



DOMINA PLUS F 24-30 E
FERELLA EXTRA F 24-30 MEL



- **Wall-Mounting Gas Boiler with antifreeze for tap water**
- **Airtight Chamber, for Hot Water and Heating**



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TECHNICAL MANUAL

EDITION
09-2002



**DOMINA PLUS F 24 - 30 E
FERELLA EXTRA F 24 - 30 MEL**

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1. TECHNICAL CHARACTERISTICS AND DATA

1.1 Introduction

Our unit is a high-efficiency heat generator for heating and hot water production running on natural or liquefied petroleum gas (configurable at the time of installation) and regulated by an advanced microprocessor control system.

The boiler shell consists of a copper laminar exchanger whose particular shape guarantees high exchange efficiency under all operating conditions and an open-flue burner equipped with electronic ignition and ionization flame control.

The boiler is totally sealed off from the installation room: the air needed for combustion is drawn from outside and the flue gases are expelled by a fan. The boiler outfit moreover includes a variable speed circulator, expansion tank, flow meter, safety valve, filler cock, air pressure switch, water pressure switch, temperature sensors, safety thermostat and an antifreeze thermostat with the relevant heating elements.

Thanks to the microprocessor control and adjustment system with advanced self-diagnosis, unit operation is for the most part automatic. The power for heating is automatically governed by the control system according to the indoor and outdoor characteristics (with an optional outdoor sensor installed), the characteristics of the building and of its location. The power for hot water is automatically and continually governed to ensure a fast delivery and comfort under all operating conditions.

The display continuously provides information on the unit's operating status and it is easily possible to obtain additional information on the sensor temperatures, set-points, etc. or configure them. Any operating trouble associated with the boiler or system is immediately signalled by the display and, if possible, corrected automatically.

General Warnings



- Installation and maintenance must be carried out by professionally qualified personnel, according to current regulations and the manufacturer's instructions.
- Incorrect installation or poor maintenance can cause damage or physical injury. The manufacturer declines any responsibility for damage caused by errors in installation and use or by failure to follow the manufacturer's instructions given in the instructions manual.
- Before carrying out any cleaning or maintenance operation, disconnect the unit from the electrical power supply using the switch and/or the special cut-off devices.

Certification



The CE marking demonstrates that Ferrol gas units conform to the requirements contained in the applicable European directives.

In particular, this unit complies with the following EU directives:

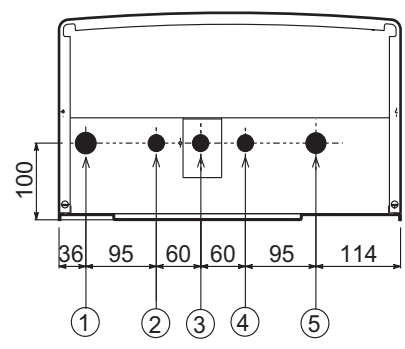
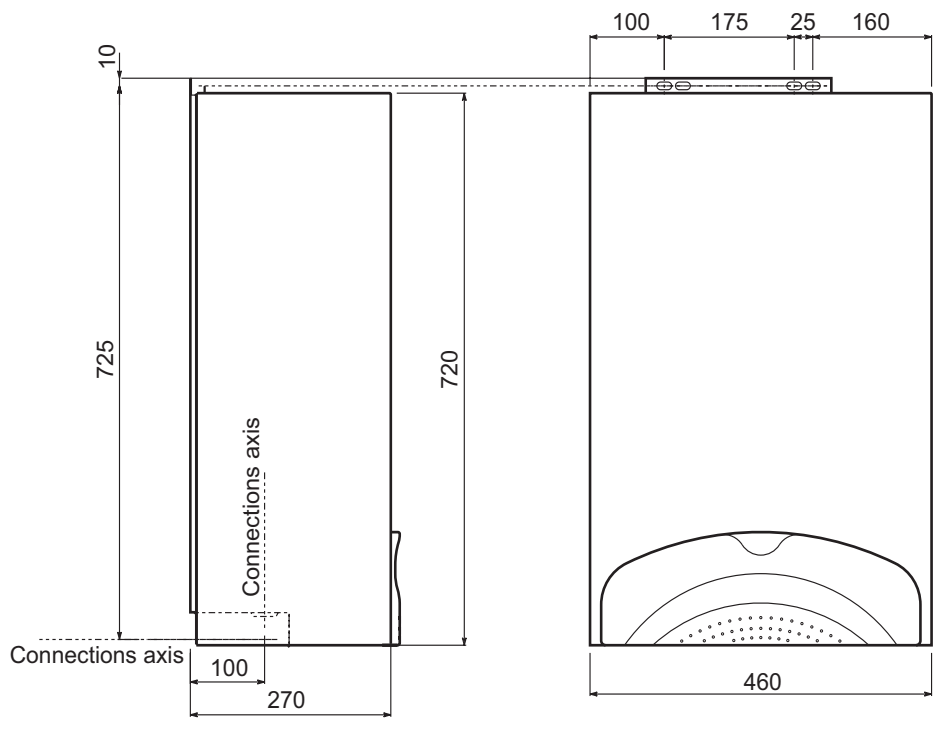
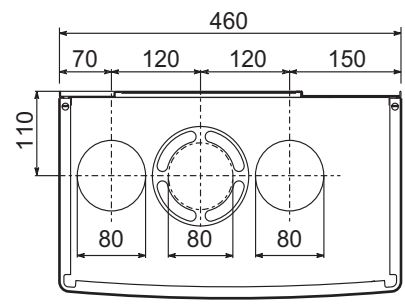
- Gas Appliance Directive 90/396 assimilated with Italian Presidential Decree DPR 15.11.96 no. 661
- Efficiency Directive 92/42 assimilated with Italian Presidential Decree DPR 15.11.96 no. 660
- Low Voltage Directive 73/23 (amended by 93/68)
- Electromagnetic Compatibility Directive 89/336 (amended by 93/68) assimilated with Italian Presidential Decree DPR 15.11.96 no. 615



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1.2 Dimensions and connections
Domina Plus F 24 E version

Top view



- Key**
- 1 System delivery
 - 2 Tap water outlet
 - 3 Gas inlet
 - 4 Tap water inlet
 - 5 System return

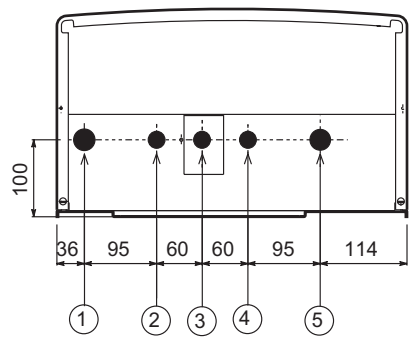
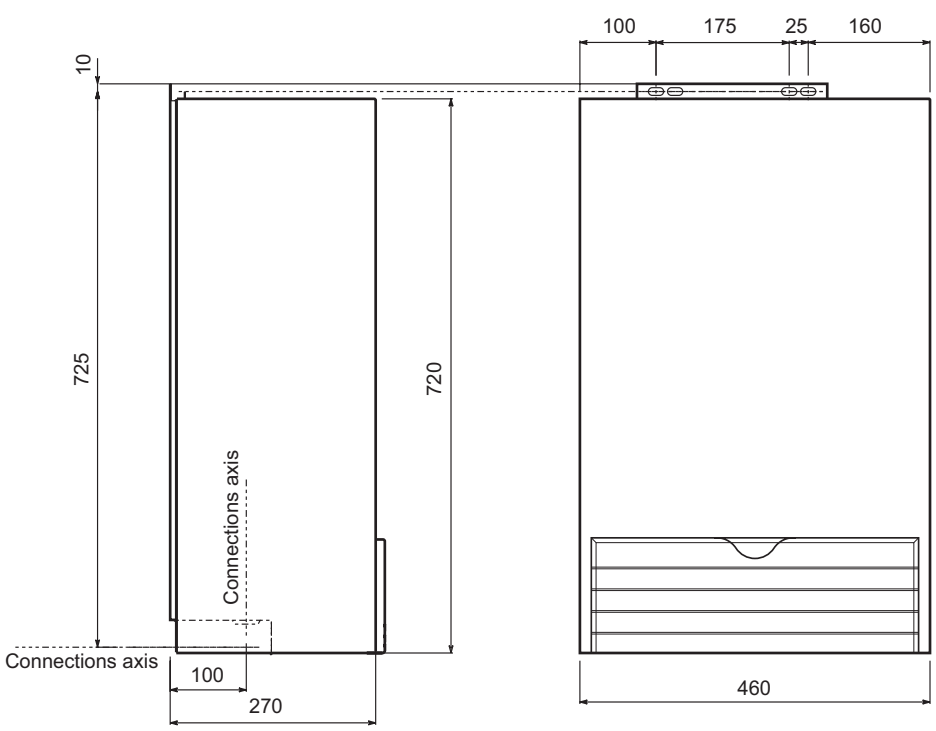
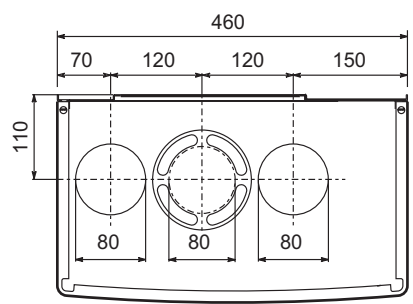
Bottom view

**DOMINA PLUS F 24 - 30 E
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Ferella Extra F 24 MEL version

Top view



- Key**
- 1 System delivery**
 - 2 Tap water outlet**
 - 3 Gas inlet**
 - 4 Tap water inlet**
 - 5 System return**

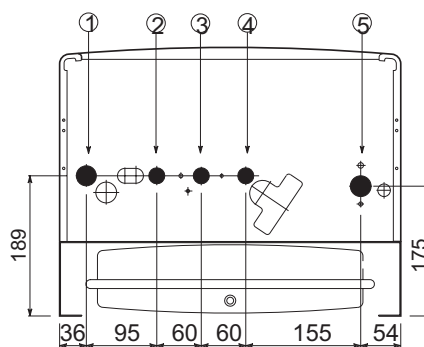
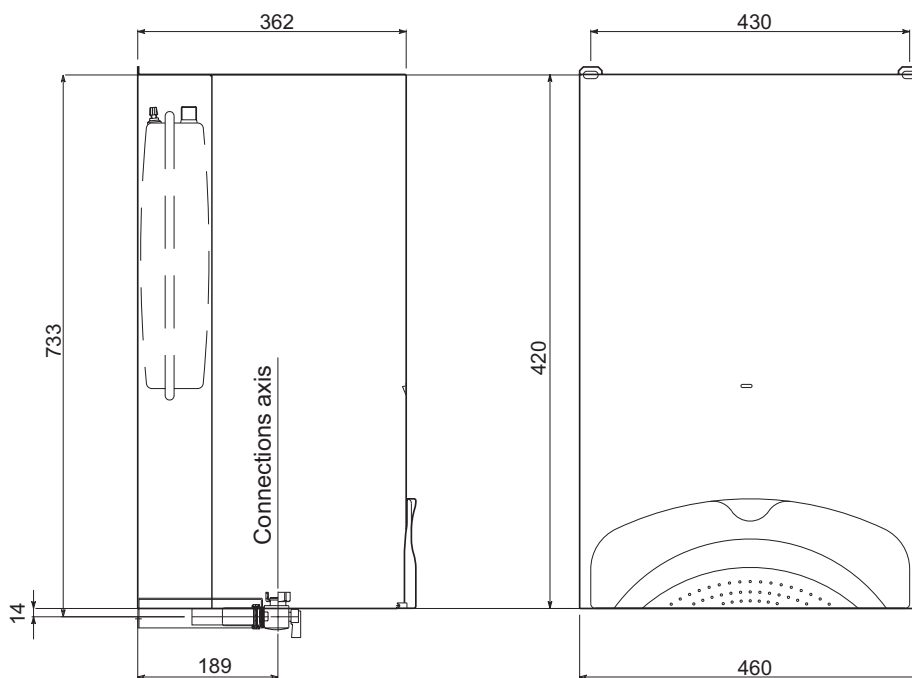
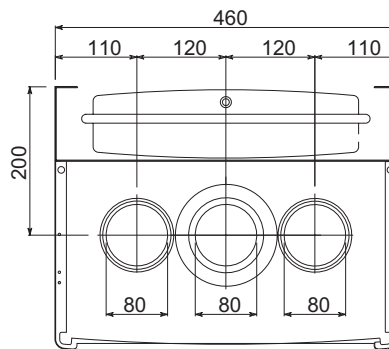
Bottom view



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Domina Plus F 30 E version

Top view



Key

- 1 System delivery**
- 2 Tapwater outlet**
- 3 Gas inlet**
- 4 Tapwater inlet**
- 5 System return**

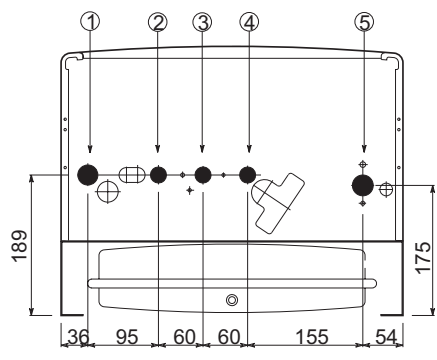
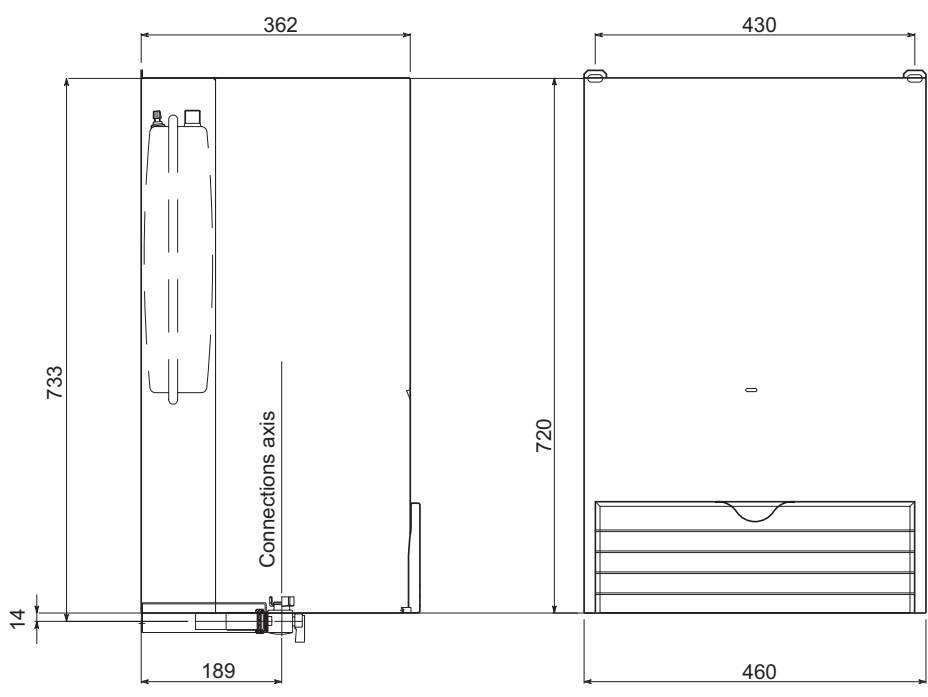
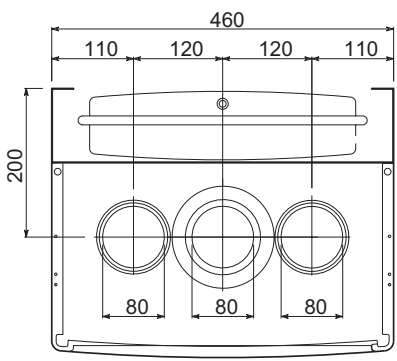
Bottom view

**DOMINA PLUS F 24 - 30 E
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Ferella Extra F 30 MEL version

Top view



- Key**
- 1 System delivery**
 - 2 Tap water outlet**
 - 3 Gas inlet**
 - 4 Tap water inlet**
 - 5 System return**

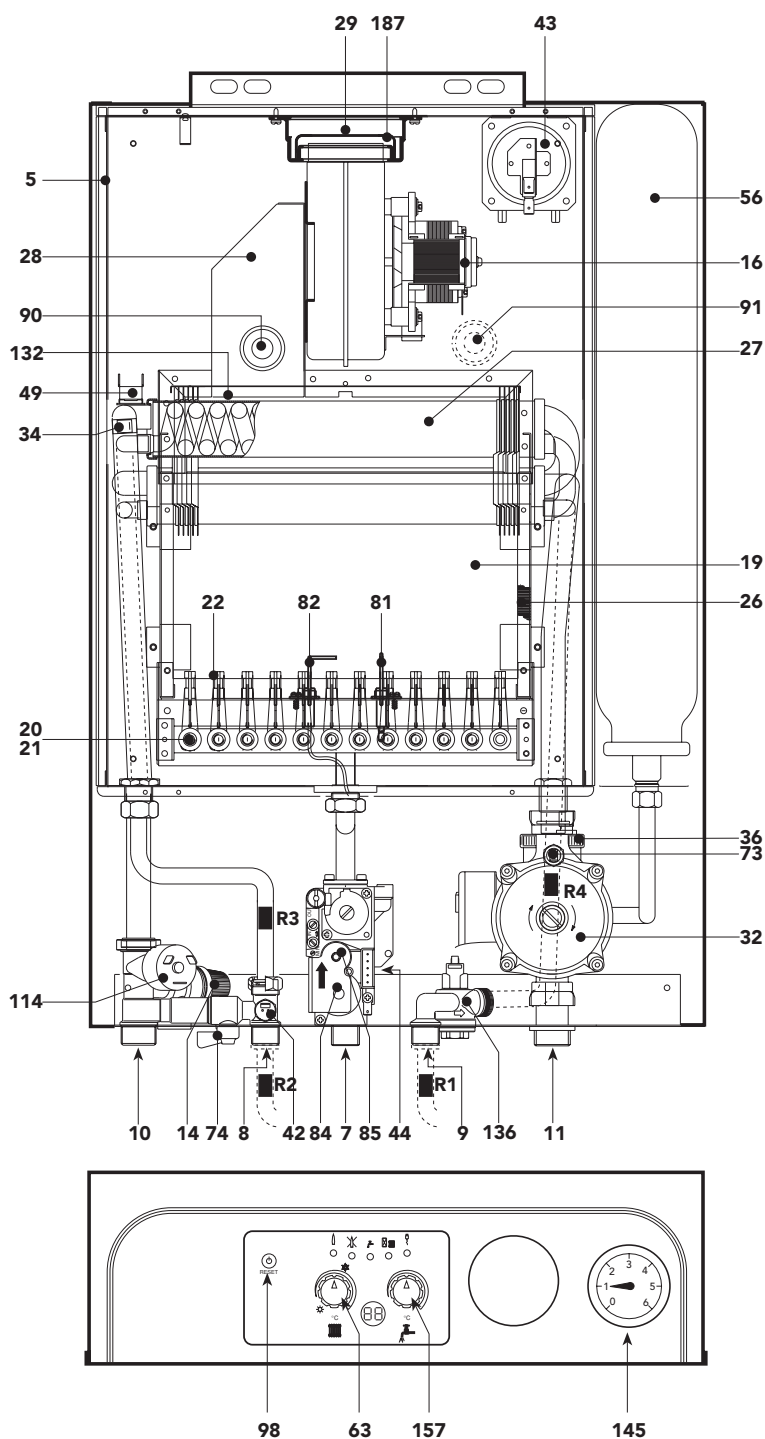
Bottom view



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1.3 General view and main components

F 24 E/MEL version



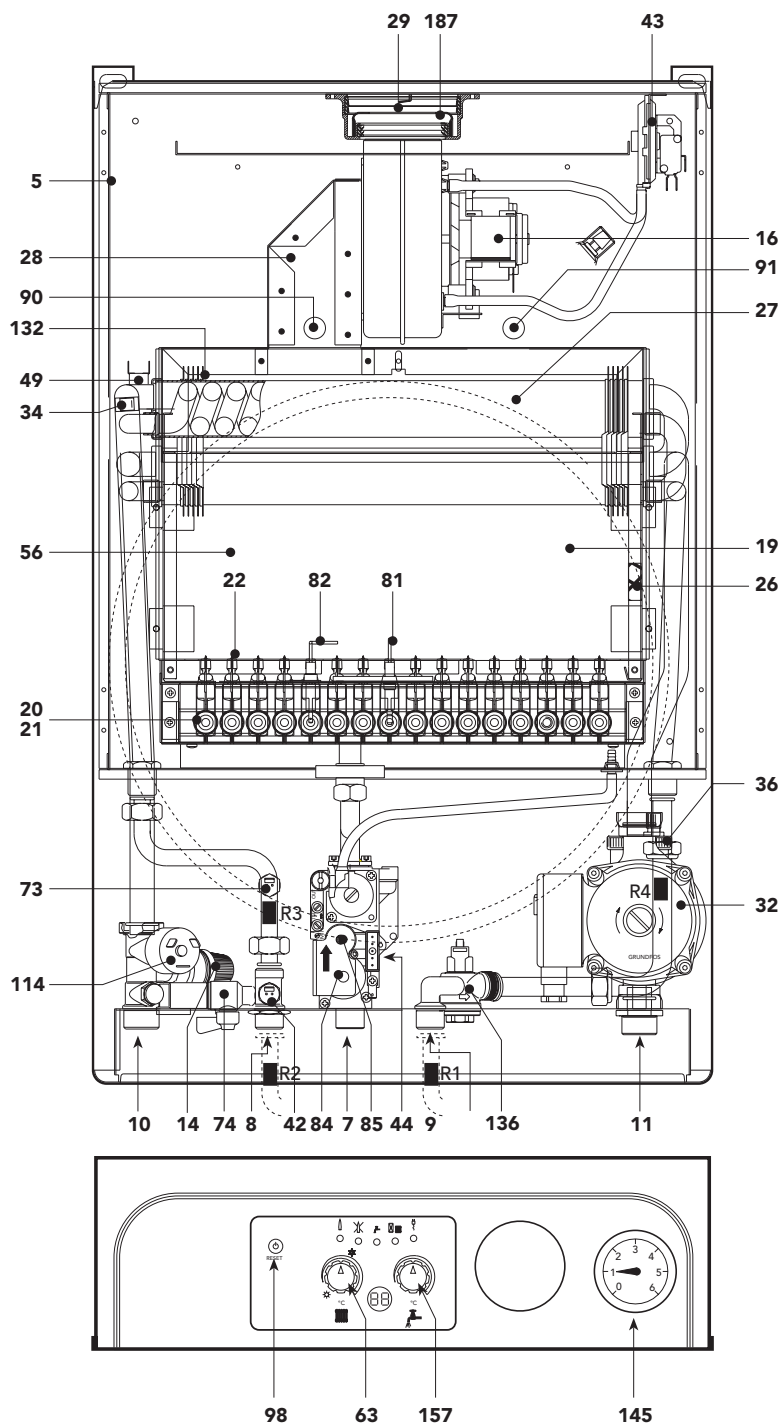
Key

- 5 Airtight chamber
- 7 Gas inlet
- 8 Tap water outlet
- 9 Tap water inlet
- 10 System delivery
- 11 System return
- 14 Safety valve
- 16 Fan
- 19 Combustion chamber
- 20 Burner assembly
- 21 Main nozzle
- 22 Burner
- 26 Combustion chamber insulation
- 27 Copper exchanger for heating and tap water
- 28 Fume manifold
- 29 Fume outlet manifold
- 32 Heating circulator
- 34 Heating temp. sensor
- 36 Automatic air vent
- 42 Tap water temperature sensor
- 43 Air pressure switch
- 44 Gas valve
- 49 Safety thermostat
- 56 Expansion tank
- 63 Heating temperature setting
- 73 Antifreeze thermostat
- 74 System filler cock
- 81 Ignition electrode
- 82 Detection electrode
- 84 1st gas valve operator
- 85 2nd gas valve operator
- 90 Fume detection point
- 91 Air detection point
- 98 Off-On-Reset switch
- 114 Water pressure switch
- 132 Fume deflector
- 136 Flow meter
- 145 Water gauge
- 157 Tap water temperature setting
- 187 Fume diaphragm
- R1-R2-R3-R4 Antifreeze heating elements

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F 30 E/MEL version



Key

- 5 Airtight chamber
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1.4 Technical data table

DOMINA PLUS - FERELLA EXTRA		24kW		30kW	
Powers		Pmax	Pmin	Pmax	Pmin
Heating Power (Net Heat Value - Hi)	kW	25.8	11.5	33.1	14.5
	kcal/h	22,200	9,900	28,500	12,500
Useful Heating Power 80°C - 60°C	kW	23.8	9.7	30.0	12.7
	kcal/h	20,400	8,300	25,800	10,900
Tap Water Heating Power	kW	23.8	9.7	30.0	12.7
	kcal/h	20,400	8,300	25,800	10,900
Gas supply		Pmax	Pmin	Pmax	Pmin
Natural Gas main nozzles (G20)	mm	12 x 1.30		16 x 1.25	
Natural Gas supply pressure (G20)	mbar	20.0		20.0	
Pressure at Natural Gas burner (G20)	mbar	11.8	2.5	13.0	2.5
Natural Gas delivery (G20)	nm ³ /h	2.73	1.22	3.50	1.53
LPG main nozzles (G31)	mm	12 x 0.77		16 x 0.75	
LPG supply pressure (G31)	mbar	37.0		37.0	
Pressure at LPG burner (G31)	mbar	36.0	7.8	35.5	7.0
LPG delivery (G31)	kg/h	2.00	0.89	2.60	1.14
Heating					
Maximum working temperature in heating	°C	90		90	
Maximum working pressure in heating	bar	3		3	
Safety valve	bar	3		3	
Minimum working pressure in heating	bar	0.8		0.8	
Expansion tank capacity	litres	7		10	
Expansion tank pre-filling pressure	bar	1		1	
Boiler water content	litres	0.8		1.5	
Tap water					
Maximum hot water production Δt 25°C	l/min	13.6		17.2	
Maximum hot water production Δt 30°C	l/min	11.3		14.3	
Maximum working pressure in hot water production	bar	9		9	
Minimum working pressure in hot water production	bar	0.25		0.25	
Hot water content	litres	0.8		0.8	
Dimensions, weights connections					
Height	mm	760		760	
Width	mm	460		460	
Depth	mm	272		363	
Weight	kg	38		48	
Gas system connection	inches	1/2"		1/2"	
Heating system connections	inches	3/4"		3/4"	
Hot water circuit connections	inches	1/2"		1/2"	
Electrical power supply					
Max electrical power absorbed	W	125		125	
Power voltage/frequency	V/Hz	230/50		230/50	
Electrical protection rating	IP	44		44	

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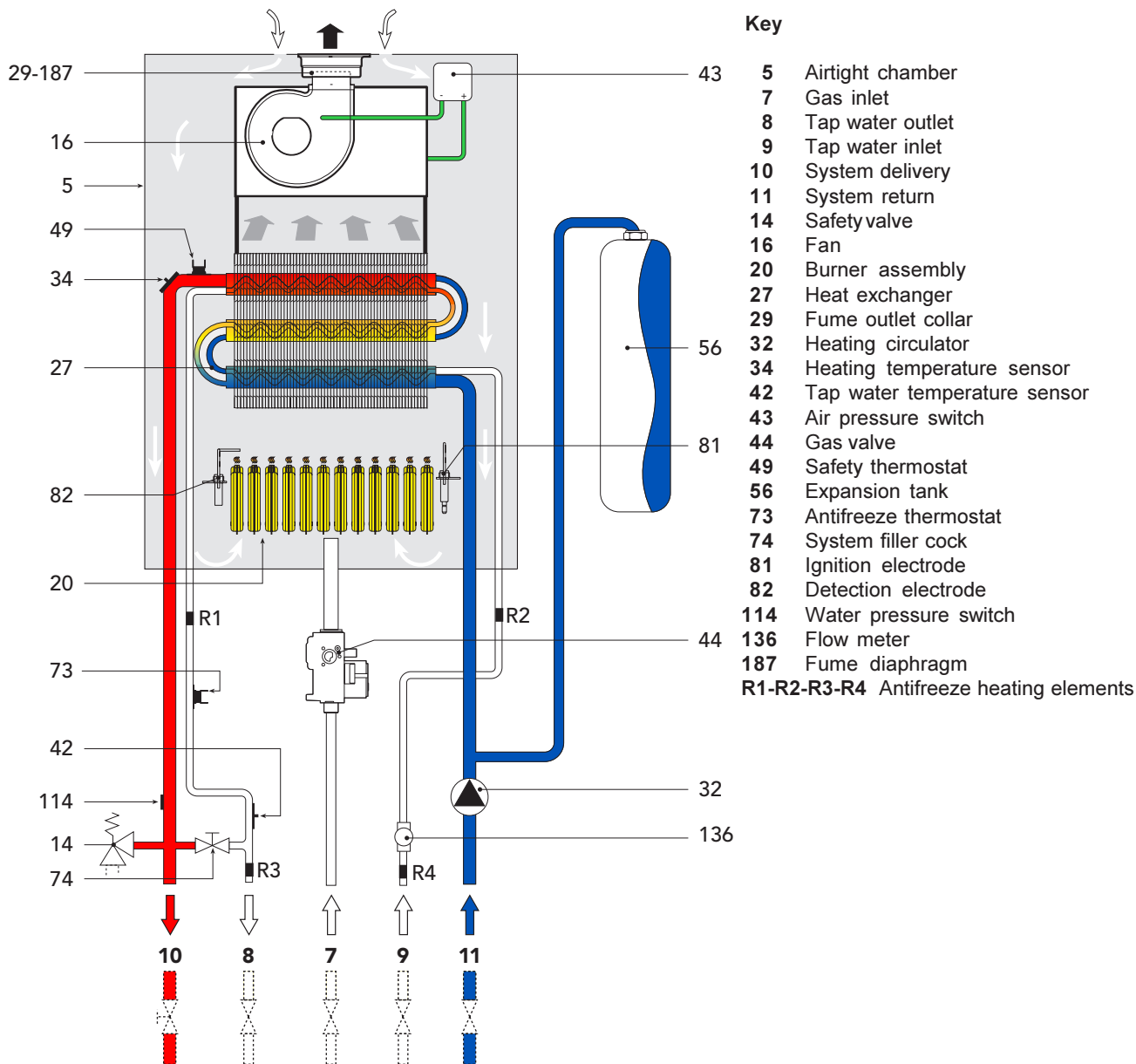


2. PRODUCT FRAMEWORK AND INTERNAL COMPONENTS

2.1 Hydraulic circuit - heating

Hydraulic diagram for heating

When there is a call for heat, the room thermostat or control system make the burners ignite and the circulation pump come into operation. The heat contained in the products of combustion is transferred to the water by the system via the exchanger. For more details on the operating logic, refer to chap.3.

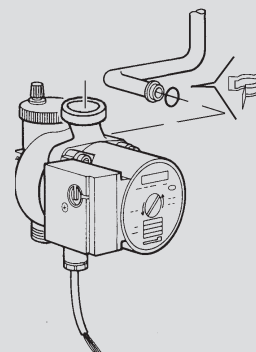




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Circulator (230v/50Hz)

Located on the heating circuit return, it is connected directly to the exchanger via special forks and connected to the system via a threaded brass section. It has three delivery/head levels (see diagram). Changing the delivery/head changes the speed of the water flowing through the boiler exchanger and as a result the temperature difference (ΔT) between heating delivery and return. Clearly, increasing the delivery of the circulator decreases ΔT and vice versa. If it is not used for a long time, the impeller might "jam" due to debris in the water. With the front screw it is possible to access the impeller, which can be freed with the aid of a screwdriver. The connection to the expansion tank and the air separator is installed on the pump casing.



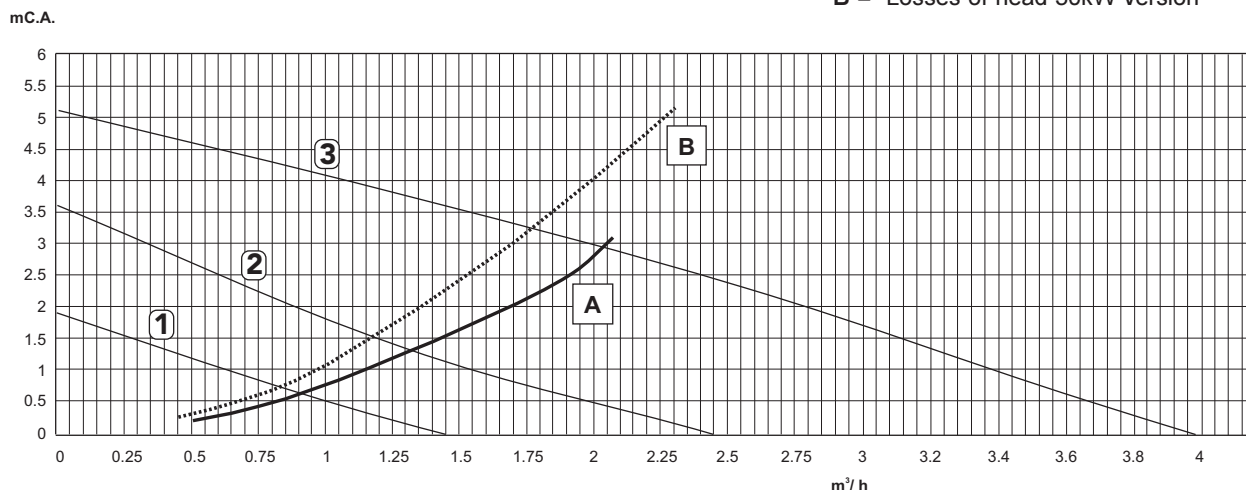
Checks

If the pump doesn't work:

- Check that the impeller is free to turn by turning the screw on the front with a screwdriver.
- Check that both the card and the pump connection are powered.
- If there is no power supply, check the card.
- If there is power, change the pump.

Key

- 1 - 2 - 3 = Pump selector position
 A = Losses of head 24kW version
 B = Losses of head 30kW version



Air separator

This is used to expel the air in the heating circuit automatically. On boilers with a twin heat exchanger, it is located on the pump casing. It is normally accessible either via the fork or by simply unscrewing it from its seat.



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Expansion tank

It is connected to the pump casing via a pipe with a fork connection. On the 24kW version, it is located above the pump, while on the 30kW version it is located behind the exchanger, inside the frame. The expansion tank contains a diaphragm in contact, on one side, with the system water and, on the other side, with the air under pressure (pre-loaded to 1 bar) inside the tank. By the expansion of the diaphragm and ensuing compression of the air, the tank compensates for the thermal expansion of the water in the heating system.

Version 24kW
7 litre

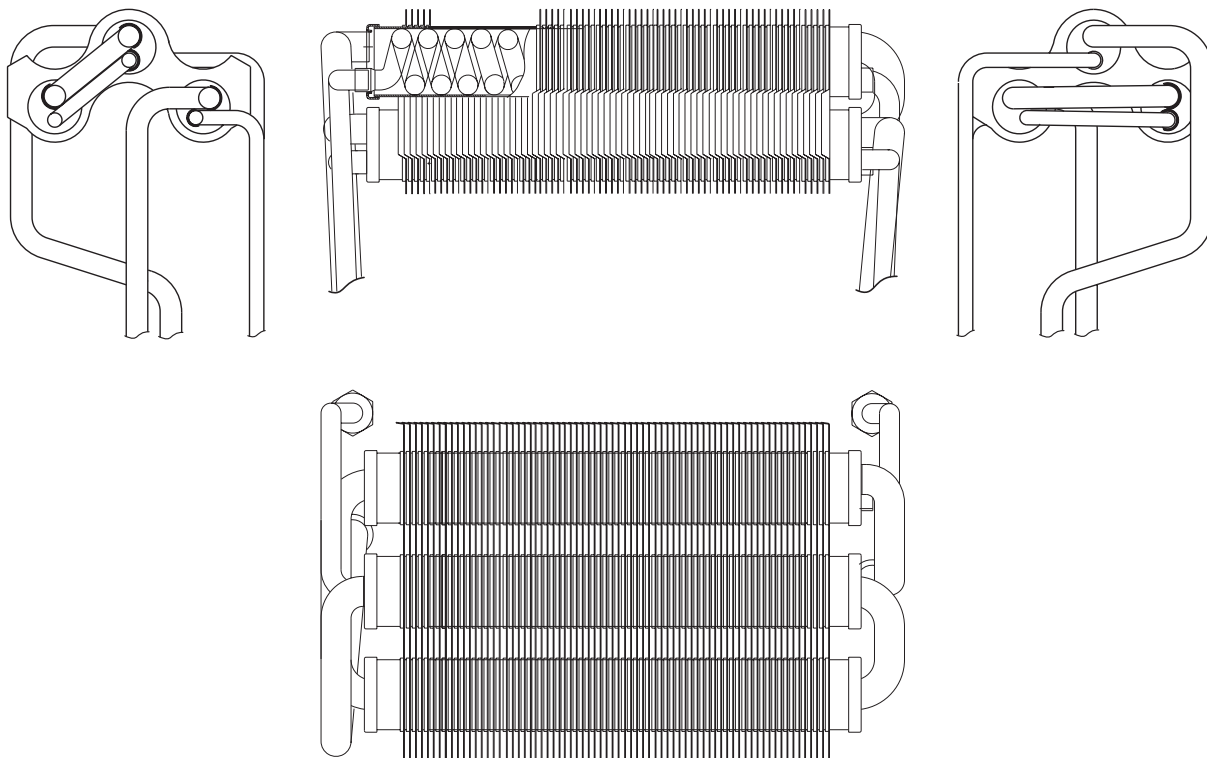


Version 30kW
10 litre



Twin Heat Exchanger

The exchanger is a copper laminar assembly. It comprises a thickly finned portion, three circular pipes containing the heating water and, inside them, another three pipes in the form of a spiral containing the tap water. The heating water exchanges directly with the burnt gases, while the tap water does not have this kind of exchange, it receives heat indirectly from the water in the three heating pipes. In this way, the surface of the coil does not reach very high temperatures so less scale gets formed. In addition, being very small, it makes the water speed very high over its entire section, making mineral deposits of any kind negligible. The typical "omega" shape of the finning ensures an even distribution of the heat over all the finning, with consequent benefits in terms of exchange efficiency and the life of the exchanger. A special surface treatment protects the exchanger against oxidation and corrosion.





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Hydraulic unit

This is a single piece of brass to which the exchanger delivery is connected for ease of access. It accommodates a number of safety and adjustment components.

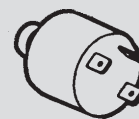
The hydraulic unit includes:

- safety valve
- water pressure switch
- heating sensor
- filler cock
- tap water sensor
- tap water check valve



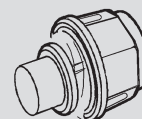
Water pressure switch

It ensures a minimum pressure for the system. It is normally open (NO) and closes the contact when the pressure exceeds 0.5 bar. It works on low voltage.



Safety valve

It opens if the pressure exceeds 3 bars, making boiler operation safer and protecting it against overpressure. You are strongly recommended not to use this valve to drain the system; once open, dirt could remain inside it, preventing it from closing completely.



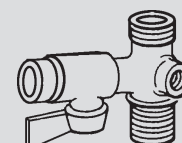
Check valve

This is necessary to ensure no water returns from the heating system to the tap water circuit.



Filler cock

This is located between the heating delivery and the tap water outlet. It is not fitted on the boiler for some markets such as the British and Belgian ones.

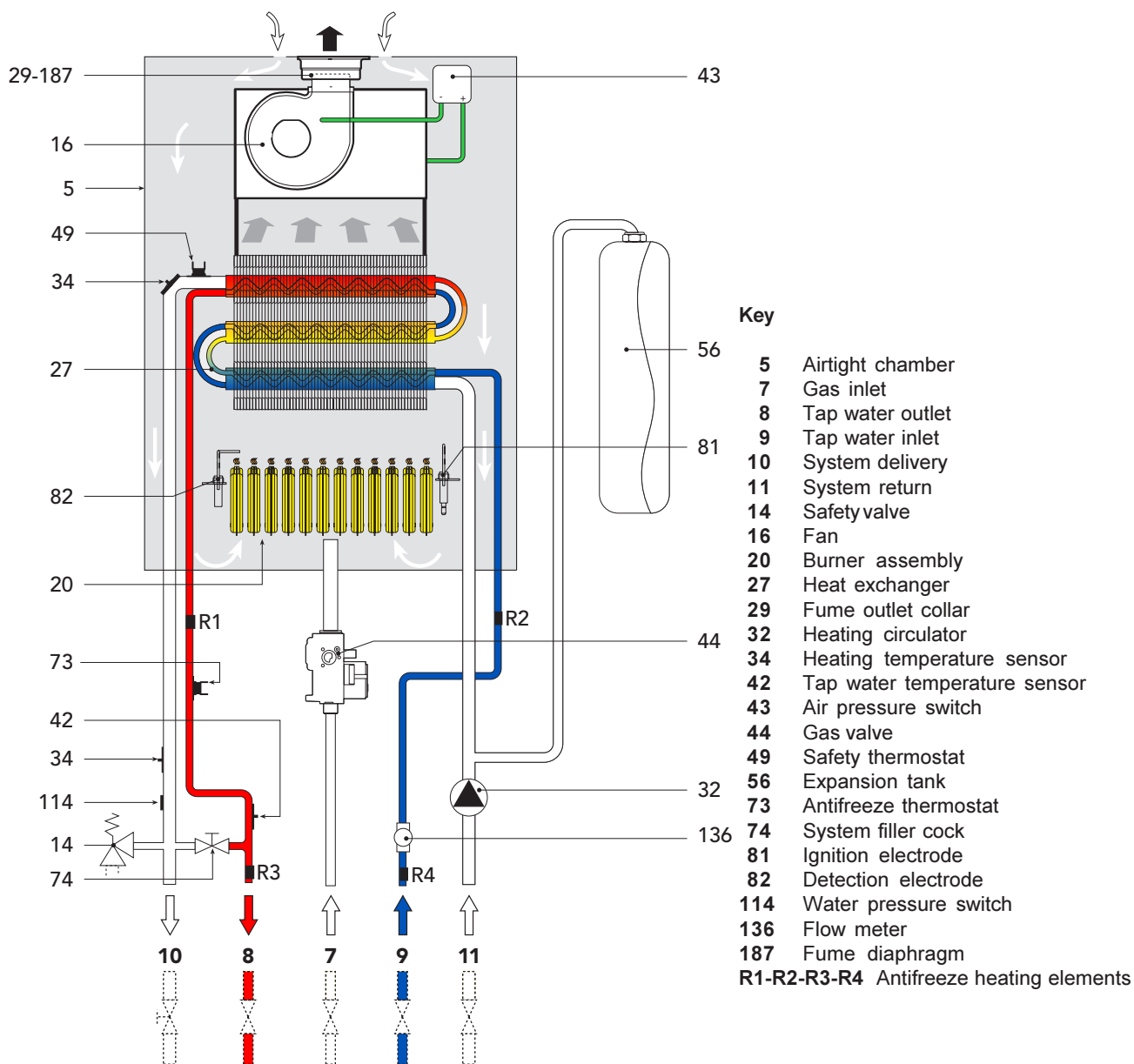


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2.2 Hydraulic circuit - tap water

Hydraulic diagram for tap water



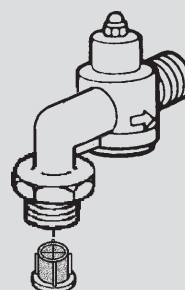
When the card receives a signal from the flow meter indicating a tap-water draw of over 2.5 l/min, the boiler starts working normally for tap water. If heating was in operation, or the pump was anyhow working, the boiler will in any case give priority to the tap water, stopping the pump. The tap water does not exchange directly with the products of combustion, but via the heating water in the exchanger, avoiding sudden changes in temperature. The boiler is equipped with 4 heating elements and an antifreeze thermostat in order to protect the tap water pipes if the temperature drops under 6°C. The heating elements heat the pipes up to a temperature of 15°C measured by the thermostat.



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Flow meter

Located at the cold water inlet, its task is to provide the card with a signal at a frequency (7 Hz per litre) in direct proportion to the tap-water flow rate. It is composed of a body (stator) and a rotor inside it. There is a filter on its inlet to prevent foreign bodies damaging it. It should be remembered that to turn on the boiler for tap-water operation, the tap-water pressure must be at least 0.25 bars and the draw flow rate must be greater than 2.5 l/min.

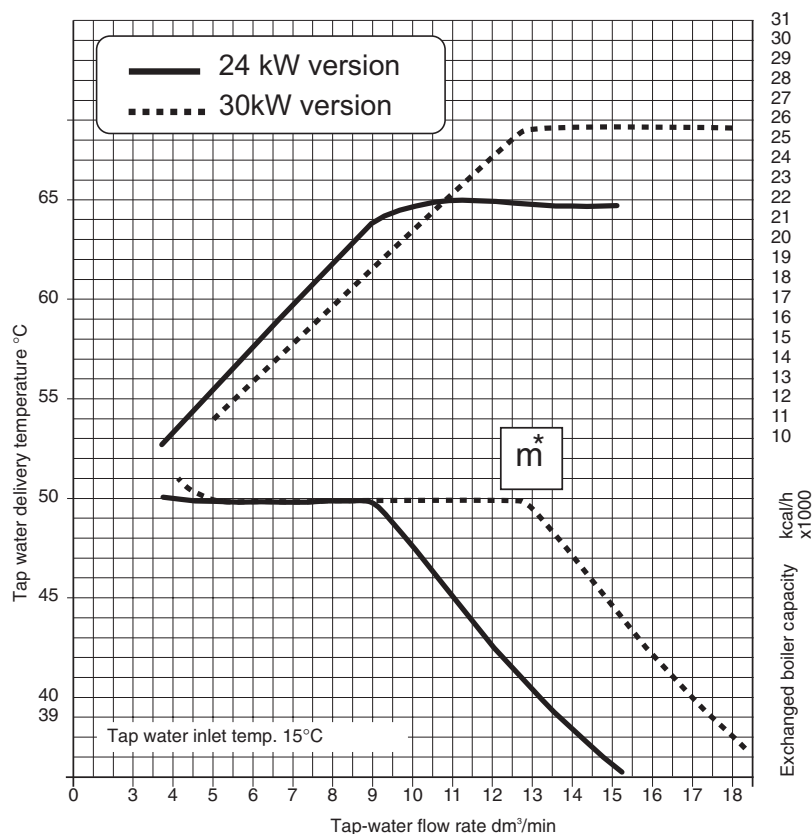


Check

To check it works properly, you need to make sure the flow rate is at least 2.5 l/min and then test the signal to the electric card with a frequency meter. This makes it possible to understand whether the problem lies with the flow meter, incorrect contacts, or the card.

Flow-rate restrictor

This is a diaphragm downstream from the flow meter. Its task is to limit the tap-water flow rate; the boiler modulates its capacity to keep the tap-water temperature set by the user, but since the boiler capacity is limited to its rated capacity, it is necessary to limit the tap-water flow rate to obtain high ΔT .



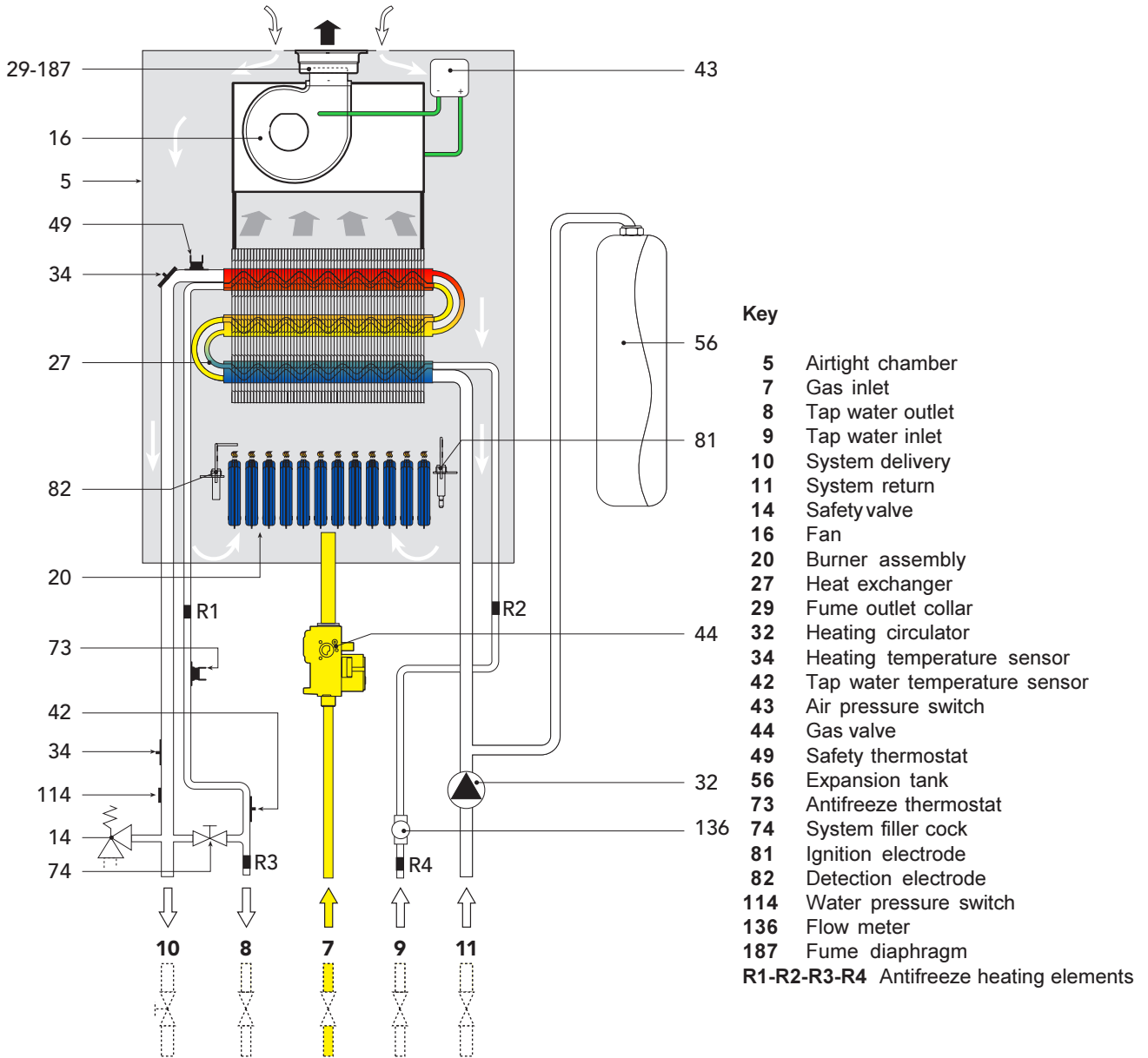
In this case, above the flow-rate limit m^* , even though the boiler is working at its rated capacity, it is not able to maintain the set temperature of 50°C

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2.3 Gas circuit

Gas circuit diagram





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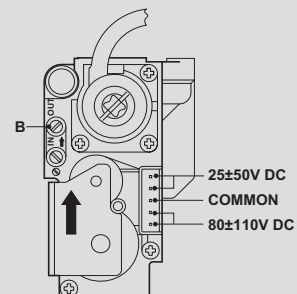
Gas valve

It supplies gas to the nozzles between a minimum and maximum pressure. For the valve to work correctly, it is necessary for the pressure upstream from it to be stable and suited to the type of gas being used, while the valve will supply a regular pressure to the nozzles. The gas valve contains two operators. The function of the first one is to open or close, while the task of the second one is to modulate the capacity according to the system's requirements. The signal comes from the card and is in the form of continuous voltage. The first operator receives fixed voltage that may be between 80 and 110V DC, for the second operator the voltage will vary between 25 and 54V DC according to the need of the main card.

Checks

If the valve doesn't work:

- The only possible check is to see whether gas comes out of the screw "B" at the rated pressure when setting the boiler on "test" with the boiler at full power (see "Test Functions" chap. 3.1).



Modulation

The control system governs its boiler capacity so as to keep the delivery temperature constant in accordance with the settings on the control panel. The nozzle gas pressure is modulated by the valve and specifically via the 2nd operator. The card provides a change in continuous voltage (between 25 and 54 V DC) according to the difference between the delivery temperature and the set point.

Checks

Modulation can be checked in three ways:

- Visually, by checking the flame.
- Using a pressure gauge to check the gas pressure downstream from the valve.
- Checking the voltage on the card (X6, 3/4) that should vary between 25 and 55V DC.



Note that with very low pressure upstream from the valve, opening the valve may be slow and the boiler could shut down due to failed ignition.

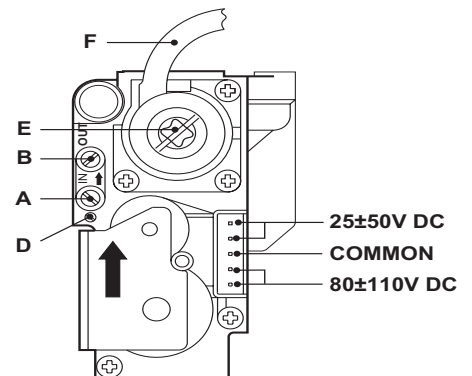
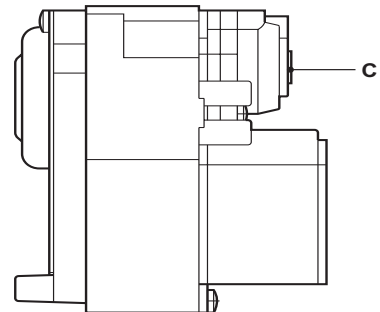
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Adjusting burner pressure

Since this unit has flame modulation, there are two fixed pressure settings: the minimum and maximum, which must be as stated in the technical data chart according to the type of gas.

- Connect a suitable pressure gauge to pressure point "B" downstream from the gas valve.
- Disconnect the pressure compensation tube "F".
- Take off the protective cap "C".
- Run the boiler in **TEST** mode (pressing RESET 3 times consecutively within 5 sec.).
- Set knob **2** on minimum.
- Adjust the minimum pressure with the screw "D", clockwise to decrease it and anticlockwise to increase it.
- Set knob **2** on maximum (clockwise).
- Adjust the maximum pressure with the screw "E", clockwise to increase it and anticlockwise to decrease it.
- Reconnect the pressure compensation tube "F".
- Put the protection screw "C" back in.

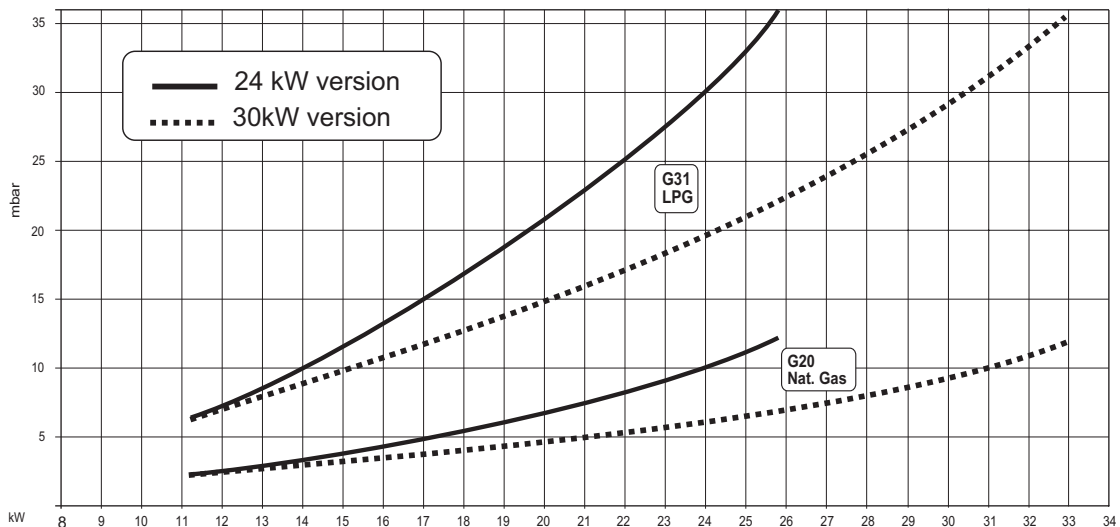


N.B. The test lasts 5 minutes. It is advisable to open 1 or 2 taps to get rid of the excess capacity.

After checking or adjusting the pressure, it is mandatory to seal the adjustment screw with paint or a specific seal.

Key

- A** Pressure point upstream
- B** Pressure point downstream
- C** Protection screw
- D** Minimum pressure adjustment screw
- E** Maximum pressure adjustment screw
- F** Pressure compensation tube



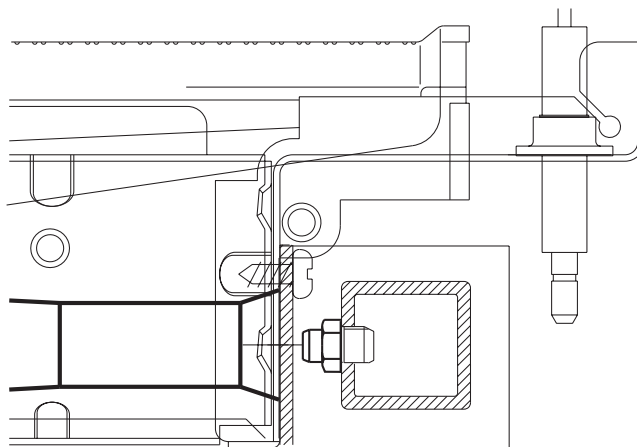


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Gas supply conversion

The unit can function with either Natural Gas or LPG and is factory-set for use with one of the two gases, as clearly shown on the packing and on the unit's dataplate. Whenever a different gas to that for which the unit is preset has to be used, a conversion kit will be required, proceeding as follows:

- 1 Replace the nozzles at the main burner, inserting the nozzles specified in the technical data table, according to the type of gas used.
- 2 Using the remote control, edit parameter 3 of the boiler parameter menu.
- 3 Adjust the burner minimum and maximum pressures, setting the values given in the technical data chart for the type of gas used.
- 4 Apply the sticker, contained in the conversion kit, near the dataplate as proof of the conversion.



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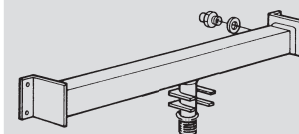
2.4 Burner unit

Operation

The burner unit comprises a manifold and 12/16 nozzles (depending on the capacity), the burner mount, electrodes and the burner assembly.

Manifold - nozzles

The valve sends gas at a suitable pressure to the manifold, which homogeneously distributes the gas to the single burner stages at the nozzles. It is secured directly to the burner mount. Its positioning must be exact since it affects the air/gas mixture. In addition, the threaded holes forming the seat of the nozzles must be aligned with the respective Venturi tube of the burner. If it were not so, the air/gas mixture would be wrong and there would be poor combustion with an unstable flame. The nozzles are made of brass and machined extremely precisely for their dimensions. There is a seal between the nozzles and the manifold.



Ignition electrode

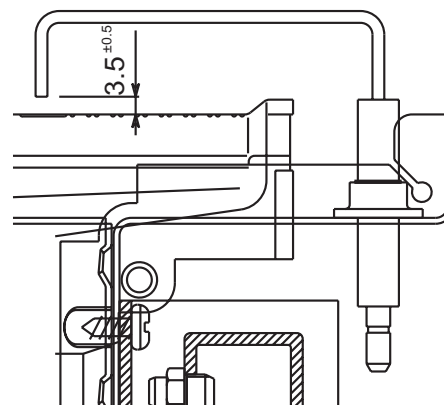
The ignition electrode is made of a metal alloy (Kanthal) that withstands high temperatures and oxidation. Its base is composed of a ceramic composite of glazed alumina whose purpose is to protect and electrically insulate it. Once the ignition procedure begins, the card powers the electrode with a pulsating voltage of a few kV, a series of electrical discharges is set off between the electrode and the head of the burner (set at a distance of 3.5 mm). Clearly, these sparks are the trigger for the air-gas mixture. It is important for the distance between the electrode and the burner head to be 3÷ 4 mm and the discharge to be made at the centre.



Checks

If there is no discharge:

- Check whether the boiler shuts down, in which case check the connection of the electrode to the card or whether it discharges at other points; if necessary, check the safety thermostat and the card.
- If the boiler does not shut down and the fan keeps on working, check the air pressure switch.
- If there is a discharge, but no ignition and after 10 seconds the boiler shuts down, check the gas valve and, if necessary, the card.
- If there is a discharge and then a flame, but the boiler still shuts down after 10 seconds, check the detection electrode and its connection.





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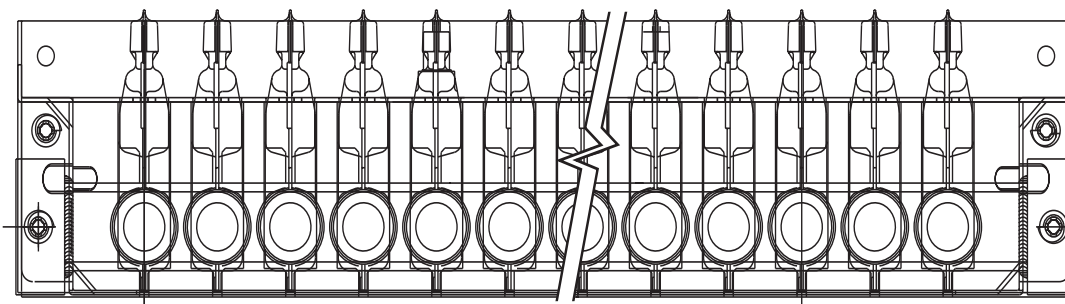
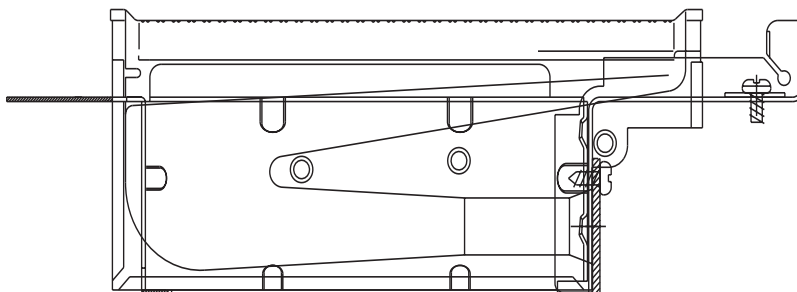
Detection electrode

Made of the same material as the ignition electrode, it is set 11 mm from the burner head. Combustion causes the flame atmosphere to ionize, making it conductive. Thanks to the mass of the burner, making a suitable potential with the electrode produces a flow of direct current on it. For our cards, it is necessary to have an ionizing current of at least $5 \mu\text{A}$ to detect a flame. A signal is normally obtained ranging from 10 to $40 \mu\text{A}$ (see chap. 3.1).



Burner assembly

The burner assembly is composed of 12 or 16 burner stages. Each stage is composed of two pressed steel half bearings, with a suitably cut stainless steel head. Gas enters at the bottom of the stage. Thanks to the special Venturi-tube shape of the bottom portion of the stage, the gas "injected" by the nozzle carries with it the primary air needed for combustion. The air-gas mixture thus formed inside the stage is evenly distributed on the burner head. Combustion takes place homogeneously over the entire length of the single stages, with the contribution of the secondary air from the bottom of the burner mount and from the combustion chamber itself. The set of stages in operation forms a single belt of flame, light blue in colour, whose size varies according to the nozzle gas pressure, that is the boiler capacity modulation.



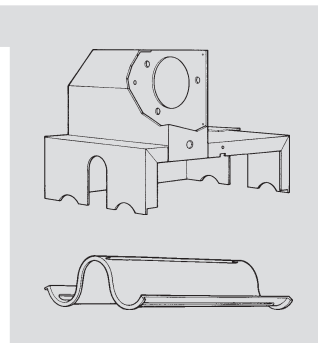
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2.5 Fume circuit

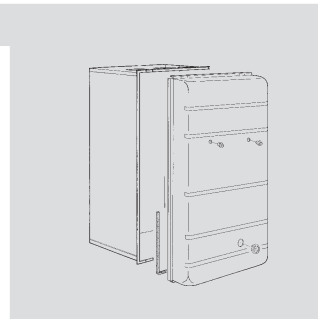
Fume deflector and manifold

All forced-flow boilers have a fume deflector above the exchanger whose main task is to make the secondary air crossing the burners uniform, making the flame homogeneous and stable. The fumes then reach a fume manifold whose job is to make them move on to the fan.



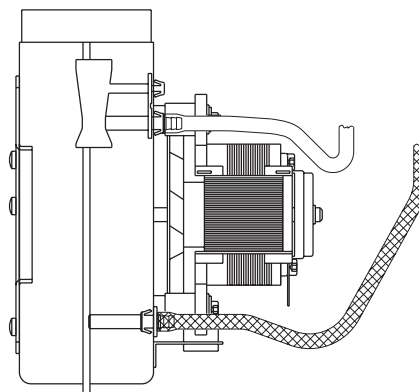
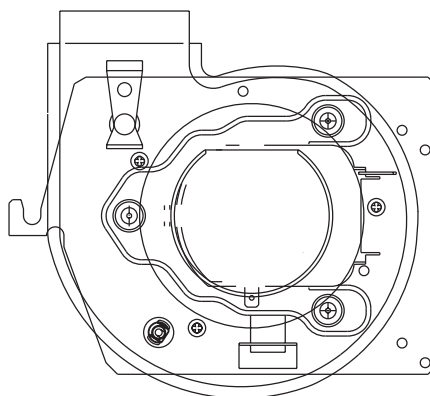
Airtight chamber

Its task is to isolate the products of combustion from the area surrounding the boiler. The airtight chamber contains all the components involved in the fume routing. The wires and pipes coming out of its lower portion are insulated with silicone seals, while its upper portion is fitted for hooking up with the flues. The cover is sealed off with a porous plate and is fitted with two plugs for using a probe to analyse the fumes and combustion air.



Fan and pressure switch points

Powered at 230V/50Hz by the card (X11 - 1/2), the fan has the job of expelling the products of combustion from the fume chamber. A plate is normally placed above the exchanger to act as a deflector, make the incoming air from the bottom of the burner uniform, make the flame stable and obtain the required air/gas ratio. In order to make sure the fan works properly, there are two pressure points inside it. The first one detects a "static" pressure signal that is positive, the second one detects a "dynamic" pressure signal via an appropriate "Venturi tube", which is negative. With the difference in pressure detected by the two test points it is possible to check whether the fumes are adequately evacuated.





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Air pressure switch

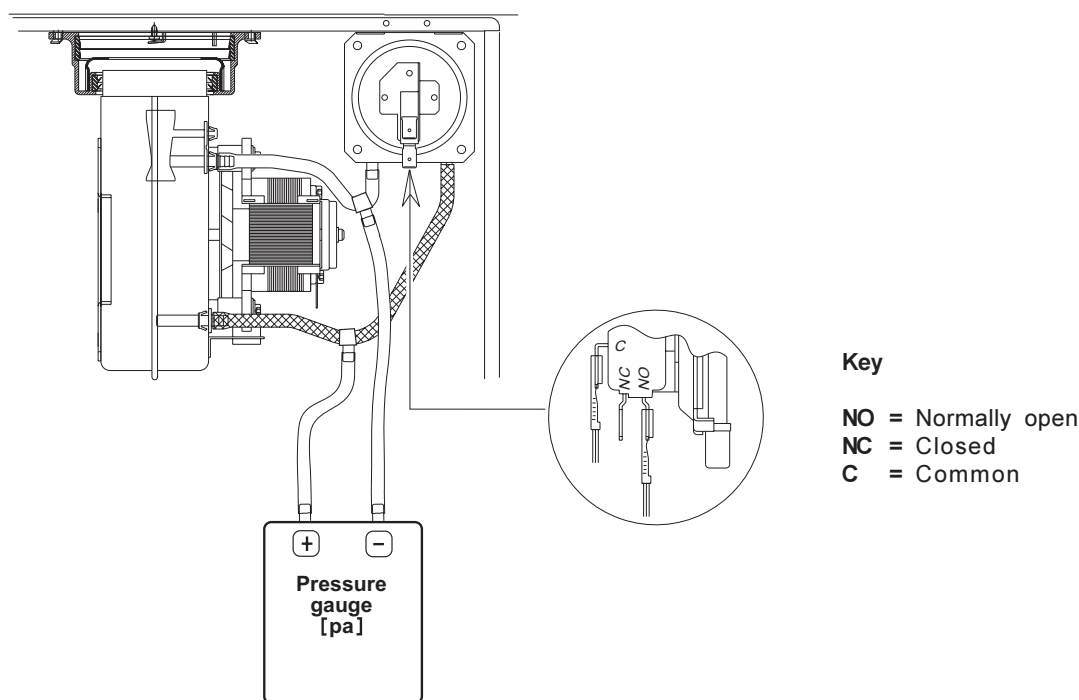
This is used to check whether the fumes are adequately evacuated. The pressure switch compares the static and dynamic signals coming from the pressure test points on the fan according to the figure. The pressure switch is connected to the card and is normally open (see diagram). Before the card initiates the ignition procedure (opening the valve, etc.), you must make sure that the fan works properly and that the air pressure switch ensures this by closing its contacts. This happens if the difference in pressure is $165 \pm 15 \text{ Pa}$. So the signal must be at least 180 Pa . To open its contacts again, the difference in pressure must drop under $150 \pm 13 \text{ Pa}$. To perform checks on contact opening and closing, it is always recommended to check directly on the card (X5 - 3/4).

Checks

It is necessary to check:

- Whether the electrical connections are correct.
- Whether the pressure test point pipes are clean and contain no condensation water.
- That the signal is open when the fan is not working.
- That the pressure is at least 180 Pa and that above this pressure the pressure switch closes its contacts.
- If the signal is low, it is necessary to check that the fume diaphragm is correct, the fan has 230 V , the pressure test points are properly inserted and the Venturi tube has no burrs of any kind. Lastly, check that the ends of the pipes are not obstructed.

N.B. The pressure difference must be measured with the airtight chamber closed. The pressure gauge connections can come out through the hole, which is closed by a silicone plug, on the front of the cover.




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Fume ducts

The unit is "type C" with an airtight chamber and forced draught, the air inlet and fume outlet must be connected to one of the following extraction/suction systems. With the aid of the tables and methods of calculation indicated, before commencing installation, it is first necessary to check that the fume ducts do not exceed the maximum permissible lengths. The current standards and local regulations must be observed.

 This C-type unit must be installed using the fume exhaust and suction ducts supplied by FERROLI S.p.A. in accordance with UNI-CIG 7129/92. Failure to use them automatically forfeits all warranty and liability of FERROLI S.p.A.

Diaphragms

Boiler operation requires fitting the diaphragms supplied with the unit as instructed in the following tables. As the resistance of the fume ducts changes, the diaphragms make it possible to keep the combustion parameters (CO₂, etc.) within the optimum operating range. Note that with low-resistance fume ducts, a high-resistance diaphragm (small hole diameter) is used and vice versa.

Choosing the diaphragm using coaxial pipes

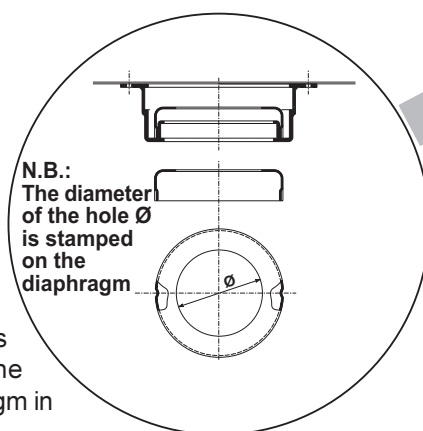
Type	Length up to:	Diaphragm to use	
		F 24	F 30
Coaxial 60/100	1 bend + 1 metre	50 mm	52 mm
	1 bend + 3 metres	No diaph.	No diaph.
Coaxial 80/125	1 bend + 3 metres	45 mm	50 mm
	1 bend + 4 metres	50 mm	No diaph.
	1 bend + 5 metres	No diaph.	No diaph.

Choosing the diaphragm using separate pipes

Pipe length calculated in linear metres		Diaphragm to use F 24	Pipe length calculated in linear metres		Diaphragm to use F 30
Min	Max		Min	Max	
0 m	13 m	45 mm	0 m	20 m	47 mm
13 m	23 m	47 mm	20 m	35 m	50 mm
23 m	38 m	50 mm	35 m	45 m	52 mm
38 m	48 m	No diaph.	45 m	50 m	No diaph.

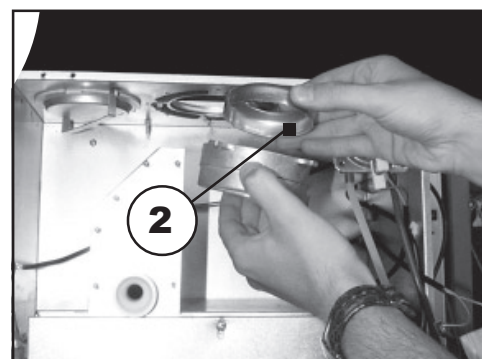
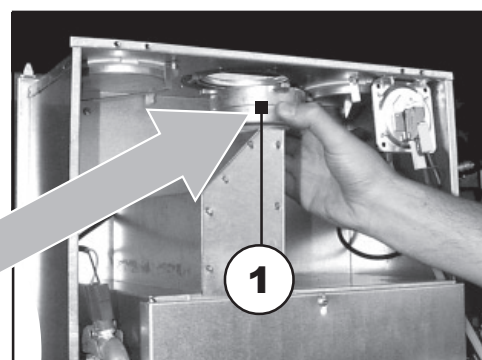
Changing the diaphragm

If inserting or changing a diaphragm, it is necessary to remove the fan assembly, take out the fume coupling 1 and insert the required diaphragm 2.



Boilers are fitted as standard with the smallest diaphragm in the series.

Before inserting the fume outlet pipe, it is therefore necessary to check there is the right diaphragm (when it is to be used) and that it is correctly positioned.

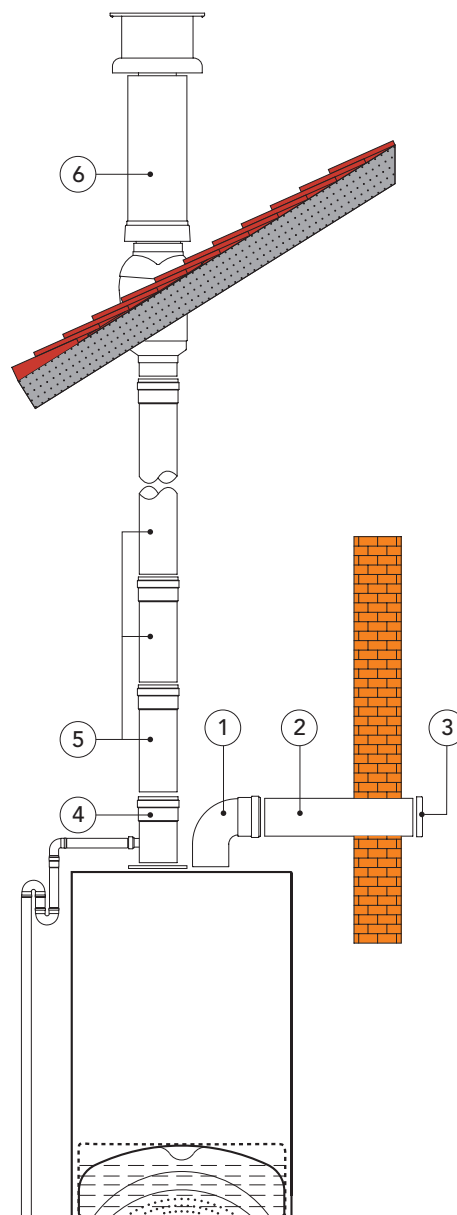




DOMINA PLUS F 24 - 30 E
FERELLA EXTRA F 24 - 30 MEL

Calculation example

Here we give an example of the calculation for a separate fume outlet. We recommend inserting a condensate trap on long vertical sections to prevent condensation getting onto the burner and damaging it. If monitoring the condensate trap is not guaranteed, it must be fitted with a suitable drain pipe and air trap, which in its turn must be appropriately connected to a suitable drain.



Ref.	No. Pieces	Description	Equivalent loss
1	1	Air bend Ø80	1.5 m
2	1	Horizontal air pipe Ø80	1.0 m
3	1	Windproof end piece	2.0 m
4	1	Condensate collection cup coupling	3.0 m
5	36	Vertical fume pipe Ø80	36.0 m
6	1	Outlet flue + coupling	4,0 m
Total			47.5 m

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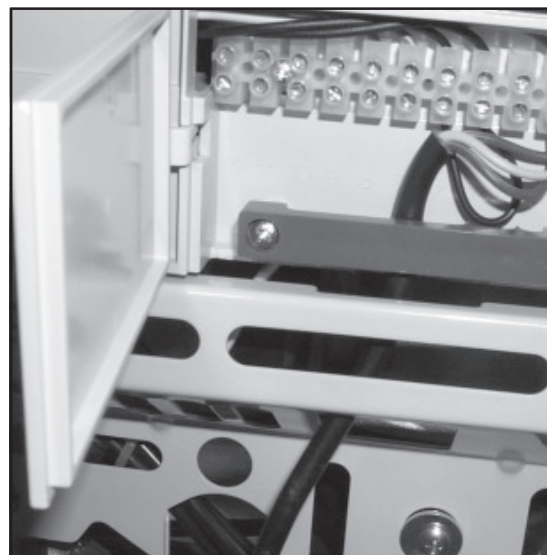


2.6 Electrical circuit

Electrical terminal board

Follow the instructions given in the figure to access the electrical connection terminal board.

The layout of the terminals for the various connections is given in the wiring diagram.

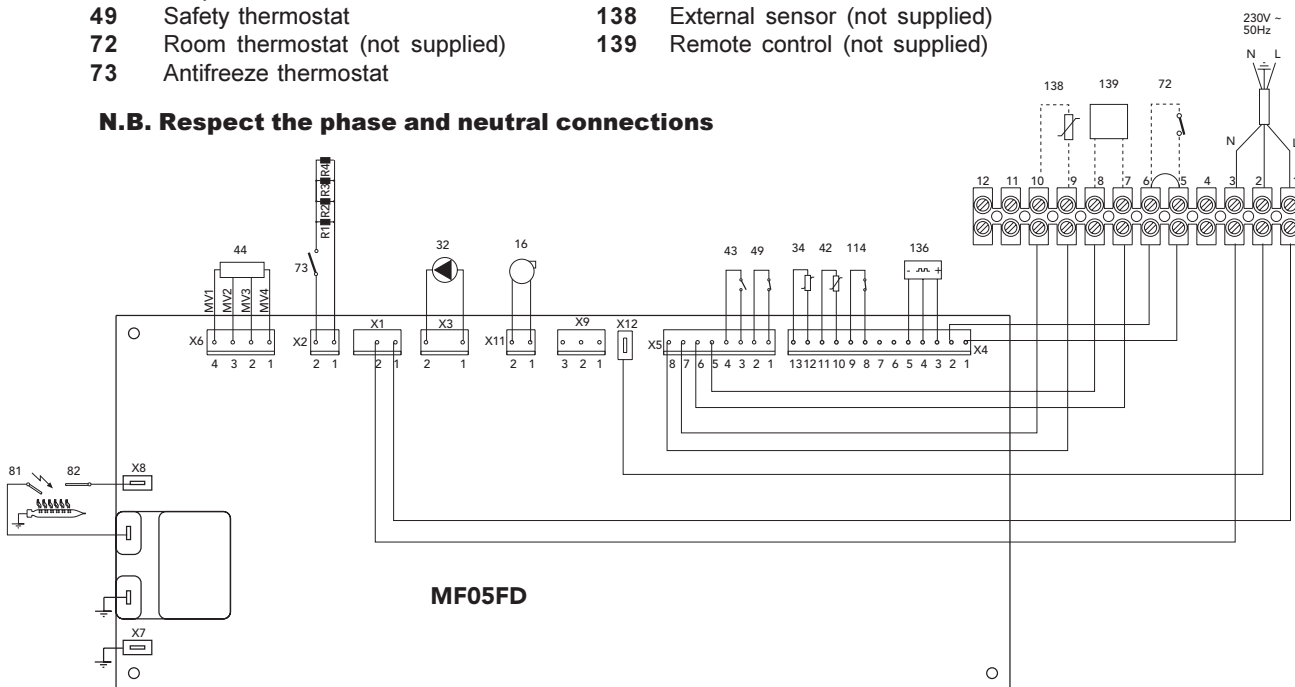


Wiring diagram

Key

- | | | | |
|----|--------------------------------|-----|--------------------------------|
| 16 | Fan | 81 | Ignition electrode |
| 32 | Heating circulator | 82 | Detection electrode |
| 34 | Heating temperature sensor | 114 | Water pressure switch |
| 42 | Tap water temperature sensor | 136 | Flow meter |
| 43 | Air pressure switch | 138 | External sensor (not supplied) |
| 49 | Safety thermostat | 139 | Remote control (not supplied) |
| 72 | Room thermostat (not supplied) | | |
| 73 | Antifreeze thermostat | | |

N.B. Respect the phase and neutral connections





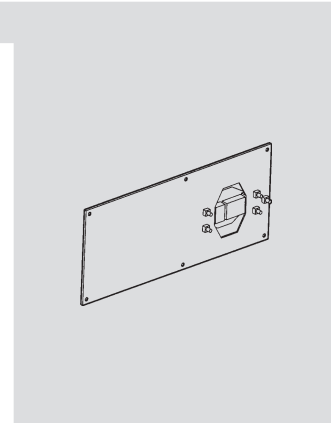
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Main electronic card

The electronic card is a Honeywell DMF05FD: part of the card works on low voltage (24V) and the remainder on 230V (see diagram). It is fitted with a fuse (2A). There are loads and controls common to the card that have already been described, such as:

- Pump
- Fan
- Gas valve
- Air pressure switch

There remain some components described hereunder.



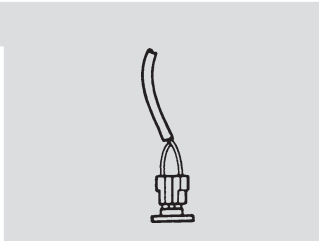
Ignition + detection electrode, see chap. 2.4 Burner Unit

**DOMINA PLUS F 24 - 30 E
FERELLA EXTRA F 24 - 30 MEL**



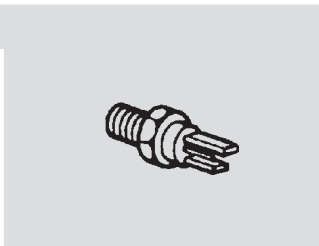
Safety thermostat

X5 - 1/2 has a thermostat with gold contacts that opens if the temperature exceeds 100°C. Connected directly to the main card, when it opens it cuts off the power supply to the valve directly, shutting down the boiler. It is set on the left-hand side of the exchanger by a spring.



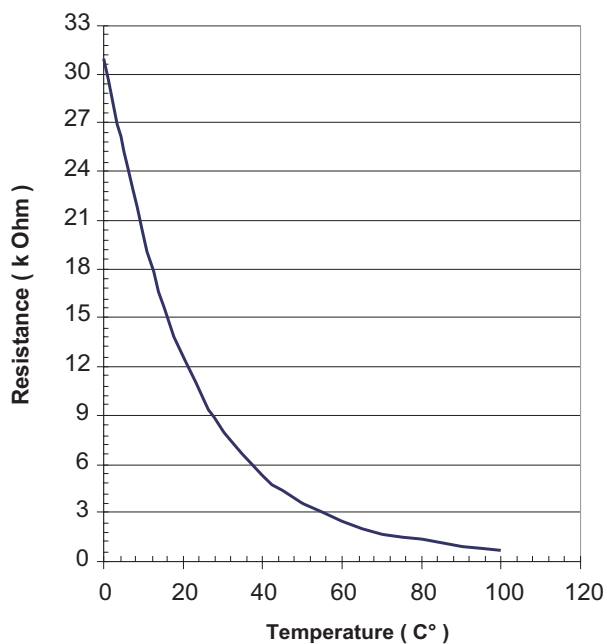
Heating and tap water temperature probe

These are NTC sensors that increase their resistance as the temperature decreases and are connected directly to the main card X4 - 24V (heating 12-13, tap water 10-11). The heating sensor performs the antifreeze function too.



Temperature (C°)	Resistance (k Ohm)
100	0,68
90	0,92
80	1,25
70	1,7
60	2,5
50	3,6
40	5,3
30	8
25	10
15	15,6
5	25,3

NTC sensor





DOMINA PLUS F 24 - 30 E FERELLA EXTRA F 24 - 30 MEL

3. OPERATION

3.1 Operating principle.

The boiler is designed to function with two types of gas: Natural Gas or LPG. It works with systems on the cutting edge of technology as it uses sophisticated software with a double processor governing the modulation, power, control and safety equipment. On powering up the boiler from the mains for the first time, the display will show in succession: 88.-LO-14-HI-06-EO-14 that represent the software release of the processor for low (LO) and high (HI) voltage and the memories (EO). Lastly, the boiler will go onto stand-by, with LED 5 on and the delivery temperature on the display.

When there is a call for heating, the circulator and fan start working; then the air pressure switch enables the control and safety unit to ignite the burner. Via the electronic flame modulation system, the boiler capacity is gradually metered till it reaches the set delivery temperature. If the power needed for the heating plant is lower than the minimum boiler power, when the delivery temperature exceeds the setting of 6°C, the burner switches off and the electronic system enables re-ignition only after another 2 minutes. On reaching the set ambient temperature (room thermostat), the burner switches off and the circulator keeps on working for another 6 minutes to enable better heat distribution throughout the system. If the remote control (Ferrol) is used, the system will try to modulate the ambient temperature according to the setting. In this passage the remote control can lower the delivery temperature under the setting to maintain the ambient temperature: in any case, if the ambient temperature exceeds the remote control setting by 1°C the burner switches off and the circulator stays on for post-circulation.

If hot tap water is drawn off during the heating phase, the electrical heating circuit automatically turns off and the hot tap water production circuit switches on.

Throughout this phase the heating system circulator stops and the boiler delivers water at the set temperature.

The boiler keeps the tap water temperature constant by means of flame modulation, even when different quantities are drawn off.

Diagnosis characteristics: the boiler shows the type of trouble directly on the display with an identification code.

Slow ignition for heating

The power in the ignition phase (10s) is 50% (adjustable) and the increase in temperature is gradual (10°C/minute - adjustable from 1 to 20°C).

Circulator anti-locking

If not used for 24 h, the heating circulator is turned on for a few seconds to prevent it locking due to an extended stoppage.



Antifreeze protection

With the heating temperature sensor, if the temperature falls under 5°C, the boiler starts working normally to then switch off when the temperature exceeds 15°C, and the circulator keeps on working for another 6 minutes. This protection is active even if the boiler is switched off from the control panel.

Tap water circuit antifreeze protection



It is possible to ensure antifreeze protection for the tap water circuit with the 4 heating elements of 10W - 230V connected to terminal X2 of the control unit. The antifreeze thermostat is connected in series with the heating elements. The protection is activated when the temperature falls under 5°C and it turns off above 15°C.

**DOMINA PLUS F 24 - 30 E
FERELLA EXTRA F 24 - 30 MEL****Test operation**

"Test" operation makes it possible to turn on the boiler in heating mode, but with idle time, flame modulation and tap water operation turned off. It is possible to turn on "test" operation from the control panel on the boiler by pressing  3 times in 5 seconds. In this phase (5 min) LED 1 will blink and the display will show the heating power. Operating knob **2**, the display will blink and you can modify the heating power that will change instantly. The power shown on the display will vary from 0 to 99. (100%) indicating the percentage change between the minimum and maximum heating power. In the same way, with knob **3** you can change the ignition power that will be set immediately. Pressing  three times in 5 seconds quits the Test function (see power adj.). Test operation can also be used to adjust the gas valve and to analyse the fumes.

N.B. To clear the boiler power during "Test" operation we recommend opening 1 or 2 taps.

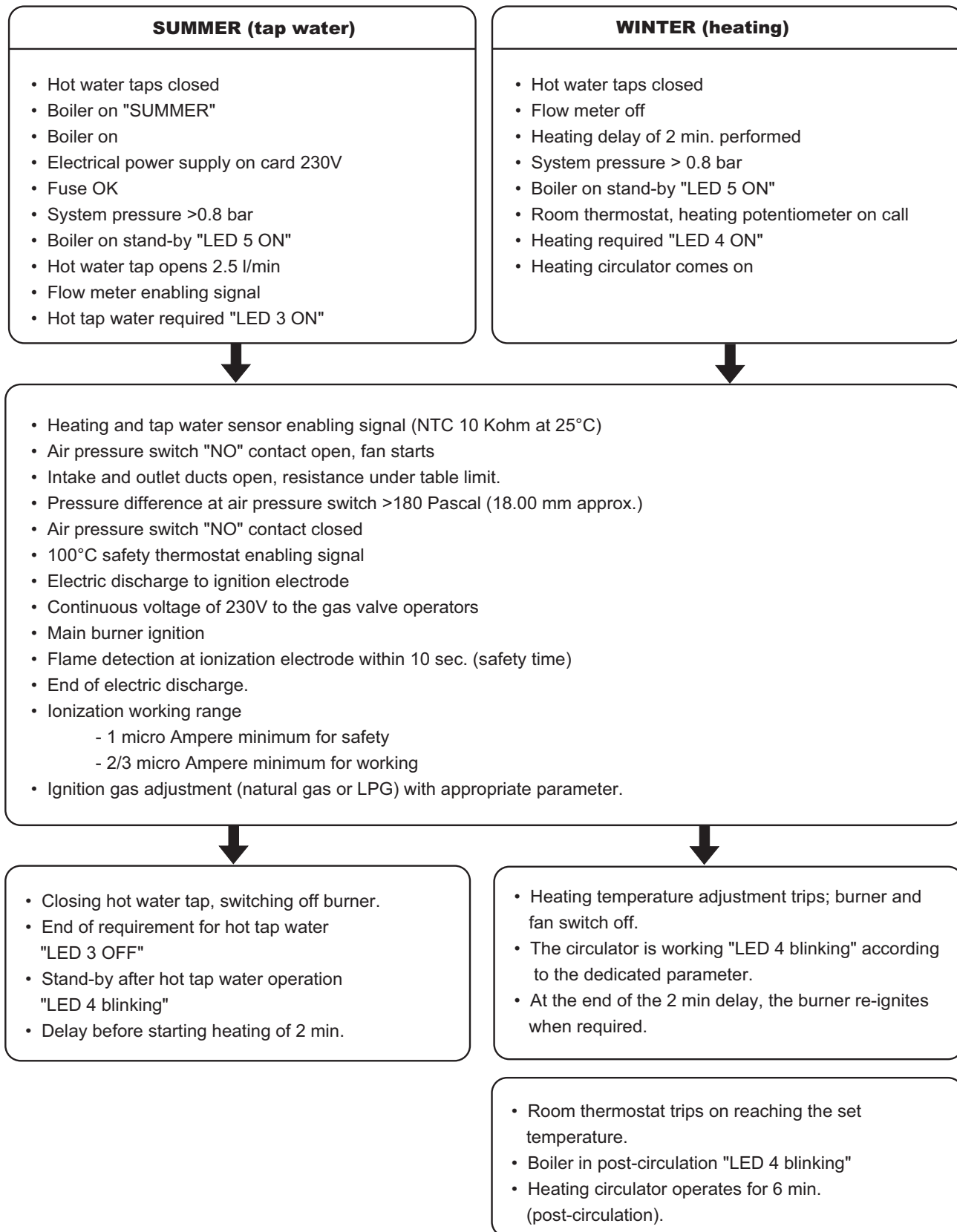
Ionization current display

During "test" operation it is possible to display the ionization current. Pressing  on the display will show the ionization current in μA that is measured instantly. If you press  a second time, the heating power will again be shown. The ionization current can vary from 10 to $40\mu\text{A}$ (depending on the power). Under $5\mu\text{A}$ the flame is not detected by the control card.



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3.2 Operating diagram





DOMINA PLUS F 24 - 30 E FERELLA EXTRA F 24 - 30 MEL

Information on the display

During normal operation, the boiler diagnostics control sends information on the state of the boiler and measures the temperature of the water. This information is automatically shown on the display according to the type of operation.

Operation	LED on	Display
Standby	L5	Heating temp. (for example 40°C)
Heating	L5, L4 + L1	Heating temp. (for example 60°C)
Tap water	L5, L3 + L1	Tap water temp. (for example 50°C)
Standby for heating op. (after tap water op.)	L5, L4 blinking	Tap water temp. (for example 60°C)
Standby for heating op. (after heating op.)	L5, L4 blinking	Heating temp. (for example 70°C)
Fault 1 (restore operation by pressing Reset)	L5, L2	For example 1 (blinking display)
Fault 2 (restore operation by removing fault)	L5, L2 blinking	For example 37 (blinking display)

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3.4 Adjustments

Room temperature adjustment

Using the room thermostat, set the temperature desired in the rooms. Controlled by the room thermostat, the boiler lights and heats the system water to the set system delivery setpoint temperature. The generator turns off when the desired temperature in the rooms is reached. If the remote control (Ferrolì) is used, the system tries to modulate the ambient temperature according to the setting. In this passage the remote control can lower the delivery temperature under the setting to maintain the ambient temperature: in any case, if the ambient temperature exceeds the setting by 1°C the burner switches off and the circulator stays on for post-circulation. The boiler also works with an external temperature sensor (see "sliding temperature"). If the room thermostat or the remote control are not installed the boiler will keep the system at the set system delivery setpoint temperature.

Summer/Winter selection

For the Summer/Winter selection, use knob 2 (see "control panel").

Turning it onto ☀️ (Summer) turns off the heating function. Only the hot tap water production is active. In this position the heating temperature shown on the display will be 20 °C. In "Summer" mode the antifreeze function stays on.

Turning it onto ❄️ (Winter) with a minimum temperature of 30°C turns on both heating and hot tap water.

Heating temperature setting

To set the system delivery temperature, turn the specific knob.

It can vary from a minimum of 30°C to a maximum of 85°C; however, it is advisable not to operate the boiler below 45°C (return temperature). Turning the knob sets the required temperature (clockwise to increase, anticlockwise to decrease) that is shown on the display. During the setting, the display quickly blinks and once defined it stops blinking after 2 sec. and goes back to showing the actual operating temperature.

If connecting to a remote timer control (optional), the system temperature is only governed with the remote control. By turning the heating temperature control knob on the boiler, the temperature can only be displayed and not changed.

Adjustment	LED on	Temperature on the display
System temperature	L5, L4	30 - 85 °C



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Hot water temperature adjustment

To set the system delivery temperature, turn the specific knob.

It can vary from a minimum of 30°C to a maximum of 65°C. Turning the knob sets the required temperature (clockwise to increase, anticlockwise to decrease) that is shown on the display. During the setting, the display quickly blinks and once defined it stops blinking after 2 sec. and goes back to showing the actual operating temperature.

Adjustment	LED on	Temperature on the display
Tap water temperature	L5, L3	40 - 65 °C

If connecting to a remote timer control (optional), the system temperature is only governed with the remote control. By turning the tap water temperature control knob on the

boiler, the temperature can only be displayed and not changed.

Adjusting the maximum heating output

To adjust the heating power, set the boiler on TEST operation (see "Test operation"). During the ignition phase, the display shows the ignition power and, immediately afterwards, the heating power. Turn the heating temperature control knob clockwise to increase the power or anticlockwise to decrease it. The display shows a percentage ranging from 0 to 100% (the display blinks during the setting). The figure shown on the display indicates the percentage change between the boiler's minimum and maximum power. This adjustment is

Adjustment	LED on	Temperature on the display
Heating system power - knob 2 -	L1, L4, L1 blinking	0-100% (Voltage at the valve to change the power)

set on the control panel, also with the remote control connected the system must be free of any errors.

Ignition power adjustment

To adjust the ignition power, set the boiler on TEST operation (see "Test operation"). During the ignition phase, the display shows the ignition power and, immediately afterwards, the heating power. Turn the tap water temperature control knob clockwise to increase the ignition power or anticlockwise to decrease it. The display shows a percentage ranging from 0 to 100% (the display blinks during the setting). The figure shown on the display indicates the percentage change between the boiler's

Adjustment (TEST mode on)	LED on	Display
Ignition power - knob 3 -	L1, L4, L1 blinking	0-100% (Voltage at the valve to change the power)

minimum and maximum power. This adjustment is set on the control panel, also with the remote control connected.

Adjusting the heating Δt by changing the delivery-head of the circulator

The temperature drop Δt (difference in temperature of the heating water between the system delivery and return) must be less than 20°C and this is obtained by changing the delivery-head of the circulator with its speed changer (or with the switch).

**DOMINA PLUS F 24 - 30 E
FERELLA EXTRA F 24 - 30 MEL**

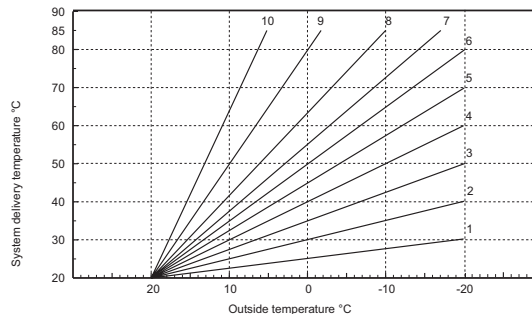


Sliding Temperature

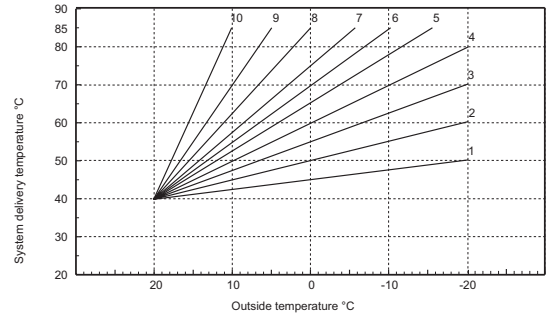
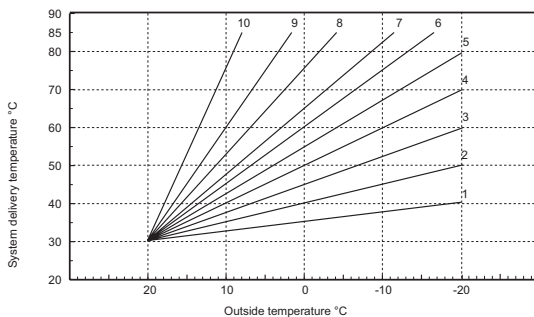
When the optional outside sensor is installed the boiler adjustment system can work with "Sliding Temperature." In this mode, the temperature of the heating system is governed according to the weather conditions outside so as to ensure a high degree of comfort and energy savings throughout the year. In particular, as the outside temperature increases the system delivery temperature decreases according to a specific "compensation curve." With the Sliding Temperature adjustment, the temperature set becomes the maximum system delivery temperature. It is recommended to set a maximum value to permit system adjustment throughout its useful working range. The compensation curve can be modified with the knobs 2 and 3 (see "control panel"). Turning knob 2 (see "control panel") and at the same time keeping the RESET key pressed adjusts the compensation curve; whereas, turning knob 3 (see "control panel") and at the same time keeping the RESET key pressed adjusts the parallel movement of the curves. To be able to make these adjustments the boiler must be on standby (only LED 5 on). If you do not set the compensation curve, leaving it on "0", the boiler cannot work in "sliding temperature" mode.

Adjustment	LED on	Display
Compensation curve - knob 2	L5	0 - 10
Parallel shift of the curves (knob 3)	L5	20 - 40 °C

Compensation curves



Example of parallel curve shift



If the boiler is hooked up with the optional remote control, the above adjustments (system temperature, hot water temperature, compensation curve) can be made solely with the remote control. The user menu on the boiler panel is disabled and functions solely as a display. In addition, the remote control will always have priority for varying the delivery temperature to keep the room temperature at the required level.

DOMINA PLUS F 24 - 30 E
FERELLA EXTRA F 24 - 30 MEL



0 **2** _____ **Position**

_____ **Selection of modulating timer-thermostat/
timer-thermostat On/Off for zone systems**
0 = Modulating
1 = On/Off zone systems

This parameter makes it possible to keep the timer-thermostat functions of the remote control even with zone systems. The sliding temperature adjustment is set and controlled via the boiler control panel and the main card. The remote control loses its room modulation function.

If the boiler is used without the remote control the boiler operation corresponds to selecting 1. But it will not be necessary to set the value to 1.

0 **3** _____ **Position**

_____ **Natural gas / LPG selection**
0 = Natural gas
1 = LPG

0 **4** _____ **Position**

_____ **Pump post-circulation / pump continuous
operation selection**
0 = Post-circulation
1 = Continuous pump

Selecting the "post-circulation" parameter, after a call for heating, the pump continues to work for the post-circulation time (6 min.).

Whereas, selecting "continuous pump," after a call for heating, the pump works constantly.

The pump is always turned off during tap water operation.

6 **5** _____ **Position**

_____ **Post-circulation time adjustment.**
Setting: 6min.
(range 1 to 255 min.)



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0 **6** _____ Position

System delivery temperature increase adjustment. Setting: 10°C/min.
(range 1 to 20°C/min.)

This permits changing the speed of increasing the delivery temperature.

100 **7** _____ Position

Heating power adjustment.
Setting: 100%
(range 0 to 100%.)

Indicates the percentage difference between the minimum and maximum boiler power.

2 **8** _____ Position

Adjustment of idle time after switching off heating.
Setting: 2 min.
(range 0 to 10 min.)

120 **9** _____ Position

Adjustment of idle time after tap water operation
Setting: 120 sec.
(range 0 to 255 sec.)

50 **0** _____ Position

Adjustment of power during ignition phase.
Setting: 50%
(range 0 to 100%.)

Indicates the percentage difference between the minimum and maximum boiler power.

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0 **1** _____ Position

_____ Compensation curve selection.
Setting: 0 (adjustment turned off)
(range 1 to 10)

30 **2** _____ Position

_____ Compensation curve fixed point adjustment
Setting: 30
(range 20 to 40)

Used to make a parallel shift of the compensation curve.

To quit the menu, press keys **1** and **3** simultaneously or wait to quit automatically after 1 minute.



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Checking operating data log

With a remote control installed, pressing keys **1** and **2** simultaneously for longer than 2 seconds takes you to the operating data log menu.

Storing the last 8 faults.

The display on the remote control shows the storage sequence of the faults and their code

F	Error code	Position
F	01	1
F	33	2
F	37	3
F	06	3
F	01	5
F	01	6
F	09	7
F	39	8

By pressing the  key you can scroll through the numbers of the faults.


Position **1** indicates the last fault that occurred. When there is a fault, this is saved at point **1**, while the ones already saved are moved on by one place.





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4. Unit self-diagnosis

Fault Diagnosis

The boiler is equipped with an advanced self-diagnosis system. In the event of trouble with the boiler, the display will show the fault code. There are faults that in order to restore operation it suffices to press RESET ; if the boiler fails to start, it is necessary to resolve the fault indicated by the operating LEDs (faults from 1 to 25); other faults cause temporary shutdowns that are automatically reset as soon as the value comes back within the boiler's normal working range (faults from 30 to 39). When the boiler starts functioning normally again, the display stops blinking and the fault code disappears.

LED	DISPLAY	Fault	Cure
 Steady light +  steady light	01	Boiler shutdown	Make sure that the gas cocks ahead of the boiler and on the meter are open. Press button 1 "Reset". In case of repeated shutdowns, contact the nearest assistance centre
 Blinking light +  steady light	37	Low system pressure	Fill the system to 1-1.5 bar cold by means of the specific cock located in the boiler. Close the cock after use.

List::

Display	Fault	Possible cause
01	No burner ignition	<ul style="list-style-type: none"> No gas Detection or ignition electrode fault Defective gas valve
03	Safety thermostat trips	<ul style="list-style-type: none"> Damaged thermostat No water circulation in the system
04	Air pressure switch (with contacts closed before turning on the fan)	<ul style="list-style-type: none"> Air pressure switch contact closed Incorrect wiring to the air pressure switch
05	Air pressure switch (fails to close the contacts within 60 sec. of turning on the fan)	<ul style="list-style-type: none"> Air pressure switch contact open Incorrect wiring to the air pressure switch Wrong diaphragm Flue not correctly sized
06	Air pressure switch (closes and opens the contacts 5 times within 60 sec. of the ignition phase)	<ul style="list-style-type: none"> Wrong diaphragm Flue not correctly sized
08	Fault on the flame control circuit	<ul style="list-style-type: none"> Interference caused by the electric mains Card microprocessor damaged
09	No burner ignition	<ul style="list-style-type: none"> Incorrect gas valve connection Broken wiring of gas valve
From 10 to 25	Card trouble	<ul style="list-style-type: none"> Interference caused by the electric mains Card microprocessor damaged

Display	Fault	Possible cause
30	Heating sensor fault	<ul style="list-style-type: none"> Sensor damaged Incorrect wiring (short-circuit)
31	Heating sensor fault	<ul style="list-style-type: none"> Sensor damaged Incorrect wiring (broken)
32	Tap water sensor fault	<ul style="list-style-type: none"> Sensor damaged Incorrect wiring (short-circuit)
33	Tap water sensor fault	<ul style="list-style-type: none"> Sensor damaged Incorrect wiring (broken)
34	Mains voltage	<ul style="list-style-type: none"> The mains voltage is under 185 VAC
35	Mains frequency	<ul style="list-style-type: none"> The frequency exceeds the tolerance of +/- 5%
36	Card trouble	<ul style="list-style-type: none"> Defective hardware
37	Low system pressure	<ul style="list-style-type: none"> System empty Water pressure switch not connected or damaged
38	RESET key jammed	<ul style="list-style-type: none"> ON/OFF button damaged
39	External sensor fault	<ul style="list-style-type: none"> Damaged sensor Sensor wiring shorted



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