DIGITAL TEMPERATURE ADJUSTMENT SYSTEMS Type 380

MICROCONTROLLER-BASED TEMPERATURE ADJUSTMENT AND CONTROL BOARD FOR CONDENSING PREMIX BOILERS

DESCRIPTION

This unit has been specifically designed for safety cycle and temperature control in condensing premix gas boilers.

GENERAL FEATURES

This board is provided with the following main features:

- CE approval according to Gas Appliance Directive 90/396/EEC and following amendments (Directive 93/68/EEC);
- compliance with EN 298:2003 (European standard for automatic gas burner control and flame monitoring systems);
- single electrode or double electrode ignition and flame monitoring (ionisation) system fitted with remote ignition device (type TR2) or external high-efficiency ignition device (type TD, TSM or TSC1);
- control of the boiler parts (system circulator, modulating fan, deflection valve, pneumatic gas valve, flow switch/flowmeter, air pressure switch, thermostats, etc.);
- controls, adjusters and signals on a customized module connected to the mother board by means of a multipolar flat cable;
- use of (up to 6) NTC contact and/or immersion probes for temperature measurement;
- microcontroller-based control of temperature adjustment functions;
- 4kV and 8mm SELV (Safety Extra Low Voltage) insulation on the printed circuit board surface between components connected to the mains supply and low voltage controls;
- flame modulation by means of a proportional, integral and derivative (PID) electronic system;
- differentiated setting of the required water temperature for heating and domestic hot water operation mode;
- prearranged for the connection of electromechanical limit and safety thermostats;
- burner heat capacity modulation by means of a PWM-controlled 230Vac brushless fan;
- possible circulator speed modulation according to the system characteristics;
- varistor protecting the system from voltage transients which may be generated in the mains supply;
- EMC system.

TECHNICAL DATA

Supply voltage:	230V - 50/60Hz
Operating temperature range:	-20°C / +60°C
Humidity:	95% max. at 40°C
Protection degree:	IP 00
Dimensions:	140x115x40mm

Classification according to EN298: FMCLXN

CONSTRUCTION

The system consists of four electronic boards:

a) **Mother Board (SM)**, which houses the electronics controlling the boiler parts (temperature adjustment) and carrying out some of the safety functions;

b) **Safety Module (MdS)**, including the electronics controlling the burner safety functions (valve control and flame detection); this module is mounted directly on the mother board by soldering, thus reducing the number of wires on the power switchboard;

c) **Control Board (SC)**, on which adjustment controls (push-buttons) and diagnostic signals (on a display) are mounted;

d) **Options Board (SO)**, including the electronics controlling optional functions, such as the Opentherm® remote communication protocol, the cascade boiler system connection interface, the control of a mixing valve, of a water filling electrical valve (if any) or of an additional room thermostat.

On customer's request, this system can be fitted to either a **Remote Ignition Device (AR)** type TR2 or an **External Ignition Device (AE)** type TSC1, TSM or TD, depending on the particular requirements of each application (reference paragraph **Part References / Option 10** on page 17).

ACCESSORIES

The system can control up to 6 temperature probes, all of them (*) provided with an NTC sensor type 10kΩ ± 1% at 25°C with β=3435°K ± 1%; these probes can be either contact (ST07) or immersion type (ST06 and ST09): in any case, do not fit terminals and female connectors of different brands.

The terminations used for board interfacing are type LUMBERG series MSF.

(*) On specific customer's request, the system can also control probes with electrical and mechanical characteristics differing from the above-mentioned ones (e.g. type ST03 or ST04).

N.B. For electrical and mechanical characteristics, please refer to the relevant Data Sheets (ST04N, ST06, ST09, ST07, ST10).

DIRECTIONS FOR INSTALLATION

- Respect the applicable national and European standards (e.g. EN60335-1/prEN50165) regarding electrical safety.
- Connect **live** and **neutral** correctly (in case the device is polarized); the non-observance of live-neutral polarity may lead to dangerous situations and cause flame detection failures.
- Before starting the system check the cables carefully: a wrong wiring can damage the devices and compromise the safety of the installation.
- Connect and disconnect the control system only after switching off power supply.
- The system can be mounted in any position.
- Avoid exposing the system to dripping water.
- The appliance in which this temperature adjustment system is mounted must provide adequate protection against the risk of electric shock (at least IP 20).
- Avoid placing control signal cables close to power cables.
- Make sure the device is connected to the grounding system correctly.

INTEGRATED TEMPERATURE ADJUSTMENT SYSTEM

Integrated temperature adjustment systems are usually customized (according to customer's requirements) as far as operation and control of the boiler parts are concerned. However, for a more detailed description, hereunder we will refer to the system type "380" in its "standard" configuration.

The main elements of this device are illustrated in the **Wiring Diagram** on page 19, whereas its main technical features are described here below.

Timings:

- prepurge time **(TW):**	1,5 … 60 s
- safety time **(TS):**	3 … 120 s
- (*) spark ignition time **(TSP):**	(TS - 1) s
- drop-out time on flame failure:	< 5 s
- post-purge time:	0 … 60 s
- inter-purge time:	1 … 240 s
- lockout for air flow failure at start up:	3 …15 s

The above times correspond to guaranteed values. Actual values may differ from declared ones, as prepurge time may be longer and safety time shorter. For a description of the Post-purge Time and the Inter-purge Time, see paragraph **Variations on operating cycle** on page 13.

*(*) Ignition with spark ignition time (TSP) can be requested as an option (see paragraph **Part References** on page 17) in double electrode systems, while it is always available in single electrode systems.*

Recycling attempts: 1…10
Power consumption: 4VA

Max. contact rating (contacts mounted on SM):

- EVG valve:	0.25A	cos φ ≥ 0.4
- Fan:	1A	cos φ ≥ 0.4
- Deflection valve:	1A	cos φ ≥ 0.4
- Circulator:	1A	cos φ ≥ 0.4
- External ignition device:	0.5A	cos φ ≥ 0.2

Max. cable length of external components: 1 m

Internal fuse: 4A quick acting

Flame control:
The flame detection device makes use of the rectification property of the flame; this device is not provided with any protection impedance, therefore the detection electrode is not safe against electric shock.

- Min. ionisation current: 0.5µA
- Recommended ionisation current: 3 ÷ 5 times the min. ionisation current
- Max. cable length: 1 m
- Min. insulation resistance of detection electrode and cable to earth: ≥ 50 MΩ
- Max. electrode stray capacitance: ≤ 1 nF
- Max. short circuit current: < 200µA AC

Remote Ignition Device (AR):
- Type: TR2

N.B. For electrical and mechanical characteristics, please refer to the relevant Data Sheets.

External Ignition Device (AE):
- Type: TSC1

N.B. For electrical and mechanical characteristics, please refer to the relevant Data Sheets.

External Ignition Device (AE) :
- Type: TD1xxxAF / TD2xxxAF

N.B. For electrical and mechanical characteristics, please refer to the relevant Data Sheets.

External Ignition Device (AE):
- Type: TSM

N.B. For electrical and mechanical characteristics, please refer to the relevant Data Sheets.

Contacts:
High voltage contacts
- Ignition device
- Fan (power supply)
- Circulator
- Gas valve
- Deflection valve / DHW circulator
- Limit thermostat

High voltage outputs or inputs are interfaced with the Mother Board (**SM**) by means of terminations type MOLEX series 2599.

Low voltage contacts
- Safety thermostat
- Air pressure switch / Combustion products discharge safety device
- Water pressure switch / Pressure transducer
- Room thermostat
- Secondary system room thermostat
- Flow switch / Flowmeter
- Fan driver
- 6 Temperature probes
- Control panel
- Serial communication (RS232)
- Night attenuation contact
- Serial communication (RS485)
- Remote communication (Opentherm®)

Low voltage outputs or inputs are interfaced with the Mother Board (**SM**) and the Options Board (**SO**) by means of screw terminal boxes (room thermostat, secondary system room thermostat, night attenuation contact, Opentherm® remote communication), terminations type LUMBERG series MSF or dedicated connectors (type RJ45 for RS485 serial communication).
Free power contacts
- Mixing valve
- Water filling valve

The mixing valve and the water filling valve control outputs are interfaced with the Options Board (**SO**) by means of a termination type MOLEX series 2599.

Temperature measuring probes
The system can control up to 6 temperature detection probes, two of which (the *primary system outgoing water probe* and the *combustion products detection probe*) must necessarily be always available: the remaining four (*domestic hot water probe*, *secondary system outgoing water probe*, *return water probe* and *external probe*) can be available or not, depending on the settings (software) selected by the user.
Please note that both the *primary system outgoing water probe* and the *combustion products detection probe* also operate as limit thermostats, enabling any heat demand to be inhibited if the water or the combustion products temperature exceeds the preset limit temperature. In this sense, if one of these two probes is cut-off or in short circuit, the temperature adjustment system will cancel any heat demand, preventing the boiler from operating.
Instead, in case of short circuit or cut-off of one of the remaining four probes, the system continues operating using the primary system outgoing water probe (for temperature adjustment), but anyway signalling the relevant failure (see paragraph **Anomalies** on page 7).

For all probes (*):

Cut-off probe detection threshold	> 50KΩ
Short-circuit probe detection threshold	< 500Ω

(*) For the *external probe* only:

Cut-off probe detection threshold	> 130KΩ
Short-circuit probe detection threshold	< 5.5KΩ

Safety thermostat
Normally, the system is perfectly safe against possible overheating in the primary system by means of a safety thermostat (either with manual or automatic reset) connected to the Mother Board (**SM**). The thermostat switching can immediately lead the system to non-volatile lockout (signalled by a suitable error code). Before attempting a new starting cycle, it is necessary to reset the board from lockout.

Mixing valve
The system can control an *electric mixing valve* to be connected to the Options Board (**SO**): this characteristic is useful in case of a mixed system for two areas with differentiated temperatures, i.e. a low-temperature area (e.g. floor radiant heaters) and a high-temperature area (e.g. classical radiators placed in bathrooms or in little frequented rooms such as mansards or taverns).
Else, in case of a system for two separate areas (without mixing valve but with *area pumps and/or valves*), the same contact as the mixing valve contact can be used (with a suitable software configuration) in order to control the second pump or the second power-driven area valve: to this purpose, see paragraph **Heating mode (secondary system)** on page 15.

(Primary system) circulator
The Mother Board (**SM**) can be fitted to any type of circulator with 230Vac power supply, which can be controlled in a classical way (*constant speed*) or through "phase-shift control" (*variable speed*): in case the latter characteristic is selected (reference paragraph **Part references / Option 12** on page 17), the system will be able to optimize the circulator control so as to make the difference (ΔT) between outgoing water temperature and return water temperature as great as possible, to the advantage of the boiler performance.

Deflection valve / DHW circulator
The system can control either boilers provided with a 3-way electric deflection valve (230Vac) to be connected to the Mother Board (**SM**), boilers fitted with an hydraulic deflection valve, or boilers equipped with a DHW circuit circulator (to be connected to the Mother Board (**SM**) on the same contact as the deflection valve). The different operation modes will be determined by suitable software parameters (see paragraph **Description of parameters / Parameter 17** on page 9).

Fan (power supply) / Fan driver
The system is prearranged for the use of a modulating fan (to be configured via software) with 230Vac power supply and controlled by means of a 24V PWM signal.
Several types of fan are compatible with the board, but it is advisable to know their characteristics for a final check.

Gas valve
The system is prearranged for the use of a valve with air-gas ratio control with230Vac power supply.
Several types of valve are compatible with the board, but it is advisable to know their characteristics for a final check.

Water filling valve
The Options Boars (**SO**) can be connected to any water filling valve with 230VAC power supply: this device can be switched on by the user (through a suitable push-button combination on the control panel) if the water pressure in the primary heating circuit is too low.

Limit thermostat
An additional protection against possible overheating in the primary circuit is given by the limit thermostat, connected to the Mother Board (**SM**) in series to the gas valve control. The thermostat switching stops the gas flow and consequently extinguishes the flame: then a starting cycle is carried out (with one or more ignition attempts) leading to non-volatile lockout.
N.B. In case the limit thermostat is not used, pins 2 and 3 of J19 (with reference to the WIRING DIAGRAM of the Mother Board on page 19) should be short-circuited.

Air pressure switch / Combustion products discharge safety device
It checks the correct circulation of combustion products in the combustion chamber and allows boiler ignition only if the fan is operating and the draft is regular; it also ensures the boiler safety shutdown if one of these conditions fails during operation.
It is important to note that the board type 380 can also work without air pressure switch (see paragraph **Description of parameters / Parameter 16** on page 9), as the boiler manufacturer may decide to disable its control via software. In this case, however, the fan speed is always kept under control (by the microcontrollers placed on the board), so that during the working cycle it can never drop below convenient safety thresholds.
N.B. In case the air pressure switch is not used, pins 6 and 7 of J5 (with reference to the WIRING DIAGRAM of the Mother Board on page 19) should be short-circuited.

Pressure transducer
The Mother Board (**SM**) can control an analog pressure transducer, such as the **IMIT** type PRP300. By means of this device, the systems constantly monitors the water pressure in the primary system (which can also be displayed by the user on the control board), thus ensuring a constantly low pressure in the system itself.

In case the pressure is too low, the temperature adjustment system inhibits any heat demand and signals the relevant failure on the Control Board (**SC**).
N.B. Usually, the board controlling the pressure transducer cannot use the water pressure switch / differential pressure switch (or vice versa) simultaneously. If this characteristic should be too restrictive, customers can ask for a product customization in order to meet their own specific requirements.

Water pressure switch / Differential pressure switch
The system is provided with an input which can be configured through the software (see paragraph **Description of parameters / Parameter 14** on page 9). This is placed on the Mother Board (**SM**) and can be used both as *(minimum) water pressure switch* and *differential pressure switch*: in the first case, the device ensures that the system pressure is higher that the minimum pressure allowed for correct operation, whereas the second solution guarantees safety against possible circulator failures.
The switching of the device connected ensures the boiler safety shutdown, but in differential pressure switch mode this will only occur with the circulator in running status.

Water flow switch / Flowmeter
The Mother Board (**SM**) is provided with an input connection signalling domestic hot water drawing. This signal can be generated by a flow sensor (flow switch or flowmeter): therefore, it is possible to control an electric 3-way valve or else a pump dedicated to the domestic hot water system.

Room thermostat
The room thermostat (or chronothermostat) is connected to the Mother Board (**SM**), at low voltage, by means of two wires; it is prearranged for operation with a contact isolated from the mains supply.

Secondary system room thermostat
The room thermostat (or chronothermostat) for the secondary system (available in double-temperature mixed systems or in systems with 2 separate areas) is connected to the Options Board (**SO**), at low voltage, by means of two wires; it is prearranged for operation with a contact isolated from the mains supply.

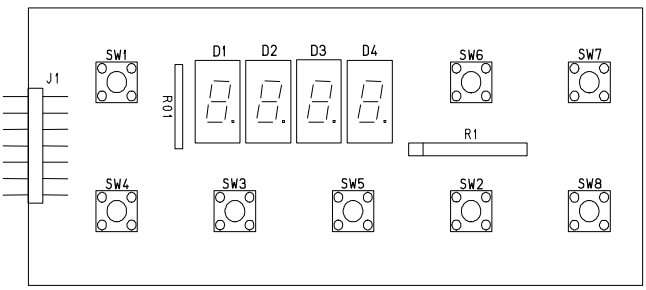
Night attenuation contact
The Options Board (**SO**) is provided with a connection for a clock or timer mounted on the boiler to adjust heating times; this clock/timer is prearranged for operation with a contact isolated from the mains supply.

RS232 serial communication
The Mother Board (**SM**) is fitted with a 6-pole connector for RS232 serial communication: this characteristic is useful both to update the board software directly on the field (without necessarily disassembling the board from the boiler or disconnecting it from the power supply), and to display system data on an external computer.

RS485 serial communication
The Options Board (**SO**) is provided with a connector for RS485 serial communication: this characteristic is useful to connect the board in a communication network (e.g. with ModBus® protocol), so as to carry out battery (condensing) boiler systems. Please note that each boiler can be controlled separately (and independently from the other ones) by means of an 8-position Dip-Switch also mounted on the Options Board (**SO**), and that the whole system will be controlled by a single BRAHMA make board (*type "382"*).

Opentherm® remote communication
The Options Board (**SO**) is provided with a connection for Opentherm® protocol communication: this characteristic is useful to control the board from a remote control panel, with possible integration in a chronothermostat, such as, for example, the *Brahma Encrono OT1*.

Control Board
For the board type 380, *Brahma* have developed two basic types of control panel: the (more traditional) one in which temperatures, settings and failure codes are displayed by means of LEDs (i.e. boards type *366* and *368*), and the one with LCD display (i.e. boards type *390* and *398*). Both control board versions are fitted with 8 push-buttons (**SW**) enabling the user to carry out any adjustment and setting during installation.
For our convenience, from now on we will refer to the control board type *368* (with LEDs), but the operation principles described hereunder are also valid for the control boards type *390* and *398* (except for some obvious differences which are only due to the use of an LCD panel).

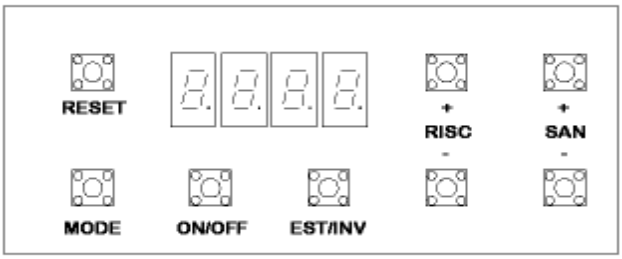


Three utilization modes are available:

1. *User* mode
2. *Password insertion* mode
3. *Parameters setting* mode, accessible both by boiler installers (by inserting the password reserved to the service centre), and factory technicians (by inserting the password reserved to the boiler manufacturer).

Depending on the selected mode (user / password insertion / parameters setting), the push-buttons and displays take on different meanings, which are described here below.

User mode



Description of push-buttons:

Push-button	Function	Description
SW1	RESET	Boiler reset from non-volatile lockout or from a communication error
SW2	- RISC	Primary system (and also secondary system, if available) set-point decrease (*)
SW3	ON/OFF	Board switching on and off
SW4	MODE	Selection of the information to display
SW5	EST/INV	Summer/winter mode selection
SW6	+ RISC	Primary system (and also secondary system, if available) set-point increase (*)
SW7	+ SAN	DHW system or hot water tank system set-point increase
SW8	- SAN	DHW system or hot water tank system set-point decrease

By pressing the push-button MODE repeatedly, the user can cyclically display any information regarding the sensors and transducers controlled by the system: each time, the display will show the probe temperatures, the system water pressure (if a pressure transducer is available) or the water pressure switch status (on/off), the flowmeter capacity (if available) or the flow switch status (on/off), and finally the number of fan revolutions.
After 10 seconds from the last pressing of the push-button MODE, the unit displays back the primary system outgoing water probe temperature.

*(*) In case both the primary and the secondary system are available (see paragraph **Description of parameters / Parameter 06** on page 9), both set-points will be displayed one after another, spaced by two segments* **[- -]** *for 3 seconds approx.*

Display description:

Display	Description
0 n	System ON
X X X.	System and flame ON
1 X X	Primary system outgoing water probe temperature
2 X X	Return water probe temperature (*)
3 X X	DHW probe temperature (**)
4 X X	External probe temperature (***)
5 X X	Combustion products detection probe temperature
6 X X	Secondary system outgoing water probe temperature (****)
7 X X	Pressure in bar (*****)
8 X X	Flowmeter capacity (********)
9 X X	Fan speed in number of revolutions per minute
I n v	Winter mode
E s t	Summer mode
	System OFF
. . . .	System OFF and power supply ON

(*) If in *Parameters setting mode* the use of this probe has not been selected (see paragraph **Description of parameters / Parameter 13** on page 9), two segments will appear on the display **[- -]** instead of the detected temperature value.
(**) If in *Parameters setting mode* a DHW circuit without the corresponding probe has been selected (see paragraph **Description of parameters / Parameter 00 and Parameter 01** on page 9), two segments will appear on the display **[- -]** instead of the detected temperature value.
(***) If in *Parameters setting mode* it has been determined that neither the primary system nor the secondary system (if available) must exploit climatic compensation (see paragraph **Description of parameters / Parameter 05 and Parameter 09** on page 9), the system will not require the availability of an external probe, therefore two segments will appear on the display **[- -]** instead of the detected temperature value.
(****) If in *Parameters setting mode* it has been determined that the secondary heating system is not

available (see paragraph **Description of parameters / Parameter 06** on page 9), two segments will appear on the display **[- -]** instead of the detected temperature value.
(*****) In case of a board controlling a *pressure transducer* (see paragraph **Part references / Option 13** on page 17), the system will display the primary circuit pressure value; otherwise, the reading **[0 n]** will appear on the display instead of the pressure value, indicating that the pressure switch is closed.
(******) If in *parameters setting mode* the availability of a flow switch has been set (see paragraph **Description of parameters / Parameter 15** on page 9), the following readings will appear on the display instead of the detected capacity value:

- **[0 n]** indicating that the flow switch is closed (domestic hot water demand in progress)
- **[- -]** indicating that the flow switch is open (no domestic hot water demand in progress).

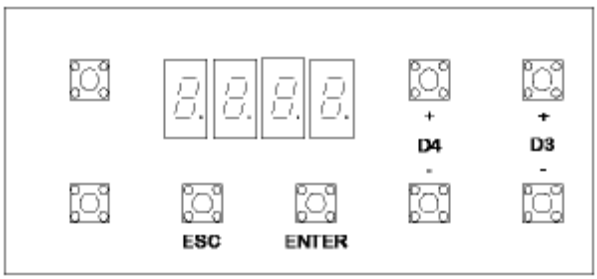
Anomalies
The board monitors the system and signals any anomalies.

Description of anomalies:

Display	Description
E 0 1	Safety thermostat opening
E 0 2	Lockout due to flame failure
E 0 3	Fan failure (*)
E 0 4	Air pressure switch / Combustion products discharge safety device stuck
E 0 5	No fan signal
E 0 6	Primary system failure (**)
E 0 7	Combustion products overheating
E 0 8	Primary system outgoing water overheating
E 0 9	Return water overheating
E 1 0	Secondary system outgoing water overheating
E 1 1	Outgoing / return water overheating
E 1 2	Primary system outgoing water probe failure
E 1 3	Return water probe failure
E 1 4	Domestic hot water probe failure
E 1 5	External probe failure
E 1 6	Combustion products detection probe failure
E 1 7	Secondary system outgoing water probe failure
E 1 8	Microcontroller failure (***)
E 1 9	Parameters setting error (****)

(*) Failure signalled when the fan does not reach the min. speed required for ignition cycle starting.
(**) Failure signalled if the system water pressure is too low (information given by the minimum pressure switch or the analog pressure transducer), or if the circulator does not work properly (information given by the differential pressure switch).
(***) Failure signalled if a problem is detected by the microcontrollers; this anomaly can be cancelled by pressing the push-button RESET or by cutting off the power supply to the board.
(****) Failure signalled if there is a problem in the storage of the parameters set; this anomaly can be cancelled by suitably changing settings or by restoring factory settings (see paragraph **Description of parameters / Parameter 12** on page 9).

Password authentication mode
By pressing on the push-buttons ON/OFF and MODE simultaneously (for a few seconds) in *User mode*, it is possible to enter the *Password insertion and checking mode*: the reading [**P 0 0**] will appear on the flashing display.
Using the push-buttons appearing in the table and figure below, the password can be set (push-buttons D3+/D3- and D4+/D4-) and confirmed (push-button ENTER): once the password has been inserted, it is checked by the system and, if it matches with the password stored, it is possible to enter the *Parameters setting mode*.
The system can recognize and control (up to) two separate passwords, which will enable to change only some of the boiler parameters (password for *service* use) or the whole boiler parameters (password for *manufacturer*'s use) respectively.



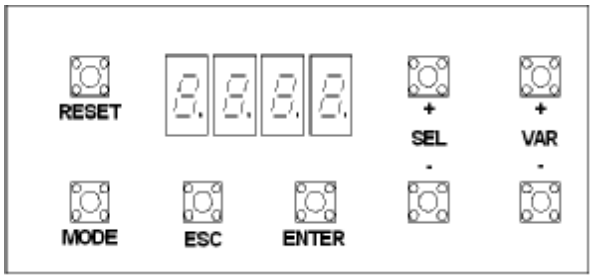
Descriptions of push-buttons:

Push-button	Function	Description
SW2	- D4	First digit decrease
SW3	ESC	Installer mode exit
SW5	ENTER	Password confirmation
SW6	+ D4	First digit increase
SW7	+ D3	Second digit increase
SW8	- D3	Second digit decrease

If the correct code is not inserted within two minutes from access to the *Password insertion mode*, the system will go back to the initial stage (*User mode*). In case of wrong password insertion, the system will exit the *Password insertion mode* and go back to the initial stage (*User mode*).

Parameters setting mode

When entering the P*arameters setting mode*, the first available parameter is immediately displayed: in particular, the number of the parameter is shown (fixed) on the left hand, while the current parameter value is shown (flashing) on the right hand. The push-buttons +VAR and -VAR can be used to change the parameter value (within allowed limits), whereas the push-buttons +SEL and -SEL are used to (cyclically) run over the parameters to display or modify.



Description of push-buttons:

Push-button	Function	Description
SW1	RESET	Boiler reset after ignition failure
SW3	ESC	Installer mode exit
SW4	MODE	Access to "chimney-sweep" function (*)
SW5	ENTER	Setting confirmation
SW6	+ SEL	Increasing selection of the parameter to display
SW2	- SEL	Decreasing selection of the parameter to display
SW7	+ VAR	Selected parameter increase (*)
SW8	- VAR	Selected parameter decrease (*)

(*) By pressing the push-buttons MODE and +VAR simultaneously, the installer switches on the "chimney-sweep" function at max. heat capacity: the flashing reading [**St H**] appears on the display. Instead, by pressing the push-buttons MODE and -VAR simultaneously, the installer switches on the "chimney-sweep" function at min. heat capacity: in this case, the flashing reading [**St L**] appears on the display.

To switch off the "chimney-sweep" function (and go back to the *Parameters setting mode*), different methods can be used:

- pressing the push-button ESC
- cut-off or overheating of the outgoing water probe or the combustion products detection probe
- boiler lockout due to flame failure
- domestic hot water demand.

Display description:

Display	Description
00 X	DHW: 0=not available / 1=available
01 X	Hot water tank: 0=not available / 1=available
02 X	Continuous pump: 0=not available / 1=available
03 X	Condensing: 0=not available / 1=available
04 X	High-temperature or low-temperature primary system: 0=low / 1=high
05 X	Primary system with thermostat or with climatic: 0=thermostat / 1=climatic
06 X	Secondary system: 0=not available / 1=available
07 X	Mixing valve: 0=not available / 1=available
08 X	High-temperature or low-temperature secondary system: 0=low / 1=high
09 X	Secondary system with thermostat or with climatic: 0=thermostat / 1=climatic
10 X	Priority: 0=primary / 1=secondary
11 X	RS232 or Opentherm: 0=RS232 / 1=Opentherm
12 X	Parameter reset: 0=no / 1=yes
13 X	Return water probe: 0=not available / 1=available
14 X	Water pressure switch or differential pressure switch: 0=water pressure switch / 1=differential pressure switch
15 X	Domestic hot water flow sensor: 0=flow switch / 1=flowmeter
16 X	Air pressure switch / combustion products discharge safety device: 0=not available / 1=available
17 X	Heating and DHW system structure: 0=circulator+deflection valve / 1=two circulators
18 X	RS485: 0=not available / 1=available
19 X	Reprogramming: 0=no / 1=yes
30 XX	Min. speed (fan rev./min. x 100)
31 XX	Max. heat capacity (fan rev./min. x 100)
32 XX	Max. DHW capacity (fan rev./min. x 100)
33 XX	SOFT-START speed (fan rev./min. x 100)
34 XX	Max. set-point temperature in DHW mode (°C)
35 XX	Max. outgoing water temperature in DHW mode (°C)
36 XX	Max. primary system outgoing water set-point (°C)

37 XX	Min. primary system outgoing water set-point (°C)
38 XX	Max. temperature measured by the external probe (°C)
39 XX	Min. temperature measured by the external probe (°C)
40 XX	Max. secondary system outgoing water set-point (°C)
41 XX	Min. secondary system outgoing water set-point (°C)
42 XX	Temperature difference for hot water tank turning on (°C)
43 XX	Temperature difference for hot water tank turning off (°C)
44 XX	Pump overrun time in heating mode (min)
45 XX	Secondary system pump overrun time in heating mode (min)
46 XX	Min. circulator speed when phase-shift controlled
47 XX	Mechanical max. speed (fan rev./min. x 100)
48 XX	Mechanical min. speed (fan rev./min. x 100)
49 XX	No. of pulses per revolution
50 XX	Pre-start speed (fan rev./min. x 100)
51 XX	Max. outgoing water probe temperature (°C)
52 XX	Max. return water probe temperature (°C)
53 XX	Max. DHW probe temperature (°C)
54 XX	Max. combustion products detection probe temperature (°C)
55 XX	Proportional K of heating mode PID
56 XX	Integral K of heating mode PID
57 XX	Derivative K of heating mode PID
58 XX	Proportional K of DHW mode PID
59 XX	Integral K of DHW mode PID
60 XX	Derivative K of DHW mode PID
61 XX	Proportional K of hot water tank PID
62 XX	Integral K of hot water tank PID
63 XX	Derivative K of hot water tank PID
64 XX	Proportional K of secondary system heating PID
65 XX	Proportional K of fan PID
66 XX	Integral K of fan PID
67 XX	Derivative K of fan PID
68 XX	Post-start time (sec)
69 XX	Waiting time between 2 consecutive ignitions in heating mode (sec)
70 XX	Waiting time between an ignition in heating mode and one in DHW mode (sec)
71 XX	Max. difference between outgoing water temperature and return water temperature (°C)

N.B.: The parameters in black can be set by both the service centre and the manufacturer, while those in red can be modified by the manufacturer only.

Once a parameter has been modified, the new value must be confirmed by pressing the push-button ENTER in order to be stored by the system; if a parameter is modified but not confirmed, upon pressing the push-button ESC any changes will be lost.
After two minutes from the last push-button pressing, the system exits automatically (and goes back to the *User mode*), and any data which have not been stored before will be lost.

At the end of the parameters setting stage, on returning to the *User mode*, the system checks the validity of the values set: if the checking result is negative (i.e. some parameters are incompatible), the system will go to stand-by, the *Parameters setting error* will be signalled and the reading [**E 19**] will flash on the display.
The failure can be cancelled by going back to the *Parameters setting mode* and running over the values saved by means of the push-buttons +SEL and –SEL (see paragraph **Parameters setting mode** on page 7): a point will appear between the (fixed) parameter number indicating the error and its flashing value (e.g. [**50.20**]). Make sure the value set is within the range allowed (to this purpose, see next paragraph **Description of parameters**) and, if necessary, modify it conveniently. Repeat this procedure for all parameters determining the above-mentioned error [**E 19**].
If you wish to go automatically back to factory settings, you can use the function *Parameters resetting* (see next paragraph **Description of parameters / Parameter 12**).

N.B.: The above-described modes (user mode / password authentication / parameters setting modes) can be customized.

Description of parameters
Parameter 00: together with parameter 01, it establishes the presence (and possibly the type) of DHW circuit. In particular, 4 configurations are available:
par. 00 = 0 / par. 01 = 0 → boiler for heating only; in this case, no domestic hot water probe is available;
par. 00 = 1 / par. 01 = 0 → boiler with instantaneous domestic hot water production; in this case, both the domestic hot water probe and the flow switch/flowmeter are available;
par. 00 = 0 / par. 01 = 1 → boiler with external hot water tank c/w thermostat; in this case, no domestic hot water probe is available, and the hot water tank thermostat is connected to the flow switch contact;

par. 00 = 1 / par. 01 = 1 → boiler with hot water tank and hot water tank probe; in this case, the hot water tank probe must be connected instead of the domestic hot water probe.

Parameter 02: when set = 1, the pump must always be working when the boiler is on.

Parameter 03: when set = 1, the system exploits a software function to optimize the boiler performance (in case of fixed-speed circulator only).

Parameter 04: when set = 1, the primary heating system is in high temperature (radiators); when set = 0, the primary heating system is in low temperature (convectors, floor heating…).

Parameter 05: when set = 0, the primary heating system is with "fixed set-point": in this case, the system operates as described in paragraph **Heating mode (primary system)** on page 14.

When this parameter is set = 1, the primary heating system is with "temperature compensation": in this case, the system operates as described in paragraph **"Shifting temperature" mode (primary system)** on page 14.

Parameter 06: when set = 1, a secondary heating system is available: in this case, the system detects the reading of the secondary heating system probe (and signals any relevant failure) and of the corresponding room thermostat (to be connected to the Options Board).

N.B. It is inadvisable to set this parameter to 1 if the Options Board (SO) is not available.

Parameter 07: when set = 0, the hydraulic system is structured in "2 separate areas", i.e. the system controls an area valve (or pump) through the Options Board (**SO**).

When this parameter is set = 1, the hydraulic system is divided into 2 areas by means of a mixing valve, i.e. the system controls a power-driven mixing valve through the Options Board (**SO**). For further details, see paragraph **Heating mode (secondary system)** on page 15.

Parameter 08: when set = 1, the secondary heating system is in high temperature (radiators); when set = 0, the secondary heating system is in low temperature (convectors, floor heating …).

Parameter 09: when set = 0, the secondary heating system is with "fixed set-point": in this case, the system operates as described in paragraph **Heating mode (secondary system)** on page 15.

When this parameter is set = 1, the secondary heating system is with "temperature compensation": in this case, the system operates as described in paragraph **"Shifting temperature" mode (secondary system)** on page 15.

Parameter 10: in a system for separate areas (without mixing valve), when this parameter is set = 0, the primary system has priority; when set = 1, the secondary system has priority. Consequently, the system will behave as described in paragraph **Heating mode (secondary system)** on page 15.

Parameter 11: when set = 0, the system can perform serial data communication (by protocol type RS232) through an external device (e.g. a portable computer with a suitable software).

When this parameter is set = 1, the system is interfaced with a remote device provided with Opentherm® protocol (e.g. a *Brahma* chronothermostat type *Encrono OT1*).

Parameter 12: when set = 1, the system restores initial parameters and any information stored before will be lost.

Parameter 13: when set = 1, the system reads the heating system return water probe.

Parameter 14: when set = 0, the boiler is equipped with a "minimum" water pressure switch (which can determine at any time if the water pressure in the primary system is high enough; when set = 1, the boiler is equipped with a differential pressure switch, which can determine if water flows inside the primary system while the circulator is running.

Parameter 15: when set = 1, the boiler is equipped with a flowmeter instead of a flow switch to detect any demand of domestic hot water production.

Parameter 16: when set = 1, the boiler is equipped with an air pressure switch or a combustion products discharge safety device.

Parameter 17: when set = 1, the boiler is equipped with a double pump (one for the heating system and one for the DHW circuit); when set = 0, the boiler is equipped with a single pump and a 3-way deflection valve.

Parameter 18: when set = 1, the system can perform serial data communication (by protocol type ModBus on RS485 network) through an external device (e.g. a master board) to control battery boiler systems.

Parameter 19: when set = 1, the system goes back to reprogramming mode to update the board software.

Parameter 30: min. fan speed both in heating and in DHW mode.

Lower limit → par. no. 48 – mechanical min. speed.

Upper limit → par. no. 47 – mechanical min. speed.

Factory-set value → 2000 rev./min.

Parameter 31: max. fan speed in heating mode.

Lower limit → par. no. 30 – min. speed.

Upper limit → par. no. 47 – mechanical min. speed.

Factory-set value → 5000 rev./min.

Parameter 32: max. fan speed in DHW mode.
Lower limit → par. no. 30 – min. speed.
Upper limit → par. no. 47 – mechanical max. speed.
Factory-set value → 5000 rev./min.
Parameter 33: fan speed at burner start up (soft-start), in both heating and DHW mode.
Lower limit → par. no. 48 – mechanical min. speed.
Upper limit → par. no. 47 – mechanical max. speed.
Factory-set value → 4000 rev./min.
Parameter 34: max. temperature which can be set for domestic hot water set-point.
Lower limit → domestic hot water set-point.
Upper limit → par. no. 53 – absolute temperature limit for domestic hot water probe.
Factory-set value → 60 °C.
Parameter 35: max. temperature that can be reached by the primary system outgoing water probe during DHW mode operation.
Lower limit → 10 °C.
Upper limit → par. no. 51 – Absolute temperature limit for outgoing water probe.
Factory-set value → 80 °C.
Parameter 36: max. temperature which can be set for the primary system outgoing water set-point.
Lower limit → primary system outgoing water set-point.
Upper limit → par. no. 51 – Absolute temperature limit for outgoing water probe.
Factory-set value → 80 °C (in case of high-temperature primary system) / 50 °C (in case of low-temperature primary system).
Parameter 37: min. temperature which can be set for the primary system outgoing water set-point.
Lower limit → 10 °C.
Upper limit → primary system outgoing water set-point.
Factory-set value → 40 °C (in case of high-temperature primary system) / 20 °C (in case of low-temperature primary system).
Parameter 38: max. temperature which can be detected by the external probe (on which there is the min. outgoing water set-point value of the primary system for the climatic curve).
Lower limit → 10 °C.
Upper limit → 30 °C.
Factory-set value → 15 °C.
Parameter 39: min. temperature which can be detected by the external probe (on which there is max. outgoing water set-point value of the primary system for the climatic curve).
Lower limit → -20 °C.
Upper limit → 0 °C.
Factory-set value → 0 °C.
N.B. For this parameter, all values displayed must be considered as negative.

Parameter 40: max. temperature which can be set for the secondary system outgoing water set-point.
Lower limit → secondary system outgoing water set-point.
Upper limit → par. no. 51 – Absolute temperature limit for outgoing water probe.
Factory-set value → 80 °C (in case of high-temperature secondary system) / 50 °C (in case of low-temperature secondary system).
Parameter 41: min. temperature which can be set for the secondary system outgoing water set-point.
Lower limit → 10 °C.
Upper limit → secondary system outgoing water set-point.
Factory-set value → 40 °C (in case of high-temperature secondary system) / 20 °C (in case of low-temperature secondary system).
Parameter 42: difference in degrees (if compared with the hot water tank set-point) to start hot water tank heating.
Lower limit → 0 °C.
Upper limit → 15 °C.
Factory-set value → 5 °C.
Parameter 43: difference in degrees (if compared with the hot water tank set-point) to stop the water tank heating.
Lower limit → 0 °C.
Upper limit → 15 °C.
Factory-set value → 5 °C.
Parameter 44: circulator overrun time in heating mode.
Lower limit → 0 min.
Upper limit → 15 min.
Factory-set value → 1 min.
Parameter 45: overrun time of the secondary system circulator in heating mode.
Lower limit → 0 min.
Upper limit → 15 min.
Factory-set value → 1 min.
N.B. This parameter is used for systems for 2 separate areas only (without mixing valve), in which the system controls the second area pump. In case the system should control a valve (instead of a pump) in the second area system, this parameter can be set = 0.
Parameter 46: min. circulator speed when phase-shift controlled.
Lower limit → 0
Upper limit → 110
Factory-set value → 20.
N.B. This parameter is a constant exploited by the system to calculate the min. speed under which the circulator cannot go: in this sense, it can be set each time depending on the dimensions of the primary system in question.

Parameter 47: max. absolute fan speed limit in both heating and DHW mode.
Lower limit → 4000 rev./min.
Upper limit → 6500 rev./min.
Factory-set value → 5300 rev./min.
Parameter 48: min. absolute fan speed limit in both heating and DHW mode.
Lower limit → 1000 rev./min.
Upper limit → 2000 rev./min.
Factory-set value → 1800 rev./min.
Parameter 49: number of pulses per fan revolution.
Lower limit → 1 pulse.
Upper limit → 3 pulses.
Factory-set value → 2 pulses.
Parameter 50: fan speed at the beginning of the safety cycle (pre-start) in both heating and DHW mode.
Lower limit → par. no. 48 – mechanical min. speed.
Upper limit → par. no. 47 – mechanical max. speed.
Factory-set value → 5300 rev./min.
Parameter 51: max. absolute temperature limit for outgoing water probe.
Lower limit → 10 °C.
Upper limit → 120 °C.
Factory-set value → 90 °C.
Parameter 52: max. absolute temperature limit for return water probe.
Lower limit → 10 °C.
Upper limit → 120 °C.
Factory-set value → 90 °C.
Parameter 53: max. absolute temperature limit for domestic hot water probe.
Lower limit → 10 °C.
Upper limit → 120 °C.
Factory-set value → 60 °C.
Parameter 54: max. absolute temperature limit for combustion products detection probe.
Lower limit → 10 °C.
Upper limit → 120 °C.
Factory-set value → 80 °C.
Parameter 55: proportional constant of heating mode PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 80.
Parameter 56: integral constant of heating mode PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 10.
Parameter 57: derivative constant of heating mode PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 60.
Parameter 58: proportional constant of DHW mode PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 80.
Parameter 59: integral constant of DHW mode PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 10.
Parameter 60: derivative constant of DHW mode PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 60.
Parameter 61: proportional constant of hot water tank PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 80.
Parameter 62: integral constant of hot water tank PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 10.
Parameter 63: derivative constant of hot water tank PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 100.
Parameter 64: proportional constant of secondary system heating PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 80.
Parameter 65: proportional constant of fan PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 80.
Parameter 66: integral constant of fan PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 10.
Parameter 67: derivative constant of fan PID.
Lower limit → 0.
Upper limit → 120.
Factory-set value → 100.
Parameter 68: stay period at soft-start speed after the end of the safety time (post-start).
Lower limit → 0 sec.
Upper limit → 199 sec.
Factory-set value → 10 sec.
Parameter 69: waiting interval between two consecutive burner ignitions in heating mode.
Lower limit → 0 sec.
Upper limit → 199 sec.
Factory-set value → 0 sec.
Parameter 70: waiting interval between a burner ignition in heating mode and the next ignition in DHW mode.
Lower limit → 0 sec.
Upper limit → 199 sec.
Factory-set value → 0 sec.
Parameter 71: max. temperature difference allowed between outgoing water probe and return water probe.
Lower limit → 0 °C.
Upper limit → 99 °C.
Factory-set value → 35 °C.

N.B. It is advisable to pay particular attention in the modification of those parameters (e.g. par. no. 30, no. 47, no. 48, no. 51, no. 53) determining the variation interval of other parameters: a wrong setting may lead the system to signal the Parameters setting error (E 19).

OPERATING CYCLE

Starting cycle

The starting cycle begins on heat demand (by the room thermostat) or, if the DHW circuit is available, on domestic hot water demand (by the water flow switch or flowmeter). The circulator is energized, and if the water temperature is lower than the preset value, a burner starting attempt will occur.

The fan will be energized only if the air pressure switch (if available) is in "no-air-flow" position: in order for the safety time TW/TS to start, the fan must reach the "*pre-start speed*" (which can be set on request, see paragraph **Description of parameters / Parameter 50** on page 9) and the air pressure switch must switch into "*air-flow*" position. In case even only one of these conditions fails (pre-start speed reached / switching of the air pressure switch), the system will remain in waiting status with the fan energized; else, if both conditions are met, the system will bring the fan to "*soft-start speed*" (which can be set on request, see paragraph **Description of parameters / Parameter 33** on page 9) and the *prepurge time* TW will begin.

At the end of the prepurge time TW, the gas valve is supplied, the ignition device is started and the *safety time* TS begins, during which the burner capacity is kept at *soft-start* value.

If no flame signal is detected within the safety time TS, the gas valve will be closed and the ignition device inhibited: if multiple ignition attempts are expected and the number of available ignition attempts has not run out yet, the system will start again with a new TW/TS cycle, constantly keeping the fan speed at *soft-start* value; otherwise a *safety shutdown* will occur and be conveniently signalled (see paragraph **Anomalies** on page 7).

To restore normal system operation, press the corresponding push-button (*RESET*): if hot water demand still occurs, the boiler will start a new ignition cycle (with one or more ignition attempts); if the conditions leading to lockout still occur, after using all available ignition attempts the boiler will go back to lockout.

If a flame signal is detected during TS, the system will inhibit the ignition device and keep the burner heat capacity at *soft-start* value for a predetermined time (which can be set on request, see paragraph **Description of parameters / Parameter 68** on page 9), called *post-start time*; then the temperature adjustment process will begin, and the burner flame will be modulated in order to reach the same water temperature as the preset value (*running stage*).

The running stage continues until either heat demand stops, or one of the safety devices switches on, or the flame extinguishes.

On accidental flame extinguishing during operation, the device carries out one or more re-ignition attempts (depending on the options selected); if these attempts do not succeed, lockout will occur.

Variations on operating cycle

Followings are possible variations on the operating cycle depending on the options selected:

– Option 2: Lockout for extraneous light

If the system detects extraneous light at start up or during the prepurge time TW, it will perform lockout.

– Option 3: No or insufficient air flow

If the system detects no (or insufficient) air flow at start up or during the prepurge time TW, it will perform lockout after 3 ÷ 15 seconds (the time is set upon request).

– Option 4: Air flow failure in running status

If the system detects air flow failure in running status, it will go to lockout condition after some time (set upon request).

– Option 5: Flame failure in running status

If the system detects flame failure in running status, it will immediately perform lockout.

– Option 6: Post-purge time

The device continues supplying the fan (at min. speed) for some time after performing a safety shutdown (the time is set upon request): this behaviour is useful to help the evacuation of humid vapours and prevent moisture from invading or damaging the fan driving circuit.

– Option 7: Ignition attempts

The system performs multiple ignition attempts after a flame failure (the number of attempts is set upon request).

– Option 8: Inter-purge time

The device starts a pre-purge time after an unsuccessful ignition attempt and before starting a new ignition attempt (TW/TS cycle).

DHW mode

Ignition demand in *DHW mode* has priority over ignition demand in *heating mode*, in order to ensure a higher comfort to the user needing domestic hot water; in this stage, the system behaviour varies according to the type of DHW system which has been set (see paragraph **Description of parameters / Parameter 00 and 01** on page 9).

Boiler with instantaneous DHW system → Access to DHW mode occurs when domestic hot water is drawn: the boiler will try and supply the user with domestic water at preset temperature. If the required capacity is lower than the min. modulation capacity, the boiler will perform short ignition and turnoff cycles. If the required capacity is higher than the boiler max. capacity (see paragraph **Description of parameters / Parameter 32** on page 9), the water temperature will be proportional to the quantity of drawn water, but lower than preset temperature.

Boiler with external hot water tank c/w thermostat → Access to DHW mode occurs on switching off of the hot water tank thermostat (connected to the flow switch contact): in this case, the boiler heats up the (domestic) water in the hot water tank through the heating circuit, making the deflection valve in the DHW circuit switch. The system will go on meeting the demand of domestic hot water (from the hot water tank) as long as the thermostat is switched off.

Boiler with and without hot water tank → Access to DHW mode occurs when the (hot water tank) probe detects that the water temperature in the hot water tank is lower than the preset set-point: in this case, the boiler heats up the (domestic) water in the hot water tank through the heating circuit, making the deflection valve in the DHW circuit switch. The system will go on meeting the demand of domestic hot water until the temperature measured by the hot water tank probe reaches the preset set-point.

The system monitors the primary heating circuit temperature constantly, and will turn the burner off if the temperature detected by the outgoing water probe is higher than the max. temperature allowed (see paragraph **Description of parameters / Parameter 51** on page 9). The burner is turned on again in case the outgoing water temperature drops below the max. temperature allowed.

Heating mode (primary system)

This boiler operation mode is only possible if the installer has set the primary system at "fixed set-point" (see paragraph **Description of parameters / Parameter 05** on page 9), and if the user decides to set the system in *Winter mode* (see paragraph **User mode** on page 6): in this case, on switching off of the room thermostat of the system in question, if the corresponding outgoing water temperature is lower than the preset set-point, the boiler will carry out an ignition cycle, and flame modulation will begin until the boiler reaches the running condition. If the outgoing water temperature of the primary system is 5°C higher than the set-point preset by the user, the boiler will switch off; re-ignition occurs as soon as the water temperature drops of 5°C below the preset value.

If the user sets the boiler in *Summer mode*, any heat demand by the room thermostat will be disregarded (the DHW system only will be controlled).

Instead, if the installer sets the primary system so as to exploit "temperature compensation", the above-described mode will not be followed, and the system will operate as described in the below paragraph **"Shifting temperature" mode (primary system)**.

In case of a board controlling a variable sped circulator (i.e. phase-shift controlled), when the boiler reaches the running condition and modulates the flame, at the same time the circulator speed is suitably modified so as to reach the temperature of 55° C on the return water probe, in order to help the production of condensation.

Circulator overrun (primary system)

Every time the boiler switches off, the circulator keeps on running for a short time, which can be set upon request (see paragraph **Description of parameters / Parameter 44** on page 9), in order to lower the water temperature in the heat exchanger.

"Shifting temperature" mode (primary system)

When the external probe is installed and the primary system is set so as to exploit "climatic compensation" (see paragraph **Description of parameters / Parameter 05** on page 9), the temperature adjustment system works in "*shifting temperature*" mode, i.e. the primary heating system outgoing water temperature is adjusted according to the outside climatic conditions, in order to ensure a high comfort and energy saving during the whole year.

In particular, on outside temperature increase, the system outgoing water temperature is decreased according to a "compensation curve", which can be set by adjusting the corresponding parameters (see paragraph **Description of parameters / Parameters 37, 38 and 39** on page 9). With reference to the diagram on page 16 (**COMPENSATION CURVE**):

- the position of **point A** on the outgoing water temperature axis (Y axis) is determined by the value of the **primary system outgoing water set-point**
- the position of **point B** on the outgoing water temperature axis (Y axis) is determined by the value of **parameter 37**
- the position of **point C** on the outside temperature axis (X axis) is determined by the value of **parameter 38**
- the position of **point D** on the outside temperature axis (X axis) is determined by the value of **parameter 39**.

By setting the above-mentioned 4 points, the installer can select the compensation curve that is more suitable to the system which will be controlled by the board.

Heating mode (secondary system)

In order for this operation mode to be available, it is necessary first to set a "fixed set-point" secondary system as available (see paragraph **Description of parameters / Parameters 06 and 09** on page 9), and then to decide if this is a "mixed" system (fitted with mixing valve) or a system for "separate areas" (see paragraph **Description of parameters / Parameter 07** on page 9): in fact, according to these indications, the boiler behaviour will change considerably.

- System with mixing valve → if the user decides that the system must be in "winter" state (see paragraph **User mode** on page 6), on switching off of the room thermostat of the system in question, if the relevant outgoing water temperature is lower than the preset set-point, the boiler will start modulating the mixing valve opening until it reaches the running condition. If the secondary system outgoing water temperature exceed of more than 2°C the set-point preset by the user, the greater the difference between required temperature and measured temperature, the quicker the system will shut off the valve; the valve opens again as soon as the water temperature drops of more than 2°C below the preset value.
- System for separate areas → if the user decides that the system must be in "winter" state (see paragraph **User mode** on page 6), heat demands can come from both systems indifferently (and independently), but the heat demand of the system having *priority* will be fulfilled first (see paragraph **Description of parameters / Parameter 10** on page 9). Consequently, a heat demand coming from the system having lower priority can be fulfilled by the system (as already described in the previous paragraph **Heating mode (primary system)**) only if no heat demand is coming from the system having higher priority.

If the user sets the boiler in *Summer mode*, any heat demand by the room thermostat will be disregarded (the DHW system only will be controlled).

Instead, if the installer sets the secondary system so as to exploit "temperature compensation", the above-described mode (regarding heat demand fulfilment through the room thermostat) will not be followed, and the system will operate as described in the below paragraph **"Shifting temperature" mode (secondary system)**.

"Shifting temperature" mode (secondary system)

When the external probe is installed and the secondary system is set so as to exploit "climatic compensation" (see paragraph **Description of parameters / Parameter 09** on page 9), the temperature adjustment system works in "*shifting temperature*" mode, i.e. the secondary heating system outgoing water temperature is adjusted according to the outside climatic conditions, in order to ensure a high comfort and energy saving during the whole year.

In particular, on outside temperature increase, the system outgoing water temperature is decreased according to a "compensation curve", which can be set by adjusting the corresponding parameters (see paragraph **Description of parameters / Parameters 38, 39 and 41** on page 9). With reference to the diagram on page 16 (**COMPENSATION CURVE**):

- the position of **point A** on the outgoing water temperature axis (Y axis) is determined by the value of the **secondary system outgoing water set-point**
- the position of **point B** on the outgoing water temperature axis (Y axis) is determined by the value of **parameter 41**
- the position of **point C** on the outside temperature axis (X axis) is determined by the value of **parameter 38**
- the position of **point D** on the outside temperature axis (X axis) is determined by the value of **parameter 39**.

By setting the above-mentioned 4 points, the installer can select the compensation curve that is more suitable to the system which will be controlled by the board.

Antifreeze mode

The system behaviour in antifreeze mode varies according as the external probe is available or not:

- External probe not available → when the primary system outgoing water temperature drops below 5°C, the circulator is started for 5 minutes. At the end of this period, if the outgoing water temperature is higher than 5°C, the circulator will be stopped, else (if the outgoing water temperature is still lower than 5°C), the boiler will start at max. capacity with a 30°C set-point and a 5-min. post-purge.
- External probe available → when the primary system outgoing water temperature drops below 5°C or the outside temperature drops below 2°C, the circulator is started for 5 minutes. At the end of this period, if the outgoing water temperature is higher than 5°C, the circulator will be stopped only if the outside temperature is higher than 2°C, otherwise it will keep on running. If 5 minutes have elapsed with the circulator running, and the outgoing water temperature is still lower than 5°C, the boiler will start at max. capacity with a 30°C set-point and a 5-min. post-purge.

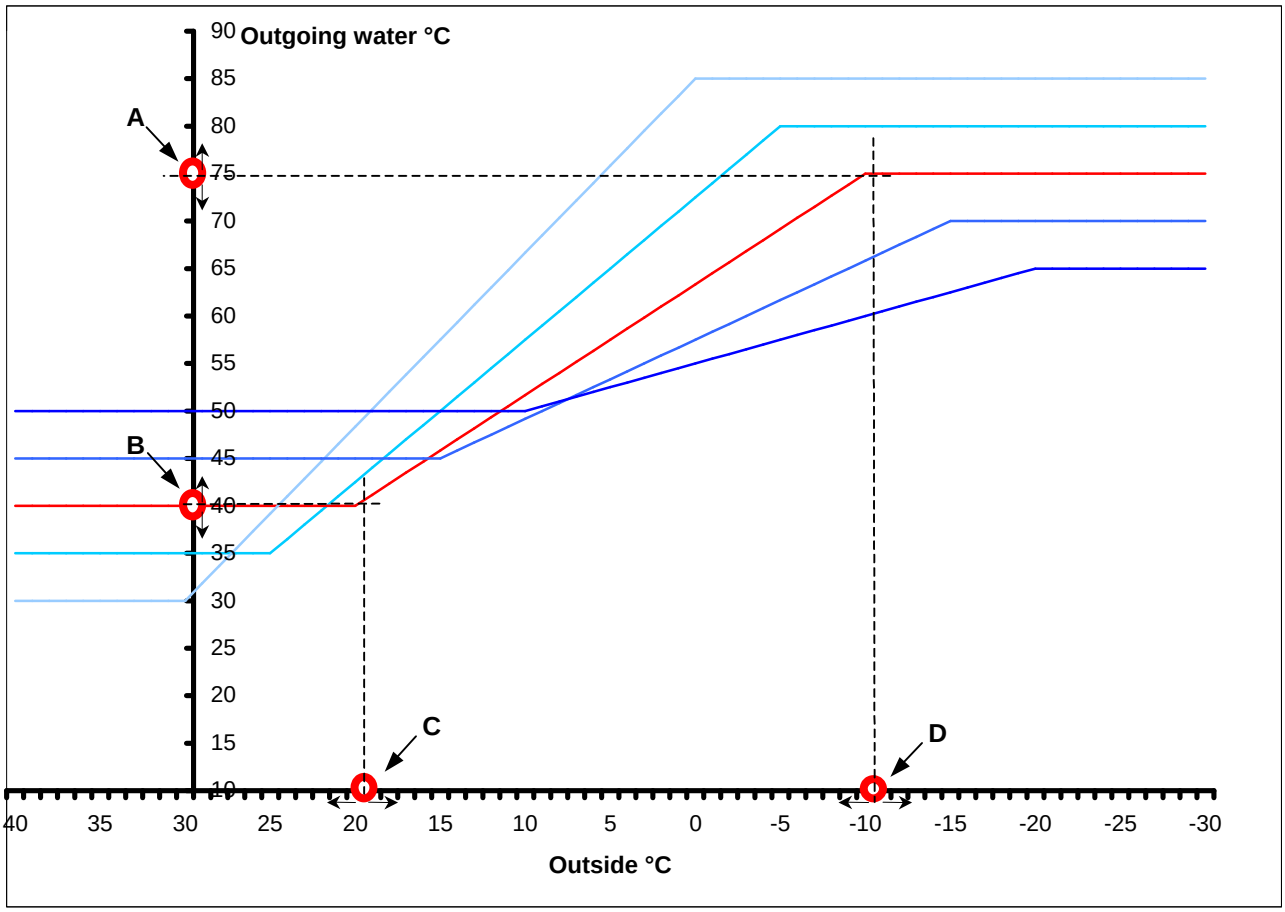
The antifreeze mode remains operating also in summer mode or when the boiler is in OFF position.

Other characteristics

Other functions are related to the system safeguard:

- Circulator lockout prevention → if the boiler has not carried out any ignition cycle within a given period of time (usually 24 hours), the circulator will switch on for 30 seconds approx. to avoid lockout due to protracted non-operation This function is working also in boiler lockout status.
- Deflection valve lockout prevention → every time the circulator switches off, the deflection valve switches for one second and then switches back to its previous position.

COMPENSATION CURVE



PART REFERENCES

Type	Options
380	(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13)

Options description

(1) Spark / ignition mode
- No letter: ignition spark stops as soon as a flame signal is detected. Standard version.
- A: spark continues for the whole TS.
- B: spark continues for the whole TSP (TS - 1).

(2) Lockout for extraneous light
- No letter: not available (the board always remains in TW). Standard version.
- C: available (the device goes to lockout).

(3) No or insufficient air flow at start-up
- No letter: the device does not start the ignition cycle. Standard version.
- D: the device goes to lockout after a given time (set upon request).

(4) Air flow failure in running status
- No letter: the device carries out one or more ignition attempts. Standard version.
- E: the device goes to lockout after a given time (set upon request).

(5) Flame failure in running status
- No letter: the device carries out one or more ignition attempts. Standard version.
- F: the device goes to lockout without delay.

(6) Post-purge
- No letter: no post-purge time. Standard version.
- G: the post-purge time is set upon request.

(7) Ignition attempts
- No letter: 1 re-ignition attempt after a safety shutdown. Standard version.
- H: the number of ignition attempts is set upon request.

(8) Inter-purge
- No letter: no inter-purge time. Standard version.
- L: the inter-purge time is set upon request.

(9) Power supply
- No letter: phase-sensitive device. Standard version.
- M: non phase-sensitive device.

(10) Ignition device
- No letter: the system controls an external ignition device type TDxxxxAF or TSM or TSC1. Standard version.
- N: the system controls a remote ignition device type TR2.

(11) Configuration of ignition / detection electrodes
- No letter: separate electrodes for ignition / detection (double electrode). Standard version.
- O: single ignition / detection electrode (monoelectrode).

(12) Circulator control
- No letter: the circulator always works at max. speed. Standard version.
- P: the board varies the fan speed to optimize performance.

(13) Water pressure switch or pressure transducer
- No letter: the board can control a water pressure switch or differential pressure switch (if any). Standard version.
- Z: the board can control a pressure transducer.

PART REFERENCES <u>for OPTIONS BOARD only</u>

Type	Options
383	(1) (2) (3) (4) (5)

Options description

(1) Connection to RS485 serial protocol
No letter: not available. Standard version.
Q: available.

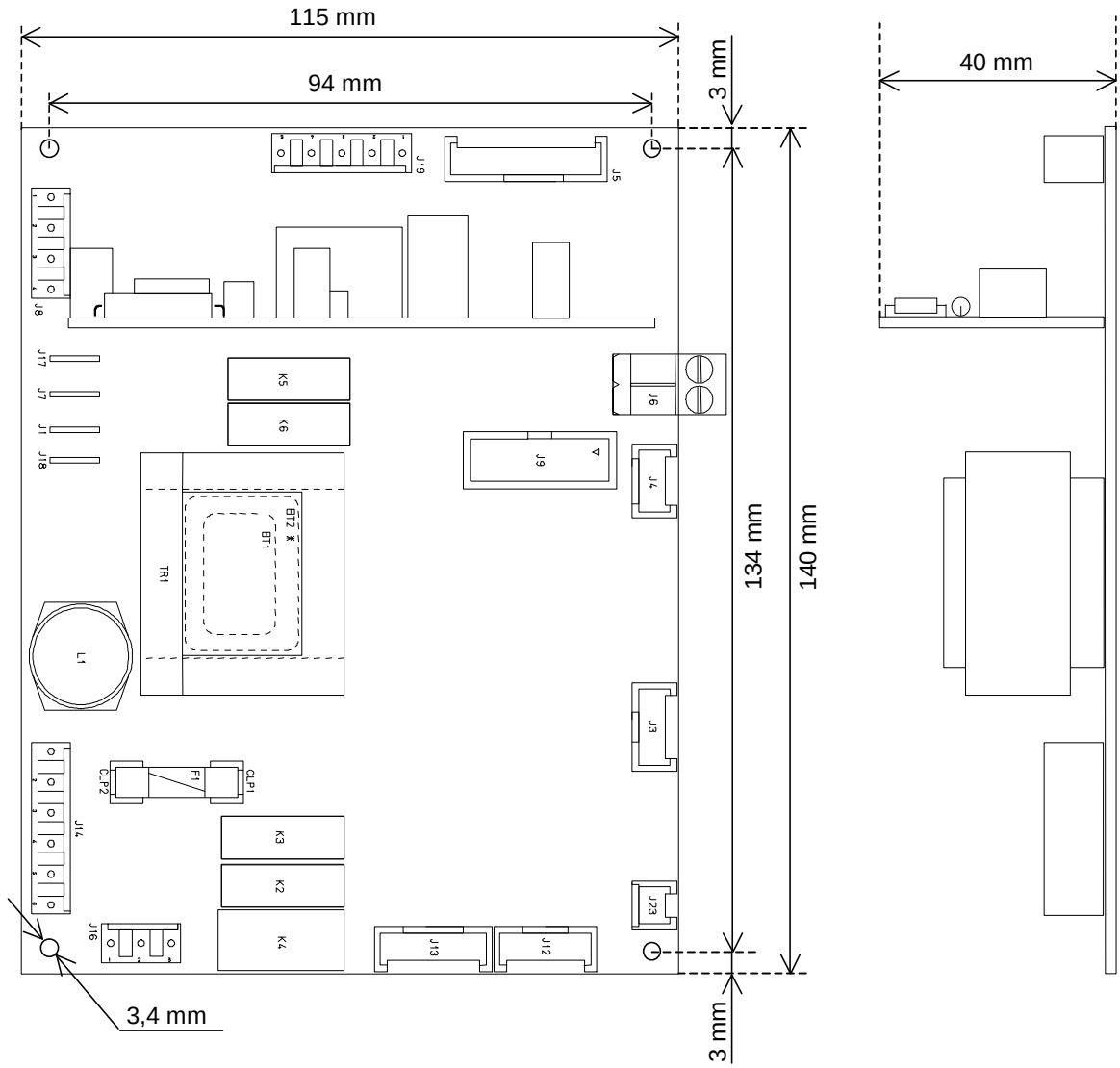
(2) Connection to Opentherm® protocol
No letter: not available. Standard version.
R: available.

(3) Control of a power-driven mixing valve
No letter: not available. Standard version.
S: available.

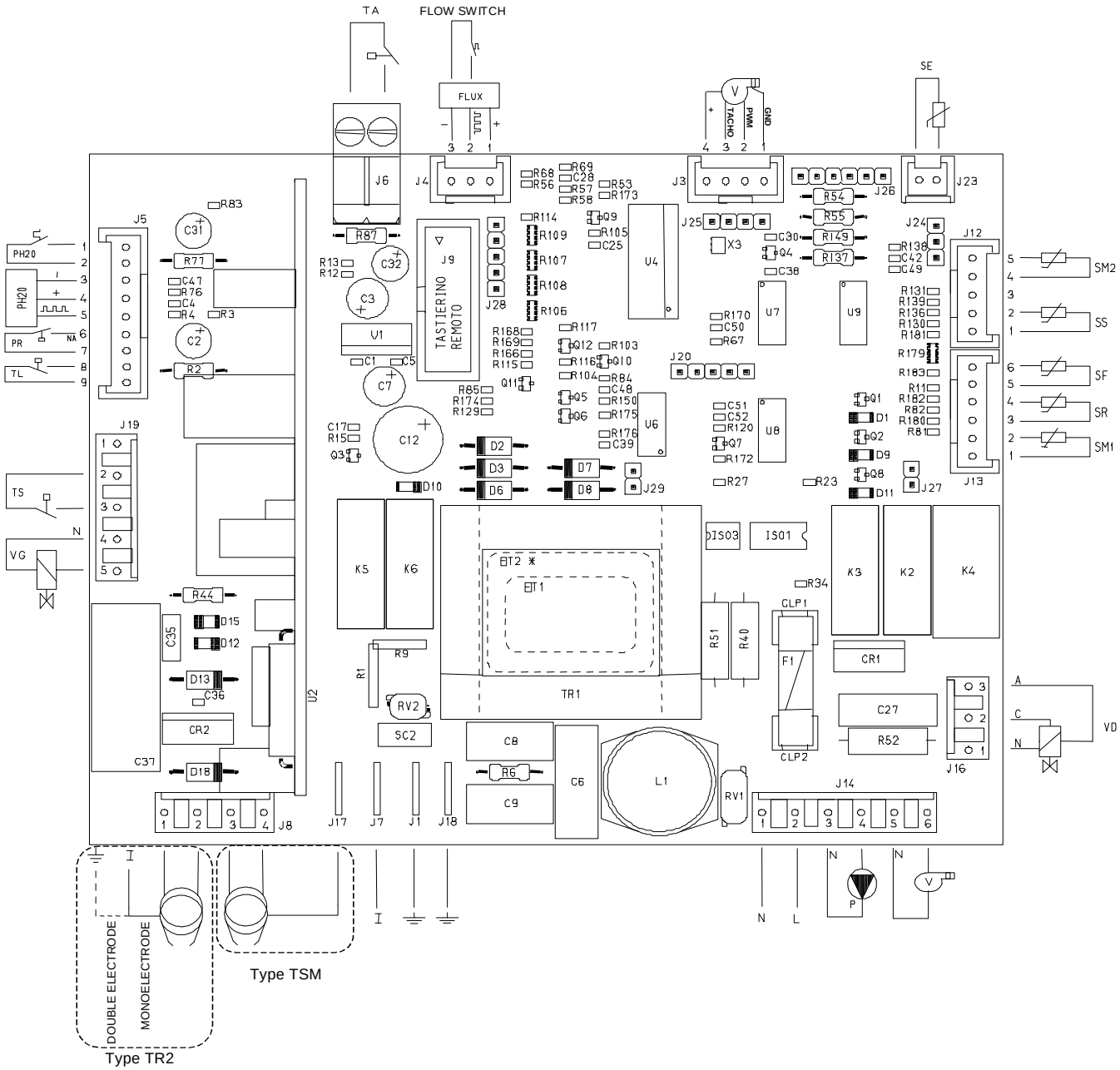
(4) Night attenuation contact
No letter: not available. Standard version.
T: available.

(5) Secondary system room thermostat contact
No letter: not available. Standard version.
U: available.

DIMENSIONS



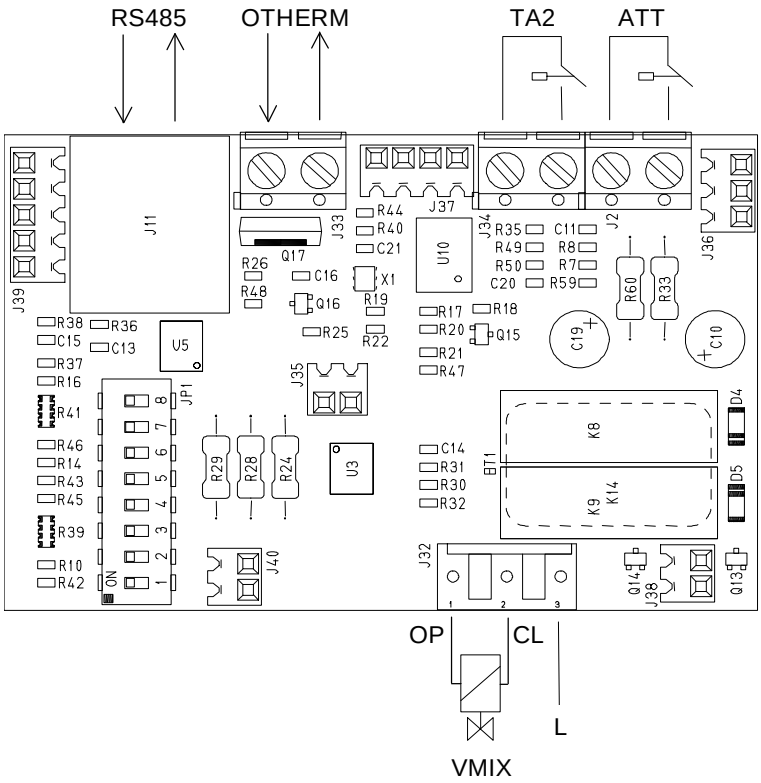
WIRING DIAGRAM of the Mother Board (SM)



Key to symbols:

SM1:	primary system outgoing water probe
SM2:	secondary system outgoing water probe
SE:	external probe
SS:	DHW probe
SR:	return water probe
SF:	combustion products detection probe
FLUX:	flowmeter / flow switch
DRIVER:	fan driver
TA:	room thermostat
PH20:	water pressure switch / differential pressure switch
TR:	ignition transformer
TRASD:	pressure transducer
PR:	combustion products discharge safety device / air pressure switch
TL:	limit thermostat
TS:	safety thermostat
VG:	gas valve
P:	system circulator
V:	fan
RS232:	RS232 communication
VD:	deflection valve
PS:	DHW circulator

WIRING DIAGRAM of the Options Board (SO)



Key to symbols:

TA2:	secondary system room thermostat	ATT:	night attenuation
OTHERM:	Opentherm communication	RS485:	RS485 communication
VMIX:	mixing valve		

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