

Fuel oil/gas boilers

# PK 450





## Installation and Service Manual

# Declaration of conformity CE

The appliance complies with the standard model described in declaration of compliance **CE**. It is manufactured and distributed pursuant to the requirements of european directives.

The original declaration of conformity is available from the manufacturer.

<b>DÉCLARATION DE CONFORMITÉ CE</b> <b>EG - VERKLARING VAN OVEREENSTEMMING</b> <b>EC - DECLARATION OF CONFORMITY</b> <b>EG - KONFORMITÄTSEKTLÄRUNG</b>		
Fabricant/Manufacturer/Hersteller/Fabrikant		: OERTLI THERMIQUE
Adresse/Adress/Adress		: Z.I Vieux-Thann - 2 avenue Josué Heilmann
Ville, pays Stad, Land/City, Country/Land, Ort		: F-68801 THANN Cedex
déclare ici que les produit(s) suivant(s)		: PK. 450 -
verklaart hiermede dat de toestel(len)		: 8, 9, 10, 11, 12, 13, 14 éléments
this is to declare that the following product(s) erklärt hiermit das die Produk(te)		
Mise en circulation par		: voir fin de notice
répond/répondent aux directives CEE suivantes: voldoet/voldoen aan de bepalingen van de onderstaande EEG-richtlijnen: is/are in conformity with the following EEC-directives: den Bestimmungen der nachfolgenden EG-Richtlinien entspricht/entsprechen:		
CEE-Directive:	92/42/CEE	normes appliquées, toegepaste normen:
EEG-Richtlijn:	92/42/EEG	tested and examined to the following norms:
EEC-Directive:	92/42/EEC	verwendete Normen:
EG-Richtlinie:	92/42/EWG	EN 303.2(1999), EN 304(1993)
	90/396/CEE	EN 303.3(1999)
	90/396/EEG	
	90/396/EEC	
	90/396/EWG	
	73/23/CEE	DIN EN 50165(2001) EN 50165 (1997+A1:2001)
	73/23/EEG	DIN EN 60335-1(2003), EN 60335-1(2002)
	73/23/EEC	
	73/23/EWG	
	89/336/CEE	EN 55014-1(2000+A1:2001)
	89/336/EEG	EN 55014-2(1997+A1:2001)
	89/336/EEC	EN 61000-3-2(2000),
	89/336/EWG	EN 61000-3-3(1995+A1:2001)
		EN55022 classe B (1998+A1 :2000)
	97/23/CEE	(art.3 section 3)
	97/23/EEG	(art. 3, lid 3)
	97/23/EEC	(article 3, sub 3)
	97/23/EWG	(Art. 3, Absatz 3)
 Wim HARBERS		Mertzwiller, 25 février 2009
Directeur des Opérations et de la Recherche et du Développement		

  
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# 1 Safety instructions


## Danger


This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

 Any operation on the installation must be performed by a qualified technician respecting professional regulations and in accordance with this document.


 Before any work, switch off the mains supply to the appliance. Protect the installation against any unwanted restarts.


 For a proper operating of the boiler, follow carefully the instructions.


 The manufacturer is not liable for any improper use of the appliance or failure to maintain or install the unit correctly (the user shall take care to ensure that the system is installed by a qualified engineer).


 Work on electrical equipment must be carried out by a qualified professional in compliance with the prevailing regulations.

 Check that the appliance is properly set for the type of gas used.

 Keep to the polarity shown on the terminals: phase (L), neutral (N) and earth  $\perp$ .


 Check the seal on the gas and water pipe connections.

 We shall not accept any responsibility for any damage and disturbance arising from not following these instructions.


 Incorrect use or unauthorised modifications to the installation or the equipment itself invalidate any right to claim.

## 1.1 General safety instructions

### 1.1.1 Fire hazard

 Do not stock products of an inflammable nature close to the appliance.

### 1.1.2 Risk of intoxication

 Do not obstruct the air inlets in the room (even partially).

 If you smell flue gases

1. Switch the appliance off
2. Open the windows
3. Evacuate the premises
4. Contact a qualified professional


### 1.1.3 Risk of being burnt

 Depending on the settings of the appliance:

- The temperature of the flue gas conduits may exceed 60°C

- The temperature of the radiators may reach 95°C
- The temperature of the domestic hot water may reach 65°C









### 1.1.4 Risk of damage

 Do not stock chloride or fluoride compounds close to the appliance.

 Install the appliance in frost-free premises.

Do not neglect to service the appliance: Contact a qualified professional or take out a maintenance contract for the annual servicing of the appliance.

## 1.2 Recommendations

-  For a proper operating of the boiler, follow carefully the instructions.
-  Any intervention on the appliance and heating equipment must be carried out by a qualified engineer.
-  The manufacturer is not liable for any improper use of the appliance or failure to maintain or install the unit correctly (the user shall take care to ensure that the system is installed by a qualified engineer).
-  Work on electrical equipment must be carried out by a qualified professional in compliance with the prevailing regulations.
-  Check that the appliance is properly set for the type of gas used.
-  Keep to the polarity shown on the terminals: phase (L), neutral (N) and earth  $\frac{\perp}{\text{—}}$ .
-  Check the seal on the gas and water pipe connections.
-  We shall not accept any responsibility for any damage and disturbance arising from not following these instructions.

## 1.3 Liabilities

### 1.3.1 Manufacturer's liability

Our products are manufactured in compliance with the requirements of the various applicable European Directives. They are therefore delivered with **CE** marking and all relevant documentation. In the interest of customers, we are continuously endeavouring to make improvements in product quality. All the specifications stated in this document are therefore subject to change without notice.

Our liability as the manufacturer may not be invoked in the following cases:

- Failure to abide by the instructions on installing the appliance
- Failure to abide by the instructions on using the appliance
- Faulty or insufficient maintenance of the appliance

### 1.3.2 Installer's liability

The installer is responsible for the installation and commissioning of the appliance. The installer is required to observe the following instructions:


- Read and follow the instructions given in the manuals provided with the appliance
- Install the appliance in accordance with the legislation and standards currently in force
- Perform the initial start up and carry out any checks necessary
- Explain the installation to the user
- If a maintenance is necessary, warn the user of the obligation to check the appliance and maintain it in good working order
- Give all the instruction manuals to the user


## 2 About this manual


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### 2.1 Symbols used in the manual

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 **Caution danger**  
Risk of injury and damage to equipment. Attention must be paid to the warnings on safety of persons and equipment.

 **Reference**  
Refer to another manual or other pages in this instruction manual.

 **Specific information**  
Information must be kept in mind to maintain comfort.

### 2.2 Abbreviations

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- ▶ **DHW:** Domestic hot water.
  - ▶ **PPS:** Polypropylene hardly inflammable.
  - ▶ **3CE:** Collective conduit for sealed boiler
- Hi:** Lower heating value LHV (Nett)  
**Hs:** Higher heating value HHV (Gross)

### 2.3 Homologations

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#### 2.3.1 Certifications

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**CE identification no: 1312 AQ 951 (Base):**  
France, Germany, Austria, Belgium, Spain, Italy, Luxemburg, Poland, Portugal, Czech Republic, Slovenia, Switzerland.

**CE identification no: 1312 AQ 952 (Export):**  
Algeria, Bulgaria, China, Finland, Greece, Ireland, Jordan, Lebanon, Morocco, Norway, Romania, Russia, Syria, Tunisia, Turkey.

#### 2.3.2 Directive 97/23/EC

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Gas and oil boilers with a maximum operating temperature of 110°C and hot water tanks with a maximum operating pressure of 10 bar pertain to article 3.3 of the directive, and therefore, cannot be CE-marked to certify compliance with the directive 97/23 EC.

The boilers and hot water tanks are designed and manufactured in accordance with the sound engineering practice, as requested in article 3.3 of the directive 97/23/EC, it is certified by compliance with the directives 90/396/EC, 92/42/EC, 2006/95/EC and 2004/108/EC.

## 3 Technical description

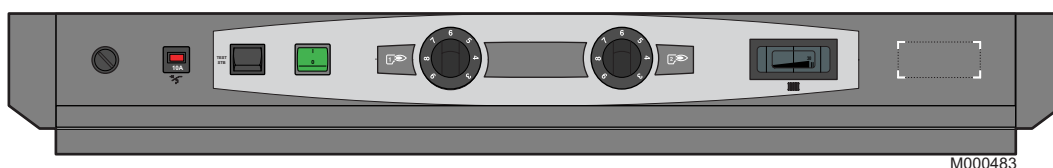
### 3.1 General description

The boilers of the PK 450 range are pressurised hot water boilers designed for connecting to a flue pipe which require a separate automatic fuel-oil or gas burner. PK 450 boilers have the following characteristics:

- Heating body in cast iron.
- **S3** or **R** control panel.
- Production of domestic hot water can be ensured by a separate hot water calorifier.

### 3.2 Composition of the range

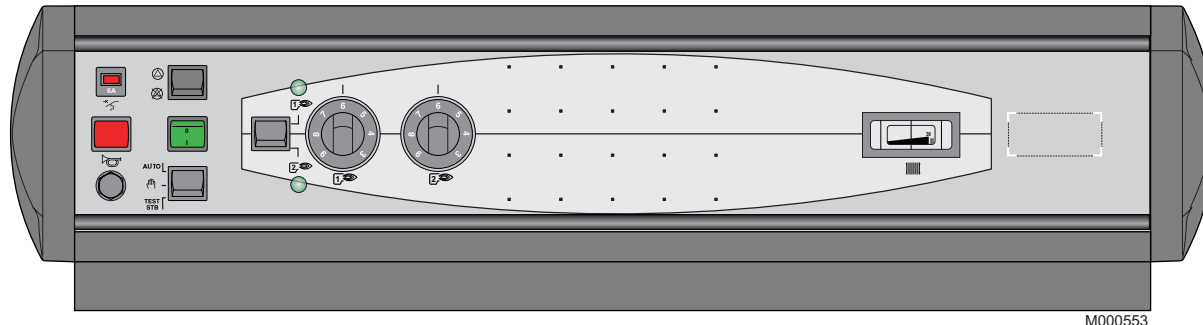
#### 3.2.1 PKX 450: Boiler with standard X control panel



Panel comprising the settings, control and safety devices allowing the boiler to operate autonomously, without regulation.

The standard panel is used to connect the boiler to the boiler room control cabinet. This cabinet can be fitted with control units.

#### 3.2.2 PKR 450: Boiler with R control panel



The control panel enables the operation of a boiler fitted with a 1 stage, 2 stage or modulating burner.

Control system based on outside temperature if a regulator has been installed (see options).

### 3.3 Operating principle

Boiler with X control panel:

The operation is controlled by the boiler thermostat or by the control system located in a cabinet, according to the heating request.

Boiler with R control panel:

If the boiler is fitted with a REA control unit, the boiler temperature is modulated by the regulator, which controls the burner and the motorised mixing valves depending upon the outside temperature.

For boilers which are not equipped with a REA regulator, either a room thermostat: The operation is controlled by the boiler thermostat, according to the heating request.

## 3.4 Technical specifications

### 3.4.1 Boilers for following countries: France, Belgium, Spain, Estonia, Luxemburg, Poland, Portugal, Czech Republic

**Conditions of use:**

Maximum operating temperature: 100 °C

Maximum operating pressure: 6 bar


Thermostat adjustable from 30 to 90°C


Safety thermostat: 110 °C

**Test conditions:**
CO<sub>2</sub> Fuel oil = 13%CO<sub>2</sub> Natural gas = 9.5%

Ambient temperature: 20 °C

Boiler			PK 450-8	PK 450-9	PK 450-10	PK 450-11	PK 450-12	PK 450-13	PK 450-14
Useful output	kW		250-310	310-370	370-430	430-495	495-570	570-645	645-700
Power input	kW		269-337	333-401	400-469	463-537	534-619	615-703	697-763
Number of sections			8	9	10	11	12	13	14
Water content	l		366	409	452	495	538	581	624
Water resistance	Δ T = 10K	mbar	19	32	51	69	94	126	156
	Δ T = 15K		9	15	23	31	42	56	70
	Δ T = 20K		5	8	13	17	24	32	39
Pressure in the furnace for nozzle pressure = 0	mbar		0.57	0.73	0.96	1.2	1.57	2.0	2.5
Smoke temperature <sup>(1) (3)</sup>	°C		200	200	200	200	200	200	200
Mass flue gas flow rate <sup>(1) (2)</sup>	Fuel oil	Kg/h	516	615	716	823	947	1071	1163
	Gas		568	677	789	906	1043	1180	1280
Combustion chamber	Diameter, combustion chamber	mm	530	530	530	530	530	530	530
	Width, combustion chamber	mm	638	638	638	638	638	638	638
	Depth, combustion chamber	mm	1183	1343	1503	1663	1823	1983	2143
	Volume	m <sup>3</sup>	0.310	0.354	0.396	0.439	0.481	0.523	0.565
Stand-by losses <sup>(4)</sup>	Δ T = 50K	W	580	600	640	740	780	870	870
Net weight	kg		1802	2072	2238	2454	2638	2880	3057

 **In order for the boiler to operate correctly, it is imperative to respect the draught at the nozzle.**

 1 mbar = 10 mmWG = 10 daPa

- (1) Nominal operation (top boiler power).
- (2) CO<sub>2</sub> = 13% on fuel oil and 9.5% on natural gas.
- (3) Boiler temperature: 80 °C.  
Ambient temperature: 20 °C.
- (4) Stand-by losses in accordance with prevailing standard (EN 303/304).



### 3.4.2 Boilers for following countries: Germany, Austria, Serbia, Slovenia

**Conditions of use:**

Maximum operating temperature: 100 °C

Maximum operating pressure: 6 bar

Thermostat adjustable from 30 to 90°C

Safety thermostat: 110 °C

**Test conditions:**
CO<sub>2</sub> Fuel oil = 13%CO<sub>2</sub> Natural gas = 9.5%

Ambient temperature: 20 °C

Boiler		PK 450-8	PK 450-9	PK 450-10	PK 450-11	PK 450-12	PK 450-13	PK 450-14
Useful output	kW	220-265	265-315	315-365	365-425	425-485	485-550	550-615
Power input	kW	238-288	286-342	339-395	392-459	457-527	522-595	591-663
Number of sections		8	9	10	11	12	13	14
Water content	l	366	409	452	495	538	581	624
Water resistance	Δ T = 10K	14	24	37	51	68	92	121
	Δ T = 20K	4	6	9	13	17	23	30
Pressure in the furnace for nozzle pressure = 0	mbar	0.4	0.55	0.68	0.9	1.1	1.5	1.8
Smoke temperature <sup>(1) (3)</sup>	°C	180	180	180	180	180	180	180
Mass flue gas flow rate <sup>(1) (2)</sup>	Fuel oil	450	530	610	710	810	910	1020
	Gas	470	555	640	745	850	955	1070
Combustion chamber	Diameter, combustion chamber	530	530	530	530	530	530	530
	Width, combustion chamber	638	638	638	638	638	638	638
	Depth, combustion chamber	1183	1343	1503	1663	1823	1983	2143
	Volume	m <sup>3</sup>	0.310	0.354	0.396	0.439	0.481	0.523
Maintenance consumption* <sup>(3)</sup>	Δ T = 50K	0.17	0.15	0.14	0.12	0.11	0.11	0.10
Net weight	kg	1802	2072	2238	2454	2638	2880	3057

\*Maintenance consumption: total heat emission when the burner is off as a percentage of the nominal input power when the difference between the mean boiler temperature and the room temperature is 50K.


**i** 1 mbar = 10 mmWG = 10 daPa

**!** In order for the boiler to operate correctly, it is imperative to respect the draught at the nozzle.

- (1) Nominal operation (top boiler power).
- (2) CO<sub>2</sub> = 13% on fuel oil and 9.5% on natural gas.
- (3) Ambient temperature: 20 °C.

# 4 Installation

## 4.1 Regulations governing installation

 Installation must be carried out in accordance with the prevailing regulations, the codes of practice and the recommendations in these instructions.

### 4.1.1 In particular for France:

Heating installations must be designed and constructed in such a way as to prevent the return of water from the heating circuit and products put into it into the drinking water network located upstream. The installation must not be in direct relation with the drinking water network (Article 16-7 of the departmental health Directive).

When these installations are fitted with a filling system connected to the drinking water network, they comprise a CB disconnecter (disconnecter for zones with non-controllable pressure differences) which satisfy the functional requirements of the NF P 43-011 standard.

#### ■ Residential buildings

##### Statutory terms and conditions of installation and maintenance:

The installation and maintenance of the appliance must be carried out by a qualified professional in compliance with the statutory texts of the codes of conduct in force, particularly:

- Order of 27 April 2009 amending the Order of 2 August 1977 Technical and safety rules applicable to combustible gas and liquefied hydrocarbon installations situated inside residential buildings and their annexes.

- NF P 45-204 standards

Gas installation, (formerly DTU 61-1, gas installations: April 1982, addendum no 1: July 1984).

- Local Sanitary Regulations

For appliances connected to the electricity network:

- NF C 15-100 standards Low voltage electrical installation - Rules..

#### ■ Establishments open to the public

##### Statutory terms and conditions of installation:

The installation and maintenance of the appliance must be carried out in compliance with the statutory texts and rules of the codes of conduct in force, particularly:

- Safety regulations against fire and panic in establishments open to the public:

##### a. General regulations

For all appliances:

- Articles GZ - Installations operating on combustible gases and liquefied hydrocarbons.

Then, depending on use:

- Articles CH-Heating, ventilation, refrigeration, air conditioning and production of steam and domestic hot water.

##### b. Instructions specific to each type of establishment open to the public (hospitals, stores, etc.).

#### ■ Certificate of compliance (only concerns PK 450 boilers fitted with a gas burner)

In application of Article 25 of the Order of 27 April 2009 amending the Order of 2 August 1977 amended and Article 1 of the amended Order of 05/02/1999, the installer is required to draw up certificates of conformity approved by the Ministers responsible for construction and gas safety:

- Different forms (forms 1, 2 or 3) for a new gas installation

- Model 4 in particular after replacing a furnace with a new one.

### 4.1.2 In particular for Germany

Abide by the following standards, rules and directives when installing and commissioning the boiler:

- DIN 4705: calculation of chimney dimensions.

- DIN EN 12828 (June 2003 edition): heating systems in buildings. Planning of hot water heating installations (up to a maximum operating temperature of 105°C and a maximum output of 1 MW).


- DIN 4753: drinking and industrial water heating installations.

- DIN 1988: technical rules on drinking water installations (TRW).

- DVGW-TRGI: technical rules on gas installations, including complementary equipment.

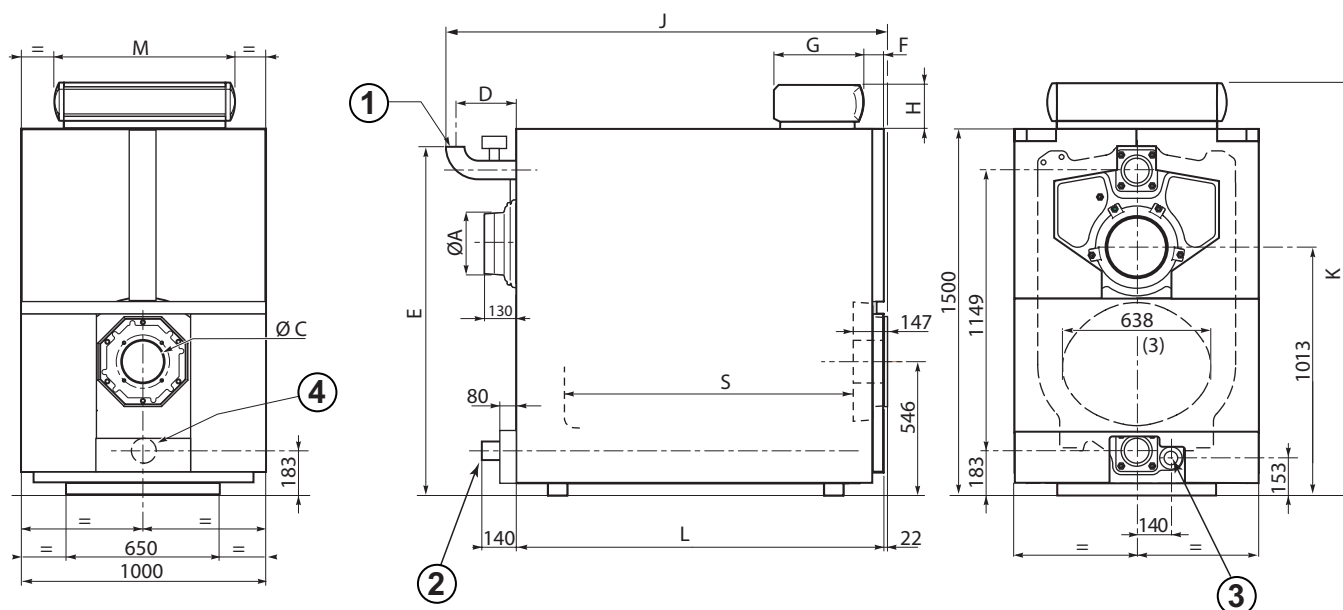
- Working paper DVGW G 260/I: technical rules on the nature of the gas.

## 4.2 Package list

 See assembly instructions.

## 4.3 Choice of the location

### 4.3.1 Main dimensions



(1) The lateral control panel can be mounted to the right or left of the boiler. Exact height positioning defined by the fitter during assembly.

(2) Inscribed diameter (in mm):

- Front section: 455
- Intermediate section: 530

Equivalent diameter (in mm): 573

Mk Tapped connection

① Heating flow - weld

② Heating return - weld

③ Rp 2" draining outlet

④ Sludge removal hole Rp 2" 1/2 - plugged

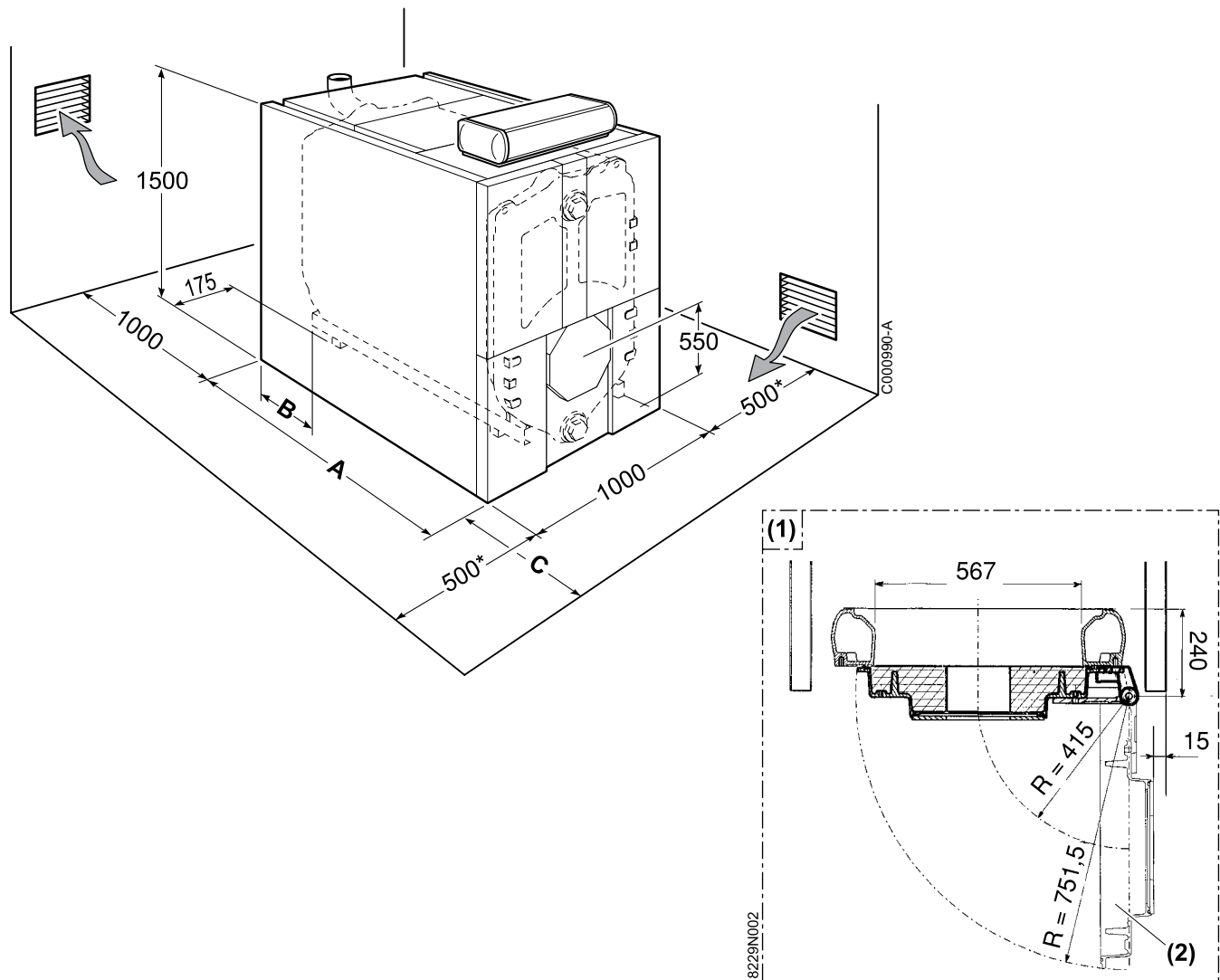
Boiler type		PK 450-8	PK 450-9	PK 450-10	PK 450-11	PK 450-12	PK 450-13	PK 450-14
Ø A	(exterior)	250	250	250	300	300	300	300
Ø ①②		2" 1/2	2" 1/2	2" 1/2	3"	3"	3"	3"
Ø C		plate intact or pre-drilled to the diameter specified on order						
D		235	235	235	254	254	254	254
E		1427	1427	1427	1447	1447	1447	1447
J		1800	1950	2120	2305	2465	2625	2785
L		1505	1665	1825	1985	2145	2305	2465
S		1183	1343	1503	1663	1823	1983	2143
R control panel	F	113.5	113.5	113.5	113.5	113.5	113.5	113.5
	G	355	355	355	355	355	355	355
	H	190	190	190	190	190	190	190
	K	1690	1690	1690	1690	1690	1690	1690
	M	755	755	755	755	755	755	755
Standard control panel - X	F	127.5	127.5	127.5	127.5	127.5	127.5	127.5
	G	130	130	130	130	130	130	130
	H	105	105	105	105	105	105	105
	K	1605	1605	1605	1605	1605	1605	1605
	M	738	738	738	738	738	738	738

### 4.3.2 Position of the boiler

For the assembly and because of their design, PK 450 boilers require no special base. Their closed furnace system means that the floor need not have refractory properties. All you have to ensure is that the floor can support the weight of the boiler when it is fitted for operation.

If the boiler location is not determined precisely, leave enough space around the boiler to facilitate monitoring and maintenance operations.

The dimensions (in mm) correspond to the minimum recommended dimensions needed to ensure adequate accessibility around the boiler.



(1) Top view

(2) Burner door

Dimension		PK 450-8	PK 450-9	PK 450-10	PK 450-11	PK 450-12	PK 450-13	PK 450-14
A	mm	1505	1665	1825	1985	2145	2305	2465
B	mm	130	-40	120	-40	120	-40	120
C	mm	1500	2000	2000	2000	2500	2500	2500


**⚠** \* Pay attention to the overall volume of the burner when the door is open. To install several boilers in cascade, these dimensions should be adapted accordingly.

### 4.3.3 Ventilation

To allow the input of combustive air, sufficient ventilation must be provided in the boiler room, for which the cross section and emplacement must satisfy regulations in force in the country in which the boiler is installed.

Position the air inlets in relation to the high ventilation vents in order that the air is refreshed throughout the boiler room.

 **Do not obstruct the air inlets in the room (even partially).**

 **In order to avoid damage to the boiler, it is necessary to prevent the contamination of combustion air by chlorine and/or fluoride compounds, which are particularly corrosive.**

These compounds are present, for example, in aerosol sprays, paints, solvents, cleaning products, washing products, detergents, glues, snow clearing salts, etc.

Therefore:

- Do not pull in air evacuated from premises using such products: hairdressing salons, dry cleaners, industrial premises (solvents), premises containing refrigeration systems (risk of refrigerant leakage), etc.
- Do not stock such products close to the boilers.

**If the boiler and/or peripheral equipment are corroded by such chloride or fluoride compounds, the contractual guarantee cannot be applied.**

#### France

The minimum cross sections and the emplacement of the fresh air inlet and the air discharge are governed by the order of 21/03/1968 amended by the orders of 26/02/1974 and 03/03/1976.

#### ■ Generator installed in a building for collective use (installations less than 70 kW)

- ▶ The fresh air inlet must:
  - Come out in the lower section of the premises,
  - Have a free minimum cross section calculated on the basis of 0.03 dm<sup>2</sup> per kilowatt installed output and at least equal to 2.5 dm<sup>2</sup>.
- ▶ The air discharge must:
  - Be located in the upper section of the premises,
  - Rise above the roof (unless using an equivalent system which does not cause a nuisance to neighbours),
  - Have a free cross section (corresponding to 2/3 of that of the air inlet and at least equal to 2.5 dm<sup>2</sup>).

#### ■ Generator installed in a building for individual use

- ▶ An adequate supply of fresh air must be provided as close as possible to the appliances. Its cross section must be at least 0.5 dm<sup>2</sup>.
- ▶ In the upper section of the premises, an air outlet must ensure effective ventilation.

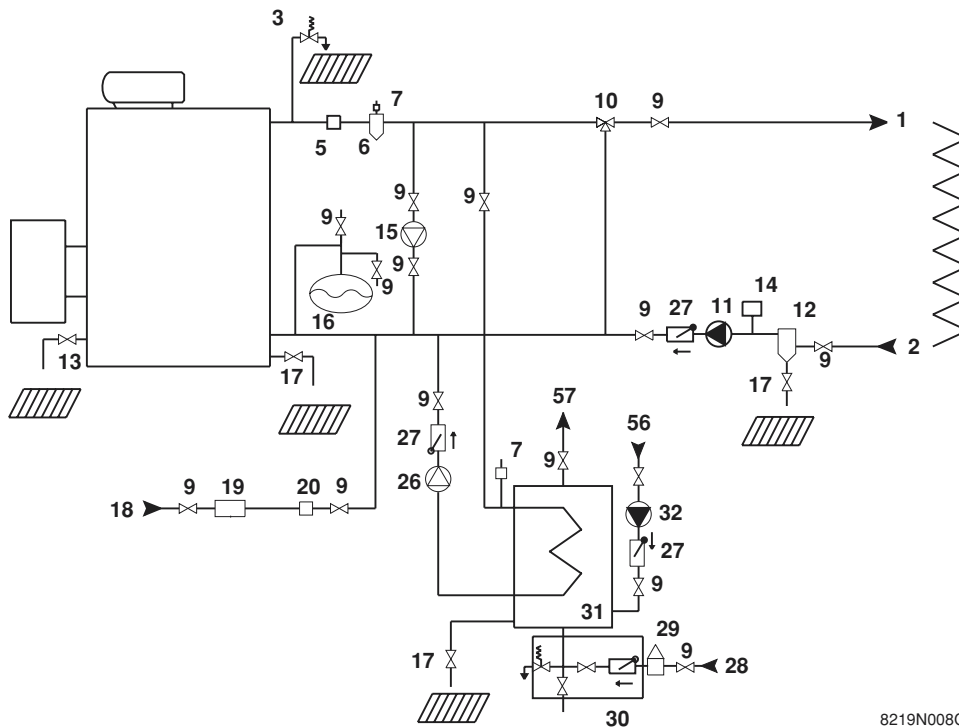
#### ■ Establishments open to the public

- ▶ New establishment: Refer to the order of 25/06/1980 (installations of more than 20 kW and less than or equal to 70 kW).
- ▶ Existing establishment: Refer to the order of 25/06/1980 (installations less than 70 kW).

## 4.4 Example of an installation

The example of an installation shown below does not cover every possible configuration..Its sole aim is to draw your attention to the basic rules to be respected.

GT 430 boiler with domestic hot water production using an independent tank.



8219N008C

- |    |  |    |   |
|----|--|----|---|
| 1  | Heating flow   | 17 | Drain cock  |
| 2  | Heating return   | 18 | Heating circuit filling (with disconnecter depending on prevailing regulations) |
| 3  | 3-bar safety valve + Pressure gauge                                    | 19 | Water treatment   |
| 5  | Flow switch  | 20 | Water meter   |
| 6  | Air separator  | 26 | DHW load pump   |
| 7  | Automatic air vent   | 27 | Non-return valve  |
| 9  | Isolating valve  | 28 | Domestic cold water inlet   |
| 10 | 3-way mixing valve   | 29 | Pressure reducer (if mains pressure > 5.5 bar)                                  |
| 11 | Boiler pump  | 30 | Safety unit calibrated to 7 bar with indicator type discharge                   |
| 12 | Sludge decanting pot (particularly recommended on older installations) | 31 | Independent domestic hot water tanks  |
| 13 | Flush valve  | 32 | Domestic hot water loop pump (optional)   |
| 14 | Water low safety pressure-sensitive switch                             | 56 | Domestic hot water circulation loop return                                      |
| 15 | Shunt pump   | 57 | Domestic hot water outlet   |
| 16 | Expansion vessel   |    |   |

## 4.5 Hydraulic connections

### 4.5.1 Flushing the system

#### ■ Installing the boiler in new installations (installations less than 6 months old)

- ▶ Clean the installation with a universal cleaner to eliminate debris from the system (copper, hemp, flux).
- ▶ Thoroughly flush the installation until the water runs clear and shows no impurities.

#### ■ Installing the boiler in existing installations

- ▶ Remove sludge from the installation.
  - ▶ See: Sludge removal.
- ▶ Flush the installation.
- ▶ Clean the installation with a universal cleaner to eliminate debris from the system (copper, hemp, flux).
- ▶ Thoroughly flush the installation until the water runs clear and shows no impurities.

### 4.5.2 Sludge removal

① A tapped  $\varnothing$  2" 1/2 hole with a plug has been provided on the bottom of the front of the boiler..

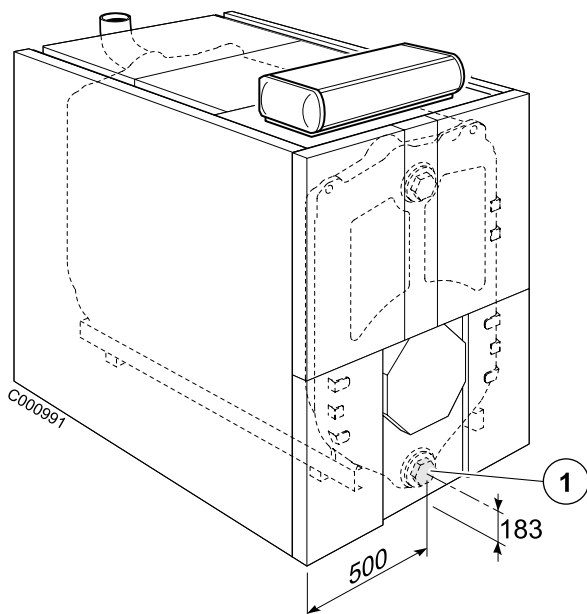
Fit a 1/4 turn valve (not supplied) on the opening to remove the sludge.

Sludge removal leads to the draining of large quantities of water, so remember to refill the system after the operation.

After this operation, go ahead and fill the installation.

▶ See: Water level.

**i** never replace a boiler in an existing system without carefully rinsing the system first. Install a sludge decanting pot on the return pipe, very close to the boiler.



### 4.5.3 Hydraulic connection of the heating circuit

---

#### ■ Water flow in the boiler

The water flow in the boiler when the burner is operating must correspond with the following formulae:

- Nominal water flow  $Q_n = 0.86 P_n/20$ .
- Minimum flow  $Q_{min} = 0.86 P_n/45$  (this flow also corresponds with the minimum recycle flow in the boiler).
- Maximum water flow  $Q_{max} = 0.86 P_n/5$ .

$Q_n$  = flow in  $m^3/h$ .

$P_n$  = Nominal output (full boiler output) in kW.

**i** Connect the flow controller to the terminal blocks **UV** in the control panel KSF CE. For the control panel KSF ISR, refer to the instruction manual of the panel.

#### ■ Operation in cascade

After stopping the burner:

- Timeout required before the order to close a 2 way valve: 3 min.
- Switch a possible shunt pump (located between the boiler and a butterfly valve) off via the end of run contact of the butterfly valve.

#### ■ Operation with 2-stage burner

- The water temperature in the boiler is maintained at 50°C or more; The first stage must be set to a minimum of 30% of the nominal stage.
- Operation at modulated low temperature (minimum outlet temperature: 40°C); The first stage must be set to a minimum of 50% of the nominal stage.

#### ■ Operation with modulating burner

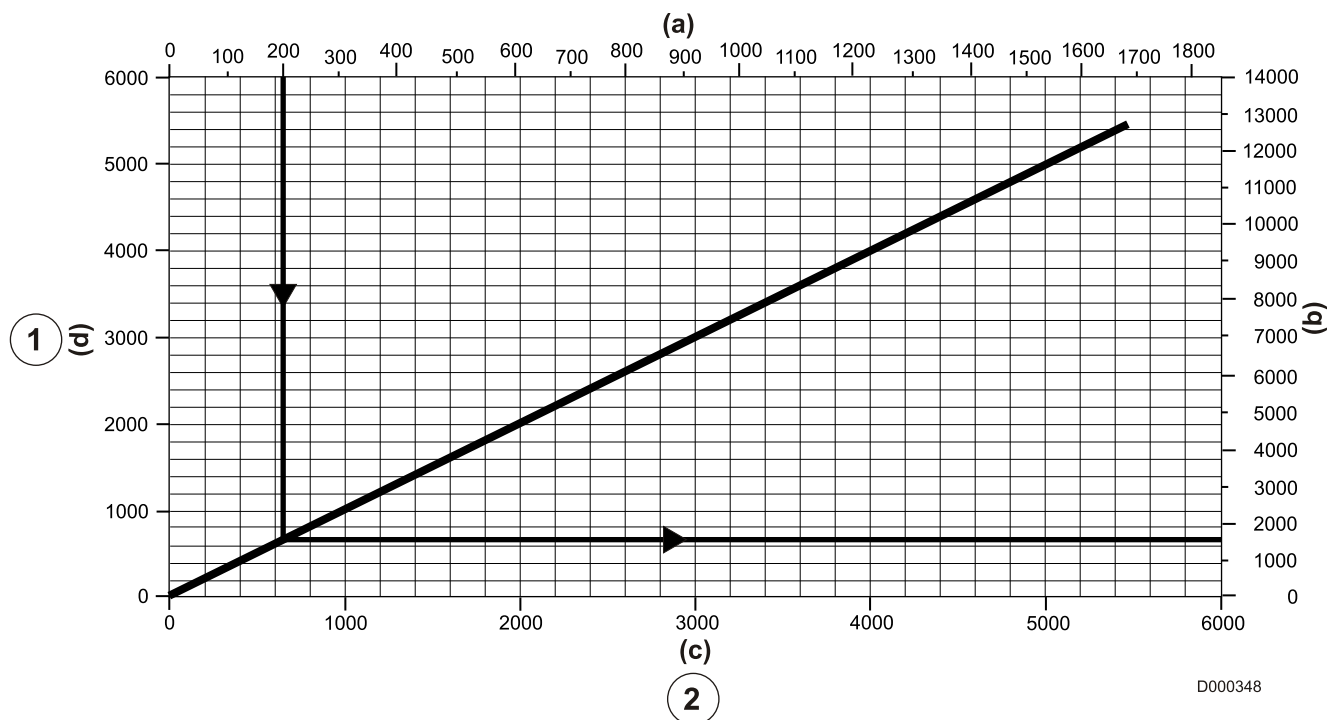
- The water temperature in the boiler is maintained at 50°C or more: The burner can modulate down to 30% of the nominal stage.
- Operation at modulated low temperature (minimum outlet temperature: 40°C); The burner can modulate down to 50% of the nominal stage.



## 4.5.4 Safety valve

The safety valve must be connected to the boiler outlet and no other valve or flap must be interposed between it and the boiler.

### ■ Minimum safety valve flowrate as a function of maximum boiler nominal output




- ① Minimum relieving capacity  
 ② Maximum gross boiler output  
 Unit (a) = kW  
 (b) = lb/h  
 (c) = MBtu/h  
 (d) = Kg/h

#### Example

Maximum boiler nominal output is 200 kW.

Minimum safety valve flowrate must be 700 Kg/h.

## 4.5.5 Connection of the water circuit for domestic use

 See: Domestic hot water calorifier instructions.

## 4.6 Chimney connection

The high-performance features of modern boilers and their use in specific conditions as a result of the advance in burner technology (e.g. first-stage or low modulation range operation) lead to very low flue gas temperatures (<math>160^{\circ}\text{C}</math>).

For this reason :

- Use flue gas pipes designed to enable the flow of condensates which may result from such operating modes in order to prevent damage to the chimney.
- Install a draining tee at the bottom of the chimney.

The use of a draught moderator is recommended as well.

### 4.6.1 Flue size

Refer to applicable regulations while determining the size of the flue. Please note that PK 450 boilers have pressurised and tight furnaces and that the pressure at the connection to the chimney must not exceed 0 mbar, unless special sealing precautions have been taken, for instance in order to connect a static condenser/regenerator.

**⚠ In order for the boiler to operate correctly, it is imperative to respect the draught at the nozzle (= 0).**

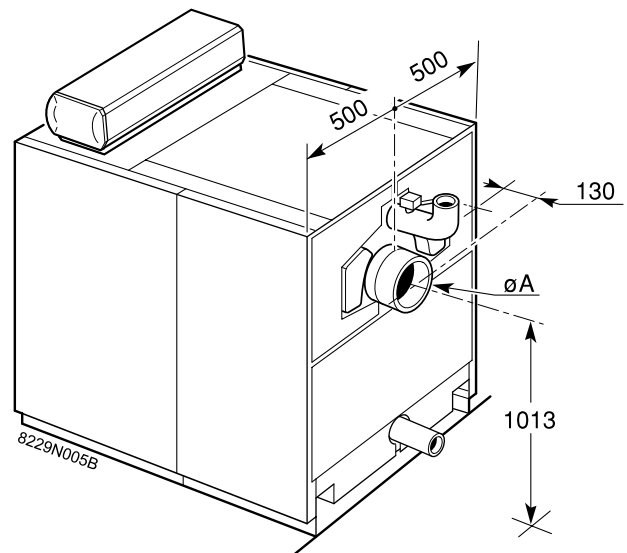
### 4.6.2 Connection to the flue gas pipe


The connection shall be removable, and offer minimum load losses, i.e. it must be as short as possible with no sudden change in section.

Its diameter shall always be at least equal to that of the boiler outlet, i.e.:

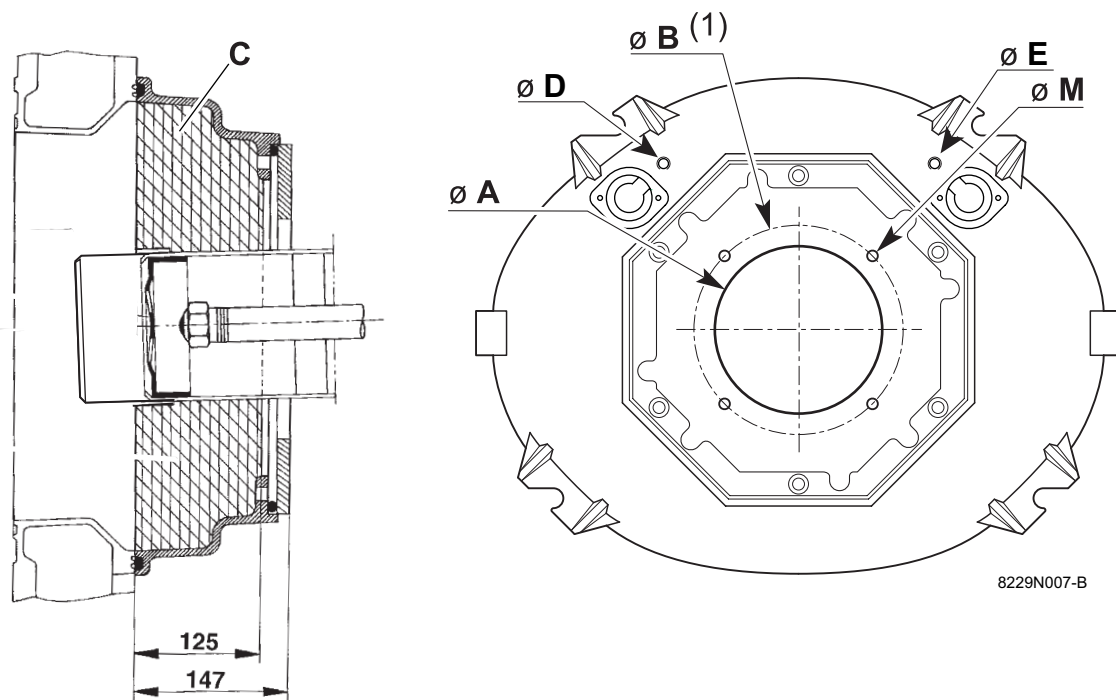
- A:  $\varnothing$  250 mm: for 8 to 10 sections.
- A:  $\varnothing$  300 mm: for 11 to 14 sections.

Fit a measuring point ( $\varnothing$  10 mm hole) on the flue, in order to adjust the burner (combustion check).



 Refer to the instructions supplied with the burner.

**!** The burner head deflector must be flush with the insulation of the burner door.




C: Furnace door insulation  
D, E: Pressure gauge measurement socket

(1) Max attachment diameter:

- Max  $\varnothing B = 290$  mm
- Max  $\varnothing B = 330$  mm with 4 fastenings at 15° or 45°

$\varnothing A$	135	175	190	240	250	290
$\varnothing B$	170	200	220	270	325	330
$\varnothing D$	10	10	10	10	10	10
$\varnothing E$	10	10	10	10	10	10
$\varnothing M$	8	8	10	10	14	12

## 4.7 Electrical connections

 Refer to the connection instructions supplied with the control panel..

## 4.8 Filling the system

Filling shall be performed with a low flow rate from a low point in the boiler room in order to ensure that all the air in the boiler is bled from the high point of the system.

All the pumps must be stopped before filling (included shunt pump(s)).

**!** Do not add cold water suddenly into the boiler when it is hot.

**!** **VERY IMPORTANT: Instructions for starting up the boiler for the first time after the system is fully or partly drained: If all the air is not bled naturally to an expansion vessel which opens out onto the air, the system must include manual bleeder valves, in addition to automatic bleeder valves with the capability to bleed the system by themselves when it is operating, the manual bleeder valves are used to bleed all the high points of the system and to make sure that the filled system is free of air before the burner is turned on.**

## 5 Commissioning

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See:

- Control panel instructions.
- Burner instructions.
- Domestic hot water calorifier instructions.

## 6 Switching off the boiler

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- ▶ Set the On/Off switch to **O**.
- ▶ Cut the gas supply to the boiler (if present).



See: Control panel instructions.

### 6.1 Precautions required in the case of long boiler stops

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- The boiler and the chimney must be swept carefully.
- Close all the doors of the boiler to prevent air from circulating inside the boiler.
- We advise removing the pipe which connects the boiler to the chimney and to close off the nozzle with a cover.

### 6.2 Precautions required if the heating is stopped when there is a risk of freezing

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We recommend the use of a correctly dosed antifreeze agent to prevent the heating circuit from freezing.

If this cannot be done, drain the system completely.

# 7 Checking and maintenance

## 7.1 System maintenance

### 7.1.1 Water level

Regularly check the level of water in the system and top up if required, taking care that cold water is not added suddenly into the boiler when it is hot.

The use of an automatic filling is strongly discouraged.

This operation should be required only a few times in each heating season, with very low quantities of water; otherwise, look for the leak and repair it.

### 7.1.2 Draining

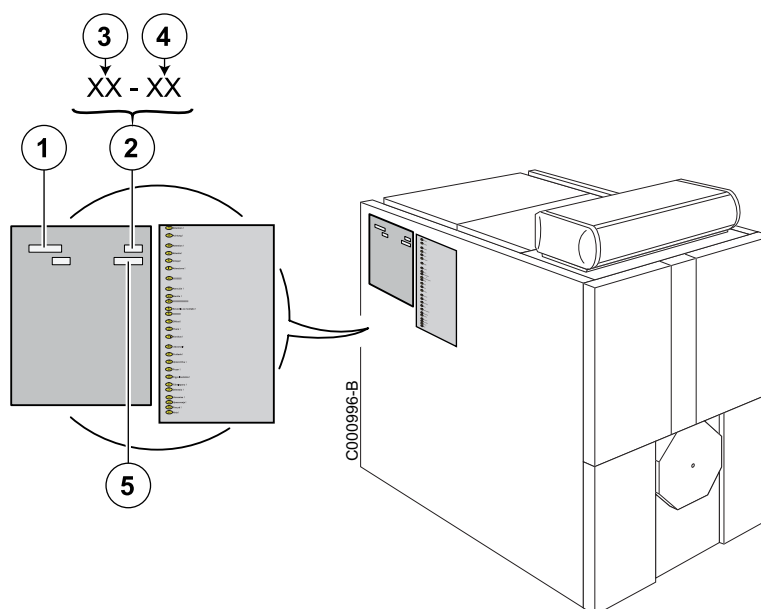
**⚠ We advise you against draining the system unless it is absolutely necessary.**

For example: Several months' absence with the risk of ice in the building.

## 7.2 Type plate

The rating plate fixed on the side of the boiler during installation is used to identify the boiler correctly and also provides the main specifications of the boiler.

- ① Boiler type
- ② Manufacturing date
- ③ Year of manufacture
- ④ Week of manufacture
- ⑤ Serial no. of the appliance



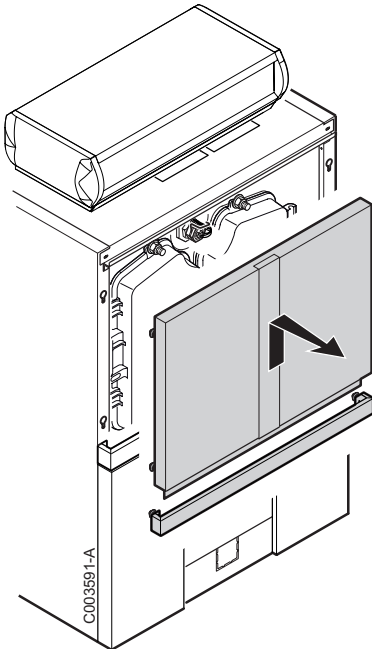
## 7.3 Maintenance

**!** The boiler will only operate efficiently if the exchange surfaces are kept clean.

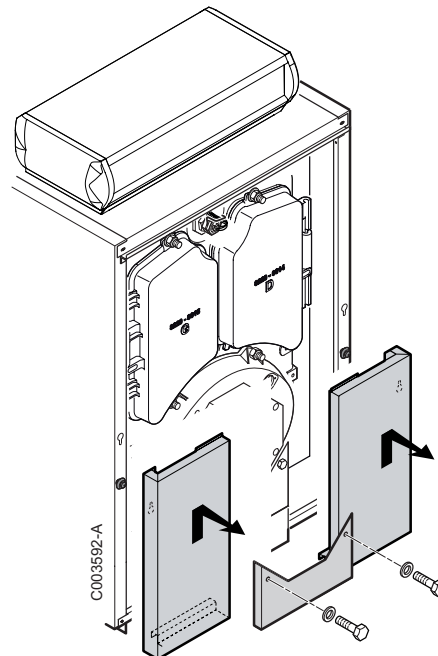
The boiler should be cleaned as soon as required and as the chimney, **at least once a year or more**, depending upon applicable regulations and specific needs.

**!** The operations described below shall only be performed with the boiler and power supply off.

### 7.3.1 Cleaning the flue gas circuit

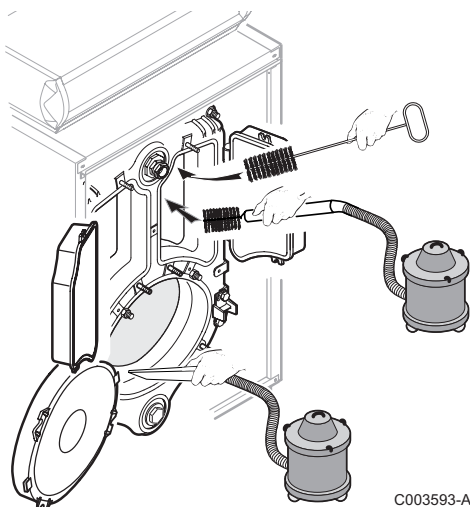


- Remove the upper front panel.
- Take off the lower panels.
- Open the sweeping doors (upper doors) by unscrewing the 3 nuts using a 19 mm spanner.
- Remove the baffle plates from the upper flue ways.
- Carefully sweep the flue ways with the brush supplied for that purpose.



- Brush the baffle plates.
- If possible, use a vacuum cleaner.
- Replace the baffle plates.
- Close the doors.

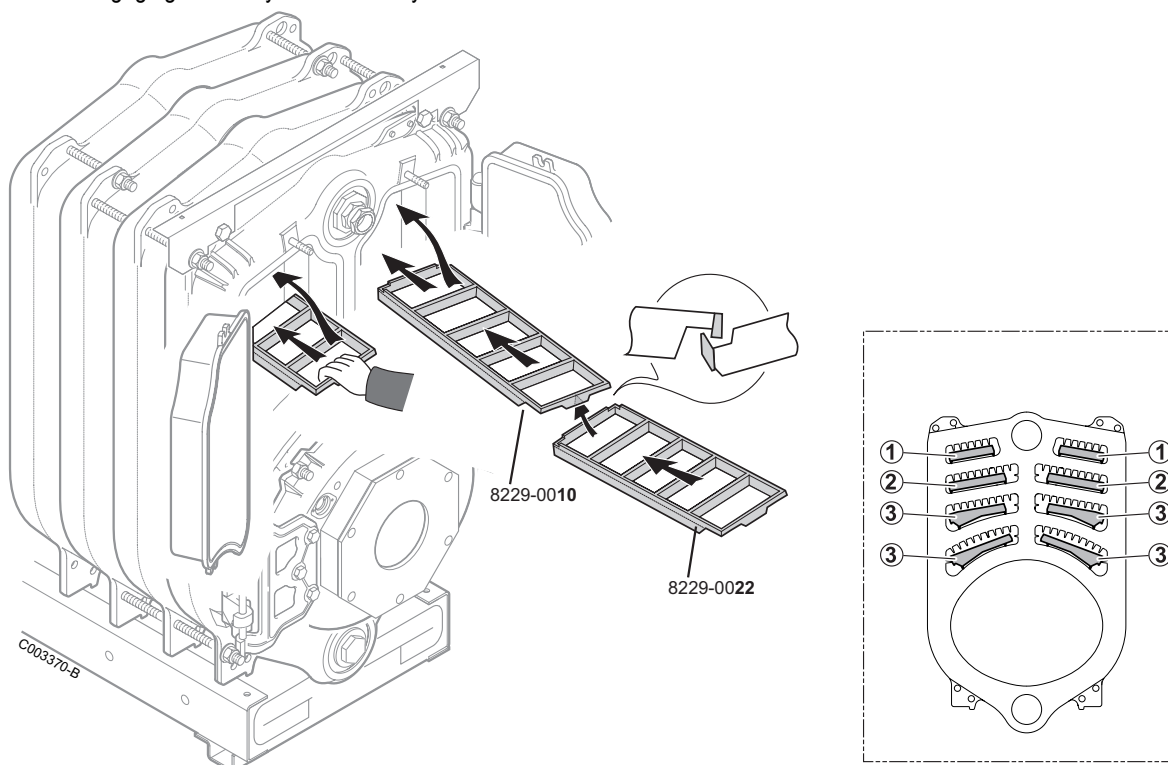
### 7.3.2 Cleaning the combustion chamber



- Unscrew the 4 closing nuts and open the furnace door.
- Brush out the inside of the furnace.
- Use a vacuum cleaner to remove any soot which has accumulated in the combustion chamber.
- Close the door and replace the front panel.

### 7.3.3 Positioning of the baffle plates

- Put the baffle plates back in place and hook them into each other before engaging them fully in the flue way.
- Close the sweeping doors.



- ⚠** Follow the order of assembly shown in the diagram.  
The 8-figure part number of the baffle plate is cast in the metal.

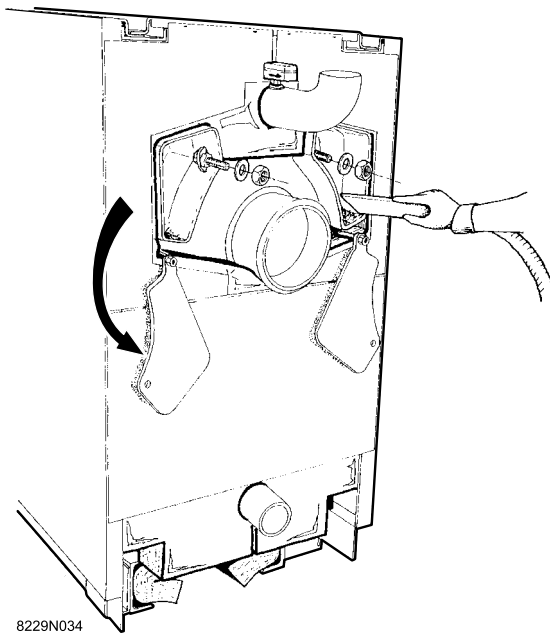
- Boilers for following countries: France, Germany, Austria, Belgium, Spain, Estonia, Luxemburg, Poland, Portugal, Czech Republic, Serbia, Slovenia, Switzerland

Boiler		PK 450-8	PK 450-9 - PK 450-10	PK 450-11 - PK 450-12	PK 450-13 - PK 450-14
Upper flue ways	①	First 8229-0010 then 8229-0022	2 x 8229-0010	First 2 x 8229-0010 then 1 x 8229-0022	3 x 8229-0010
Central flue ways	②	First 8229-0011 then 8229-0023	2 x 8229-0011	First 2 x 8229-0011 then 1 x 8229-0023	3 x 8229-0011
Lower flue ways	③	First 8229-0012 then 8229-0024	2 x 8229-0012	First 2 x 8229-0012 then 1 x 8229-0024	3 x 8229-0012

- Boilers for following countries: Bulgaria, China, Cyprus, Denmark, Finland, Greece, Norway, Romania, Russia, Sweden, Tunisia

Boiler		PK 450-8	PK 450-9 - PK 450-10	PK 450-11	PK 450-12	PK 450-13 - PK 450-14
Upper flue ways	①	First 8229-0010 then 8229-0022	2 x 8229-0010	First 2 x 8229-0010 then 1 x 8229-0022	First 2 x 8229-0010 then 1 x 8229-0022	3 x 8229-0010
Central flue ways	②	First 8229-0011 then 8229-0023	2 x 8229-0011	First 2 x 8229-0011 then 1 x 8229-0023	First 2 x 8229-0011 then 1 x 8229-0023	3 x 8229-0011
Lower flue ways	③	First 8229-0012 then 8229-0024	2 x 8229-0012	First 2 x 8229-0012 then 1 x 8229-0024	2 x 8229-0012	2 x 8229-0012

### 7.3.4 Cleaning the flue gas box



To do so:

- Open the left and right cleaning hatches on the flue gas box (2 nuts H 12 + flat washers with a 19 mm spanner) and remove any soot which has accumulated using a vacuum cleaner.
- Replace the cleaning hatches.

### 7.3.5 Chemical sweeping

#### ■ General principle

Boilers are traditionally swept mechanically. There are now chemical sweeping methods which facilitate this maintenance work.

A chemical reagent is applied to the boiler's heating surfaces.

After application, the reaction is completed by igniting the burner. The initial deposits are neutralised and pyrolysed. The remaining pulverent residues are easy to remove by sweeping or vacuum cleaning.

#### ■ The products

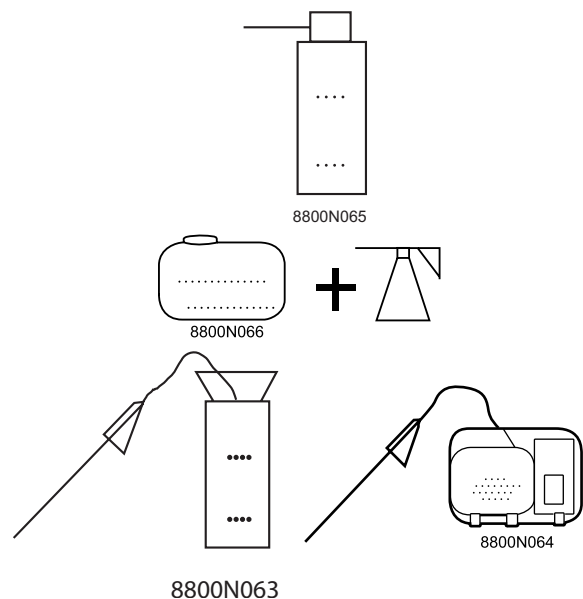
The product must be suitable for boilers with a cast iron body. Various manufacturers offer products in the form of a concentrated liquid or aerosol.

The aerosols are packaged in 0.5 to 1 l spray cans for treating domestic boilers. Refer to the instructions supplied with the product.

The liquid products are available in 1 to 50 l containers. These concentrated liquids are diluted before application with a spray.

Sprays exist in various forms suitable for their intended use:

- Low capacity (2 or 3 l) spray with built-in reservoir for small boilers and moderate frequency. Manual pressurisation of the reservoir.
- 5 l spray with separate reservoir, nozzle and connecting tube. The nozzles enable easy application at the back of the combustion chamber. Manual pressurisation of the reservoir.
- Motor-assisted pressurisation spray with reservoir, nozzle and connecting tube. These sprays are intended for intensive use.





## ■ Operational mode

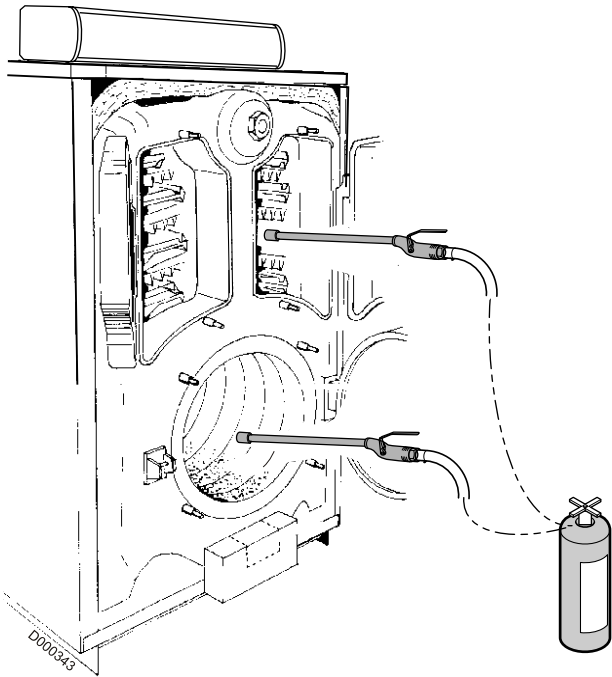
The operating mode mentioned corresponds to standard user situations. Refer to the manufacturer's instructions for specific advice on the product used.

## ■ Application

- Depending on the product, the boiler must be cold or heated. Refer to the instructions supplied with the product.
- Direct application to the heating surfaces with aerosol sprays.
- The concentrates are diluted in the proportions 1/5 to 1/20 (depending on the product and the condition of the boiler).
- Application with the spray is done in the upper part of the boiler and on the walls of the combustion chamber. Surfaces are dampened but not washed. It is not necessary to use the spray to get between the heating surfaces.
- A volume of one litre of solution is generally used for 1 m<sup>2</sup> of heating surface (domestic boiler), i.e. 0.05 to 0.2 l of concentrate.

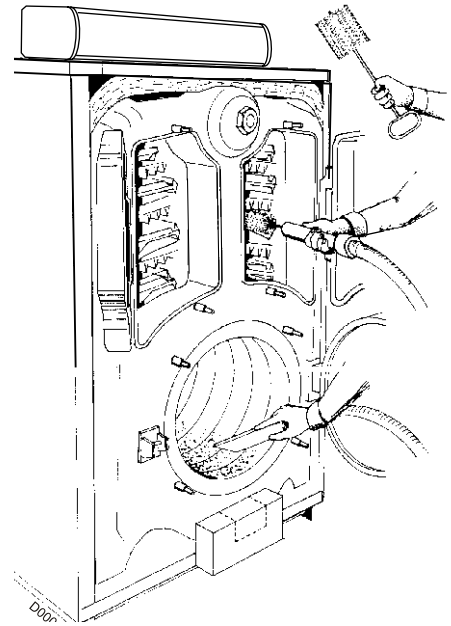
## ■ Ignition

The burner is ignited after allowing the product time to penetrate for 2 to 5 min. Refer to the instructions supplied with the product.



## ■ Cleaning

- Remove the baffle plates.
- Light sweeping will remove the pulverent residues remaining after combustion.  
The remaining pulverent residues are easy to remove by sweeping or vacuum cleaning.  
For certain products, brief application after cleaning has a preventive effect, limiting deposits on the heating surfaces.
- Replace the baffle plates.
- Close the door of the combustion chamber.
- Service the burner.
- Replace the front panel.



## 7.4 Cleaning the casing material

Use a soapy solution and a sponge only. Rinse with clean water and dry with chamois leather or a soft cloth.

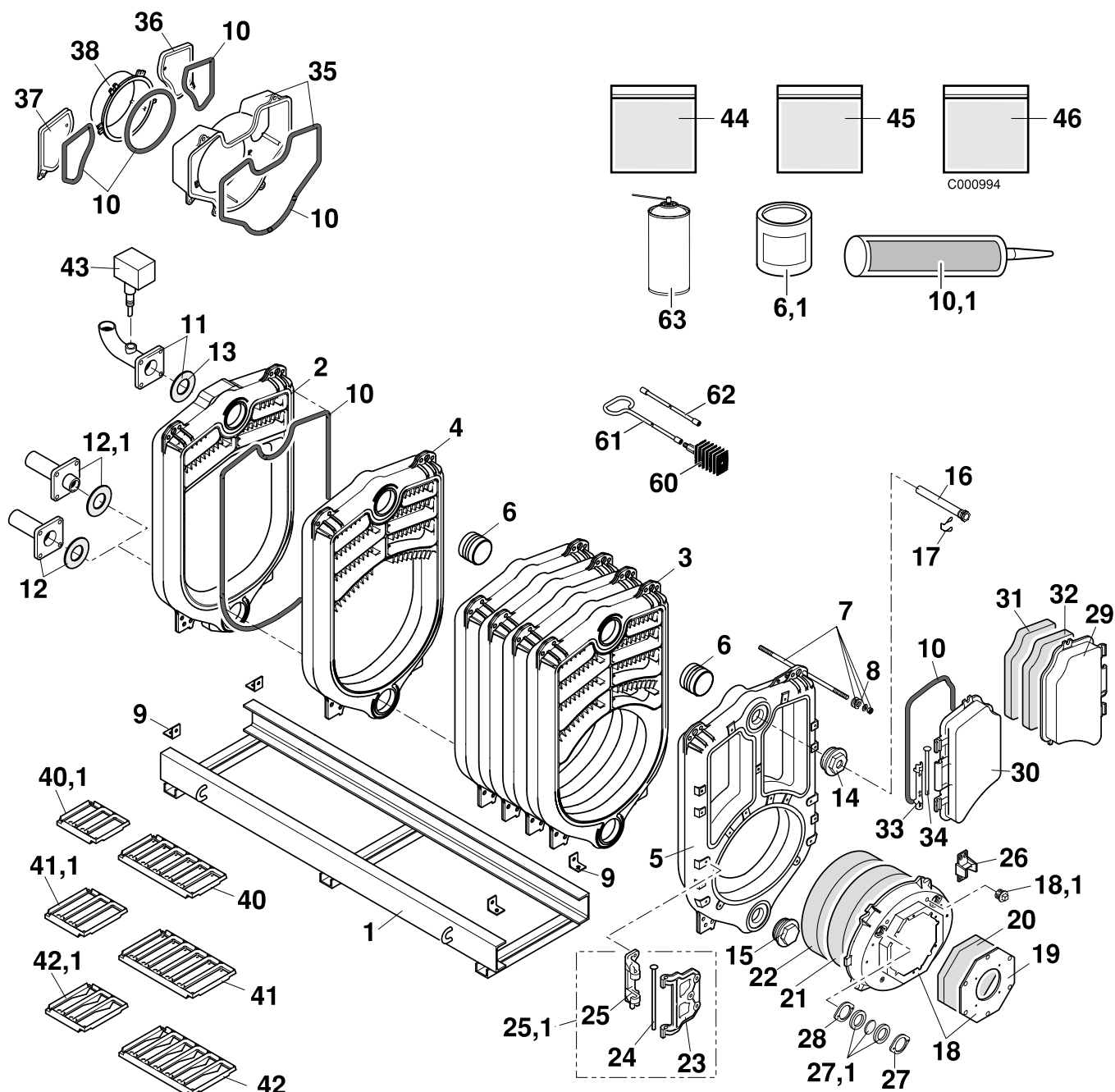
## 7.5 Maintenance of the burner

 Refer to the instructions supplied with the burner.

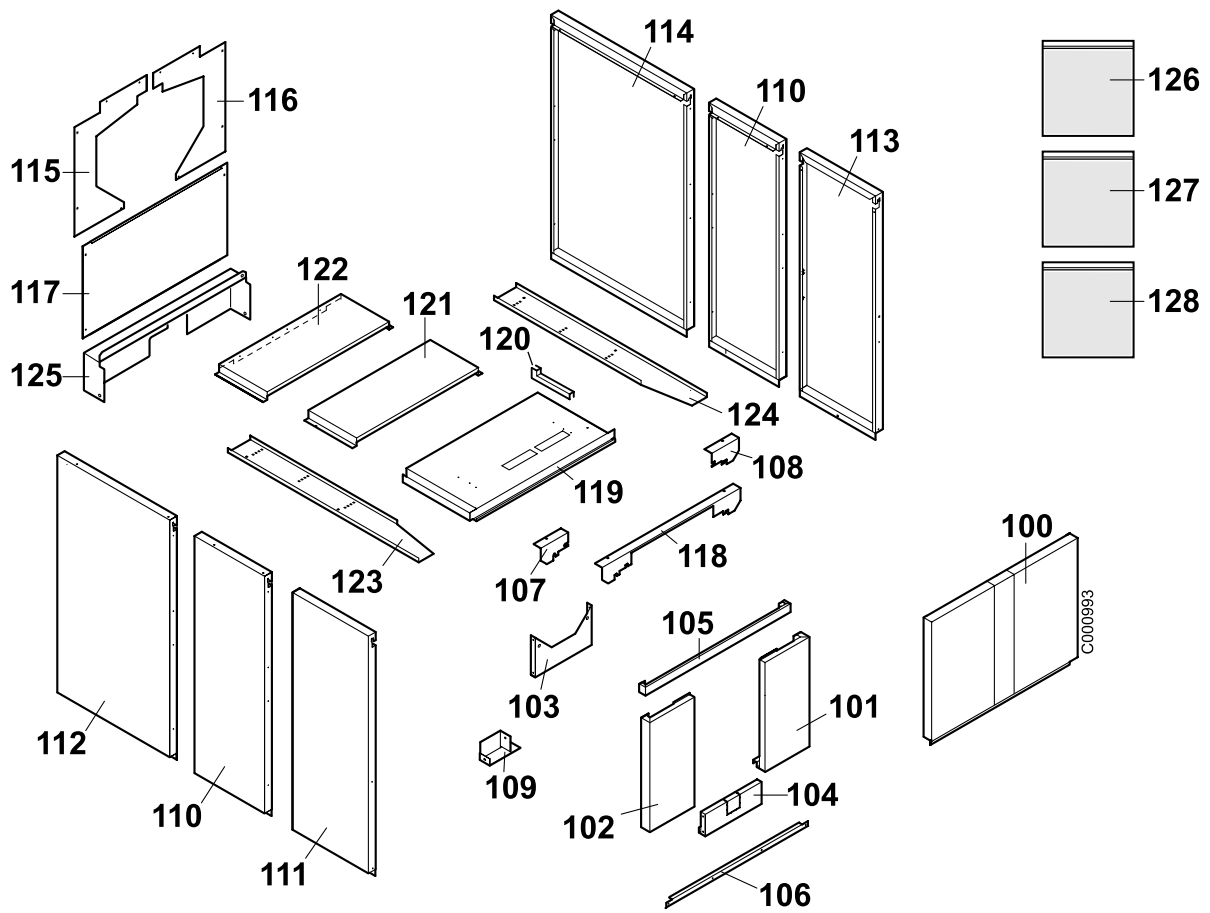
# 8 Spare parts - PK 450

**i** To order a spare part, quote the reference number next to the part required.

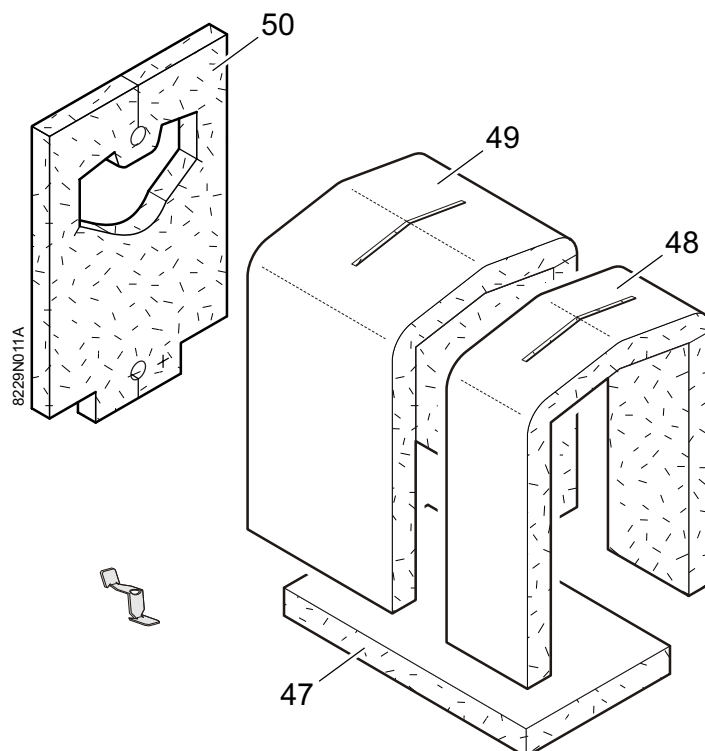
## Boiler body + Miscellaneous




## Casing

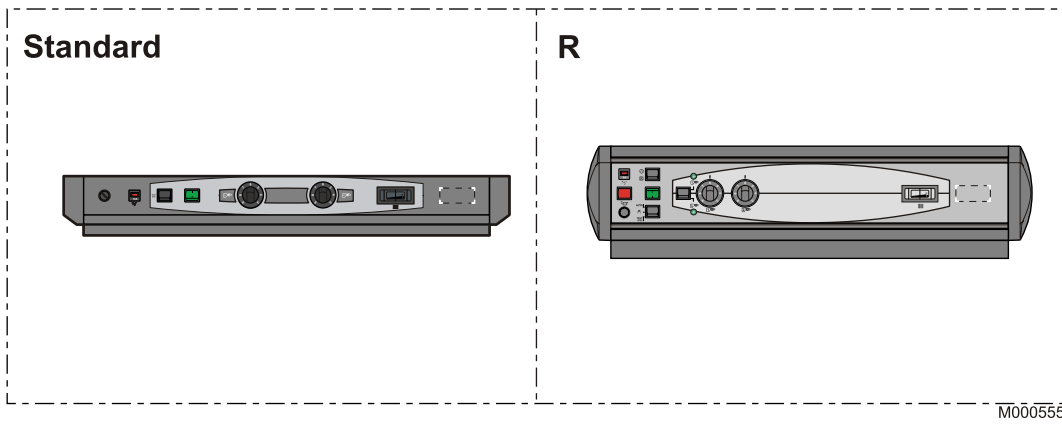


## Insulating material for body



## Control panels

 Refer to the Spare Parts list in the panel instructions



Markers	Code no.	Description
<b>Boiler body + Accessories</b>		
<b>Base frame</b>		
1	300010442	Complete frame 7-8 sections
1	300010443	Complete frame 9-10 sections
1	300010444	Complete frame 11-12 sections
1	300010445	Complete frame 13-14 sections
2	602212	Complete rear section
3	602213	Normal intermediate section
4	124609	Special intermediate section
5	602211	Complete front section
6	601015	Nipple
6.1	122666	Nipple greasing product
7	124610	Assembly rod 425 mm
7	124611	Assembly rod 620 mm
7	124612	Assembly rod 784 mm
8	601021	Spring
9	124613	Mounting square
10	121870	Glass fibre cord $\varnothing$ 10 mm (metre)
10.1	603151	Tube of silicon mastic
11	124614	Water flow pipe + gasket, 7 to 10 sections
11	124615	Water flow pipe + gasket, 11 to 14 sections
12	601040	Return collector + seal, 7 to 10 sections
12.1	124616	Return collector + seal, 11 to 14 sections
13	601042	Gasket 162x120x4
14	600690	2" 1/2 plug with 1/2" opening
15	600689	Solid plug 2" 1/2
16	601024	Sensor tube
17	120166	Spring for sensor tube
18	124617	Complete combustion chamber door, no opening
18	124809	Complete 10 mm combustion chamber door with opening on request
18.1	124811	Plug 1/4"
19	122563	Plate for combustion chamber door, no opening
19	124812	Plate for combustion chamber door with opening $\varnothing$ 135
19	124620	Plate for combustion chamber door with opening $\varnothing$ 175
19	124813	Plate for combustion chamber door with opening $\varnothing$ 190
19	124814	Plate for combustion chamber door with opening $\varnothing$ 240
19	124621	Plate for combustion chamber door with opening $\varnothing$ 250
19	124815	Plate for combustion chamber door with opening $\varnothing$ 290
19	124816	Plate for combustion chamber door with opening on request
20	124622	Height converter, insulation
21	122471	Furnace door guard

Markers	Code no.	Description
22	122472	Furnace door insulation
23	8229-0020	Added hinge
24	124624	Hinge pin for combustion chamber door
25	124625	Hinge for combustion chamber door
25.1	124626	Hinge unit
26	124627	Ramp
27	700397	Inspection flange
27.1	121128	Flame inspection window + gaskets
28	124628	Flame inspection window gasket
29	124629	Complete sweeping door, right
30	124630	Complete sweeping door, left
31	124631	Insulation, sweeping door
32	124632	Inner protection, sweeping door
33	124633	Hinge for sweeping door
34	124634	Hinge pin for sweeping door
35	124635	Complete flue gas box
36	124636	Complete right-hand cleaning trap
37	124637	Complete left-hand cleaning trap
38	124638	Flue gas nozzle $\varnothing$ 250 - 7 to 10 sections
38	124639	Flue gas nozzle $\varnothing$ 250 - 11 to 14 sections
40	124648	Upper baffle plate, width 190 mm
40.1	124649	Additional upper baffle plate, width 190 mm
41	124650	Upper baffle plate, width 240 mm
41.1	124651	Additional upper baffle plate, width 240 mm
42	124652	Lower baffle plate
42.1	124653	Additional lower baffle plate
<b>Flow switch (France + Germany)</b>		
43	700380	Flow controller PK 450-7
43	700255	Flow controller PK 450-8
43	124642	Flow controller PK 450-9
43	124643	Flow controller PK 450-10
43	124644	Flow controller PK 450-11
43	124645	Flow controller PK 450-12
43	124646	Flow controller PK 450-13
43	124647	Flow controller PK 450-14
44	126498	Screws and accessories bag
45	126499	Variable screws and accessories bag
46	126500	Body screws packet
<b>Insulating material for body</b>		
47	124654	Lower insulation, boiler body - 7 and 8 sections
47	124655	Lower insulation, boiler body - 9 and 10 sections
47	124656	Lower insulation, boiler body - 11 and 12 sections
47	124657	Lower insulation, boiler body - 13 and 14 sections

## 8. Spare parts - PK 450

Markers	Code no.	Description
48	124658	Front boiler body insulation, width 500 mm
49	124659	Boiler body insulation, width 520 mm
49	124660	Insulating material for body - Length 600 mm
49	124661	Insulating material for body - Length 800 mm
49	124662	Insulating material for body - Length 900 mm
50	124663	Rear insulation
<b>Miscellaneous</b>		
60	124729	Brush
61	124730	1300 mm brush rod
62	124731	Extension for brush rod 650 mm
63	9434-5103	Retouching spray paint - White
63	126581	Retouching spray paint - anthracite grey
<b>Casing</b>		
	100013270	Casing (common parts) - Package MH1
	100007214	Casing, variable parts - Package MP2
	100007215	Casing, variable parts - Package MP3
	100007216	Casing, variable parts - Package MP4
	100007217	Casing, variable parts - Package MP5
100	200015306	Complete upper front panel
101	124683	Complete lower front panel, right
102	124684	Panel for furnace door
103	124685	Complete lower front panel, left
104	124686	Sludge removal cap
105	124687	Complete front casing support
106	124688	Lower front crosspiece
107	124689	Upper casing support, left
108	603145	Upper casing support, right
109	124690	Lower casing support
110	124691	Side panel, left or right, width 480 mm
111	200007422	Complete front side panel, left
112	124693	Complete side panel, left, width 770 mm
112	124694	Complete side panel, left, width 610 mm
112	124695	Complete side panel, left, width 930 mm
113	200007421	Complete front side panel, right
114	124697	Complete side panel, right, width 610 mm
114	124698	Complete side panel, right, width 770 mm
114	124699	Complete side panel, right, width 930 mm
115	124700	Complete upper rear panel, left
116	124701	Complete upper rear panel, right
117	124702	Lower back panel
118	124703	Complete upper cross-bar
119	700528	Complete front cover
120	124705	Rubber profile for cable way
121	124706	Complete intermediate cover

Markers	Code no.	Description
122	124707	Complete rear cover, width 170 mm
122	124708	Complete rear cover, width 330 mm
122	124709	Complete rear cover, width 490 mm
123	8229-8818	Complete cable way, left, PK 450-7
123	124711	Complete cable way, left, PK 450-8
123	124712	Complete cable way, left, PK 450-9
123	124713	Complete cable way, left, PK 450-10
123	124714	Complete cable way, left, PK 450-11
123	124715	Complete cable way, left, PK 450-12
123	124716	Complete cable way, left, PK 450-13
123	124717	Complete cable way, left, PK 450-14
124	8229-8826	Complete cable way, right, PK 450-7
124	124719	Complete cable way, right, PK 450-8
124	124720	Complete cable way, right, PK 450-9
124	124721	Complete cable way, right, PK 450-10
124	124722	Complete cable way, right, PK 450-11
124	124723	Complete cable way, right, PK 450-12
124	124724	Complete cable way, right, PK 450-13
124	124725	Complete cable way, right, PK 450-14
125	125387	Additional lower rear panel
126	124726	Screw bag, common parts
127	124727	Screw bag, variable parts CS11
128	124728	Screw bag, variable parts CS13
<b>Control panel</b>		
112	100004380	Standard panel - S3
112	100004381	R control panel

## Appendix

### Information on space heater systems

# Contents

<b>1</b>	<b>Specific information</b>	<b>3</b>
1.1	Recommendations	3
1.2	Technical data	3
1.3	Disposal and Recycling	4



# 1 Specific information

## 1.1 Recommendations


**Note**

Only qualified persons are authorised to assemble, install and maintain the installation.

## 1.2 Technical data

Tab.1 Technical parameters for boiler space heaters

			PK450-8	PK450-9
Condensing boiler			No	No
Low-temperature boiler <sup>(1)</sup>			Yes	Yes
B1 boiler			No	No
Cogeneration space heater			No	No
Combination heater			No	No
<b>Rated heat output</b>	$P_{rated}$	kW	310	370
Useful heat output at rated heat output and high temperature regime <sup>(2)</sup>	$P_4$	kW	310.0	370.0
Useful heat output at 30% of rated heat output and low temperature regime <sup>(1)</sup>	$P_1$	kW	88.6	88.5
Useful efficiency at rated heat output and high temperature regime <sup>(2)</sup>	$\eta_4$	%	86.9	87.0
Useful efficiency at 30% of rated heat output and low temperature regime <sup>(1)</sup>	$\eta_1$	%	90.4	90.7
<b>Auxiliary electricity consumption</b>				
Full load	$el_{max}$	kW	1.006	1.006
Part load	$el_{min}$	kW	0.493	0.493
Stand-by	$P_{SB}$	kW	0.006	0.006
<b>Other characteristics</b>				
Standby heat loss	$P_{stby}$	kW	0.306	0.318
Emissions of nitrogen oxides	NO <sub>x</sub>	mg/kWh	136	150
<b>Technical parameters obtained in association with the following burner:</b>			OES 355 LZ	OES 441 LZ
(1) Low temperature means for condensing boilers 30°C, for low temperature boilers 37°C and for other heaters 50°C return temperature (at heater inlet). (2) High temperature regime means 60°C return temperature at heater inlet and 80°C feed temperature at heater outlet.				



**See**

Technical parameters pertaining to the countries listed in paragraph 3.3.1 of the manual.



**See**

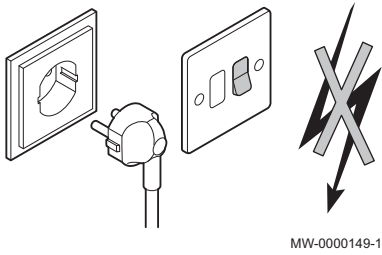
The back cover for contact details.

### 1.3 Disposal and Recycling

Fig.1 Recycling



Fig.2 Cutting the mains supply



**Warning**

Removal and disposal of the boiler must be carried out by a qualified installer in accordance with local and national regulations.

Proceed as follows to dismantle the boiler:

1. Cut the electrical power to the boiler.
2. Close the fuel supply device upstream of the boiler.
3. Disconnect the cables on the electrical components.
4. Close the water mains.
5. Drain the installation.
6. Remove the air vent hose above the siphon.
7. Remove the siphon.
8. Remove the air/flue gas pipes.
9. Disconnect all pipes on the underside of the boiler.
10. Scrap or recycle the boiler.



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