



DOMINA OASI F 24-30 E
FERELLA BOIL F 24-30 MEL
KEA AIR COMPACT E



- **Wall-Mounting
Gas Boiler**
- **Airtight Chamber,
for Heating and Hot
Water with
Integrated Boiler**

**TECHNICAL
MANUAL**

**EDITION
09-2002**



DOMINA OASI F 24 - 30 E
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KEA AIR COMPACT E

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1. GENERAL TECHNICAL CHARACTERISTICS AND DATA

1.1 Introduction

Our appliance is a high-efficiency heat generator for central heating and hot-water production running on natural gas or LPG (configurable at the time of installation).

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 stainless steel boiler of 55 or 65 litres for tap water, a variable speed circulator and a fixed speed circulator, an expansion tank for heating and for the boiler, safety valve, filler cock, air pressure switch, water pressure switch, temperature sensors, limiting and safety thermostats.

Thanks to the control and adjustment system, unit operation is for the most part automatic. The power for heating is automatically governed by the control system according to the indoor characteristics, the characteristics of the building and of its location. The tap water capacity is ensured by a boiler that is kept at the required temperature.

There are 5 LEDs on the control panel providing information on the unit's operating status.

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.

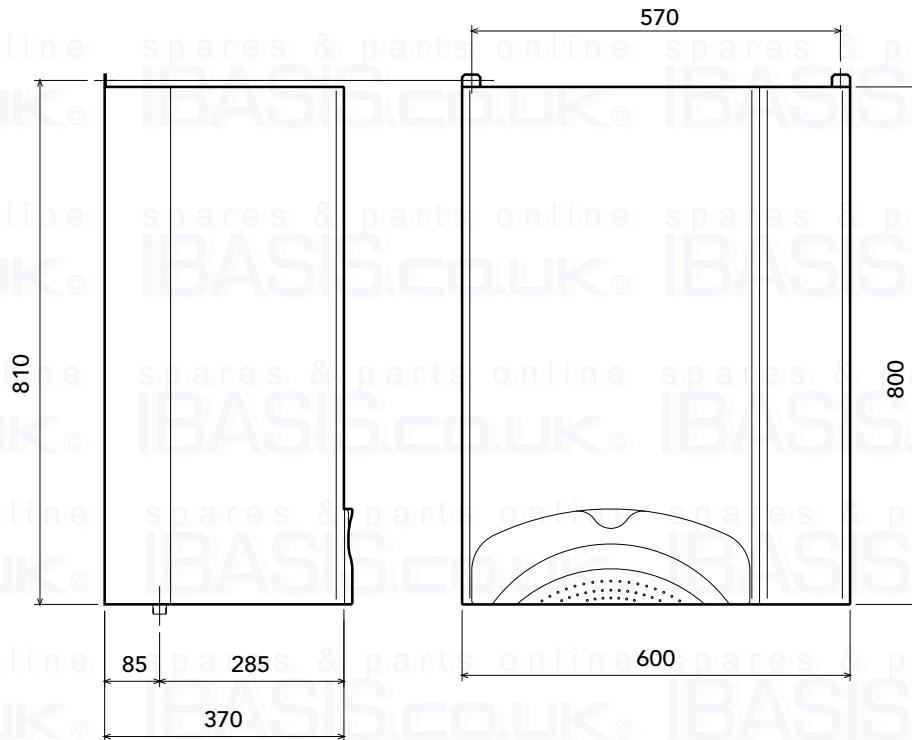
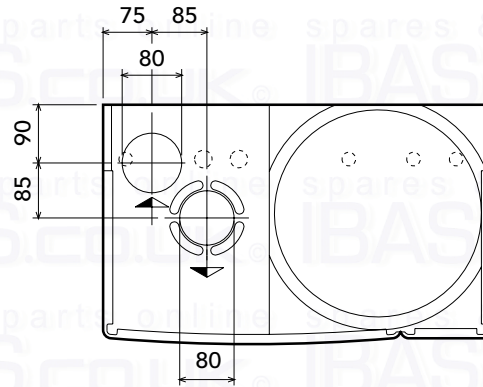
In particular, this unit complies with the following EU directives:

- 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

1.2 Dimensions and connections

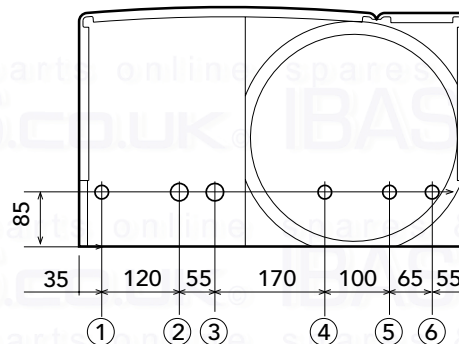
Domina Oasi F 24 E version

Top view



Key

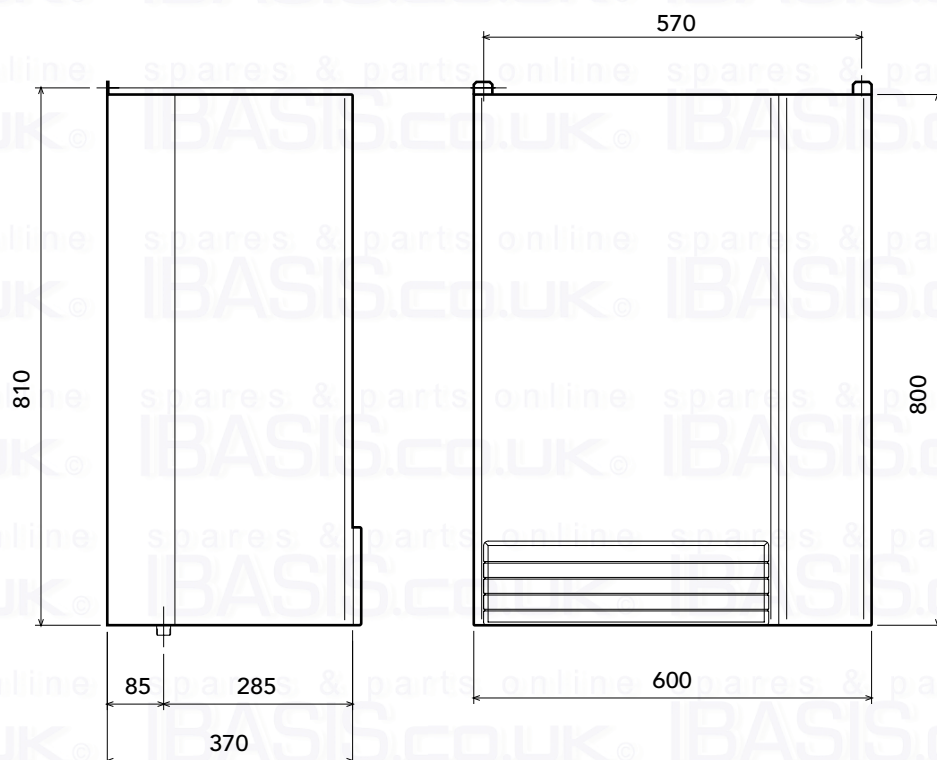
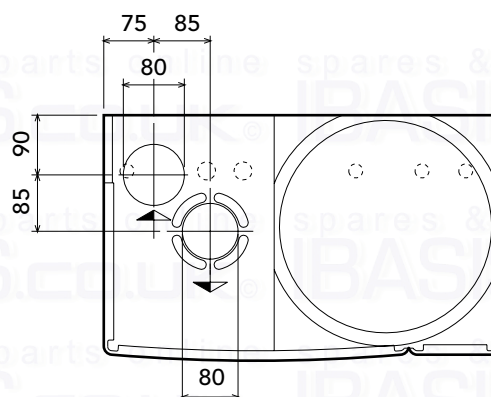
- 1 Gas inlet
- 2 3/4" System delivery
- 3 3/4" System return
- 4 1/2" Hot tap water
- 5 1/2" Cold tap water
- 6 1/2" Outlet/Recirculation



Bottom view

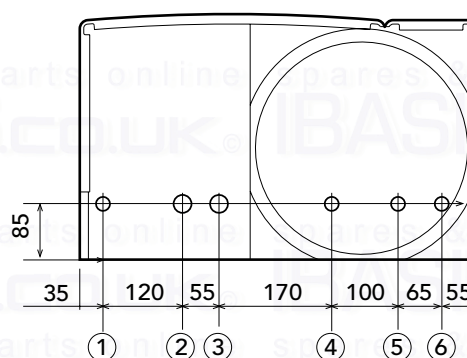
Ferella Boil F 24 MEL version & Kea Air Compact E version

Top view



Key

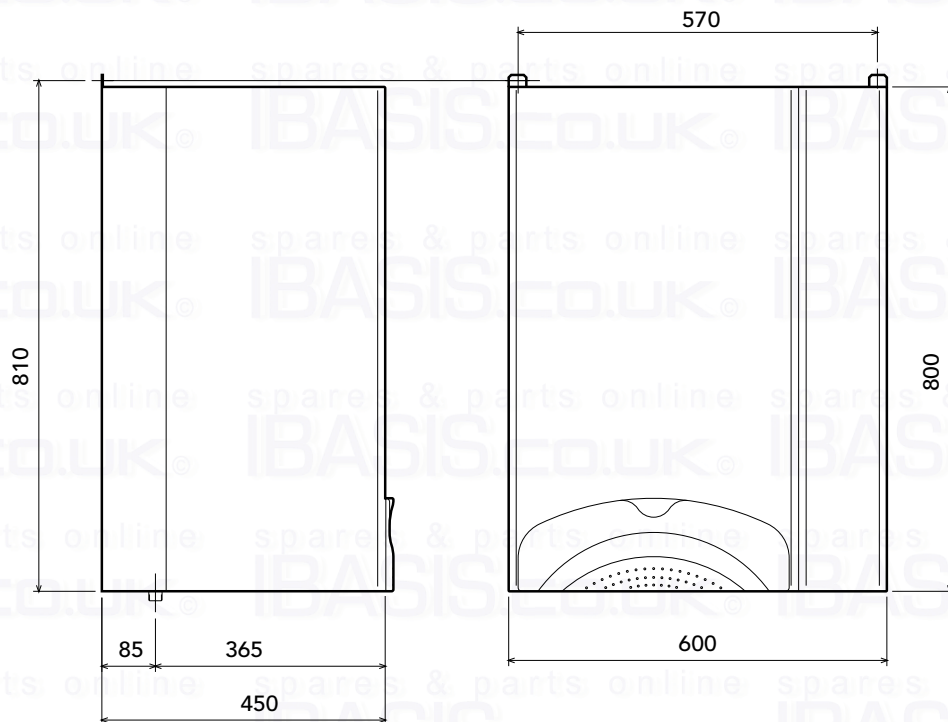
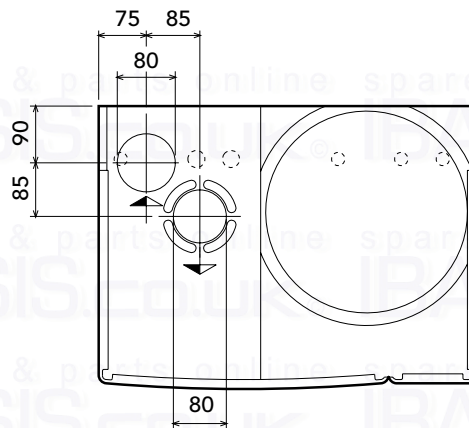
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- 3 3/4" System return
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- 5 1/2" Cold tap water
- 6 1/2" Outlet/Recirculation



Bottom view

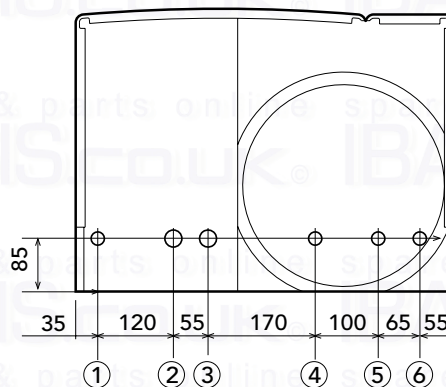
Domina Oasi F 30 E version

Top view



Key

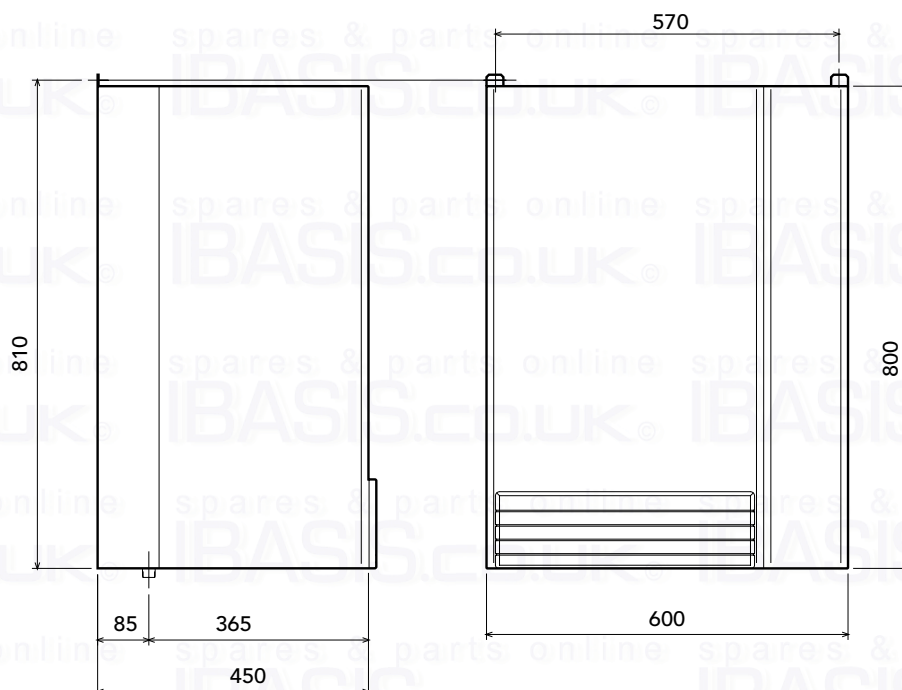
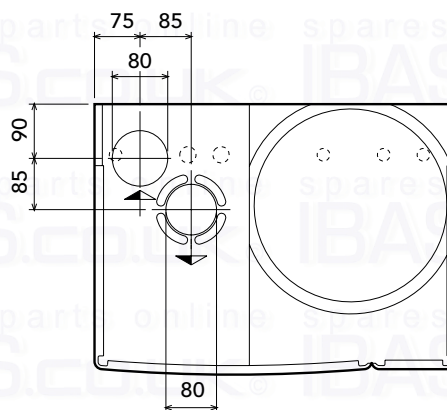
- 1 Gas inlet
- 2 3/4" System delivery
- 3 3/4" System return
- 4 1/2" Hot tap water
- 5 1/2" Cold tap water
- 6 1/2" Outlet/Recirculation



Bottom view

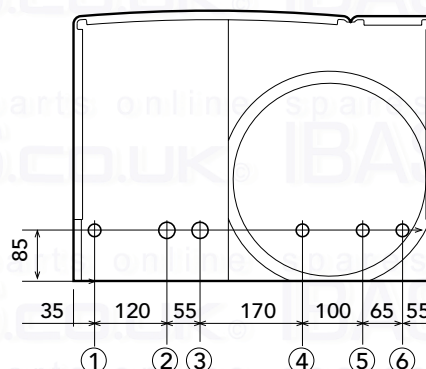
Ferella Boil F 30 MEL version

Top view



Key

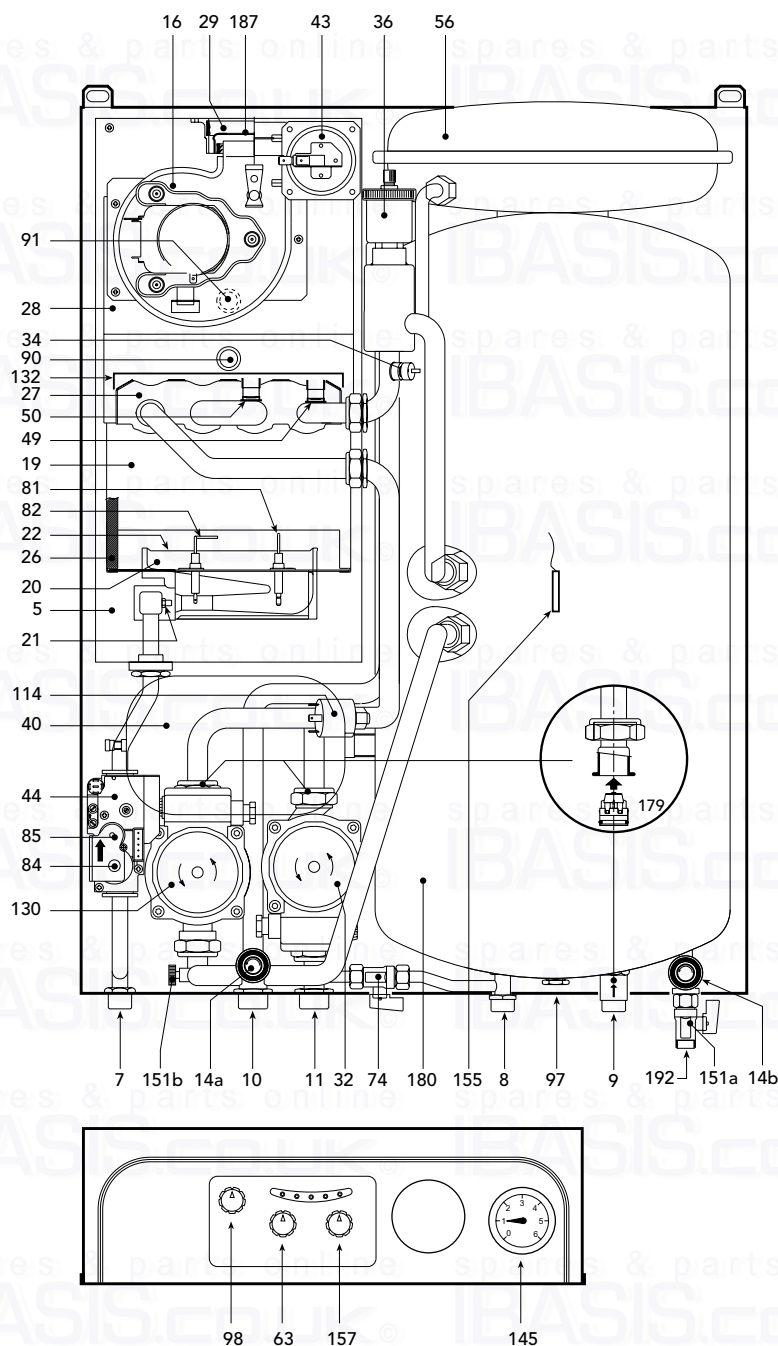
- 1 Gas inlet
- 2 3/4" System delivery
- 3 3/4" System return
- 4 1/2" Hot tap water
- 5 1/2" Cold tap water
- 6 1/2" Outlet/Recirculation



Bottom view

1.3 General view and main components

F 24 E/MEL version



DOMINA OASI - FERELLA BOIL
KEA AIR COMPACT E version

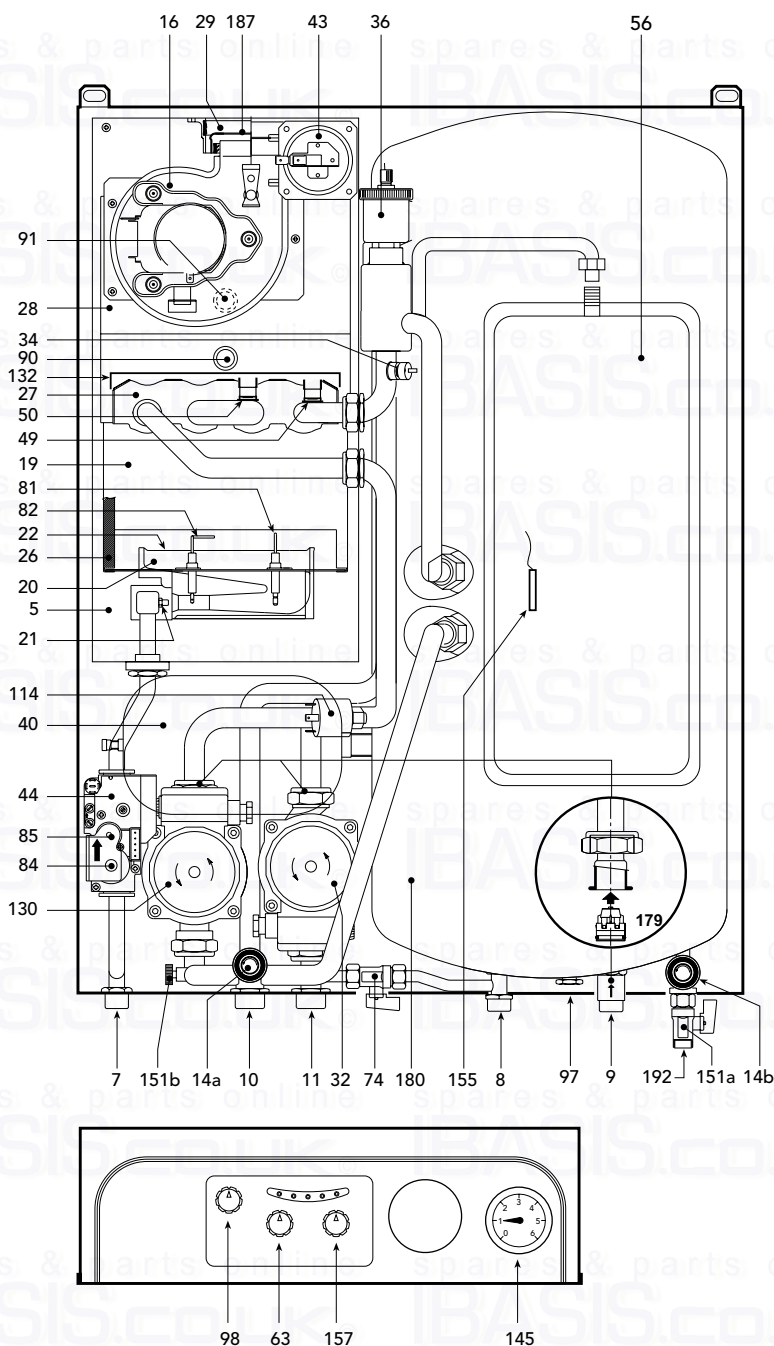
Key

- 5 Airtight chamber
- 7 Gas inlet
- 8 Tap water outlet
- 9 Tap water inlet
- 10 System delivery
- 11 System return
- 14a 3-bar safety valve (heating)
- 14b 7-bar safety valve (boiler)
- 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 Delivery temperature sensor
- 36 Automatic air vent
- 40 Tap water expansion tank
- 43 Air pressure switch
- 44 Gas valve
- 49 Safety thermostat
- 50 Heating thermostat
- 56 Expansion tank for heating system
- 63 Heating temperature setting
- 74 Heating system 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
- 97 Magnesium anode
- 98 Off-On-Reset switch
- 114 Water pressure switch
- 130 Boiler circulator
- 132 Fume deflector
- 145 Water gauge
- 151a Boiler drain cock
- 151b System drain cock
- 155 Boiler temperature sensor
- 157 Tap water temperature setting
- 179 Check valve
- 180 Boiler
- 187 Fume diaphragm
- 192 Recirculation (when connecting, insert a T-junction to connect the drain cock)

DOMINA OASI F 24 - 30 E
FERELLA BOIL F 24 - 30 MEL
KEA AIR COMPACT E



F 30 E/MEL version



DOMINA OASI - FERELLA BOIL Version

Key

- 5 Airtight chamber
- 7 Gas inlet
- 8 Tap water outlet
- 9 Tap water inlet
- 10 System delivery
- 11 System return
- 14a 3-bar safety valve (heating)
- 14b 7-bar safety valve (boiler)
- 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 Delivery temperature sensor
- 36 Automatic air vent
- 40 Tap water expansion tank
- 43 Air pressure switch
- 44 Gas valve
- 49 Safety thermostat
- 50 Heating thermostat
- 56 Expansion tank for heating system
- 63 Heating temperature setting
- 74 Heating system 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
- 97 Magnesium anode
- 98 Off-On-Reset switch
- 114 Water pressure switch
- 130 Boiler circulator
- 132 Fume deflector
- 145 Water gauge
- 151a Boiler drain cock
- 151b System drain cock
- 155 Boiler temperature sensor
- 157 Tap water temperature setting
- 179 Check valve
- 180 Boiler
- 187 Fume diaphragm
- 192 Recirculation (when connecting, insert a T-junction to connect the drain cock)

1.4 Technical data table

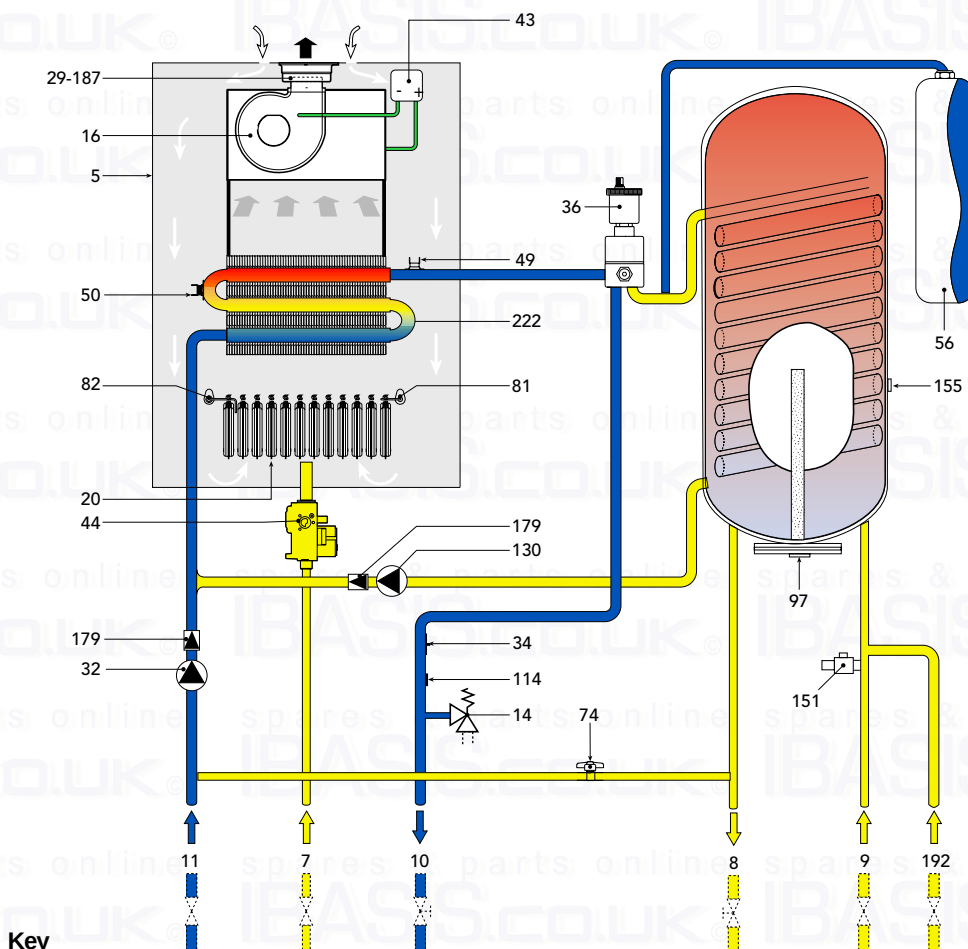
DOMINA OASI - FERELLA BOIL - KEA COMPACT E- MILOS		24 Kw		30 Kw	
Powers		Pmax	Pmin	Pmax	Pmin
Heating Power (Net Heat Value - Hi)	kW	25.8	11.5	33.1	14.5
	kcal/h	22,200	9,900	28,500	12,500
Useful Heating Power 80°C - 60°C	kW	23.5	9.7	30.0	12.7
	kcal/h	20,200	8,300	25,800	10,900
Hot Water Heating Power	kW	23.5	9.7	30.0	12.7
	kcal/h	20,200	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	35.0	7.8	35.5	7.0
LPG burner (G31)	Kg/h	2.00	0.89	2.57	1.13
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	6		10	
Expansion tank pre-filling pressure	bar	1		1	
Boiler water content	litres	1.5		1.8	
Hot water					
Specific flow rate with Δt 30°C	l/min	15		19	
Specific flow rate with Δt 30°C	l/10 min	150		190	
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	55		65	
Dimensions, weights connections					
Height	mm	800		800	
Width	mm	600		600	
Depth	mm	370		450	
Weight with packing	kg	52		60	
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	

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.

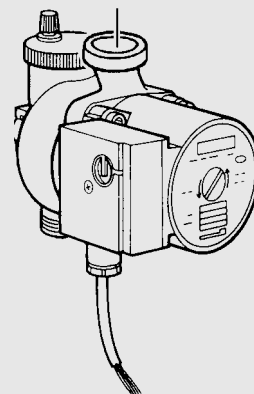


Key

- | | | | |
|----|----------------------------|-----|---------------------------|
| 5 | Airtight chamber | 49 | Safety thermostat |
| 7 | Gas inlet | 50 | Heating thermostat |
| 8 | Tap water outlet | 56 | Expansion tank |
| 9 | Tap water inlet | 74 | Heating system cock |
| 10 | System delivery | 81 | Ignition electrode |
| 11 | System return | 82 | Detection electrode |
| 14 | Safety valve | 97 | Magnesium anode |
| 16 | Fan | 114 | Water pressure switch |
| 20 | Burner assembly | 130 | Boiler circulator |
| 29 | Fume outlet manifold | 151 | Boiler drain cock |
| 32 | Heating circulator | 155 | Boiler temperature sensor |
| 34 | Heating temperature sensor | 179 | Check valve |
| 36 | Automatic air vent | 187 | Fume diaphragm |
| 43 | Air pressure switch | 192 | Recirculation |
| 44 | Gas valve | 222 | Copper exchanger |

Circulator (230v/50Hz)

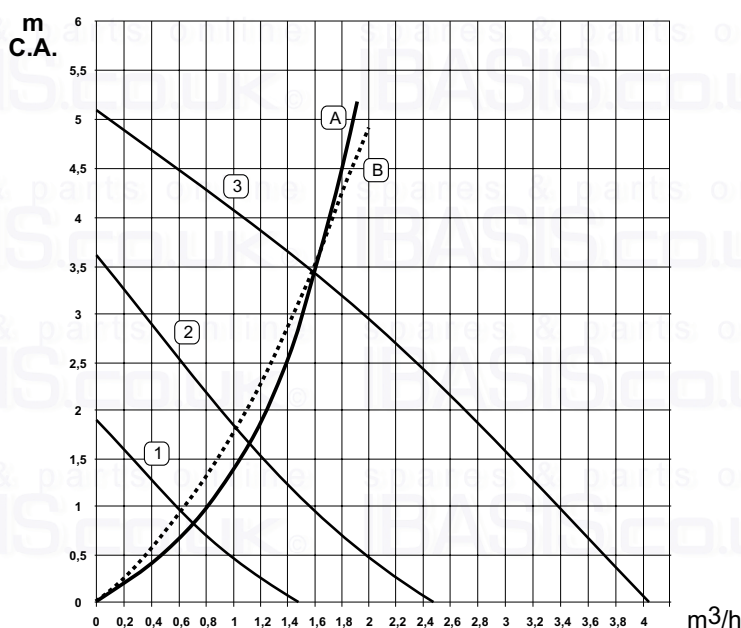
Located on the heating circuit return, it is connected directly to the exchanger via special forks and connected to the system via a threaded brass fitting. It has three delivery/head levels (see diagram). Changing the delivery/head changes the speed of the water flowing through the boiler exchanger 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 and automatic air vent

This is used to expel the air in the tap-water and heating circuit automatically. It can be removed by simply unscrewing it from its seat on the air separator. The function of the latter is to slow down the speed of the water, preventing the air it contains from getting dragged along.



Expansion tank

It is connected via a pipe with a threaded connection close to the air separator. For the 24kW version, it is above the boiler and for the 30kW version, it is in front of the boiler, 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.

24kW 6-litre version

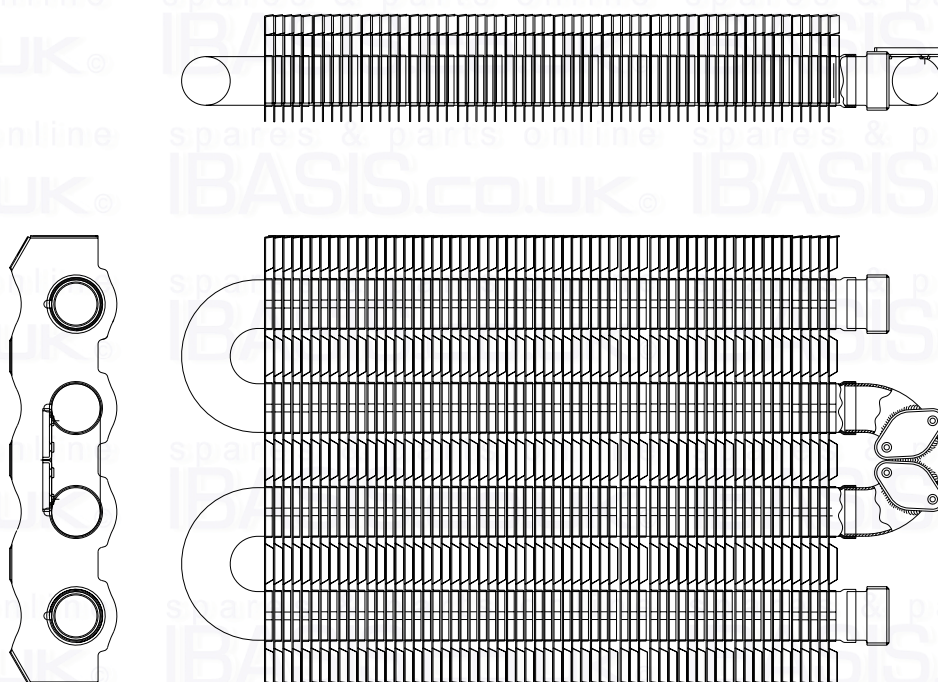


30kW 10-litre version



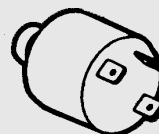
Exchanger

The exchanger is a copper laminar assembly. It comprises a thickly finned portion and four circular pipes connected together in series. The water exchanges directly with the combustion gases and makes the system safe via a safety thermostat set to 100°C and the limit thermostat (88°C) located in the exchanger. Due to its shape and design, the heat gets evenly distributed 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.



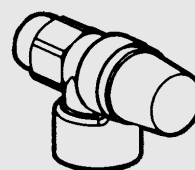
Water pressure switch

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.



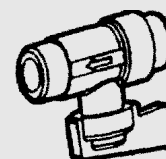
Check valve

It is necessary to ensure the water flows in one direction only and it is located above the two pumps.



Filler cock

This is located between the heating return and the tap water outlet. It is not fitted on the boiler for some markets such as the British and Belgian ones. For French boilers there is a disconnecter to be installed externally.



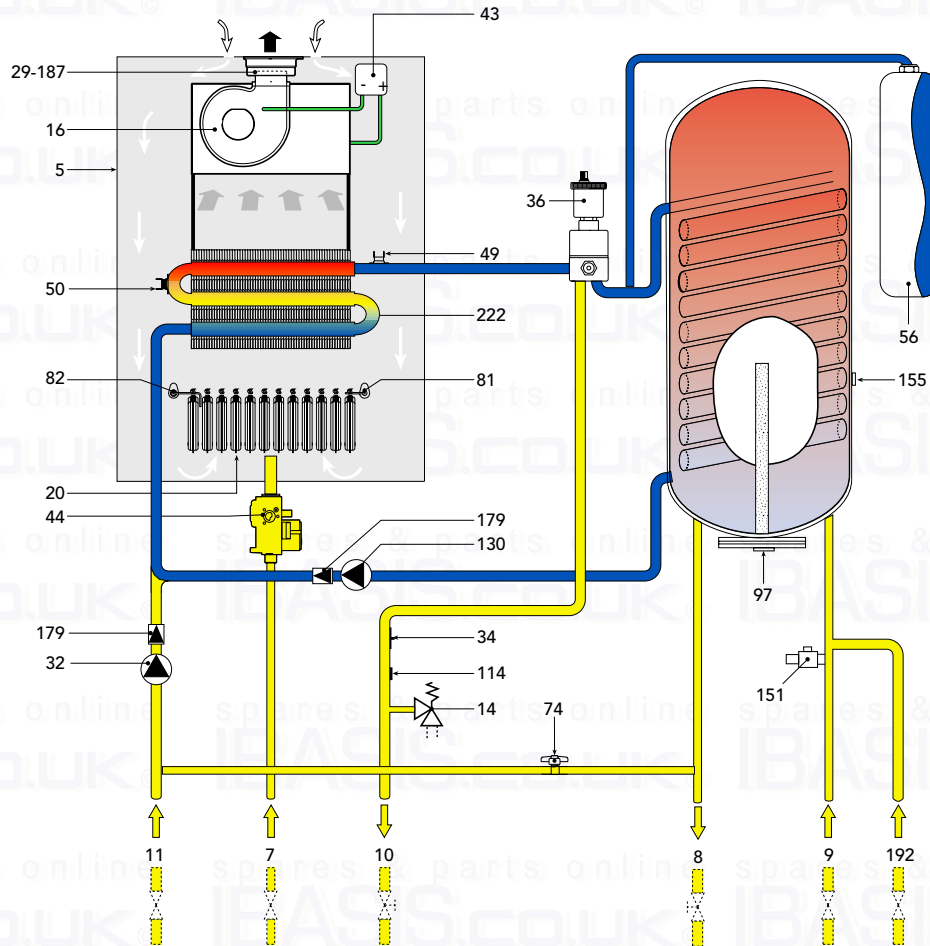
Drain cock

This is located upstream from the tap-water pump and has the function of draining the system.



2.2 Hydraulic circuit – tap water

Hydraulic diagram for tap water



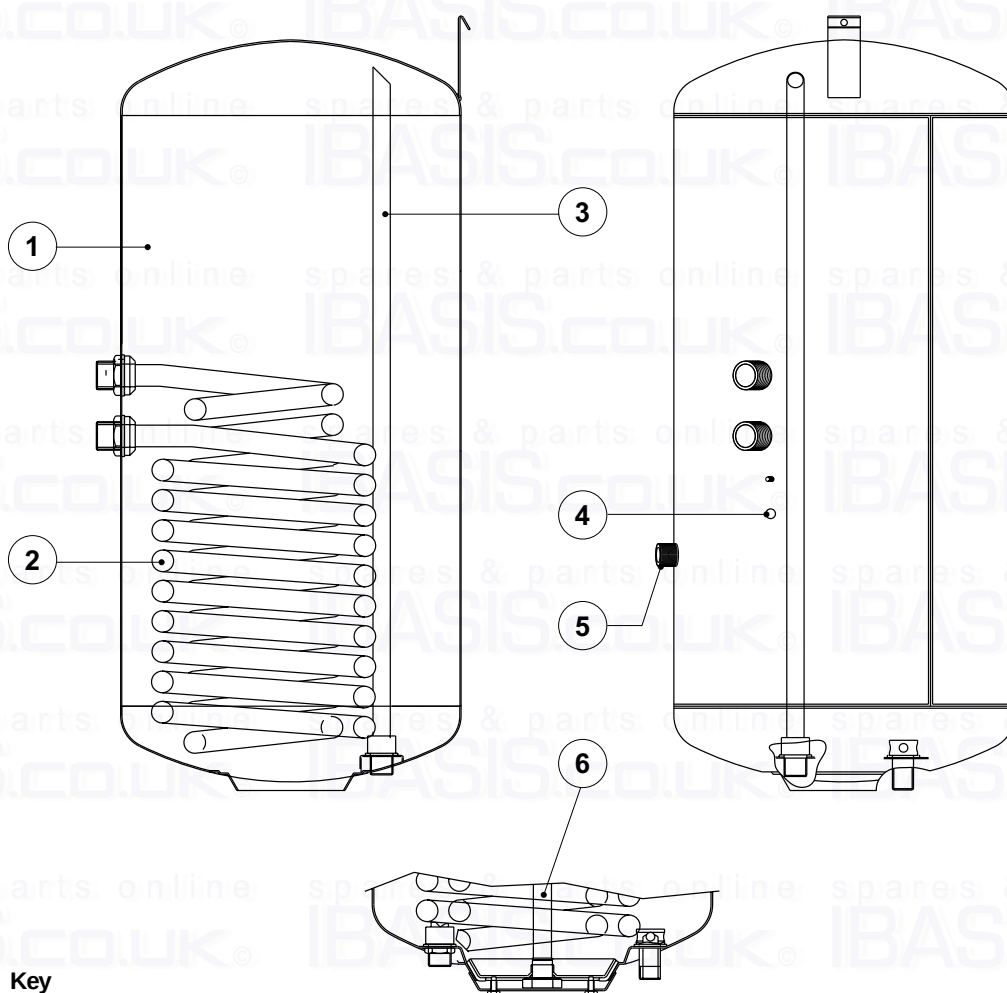
Key

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9	Tap water inlet	74	Heating system cock
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11	System return	82	Detection electrode
14	Safety valve	97	Magnesium anode
16	Fan	114	Water pressure switch
20	Burner assembly	130	Boiler circulator
29	Fume outlet manifold	151	Boiler drain cock
32	Heating circulator	155	Boiler temperature sensor
34	Heating temperature sensor	179	Check valve
36	Automatic air vent	187	Fume diaphragm
43	Air pressure switch	192	Recirculation
44	Gas valve	222	Copper exchanger

The tap water is supplied via an integrated boiler. It is heated indirectly by a coil in the boiler. The primary water circulates in the coil thanks to a pump and is kept at a temperature of 85°C by the heating sensor. When the temperature detected by the boiler sensor is 1°C lower than the set temperature, the heating pump stops and the tap-water pump starts up immediately. In this way, heating is turned off and the boiler exchanges with the closed circuit water that in its turn yields the heat to the tap water contained in the boiler.

Boiler

The boiler is made of stainless steel and may be of 55 litres (24 kW) or 65 litres (30 kW). It contains a coil (Aisi 316) whose purpose is to transfer the heat from the primary circuit to the tap-water circuit contained in the boiler. The cold tap-water inlet (with check valve) is located at bottom right of the boiler. Whereas hot tap water comes out on the left. Since the water is stratified inside the boiler according to its temperature, a priming pipe (PVC) is used to draw off the hotter water at the top of the boiler. At the bottom, again, there is a third connection whose job is to drain the boiler via a cock. The boiler's safety valve is located between this cock and the boiler (7 bar). This connection can be utilized if the tap-water system is a ring and therefore needs recirculation. In this case, it is necessary to install the drain cock with a T-junction. At the bottom of the boiler, near the coil inlet and outlet, there is an NTC sensor in contact (see the paragraph on sensors). The entire boiler is insulated with polystyrene. A 2-litre diaphragm expansion tank set to 2.5 bar is installed on the left-hand side. The boiler is flanged at the bottom to permit inspection. There is a magnesium anode on the flange.

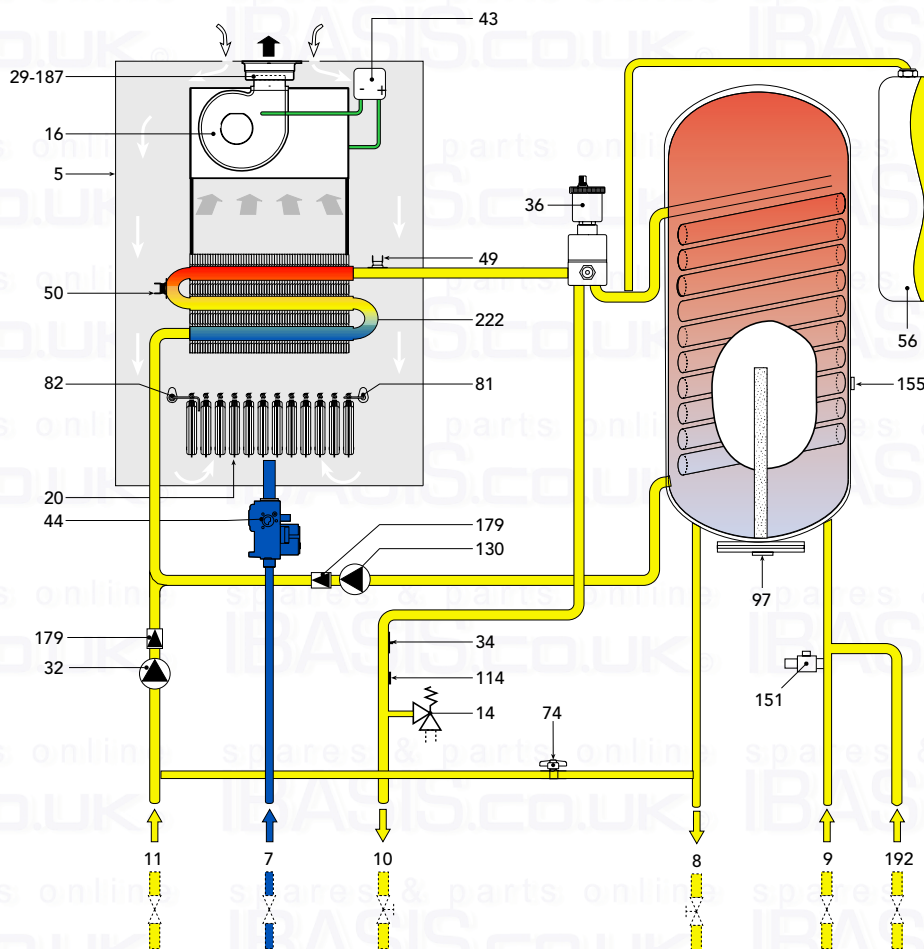


Key

- 1 Boiler
- 2 Coil
- 3 Priming pipe
- 4 NTC sensor
- 5 Expansion tank connection
- 6 Anode

2.3 Gas circuit

Gas circuit diagram

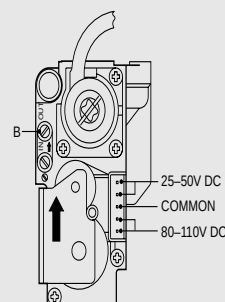


Key

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|----|----------------------------|-----|---------------------------|
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| 34 | Heating temperature sensor | 179 | Check valve |
| 36 | Automatic air vent | 187 | Fume diaphragm |
| 43 | Air pressure switch | 192 | Recirculation |
| 44 | Gas valve | 222 | Copper exchanger |

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 (X6-1/2/3/4) 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:

- Check there is gas, and that gas comes out of the valve by means of screw B.
- If there is no gas, you must check there is voltage at the operators. This makes it possible to understand whether the problem lies with the valve (there is voltage at the operators) or with the card (there is no voltage at the contacts X6-1/2/3/4).

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 of the second operator on the card (X6, 1/2). This is the most effective method in some situations. With this test, it is possible to understand whether the problem lies with the valve or with the card.

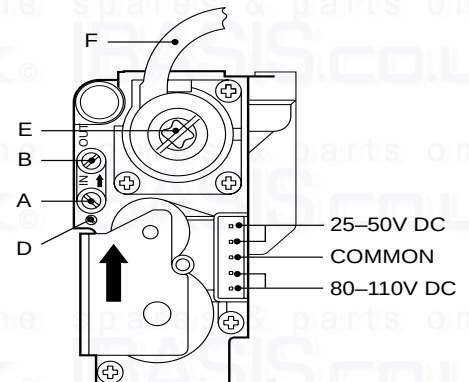
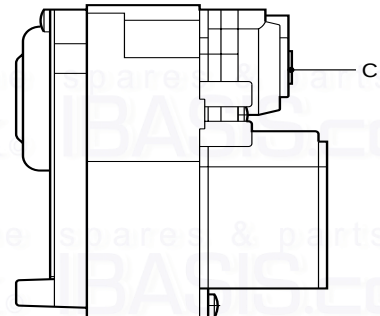


Note that with very low pressure upstream from the valve, opening the valve may be slow and the boiler could shut down due to failed ignition.

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".
- Set the potentiometer **P3** (on the control card) to minimum (clockwise).
- Run the boiler in heating mode.
- Adjust the minimum pressure with the screw "D", clockwise to decrease it and anticlockwise to increase it.
- Set the potentiometer **P3** to maximum (anticlockwise).
- Turn on the "TEST" function by temporarily bridging X5.
- 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.
- Disconnect the test jumper.

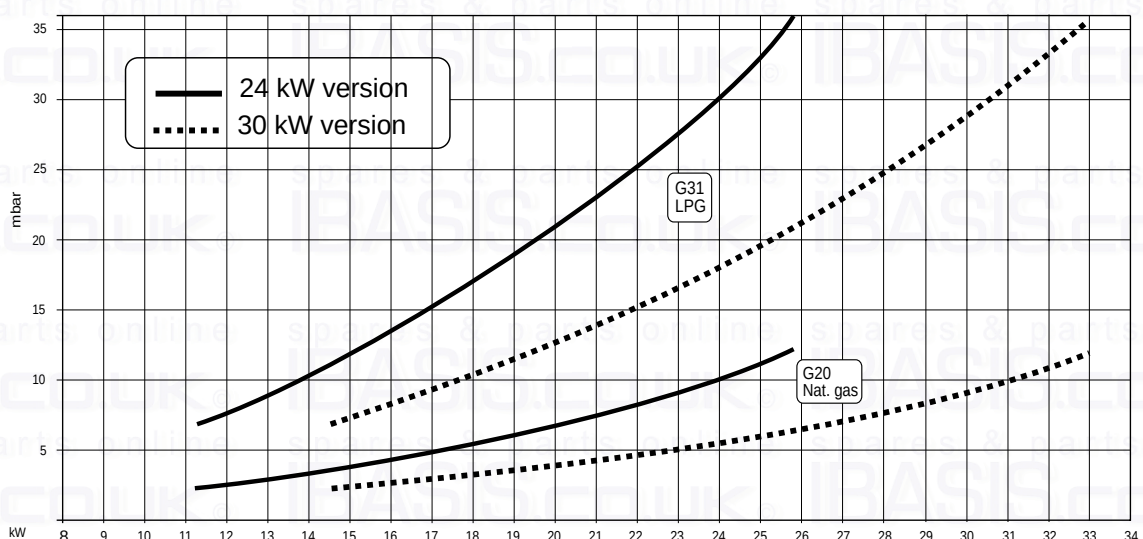


N.B. The test lasts 5 minutes.

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

Key

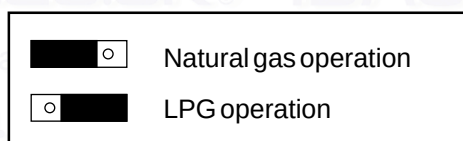
- A Pressure point upstream
- B Pressure point downstream
- C Protection screw
- D Minimum pressure adjustment screw
- E Maximum pressure adjustment screw
- F Pressure compensation tube



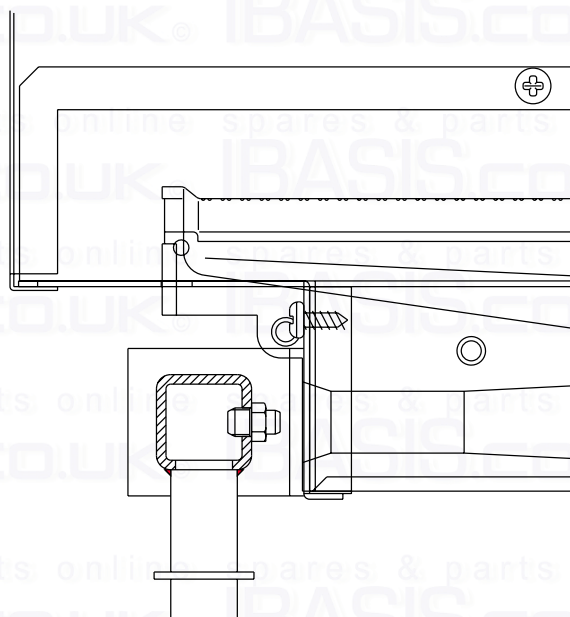
Gas supply conversion

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 Adjust the burner minimum and maximum pressures, setting the values given in the technical data chart for the type of gas used.
- 3 Move the jumper JP02 on the card, as shown in the diagram:



- 4 Apply the sticker, contained in the conversion kit, near the dataplate as proof of the conversion.



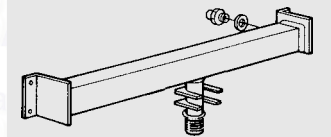
2.4 Burner unit

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

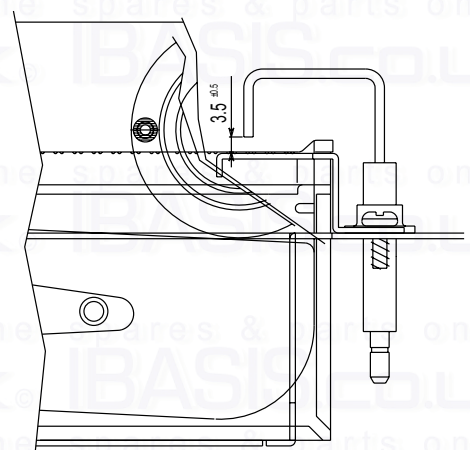
The ignition electrode is made of a metal alloy (Kanthal) that withstands high temperatures and oxidation. Its base is composed of a ceramic composite of glazed alumina whose purpose is to protect and electrically insulate it. Once the ignition procedure begins, the card powers the electrode with a pulsating 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.



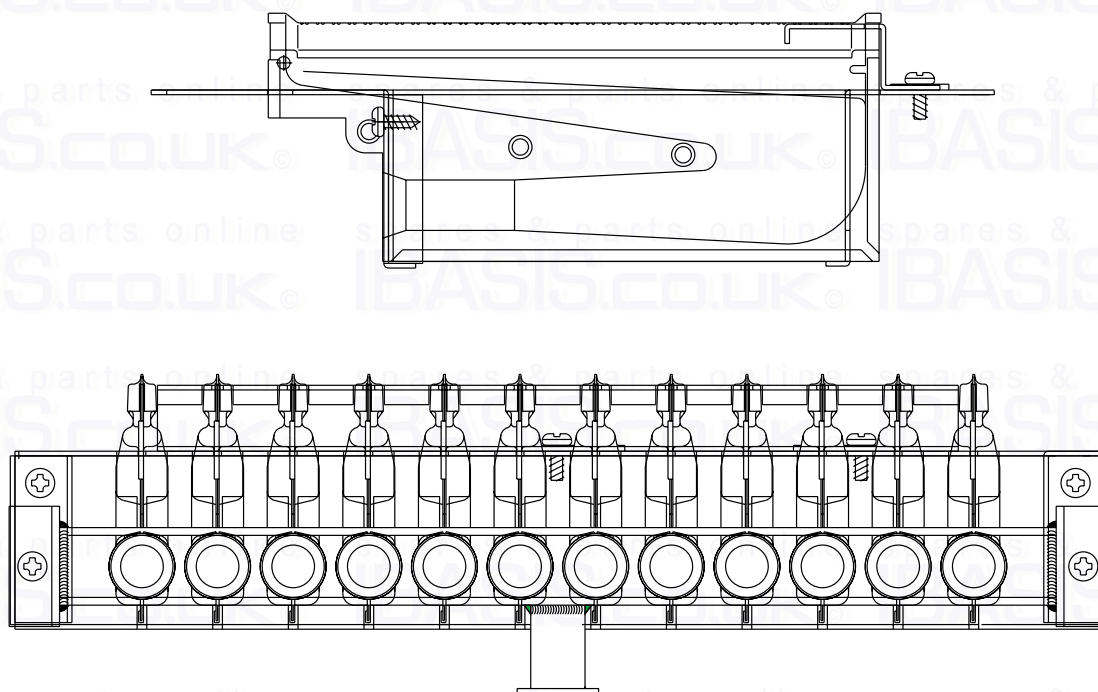
Detection electrode

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 $0.5 \mu\text{A}$ to detect a flame. A mean signal is normally obtained of approximately $2 \mu\text{A}$.



Burner assembly

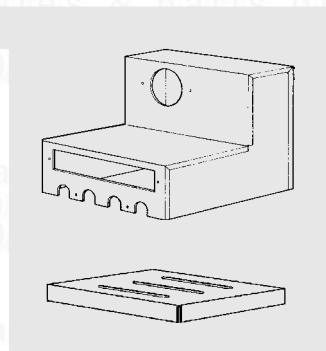
The burner assembly is composed of 12 or 16 burner stages. Each stage is composed of two pressed steel half bearings, with a suitably cut stainless steel head. Gas enters at the bottom of the stage. Thanks to the special Venturi-tube shape of the bottom portion of the stage, the gas "injected" by the 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.



2.5 Fume circuit

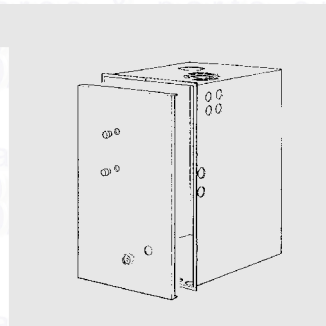
Fume deflector and manifold

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.



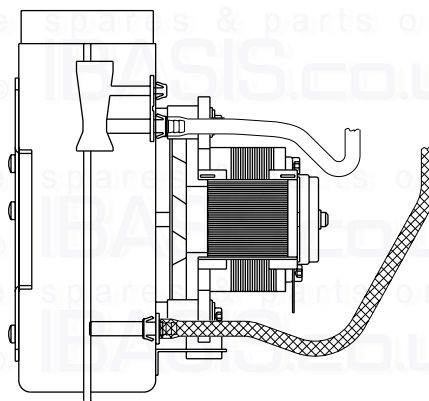
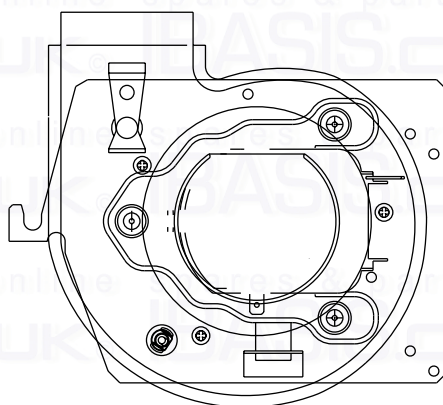
Airtight chamber

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 side or 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 (X6 - 7/8), 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.



Air pressure switch

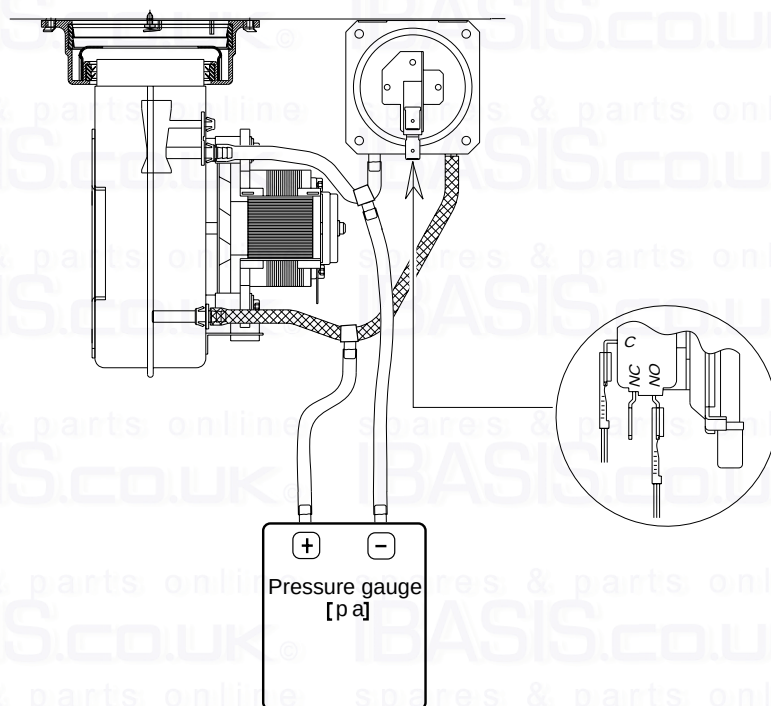
This is used to check whether the fumes are adequately evacuated. The pressure switch compares the static and dynamic signals coming from the pressure test points on the fan according to the figure. The pressure switch is connected to the card and is normally open (see diagram). Before the card initiates 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.



Key

- NO** = Normally open
NC = Closed
C = Common

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

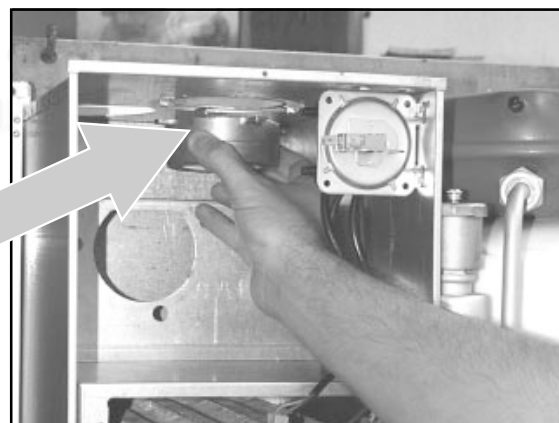
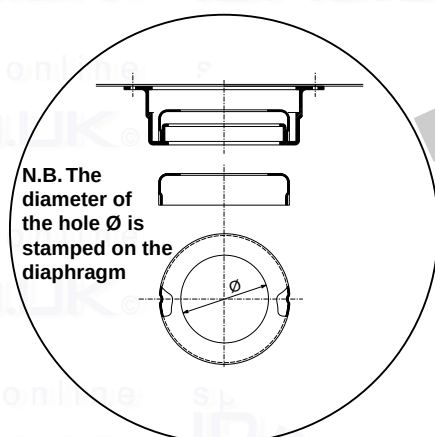
Type	Length up to:	Diaphragm to use	
		HF 24	HF 30
Coaxial 60/100	1 bend + 1 metre	50 mm	52 mm
	1 bend + 3 metres	No diaph	No diaph
Coaxial 80/125	1 bend + 3 metres	45 mm	50 mm
	1 bend + 4 metres	50 mm	No diaph
	1 bend + 5 metres	No diaph	No diaph

Choosing the diaphragm using separate pipes

Pipe length calculated in linear metres		Diaphragm to use	Pipe length calculated in linear metres		Diaphragm to use
Min	Max		Min	Max	
0 m	7 m	F 24	0 m	15 m	F 30
7 m	17 m	45 mm	15 m	30 m	47 mm
17 m	32 m	47 mm	30 m	40 m	50 mm
32 m	42 m	50 mm	40 m	45 m	52 mm
		No diaph.			No diaph.

Changing the diaphragm

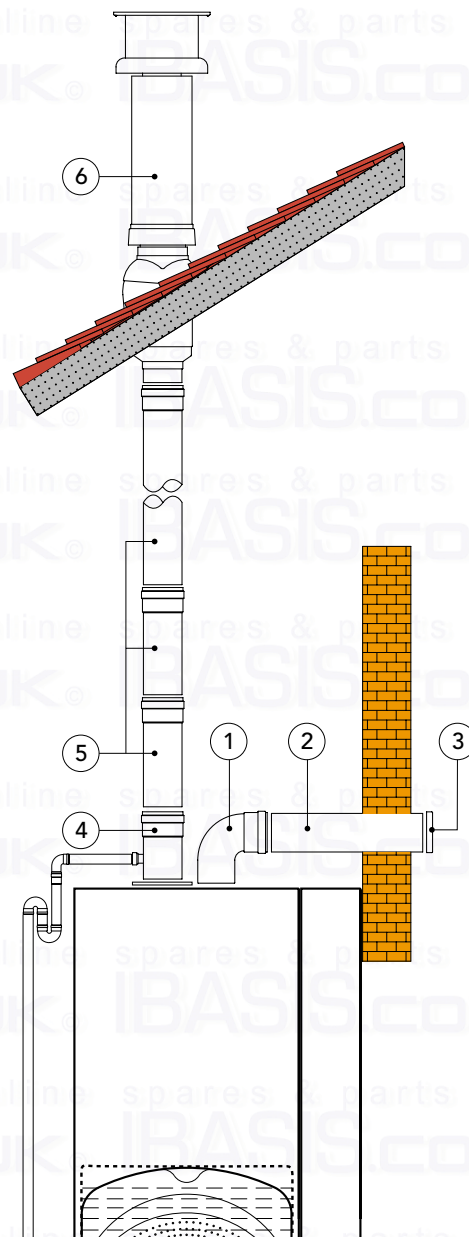
If inserting or changing a diaphragm, it is necessary to remove the fan assembly, take out the fume coupling 1 and insert the required diaphragm 2.



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.

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.



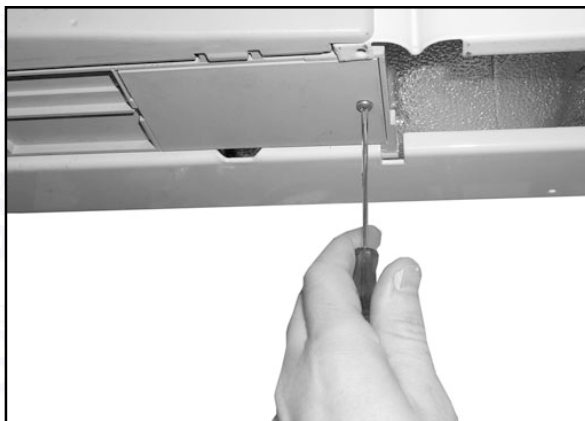
Ref.	No.Pieces	Description	Equivalent loss
1	1	Air bend 80	1.5 m
2	1	Horizontal air pipe 80	1.0 m
3	1	Windproof end piece	2.0 m
4	1	Condensate collection cup coupling	3.0 m
5	36	Vertical fume pipe 80	36.0 m
6	1	Outlet flue + coupling	4.0 m
Total			47.5 m

2.6 Electrical circuit

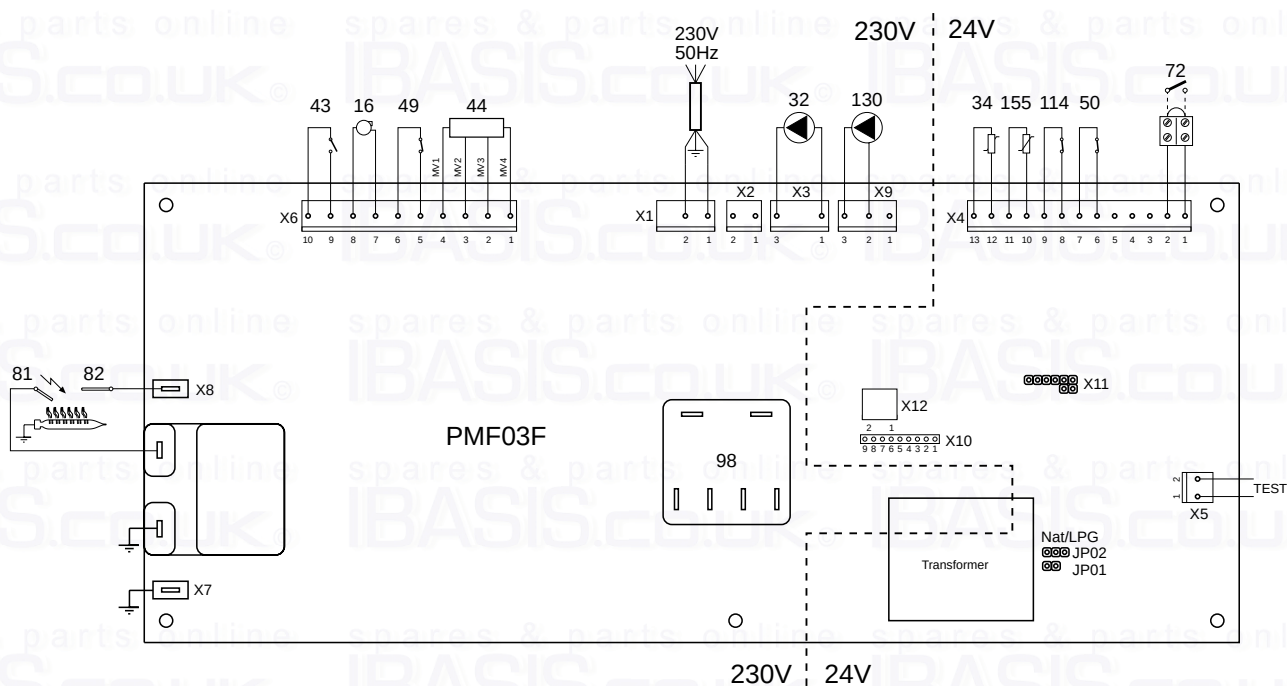
Electrical terminal board

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	72	Room thermostat (not supplied)
32	Heating circulator	81	Ignition electrode
34	Heating temperature sensor	82	Detection electrode
43	Air pressure switch	114	Water pressure switch
44	Gas valve	130	Tap water circulator
49	Safety thermostat	155	Boiler sensor
50	Heating thermostat		

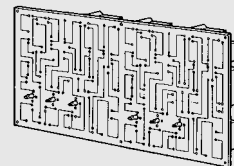
N.B. Respect the phase and neutral connections

Main electronic card

The electronic card is a Honeywell PMF03: part of the card works on low voltage (24V) and the remainder on 230V (see diagram) and it is fitted with a fuse (2A). Part of the card is used to control ignition, so it is hooked up to the detection and ignition electrodes and the safety thermostat. There are loads and controls common to the card that have already been described, such as:

- Pumps.
- Fan.
- Gasvalve.
- Air pressure switch.

There remain some components described hereunder.



Ignition + detection electrode, see chap. 2.4 Burner Unit

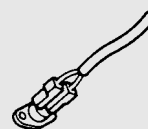
Safety thermostat

X6 - 5/6 has a thermostat with gold contacts that opens if the temperature exceeds 100°C. Connected directly to the ignition and main card, when it opens it cuts off the power supply to the valve directly, shutting down the boiler. It is located on the exchanger delivery pipe in a flat seat.



Limit thermostat

Connected on the main card X4 - 6/7, it is a thermostat with silver contacts that opens if the temperature exceeds 88°C. It requires no manual resetting and closes the contacts again if the temperature falls under 70°C. It is located on a bend in the exchanger pipe in a flat seat.



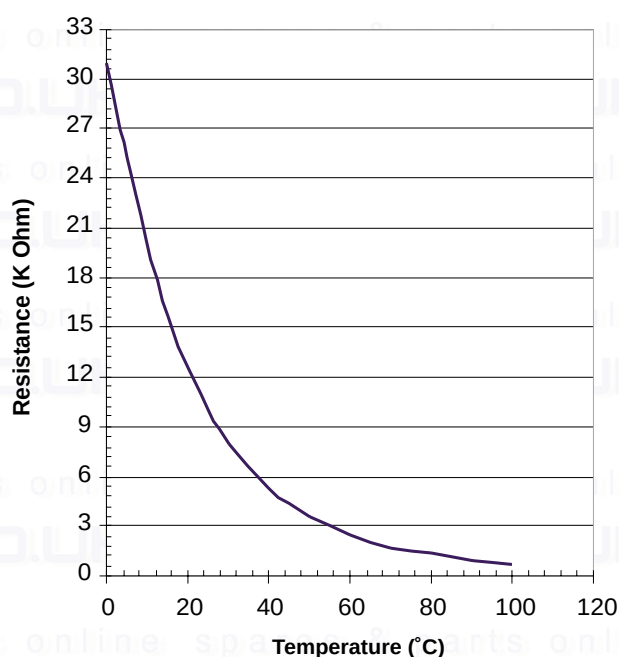
Heating and tap water temperature probe

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.



NTC sensor

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



3. OPERATION

3.1 Operating principle

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 hot tap water is called for 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 primary circuit circulator starts up to heat the boiler. The boiler detects the tap-water temperature via the NTC sensor. The call for tap water is active when the boiler tap-water temperature measured by the sensor is at least 1°C lower than the temperature set on the potentiometer "C" of the control panel. The call ends when the boiler temperature exceeds the temperature set on the panel by 1 or 2°C.

Test function

Bridging the terminals of connector X5 turns on "Test" operation. In this mode the boiler works as in heating mode, but tap water operation, idle time and modulation are turned off. The test lasts 5 minutes.

Heating post-circulation

After the call for heating, the circulator performs "post-circulation" for approximately 6 minutes to prevent thermal inertia and balance the system boiler temperature.

Boiler post-circulation

After the call for tap water, the boiler circulator stays in operation for another 2 minutes to prevent thermal inertia and deliver the heat of the exchanger to the tap water. At the end of the two minutes, the boiler can start heating immediately if this is called for.

Circulator anti-locking

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

Gradual starting on heating (gradual increase in heating temperature)

The time to reach the maximum heating temperature is 5 minutes.

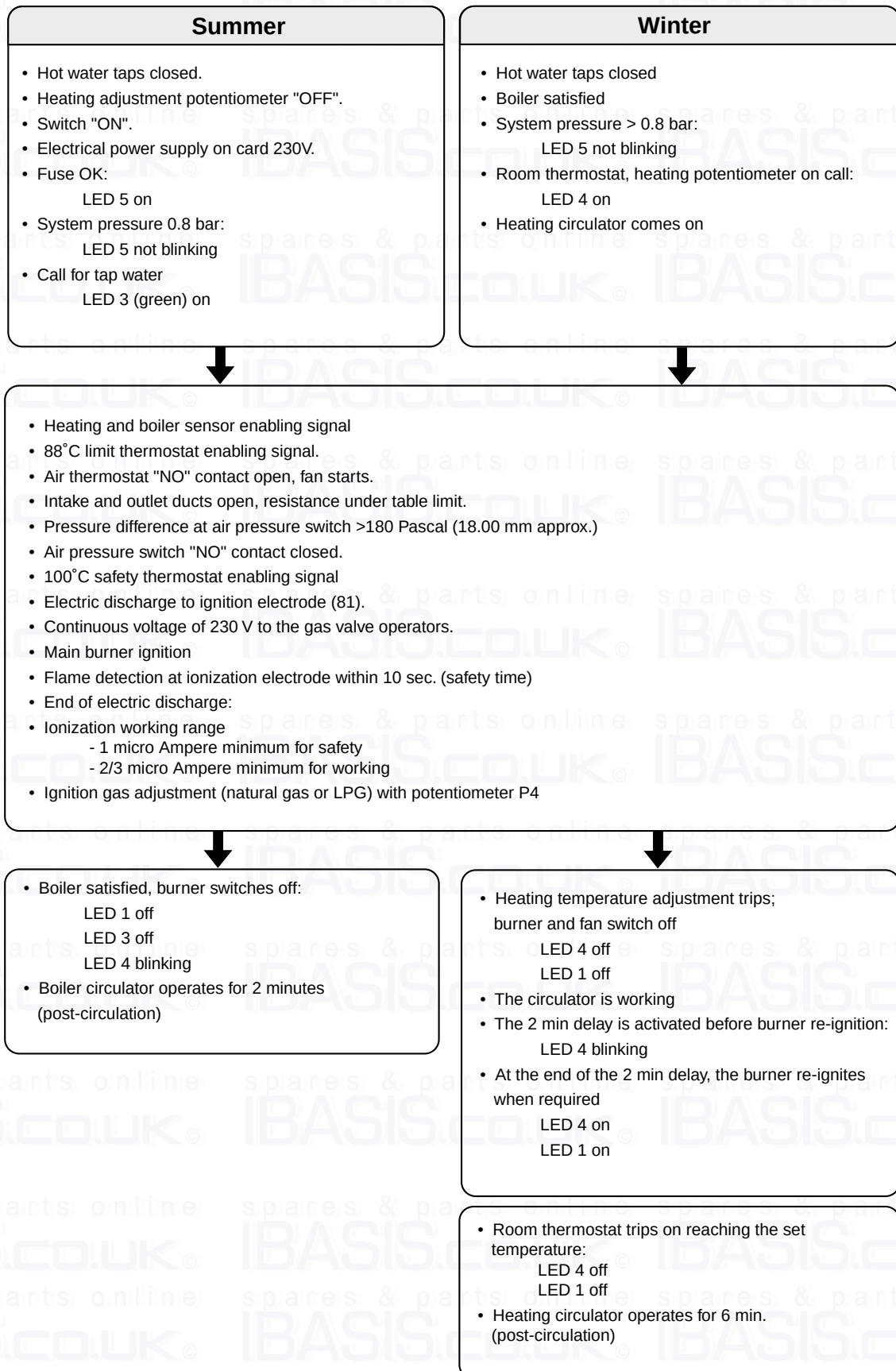
Limit thermostat

The 88°C limit thermostat coming on causes the burner to switch off momentarily via the ignition unit and the heating circulator to start up.

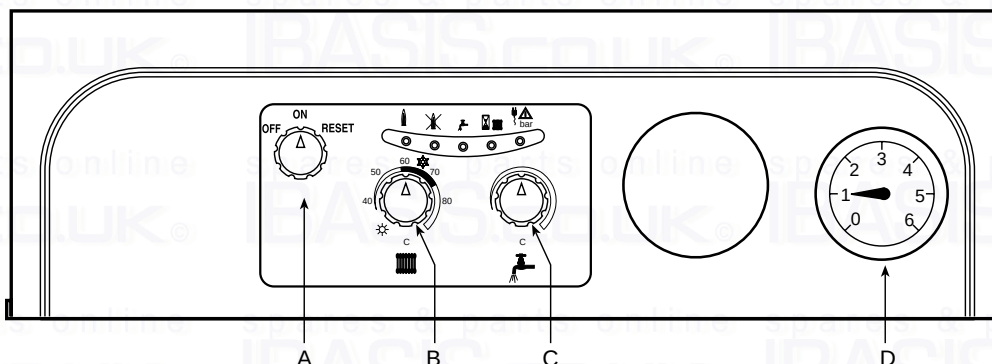
Antifreeze protection

The antifreeze function is turned on by the heating temperature sensor when the temperature falls under 5°C. In this phase, both the burner and the circulator start working. When the temperature reaches 15°C, the burner switches off while the circulator keeps on working for another 6 minutes.

3.2 Operating diagram



3.3 Control panel



LED		ITEM	DESCRIPTION
1		A	OFF/ON/RESET switch
2		B	Heating temperature setting
3		C	Hot water temperature setting
4			
			
5		D	Water gauge
			

3.4 Adjustments

Room temperature adjustment (with room thermostat on)

Using the room thermostat or remote control, 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 room thermostat is not installed the boiler will keep the system at the set system delivery setpoint temperature.

System temperature adjustment

With knob "B" on the control panel we can set the required system temperature. To prevent localized condensation on the fume circuit, we recommend a minimum temperature of 60°C.

Hot water temperature adjustment

With knob "C" on the control panel we can set the tap water temperature from 10°C to 65°C (of the boiler).

Summer/Winter selection

Setting the adjustment potentiometer "B" to minimum (☼), the boiler works on "Summer".

Adjusting the heating Δt by changing the circulator delivery-head

The temperature difference Δt (difference between the system delivery and return heating water temperatures) must be under 20°C and is obtained by changing the circulator delivery-head with its variable speed device (or switch).

3.5 Operating parameter adjustment

Boiler parameter adjustment

- P1** Temperature adjustment potentiometer.
Controls the heating delivery temperature from 30°C to 85°C.
The minimum position selects "Summer" operation.
- P2** Hot tap water adjustment potentiometer.
Controls the hot tap water temperature from 10°C to 65°C.
- P3** Heating capacity adjustment potentiometer.
- P4** Potentiometer to adjust the burner gas pressure in the ignition phase.
The maximum ignition time is 10 sec.
The ignition curve should be regulated taking account of the type of burner and fuel used (natural gas or LPG).
- P5** Minimum pressure adjustment potentiometer.
The potentiometer P5 is to be used if it is necessary to adjust the minimum current to the second coil of the gas valve.
This adjustment makes it possible to increase the gas valve minimum opening pressure electrically. The potentiometer P5 is used when the mechanical minimum of the gas valve does not enable adequate adjustment.

Jumper operation

Jumper JP01: For boiler and tap water

JP01	Inserted	Not contemplated
	Not inserted	Two-pump system

The boilers are made with JP01 not inserted

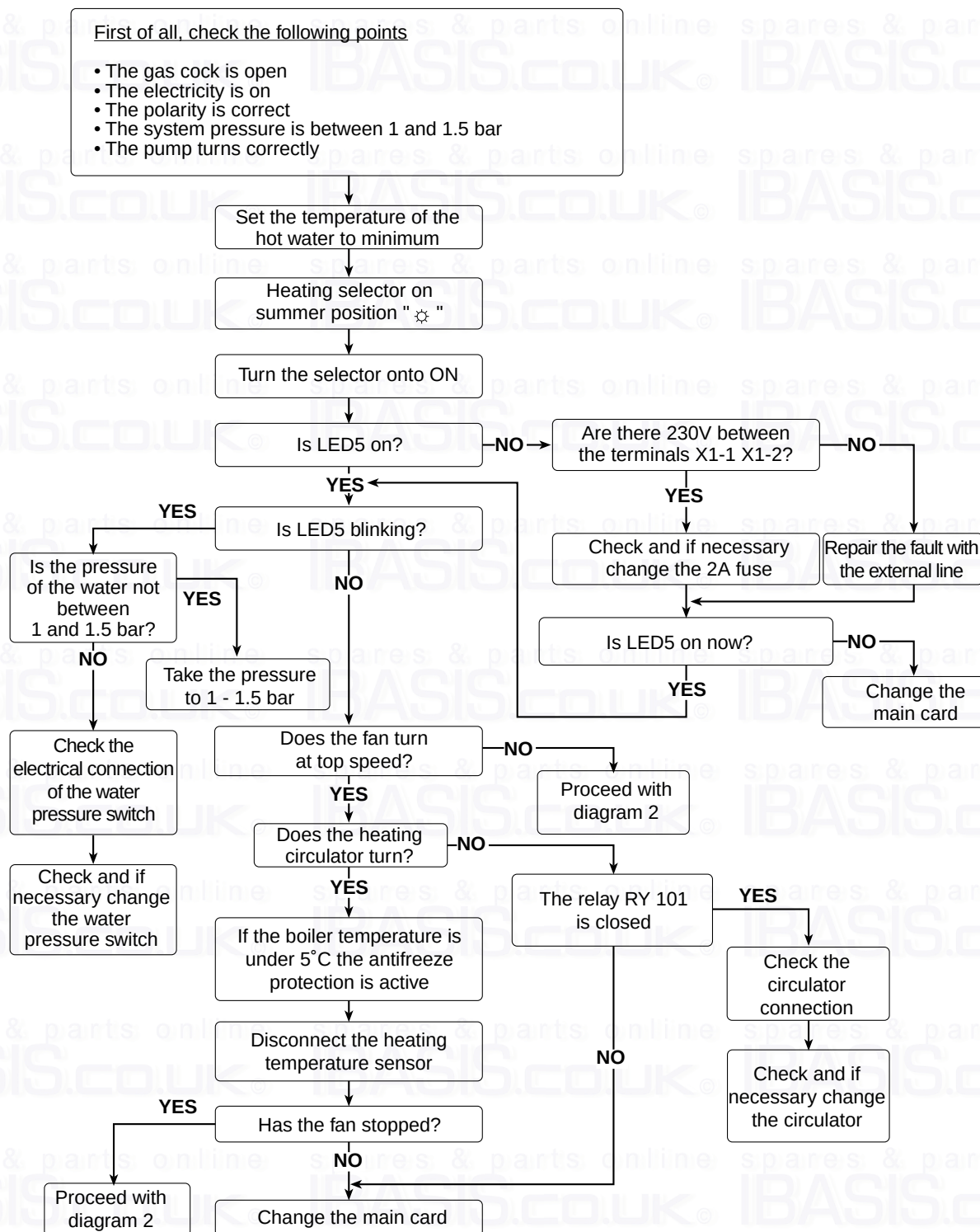
Jumper JP02: Boiler operation with natural gas or LPG

JP02	Inserted 	Natural gas operation
	Not inserted 	LPG operation

4. Troubleshooting

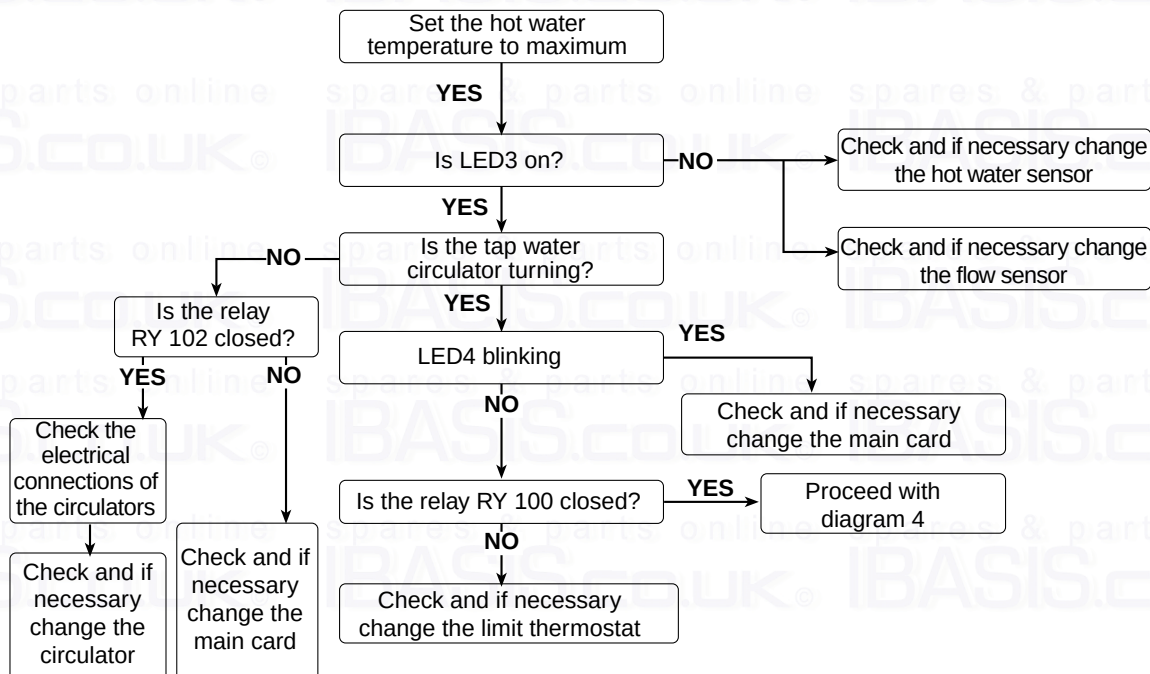
Flow Diagram 1

Checking Electric Power Supply - System Pressure and Antifreeze Protection



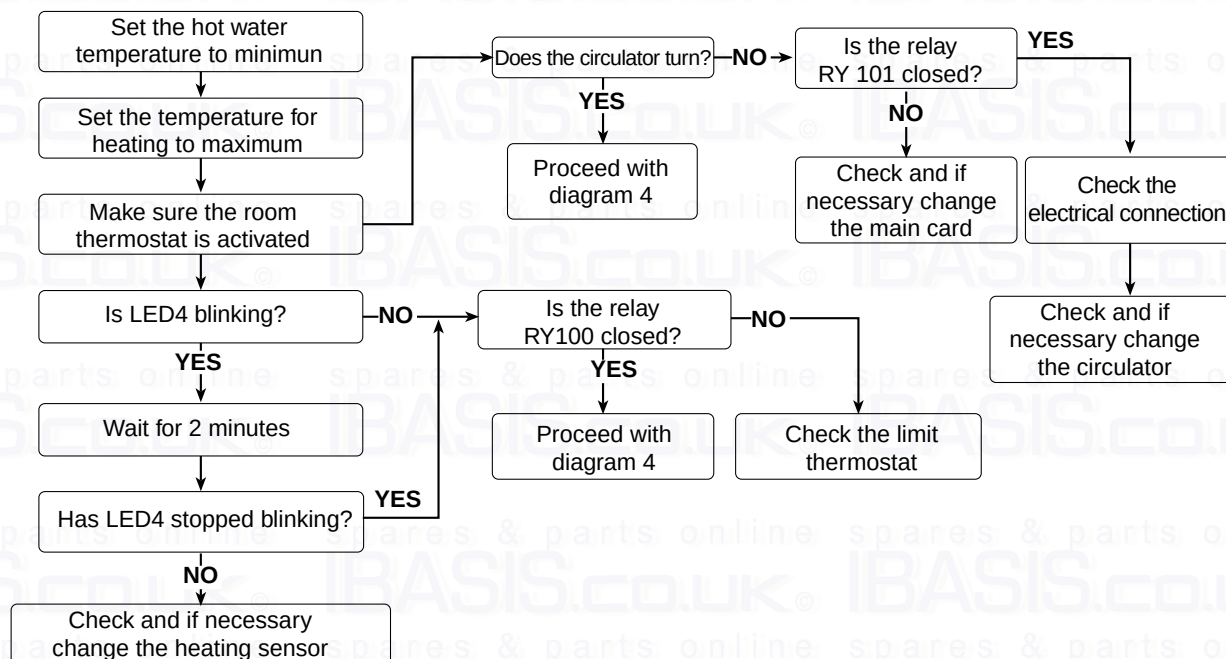
Flow Diagram 2

Checking Hot Water Operation



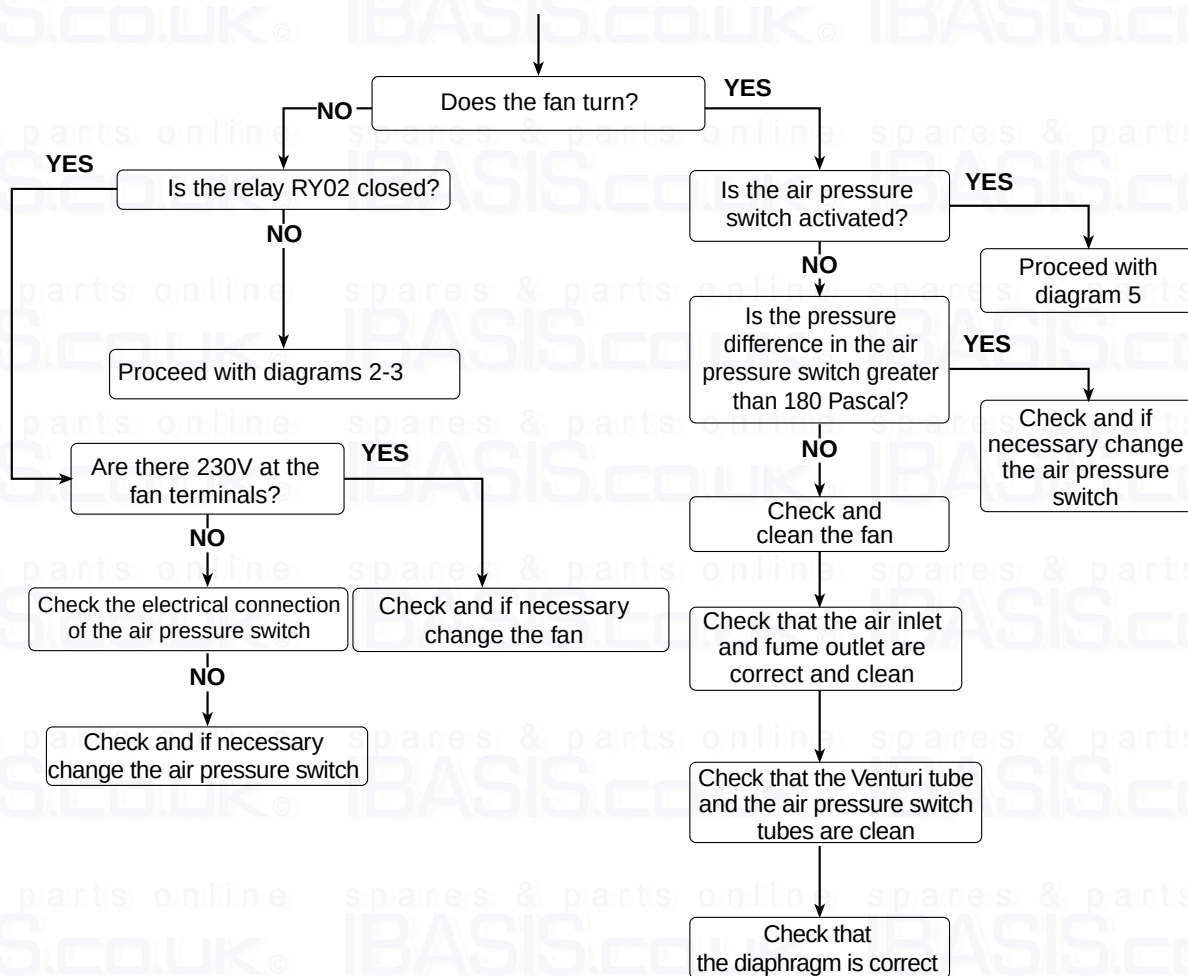
Flow Diagram 3

Checking Heating Operation



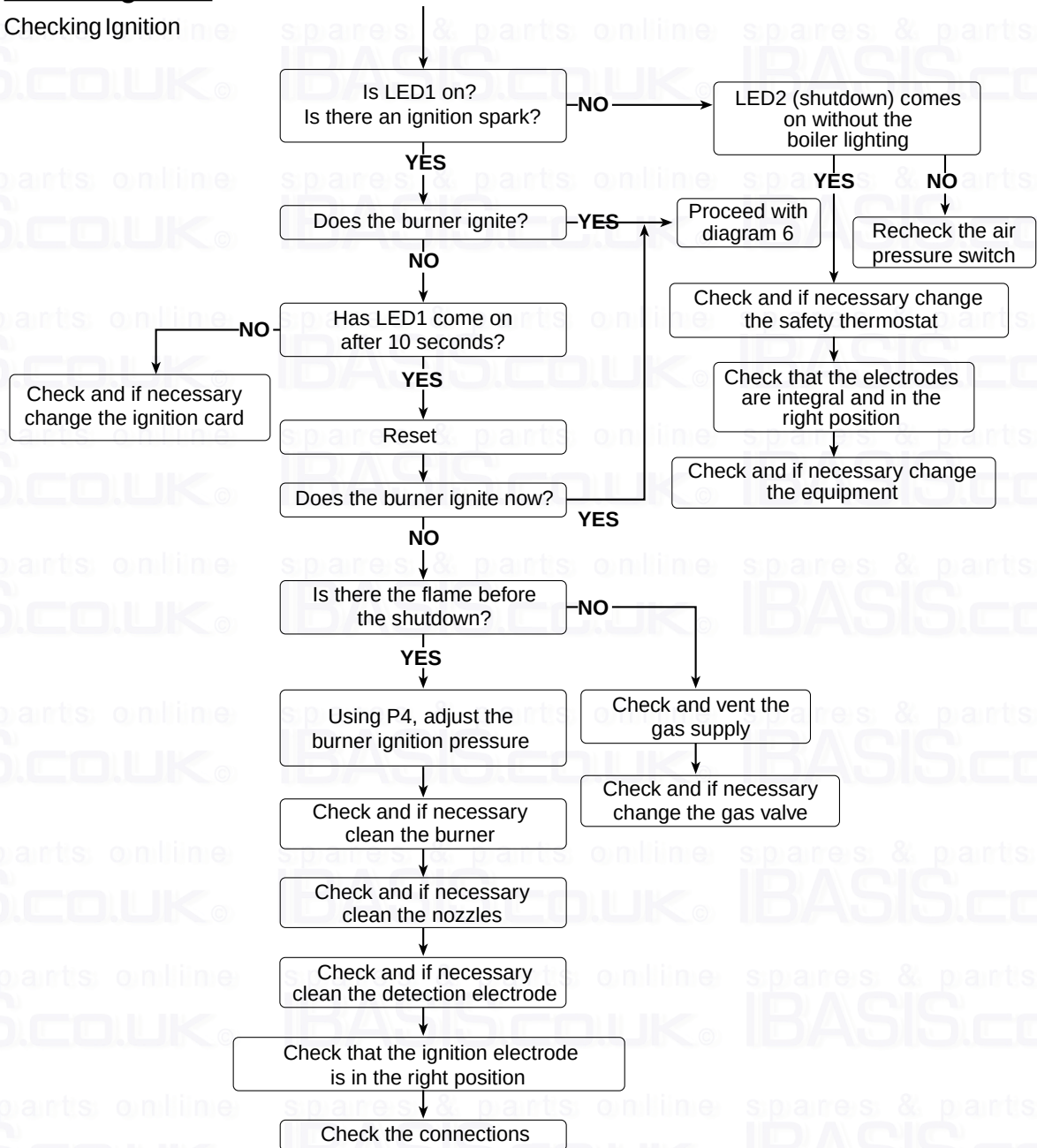
Flow Diagram 4

Checking Fan/Fume Circuit



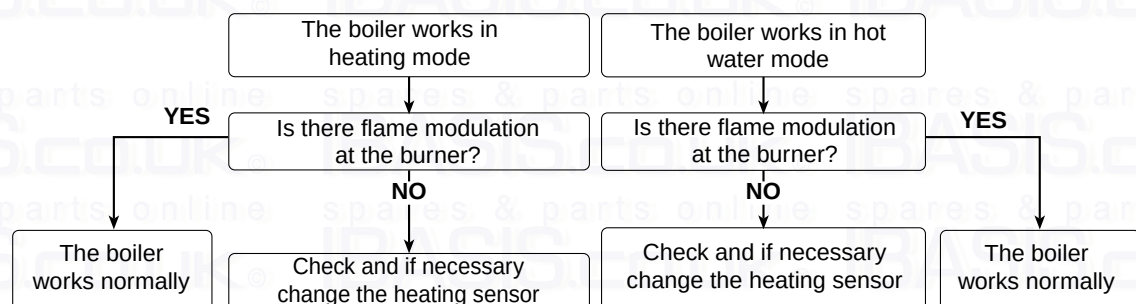
Flow Diagram 5

Checking Ignition



Flow Diagram 6

Check the Modulation of the Hot Water and Heating



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tel. 045/6139411 - tlx 480172

fax 045/6100233-6100933

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