

DIDACTIC MANUAL

FAMILY: Wall-hung
atmospheric boilers

GROUP: Instantaneous type
and forced and natural
draught heating only

MODELS: *Formentera*

VERSION: For indoor installation

PART NO.: AST 14 C 256/00

1st Edition, February 2013

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SECT. 1**TECHNICAL CHARACTERISTICS****1.1 MODELS**

FORMENTERA RTN 24
FORMENTERA RTFS 24 - 28 - 32
FORMENTERA CTN 24
FORMENTERA CTFS 24 - 28 - 32

ABBREVIATION KEY:

R : CH only
C : combined
TN : natural draught
TFS : forced draught

MAIN CHARACTERISTICS:

- **FORMENTERA RTN 24:**
atmospheric boiler for indoor installation, CH only, open chamber, natural draught, mono-thermal.
- **FORMENTERA CTN 24:**
atmospheric boiler for indoor installation, combined instantaneous, with production of domestic hot water + heating, open chamber, natural draught, mono-thermal with plate exchanger;
- **FORMENTERA CTFS 24 – 28 - 32:**
atmospheric boiler for indoor installation, combined instantaneous, with production of domestic hot water + heating, sealed chamber, forced draught, mono-thermal with plate exchanger;
- **FORMENTERA RTFS 24 – 28 - 32:**
atmospheric boiler for indoor installation, CH only, sealed chamber, forced draught, mono-thermal

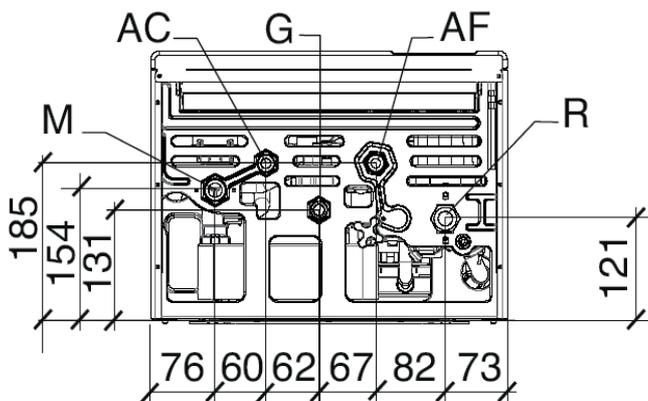
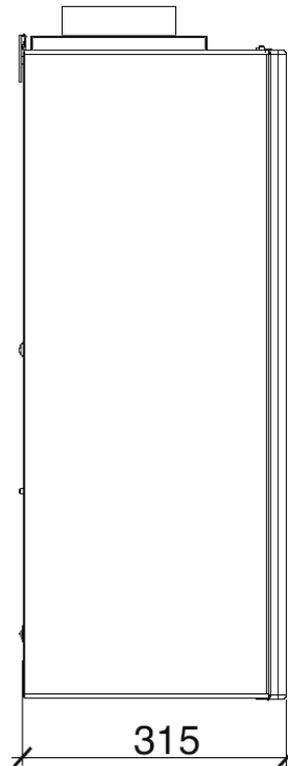
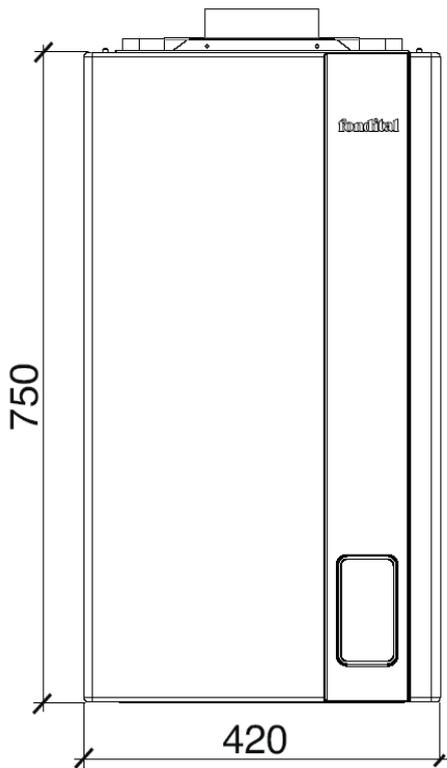
1.2 OVERALL DIMENSIONS

Height H = 750 mm

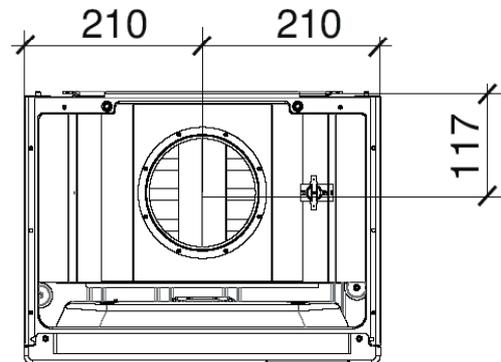
Width L = 420 mm

Depth D = 315 mm



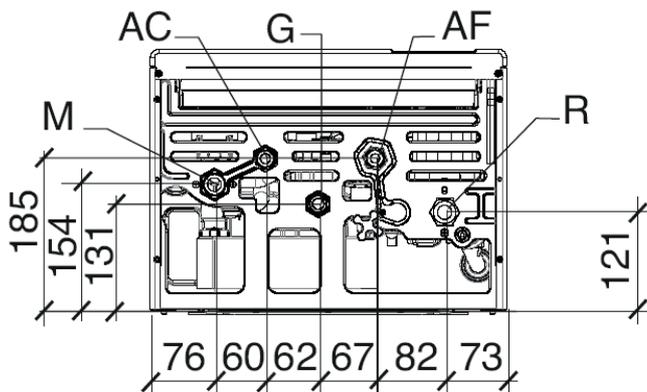
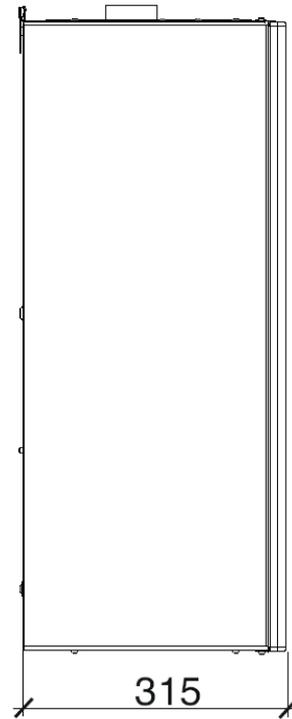
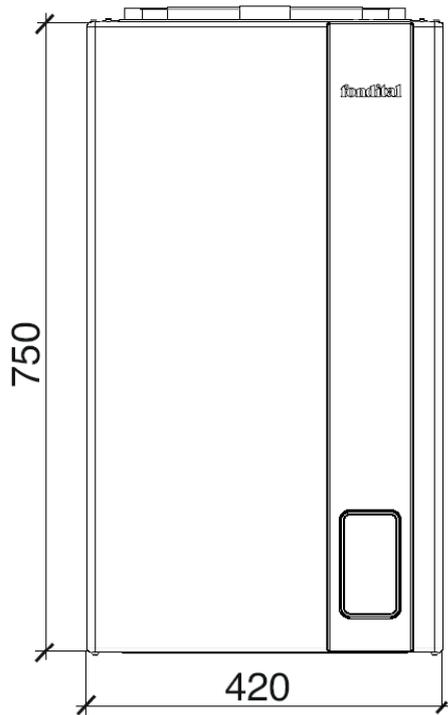
**CTN and RTN version**

VISTA DAL BASSO

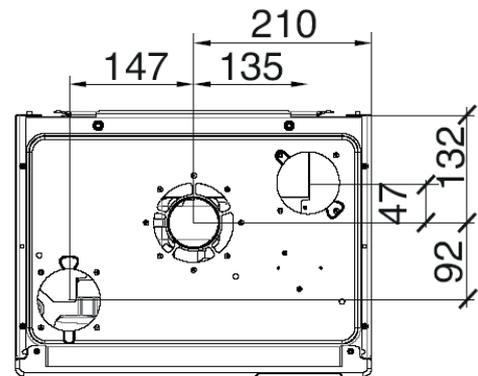


VISTA DALL'ALTO

- G** Gas inlet (1/2")
- M** CH system flow (3/4")
- R** CH system return (3/4")
- AF** Cold water inlet (1/2")
- AC** Hot water outlet (1/2") *only for CTN*

**CTFS VERSION**

VISTA DAL BASSO

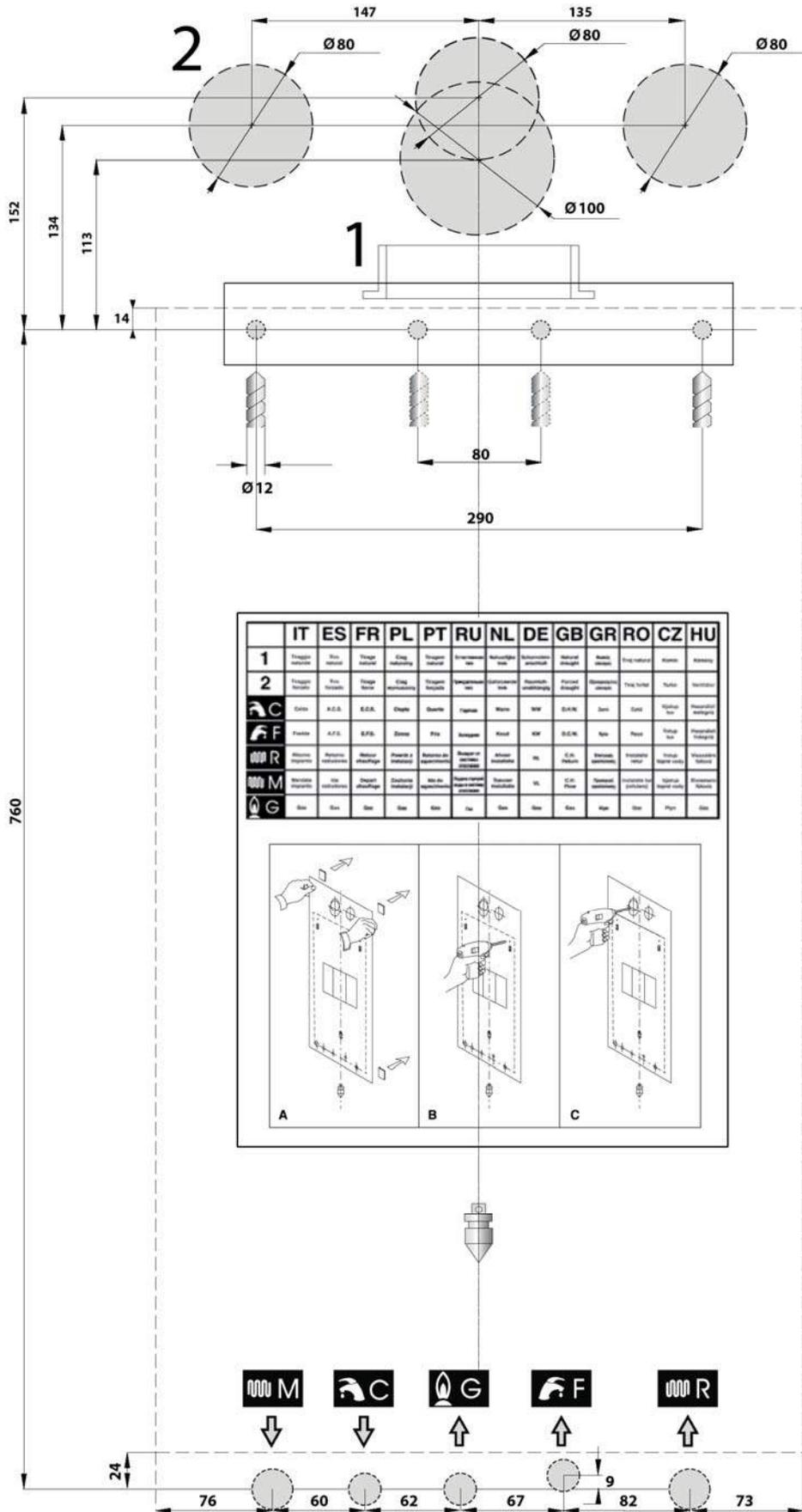


VISTA DALL'ALTO

- G** Gas inlet (1/2")
- M** CH system flow (3/4")
- R** CH system return (3/4")
- AF** Cold water inlet (1/2")
- AC** Hot water outlet (1/2")



INSTALLATION TEMPLATE



1.3 TECHNICAL SPECIFICATIONS

General Characteristics

		RTN 24 CTN 24	RTFS 24 CTFS 24	RTFS 28 CTFS 28	RTFS 32 CTFS 32
Operating parameters					
Equipment category		II2H3+			
Burner nozzles	no.	11			13
CH circuit max. and min. pressure	bar	3 - 0.5			
DHW circuit max. and min. pressure (KC)	bar	-	6 - 0.5		
DHW specific flow rate Δt 30°C	l/min	-	11.2	11.6	14.2
Double flow probe triggering temperature OFF	°C	105			
Double flow probe triggering temperature ON	°C	90			
Flue gas thermostat triggering temperature	°C	70		-	
Standard central heating setting range	°C	35 ÷ 78			
Standard max. operating temperature range	°C	78 + 5			
Reduced central heating setting range	°C	35 ÷ 45			
Reduced max. working temperature range	°C	45 + 2			
Plate DHW setting range	°C	-	35 ÷ 57		
Plate maximum DHW operating temperature	°C	-	57 + 5		
Boiler DHW setting range	°C	35 ÷ 65		-	
Nominal capacity of expansion tank	l	7			
Maximum recommended system capacity (**)	l	150			
Nominal electrical data					
Power supply: Voltage/Frequency	V / Hz	230-50			
Power mains supply fuse	A	2			
Electric cabinet protection degree	IP	X5D			
Max. absorbed power	W	86	125	134	
Electric power in standby condition	W	2.3			
Overall dimensions and connections					
Height	mm	750			
Width	mm	420			
Depth	mm	315			
Gas connection	-	G ½			
Flow and return connection	-	G ¾			
Cold water and hot domestic water connection / boiler	-	G ½			
Net weight	Kg	30	32	28	35.5
Consumptions at maximum flow rate					
Natural gas consumption (*)	m ³ /h	2.69			3.23
Butane gas consumption	kg/h	2.01			2.40
Propane gas consumption (LPG)	kg/h	1.97			2.36
Operating characteristics					
Type of ignition	-	Electronic			
Flame surveillance	-	Ionisation			
Type of detection	-	Non-polarised			

(*) Value related to 15°C - 1013 mbar condition

(**) Maximum water temperature at 83°C, tank preloaded at 1 bar

Design data and flue sizing

RTN-CTN 24

		<i>Pmax.</i>	<i>Pmin.</i>	<i>Load at 30 %</i>
Casing heat loss with burner off	%	0.57		-
Casing heat loss with burner on	%	1.88	3.14	-
Flue system heat loss with burner on	%	7.52	11.46	-
Flue system mass capacity	g/s	20.73	18.90	-
Flue gas temp. – air temp.	°C	86	63	-
Residual head available	Pa	-2	-2	-
CO ₂ value	%	4.8	2.0	-
Heat output efficiency rating (60/80°C)	%	90.6	85.4	89.4
Heat output efficiency rating (30/50°C)	%	-	-	-
Efficiency rating (according to 92/42/EC)	-	★★		
Nox emission class	-	2		

CTFS-RTFS 24

		<i>Pmax.</i>	<i>Pmin.</i>	<i>Load at 30 %</i>
Casing heat loss with burner off	%	0.26		-
Casing heat loss with burner on	%	1.05	0.63	-
Flue system heat loss with burner on	%	5.97	10.37	-
Flue system mass capacity	g/s	15.44	16.38	-
Flue gas temp. – air temp.	°C	95	77	-
Residual head available	Pa	105	105	-
CO ₂ value	%	6.6	2.9	-
Heat output efficiency rating (60/80°C)	%	93.0	89.0	90.2
Heat output efficiency rating (30/50°C)	%	-	-	-
Efficiency rating (according to 92/42/EC)	-	★★★		
Nox emission class	-	2		

CTFS-RTFS 28

		<i>Pmax.</i>	<i>Pmin.</i>	<i>Load at 30 %</i>
Casing heat loss with burner off	%	0.2		-
Casing heat loss with burner on	%	0.76	1.01	-
Flue system heat loss with burner on	%	5.54	10.09	-
Flue system mass capacity	g/s	17.29	17.75	-
Flue gas temp. – air temp.	°C	101	87	-
Residual head available	Pa	70	70	-
CO ₂ value	%	7.1	2.9	-
Heat output efficiency rating (60/80°C)	%	93.7	88.9	90.6
Heat output efficiency rating (30/50°C)	%	-	-	-
Efficiency rating (according to 92/42/EC)	-	★★★		
Nox emission class	-	2		

RTFS - CTFS 32

		<i>P_{max.}</i>	<i>P_{min.}</i>	<i>Load at 30 %</i>
Casing heat loss with burner off	%	0,2		-
Casing heat loss with burner on	%	1,37	1,40	-
Flue system heat loss with burner on	%	5,23	9,20	-
Flue system mass capacity	g/s	17,8	19,7	-
Flue gas temp. – air temp.	°C	105	73	-
Residual head available	Pa	78	78	-
CO ₂ value	%	7,5	3,1	-
Heat output efficiency rating (60/80°C)	%	93,4	89,4	91,0
Heat output efficiency rating (30/50°C)	%	-	-	-
Efficiency rating (according to 92/42/EC)	-	★★★		
Nox emission class	-	2		

Settings

RTN - CTN 24

	<i>Heat capacity</i>	<i>Heat output MIN-MAX</i>	<i>Supply pressure</i>	<i>Nozzle Diameter</i>	<i>Burner pressure MIN-MAX</i>
	(kW)	(kW)	(mbar)	(mm)	(mbar)
<i>Natural gas G20</i>	25,5	8,5 – 23,1	20	1,35	2,0 – 12,0
<i>butane gas G30</i>	25,5	8,5 – 23,1	29	0,78	4,5 – 28,0
<i>propane gas G31</i>	25,5	8,5 – 23,1	37	0,78	6,0 – 35,0

RTFS - CTFS 24

	<i>Heat capacity</i>	<i>Heat output MIN-MAX</i>	<i>Supply pressure</i>	<i>Nozzle Diameter</i>	<i>Burner pressure MIN-MAX</i>
	(kW)	(kW)	(mbar)	(mm)	(mbar)
<i>Natural gas G20</i>	25,5	11,1 – 23,7	20	1,35	3,2 – 12,2
<i>butane gas G30</i>	25,5	11,1 – 23,7	29	0,78	7,5 – 28,3
<i>propane gas G31</i>	25,5	11,1 – 23,7	37	0,78	7,6 – 34,2

RTFS - CTFS 28

	<i>Heat capacity</i>	<i>Heat output MIN-MAX</i>	<i>Supply pressure</i>	<i>Nozzle Diameter</i>	<i>Burner pressure MIN-MAX</i>
	(kW)	(kW)	(mbar)	(mm)	(mbar)
<i>Natural gas G20</i>	30,5	12,0 – 28,6	20	1,35	2,7 – 12,4
<i>butane gas G30</i>	30,5	12,0 – 28,6	29	0,78	6,0 – 29,3
<i>propane gas G31</i>	30,5	12,0 – 28,6	37	0,78	8,1 – 36,3

RTFS - CTFS 32

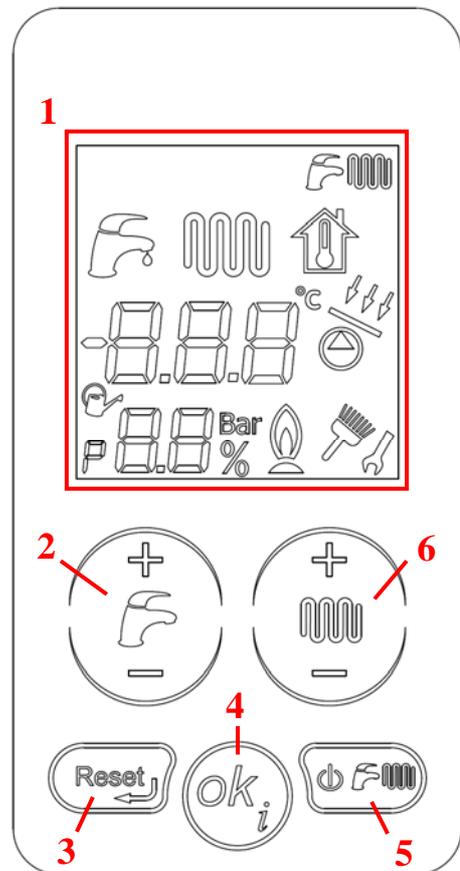
	<i>Heat capacity</i> (kW)	<i>Heat output MIN-MAX</i> (kW)	<i>Supply pressure</i> (mbar)	<i>Nozzle Diameter</i> (mm)	<i>Burner pressure MIN-MAX</i> (mbar)
Natural gas G20	33,0	14,3 – 30,8	20	1,35	2,84 – 11,11
butane gas G30	33,0	14,3 – 30,8	29	0,77	7,1 – 28,7
propane gas G31	33,0	14,3 – 30,8	37	0,77	9,5 – 35,3

SECT. 2**TOUCH SCREEN CONTROL PANEL AND DIAGNOSTICS****2.1 USER'S INTERFACE**

Warning: to access the setting area, simply "touch" the keys on the interface key-area. In this way, back-lighting (keys + LCD) and access to the various functions are enabled. Only "active" keys will be backlit, thus guiding the user to proper use.

One minute after the last key has been touched, interface is disabled and back-lighting is turned off.

NB: three different back-lighting modes can be enabled using parameter P78 : **0** = standard, **1** = LCD always on, **2** = LCD + keys always on (default P78=0):

**1. LCD Display**

The LCD shows the boiler status and operation information (see following paragraph).

2. Domestic hot water temperature set key

These keys are used to set (increase or decrease) the domestic hot water temperature within a range from 35°C to 57°C.

3. Boiler reset key

This key enables to resume boiler operation after a shut-down (only for resettable faults), or to return to the main page during the parameter selection.

4. Recall information and confirm parameters key

The function of this key is to scroll in sequence the values of some parameters for displaying purpose only. It is used as well to confirm the setting of the edited parameters.

5. Boiler status selection key

Press this key to set the following functions:

SUMMER : Boiler produces domestic hot water only.

WINTER : Boiler provides both central heating and domestic hot water.

CENTRAL HEATING ONLY : Boiler provides central heating only

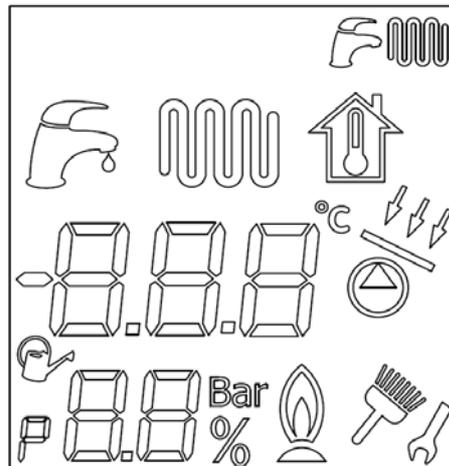
STAND-BY **OFF**: Boiler in standby mode: central heating and DHW functions are disabled.

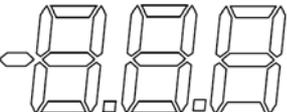
6. Central heating water temperature set key

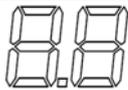
Without external probe, this key is used to set the water temperature value of the heating system between a minimum value of 35°C and a maximum value of 45°C (*reduced range*) or 78°C (*standard range*). With external probe, instead, it is used to set the fictitious temperature (see paragraph about thermoregulation).



2.2 LCD



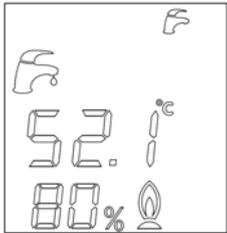
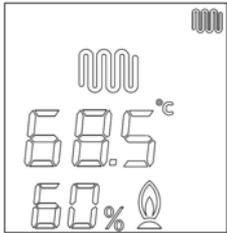
Symbol	Description
	<p>Boiler status indicator Icons indicate the operating modes enabled: SUMMER: only the icon is lit  SUMMER and WINTER: both icons are lit   CENTRAL HEATING ONLY: only the icon is lit  STAND-BY: only the OFF icon is lit</p>
	<p>DHW indicator This comes on when the boiler is in DHW mode. It flashes when setting the DHW temperature with the key 2 (see previous paragraph).</p>
	<p>Central heating indicator This comes on when the boiler is in CH mode. It flashes when setting the CH temperature with key 6 (see previous paragraph).</p>
	<p>Fictitious ambient temperature indicator In case an external probe is installed, this indicator flashes when the fictitious ambient temperature is set with the key 6 (see previous paragraph).</p>
	<p>Alphanumeric indicator Alphanumeric values indicating:</p> <ul style="list-style-type: none"> - flow water temperature during “heating” function; - central heating water temperature setting; - domestic hot water temperature during the “DHW” function; - domestic hot water temperature setting; - parameter value display - boiler status; - boiler diagnosis.
	<p>Centigrade degree indicator When displayed simultaneously with the <i>alphanumeric indicator</i>, it shows the value expressed in centigrade degrees.</p>
	<p>Solar indicator It turns on when the solar function of pump or solar valve is enabled through the multifunction relay or the supplementary board (depending on the type of system to be managed).</p>

	SUPER-TECHNICAL parameter indicator When displayed simultaneously with the <i>parameter display indicator</i> , it shows that the "super-technical parameter" programming mode has been reached. An access code is needed to access the display or editing mode.
	Installation parameter indicator When displayed simultaneously with the <i>parameter display indicator</i> , it shows that the "parameter programming" mode has been entered.
	Parameter display indicator Depending on the operating status, it indicates the parameter or the system pressure or the burner output rate.
Bar	Pressure indicator When displayed simultaneously with the <i>parameter display indicator</i> , it shows the system pressure only with the boiler waiting for a request.
%	Percentage indicator When displayed simultaneously with the <i>parameter display indicator</i> , it shows the output rate at which the boiler is operating following a request.
	Flame lighting indicator It turns on upon detecting burner flame lighting.
	Flue cleaning function indicator It flashes when the function is started (by pressing the <i>reset</i> key for three seconds) and then remains steady on once the function is active. During such function, the fan rpm is displayed by the <i>alphanumeric indicator</i> , while the flow temperature is displayed on the <i>parameter display indicator</i> .
	Parameter editing indicator During the programming of any parameter, it shows the possibility to edit the associated parameter value. It flashes upon accessing the programming mode.

2.3 BOILER STATUS AND FAULT CODES

Normal operation

Boiler in STANDBY mode. Only the system pressure is displayed.	
Boiler in SUMMER or WINTER mode <i>No active function.</i> The flow temperature and the system pressure are displayed.	

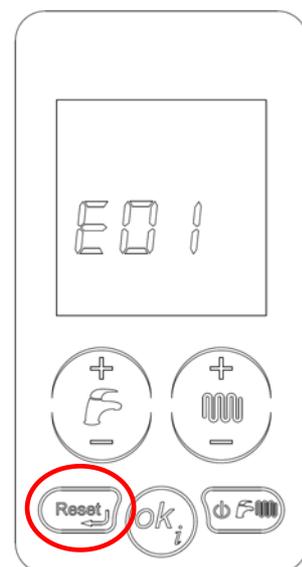
<p>Boiler in SUMMER mode only <i>DHW function active</i> with flame lit. The hot domestic water temperature and the burner power rate percentage are displayed</p>	
<p>Boiler in SUMMER or WINTER mode <i>DHW function active</i> with flame lit. The hot domestic water temperature and the burner power rate percentage are displayed</p>	
<p>Boiler in SUMMER or WINTER mode <i>CH function active</i> with flame lit. The flow temperature and the burner power rate percentage are displayed</p>	
<p>Boiler in WINTER mode only <i>CH function active</i> with flame lit. The flow temperature and the burner power rate percentage are displayed</p>	

Malfunction, errors to be reset by user and self-resettable faults

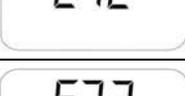
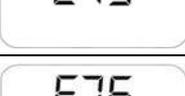
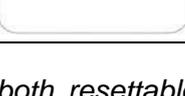
The display indicates the fault through the relevant error code (see following table). Some faults can be reset (r) by pressing the "reset" key, some others are self-resettable (a) and reset only when the fault is resolved:

Warning: in case of self-resettable faults, only back-lighting of the LCD will remain active while the relevant error code will flash. In case of resettable faults, instead, the error is displayed in a steady way, and the "reset" key is enabled as well to reset boiler shut-down condition.

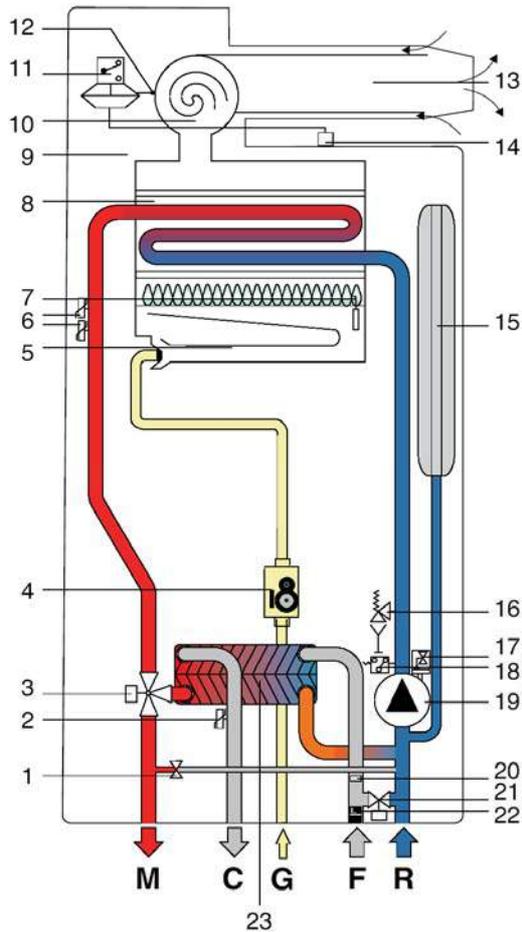
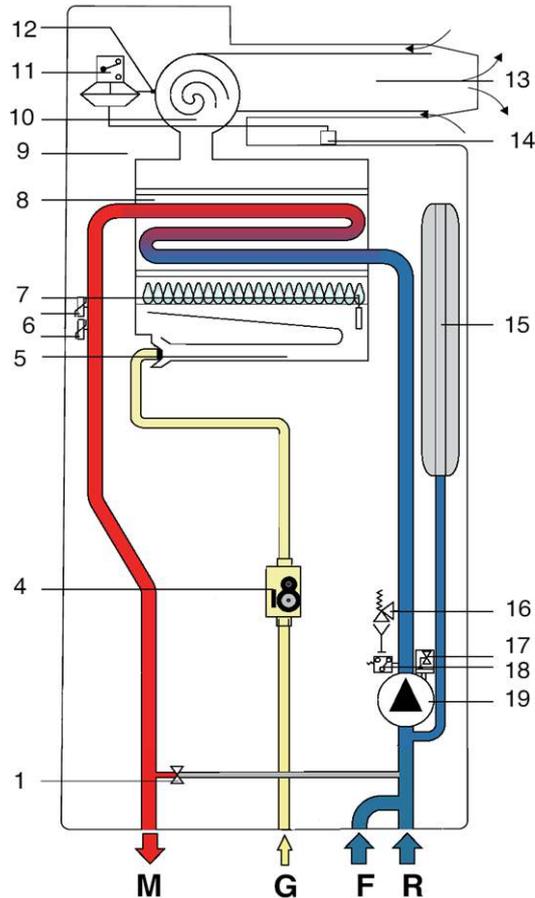
In either case, once the fault has been resolved, back-lighting of all keys is enabled and after one minute (no other key being pressed) the interface is disabled depending on parameter P78.



Boiler shut-down due to missing flame (r)	E01
Boiler shut-down due to double flow probe triggering (r)	E02
Boiler shut-down due to flue gas pressure switch (CTFS) or flue gas thermostat (RTN-CTN) (r) triggering	E03
Boiler shut-down due to too low system pressure (a)	E04
Boiler shut-down due to double flow probe fault (a)	E05
Boiler shut-down due to DHW probe fault (<i>only for CTN and CTFS</i>) (a)	E06
System pressure too high	E09
Boiler shut-down due to boiler probe fault (<i>only for RTN combined with boiler</i>) (a)	E12
External probe fault (a)	E23
Solar collector probe fault (SCS) (a)	E24
Solar valve probe fault (SVS) (a)	E27
Solar water heater probe fault (SBS) (a)	E28
Remote control connection fault (<i>signalled only by remote control</i>) (a)	E31
Triggering of safety thermostat in mixed zone 2 (a)	E35
Mixed zone 2 flow probe fault (a)	E36 02
Mixed zone 3 flow probe fault (a)	E36 03

Mixed zone 4 flow probe fault (a)	
Communication failure between peripheral devices: interface or supplementary board (a)	
Hydraulic configuration not allowed	
Zone configuration error (<i>remote control and ambient thermostat</i>)	
Pressure transducer fault (a)	
Communication error between main board and interface board	
Shut-down due to safety circuit hardware fault	
	
	
Air pressure switch (CTFS) or flue gas thermostat (RTN and CTN) recognition failure	
Incompatibility between boiler board and interface board	
Modulation coil fault (a)	
Max. number of reset attempts from interface reached (r)	
Max. number of reset attempts from remote control reached (<i>signalled both by remote control and interface</i>) (r)	

NB: The board is able to count and store the boiler's latest five faults (both resettable and self-resettable). View them by scrolling super-technical parameters from P01 to P05.

**SECT. 3****HYDRAULIC DIAGRAMS AND COMPONENTS****3.1 HYDRAULIC DIAGRAMS****CTFS****RTFS**

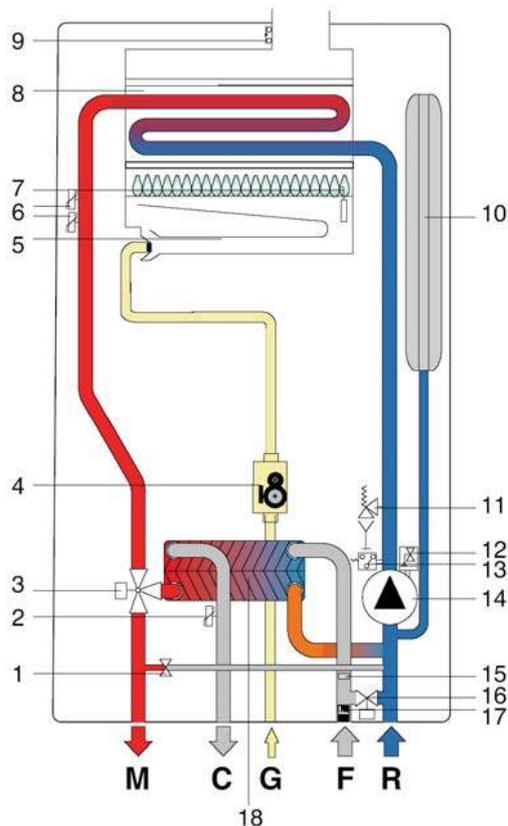
duct

1. Automatic by-pass
2. Domestic hot water temperature sensor
3. Motorised 3-way valve
4. Modulation gas valve
5. Burner
6. Double flow probe
7. Ignition/detection electrode
8. Mono-thermal exchanger
9. Sealed combustion chamber
10. Flue gas extractor fan
11. Safety air pressure switch
12. Pressure measurement point on flue gas duct

M CH system flow
G Gas inlet
R CH system return

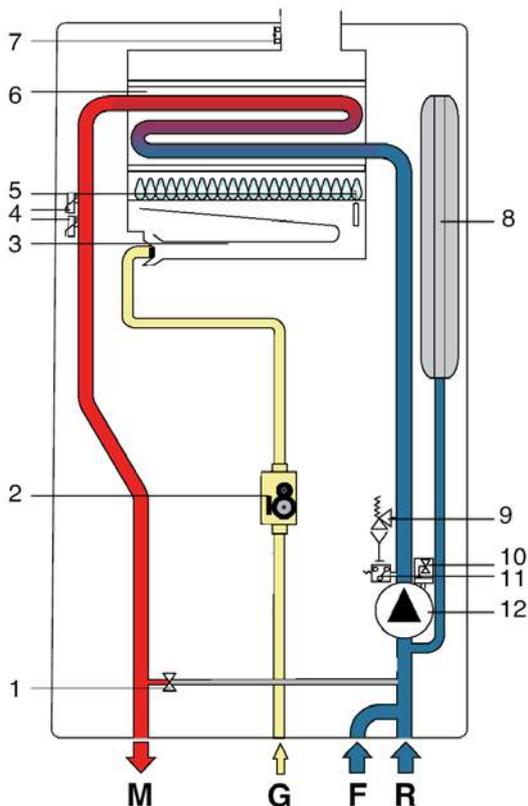
13. Air intake and venting duct
14. Pressure measurement point on flue gas
15. Expansion tank
16. 3-bar safety valve
17. Deaerator
18. Pressure transducer
19. 3-speed circulation pump
20. Flow rate limiting device
21. Filler cock
22. Cold water flow switch with filter
23. Secondary plate exchanger

C Domestic hot water outlet
F Cold water inlet

**CTN**

1. Automatic by-pass
2. Domestic hot water temperature sensor
3. Motorised 3-way valve
4. Modulation gas valve
5. Burner
6. Double flow probe
7. Ignition/detection electrode
8. Mono-thermal exchanger
9. Flue gas thermostat
10. Expansion tank
11. 3-bar safety valve
12. Deaerator
13. Pressure transducer
14. 3-speed circulation pump
15. Flow rate limiting device
16. Filler cock
17. Cold water flow switch with filter
18. Secondary plate exchanger

M CH system flow
C Hot water outlet
G Gas inlet
F Cold water inlet
R CH system return

RTN

1. Automatic by-pass
2. Modulation gas valve
3. Burner
4. Double flow probe
5. Ignition/detection electrode
6. Mono-thermal exchanger
7. Flue gas thermostat
8. Expansion tank
9. 3-bar safety valve
10. Deaerator
11. Pressure transducer
12. 3-speed circulation pump

M CH system flow
G Gas inlet
F Cold water inlet
R CH system return

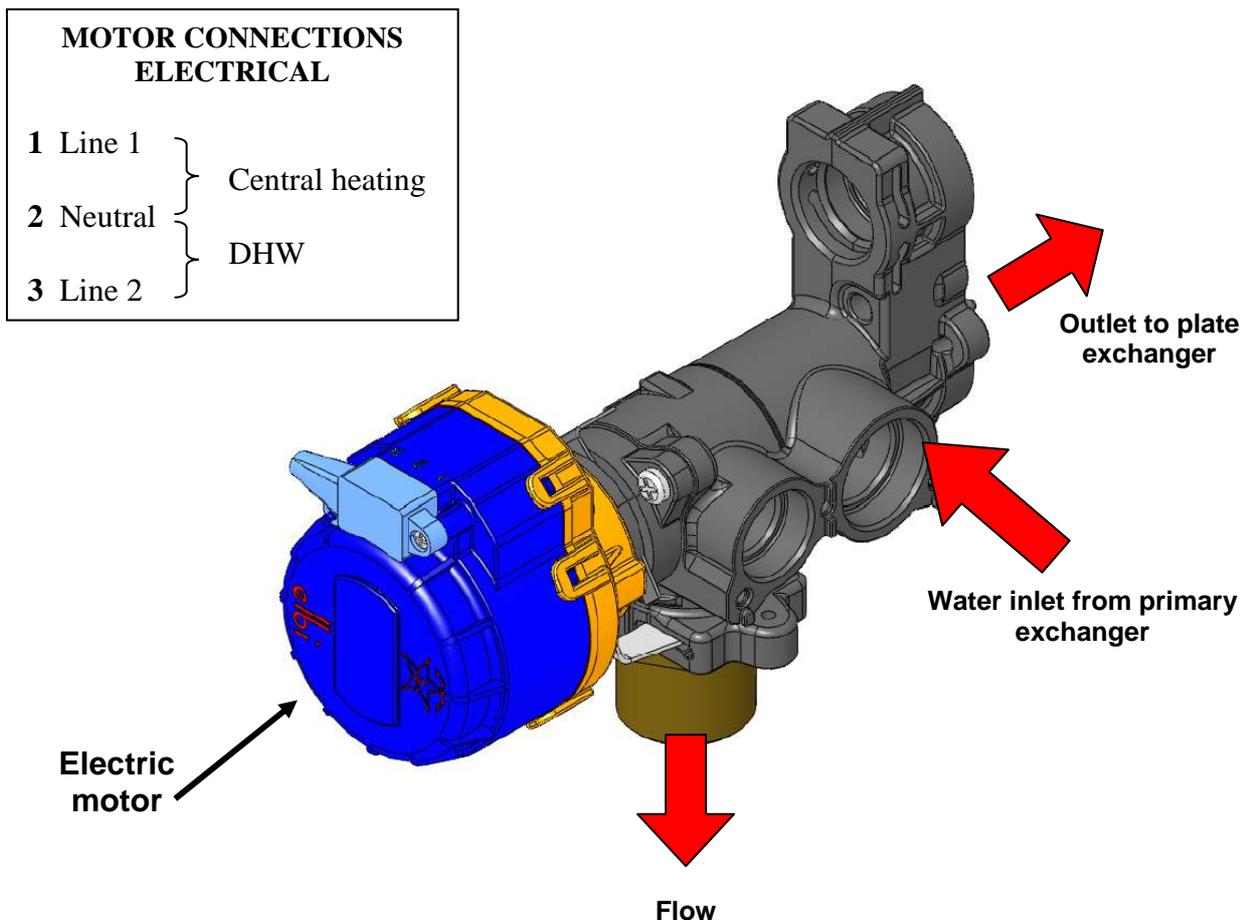


3.2 HYDRAULIC UNIT

MOTORISED THREE-WAY VALVE (only for CTN and CTFS versions)

The boiler uses a three-way valve to divert the water flow coming from the primary exchanger into another pipe, in particular it diverts the water into the secondary (plate) exchanger, where heat will be transferred to the DHW.

This valve consists of one main three-way body, one plastic (thermosetting polymer) cartridge, and one electric motor (actuator) to move the internal shutter.



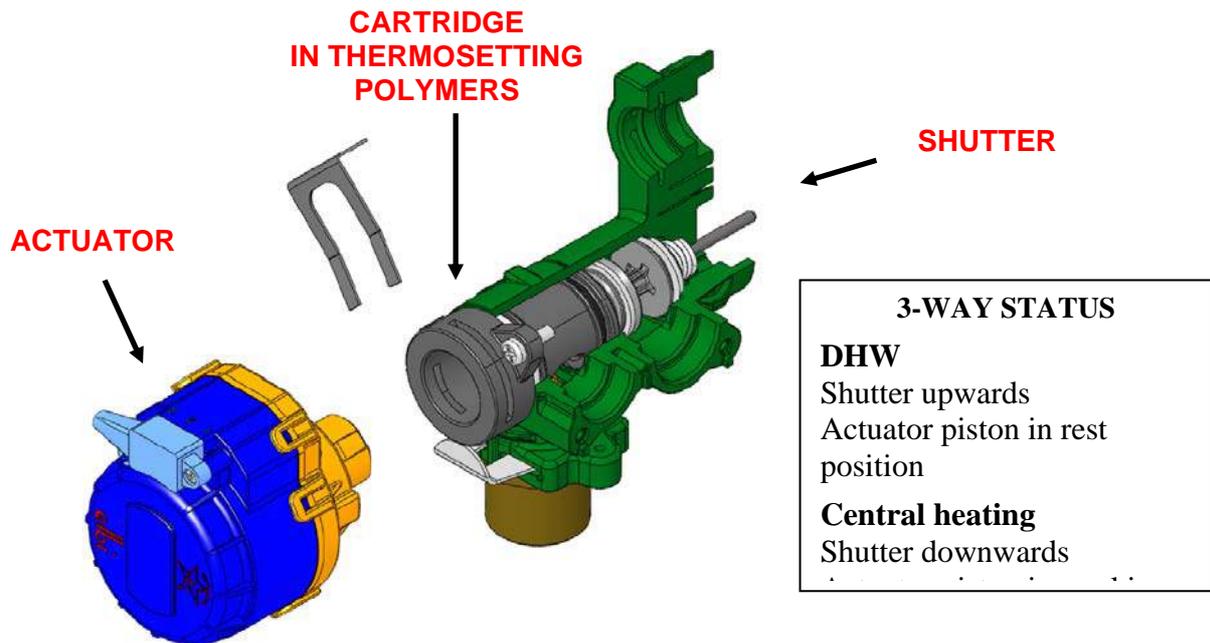
The secondary exchanger is fixed by the three-way valve and another unit made of thermosetting polymers connecting the cold water inlet pipe to the rest of the hydraulic system.

The stainless steel plate exchanger consists of 26 plates both for the 24 and for the 28 kW versions.

When hot domestic water is required, the cold water coming from the hot domestic water system passes through the flow switch setting the boiler to "DHW" mode. Then the three-way valve diverts the hot water coming from the primary exchanger into the secondary one so that it can transfer its heat to the plates for the instantaneous production of domestic hot water.

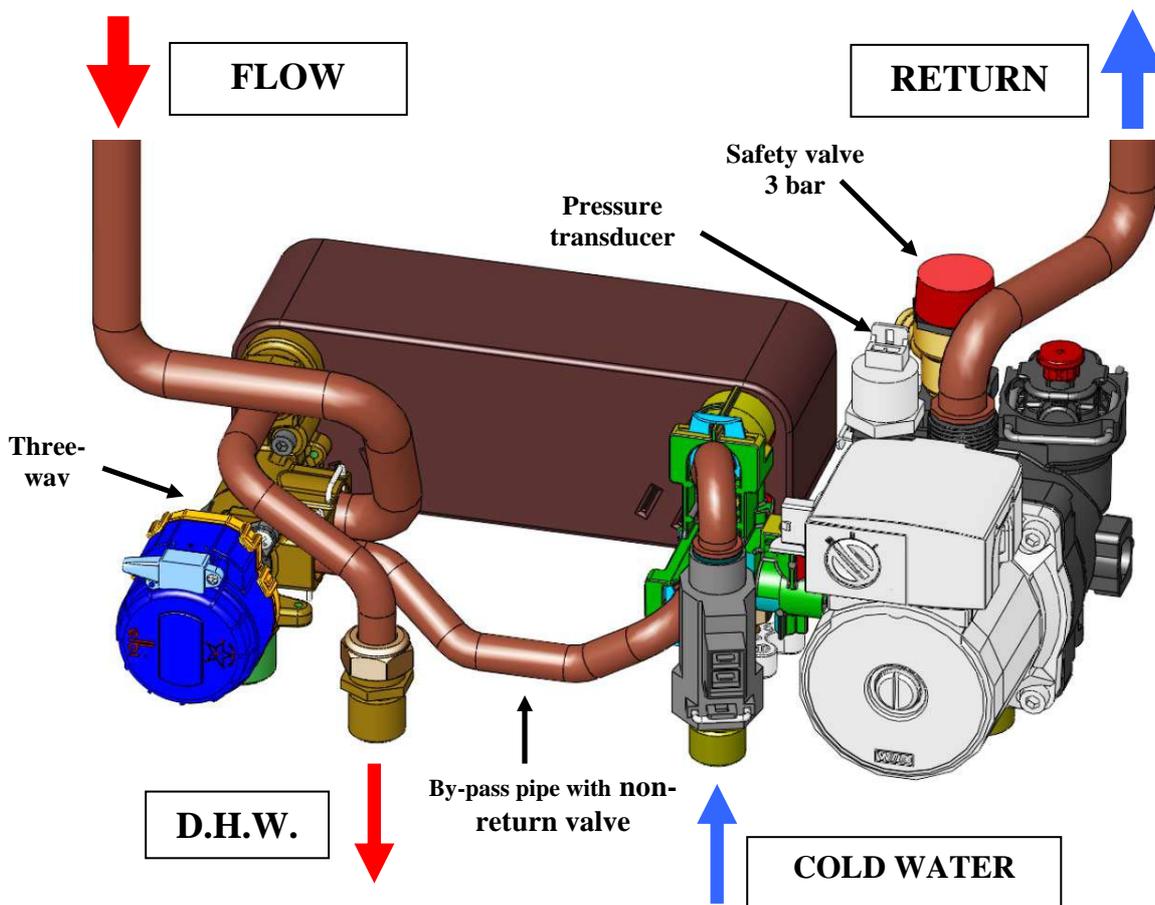
N.B. In rest condition, the three-way valve is in DHW mode position.

Three-way valve section:



The boiler is fitted with an internal automatic by-pass with non-return valve, whose opening threshold is 400 mBar.

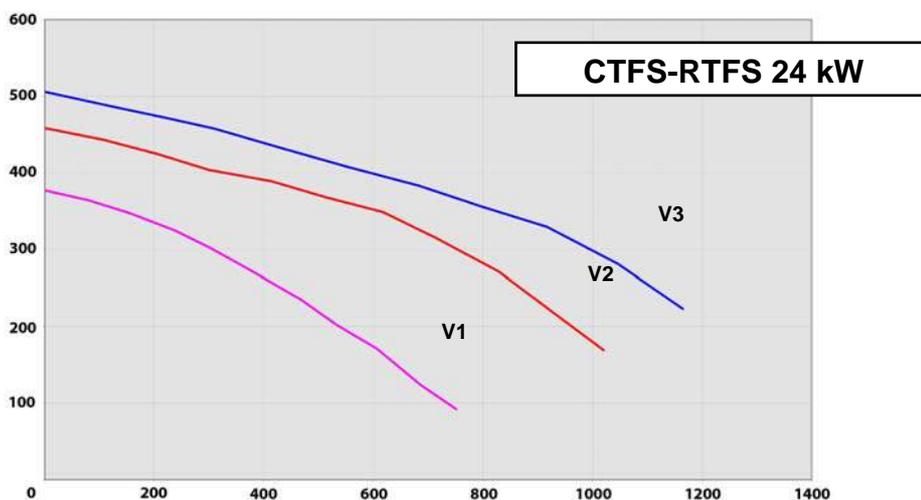
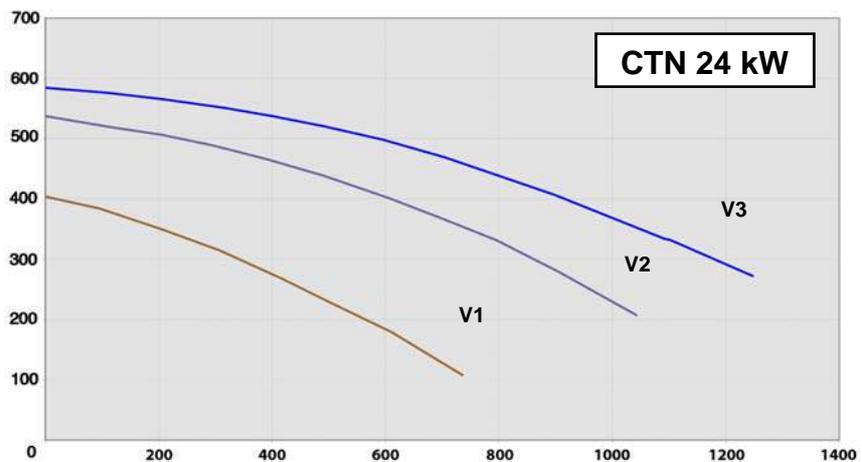
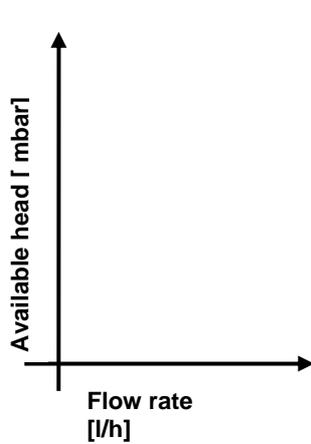
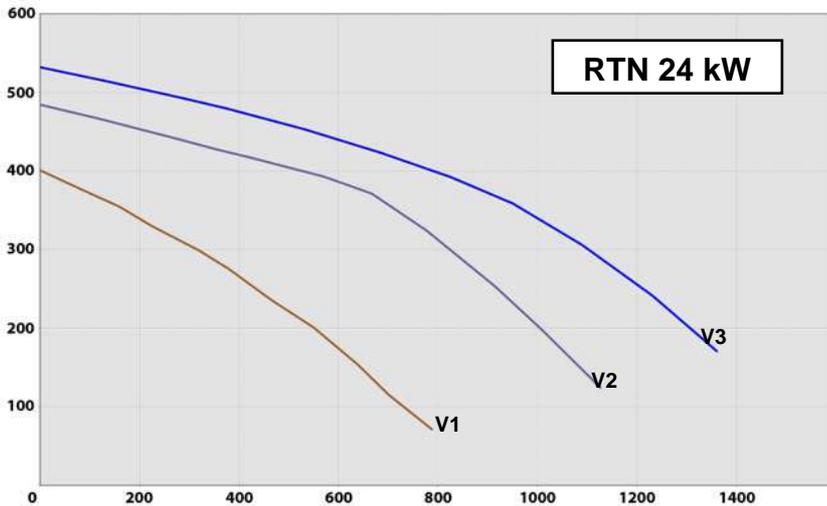
In case of load losses in the system due to thermostatic valve triggering, the by-pass ensures a minimum flow rate inside the primary exchanger. The function of the by-pass is to protect the primary exchanger from overtemperatures due to poor water flow.





The circulation pump end block features one 3-position selector to set the motor rotation speed and thus the head to the system.

The circulation pump is the same for all output rates, what varies (depending on the hydraulic circuit of the boiler) is the residual head curve:

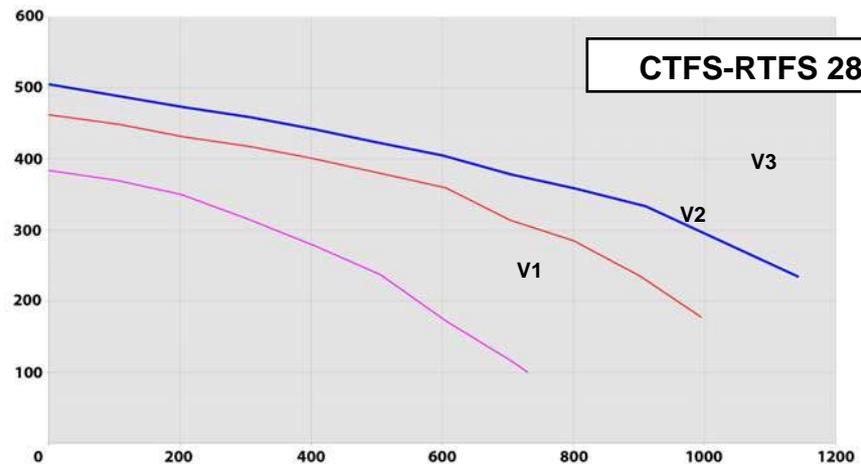


CIRCULATION PUMP TECHNICAL SPECIFICATIONS

- Maximum head: 6 m
- Max. operating pressure: 6 bar
- Max. circulation temperature: 95 °C

**CTFS-RTFS 28-32 kW****KEY**

- V1 Pump speed I (min.)
- V2 Pump speed II
- V3 Pump speed III (max.)

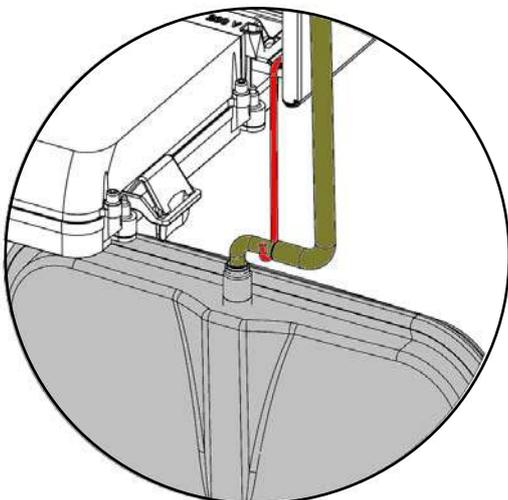
**DHM FLOW SWITCH (only for CTN and CTFS versions)**

The domestic hot water flow switch features a magnet switch whose position determines the minimum quantity of hot domestic water necessary to start the boiler (3 l/min ON and 1 l/min OFF). If the request of DHW does not exceed such value, the micro-switch does not close the contact and inhibits the boiler starting to avoid the boiling risk at very low flow rates.

According to the different power rates, the main difference between one flow switch and the other is the flow rate limiting device (flow regulator) that determines the litres/minute that can be drawn at Δt 30K (10 l/min for 24 kW models and 13 l/min for 28 kW models).

3.3 EXPANSION TANK

An increase in heating water temperature inside a closed circuit corresponds to an increase in the water volume. As no further space is available, the increase will affect the pressure and not the volume. If pressure value exceeds safety valve triggering point, this latter will open and discharge water from the system. To prevent such occurrence an expansion tank is positioned inside the circuit; the vessel houses an air diaphragm used to balance overpressure.



Tank capacity: 7 litres

WARNING: the expansion tank is in front of the combustion chamber within a containment tank.

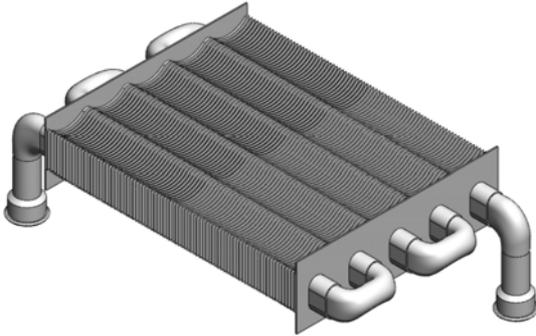
The boiler is provided with an internal hook to support the tank during maintenance (see picture on the side); it does not need to be disconnected from the hydraulic line.

3.4 HEAT EXCHANGERS

PRIMARY EXCHANGER

It is made up of a set of copper pipes, connected to each other in a way to create a "coil". The finning improves the efficiency of the heat exchange between the water flowing inside, the heat developed by the burner flame and the hot combustion flue gases. The number of fins determines the type of exchanger used for the different output rates.

The heat exchanger and the pipes are connected by means of special clips. Hydraulic sealing by pressure is ensured by O-rings applied to the specific pipes.



88 fins for **24 kW TN** models

98 fins for **24 kW TFS** models

106 fins for **28 kW TFS** models

Warning: to replace the heat exchanger, proceed as follows:

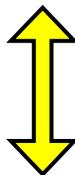
- remove boiler front casing;
- release the expansion tank (*place it as shown in previous paragraph*);
- remove combustion chamber panel;
- remove fan and flue gas hood;
- release the retaining clips;
- pull the exchanger upward to replace it;
- refit all components, lubricate O-ring with care.

SECONDARY EXCHANGER (*only for CTFS and CTN versions*)

It is made up of a number of overlaying metal plates. In the spaces between the plates, the hot water coming from the CH circuit and the DHW system cold water flow simultaneously in separate circuits.

The hot water will transfer its heat to the DHW system cold water. Therefore, at the outlet, the DHW will be warmer and the CH water (primary circuit) will be cooler.

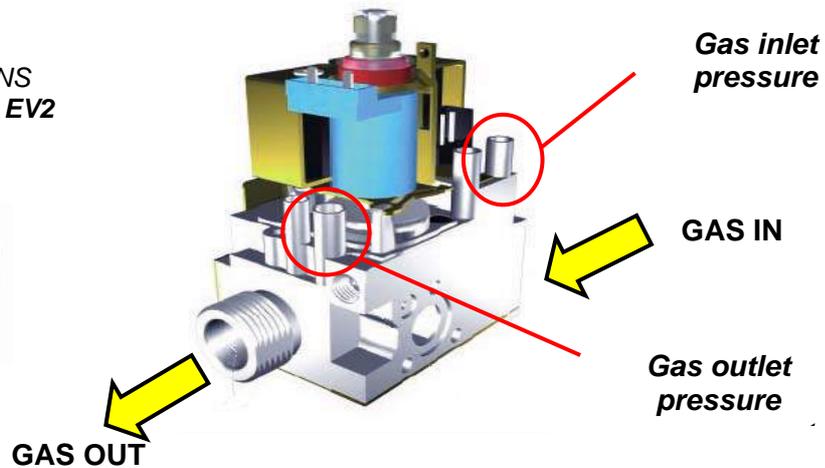
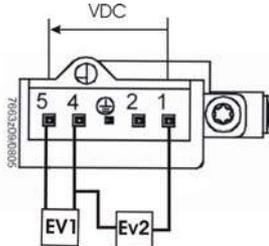
26 plates
FOR ALL
POWER RATES



3.5 GAS VALVE

The boiler is approved for operating with gas valve, model SIT 845:

ELECTRICAL CONNECTIONS SOLENOID VALVES EV1 and EV2



Gas valve characteristics	
EV1 and EV2 safety coil operating power supply	230 VAC 50 Hz
EV1 operating current	40 mA
EV2 operating current	12 mA
EV1 supply pin	4 - 5
EV2 supply pin	4 - 1
Modulation coil operating power supply	17 VDC
Max. operating pressure	60 mbar
Working temperature	-15 / 60°C
Modulation parameters	
Current of gas modulation coil at maximum output	120 (natural gas) / 170 (LPG) mADC
Current of gas modulation coil at minimum output	20 (natural gas) / 30 (LPG) mADC
Current of gas modulation coil at the end of the ignition ramp	80% of maximum current for TFS 65% of maximum current for TN
Current of gas modulation coil at the end of the heating rising ramp	At maximum CH output (P7)
Coils	
Safety coil interchangeability	Yes
EV1 resistance value	~ 1600 Ohm
EV2 resistance value	~ 6.77 KOhm
Modulation coil resistance value	~ 78 Ohm

The valve features a compensation pressure point connected to the combustion chamber through a silicone pipe.

Valve thus knows the pressure on nozzles and can supply the correct quantity of gas even in case of overpressure or vacuum inside the chamber.

For example, upon ignition when fan is activated, a vacuum develops inside the combustion chamber. Thanks to this pressure point, valve decreases nozzle pressure so as to balance any exceeding gas supply due to vacuum.

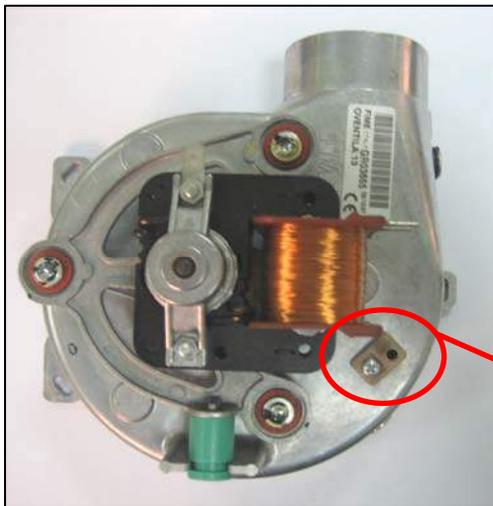


3.6 FLUE GAS FAN

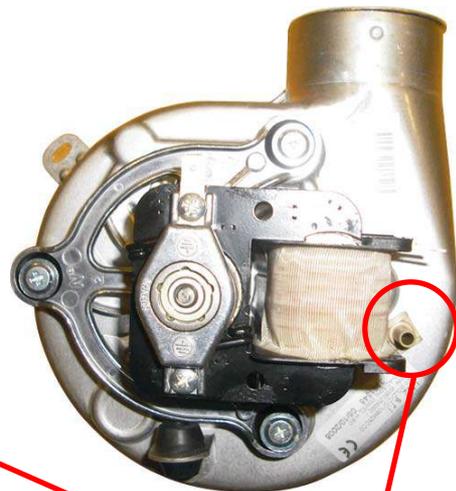
Flue gas fan is of asynchronous type (fixed speed) and is used to purge flue gases generated by combustion during boiler operation. The fan features a Pitot plastic pipe to limit the condensate build up on the fan pressure measurement point to which a control device (air pressure switch) is connected to ensure correct ventilation. This device ensures that the difference between the pressure generated by the fan and the pressure detected in the boiler is at least equal to the minimum value needed for the boiler to work properly. Power of flue gas fan, as well as pressure switch for ventilation control, vary depending on boiler model.

A double fan, interchangeable depending on the supplier (FIME or NATALINI), is available only for the 24 kW boiler, whereas only one version (FIME) is available for the 28 kW model. The differences between the two models are listed below:

FIME



NATALINI



Fan technical characteristics:

Boiler output	24 kW		28 kW
Supplier	Fime	Natalini	Fime
Power supply	230 Vac, 60 Hz		
Power [W]	38	35	60
Type of worm screw	Die-cast	Sheet metal	Die-cast

Air pressure switch technical characteristics:

Boiler output	24 kW	28 kW
Working scale [Pa]	45 - 32	125 - 112
Reference colour	white	yellow

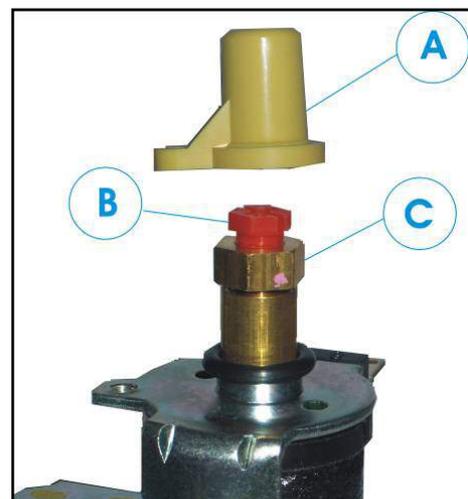
SECT. 4

GAS SETTING AND PARAMETERS

4.1 GAS VALVE SETTING

To set the gas valve, proceed as follows:

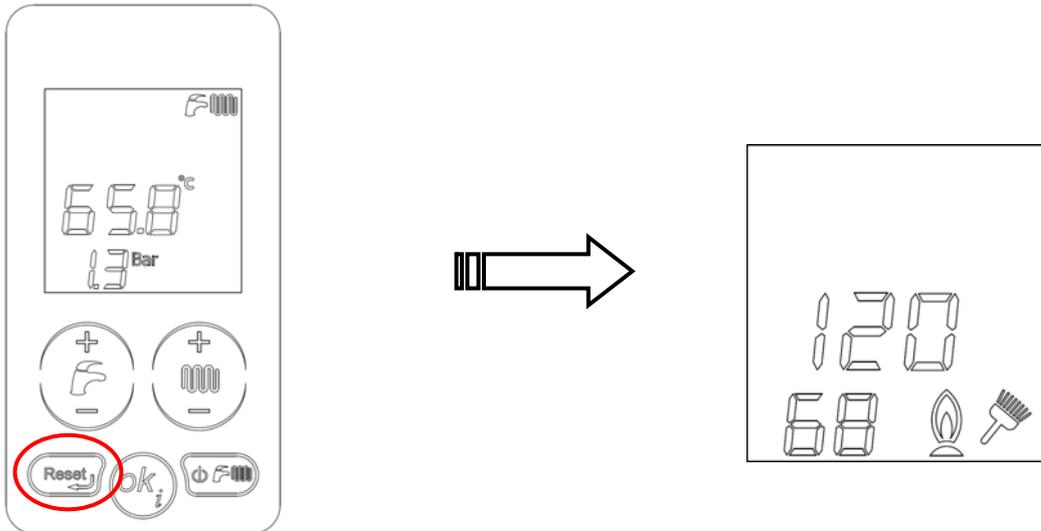
- **check supply static pressure** by means of the inlet pressure measurement point **E** referring to the "setting" table on page 10, according to the type of fuel used (pressure values lower than requested do not guarantee proper boiler operation);
- check that the **heating maximum output** set with the parameter **P7** is **100%** (to view or edit this parameter, refer to the sequence described in the "parameter editing" paragraph, on page 29);
- switch heating system on with the ambient thermostat;
- ignite boiler in the "**flue cleaning**" mode (see following paragraph);
- with the pressure gauge in the inlet pressure measurement point **E**, check **supply dynamic system pressure** while the boiler is working (in case the pressure is too low, boiler proper operation is not guaranteed);
- remove the plastic cover protecting the adjustment screws at the top of the modulation coil;
- then connect the pressure gauge to the gas outlet pressure measurement point **D** after closing the inlet pressure measurement point;
- turn the maximum output screw **C** to increase (screw in) or decrease (loosen) the **maximum pressure**, making reference to the "setting" table on page 10;
- electrically disconnect one of modulation coil connectors to operate the boiler at the minimum output;
- adjust the **minimum pressure** by turning the screw **B** of the gas valve (while holding the external screw **C**). Make reference to the "setting" table;
- re-connect connector to modulation coil and check maximum pressure again;
- disconnect the pressure gauge and check for any gas leakage both on the pressure measuring points and on the gas valve connection fly nuts;
- refit protection cover;
- quit the "flue cleaning" function by pressing the "**reset**" key;
- in case parameter **P7** has been edited, set the correct value again;
- switch the heating system off with the ambient thermostat.



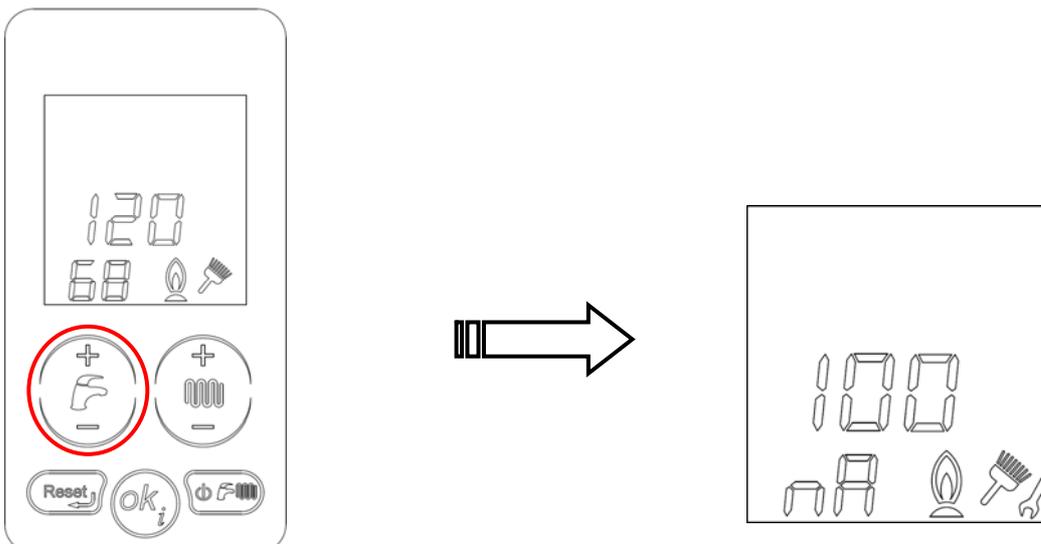
4.2 FLUE CLEANING FUNCTION

The boiler features a flue cleaning function which must be used to measure combustion efficiency during operation and to set the burner.

This function can be enabled only in the CH + DHW operating mode. To enable it, **press "reset"** key and keep it pressed for more than **three seconds**. Now the boiler performs the ignition sequence and then operates at the burner **maximum output** set by parameter **P7**. The display will show simultaneously the current (mA) supplied to the modulation coil, the flow temperature, the lit flame symbol with burner on, the "broom" symbol to indicate that the flue cleaning function is active:



Use the "+" or "-" **DHW** keys to change the value of the **current supplied to the modulation coil**, from the minimum to the maximum value according to parameter P7. In this case, the display will show the wrench symbol (parameter editing indicator) and the value of the current supplied to the modulation coil being edited:



This operation is useful when setting the boiler combustion with closed casing. The desired output is set by pressing the DHW keys.

The current supplied to the modulation coil at the minimum and at the maximum output values according to the gas used are given below:

	max [mA]	min [mA]
Natural gas	120	20
LPG	170	30

Release the “+” or “- *DHW*” keys to return to the previous page showing the current at the modulation coil and the flow temperature.

The burner is switched off when the temperature detected by the flow probe exceeds 90°C and switched on again when reaching 70°C.

During such function the pump is supplied with power, the three-way valve switches to the heating position, and the multifunction relay is energised with parameter P17=1 (remote relay) or P17=3 (heating relay).

The function automatically stops after 15 minutes, or by pressing the “reset” key, or setting a mode different from the “*CH+DHW*” one.

WARNING: the connected zone boards, if any, will also transfer the heat as a result of mixing valve setting, thus enabling the zone pump to maintain the flow set-point.

4.3 GAS CONVERSION

Boilers are manufactured to run on the type of gas (natural gas or LPG) specifically required upon purchase order placing, and any conversion shall be made by qualified personnel.

During gas conversion, proceed as follows:

- make sure to work with the boiler disconnected from the electric power supply;
- remove combustion chamber front panel;
- remove burner upper part concerning gas ramps;
- remove burner nozzles and replace them with new ones having a diameter suitable for the new gas type (see “setting” paragraph on page 10).

WARNING: it is mandatory to fit the copper gaskets supplied along with the conversion kit;

- refit burner and combustion chamber;
- supply the boiler with power;
- access parameter setting page, and set the P0 parameter to the value corresponding to the type of gas used (refer to the illustrated sequence on “Parameter editing” on page 29):

P0 → 1 = 24 kW natural gas

P0 → 3 = 28 kW natural gas

P0 → 0 = 24 kW LPG

P0 → 2 = 28 kW LPG

- gas valve can now be set (paragraph 4.1).

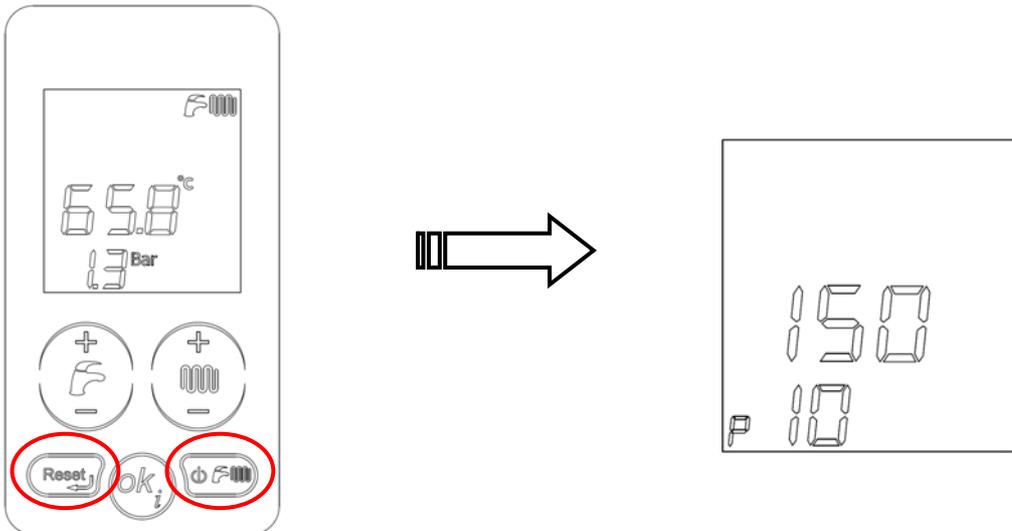
N.B. “Polidoro” burners feature as a standard nozzles without copper washers. It is mandatory to fit them during conversion. Failure to do so may affect the proper sealing.

4.4 PARAMETERS

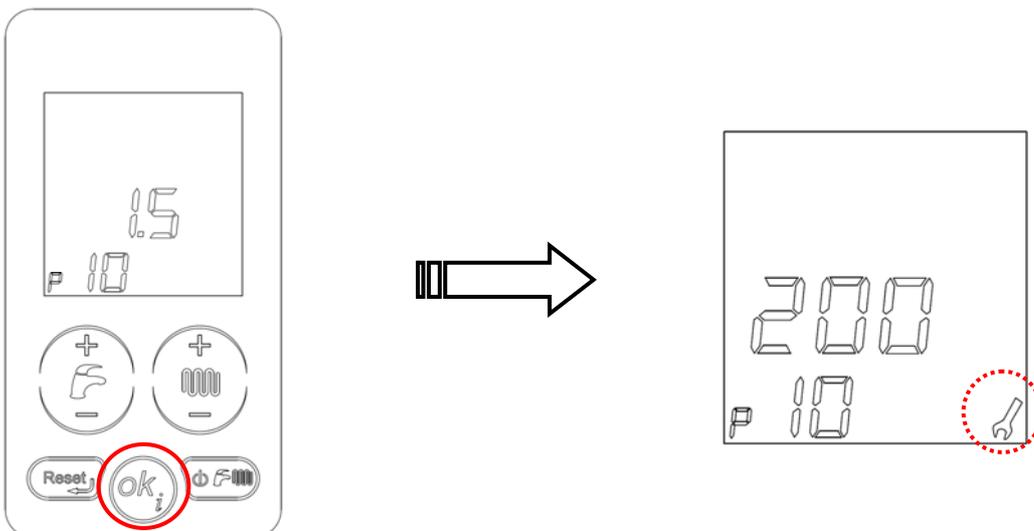
The boards feature a memory with a series of parameters that can be accessed for displaying purposes only. They can as well be edited for boiler perfect configuration depending on the system used. These parameters can be directly accessed from user's interface, or through the remote control. In the latter case, it is possible to access only up to the 29th parameter.

TECHNICAL parameter editing

To access the parameter setting mode, press “reset” and “boiler status” keys simultaneously for three seconds. Then use the “+/- CH” keys to select the desired parameter (see list at the following paragraphs).



Press “OK” to confirm that parameter value must be edited; the adjustable wrench symbol indicates that parameter value can be edited using keys “+/- heating”.

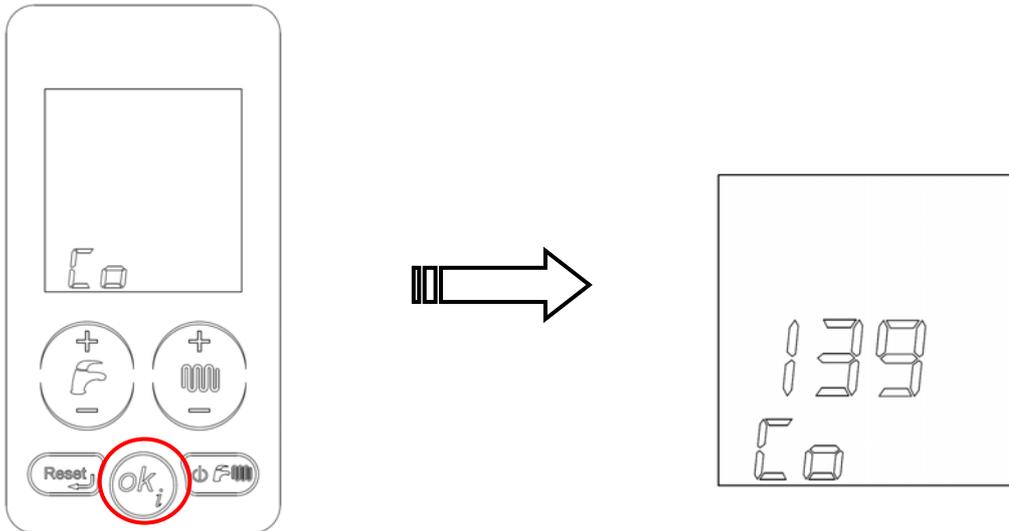


Then confirm the modification of the parameter value by pressing the “ok-info” key again and scroll the list to edit more parameters, or quit the setting with the “reset” key.

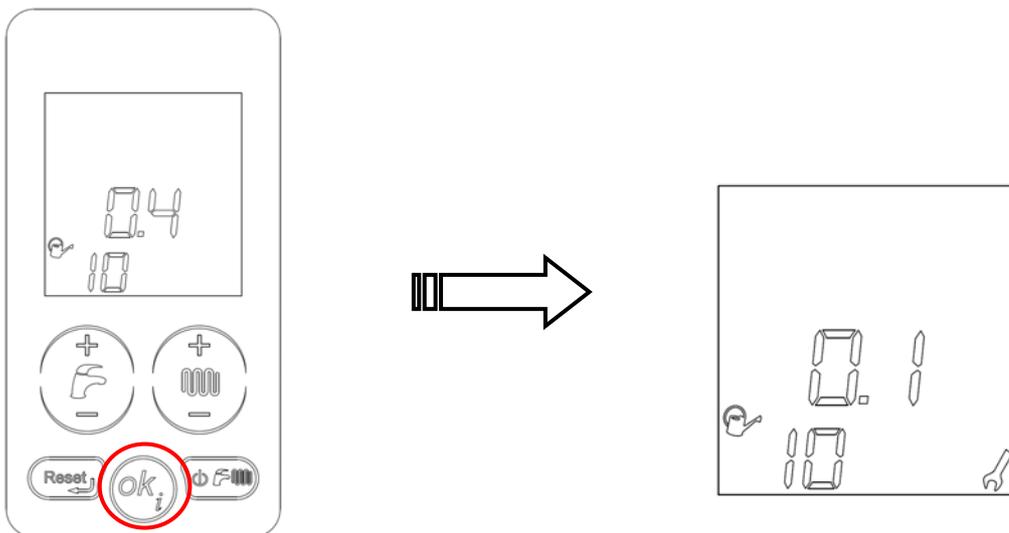
SUPER-TECHNICAL parameter editing

To access the super-technical parameter programming, proceed as described in the previous paragraph (press “reset” and “boiler status” keys simultaneously for three seconds). Super-technical parameters are in sequence after the 99th parameter.

The message “Co” shows that a **code** must be entered (default **139**) with the “+ and – CH” keys (confirm each single number with the “ok” key).



After entering the correct entry code, an icon will be displayed, showing  that the super-technical parameter area has been accessed. It is now possible to select and edit the desired parameters following the same procedure described in the previous paragraph (“ok-info” key to access the parameter and “+/- CH” key to change its value).



Then confirm the modification of the parameter value by pressing the “ok-info” key again and scroll the list to edit more parameters, or quit the setting with the “reset” key.

Parameter display (read-only)

Press the "OK-info" key several times to scroll in sequence the values of the parameters for displaying purposes only (from P30 to P50), such as the temperatures detected by the connected probes.

To quit the displaying function, simply press "reset". The start page will be displayed anyway 60 seconds after the last time the key has been pressed.

TECHNICAL parameter list

Parameter	Range	Default values	Notes
P0 Boiler output selection (<i>selection of "current-output" curve</i>)	0 ÷ 5	1	0 = 24 kW LPG 1 = 24 kW natural gas 2 = 28 kW LPG 3 = 28 kW natural gas 4 = 32 kW LPG 5 = 32 kW natural gas
P2 Selection of pressure control type	0 ÷ 1	0	0 = pressure transducer 1 = low water pressure switch
P3 Boiler type selection	1 ÷ 3	1	1 = combined instantaneous 2 = CH only 3 = with water heater
P6 Ignition power setting	0 to 100 %	0	0 = operation with ignition ramp; ≠ 0 , ignition power identical to set power
P7 CH maximum output	10 to 100 %	100	10 = minimum output 100 = maximum output
P10 Heating curve	0 ÷ 3 (1=100)	1.5	<u>With external probe:</u> <i>Low temp. from 0 to 0.8</i> <i>High temp. from 1 to 3</i> <u>Without external probe:</u> Value < 1, reduced range for low temperature, from 35° to 45°C.
P11 Heating thermostat timing	0 to 10 min	4	
P12 CH power rising ramp timer	0 to 10 min	1	
P13 Timer for CH post-circulation, freeze protection and flue cleaning function	30 to 180 s	30	
P14 "Solar" DHW thermostat setting	0 ÷ 1	0	0 = normal 1 = solar
P15 Water hammer protection delay, configurable	0 to 10 s	0	
P16 Ambient thermostat reading delay / OT	0 to 199 s	0	
P17 Multifunction relay setting	0 ÷ 3	0	0 = shut-down and fault 1 = remote relay/TA1 2 = solar relay 3 = request TA2

Solar par. (with P17=2 or with supplementary board)	P18 Solar plant selection (with P17=2P3=1)	0 ÷ 1	0	0 = solar valve 1 = solar pump
	P19 Water heater set-point setting range	10 to 90 °C	60 °C	<i>Only with forced circulation solar plant</i>
	P20 ΔT ON (diff. for solar pump switch-on)	1 to 30 °C	6 °C	
	P21 ΔT OFF (diff. for solar pump switch-off)	1 to 30 °C	3 °C	
	P22 Maximum collector temperature	80 to 140 °C	120 °C	
	P23 Minimum collector temperature	0 to 95 °C	25 °C	
	P24 Solar collector anti-freeze	0 ÷ 1	0	0 = anti-freeze not enabled 1 = anti-freeze enabled
	P25 Solar charge forcing (from multif. relay)	0 ÷ 1	0	0 = automatic operation 1 = always enabled
	P26 Enabling of water heater cooling	0 ÷ 1	0	0 = disabled 1 = enabled
P27 Heating timer reset temperature	35 ÷ 78 °C	<i>P10<1 (low temp.) = 35°C</i> <i>P10≥1 (high temp.) = 40°C</i>		
P28 Selection of hydraulic control (only for CH-only version)	0 ÷ 1	0	0 = pump + deviating valve 1 = double pump	
P29 Default parameters setting except for P0, P2, P17 and P28	0 ÷ 1	0	0 = OFF 1 = default parameters	
Display only	P30 Display of external temperature			It can be displayed with connected external probe only
	P31 Flow temp. displaying			
	P32 Display of calculated nominal flow temperature			It can be displayed with connected external probe only
	P33 Display of flow temperature set-point for zone 2			It can be displayed with a connected zone board only
	P34 Display of current flow temperature for zone 2			It can be displayed with a connected zone board only
	P36 Display of flow temperature set-point for zone 3			It can be displayed with two connected zone boards
	P37 Display of current flow temperature for zone 3			It can be displayed with two connected zone boards
	P39 Display of flow temperature set-point for zone 4			It can be displayed with three connected zone boards
	P40 Display of current flow temperature for zone 4			It can be displayed with three connected zone boards

Display	P42 Plate DHW temp. displaying			
	P44 Boiler temp. displaying			Visible only for the R versions with connected boiler probe
	P46 Display of solar collector temperature			Visible only with connected solar collector probe
	P47 Display of temperature of water heater or solar valve from boiler			Visible only with connected water heater probe or solar valve
	P48 Display of water heater or solar valve temperature from solar card			As above, but visible only with connected supplementary board
	P59 Type of temperature visualisation on display	0 ÷ 7	0	0 = flow temperature 1 and 2 = not allowed 3 = external temperature 4 = water heater temp. 5 = solar collector temp. 6 = solar valve temp. 7 = solar valve temp. from supplementary board
P60 Number of supplementary boards connected to the mother board (zone + solar)	0 ÷ 4	0	Max. 4 boards, three zone boards and a solar card	
P61 Ambient thermostats and remote association	00 ÷ 02	00	00 = remote control zone2; Ta2 zone1; 01 = Ta1 zone2; Ta2 zone1; 02 = Ta2 zone2; remote control zone1;	
P62 Selection of zone 2 curve	0 ÷ 3 (1=100)	0.6	It can be set only with connected zone board. <u>Without external probe:</u> value < 1, reduced range (low temperature)	
P63 Zone 2 set-point selection (fictitious temp.)	5 ÷ 30 °C	20°C	It can be set only with one connected zone board. <u>Without external probe:</u> Fixed flow set-point	
P66 Selection of zone 3 curve	0 ÷ 3 (1=100)	0.6	It can be set only with two connected zone boards <u>Without external probe:</u> value < 1, reduced range (low temperature)	
P67 Zone 3 set-point selection (fictitious temp.)	5 ÷ 30 °C	20°C	It can be set only with two connected zone boards <u>Without external probe:</u> Fixed flow set-point	
P70 Selection of zone 4 curve	0 ÷ 3 (1=100)	0.6	It can be set only with three connected zone boards <u>Without external probe:</u> value < 1, reduced range (low temperature)	

P71 Zone 4 set-point selection (fictitious temp.)	5 ÷ 30 °C	20°C	It can be set only with three connected zone boards <u>Without external probe:</u> Fixed flow set-point	
P74 Low temperature zone mixer valve opening time	0 to 300 s	140 s	It can be set only with a zone board connected.	
P75 Rise in nominal boiler temperature with zone board	0 ÷ 35 °C	5 °C	Useful to balance thermal shocks at the circuit breaker	
P76 Thermal discharge enabling with solar card	0 ÷ 1	0	0 = disabled 1 = enabled	
P78 Interface back-lighting switching on	0 ÷ 2	0	0 = standard (off) 1 = LCD always on 2 = LCD + keys always on	
System check	P80 Multifunction relay forcing	0 ÷ 1	0	0 = standard function 1 = relay energised
	P81 Zone 2 pump relay forcing	0 ÷ 1	0	0 = standard function 1 = relay energised
	P82 Zone 2 mixing valve forcing	0 ÷ 2	0	0 = standard function 1 = force opening 2 = force closing
	P84 Zone 3 pump relay forcing	0 ÷ 1	0	0 = standard function 1 = relay energised
	P85 Zone 3 mixing valve forcing	0 ÷ 2	0	0 = standard function 1 = force opening 2 = force closing
	P87 Zone 4 pump relay forcing	0 ÷ 1	0	0 = standard function 1 = relay energised
	P88 Zone 4 mixing valve forcing	0 ÷ 2	0	0 = standard function 1 = force opening 2 = force closing
	P90 Solar card pump relay forcing	0 ÷ 1	0	0 = standard function 1 = relay energised
	P91 Solar card valve relay forcing - opening	0 ÷ 1	0	0 = standard function 1 = relay energised
	P92 Solar card valve relay forcing - closing	0 ÷ 1	0	0 = standard function 1 = relay energised
P95 Maximum current to modulation coil (<i>point C of curve</i>)	0 to 170 mA	According to P0	See modulation diagrams on page 37	
P96 Minimum current to modulation coil (<i>point B of curve</i>)	0 to 170 mA	According to P0		

SUPER-TECHNICAL parameter list  (code 139)

<i>Parameter</i>	<i>Range</i>	<i>Default values</i>	<i>Notes</i>
P0 Display of boiler type	XYZ		X = P0 technical parameters Y = P2 technical parameters Z = P18 technical parameters
P1 Display of most recent boiler shut-down			Fault code
P2 Display of penultimate boiler shut-down			Fault code
P3 Display of third last boiler shut-down			Fault code
P4 Display of fourth last boiler shut-down			Fault code
P5 Display of fifth last boiler shut-down			Fault code
P6 Shut-down display reset	0 ÷ 1	0	1 = shut-down reset
P7 Display of total alarm counting			
P8 Display of board usage in months	Counting based on the board micro-switch reset. 30 reset operations correspond to one month.		
P10 Low water alarm threshold (E04)	0.4 ÷ 1 Bar	0.4	
P13 High pressure alarm threshold (E09)	2 ÷ 4 Bar	2.8	
P14 Error E09 reset	1.8 ÷ 3.8 Bar	2.6	
P15 Error E04 reset	0.6 ÷ 2 Bar	0.8	
P25 Flame propagation time on TFS boiler with ramp enabled	0 to 4 s	2	
P26 DHW flow measurement	0 ÷ 2	2	0 = flow switch 1 = flowmeter 2 = automatic: mid-interface, flow switch, top interface: flowmeter
P27 Gas valve modulation coil short-circuit control enable	0 ÷ 1	0	0 = disabled 1 = enabled
P91 Boiler overtemperature control	0 ÷ 1	0	0 = double probe 1 = limit thermostat
P92 Post-ventilation timer for TFS boilers after burner switching off	0 to 60 s	10	

SECT. 5**OPERATING LOGIC****5.1 MAIN GENERAL CHARACTERISTICS**

- Function priority;
- Boiler type selection;
- Automatic flame control;
- Ignition with ramp or at pre-set power;
- DHW control;
- Plate DHW modulation;
- Boiler DHW modulation;
- Ambient thermostat;
- Adjustable CH maximum output;
- Temperature range pre-selection;
- Heating modulation;
- Ambient thermostat timer (antifast);
- Thermoregulation with external probe;
- Presetting for Remote Control;
- Programmable multifunction relay;
- Presetting for connection to supplementary boards;
- Temperature probe integrity check;
- Gas proportional modulation coil integrity check;
- Anti-seize function;
- Post-ventilation function;
- Pump post-circulation function;
- Anti-freeze function;
- Anti-legionella function;
- Safety devices and functions;

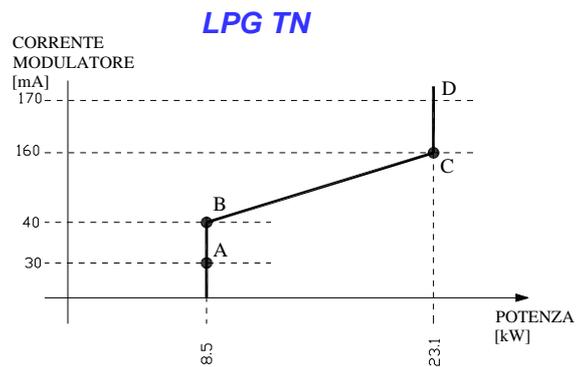
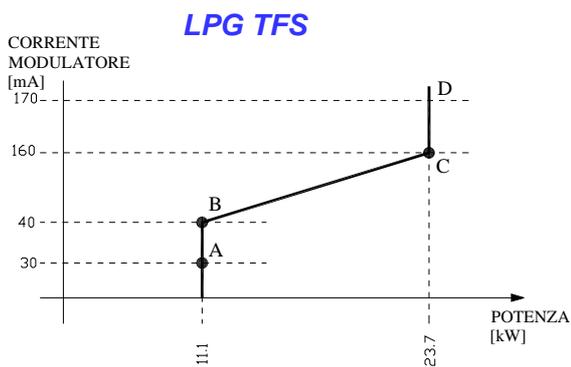
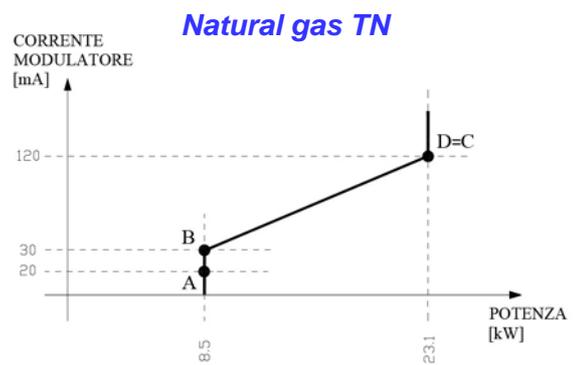
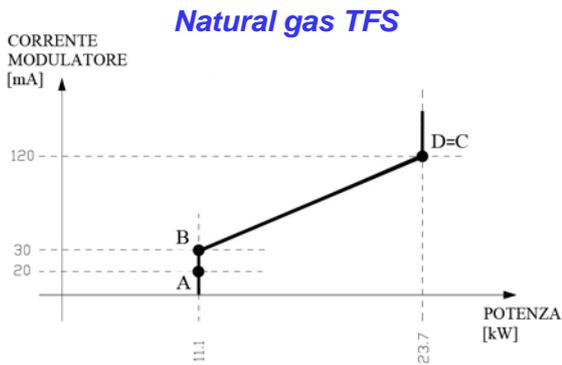
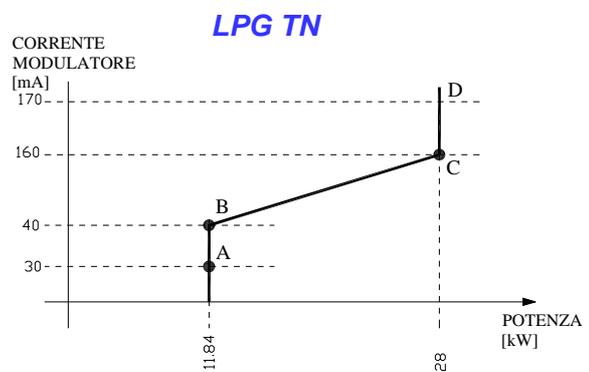
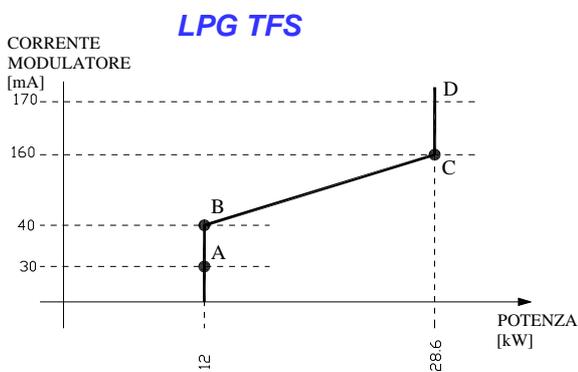
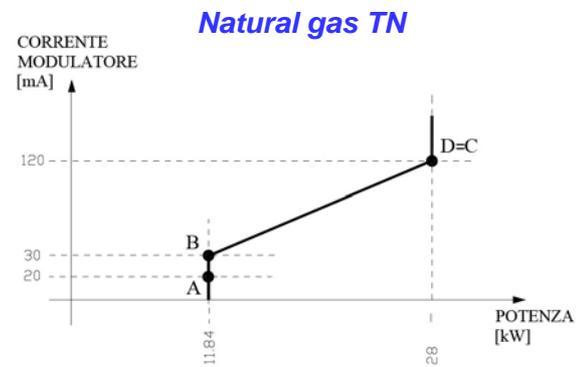
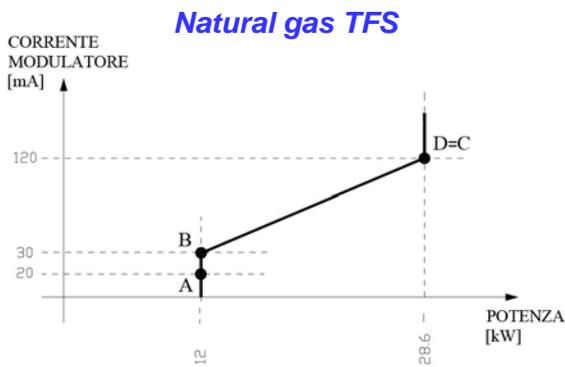
FUNCTION PRIORITY

The following table shows main function enabling priorities in case of simultaneous request of two or more functions.

Priority	Status
1	Shut-down status (<i>pump only freeze protection mode and pump anti-seize functions can anyway be performed</i>)
2	Flue cleaning
3	Boiler anti-legionella (<i>only for R version with water heater</i>)
4	DHW request
5	DHW anti-freeze
6	Heating request in "DHW + CH" mode
7	Heating anti-freeze both in "DHW" and "DHW + CH" modes
8	Post-circulation
9	Pump anti-seize function
10	Waiting for a request

BOILER TYPE SELECTION**Natural gas or LPG configuration**

This selection is obtained by setting parameter P0 (see previous section) to select the "current-output" curve to be applied to the gas proportional modulation coil in order to achieve the correct modulation:

**24 kW:****28 kW:**

Warning: the “current-output” curve can be modified by moving point B through parameter P96 and point C through parameter P95.

CTFS Configuration (forced draught) or CTN (natural draught)

The type of boiler (sealed chamber or open chamber) is automatically recognised each time the board is supplied with power. The board attempts to read the inputs dedicated to the air pressure switch. During such phase, “CHA” will appear on the boiler display and upon the following recognition (which must take place within the first two minutes) **c** (sealed chamber) or **b** (open chamber) will be displayed for 5 seconds.

No request will be performed during combustion chamber type recognition. In case of wrong self-recognition, see the specific paragraph on page 72.

Boiler type configuration

This board is preset to manage 3 different types of boiler configurations, depending on the setting of parameter P3:

P3 = 1 → *combined instantaneous, plate-type* (models CTFS and CTN)

P3 = 2 → *CH only* (model RTN)

P3 = 3 → *with water heater* (model RTN with boiler control)

Boiler hydraulic configuration (with P3=3)

For CH-only boilers to which a DHW system is combined, the board is able to manage different hydraulic configurations through parameter P28 (default setting is 0) depending on system type.

The two configurations allowed are listed below:

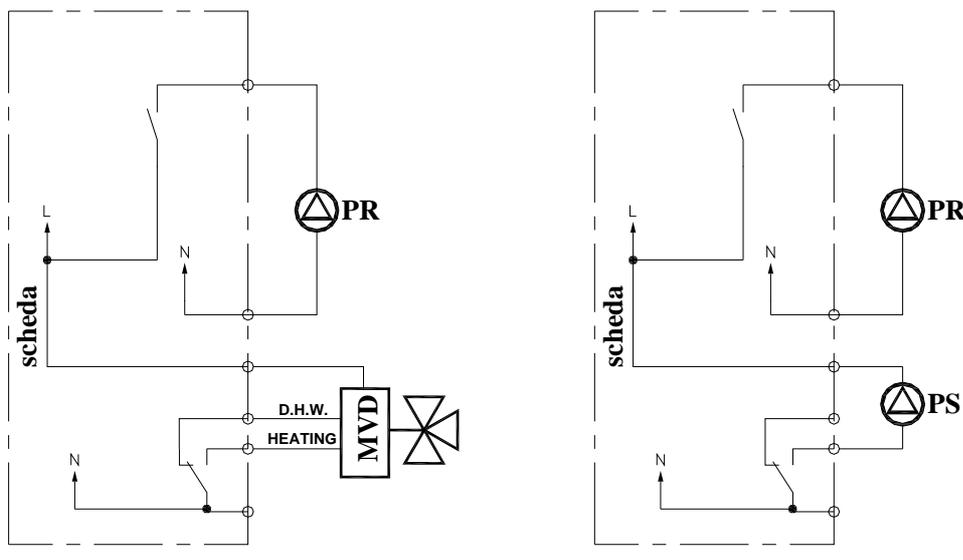
P28=0, boiler pump + deviating valve: DHW system is managed by the operation of both the boiler pump and of the three-way deviating valve. The latter should be of spring return type and is to be connected to terminals 15 and 16 of the boiler.

Warning: respect the priority toward the DHW system when installing the valve (valve normally open to the domestic hot water heating circuit).

P28=1, double pump: the DHW system is managed by a dedicated external pump to be connected to the terminals 15 and 16.

Boiler pump is off during domestic hot water heating.

Reference wiring diagrams are given below:



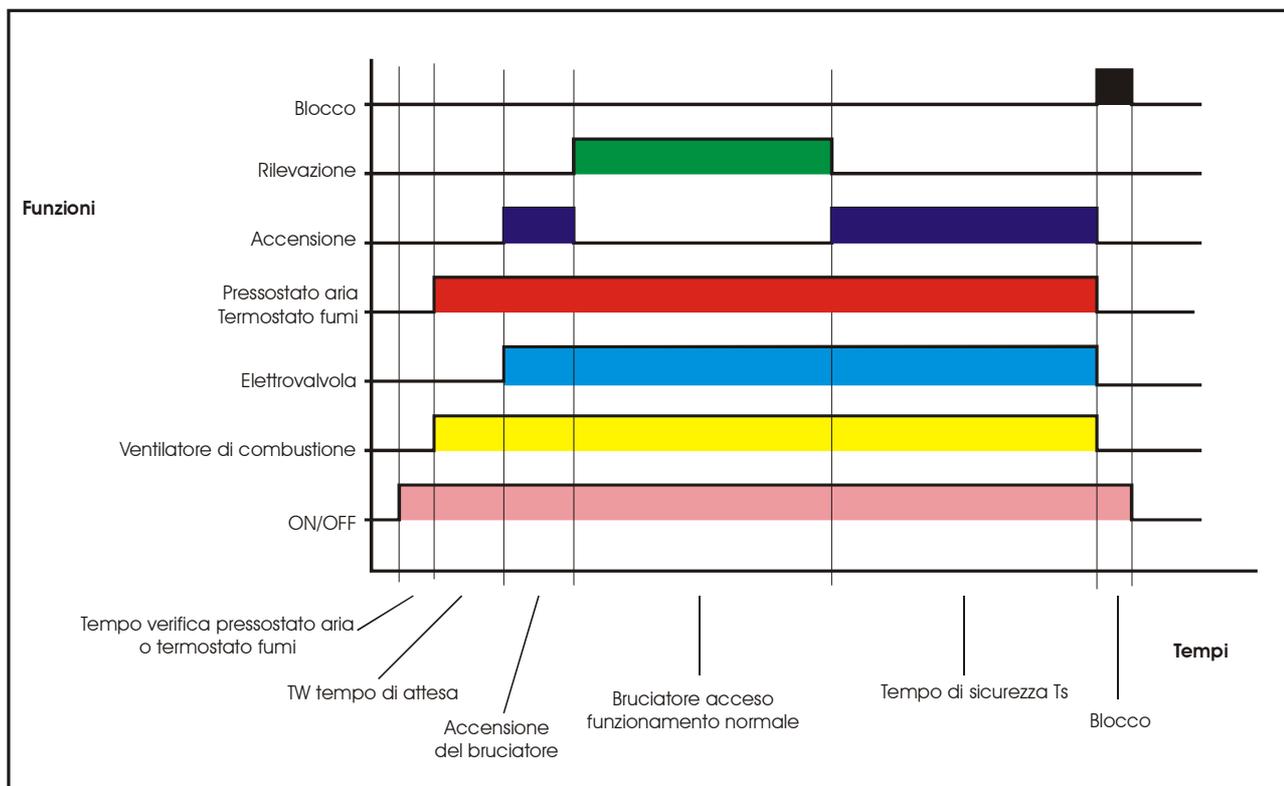


AUTOMATIC FLAME CONTROL

The device is always enabled and constantly performs self-check functions.

Upon an operation request, the fan is supplied with power after checking that the air pressure switch (C type) is in rest condition. As soon as the air pressure switch or the flue gas thermostat (type B) enabling is output, the flame control device starts measuring the waiting time TW (1.5 seconds); after such time, gas valve and igniter will be energised for a maximum safety time TS (10 seconds). If a flame is detected within such time, the gas valve is kept open (energised) and the igniter is cut-out.

Hereinafter is boiler operation logical diagram:



In case no flame is detected during an **ignition** attempt, the automatic flame control will repeat the ignition sequence, performing up to **5 ignition attempts in the case of a forced draught boiler, or 2 ignition attempts in the case of a natural draught boiler**, with a ventilation cycle of 10 seconds or 35 seconds respectively to flush the chamber after each attempt.

In case of flame detection, even if just for a moment, only one ignition attempt will be performed.

The *flame control shut-down* will be activated if no flame is detected within the TS safety time since the last ignition attempt, or if a parasitic flame (while the gas valve is not energised) is detected for over one minute. After 5 seconds, reset the shut-down status by pressing the "reset" key on the boiler board or on the remote control.

WARNING: maximum 5 reset attempts are allowed, both from remote control and from the boiler interface. After such attempts, the error E98 or E99 will be displayed (*no more shut-down-reset attempts allowed*). Alarm counting is reset each time the board detects a flame or its power supply is interrupted.



IGNITION WITH RAMP OR AT PRE-SET POWER

Boiler ignition mode is selected with parameter P6 (default setting is 0):

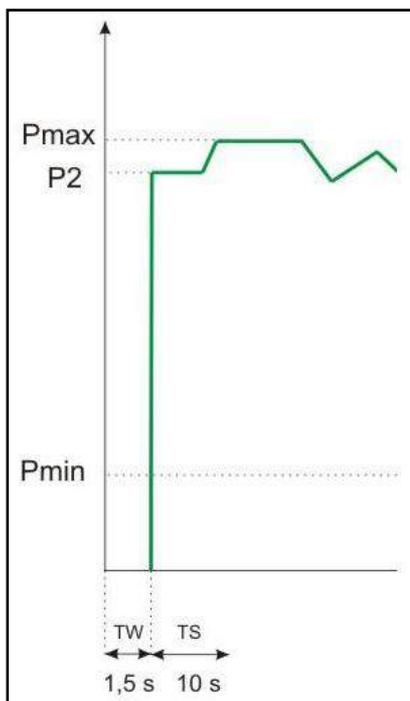
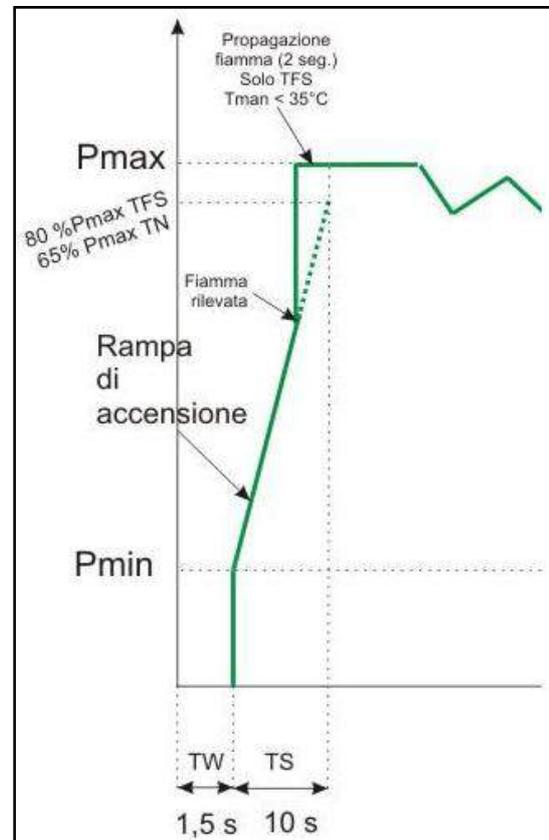
P6=0 → Ignition with ramp

Upon every operation request entailing burner ignition, burner will be ignited with a current ramp to modulation coil changing from the initial to the final value within 10 seconds. The initial value corresponds to the minimum current supplied to the modulation coil (30 mA for LPG and 20 mA for natural gas), whereas the final value depends on the model: 65% of the maximum current for CTN and 80% for CTFS (the maximum current is 170 mA for LPG and 120 mA for natural gas).

The ignition ramp ends one second after the flame control has detected the flame.

In forced draught boilers (TFS) and only if flow temperature is below 35 °C, flame propagation will now take place, i.e. the modulation coil will be supplied with current for maximum two seconds (super-technical parameter P25).

At the end of the flame propagation phase, boiler will start operating normally and igniter will be cut out two seconds after flame detection or one second before TS safety time runs out.



P6≠0 → Ignition at pre-set and adjustable power

Upon every operation request entailing burner ignition, burner will be ignited by supplying the modulation coil with a pre-set current, equal to parameter P6 value. Once flame is detected, the following flame propagation phase, which lasts 2 seconds, will be started (super-technical parameter P25), proceeding then with the modulation output.

Igniter will be cut out two seconds after flame detection or one second before TS safety time runs out.



DHW CONTROL

With boiler running in "DHW" or "DHW + CH" mode, closing up of DHW flow switch electric contact (CTFS and CTN versions) or of timer electric contact (RTN-RTFS version with water heater) will originate a DHW operation request, thus starting "*DHW modulation*."

The operation request in DHW mode has the priority over all other requests, and finishes when the previously mentioned electric contacts are open again.

WARNING: only for combined instantaneous versions (CTFS and CTN), with parameter P15 it is possible to delay the flow switch reading for the DHW mode (from 0 to 10 seconds).

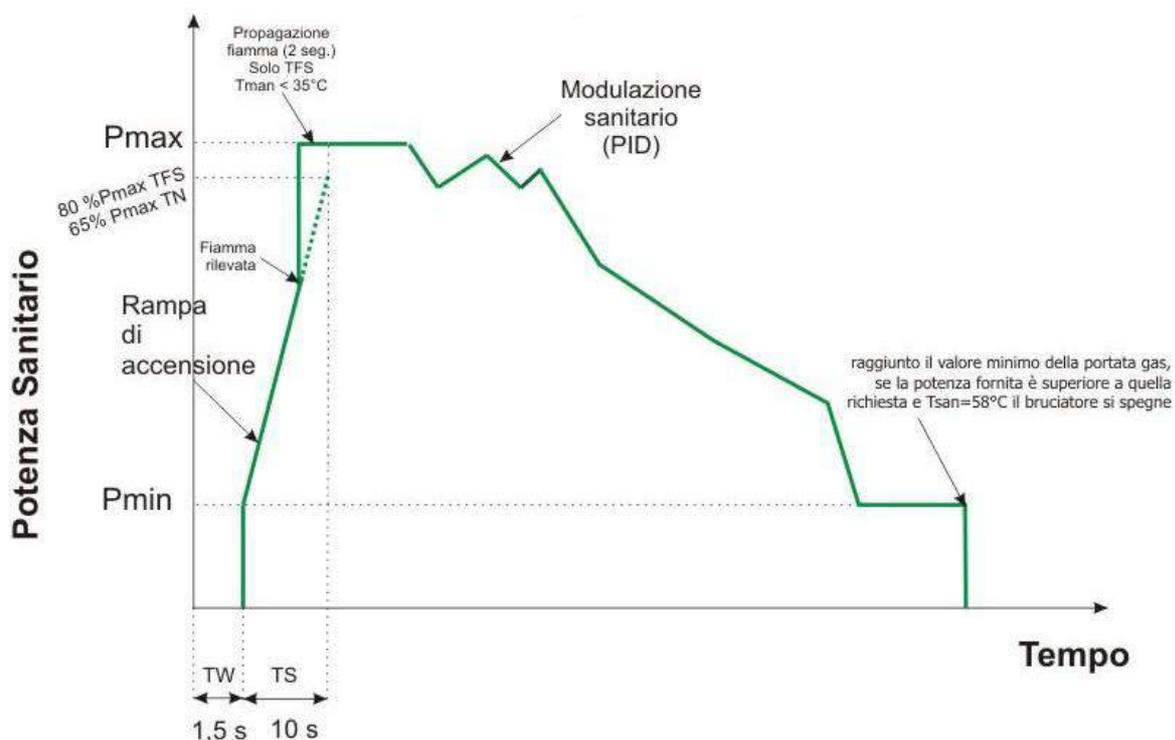
PLATE DHW MODULATION *(only for combined version, P3=1)*

Upon closing up of pressure switch electric contact, if the water temperature read by the domestic hot water NTC probe is lower than the set-point value + 3°C (*plate DHW thermostat triggering temperature ON*), the burner ignition sequence is started with the automatic flame control enabling.

Immediately after burner ignition, gas flow rate corresponds to flame modulation value which, thanks to a PID-type action, allows to reach and maintain the set DHW temperature.

In case of poor heat output by the plate exchanger due to possible clogging and consequent overtemperature of the primary body, another PID type adjustment of the flow is added to the DHW modulation. Such operation occurs at a flow temperature higher than 81°C and disables when the flow temperature falls below 75°C. In presence of double modulation, the gas flow rate supplied to the burner corresponds to the lowest of the two calculated modulation values.

Modulation with P6=0



During DHW modulation, once the min. gas flow rate is reached and with the supplied output above the required one, the burner is switched off when DHW temperature reaches the + 5°C set-point value. After burner switching off, whilst the operation request is still present, burner will be ignited again when the temperature falls below the + 3°C set-point.

During the first 20 seconds when the DHW is being drawn, to avoid boiler continuous "switch on/off", the maximum temperature allowed by the DHW probe to switch off the burner is set to 15°C higher than the set-point, whereas to switch it on again the temperature must fall below the + 8°C set-point.

During the plate DHW modulation mode, the boiler pump is supplied with power and the deviating valve is in DHW position, whereas the multifunction relay is in the rest condition.

Warning: the burner is switched off also in case the flow probe detects a value of 85°C and then ignited again (with the request still present) only upon reaching 80°C.

Plate DHW modulation temperatures:

- DHW temperature setting range: **35 °C ÷ 57 °C**
- DHW thermostat triggering temperature OFF = set point + 5°C
- DHW thermostat triggering temperature ON = set point + 3°C
- DHW thermostat triggering temp. initial draw (first 20 sec) OFF = *set point + 15° C*
- DHW thermostat triggering temp. initial draw (first 20 sec) ON = *set point + 8° C*
- Flow water thermostat triggering temperature with plate DHW mode: *OFF 85° C*
- Flow water thermostat triggering temperature with plate DHW mode: *ON 80° C*
- Flow water PID triggering temperature with DHW mode: *81° C*
- Flow water PID deactivating temperature with DHW mode: *75° C*

N.B. In case the boiler is combined with a solar plant with instantaneous-type integration, it is recommended to set parameter P14 to 1. This increases the modulation range avoiding boiler hunting (start and stop) with inlet temperature very close to the set-point. In such case the limit temperatures are as follows:

- DHW thermostat triggering temp. OFF with instantaneous solar integr.: *set-point + 10° C*
- DHW thermostat triggering temp. ON with instantaneous solar integr.: *set-point + 9° C*

BOILER DHW MODULATION (only for R version with water heater, P3=3)

With boiler running in "DHW" or "DHW + CH" mode, the closing of the "timer" contact for boiler programming will originate a DHW operation request.

If the water heater temperature read by the NTC probe is lower than the *boiler priority thermostat ON* triggering temperature (set-point - 3°C) set either through boiler or through remote control and the flow temperature is lower than 70°C, the burner ignition sequence is started with the automatic flame control enabling.

At the end of this sequence, the power supplied to the burner corresponds to the flame modulation value which, thanks to a PID-type action, allows to reach and maintain the **flow modulation temperature** in boiler mode. Such temperature is calculated according to the requested boiler temperature and of the current temperature read by the probe, and shall in any way lie within a lower value (corresponding to "*requested boiler temperature + 10°C*") and a higher value (85°C). Max. flow modulation occurs when the difference between *requested boiler temperature* and *current boiler temperature* is higher or equal to 10°C.

During boiler heating phase:

- with **P28 = 0** (*pump and deviating valve*), the boiler pump is supplied with power whereas the deviating valve is in DHW position;
- with **P28 = 1** (*heating pump and DHW pump*), the heating pump is off whereas the DHW pump is supplied with power;

while the multifunction relay is in the rest condition.

Boiler DHW modulation temperature:

- DHW temperature setting range: **35 °C ÷ 65 °C**
- Boiler priority thermostat triggering temperature OFF = *set-point* + 0 °C
- Boiler priority thermostat triggering temperature ON = *set-point* - 3 °C
- Max. flow modulation temperature in boiler mode = 85° C
- Minimum temperature difference between requested boiler and flow modulation temperatures = 10° C
- Temperature difference between requested and current boiler temperatures for max. flow modulation = 10° C
- Temperature difference between requested and current boiler temperatures for min. flow modulation = 0° C
- Flow water thermostat triggering temperature in DHW mode - boiler OFF = 86° C
- Flow water thermostat triggering temperature in DHW mode - boiler ON = 70° C

AMBIENT THERMOSTAT

With the boiler set on the "CH" or "DHW + CH" operating mode, the closing of ambient thermostat electric contact or a heating request from the remote control will originate a heating request, thus starting CH modulation.

WARNING: with parameter P16 it is possible to delay the ambient thermostat or the remote control reading to allow the zone valves to open before the boiler pump starts (from 0 to 199 seconds).

ADJUSTABLE HEATING MAXIMUM OUTPUT

During operation in CH mode, the maximum power supplied to the burner is equal to the one set by parameter P7.

This parameter represents the percentage (default 100%) of maximum admissible current supplied to the modulation coil (*120 mA for natural gas and 170 mA for LPG*).

TEMPERATURE RANGE PRE-SELECTION

With parameter P10, without any external probe, it is possible to set two ranges (standard or reduced) in order to adjust the flow water by means of the boiler keys or the remote control:

- P10 < 1 → heating temperature reduced range: 35 ÷ 45°C
- P10 ≥ 1 → heating temperature standard range: 35 ÷ 78°C

Using an external probe instead, such parameter corresponds to the thermoregulation curve selection (refer to paragraph "Thermoregulation with external probe").

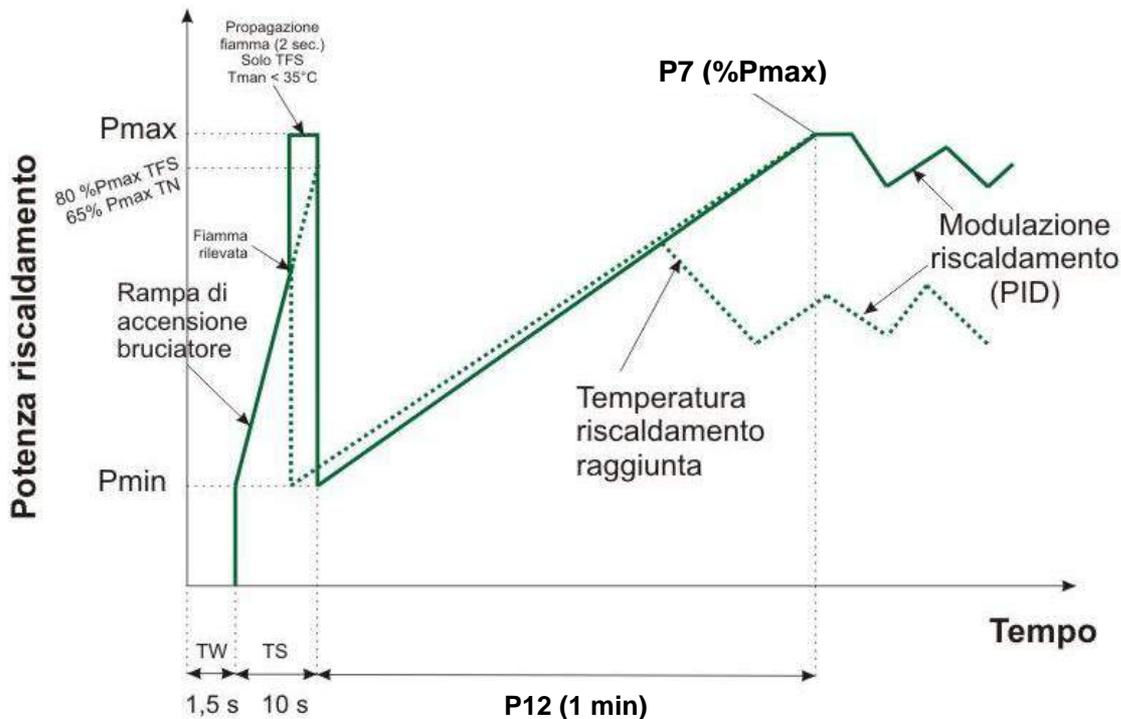
CH MODULATION

Upon closing of ambient thermostat electric contact, if the water temperature read by the flow NTC probe is lower than the set temperature value, the burner ignition sequence is started with the automatic flame control enabling.

At the end of the ignition sequence, gas flow rate goes to its minimum value and then reaches the value set by parameter P7 (maximum heating output) with a ramp duration equal to the heating output rising ramp timing which can be set by parameter P12 (default - one minute).

From now on, the flow water temperature will constantly be read and the rising ramp will be stopped with a PID-type action upon reaching the set temperature, in order to maintain the selected flow temperature.

Modulation with P6=0



Upon reaching the minimum gas flow rate (P_{min}), if the power supplied is still higher than requested, the burner will be switched off as soon as a flow temperature higher than the set temperature is reached (set-point $+5^{\circ}\text{C}$ in case of a standard range and set-point $+2^{\circ}\text{C}$ at a reduced range). The burner is switched off and measuring of burner deactivation time starts (see following section about "Ambient thermostat timer").

During the heating phase:

- with **P28 = 0** (*pump and deviating valve*), the pump is supplied with power and the deviating valve is in CH position;
- with **P28 = 1** (*heating pump and DHW pump*), the heating pump is supplied with power whereas the DHW pump is off;

- with **P17 = 1** (multifunction relay in *remote relay/TA1*), the relay is energised in response to a request from the remote control or from TA1 and returns to the rest condition upon a DHW request or in case the boiler is switched OFF or to DHW ONLY mode;
- with **P17 = 3** (multifunction relay in *TA2 request*), the relay is energised in response to a request from TA2 and returns to the rest condition upon a DHW request or in case the boiler is switched OFF or to DHW ONLY mode;

During the operation in heating mode, upon any DHW request, the latter has higher priority and forces the interruption of the function in progress.

Heating modulation temperature - standard range (P10≥1):

- CH temperature setting range: 35÷78°C
- CH thermostat triggering temperature OFF = *set-point* + 5° C
- CH thermostat triggering temperature ON = *set-point* + 0° C
- Heating thermostat timer (antifast) - can be set through P11: 0÷10 min, default 4 min with $T_{flow} > P27$
- CH thermostat timer reset temperature through parameter P27: 35÷78°C, default 40°C
- Heating output rising ramp timing by means of parameter P12: 0÷10 min, default 1 min

Heating modulation temperature reduced range (P10<1):

- Heating temperature setting reduced range: 35÷45°C
- Reduced CH thermostat triggering temperature OFF = *set-point* + 2° C
- Reduced CH thermostat triggering temperature ON = *set-point* - 2° C
- Heating thermostat timer (antifast) - can be set through P11: 0÷10 min, default 4 min with $T_{flow} > P27$
- CH thermostat timer reset temperature through parameter P27: 35°C fixed
- Heating output rising ramp timing by means of parameter P12: 0÷10 min, default 1 min

The **set-point** depends on the setting of the heating temperature through the boiler keys or the temperature set through remote control.

AMBIENT THERMOSTAT TIMER (ANTIFAST)

During modulation in heating mode, after burner switching off, wait 240 sec (parameter P11). After that, if the flow temperature is lower than the “set-point”, the burner is switched on again.

The heating thermostat timer is reset:

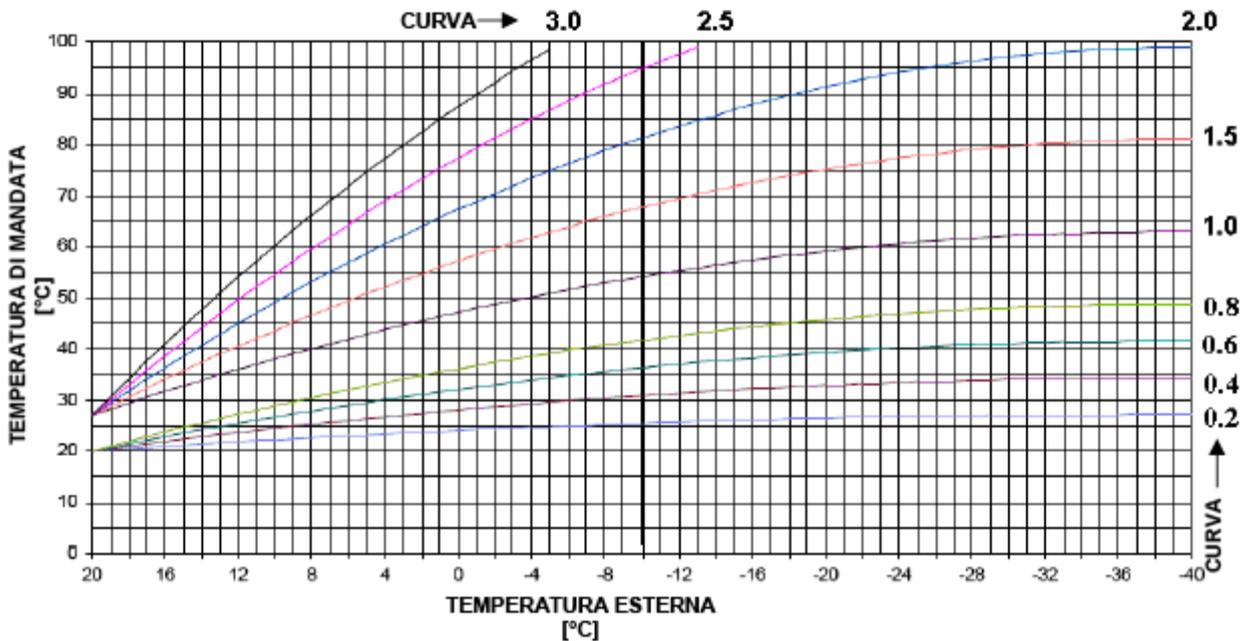
- upon a DHW request;
- at the end of a heating request;
- selecting the “standby” or “DHW” mode or resetting the boiler;
- if the flow water temperature value falls below the parameter P27 (40°C with standard range, or 35°C with reduced range).

THERMOREGULATION WITH EXTERNAL PROBE

The external temperature probe to be connected will automatically modify the heating flow water temperature according to:

- the measured external temperature;
- the thermoregulation curve selected;
- the selected fictitious ambient temperature.

The thermoregulation **curve** is selected by means of parameter **P10** (value from 0 to 3), whereas the **fictitious ambient temperature** is selected with the “heating” keys.



The board independently detects the presence of the external temperature probe and enables the thermoregulation function, by keeping the flow temperature within the heating temperature pre-selection range (35 °C ÷ 78 °C or 35 °C ÷ 45 °C).

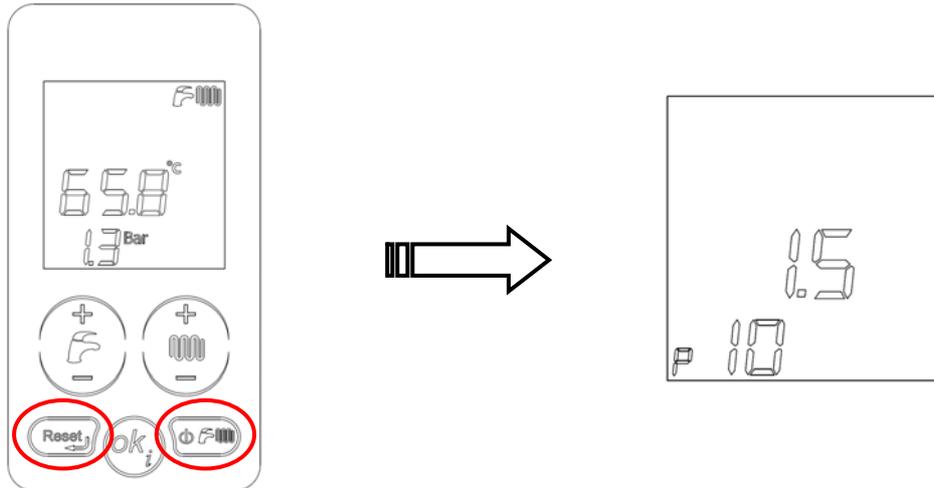
If both the external probe and the remote control are present, assuming that the remote control is able to set and carry out its own thermoregulation, the modulation board transmits the external temperature value to the remote control, and if the heating request is determined by the same control, this will determine the flow temperature according to its thermoregulation curve and to the room temperature previously set.

Otherwise, if the heating request comes simultaneously from the remote control and the amb. T. contact closing on the board, both the remote control and the modulation board independently calculate the flow temperature according to relevant thermoregulation curves and set ambient temperatures. The highest of the two flow temperature values will be used.

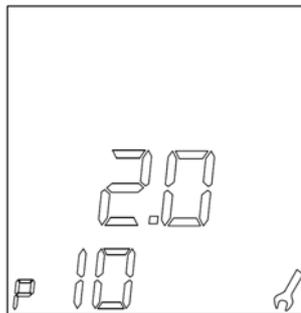
Thermoregulation curve setting

To access the parameter setting mode, press “reset” and “boiler status” keys simultaneously for three seconds.

Use keys “+/- heating”, to select parameter P10:



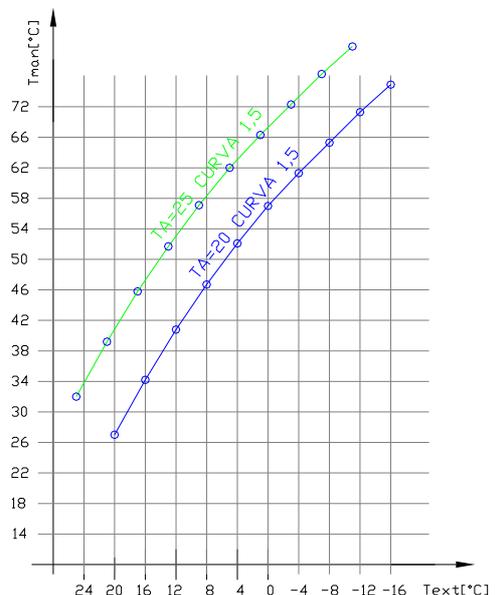
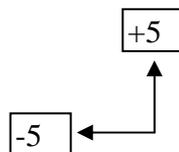
Press “ok” to confirm that parameter value must be edited. The wrench symbol indicates that parameter value can be edited using “+/- CH” keys.



- **For high temperature systems**, we recommend setting parameter P10 to a value between 1 and 2.
- **For low temperature systems**, it is recommended to set parameter P10 to a value between 0.2 and 0.8.

Then confirm the modification of the parameter value by pressing “ok-info” and quit the setting with the “reset” key.

The curves given in the above diagram refer to a request of a “fictitious ambient temperature” of 20°C. In case of different fictitious temperature, all curves are shifted in a parallel translation.



Example of curve shifting with P10=1.5 and ambient fictitious temperature from 20° to 25°C.

Curves can be chosen proceeding either roughly and approximately or using a simple mathematical formula. In either case, it will be necessary to check the temperature changes so as to correct and choose the proper curve accurately.

In the former case you will simply need to take an actual value of external temperature and associate the desired flow value to it. Then choose the closest curve.

Example:

at an external temp. of -4°C , a flow of 62°C is required; **curve: 1.5**

In the second case use the following formula:

$$\text{CURVE} = \frac{T_{\text{max}} - 20}{20 - T_{\text{extmin}}}$$

Where, T_{max} is the maximum flow temperature and T_{extmin} is the minimum external temperature.

Example:

Low temperature:

$T_{\text{max}} = 44^{\circ}\text{C}$
 $T_{\text{ext}} = -10^{\circ}\text{C}$

$$\text{CURVE} = \frac{44 - 20}{20 - (-10)}$$

P10 curve = 0.8

High temperature:

$T_{\text{max}} = 70^{\circ}\text{C}$
 $T_{\text{ext}} = -10^{\circ}\text{C}$

$$\text{CURVE} = \frac{70 - 20}{20 - (-10)}$$

P10 curve = 1.7

Checking the thermoregulation curve setting

It takes time to choose the best curve. Consider the following suggestions:

- if upon external temperature decrease the ambient temperature increases, it is necessary to set a curve with a lower slope, i.e. a lower curve;
- if upon external temperature decrease the ambient temperature decreases, it is necessary to set a curve with a higher slope, i.e. a higher curve;
- Lastly, if the ambient temperature remains constant upon changing of the external temperature, the curve is correct.

If the ambient temperature is constant but different from the desired value it is necessary to translate the curve.

This occurs automatically by pressing the “+/- heating” keys on the boiler panel. In fact, with an external probe installed, such keys do not adjust the flow temperature as usual but the desired fictitious temperature ranging from 5°C to 30°C .

It is recommended to set a value between 20°C and 25°C , or at least similar to the value set by the ambient thermostat.



REMOTE CONTROL PRE-SETTING

The board is provided with an internal interface that allows the connection of an OpenTherm protocol-based remote control. This latter, besides serving as an ambient thermostat for its zone, allows to set some of the boiler main parameters. Connect the remote control to the board with two non-polarised conductors. When the connection is done, "Con" will appear on the boiler LCD display. **Instead of the remote control, an ambient thermostat connection** (clean contact) is arranged: when closed for more than 10 seconds, it generates a heating request for the zone managed by the remote control. The request stops when the contact remains open for more than one second. When the remote control is not connected and/or does not communicate, all settings are made from the boiler. Board and remote control communicate in each operating mode: DHW, DHW+CH, CH or STANDBY.

A communication loss will entail the continuous attempt to restore it but, after 1 minute, the board will resume operation in local mode until connection is restored. In this case the system temporarily ignores the heating request that could be generated by a possible contact connected on opentherm. When the connection is active, remote control has a priority over boiler switch, and it enables/disables DHW and CH functions.

The remote control can request the boiler and display the flow, DHW, external probe temperatures, the temperatures set for DHW and heating, the current modulation level, as well as the error code. It can also display the different operation states (DHW, heating, flame lighting, fault presence or shut-down) and it can reset the boiler after a shut-down for a limited number of times and period (no more than 3 times in 24 hours).

Warning: the remote control allows access only to the first 29 parameters.

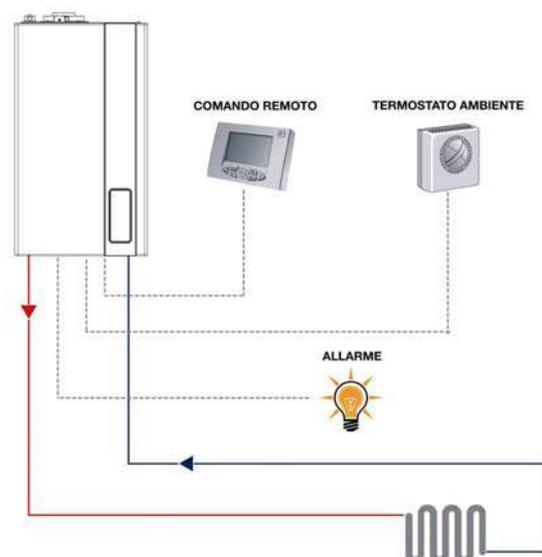
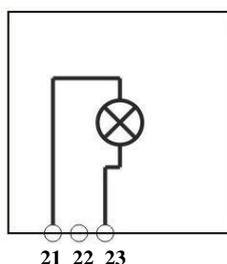
PROGRAMMABLE MULTIFUNCTION RELAY

The boiler is fitted with a multifunction relay (230 Vac, 10A $\cos\phi 1$) which can be associated to a different function by setting parameter P17:

- **P17=0 Alarm reference**

Upon each shut-down or fault the relay is energised:

Electrical connections:

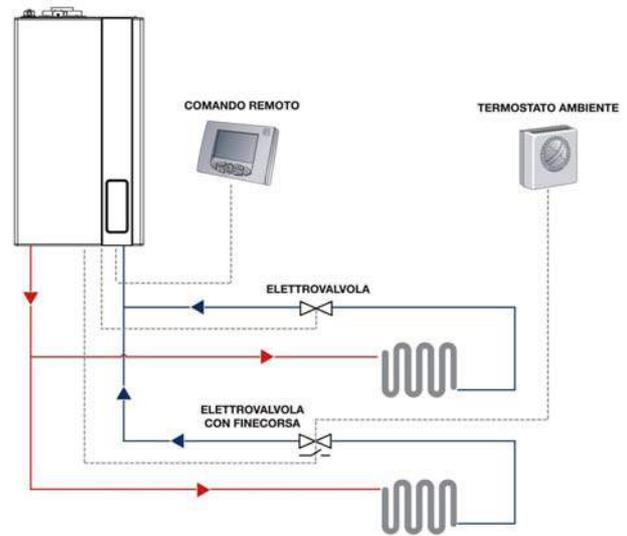
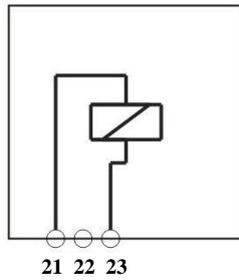




- **P17=1 Remote control reference**

Upon each request from the remote control (or TA1), the relay is energised:

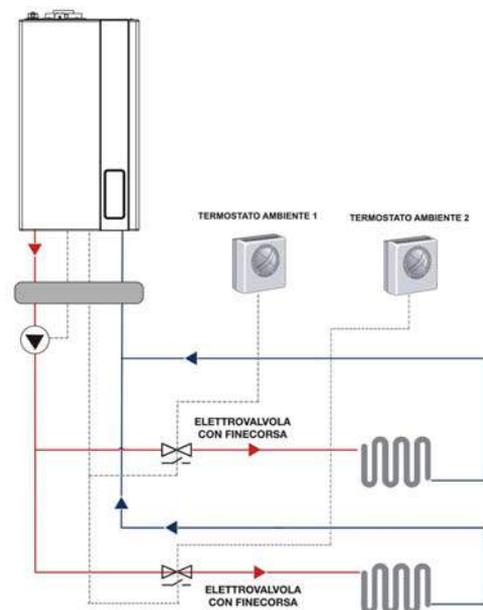
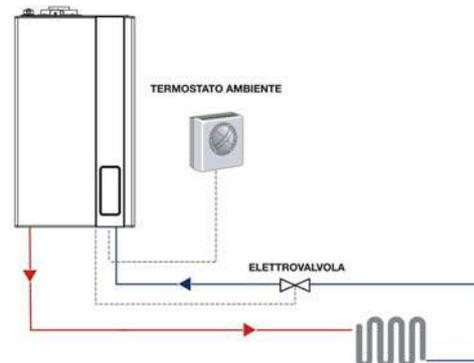
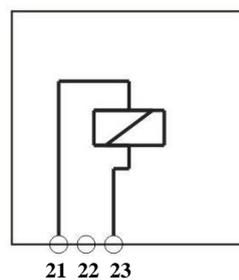
Electrical connections:



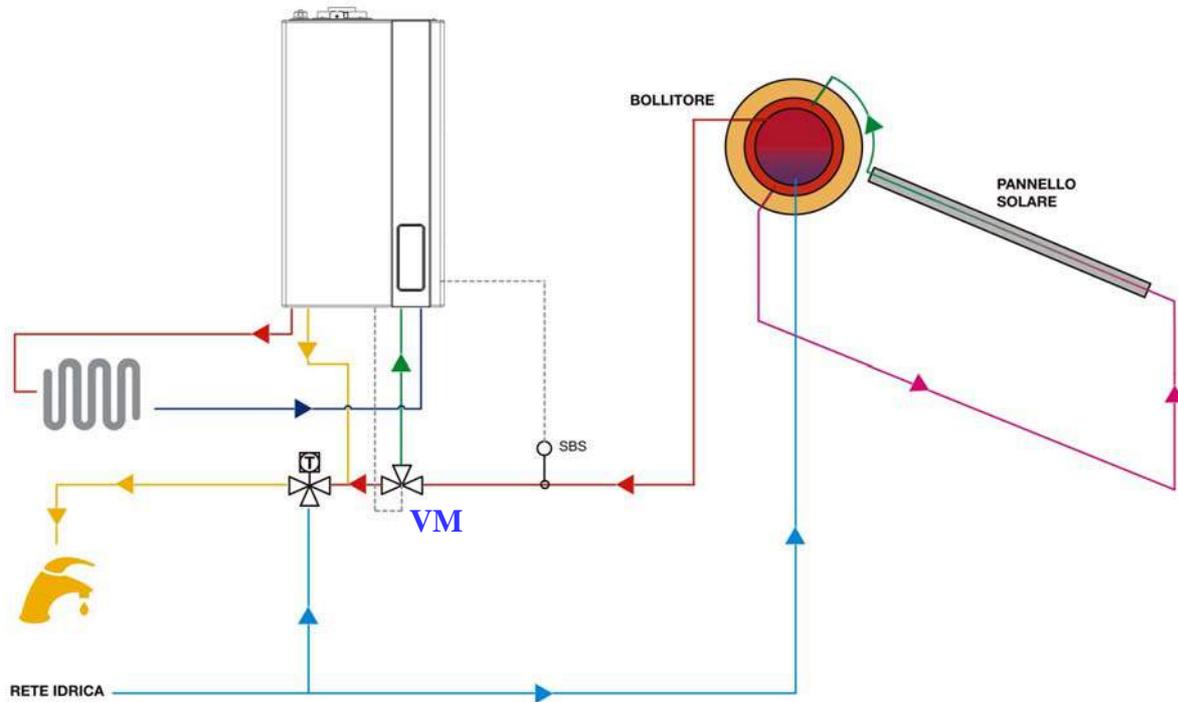
- **P17=3 Ambient thermostat reference**

Upon each request from the ambient thermostat TA2, the relay is energised:

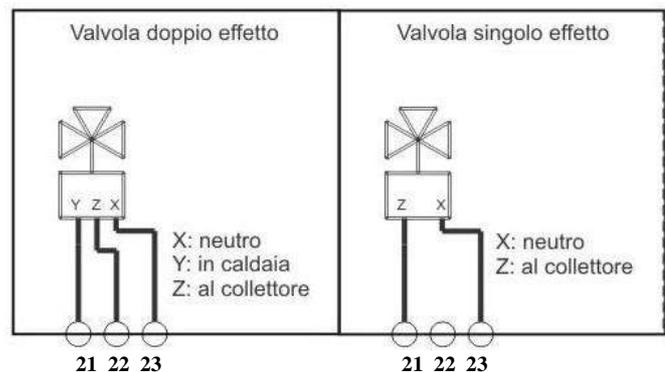
Electrical connections:



- P17=2 Solar plant reference: **BOILER INTEGRATION (P18=0)** only for CTFS or CTN
Management of a solar plant deviating valve (VM):



Electrical connections:



The function consists in properly controlling the motorised valve VM by means of the multifunction relay and **in activating the boiler burner only if the solar water heater temperature is sufficient to fulfil the request for operation.**

This valve is controlled by a **solar water heater probe (SBS)** located at the water heater output.

The VM valve remains in the rest condition (boiler integration) when the temperature detected by the SBS probe is lower than the DHW set-point temperature - 2°C. Instead, it is supplied with power (solar-only mode) when the solar water heater probe temperature reaches the DHW set-point set in the boiler, or in case of probe fault.

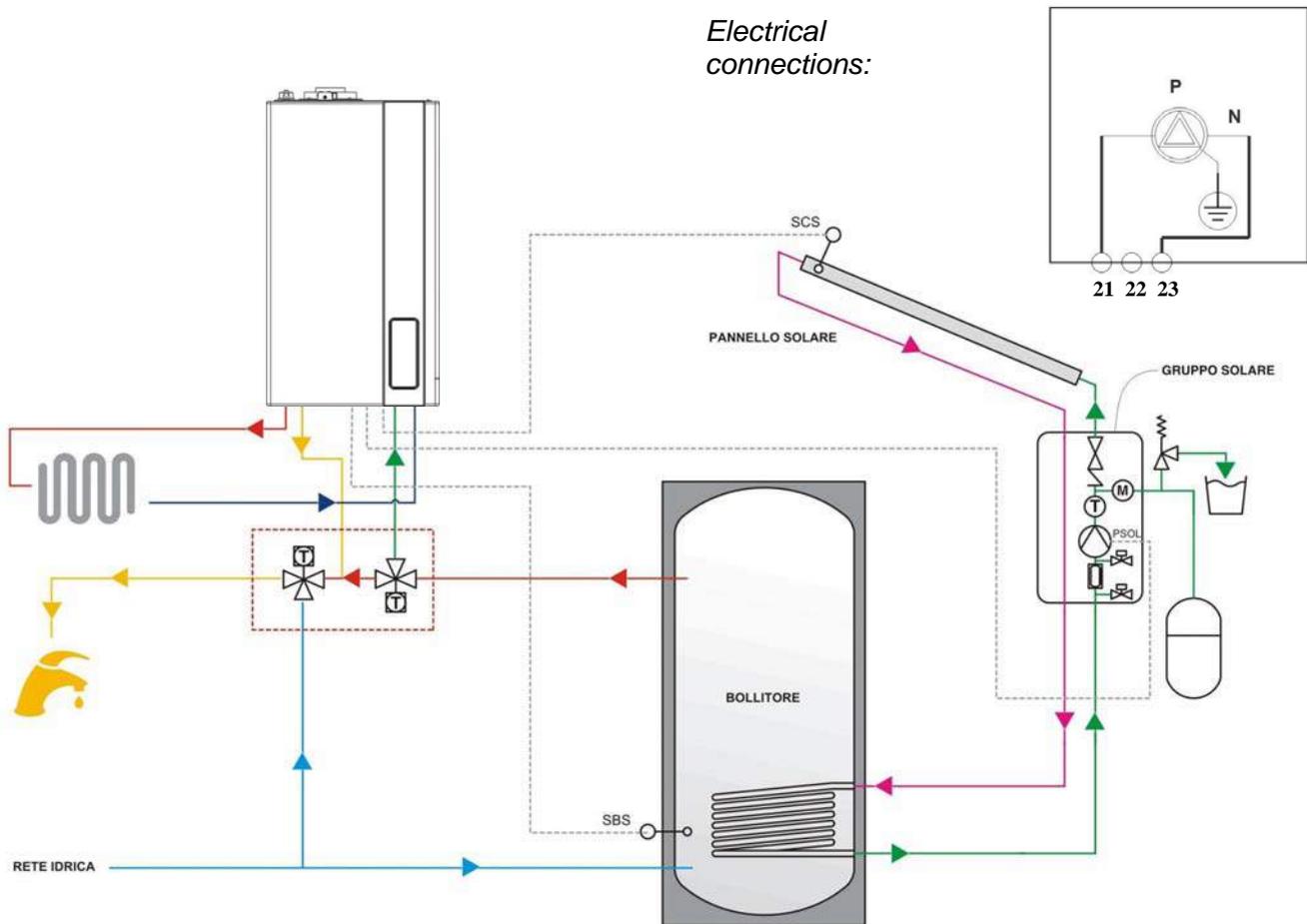
When the VM valve is in solar-only mode, the boiler will not perform the DHW function.

Warning: said function is active only if either the DHW + CH, or the CH ONLY or DHW ONLY mode is selected in the boiler. With boiler in OFF or FREEZE PROTECTION mode, the VM valve remains constantly supplied with power.

Any probe faults are reported in the boiler interface or on the remote control through the relevant error code (E28).

P17=2 Solar plant reference **WATER HEATER FILLING** (P18=1)

Management of a forced-type solar plant pump (PS):



The function consists in controlling, on specific conditions, the solar pump through the multifunction relay to heat a water heater. This is achieved by controlling two **probes** located respectively on the **solar collector** (SCS) and at the bottom of the **solar water heater** (SBS).

Water heater filling conditions (*pump ON*):

Boiler temperature is set with parameter P19, which corresponds to a value ranging from 10 to 90°C (default 60°C).

Solar pump PS is enabled in the following conditions:

- $T_{sbs} < P19 - 2^{\circ}\text{C}$
and
- $T_{scs} - T_{sbs} > \Delta T \text{ ON } (P20)$
and
- $T_{scs} > T_{min \text{ pump collector ON}} (P23)$
and
- $T_{scs} < T_{max \text{ pump collector ON}} (P22 - 5^{\circ}\text{C})$

Where T_{sbs} is the temperature detected by the solar water heater probe and T_{scs} is the temperature detected by the solar collector probe.

Water heater filling condition (pump OFF):

Solar pump PS is disabled in the following conditions:

- $T_{sbs} > P19$
or
- $T_{scs} - T_{sbs} < \Delta T \text{ OFF (P21)}$
or
- $T_{scs} < T_{min \text{ solar collector OFF (P23 - 5}^\circ\text{C)}$
or
- $T_{scs} > T_{max \text{ solar collector OFF (P22)}$

Where T_{sbs} is the temperature detected by the solar water heater probe and T_{scs} is the temperature detected by the solar collector probe.

Special solar functions (only for water heater filling with P17=2 and P18=1)➤ **Collector heat transfer function**

This function prevents solar collectors from remaining in a stagnation state for a long time, which would expose them to high risk of thermal stress, when solar water heater temperature is reached. For this reason solar pump PS is reactivated according to the following logic:

$$T_{scs} > (P22 - 10^\circ\text{C})$$

and

$$T_{sbs} \leq 93^\circ\text{C}$$

and

$$T_{scs} \leq (P22 - 5^\circ\text{C})$$

The function stops when the PS is switched off at the following conditions:

$$T_{scs} \leq (P22 - 12^\circ\text{C})$$

or

$$T_{sbs} > 95^\circ\text{C}$$

or

$$T_{scs} > (P22)$$

➤ **Water heater cooling function**

This function consists in cooling water heater down to the set-point value by transferring excess heat from the boiler to the solar collector. This occurs only if the solar water heater exceeds the set-point temperature following the activation of the "collector heat transfer" function.

If the remote control is not connected, the "water heater cooling" function is always enabled, otherwise it is enabled only from 00.00 to 6.00.

Solar pump (PS) enabling condition for water heater cooling:

$$T_{sbs} > P19 + 2^\circ\text{C}$$

and

$$T_{scs} < T_{sbs} - \Delta T \text{ ON (P20)}$$

The function stops when the PS is switched off at the following conditions:

$$T_{sbs} < P19$$

or

$$T_{scs} > T_{sbs} - \Delta T \text{ OFF (P21)}$$

If solar water heater temperature probe (SBS) is faulty, the function is not performed.

WARNING: the water heater cooling function is normally disabled. Set parameter P26 to 1 to enable it. Besides it is enabled only if either the "DHW ONLY", or the "DHW + CH" or the "CH ONLY" mode is selected in the boiler.

➤ Solar collector anti-freeze

When the temperature read by the collector probe is lower than 4°C, the solar pump PS is activated until the temperature reaches 5°C.

WARNING: the collector anti-freeze function is enabled only if parameter P24 is set to 1, whereas the boiler mode has no impact over said function.

Solar plant characteristics with P17=2 and P18=1

Each time the solar pump becomes operational, its active state will be signalled by the icon on the boiler display.



In case of fault of the solar water heater probe (SBS) or of the solar collector probe (SCS), the solar pump is immediately switched off and the fault is reported through the boiler board interface and the remote control (if connected) with the relevant error codes (E28 and E24 respectively).

It is moreover possible to force solar charge during maintenance by setting parameter P25 to 1. In this way, the multifunction relay is energised until such parameter is restored.

PRESETTING FOR CONNECTION TO SUPPLEMENTARY BOARDS

One or more supplementary board(s) (max 4) can be connected to the boiler board for the management of a zone system and of a solar plant.

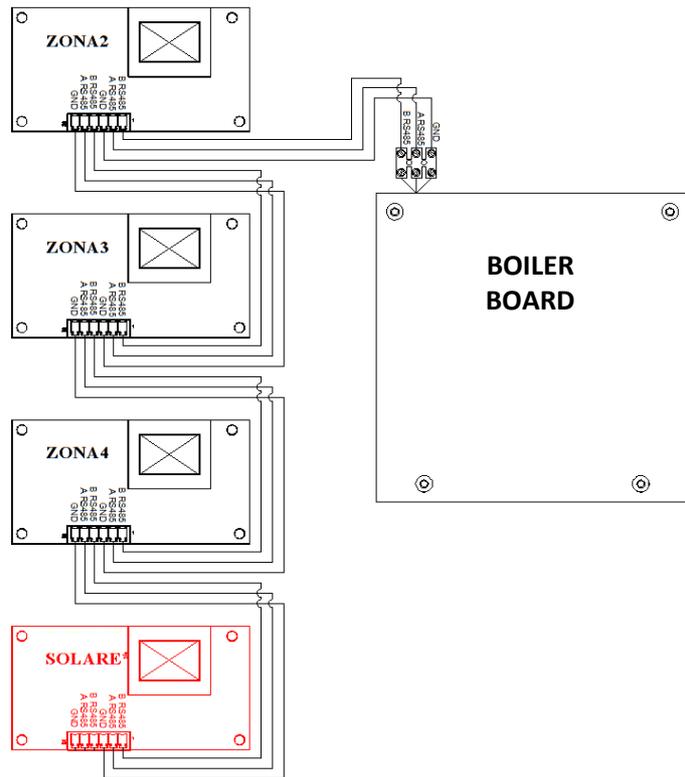
In particular, besides the multifunction relay that can control the high temperature direct zone (TA1), it is possible to install up to three supplementary boards for controlling the equivalent number of mixed zones and one more board for managing a solar plant (available in two configurations).

WARNING: the electric panel of the boiler is preset for housing up to two supplementary boards (management of max. a three-zone system, or of a two-zone system plus a solar plant). In the case of complex plants, where several boards need to be installed, these must be located outside the boiler, arranging a special electric panel.



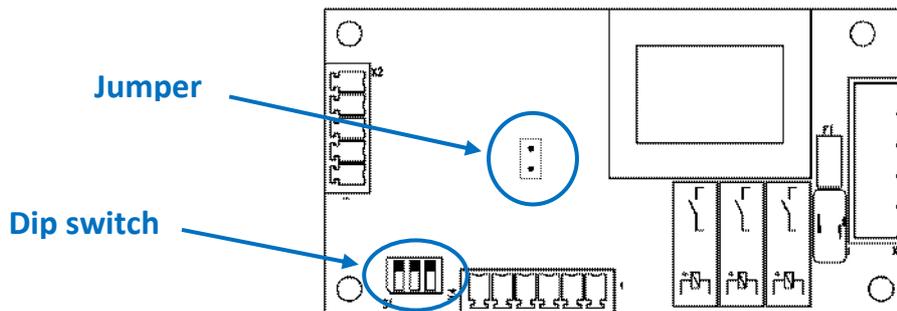
RS 485 Connection and setting

Regardless of the number of boards used, each of them must be connected to the boiler board in a cascade-type connection through an RS485 connection as shown in the image on the side:



Both boiler board and relevant supplementary boards are fitted with a **jumper** whose function is to close the RS 485 communication line in case of problems in the transmission of data between the boards due to very long connection lines or to electromagnetic disturbances.

Leave only the jumper on the last board in the cascade. All the other jumpers must be removed, including the jumper on the boiler board.



	OFF-OFF-OFF: ZONA MISCELATA2
	OFF-ON-OFF: ZONA MISCELATA3
	ON-OFF-OFF: ZONA MISCELATA4
	ON-ON-OFF: SOLARE COMPLESSO

Each supplementary board must be addressed with dip switches on it, so as to associate the supplementary board to the relevant zone or solar plant to be managed.

Of the three dip switches, only the first two are used for the setting (the third one must be left "down", i.e. OFF).

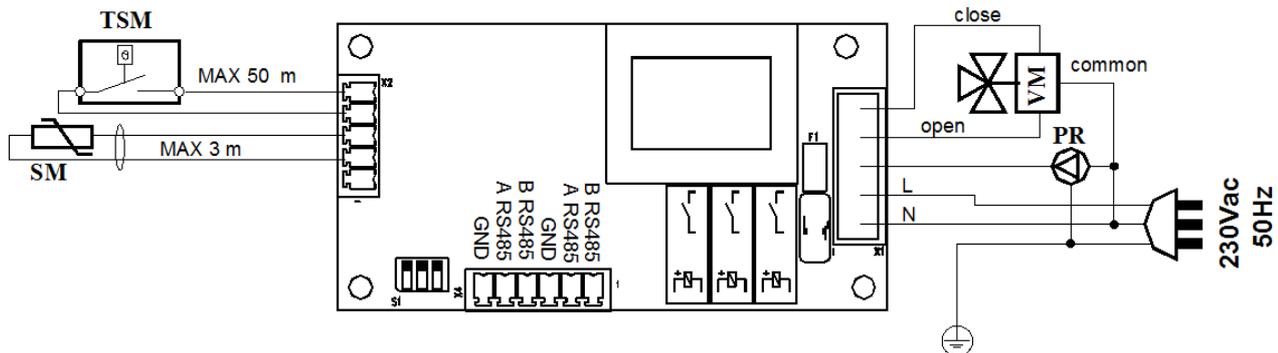


Wiring diagrams

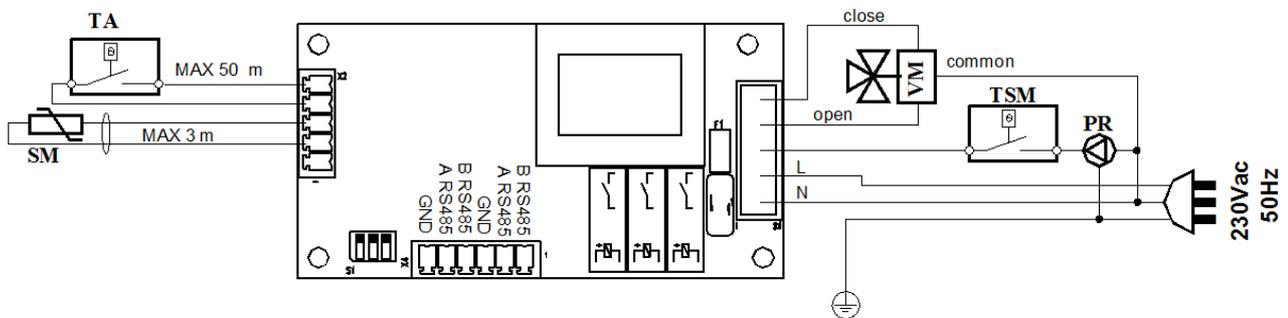
The heating zones 1 and 2 can be controlled by remote control (TA1) or ambient thermostat (TA2) that can be connected to the boiler boards, whereas zones 3 and 4 are activated by the ambient thermostat directly connected to the relevant zone board. Zones 3 and 4 can not manage the safety thermostat on flow line (TSM) which therefore is to be connected in series to the pump power supply and cannot be signalled as a fault.

Whereas, as far as spatial plant connections are concerned, the solar collector probe (SCS) and the solar water heater probe (SBS) are on the boiler board, while the connection of the solar valve probe (SVS) is on the supplementary board.

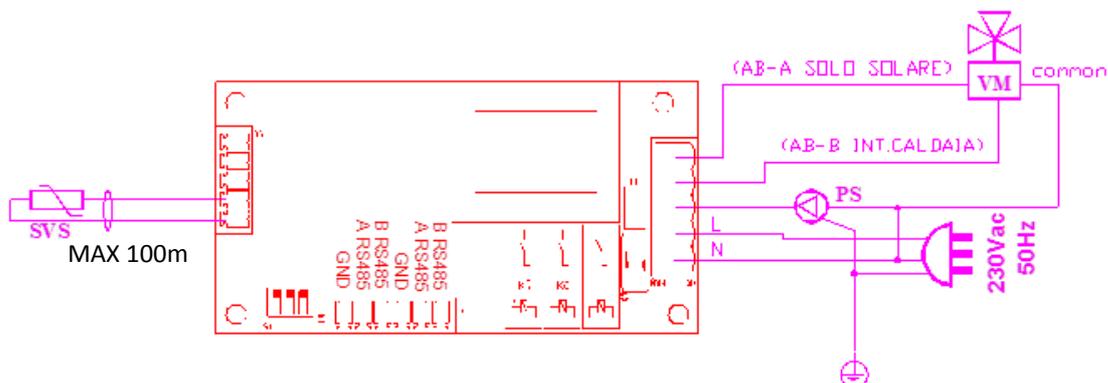
Zone 2



Zone 3 and 4



Solar



The zone board is further supplied with a bi-colour LED with the following indications:

- *Green steady* → pump enabled;
- *Red quick flashing* → valve opening;
- *Red slow flashing* → valve closing;
- *Green flashing* → boards with no request;
- *Red flashing slow-slow (1s on, 1s off)* → faulty communication with boiler board;
- *Red steady* → zone 2 safety thermostat open;
- *Red steady + green steady* → flow probe fault with error E36 on the boiler display;

Zone setting

The zones are set with the relevant zone configuration by means of the dip switches on the zone board (see previous paragraph), and then indicating on the boiler board how many supplementary boards are connected through parameter P60 setting (max. 4).

In case of zone 1 and 2 management different than the standard one (remote control associated with zone 2 and ambient thermostat with zone 1), change the coupling using parameter P61.

It is now possible to access the parameter programming for each single zone:

Zone 1:

parameter P10 setting to set the thermoregulation curve (with external probe) or the operation range (without external probe).

Adjustment through heating key of the fictitious ambient temperature (with external probe) or of the flow value at fixed point (without external probe) according to the selected range. Parameter P32 displays the calculated flow temperature, whereas parameter P31 the current one detected by the boiler probe.

Zone 2:

parameter P62 setting to set the thermoregulation curve (with external probe) or the operation range (without external probe).

Adjustment through parameter P63 of the fictitious ambient temperature (with external probe) or of the flow value at fixed point (without external probe) according to the selected range. Parameter P33 displays the calculated flow temperature, whereas parameter P34 the current one detected by the boiler probe.

Warning: *with remote control for managing zones 1 or 2, the boiler board communicates to the remote control the minimum and maximum flow limit according to the curve set by the relevant parameter (reduced or standard range), whereas the setting at fixed point (without external probe) or of the fictitious temperature (with external probe) must be carried out with the remote control.*

Zone 3:

parameter P66 setting to set the thermoregulation curve (with external probe) or the operation range (without external probe). Adjustment through parameter P67 of the fictitious ambient temperature (with external probe) or of the flow value at fixed point (without external probe) according to the selected range. Parameter P36 displays the calculated flow temperature, whereas parameter P37 the current one detected by the boiler probe.

Zone 4:

parameter P70 setting to set the thermoregulation curve (with external probe) or the operation range (without external probe). Adjustment through parameter P71 of the

fictitious ambient temperature (with external probe) or of the flow value at fixed point (without external probe) according to the selected range. Parameter P39 displays the calculated flow temperature, whereas parameter P40 the current one detected by the boiler probe.

NB: with heat requests from different zones at the same time, the boiler flow set-point corresponds to the highest of the calculated values. The flow set-point required by the mixed zones is equal to the value calculated by the thermoregulation plus the value set by parameter P75 (default 5°C).

When domestic hot water is drawn, heating requests are interrupted and then re-activated when domestic hot water draw is finished.

CH functions are disabled when the boiler is in the OFF or SUMMER ONLY modes.

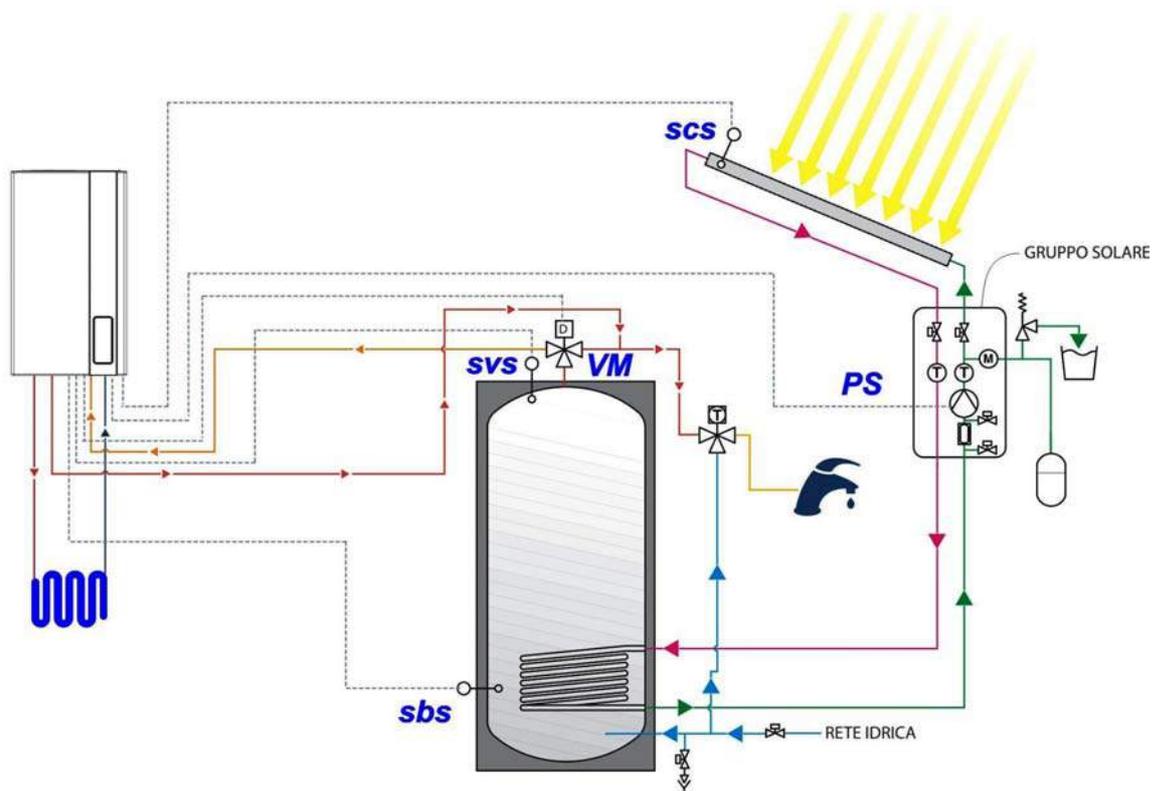
Solar mode programming

The solar card allows for managing "complex" solar plants when two solar loads (pump + deviating valve) are to be controlled, or when the multifunction relay is already used for managing one zone of the system.

CONFIGURATION 1:

suitable only for "instantaneous"-type boilers (P3=1), where the "complex" solar plant to be managed is designed for heating the solar storage in a forced circulation system through the pump **PS** and for the instantaneous integration in the boiler for DHW through the deviating valve **VM**.

Plant diagram is shown below:



Water heater filling function (pump ON)

Boiler temperature is set with parameter P19, which corresponds to a value ranging from 10 to 90°C (default 60°C).

Solar pump PS is enabled in the following conditions:

- $T_{svs} < P19 - 2^{\circ}\text{C}$
and
- $T_{scs} - T_{sbs} > \Delta T \text{ ON (P20)}$
and
- $T_{scs} > T_{min \text{ pump collector ON (P23)}}$
and
- $T_{scs} < T_{max \text{ pump collector ON (P22 - } 5^{\circ}\text{C)}$

Where T_{svs} is the temperature detected by the upper solar water heater probe, T_{sbs} the one detected by the lower probe, and T_{scs} is the temperature detected by the solar collector probe.

Water heater filling function (pump OFF)

Solar pump PS is disabled in the following conditions:

- $T_{svs} > P19$
or
- $T_{scs} - T_{sbs} < \Delta T \text{ OFF (P21)}$
or
- $T_{scs} < T_{min \text{ solar collector OFF (P23 - } 5^{\circ}\text{C)}$
or
- $T_{scs} > T_{max \text{ solar collector OFF (P22)}$

Warning: in case of solar valve probe SVS fault, the deviating valve is enabled in solar-only mode, while the water heater filling is managed according to the same logic, taking into account the solar water heater probe SBS instead of the faulty one.

Boiler integration function

The function consists in properly controlling the motorised valve VM and in activating the boiler burner only if the solar water heater temperature is not sufficient to fulfil the request for operation.

The VM valve remains in the rest condition (boiler integration) when the temperature detected by the SVS probe is lower than the DHW set-point temperature - 2°C. Instead, it is supplied with power (solar-only mode) when the solar water heater probe temperature reaches the DHW set-point set in the boiler, or in case of probe fault.

When the VM valve is in solar-only mode, the boiler will not perform the DHW function.

Warning: said function is active only if either the "DHW + CH", or the "CH-ONLY" or "DHW-ONLY" mode is selected in the boiler. With boiler in OFF mode, the VM valve remains constantly supplied with power.

Collector heat transfer function

This function prevents solar collectors from remaining in a stagnation state for a long time, which would expose them to high risk of thermal stress, when solar water heater temperature is reached. For this reason solar pump PS is reactivated according to the following logic:

$$T_{scs} > (P22 - 10^{\circ}\text{C})$$

and

$$T_{svs} < 95^{\circ}\text{C}$$

and stopped when one of the following conditions occurs:

$$T_{scs} < (P22 - 12^{\circ}\text{C})$$

or

$$T_{svs} \geq 95^{\circ}\text{C}$$

Besides, the function is disabled with $T_{scs} > P22$ and re-activated with $T_{scs} < P22$ minus 5°C .

Warning: *said function is active only if either the "DHW + CH", or the "CH-ONLY" or "DHW--ONLY" mode is selected in the boiler, whereas it is not active in case of solar valve probe SVS fault.*

Water heater cooling function

This function consists in cooling water heater down to the set-point value by transferring excess heat from the boiler to the solar collector. This occurs only if the solar water heater exceeds the set-point temperature following the activation of the "heat transfer" function.

If the remote control is not connected, the "water heater cooling" function is always enabled, otherwise it is enabled only from 00.00 to 6.00.

Solar pump (PSOL) enabling condition for water heater cooling:

$$T_{svs} > P19 + 2^{\circ}\text{C}$$

and

$$T_{scs} < T_{sbs} - \Delta T \text{ ON } (P20)$$

The function stops when the PSOL is switched off at the following conditions:

$$T_{svs} < P19$$

or

$$T_{scs} > T_{svs} - \Delta T \text{ OFF } (P21)$$

Warning: *said function is active only if either the "DHW + CH", or the "CH-ONLY" or "DHW--ONLY" mode is selected in the boiler, whereas it is not active in case of solar valve probe SVS fault.*

To enable the function, it is moreover necessary to set parameter P26 to 1.

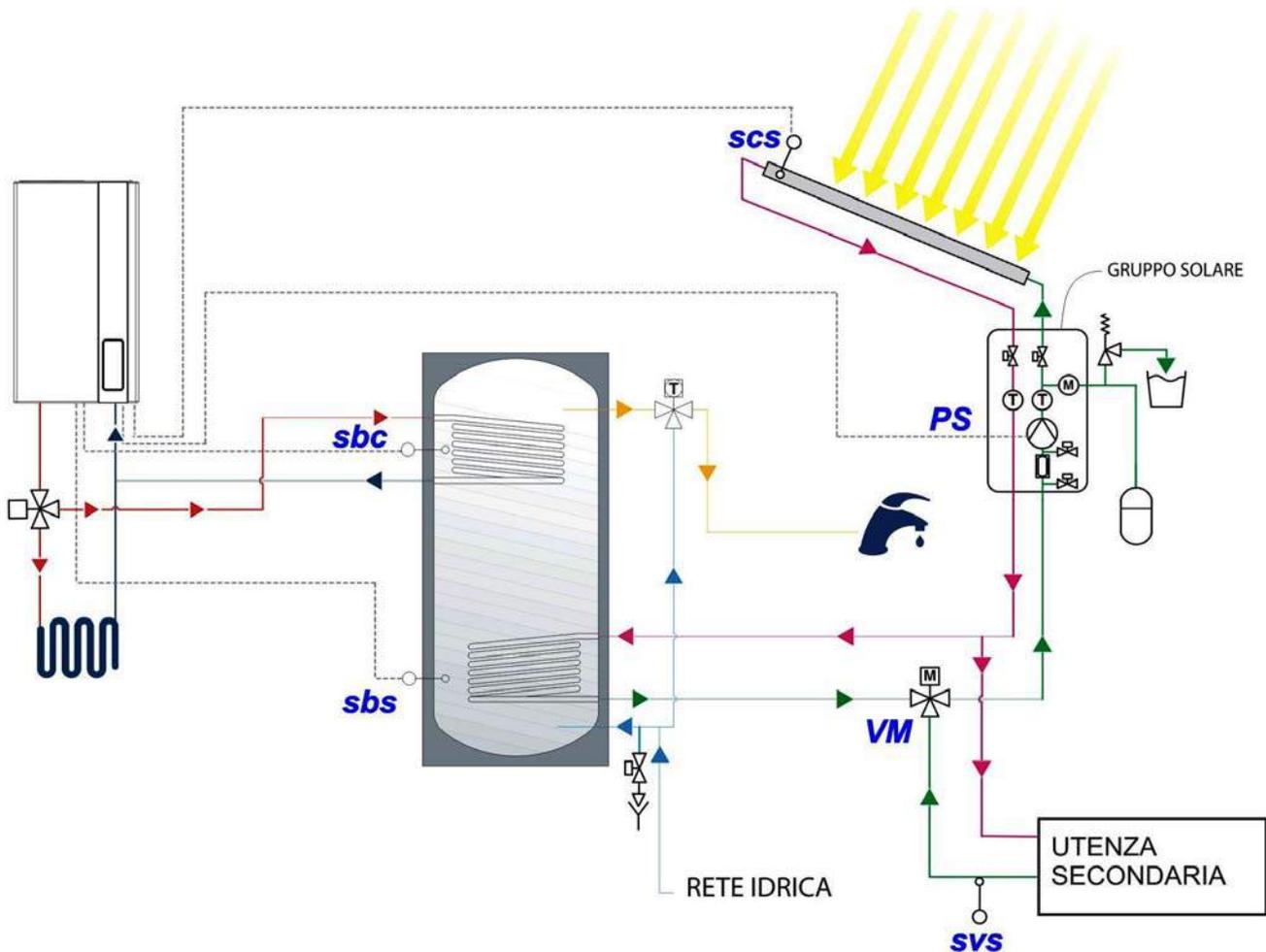
Solar collector freeze protection function

The function is enabled by setting parameter **P24** to **1**. In this way, when the temperature read by the collector probe is lower than 4°C , the solar pump PSOL is activated until the temperature reaches 5°C .

CONFIGURATION 2:

suitable for boilers with integrated water heater (P3=3), where the "complex" solar plant to be managed is designed for heating the solar storage in a forced circulation system through the pump **PS** with the option of transferring the excess solar energy to a secondary item through the deviating valve **VM**.

Plant diagram is shown below:

**Water heater filling function (pump ON)**

Boiler temperature is set with parameter P19, which corresponds to a value ranging from 10 to 90°C (default 60°C).

Solar pump PS is enabled in the following conditions:

- $T_{sbc} < P19 - 2^{\circ}\text{C}$
and
- $T_{scs} - T_{sbs} > \Delta T \text{ ON (P20)}$
and
- $T_{scs} > T_{min \text{ pump collector ON (P23)}}$
and
- $T_{scs} < T_{max \text{ pump collector ON (P22 - 5}^{\circ}\text{C)}$

Where T_{sbc} is the temperature detected by the upper solar water heater probe, T_{sbs} is the one detected by the lower probe, and T_{scs} is the temperature detected by the solar collector probe.

Water heater filling function (pump OFF)

Solar pump PS is disabled in the following conditions:

- $T_{sbc} > P19$
or
- $T_{scs} - T_{sbs} < \Delta T \text{ OFF (P21)}$
or
- $T_{scs} < T_{min \text{ solar collector OFF (P23 - 5}^\circ\text{C)}$
or
- $T_{scs} > T_{max \text{ solar collector OFF (P22)}$

Warning: in case of boiler water heater probe SBC fault, the water heater filling is managed according to the same logic, taking into account the solar water heater probe SBS instead of the faulty one.

Collector heat transfer function

This function prevents solar collectors from remaining in a stagnation state for a long time, which would expose them to high risk of thermal stress, when solar water heater temperature is reached.

Therefore, the solar pump PS is reactivated (with valve VM in "boiler filling" mode) according to the following logic:

$$T_{scs} > (P22 - 10^\circ\text{C})$$

and

$$T_{sbc} < 95^\circ\text{C}$$

and stopped when one of the following conditions occurs:

$$T_{scs} < (P22 - 12^\circ\text{C})$$

or

$$T_{sbc} \geq 95^\circ\text{C}$$

Besides, the function is disabled with $T_{scs} > P22$ and re-activated with $T_{scs} < P22$ minus 5°C .

Warning: said function is active only if either the "DHW-ONLY", or the "CH-ONLY" or "DHW + CH" mode is selected in the boiler, whereas it is not active in case of boiler water heater probe SBC fault.

Thermal discharge function

This function can be enabled only with **P76=1**. It allows for controlling a solar motorised valve VM in order to discharge the solar energy on a secondary actuator.

This occurs only if the *collector heat transfer* function can no more be enabled since the maximum temperature inside the water heater (95°C) has been reached.

The valve VM is supplied with power in the "thermal discharge" mode according to the following logic:

$T_{scs} > (P22 - 10^{\circ}\text{C})$
 and
 $T_{sbc} > 95^{\circ}\text{C}$

The solar pump PS (with the VM in "thermal discharge" mode) is now supplied with power when:

$T_{scs} > T_{svs}$

The function stops when the PS is switched off at the following conditions:

$T_{scs} < (P22 - 12^{\circ}\text{C})$
 or
 $T_{scs} > P22$

Warning: *the function is not performed in case of boiler water heater probe SBC fault, as well as in case a mode other than "CH-ONLY" or the "DHW-ONLY" or the "DHW + CH" is selected.*

Water heater cooling function

This function consists in cooling water heater down to the set-point value by transferring excess heat from the boiler to the solar collector. This occurs only if the solar water heater exceeds the set-point temperature following the activation of the "heat transfer" function.

If the remote control is not connected, the "water heater cooling" function is always enabled, otherwise it is enabled only from 00.00 to 6.00.

Solar pump (PSOL) enabling condition for water heater cooling:

$T_{sbc} > P19 + 2^{\circ}\text{C}$
 and
 $T_{scs} < T_{sbs} - \Delta T \text{ ON } (P20)$

The function stops when the PSOL is switched off at the following conditions:

$T_{sbc} < P19$
 or
 $T_{scs} > T_{sbs} - \Delta T \text{ OFF } (P21)$

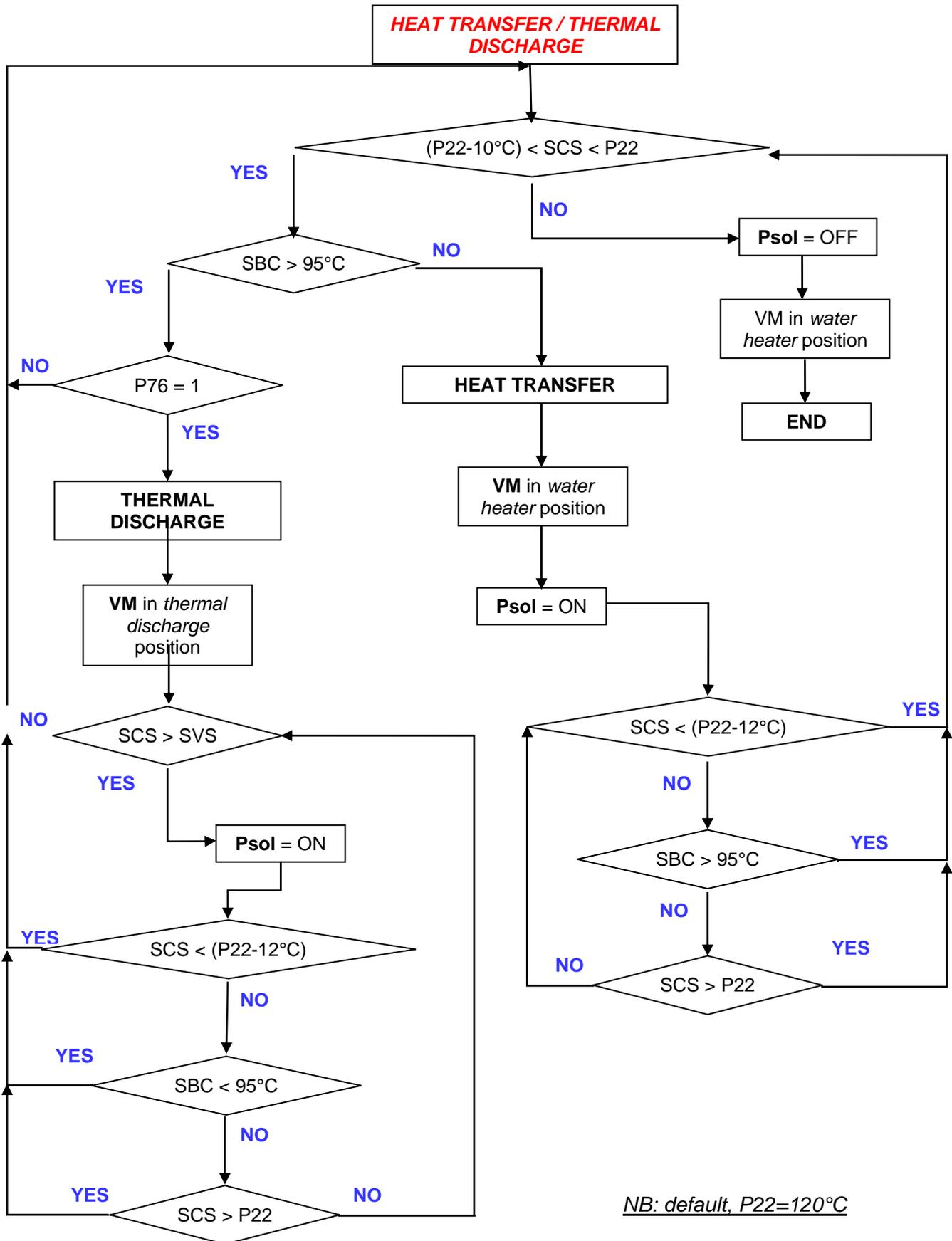
Warning: *said function is active only if either the "DHW + CH", or the "CH-ONLY" or "DHW--ONLY" mode is selected in the boiler, whereas it is not active in case of solar valve probe SVS fault.*

To enable the function, it is moreover necessary to set parameter **P26** to 1.

Solar collector freeze protection function

The function is enabled by setting parameter **P24** to 1. In this way, when the temperature read by the collector probe is lower than 4°C, the solar pump PSOL is activated until the temperature reaches 5°C.

Logical diagram of *heat transfer / thermal discharge operation*





Solar functions characteristics

Each time the solar pump becomes operational, its active state will be signalled by the icon on the boiler display.

In case of fault of the solar water heater probe (SBS) or of the solar collector probe (SCS), the solar pump is immediately switched off and the fault is reported through the boiler board interface and the remote control (if connected) with the relevant error codes (E28 and E24 respectively).

It is moreover possible to force the solar charges during maintenance by setting parameters P90, P91 and P92. In this way, the supplementary board relays are energised until such parameter is restored.

Supplementary board characteristics

Power supply	230 Vac -15/+10% 50Hz
Load output	230 Vac, 1° max
Flow probe	NTC 10 kOhm @25°C B3435 Max. 3 metres
Solar probe	PT1000 Max. 100 metres
Flow probe operation correct range	-5°C +120°C
Solar probe operation correct range	-40°C +290°C
Mixing valve disabling range for reached set-point	Set+1.5°C / Set-2°C
Mixing valve opening total timer	From 0 to 300 s (P74)
Initial closing timer with powered board	P74 + 40 s
Request end closing timer	P74 + 20 s
Post-circulation timer	From boiler with P13
Circulation pump anti-seizing timer	3 s each 24 hours
Anti-freeze function timer	15 min
Anti-freeze triggering temperature	< 5 °C

TEMPERATURE PROBE INTEGRITY CHECK

The system checks for any faults in the probes connected to the modulation board, signalling any detected faults with the relevant error code. The failure condition occurs when probe is not supplied with power (except for the external probe), or when it detects a temperature value outside probe correct operating range:

- **Double flow probe (E05)** fault: the burner is immediately switched off whereas the fan is still supplied with power.

The pump circulates water until the fault is reset, with deviating valve in heating position, if before the fault a heating, flow-return anti-freeze, flue cleaning request was present, or if the boiler does not feature any request.

The pump circulates with deviating valve in DHW position only if before the fault there was a request in DHW or DHW anti-freeze mode.

With P17=1 and P17=3 (multifunction relay), the relay remains energised until the fault is reset in case a heating, flow-return anti-freeze, flue cleaning request, or no requests were present.

- **Plate DHW probe (E06):** fault: with a request in DHW mode, the burner is not activated (if it was ON it is switched OFF) and the pump is activated as long as the request persists. At the end of the request, if no other requests are present, the system performs a 30-second post-circulation cycle. This circulation occurs even without operating request.

With operating request in heating, flow anti-freeze, or flue cleaning function, the standard management operations of the request are ensured.

If the fault is reset, the system restores the standard operation.

Resistance values (Ω) of NTC flow probes and of plate DHW at the different temperatures:

Probe calibration: 10k Ohm at 25°C

T°C	0	2	4	6	8
0	27203	24979	22959	21122	19451
10	17928	16539	15271	14113	13054
20	12084	11196	10382	9634	8948
30	8317	7736	7202	6709	6254
40	5835	5448	5090	4758	4452
50	4168	3904	3660	3433	3222
60	3026	2844	2674	2516	2369
70	2232	2104	1984	1872	1767
80	1670	1578	1492	1412	1336
90	1266	1199	1137	1079	1023

Correct operating range: from -20 to +120°C, general tolerance: +/- 3°C

- **Solar probe (E24, E27, E28)** fault: in case of fault of the solar water heater probe (SBS) or of the solar collector probe (SCS), the solar pump is immediately switched off.

In case of fault of the solar valve probe (SVS), the deviating valve is enabled in "solar-only" mode and the "heat transfer" and "water heater cooling" functions are disabled. In such case, the "boiler filling" function is anyway ensured, taking into consideration the solar water heater probe SBS.

The usual management operations are guaranteed for all requests made, except for requests referring to "solar" operation.

Resistance values (Ω) of the solar probes PT1000 at the different temperatures:

Probe calibration: 1KOhm at 0°C

Temperature °C	Resistance Ω	Temperature °C	Resistance Ω
-20	922	60	1232
-10	961	70	1270
0	1000	80	1309
10	1039	90	1347
20	1078	100	1385
30	1118	110	1422
40	1155	120	1460
50	1194	130	1499

Correct operation range: from -40°C to +290°C, general tolerance: +/- 3°C.

- **External probe fault (E23):** each operation request in heating mode entailing the burner ignition is carried out ignoring the calculation algorithm: the curve value is used to determine the operation range (standard or reduced) with set-point corresponding to the set one.

Correct operating range: *from -40 to +50°C, general tolerance: +/- 3°C.*

Warning: if the boiler or the remote control is in "OFF" mode, the fault is only signalled, whereas all the other boiler control elements (gas valve, fan, pumps, three-way valve, multifunction relay) remain in the rest position.

GAS PROPORTIONAL MODULATION COIL INTEGRITY CHECK.

The system checks the gas proportional modulation coil for faults (*error E76*) in case of modulation coil not being supplied with power or short-circuited. If this fault occurs, all the standard boiler functions are anyway performed with the burner working at minimum output. The faulty modulation coil signal is interrupted when its electric parameters return within the preset limits.

ANTI-SEIZE FUNCTION

Boiler pump, deviating valve, and DHW pump

The electronic board calculates the time elapsed since boiler pump disabling; if this time is equal to 24 hours, the pump, along with the deviating valve (P28=0) or the DHW pump (P28=1), will be enabled again for 30 seconds.

During the pump anti-seizing function the burner remains off and upon each activation of the pump for any request the timer is reset.

Any operation request in CH, DHW or freeze protection functions will have higher priority, and thus the function in progress will be forced to end in order to carry out such request.

Multifunction relay

The multifunction relay carries out the anti-seize operation as indicated in the previous paragraph only if it is set as pump or valve (P17=1, P17=2 and P17=3).

In case it is set to signal faults and errors (P17=0) the relay does not carry out the anti-seize operation.

POST-VENTILATION FUNCTION.

Upon burner switching off, the fan is still supplied with power for **10 seconds** (*super-technical parameter P94*), regardless of boiler operating mode.

Moreover, a post-ventilation cycle is started when the temperature read by the flow probe reaches 95°C and is stopped when the temperature falls below 90°C.

Any operation request during CH, DHW, anti-freeze, flue cleaning functions will have higher priority and thus the ventilation function in progress will be forced to end in order to carry out such request.

PUMP POST-CIRCULATION FUNCTION

At the end of a heating, anti-freeze or flue cleaning request, the burner (if ON) is immediately switched off, whereas the pump continues to be supplied with power for 30 seconds (time that can be set by means of parameter P13). The same applies to the multifunction relay with P17=1 or P17=3 at the end of each request by the remote control or the associated ambient thermostat.

At the end of an operation request in plate DHW mode, the pump is still supplied with power for 30 seconds, with deviating valve switched to DHW mode.

With no operation request, if the water temperature detected by the flow NTC probe is higher than 78 °C, the pump remains supplied with power until the flow temperature falls below such value. In this case the deviating valve is switched to heating mode.

Any operation request during CH, DHW, anti-freeze, flue cleaning mode will have higher priority, and thus the post-circulation function in progress will be forced to end in order to carry out such request.

FREEZE PROTECTION FUNCTION

Flow

A flow NTC probe measures the water temperature inside the boiler and if it falls below 5°C it generates an operation request in flow anti-freeze mode, with consequent burner ignition.

At the end of the ignition sequence, the output rate supplied to burner will be forced to the minimum value.

The operation request in flow anti-freeze mode ends when the flow temperature exceeds 30°C or when reaching an operation time of 15 minutes with flow temperature above 5°C.

Any operation request in heating mode or DHW has higher priority, and forces the interruption of the function in progress.

During a flow anti-freeze operation the boiler pump is activated, whereas the three-way valve switches to heating position.

With P17 equal to 1 or 3, also the multifunction relay is energised.

In case of flame control shut-down and impossibility to ignite the burner, the anti-freeze function activates a pump circulation cycle with active multifunction relay (if P17=1 or P17=3).

Warning, the freeze protection function does not protect the CH system but the boiler only.

Summary of operation thresholds:

DESCRIPTION	ON	OFF
Flow freeze protection function	5°C	30°C (or after 15' of operation)
Temperature general tolerance	± 3°C	

Plate DHW (only combined instantaneous versions)

The DHW NTC probe measures the DHW temperature and if it falls below 5°C it generates an operation request in DHW freeze protection mode. The pump is activated and after a 30 sec. waiting time, the burner ignites with output forced to the minimum value.

During a DHW anti-freeze operation the temperature detected by the flow probe is constantly checked, and in case it reaches 60°C the burner is switched off. The burner ignites again if the operation request in anti-freeze mode is still present and the flow temperature is lower than 60°C.

The operation request in DHW anti-freeze mode ends when the DHW temperature exceeds 10°C or when reaching an operation time of 15 minutes with DHW temperature above 5°C.

Any operation request in DHW mode has higher priority, and forces the interruption of the function in progress.

During a DHW anti-freeze operation, the pump is supplied with power, the electric deviating valve is in DHW position and the multifunction relay is in rest condition.

In case of flame control shut-down and impossibility to ignite the burner, the DHW anti-freeze function will anyway carry out a pump circulation cycle.

DESCRIPTION	ON	OFF
DHW freeze protection function	5°C	10°C (or after 15' of operation, or if the flow temperature is > 60°C)
Temperature general tolerance	± 3°C	

Boiler (heating only with water heater)

The water heater NTC probe measures the DHW boiler temperature and if it falls below 5°C, it generates an operation request in boiler anti-freeze mode. The pump is activated and after a 30 sec. waiting time, the burner ignites with output forced to the minimum value.

Moreover, during a boiler anti-freeze operation the temperature detected by the flow probe is constantly checked, and in case it reaches 60°C the burner is switched off. The burner is switched on again if the operation request in anti-freeze mode is still present and the flow temperature is lower than 60°C.

The operation request in boiler anti-freeze mode ends when the boiler temperature exceeds 10°C or when reaching an operation time of 15 min. Any operation request in heating mode or DHW has higher priority, and forces the interruption of the function in progress.

The anti-freeze function is enabled with any boiler setting, besides, in case of flame control shut-down and impossibility to ignite the burner, the anti-freeze function activates a pump circulation cycle with the three-way valve in the DHW position.

DESCRIPTION	ON	OFF
Water heater freeze protection mode	5°C	10°C (or after 15' of operation, or if the flow temperature is > 60°C)
Temperature general tolerance	± 3°C	

ANTI-LEGIONELLA FUNCTION (CH-only with water heater)

The anti-legionella function is available in the boiler-version systems (P3=3) and is always enabled. This function is enabled whenever a time interval of 15 days elapses. Once this time interval has run out, a boiler heating phase, having a fixed set-point of 65 °C and a maximum duration of 30 minutes, is started.

The anti-legionella function has higher priority over any DHW, CH or anti-freeze mode that might be in progress when such function is activated.

Warning: this function is performed only using the boiler probe for DHW management.

SAFETY DEVICES AND FUNCTIONS

Double flow probe (E02 shut-down)

The overtemperature check is carried out by the double probe placed on the flow pipe in place of the standard safety contact thermostat.

When reaching 105°C, the gas valve power supply is immediately interrupted, with consequent indication of error E02 on the display.

Use the "reset" key to reset when the flow temperature reaches 90°C.

In case of E02 shut-down:

The fan performs a 10-second post-ventilation cycle and the boiler can be reset within that time.

The pump performs a post-circulation cycle with deviating valve in heating position if before the shut-down there was a heating, flow-return anti-freeze, or flue cleaning function request. Instead, the post-circulation cycle with deviating valve in DHW mode is performed if a DHW request or a DHW anti-freeze request had been launched before the shut-down.

With P17=1 or P17=3, the multifunction relay performs a post-circulation cycle only if it was energised before the shut-down.

Air pressure switch (E03 shut-down for CTFS version)

The air pressure switch, fitted only in the forced draught models, is a normally open contact connected in series with the gas valve, and is directly managed by the automatic flame control. Its function is to detect a proper pressure difference in two different points of the boiler and is directly managed by the electronic board.

The pressure switch contact must be open before fan is supplied with power and closed when it starts working. At the end of the request, when the fan is no more supplied with power, the contact must re-open. Therefore, the board double-checks the contact opening, one check is performed at the initial and one at the final phase.

When the pressure switch is open, the gas valve cannot be supplied with power.

After 10 seconds since powering the combustion fan, if the pressure switch contact is still open, a volatile shut-down signal is generated. Said signal does not need to be reset. The same shut-down signal is generated if the pressure switch is in a wrong position or in a waiting status. The boiler will enter a non-volatile shut-down mode only if the pressure switch is in a wrong position for more than one minute and must be reset.

Differential pressure switch CTFS 24 kW: 35/45 Pascal	P _{max} =1500 Pa
Differential pressure switch CTFS 28 kW: 125/112 Pascal	P _{max} =1500 Pa

Flue gas thermostat (E03 shut-down for CTN and RTN versions)

Fitted only on the natural draught models, the flue gas thermostat has a normally closed contact that opens when temperature reaches 70°C.

It is fitted on a side fin and signals whether flue gas draught is correct or not.

Upon contact opening, the gas valve power supply is cut, and after 4 seconds, the board enters the "flue gas thermostat" shut-down status, starting a post-circulation cycle. Along with the shut-down, a 10-minute timing will start as well in order to re-start the boiler automatically, on the condition that meanwhile the contact of the flue gas thermostat has been restored. To

reset the timer after a boiler shut-down, press the “RESET” key. Boiler will switch on again only if the contact is closed, otherwise the timer will start again.

In case the thermostat contact is restored within 4 seconds after its opening, the boiler will resume its normal operation.

Pressure transducer (shut-down E04 and E09)

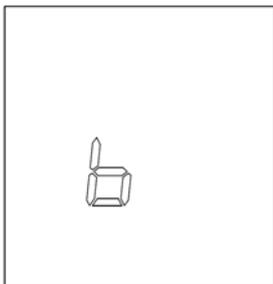
Its function is to constantly check the system pressure. If pressure is equal to or lower than 0.4 bar, a low pressure signal (error code E04) is generated. Besides, all requests of operation will be ignored and pump will be immediately switched off. Also the multifunction relay is de-energised if selection is P17=1 or 3. Signalling will be reset upon reaching 1 bar during the filling phase.

The transducer checks as well that the system does not reach a too high pressure. Therefore, if pressure is equal to or higher than 2.8 bar, the E09 fault is signalled without interrupting any functions in progress. The error is reset when pressure is lower than 2.6 bar.

WARNING: all pressure limit values can be edited through the super-technical parameters (see parameter list on page 36).

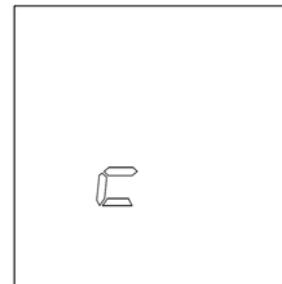
Boiler combustion chamber automatic recognition (E72 shut-down)

The type of boiler (forced draught or natural draught) is automatically recognised each time the board is supplied with power. The board attempts to read the inputs dedicated to the air pressure switch or to the flue gas thermostat. During such phase, “CHA” will appear on the boiler display and upon the following recognition (which must take place within the first two minutes) one of the following messages will be displayed for 5 seconds:



= NATURAL DRAUGHT

FORCED DRAUGHT =



If for any reason the board is not able to detect the presence of the air pressure switch, the E72 fault will be signalled. To reset this shut-down status, power off and back on to start a new self-recognition cycle.

Warning: during the combustion chamber type recognition step, no request is performed.

3-bar safety valve

This valve is installed on CH water pipe, and checks that pressure does not exceed 3 bar as this condition would entail boiler inner problems.

Should valve read a pressure higher than the allowed limit, it will open to discharge water outside.

SECT. 6**ELECTRICAL SYSTEM****6.1 ELECTRONIC BOARD**

Boiler is managed by means of two electronic boards, a main board and an interface board. The former is the boiler hardware in which also the ignition transformer is integrated. The latter enables the user to control the boiler through a touch screen interface and an LCD display.

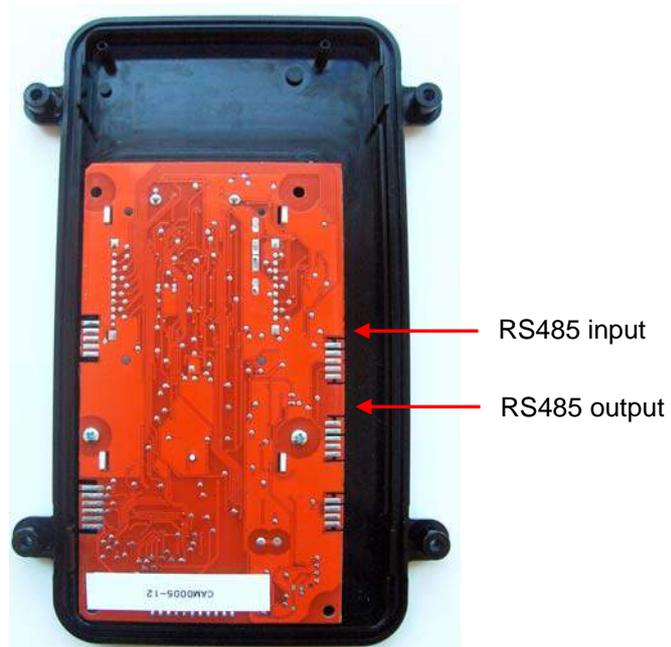
The communication between the two boards is made through a cable with an RS485 connection and 24V power supply.

Main board characteristics

<i>Operating voltage:</i>	from 170Vac to 300 Vac
<i>Power supply frequency:</i>	45 – 66 Hz
<i>Operation ambient temp.:</i>	-20°C ÷ +60°C
<i>Protection class:</i>	IP00
<i>Max absorpt. in stand-by:</i>	1.2 W
<i>Protection fuse:</i>	5x20 2AF
<i>Ionisation current:</i>	2 µA
<i>Max. multifunct. relay charge:</i>	230VAC 100VA power factor 0.7
<i>Flame detection method:</i>	ionisation
<i>Type of detection:</i>	non-polarised

**Interface board characteristics**

<i>Operating voltage:</i>	24 Vdc
<i>Operation ambient temp.:</i>	-20°C ÷ +60°C
<i>Type of communication:</i>	RS485
<i>Protection class:</i>	IP00
<i>No. of LCD digits:</i>	5 (3 + 2)
<i>Back-lighting:</i>	yes
<i>Background:</i>	white

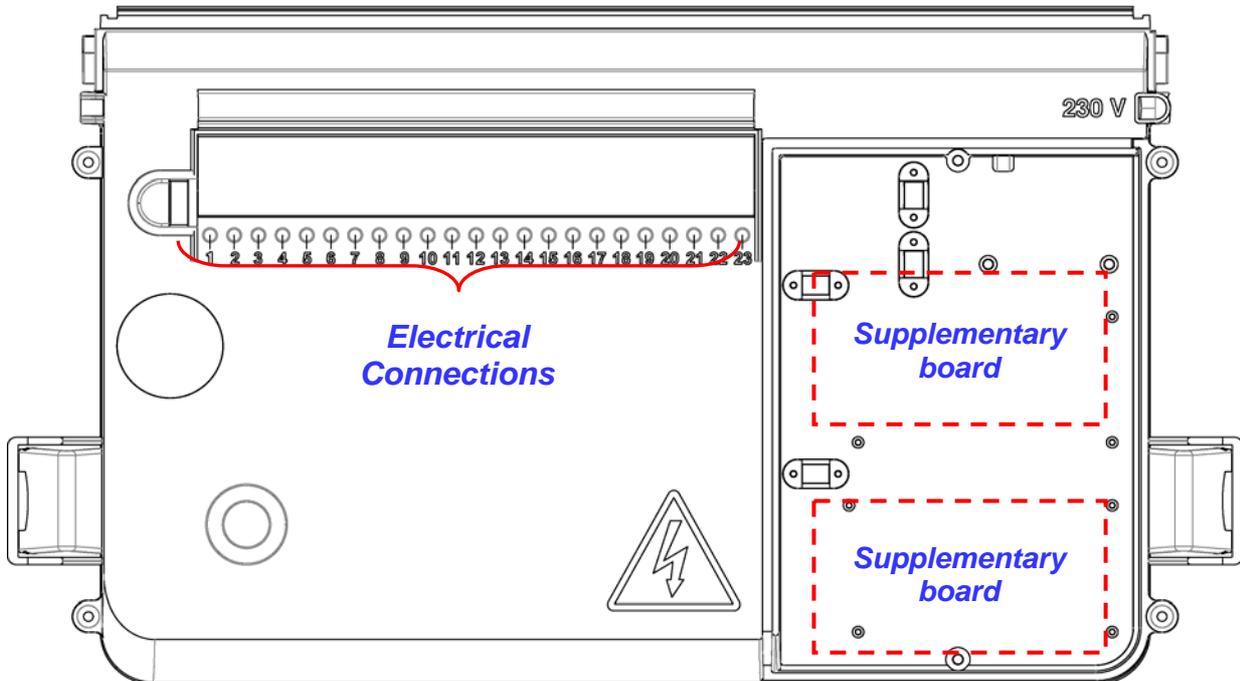


WARNING: removing the plastic front part of the interface board is not allowed (spare part is supplied pre-assembled).

6.2 OUTER TERMINAL BOX ELECTRICAL CONNECTIONS

All the electrical connections are ensured through the terminal box located on the back side of the electric panel.

The supplementary boards (used to manage the zones or complex solar plants) are housed outside, on the panel back side.



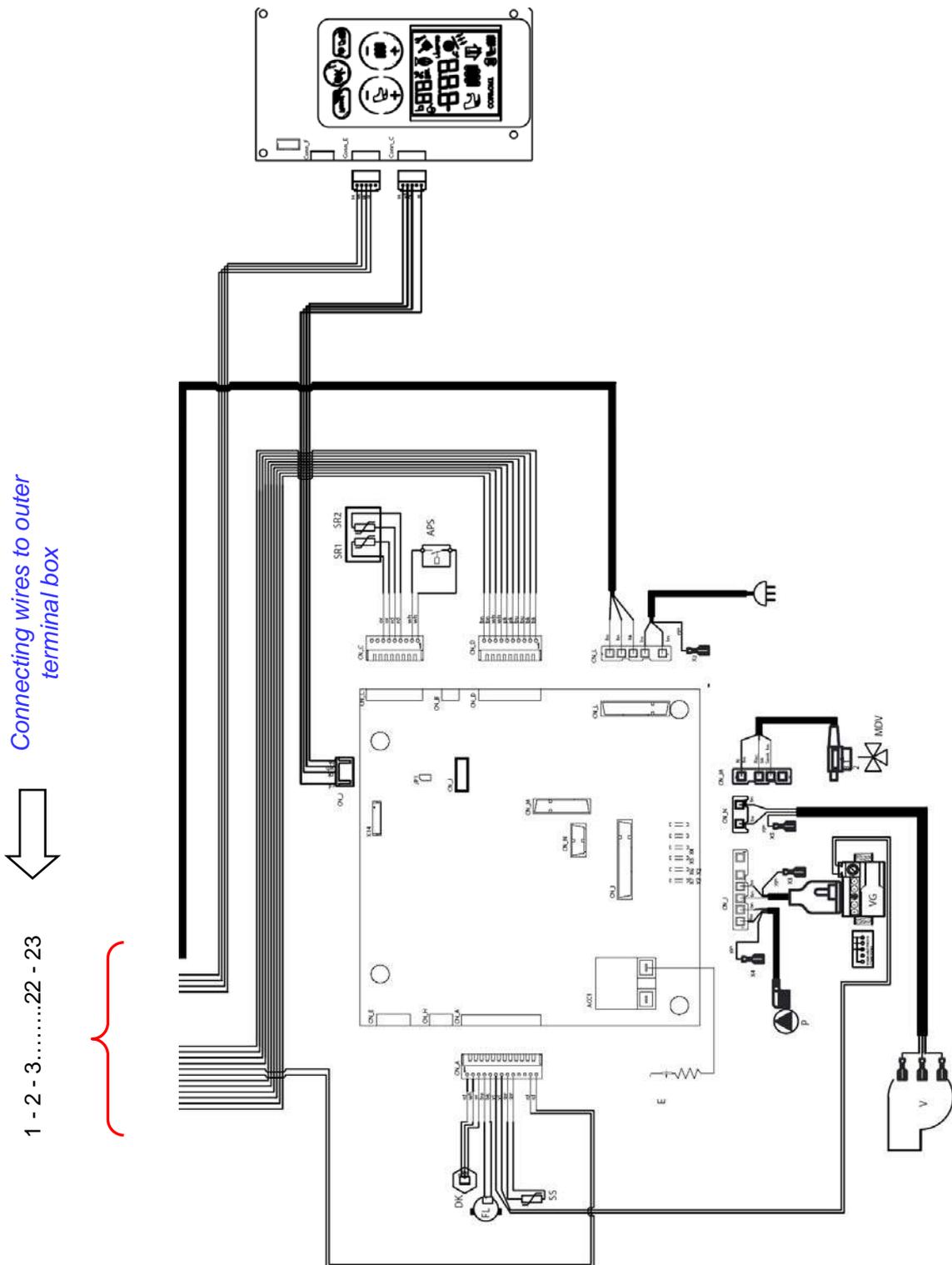
Key to connections:

- 1-2** ambient thermostat 2
- 3-4** ambient thermostat 1 or Remote Control ($L \leq 30m$)
- 5-6** external probe (10K Ohm at 25°C B3977 $L \leq 100m$)
- 7-8** boiler water heater probe *SBC* for R version (10K Ohm at 25°C B3435 $L \leq 3m$)
- 9-10** solar water heater probe *SBS* (PT1000 $L \leq 3m$)
- 11-12** solar collector probe *SCS* (PT1000 $L \leq 100m$)
- 13-14** boiler timer or thermostat only for R version
- 15-16** spring return-type motorised valve ($P28=0$) or DHW pump ($P28=1$) only for R version
- 17** serial connection GND
- 18** serial connection 485A
- 19** serial connection 485B
- 20** serial connection +5V
- 21** "normally open" relay phase (*NO*)
- 22** "normally closed" relay phase (*NC*)
- 23** multifunction relay neutral

Warning: in case of complex solar plants, the solar valve probe (*SVS*) must be connected to the supplementary board.



6.3 WIRING DIAGRAM

**Key:**

DK: pressure transducer
FL: flow switch
SS: DHW probe NTC 10K Ohm
E: ignition and detection electrode
APS: air pressure switch

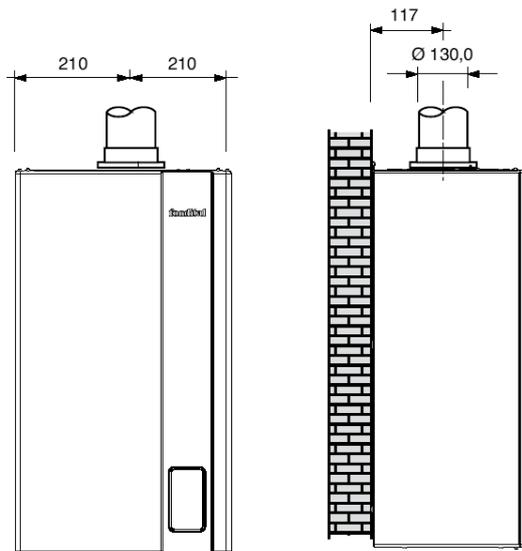
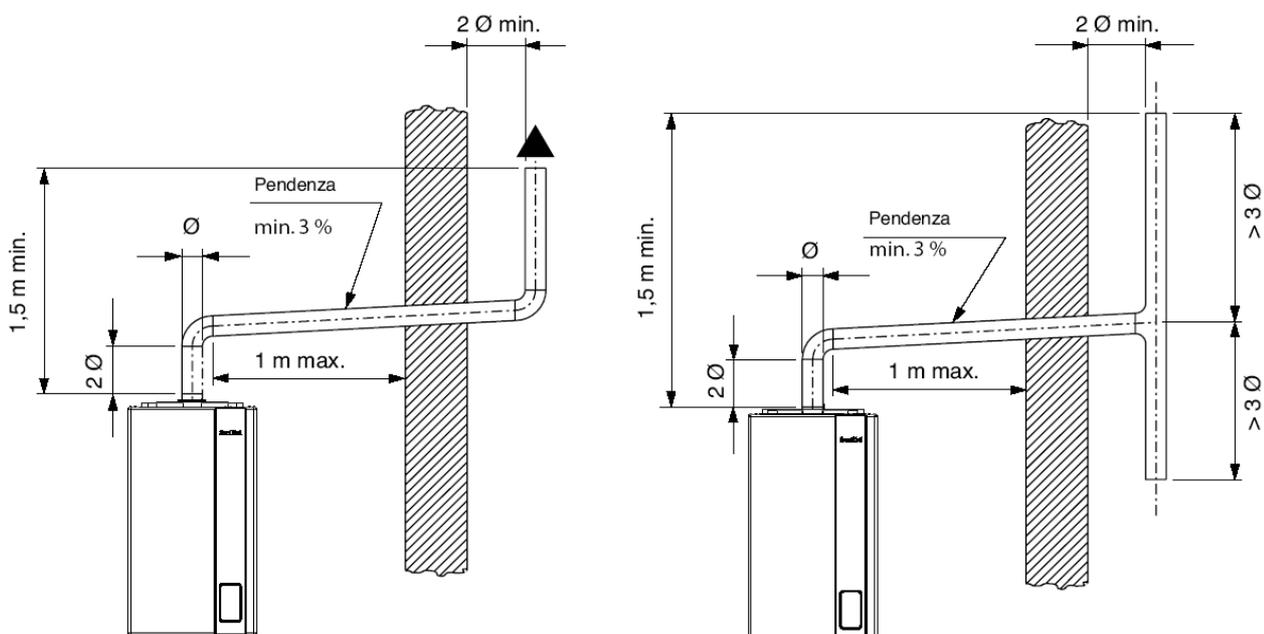
SR1 SR2: double flow probe NTC 10K Ohm
MVD: motorised deviating valve
VG: gas valve
P: boiler circulation pump
V: fan

**SECT. 7****VENT DUCTS AND PIPES**

For intake/flue gas vent lines use only original ducts designed for the specific boiler (as per manufacturer's specifications).

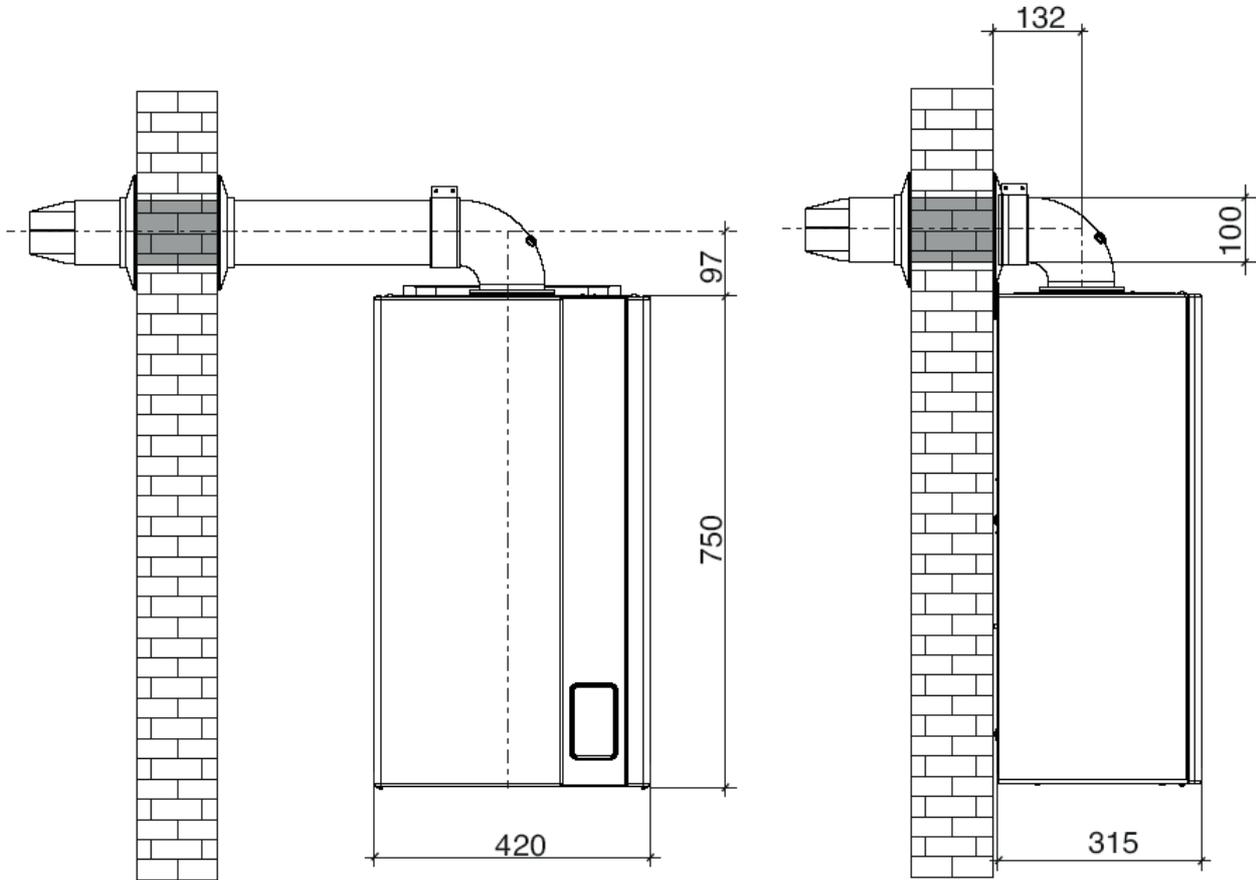
7.1 NATURAL DRAUGHT BOILER VENT DUCT

TYPE OF INSTALLATION	PIPE DIAMETERS (mm)
B11 With adapter	$\varnothing 125^1/130$

Dimensions for connection of flue gas vent duct**Connecting to the flue system**

7.2 100/60 CO-AXIAL AIR/VENT DUCTS

Dimensions for connection of flue gas duct to co-axial pipes



Type C12 horizontal vent

The minimum permissible length of horizontal coaxial pipes is 0.5 metres, including the first elbow connected to the boiler.

The maximum permissible length of horizontal coaxial pipes is 6 metres for 24 kW models and 7 metres for 28 kW models, excluding the first elbow connected to the boiler.

For each additional 90° elbow, maximum permissible length is to be reduced by 1 metre, whereas for the 45° one by 0.5 metres. The duct is to be tilted down by 1% toward its outlet, to prevent rain water from entering it.

Flue gas vent diaphragms:

Pipe length (m)	Flue gas vent diaphragm diameter [mm]		
	24 kW	28 kW	32 kW
$0,5 \leq L \leq 2^*$	39,8	39	39,8
$2 < L \leq 3^*$	42	41	41
$3 < L \leq 4^*$	45		44
$4 < L \leq 5^*$	49	47	47
$5 < L \leq 6^*$	-		Not allowed
$6 < L \leq 7^*$	Not allowed	-	

* Excluding the first elbow

Type C32 vertical vent

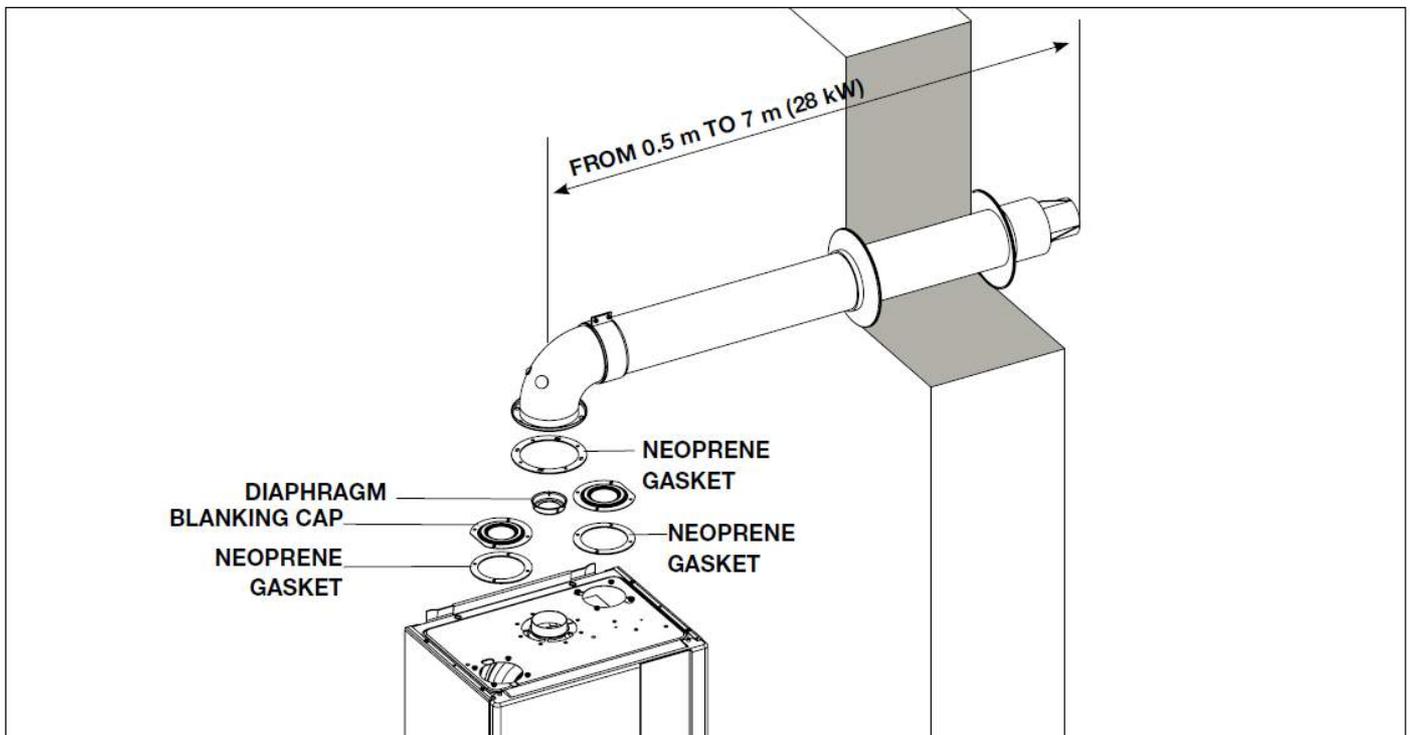
Minimum permissible length for vertical coaxial pipes is one metre, equal to the length of the flue.

The maximum permissible length of vertical coaxial pipes is 6 metres for 24 kW models and 7 metres for 28 kW models, including the flue.

For each additional 90° elbow, maximum permissible length is to be reduced by 1 metre, whereas for the 45° one by 0.5 metres. Roof vent terminal is equivalent to 1.5 metres of pipe.

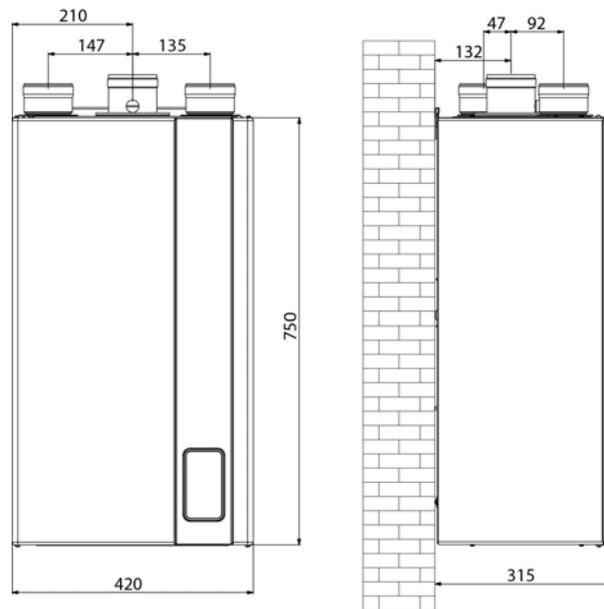
Flue gas vent diaphragms:

Pipe length (m)	Flue gas vent diaphragm diameter [mm]		
	24 kW	28 kW	32 kW
$0,5 \leq L \leq 2$	39,8	39	39,8
$2 < L \leq 3$	42	41	41
$3 < L \leq 4$	45		44
$4 < L \leq 5$	49	47	47
$5 < L \leq 6$	-		Not allowed
$6 < L \leq 7$	Not allowed	-	





7.3 80/80 SPLIT AIR/VENT DUCTS

Type C12 - C32 - C42 – C52 – C82**24 kW Flue gas vent diaphragms:**

Pipe length (m)	Diaphragm diameter flue gas vent [mm]
$1 \leq L < 3$	39.8
$3 \leq L < 14$	42
$14 \leq L < 26$	45
$26 \leq L < 34$	49
$34 \leq L < 42$	-

28 kW Flue gas vent diaphragms:

Pipe length (m)	Diaphragm diameter flue gas vent [mm]
$1 \leq L \leq 18$	45
$18 < L \leq 23$	47

32 kW Flue gas vent diaphragms:

Pipe length (m)	Diaphragm diameter flue gas vent [mm]
$1 \leq L \leq 5$	44
$5 < L \leq 12$	45
$12 < L \leq 19$	47
$19 < L \leq 24$	49

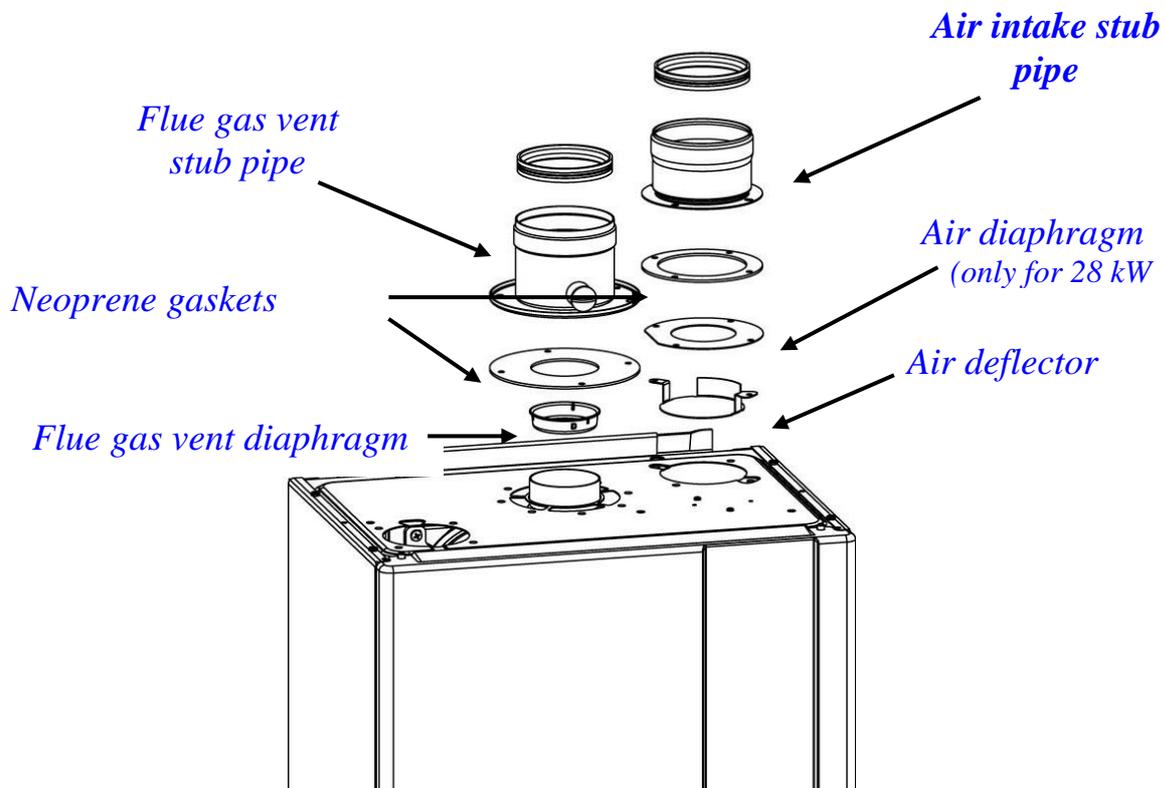
WARNING: in the 28 kW version the 55.5 mm diaphragm (supplied along with the boiler) must always be fitted on the intake

+

80/80 split duct load loss table

Part	Vent			Intake		
	24 kW	28 kW	32 kW	24 kW	28 kW	32 kW
1m extension	1			0,6		
0.5m extension	0,5			0,3		
90° elbow	1,4			0,8		
90° Elbow - narrow radius	2,8			1,7		
45° elbow	2,3	2,4		1,4		
Elbow with flue gas measurement point	2,8			1,7		
Wall vent terminal	4,4	4,5		-		
Roof vent terminal	4,4	4,5		-		
Vertical stub pipe	0,1			0,1		
Vertical condensate drain	2,8	2,9		-		
Horizontal condensate drain	0,3			-		
Chinese-type vertical vent terminal	4,8	4,9	5	-		
Suction opening	-			2,6	2,7	2,6
Split vent duct flue	5,7	5,9		4,2	4,3	4,2

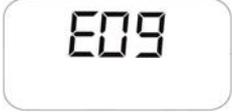
Base splitter kit **OSDOPPIA11**:

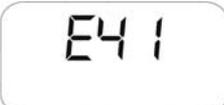


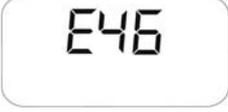
WARNING: the air deflector is supplied along with the splitter kit, whereas the air diaphragm is supplied along with the boiler.

TABLE OF TECHNICAL FAULTS

Boiler Status	Malfunction	Probable cause	Solution
Boiler shut-down, picture flashes: 	Burner does not ignite	Gas supply fault	Check gas pressure. Check gas supply cock or gas network safety valve intervention
		Gas valve is disconnected	Re-connect it
		Gas valve is faulty	Replace it
		The board is faulty	Replace it
	Burner does not ignite: no spark	Ignition relay is faulty.	Replace the electrode.
		Ignition transformer faulty.	Replace the ignition transformer.
		Electronic board does not ignite. It is faulty	Replace electronic board.
	Burner ignites for a few seconds and goes off	Electronic board does not detect flame: inverted phase and neutral	Verify correct neutral and phase connection sequence
		Detection electrode cable interrupted	Re-connect or replace cable
		Flame detection electrode is faulty	Replace the electrode.
		Electronic board does not detect flame: it is faulty	Replace the board
		Ignition heat input setting is too low	Increase it
Minimum heat input is not set correctly		Check burner setting	
Boiler shut-down, picture flashes: 	Flow double probe check has been triggered	Water does not flow in the system (thermostatic valves shut, system shut-off cocks closed) and the by-pass valve is not triggered	Check system status and by-pass valve
		Circulation pump is blocked or faulty	Check the circulation pump
		Double flow probe faulty.	Check probe values.
Boiler shut-down, picture flashes: 	Flue gas pressure switch triggering (only CTFS)	Combustion air intake is insufficient or flue gas vent is difficult	Check air intake/flue gas vent ducts: clean or replace as necessary.
		Flue gas pressure switch is faulty	Check flue gas pressure switch: replace it if faulty
		Silicone pipe of flue gas pressure switch clogged or not connected	Connect or clean pipe as necessary
		Fan is faulty	Replace it
	Flue gas thermostat triggering. (only CTN or RTN)	Poor flue draught	Check flue draught and suction openings
		Flue gas thermostat is faulty	Replace it

Boiler shut-down, picture flashes: 	CH system water pressure is low	Low water inside heating system	Fill up system
		Leaks in the CH system	Check system
Boiler shut-down, picture flashes: 	Double flow probe fault	One of the two probes is disconnected or in short-circuit	Reconnect or replace it
		The difference between the temperatures detected by the double probe is higher than 5°C	Replace the probe
Boiler shut-down, picture flashes: 	DHW probe is not working <i>(only for CTN and CTFS)</i>	Disconnected or short-circuited probe	Reconnect or replace it
Boiler is not supplying DHW	DHW flow switch is not working	System insufficient pressure or flow rate	Check system Check condition of flow switch filter
		DHW flow switch probe is faulty or disconnected	Connect or replace it
	DHW probe does not output enabling	Probe not correctly set	Replace the probe
	DHW function is not enabled on the display	Check active functions on the display	Enable the function
The boiler is working but the image is flashing: 	Too high system pressure	System overload	Check pressure when the system is not heated
		Expansion tank discharged or faulty	Check pressure when the system is empty
		Undersized expansion tank	Add a supplementary tank
Boiler shut-down, picture flashes: 	Boiler probe fault <i>(only for RTN with water heater)</i>	Disconnected or short-circuited probe	Reconnect or replace it
Boiler shut-down, picture flashes: 	External probe is not working <i>(error signalling occurs only when a heating request is active)</i>	Disconnected or faulty probe	Reconnect or replace it

Boiler shut-down, picture flashes: 	Solar collector probe SCS fault (connected to boiler board)	Disconnected or faulty probe	Reconnect or replace it
		Probe detects a value lying outside the admissible range	Make sure the probe is of PT1000 type
Boiler shut-down, picture flashes: 	Solar valve probe SVS fault (connected to the supplementary solar card)	Disconnected or faulty probe	Reconnect or replace it
		Probe detects a value lying outside the admissible range	Make sure the probe is of PT1000 type
Boiler shut-down, picture flashes: 	Solar water heater probe SBS fault (connected to the boiler board)	Disconnected or faulty probe	Reconnect or replace it
		Probe detects a value lying outside the admissible range	Make sure the probe is of PT1000 type
Boiler shut-down, on remote control picture flashes: 	The boiler does not communicate with the Remote Control	The connection with the Remote Control is interrupted.	Check the Remote Control connections (wiring longer than 5 meters must be shielded)
		Remote control is faulty	Replace the Remote Control
Boiler shut-down, picture flashes: 	Safety thermostat triggering in mixed zone 2	Faulty or disconnected safety thermostat	Replace it or reconnect cables
		Too high flow temperature	Check boiler settings or mixing valve correct operation
Boiler shut-down, picture flashes: 	Flow probe fault in mixed zone (with indication of the zone number)	Disconnected or faulty probe	Reconnect or replace it
		Probe detects a value lying outside the admissible range	Make sure the probe is of NTC type
Boiler shut-down, picture flashes: 	Communication failure between main board and supplementary boards	The main board does not find all supplementary boards or finds more than the ones actually connected	Check parameter P60 value. It must correspond to the number of supplementary board(s) used

Boiler shut-down, picture flashes: 	Hydraulic configuration not allowed	The main board does not recognise the probes for correct operation	Check the P3 board configuration parameter
Boiler shut-down, picture flashes: 	Configuration error between remote control or supplementary zone board	The main board does not recognise the setting matched with the zones	Check the system configuration parameter values (P60 and P61).
Boiler shut-down, picture flashes: 	Pressure transducer fault	Faulty transducer	Replace it
		Disconnected transducer	Connect it
Boiler shut-down, picture flashes: 	Communication failure with the interface board	Disconnected communication cable RS485	Check connections
		Interface board or mother board fault	Replace faulty board
Boiler shut-down, picture flashes: 	Safety circuit hardware fault (<i>fan relay</i>)		Replace main board
Boiler shut-down, picture flashes: 	Safety circuit hardware fault (<i>fan relay</i>)		Replace main board
Boiler shut-down, picture flashes: 	Safety circuit hardware fault (<i>gas valve relay</i>)		Replace main board

Boiler shut-down, picture flashes: 	Boiler combustion chamber recognition failure <i>(to reset the boiler, the power supply must be cut)</i>	Combustion air intake is insufficient or flue gas vent is difficult	Check air intake/flue gas vent ducts: clean or replace as necessary.
		Flue gas pressure switch is faulty	Check flue gas pressure switch: replace it if faulty
		Silicone pipe of flue gas pressure switch clogged or not connected	Connect or clean pipe as necessary
		Fan is faulty	Replace it
La caldera está bloqueada, destella la imagen: 	Incompatibility between boiler board and interface board	Boiler board and interface board don't belong to the same type: atmospheric / condensing	Check boiler board and interface board type
Boiler shut-down, picture flashes: 	Gas valve modulation coil fault	Connection of electronic board to the gas valve modulation coil non correct or missing	Check electrical connections
		Gas valve modulation coil is faulty	Replace the gas valve
Boiler shut-down, picture flashes: 	Max. number of reset attempts from interface reached <i>(to reset the boiler, the power supply must be cut)</i>	Presence of one error that can not be reset	Work directly on the boiler
Boiler shut-down, picture flashes: 	Max. number of reset attempts from remote control reached <i>(to reset the boiler, the power supply must be cut)</i>	Presence of one error that can not be reset	Work directly on the boiler

IF NONE OF THESE HYPOTHESES IS VALID, FAILURE IS ORIGINATED BY MAIN ELECTRONIC BOARD. YOU CAN JUST CHECK CONNECTIONS OR CHANGE THE BOARD.

WARNING

The touch screen interface performs a keyboard self-calibration each time the boiler is connected to the power supply line. Keyboard sensitivity depends on the pressure detected upon power supply

After completing the maintenance operations, it is recommended to **power off and on again while the casing is closed**, to avoid any key operation failure.



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