGNAZIONE BLOCCO CONTROLLO TENUTA VALVOLE	INDICATOR LIGHT FOR LEAKAGE OF VALVES								
LT	LAMPADA SEGNAZIONE BLOCCO TERMICO	INDICATOR LIGHT FOR MOTOR OVERLOAD THERMAL CUTOUT								
LTA	LAMPADA SEGNAZIONE TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER INDICATOR LIGHT								
MV	MOTORE VENTILATORE	FAN MOTOR								
PA	PRESSOSTATO ARIA	AIR PRESSURE SWITCH								
PGMAX	PRESSOSTATO GAS DI MASSIMA PRESSIONE	MAXIMUM PRESSURE GAS SWITCH								
PGMIN	PRESSOSTATO GAS DI MINIMA PRESSIONE	MINIMUM GAS PRESSURE SWITCH								
PS	PULSANTE SBLOCCO FIAMMA	FLAME UNLOCK BUTTON								
PS1	PULSANTE SBLOCCO FIAMMA	FLAME UNLOCK BUTTON								
PT100	SONDA DI TEMPERATURA	TEMPERATURE PROBE								
RWF50.2x	REGOLATORE MODULANTE	BURNER MODULATOR								
RWF55.5x	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)								
SD-PRESS	SONDA DI PRESSIONE	PRESSURE PROBE								
SD-TEMP.	SONDA DI TEMPERATURA	TEMPERATURE PROBE								
SD - 0÷10V	TRASDUTTORE USCITA IN TENSIONE	TRANSDUCER VOLTAGE OUTPUT								
SD - 4÷20mA	TRASDUTTORE USCITA IN CORRENTE	TRANSDUCER CURRENT OUTPUT								
SIEMENS LME22.233	APPARECCHIATURA CONTROLLO FIAMMA	CONTROL BOX								
SIEMENS LME22.331	APPARECCHIATURA CONTROLLO FIAMMA	CONTROL BOX								
SIEMENS SQN72.2A4A20 (AB)	SERVOCOMANDO SERRANDA ARIA	AIR DAMPER ACTUATOR								
SIEMENS SQN72.6A4A20 (PR-MD)	SERVOCOMANDO SERRANDA ARIA	AIR DAMPER ACTUATOR								
SMA	SELETTORE MANUALE/AUTOMATICO	MANUAL/AUTOMATIC SWITCH								
SMF	SELETTORE MANUALE FUNZIONAMENTO MIN-0-MAX	MIN-0-MAX MANUAL OPERATION SWITCH								
ST	SERIE TERMOSTATI/PRESSOSTATI	SERIES OF THERMOSTATS OR PRESSURE SWITCHES								
TA	TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER								
TAB	TERMOSTATO/PRESSOSTATO ALTA-BASSA FIAMMA	HIGH-LOW THERMOSTAT/PRESSURE SWITCHES								
TC	TERMOCOPPIA	THERMOCOUPLE								
TS	TERMOSTATO/PRESSOSTATO DI SICUREZZA	SAFETY THERMOSTAT OR PRESSURE SWITCH								
TV	TERMICO MOTORE VENTILATORE	FAN MOTOR THERMAL								
VPS50x	CONTROLLO DI TENUTA VALVOLE GAS (OPTIONAL)	GAS PROVING SYSTEM (OPTIONAL)								
microA	MICROAMPEROMETRO	MICROAMMETER								

Data	09/02/2018	PREC.	FOGLIO
Revisione	00	3	4
Dis. N.	18 - 0317	SEQUE	TOTALE
		1	4



C.I.B.UNIGAS S.p.A.

Via L.Galvani ,9 - 35011Campodarsego (PD) - ITALY

Tel. +39 049 9200944 - Fax +39 049 9200945

website:www.cibunigas.it-e-mail:cibunigas@cibunigas.it

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

LME73.000Ax + PME73.831AxBC LME73.831AxBC



Service instruction manual

M12921CB Rel.1.2 02/2016

GENERAL FEATURES

LME/ is suitable for gas, light and heavy oil burners

LME7 series has two devices: LME73.000 (hardware) and PME73.831AxBC (programmable unit). The LME73.831AxBC is also available: it has a built in software and it is not programmable.

LME7 is inside the control panel. If supplied, PME73.831BC is inside the LME7;

The display AZL23.. or AZL21.. is available for Service and hardware setup.

LME7... are used for the startup and supervision of 2-stage/progressive, modulating forced draft gas burners in intermittent operation.

The flame is supervised with an ionization probe, optionally with UV flame detector QRA2..., QRA4.U or QRA10....

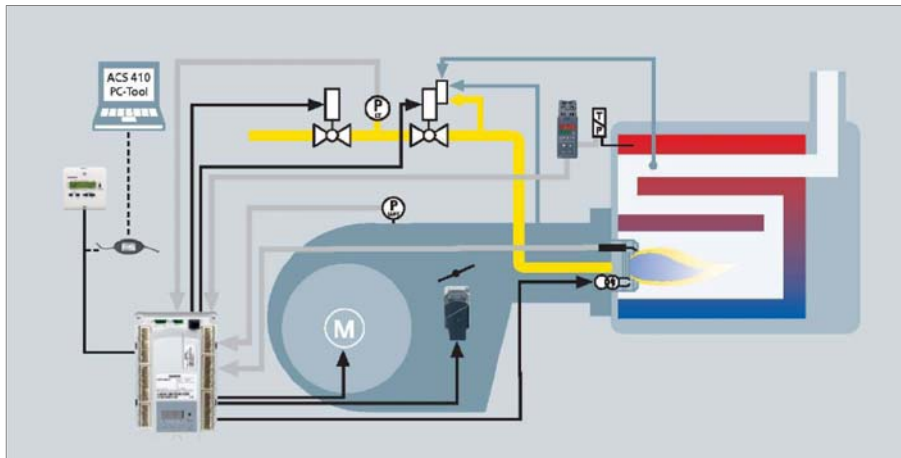
Integrated in the LME7... basic unit are:

- Burner control
- BCI
- Control for one actuator
- Lockout reset button (info button)
- 3 multicolor signal lamp LED for operations and fault notifications
- 3 x 7-segment display for service, fault and operating state information
- Interface for program module (no function)

Passwords protect the different parameter levels against unauthorized access. Basic settings that the plant operator can make on site require no password.

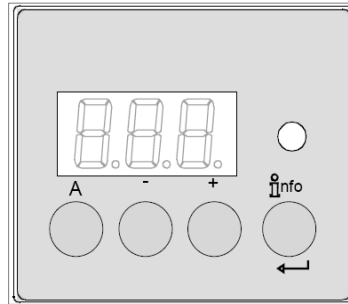
Functions:






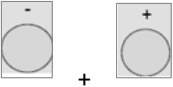
- Undervoltage detection
- Electrical remote reset facility
- Accurate control times thanks to digital signal handling
- Multicolor indication of fault status and operating state messages
- Air pressure supervision with function check of air pressure switch during start and operation (gas)
- Repetition limitation
- Controlled intermittent operation after 24 hours of continuous operation*
- BCI
- Indication of program sequence



* after no more than 24 hours of continuous operation, the burner control initiates automatic controlled shutdown followed by a restart.

User interface :





	<p>Button A</p> <ul style="list-style-type: none"> - Display preset output - In lockout position: Power value to the time of fault
	<p>Info and Enter button</p> <ul style="list-style-type: none"> - Reset in the event of fault, changeover visual diagnostic of the cause of fault (refer to chapter Diagnostics of cause of fault)
	<p>- button</p> <ul style="list-style-type: none"> - Display flame signal current 2 or phases display - In lockout position: MMI phase to the time of fault
	<p>+ button</p> <ul style="list-style-type: none"> - Display flame signal current 1 or phases display - In lockout position: MMI phase to the time of fault
	<p>3 multicolor signal lamp</p> <ul style="list-style-type: none"> - Refer to chapter "Blink code table"
	<p>+ and - button: Escape function (press + and - simultaneously)</p> <ul style="list-style-type: none"> - No adoption of value - One menu level up - Keep depressed for >1second for backup / restore function

First startup when PME is supplied or PME replacement:

First startup:

- 1) insert a new PME
- 2) turn the power on; The display shows "rst" and "PrC" one after the other.

- 3) keep pushing the INFO  button more than 3 seconds; "run" appears; PME parameters will be transferred to LME
- 4) at the end, "End" and "rst" appears one after the other; Later (2'), the control box locks out "Loc 138"

- 5) reset the control box by pressing the INFO  button (for less than 3 seconds)
Now the display shows "OFF"; the burner is ready to be started.



Replacement:

- 1) Turn off the burner, replace the existing PME with a new one
- 2) For the first startup, repeat the above procedure, from step 2.

List of phase display on board LME :

Phase number of 7-segment display	LED	Function
Standby		
OFF	Off	Standby, waiting for heat demand
P08	Off	Mains ON / test phase (e.g. detector test)
Startup		
P21	Yellow	Safety valve ON, air pressure switch test / POC test (timeout / locking
P22	Yellow	Fan motor ON / air pressure switch test / settling time
P24	Yellow	Actuator opens in prepurging position
P30	Yellow	Prepurging
P36	Yellow	Actuator closes in ignition load / low-fire position
P38	Yellow blinking	Preignition time
P40	Yellow blinking	1st safety time (TSA1) / ignition transformer ON
P42	Green	Safety time (ignition transformer OFF), flame check
P44	Green	Interval: End of safety time and fuel valve 1 (V1) ON Interval: End of safety time and load controller (LR) release
P50 Green	P50 Green	2nd safety time (TSA2)
P54 Green	P54 Green	P259.01: Actuator opens in > low-fire
P54 Green	P54 Green	P260: Actuator closes in low-fire
oP1 Green	oP1 Green	Interval until release of load controller target (analog or 3-position step input)
Operation		
oP	Green	Operation, modulating operation
Shutdown		
P10	Yellow	Shutdown, actuator opens in CLOSE position (home run)
P72	Yellow	Actuator opens in high-fire position / end of operation
P74	Yellow	Postpurging
Valve proving		
P80	Yellow	Test space evacuating
P81	Yellow	Checking time fuel valve 1
P82	Yellow	Test space filling
P83	Yellow	Checking time fuel valve 2
Waiting phases (start prevention)		
P01	Red / yellow blinking	Undervoltage
P02	Yellow	Safety loop open
P04	Red / green blinking	Extraneous light on burner startup (timeout / locking after 30 s)
P90	Yellow	Pressure switch-min open
Lockout		
LOC	Red	Lockout phase

Operation :

	<p>The lockout reset button (info button) (EK) is the key operating element for resetting the burner control and for activating / deactivating the diagnostics functions.</p>
	<p>The multicolor signal lamp (LED) is the key indicating element for visual diagnostics.</p>

Both lockout reset button (EK) and signal lamp (LED) are located in the control panel.

There are 2 diagnostics choices:

1. Visual diagnostics: Indication of operating state or diagnostics of cause of fault
2. Diagnostics: Via internal display or to AZL2.. display and operating unit

Visual diagnostics:

In normal operation, the different operating states are indicated in the form of color codes according to the color code table given below.

Color code table for multicolor signal lamp (LED) :

State	Color code	Color
Waiting time (tw), other waiting states	○.....	OFF
Ignition phase, ignition controlled	●○●○●○●○●○●○●○	Blinking yellow
Operation, flame o.k.	□.....	Green
Operation, flame not o.k.	□○□○□○□○□○□○□○	Blinking green
Extraneous light on burner startup	□▲□▲□▲□▲□▲□▲	Green-red
Undervoltage	●▲●▲●▲●▲●▲●▲	Yellow-red
Fault, alarm	▲.....	Red
Error code output (refer to «Error code table»)	▲○▲○▲○▲○▲○▲○	Blinking red
Interface diagnostics	▲▲▲▲▲▲▲▲▲▲▲▲	Red flicker light
Heating request	●.....	Yellow
Heating request	●●▲●●▲●●▲●●▲	Yellow

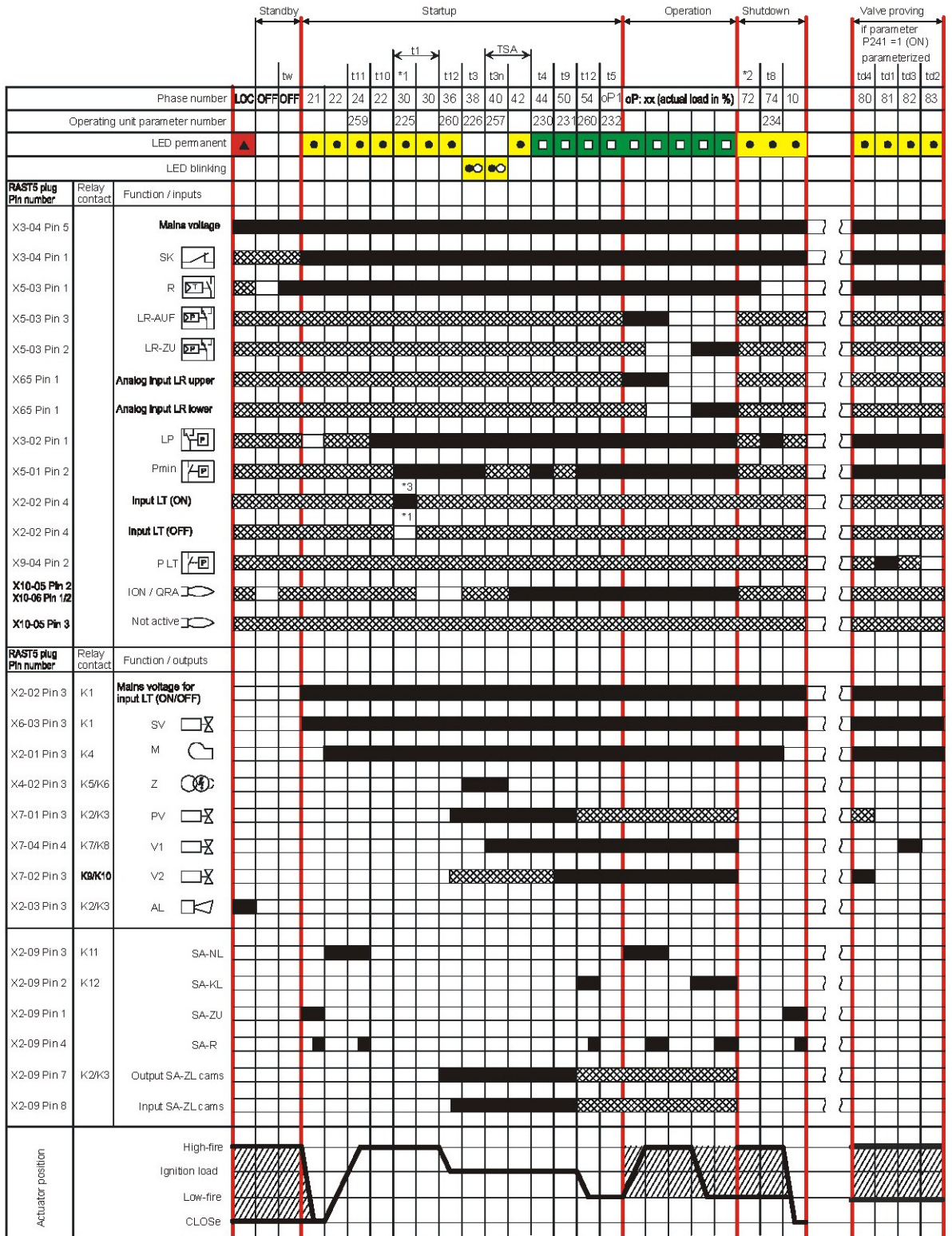
Key

.....	Steady on
○	Led off
▲	Led red
●	Led yellow
□	Led green

Program sequence :

Version 2:

- Ignition load > low-fire
- Prepurging in high-fire
- Parameter 515 = 1 (condition parameter 259.01 = 0 seconds)



7114d04e/0112

Phase number	Function
LOC	Lockout phase
OFF	Standby, waiting for heat demand
oP	Operation, modulating operation
oP1	Interval until release of load controller target (analog or 3-position step input)
01	Under voltage
02	Safety loop open
04	Extraneous light on burner startup (timeout/locking after 30 seconds)
08	Mains ON/test phase (e.g. detector test)
10	Shutdown, actuator opens in CLOSE position (homerun)
21	Safety valve ON, air pressure switch OFF, actuator opens in CLOSE position
22	Part 1: Fan motor ON
	Part 2: Specified time (t10) air pressure switch (LP)
	Message (timeout) stabilization air pressure switch
24	Actuator opens in prepurge position
30	Part 1: Prepurge time (t1) without extraneous light test
	Valve proving after mains ON, lockout
	Part 2: Prepurge time (t1) with extraneous light test
36	Actuator closes in ignition load
38	Preignition (t3)
40	Postignition time (t3n), parameter 257 + 0.3 seconds
42	Flame detection
44	Interval (t4): End of safety time (TSA) and burner valve 2 ON
50	2nd safety time (t9)
54	Parameter 259.01: Actuator opens in > low-fire
	Parameter 260: Actuator closes in low-fire
72	End of operation, checking if valve proving (LT) shall be performed
74	Postpurging (t8)
80	Test space evacuation (td4)
81	Test time (td1) fuel valve 1 (V1)
82	Test space filling (td3)
83	Test time (td2) fuel valve 2 (V2)
90	Pressure switch-min open <input type="checkbox"/> safety shutdown
*1	Valve proving is conducted when...
	- parameter 241.00 = 1 and parameter 241.02 = 1, or
	- parameter 241.00 = 1 and parameter 241.01 = 0
*2	Valve proving is conducted when...
	- parameter 241.00 = 1 and parameter 241.02 = 1, or
	- parameter 241.00 = 1 and parameter 241.01 = 1
*3	Valve proving (LT) will not be performed

Error code table :

Red blink code of fault signal lamp (LED)	Possible cause
2 x blinks	No establishment of flame at the end of the safety time (TSA)
	<ul style="list-style-type: none"> - Faulty or soiled flame detector - Faulty or soiled fuel valves - Poor adjustment of burner, no fuel - Faulty ignition equipment
3 x blinks	Air pressure switch (LP) faulty <ul style="list-style-type: none"> - Loss of air pressure after specified time (t10) - Air pressure switch (LP) welded in no-load position
4 x blinks	Extraneous light on burner startup
5 x blinks	Time supervision air pressure switch (LP) <ul style="list-style-type: none"> - Air pressure switch (LP) welded in working position
6 x blinks	Actuator position not reached <ul style="list-style-type: none"> - Actuator faulty - Wrong adjustment of cam - Actuator defective or blocked - False connection - Misadjustment
7 x blinks	Too many losses of flame during operation (limitation of repetitions) <ul style="list-style-type: none"> - Faulty or soiled flame detector - Faulty or soiled fuel valves - Poor adjustment of burner
8 x blinks	Free
9 x blinks	Free
10 x blinks	Wiring error or internal error, output contacts, other faults
12 x blinks	Valve proving (LT) <ul style="list-style-type: none"> - Fuel valve 1 (V1) leaking
13 x blinks	Valve proving (LT) <ul style="list-style-type: none"> - Fuel valve 2 (V2) leaking
14 x blinks	Error in connection with valve closure control POC
15 x blinks	Error code ≥ 15 Error code 22: Error of safety loop (SL)

During the time the cause of fault is diagnosed, the control outputs are deactivated:

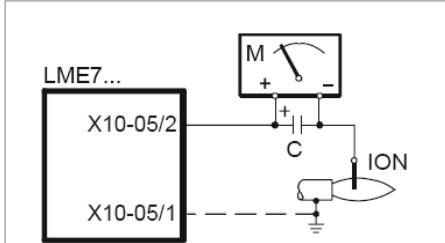
- Burner remains shut down
- External fault indication (AL) at terminal X2-03, pin 3 steady on

Diagnostics of cause of fault is quit and the burner switched on again by resetting the burner control. Press the lockout reset button (info button) for about 1 second (<3 seconds).

Flame detection – detection electrode :

Short-circuit current	Max. AC 1 mA
Required detector current	Min. DC 2 μ A, display approx. 45 %
Possible detector current	Max. DC 3 μ A, display approx. 100 %
Permissible length of detector cable (laid separately)	30 m (core-earth 100 pF/m)

Measuring circuit



Keys

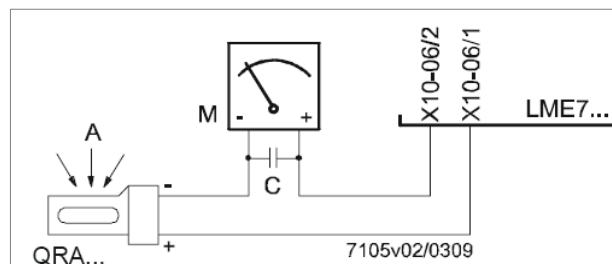
- C - Electrolytic condenser 100...470 μ F; DC 10...25 V
- ION - Ionization probe
- M - Microammeter Ri max. 5,000 Ω

Flame detection – UV probe :

Threshold values when flame is supervised by QRA...

- Start prevention (extraneous light)	Intensity (parameter 954) approx. 12 %
- Operation	Intensity (Parameter 954) approx. 13 %
Operating voltage	AC 280 V \pm 15 %
Mains frequency	50...60 Hz \pm 6 %
Required detector current	Min. 70 μ A
Possible detector current	
- Operation	Max. 700 μ A
Perm. length of detector cable	
- Normal cable, laid separately ¹⁾	Max. 100 m

¹⁾ Multicore cable not permitted



Keys

- A - Exposure to light
- C - Electrolytic condenser 100...470 μ F; DC 10...25 V
- M - Microammeter Ri max. 5,000 Ω

Warning!

Input QRA... is not short-circuit-proof!
 Short-circuits of X10-06/2 against earth can destroy the QRA... input
 Simultaneous operation of flame detector QRA... and detection electrode is not permitted
 To make certain the age of the UV tube can be determined, the LME7... basic unit must always be connected to mains supply.

Gas proving system :

Valve proving is dependent on input valve proving ON / OFF (X2-02). When a leak is detected, the gas valve proving function ensures that the gas valves will not be opened and that ignition will not be switched on. Lockout will be initiated.

Valve proving with separate pressure switch (P LT)

Step 1: td4 – Evacuation of test space

Gas valve on the burner side is opened to bring the test space to atmospheric pressure.

Step 2: td1 – Test atmospheric pressure

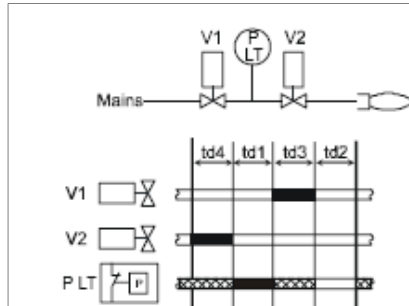
When the gas has closed, the gas pressure in the test space must not exceed a certain level.

Step 3: td3 Filling of test space

Gas valve on the mains side opens to fill the test space.

Step 4: td2 – Test gas pressure

When the gas valve has closed, the gas pressure in the test space must not drop below a certain level.



Controllo tenuta con pressostati separati

Keys

td1 Test atmospheric pressure

td2 Test gas pressure

td3 Filling of test space

td4 Evacuation of test space

V... Fuel valve

PLT Pressure switch valve proving

■ Input / output signal 1 (ON)

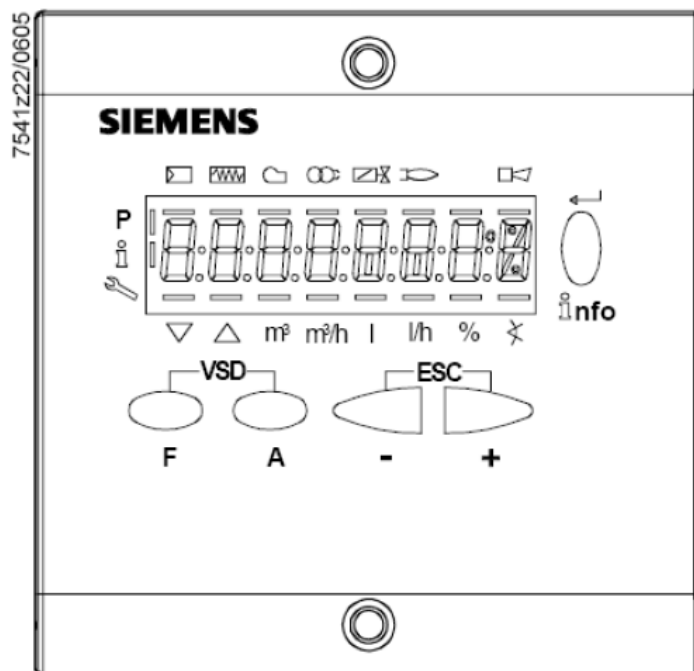
□ Input / output signal 0 (OFF)

▨ Input permissible signal 1 (ON) or 0 (OFF)

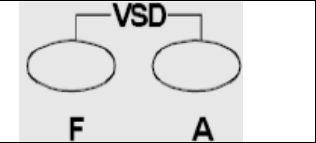


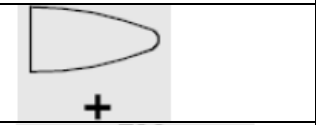
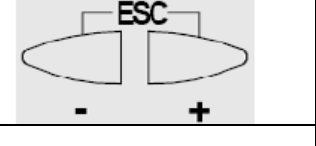
No.	Parameter
242	Valve proving evacuation of test space
243	Valve proving time test atmospheric pressure
244	Valve proving filling of test space
245	Valve proving time test gas pressure

Instruction, control and modify via AZL2x :

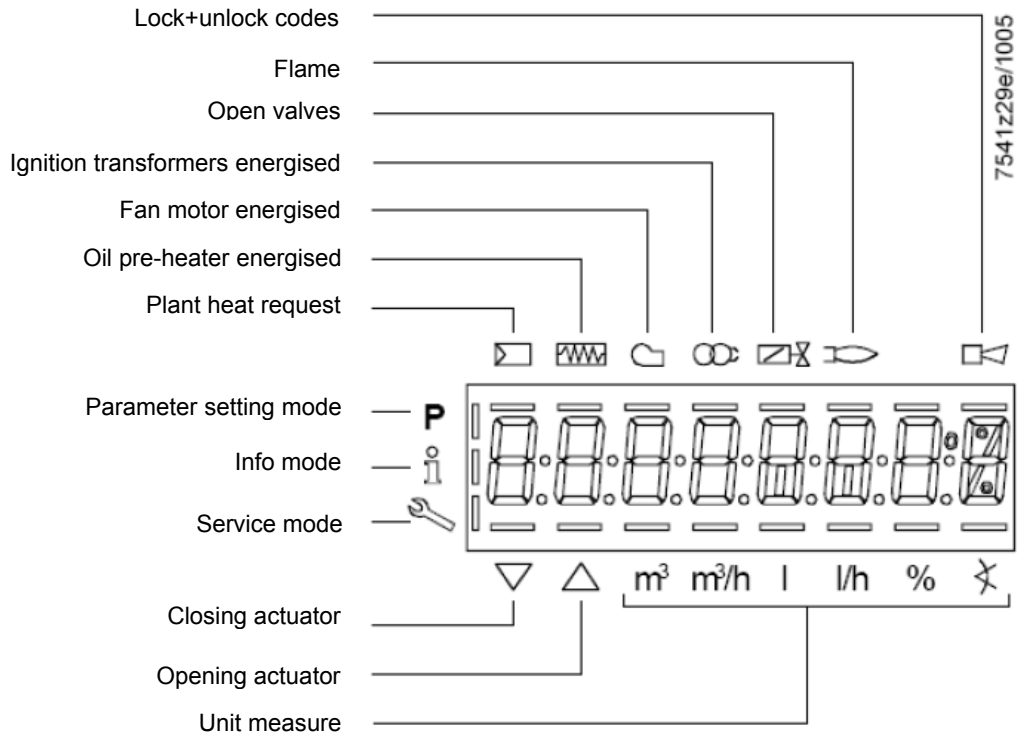
The AZL2x.. display/programming unit is shown below:




The keys functions are the following:

	<p>Key F + A While pressing the two keys contemporarily, the code message will appear: by entering the proper password it is possible to access the Service mode.</p>
	<p>Info and Enter keys Used for Info and Service menus Used as Enter key in the setting modes Used as Reset key in the burner operation mode Used to enter a lower level menu</p>
	<p>Key - Used for one menu level down Used to decrease a value</p>
	<p>Key + Used for one menu level up Used to increase a value</p>
	<p>Keys (+ & -) = ESC By pressing + and - at the same time, the ESCAPE function is performed No adoption of value One menu level down</p>

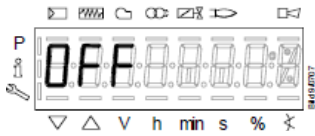
The display will show these data:



While pushing the  button together with whatever else button, LME73 locks out; the display shows



On stand-by position,  appears



On operation, all the phases appears with their number.



List of phase with display AZL2x :

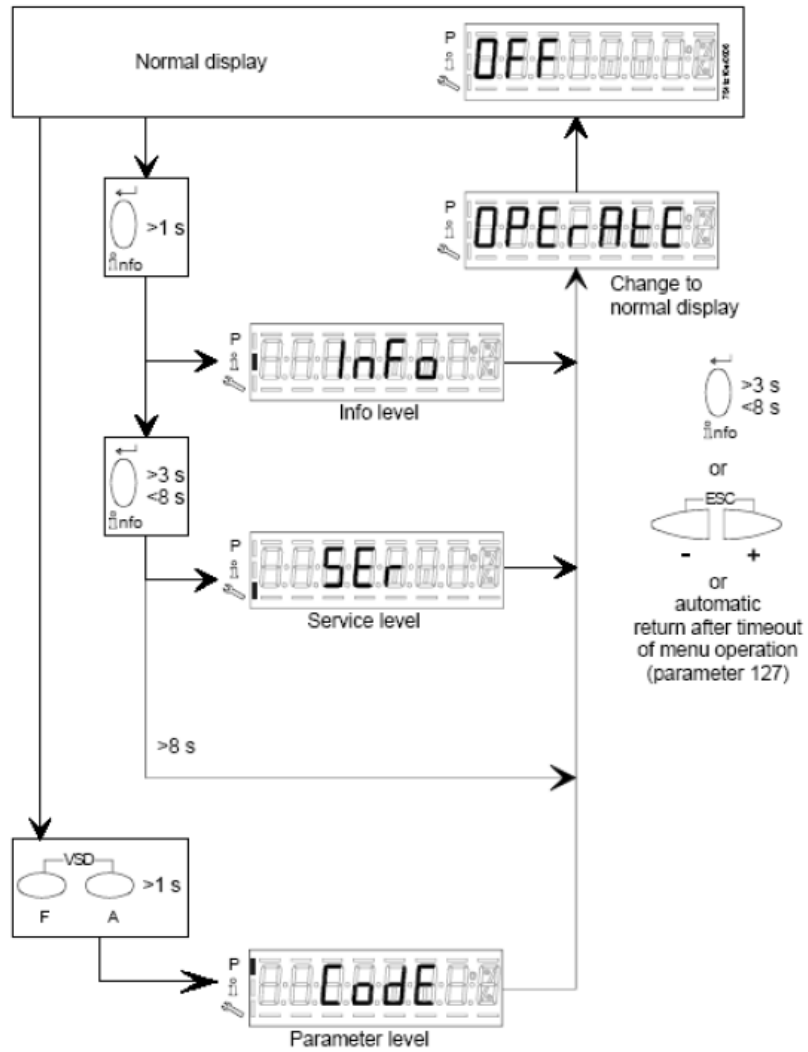
Phase number	Function
Standby	
OFF	Standby, waiting for heat request
Ph08	Power ON / test phase (e.g. detector test)
Startup	
Ph21	Safety valve ON, air pressure switch test / POC test (timeout / locking after 5 seconds), actuator opens in low-fire position / CLOSE position
Ph22	Fan motor ON or air pressure switch test / settling time
Ph24	Actuator travels to the prepurge position
Ph30	Prepurging
Ph36	Actuator closes until ignition load / low-fire is reached, and parameter 259.02: Actuator opens to a position > ignition load
Ph38	Preignition
Ph40	1st safety time (TSA1) / ignition transformer ON
Ph42	Safety time (ignition transformer OFF), flame check
Ph44	Interval: End of safety time and fuel valve 1 (V1) ON
Ph50	2nd safety time (TSA2)
Ph54	P259.01: Actuator opens in > low-fire
Ph54	P260: Actuator closes in low-fire
oP1	Interval until release of load controller target (analog or 3-position step input)
Operation	
oP	Operation, modulating operation
Shutdown	
Ph10	Shutdown, actuator opens in CLOSE position (home run)
Ph72	Actuator opens in high-fire position / end of operation
Ph74	Postpurging
Valve proving	
Ph80	Test space evacuating
Ph81	Checking time fuel valve 1
Ph82	Test space filling
Ph83	Checking time fuel valve 2
Waiting phases (start prevention)	
Ph01	Undervoltage
Ph02	Safety loop open
Ph04	Extraneous light at burner startup (timeout / locking after 30 seconds)
Ph90	Pressure switch-min open → safety shutdown
Lockout	
LOC	Lockout phase

Error code list with operation via internal AZL :

Error code	Clear text	Possible cause
Loc 2	No establishment of flame at the end of the safety time (TSA)	<ul style="list-style-type: none"> - Faulty or soiled fuel valves - Faulty or soiled flame detector - Poor adjustment of burner, no fuel - Faulty ignition equipment
Loc 3	Air pressure faulty (air pressure switch (LP) welded in no-load position, decrease to specified time (t10) (air pressure switch (LP) response time)	<ul style="list-style-type: none"> - Air pressure switch (LP) faulty - Loss of air pressure signal after specified time (t10) - Air pressure switch (LP) is welded in no-load position
Loc 4	Extraneous light	Extraneous light when burner startup
Loc 5	Air pressure faulty, air pressure switch welded in working position	<ul style="list-style-type: none"> - Time out air pressure switch (LP) - Air pressure switch (LP) is welded in working position
Loc 6	Fault of actuator	<ul style="list-style-type: none"> - Actuator faulty or blocked - Faulty connection - Wrong adjustment
Loc 7	Loss of flame	<ul style="list-style-type: none"> - Too many losses of flame during operation (limitation of repetitions) - Faulty or soiled fuel valves - Faulty or soiled flame detector - Poor adjustment of burner
Loc 8	---	Free
Loc 9	---	Free
Loc 10	Error not relatable (application), internal error	Wiring error or internal error, output contacts, other faults
Loc 12	Valve proving	Fuel valve 1 (V1) leak
Loc 13	Valve proving	Fuel valve 2 (V2) leak
Loc 22	Safety loop open	<ul style="list-style-type: none"> - Gas pressure switch-max open - Safety limit thermostat cut out
Loc 138	Restore process successful	Restore process successful
Loc 167	Manual locking	Manual locking
Loc: 206	AZL2... incompatible	Use the latest version

Entering the Parameter levels:

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



Info level :

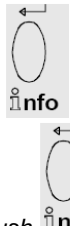


Keep pushing the **info** button until **Info** appears. Use + or - for scrolling the parameter list. If on the right side a dash-dot appears, it means the display doesn't show the full description. Push **info** again for 1 to 3 s in order to show the full description.

Below the visible **Info** parameters:

Parameter number	Parameter list PME73.000Ax + PME73.831AxBC LME73.831AxBC	Edit	Value range		Resolution	Factory setting	Password level reading from level	Password level writing from level
			Min.	Max.				
100	General							
102	Identification date	Read only	---	---	---		Info	---
103	Identification number	Read only	0	9999	1		Info	---
113	Burner identification	Read only	x	xxxxxxxx	1		Info	---
164	Numbers of startups resettable	Resettable	0	999999	1		Info	Info
166	Total number of startups	Read only	0	999999	1		Info	---
170.00	Switching cycles actuator relay K12	Read only	0	999999	1		Info	---
170.01	Switching cycles actuator relay K11	Read only	0	999999	1		Info	---
170.02	Switching cycles actuator relay K2	Read only	0	999999	1		Info	---
170.03	Switching cycles actuator relay K1	Read only	0	999999	1		Info	---
171	Max. switching cycles actuator relay	Read only	0	999999	1		Info	---

Service level :



Keep pushing the **info** button until full description. Push **info** again for 1 to 3 s in order to show the full description.

Below the visible **Info** parameters:

Parameter number	Parameter list PME73.000Ax + PME73.831AxBC LME73.831AxBC	Edit	Value range		Resolution	Factory setting	Password level reading from level	Password level writing from level
			Min.	Max.				
700	Error history							
701	Current error: 00: Error code 01: Startup meter reading 02: MMI phase 03: Power value	Read only	2 0 --- 0%	255 999999 --- 100%	1 1 --- 1		Service	---
702	Error history former 1: 00: Error code 01: Startup meter reading 02: MMI phase 03: Power value	Read only	2 0 --- 0%	255 999999 --- 100%	1 1 --- 1		Service	---
•								
•								
•								
711	Error history former 10: 00: Error code 01: Startup meter reading 02: MMI phase 03: Power value	Read only	2 0 --- 0%	255 999999 --- 100%	1 1 --- 1		Service	---

900	Process data							
936	Normalized speed	Read only	0%	100%	0.01 %		Service	---
951	Mains voltage	Read only	0 V	LME73.000A1: 175 V LME73.000A2: 350 V	1 V		Service	---
954	Flame intensity	Read only	0%	100%	1%		Service	---

Parameter level (Heating engineering) :

This level lets the engineer to modify some burner parameters. It is protect with a 4 digit password (SO level) and a 5 digit password (OEM level)

Password input : push **F** and **A** buttons together until the display shows "**code**" and 7 underlines. The left one flashes. By **+** or **-** move the flashing underline until it is on the desired position and push "enter". The underline becomes a dash. By means of **+** or **-**, choose the right character and push "enter". Input the whole password and the **PARA** appears and later on **000 Int** .

Scroll the parameters using **+** or **-**: **000Int, 100, 200, 500, 600 are on the display**. Choose the proper parameter group with the **enter** button and scroll the options with **+** e poi **-** (below the full par set: the two columns on the right give the level access). Choose the parameter to be modified with "enter" is writing is allowed. The parameter now flashes: **+** or **-** modifies the parameter and **enter** confirms. **+** and **-** pushed together movbe the menu one step back. Push **+** and **-** several times in order to get the home position..

Parameter number	Parameter list PME73.000Ax + PME73.831AxBC LME73.831AxBC	Edit	Value range		Resolution	Factory setting	Password level reading from level	Password level writing from level
			Min.	Max.				
0	Internal parameter							
41	Heating engineers password (4 characters)	Edit	xxxx	xxxx	---		---	OEM
42	OEM's password (5 characters)	Edit	xxxxx	xxxxx	---		---	OEM
60	Backup / restore	Edit	Restore	Backup	---		---	SO
100	General							
123	Min. power control step	Edit	1%	10%	0.1		SO	SO
140	Mode display of Display and operating unit AZL2... 1 = Standard (program phase) 2 = Flame 1 (QRA... / ION) 3 = Flame 2 (QRB... / QRC...) 4 = Active power (power value)	Edit	1	4	4		SO	SO
200	Burner control							
224	Specified time (t10) air pressure switch (LP)	Edit	0 s	13.818 s	0.294 s	12,054	SO	OEM
225	Gas: Prepurge time (t1)	Edit	0 s	1237 s	4.851 s	29,106	SO	OEM
226	Gas: Preignition time (t3)	Edit	1.029 s	37.485 s	0.147 s	2,058	SO	OEM
230	Interval (t4): End of safety time (TSA) - fuel valve 1 (V1) ON	Edit	3.234 s	74.97 s	0.294 s	3,234	SO	OEM
231	Interval (t9): Fuel valve 1 (V1) ON - pilot valve (PV) OFF	Edit	0 s	74.97 s	0.294 s	2,940	SO	OEM
232	Interval (t5): Pilot valve (PV) OFF - load controller (LR) release	Edit	2.058 s	74.97 s	0.294 s	8.820	SO	OEM
234	Gas: Postpurge time (t8)	Edit	0 s	1237 s	4.851 s	0	SO	OEM
239	Gas: Intermittent operation after 24 hours of continuous operation 0=OFF 1=ON	Edit	0	1	1	1	SO	OEM

240	Repetition in the event of loss of flame during operation 0 = None 1 = None 2 = 1 x Repetition	Edit	0	2	1	0	SO	OEM
241.00	Valve proving 0 = Off 1 = On	Edit	0	1	1	1	SO	OEM
241.01	Valve proving 0 = During prepurge time (t1) 1 = During postpurge time (t8)	Edit	0	1	1	0	SO	OEM
241.02	Valve proving 0 = According to P241.01 1 = During prepurge time (t1) and postpurge time (t8)	Edit	0	1	1	0	SO	OEM
242	Valve proving test space evacuating	Edit	0 s	2.648 s	0.147 s	2,646	SO	OEM
243	Valve proving time test atmospheric pressure	Edit	1.029 s	37.485 s	0.147 s	10,290	SO	OEM
244	Valve proving test space filling	Edit	0 s	2.648 s	0.147 s	2,646	SO	OEM
245	Valve proving time test gas pressure	Edit	1.029 s	37.485 s	0.147 s	10,290	SO	OEM
254	Response time detector error 0 = 1 s 1 = 3 s	Edit	0	1	1	0	SO	OEM
257	Gas: Postignition time (t3n – 0.3 seconds)	Edit	0 s	13.23 s	0.147 s	2,205	SO	OEM
259.00	Opening time of actuator (t11) (timeout for lockout)	Edit	0 s	1237 s	4.851 s	67,914	SO	OEM
259.01	Opening time of actuator from ignition load to low-fire position	Edit	0 s	37.485 s	0.147 s	14,994	SO	OEM
259.02	Opening time of actuator from low-fire to ignition load position	Edit	0 s	37.485 s	0.147 s	14,994		
260	Closing time of actuator (t12) (timeout for lockout)	Edit	0 s	1237 s	4.851 s	67,914	SO	OEM
500	Ratio control							
515	Actuator position during prepurge time (t1) and postpurge time (t8) 0: Purging in low-fire 1: Purging in high-fire	Edit	0	1	1	1	SO	OEM
560	Pneumatic combustion control 0 = off / 3-step modulation 1 = PWM fan / analog modulation 2 = air damper / analog modulation (feedback potentiometer ASZxx.3x required)	Edit	0	2	1	1	SO	SO

600 Power setting									
654	Analog input (feedback potentiometer ASZxx.3x required) 0 = 3-position step input 1 = 0...10 V 2 = 0...135 Ω 3 = 0...20 mA 4 = 4...20 mA with lockout at I <4 mA 5 = 4...20 mA	Edit	0	5	1	0	SO	SO	

WARNING

Parameter Num. :

41
42
60
123
140
242
243
244
245
259.01

**Adjustable parameters from SO or OEM levels for
LME73.831AxBC**

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



USER'S MANUAL

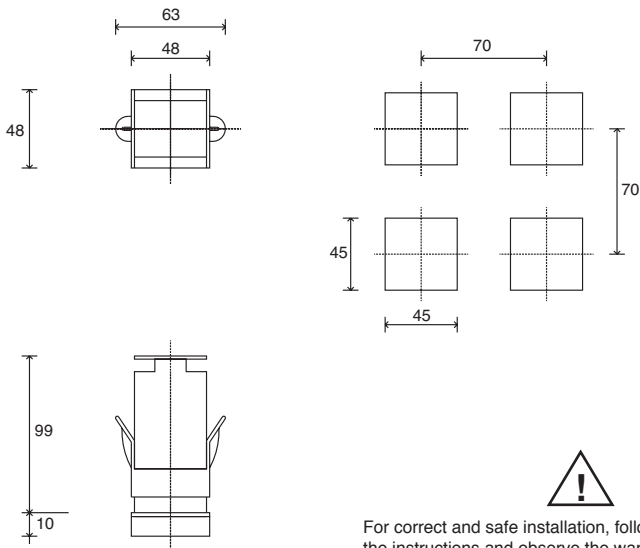
COD. M12925CA Rel 1.2 08/2014

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



1 • INSTALLATION

• Dimensions and cut-out; panel mounting



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

Panel mounting:

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

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

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

Cut power to the device before accessing internal parts.

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

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

EMC conformity has been tested with the following connections

FUNCTION	CABLE TYPE	LENGTH
Power supply cable	1 mm ²	1 m
Relay output cable	1 mm ²	3,5 m
TC input	0,8 mm ² compensated	5 m
Pt100 input	1 mm ²	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.)

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

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

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

SV display: Indication of setpoint

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

4 · CONNECTIONS

• Outputs

Out2 (19) - 5A at 250Vac/30Vdc relay

Out1 (20) - 5A/250Vac relay

Out3 (6) - 5A at 250Vac/30Vdc relay

TOP

• Inputs

• TC Input

Available thermocouples: J, K, R, S, T (B, E, N, L, U, G, D, C custom linearization is available)

- Observe polarities

- For extensions, use the correct compensating cable for the type of TC used

• Power Supply

Standard: 100...240Vac ± 10%

Optional: 11...27Vac/Vdc ± 10%

Max. power 8VA; 50/60 Hz

• Linear input (I)

Linear input in dc current

20mA, Ri = 50Ω

• Input 1 linear with transmitter 2 wires

• Identification of boards

Power board - Solder side

Select transmitter voltage

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

CPU board - Component side

IN/OUT boards (see appendix)

Select signal at contact 3

• Linear input (V)

Linear input in dc voltage

60mV, 1V

Ri > 1MΩ

5V, 10V

Ri > 10KΩ

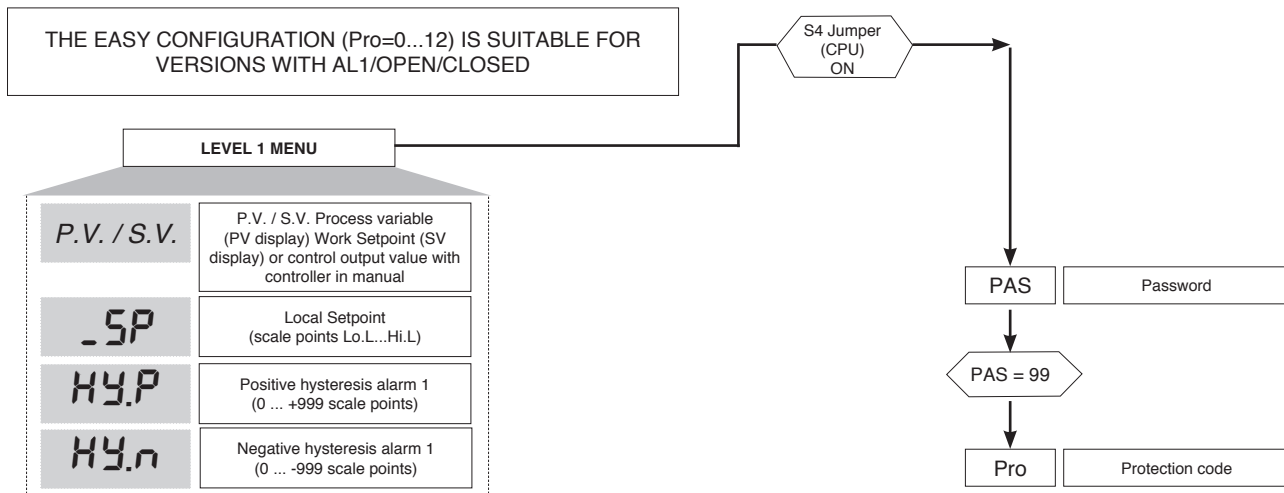
• Pt100 / PTC / NTC

Use wires of adequate diameter (min. 1mm²)

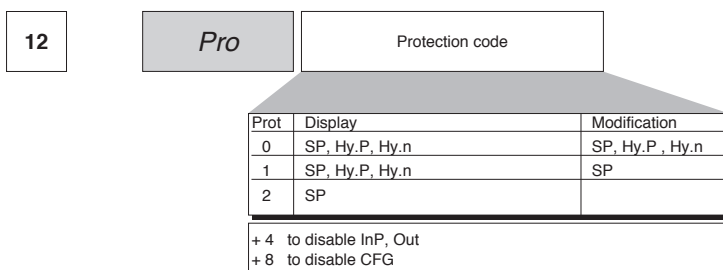
PT100, JPT100, PTC, NTC

• Device structure

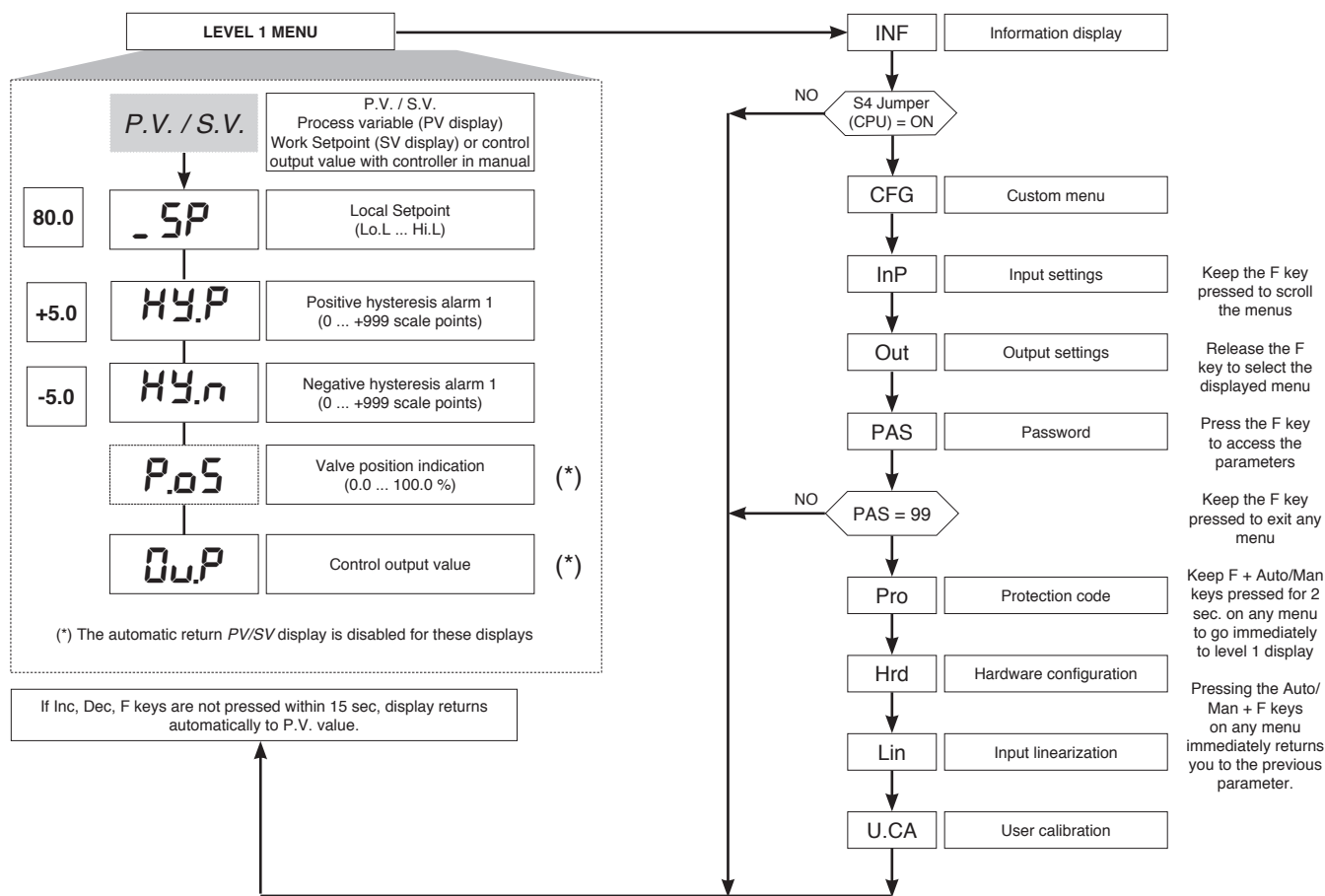
5 • “EASY” PROGRAMMING and CONFIGURATION



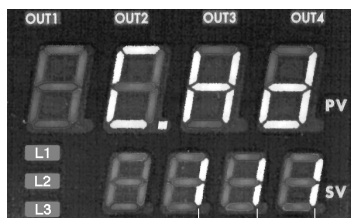
• Prot



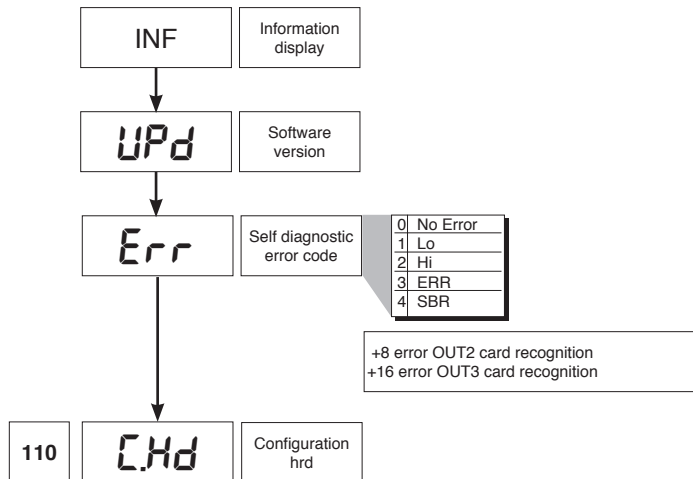
6 • PROGRAMMING and CONFIGURATION



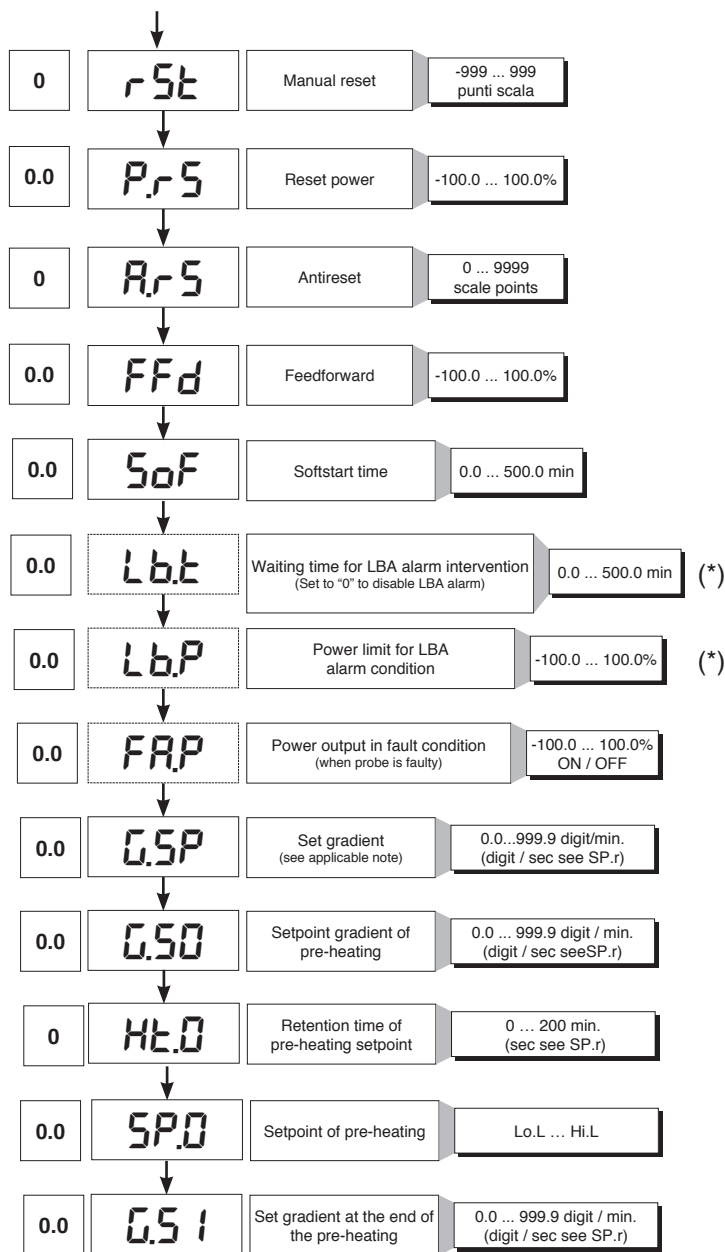
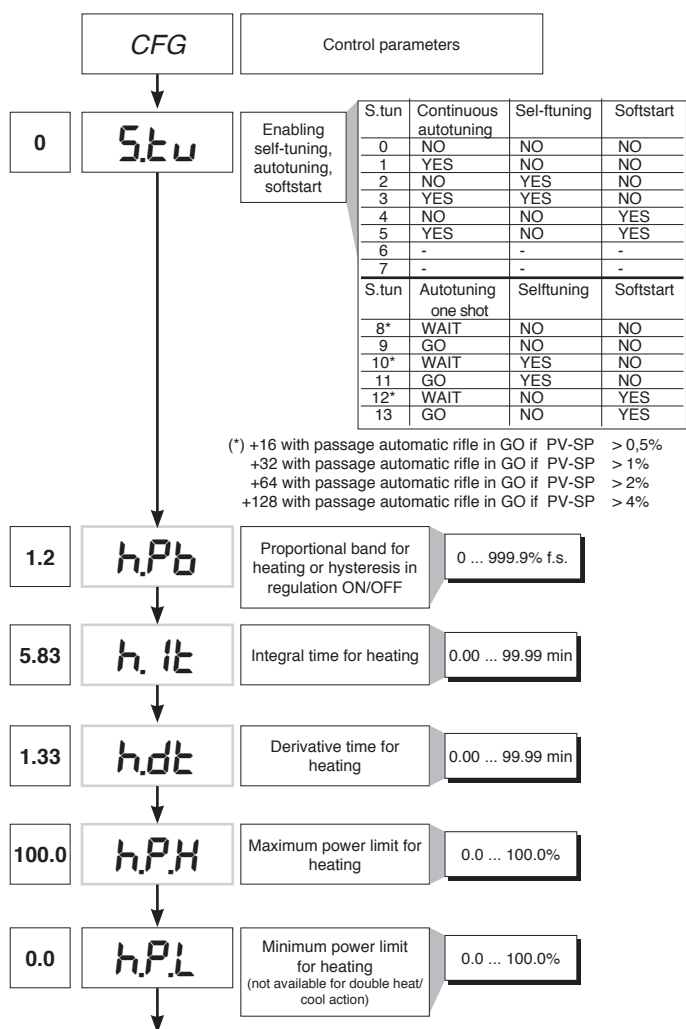
N.B.: Once a particular configuration is entered, all unnecessary parameters are no longer displayed



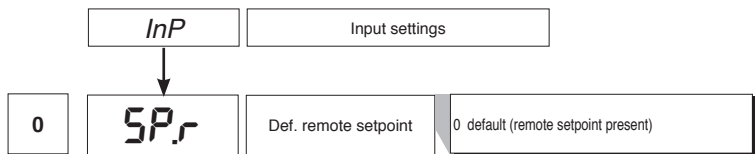
OUTPUT 2	OUTPUT 3	SERIAL COMMUNICATION
0 = None	0 = None	0 = None
1 = Relay	1 = Relay	



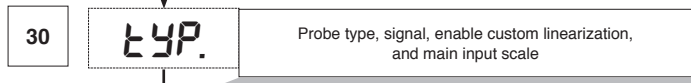
• CFG



(*) LBA alarm may be reset by simultaneously pressing Δ + ▽ keys when OutP is displayed or by switching to Manual.



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



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

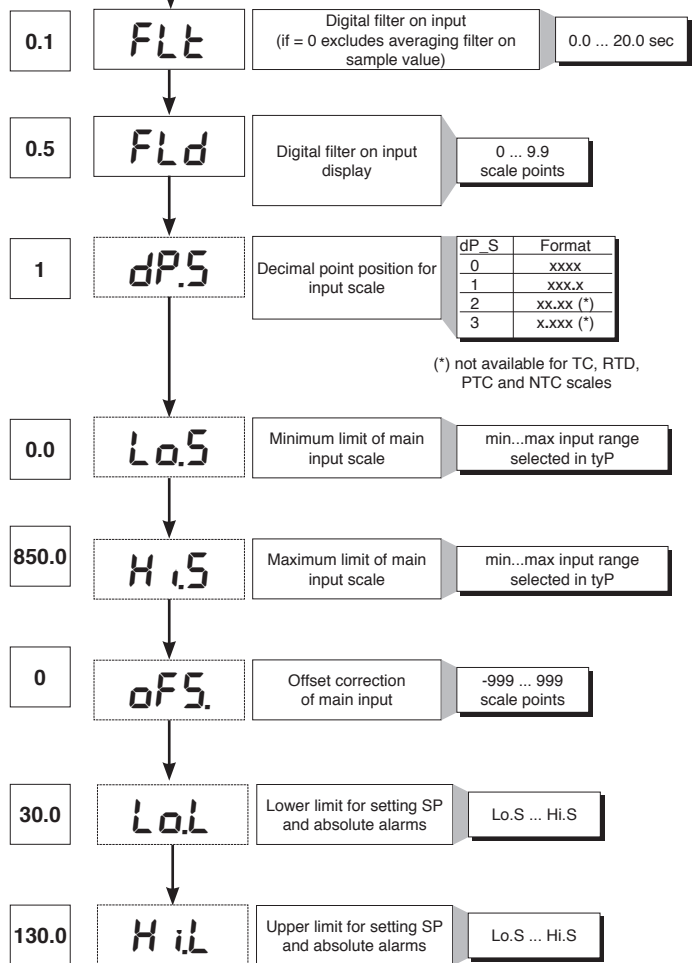
For custom linearization:
 - LO signal is generated with variable below Lo.S or at minimum calibration value
 - HI signal is generated with variable above Lo.S or at maximum calibration value

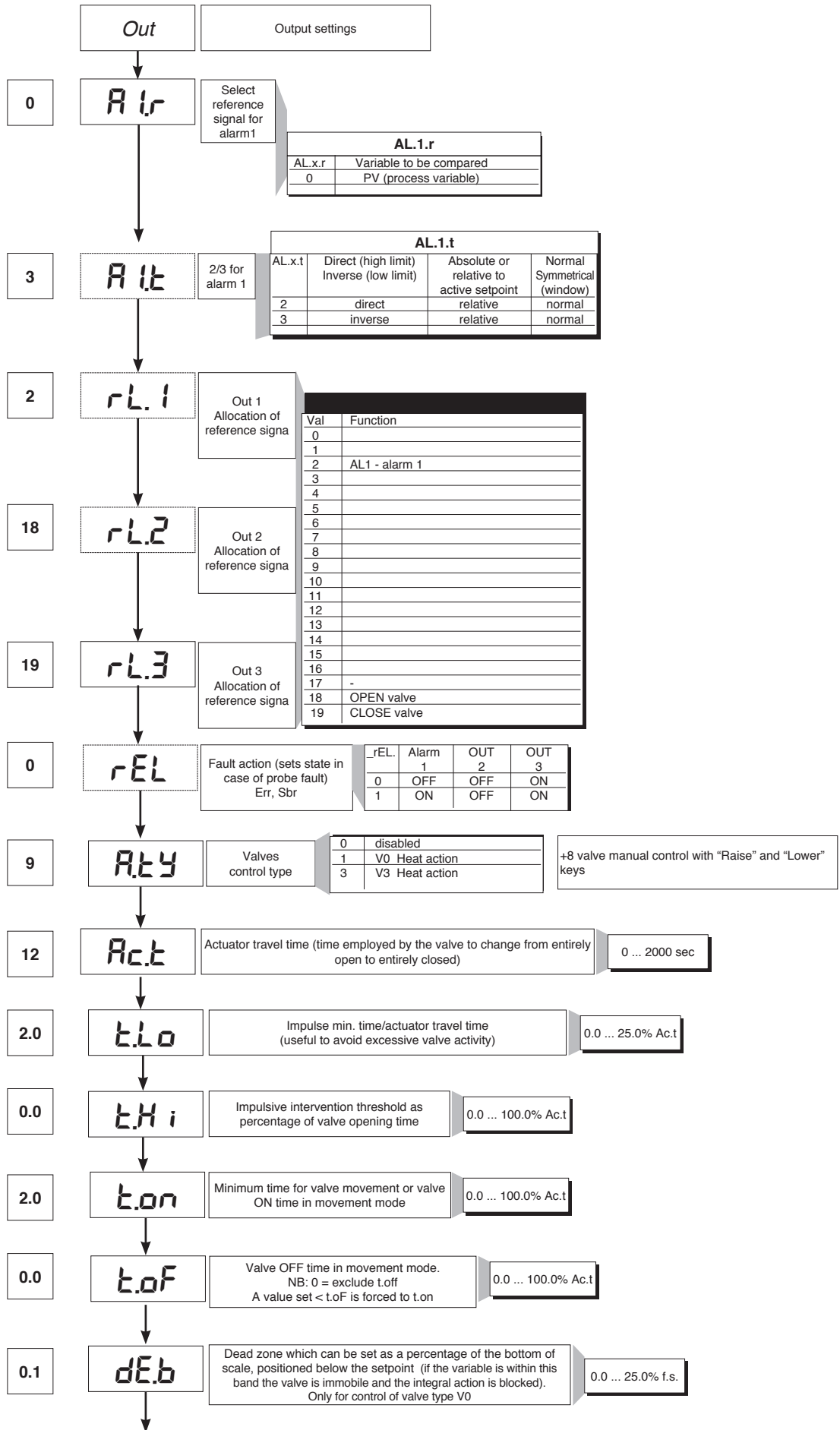
Max. non-linearity error for thermocouples (TC), resistors (PT100) and thermistors (PTC, NTC).
 The error is calculated as deviation from theoretical value and is expressed as percentage of full scale (in °C).

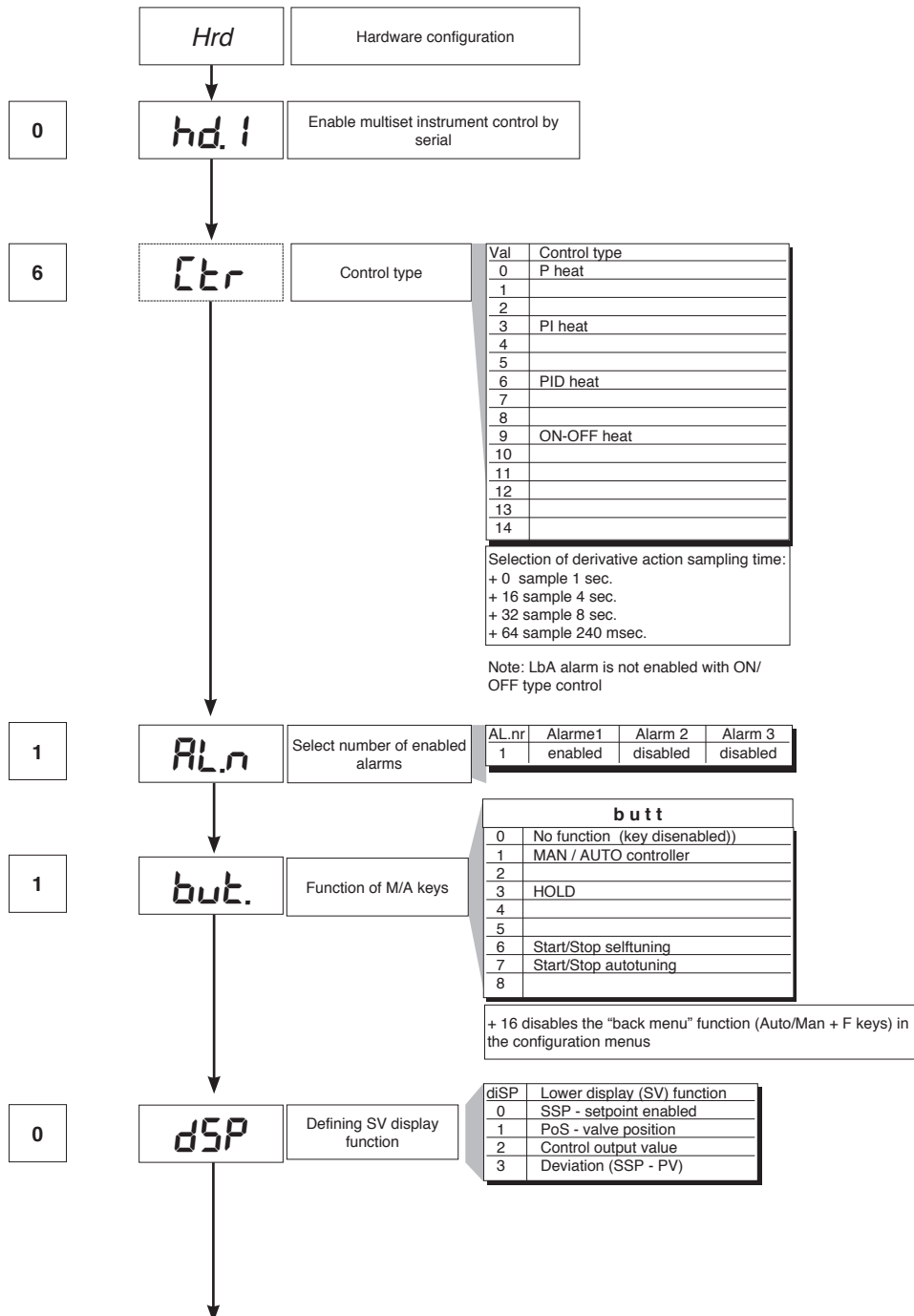
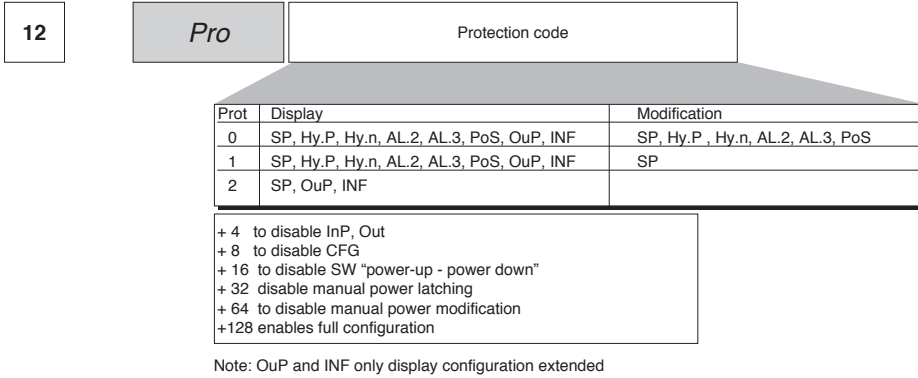
S, R range 0...1750°C; error < 0.2% f.s. (t > 300°C) / for other range; error < 0.5% f.s.
T error < 0.2% f.s. (t > -150°C)
B range 44...1800°C; error < 0.5% f.s. (t > 300°C) / range 44.0...999.9; error < 1% f.s. (t > 300°C)
U range -99.9...99.9 and -99...99°C; error < 0.5% f.s. / for other range; error < 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.

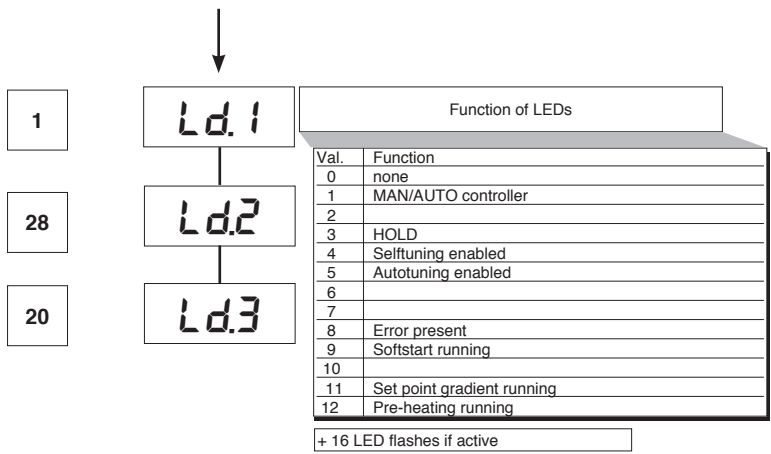
NTC error < 0.5% f.s.

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)

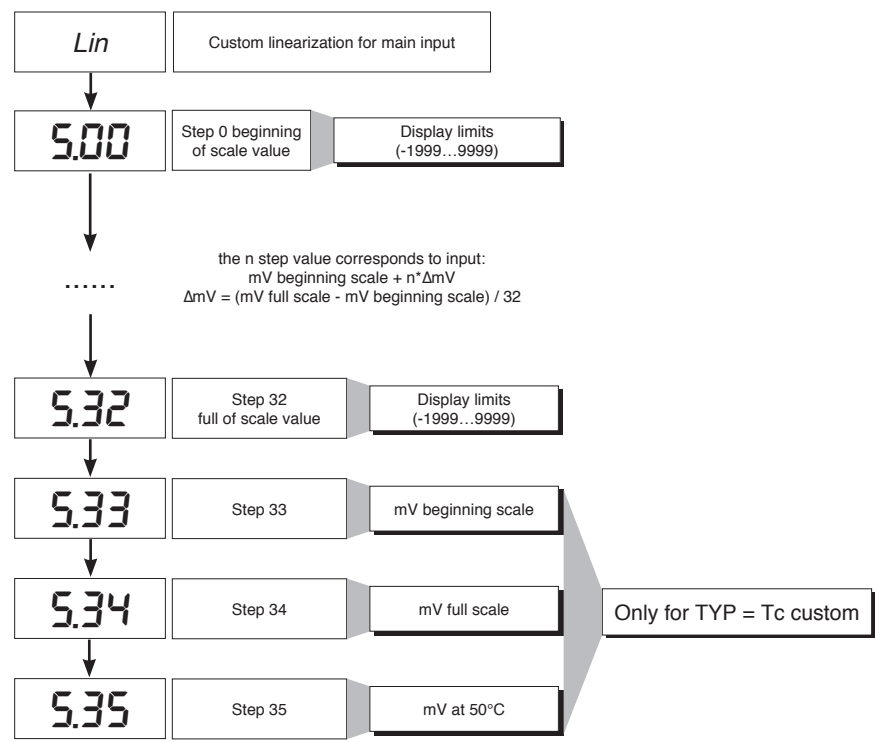




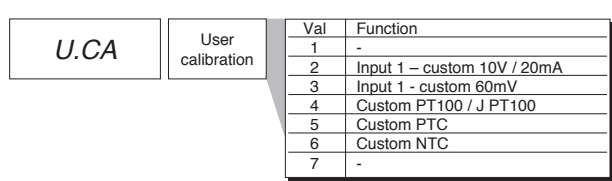




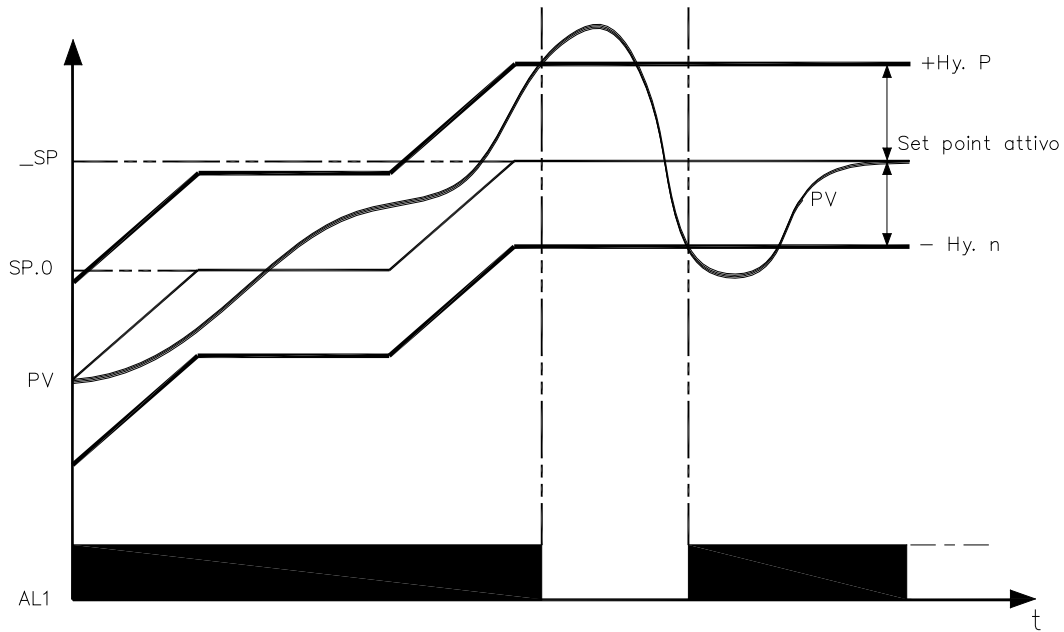
• Lin



• U.CAL



7 · CONSENT FOR BURNER AL1



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

8 · PRE-HEATING FUNCTION

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

- Ramp 0 phase

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

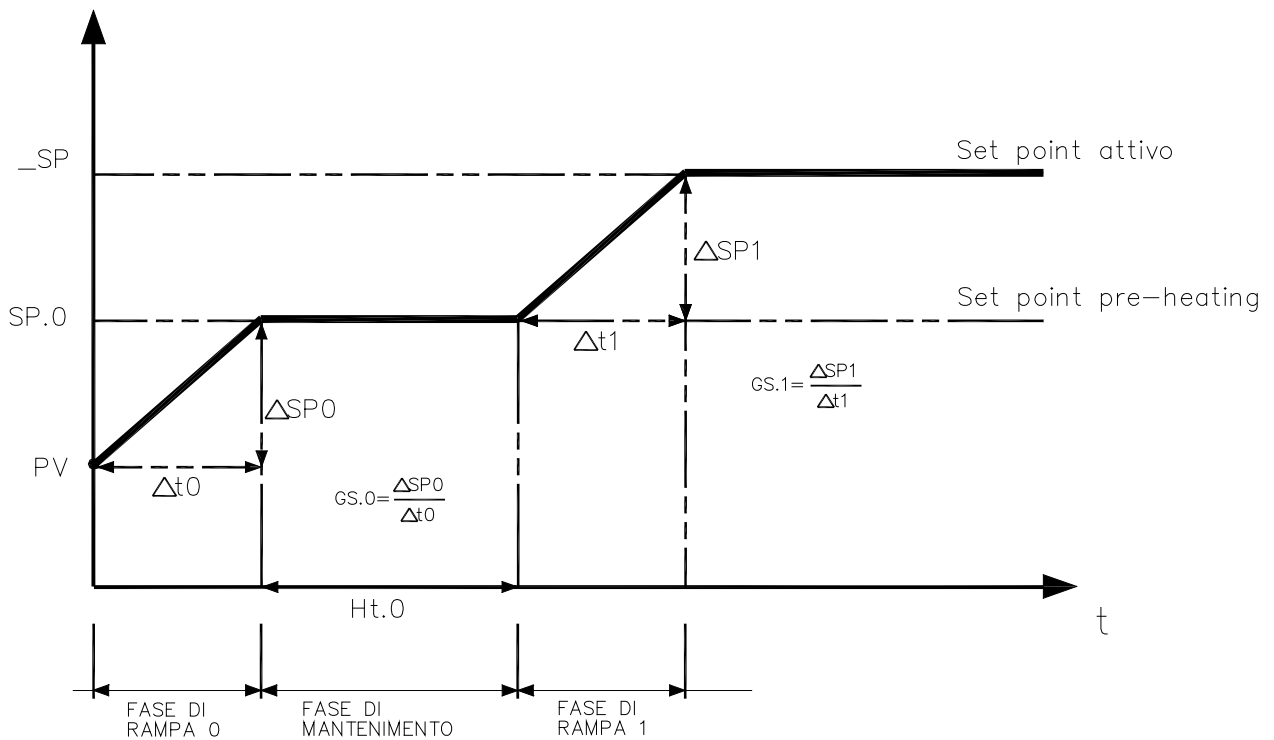
- Maintenance phase

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

- Ramp 1 phase

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

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



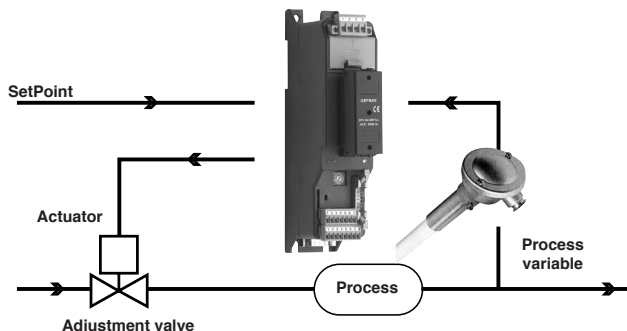
9 • ADJUSTMENT WITH MOTORIZED VALVE

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

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

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

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



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

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

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

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

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

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

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

You can choose between 2 types of control:

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

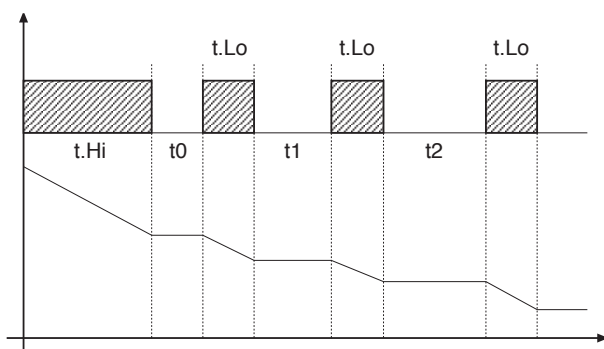
2) ON time of movement = $t.on$ and OFF time = $t.oF$. A value set for $t.oF < t.on$ is forced to $t.on$. To activate this type, set $t.oF >> 0$.

The type of movement approach allows fine control of the reverse drive valve (from potentiometer or not), especially useful in cases of high mechanical inertia. Set $t.Hi = 0$ to exclude modulation in positioning.

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

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

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



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

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

$t_0 = t.Lo$

Valve control modes

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

V0 - for floating valve without potentiometer

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

In this way there is always a presumed position of the valve which is compared with the position request of the controller.

Having reached a presumed extreme position (entirely open or entirely closed determined by the "virtual potentiometer") the controller provides a command in the same direction, in this way ensuring the real extreme position is reached (minimum command time = t.on).

The actuators are usually protected against the OPEN command in the entirely open position or CLOSE command in the entirely closed position.

V3 - for floating valve, PI control

When the difference between the position calculated by the controller and the only proportional component exceeds the value corresponding to the minimum impulse t.Lo the controller provides an OPEN or CLOSE command of the duration of the minimum impulse itself t.Lo.

At each delivery the integral component of the command is set to zero (discharge of the integral).

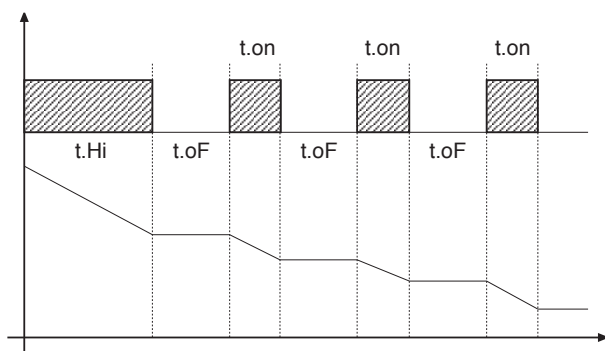
The frequency and duration of the impulses is correlated to the integral time (h.it or c.it).

Non-movement behavior

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

Movement behavior

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



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

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

10 • CONTROL ACTIONS

Proportional Action:

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

Derivative Action:

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

Integral Action:

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

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

* An increase in P.B. reduces oscillations but increases deviation.

* A reduction in P.B. reduces the deviation but provokes oscillations of the controlled variable (the system tends to be unstable if P.B. value is too low).

* An increase in Derivative Action corresponds to an increase in Derivative Time, reduces deviation and prevents oscillation up to a critical value of Derivative Time, beyond which deviation increases and prolonged oscillations occur.

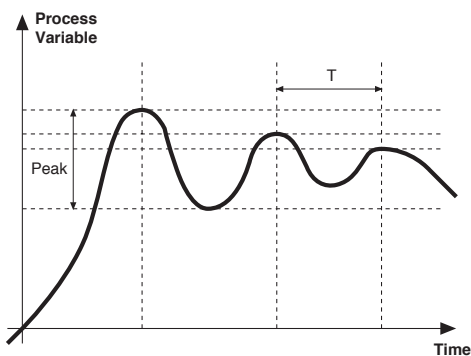
* An increase in Integral Action corresponds to a reduction in Integral Time, and tends to eliminate deviation between the controlled variable and the setpoint when the system is running at rated speed.

If the Integral Time value is too long (Weak integral action), deviation between the controlled variable and the setpoint may persist.

Contact GEFRA for more information on control actions.

11 • MANUAL TUNING

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



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

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

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

Integral time: $I_t = 1.5 \times T$

Derivative time: $d_t = I_t/4$

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

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

12 • SET GRADIENT

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

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

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

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

13 • SOFTWARE ON / OFF SWITCHING FUNCTION

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

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

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

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

14 • SELF-TUNING

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

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

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

How to activate self-tuning:

A. Activation at power-on

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

B. Activation from keyboard

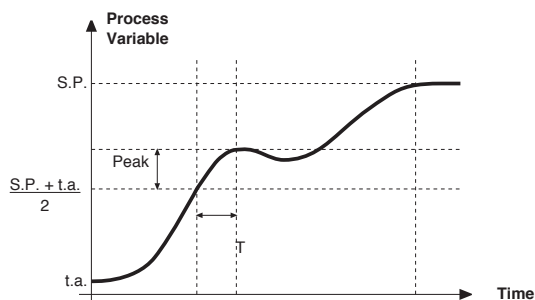
1. Make sure that key M/A is enabled for Start/Stop selftuning (code but = 6 Hrd menu)
2. Bring the temperature near room temperature
3. Set the setpoint to the required value
4. Press key M/A to activate selftuning (Attention: selftuning interrupts if the key is pressed again)

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

Notes :

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

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



15 • ACCESSORIES

• Interface for instrument configuration



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

Lets you read or write all of the parameters

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

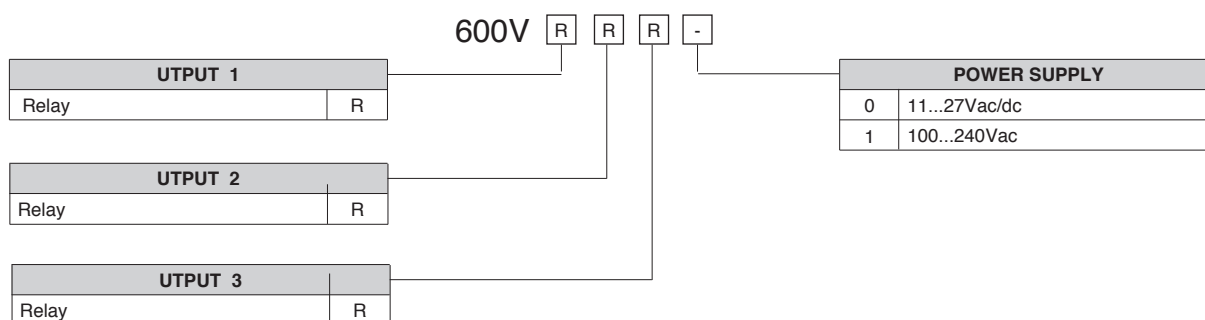
Component Kit:

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

• ORDERING CODE

GF_eXK-2-0-0	cod F049095
--------------	-------------

16 • ORDER CODE



• WARNINGS

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

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

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

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

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

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

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

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

• **Power:** supplied from a disconnecting switch with fuse for the device section; path of wires from switch to devices should be as straight as possible; the same supply should not be used to power relays, contactors, solenoid valves, etc.; if the voltage waveform is strongly distorted by thyristor switching units or by electric motors, it is recommended that an isolation transformer be used only for the devices, connecting the screen to ground; it is important for the electrical system to have a good ground connection; voltage between neutral and ground must not exceed 1V and resistance must be less than 60hm; 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.

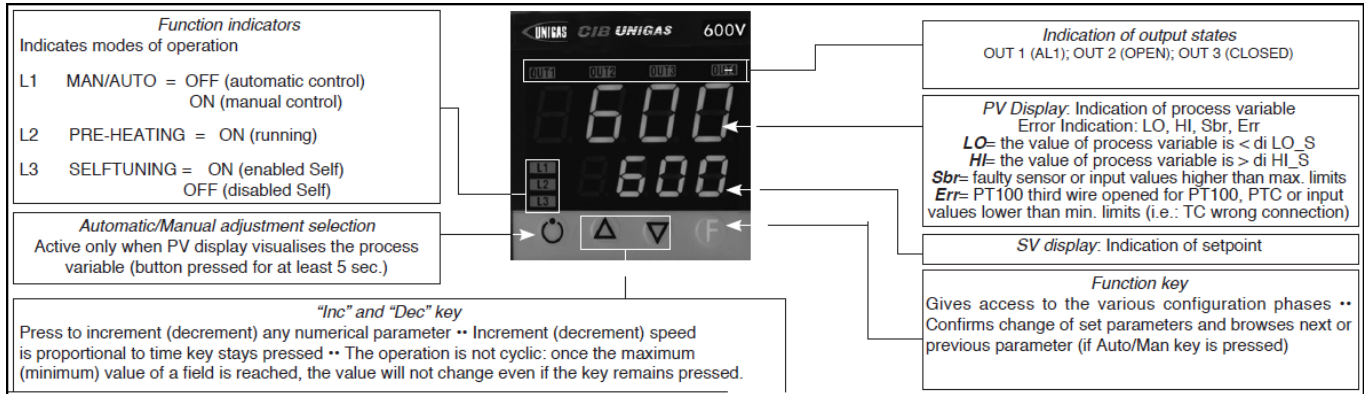
GEFRAN spa will not be held liable for any injury to persons and/or damage to property deriving from tampering, from any incorrect or erroneous use, or from any use not conforming to the device specifications.

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.

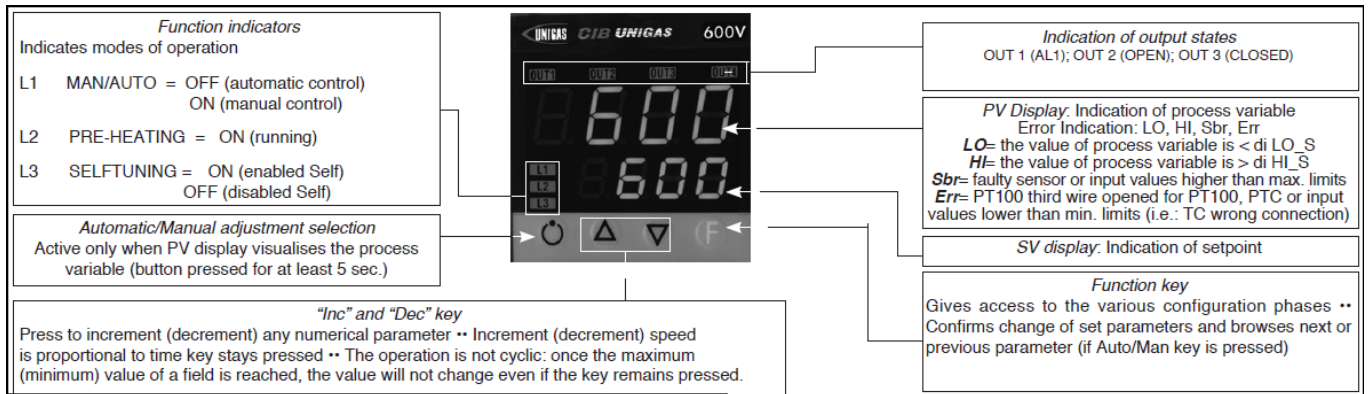
Software switch off :

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.

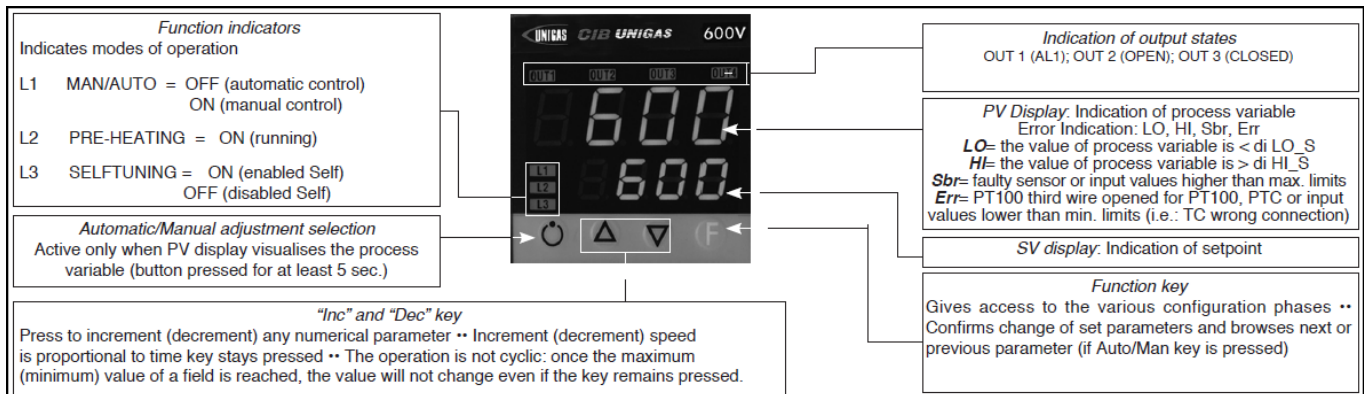
To come back to normal working keep the lower left key pushed for at least 5 sec.

Software switch off :

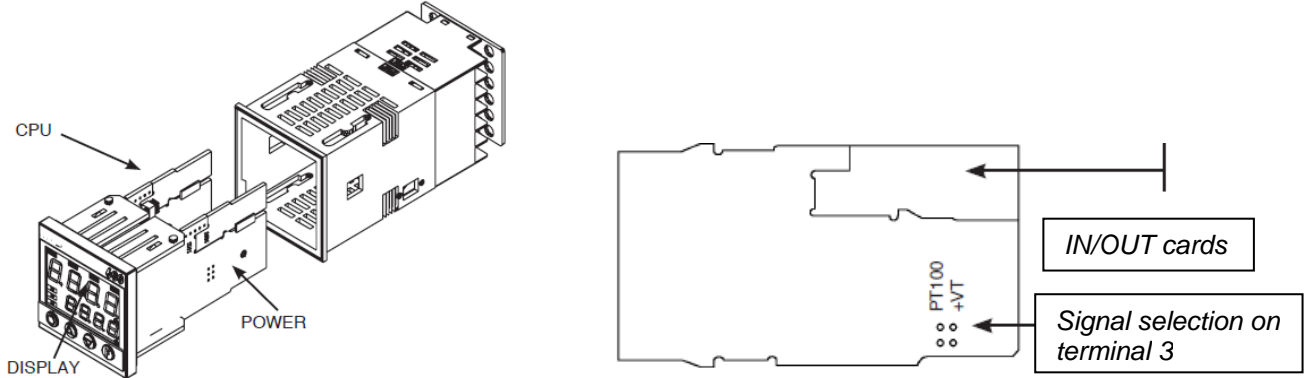
By keeping pushed keys **Arrow up** + **F** for more than 5 sec. the instrument switches off the software, does not command the outputs and visualize only the variable of process measured by the probe.

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.

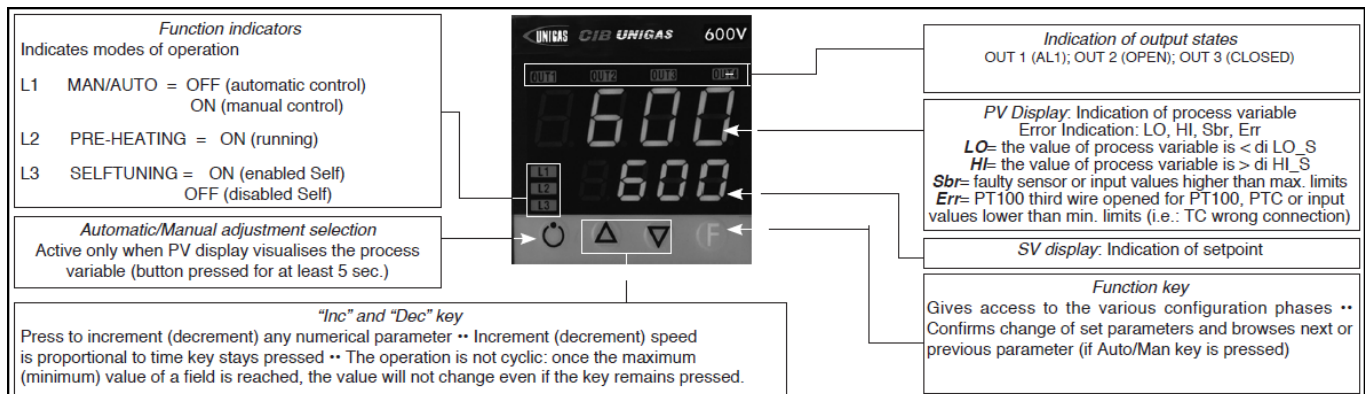
Software switch off :

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.

MANUAL FOR OPERATION AND CALIBRATION

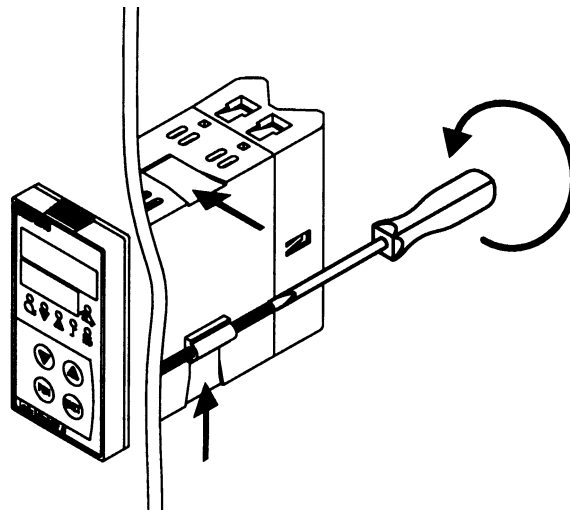
MODULATOR

SIEMENS RWF 40....

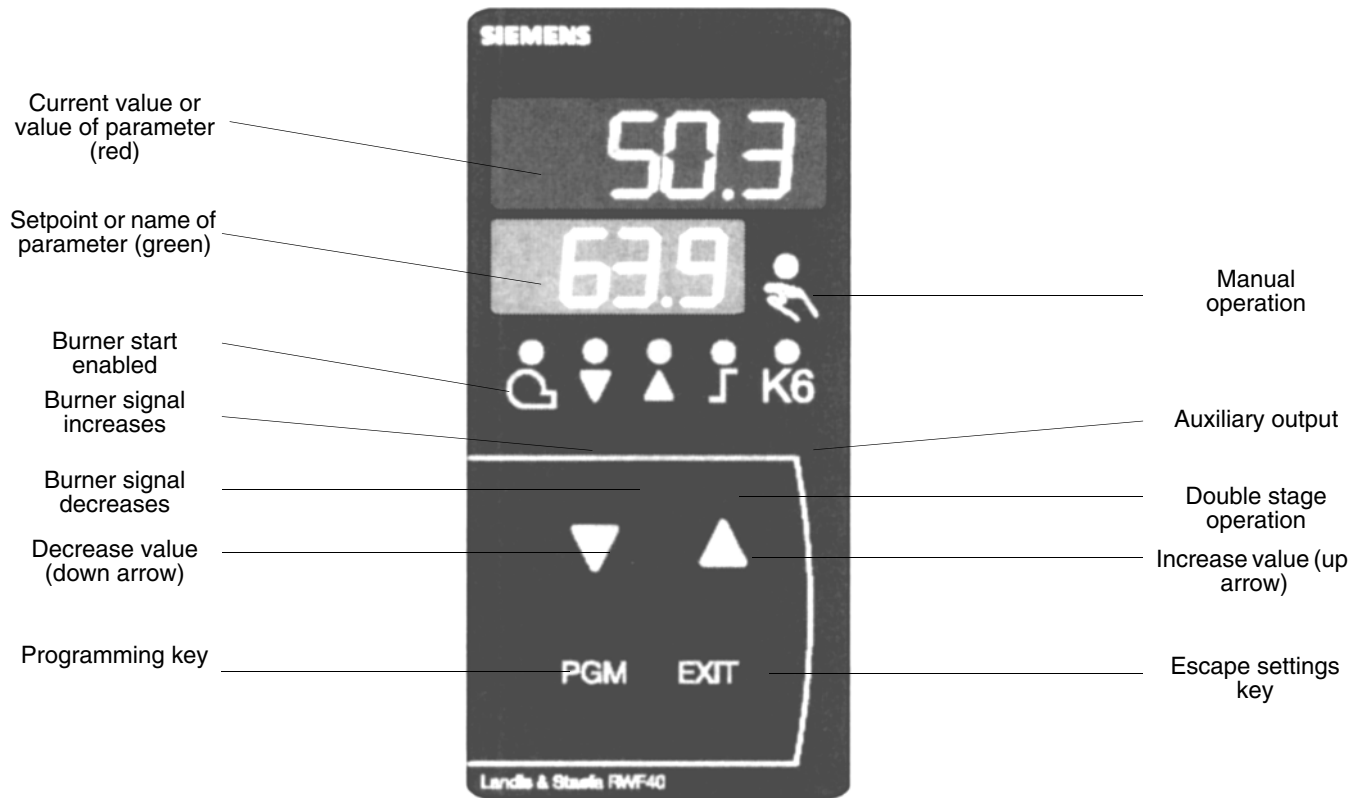
INSTRUMENT MOUNTING

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

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



INSTRUMENT FRONTAL PANEL



INSTRUMENT SETTINGS

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

1. Setting or editing of setpoint value

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Configuring process values:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6. Manual control

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

7. Instrument self-setting (auto-tuning)

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

Note:

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

TABLE 1 - "PID" PARAMETERS AND RELEVANT FACTORY SETTINGS

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

(*) Parameters affected by setting of decimal place (C113 configuration 01X0)

TABLE 2 - INPUTS CONFIGURATION C111

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

TABLE 3 - CONFIGURATION C112

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

Note: (*) for RWF 40.002 only

TABLE 4 - CONFIGURATION C113

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

TABLE 5 - SUMMARY OF STANDARD PARAMETER SETTINGS

SENSORS/PROBES	PARAMETERS TO BE EDITED												
	C111	C113	SCL	SCH	SPL	SPH	HYS1 (*)	HYS3 (*)	Pb. 1	dt	rt	SP1 (*)	
Siemens QAE2120.010	9030	0110	-	-	30	95	-5	5	10	80	350	80°C	
Siemens QAM2120.040	9030	0110	-	-	0	80	-2,5	2,5	10	80	350	40°C	
Pt1000 (130°C max.)	5030	0110	-	-	30	95	-5	5	10	80	350	80°C	
Pt1000 (350°C max.)	5030	0110	-	-	0	350	-5	10	10	80	350	80°C	
Pt100 (130°C max.)	0030	0110	-	-	0	95	-5	5	10	80	350	80°C	
Pt100 (350°C max)	0030	0110	-	-	0	350	-5	10	10	80	350	80°C	
Termocouple K	A030	0110	-	-	0	1200	-5	20	10	80	350	80°C	
Danfoss/Siemens 4÷20mA p 1,6 bar	F030	0100	0	160	0	160	0	20	5	20	80	100kPa	
Danfoss/Siemens 4÷20mA p 10 bar	F030	0100	0	1000	0	1000	0	50	5	20	80	600kPa	
Danfoss/Siemens 4÷20mA p 16 bar	F030	0100	0	1600	0	1600	0	80	5	20	80	600kPa	
Danfoss/Siemens 4÷20mA p 25 bar	F030	0100	0	2500	0	2500	0	125	5	20	80	600kPa	
Danfoss/Siemens 4÷20mA p 40 bar	F030	0100	0	4000	0	4000	0	200	5	20	80	600kPa	
Siemens QBE2.. P4	G030	0100	0	400	0	400	0	20	5	20	80	200kPa	
Siemens QBE2.. P10	G030	0100	0	1000	0	1000	0	50	5	20	80	600kPa	
Siemens QBE2.. P16	G030	0100	0	1600	0	1600	0	80	5	20	80	600kPa	
Siemens QBE2.. P25	G030	0100	0	2500	0	2500	0	125	5	20	80	600kPa	
Siemens QBE2.. P40	G030	0100	0	4000	0	4000	0	200	5	20	80	600kPa	
Signal 0÷10V	G030	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	5	20	80	to be fixed
Signal 4÷20mA	F030	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	to be fixed	5	20	80	to be fixed
tt - servocontrol run	12 sec.	Servocontrol Berger STA12B.../Siemens SQN30.251/Siemens SQN72.4A4A20											
tt - servocontrol run	13 sec.	Servocontrol Berger STA13B...											
tt - servocontrol run	15 sec.	Servocontrol Berger STA15B...											
tt - servocontrol run	30 sec.	Servocontrol Siemens SQL33.03/Siemens SQM10/Siemens SQM50/Siemens SQM54/Berger STM30../Siemens SQM40.265											

NOTES

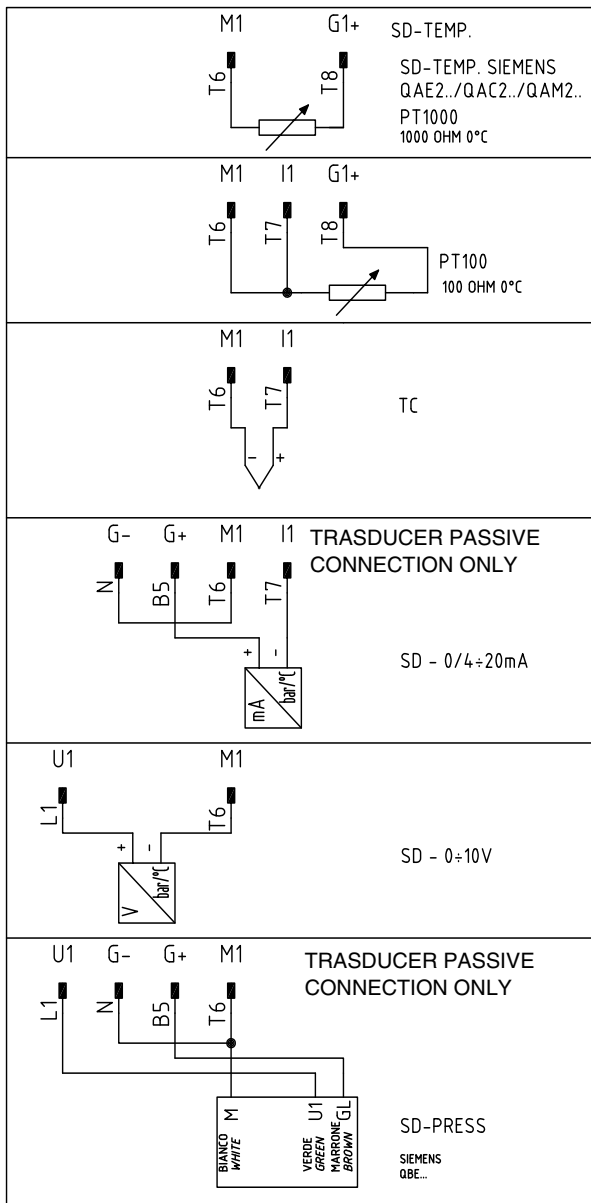
(*) These values are factory set - values must be set during operation at the plant based on the real working temperature/pressure value.

WARNING

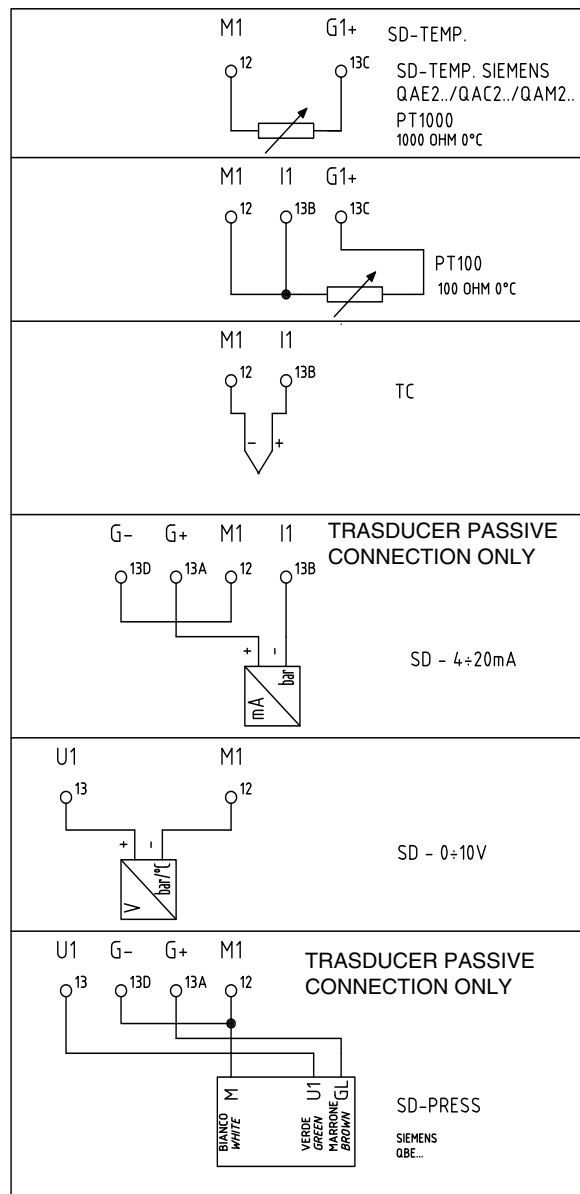
With pressure sensors, parameters SP1, SCH, SCL, HYS1, HYS3 must be selected and displayed in kPa (kilo Pascal).
(1bar = 100,000Pa = 100kPa)

Probe electric connection :

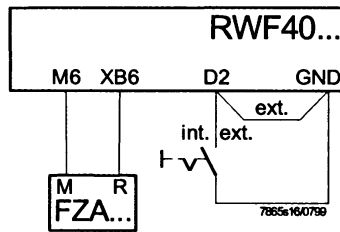
With 7 pins connector version



With terminals version

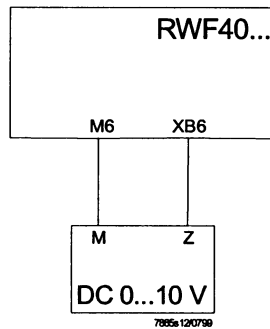


With external setpoint



C111 configuration code = X1X1

With setpoint modified by independent management system



C111 configuration code = X9XX

$$\text{SCH2} = 0.5 \times (\text{SPH} - \text{SPL})$$
$$\text{SCL2} = -0.5 \times (\text{SPH} - \text{SPL})$$

Example:

SPH = max. 130° C

SPL = min. 30° C

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

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

APPENDIX: PROBES CONNECTION

To assure the utmost comfort, the control system needs reliable information, which can be obtained provided the sensors have been installed correctly.

Sensors measure and transmit all variations encountered at their location.

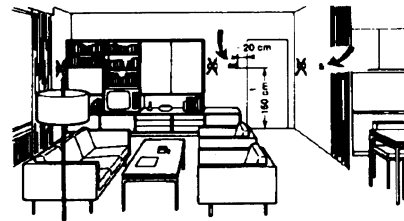
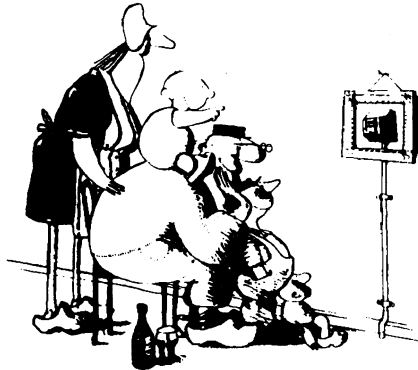
Measurement is taken based on design features (time constant) and according to specific operating conditions.

With wiring run in raceways, the sheath (or pipe) containing the wires must be plugged at the sensor's terminal board so that currents of air cannot affect the sensor's measurements

Ambient probes (or ambient thermostats)

Installation

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



Outside probes (weather)

Installation

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

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

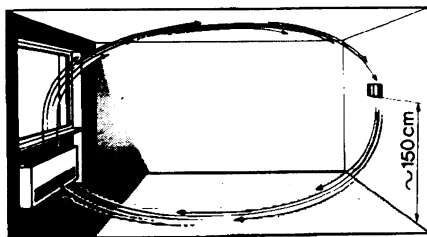
Heating systems: the room sensor must not be installed in rooms with heating units complete with thermostatic valves. Avoid all sources of heat foreign to the system.



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

Location

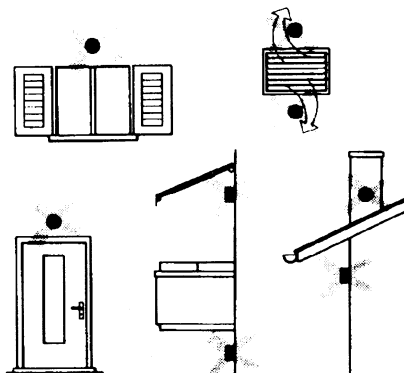
On an inner wall on the other side of the room to heating units height above floor 1.5 m, at least 1.5 m away from external sources of heat (or cold)



Installation position to be avoided

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

Positions to be avoided



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

The sensor must not be painted (measurement error).

Duct or pipe sensors

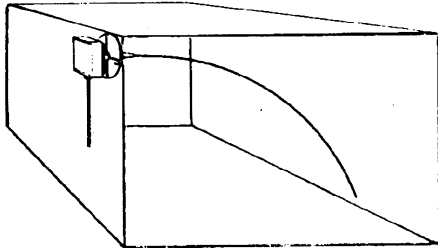
Installing temperature sensors

For measuring outlet air:

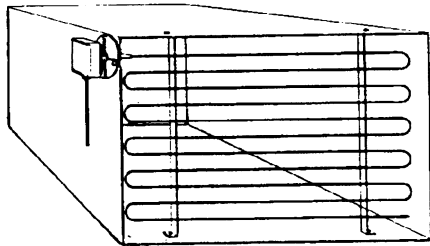
- after delivery fan or
- after coil to be controlled, at a distance of at least 0,5 m

For measuring room temperature:

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



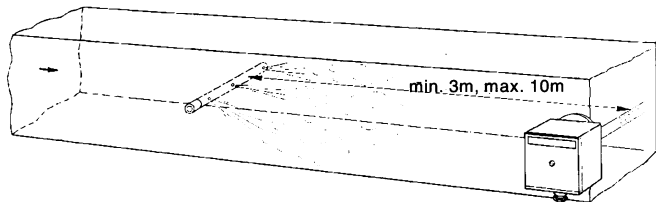
Bend 0.4m sensor by hand (never use tools) as illustrated.



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

Installing combined humidity sensors

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



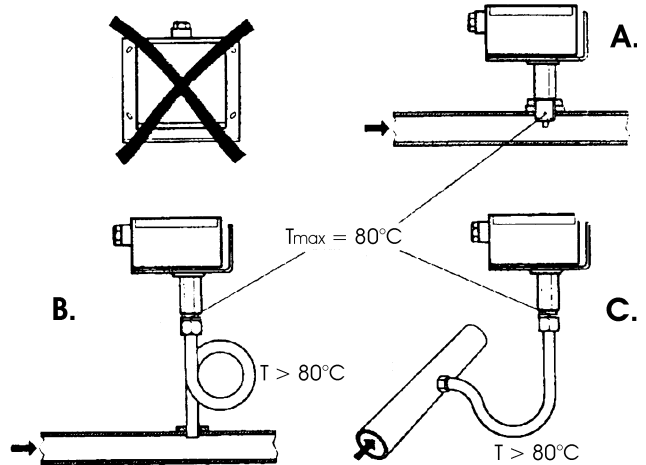
Installing pressure sensors

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

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

C - installation on ducts at high temperatures:

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



Installing differential pressure sensors for water

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

when installing:

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

Putting into operation

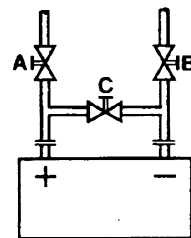
start disable

1=open C1=open C

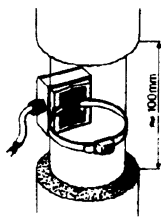
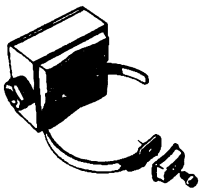
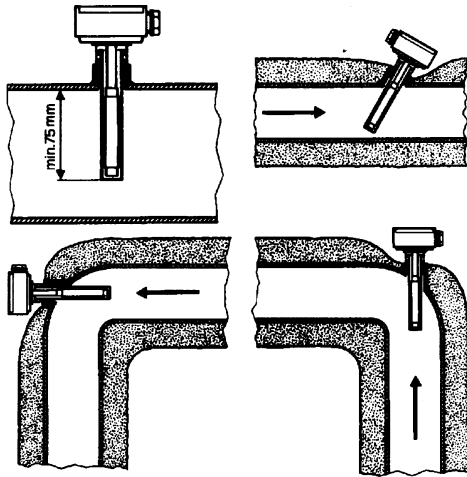
2=open A2=close B

3=open B3=close A

4= close C



Immersion or strap-on sensors



Immersion probes mounting

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

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

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

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

Installing QAD2.. strap-on sensors

Make sure fluid is circulating in the chosen location.

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

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

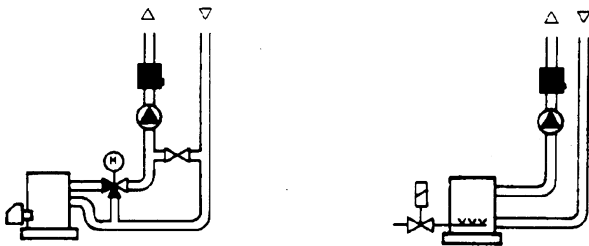
Placing the probes (QAD2.../QAE21.../QAP21.../RCA...)

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



Strap-on or immersion sensors?

QAD2.. strap-on sensors

Advantages

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

Limits:

Suitable for pipe diameters max. 100 mm

- Can be affected by currents of air etc.

QAE2... immersion sensors

Advantages

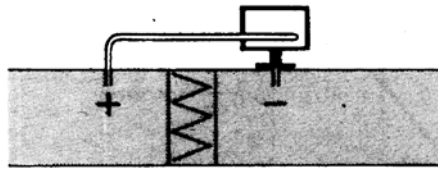
- Measure "mean" fluid temperature
- No external influence on measurement such as: currents of air, nearby pipes etc.

Limits

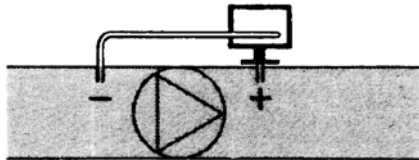
- Time constant with sheath: 20 sec.
- Hard to change installation position if it proves incorrect.

Duct pressure switches and sensors

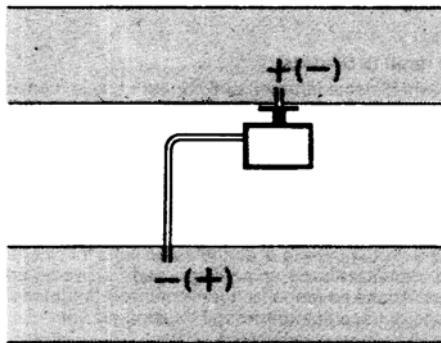
Installing differential pressure probes for air



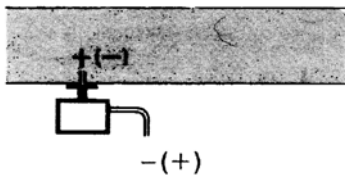
A - Control a filter (clogging)



B - Control a fan (upstream/downstream)



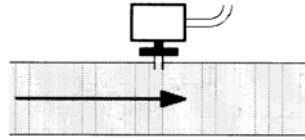
C - Measurement of difference in pressure between two ducts



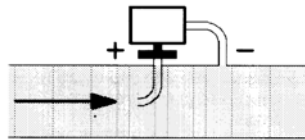
D - Measurement of difference in pressure between two rooms or of inside of duct and outside

Basic principles

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



Measuring dynamic pressure

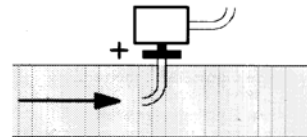


$$Pd = \frac{\gamma v^2}{2g}$$

Key

- y kg/m³, specific weight of air
- q m/s, air speed
- g 9.81 m/s², gravity acceleration
- Pd mm C.A., dynamic pressure

Measuring total pressure

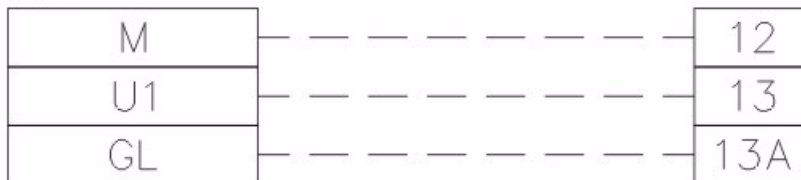


Pressure probes connection Siemens QBE 2...P... to burner's terminal block

SONDA DI PRESSIONE
PRESSURE SENSOR
SONDE DE PRESSION
QBE 2..P...

MORSETTIERA BRUCIATORE
BURNER TERMINAL BLOCK
BORNIER DU BRÛLEUR

- BLANC - BIANCO
- WHITE
- VERT - VERDE
- GREEN
- BRUN - MARRONE
- BROWN



Spare parts

Description	Code
Modulator RWF40.000	2570112
Adapting frame Siemens ARG40 from RWF32.. to RWF40..	2570113
Temperature probe Siemens QAE2120.010A (30÷130°C)	2560101
Temperature probe Siemens QAM2120.040 (-15÷+50°C)	2560135
Thermoresistor Pt1000 \varnothing = 6mm L = 100mm (30÷130°C)	2560188
Thermoresistor Pt1000 \varnothing = 10mm L = 200mm (0÷350°C)	2560103
Pressure probe Siemens QBE2.. P4 (0÷4bar)	2560159
Pressure probe Siemens QBE2.. P10 (0÷10bar / signal 0÷10V)	2560160
Pressure probe Siemens QBE2.. P16 (0÷16bar / signal 0÷10V)	2560167
Pressure probe Siemens QBE2.. P25 (0÷25bar/ signal 0÷10V)	2560161
Pressure probe Siemens QBE2.. P40 (0÷40bar / signal 0÷10V)	2560162
Pressure probe Danfoss MBS3200 p 1,6 (0÷1,6bar / segnale 4÷20mA)	2560189
Pressure probe Danfoss MBS3200 p 10 (0÷10bar / segnale 4÷20mA)	2560190
Pressure probe Danfoss MBS3200 p 16 (0÷16bar / segnale 4÷20mA)	2560191
Pressure probe Danfoss MBS3200 p 25 (0÷25bar / segnale 4÷20mA)	2560192
Pressure probe Danfoss MBS3200 p 40 (0÷40bar / segnale 4÷20mA)	2560193
Pressure probe Siemens 7MF1564-3BB00-1AA1 (0÷1,6bar / segnale 4÷20mA)	25601A3
Pressure probe Siemens 7MF1564-3CA00-1AA1 (0÷10bar / segnale 4÷20mA)	25601A4
Pressure probe Siemens 7MF1564-3CB00-1AA1 (0÷16bar / segnale 4÷20mA)	25601A5
Pressure probe Siemens 7MF1564-3CD00-1AA1 (0÷25bar / segnale 4÷20mA)	25601A6
Pressure probe Siemens 7MF1564-3CE00-1AA1 (0÷40bar / segnale 4÷20mA)	25601A7
Thermocoupling type K \varnothing = 10mm L = 200mm (0÷1200°C)	2560142
Thermoresistor Pt100 \varnothing = 10mm L = 200mm (0÷350°C)	2560145

RWF50.2x & RWF50.3x

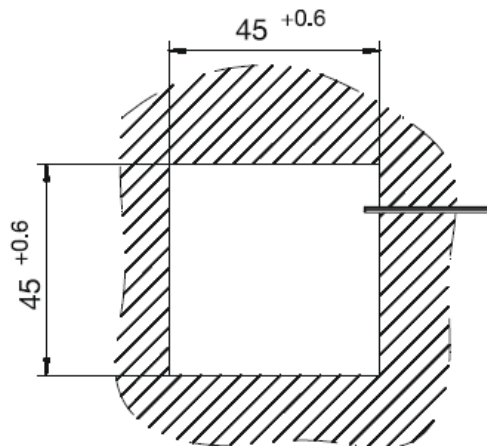
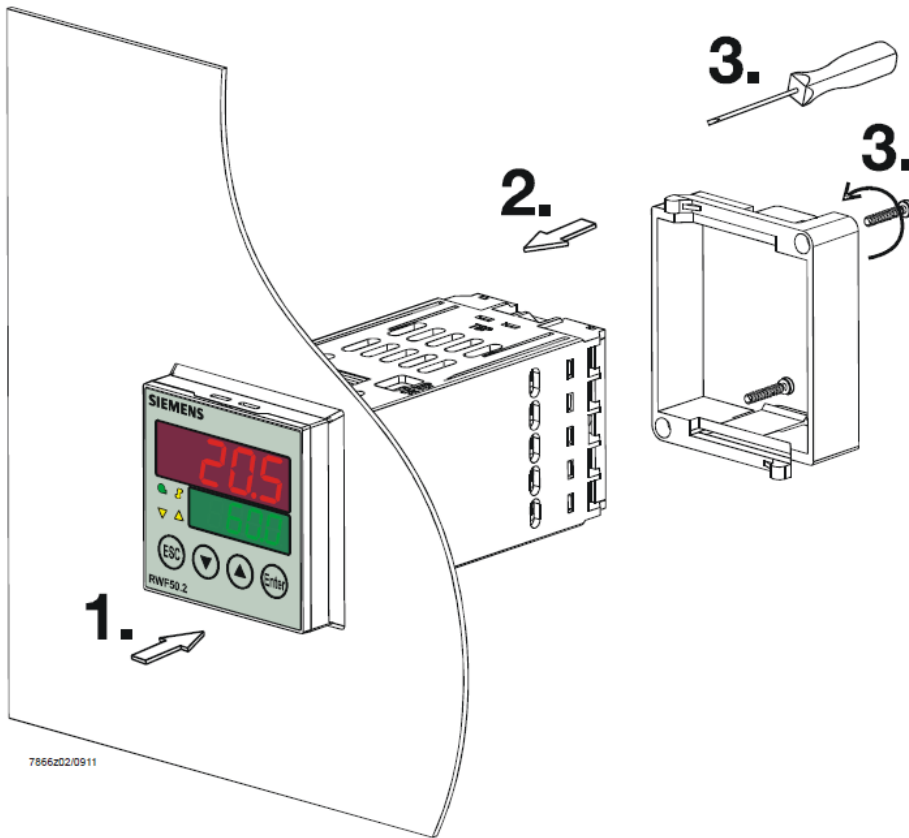


User manual

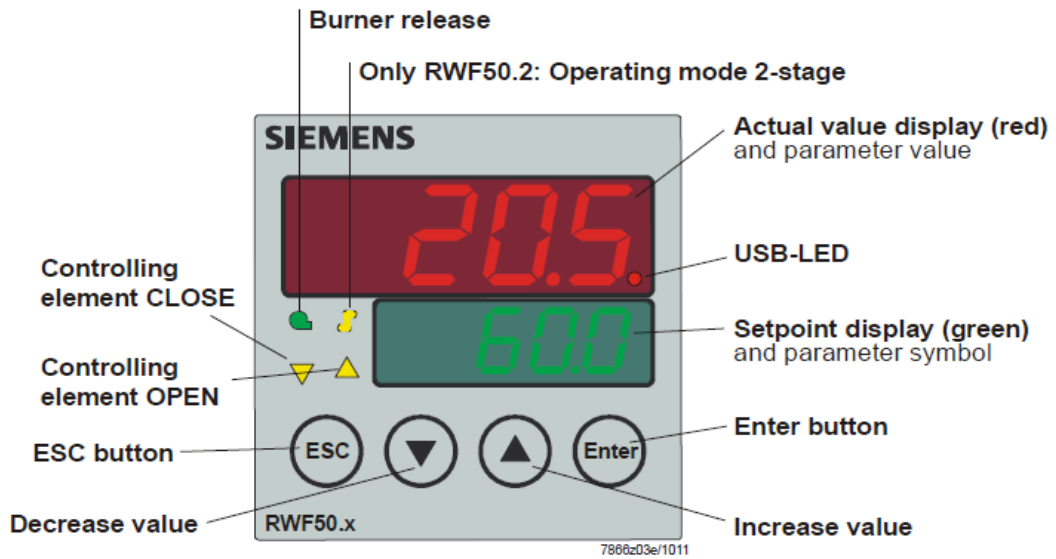
DEVICE INSTALLATION

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

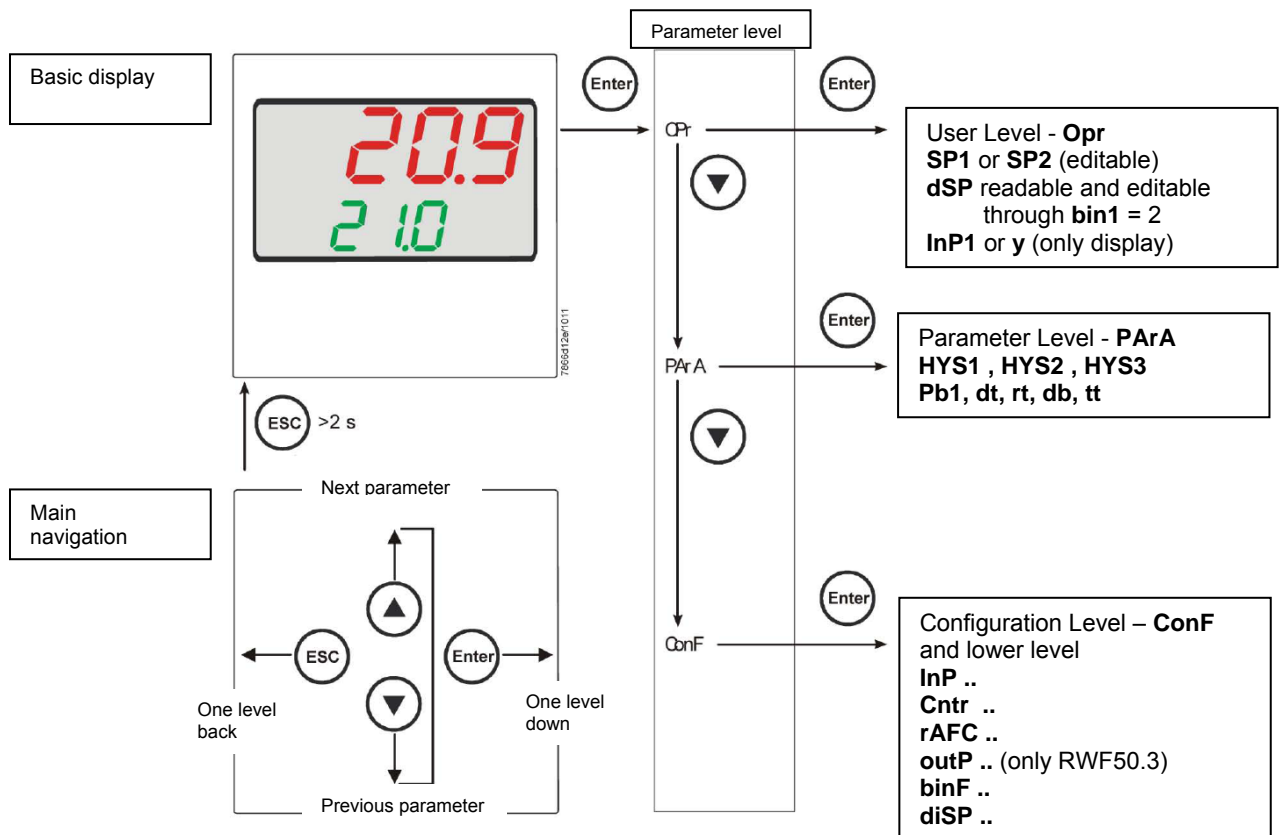
To wire the device and sensors, follow the instructions on the burner wiring diagram.



FRONT PANEL



NAVIGATION MENU



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

Set-point: set or modification:

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

PID parameters set and modifications (see table below):

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

Parameter	Display	Range	Factory setting	Remarks
Proportional band	PB.1	1... 9999 digit	10	Typical value for temperature
Derivative action	dt	0... 9999 sec.	80	Typical value for temperature
Integral action	rt	0... 9999 sec.	350	Typical value for temperature
Dead band (*)	db	0... 999,9 digit	1	Typical value
Servocontrol running time	tt	10... 3000 sec.	15	Set servocontrol running time
Switch-on differential (*)	HYS1	0,0... -1999 digit	-5	Value under setpoint below which the burner switches back on (1N-1P closes)
Switch-off differential 2° stage (*)	HYS2	0,0 ... HYS3	3	(enable only with parameter 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 displayed. Enter to confirm.
- You are inside **InP1**; the green display shows **Sen1 (sensor type)**, while the red display shows the chosen sensor code
- Push **Enter** to enter the **Sen1** parameter, then choose the desired sensor using the **arrows**. Push **Enter** to confirm and **ESC** to escape.
- Once selected the sensor, you can modify all the other parameters using **up and down arrows** according to the tables here below.

ConF > InP > InP1

Parameter	Value	Description
SEn1 type of sensor for analog input 1	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

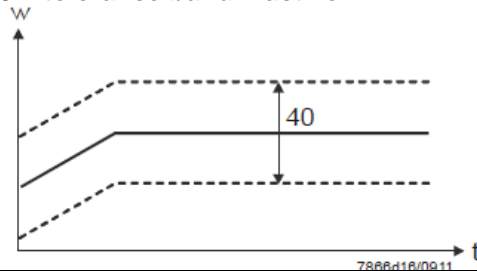
Parameter	Value	Description
CtYP controller type	1 2	1 = 3-position controller (open-stop-close only RWF50.2) 2 = continuative action controller (only RWF50.3)
CACt control action	1 0	1 = heating controller 0 = cooling controller
SPL least value of the set-point range	-1999.. 0 ..+9999	set-point limitation 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 time the device shuts the burner down (start led switched off - contact 1N-1P open), the manual control is not active.

Device self-setting (auto-tuning):

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



78662d4/0911

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 :

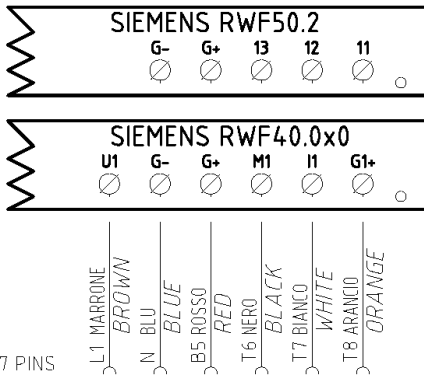


78662d5/0911

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

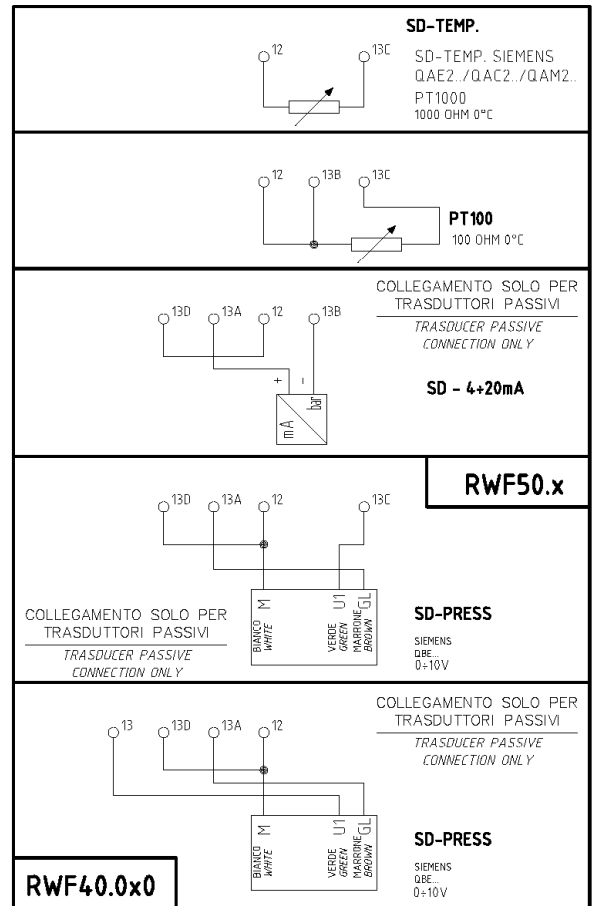
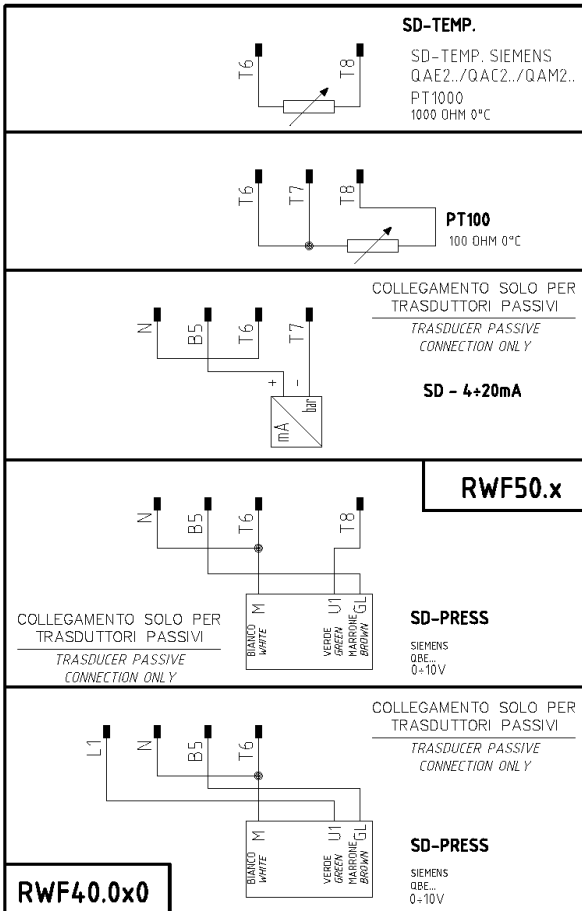
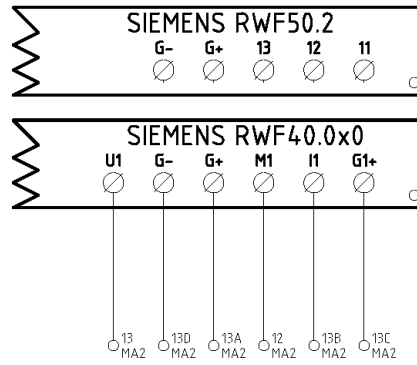
Electric connection :

With 7 pins connector version

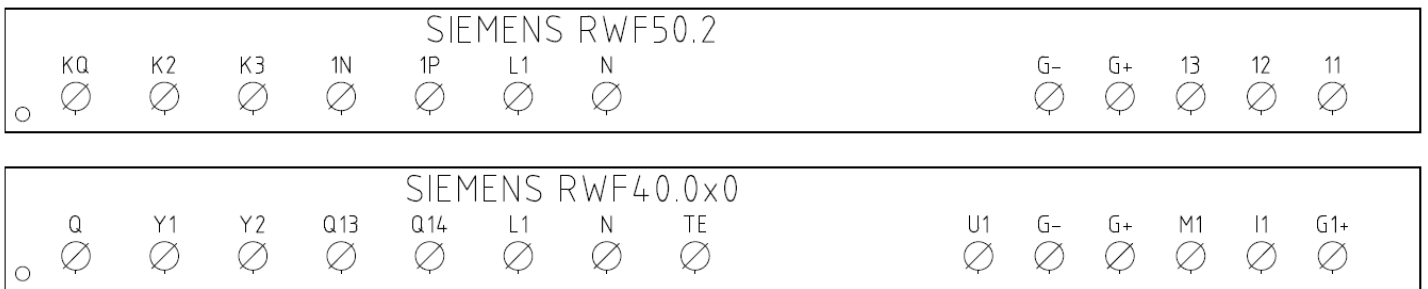


CONN. 7 PINS

With terminals version



Matches terminals between RWF50.2 and RWF40.0x0



Parameters summarising for RWF50.2x:

Navigation menù	Conf Inp					Conf			PArA					Opr	
	Inp1					Cntr		diSP							
Types of probe	SEn1	OFF1	SCL	SCH	Unit	SPL	SPH	dECP	Pb. 1	dt	rt	tt	HYS1 (*)	HYS3 (*)	SP1 (*)
Siemens QAE2120...	6	0	needless	needless	1	30	95	1	10	80	350 (#)		-5	5	80 °C
Siemens QAM2120..	6	0	needless	needless	1	0	80	1	10	80	350 (#)		-2.5	2.5	40°C
Pt1000 (130°C max.)	4	0	needless	needless	1	30	95	1	10	80	350 (#)		-5	5	80°C
Pt1000 (350°C max.)	4	0	needless	needless	1	0	350	1	10	80	350 (#)		-5	10	80°C
Pt100 (130°C max.)	1	0	needless	needless	1	0	95	1	10	80	350 (#)		-5	5	80°C
Pt100 (350°C max)	1	0	needless	needless	1	0	350	1	10	80	350 (#)		-5	10	80°C
Sonda 4÷20mA / 0÷1,6bar	16	0	0	160	needless	0	160	0	5	20	80 (#)		0	20	100 kPa
Sonda 4÷20mA / 0÷10bar	16	0	0	1000	needless	0	1000	0	5	20	80 (#)		0	50	600 kPa
Sonda 4÷20mA / 0÷16bar	16	0	0	1600	needless	0	1600	0	5	20	80 (#)		0	80	600 kPa
Sonda 4÷20mA / 0÷25bar	16	0	0	2500	needless	0	2500	0	5	20	80 (#)		0	125	600 kPa
Sonda 4÷20mA / 0÷40bar	16	0	0	4000	needless	0	4000	0	5	20	80 (#)		0	200	600 kPa
Sonda 4÷20mA / 0÷60PSI	16	0	0	600	needless	0	600	0	5	20	80 (#)		0	30	300 (30PSI)
Sonda 4÷20mA / 0÷200PSI	16	0	0	2000	needless	0	2000	0	5	20	80 (#)		0	75	600 (60PSI)
Sonda 4÷20mA / 0÷300PSI	16	0	0	3000	needless	0	3000	0	5	20	80 (#)		0	120	600 (60PSI)
Siemens QBE2002 P4	17	0	0	400	needless	0	400	0	5	20	80 (#)		0	20	200 kPa
Siemens QBE2002 P10	17	0	0	1000	needless	0	1000	0	5	20	80 (#)		0	50	600 kPa
Siemens QBE2002 P16	17	0	0	1600	needless	0	1600	0	5	20	80 (#)		0	80	600 kPa
Siemens QBE2002 P25	17	0	0	2500	needless	0	2500	0	5	20	80 (#)		0	125	600 kPa
Siemens QBE2002 P40	17	0	0	4000	needless	0	4000	0	5	20	80 (#)		0	200	600 kPa
Segnale 0÷10V	17	0	to be fixed	to be fixed	needless	to be fixed	to be fixed	to be fixed	5	20	80 (#)		to be fixed	to be fixed	to be fixed
Segnale 4÷20mA	16	0	to be fixed	to be fixed	needless	to be fixed	to be fixed	to be fixed	5	20	80 (#)		to be fixed	to be fixed	to be fixed

NOTE : (#) tt - Types of probe

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

(*) 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).

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

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

NOTE : (#) tt - servocontrol travel time

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

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

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

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

APPENDIX: PROBES CONNECTION

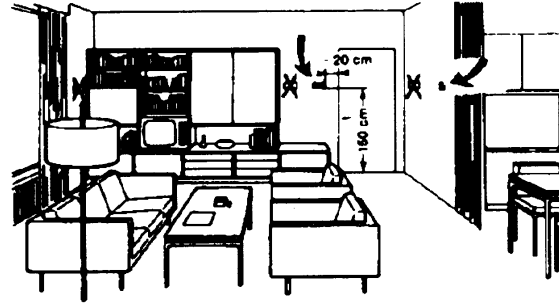
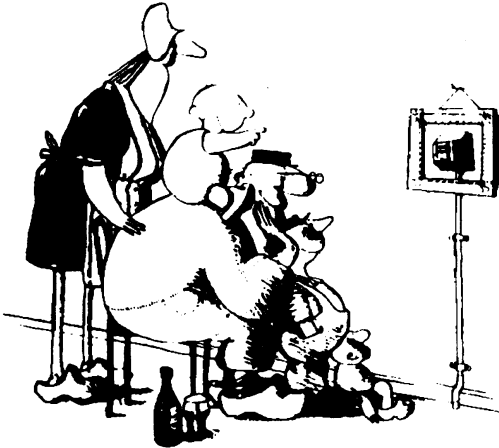
To assure the utmost comfort, the control system needs reliable information, which can be obtained provided the sensors have been installed correctly. Sensors measure and transmit all variations encountered at their location.

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

Ambient probes (or ambient thermostats)

Installation

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



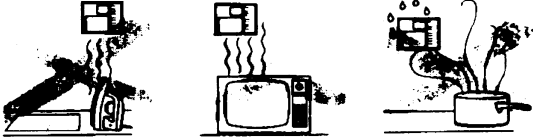
Outside probes (weather)

Installation

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

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

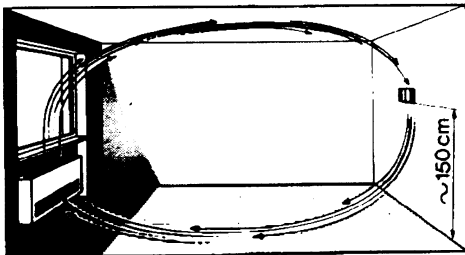
Heating systems: the room sensor must not be installed in rooms with heating units complete with thermostatic valves. Avoid all sources of heat foreign to the system.



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

Location

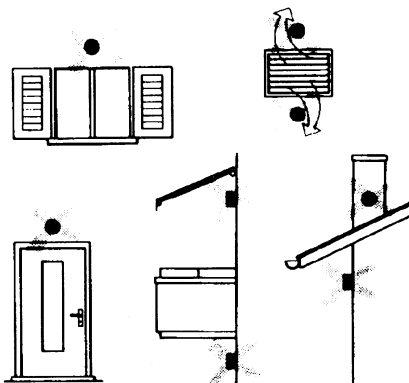
On an inner wall on the other side of the room to heating units height above floor 1.5 m, at least 1.5 m away from external sources of heat (or cold).



Installation position to be avoided

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

Positions to be avoided



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

The sensor must not be painted (measurement error).

Duct or pipe sensors

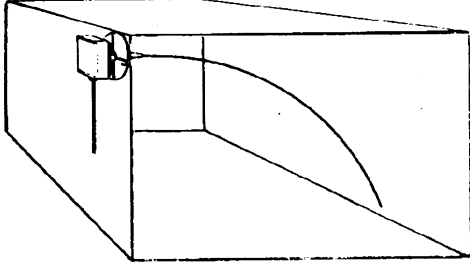
Installing temperature sensors

For measuring outlet air:

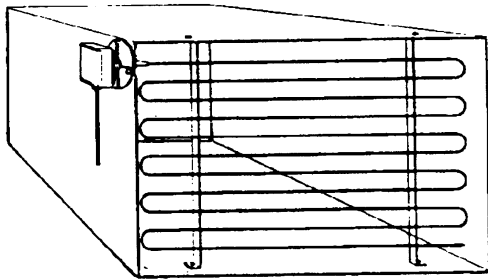
- after delivery fan or
- after coil to be controlled, at a distance of at least 0,5 m

For measuring room temperature:

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



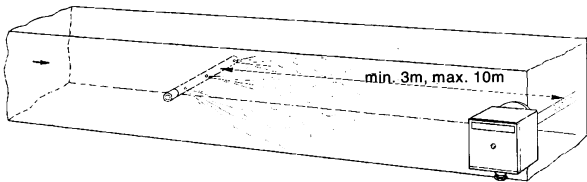
Bend 0.4m sensor by hand (never use tools) as illustrated.



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).



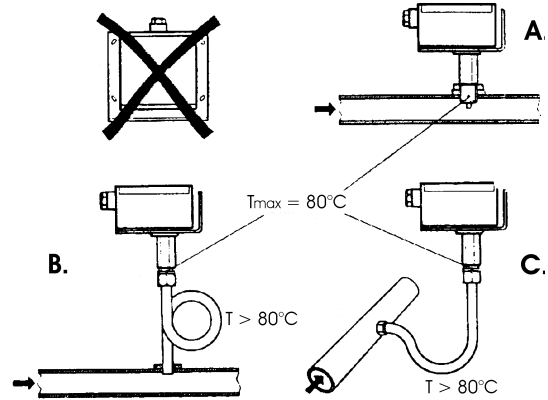
Installing pressure sensors

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

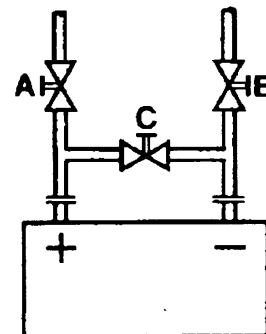
Start disable

1=open C1=open C

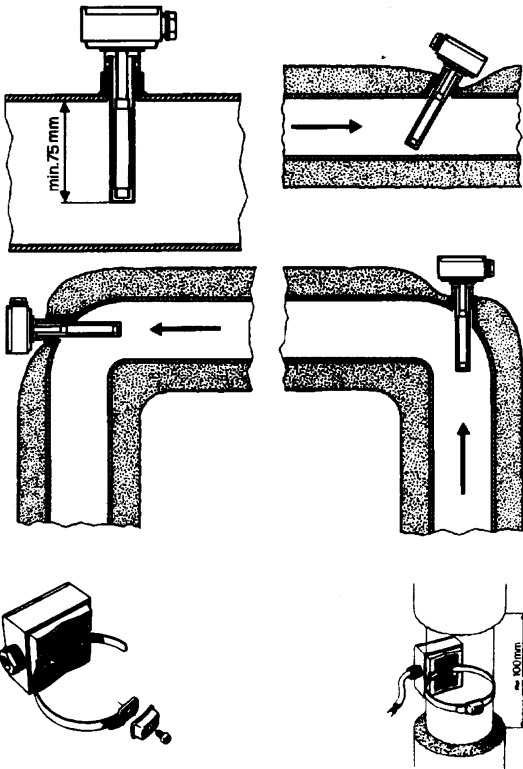
2=open A2=close B

3=open B3=close A

4= close C



Immersion or strap-on sensors



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

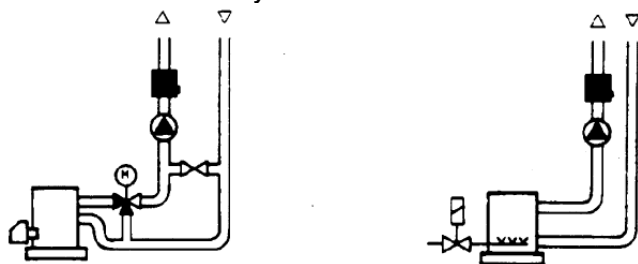
Placing the probes (QAD22.../QAE21.../QAP21.../RCA...)

With pumps on outlet

with 3 ways valves / with 4 ways valves



Panel system / burner control



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.

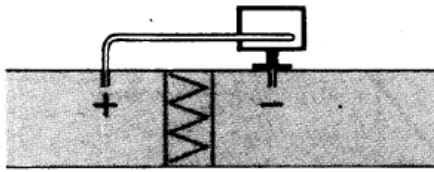
With pumps on return

with 3 ways valves / with 4 ways valves

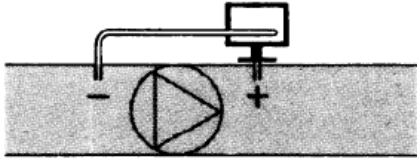


Duct pressure switches and sensors

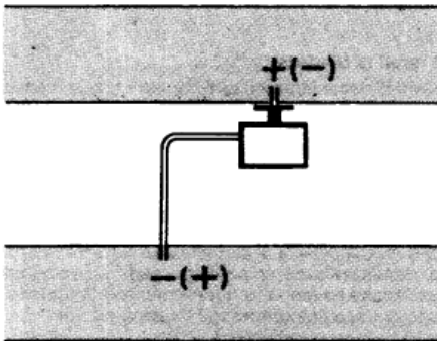
Installing differential pressure probes for air



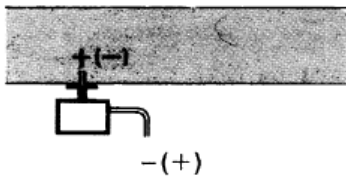
A - Control a filter (clogging)



B - Control a fan (upstream/downstream)



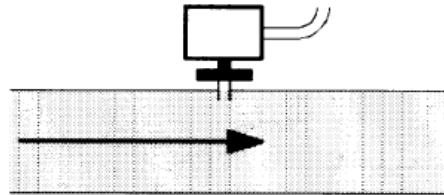
C - Measurement of difference in pressure between two ducts



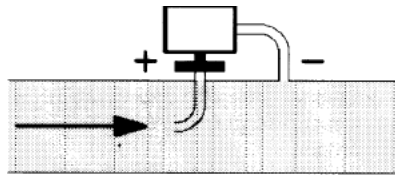
D - Measurement of difference in pressure between two rooms or of inside of duct and outside

Basic principles

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



Measuring dynamic pressure

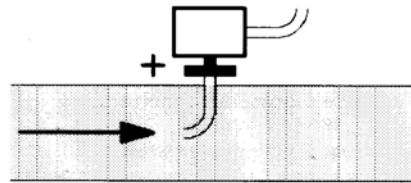


$$Pd = \frac{\gamma v^2}{2g}$$

Key

- γ Kg/m³, specific weight of air
- v m/s, air speed
- g 9.81 m/s² gravity acceleration
- Pd mm C.A., dynamic pressure

Measuring total pressure



Spare parts

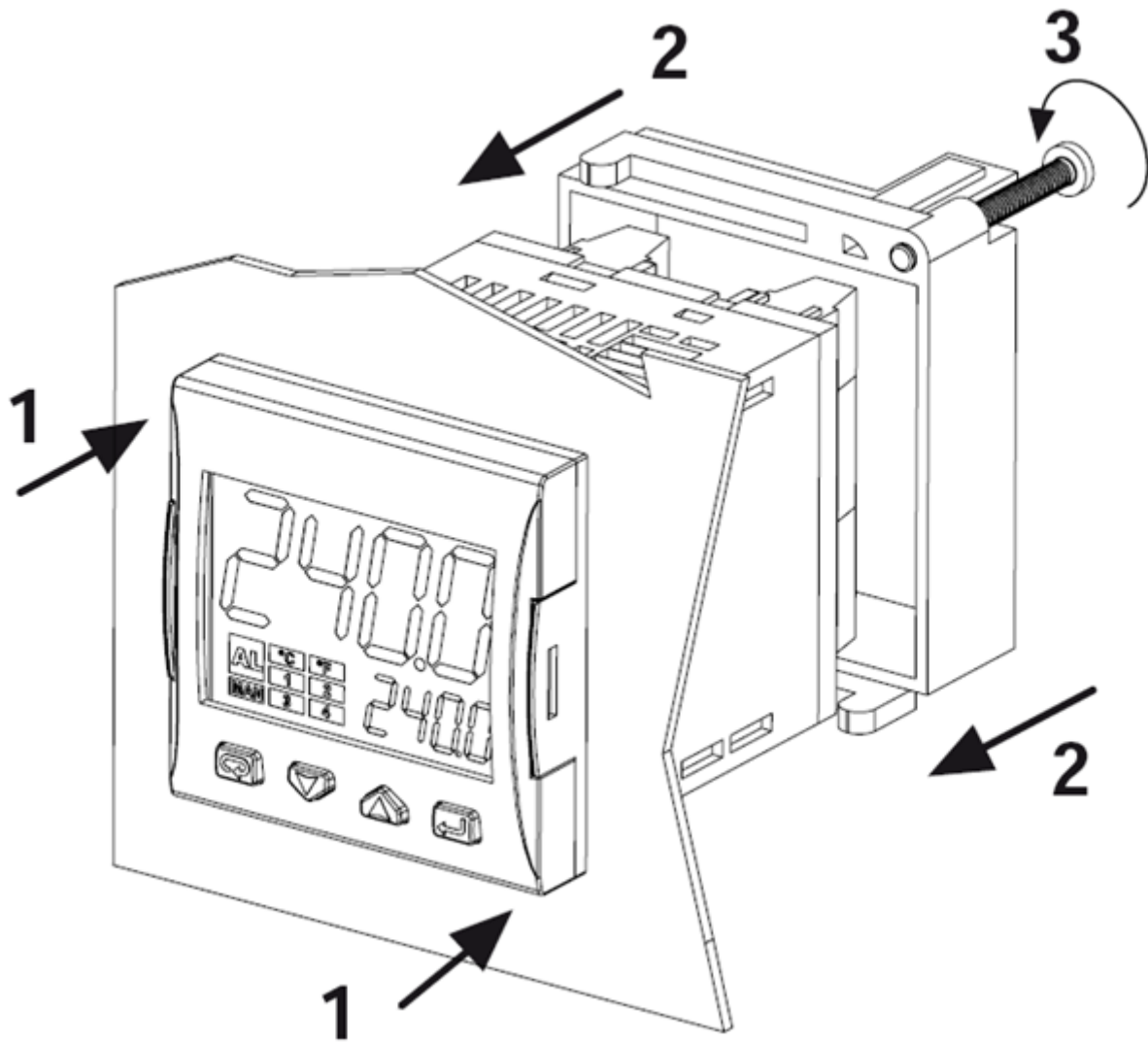
Description	Code
Modulator RWF50.2 (uscita a 3 punti - apri, fermo, chiudi) 2570148	2570148
Modulator RWF50.3 (uscita continua 0÷20mA, 4÷20mA, 0÷10V) 2570149	2570149
Temperature probe Siemens QAE2120.010A (30÷130°C) 2560101	2560101
Temperature probe Siemens QAM2120.040 (-15÷+50°C) 2560135	2560135
Thermoresistor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

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

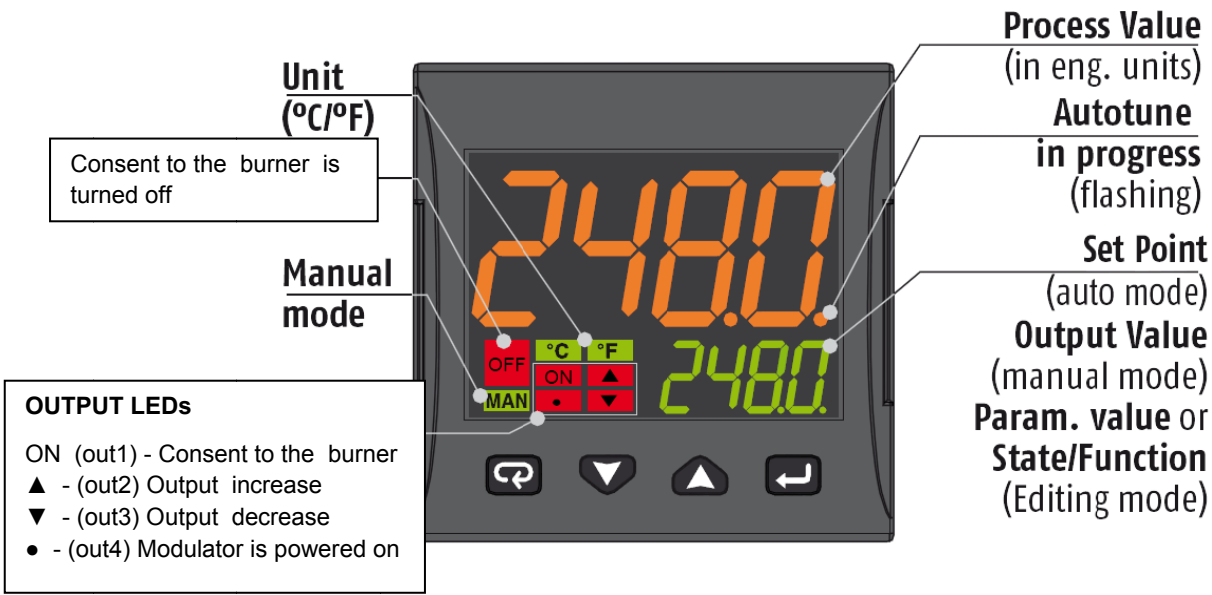
KM3 Modulator

USER MANUAL

MOUNTING

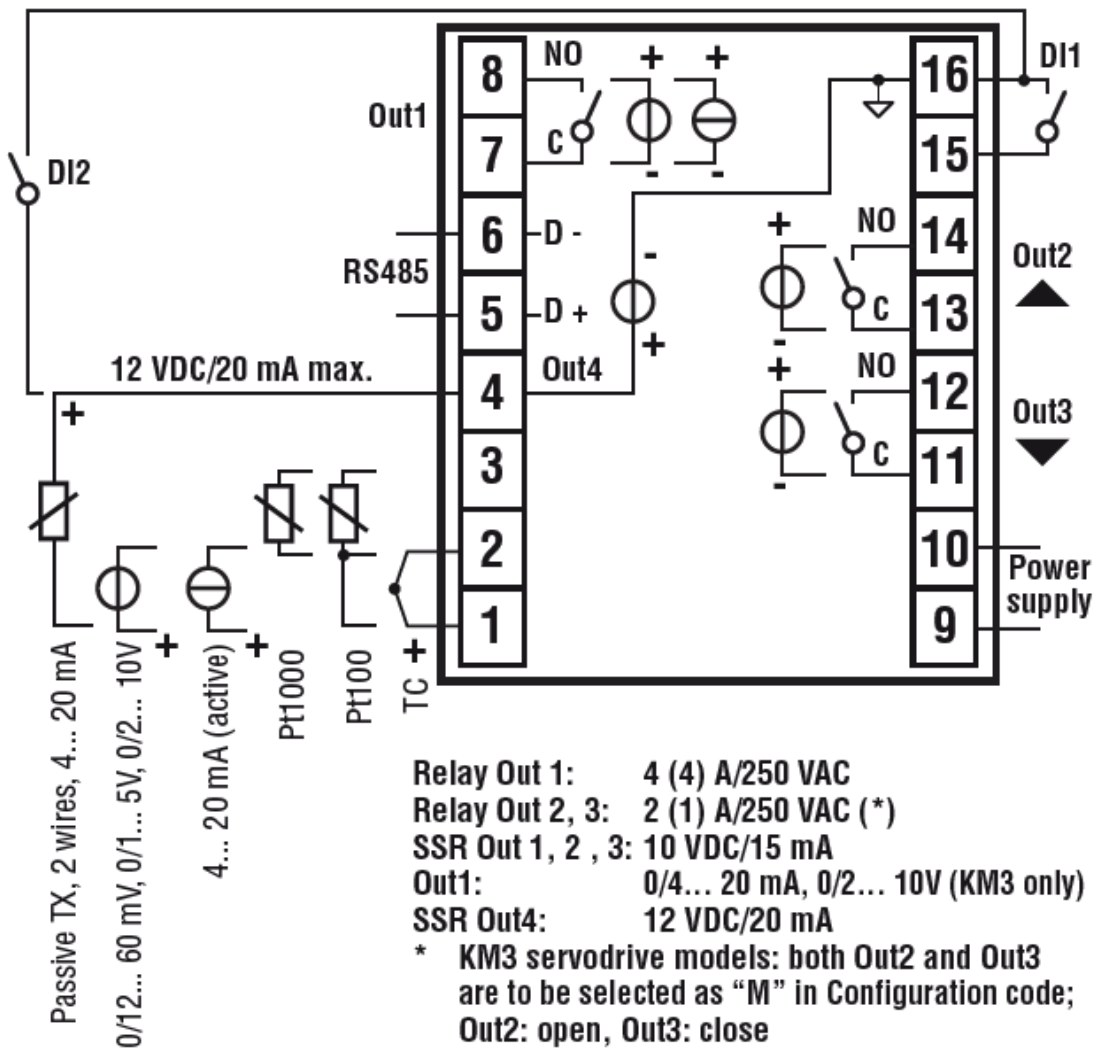


DISPLAY AND KEYS



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

CONNECTIONS DIAGRAM



Probe connection:

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


Power supply connection:

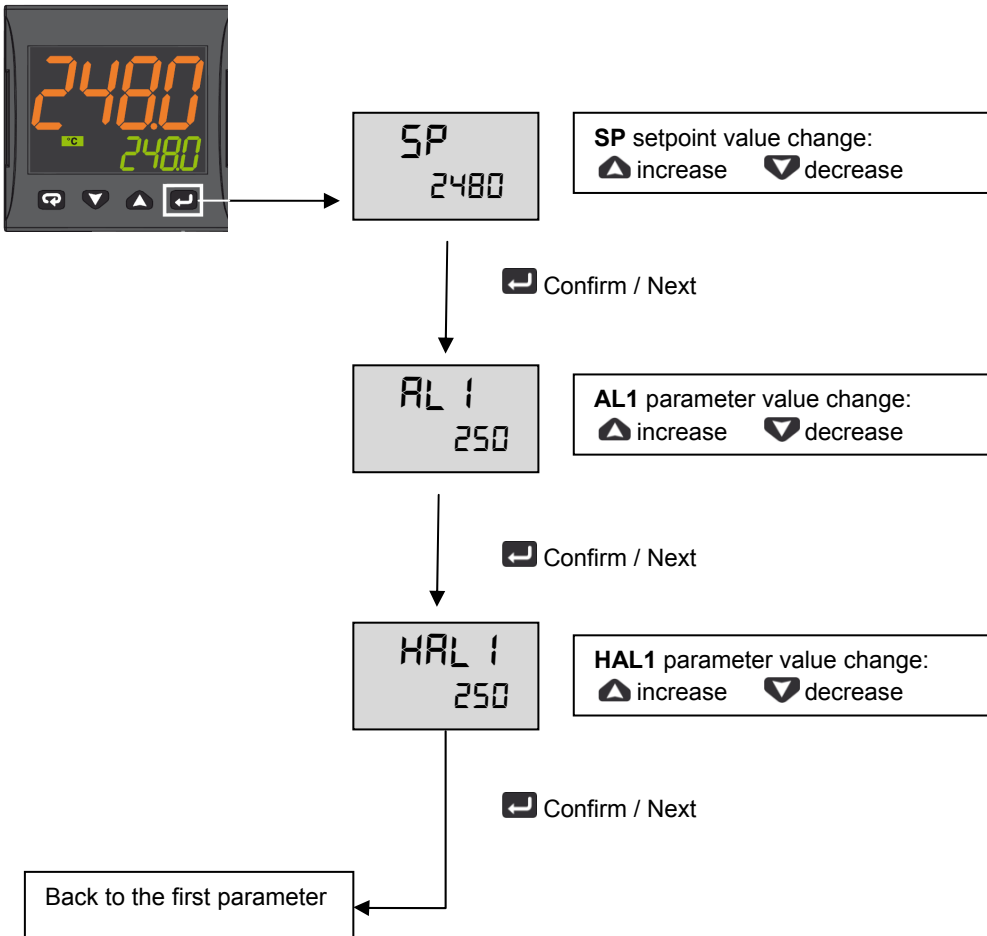
- **Neutral wire:** terminal 9
- **Phase:** terminal 10 (100...240 Vac)
- Close terminals 15-16 to switch to the set point 2

Output connection:

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

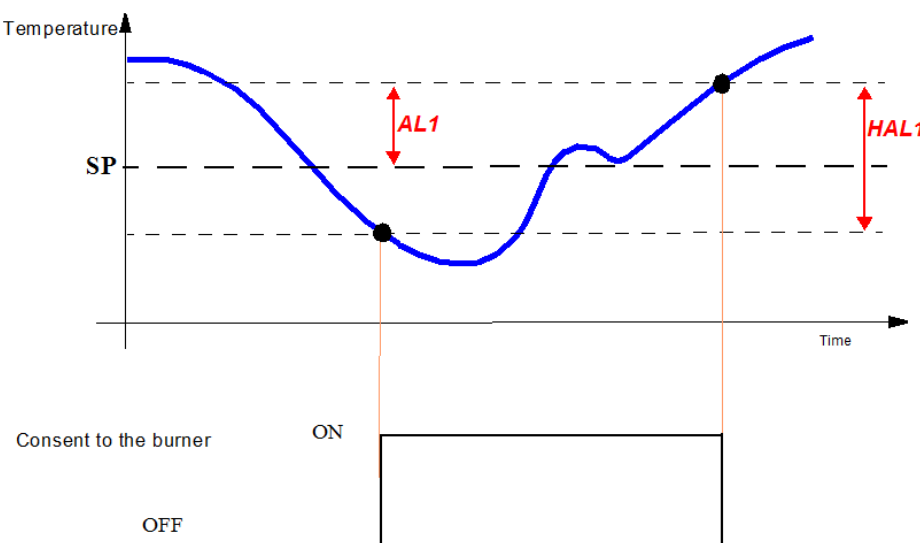
SETPOINT AND HYSTERESIS CONFIGURATION (SP, AL1, HAL1 parameters)

Push the  button to enter into the setpoint configuration:



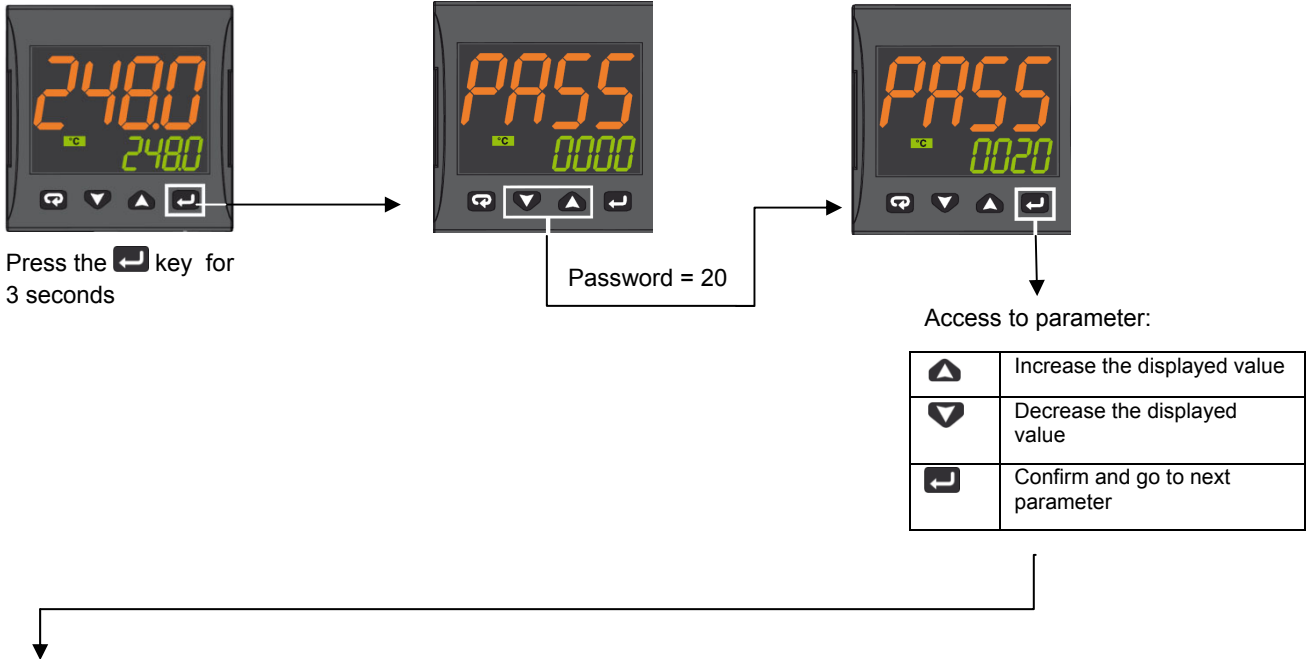
To return to normal mode, press the  key for 3 seconds or wait the 10s timeout

Operation example



LIMITED ACCESS LEVEL

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



Param	Description	Values	Default
SEnS	Input type	Pt1 = RTD Pt100 Pt10 = RTD Pt1000 0.20 = 0..20mA 4.20 = 4..20mA Pressure probe 0.10 = 0..10V 2.10 = 2..10V crAL= Thermocouple K	Depends on the probe
SP	Set point 1	SPLL ... SPLH	See page 7
AL1	AL1 threshold	AL1L... AL1H (E.U.)	
HAL1	AL1 hysteresis	1... 9999 (E.U.)	
Pb	Proportional band	1... 9999 (E.U.)	
ti	Integral time	0 (oFF) ... 9999 (s)	
td	Derivative time	0 (oFF) ... 9999 (s)	
Str.t	Servomotor stroke time	5...1000 seconds	
db.S	Servomotor dead band	0...100%	
SPLL	Minimum set point value	-1999 ... SPLH	
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			
	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 / 0-1,6bar Pressure 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 configuration					
Liv	N°	Param	Description	Values	Default
A	1	SEnS	Input type	Pt1 = RTD Pt100 Pt10 = RTD Pt1000 0.20 = 0..20mA 4.20 = 4..20mA Pressure probe 0.10 = 0..10V 2.10 = 2..10V crAL= Thermocouple K	Depends on the probe
A	2	dp	Decimal point position	0... 3	See page 7
A	3	SSc	Initial scale read-out for linear inputs (available only if SEnS parameter is not equal to Pt1, Pt10, crAL values)	-1999... 9999	0
C	4	FSc	Full scale read-out for linear input inputs (available only if SEnS parameter is not equal to Pt1, Pt10, crAL values)	-1999... 9999	Depends on the probe
C	5	unit	Unit of measure (present only in the case of temperature probe)	°C/°F	°C
C	6	Fil	Digital filter on the measured value	0 (= OFF)... 20.0 s	1.0
C	7	inE	Selection of the Sensor Out of Range type that will enable the safety output value	or = Over range ou = Under range our = over e under range	or

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

Out GROUP- Output parameters

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

AL1 GROUP - Alarm 1 parameters

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

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

GRUPPO AL2 - parametri allarme 2

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

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

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

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

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

SP Group - Set point parameters

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

PAn Group - Operator HMI

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

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

SEr Group - Serial link parameter

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

con Group - Consumption parameters					
Liv	N°	Param	Description	Values	Default
C	134	Co.tY	Count type	<p>oFF = Not used</p> <p>1 = Instantaneous power (kW)</p> <p>2 = Power consumption (kW/h)</p> <p>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</p> <p>4 = Total worked days: number of hours the instrument is turned ON divided by 24.</p> <p>5 = Total worked hours: number of hours the instrument is turned ON.</p> <p>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.</p> <p>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.</p> <p>8 = Totalizer of control relay worked days: number of hours the control relay has been in ON condition, divided by 24.</p> <p>9 = Totalizer of control relay worked hours: number of hours the control relay has been in ON condition.</p> <p>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.</p> <p>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.</p>	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.





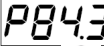



AUTOMATIC MODE

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 ALx0 (Alarm x enabling during Stand-by mode) parameter setting.
- If you set stand by mode during program execution, the program will be aborted.
- If you set stand by mode during self-tune execution, the self- tune function will be aborted.
- During stand by mode, all functions not related with the control (wattmeter, independent timer, “worked time”, etc) continue to operate normally.
- When the instrument is swapped from stand by to auto modes, the instrument will start automatically the alarm masking, the soft start functions and the auto-tune (if programmed).

AUTOTUNE (EVOTUNE)

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

ERROR MESSAGES

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

Over-range: 

Under-range 

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

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

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

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

List of possible errors

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

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

NoAt Auto-tune not finished within 12 hours.

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





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

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

FACTORY RESET

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

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

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

The procedure is complete.

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

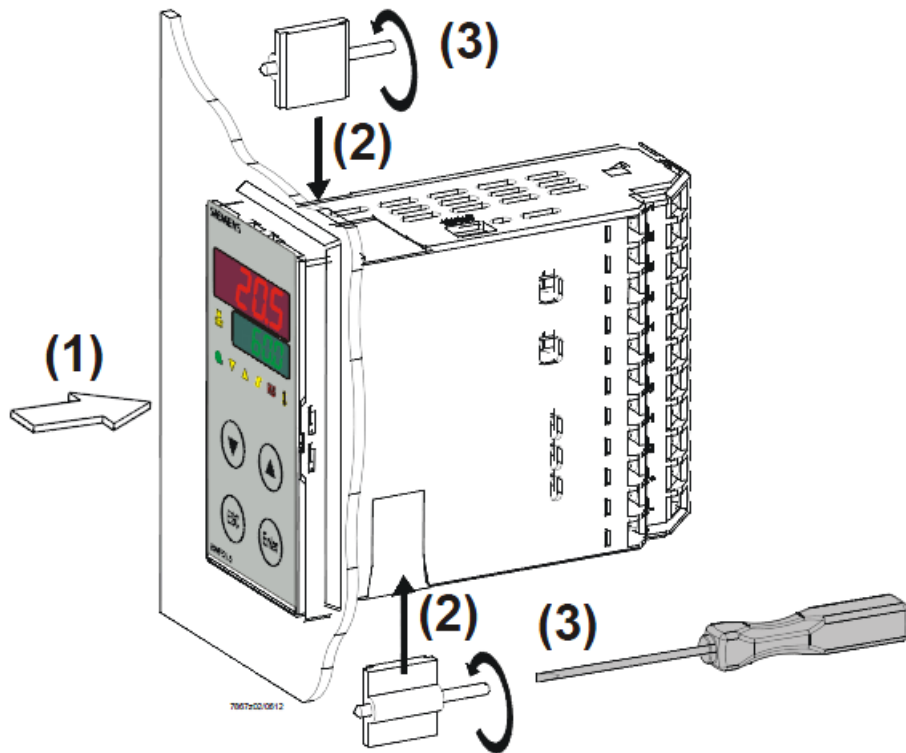
RWF55.5X & RWF55.6X



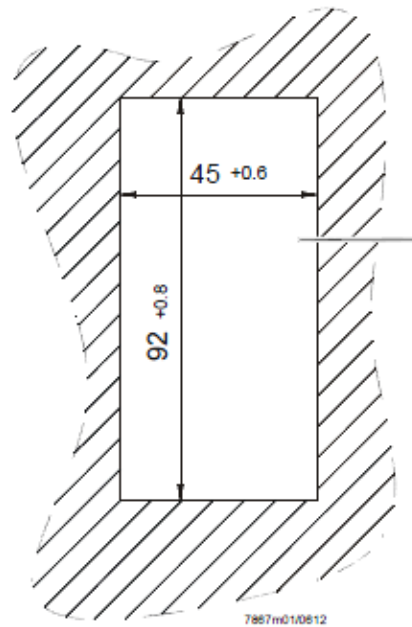
User manual

DEVICE INSTALLATION

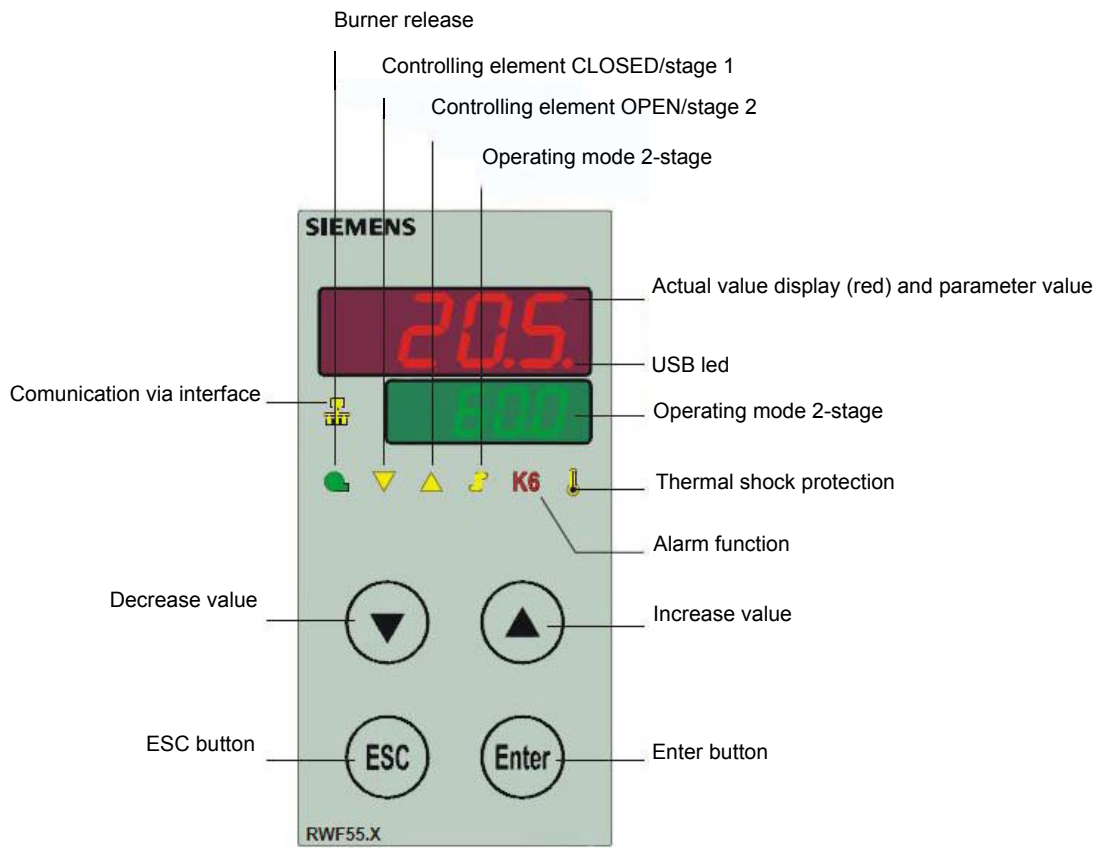
Fixing system



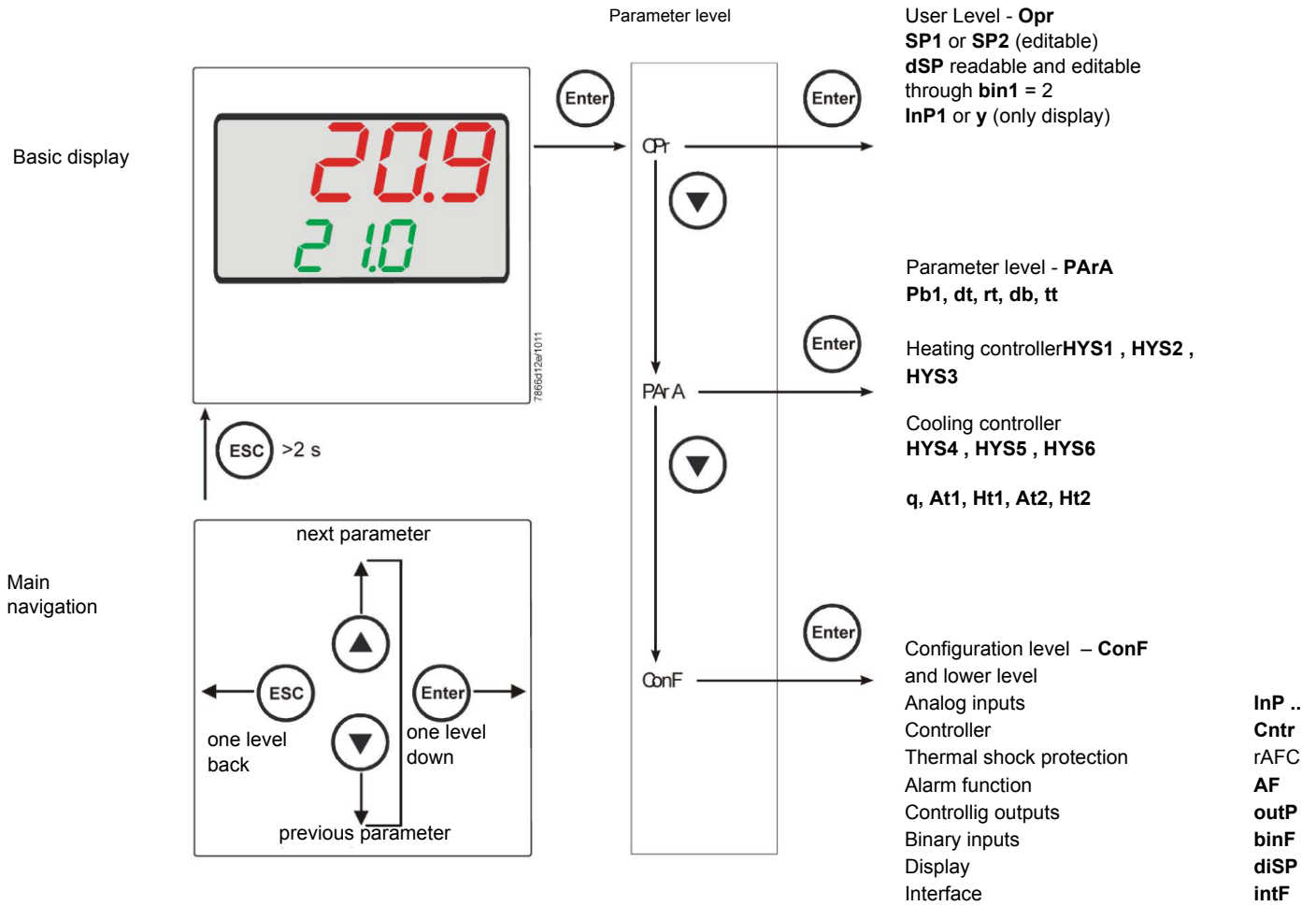
Drilling dimensions:



FRONT PANEL



NAVIGATION MENU



RWF55 is preset good for 90% of applications. However, you can set or edit parameters as follow:

Set-point: set or modification:

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

PID parameters set and modifications (PARA):

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

Parameter	Display	Range	Factory setting	Remarks
Proportional band	Pb1	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 T
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 parameter CACT = 0 and parameter bin1 =0)
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
T Outside temperature Curve point 1 (*)	At1	-40 ...120 digit	-10	First point of external temperature for climatic curve
Boiler temperature Curve point 1 (*)	Ht1	SPL...SPH	60	Set-point temperature for the external temperature 1
TT Outside temperature Curve point 2 (*)	At2	-40 ...120 digit	20	Second point of external temperature for climatic curve
Boiler temperature Curve point 2 (*)	Ht2	SPL...SPH	50	Set-point temperature for the external temperature 2

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

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

Push the **Enter** button: on the lower display (green) **Opr** appears. Using the **up and down arrows** find **ConF**. Push **Enter** to confirm. Now on the green display the group **InP** appears. Push **Enter** and **InP1** is displayed. Enter to confirm. You are inside **InP1**; the green display shows **Sen1 (sensor type)**, while the red display shows the chosen sensor code Push **Enter** to enter the **Sen1** parameter, then choose the desired sensor using the **arrows**. Push **Enter** to confirm and **ESC** to escape.

Once selected the sensor, you can modify all the other parameters using **up and down arrows** according to the tables here below :

ConF > InP > InP1

Parameter	Value	Description
SEn1 type of sensor for analog input 1	1	Pt100 3 wire
	2	Pt100 2 wire
	3	Pt1000 3 wire
	4	Pt1000 2 wire
	5	Ni1000 3 wire
	6	Ni1000 2 wire
	7	0 ÷ 135 ohm
	8	Cu-CuNi T
	9	Fe-CuNi J
	10	NiCr-Ni K
	11	NiCrSi-NiSi N
	12	Pt10Rh-Pt S
	13	Pt13Rh-Pt R
	14	Pt30Rh-Pt6Rh B
	15	0 ÷ 20mA
	16	4 ÷ 20mA
	17	0 ÷ 10V
	18	0 ÷ 5V
	19	1 ÷ 5V
OFF1 Sensor offset	-1999..0.. +9999	Correction value measured by the sensor
SCL1 scale low level	-1999..0.. +9999	minimum scale value(for input ohm, mA, V)
SCH1 scale high level	-1999.. 100 .. +9999	maximum scale value(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	1 = degrees Celsius
	2	2 = degrees Fahrenheit

(**bold** = factory settings)

ConF > InP > InP2

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

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

(**bold** = factory settings)

ConF > InP > InP3

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

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

(**bold** = factory settings)

ConF > Cntr

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

Parameter	Value	Description
CtYP controller type	1 2	1 = 3-position controller (open-stop-close) 2 = continuative action controller (0 ÷ 10V or 4 ÷ 20mA)
CACT control action	1 0	1 = heating controller 0 = cooling controller
SPL least value of the set-point range	-1999..0..+9999	minimum set-point scale
SPH maximum value of the set-point range	-1999..100..+999	maximum set-point scale
Self-optimization	0 1	0 = Free 1 = Locked Self-optimization can only be disabled or enabled via the ACS411 setup program. Self-optimization is also disabled when the parameter level is locked
oLLo 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

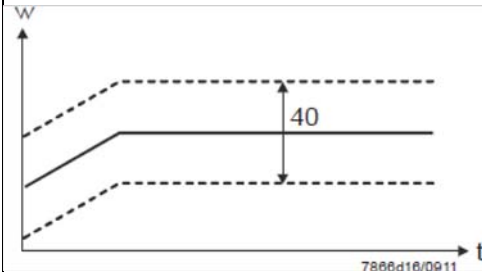
(bold = factory settings)

ConF > rAFC

Activation boiler shock termic protetion:

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

Parameter	Value	Description
FnCT type of contol	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	2 x (HYS1) = 10...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



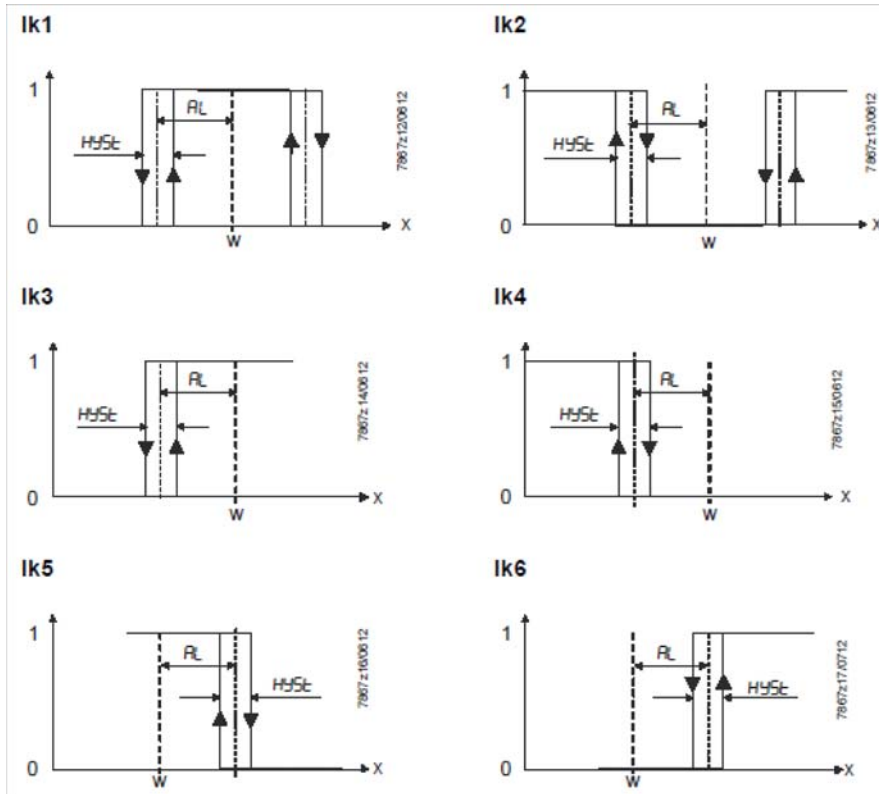
(bold = factory settings)

Alarm function AF

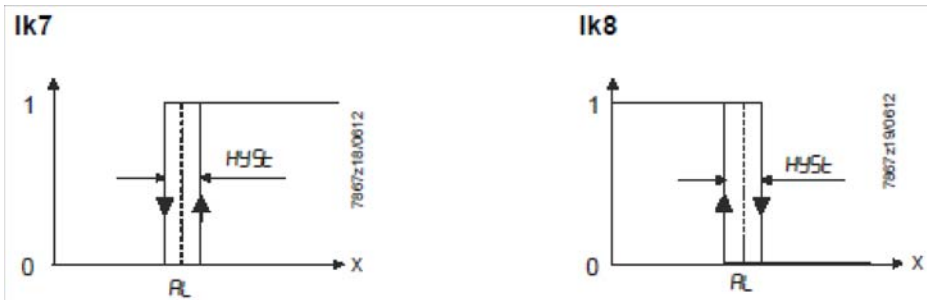
The alarm function can be used to monitor the analog inputs. If the limit value is exceeded, multifunctional relay K6 (terminals **6N** and **6P**) is activated (depending on the switching characteristic)

The alarm function can have different switching functions (Ik1 to Ik8) and can be set to a deviation from the active setpoint or to a fixed limit value

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



Fixed limit value **AL**



ConF > AF

Parameter	Value	Description
FnCt type of control	0 1 2 3 4 5 6 7 8 9 10 11 12	0 = Without function lk1 = monitored input InP1 lk2 = monitored input InP1 lk3 = monitored input InP1 lk4 = monitored input InP1 lk5 = monitored input InP1 lk6 = monitored input InP1 lk7 = monitored input InP1 lk8 = monitored input InP1 lk7 = monitored input InP2 lk8 = monitored input InP2 lk7 = monitored input InP3 lk8 = monitored input InP3
Alarm value AL	-1999 ... 0 1999	Limit value or deviation from setpoint to be monitored (see alarm functions lk1 to lk8 : limit value AL) Limit value range for lk1 and lk20 ...9999
HySt switching differential	0... 1... 9999	Switching differential for limit value AL
ACrA response by out of range	0 1	Switched-off ON Switching state in the case of measuring range overshoot or undershoot (Out of Range)

(**bold** = factory settings)

ConF > OutP

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

The binary outputs of the RWF55 offer no setting choices

The RWF55 has an analog output.

The analog output offers the following setting choices:

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

(**bold** = factory settings)

ConF > binF

This setting decides on the use of the binary inputs **D1**, **D2**, **DG**

b

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

(**bold** = factory settings)

ConF > dISP

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

Parameter	Value	Description
diSU upper display (red)	0 1 2 3 4 6 7	Display value for upper display: 0 = display power-off 1 = analog input 1 (InP1) value 2 = analog input 2 (InP2) value 3 = analog input 3 (InP3) value 4 = controller's angular positioning 6 = set-point values 7 = end value with thermal shock protection
diSL lower display (green)	0 1 2 3 4 6 7	Display value for lower display: 0 = display power-off 1 = analog input 2 (InP2) value 2 = analog input 2 (InP2) value 3 = analog input 2 (InP2) value 4 = controller's angular positioning 6 = set-point values 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 place
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)

ConF > IntF

The controller can be integrated into a data network using an optional RS-485 (terminals R+ and R-) interface or an optional Profibus DP interface(only model **RWF55.6x** terminals C1-C2-C3-C4)

Parameter	Value	Description
bdrt	0	0 = 4800 baud
baudrate	1	1 = 9600 baud
	2	2 = 19200 baud
	3	3 = 38400 baud
Adr	0..	Address in the data network
Device address Modbus	1..	
	254	
dP	0.. 125	only with RWF55.6x
Device address Profibus		
dt	0..	0 = switched-off
Remote detection time	30 ..	
	7200s	

(**bold** = factory settings)

Manual control :

In order to manual change the burner load, while firing keep pushing the **ESC** button for more than 5 s; on the lower green display **Hand** appears.

using the **UP** and **DOWN** arrows, the load varies.

Keep pushing the **ESC** button for getting the normal operation again.

NB: every time the device shuts the burner down (start led switched off - contact 1N-1P open), the manual control is not active.

Device self-setting (auto-tuning):

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



Follow the below instructions:

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

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

Display of software version :

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



Weather-compensated setpoint shifting (climatic regulation):

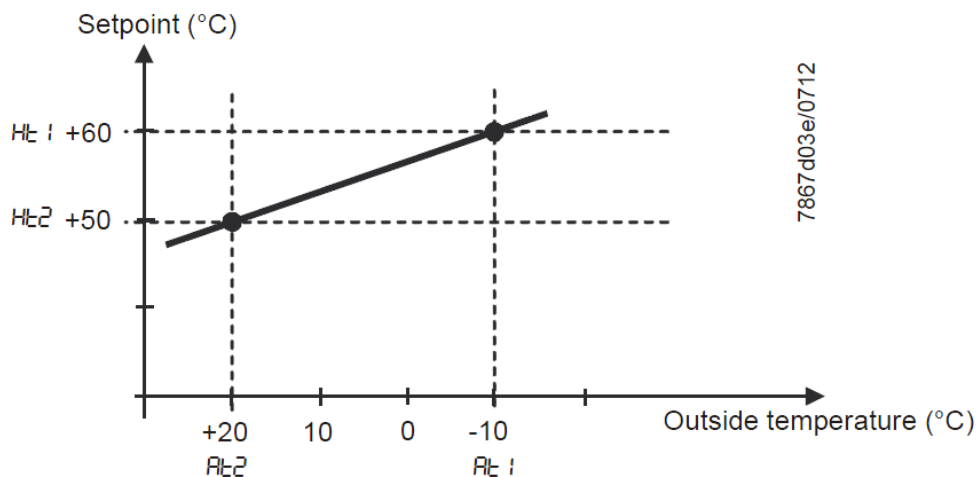
The RWF55 can be configured so that weather-compensated setpoint shifting is activated when an LG-Ni1000 outside sensor or a Pt1000 is connected (see parameter **InP3**).

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

The minimum and maximum setpoints can be set using the lower setpoint limit **SPL** and the upper setpoint limit **SPH** of the menu **Crtr**.

The system also prevents the lower working range limit **oLLo** and upper working range limit **oLHi** from exceeding/dropping below the system temperature limits.

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



For setting climatic regulation function set:

PArA > parameters **At1**, **Ht1**, **At2**, **Ht2**

ConF > **InP** > **InP3** parameters **SEn3**, **FnC3** = 1 (Weather-compensated setpoint).

Modbus interface

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

The entries under Access have the following meanings:

R/O Read Only, value can only be read

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

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

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

User level

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

Parameter level

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

Configuration level

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

Remote operation

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

Legend

* = Local

** = Controller OFF

Dati dell'apparecchio

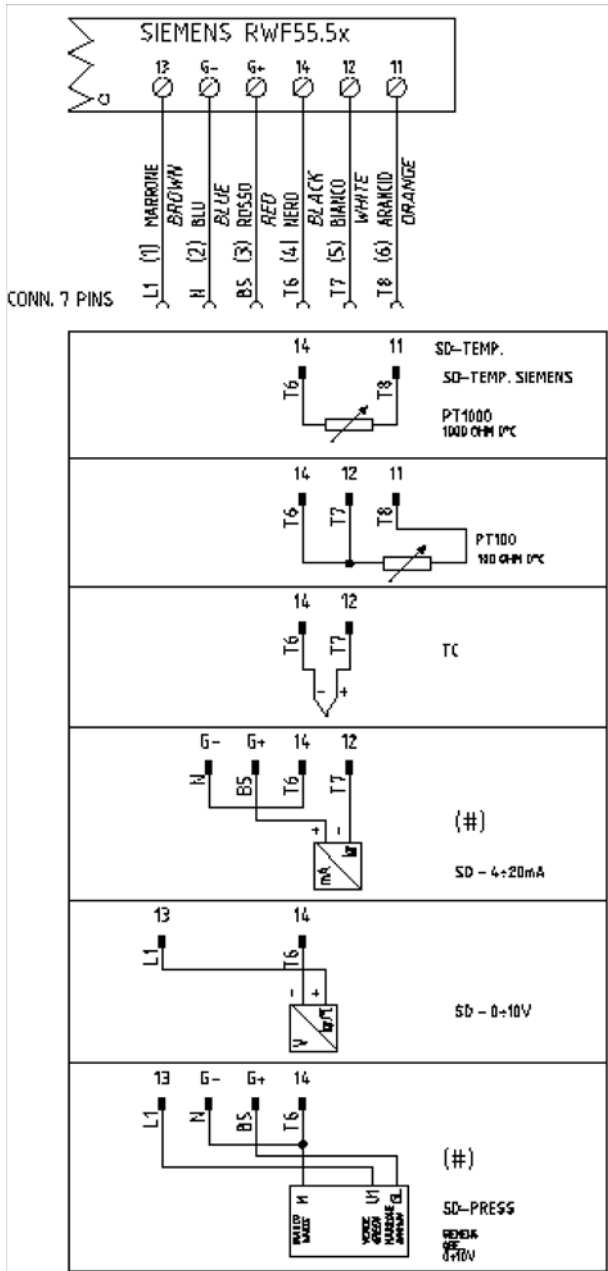
Address	Access	Data type	Signal reference	Parameter
0x8000	R/O	Char12	---	Software version
0x8006	R/O	Char14	---	VdN number

Stato dell'apparecchio

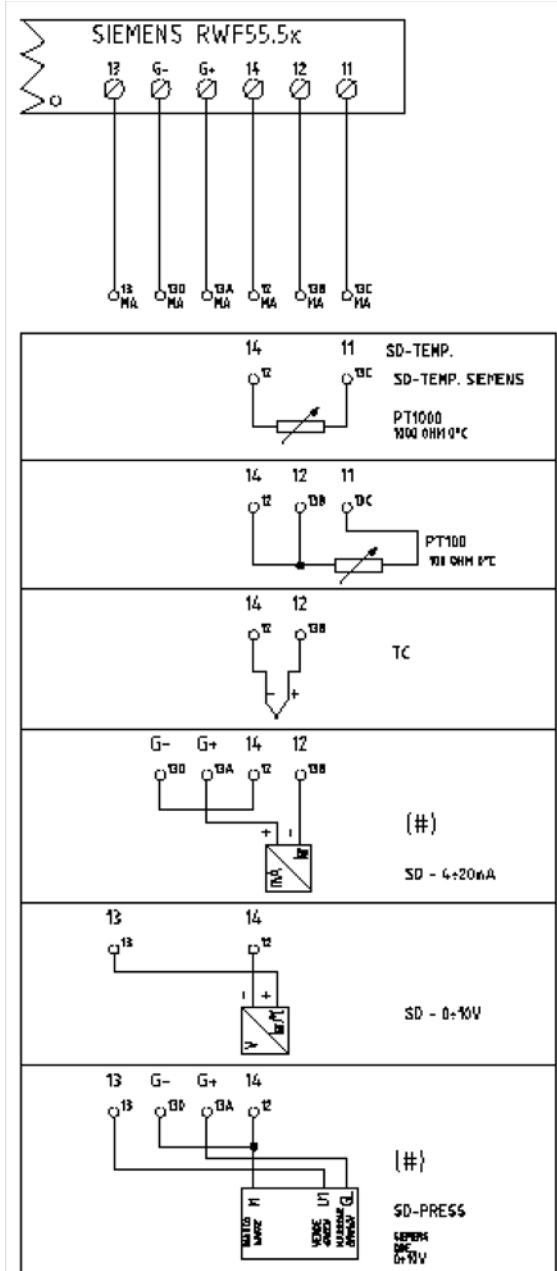
Address	Access	Data type	Signal reference	Parameter
0x0200	R/O	Word	---	Outputs and states
			Bit 0	Output 1
			Bit 1	Output 3
			Bit 2	Output 2
			Bit 3	Output 4
			Bit 8	Hysteresis limitation
			Bit 9	Control system
			Bit 10	Self-optimization
			Bit 11	Second setpoint
			Bit 12	Measuring range overshoot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

Electric connections :

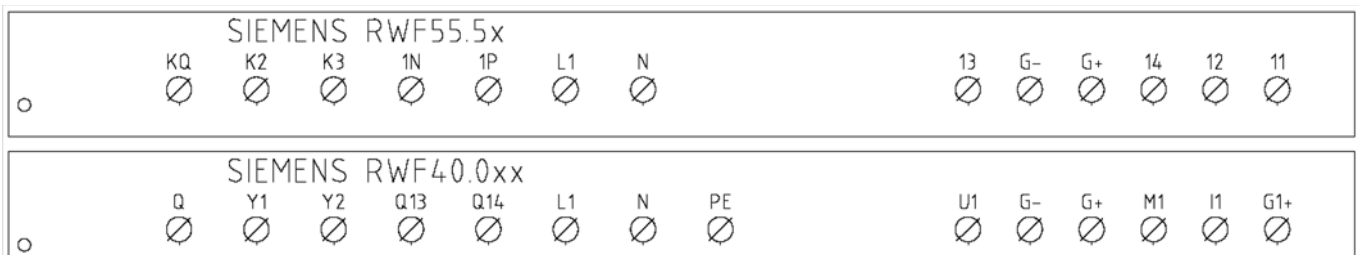
With 7 pins connector version



With terminals version



Correspondences bornes entre RWF55.5x y RWF40.0x0 Matches terminals between RWF55.5x and RWF40.0x0



Parameters summarising for RWF55.xx :

Navigation menu	ConF					ConF			PArA						Opr
	Inp							diSP							
	Inp1					Cntr		dECP							
	SEn1	OFF1	SCL	SCH	Unit	SPL	SPH		Pb. 1	dt	rt	tt	HYS1 (*)	HYS3 (*)	SP1 (*)
Siemens QAE2120...	6	0	needless	needless	1	30	95	1	10	80	350	(#)	-5	5	80 °C
Siemens QAM2120..	6	0	needless	needless	1	0	80	1	10	80	350	(#)	-2,5	2,5	40°C
Pt1000 (130°C max.)	4	0	needless	needless	1	30	95	1	10	80	350	(#)	-5	5	80°C
Pt1000 (350°C max.)	4	0	needless	needless	1	0	350	1	10	80	350	(#)	-5	10	80°C
Pt100 (130°C max.)	1	0	needless	needless	1	0	95	1	10	80	350	(#)	-5	5	80°C
Pt100 (350°C max)	1	0	needless	needless	1	0	350	1	10	80	350	(#)	-5	10	80°C
Probe4+20mA / 0+1,6bar	16	0	0	160	needless	0	160	0	5	20	80	(#)	0	20	100 kPa
Probe4+20mA / 0+3bar	16	0	0	300	needless	0	300	0	5	20	80	(#)	0	20	200 kPa
Probe 4+20mA / 0+10bar	16	0	0	1000	needless	0	1000	0	5	20	80	(#)	0	50	600 kPa
Probe 4+20mA / 0+16bar	16	0	0	1600	needless	0	1600	0	5	20	80	(#)	0	80	600 kPa
Probe 4+20mA / 0+25bar	16	0	0	2500	needless	0	2500	0	5	20	80	(#)	0	125	600 kPa
Probe 4+20mA / 0+40bar	16	0	0	4000	needless	0	4000	0	5	20	80	(#)	0	200	600 kPa
Probe 4+20mA / 0+60PSI	16	0	0	600	needless	0	600	0	5	20	80	(#)	0	30	300 (30PSI)
Probe4+20mA / 0+200PSI	16	0	0	2000	needless	0	2000	0	5	20	80	(#)	0	75	600 (60PSI)
Probe4+20mA / 0+300PSI	16	0	0	3000	needless	0	3000	0	5	20	80	(#)	0	120	600 (60PSI)
Siemens QBE2002 P4	17	0	0	400	needless	0	400	0	5	20	80	(#)	0	20	200 kPa
Siemens QBE2002 P10	17	0	0	1000	needless	0	1000	0	5	20	80	(#)	0	50	600 kPa
Siemens QBE2002 P16	17	0	0	1600	needless	0	1600	0	5	20	80	(#)	0	80	600 kPa
Siemens QBE2002 P25	17	0	0	2500	needless	0	2500	0	5	20	80	(#)	0	125	600 kPa
Siemens QBE2002 P40	17	0	0	4000	needless	0	4000	0	5	20	80	(#)	0	200	600 kPa
Signal 0+10V	17	0	needless	needless	needless	needless	needless	needless	5	20	80	(#)			
Signal 4+20mA	16	0	needless	needless	needless	needless	needless	needless	5	20	80	(#)			

NOTE:

(#) tt – servo control run time

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

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

WARNING :

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

With pressure probes in PSI the parameters SP1, SCH, SCL, HYS1, HYS3 must be set and displayed in PSI x10 (example: 150PSI > I display 1500).

APPENDIX: PROBES CONNECTION

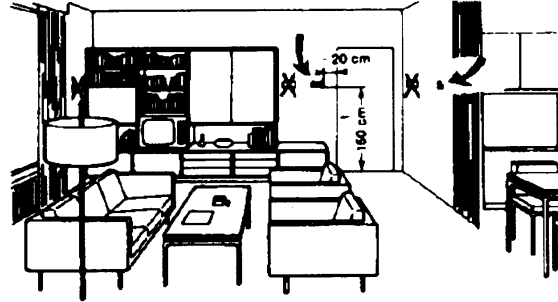
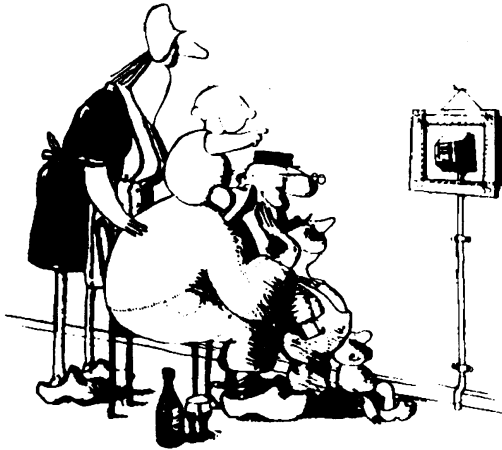
To assure the utmost comfort, the control system needs reliable information, which can be obtained provided the sensors have been installed correctly. Sensors measure and transmit all variations encountered at their location.

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

Ambient probes (or ambient thermostats)

Installation

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

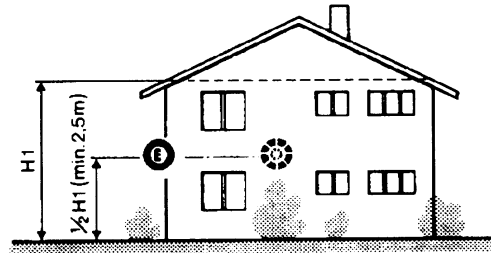
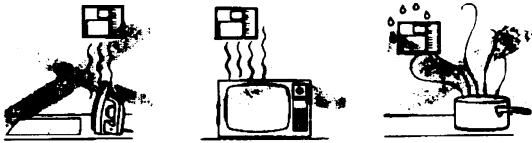


Outside probes (weather) Installation

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.

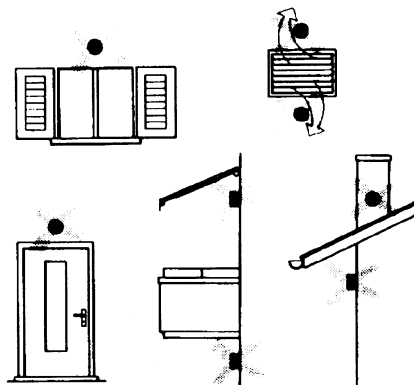
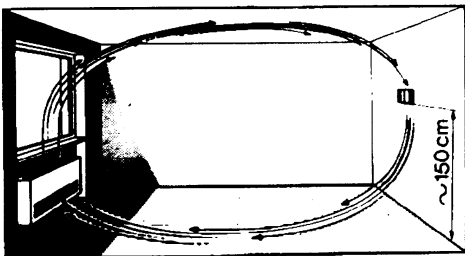


General rule: en on the outer wall of the building where the living rooms are, never on the south-facing wall or in a position where they will be affected by morning sun. If in any doubt, place them on the north or north-east façade.

Positions to be avoided

Location

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



Installation position to be avoided

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

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:

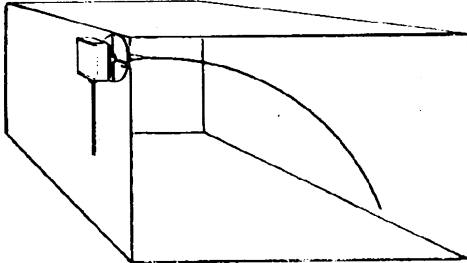
"after delivery fan or

"after coil to be controlled, at a distance of at least 0,5 m

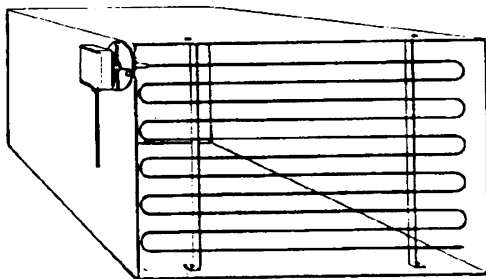
For measuring room temperature:

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

For measuring saturation temperature: after mist eliminator.



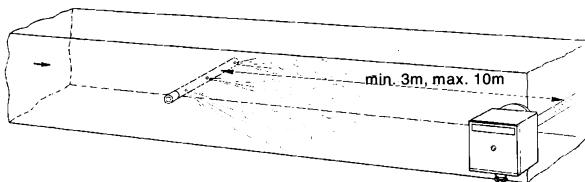
Bend 0.4m sensor by hand (never use tools) as illustrated .



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

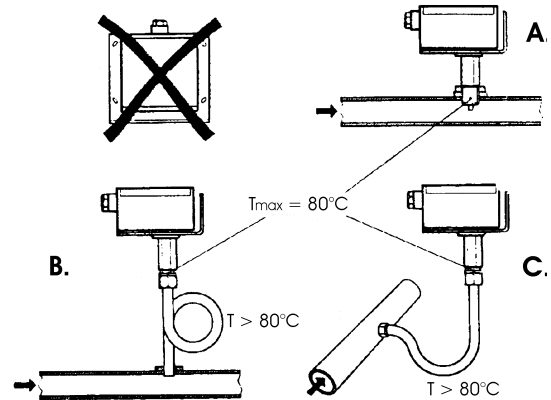
A - installation on ducts carrying fluids at max. temperature 80°C

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 the value permitted by the sensor

when there are high static pressures, make sure you insert shutoff valves A-B-C.

Putting into operation

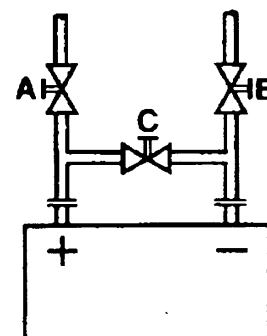
Start disable

1=open C1=open C

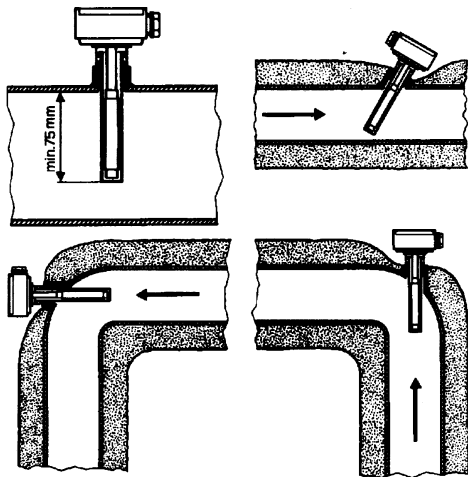
2=open A2=close B

3=open B3=close A

4= close C



Immersion or strap-on sensors



Immersion probes installation

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

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

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

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

Installing QAD2.. strap-on sensors

Make sure fluid is circulating in the chosen location.

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

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

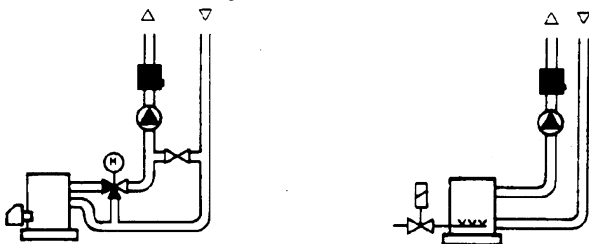
Placing the probes (QAD22.../QAE21.../QAP21.../RCA...)

With pumps on outlet

with 3 ways valves / with 4 ways valves



Panel system / burner control



With pumps on return

with 3 ways valves / with 4 ways valves



Strap-on or immersion sensors?

QAD2.. strap-on sensors

Advantages :

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

ΠLimits:

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

QAE2... immersion sensors

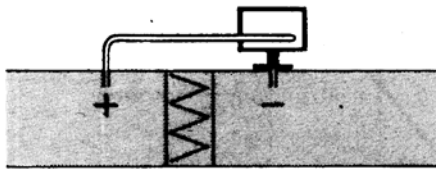
Advantages:

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

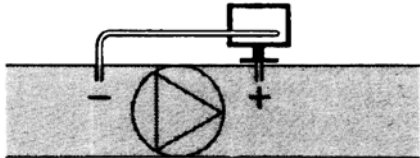
Limits:

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

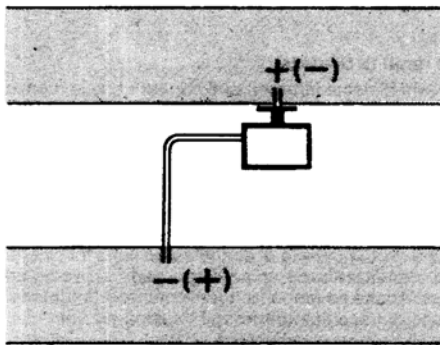
Installing differential pressure probes for air



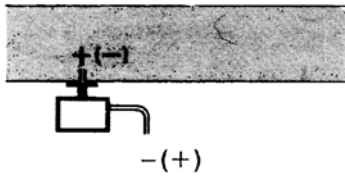
A - Control a filter (clogging)



B - Control a fan (upstream/downstream)



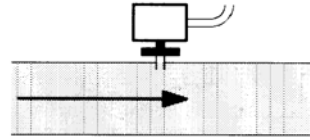
C - Measurement of difference in pressure between two ducts



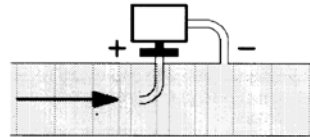
D - Measurement of difference in pressure between two rooms or of inside of duct and outside

Basic principles

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



Measuring dynamic pressure

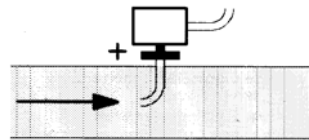


$$P_d = \frac{\gamma v^2}{2g}$$

Legend

- y Kg/m³, specific weight of air
- q m/s, air speed
- g 9.81 m/s² gravity acceleration
- P_d mm C.A., dynamic pressure

Measuring total pressure



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