



**TECHNICAL SPECIFICATION DATA MANAGEMENT AND CONTROL
FLAME GAS APPLIANCES – GRILLVAPOR -**

TECHNICAL SPECIFICATION DATA MANAGEMENT AND CONTROL OF FLAME SERIE 960 TYPE 960.AE1.03.01 CODE 16025012 CONTROL BOARD WITH LCD TYPE LCD1.B80 150MM CODE 16021100

TABLE OF CONTENTS

1	LABEL AND CODIFICATION PLAN	3
1.1	THERMOREGULATION BOARD SERIE 960	3
1.2	SAFETY STANDARD MODULE SERIE SRM	4
1.3	CONTROL BOARD LCD TYPE LCD1.B80 150MM	5
2	DESCRIPTION	5
3	GENERAL FEATURES	5
4	INSTRUCTIONS FOR THE INSTALLATION	6
5	WIRING DIAGRAM	7
5.1	CONNECTION FOR HIGH-VOLTAGE	8
5.2	CONNECTION FOR LOW-VOLTAGE (SELV)	8
5.3	SOFTWARE PARAMETERS	8
5.4	JUMPER FUNCTION	9
6	TECHNICAL DATA	10
7	SAFETY STANDARD MODULE SERIE SRM	10
7.1	GENERAL FEATURES	10
8	OPERATING CONTROL BOARD 960.AE1.03.01	11
8.1	ASPECT OF CONTROL BOARD LCD TYPE LCD1.B80 150MM	11
8.2	CONTROL BOARD LCD1.B80 150MM IN USER MODE	11
8.3	CONTROL BOARD LCD1.B80 150MM IN PARAMETER MENU MODE	13
8.4	POWER CYCLE	13
8.5	COOKING WITHOUT CORE PROBE	14
8.6	COOKING WITH CORE PROBE	15
8.7	CODIFICATIONS OF ANOMALIES	16

1 LABEL AND CODIFICATION PLAN

1.1 THERMOREGULATION BOARD SERIE 960

Label	Description
	960. AE1 . 03 . 01 - Versione del firmware di sicurezza - Versione del firmware di termoregolazione - Tipo di scheda - Lettera di identificazione cliente

Revisions

N. ° document SAP	Description
19721_r00	First issue board 960.AE1.00.00 (RNC 19277_r00)
19721_r01	Updates board according to the changes requested by IMQ Primacontrol (ECO500000002060)
19721_r02	Updates removal functional mode "Block for loss of flame capacity" (ECO500000002081)
19721_r03	Updates for software changes requested by the client: management enable input to the use of button SW3 (poles 51-52 / (ECO500000002228)

Hardware and software description

The following table shows the features and options of your board 960.AE1.03.01 not identifiable by the label on the board itself.

1	Power transformer	15VA
2	Output 230V~ (AUX1)	YES (buzzer)
3	Pump 230V~	YES (skewer motor)
4	Deverter 230 V~	YES (water loading electrovalve)
5	Exit connector 230V _{AC} (AUX2)	NO
6	Thermostat second zone	NO
7	Safety thermostat	YES
8	Environment thermostat	YES (not managed by the software)
9	Connector 14 poles for control board	YES
10	Led on shape board	NO
11	Control panel	LCD (type LCD1.B80 150MM)
12	Trimmer	NO
13	EEPROM external	YES
14	Microcontroller	8k word
15	Strip for interface connection	NO
16	Switch on transformer	On-board 15kV _{PK}
17	Fan	ON/OFF
18	Switching attempts	3
19	Gas electrovalve	Brahma type VCM02*Sxx 24VDC

1.2 SAFETY STANDARD MODULE SERIE SRM

Label	Description
	SRM . AE1 . 01 - Versione del firmware di sicurezza - Tipo di scheda - Lettera di identificazione cliente

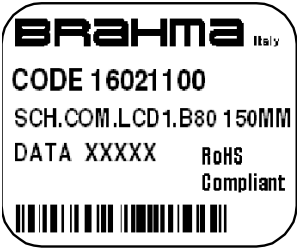
Hardware and software description

The following table shows the features and options of the SRM module board 960.AE1.02.01 not identifiable by the label on the board itself

Serie	Type	Options
SRM	M 1 _ N L (1) (2) (3) (4) (5)	TW/TP 1,5 TS 7,5 _ G _ _ _ _ Y3 (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19)

(1)	Type of lock status	M Non volatile lock
(2)	Type of driven fan	1 Module for the control of a fan with the button ON/OFF (fixed speed)
(3)	Type of driven control device	No digit Driving of an ignition device with capacitive discharge
(4)	Type of connection to the power supply	N Non-polarized device
(5)	Optical LED interface	L LED module for functional state signal
(6)	Waiting time or pre-ventilation time	TW/TP 1,5 Duration of waiting time or pre-ventilation time in seconds
(7)	Safety time	TS 7,5 Duration of safety time in seconds
(8)	Minimum value of the ionization electricity	No number 0.5μA _{DC} (standard sensitivity)
(9)	Supply voltage	G 230Vac 50/60Hz
(10)	Operating mode of the ignition device	No digit The ignition device works during the discharge time TSP (TS – 1second)
(11)	Repetition rate of the spark	No digit 25 Hz
(12)	Behavior in the presence of a parasitic flame signal or with failure of the flame amplifier	No digit The module stays expectant/ pre-ventilation non-stop
(13)	Absence or insufficiency of air at start/fume thermostat open at start	No digit The module stays expectant/ pre-ventilation non-stop
(14)	Absence or insufficiency of air in the system/fume thermostat open in the system	No digit Safety stop followed by expectant permanence/ pre-ventilation non-stop
(15)	Absence of flame in the system	No digit Repetition of 3 ignition attempts
(16)	Repetition attempts of the ignition cycle	Y3 Multiple attempts (3)
(17)	Pre-ignition time	No digit Not available (the ignition device starts at the beginning of the safety time)
(18)	Post-ventilation time	No digit No time for post-ventilation
(19)	Waiting intertime or ventilation intertime	No digit No ventilation intertime

1.3 CONTROL BOARD LCD TYPE LCD1.B80 150MM

Label	Description
	LCD1.B80 150MM → Lunghezza cavo flat 14 poli → Tipo di tasti (100±50 gf 8 mm) → Numero tasti presenti → Retroilluminazione di colore blu

2 DESCRIPTION

The board 960.AE1.03.01 code 16025012 has been developed for use on cooking appliances series "Grillvapor", produced by Arris Catering Equipment S.r.l, with atmospheric gas burner, with an open combustion chamber or, in the future, watertight. The board with two microcontrollers is able to control the operation of the cooking system according to the functional specifications required by the customer, and to implement the ignition cycle and to control the burner flame.

3 GENERAL FEATURES

The board 960 has the following features:

- Compliance with the EN298 - 2003 (European standard for automatic programming and verification of the presence of flame gas burner);
- Independent control of safety functions and management of the stove, through the use of two separate microcontrollers;
- Monitoring and control of the various parts of the cooking system: buzzer 230V~, electric motor 230V~ spit, electrovalve 230V~ for automatic loading/manual water, capacitive discharge ignition device on board, smoke extraction speed fixed (application sealed chamber) Brahma gas valve serie VCM02*Sxx 24VDC, safety thermostat, flue gas thermostat (application open chamber) or air pressure (application sealed chamber), water level sensor of drawer, drawer status sensor, temperature sensor with PT1000 sensor, enabling input/inhibition of key SW3 of control board LCD1;
- Use of application with separated ignition electrode and flame detection electrode (bi-electrode);
- Waiting time (TW - application with open chamber) or pre-ventilation (TP - application with the sealed chamber) 1,5 sec, safety time (TS) 7,5 sec (nominal values);
- Three attempts of start;
- Condition of non-volatile lockout with manual reset;
- Minimum flame signal is detected (sensitivity of the board) $0,5\mu A_{DC}$;
- System not sensitive to the polarity of the main power supplies (unit non-polarized);
- Cooking programs with core probe with thermosensitive element PT1000 (1000Ω at $0^{\circ}C$ class B) with characteristic for $t \geq 0^{\circ}C$

$$R(t) [\Omega] = R_0 [\Omega] * (1 + A * t + B * t^2)$$

where: $A = 3,9083 * 10^{-3} \text{ }^{\circ}C^{-1}$ and $B = -5,775 * 10^{-1} \text{ }^{\circ}C^{-2}$;

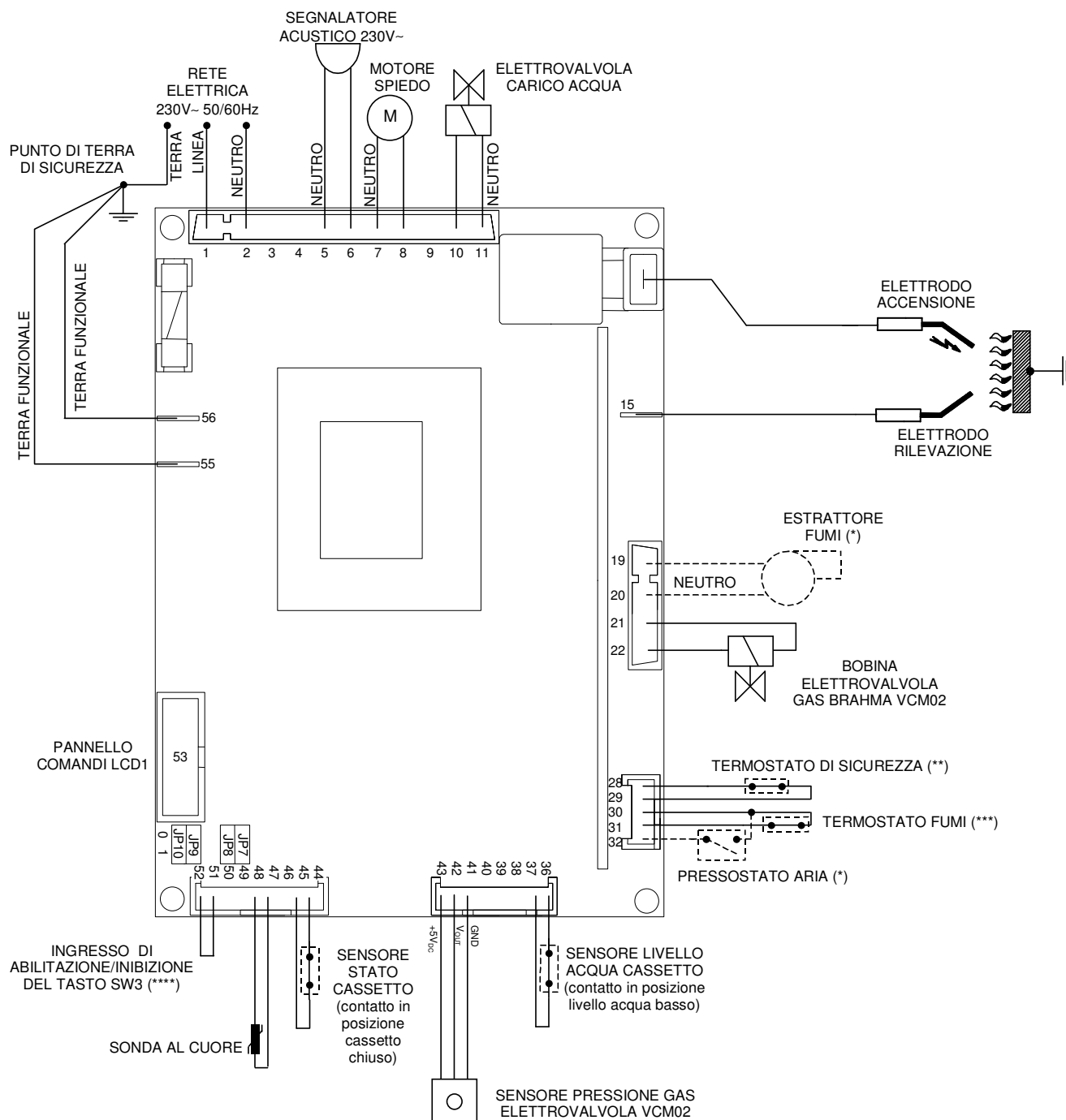
- Insulation SELV (Safety Extra Low Voltage) of 3,75kV and 5 mm on the surface of the printed circuit between components connected to the main and low voltage controls;
- Power of operation set by the users in the range $0\% \div 100\%$ with 11 possible levels in case of operation with natural gas (from L. 1 $\Rightarrow$ 0% to L. 11 $\Rightarrow$ 100%) and with 13 possible levels in case of operation with LPG gas (from L. 1 $\Rightarrow$ 0% to L. 13 $\Rightarrow$ 100%);
- Adjustments and diagnostic information on control board LCD type LCD1.B80 150MM connected via 14-pin flat cable;
- Selection of the type of gas through a jumper and selection of the version of "Grillvapor" on which the board is used;
- Setting the functional parameters by software;
- Compatible EMC system ;
- Varistor protection from voltage transients, which can be generated into the electricity grid.

4 INSTRUCTION FOR THE INSTALLATION

In order to allow the proper functioning of the system it recommended to follow the guidelines:

- Respect the applicable national and European standards relation the electrical safety;
- The board 960 has been designed for proper operation of single-phase system with a grounding conductor. In the presence of power supply phase to phase is recommended the installation of an isolation transformer with a power suitable to the final application, in which one pole of the secondary result connected to the ground potential;
- The ground connection of the board is "functional". For further information about ground connection, see section 5 "Wiring Diagram";
- Before starting the appliances, check the cable carefully. Wrong connections can damage the device and compromised safety;
- Arm and disarm the control system only in absence of tension;
- The board 960 can be installed in all positions;
- Avoid the system to be exposed to dropping water or condensation;
- The appliance on which the temperature control system will be installed must provide suitable protection against the risk of electric shock (at least IP20);
- It is recommended to keep separate the signal cables (tension SELV) from the power ones (voltage and high voltage cable of the ignition device).

5 WIRING DIAGRAM



(*) Parts used only on application with sealed combustion chamber (JP7 = position 0).

(**) In case of absence of the safety thermostat the poles 28 and 29 must be shorted.

(***) The flue gas thermostat should be used with final application with open chamber (JP7 = position 1) and the above mentioned parts at point (*) must not be installed. In the case in which the flue gas thermostat with the final application on open chamber is not present, the poles 30 and 31 must be shorted.

(****) The bridge wire is to be made only on the final application with core probe.

5.1 CONNECTION FOR HIGH-VOLTAGE

Function	Contact position	Type of connector
Supply voltage 230V~	1 (linea) - 2 (neutro)	11 poli Stelvio CFM/...A o Stocko MKS 2820
Buzzer 230V~	5 (neutro) - 6 (linea - n.o.)	
Electric motor skewer 230V~	7 (neutro) - 8 (linea - n.o.)	
Water loading electrovalve 230V~	10 (linea - n.o.) - 11 (neutro)	
Ignition electrode	trasformatore on-board	Fast-on maschio 2,8x0,5
Fume extractor (*)	19 (linea) - 20 (neutro)	4 poli Stelvio CFM/...A o Stocko MKS 2820
Electrovalve coil Brahma serie VCM02*SPP 24VDC	21 (GND n.o.) - 22 (PWM@24V _{DC} n.o.)	
Functional ground	55 - 56	Fast-on maschio 6,3x0,8

5.2 CONNECTION TO LOW-VOLTAGE (SELV)

Function	Contact position	Type of connector
Safety thermostat (**)	28 - 29	6 poli Lumberg 2,5 MSF
Fume thermostat (***)	30 - 31	
Presso stato aria (*)	30 - 32	
Water level sensor	36 - 37	8 poli Lumberg 2,5 MSF
Gas pressure electrovalve sensor Brahma serie VCM02*Sxx 24VDC	38 (GND) - 39 (V _{OUT}) - 40 (+5V _{DC})	
Drawer status sensor	44 - 45	9 poli Lumberg 2,5 MSF
Core probe (PT1000)	47 - 48	
Input SI/NO digit SW3	51 - 52	
Control board LCD1.B80 150MM	53	AMP – 281272-2

5.3 SOFTWARE PARAMETER

The board 960.AE1.03.01 has 12 software parameter, which allow to configure the system in relation to the final application on which it is installed. The following table shows the meaning of the parameters and the respective range of allowed values.

Parameter index	Range parameter value	Parameter meaning	Parameter value pre-installed
1	0 ÷ 100% - step 1%	Power of burner ignition	100%
2 (note 1)	0 mbar ÷ parameter value n.° 3 mbar step 0.2 mbar	Minimum pressure to the burner supplied with natural gas (JP9 = position 0) and final application serie 700/710 - GV ...7 (JP10 = position 0)	2,9 mbar
3 (note 1)	parameter value n.° 2 mbar ÷ 40.0 mbar step 0.2 mbar	Maximum pressure to the burner supplied with natural gas (JP9 = posizione 0) and final application serie 700/710 - GV ...7 (JP10 = position 0)	11,1 mbar
4 (note 2)	0 mbar ÷ parameter value n.° 5 mbar step 0.2 mbar	Minimum pressure to the burner supplied with LPG (JP9 = position 1) and final application serie 700/710 - GV ...7 (JP10 = position 0)	11,9 mbar
5 (note 2)	parameter value n.° 4 mbar ÷ 40.0 mbar step 0.2 mbar	Maximum pressure to the burner supplied with LPG (JP9 = position 1) and final application serie 700/710 - GV ...7 (JP10 = position 0)	35 mbar
6 (note 3)	0 mbar ÷ parameter value n.° 7 mbar step 0.2 mbar	Minimum pressure to the burner supplied with natural gas (JP9 = position 0) and final application serie 900/910 - GV ...9 (JP10 = position 1)	2,9 mbar
7 (note 3)	parameter value n.° 6 mbar ÷ 40.0 mbar step 0.2 mbar	Maximum pressure to the burner supplied with natural gas (JP9 = position 0) and final application serie 900/910 - GV ...9 (JP10 = position 1)	11,1 mbar
8 (note 4)	0 mbar ÷ parameter value n.° 9 mbar step 0.2 mbar	Minimum pressure to the burner supplied with LPG (JP9 = position 1) and final application serie 900/910 - GV ...9 (JP10 = position 1)	11,9 mbar

Parameter index	Range parameter value	Parameter meaning	Parameter value pre-installed
9 (note 4)	parameter value n.° 8 mbar ÷ 40.0 mbar step 0.2 mbar	Maximum pressure to the burner supplied with LPG (JP9 = position 1) and final application serie 900/910 – GV ...9 (JP10 = position 1)	35 mbar
10	5 ÷ 60 sec. - step 1 sec.	Duration time of the water loading phase in manual mode (press button SW5)	10 sec.
11	1 ÷ 20 min - step 1 min.	Duration time of water loading phase, 1n automatic mode (contact sensor level close)	4 min.
12	0 - 1 - 2	Behavior of the system at the end of the phase of cooking with core probe, or when the sensor detects a temperature higher than the one set by the user: 0 = burner off and acoustic signal of end cooking 1 = the burner works at level L. 1 with acoustic signal of end cooking 2 = the burner goes on working at the set level with acoustic signal of end cooking	0

Note 1: The parameters n.° 2 and 3 are used if JP9 and JP10 are in position 0; conversely, the value is replaced by “---” because parameters are not of interest to the final application in which the board is installed.

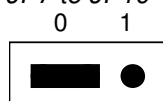
Note 2: The parameters n.° 4 and 5 are used if the jumper JP9 is in position 1 and the jumper JP10 is in position 0; conversely, the value is replaced by “---” because parameters are not of interest to the final application in which the board is installed.

Note 3: The parameters n.° 6 and 7 are used if the jumper JP9 is in position 0 and the jumper JP10 is in position 1; conversely, the value is replaced by “---” because parameters are not of interest to the final application in which the board is installed.

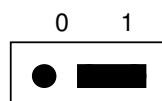
Note 4: The parameters n.° 8 and 9 are used if the jumper JP9 and JP10 are in position 1; conversely, the value is replaced by “---” because parameters are not of interest to the final application in which the board is installed.

5.4 JUMPER FUNCTION

Jumper from JP7 to JP10



Jumper in posizione 0



Jumper in posizione 1

Jumper	Operation with jumper in position 0	Operation with jumper in position 1	Jumper position from factory
JP7	Application with sealed chamber	Application with open chamber	1
JP8	Not used	Not used	0
JP9	Application with natural gas	Application with LPG	0
JP10	Used control board 960.AE1.03.01 on application 700/710 – GV ...7	Used control board 960.AE1.03.01 on application 900/910 – GV ...9	0

Modify the position of the jumper when the board is not supplied.

6 TECHNICAL DATA

Power voltage	230 V~ +10% -15%
Supply frequency	50/60 Hz
Operation temperature range	from -20 °C to +60 °C
Umidity	95% max at 40 °C no condensation
Potection grade	IP00
Consumption without load	15VA
Weight	About 523 g

Maximum contact rating (*)	
Gas electrovalve Brahma type VCM02*Sxx 24VDC	0,4 A _{DC}
Fume extractor	0,5 A cos $\varphi \geq 0,4$
Water loading electrovalve	0,1 A cos $\varphi \geq 0,4$
Electric motor skewer	0,5 A cos $\varphi \geq 0,4$
Buzzer	0,1 A cos $\varphi \geq 0,4$

(*) The total amount of the loads in operation must be less than 1 A

Internal fuse	3.15 A rapido 250 V~
Maximum length of core probe cable	< 3 m
Maximum length of other cables	< 1 m

Classification according to EN 298	B M C L X N
CE PIN	0694BR0914

7 SAFETY STANDARD MODULE SRM

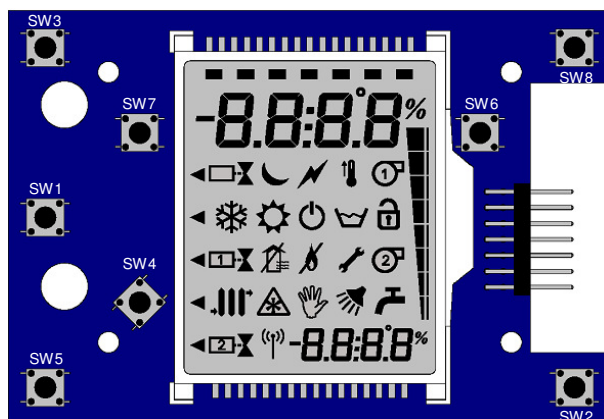
7.1 GENERAL FEATURES

The board 960.AE1.03.01 has two microcontrollers. The first one is located in the module serie SRM (PCB vertical) and has the task of managing all the security features of the system, such as the feeding of the gas, the flame monitoring, control fume extractor, the air pressure or the flue gas thermostat and safety thermostat. The second one is located on the 960 board (PCB horizontal - base) on which is put the SRM module and performed all the functions of the non-safety management system (non-safety loads, management control board, etc...).

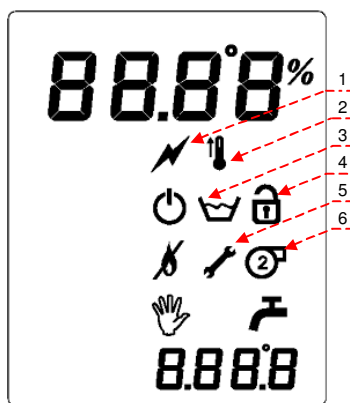
The SRM module is equipped with non-volatile lockout, so the release function is manually performed through the bottom SW2 on the board LCD1. The SRM module performs the operations of power and control of burner flame after the receipt of the request for heating by the adjustment section. The functional status of the SRM module has constantly transmitted to the second microcontroller through I2C bus communication protocol. This allows the knowledge of all the necessary information for the monitoring of the system and the display of diagnostic information on the LCD display connected to the control board.

8 OPERATING CONTROL BOARD 960.AE1.03.01

8.1 ASPECT OF THE CONTROL BOARD LCD TYPE LCD1.B80 150MM



Used digit and icons



8.2 CONTROL BOARD LCD1.B80 150MM IN USER MODE

Button	Function	Description
SW8	ON/OFF	Pressing and holding in the button for 4 seconds determines the passage of the board from OFF state to ON state. To re-set the board in OFF state it is needed to press and hold the button for 2 seconds.
SW6	none	<i>Cooking without the use of the core probe (see button SW3)</i> The button is inhibited.
	SELECT	<i>Cooking with the use of the core (see key SW3)</i> The button performs the selection of the level flame function or cooking end temperature that the user needs to know and/or needs to modify. In practice, if the LCD displays the flame level, for example, L. 5 after the pressing of SW6 button, the set point temperature is shown continuously, for example 90°, which determines the end of the cooking phase. The pressing of SW6 button determines the display of the selected level flame.
SW2	reset anomalies Err 2 Err 8	- This button is used to restore the functioning of the system when there are the following conditions of block: - Block non-volatile due to lack of burner ignition Err 2; - Block non-volatile due to the intervention of the safety thermostat Err 8;

Button	Function	Description
SW7	Increasing of flame level	<i>Cooking without the use of core probe</i> (see button SW3) After the press of the button the value of flame level on the display is increased by one unit. While holding in the button, the value of flame level is continuously increased.
	Increasing of flame level or end cooking temperature	<i>Cooking with the use of core probe</i> (see button SW3) After the press of the button the value of flame level or end cooking temperature on the display is increased by one unit. While holding in the button, the value of flame level or the value of end cooking temperature is continuously increased.
SW4	Decreasing of flame level	<i>Cooking without the use of core probe</i> (see button SW3) After the press of the button the value of flame level on the display is decreased by one unit. While holding in the button, the value of flame level is continuously decreased.
	Decreasing of flame level or end cooking temperature	<i>Cooking with the use of core probe</i> (see button SW3) After the press of the button the value of flame level or end cooking temperature on the display is decreased by one unit. While holding in the button, the value of flame level or the value of end cooking temperature is continuously decreased.
SW3	none	<i>No wire bridge jumper pin 51-52</i> The button is inhibited.
	Enable / Inhibit the use of core probe	<i>Presence wire bridge pin 51-52</i> With this button, the user enables or inhibits the use of the core probe. In case where the use is enabled, in the lower part of the display the temperature measured by the core probe is shown, while in the upper part of the display the flame level or the end cooking temperature value set by the user are displayed. The latter appears after pressing SW6 button. By pressing SW3 button the use of the core probe is inhibited, as a result on the LCD display the temperature detected by the core probe disappears and on the top only selected flame level is shown. During the ignition burner phase, the indication of the temperature value detected by the core probe is temporarily replaced by the number of the ongoing ignition attempt.
SW1	ON/OFF skewer motor	Using this button the engine of the skewer can be turned on or turned off. In the case in which it is turned on the icon 6 is visible.
SW5	ON/OFF manual loading of water	Using this button the manual loading of the water can be activated, which is automatically turned off by the board at the end of the time set by the parameter n.10. The loading can also be terminated before the expiry of this time, by pressing SW5 button. When the water loading is active, icon H is visible.
SW6+SW8	Access to the parameters menu	By simultaneously pressing the button SW6 and SW8, the parameter menu of the board is accessible, where it is possible to see and to change the value of the parameters described in section 5.3 "Parameter software."

With board in OFF state the backlight device is off. It will be on, if a button is pressed for five seconds or it will permanently on, if the parameter menu is entered.

With board in ON state the backlight device is always on. When it is switched from ON state to OFF state the backlight device stays on for five seconds and then it turns off.

8.3 CONTROL BOARD LCD1.B80 150MM IN PARAMETER MENU MODE

Mediante la pressione simultanea dei tasti SW6 ed SW8, si ha accesso al menù parametri della scheda. Sul display LCD della scheda comandi sono riportate le seguenti indicazioni:

<i>Visualization</i>	<i>Visualization meaning</i>
F	Active parameter menu (active flashing icon)
Writing from P.1 to P.12	Parameter index, shown on the lower right corner
Value from 0 to 100	Parameter value, with possible unit of measure, shown on the top

The buttons have the following functions:

<i>Button</i>	<i>Function</i>	<i>Description</i>
SW8	Parameters exit menu	By pressing this button is caused the exit of the system from the parameters menu, in fact, the control board will return to work as described in section 8.2 "Control board in user mode."
SW6	Enable/inhibit the modifications of the parameter value	In the case that it is needed to change the displayed parameter value, the user must press this button to change the parameter value using the buttons SW4 and SW7, and then press it again, in order to inhibit the change of the added modifications. When the system allows the change of the value of the displayed parameter, the icon 4 is active and flashing.
SW2	reset anomalies Err 2 Err 8	See section 8.2 "Control board LCD1.B80 150MM in user mode."
SW7	Increase of parameter index	By pressing this button, the parameter index is increased by one unit. While holding in the button, the index is continuously increased. This operation is valid, if icon 4 is turned off, the SW6 back button must be pressed to inhibit the change in the parameter value.
	Increase of the shown parameter value	After pressing the button, the parameter value is increased by one unit. While holding in the button the value of the parameter is continuously increased. This operation is valid, if the icon 4 is active and flashing. Vice versa, the SW6 button must be pressed to allow the modification of the parameter value.
SW4	Decrease of parameter index	By pressing this button, the parameter index is decreased by one unit. While holding in the button, the index is continuously decreased. This operation is valid, if icon 4 is turned off, the SW6 back button must be pressed to inhibit the change in the parameter value.
	Decrease of the shown parameter value	After pressing the button, the parameter value is decreased by one unit. While holding in the button the value of the parameter is continuously decreased. This operation is valid, if the icon 4 is active and flashing. Vice versa, the SW6 button must be pressed to allow the modification of the parameter value.
SW3	Enable/inhibit the use of the core probe	See section 8.2 "Control board LCD1.B80 150MM in user mode."
SW1	ON/OFF skewer motor	See section 8.2 "Control board LCD1.B80 150MM in user mode."
SW5	ON/OFF manual loading of water	See section 8.2 "Control board LCD1.B80 150MM in user mode."

8.4 POWER CYCLE

After powering up the board, it takes about 5 seconds before it meets any request of heat, or signal anomalies, in order to allow a proper initialization of the system. During this phase, the display LCD is visible at the top and flashes the icon "----", while in the lower right corner is displayed in flashing mode the word r. 3.1, which shows the revision (r.) of the microcontroller's firmware that performs the management functions of the non-safety system (board 960, first digit "3") and the one that performs switching and control the burner

flame (SRM module, second digit "1"). The blue backlight of the display is active. The ignition cycle of the burner will start, if the system is in ON state (icon A is not present on the LCD display) and if the sensor of the status tray and water level are at rest (respectively with cleaned and close contact - closed and open drawer – water level corrected). Conversely, their faults are reported and the burner is off. In the case of application with sealed combustion chamber, the control device puts into operation the smoke extractor if, and only if, the air pressure is in the condition of "non air circulation"; when the latter switches into "air circulation" begins the pre-ventilation TP, after which, with the power of the gas valve and the activation of the ignition device starts the safety time TS.

In the case of final application open chamber, the device sets the beginning of the waiting time TW after checking that the flue gas thermostat is closed, and, at the end of the phase, with the power of the gas valve and the activation of the ignition device since the beginning of the safety time TS.

During the safety time (icon 1 is active and words "Acc. 1" or "Acc. 2" or "Acc. 3" are present in the lower right), the burner output, ie. the output pressure of the gas valve is maintained at a value (ignition power) according to parameter n.° 1, according to the following relationship:

$$P_{OUT} [\text{mbar}] = ((\text{parameter value n.}^\circ 1 * (P_{OUTMAX} [\text{mbar}] - P_{OUTMIN} [\text{mbar}])) / 100) + P_{OUTMIN} [\text{mbar}]$$

P_{OUT} = output pressure of the gas valve during the ignition phase

P_{OUTMAX} = maximum output pressure to the gas valve, which is set by the parameters n.° 3 or n.° 5 or n.° 7 or n.° 9, in relation to the position taken by the jumpers JP9 and JP10

P_{OUTMIN} = minimum output pressure to the gas valve, which is set by the parameters n.° 2 or n.° 4 or n.° 6 or n.° 8, in relation to the position taken by the jumpers JP9 e JP10

If, at the end of the safety time, a flame is detected (icon J is on), the operating power of the burner will be adjusted to the level set by the user, vice versa the gas valve is closed and there is a further attempt power - sharing from time to pre-ventilation or wait. The board is characterized by three ignition attempts at the end of which, if not detected, flame goes into lock state nonvolatile. This state is reported to the user through an error code and to restore the system, the button SW2 must be pressed on the control panel LCD1.B80 150MM. In case there is still a demand for heat, the board will begin a new cycle of ignition and if the conditions that led to the block are still present will return in that state. The condition of the system (gas valve and fed flame are present) continues until the request for heat ends, one of the safety devices occur or turn off the flame.

8.5 COOKING WITHOUT CORE PROBE

The cycle of activation and operation of the system in the case of cooking without core probe is described below, starting from the condition of board in OFF state.

Board in OFF state:

On the LCD display of the control board the icon "A" is on. The flame level displayed is the "L. 7", which is set in an automatic way from the card when it passes from the ON state to the OFF one. The automatic setting of this level is independent concerning the type of fuel used (natural gas/LPG - JP9 position) or the type of final application selected (GV...7/GV...9 - JP10 position).

The keys on the control board have the function shown in section 8.2 "Control board LCD1.B80 150MM in user mode".

Board in ON state:

Pressing and holding in the button SW8 for 4 seconds the change of status of the board from OFF state to ON state is determined with the switching off of icon A and the backlight of the display is switched on. If the sensor of drawer status reports "drawer closed" (cleaned close contact), the control board 960 performs the control of the water level in the drawer. Vice versa, with an open drawer (cleaned close contact) the failure is signaled by the flashing code "Open P" and will not start the ignition cycle until the drawer is closed. If the water level sensor indicates the presence of a proper amount of liquid in the tray (cleaned open contact), it starts the ignition cycle of the burner. Vice versa (cleaned close contact) the automatic water loading is started (electrovalve water loading supply), it is signaled by the flashing of icon 3 and if within the time value prefixed by parameter n.° 11, the sensor does not report the achieving of the expected level (cleaned open contact), the error is reported to the user by an error code. To allow the system to re-start, it is necessary to turn off and on the board by pressing SW8 button. In case of opening of the drawer during the loading phase, the water is stopped. Once the operation of automatic water loading is finished, the control board sets the beginning of the ignition cycle of the burner, which is performed as described in section 8.4 "Power cycle". In the case in which the sensor of water drawer status is not present on the final application, there is

the functional condition that states that the board 960 detects the information about the right water level (cleaned open contact) even if the water drawer is not properly closed, it does not matter how much water is in. Consequently, even in the absence of water in the tray, the burner is lit, but some problems of overheating of the final application may be occurred. The automatic water loading is started, if required by the level sensor, when the drawer is correctly closed. if, at the end of the safety time, the board has detected the presence of the flame, the system goes to work at the level set by the user. The flame level set by the user is in practice translated into a pressure value that the system has to chase and maintain stable. The system measures the pressure in output gas valve Brahma serie VCM02*Sxx 24VDC. The formula relating the level flame to the pressure value is the following:

$$P_{OUT} \text{ [mbar]} = (((\text{level flame value} - 1) * (P_{OUTMAX} \text{ [mbar]} - P_{OUTMIN} \text{ [mbar]})) / 10) + P_{OUTMIN} \text{ [mbar]}$$

P_{OUT} = output pressure of the gas valve during the ignition phase

P_{OUTMAX} = maximum output pressure to the gas valve, which is set by the parameters n.° 3 or n.° 5 or n.° 7 or n.° 9, in relation to the position taken by the jumpers JP9 and JP10

P_{OUTMIN} = minimum output pressure to the gas valve, which is set by the parameters n.° 2 or n.° 4 or n.° 6 or n.° 8, in relation to the position taken by the jumpers JP9 e JP10

Example of calculation

JP9 = position 1 (application runs on LPG)

JP10 = position 0 (GV...7)

P_{OUTMAX} = parameter value n.° 5 = 35 mbar

P_{OUTMIN} = parameter value n.° 4 = 11.9 mbar

Flame level set = L. 8

$$P_{OUT} \text{ [mbar]} = (((8 - 1) * (35 \text{ [mbar]} - 11,9 \text{ mbar})) / 10) + 11,9 \text{ [mbar]} = 28 \text{ [mbar]}$$

In the case that the water tray is open (cleaned open contact) and the burner works, the functional stop of the system occurs (burner OFF) on the display LCD of the control board LCD1.B80 the words "Open P" appear. In the case that the burner works and the level sensor detects an insufficient water quantity (cleaned close contact), the system activates the electrovalve of loading. This phase (cleaned close contact) must end within the prefixed time set in the parameter n.° 10, if not the function of the system will stop (burner OFF).

To turn off the burner it is necessary to lead the system to the OFF state by pressing and holding in the button SW8 for at least 2 seconds. The operation of the buttons of the control board is reported in section 8.2 "Control board LCD1.B80 150MM in user mode".

8.6 COOKING WITH CORE PROBE

The system works as described in section 8.5 "Cooking without core probe" with the following differences:

- The start up of the burner occurs with the board in ON state and if the temperature detected by the core probe is lower than the temperature of the end cooking set point fitted by the user (given that the drawer status sensors and water level sensors are in resting state);
- When the temperature exceeds the set point fitted by the user (end of cooking phase with core probe) the board behaves in different ways depending on the value of the parameter n.° 12 as described below:

Parameter value n.° 12	Work of the system
0	The board goes from ON to OFF when the temperature measured by the core probe becomes higher (greater) than the set point selected by the user. The board provides an indication at the end of cooking through the exit for the acoustic signal which is supplied for 1 second every 3 seconds.
1	The flame level passes automatically from the value set by the user to the value L.1, when the temperature measured by the core probe becomes higher (greater) than the point selected by the user. The board provides an indication at the end of cooking through the exit for the acoustic signal which is supplied for 1 second every 3 seconds.
2	The board provides an indication at the end of cooking through the exit for the acoustic signal which is supplied for 1 second every 3 seconds, when the temperature measured by the core probe becomes higher (greater) than the set point selected by the user. The flame level will remain fixed to the value set by the user.

- At the end of the cooking phase an indication of the temperature measured by the probe is flashing. To cancel the optical and acoustic signals the user must press the button SW3. Subsequently the burner will turn off if active (board in OFF state)
- In case of failure of the sensitive element of the probe the system does not turn on the burner or turned it definitively off.

8.7 CODIFICATION OF ANOMALIES

In case of anomalies, the related error code is flashing displayed on the LCD display. There is the sign ERR. on the top of the display, the error code on right lower and the icon L. The following scheme describes the error codes for each anomalies.

Error code	Type of anomalies
Err 1	<u>Automatic load of water failed</u> If the phase of automatic load of water, which started after the closure of the clean contact of level sensor, doesn't finish within the prefixed time of parameter n° 11, there will be the instant stop of the system (switch off of the burner if on or miss switching if off) and the display of error code (ERR 1) and of icons P, H and L. To allow the work of the system is necessary to select OFF status and then ON status through the button N°8 on control screen.
Err 2	<u>Stop non-volatile for the lack of the ignition</u> In case of the lack of flame detection after 3 attempts the system reaches the status of stop non-volatile and the related error code can be seen on the control panel. The icon K can be seen. To allow the board to start again it is necessary to push the button N°2 on the control board.
Err 5	<u>Fault air pressure status</u> (Application sealed chamber JP7 = position 0) <i>Air pressure status pasted to the starting point:</i> in the case where the air pressure is detected in the position of " air circulation ", before the start of the pre-ventilation time, it has the non-execution of the ignition cycle and after 5 seconds from the start of fume extractor, the error code is displayed. <i>Absence or insufficient air flow at start:</i> in the event that the air pressure switch is not in the position of " air circulation " during the pre -purge , you have the non-performance of the ignition cycle and after 15 seconds error code is displayed. <i>Absence or insufficient airflow during the TS or scheme:</i> if the air pressure returns to the position of " non-circulation air " it is necessary an immediate turn off the burner and after 10 seconds the error code is displayed. To restore the system to work properly, it is necessary to remove the fault condition.

Error code	Type of anomalies
Err 6	<u>Breakdown of gas pressure sensor</u> In case of breakdown or disconnection of gas pressure sensor, which is near the gas exit valve serie VCM, the immediate stop of the burner occurs and the related error code can be seen. In order to restore the right work of the system it is necessary to remove the breakdown condition or substitute the gas valve.
Err 7	<u>Breakdown on flame detector</u> The detector of a simulated flame signal does not switch on the burner. The icon J can be seen and it is flashing. In order to restore the right work of the system it is necessary to remove the breakdown condition or substitute the board.
Err 8	<u>Intervention of the security thermostat</u> The intervention of the security thermostat (opening contact) causes the immediate stop of non-volatile by the system. ON LCD display the icon 2 is on. In order to allow the board to re-start (reset) it is necessary to push button N°2.
Err 10	<u>Intervention of the flue gas thermostat</u> (application open chamber JP7 = position 1) <i>Flue thermostat open at the start:</i> in case the flue gas thermostat responds (contact opening) before the start of the waiting time (TW), the non-performance of the ignition cycle occurs and after about 5 seconds the system moves to state safety stop.

	<i>Opening the flue gas thermostat during the TS or at operating capacity:</i> immediate shutdown of the burner and after about 5 seconds, the system comes to a safe stop. To enable the Board to allocate the button SW8 the control board must be pressed.
Err 11	<u>Anomalies to core probe</u> The failure of core probe, for example the disconnection or damage, causes the instant stop of the burner followed by the display of the related error code. This damage is detected and signaled only if the system was set up (button SW3) for the use of core probe. In order to restore the right work of the system is necessary to remove the failure condition or to use the application inhibiting the use of core probe (see the paragraph 8.2 "Control screen LCD1.B80 150MM in user method" button N°3)
Err 12 Err 30 Err 99	<u>Internal breakdown on board 960</u> In case that there are problems of communication between the microcontroller of the thermoregulation section and of the microcontroller module SRM (Err 30), internal problems to the memory eeprom (Err 12) or internal problems detected by the microcontroller module SRM (Err 99) the immediate stop of the burner occurs and the error code can be seen. In this case it is necessary to substitute the board.
Open P	<u>Open water drawer</u> The 960 board has detected the failure of closing the water drawer, consequently it reveals the opening of the drawer and if the burner is off, the board deactivates it, otherwise if the burner is on, it will switch off.

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